NI 43-101 Technical Report Feasibility Study

James Bay Lithium Project Québec, Canada

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Effective Date: January 11, 2022
Issue Date: January 11, 2022

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NI 43-101 Technical Report Feasibility Study – James Bay Lithium Project

Revision 00

Québec, Canada

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Table of Contents

List of Figures

List of Tables

1 EXECUTIVE SUMMARY

1.1 Introduction

G Mining Services Inc. ("GMS") was retained by Galaxy Lithium (Canada) Inc. (the "Company" or "Galaxy") to produce a Feasibility Study (the "FS" or "Study") for the James Bay Lithium Mine Project ("the Project") located in the Nord-du-Québec administrative region in the Eeyou Istchee James Bay territory and to prepare an independent technical report ("the Report") in accordance with the Canadian National Instrument 43-101 ("NI 43-101") Standards of Disclosure for Mineral Projects to support the results of the FS and the Mineral Resource Estimate ("MRE"). The purpose of this independent technical report is to support the disclosure of Mineral Reserves and Mineral Resources at the James Bay Mine as of October 8, 2021.

1.2 Project Description and Scope

The Project is in the Nord-du-Québec administrative region of Québec. Galaxy is proposing to develop a lithium mine, located along the Billy Diamond Highway (previously the James Bay Road or Route de la Baie James), near the "Relais Routier km 381" Truck Stop.

The Project site will include:

- Open pit mine
- Process plant (crushing & reclaim, dense medium separation ("DMS") building)
- Concentrate storage facility
- Four Waste Rock and Tailings Storage Facilities ("WRTSF")
- Overburden and Peat Storage Facility ("OPSF")
- Two Water Management Ponds ("WMP") and a Plant Water Management Pond
- Run-of-Mine ("ROM") pad
- Support infrastructure including a temporary construction and operation camps as well as a main 69 kV electrical sub-station connected to a Hydro-Quebec power line.

The concentrated ore (spodumene) will be trucked to a transfer site located in Matagami, which is owned and operated by the municipality. The spodumene concentrate will then be loaded onto trains and transported to the Trois-Rivieres port facility.

1.2.1 Project Proponent

Galaxy is a wholly owned subsidiary of Orocobre Limited ("Orocobre"), a company listed on the Australian Securities Exchange ("ASX"). Orocobre merged with Galaxy Resources Limited on August 25, 2021. Orocobre is a leading producer and developer of lithium with several world-class growth projects in Australia, Argentina and Canada. Orocobre is a proven and experienced producer of lithium concentrate as demonstrated by the success of its Mt. Cattlin operation in Western Australia. The Canadian head office (and project office), contact information is as follows:

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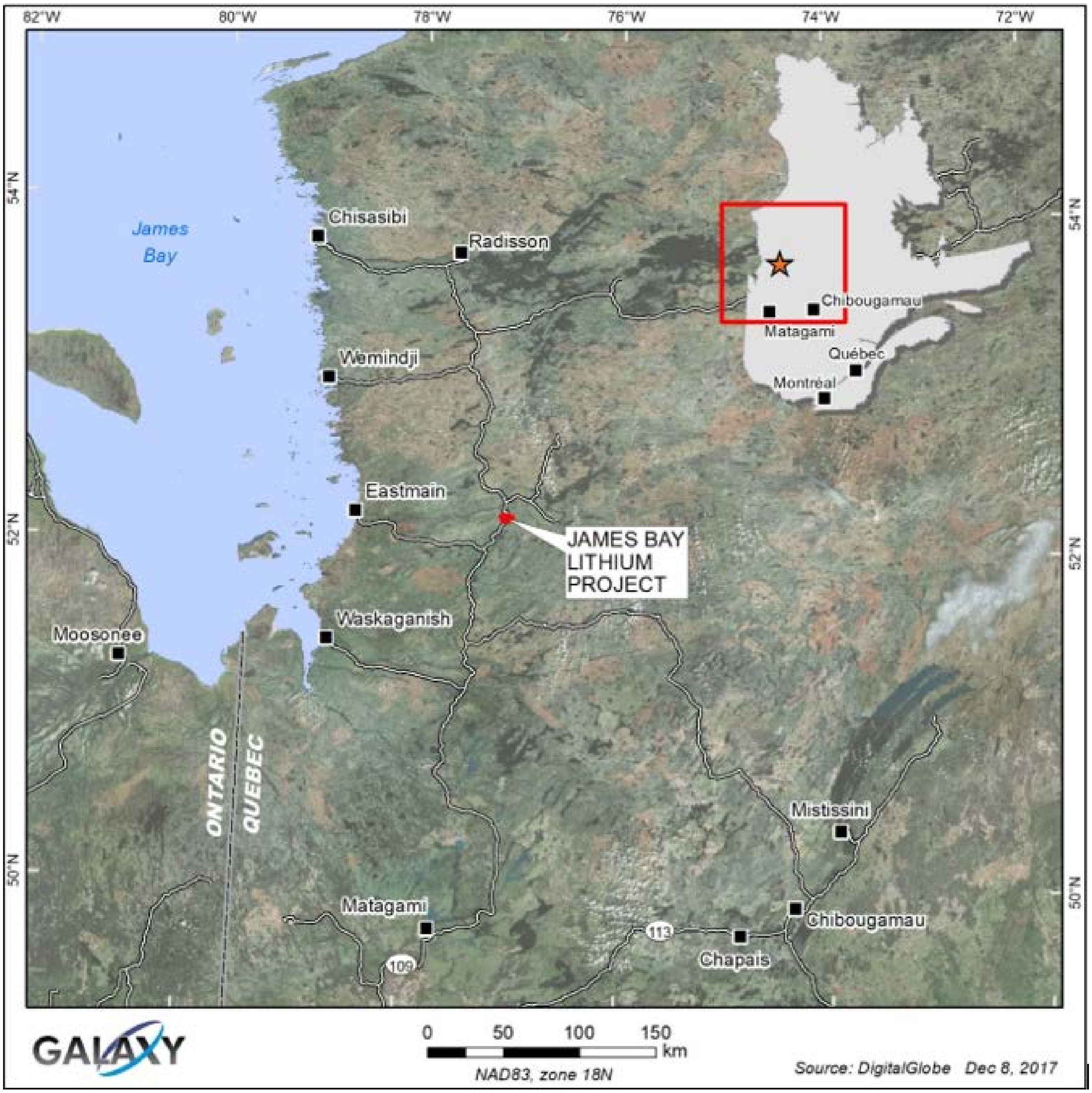
w: https://gxy.com/james-bay-community/ Québec enterprise number (NEQ): 1167071928

1.3 Property Description and Ownership

The Project is located in the Nord-du-Québec administrative region, approximately 10 km south of the Eastmain River and 130 km east of James Bay and the Cree Nation of Eastmain community as show in Figure 1.1. The property is located on Category III lands of the James Bay and Northern Québec Agreement ("JBNQA"). The follow are sites geographical coordinates in the NAD83, UTM, zone 18N system: X: 358,891 and Y: 5,789,180.

Figure 1.1: Project Location



The Project lands, subject to mining claims are easily accessed by the Billy Diamond Highway, which connects the communities of Matagami and Radisson. This road crosses the Project property 382 km north of Matagami, close to the Truck Stop at km 381. The truck stop is managed by the Société de Développement de la Baie James ("SDBJ").

The property is comprised of 54 contiguous mining titles that cover an area of approximately 2,164 ha. The centre of the property is located at approximately 52.24 degrees latitude north and 77.07 degrees longitude west. These 54 claims will expire between June 12, 2022, and June 20, 2023.

Although they can be renewed for an additional two years, an application for a mining lease under Section 100 of the Mining Act (R.S.Q. c. M-13.1) will be filed for the operation of a mine and process plant with an annual production capacity of 2,000,000 tonnes of ore. This application will be submitted to Québec's Ministère de l'Énergie et des Ressources naturelles ("MERN").

Wholly owned subsidiaries of Orocobre, including the Project promoter, Galaxy, are the holders of the mining claims currently comprising the mining property of the Project.

On July 4, 2012, Orocobre, through its wholly owned subsidiaries, Galaxy Lithium (Canada) Inc. and Galaxy Lithium (Ontario) Inc., successfully completed a CAD 112M merger with Lithium One Inc. ("Lithium One"), acquiring 100% of the Project as between the two subsidiaries. In October 2018, this holding was amended by Deed of Transfer to reflect the current holding of 49% Galaxy Lithium (Ontario) Inc. and 51% Galaxy Lithium (Canada) Inc.

Lithium One had previously entered three option agreements between March 2008 and June 2009; the status of these agreements remain unchanged since Galaxy's acquisition of the company. They are summarized as follows.

- On March 29, 2008, Lithium One entered into an option agreement with SDBJ and four arm's length Optioners to acquire a 100% interest in the Cyr Lithium Prospect. The terms of the agreement included a 2% net smelter return ("NSR") royalty, of which Lithium One can purchase half (or 1%) of this royalty for CAD 1.0M. Lithium One fully exercised its option to complete the acquisition of the Cyr Lithium Prospect on November 2, 2010 with a final payment of CAD 2.5M and CAD 500,000 in common shares to SDBJ. The vendors retain a 2% NSR interest.
- On May 14, 2009, Lithium One entered into an option agreement with Jacques Frigon and Gérard Robert. The terms of the agreement included a 1.5% NSR on the Project. Lithium One will have the right to repurchase at any time one third (or 0.5%) of this royalty for a cash payment of CAD 500,000.
- On June 9, 2009, Lithium One entered into an agreement with Ressources d'Arianne Inc. The terms of the agreement included that the vendors retain a 1.5% NSR of which one third (0.5%) can be purchased by Lithium One for a cash payment of CAD 500,000.

On March 18, 2019, a Preliminary Development Agreement ("PDA") was signed with the Cree Nation of Eastmain, Grand Council of the Cree and Cree Nation Government. This PDA is to be replaced by an Impact Benefit Agreement (IBA) before construction is initiated. The IBA is currently in negotiation between the relevant parties, reflecting the PDA requirements.

1.4 Geology and Mineralization

The Project is in the northeastern part of the Superior Province. It lies within the Lower Eastmain Group of the Eastmain greenstone belt, which consists predominantly of amphibolite grade mafic to felsic metavolcanic rocks, metasedimentary rocks and minor gabbroic intrusions.

The property is underlain by the Auclair Formation, consisting mainly of paragneisses of probable sedimentary origin which surround the pegmatite dikes to the northwest and southeast. Volcanic rocks of the Komo Formation occur to the north of the pegmatite dikes. The greenstone rocks are surrounded by Mesozonal to catazonal migmatite and gneiss. All rock units are Archean in age.

The pegmatites delineated on the property to date are oriented in a generally parallel direction to each other and are separated by barren host rock of sedimentary origin (metamorphosed to amphibolite facies). They form irregular dikes attaining up to 60 m in width and over 200 m in length. The pegmatites crosscut the regional foliation at a high angle, striking to the south-southwest and dipping moderately to the west-northwest.

Spodumene is the principal source of lithium found at the Project. Spodumene is a relatively rare pyroxene that is composed of lithium (8.03% Li_2O), aluminium (27.40% Al_2O_3), silicon (64.58% SiO_2) and oxygen (51.59% O). It is found in lithium rich granitic pegmatites, with its occurrence associated with quartz, microcline, albite, muscovite, lepidolite, tourmaline and beryl.

1.5 Sampling Method, Approach and Analysis

Galaxy used sampling procedures that meet generally accepted industry best practices. All sampling was conducted by appropriately qualified personnel under the direct supervision of appropriately qualified geologists. Assay samples were collected from half core sawed lengthwise on nominal 1.5 m intervals, honoring geological boundaries. In 2017, Galaxy collected 9,186 core samples from 157 boreholes totaling 33,339 m.

Samples were shipped to ALS Minerals in Val-d'Or for preparation and analyses. The laboratory is accredited ISO/IEC 17025:2005 by the Standards Council of Canada for various testing procedures.

Galaxy relied partly on the internal analytical quality control measures implemented at ALS Minerals. In addition, Galaxy implemented external analytical quality control measures consisting of using control samples (field blanks, in-house standards and field duplicates) inserted with batched samples submitted for certain holes in 2017. A comprehensive reanalysis of pulps was completed in 2021 to compare the 4-

acid digestion with a sodium-peroxide fusion. The results were very similar and supported the previous analyses.

1.6 Data Verification

Galaxy implemented a series of industry standard routine verifications to ensure the collection of reliable exploration data. Documented exploration procedures exist to guide most exploration tasks to ensure the consistency and reliability of exploration data. In accordance with the NI 43-101 guidelines, GMS visited the Project during the period of June 14th to June 17th, 2021. At the time of the visit no drilling was taking place. The purpose of the site visit was to ascertain the geological setting of the Project, witness the extent of exploration work carried out on the property and assess logistical aspects and other constraints relating to conducting exploration work in the area.

GMS conducted a series of routine verifications to ensure the reliability of the electronic data provided by Galaxy. These verifications include auditing the electronic data against original records. No significant errors were found in the electronic data provided by Galaxy. In addition, GMS validated several collar coordinates against the database value.

GMS reviewed the assay results for the external quality control samples from the 2017 drilling program. In general, the analytical quality control data supports that lithium grades can be reasonably reproduced, suggesting that the assay results reported by the primary assay laboratory are generally reliable for the purpose of resource estimation.

1.7 Mineral Processing and Metallurgical Testing

SGS Canada Inc. ("SGS") and Nagrom were contracted in 2011 and 2018 respectively to undertake metallurgical testwork programs. SGS's scope was to undertake preliminary gravity separation testwork on a single composite sample. Nagrom's testwork was divided into two phases, with the first phase evaluating several composite samples and the second phase devoted to the testing of composites samples expected to be processed in "Early Years" and "Mid/Later Years" related to the original mine plan/schedule.

Flowsheets for the lithium beneficiation were developed in conjunction with the testwork programs with the flowsheet evolving as more results were received and evaluated. The target was to produce a concentrate containing at least 6.0% Li_2O and no more than 1% Fe_2O_3.

The results from the testwork program at SGS indicated that the heavy liquid separation ("HLS") and dense medium separation ("DMS") testwork results were similar with a 75% recovery of Li_2O achieved at a concentrate grade of 6.5%. The rejected material via DMS floats was relatively low at 8% of total contained Lithia.

Phase 1 testwork program at Nagrom examined multiple composites and used different crusher product screen sizes. The overall DMS recoveries achieved were 56.5% for the coarse DMS and 87.5% for the fines DMS, however the target concentrate grade of 6.0% Li_2O was not reached.

Further testwork was then undertaken with re-crushing to 4 millimetres (mm) on the coarse secondary DMS floats material resulting in an improvement of concentrate grade of 6.0% Li_2O. It was also noted that there was a large difference between the HLS and DMS results for the same samples. This led to a requirement for further investigation and a second phase of testwork was instigated at Nagrom.

The following three composites were formed and tested in the Phase 2 Nagrom testing program representing plant feed materials during nominal early, mid, and later years of processing.

A total DMS recovery of 85.8% at a Li_2O grade of 6.0% was achieved for the Early Years composite. This result has been scaled using operating data from Mt Cattlin and other operations in Western Australia, therefore the predicted actual overall plant recovery and grade was reduced to 66.5% and 6.0% respectively.

The DMS results for the "Mid Years/Later Years" composites were lower than that achieved for the "Early Years" composite with a total DMS lithia recovery of 79.9% at an achieved grade of 5.9%. These results were also scaled using operating data from Mt Cattlin and other operations in Western Australia to 61.9% recovery at a product grade of 5.9% Li_2O.

Modifying factors including particle size distribution, larger diameter cyclones used in the operating plant, dense medium contamination as well as operating data from other spodumene plants were used to determine performance on a full-scale plant. Recovery scale-up factors of 0.85 for Early Years and 0.82 for Mid and Late Years were used for James Bay.

The basis of design for the processing plant will be to produce 6.0% Li_2O and engineering was performed on that basis. Process plant design always include a design allowance allowing to operate the process plant within a normal range of operation condition (higher or lower) based on market condition.

Following the recent changes in the lithium market, the modelled operating parameters of the James Bay processing plant has been flexed to produce a final product grade of 5.6% Li_2O, as this will improve the economics of the project by improving the overall plant recovery to 71.2% and 66.5% for Early Years and

Mid/Later Years ores (related to the original mine schedule) respectively. These increased recovery targets have been estimated using Mt Cattlin LIMN modelling which provides grade-recovery curves based on head grade. The changes have been incorporated into the process design criteria (PDC) and mass balance. Plant design changes are anticipated to be minimal and will not materially affect the capital cost and operating cost estimates at this FEED Phase of the Project. Any potential design changes will be reviewed/addressed during the next Phase of the Project.

1.7.1 Core Samples (Pegmatite Deposit)

A single ore sample weighing 14,690 kg grading 1.51% Li_2O was sent to SGS for testing.

Some 400 kg of drill core samples were sent to Nagrom in 2017 for Phase 1 testing. The Li_2O (lithia) assays of the tested composite samples ranged from 0.9% to 1.8% Li_2O. Samples were composited based on pegmatite zone and grouped by depth (typically 0 – 100 m or 100 – 200 m). The samples represent an average composite.

A total of 4,643 kg of Early Years, 1,751 kg of Mid-Years and 1,760 kg of Later years samples were sent to Nagrom for testing.

1.8 Mineral Resource Estimate

The mineral resource model was originally released by Galaxy in December 2017 and was validated by GMS. The mineral resource model considers 102 core boreholes drilled by Lithium One during the period of 2008 to 2009, 53 channel samples collected by Lithium One in 2009 and 2010, and 157 core boreholes drilled by Galaxy in 2017. The resource estimation work has been verified by James Purchase P. Geo of G Mining Services (OGQ #2082), who is an independent Qualified Person as defined in NI 43-101. The effective date of the Mineral Resource Statement is December 4, 2017.[1] No new material technical or scientific information has been added to the project since the release of the mineral resource. The QP also confirms that the mineral resource has been prepared in compliance with the JORC Code (2012).

In the opinion of GMS, the resource evaluation reported herein is a reasonable representation of the global lithium oxide (Li_2O) mineral resources found in the Project at the current level of sampling. The mineral

[1] SRK Consulting (Canada) Inc. produced the James Bay Lithium Mine Project mineral resource as compliant with the requirements of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC). See the Australian Securities Exchange announcement entitled "James Bay Resource Update" dated December 4, 2017, available to view on www.gxy.com and www.asx.com.au.

resources have been estimated in conformity with generally accepted CIM Estimation of Mineral Resource and Mineral Reserves Best Practices Guidelines and are reported in accordance with the Canadian Securities Administrators' NI 43-101.

The database used to estimate the Project Mineral Resources was validated by GMS. GMS is of the opinion that the current drilling information is sufficiently reliable to interpret with confidence the boundaries for Li_2O mineralization and that the assay data are sufficiently reliable to support mineral resource estimation.

Based on core drilling data, surface geology mapping and outcrop channel sampling provided by Galaxy, a three-dimensional model was completed for the main pegmatite dikes. The three-dimensional model honours drilling data. The bodies were modelled from logged pegmatite intervals, not Li_2O grades, as implicitly derived intrusions, or vein contact surfaces in Leapfrog Geo software (version 4.0.1). The resulting geological model incorporates 18 pegmatite dikes. Sixteen pegmatite bodies were created as intrusion contact surfaces with a spheroidal interpolant, while two smaller pegmatites (550 and 850) were created with the vein modelling tool within the boundaries defined by hanging wall and footwall surfaces.

The overburden material was also modelled, consisting of glacial till, using the logged drill intervals and mapped outcrops. The three-dimensional model is clipped to a topography surface created from a Lidar survey provided by Galaxy.

Borehole assays were extracted for each of the 18 pegmatite dikes and examined for determining an appropriate composite length. Block model cell dimensions and anticipated open pit mining methods were also considered in the selection of the composite length. A modal composite length of 1.5 m was applied to all data. No capping was applied on the analytical composite data. Any unsampled intervals were assigned a value of 0% Li_2O. From the 8,624 samples extracted, 7,954 composites were generated honouring the pegmatite dike boundaries.

Criteria used in the selection of block size included the borehole spacing, composite assay length, the geometry of the modelled zones, and the anticipated open pit mining technique. In collaboration with Galaxy, GMS chose a block size of 10 x 3 x 10 m. Subcells, at 0.25 m resolution, were used to honour the geometry of the modelled pegmatite dikes. Subcells were assigned the same grade as the parent cell. The model is rotated on Z to be parallel to the general trend of the pegmatite dikes.

Li_2O grade estimation used ordinary kriging and four passes informed by capped composites. The first pass was the most restrictive in terms of search radii and number of boreholes required. Successive passes usually populate areas with less dense drilling, using relaxed parameters with generally larger search radii and less data requirements.

For the first estimation pass, composites from at least two boreholes informing at least seven of the search ellipsoid octants were necessary to estimate a block. This pass also used restrictive octant search options, but only five octants were required. Because of their distinct geological identity, each pegmatite dike was estimated independently using a hard boundary.

Block model quantities and grade estimates for the Project were classified according to the CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014).

GMS is satisfied that the geological modelling honours the current geological information and knowledge. The location of the samples and the assay data are sufficiently reliable to support resource evaluation. The sampling information was acquired primarily by surface channel sampling and core drilling on sections spaced at 25 to 50 m. The 18 modelled intrusive pegmatite dikes were investigated by several boreholes, providing sampling to approximately 25 to 40 m spacing. Most pegmatite dike domains have been sampled by a sufficient number of boreholes to model the spatial variability of Li_2O. Accordingly, all block estimates within the conceptual pit shell have been classified as Indicated.

GMS considers that the Li_2O mineralization in the Project is amenable to open pit extraction. In collaboration with Galaxy, GMS considered the pit optimization assumptions listed in Table 1.1 to select appropriate reporting assumptions. The conceptual open pit shells were not restricted by any existing surface infrastructure. Upon review, GMS considers that it is appropriate to report the James Bay mineral evaluation at a cut-off grade of 0.62% Li_2O. Insufficient material below the conceptual open pit shell is present to support an underground evaluation.

Mineral resources are not mineral reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the mineral resources will be converted into mineral reserve. GMS is unaware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, and political or other relevant issues that may materially affect the mineral resources.

Table 1.1: Mineral Resource Statement, James Bay Lithium Project, effective November 23, 2017

Resource Category	Quantity (t)	Grade Li_2O (%)
Indicated	40,330,000	1.40

Notes:

1. Mineral Resources are reported at a cut-off grade of 0.62% Li2O inside a conceptual pit shell optimized using spodumene concentrate price of USD 950 per tonne containing 6.0% Li2O, metallurgical and process recovery of 70%, overall mining and processing costs of USD 55 per tonne milled and overall pit slope of 50 degrees.
2. All figures rounded to reflect the relative accuracy of the estimates.
3. Mineral resources are not mineral reserves and do not have demonstrated economic viability

4. The effective date of the mineral resource is November 23, 2017
5. The independent and qualified person for the MRE is Mr. James Purchase, P.Geo or G Mining Services Inc.

There are no adjacent properties that are considered relevant to this Technical Report.

1.9 Mineral Reserves Estimate

Table 1.2: James Bay Project Open Pit Mineral Reserve (October 8, 2021)

	Crude Ore Tonnage	Crude Lithium Grade
	k dmt	% Li_2O
Proven	0	0
Probable	37,207	1.30
Proven + Probable	37,207	1.30

Notes:

1. *CIM Definitions Standards on Mineral Resource and Reserves (2014) were followed.*
2. *Effective date of the estimate is October 8, 2021.*
3. *Mineral Reserves are estimated using the following long-term metal prices (Li_2O Conc = USD 950/t Li_2O at 6.0% Li_2O) and an exchange rate of CAD/USD 1.33.*
4. *A minimum mining width of 5 m was used.*
5. *Cut-off grade of 0.62% Li_2O.*
6. *Bulk density of ore is variable, outlined in the geological block model and average 2.7 g/t.*
7. *The average strip ratio is 3.54:1.*
8. *The average mining dilution factor is 3.0% at 0.38% Li_2O.*
9. *Numbers may not add due to rounding.*

The Mineral Reserve Estimate was prepared by GMS. The mine design and Mineral Reserve have been completed to a level appropriate for feasibility studies. The Mineral Reserve stated herein is consistent with the CIM definitions (2014) and is suitable for public reporting. As such, the Mineral Reserves are based on Measured and Indicated Mineral Resources which were considered for optimization purposes with mining dilution factors applied. The Mineral Reserve does not include any Inferred Mineral Resources which were classified as waste for reporting purposes.

GMS regularized the resource block model to 5 m x 3 m x 5 m. The density and the Li_2O grade were calculated using a weighted mass average while the domain and class were estimated using the value with the largest volume. The James Bay Project uses a diluted cut-off grade of 0.62% Li_2O.

Open pit optimization was conducted in GEOVIA Whittle™ to determine the optimal economic shape of the open pit with pit slopes according to Petram Mechanica feasibility level pit slope design study. The conclusions of this study have been used as an input to the pit optimization and design process.

A mining dilution assessment was made by evaluating the number of contacts for blocks above an economic cut-off grade (“CoG”). The block contacts are then used to estimate a dilution skin around ore blocks to estimate an expected dilution during mining. The dilution skin consists of 0.75 m of material in a north-south direction (across strike) and 0.75 m in an east-west direction (along strike). The dilution is therefore specific to the geometry of the ore body and the number of contacts between ore and waste.

The Mineral Reserve for the James Bay Project is estimated at 37.2 Mt, at an average grade of 1.3% Li_2O. The Mineral Reserve (“MR”) was prepared by GMS as of October 8, 2021.

1.10 Mining Methods

The pegmatite deposit will be mined by conventional open pit methods. All material will require drilling and blasting and will be removed using mining excavators and haul trucks.

The slope angles used in the pit design were based on results of geotechnical investigation and lab results that were analyzed as listed below:

- Nominal face height of 20 m (double benched 10 m-high benches)
- Bench face angle of 75° for in-situ rock material
- Berm widths of 9 m
- Additional geotechnical berms of 20 m were included in the central portions of JB2 of the design in sections of the pit walls with elevation differences greater than 120 m between ramps

The preliminary pit design extends approximately 2 km NW/SE along strike of the pegmatite mineralization and has an average width of 500 m. The design is divided into three areas, labelled JB1, JB2 and JB3. JB2 is the deepest portion of the pit at 260 m. Depth for JB1 is at 160 m and for JB3 at approximately 170 m.

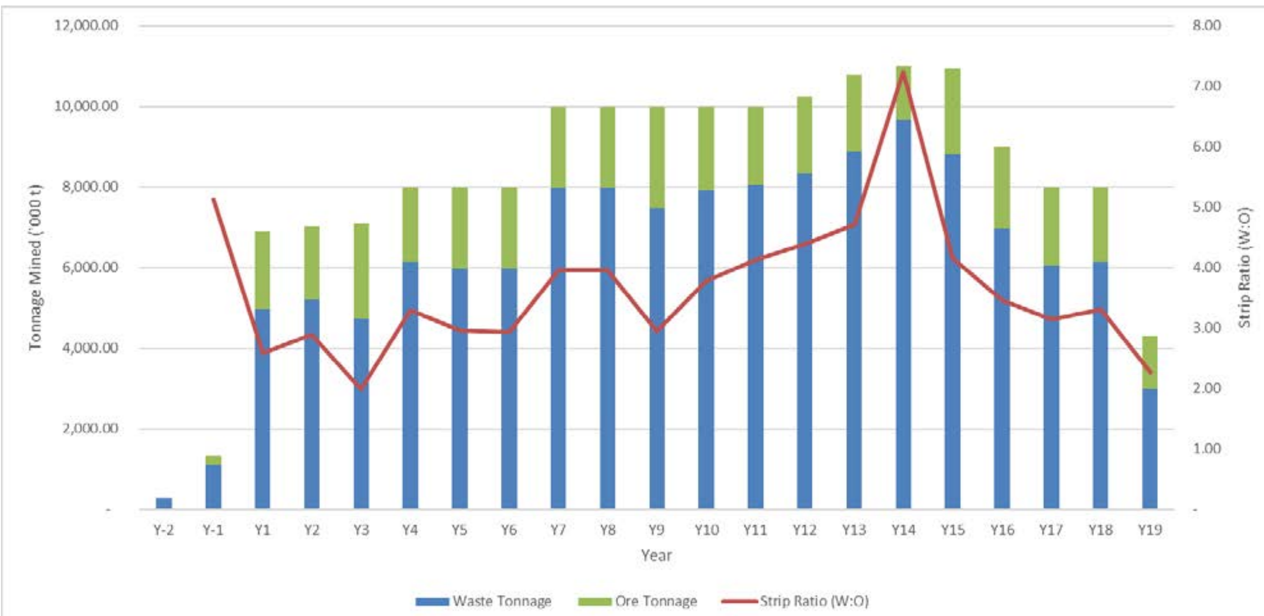
The open pit is planned to be sequenced and scheduled utilizing phased pits to enable a smooth transition of lower waste stripping during the initial years of production with a gradual increase later in the mine life. Overburden and topsoil material will be trucked to an overburden stockpile. Waste rock will be hauled to the multiple Waste Rock Tailings Storage Facility (“WRTSF”) and ROM Feed ore will be hauled to the ROM pad, located to the northeast of the pit.

Grade control will be applied for maintaining feed quality. Grade control is proposed to be accomplished through blast pattern design, mining direction method and in-field sample collection.

Explosive products and blasting accessories will be provided by a third-party contractor who will be responsible for the storage on site and delivery of these products to the drill hole. This contractor will also supply a magazine for blasting caps and accessories and a separate magazine for boosters and packaged explosive products.

The project basis of design is for 2.0 million tonnes (Mt) of concentrator feed annually. The life-of-mine ("LOM") plan has been scheduled using annual increments. The LOM schedule covers approximately 18.75 years of production with 131.7 Mt of waste rock, 5.6 Mt of overburden, and 37.2 Mt of ROM Feed ore for a total of 168.9 Mt of material mined. The average strip ratio for the LOM plan is 3.54:1. Figure 1.2 states the mine plan tonnages by year, based on the preliminary mine plan / LOM schedule.

Figure 1.2: Mine Production Schedule



Mining Services

Source : GMS, 2021

Year -2 and Year -1 (pre-production period) will have no mill operation and all ore generated will be stockpiled and rehandled during production years. Pre-production years prioritize waste to use as construction material and to ease access to ore in production years, thus reducing the rehandle required.

Site preparation including logging, clearing, grubbing and peat/topsoil removal will occur during the construction phase (Year -2 and Year -1), in advance of the concentrator commissioning. These activities will be required within the footprint of the pit and will be conducted by a third-party contractor. These activities will take place in the pre-production period with adequate areas cleared to support five years of production.

Surface mining equipment requirements are based on mining 10 m benches. Conventional excavator and truck fleet are sized to meet the planned tonnage requirements to feed the concentrator at 2 Mtpa. The same haul trucks will transport tailings from the plant to the proposed WRSTF as well as transporting waste rock directly to the WRTSF. The number of excavators, haul trucks and drills are based on the annual production values from the current mining schedule. The primary equipment fleet estimate includes:

- One 6.3-m^3 bucket, diesel hydraulic excavator (backhoe configuration)
- One 8.3-m^3 bucket, electric hydraulic shovel (front-shovel configuration)
- Up to nine 100-t rigid frame haul trucks
- Three 10.7-m^3 front end loader (FEL)
- Two drills (4-8”), one for production and one for pre-splitting and production support

Secondary equipment will be used to support the production fleet. The secondary equipment fleet includes:

- Three track dozers
- One-wheel dozers
- Two (14 ft) graders
- One water (34 kl) truck/sanding truck is required on each shift

The personnel requirements are based on two Fly-In, Fly-Out (“FIFO”) rosters: four days on / three days off for the senior staff positions and local community members, and 7 days on / 7 days off rotation for the rest of the workforce. Each on-site crew will be assigned to work night or day shift. The mine workforce peaks at 146 individuals in Year 4.

1.11 Recovery Methods

The process design is based on the concentration of spodumene mineralization from the mine to a beneficiated concentrate of 6.0% Li_2O. The selected process is similar to that currently being utilized at Orocobre’s Mt. Cattlin mining operation in Australia which comprises a similar flowsheet based on crushing and DMS.

Metallurgical modelling predicts an improvement in recovery of approximately 6% and increase in final product tonnage of approximately 18% at a lower 5.6% Li_2O final product grade. This equates to approximately 12% increase in revenue at the current spodumene concentrate prices.

Test work recoveries were used to develop actual plant operating recoveries and indicate that a recovery of 66.5% in the early years and 61.9% in later years (related to the original mine schedule) is achievable for a spodumene concentrate containing 6.0% Li_2O. LIMN modelling from Mt Cattlin production data indicates that a recovery of 71.2% in the early years and 66.5% in later years (related to the original mine schedule) is achievable for a spodumene concentrate containing 5.6% Li_2O.

The processing plant includes the following sub processes:

- Three stage crushing circuit and crushed ore stockpile
- DMS plant
- Tailings dewatering and loading system for hauling to WRTSF
- Water, air and ancillary services
- Spodumene concentrate stockpile and dispatch system

Crushing Circuit

The ROM ore is fed to the three-stage crushing plant consisting of a primary jaw crusher, a secondary cone crusher and tertiary cone crusher. These crushers, combined with two double-deck sizing screens, produce a crushed product which is all less than 15 mm and is stored in a covered primary ore stockpile.

DMS Plant

The primary ore is reclaimed from the stockpile and fed in a controlled manner by vibrating feeders and a reclaim conveyor to the DMS plant. Ahead of the DMS is a sizing screen, with a top deck of 4 mm and a 1 mm bottom deck which removes the fines (- 1 mm) material which is sent to the tails dewatering section for disposal.

Prior to feeding the DMS cyclones, the crushed ore is mixed with a ferrosilicon (FeSi) slurry, which acts as a densifying medium to enhance the gravity separation of the spodumene from lower density gangue minerals.

DMS cyclone overflow streams are dewatered over a series of screens from where the FeSi is also recovered for re-use in the process. These dewatered waste products are then conveyed to the tailings loadout facility.

The DMS cyclone underflow, containing the high SG minerals, are also dewatered over a series of screens from where the FeSi is recovered in the screen undersize and a magnetic recovery process. The primary underflow product is screened to produce a coarse (-15 +4 mm) and fine (-4 +1 mm) product.

The primary coarse underflow product will report to the Secondary Coarse DMS cyclones where the process is repeated in order to achieve the target concentrate grade. After processing, the concentrate is conveyed to the product stockpile from where it is transported to the customers.

For recovery enhancement, the oversize from the secondary floats screen is re-crushed using a cone crusher. After removal of the minus 1 mm material, which is sent to the tailings treatment area, the oversize is processed through the re-crush DMS plant which follows the same process as the primary and secondary DMS circuits.

The plant also incorporates a secondary fine DMS for re-processing of the Primary fine underflow product from the primary DMS circuit. This material is processed through a fine DMS cyclone with underflow screened and oversize reporting to the final product. Screening recovers the FeSi slurry for re-use and the effluent from the FeSi magnetic separators sent to the tailing's treatment area.

The following are the utilities and consumables that are required to operate the processing plant:

- Process make-up water
- Potable water
- Electrical power
- Consumables as required for operation of the crushing and DMS plants
- Ferrosilicon, lime, and flocculant

1.12 Project Infrastructure

The following infrastructure facilities are planned for the Project:

- 69 kV Main-substation
- Administrative and laboratory building

- Operations camp
- Workshop and reagent buildings
- Propane storage and distribution facility
- Diesel storage and distribution facility
- Truck-shop including a Wash-bay
- Cold dome warehouse for the storage of critical parts
- Water treatment plant (effluent)
- Potable water treatment plant
- Sewage treatment plant

Operational personnel will be housed on-site. Planned permanent accommodations will be sufficiently sized and will include back-up power generation, potable water storage and distribution and waste-water treatment and disposal. Raw water from suitably selected wells will be sourced and treated for potable water requirements.

The process plant and supporting infrastructure will be powered by Hydro-Québec's 69 kV overhead distribution system. The 69 kV distribution line is relayed through Hydro-Québec's Muskeg substation and ultimately fed by the Némiscau substation located roughly 100 km southwest of the Project site. An overhead distribution line extension will be built to the plant substation from the 69 kV line (L-614) located 10km south of the Project site. The 69 kV power supply is limited by a capacity of 8 MVA due to the sensitivity of the network and distance from the supplying substation.

All essential power loads will be supported with emergency power supply available from the emergency diesel generators, in the event of loss of grid power supply.

A propane storage, unloading and distribution facility will be installed to supply propane gas to the camp and kitchen. This facility will supply propane for the accommodation facilities' heating and cooking requirements.

Suitable diesel storage, unloading and distribution facilities will be installed to provide uninterrupted diesel fuel supply to the operations and maintenance fleet and equipment.

Additionally, communication facilities will need to be developed as the site is not currently serviced by cellular data or fiber optics.

The site infrastructure will include:

- ROM pad and stockpile
- Crushed Ore stockpile
- Four Waste Rock and Tailings Storage Facilities (“WRTSFs”)
- Overburden and Peat Storage Area (“OPSF”)
- Two Water Management Ponds (“WMPs”) and a Plant Water Management Pond
- Contact water ditches and non-contact diversion water ditches
- Fine and coarse tailing warehouse building
- Spodumene concentrate warehouse facility
- Emulsion & explosive storage and distribution facility

The tailings warehouse and spodumene concentrate warehouse will be located adjacent to the process plant.

All storage areas were selected to minimize their environmental impact. A surface drainage network will be built to divert non-contact water from the ROM pad and stockpile, WRTSF, OPSF stockpiles and process plant. A similar drainage network will be used to manage the surface water run-off (contact) for all disturbed land. A pumping system with heat traced pipe will be installed.

All on-site work and locations of the various infrastructure and buildings will comply with the required minimal setback distance of 60 m from the high-water line of any lake or watercourse.

1.12.1 Off-site Infrastructure

1.12.1.1 Air Transport

The Eastmain airport (130 km from site) will be used to transport workers from southern Québec. Galaxy is in discussions with Transport Canada with respect to regulations and permits for operating equipment upgrades/installations, such as de-icing equipment and a fueling station. Instrumentation upgrades and procedures need upgrading to mitigate flight cancellations due to bad weather.

OWNERSHIP/GOVERNANCE

The airport is the property of Transport Canada, which offers advantages in terms of quality and maintenance with respect to new installations.

Transport Canada has awarded a five-year contract to the Cree Nation of Eastmain Council for management of the airport. The land on which the airport is built is designated as a Category I ancestral land by the James Bay and Northern Québec Agreement, which reserves the land to the exclusive use and benefit of the Cree population. Negotiations with the community will be required prior to installing new infrastructure or any airport upgrades.

Galaxy continues discussions with Transport Canada and the Crees to analyses the requirements for any necessary upgrades.

FLIGHT OPERATIONS

The gravel apron tarmac covering approximately 3,700 m^2 can accommodate, with some limitations, two Dash 8–100 aircrafts at a time, allowing Galaxy flights to transit concurrently with commercial flights. The runway is 1,067 m long and 30 m wide and can readily accommodate Dash 8–100 type aircraft (37 passengers). Under certain circumstances, it can accept Dash 8–300 types (52 passengers), provided several conditions are met and evaluated before the flight, including weather, temperature, runway conditions and the loaded weight of the aircraft.

The following additional support equipment will be required: de-icing equipment, ground power units and fueling facilities (to avoid a refueling stop).

1.13 Market Studies and Contracts

1.13.1 Market Studies

Lithium is the lightest and least dense solid element in the periodic table with a standard atomic weight of 6.94 u. In its metallic form, lithium is a soft silvery-grey metal, with good heat and electric conductivity. Although being the least reactive of the alkali metals, lithium reacts readily with air, burning with a white flame at temperatures above 200˚C and at room temperature forming a red-purple coating of lithium nitride. In water, metallic lithium reacts to form lithium hydroxide and hydrogen. As a result of its reactive properties, lithium does not occur naturally in its pure elemental metallic form, instead occurring within minerals and salts.

Lithium demand has historically been driven by macro-economic growth, but the increasing use of rechargeable batteries in electrified vehicles over the last several years has been the key driver of global demand. Global demand between 2015 and 2020 has almost doubled, reaching 388.4 kt LCE with a CAGR of 14.0% over the period. Adding to this growth, in 2021 global lithium demand is expected to increase by 33.8% to 519.6 kt LCE as demand for rechargeable batteries grows further. Over the next decade, global demand for lithium is expected to grow at a rate of 19.2% CAGR and exceed 3,000 ktpa by 2031.

The growing battery market is expected to create opportunities for lithium producers. From the mining side, battery and auto makers will require long-term offtake agreements or other type of partnership to guarantee price stability over the outlook period. Although the greatest opportunity is expected to occur in the automotive supply chain, the ESS industry will require additional supply of more than 150 ktpa LCE by 2031, whilst Motive applications are expected to see lithium demand increase >450% over the same period.

Between 2015 and 2019, growth in production from hard rock lithium mines averaged 39% pa, reaching a peak of 264 ktpa in 2019 before decreasing to 213 ktpa in 2020 as a result of curtailed production in a challenging environment. This continued growth up to 2019 was underpinned by expansions and commissioning of new capacity at operations in Australia, predominantly in 2017 when Australian production displayed a y-on-y increase of 300% (Figure 6). The sharp increase in 2017 mine output represented the reaction to increasing lithium compound and spodumene concentrate prices during 2016, which continued into 2017. The commissioning of the Mt. Cattlin mine operated by Galaxy Resources and ramp-up of the Mt. Marion mine commissioned by Neometals (now operated by a Ganfeng/Mineral Resources JV) in 2017 was accentuated by a ramp-up in production at Talison Lithium's Greenbushes. Including lithium produced from brines, global lithium production in 2021 is estimated at 476 kt LCE, up 19% from 2020.

A recovery in mined lithium supply in 2021 driven by strong demand is expected to exceed pre-COVID-19 levels and increase to over 265 ktpa. Mine production is derived from operations targeting predominantly spodumene and lepidolite mineralization. In 2020, recovery of lithium from brines accounted for 47% of global supply, followed by spodumene concentrates with 44%. With the exception of 2020, spodumene concentrate production has displayed strong growth since 2015 and is forecast to continue on a rapid growth trajectory. By 2031, lithium supply from spodumene concentrates is expected to reach nearly 600 ktpa.

In terms of life of mine (LOM) site operating cost and all-in sustaining cost (AISC), the James Bay project positions in the second quartile of the cost curve. Orocobre estimates the LoM site operating cost of USD 229/t concentrate and an AISC (CIF) cost of USD 386/t concentrate at the James Bay project.

The lithium mine (hard rock) supply balance is forecast to enter a deficit 2021 and 2022 which is currently driving high prices. With additional capacity being brought on in 2023 and 2024 it is forecast that the market will return to a small surplus before entering a long-term structural deficit, which is forecast to grow during the forecast period. Roskill forecasts the supply deficit in 2021 to be around 85 kt LCE which will ease to 21 kt LCE in 2022 before entering a few years with a small surplus reaching 43 kt in 2024. The limited investments in both exploration and capacity during the industry downturn is likely to manifest itself from 2025 where increases in supply will be insufficient to keep up with the strong growth in demand for mineral feedstock by mineral converters. The deficit is expected to propagate from 2026, requiring significant additional supply to enter the market.

On a refined product basis, the market is forecast to show a surplus of 66 kt LCE in 2021 as new capacity enters the market. The quality of the product is, however, uncertain due to the commissioning of new projects. The fast-increasing demand will see the surplus decreasing to 18 kt LCE in 2022 before entering a continued deficit. Beyond 2024 a growing structural deficit is expected to form reaching 1.5Mt LCE by 2031, requiring significant additional supply from both existing and new producers.

Global lithium demand is forecast for exponential growth over the next decade, primarily driven its use in lithium-ion battery applications. Roskill forecasts global lithium demand to grow at 19.21% CAGR over the next decade from 520 ktpa in 2021 to over 3,000 ktpa by 2031. Growth in lithium demand will outpace rising supply by 2025 when the mine market balance is expected to record a deficit. Without new supply from development of new projects, the supply deficit will continue to grow driving lithium prices upwards.

Spodumene concentrate will continue to feature as a key feedstock in the global lithium supply chain and increasing tonnages will be required to meet future demand for refined lithium. Increasing supply in the short term will put pressure on spodumene prices but as demand catches up, prices will recover. Contract prices for chemical-grade spodumene concentrate are expected to range between USD 754/t and USD 1121/t between 2022 and 2031.

1.13.2 Contracts

As of the date of this Technical Report, Galaxy has no existing commercial offtake agreements in place for the sale of lithium concentrate, lithium carbonate or lithium hydroxide (collectively, “lithium products”), from the James Bay Project.

Galaxy is having discussions with potential offtake customers for James Bay. In line with the Project execution schedule, these discussions are expected to advance to negotiations throughout the course of the project.

Galaxy has been an active participant in lithium markets since 2012 and has been a seller in both lithium concentrate (“concentrate” or “spodumene”) and lithium chemicals markets due to past and present operations.

At present, Galaxy is the sole owner and operator of the Mt Cattlin spodumene mine and concentration project. Galaxy produces a 6.0% Li_2O lithium concentrate which is sold to various customers in Asia.

Galaxy currently has no contract in place in support of project execution and construction, nor for operations. Discussion have commenced to sign a power supply contract with Hydro-Québec. Discussions with Transport Canada regarding the Eastmain Airport upgrade are ongoing.

1.14 Environmental Studies, Permitting and Social or Community Impact

1.14.1 Regulations and Permitting

The Project is subject to a federal and provincial environmental assessment, as required under Section 13 of the Canadian Environmental Assessment Act (“CEAA”) (2012) (S.C. 2012, c. 19, s. 52) and (par. 16[b]) of the Regulations Designating Physical Activities (SOR/2012-147). The Project is also subjected to Section 153 of the Environment Quality Act (“EQA”), (CQLR, c.Q-2), which automatically subjects all mining developments in the JBNQA territory to the assessment and review procedure contemplated in Sections 153 to 167 of the EQA.

As the Project is located within the territory governed by the JBNQA, it is also subjected to Chapter 22 of the JBNQA. According to the JBNQA, the Project is located on Category III land where mining rights belong to the provincial government.

An Environmental and Social Impact Assessment (“ESIA”), complying with the Impact Assessment Agency of Canada (“IAAC”) guidelines and the directive of Québec’s Ministère de l’Environnement et de la Lutte contre les changements climatiques (“MELCC”), for this Project was submitted to the authorities in October 2018. As part of the technical review of the ESIA, information requests were received from federal and provincial authorities. Answers were provided by Galaxy for most of these requests. Given the changes to the Project design, a second version of the ESIA was prepared to reflect these changes, and which also considered all information requests received from the authorities as part of the ESIA process. This ESIA (version 2) was submitted in July 2021.

Following ESIA approval from regulators, construction and operation permits will be required under the Fisheries Act and any other federal regulations, when required. The Metal and Diamonds Mining Effluent

Regulations (“MDMER”) pursuant to Section 36 of the Fisheries Act, and administered by Environment Canada, will apply at the operation phase.

After approval of the ESIA by the provincial authorities, the Project will be subjected to Section 22 of the Environmental Quality Act (“EQA”), pursuant to which an authorization is required for activities that may result in a change in the quality of the environment. Each activity such as mining, milling and maintenance may be subjected to different authorizations. The applications to the MELCC will be accompanied by sufficiently comprehensive studies to address the requirements of Directive 019 applicable to the Mining Industry.

Other permits, authorizations, approvals and leases from the MERN, the MELCC, Québec Building Agency (Régie du Bâtiment) and potentially the Ministry of Forests, Wildlife and Parks (Ministère des Forêts, de la Faune et des Parcs (“MFFP”), for various Project components or activities on the Project site may be required.

On March 18, 2019, a Preliminary Development Agreement (“PDA”) was signed with the Cree Nation of Eastmain, Grand Council of the Cree and Cree Nation Government. The PDA will be replaced by an Impact Benefit Agreement (“IBA”) before construction is initiated.

1.14.2 Environmental Baseline Studies

In 2017, various studies were undertaken to update a former data collection from 2011 and to obtain the necessary baseline information required to assess the Project’s impacts as part of the ESIA. Some complementary studies were also performed in 2020 and 2021

1.14.2.1 Physical Environment

The surface soils are mainly till (sandy) and clay deposits. Based on the information collected as part of the Project, the rock underneath corresponds to a Class II fractured aquifer, meaning the aquifer is a potential source of drinking water. The till at the surface in the proposed mine location is mainly comprised of silty and gravelly sand with traces of clay. It is moderately permeable and has a low aquifer potential.

The Project is located inside the Eastmain River watershed. Three lakes are located near the proposed mine site: Asini Kasachipet Lake, Kapisikama Lake and Asiyan Akwakwatipusich Lake. Six watercourses (CE1 to CE6) are found within the limits of the local study area. The CE1, CE2 and CE6 watercourses flow west toward the Miskimatao River and then onto the Eastmain River, whereas C3, C4 and C5 flow east, but also join up to the Eastmain River.

The waterbodies are natural and are not affected by pollution originating from human activity. Onsite measurements show that pH and dissolved oxygen values are low, and that surface water is very acidic given the nature of the soil and the type of vegetation. Although a few trace metals are higher than the recommended criteria in the surface water samples, they are within the natural range for Canadian surface water. Among the groundwater and sediment samples analyzed, certain exceeded the water quality / sediment criteria for different metals, but as for surface water, they are still within the range of natural conditions.

1.14.2.2 Biological Environment

The proposed Project is located at the northeastern boundary of the Abitibi and James Bay Lowlands natural province. Across the study area (3,689 ha), terrestrial environments cover 18.5% (683 ha), wetlands 74.4% (2,744 ha), hydric environments (including lakes and streams) 5.9% (218 ha), and anthropogenic environments 1.2% (44 ha).

Recent forest fires (in 2005, 2009 and 2013) have significantly affected the plant group structure and composition in the Project area to the point where the short- and long-term development of existing stands could be disrupted. The repeated disturbances could significantly limit their regeneration. Evidence of fires are still visible.

Wetlands and lands around the proposed mine location have a very limited potential for comprising threatened or vulnerable plant species. No special status plant species were identified in the Project area.

Seven fish species were identified in the lakes and streams of the Project study area, namely the spined stickleback, brook char, white sucker, yellow perch, lake chub, troutperch, and northern pike. None of these species are listed on the federal Species at Risk Act or likely to be vulnerable or endangered in Québec.

An aerial survey conducted in 2018 confirmed the presence of moose based on the observation of individuals mostly in residual coniferous islands near rivers. Black bear and grey wolf were not identified during the aerial survey. However, signs (feces and traces) of black bears were seen during opportunistic observations in the study area. Both bears and wolves have been seen by Cree and Truck Stop km 381 personnel in recent years.

Caribou benefit from dual protection, at both the federal and provincial levels. Areas providing the highest probability of occurrences are generally residual mature forest islands formed after forest fires. The habitat available within a 10 km range of the center of the projected mine is very fragmented. Therefore, due to its high disturbance rate, the study area offers poor habitat conditions for woodland caribou. Also, an aerial survey of 40 km x 40 km around the proposed mine site did not allow for the identification of any caribou.

The presence of 53 bird species was confirmed, most of them are common and largely distributed across habitats at these latitudes in the Province of Québec. Of these species, two species at risk were surveyed: the common nighthawk and the rusty blackbird. Availability of their habitats is not at risk in the surrounding environment near the study area or across Québec.

Surveys conducted in 2017 allowed for the identification of the big brown bat, hoary bat, and another chiroptera of the Myotis genus. The scarcity of mature forest due to forest fires may be the cause of chiroptera's weak presence in the study area. Habitat of higher quality for species at risk are found in the surrounding environment of the study area.

1.14.2.3 Geochemical Characterization

Several geochemical characterizations were completed on waste rock, tailings, ore and soils that will be manipulated and stored during the operations at mine. The main objectives of these studies are to assess the material's acid generating potential, its metal leaching potential and to determine the possibility of using waste rock as construction material. Results from kinetic testing on waste rock, tailings, ore show that they are non-potentially acid generating. Some metal leaching, exceeding the provincial resurgence in surface waters ("RES") criteria, was observed during the first weeks of testing. For the waste rock, exceedances were observed until week 14. For the tailings, all metals complied with RES criteria after week 14, except copper that was still punctually over the RES criterion up to week 28.

1.14.2.4 Social Environment

The Project is located 130 km east of the Cree Nation of Eastmain community. The planned mining infrastructure is located on the RE2 trapline. The study area, located in the trapline's eastern section, covers nearly half of its area. It is bordered to the north by the Eastmain River. The Eastmain River segment and a sector with larger lakes in the south are the most frequented by the Cree community. Activities are also carried out along the Billy Diamond Highway due to its accessibility. The main activities carried out on the traplines are hunting, fishing and trapping of fur-bearing animals. These activities take place year-round, according to specific practices, timetables and migration patterns.

A total of 27 locations with prehistoric archaeological potential were identified within the proposed Project area. These sites are those that are most likely to contain remains attesting to a human presence from prehistoric time up to the twentieth century. An archaeologic inventory, including 322 holes covering a total of 80.5 m^2, was conducted in 2021 in the footprint of the planned infrastructures to ensure the projected construction work does not result in the destruction of archaeological and ethnological remains. No archaeological evidence was revealed during the visual inspection and inventory.

Based on field observations, sectoral studies and photographs taken from various viewpoints, the following five landscape units were identified as characterizing the landscape of the proposed Project area:

- Valley
- Plain
- Plateau
- Powerline
- Road

1.14.2.5 Socio-economic

The structure of the Cree economy is mainly driven by tertiary sector activities, particularly in band councils and school and health institutions. Traditional Cree hunting, fishing, and trapping activities are still present and important in the Eeyou Istchee James Bay communities. In 2016, nearly two-thirds of the experienced labor force[2] in the Eeyou Istchee James Bay communities worked in the following categories: business, finance and administration; sales and services; and education, law and social, community and government services. Occupations in the trade, transportation and machinery categories accounted for 13.7% of the experienced labor force. Occupations in the primary sector accounted for 4.6% of the Eeyou Istchee James Bay workforce in 2016 versus 1.6% in Québec. The processing, manufacturing and utilities sectors accounted for only 0.85% of the experienced labor force in 2016, compared to 4.9% for Québec.

1.14.3 Surveillance and Monitoring Program

Galaxy will implement an environmental surveillance program and perform environmental surveillance to ensure compliance with laws, regulations and other environmental considerations set out during the development of the Project and the impact assessment.

The environmental surveillance program will be included in the site construction procedures and will include the following:

[2] Persons aged 15 and over who were employed or unemployed during the week prior to the day of the Census and have last worked for pay or self-employed in 2005 or 2006.

- List of elements that require environmental surveillance
- All measures to be applied and means planned for protecting the environment
- Detailed monitoring program activities
- Intervention mechanisms in the event of non-compliance with legal and environmental requirements
- Commitments with regards to filing monitoring reports and distributing environmental surveillance results to the affected population
- Intention to hire Cree Environmental Monitors (subject to training and availability)

Environmental monitoring will be implemented for the operation phase for sensitive environmental components and for those that are likely to be most affected by the Project, such as monitoring of:

- Surface water and sediment quality
- Groundwater (flow, level, and quality)
- Fish population and benthic invertebrate community
- Air quality and ambient noise
- Vegetation along the periphery of infrastructure (including the introduction and spreading of invasive alien plant species)
- Wildlife (including beaver population and beaver dams, bird population, species at risk)
- Socioeconomic environment (including socioeconomic conditions, land, and resource use for traditional purposes as well as quality of life and well-being)

1.14.4 Closure and Rehabilitation

A preliminary closure plan was prepared and included as an appendix to the ESIA (version 2). An official Closure plan will be developed and submitted to the MERN in accordance with article 232.1 of the Mining Act for approval prior to the filing of the mining lease application.

The protection, redevelopment and restoration measures planned as part of the Closure plan aim to close the mine site to satisfactory condition, namely:

- Eliminate unacceptable risks to health and ensure the safety of persons

- Limit the production and spread of substances liable to harm the receiving environment and, in the long term, aim to eliminate all forms of maintenance and follow-up
- Restore the site to a visually acceptable condition for the community
- Restore the infrastructure site to a state compatible with future use.

A follow-up study of the physical stability of the structures, chemical quality of drainage and return of vegetation will be carried out over a minimum period of five years after the cessation of mining and transformation activities.

1.14.5 Public Consultation

Galaxy established a stakeholder consultation and engagement process which allows Galaxy to gather concerns, views, and expectations of local communities, as well as to provide mitigation strategies where possible.

As presented in the ESIA, Galaxy has committed to developing sustainable relationships with stakeholders and to maximize the social and economic benefits of the Project while minimizing environmental impacts. In 2018, Galaxy hosted "open houses" to share project information, organized individual and group sessions with stakeholders, posted updates on the James Bay Project website and maintains direct contact with community members on a regular basis, including the RE2 tallyman. The relationship and exchanges between Galaxy and stakeholders will be maintained throughout the life of the Project.

From 2011-2012, and from 2017-2020, in-person meetings were held with stakeholders from various spheres: municipal administration, economic development, land use and planning, and natural resources, as well as the communities of Eastmain, Waskaganish and Waswanipi. Stakeholders expressed their support for mining development in their region, and also importance of establishing conditions to ensure and maximize socioeconomic spin-offs for the region, as well as environmental protection. Galaxy continues to respond to questions, expectations and recommendations voiced by stakeholders. Galaxy's responses are detailed in the ESIA consultation log.

Communications with stakeholders, including indigenous members, have been maintained since the submittal of the ESIA in October 2018. Preoccupations and expectations expressed are addressed in the ESIA (version 2).

1.14.6 Consultation of Indigenous Peoples

Suspended in 2012 for economic reasons, the Project was relaunched in 2017. Eighteen meetings were organized with the Eastmain Cree community to inform and consult stakeholders concerned by this mining development. The meetings were primarily aimed at socioeconomic stakeholders, RE2, VC33 and VC35 tallymen, the users of the territory of these traplines, and members of the Eastmain community. Stakeholders' concerns, expectations and recommendations regarding the Project were recorded throughout the consultation process. It was determined during the exchanges held in 2011–2012 and in 2019, with the RE1 trapline tallyman that they did not feel concerned about the Project.

Galaxy conducted interviews in Eastmain with stakeholders from various sectors relating to the economy, the socio-cultural world, health, hunting, fishing, trapping, the environment, and from focus groups. The stakeholders expressed their support for mining development in their region, but many also stressed the importance of environmental protection and maximizing socioeconomic spin-offs for the region.

Two formal public consultation presentations were made to the community to present the Project and the results of the ESIA, as well to initiate a transparent and respectful dialogue. Individual meetings, by telephone or face-to-face, were held with socio-economic stakeholders from the community. Focus group discussions were held. Group interviews with the trapline tallymen and their families were organized during the ESIA consultations.

Maps of the traplines were provided to participants so that they could mark their activities and camps, drinking water supplies, transportation links and enhancement and preservation sectors. A group interview was conducted during the consultation of the Cree Board of Health and Social Services of James Bay ("CBHSSJB"), and of the Cree School Board ("CSB"). All stakeholders from these two bodies were invited to the meeting, allowing canvassing of the views of each area of intervention within these organizations.

The purpose of all these meetings was to address participants' knowledge of the Project; the known effects of other mining projects on the EIJB territory; participants' views on the proposed project; its potential positive and negative impacts; its potential cumulative impacts; mitigation measures to consider; and any other expectations, concerns or queries members of the community wished to voice. Minutes were drafted following each of the meetings and sent for approval to the stakeholders.

1.15 Capital and Operating Costs

The capital expenditures ("CAPEX") for Project construction, including processing, mine equipment purchases, infrastructures and other direct and indirect costs is estimated and summarized in Table 1.3

The total initial Project CAPEX including an 8.4% contingency is estimated at CAD 380.1M. Deferred and Sustaining CAPEX is required during operations for additional equipment purchases, a truck shop bay addition, and mine civil works.

Operating costs include mining, processing, general and administrative services, mining, processing and concentrate transportation. The LOM operating cost summary is presented in Table 1.4.

Table 1.3: Summary of LOM Capital Costs

Capital Expenditures	CAD M
Initial CAPEX (CAD M)	
100 - Infrastructure	37.93
200 - Power and Electrical	41.81
300 - Water	33.62
400 - Surface Operations	7.82
500 - Mining Open Pit	36.01
600 - Process Plant	87.62
Subtotal Direct Costs	244.81
700 - Construction Indirects	49.12
800 - General Services	56.71
900 - Pre-production, Start-up, Commissioning	1.66
990 - Contingency	27.8
Subtotal Indirect Costs	115.29
Total Initial CAPEX	380.1
Deferred and Sustaining CAPEX (CAD M)	
100 - Infrastructure	1.52
200- Power and electrical	0.06
300 - Water Management	14.34
500 - Mining	111.45
600 - Process Plant	2.76
Total Deferred and Sustaining CAPEX	**130.13**

Table 1.4: Summary of LOM Operating Costs

Item	Total Cost (CAD M)	Unit Cost CAD/t Tonnes Processed
Mining	818.97	22.01
Processing	492.35	13.23
General and Administration	534.27	14.36
Concentrate Transportation	706.34	18.98
Total	**2,551.93**	**68.59**

1.16 Economic Analysis

An economic analysis was developed using the discounted cash flow method and was based on the data and assumptions for capital and operating costs detailed in this report for mining, processing, and associated infrastructure. An exchange rate of CAD 1.33 per USD was used to convert some items of the cost estimates from USD. No provision was made for inflation and the base currency was considered on a constant 2021 CAD basis. The evaluation was undertaken on a 100% equity basis. Exploration costs are deemed outside of the project and any additional project study costs have not been included in the analysis.

Base case scenario results are detailed in Table 1.5.

Table 1.5: Base Case Scenario Results

Project Economics - Base Case Results	
Production Summary (Life-of-Mine)	
Tonnage Mined (Mt)	168,896
Ore Processed (Mt)	37,207
Strip Ratio (W:O)	3.54
Spodumene Concentrate (k dmt)	6,026
Metal	**Li_2O**
Head Grade (% Li2O)	1.30
Contained Metal ('000 t Li)	225
Recovered Metal ('000 t Li)	158
Cash Flow Summary (M CAD)	
Gross Revenue	8043
Mining Costs (incl. rehandle)	-819
Processing Costs	-492
Concentrate Transportation	-706
G&A Costs	-534
Royalty Costs	-121
Total Operating Costs	-2,673
Operating Cash Flow	5,371
Initial CAPEX	-380
Operation Cost during Construction	-26
Sustaining CAPEX	-126
Total CAPEX	-532
Salvage Value	0
Closure Costs	-47
Interest and Financing Expenses	0
Taxes (mining, prov. & fed.)	-1,924
Before-Tax Results	
Before-Tax Undiscounted Cash Flow (M CAD)	4,789
NPV 8% Before-Tax	1,893
Project Before-Tax Payback Period	2.4
Project Before-Tax IRR	45.8%
After-Tax Results	
After-Tax Undiscounted Cash Flow	2865
NPV 8% After-Tax	1097
Project After-Tax Payback Period	2.9
Project After-Tax IRR	35.2%

1.17 Recommendations

1.17.1 Mineral Resource

In reviewing the geological and block model constructed for the Project, the Qualified Person ("QP") makes the following recommendations:

- Continue exploration diamond drilling around the periphery of the pegmatite dykes to delineate them, especially to the north of the deposit
- Conduct shallow RC drilling in near-surface areas of the deposit defined by mapping to be geological complex, which could represent a potential risk to the ore mined in the pre-production period.
- Undertake a new geological model which incorporates updated surface mapping, the individual strike-orientations of each dyke, and any unmodelled intervals of pegmatite in the eastern portion of the deposit that are not represented in the current block model.
- Commercially available certified reference material should be used as part of the analytical quality control procedure.
- All future drill collars should be surveyed using a differential GPS.
- Geotechnical logging should be included in routine drilling procedures. Rock geotechnical information will become invaluable for future engineering conceptual studies.
- Condemnation drilling is recommended to confirm the extent of the pegmatite dikes.
- Further mineralogical studies should be conducted to determine the presence any minor lithium-bearing minerals (such as petalite, lepidolite, etc.) and incorporated into the geological model.

1.17.2 Mining

The following recommendations were provided by GMS:

- Develop a slope monitoring program and a ground control management plan for the operations phase: covered in CAPEX and OPEX.
- Monitor ground water conditions and assess predicted conditions against actual conditions for the Ultimate Wall design (during the operations phase): cost tbc.
- Further define levels of deleterious metals (i.e. Fe_2O_3) that may be present within the external waste dilution.

1.17.3 Mine Waste and Water Management

Geotechnical Investigation

Further geotechnical investigation drilling will be required to adequately delineate and characterize the foundation deposits at the waste rock and filtered tailings co-placement storage facility and the overburden and peat storage area, with a focus on infill drilling and further characterization/validation of foundation material properties. Investigation should include provisions for rock coring to confirm bedrock hydrogeological conditions, cone penetration tests ("CPT"), particle size distribution ("PSD") evaluation, direct simple shear testing and one-dimensional consolidation (oedometer) testing on select soil samples. In addition, geotechnical investigations should be carried out to identify and/or confirm granular borrow sources.

WRTSF and OPSF

The following additional validation is required to refine the design of the WRTSF and OPSF:

- Additional site characterization to validate the design parameters of stability analyses.
- Tailings laboratory testing to determine the filterability (dewatering) and geotechnical (shear strength) characteristics.
- Geotechnical laboratory testing of the waste rock, including strength and durability testing.
- Additional tailings and waste rock geochemical characterization to determine acid generation potential and metal leaching in accordance with Quebec Directive 19.
- Tailings and waste rock mixing tests to evaluate interface shear strength, filter compatibility and seepage characteristics.
- Develop an instrumentation and monitoring program for construction and operation of the WRTSF with established threshold alert levels and appropriate response framework.
- Confirmation of mine plan and material balance to confirm availability of construction materials for development of the WRTSFs over the life of mine including pre-production and closure periods.
- Condemnation drilling for the WRTSF sites to verify the absence of mineralization.

Water Management

The water management strategy or infrastructure design relies upon the current understanding that no water treatment will be required. The predicted water quality on site should continue to be updated as additional geochemical information relating to the orebody, waste rock/host rock, tailings, and natural deposits is obtained. In addition, the following water management studies are recommended:

- Further refinement of the site-wide water balance considering effluent treatment operation.
- Further optimization of the of the WMP designs to evaluate geosynthetic liner versus clay liner.
- A dam breach and inundation study to support the WMP dam classification.
- Perform a more detailed flood study based on improved topographic mapping for the CE-3 Creek, considering spring and summer fall extreme events, and potential risk of blockage of the James Bay Road culvert by ice or debris.
- Refine the design of the water management infrastructure based on improved topographic survey data.
- Fish sampling in the proposed WRTSF and WMP areas should be conducted to confirm fish presence/absence in the waterbodies of interest that may be impacted by the proposed development.

1.17.4 Processing and Metallurgical Testing

The following are the recommendations for processing and metallurgical testing.

- Undertake DMS testwork on the JB1 / West pit to confirm recovery/grade performance
- Review treatment options for fines (-1 mm) tailings and complete a trade-off study to establish the best option for increasing Li_2O recovery/economics outcome.

1.18 Responsibility Matrix

Table 1.6 summarizes the different QPs and responsibilities with their respective sections.

Table 1.6: Summary of Qualified Persons

	QP	Company	Report Sections
1	Joel Lacelle, P.Eng.	G Mining Services Inc.	1;1.1;1.2;1.3; 2, 3, 4, 5, 18.1,18.5 to 18.18, 21, 23, 24
2	Carl Michaud, P Eng, MBA	G Mining Services Inc.	1.9; 1.15;1.16;1.17;1.18;1.19, 15, 16,19, 22, 25.1.2;26.2
3	James Purchase, P.Geo	G Mining Services Inc.	1.4;1.5;1.6;1.8; 1.16.1, 6, 7, 8, 9, 10, 11, 12, 14, 25.1.1, 26.1
4	Darrin Johnson, P.Eng.	Golder Associates Ltd.	18.2;18.3;18.4, 26.3; 26.4
5	Joao Paulo Lutti, P.Eng.	Golder Associates Ltd.	18.4.1; 18.4.2
6	Christopher Larder, P.Eng.	Wave International	1.7;1.10, 1.11, 13, 17, 25.1.3, 26.5
7	Simon Latulippe P.Eng.	WSP Canada Inc.	1.14, 20

2 INTRODUCTION

This report was prepared by G Mining Services Inc. ("GMS") for Galaxy Lithium (Canada) Inc. ("GLCI") to summarize the results of a feasibility study (FS) for the James Bay Lithium Mine project ("the Project"). The report was prepared in compliance with the Canadian disclosure requirements of National Instrument 43-101 (NI 43-101) and in accordance with the requirements of Form 43-101 F1.

Golder Associates Ltd. (Golder), Wave International (Wave), Roskill and WSP Canada Inc. (WSP) provided input to the report. The individuals presented in Section 2.3, by virtue of their education, experience, and professional association, are considered Qualified Persons (QPs) as defined by NI 43-101 (CIM, 2014). The QPs meet the requirement of independence defined in NI 43-101.

2.1 Terms of Reference

The report supports the disclosure by GLCI in the news release dated December 21, 2021, entitled "James Bay Lithium Project Feasibility Study & Maiden Ore Reserve".

Mineral Resources and Reserves are reported using the 2014 Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards (2014 CIM Definition Standards) and the CIM Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines (CIM, 2019).

This Report is based, in part, on internal reports and information as listed in Section 27 of this Report. Where sections from reports authored by other consultants have been directly quoted in this Report, they are indicated as such in the Report sections.

A previous technical report was prepared for the James Bay Lithium Project by GMS to summarize the results of a preliminary economic assessment (PEA) with an effective date of March 8, 2021. Prior to the PEA a technical report was prepared by SRK Consulting (Canada) Inc. to support a revised mineral resource model and accompanying mineral resource statement with an effective date of November 23, 2017 (SRK, 2017). The mining study documented in this report is based on this mineral resource model. Sections 4 to 12 and 14 in this report are modified from those respective sections in SRK (2017).

2.2 Effective Dates

The effective date of the Mineral Resource estimate is December 4, 2017.

The effective date of the Mineral Reserve estimate is October 8, 2021.

The effective date of the financial analysis is December 21, 2021.

The overall effective date of the Report is the date of the financial analysis supporting the Mineral Resource and is December 21, 2021.

2.3 Qualified Persons

This Technical Report was prepared for GLCI by or under the supervision of the following Qualified Persons (QPs):

- The mineral resource estimate was originally completed by SRK Consulting (Canada) Inc. in 2017, and was verified by Mr. James Purchase, P.Geo (OGQ #2082) of GMS who is now acting as QP (and CP under JORC Code 2012) for the mineral resource
- The site visit and data verification were completed by Mr. James Purchase, P.Geo (OGQ #2082), of GMS in June 2021.
- Capital cost (CAPEX) and Operating cost (OPEX) estimates were completed by Joel Lacelle, P.Eng., from GMS.
- The Infrastructures section was completed by Joel Lacelle, P.Eng., from GMS.
- The mineral reserves estimate, the mining methods and the economic analysis was completed by Mr. Carl Michaud, P.Eng. MBA, from GMS.
- The design of the tailings and waste rock storage facilities and the overburden and peat storage facility were completed by Mr. Darrin Johnson, P.Eng., from Golder Associates Ltd.
- The design of the water management ponds for the tailings and waste rock storage facilities was completed by Joao Paul Lutti, P.Eng. from Golder Associates Ltd.
- The mineral processing and the recovery methods (process plant) plant were completed by Christopher Larder, P.Eng., from Wave.
- The environmental and social impacts study was completed by Mr. Simon Latulippe, P.Eng., from WSP.

2.4 Site Visits

In accordance with NI 43-101 guidelines, Mr. James Purchase of GMS visited the Project from June 14, 2021 to June 17, 2021, accompanied by Mr. Patrick Gince of GLCI.

The site visit did not take place during active drilling activities. All aspects that could materially impact the integrity of the data informing the mineral resource estimate were reviewed, including outcrop inspection, channel sampling areas, core logging, sampling methods and security and database management.

GMS was given full access to relevant data and conducted interviews with GLCI personnel to obtain information on exploration work and to understand the procedures used to collect, record, store and analyze historical and current exploration data.

2.5 Units of Measure and Currency

The International system of units (SI) are used, including metric tonnes (tonnes, t) for weight.

All currency amounts are stated in Canadian dollars (CAD) unless otherwise stated.

2.6 Abbreviations and Nomenclature

A list of the main abbreviations and terms used throughout this Report is presented in Table 2.1**.**

Table 2.1: List of Main Abbreviations

Abbreviations	Full Description
AA	Atomic absorption
ACQ	Association de Construction du Québec
Ai	Bond abrasion index
Al_2O_3	Aluminium oxide
ALS	ALS Canada Ltd.
BBWi	Bond ball mill work index
BCM	Bank cubic metres (in situ)
BRWi	Bond rod mill work index
°C	Celsius
CAD	Canadian Dollar
$CaCO_3$	Calcium carbonate
CaO	Lime
CARS	Community Aerodrome Radio Stations
CBHSSJB	Cree Board of Health and Social Services of James Bay
CDA	Canadian Dam Association
CEAA	Canadian Environmental Assessment Act
CEAAg	Canadian Environmental Assessment Agency
CoG	Cut-off grade

Abbreviations	Full Description
COMEX	Committee of the James Bay and Northern Québec Agreement
COREM	COREM Research Laboratory
CSA	Canadian Standards Association
CWi	Bond crusher work index
DOR	Direction of Rotation
DMS	Dense media separation
DTH	Down the Hole
EIA	Environmental Impact Assessment
EIJB	Eeyou Istchee James Bay
EIJBRG	Eeyou Istchee James Bay Regional Government
EPA	Environmental Protection Agency
EQA	Environment Quality Act
ESA	Environmental Site Assessment
ESIA	Environmental and Social Impact Assessment
EWMP	East Water Management Pond
EY	Early years
FEL	Front end loader
FeSi	Ferrosilicon
g	Grams
GLCI	Galaxy Lithium Canada Inc.
GLOI	Galaxy Lithium (Ontario) Inc.
GSLib	Geostatistical Software Library
Ha	Hectares
HARD	Half absolute relative deviation
HLS	Heavy liquid separation
HQ	Hydro-Québec
HRD	Half relative deviation
IAAC	Impact Assessment Agency of Canada
ICP-AES	Inductively coupled plasma-atomic emission spectrometry
Ind	Indicated material (classification)
IO	Input/Output
IP	Induced Polarization
JAC	Joint Assessment Committee
JBNQA	James Bay and Northern Québec Agreement
kg	Kilograms
km	Kilometres
kt	Thousand tonnes

Abbreviations	Full Description
l	Litre
LCM	Loose cubic metre
LCT	Lithium, Caesium, Tantalum
LETI	Landfill in remote area (Lieux d'enfouissement en territoire isolé)
Li_2CO_3	Lithium Carbonate
Li_2O	Lithium Oxide
Li_2O	Lithia
Li_2SO_4	Lithium sulphate
Lithium One	Lithium One Inc.
LOM	Life of Mine
LY	Later years
m	Metre
m^2	Square metre
m^3	Cubic metre
Ma	Million years ago
MASL	Metres above mean sea level
MCAF	Mining cost adjustment factor
MCC	Motor Control Centre
MELCC	Ministry of Environment and Fight against Climate Change (Ministère de l'Environnement et de la Lutte contre les changements climatiques)
MERN	Ministère de l'Énergie et des Ressources naturelles
MFFP	Ministry of Forests, Wildlife and Parks
Mg(OH)2	Magnesium hydroxide
MLEGB	Middle and Lower Eastmain Greenstone Belt
MDMER	Metal and Diamond Mining Effluent Regulations
mm	Millimetres
MNRF	Ministry of Natural Resources and Forestry
MOU	Memorandum of Understanding
MP	Mining Plus
MR	Mineral Reserve
MRE	Mineral Resource Estimate
Mt	Million tonnes
Mtpa	Million tonnes per annum
MY	Mid years
Na_2CO_3	Sodium carbonate
NAG	Non-acid generating
NaOH	Sodium hydroxide

Abbreviations	Full Description
NBL	Natural background levels
NOR	Notice of Energization
NPAG	Non-Potential Acid Generating
NPV	Net present value
NSR	Net smelter return
NTS	National Topographic System
NWMP	North Water Management Pond
O	Oxygen
OCS	Operator Control Station
OK	Ordinary kriging
OEE	Overall Equipment Effectiveness
OPSF	Overburden and Peat Storage Facility
PAG	Potentially Acid Generating
PCS	Process Control System
PLC	Programmable Logic Controller
Q-Q	Quantile-quantile
RES	Water Quality criteria for groundwater (Résurgence dans l'eau de surface)
RF	Revenue Factor
RL	Reduced Level
RWP	Process Plant Raw Water Pond
ROM	Run of Mine
SCADA	Supervisory Control and Data Acquisition
SDBJ	Société de développement de la Baie James
SD	Standard Deviation
SG	Specific gravity
SGS	SGS Mineral Services Lakefield Laboratory
SI	Site Investigation
SiO_2	Silicon Dioxide (Silica)
SMC	SAG mill comminution
SR	Stripping ratio
STP	Sewage treatment plant
t	Tonnes (metric tonnes)
tph	Tonnes per hour
TTG	Plutonic rocks
TWRSF	Tailing and Waste Rock Storage Facility
UCS	Uniaxial compressive strength
UF	Ultrafine
USD	United States Dollar

Abbreviations	Full Description
Whittle	Mining software produced by Dassault Systèmes' Geovia software
WMP	Water Management Pond
WRAC	Work risk assessment control
WRTSF	Waste Rock and Tailings Storage Facility
XRD	X-Ray Diffraction
µm	Micron
Ω	Ohm

3 RELIANCE ON OTHER EXPERTS

This Technical Report has been prepared by GMS for GLCI. The information, conclusions, opinions, and estimates contained herein are based on:

- Information and documents available to GMS at the time of preparation of this Technical Report are listed in Section 27, References.
- The authors have assumed the references, are accurate and complete in all material aspects. While the authors have carefully reviewed, within the scope of their technical expertise, all the available information presented to them, they cannot guarantee its accuracy and completeness. GMS reserves the right, but will not be obligated to, revise the Technical Report and its conclusions if additional information becomes known to them subsequent to the effective date of this report.

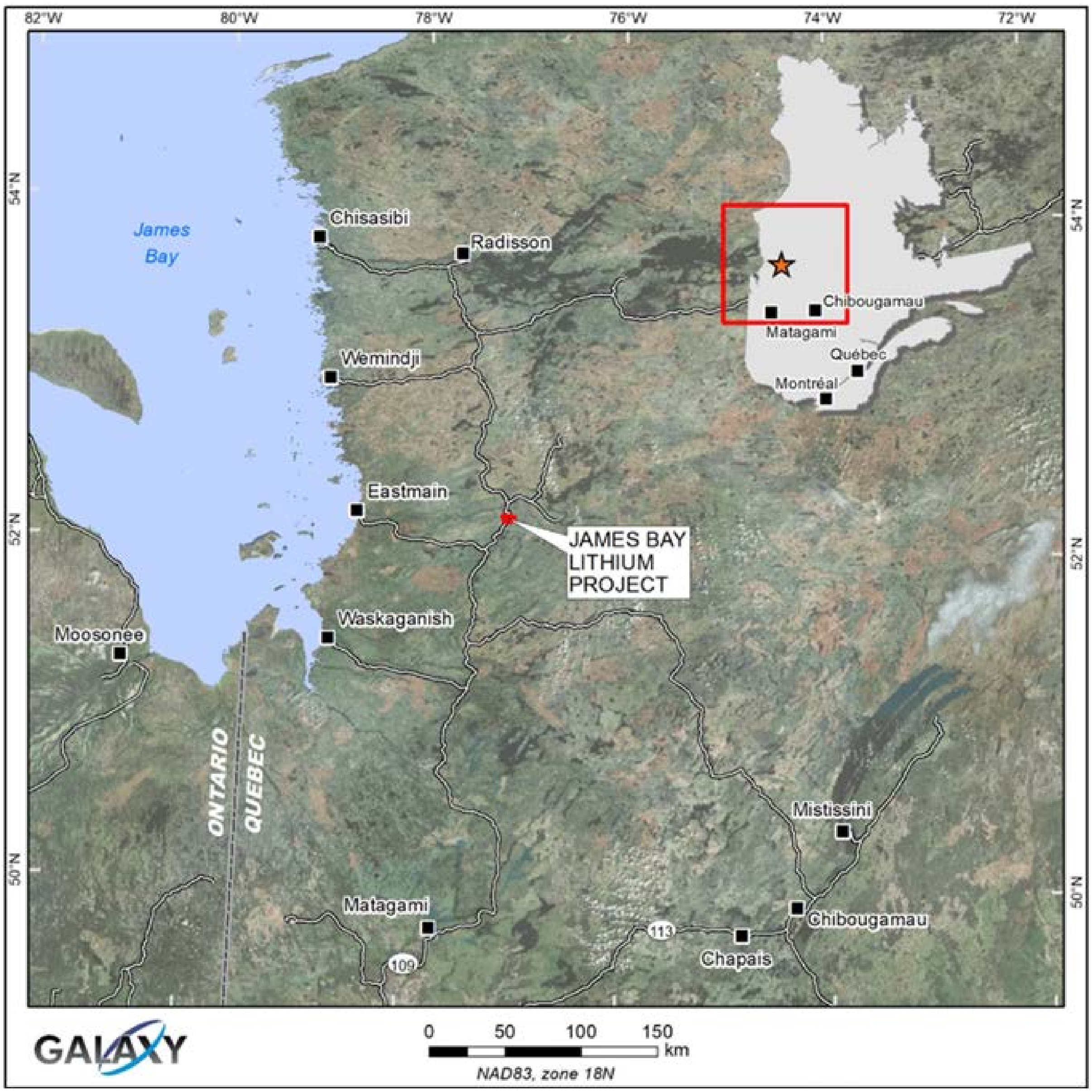
For the purpose of this Technical Report, GMS has relied on ownership information provided by GLCI. GMS has not researched property title or mineral rights for the Project and expresses no opinion as to the ownership status of the Property. GMS are not experts with respect to legal, socio-economic, land title, or political issues, and are therefore not qualified to comment on issues related to the status of permitting, legal agreements, and royalties. Information related to these matters has been provided directly by GLCI and include, without limitation, validity of mineral tenure, status of environmental and other liabilities, and permitting. These matters were not independently verified by the QPs but appear to be reasonable representations that are suitable for inclusion in Section 4 of this report.

4 PROPERTY DESCRIPTION AND LOCATION

The Project is located in northwestern Québec, 382 km north of the community of Matagami (Figure 4.1). The property is located 10 km south of the Eastmain River and 130 km east of James Bay and is readily accessible by the paved Billy-Diamond Highway that connects Matagami to the village of Radisson.

The center of the property is located at approximately 52.24 degrees latitude north and 77.07 degrees longitude west.

Figure 4.1: Project Location



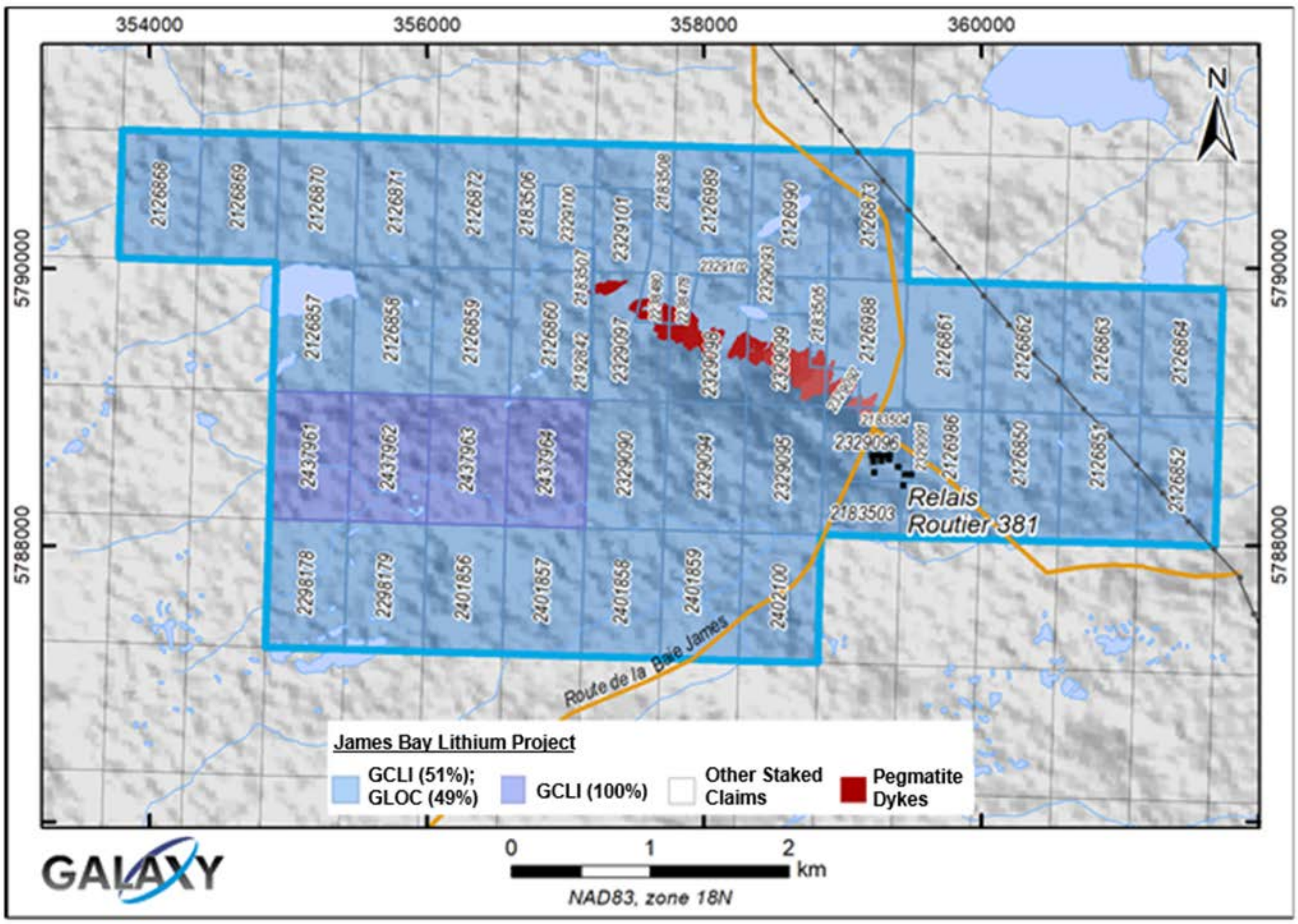
Source: DigitalGlobe, Dec 2017

4.1 Tenure

4.1.1 Mineral Tenure

The Project comprises 54 contiguous mining titles located in NTS map sheet 33C/03, covering an area of approximately 2,164 hectares (Figure 4.2). The boundaries of the claims have not been legally surveyed. A summary of the tenure information, as extracted from the Government of Québec GESTIM website is presented in Table 4.1. All claims are in good standing, with expiry dates between June 12, 2022 and June 20, 2023. The Tenure are registered under Galaxy Lithium (Canada) inc. ("GLCI") and Galaxy Lithium (Ontario) Inc. ("GLOI").

Figure 4.2: Mineral Tenure



Source: GESTIM, October 2021

Table 4.1: Mineral Tenure Information

Title Number	Status	Registration Date (y/m/d)	Expiry Date (y/m/d)	Area (ha)	Registered To
2126850	Active	2007-10-04	2022-06-12	52.78	GLCI (51%)/GLOI (49%)
2126851	Active	2007-10-04	2022-06-12	52.78	GLCI (51%)/GLOI (49%)
2126852	Active	2007-10-04	2022-06-12	52.78	GLCI (51%)/GLOI (49%)
2126857	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126858	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126859	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126860	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126861	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126862	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126863	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126864	Active	2007-10-04	2022-06-12	52.77	GLCI (51%)/GLOI (49%)
2126868	Active	2007-10-04	2022-06-12	52.76	GLCI (51%)/GLOI (49%)
2126869	Active	2007-10-04	2022-06-12	52.76	GLCI (51%)/GLOI (49%)
2126870	Active	2007-10-04	2022-06-12	52.76	GLCI (51%)/GLOI (49%)
2126871	Active	2007-10-04	2022-06-12	52.76	GLCI (51%)/GLOI (49%)
2126872	Active	2007-10-04	2022-06-12	52.76	GLCI (51%)/GLOI (49%)
2126873	Active	2007-10-04	2022-06-12	52.76	GLCI (51%)/GLOI (49%)
2126986	Active	2007-10-04	2022-06-12	49.98	GLCI (51%)/GLOI (49%)
2126988	Active	2007-10-04	2022-06-12	45.88	GLCI (51%)/GLOI (49%)
2126989	Active	2007-10-04	2022-06-12	47.39	GLCI (51%)/GLOI (49%)
2126990	Active	2007-10-04	2022-06-12	51.91	GLCI (51%)/GLOI (49%)
2183503	Active	2009-06-16	2022-06-12	22.41	GLCI (51%)/GLOI (49%)
2183504	Active	2009-06-16	2022-06-12	3.55	GLCI (51%)/GLOI (49%)
2183505	Active	2009-06-16	2022-06-12	18.51	GLCI (51%)/GLOI (49%)
2183506	Active	2009-06-16	2022-06-12	36.08	GLCI (51%)/GLOI (49%)
2183507	Active	2009-06-16	2022-06-12	0.33	GLCI (51%)/GLOI (49%)
2183508	Active	2009-06-16	2022-06-12	27.53	GLCI (51%)/GLOI (49%)
2192842	Active	2009-10-27	2022-06-12	1.83	GLCI (51%)/GLOI (49%)
2238478	Active	2010-06-21	2023-06-20	5.75	GLCI (51%)/GLOI (49%)

Title Number	Status	Registration Date (y/m/d)	Expiry Date (y/m/d)	Area (ha)	Registered To
2238480	Active	2010-06-21	2023-06-20	7.54	GLCI (51%)/GLOI (49%)
2298178	Active	2011-06-21	2022-06-12	52.79	GLCI (51%)/GLOI (49%)
2298179	Active	2011-06-21	2022-06-12	52.79	GLCI (51%)/GLOI (49%)
2329090	Active	2012-02-10	2022-06-12	52.78	GLCI (51%)/GLOI (49%)
2329091	Active	2012-02-10	2022-06-12	2.80	GLCI (51%)/GLOI (49%)
2329092	Active	2012-02-10	2022-06-12	6.89	GLCI (51%)/GLOI (49%)
2329093	Active	2012-02-10	2022-06-12	0.85	GLCI (51%)/GLOI (49%)
2329094	Active	2012-02-10	2022-06-12	52.78	GLCI (51%)/GLOI (49%)
2329095	Active	2012-02-10	2022-06-12	52,78	GLCI (51%)/GLOI (49%)
2329096	Active	2012-02-10	2022-06-12	26,82	GLCI (51%)/GLOI (49%)
2329097	Active	2012-02-10	2022-06-12	43,41	GLCI (51%)/GLOI (49%)
2329098	Active	2012-02-10	2022-06-12	47,03	GLCI (51%)/GLOI (49%)
2329099	Active	2012-02-10	2022-06-12	34,26	GLCI (51%)/GLOI (49%)
2329100	Active	2012-02-10	2022-06-12	16,68	GLCI (51%)/GLOI (49%)
2329101	Active	2012-02-10	2022-06-12	24,90	GLCI (51%)/GLOI (49%)
2329102	Active	2012-02-10	2022-06-12	5,37	GLCI (51%)/GLOI (49%)
2401856	Active	2014-03-18	2023-03-17	52,79	GLCI (51%)/GLOI (49%)
2401857	Active	2014-03-18	2023-03-17	52,79	GLCI (51%)/GLOI (49%)
2401858	Active	2014-03-18	2023-03-17	52,79	GLCI (51%)/GLOI (49%)
2401859	Active	2014-03-18	2023-03-17	52,79	GLCI (51%)/GLOI (49%)
2402100	Active	2014-03-27	2023-03-26	52,79	GLCI (51%)/GLOI (49%)
2437961	Active	2016-03-14	2023-03-13	52,78	GLCI (100%)
2437962	Active	2016-03-14	2023-03-13	52,78	GLCI (100%)
2437963	Active	2016-03-14	2023-03-13	52.78	GLCI (100%)
2437964	Active	2016-03-14	2023-03-13	52.78	GLCI (100%)
Total				**2,163.75**	

4.1.2 Underlying Agreements

In February 2011, Galaxy signed a Joint Venture Agreement with Lithium One Inc. (Lithium One) for the exploration and eventual development of the Project. In May 2011, under the terms of that agreement, Galaxy acquired an initial 20% equity interest for CAD 3.0M and had the potential to increase its stake to 70% through the completion of a definitive feasibility study within a 24-month period.

On July 4, 2012, Galaxy successfully completed a CAD 112M merger with Lithium One, effectively acquiring 100% of the Project. Lithium One shares were de-listed from the TSX and the transfer of Galaxy Resources shares to eligible Lithium One shareholders was completed, such that 80% of the Project was now held by GLOI (formerly Lithium One) and 20% by GLCI. In October 2018, this holding was further amended by Deed of Transfer between the parties to reflect the current holding of 49% GLOI and 51% GLCI. On August 25, 2021 Galaxy Resources merged with Orocobre Limited ("Orocobre"). Under the merger, Orocobre acquired 100% of the fully paid ordinary shares in Galaxy Resources in exchange for the issue of new fully paid ordinary shares in Orocobre.

Lithium One had previously entered three option agreements between March 2008 and June 2009; the status of these agreements remain unchanged since Galaxy Resources' acquisition of the company and are described below.

On March 29, 2008, Lithium One entered into an option agreement with Société de Développement de la Baie-James (SDBJ) and four arm's length Optioners to acquire a 100% interest in the Cyr Lithium Prospect (refer to Section 6 for details regarding the Cyr Lithium Prospect). Portions of the mineral resources reported herein are located on these claims of the Project. The terms of the agreement are as follows:

- A non-refundable cash payment of CAD 60,000 (completed)
- Issue 500,000 free trading common shares of Lithium One (completed)
- Two further payments of 1,000,000 free trading shares each (four-month hold) with the first payment occurring in October 2008 (completed) and the second payment scheduled for October 2009 but deferred until April 2010 for consideration of cash payment of CAD 25,000 (completed)
- On the third anniversary of the Letter of Intent in 2010, if the value of the 2,500,000 shares mentioned above is less than CAD 5.0M, Lithium One shall pay in cash the difference (completed)
- A 2% net smelter return (NSR) royalty, of which Lithium One can purchase half (or 1%) of this royalty for CAD 1,000,000

Lithium One fully exercised its option to complete the acquisition of the Cyr Lithium Prospect on November 2, 2010 with a final payment of CAD 2.5M to the Optioners and CAD 500,000 in common shares to SDBJ. The vendors retain a 2% NSR interest.

On May 14, 2009, Lithium One entered into an option agreement with Jacques Frigon and Gérard Robert. Portions of the mineral resources reported herein are located on four of these claims (claim number 2329097, 2238480, 2238478, and 2329098). The terms of the agreement are stated below:

- Lithium One will acquire 100% interest in the Frigon property by paying CAD 32,000 (completed)
- Issue 100,000 common shares of the company (completed)
- Four annual payments of CAD 25,000 and issuance of 100,000 common shares (completed)
- A 1.5% NSR on the project. Lithium One will have the right to repurchase at any time one third (or 0.5%) of this royalty for a cash payment of CAD 500,000

On June 9, 2009, Lithium One entered into an agreement with Resources d'Arianne Inc. Portions of the mineral resources reported herein are located on a claim (claim number 2126988) of the Project. The terms of the agreement are stated below:

- Lithium One will acquire 100% of all the mineral substances on the mining claims and lithium only on four mineral claims
- Cash payment of CAD 75,000 (completed)
- Issuance of a total of 500,000 common shares over a five-year period (completed)
- Vendors retain a 1.5% NSR of which one third (0.5%) can be purchased by Lithium One for a cash payment of CAD 500,000

4.1.3 Permits

GLCI has obtained all necessary permits and certifications from government agencies to allow exploration on the property. In 2020 and 2021, MFFP has issued annual Forest intervention licenses for mining activities to GLCI allowing the clearance of 6,12 ha and 1,72 ha to create access for geotechnical drillings. In 2021, the geotechnical drillings were also subjected to the recent regulation known as REAFIE. The required *Déclaration de conformité* was agreed by MELCC on January 27, 2021. The authors of this Report are unaware of any other significant factors and risks that may affect access, title, or the right, or ability to perform the exploration work recommended for the James Bay property.

4.1.4 Environmental Considerations

The Project is an undeveloped exploration project. Minimal surface disturbances have occurred, which are limited primarily to wood clearance for access, surface drilling and prospecting.

The authors of this Technical Report are not Qualified Persons with respect to environmental liability. As far as the authors can determine, the environmental liability, if any, related to the Project is negligible.

4.2 Legal Framework

The mining industry in Québec is subject to federal and provincial laws and regulations. Both levels of government regulate environmental assessments and operation outputs to the receiving environment. The EIJBRG is informed of the project by the COMEX and JAC committees.

4.2.1 Federal

The Canadian Environmental Assessment Act (S.C. 2012, c. 19, s. 52) is the legal basis for the federal environmental assessment process of the Project. This version was used in October 2017, while filing the Project Description. In application of the Regulations Designating Physical Activities (DORS/2012-147), as the mine will extract more than 3,000 t/d (s.16a) and the concentrator will have an input capacity higher than 4,000 t/d an Impact Assessment was to be conducted by the Canadian Environmental Assessment Agency ("CEAA"), now the Impact Assessment Agency of Canada ("IAAC"). In June 2019, an agreement between the CEAA and the Cree Nation Government ("CNG") established that the impact assessment will be conducted by a Joint Assessment Committee ("JAC"), composed of representatives appointed by the CNG and the Agency. When the JAC and IAAC are satisfied with the Project, they file their assessment report to the Minister for approval. This authorization grants the right to apply for construction and operation permits required under the Fisheries Act and any other federal regulations, when required.

The federal *Fisheries Act* prohibits disturbance or destruction of fish habitat without an authorization. Given that fish habitats will be impacted by Project activities, an authorization pursuant to Section 35(1) of the *Fisheries Act* will be required. The application will have to include a compensation plan for the fish habitat loss due to Project construction and operations.

The *Metal and Diamond Mining Effluent Regulations* ("MDMER") pursuant to Section 36 of the *Fisheries Ac*t, and administered by Environment Canada, will apply when the Project is operational. The final effluent quality will then be submitted to toxicity testing and to deleterious substances restrictions as the Environmental Effects Monitoring Program will have to be initiated.

The environmental assessment process has been started but is not completed (see Section 20 of this document for details on the Project's permitting progress).

4.2.2 Provincial

The Ministry of Environment and the Fight against Climate Change (known as the *Ministère de l'Environnement et de la Lutte contre les changements climatiques* ("MELCC") is the Québec entity responsible for environmental protection and the conservation of biodiversity to improve the environmental quality of life. This ministry is responsible for the control and enforcement of laws and regulations concerning environmental protection, including the analysis of application to certificates of authorizations and other permits. It also regulates the prevention or reduction of the contamination of water, air and soil, drinking water quality, measures against climate change, as well as the conservation and protection of wildlife and its habitats.

The Environment Quality Act ("EQA"), (CQLR, c.Q-2) establishes the provincial environmental authorization scheme. As the Project is located within the territory governed by the James Bay and Northern Québec Agreement ("JBNQA"), it is also subjected to Chapter 22 of the JBNQA. According to Schedule A, paragraph a) all mining developments in the JBNQA territory are automatically subject to the assessment and review procedure contemplated in Sections 153 to 167 of the EQA.

The regulation stipulates that, further to a Project Notice, the ESIA, developed in accordance with provided guidelines, is submitted to the Environmental and Social Impact Review Committee (Review Committee or COMEX). This independent body composed of members appointed by the Québec and the Cree Nation governments analyses the ESIA report and provides the government of Québec with their recommendations regarding the Project. The MELCC's Deputy Minister as JBNQA Administrator then sign the Project authorization. This authorization gives the right to apply for construction and operation permits required under the EQA, Mining Act and any other permits required under the Quebec legislation (see Section 20 of this document for details with respect to the Project's permitting progress).

The Mining Act (CQLR, c. M-13.1) requires the claims to be transferred into a mining lease before mineral is extracted from the mine. The application for the mining lease is to be submitted to the Ministry of Energy and Natural Resources (*Ministère de l'Énergie et des Ressources naturelles* (MERN)) and must be accompanied by a survey of the parcel of the land concerned, a Project Feasibility Study, a Closure Plan as well as a Scoping and Market Study regarding the likelihood of processing in Québec (secondary transformation). The concentration stage planned as part on the Project site is not considered as a processing activity.

Sandpits and quarries located outside the mining lease (“BM”) boundaries are also subjected to mining rights such as a non-exclusive lease (“BNE”) and an exploitation lease (“BEX”). The sandpits and quarries are also subjected to ESIA under Chapter 22 of the JBNQA.

4.3 Environmental and Social Considerations

Until 2018, only exploration activities had been conducted on the Project site. Since, minimal drilling and pit testing were completed for geotechnical purposes. No other anthropogenic environmental disturbances were observed.

On March 18, 2019, a Preliminary Development Agreement (“PDA”) was signed with the Cree Nation of Eastmain, Grand Council of the Cree and Cree Nation Government. The IBA is currently in negotiation between the relevant parties, reflecting the PDA requirements.

The key points of the PDA that GLCI agreed to are:

- Maximize Cree/local employment and training
- Appoint and pay an Eastmain Cree Liaison Officer – complete
- Notify Cree of supply and service requirements and opportunities twice yearly, for subsequent 12 months
- Open a Business Development Office (BDO) in Eastmain in timely manner
- Award certain contracts on preferential Cree basis with equal conditions and not more than 5% over lowest bidder
- Provide information on project application for approvals and permits as public announcements. Documents to be available at BDO for public access

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The Project is accessible year-round via the paved Billy-Diamond Highway. The property is approximately four hours north of Matagami, Québec, at km 382, near the Relais Routier km 381 Truck Stop.

5.2 Climate

The climate at the Project site is classified as Continental Subarctic. The Project area is characterized as having long cold winters and short warm summers. The winter season can begin as early as October and extend through April. Temperatures range from 5 °C to below -45 °C, with significant snow cover. Temperatures range from approximately 15 to 35 °C during the summer months, with moderate rainfall and thunderstorms during exceptionally hot weather conditions.

5.3 Local Resources

The km 381 Truck Stop provides services including lodging and food, fuel, electricity, telephone services and a helipad. It is owned and operated by the Société de Développement de la Baie-James (SDBJ, Government of Quebec) and is located less than one kilometre from the Project.

The town of Matagami is an established community, 381 km south of the Truck Stop. The community is able to provide additional services and support to industrial projects in the James Bay territory, including the mining sector.

5.4 Physiography

The Canadian Shield covers nearly 90% of Québec. It is relatively flat and exposed, punctuated by the higher relief of mountain ranges such as the Laurentian Mountains in southern Québec, the Otish Mountains in central Québec and the Torngat Mountains near Ungava Bay in northern Québec. The topography of the Shield has been scoured by glaciers, explaining the extensive glacial deposit of boulders, gravel and sand, and the thick clay deposits left behind by postglacial seawater and lakes. The Canadian Shield is also characterized by an intricate hydrological network of lakes, peat bogs, rivers and streams.

The Eastmain River, located approximately ten kilometres north of the property, is a west-flowing river of approximately 600 km in length. The river separates approximately 40 km from its mouth and divides into two branches that are frequently interrupted by rapids and falls of up to 35 m in height.

The boreal forest is the most northerly and abundant of Québec's three forest zones, straddling the Canadian Shield and Hudson Bay Lowlands regions of the province. Dominated by black spruce and carpets of moss, the ecology of this zone is heavily influenced by fire disturbance regimes, meaning that forest fires are critical in defining the numbers of, and the relationship between, living organisms in this zone. Figure 5.1 illustrates the landscape typical of the Project area.

Figure 5.1: Typical Landscapes in the Project Area

Source: Galaxy, 2021

6 HISTORY

The following paragraphs regarding the history of the Project are largely extracted from a previous technical report prepared by Broad Oak Associates (November 2009).

Prospector Jean Cyr first discovered spodumene pegmatite outcrops on the property in 1964. The property was staked in 1966 by Mr. Cyr and was optioned by the SDBJ in 1974, who after conducting some exploration on the property, returned it to Mr. Cyr on June 10, 1986.

The Cyr Property Mining Claims are now managed by Louis McGuire, of Eastmain Management Inc.

A consultant, Mr. G. Valiquette, prepared a preliminary evaluation report on the property in 1974. This report described a ridge-like occurrence of spodumene pegmatite outcrops that rose 15 m above the surrounding swamp and extended for approximately 500 m. Selected samples from four test pits excavated by Mr. Cyr yielded the following results (note: the reader is cautioned that the assaying results reported herein are from selected samples that may not be representative of the lithium oxide (Li_2O) grades of the pegmatite dikes sampled):

Pit Number 1	2.34% Li_2O
	3.35% Li_2O
Pit Number 2	4.42% Li_2O
	3.63% Li_2O
Pit Number 3	3.58% Li_2O
	3.28% Li_2O
Pit Number 4	0.86% Li_2O

Commencing in 1974, SDBJ conducted an exploration program that consisted of geological mapping, systematic sampling and diamond drilling of the mineralized outcrops to evaluate the lithium potential of the property. The mapping defined an area of 45,000 square metres of outcropping spodumene dikes. According to a 1977 report by SDBJ, the pegmatite dikes contained 25% spodumene and dipped at 65 degrees. The geological mapping suggested a possible extension of the spodumene pegmatite dikes into an irregular east-west trending “corridor” four kilometres in length, with lenses or sill-like bodies up to 300 m in length.

The average grade from 277 powder samples recovered by SDBJ in 1974 was found to be 1.7 +/- 0.1 weight percent Li_2O (95% confidence limits), with a standard deviation of 0.8% Li_2O. The analyses also indicated low concentrations of beryllium (less than 200 parts per million), cesium (less than 100 parts per million), niobium and tantalum.

In 1975, SDBJ produced a geological map of the property showing typical rock types for greenstone belts of the northern Superior Province, including biotite schists, gneiss, mafic metavolcanic rocks, dacite, quartzite, conglomerate, gabbro, granite and pegmatite. The pegmatites occur as northeast-southwest trending irregular dikes or lenses and are interlayered with biotite schists and contain inclusions of greenstone. Spodumene occurs as bladed crystals ranging from a few centimetres to over a metre in length.

The Centre de Recherches Minérales du Québec conducted concentration tests and chemical analyses in 1975. A composite sample of the spodumene pegmatite grading 1.7% Li_2O yielded a spodumene concentrate grading an average of 6.2% Li_2O with a recovery factor of 71%.

Three core boreholes totalling 383 m were drilled on the property in 1977, which confirmed the presence of spodumene mineralization to a depth of approximately 100 m. The three boreholes were drilled along the axis of the “corridor,” across the pegmatite lenses, and intersected a sequence of interlayered spodumene pegmatite and biotite schists. The pegmatite contained up to 35% spodumene, locally, and several Li_2O intersections were reported.

The main Li_2O intersections obtained from the drilling program are summarized in Table 6.1.

Table 6.1: Main Li_2O Values Intersected in the Three Boreholes Drilled in 1977

Hole ID	Length (m)	From (m)	To (m)	Interval * (m)	Li_2O (%)	Comment
77-2	151.8	17.19	51.11	33.92	1.92	53% pegmatite
		63.03	75.01	11.98	1.62	
		83.94	107.20	23.26	2.00	
		107.96	119.05	11.09	1.76	
77-3	105.2	61.17	84.37	23.20	1.78	34% pegmatite
		92.63	100.43	7.80	2.12	
77-4	125.6	28.68	45.93	17.25	1.45	36% pegmatite
		48.22	53.04	4.82	2.00	
		57.61	66.05	8.44	1.73	
		92.99	97.54	4.55	2.24	

* *Historical core length intervals. It is uncertain if the reported core length intervals represent true widths. This historical assay data was not considered for mineral resource estimation.*

6.1 Historical Mineral Resource Estimate

The first mineral resource estimate prepared for the Project in accordance with the Canadian Securities Administrators' National Instrument 43 101 was completed by SRK in 2010 for Lithium One. The mineral resource model considered 102 core boreholes and 45 channel samples collected by Lithium One during the period of 2008 to 2010. The database included a total of 3,724 assay intervals with assay results for lithium. SRK was of the opinion that the drilling information was sufficiently reliable to interpret with confidence the boundaries for pegmatite dikes containing spodumene mineralization and that the assay data were sufficiently reliable to support mineral resource estimation.

The November 18, 2010 Mineral Resource Statement for the Project is presented in Table 6.2 and was supported by a technical report dated December 10, 2010.

Table 6.2: Mineral Resource Statement*, November 18, 2010

Resource Category	Quantity (t)	Grade Li_2O (%)
Indicated	11,750,000	1.30
Inferred	10,470,000	1.20

* Reported at a cut-off grade of 0.75% Li_2O inside conceptual pit shells optimized using Lithium Carbonate price of USD 6,000/t containing 40.4% Li_2O, metallurgical and process recovery of 70%, overall mining and processing costs of USD 64/t milled and overall pit slope of 45 degrees. All figures rounded to reflect the relative accuracy of the estimates. Mineral resources are not mineral reserves and do not have demonstrated economic viability.

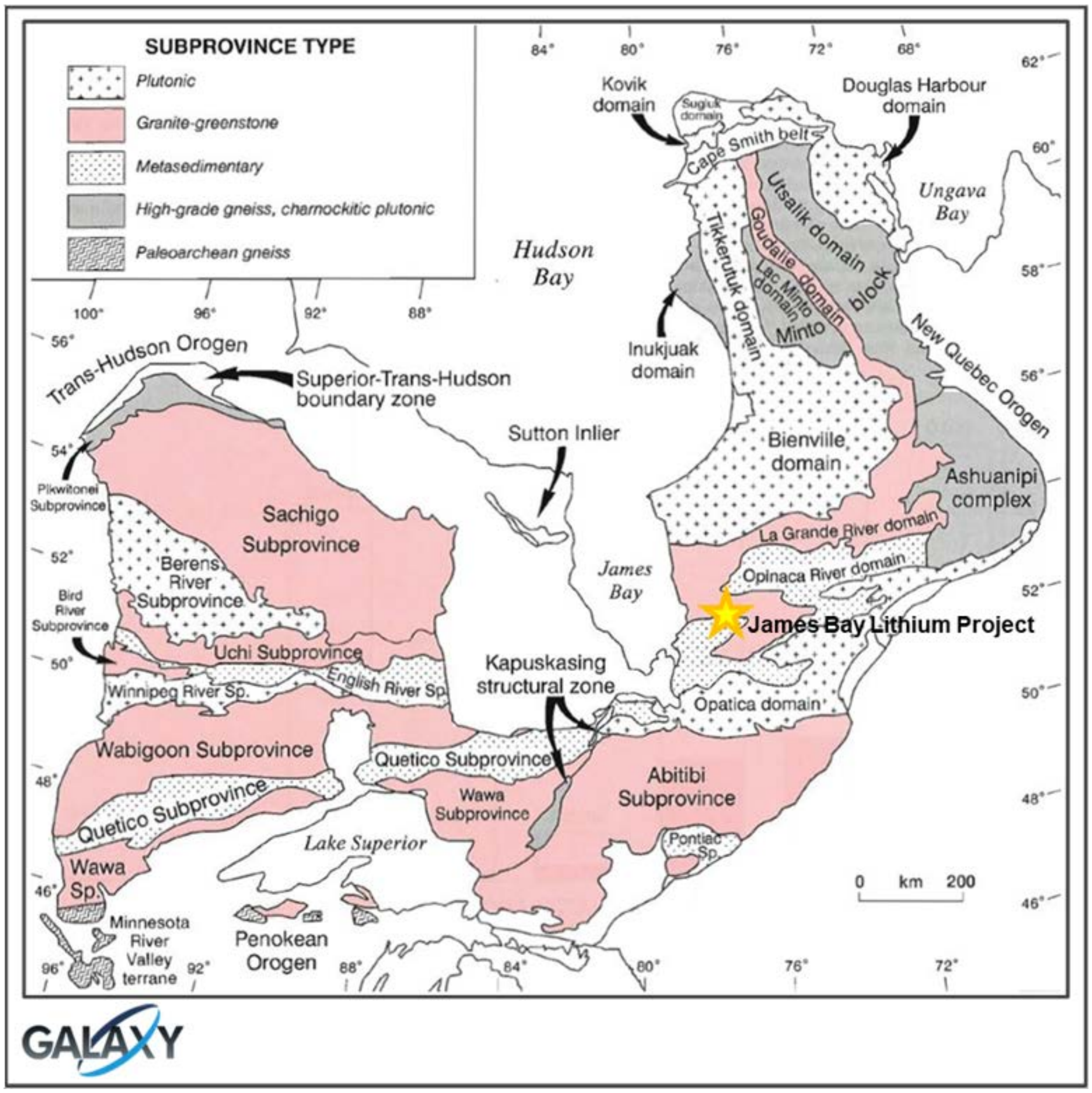
7 GEOLOGICAL SETTING AND MINERALIZATION

The following paragraphs are largely extracted from a previous technical report prepared by Broad Oak Associates (November 2009).

7.1 Regional Geology

The Project is found in the North-eastern part of the Superior Province (Figure 7.1). The site lies within the Lower Eastmain Group of the Eastmain greenstone belt, which consists predominantly of amphibolite grade mafic to felsic metavolcanic rocks, metasedimentary rocks and minor gabbroic intrusions.

Figure 7.1: Regional Geology Setting and Subdivisions of the Superior Province



Source: Moukhsil, 2007

The property is underlain by the Auclair Formation, consisting mainly of paragneisses, of probable sedimentary origin, which surround the pegmatite dikes to the northwest and southeast. Volcanic rocks of the Komo Formation occur to the north of the pegmatite dikes. The greenstone rocks are surrounded by Mesozonal to Catazonal migmatite and gneiss (Franconi, 1978; Moukhsil et al., 2007). All rock units are Archean in age.

The following excerpt extracted from Moukhsil, et al. (2007) summarizes the regional geological setting of the Project:

"The Middle and Lower Eastmain greenstone belt (MLEGB) is in the James Bay region.

The region comprises an Archean volcano-sedimentary assemblage which is assigned to the Eastmain Group. This group is made up of komatiitic to rhyolitic volcanic rocks and a variety of sedimentary rocks. The assemblage is overlain by the paragneisses of the Auclair Formation (Nemiscau and Opinaca basins). The mineral occurrences are spatially related to the MLEBG and grouped in very specific areas.

In the Middle and Lower Eastmain sector, four volcanic cycles are recognized based on age 1) 2,752 to 2,739 Ma; 2) 2,739 to 2,720 Ma 3) 2,720 to 2,705 Ma and 4) <2,705 Ma (Figure 7.2). Research on plutons allowed the identification of several suites (TTG, TGGM and TTGM) with emplacement episodes spanning the period 2,747 to 26,97 Ma. Around 2,668 Ma, late intrusions of granodioritic to granitic composition that are locally pegmatitic transected the Auclair Formation. Several lithium and molybdenum showings are associated with these late intrusions, which are attributed to a period of crustal extension.

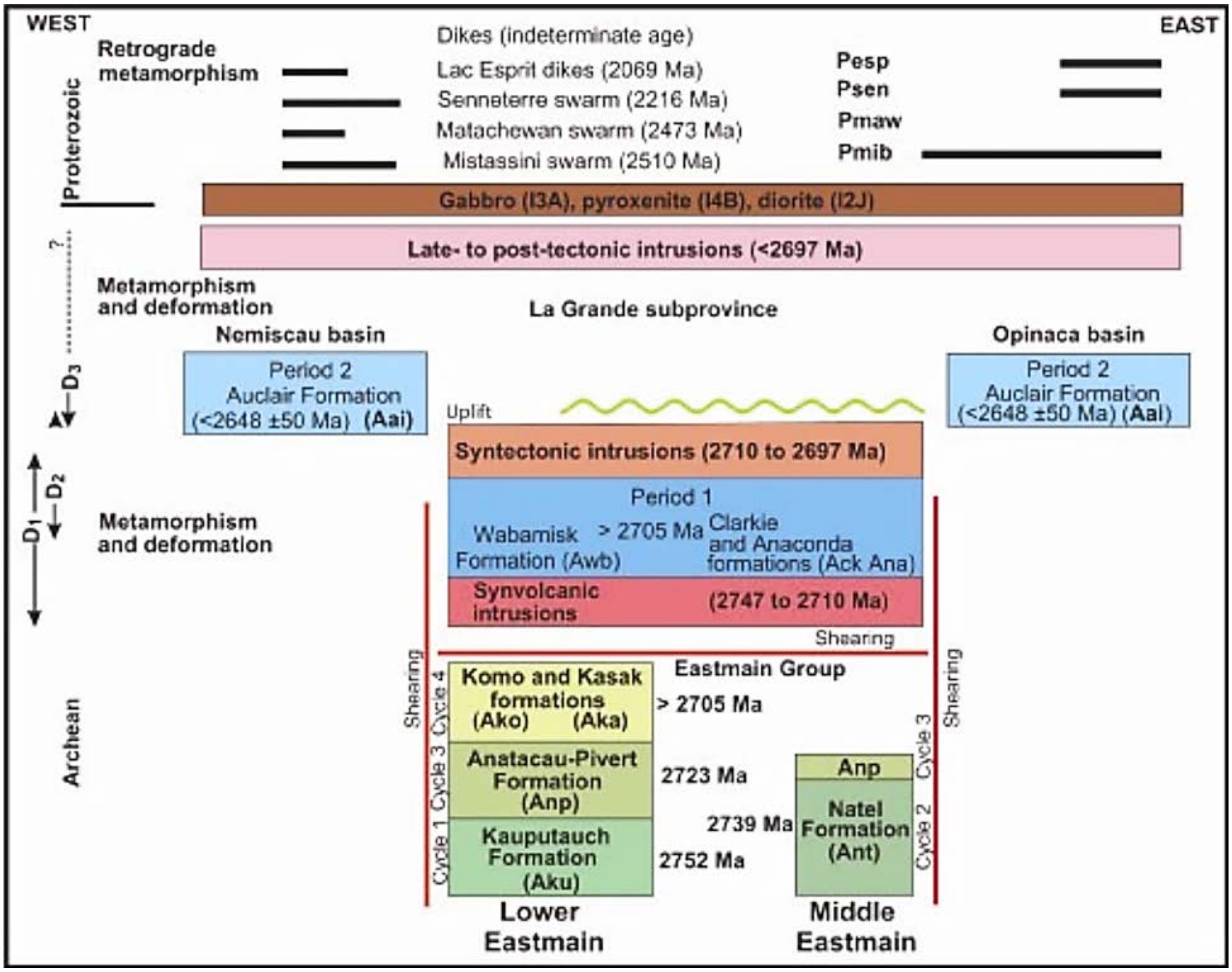
The regional settings and the geochemical composition of the volcanic rocks of the Middle and Lower Eastmain belt suggest that the earliest volcanic formations are the product of volcanism associated with ocean floor spreading (i.e. mid-ocean ridges and/or oceanic platforms).

The period 2,752 to 2,720 Ma (stages 1 and 2) marks the construction of oceanic platforms and a few andesitic arcs. The calc-alkaline (1-type) plutonic rocks (TTG) are indicative of subduction zone magmatism occurring around 2,747 Ma, although an episode of crustal thickening, followed by melting at the base of the crust, may explain the emplacement of a considerable array of batholiths up until 2,710 Ma. The different types of synvolcanic mineralization reveal peak activity at specific stages of volcanic construction, that is, epithermal mineralization about 2,751 Ma, volcanogenic massive sulphide mineralization between 2,720 and 2,739 Ma, and porphyry-type mineralization at about 2,712 Ma.

Between 2,697 and 2,710 Ma (stage 4), a resurgence of syntectonic plutonism (D1) occurred. After this period, crustal shortening (N-S) generated a few regional faults (E-W to ENE) and widespread uplifting.

The destruction of volcano-plutonic assemblages is partly reflected in the deposition of conglomerates (D2). Orogenic-type gold occurrences are associated with these two deformation episodes; however, the most extensive zones of mineralization, such as the Eau Claire deposit and the mineral occurrences on the Auclair property, are related to the D2 event. Tectonic activity culminated with the formation of the Nemiscau and Opinaca basins (before 2,700 Ma), which are associated with arc-extension periods."

Figure 7.2: Schematic Time Chart for the Three Phases of Deformation



Source: Moukhsil, 2007

7.2 Property Geology

The following is reproduced from a report prepared for Coniagas Resources Ltd. by A. James McCann (Report 2008 Diamond Drilling Program Cyr-Lithium Property (33C/03) James Bay):

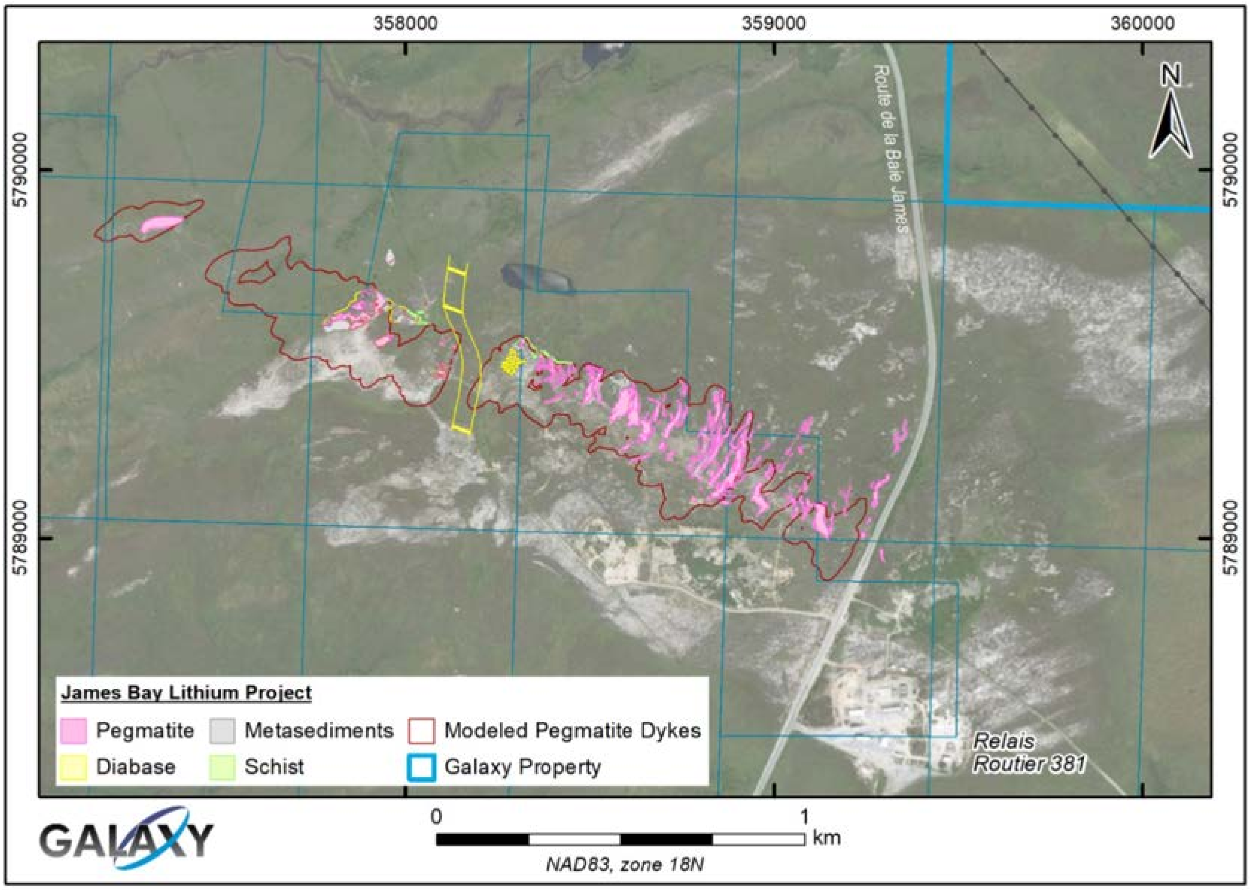
"The pegmatites found on the Cyr-Lithium property are located within the Lower Eastmain Group of the Eastmain River Greenstone Belt. A reconnaissance geological map of the property was produced by the

SDBJ in 1975. Biotite schist and gneisses, together with mafic metavolcanics, dacites, quartzites, meta-conglomerates, meta-gabbros, granites and pegmatites have been identified. Most of the non-intrusive rocks are well foliated, striking E-NE, and dipping subvertically; the granites and pegmatites have a more massive appearance. According to (Boisvert, 1989), "…the pegmatites are unzoned, except for the occasional presence of border zones a few centimetres thick occurring in contact with the host amphibolite."

Mapping by J. C. Potvin of SDBJ had identified 14 important dikes of spodumene (SDBJ: GEOLOGIE ET STRUCTURE MAPS, project 350-3610-010, Oct. '75). According to (Pelletier, 1977), "The individual bodies are mostly irregular dikes or lenses attaining up to 60 metres in width and over 100 metres in length. They cross-cut at a high angle the foliation and presumed bedding of the intruded rocks on a local and regional scale". And "These dikes strike most often N20°E/60°W but may vary from north-east to north-west and generally show a westerly dip of 60° or steeper". The group of outcrops forms a discontinuous band or "corridor" approximately 4 kilometres long by 300 metres wide striking N103°E and cutting the host rock at a low angle. The pegmatites are generally perpendicular to the trend of the "corridor"; they form small hills reaching up to 30 metres above the surrounding swamps.

The pegmatites delineated on the property to date are oriented generally parallel to each other and are separated by barren host rock of sedimentary origin, metamorphosed to amphibolite facies (Figure 7.3). A total of 50 individual pegmatite dikes have been resolved on the Project to date (some grouped into swarms), with the potential of additional dikes to be delineated on the property to the east with additional drilling, based on numerous undefined borehole intersections of pegmatite during 2017 drill program.

Figure 7.3: Outcrop Geology Displaying Mapped Pegmatites and Modelled Pegmatites Projected to Surface



Source: Galaxy, 2021

7.3 Mineralization

Spodumene is a relatively rare pyroxene that is composed of lithia (8.03% Li_2O), aluminium oxide (27.40% Al_2O_3) and silica (64.58% SiO_2). It is found in lithium-rich granitic pegmatites, commonly associated with quartz, microcline, albite, muscovite, lepidolite, tourmaline and beryl. Spodumene is the principal source of lithium found at the Project (Figure 7.4).

Figure 7.4: Spodumene Crystals Observed at the Project

Source: G Mining Services, June 2021

The following is reproduced from a report prepared for Coniagas Resources Ltd. by A. James McCann (Report 2008 Diamond Drilling Program Cyr-Lithium Property (33C/03) James Bay) regarding the pegmatites found on the Project:

The crystal orientation of the spodumene laths can be used as a means to identify the orientation of the pegmatites; as the crystal laths are generally perpendicular to the dike trend or long axis (Valiquette, 1974). (Pelletier, 1975) of the SDBJ suggested that the pegmatites intruded in radial fractures emanating from a centre located to the West. In his thesis, (Potvin, 1976) hypothesizes that the spodumene pegmatites are related to a granitic batholith located SW of the property. Spodumene occur as white to greenish prismatic and striated crystals varying from a few millimetres to over one metre in length. When altered, sericite forms on the surface of the spodumene and as it progresses, the colour changes to brown from the increasing iron oxides adhering to the surface. Spodumene can also alter to a Li-bearing mica in platy aggregates pseudomorphs after spodumene. Microprobe analyses reveal the Cyr-Lithium spodumene with the following formula (Li0.99 Na0.01) $AlSi_2O_6$, with an iron content of 0.96% (Total Fe_2O_3). Work by the SDBJ identified the major minerals associated with spodumene pegmatites in decreasing order of abundance as: perthitic feldspar, spodumene (25%), quartz, muscovite, apatite, beryl, iron oxides, ilmenite, serpentine, tourmaline (?) and ferrisicklerite or lithiophilite (Li (Mn, Fe) PO_4). In 1974, Valiquette revealed that pale green muscovite contained 0.18% Li_2O.

8 DEPOSIT TYPES

London (2008) describes pegmatite as: *"an igneous rock commonly of granitic composition, that is distinguished from other igneous rocks by its extreme coarse but variable grain-size, or by an abundance of crystals with skeletal, graphic or other strongly directional growth habits. Pegmatites occur as sharply bounded homogeneous to zoned bodies within igneous or metamorphic host rocks."*

Granitic pegmatites are a well-known source of a variety of rare metals and industrial minerals. The high concentration of rare metal mineralization and the high purity of most industrial minerals, combined with their coarse-grained nature, are the primary factors favouring pegmatite exploitation (Ĉerný, 1991). The available data suggests that the pegmatites of the Project are of the rare-element 'class', the lithium, cesium, tantalum (LCT) 'family' and the albite-spodumene 'type' according to the classification of Ĉerný (1991).

LCT pegmatites are the products of plate convergence and have been emplaced into orogenic hinterlands, even those now in the core of Precambrian cratons (Bradley and McCauley, 2016). Most LCT pegmatites are known to have intruded metasedimentary rocks, typically at low-pressure amphibolite to upper green schist facies (Ĉerný, 1991). LCT pegmatites represent the most highly differentiated and last to crystallizing components of certain granitic melts. Regional zonation of rare metals is generally observed in such pegmatites, resulting from a cogenetic intrusion (Ĉerný, 1991). This zonation indicates an enrichment of various rare metals in pegmatite dikes as a function of their distance from the cogenetic intrusion. Spodumene-bearing pegmatites of the Project are likely the most differentiated dikes and the most distant from the cogenetic intrusion; the Kapiwak Pluton located to the south of the property (Moukhsil et al., 2001).

Individual pegmatites can form tabular sills, dikes and lenticular bodies or irregular masses, and most LCT pegmatites show some sort of structural control. At shallower crustal depths, pegmatites tend to be intruded along faults, fractures, foliation and bedding (Brisbin, 1986), whereas in higher grade metamorphic terranes, pegmatites are typically concordant with the regional foliation and form lenticular, ellipsoid or "turnip-shaped" bodies (Fetherston, 2004).

Granitic pegmatites are generally more resistive to weathering and stand above their surroundings, as is the case for the James Bay pegmatites, and are readily recognizable due to their light color and unusually large crystal size. The pegmatite dikes of the Project are interpreted as being up to 60 m in width and over 200 m in length, generally striking south-southwest and dipping moderately to the west-northwest (215 degrees / 60 degrees).

9 EXPLORATION

Lithium One completed extensive geological mapping of the immediate area surrounding the Project. Ground geophysical surveys conducted in 2008 and 2021 show resistivity anomalies associated with the pegmatite occurrences, and in 2009 a significant cut grid was established on the property. In 2010, an airborne LIDAR survey was conducted to improve the topographic contour model.

9.1 Induced Polarization and Magnetometer Survey

9.1.1 2008 Survey

Géophysique TMC Inc., a geophysical consulting firm from Val-d'Or, Québec, performed an induced polarization (IP) and magnetometer survey over the Project property in June 2008. The purpose of the survey was to gain a better understanding of the geology of the property and its relationship with spodumene-bearing pegmatites that outcrop in the area. The surveys were carried out along northwest-southeast oriented lines. The survey grid lines, totalling 26.6 line-kilometres, were spaced every 50 m and picketed every 25 m by Corriveau JL & Associated Inc. All stations were surveyed using a high precision GPS.

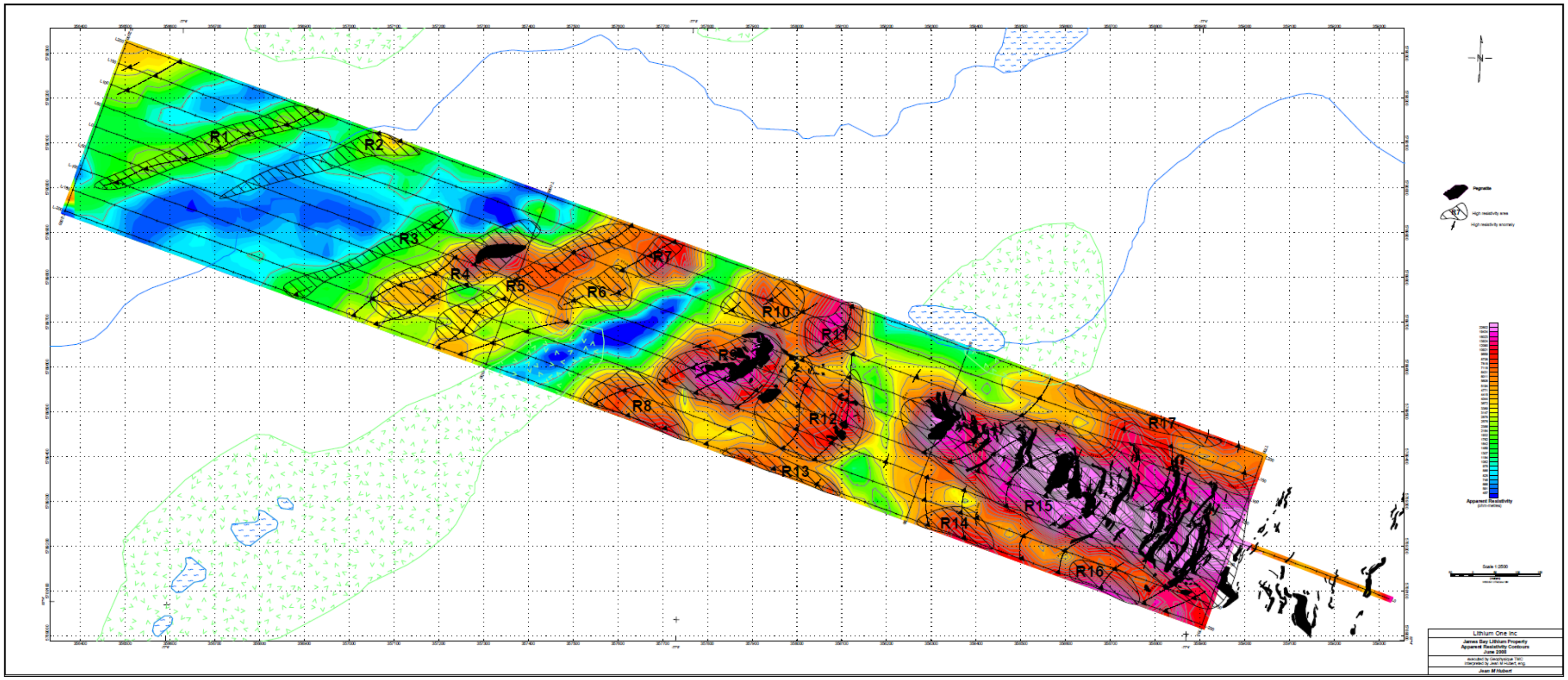
The magnetic survey was conducted along the survey lines, base line and tie lines for a total length of 26.3 line-kilometres, with readings every 12.5 m (Figure 9.1 to Figure 9.3). The readings were taken using an Overhauser GSM-19 magnetometer built by GEM Systems. The IP survey was conducted along the lines for a total length of 24.3 line-kilometres. An Elrec Pro time domain receiver built by Iris Instruments and a transmitter GDD Tx III built by GDD Instrumentation were used to carry out the survey (Figure 9.1 to Figure 9.3).

A highly magnetic anomaly observed between grid line L200S – 1+00W and L200N – 2+50 W is due to a diabase dike (Figure 9.1 to Figure 9.3). Its deviation north of L0 was interpreted as being caused by a fault, however, the magnetic map did not indicate in which direction. In the northwest portion of the surveyed area, high and low magnetic lineaments oriented in a northeast-southwest direction reflect the regional trend of the geology in the area. No significant contrast in the magnetic properties of the pegmatites and the surrounding rocks were observed, and it was concluded that the magnetic map was not useful in defining the extent of known pegmatites or of resolving new pegmatite bodies.

The apparent resistivity values measured in the survey area varied from 220 Ω-metres to 51,000 Ω-metres (controlled primarily by the thickness and the conductivity of the overburden); a total of 17 high-resistivity areas were interpreted from the survey (Figure 9.1 to Figure 9.3). In the northwest portion of the survey area, a number of resistive formations were identified. Pseudo sections indicated that the overburden in this area could be 15 to 25 m thick, however, the inversion model suggested the resistive formations form a ridge, and the overburden thickness should therefore be less over them; these anomalies were recommended to be tested. It was also recommended that the resistivity survey be extended to the southeast for approximately 2 km, as pegmatites have been observed for over 1 km beyond the Billy Diamond Highway (formerly the James Bay road). Furthermore, additional survey lines were recommended to the north and south of the actual line grid to delineate some of the resistive areas prior to drill investigation.

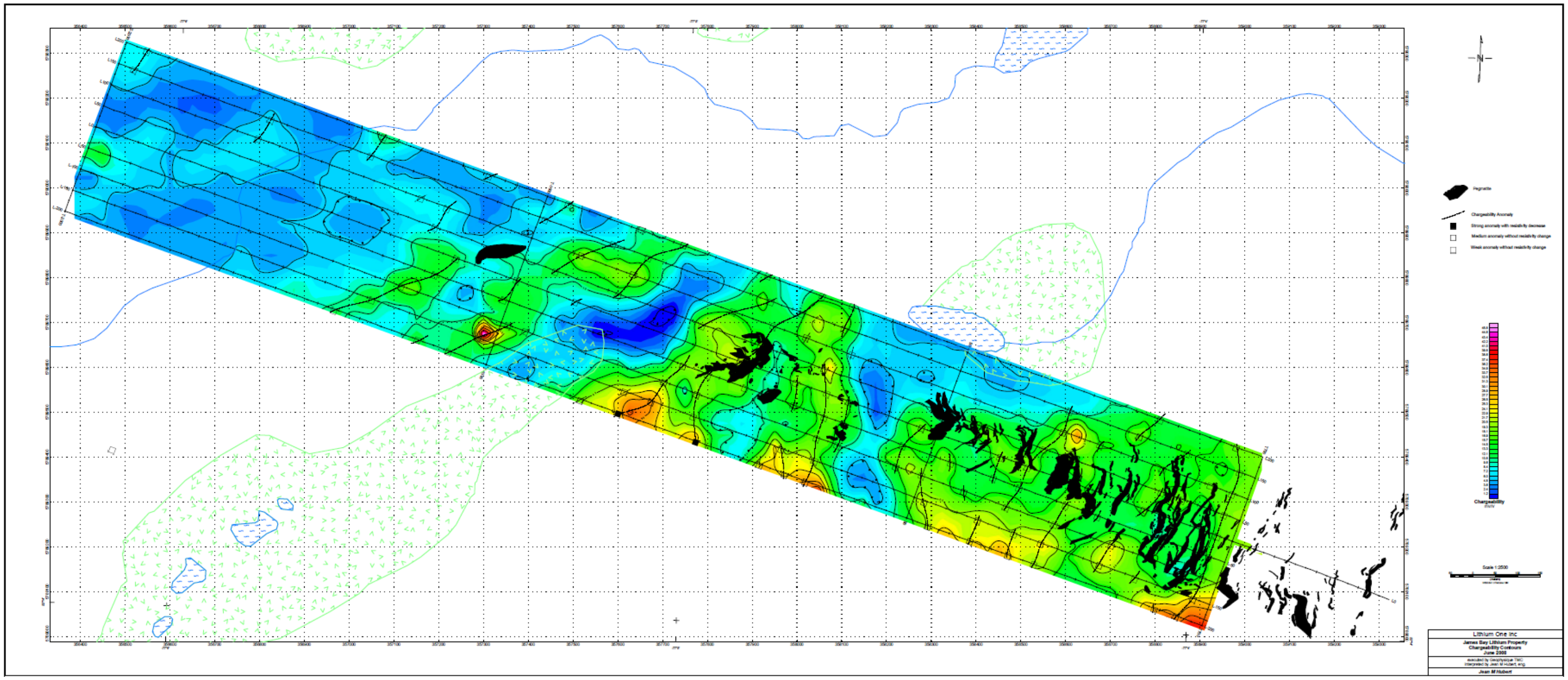
Most of the chargeability anomalies were associated with increased resistivity. Spodumene bearing pegmatites are not chargeable, and the chargeability did not provide any additional information to define them.

Figure 9.1: Geophysical Survey Conducted over the Project Property in June 2008: *Apparent Resistivity*



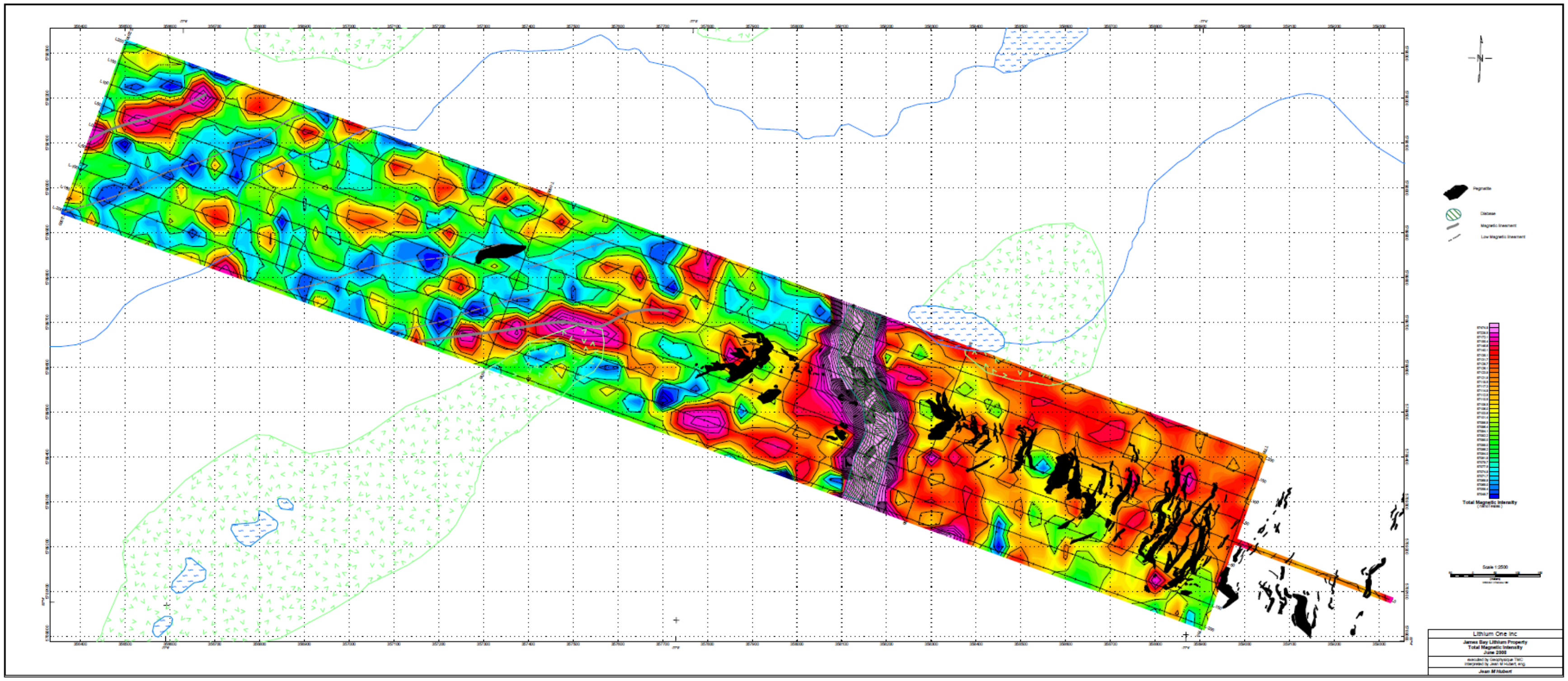
Source: Géophysique TMC, June 2008

Figure 9.2: Geophysical Survey Conducted over the Project Property in June 2008: *Chargeability Contours*



Source: Géophysique TMC, June 2008

Figure 9.3: Geophysical Survey Conducted over the Project Property in June 2008. *Total Magnetic Intensity*



Source: Géophysique TMC, June 2008

9.1.2 2021 Survey

As a part of the ongoing exploration program, Galaxy Lithium (Canada) Inc. commissioned TMC Geophysics to carry out a ground resistivity survey on the James Bay Project**.** The fieldwork lasted from April 13th through May 10th, 2021 and consisted of 58.9 km of ground IP resistivity profiles using the dipole-dipole electrode array.

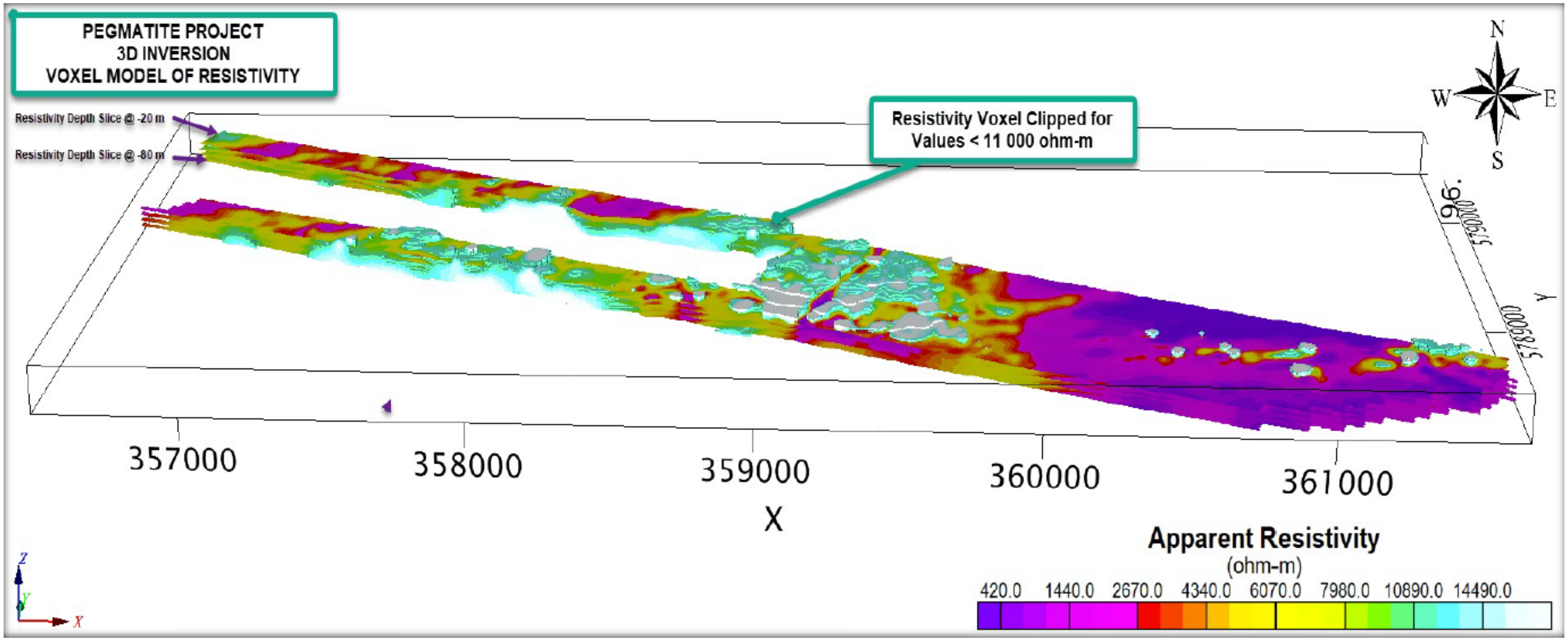
The ground resistivity measurements were acquired on a single grid that consists of a network of 17 N110º/N290º oriented profiles spaced every 50 m from L-400S to L-400N. Profiles were designed over distances ranging between 2.425 and 5.50 km and crosscut the central and eastern part of the property. The survey lines were picketed every 25 m with wooden stakes. On each of these stakes, the line and station numbers were indicated. The coordinates of all pickets were determined by using a Garmin GPS receiver. This information was ultimately used to geo-reference the geophysical database to the UTM18N_NAD83.

The induced polarization equipment consisted of a transmitting and receiving apparatus using a commuted signal. A motor generator drove the GDD Instrumentation TX-III transmitter capable of supplying 1.8 kW of continuous power.

A 3D inversion of the resistivity data was produced, and sections were cut at 20 m, 40 m and 60 m depths. See Figure 9.4 and Figure 9.5 for examples.

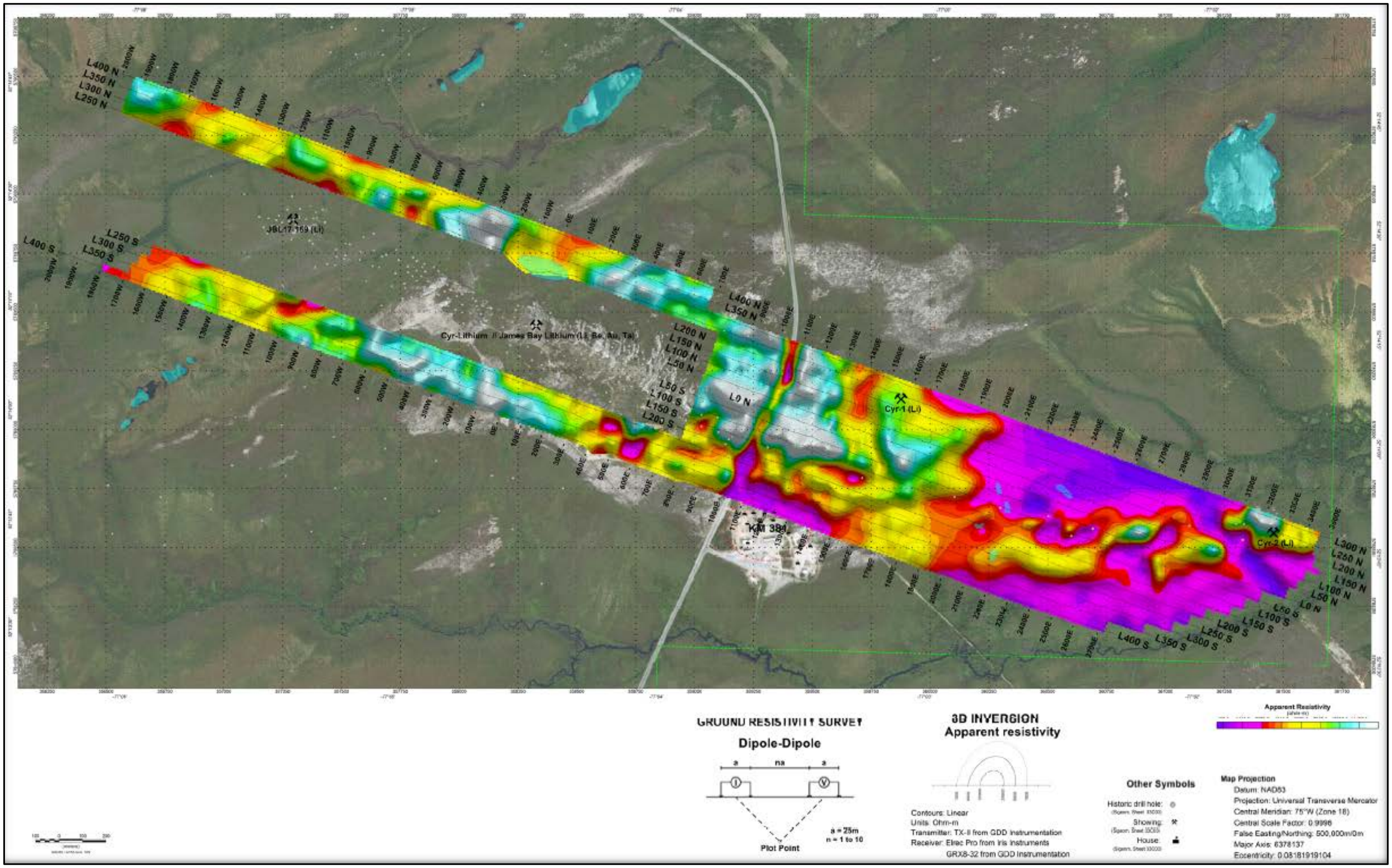
The continuation of the resistivity anomaly to the east of the highway suggests the pegmatite dyke swarm continues beneath glacial overburden. This hypothesis is supported by isolated outcrops of spodumene-bearing dykes 1 km to the east of the orebody (Cyr-2 Prospect).

Figure 9.4: 3D Inversion of Resistivity – 2021 Survey



Source: Géophysique TMC, June 2021

Figure 9.5: Horizontal slice of 3D Inversion Model at 40-m vertical Depth - Resistivity



Source: Géophysique TMC, June 2021

10 DRILLING

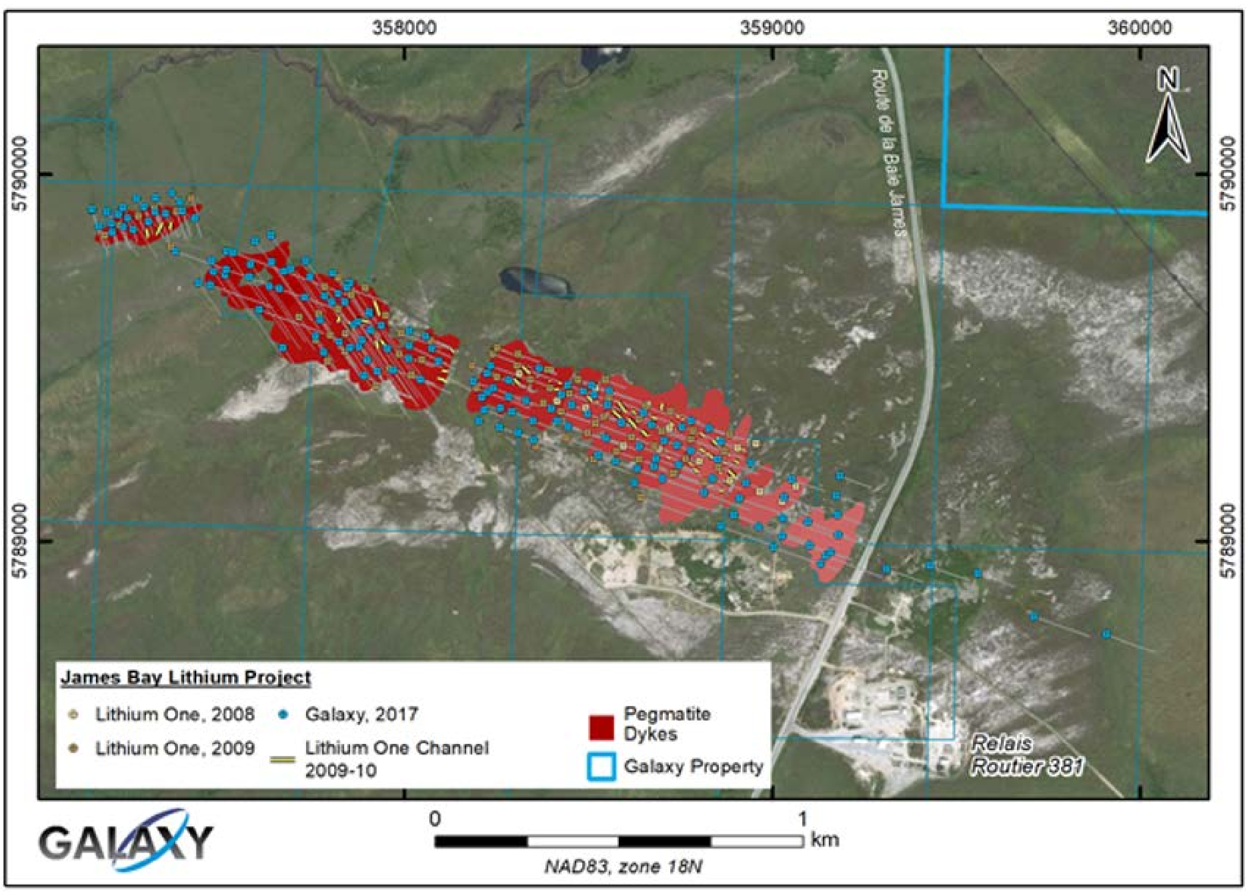
10.1 Drilling by Lithium One

The following paragraphs are summarized from a previous technical report prepared by Broad Oak Associates (November 2009) and have been elaborated to include drilling undertaken by GLCI during the winter of 2017/2018.

10.1.1 2008 Core Drilling Program

In September 2008, Lithium One drilled 18 core boreholes at a nominal spacing of 100 m (Figure 10.1). Due to a highly accentuated topography, large variations existed in the borehole spacing as maintaining a constant distance between holes was difficult due to the size of the drilling equipment used. Borehole collars were surveyed using a handheld GPS unit.

Figure 10.1: Distribution of Drilling and Channel Sampling on the Project as of December, 2017



Source: GLCI, Dec 2017

The boreholes were initially planned to investigate the pegmatite dikes along a rectangular grid consisting of two parallel lines of nine holes each, set at a 50-m spacing between holes. The grid would have covered an area of 50,000 m^2 (five hectares), evaluating approximately 500 m of strike length of the “corridor.” The original concept was modified to investigate a longer strike length of the pegmatite field at wider line spacing. The area increased to 180 hectares, and the strike length investigated by the drilling reached 900 m.

10.1.2 2009 Core Drilling Program

In 2009, Lithium One drilled a total of 84 core boreholes, achieving an average spacing of 50 to 60 m (Figure 10.1 and Figure 10.2). New areas of pegmatite were identified, and a new grid was established over these areas to facilitate drilling at a better angle. Borehole collars were surveyed using a handheld GPS unit.

Several higher-grade pegmatite sections were intersected in the new swarms to the west, suggesting a potential for higher grade spodumene mineralization.

10.1.3 2009 and 2010 Channel Sampling

A channel sampling program was conducted in 2009 and 2010 to sample the outcropping surface of a number of the pegmatite dikes; a total of 53 channel samples were cut from surface outcrops (Figure 10.1 and Figure 10.2). Lithium One hired Nord-Fort Inc. from Ste-Anne-des-Lacs, Québec between August 19 and 31, 2010 to sample specific sections of the outcropping pegmatites using 14-inch diamond channelling saws. The channel samples are represented in the exploration database as sub-horizontal boreholes.

10.1.4 Sampling Method and Approach

Standardized core sampling protocols were used by Lithium One. Initially, during the 2008 drilling program, core was sampled at 2.5 m intervals, and subsequently at 1.5 m intervals. A selective sampling procedure was used based on lithological contacts, where the maximum (and most common) sample interval was 1.5 m. Shorter samples were collected to define geological domains. Channel samples were also sampled at 1.5 m intervals.

Sample intervals were marked by appropriately qualified geologists. Two sample tags were placed at the beginning of each sample interval, while a third copy remained in the sample booklet along with the associated “from” and “to” information recorded by the geologist. A geotechnician was responsible for core cutting and for preparing the samples for dispatch to the preparation laboratory – Table Jamésienne de

Concertation Minière in Chibougamau. Assay samples were collected on half core sawed lengthwise using a diamond saw; the remaining half was replaced in the core box for future reference. Archived core was stored outdoors, cross-piled on shipping pallets or in metal racks at Relais Routier km 381 Truck Stop.

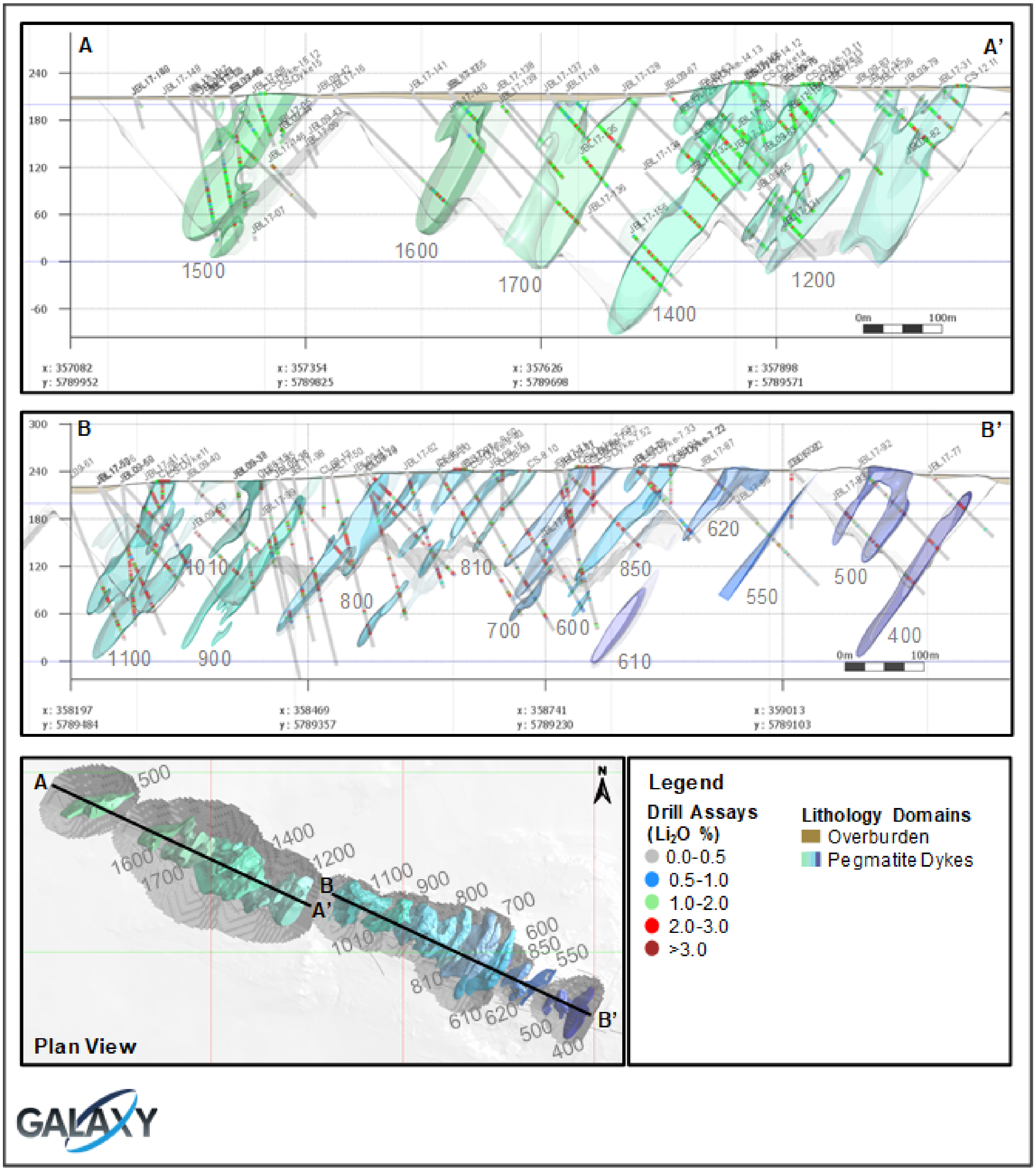
In the opinion of the authors, the sampling procedures used by Lithium One meet generally accepted industry best practices. The drill core sampling was conducted by qualified personnel under the direct supervision of qualified geologists.

10.2 Drilling by GLCI

10.2.1 2017 Core Drilling Program

Infill drilling at the Project commenced in early March 2017 and was completed in mid August, with the objective of refining the scale of the various pegmatite dikes and to aid in potential resource extension. Step-out holes were drilled to explore the down-dip extension of known pegmatites, and drilling commenced on previously mapped, but unexplored, pegmatites.

Figure 10.2: Representative Cross Sections of Pegmatite Domains Defined by Drilling and Channel Sampling by Lithium One and Galaxy



Source: SRK, Dec 2017

Previous drilling by Lithium One in 2008 and 2009 targeted pegmatites located on the west side of the James Bay Highway. GLCI mapped and drilled additional pegmatite bodies located on the east side of the highway, expanding the footprint of the known mineralization. GLCI drilled 157 boreholes on the property in the summer of 2017, totalling 33,339 m (Figure 10.1 and Figure 10.2).

10.2.2 2017 / 2018 Geotechnical, Metallurgical and Sterilization Drilling

In addition to the resource definition program in the summer of 2017, additional drilling was conducted between late November 2017 and the end of February 2018 for the following purposes:

- Collection of drill core samples for metallurgical test work
- Geotechnical drilling and logging
- Sterilization drilling under proposed infrastructure locations

In addition, three additional resource definition drill holes were drilling (JBL17-157 – JBL17-159). A summary of the meterage for each drilling campaign is shown in Table 10.1.

Table 10.1:Summary of Winter 2017/2018 Drilling Program

Drilling Purpose	Total Meterage	Number of Drill Holes	Average Depth
Res. Definition	1,246	3	415
Geotech	1,565	14	112
Metallurgical	1,477	30	49
Sterilization	6,612	55	120
Total	**10,900**	**102**	**107**

10.2.3 Sampling Method and Approach

All drill core handling was performed at the Relais Routier km 381 Truck Stop, with logging and sampling conducted by employees and contractors of GLCI. Lithology, structure, mineralization, sample number, and location were recorded by the geologists in a GEOTIC log database and stored on an external hard drive for additional security.

Drill core was stored in wooden core boxes and delivered to the core logging facility at the km 381 camp twice daily by the drill contractor. The drill core was first aligned and measured for core recovery by a technician, followed by RQD measurements. Due to the hardness of the pegmatite units, the recovery of the drill core was generally very good, averaging over 95%. The core was then logged, and sampling intervals were defined by the geologist. Before sampling, the core was photographed using a digital camera and core boxes were marked with box number, hole ID, and aluminum tags indicating “from” and “to” measurements.

Sample intervals were determined based on observations of the lithology and mineralization and were marked and tagged by the geologist. The typical sample length was 1.5 m but varied according to lithological contacts between the mineralized pegmatite and the country rock. In general, one country rock sample was collected from each side of the contact with the pegmatite.

The drill core was split lengthwise; one half was placed in a plastic bag with a sample tag, and the other half was left in the core box with a second samples tag for reference. The third sample tag was archived on site. The samples were then catalogued and placed in rice bags for shipping. Sample shipment forms were prepared on site, with one copy inserted with the shipment and a second copy given to the carrier. One copy was kept for reference. The samples were transported regularly by contractors’ truck directly to the ALS Canada Ltd – ALS Minerals laboratory in Val-d’Or, Québec. At the ALS facility, the sample shipment was verified, and a confirmation of receipt of shipment and content was sent digitally to the Galaxy project manager.

10.3 Comments

The QP is of the opinion that the drilling and sampling procedures used by GLCI, and previously by Lithium One, are consistent with generally recognized industry best practices. The resultant drilling pattern is sufficiently dense to interpret the geometry and the boundaries of pegmatite domains with confidence. The core samples were collected by competent personnel and the process was undertaken or supervised by suitably qualified geologists. The QP believes the samples are representative of the source materials and that there is no evidence that the sampling process has introduced a bias.

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

This section has been updated from the section originally prepared by SRK Consulting Inc. in the Preliminary Economic Assessment released in March 2021. Since the effective date of the mineral resource estimation, sampling and QAQC data has been compiled into a centralized database, and new information has been located. The graphs and tables present an overview of all QAQC data available at the effective date of this report.

11.1 Sample Preparation and Analyses

11.1.1 2008 to 2010 Lithium One Core and Channel Samples

Between 2008 and 2010, Lithium One collected 3,239 core samples from 100 boreholes (totaling 4,140 m of sampling material) and 562 channel samples from 53 channel cuts on surface outcrops (totaling 809 m). The average sample lengths for this phase are 1.28 m for diamond drilling and 1.44 m for channel sampling, with median lengths of 1.50 m for both sample types.

Samples were shipped from site in secure containers to Table Jamésienne de Concertation Minière in Chibougamau for preparation. The protocol for sample preparation involved weighing, drying, crushing, splitting and pulverizing.

The pulverized pegmatite core samples were shipped by the Table Jamésienne de Concertation Minière to the COREM Research Laboratory (COREM) in Québec City. COREM was accredited ISO/IEC 17025:2005 by the Standards Council of Canada for various testing procedures on April 30, 2009. The scope of accreditation did not include the specific testing procedures used by COREM to assay lithium (method code B23).

Lithium One also utilized SGS Mineral Services Lakefield Laboratory (SGS) as an umpire laboratory to monitor the reliability of assaying results delivered by the primary laboratory COREM. SGS is also accredited ISO/IEC 17025:2005 by the Standards Council of Canada for mineral testing by various methods. Similar to COREM, the scope of accreditation of SGS does not include the specific testing procedures used to assay lithium (method code 9-8-40).

In February 2010, Lithium One observed a positive bias (+17%) in SGS Li_2O umpire check assays. Assays were reanalyzed and additional samples were sent to ALS Minerals for further check the results. The SGS check assays were found in to inaccurate, and the ALS assays reproduced the COREM values.

At COREM, prepared samples were assayed using three-acid digestion (nitric acid, hydrofluoric acid, perchloric acid) in boiling water. The dissolved sample was analyzed by atomic absorption (AA) spectrometry. At SGS, prepared samples were assayed by sodium peroxide fusion and atomic absorption spectroscopy. At ALS Minerals, prepared samples were assayed using four-acid digestion (perchloric acid, hydrofluoric acid, nitric acid and hydrochloric acid) with ICP-AES finish.

Composite core samples were also submitted to Hazen Research Inc. in Golden, Colorado, for metallurgical testing. This laboratory is not accredited.

11.1.2 <u>2017 Galaxy Core Samples</u>

As part of the current mineral resource evaluation, Galaxy collected 9,194 core samples from 156 boreholes totalling 11,863 m in 2017. The average sample length for this phase is 1.29 m, with a median of 1.50 m.

Samples were shipped to ALS Minerals in Val-d'Or for preparation and analyses. The laboratory is accredited ISO/IEC 17025:2005 by the Standards Council of Canada for various testing procedures, however, the scope of accreditation does not include the specific testing procedure used to assay lithium.

Sample preparation involved the sample material being weighed and crushed to 70% passing 2 mm. The ground material was then pulverized to 90% passing 75 microns before being analyzed.

At ALS Minerals, prepared samples were assayed for mineralization grade lithium by specialized four-acid digestion and inductively coupled plasma – atomic emission spectrometry (ICP-AES) finish (method code Li-OG63). An approximately 0.4-gr sample was first digested with perchloric, hydrofluoric, and nitric acid until dry. The residue was subsequently re-digested in concentrated hydrochloric acid, cooled and topped up to volume. Finally, the samples were analyzed for lithium by ICP-AES. The method used has a lower detection limit of 0.01% lithium and an upper limit of 10% lithium.

11.2 <u>Specific Gravity Data</u>

GLCI conducted specific gravity on 92 core samples collected from various pegmatite dikes (30 samples) and host rock (62 samples) on the property. ALS Minerals laboratory determined the specific gravity by weighing each sample in air and in water and reporting the ratio between the density of the sample and the density of water (method code OA-GRA08).

The core sample was weighed (up to 6 kg) and then weighed again while suspended in water. The weight of the samples varied between 1.25 and 3.6 kg, with an average of 2.21 kg. The resulting measurements reported an average specific gravity value of 2.70 for the pegmatite material and 2.77 for the host rock.

The total count of specific gravity measurement on pegmatite dykes appears to be insufficient for the size of the deposit (approximately 0.5% of pegmatite assays). GMSI recommends additional specific gravity tests by ensuring they cover the mineral resource homogeneously, throughout the strike-length of the deposit. While this would increase confidence in the density model, it is not judged critical given that preliminary tests show a low variance in results.

11.3 Quality Assurance and Quality Control Programs

Quality control measures are typically set in place to ensure the reliability and trustworthiness of exploration data. This includes written field procedures and independent verifications of drilling, surveying, sampling and assaying, data management and database integrity. Appropriate documentation of quality control measures and regular analysis of quality control data are important as a safeguard for project data and form the basis for the quality assurance program implemented during exploration.

Analytical control measures typically involve internal and external laboratory control measures implemented to monitor the precision and accuracy of the sampling, preparation and assaying. They are also important to prevent sample mix-up and monitor the voluntary or inadvertent contamination of samples. Assaying protocols typically involve regular duplicate and replicate assays and insertion of quality control samples to monitor the reliability of assaying results throughout the sampling and assaying process. Check assaying is typically performed as an additional reliability test of assaying results. This typically involves re-assaying a set number of sample rejects and pulps at a secondary umpire laboratory.

11.3.1 Lithium One QA/QC Program

Lithium One relied partly on the internal analytical quality control measures implemented by COREM laboratory. Additionally, Lithium One implemented external analytical quality control measures consisting of using control samples (field blanks, in house standards and field duplicates) inserted with sample batches submitted for assaying in 2009 and 2010, and coarse reject duplicate samples in 2008. Table 11.1 summarizes the analytical control samples inserted by Lithium One.

Table 11.1: Summary of Analytical Quality Control Data Produced by Lithium One

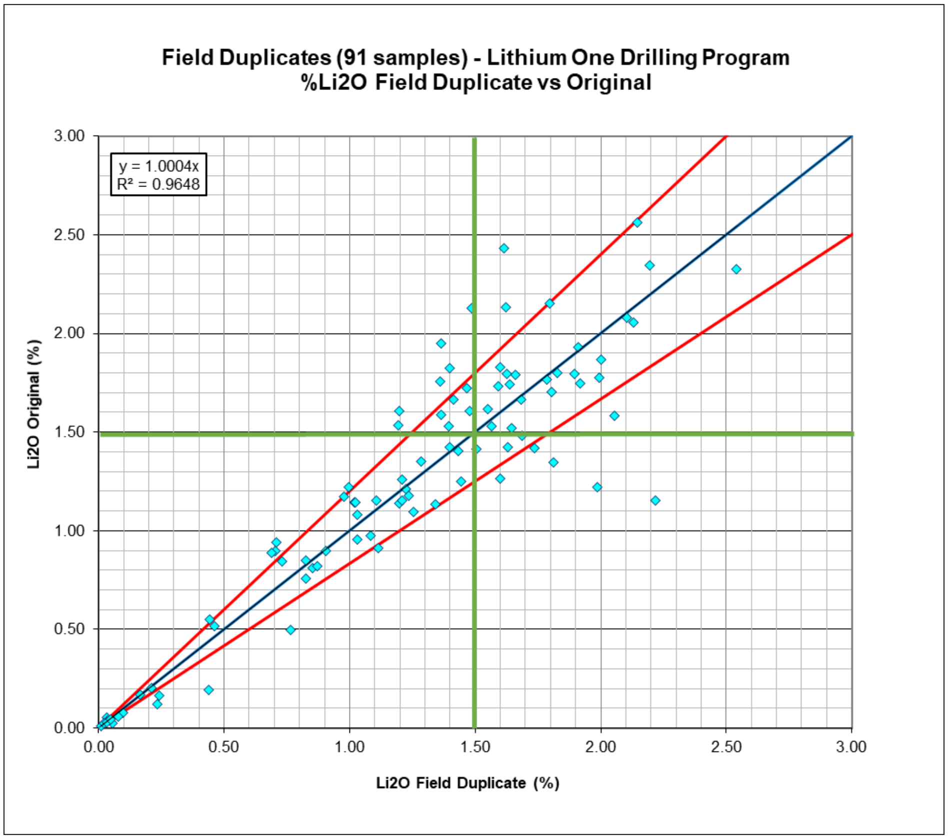
DDH/Channel			
Sampling Program	**2008-2010**	**(%)**	**Expected Value**
Sample count	*3,801*		
Field blanks (sand)	**23**	**0.6%**	<0.01 Li_2O (%)
QC samples	**44**	**1.2%**	
Standard-Low	21		0.84 Li_2O (%)*
Standard-High	23		1.34 Li_2O (%)*
Field duplicates	**91**	**2.4%**	
Total QC Samples	**158**	**4.2%**	
Check assay to umpire laboratory	100	2.6%	ALS Minerals
Check assay to umpire laboratory	100	2.6%	SGS Lakefield

* Expected values are equal to the average of results

11.3.1.1 Field Duplicates

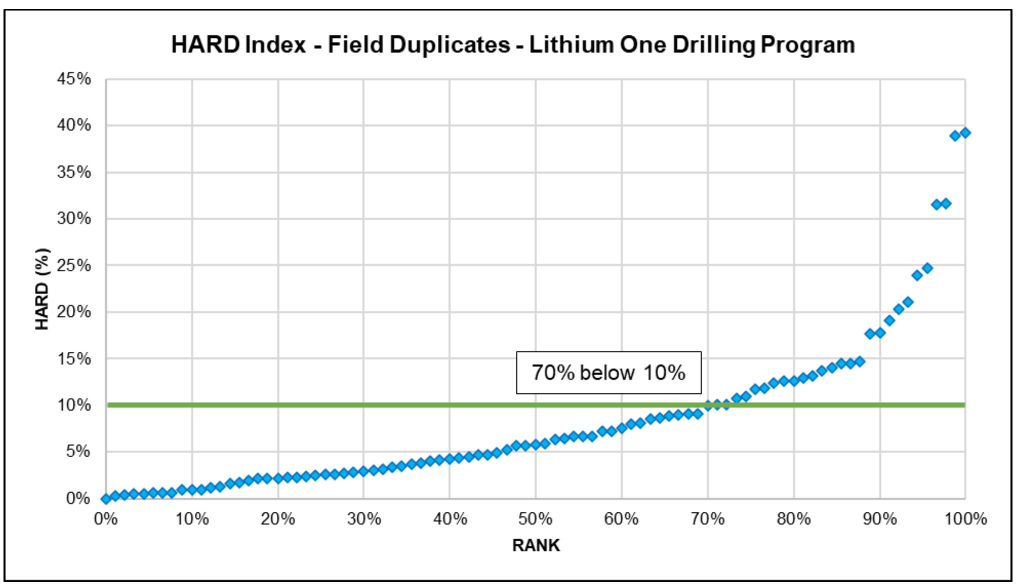
Field duplicates were generated from quarter core samples and inserted every 40 samples. Results, shown in Figure 11.1, show that while some results are above or below ±20%, there is no positive or negative bias in assay results. This can be witnessed by a trend near y=x (y=1.004x). The spread of data can be explained by the coarse spodumene mineralization in the pegmatites, as observed in outcrop and drill core, resulting in a certain variability between the field duplicate results. To gain further confidence in the reproducibility of data, the HARD index plot (Figure 11.2) shows that approximately 70% of data have a half absolute relative difference below 10%.

Figure 11.1: Field Duplicate (Quarter Core) – COREM Laboratory



Source: GMS, June 2021

Figure 11.2: HARD Index Plot of Field Duplicates – COREM Laboratory

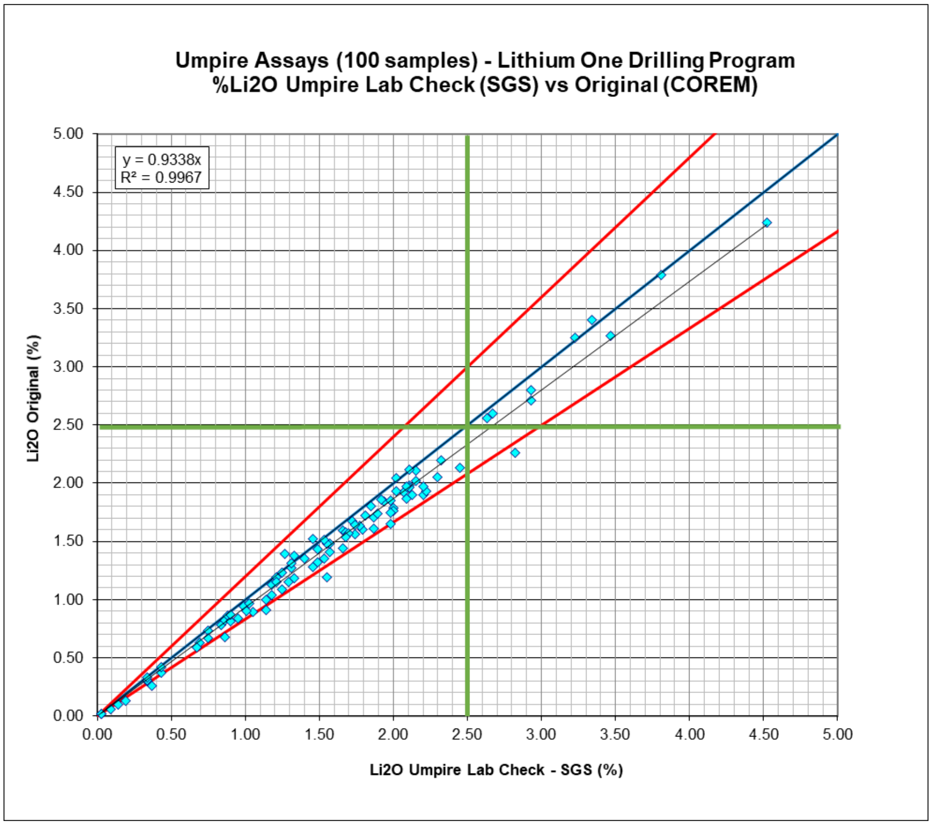


Source: GMS, June 2021

11.3.1.2 Umpire Assays

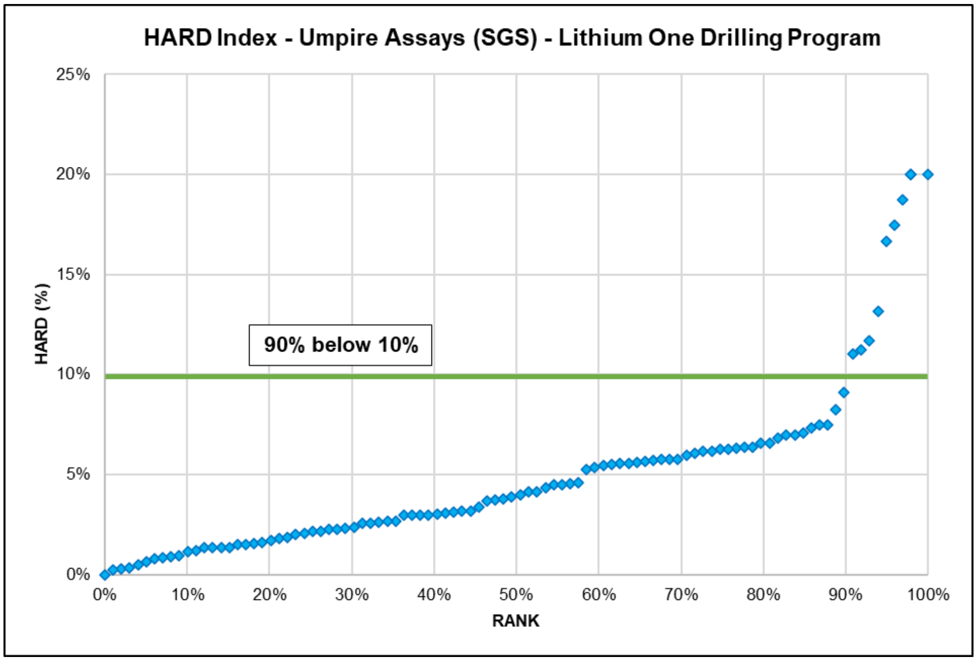
Umpire assays were sent to SGS and ALS Minerals, Compilation of results against original assays show that COREM results are globally 7% lower than SGS and 4% lower than ALS Minerals results. Results are shown in Figure 11.3 and Figure 11.5 for SGS and ALS respectively, where the positive bias of umpire laboratories is observed, but within acceptable ranges. HARD indexes (Figure 11.4 and Figure 11.6) also show that the assays are well replicated by umpire laboratories with 90% of data with a half absolute relative difference below 10%.

Figure 11.3: Umpire Assays – SGS Laboratory



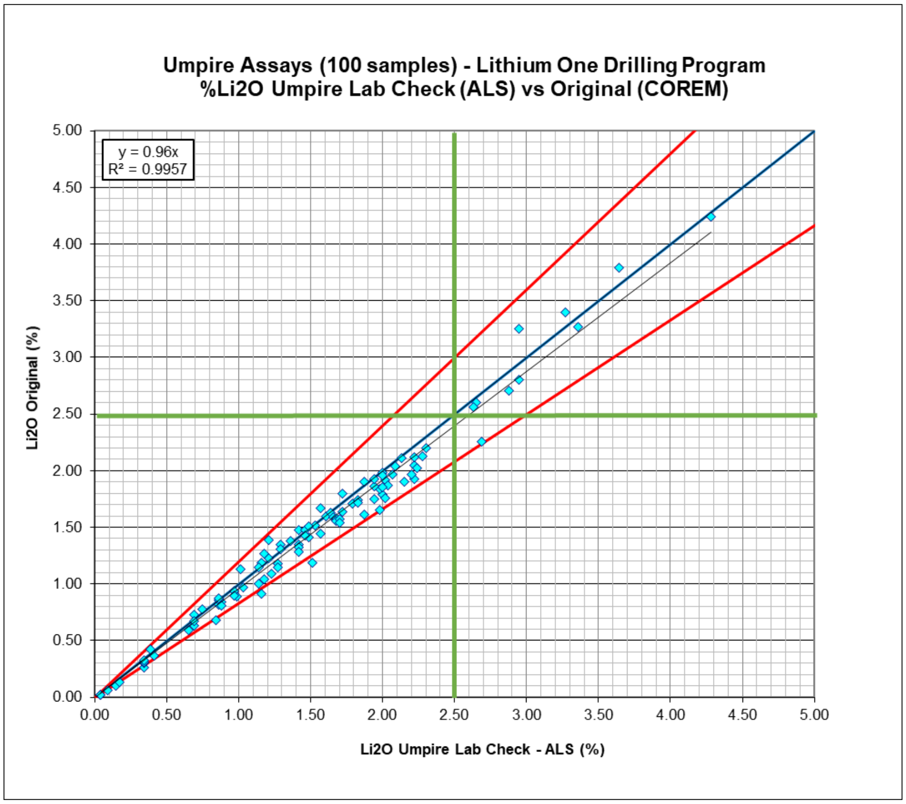
Source: GMS, June 2021

Figure 11.4: HARD Index Plot of Umpire Assays – SGS Laboratory



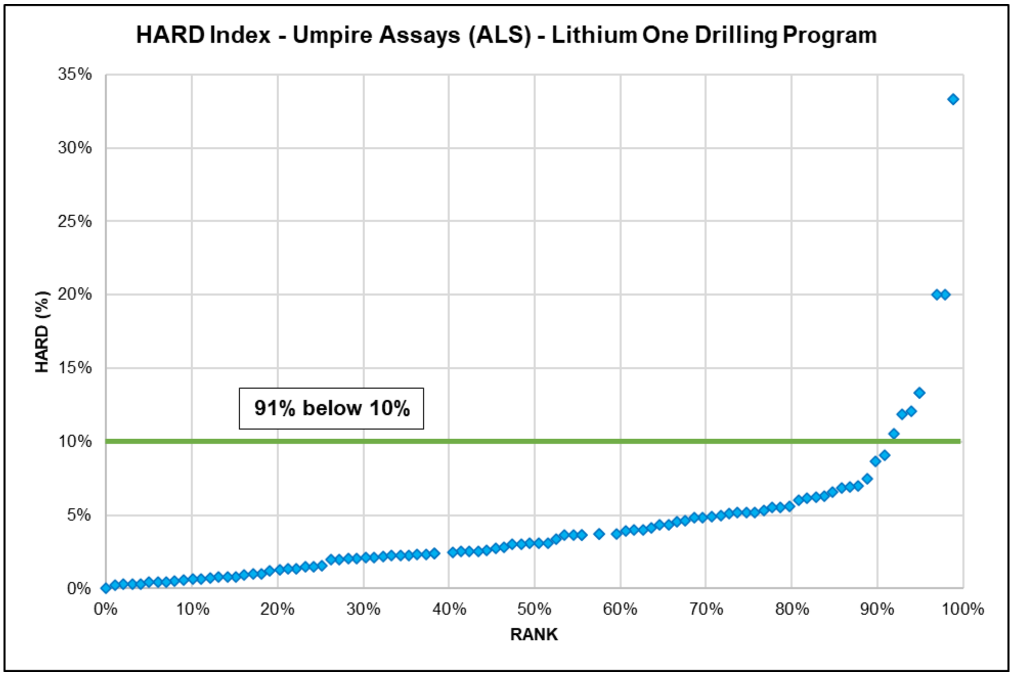
Source: GMS, June 2021

Figure 11.5: Umpire Assays – ALS Minerals Laboratory



Source: GMS, June 2021

Figure 11.6: HARD Index Plot of Umpire Assays – ALS Minerals Laboratory

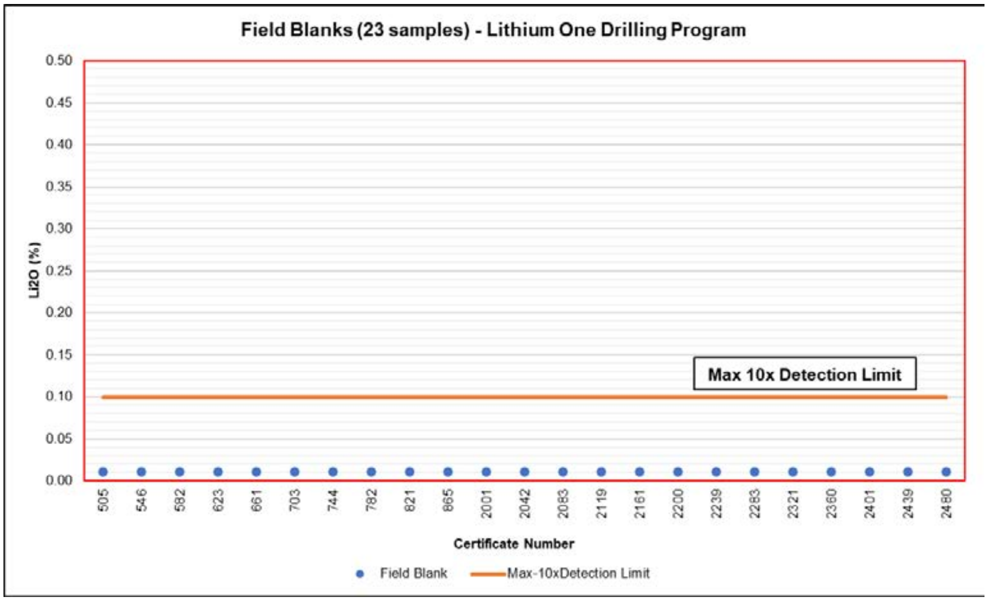


Source: GMS, June 2021

11.3.1.3 Field Blanks

The field blank used by Lithium One consisted of barren filtration sand (pure silica). Figure 11.7 shows results of blanks assayed by COREM, generally inserted every 40 samples. All samples are below the detection limit of 0.01% Li_2O.

Figure 11.7: Field Blanks (Pure Silica) – COREM Laboratory



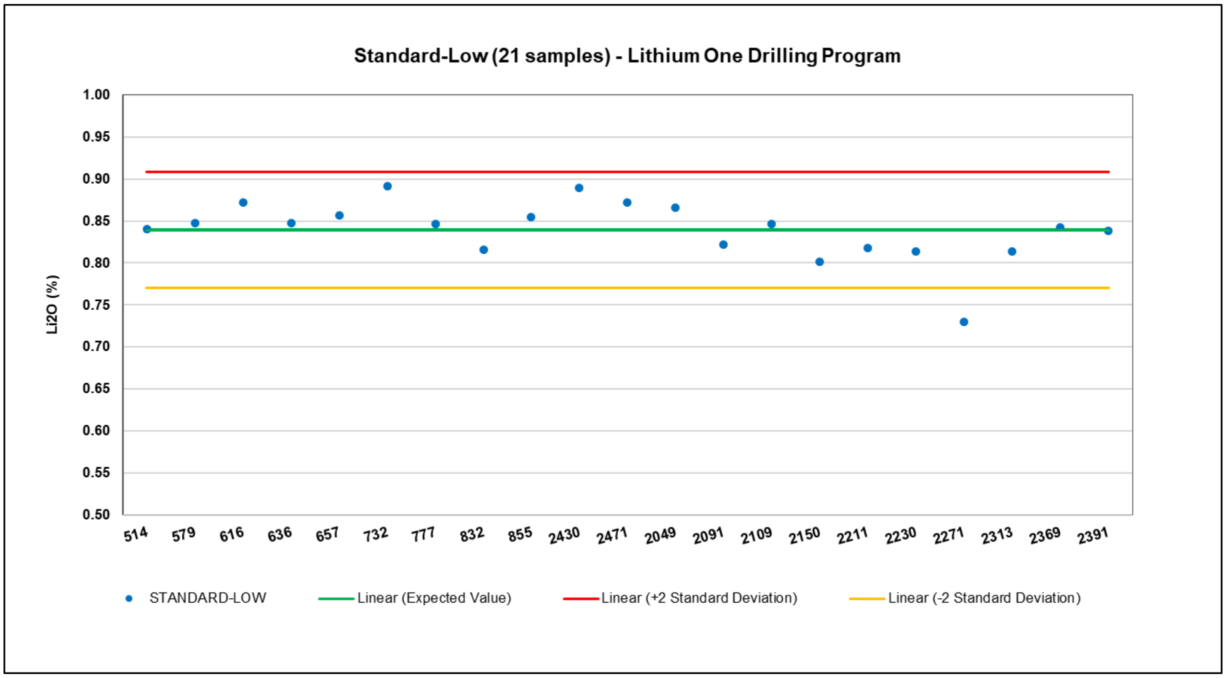
Source: GMS, June 2021

11.3.1.4 <u>Noncertified Standards</u>

The noncertified standards were two "self-made" standards prepared at the demand of Lithium One, and under their specifications at the Table Jamésienne de Concertation Minière. The standards were made from outcropping material from one of the pegmatite dikes. The "Standard High" consisted of material representing the average grade of the pegmatite dikes sampled, while the "Standard Low" was created by adding 40% silica blank to "Standard High". Although these control samples were not certified through round robin assaying, they are appropriate control samples to monitor the analytical drift.

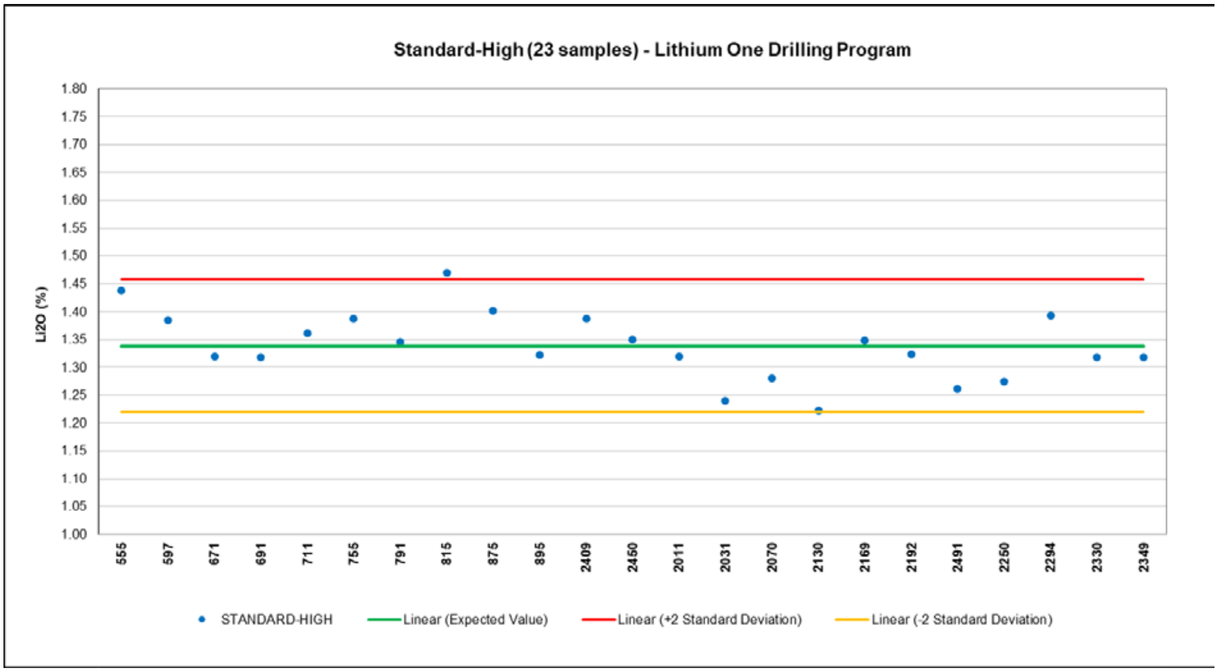
Figure 11.8 and Figure 11.9 show performance charts of standards used during the Lithium One drilling campaign. Standards are generally inserted every 40 samples. Given that these standards are not certified, the average and standard deviation (SD) of the populations were used as threshold guides to evaluate the laboratory performances. As shown, a total of two internal standards (one low and one high) failed to pass the ±2 SD test (4.5%). Only one (Standard-Low) failed the ±3 SD test. Investigations of nearby standards, blanks or field duplicate do not show any sign of sample contamination. The range of the Standard-Low is approximately 60% of the range of the Standard-High, which is concordant with the methodology used to produce this material.

Figure 11.8: Noncertified Reference Material (Standard-Low) – COREM Laboratory



Source: GMS, June 2021

Figure 11.9: Noncertified Reference Material (Standard-High) – COREM Laboratory



Source: GMS, June 2021

11.3.2 GLCI QA/QC Program

GLCI relied partly on the internal analytical quality control measures implemented by the ALS Minerals laboratory, which involved routine pulp duplicate analyses. GLCI also implemented external analytical quality control measures including the insertion of control samples (blanks, in house standards and field duplicates) with sample batches submitted for assaying at ALS Minerals in 2017. In 2017, a number of pulp samples were also re-submitted to the SGS laboratory in Lakefield, Ontario for umpire check assays. In 2020, additional pulp samples were resubmitted to Nagrom Analytical, Perth. Table 11.2 summarizes the analytical control samples produced by GLCI.

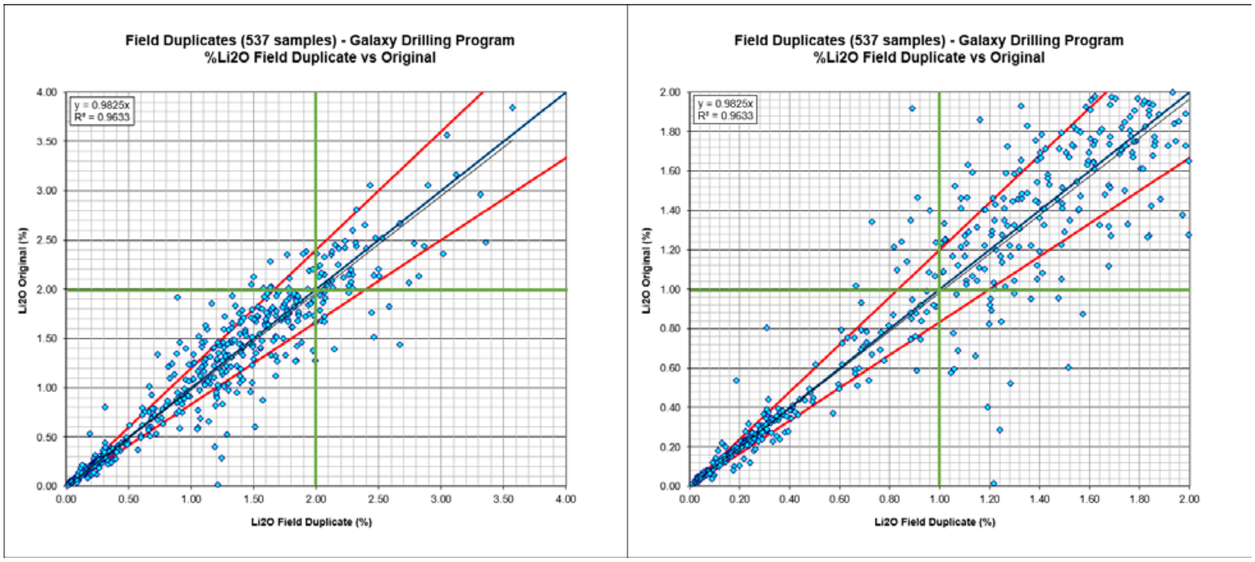
Table 11.2: Summary of Analytical Quality Control Data Produced by GLCI (note: check assays include only pegmatite assays)

	DDH		
Sampling Program	**2017/2020**	**(%)**	**Expected Value**
Sample count	*9,401*		
Field blanks	**539**	**5.7%**	<0.01 Li_2O (%)
Quartz	113		
Sand	426		
QC samples	**92**	**1.0%**	
Standard A	33		2.09 Li_2O (%)
Standard B	35		1.39 Li_2O (%)
Standard C	24		1.13 Li_2O (%)
Field duplicates	**537**	**5.7%**	
Total QC Samples	**1,168**	**12.4%**	
Check assay to umpire laboratory - 2017	875		SGS Lakefield
Check assay to umpire laboratory - 2020	90		Nagrom Analytical

11.3.2.1 Field Duplicates

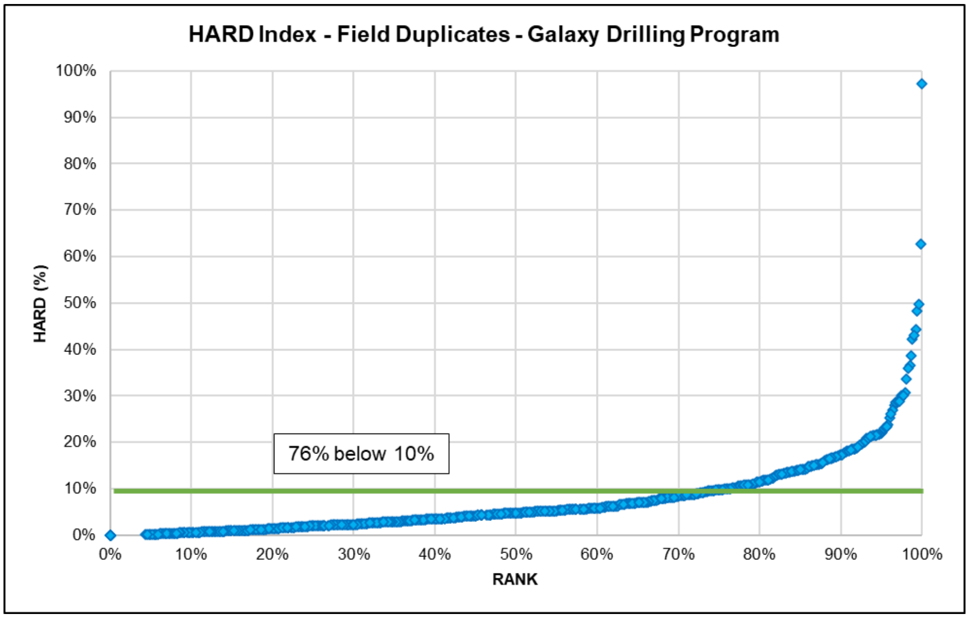
Duplicate samples were inserted into each sample series at a rate of one in every 20 samples. Duplicates corresponded to a quarter core from the sample left behind as reference. As observed in the field duplicates during Lithium One campaign, quarter core duplicates from GLCI display a moderate spreading of data with no clear positive or negative bias (Figure 11.10). HARD index compilation reinforces the reproducibility of assays, where 76% of assay pairs have a half absolute relative difference lower than 10% (Figure 11.11). As stated above, the difference between sample pairs is thought to be attributable to a certain level of nugget effect inherent to the coarse spodumene mineralization in the pegmatites.

Figure 11.10: Field Duplicate (Quarter Core) – ALS Minerals Laboratory



Source: GMS, June 2021

Figure 11.11: HARD Index Plot of Field Duplicates – ALS Minerals Laboratory



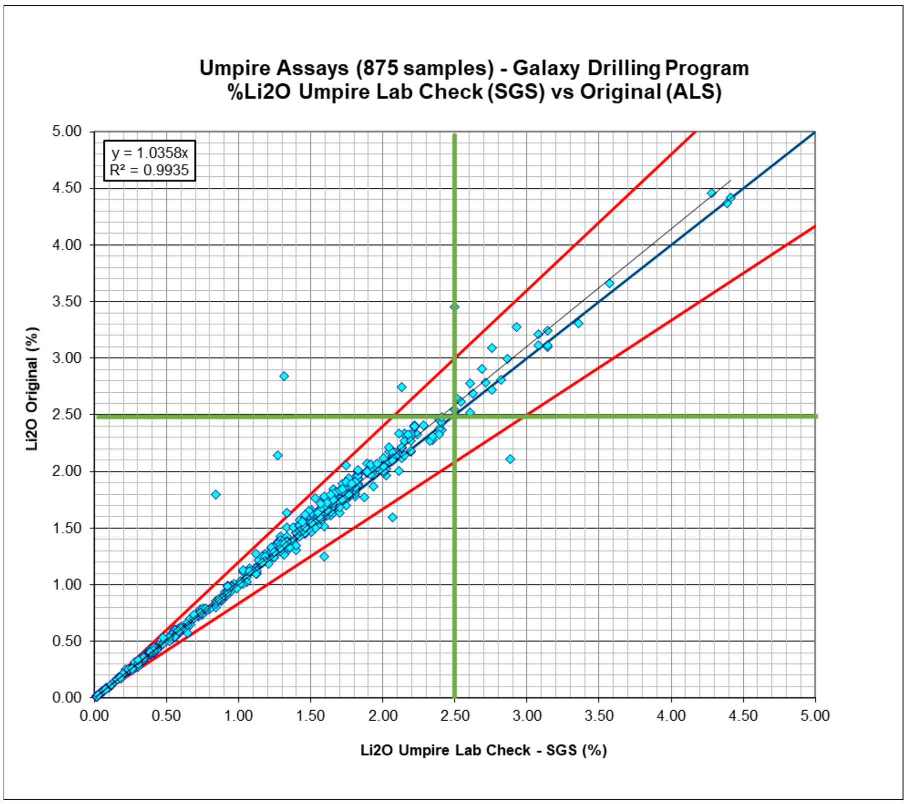
Source: GMS, June 2021

11.3.2.2 Umpire Assays

Three sets of umpire check assays (pulps) were sent to two different laboratories: SGS in 2017 and Nagrom Analytical in 2020 and 2021.

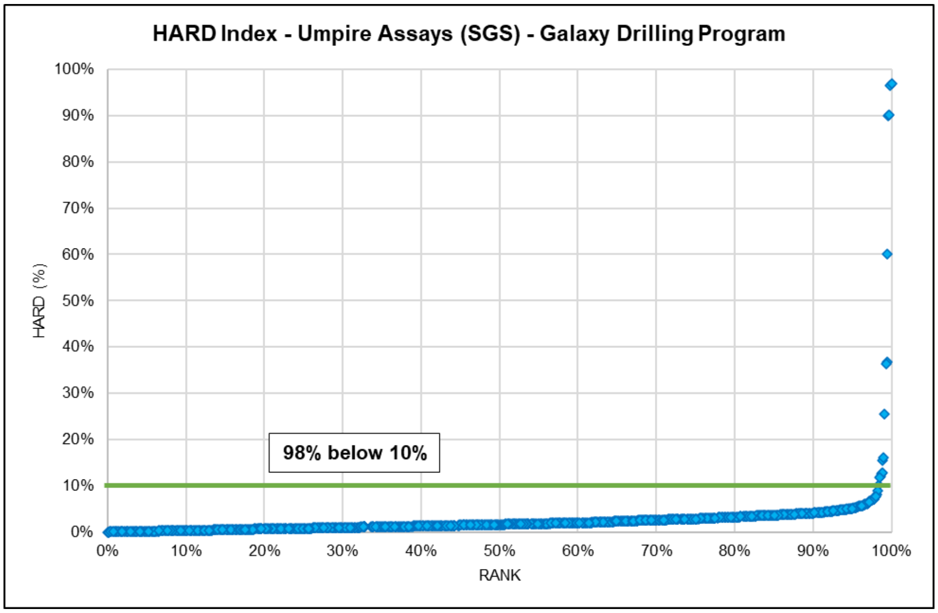
At total of 875 samples were sent to SGS in 2017 for umpire laboratory checks. Compilation of assays against original data (Figure 11.12) shows a small negative bias towards SGS laboratory (-4% versus ALS) but generally very good correlation. HARD index (Figure 11.13) shows that 98% of sample pairs have a half absolute relative difference of less than 10%. ALS assays are judged be well replicated by SGS laboratory.

Figure 11.12: Umpire Assays – SGS Laboratory



Source: GMS, June 2021

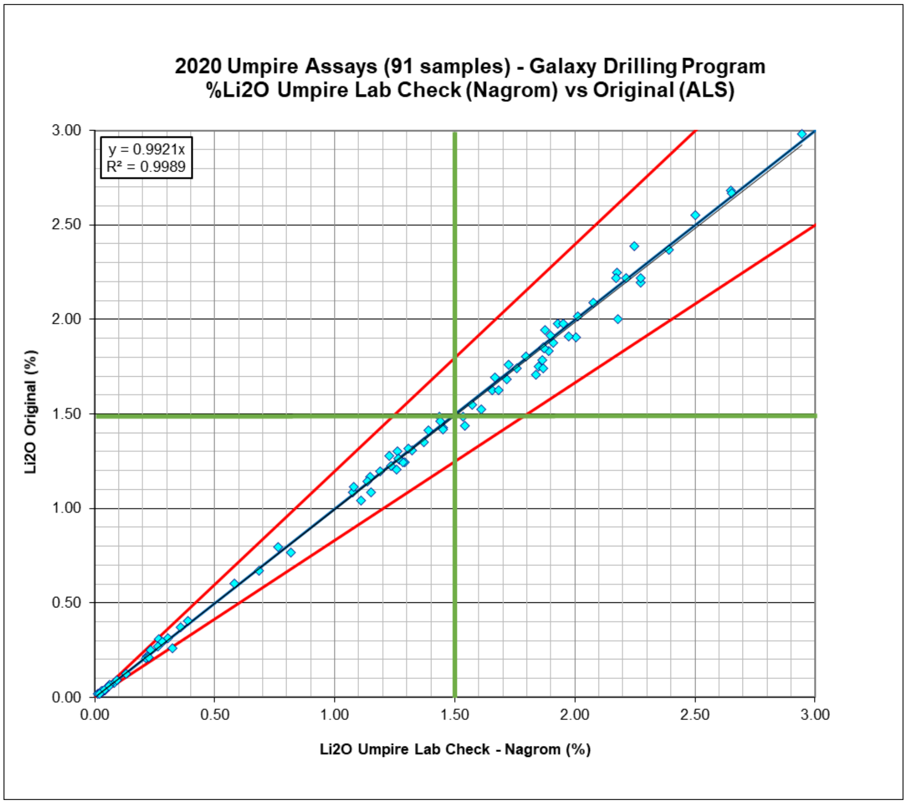
Figure 11.13: HARD Index Plot of Umpire Assays – SGS Laboratory



Source: GMS, June 2021

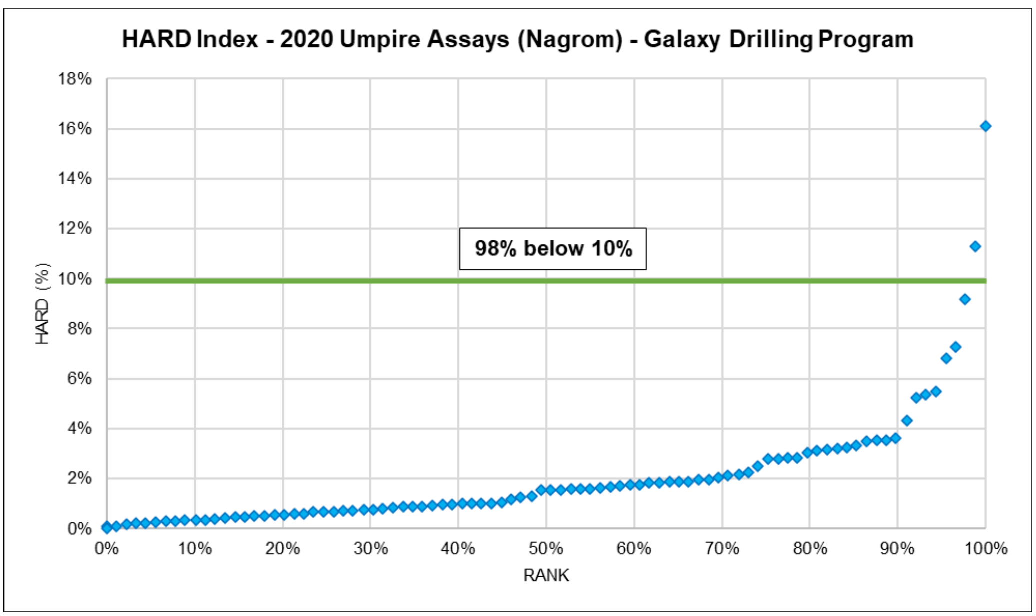
In 2020, a first series of pulp samples were sent to Nagrom Analytical (Perth) to evaluate a possible under-reporting of Li_2O content from ALS Minerals assays and to provide an initial indication of Tantalum mineralization potential. Reassaying by Nagrom was judged necessary to assess a different analytical method which is now the industry standard for rare metal pegmatites (*i.e.*: sodium peroxide fusion with ICP finish for a complete dissolution of Lithium and Tantalum compounds). The results show that the analytical method previously used do not materially impact Li_2O content (less than 1%), as shown in Figure 11.14. HARD index also demonstrates a good reproducibility of assays with 98% of sample pairs having a half absolute relative difference below 10% (Figure 11.15). However, the differences are higher for samples with greater Lithium content. This, and the occurrence of local Tantalum concentrations, leads to the recommendation of pursuing future analysis with the Sodium Peroxide fusion analytical method (Kneer, 2020). It is also recommended to further investigate the grade difference spatially, including Lithium One pulp samples (check against COREM).

Figure 11.14: Umpire Assays – Nagrom Laboratory (2020)



Source: GMS, June 2021

Figure 11.15: HARD Index Plot of Umpire Assays – Nagrom Laboratory (2020)

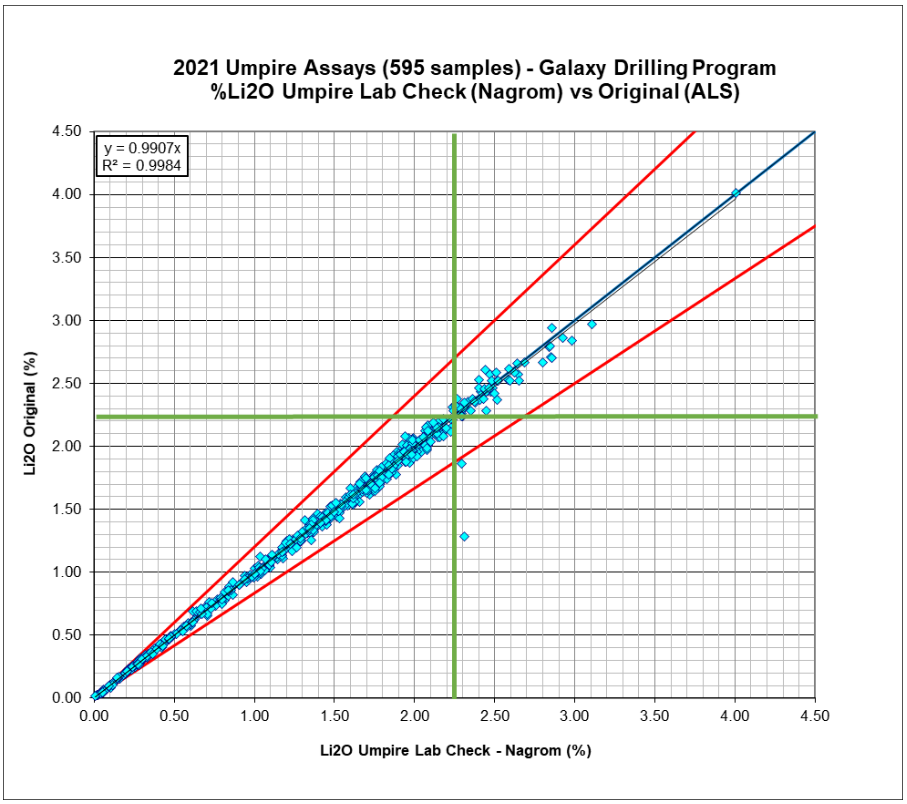


Source: GMS, June 2021

In 2021, a second series of 595 pulp samples were sent to Nagrom Analytical (Perth) for reassays. The goal of this second phase was to further investigate the potential Li_2O bias due to different analytical methods and also to gather information on potentially economic elements (Tantalum, Cesium and others). The results confirm the conclusion of the previous Nagrom reassay campaign (2020) that the analytical method does not materially impact the global Li_2O content (less than 1%), as show in Figure 11.16. Two outliers are seen but represent 0.3% of the samples assayed. As noted from the previous series of 2020, there is a slight bias for samples with higher Lithium content. This is only seen on Li_2O above 2.6% with a difference of approximately 2%. This difference is judged to have no material impact on the resource. Furthermore, HARD index again demonstrates a good reproducibility of assays with 99% of sample pairs having a half absolute relative difference below 10%.

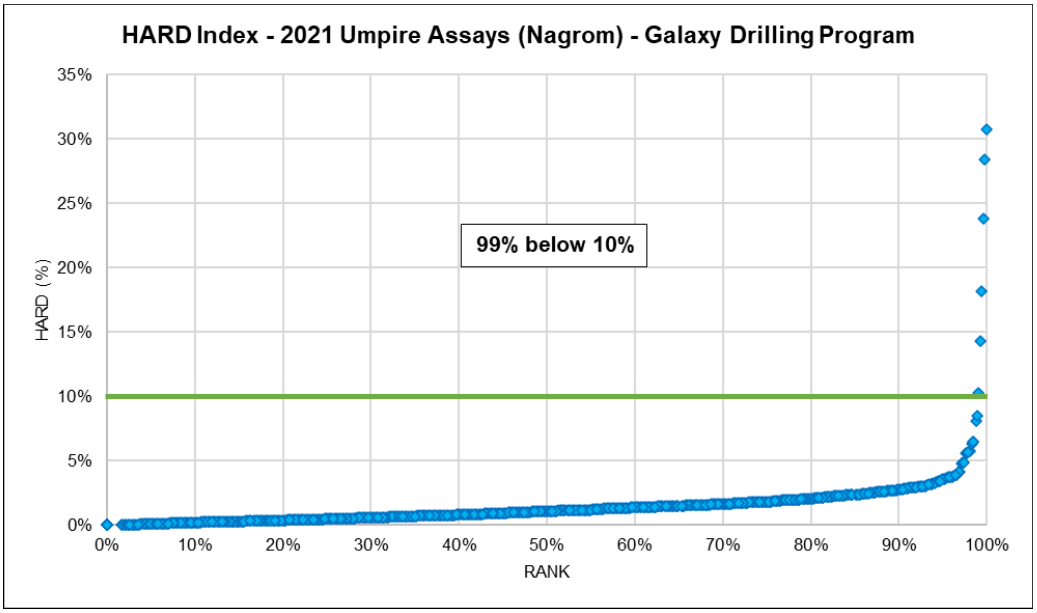
Tantalum content in this reassay batch, which covers the deposit homogeneously, is not judged to be significant. The highest value is of 0.03% Ta_2O_5 (343 ppm), with an average of grade of 0.004% Ta_2O_5 (41 ppm) over 595 samples.

Figure 11.16: Umpire Assays – Nagrom Laboratory (2021)



Source: GMS, June 2021

Figure 11.17: HARD Index Plot of Umpire Assays – Nagrom Laboratory (2021)

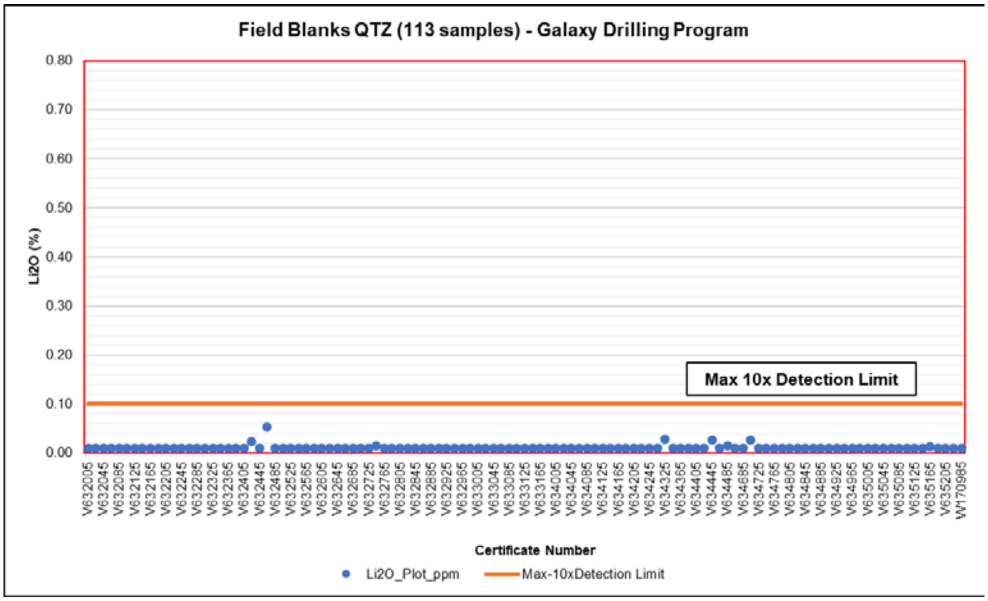


Source: GMS, June 2021

11.3.2.3 <u>Field Blank</u>

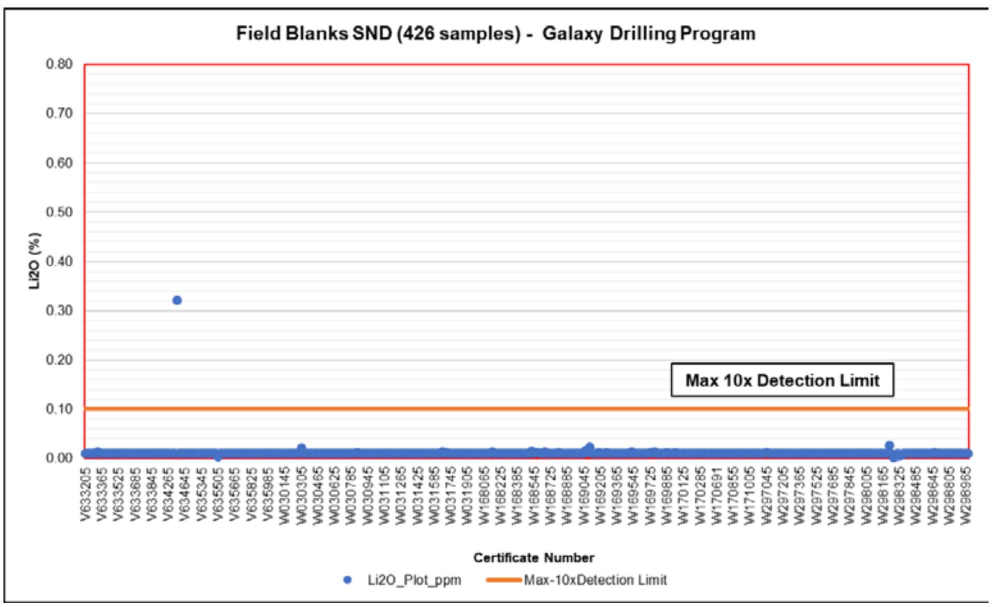
Two different sets of field blanks were inserted in the sampling stream by GLCI. Blank samples were made of coarse silica or swimming pool filtering sand and were inserted into each sample series at a rate of one in every 20 samples prior to shipment to ALS Minerals. Only one sample out of the two blanks (0.2% of blanks) show an anomalous value at 0.321% Li_2O. Investigation of quality control assays available for this batch (laboratory internal blanks and standards) shows no evidence of a batch contamination and may be due to a minor contamination of the sand blank. It is noteworthy that all ALS internal blanks for this specific batch all yield values below detection limit. Not batch re-assay is warranted is this case and results are judged to be acceptable.

Figure 11.18: Field Blanks (coarse silica) – ALS Laboratory



Source: GMS, June 2021

Figure 11.19: Field Blanks (sand) – ALS Laboratory



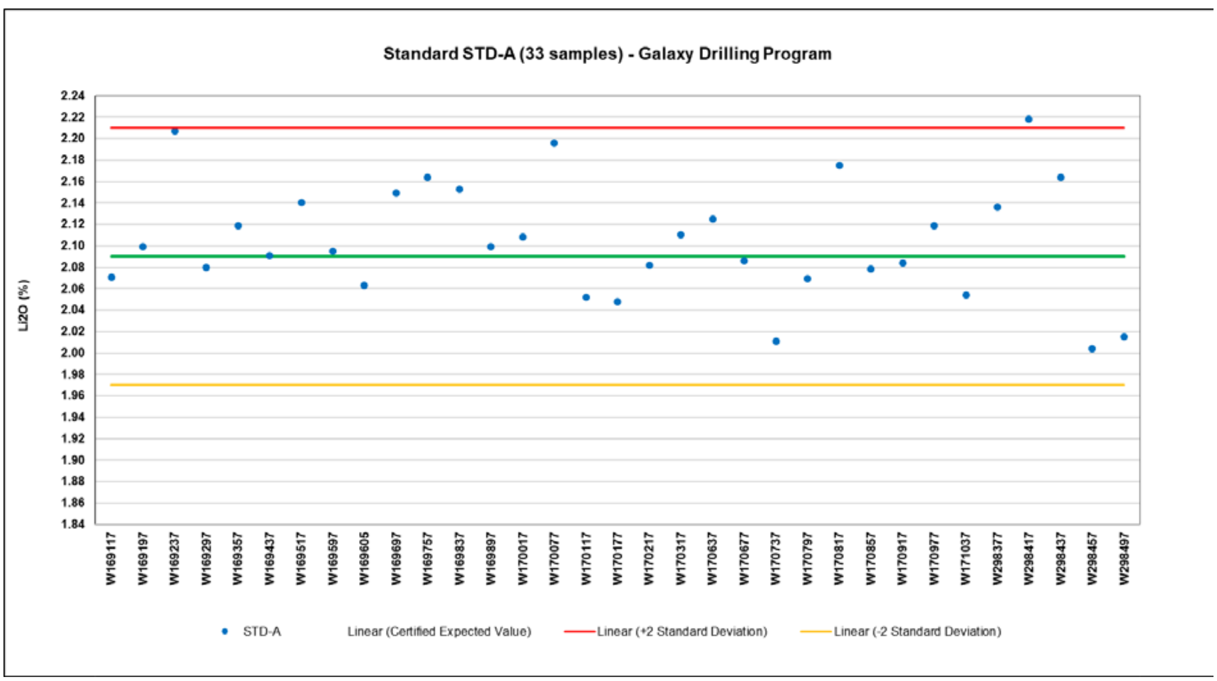
Source: GMS, June 2021

11.3.2.4 Non-Certified Standards

Three different standards were used by GLCI for their quality control program: one high grade lithium, one medium grade lithium, and one low grade lithium standard. The standards were custom made using material from the 2012 bulk sample and were prepared and analysed at ALS Minerals following the same protocol that was used for regular samples. The standards were inserted with samples from the following boreholes: JBL17-122 to JBL17-127, JBL17-136 and JBL17-139 to JBL17-156. A standard was inserted at a rate of one in every 20 samples, alternating between the low-, medium- and high-grade standards. The standard deviation criteria returned from the initial analyses were considered to determine warning and failure intervals of each standard.

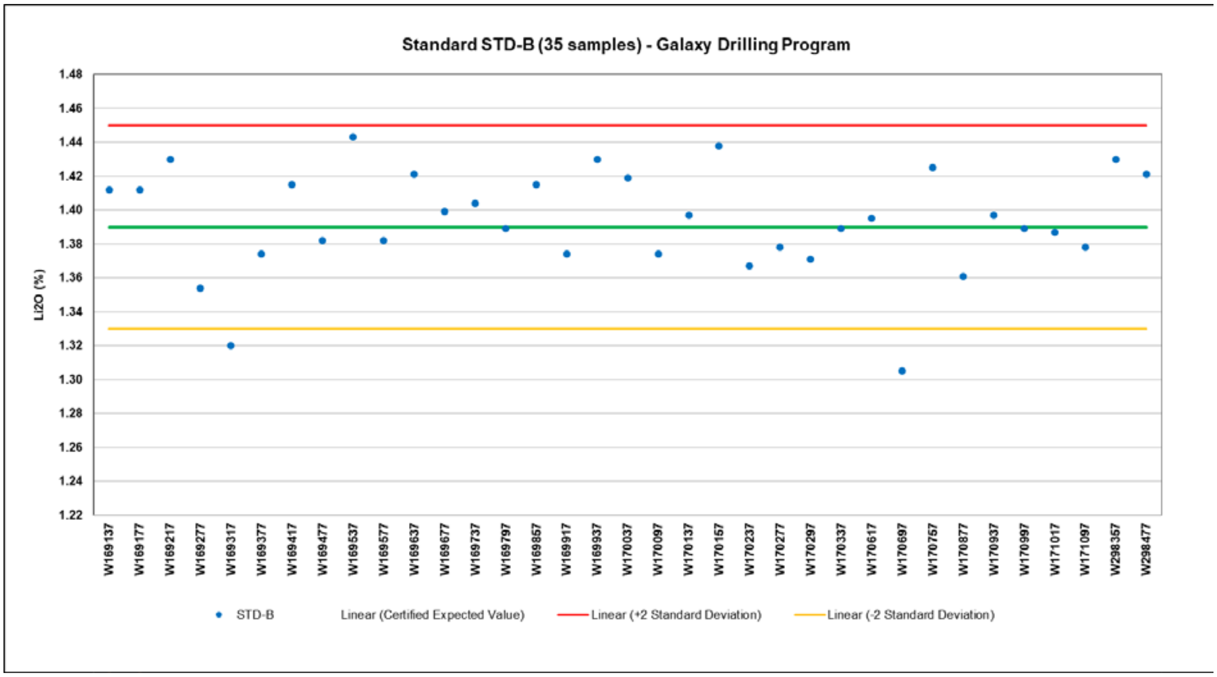
Compilation of the three standards against ±2 standard deviation is displayed in Figure 11.20, Figure 11.21 and Figure 11.22 for standards A, B and C respectively. A total of five standards did not pass the ±2 standard deviation and two did not pass the ±3 standard deviation. All reference materials not passing the ±2 standard deviation threshold but passing the ±3 standard deviation do not show any sign of contamination upon investigation of ALS internal controls (blanks and standards) and other controls put in place by Galaxy. Only one standard (sample #W169617) results in a very low value that could request reassay of a portion of the batch (batch #SD17181974) pertaining to that specific standard. All other controls before or after that failed standard show acceptable values but one ALS internal standard (SRM-181). A validation should be undertaken prior to sending pulps for reassays to ensure that the internal failed standard relies to the failed Galaxy Standard.

Figure 11.20: Noncertified Reference Material (STD-A) – ALS Laboratory



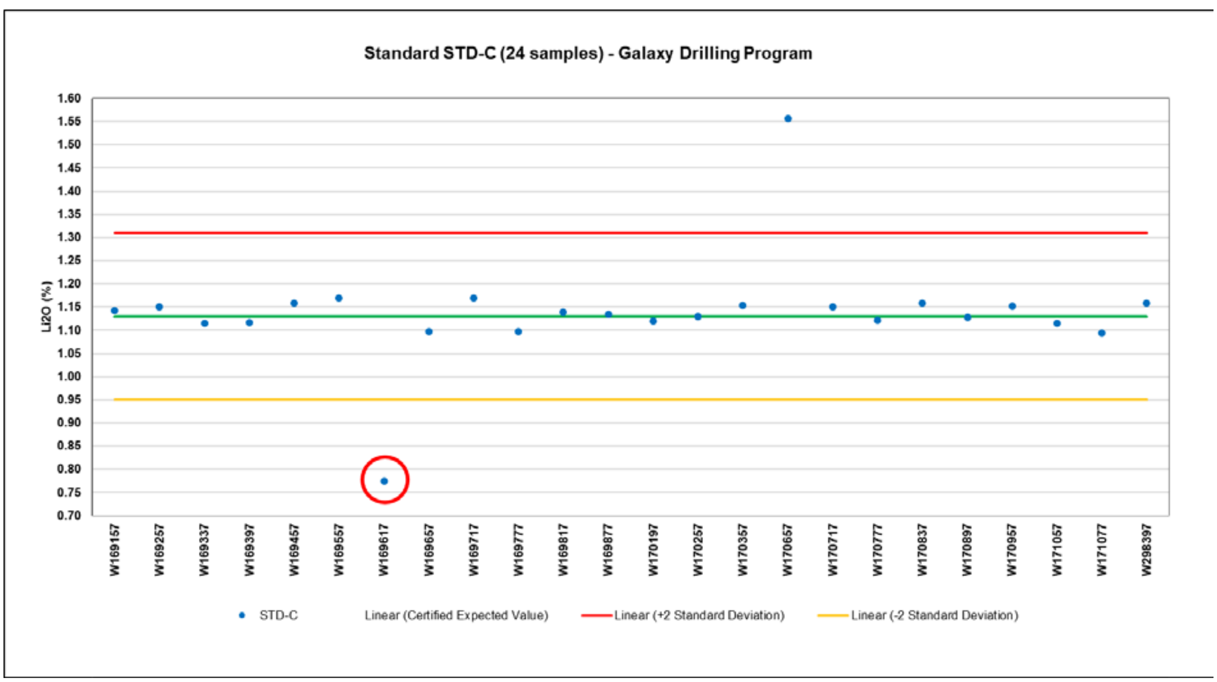
Source: GMS, June 2021

Figure 11.21: Noncertified Reference Material (STD-B) – ALS Laboratory



Source: GMS, June 2021

Figure 11.22: Noncertified Reference Material (STD-C) – ALS Laboratory



Source: GMS, June 2021

11.3.3 Sample Security

Coarse reject and pulp samples are currently stored on-site in a secured facility, a dome structure located near the truck stop at 381km of the James Bay highway. Coarse rejects are stored on pallets and organised by laboratory batch. They are sealed within rice bags with security tags. The storage facility is managed by Galaxy and provides all-season protection. In 2021, an inventory of all coarse rejects and pulps was completed to facilitate future resampling and metallurgical programs. The storage facility is shown in Figure 11.23.

Figure 11.23: Storage of Coarse Rejects and Pulps Within the Protected Dome

Source: GMS, June 2021

11.3.4 QP Commentary

In the opinion of the QP, the sampling preparation, security and analytical procedures used by GLCI are consistent with generally accepted industry best practices and are, therefore, adequate. The QP recommends the use of commercially available certified reference materials in replacement of the current in-house non-certified standards which have shown moderate variability due to a potential lack of homogenization. In addition, certified reference material (standards) should be routinely inserted for each hole. It is also recommended that a pulp resampling program should be undertaken targeting drill holes in the 2017 campaign with weaker QAQC support.

In future, a sodium peroxide fusion with ICP finish analysis method should be used instead of the 4-acid digest method, to ensure a full analysis of refractory minerals.

12 DATA VERIFICATION

This section has been updated from the section originally prepared by SRK Consulting Inc. in the Preliminary Economic Assessment released in March 2021. Since the effective date of the mineral resource estimation, new data verification steps have been undertaken, including a comprehensive check assay campaign of sample pulps, and a site visit by James Purchase, P.Geo.

12.1 Verification by Lithium One

Lithium One relied partly on the internal analytical quality control measures implemented by COREM and implemented external analytical quality control measures consisting of control samples in all sample batches submitted for assaying. Lithium One also submitted a suite of representative samples to SGS for check assays. Both pulp and coarse reject samples were analysed by SGS covering a range of lithium grades. Sample shipments and assay deliveries were routinely monitored as produced by the preparation and assaying laboratories.

During drilling, experienced Lithium One geologists implemented practical measures designed to ensure the reliability and trustworthiness of exploration data acquired on the Project. In the opinion of the QP, the field procedures used by Lithium One generally meet “industry best practices”.

12.2 Verifications by GLCI

GLCI relied partly on the internal analytical quality control measures implemented by ALS and implemented external analytical quality control measures consisting of control samples in all sample batches submitted for assaying. GLCI also submitted a suite of representative samples to SGS and Nagrom for check assays. Sample shipments and assay deliveries were routinely monitored as produced by the preparation and assaying laboratories.

GLCI geologists implemented practical measures designed to ensure the reliability and trustworthiness of drilling and exploration data acquired on the Project. In the opinion of the QP, the field procedures used by GLCI generally meet “industry best practices”.

12.3 Verifications by G Mining Services

12.3.1 Site Visit

In accordance with NI 43-101 guidelines, Mr. James Purchase of GMS visited the Project from June 14, 2021 to June 17, 2021, accompanied by Mr. Patrick Gince of GLCI.

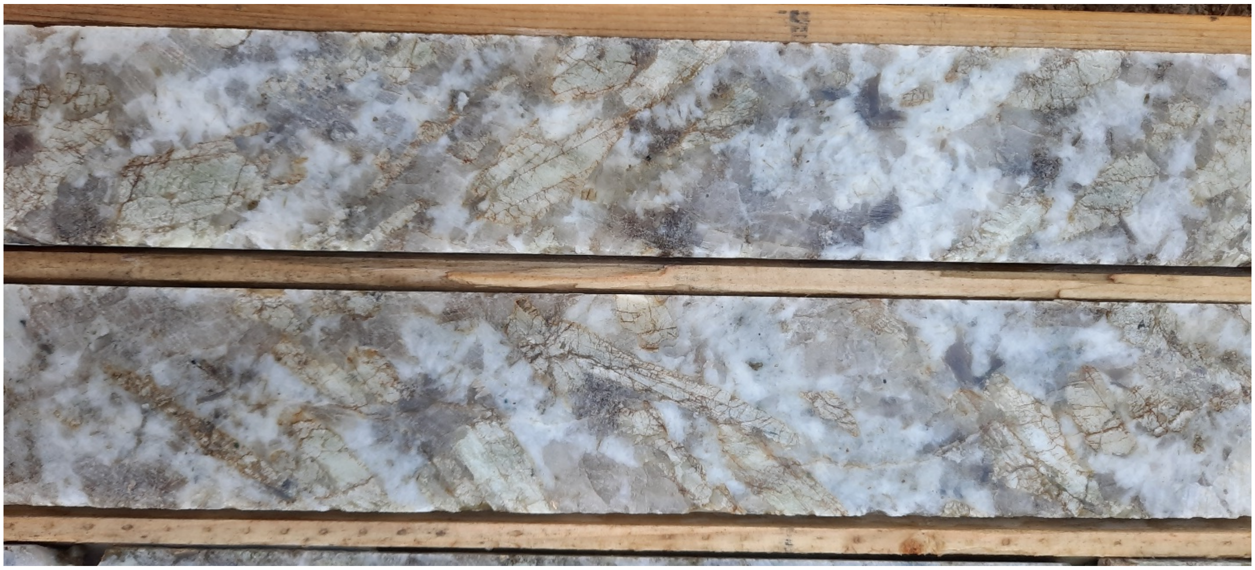
The site visit did not take place during active drilling activities. All aspects that could materially impact the integrity of the data informing the mineral resource estimate were reviewed, including outcrop inspection, channel sampling areas, core logging, sampling methods and security and database management. Mr. Purchase examined core from numerous boreholes from each of the major dikes and confirmed that the logging information in the drilling database accurately reflects the actual core; the lithology contacts honour the original core logs and spodumene was observed in drill core in sufficient amounts to justify the concentrations observed in analyses.

A photo of the spodumene-bearing pegmatite outcrops is shown in Figure 12.1, and a typical example of mineralised drill core is shown in Figure 12.2.

Figure 12.1: Outcropping Spodumene-bearing Pegmatites at the James Bay Project

Source: GMS, June 2021

Figure 12.2: Spodumene-bearing Pegmatite in Drill Core, NQ Drill Core



Source: GMS, June 2021

Channel sampling locations were also inspected to ensure the channel samples are of sufficient quality to be included in the Mineral Resource Estimate. GMS found the channel samples to be excellent quality, with a consistent width and depth observed at most places. GMS also notes that channels were ended at the contact between the pegmatite and the host lithologies (metasediments in most cases). Examples of channel sampling is shown in Figure 12.3.

Figure 12.3: Example of Channel Sampling. Left: Channel Sample Perpendicular to Pegmatite Orientation. Right: Channel Sample Ending at Contact with Metasediments.

Source: GMS, June 2021

GMS also checked several drill collar coordinates with a handheld GPS in various areas of the orebody to compare with the drilling database. All were found to be within acceptable limits of accuracy.

Table 12.1: Drill Hole Coordinates

Drill Hole ID	QP Check Coordinates		Original Coordinates used in the 2017 MRE	
JBL-17-41	358,286	5,789,439	358,283	5,789,439
JBL-17-45	358,427	5,789,407	358,427	5,789,399
JBL-17-65	358,754	5,789,313	358,754	5,789,311
JBL-17-69	358,827	5,789,311	358,828	5,789,307
JBL-17-82	359,033	5,789,125	359,033	5,789,120
JBL-17-96	358,671	5,789,317	358,671	5,789,317

12.3.2 GMS Data Verification

As part of data validation, GMS compared 10% of the original assay certificates with the drilling database used by SRK in the 2017 MRE (the basis of the MRE used in the feasibility study), and no data entry errors were identified. Assays from both the Lithium One and GLCI series drilling were checked.

GMS also inspected control samples performances and they were found to be performing well, as discussed in Section 11.3.4. The various umpire assays, field duplicates, field blanks and laboratory internal controls show that the assay database is in good standing and suitable for Mineral Resource Estimation purposes. In future, GMS recommends inserting Certified Reference Materials (CRM) in the sample stream or making customized CRM`s from a bulk sample that are certified by multiple laboratories.

As part of data verification, GMS also inspected data related to sample positioning, such as collars (XYZ) and downhole surveys. It appears that most drill hole collars as used in the 2017 MRE were surveyed using a handheld GPS. Since then, GLCI have resurveyed a large proportion of the drill hole collars using a RTK (real-time kinematic) or Differential GPS method and the database has been updated accordingly. GMS checked the validity of the collar coordinates used in the 2017 MRE against the newer RTK coordinates and found them to be within acceptable limits (elevations < 1 m different in most cases, and 97% of collars show an XY deviation of less than 5 m). Only a single drill hole, JB17-37A, was misplaced by a significant distance, yet this hole is shallow (30-m deep) and has a very minor effect on the overall MRE.

GMS also noted that for all drill holes except one, the first downhole survey (at 0 m) is the planned survey entry, which is not representative of the true dip of the drill hole at surface. A visual 3D inspection revealed that most drill holes would be misplaced by less than 1 m and often by less than 0.5 m. In two instances, deviations were observed up to 9 m. This issue has been resolved subsequent to the 2017 MRE, and it is not believed to materially impact the precision of the MRE.

12.4 Nagrom Pulp Reassays using Sodium Peroxide Fusion methodology

GLCI issued two series of pulp samples for reassaying using the sodium peroxide fusion methodology in November 2020, and March 2021. This method is now the industry standard for rare metal pegmatites, and this test aimed at providing insights on possible under-reporting of Li_2O content from ALS Minerals assays using 4-acid digestion. This was also done to properly assess Tantalum content.

With a global difference lower than 1% over 686 samples, the reassays demonstrate that there is no significant under-evaluation of Li_2O content with the 4-acid digestion method. The difference appears slightly greater with higher Li_2O samples (approximately 2%) but does not impact the mineral resource. Tantalum content is not judged to be significant (highest value of 0.03% Ta_2O_5). Further details can be found in Section 11.3.

12.5 QP Commentary

In the opinion of the QP, the integrity of the data used to produce a mineral resource estimation is sufficiently reliable. While there are some weaknesses in prior QAQC protocols (*i.e.,* lack of systematic insertion of certified reference material in later stages of drilling) and drill hole database, none are considered to be impacting materially the final resource model. Since the 2017 MRE, GLCI have improved substantially the integrity of the drilling data at the James Bay project, and GMS is also satisfied that the data used in the 2017 MRE is of sufficient quality to be used in the feasibility study.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

SGS Canada Inc. (SGS) and Nagrom were contracted separately by Galaxy Resources Limited (Galaxy) in 2011 and 2018 respectively to undertake metallurgical testwork to support the design of the concentrator plant for the James Bay Project.

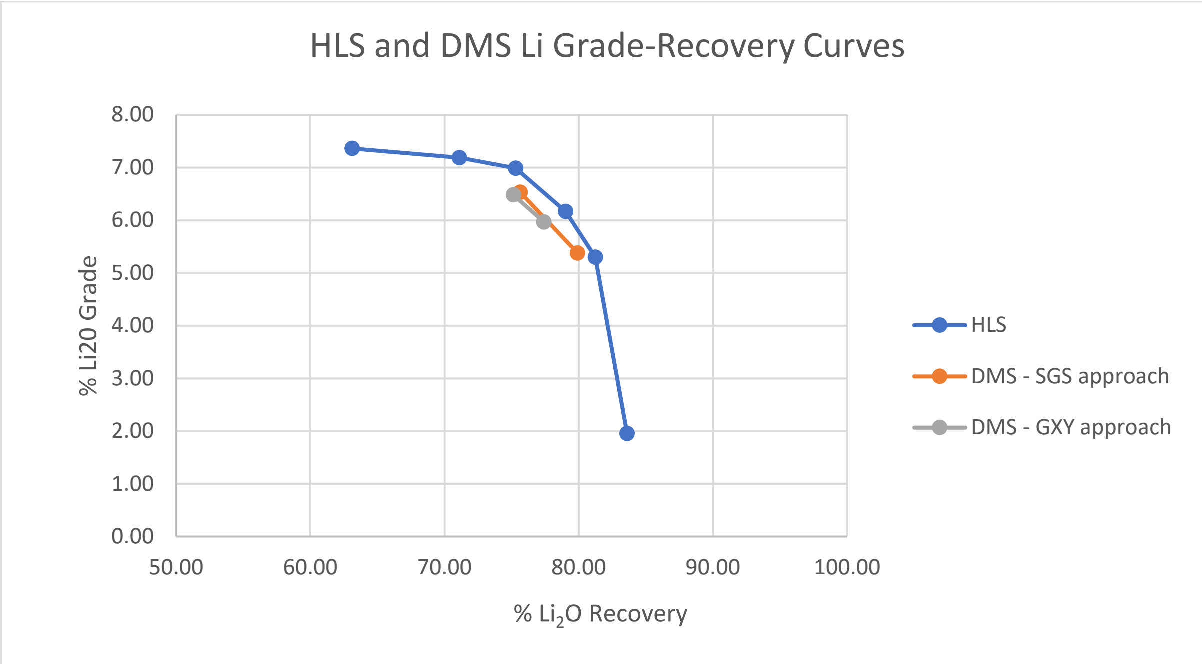
13.2 Executive Summary

The following report summarizes the metallurgical testwork performed on the James Bay Project samples between 2011 and 2019 and comprises the following:

- SGS preliminary testwork on a single sample.
- Nagrom Phase 1 testwork on several composites.
- Nagrom Phase 2 testwork on composites within the defined Early Years (EY), Mid Years (MY) and Later Years (LY) in the original mine plan.

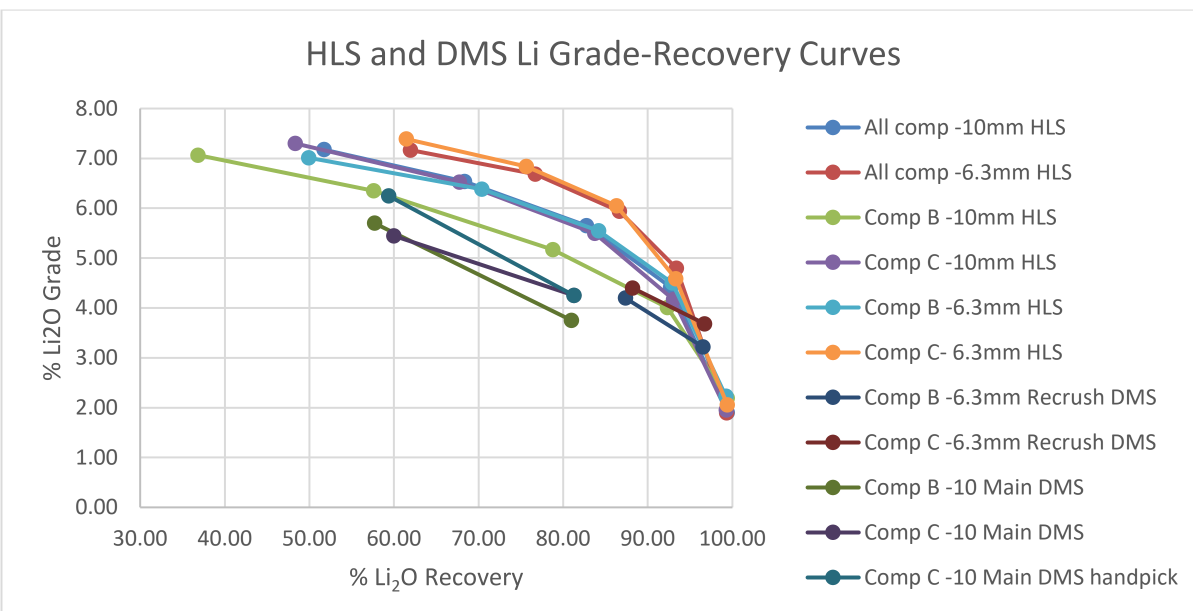
Results from the SGS Heavy Liquid Separation (HLS) and both Dense Medium Separation (DMS) tests (presented in Figure 13.1) were comparable, the DMS tests resulting in a sinks yield of 18.9% at 75.7% recovery of Li_2O and a grade of 6.53% Li_2O on a P_{100} 6 mm crushed sample, slightly lower than was predicted by the HLS tests as expected. Overall results are presented in Figure 13.1 (Reference SGS Canada Inc. Project 13531-001 Final Report 27/02/2013).

Figure 13.1: SGS Grade-Recovery Relationship of HLS and DMS



Nagrom Phase 1 metallurgical performance for the DMS tests (presented in Figure 13.2) were markedly lower than that achieved for the HLS tests. Further metallurgical testwork (Phase 2) was carried out including a 4 mm re-crush stage.

Figure 13.2: Nagrom Phase 1 – Grade-Recovery Relationship of HLS v DMS



The combined (coarse and fine) Phase 2 DMS results (presented in Figure 13.3 and Figure 13.4) were marginally lower than the HLS results but consistent with the HLS-DMS off-set expected and experienced during the SGS HLS-DMS testwork program.

The overall (coarse and fine) DMS Li_2O recovery for the EY was 13.7% higher than that for the MY/LY due to a lower recovery in the MY/LY secondary coarse DMS "circuit". This is attributed to a higher percentage of middlings/locked spodumene in the near-density material for the MY/LY samples.

The re-crushing of the secondary coarse DMS floats stream increased the EY overall Li_2O recovery from 69.5% to 85.7% at an overall combined final concentrate grade of 6.2% Li_2O. Comparative data for MY/LY showed an increase in overall recovery from 55.8% to 82.0% at a final concentrate grade of 6.0% Li_2O.

Figure 13.3: Nagrom Phase 2 – Grade-Recovery Relationship of HLS v DMS, Early Years

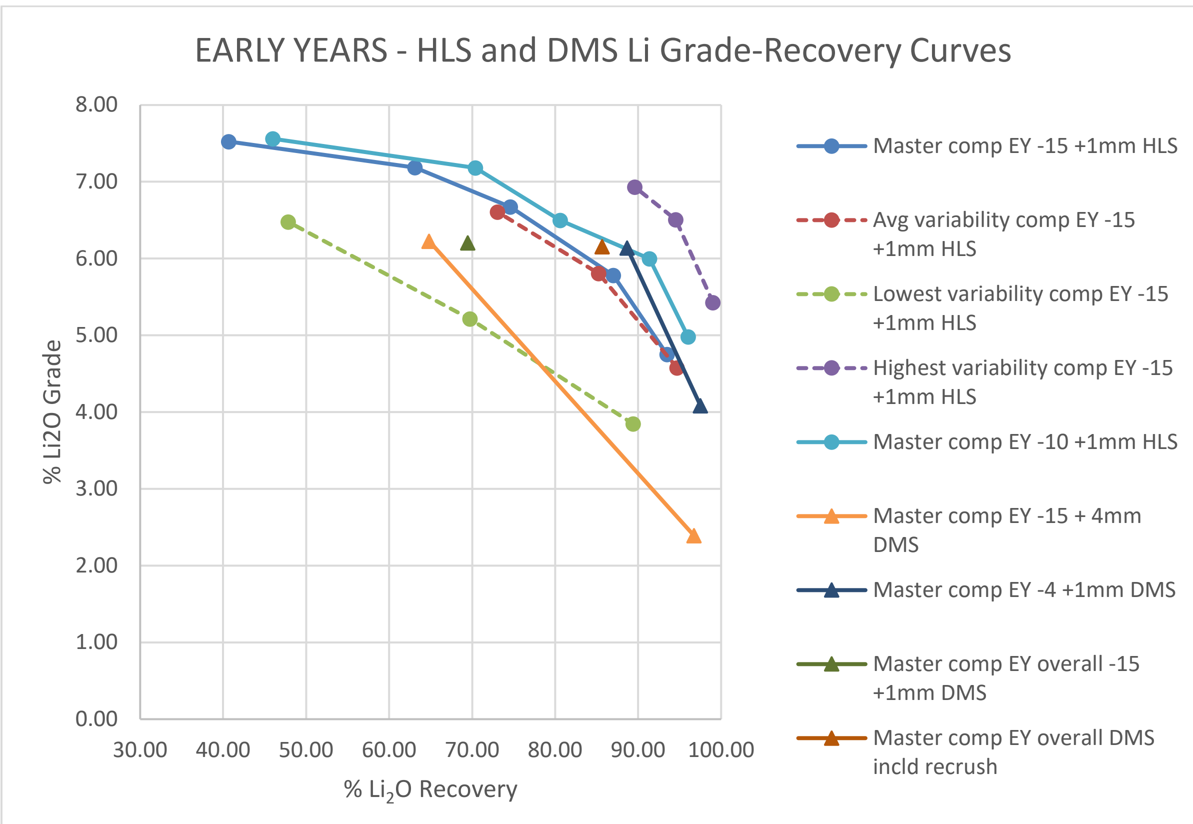
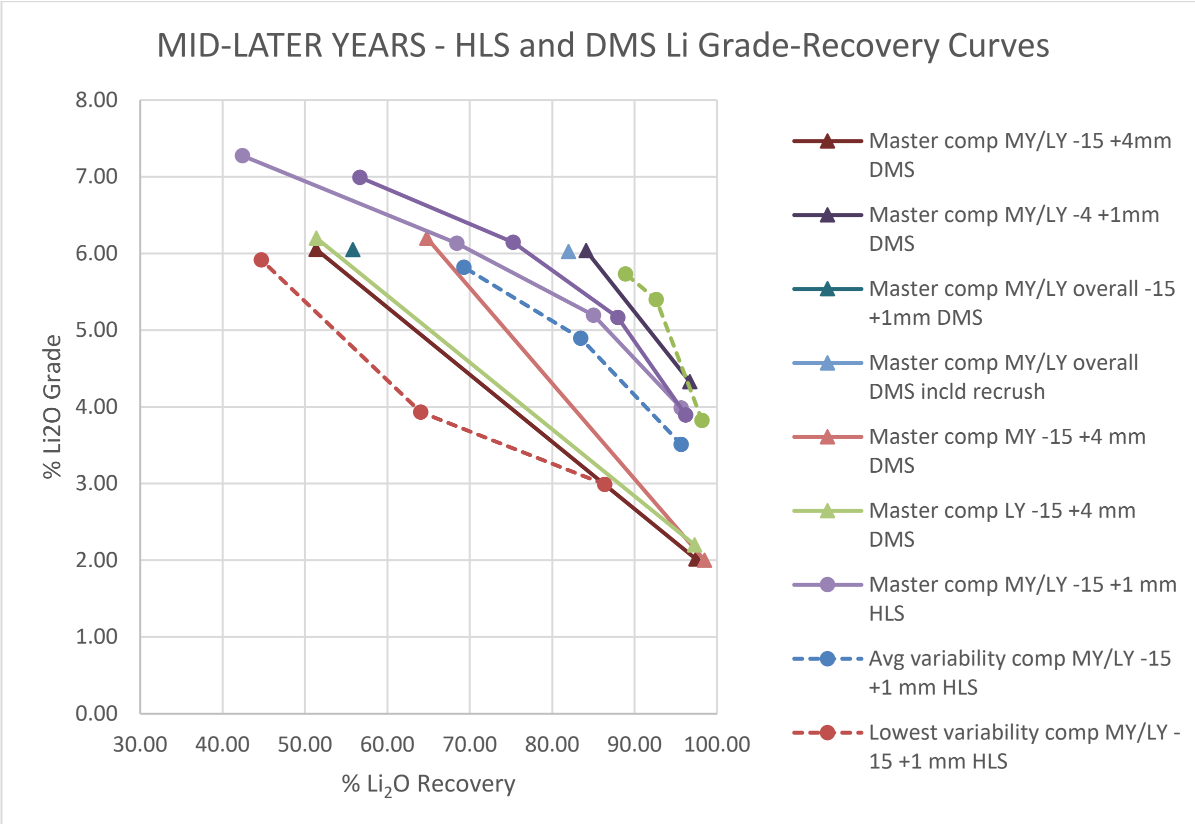


Figure 13.4: Nagrom Phase 2 – Grade-Recovery Relationship of HLS v DMS, Mid/Later Years



The major process design criteria (PDC) based on the metallurgical testwork results (adjusted for a lower 5.6% final product grade to provide improved project economics) are presented in Table 13.1.

Table 13.1: Process Plant Design Basis

Parameter	Units	Design Value	Comments
ROM CHARACTERISTICS			
ROM:			
Feed grade - LOM Average	% Li_2O	1.30	6% waste dilution
Production:			
Early Years (original mine schedule):			
Coarse DMS Recov. (contribution to total DMS Recov.)	% Li_2O	58.1	

Parameter	Units	Design Value	Comments
Fine DMS Recov. (contribution to total DMS Recov.)	% Li_2O	15.0	
Re-Crush DMS Recov. (contribution to total DMS Recov.)	% Li_2O	12.9	
Total DMS Recovery	% Li_2O	86.0	
Overall Plant Recovery (including -1 mm fines losses)	% Li_2O	71.2	
Final Concentrate Grade	% Li_2O	5.6	
Concentrate Production - nominal	t/a	330,571	
Mid/Later Years (original mine schedule):			
Coarse DMS Recov. (contribution to total DMS Recov.)	% Li_2O	48.3	
Fine DMS Recov. (contribution to total DMS Recov.)	% Li_2O	11.0	
Re-Crush DMS Recov. (contribution to total DMS Recov.)	% Li_2O	21.2	
Total DMS Recovery	% Li_2O	80.5	
Overall Plant Recovery (including -1 mm fines losses)	% Li_2O	66.5	
Final Concentrate Grade	% Li_2O	5.6	
Concentrate Production - nominal	t/a	308,750	
ROM FEED			
Crushing Work Index:			
Early Years:			
Average	kWh/t	8.0	
Mid Years:			
Average	kWh/t	8.1	

Parameter	Units	Design Value	Comments
Later Years:			
Average		7.6	
UCS:			
Design	MPa	150	
Crushing Work Index:			
Bond Rod Mill Work Index @ 1180 µm closing screen			
Early Years	kWh/t	14.2	
Mid Years	kWh/t	12.1	
Bond Ball Mill Work Index @ 106 µm closing screen			
Early Years	kWh/t	21.9	
Mid Years	kWh/t	21.5	
Material Properties:			
ROM SG Average:			
Early Years		2.73	
Mid Years		2.70	
Bulk density crushed ROM:			
Early Years		1.76	
Mid Years		1.74	
Mass Design		1.75	
Volume Design		1.65	
CIRCUIT SPLITS & PARTICLE SIZE DISTRIBUTIONS			
Crushing circuit P_{100}	mm	15	
Crushed ore mass splits:			
P_{80}	µm	9.4	
P_{50}	µm	4.2	

Parameter	Units	Design Value	Comments
-1 mm Fines	%	20.3	
Li_2O deportment -1 mm	%	17.2	

A detailed PDC is presented in Table 13.18.

James Bay testwork results were compared to Mt Cattlin and other Australian operations and a scale-up factor has been estimated by considering modifying factors including particle size distribution, larger equipment sizes, contamination, and data from other spodumene plants. Full-scale plant performance of Mt Cattlin and other Australian operations were compared to the James Bay testwork data. A final recovery scale-up factor of 0.85 for the early years and 0.82 for the mid/later years was adopted. Refer to Section 13.3.4.2 for more details.

DMS testwork was undertaken on ultrafine (UF) -1 +0.5 mm and -1 + 0.3 mm material for EY and MY/LY. The single stage -1 + 0.5 mm DMS tests produced concentrate grades of between 4.8% and 5.2% Li_2O and those for the -1 +0.3 mm produced concentrate grades of between 3.9% and 4.6% Li_2O. The two-stage DMS tests all achieved final concentrate grades above 6.0% Li_2O. The improved concentrate grades for two-stage DMS are attributed to a large proportion of near (cut-point) density material. The additional recovery realised from the -1 mm fraction using UF DMS has not been included in the existing PDC but will be reviewed and compared with flotation recovery for this size fraction as the Project develops.

Tailings thickening and filtration testwork was undertaken by Tenova and Outotec and dewatering using screens will be undertaken in the next phase of the project. A summary of Outotec's thickener testwork results were:

- 0.25 $t/m^2/h$ flux rate
- 11.3 m/h rise rate
- 20 g/t flocculant consumption

13.3 Testwork Programs

13.3.1 SGS Testwork

A single sample weighing 14,690 kg from the James Bay Project spodumene resource grading 1.51% Li_2O was submitted in December 2011 to SGS in Lakefield, Ontario for HLS and DMS testing. The testwork was completed in February 2013.

The bulk of the sample was crushed to -6 mm and screened at 0.5 mm to remove the fines before undertaking HLS and DMS testwork on the coarse fraction. Two approaches for primary and secondary DMS were tested viz:

- Primary DMS at 2.65 SG cut-point followed by secondary DMS on the primary sinks product at 2.85 SG cut-point to produce a final sinks product (standard SGS approach).
- Primary DMS at 2.85 SG cut-point followed by secondary DMS on the primary sinks product at 2.85 SG cut-point to produce a final sinks product.

Results from the HLS and both DMS tests were comparable, the DMS tests resulting in a sinks yield of 18.9% at 75.7% recovery of Li_2O and a grade of 6.53% Li_2O. Approximately 55% of the mass was rejected as DMS floats, containing 8% of the total lithium (including the fines). The fines stream comprised approximately 26% of the total feed material and contained 16.2% of the total lithium. Further processing of the fines was recommended to improve the overall recovery but did not form part of the SGS testwork.

The QP believes the reason for the comparable results from the two DMS testwork approaches are related to the relatively fine (P_{100} 6 mm) particle size distribution (PSD) which resulted in improved liberation of lithium and reduction of “middlings”/near density material. This is discussed further in Section 13.3.2 / Table 13.18.

Figure 13.5: SGS Grade-Recovery Relationship of HLS v DMS

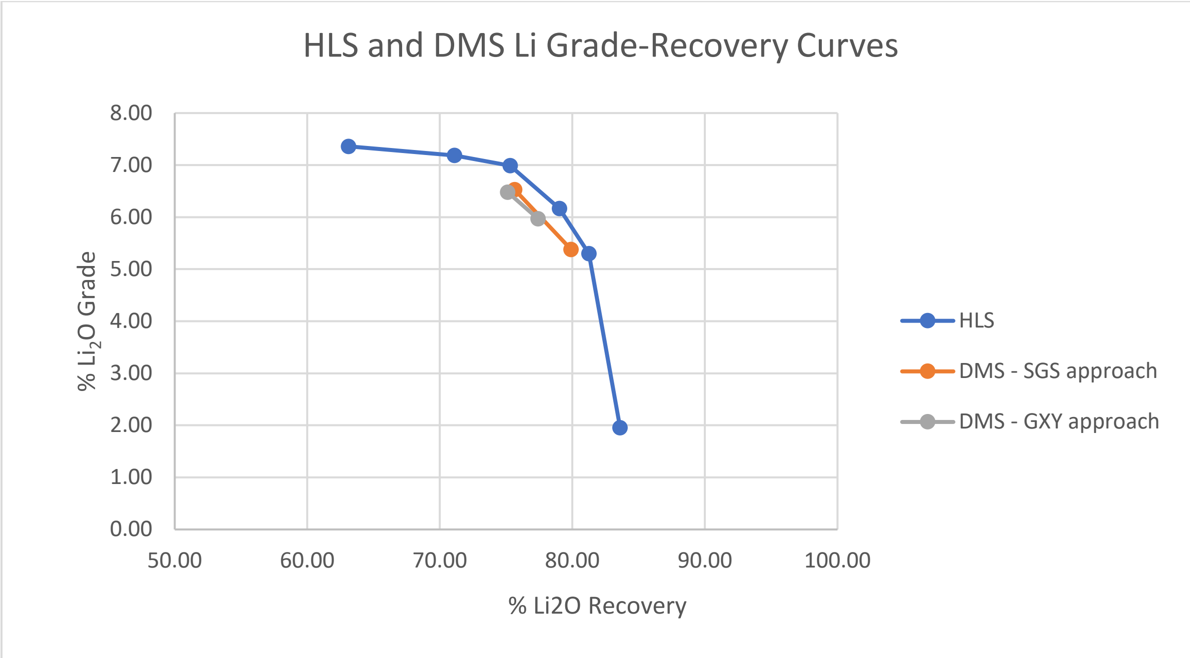


Figure 13.4 indicates that there was little difference between the two DMS approaches, and both were comparable with the HLS results.

13.3.2 Nagrom Testwork

13.3.2.1 Preliminary Phase 1 Testwork (T2407)

41 drill core samples totaling approximately 400 kg were submitted to Nagrom during 2017 for Phase 1 metallurgical testing and these were initially prepared to produce four composites viz A, B, C and D. The following metallurgical testwork was undertaken on the four composites:

- Crushing to P_{100} of 14 mm and assay by size
- Wet screening at 1 mm of P_{100} crush size of 14, 10 and 6.3 mm
- HLS and HLS microscopy
- Stream PSD
- DMS in 100 mm diameter cyclone

An additional eight samples were provided for further crushing, sizing and HLS testwork.

A summary of the testwork is provided below:

- Uniaxial compressive strength (UCS) tests result at an average of 67 MPa indicated ROM that was considered to be lower than benchmarked hard rock lithium projects.
- An abrasion index at 0.27 was also lower than benchmarked hard rock lithium projects.
- Initial crushing was undertaken at P_{100} of 10 mm and 6.3 mm with accompanying HLS testwork.
- Further crushing was undertaken at a coarser P_{100} of 14 mm on four of the 12 composites to compare HLS performance with finer crush sizes.
- A decrease in lithium deportment to sinks at 2.70 SG separation was noted as the crush size was reduced.
- Initial crushing to P_{100} of 10 mm in conjunction with re-crushing of the coarse cleaner/secondary DMS floats was recommended.
- An initial Primary DMS cut-point of 2.70 SG followed by a Secondary DMS cut-point of 2.90 SG was reported as providing the optimum lithium grade/recovery which aligned with the SGS testwork results (refer to Section 2.1 above).
- DMS testwork was undertaken on two of the 12 composites which were closest to the expected feed grade from the mine:
    - Crush size P_{100} of 10 mm and a re-crush of 6.3 mm on the secondary DMS floats.
    - Primary and secondary DMS cut point at 2.70 and 2.90 SG respectively.
    - Low DMS sinks grades from the 6.3 mm re-crush size or target sinks grades with lower recoveries were produced.
    - Further tests at 4.0 mm re-crush size resulted in sinks grades of 6.0% Li_2O at acceptable recoveries.

- The overall DMS100 testwork on composites B and C produced a lithium recovery of 66.3% and 65.9% respectively at a target concentrate grade of 6.0% Li_2O. These results supported a design lithium recovery of 66.0%.

The following comments relate to the Phase 1 testwork program:

13.3.2.1.1 Lithium Deportment to -1 mm vs Crush Size P100

Table 13.2 compares -1 mm lithium at varying crush sizes.

Table 13.2: Crush Size v -1 mm Li_2O

Composite	Percent of Total Li_2O in -1 mm Fraction at Varying Crush Size P100		
#	14 mm	10 mm	6.3 mm
Average A to D	7.6	9.6	11.4
Average all composites	7.4	10.3	14.4

An approximate 2.9% increase in the amount of Li_2O in the -1 mm size fraction is produced when the crush size is reduced from P_{100} of 14 mm to 10 mm and a further 4.1% increase when crushing to 6.3 mm based on the average result for all composites tested, which is expected.

13.3.2.2 Decrease in Lithium Deportment to HLS Sinks at 2.70 SG Separation

Table 13.3: Crush Size v HLS Li_2O Recovery at 2.70 SG Separation

Composite	% Li_2O Recovery at 2.70 SG Separation at Varying Crush Size P_{100}		
#	14 mm	10 mm	6.3 mm
A	92.0	93.7	94.8
B	93.2	92.3	92.9
C	93.2	93.1	93.3
D	93.1	91.9	93.7
Average	92.9	92.7	93.7

There is no significant difference in HLS 2.70 SG sinks recovery when the crush size is reduced from P_{100} of 14 mm to 10 mm but a 1.0% increase in recovery when further crushing to 6.3 mm - this increase in recovery is largely driven by the results for composite A.

13.3.2.3 Further Comparison of Two DMS Testwork Approaches Undertaken by SGS

Following on from comments provided in Section 13.3.1, Table 13.4 compares HLS lithium recovery at 2.90 SG at varying crush sizes.

Table 13.4: Crush Size v HLS Li_2O Recovery at 2.90 SG Separation

Composite	% Li_2O Recovery at 2.90 SG Separation at Varying Crush Size P_{100}		
#	14 mm	10 mm	6.3 mm
A	58.3	61.5	81.4
B	52.2	57.6	70.4
C	63.7	67.7	75.7
D	64.1	58.1	77.2
Average	59.5	61.2	76.2

There is a marked reduction in lithium recovery at 2.90 SG between crush size P_{100} of 14/10 mm compared to 6.3 mm. Note that the average recovery at P_{100} of 6.3 mm is comparable with the 75.7% recovery achieved during the SGS DMS testwork (refer Section 13.3.1).

Using a preferred crushing size of either 14 (15) or 10 mm the 2.85/2.85 Primary/Secondary DMS SG approach will result in markedly lower overall DMS recoveries and therefore operating a 2.65/2.85 Primary/Secondary DMS SG approach as adopted by SGS is recommended.

13.3.2.3.1 Total HLS Recovery at Different Crush Sizes

Table 13.5 compares the total lithium recovery at two different crush sizes relating to losses to the -1 mm fraction and HLS recovery averaged for composites A to D.

Table 13.5: Crush Size v Li_2O Recovery at 2.90 SG Separation

Crush size P_{100}	% Li_2O Recovery at Varying Crush Size P_{100}		
mm	Loss to -1 mm	HLS at 2.90 SG	Overall
14	7.6	59.9	52.3
10	9.6	61.2	51.6
Difference (14 – 10 mm)	-2.0	-1.3	0.7

There is a marginally better lithium recovery at a crush size P_{100} of 14 mm compared to 10 mm.

13.3.2.3.2 Overall HLS Performance

Table 13.6 presents the overall HLS test results for the 12 composites at a crush size P_{100} of 10 mm and separations SG of 2.70 and 2.90.

Table 13.6: Overall HLS Results for 12 Composites

Composites		Composites HLS Recovery and Grade Results			
#	Head Grade	2.70 SG		2.90SG	
A to K	% Li_2O	% Li_2O Recovery	% Li_2O Conc. Grade	% Li_2O Recovery	% Li_2O Conc. Grade
Average	1.54	92.7	4.4	68.4	6.5
Lowest	1.00	90.4	4.4	57.6	6.4
Highest	1.91	94.9	4.6	83.8	7.0
SD	-	1.28	0.39	8.01	0.25

An average recovery of 68.4% Li_2O at 6.5% Li_2O grade was achieved for the 12 composites tested.

13.3.2.3.3 Overall DMS Recovery

Table 13.7 presents the overall DMS recovery at a crush size P_{100} of 10 mm and re-crush of 6.3 mm

Table 13.7: DMS Recovery and Concentrate Grade

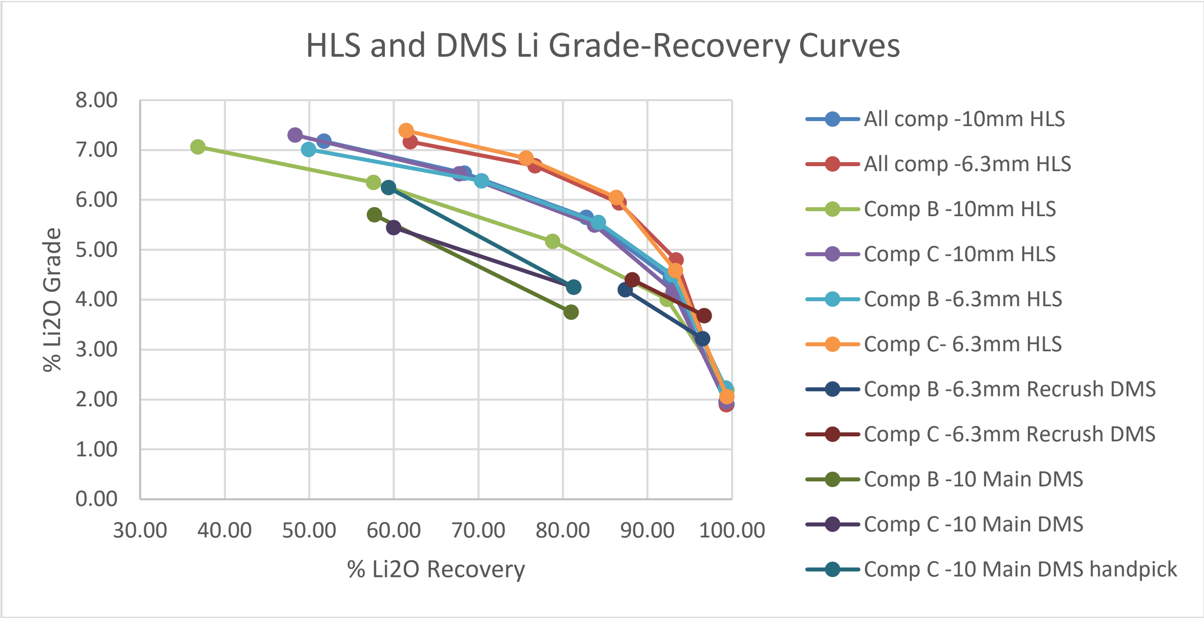
Comp.		Main DMS (-10 +1 mm)				Re-Crush DMS (-6.3 +1 mm)				Overall DMS	
#		Primary		Secondary		Primary		Secondary		Main	Re-Crush
	Head grade %Li_2O	% Li_2O stage Rec.	% Li_2O Conc. Grade	% Li_2O stage Rec.	% Li_2O Conc. Grade	% Li_2O stage Rec.	% Li_2O Conc. Grade	% Li_2O stage Rec.	% Li_2O Conc. Grade	% Li_2O Rec.	% Li_2O Rec.
B	1.51	81.0	3.8	71.3	5.7	96.5	3.2	90.5	4.2	57.7	87.4
C	1.53	81.3	4.3	73.8	5.5	96.7	3.7	91.2	4.4	60.0	88.2
C (mica pick)	1.53	81.3	4.3	73.1	6.3	96.7	3.7	91.2	4.4	59.4	78.2
Average		81.1	4.0	72.6	5.6	96.6	3.5	90.9	4.3	58.9	87.8

A target secondary concentrate grade of 6.0% Li_2O was not achieved for either the main or re-crush DMS. Increasing the SG set-point achieved the target concentrate grade but with loss of recovery. Mica and basalt hand picking were undertaken on composite C main secondary sinks product resulting in an increase in grade from 5.5% to 6.3% Li_2O. Further re-crush tests at 4 mm were undertaken on the main secondary floats resulting in an increase in HLS concentrate grade from 6.0 to 6.5% Li_2O and 6.6% to 6.8% for composite B and C respectively. There was no observed recovery benefit for composite C at the finer crush size where an overall recovery of 65.9% Li_2O was achieved.

13.3.2.3.4 HLS and DMS Comparison

Figure 13.6 compares the grade-recovery relationships of the HLS and the DMS testwork.

Figure 13.6: Grade-Recovery Relationship of HLS v DMS



Data in Table 13.6, Table 13.7 and Figure 13.5 indicate that metallurgical performance for the DMS tests were markedly lower than that achieved for the HLS tests. The reason for this was unclear and further investigation was recommended for Phase 2 of the James Bay testwork on EY, MY and LY samples covering geological lithology, spodumene grain size, gangue minerals, degree of spodumene liberation etc.

13.3.2.4 Bulk Phase 2 Testwork (T2523)

Drill core samples were submitted to Nagrom during 2018 to undertake Phase 2 metallurgical testing on EY, MY and LY samples as a continuation to the earlier Phase 1 testwork. In total, 50 EY, 44 MY and 44 LY samples were submitted totaling 4,643 kg, 1,751 kg and 1,760 kg respectively. The following metallurgical testwork was undertaken for these samples:

- ROM characterization
- Crushing to 25 mm, 15 mm, 10 mm, 6.3 mm and 3.35 mm, wet screening, HLS and assay by size
- Stage crushing of Master Composite to P_{100} of 15 mm and assay by size
    - Mineralogy
    - Bond Work Indices
    - Wet screening at 15, 4 and 1 mm
    - Reflux classification on -4 +1 mm
    - Primary and Secondary DMS250 on coarse -15 + 4 mm and fines -4 +1 mm

- Magnetic separation on fine cleaner DMS sinks
- Variability stage 2 composites (14, 15 and 19)
    - Stage crush to 15 mm
    - Wet screening at 15 and 1 mm
    - HLS

13.3.2.4.1 ROM Characterization

Table 13.8 presents ROM characterization data for EY, MY and LY.

Table 13.8: ROM Characterization

#		Sample			
ID	**Units**	**Early Years**	**Mid Years**	**Later Years**	**Average**
UCS:					
Shallow - lowest	MPa	78.9	96.2	92.4	85.7
Shallow - highest	MPa	137.4	111.3	92.4	124.4
Mid - lowest	MPa	49.8	125.7	88.4	69.1
Mid - highest	MPa	74.9	147.1	95.4	111.0
Deep - lowest	MPa	65.3	89.2	87.3	76.3
Deep - highest	MPa	134.6	96.2	87.3	115.4
Waste - lowest	MPa	81.7	48.6	197.1	65.2
Waste - highest	MPa	157.1	48.6	204.1	180.6
CWi:					
Shallow - lowest	kWh/t	7.6	8.3	9.1	8.0
Shallow - highest	kWh/t	8.0	8.3	9.1	8.6
Mid - lowest	kWh/t	6.6	-	6.8	6.7
Mid - highest	kWh/t	7.5	-	7.5	7.5
Deep - lowest	kWh/t	8.8	6.5	-	7.7
Deep - highest	kWh/t	9.8	7.4	-	8.6
Waste - lowest	kWh/t	17.4	11.0	-	14.2
Waste - highest	kWh/t	17.6	13.9	-	15.8

#		Sample			
ID	Units	Early Years	Mid Years	Later Years	Average
Bond Work Indices:					
BRWi	kWh/t	14.2	12.1		13.2
BBWi	kWh/t	21.9	21.5		21.7
Bulk Density:					
(BRWi)	t/m^3	1.88	1.95		1.92
(BBWi)	t/m^3	1.76	1.74		1.75
Specific Gravity:					
lowest	-	2.69	2.63	2.70	2.66
highest	-	2.79	2.78	2.78	2.79
Waste - lowest	-	2.74	2.74	-	2.74
Waste - highest	-	2.77	2.77	-	2.77
SMC Tests:					
DWi	kWh/m^3	12.0	12.0		12.0
Mia	kWh/t	10.8	11.0		10.9
Mib	kWh/t	6.9	7.0		7.0
Mic	kWh/t	3.6	3.6		3.6
SG		2.73	2.70		2.72
A		71.2	70.7		71.0
B		1.18	1.17		1.18
A x b		84.0	82.7		83.4
t_a		0.80	0.79		0.80
SCSE*	kWh/t	7.29	7.31		7.30
Abrasion Index:					
Ai		0.26	0.26		0.26

** SCSE = SAG circuit specific energy*

The DWi and Mic both lie within the lower 12% of the SMC database indicating relatively soft ores. The A x b and SCSE values also indicate relatively soft ores.

13.3.2.4.2 Mineralogy

EY and MY/LY -15 mm samples were sent to Bureau Veritas (BV) for mineralogical investigation to determine the following:

- Quantitative XRD analysis (crystalline phases)
- QEMSCAN to determine:
  - Mineral lists
  - Mineral abundance in different size ranges
  - Elemental deportment
  - Particle and grain size distribution
  - Liberation
  - Locking

XRD results are presented in Table 13.9.

Table 13.9: XRD Results

		T2523 Head Percent Mass	
Mineral	**Composition**	**Early Years**	**Mid/Later Years**
Quartz	SiO_2	24	22
Plagioclase	(Na, Ca) Al (Al,Si)Si_2O_8	34	36
K feldspar	$KAlSi_3O_8$	13	14
Pyroxene group - Spodumene	ABZ_2O_6	23	20
Mica group	$X_2Y_{4\text{-}6}Z_8O_{20}(OH,F)_4$	5	8
Chlorite group	$A_{4\text{-}6}Z_4O_{10}(OH,O)_8$	<1	<1

Mica group in which X is K, Na, Ca or less commonly Ba, Rb, or Cs; Y is Al, Mg, Fe or less commonly Mn, Cr, Ti, Li, etc.; Z is chiefly Si or Al but also may include Fe^{3+} or Ti.

Pyroxene and chlorite groups where A is Al, Fe^{2+}, Fe^{3+}, Li, Mg, Mn^{2+}, Ni, Zn; Z is Al, B, Fe_3+, Si.

The main lithium mineral present is spodumene; 23% and 20% by mass for EY and MY/LY respectively.

Laser ablation identified low amounts of lithium in mica (approximately 0.1% of the total lithium in each sample) and indicated muscovite with low amounts of lithium rather than lepidolite. The mica content was 5% and 8% for the EY and MY/LY respectively indicating that mica removal circuits would likely be required as part of the plant design.

Some 53% and 79% for the EY and MY/LY sample respectively was contained in the +5.6 mm fraction.

The liberation and locking data for both samples indicated that spodumene has a natural P_{80} of approximately 1 mm. However, review of the BV reports indicates that spodumene is reasonably well liberated in the -4 +2 mm size fraction which corresponds to the benefits of re-crushing the coarse secondary DMS floats stream to 6.3 mm to improve final recovery.

Appreciable spodumene association with micas was noted in the +2 mm size fraction.

13.3.2.4.3 Lithium Deportment to -1 mm v Crush Size P_{100}

Table 13.10 compares -1 mm lithium at varying crush sizes for EY, MY and LY.

Table 13.10: Crush Size v -1 mm Li_2O

Composite	Percent of Total Li_2O in -1 mm Fraction at Varying Crush Size P_{100}		
#	15 mm	10 mm	6.3 mm
Early Years:			
Average all composites	11.2	-	-
Master composite	7.8	10.0	12.0
Mid Years:			
Average all composites	11.6	-	-
Later Years:			
Average all composites	12.6	-	-
Mid/Later Years:			
Master composite	9.5	10.4	21.0

Approximately 2.2% increase in the amount of Li_2O in the -1 mm size fraction is produced when the EY ROM crush size is reduced from P_{100} of 15 mm to 10 mm which is comparable with the results from the Phase 1 testwork presented in Table 13.2. The difference for the MY/LY ROM for the corresponding data is an increase of only 0.9% Li_2O.

13.3.2.4.4 Total HLS Recovery at Different Crush Sizes

Table 13.11 compares the total lithium recovery at two different crush sizes relating to losses to the -1 mm fraction and HLS recovery for the EY Master Composite.

Table 13.11: Crush Size v Li_2O Recovery at 2.70 SG (early years)

Crush Size P_{100}	% Li_2O Recovery at Varying Crush Size P_{100}		
Mm	Loss to - 1 mm	HLS at 2.70 SG	Overall
15	7.8	74.6	66.8
10	10.0	80.6	70.6
Difference (15 – 10 mm)	-2.2	-6.0	-3.8

There is a 3.8% increase in lithium recovery at a crush size P_{100} of 10 mm compared to 15 mm based on the laboratory results produced from jaw/rolls crushing of drill core samples. However, based on typical (Bruno simulation) PSD curves from a jaw/cone crushing circuit (following pit blasting/ROM feed material) at P_{100} of 10 mm and 15 mm, the production of -1 mm material increases from approximately 18% to 32% when operating at the finer crush size resulting in substantially higher lithium losses than predicted by the laboratory testwork crushing configuration. The results from the Bruno simulation are expected to be more representative of full-scale operation, particularly with regard to fines generation.

13.3.2.4.5 Overall HLS Performance

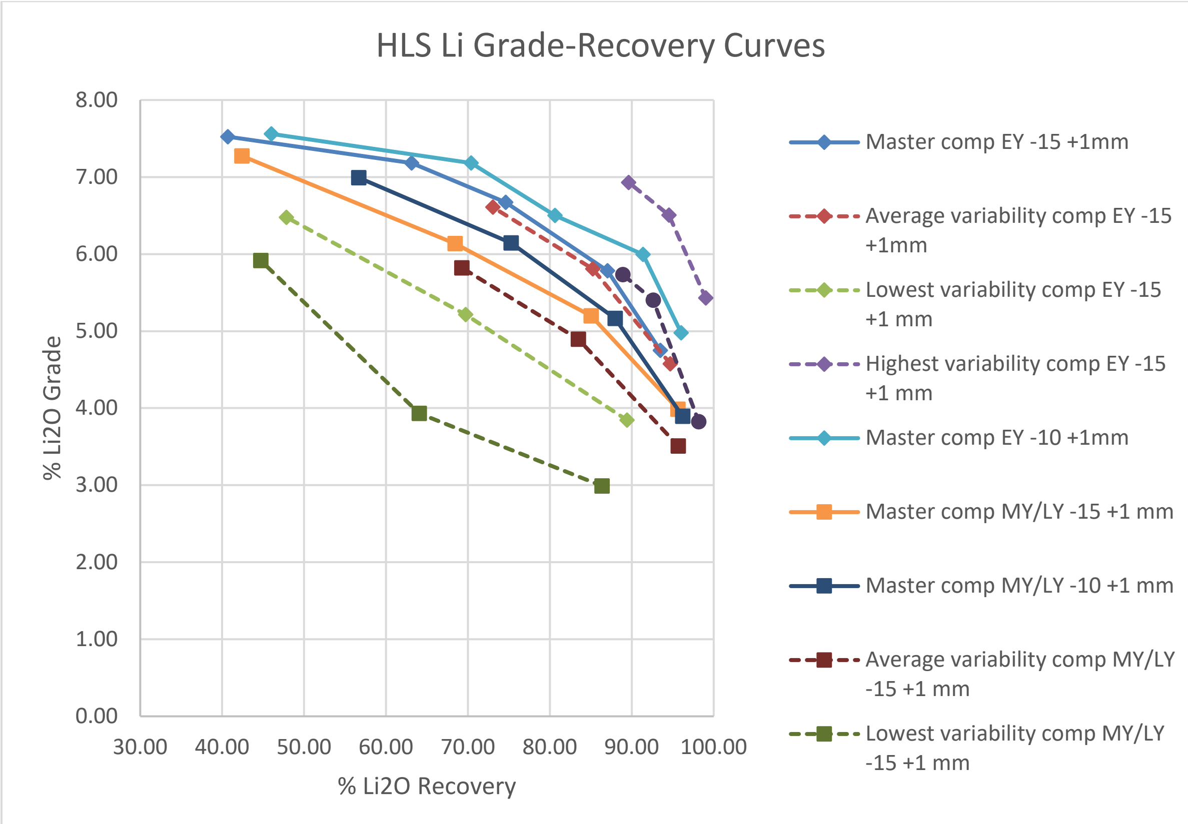
Table 13.12 presents the overall HLS test results for 14 EY and 34 MY/LY variability composites at a crush size P_{100} of 15 mm and separations SG of 2.70 and 2.90.

Table 13.12: Overall HLS Results for Variability Composites

Composites		Composites HLS Recovery and Grade Results			
#	Head grade	2.70 SG		2.90 SG	
1 to 14	%Li_2O	%Li_2O Recovery	%Li_2O Conc Grade	%Li_2O Recovery	% Li_2O Conc Grade
EY					
Average	1.74	94.7	4.6	75.0	6.6
Lowest	0.50	89.4	3.1	63.5	6.0
Highest	2.10	97.3	5.3	84.4	7.0
SD	-	2.44	0.65	9.66	0.31
MY/LY					
Average	1.46	95.7	3.5	69.3	5.8
Lowest	0.72	86.4	2.4	63.0	4.3
Highest	1.87	98.2	4.4	88.9	6.5
SD	-	2.53	0.52	8.23	0.39

An average recovery of 75.0% Li_2O at 6.6% Li_2O grade (P_{100} 15 mm) was achieved for the 14 EY variability composites and an average recovery of 69.3% Li_2O at 5.8% Li_2O grade (P_{100} 15 mm) was achieved for the 34 MY/LY variability composites compared to an average recovery of 68.4% Li_2O at 6.5% Li_2O grade for the 12 composites in the Phase 1 testwork (P_{100} 10 mm). Figure 13.6 compares the grade-recovery relationships of the HLS testwork.

Figure 13.7: Grade-Recovery Relationship of HLS



Data in Table 13.12 and Figure 13.6 indicate reasonable consistency between the (average) variability composites and the Master composite HLS results though the range of performance for the variability composites is quite pronounced.

13.3.2.4.6 Total DMS Recovery

Coarse DMS testwork was undertaken at a primary and secondary cut-point SG of 2.70 and 2.90 respectively and fine DMS testwork was undertaken at a primary and secondary cut-point SG of 2.70 and 2.80 respectively. Re-Crush DMS testwork initially performed at a cut-point SG of 2.80 produced a low (5.2% Li_2O) sinks grade. The test was repeated at 2.90 SG which produced a sinks grade of 5.9% (EY) and 6.0% (MY/LY).

Table 13.13 presents the coarse (-15 +4 mm) and fine (-4 +1 mm) DMS recovery for the EY, MY and LY at a crush size P_{100} of 15 mm and re-crush of 4.0 mm.

Table 13.13: DMS Recovery and Concentrate Grade

	Coarse DMS				Fine DMS				Overall DMS		Overall DMS	
Comp.	Primary		Secondary		Primary		Secondary		Coarse	Fine	C, F & Re-Crush	
#	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Recov.	% Li_2O Recov.	% Li_2O Recov.	% Li_2O Conc Grade
Master EY	96.7	2.4	67.0	6.2	97.5	4.1	96.4	6.0	64.8	88.7	85.7	6.2
Master MY/LY	97.5	2.0	52.7	6.1	96.7	4.3	96.1	5.9	51.4	84.1	82.0	6.0
Master MY	98.5	2.0	65.8	6.2	-	-	-	-	-	-	-	-
Master LY	77.3	2.2	52.8	6.2	-	-	-	-	-	-	-	-

An overall (coarse and fine combined) DMS recovery of 76.8% Li_2O at 6.1% Li_2O grade for EY and a recovery of 67.8% Li_2O at 6.0% Li_2O grade for MY/LY were achieved at a crush size P_{100} of 15 mm. These results compare with a total DMS recovery of 78.4% Li_2O at 5.2% Li_2O grade for the 12 composites in the Phase 1 testwork at a crush size P_{100} of 10 mm.

The overall (coarse and fine) DMS Li_2O recovery for the EY (69.5%) was 13.7% higher than that for the MY/LY (55.8%) due to a lower recovery in the MY/LY secondary coarse DMS 'circuit'. This is attributed to a higher percentage of middlings/locked spodumene in the near-density material for the MY/LY ROM and is confirmed by mineralogy/QEMSCAN testwork results which indicate that the EY samples in the +5.6 mm and +4.0 mm fractions are more liberated than the MY/LY samples. With the incorporation of a re-crush/DMS circuit the difference in overall DMS recovery between the ROM types is negligible as confirmed by the total (coarse, fine and re-crush) DMS recovery of 85.7% and 82.0% Li_2O for EY and MY/LY respectively.

The re-crushing of the secondary coarse DMS floats stream for the EY sample increased the overall Li_2O recovery from 69.5% to 85.7% (an additional 16.2% recovery) with an overall combined final concentrate grade of 6.2% Li_2O. Comparative data for MY/LY showed an increase in overall recovery from 55.8% to 82.0% (an additional 26.2% recovery) at a grade of 6.0% Li_2O.

A separate MY only composite coarse DMS test produced similar results to the EY coarse DMS tests. Likewise, a separate LY only composite coarse DMS test produced similar results to the MY/LY coarse DMS tests as presented in Table 13.13.

The fine (-4 +1 mm) DMS tests included a pre-DMS reflux classifier stage to reduce the level of mica in the DMS feed stream. Continuous up-flow classifier tests rejected approximately 32% of the mica and reduced the mica content in the fine DMS feed from 5.5% to 3.9%.

Magnetic separator testwork on the fine DMS final sinks product indicated removal of between 22% and 23% of the Fe_2O_3 at a Li_2O recovery of 96% to 99%. Future vendor testwork is planned to confirm the suitability of this equipment for upgrading the final fine DMS product.

Note that these results do not include any upgrade (optical sorting to remove waste) on the coarse DMS final sinks product.

13.3.2.4.7 <u>HLS and DMS Comparison</u>

Table 13.14 compares HLS and DMS sinks percent yields at a crush size P_{100} of 15 mm.

Table 13.14: HLS and DMS Sinks Yields

	Coarse DMS						Fine DMS					
Comp.	Primary (2.70 SG)			Secondary (2.90 SG)			Primary (2.70 SG)			Secondary (2.80 SG)		
#	Sinks % Yield	% Li_2O Recov.	% Li_2O Conc Grade	Sinks % Yield	% Li_2O Recov.	% Li_2O Conc Grade	Sinks % Yield	% Li_2O Recov.	% Li_2O Conc Grade	Sinks % Yield	% Li_2O Recov.	% Li_2O Conc Grade
HLS EY	35.7	92.1	4.6	19.1	69.7	6.5	29.1	97.1	5.2	22.7	93.2	6.4
DMS EY	71.9	96.7	2.4	18.5	67.0	6.2	41.6	97.5	4.1	27.2	96.4	6.0
HLS MY/LY	41.2	95.2	3.6	16.6	60.0	5.7	30.4	96.4	4.8	23.0	91.5	6.1
DMS MY/LY	69.7	97.5	2.0	12.2	52.7	6.1	38.2	96.7	4.4	27.1	96.1	5.9

Figure 13.7 and Figure 13.8 compare the grade-recovery relationships of the HLS and the DMS testwork for EY and MY/LY respectively.

Figure 13.8: Grade-Recovery Relationship of HLS v DMS, Early Years

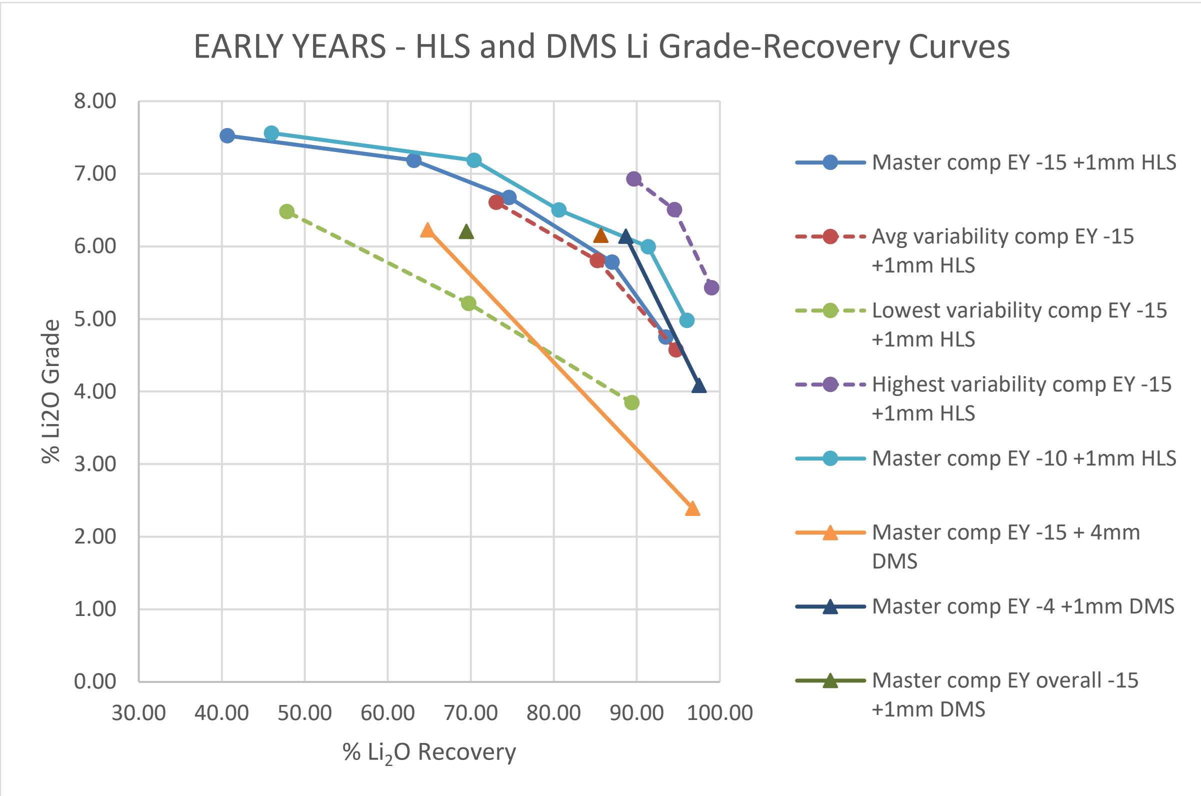
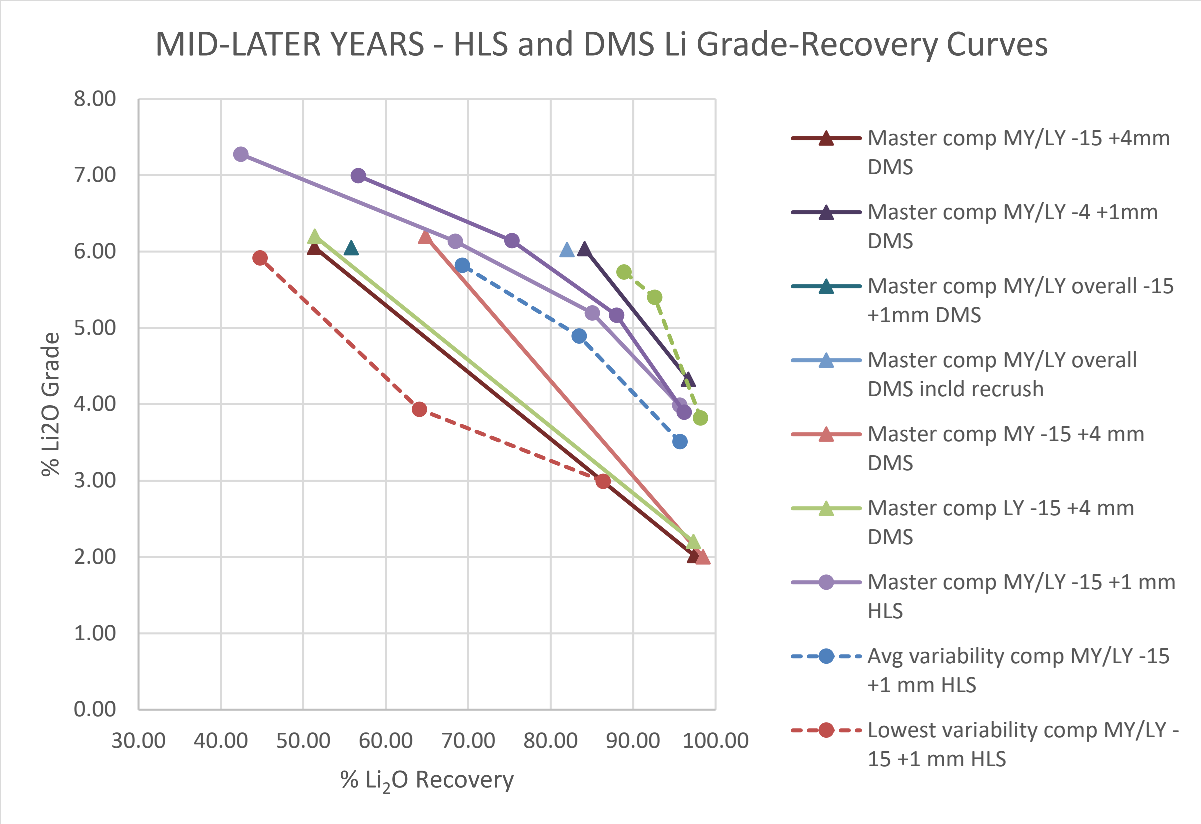


Figure 13.9: Grade-Recovery Relationship of HLS v DMS, Mid/Later Years



Data in Table 13.13, Table 13.14, Figure 13.7 and Figure 13.8 indicate that metallurgical performance for the EY and MY/LY coarse DMS tests were markedly lower than that achieved for the HLS tests. However, the EY and MY/LY fine DMS test results were comparable with the HLS results. The combined (coarse and fine) DMS results were marginally lower than the HLS results but consistent with the HLS-DMS off-set expected and experienced during the SGS HLS-DMS testwork program. The overall DMS recovery and grade (including re-crush) for EY and MY/LY were comparable with the HLS test results.

13.3.3 Overall Testwork Comparison and Preliminary Design Criteria

Table 13.15 compares the results of the three HLS testwork programs at different crush sizes and separation SG of 2.70 and 2.90.

Table 13.15: Overall HLS Results

		Crush Size	Average HLS Recovery and Grade Results			
Composites	Head Grade	P_{100}	2.70 SG		2.90 SG	
#	% Li_2O	mm	% Li_2O Recovery	% Li_2O Conc Grade	% Li_2O Recovery	% Li_2O Conc Grade
SGS	1.49	6.0	81.4	5.3	75.3	7.0
Nagrom Phase 1 A to D	1.58	10.0	92.7	4.1	61.2	6.4
Nagrom Phase 1 ALL	1.54	10.0	92.7	4.4	68.4	6.5
Nagrom Phase 1 A to D	1.67	14.0	92.9	4.1	60.0	6.4
Nagrom Phase 2 Master – EY	1.68	10.0	96.0	5.0	80.6	6.5
Nagrom Phase 2 Master – EY	1.69	15.0	93.5	4.8	74.6	6.7
Nagrom Phase 2 ALL/Variability – EY	1.74	15.0	94.7	4.6	75.0	6.6
Nagrom Phase 2 Master – MY/LY	1.61	6.3	97.8	4.9	85.6	6.9
Nagrom Phase 2 Master – MY/LY	1.52	15.0	95.6	4.0	68.4	6.1
Nagrom Phase 2 ALL/Variability – MY/LY	1.46	15.0	TBC	TBC	TBC	TBC

An average recovery of 75.0% Li_2O at 6.6% Li_2O grade (P_{100} 15 mm) was achieved for the EY Nagrom Phase 2 testwork compared to an average recovery of 68.4% Li_2O at 6.5% Li_2O grade for Phase 1 testwork (P_{100} 10 mm). Comparative results for MY/LY were 68.4% Li_2O recovery at 6.1% Li_2O grade.

Table 13.16 and Table 13.17 compare the results of the three DMS testwork programs at different crush sizes.

Table 13.16: Coarse and Fines DMS Recovery and Concentrate Grade

		Crush Size	Coarse DMS				Fine DMS				Total DMS	
Composite	**Head Grade**	**P100**	**Primary**		**Secondary**		**Primary**		**Secondary**		**Coarse**	**Fines**
#	**% Li_2O**	**mm**	**% Li_2O Stage Recov.**	**% Li_2O Conc Grade**	**% Li_2O Stage Recov.**	**% Li_2O Conc Grade**	**% Li_2O Stage Recov.**	**% Li_2O Conc Grade**	**% Li_2O Stage Recov.**	**% Li_2O Conc Grade**	**% Li_2O Overall Recov.**	**% Li_2O Overall Recov.**
SGS*	1.63	6.0	79.9	5.4	94.6	6.5	-	-	-	-	75.6	-
Nagrom Phase 1 **	1.51	10.0	81.2	4.0	72.6	5.6	96.6	3.7	90.9	4.3	58.5	87.8
Nagrom Phase 2 – EY ***	1.78	15.0	96.7	2.4	67.0	6.2	97.5	4.2	96.4	6.0	64.8	88.7
Nagrom Phase 2 – MY/LY ***	1.56	15.0	97.5	2.0	52.7	6.1	96.7	4.3	96.1	5.9	51.4	84.1
Nagrom Phase 2 - MY	1.57	15.0	98.5	2.0	65.8	6.2	-	-	-	-	-	-
Nagrom Phase 2 - LY	1.67	15.0	97.3	2.2	52.8	6.2	-	-	-	-	-	-

** Single size range (-6 +1 mm) Primary/Secondary DMS*
*** Coarse designation is Main DMS -10 +1 mm; Fine designation is Re-Crush (Main Secondary Floats) DMS -6.3 +1 mm.*
**** Excluding Re-Crush DMS.*

Table 13.17: Total DMS Recovery, Overall Plant Recovery and Concentrate Grade (including Re-Crush)

Composite	Crush Size P_{100}	Total DMS		Overall Plant	
#	mm	% Li_2O Recovery	% Li_2O Grade	% Li_2O Recovery	% Deportment Li_2O -1 mm
SGS*	6.0	75.6	6.5	-	-
Nagrom Phase 1	10.0	72.7	6.0	66.0	9.2
Nagrom Phase 2 – EY**	15.0	85.7	6.2	76.2	11.1
Nagrom Phase 2 – MY/LY**	15.0	82.0	6.0	75.6	7.8

* *Single size range (-6 +1 mm) Primary/Secondary DMS*
*** Including Re-Crush DMS.*

A total (coarse, fine and re-crush combined) DMS recovery of 83.9% Li_2O at 6.1% Li_2O grade (average EY and MY/LY) was achieved for the Phase 2 testwork. This compares to a total DMS recovery of 72.7% Li_2O at 6.0% Li_2O grade for the Phase 1 testwork and a total DMS recovery of 75.6% Li_2O at 6.5% Li_2O grade (no re-crush) for the SGS preliminary testwork.

Table 13.18 presents the preliminary Process Design Criteria for the James Bay Concentrator based on the results of the Nagrom Phase 2 metallurgical testwork (adjusted for a lower 5.6% final product grade to provide improved project economics).

Table 13.18: Preliminary Process Design Criteria

Parameter	Units	Design Value	Comments
OPERATING SCHEDULE			
Operating schedule:			
Nominal throughput	t/a	2,000,000	
Crusher Operating schedule:			
Crushing circuit overall utilization	%	68.5	
Moisture content	%	3.0	
Crushing rate	dry t/h	333	
Crushing rate	wet t/h	352	
DMS Operating schedule:			
DMS circuit overall utilization	%	85.0	

Parameter	Units	Design Value	Comments
DMS Feed rate	dry t/h	269	
ROM CHARACTERISTICS			
Feed grade – LOM	% Li_2O	1.30	6% waste dilution
Production:			
Early Years (original mine schedule):			
Coarse DMS Recov. (contribution to total DMS Recov.)	% Li_2O	58.1	
Fine DMS Recov. (contribution to total DMS Recov.)	% Li_2O	15.0	
Re-Crush DMS Recov. (contribution to total DMS Recov.)	% Li_2O	12.9	
Total DMS Recovery	% Li_2O	86.0	
Overall Plant Recovery (including -1 mm fines)	% Li_2O	71.2	
Final Concentrate Grade	% Li_2O	5.6	
Concentrate Production - nominal	t/a	330,571	
Mid/Later Years (original mine schedule):			
Coarse DMS Recov. (contribution to total DMS Recov.)	% Li_2O	48.3	
Fine DMS Recov. (contribution to total DMS Recov.)	% Li_2O	11.0	
Re-Crush DMS Recov. (contribution to total DMS Recov.)	% Li_2O	21.2	
Total DMS Recovery	% Li_2O	80.5	
Overall Plant Recovery (including -1 mm fines)	% Li_2O	66.5	
Final Concentrate Grade	% Li_2O	5.6	
Concentrate Production - nominal	t/a	308,750	
ROM FEED			
Crushing Work Index:			

Parameter	Units	Design Value	Comments
Design	kWh/t	8.0	
Early Years:			
Average	kWh/t	8.0	
Max	kWh/t	9.8	
Min	kWh/t	7.6	
SD			
Later Years:			
Average	kWh/t	7.6	
Max	kWh/t	9.1	
Min	kWh/t	6.5	
Abrasion Index:			
Design	g	0.26	
Early Years average	g	0.26	
Mid Years average	g	0.26	
UCS:			
Design	MPa	150	
Early Years:			
Average	MPa	90.2	
Max	MPa	137.4	
Min	MPa	49.8	
Mid Years:			
Average	MPa	103.8	
SD	MPa		
Max	MPa	147.1	
Min	MPa	87.3	
Crushing Work Index (not used in design):			

Parameter	Units	Design Value	Comments
Bond Rod Mill Work Index @ 1180 µm closing screen:			
Early Years	kWh/t	14.2	
Mid Years	kWh/t	12.1	
Bond Ball Mill Work Index @ 106 µm closing screen			
Early Years	kWh/t	21.9	
Mid Years	kWh/t	21.5	
SMC (not used in design):			
DWi:			
Early Years	kWh/m^3	12.0	
Mid Years	kWh/m^3	12.0	
A:			
Early Years		71.2	
Mid Years		70.7	
b:			
Early Years		1.18	
Mid Years		1.17	
Mia:			
Early Years	kWh/t	10.8	
Mid Years	kWh/t	11.0	
Material Properties:			
ROM SG Average:			
Early Years		2.73	
Mid Years		2.70	
Bulk Density Crushed ROM:			
Mass Design	t/m^3	1.75	
Volume Design	t/m^3	1.65	
Early Years	t/m^3	1.76	

Parameter	Units	Design Value	Comments
Mid Years	t/m^3	1.74	
ROM moisture content	%	3.0	
CIRCUIT SPLITS & PARTICLE SIZE DISTRIBUTIONS			
Crushing circuit P_{100}	mm	15	
ROM feed basis mass splits:			
P_{80}	mm	9.4	
P_{50}	mm	4.2	
-1 mm Fines	%	20.3	
Li_2O deportment -1 mm	%	17.2	
Coarse secondary DMS floats re-crush size	mm	6.3	
DMS			
Circuit SG cut-points:			
Coarse Primary		2.7	
Coarse Secondary		2.9	
Fine Primary		2.7	
Fine Secondary		2.8	
Circuit sinks yield:			
Coarse Primary	%	69.7 - 71.9	
Coarse Secondary	%	17.6 - 25.7	
Fine Primary	%	38.2 - 41.6	
Fine Secondary	%	65.4 - 71.0	
Re-Crush	%	12.1 - 14.5	
Stage DMS recovery (+1 mm):			
Coarse DMS	%	51.4 - 64.8	
Fine DMS	%	84.1 - 88.7	
Re-Crush	%	63.4 – 65.7	
Overall	%	82.0 – 85.7	

A total (coarse, fine and re-crush) DMS recovery of 85.7% Li_2O at 6.2% Li_2O grade and a recovery of 82.0% Li_2O at 6.0% Li_2O grade were achieved for the Phase 2 EY and MY/LY testwork respectively. This compares with 78.4% DMS recovery at 5.2% Li_2O grade (reportedly including re-crush) achieved during the Phase 1 testwork.

13.3.4 Testwork, Recovery Review, Scale-Up Factors and Design Recovery

13.3.4.1 Testwork Data Review

The metallurgical testwork and the results presented in this Metallurgical Testwork Report were reviewed by external consultant Jeremy Bosman of PESCO to confirm the overall plant recovery design target.

PESCO used a mass balance smoothing simulation software package called BILCO to confirm the testwork DMS and overall recovery presented in previous sections of this report.

Table 13.19 and Table 13.20 compare the testwork DMS and overall recoveries/grades for the EY and MY/LY from the Report and BILCO.

Table 13.19: Preliminary Process Design Criteria

	Testwork				
	DMS		-1 mm Deportment	Overall	
	Recov.	Grade	Li_2O	Recov.	Grade
EY	85.7	6.2	11.2	76.1	6.2
MY/LY	82.0	6.0	7.8	75.6	6.0

Table 13.20: Testwork Recovery and Grades – BILCO Simulation

	Testwork				
	DMS		-1 mm Deportment	Overall	
	Recov.	Grade	Li_2O	Recov.	Grade
EY	85.8	6.0	8.7	78.3	6.0
MY/LY	79.9	5.9	6.0	75.1	5.9

The results indicate an overall testwork recovery of 76.1% and 75.6% for EY and MY/LY respectively compared to the BILCO results of 78.3% and 75.1% recovery, indicating that the two methods for interpreting the testwork data are relatively close.

13.3.4.2 Scale-Up to Full-Scale Plant

In order to 'translate' the overall testwork recovery into a full-scale plant recovery, the following "modifying" factors have been used:

- PSD
- DMS Scale-up factor that considers the use of larger diameter cyclones and medium contamination/viscosity challenges as well as data from other spodumene projects

The PSD created during testwork is distinctly different from that created on a mine site where for example, blasting will increase the quantity of fines produced. Nagrom Phase 2 testwork indicated that between 7% and 10% of the Li_2O reported to the -1 mm fraction compared to 15.3% for the Mt Cattlin operating plant at a similar P_{100} crush size.

Table 13.21 and Table 13.22 present the amended Li_2O deportment data for the James Bay Project based on the Mt Cattlin PSD and James Bay size by assay data.

Table 13.21: Adjusted PSD EY

		Li_2O	Deportment		
		%	Yield	Li_2O	Li_2O metal
Calc. Head		1.554	100.00%	100.00%	1.554
Size (mm)					
+4		1.626	55.00%	57.55%	0.894
+1		1.586	24.70%	25.21%	0.392
-1		1.319	20.30%	17.24%	0.268

Table 13.22: Adjusted PSD MY/LY

		Li_2O	Deportment		
		%	Yield	Li_2O	Li_2O metal
Calc. Head		1.383	100.00%	100.00%	1.383
Size (mm)					
+4		1.460	55.00%	58.08%	0.803
+1		1.372	24.70%	24.51%	0.339
-1		1.186	20.30%	17.42%	0.241

The PSD data indicates that the average loss of Li_2O to the -1 mm stream for the plant is 17.2% and 17.4% for EY and MY/LY respectively.

Table 13.23 presents testwork and full-scale plant performance data for Mt Cattlin, and others Australian operations and compares these with James Bay testwork data.

Table 13.23: Mt Cattlin, Australian Operations and James Bay Scale-Up Factors

	Head Grade	Impurities	Circuits	Crush P_{100} (mm)		Recovery/grade $\%Li_2O$			
	$\% Li_2O$			Testwork	Plant	DMS		Overall	
						Testwork	Plant	Testwork	Plant
Mt Cattlin	1.05	Basalt & Mica	DMS only	10	14	80/6.0	75/6.0	67	56/5.9
Operation 1	0.94	Mica (no basalt)	DMS only	14	18	86/6.0	80*	76	65/6.1
Operation 2a	1.20	Basalt & mica	DMS & flotation	6.5	8	-	60/6.1	80/6.4	58/5.8
James Bay	1.40	Mica (no basalt)	DMS only	15	15	80 to 86/5.9 to 6.0	-	75 to 78/5.9 to 6.0	-

**Estimated based on Mt Cattlin DMS scale-up*

Testwork DMS recoveries for the three DMS-only Projects (Mt Cattlin, Operation 1 and James Bay) varied between 80% and 86% which translated to between 67% and 76% overall testwork recovery for Mt Cattlin and Operation 1 respectively.

Table 13.24 compares scale-up factors for Mt Cattlin, Operation 1 and James Bay

Table 13.24: James Bay EY and MY/LY full-Scale Performance Estimate

	DMS Scale-up	Overall Scale-up
Mt Cattlin	0.94	0.80
Operation 1	0.93	0.86
James Bay	0.94	0.84

The DMS scale-up factor of 0.94 for Mt Cattlin has been calculated from actual data (75/80 testwork/plant recovery) and this factor has been used for James Bay to estimate a plant DMS recovery for EY and MY/LY. The total scale-up factor of 0.84 for James Bay has been calculated from this estimated plant DMS recovery multiplied by the +1 mm Li_2O wt% deportment. The plant DMS recovery, overall recovery and overall scale-up factors for EY and MY/LY are presented in Table 13.25.

Table 13.25: James Bay EY and MY/LY Full-Scale Performance Estimate

	Full-scale Plant					
	DMS		-1 mm Deportment	Scale-up Factor	Overall	
	Recov	Grade	Li_2O (Mt Cattlin)		Recov	Grade
EY	80.4	6.0	17.2	0.85	66.5	6.0
MY/LY	74.9	5.9	17.4	0.82	61.9	5.9

As an independent check on the James Bay EY data presented in Table 13.25, the Operation 1 testwork data presented in Table 13.23 indicated a DMS testwork recovery of 86% and an overall plant recovery of 65% which is reasonably close to the corresponding James Bay data in Table 13.20 (85.8%) and Table 13.25 (66.5%).

Based on the data presented in Table 13.25, the design overall plant recovery for the James Bay Project is 66.5% for EY and 61.9% for MY/LY targeting a 6.0% Li_2O product.

However, various analyses were performed to identify the operational conditions based on the current market within the design allowance already integrated in the process plant design. Operating the James Bay processing plant to produce a final product grade target of 5.6% Li_2O compared to the testwork and basis of design of 6.0% Li_2O will markedly improve the economics of the project, by increasing the overall plant recovery to 71.2% and 66.5% for EY and MY/LY respectively. These increased recovery targets have been estimated using Mt Cattlin LIMN® modelling which provides grade-recovery curves based on head grade. Further DMS testwork will need to be undertaken to confirm the achievable recovery at the lower product grade. Plant design changes (around the secondary DMS and re-crush circuits) are anticipated to be minimal and will not materially affect the capital cost and operating cost estimates of the Project.

13.3.5 -1 mm Recovery Options

The use of flotation and UF DMS for recovery of lithium for the -1 mm fraction will be further investigated in later stages of the project. Previous testwork focused on UF DMS recovery from the –1 mm material, however, a recent in-house options study showed that flotation would be the preferred route to maximise the financial benefit from this stream.

UF DMS testwork results are summarised below.

Additional DMS testwork was undertaken on the -1 mm fraction to improve the overall plant recovery.

UF DMS testwork was undertaken at the following cut-points for -1 +0.5 mm and -1 + 0.3 mm material for EY and MY/LY:

- Single stage 2.90 SG
- Single stage 2.95 SG
- Single stage 2.85 SG
- Two-stage both at 2.80 SG

The single stage -1 + 0.5 mm DMS tests produced concentrate grades of between 4.8% and 5.2% Li_2O and those for the -1 +0.3 mm produced concentrate grades of between 3.9% and 4.6% Li_2O. The two-stage DMS tests all achieved final concentrate grades above 6.0% Li_2O. The improved concentrate grades for two-stage DMS are attributed to a large proportion of near (cut-point) density material.

Table 13.26 presents the two-stage UF DMS results for the EY and MY/LY at a crush size P_{100} of 15 mm.

Table 13.26: Ultrafine DMS Recovery and Concentrate Grade

Comp.	UF DMS -1 +0.5 mm						UF DMS -1 + 0.3 mm					
#	Primary		Secondary		Overall		Primary		Secondary		Overall	
	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Recov.	% Li_2O Conc Grade	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Stage Recov.	% Li_2O Conc Grade	% Li_2O Recov.	% Li_2O Conc Grade
Master EY	85.1	4.8	91.7	6.3	78.1	6.3	71.3	4.3	84.2	6.0	60.0	6.0
Master MY/LY	81.7	4.7	91.0	6.4	74.3	6.4	69.1	4.2	82.1	6.1	56.8	6.1

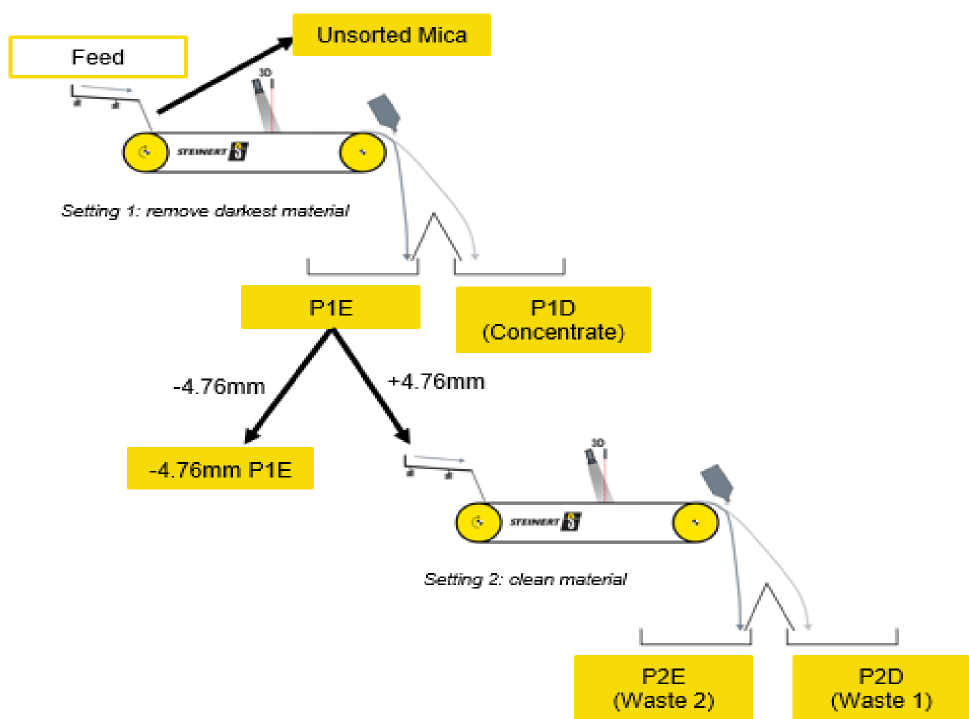
The additional recovery realized from the -1 mm fraction has not been included in the existing PDC but will be reviewed and reconsidered during a future Phase of the Project.

13.3.6 Optical Sorting

Optical sorting isn't being pursued for the James Bay project due to the lack of recovery improvement that this technology generated from James Bay material, as the waste is low SG metasediments compared to high SG basalt at Mt Cattlin. However, a summary of these results is shown below.

Preliminary optical sorter testwork on the EY and MY/LY final DMS product was undertaken by Steinert using a two stage 3-D laser sorting flowsheet to reject waste material. The testwork flowsheet is presented in Figure 13.10.

Figure 13.10: Final Product Optical Sorting Flowsheet



Optical sorter testwork results are presented in Table 13.27 and Table 13.28.

Table 13.27 Optical Sorter Results, Early Years

					Stage	Overall
	Mass	**Yield**	**Grade**	**kg**	**Recovery**	**Recovery**
	kg	**%**	**% Li_2O**	**Li_2O**	**% Li_2O**	**% Li_2O**
Feed	137.02		6.5	8.847		
Mica Recovered	1.10		2.2	0.025		
P1D +4 mm	108.00	78.82	6.7	7.208	81.5	81.5
P1D -4 mm	7.65		5.5	0.422		
P1E Total	20.27			1.192		
P1E +4 mm	8.33			0.542		
P1E – 4 mm	11.94		5.4	0.650		
P2E	7.99	95.92	6.6	0.529	97.7	6.0
P2D	0.34		3.7	0.013		
Total Product	115.99	84.65	6.7	7.737		87.5

Table 13.28: Optical Sorter Results, Mid/Later Years

					Stage	Overall			Stage	Overall
	Mass	Yield	Grade	kg	Recov.	Recov.	Grade	kg	Rejection	Rejection
	kg	%	% Li_2O	Li_2O	% Li_2O	% Li_2O	% Contaminant	Contaminant	% Waste	% Waste
Feed	185.12		6.3	11.654			0.97	1.799		
Mica Recovered	0.66		2.7	0.018						
P1D +4 mm	146.00	78.87	6.5	9.484	81.4	81.4	0.00	0.000	100.00	
P1D -4 mm	7.77		5.5	0.431						
P1E Total	30.69			1.721				1.799		
P1E +4 mm	5.77			0.265				1.799		
P1E – 4 mm	24.92		5.9	1.457						
P2E	4.25	73.66	5.9	0.251	94.8	2.2	10.15	0.431	76.02	76.02
P2D	1.52		0.9	0.014			89.95	1.367		
Total Product	150.25	81.16	6.5	9.735		83.5	0.29	0.431		76.02

Based on these preliminary tests, Li_2O recovery was between 83.5% (MY/LY) and 87.5% (EY). Waste rejection based on MY/LY results was 76.0%.

The additional upgrade realized from optical sorting of the final product has not been included in the existing PDC but will be reviewed and factored in during the next Phase of the Project.

13.3.7 Thickening & Filtration

Tailings thickening and filtration testwork was initially undertaken by Tenova. Further testwork was undertaken by Outotec due to insufficient fines being available for the Tenova filtration tests. The results of the thickening testwork are presented in Table 13.29.

Table 13.29: Thickening Testwork Results

Sample/Vendor	Flux Rate	Rise Rate	Feed Density	Flocculant		Underflow Density	Underflow Yield Stress	Overflow Clarity	Thickener Diameter
	$t/m^2/h$	m/h	% Solids w/w	Type	Consumption (g/t)	% Solids w/w	Pa	Wedge - mg/L	m
Combined Years									
Tenova	0.6	5.6	10.0	Nalco 83376	2.0	65.9	51	15 (wedge)	16
Early Years									
Outotec	0.25	11.3	2.2	Nalco 83372	20	>70	>550	20 – 280	12
Mid/Later Years									
Outotec	0.25	11.3	2.2	Nalco 83372	20	>70	>550	> 46 - 200	12

The flux rate indicated by the Tenova testwork at 0.6 $t/m^2/h$ was substantially higher than 0.25 $t/m^2/h$ indicated by the Outotec testwork. Based on the author's experience, the flux rate reported by Tenova is similar to that obtained in concentrate thickeners where higher solids SGs are apparent. This flux rate is considered excessive for lithium tailings.

The Tenova testwork was conducted at a feed density of 10.0% solids w/w contrary to the specified design of 2.2%. Tenova's calculated flocculant consumption at 2.0 g/t was very low and well below a more typical 20 g/t indicated by Outotec. For this reason, the Outotec data has been used for design purposes.

The results of the filtration testwork are presented in Table 13.30.

Table 13.30: Filtration Testwork Results

Sample/Vendor	Feed Density	Filtration Rate	Cake Thickness	Filter Cake	Flocculant	Filtrate
	% Solids w/w	$kg/m^2/h$	mm	% Moisture	Consumption (g/t)	% Solids w/w
Early Years						
Tenova (+0.5 mm only)		3,000	8	-	-	0.037
Outotec	56.0	756	19	9.0	20	-
Mid/Later Years						
Outotec	56.0	776	19	7.7	14	-

The Tenova filtration testwork indicated a filtration rate of 3,000 $kg/m^2/h$ but this was obtained using only coarse/+ 0.5 mm material due to the lack of -0.5 mm material from the thickening testwork.

The filtration rate for the full stream of tailings indicated by the Outotec testwork was between 756 and 775 $kg/m^2/h$. For this reason, the Outotec data has been used for design purposes.

14 MINERAL RESOURCE ESTIMATES

This section has been updated from the section originally prepared by SRK Consulting Inc. in the Preliminary Economic Assessment released in March 2021. Given there has been only minor geotechnical and metallurgical drilling since the effective date of the current mineral resource estimation (November 23rd, 2017), this mineral resource remains current. GMS has validated the current mineral resource and concludes that it is fit for purpose in the Feasibility Study (see QP Commentary section)

14.1 Introduction

The Mineral Resource Statement presented herein represents the second mineral resource evaluation prepared for the Project in accordance with the Canadian Securities Administrators' National Instrument 43101 and the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (**JORC**).

The mineral resource model considers 102 core boreholes drilled by Lithium One during the period of 2008 to 2009, 53 channel samples collected by Lithium One in 2009 and 2010, and 157 core boreholes drilled by Galaxy in 2017. The resource estimation work has been verified by Mr. James Purchase, P.Geo of GMS (**QP**), an independent Qualified Person as defined in National Instrument 43-101. The effective date of the Mineral Resource Statement is December 4, 2017[3], as no new material technical or scientific information has been acquired since this date.

This section describes the resource estimation methodology and summarizes the key assumptions considered by the QP. In the opinion of the QP, the resource evaluation reported herein is a reasonable representation of the global lithium oxide (Li_2O) mineral resources found in the Project at the current level of sampling. The mineral resources have been estimated in conformity with generally accepted CIM Estimation of Mineral Resource and Mineral Reserves Best Practices Guidelines and the requirements for JORC 2012 and are reported in accordance with the Canadian Securities Administrators' National Instrument 43-101. Mineral resources are not mineral reserves and have not demonstrated economic viability. There is no certainty that all or any part of the mineral resource will be converted into mineral reserve.

The database used to estimate the Project mineral resources was validated by the QP. The QP is of the opinion that the current drilling information is sufficiently reliable to interpret with confidence the boundaries

[3] GMS has certified the James Bay Lithium Mine Project mineral resource as compliant with the requirements of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC). See the Australian Securities Exchange announcement entitled "[insert]" dated December 4, 2017, available to view on www.asx.com.au.

for Li_2O mineralization and that the assay data are sufficiently reliable to support mineral resource estimation.

In 2017, Leapfrog Geo™ software was used to construct the geological solids, and Datamine Studio RM™ was used to prepare assay data for geostatistical analysis, construct the block model, estimate metal grades, and tabulate mineral resources. The Geostatistical Software Library (GSLib) family of software was used for geostatistical analysis and variography. Validations by GMS has been undertaken using in-house software and Leapfrog Edge™.

14.2 Resource Estimation Procedures

The mineral resources reported herein have been estimated using a geostatistical block modelling approach informed from core borehole data and surface channel samples, all constrained within pegmatite dikes. The geological models of the pegmatite dikes were defined using implicit modelling within Leapfrog GEO™ using lithological codes from the drilling database.

The resource evaluation methodology involved the following procedures:

- Database compilation and verification
- Construction of wireframe models for the boundaries of the Li_2O mineralization
- Definition of resource domains
- Data conditioning (compositing and capping) for geostatistical analysis and variography
- Block modelling and grade interpolation
- Resource classification and validation
- Assessment of “reasonable prospects for eventual economic extraction” and selection of appropriate cut-off grades

14.3 Resource Database

Exploration data available to evaluate the mineral resources for the Project includes surface 102 boreholes drilled (13,475 m) by Lithium One in 2008 (18 holes) and 2009 (84 holes). The sample database also includes 53 channels (809 m) with 562 samples collected by Lithium One in 2009 and 2010. Since the acquisition of the Project by GLCI in 2011, 157 infill boreholes were completed in 2017 for a total of an additional 33,339 m.

Original lithium assays were converted into Li_2O and expressed as percentages. Geostatistical analysis, variography and grade estimation considers lithium assays expressed as Li_2O.

The collar position of each borehole and channel sample was assessed using a hand-held GPS unit with accuracies generally within a few metres. Most of the collars were resurveyed by a total station when possible. When required, the elevation of the boreholes and channels was adjusted using a high-resolution topographic profile provided by GLCI.

Drill hole data was imported into Leapfrog Geo and Datamine Studio RM from csv format. The following validation steps were followed:

- Checked minimum and maximum values for each quality value field and confirmed/edited those outsides of expected ranges
- Checked for gaps, overlaps and out of sequence intervals in assays tables

No errors were found and the QP is satisfied with the database used in the mineral resource estimate.

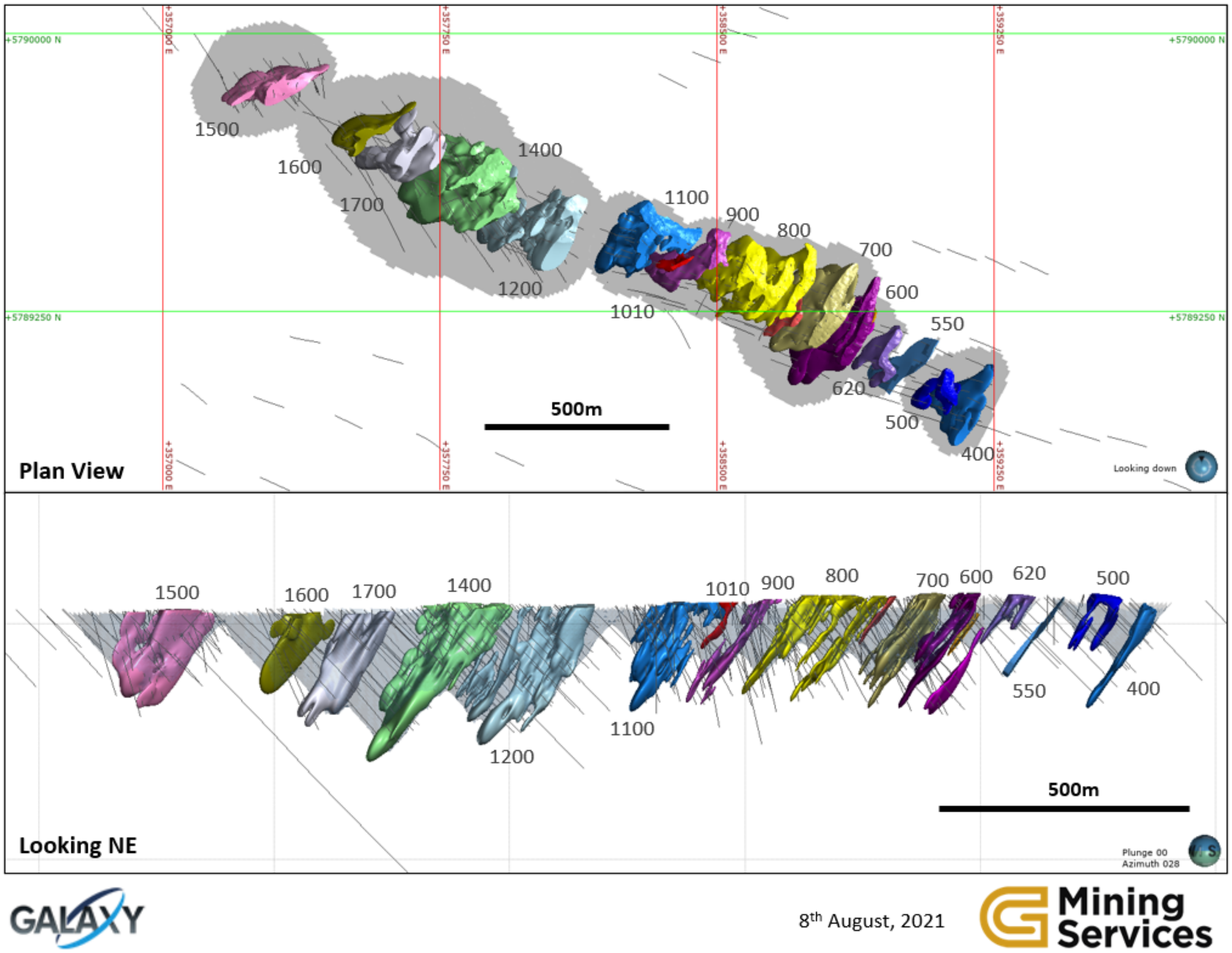
14.4 Geological Modelling

The spodumene-bearing pegmatite bodies of the Project are irregular dikes attaining up to 60 m in width and over 200 m in length. The pegmatite intrusions generally strike south-southwest dipping moderately to the west-northwest (215 degrees / 60 degrees).

Based on core drilling data, surface geology mapping, and outcrop channel sampling provided by GLCI, a three-dimensional model was created for the main pegmatite dikes (Figure 14.1 and representative cross sections in Figure 10.2). The three-dimensional model honours drilling data. The bodies were modelled from logged pegmatite intervals, not Li_2O grades, as implicitly derived intrusions or vein contact surfaces in Leapfrog Geo software (version 4.0.1). The resulting geological model incorporates 18 pegmatite dikes. Sixteen pegmatite bodies were created as intrusion contact surfaces with a spheroidal interpolant, while two smaller pegmatites (550 and 850) were created with the vein modelling tool within the boundaries defined by hanging wall and foot wall surfaces.

The overburden material was also modelled, consisting of glacial till, using the logged drill intervals and mapped outcrops. The three-dimensional model is clipped to a topography surface created from a Lidar survey provided by Galaxy.

Figure 14.1: Modelled Pegmatite for the Project Within Conceptual Pit Shell

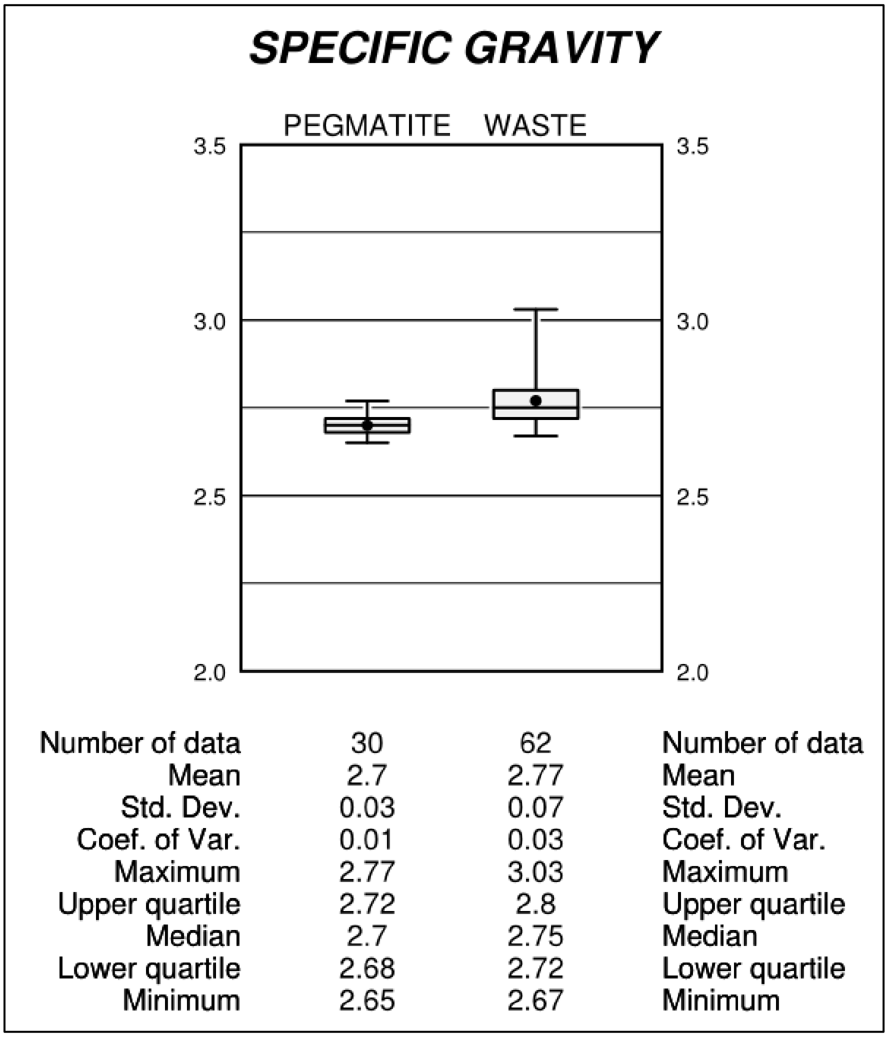


Source: GMS, 2021

14.5 <u>Specific Gravity</u>

Specific gravity measurements were obtained by pycnometry at the assay laboratory, as part of the routine assaying protocol. A total of 30 specific gravity measurements were taken with the pegmatite dikes (Figure 14.2). Based on this data, a uniform specific gravity of 2.7 was applied to all the pegmatite dikes.

Figure 14.2: Summary of the Specific Gravity Database

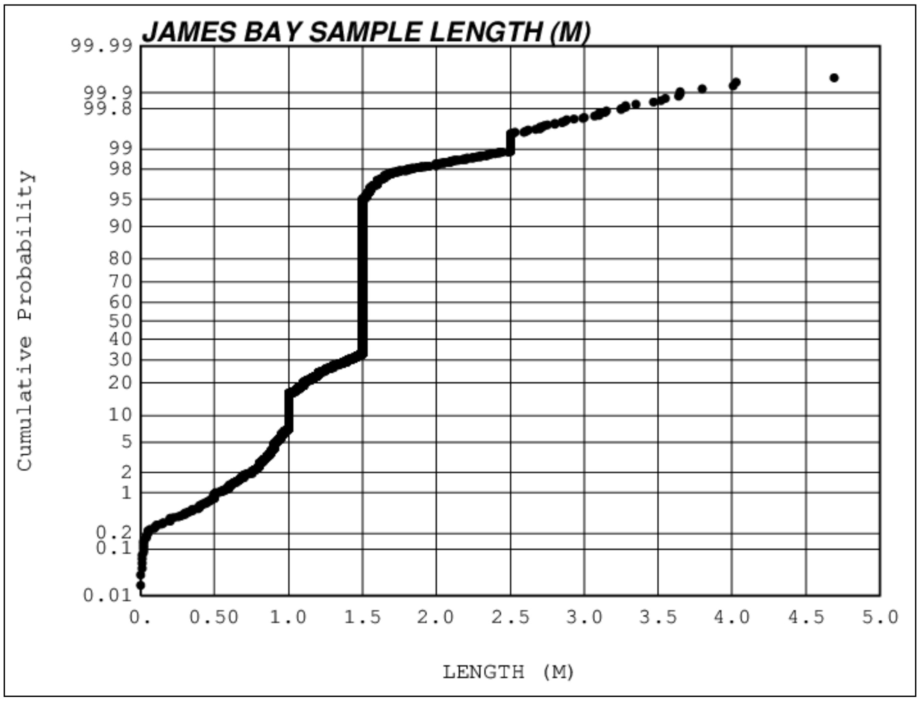


Source: SRK, 2017

14.6 Composite and Capping

Borehole assays were extracted for each of the 18 pegmatite dikes (Figure 14.3) and examined for determining an appropriate composite length. Block model cell dimensions and anticipated open pit mining methods were also considered in the selection of the composite length. A modal composite length of 1.5 m was applied to all data (Figure 14.3). No capping was applied on the analytical composite data, as it was deemed unnecessary. Any unsampled intervals were assigned a value of 0% Li_2O. From the 8,624 samples extracted, 7,954 composites were generated honouring the pegmatite dike boundaries.

Figure 14.3: Sampling Length within the Pegmatite Dikes



Source: SRK, 2017

14.7 Block Model Definition

Criteria used in the selection of block size included the borehole spacing, composite assay length, the geometry of the modelled zones, and the anticipated open pit mining technique. A block size of 10 m x 3 m x 10 m was chosen. Subcells, at 0.25-metre resolution, were used to honour the geometry of the modelled pegmatite dikes. Subcells were assigned the same grade as the parent cell. The model is rotated on Z to be parallel to the general trend of the pegmatite dikes. The characteristics of the final block model are summarized in Table 14.1.

Table 14.1: Project Block Model Specifications

Domain	Axis	Block Size (m)		Origin*	Number of Cells	Rotation Angles (clockwise)	Rotation Priority
		Parent	Subcell				
All	X	10	0.25	357,215	119	-	-
	Y	3	0.25	5,790,681	974	-	-
	Z	10	0.25	-459	106	118	1

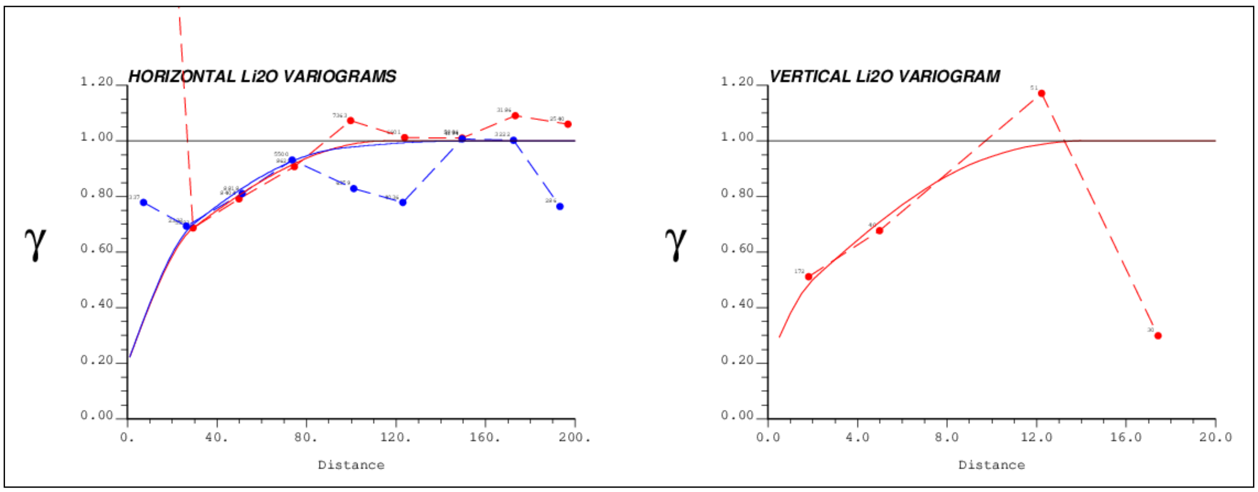
* UTM grid (NAD 83 datum)

14.8 Statistical Analysis and Variography

Spatial continuity was assessed using variograms and correlograms on data from one of the largest and more defined dikes, Dike 1400. Continuity directions were assessed based on the orientation of the pegmatite dike, composites, and their spatial distribution. Further, variogram calculation considered sensitivities on orientation angles prior to finalizing the correlation orientation. All variogram analysis and modelling was performed using Datamine Studio 3 and the Geostatistical Software Library (GSLib; Deutsch and Journal, 1998).

The modelled variogram for Dike 1400 is presented in Figure 14.4 and Table 14.2. The same variogram was applied to all other dikes but the orientation was adjusted to honour the individual dike's orientation and dip (Table 14.3).

Figure 14.4: Variogram for Dike 1400 that Forms the Basis for Variogram Fitting



Source: SRK, 2017

Table 14.2: Variogram Parameters for the Project

Element	Source	Structure	Contribution	Model	R1x (m)	R1y (m)	R1z (m)
Lithium Oxide (Li_2O)	Dike 1400	C_0	0.15	Nugget	-	-	-
		C_1	0.15	Spherical	30	30	10
		C_2	0.35	Spherical	95	115	14
		C_3	0.15	Spherical	150	115	14

Table 14.3: Variogram Angle Orientations for the Project

Dike	Angle[1] 1	Angle[1] 2	Angle[1] 3	Axis 1	Axis 2	Axis 3
400	115	-55	80	Z	X	Z
500	120	-55	80	Z	X	Z
550	122	-55	80	Z	X	Z
600	115	-55	80	Z	X	Z
610	125	-55	80	Z	X	Z
620	125	-58	80	Z	X	Z
700	122	-55	80	Z	X	Z
800	122	-55	80	Z	X	Z
810	122	-55	80	Z	X	Z
850	122	-55	80	Z	X	Z
900	122	-55	80	Z	X	Z
1010	150	-60	80	Z	X	Z
1100	120	-55	80	Z	X	Z
1200	120	-65	80	Z	X	Z
1400	100	-43	80	Z	X	Z
1500	160	-75	80	Z	X	Z
1600	145	-70	80	Z	X	Z
1700	120	-60	80	Z	X	Z

14.9 Grade Estimation Strategy

Table 14.4 summarizes the general estimation parameters used for the Li_2O estimation. In all cases, grade estimation used ordinary kriging and four passes informed by capped composites (Table 14.5). The first pass was the most restrictive in terms of search radii and number of boreholes required. Successive passes usually populate areas with less dense drilling, using relaxed parameters with generally larger search radii and less data requirements. The sensitivity of the Li_2O block estimates to changes in minimum and maximum number of data, use of octant search, and the number of informing boreholes was also assessed. Results from these studies show that globally the model is relatively insensitive to the selection of the estimation parameters and data restrictions mainly due to the relative uniformity of the Li_2O grade distribution.

For the first estimation pass, composites from at least two boreholes informing at least seven of the search ellipsoid octants were necessary to estimate a block. This pass also used restrictive octant search options, but only five octants were required. Because of their distinct geological identity, each pegmatite dike was estimated independently using a hard boundary.

Table 14.4: Summary of the Estimation Search Parameters for all Metals and Specific Gravity

Parameter	1st Pass	2nd Pass	3rd Pass	4th Pass
Interpolation method	OK	OK	OK	OK
Search range X (relative to variogram range)	1x	1x	1x	1x
Search range Y (relative to variogram range)	1x	1x	1x	1x
Search range Z (relative to variogram range)	1x	1x	1x	1x
Minimum number of composites	4	7	7	2
Maximum number of composites	8	10	14	16
Octant search	Yes	Yes	Yes	No
Minimum number of octants	7	5	3	-
Minimum number of composites per octant	1	1	1	-
Maximum number of composites per octant	12	12	12	-
Maximum number of composites per borehole	3	3	3	3

Table 14.5: Volume Estimated per Pass

Dike	Estimation Pass	Volume Estimation	% Estimated
All	1	7,593,407	42
	2	6,219,128	35
	3	3,505,113	20
	4	562,212	3

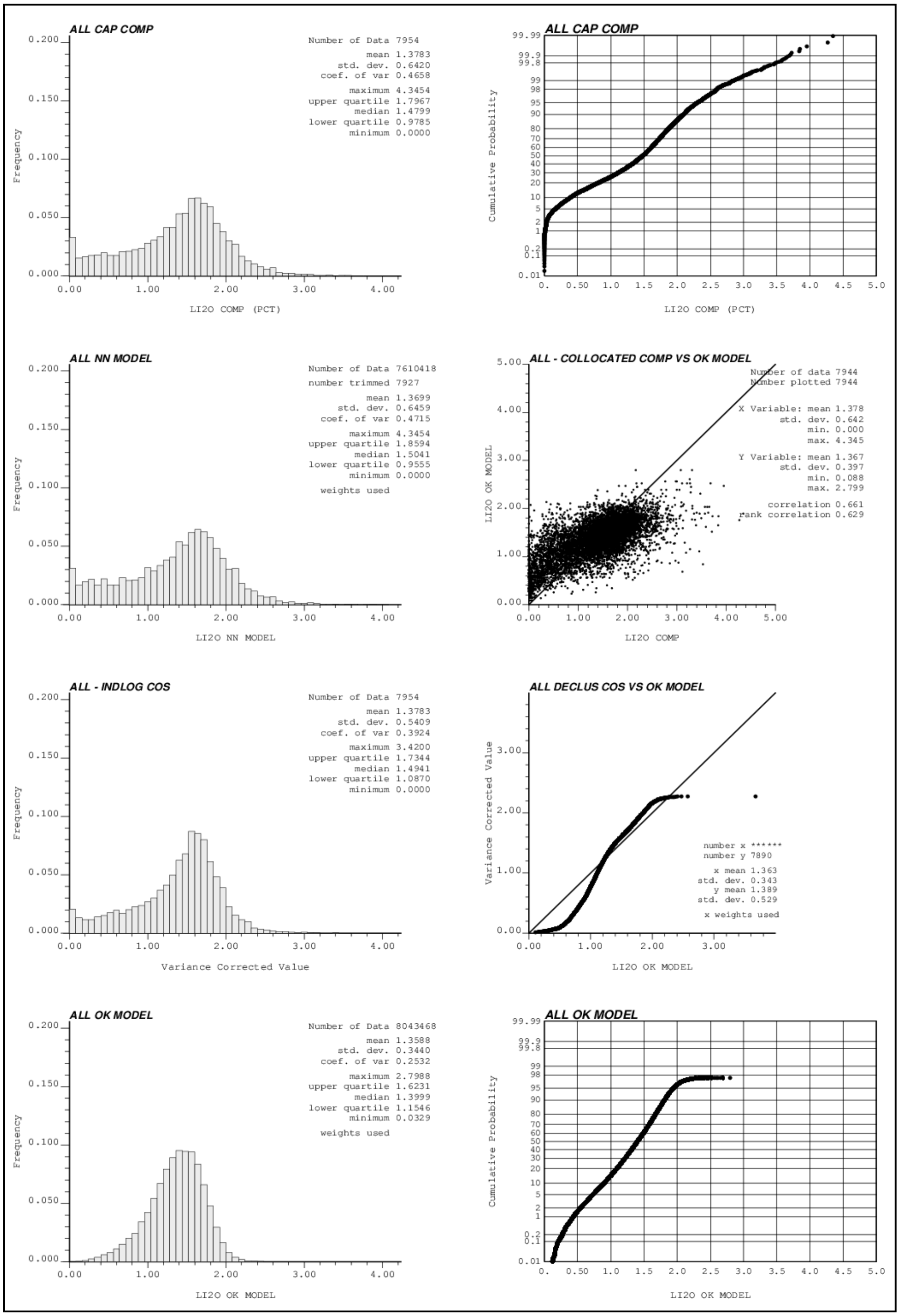
14.10 Block Model Validation in 2017.

The block model estimates were validated through:

- Comparison of the basic statistics of ordinary kriging estimates with nearest neighbour estimates and with the original capped composite source data (Figure 14.5).
- Comparison of kriged estimates against an inverse distance (power of two) estimates to assess potential impact of negative kriging weights.
- Visual comparison of block estimates to original borehole data on plans and sections.

Validation checks confirm that the block estimates are a reasonable representation of the informing data considering the current level of geological and geostatistical understanding of the deposit.

Figure 14.5: Validation of the Lithium Oxide (Li_2O) Block Estimates for the Project



Source: SRK, 2017

14.11 Block Model Validation by GMS

GMS validated the block model using the following methods:

- Global comparison of the declustered composite data with the block grades for each estimation domain
- Swath plots along strike of the deposit to assess local precision in the block model

In addition, GMS produced an independent block model in Leapfrog Edge™ for comparative purposes to validate the tonnages and grades within the block model produced by SRK. Using the existing pegmatite wireframes and similar estimation parameters (search ellipses, compositing, etc.), GMS was able to reproduce the grade and tonnages within less than 1%.

14.12 Mineral Resource Classification

Block model quantities and grade estimates for the Project were classified according to the CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014) and the CIM Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines (CIM, 2019).

Mineral resource classification is typically a subjective concept. Industry best practices suggest that resource classification should consider the confidence in the geological continuity of the mineralized structures, the quality and quantity of exploration data supporting the estimates, and the geostatistical confidence in the tonnage and grade estimates. Appropriate classification criteria should aim at integrating these concepts to delineate regular areas at similar resource classification.

The QPs are satisfied that the geological modelling honours the current geological information and knowledge. The location of the samples and the assay data are sufficiently reliable to support resource evaluation. The sampling information was acquired primarily by surface channel sampling and core drilling on sections spaced at 25 to 50 m. The 18 modelled intrusive pegmatite dikes were investigated by several boreholes, providing sampling to approximately 25 to 40 m spacing. Most pegmatite dike domains have been sampled by a sufficient number of boreholes to model the spatial variability of Li_2O. Accordingly, all block estimates within the conceptual pit shell have been classified as Indicated.

GMS reviewed the mineral resource classification, and found it to be acceptable. Given that all material within the pit optimization was classified as Indicated Category, GMS further investigated if there were blocks located further away from drilling to be potentially downgraded to Inferred Category. GMS found that only 3% of the blocks above a 0.62% Li_2O cut-off in the Indicated Category were located further than 50 m from drilling, which GMS considers as negligible.

14.13 Mineral Resource Statement

CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014) defines a mineral resource as:

> *"A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.*
>
> *The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling."*

The "reasonable prospects for eventual economic extraction" requirement generally implies that the quantity and grade estimates meet certain economic thresholds and that the mineral resources are reported at an appropriate cut-off grade that considers extraction scenarios and processing recoveries.

GMS considers that the Li_2O mineralization in the Project is amenable to open pit extraction. In collaboration with GLCI, the pit optimization assumptions listed in Table 14.6 were applied during the Whittle optimization process. The conceptual open pit shells were not restricted by any existing surface infrastructure. GMS considers that it is appropriate to report the James Bay mineral evaluation at a cut-off grade of 0.62% Li_2O. Insufficient material below the conceptual open pit shell is present to support an underground evaluation at this point in time.

Table 14.6: Assumptions Considered for Conceptual Open Pit Optimization

Parameters	Value	Unit
Spodumene concentrate (6.0% Li_2O) price	950	USD/t
Off-site costs (marketing, etc.)	2.5	% of price
Mining costs	5	USD/t mined
Processing costs	50	USD/t of feed
General and Administrative	12	USD/t of feed
Mining dilution	5	%
Mining loss	10	%
Overall pit slope	50	degrees
Process rate	2,000,000	tonne of feed/year
Li_2O process recovery	70	%
In situ cut-off grade	0.62	% Li_2O

Mineral resources are not mineral reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the mineral resources will be converted into mineral reserve. The authors are unaware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, and political or other relevant issues that may materially affect the mineral resources.

The Mineral Resource Statement for the Project is presented in Table 14.7.

Table 14.7: Mineral Resource Statement*, James Bay Lithium Project, Québec, effective November 23, 2017

Resource Category	Quantity (tonnes)	Grade Li_2O (%)
Indicated	40,330,000	1.40

Notes:

1. *Mineral Resources are reported at a cut-off grade of 0.62% Li_2O inside a conceptual pit shell optimized using spodumene concentrate price of USD 950 per tonne containing 6.0% Li_2O, metallurgical and process recovery of 70%, overall mining and processing costs of USD 55 per tonne milled and overall pit slope of 50 degrees.*
2. *All figures rounded to reflect the relative accuracy of the estimates.*
3. *Mineral resources are not mineral reserves and do not have demonstrated economic viability.*

4. *The effective date of the mineral resource is November 23, 2017.*
5. *The independent and qualified person for the MRE is Mr. James Purchase, P.Geo of G Mining Services Inc.*

14.14 <u>Grade Sensitivity Analysis</u>

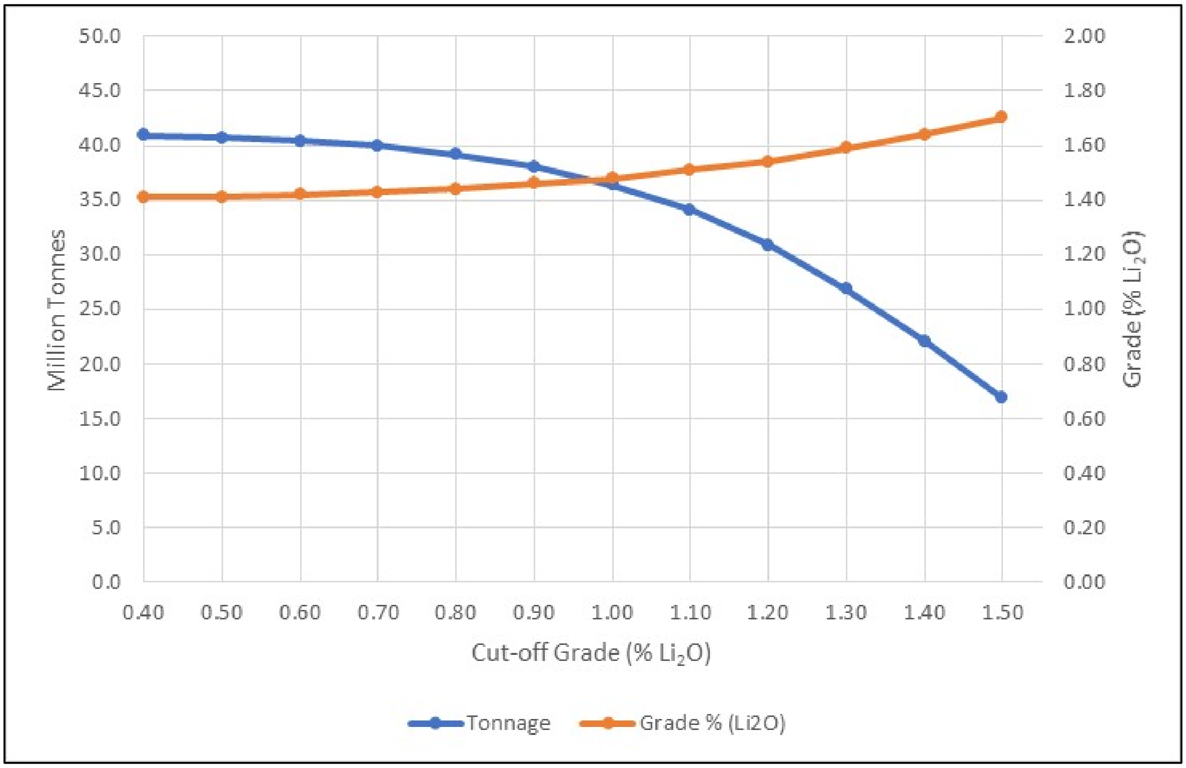
The mineral resources of the Project are relatively sensitive to the selection of the reporting Li_2O cut-off grade. To illustrate this sensitivity, the global model quantities and grade estimates are presented in Table 14.8 at different cut-off grades. The reader is cautioned that the figures presented in this table should not be misconstrued with a Mineral Resource Statement. The figures are only presented to show the sensitivity of the block model estimates to the selection of cut-off grade. Figure 14.6 presents this sensitivity as grade tonnage curves.

Table 14.8: Global Block Model Quantities and Grade Estimates* at Various Li_2O Cut-off Grades within the Conceptual Open Pit Shell

Cut-off Grade	Indicated Blocks		
	Volume / Quantity		Grade
Li_2O (%)	Volume (m^3)	Tonnage (t)	Li_2O (%)
0.40	15,148,000	40,900,000	1.41
0.50	15,078,000	40,711,000	1.41
0.60	14,966,000	40,407,000	1.42
0.70	14,793,000	39,942,000	1.43
0.80	14,496,000	39,138,000	1.44
0.90	14,094,000	38,055,000	1.46
1.00	13,486,000	36,412,000	1.48
1.10	12,636,000	34,117,000	1.51
1.20	11,448,000	30,909,000	1.54
1.30	9,943,000	26,845,000	1.59
1.40	8,179,000	22,083,000	1.64
1.50	6,261,000	16,906,000	1.70

** The reader is cautioned that the figures in this table should not be misconstrued with a Mineral Resource Statement. The figures are only presented to show the sensitivity of the block model estimates to the selection of a cut-off grade.*

Figure 14.6: Global Grade Tonnage Curves for the Project within the Conceptual Open Pit Shell



Source: GMS, 2021

14.15 Reconciliation to Previous Mineral Resource Estimate

A comparison between the 2010 and 2017 Mineral Resource Statements is provided in Table 14.9. Significant infill drilling and associated modelling and estimation confidence has allowed conversion of the Inferred material to be upgraded to Indicated, as well as the definition of new pegmatite dikes.

Table 14.9: Reconciliation Between the 2010 and 2017 Mineral Resource Statements

Category	Tonnage (000 tonnes)		Grade Li_2O (%)	
	2010	2017	2010	2017
Indicated	11,750	40,330	1.30	1.40
Inferred	10,470	-	1.20	-

14.16 QP Commentary and Recommendations

The mineral resource for the James Bay Lithium Project produced in 2017 was verified by GMS and was found to be fit-for-purpose as an input into the feasibility study. Since the effective date of the resource, no significant technical or scientific data has been collected to justify modifying the mineral resource, and the current block model remains valid. GMS has verified the grades and tonnages presented in this section using various methods, and is satisfied that the mineral resource adheres to the CIM Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines (CIM, 2019) and the JORC Code (2012) and is a good representation of the deposit.

GMS recommends that the extremities of the deposit be further delineated to the north and south, as a significant proportion of pegmatites remain open in these directions, supported by mineralised outcrops, that remain undrilled and fall within the existing pit optimization.

15 MINERAL RESERVE ESTIMATES

15.1 Summary

The Mineral Reserve for the James Bay Project is estimated at 37.2 Mt, at an average grade of 1.3% Li_2O as depicted in Table 15.7. It should be noted that the LOM Concentrate production of 6,056 tonnes stated in the current section includes 0.5% transport losses, whereas the 6,026 tonnes figure reported elsewhere in the Report already has the 0.5% transport losses deducted. The Mineral Reserve ("MR") was prepared by GMS as of October 8, 2021.

The mine design and MR have been completed to a level appropriate for feasibility studies. The MR stated herein is consistent with the CIM definitions and Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (**JORC**) requirements and is suitable for public reporting. As such, the Mineral Reserves are based on Measured and Indicated Mineral Resources, and do not include any Inferred Mineral Resources. The Inferred Mineral Resources contained within the mine design are classified as waste with a grade of zero.

15.2 Resource Block Model

GMS regularized the resource block model to 5 m x 3 m x 5 m. The density and the Li_2O grade were calculated using a weighted mass average while the domain and class were estimated using the value with the largest volume.

The diluted block model was created by applying a 0.75 m thick skin to the minable resource body of the regularized block model. This skin size is considered appropriate considering the equipment size and the nature of the deposit. To do this, GMS uses a series of scripts that calculate dilution on a block-by-block basis by considering the density and grade of the surrounding blocks of a minable resources block. The diluted block model uses the same block size as the resource block model so to consider the mining dilution, the script calculates a new density and a new grade where the total tonnage and metal of the block model are conserved. The diluted block model results give a mining dilution of 7.8% at 0.30% Li_2O for a dilution skin of 0.75 m.

15.3 Pit Optimization

Open pit optimization was conducted in GEOVIA Whittle™ to determine the optimal economic shape of the open pit to guide the pit design process. This task was undertaken using the Whittle software which is based on the Lerchs-Grossmann algorithm. The method works on a block model of the ore body, and progressively constructs lists of related blocks that should, or should not, be mined. The method uses the values of the blocks to define a pit outline that has the highest possible total economic value, subject to the required pit slopes defined as structure arcs in the software. This section describes all the parameters used to calculate block values in Whittle™.

For this Report, Measured and Indicated Mineral Resource blocks were considered for optimization purposes and for mineable resource calculations.

15.3.1 Pit Slope Geotechnical Assessment

Petram Mechanica was mandated in 2018 to produce a feasibility level geotechnical assessment study to support the mine designs. The conclusions of this study have been used as an input to the pit optimization and design process which can be found in Section 16.

The pit area is composed mostly of the Metasediment (M1) geotechnical domain that appears to have consistent structural properties; therefore, the pit was not divided in sectors as it was concluded to be of limited to no value. It was found that no large-scale geological structures intersect the open pit mine design. Based on the stability analyses and precedent practice, Petram Mechanica indicates that the recommended geometries are appropriate but strongly recommend the use of controlled blasting, proactive geotechnical monitoring and geomechanical analyses.

The slope configuration recommendations are presented in Table 15.1. Double benching will have to be done with pre-split and well controlled blasting practices are required. The pit slope profile is based on recommendations by Petram Mechanica as presented in Table 15.1. Petram Mechanica considered the overburden as a separate domain and suggest using a 2H:1V with 10 m-high/ wide benches.

Table 15.1: James Bay Project Final Wall Geotechnical Recommendations

Slope Parameters	
Final Bench Height (m)	20.0
Bench Face Angle (º)	75
Avg. Design Catch Bench Width (m)	9
Inter-ramp Angle (º)	54
Overall Slope Angle (º)	48
Geotechnical Benches (m)	20

Petram Mechanica recommends that a slope depressurization and dewatering program be implemented prior to mining and maintained through the life of the operation.

GMS recommends for future steps to re-evaluate the geotechnical parameters of the pit in consideration of the hydrogeological study performed by WSP in 2021. It was stated that about 1,000 m^3/d of water will be pumped out of the pit, which 18% to 29% would be from underground water infiltration. GMS recommends investigating the consequences on the pit design of the underground water infiltration.

15.3.2 Mining Dilution and Ore Loss

A mining dilution assessment was made by evaluating the number of contacts for blocks above an economic cut-off grade (“CoG”). The block contacts are then used to estimate a dilution skin around ore blocks to estimate an expected dilution during mining. The dilution skin consists of 0.75 m of material in a north-south direction (across strike) and 0.75 m in an east-west direction (along strike). The dilution is therefore specific to the geometry of the ore body and the number of contacts between ore and waste.

For each mineralized block in the resource model, diluted grades and a new density are calculated by taking into account the in-situ grades and in-situ density of the surrounding blocks.

Ore blocks that are surrounded by waste designated blocks are redefined as waste and categorized as ore loss. Waste blocks that are surrounded by ore blocks are tagged as ore and categorized in dilution.

15.3.3 Pit Optimization Parameters & Cut-Off Grade

A summary of the pit optimization parameters is presented in

Table 15.3 for a nominal milling rate of 2 Mtpy based on long-term metal price assumptions and an exchange rate of CAD/USD 1.33. A lithium concentrate grading 5.6% Li_2O will be produced and sold as Spodumene. A concentrate transportation and insurance cost of USD 86.16/t has been assumed.

The mining cost of mining blocks is fixed at CAD 4.85/t ore to which a mining sustainable Capex of CAD 0.5/t ore is added, for a total of CAD 5.35/t ore.

Unit reference mining costs are used for a “reference mining block” usually located near the pit crest or surface and are incremented with depth which corresponds to the additional cycle time and thus hauling cost. The reference mining cost is estimated at CAD 0.82/t with an incremental depth factor of 0.030/t per bench.

The overall slope angles utilized in Whittle are based on the Petram Mechanica inter-ramp angles recommended in the geotechnical assessment study with provisions for ramps and geotechnical berms. The overall slope angle in competent rock is 48 degrees based on a designed inter-ramp angle of 54 degrees.

The total ore-based cost is estimated at CAD 33.17/t (USD 24.94/t) which includes processing, general and administration costs, royalties, assumed Impact Benefit Agreements fixed payments, sustaining capital, and a closure cost provision as summarized in Table 15.2. The diluted cut-off grade calculated is 0.62%.

Table 15.2: Ore Based Cost Assumption

Ore Based Cost Assumptions	CAD/t
Plant	13.23
G&A Cost	13.86
Royalties	3.74
Closure & Reclamation	1.27
Sustaining Capital	1.07
Ore Based Cost	**33.17**

Table 15.3: James Bay Project Pit Optimization Parameters

Process Recoveries		2021 Feasibility Results
Processing Rate	kt/y	2,000
Mining Dilution	%	Included in BM
Mining Loss	%	Included in BM
Plant Head Grade	% Li_2O	1.30%
Process Recovery	%	70.1%
Concentrate Grade	% Li_2O	5.6%
Flotation Concentrate (Spodumene)	kt	325.42
Spodumene Sales	kt	-
Ratio of Li_2O Tonnage to Conc. Tonnage	t Li_2O/t conc.	12.52

Process Recoveries		2021 Feasibility Results
Commodity Prices		
Exchange Rate	CAD/USD	1.33
Spodumene	USD/t	950
Transport & Insurance	USD/t	86.16
Unit Costs		
Plant	CAD/t ore	13.23
G&A Cost	CAD/t ore	13.86
Royalties + IBA Fixed Payments	CAD/t ore	3.74
Closure & Reclamation	CAD/t ore	1.27
Sustaining Capital	CAD/t ore	1.07
Ore Based Cost	CAD/t ore	33.17
Cut-off Grade Calculated	%	0.23%
Raised Cut-off Grade	%	0.62%
Mining Cost	CAD/t ore	4.82
Overall Slope Angle	Deg	47.50

15.3.4 Open Pit Optimization Results

The Whittle nested shell results are presented in Table 15.4 using only the Measured and Indicated Mineral Resource. The nested shells are generated by using revenue factors to scale up and down from the base case selling price.

Table 15.4: Measured and Indicated Mineral Resource Whittle Shell Results for Combined Diluted Model @ USD 950/t conc.

Pit Shell	Best Case Disc. @ 8% (M CAD)	Specified Disc. @ 8% (M CAD)	Worst Case Disc. @ 8% (M CAD)	Total Tonnage (kt)	Ore Tonnage (kt)	Strip Ratio (W:O)	Waste Tonnage (kt)	Li_2O Grade %	Conc. (kt)	LOM (Y)
8	1,076	1,067	1,046	34,585	15,361	1.25	19,224	1.40	2,546	7.7
9	1,163	1,150	1,123	42,872	17,446	1.46	25,426	1.39	2,882	8.7
10	1,236	1,219	1,185	51,670	19,448	1.66	32,221	1.39	3,202	9.7
11	1,303	1,280	1,239	61,503	21,525	1.86	39,978	1.38	3,529	10.8
12	1,359	1,329	1,281	71,662	23,521	2.05	48,141	1.38	3,837	11.8
13	1,419	1,381	1,326	84,657	25,957	2.26	58,700	1.37	4,208	13.0
14	1,445	1,402	1,343	91,769	27,152	2.38	64,618	1.36	4,389	13.6
15	1,467	1,419	1,353	98,824	28,348	2.49	70,476	1.36	4,563	14.2
16	1,487	1,433	1,363	106,711	29,499	2.62	77,213	1.35	4,737	14.7
17	1,506	1,442	1,367	114,711	30,627	2.75	84,084	1.35	4,904	15.3
18	1,527	1,454	1,364	127,150	32,148	2.96	95,002	1.35	5,138	16.1
19	1,541	1,456	1,351	136,847	33,241	3.12	103,606	1.35	5,308	16.6
20	1,551	1,452	1,333	144,870	34,244	3.23	110,625	1.34	5,451	17.1
21	1,557	1,450	1,322	151,188	34,963	3.32	116,225	1.34	5,554	17.5
22	1,568	1,442	1,290	163,690	36,369	3.50	127,321	1.33	5,752	18.2

Pit Shell	Best Case Disc. @ 8% (M CAD)	Specified Disc. @ 8% (M CAD)	Worst Case Disc. @ 8% (M CAD)	Total Tonnage (kt)	Ore Tonnage (kt)	Strip Ratio (W:O)	Waste Tonnage (kt)	Li_2O Grade %	Conc. (kt)	LOM (Y)
23	1,572	1,439	1,275	168,599	36,868	3.57	131,731	1.33	5,824	18.4
24	1,575	1,437	1,261	174,258	37,387	3.66	136,871	1.33	5,902	18.7
25	1,576	1,435	1,256	176,308	37,576	3.69	138,733	1.33	5,929	18.8
26	1,581	1,427	1,211	188,336	38,670	3.87	149,666	1.33	6,085	19.3
27	1,582	1,424	1,199	191,235	38,937	3.91	152,298	1.33	6,122	19.5
28	1,583	1,422	1,190	193,640	39,162	3.94	154,478	1.32	6,152	19.6
29	1,583	1,421	1,185	195,654	39,344	3.97	156,310	1.32	6,176	19.7
30	1,583	1,419	1,179	197,089	39,440	4.00	157,649	1.32	6,191	19.7
31	1,583	1,419	1,178	197,421	39,466	4.00	157,955	1.32	6,194	19.7
32	1,583	1,418	1,176	197,844	39,504	4.01	158,340	1.32	6,199	19.8
33	1,584	1,417	1,173	198,869	39,580	4.02	159,289	1.32	6,209	19.8
34	1,584	1,417	1,173	199,304	39,618	4.03	159,686	1.32	6,213	19.8
35	1,584	1,416	1,169	200,112	39,679	4.04	160,433	1.32	6,221	19.8
36	1,584	1,416	1,168	200,493	39,701	4.05	160,792	1.32	6,225	19.9
37	1,584	1,415	1,166	200,892	39,727	4.06	161,165	1.32	6,228	19.9
38	1,584	1,415	1,166	201,055	39,741	4.06	161,314	1.32	6,230	19.9

Pit Shell	Best Case Disc. @ 8% (M CAD)	Specified Disc. @ 8% (M CAD)	Worst Case Disc. @ 8% (M CAD)	Total Tonnage (kt)	Ore Tonnage (kt)	Strip Ratio (W:O)	Waste Tonnage (kt)	Li_2O Grade %	Conc. (kt)	LOM (Y)
39	1,584	1,414	1,164	201,291	39,752	4.06	161,539	1.32	6,232	19.9
40	1,583	1,413	1,161	201,912	39,792	4.07	162,119	1.32	6,237	19.9
41	1,583	1,413	1,161	201,948	39,795	4.07	162,153	1.32	6,237	19.9
42	1,583	1,413	1,161	202,036	39,801	4.08	162,235	1.32	6,237	19.9
43	1,583	1,413	1,161	202,080	39,804	4.08	162,276	1.32	6,238	19.9
44	1,583	1,413	1,160	202,183	39,812	4.08	162,371	1.32	6,239	19.9
45	1,583	1,413	1,160	202,367	39,822	4.08	162,545	1.32	6,240	19.9
46	1,583	1,413	1,159	202,521	39,830	4.08	162,691	1.32	6,241	19.9
47	1,583	1,413	1,159	202,546	39,832	4.08	162,714	1.32	6,241	19.9
48	1,583	1,412	1,159	202,598	39,836	4.09	162,762	1.32	6,242	19.9
49	1,583	1,412	1,159	202,659	39,839	4.09	162,819	1.32	6,242	19.9
50	1,583	1,412	1,159	202,678	39,840	4.09	162,838	1.32	6,242	19.9

Table 15.4 showcases all the different scenarios tested by Whittle and the shell selection is presented in Table 15.5.

Pit shell 23 is selected as the desired final pit shell, corresponding to an 18.4-year LOM pit shell (Revenue Factor of 0.74).

This shell has a total tonnage of 168.4 Mt including 36.9 Mt of ore. This pit shell has a lower theorical operating cash flow than the pit shell 19, which itself has the maximum operating cash flow, but adds four years to the LOM. GMS is confident that pit shell 23 is appropriate to maximize the overall project value and assures an adequate LOM.

Figure 15.1: Pit by Pit Graph M&I Resource

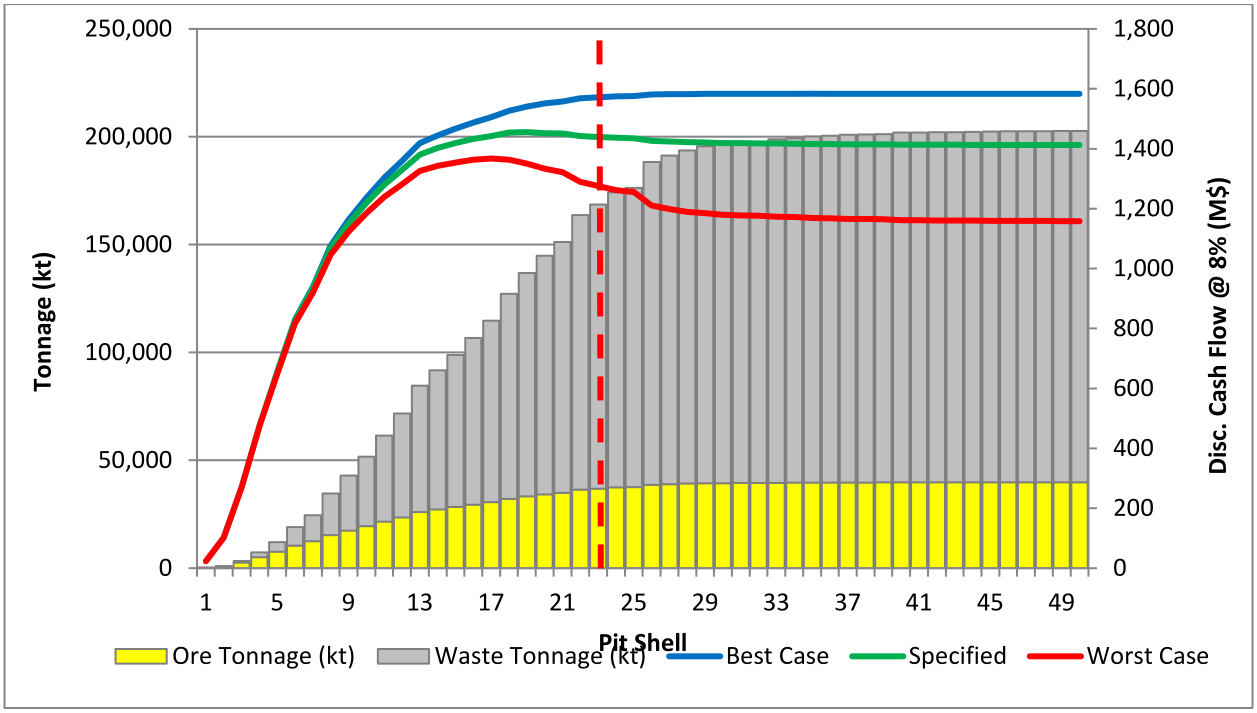


Table 15.5: Measured and Indicated Mineral Resource Pit Shell Selection @ USD 950/t conc.

Shell Selection	Selection
Shell Number	23
Shell RF	0.74
Shell Price	703
Total Tonnage (kt)	168,599
Waste Tonnage (kt)	131,731
Strip Ratio (W:O)	3.57
Ore Tonnage (kt)	36,868
Li_2O Grade (%)	1.33
Conc. Tonnage (kt)	5,824
Discounted Cash Flow @ 8% (M$)	1,275
LOM (Y)	18.4

15.4 Mineral Reserve Statement

The Mineral Reserve and stripping estimates are based on the final pit design presented in the previous section. The Proven and Probable Mineral Reserves are inclusive of mining dilution and ore loss. The total ore tonnage before dilution and ore loss is estimated at 36.1 Mt at an average grade of 1.33 % Li_2O. Isolated ore blocks are treated as an ore loss and represent 5 kt, less then 0.1% of total ore tonnage. The dilution envelope around the remaining ore blocks results in a dilution tonnage of 1.1 Mt. The dilution tonnage represents 3.0% of the ore tonnage before dilution and the dilution grade is estimated from the block model and corresponds to the average grade of the dilution skin. Table 15.6 presents a Resource to Reserve reconciliation.

Table 15.6: Resource to Reserve Reconciliation

Mineral Reserves by Category	Tonnage (kt)	% Li_2O
Ore before ore loss and dilution	36,118	1.33
Less: Ore loss (isolated blocks)	5.0	0.73
Ore before mining dilution	36,113	1.33
Add: Mining dilution	1,094	0.38
Proven & Probable Mineral Reserve	37,207	1.30

The Mineral Reserve for the James Bay Project is estimated at 37.207 Mt an average grade of 1.3% Li_2O as depicted in Table 15.7 all material is classified as Probable. The MR was prepared by GMS.

Table 15.7: James Bay Project Open Pit Mineral Reserve (October 8, 2021)

	Crude Ore Tonnage	Crude Lithium Grade
	k dmt	% Li_2O
Proven	0	0
12.5 Probable	37,207	1.30
Proven + Probable	37,207	1.30

Notes:

1. *CIM Definitions Standards on Mineral Resource and Reserves (2014) were followed.*
2. *Effective date of the estimate is October 8, 2021.*
3. *Mineral Reserves are estimated using the following long-term metal prices (Li_2O Conc = USD 950/t Li_2O at 6.0% Li_2O) and an exchange rate of CAD/USD 1.33.*
4. *A minimum mining width of 5 m was used.*
5. *Cut-off grade of 0.62% Li_2O.*
6. *Bulk density of ore is variable, outlined in the geological block model and average 2.7 g/t*
7. *The average strip ratio is 3.54:1.*
8. *The average mining dilution factor is 3.0% at 0.38% Li_2O.*
9. *Numbers may not add due to rounding.*

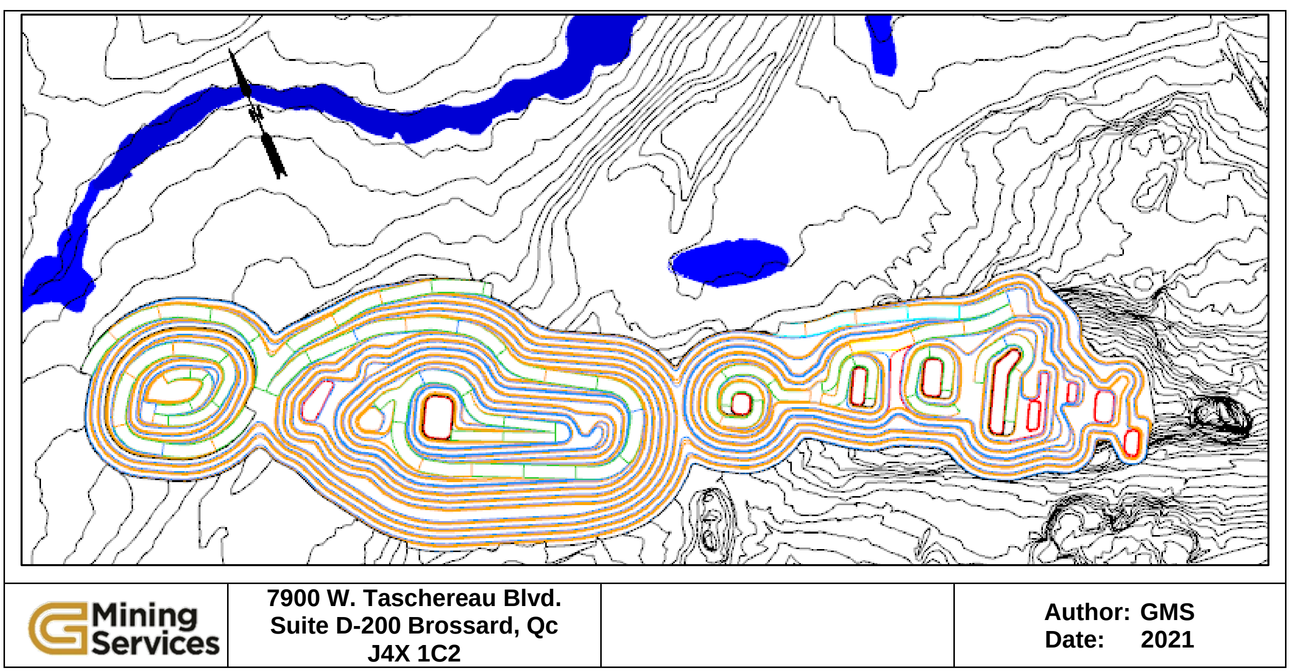
16 MINING METHODS

16.1 Introduction

The James Bay Project is planned as a conventional open pit mine, employing haul trucks coupled to loading units that consist of an electric-hydraulic shovel and a diesel-powered hydraulic excavator. The loading fleet will be supported by a production wheel loader. Trucks will haul the ore to a Run-of-Mine (ROM) pad where it will be rehandled and processed through the concentrator. Over the 18.75-year mine life, the Project will produce 37.2 Mt of ore and 131.7 Mt of waste at an overall stripping ratio of 1:3.54 (ore to waste).

Mining of the James Bay Project is planned in four (4) phases and three (3) separate pits. The summary of each of the mining phases and pits is listed in Figure 14.1 and illustrated in Figure 16.2.The objective of pit phasing is to improve the economics of the Project by feeding the mill with higher grade ore during the earlier years and/or delaying waste stripping until later years. Internal phases are designed to have a lower stripping ratio than the subsequent phases. The project is split into the three (3) separate pits: JB1, JB2 and JB3. JB1 contains two (2) phases while JB2 contains three (3) phases and JB3 contains four (4) phases. The pit designs are based on the optimized whittle shells described in Section 15 and created with the parameters outlined in Subsection 15.3.3.

Figure 16.1: James Bay Project in Final Phase



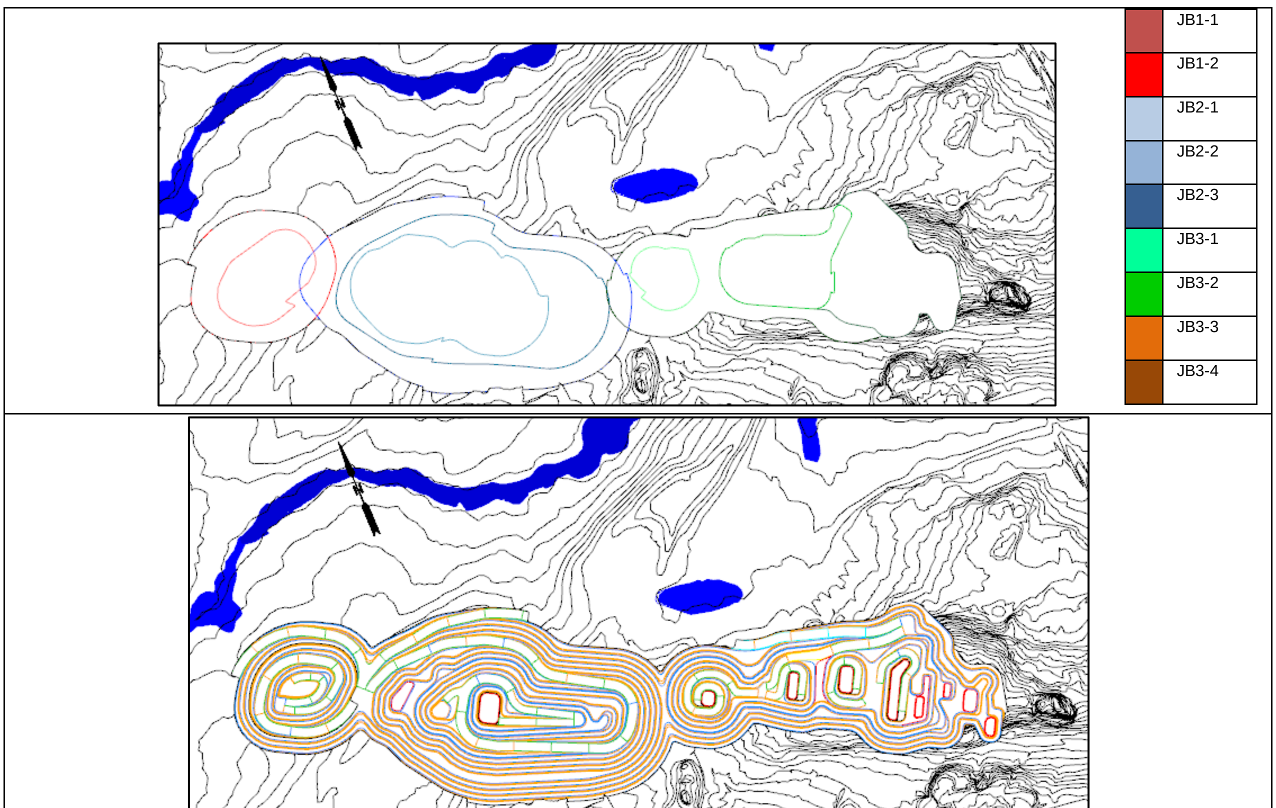
16.2 Mine Design

16.2.1 Pit Phasing

Phased pits are designed to accommodate three areas: JB1, JB2 and JB3. Pushback distances are accounted for to ensure adequate room for mine equipment to move. Distances of 60 m are applied to interim phased pits and 70 m for the final push back to the ultimate pit wall. Some 10-m box cuts are applied at the bottom of each of the phases to reduce stripping. Most phases contain both single and dual lane ramps whose widths are 19 m and 25 m respectively to accommodate for 100 T trucks. Single lane ramps are employed for the bottom 40 m of a phase to reduce stripping.

The phased pits enable individual access within three areas for optimal surface hauling along with schedule flexibility for balancing waste stripping and grade selectivity. Figure 16.2 illustrates the limits of each of the phases and pits and the end of the life of mine (LOM) design. Table 16.1 shows the summary inventories of each of the pits and the subsequent phases.

Figure 16.2: Pit and Phase Limits



Source: GMS, 2021

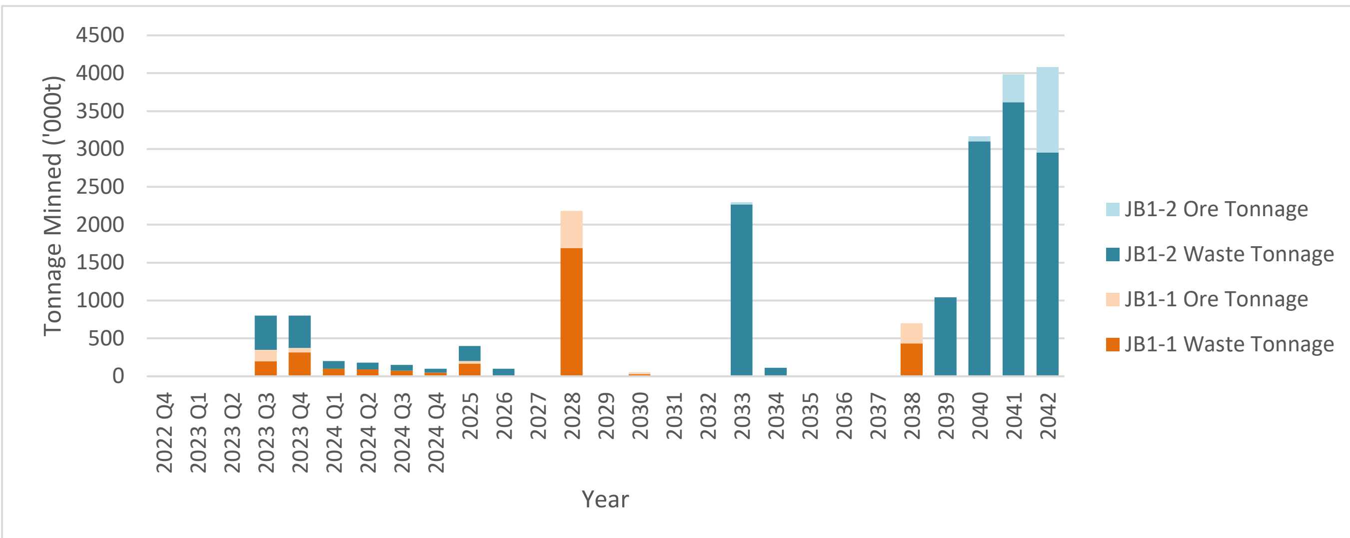
Table 16.1: Pit and Phase Inventories

	Units	Total	JB1			JB2				JB3				
			Phase 1	Phase 2	Total	Phase 1	Phase 2	Phase 3	Total	Phase 1	Phase 2	Phase 3	Phase 4	Total
Total	000 t	168,896	4,184	16,173	20,356	19,636	33,189	48,546	101,371	1,729	5,809	12,984	26,647	47,169
Waste Tonnage	000 t	131,689	3,143	14,575	17,718	12,837	25,830	40,291	78,958	1,169	3,517	8,497	21,829	35,013
Strip Ratio (W:O)	W:O	3.54	3.02	9.12	6.72	1.89	3.51	4.88	3.85	2.09	1.53	1.89	4.53	3.35
Ore Tonnage	000 t	37,207	1,041	1,597	2,638	6,799	7,359	8,255	22,413	560	2,292	4,487	4,818	12,156
Li_2O Grade	$\%Li_2O$	1.30	1.28	1.29	1.29	1.43	1.36	1.35	1.37	1.27	0.41	1.18	1.10	1.03

16.2.1.1 JB1

JB1 is the smallest pit to be mined in the Project. Located to the west of JB2 pit, JB1 pit contains simple concentric circular pits with clockwise ramping. JB1 pit connects with JB2 pit in its second phase of its two phases. Figure 16.3 shows the production of ore and waste from JB1 through the mine life. Where JB1-1 is mined in the early years of the mine, JB1-2 is mined towards the end of the mine life. In current forecast, Year 1 corresponds to year 2024; first year of commercial production.

Figure 16.3: JB1 Ore and Waste Distribution over the Life of Mine by Year



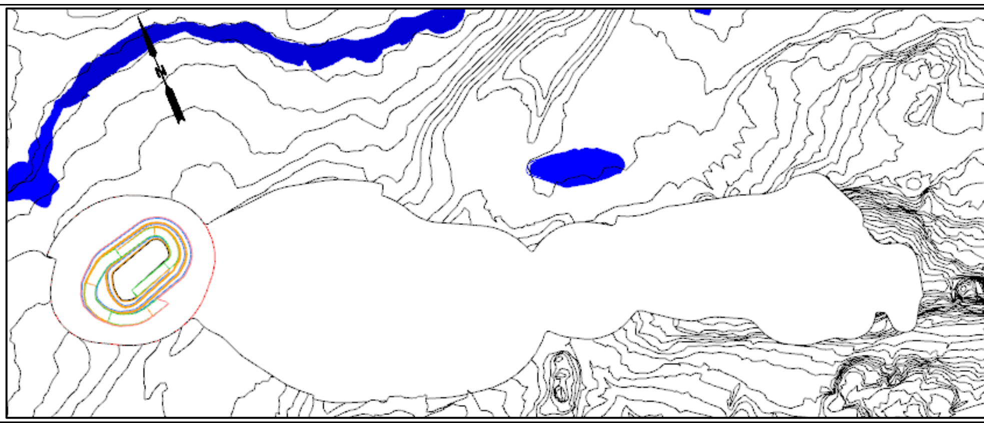
Mining Services

Source: GMS, 2021

Phase 1 of JB1 (JB1-1) is designed to provide the exact amount of waste material required to match pre-production construction requirements and to contain the least amount of minable resources as possible. Any minable resources mined at this phase will have to be stockpiled temporarily and rehandled when the processing plant is ready.

Figure 16.4 shows JB1-1 has an oblong shape as it follows the minable resource body. JB1-1 is 50 m deep, 175 m wide and 290 m long.

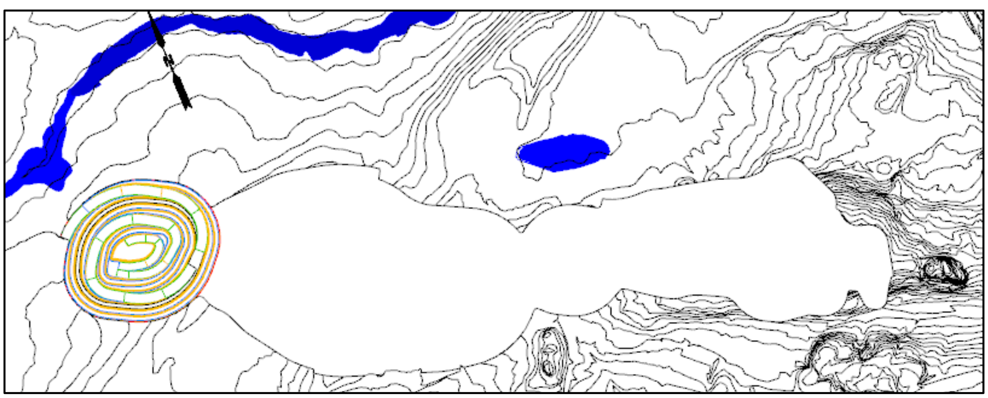
Figure 16.4: JB1-1 Layout



Source: GMS, 2021

Figure 16.5 shows JB1-2 extension beyond JB1-1 on all sides, driving deeper. A flat ramp section is incorporated where the JB2-3 and JB1-2 ramps meet to allow the three ramp segments to easily access alternative routes. The JB1-2 ramp exits to the North-West close to the JB1 dump. JB1-2 is 160 m deep, 400 m wide and 400 m long.

Figure 16.5: JB1-2 Pit Layout

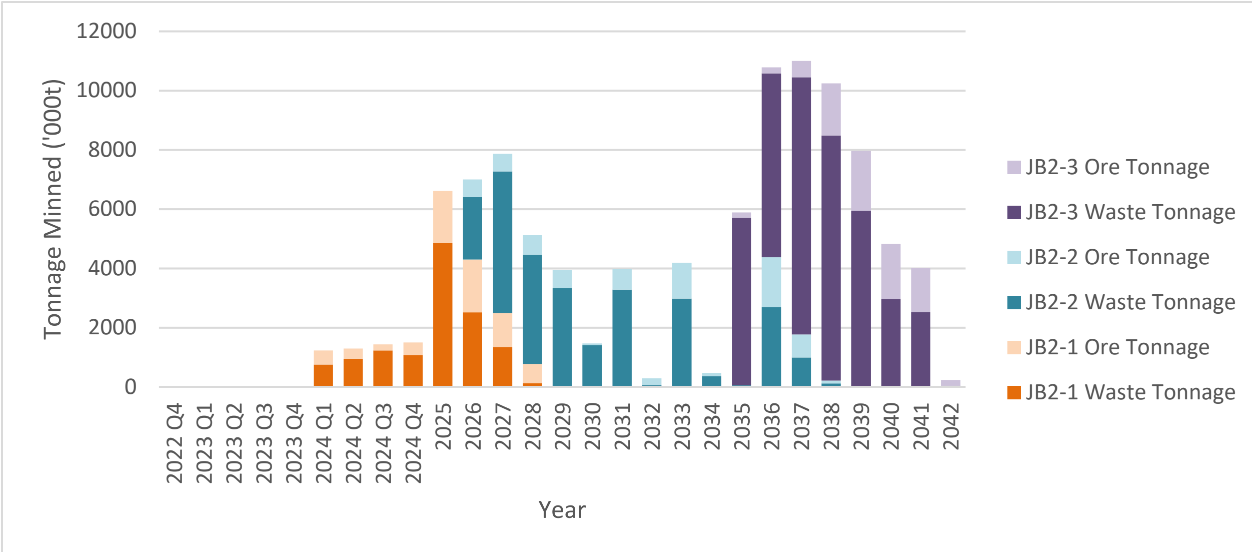


Source: GMS, 2021

16.2.1.2 JB2

JB2 pit is the largest and most significant pit in the Project. JB2 pit connects the JB1 and JB3 pits into a final pit and covers the entire deposit. JB2 pit consists of three nested phases, JB2-1 through JB2-3, which represent the bulk of mining over the mine life. Figure 16.6 shows the distribution of ore and waste over the life of mine for all JB2 phases.

Figure 16.6: JB2 Ore and Waste Distribution over the Life of Mine by Year



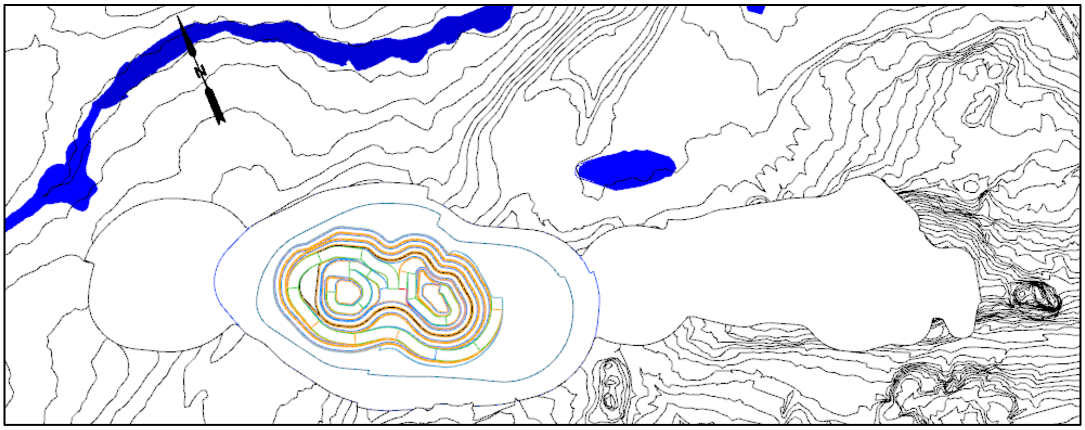
Mining Services

Source: GMS, 2021

JB2-1 is the smallest pit in the entire Project and is planned to be mined predominantly in the first five years of the production. Phases will be mined simultaneously to achieve production targets and Figure 16.7 showcases both double and single lane ramps, box cuts and the access ramp exit towards the processing plant to be as efficient as possible in terms of production and hauling capacities.

JB2-1 is 130 m deep, 240 m wide and 525 m long.

Figure 16.7: JB2-1 Pit Layout

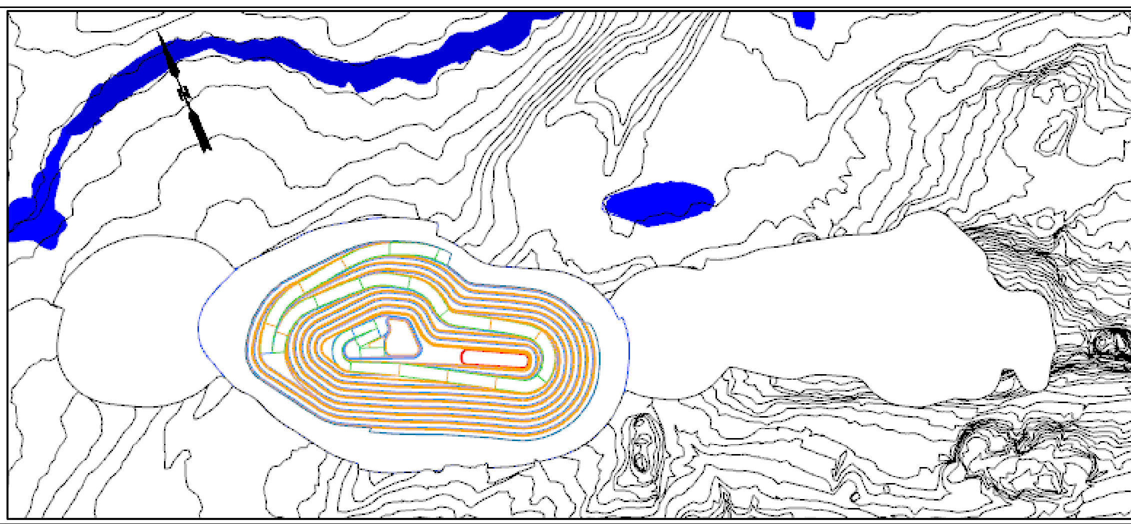


Source : GMS, 2021

The second phase of the JB2 pit, is mined over 12 years, finishing in 2038. Ramping exits towards the processing plant and waste dumps to reduce hauling requirements. Figure 16.8 shows at the bottom of the pit, a single lane ramp accesses a minable resource-rich area with a box cut.

JB2-2 is 190 m deep, 360 m wide and 720 m long.

Figure 16.8: JB2-2 Pit Layout

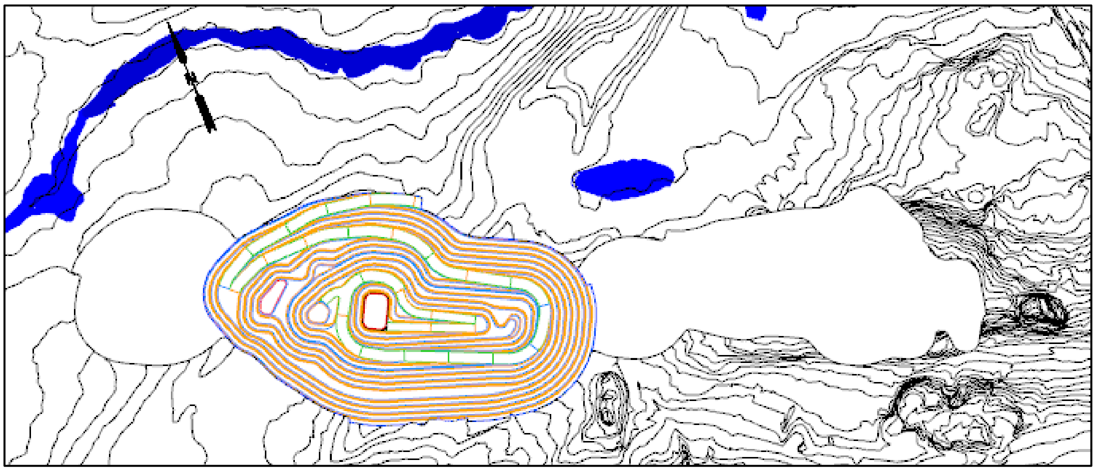


Source : GMS, 2021

The last phase of JB2 pit is JB2-3. The phase is mined over seven years, finishing in 2042 and is the deepest pit, as shown in Figure 16.9

JB2-3 is 260 m deep, 500 m wide and 875 m long.

Figure 16.9: JB2-3 Pit Layout



Mining Services

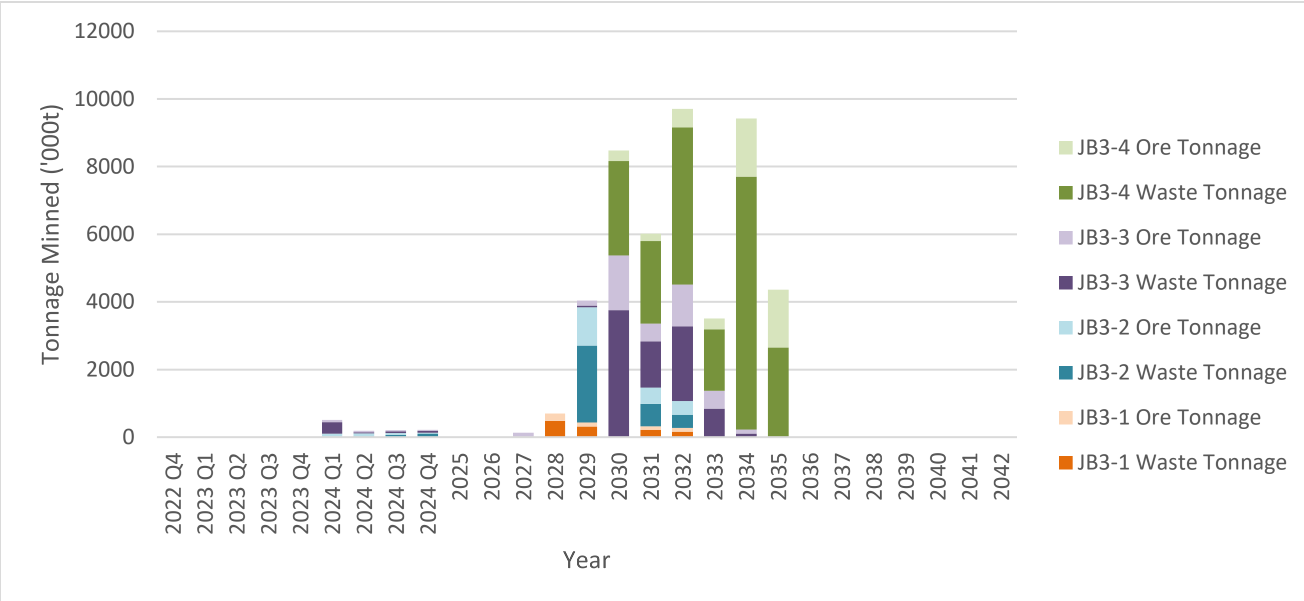
Source : GMS, 2021

16.2.1.3 JB3

JB3 is located to the east of JB2 and the pit shape is long and narrow, following the ore. The minable resource body is narrow, consisting of many small fingers dipping deeply. Smaller sub pits are placed at the bottom to capture as much of the minable resources as feasible.

Single lane ramps connect these shallow sub pits at the bottom before combining into the main JB3 ramp along the northern side. This north ramp will be lengthened at the switch back on the west wall when it is joined with the final JB2 pit. Figure 16.10 presents the ore and waste distribution over the life of mine. Producing a small quantity of ore and waste (341 kt of waste and 463 kt of ore) in the earlier years, JB3's production starts in earnest in 2028 with JB3-1.

Figure 16.10: JB3 Ore and Waste Distribution Over the Life of Mine by Year



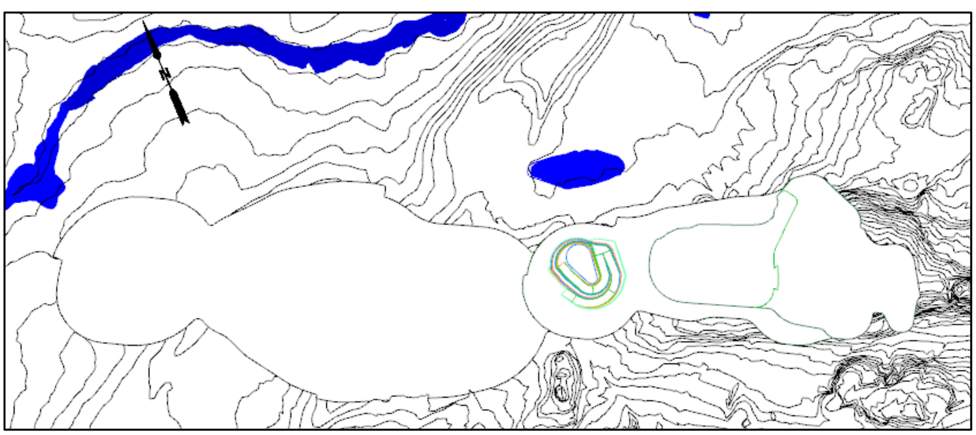
Mining Services

Source : GMS, 2021

JB3-1 is the smallest of the JB3 pit's phases, and it is mined over four years starting in 2028.

JB3-1 is 50 m deep, 140 m wide and 150 m long.

Figure 16.11: JB3-1 Pit Layout



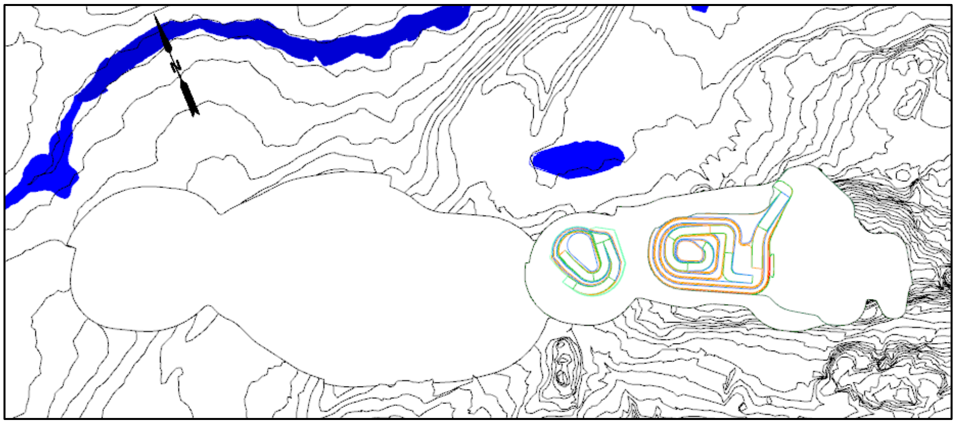
Mining Services

Source : GMS, 2021

JB3-2 is located in the middle of JB3 and shares a wall with JB3-3.

JB3-2 is 80 m deep, 190 m wide and 300 m long.

Figure 16.12: JB3-2 Pit Layout

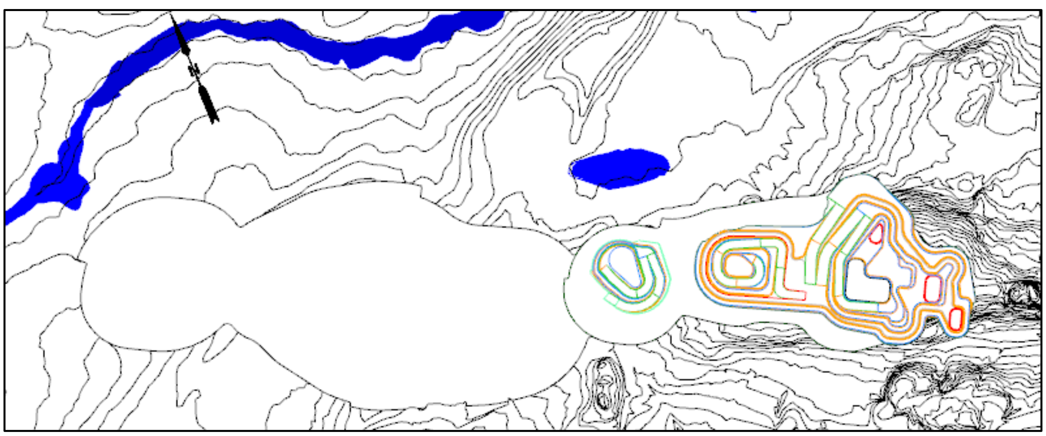


Source : GMS, 2021

JB3-3 is located in the most eastern part of the JB3 pit. It shares a wall with JB3-2.

JB3-3 is 100 m deep, 300 m wide and 650 m long.

Figure 16.13: JB3-3 Pit Layout

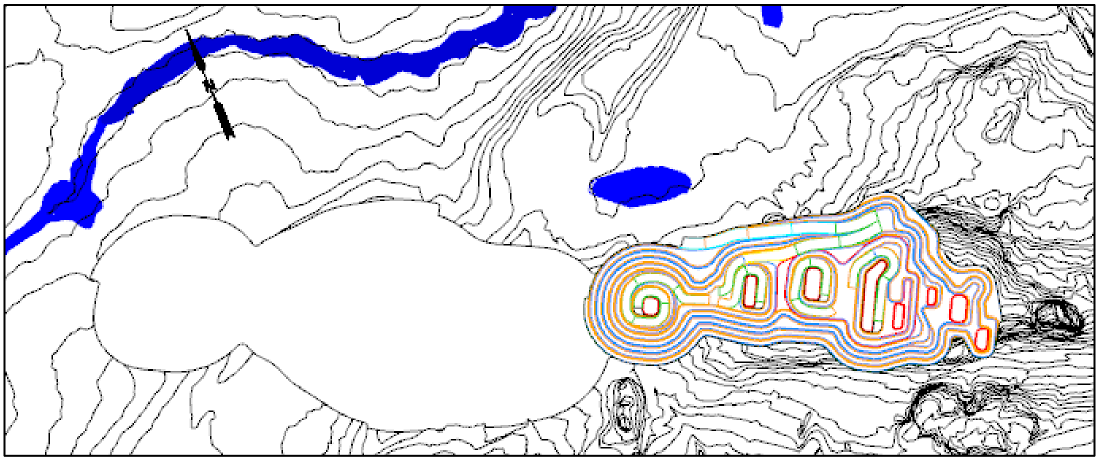


Source : GMS, 2021

JB3-4 is the pushback of all the previous phases. It is the longest pit and encompasses all phases of JB3.

JB3-4 is 170 m deep, 400 m wide and 920 m long.

Figure 16.14: JB3-4 Pit Layout



Mining Services

Source : GMS, 2021

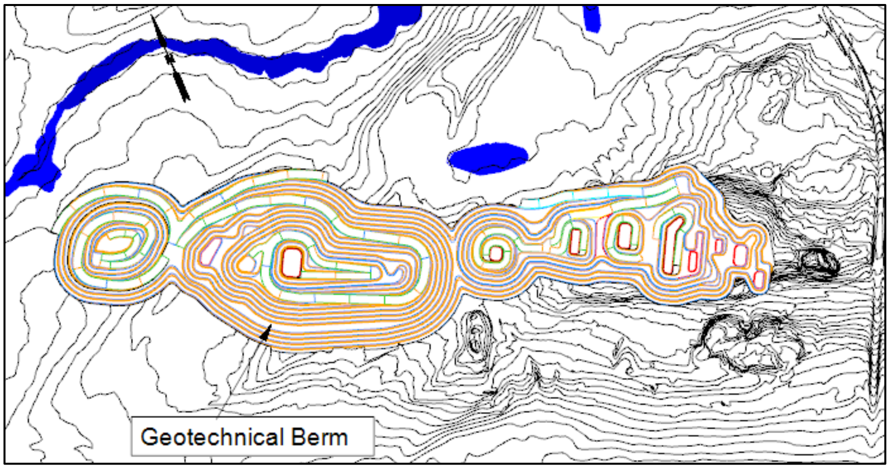
16.2.2 Geotechnical Parameters

Slope angle definition and geotechnical investigation has been led by Petram Mechanica and are listed below:

- Nominal face height of 20 m (double benched 10-meter-high benches)
- Bench face angle of 75° for in-situ rock material
- Berm widths of 9 m
- Inter-ramp angle of 54°
- Overall slope angle of 48°

Geotechnical berms 20 m in width were designed in the central portions of JB2 where the pit wall has a vertical stack height of over 120 m. This feature mitigates the risks of overbank hazards on the pit wall and catches debris from previous pit phases. Figure 16.15 highlights the areas where these geotechnical berms were incorporated into the ultimate pit wall.

Figure 16.15: Geotechnical Berms



Source : GMS, 2021

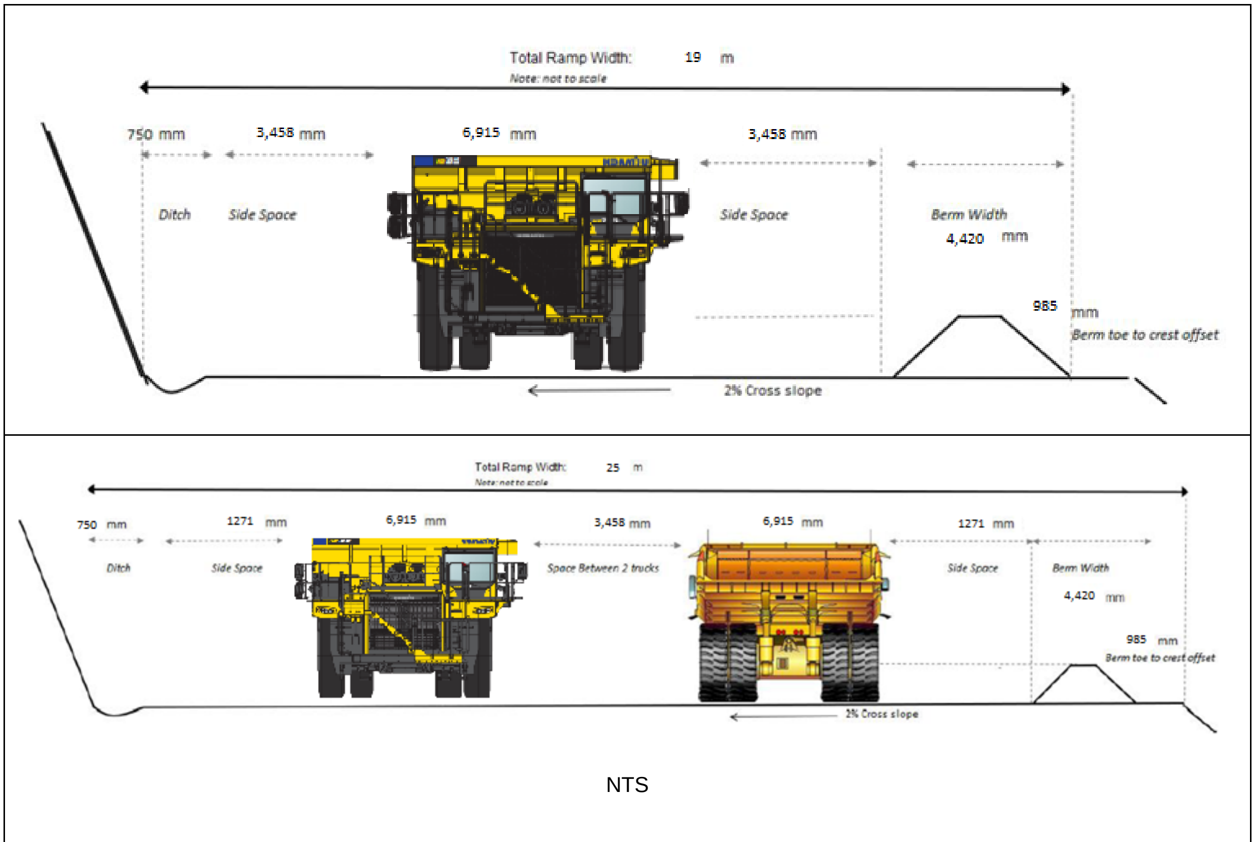
16.2.3 Ramp and Road Design

Ramp designs are shown in Figure 16.16 for the single lane and double lane ramps, respectively. Single lane ramps are introduced in the last 40 m of each phase to reduce stripping. The ramps are designed specifically for the primary hauler, the Komatsu HD785. In accordance with SME Standard of 3.5 x and 2.0 x ramp width of the vehicle operating width, the operating width of the Komatsu HD785 is 6.9 m. Ramp gradients are established at 10%.

The ramp includes adequate distance for the vehicles to operate and includes a safety berm on the pit side and a drainage ditch on the wall side. These shoulder barriers are required wherever a drop-off greater than 3 m exists and will be designed at 1.1H:1V.The safety berm is designed to be at least half the height of the tallest tire to be used on site, in this case the tires of the Komatsu HD785.

To facilitate drainage of the roadway a 2% cross slope on the ramp is planned.

Figure 16.16: Single and Double Lane Ramp



Mining Services

Source : GMS, 2021

A shoulder barrier or safety berm on the outside edge will be constructed of crushed rock to a height equal to the rolling radius of the largest tire using the ramp. The rolling radius of the truck tire is 1.35 m. A ditch planned on the highwall will capture run-off from the pit wall surface and assure proper drainage of the running surface. The ditch will be 1.0 m wide.

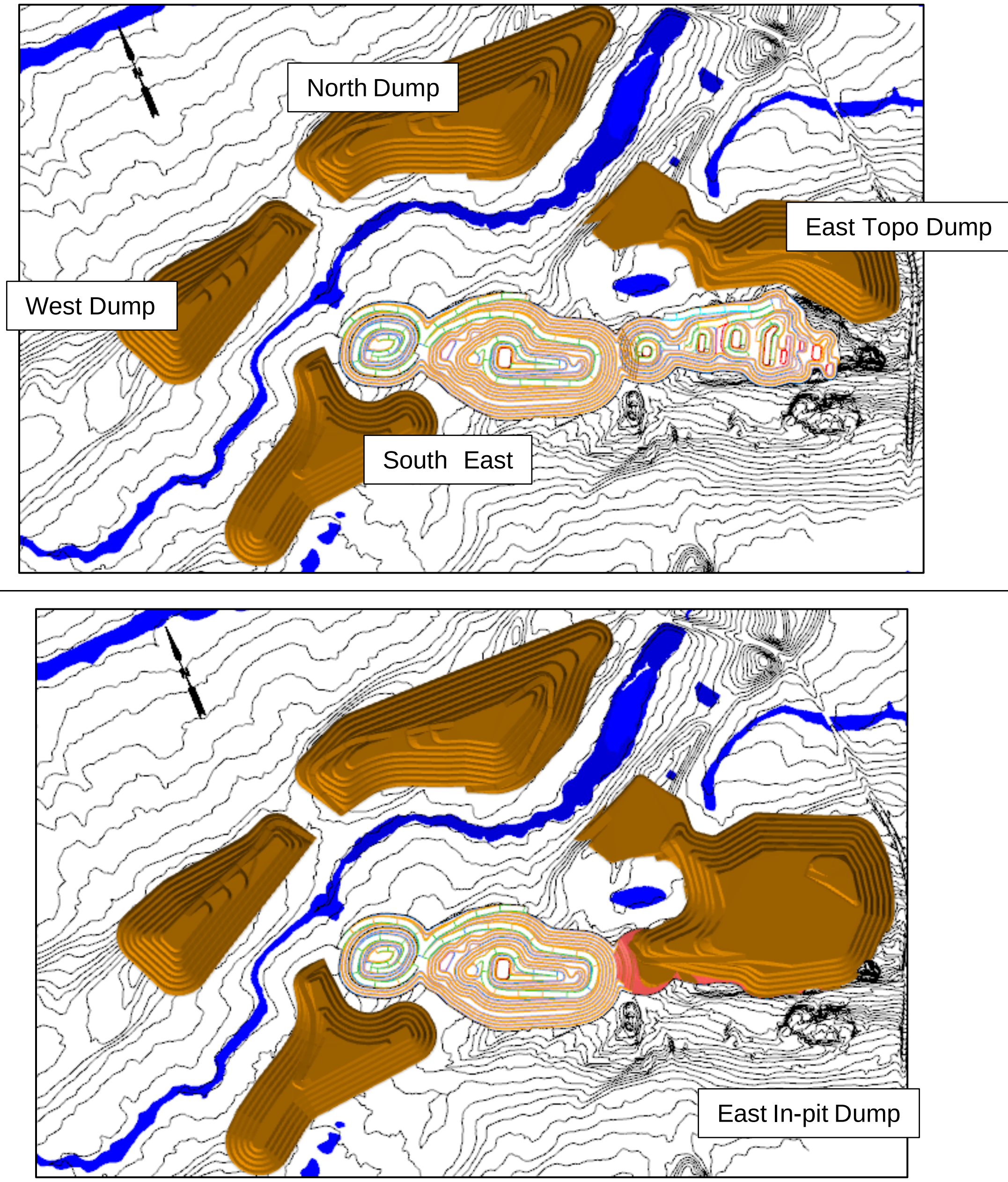
The double lane ramp has a width of 25 m, and the single lane ramp of 19 m.

16.2.4 Overburden and Waste Rock Storage

Over the 18.75-year life of mine, 5.56 Mt of overburden is stored in the OPSF and 126.13 Mt of waste rock will be stored in the WRTSF. Both overburden and waste rock will be mined in stages, depending on the pit phases and their internal phases. This phasing is to optimize overburden removal, and avoid increasing strip ratio in the earlier years. The total waste rock needed for the pre-production is about 1.4 Mt and will be taken from JB1-1.

The dumps are designed to meet the expected waste requirements for the Project. Figure 16.17 lists the capacity of each of the dumps, including in-pit dumping in the JB3 pit. Dumps are designed to minimize haulage distances from the pits while also respecting distances from active roads and rivers.

Figure 16.17: Dump Layouts



Source : GMS, 2021

Table 16.2: Dump Inventories

Waste Dump	Capacity (M m³)	Capacity (Mt)	Height (m)	Footprint ('000 m²)	% Filled
West Dump	9.3	20.13	60	289.87	100
North Dump	22.0	47.48	70	543.61	100
Southwest Dump	9.8	21.07	50	338.21	97
East Dump	22.7	49.06	60	730.35	101
East In-pit Dump	16.9	36.47	170	255.93	80
Total	80.7	174.2			

All waste dumps are designed with the following parameters:

- 37-degree batter angles
- 12-m berms, and
- 10-m benches

16.3 Production Scheduling

16.3.1 Mining Scheduling

Mine scheduling and optimization have been performed with MineMax software. The software optimizes the NPV of projects under several constraints. Yearly production, LOM, and waste tonnage are some of the constraints applied to the model. The mine production schedule is completed on a quarterly basis during the pre-production period (Q4 2022 - Q4 2023) and first year (Q1 2024 - Q4 2024) of commercial production and on an annual basis thereafter. The mine preproduction is initiated in Q4 2022 and transitions to commercial operation in first quarter of 2024. The mine pre-production period lasts a total of 12 months, which is planned to allow for a gradual commissioning of mining equipment, hiring and training, and timely delivery of waste rock for civil work.

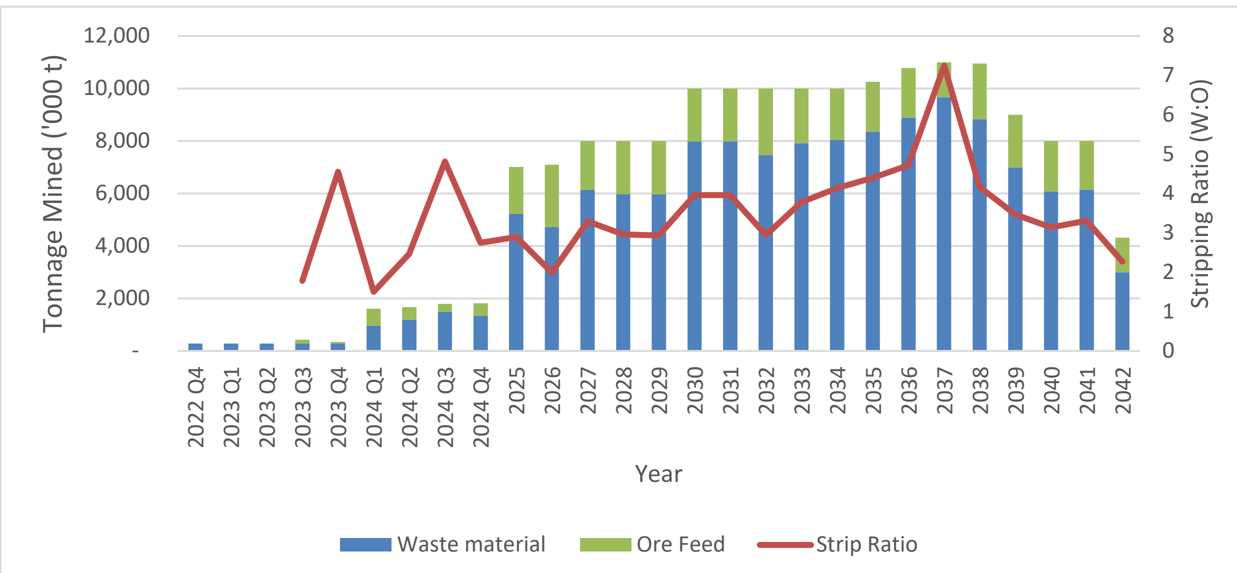
The objectives of the LOM plan are to maximize discounted operating cash flow of the Project subject to the following constraints:

- Limit pre-production to requirements for civil works and feed of the plant once started.

- Supply best-grade ore to plant and feed to a nominal capacity of 2 Mtpa.
- Limit the vertical drop-down rate to six benches per phase per year.
- Maximize the LOM.
- The peak mining rate of approximately 11 Mt is reached in 2037. A rapid mining rate decline follows until the end of the mine life in 2042.

Figure 16.18 depicts the mine production schedule by material type and stripping ratio. A more detailed table of the mining physicals can be found in Table 16.3. In the year of 2037, a peak in stripping ratio can be explained by the fact that JB2-3 requires stripping waste prior to reaching the orebody. Being the largest pit of the three pits, the additional waste mined significantly increases the stripping ratio for that year.

Figure 16.18: Mine Production Schedule

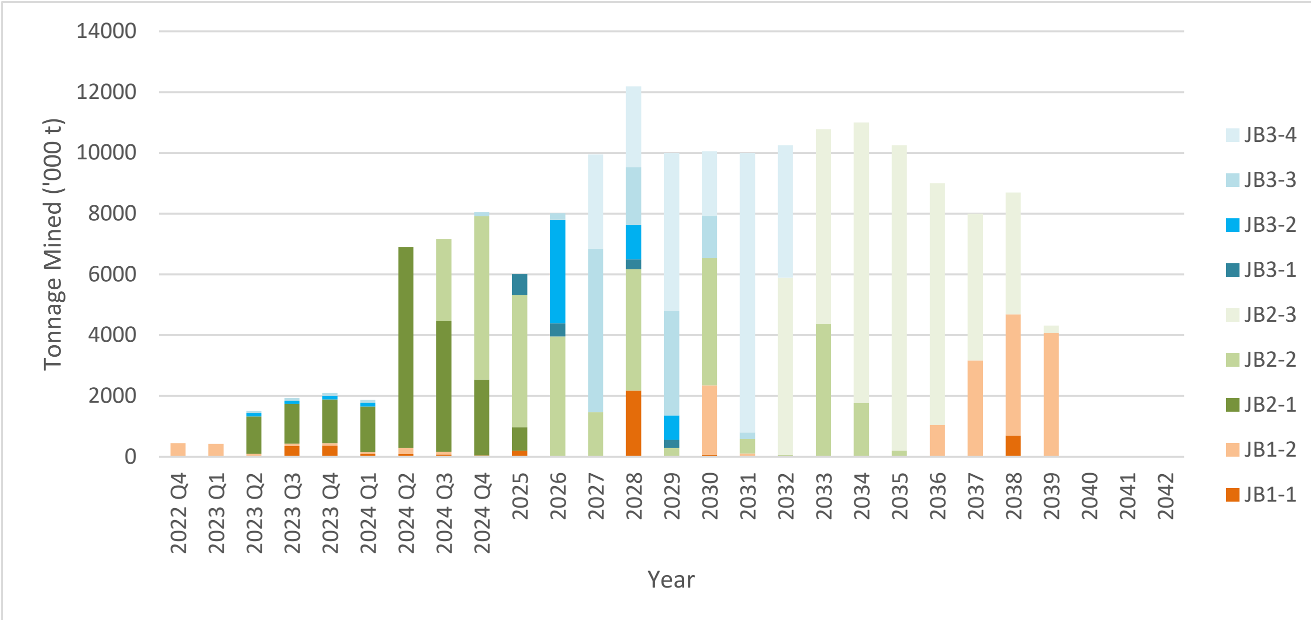


Mining Services

Source : GMS, 2021

Figure 16.19 depicts all mined tonnage by phases and pits over the LOM. To prevent loss in production from extensive dead heading, the maximum phases mined simultaneously is three. A minimum mining depth of six levels is used to prevent mining within the same pit on different phases from interfering with each other. JB2 pit is the predominant pit of the Project and is mined over the entire mine life. Once JB3 pit is mined out in year 2035, it is then used for in-pit dumping.

Figure 16.19: Mine Production from Pits and Phases

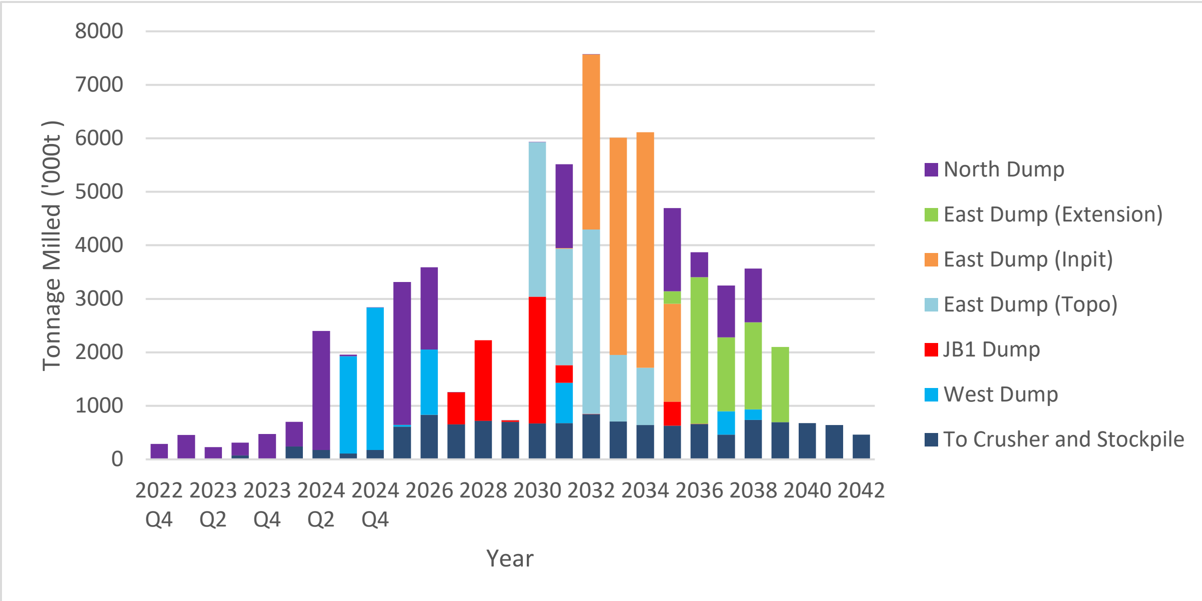


Mining Services

Source : GMS, 2021

Material movements from pits are depicted in Figure 16.20. There are only six possible locations for material to go. Waste material is sent to one of four dumps. Dewatered tailings material from the process plant is sent at first to the North Dump and then spreads into the other dumps. ROM ore is sent to the crusher or ROM stockpile, located in the same location.

Figure 16.20: Total Movement Schedule



Mining Services

Source : GMS, 2021

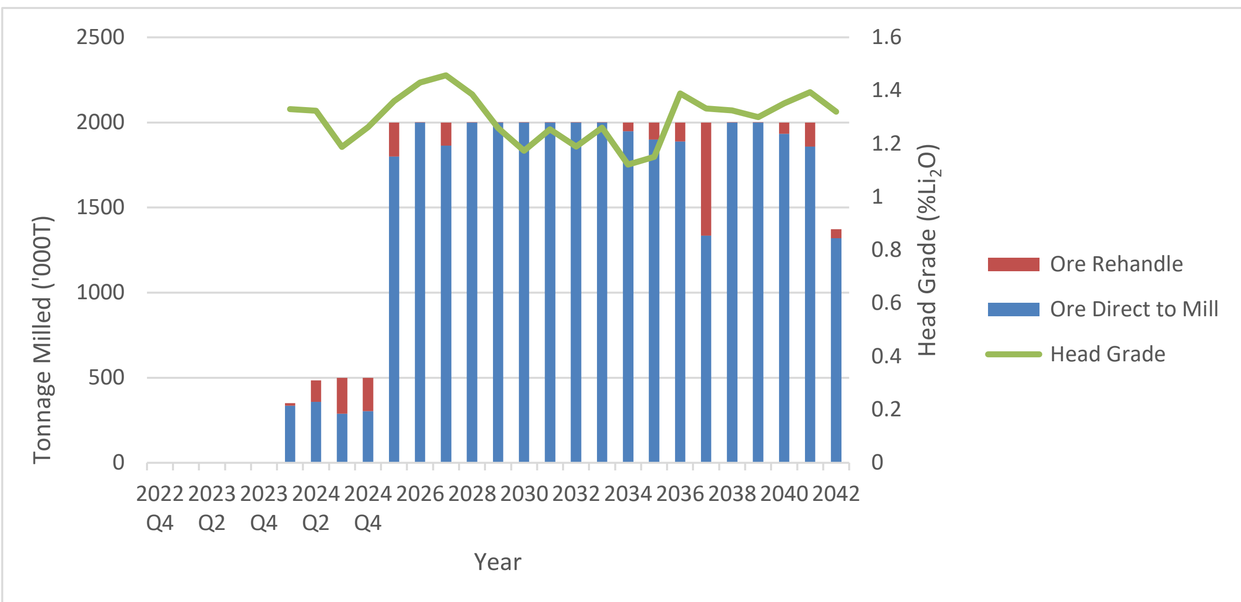
Table 16.3: Detailed Mine Production

	Units	Total	2022 Q4	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Total Tonnage	000 t	168,896	277	277	277	432	338	1,609	1,668	1,794	1,823	7,013	7,098	8,000	8,000	8,000	9,999	10,000	10,000	10,000	10,000	10,251	10,781	11,000	10,945	9,000	8,000	8,000	4,315
Waste Tonnage	000 t	131,689	277	277	277	277	277	966	1,186	1,485	1,336	5,213	4,723	6,136	5,977	5,967	7,984	7,983	7,465	7,908	8,053	8,352	8,893	9,666	8,824	6,983	6,067	6,142	2,995
Ovb Tonnage	000 t	5,563	96	96	96	96	96	378	555	414	303	185	765	340	91	44	587	-	-	59	-	1,350	12	-	-	-	-	-	-
Rock Waste	000 t	126,126	181	181	181	181	181	588	631	1,072	1,034	5,028	3,958	5,796	5,887	5,923	7,397	7,983	7,465	7,848	8,053	7,002	8,881	9,666	8,824	6,983	6,067	6,142	2,995
Strip Ratio (W:O)	W:O	3.54				1.8	4.6	1.5	2.5	5	3	3	2	3	3	3	4	4	3	4	4	4	5	7	4	3	3	3	2
Minable Resource Tonnage	000 t	37,207				155	61	643	482	309	486	1,800	2,375	1,864	2,022	2,033	2,016	2,017	2,535	2,092	1,947	1,899	1,888	1,334	2,121	2,017	1,933	1,858	1,320
Grade	% Li_2O	1.30						1.32	1.29	1.14	1.33	1.37	1.43	1.45	1.39	1.27	1.18	1.25	1.20	1.27	1.11	1.13	1.38	1.38	1.34	1.30	1.35	1.38	1.36
Li_2O Content	kt Li_2O	484				-	-	4.65	6.40	5.94	6.31	27.20	28.60	29.14	27.71	25.19	23.46	25.09	23.78	25.20	22.43	23.00	27.77	26.64	26.51	25.99	27.03	27.88	17.95

16.3.2 Processing Schedule

The processing schedule targets 2.0 Mt of ore annually. The ore feed has a cut-off grade of 0.62% Li_2O. Starting the second year of operation, the process plant will be at 100% of nominal capacity. Due to the pit phasing, the mine stockpile will be used sporadically throughout the life of mine, with increased tonnages coming from the stockpile in Year 2037 to meet the process plant requirements. Most of the ore comes directly from the pits and will be stockpiled on the ROM pad. The ore feed wheel loader will then rehandle the ore to the process plant crusher, allowing for blending if required.

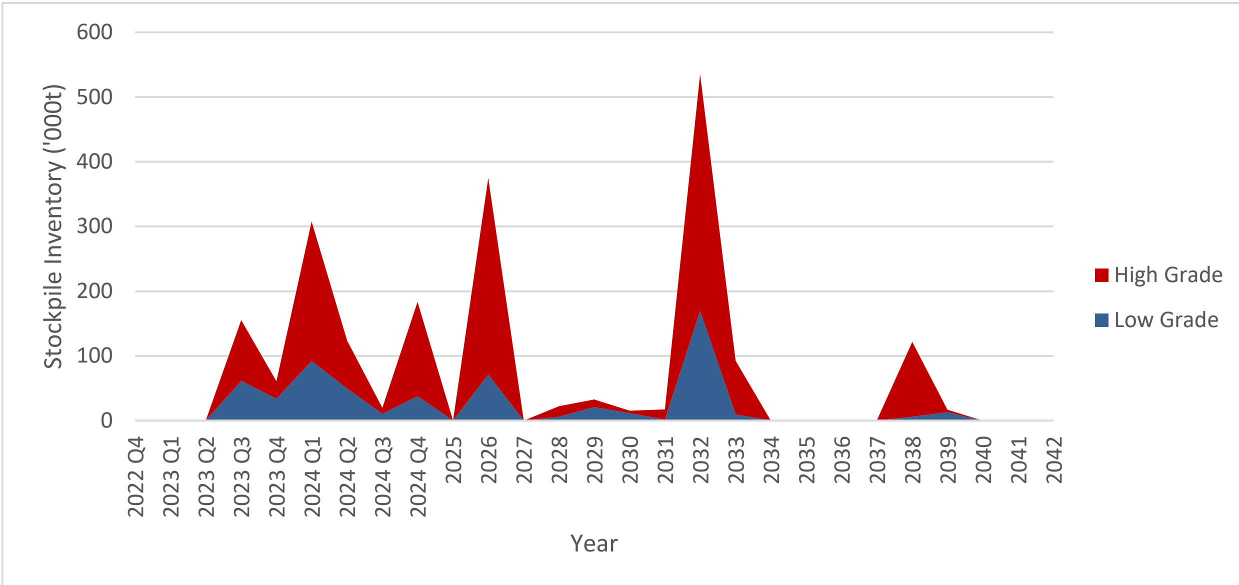
Figure 16.21: Processing Production Schedule



Mining Services **Source : GMS, 2021**

The stockpile peaks at an inventory of 535,000 t of combined high- and low-grade feed ore as seen in Figure 16.22. The entirety of the stockpile is depleted in Year 2042, the last year of operation.

Figure 16.22: Stockpile Inventory



Source : GMS, 2021

Over LOM, it is expected that 37,207 kt of ore will be processed at an average head grade of 1.30% Li_2O.

Table 16.4: Detailed Process Production Schedule

Process Plant Production Schedule	Units	Total	2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Process Plant Rate	kt/d	5.44			3.85	5.31	5.44	5.44	5.48	5.48	5.48	5.46	5.48	5.48	5.48	5.46	5.48	5.48	5.48	5.46	5.48	5.48	5.48	5.46	5.48	5.03
Ore Milled	'000 t	37,207	-	-	350	483	500	500	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,373
Head Grade	% Li_2O	1.30	-	-	1.31	1.36	1.05	1.33	1.38	1.42	1.42	1.39	1.27	1.18	1.25	1.17	1.26	1.10	1.15	1.39	1.42	1.32	1.30	1.35	1.35	1.32
Contained Li_2O	kt Li_2O	484	-	-	4.58	6.56	5.25	6.63	27.67	28.47	28.39	27.86	25.36	23.55	25.03	23.46	25.17	22.08	23.01	27.78	28.42	26.46	26.01	27.08	26.90	18.17
Contained Li	kt Li	225	-	-	2.13	3.05	2.44	3.08	12.87	13.24	13.20	12.95	11.79	10.95	11.64	10.91	11.71	10.26	10.70	12.92	13.22	12.30	12.09	12.59	12.51	8.45

16.4 Mine Operation

16.4.1 General Mining Operations

The mine operations department will consist of four crews, two on site and two offsite to accommodate a 1-week Fly In, Fly Out (FIFO) rotation. Each on-site crew will be assigned to work the night or day shift with each shift being 12 h and having a mine foreman to direct activities for equipment and personnel.

The mine crew supervisor will work closely with the maintenance and plant crew supervisors to ensure overall on-site shift goals are met. During dayshift between Monday and Thursday, the mine crew supervisor will be supported by the mine general supervisor and technical personnel. All blasting activities, and equipment movements will occur on dayshift to allow nightshift to focus on production activities such as loading, hauling and drilling. Dayshift activities will also include weekly and monthly mining plans and training activities for personnel.

16.4.2 General Mining Sequence

Typical excavator and truck surface mining will be utilized to extract and transport waste and ROM. An electric hydraulic front shovel will manage the bulk of the production, while the diesel hydraulic excavator, will provide higher mining selectivity if required. The backhoe excavator also provides additional flexibility for mining from the bench above without ramping down.

Mining for each bench will start on the hanging wall side of the minable resource body and progress towards the resource. Once the minable resources are extracted, remaining waste material on the footwall will be mined out in conjunction with developing a sinking ramp and/or access road for accessing the next bench below.

Material will be sequenced and scheduled utilizing phased pits. This enables a smooth transition of lower waste stripping during the initial years with a gradual increase later in the mine life. Minable resources will be trucked to the ROM pad located on the Northeast side of the pit. Overburden and topsoil material will be placed in the Overburden and Peat Storage Facility. Waste rock will be transported to the Waste Rock Tailings Storage Facility (WRTSF) stockpiles.

16.4.3 Grade Control and Reconciliation

Grade control will be applied for maintaining feed quality. The grade control process is divided into three operation components:

- Blast pattern design – pattern boundaries to reference mineralized and waste contact
  - When vertical dilution is high, the 10 m blast is reduced to 5 m blast for further differentiation.
- Mining Direction method – operating bench face to follow mineral deposit strike direction.
  - Individual pegmatite swarms (dykes) are narrow in nature and run in the north-east and south-west direction. Minable resources will be mined along strike direction (NE, SW) to achieve selective extraction of pegmatite material.
- In-field sample collection – periodic drill cuttings will be sampled and taken to the assay lab.
  - Field samples on production drill cuttings are taken for grade control and reconciliation purposes.

16.4.4 Operation in Cold Weather

16.4.4.1 Personnel Implications

Staff working outdoors during the winter seasons will encounter cold working conditions with windchill and risks of frostbite and hypothermia. Procedures will be required to assess and mitigate these two major risks. The following are general guidelines for working in cold temperature conditions:

- Temperatures between 0°C and -20°C with wind chill: risk of frostbite and hypothermia exist but can be prevented by wearing proper clothing.
- Temperatures between -20°C to -45°C with wind chill: work should be restricted to essential activities and limited to 2-hour periods with rest breaks taken indoors.
- Temperatures below -45°C with wind chill: all outdoor work is prohibited except for emergency services.

16.4.4.2 Equipment Implications

Equipment is prone to mechanical breakdowns during extreme cold temperatures. In extreme weather conditions a mechanical breakdown can be life threatening. It is, therefore, prudent to take additional care to ensure that all equipment is in good working order in extreme cold temperatures.

16.5 Mine Equipment

Surface mining equipment requirements are based on mining 10 m benches for minable resources and waste. Conventional excavator and truck fleet will be used to meet the tonnage requirements specified by the mine plan.

Liebherr and Komatsu equipment specifications have been used in this report.

16.5.1 Operating Hours

Table 16.5 summarizes the gross operating hours used for subsequent equipment fleet requirement calculations. Additional delays and applied factors are described in productivity calculations for each fleet.

Table 16.5: Equipment Usage Assumptions

		Shovels	Loaders	Trucks	Drills	Ancillary	Support
Days in Period	*days*	365	365	365	365	365	365
Weather, Schedule Outages	*days*	10.0	10.0	10.0	10.0	10.0	10.0
Shifts per Day	*shift/day*	2.0	2.0	2.0	2.0	2.0	2.0
Hours per Shift	*h/shift*	12.0	12.0	12.0	12.0	12.0	12.0
Availability	*%*	82.0	80.0	85.0	80.0	85.0	85.0
Use of Availability	*%*	90.0	90.0	90.0	90.0	85.0	80.0
Utilization	*%*	73.8	72	76.5	72	72.25	68
Effectiveness	*%*	87.0	85.0	87.0	85.0	80.0	80.0
Overall Equipment Effectiveness (OEE)	*%*	64.2	61.2	66.6	61.2	57.8	54.4
Total Hours	*h*	8,760	8,760	8,760	8,760	8,760	8,760
Scheduled Hours	*h*	8,520	8,520	8,520	8,520	8,520	8,520
Down Hours	*h*	1,534	1,704	1,278	1,704	1,278	1,278
Delay Hours	*h*	817	920	847	920	1,231	1,159
Standby Hours	*h*	699	682	724	682	1,086	1,448
Operating Hours	*h*	6,288	6,134	6,518	6,134	6,156	5,794
Ready Hours	*h*	5,470	5,214	5,670	5,214	4,925	4,635

16.5.2 Drilling and Blasting

Drill and blast specifications are established to effectively drill a 10 m bench. For this bench height, a 165 mm blast hole size is proposed with a 5.1 m x 5.1 m pattern for ore, 5.2 m x 5.2 m for waste and overburden, and with 1.0 m of sub-drill. These drill parameters combined with a high energy bulk emulsion with a density of 1.2 kg/m^3 result in a powder factor of 0.30 kg/t for ore and 0.32 kg/t for waste. Blast holes are planned to be initiated with electronic detonators and primed with boosters

Drilling will be done using diesel powered Sandvik DI650i S5 DTH surface drill. Blastholes will generally be drilled to depths of 11.5 m (10 m bench with 1.5 m sub-drill depth).

Table 16.6 summarizes the drill parameters that are utilized in estimating drill requirements.

Table 16.6: Drill & Blast Parameters

Drill & Blast Parameters		Ore	Waste	OVB
Drill Pattern				
K_S : Spacing/Burden		1.00	1.00	1.00
K_B : Burden/Diameter		30.89	31.50	31.50
K_J : Subdrill/Burden		0.29	0.29	0.29
K_T : Stemming/Burden		0.59	0.58	0.58
K_H : Height/Burden		1.96	1.92	1.92
Explosive Density	*g/cm^3*	1.20	1.20	1.20
Hole Diameter	*in*	6.50	6.50	6.50
Diameter (D)	*m*	0.165	0.165	0.165
Burden (B)	*m*	5.10	5.20	5.20
Spacing (S)	*m*	5.10	5.20	5.20
Subdrill (J)	*m*	1.50	1.50	1.50
Stemming (T)	*m*	3.00	3.00	3.00
Bench Height (H)	*m*	10.0	10.0	10.0
Blasthole Length (L)	*m*	11.5	11.5	11.5
Pattern Yield				
Rock Density	*t/bcm*	2.70	2.77	1.89
BCM/Hole	*bcm/hole*	260	270	270
Yield Per Hole	*t/hole*	702	749	511
Yield Per Meter Drilled	*t/m drilled*	61	65	44

Drill & Blast Parameters		Ore	Waste	OVB
Drill Pattern				
Explosive Column (LE)	*m*	8.5	8.5	8.5
Volume of Explosives/ Hole	*m^3*	0.18	0.18	0.18
Weight of Explosives/Hole	*kg*	218.37	218.37	218.37
Powder Factor	*kg/t*	0.31	0.29	0.43
Powder Factor	*kg/bcm*	0.84	0.81	0.81
Drill Productivity				
Re-drills	*%*	5.0%	5.0%	5.0%
Pure Penetration Rate	*m/h*	35.0	35.0	35.0
Overall Drilling Factor (%)	*%*	0.50	0.50	0.50
Overall Penetration Rate	*m/h*	17.5	17.5	17.5
Drilling Efficiency	*t/h*	1,069	1,140	778
Drilling Efficiency	*holes/h*	1.52	1.52	1.52

Drill and blast configurations consider the required stand-off distances to account for fly rock, air blasts, and ground vibrations for buildings and public roads.

Légis Québec states a maximum quantity of explosives detonated within an 8 mms time frame (S-2.1, r.4, Schedule 2.6, Section 4.7.5). GMS has considered the impact of this restriction to the proximity of the km 381 Truck Stop at the southern side of the mine. As a result, a small portion of the pit in the south consisting of approximately 2% of the entire ultimate pit volume will require production blasts at 5 m-high benches. This has been accounted within the 10% of total minable resources material blasted at 5 m.

Pre-split drill and blast have been accounted for in the drill and blast requirements. The purpose of pre-split drill and blast design is to break the rock near or up to the final pit limit while causing minimal damage to the rock beyond the limit. There are a number of wall control blast techniques available to achieve this including line drilling, presplitting, trim blasting, cushion blasting and buffer blasting. The preferred method should be selected from field trials.

The drill selected for this application is the same as the production drill, capable of drilling angled holes for probe drilling and pit wall drain holes. The standardization of the drill fleet will bring some flexibility and ensure that the drilling productivity is kept at its desired level

Blasting activities will be outsourced to an explosives provider who will be responsible for supplying and delivering explosives in the hole through a shot service contract. The mine engineering department will be responsible for designing blast patterns and relaying hole information to the drilling team.

16.5.3 Loading

The loading fleet consist of one electric hydraulic shovel (front-shovel configuration) with an 8.3 m^3 bucket, one diesel hydraulic excavator (backhoe configuration) with a 6.3 m^3 bucket and a diesel front-end wheel loader (“FEL”) with a 10.7 m^3 bucket.

The excavators will be matched with a fleet of 100 t payload capacity mine trucks. Although interchangeable, the hydraulic excavators will primarily be operating in ROM and waste rock. The wheel loader will primarily be taking care of the stockpile rehandling activities while complementing the excavators in waste rock. The electric-powered hydraulic front shovel will achieve higher productivity rates while lowering fuel consumption costs. The diesel-powered hydraulic excavator and the wheel loader will both compensate for the probable loss of productivity generated by the restricted mobility of the electric unit. Table 16.7 shows the loading productivity assumptions per loading unit.

Table 16.7: Loading Productivity Assumptions

		Ore/Waste			Tailings Rehandling
		Front Shovel	Excavator	Wheel Loader	Wheel Loader
		Liebherr R9150B E	Komatsu PC1250	Komatsu WA800	Komatsu WA800
Loading unit		Mining Truck	Mining Truck	Mining Truck	Mining Truck
Haulage unit		Komatsu HD785	Komatsu HD785	Komatsu HD785	Komatsu HD785
Rated Truck Payload	t	90	90	90	90
Heaped Tray Volume	m^3	64	64	64	64
Bucket Capacity	m^3	8.3	6.2	10.2	10.2
Bucket Fill Factor	%	90%	90%	90%	95%
In-Situ Dry Density	t/bcm	2.77	2.77	2.77	
Moisture	%	3%	3%	3%	
Swell	%	40%	40%	40%	
Wet Loose Density	t/lcm	2.04	2.04	2.04	1.70
Bucket Payload Rating	t	15.22	11.37	18.71	20.18
Actual Load per Bucket	t				16.47
Bucket Margin at 100% Fill Factor					85.93%
Passes (Decimal)	#	5.91	7.91	4.81	5.46
Passes (Whole)	#	6.0	8.0	4.5	5.0
Actual Truck Wet Payload	t	91.34	90.97	84.19	82.37
Actual Truck Dry Payload	t	89	88	82	82
Actual Heaped Volume	m^3	45	45	41	48
Payload Capacity	%	99%	98%	91%	92%
Heaped Capacity	%	70%	70%	65%	76%
Cycle Time					
Hauler Exchange	min	0.6	0.6	0.7	0.7
First Bucket Dump	min	0.1	0.1	0.1	0.1
Average Cycle Time	min	0.65	0.7	0.8	1.05
Load Time	min	3.95	5.60	3.60	5.00
Cycle Efficiency with Wait Time	%	75%	75%	75%	75%
Number of Trucks Loaded per H	#	11.39	8.04	12.50	9.00
Production / Productivity					
Productivity Dry Tonnes / Op. H	t/h	1010	710	1022	741
Effective Hours per Year	h/y	5,470	5,470	5,214	5,214
Dry Annual Production Capacity	kt/y/unit	5,526,197	3,882,288	5,327,065	3,865,060
Number of Units	#	1	1	1	1
Tonnes	t/y	5,526,197	3,882,288	5,327,065	3,865,060
		14,735,549			
		133.96%			

16.5.4 Hauling

Haulage will be performed with 100-ton class mine trucks. The truck hours and cycle times have been calculated with the Deswik extension Landform & Haulage (LHS) where the cycle times have been estimated for each period and all possible destinations as there are several waste storage areas.

Haul trucks are also required to transport tailings from the plant to the proposed waste and dewatered tailings stack areas. A FEL will be used to load the tailings from the tailings stockpile into trucks. The same production trucks will be used to transport the tailings to their destination.

16.5.5 Haulage Simulation

Deswik Landform & Haulage was used to simulate the hauling systems over the life of mine. The following assumptions and design criteria were used to guide the simulations.

Table 16.8: Site Speed Limits

	Speed (km/h)
Site Max	50
Down Hill	30

Table 16.9: Site Rolling Resistance Assumptions

	Rolling Resistance (%)
Main Road	2.0
Pit Ramp	2.0
Dump	2.0
Pit Floor	2.0

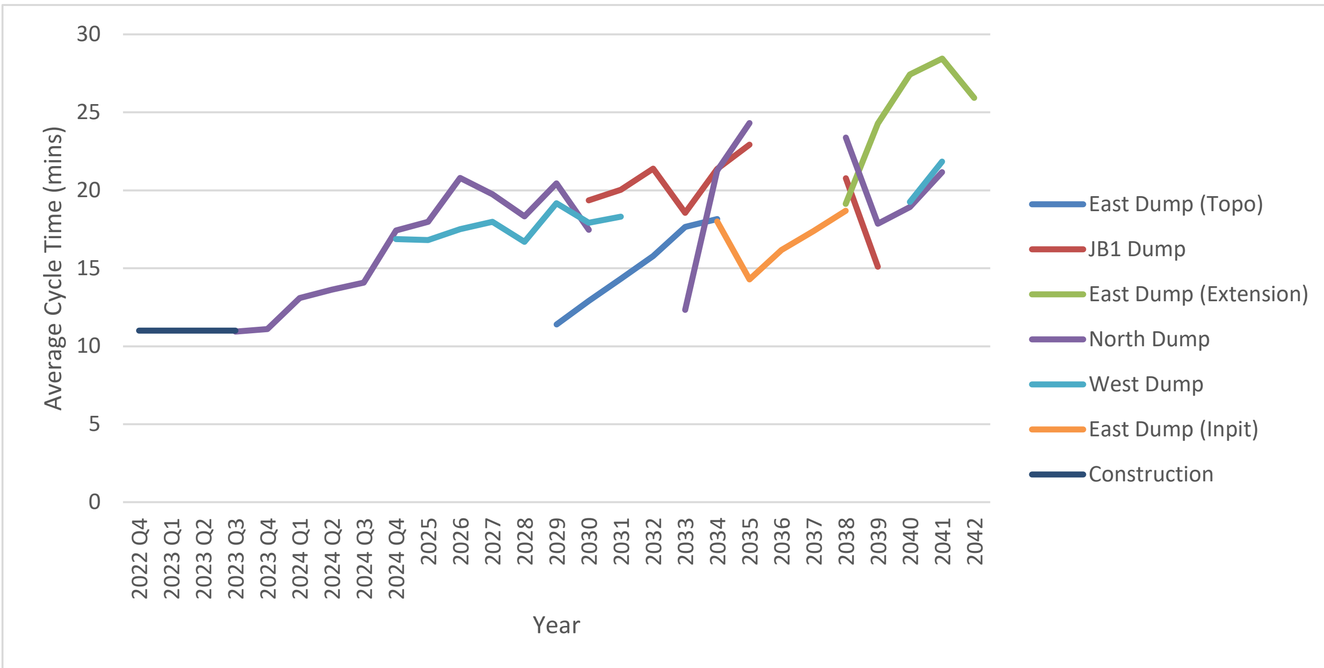
Table 16.10: Fixed Cycle Time Components

	Time (mins)
Queue Time	1.42
Spot Time	0.6
Loading Time	2.37
Total Loading	**4.39**
Queue Time	0
Spot Time	0.3
Dumping Time	0.2
Total Dump	**0.5**
Total Fixed	**4.89**

A multiple waste dump strategy is used to minimize the truck requirements for the Project. During the critical years of the Project, waste rock is sent to the closest waste dump, allowing for optimal truck requirement. Figure 16.23 shows the truck cycle times by destination, while Figure 16.24 summarizes the haulage hours by destination. Typically, cycle time increases with the increase of the depth of the pit over the mine life.

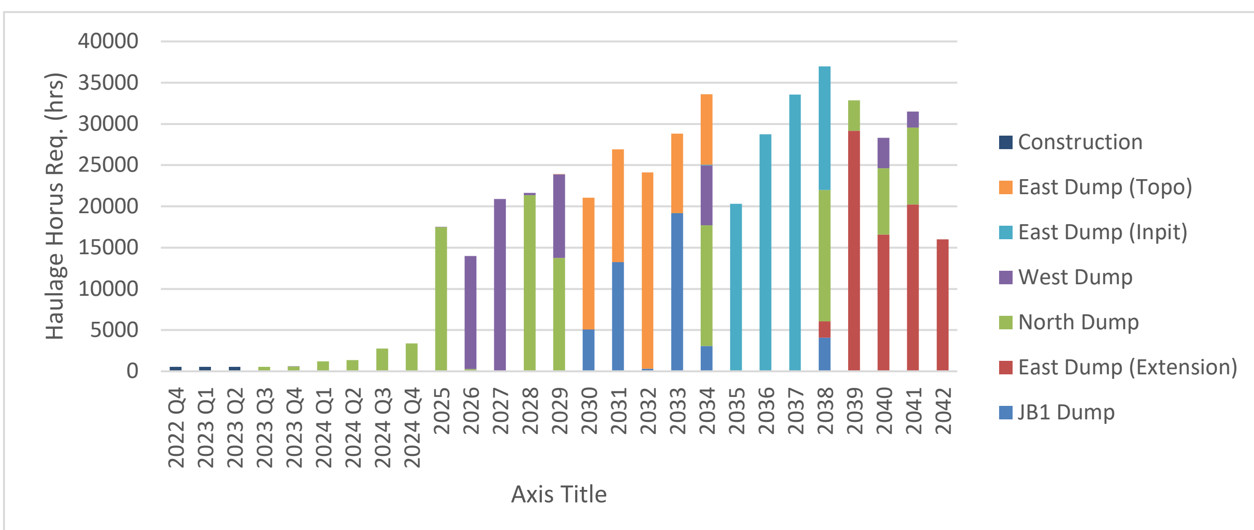
Cycle time is also dependant on the dumping schedule and the distance each dump is from the pits. The dump schedule is planned so that cycle time tends to plateau at a maximum limit to allow for a consistent fleet over most of the mine life. The variation in cycle time between years within the same phase represents material being diverted to a different destination with a new corresponding cycle time.

Figure 16.23: Truck Cycle Times by Destination



Source : GMS, 2021

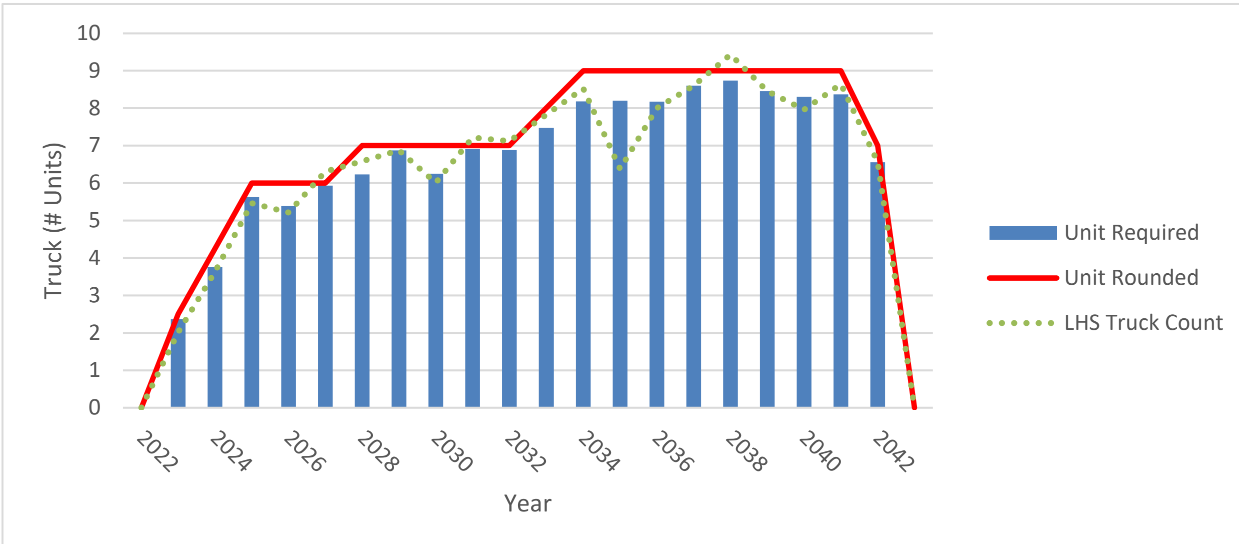
Figure 16.24: Haulage Hours by Destination



Source : GMS, 2021

The total haul hours required by period, coupled with the truck mechanical availability, were used to determine the number of trucks required throughout the LOM. The truck fleet was optimized to reach a maximum of 9 units in Year 2034 and it remains at this level until Year 2040 before it starts decreasing as a result of a decrease in mining rate. Figure 16.25 below summarizes the truck requirement.

Figure 16.25: Truck Requirements



Mining Services

Source : GMS, 2021

Over the LOM, the truck fleet will consume 39.8 million litres at an average fuel consumption rate of 49.9 l/h per truck.

16.5.6 Equipment Fleet Requirements

With the equipment production rates and scheduled mine plan tonnage requirements determined, the total mining fleet requirements over the mine life are determined. The number of excavators, haul trucks and drills are based on the scheduled production values provided above while the secondary and support equipment fleet requirements are generally based on the number of excavators and trucks required.

Table 16.11 illustrates the equipment requirement schedule for both primary and secondary equipment per year, while Table 16.12 shows the equipment purchase schedule.

Due to lead-times, some mining equipment will have to be purchased one calendar year before the actual pre-production period starts.

Table 16.11: Equipment Requirement Schedule

Equipment Requirement Schedule	Max	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Major Equipment																						
Production Drill (4-8")	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Auxiliary Pre-split Drill (4.5-8")	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Electric Hydraulic Shovel (8.3 m³)	1	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Diesel Hydraulic Excavator (6.3 m³)	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wheel Loader (10.7 m³)	3	-	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mining Haul Truck (100 t)	9	-	-	3	6	6	6	6	7	7	7	7	7	8	9	9	9	9	9	9	9	9
Track Dozer (436 HP)	3	-	-	1	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Motor Grader (14 ft)	2	-	-	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Water/Sand Articulated Truck (34 kL tank)	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wheel Dozer (496 HP)	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Support Equipment																						
Excavator (49 t)	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hydraulic Hammers for Excavator 49 t	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Emulsion truck (Part of Blasting Contract)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stemming Loader	1	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wheel Loader 271 HP	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cable Handling Wheel Loader 271 HP	1	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Boom Truck 28 t	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Telehandler	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Forklift Diesel 4 t	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mechanic Service Truck	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tire Handler Truck	1	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fuel & Lube truck 10 Wheel	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Truck Tractor for Trailers	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Trailer Lowboy	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pick-up Truck	15	-	2	13	13	13	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Pit Bus	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mobile Air Compressor 185CFM	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Welding Machine Electric	2	-	-	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Welding Machine Diesel 400 A	2	-	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Light Plant	8	-	-	4	4	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Genset 6 kW	2	-	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Genset 60 kW	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Water Pump 3 in - Gasoline	4	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Pump 10 in - Diesel	3	-	-	1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Powered Air Heaters	2	-	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Table 16.12: Equipment Purchase Schedule

Equipment Purchase Schedule	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Major Equipment																						
Production Drill (4-8")	4	-	1	-	-	-	-	-	-	1	-	-	-	1	-	-	-	1	-	-	-	-
Auxiliary Pre-split Drill (4.5-8")	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electric Hydraulic Shovel (8.3 m³)	2	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Diesel Hydraulic Excavator (6.3 m³)	2	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Wheel Loader (10.7 m³)	4	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Mining Haul Truck (100 t)	15	-	3	-	3	-	-	1	-	-	-	-	1	1	-	-	-	-	3	3	-	-
Track Dozer (436 HP)	7	-	1	-	1	-	1	-	-	-	-	1	1	-	-	1	-	-	-	-	1	-
Motor Grader (14 ft)	6	-	1	-	1	-	-	-	-	1	-	1	-	-	-	-	1	1	-	-	-	-
Water/Sand Articulated Truck (34 kL Tank)	2	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Wheel Dozer (496 HP)	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Support Equipment																						
Excavator (49t)	2	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Hydraulic Hammers for Excavator 49 t	4	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	1	-	-
Emulsion Truck (Part of Blasting Contract)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stemming Loader	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wheel Loader 271 HP	2	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Cable Handling Wheel Loader 271 HP	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boom Truck 28 t	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-
Telehandler	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Forklift Diesel 4 t	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Mechanic Service Truck	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-

Equipment Purchase Schedule	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Major Equipment																						
Tire Handler Truck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fuel & Lube Truck 10 Wheel	3	-	1	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-
Truck Tractor for Trailers	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Trailer Lowboy	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pick-up Truck	58	-	4	9	-	2	-	-	13	-	-	2	-	4	9	-	2	-	2	11	-	-
Pit Bus	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-
Mobile Air Compressor 185CFM	3	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-
Welding Machine Electric	4	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Welding Machine Diesel 400A	6	-	1	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-
Light Plant	32	-	-	4	-	4	-	-	4	-	4	-	-	4	-	4	-	-	4	-	4	-
Genset 6 kW	6	-	-	2	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-	-	-	-
Genset 60 kW	4	-	-	1	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-
Water Pump 3 in - Gasoline	28	-	-	4	-	-	4	-	-	4	-	-	4	-	-	4	-	-	4	-	-	4
Water Pump 10 in - Diesel	3	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Power Air Heaters	8	-	1	-	1	-	-	-	1	1	-	-	-	-	2	-	-	-	-	1	1	-

16.5.7 Fleet Management System

Due to the small size of the fleet, reaching eight trucks only in Y7 of the project's life, and nine trucks in Y13, it was not deemed beneficial enough to have the truck loading units and drills fitted with a fleet management system, considering the fixed installation costs for such a system, and the low complexity of having the mine supervisor dispatching such a small fleet. The drills will however come with their own hole geolocation system.

16.5.8 Crushing Plant

The production of crushed material will be necessary, for blasthole stemming purposes, for road maintenance or spreading of road abrasive on the ramps during winter. It is assumed that the required aggregate material production will occur during summertime, with the mobilization of a contracted mobile crusher to site. Waste rock to feed the small crushing plant will come from the pit, and the material produced will be stockpiled for use throughout the year. Cost of such contract services have been accounted for in the cost/tonne of aggregate used in the model.

16.5.9 Electrical Cable Handling

An electric cable handling strategy has been developed to electrify the pits. The main production loading unit, a hydraulic front shovel, along with the pit submersible dewatering pump system starting in Y3, will be running on electricity.

The operation of a 271HP Wheel loader with a removable cable reel attachment has been budgeted to handle the electric cables required for the electric shovel operation. The pit electrification cost was accounted for, with an electric main ground cable line running along the west side of the pits, from JB1 in the North all the way to JB3 in the south. A mobile substation will be connected to the electric line, and all the electric units will be connected to that substation. A crew of two electricians on dayshift have also been considered to help with the electric shovel moving and submersible pumps connection.

16.5.10 Pit Slope Monitoring

Pit slope monitoring systems are used to gather any information on micro and macro movements of the pit walls. It usually consists of strategically placed prisms that are surveyed under a controlled environment (windless, rainless and stationary). No monitoring system has been developed during this phase of the feasibility study and should be an element of focus in the basic engineering stage.

16.5.11 Support Equipment

All construction related work, such as berm construction and water ditch cleaning will be done by one 49-t excavator (equipped with an optional hydraulic hammer when required).

One electric-powered pit bus will transport workers to their assigned workplace and a total of 15 F150 electric pick-ups will be purchased for all the mining departments.

Several other equipment purchases are included to support the mining activities. Also included are one boom truck (28-t crane) and one 271 HP wheel loader.

16.5.12 Road and Dump Maintenance

Waste and ore storage areas will be maintained by up to two 436 HP track dozers.

Pit operating floors and dump roads and floors will be maintained by a 496 HP wheel-type dozer.

Mine roads will be maintained by two 14-ft blade motor graders and a water/sand truck will be used to spray roads to suppress dust or spread road aggregate during winter months.

16.5.13 Mine Maintenance

The Project has not included a maintenance and repair contract (“MARC”) for its mobile equipment fleet. The maintenance department and personnel requirement has been structured to fully manage this function, performing maintenance planning and training of employees. However, reliance on dealer and manufacturer support will be key for the initial years of the project, and major component rebuilds will be supported by the OEM’s dealer throughout LOM. An evaluation of a MARC will be considered with the Basic Engineering process. Tire monitoring, rotation and / or replacement will be carried out by a specialized contractor.

Some other equipment will also be purchased to facilitate the maintenance activities and support the operation, such as one fuel and lube trucks, a forklift, one telehandler TL943, one 80-ft diesel forklift, one fuel and lube truck, one 100-t low-boy trailer and tractor for moving the tracked equipment. Other small equipment such as mechanic service truck, generators, compressors, light towers, welding machines, water pumps, air heaters.

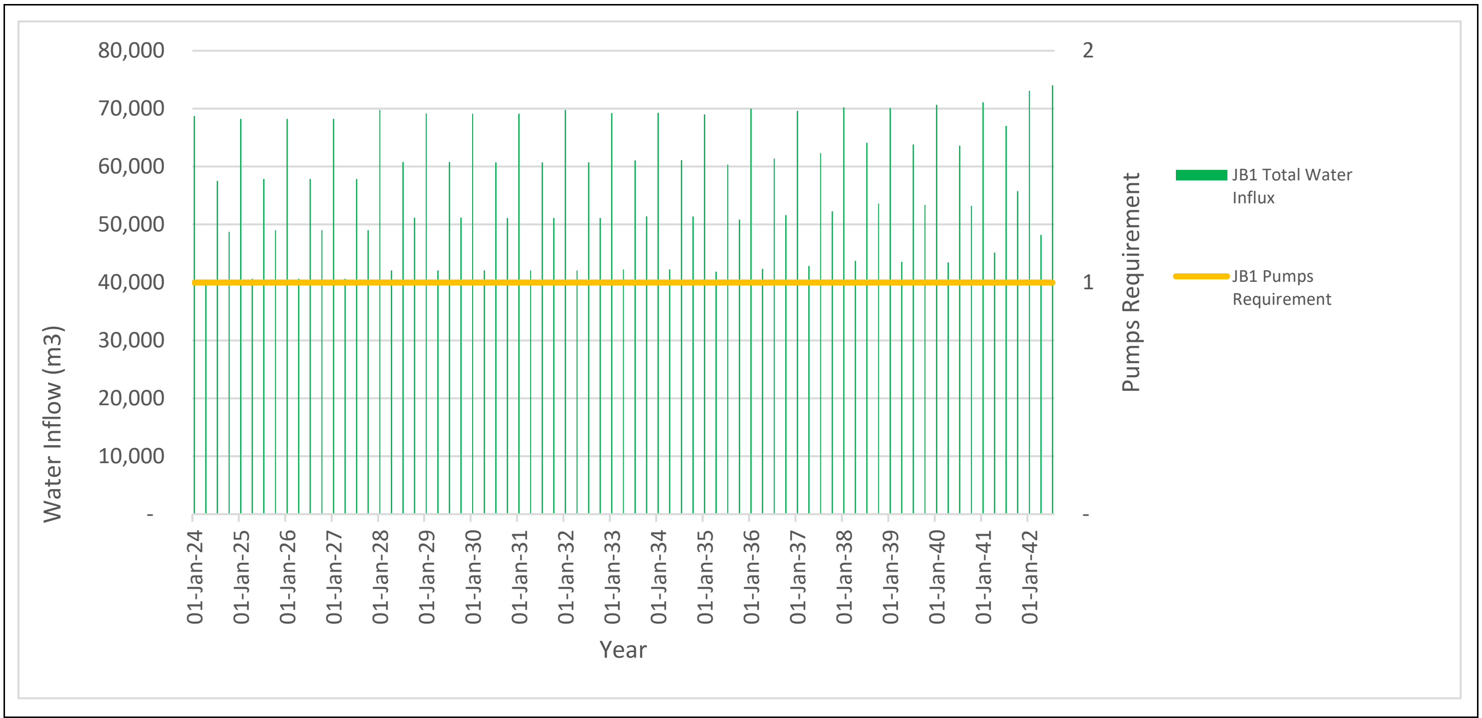
16.5.14 Dewatering

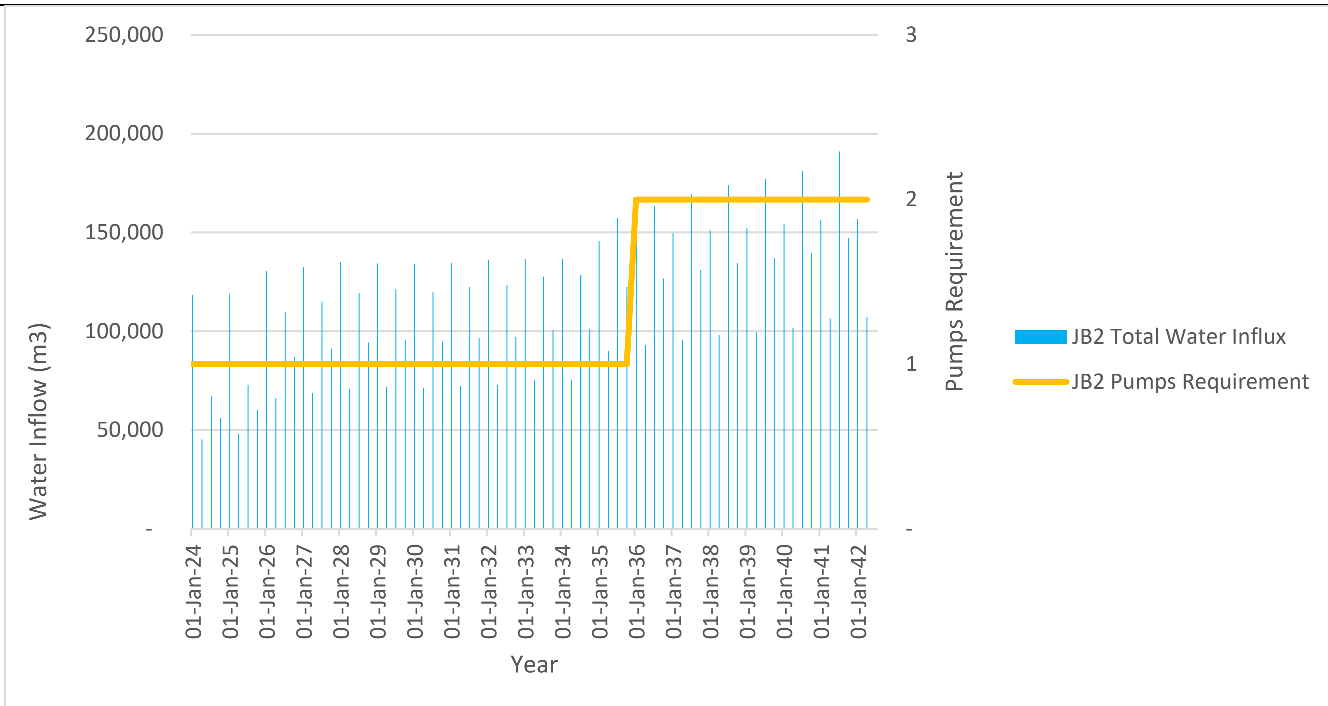
It is assumed that each pit will receive 775 mm/year of rainwater and JB1, JB2 and JB3 will receive an average of 211,527 m^3/y, 449,834 m^3/y and 196,608 m^3/y of ground water influx, respectively. Calculating from the production schedule it is estimated that a total 15.3 mm^3 of water will be pumped from all the pits over the mine life.

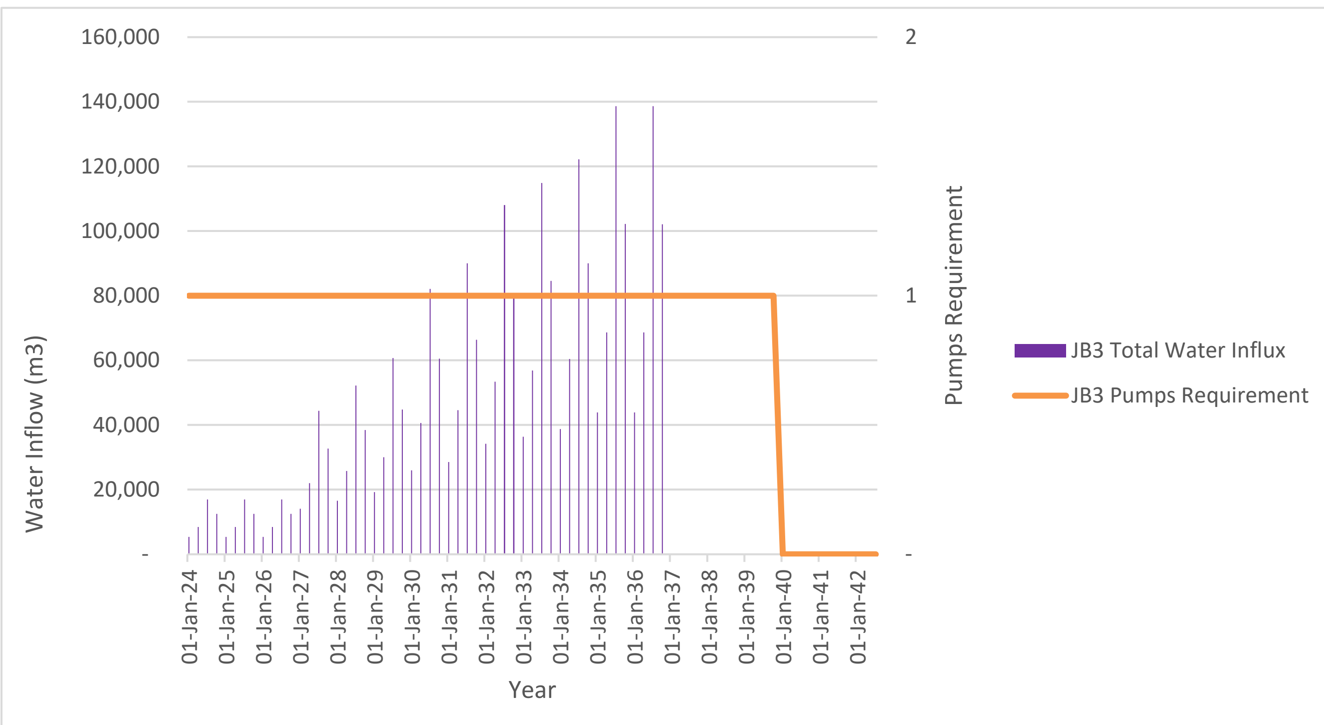
A total of seven submersible electric Gormann-Rupp S8D1 will be bought over the mine life. Due to the staggered mining, pumps can be moved to other pits when the pit is completely mined out. In-pit pumps are placed in sumps equal to the lowest mining level and, using 12-inch insulated pipe segments, the water is pumped to surface settling ponds. It is assumed that the pumping will start with diesel pumps for the first three years, then switch to electric submersible pumps starting Year 3 due head loss concerns.

Figure 16.26 depicts the dewatering requirements by pit and period. JB2 having the highest influx of water due to exposed area, is second by JB3 and finally, JB1. In 2036, JB3 will be mined out and it will take 3.5 years to fill it, thus a pump will continue to be needed as the pit will be continuously filled with waste rock via haul trucks.

Figure 16.26: Water Requirements for Pit JB1, JB2 and JB3 by Year







Mining Services

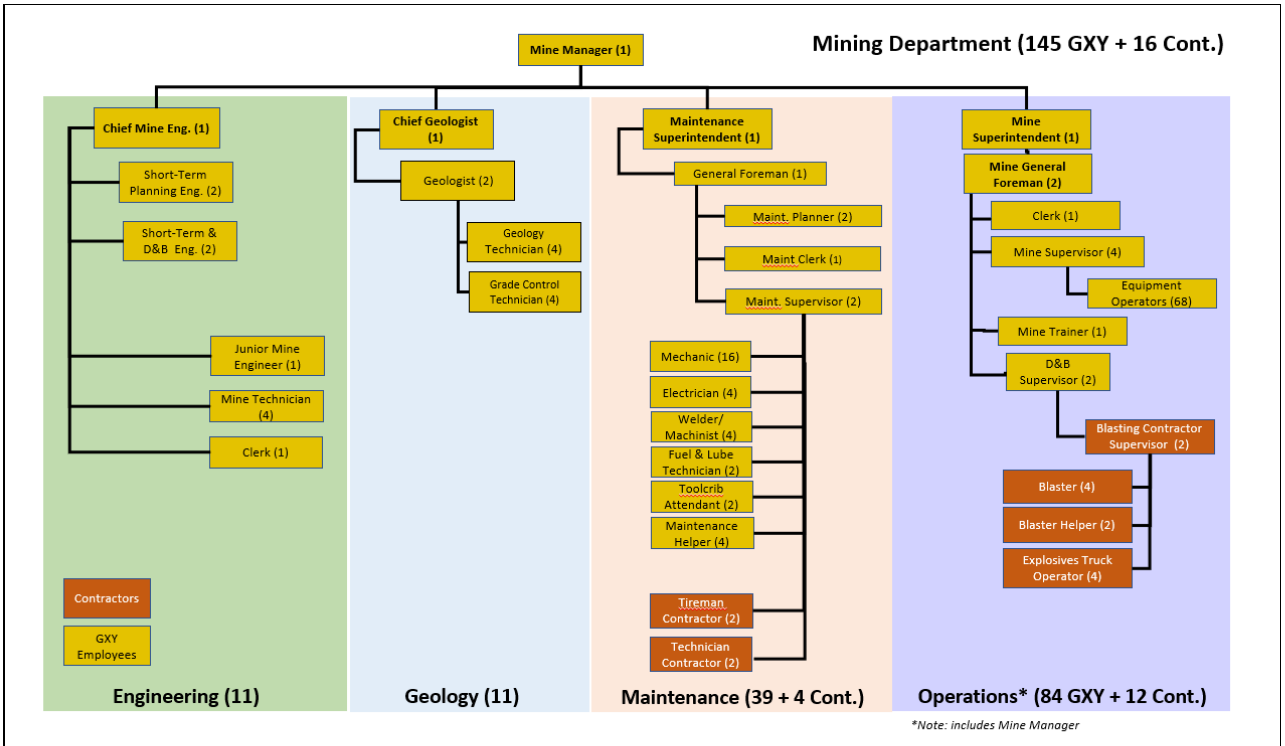
Source : GMS, 2021

16.6 Personnel Requirements

This section provides details for the workforce requirements for mining operations, maintenance and supervision based on the overall equipment fleet defined in Section 16.5.

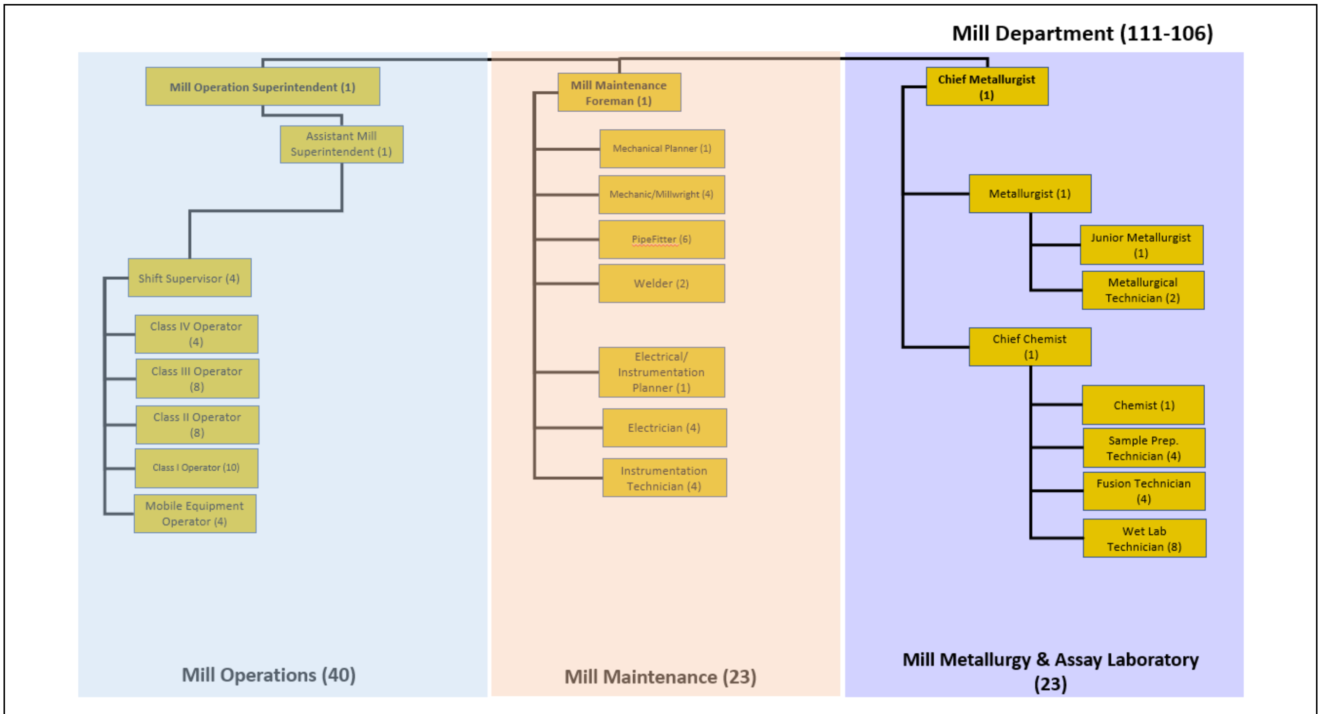
The personnel requirements are based on two rosters: four days on / three days off for the senior staff positions, and 7 days on / 7 days off for the rest of the workforce. Table 16.13 shows the estimated mine workforce requirements over the life of mine. The mine workforce peaks at 146 individuals in Year 4. Figure 16.27, Figure 16.28 and Figure 16.29 are the organizational chart of the key departments.

Figure 16.27: Mining Department Organizational Chart



Source : GMS, 2021

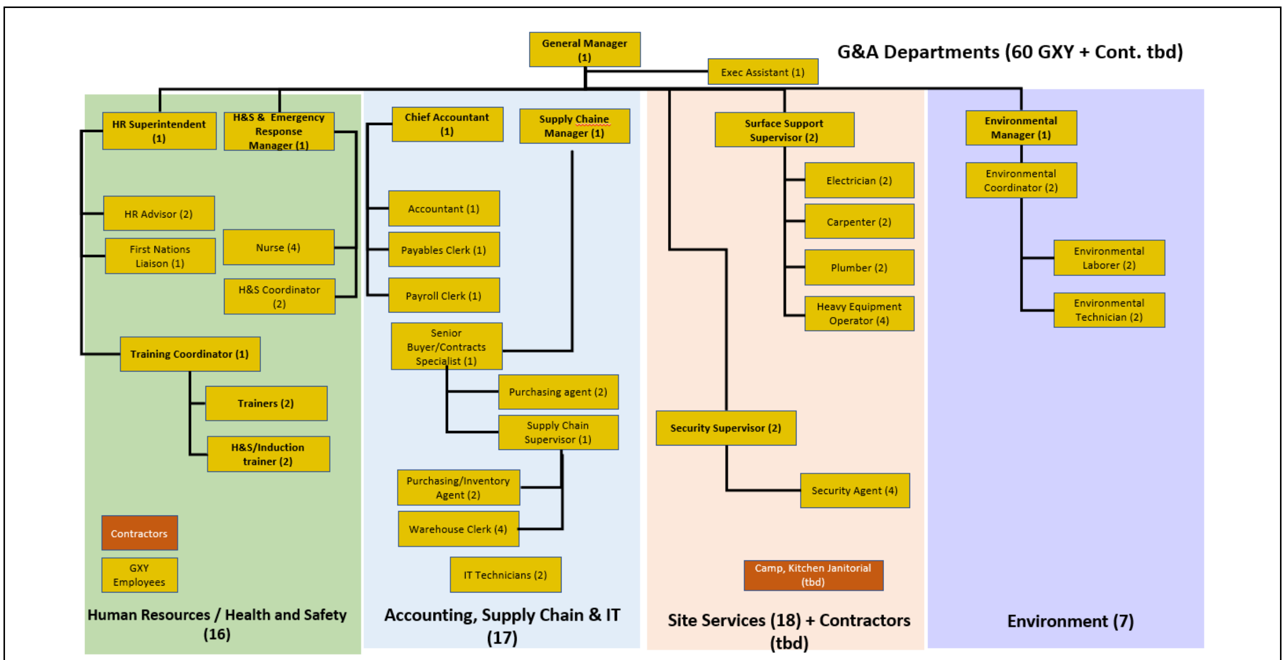
Figure 16.28: Mill Department Organizational Chart



Mining Services

Source : GMS, 2021

Figure 16.29: G&A Departments Organizational Chart



Mining Services

Source : GMS, 2021

Table 16.13: Workforce Forecast

Manpower Schedule	Max	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Mine Operation																						
Mine Operations - Mine Superintendent	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Mine Operations - Mine Ops. General Foreman	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mine Operations - Supervisor	2	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mine Operations - Mine D&B Supervisor	4	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2
Mine Operations - Clerk	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mine Operations - Trainer	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mine Operations - Laborer	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mine Operations - Shovel/Excavator Operator	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Operations - Loader Operator	8	0	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Mine Operations - Haul Truck Operator	4	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mine Operations - Drill & Blast Operator	32	0	12	24	24	24	24	24	24	24	24	24	28	32	32	32	32	32	32	32	32	24
Mine Operations - Drill & Blast Operator	4	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Geology - Grade Control Laborers / Samplers	4	0	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mine Operations - Dozer Operator	4	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mine Operations - Grade Operator	12	0	4	8	8	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	12	12
Mine Operations - Haul Truck Operator	8	0	1	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	4
Mine Operations - Dozer Operator	4	0	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mine Operations - Shovel/Excavator Operator	4	0	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mine Maintenance																						
Mine Maintenance - Superintendent	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mine Maintenance - General Foreman	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mine Maintenance - Supervisor	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Mine Maintenance - Planner	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mine Maintenance - Clerk	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mechanic	16	3	7	12	12	12	16	16	16	16	16	16	16	16	16	16	16	16	16	12	16	12
Electrician	4	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Welder/Machinist	4	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Fuel & Lube Technician	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tool crib Attendant	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Maint. Helper	4	0	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mine Geology																						
Geology - Chief Geologist	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Geology - Geologist	2	0	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Geology - Geology Technician	4	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2
Mine Engineering																						
Engineering - Chief Mine Engineer	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Engineering - Short-Term Planning Engineer	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Engineering - Junior Mine Engineer	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Engineering - Technician	4	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Engineering - Clerk	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Table 16.14: Mine Manpower Requirement Summary

Manpower per Department	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Mine Operation	2	47	90	90	90	92	92	92	92	92	92	96	100	100	100	100	100	100	100	102	89
Mine Maintenance	8	20	35	35	35	39	39	39	39	39	39	39	39	39	39	39	39	39	35	39	34
Geology	0	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	5	5
Mine Engineering	2	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	7
Total Workforce	**12**	**80**	**140**	**140**	**140**	**146**	**146**	**146**	**146**	**146**	**146**	**150**	**154**	**154**	**154**	**154**	**154**	**154**	**150**	**154**	**134**

17 RECOVERY METHODS

This section provides a detailed description of the processing plant planned for the James Bay Lithium Project. A process plant schematic diagram is presented in Figure 17.1.

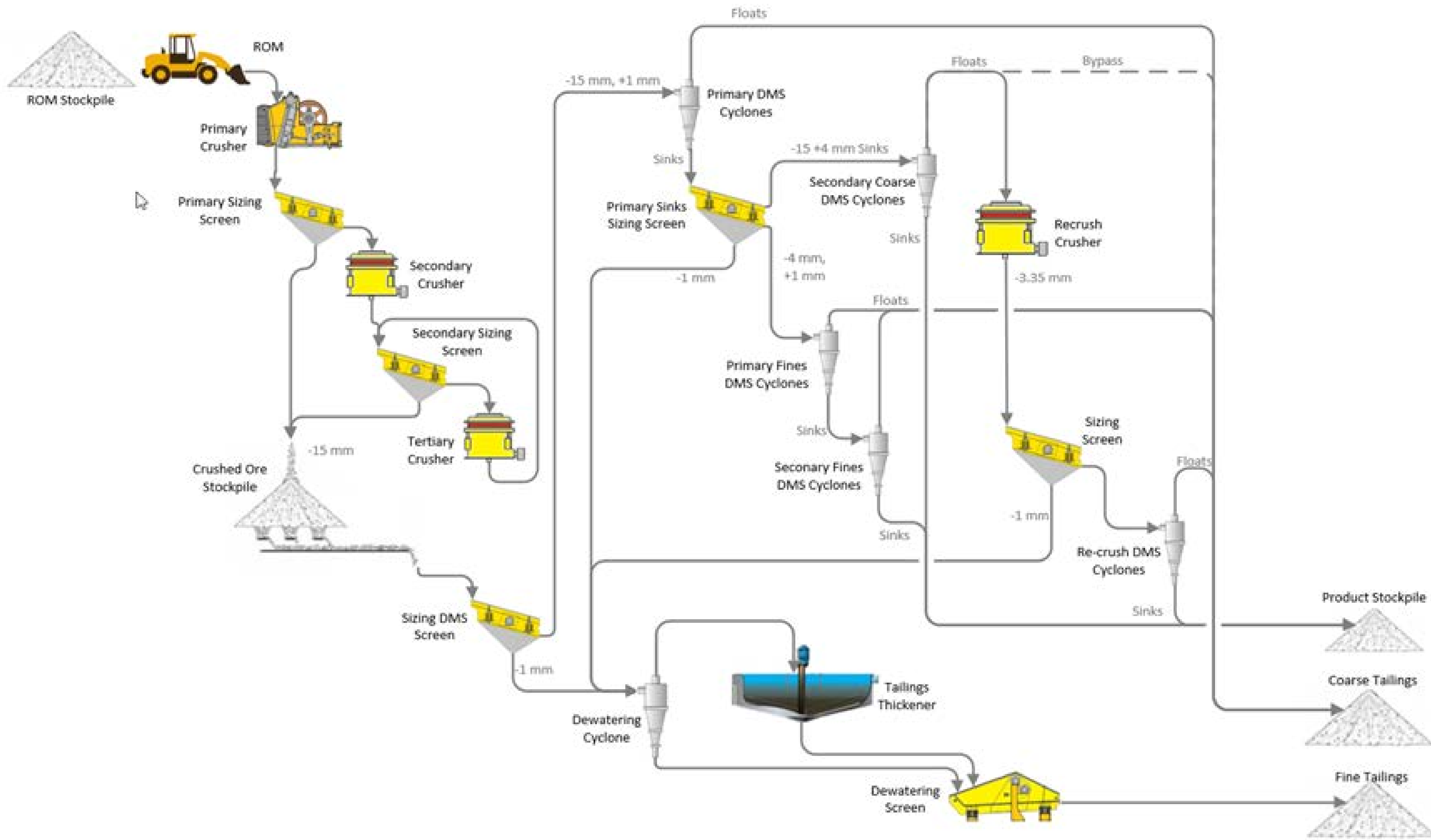
17.1 Facility Description

The process described below was designed with the purpose of upgrading the Li_2O contained in raw pegmatite feedstock into a high grade, high quality Li_2O product with significant commercial value. Based on testwork that supports the current design criteria including detailed mass balance and operating principles, the current flowsheet will produce spodumene concentrate at a grade of 5.6% Li_2O and at a 71.5% recovery in the early years (EY) of the operation and 66.5% recovery in the mid/later (MY/LY) years.

The process consists of the following key areas:

- Run of Mine ("ROM") Pad
- Three stage crushing circuit: Crushing is carried out to reduce the particle size of the ROM and allow increased separation efficiency downstream
- Dense media separation ("DMS"): The DMS stage follows crushing and utilizes the density differences between the various minerals in the feed to separate the gangue from the material of value. See DMS section below for a detailed overview
- Fines tailings dewatering and disposal
- Coarse tailings disposal
- Reagent storage and preparation
- Concentrate handling.

Figure 17.1: Process Plant Schematic Diagram



Source: Wave, 2021

17.2 ROM Pad

17.2.1 ROM Pad Layout

Haul trucks will deliver ROM ore from the pit to the stockpile on the ROM pad where it will be reclaimed by front-end loader (FEL) to feed the crushing circuit. The pad will be sized to allow trucks to be emptied, circulate and for temporary stockpiling before the material is fed into the crusher circuit ROM bin. The pad is sized to be capable of initially accommodating (in the early years) up to 20,000 t of ROM ore.

The in situ specific gravity of the ROM ore is 2.73, with a swell factor of 30%. The bulk density of the mineralized material is estimated at 1.75 t/m^3. The stockpile height will be limited to that required to provide the requisite storage capacity.

A safety berm around the top of the pad will be required to prevent vehicles from falling down the steep grades and to allow segregation of contact stormwater and clean runoff stormwater.

17.2.2 Pad Drainage

The ROM pad design includes an impermeable layer. ROM pad grading will be designed to ensure a maintainable surface that is not subject to flooding or erosion. A minimum 2% downslope grading toward a design sump area will be used so that contact water can be pumped to the raw water pond to be used in the process plant.

17.3 Three Stage Crushing Circuit

The ore from the ROM pile is removed by a FEL and passed through a 700 mm grizzly into the ROM bin. Material that does not pass through is broken down further by a fixed rock breaker. It is then fed onto a vibrating grizzly of aperture 125 mm. The oversize from this vibrating grizzly is broken down by a jaw crusher.

The crushed material from the jaw crusher is fed over a primary sizing screen. This screen is a double deck single-shaft vibrating horizontal screen with top deck aperture size of 24 mm and bottom deck aperture size of 15 mm. Oversize material from the primary sizing screen is crushed in a secondary cone crusher. Crushed material from the secondary crusher is conveyed to a secondary double-deck vibrating horizontal screen identical to the primary screen, with top deck aperture size of 20 mm and bottom deck aperture size of 15 mm. Undersize material from the primary and secondary screens is conveyed to the crushed material stockpile.

Oversize material from the secondary screen is fed through a tertiary cone crusher and conveyed back to the secondary sizing screen. Material is recycled through the crushing circuit this way until it is below 15 mm particle size. The stockpile is covered by a 35 m high structural dome in order to protect the crushed material from outdoor weather conditions, particularly to prevent it from freezing during the colder periods.

The crushed ore is reclaimed using multiple reclaim vibrating pan feeders onto the DMS Sizing Screen Feed conveyor that is located in a tunnel under the stockpile and transfers the material to the DMS area.

17.4 DMS

DMS involves the use of a suspension medium with a high specific gravity. In this process, a Ferrosilicon (FeSi) slurry is used, known as the “correct medium”. The correct medium’s high specific gravity enhances the floatability of the lower density material, which contains the gangue particles. The difference in particle density creates a situation where the lighter gangue floats and the higher density material that contains the valuable minerals sinks. This separation allows the floated lower SG material to be easily removed from the process. The material previously processed through the 3-stage crushing circuit is transferred from the primary stockpile into the DMS sizing screen feed box. Process water is added to the DMS sizing screen feed box to form a slurry. From the feed box the slurry is passed over a double deck vibrating horizontal sizing screen with top deck aperture size of 4 mm and bottom deck aperture size of 1 mm.

17.4.1 Primary DMS

Oversize material (-15 +1 mm) from both sizing screen decks is transferred into the Primary DMS Mixing Boxes 1 and 2, with the +4 mm material being passed through the DMS Oversize Static Grizzly which removes and oversized material. Undersize material from the grizzly is combined with the FeSi correct medium. The -1 mm undersize material from the DMS sizing screen is collected in a hopper and pumped to the tails dewatering cyclones.

Slurry from each of the mixing boxes is pumped into two 510-mm diameter cyclones. The cyclones use centrifugal force to separate the denser particles from the lower density particles. The floats and sinks from the cyclones are then processed through separate floats and sinks drain and rinse screening circuits; first through separate floats and sinks inclined static drain screens with 630 µm aperture size; then passed over separate single deck floats and sinks vibrating screens with aperture size of 630 µm. The undersize stream from both the floats and sinks drain sections is reused as correct medium.

Oversize material from the sinks screen reports to the primary sinks sizing screen which is a double deck vibrating screen. Undersize material from the primary sinks sizing screen is -1000µm and is fed into the DMS dewatering cyclone. The top deck oversize and bottom deck oversize from the double deck screen are separated as coarse and fine material. Both are then processed through separate secondary DMS stages, the process of which is the same as the primary DMS stage.

The primary floats screen oversize reports as tailings and is discharged via tailings conveyors to the tailings stockpile. Before the sinks and floats oversize material is discharged from the vibrating screen, the FeSi is removed by screen water sprays and recovered from the screen undersize material by magnetic separation which allows it to be recycled. This is achieved by passing the material through a magnetic separator, the resulting effluent is then sent to tailings via the DMS dewatering cyclone and the magnetic fractions are sent through a demagnetising coil before being recycled into the circuit.

A bleed of correct medium from the correct medium head boxes containing heavier suspended particles is passed through a de-grit sieve bend via a screen distributor. The sieve bend has an aperture of 600 µm. The undersize is reused as correct medium, the oversize is screened using a single deck high frequency vibrating screen with deck aperture size of 600 µm. Undersize material from this screen is reused as correct medium, oversize is combined with coarse tailings.

17.4.2 Secondary Coarse DMS

The secondary coarse DMS circuit involves pre-mixing of the -15+4 mm primary coarse DMS sinks material with FeSi correct medium before feeding it into a 610 mm diameter cyclone. The floats and sinks from the cyclone are then processed separately through identical screening circuits; first through an inclined static drain screen with 630 µm aperture size; then a single deck vibrating screen with aperture size of 630 µm. Undersize material from both the floats and sinks is reused as correct medium. Oversize material from the coarse sinks is collected and sent via conveyors through to the final product stockpile.

A bleed of correct medium from the correct medium head box containing heavier suspended particles is passed through a de-grit sieve bend via a screen distributor. The sieve bend has an aperture of 600 µm. The undersize is reused as correct medium, the oversize is screened using a single deck high frequency vibrating screen with deck aperture size of 600 µm. Undersize material from this screen is reused as correct medium, oversize is collected in bulka-bags and then combined with coarse tailings.

FeSi is recovered from the secondary coarse DMS process using magnetic separators. The effluent is either processed as tailings or used to dilute the correct medium to the appropriate concentration in a hopper. The magnetic fractions are demagnetised by passing through a demagnetising coil and then reused as correct medium.

Oversize material from the secondary coarse floats screen is re-crushed in a the recrush circuit, which includes a cone crusher in closed circuit with a vibrating screen to produce a recrush material to a particle size of 6.3 mm. From here it is conveyed onto a single deck horizontal vibrating screen with a deck aperture of 1 mm. Undersize material from screen is sent to the tailings dewatering cyclone. Oversize material is sent to be processed through the re-crush DMS circuit.

17.4.3 Re-Crush DMS

The Re-crush DMS circuit involves the pre-mixing of the re-crushed -6.3+1 mm material with FeSi correct medium before feeding it into two 420-mm diameter cyclones. The floats and sinks from the cyclones are then processed separately through identical screening circuits. First through an inclined static drain screen with 630 µm aperture size, then a single deck vibrating screen with aperture size of 630 µm. Undersize material from both the floats and sinks is reused as correct medium. Oversize material from the coarse sinks is collected and sent via conveyors through to the final product stockpile.

The re-crush floats screen oversize material reports as coarse tailings and is discharge via coarse tailings conveyors to the coarse tailings stockpile. A bleed of correct medium from the correct medium head box containing heavier suspended particles is passed through a de-grit sieve bend via a screen distributor. The sieve bend has an aperture of 600 µm. The undersize is reused as correct medium, the oversize material is screened using a single deck high frequency vibrating screen with deck aperture size of 600 µm. Undersize material from this screen is reused as correct medium, oversize material is processed as tailings.

FeSi is recovered from the re-crush DMS process using magnetic separators. The effluent is either processed as tailings or used to dilute the correct medium to the appropriate concentration in a hopper. The magnetic fractions are demagnetised in a demagnetising coil and then reused as correct medium.

17.4.4 Secondary Fine DMS

Fine -4+1 mm sinks material from the primary DMS circuit is mixed with additional FeSi correct medium before being fed into a 360 mm fine cyclone. Underflow material (sinks) from the cyclone is screened through an inclined static drain screen with aperture size of 630 µm, where the oversize is then fed through a single deck horizontal vibrating screen with 630 µm aperture size. The undersize from the screen is recycled as correct medium. The oversize is conveyed to the final product stockpile.

Overflow material (floats) from the fine cyclone is screened through a screen circuit identical to the one described above for the cyclone underflow. The undersize material from the single deck horizontal screen is recycled as correct medium, the oversize material is collected and processed as coarse tailings.

A bleed of correct medium from the re-crush circuit and the secondary fine circuit from the respective correct medium head boxes, is fed into a de-grit sieve bend via a feed distributor. The sieve bend has an aperture of 600 µm. Underflow is recycled as correct medium; overflow is screened through a single deck high frequency vibrating screen with screen aperture of 600 µm. Undersize from this screen is collected and reused as correct medium, oversize is processed as tailings.

FeSi is recovered from the secondary fine DMS process using a magnetic separator. The effluent is either processed as tailings or used to dilute the correct medium to the appropriate concentration in a hopper. The magnetic fractions are demagnetised in a demagnetising coil and then reused as correct medium.

17.5 Tailings Processing

Coarse tailings material from various areas of the plant are fed directly onto the coarse tailings stockpile via a transfer conveyor and from there can be removed by FEL and transported to the coarse tailings stack. The sources of coarse tailíngs are listed below:

- Primary coarse DMS floats
- Primary de-grit screen oversize
- Secondary fine DMS/re-crush floats
- Secondary coarse de-grit screen oversize (via bulka bag)
- Secondary fine/re-crush de-grit screen oversize

The fines tailings stream is initially dewatered in two tails dewatering cyclones (duty/standby arrangement). Cyclone underflow reports to the fine tailings dewatering screen and the cyclone overflow to the tailings thickener feed box, where it is mixed with diluted flocculant and fed into a 13-m diameter thickener. The sources of fines tailings are listed below:

- DMS sizing screen undersize
- DMS scavenger magnetic separator effluent
- DMS dewatering cyclone overflow

- Material returned from spillage sumps
- Recrush sizing screen undersize

The tails thickener overflow is collected and re-used as process water.

The thickener underflow solids concentration is approximately 60%w/w and this material is fed onto the fines tailings dewatering screen for further dewatering with the tailings dewatering cyclone underflow stream. The tails dewatering screen is an incline screen that produces a screen oversize with approximately 15% moisture. The screen undersize is recycled back to the dewatering cyclone feed. The screen oversize is conveyed to the fines tailings stockpile and from there can be removed by FEL and transported to the filtered tailings stack.

17.6 Reagents

17.6.1 Flocculant

Flocculant is used as an agglomerating medium in the tails processing area to help separate the water from the solids.

Flocculant is delivered to site in powdered form in 25 kg bags. The bags are lifted manually above the flocculant powder hopper and split. From the hopper the material is discharged into the flocculant heated cone. The powder is then transported into the flocculant mixing tank where it is mixed with raw water and homogenised by a flocculant mixing tank agitator. The resultant solution concentration is about 0.25% w/v. The solution is then stored in the flocculant storage tank.

From the storage tank, the flocculant is sent to the flocculant in-line mixer and then to the tailings thickener by dosing pumps.

17.6.2 Lime

Hydrated lime will be delivered to site in 20 kg bags, and during extended plant outages this is added as required to maintain a pH of greater than 8.5 in the FeSi sumps to prevent corrosion of the FeSi. Nominally 2 kg of hydrated lime per t of FeSi is added, and this is dependent on the initial pH of the FeSi slurry in the sump.

17.7 Other Consumables

Raw water is used in various areas around the plant and provides a source of gland water and fire water to be used in the event of an emergency.

Raw water from a local supply is delivered into the raw/fire water tank which is equipped with a heater to be used as required to ensure the water does not freeze during colder months. Water is discharged from the tank into two streams depending on its downstream use. In the first stream, it feeds into either of the process water tanks and it is also sent to the raw water distribution line.

Water from the tailings thickener overflow is collected in one of two process water tanks and sent through to the process water supply main. Water is also able to be recycled back into process water tanks as required.

Raw water is filtered by one of two gland water filters and collected in the gland water tank. From the gland water tank, the gland water is discharged and distributed into the gland water ring main.

18 PROJECT INFRASTRUCTURE

The following infrastructure facilities will be required for the Project:

- North Water Management Pond (NWMP), East Water Management Pond (EWMP), ROM Water Management Pond and Process Plant Raw Water Pond (RWP)
- Plant substation (69 kV)
- Truckshop
- Accommodation camp, Kitchen and Reception
- Domestic Water Treatment Plant
- Sewage Treatment Plant
- Waste disposal facility
- Fuel Station
- Administration building, laboratory, and emergency services facilities (fire and medical)
- Propane storage and distribution facility
- Explosives storage
- Water Treatment Plant
- Mining material stockpiles and mine waste storage facilities will include:
- Run-of-Mine (ROM) pad and stockpile
- Dome-covered crushed ore stockpile
- Four (4) Waste Rock and dewatered Tailings co-disposal Storage Facility (WRTSF) stockpiles
- Spodumene concentrate stockpile and building
- Coarse and Fine Tailings stockpiles and building
- Overburden and Peat Storage Facility (OPSF)

The Run-of-Mine (ROM) stockpile, tailings stockpiles and spodumene concentrate stockpile will be located adjacent to the process plant.

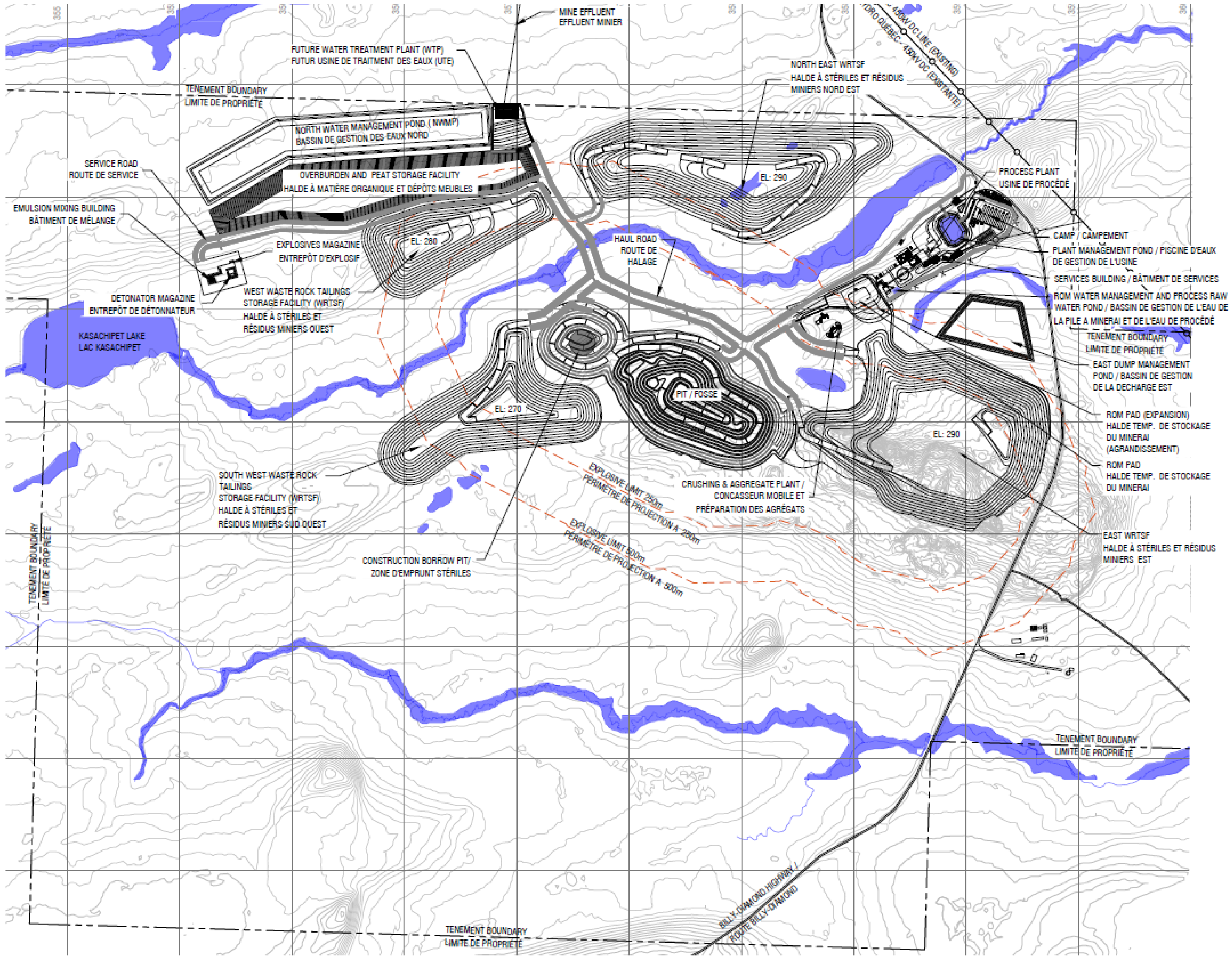
The four (4) WRTSF stockpiles will be constructed around the open pit. The WRTSF stockpile locations were selected to minimize haul distance from the open pit. A surface water drainage network will be built to collect and convey contact water from the ROM and process plant area to the ROM sump, and from the WRTSF and OPSF to one (1) of two (2) water management ponds (WMPs) or to the open pit. The same strategy will be used to manage the surface water run-off (contact water) for all disturbed land. All contact water collected on the mine site will ultimately be transferred by gravity or by pumping to the North WMP. Excess water from the North WMP will be treated for discharge to the CE2 Creek (see Section 18.4.2).

Most on-site work and the locations of the various infrastructure and buildings will comply with the required minimal setback distance of 60 m from the high-water mark of any lake or watercourse. The exception is the haul road required to cross the CE3 Creek.

18.1 General Site Plan

The overall site plan shows the proposed mine pit, process plant, four WRTSF stockpiles, OPSF, WMPs, mining services area as well as access roads (Figure 18.1). The mine site will be accessible from the existing Billy-Diamond Highway (formerly James Bay Road), which runs along the east perimeter of the site.

Figure 18.1: General Site Plan



Mining Services

7900 W. Taschereau Blvd. Suite D-200
Brossard, Qc J4X 1C2

Title: GENERAL PLAN VIEW

Author: P.Gauthier Date: 21-08-25

18.2 Waste Rock and Tailings Storage Facility (WRTSF)

Tailings and waste rock will be co-disposed in four stockpiles referred to as the Waste Rock and Tailings Storage Facility (WRTSF). Co-disposal of dewatered tailings and waste rock offers the following advantages:

Free draining waste rock embankment that does not impound water.

Waste rock embankment zones that improve the physical slope stability of the WRTSF stockpiles.

Accelerated consolidation and improved shear strength of tailings.

Reduced risk of embankment failure and loss of tailings containment.

Reduced total mine waste stockpiled volume due to tailings penetrating into some of the waste rock voids.

Reduced total footprint area for mine waste disposal facilities.

Reduced freeze-drying, dust generation and erosion of tailings.

Improved opportunities for progressive closure.

The storage of waste rock and dewatered tailings will be divided into four (4) distinct management stockpiles designated as the “West”, “North”, “Southwest (JB1)” and “East” WRTSF stockpiles as indicated on Figure 18.1. The WRTSF stockpiles will receive waste rock trucked from the open pit and dewatered tailings trucked from the process plant. The WRTSF stockpiles have been designed to accommodate an aggregate total of 31.6 million tonnes (approximately 18.9 million m^3) of dewatered tailings solids and 126.1 million tonnes (approximately 58.4 million m^3) of waste rock. The East WRTSF stockpile will extend into the southeast end of the open pit after it is mined out for in-pit disposal of waste rock only (referred to as the “East Dump Extension”). Approximately 17 million m^3 of waste rock will be disposed in-pit (in the southeast end of the open pit after it is mined out). The WRTSF stockpiles have been designed with associated water management infrastructure including a base drainage rock layer and perimeter water collection ditches reporting to two WMPs and/or the open pit (where water will be pumped to the NWMP). Progressive development (staged construction) of the mine waste and water management facilities has been considered in the design. Design of the WRTSF and WMPs has considered surface water management and slope stability.

The WRTSF stockpiles were designed taking into consideration the site requirements and the design criteria of *Directive 019 sur l'Industrie Minière* (MELCC, 2012) and the Guidelines for preparing mine closure plans in Québec (MERN, 2017). Hydrogeological investigation indicates that the WRTSF foundation soil has sufficiently low permeability to meet the maximum infiltration requirements of Québec Directive 019. The proposed WRTSF stockpile locations were selected to minimize haul distance from the open pit. Figure 18.1 presents the general layout of the site and the four WRTSF stockpiles.

The WRTSF stockpiles are designed to contain two (2) waste streams: waste rock from the open pit and dewatered tailings from the process plant. The ratio of tailings to waste rock is approximately 20% tailings and 80% waste rock by dry mass (24% tailings and 76% waste rock by volume) over the LOM. Approximately 70% of the tailings stream will be classified as coarse tailings (>1 mm) and approximately 30% classified as fine tailings (<1 mm). During the first five years of mine operation all of the fine tailings will be deposited in a single, designated cell within the North WRTSF stockpile for potential future reprocessing. All tailings will be dewatered and compacted into cells within one of the four WRTSF stockpiles. Fine tailings will be prevented from migrating through the external waste rock embankment slopes or base drainage layer by transition rockfill and coarse tailings filter zones. Co-disposal of tailings and waste rock was selected to reduce life cycle cost, improve stockpile slope stability and allow for progressive reclamation. The construction of the WRSTF stockpiles will include a waste rock base drainage layer, perimeter access roads, non-contact water diversion (where required), perimeter contact water collection ditches and sumps. Runoff from the WRTSF stockpiles will be collected by perimeter ditches and conveyed to the WMPs or to the open pit, where water will be pumped to the NWMP. The WMPs will have associated emergency spillways and water pumping infrastructure. From the NWMP, the contact water will either be pumped to the process plant for reuse or treated and discharged to the environment.

18.2.1 Geometry and Location

The WRTSF stockpiles are located within the Project site limits and positioned around the open pit to reduce waste rock haul distance. The WRTSF stockpiles have a combined footprint of approximately 186.7 ha. Table 18.1 summarizes the proposed geometry of the WRTSF stockpiles. The design of the four (4) WRTSF stockpiles considered applicable regulations and current government recommendations, including *Directive 019 sur l'Industrie Minière* (MELCC, 2012) and the Guidelines for Preparing Mine Closure Plans in Québec (MERN, 2017). One of the criteria is that mine waste management facilities must be located 60 m from the high-water mark of natural water courses and water bodies.

Table 18.1: Summary of WRTSF Geometries and Attributes

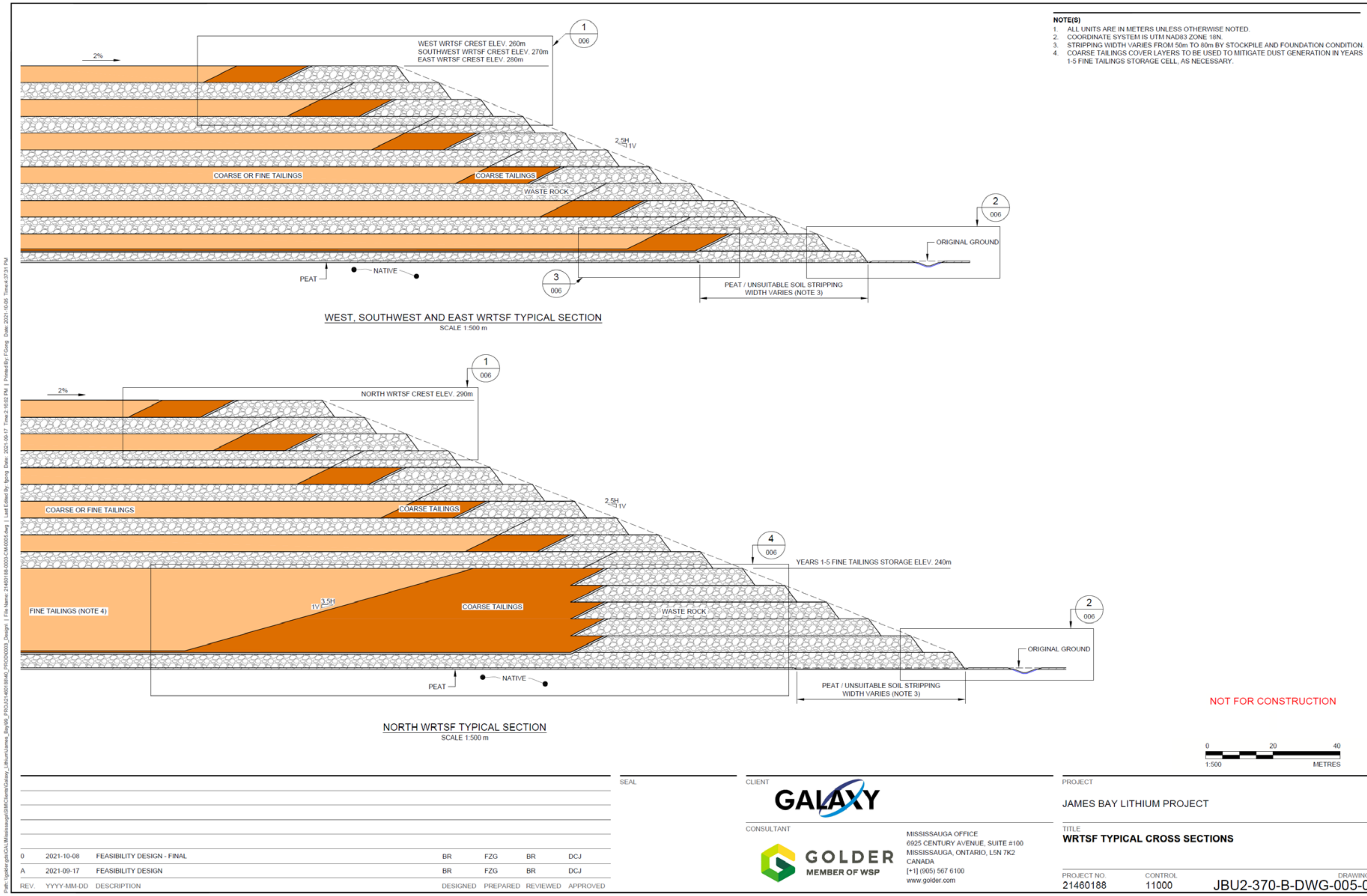
WRTSF	Ultimate Footprint Area (ha)	Ultimate Crest Elevation (masl)	Maximum Final Height (m)	Slope Overall Grade (X H:1V)
West	25.4	280	73	2.5
North	54.4	290	83	2.5
Southwest (JB1)	33.8	270	61	2.5
East	73.1	290	74	2.5

The foundation soils beneath the proposed WRTSF stockpiles primarily consist of granular non-cohesive sand and silt till deposits, with some areas having an upper deposit of low plasticity clayey silt. Based on available investigation data, infiltration rates beneath the WRTSF stockpiles are predicted to be lower than 3.3 L/m^2/day (WSP, 2021), indicating that a geomembrane liner will not be required beneath the WRTSF stockpiles in accordance with Québec Directive 019. Slope stability of the WRTSF slopes has been confirmed based on available geotechnical investigation in the proposed WRTSF areas.

In general, the WRTSF embankment slopes will have an overall grade of 2.5H:1V. The WRTSF embankment slopes will be upstream raised, with 5 m high angle of repose (0.75H:1V) waste rock benches, each having a crest width of 25 m. Tailings and waste rock will be stockpiled upstream of the perimeter waste rock embankment slope in alternating layers to promote drainage. For tailings layers, the area immediately upstream of the waste rock embankment slope will consist of coarse tailings, to provide suitable foundation for future raising of the embankment slope, with both fine and coarse tailings stockpiled interior to this area. A minimum 2.5 m thick waste rock drainage layer will be provided at the base of the WRTSF stockpiles. Transition layers of select/processed waste rock followed by coarse tailings will be placed above the base waste rock drainage layer and on the upstream slopes of the perimeter waste rock embankment at tailings storage areas to provide filter compatibility and prevent the migration of fine tailings. Typical cross-sections of the WRTSF embankment slopes are shown in Figure 18.2 with details shown in Figure 18.3.

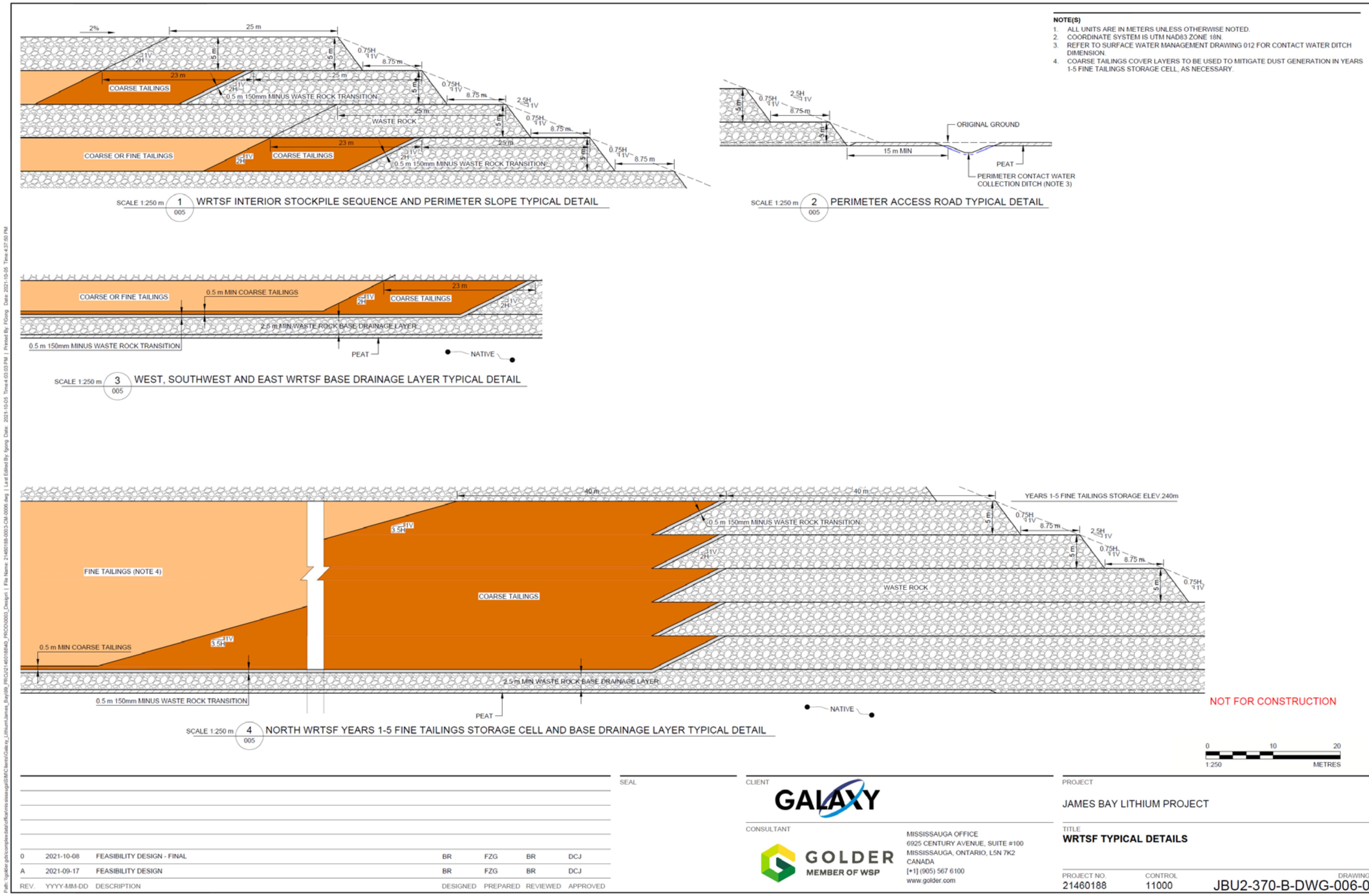
During construction of the WRTSF stockpiles, peat and organic topsoil will be stripped from a 50 to 80 m width (depending on WRTSF foundation conditions and slope stability) beneath each WRTSF toe to improve external embankment slope stability. This material will be temporarily stored downstream of the WRTSF footprints, and used immediately to progressively reclaim the completed lower slopes of the WRTSF stockpiles or hauled to the OPSF.

Figure 18.2: Typical WRTSF Cross-Sections



Source: Golder, 2021

Figure 18.3: WRTSF Details



Source: Golder, 2021

18.2.2 Proposed Equipment

For development of the WRTSF stockpiles, a combination of off-highway trucks (for hauling waste rock and tailings), hydraulic excavators or loaders (for loading waste rock and tailings into trucks), bull dozers (for spreading waste rock and tailings in lifts in the WRTSF stockpiles) and compactors (to compact tailings and waste rock in the WRTSF) will be required.

18.2.3 Tailings Properties

It is estimated that the amount of tailings produced will be approximately 85% of the tonnage of ROM processed due to mineral (i.e., lithium concentrate) recovery. The estimated annual tailings tonnage over the currently proposed life of mine is presented in Table 18.2.

Table 18.2: Annual ROM Production, Tailings, Waste Rock and Overburden

Year	ROM Processed (t)	Tailings Generated (t)	Waste Rock Mined (t)	Overburden Mined (t)
-1	0	0	1,573,612	826,370
1	1,833,600	1,558,560	2,872,040	1,474,176
2	2,000,000	1,700,000	4,808,472	38,698
3	2,000,000	1,700,000	3,914,640	714,460
4	2,000,000	1,700,000	5,795,566	340,040
5	2,000,000	1,700,000	5,848,854	90,718
6	2,000,000	1,700,000	5,923,217	43,843
7	2,000,000	1,700,000	7,425,412	586,840
8	2,000,000	1,700,000	7,982,906	-
9	2,000,000	1,700,000	7,465,445	-
10	2,000,000	1,700,000	7,821,880	85,779
11	2,000,000	1,700,000	8,052,958	-
12	2,000,000	1,700,000	7,001,815	1,350,300
13	2,000,000	1,700,000	8,880,989	11,845
14	2,000,000	1,700,000	9,666,148	-
15	2,000,000	1,700,000	8,850,306	-
16	2,000,000	1,700,000	6,983,293	-
17	2,000,000	1,700,000	6,067,160	-
18	2,000,000	1,700,000	6,163,551	-
19	1,281,474	1,089,253	2,930,964	-
20	55,986	47,588	97,108	-
Total	37,171,061	31,595,402	126,126,337	5,563,070
Bulk Density (t/m^3)		1.67	2.16	1.8
Total Volume (m^3)		18,938,976	58,391,823	3,090,594

James Bay Lithium Mine Project tailings samples were geochemically characterized (WSP, 2018a) and are non-potentially acid generating (non-PAG) (see Section 18.2.7.3 for further tailings geochemistry discussion). The tailings will be separated into coarse (>1 mm) and fine (<1 mm) streams during processing, prior to filtering and disposal in the WRTSF, with an anticipated distribution of approximately 70% coarse tailings and 30% fine tailings (by mass). The coarse tailings are anticipated to consist of fine gravel to medium sand sized particles, with a maximum particle size of 15 mm and having a grain size distribution of approximately 45% gravel and 55% sand sized particles. The fine tailings are anticipated to consist of medium sand to silt sized particles with a grain size distribution of approximately 98% to 84% sand sized particles (4.75 mm to 0.075 mm) and 2% to 16% fines (<0.075 mm).

The moisture content of the dewatered tailings from the process plant was estimated by Wave to be 5% and 15% by total mass for the coarse and fine tailings, respectively. For the tailings to achieve long term strength parameters and not be susceptible to liquefaction, it is critical that the tailings be sufficiently dewatered to permit adequate compaction during placement in the WRTSF stockpiles. For the purposes of calculating placed tailings volume in the WRTSF stockpiles, a dry density of 1.7 t/m^3 and 1.6 t/m^3 has been assumed for the coarse and fine tailings, respectively. This corresponds to void ratios of 0.61 and 0.71 (coarse and fine tailings) for a tailings' specific gravity of 2.73. Confirmation of the optimum water content and dry density of the placed tailings will be required during the next phase of study.

18.2.4 Waste Rock Properties

The anticipated amount of waste rock produced during each year of mine operation was provided by GMS and the tonnage is presented in Table 18.2 (above).

Waste rock was previously geochemically characterized (WSP, 2018a) and determined to be non-PAG but metal leaching over the short-term only (see Section 18.2.7.1 for further waste rock geochemistry discussion). The waste rock is expected to consist of particles ranging from 50 mm to a maximum of 1000 mm in diameter with a D50 of about 2,250 mm (average size). The unit weight of compacted waste rock in the WRTSF stockpiles was assumed to be 2.16 t/m^3. The moisture content of waste rock excavated from the open pit and hauled to the WRTSF stockpiles was estimated to be 3% by weight.

18.2.5 Design Criteria

The WRTSF and WMP embankments were classified using the Canadian Dam Association (CDA) "Dam Safety Guidelines" (2013) and "Application of Dam Safety Guidelines to Mining Dams" (2019). Hazard classification determines the design criteria for slope stability, design floods and design earthquake levels. The WRTSF and WMP embankments were classified as having a "Significant" consequence of failure because there is no downstream population at risk (i.e., temporary workers only), failure would not result in significant loss of important fish or wildlife habitat and restoration or compensation of fish or wildlife habitat is expected to be possible. In accordance with Quebec's Directive 019, the design earthquake annual exceedance probability (AEP) was defined as 1/2,475 years, which exceeds the CDA requirement of between 1/100 and 1/1000 for a “Significant” dam hazard classification during operation and satisfies the CDA requirement of 1/2,475 during closure. The 1/2,475 AEP design earthquake for the James Bay Lithium Mine Project site has an associated Peak Ground Acceleration (PGA) value of 0.038 g obtained from the National Building Code of Canada seismic hazard database (NRCC, 2015).

Table 18.3 summarizes minimum Factor of Safety (FoS) values for WRTSF embankment slope stability recommended in applicable CDA Guidelines and Quebec’s Directive 019. For mine closure, reclamation of the WRTSF surface will be required. The Guidelines for Preparing Mine Closure Plans in Québec (MERN, 2017) recommend minimum FoS values consistent with those outlined in Table 18.3.

Table 18.3: Minimum Factors of Safety for WRTSF Slope Stability

Loading Condition	Minimum Factor of Safety
Short-term	1.3
Long-term	1.5
Pseudo-static	1.1
Post-earthquake (where applicable)	1.3

Slope stability results are presented and discussed in the Mine Waste Front End Engineering Design Report (Golder, 2021). Stability criteria for the overall WRTSF embankment slopes were satisfied.

18.2.6 Development Plan

Tailings and the waste rock will be co-disposed within the WRTSF, with dewatered tailings placed and compacted into cells contained within a waste rock embankment. Table 18.4 presents the cumulative production volumes of waste rock and tailings over the life of the Project, using dry density parameters discussed earlier. Table 18.4 also designates which WRTSF will receive tailings during each year of mine operation and the WMP that will collect contact water.

Table 18.4 : Waste Rock and Tailings Volumes by Year

Year	Waste Rock Volume (m^3)	Tailings Volume (m^3)	Coarse Tailings Volume (m^3)	Fine Tailings Volume (m^3)	WRTSF Receiving Tailings	WRTSF Receiving Waste Rock	WMP Receiving Runoff from Active WRTSF
-1	728,524	-	-	-	-	North	-

1	1,329,648	934,236	637,840	296,396	North	North	North WMP
2	2,226,144	1,019,018	695,724	323,294	North	North	North WMP
3	1,812,333	1,019,018	695,724	323,294	North and West	North and West	North WMP
4	2,683,132	1,019,018	695,724	323,294	North and West	North and West	North WMP
5	2,707,803	1,019,018	695,724	323,294	North and West	North and West	North WMP
6	2,742,231	1,019,018	695,724	323,294	West	East and West	North WMP and East WMP
7	3,437,691	1,019,018	695,724	323,294	East	Southwest and East	North WMP and East WMP
8	3,695,790	1,019,018	695,724	323,294	Southwest and East	Southwest and East	North WMP and East WMP
9	3,456,225	1,019,018	695,724	323,294	Southwest and East	Southwest and East	North WMP and East WMP
10	3,621,241	1,019,018	695,724	323,294	Southwest and East	North, Southwest and East (JB3 in-pit)	North WMP and East WMP
11	3,728,221	1,019,018	695,724	323,294	North, Southwest and East	North, Southwest and East (JB3 in-pit)	North WMP and East WMP
12	3,241,581	1,019,018	695,724	323,294	North and South	North, Southwest and East (JB3 in-pit)	North WMP and East WMP
13	4,111,569	1,019,018	695,724	323,294	North	North, Southwest and East (JB3 in-pit)	North WMP and East WMP
14	4,475,069	1,019,018	695,724	323,294	North	North, Southwest and East (JB3 in-pit)	North WMP and East WMP
15	4,097,364	1,019,018	695,724	323,294	North	North, Southwest and East (JB3 in-pit)	North WMP and East WMP
16	3,233,006	1,019,018	695,724	323,294	Southwest and East	Southwest and East (JB3 in-pit)	North WMP and East WMP
17	2,808,870	1,019,018	695,724	323,294	East	East	North WMP and East WMP
18	2,853,495	1,019,018	695,724	323,294	East	East	North WMP and East WMP
19	1,356,928	652,922	445,776	207,146	East	East	North WMP and East WMP
20	44,957	28,525	19,475	9,050	East	East	North WMP and East WMP
Total	**58,391,822**	**18,938,976**	**12,930,394**	**6,008,582**	**-**	**-**	**-**

The following is a summary of development and operation of the WRTSF and WMPs:

Pre-Production (Year -1): Under the proposed development plan, the North WMP will need to be constructed in the pre-production period (i.e., Year -1). Waste rock mined during the pre-production period will be used to construct the base drainage layer and initial waste rock perimeter embankment slopes for the North WRTSF stockpile. Overburden from pit stripping, North WRTSF foundation preparation and site development will be placed in the OPSF with runoff being collected in the NWMP.

Start-up and Fine Tailings Segregation (Years 1 through 5): In Years 1 through 5 of mine operation, waste rock placement will occur at both the North and West WRTSF stockpiles, including construction of the perimeter embankment slopes and West WRTSF base drainage layer. Fine tailings will be placed within a single large interior cell at the North WRTSF, provided to accommodate potential future reprocessing of the fine tailings. Coarse tailings will be placed in North WRTSF as required to support the fine tailings cell, with surplus material placed within the West WRTSF. Overburden from the West WRTSF foundation preparation will be placed in the OPSF. Contact water from the North and West WRTSF and the OPSF will be collected in the NWMP. The East WMP will need to be constructed prior to the end of Year 5 (i.e., prior to development of the East WRTSF in Year 6).

Potential Fine Tailings Reprocessing (Years 6 through 10): During Years 6 through 10 of mine operation, waste rock, coarse tailings and fine tailings will be placed within the West, Southwest and East WRTSF stockpiles, including construction of the waste rock perimeter embankment slopes and Southwest and East WRTSF stockpiles base drainage layers. No placement is anticipated in the North WRTSF during this period in order to maintain the fine tailings stockpiled during Years 1 through 5 accessible for potential reprocessing. The West WRTSF is anticipated to reach its ultimate design limits during this period. Overburden from the Southwest and East WRTSF foundation preparation will be placed in the OPSF. Contact water from North and West WRTSF stockpiles and the OPSF will continue to be collected in the NWMP. Contact water from the Southwest WRTSF stockpile will drain to the open pit where it will be pumped to the NWMP. Contact water from the East WRTSF stockpile will drain to the EWMP (to the north), and to the open pit (to the south) where it will be pumped to the NWMP.

Years 11 through 16: During Years 11 through 16 of mine operation, waste rock, coarse tailings and fine tailings will be placed within the North, Southwest and East WRTSF stockpiles, including continued construction of the waste rock perimeter embankment slopes. Development of the North WRTSF will continue above its single large interior fine tailings cell (after the fine tailings have either been reprocessed or deemed un-economical). The North and Southwest WRTSF stockpiles are anticipated to reach their ultimate design limits during this period. In-pit filling of JB-3 with waste rock will occur during this period. Contact water from the WRTSF stockpiles and OPSF will continue to be collected in the NWMP, EWMP or open pit where it will be pumped to the NWMP.

Years 17 through 20: During the final years of mine operation, waste rock, coarse tailings and fine tailings will be placed within the East WRTSF, extended above the infilled open pit JB-3 (“East WRTSF extension”). There will also be some waste rock placement in the other WRTSF stockpiles to cover any exposed tailings and achieve the required external waste rock embankment slopes. Runoff from the OPSF, West WRTSF and North WRTSF will drain to the NWMP. The EWMP will continue to collect contact water from the north and east sides of the East WRTSF. Runoff from the Southwest WRTSF and south side of the East WRTSF will continue to drain to the open pit and be pumped to the NWMP.

After the planned footprint of each WRTSF stockpile has been developed to the full extent (i.e., completion of the base waste rock drainage layer), waste rock will then be used to construct perimeter embankment slopes, internal haul roads and alternating drainage layers, to accommodate internal tailings disposal in successive lifts across the entire WRTSF plateau surface to the maximum elevations outlined in Table 18.1, and as per the typical geometry illustrated on Figures 18.2 and 18.3.

Initial WRTSF footprint development, including drainage layer construction and lower perimeter berm raise construction, will have to be carried out carefully to prevent localized failure of any underlying clayey soil foundation, where present. Clayey soil layers encountered during geotechnical investigations of the foundations of the WRTSF stockpiles were relatively thin. Excess pore water pressure in the foundation soils resulting from WRTSF fill placement are expected to partially dissipate over the duration of the WRTSF development. The development and dissipation of excess pore water pressures will be monitored during construction. Should excess pore water pressure locally exceed anticipated levels, stockpile operations will be temporarily relocated to a different area or to a different WRTSF stockpile, allowing additional time for excess pore pressure dissipation. Stability analyses indicate that a 2.5 H:1V overall slope will provide stable external WRTSF slopes. The foundation consolidation assessment, benching design and inter-bench slopes for progressive development of the WRTSF stockpiles should be further optimized during the next phase of study, following completion of additional site characterization work (e.g., field investigation and laboratory testing). The ultimate WRTSF development plan is illustrated on Figure 18.1.

18.2.7 Geochemical Characterization

18.2.7.1 Waste Rock

Four main lithologies were targeted for the geochemical characterization of waste rock: one (1) pegmatite waste rock unit (I1G), gneiss (M1) and banded gneiss units (M2) and one (1) unit of mafic volcanic rock (V3) which included the basalt unit (V3B). The economic material is associated with spodumene, which occurs in large crystals in pegmatite intrusions and is also part of unit I1G. A total of 81 samples were tested for static parameters, including modified acid base accounting (MABA), available metal content and Toxicity Characteristic Leachate Procedure leaching test was performed on all the samples for which the available metal content exceeded criteria “A” in the *Guide d’intervention - Protection des sols et réhabilitation des terrains contaminés* (Beaulieu, 2016) to determine the mobility of inorganic analytes.

The results of the static MABA testing indicated a total sulphur concentration of less than 0.3% for all the waste rock samples of units I1 G and V3B, therefore a non-PAG classification is applicable under D019. However, 30% of the samples of unit M1 and 50% of the samples of unit M2 are classified as potentially acid generating (PAG) under D019, and waste rock of these lithologies is therefore considered PAG. The leachable species identified in the testing include As, Ag, Ba, Cd, Cu, Mn, Ni, Pb, Zn. The results of these analyses show that all the waste rock is considered “low risk” under the D019, however the waste rock is leachable on short-term only to varying degrees under this same directive according to the TCLP results.

18.2.7.2 Pegmatite

The results of the MABA static test indicated that 79% of the samples are considered non-PAG and 21% are considered PAG under D019. Leachable species identified include Ag, As, Cd, Cu, Hg, Ni, Pb and Zn.

When compared to the criteria in Table 1 of Appendix II of D019, the results of these analyses show that 96% of the samples analyzed would be considered “low risk” materials. However, the material is considered leachable under the same directive.

18.2.7.3 Tailings

MABA static tests were performed on 12 tailings samples, and total sulfur concentrations were less than 0.3% in all. All samples are therefore classified as non-PAG under D019.

Twelve (12) tailings samples were analyzed for total metal content, and all exceeded at least one of criteria “A” in the ‘Guide d’intervention’. A leaching test was therefore performed on the 12 samples to determine the mobility of inorganic analytes. The results showed that none of the criteria in Table 1 of Appendix II of D019 were exceeded; the risk of the analyzed tailings is therefore classified as “low risk.” However, all the samples analyzed showed exceedances of the RES criteria in the *Guide d’intervention – Protection des sols et réhabilitation des terrains contaminés* (Beaulieu, 2016) for copper and manganese. 33% of the samples exceeded the criteria for cadmium while one sample also exceeded the RES criterion for mercury.

Therefore, according to applicable regulations, the tailings which will be generated on the site would be considered non-PAG, Low Risk under Directive 019, and leachable for cadmium, copper, manganese, mercury and zinc.

18.2.7.4 Conclusion

It is concluded that, in general, the chances of PAG development within the WRTSF (i.e., waste rock and tailings) is very low. Contact water (i.e., runoff) from the WRTSF will be collected in perimeter collection ditches and WMPs. It is anticipated that water treatment will be required to discharge collected contact water from the North WMP. Effluent from the North WMP should be monitored for total suspended solids

(TSS) and the above-mentioned potential contaminants. A groundwater monitoring system (i.e., monitoring wells) will be required downstream of the WRTSF to monitor groundwater quality.

18.3 Overburden and Peat Storage Facility (OPSF)

Site preparation work, including pre-stripping for the open pit, and excavation of the WMPs, will generate overburden soil materials to be managed and stockpiled. The bulk of overburden stripping will be stored in the OPSF located immediately north of the West WRTSF stockpile. The potential for local temporary stockpiling of overburden material adjacent to the WRTSF and WMP downstream slopes to aid in future reclamation should be considered during detailed engineering. (Figure 18.1). Details regarding the design of the OPSF are contained within the Mine Waste Front End Engineering Design Report (Golder, 2021).

Organic soils (primarily peat) and non-organic mineral soil waste are to be stored separately in distinct zones within the OPSF to achieve stable slopes and to support potential reuse at closure. The OPSF will be located immediately upstream of the North WMP, with the overall surface drainage directed to the latter.

It is estimated that the OPSF will need to store a total of approximately 4.1 mm^3 of waste materials (7.3 Mt at 1.8 t/m^3), of which approximately 1.2 mm^3 is anticipated to be organic topsoil and peat. The total storage capacity of the OPSF considers an assumed 0.9 mm^3 of overburden materials that will be utilized for progressive reclamation of the WRTSF stockpiles over the LOM. A total storage capacity of approximately2.8 mm^3 is anticipated to be required in the OPSF through the end of Year 3. The OPSF will be developed in a phased approach, with Phase 1 being constructed to manage overburden waste generated from Years 1 to 3 of development and Phase 2 for the remaining balance of the LOM.

The main features of the OPSF design are as follows:

- The OPSF will have a 16 m wide perimeter waste rock haul road toe berm. Peat will be excavated from a 15 m wide strip around the perimeter of the OPSF. The perimeter haul road will be constructed at the toe of the OPSF for access prior to waste deposition. The haul road will also act as a toe berm for slope stability purposes. The haul road / toe berm is proposed to be constructed of waste rock with dimensions of 16 m width and 4 m height.

- The slope of the OPSF has been designed at 5H:1V, to a maximum design crest elevation of 223 m (19 m max. height). The slope will be protected with a layer of waste rock erosion protection material. The OPSF will be zoned with fine grained clay / silt waste material being stored internally and granular waste peripherally. The finer clay / silt waste is to be stored a minimum 15 m offset from the slope crest to maintain stability.

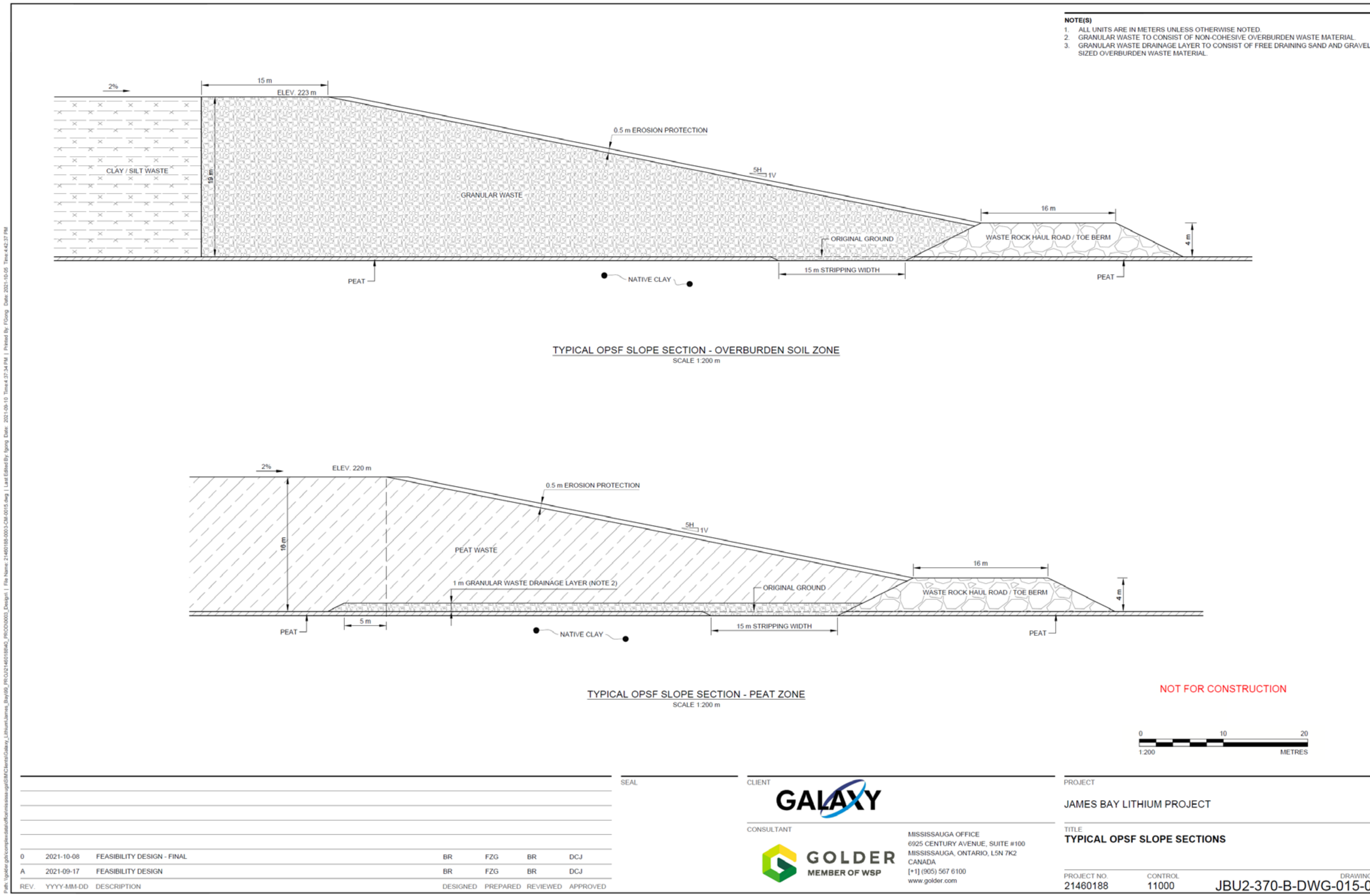
- The peat waste will be stored in its own designated area at the east end of the OPSF, separate from the mineral soil overburden waste (clay / silt and granular materials), to a maximum design crest elevation of 220 m (16 m max. height). A 1.0 m thick granular waste base drainage layer will be provided beneath the peat waste perimeter slope, extending a minimum 5 m interior of the ultimate crest, to provide drainage of excess pore water pressure expected to develop in the underlying foundation clay layers. Monitoring of excess pore water pressures generated in the underlying clay foundation materials during operations will be important to ensure design criteria for slope stability remain satisfied.

- The OPSF will include perimeter ditches at the east and west limits to drain water from the OPSF to the North WMP.

Typical OPSF cross-sections for peat and overburden mineral soils are illustrated on Figure 18.4.

The quantity of peat and overburden soil waste generated is based on the mining plan and construction quantity estimates. The OPSF design is flexible and can accommodate an increase or decrease in storage volume. In the event that additional storage is required, the portion of the southern perimeter of the OPSF which immediately abuts the West WRTSF could be raised with an upper bench or the OPSF could be expanded south to the area immediately west of the West WRTSF.

Figure 18.4: OPSF Slope Sections



Source: Golder, 2021

18.4 Clean Water Diversion and Contact Water Management

18.4.1 Process Plant Water Demand: Operational Procedures

For mining facilities in Northern Québec, where the norm is to maintain a surplus of water, the concerns and risks associated with low water reserves can be mitigated with well-defined operational procedures and controls. The following are recommended:

Commissioning of the mine should occur following the spring melt period (late May to early June), when sufficient runoff is produced to meet operational needs without requiring supplemental water sources. The risks due to inadequate water reserves can be further mitigated by completing construction of the North WMP during the summer prior to plant start-up, allowing for an accumulation of stormwater.

Additional quantities of water should be reserved in the North WMP prior to the onset of winter to account for losses due to surficial ice formation for a prolonged period (typically from November to May) where precipitation ceases to augment reserves.

The design of the North WMP considers a minimum water reserve for the process plant supply in case of a late spring freshet equal to 60 days of water demand (21,600 m^3 at 15 m^3/h plant water demand).

The results from the water balance model (Golder, 2021) determined that the NWMP can meet the process plant make-up water requirements. The annual water balance is positive even during dry historical years, and the process plant demand could be supplied by the site runoff and pit dewatering flows. Effluent is expected to be discharged to the environment even under dry scenarios. During the next phase, a water management protocol should be developed to further assess the potential risks associated with a prolonged dry season or prolonged winter period and identify viable options to ensure a constant supply of water.

18.4.2 Water Management Infrastructure

All runoff water generated by precipitation which falls on areas impacted by mining activities is considered “contact water”. Contact water will be collected and retained for settling of sediment and treatment prior to being released to the environment. The current study assumes that an effluent treatment plant will be required. The primary components of the contact water management system include the following:

- North and East WMPs
- Sumps at the process plant area, open pit, and south of the North WRTSF

- ROM pad Pond
- Camp Pond
- Contact water ditches and associated sumps
- Non-contact water diversion berms
- Effluent treatment plant

The WMPs primarily collect contact water from the WRTSF and OPSF. The site-wide water balance and the sizing of the WMPs have been updated for the Front End Engineering Design Report (Golder, 2021). The North WMP will serve as the main retention basin for all contact water from the WRTSF and remainder of the site (i.e., water drained by gravity or pumped from sumps at the process plant area, open pit, haul roads, explosives magazine and East WMP) with the exception of runoff from the ROM pad. Runoff from the ROM pad will be directed to the ROM pad Pond and will preferentially be used to supply the process plant. Storm water from the process plant area, haul roads, explosives magazine and other mine infrastructure will be contained and directed to the North WMP.

The North WMP will also serve as main source of raw water to the process plant (in addition to runoff water from the ROM pad). The water used for process plant will be pumped in an underground and/or above ground piping network using dedicated sump pumps located in the basin. A reserve of water will be maintained to ensure a steady, year-round supply. Excess water in the North WMP will be treated and discharged to the environment (to CE-2 Creek) at a controlled effluent point.

The ROM pad Pond will be lined with HDPE geomembrane liner (to be designed during future phases).

Non-contact water will be diverted by a diversion berm around the OPSF to minimize the quantity of contact water being managed in the WMPs, and avoid mixing of natural water with contact water.

Effluent criteria from the Directive 019 and the Metal and Diamond Mining Effluent Regulations (MDMER) will apply to the North WMP discharge point at creek CE-2. All contact water will be contained and treated prior to discharge.

The basis for the sizing of the WMPs is described below.

18.4.2.1 WMP Design Criteria

Regulatory Criteria: Design Flood Management

As specified in *Directive 019 sur l'industrie minière*, all impoundment dykes with water retention associated with tailings storage facilities must be designed to allow the containment (storage) of the design flood event, defined as the contact water volume generated by a 30-day snowmelt from a snow accumulation with a return period of 100 years, combined with the contact water volume generated by a 24-hour rainfall event with a return period of 1,000 years. The WMPs design will allow the containment of the design flood for each staging interval.

Regulatory Criteria: Freeboard

A freeboard of 1.0 m from the design flood maximum water level and the dyke crest will be maintained as recommended by *Directive 019 sur l'industrie minière*.

Regulatory Criteria: Inflow Design Flood

As specified in *Directive 019 sur l'industrie minière*, both WMPs will have an emergency spillway designed to safely convey a probable maximum flood (PMF), estimated based on the probable maximum precipitation (PMP).

Operational Criteria: Winter Availability of Process Water

Sufficient process water is to be available under ice cover (assumed to be 1.5 m thick) for the winter months. Plant demand has been estimated by Wave at 15 m^3/h to be continually available for processing requirements.

18.4.2.2 Input Data

Weather Data

Table 18.5 provides the extreme weather data pertinent to the estimation of the design flood, which are estimated based on historical climate data statistics from the La Grande Rivière Airport weather station, located approximately 160 km north from the project site.

To consider the impact of climate change, design of water management structures (e.g., spillways, ditches, culverts and ponds) utilized the 24-hour design storm event based on historical climate statistics which was increased by 18%, as recommended by the Province of Québec Ministère de l'Environnement et de la Lutte contre les Changements Climatiques (MELCC, 2020).

Table 18.5: Extreme Event Statistics Considered for the Preliminary Design of Water Management Infrastructure for the James Bay Lithium Project

Data Description	Unit	Value
100-Year 24-Hour Rainfall	mm	95.3
1,000-Year 24-Hour Rainfall	mm	121.2
100-Year Snow Accumulation	mm of Water Equivalent	350.0
Probable Maximum Precipitation	mm	389.4

** Source. Golder, 2021.*

18.4.3 Design Assumptions

The following assumptions were used for sizing the WMPs:

The estimation of the design flood volume considers the following volumetric runoff coefficients based on the designer experience on similar projects:

- 0.55 for the WRTSF and OPSF.
- 0.80 for the open pit.
- 0.65 for haul roads.
- 0.70 for the ROM pad, process plant, explosives magazine and effluent treatment plan areas.
- 1.0 (no losses) for the pond area.

The dead storage (volume beneath the pump's intake) of the WMPs is assumed to be negligible.

18.4.3.1 WMP Design Configuration

Contact water from the WRTSF and OPSF will be collected in perimeter ditches that drain to either the North WMP, East WMP or open pit mine. Water collected in the East WMP and open pit mine will be pumped to the North WMP. The North WMP must be constructed prior to commencement of operations (i.e., Year -1). Construction of the East WMP must be constructed prior to Year 6 (i.e., completed in Year 5) when construction of the East WRTSF commences.

The North WMP is located in a low ground flat area with the natural topography elevation around 200 masl. The Dimensions of the North WMP are approximately 1,430 m x 145 m. The dimensions of the East WMP are approximately 400 m x 300 m. Both WMPs will be excavated with low-height dykes constructed around the perimeter to balance cut and fill as much as practical. The estimated storage volumes and corresponding crest elevations for the North WMP and the East WMP are summarized in Table 18.6. Figure 18.5 illustrates the plan view of the North and East WMPs and perimeter water collection ditches. Figure 18.6 presents the typical cross-section of the East WMP and North WMP dykes and the perimeter water collection ditch.

Table 18.6: Design of the North and East Water Management Ponds

Description	North WMP	East WMP
Required Water Storage Volume (m^3)	1,220,000	180,000
Dyke Crest Elevation (masl)	206.2	213.0

A deterministic water balance model for the project site was developed, which simulated the mine operation under 45 years of historical climate conditions (Golder, 2021). The results from the wide water balance model indicate that the average monthly effluent discharge from the North WMP to CE-2 Creek varies from about 62,000 m^3/month for Year 1 to about 116,700 m^3/month for Year 12, with a monthly peak discharge of about 458,300 m^3/month (625 m^3/h) in July of Year 19. Table 18.7 presents the estimated monthly effluent discharge volumes from the North WMP to CE-2 Creek for operational Year 19.

Table 18.7 presents the calculated North WMP monthly average, minimum and maximum storage volumes for the 45 climate realizations of the balance model (Golder, 2021).

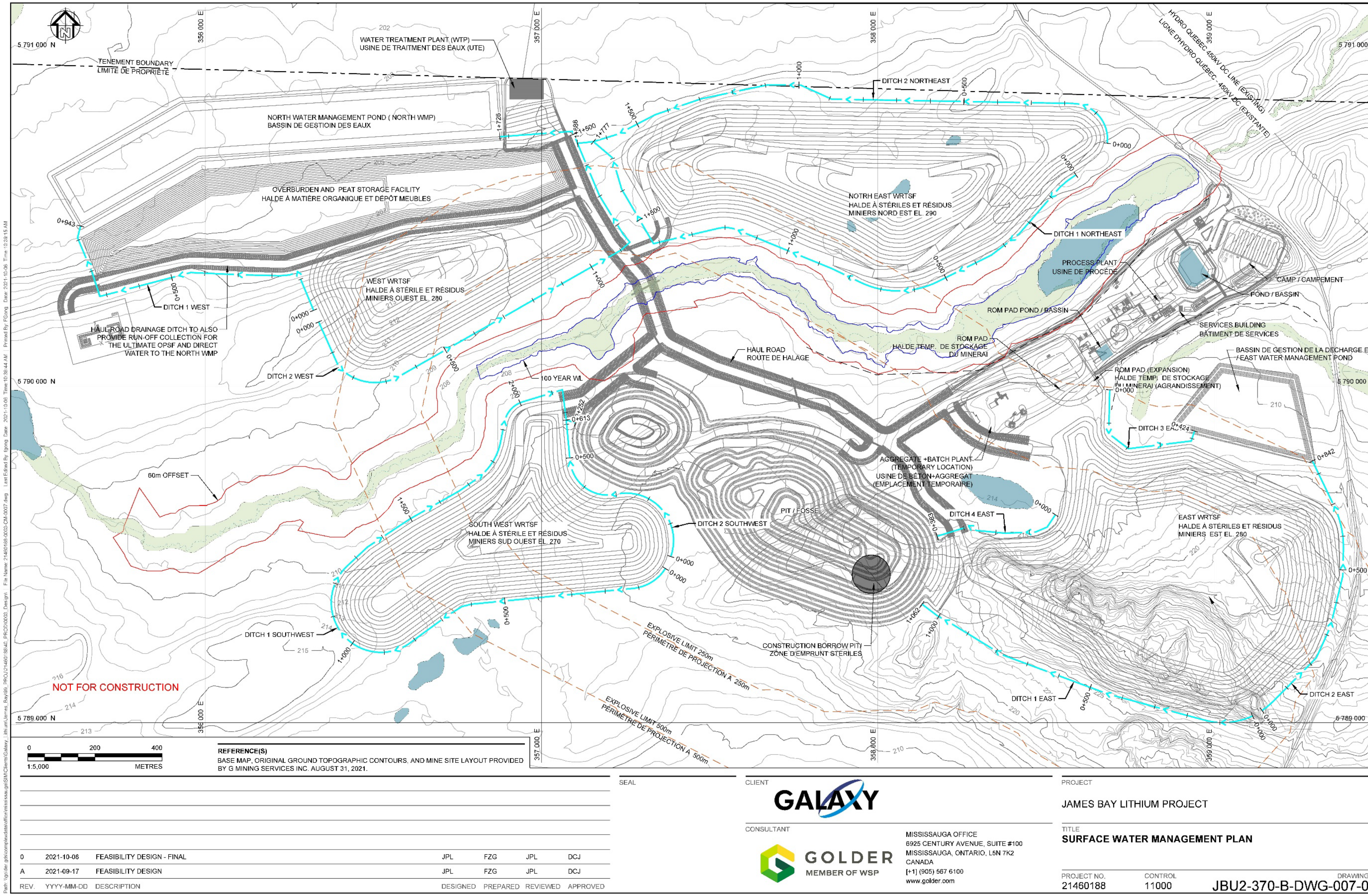
Table 18.7: Year 19 Monthly Effluent Discharge Rate from the North Water Management Pond to CE2 Creek

Month	Effluent Discharge Rate Based on 45 Climate Realizations (m^3)		
	Average	Minimum *	Maximum *
January	62,750	59,140	73,920
February	65,050	59,140	73,920
March	65,050	59,140	73,920
April	71,950	59,140	443,530
May	1,640	0	44,350
June	209,650	0	443,530
July	268,420	14,780	458,320
August	102,830	29,570	206,980
September	225,710	73,920	428,750
October	165,260	0	384,390
November	6,900	0	14,780
December	59,790	44,350	73,920

** Minimum or maximum values for the different months do not occur in the same climate realization.*

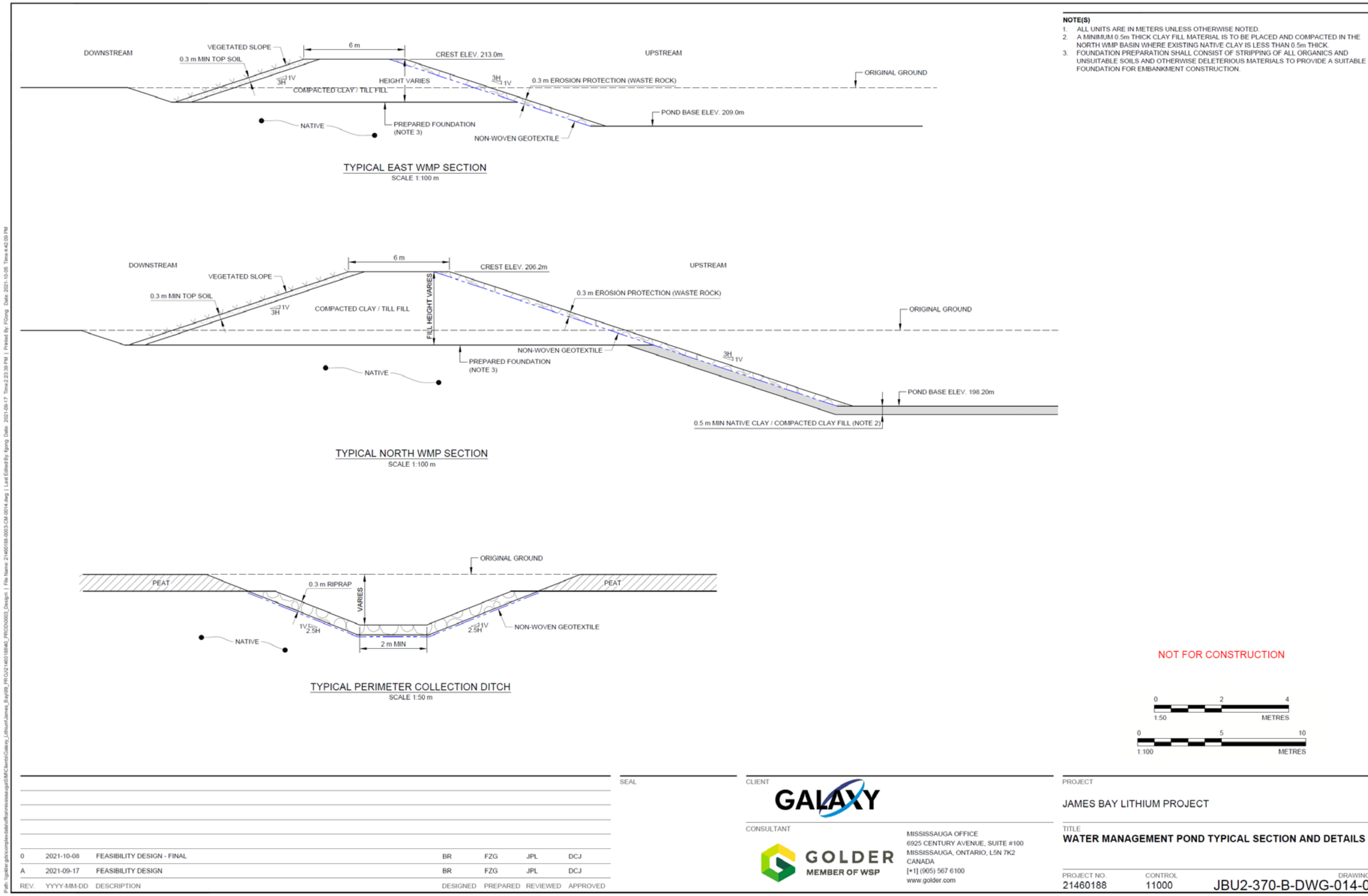
*** Source. Golder, 2021.*

Figure 18.5: Surface Water Management General Arrangement Plan



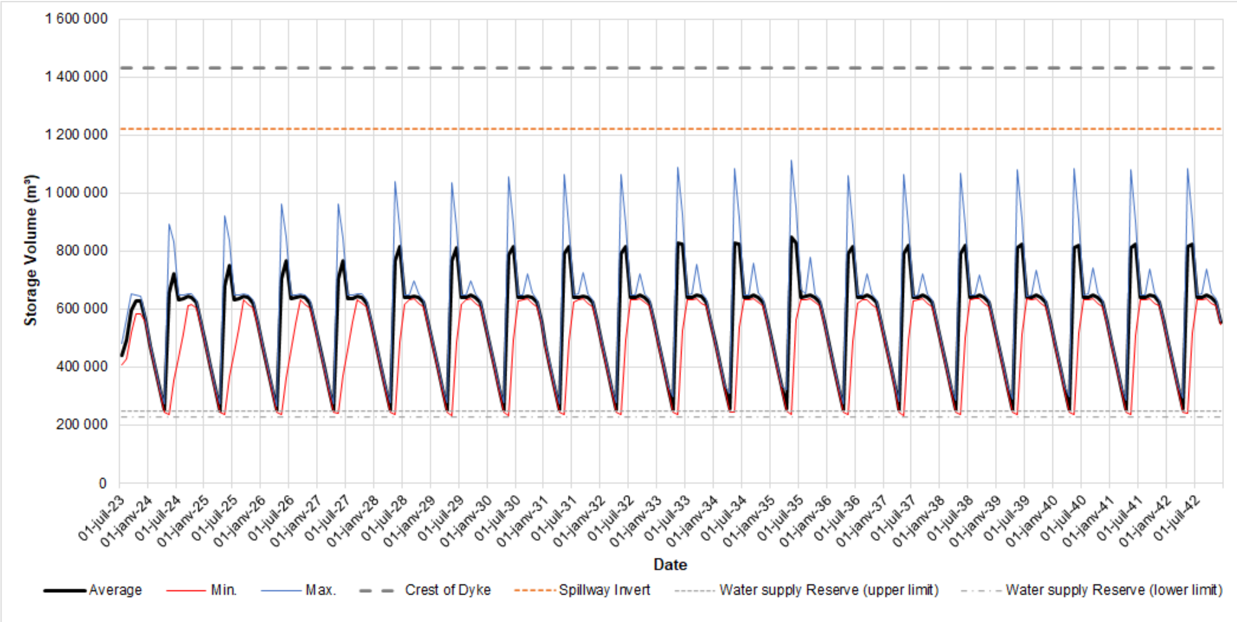
Source: Golder, 2021

Figure 18.6: Water Management Pond Typical Sections



Source: Golder, 2021

Figure 18.7: Monthly North Water Management Pond Water Volume



Source: Golder, 2021

18.4.3.2 Stormwater Network Design Criteria

As per the overall water management strategy, surface water infrastructure will be built to collect seepage and runoff from the WRTSF and OPSF, which includes 10 collections ditches, sumps (one south of North WRTSF and two in open pit) and associated pump/pipeline systems. The 10 collection ditches collectively will have a total length of about 11.7 km.

As recommended by *Directive 019 sur l'industrie minière*, collection ditches and sumps around WRTSF and OPSF were designed to manage a 100-year design flood without overflow to the environment.

The design of collection ditches considered a minimum freeboard of 0.5 m above the maximum water level. Collection ditches will have a trapezoidal section with side slopes of 2.5H:1V, and will be armoured with rip-rap to protect the ditch against erosion.

18.5 Fresh Water and Potable Water

18.5.1 Fresh Water

The fresh water will come from water wells located nearby and will be transported by above ground heat traced piping to the potable water treatment plant. Two parallel pumps will be installed in a pump house, one pump on duty and one in duty or standby mode to accommodate peak demand flows.

18.5.2 Potable Water

Potable water treatment plan will be fed continuously by fresh water. Buffer tanks will be installed. The potable treatment plant includes a filtration system module, reverse osmosis module, ultraviolet module and chlorination module. A distribution pump will ensure the supply of the potable water throughout the various buildings. The potable water treatment building is modular and additional filtration modules can be added in future years.

18.6 Roads

The following plant roads were considered in the study:

- Site Entrance West to the Billy-Diamond Highway (formerly James Bay Road) (12 m wide, unpaved)
- Explosives magazine and North Water Management Service Pond access road (6 m wide, unpaved)
- Haul roads to different deposition sites (including the ROM pad (20.1 m wide, unpaved)
- Haul road from tailings loadout, truckshop and Fuel bay Access near the processing plant to the WRTSF and Main Haul Road (20.1 m wide, unpaved)
- In-plant roads

18.7 Earthworks and Buried Services

Planned earthworks include construction of plant pads designed to allow collection and discharge of contact stormwater to the process plant raw water pond. Plant pads will consist of base surface of crushed granular material surface on a natural granular subbase.

Perimeter contact water ditches and proper grading on the process plant platform are provided on the plant earthwork pads. The natural topography facilitates gravitational drainage of the surface water to a main event pond on the process plant. Some collection ponds may be required following the detailed phase.

Buried services include the following:

- Stormwater pumping network piping
- Electrical cable

Some of those services, notably around the camp facilities will be construct above ground with heat tracing and proper associated insulation

18.8 Power and Control

18.8.1 Power Supply

The process plant and supporting infrastructures will be powered by Hydro-Québec's (HQ) 69 kV overhead distribution system. The 69 kV distribution line is relayed through Hydro-Québec's Muskeg substation and ultimately fed by the Némiscau substation located about 100 km southwest of the Project site. An overhead distribution line extension will be built to the plant substation from the 69 kV line (L-614) located 11 km south of the Project site.

The 69 kV power supply is limited to a capacity of 8 MW due to the sensitivity of the upstream network.

All essential power loads will be supported with emergency power supply available from the emergency diesel generators, in the event of loss of grid power supply.

The estimated plant peak demand load is 11.6 MW, with an average demand load of 9.8 MW. Peak loading figures during operation are expected to be lower considering the loads will not all run concurrently; Furthermore, dual energy heating of site buildings will be employed to reduce electrical loads by up 2.5 MW to meet the limited capacity of the HQ power line.

18.8.2 Plant Substation

The 69 kV distribution line will enter the substation via a dead-end structure. There will be one set of outdoor disconnect switches to isolate the plant from Hydro-Québec's system, and another further down the line to isolate the metering equipment. The plant substation will send real time data back to the utility and will be capable of remote tripping through a live tank circuit breaker. There will be a single 10 MVA oil filled power transformer which steps down the 69 kV to a 4.16 kV switchgear for distribution to the plant. Voltage regulation will be installed for +10/-15% to compensate for the line losses in the supply.

The substation relays, SCADA equipment, communications panel and battery charger systems will be housed in a control building within the substation fence. Power factor correction equipment will be installed to improve the plant power factor as required by Hydro-Québec. In addition, since there is a communication over power line carrier on the 69 kV line, the plant substation is required to be equipped with a resonant circuit.

18.8.3 Electrical Distribution

The main electrical distribution from the plant substation will be a 4.16 kV radial network to the plant and supporting facilities. The voltage will be stepped down to 600 V at each area by 2.5 MVA dry type distribution transformers. The loads from the different facilities are shown in Table 18.8. In case of power outage, a load shedding scheme will be developed to keep all essential loads fed from the same buses and supported by two 1.8 MW at 600 V diesel generators. Dedicated panels and boards will be specified for emergency power. There will be three main electrical switchrooms located in the process plant: substations, crushing and DMS. The other electrical rooms will be integrated to the building's envelope.

Table 18.8: Electrical Load Summary

Description	Power Demand	
	Peak (MW)	Average (MW)
Crushing	1.56	1.35
DMS	2.45	2.28
Tailings, Services & Reagents	0.98	0.84
Water Infrastructures	2.7	2.41
Balance-of-Plant (BOP)	3.89	2.96
Total Power Demand (MW)	**11.58**	**9.84**
Total Power Demand (MWA @ 0.95PF)	**12.48**	**10.61**

Power and control cables will be standardized to stranded copper, aluminium armoured, XLPE insulated, 90 deg rated, PVC sheathed cables. Stranded aluminium conductors could be considered for larger conductor. Cables will be installed on aluminium cable trays whenever possible, segregated by their voltage levels in accordance with CSA standards.

All motors will be connected to 600 V Motor Control Centres. Standard motor starting methods will be limited to Direct Online, Soft-Start Starter and Variable Frequency Drives. Lighting, heat tracing and other small power loads will be fed at appropriate voltage of 600 V or 208-120 V.

18.8.4 Lighting

Plant lighting will be standardized to LED fixtures designed for industrial applications. Lighting levels will be designed to meet Canadian Occupational Health and Safety Regulations, outlined below in Table 18.9. All emergency lighting will be connected to the emergency panels and boards or it will have battery pack or UPS back-up. Emergency lighting shall be installed in the following areas: all egress routes, stair towers, control rooms and diesel generator areas.

Table 18.9: Plant Lighting

Location	Area Description	Lighting Level (lx)	Colour (K)
Outdoor	Conveyor Walkway (open)	50	3000K
	Stair Towers, Elevated Platforms (outdoor)	100	
	Work Areas (with vehicle traffic)	100	
	Building Entrance/Exit (all buildings)	50	
	Substation Area	50	
	Tank Area	50	
	Stockpile Area	10	
	Perimeter Fence – Camps	10	
	Plant Roads and Parking Area	10	
Indoor	High Bay - Process Plant	300	5000K
	High Bay – Warehouses	300	
	12 ft Ceiling – General	300	
	Task Areas	500	
	Control Rooms	300	
	Stair Towers, Elevated Platforms	100	

18.8.5 Control System

The Plant Control System (PCS) is responsible for monitoring all plant equipment and instruments, and for the control of all motor starters. Vendor PLCs might be used for control of certain vendor packages within the plant and will typically only send monitoring and status information to the PCS.

The Operator Control Stations (OCS) located in the control rooms allow processes to be started, controlled, monitored and shut down through the PCS.

Plant PLC processor racks will be in switchrooms except for vendor package PLCs which may be located in field control panels. The PLC hardware and associated code will be divided according to the process areas in a logical manner.

The Main Plant SCADA system hardware shall include a redundant master – follower IO server pair of rack mount SCADA computers located in a communications rack in or near the plant control room. The computers and the control room network equipment shall be powered by a rack mount UPS. Each SCADA computer shall have dual screens. If required, additional SCADA computers will be clients to the main redundant SCADA servers.

18.9 Communications (including IT / IS Interfaces)

Broadband connection will be provided by the local communications vendor, Eeyou Communications Network, via single-mode fibre optic cables. These fibre optic cables will be trenched approximately 2.4 km to the process plant from the km 381 Truck Stop, the closest node. The service will be redundant, low latency, between 1 Mbps to 2 Gbps.

Ethernet communications within the plant facilities to locations outside of the switchroom / control room building shall be interconnected with a multimode fibre optic self-healing ring/mesh. Communications within buildings and panels shall be radial (star) copper CAT5E communications with RJ45 connections. Connections to distant equipment be by single mode fibre optic cable.

The production/processing facilities will be connected to the local site communications network via ethernet links interconnected throughout the production/processing plant buildings.

A dedicated mobile radio system will ensure mobile communication for operations staff and mobile plant equipment, over the mine site and production/processing plant facilities.

18.10 Fuel and Propane Supply

A diesel storage and dispensing facility will be installed and commissioned as soon as practically possible. Until such time, early works contractors will provide their own diesel fuel in approved transport and storage vessels. Lesser fuel requirements may be sourced from the km 381 Truck Stop, but larger requirements (for example bulk earthworks) will need to set-up temporary storage facilities and manage fuel deliveries.

Once the fuel storage and dispensing facility has been installed and commissioned, Galaxy will coordinate the deliveries to site and dispense fuel for all site requirements. All fuel usage will be back charged to the contractors.

The fuel system storage, unloading and distribution facilities will provide uninterrupted diesel fuel supply to the operations and maintenance fleet and equipment. This facility will consist of 2 – 150 000 L self-bunded tanks with a total storage capacity of 300,000 L. The stored diesel amount for 14 days supply of site operation. The design and layout ensure that the mine truck/machinery does fuel on one side of the facility and the light vehicle on the other side.

One propane storage and distribution facility will be installed to provide propane heating for the construction/operations camp. The installation of the camp propane storage facility will be installed and commissioned in time to provide heating to the camp.

For the construction phase, temporary gas-fired heaters for the process buildings (and any other heating requirements) will be used until the plant permanent HVAC installations have been completed.

Another propane storage and distribution facility is planned between the truckshop and the DMS building. This propane source will be used for the HVAC system (air make up), during the cold winter temperature peaks to ensure adequate usage of the electricity grid.

All deliveries of propane to the Project site will be coordinated by the construction team and Galaxy.

18.11 Waste Disposal (Industrial and Camp)

18.11.1 Waste Sources

WSP carried out a preliminary design study (REF:171-026562-01 Engineering Brief – Residual Materials Management) to recommend a suitable waste management plan for the Mine.

It is estimated that 1,015 metric tonnes of residual waste materials will be generated yearly from the planned construction, mine operations and resident workers. A laydown is planned for the waste disposal and sorting. Waste sources include recyclable materials, food waste, hazardous household waste, waste oil, grease and oily water, construction debris and residual hazardous waste.

18.11.2 Treatment and Management

The waste management plan includes collecting, sorting, stabilization, compaction of all generated waste and transport to an offsite waste treatment facility. This plan will ensure that no environmental footprint is left on site nor require the need for post-mine-closure waste management. Special attention must be paid to leachate such as oil, grease and various fluids, which may contaminate the soil and water table. This waste will be stored in an impervious container with liquid retention capacity. A composter mixer is planned for the compostable material such as food and cardboard. The compost will be shipped out of site once sufficient quantity and quality is achieved.

Waste disposal by landfill and incineration was considered. However, this was deemed unsuitable given the small volume of residual materials generated, the significant initial capital investment required, the development of operating systems and the environmental monitoring as required by the MELCC.

Only minor infrastructure will be required for waste management activities on site, namely suitable storage bins, a storage and sorting building (temporary dome type structure) and associated mobile equipment. All infrastructure will be compliant with Quebec legal requirements related to waste management and hazardous materials management.

18.12 Sewage

18.12.1 Design Requirements

The Project plans to develop a camp with a maximum capacity of 280 people during the construction phase, and a capacity of 180 people during operations. The planned accommodations must be provided with a domestic sewage treatment system in compliance with government regulations. WSP carried out a preliminary study to determine the sewage treatment system capacity, to identify feasible treatment technologies and to direct subsequent steps leading to the final choice of technology (Ref: WSP: 171-02562-01 Mine Site Wastewater Treatment System – Engineering Brief).

The sewage treatment system is designed to service the cafeteria and the accommodation camp during the construction phase. Additionally, the system will be designed to service the process plant, truckshop, administration building sanitary for the operations phase.

Sanitary wastewater from the plant facilities will be collected and conveyed to a sewage treatment plant (STP) using an aboveground piping network within enclosed structures. The STP will be located within the site accommodation camp area. STP solids waste removal will be by a specialised pump truck service as required. The treated water discharge point is at the same discharge of the mine water treatment plant. The water will be transported by above ground heat traced piping.

The estimated capacity of the sewage treatment system was determined as follows:

Construction Phase:

Number of people: 280

Total flow – camp: 280 people x 200 l/per/d= 56,000 l/d

Total flow – cafeteria: 12 l/meal x {(280 x 1.0) + (280 x 0.2) + (280 x 1.0)} = 7,392 l/d

Operations Phase:

Number of people: 180

Total flow – camp, process plant facilities with sanitary blocks: 180 people x 200 l/per/d = 36,000 l/d

The flow generated by the cafeteria (7,392 l/d) will be used for the sizing of the grease trap (required for kitchen wastewater). The grease trap will have a volume of 14,800 l and will be installed during the construction Phase and remain in place for the operations phase.

18.13 Fire Protection

The Fire Protection Design Basis defines the fire detection and protection system for the concentrator plant, including the fire water supply, fire main, automatic sprinkler system and the fire alarm system for all electrical rooms and other high-risk areas. Detection and protection system will be implemented in various buildings in accordance with the insurer requirements. The plant fire protection system will provide “fit-for-purpose” fire safety solutions in-line with the level of risk and business interruption potential through a fast, reliable and practical automatic fire detection and alarm system, a site wide fire water storage, pumping and reticulation system, fire hydrants, hose stations, automatic wet pipe sprinkler systems and potable fire extinguishers.

The system shall be compliant with the statutory requirements of the National Building Code of Canada, Quebec Safety Code, ULC standards, NFPA standards and FM data sheets. The final design will meet the insurance requirements in terms of maintaining a safe and secure workplace.

All piping will be above ground and will be routed throughout the building and the “utilidor.” Pumps are located on the first floor of the DMS building. The fire water tank is located outside, the tank will be insulated and a heater will keep the water to the required temperature.

18.14 Security

To help safeguard physical and human assets, the concentrator plant will include physical access control, means to identify and control individuals who enter and exit the facility, track movements of building occupants and assets, and control access to restricted areas. A guard house and fence will be located at the entrance of the site, near the highway. The final design will meet the regulatory and insurance requirements in terms of maintaining a safe and secure workplace.

18.15 Accommodations

Until the construction camp accommodation has been commissioned, temporary accommodation facilities will be available at the km 381 Truck Stop. In addition to fuel, the truck stop also has suitable messing facilities and a general store. However, accommodation at the truck stop is limited to approximately 40 beds. The provision of trailer accommodation may be required by some early works contractors until the construction camp is ready for use.

The Camp dorms for the operation of the mine will be sized for 180 personnel and a temporary construction camp addition will be required for the duration of the construction, sized for 100 additional personnel. For the construction camp, priority will be given to initially install the camp modules for 100 personnel. There will be accommodation for a total of 280 personnel at the peak of construction and then be downsized for operations to accommodate 180 operations personnel. The camp will consist of the following:

Permanent Facilities:

- Kitchen complex suitable for 280 personnel

- Camp office and welcome center
- Laundry complex
- Recreational center and gym
- Wastewater treatment plant
- Potable water storage tanks and distribution
- Propane storage and distribution
- Food storage
- Arctic “Utilitdor” from the camp to the admin building.
- Temporary Facilities – to be demobilized after construction:
- Construction camp 100-man camp - to be demobilised at construction completion

18.16 Product Warehousing

Site warehousing/stores will be designed to provide a minimum storage time of four (4) weeks supply for production/process plant consumables. An insulated fabric dome will be installed near the truck shop and process plant. This dome will store major and critical part for the mine vehicle/machinery and process plant equipment. Food storage will be installed near the camp to allow easy access.

18.17 Mining Infrastructure

The mining infrastructure will include the following:

- Truckshop & washbay (for maintenance and repair of equipment)
- Administration building
- Explosive magazine
- Emulsion preparation distribution facility

18.17.1 Truckshop and Washbay

The truck shop will be located near the process plant. the mining machinery and truck will have easy access to the truck shop via large road. A fully lighted parking with electricity plug for bloc heater will be adjacent to the truck shop. The truck shop includes three service bay, one light vehicle bay, one maintenance/welding bay and one wash bay. A lubricant and grease compartment will include the various oil and grease which will be distributed with fixed piping and pumps. The truck shop will also include office space, a kitting room, tools storage and a mezzanine with lunchroom, restroom and locker. This building will also include a compressed air system, an overhead crane and an HVAC system. The HVAC system will be powered by electricity most of the time. Propane will be used during the coldest days of the year to manage proper electricity grid operation. This building will be made of steel structure, prefabricated sandwich wall and roof, also it will be insulated to minimize heat loss.

18.17.2 Administration Building

The administration building will be located close the DMS building. The essay lab, offices, meeting room electrical room and sanitary will be located on the first floor. The second floor will include more offices, IT server and a lunchroom. This building will be a prefabricated Honco style building. The HVAC system will be powered by electricity most of the time. Propane will be used during the coldest days of the year to manage proper electricity grid operation

18.17.3 Explosive Magazine

The explosive magazine will consist of two explosive magazines, one dedicated for the storage of 25,000 kg 1.1D class explosives (pre-split packaged explosives and boosters) and another magazine for the storage of 75,000 detonators classified 1.1B. Their respective sizes are 8’ x 12’ x 7’ for the 1.1D class explosives and 12’ x 24’ x 7’ for the 1.1B detonators.

18.17.4 Emulsion Transfer and Distribution Facility

The management and supply of the explosives needed for mining operations will be provided by a certified sub-contractor; however, all permit requests for its use will be made by Galaxy in compliance with the Federal Explosives Act and the Provincial Act Respecting Explosives.

No emulsion will be made on site and all emulsion will be transported from the sub-contractor’s closest plant in accordance with applicable laws and regulations to the mine site. The emulsion will be transported from the explosives storage and manufacturing facilities to the open pit via a Mobile-Mixing Unit (MMU) whereas the boosters and detonators will be transported via a pickup truck in accordance with applicable laws and regulations.

18.18 Process Plant Building

The process plant will include the following buildings:

- Crushing building
- Screening building
- Primary ore storage dome
    - DMS building Metallurgical lab
    - Workshop (and storage)
    - Lunchroom, locker and sanitary
- Tailings handling facility
- Concentrate storage and handling

18.18.1 Crushing Building

The crushing building will house the primary crusher and related equipment. A conveyor will carry out the primary crushed ore to the screening building. The crushing building will be made of steel structure, prefabricated sandwich wall and roof, also it will be insulated to minimize heat loss. An overhead crane will facilitate maintenance activity. A dust collection will be installed. The HVAC system will be powered by electricity most of the time. Propane will be used during the coldest days of the year to manage proper electricity grid operation.

18.18.2 Screening Building

The screening building will screen, sort and crush ore. A conveyor will carry out the final crushed ore to the crushed ore stockpile storage building (dome). The screening building will be a steel structure, with prefabricated sandwich wall and roof, and will be insulated to minimize heat loss. An overhead crane will facilitate maintenance activity. A dust collection will be installed. The HVAC system will be powered by electricity most of the time. Propane will be used during the coldest days of the year to manage proper electrical grid operation

18.18.3 Ore Storage Dome

The ore storage dome will store ore between the crushing stage and the DMS process stage. At the base of the dome, an underground reclaim/chute system will allow the ore to be metered onto a conveyor to be transferred from under the stockpile to the DMS process building. The underground concrete chamber which provides support to the reclaim chutes and feeders will be accessible by a secondary staircase located beside the dome. The main form of access to the concrete chamber will be via the conveyor access way. The ore storage dome will be made of steel structure and steel cladding. This building will not be heated or ventilated with the exception of a unit heater inside the chute and conveyor concrete chamber.

18.18.4 DMS Building

The DMS building will house the main process equipment. It will also include a metallurgical lab, a workshop (include storage) and personnel facility. A large vehicle drive through will be located in between the process equipment side and the workshop and reagent side. The building will be made of steel structure, prefabricated sandwich wall and roof, also it will be insulated to minimize heat loss. A main DMS building overhead crane will facilitate maintenance activity. A second overhead crane will be installed in the workshop and reagent areas. The HVAC system will be powered by electricity most of the time. Propane will be used during the coldest days of the year to manage proper electricity grid operation. The personnel facility will include lunchroom, locker and sanitary.

18.18.5 Tailings Handling Facility

The tailings handling facility will be adjacent to the DMS on the heavy vehicle side. A front-end loader will load trucks as required and tailings will be hauled to the WRTSF stockpiles. The building will be made of steel structure and steel cladding. The building will be closed on three ends only and will not be insulated. Two large openings will give access to the fine tailings stockpile and the coarse tailings stockpile and provide protection from the elements.

18.18.6 Concentrate Storage and Handling

The concentrate storage and handling facility will be adjacent to the DMS. A large semi truck will enter the building via a drive though access way, a front-end loader will load trucks as required and the trucks will transport concentrate product off-site. The building will be made of steel structure, prefabricated sandwich wall and roof, also it will be insulated to minimize heat loss. The HVAC system will be powered by electricity.

18.19 Existing Infrastructure

18.19.1 Billy-Diamond Highway

The Project site is conveniently located adjacent to a major paved roadway, The Billy-Diamond Highway (formerly James Bay Road), which connects the Project site and the community of Matagami. This road was originally built in 1970 to accommodate transportation of heavy equipment for a large Hydro-Québec project. It is maintained by the SDBJ, an organization created by the province of Québec to foster the development of the James Bay area.

Billy-Diamond Highway (formerly James Bay Road) specifications:

- Total length: 620 km
- 2 asphalt paved lanes - 3.65 m width each
- 2 gravel shoulders – 3 m width each
- Total width: 13.3 m
- Posted speed limit: 100 km/h
- Design capacity of bridges: 500 tonnes

18.19.2 Truck Stop

The SDBJ also operates a truck stop, named “Relais Routier km 381” located across the road from the Project site. It is equipped with a gas station, temporary accommodations, cafeteria, general store, rental meeting rooms and a vehicle mechanic. SDBJ has regular operating staff on site throughout the day. Fibre optic internet is provided by the local vendor, Eeyou Communications Network. Potable water is supplied by a local water treatment system.

The “Relais Routier km 381” has been serving as accommodations for Project staff during the Project exploration phase.

18.19.3 Airport

The Eastmain airport (130 km from the Project site) will be used to transport contractors and workers from southern Québec. Upgraded operating equipment such as de-icing equipment and a fueling station will be required. Instrumentation and procedures will need to be improved to mitigate flight cancellations due to bad weather conditions.

18.19.3.1 Ownership and Governance

The airport is the property of Transport Canada who has awarded a 5-year contract to the Cree Nation of Eastmain Council for management of the airport (beginning in April 2019). Although Transport Canada has ownership of the airport infrastructure, any modification will have to be supported by the Eastmain Band Council and the Grand Council as the land on which the airport is built is designated as a Category 1A ancestral land by the James Bay and Northern Québec Agreement, which reserves the land to the exclusive use and benefit of the Cree population.

CARS (Community Aerodrome Radio Stations) communicates weather information for flights. As in all northern communities, the presence of a radio operator is not always ensured. This person reports to the Band Council. This irregular service could have an impact on the efficient exploitation of Galaxy's flights.

18.19.3.2 Project Parameters and Summary

The airport upgrade assessment is based on the following parameters:

- The expected operating life of the mine is 19 years
- The beginning of the construction of the mine is planned for Q2 2022
- The operation of the mine (pre-production) is expected to start in Q1 2023
- During construction, approximately 280 workers are estimated to be on site on 21 days in and seven days out rotation
- During the operation phase, between 150 and 180 workers will be on site based on a 14/14 schedule, and a 4/3 schedule for managerial staff
- OCTANT Aviation carried out a review of the required equipment and issued a report. The following summarizes the assessment of the existing infrastructure:
- Fuel: no aviation fuelling system is installed or available. This equipment needs to be installed to avoid refuelling stops.
- De-icing: truck-towed de-icing equipment is available.
- Instrument approaches: the airport has LNAV approaches that are not the most modern. Currently, approach minimums fluctuate between 416 and 478 feet. To maximize the likelihoods of successful

landings, it would be imperative to implement LPV approaches. Instrument procedures will need to be improved to minimize the number of aborted landings. The proximity of the airport to James Bay and Eastmain River increases the formation of fogbanks in the area.

- Electric or gas-powered ground power unit (GPU).

The equipment could be provided either by the company responsible for ground handling or by the air carrier and reimbursed contractually. This cost is captured as a CAPEX for the study.

18.19.4 Concentrate Trucking and Transhipment

Concentrate will be loaded into 85 t trailers at the plant stockpile by front-end loaders. There will be a maintenance shop at the site provided and managed by the transport contractor. Loading time at the site is restricted to 45 minutes to allow each driver to complete a round trip per day. The product will be transported via the Billy-Diamond Highway (formerly James Bay Road) to Matagami for transhipment.

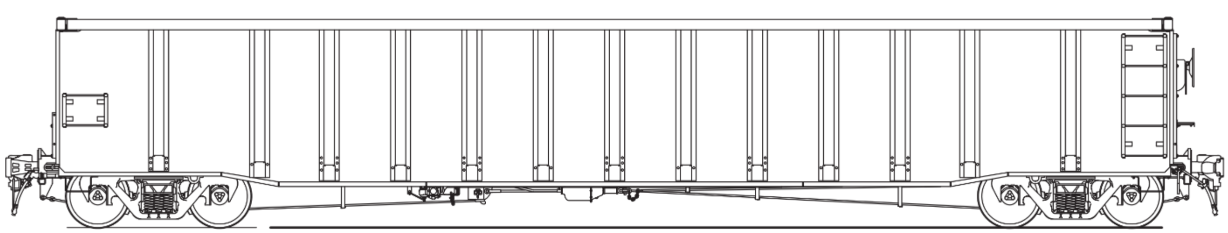
The concentrate will be offloaded at Matagami Transhipment Terminal and stockpiled for loading onto railcars. The storage, maintenance, tariffs and loading of the concentrate onto the trains will be subcontracted to the Cour de Transbordement de Matagami.

18.19.4.1 Rail Transport

The railcars transporting the product from Matagami station to the Port of Trois-Rivières will be operated by CN Rail, which currently services Matagami. Three trips a week will be required for product transport based on 22 railcars per train for an estimated 18-day cycle for loading, transit, unloading and return.

Railcars will be 52’-6” mill gondolas with an open top, solid bottom, fixed ends, 2,791 ft^3 capacity. The maximum payload for the rail is 89.91 t. Fibreglass railcar covers with automatic locks will be used.

Figure 18.8: Typical 52' Open Gondola



19 LITHIUM MARKET OVERVIEW

Lithium is the lightest and least dense solid element in the periodic table with a standard atomic weight of 6.94. In its metallic form, lithium is a soft silvery-grey metal, with good heat and electric conductivity. Although being the least reactive of the alkali metals, lithium reacts readily with air, burning with a white flame at temperatures above 200°C and at room temperature forming a red-purple coating of lithium nitride. In water, metallic lithium reacts to form lithium hydroxide and hydrogen. As a result of its reactive properties, lithium does not occur naturally in its pure elemental metallic form, instead occurring within minerals and salts.

The crustal abundance of lithium is calculated to be 0.002% (20 ppm), making it the 32^{nd} most abundant crustal element. Typical values of lithium in the main rock types are 1-35 ppm in igneous rocks, 8 ppm in carbonate rocks and 70 ppm in shales and clays. The concentration of lithium in seawater is significantly less than the crustal abundance, ranging between 0.14 ppm and 0.25 ppm.

19.1 Sources of Lithium

There are five naturally occurring sources of lithium, of which the most developed are lithium pegmatites and continental lithium brines. Other sources of lithium include oilfield brines, geothermal brines and clays.

Lithium Minerals

There are around 250 identified lithium bearing minerals, although many of these only contain minor amounts of lithium in their composition. The most common sources of mined lithium from mineral sources are:

Spodumene [$LiAlSi_2O_6$] is the most commonly mined mineral for lithium, with historical and active deposits exploited in China, Australia, Brazil, the USA and Russia. The high lithium content of spodumene (8% Li_2O) and well-defined extraction process, along with the fact that spodumene typically occurs in larger pegmatite deposits, makes it an important mineral in the lithium industry.

Lepidolite [$K(Li,Al)_3(Si,Al)_4O_{10}(OH,F)_2$)] is a monoclinic mica group mineral typically associated with granite pegmatites, containing approximately 7% Li_2O. Historically, lepidolite was the most widely extracted mineral for lithium; however, its significant fluorine content made the mineral unattractive in comparison to other lithium bearing silicates. Lepidolite mineral concentrates are produced largely in China and Portugal, either for direct use in the ceramics industry or conversion to lithium compounds.

Petalite [$LiAl(Si_4O_{10})$] contains comparatively less lithium than both lepidolite and spodumene, with approximately 4.5% Li_2O. Like the two aforementioned lithium minerals, petalite occurs associated with granite pegmatites and is extracted for processing into downstream lithium products or for direct use in the glass and ceramics industry.

Lithium Clays

Lithium clays are formed by the breakdown of lithium-enriched igneous rock which may also be enriched further by hydrothermal/metasomatic alteration. The most significant lithium clays are members of the smectite group, in particular the lithium-magnesium-sodium end member hectorite [$Na_{0.3}(Mg,Li)_3Si_4O_{10}(OH)_2$]. Hectorite ores typically contain lithium concentrations of 0.24%-0.53% Li and form numerous deposits in the USA and northern Mexico. As well as having the potential to be processed into downstream lithium compounds, hectorite is also used directly in aggregate coatings, vitreous enamels, aerosols, adhesives, emulsion paints and grouts. Other lithium bearing members of the smectite group are salitolite [$(Li,Na)Al_3(AlSi_3O_{10})(OH_5)$] and swinefordite [$Li(Al,Li,Mg)_4((Si,Al)_4O_{10})_2(OH,F)_4nH_2O$].

Lithium Brines

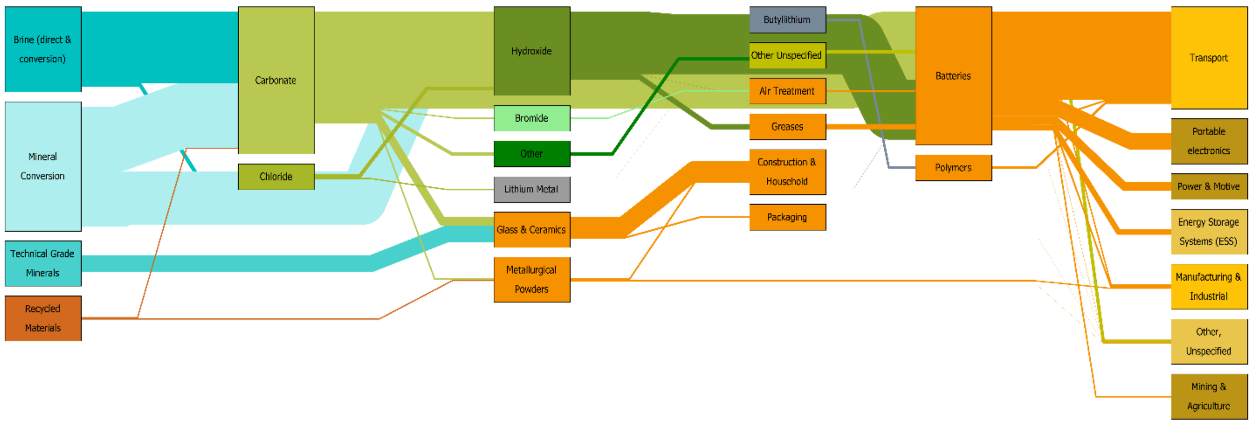
Lithium-enriched brines occur in three main environments: evaporative saline lakes and salars, geothermal brines and oilfield brines. Evaporative saline lakes and salars are formed as lithium-bearing lithologies which are weathered by meteoric waters forming a dilute lithium solution. Dilute lithium solutions percolate or flow into lakes and basin environments which can be enclosed or have an outflow. If lakes and basins form in locations where the evaporation rate is greater than the input of water, lithium and other solutes are concentrated in the solution, as water is removed via evaporation. Concentrated solutions (saline brines) can be retained subterraneously within porous sediments and evaporites or in surface lakes, accumulating over time to form large deposits of saline brines.

The chemistry of saline brines is unique to each deposit, with brines even changing dramatically in composition within the same salar. The overall brine composition is crucial in determining a processing method to extract lithium, as other soluble ions such as Mg, Na and K must be removed during processing. Brines with a high lithium concentration and low Li:Mg and Li:K ratios are considered most economical to process. Brines with lower lithium contents can be exploited economically if evaporation costs or impurities are low. Lithium concentrations at the Salar de Atacama in Chile and Salar de Hombre Muerto in Argentina are higher than the majority of other locations, although the Zabuye Salt Lake in China has a more favourable Li:Mg ratio.

19.2 Lithium Industry Supply Chain

Figure 19.1 shows a schematic overview of the flow of material through the lithium industry supply chain in 2021. Raw material sources in blue and brown represent the source of refined production and technical grade mineral products consumed directly in industrial applications. Refined lithium products are distributed into various compounds displayed in green. Refined products may be processed further into specialty lithium products, such as butyllithium or lithium metal displayed in grey. Demand from major end-use applications is shown in orange with the relevant end-use sectors shown in yellow.

Figure 19.1: Lithium Industry Flowchart, 2021



Source: Roskill – Wood Mackenzie

19.3 Global Demand for Lithium

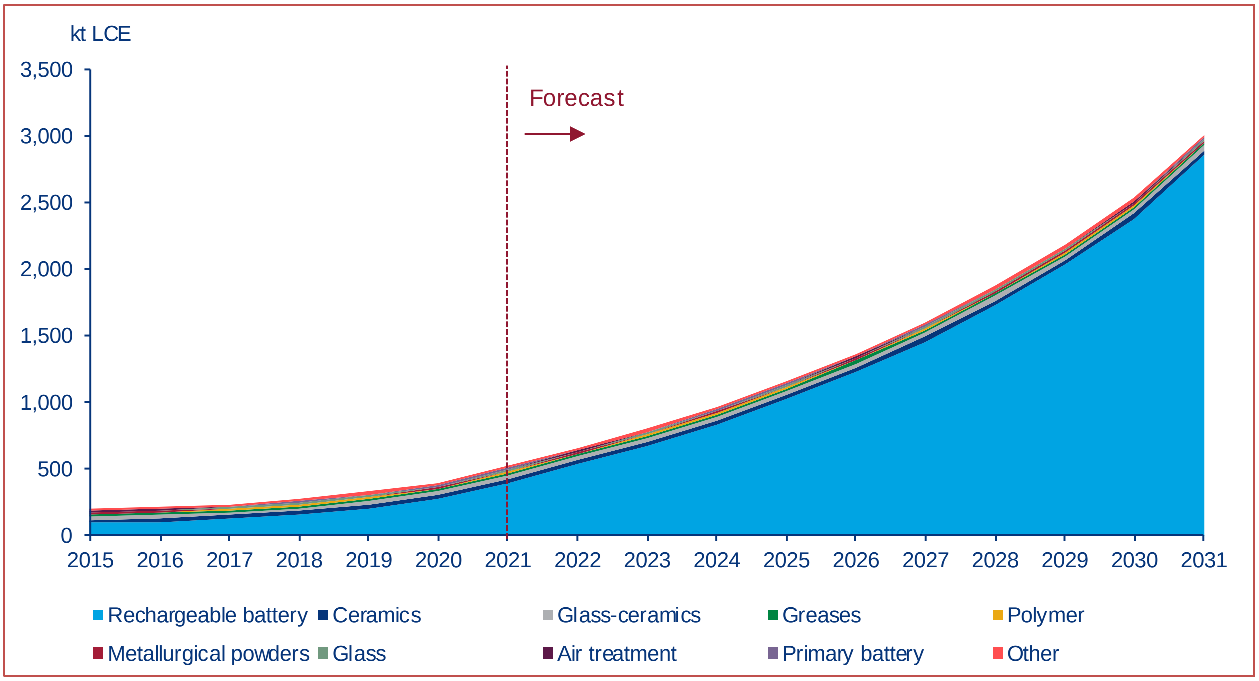
Lithium demand has historically been driven by macro-economic growth, but the increasing use of rechargeable batteries in electrified vehicles over the last several years has been the key driver of global demand. Global demand between 2015 and 2020 has almost doubled, reaching 388.4 kt LCE with a CAGR of 14.0% over the period. Adding to this growth, in 2021 global lithium demand is expected to increase by 33.8% to 519.6 kt LCE as demand for rechargeable batteries grows further. Over the next decade, global demand for lithium is expected to grow at a rate of 19.2% CAGR and exceed 3,000 ktpa by 2031.

19.1.1 Lithium Demand by End Use

In recent years lithium-ion batteries have become the battery technology of choice for electric vehicles, from hybrid vehicles to full electric vehicles. The lithium-ion battery industry, particularly in its use in automotive applications will be the largest driver of lithium demand for the foreseeable future. Roskill's analysis shows that total vehicle sales continued to increase up until 2017, before the market saw marginal declines in 2018 and 2019. Sales in 2020 saw a sharp decline as the global COVID-19 pandemic set in and restricted movement and production. Demand growth for lithium in rechargeable batteries grew at 24.9% CAGR between 2015 and 2020, forming over 50% of lithium demand since 2017. Unlike most other major end-use applications, demand from rechargeable batteries continued to increase in 2020, despite disruption caused by the COVID-19 pandemic and related lockdowns.

All other end-uses for lithium have also experienced growth since 2015, albeit at lower rates than the rechargeable battery sector. Non-battery uses of lithium include ceramic glazes and porcelain enamels, glass-ceramics for use in high-temperature applications, lubricating greases and as a catalyst for polymer production. Between 2015 and 2019 growth in demand from ceramics, glass-ceramics, greases and polymers increased on average by between 1.6% pa and 4.4% CAGR, though demand volumes fell notably in 2020 as a result of COVID-19 related lockdowns and reduced industrial output. In 2021, the recovery in industrial production is expected to support a growth in demand once again, with non-battery demand returning to around 2019 levels.

Figure 19.2: Global Demand for Lithium by End Use, 2015 - 2031 (kt LCE)



Source: Roskill – Wood Mackenzie

Our base-case scenario forecasts lithium demand to increase by 19.2% CAGR in the period 2021 to 2031, reaching a total of 3.01 Mt in 2031. Lithium demand is predominantly derived from the expected build-out of battery production, with 2,733 GWh capacity required across all end-use applications.

The volume of lithium demand in rechargeable batteries is now starting to have much more of an impact on the lithium compound demand. The automotive sectors influence on the battery industry will continue to increase out to 2031. In 2015, less than half of lithium consumption was in battery applications. However, rechargeable battery use has increased rapidly over the last five years, in 2020 72% of lithium was consumed in battery applications, with market share expected to grow to 95% by 2031.

The base-case scenario is aligned with the EV targets envisioned by the European Union and China through their EV regulations. Uncertainty surrounding the use of Li-ion batteries in xEV models caused by the COVID-19 pandemic has largely dissipated, with strong growth in unit sales in major regions with 2020 and into 2021. Regulation globally pushing for stricter CO2 emissions limits by 2030 continues to force automotive OEMs to shift to hybrid and BEV models, a challenge which some OEMs have progressed significantly with since mid-2020. This transition continues to see the repurposing of traditional ICE vehicle component and model manufacturing centres be refitted as production facilities for xEVs and batteries, requiring investment and retraining of staff. The use of Li-ion batteries in xEVs is embedded into the growth trend, with little risk that a significant change in technology will occur in the short-mid-term.

Longer term, the development of next-generation battery technologies has the potential to both disrupt or accelerate lithium demand growth, dependent upon the prevalent technology. Sodium-ion (Na-ion) batteries have the potential to compete with Li-ion batteries in low-demand applications, whilst solid-state technologies have the potential to increase the use of lithium metal within battery technologies significantly.

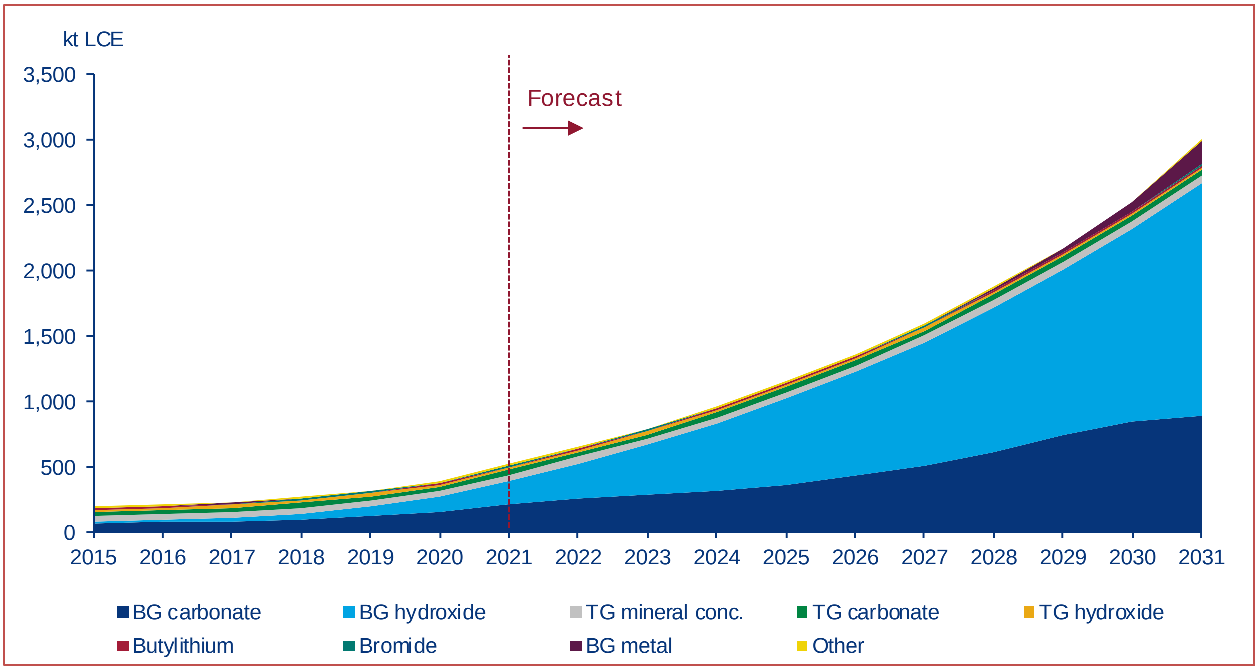
Demand from non-battery applications is expected to form a diminishing proportion of lithium demand, with demand from sectors including ceramics, greases, glass and metallurgical powders decreasing from 23.6% in 2021 to 5.1% in 2031. Non-battery applications are expected to show continued demand growth of between 1.2-3.0% CAGR over the period to 2031, aligned to growth in global and regional GDP and industrial production.

The growing battery market is expected to create opportunities for lithium producers. From the mining side, battery and auto makers will require long-term offtake agreements or other type of partnership to guarantee price stability over the outlook period. Although the greatest opportunity is expected to occur in the automotive supply chain, the ESS industry will require additional supply of more than 150 ktpa LCE by 2031, whilst Motive applications are expected to see lithium demand increase >450% over the same period.

19.1.2 <u>Lithium Demand by Product</u>

Lithium is produced in a variety of chemical compositions which in turn serve as precursors in the manufacturing of its end use products such as rechargeable batteries, polymers, ceramics and others.

Figure 19.3: Global Demand for Lithium by Product, 2015 - 2031 (kt LCE)



Source: Roskill – Wood Mackenzie

Lithium in the form of lithium hydroxide and lithium carbonate collectively accounted for nearly 85% of production in 2020 and will continue to be the most important lithium products for the foreseeable future. Lithium hydroxide and lithium carbonate products are classified as 'battery-grade' for use in rechargeable battery applications and 'technical-grade' which is primarily used in industrial applications. Technical grade lithium carbonate can also be processed and upgraded to higher purity carbonate or hydroxide products.

Lithium carbonate is the most widely consumed product, finding application in rechargeable batteries, ceramics, glass-ceramics, glass, metallurgical powders, aluminium and other uses. Demand for battery-grade (BG) and technical-grade (TG) lithium carbonate was 191.9 kt LCE in 2020, with battery-grade now accounting for 41.4% of total refined lithium compound demand and technical-grade 8.0% (Figure 19.3).

BG carbonate demand increased by 24% pa between 2015 and 2020 and has remained the most widely consumed lithium compound. TG mineral concentrates accounted for a further 10.3 % of consumption in 2020 and are used in similar ceramic, glass-ceramic, glass, and metallurgical applications to lithium carbonate. Consumption of mineral concentrates has increased particularly in periods of higher lithium carbonate pricing, as some consumers may switch between the two products in their production process.

TG and BG lithium hydroxide together represented 34.3% of total consumption in 2020, with BG showing the highest growth rate of all lithium products since 2015 at 109%pa. The use of lithium hydroxide in high-

Ni cathode materials for Li-ion batteries is the main factor attributing to the rapid increase in BG lithium hydroxide demand.

BG carbonate and hydroxide together accounted for 70.8% of total demand in 2020 reflecting the share of the rechargeable battery market in the overall lithium market. A small amount of battery-grade metal is used in rechargeable batteries, but its main use is in primary batteries, with all battery uses for lithium still slightly below 50% of total product consumption. Technical-grade hydroxide is mainly used in greases, butyllithium in polymers and bromide in air treatment.

As a result of the strong growth in demand from rechargeable battery applications, demand growth for battery grade products is forecast to accelerate towards the end of the forecast period. In this context, lithium hydroxide is expected to experience exponential growth due to the introduction of high-nickel Li-ion batteries by the early part of the decade. This type of high-performing batteries was present in the technology roadmaps of most global automakers in 2020 as they could be the key enablers of long-distance driving EV ranges. In the outlook period, however, competition from LFP (Lithium-iron-phosphate) batteries using lithium carbonate, is to be expected in passenger EVs in developing countries and even in the urban vehicles of western auto markets. This will be result of the better economics and the longer cycle life of this battery type, whose cost does not depend on the cobalt and the nickel markets.

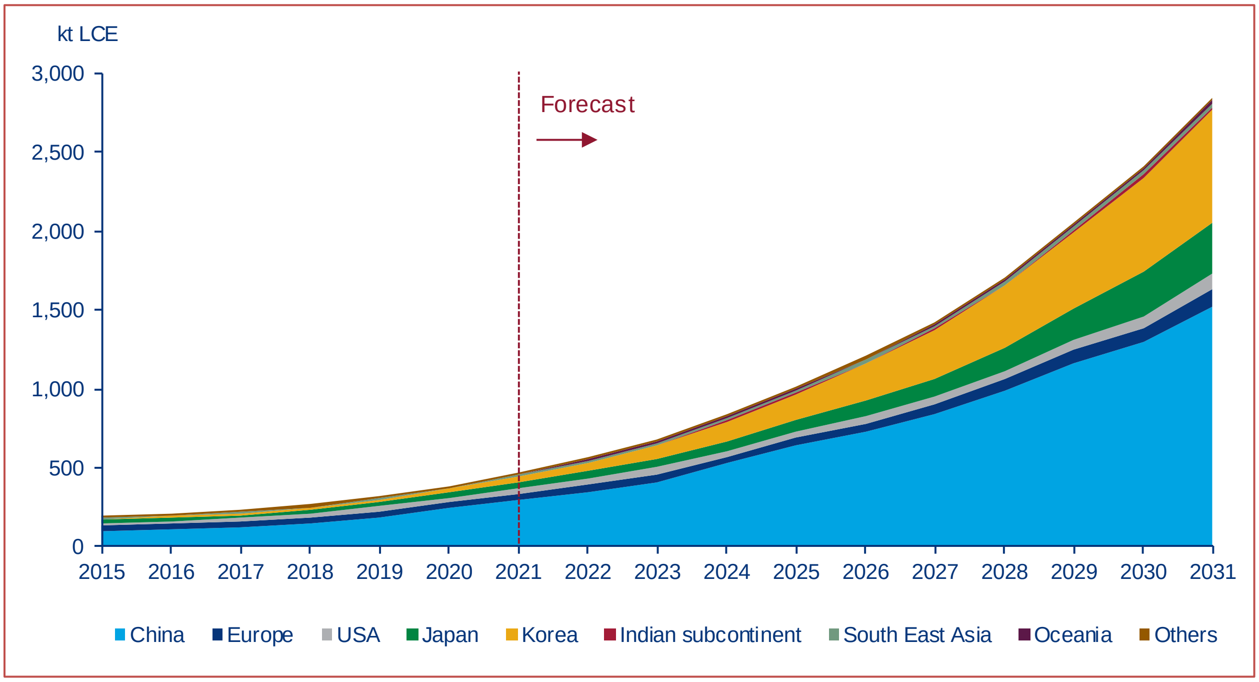
Battery-grade lithium carbonate and hydroxide demand is forecast to increase by 15.2% CAGR and 25.8% CAGR respectively between 2021 and 2031, reaching 896.3 kt LCE and 1,777.3 kt LCE respectively. Battery-grade metal is also forecast to grow above the industry average at 47.6% CAGR, though from a low base of 9.5 kt LCE in 2020, as more is used in advanced lithium rechargeable batteries and primary batteries. Other products are expected to show CAGRs or between 1.3-3.7% CAGR.

In addition to electric vehicle applications, rechargeable batteries will also play an important role in the energy transition. As the world shifts away from fossil-fuel based energy generation to renewable energy sources, growth in energy storage systems used to complement wind and solar generation will contribute to global growth in lithium consumption.

19.1.3 Lithium Demand by Country

On a regional basis, China is the world’s largest consumer of lithium, forecast to account for 62% of consumption in 2021. China, South Korea and Japan are the dominant Li-ion battery and battery material producers, and consumption has increased rapidly since 2000 on increased rechargeable battery cathode material output. While China fundamentally serves its internal battery market with lithium-based cathode materials, Korean and Japanese companies produce the cathode materials in their Asian facilities to later transport them to their battery cell plants in the USA and Europe. Consumption in South Korea and Japan accelerated in the early 2010s with a shift to produce automotive batteries, and they were the second- and third-largest consumers in 2019 at 40.8 kt LCE and 38.0 kt LCE respectively. Europe and North America consume lithium mainly in the manufacture of industrial and construction-related products, such as ceramics, glass-ceramics, greases, polymers and aluminium, as there is not yet an established Li-ion battery industry like in Asia, although this is expected to change with new domestic supply chain initiatives promoted at a governmental level.

Figure 19.4: Global Demand for Lithium by Country/Region, 2015 - 2031 (kt LCE)



Source: Roskill – Wood Mackenzie

19.1.4 <u>China</u>

Chinese demand has increased by 19.1% CAGR between 2015 and 2020, largely through rapid expansion of the domestic Li-ion battery sector with supplementary growth in industrial end-use markets. The construction of significant Li-ion battery production capacity since 2018 has seen an acceleration of China's demand for lithium products. The relocation of some production capacity from South Korea and Japan into China has caused further increases in market share.

The Chinese lithium market is heavily dependent upon imports of lithium mineral concentrates and lithium compounds produced in the rest of the world. Imports of mineral concentrates from Australia and lithium compounds from South America provide key raw material sources to supplement domestic production and meet demand. Chinese imports of lithium carbonate increased sharply from 29.5 kt in 2019 to 50.1 kt in

2020, with imports from Chile (37.1 kt) and Argentina (12.8 kt) forming the majority of imported material. In Q1 2021, imports from South America represented 98% of total lithium carbonate imports.

19.1.5 Japan

Japan has no domestic production of lithium raw materials and is wholly reliant on imports of lithium products to satisfy demand. The Japanese lithium-ion battery industry is a major consumer of battery-grade lithium carbonate and lithium hydroxide.

Chile (both SQM and Albemarle) is the main source of lithium carbonate, accounting for 75-85% of imports in any one year, with most of the balance coming from Argentina and China.

Lithium hydroxide is imported and used as a raw material for production of NCA cathode materials, such as at Panasonic’s facilities in Japan, and high nickel content NCM cathode materials at a number of manufacturers such as Tanaka Chemical, SANYO, Hitachi Maxwell and GS Yuasa. Imports from Livent in the USA have fallen sharply in recent years and China is now the main source of supply to the Japanese market.

19.1.6 South Korea

South Korea has no domestic supply of mined lithium materials, though lithium compounds are produced in-country from reprocessing lithium compounds and recycling of lithium-ion batteries sourced domestically and from imports. Strong demand for lithium compounds from the lithium-ion battery and lithium grease industries in South Korea led to imports rising steadily in the 2010s, with the increase in imports accelerating after 2017.

South Korea is the largest market, after China, for lithium carbonate exported from Chile and is by far the biggest market for that country’s exports of lithium hydroxide. It is also the principal destination for China’s exports of lithium carbonate and lithium hydroxide. The increase in Chinese imports of lithium carbonate in recent years represent growing trade between Ganfeng Lithium and LG Chem.

The increase in imports of lithium hydroxide from about 2019 came as battery cathode manufacturers based in South Korea ramped up production of higher nickel NMC and NCA type cathode materials which require lithium hydroxide as opposed to lithium carbonate. Major global cathode and battery manufactures operate facilities in South Korea, include LG Chemical, Samsung SDI and L&F Corp.

19.1.7 Other Markets

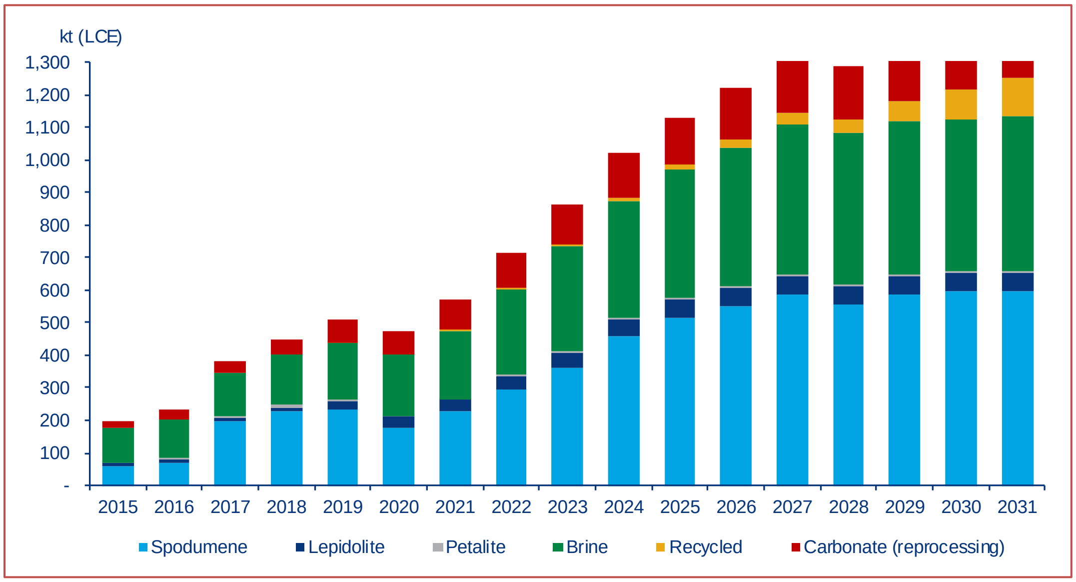
European demand has risen significantly in the period since 2015, with the majority of demand growth occurring in the period since 2018 with greater Li-ion battery manufacturing taking place in the region. Consumption in North America in 2021 is expected to have displayed a 13% CAGR from 2015, again driven by greater battery manufacturing capabilities in the region. Both Europe and North America are mature markets for lithium, and while some end-uses for lithium have grown, such as construction, others, like ceramics, glass and aluminium, have fallen, with growth remaining flat since the 2010s. The impact of the COVID-19 pandemic and resultant lockdowns on these mature markets was significant, causing a sharp fall in lithium demand within these regions where industrial applications continue to form a significant portion of total demand. The construction of new battery production hubs in Europe and North America by major battery manufacturers is expected to see these regions increase their overall market share over the coming decade.

India and Southeast Asia remain relatively small markets, together estimated to represent 3% of total demand in 2021. The Indian market has increased by 8% pa since 2015, though from a small base and was only around 7.4 kt LCE in 2021, mainly for grease, polymer and ceramic tiles, though with a growing demand from rechargeable batteries. Other countries have also displayed strong growth, especially Southeast Asia where ceramic and primary battery production is growing (e.g. in Indonesia, Thailand and Malaysia) as well as rechargeable battery raw material production (e.g. Taiwan).

19.4 Global Supply of Lithium

The world’s lithium is supplied by primary production from hard rock mineral mines (spodumene, lepidolite, petalite), continental lithium brines and reprocessing (upgrading) of lithium carbonates.

Figure 19.5: Refined Lithium Production by Type, 2015 - 2031 (kt LCE)



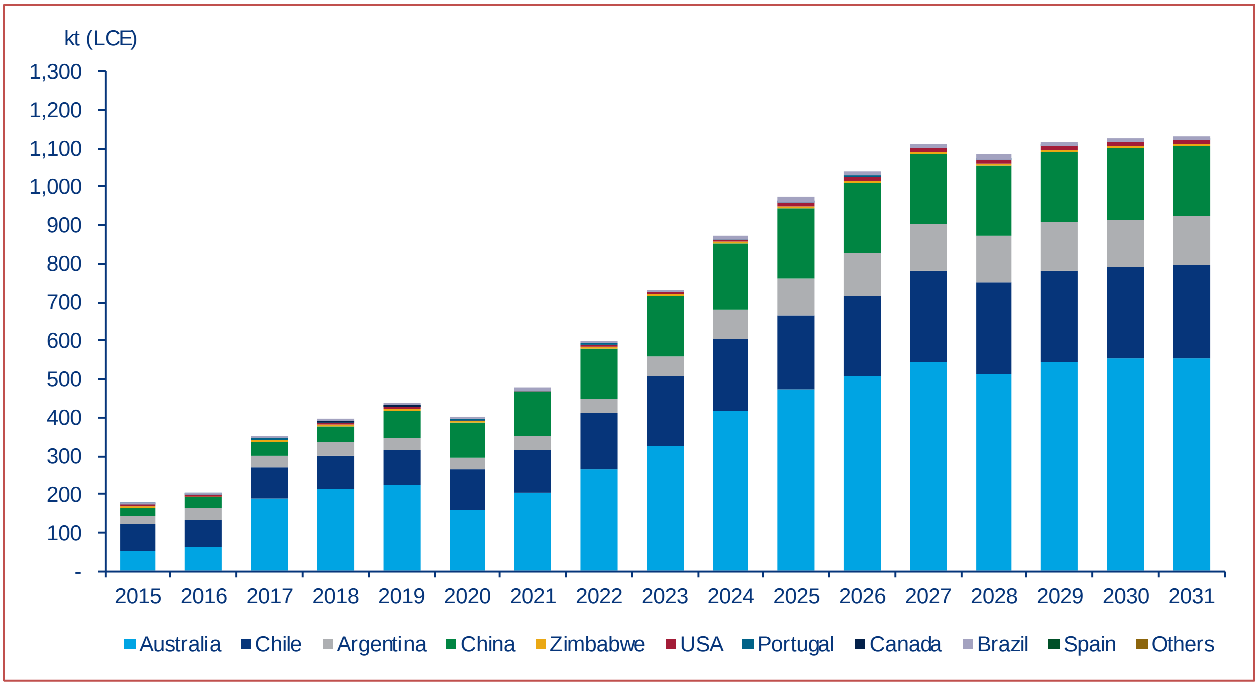
Source: Roskill – Wood Mackenzie

Between 2015 and 2019, growth in production from hard rock lithium mines averaged 39% pa, reaching a peak of 264 ktpa in 2019 before decreasing to 213 ktpa in 2020 as a result of curtailed production in a challenging environment. This continued growth up to 2019 was underpinned by expansions and commissioning of new capacity at operations in Australia, predominantly in 2017 when Australian production displayed a y-on-y increase of 300% (Figure 19.6). The sharp increase in 2017 mine output represented the reaction to increasing lithium compound and spodumene concentrate prices during 2016, which continued into 2017. The commissioning of the Mt. Cattlin mine operated by Galaxy Resources and ramp-up of the Mt. Marion mine commissioned by Neometals (now operated by a Ganfeng/Mineral Resources JV) in 2017 was accentuated by a ramp-up in production at Talison Lithium's Greenbushes. Including lithium produced from brines, global lithium production in 2021 is estimated at 476 kt LCE, up 19% from 2020.

A recovery in mined lithium supply in 2021 driven by strong demand is expected to exceed pre-COVID-19 levels and increase to over 265 ktpa. Mine production is derived from operations targeting predominantly spodumene and lepidolite mineralization. In 2020, recovery of lithium from brines accounted for 47% of global supply, followed by spodumene concentrates with 44%. With the exception of 2020, spodumene concentrate production has displayed strong growth since 2015 and is forecast to continue on a rapid growth trajectory. By 2031, lithium supply from spodumene concentrates is expected to reach nearly 600 ktpa.

Australia is the world's largest producer of mined lithium with an estimated output of 204 ktpa in 2021. With no known brine operations or projects, Australian lithium is and will continue to be produced entirely from spodumene mineralization. Rising lithium prices leading up to 2018 enabled the production of direct-ship-ore (DSO) at MARBL's Wodgina operation and Pilbara Minerals Pilgangoora mine before it was suspended due to falling prices. Despite the suspension of DSO, Australia has maintained its dominant position for lithium mine production. Throughout the forecast period, Australia will increase its share of global lithium from 43% in 2020 to 49% by 2031.

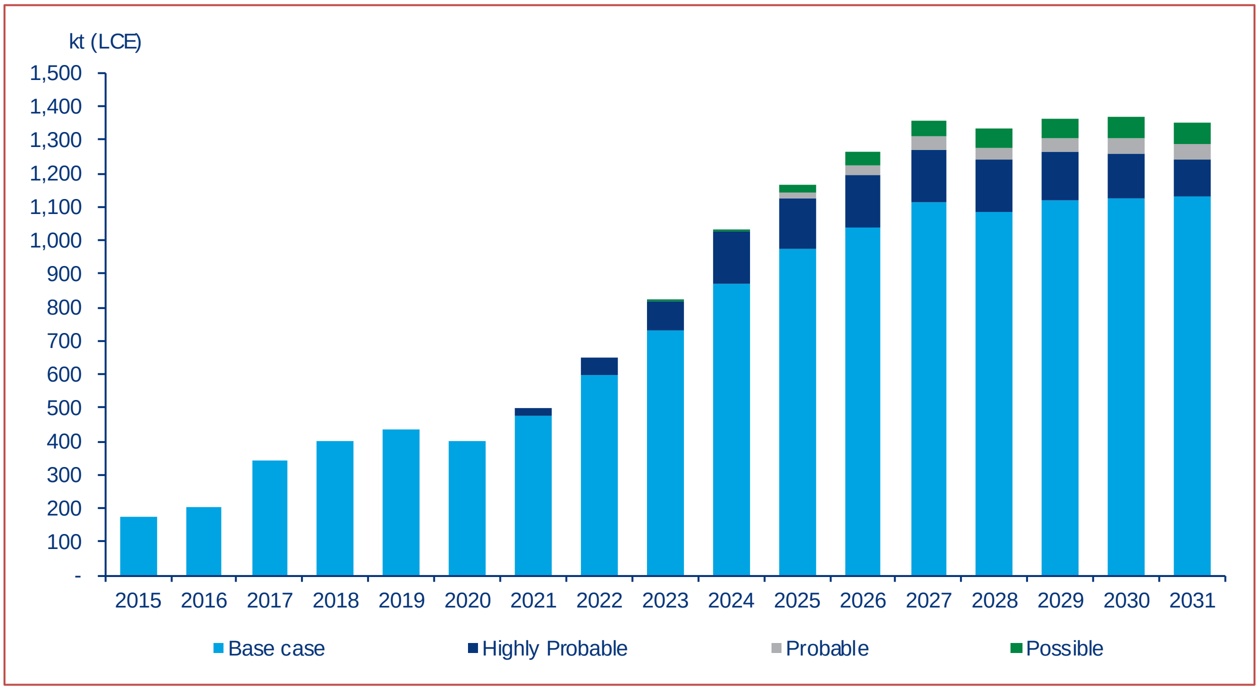
Figure 19.6: Lithium Production by Country, 2015-2030 (kt LCE)



Source: Roskill – Wood Mackenzie

Production from base case operations is forecast to plateau at around 1.25 Mtpa over the next decade, with an estimated potential of over 200 ktpa LCE of additional production from new projects over the forecast period.

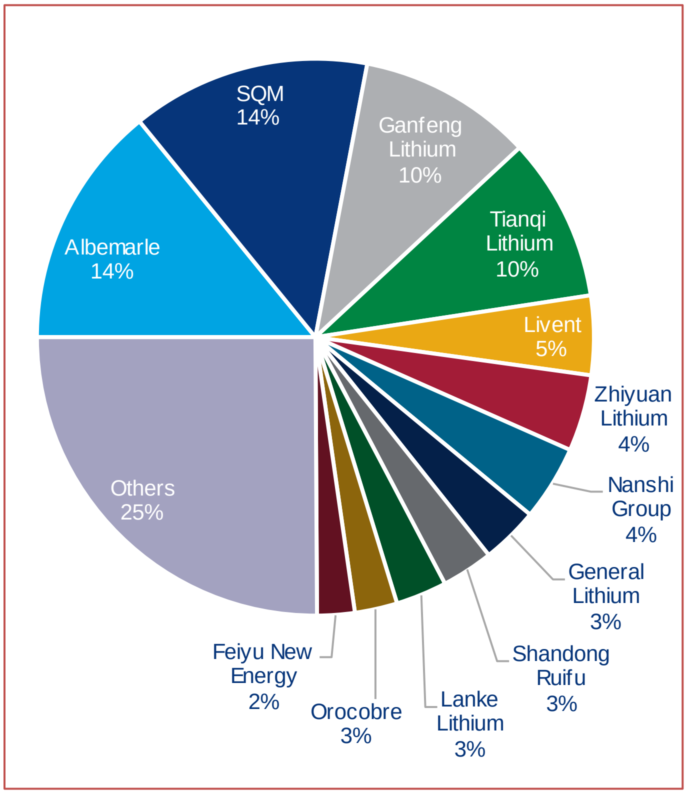
Figure 19.7: Lithium Production Outlook by Status, 2021 – 2030 (kt LCE)



Source: Roskill – Wood Mackenzie

Refined lithium production is dominated by integrated producers, with integrated production totaling 386.0 kt LCE in 2020 representing 80% of total refined production. Mineral conversion companies have increasingly sought to integrate upstream, in efforts to remove supply-chain risk and additional margin between the mineral concentrate and mineral conversion stages. Despite this, the development of new production capacity reliant upon the free-market or off-take agreements with mineral concentrate producers has outpaced integrated in terms of y-on-y growth between 2014-2021.

Figure 19.8: Global Refined Lithium Market Share 2020



Source: Roskill – Wood Mackenzie

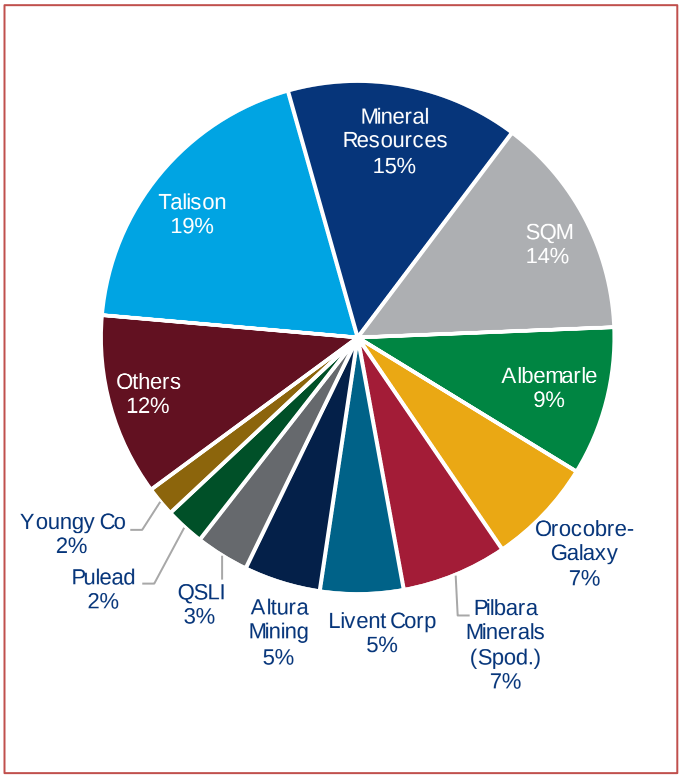
Production of lithium compounds from brine operations is almost entirely considered integrated, as there is no separation between extraction and the production of refined lithium products, predominantly at a local downstream processing facility. The exception to this is Hengxinrong Lithium in China, which produces lithium carbonate from brine extracted at CITIC Guoan's West Taijinaier Salt Lake operation.

In 2020, Albemarle produced 64.8 kt LCE (net volume) or 14% of global refined output. SQM, Gangfeng, Tianqi Lithium and Livent follow as the top five producers, with SQM producing 63.6 kt LCE (14% of global refined production) and Ganfeng producing 46.3 kt LCE (10%) in 2020.

The five largest lithium refining companies collectively produced 239.6 kt LCE refined lithium compounds in 2020, equating to 52% of global production. Though refined production remains dominated by a small number of incumbent producers, market competition has increased in 2020 and 2021, with 64 facilities producing refined lithium products reported in 2021, up from 46 in 2018.

Across its five refineries in operation during 2021, Albemarle is expected to produce 73.4 kt LCE (net volume) or 12.0% of global refined output in 2021. With the commissioning of additional capacity at Xinyu and Ningdu, Ganfeng is expected to be the largest producer in 2021 with production of 85.8 kt LCE or 14%.

Figure 19.9: Global Producers of Lithium (extraction), 2020



Source: Roskill – Wood Mackenzie

Unsurprisingly Australian mining companies are some of the largest lithium producers in the world. Talison is owned by a joint venture between Tianqi Lithium / IGO Limited (51%) and Albemarle Corporation (49%) and operates the Greenbushes mine in Western Australia, the largest hard-rock lithium mine in the world. Other large producers include Mineral Resources, SQM and Albemarle accounting for 15%, 14% and 9% of global production in 2020 respectively.

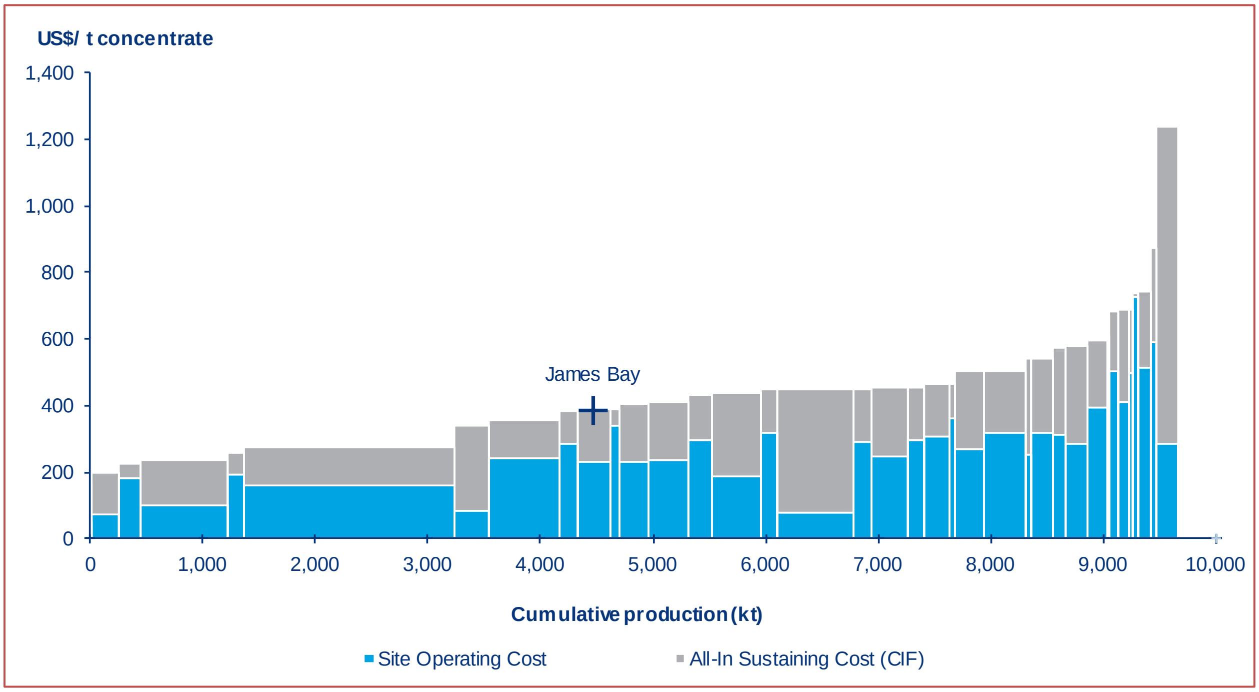
Following its merger in 2021, the combined Orocobre Limited and Galaxy Resources is now the fifth largest lithium producer in the world, with a global footprint spanning Australia, Argentina and Canada, and producing both spodumene concentrate and lithium carbonate.

19.5 <u>Cost of Supply</u>

Roskill's estimates for life of mine (LOM) site operating cost and all-in sustaining cost (AISC) are presented in Figure 19.10. Based on a population of 38 mineral concentrate producing operations and projects, the James Bay project positions in the second quartile of the cost curve. Orocobre estimates the LoM site operating cost of USD 229/t concentrate and an AISC (CIF) cost of USD 386/t concentrate at the James Bay project.

With spodumene prices forecast between USD 750/t and USD 1,100/t over the next decade, the James Bay project is expected to remain highly competitive.

Figure 19.10: Global Mineral Concentrate Cost Curve, LOM (2021 – 2040)



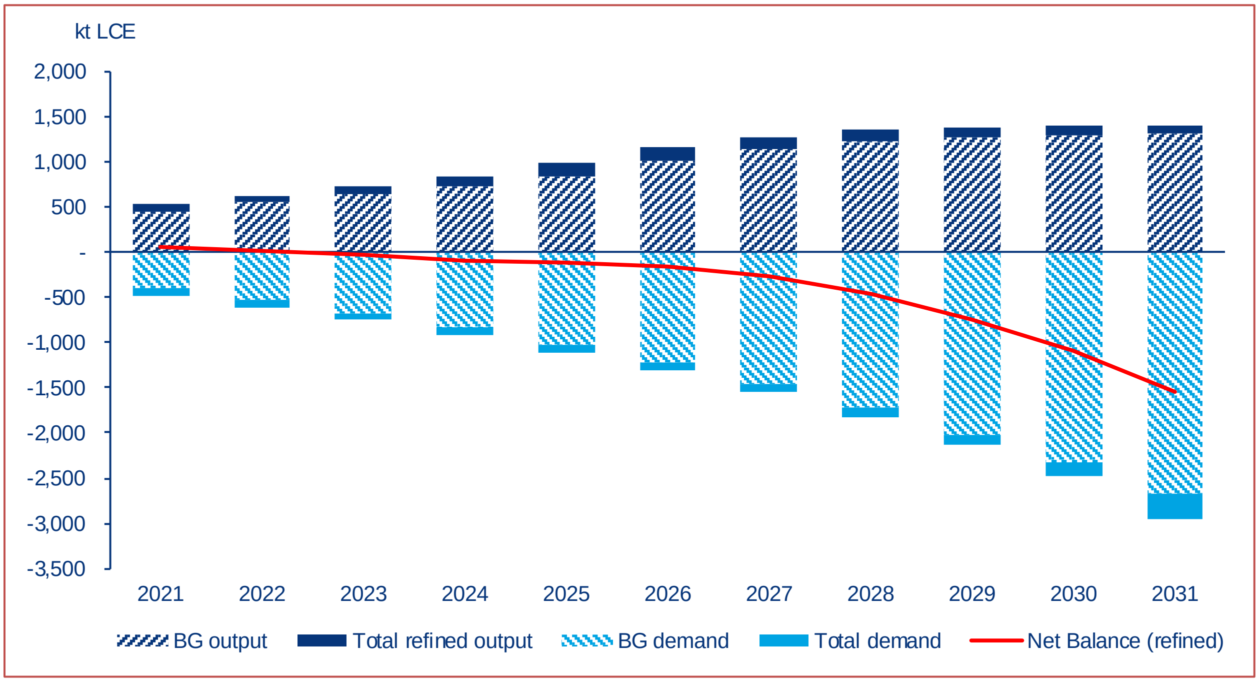
Source: Roskill – Wood Mackenzie, Orocobre Limited

19.6 <u>Market balance</u>

The lithium mine (hard rock) supply balance is forecast to enter a deficit 2021 and 2022 which is currently driving high prices. With additional capacity being brought on in 2023 and 2024 it is forecast that the market will return to a small surplus before entering a long-term structural deficit, which is forecast to grow during the forecast period. Roskill forecasts the supply deficit in 2021 to be around 85 kt LCE which will ease to 21 kt LCE in 2022 before entering a few years with a small surplus reaching 43 kt in 2024. The limited investments in both exploration and capacity during the industry downturn is likely to manifest itself from 2025 where increases in supply will be insufficient to keep up with the strong growth in demand for mineral feedstock by mineral converters. The deficit is expected to propagate from 2026, requiring significant additional supply to enter the market.

On a refined product basis, the market is forecast to show a surplus of 66 kt LCE in 2021 as new capacity enters the market. The quality of the product is, however, uncertain due to the commissioning of new projects. The fast-increasing demand will see the surplus decreasing to 18 kt LCE in 2022 before entering a continued deficit. Beyond 2024 a growing structural deficit is expected to form reaching 1.5 Mt LCE by 2031, requiring significant additional supply from both existing and new producers.

Figure 19.11: Refined Lithium Market Balance



Source: Roskill – Wood Mackenzie

Table 19.1: Outlook for Mined and Refined Lithium Supply and Demand, 2021-2031 (LCE kt)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Mine (Hard Rock) Output	301	389	475	632	719	764	822	861	870	876	876
Refined Output	539	629	725	829	982	1,156	1,278	1,358	1,380	1,390	1,396
Refined Output (BG Compounds)	440	549	647	730	832	1,009	1,132	1,233	1,266	1,285	1,305
Total Consumption	413	528	647	781	935	1,122	1,311	1,548	1,819	2,150	2,556
Total Demand	474	611	749	916	1,105	1,314	1,543	1,819	2,122	2,473	2,951
Demand (BG Compounds)	397	533	669	834	1,021	1,229	1,454	1,723	2,011	2,318	2,674
Balance (Hard Rock)	-85	-21	16	43	-13	-113	-146	-206	-233	-261	-299
Balance (Refined)	66	18	-24	-87	-123	-158	-265	-461	-742	-1,084	-1,555
Balance (BG Compounds)	43	16	-22	-104	-189	-220	-322	-491	-746	-1,033	-1,369

Note: Hard rock refers to lithium from mined hard rock deposits (spodumene, lepidolite, petalite)

Source: Roskill – Wood Mackenzie

The supply-demand balance for battery grade lithium products, including both battery grade lithium carbonate and battery grade lithium hydroxide, will remain in a small surplus for the next few years as recent additional capacity has been in battery grade products. The timely and successful ramp-up of refined lithium operations will be critical to meetings demand growth in the short-medium term. BG lithium carbonate is expected to remain tight, as many new expansions have targeted BG lithium hydroxide production and has been unable to meet demand from an increasing use of LFP type cathode materials in the Chinese domestic industry. It is worth considering that the BG segment also contains BG products which are not directly suitable for the EV industry where the majority of growth occurs which could lead to a bifurcation of the balance within the BG segment. Supply deficit is forecast to extend to almost 1.4 Mt LCE by 2031 based on current announced expansion and pipeline capacity. Multiple significant lithium projects and expansions will be required to meet demand growth throughout the 2020s, supported and incentivised by higher lithium prices.

19.7 Lithium Prices

Lithium product prices respond to variations in supply, demand, and the perceived supply/demand balance, costs and economic factors in a similar way to most other raw materials. The most commonly referenced currency for lithium transactions is the US dollar (USD), although most domestic transactions between Chinese producers and consumers are conducted in Renminbi (RMB). The units of measure used in transactions vary from region to region and between product types.

The three most commonly sold finished products are lithium carbonate, lithium hydroxide, and mineral concentrate (technical-grade); each is available in a range of grades designed to meet lithium's diverse range of end-uses. Chemical-grade mineral concentrate, used for conversion into refined lithium chemicals, while low-priced on a gross weight basis is the highest volume traded lithium product.

Transactions are negotiated between the producer (or agent / trader) and the consumer (from first through to end user) to suit individual circumstances. Lithium is not traded on any exchange, although the London Metal Exchange (LME) are pursuing this area and some online exchanges have existed as trading platforms in China in the past. In August 2021 Pilbara Minerals conduced the first 10 kt spodumene concentrate trade on a trading platform. Producers of lithium negotiate prices with individual consumers and price information is rarely reported, particularly for downstream lithium inorganic and organic chemicals, and metal products. Commercial payment terms are also negotiated between buyer and seller and can vary widely. Annual or longer contracts were common until the mid-2010s but have now been supplemented by more frequently negotiated agreements, while longer-term contracts can include more frequent pricing changes. More contracts have linked to spot prices since 2018 as some producers and consumers seek price references on which to measure product value. Trade data -based prices have also been used as a reference, for example in pricing chemical-grade mineral concentrate from Australia in sales/off-take contracts. A basket of price references and trade data is commonly used in contracts to determine prices. The weight assigned to each price reference and trade data set varies from contract to contract and will often depend on the market in which the buyer operates. It is not uncommon to see floor and ceiling prices incorporated into contracts.

Spot transactions by definition use a spot price to settle. Spot prices for lithium have become more widely quoted, especially those sourced within China. Although they were until 2018 not influencing contract pricing directly, at least outside China, they do reflect supply/demand of material available off-contract in small volumes, and are therefore a sign of market balance which may later influence contract pricing as has proved the case since 2016. Spot prices are generally higher, when the market is good, or lower, when the market is poor, compared to contract prices. The price profiles quoted by price reporting agencies (PRAs) – Fastmarkets, Asian Metal and Benchmark Minerals being the three most used - are usually similar over an extended term although they might show a small, consistent offset. These PRAs publish prices on a weekly, twice-weekly or month-end basis. They quote the low price and the high price that represents what has been the general consensus of industry correspondents who have reported spot business for the period, but are not always based on completed transactions and often use bids or offers instead. The spot price itself is open to negotiation between buyer and seller according to the perceived market conditions.

Spodumene Concentrate (chemical-grade) Pricing

Assessing the market price of spodumene concentrate remains challenging as no official trading index exists, international trade is done on a generic product code and the number of suppliers remain very limited.

In the past, the pricing of spodumene concentrate has been discussed at three different tiers comprising of ‘Inter-company’, ‘Related party’ and ‘Arms length’ accounting for the different levels of ownership and offtake arrangements. Roskill believes that these ‘tiers’ are merging to a large extent, and going forward it is increasingly likely that offtake agreements will be linked to a basket of measures that could include trade data, spodumene concentrate prices as well as lithium chemical prices reported by various price reporting agencies. Some offtake agreements will include floor and ceiling prices as well.

Roskill’s forecast of spodumene concentrate prices are presented in Table 19.2. FOB Montreal prices have been estimated using Wood Mackenzie’s proprietary freight model assuming bulk shipping in a Handysize or similar sized vessel.

Table 19.2: Spodumene Concentrate Price Outlook, 2021-2031

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
CIF Asia (USD/t)											
Contract	839	933	1,059	803	835	912	987	1,058	1,040	1,108	1,173
Spot	1,196	1,399	1,380	1,133	1,160	1,186	1,256	1,235	1,301	1,364	1,425
FOB Montreal (USD/t)											
Contract	773	884	1,011	754	785	862	936	1,007	988	1,056	1,121
Spot	1,130	1,350	1,332	1,084	1,110	1,136	1,205	1,184	1,249	1,312	1,373

Source: Roskill – Wood Mackenzie

19.8 Conclusions

Global lithium demand is forecast for exponential growth over the next decade, primarily driven its use in lithium-ion battery applications. Roskill forecasts global lithium demand to grow at 19.21% CAGR over the next decade from 520 ktpa in 2021 to over 3,000 ktpa by 2031. Growth in lithium demand will outpace rising supply by 2025 when the mine market balance is expected to record a deficit. Without new supply from development of new projects, the supply deficit will continue to grow driving lithium prices upwards.

Spodumene concentrate will continue to feature as a key feedstock in the global lithium supply chain and increasing tonnages will be required to meet future demand for refined lithium. Increasing supply in the short term will put pressure on spodumene prices but as demand catches up, prices will recover. Contract prices for chemical-grade spodumene concentrate are expected to range between USD 754/t and USD 1121/t between 2022 and 2031.

19.9 Contracts

At time of writing, Orocobre – Galaxy has no existing commercial offtake agreements in place for the sale of lithium concentrate, from the James Bay Project. Orocobre - Galaxy is having discussions with potential offtake customers for James Bay. In line with the Project execution schedule, these discussions are expected to advance to negotiations throughout the course of the project.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

20.1 Environmental Policy

According to its Environmental Policy, GLCI is committed to conducting their activities in an environmentally responsible manner. From a starting point of compliance with all applicable regulations, GLCI applies a management system that ensures the application of the environmental standards to their products, services and processes. To fulfill this policy, GLCI shall:

- Include environmental considerations in all planning decisions and overall corporate strategy.
- Assess all services and processes for potential environmental impact from the initial design stage to delivery and disposal.
- Develop products and services and operate facilities in such a manner that prevents pollution, improve efficiency, reduce energy use, use renewable resources and minimise waste through recycling wherever possible.
- Promote a culture in which all employees, contractors, suppliers, customers and the community share GLCI's commitment.
- Respect cultural heritage and the local communities.
- Aim to improve the environmental management system and performance continually, considering technical developments, scientific understanding, consumer needs and community expectations.
- Strive to prevent environmental incidents and have effective contingency plans available for emergency situations.
- Ensure adequate resources and training is provided at all levels and there is proper understanding and implementation of this policy.
- Comply with relevant legislative and industry requirements.

20.2 Regulatory Review Status

As mentioned in Subsection 4.2, the mining industry in Québec is subject to federal and provincial regulations and environmental review processes. In addition, the Project is located within the territory governed by the James Bay and Northern Québec Agreement ("JBNQA").

An Environmental and Social Impact Assessment (ESIA) was prepared in 2017 and submitted to authorities in 2018. As an environmental review process aim at optimizing a project, various changes have been made since. A second version of the ESIA was prepared to address the most recent project changes. The updated ESIA (version 2) was submitted in July 2021 (WSP, 2021).

20.2.1 Federal Regulations and Permitting

In October 2017, GLCI submitted a preliminary Project Description to the Canadian Environmental Assessment Agency ("CEAA") to ensure compliance with the Canadian Environmental Assessment Act (2012). The ESIA report was prepared and submitted to the CEAA on October 30, 2018. The ESIA was deemed compliant with the CEAA final guidelines on March 7, 2019. The ESIA and related documentation is available on the Impact Assessment Agency of Canada ("IAAC") registry at https://iaac-aeic.gc.ca/050/evaluations/document/132306. Note that the CEAA was renamed the IAAC in 2019.

As part of the federal ESIA Joint Assessment Committee (JAC) review, an initial information request was received on June 27, 2019 and complete answers were provided by GLCI on December 23, 2019. A second information request was received from the JAC on March 27, 2020 (Part 1) and July 8 (Part 2) and answers were provided by GLCI on June 17, 2020 regarding Part 1. Answers to the following requests for information were provided within the updated ESIA (version 2), submitted in July 2021:

- Additional information requested by the IAAC on July 15, 2020, on the answers provided to the Information request n°2 (1st part).
- Information request n°2 (2nd part) received from the IAAC on July 8, 2020.

The updated ESIA (version 2) also considers additional engagement activities that were conducted after the initial ESIA submission. GLCI anticipates receiving federal authorizations/approvals in Q1 2022, which would allow construction to commence in 2022.

20.2.2 Provincial Regulations and Permitting

The ESIA was prepared according to Section 153 of the Environmental Quality Act ("EQA") which embeds any mining project in the process described in the Regulation respecting the environmental and social impact assessment and review procedure applicable to the territory of James Bay and Northern Québec (CQLR, c.Q-2, r.25).

In parallel to the federal assessment process, the Project Notice was submitted in October 2017 and the ESIA report on October 30, 2018. As part of the ESIA review by the Committee of the James Bay and

Northern Québec Agreement (COMEX), a first request for additional information was received on April 18, 2019. GLCI provided the requested information on July 24, 2019. A second series of questions and comments was received from the COMEX on December 20, 2019 and GLCI provided the answers on June 2, 2020. The ESIA and related documentation is available on the COMEX registry at https://comexqc.ca/en/fiches-de-projet/projet-de-de-lithium-baie-james-GLCI-lithium-canada-inc/.

Additional questions and comments were received from Québec's Ministère de l'Environnement et de la Lutte contre les changements climatiques ("MELCC") on September 11, 2020. These requests were answered in the updated ESIA (version 2), which reflects the modifications made to the Project design, and considers additional engagement activities that were conducted since the submittal of the former ESIA. GLCI expects to receive general provincial governmental authorizations in Q1 2022, which would allow construction to commence in 2022.

After ESIA approval, the Project will be subjected to Section 22 of the EQA, pursuant to which an authorization is required for activities that may result in a change to the environment. Each activity such as mining, concentration and maintenance may be subjected to different authorizations. The applications to the MELCC will be accompanied by sufficiently comprehensive studies to address the requirements of Directive 019 applicable to the Mining Industry.

Any application for an authorization involving works in wetland will have to be accompanied by a compensation program. In the Project area, the nature of the program is to be determined by agreement between proponents, authorities and the Cree Nation.

Other permits, authorizations, approvals and leases from the Québec's Ministère de l'Énergie et des Ressources naturelles ("MERN"), the MELCC, Québec Building Agency (*Régie du Bâtiment*) and potentially the Ministry of Forests, Wildlife and Parks (*Ministère des Forêts, de la Faune et des Parcs* ("MFFP"), for various Project components or activities on the Project site may be required.

These applications may be associated with the following works:

- Surface lease
- High-risk petroleum products containment installation
- Forest clearing
- Explosive storage

The required applications will be filed during the Project's development. A permit register coherent with the Project construction schedule will be developed.

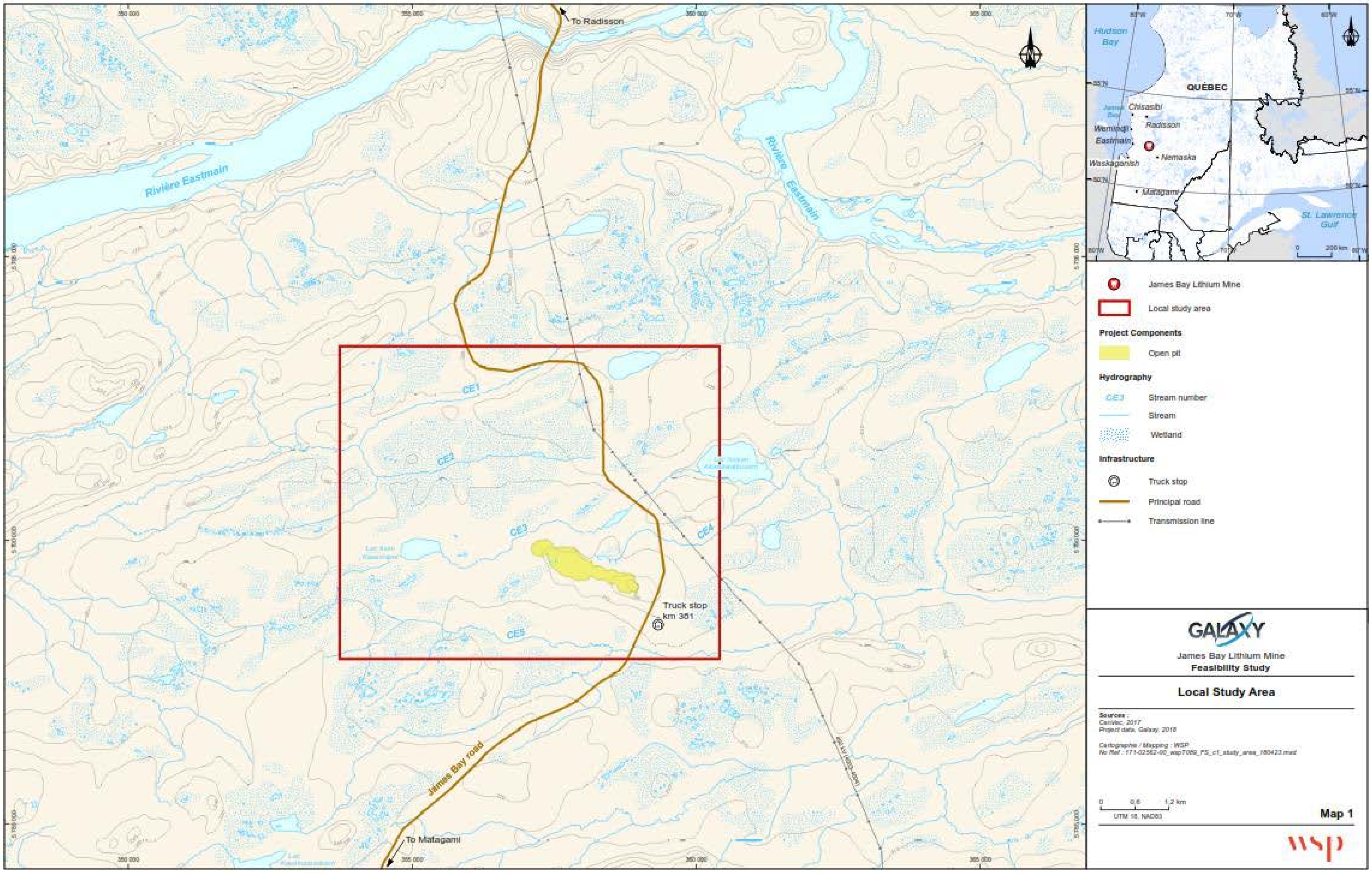
With the exception of wood cutting permits for site access and drilling compliance, no other permit, lease or certificate application has been issued or submitted at this time.

20.3 Environmental Baseline Studies

In 2017, various studies were undertaken to update a former data collection from 2011 to obtain necessary baseline information required to assess the Project's impacts as part of the ESIA.

Different study areas were identified for the ESIA and its associated baseline studies. Most studies have been conducted inside the "local study area" which include areas that are impacted by the mine development, including the infrastructure's location (Figure 20.1). Larger study areas have been defined for components such as waterfowl, air quality, Cree land use, noise (modelling), air quality (modelling, including greenhouse gases), hydrogeology and human health since the anticipated impacts extend out of the property and/or are associated with potential cumulative effects on the receiving environment. Chapter 6 of the ESIA summarizes this information.

Figure 20.1: Local Study Area for Environmental Components



Source: WSP, 2017

20.3.1 Physical Environment

The information related to climate and physiography is available under Section 5 of this document.

20.3.1.1 Geochemistry

Several geochemical characterizations were completed on waste rock, tailings, mineral, and soils that will be manipulated and stored during the operations at the mine. The main objectives of these studies are to assess the material's acid generating potential, its metal leaching potential and to determine the possibility of using waste rock as construction material.

These geochemical studies are summarized below:

20.3.1.1.1 Waste Rock

Four main lithologies were submitted to static testing, namely barren pegmatite (21 samples), gneiss (30 samples), banded gneiss (20 samples) and mafic volcanic/basalt (10 samples).

Kinetic testing was also performed on composite waste rock material:

- Two testing columns were built using waste rock material, composed of all the above waste rock lithologies in proportions to their actual occurrence in the deposit (79% gneiss, 14% banded-gneiss, 4% basalt, 4% pegmatite). One of these columns was maintained saturated throughout the duration of the test (50 weeks) while the other was maintained unsaturated. Flushes were performed each week for the first four weeks, and once every two weeks afterwards.
- The results of these kinetic tests demonstrate that waste rock is considered Non-Potential Acid Generating ("Non-PAG") (pH ranging from 6.25 to 8.0).
- Some metal leaching that exceeded the RES criteria was encountered during the first weeks of testing, but all metals complied with the RES criteria after week 14.

Diabase

An important diabase dyke occurs in the middle of the pit, south side. Kinetic testing was performed to evaluate the geochemical characteristics of diabase rock coming from a dyke in the mining deposit and considered as potential road construction material. A column was built using only diabase material and maintained unsaturated throughout the duration of the test (25 weeks). Flushes were performed each week.

The results of these kinetic tests demonstrate that diabase is considered Non-PAG (pH ranging from 7.32 to 8.80 throughout the test).

Some metal leaching exceeding the RES criteria was encountered for the first weeks of testing, but all metals complied with the RES criteria after week 13, except for mercury concentrations that were still occasionally above the RES criterion up to the end of the test. No clear tendency was observed for mercury concentrations throughout the test.

20.3.1.1.2 Tailings

A total of 12 tailings samples were submitted to static testing. Kinetic testing was also performed on tailings:

- A testing column was built using tailings and was maintained unsaturated throughout the duration of the test (50 weeks). Flushes were performed each week for the first four weeks, and once every two weeks afterwards.
- The results of this kinetic test show that tailings are considered Non-PAG (pH ranging from 6.25 to 8.0).
- Metal leaching above the RES criteria was encountered for the first weeks of testing, but all metals complied with RES criteria after week 14, except copper that was still occasionally over the RES criterion up to week 28.
- Management of tailings is discussed in Section 18 of this document.

20.3.1.1.3 Mineralized Samples

A total of 28 samples of pegmatite were submitted to static testing. Kinetic testing was also performed on pegmatite material:

- A testing column was built using pegmatite material and was maintained unsaturated throughout the duration of the test (25 weeks). Flushes were performed each week.
- The results of this kinetic test show that pegmatite is considered Non-PAG (pH ranging from 6.5 to 7.53).
- Some metal leaching exceeding the RES criteria was encountered during the first weeks of testing, but all metals complied with the RES criteria after week 13, except for mercury concentrations that were still occasionally above the RES criterion up to the end of the test. No clear tendency was observed for mercury concentrations throughout the test.

20.3.1.1.4 Soils

A total of eight samples (two clay and six sand samples) were submitted to static leaching tests. Both clay samples results exceeded the RES criteria for copper, lead and zinc. One of these two samples also exceeded the RES criterion for manganese. No exceedance of the RES criteria was noted for sand samples.

20.3.1.2 Soil Quality

A natural background levels ("NBL") assessment was realized on the soils located in the study area. This study was conducted within the framework of the Project environmental baseline to address provincial and federal requirements associated with the ESIA.

The establishment of the NBL required testing 114 samples taken in exploration trenches (66) and drilling sites (10) spread out over the study area, following a methodology approved by the provincial government and the United States Environmental Protection Agency ("EPA"). These samples were analysed for all metals and the NBL were calculated based on a statistic analysis for the following parameters: aluminium, barium, calcium, hexavalent chromium, iron, lithium, magnesium, manganese, potassium, titanium and vanadium[4]. Results show that the NBL calculated is lower than the generic criterion 'A' from the provincial guidelines for barium, hexavalent chromium and manganese, except for hexavalent chromium in the gravelly sand unit where it is between the 'C' and 'D' criteria of the same guidelines. For all the other parameters analysed, no criteria are defined in the guidelines.

In 2020, additional soil samples were taken where CrVI exceeded the generic criterion "B" in 2018. All samples collected showed hexavalent chromium levels below the generic criterion "A", when analyzed using ion-exchange chromatography. It is likely that levels detected in samples in 2018 are attributed, in full or in part, to interference from the method of analysis used (colorimetry). It is reasonable to conclude that the higher Cr(VI) concentrations obtained in 2018 can be attributed to false positives from the method, or at least, that the results from this additional characterization demonstrate that this higher hexavalent chromium level, if it existed, was an isolated event limited to the three sectors investigated. Consequently, there is no reason to believe at this stage that there is a hexavalent chromium problem on the site.

In July 2017, GLCI commissioned WSP to produce an Environmental Site Assessment ("ESA") – Phase I of the property located on the west side of the Billy Diamond Highway (formerly the James Bay Road),

[4]NBL were calculated only for parameters for which more than 50% or more than 10 samples were above the detection limit to be statistically representative.

at km 381, within the Eeyou Istchee territory. The purpose of the study was to identify real or potential soil contamination risks that could be caused by past or current activities on the site or its immediate vicinity. The information collected by WSP during the study allowed for the identification of several major risks of contamination for the site, namely:

- Landfilled residual materials at the remoted local landfill (*lieu d'enfouissement en territoire isolé* ("LETI").
- Piles of wood-treated poles.
- Possible incineration of residual materials in the LETI.

Considering those risks, a soil characterization (ESA – Phase II) was conducted within the LETI area and demonstrated the contaminated state of the land and groundwater in this area.

20.3.1.3 Hydrogeology

The assessment of hydrogeological conditions at the Project site was carried out using data collected in the 2017, 2018, 2020 and 2021 investigation campaigns. Compiled data allowed to determine the different hydrogeological units, assessing hydraulic properties and piezometry as well as groundwater quality.

During the hydrogeological and geotechnical work of fall 2017 and winter 2018, seventy-seven (77) drillings (boreholes, test pits and piezometers) were done, including three open-rock wells. A second geotechnical site investigation (SI) was conducted in summer 2020 and winter 2021. As part of this SI, 26 boreholes were drilled and 11 of them were converted into observation wells. Additional stratigraphic investigations (trenches) provided information on the stratigraphy of the study area.

The hydraulic properties of the materials were determined for each unit from the work carried out in the study area, namely:

- granulometric analysis (110 analyses)
- pumping test (one test at well WSP-PW03)
- permeability tests (64 tests on 30 wells)

All collected data and hydraulic properties were used to develop the conceptual model to carry out hydrogeological 3D modelling. The study determined baseline conditions such as groundwater flow direction, hydrogeological formations, permeability of the various units and groundwater quality. The outcome of the study helped assess the potential impacts of the pit dewatering on groundwater and propose an appropriate monitoring plan. Modelling results show that once operation activities are completed, the groundwater table drawdown will be nil at approximately 2 km east of the pit. For the south and west sectors, the drawdown will be almost nil at a distance of 500 to 900 m from the pit walls. In the northwest sector, the retention basin will create a slight local increase in the groundwater level of about 0.5 m (negative drawdown). According to the modifications on the hydrogeological regime, the results also show that the impact on lakes and watercourses will involve a natural base flow reduction between 1 and 64%, meaning a decrease in average overall flow between 0 and 2%. Groundwater contribution to the base flow of watercourse CE4 will become very low and Lake Kapisikama, located less than 200 m from the pit, will be impacted and will no longer be supplied by groundwater as of Year 4.

20.3.1.4 Groundwater Quality

In Quebec, groundwater quality is controlled under *Le guide d'intervention des sols et réhabilitation des terrains contaminés, annexe 7 – Grille des critères de qualité des eaux souterraines (Soil and contaminated site rehabilitation intervention guide, appendix 7 - Groundwater quality criteria),* This appendix 7 has two sets of criteria, one for drinking water and one for resurgence water. For the purpose of this component of the project, referential is resurgence water criteria known as RES. Results from the sampling campaigns showed that the groundwater in the area has significant concentrations of calcium and magnesium bicarbonate. Since the hardness of the receiving medium is low (less than 10 mg/l), the RES or alert threshold ("SA" ou Seuil d'alerte) criteria for certain metals are very restrictive. Among the 36 samples analysed, 30 samples exceeded the RES or SA criteria for one or the other of the following metals: silver, barium, copper, manganese and zinc. Results for all other metals are below the RES or SA criteria. The drinking water criteria were exceeded for the following metals: aluminum, arsenic and manganese.

As a result of these analyses, groundwater natural background levels were established from the 36 samples taken from wells distributed in the study area. The parameters for which a background level has been determined are aluminum, arsenic, barium, copper, iron, lithium, manganese and zinc.

Depending on the analyses performed, the following parameters could exceed the RES or SA criteria in certain wells, from time to time, without being linked to the activities of the future mine site: barium, copper, manganese and zinc.

20.3.1.5 Hydrology

The study area is located within the Eastmain River watershed which covers an area of 46,000 km² including many lakes and rivers. Six watercourses (CE1 to CE6) are found within the limits of the local study area. The CE1, CE2 and CE6 watercourses flow west toward the Miskimatao River and then onto the Eastmain River, whereas C3, C4 and C5 flow east, but also join up to the Eastmain River.

The study aimed at providing the overall hydrological profile of the study area. Five streams were visited (CE1, CE2, CE3, CE4 and CE5) between June and October 2017. Flow rates (mean, flood, and low water) of streams were estimated using various methods (inter-basin water transfers, rational method and linear regression).

Mean monthly flow rates were estimated using the inter-basin transfer method from the Eau Claire River hydrometric station. The annual specific mean flow rate of the streams was estimated at 18.7 $L/s/km^2$.

The low flow rates were estimated using the linear regression method developed by the MELCC (2017). They range from 16 L/s (Q10.7 annual) to 80 L/s (Q2.7 summer) for the north-western part (CE1 + CE2 + CE6, 19.8 km^2), and from 22 L/s (Q10.7 annual) to 109 L/s (Q2.7 summer) for the south-eastern part (CE3 + CE4 + CE5, 48.8 km^2). The flood flows were estimated using the rational method, which considers the rolling effect of the wetlands in the study area. These flood flows range from 1.62 m^3/s (2-year flood) to 4.03 m^3/s (100-year flood) for the northwest part, and from 3.78 m^3/s (2-year flood) to 9.06 m^3/s (100-year flood) for the south-eastern part.

Flow rates measured by gauging during summer 2017 suggests that values estimated in this study provide a correct order of magnitude. However, the hydrographical network in the study area stands for a very small percentage of the Eastmain River watershed (total of 0.1% for the five watersheds assessed).

20.3.1.6 Surface Water and Sediment Quality

In Quebec, there are several criteria for surface water quality. Table 20.1 presents the ones that are likely applicable to the project.

Table 20.1: Type of Criteria for Surface Water Quality

Type of Criterion	Usage of Application
Prevention of contamination of water and aquatic organisms	At drinking water intakes
Prevention of contamination of aquatic organisms	To all fresh, brackish and salt water
Aquatic life	Freshwater surface water (for freshwater aquatic life criteria) In brackish and salt water (for saltwater aquatic life criteria) To all fresh, brackish and salted waters (for organoleptic criteria for the flesh of organisms)
Piscivorous terrestrial fauna	In all fresh, brackish and salt water
Recreational activities	At the specific place of use in fresh, brackish and salt water
D019 effluent	To mining effluent discharge

Water sampling was carried out monthly from June to November 2017 to document annual variability. Nine sampling stations were chosen to define the representativeness of aquatic environments in the study area located within the Eastmain River watershed. On-site measurements were also taken. Sediment sampling was first conducted in September 2017 at the same sampling stations. Two additional sediment sampling campaigns were conducted: in September 2019 at the same stations as in 2017, to analyse the sulphur content in sediments given that this parameter was missing from the 2017 campaign, and in July 2020, where two additional sediment sampling stations located downstream from the planned discharged point for the mining effluent were characterized. Water and sediment samples were sent to an accredited laboratory for analysis. Water and sediment results were compared to recommended federal and provincial criteria for quality evaluation.

On site pH measurements in surface water were more acid than recommended federal and provincial criteria for water quality at all stations sampled. Dissolved oxygen concentrations were lower than both recommended criteria at one point. The nature of the soil and the presence of the peatland environment in the study explain these observations.

Some metals had concentrations above water quality criteria even though the area is uninfluenced by human activities. Metal concentrations of aluminium, arsenic, beryllium, iron, manganese, mercury and lead were above the recommended federal and provincial criteria. The most stringent provincial criterion (criterion for preventing contamination of aquatic organisms) was most often surpassed when it comes to aluminium, arsenic and iron. Even if certain measurements show results above some criteria, they are representative of the current (pre-project) natural conditions of the environment.

Annual variability was observed for certain parameters. In particular, metal concentrations of antimony, beryllium, boron, cobalt, copper, molybdenum and selenium showed some variations between June and November.

Regarding sediment samples, no sign of specific contamination was observed based on analysed parameters. The most stringent federal and provincial criterion was surpassed occasionally for arsenic, chromium, cadmium, mercury, lead, copper, and zinc, but are representative of the current (pre-project) natural environment. Most of the samples analysed (in five out of six sampling stations) presented a sulphur content exceeding the criterion 'A' of the *Regulation on the protection and rehabilitation of land* (*Règlement sur la protection et la réhabilitation des terrains* ("RPRT") and among these, one station showed a sulphur content higher than the criterion 'B'. The sediment samples of only one station presented sulphur concentrations lower than the criterion 'A'.

20.3.1.7 <u>Air Quality</u>

Modelling of the air dispersion was conducted to assess the impacts of the Project (mobile and stationary emission sources) on ambient air quality. Results of the modelling were compared with the Canadian Ambient Air Quality Standards ("CAAQS") and the provincial Clean Air Regulation ("CAR") and the provincial criteria for parameters such as total particulates ("PMT"), fine particulates (PM2.5), carbon monoxide ("CO"), nitrogen dioxide ("NO_2") and sulphur dioxide ("SO_2").

Since no air quality sampling has been conducted on the Project site, the air quality baseline has been established using initial concentrations (background) suggested in the air modelling provincial guidelines for mining projects in northern Québec (*Guide d'instructions – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers*).

The modelling results indicated emissions of nitrogen dioxide exceeding the CAAQs and silica dust exceeding the provincial criteria at some sensitive receptors. Some modifications to the blasting program, to truck and heavy equipment characteristics and dust collecting systems were made in order to reduce these emissions. In addition, the implementation of a dust management plan will make it possible to limit the project's impacts on air quality by the implementation of appropriate mitigation measures supported by an ambient air quality monitoring program.

20.3.1.8 Noise

Field data collection for noise was completed between June and October 2011[5]. Noise data was collected with a sound level meter at seven different locations within and around the study area, following standards outlined in the provincial guidelines (Directive 019) for the mining industry. All background levels monitored were under the guidelines criteria for Zone IV (non-sensitive area), which is 70 dBa for both day and night periods. However, on the land of an existing dwelling in an industrial zone and established in accordance with municipal regulations in force at the time of its construction, the criteria are 50 dBA at night and 55 dBA during the day.

A noise modelling study considering all the facilities and mobile equipment for the Project, as well as sensitive receptors, was conducted as part of the ESIA. Modelling results show that noise levels during construction and operation will comply with the guidelines criteria for day and night periods. General mitigation measures will however have to be implemented to minimize the effects of the Project on the ambient noise environment.

20.3.1.9 Artificial Light at Night

A study was conducted to document the luminous environment surrounding the Project area, i.e. the clarity of the sky, intrusive light and nocturnal landscapes. The objective was to assess existing artificial light emitters in the study area as well as the receiving elements which could be affected by light emitted by the Project.

Results show that the Project’s site is in an area where the clarity of the sky is almost optimal. The only artificial light emitter in the study area is the km 381 Truck Stop on the Billy Diamond Highway (formerly the James Bay Road), which is associated with a low-light zone. However, the light quickly fades after a few kilometres and gives place to a sky clarity of very good quality.

Modelling was conducted to assess the impact of future facilities on artificial nocturnal light. Modelling results show that expected changes in the brightness of the sky will have very little effect in the sky glow. The effects will only be visible near lit areas. Changes will be barely perceptible on all other sensitive receptors in the study area, including permanent Cree camps, and on the uses of the territory (traditional or otherwise).

[5] Given that the land use and activities in the Project area have not changed since 2011, the data collected is still considered relevant.

20.3.2 Biological Environment

20.3.2.1 Flora and Wetlands

Vegetation inventories were conducted to characterize and delineate land and wetland plant groups, validate the presence of threatened or vulnerable plant species (or species likely to be designated) as well as species of traditional interest. Across the study area (3,677 ha), terrestrial environments cover 18.2% (668 ha), wetlands 78.6% (2,891 ha), hydric environments (including lakes and streams) 2.0% (74 ha), and anthropogenic environments 1.2% (44 ha).

Wetlands are composed of open peatlands, shrub peatlands and wooded peatlands which largely dominate the landscape of the study area. Environments surveyed presented typical characteristics of wetlands and peatlands found across the James Bay territory. Under a conservative assessment, it seems that 43.3% of land from the Abitibi and James Bay lowlands are covered with wetlands. According to this comparison, the study area contains a greater proportion of wetlands than the regional level.

No species at risk or invasive species were identified during inventories.

Up to 27 plants of interest to the Cree were also identified: five tree species, 16 shrub species, five herbaceous species and one nonvascular species. For the most part, the medicinal plants observed during inventories are common in the study area and in this part of Québec.

Finally, even if ecosystems have adapted to forest fire dynamics over the past decade (2005, 2009 and 2013), successive forest fires have modified the composition of the vegetation cover in the short and medium terms.

20.3.2.2 Terrestrial Fauna and Avifauna

Wildlife inventories were conducted in 2011, 2012, 2017 and 2018 to document fauna in the study area. Inventories were led for herpetofauna, avifauna, chiroptera, small and large mammals.

Forest fires that struck the area in the last decade have profoundly changed habitats in terms of vegetation cover and food availability. These phenomena caused death or flight of most of wildlife species.

20.3.2.2.1 Herpetofauna

Opportunistic observations in potential habitats were conducted since no species at risk was foreseen in the study area. Four species were identified, namely the American toad (*Bufo americanus*), wood frog (*Lithobates sylvaticus*), mink frog (*Lithobates septentrionalis*) and the common garter snake (T*hamnophis sirtalis*). These species are largely spread across Québec's territory. Nevertheless, few specimens were identified in 2017, possibly because of the occurrence of forest fires in recent years.

20.3.2.2.2 Avifauna

Various field surveys were conducted between June and July 2017, such as an aerial survey of waterfowl, a nesting bird survey, and a targeted search for species at risk. In 2012, a survey of nesting birds was also conducted in a portion of the study area. The presence of 53 bird species was confirmed, most of them are common and largely distributed across habitats at these latitudes in Québec. Of these species, two species at risk were surveyed: the nighthawk (*Chordeiles minor*) and the rusty blackbird (*Euphagus carolinus*). Availability of their habitats is not at risk in the surrounding environment near the study area or across Québec.

20.3.2.2.3 Chiroptera

Surveys were conducted during reproduction and migration season in 2017 using an acoustic method based on protocols developed by the ministry of natural resources and fauna (*Ministère des Ressources naturelles et de la Faune* ("MRNF")[6]). Results indicate very low density of chiroptera (68 crossings) and identity three out of four species potentially present in the study area. These species are the big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), and a chiroptera of the *Myotis* genus. The scarcity of mature forest due to forest fires may be the cause of chiroptera's weak presence in the study area. Habitat of higher quality for species at risk are found in the surrounding environment of the study area.

20.3.2.2.4 Small Mammals

The survey method used for small mammals is the one developed by the MRNF. The survey identified eight species in 2011 and two species in 2017. Capture success was five times less in 2017 than 2011, probably because of successive forest fires in recent years. One species at risk was identified, namely the yellow-nosed vole (*Microtus chrotorrhinus*), but its habitat seems to have disappeared between 2011 and 2017.

[6] Now called the ministry of forest, fauna and parks (*ministère des Forêts, de la faune et des Parcs*, MFFP).

20.3.2.2.5 Large Fauna

An aerial survey was conducted in March 2018 in a study area of approximately 1,600 km^2 to identify larger species that are mobile on land.

Inventories confirmed the presence of moose (*Alces alces*) based on the observation of individuals mostly in residual coniferous islands near rivers. Black bear (*Ursus americanus*) and grey wolf (*Canis lupus*) were not identified during the aerial survey. However, signs (feces and traces) of black bears were seen during opportunistic observations in the study area. Both bears and wolves have been seen by Cree and km 381 Truck Stop personnel in recent years.

Regarding the caribou (woodland and migratory of the Leaf River Herd) (*Rangifer tarandus caribou*), which is protected at both federal and provincial levels, no individuals or signs of their presence were observed, even if the species distribution could be in the study area. Migratory caribou monitored with geolocation collars by the MFFP have not been detected in the study area in recent years. No individual was ever reported in a 20 km radius of the future mine site. In other words, it seems that the study area is rarely occupied by this species, specifically over the last years where forest fires destroyed mature forest in the area. The presence of migratory caribou in the area is marginal as its preferential habitat (mature forest) is absent.

The habitat quality for large fauna in the study area remains poor due to successive forest fires in the past decade.

20.3.2.3 Aquatic Fauna

Fish sampling was conducted in 2012 and 2017 in four streams and four lakes. The key objectives of the study were to describe the fish communities, determine the fish density, identify the species used for recreational, commercial and subsistence fishing, and identify species at risk in waterbodies and watercourses of the study area. Work also aimed at describing fish habitats and benthic communities in the water systems.

Fish density was low in streams. Seven species were identified across the study area, namely the spined stickleback (*Culaea inconstans*), brook char (*Salvelinus fontinalis*), white sucker (*Catostomus commersonii*), yellow perch (*Perca flavescens*), lake chub (*Couesius plumbeus*), trout-perch (*Percopsis omiscomaycus*) and northern pike (*Esox Lucius*). None of these species are listed on the federal Species at Risk Act or likely to be vulnerable or endangered in Québec. Species richness was the greatest in CE5 Creek which sheltered six species. Brook char was present in all streams, but none was caught in lakes. Yellow perch was only captured in the Kapisikama Lake. Its population seems completely isolated from the rest of the water network.

Physical characteristics of all streams were similar featuring U channel, meandering through peatlands and floodplains, fine particles substrate, low flow and an acidic pH. Even though these characteristics are not optimal for salmonids, it did not seem to affect brook char settlement in watercourses. Watercourses sheltered between two and six fish species.

The lakes were characterized by low depths (less than 3 m). The Asini Kasachipet Lake was no more than one metre deep. Lakes sheltered one to three species, except Sans Nom 1 Lake where no fish was captured. Both Asini Kasachipet and Kapisikama lakes are headwater lakes, which may explain the low species richness (only one species captured).

No potential spawning grounds were found for brook char in watercourses of the study area. In CE5 Creek, its floodplain may be used as potential spawning grounds for northern pike. The floodplain of the Asiyan Akwakwatipusich Lake may also provide potential spawning grounds for this species.

In September 2019, a total of 20 brook char were collected in the CE1 and CE2 watercourses. Samples of fish tissue were sent to an accredited laboratory to analyse the mercury content. All the samples analysed were below the MELCC criterion related to fish consumption recommendations.

Regarding benthic communities, 48 species were identified at four sampling stations in July, September and October in 2017. Communities were mainly composed of insects for all three sampling campaigns.

20.3.3 Social Environment

20.3.3.1 Political Context

The Project is located in the region of Nord-du-Québec on the territory of the Regional Government of Eeyou Istchee James Bay, which, as of 2014, entirely replaced the James Bay municipality. The territory of Eeyou Istchee James Bay includes the municipalities of Chapais, Chibougamau, Lebel-sur-Quévillon and Matagami, the three localities of Radisson, Valcanton and Villebois, as well as the Cree communities of Whapmagoostui, Chisasibi, Wemindji, Eastmain, Waskaganish, Mistissini, Nemaska, Oujé-Bougoumou and Waswanipi.

Northern Québec is governed by the James Bay and Northern Québec Agreement ("JBNQA") and the Agreement Concerning a New Relationship between the Government of Québec and the Cree of Québec, also referred to as the Paix des Braves (French for “Peace of the Braves”). The land regime introduced by the JBNQA is an important element in territorial use. It divides the James Bay territory into Category I, II and III lands. The Project is on Category III land on which the Cree have exclusive rights to trap fur animals and have certain benefits in the field of outfitting.

20.3.3.1.1 Plan Nord

The “Plan Nord” is a provincial economic development strategy initiated by the government in 2011 to provide numerous incentives to develop the natural resources extraction sector in the north of the province. The “Fonds d’initiatives Nordiques” supports and promotes projects in the North to generate economic activity and to create and maintain jobs in the area covered by the Plan Nord. A Northern Action Plan was developed for the 2020-2023 period by the Société du Plan Nord (2020).

20.3.3.1.2 La Grande Alliance

The “La Grande Alliance” is a memorandum of understanding for collaboration and consolidation of socio-economic ties between the Cree Nation and the Quebec government to connect, develop and protect the territory. This long-term economic development plan for the Eeyou Istchee Baie-James region is valued at CAD 4.7 billion and is to be spread over a period of thirty years. In particular, it provides for the extension of the rail network by around 700 kilometers, the construction of hundreds of kilometers of new roads and power lines, the creation of a deep-water port, the electrification of certain industrial projects, the formation of a local workforce and the creation of a network of protected areas.

20.3.3.2 Land Use for Traditional Purposes

The Cree Nation of Eastmain is located 130 km West of the proposed Project site. The Cree community of Eastmain is impacted by the Project with respect to traplines located near the Project site (RE1, RE2, RE3, VC33 and VC35). The Project site is located on the RE2 trapline. Most activities conducted on this trapline are located near the Eastmain River, which is outside the proposed Project site. Marginal activities are also carried out along on both sides of the Billy Diamond Highway. They include moose and goose hunting, beaver trapping, fishing, wood cutting, and blueberry picking. A small camp, snowmobile trails and goose ponds set by the tallyman are located near the Project.

20.3.3.3 Infrastructure

A truck stop owned and managed by the *Société de développement de la Baie-James* (“SDBJ”) is located in the study area, at km 381. The truck stop provides lodging, restaurant, meeting room and mechanical repair services. A convenience store, laundry room, cafeteria, motel, two garages and a service station are also part of the complex. Two secondary roads are located within the study area: one south-east of the project area, which provides access to the transmission line corridor of the 4003-4004 circuit, and another along the pegmatite hill, in the south, which stops at the remote landfill ("LETI").

The LETI is located near the future open pit and is associated with the operations of the truck stop. The LETI site has been used for the management of residual materials since 1983. Until 2011, residual materials transported to site were buried in trenches, but these are now incinerated in containers and buried.

20.3.3.4 Archaeology

In 2011, an archaeological potential study was undertaken by Arkéos Inc. in the Project area. This study was updated in 2017 to adjust the study area to the new project definition. at the end of July 2021, a team of archaeologists conducted an archaeologic inventory of areas presenting high archaeological potential to ensure the projected construction work does not result in the destruction of archaeological and ethnological remains. The archaeological inventory included 322 holes (80.5 m^2). No archaeological evidence was revealed during the visual inspection and inventory (Arkéos, 2021).

According to the knowledge acquired as part of the Eastmain-1 Hydro Quebec Complex Development Project, human occupation in the region dates from 4600 to 4100 BP. Besides, a prehistoric archaeological site is known at the site of km 381Truck Stop. The territory has been occupied and harnessed by First Nations since prehistoric times, and even today, the study area and its immediate surroundings encompass sections, of varying sizes, of Eastmain traplines.

20.3.3.5 Landscape

A landscape inventory and analysis were performed to assess the impact of the Project on the landscape and in the visual field of the observers. The landscape study area corresponds to the human environment study area. Field observations, other sectoral studies and photographs taken from various viewpoints were considered. The study area is divided into five types of landscape units based on the homogeneity of the permanent elements of the landscape and the visual characteristics that prevail. Landscape units are largely defined by topography and land use. The landscape units of the study area are as follows:

- Valley
- Plain
- Plateau

- Powerline
- Road

20.4 Surveillance and Monitoring Program

As presented in the ESIA, and required as part of the authorization process, an environmental surveillance and monitoring program will ensure that work carried out complies with laws, policies and regulations in effect, commitments and obligations of the proponent, plans and specifications, and mitigation measures that were presented in the ESIA to minimize the Project's effects. In addition, an environmental surveillance and monitoring program will verify the proper functioning of equipment and facilities and manage any environmental changes caused by the Project.

20.4.1 Construction

Regular surveillance will be carried out by GLCI during the construction. The surveillance program will include inspection of the construction site, documentation control, report preparation and communications. Construction site surveillance involves direct communication between site manager and all workers to ensure efficient work when faced with any potential non-conforming situations.

Operation procedures will be established to document and follow all construction activities, construction site observations, decisions regarding non-conforming situations, corrective actions, observed results of these actions, and preventive measures put in place to ensure that these non-conforming situations do not occur again.

Mitigation measures will be followed rigorously during construction, notably when construction will occur near or in watercourses. Also, improvements to mitigation measures already in place will be proposed, where appropriate, in accordance with environmental requirements, specifications and objectives.

20.4.2 Operations

A monitoring program will be required for surface and groundwater. Sampling of the final effluent will be carried out in accordance with Directive 019 (provincial) and the Metal and Diamond Mining Effluent Regulations ("MDMER" federal). Surface water quality of the receiving environment will also be monitored according to MDMER. A sediment physicochemical quality monitoring program will tie into the water quality monitoring. As part of the MDMER, monitoring of the fish population and the benthic invertebrate community as well as monitoring of fish tissue will also be conducted.

For groundwater, a surveillance network will be implemented around potentially at-risk infrastructure. The monitoring wells will be distributed upstream and downstream of the waste rock and tailings storage facilities (16 sites), the pit (4 sites), the industrial sector (4 sites) and the explosives warehouse area (3 sites). Groundwater quality as well as groundwater levels around the pit will be monitored.

GLCI will monitor drinking water quality and supply at the km 381 truck stop and at the wells supplying the mine's administrative and industrial sector.

A monitoring program will also be developed and implemented for air quality. Total particulate matter (TPM), respirable suspended particulate matter (PM10), fine particulate matter (PM2.5) and crystalline silica will be monitored. The monitoring will be modulated according to the results obtained. The potential emission of NO_2 generated during blasting will be monitored mainly through the observation of blasting events.

A noise monitoring program will be implemented. This program will include measurements taken continuously over at least 24 hours during suitable weather conditions (wind speed lower than 20 km/h, absence of rain, air temperature higher than -10 ºC, relative humidity lower than 90 %) at the workers' camp and at the km 381 truck stop.

A monitoring program will be developed for the vegetation surrounding the Project infrastructure. This monitoring program will namely allow validating the project's indirect impacts on the terrestrial and wetland plant communities. The monitoring of the introduction and spreading of invasive alien species as well as the monitoring of compensation projects for the loss of wetlands are also planned as part of this program.

GLCI will develop and implement a wildlife monitoring program comprising:

- Beaver monitoring to ensure the safety of the dams and the colony's health while considering the dynamics of the beaver habitat.
- Bird population monitoring, focussing on migratory birds, and more specifically on waterfowl and species at risk, and their use of water ponds and borrow pits.
- Overall monitoring of breeding birds, including species at risk.
- Monitoring of other species at risk, such as bats and caribou.

Social monitoring will also be performed during the operation phase of the Project. The social monitoring program will namely include:

- Monitoring of socioeconomic conditions within the Eastmain community.

- Monitoring of land and resource uses for traditional purposes.
- Monitoring of the quality of life and well-being for the population of the Eastmain community.

GLCI is committed to developing a monitoring program for the quality of plants used by the Cree community as traditional food. The objective of this program will be to record any changes in the chemical composition of the main foods used by the community. The monitoring programs for the physical environment (water, air and sediment quality) will complement the traditional food monitoring program and ensure compliance with environmental requirements.

20.5 Closure and Rehabilitation

As stated in the regulation associated with the Québec Mining Act, a closure and rehabilitation plan will have to be submitted with cost estimate for approval by authorities and the total amount of the cost estimate secured within three years (CQLR, c. M-13.1, s.232.1, 232.4; c. M-13.1, r.2, s.113). The mine site closure and rehabilitation program will be developed according to the guidelines for preparing mine closure plans in Québec (MERN, 2017).

A preliminary closure plan was prepared and included as an appendix to the ESIA (WSP, 2021). An official Closure plan will be developed and submitted to the MERN in accordance with article 232.1 of the Mining Act for approval prior to the filing of the mining lease application.

The protection, redevelopment and restoration measures presented below aim to close the mine site to satisfactory condition, namely:

- Eliminate unacceptable risks to health and ensure the safety of persons.
- Limit the production and spread of substances liable to harm the receiving environment and, in the long term, aim to eliminate all forms of maintenance and follow-up.
- Restore the site to a visually acceptable condition for the community.
- Restore the infrastructure site to a state compatible with future use.

The mine site closure and rehabilitation program will focus on the following elements:

- Access to the site will be secured by a locked fence.
- The perimeter of the pit will be surrounded by a 2 m-high berm, with a surface water collection ditch as standard water management infrastructure. Danger signs will be installed every 30 m, in

accordance with article 104 of the Regulation on mineral substances other than petroleum, natural gas and brine.

- Buildings and other infrastructure will be dismantled and demolished at the end of the mining activities. Management of dismantled materials will be done in compliance with best sound practices.
- All non-hazardous and clean material that cannot be sold or given out will be forwarded to the nearest authorized disposal site [7].
- After dismantling of the buildings and the surface infrastructures, the concrete foundation slabs will be cleaned, perforated and broken up; surfaces will be covered with reserved material from the overburden pile. In the event that there is a potential for creating wetlands, a soil surface design will be developed to create poor drainage conditions and it will be covered with unconsolidated deposits before being vegetated.
- A characterization study will be carried out in sectors likely to have been contaminated, within six months of the final cessation of activities in accordance with Section 31.51 of the Environment Quality Act.
- Equipment and heavy machinery will be sold or drained of any fluid, broken in parts and sent to an authorized site.
- All petroleum tanks and related pipelines will be drained, cleaned and sold or disposed of in accordance with applicable regulations.
- No residual hazardous material shall be present on site after the cessation of the mining activities.
- The waste rock and tailings storage facilities will be reshaped to ensure long-term physical stability and neat landscape integration; if future studies demonstrate that vegetation can survive adequately, the pile will be covered with substratum and seeded.
- In coherence with the mining schedule, some waste rock will be disposed of in a pit where extraction is completed.
- The residual pit will be naturally filled with precipitation and groundwater to a level equilibrium with the water table; spillway and ditches will be constructed to avoid stagnant waters in the filled pit and ensure drainage to natural waterways.
- All affected land will be revegetated to avoid soil erosion and to give back a natural character to the site until the satisfaction criteria are attained according to the provincial guidelines.
- Roads will be scarified to let natural reinsertion of vegetation or left as is, upon tallyman request.

[7] Note that the resale value of equipment or materials cannot be deducted from dismantling cost.

20.5.1 Post Closure Monitoring Program

A follow-up study of the physical stability of the structures, chemical quality of drainage and return of vegetation will be carried out over a minimum period of five years after the cessation of mining and transformation activities:

- Site inspections will be conducted by a geotechnical expert once a year, for five consecutive years and periodically for the next ten years. Parameters such as the chemical and physical stability, over a short and long-term period, will be validated by these inspections.
- The final effluent will be monitored as per operational conditions mentioned in the last depollution attestation issued during the mining operations, in accordance with the regulations. A surveillance network of groundwater wells will be implemented around remaining at-risk infrastructure, such as the waste rock and tailings storage facilities. At least six wells will be sampled after rehabilitation.
- The visual assessment will include percentage of area with vegetation recovery, soil erosion and other parameters associated to the satisfaction criteria. A request to cease monitoring will be sent to Ministère de l'Énergie et des Ressources naturelles ("MERN") at the end of the five-year term.

20.6 Socio-economic

GLCI established a stakeholder consultation and engagement process as part of its project acceptance activities, which allowed GLCI to gather information, questions and expectations of local communities and stakeholders. Mitigation measures were proposed based on the consultation process.

GLCI signed a Preliminary Development Agreement ("PDA") with the Cree Nation of Eastmain, Grand Council of the Cree and Cree Nation Government dated on March 15, 2019. This PDA is to be replaced by an Impact Benefit Agreement ("IBA"), before project construction.

20.6.1 Public Consultation

To reach the largest number of people in the James Bay area, in 2011-2012 and in 2017-2018, GLCI met with a wide reach of stakeholders including, municipal administration, economic development, land use and planning, and natural resources. Stakeholders expressed support for responsible mining development in their region, but also voiced the importance of establishing positive working relationships, regional socioeconomic benefits, and carefully considered environmental protection planning and monitoring.

Stakeholder concerns, expectations and recommendations regarding the Project were recorded throughout the consultation process. A summary of the concerns and expectations is shown in Table 20.2 below.

Table 20.2: Summary of Stakeholders' Concerns and Expectations

Topic	Stakeholders' Concerns and Expectations
Concentrate Processing	- Environmental impact from the processing. - Consideration of processing the spodumene on EIJB land.
Environmental	- Impact of disturbances on the environment and risk of drinking contaminated water during construction and operation. - The effects of the mining project on land integrity. - Compliance with the new regulation to protect peatland.
Sustainable Development	- Intention of the promoter to participate in the region's economic development.
Land Use	- Impact of commuting on the James Bay community (fewer economic spin-offs, loss of job opportunities, loss of residents in the Nord-du-Québec region, etc.). - The site of the mine's administrative and operating hub. - Logistics of worker transportation.
Jobs and Labour	- Employee retention problems in the administrative region of Nord-du-Québec. - Giving due consideration to Cree workers. - The mining project's impact on small business owners or service providers.
Training	- Consideration to use the region's vocational training centres/establishments. - Training in time for construction/operation
Economic Spin-offs	- Concerns regarding the lack of economic spin-offs for the region. - The need to obtain year-round air service.
SDBJ Facilities	- Effects on SDBJ infrastructure and services. - Risk of contaminating the drinking water supply at the km 381 truck stop.
Billy-Diamond Highway (formerly the James Bay Road)	- Impact of the mining project and the associated increase in traffic on the road's integrity. - - Concerns regarding the weight-bearing capacity of the Billy-Diamond highway.
Leadership	- Fear that GLCI will not use its mining expertise to assume a leadership role and set the tone for other junior companies that will develop projects in the region.

GLCI has already responded to all concerns, expectations and recommendations voiced by the James Bay and Cree stakeholders. GLCI's responses are detailed in the ESIA consultation log.

Since the submittal of the 1st version of the ESIA in October 2018, communication and engagement with Project stakeholders have continued and will be ongoing through life of project. No particular preoccupations and concerns have however been expressed since the submittal of this ESIA in 2018.

20.6.1.1 Consultation of Indigenous Peoples

Meetings were organized with the Eastmain Cree community to inform and consult stakeholders concerned by this mining development. These meetings were primarily aimed at socioeconomic stakeholders, RE1, RE2, RE3, VC33 and VC35 tallymen, the users of the territory of these traplines, and members of the Eastmain community. RE2 trapline is the most impacted. Meetings were also organized with Waskaganish and Waswanipi where community members, designated senior community officials and tallymen were consulted.

GLCI conducted interviews in Eastmain with stakeholders from various sectors relating to the economy, the socio-cultural aspects, health, hunting, fishing, trapping, quality of the surrounding environment, and from focus groups.

GLCI hosted community presentations to share project information, organized individual and group sessions with stakeholders, posted updates on the James Bay Project website and maintains direct contact with community members on a regular basis, including the RE2 Tallyman.

Maps of the traplines were provided to Cree Nation members, giving them an opportunity to identify areas where traditional activities take place, camp sites, drinking water supplies, transportation links and enhancement and preservation sectors. A group interview was conducted during the consultation of the Cree Board of Health and Social Services of James Bay (“CBHSSJB”), and of the Cree School Board (“CSB”). All stakeholders from these two bodies were invited to the meeting, allowing canvassing of the views of each area of intervention within these organizations.

The purpose of all meetings was to address participants’ knowledge of the Project; the known effects of other mining projects on the EIJB territory; participants’ views on the proposed Project; its potential positive and negative impacts; its potential cumulative impacts; mitigation measures to consider; and any other expectations, concerns or queries members of the community wished to voice. Minutes were drafted following each of the meetings and sent for approval to the stakeholders.

Communications with the Cree community has been maintained since the submittal of the first version of the ESIA in October 2018. Meetings were held in 2019 with Cree stakeholders. Although the 2020 Covid-19 sanitary crisis have limited the consultations activities, some were held by using videoconferencing platforms in 2020 and 2021. The changes made to the project design were presented during the consultations conducted in 2021.

Concerns, expectations, and recommendations regarding the Project were recorded throughout the consultation process. A summary of the concerns and expectations expressed by the Cree community is shown in Table 20.3.

Table 20.3: Summary of Cree Community's Concerns and Expectations

Topic	Cree Community's Concerns and Expectations
Environment	- The impact of disturbances (dust, noise, vibration, odours, etc.) on fauna and flora as well as on water and air quality. - The risks of contaminating the territory's resources. - Effect of cumulative impacts from hydroelectric and mining developments on the territory.
Employment	- Prioritization of Cree workers. - Impacts of the mining project on the workforce of the community and its services. - Access to employment for women, including single mothers.
Training	- Fear that the Cree workforce is not sufficiently qualified to obtain jobs on the mining site.
Work and Culture	- Obstacles that could hinder Cree workers, such as the French language requirement, racism, sexual harassment between workers, and GLCI's expectations regarding professionalism and ethical standards.
Communication	- Lack of knowledge of mining operations and problems. - Fear of not being well informed or of not having a proper understanding of the issues related to the proposed mine project.
Business and Partnerships	- Implementation of a business model that will contribute to enriching the community while respecting its culture and values. - Possibility of forming partnerships between the company and the Eastmain community.
Economy	- Concerns about the boom–bust phenomenon and its effects.
Traditional Activities	- The mining project's impact on hunting, fishing and gathering activities. - Impact on the quality of resources produced by traditional activities. - Work schedule constraints on workers' traditional activities.
Traffic, Transportation and Rails	- Increased road traffic and resulting accelerated degradation of road infrastructures, security issues. - Impact on the environment in the event of a spill. - Surveillance of transportation of chemicals.
Km 381 Truck Stop	- Impact of the mining project on the infrastructures of the km 381 Truck Stop and on the quality of drinking water from the well. - Possibility of relocating the km 381 Truck Stop.

20.6.1.2 Stakeholder Commitment

GLCI is committed to developing sustainable relationships with stakeholders to maximize social and economic benefits, while managing and mitigating environmental impacts. The relationship between GLCI and stakeholders will be maintained throughout the life of the Project.

GLCI will establish several monitoring committees to foster the participation of the involved communities in the Project's execution. These committees will start to be created prior to the mine's construction and will remain active throughout its life, until works for the mining site rehabilitation and restoration plan are fully completed. The composition of the committees will be detailed in the IBA.

20.6.2 Economy

The structure of the Cree economy is mainly driven by tertiary sector activities, particularly in band councils, education and health institutions. Traditional Cree hunting, fishing and trapping activities are still present and important in the communities of the Eeyou Istchee Baie-James. For the 2017-2018 period, 13.4% of Cree community members were beneficiaries of the federal Income Security Programs, a decrease compared to the 2016-2017 rate of 13,9%, and 2015-2016 rate of 15.2%.

In 2016, nearly two-thirds (62.8%) of the experienced labor force[8] in the Eeyou Istchee James Bay communities were working in the following three categories: (1) business, finance and administration, (2) sales and services, and (3) education, law and social, community and government services. Occupations in the trades, transportation and machinery category accounted for 13.7% of the experienced labor force. Occupations in the primary sector accounted for 4.6% of the workforce of the Eeyou Istchee Baie-James in 2016 against 1.6% in Québec. The processing, manufacturing and utilities sector accounted for only 0.85% of the experienced labor force in 2016, compared with 4.9% for Québec.

The Council of the Cree Nation of Eastmain employed about 75 people in 2021. Activities are divided into eight departments: Administration and Human Resources, Public Works, Public Safety (Public Safety and Fire Protection), Public Health, which includes First Response and "Healing" Departments, Special Projects, Culture, Youth, Sports and Recreation, Housing and Police Service.

[8] Persons aged 15 and over who were employed or unemployed during the week prior to the day of the Census and have last worked for pay or self-employed in 2005 or 2006.

20.6.2.1.1 Eastmain Community

Economic activities in Eastmain are primarily related to the following sectors: service, restaurant, transportation (including airport management), construction (three businesses), trapping, and to a lesser extent, trade and outfitters. The Wabannutao Eeyou Economic Development Corporation ("WEDC") promotes business development in the community. WEDC manages various businesses in the community (motel, two casinos, construction company, gas station and mechanical workshop), and runs two outfitters in Eastmain with sporadic activity.

20.6.2.1.2 Jamesian Community

The Jamesian economy is largely dependent on the energy, mining and forestry sectors. The structure of the Jamesian economy remained relatively similar from 2006 to 2011. In 2006, management, business, finance and administration, science and sales and services occupations accounted for 56.7% of the experienced labor force of 15 years and over, and 59.7% in 2011. In 2016, for the same sectors, the rate decreased to 44.9%. Trades, transportation and machinery occupations accounted for about 21 % of the experienced labor force in 2006 and 2011, and 18.5% in 2016. Moreover, occupations specific to the primary sector increase in popularity in 2016 (7.1%) compared to 2006 (5.9%) and 2011 (3.2%). The Jamesian experienced labor force in the primary sector is greater than in Québec (1.6%).

Machinery rental represents a large part of the activities of Jamesian construction companies. Construction and transportation contracts come mainly from mining and forestry companies, and most notably from the hydroelectric projects Eastmain-1 and Eastmain-1-A - Sarcelle-Rupert. Residential construction was slowing down because of declining population.

20.6.3 Workforce Issues

Workforce related issues and concerns are being gathered throughout the engagement and consultation process, including the Cree Women's Association of Eeyou Estchee. A full time Human Resource team will be hired in the future to further manage Human Resource and Workforce issues, including a Cree Human Resource Coordinator.

20.6.3.1 Education and Training

Training and Education initiatives will be ongoing throughout the life of the project. The approach will not be static and will require careful management by the Human Resource Department to maximize benefits to the local communities and the region.

20.6.3.1.1 Eastmain Community

The level of education may hinder employment capacity in the community. In 2011, 4,810 Cree aged 15 and over had at least a high school diploma, corresponding to 44.2% of the population of Eeyou Istchee James-Bay compared to 77.8% for the province of Québec. This number increased to 5,715 Cree in 2016, which represents 48.7% of the population of Eeyou Istchee James-Bay compared to 80.1% for the province of Québec.

In addition, the level of Cree participation in postsecondary education is lower than the province average. In fact, in 2016, the rate of university graduates (all levels) in the Cree communities (8.8%) was lower than for the population of Québec (24.1%). Nevertheless, the number of university graduates rose from 880 (8.1% of the population of Eeyou Istchee James-Bay) in 2011 to 1,030 (8.8% of the population) in 2016. Between 2011 and 2016, Cree collegial enrolment has increased the most with a rate of change of 26.3%, followed by professional training with a rate of 19.5%.

According to the Cree School Board, in 2017-2018, 511 students were enrolled in post-secondary studies, compared with 638 in 2015. Of the 511 students, 379 students were enrolled in a general and professional college ("CÉGEP"), 119 in a university, and 13 in another training centre.

20.6.3.1.2 Jamesian Community

In 2016, the level of education was lower among Jamesians than the population of Québec. In total, 73% of residents aged 15 and over had at least a high school diploma, compared with 80.1% for Québec. This gap is greater at the university level. Only 1,360 Jamesians (12.1%) had a university level education (all levels combined), almost half the proportion of the population of Québec (24.1%). However, it should be noted that graduation rates have been steadily increasing since 2011 for all education levels. Professional training is important among the Jamesian population in 2011 and 2016. In 2016, it represented 26.9% of the Jamesian population compared to 16.9% for the population of Québec. Regarding the high school graduation rate for the Jamesians, the available data shows that in 2018 it was 63.9% after five years of study.

The *Centre de formation professionnelle de la Baie-James* in Chibougamau has two other points of service, one in Lebel-sur-Quévillon and the other in Matagami. It offers a set of study programs in several sectors, including the mining sector. The programs offered are determined in collaboration with the *Commission de la Construction du Québec* ("CCQ"), the regional health agency or *Emploi-Québec*, to ensure that they meet the labor needs of the region. Other programs of interest to the mining industry are also offered, including Diamond Drilling, Drilling and Blasting, Mining and Mining Machinery Operations programs.

21 CAPITAL AND OPERATING COSTS

21.1 Basis of Estimates

The capital cost estimate (CAPEX) and operating cost estimate (OPEX) of the project were accounted at a feasibility level and should provide further guidance for the project implementation phase. The estimate parameters are as follows:

- Estimate target accuracy initial capital costs: +15% / -15%
- Estimate target accuracy sustaining capital costs: +15% / -15%
- Estimate target accuracy operating costs: +15% / -15%
- Estimate period: Q3 2021
- Estimate currency: Canadian Dollars (CAD)

The estimate was developed based on the GMS standard commodity coding structure for mineral projects. A work breakdown structure (WBS) was developed for the project to organize the project in a logical structure based on function and location. The first level WBS structure includes the following areas:

- 100 Infrastructure
- 200 Power & Electrical
- 300 Water & Tailings Management
- 400 Surface Operations
- 500 Mining (Open Pit)
- 600 Process Plant
- 700 Construction Indirect
- 800 General Services - Owner's Costs
- 900 Pre-Prod, Start-up, Commissioning & Contingency

The operating cost estimate was broken down as follows:

- Mining (drill and blast, load and haul, geology, maintenance, dewatering, electric cable handling, other)
- Processing (crushing and screening, storage and reclaim, DMS, concentrate handling, tailings handling, ore feed, maintenance, other)

- Services (health and safety, environment, lab and stores, other)
- Administration and other (office, camp, community, other)

OPEX are inclusive of labour, consumables, power, maintenance materials as well as General and Administration.

21.1.1 General

The mining capital and operating cost estimates were developed by GMS to include the mine mobile equipment, i.e. primary, secondary, support, auxiliary and ancillary equipment, as well as pre-production mine development.

Mining infrastructures namely haul roads, mine facilities as well as explosives storage and processing plant were developed by GMS. Costs pertaining the upgrades necessary for an electric shovel were estimated by GMS with the help of the supplier

The capital and operating cost estimates for the process plant were developed by GMS with input from Wave (including processing plant design, bulk quantities and equipment lists).

The tailings and overall site water management capital and operating cost estimates were developed by GMS with input from Golder.

Costs pertaining to off-site infrastructures, namely the upgrade of the Eastmain airport as well as the overhead power line and associated upgrade of existing facilities were provided by Octant and Hydro-Québec, respectively.

The road between the Project site and Matagami and the railroad between Matagami and Trois-Rivières are adequate for the transportation needs of the Project and thus require no CAPEX.

The initial CAPEX estimate includes all Project direct and indirect costs to be expended during the implementation phase of the Project. The initial CAPEX estimate covers the period from the approval date by Galaxy of this report to the successful completion of the Plant commissioning phase. Any costs expended beyond the Plant commissioning phase are captured with the Sustaining CAPEX, deferred CAPEX or OPEX. (CAPEX starts at Detailed engineering phase) Various studies phases, test-work, preliminary engineering, etc. and including permitting activities are excluded from the estimate (sunk cost).

21.1.2 Mining

The CAPEX estimate reflects an owner-managed project delivery model.

A budgetary price RFP process was undertaken for most of the mine equipment fleet, and a preliminary technical and commercial evaluation process was completed. This budgetary quote pricing is the basis for the CAPEX estimate.

All the mining equipment purchase costs are captured in WBS Area 500.The equipment pricing includes the base machine with several required options, tires, fire suppression systems in most cases and assembly and commissioning when required.

The direct costs include all operating costs for equipment such as fuel, electricity, maintenance parts, operators, and consumables (tires, explosives, etc.). Indirect costs consist of the labour costs for mine supervision, management, and technical support. Direct and indirect costs during pre-production were both captured in the OPEX.

Equipment freight costs are presented in WBS Area 800.

21.1.3 Processing Plant and Infrastructure

The physical conceptual design is prepared in accordance with the WBS where all the tasks and areas were developed in enough detail to establish an estimate of +/-15% accuracy. A general contingency of 8.4% was generated using a Monte Carlo analysis.

Table 21.1 presents WBS Level 1.

Table 21.1: WBS Level 1

WBS L1	Description
001	All Site General
100	Infrastructure
200	Power & Electrical
300	Water & Tailings Management
400	Surface Operations
500	Mining (Open Pit)
600	Process Plant
700	Construction Indirect
800	General Services - Owner's Costs
900	Pre-Prod, Start-Up, Commissioning & Contingency

The process plant costs were established by obtaining prices for more than 85% of the process equipment from multiple suppliers. Detailed material take-offs (MTOs) were prepared for all bulk materials, i.e. concrete, primary and secondary steel, architectural items, cable trays, electrical cables and piping (steel and HDPE). The cost of instrumentation was factored as 6% of the price of mechanical equipment.

Prices were obtained for all prefabricated buildings including the Ore Stockpile Dome and the Warehouse and quotations were obtained for the Camp. The ore reclaim conveyor tunnel cost was based on a quotation from a specialized manufacturer. The cost of the main electrical sub-station was based on prices obtained from three major manufacturers.

The MTOs for earthworks, including the waste rock and tailings stockpile design are based on physical material take-offs from preliminary designs prepared by Golder. Unit costs are estimated using Quebec labour hourly rates from different recent projects, collective agreements, and historical data.

Estimates from GMS experience and data room from similar projects were completed for the sewage treatment plant and other ancillary buildings, and temporary / construction infrastructure. The remaining equipment and material costs were based on budgetary bid processes, quotes, consultant's historical data and in-house databases, or benchmarked from previous projects. The power supply costs are based on Hydro-Québec's published "Rate L".

21.2 Capital Cost Estimates

The capital cost estimate summary is presented in Table 21.2.

Table 21.2: Capital Cost Summary

Capital Expenditures	CAD M
100 - Infrastructure	37.93
200 - Power and Electrical	41.81
300 - Water	33.62
400 - Surface Operations	7.82
500 - Mining Open Pit	36.01
600 - Process Plant	87.62
700 - Construction Indirect	49.12
800 - General Services	56.71
900 - Pre-production, Start-up, Commissioning	1.66
990 - Contingency	27.80
Total	380.11

The following assumptions apply to the capital cost estimate:

- All equipment and materials will be new.
- The labour rate build-up is based on the statutory laws governing benefits to workers.
- Fuel Cost: CAD 0.98/l.
- Electricity Cost: CAD 0.049/kWh
- Foreign exchange rate: CAD 1.33/USD.
- Workweek of seven days @ 10 hours per day
- Rotation schedule of fourteen days of work followed by seven days of rest and relaxation (R&R)
- Single shift per day
- Labour rates are fully burdened, i.e. inclusive of salaries, fringe benefits, fees, funds, premiums,

- Employers' participation to various plans as well as income tax, and are based on the Labour Decree in effect in the Province of Québec
- Labour rates are representative of the rates prepared by the ACQ (Association de Construction du Québec) for work performed in the Heavy Industry field of activity in remote areas or with camp & catering services. It should be noted that the first weekly 40 hours are paid at regular time while the remaining 30 hours are paid at double the base salary.
- Source of aggregate, adequate for fill/backfill as well as for concrete mix, in sufficient quantity, is located outcropping the pit, in the JB1 portion.
- Waste rock from the mine pit will be adequate for fill requirements for the ROM pad.
- Structural design will not be modified as a result of further geotechnical studies.
- Transfer of tailings to the TSF will be via 100t haul trucks.
- No provision for rework or repair of equipment and material delivered to site.
- No rework to field-erected and installed equipment and material.
- The estimate assumes no concrete work will require heating, i.e. concrete works will occur between the months of June and October.
- Estimate assumes no shortage of skilled trades worker throughout the entire construction phase.
- No provision for potential increase in salaries necessary to attract skilled trades workers.
- Construction contractors' facilities will be located within a maximum of five minutes' walking distance from any working point for the whole duration of the Project implementation.
- The construction site will be accessible 24 hours daily and seven days weekly, with sufficient and adequate safety supervision.
- No allowance for time and material type construction contracts
- Permanent administration offices will be made available in the early stages of the construction phase and used during construction.
- Estimate assumes transportation will be via chartered flights.

Exclusions (CAPEX)

- Escalation (or de-escalation) is excluded from the CAPEX and is part of the financial model
- Cost relating to certain agreements with third parties.
- Cost relating to financing and interest.
- Cost for pre-start-up operations and maintenance training.

- Goods and Services Tax as well as Provincial Sales Tax.
- Risk provision, including costs pertaining to mitigation plans.
- Work stoppage resulting from labour dispute.
- Work stoppage resulting from community relations dispute.
- Work stoppage resulting from inadequate camp and catering service.
- Any and all scope changes.
- Delays resulting from:
  - Permitting issues
  - Project financing
- Allowance for negative impact of a schedule deviation.

Table 21.3 presents the variance in CAPEX estimate for the PEA and the current Feasibility Study.

Table 21.3: Variance between CAPEX PEA and FS Estimate

Description	Variance (M USD)
PEA CAPEX	244
Environmental (ESIA modelling) / Waste Rock / Water Treatment	+10.0
Change of WRTSF design due to results from winter site investigation	+2.5
Change of design due to ESIA modelling (dust)	+1.5
Addition of Water Treatment Plant (change of regulation)	+3
Water Management Pond added to CAPEX (from deferred) due to Mining Schedule	+3
Market (inflation / Unit price increase)	+7.5
Hydro-Québec	-8.5
Design Change due to power limitation / optimization	+4
Omission from PEA (process equipment)	+7.5
Design Growth	+5
FS CAPEX	**270**

21.2.1 100 – Infrastructure

A capital expenditures summary for infrastructures is presented in Table 21.4. The main infrastructures of the mine are notably the road accesses, truck shop and blasting buildings, all permanent administrative buildings, camp, process plant, fuel storage and any offsite residences.

Table 21.4: Infrastructures Capital Expenditures

Capital Expenditures	Total (CAD M)
101 - Upgrade entrance road (109) to process plant	
Earthworks	0.11
110 - Roads and Fencing	
111 - General Earthwork	0.81
113 - Explosive Magazine Access Road	0.49
114 - Camp Platform	0.17
116 - Fencing	0.38
120 - Mine Infrastructure	
121 - Truck Shop (Wash Bay)	9.98
126 - Explosive Magazine	0.48
127 - Emulsion Building	0.33
130 - Support Infrastructure	
131 - Administrative Building	5.87
132 - Site Guard House	0.02
134 - Warehouse (Included in DMS building)	1.09
135 - Laydown	0.19
140 - Camp Facilities	
141 - Camp Dorms	11.11
146 - Recycling / Sort Facility	0.08
Earthworks	0.75
160 - Process Plant Infrastructure	
162 - Work Shop (Included in DMS building)	0.92
163 - Control Room (Included in Administrative Building)	0.26
170 - Fuel Systems Storage	
171 - Heavy and Light Vehicle	1.79
172 - Propane Facility	0.38
190 - Offsite Facilities	
192 - Concentrate Storage and Handling - Mattagami	0.50
194 - Transport of concentrate - Rail	1.76
196 - Eastmain Airport Upgrade	0.46
Total	37.93

21.2.2 200 – Power and Electrical

The CAPEX estimate for WBS Area 200 - Power Supply and Communications. A summary of the capital expenditures for electrical and communications is presented in Table 21.5.

Table 21.5: Power Supply and Communications Capital Expenditures

Capital Expenditures	Total (CAD M)
210 - Main Power Generation	
211 - Offsite Substation	4.82
212 - Power Transmission Line	12.23
213 - Site Main Substation	9.74
220 - Secondary Power Generation	
221 - Emergency Power Generation	5.54
230 - Water Management Electrical Room	
231 - ETP area Distribution	0.01
240 - Service Electrical Room	
241 - Camp E-room	0.66
260 - Process Plant Electrical Rooms	
261 - Crushing Electrical Room	1.22
262 - DMS Circuit Electrical Room	3.36
264 - Tailings Electrical Room	0.01
270 - O/H Distribution Line	
EL - Electrical	1.80
EW - Earthworks	0.36
280 - Automation Network	
281 - Automation Network	0.18
290 - IT Network & Fire Detection	
291 - IT Network	0.66
293 - Fire Detection Network	0.58
294 - Security Network	0.13
295 - Server Room	0.21
296 - Mine Communication System & Tower	0.32
Total	41.81

21.2.3 300 – Water Management

The CAPEX estimate for WBS Area 300 - Water and Tailings Storage Facility is presented in Table 21.6. The potable water supply is provided from the wells. Effluent and surface water management primarily consists of the mine waste stock collection water ponds, ditches and water management pumps and pipelines.

Table 21.6: Water Capital Expenditures

Capital Expenditures	Total (CAD M)
310 - Fresh Water Intake / Wells	
311 - Fresh Water Intakes	0.67
320 - Water Ponds and Water Management	
321 - WMP - Foundation Preparation	7.91
322 - WMP - Perimeter Embankment Construction	2.47
323 - Process Plant Water Management Pond	0.97
AR - Architecture	0.02
CI - Civil	0.02
MC - Mechanical	0.81
PI - Piping/Plumbing	3.47
EL - Electrical	3.28
ST - Structure	0.04
330 - Domestic Water (Cost Code Account)	
EL - Electrical	0.60
MC - Mechanical	0.44
PI - Piping/Plumbing	0.35
340 - Sewage (Cost Code Account)	
MC - Mechanical	0.83
PI - Piping/Plumbing	0.34
EL - Electrical	0.46
350 - Fire Protection (Cost Code Account)	
MC - Mechanical	0.88
FP - Fire Protection	2.55
EL - Electrical	0.31
360 - Effluent Water Treatment	4.00
370 - Filtered Tailing Storage Facility	
371 - WRTSF - Foundation Preparation	1.02
375 - WRTSF - Diversion Channels	0.94
376 - WRTSF - Perimeter Embankments	1.24
Total	33.62

21.2.4 400 - Surface Operation

The Surface Operations CAPEX consist mainly of the Capital Expenditure for the acquisition of the mobile equipment required for the surface operation (site services), General Services departments and Process Plant, along with the operating costs for this equipment during the construction phase. It also includes the cost for setting up a batch plant and an aggregate plant on site for the whole construction period. All costs were based on budgetary pricing received from suppliers. The equipment pricing includes, when applicable, tires, transport to the Project site, assembly, and commissioning. A summary for the capital expenditures for surface mobile equipment is presented in Table 21.6

Table 21.7: Surface Mobile Equipment Expenditures

Capital Expenditures	Total (CAD M)
400 - Surface Operation	
410 - Surface Operations Equipment	
413 - Surface Mobile Equipment	3.51
415 - Process Plant Mobile Equipment	1.68
431 - Concrete Batch Plant Construction	0.04
480 - Aggregate Plant	2.59
Total	7.82

21.2.5 500 - Mining

21.2.5.1 Mine Infrastructure

Equipment costs are based on budgetary quotes for major equipment. Komatsu equipment was selected as the main supplier for the study; however, this does not preclude the eventual use of other similar models in the future. For ancillary equipment, unit costs were obtained from a variety of sources from OEM suppliers, and/or from cost databases.

Equipment purchases costs include the machine cost, assembly, and training. Primary equipment includes the drill-load-haul equipment. Secondary equipment includes the dozers and graders. Ancillary equipment includes the remaining support equipment such as water truck, utility excavators, maintenance vehicles, light vehicles, pumps, light towers, computers, and radios.

Table 21.8: Mining Capital Expenditures

Capital Expenditures	Total (CAD M)
500 – Mining (Open Pit)	
540 – Mine Infrastructure	
541 - Haul Road	5.23
EL - Electrical	0.60
550 – Mine Equipment	
551 - Primary Mining Equipment	15.53
552 - Secondary Mining Equipment	4.98
553 - Ancillary Mining Equipment	1.53
554 - Other Equipment	5.69
555 - FMS/Dispatch/Equipment Communication Systems	1.70
556 - Truckshop Tools	0.75
Total	36.01

21.2.6 600 – Process Plant

The capital cost estimates for the processing areas are presented in Table 21.9.

Table 21.9: Processing Capital Expenditures

Capital Expenditures	Total (CAD M)
600 - PROCESS PLANT	
601 - Site prep/ Road / Berms	
EW - Earthworks	3.69
603 - UG Services	
EW - Earthworks	0.09
604 - ROM pad & MSA wall	
CI - Civil Concrete	0.33
EW - Earthworks	1.91
605 - Final Grading	
EW - Earthworks	0.58

Capital Expenditures	Total (CAD M)
610 - Crushing & Reclaim	
611 - Primary Crusher	8.11
612 - Secondary & Tertiary Crushers	10.97
613 - Ore Reclaim & Stockpile	8.46
620 - DMS (Dense Medium Separation) Building	
621 - Primary DMS Circuit	26.32
622 - Secondary DMS Circuit	1.92
623 - Recrush DMS Circuit	4.79
630 - Concentrate Handling and Storage	
AR - Architectural	0.78
CI - Civil Concrete	1.95
EL - Electrical Lighting	0.15
EL - Electrical	0.28
EW - Earthworks	0.18
HV - HVAC	0.58
IN - Instrumentation	0.15
MC - Mechanical	1.18
PI - Piping/Plumbing	0.02
ST - Structure	1.87
640 - Tailings Handling	
641 - Tailings Thickener	5.06
642 - Tailings Filtration	1.22
643 - Tailings Filtration - Compressors	0.89
650 - Reagent	
651 - Flocculant System	0.55
652 - Ferrosilicon (FeSi)	0.32
690 - Process Plant Services	
691 - Plant Air (w/ instrument air)	0.53
692 - Process Water	3.63
693 - Treated Water	0.51
694 - Gland Water	0.25
695 - Emergency Water (Safety Showers)	0.35
Total	87.62

21.2.7 700 – Construction Indirect Costs

Construction Indirect Costs are presented in Table 21.10.

Table 21.10: Construction Indirect Capitals

Capital Expenditures	Total (CAD M)
700 - CONSTRUCTION INDIRECT	
711 - Project Management	
CM Staff and Consultants	10.81
720 - Construction Offices, Facilities & Services	
721 - Construction Offices / Trailers	0.77
725 - Camp Construction Temporary Facilities	2.50
726 - Concrete Batch Plant Operation and Maintenance	0.53
727 - Site Toilets / Ablution Units	0.13
728 - Construction Temp Power Distribution	1.46
729 - Construction Temp water and piping network	0.25
740 - Construction Equipment & Tools	
741 - Owned Equipment	3.61
742 - Rentals	4.95
744 - Major Construction Tools	2.03
745 - Construction Tools and consumables	1.61
746 - Temporary Power Generation O&M	0.73
760 - Energy	
Fuel	6.93
Propane	0.68
Electricity	0.32
770 - External Engineering	
Detailed Engineering	11.18
780 - Contractor Indirects	
781 - Construction Bonds, Insurances, etc.	0.65
Total	49.12

21.2.8 800 – General Services – Owner's Costs

General Services -Owner's Costs are presented in Table 21.11.

Table 21.11: General Services Owner's Cost

Capital Expenditures	Total (CAD M)
800 - General Services - Owner's Costs	
Owner's Costs and Covid Reserve	26.17
812 - Supply Chain & Procurement	1.95
813 - HR & Training	2.99
815 - Security	0.88
817 - IT & Telecommunications Service	1.03
818 - Accounting, Finances & Project Control	1.69
820 - Logistics / Taxes / Insurance	
821 - Freight (Insurance)	5.73
822 - Customs, Taxes and Duties	0.87
830 - Operating Expenses	
831 - Camp Opex	6.43
832 - Travel & Transportation	2.51
833 - Surface Support	1.48
834 - Surface Mobile Eq Operating Costs	0.32
840 - Environmental	
Waste Disposal (General, Recycling, Hazardous)	0.90
Lab Analysis and Reports	0.15
850 - Health and Safety	
851 - H&S Dept Overhead	1.61
852 - PPE	0.17
853 - Medical Expenses	0.47
860 - Site Insurance	1.38
Total	**56.71**

21.2.9 900 – Preprod, Start-up, Commissioning

Preprod, Start-up, Commissioning costs are presented in Table 21.12.

Table 21.12: Preprod, Start-up, Commissioning

Capital Expenditures	Total (CAD M)
900 - Pre-Prod, Start-up, Commissioning	
950 - Process Plant Pre-Prod	
952 - Vendor Reps	0.25
960 - First Fill, Spares & Consumables	
961 - Spare Parts and First Fill	1.41
Total	1.66

21.2.9.1 Mining Pre-production

The following assumptions apply to the Mining CAPEX estimate:

- Mining cost estimate is based on an Owner-operated scenario
- Process Plant start-up is defined as the beginning of production period.
- Pre-production period for mining related activities is estimated to be 15 months for Drill & Blast and 12 months for Load and Haul.
- Capital costs do not account for depreciation or salvage value at the end of the equipment life.

Mining operating costs during the construction phase (pre-production operating costs) have been estimated at CAD 13.46M. Those costs have been excluded from the CAD 380.11M project's CAPEX but are to be expended during construction as an OPEX cost. GMS's cost estimate includes all pre-production mining related activities and initial purchase of mining equipment. Pre-production work includes clearing and topsoil removal from an area within the pit footprint as well as the mining (drilling, blasting, loading, and hauling) of pit material in preparation of the process plant start-up. The waste material mined during pre-production will be used as construction material for site set-up (roads, platforms, etc.) whenever possible.

21.2.9.2 Process Plant Pre-production

Plant Pre-Production costs during the construction phase (pre-production operating costs) have been estimated at CAD 8.3M. Those costs have been excluded from the CAD 380.11M project's CAPEX but are to be expended during construction as an OPEX cost.

21.2.9.3 G&A Pre-Production

The G&A costs linked to the Pre-production mining and process activities have been estimated at CAD 3.9M. Those costs have been excluded from the CAD 380.11M project's CAPEX but are to be expended during construction as an OPEX cost.

21.2.9.4 Contingency

The CAPEX estimate contingency was evaluated using a Monte Carlo approach. Contingency was not applied to the OPEX estimate.

Table 21.13: Contingency

Area	Total (CAD M)
Total CAPEX before contingency	352.32
990 - Contingency (7.9%)	27.80

21.2.10 Deferred and Sustaining Capex

A Deferred CAPEX consist of the purchase of additional new mine equipment required for the increase in production. An additional Truckshop bay to accommodate additional mining trucks and work for additional water ponds and ROM pad extension during the operation.

Sustaining Capital for the G & A Department consist of the replacement of mobile equipment throughout the LOM for a total of CAD 4.52M.

Sustaining capital for the mine includes equipment replacement purchases for a total of CAD 60.93M.

Equipment's Major Repairs (Major components) are capitalized which represent CAD 46.30M over the LOM. Sustaining capital is presented in Table 21.14.

Table 21.14: Deferred and Sustaining Capex

Areas	Total (CAD M)	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
100 Infrastructure																				
121 Truckshop Extension	1.44	1.44																		
127 - Emulsion Building	0.08	0.08																		
270 - O/H Distribution Line	0.06					0.06														
320 - Water Ponds and Water Management																				
EL - Electrical 320 - Water Ponds and Water Management	0.53		0.53																	
MC - Mechanical	0.10		0.10																	
AR - Architecture	0.10		0.10																	
CI - Civil	0.01		0.01																	
ST - Structure	0.02		0.02																	
PI - Piping	0.00		0.00																	
321 - WMP - Foundation Preparation	0.83		0.83																	
322 - WMP - Perimeter Embankment Construction	0.42		0.42																	
360- Effluent Water Treatment	2.00				2.00															
370 - Waste Rock and Tailings Storage Facility (WRTSF)																				
371 - TSF - Foundation Preparation	4.06		4.06																	
375 - WRTSF - Diversion Channels	2.49		2.49																	
376 - WRTSF - Perimeter Embankments	3.78		3.78																	
500 Mining																				
540 - Mine Infrastructure	4.22																			
550 - Mine Equipment	60.93	11.86	1.21	0.96	2.07	1.48	2.16	0.94	1.51	7.36	6.43	2.29	1.64	1.12	5.38	6.04	6.87	1.48	0.11	0.01
556- Major Components	46.30	0.19	0.74	2.37	3.16	3.56	1.46	2.99	3.49	2.72	1.89	3.12	2.59	4.09	3.77	1.35	2.81	3.23	2.52	0.23
601-Site Prep/Road/Berms	1.42	1.42																		
604 - ROM pad & MSA wall																				
EW - Earthworks	1.34	1.34																		
Total Deferred and Sustaining Capex Costs	130.04																			

21.3 Operating Cost Estimate

The operating cost estimate (OPEX) includes mining, process, G&A and product transport from the mine site to the port of Trois-Rivières in Québec. Operating Costs are summarized in Table 21.15.

Table 21.15: Operating Costs Summary

Item	Total Cost (CAD M)	Unit Cost CAD/ t Tonnes Processed
Mining	821.39	22.08
Processing	492.35	13.23
General and Administration	515.52	13.86
Concentrate Transportation	710.79	19.10
Total	2,540.05	68.27

**Operating Costs only. Excludes Royalties and IBA*

A summary of the total operating costs including mining, processing, G & A and concentrate transportation as well as total cost per ton processed is presented in Table 21.18.

Table 21.16 presents the variance in OPEX estimate for the PEA and the current Feasibility Study.

Table 21.16: Variance between OPEX PEA and FS Estimate

Description	Variance	
OPEX (FS vs PEA): USD 315/t conc. (vs USD 280/t conc.) :	+USD 35/t conc.	(+12.5%)
Omission from PEA (process plant maintenance):	+USD 17/t conc.	
Market (Inflation / Unit Price Increase)	+USD 14/t conc.	
Mining (labour, fuel, etc.) and transportation of concentrate		
Water Treatment Plant addition:	+USD 4/t conc.	
Addition of Water Treatment Plant (change of regulation)		

Table 21.17: Total Tonnes (kt)

Description	Total Pre-Production	Total Production	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Tonnes Mined	1,600	167,296	277	1,323	6,894	7,013	7,098	8,000	8,000	8,000	9,999	10,000	10,000	10,000	10,000	10,251	10,781	11,000	10,945	9,000	8,000	8,000	4,315
Tonnes Processed	-	37,207	-	-	1,834	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,373
Tonnes dry Concentrate	-	6,056	-	-	287	352	362	359	351	311	284	307	284	313	267	279	353	361	336	331	344	342	231

Table 21.18: Total Operating Costs Summary (CAD M)

Description	Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Mining	821.39	38.84	41.51	41.98	43.10	43.46	43.21	42.64	43.49	43.68	44.84	45.97	46.08	46.45	46.43	47.31	45.82	44.65	44.80	27.12
Processing	492.35	24.25	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	26.47	18.16
General Services	515.52	15.84	27.55	28.02	27.60	27.73	27.75	27.69	27.63	27.65	27.69	27.80	27.86	27.87	27.86	27.86	27.86	27.82	26.37	31.29
Concentrate Transportation	710.79	33.68	41.30	42.49	42.16	41.22	36.48	33.38	36.08	33.35	36.77	31.33	32.73	41.45	42.41	39.48	38.81	40.41	40.15	27.12
Total OPEX	2,540.05	110.39	136.82	138.96	139.34	138.88	133.91	130.18	133.68	131.15	135.77	131.56	133.13	142.24	143.16	141.12	138.96	139.34	137.78	103.69
Total Cost/t Tonnes Processed	68.27	2.97	3.68	3.73	3.75	3.73	3.60	3.50	3.59	3.52	3.65	3.54	3.58	3.82	3.85	3.79	3.73	3.74	3.70	2.79
Total Cost/t Concentrate (dry)	419.43	18.23	22.59	22.95	23.01	22.93	22.11	21.50	22.07	21.66	22.42	21.72	21.98	23.49	23.64	23.30	22.95	23.01	22.75	17.12

21.3.1 Mining Operating Costs Summary

The mine operating costs are estimated from first principles for all mine activities. Equipment hours required to meet production needs of the LOM plan are based on Deswik LHS simulations over the Life of Mine. Each piece of equipment has an hourly operating cost which includes operating and maintenance labour, fuel and lube, maintenance parts, tires (if required) and ground engaging tools (if required). A budgetary RFP process has been completed for the mine equipment and associated operating costs, fuel, tires, explosives, and accessories, etc.

The average mining cost during operations is estimated at CAD 4.94/t mined including re-handling costs. This operating cost estimate excludes capital repairs which are treated as sustaining capital.

Hauling is the major mining cost activity representing 18.3% of total costs followed by Blasting (12.3%), Loading (7.8%) and Mine Maintenance Admin (7.5%). Loading and haulage for stockpile re-handling is also captured as a separate activity cost.

Salaries is the dominant cost, by element, representing 45.2% of total costs, followed by Fuel (15.5%), Maintenance parts (10.2%) and bulk explosives (6.1%).

Table 21.19 presents the breakdown of mining costs, by department, while Table 21.20 presents the major cost drivers for the mine department.

The Mining OPEX is estimated to be CAD 22.08/t processed or CAD 135.63/t of spodumene concentrate produced (Table 21.21 excluding product transport).

Table 21.19: Mining Cost Summary Total (CAD M)

Mining Costs	Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Mine Operations	45.8	2.5	2.5	2.5	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	1.3
Mine Maintenance Admin.	61.1	4.4	4.4	4.4	4.2	4.2	4.2	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.8
Mine Geology	24.7	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.1	0.7
Mine Engineering	33.3	1.8	1.8	1.8	1.8	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.0
Grade Control	10.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.3
Electric Equipment Cable Handling	15.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6
Drilling	43.5	1.9	2.0	2.0	2.1	2.2	2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7	2.3	2.2	2.2	1.3
Blasting	99.7	4.9	5.0	5.0	5.2	5.1	5.2	5.8	5.8	5.8	5.5	5.5	5.5	5.8	5.8	5.8	5.2	4.9	4.9	2.8
Pre-Split D&B	27.1	1.2	0.9	1.5	1.4	1.8	1.1	1.2	1.4	1.5	1.7	1.6	1.9	1.8	1.3	1.9	1.7	1.1	1.3	0.9
Loading	63.7	2.8	3.0	3.4	3.4	3.4	3.4	3.5	3.5	3.5	3.6	3.5	3.6	3.7	3.6	3.7	3.5	3.3	3.3	1.8
Hauling	150.3	4.2	6.1	6.0	6.3	6.6	6.9	6.8	7.4	7.4	8.6	9.6	9.3	9.3	9.4	10.1	10.4	10.1	10.1	5.7
Dump Maintenance	45.4	1.9	2.1	2.1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.1	1.8
Road Maintenance	60.9	2.9	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.9	1.9
Dewatering	3.8	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Support Equipment	50.7	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.0
Tailing Rehandling	51.5	2.4	2.8	2.8	2.8	2.8	2.8	2.6	2.6	2.6	2.7	2.8	2.9	2.9	2.9	2.9	2.5	2.8	2.8	1.9
Sub-Total In-Situ Mining	**819.0**	**36.38**	**39.34**	**40.28**	**41.28**	**41.76**	**41.51**	**40.94**	**41.79**	**41.98**	**43.14**	**44.22**	**44.29**	**44.66**	**44.22**	**45.61**	**44.12**	**42.89**	**42.97**	**25.88**
Rehandling	**2.4**	**0.8**	**0.5**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.5**	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**
Total Mining Cost	**821.4**	**37.23**	**39.81**	**40.28**	**41.40**	**41.76**	**41.51**	**40.94**	**41.79**	**41.98**	**43.14**	**44.27**	**44.38**	**44.75**	**44.73**	**45.61**	**44.12**	**42.95**	**43.10**	**25.92**
Total Cost/t Mined	**4.91**	**4.91**	**4.90**	**4.90**	**4.89**	**4.88**	**4.87**	**4.86**	**4.84**	**4.83**	**4.82**	**4.81**	**4.79**	**4.78**	**4.77**	**4.76**	**4.75**	**4.74**	**4.73**	**4.72**

Table 21.20: Top Three Mining Costs (CAD M)

Top Mining Costs	Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Salaries	416	19.5	21.0	21.6	21.9	22.0	22.0	22.0	22.1	22.1	22.6	23.2	23.2	23.2	23.3	23.3	23.2	23.1	22.8	14.0
Diesel/Fuel	127	4.8	5.6	5.7	6.2	6.3	6.1	6.3	6.6	6.6	7.1	7.5	7.4	7.5	7.6	8.0	7.8	7.6	7.8	4.6
Maintenance Parts	84	3.4	4.0	4.0	4.3	4.3	4.4	4.3	4.5	4.5	4.6	4.8	4.9	4.9	5.0	5.0	4.8	4.7	4.8	2.9
Sub-Total Top Three	211	27.7	30.6	31.3	32.4	32.6	32.5	32.6	33.1	33.2	34.4	35.5	35.5	35.6	35.8	36.3	35.8	35.4	35.5	21.4

21.3.2 Processing Plant Operating Cost Summary

The processing plant operating cost estimate includes mining, crushing and DMS circuits and is based on a ±15% level of accuracy, utilizing budgetary quotations where possible and otherwise, GMS database estimates and recent experience in the lithium industry, and Galaxy's Mt Cattlin facility. The processing OPEX includes operating and maintenance labour, power, fuel and indirect charges associated with the processing plant. Based on these cost assumptions, inclusions and exclusions, The OPEX is estimated to be CAD 13.23/t processed or CAD 81.30/t of spodumene concentrate produced (Table 21.21 excluding product transport).

Table 21.21: Total Yearly Processing Costs (CAD M)

Process Plant Operating Costs (CAD M)	Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Labour	201.46	9.93	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	7.44
Power	45.09	2.21	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	1.66
Maintenance & Shutdown Contractors	152.39	7.51	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	5.62
Consumables & Reagents	79.77	3.93	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	4.29	2.94
Miscellaneous	2.14	0.10	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.07
Process Plant Mobile equipment	11.50	0.57	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.42
Total Process Plant Costs	**492.35**	**24.25**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**26.47**	**18.16**
Total Cost/t Processed	**13.23**	**0.65**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.49**

21.3.3 General Services and Owner's Operating Cost Summary

General Services include general management, accounting and finance, IT, environmental and social management, human resources, supply chain, camp, surface support, health and safety, security and operating cost of the various supply chain equipment. In most cases, these services represent fixed costs for the site as a whole. The General Services costs exclude certain costs such as transport of concentrates and environmental rehabilitation costs.

A summary of G&A costs is presented in Table 21.20.

The General Services OPEX is estimated to be CAD 13.86/t processed or CAD 85.13/t of spodumene concentrate produced (Table 21.19 excluding product transport).

Table 21.22: General Services & Administration Cost Summary (CAD M)

General Services - Owner's Costs (CAD M)	Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Owner's costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
General Management	9.31	0.25	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49
Supply Chain	27.81	0.75	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.37
Human Resources	22.97	0.76	1.53	1.53	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.12
Security	11.16	0.30	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Corporate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Information Technology	10.01	0.27	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Accounting / Finance	13.47	0.36	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Freight	28.13	0.75	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Customs, Taxes and Duties	32.63	0.87	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74
Camp/Catering Costs	77.17	1.93	4.09	4.11	4.07	4.13	4.13	4.11	4.08	4.09	4.11	4.16	4.18	4.19	4.18	4.18	4.18	4.17	4.16	3.99
Employee Transportation Costs	92.67	2.33	4.92	4.94	4.89	4.96	4.97	4.94	4.91	4.91	4.94	5.00	5.03	5.03	5.03	5.03	5.03	5.00	5.00	4.76
Surface Support	89.95	2.38	4.56	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	3.57	3.57
G&A Mobile Equipment	15.01	0.40	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Environment	36.32	0.98	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
Health & Safety	22.67	0.60	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21
Insurance & Banking Fees	26.25	0.70	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Total G&A Cost	515.52	13.63	27.55	28.02	27.60	27.73	27.75	27.69	27.63	27.65	27.69	27.80	27.86	27.87	27.86	27.86	27.86	27.82	26.37	25.75
Total Cost/t Processed ($/t)	13.86	0.37	0.74	0.75	0.74	0.75	0.75	0.74	0.74	0.74	0.74	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.71	0.69

21.3.4 Concentrate Transportation Operating Cost Summary

Concentrate transport cost has been estimated at CAD 115.07/t of concentrate (wet). The product transport cost was based upon updated budgetary proposals for the logistics chain to the Port at Trois-Rivières: i.e. product road transport via trucks from site to Matagami, transhipment at Matagami, rail transport to the Port of Trois-Rivieres, port storage and handling. Rental of the train wagons and their covers are included in the product transport costs. The study is based on cost FOB Trois-Rivières as the end users are not yet defined by the Galaxy. From Trois-Rivieres Galaxy can service North America, Europe, and Asia. Ocean freight is excluded from the shipping cost.

Table 21.24 shows a summary of the unit costs per tons of concentrate transported.

Table 21.23: Unit Cost per Ton Summary

Concentrate Transportation Costs (CAD/t)	Unit Cost
Trucking Site to Matagami	41.55
Transload Matagami	7.00
Rail Matagami to POL	45.92
FOB Fees	20.60
Total Cost/t Concentrate Transported (wet)	115.07

Table 21.24: Concentrate Transportation Costs Summary (CAD M)

Concentrate Transportation Costs (CAD M)	Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Trucking Site to Matagami	256.66	12.16	14.91	15.34	15.23	14.88	13.17	12.05	13.03	12.04	13.28	11.31	11.82	14.97	15.31	14.26	14.01	14.59	14.50	9.79
Transload Matagami	43.24	2.05	2.51	2.58	2.56	2.51	2.22	2.03	2.19	2.03	2.24	1.91	1.99	2.52	2.58	2.40	2.36	2.46	2.44	1.65
Rail Matagami to POL	283.65	13.44	16.48	16.96	16.83	16.45	14.56	13.32	14.40	13.31	14.67	12.50	13.06	16.54	16.92	15.75	15.49	16.12	16.02	10.82
FOB Fees	127.25	6.03	7.39	7.61	7.55	7.38	6.53	5.97	6.46	5.97	6.58	5.61	5.86	7.42	7.59	7.07	6.95	7.23	7.19	4.86
Total Transportation Cost	**710.79**	**33.68**	**41.30**	**42.49**	**42.16**	**41.22**	**36.48**	**33.38**	**36.08**	**33.35**	**36.77**	**31.33**	**32.73**	**41.45**	**42.41**	**39.48**	**38.81**	**40.41**	**40.15**	**27.12**
Total Cost/t Processed ($/t)	**19.10**	**0.91**	**1.11**	**1.14**	**1.13**	**1.11**	**0.98**	**0.90**	**0.97**	**0.90**	**0.99**	**0.84**	**0.88**	**1.11**	**1.14**	**1.06**	**1.04**	**1.09**	**1.08**	**0.73**

22 ECONOMIC ANALYSIS

This section presents all elements of the economic model, which principally consist of spodumene production and revenues, royalty agreements, operating costs, capital costs, sustaining capital, salvage value, closure and reclamation costs, taxation and net Project cash flow.

The economic analysis is carried out in real terms (i.e. without inflation factors) in 2021 Canadian dollars without any project or equipment financing assumptions. The evaluation was undertaken on a 100% equity basis. The economic results are calculated as of the beginning of Year -2, which corresponds to the start of the 18 months pre-production CAPEX phase, including engineering and procurement. Exploration costs are deemed outside of the project and any additional project study costs have not been included in the analysis. The economic results such as the net present value (“NPV”) and internal rate of return (“IRR”) are calculated on an annual basis.

Base case scenario results are detailed in Table 22.1**.**

Table 22.1: Base Case Scenario Results

Item	Unit	Value
Pre-Tax NPV @ 8%	M CAD	1,893.2
Pre-Tax IRR	% p.a	45.8%
Pre-Tax Payback Period	years	2.4
After-Tax NPV @ 8%	M CAD	1,097.4
After-Tax IRR	% p.a	35.2%
After-Tax Payback Period	years	2.9

A sensitivity analysis reveals that the project’s viability will not be significantly vulnerable to variations in initial capital expenditures, mining costs and fuel cost, within the margins of error associated with feasibility study estimates. However, the project’s viability remains more vulnerable to the uncertainty in spodumene market prices.

22.1 Cautionary Statement

The economic analysis is based on forward looking information as defined under Canadian securities law. The results depend on inputs that are subject to several unknown risks, uncertainties and other factors that may ensure in results to differ materially from those presented here. Forward-looking statements in this section include, but are not limited to, statements with respect to:

- Currency exchange rate fluctuations
- Proven and Probable Mineral Reserves that have been modified from Measured and Indicated Mineral Resource estimates
- Future prices of spodumene concentrates
- Estimated costs and timing of capital and operating expenditures
- Changes to interest rates, tax rates or applicable laws
- Proposed mine and process production plan
- Projected mining and process recovery rates
- Cash flow forecasts
- Assumptions as to closure costs and closure requirements
- Assumptions as to environmental, permitting, and social risks; and
- Ability to maintain the social license to operate

22.2 Assumptions / Basis

The key assumptions influencing the economics of the Project include:

- Spodumene price @ 6% Li_2O (FOB Canada)
- Canadian dollar to United States dollar exchange rate ("CAD/USD")
- Diesel price in CAD/L

22.2.1 Spodumene Price

The price forecasts for spodumene concentrate 6% Li_2O were based on projections from the 2021 lithium market study presented in Section 19 and is presented here as a weighted average. The Spodumene priced used in the base case scenario are detailed in Table 22.2.

Table 22.2: Spodumene Concentrate Pricing Forecast

Item	Unit	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8-Y19	Average
Concentrate Price @ 5.60% Li_2O (FOB Canada)	USD/t	884	1011	754	785	862	936	1007	988	1056	1121	1020.6

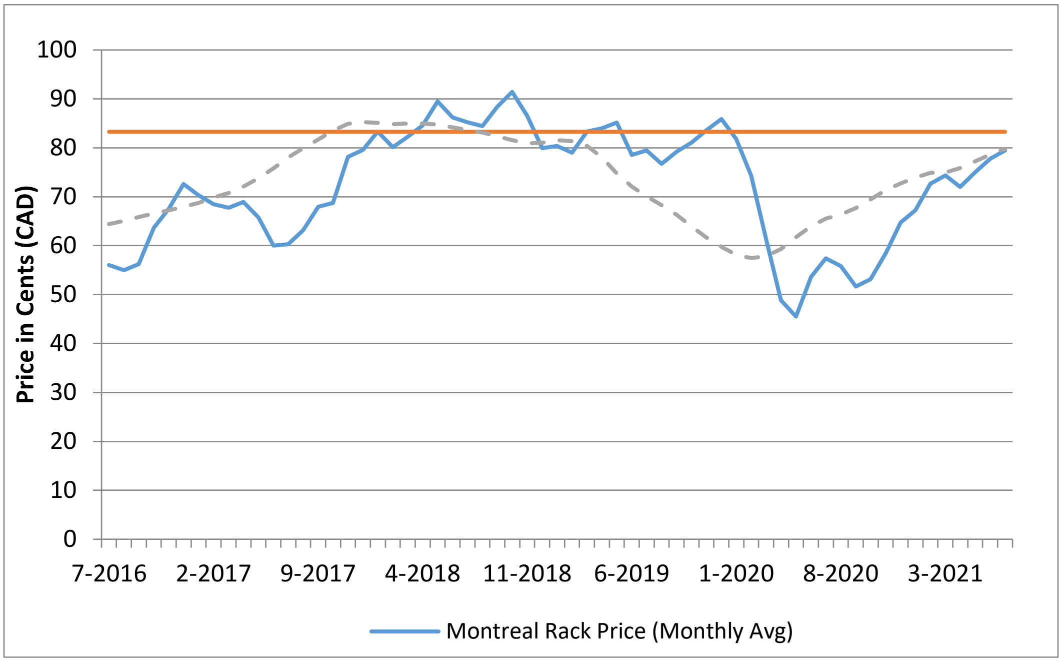
22.2.2 Currency Exchange Rates

The base case Canadian dollar exchange rate for economic evaluation is CAD/USD 1.33. Most operating costs are estimated in Canadian dollars with the US dollar denominated Spodumene revenue converted to Canadian dollars.

22.2.3 Fuel

The reference diesel fuel price used for estimating operating costs is CAD 0.9833/L, which is an estimated delivered price to site for coloured diesel destined for off-road vehicles. It is exclusive of provincial road taxes and sales taxes which are reimbursable but includes the federal excise tax. The reference price is benchmarked from Montreal, Québec rack price for ultra-low sulfur diesel no. 1. The price assumption is based on a flat average rate between 2018 and 2019 rate. Due to the high volatility of prices over 2020 and 2021 periods, (covid period) this period was not considered. The average Montreal rack price is 83.28¢/liter, on which the transportation cost and taxes was applied. The 5-year Montreal Fuel Rack Price is details in Figure 22.1. Table 22.3 shows the diesel fuel price analysis.

Figure 22.1: Five Years Rack Price (Montreal) Historical Data – ULS Diesel (Monthly)



Source: GMS, 2021

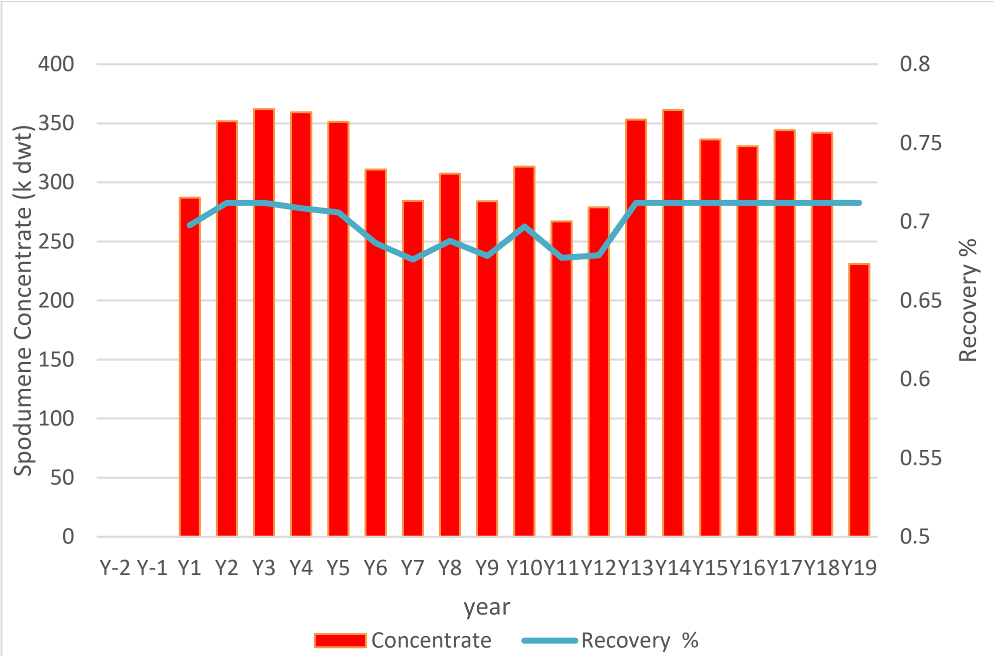
Table 22.3: Diesel Fuel Price Analysis

Fuel Type	Average Montreal Rack Price	Transport Depot to Matagami	Transport Matagami to Site	Discount	Fed Excise	Prov. Road Tax	Fuel Cost at Site
ULSD	*¢/litre*	*¢/litre*	*¢/litre*	*¢/litre*	*¢/litre*	*¢/litre*	*¢/litre*
Colored Diesel	83.28	10.00	7.00	-5.950	4.00	0.00	98.33

22.3 Spodumene Concentrate Production and Revenues

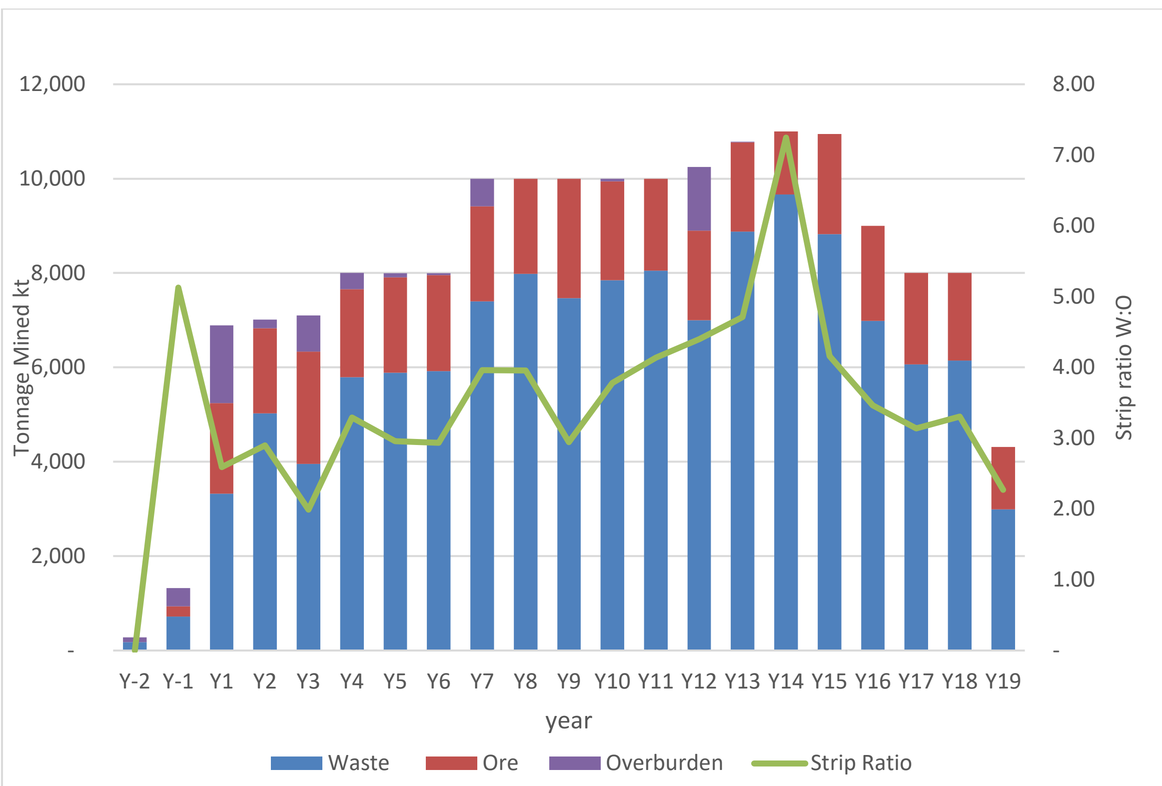
Spodumene concentrate production over the Project life is 6,056 kt with an average annual spodumene concentrate production of 321 kt. The Spodumene concentrate gross revenue during operations is CAD 8,365M. This study assumes an owner mining operation. The spodumene recovery rate is based on the results of the metallurgical testwork programs done by SGS Canada Inc. and Nagrom in 2018, 2019 and 2020. The design weighted average overall plant recovery is 70.1%. The concentrate production is summarized in Figure 22.2. The annual mine and mill production is summarized in Figure 22.3, Figure 22.4 and Table 22.4

Figure 22.2: Annual Spodumene Concentrate Production



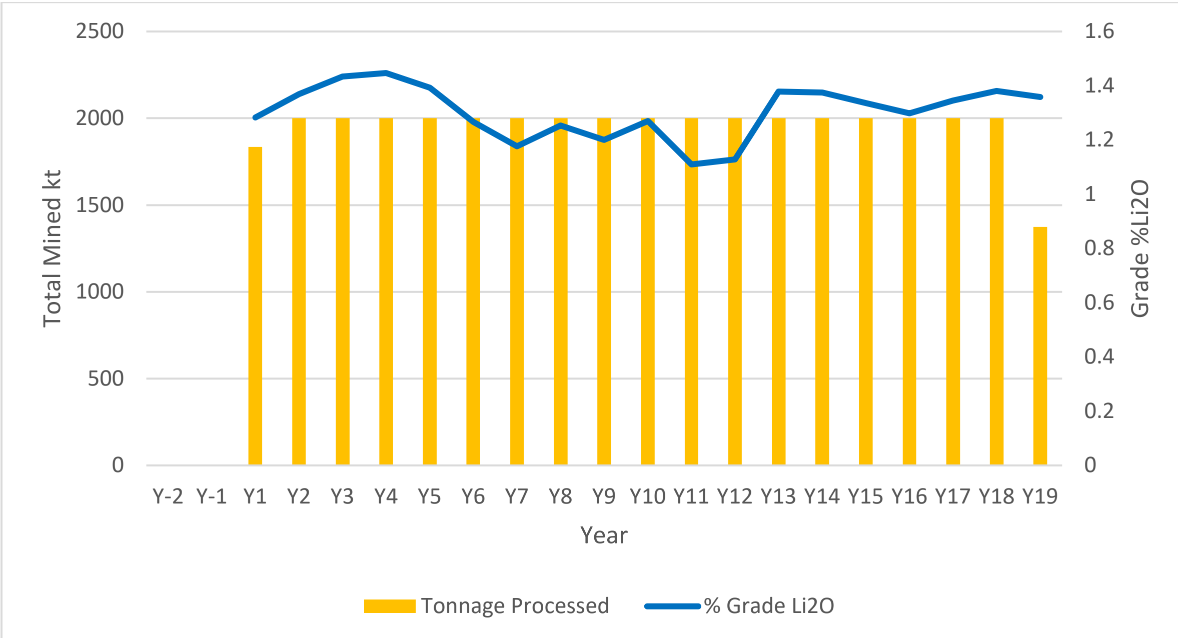
Source: GMS, 2021

Figure 22.3: Mine Production Profile



Source: GMS, 2021

Figure 22.4: Mill Production Profile



Source: GMS, 2021

Table 22.4 Annual Mine and Mill Production Summary

Description	Total	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Total
Mill Production																							
Tonnage Processed	kt	-	-	1,834	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,373	37,207
Head Grade	%	-	-	1.26	1.38	1.42	1.42	1.39	1.27	1.18	1.25	1.17	1.26	1.10	1.15	1.39	1.42	1.32	1.30	1.35	1.35	1.32	1.30
Contained Li_2O	kt Li_2O	-	-	23.0	27.7	28.5	28.4	27.9	25.4	23.6	25.0	23.5	25.2	22.1	23.0	27.8	28.4	26.5	26.0	27.1	26.9	18.2	483.9
Contained Li	kt Li	-	-	10.7	12.9	13.2	13.2	13.0	11.8	11.0	11.6	10.9	11.7	10.3	10.7	12.9	13.2	12.3	12.1	12.6	12.5	8.5	225.0
Recovery	%	-	-	69.8	71.2	71.2	70.8	70.6	68.6	67.6	68.8	67.8	69.7	67.7	67.9	71.2	71.2	71.2	71.2	71.2	71.2	71.2	70.1
Recovered Li_2O	kt Li_2O	-	-	16.1	19.7	20.3	20.1	19.7	17.4	15.9	17.2	15.9	17.5	14.9	15.6	19.8	20.2	18.8	18.5	19.3	19.2	12.9	339.1
Recovered Li	kt Li	-	-	7.5	9.2	9.4	9.4	9.1	8.1	7.4	8.0	7.4	8.2	7.0	7.3	9.2	9.4	8.8	8.6	9.0	8.9	6.0	157.7
Concentrate	kt Li	-	-	287.0	351.8	362.0	359.2	351.2	310.8	284.4	307.4	284.1	313.3	266.9	278.8	353.1	361.3	336.4	330.7	344.3	342.0	231.1	6,056
Concentrate grade	% Li	-	-	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604	2.604
Mine Production																							
Waste	kt	181	723	3,325	5,028	3,958	5,796	5,887	5,923	7,397	7,983	7,465	7,848	8,053	7,002	8,881	9,666	8,824	6,983	6,067	6,142	2,995	126,126
Overburden	kt	96	385	1,649	185	765	340	91	44	587	-	-	59	-	1,350	12	-	-	-	-	-	-	5,563
Ore	kt	-	216	1,920	1,800	2,375	1,864	2,022	2,033	2,016	2,017	2,535	2,092	1,947	1,899	1,888	1,334	2,121	2,017	1,933	1,858	1,320	37,207
Total Mined	kt	277	1,323	6,894	7,013	7,098	8,000	8,000	8,000	9,999	10,000	10,000	10,000	10,000	10,251	10,781	11,000	10,945	9,000	8,000	8,000	4,315	168,896
Strip Ratio	W:O	-	5.13	2.59	2.90	1.99	3.29	2.96	2.94	3.96	3.96	2.95	3.78	4.14	4.40	4.71	7.25	4.16	3.46	3.14	3.31	2.27	3.54

22.4 Royalties

The project royalties will include 1.5% NSR as mentioned in Section 4.1.2.

22.5 Operating Cost Summary

Operating costs include mining, processing, G&A, transportation. The operating cost summary is presented in Detailed operating cost budgets have been estimated from first principles based on detailed wage scales, consumable prices, fuel prices and productivities. Table 22.5 summarizes the project operating cost.

Table 22.5 Operating Cost Summary

Description	Total
Mining	819.0
Processing	492.4
General Services	534.27
Concentrate Transportation	706.4
Royalty Cost	120.7
Total OPEX	2,673.6
Total Cost/t Milled	71.83
Total Cost/t Concentrate (dry)	**443.5**

22.6 Capital Expenditures

The capital expenditures include initial capital ("CAPEX") as well as sustaining capital to be spent after commencement of commercial operations.

22.6.1 Initial Capital

The CAPEX for Project construction, including processing, mine equipment purchases, pre-production activities, infrastructures and other direct and indirect costs is estimated to be CAD 380.1M. The total initial Project capital includes a contingency of CAD 27.8M which is 7.9% of the total CAPEX. The initial capital including pre-production cost, working capital variation and IBA payments during construction is estimated at CAD 407.2M.

22.6.2 Sustaining Capital Expenditures

Sustaining capital is required during operations for additional equipment purchases, mine equipment capital repairs, mine civil works and additional infrastructure relocation. The sustaining capital is estimated at CAD 125.8M. The Table 22.6 summarize the sustaining capital cost.

Table 22.6 Sustaining Capital Summary

Sustaining Capital Cost (M CAD)	
Mine Equipment Capital Repairs	46.30
Mine Equipment Purchase	60.93
Civil Work	18.60
Total Sustaining Capital	**125.8**

22.6.3 Working Capital

Working capital requirements were estimated based on 30-days accounts receivable, 30-days inventory, and 30-days accounts payable and other current liabilities.

22.6.4 Reclamation and Closure Costs

Reclamation and closure costs include infrastructure decommissioning, site preparation and revegetation, maintenance and post closure monitoring. The reclamation cost is spent over two years at the end of operations. The total reclamation and closure cost is estimated at CAD 47.4M, as summarized in Table 22.7

Table 22.7: Closure Cost

Closure Cost m CAD	
Closure Cost	31.33
Monitoring and Studies	9.89
Contingency	6.18
Total	**47.4**

22.6.5 Taxes

The project is subject to three levels of taxation including provincial mining tax, provincial income tax and federal income tax. The current Canadian tax system applicable to Mineral Resource Income was used to assess the annual tax liabilities for the Project. This consists of federal and provincial corporate taxes, as well as provincial mining taxes. Galaxy will pay approximately CAD 1,924.3 in tax payments over the life of the Project.

22.6.6 Provincial Mining Tax (Quebec Mining Tax)

The marginal tax rates applicable under the recently proposed mining tax regulations in Québec (Bill 55, December 2013) are 16%, 22% and 28% of taxable income and are dependent on the profit margin. It has been assumed that the 10% processing allowance rate associated with transformation of the mine product to a more advanced stage within the province would be applicable in this instance.

22.6.7 Federal and Provincial Income Taxes

The federal and provincial income taxes have both been estimated from an identical taxable income which is arrived at by deducting the Québec mining tax and various tax depreciations allowances. The federal income tax rate is 15% while the Québec income tax rate is 11.5%. The total federal income tax is estimated at CAD 594.1M and the provincial income tax at CAD 455.5M.

The tax summary is presented in the Table 22.8.

Table 22.8: Tax Summary

Tax Summary (CAD M)	Total
Quebec Mining Duties	874.7
Quebec Income Tax	455.5
Federal Income Tax	594.1
Total	**1,924.3**

22.7 Project Financing

The economic model excludes any Project debt or equipment financing and is therefore 100% financed through equity for the purposes of the Report. The funding requirement is CAD 407.2M.

22.8 Economic Results

The main economic metrics used to evaluate the Project consist of net undiscounted after-tax cash flow, net discounted after-tax cash flow or NPV, IRR and payback period. The discount rate used to evaluate the present value of the Project corresponds to the weighted average cost of capital. The discount rate represents the required rate of return that an investor would expect based on the risks inherent in achieving the expected future cash flows. An 8% discount rate was applied to the cash flow to derive the NPV for the Project on a pre-tax and after-tax basis.

A summary of the Project economic results is presented in Table 22.9 and the annual Project cash flows are presented in Table 22.9. The total after-tax cash flow over the Project life is CAD 4,789M and after-tax NPV 8% is CAD 2,865M. The after-tax Project cash flow results in a 2.9-year payback period from the commencement of commercial operations with an after-tax IRR of 35.2%.

Table 22.10 illustrates the after-tax cash flow and cumulative cash flow profiles of the project under the base case scenario with a discount rate of 8%. The intersection of the after-tax cumulative cash flow with the horizontal zero line represents the payback period, measured from the start of the project construction which is not the start of commercial production. The total net revenue derived from the sale of spodumene concentrate at 5.6% Li_2O was estimated at CAD 8,043M which includes an estimate penalty of USD 10/t of concentrate for every 0.1% under 6.0% Li_2O.

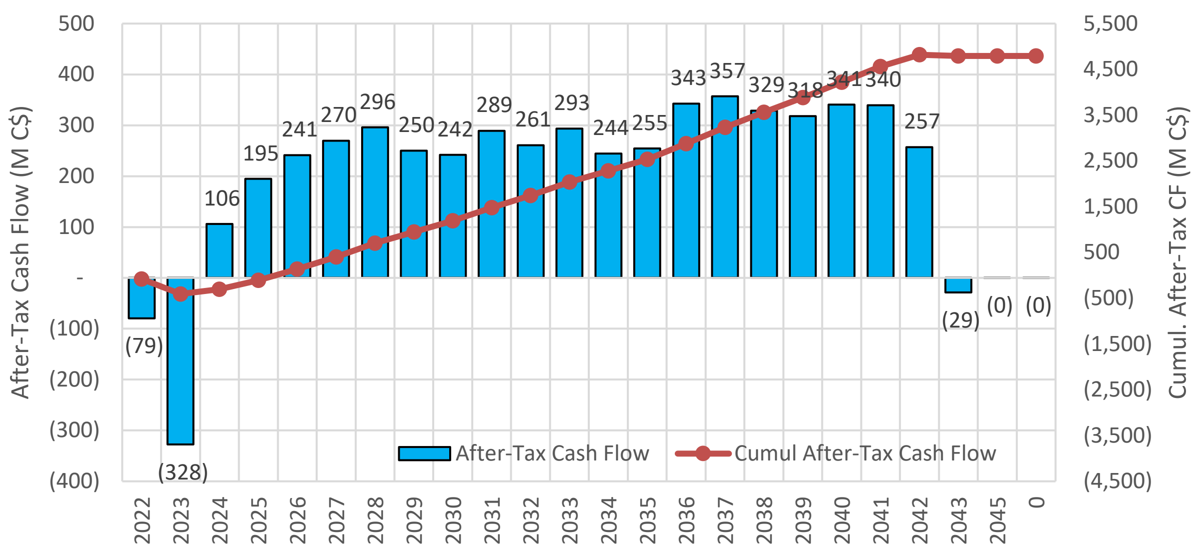
The annual Project cash flows are presented in Table 22.11.

Table 22.9: Project Economic Results Summary

Project Economics - Base Case Results	
Production Summary (Life-of-Mine)	
Tonnage Mined (Mt)	168,896
Ore Processed (Mt)	37,207
Strip Ratio (W:O)	3.54
Spodumene Concentrate (k dmt)	6,026
Metal	**Li_2O**
Head Grade (% Li_2O)	1.30
Contained Metal ('000 t Li)	225
Recovered Metal ('000 t Li)	158
Cash Flow Summary (M CAD)	
Gross Revenue	8,043
Mining Costs (incl. rehandle)	-819
Processing Costs	-492
Concentrate Transportation	-706
G&A Costs	-534

Project Economics - Base Case Results	
Production Summary (Life-of-Mine)	
Royalty Costs	-121
Total Operating Costs	-2,673
Operating Cash Flow	5,371
Initial CAPEX	-380
Operation Cost during Construction	-26
Sustaining CAPEX	-126
Total CAPEX	-532
Salvage Value	0
Closure Costs	-47
Interest and Financing Expenses	0
Taxes (mining, prov. & fed.)	-1,924
Before-Tax Results	
Before-Tax Undiscounted Cash Flow (M CAD)	4,789
NPV 8% Before-Tax	1,893
Project Before-Tax Payback Period	2.4
Project Before-Tax IRR	45.80%
After-Tax Results	
After-Tax Undiscounted Cash Flow	2,865
NPV 8% After-Tax	1,097
Project After-Tax Payback Period	2.9
Project After-Tax IRR	35.20%

Table 22.10: After-Tax Cash Flow



Source: GMS, 2021

Table 22.11: Project Cash Flow Summary

Cash Flow Summary	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Revenue	7,712	-	-	272	348	395	427	450	391	383	441	407	449	383	400	506	518	482	474	494	490	331	-
Total Operating Costs	(2,444)	-	-	(124)	(136)	(138)	(139)	(139)	(134)	(130)	(133)	(131)	(136)	(131)	(133)	(142)	(142)	(141)	(139)	(138)	(137)	(90)	-
Ebitda	5,268	-	-	148	212	256	288	312	257	253	307	277	314	251	267	365	376	341	335	355	353	241	-
Investment Capital	(352)	(70)	(282)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Contingency	(28)	(6)	(22)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sustaining Capital	(126)	-	-	(16)	(5)	(4)	(8)	(6)	(5)	(5)	(6)	(11)	(9)	(5)	(4)	(5)	(9)	(7)	(10)	(5)	(3)	(0)	-
Salvage Value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	(135)	(1)	(1)	(5)	(6)	(7)	(7)	(8)	(7)	(7)	(8)	(7)	(8)	(7)	(7)	(9)	(9)	(8)	(8)	(8)	(8)	(6)	-
Change in Working Capital	(37)	(1)	1	(20)	(6)	(4)	(3)	(2)	4	0	(4)	3	(3)	5	(1)	(8)	(1)	3	1	(2)	0	37	-
Taxes (Incl. Royalties and Others)	(1,839)	-	-	(3)	(41)	(66)	(91)	(110)	(90)	(90)	(115)	(102)	(118)	(92)	(99)	(142)	(146)	(132)	(129)	(138)	(136)	(85)	-
Closure Costs	(3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(3)	(15)	(29)
Cfads	2,748	(77)	(304)	103	154	175	179	186	160	151	174	159	175	152	155	201	211	197	189	203	204	172	(29)
Equity Contribution	407	79	328	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment MLA Funding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment MLA Service (Capital + Interest)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt Funding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRA Receipts / (Disbursements)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSRA Receipts / (Disbursements)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IBA Profit Sharing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt Service (Capital + Interest)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Excess Cash Flow	3,155	2	24	103	154	175	179	186	160	151	174	159	175	152	155	201	211	197	189	203	204	172	(29)
Mandatory Prepayments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Free Cash Flow	3,155	2	24	103	154	175	179	186	160	151	174	159	175	152	155	201	211	197	189	203	204	172	(29)
After-Tax Cash Flow	4,561	(79)	(328)	106	195	241	270	296	250	242	289	261	293	244	255	343	357	329	318	341	340	257	(29)
Cumul After-Tax Cash Flow		(79)	(407)	(301)	(106)	135	404	700	950	1,192	1,482	1,742	2,036	2,280	2,534	2,877	3,234	3,563	3,881	4,222	4,561	4,818	4,790

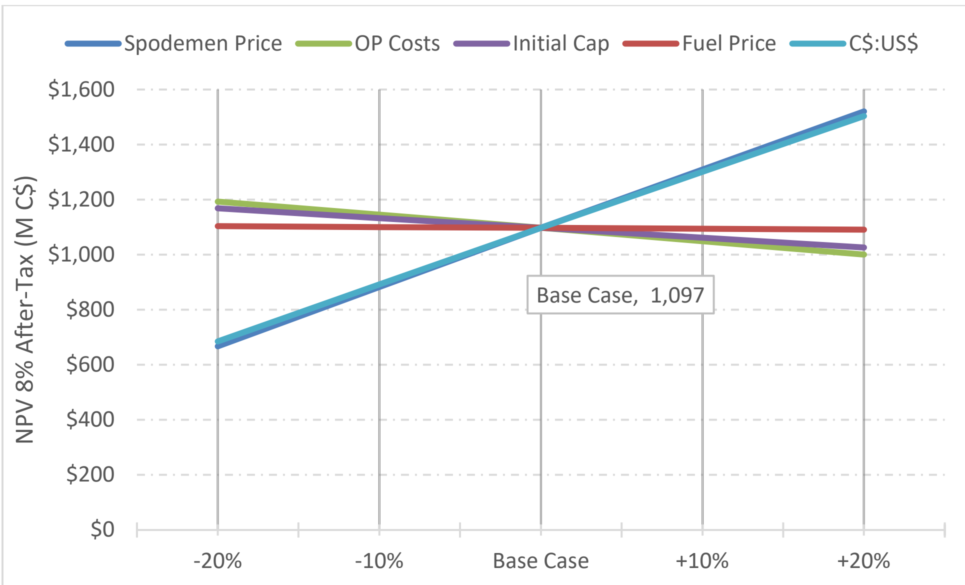
Notes: 1. Non-GAAP measure.
2. Numbers may not add due to rounding

22.9 Sensitivity Analysis

A sensitivity analysis was carried out with the base case as described above as the midpoint. An interval of ± 20% versus base case values was considered with increments of 10%.

The objective of the sensitivity analysis is to assess the impact on the Project's net present value (NPV) and internal rate of return (IRR), on both a pre-tax and after-tax basis, of changes in spodumene price, pre-production initial capital expenditure and operating expenses.

Figure 22.5: Sensitivity Analysis on the NPV 8% After-Tax



Source: GMS, 2021

As seen in Figure 22.5, variances in spodumene prices have the largest impact on the NPV then any other variable. Operating costs (mining cost, processing cost and G&A cost) have the second largest impact followed by initial pre-production CAPEX and fuel price.

Table 22.12 to Table 22.16 show the different sensitivity analysis for the project.

Table 22.12: Sensitivity Analysis on Spodumene Price Variation

Scenarios		-20% Spodumene	-10% Spodumene	Base Case	+10% Spodumene	+20% Spodumene
Before-Tax Results						
NPV 0% Before-Tax Equity CF	M CAD	3,141	3,965	4,789	5,613	6,437
NPV 8% Before-Tax Equity CF	M CAD	1,154	1,524	1,893	2,263	2,632
Equity Before-Tax Payback Period	years	3.4	2.8	2.4	2.2	1.9
Equity Before-Tax IRR	%	32.4%	39.2%	45.8%	52.2%	58.5%
After-Tax Results		-	-	-	-	-
NPV 0% After-Tax Equity CF	M CAD	1,917	2,392	2,865	3,336	3,805
NPV 8% After-Tax Equity CF	M CAD	667	883	1,097	1,310	1,521
Equity After-Tax Payback Period	years	3.8	3.3	2.9	2.6	2.3
Equity After-Tax IRR	%	25.5%	30.5%	35.2%	39.7%	43.9%

Table 22.13: Sensitivity Analysis on Exchange Rate Variation (CAD:USD)

Scenarios		-20% CAD/USD	-10% CAD/USD	Base Case	+10% CAD/USD	+20% CAD/USD
Before-Tax Results						
NPV 0% Before-Tax Equity CF	M CAD	3,205	3,997	4,789	5,581	6,374
NPV 8% Before-Tax Equity CF	M CAD	1,184	1,539	1,893	2,248	2,602
Equity Before-Tax Payback Period	years	3.3	2.8	2.4	2.2	2.0
Equity Before-Tax IRR	%	33.0%	39.5%	45.8%	51.9%	57.9%
After-Tax Results		-	-	-	-	-
NPV 0% After-Tax Equity CF	M CAD	1,954	2,410	2,865	3,317	3,768
NPV 8% After-Tax Equity CF	M CAD	685	892	1,097	1,301	1,503
Equity After-Tax Payback Period	years	3.7	3.2	2.9	2.6	2.4
Equity After-Tax IRR	%	26.0%	30.7%	35.2%	39.5%	43.5%

Table 22.14: Sensitivity Analysis on Opex Cost Variation

Scenarios		-20% OP Cost	-10% OP Cost	Base Case	+10% OP Cost	+20% OP Cost
Before-Tax Results						
NPV 0% Before-Tax Equity CF	M CAD	5,155	4,972	4,789	4,606	4,424
NPV 8% Before-Tax Equity CF	M CAD	2,065	1,979	1,893	1,807	1,722
Equity Before-Tax Payback Period	years	2.3	2.4	2.4	2.5	2.6
Equity Before-Tax IRR	%	49.2%	47.5%	45.8%	44.1%	42.4%
After-Tax Results		-	-	-	-	-
NPV 0% After-Tax Equity CF	M CAD	3,064	2,965	2,865	2,765	2,664
NPV 8% After-Tax Equity CF	M CAD	1,193	1,145	1,097	1,049	1,001
Equity After-Tax Payback Period	years	2.7	2.8	2.9	3.0	3.1
Equity After-Tax IRR	%	37.6%	36.4%	35.2%	34.0%	32.8%

Table 22.15: Sensitivity Analysis on Initial Capex Cost Variation

Scenarios		-20% Initial Cap	-10% Initial Cap	Base Case	+10% Initial Cap	+20% Initial Cap
Before-Tax Results						
NPV 0% Before-Tax Equity CF	M CAD	4,865	4,827	4,789	4,751	4,713
NPV 8% Before-Tax Equity CF	M CAD	1,964	1,929	1,893	1,858	1,822
Equity Before-Tax Payback Period	years	2.1	2.3	2.4	2.6	2.8
Equity Before-Tax IRR	%	53.8%	49.5%	45.8%	42.7%	40.0%
After-Tax Results		-	-	-	-	-
NPV 0% After-Tax Equity CF	M CAD	2,941	2,903	2,865	2,827	2,789
NPV 8% After-Tax Equity CF	M CAD	1,169	1,133	1,097	1,062	1,026
Equity After-Tax Payback Period	years	2.4	2.6	2.9	3.1	3.3
Equity After-Tax IRR	%	42.2%	38.4%	35.2%	32.5%	30.2%

Table 22.16: Sensitivity Analysis on Fuel Price Variation

Scenarios		-20% Fuel Price	-10% Fuel Price	Base Case	+10% Fuel Price	+20% Fuel Price
Before-Tax Results						
NPV 0% Before-Tax Equity CF	M CAD	4,814	4,801	4,789	4,777	4,765
NPV 8% Before-Tax Equity CF	M CAD	1,905	1,899	1,893	1,887	1,882
Equity Before-Tax Payback Period	years	2.4	2.4	2.4	2.4	2.5
Equity Before-Tax IRR	%	46.0%	45.9%	45.8%	45.7%	45.6%
After-Tax Results		-	-	-	-	-
NPV 0% After-Tax Equity CF	M CAD	2,878	2,872	2,865	2,858	2,851
NPV 8% After-Tax Equity CF	M CAD	1,104	1,101	1,097	1,094	1,091
Equity After-Tax Payback Period	years	2.8	2.9	2.9	2.9	2.9
Equity After-Tax IRR	%	35.4%	35.3%	35.2%	35.1%	35.0%

23 ADJACENT PROPERTIES

There are no adjacent properties that are considered relevant to this technical report.

24 OTHER RELEVANT DATA AND INFORMATION

24.1 Introduction

This section describes the proposed development of the Project after completion of the Feasibility Study phase. It describes the next stages of the Project; the sequencing of activities and milestones and includes as an attachment a level-3 project planning.

The development plan assumes normal project execution conditions based on the nature of business, location of the projects, inputs availability, etc. The proposed plan uses global project working criteria for similar industries and considers the specifics of this project in terms of size, location, logistics, availability of resources, etc. Each stage is planned with enough contingency in terms of duration to minimize disturbances, which may occur during implementation, thereby affecting subsequent stages.

24.2 Project Overview

24.2.1 Project Objectives

In order to align with GLCI's business and project objectives, the Project delivery objectives are to:

- Meet or exceed GLCI's HSE, community and project execution standards.
- Deliver the Project within the approved budget and approved milestones and schedule dates.
- Conform to statutory requirements and GLCI's commitments regarding licenses and approvals.
- Achieve the mining rate and lithium production as nominated in the design criteria.
- Leave a positive impact on the community.

24.2.2 Project Stages

The major subsequent stages of the Project are as follows:

a) Basic Engineering Phase (5 months)

- Provide engineering required to support the preparation of permits for the work planned in 2022.
- Progress engineering to about 30% for the Processing Area to support a Class 2 CAPEX estimate as defined by the Association of the Advancement of Cost Engineers (AACE).

- Obtain firm price bids for key mechanical and electrical equipment, including long-lead items and be in position for award to obtain vendor data for detailed engineering.
- Commitment to off-site utilities required to maintain the schedule

b) Execution (27 months)

- To start immediately upon Financial Approval Decision (“FAD”) in 2022.
- Develop the detailed engineering for construction.
- Perform the procurement & contracting activities required for the Project.
- Execute the full construction for the Project.
- Perform the commissioning and start-up of the process plant.
- Execute the ramp-up up to commercial production.

24.2.2.1 Project Implementation Steps

The following chart illustrates the main steps of the Project implementation

- Basic engineering to finish by Q1 2022
- Detailed engineering and procurement including long lead items to start by Q1 2022
- Site preparation work
- Construction
- Pre-production (mine stripping work)
- Commissioning & start up
- Commercial production start (including ramp up).

Figure 24.1: Project Development Phases & Milestones

24.3 Project Delivery Strategy

For the Execution Phase, GLCI will implement the project delivery strategy described below:

All the procurement and contracting activities will be managed directly by the Project team.

GLCI will implement an integrated team approach for construction management to carry out the Project`s construction activities. An Owner's Integrated Team organization will be put in place combining GLCI, main consultants and contractors to perform all technical / operational functions in-house and manage the required contractors to build the Project facilities. In this approach, the contractors will be involved as early as possible with the detailed engineering and constructability development.

24.3.1 Primary Strategy

The basis of this study is the project will be delivered using an Integrated Team approach. GLCI Team will manage and deliver the project and will incorporate resources within the GLCI's Team project for project specific positions as project management, procurement, construction / site management, etc.) coming from a specialized firm. They will act as GLCI Team representatives and function will not be duplicated.

GLCI will added key positions (hiring) for key positions that will remain after the completion of the project, i.e., future operation as technical (geology, mining, processing, waste rock and tailings management, etc.) and other functions (Contract, Finance, HR, etc.).

24.3.2 Engineering

Basic and detailed engineering will be performed using traditional way, i.e., hiring engineering firms with knowledge in specific fields as:

- Geology
- Mining Engineering
- Process Plant
- Waster Rock, Tailings and Water management
- Site / General Infrastructure (non-process)

24.3.3 Purchasing

Purchasing of equipment will be performed using a traditional way for worldwide vendors and suppliers. Organization with local technical offices (Quebec, Canada, North America, etc.) will be favored in view of obtaining support for commissioning and operation.

24.3.4 Construction

Various contractors will be hired following tender process based on a contracting strategy established. Some engineering will incorporate into construction package on Design, build and Install (ex: Fuel Bay) and / or design / supply package (ex: buildings).

With exception of long lead items or specific material, materials supply will be integrated within construction contracts.

The following Table presents a summary of contracting strategies develop for the study. Contracting strategies is preliminary and will be develop and confirm during the next phases of the project.

Table 24.1: Contracting Strategies Summary

No.	Contract	Scope	Type of Packages
EW-1	Earthworks & Underground Services	All earthworks and U/G services during Early Works and construction to include: - Installation of the AIL Conveyor Tunnel and Escape Tunnel - Installation of the Macaferri MSE Wall	Build
EW-2	Tree Clearing and Grubbing	All tree clearing and grubbing during Early Works	Services
CO-1	Concrete	All concrete works during construction including Camp foundations	Build
ST-1	Structural Steel	ALL primary structural steel for: - DMS building - Concentrate storage and load-out - Workshop and reagents storage	Design, Supply & Build
ST-2	Structural Steel	ALL primary structural steel for: - Crushing & Screening building, excluding steel supplied with the Crushers - COS Dome (erect only) - Admin Building - Mine Service Area (Truck shop)	Design, Supply & Build

No.	Contract	Scope	Type of Packages
ME-1	MPEI & Equipment Steel 1	Mechanical, piping, electrical and instrumentation works for: - DMS - Workshop/Reagent Storage - Tailings load-outs - Concentrate storage and load-out	Design and build
ME-2	MPEI & Equipment Steel 2	Mechanical, piping, electrical and instrumentation woks for: - Crushing & Screening - Crushed Ore Stockpile and Reclaim - Mine Service Area	Design and build
ME-3	Fuel Bay	Complete fuel supply and dispensing system	Design, supply and install
AR-1	Fencing	Fencing during Early Works and Construction	Supply and build
PFB-1	Permanent Camp	Complete Camp with sewage treatment unit, excluding concrete foundations	Design, supply and install
PFB-2	Crushed Ore Building	Complete building, excluding foundations	Design and Supply
PFB-3	Cold Storage Warehouse	Complete building, installed on custom-designed containers	Design, supply and install
PFB-4	Corrugated Steel Tunnels	Pre-fabricated Conveyor + Escape tunnels	Design and Supply
AR-2	Architecture	Siding, roofing, doors, windows for all process and non-process buildings except Camp	Supply and install
PB-1	Plumbing	Plumbing for all process and non-process buildings except Camp	Design, supply and build
HV-1	HVAC	HVAC for all process and non-process buildings except Camp	Design, supply and install
FP-1	Fire Protection	Fire detection for all process and non-process buildings except Camp	Design, supply and install
EL-1	Main HV Sub-Station, E-Room, Emergency Power	Supply (E-Rooms) and install	Install
EL-2	All site E&I Services	All site electrical and instrumentation services including lighting and grounding	Install
IT-1	Communication / Data Networks	Telephone, Internet, communications systems	Design, supply and install
HQ	Power Line	Excluded from Scope; by HQ	Design, supply and install
CO-2	Batch Plant	Batch Plant including supply of cement	Supply, install and operate

No.	Contract	Scope	Type of Packages
SE-1	Propane	Supply of propane tanks	Supply and install
SE-2	Scaffolding	All scaffolding for process and non-process building	Supply and install
SE-3	Mobile construction equipment	All non contractor-supplied construction equipment such as cranes, scissor lifts, fork lifts, bobcats etc.	Supply and operate
SE-4	Water Treatment Plant	Temporary water treatment plant during construction	Supply and install
SE-5	Sewage Treatment Plant	Temporary sewage treatment plant during construction	Supply and install
SE-6	Explosives Plant	Temporary explosive plant during construction	Supply and install
SE-7	Surveying	Surveying services	Service
SE-8	Engineering	Detailed engineering services	Service
SE-9	QA, QC	Quality assurance during construction	Service
SE-10	Catering	Supply of meals to construction workers on site	Service
SE-11	Security	Site security and gate keeping	Service
SE-12	Offices	Temporary offices	Service
SE-13	Water supply	Potable and non-potable water supply	Service
SE-14	Waste disposal	Collection of sludge from Sewage Treatment Plant, kitchen materials, garbage	Service
SE-15	Recycling	Collection of recyclable material	Service

To promote employment and involvement of the cree enterprises within the project, packaging will consider capabilities of Cree enterprises on the James Bay territory and efforts will be made to structure the package to encourage Cree enterprises to submit proposals.

24.4 Project Execution Schedule

To further develop the high-level schedule agreed during the FS, a level 3 Project Execution Schedule was developed including the complete scope of the Project from the completion of the FS to the completion of the ramp-up.

It is assumed that the detailed execution schedule will be further developed during the Basic Engineering Phase. Back-end activities included within pre-commissioning and ramp-up should be developed during the execution phase by the Commissioning Team.

Equipment lead times were obtained from vendor proposals received during the FS phase and Basic Engineering phase (for the Process Plant equipment) and considered in the schedule.

24.4.1 Introduction

The purpose of this section is to present in detail the Project Execution Schedule developed as the approach for the Project Execution Plan.

GLCI has established the Project executing strategy per sequence below:

- Basic Engineering
- GLCI Stage Gate review
- Full execution after the FAD
- Detailed engineering phase and award of LLI and critical construction packages
- GLCI Owner's Team (self-perform execution with Integrated Team approach)
- Commercial production.

24.4.2 Execution Strategy

After completion of the FS phase, the Project will be executed as follows:

Basic Engineering ("BE") Phase: To progress engineering and construction permit preparation to reach "Ready for Construction" status. The BE Phase includes the following scope:

- Engineering required to support the preparation of construction permit applications for the work planned in 2022.
- Progress engineering to about 30% to support a Class 2 CAPEX estimate.
- Obtain firm price bids for key mechanical and electrical equipment, including long-lead items and be in position to award orders to obtain vendor data required for detailed engineering.

Execution Phase: Comprising detailed engineering, procurement and construction, this phase covers the completion of the required detailed engineering for the construction phase of the Project, the award of all purchase orders and contracts for all the identified packages and the execution of the construction activities. The Execution Phase will only be started after the FAD.

24.4.3 Key Milestones

Following the High-Level Plan agreed, the High-Level Project Milestones and dates as extracted from the Primavera schedule are presented in Table 24.2.

Table 24.2: High-Level Project Milestones

Milestone	Date
Basic Engineering Phase - Start	August 2021
Award Turnkey Contract to Hydro Quebec	October 2021
Execution Phase - Financial Approval Decision (FAD)	Q2 2022
Construction Start – (Early Works)	Q2 2022
Permanent Camp Available	November 2022
Power Line Completion by HQ	July 2023
Project Main Substation Completion and Energized	October 2023
DMS Building - Mechanical Completion	September 2023
Start Dry Commissioning	October 2023
Wet Commissioning Completion	January 2024
Ramp-up Complete	March 2024

24.4.4 Permits

All legal requirements and permits must be obtained before starting any construction work. The Execution Schedule shows all the permits to be obtained by GLCI. Every permit in the schedule has been linked to the appropriate construction activities.

Also, an IBA program is in development and should be signed by Cree Nation prior to get the ESIA approval

The permits are grouped in two categories:

- Early Works Permits, which are to be prepared before the Environmental Impact Statement Assessment ("EISA") signature in order to be ready for submission the day the ESIA is deemed accepted.
- Construction Permits, which are to be prepared immediately after obtaining the EISA approval.

The following tables present the grouped permits as listed in the Execution Schedule:

Table 24.3: Early Works Permits

Permit Name	Planned Approval Date
Surface Lease for Industrial Site – Land Management Services	Jul. , 2022
Construction of Roads and Yards with Ditches and Creek Crossing	Jul. , 2022
Use of Waste Material for Construction	Aug. , 2022
Sand pits environment authorization - sand/gravel - pit to open	Jul. , 2022
Camp Sewage with Kitchen Grease Trap	Aug. , 2022
Wood Cutting Permit (for deforestation)	Apr. , 2022
Permit for Bulk Sampling	Feb. , 2022
Drinking Water Treatment and Distribution	Aug. , 2022
Earthworks Permit	May, 2022
Drinking Water Well	Jul. , 2022
Aggregate Permitting - (construction crusher)	Jul. , 2022
BNE – Sand / Gravel – Extension to existing Pit	Jul. , 2022
Petroleum Equipment	May, 2022
Industrial Water Source	Jan. , 2023

Table 24.4: Construction Permits

Permit Name	Planned Approval Date
Licenses for Vehicles On-road and Off-road	Apr. , 2022
MELCC – Certif. of Authorization - Concentrator (to start concrete pouring)	Jul. , 2022
MELCC - Certif. of Authorization - Mining Extraction	Jul. , 2022
MELCC - Compensation for Wetland Destruction	Aug. , 2022
ECCC - Compensation Loss of Fish Habitat	Aug. , 2022
MERN - Surface Lease for all Infrastructure - Tailings Location Approval	Aug., 2022
MELCC – Certif. of Authorization - Waste Piles	Sep. , 2022
SQ - Explosive Magazine	Sep. , 2022
NRCan - Explosive Fabrication	Oct. , 2022
MERN - Closure Plan Approval and Mining Lease	Apr. , 2023
RBQ - Propane Storage - Submit ERP to ECCC	Sep. , 2023

24.4.5 Critical Path

The critical path for the Project Execution Schedule is driven by the ESIA signature which is a pre-requisite of the obtention of the main construction permit (Certificate of Authorization) as described below:

- Signed IBA and ESIA
- Certificate of Authorization to begin concrete pouring
- Temporary Camp at Truckstop 381
- Mobilization of the concrete Contractor
- Construction and completion of the of the DMS building facilities, including its foundations, building erection, cladding / roofing, mechanical and piping installation, electrical & instrumentation installation, and pre-operational verifications.
- Plant dry commissioning
- Plant wet commissioning
- Plant ramp-up.

A near critical activity is the availability of accommodations for the construction workforce. Temporary accommodations will need to be available to do the early works, including the construction of the permanent camp which will be driven by the FAD.

24.4.6 <u>Construction Sequence</u>

This section will outline the high-level execution sequencing constraints that were evaluated to determine the execution schedule baseline for the Execution Phase.

During the Basic Engineering phase, GLCI will start the preparation of all the identified early work permits required to start construction woks on site. These early works permits will need to be completed prior to the first mobilization to site.

Once the early work permits are secured, the first contractors to mobilize will be: Tree-clearing and grubbing, early civil works, temporary services, and permanent camp installation. It is critical that the clearing and grubbing contractor cut the trees before the migratory bird nesting tree-cutting ban. As the clearing and grubbing activities continue, the heavy civil work will follow behind to strip the topsoil and organics and stockpile the material in designated areas for future remediation works. Temporary water management catchments and ditches will also be developed as the civil works continues in the process plant pad development, mine pit, as well as the tailings management footprint.

After the early civil works are completed, the process plant concrete foundation works will begin by mid-Q3 2022 for the DMS building and the crushed ore stockpile Dome, followed by their respective erection and building closing to allow installation works (mechanical, piping, electrical & instrumentation) inside the buildings during the winter season. All other concrete foundation works will be scheduled to start early in Spring 2023. Construction will be continuous until commissioning activities begin in Q4 2023.

24.4.7 <u>Winter Construction</u>

Construction will continue through the 2022/2023 winter period. To mitigate downtime and loss of productivity the following considerations were included in the execution schedule.

The concrete foundations work for the process plant are, for the most part, scheduled to be built during the summer months. The construction sequence for the process plant assumed that the foundations of the DMS buildings and the erection of the buildings, roofing and cladding will be completed before the onset of winter to allow installation works to continue inside the building, sheltered from inclement weather. Priority will also be given to erect the COS Dome and the truck shop / warehouse buildings for additional all-weather storage for the winter months.

24.4.8 Site Laydown Requirements

An early priority for site construction should be the assembly of temporary and permanent storage warehouse facilities with sufficient space to store any goods with indoor storage requirements.

Any goods or equipment which can be stored outdoor will be placed in an on-site outdoor lay down area, ideally to be located near the storage warehouse. The outdoor lay down area will have to be on level ground, with all snow removed done prior to the delivery of goods and equipment. A typical lay down area would normally have a surface of 10,000 m^2 (e.g., 100 m x 100 m).

Both the site lay down area and the storage warehouse must obtain the necessary permits for the storage of hazardous materials, as applicable. The required security, protective and handling equipment should be available to allow for the temporary storage of hazardous materials whenever necessary.

24.4.9 Camp Requirements

Fuel and limited accommodation (30 beds capacity to be dedicated to the Project) are available at the "Relais Routier km 381" Truck Stop, a facility located 1 km from the property. For the initial phase of construction, there will be a need to temporarily increase the number of available beds at the Truck Stop, starting in Q2 2022.

Currently 180 additional beds are estimated to be required to principally accommodate the workforce for clearing and grubbing, earthworks, temporary services installation, main camp installation, concrete works to be completed before winter 2022-2023, and the start of the DMS building erection.

A single permanent camp with 186 bed capacity will be built and utilized for both the construction phase and operations phase of the James Bay Lithium Project. The permanent camp will be completed to its full capacity by Q4, 2022.

The Preliminary Construction Manpower Forecast is shown below:

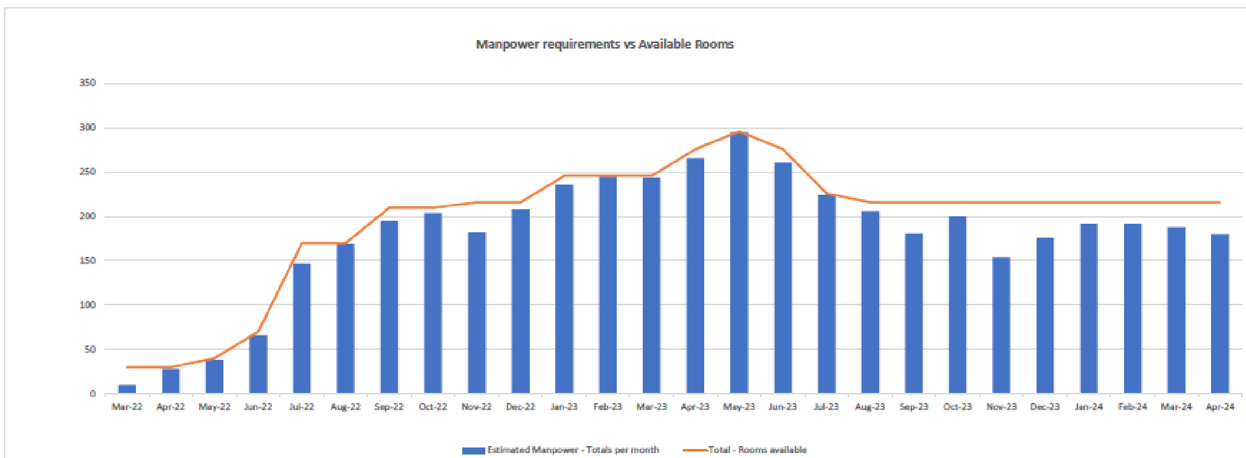
Figure 24.2: Preliminary Construction Manpower Forecast

Galaxy James Bay Lithium Project - CAJB

Preliminary Construction Manpower Forecast - for Execution Plan

Preliminary Manpower requirement Estimate	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24
Tree-cutting	10	12				6	14	14	14	8																
Earthworks (inc TSF)		15	20	30	30	30	30	30	30	30	30	30	30	20	16	12										
Fencing			6	8	8	8	6																			
Temporary Accommodation (install & Operate)			10	10	10	20	20	20	8	8	8	8	8	8	8	8										
Accommodation Camp (installation / Operation)					12	12	12	12	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Communication / Network Install					8	10	8																			
MSE Wall												8														
Concrete				10	30	30	30	30	10	20	20	20	20	30	30	20										
DMS Building (+Cladding) & Dome							30	40	40	30	20															
Other Buildings														10	25	25	25	25								
Early Works (Others)				6	10	10																				
MPE&I Contractor B											20	30	30	30	30	30	30	30	30	20						
MPE&I Contractor A												12	12	12	20	20	20	20	20	20	10					
Other Contractors (Plumbing/Lightning/HVAC)														8	16	16	16	20	20	16	4					
HV Substation Installation													6	10	12	12	12	10	10	4						
Commissioning																				8	8	8	8	8	8	
Project Management	0	1	2	2	2	4	4	6	6	8	12	12	12	12	12	12	12	12	12	12	12	8	8	8	4	
Hydro Quebec - Construction manpower										30	40	40	40	40	40	20	20									
Mining Crew (from Mining Plan)								10	10	10	15	15	15	15	15	15	17	17	17	50	50	50	68	68	68	72
G&A					37	37	37	38	38	38	41	41	41	41	41	41	42	42	42	40	40	40	40	40	40	40
Process																						40	40	40	40	40
Contingency						2	4	4	4	4	8	8	8	8	8	8	8	8	8	8	8	8	6	6	6	6
Estimated Manpower - Totals per month	10	28	38	66	147	169	195	204	182	208	236	246	244	266	295	261	224	206	181	200	154	176	192	192	188	180

Rooms Availability Forecast	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24
TruckStop 381 (Current estimated availability)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Temporary Rooms to add at Truckstop 381			10	40	140	140	180	180			30	30	30	60	80	60	10									
Galaxy's New Permanent Camp Capacity									186	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186
Total - Rooms available	30	30	40	70	170	170	210	210	216	216	246	246	246	276	296	276	226	216	216	216	216	216	216	216	216	216



Source: GMS, 2021

The Construction Manpower Forecast was developed to reflect the manpower required for the different construction contracts. The forecast accounts for the Hydro Quebec construction workforce requirements.

Most major construction contracts will be awarded to regional contractors using local personnel whenever possible. The schedule assumes that there are no skilled labour restrictions.

24.4.10 Scheduling Software

The software used to develop the schedule was Primavera P6 Project Management, Release 16.2. The P6 scheduling options used for this project are listed below:

- Use of expected finish dates
- Total float is calculated as: Total Float = Late Finish – Early Finish
- Define critical activities as those having a total float less than or equal to 0 days
- When using lags between activities, the associated calendar to the lag is the predecessor activity calendar.
- Positive lags are used in the schedule logic in start-to-start, finish-to finish or finish-to-start relationships where appropriate. Negative lags and/or start-to-finish relationships are not used in accordance with industry best practices.

24.4.11 Project Calendars

Four different calendars were used in the schedule, assigned to every activity based on the type of work associated as shown in Table 24.5.

Table 24.5: Project Calendars

Calendar	Description	Type of Activity
Office Calendar	40 hours per week (8 h a day) from Monday to Friday.	Applies to Engineering, Procurement, Contracting, Permitting and off-site activities.
Construction Calendar	70 hours per week (10 h a day 7 days a week) considers Quebec Construction Vacation time	Applies to Construction & Commissioning Activities.
Construction Calendar – No Winter works	70 hours per week (10 h a day 7 days a week) No work allowed from starting November to end of March	Applies to activities not allowed during winter season.
Fabrication & Delivery	70 hours per week (10 h a day 7 days a week)	Applies to all Fabrication and Delivery activities.
Construction – Out of Bird Nesting Season	70 hours per week (10 h a day 7 days a week) No work allowed from May 1st to August 15th each year	Applies to tree-clearing which is not allowed during the bird nesting season.

24.4.12 Constraints

The following project constraints were considered in developing the schedule:

- The Execution Phase cannot start prior to the GLCI FAD.
- Tree-cutting activities cannot be carried out during the nesting period, which is from May 1 to August 15 every year.
- Concrete pouring for building foundations is not to be performed during the winter season.
- Limited availability of accommodations at site.
- The Project includes some Wetlands, where digging and excavation need to be performed during winter periods when the ground is frozen

24.4.13 Assumptions

24.4.13.1 General Assumptions

- At the end of the Basic Engineering Phase, the GLCI's Stage Gate review will be performed, to be followed by the FAD.
- All the required permits for construction (including early works) will be available on time, as shown in the Execution Schedule.
- Project funding will be in place when required.

- Early award of the Turnkey Contract to Hydro Quebec for the construction of the power line to the Project's site will be completed by October 2021.
- Required temporary accommodations to be installed at the Truck Stop (Relais 381) will be ready and available on time to allow the start of the early works.
- Construction package by Hydro Québec will be executed and completed in a timely manner.
- Permanent electrical power supply will be available on time to start commissioning.

24.4.13.2 Permit Assumptions

The execution schedule assumes that the following dates are achievable for the following permits:

- ESIA signature by February, 2022
- Deforestation Permit by April, 2022
- Earthworks Permit by May, 2022
- Construction Permit by July, 2022

24.4.14 Engineering

- Basic Engineering Phase:
  - The main purpose of the BE Phase is to develop the engineering level sufficiently to obtain firm quotations for the equipment and bring the Project to "Ready for Construction" status.
  - If necessary, the detailed engineering required to prepare the purchase of long lead items and critical packages will be prioritized.
- Execution Phase:
  - Each engineering contractor will finalize and issue all the detailed engineering deliverables required for construction on time.

24.4.15 Procurement

During the Basic Engineering Phase, firm prices and confirmed lead times will be obtained for most equipment, especially long lead items. This will allow to increase the precision level of the information and support the FAD.

The following assumptions were considered when developing the Project Execution Schedule:

- The preparation of the required documentation for all equipment and material procurement will be done by GMS.
- Most of the technical recommendations for key equipment packages and contracts are to be completed before the FAD.
- Purchase orders and contracts will be issued/signed by GLCI only after the FAD will be done.
- The following packages are considered as long lead items:

Table 24.6: Long Lead Items – James Bay Lithium Project

Package	Description
Tree Clearing & Grubbing	Cutting trees and other vegetation, as well as the removal of roots from the designated areas.
Batch Plant	Aggregates and concrete supply.
Earthworks & Underground Services	Execution of all earthworks for the site including the Tailings Storage Facility and Water Management Facility.
Temporary Camp	Supply and installation of the temporary camp facility required while the permanent camp will be installed.
Permanent Camp	Design, supply, and installation of a permanent camp including its related services (kitchen, dining room, laundry, etc.).
Concrete	Site wide concrete installation contract
Structural Steel & Architecture - B	Engineering, supply, and erection of administration building, truck shop and non-process buildings.
Mechanical / Piping / Electrical / Instrumentation (MPEI) – A	Mechanical, piping, electrical and instrumentation installation for administration building, truckshop and non-process bldgs.
COS Dome	Design, supply and erect of a dome for the crushed ore storage facility.
Cold Storage Warehouse	Design, supply and erect of the cold storage warehouse facility.
Main HV Sub-Station + E-Room	Engineering, equipment supply, and installation of the main HV substation, including the E-room and emergency power.
Electrical / Instrumentation service Contractor	All site - design, supply and install of electrical & instrumentation components non-covered on the MPEI A/B contracts.
Power Line by Hydro Quebec	Design, procure and install of the permanent electrical powerline for the Project's facilities.

24.4.16 Construction

In general, construction activities will be executed by the selected contractors according to the contracting strategy and following the construction sequence established in the Execution Schedule. However, early works will be required upfront at the start of the main construction works. The contracts indicated below are identified as required for these early works. As such, they will need to be awarded and executed immediately after the FAD is made:

- Tree Clearing and Grubbing: To clear the designated areas by cutting trees, vegetation, and roots removal.
- Earthworks Contract: The scope of this contract is to perform the overall earthwork at the Project site. This contract is required to start site preparation works, including the construction of the roads and the platforms pads / underground facilities to build the Project. The contract must include the WRTSF facilities construction as well as water management related works.
- Batch Plant Contract: Required to supply concrete for the pouring of the foundations, equipment bases, slabs, etc. for the entire project needs.
- Temporary Camp Contract: To provide the temporary lodging required to start the early works and provide supplementary accommodation during the peak construction periods.
- Permanent Camp Contract: The plan is to house the construction workers as soon as possible in the permanent camp, which will accommodate the future mining and plant personnel. As a result, the camp's construction should be prioritized.
- Fencing: To install a proper fence at the property's perimeter.
- Temporary Site Services: To provide temporary services to support early works, temporary power supply, and electrical distribution for construction.
- Communication & Internet Services: To acquire and setup the proper site communications infrastructure to be used by the Project starting at the construction phase and throughout the Project's operation phase.

No Construction Schedule Risk Analysis was performed as part of the FS phase.

24.4.16.1 Pre-Commissioning & Commissioning Assumptions

Detailed activities for pre-commissioning and commissioning will be further developed by the Commissioning Team during the BE and will be integrated in the project schedule.

Pre-commissioning and commissioning will only start after permanent power is available on site.

25 INTERPRETATION AND CONCLUSIONS

25.1 Interpretation and Conclusions

25.1.1 Mineral Resources

Since the acquisition of the Project by GLCI from Lithium One in 2012, GLCI has used additional core drilling to delineate eighteen irregular dikes attaining up to 60 m in width and over 200 m in length containing spodumene mineralization from the surface to a depth of approximately 300 m over a strike length of 2.2 km.

The QP has witnessed the extent of the exploration work during a site visit and after verification and validation confirm that the exploration data and geological interpretation are sufficiently reliable to support geological modelling and mineral resource evaluation.

The Mineral Resource Statement reflects current level of information available for the Project. In most cases, the spacing between samples is too large or the geological information insufficient to allow modelling the internal waste (barren xenoliths, barren chilled margins) with confidence. For those dikes, infill drilling along a tighter drill pattern would improve the confidence in the geological model and allow removing some internal barren waste inside the pegmatite dykes. This represents an opportunity to improve the grade of some modelled pegmatite dikes. In addition, there are a number of pegmatite intercepts in drilling that remained unmodelled due to a lack of continuity, and do not form part of the mineral resource despite being contained within the proposed open pit. Lastly, several pegmatites remain open to the north, and extensions to these pegmatites could be larger than currently modelled. These areas all fall within the proposed open pit, and represent an opportunity to increase ore volumes and reduce the strip ratio.

The mineral resource model presented herein confirms that the Project contains a significant near-surface Li_2O mineral resource amenable to open pit mining. The drilling and channel sampling data indicate that the thickness and Li_2O grades of the pegmatite dike swarms exhibit good continuity along their length and dip over the 2.2 km of strike length investigated, confirming that the geological model is robust. The outcrop pattern and continuity of the pegmatite bodies suggest that the pegmatite dike could be extended in length and along strike to the east. On this basis, there is reasonably good potential to grow the mineral resources with additional drilling beyond the area investigated by GLCI.

25.1.2 Mining

Mine planning work performed previously for the PEA, is based on the 3D block model provided by GLCI in 2020. The block model contains sub-blocks of sizes varying from 0.25 m x 0.25 m x 0.25 m to 10 m x 3 m x 10 m. For an open pit project, it is preferable to use a standard block size with the Smallest Minable Unit ("SMU"). This block is the smallest volume of material the mining mobile equipment can mine. To reduce the impact of dilution, all blocks were regularized to 5 m x 3 m x 5 m.

For this study, GMS determined that the Project was amenable to conventional open pit mining methods. The mine provides mill feed of mineralized material at a rate of 2 Mtpa beginning the first year of the mine life.

The ultimate pit design is based on the Feasibility Study ("FS") design and contains 37.2 Mt of mill feed with an average grade of 1.30% Li_2O. The mill feed includes a mining dilution (7.8% at 0.30% Li_2O) and some loss (2.2%) related to the regulation process. The overall stripping ratio is 3.54:1 (tonnes waste to tonnes ore) and a total of 131.7 Mt of waste material will be moved over the mine life of approximately 19 years.

The ultimate pit design contains three phases, each containing between 2 and 4 internal phases. Benches are 10 m high, with a general berm width of 9 m. It is planned that mining will be carried out utilizing an equipment fleet of up to 2x (4-8'') diameter Blasthole Drills, 1x Electric Hydraulic Shovel (8.3 m^3), 1x Diesel Hydraulic Excavator (6.3 m^3), 3x production front-end wheel loader ("FEL") with 10.7 m^3 bucket and up to 9 x 100 t haul trucks, supplemented by support equipment such as tracked dozers, wheel dozers, graders, a water truck and other minor support equipment items.

25.1.3 Mineral Processing and Metallurgy

SGS Canada Inc ("SGS") and Nagrom were contracted in 2011 and 2018 respectively to undertake metallurgical test work. SGS's scope was for preliminary test work (HLS and DMS) on a single sample. Nagrom's test work was for two phases: Phase 1 for several composites and Phase 2 for ROM within defined Early Years, Mid Years and Later Years.

For this Study, it is determined that the Project is amenable to conventional Dense Media Separation ("DMS") processing method. The cut-point SGs are 2.70 and 2.90 for coarse (-15+4 mm) Primary and Secondary DMS, respectively. The cut-point SGs are 2.70 and 2.80 for fine (-4+1 mm) Primary and Secondary DMS, respectively.

The processing plant consists of crushing, screening, DMS and dewatering circuits. The 66.5% overall plant recovery in the design for the Early Years is equivalent to 80.4% total DMS recovery (assuming 20.3% mass and 17.2% Li_2O deportment in the -1 mm in the plant feed) with an average grade of 6.0% Li_2O. This allows for a scale-up factor when transitioning from laboratory to a full-scale operating plant.

The 61.9% overall plant recovery in the design for the Mid-Later Years is equivalent to 74.9% total DMS recovery (assuming 20.3% mass and 17.4% Li_2O deportment in the -1 mm in the plant feed) with an average grade of 5.9% Li_2O. This allows for a scale-up factor when transitioning from laboratory to a full-scale operating plant.

Based on the data presented above, the design overall plant recovery for the James Bay Project is 66.5% for EY and 61.9% for MY/LY targeting a 6.0%. Li_2O product.

Following the recent improvement in the lithium market, the design for the James Bay processing plant is now targeting to produce a final product grade target of 5.6% Li_2O compared to the test work and basis of design for the PEA of 6.0% Li_2O, as this will markedly improve the economics of the Project by increasing the overall plant recovery to 71.2% and 66.5% for Early Years and Mid/Later Years respectively.

25.2 Project Risks

The purpose of the current section of the FEED report is to provide an overview of the identified event risk profile for the Project and to outline the approach adopted by the Project team to ensure these risks are appropriately managed to support Galaxy's core values.

The James Bay Project FEED stage risk profile was categorized into the following areas:

Pre-Execution Risks:	These relate to risks associated with the development of the Project through the Engineering phases to achieving the final investment decision
Execution Risks:	These relate to risks associated with delivering the approved project (detailed design, procurement, mobilization, construction, commissioning and hand-over).
Operational Risk:	This relates to the risks once the Project is handed over to operations and production commences (including ramp-up to full production).

The predominant issues seen as potential risks to project viability are: (These risks are considered standard at the FEED phase of a project.) .

a) Geology

Some minor uncertainty exists regarding the geological-metallurgical model (grade, contamination, etc.). Targeted technical studies are planned to improve the model.

b) Processing

The process plant design uses similar flowsheets and experience from Galaxy's Mt. Cattlin existing operation. However, considering the worldwide lithium industry challenge in the last decade regarding achieving design throughput and ramp-up to full production on an established timeframe, medium risks exist and will be addressed during the subsequent study / engineering phases.

c) Waste Rocks and Tailings

Co-disposal of waste rock and tailings, including water management, are considered low risk but will require additional studies and specific design / procedures / methodologies to be established in the subsequent phases.

d) Project Execution

Cost and schedule overruns are common in mining industry projects in general. Engineering progress after the study phases and sound execution planning are proposed to mitigate these cost and schedule risks.

The present project schedule assumes that all permits have been obtained as planned. Delays in permitting will delay the Project schedule and, likely, result in increased project costs.

e) COVID-19

The COVID-19 worldwide pandemic may impact project execution cost and schedule including productivity, commodity prices, etc.

In line with Galaxy Risk Standard requirements, the Project will develop a Risk Management Plan ("RMP") during its next phase. The James Bay Project RMP will detail how the Project team will coordinate the various risk activities (financial, design, construction, etc.) and ensure that control actions are tracked and closed out so that risks are maintained in line with Galaxy's expectations. The purpose of the plan is to document how the Owner's team (together with the contractors) will meet its risk management objectives by identifying, understanding, implementing, monitoring and controlling project development risks.

The RMP will be maintained for the duration of the Project and the performance against the RMP KPIs will be a routine project reporting parameter to the Project executive team. The risk management process has ensured that key risks and opportunities associated with the Project have been identified early in the project and will be used going into the subsequent steps of the Project to provide the Project team (James Bay Project team, contractors, etc.) with a common understanding of the risk drivers and ensure appropriate focus on the required and appropriate risk controls.

In conclusion, it can be said that while there is still considerable risk assessment work to be undertaken throughout the development of the project design, execution and hand-over to operations, there are no risk issues that have been identified for which adequate practical control programs are not understood. Therefore, the Project team believes, based on the work conducted to date, that there is no reason on a risk basis that the James Bay Project should not progress to its next stage.

26 RECOMMENDATIONS

26.1 Mineral Resources

In reviewing the geological and block model constructed for the Project, the Qualified Person ("QP") makes the following recommendations:

- Continue exploration diamond drilling around the periphery of the pegmatite dykes to delineate them, especially to the north of the deposit.
- Conduct exploration drilling to the east of the existing deposit, where outcropping pegmatites with visible spodumene mineralization have been identified.
- Conduct shallow RC drilling in near-surface areas of the deposit defined by mapping to be geologically complex, which could represent a potential risk to the ore mined in the pre-production period.
- Undertake a new geological model which incorporates updated surface mapping, the individual strike-orientations of each dyke, and any unmodelled intervals of pegmatite in the eastern portion of the deposit that are not represented in the current block model.
- Commercially available certified reference material should be used as part of the analytical quality control procedure.
- All future drill collars should be surveyed using a differential GPS.
- Geotechnical logging should be included in routine drilling procedures. Rock geotechnical information will become invaluable for future engineering conceptual studies.
- Further mineralogical studies should be conducted to determine the presence any minor lithium-bearing minerals (such as petalite, lepidolite, etc.) and incorporated into the geological model.

The resource evaluation work undertaken considers the barren gneiss sections inside the pegmatite dikes as internal dilution. This approach assigns negligible values to unsampled intervals inside the pegmatite resource domains. In doing so, the spodumene-bearing intervals are "diluted" by the unsampled intervals, yielding lower average grades for those pegmatite bodies containing significant "internal waste" that cannot be isolated by wireframing. More tightly spaced drilling information could help reduce this problem by tightening the wireframing of the pegmatite contours.

The QP is unaware of any other significant factors and risks that may affect access, title, or the right or ability to perform the exploration work recommended for the Project.

26.2 Mining

The following recommendations are made for mining:

- Develop a slope monitoring program and a ground control management plan for the operations phase. Monitoring performance of interim phase walls in actual ground conditions in the early phases of the operation can allow for timely modification to slope design criteria for Ultimate Wall design: covered in CAPEX and OPEX.
- Monitor ground water conditions and assess predicted conditions against actual conditions to determine whether advanced dewatering and depressurization controls, like horizontal drain holes, would be needed for the Ultimate Wall design (during the operations phase).
- Geotechnical study analysis considered dry pit slope conditions. Consideration should be given to undertaking further analyzes using the results of completed hydrogeological modelling for the site (tbc)

There is a lack of chemical information associated with the waste material and, hence, some uncertainty exists in the levels of deleterious metals (i.e. Fe_2O_3) that may be present within the external waste dilution. Consequently, dilution material may lower spodumene concentrate grade within the Dense Medium Separation ("DMS") processing.

26.3 Geotechnical Investigation

Additional geotechnical investigation and laboratory testing is recommended to further delineate and characterize the foundation materials at the waste rock and tailings co-placement storage facilities (WRTSF) and overburden and peat storage facility (OPSF), with a focus on further strength (direct simple shear) and consolidation testing of clayey soil foundation materials. Additional geotechnical investigation in the process plant area will also be required to support detailed design of the foundations and to improve the accuracy of bulk earthworks capital expenditure estimates. Investigation should include provisions for rock coring to confirm bedrock hydrogeological conditions, cone penetration tests ("CPT"), particle size distribution ("PSD") evaluation, direct simple shear testing and one-dimension consolidation (oedometer) testing on select soil samples. In addition, geotechnical investigations should be carried out to identify and/or confirm potential granular borrow sources.

26.4 Mine Waste Storage Facilities

The following additional validation is required to refine the detailed design of the WRTSF, OPSF and WMPs:

- Supplemental geotechnical site investigation of the WRTSF, OPSF and WMP areas to characterize the foundation conditions, including electric vane shear strength testing, direct simple shear strength testing and consolidation testing of WRTSF silty clay foundation materials.
- Static and cyclic liquefaction susceptibility assessment of WRTSF foundation soils, including post-liquefaction stability analysis.
- Given the presence of undrained foundation conditions, staged consolidation and slope stability analysis should be considered.
- Tailings laboratory testing to determine the filterability (dewatering) and geotechnical (shear strength) characteristics.
- Geotechnical laboratory testing of the waste rock, including strength and durability testing.
- Re-evaluate the WRTSF site selection and footprints considering water management criteria. For example, interim collection of runoff/drainage from the Southwest and East WRTSFs in the open pit mine may not be the most energy efficient strategy (e.g., water pumping cost) and could impact mining operations during the spring or extreme rainfall events.
- Optimization and further evaluation of the proposed WRTSF designs and construction staging based on the findings of the geotechnical site investigations.
- Validation for the filling plan methodology (i.e., optimization of filtered tailings and waste rock co-disposal details). Tailings and waste rock mixing tests should be carried out to evaluate interface shear strength, filter compatibility and seepage characteristics. In addition, field trials can be carried out during operations to assess opportunities for efficient co-mingling of the tailings with waste rock.
- Develop an instrumentation and monitoring program for construction and operation of the WRTSF with established threshold alert levels and appropriate response framework.
- Confirmation of mine plan and material balance to confirm availability of construction materials for development of the WRTSFs over the life of mine including pre-production and closure periods.
- Condemnation drilling for the WRTSF sites to verify the absence of mineralization.
- Advancement of mine closure planning for the WRTSF and OPSF.

26.5 Processing and Metallurgy

The following additional test work and studies are recommended for Processing:

- Undertake DMS testwork on the JB1 / West pit to confirm recovery/grade performance

- Review treatment options for fines (-1 mm) tailings and complete a trade-off study to establish the best option for increasing Li_2O recovery/economics outcome.

26.6 Water Management

The following studies related to water management are recommended to support future detailed design:

- The site-wide water management strategy and the water balance model should be updated once the design of the effluent treatment system is completed, considering the operational requirements of the effluent treatment plant.
- Optimization of the WMP designs including further consideration of liner requirements, minimizing excavation and dam height. Completion of a trade-off study evaluating geosynthetic versus clay lining for the WMP dams and North WMP basin. In particular, confirming if the existing clay overburden material is suitable for WMP dam construction and/or if it can be dried to a moisture content suitable for construction.
- A dam breach and inundation study to support the WMP dam classification.
- Perform a more detailed flood study based on improved topographic mapping for the CE-3 Creek, considering spring and summer fall extreme events, and potential risk of blockage of the James Bay Road culvert by ice or debris.
- Refine the design of the water management infrastructure based on improved topographic survey data.
- Confirm water treatment requirements for effluent discharge.

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