NI 43-101 Technical Report on
Quebrada Blanca Phase 2
Región de Tarapacá, Chile

Prepared for:
Teck Resources Limited.

Prepared by:
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Effective date:
1 January, 2019.

Report date:
25 February, 2019.

CERTIFICATE OF QUALIFIED PERSON

I, Eldwin Huls, P.Eng., am employed as the Principal Mechanical Engineer Quebrada Blanca Phase 2, with Teck Resources Limited (“Teck”) at the Teck project office situated at Apoquindo 3885, Piso 7 Las Condes, Santiago, Chile.

This certificate applies to the technical report titled “NI 43-101 Technical Report on Quebrada Blanca Phase 2 Project Región de Tarapacá, Chile” that has an effective date of 1 January, 2019 (the “technical report”).

I am a professional engineer registered with Professional Engineers Ontario #100124516. I graduated in 2004 from Queens University with a Bachelor of Science - Mechanical Engineering with Professional Internship

I have practiced my profession for 14 years. I have been directly involved in mining project design and commissioning for large mining projects and associated infrastructure in the United States, Canada, Australia, and Chile.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I have visited the Quebrada Blanca property numerous time and my last visit was during 22–25 September 2014.

I am responsible for Section 18 and 21,and co-responsible for, Sections 1, 5, 24, 25.

I am not independent of Teck as independence is described by Section 1.5 of NI 43–101.

I have been involved with the Quebrada Blanca property since 2011 in my previous and current roles as Mechanical, Senior Mechanical and Principal Mechanical Engineer – Quebrada Blanca Phase 2.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 25 February 2019

“Signed”

Eldwin Huls, P.Eng.

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CERTIFICATE OF QUALIFIED PERSON

I, Paul Kolisnyk, P.Eng. am employed as the Director, Technical Marketing, with Teck Resources Limited ("Teck") at the Teck Marketing and Logistics office situated at 11 King St. W, Suite 1700, Toronto, Ontario M5H 4C7, Canada.

This certificate applies to the technical report titled "NI 43-101 Technical Report on Quebrada Blanca Phase 2 Project Región de Tarapacá, Chile" that has an effective date of 1 January, 2019 (the "technical report").

I am a Professional Engineer, Metallurgy And Materials Science # 24358509. I graduated from the University of Toronto, with a Bachelor of Applied Science (B.A.Sc.) in Metallurgy and Materials Science in 1981.

I have practiced my profession at Teck for 38 years. I have been directly involved in technical marketing, market research and downstream product technologies for copper, zinc, lead as well as the related co-products in this tenure at Teck. This includes direct engagement with metallurgical facilities that purchase and treat copper and molybdenum concentrates.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I have not visited the Quebrada Blanca property.

I am responsible for Section 19 and co-responsible for Sections 1, 25 and 26.

I am not independent of Teck as independence is described by Section 1.5 of NI 43–101.

I have been involved with the technical marketing and market research for similar products as those to be produced from the Quebrada Blanca property since 2011 in my role as Director, Technical Marketing.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 25 February 2019

"Signed"

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CERTIFICATE OF QUALIFIED PERSON

I, Bryan Rairdan, P.Eng., am employed as the Technical Director, Processing with Teck Resources Limited (“Teck”) at the Teck corporate office situated at 1000 – 205 9 Avenue SE, Calgary, Alberta Canada.

This certificate applies to the technical report titled “NI 43-101 Technical Report on Quebrada Blanca Phase 2 Project Región de Tarapacá, Chile” that has an effective date of 1 January, 2019 (the “technical report”).

I graduated from the University of Alberta with a Bachelor of Science degree in Metallurgical Engineering in 1997. I also graduated from the Simon Fraser University in 2015 with a Masters of Business Administration degree.

I am a Professional Engineer registered with the Engineers and Geoscientists of British Columbia (EGBC), license #37788. I have practiced my profession for 22 years. I have been directly involved in mining and mineral processing operations, from conceptual project design through operations management, in Canada, the United States, Chile and Mexico. I have direct experience and involvement in copper sulphide concentrator design and operational management at the scale of the Quebrada Blanca Phase 2 project.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 Standards of Disclosure for Mineral Projects (NI 43–101).

I have not visited the Quebrada Blanca property**.**

I am responsible for Sections 13 and 17, or co-responsible for, Section 1, 25 and 26.

I am not independent of Teck as independence is described by Section 1.5 of NI 43–101.

I have been involved with the Quebrada Blanca property since 2012 in my previous role as Manager, Mineral Process Engineering (Teck Resources Limited) and in my current role as Technical Director, Processing (Teck Resources Limited).

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 25 February 2019

“Signed”

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CERTIFICATE OF QUALIFIED PERSON

I, Rodrigo Alves Marinho, P.Geo. am employed as the Technical Director, Reserve Evaluation, with Teck Resources Limited ("Teck") at the Teck corporate office situated at Bentall 5, 3300-550 Burrard St, Vancouver, BC V6C 0B3, Canada.

This certificate applies to the technical report titled "NI 43-101 Technical Report on Quebrada Blanca Phase 2 Project Región de Tarapacá, Chile" that has an effective date of 1 January, 2019 (the "technical report").

I am registered as a Professional Geologist with the Association of Professional Engineers and Geoscientists of British Columbia #39505. I graduated from the University of São Paulo State with a Bachelor of Sciences degree in Geology in 1993.

I have practiced my profession for 25 years. I have been directly involved in mining operations, mineral resource and mineral reserve estimation, and analysis at open-pit and underground mines worldwide. I have experience in exploration, drilling program definition, geological mapping, interpretation and modeling, grade estimation and grade control, mine planning, pit optimization and mine design.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I most recently visited the Quebrada Blanca mine from October 14–16 2016.

I am responsible for Sections 2, 3, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16; 20, 22, 23 24 and 27 and co-responsible for Sections 1, 5, 25 and 26 of the technical report.

I am not independent of Teck as independence is described by Section 1.5 of NI 43–101.

I have been involved with the Quebrada Blanca property since 2012 in my role as Technical Director, Reserve Evaluation.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 25 February 2019

"Signed and sealed"

Rodrigo Alves Marinho, P.Geo.

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1.0 SUMMARY

1.1 Introduction

Mr. Rodrigo Alves Marinho, P.Geo., Mr. Bryan Rairdan, P.Eng, Mr. Eldwin Huls, P.Eng and Mr. Paul Kolisnyk, P.Eng. prepared this technical report (the Report) for Teck Resources Limited (Teck) on the Quebrada Blanca mining operation (the Project), located in Chile's Región de Tarapacá.

The initial open pit mine at Quebrada Blanca (the Quebrada Blanca Phase 1 operation or QB1) commenced operation in 1994, exploiting supergene copper mineralization. To date, operations at the mine have used a heap leach and dump leach and solvent extraction/electrowinning (SX/EW) process. The supergene ore is now depleted and mining operations have ceased; however, the SX/EW plant will continue to produce cathodes throughout 2019 and 2020 from existing supergene leaching pads. The Quebrada Blanca Phase 2 project (QB2) is planned to exploit hypogene mineralization below the supergene mineralization mined in QB1. The environmental impact assessment (EIA) for QB2 was prepared in 2016, and approved by the Chilean environmental authorities in August 2018. The Teck board has approved the QB2 project for full construction, with first production targeted for the second half of 2021.

The Report supports Teck's 2018 annual information form (AIF) and updated Mineral Resource and Mineral Reserve estimates.

The Project owner is Compañia Minera Teck Quebrada Blanca S.A. (QBSA). As at 4 December 2018, the company shareholders were Teck, which has an indirect 90% holding, and Empresa Nacional de Minería (ENAMI), the Chilean State-run minerals company, which has a 10% holding. Teck is the Project operator. On 4 December 2018, Teck announced that Sumitomo Metal Mining Co., Ltd. (SMM) and Sumitomo Corporation (SC) would acquire a 30% indirect interest in QBSA; this transaction is expected to close by 31 March 2019.

Currency is expressed in US dollars unless stated otherwise; units presented are typically metric units, such as metric tonnes, unless otherwise noted. The Report uses Canadian English. Mineral Resources and Mineral Reserves are reported using the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves (the 2014 CIM Definition Standards). Mineral Resources, Mineral Reserves, and the economic analysis are presented on a 100% basis. At the effective date of the Mineral Resources and Mineral Reserves, Teck had a 90% Project interest, with ENAMI holding a 10% interest.

1.2 Project Highlights

Teck prepared two mine plans for the Project:

- Base Case that includes only Measured and Indicated (MI) Mineral Resources and supports reporting of Mineral Reserves. This plan schedules a total of 1.4 Bt of mill feed and 0.56 Bt of waste rock over a mine life of about 28 years at a 0.41:1 strip ratio. The Base Case plan is tailored to the current tailings management facility (TMF) constraints;
- Sanction Case that includes Measured, Indicated, and Inferred Mineral Resources (MII). The Sanction Case optimization, mine planning and financial analysis considered realistic mining conditions and the likely continuity of the ore body. The plan, used for Project evaluation purposes, generates a total mill feed of 1.4 Bt and 0.909 Bt of waste rock over a 28-year mine life at a 0.65:1 strip ratio.

The Sanction Case contains economic analysis based on inferred resources. Inferred resources are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. Nonetheless, based on the nature of the mineralization, Teck has used the Sanction Case mine plan, including inferred resources, as the development mine plan for the Project. The economic analysis of the Sanction Case, which includes inferred resources, may be compared to the economic analysis of the Base Case which does not include the use of inferred resources.

At base assumptions, and before giving effect to shareholder loans, the Base Case generates an internal rate of return (IRR) of 13.0% and a net present value (NPV) at an 8% discount rate (NPV_8) of $1,808 M as of January 1, 2019, with payback before financing costs estimated to occur in March 2027, 5.5 years after first production.

At base assumptions, and before giving effect to shareholder loans, the Sanction Case generates an IRR of 13.6% and an NPV_8 of $2,205 M as of January 1, 2019, with payback before financing costs estimated to occur in January 2027, 5.3 years after first production.

Giving effect to shareholder loans, which reduce the taxes payable, the Base Case generates an IRR of 13.5% and an NPV_8 of $2,030 M while the Sanction Case generates an IRR of 14.1% and an NPV_8 of $2,426 M.

Initial capital costs are estimated at $4,739 M as of January 1, 2019. Sustaining capital costs are estimated at $782 M for the Base Case and $784 M for the Sanction Case.

Closure costs were estimated by a third-party consultant at $216 M. The post-closure costs were calculated as $138 M over a period of 350 years following closure.

Operating costs for the Base Case are estimated at $701 M/a. The operating costs for the Sanction Case are estimated at $715 M/a.

Mineral Reserves, supported by the Base Case mine plan, consist of 476.2 Mt grading 0.51% Cu, 0.018% Mo, and 1.4 g/t Ag in the Probable category, and 923.8 Mt grading 0.47% Cu, 0.019% Mo, and 1.2 g/t Ag in the Proven category, for an overall Mineral Reserve estimate of 1,400 Mt grading 0.48% Cu, 0.018% Mo, and 1.3 g/t Ag.

Mineral Resources are reported exclusive of those Mineral Resources that have been converted to Mineral Reserves, and do not have demonstrated economic viability. The Mineral Resource estimate comprises 36.2 Mt grading 0.42% Cu, 0.014% Mo and 1.23 g/t Ag in the Measured category, 1,558 Mt grading 0.4% Cu, 0.016% Mo and 1.141 g/t Ag in the Indicated category for a combined Measured and Indicated estimate of 1,594 Mt grading 0.4% Cu, 0.016% Mo, and 1.14 g/t Ag. There is also 3,125 Mt grading 0.38% Cu, 0.018% Mo and 1.14 g/t Ag in the Inferred category.

1.3 Property Description, Location, and Access

The Quebrada Blanca deposit is located in Chile's Región de Tarapacá, approximately 165 km directly and 240 km by road southeast of the regional capital city of Iquique. Road access to the Project from Iquique is via the Iquique–Alto Hospicio road, then Ruta 16, and Ruta 5 and then the Camino Pintados road. An alternative route from Iquique through Pozo Almonte, then taking Ruta A-65 to the Collahuasi mine and passing through Collahuasi to the Quebrada Blanca mine, is approximately 254 km by road.

Currently, copper cathodes produced from the existing leaching and solvent extraction/electrowinning (SX/EW) operation at Quebrada Blanca are trucked by road to the port of Iquique for ocean shipping. The port site location at Punta Patache, a bulk handling private port, is proposed as the shipping port for the bulk copper concentrate to be produced by QB2.

QBSA currently holds 261 mining concessions of which 158 are exploitation-stage concessions, and 103 are exploration concessions, totalling 99,205 ha. The exploitation mining concessions have no expiry date.

Almost 99% of the surface lands where Project facilities are, or will be, located belongs to the State. Teck has obtained 100% of the surface rights for operations through judicial easements and State lease agreements. A land acquisition study identified several third-party mining rights concession holders within some of the areas that were required to support operations. Agreements have been concluded with those third-parties to support operations. A maritime concession to use the Patache Bay as a port facility has been granted.

QBSA currently holds highlands (Altiplano) water rights from the Salar de Michincha (315.9 L/s) and the Salar de Alconcha (120.3 L/s) for use with respect to the QB1 operation. QB2 will use desalinated water.

Infrastructure is planned to be: mine and concentrator, TMF, pipelines corridor and port and desalination plant. The Quebrada Blanca mine is situated within the Chilean Altiplano at an average elevation of 4,400 masl. The terrain is rugged, with the mountains being intersected by many steep ravines/canyons (quebradas). The planned TMF will be located south of the mine site at an average elevation of approximately 3,900 masl. The coast at the proposed port site is rocky, with a narrow coastal plain to the east before moderate cliffs ascend to a larger plateau.

The QB1 operations were conducted year-round, and it is expected that QB2 will also be year-round.

Earthquakes with an energy release of over seven on the Richter scale have a history of occurrence in the area.

1.4 History

Mineralization was identified at Quebrada Blanca as early as the 1800s. Mining activity, assumed to be in the period from about 1905 to 1930, included prospecting pits, shallow shafts and short adits. The underground mine workings were small, accounted for only small tonnage extractions, and there is no formal production record.

Exploration has been conducted by a number of entities and companies, including the Chile Exploration Company, Chilean Geological Survey, Codelco's Chuquicamata Division, the Superior Oil-Falconbridge Group through its Chilean subsidiary Compañía Exploradora Doña Inés Limitada, ENAMI, Compañía Minera Quebrada Blanca S.A., Aur Resources Inc., and Teck/QBSA. Exploration activities have included surface geological mapping; pit mapping; geochemical sampling; ground magnetic and induced polarization (IP)/resistivity geophysical surveys, airborne magnetic geophysical surveys; reverse circulation (RC), core, and blast hole drilling; metallurgical test work; and mining studies, including scoping, pre-feasibility and feasibility studies.

The supergene operations commenced in 1994 targeting supergene ore by means of open pit mining, leaching and SX/EW. The QB1 mining operations ceased in late 2018; however, the SX/EW plant will continue to produce cathodes throughout 2019 and 2020 from existing supergene leaching pads. From 2006 to 2018, a total of 75 Mt grading 0.819% soluble copper (CuS) was mined and sent to the heap leach pads. An additional 144 Mt, grading 0.283% CuS was sent to the run-of-mine (ROM) dump leach operation. Approximately 777,032 t of copper cathode was produced by the operations during this period.

The QB2 mine plan was developed to mine and process hypogene ore below the supergene mineralization. The initial feasibility study on QB2, completed in 2012 (FS2012), was superseded by the 2016 study (FS2016). A new mine plan was developed in 2018, and forms the basis for this Report.

1.5 Geological Setting, Mineralization, and Deposit Types

The porphyry-style mineralization at Quebrada Blanca is considered to be typical of an Andean porphyry copper–molybdenum deposit. The deposit is hosted in the middle Eocene to early Oligocene metallogenic belt of northern Chile. Quebrada Blanca is part of a set of porphyry systems that includes the Ujina, Rosario and Copaquire (La Profunda) porphyry deposits. The complexes lie along a northwest-trending lineament that has developed in the Collahuasi Formation.

Quebrada Blanca has an intricate magmatic and hydrothermal history that includes a polyphase intrusive complex, multiple cross-cutting breccia facies, and at least two separate hydrothermal stages. Mineralization consists of supergene (chalcocite and, to a lesser degree, copper oxides such as atacamite, cuprite, and locally brochantite) and hypogene (chalcopyrite, bornite, molybdenite, and, to a lesser degree, silver and gold) mineralization.

Mineralization in the hypogene porphyry environment consists of disseminated and veinlet chalcopyrite with molybdenite in an east–northeast-trending area of approximately 2 x 5 km that is hosted within Eocene intrusions, hydrothermal breccias, and porphyritic dikes. Drill holes have intersected mineralization to an approximately 800 m vertical depth in the hypogene zone. The hypogene mineralization remains open to the northeast, east, southeast, and at depth.

Alteration zoning patterns are typical of those documented for porphyry copper deposits. Three main structural trends, to the east–northeast, north–northeast–north–northwest, and northwest, control aspects of the mineralization and intrusive emplacement.

1.6 Exploration

The mining operations use a combination of a local grid that is based on a truncation of the X and Y co-ordinates using the UTM PSAD 56 19S datum, and the SIRGAS WGS84 datum.

A number of geological mapping programs have been completed, at map scales ranging from a regional 1:10,000 scale, to pit mapping at 1:2,000 scale. Information from these programs is used to support the geological interpretations used in resource estimation.

Rock chip sampling was completed as part of the reconnaissance mapping programs. There is no information available as to the number of samples taken.

Airborne geophysical data, from regional surveys flown by third-parties in 1992 and 1999 have been used in support of structural interpretations. Ground geophysical data have been used to delineate areas of shallow geophysical responses that could correspond to porphyry copper mineralization.

A number of regional exploration targets have been identified and tested since 2013. The majority are not considered to retain significant near-surface exploration potential; however, the potential for hypogene mineralization is still being investigated in the following areas: Las Arterias–Elena, West Mag Low, El Colorado Norte and La Cruz.

1.7 Drilling

Drilling completed up to 31 December, 2018 on the Quebrada Blanca Project includes 867 core drill holes (256,738 m) and 1,512 RC drill holes (204,960 m) for a total of 2,379 drill holes (461,698 m). The Mineral Resource estimate in Section 14 is supported by 740 core holes (211,957 m). Drill holes that are not used in the estimate were either completed after the database cut-off date for estimation, were drilled for purposes other than estimation support such as for facilities geotechnical information, or had assay data that was outstanding at the cut-off date. RC drilling is not used to support estimation. Blast hole drilling was conducted in support of supergene mining operations. Blast hole data are also not used in estimation.

A number of core diameters have been employed over the history of the project, including BX (36.6 mm core diameter), NX (54.9 mm), HX (76.2 mm), HQ3 (63.5 mm), NQ3 (47.6 mm) and PQ core (85 mm) sizes.

The core drill holes were geologically logged for lithology, structure, alteration, and mineralization. Geological logging of RC chips records similar information to that described for the core programs. Percentage core recovery, rock quality designation (RQD), fracture frequency, and hardness were recorded for all drill cores to establish a geotechnical database. In general, most drill holes intersect mineralized zones at an angle, and the drill hole intercept widths reported for the Project are typically greater than the true widths of the mineralization at the drill intercept point.

Core recovery at Quebrada Blanca has been acceptable, averaging >95%. Approximately 10% of the data included in the database have recovery percentages that are less than 85%; however, most of these lower recoveries are related to the presence of faults or gravel.

Drill collars have been surveyed using theodolites and global positioning instruments (GPS). From 2000 to date, a gyroscopic instrument has been used, with data collected at 10–20 m intervals down the core hole.

Metallurgical programs were completed from 2002 to 2018, in support of mining studies. Drill sizes included PQ and HQ core. Drill holes were located throughout the deposit, and with locations selected to represent the initial five years of the mine schedule, and to intersect the major geological and mineralogical domains.

1.8 Sampling, Analysis, and Data Verification

Core sampling was generally performed at fixed 2 m intervals, and core was halved where competent using a core saw. In less competent areas, a hydraulic splitter was used. The RC samples were typically taken on 1 m or 2 m intervals. Blast hole samples were cone-and-quarter sampled to form one complete sample over the hole length.

Density samples were taken approximately every 20 m or at a clear lithology change, to ensure there was sufficient representation of all lithology types. The database contains 5,493 density measurements within the deposit area, all obtained from post-2007 exploration drill programs. Average values for the key lithologies were used in the Mineral Resource interpolation.

Sample preparation and analytical laboratories used included the following independent laboratories: CESMEC, Iquique, Chile (accreditations unknown); Union Assay, Salt Lake City, USA (accreditations unknown); Assayers Canada, Vancouver, Canada (accreditations unknown); Acme Laboratories, Santiago, Chile (ISO 9001:2000); Andes Analytical Laboratories, Santiago (ISO 9001:2000 from 2006); Acme, Copiapó, Chile (ISO 9001:2000 from 2010); and Geoanalitica Laboratories (ISO 9001:2008). During the early campaigns, the onsite mine laboratory prepared exploration samples. The mine laboratory prepared and analysed the RC and blast hole samples. It is not accredited, and is not independent of Teck.

Sample preparation methods have included crushing and pulverizing; however, the crush and pulverization sizing has slightly changed over time. Currently, the protocol is crush to 70% passing -10 mesh, pulverize to 85% passing -200 mesh. Analytical methods have been primarily by atomic absorption spectroscopy (AAS) for copper and molybdenum. Multi-element suites have been determined for selected samples; these are reported using inductively-coupled plasma (ICP) methods.

Core drilling prior to 2007 was not subject to an onsite quality assurance and quality control (QA/QC) program; however, the laboratories selected during this period used internal quality control programs that conformed to international norms for the time. QA/QC measures adopted for the drilling after 2008 included submission of blank, standard reference materials (standards) and field duplicates. The QA/QC insertion rates consisted of 5% coarse blanks, 5% standard reference materials, and 5% half-core duplicates; these insertion rates are in line with industry norms. Review of the QA/QC data indicates that although there were batches that indicated QA/QC failures, after re-submission of the outlier samples to the laboratory, the resulting re-assay data were acceptable.

A number of check or re-assay programs have been completed:

- 1977 to 1983 drilling: re-assay of 2,461 sample pulps; re-assay of 23 historic drill holes;
- 2007 drilling: re-assay of 5% of the core.

Based on acceptable results from the check and re-assay programs, Teck decided to use all of the core drilling from these early drill programs in grade estimation.

No major areas of bias or errors are considered to remain in the core sample database for copper. Repeated duplicate sampling of drill core has indicated that there are lower levels of sampling precision for molybdenum when duplicate sampling results are reviewed. This has been attributed to the nugget and veinlet mineralization style of the molybdenite. Overall, the copper, silver and molybdenum data from drill cores are considered acceptable for use in resource estimation.

Geological, survey and assay data are currently stored in an acQuire database, which is under the supervision of a database administrator. Data are checked on database upload. The acQuire database is backed-up on a regular basis in accordance with Teck protocols.

There is no information available on the sample security measures in place for the 1975, 1977–1982, 1990, 2000, and 2005 drill programs. From 2007, samples have been stored in a secure area under 24-hour security. No significant security issues have been identified.

Two external data verification reviews were performed on the database that supported the FS2016. In each review, the quality and completeness of the database at the time was found sufficient to support a Mineral Resource estimate.

Teck prepares an annual resource and reserve report for its operations. Each report provides a review of the data used to support that year's estimates. No issues that would materially affect the Mineral Resource estimates were noted during these annual reviews.

The QP has participated in every annual process review for the Quebrada Blanca Mineral Resources and Mineral Reserves from 2013 to date; no major issues that would materially affect the Mineral Resource or Mineral Reserve estimates were noted in any of these reviews.

Prior to this current report, NI 43-101 technical reports have been filed on the Quebrada Blanca deposit and operations. These reports require that sufficient data verification is performed to support the Mineral Resource estimate at the time. A combination of Teck staff and the QPs for the reports provided information on the verification programs performed. No issues that would materially affect the Mineral Resource estimates were noted in any of the three reports.

The checks performed by Teck staff, including the continuous QA/QC checks conducted by the database administrator and Project geologists, annual QA/QC reviews, and verification conducted as part of compilation of NI 43-101 technical reports, in particular from 2008 to date, are in line with industry standards for data verification and have identified no material issues with the data or the Project database.

This level of review has adequately verified the quality of the core database as sufficient for use in estimating Mineral Resources and Mineral Reserves, and for use in mine planning. Sample preparation, security, and analytical procedures are acceptable to support estimation.

1.9 Mineral Processing and Metallurgical Testing

Much of the metallurgical test work completed for the FS2012 was superseded for the FS2016. Test work that was superseded includes aspects of the comminution circuit design, and flotation, hardness, and pilot plant testing. Additional test work was completed in 2012–2013 and in 2017–2018 to support the current design criteria. The metallurgical test work completed to-date is based on 306 samples that adequately represent the variability of the proposed mine plan.

Independent metallurgical firms and laboratories involved in the current test work include: Aminpro, Garibaldi Highlands, BC, Canada; DJB Consultants Inc., North Vancouver, BC, Canada; G&T Metallurgical Services Ltd., Kamloops, BC, Canada; Inspectorate PRA Group, Richmond, BC, Canada; Phillips Enterprises, Golden, Colorado, USA; SGS Lakefield, Santiago, Chile; JKTech Pty Ltd., Brisbane, Australia; and SimSAGe Pty Ltd., Brisbane, Australia.

Samples supporting the current process flowsheet were defined via the use of sequential copper leach assay data from core samples. Six domains: gravel, oxide, leached, enriched, transitional, and primary were defined. Pyrite and chalcopyrite are the dominant sulphide species, with minor levels of molybdenite and other copper sulphides (chalcocite, covellite, enargite and bornite). The major non-sulphide minerals are quartz, feldspar, plagioclase and sericite/muscovite. The metallurgical test work completed to-date is based on samples which adequately represent the variability of the proposed mine plan.

Comminution test work included Bond ball mill work index (BMWi) and SAG mill comminution (SMC) tests. The majority of Quebrada Blanca samples fall in the medium to hard categories as defined by the SMC tests, and have a medium resistance to abrasion breakage. The BMWi results indicate a medium hardness in terms of ball milling.

The flotation test program included flowsheet development, pilot plant campaigns, copper–molybdenum separation test work, and variability testing. Flowsheet development focused on establishing the flotation circuit and baseline conditions, and on developing design criteria. The pilot plant campaign was undertaken to generate bulk products for additional testing and to demonstrate flowsheet stability. Copper–molybdenum separation test work was undertaken to assess separation performance, develop design criteria, and generate final concentrates. Variability testing was used to assess variation in metallurgical performance across the orebody, and subsequently to develop metallurgical projections for concentrate grades and metal recoveries.

A series of ancillary tests to support process equipment selection were also completed, and included concentrate regrind tests, bulk concentrate and copper concentrate thickening tests, concentrate filtration tests, transportable moisture limit determinations, and tailings thickening tests.

The geometallurgical evaluation of the recovery model domains (UG Rec) considered all available metallurgical and geological information, including lithology, mineral zonation, spatial distribution, structural blocks, quantitative evaluation of materials by scanning electron microscopy (QEMSCAN), metallurgical results and assays from the 2012 and 2017–2018 programs.

For copper rougher recovery, 10 domains (UG Rec Cu) were defined from the mineral zones, total copper head grade (Cu), lithology, copper/sulphur (Cu/S) assay ratio and spatial occurrence (elevation). The maximum global recovery was capped according to mineralization zone with a maximum copper recovery of 85.0% for enriched, 90.9% for transitional and 93.6% for primary ore. For molybdenum rougher recovery, eight domains (UG Rec Mo) were defined from the mineral zones, lithology and spatial occurrence (structural blocks). The maximum global recovery was capped according to mineralization zone with a maximum molybdenum recovery of 62.4% for enriched, 59.3% for transitional and 86.4% for primary ore.

Three copper concentrate grade domains were defined based on copper head grades and the Cu/S ratio. In the case of the silver grade in the concentrate, two domains were defined based on the silver head grades. The copper concentrate grade is capped at 18.0% Cu for low head grades and at 30.0% Cu for elevated head grades and Cu/S ratio. The concentrate grade projections align with the results from the lock cycle tests.

No elements are present at penalty levels in the copper concentrates. Silver credits are expected, and are included in the financial model at an average grade of 47.8 g/t Ag, which is well above the payable value of 30 g/t Ag in the concentrate. Gold is not present at payable levels. The average copper grade in the molybdenum concentrates is 1.4% Cu. Copper grades >1% Cu are expected to impact the molybdenum concentrate payment structure. No additional penalty elements are expected. The rhenium content of the molybdenum concentrate would, at minimum, make the molybdenum concentrate more marketable, and is also considered to be a Project upside opportunity

1.10 Mineral Resource Estimates

The geological features interpreted to support the Mineral Resource estimate are lithology, mineral type and structural domains. Commercially-available Leapfrog Geo software, with geological conceptual sections and control points, was used to construct 3D wireframe models for each geological variable of interest.

Exploratory data analysis (EDA) was performed on different combinations of oxidation state, lithology, and structural domains with histograms, log probability plots, and box and whisker plots. Contact analysis plots were also prepared to analyze grade trends and contact relationships between the units. The assigned block model specific gravity (SG) values were based on average SG measurements for mineralization and lithology domains.

A 4 m composite interval was used. No direct grade capping was done; the extended influence of the high-grade outlier composites was restricted in the kriging plans where necessary using an “influence area” methodology. Outlier controls applied were as follows: acid soluble copper ranged from 0.24–0.58%, cyanide-soluble copper ranged from 0.13 to 4.8%, total copper ranged from 0.37 to 4.7%, molybdenum ranged from 0.022 to 0.54%, silver ranged from 1.8 to 19 ppm, and sulphur ranged from 1.768 to 8.276%.

Commercially-available Supervisor V. 8.8 software was used for calculating and modeling the experimental semi-variograms for total copper, sequential copper, molybdenum, silver, and sulphur composites. For a few domains, it was not possible to find an adequate continuity model due to the limited number of available composites. In these domains, it was necessary to use inverse distance weighting (IDW). Once the variographic analysis was finished, a kriging neighborhood analysis (KNA) was carried out with the aim of defining the correct number of samples to use within the search volume or “kriging neighborhood”.

Modelling considered sub-block proportions for the structural model, oxidation zones and lithology. Sub-blocking to a minimum 5 m x 5 m x 5 m was used in commercially-available Vulcan software to better honour the variability of the geological models. The estimation model was re-blocked to the parent 20 m x 20 m x 15 m block size, saving the proportion of each domain. Grades were estimated using the proportion of each in the domain. The parent block size is considered to be appropriately aligned with mine selectivity and equipment size requirements.

Total and soluble copper, molybdenum, silver and sulphur were estimated into the model using ordinary kriging (OK). The kriging parameters applied to the estimates were customised for each parameter and within each domain. Where estimates could not be made within the kriging pass criteria described above, values were interpolated using inverse distance weighted (IDW) in two passes. Interpolation parameters varied by element by interpolation pass. Estimates were validated using a combination of visual validation, statistical evaluations, and swath plots.

The resource classification methodology consists of an interpolation plan set up specifically to assess the level of information of each individual block in relation to the location and density of drill holes available in the block neighbourhood.

The evaluation of reasonable prospects of eventual economic extraction assumes a conventional open pit mining method, and an assumed mining rate of 100 Mt/year for the first five years of operation. From year 6, it was assumed that the total movement would be increased to 120 Mt/year. Teck used commercially-available Geovia Whittle software to define a resource pit shell. The ultimate pit was created based on the same parameters (costs, prices, metallurgical recoveries and pit slope angles) that were used for defining Mineral Reserves; however, the pit outline selected for Mineral Resources represents the revenue factor (RF) 1 pit. The metallurgical recovery equations used were a function of head grade, copper-to-sulphur ratio, and mineralization type.

The mine plan uses a variable cut-off grade strategy to maximize the value of the material delivered to the concentrator and averages $19.86/t NSR. Material below the operation cut-off and above $24/t will be sent to the high-grade stockpile. Material below the operational cut-off and between $24/t and $13/t will be sent to the low-grade stockpile and will be processed towards the end of the mine plan. In any given year if the operational cut-off drops below the grade of material available in the stockpiles, the corresponding material can be fed from the stockpiles to the plant. The material below the operational cut-off of $13/t will be deposited in the waste rock storage facilities (WRSFs) and not re-handled.

1.11 Existing Hypogene Stockpile

Hypogene mineralization was exposed while mining the supergene ore, and was stockpiled when encountered. Tonnages and copper grades were tracked and recorded as part of grade control practices. These existing stockpiles are classified and reported as Indicated Mineral Resources and are not scheduled in the current life-of-mine (LOM) plan (LOMP).

The molybdenum grade of the stockpile is unconfirmed as it was not tested at the time of extraction.

1.12 Mineral Resource Statement

The Mineral Resource estimate is reported exclusive of those Mineral Resources that have been converted to Mineral Reserves, and uses the 2014 CIM Definition Standards. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo., Technical Director Reserve Evaluation, a Teck employee. Mineral Resources have an effective date of 30 November, 2018. Table 1-1. summarizes the Measured, Indicated and Inferred Mineral Resources for the Project..

Table 1-1: Mineral Resource Summary Table

Category	Tonnage (x 1,000 t)	Grade			Contained Metal		
		Cu	Mo	Ag	Cu	Mo	Ag
		(%)	(%)	(g/t)	(x 1,000 t)	(x 1,000 t)	(Moz)
Measured	36,200	0.42	0.014	1.23	152	5	1.433
Indicated	1,558,000	0.40	0.016	1.14	6,218	247	56.965
Measured & Indicated	**1,594,200**	**0.40**	**0.016**	**1.14**	**6,370**	**252**	**58.398**
Inferred	3,125,200	0.38	0.018	1.14	11,880	555	114.791

Notes to Accompany Mineral Resource Tables:

1. Mineral Resources are reported effective 30 November, 2018. The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo, a Teck employee.
2. Mineral Resources are reported exclusive of those Mineral Resources converted to Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
3. Mineral Resources are reported on a 100% basis using a net smelter return cut-off of US$11/t, which assumes metal prices of US$3.00/lb Cu and US$9.40/lb Mo. As at 30 November 2018, Teck had a 90% interest, with ENAMI holding a 10% interest.
4. Mineral Resources are contained within a conceptual pit shell that is generated using the same economic and technical parameters as used for Mineral Reserves but at a selected revenue factor of 1. Direct mining costs are estimated at $3.37/t of material moved. Processing costs are US$11.02/t of material milled and include concentrator, tailings management facility, port, and desalination costs. Infrastructure of US$0.60/t include desalination plant (US$0.37/t) and port operating costs (US$0.23/t). G&A costs are US$1.36/t. Metallurgical recoveries average around 91% for Cu and 76% for Mo, but are variable by block. Pit slope inter-ramp angles vary from 30–44º. Mineral Resources also include mineralization that is within the Mineral Reserves pit between NSR values of US$10.36/t and US$15.07/t which has been classified as Measured and Indicated, as well as all material classified as Inferred that is within the Mineral Reserves pit. In addition, Mineral Resources include 23.8 Mt of hypogene material grading 0.54% copper that has been mined and stockpiled during supergene operations.
5. Tonnage and contained copper and molybdenum tonnes are reported in metric units and grades are reported as percentages.
6. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal content.

Factors which may affect the Mineral Resource estimates include: metal price and exchange rate assumptions; changes to the assumptions used to generate the NSR cut-off; changes in local interpretations of mineralization geometry and continuity of mineralized zones; density and domain assignments; changes to geotechnical, mining and metallurgical recovery assumptions; changes to input and design parameter assumptions that pertain to the conceptual Whittle pit design constraining the estimate; and assumptions as to the continued ability to access the site, retain mineral and surface rights titles, maintain environmental and other regulatory permits, and maintain the social licence to operate.

1.13 Mineral Reserve Estimate

The mine plan was developed using Measured and Indicated Mineral Resources. Inferred Mineral Resources were set to waste for the pit optimization process and mine scheduling. Mining assumes conventional open pit operations using truck-and-shovel technology. No internal or external mining dilution was added to the block model during the mine design process. The QP concluded that smoothing within the block model provided sufficient dilution and accounted for potential mine losses.

The design reserve pit was based on a Lerchs–Grossmann (LG) optimization process using Whittle software and a detailed phased pit design. Nine mine phases were designed to prioritize the higher-grade zones within the mineral extraction plan, while maintaining suitable working widths that would enable high-productivity mining sequences using large-scale mining equipment.

The mine plan was optimized by analyzing numerous scenarios that employed high and low-grade stockpiling strategies, as well as a variable cut-off grade profile. The size of the open pit and the production rate are controlled by the storage capacity of the TMF, which is in turn affected by site-specific constraints. Pit shell 46 was found to be the appropriate shell that provided Mineral Resources that most closely matched the available TMF capacity. The TMF has a finite tailings capacity due to site constraints (about 1.40 Bt). This capacity dictated the low-grade stockpile cut-off because the direct feed mineral rock plus the low-grade and high-grade stockpile material had to align with the constrained LOM concentrator production. By a trial and error process, the low-grade stockpile NSR cut-off value was established at $13/t. Any remaining mineralized rock that is not required to meet mill capacity will be sent to the WRSF.

1.14 Mineral Reserve Statement

Proven and Probable Mineral Reserves are reported effective 30 November, 2018 using the 2014 CIM Definition Standards. The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo., Technical Director Reserve Evaluation, a Teck employee.

Mineral Reserves are summarized in Table 1-2. The estimated Mineral Reserves are reported using metal prices of $3.00/lb Cu and $9.40/lb Mo, and a variable grade cut-off approach based on NSR values that average $13.39/t over the planned LOM.

Table 1-2: Mineral Reserve Statement

Category	Tonnage (x 1,000 t)	Grade			Contained Metal		
		Cu	Mo	Ag	Cu	Mo	Ag
		(%)	(%)	(g/t)	(x 1,000 t)	(x 1,000 t)	(Moz)
Proven	476,300	0.51	0.018	1.4	2,411	84	21.466
Probable	923,800	0.47	0.019	1.2	4,350	173	37.174
Proven & Probable	**1,400,000**	**0.48**	**0.018**	**1.3**	**6,761**	**258**	**58.64**

Notes to Accompany Mineral Reserves Table:

1. Mineral Reserves are reported effective 30 November, 2018. The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo, a Teck employee.
2. Mineral Reserves are reported on a 100% basis using an average net smelter return cut-off of US$13.39/t, which assumes metal prices of US$3.00/lb Cu and US$9.40/lb Mo. As at 30 November, 2018, Teck had a 90% interest, with ENAMI holding a 10% interest.
3. Mineral Reserves are contained within operational phases defined with an optimized pit shell sequence. Mining will use conventional open pit methods and equipment, and use a stockpiling strategy. Direct mining costs are estimated at US$3.37/t of material milled. Processing costs are US$11.02/t of material milled and include concentrator, tailings management facility, port, and desalination costs. Infrastructure costs of $0.60/t includes desalination plant (US$0.37/t) and port operating costs (US$0.23/t). General and administrative (G&A) costs are US$1.36/t. Metallurgical recoveries average around 91.04% for copper and 74.20% for molybdenum, but are variable by block. Pit slope inter-ramp angles vary from 30–44º, where the lowest slope angles are predicted in the gravel unit. The life-of-mine strip ratio is 0.41.
4. Tonnage and contained copper and molybdenum tonnes are reported in metric units and grades are reported as percentages.
5. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal content.

Factors which may affect the Mineral Reserve estimates include: commodity price assumptions; changes to the input parameters to the NSR cut-off grade; changes to the input parameters to the constraining pit shell, and the mine plan that is based on that pit shell; changes to metallurgical recovery assumptions; changes to the assumed permitting and regulatory environment under which the mine plan was developed; ability to maintain mining permits and/or surface rights; and ability to maintain social and environmental license to operate.

1.15 Mining Methods

Mining operations will continue to use open pit methods, and conventional truck-and-shovel operations. From an operational standpoint, QB2 represents a continuation of the existing supergene mine activities; however, there are significant differences between the two operations, such as the significant increase in the ultimate pit depth and width, the change in rock type from enriched supergene to hypogene, and increases in the mining extraction rate.

The conventional open pit supergene mining operation was completed in October 2018. The existing QB1 mining fleet will be used in pre-production and early works activities related to QB2, including the mass excavation required for the concentrator site, and mass earthworks associated with construction of the starter dam for the TMF.

As noted in Section 1.2, two mine plans, a Base Case and a Sanction Case, have been developed for QB2.

The ultimate pit for the Base Case was designed to follow the pit shell that hosted a sufficient quantity of Measured and Indicated Mineral Resources that could meet plant feed requirements for a mine life of 28 years, and that aligned with the capacity of the TMF. Nine phases were designed and used in the mine plan, including the subdivision of the phases 4 and 6 into two stages, designated A and B. This plan schedules a total of 1.4 Bt of mill feed and 0.56 Bt of waste rock at a 0.41:1 strip ratio.

The Sanction Case differs from the Base Case in that it includes one additional pit phase, Phase 8. The plan, used for Project evaluation purposes, generates a total mill feed of 1.4 Bt and 0.909 Bt of waste rock over a 28-year mine life at a 0.65:1 strip ratio.

A systematic process was followed to determine the optimum mining rate, cut-off grade, and stockpile capacities, while using a range of mining constraints to ensure the mine plan is viable and achievable given the Project constraints. For the purposes of generating a LOM schedule, blocks flagged as Inferred Mineral Resources were considered in the same manner as the Measured and Indicated blocks, and therefore are scheduled as mill feed material in the mine plan using the COMET algorithm.

The mine plan uses a variable cut-off grade strategy to maximize the value of the ore delivered to the concentrator. The actual NSR cut-off value ranges between $13.00/t and $27.55/t NSR (mineral value minus realization costs). The NSR value considers the copper and molybdenum revenues, projected metal recoveries, as well as transportation, refining, and other logistical costs.

The WRSFs and stockpiles were designed according to the requirements obtained in the mining plan. The facilities included are:

- High-grade stockpile;
- Low-grade stockpile;
- North WRSF;
- South WRSF.

Equipment requirements are identical for the Base Case and the Sanction Case. At its peak, the loading fleet would be four electric rope shovels, one hydraulic shovel, and two front-end loaders. At the peak, the haulage fleet would require 34 haul trucks, and support equipment would require four tracked dozers, four wheeled dozers, seven graders, five water trucks, one tracked excavator, three cable reelers and two mobile generators.

1.16 Recovery Methods

The process design is conventional and uses conventional equipment.

The primary crushing facility would contain a single primary crusher with a double-sided dump pocket for the mine haulage trucks. The coarse ore conveyor facility would consist of two overland conveyors to transport the crushed ore from the primary crusher to the coarse ore stockpile. The coarse ore stockpile will have a live capacity of 80,000 t, and an overall 270,000 t capacity.

The concentrator facility would contain two semi-autogenous grinding (SAG) mills and four ball mills, cyclone feed pumps, and cyclone clusters. The pebble crushing area would include pebble transfer conveyors, storage bins, feeders, and crushers. The flotation system would include bulk rougher flotation cells, bulk rougher regrind cyclone clusters, high-intensity grinding (HIG) regrind mills, and cleaner/scavengers. The concentrator thickener area will include bulk concentrate and copper concentrate thickeners.

The molybdenum plant would consist of the molybdenum rougher, first cleaner, second cleaner, and third cleaner flotation and regrind equipment, as well as the molybdenum concentrate thickener, filter, dryer and packaging equipment.

The reagent facility would consist of equipment and systems for mixing, storing, and distributing the various reagents to their points of use.

Two tailings thickeners and their associated equipment would comprise the tailings thickening area.

Power for the process plant will be sourced from the Chilean grid. Process make-up water will be from desalinated water with reclaim water from the TMF.

1.17 Markets and Contracts

Teck reviewed the estimated quality of, and potential markets for copper and molybdenum concentrates that would be produced by the Project. Input from market and industry analysts, Wood Mackenzie and the CPM Group (CPM) were used to support the assumptions for copper and molybdenum respectively.

The Project's copper concentrate is clean and contains low levels of deleterious elements, but lacks any distinguishing characteristics, so it is anticipated that it is unlikely to obtain a premium over the market Benchmark commercial terms. Key features of the bulk copper concentrate include:

- An average 26% copper grade, which would be accepted by most copper smelters in the custom market;
- Low levels of deleterious elements such as arsenic, zinc, mercury and lead, providing a competitive edge in the concentrate market.

The concentrate contains silver at payable levels.

Teck's marketing strategy for copper concentrate would focus on the major custom smelting companies in the world that are logistically practical for the delivery of concentrates. Teck would look to contract with companies that have a strong business base and that would be strategic long-term customers for the entire Teck suite of mines. Some production may also be sold on the spot market.

The molybdenum concentrate would be the product of differential copper–molybdenum flotation and would not be expected to require leaching for copper removal in order for it to be marketable. Teck would market the molybdenum concentrates on the global market in an unleached form. While rhenium is present in the concentrates, it is considered as an enhancement to the marketability of the molybdenum concentrate.

No contracts are currently in place for the concentrate to be produced by the planned mine expansion. It is expected that any sales contracts signed would be within market norms. Selected off-take agreements are under negotiation with potential buyers of QB2 products. Such agreements may offer the potential for project financing, under terms that reflect the long-term potential of the project.

Copper and molybdenum prices of $3.00/lb and $10.00/lb respectively have been used as the long-term metal prices for marketing assumptions. These prices are supported by research from independent forecasters and analysts Wood Mackenzie and CPM.

Teck has multiple major contracts in place or under negotiation that support operations. These include contracts relating to fuel, transport, contractor mining, mine and plant maintenance, consumables and bulk commodity supply, operational and technical services, and administrative services. Contracts are negotiated and renewed as needed. Contract terms are considered to be in line with typical such contracts in Chile.

1.18 Infrastructure

The major facilities supporting QB2 would be located at three principal sites:

- Mine and concentrator at an elevation of approximately 4,400 masl;
- TMF at an elevation of approximately 3,900 masl and located approximately 7 km south of the concentrator site;
- Port and desalination plant at the coast.

A new (additional) access road bypassing Collahuasi, known as the A-97 bypass, would be constructed from the A65 highway to the mine, and internal roads constructed to act as haul roads, to connect the tailings site with the mine site, and to provide access to the pipelines for maintenance activities. In addition, there would be construction of a new overhead high voltage (HV) electric power transmission line, a concentrate pipeline system to the port, a tailings transport system to the TMF, a reclaim water pipeline system from the TMF, and a desalinated makeup water pipeline system to supply water from the port to the mine for use in the process plant.

Support buildings will include an accommodation camp, administration building, shop and warehouse, laboratory, change house and dining facility, and main gatehouse.

A number of power purchase agreements were signed with AES Gener in 2012 and thereafter, under which QBSA would receive power in aggregate from a number of sources, including conventional and solar power plants. The total Project power consumption is estimated at approximately 2,000 GWh per year.

1.19 Environmental Considerations

A number of baseline and monitoring studies were performed in support of the Project "Estudio de Impacto Ambiental Proyecto Minero Quebrada Blanca Fase 2" report (the 2016 EIA), and included the following key areas: climate and meteorology; air quality; noise; geology, geomorphology, and geological risks; soil; vibrations; hydrology; hydrogeology; water quality; marine water resources; terrestrial ecosystems; continental aquatic ecosystems; marine ecosystems; cultural heritage; landscape; protected areas and priority conservation sites; natural and cultural attractions; land use and relationship with planning; and the human environment.

The 2016 EIA was submitted to the Chilean environmental authorities on 26 September, 2016 and was approved in August 2018.

Teck will develop monitoring, contingency and emergency plans in support of mining operations. Teck has also proposed measures to address unplanned situations deemed as environmental risks to the environment and communities within the areas of influence of the mine expansion project.

QBSA has undertaken voluntary environmental commitments to contribute to the improvement of relations between the mine and neighbouring communities, and to the well-being of the environment. These cover aspects of wildlife, cultural heritage, land use, and the human environment.

Closure is subject to separate sectorial regulatory requirements and approval must be sought from the Chilean Government National Geology and Mining Service agency, Sernageomin.

1.20 Permitting Considerations

After a major project has been granted its environmental approval in Chile, additional sector-specific applications to various governmental agencies and ministries are needed in order to construct or operate the facilities.

There are 198 different types of permits identified as being required for the QB2 project. Some of these permits are subject to environmental requirements and they are therefore included in the 2016 EIA.

The number of permits is based on the project description included in the 2016 EIA and will be grouped wherever possible, to optimize the number of separate applications. A sectorial permitting strategy will be developed, dependent on project needs and considering preparation and processing times in relation to the planned project development schedule. Currently Teck has applied for more than 600 permits and has obtained approval for more than 300 of these. Many permits are related to construction activities and include flora, fauna and archeology clearances. Other permits are related to major infrastructure, such as approval of the mining method and TMF construction permit. The permitting strategy is currently aligned with the Project execution schedule.

1.21 Social Considerations

QBSA subscribes to Teck’s corporate policies and guidelines for corporate sustainability, which define the corporate expectations for sustainable conduct and sustainable development for all projects with which Teck or its subsidiaries become involved.

1.22 Capital and Operating Costs

1.22.1 Capital Costs

The estimates have been prepared to a target accuracy of ±15% as per AACE International Level 3 study recommendations, and are based on second quarter 2017 pricing. The estimate is based on a 625 CLP:US$ exchange rate and does not include escalation.

Contingency allowances were applied, as appropriate, and were based on evaluations of all major cost categories. The overall contingency allowance is approximately 12%.

The initial capital costs include EPCM, and pre-operational testing, and as spent in accordance with the project execution plan through to operations. Early works construction activities commenced on September 15, 2018, and based on the current execution schedule the project has an expected operational start date of Q4 2021 with an approximate six-month ramp-up curve to full production rates. The estimate is in constant Q2 2017 dollars, not including working capital, escalation or interest during construction.

Mine capital estimates were developed for the LOMP. These estimates include mine equipment (consisting of freight, safety systems, assembly, and additional options required to meet Teck operating standards) as well as mine area development costs (such as pioneering and pre-stripping requirements).

The concentrator estimate includes the estimated capital costs for the procurement, construction, pre-operational testing, and start-up of all facilities within the third-party engineering firm scope allocation, which includes crushing, grinding, and flotation processes, and their ancillary operations and buildings.

The infrastructure estimate includes costs for offsite access roads, electrical substations, and buildings and camp construction.

The scope of the TMF estimate includes a starter dam foundation preparation, grout curtains, dam embankments, tailings sand cycloning, sands distribution, tailings distribution, and seepage and reclaim water systems. Subsequent dam raises during operations will be on a continual basis and are included in operating costs.

Pipeline and tailings transport include the concentrate transport system, makeup water transport system, reclaim water system, and the tailings transport system.

Port facilities include all concentrate dewatering and storage, marine structures, floating mooring system, the ship loader feed conveyor, ship loader, desalination plant and the seawater intake system that would feed the desalination plant.

Owner's costs include the costs for items such as, but not limited to, Owner's project development team staffing and costs, Owner's operational readiness team staffing and costs, drilling, assays and other test work, permitting and community programs, land acquisition, initial fills and commissioning support, other construction and external support services, and insurances.

The overall capital cost estimate for the QB2 Project is $4,739 M as of January 1, 2019 and is summarized in Table 1-3.

A replacement schedule was derived for all major mine equipment. Other major sustaining capital items include TMF area changes as the facility expands, an expansion of the new mine maintenance facilities as the mine fleet grows in size, and allowances for other sustaining capital requirements for the concentrator and general site and ancillary facilities.

Table 1-3: Initial Capital Cost Estimate Summary

Item	Cost Estimate ($ M)
Mine directs	290
Concentrator directs	1,077
TMF directs	358
Pipelines and pump stations directs	449
Port onshore and offshore structures directs	432
Infrastructure directs	227
Field indirects	779
EPCM services	290
Contingency and schedule growth allowance	510
Owner's cost	315
Late adjustment for cash expenditure timing	10
Estimated Total Capital Cost, Second Quarter 2017	***4,739***

Note: totals may not sum due to rounding.

Sustaining capital costs are:

- Mine fleet: $420 M (Base Case), $422 M (Sanction Case);
- TMF area changes: $56 M (both cases);
- Mine maintenance facilities expansion: $50 M (both cases);
- Concentrator and general: $256 M (both cases).

An allowance of approximately $5–10 M per year through the life of the operation has been included to cover other sustaining capital requirements.

Closure costs were estimated by a third-party consultant at $216 M based on a detailed analysis of the closure plan and commitments. A post-closure cost estimate was developed using current regulatory requirements. The post-closure costs were calculated as $138 M over a period of 350 years following closure. This number includes value-added tax (VAT) as per the current regulations.

1.22.2 Operating Costs

The operating cost estimate includes all operational activities required for the mining and processing of hypogene ore through the concentrator facilities and production of copper and molybdenum concentrates, including all services required to support these operations. The battery limits of the estimate are in-situ ore through to dewatered concentrate, loaded either onto a ship (in the case of copper concentrate) or bagged and waiting at the port (in the case of molybdenum concentrate).

The life of the operation is 28 calendar years with the first and last years representing partial years, at an initial processing plant throughput rate of 140,000 t/d and reaching a rate of 143,000 t/d by the end of 2024. Steady-state costs are based on a maximum annual ore treatment rate of 52,195,000 t/a, at an average of 143,000 t/d, with costs in years of ramp-up and ramp-down determined using key cost drivers and fixed and variable components of these costs.

The general scope of each operating cost operating area includes:

- Mine: Costs associated with the open pit mining of ore and waste, including pit dewatering, haul road maintenance, and maintenance of the mining equipment and facilities;
- Concentrator: Costs associated with the primary crushing of ROM ore, coarse ore transport of the crushed ore to the coarse ore stockpile, coarse ore stockpile/reclaim of the coarse ore to be fed to grinding, and concentrator operations including grinding, pebble crushing, bulk flotation, regrind, concentrate thickening, molybdenum plant, reagents, and tailings thickening;
- TMF: Costs associated with the tailings classification system, tailings distribution system to the dam, tailings placement, tailings sand dam construction, and reclaim water system;
- Port facilities and desalination plant: Costs associated with concentrate filtration and ship loading, and general port site offices and facilities, as well as costs associated with seawater intake, brine outfall, and seawater treatment;
- Pipelines: Costs associated with the pipeline systems, which include the concentrate transport system, make up water system and tailings transport system. Costs of the reclaim water system are covered under the TMF area;
- Infrastructure: Costs associated with access road maintenance and some oversight of high-voltage power lines;
- General and administration: Costs associated with indirect support of the operation, including site services and administration facilities, G&A personnel and functions,

and off-site offices, and specific corporate service fees for direct support provided to the operation.

Table 1-4 and Table 1-5 provide a summary of the estimated annual costs for a nominal year of operation for the Base Case and Sanction Case respectively.

Table 1-4: Base Case Estimated Annual Operating Cost Summary ($ M/a)

Cost Category	Mine	Concentrator	TMF	Pipelines	Port	Desalination Plant	Infrastructure	Site G&A	Global
Labour	17	21	6	4	6	3	1	14	73
Diesel / Gasoline	34	0	0	0	0	0	0	0	34
Electricity	5	133	20	57	3	9	0	2	229
Operating Supplies	42	81	0	0	0	3	0	1	128
Maintenance Supplies	34	43	4	3	3	4	0	1	92
Contracts	33	14	26	2	1	0	3	22	101
Other	0	2	3	0	0	0	0	38	44
Total	***165***	***295***	***59***	***66***	***13***	***19***	***3***	***79***	***701***

Note: Totals may not sum due to rounding. The operating costs shown reflect total operating costs which consist of site operating costs excluding concentrate transportation and ocean freight costs

Table 1-5: Sanction Case Estimated Annual Operating Cost Summary ($ M/a)

Cost Category	Mine	Concentrator	TMF	Pipelines	Port	Desalination Plant	Infrastructure	Site G&A	Global
Labour	17	22	6	4	6	3	1	14	74
Diesel / Gasoline	38	0	0	0	0	0	0	0	38
Electricity	6	133	20	56	3	9	0	2	228
Operating Supplies	46	81	0	0	0	3	0	1	131
Maintenance Supplies	37	43	4	3	3	4	0	1	95
Contracts	35	14	26	2	1	0	3	22	103
Other	0	2	3	0	0	0	0	38	44
Total	***179***	***297***	***59***	***65***	***13***	***19***	***3***	***79***	***715***

Note: Totals may not sum due to rounding. The operating costs shown reflect total operating costs which consist of site operating costs excluding concentrate transportation and ocean freight costs

1.23 Economic Analysis

The results of the economic analysis conducted to support Mineral Reserves, and the Mineral Resource and Mineral Reserve estimates represent forward-looking information that is subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here.

Forward-looking statements in this Report include, but are not limited to, statements with respect to future metal prices, exchange rates, and concentrate sales contracts; taxation; smelter and refinery terms; assumed mining and metallurgical recovery factors; the estimation of Mineral Reserves and Mineral Resources; the realization of Mineral Reserve estimates; the timing and amount of estimated future production, costs of production relevant to a high-altitude mining operation in Chile; capital expenditures; operating costs; timing of the development of new open pit pushbacks; technological changes to the mining, processing and waste disposal activities outlined; permitting time lines for tailings storage facility raises; requirements for additional capital; government regulation of mining operations; environmental risks; ability to retain social licence for operations; unanticipated reclamation expenses; title disputes or claims; and limitations on insurance coverage.

Additional risk can come from actual results of active reclamation activities; conclusions of economic evaluations; changes in Project parameters as mine, process and closure plans continue to be refined, possible variations in Mineral Resources or Mineral Reserves, grade, dilution, or recovery rates; geotechnical and hydrogeological considerations during mining; failure of plant, equipment or processes to operate as anticipated; shipping delays and regulations; accidents, labour disputes and other risks of the mining industry; and delays in obtaining renewals to governmental approvals.

The foregoing list of risks and assumptions is not exhaustive. Other events or circumstances could cause our actual results to differ materially from those estimated or projected and expressed in, or implied by, our forward-looking statements. Except as required by law, we undertake no obligation to update publicly or otherwise revise any forward-looking statements or the foregoing list of factors, whether as a result of new information or future events or otherwise.

The financial evaluation is based on a discounted cashflow (DCF) model. The DCF approach involves projecting yearly estimated revenues and subtracting yearly estimated cash outflows such as operating costs including mining costs, milling costs, G&A costs and associated maintenance costs, initial and sustaining capital costs, taxes and royalties to obtain the estimated net annual free cash flows.

These net cash flows are discounted back to the valuation date using a real, after-tax discount rate of 8%, and then summed to determine the NPV_8 of the project. The 8% discount rate reflects Teck's estimated weighted average cost of capital. There are no additional project or country specific risk factors or adjustments considered. For the purposes of discounting, the model assumes that all revenues, operating and capital costs, taxes, and resulting free cash flows occur in the middle of each year.

The DCF model was constructed on a constant US dollar basis and none of the inputs or variables were escalated or inflated. The pricing basis for the capital cost estimates is Q2, 2017, and the pricing basis for the operating cost estimate is Q2, 2018. For discounting purposes, 1 January 2019 is considered to be the first period (valuation date). All cash expenditures related to the project before this date have been excluded. The benefit of accumulated tax pools as well as the use of certain physical equipment acquired as a result of these prior expenditures has been incorporated in the evaluation. The primary outputs of the analysis are NPV_8, IRR, payback period, annual earnings before interest, tax, depreciation and amortization (EBITDA) and annual free cash flow, all on a 100% project basis. Teck holds a 90% interest and ENAMI holds a 10% interest.

The DCF analysis is based on a 28-year operating life (2021–2048 with partial years in the first and last year of operation) and production rates mentioned in the costs section of this Report.

An estimated treatment charge cost of $83/dmt of copper concentrate and a refining cost of $0.083/lb of copper have been assumed. Metal price assumptions are $3.00/lb Cu, $10/lb Mo, and $18/oz Ag.

The Project economics were modelled on an after-tax basis assuming project ownership by a Chilean-domiciled entity. The economics do not include any potential withholding tax for the repatriation of dividends outside of the country. The Project economics are presented on an unlevered basis, both before and after giving effect to an optimized funding structure through the use of shareholder loans which create a tax shield and therefore improve the unlevered project returns. In addition, there are third-party debt and off-shore funding and structuring options available to the Project and Project sponsors which are not considered here. Inclusion of these options further improve Project returns over the scenarios presented in this Report. The analysis assumes access to $974 M of pre-existing income tax pools and $980 M of pre-existing mining tax pools related to Project expenditures prior to 2019 which have not yet been depreciated.

For the purposes of the financial analysis, capital expenditures are allocated into four depreciation asset classes and are depreciated over six, 10, 20 and 50 years depending on the class using the straight-line method for mining tax purposes and are accelerated to three, three, six, and 16 years using the straight-line method for corporate income tax purposes. All capital assets relating to expenditures prior to mill start-up are assumed to be placed into service upon mill start-up in Q4 2021. Thereafter, all capital assets are assumed to be placed into service in the year the capital expenditure is incurred.

At base assumptions, and before giving effect to shareholder loans, the Base Case generates an IRR of 13.0% and an NPV at an 8% discount rate (NPV_8) of $1,808 M as of January 1, 2019, with payback before financing costs estimated to occur in March 2027, 5.5 years after first production.

At base assumptions, and before giving effect to shareholder loans, the Sanction Case generates an IRR of 13.6% and an NPV at an 8% discount rate (NPV_8) of $2,205 M as of January 1, 2019, with payback before financing costs estimated to occur in January 2027, 5.3 years after first production.

Table 1-6 summarizes the key financial metrics for the Base Case, while Table 1-7 summarizes the key financial metrics for the Sanction Case.

Giving effect to shareholder loans, which reduce the taxes payable, the Base Case generates an IRR of 13.5% and an NPV_8 of $2,030 M while the Sanction Case generates an IRR of 14.1% and an NPV_8 of $2,426 M.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

1.24 Sensitivity Analysis

Figure 1-1 and Figure 1-2 show NPV_8 sensitivity to changes in key model inputs, based on ±10% changes in the base case assumption for the Base Case and Sanction Case respectively.

Of the factors assessed in Figure 1-3 and Figure 1-4, the NPV_8 is most sensitive to changes in copper price, and moderately sensitive to changes in operating costs, exchange rate, and initial capital.

For the Base Case, a 1% change in copper recovery from the base assumption results in a change to QB2's NPV_8 of approximately $90 M. For every $0.25/lb change in copper price, over the range of sensitivities, QB2's NPV_8 changes by approximately $870 M; while every $0.25/lb change in molybdenum price changes the NPV_8 by approximately $21 M. A 10% change in initial capital and operating costs, on average across the range of sensitivities, results in changes to QB2's NPV_8 of approximately $350 M and $500 M, respectively.

1.25 Other Relevant Data

Teck has commenced a preliminary evaluation of a further expansion scenario, termed "QB3", which would potentially double the QB2 throughput capacity. The material that could be used in an expansion scenario is that outside the QB2 Mineral Reserve pit limits.

Table 1-6: Base Case -Summary of Key Metrics Estimated Economics

Category	Unit	Total [(1)]			Annual Average [(2)]		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Mining							
Total material moved	Mt	517	1,116	2,402	103.5	111.6	89.8
Processing							
Total ore processed	Mt	259	520	1,400	51.8	52.0	52.1
Head grade – copper	%	0.61	0.58	0.48	0.61	0.58	0.48
Head grade – molybdenum	%	0.018	0.020	0.018	0.018	0.020	0.018
Production							
Copper production	t x 1,000	1,431	2,722	6,092	286	272	228
Molybdenum production	t x 1,000	32	78	190	6.5	7.8	7.1
Silver production	Moz	10	17	40	1.9	1.7	1.5
Copper equivalent production [(3)]	t x 1,000	1,565	3,030	6,832	313	303	256
Financial Summary							
Revenues (Net TCRC)	$ M	9,121	17,609	39,617	1,824	1,761	1,486
Site operating costs	$ M	3,652	7,348	18,852	730	735	701
Concentrate transportation costs	$ M	276	531	1,213	55	53	45
EBITDA	$ M	5,193	9,730	19,552	1,039	973	740
Free cash flow	$ M	4,546	7,925	9,337	909	793	554
Cash Costs [(5)]							
Before by-product credits	$/lb Cu	1.52	1.60	1.79	1.52	1.60	1.77
After by-product credits	$/lb Cu	1.29	1.31	1.48	1.29	1.31	1.47
All-in sustaining costs	$/lb Cu	1.40	1.38	1.55	1.40	1.38	1.53
Category	**Unit**	**Total [(1)] LOM**					
Capital Costs							
Development capital costs	$ M	4,739					
Sustaining capital costs	$ M	781					
Closure and post-closure costs [(6)]	$ M	234					
Economic Summary (unlevered – before shareholder loans)							
Net present value (8%)	$ M	1,808					
Internal rate of return	%	13.0					
Payback (from first production)	years	5.5					

Category	Unit	Total [1]			Annual Average [2]		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Mine life/payback [7]	—	5.1					
Economic Summary (unlevered – after shareholder loans)							
Net present value (8%)	$ M	2,030					
Internal rate of return	%	13.5					
Payback (from first production)	years	5.7					
Mine life/payback [7]	—	4.9					

Notes to Accompany the Base Case Key Metrics Table:

1. Total numbers for first five years and first 10 years exclude the first partial year of operations in 2021;
2. Annual average numbers exclude the first partial year of operations in 2021 and in the case of the LOM annual average also exclude the last partial year of operations in 2048;
3. Copper equivalent figures are calculated by converting molybdenum and silver production into equivalent copper tonnages using base case metal price assumptions;
4. Cash costs before by-product credits allocate all costs, except for specific molybdenum concentrate freight costs and roasting charges and silver refining charges, to the payable copper produced. Cash costs after by-product credits deduct the revenue received from silver in copper concentrate and molybdenum concentrate sales, net of specific molybdenum concentrate freight costs and roasting charges and silver refining charges, from cash costs before by-product credits. Cash costs are inclusive of all stripping costs during operations.
5. Closure and post-closure costs presented here reflect $216 M in closure costs, plus the NPV at a 1.65% discount rate of post-closure costs of $138 M, spent over 350 years, which equates to a value of $19 M;
6. Mine life/payback ratio is the planned mine life in years divided by the number of years from first production that capital payback is achieved
7. Information is presented on a 100% basis. As at 1 January 2019, Teck had a 90% interest, with ENAMI holding a 10% interest.

Table 1-7: Sanction Case Summary of Key Metrics Estimated Economics

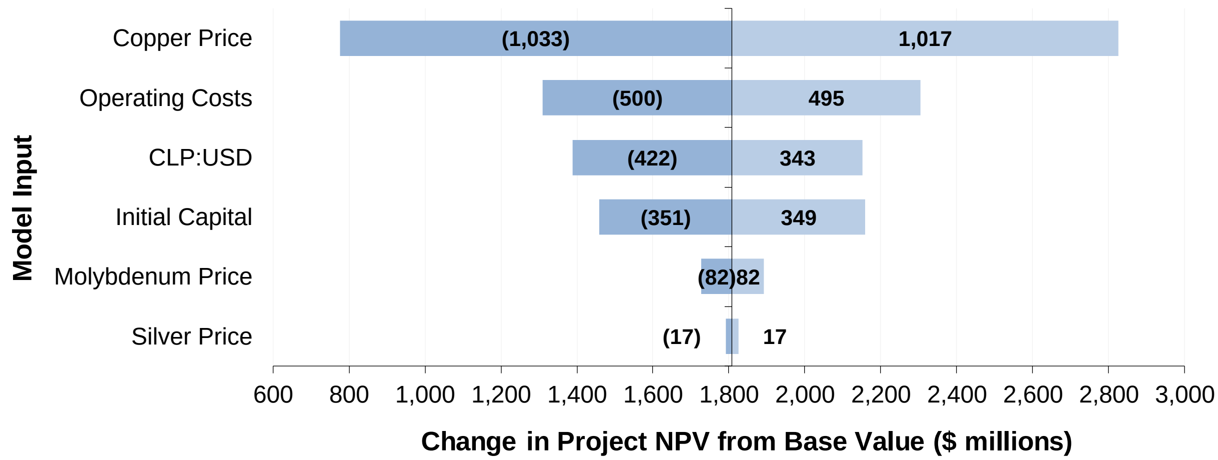
Category	Unit	Total (1)			Annual Average (2)		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Mining							
Total material moved	Mt	519	1,117	2,619	103.8	111.7	98.1
Processing							
Total ore processed	Mt	259	520	1,400	51.8	52.0	52.1
Head grade – copper	%	0.61	0.59	0.52	0.61	0.59	0.52
Head grade – molybdenum	%	0.017	0.020	0.021	0.017	0.020	0.021
Production							
Copper production	t x 1,000	1,448	2,764	6,590	290	276	247
Molybdenum production	t x 1,000	32	78	217	6.5	7.8	8.2
Silver production	Moz	10	17	41	1.9	1.7	1.5
Copper equivalent production (3)	t x 1,000	1,582	3,069	7,425	316	307	279
Financial Summary							
Revenues (Net TCRC)	$ M	9,219	17,846	43,103	1,844	1,785	1,617
Site operating costs	$ M	3,650	7,324	19,204	730	732	715
Concentrate transportation costs	$ M	278	538	1,292	56	54	48
EBITDA	$ M	5,292	9,983	22,607	1,058	998	854
Free cash flow	$ M	4,652	8,089	11,420	930	809	631
Cash Costs (5)							
Before by-product credits	$/lb Cu	1.51	1.57	1.70	1.51	1.57	1.69
After by-product credits	$/lb Cu	1.28	1.30	1.38	1.28	1.30	1.37
All-in sustaining costs	$/lb Cu	1.38	1.37	1.44	1.38	1.37	1.42
Category	**Unit**	**Total (1) LOM**					
Capital Costs							
Development capital costs	$ M	4,739					
Sustaining capital costs	$ M	783					
Closure and post-closure costs (6)	$ M	234					
Economic Summary (unlevered – before optimized funding structure)							
Net present value (8%)	$ M	2,205					
Internal rate of return	%	13.5					
Payback (from first production)	years	5.3					
Mine life/payback (7)	—	5.2					

Category	Unit	Total (1)			Annual Average (2)		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Economic Summary (unlevered – after optimized funding structure)							
Net present value (8%)	$ M	2,426					
Internal rate of return	%	14.1					
Payback (from first production)	years	5.6					
Mine life/payback (7)	—	5.0					

Notes to Accompany the Sanction Case Key Metrics Table:

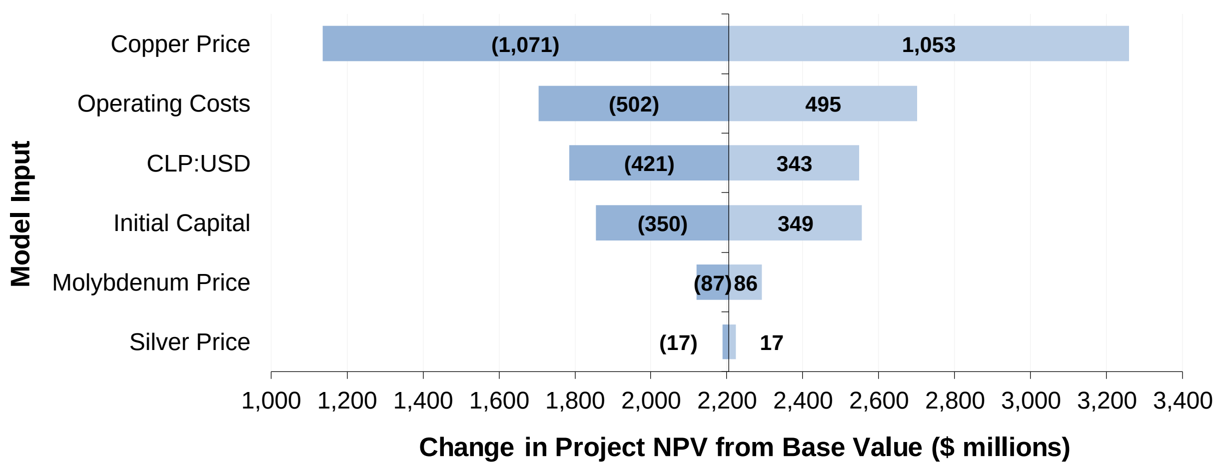
1. Total numbers for first five years and first 10 years exclude the first partial year of operations in 2021;
2. Annual average numbers exclude the first partial year of operations in 2021 and in the case of the LOM annual average also exclude the last partial year of operations in 2048;
3. Copper equivalent figures are calculated by converting molybdenum and silver production into equivalent copper tonnages using base case metal price assumptions;
4. Cash costs before by-product credits allocate all costs, except for specific molybdenum concentrate freight costs and roasting charges and silver refining charges, to the payable copper produced. Cash costs after by-product credits deduct the revenue received from silver in copper concentrate and molybdenum concentrate sales, net of specific molybdenum concentrate freight costs and roasting charges and silver refining charges, from cash costs before by-product credits. Cash costs are inclusive of all stripping costs during operations.
5. Closure and post-closure costs presented here reflect $216 M in closure costs, plus the NPV at a 1.65% discount rate of post-closure costs of $138 M, spent over 350 years, which equates to a value of $19 M;
6. Mine life/payback ratio is the planned mine life in years divided by the number of years from first production that capital payback is achieved.
7. Information is presented on a 100% basis. As at 1 January 2019, Teck had a 90% interest, with ENAMI holding a 10% interest.

Figure 1-1: Base Case Sensitivity Analysis (10% Change)



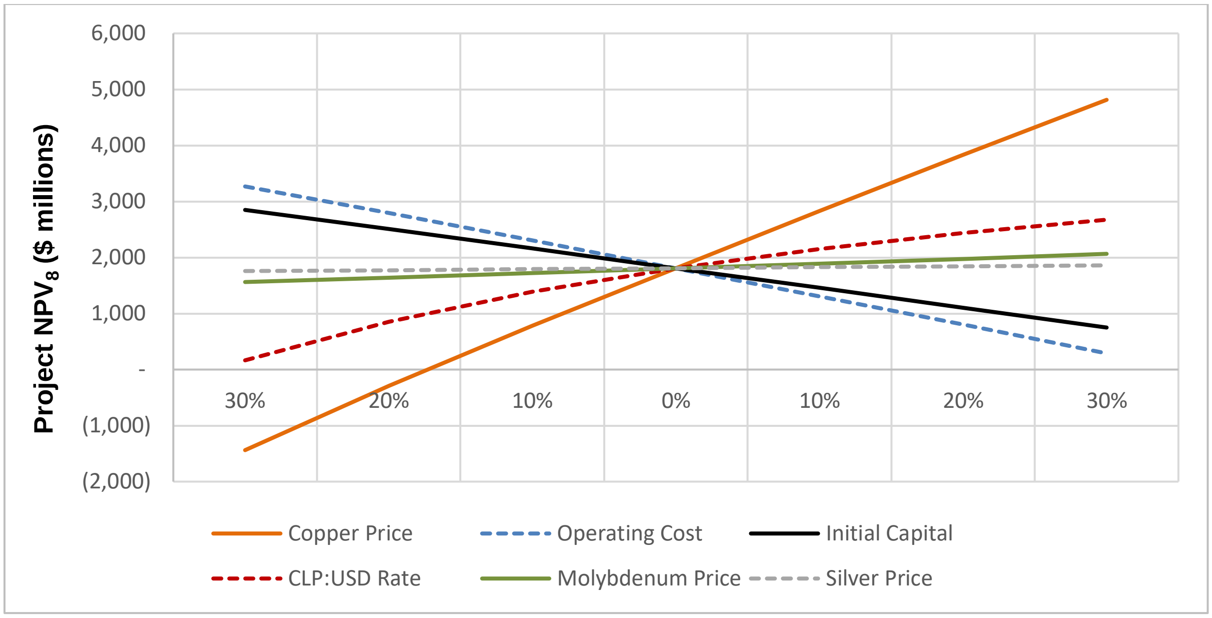
Note: Figure prepared by Teck, 2018

Figure 1-2: Sanction Case Sensitivity Analysis (10% Change)



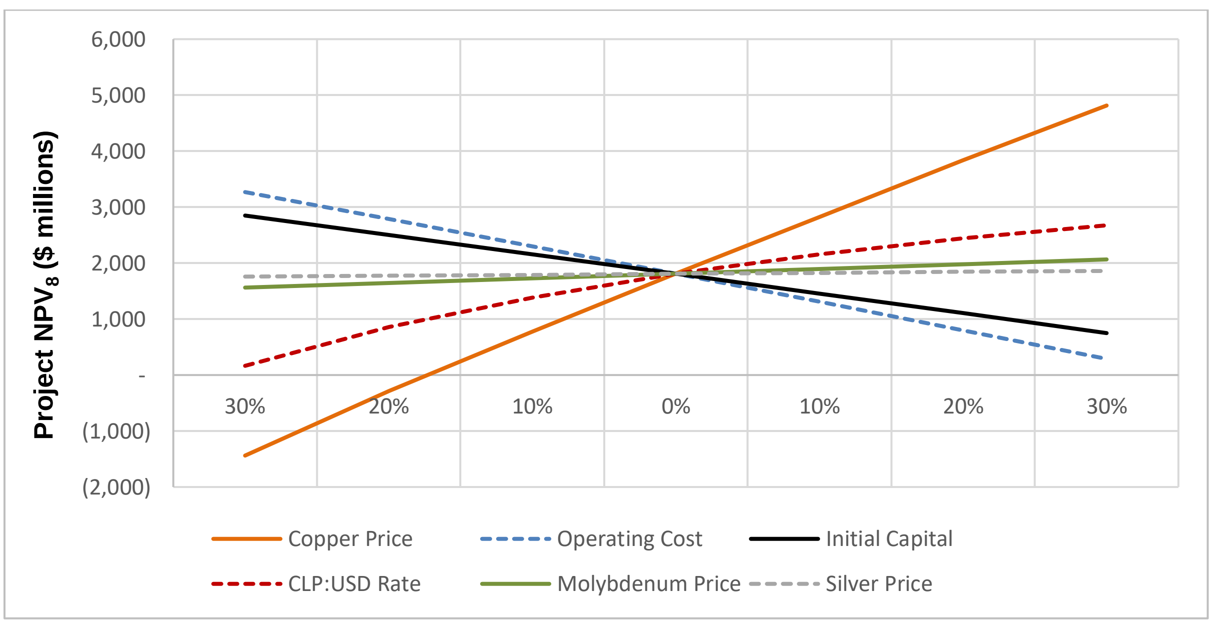
Note: Figure prepared by Teck, 2018

Figure 1-3: Base Case Change in NPV8 for Percent Changes in Model Inputs



Note: Figure prepared by Teck, 2018

Figure 1-4: Sanction Case Change in NPV8 for Percent Changes in Model Inputs



Note: Figure prepared by Teck, 2018

For the Sanction Case, a 1% change in copper recovery from the base assumption results in a change to QB2's NPV_8 of approximately $100 M. For every $0.25/lb change in copper price, over the range of sensitivities, QB2's NPV_8 changes by approximately $900 M; while every $0.25/lb change in molybdenum price changes the NPV_8 by approximately $22 M. A 10% change in initial capital and operating costs, on average across the range of sensitivities, results in changes to QB2's NPV_8 of approximately $350 M and $500 M, respectively.

1.26 Interpretation and Conclusions

Under the assumptions discussed in this Report, both the Base Case and the Sanction Case return a positive economic outcome. The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

1.27 Recommendations

A multidiscipline work program is planned to support both QB2 operations and the preliminary evaluation of the QB3 expansion scenario.

In the development of the program each discipline area was reviewed to determine if additional test work or investigative studies should be completed in support of the planned QB2 operations as well as the QB3 evaluation study.

A significant program of drilling (both infill and upside), re-logging, assaying and development of updated geological models is recommended and in portions are in progress including:

- Confirmation of the silver and molybdenum content of the current hypogene stockpile;
- Over 55,000 m of infill and step-out drilling to potentially support upgrade of Mineral Resource confidence categories and potential conversion to Mineral Reserves and to identify additional mineralization that could potentially support Mineral Resource estimation;
- Re-logging of ~20,000 m of historic drill core in support of refining and improving the geological models;
- Updating the geological models;

The QB3 evaluation study will address aspects of a further mine expansion, including mine and process design, permitting, environmental and community considerations and an assessment of associated costs and potential economics.

The total program cost is estimated at approximately $45 M based on historic cost performance and is expected to be incurred in a staged fashion.

2.0 INTRODUCTION

Mr. Rodrigo Alves Marinho, P.Geo., Mr. Bryan Rairdan, P.Eng, Mr. Eldwin Huls, P.Eng. and Mr. Paul Kolisnyk, P.Eng. prepared this technical report (the Report) for Teck Resources Limited (Teck) on the Quebrada Blanca mining operation (the Project), located in Chile's Región de Tarapacá (Figure 2-1).

The initial open pit mine at Quebrada Blanca (the Quebrada Blanca Phase 1 operation or QB1) commenced operation in 1994, exploiting supergene copper mineralization. To date, operations at the mine have used a heap leach and dump leach and solvent extraction/electrowinning (SX/EW) process. The supergene ore is now depleted and mining operations have ceased; however, the SX/EW plant will continue to produce cathodes throughout 2019 and 2020 from existing supergene leaching pads. The Quebrada Blanca Phase 2 (QB2) project is planned to exploit hypogene mineralization below the oxide and supergene mineralization mined in QB1. The Teck Board has approved the QB2 project for full construction, with first production targeted for the second half of 2021.

2.1 Terms of Reference

The Report supports Teck's 2018 annual information form (AIF) and updated Mineral Resource and Mineral Reserve estimates.

The Project owner is Compañia Minera Teck Quebrada Blanca S.A. (QBSA). As at 4 December 2018, the company shareholders were Teck, which has an indirect 90% holding, and Empresa Nacional de Minería (ENAMI), the Chilean State-run minerals company, which has a 10% holding. Teck is the Project operator. On 4 December 2018, Teck announced that Sumitomo Metal Mining Co., Ltd. (SMM) and Sumitomo Corporation (SC) would acquire a 30% indirect interest in QBSA; this transaction is expected to close by 31 March 2019 (see discussion in Section 4.3).

Currency is expressed in US dollars unless stated otherwise. The local currency is the Chilean peso (CLP). Units presented are typically metric units, such as metric tonnes, unless otherwise noted. The Report uses Canadian English. Total copper is expressed as Cu, meaning total copper. Soluble copper is expressed as CuS, and consists of acid-soluble copper (CuSH) and cyanide-soluble copper (CuCN).

Mineral Resources and Mineral Reserves are reported using the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves (the 2014 CIM Definition Standards). Mineral Resources, Mineral Reserves, and the economic analysis are presented on a 100% basis. As at November 30, 2018, the effective date for the Mineral Resources and Mineral Reserves, Teck had a 90% interest, with ENAMI holding a 10% interest.

Figure 2-1: Project Location Map

Note: Figure prepared by MHW and Teck, 2016.

2.2 Qualified Persons

The following Teck employees serve as the qualified persons for this Technical Report as defined in National Instrument 43-101, Standards of Disclosure for Mineral Projects, and in compliance with Form 43-101F1:

- Mr. Rodrigo Alves Marinho, P.Geo., Technical Director, Reserve Evaluation;
- Mr. Bryan Rairdan, P.Eng., Technical Director, Processing;
- Mr. Eldwin Huls, P.Peng., Senior Mechanical Engineer, Quebrada Blanca Phase 2;
- Mr. Paul Kolisnyk, P.Eng., Director, Technical Marketing.

2.3 Site Visits and Scope of Personal Inspection

Mr. Marinho has visited the property on a regular basis since December 2012. During his most recent visit from February 2–5, 2019, Mr. Marinho reviewed drill hole core stored in the facilities of the town of Pozo Almonte and discussed geological interpretations with the geology group. Mr Marinho visited the Quebrada Blanca mine site for last time during October 14-16, 2016.

Mr. Huls has visited the project site numerous times since 2011. His most recent site visit to Quebrada Blanca mine was from 22–25 September 2014. During those visits he has inspected the sites for all planned facilities, including the port area, pipeline routes, access roads, concentrator site, and the tailings management facility (TMF). Additionally, Mr. Huls has visited various facilities which have similar design concepts planned for QB2, including the Escondida Water Supply Project on March 7 2016 to observe construction procedures for the pipeline and associated port facility; the Pelambres concentrator, tailings management, and port facilities in April 2018, and the Carlsbad desalination plant in July 2018, to gain insights into maintenance and operational issues.

Mr. Rairdan visited the core storage facility at Pozo Almonte during January 6–9, 2018 to view drill hole core and review the geological and geometallurgical context and interpretations of the project team.

2.4 Effective Dates

The Report has a number of effective dates as follows:

- Date of latest information on exploration and drilling programs: 31 December, 2018;
- Date of close-out of database used in resource estimation: 15 March, 2018;
- Date of resource model: 30 September, 2018;
- Date of Mineral Resource estimate: 30 November, 2018;

- Date of Mineral Reserve estimate: 30 November, 2018;
- Date of financial analysis: 1 January, 2019;
- Date of supply of latest information on mineral tenure, surface rights and Project ownership: 4 December, 2018.

The overall effective date of the Report is taken to be the date of the financial analysis which is 1 January, 2019.

2.5 Information Sources and References

The reports and documents listed Section 27.0 of this Report were also used to support the preparation of the Report.

Additional information was sought from Teck or QBSA personnel where required.

2.6 Previous Technical Reports

Teck has previously publicly filed the following technical reports on the Quebrada Blanca deposit on SEDAR:

- Marinho, R., and Nelson M., 2016: NI 43-101 Technical Report on Quebrada Blanca Phase 2 Feasibility Study 2016, Región de Tarapacá, Chile: report prepared for Teck Resources Inc., effective date 3 February 2017;
- Allan, M.J., Yuhasz, C., Witt, P., and Baxter, C., 2012: National Instrument 43-101 Technical Report, Quebrada Blanca Phase 2 Project, Region I, Chile: report prepared for Teck Resources Inc., effective date April 24, 2012;
- Barr, N.C., 2008: NI 43-101 Technical Report on Hypogene Mineral Resource Estimate, at Dec 31, 2007, Quebrada Blanca Region I, Chile: report prepared for Teck Cominco Limited and Compañía Minera Quebrada Blanca S.A, filing date 31 March, 2008.

Prior to Teck's interest in the Project, Aur Resources Inc. (Aur Resources) filed the following technical report:

- Barr, N.C. and Reyes, R., 2004: Report on Mineral Resources and Mineral Reserve Estimates at Dec. 31, 2003, Quebrada Blanca Copper Mine, Region I, Chile, report prepared for Aur Resources and Compañía Minera Quebrada Blanca S.A, filing date 31 March 2004.

3.0 RELIANCE ON OTHER EXPERTS

This section is not relevant to this Report.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 Introduction

The Quebrada Blanca mine and its proposed copper concentrator are located in Chile's Región de Tarapacá, approximately 165 km directly and 240 km by road southeast of the regional capital city of Iquique and near the Bolivian border on the western flank of northern Chile's Andes Mountains.

The current open pit operation is located at approximately 21°00'08"S and 68°48'30"W.

The proposed site for the Project's tailings management facility (TMF) would be located approximately 7 km from the concentrator site at 20°59'33.46"S and 68°50'07.46"W.

The port facilities would be located at Punta Patache, which is approximately 145 km west of the mine and 60 km south of Iquique, at a location of 20°48'36.47"S and 70°12'01.49"W.

4.2 Fraser Institute Survey

Teck has used the Investment Attractiveness Index from the 2017 Fraser Institute Annual Survey of Mining Companies report (the Fraser Institute survey) as a credible source for the assessment of the overall political risk facing an exploration or mining project in Chile.

Teck has relied on the Fraser Institute survey because it is globally regarded as an independent report-card style assessment to governments on how attractive their policies are from the point of view of an exploration manager or mining company, and forms a proxy for the assessment by industry of political risk in Chile from the mining perspective.

The Fraser Institute annual survey is an attempt to assess how mineral endowments and public policy factors such as taxation and regulatory uncertainty affect exploration investment.

Chile has a Policy Perception Index rank of 25 out of the 91 jurisdictions in the Fraser Institute survey. Chile's Investment Attractiveness Index rating is eight out of the 91 jurisdictions, and it is ranked seventh on the Best Practices Mineral Potential Index

4.3 Project Ownership

QBSA is organized as a Chilean closed corporation (sociedad anónima cerrada) with two Series of shares: Series A (common) and Series B (preferred). Quebrada Blanca Holdings SpA (JVCo), currently a wholly-owned subsidiary of Teck, directly holds 90% of total QBSA share capital in the form of Series A shares. The Government of Chile through its State-run minerals company, Empresa Nacional de Minería (ENAMI) holds all of the Series B shares of QBSA, which constitutes the remaining 10% of the total equity.

Teck’s direct interest is held by Teck Resources Chile Limitada (TRCL), which in turn is owned by Teck and a number of other Teck wholly-owned subsidiaries.

On 4 December 2018, Teck announced that SMM and SC would acquire a 30% indirect interest in QBSA, which is expected to close by 31 March 2019. In anticipation of closing, TRCL, the subsidiary who held the direct Teck interest in the Series A QBSA shares, contributed the shares to JVCo. Upon completion of the subscription by SMM/SC, JVCo will be directly two-thirds owned by TRCL and one-third owned by a Chilean entity that will ultimately owned by SMM and SC. This structure will result in effective ultimate QBSA ownership of 60% Teck, 30% SMM/SC and 10% ENAMI.

The SMM and SC transaction includes the following payable considerations:

- $1.2 B contribution for a 30% indirect interest in QBSA:
  - $800 M earn-in contribution;
  - $400 M matching contribution;
- $50 M to Teck upon QB2 achieving optimized target mill throughput of 154 kt/d by December 31, 2025, subject to adjustment;
- Contingent contribution of 12% of the incremental net present value (NPV) of a major expansion project (QB3) upon approval of construction, subject to adjustment:
  - 8% contingent earn-in contribution;
  - 4% matching contribution.

4.4 Mineral Tenure

4.4.1 Overview

The state owns all mineral resources, but exploration and exploitation of these resources by private parties is permitted through mining concessions, which are granted by the courts. The concessions grant both rights and obligations, as defined by the Ley Orgánica Constitucional Sobre Concesiones Mineras 1982 (COM) and Código de Minería 1983 (MC), and by other general and special regulations. The Chilean National Geology and Mining Service (Sernageomin in the Spanish acronym) administers and regulates the mining industry in Chile.

Concessions can be mortgaged or transferred and the holder has full ownership rights. An owner is also entitled to obtain rights-of-way. In addition, a concession holder has the right to defend concession ownership against the state and third parties. A concession is obtained by filing a claim and includes all minerals that may exist within its area. Mining rights in Chile are acquired in the following stages:

- An exploration mining concession is granted for a two-year period, and can be extended for a maximum of two additional years upon waiver of half of the area allocated. An exploration mining concession holder is entitled to conduct all exploration activities. While an exploration concession is in force, only the concession holder can file exploitation claims;
- Exploitation mining concessions are granted indefinitely, and give the holder the right to explore and to exploit the entire mineral resource found within their boundaries.

4.4.2 Project Concessions

QBSA currently holds 261 mining concessions of which 158 are exploitation-stage mining concessions, and 103 are exploration mining concessions (Table 4-1). These mining concessions cover a total of 99,205 ha, and are primarily located in the I Región, Comunas de Pica e Iquique. A small number of the tenures are situated in the II Región, Comuna de Ollague, sector Alconcha.

The tenure is divided into seven subareas: mine, access road, Ramucho–Hundida, Pampa, Alconcha, Cposa Road and Port Patache:

- The mine sub-area includes industrial land (Terreno Industrial, see Section 4.5), concentrator plant, tailings transport system, and the TMF. The mine area covers the existing open pit and all related infrastructure. Tenure consists of 40 exploitation concessions (23,108 ha), and one exploration concession (100 ha);
- The access road sub-subarea is covered by 26 exploitation concessions (4,586 ha) and consists of the road from Colonia Pintados (main A-5 road);
- The Ramucho–Hundida area is situated to the south of the mine area. It is covered by 14 exploitation concessions (23,861 ha), and five exploration concessions (1,300 ha);
- The Pampa area covers part of the facilities and infrastructure of the lineal works, such as desalinated water and concentrate pipelines, power transmission lines, and pump stations. It also includes the temporary construction camp, solids residue treatment plant, access roads, and explosives management store. It is covered by 62 exploitation concessions (18,564 ha), and 87 exploration concession (21,900 ha);
- The Alconcha sub-area is covered by 10 exploitation concessions (3,000 ha) for water rights, located in the II Región;
- Located in Coposa Salar, north of the mine, the Coposa Road area includes the Bypass A-97 access road and part of the projected road from the main A-97 road

into the Quebrada Blanca mine site. The area consists of four exploration concessions (1,000 ha);

- The Port Patache area includes port facilities and related infrastructure, water desalination plant, and concentrate handling and shipping area. Tenure covering these facilities consists of six exploitation concessions (586 ha) and six exploration mining concessions (1,200 ha).

A general tenure layout plan is shown in Figure 4-1. Concession location plans are provided by area in Figure 4-2 to Figure 4-8. Appendix A provides a detailed list of the concessions.

4.5 Surface Rights

4.5.1 Overview

Ownership rights to the subsoil are governed separately from surface ownership rights. Articles 120 to 125 of the Mining Code regulate mining easements. The Mining Code grants full rights to use the surface land to any owner of a mining exploitation or exploration concession, provided that reasonable compensation is paid to the surface land owner.

4.5.2 Project Area

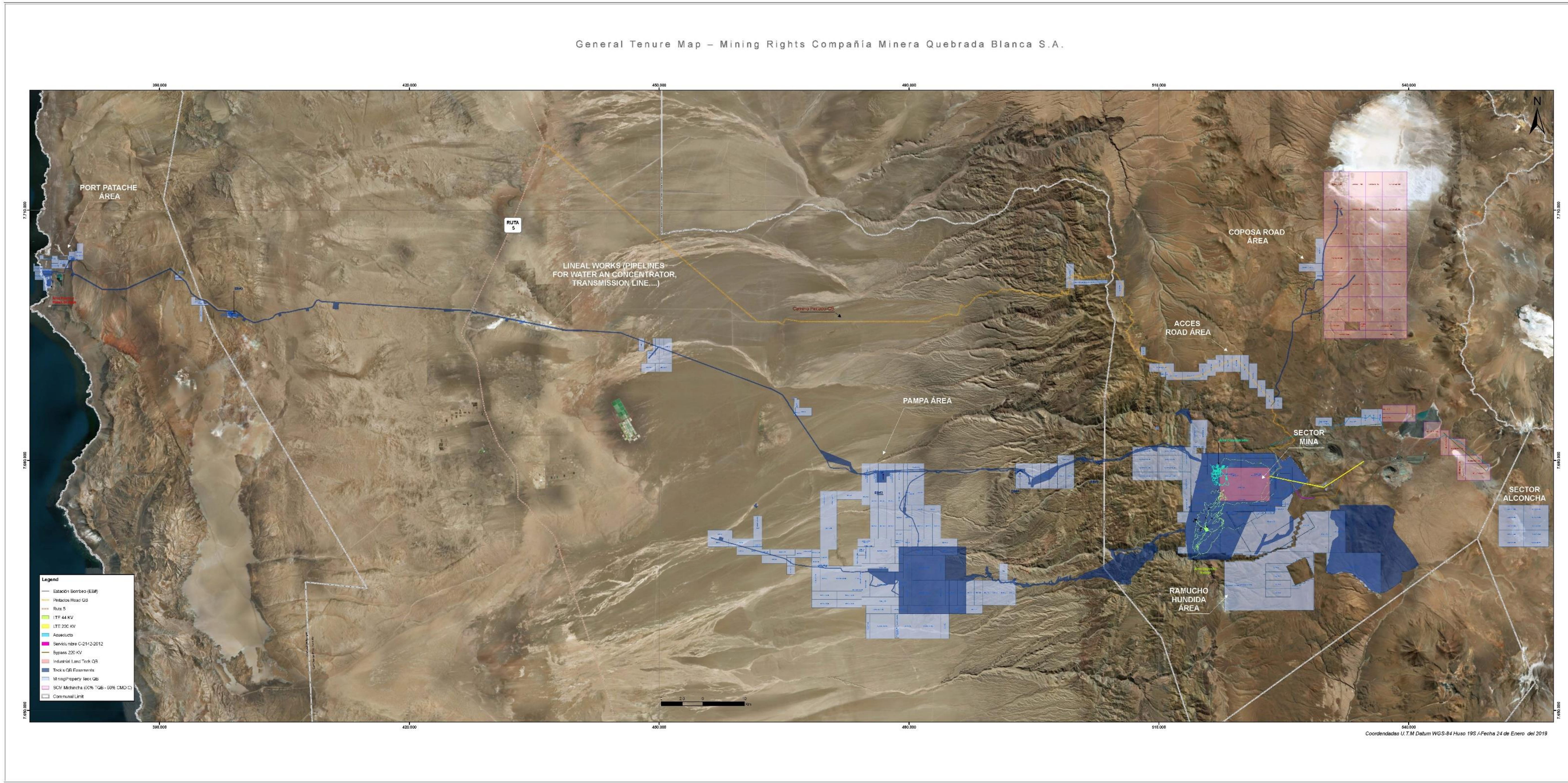
Almost 99% of the surface lands where Project facilities are, or will be, located belongs to the State. Teck has obtained 100% of the surface rights for operations through judicial easements and State lease agreements. Surface rights include:

- Mine area: the Terreno Industrial is the main surface right, and was purchased by Teck in 1993. It covers an area of 2,400 ha and covers the open pits, mining facilities, process facilities associated with the oxide QB1 phase, and other facilities necessary for mining and operations. A judicial easement has been granted covering 4,752 ha which will cover the concentrator plant installation, waste rock storage facility (WRSF), power lines, and mine access roads;
- Road areas: a judicial easement is under application for the A-97 Bypass road;
- TMF: an easement is in place for the TMF (formerly referred to as Area S21), covering 4,616 ha. There is a supplemental easement of 209.45 ha for the TMF;

Table 4-1: Mineral Concessions Summary Table

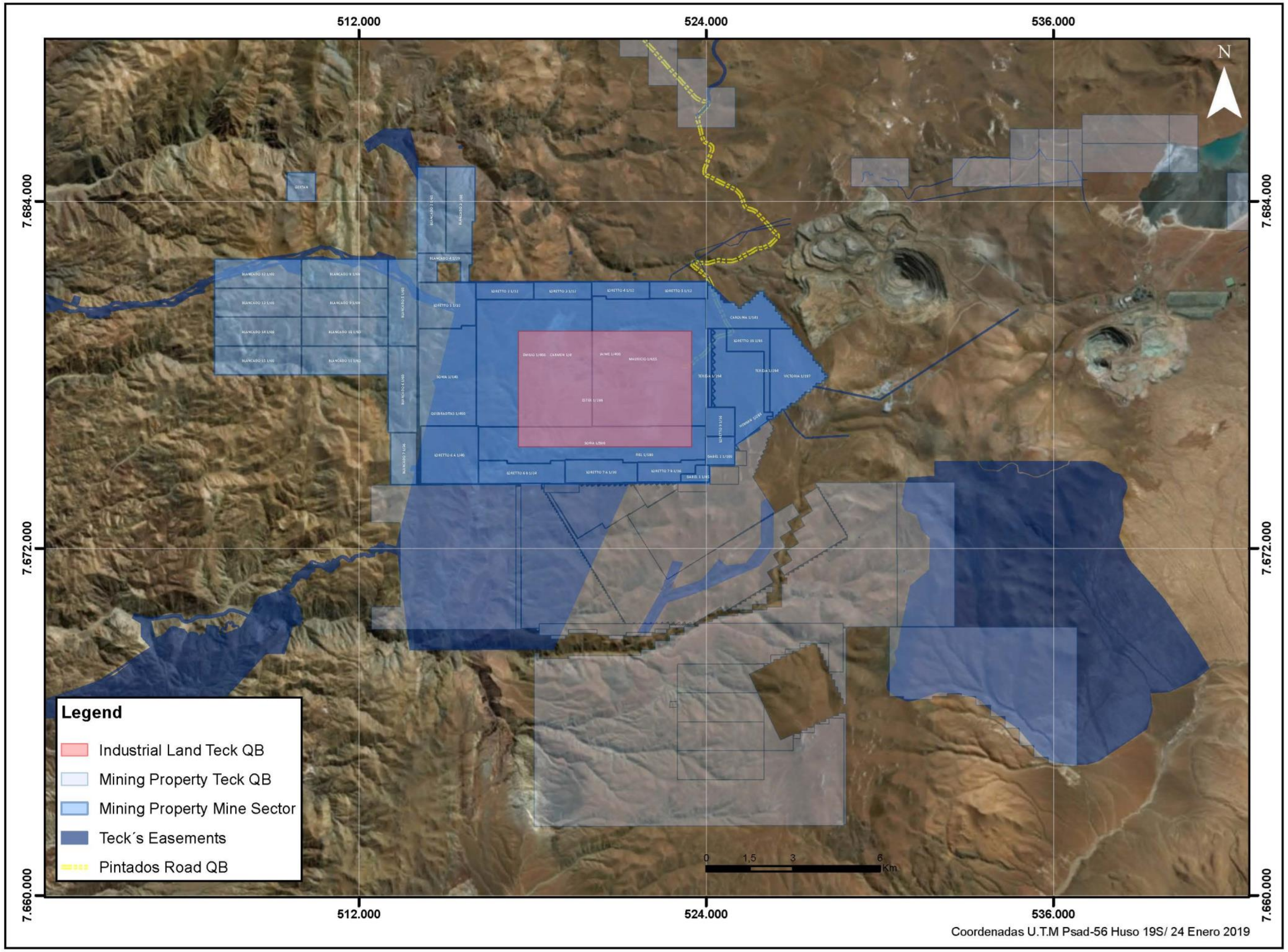
Concessions	Number of Concessions	Area (ha)	Sector Name
Exploitation	40	23,108	Mine
Exploration	1	100	
Exploitation	26	4,586	Access road to Quebrada Blanca
Exploration	—	—	
Exploitation	14	23,861	Ramucho–Hundida
Exploration	5	1,300	
Exploitation	62	18,564	Pampa
Exploration	87	21,900	
Exploitation	10	3,000	Alconcha
Exploration	—	—	
Exploitation	—	—	Coposa Road area, includes the Bypass A-97 access road
Exploration	4	1,000	
Exploitation	6	586	Port
Exploration	6	1,200	
		99,205	

Figure 4-1: General Tenure Map Showing Mining Concessions



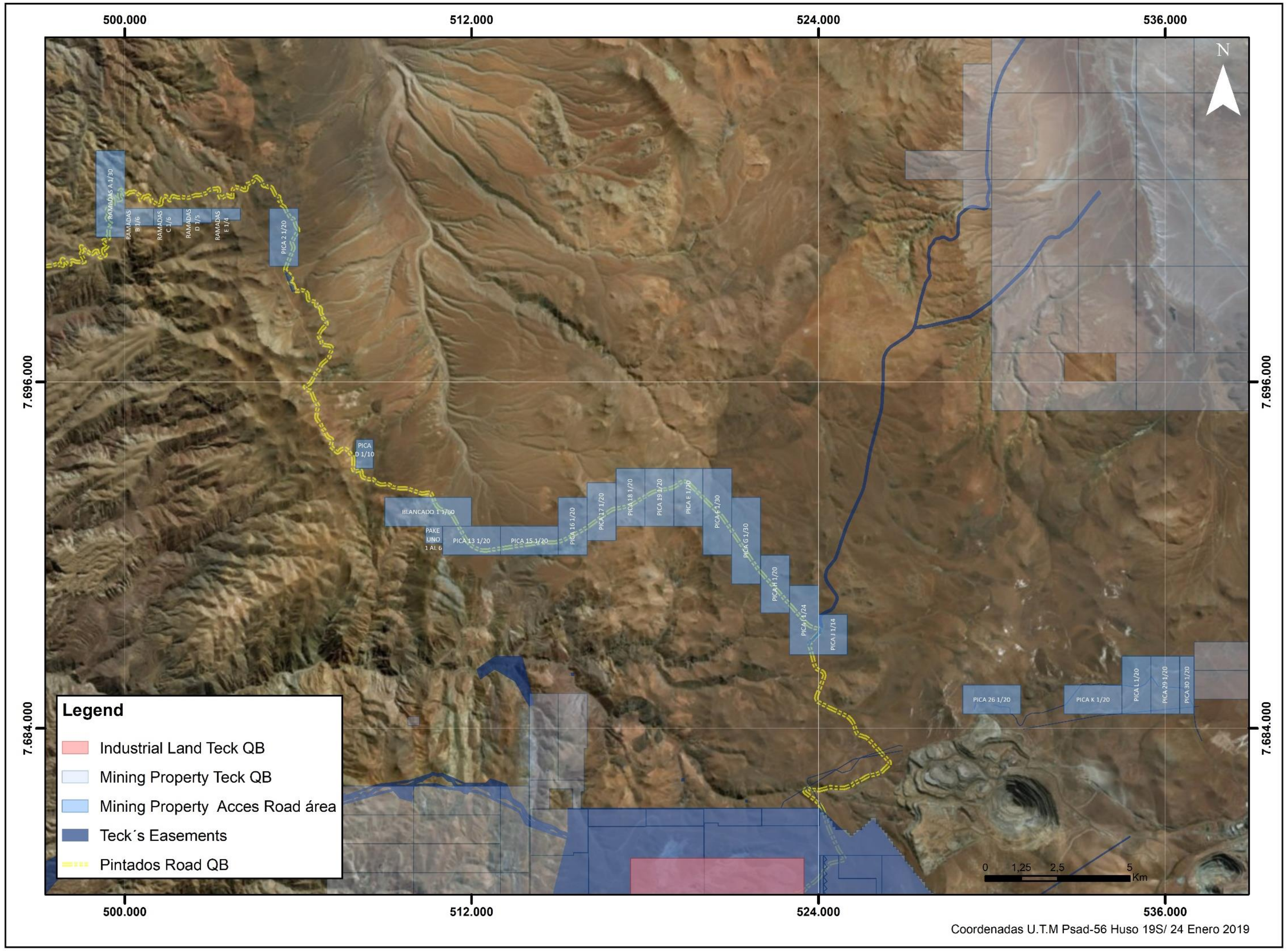
Note: Figure prepared by Teck, 2018.

Figure 4-2: QBSA Mine Area Mineral Concessions



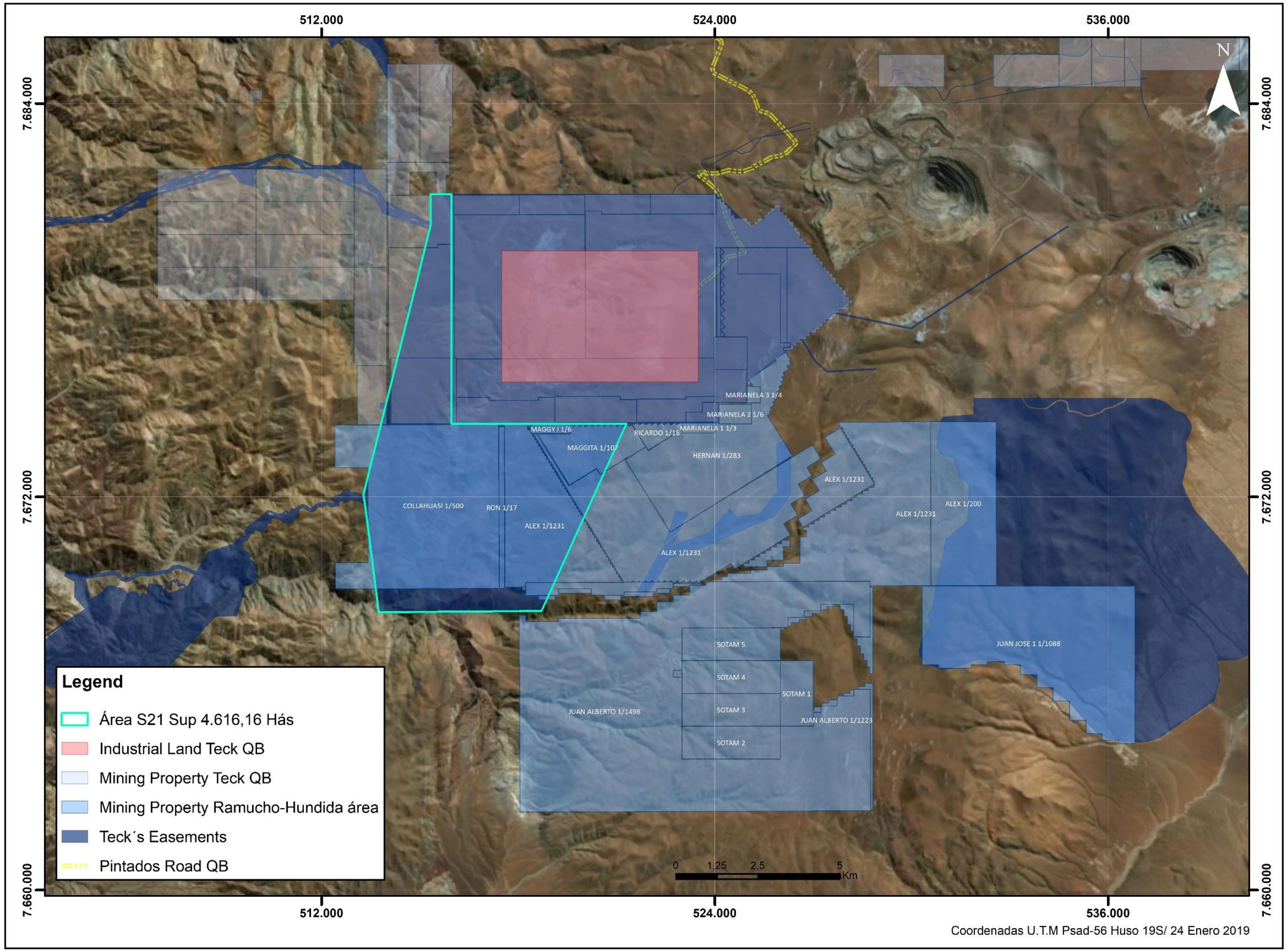
Note: Figure prepared by Teck, 2018.

Figure 4-3: QBSA Road Access Area Mineral Concessions



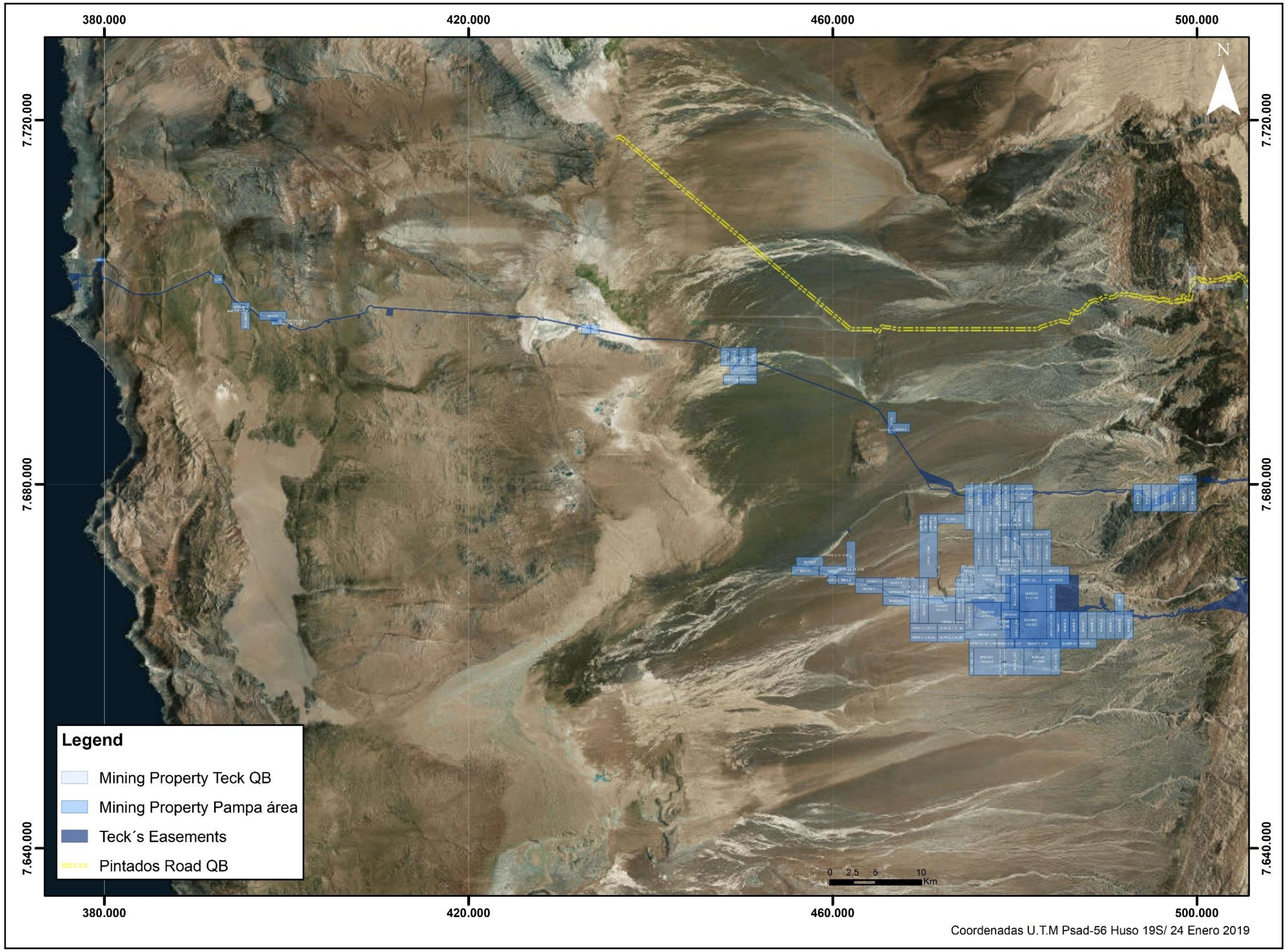
Note: Figure prepared by Teck, 2018.

Figure 4-4: Ramucho-Hundida Area Mineral Concessions



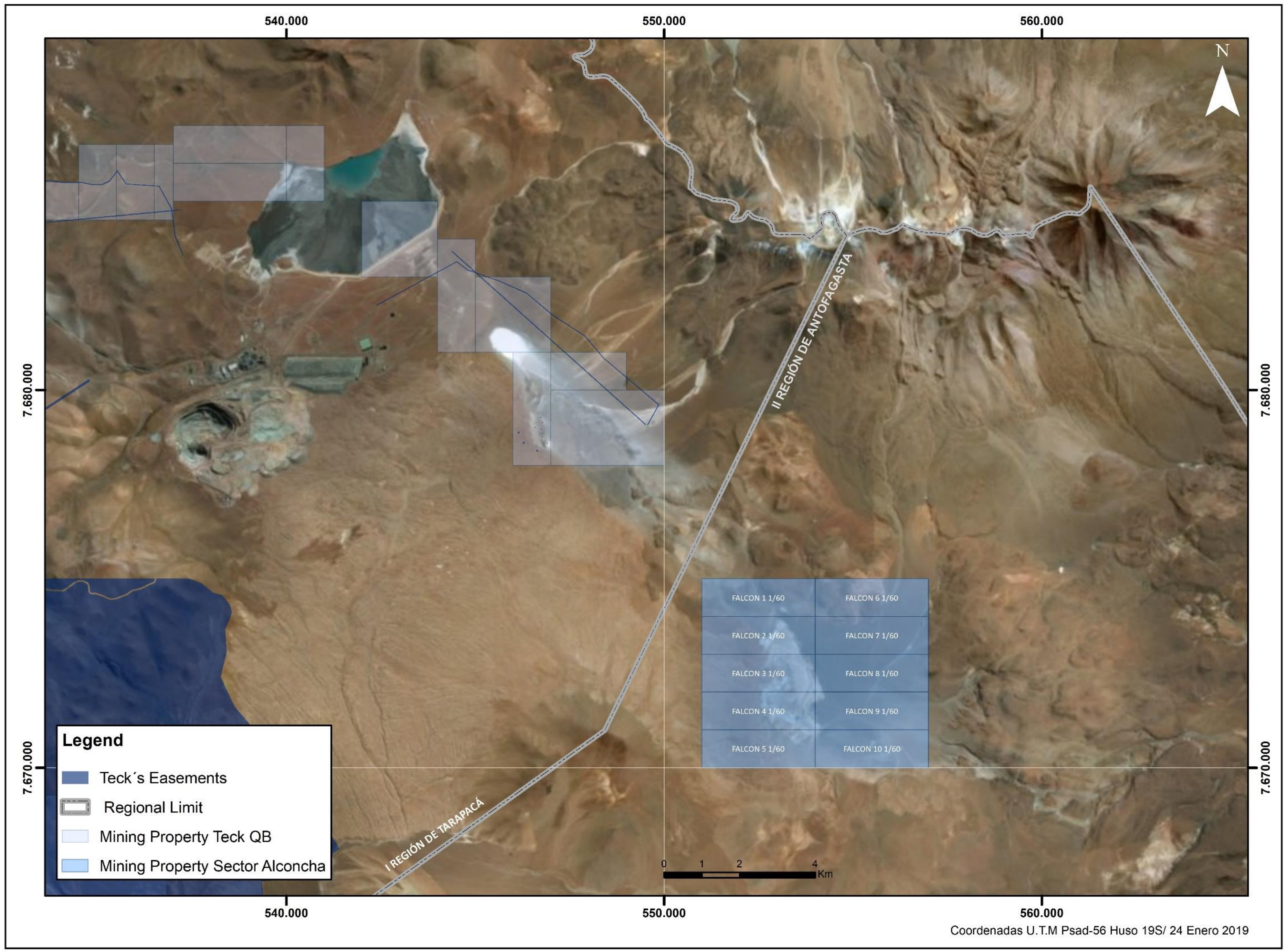
Note: Figure prepared by Teck, 2018.

Figure 4-5: Pampa Area Mineral Concessions



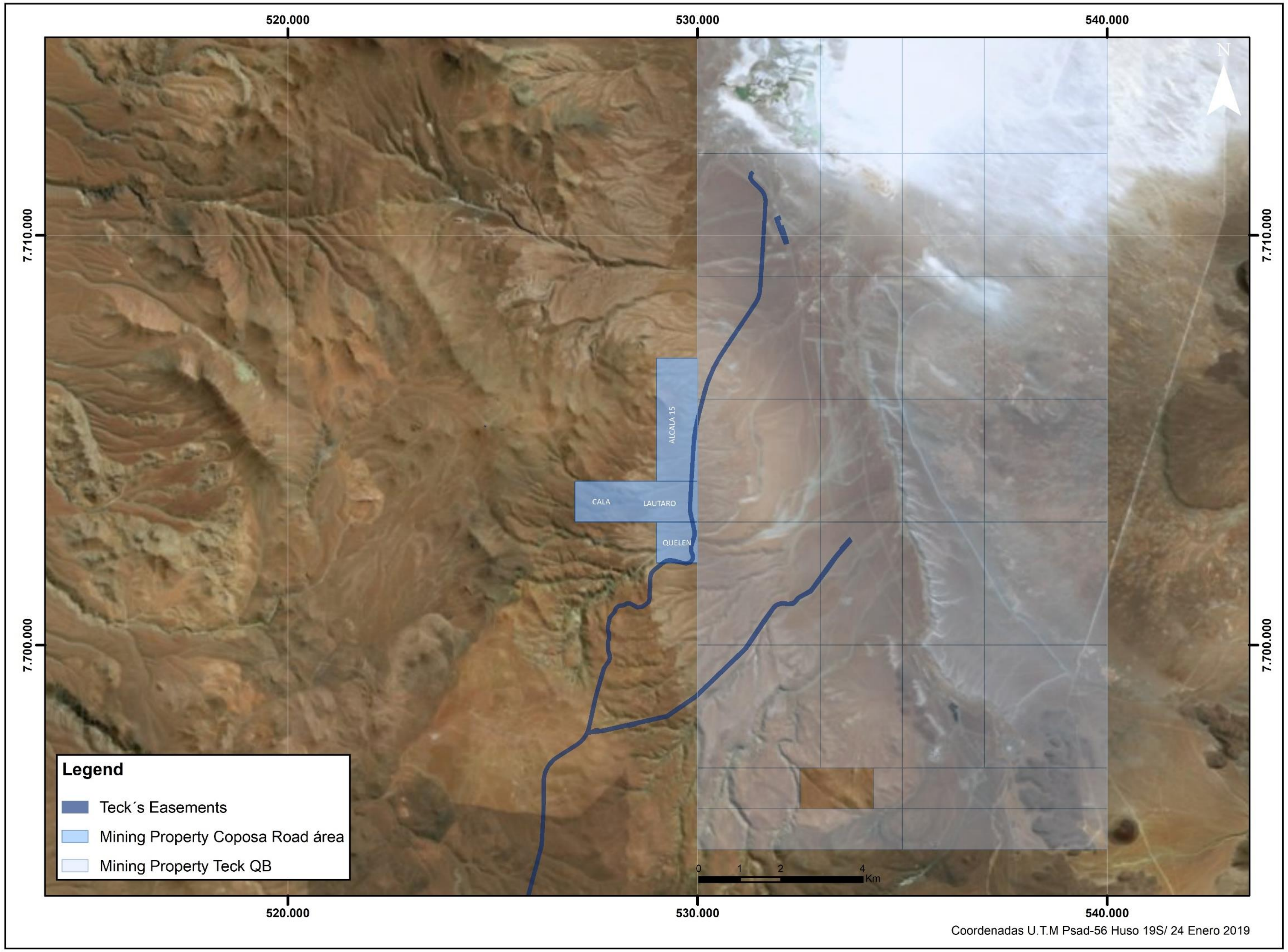
Note: Figure prepared by Teck, 2018.

Figure 4-6: Alconcha Area Mineral Concessions



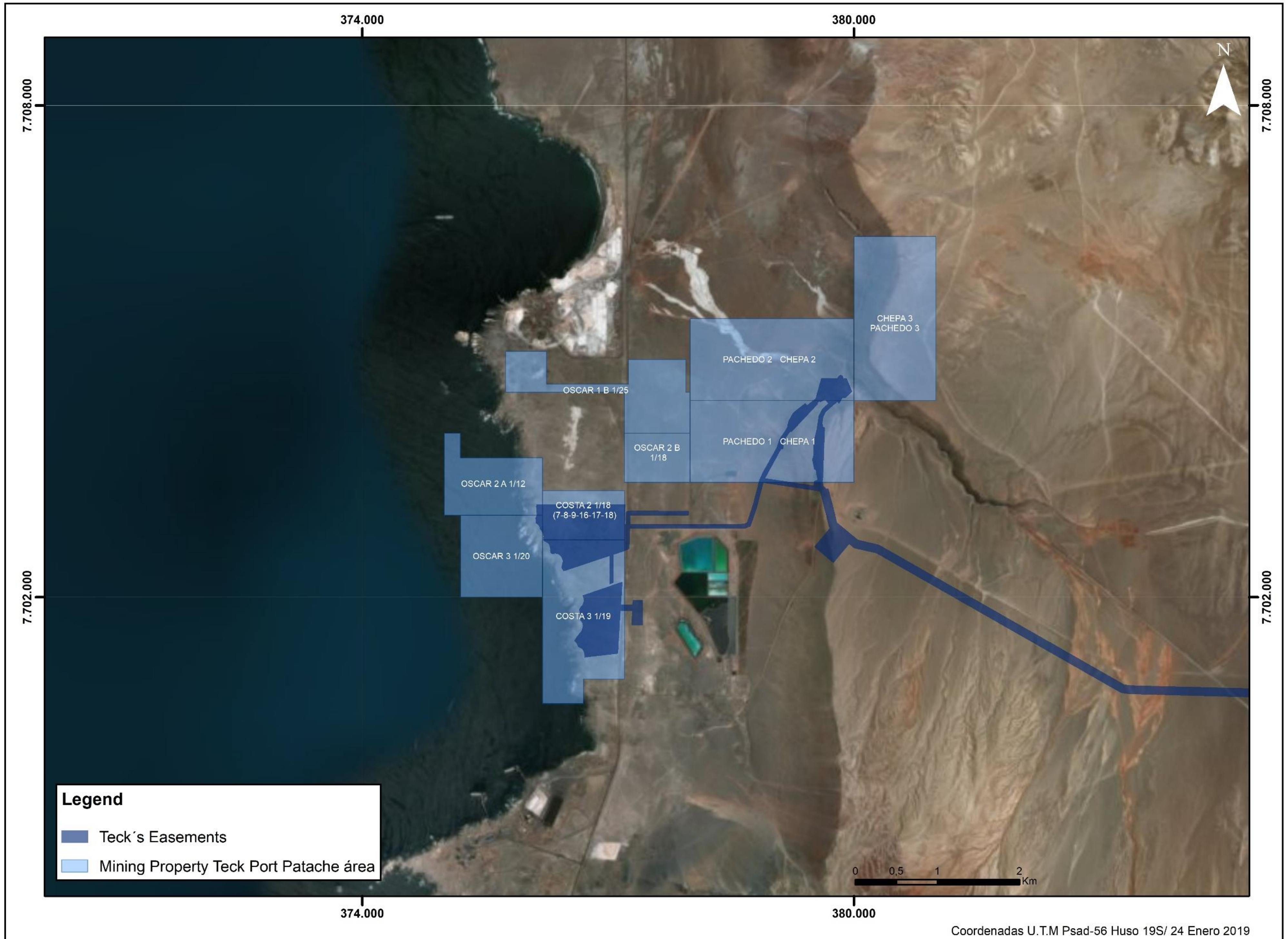
Note: Figure prepared by Teck, 2018.

Figure 4-7: Coposa Road Area Mineral Concessions



Note: Figure prepared by Teck, 2018.

Figure 4-8: Port Patache Area Mineral Concessions



Note: Figure prepared by Teck, 2018.

- Pampa area: judicial mining easements have been granted covering the concentrate and water pipelines, the power transmission line, construction camps, and items such as pump stations;
- Port area: a 99.63 ha easement, covering State-owned land, is in place for the projected port site;

A land acquisition study identified several third-party mining rights concession holders within some of the areas that were required to support operations. Agreements have been concluded with those third-parties to support operations.

Figure 4-9 is a layout plan showing the surface rights in relation to the mineral tenure.

4.6 Maritime Concession

In May 2013, Teck filed a request with the Armada de Chile (Chilean Navy) to use Patache Bay as a port facility. Teck holds a maritime concession, granted through two decrees:

- Supreme Decree 516, dated 28 August 2012;
- Supreme Decree 918 dated 30 December 2016.

4.7 Water Rights

QBSA currently holds the following highland (Altiplano) water rights:

- Salar de Michincha: 315.9 L/s;
- Salar de Alconcha: 120.3 L/s.

4.8 Royalties and Encumbrances

The Chilean mining tax rate is based on a sliding scale based on operating margins, with a minimum rate of 5.0% and a maximum rate of 14.0%. There is no provision in the current mining tax code for carrying mining tax losses forward.

There are no other royalties or encumbrances currently known on the Project other than the requirement to pay the Chilean mining tax.

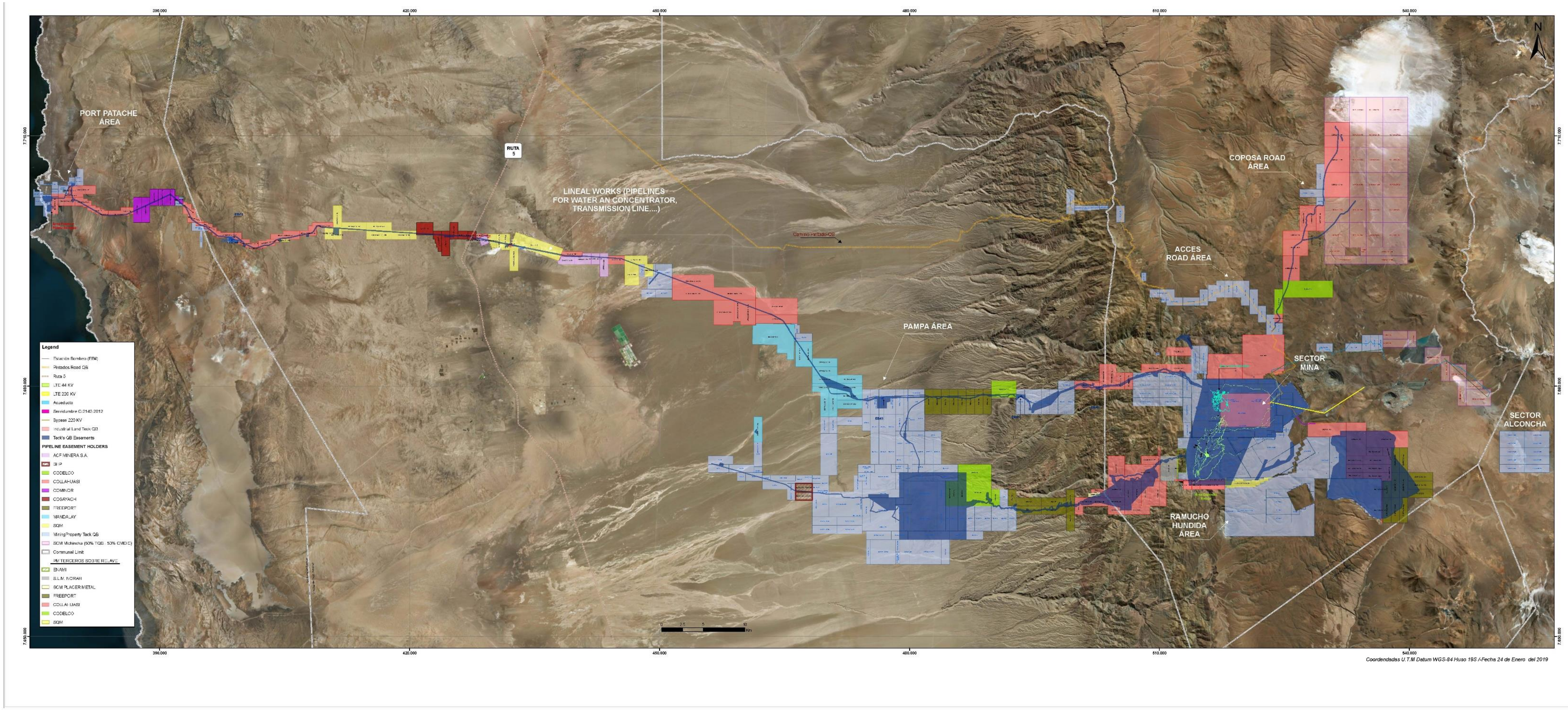
4.9 Permits

Permitting for the Project is discussed in Section 20.

4.10 Environmental Considerations

Environmental considerations for the Project are discussed in Section 20. Environmental liabilities associated with the Project include open pit mining, processing and support facilities required for the QB1 operations.

Figure 4-9: Overview Surface Rights and Mineral Tenures



Note: Figure prepared by Teck, 2018.

4.11 Social License Considerations

Social licence considerations for the Project are discussed in Section 20.

4.12 Comments on Property Description and Location

Information from Teck and QBSA land experts supports that the mineral tenure held is valid and is sufficient to support the declaration of Mineral Resources and Mineral Reserves.

Teck holds sufficient surface rights in the mine, TMF, Pampa and port areas to support the mine expansion. Road access rights are still being negotiated.

A maritime permit to use Patache Bay as a port facility is in place.

There are no other royalties or encumbrances currently known on the Project other than the requirement to pay the Chilean mining tax.

To the extent known, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the property that have not been discussed in this Report.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 Accessibility

Iquique, the region's capital, is mainly accessed by a coastal highway, Chile's Ruta 1. There is an international airport in the region, which is situated on the coast approximately 40 km south of Iquique and is accessed via Ruta 1.

From Iquique, the Project can be accessed by taking the Iquique–Alto Hospicio road, continuing east on Ruta 16 to Pozo Almonte, then taking Ruta 5 south to Camino Pintados, a surfaced road approximately 130 km long, which intersects Ruta 5 at kilometre marker 1775 and continues to the Project area. The total distance to the mine by road is approximately 240 km. An alternative route from Iquique through Pozo Almonte, then taking Ruta A-65 to the Collahuasi mine and passing through Collahuasi to the Quebrada Blanca mine, is approximately 254 km by road.

5.2 Port

There are three major ports in the Región de Tarapacá: one at Iquique and two others south of Iquique at Caleta Patillos and Punta Patache. The port of Iquique is a multi-use commercial port that handles break bulk cargo in the Región de Tarapacá, while Caleta Patillos (salt) and Punta Patache (copper concentrates and coal) are both bulk handling private ports.

Currently, copper cathodes produced from the existing leach and SX/EW operation at Quebrada Blanca are trucked by road to Iquique for ocean shipping.

5.3 Climate

Rainfall typically occurs in the summer season, from January through March. While the annual total precipitation is limited, individual storms can be quite concentrated. The rain storms are routinely accompanied by lightning. The recorded annual rainfall for the mine area amounts to 94.9 mm per year. Recorded year-round temperatures at the proposed concentrator site vary between highs of 11.4ºC and lows of -3.2ºC.

The TMF area has recorded an average annual precipitation of 91 mm, with temperatures ranging from a maximum of 5.8ºC to a minimum of 0.5ºC throughout the year.

Precipitation at the port site location at Punta Patache is negligible, while temperatures are mild throughout the year.

The QB1 operations were conducted year-round, and it is expected that QB2 will also be a year-round operation.

5.4 Local Resources and Infrastructure

The closest major population centre to the mining operation is Iquique, which provides services for a number of large mining operations in the region.

Huatacondo is the closest town to the existing mining facilities, and is located within the Pozo Almonte comuna in the mountains. The small settlements of Tamentica, Quebrada Casillas (Choja Alto), Chiclla and Copaquiri are in proximity to areas planned for the TMF and concentrate and water pipelines. The population centres of Caramucho, Chanavayita and Cáñamo are in proximity to planned port operations.

Additional information on the Project infrastructure and setting is provided in Section 18 and Section 20.

5.5 Physiography

The Quebrada Blanca mine is situated in the Chilean Altiplano at an average elevation of about 4,400 masl. The terrain is rugged, with the mountains being intersected by many steep canyons or ravines (quebradas).

A species of desert plant, the Llareta, occurs in close proximity to the mine and planned supporting mining facilities. Animal life in the area consists primarily of llama, vicuña, viscacha, and foxes.

The planned TMF would be located southwest of the mine site at an average elevation of approximately 3,900 masl. The TMF area does not contain any relevant archeological sites; however, there is some vegetation in close proximity to drainage areas.

The sea coast has limited vegetation, which is typical of the west coast of South America. The planned port area is rocky, with moderate cliffs descending to the ocean, and is subject to strong breezes.

5.6 Seismic Considerations

The Project is within the zone of seismic intensity caused by the subduction of the Nazca Plate under the South American Plate. Plate seismic ratings, as defined in Chilean norm NCh 433, range from 2 for the proposed plant site to 3 nearer the ocean and planned port facilities. Earthquakes with an energy release of over seven on the Richter scale have a history of occurrence in the area. From the same Chilean norm, NCh 433, the maximum ground acceleration is 0.3*g* in the planned process plant area and 0.4*g* for the proposed port area.

5.7 Comments on Accessibility, Climate, Local Resources, Infrastructure, and Physiography

The QB1 operations were conducted year-round, and it is expected that QB2 will also be year-round.

Infrastructure is planned to be located over three different sites, mine and concentrator, TMF, and port and desalination plant. There is sufficient suitable land available within Teck's concessions for the TMF, mine waste disposal, and mining-related infrastructure such as the open pit, process plant, workshops and offices. Teck holds sufficient rights to support port and desalination plant operations. Surface rights required for Project operation are discussed in Section 4.5.

6.0 HISTORY

6.1 Project History

Mineralization was identified at Quebrada Blanca as early as the 1800s. Mining activity, assumed to be in the period 1905–1930, included prospecting pits, shallow shafts and short adits. The underground mine workings were small, accounted for only small tonnage extractions, and there is no formal production record.

The QB1 mining operations commenced in 1994 to exploit and process supergene ore using a combination of leaching and SX/EW. This operation was originally designed to produce 75,000 t of cathode copper annually, but has reached as much as 85,000 t of cathode copper on an annual basis. The QB1 mining operations ceased in late 2018; however, the SX/EW plant will continue to produce cathodes throughout 2019 and 2020 from existing supergene leaching pads.

The QB2 mine plan was developed to mine and process hypogene ore below the supergene mineralization. The initial feasibility study on QB2, completed in 2012 (FS2012), was superseded in 2016 (FS2016). A new mine plan was developed in 2018, and forms the basis for this Report.

6.2 Production

From 2006 to 2018, a total of 75 Mt grading 0.819% CuS was mined and sent to the heap leach pads. An additional 144 Mt, grading 0.283% CuS was sent to the run-of-mine (ROM) dump leach operation. Approximately 777,032 t of copper cathode was produced by the operations during this period.

Table 6-1: Project History

Company	Active Period	Work Completed
Chile Exploration Company	1950s–1971	Claim staked
Chilean Geological Survey	1973–1975	Geological mapping program, IP and resistivity geophysical survey.
Codelco (Chuquicamata Division)	1975–1977	One core drill hole.
Superior Oil-Falconbridge Group	1977–1983	Optioned property. Exploration performed by subsidiary, Compañía Exploradora Doña Inés Limitada (Exploradora Doña Inés). Conducted detailed surface geological mapping, ground magnetic survey geochemical and mineralogical investigations, core drilling, underground tunnelling (2,600 m approx.), metallurgical test work (flotation, crushing, grinding, column tests), focusing on supergene mineralization. However, a small number of core holes (15 holes for 5,598 m) specifically targeted hypogene mineralization. Completed a pre-feasibility study on the supergene mineralization, and although results were positive, the Superior Oil-Falconbridge Group did not exercise the option due to the poor commodity prices prevailing at the time.
Empresa Nacional de Minería (ENAMI)	1983–1989	Acquired Codelco's interest in the property. Sought partners to help develop the property in 1989.
Cominco	1989	Acquired a property interest
Compañía Minera Quebrada Blanca S.A	1989–2000	Compañía Minera Quebrada Blanca S.A. formed 1989. Initial ownership was Cominco Ltd. (76.5%), ENAMI (10%), and Sociedad Minera Pudahuel (13.5%). Cominco subsequently sold 29.5% of its property share to Teck Corporation. Pre-feasibility and feasibility studies completed during 1990 and 1991 on the supergene mineralization, with a decision to commence mining in 1992. First cathodes produced in 1994.
Regional exploration by third-parties	1992–1999	Codelco, 1992: regional-scale airborne magnetic survey Noranda, 1999: a regional-scale hyper-spectral survey
Aur Resources	2000–2007	Purchased the Teck and Cominco interests to obtain their 76.5% interest in Compañía Minera Quebrada Blanca S.A. Continued to operate the SX/EW operation, and prioritized exploration and infill drilling for leach ore. Treatment of low-grade run-of-mine (ROM) material via dump leaching methods commenced in 2003. Limited hypogene exploration performed. Exploration activities included IP/resistivity surveys (2000, 2003); ground magnetic survey (2002); acquisition of Codelco and Noranda airborne geophysical survey data and data interpretation (2003); transient electro-magnetic (TEM) survey (2004). Ongoing core and RC drilling.

Company	Active Period	Work Completed
Teck	2007 to date	Acquired Aur Resources in 2007. Renamed to QBSA. Continued with active supergene mining operations, with material being sent to heap leach or the run-of-mine (ROM) dump leach; annual Mineral Resource and Mineral Reserve estimates completed on the supergene mineralization. Undertook core and RC drilling, metallurgical test work, environmental studies, Mineral Resource and Mineral Reserve estimation in support of evaluation of the hypogene mineralization. Engineering studies on the hypogene mineralization included: advanced scoping study, 2009; tailings management site location study, 2009; pre-feasibility study, 2010; initial feasibility study, 2012; update feasibility study, 2016. Geological interpretations updated based on additional drilling from 2012 to 2018 support an updated resource model and mine plan. Announcement of SMM/SC transaction in late 2018.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Quebrada Blanca porphyry copper deposit is hosted in the middle Eocene to early Oligocene metallogenic belt of northern Chile, which coincides throughout much of its length with the Domeyko Fault System. This fault system formed as an intra-arc structural feature by contractional deformation during the Incaic tectonic event. Along the Andean margin, the Incaic tectonic event caused crustal shortening, uplift, and thickening, followed by a stage of weak crustal extension in the early Oligocene. Figure 7-1 shows the locations of Chilean metallogenic belts and major deposits in the region.

7.2 Project Geology

The Quebrada Blanca deposit is located east of the Domeyko Fault, a major structural feature that is interpreted in part to have controlled the emplacement of other giant Eocene–Oligocene porphyries to the south of the mine, including the third-party owned Chuquicamata, Escondida, El Abra, and El Salvador deposits (Figure 7-1). The Quebrada Blanca deposit is part of a set of porphyry systems forming the Collahuasi district (Figure 7-2) including the Ujina, Rosario and Copaquire (La Profunda) porphyry deposits (held by third parties).

Pre-Permian rocks are not exposed around Quebrada Blanca. The oldest known rocks are a Permo–Triassic calc–alkaline succession of sub-aerial and sub-aqueous, andesitic to rhyolitic volcanic flows of the Collahuasi Formation. The volcanic units are locally interbedded with minor volcaniclastic rocks, limestone and mudstone. A co-magmatic north–south-trending granodioritic to dioritic batholith intruded the volcanic sequence.

To the northwest of the Quebrada Blanca deposit, sedimentary rocks of the Quehuita Formation unconformably overlie the Collahuasi Formation. The formation consists of deep to shallow marine limestone, calcareous sandstone, arenites, and conglomerates.

The Cretaceous Cerro Empexa Formation crops out to the west and southeast of the Quebrada Blanca area, and is composed of dacite lavas, volcaniclastic breccias, and interbedded arenite and conglomerates. Granite stocks of 95 Ma age have intruded the Cerro Empexa Formation.

An Eocene to early Oligocene igneous suite subsequently intruded the earlier rocks, and is associated with the copper porphyry mineralization in the Quebrada Blanca and Collahuasi districts.

Figure 7-1: Locations of Metallogenic Belts and Major Deposits in Northern Chile

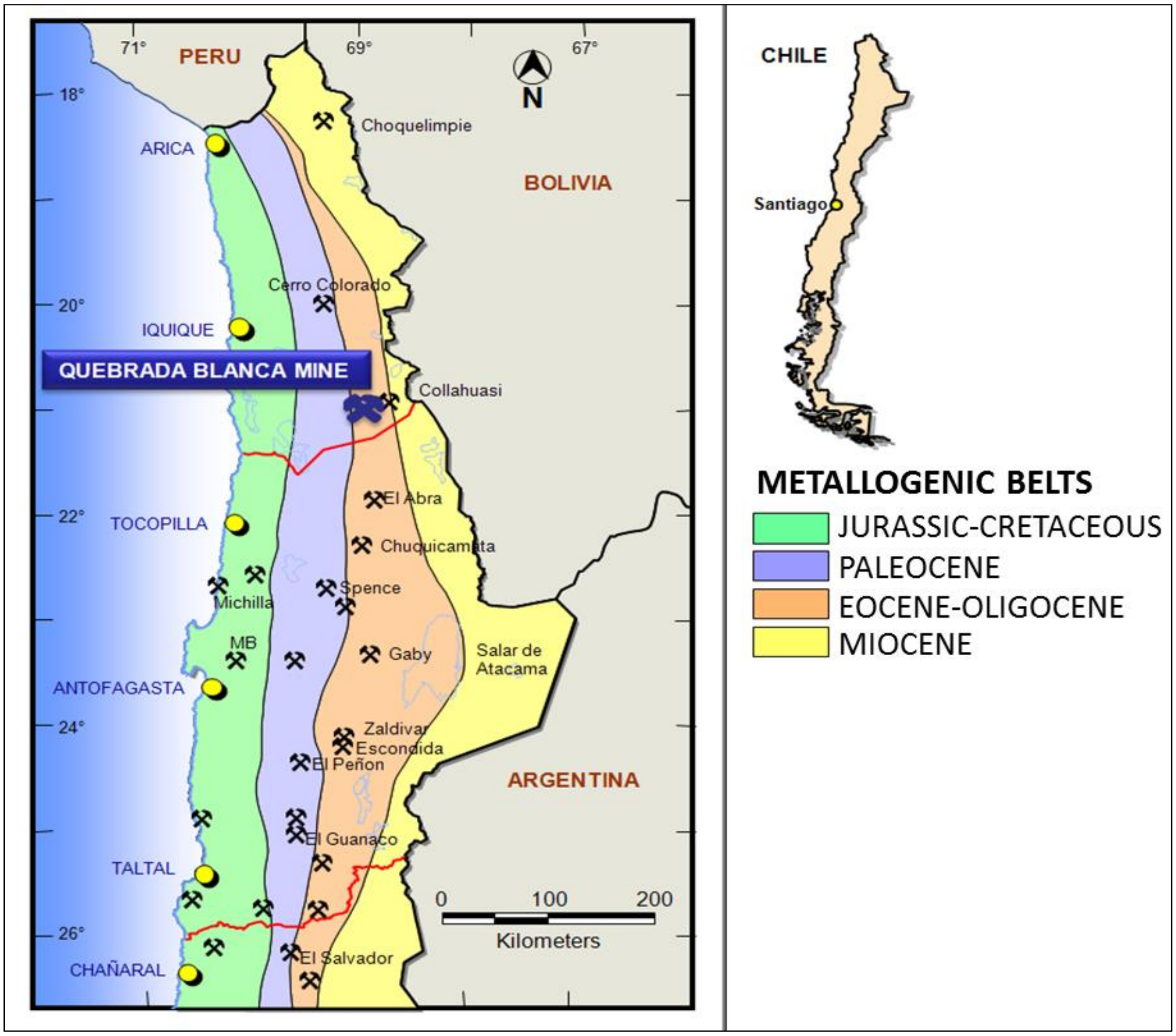


Figure prepared by Teck, 2016. Deposits other than Quebrada Blanca shown in the figure are held by third-parties.

Figure 7-2: Regional Geology Map of the Quebrada Blanca–Collahuasi District

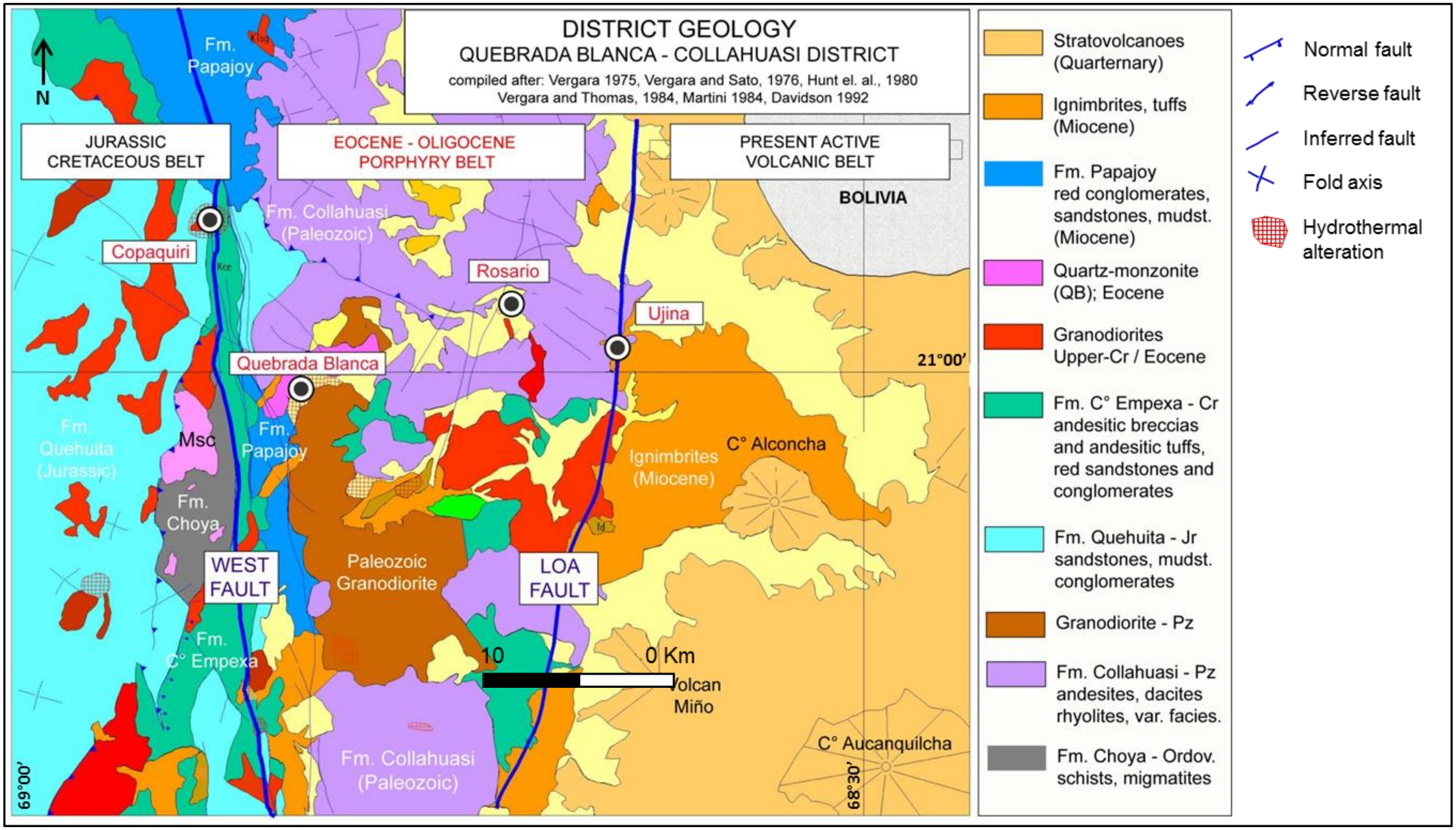


Figure prepared by Teck, 2016. Deposits other than Quebrada Blanca shown on the figure are held by third-parties

7.3 Deposit Geology

7.3.1 Overview

Quebrada Blanca has a complex magmatic and hydrothermal history that includes a polyphase intrusive complex, multiple cross-cutting breccia facies, and at least three separate hydrothermal stages.

The intrusive complex is hosted in Collahuasi Formation rocks. The initial intrusive phase consisted of Paleozoic quartz monzonite to granodiorite and diorite. These rocks were in turn intruded by pre- to syn-mineral feldspar porphyries and syn-mineral hydrothermal breccias that were emplaced along northeast–north–northeast-trending faults (Figure 7-3). The hydrothermal breccia is interpreted to be a single event, with textural and hydrothermal facies representing different energy conditions and hydrothermal zonation.

The deposit is divided into four domains or blocks (Figure 7-4), with the south and east blocks containing most of the mineralization. The blocks have different oxidation, alteration, and lithology characteristics. The western block, limited by a major northwest fault, the DDH-49 fault, is characterised by alteration features indicative of deeper parts of a porphyry system, and has been well drilled out. The eastern block has alteration facies consistent with the upper levels of a porphyry system, and is not as well drilled out. The northeastern-most block shows intermediate-level alteration features and has the least drill information.

Supergene leaching of the upper portions of the deposit and subsequent remobilization of copper produced supergene mineralization consisting of chalcocite and, to a lesser degree, copper oxides such as atacamite, cuprite, and locally brochantite.

7.3.2 Structure

The emplacement and geometry of the quartz monzonite to granodiorite stock, feldspar porphyritic intrusions and the hydrothermal breccias are controlled by two structural corridors oriented to the northeast, and to a lesser extent by northwest-oriented faults. The deposit structural model is interpreted from measured faults and fractures in the pit and at depth in drill cores. Figure 7-5 is a plan view showing the major faults; Figure 7-6 is a structural cross-section.

Figure 7-3: Geology Map of Quebrada Blanca

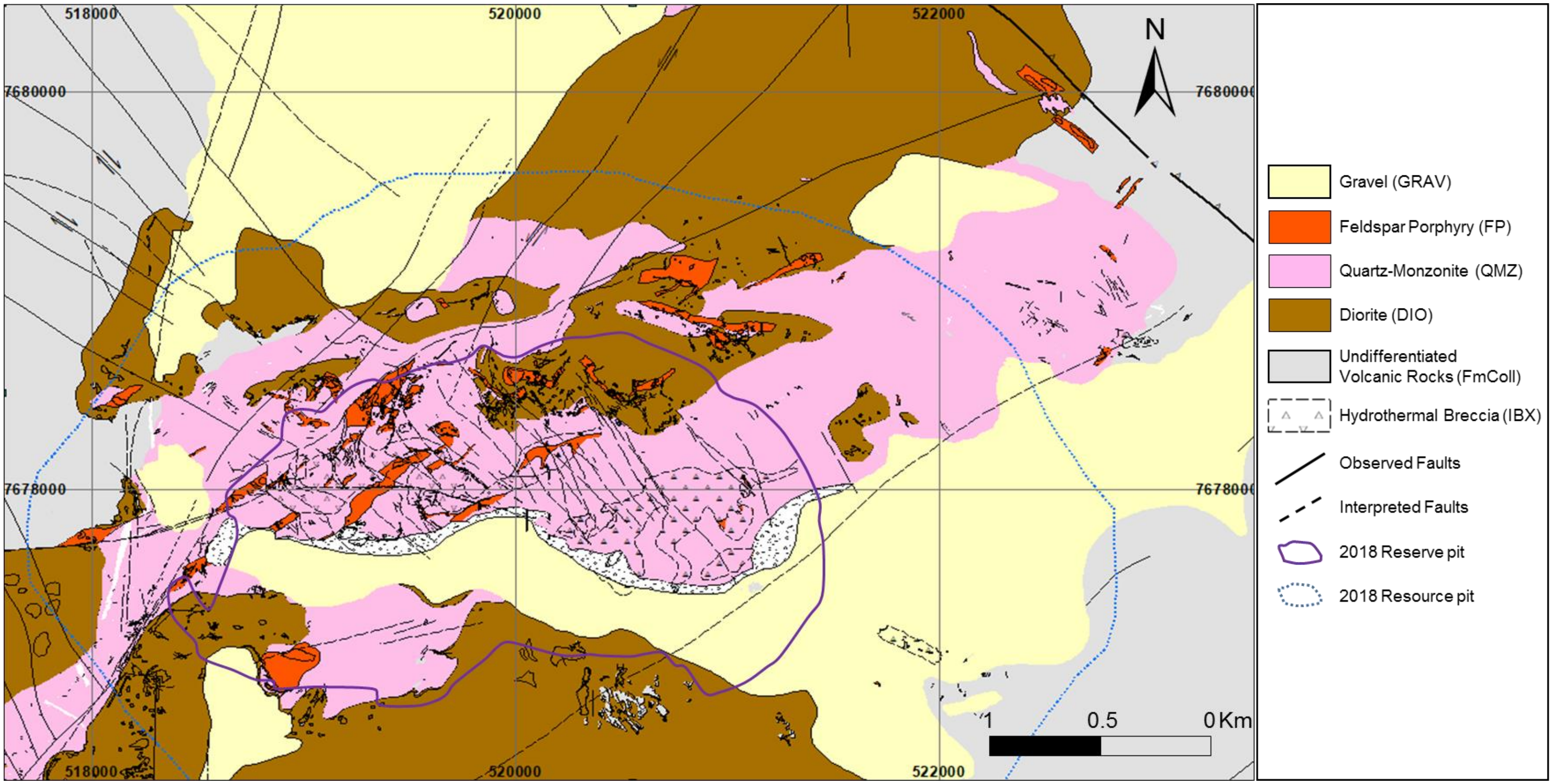


Figure prepared by Teck, 2018

Figure 7-4: Structural Domains and Boundary Faults

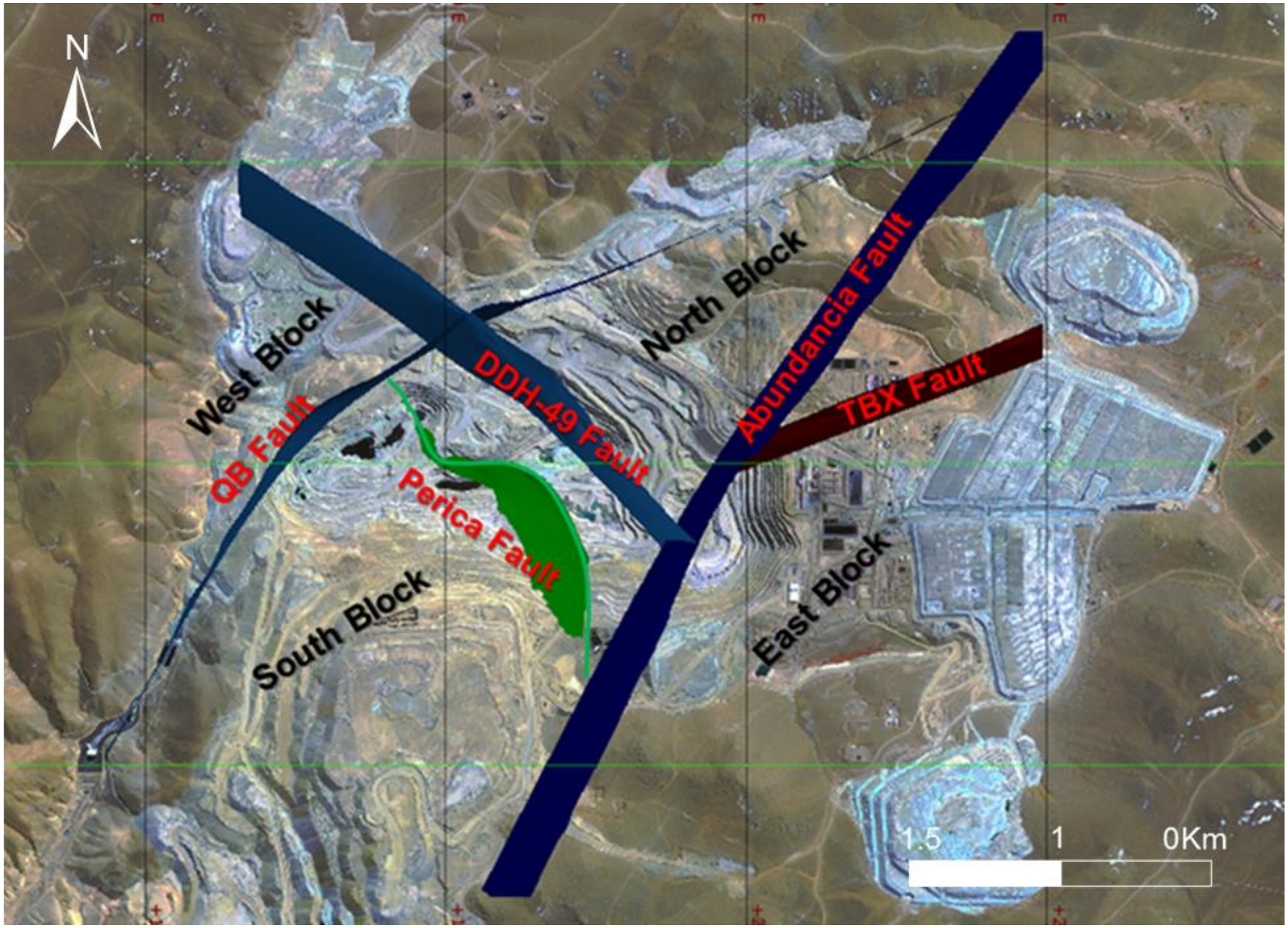


Figure prepared by Teck, 2018.

Figure 7-5: Structural Plan View

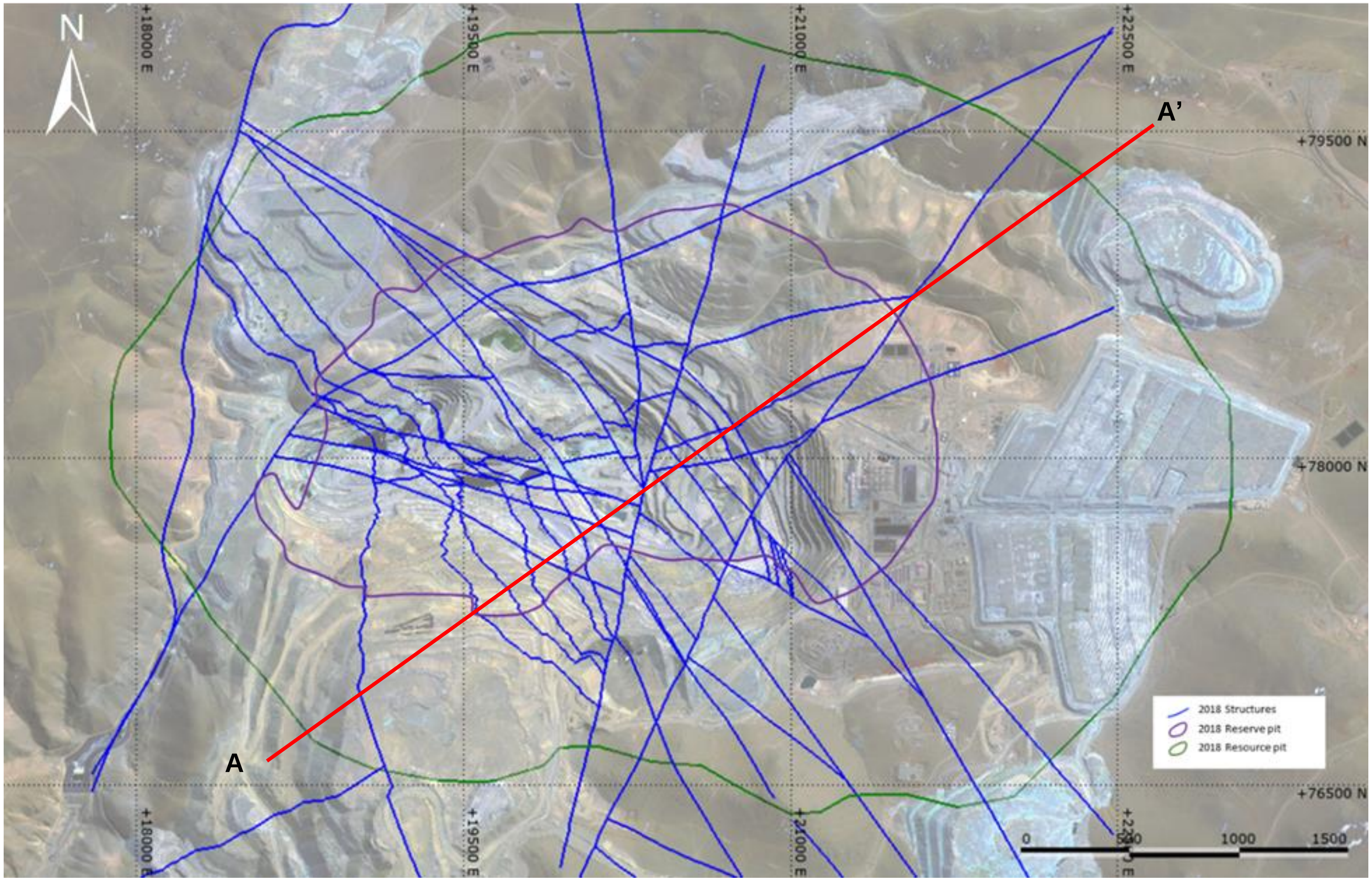


Figure prepared by Teck, 2018. Interpreted faults shown in blue. Cross-section line indicates the approximate location of Figure 7-6.

Figure 7-6: Southwest–Northeast Longitudinal Structural Section

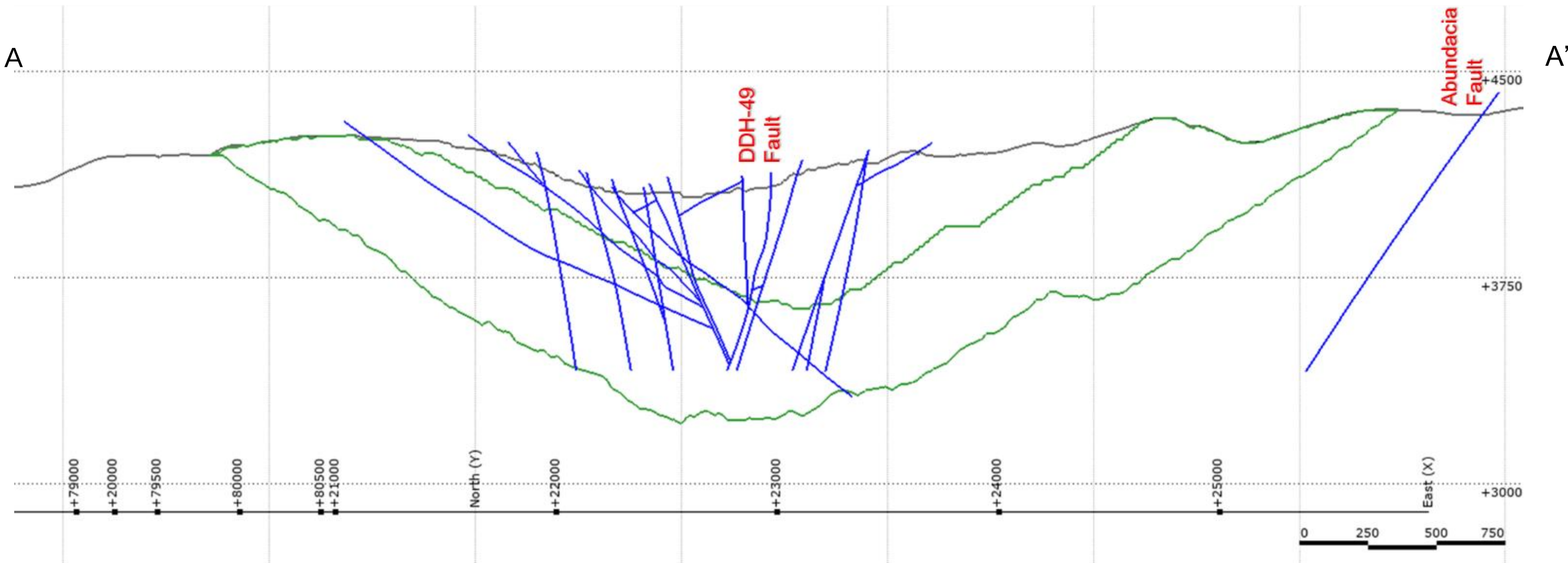


Figure prepared by Teck, 2018. Blue lines are fault traces. Green outlines are pit shapes.

The primary structural control on lithology, grade and early stage alteration corresponds to east–northeast-trending faults dipping either to the south (in the west) and to the north (in the east). The northwest-oriented faults controlled a late-stage alteration, pre-supergene enrichment as well as horizontal and vertical structural block displacements. These faults show normal movement not exceeding 45 m as observed in the field.

North–northwest-oriented faults have a normal displacement of approximately 80 m, mainly affecting the gravel units. These structures appear as oblique normal faults; however, the fault movement age is later than about 14 Ma, as shown by offsets in the overlying Tertiary gravel. No movement has been observed along the east–northeast-trending faults.

The Quebrada Blanca, DDH-49, Abundancia and/or the TBX faults limit the structural blocks.

7.3.3 Lithologies

Table 7-1 summarizes the major deposit lithologies. Figure 7-7 and Figure 7-8 are plan views showing the deposit geology.

Collahuasi Formation (FCOLL)

The Collahuasi Formation generally consists, in the Quebrada Blanca area, of Permian sub-aerial and sub-aqueous dacite and rhyolite volcanic flows of with minor volcaniclastic rocks.

Diorite (DIO)

The Paleozoic diorite consists of a dark green to black equigranular diorite to quartz-diorite, with 1–5% quartz; 65–80% plagioclase; 10–35% plagioclase, amphibole, and biotite; and <5% potassium feldspar and magnetite. The unit appears mostly in the northern portion of the open pit but is also found to some extent in the southern part of the deposit. The diorite has been affected by a regional or early metasomatic event of biotite (hornfels) and local hydrothermal alteration and mineralization associated with the porphyry.

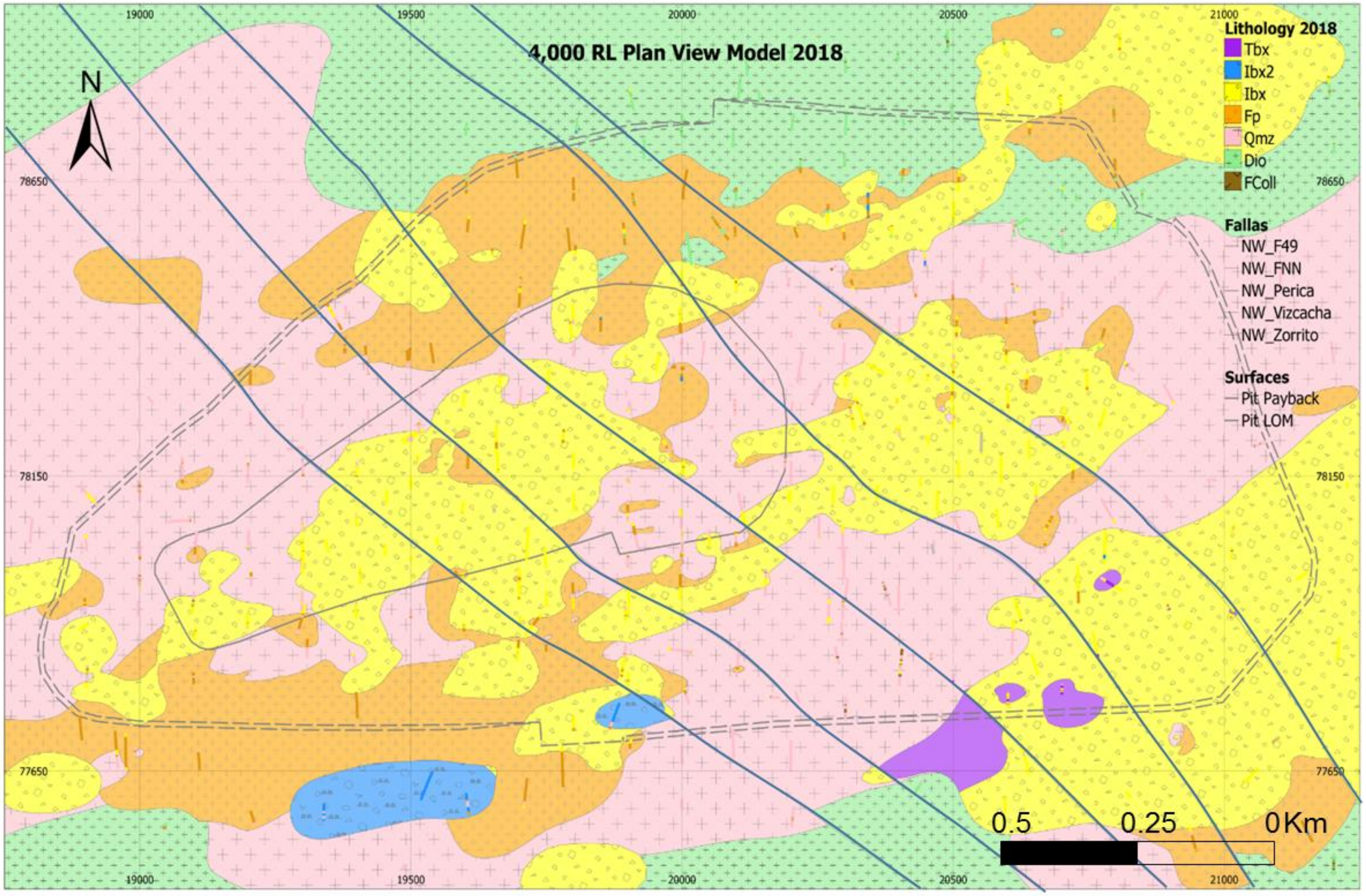
Quartz Monzonite (QMZ)

The Permian quartz monzonite to granodiorite stock is considered to be a pre-mineral intrusion. Petrological investigations done by Teck staff on a few samples and chemical analyses performed by consultants have shown that the unit mapped as quartz monzonite actually corresponds to a range of compositions. The unit is primarily a granodiorite, but quartz diorite, quartz monzonite, and porphyritic quartz monzonite phases are also present.

Table 7-1: Major Lithologies

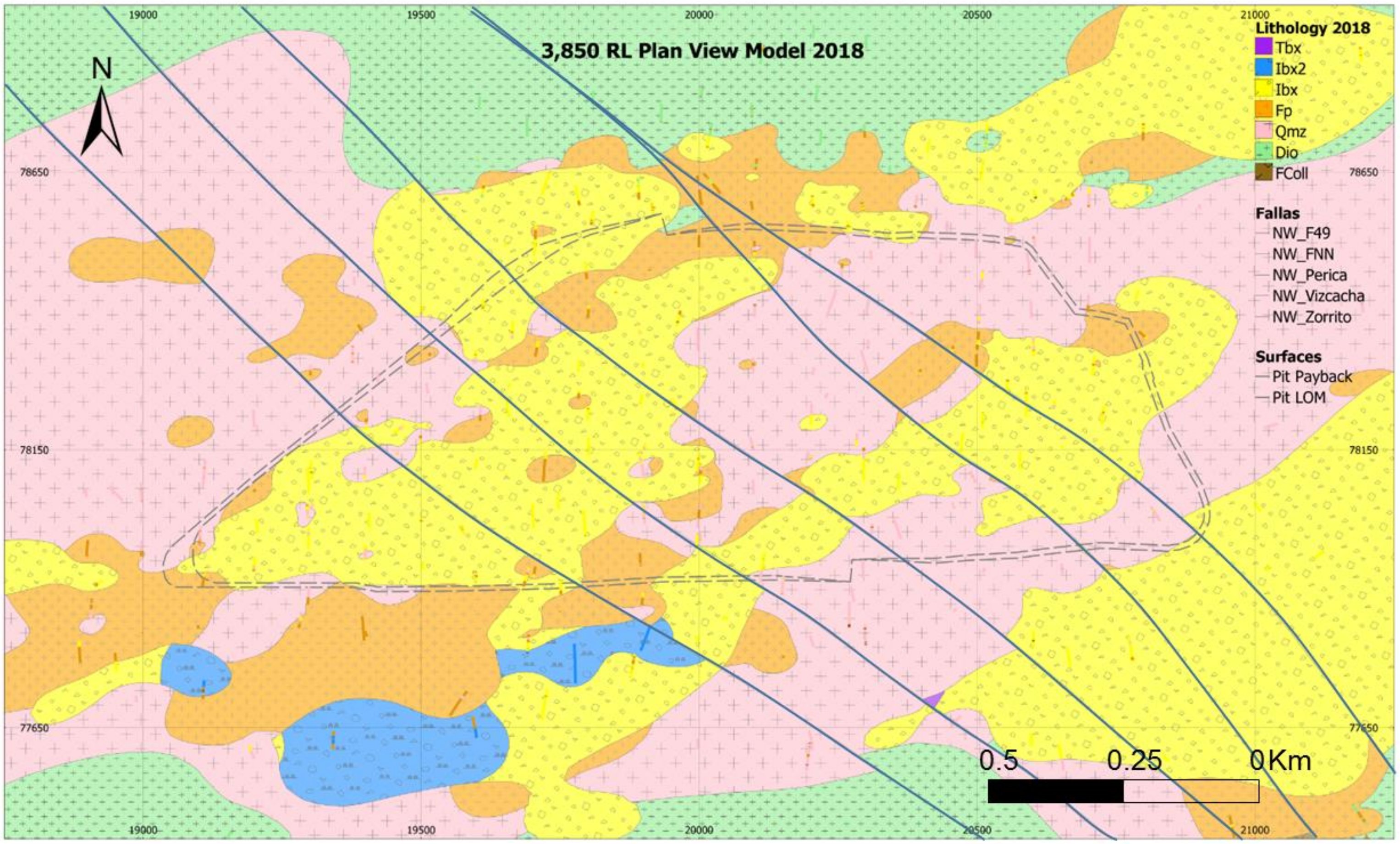
Lithology or Unit	Code	Description	Age
Gravel	GRA	Tertiary gravel	Tertiary
Andesite dikes	AND	Aphanitic to micro-porphyritic green andesite dikes	Uncertain
Tourmaline breccia	TBX	Cement-supported tourmaline dominant polymictic breccia.	Eocene
Late hydrothermal breccia	IBX2	Polymictic matrix-supported hydrothermal breccia interpreted as a border expression of hydrothermal breccias and is related to faults	Eocene
Hydrothermal breccia	IBX	Polymictic hydrothermal breccia including a number of subunits (HBCm, HBM, HBCmQF). Hydrothermal breccia facies vary from cement-dominated to cement plus matrix dominated, clasts include QMZ, FP, DIO	Eocene (~34.5 Ma)
Quartz-feldspar porphyry	FP	Pre to syn-mineral quartz feldspar porphyry dikes consists of two types of porphyry dike: crowded quartz feldspar porphyry (FP1) and groundmass-rich quartz feldspar porphyry (FP2).	Eocene (37.5–36.1 Ma)
Quartz monzonite	QMZ	Quartz-monzonite to granodiorite stock intruding the Collahuasi Formation	Permian (295.2–294.8 Ma)
Diorite	DIO	Dark green to black equigranular diorite to quartz-diorite	Late Carboniferous to Middle Triassic
Collahuasi Formation	FCOLL	Andesitic dacitic and rhyolitic facies volcanic rocks and sedimentary rocks	

Figure 7-7: Geological Plan View, 4,000 RL



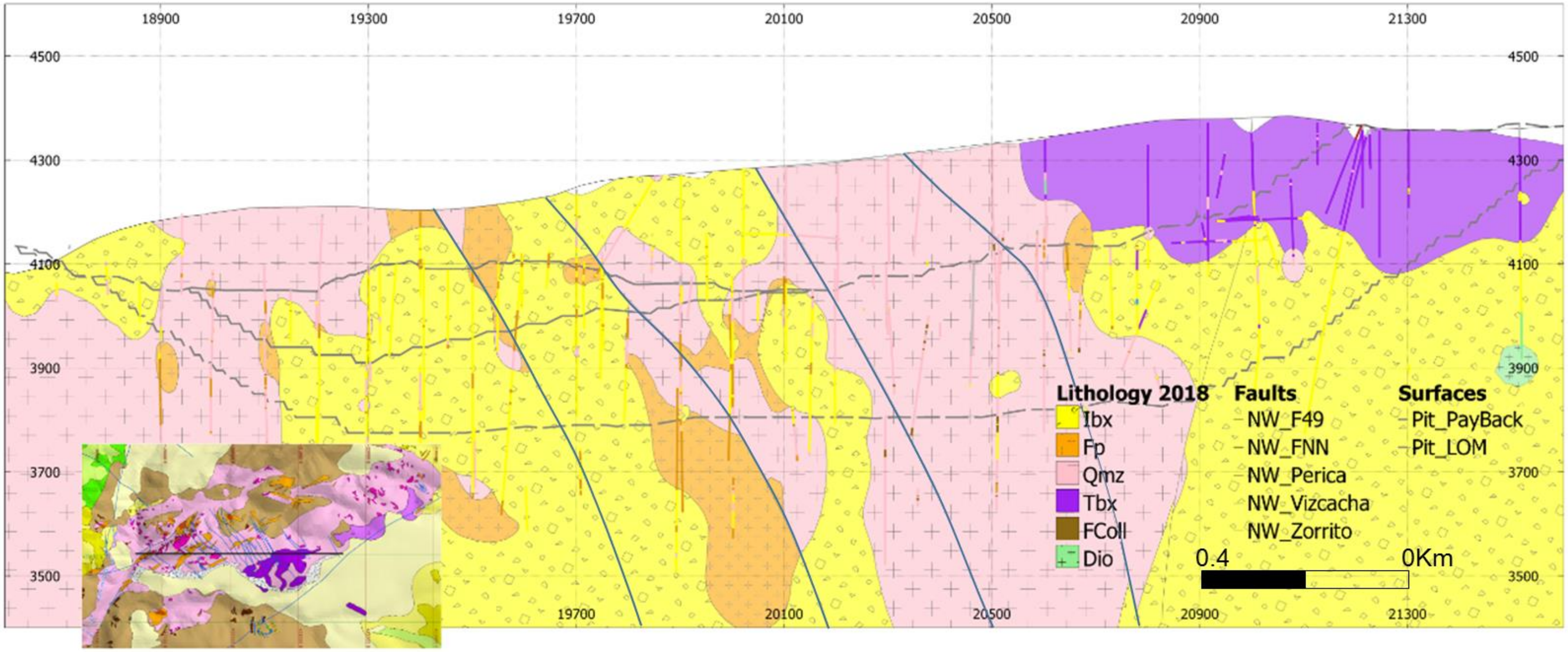
Note: Figure prepared by Teck, 2018.

Figure 7-8: Geological Plan View, 3850 RL



Note: Figure prepared by Teck, 2018.

Figure 7-9: Longitudinal Geological Section (78,000 N)



Note: Figure prepared by Teck, 2018. Figure looks north.

Feldspar Porphyries (FP1 and FP2)

A series of syn-mineral granodioritic feldspar porphyry dikes have invaded the central portion of the quartz-monzonite stock. The majority of the dikes are steeply southeast- to northeast-dipping and northeast–north–northeast-trending, which is roughly parallel to the elongation of the quartz monzonite stock.

The crowded porphyry (FP1) dikes have been dated at between 37.5 and 36.5 Ma (U–Pb on zircon). They are grey in colour and are characterized by phenocrysts of predominantly plagioclase with fewer quartz and biotite. The percentage of phenocrysts can vary from <30–>50%, suggesting there may have been multiple injections. Some contact relationships have, in fact, shown a later event of similar composition but different texture, with smaller amounts of phenocrysts and a grey matrix. These phases have been named FP2 and are dated at 36.4 and 36.1 Ma. The two types of intrusive unit are separately logged; however, they are modeled for estimation purposes as a single unit. The spatial extension of FP2 appears to be more restricted than FP1.

The dikes have been cut by a hydrothermal breccia event and have been, in many cases, been incorporated as blocks or fragments within the breccia.

Igneous Breccias (IBFP1, IBFP2, IBQMZ, IBDIO)

Several igneous breccias (IBFP1, IBFP2, IBQMZ, IBDIO) have been recognized and are interpreted to have formed during the intrusion of feldspar porphyries or the quartz monzonite stock into their host units, since they always occur at the border of the intrusions. They may locally be mineralized due to their permeability to hydrothermal fluids. They are generally clast-supported breccias with some occasional matrix-supported breccias. These breccias have been included in their corresponding coherent units, depending on the nature of the matrix and with which intrusion they were formed.

Hydrothermal Breccias (IBX)

Hydrothermal breccias are varied in their matrix and cement content and nature. The proportion of matrix versus cement can be challenging since similar minerals, such as biotite, occur in both matrix and cement. In general, the breccias were differentiated by the type of cement and are described below, but for modelling purposes, all hydrothermal breccias were modeled as a single breccia body, except for HBMx which is a matrix-dominant breccia and TBX which was historically separately modelled. In general, they are cement- to clast-supported, monomictic to polymictic breccias. Hydrothermal breccias, cement-dominant with varied composition or overprinted by supergene events are named HBCm. Locally, a breccia with a cement dominantly composed of K-feldspar and quartz, with local subordinate biotite, correspond to HBCmQF. The grainsize of potassium feldspar and quartz can be variable, from very coarse (almost pegmatitic) to fine.

In the east of the deposit, a breccia body with a vertical zoning has been described and consists of a deep, biotite-dominant cement, grading upward to biotite–magnetite and finally into a tourmaline breccia at shallow levels. The lower parts of this breccia are characterized by biotite as cement with trace magnetite (HBB). A biotite–magnetite cement breccia in which the magnetite contents are variable and can be dominant over biotite is named HBM. Quartz is in general also present in the cement. Finally, a tourmaline breccia occurs at shallow levels (TBX) and since it has been modelled separately, it is described in the next subsection.

Tourmaline Breccia (TBX)

This breccia is characterized by a cement composed of tourmaline and quartz. In general, when the unit is well developed, it is cement supported and can be monomictic or polymictic with angular clasts.

Hydrothermal Breccia 2 (IBX2)

IBX2 (also called HBMx) is a hydrothermal, dark-colored, matrix-supported, polymictic breccia. Clasts are generally rounded, and can include all lithologies. The matrix is locally fine-grained. The brecccia is interpreted to be a border expression of a hydrothermal breccia and to generally occur near faults. Grades are typically lower in this breccia.

Andesite Dikes (AND)

A series of narrow, aphanitic to micro-porphyritic green andesite (AND) dikes trending east–northeast and north–northeast containing up to 10% subhedral plagioclase crystals (to 0.5 mm in size) are also present. These dikes appear to post-date most of the intrusive rocks, but may pre-date the igneous breccias, as dike fragments are frequently present within the igneous breccia.

Gravel (GRAV)

Tertiary polymictic gravels occur in the deposit area and consist of 2–64 mm clasts, formed from the erosion of pre-existing rocks.

7.3.4 Alteration

Alteration zoning patterns at Quebrada Blanca are typical of porphyry copper deposits, and a detailed paragenetic sequence has been established. The three major alteration stages include:

- Potassic alteration event: Defined by secondary K-feldspar and biotite with associated biotite veinlets (EB), dark mica veins (EDM with biotite and green mica), and A veins (mainly quartz with K-feldspar halos). Brecciation occurred during the potassic event, permitting these hydrothermal minerals to develop locally as breccia cement. Chalcopyrite ± bornite occur as disseminations, in veins and/or in the cement of the breccia;

- Transitional alteration event: Consists of grey-green sericite (SGV) and quartz as cement in breccias and/or as veins in coherent rocks. Quartz veins with sulfides (chalcopyrite and molybdenite and B veins) occur in this event as well as a biotite-, or biotite–magnetite- and chalcopyrite-cemented hydrothermal breccia;
- Late alteration event: Consists of sericite–quartz–pyrite (phyllic; QS alteration) mainly as planar veins showing a prominent alteration halo (typical of D veins) and intermediate argillic alteration with kaolinite–smectite clays dominant.

Table 7-2 provides a summary the main characteristics of the different alteration types. Figure 7-10 and Figure 7-11 show the alteration in plan and section view, respectively.

7.3.5 Mineralization

Mineralization consists of supergene (chalcocite and, to a lesser degree, copper oxides such as atacamite, cuprite, and locally brochantite) and hypogene (chalcopyrite, bornite, molybdenite) mineralization.

Supergene Zone

Secondary mineralization appears to be preferentially concentrated close to structures and more permeable rocks. The leach cap varies from about 7–200 m in thickness, whereas the thickness of the secondary copper zone ranges from 10–200 m. Continuous supergene copper mineralization has been traced over a 2.5 x 1.5 km area. The lower portions of the secondary enrichment zone transition into primary copper mineralization, resulting in a mixed low-grade ore type that was processed through run-of-mine (ROM) dump leaching.

Hypogene Zone

In the hypogene environment, mineralization occurs mainly as disseminated, veinlet-like and breccia cement mineralization following an east–northeast-trending area of about 2 x 5 km that is hosted within the Paleozoic quartz-monzonite to granodiorite, feldspar porphyry intrusions, and breccias. Drill holes have intersected mineralization over 1,000 m vertical depth in the hypogene zone.

Table 7-2: Major Alteration Types

Alteration	Code	Description
Contact metasomatism	Biomet	Affects the diorite on the outer edges of the deposit. Characterized by the development of biotite, quartz, and some pyrite. Locally, can incorporate some mineralization as an early stage or result in an overprinting of the early biotitization; however, it is generally non-mineralized. Can contain elevated levels of silica.
Argillic	ARG	Last alteration stage; characterized by supergene minerals such as kaolinite and montmorillonite. The argillic alteration distribution correlates with well-developed phyllic alteration zones.
Propylitic	Prop	Pervasive chlorite and epidote assemblage. Locally, veins of actinolite, epidote, calcite, magnetite, and specularite have been observed. Forms the outermost halo around the potassic core, enlarging the hydrothermal footprint to a conservative estimate of 6 x 5 km.
Phyllic	QS	Sericite, quartz, pyrite with local chalcopyrite. Occurs in the shallow parts of the deposit and deepen along structures.
Green mica	GMica	Quartz–K feldspar–biotite–phlogopite–muscovite–corundum–andalusite alteration assemblage. Zones of moderate to intense green mica alteration coincide with copper grades >0.5%. The alteration type corresponds to the transitional alteration event. This alteration occurs mainly in the western portion of the deposit.
Potassic	K-Feld; Bio	Potassic alteration is associated with the QMZ stock, IBX, and FP dikes. The alteration type has an overall east–northeast trend. K-feldspar dominant alteration: primary feldspars are replaced or overgrown by K-feldspar. An increase in the intensity of the K-feldspar alteration is observed in the southern portion of the deposit and at depth. Biotite dominant alteration: secondary biotite replaces primary mafic minerals and fine-grained biotite.

Figure 7-10: Alteration Plan View (level 3850 m)

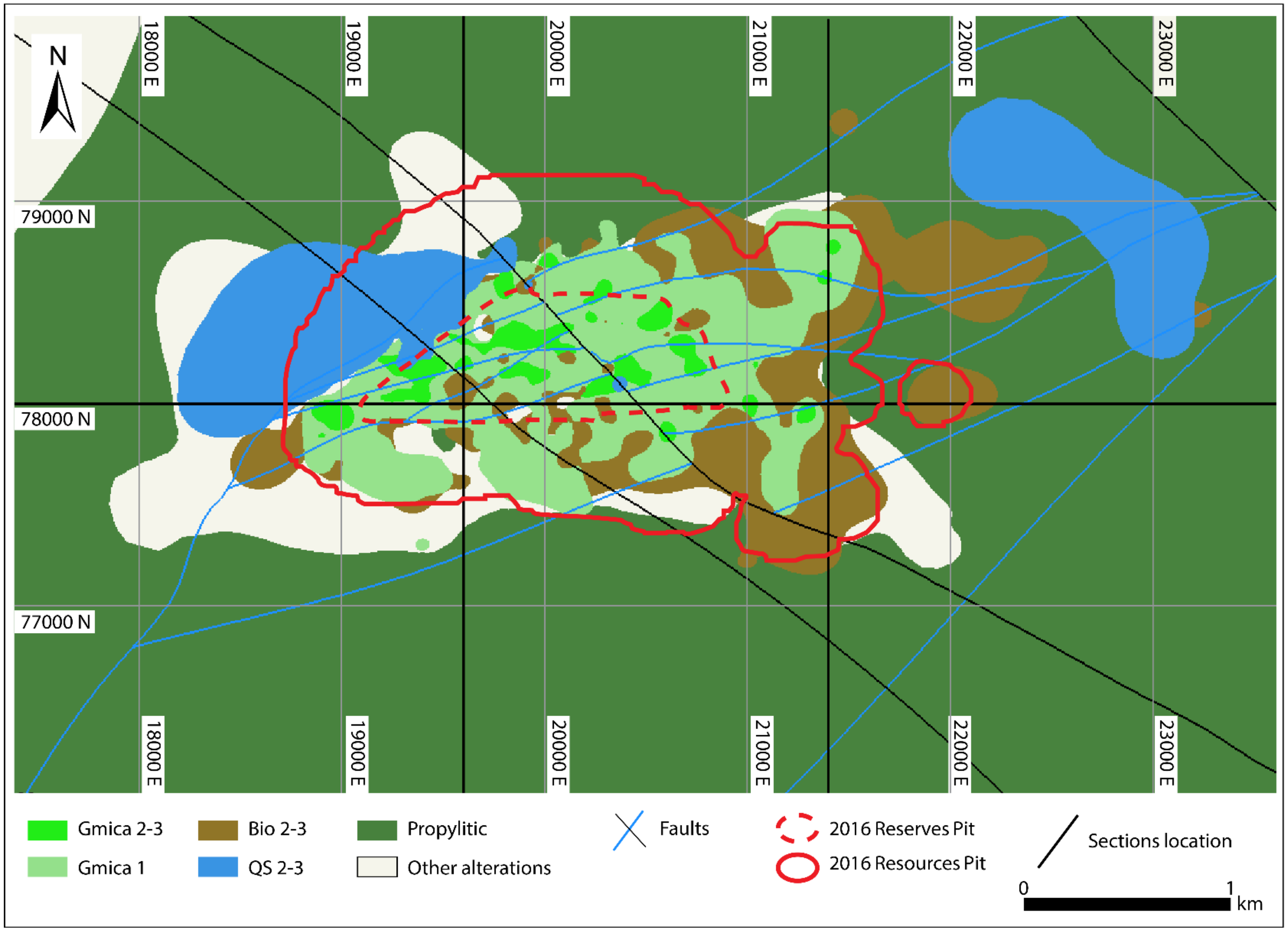


Figure prepared by Teck, 2016.

Figure 7-11: Longitudinal Alteration Section (78,000 N)

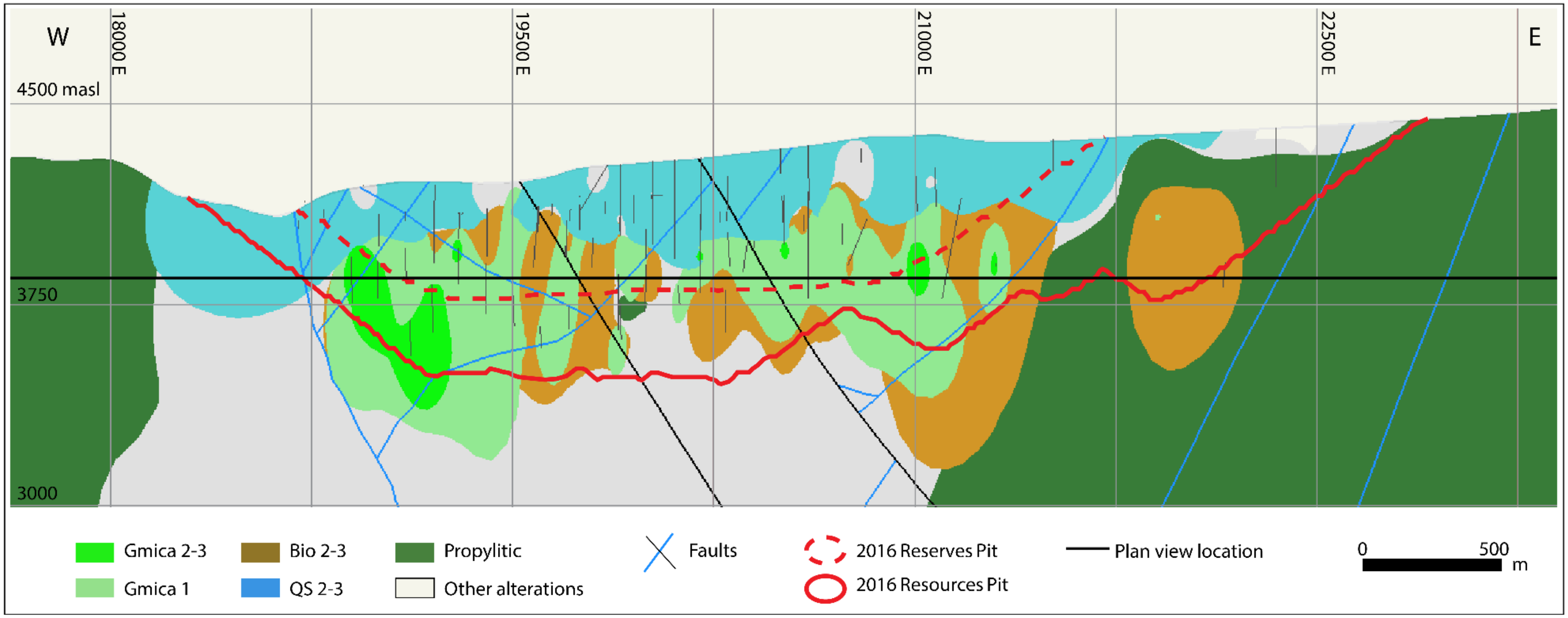


Figure prepared by Teck, 2016. Grey lines on figure are drill traces projected to the section. Figure looks north.

Hypogene mineralization remains open to the west, northeast, east, southeast, and at depth.

Mineralization displays the following trends:

- East–northeast trend:
  - Bornite mineralization forms two distinct zones that are interpreted to represent two different mineralizing centers as they do not spatially coincide with the higher copper grade areas hosted in chalcopyrite. Bornite presence is concentrated mainly in south-western part of the pit and in the north-eastern part of the east–northeast corridor that controls the porphyry and breccia intrusions;
  - Chalcopyrite is controlled by the east-northeast trend in early potassic alteration as well as in transitional grey–green sericite and magnetite–chalcopyrite;
  - Molybdenite mineralization is controlled by the same east–northeast-trending structures controlling higher copper grades (>0.5% Cu), but is also associated with northwest-trending structures in the eastern portion of the deposit;
- Northwest trend:
  - Pyrite distribution is generally related to quartz–sericite alteration and highly concentrated in late veins, typical of the northwest principal faults where they also control supergene copper mineralization characterized by chalcocite and minor covellite;
  - Gold and silver distributions correlate with mineralization grading >0.5% Cu.

The locations of higher metal grades also appear to be structurally controlled, with grades increasing towards the hanging wall of the main fault. Apart therefrom the general mineral distributions described, locally, occurrences of these minerals outside of the main trends can occur.

shows the distribution of the copper sulphide mineralization. Figure 7-13 is a longitudinal section showing copper sulphide mineralization, and Figure 7-14 shows the copper grade shells in a longitudinal view.

7.3.6 Mineralization Zone

The mineralization zone defines the copper sulphide assemblages based on the environment they formed in and the copper mineral species. The initial calculation was focused on the supergene zones and used during the QB1 supergene mining phase. The calculation was updated to describe the transition and primary zones of the hypogene mineralization within QB2.

Figure 7-12: Copper Sulphide Mineralization Plan (level 3850 m)

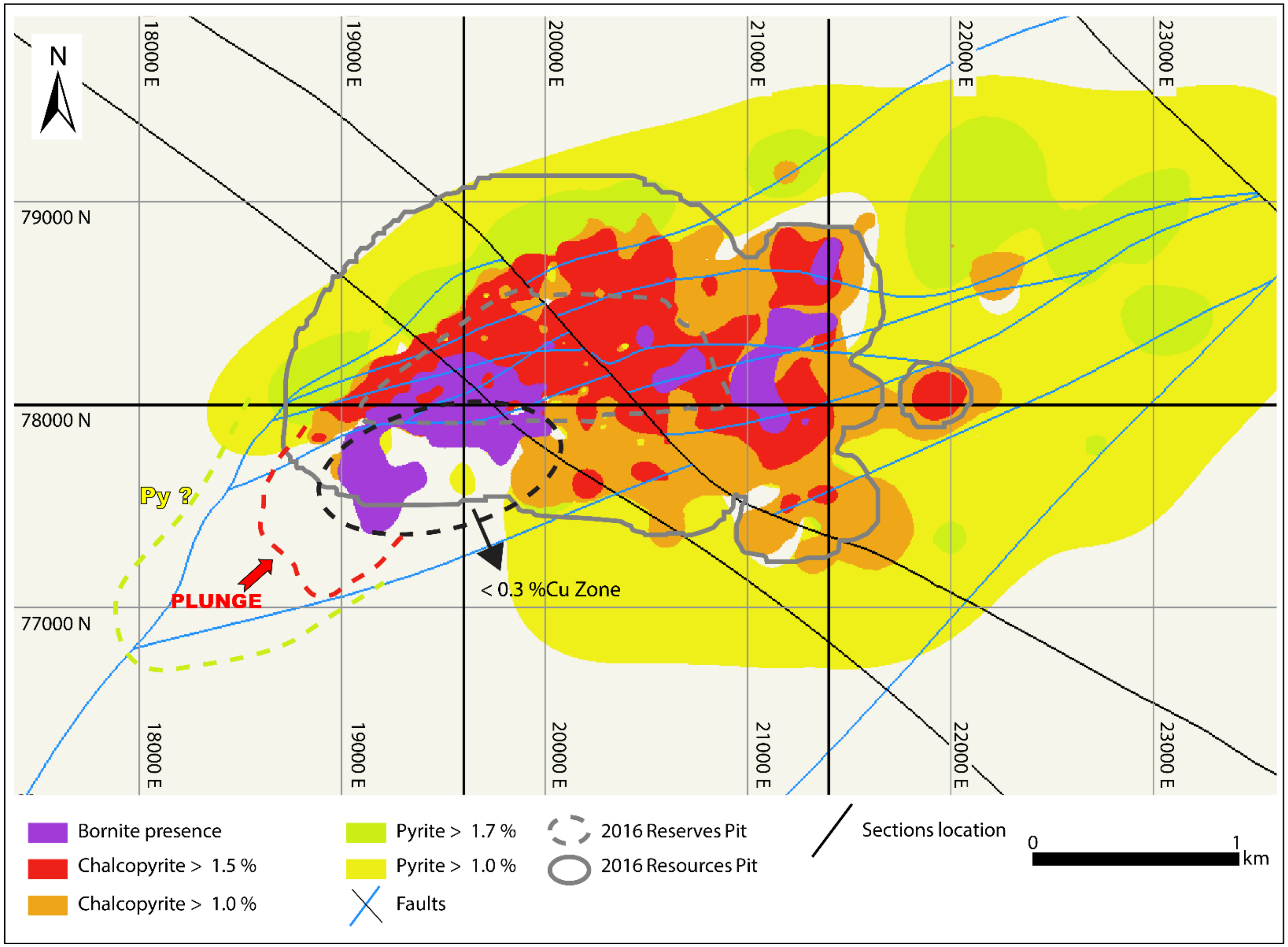


Figure prepared by Teck, 2016.

Figure 7-13: Longitudinal Copper Sulphide Mineralization Section (78,000 N)

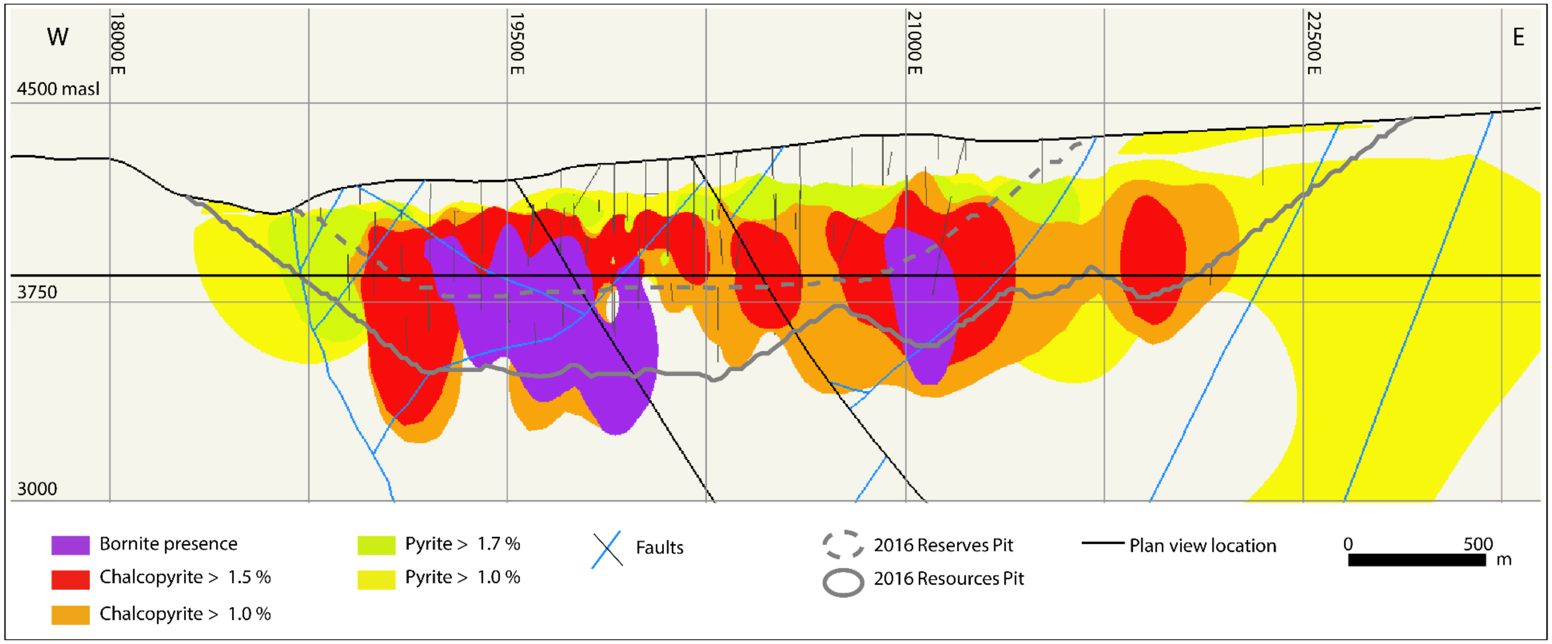


Figure prepared by Teck, 2016. Grey lines on figure are drill traces projected to the section. Figure looks north.

Figure 7-14: Longitudinal Copper Grade Shell Section (78,000 N)

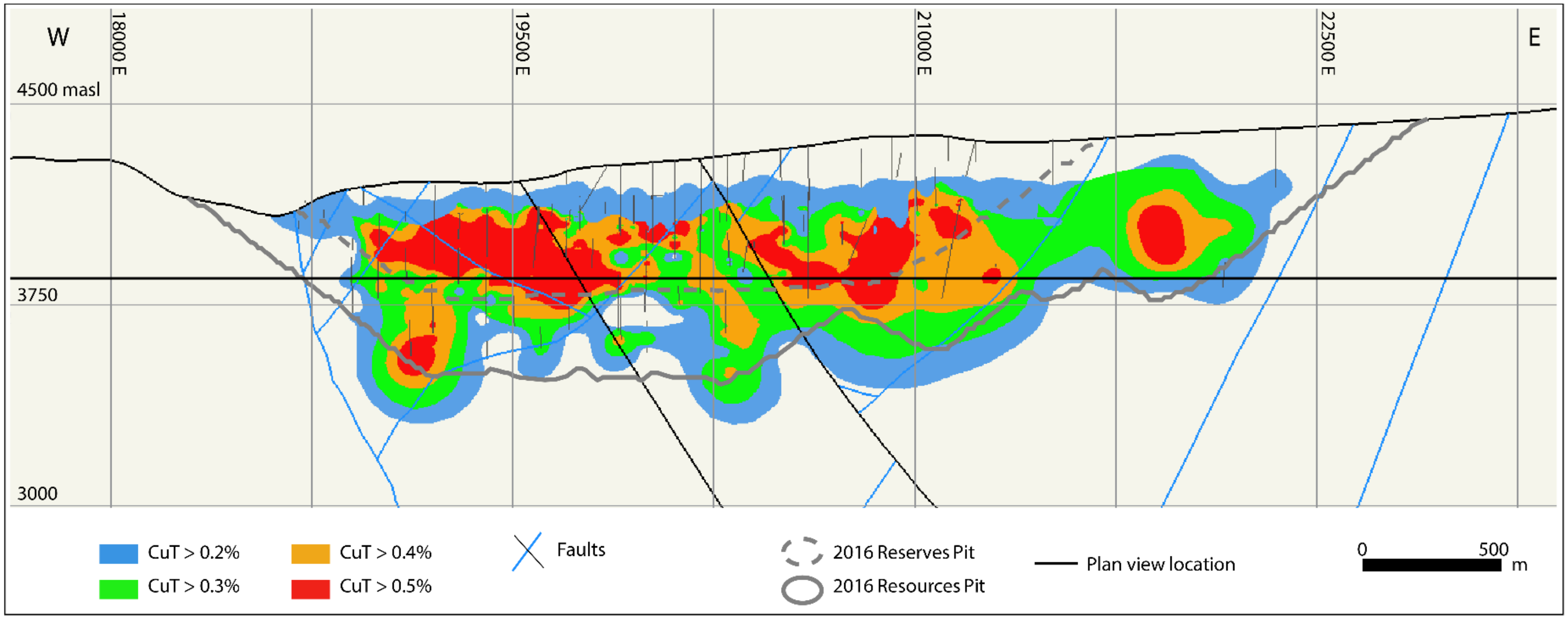


Figure prepared by Teck, 2016. Grey lines on figure are drill traces projected to the section. Figure looks north.

Several assumptions are made to enable consistency in the calculation. All sulphur deports to sulfides, which is supported by mineralogical data (quantitative evaluation of materials by scanning electron microscopy (QEMSCAN) mineralogical data on 250 geometallurgy samples). In addition, the sequential copper analyses have the following assumptions:

- In the supergene zone:
  - No bornite is present;
  - All CuCN correspond to chalcocite and covellite;
  - All CuSH correspond to oxides;
  - All CuRes correspond to chalcopyrite;
- In the primary (hypogene) zone:
  - All CuCN correspond to bornite;
  - All CuSH is low to inexistent;
  - All CuRes correspond to chalcopyrite.

The mineralization zone (“min-type” in the database) used for interpretation and modelling corresponds to a calculation based on sequential copper assays for all zones and with visual logging for the leached zone. The detailed logic to define and assign the mineralization zones is shown in Figure 7-15.

7.4 Comments on Geological Setting and Mineralization

The understanding of the deposit setting is acceptable to support Mineral Resource and Mineral Reserve estimation and mine planning.

Figure 7-15: MinType Definition Logic

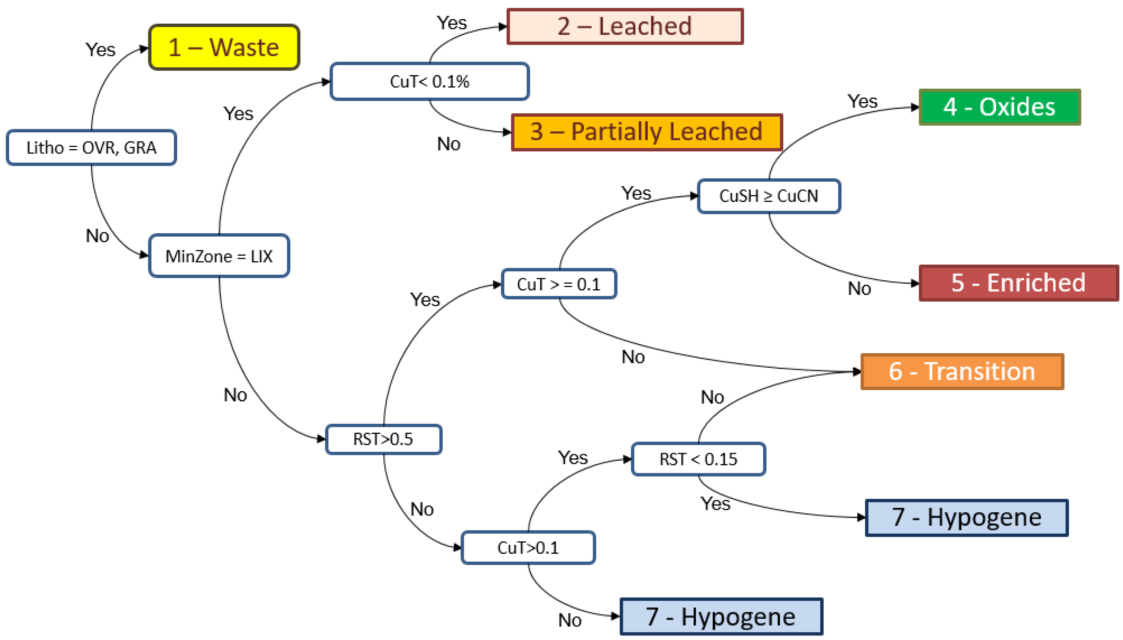


Figure prepared by Teck, 2018. (Abbreviations: CuCN= Cyanide soluble Cu, CuSH= Acid soluble Cu, CuT= total Cu, LIX = leach zone, OVR and GRA = Gravels/soil, RST= (CuCN+CuSH)/CuT)).

8.0 DEPOSIT TYPES

8.1 Overview

The porphyry-style mineralization at Quebrada Blanca is considered to be typical of an Andean porphyry copper–molybdenum deposit. Common features of this subset of porphyry-style deposits include:

- Large zones (>10 km^2) of hydrothermally altered rocks that commonly grade from a central potassic core to peripheral phyllic-, argillic-, and propylitic-altered zones;
- Mineralization is generally low grade and consists of disseminated, fracture, veinlet, and quartz stock-work controlled sulphide mineralization. Deposit boundaries are determined by economic factors that outline ore zones within larger areas of low-grade, concentrically-zoned mineralization;
- Mineralization is commonly zoned with a chalcopyrite–bornite–molybdenite core and peripheral chalcopyrite–pyrite and pyrite zones;
- The effects of surface oxidation commonly modify porphyry deposits in weathered environments. Low pH meteoric waters generated by the oxidation of iron sulphides will leach copper from hypogene copper sulphides and form oxide copper minerals such as malachite, chrysocolla, and brochantite, and redeposit copper as secondary chalcocite and covellite immediately below the water table in flat tabular zones of supergene enrichment.

8.2 Comments on Deposit Types

The middle Eocene to early Oligocene metallogenic belt of northern Chile, which hosts the Quebrada Blanca deposit, is also host to other large porphyry copper deposits, such as Escondida, El Abra, Chuquicamata, and the nearby Collahuasi mine.

The QB1 mining phase exploited the surface oxidation (supergene) mineralization developed over the Quebrada Blanca porphyry deposit.

The QP is of the opinion that exploration programs that use an Andean porphyry copper–molybdenum deposit model focusing on the late Eocene–Early Oligocene metallogenic belts in northern Chile are appropriate for the region.

9.0 EXPLORATION

9.1 Grids and Surveys

The supergene mining operations initially used the UTM PSAD 56 19S datum for all general surveying purposes. Chile moved the country's datum to the worldwide SIRGAS WGS84 in 1993. Quebrada Blanca operations transitioned to the new country official geodetic system in 1998 by connecting the total stations available at the time to the new SIRGAS WGS84.

For day-to-day mining operational convenience, however, local reference points based on PSAD 56 19S were established as the Quebrada Blanca local coordinate reference grid for which the actual easting (X) and northing (Y) coordinates were truncated by removing the first two digits. These local co-ordinates remain in use.

Translation scripts have been developed to move mine coordinates to SIRGAS WGS84 and vice-versa.

The original mine topographic surface was surveyed; annual end-of-year surfaces are also surveyed.

9.2 Geological Mapping

Field mapping was completed by Exploradora Doña Inés over a five-year period from 1977 to 1982, producing reports and several detailed maps depicting lithology, alteration, structure, mineralogy, and copper–molybdenum–gold–silver distributions.

A 1:10,000 scale geological mapping program over the Quebrada Blanca property was completed during 2008 and 2009. This mapping program differentiated the deposit by lithology, alteration, mineralization, and structures, which had not previously been done. The mapping program was extended during 2010 to areas outside the Quebrada Blanca concessions and resulted in the generation of several exploration targets. The geological interpretation was revisited during 2011 to incorporate findings from a high-resolution aero-magnetic/radiometric dataset into the 1:10,000 scale district maps.

Detailed geological mapping at 1:2,000 and 1:5,000 scale has been performed on selected exploration targets from 2012 onwards, with a focus on the Las Arterias target.

In 2014, a Project-wide initiative commenced to compile all available geoscientific data, including geological, geochemical, and geophysical interpretations. As part of this program, structural mapping and structural interpretation was conducted in 2015–2016 by consultant Matías Sánchez. Additional geological interpretation using existing geophysical information, existing geological and Landsat maps, and geochemical and age-dating information was subsequently conducted and a regional complied map was produced. The results of this work led to the identification of new targets which were reviewed in the field. Of these, Las Arterias, Yuruguico, La Cruz, West Mag Low and El Colorado Norte were interpreted to warrant additional evaluation. These areas are shown in Figure 9-1.

Pit mapping of the operating supergene pit was conducted at 1:2,000 scale, and included collection of lithology, alteration, mineralization and structural information.

During 2018, Teck's structural geologists focused on improving the structural model based on pit mapping, drill core data compilation, and through collaboration with mine geotechnical staff.

9.3 Geochemical Sampling

Rock chip sampling was completed as part of the reconnaissance mapping programs, with samples analysed for copper. No significant copper anomalies were generated by the program; although, some areas of elevated copper were identified.

Additional rock chip samples were taken during the regional geoscientific data compilation initiative, including a property-wide 400 x 400 m rock chip sampling program covering a significant area of outcropping rocks. Each sample was also measured for its spectral response. Results of this work were included in the compilation work discussed in Section 9.1, and were used for vectoring at the defined targets.

9.4 Geophysics

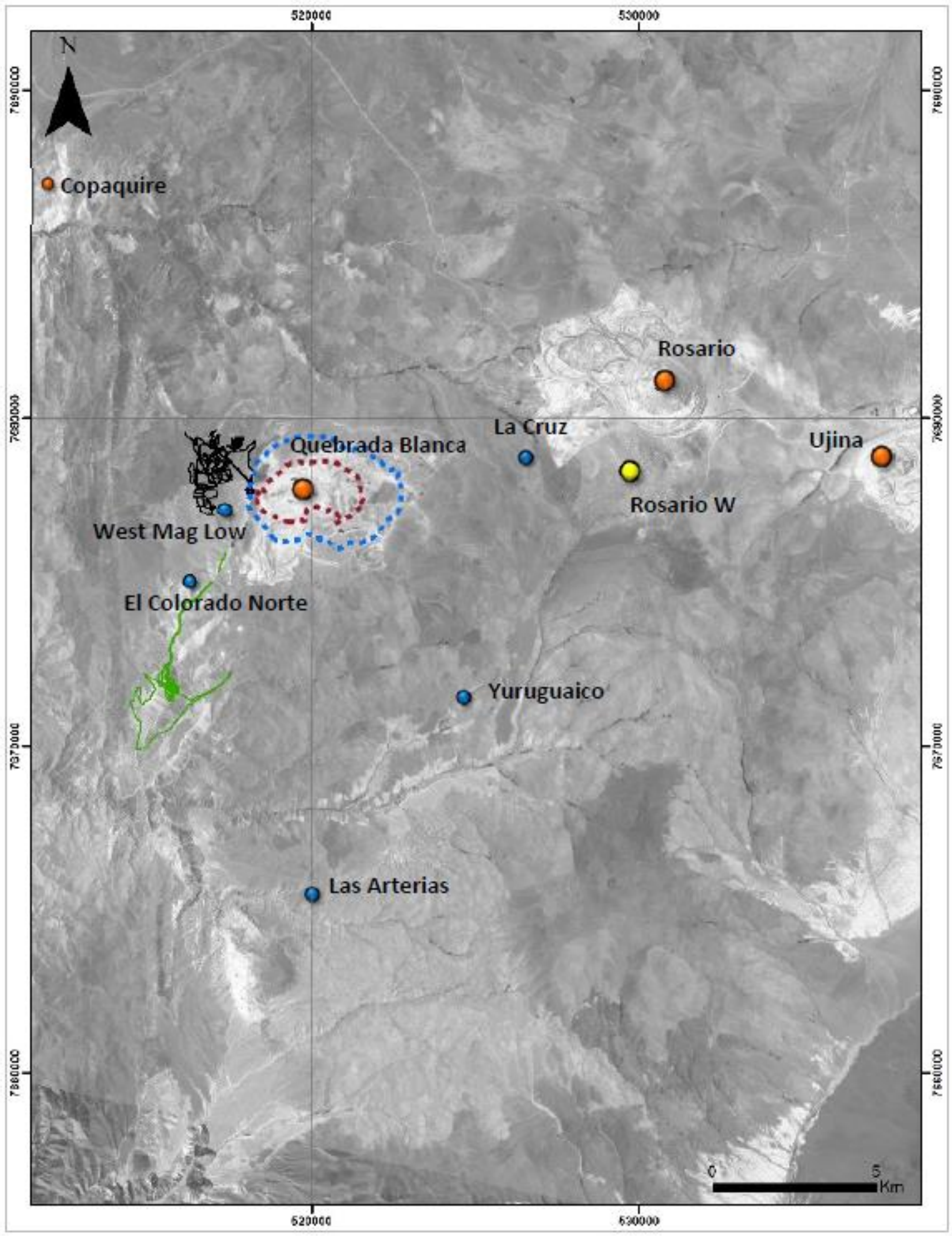
9.4.1 Airborne Surveys

Aur Resources acquired data from regional surveys flown by Codelco in 1992, and Noranda in 1999.

The Codelco survey covered most of northern Chile. Flight lines were oriented north–south and spaced at 500 m intervals. These files were sent to Quantec Geofisica Ltda (Quantec) for processing and the subsequent interpretations were used for regional exploration. A series of north–northeast, east–northeast and northwest lineaments was interpreted by Compañía Minera Quebrada Blanca S.A. (CMQB; a predecessor company to QBSA) geological staff as potential structural controls for the Quebrada Blanca deposit.

Noranda's regional hyper-spectral survey included the Quebrada Blanca area. No additional details of the program are available. Spectral International Inc. processed the data and produced a series of maps for a suite of minerals including alunite, chlorite, hematite, illite, kaolinite, and tourmaline. The chlorite map was used to locate the extent of the propylitic alteration zone mapped to the north and south of the open pit.

Figure 9-1: Exploration Prospects



Note: Figure prepared by Teck, 2016. Rosario and Ujina are mines held by third parties. Blue dashed line is the FS2016 resource pit, red dashed line is the FS2016 reserve pit; proposed concentrator location is shown in black, planned TMF location in green. Yuruguico = Yuruguako.

New Sense Geophysics Limited was engaged to acquire helicopter-borne magnetic-radiometric data on behalf of QBSA in 2010. The survey covered an area of approximately 380 km^2 centred over the Quebrada Blanca mine development. Flight lines were oriented north–south and spaced at 200 m intervals, with three areas of infill at 100 m line spacing. New Sense Geophysics Limited processed the data and delivered a suite of final processed products. In 2014, Matías Sanchez of Fault Rocks Inc. was engaged to complete a structural interpretation of the dataset, and these interpretations formed part of the 2014 geological compilation work (refer to Section 9.1).

HyVista was engaged to acquire hyperspectral data on behalf of Teck in 2017. The survey covered an area of approximately 4,000 km^2 within and around the Quebrada Blanca mining district, neighbouring tenure and additional areas of interest. Flight lines were oriented north–south and spaced at 2,000 m intervals. HyVista processed the data and delivered a suite of final processed products including mineral maps. An in-house first-pass interpretation was conducted in 2018 with a focus on leveraging spectral characteristics from drill core from the Quebrada Blanca hypogene system and applying those criteria to the district.

9.4.2 Ground Surveys

In 1973, an IP and resistivity study was conducted by the Chilean Geological Survey over a 2 x 2 km area, directly centered over the current pit. The lines were oriented in several directions, with dipole spacings of 50 m and 100 m in order to enhance the resolution of shallow features.

A magnetic survey over the Pampa Negra area in the east–central portion of the Quebrada Blanca property was conducted in 1978 to better define poorly-exposed magnetic breccias. The survey identified several zones with higher magnetic responses.

In 1992, CMQB performed an IP and resistivity survey that covered approximately 85% of the Quebrada Blanca mining concession. The survey was performed along north–south lines, with a line spacing of 1 km and dipole spacing of 200 m. The line spacing was reduced to 500 m over the area of the 1991 feasibility study design pit.

Quantec conducted a magnetic survey in 2002 on behalf of CMQB over an area measuring approximately 5.5 x 1.5 km located immediately north of the Quebrada Blanca open pit. The survey was performed along north–south lines, at a 100 m line spacing. The purpose of the survey was to define the diorite–quartz monzonite contact. The results, as interpreted by Quantec, showed that the contact was very irregular and marked by several moderately magnetic bodies extending from 100–250 m below the surface, with no apparent deeper root. Based on surface mapping, these magnetic bodies were found to coincide with the known diorite batholiths.

An IP/resistivity survey was conducted by CMQB in 2003 in the Colorado West area. This survey was performed to evaluate at mineralization in alluvial-filled graben and to generate an estimate of the depth of the graben.

During December 2004, CMQB undertook a transient electromagnetic survey (TEM) survey over the northeastern and east–northeastern portions of the Quebrada Blanca mine area where a zone of propylitic alteration had been mapped.

During 2011, a three-dimensional Mount Isa Mine's distributed acquisition system (3D-MIMDAS) geophysical survey was conducted over some of the targets generated during Teck's 2010 mapping program. These targets were situated south of Quebrada Blanca claims. In addition, an IP/resistivity survey was performed over selected targets. This work generated a target area that corresponds to the east–northeast extension of the mineralization in the open pit.

During 2017, an IP/resistivity in the las Arterias area was conducted by SouthernRock Geophysics. The survey was performed to delineate a chargeability anomaly present in the western part of that area. A 3D MIMDAS survey was also completed in 2017 in the Yuruguaico area by conducted by Geophysical Resources and Services. The objective was to investigate for any areas of the chargeability and resistivity subsurface of anomalous copper concentrations in rock samples collected at surface.

Figure 9-1 includes the locations of the two targets investigated in 2017.

9.5 Petrology, Mineralogy, and Research Studies

A number of research studies have been completed over the Quebrada Blanca deposit, including three honours theses, three doctoral theses, and a number of published papers.

Teck provided access to researchers from AMIRA International (a research organization) in 2018 to undertake a "green mineral chemistry" study, with the objective of assessing whether the chemistry of individual chlorite and epidote samples can be used to target toward a known mineralized hypogene system. Samples from the Quebrada Blanca mine were provided to the researchers. Results were ambiguous.

9.6 Exploration Potential

9.6.1 Quebrada Blanca Open Pit

The primary hypogene mineralization remains open to the immediate east–southeast of the FS2016 pit boundary. No infrastructure is currently planned for this area and it was the target of drilling in 2018. The program encountered hypogene mineralization, and the area remains open.

A zone of potentially higher-grade chalcopyrite–bornite mineralization was interpreted from sulphide mineral zoning studies at depth to the west–southwest of the FS2016 pit boundary. The interpretation remains to be drill tested.

To the east–northeast of the FS2016 pit boundary is an area that contains quartz monzonite stocks, a large diorite roof pendant or fragment, and a few small porphyry dikes (refer to Figure 7-3). A well-developed propylitic alteration zone has been mapped, which is characterized by 3–30% chlorite and trace to 3% epidote. Northwest-striking zones of phyllic alteration, consisting of approximately 8–45% sericite and 2–20% quartz cross-cut the propylitic alteration. These zones contain 1–5% pyrite, and minor chalcopyrite, chalcocite, bornite and magnetite. The 2004 TEM survey identified a high chargeability and low resistivity anomaly in the approximate area of the alteration, which was attributed to the presence of pyrite and magnetite.

The 2004 TEM survey also identified a pronounced northeasterly-oriented magnetic high anomaly along the contact between quartz monzonite and Collahuasi Formation rhyolites. A drill program to test the boundary between the magnetic high and associated magnetic low was completed and returned anomalous copper values.

Drill testing of a zone of hydrothermal breccias in the eastern portion of this area also returned an anomalous copper intercept in drill hole DDH151 (Table 9-1).

9.6.2 District Targets

A number of targets have been identified and tested since 2013 within the Quebrada Blanca Project area (refer to Figure 9-1). The majority are not considered to retain significant near-surface exploration potential; however, the potential for hypogene mineralization is still being investigated in the following areas: Las Arterias–Elena, West Mag Low, El Colorado Norte and La Cruz.

The Las Arterias–Elena target is located ~15 km south of Quebrada Blanca mine, where Eocene porphyritic bodies are intruded into Paleozoic granodiorite. Structurally, the target area is east of the Domeyko Fault and is interpreted to be along sub-parallel strands of the related north-east striking El Loa Fault system. The target area is characterized in outcrop by mineralized hydrothermal breccias and the presence of porphyritic intrusions of the same texture and mineralogy as are present within the Quebrada Blanca system. Drill-tested outcropping areas are interpreted have intercepted alteration facies representative of the deeper parts of a porphyry center and drilling of covered areas of the target intercepted alteration. With only 10 drill holes to date, the system remains open. Importantly, the target highlights the under-explored nature of the Collahuasi District where undrilled outcropping porphyry systems exist.

Table 9-1: Drill Hole DDH151 Intercept

Hole ID	Easting	Northing	Elevation (m)	Azimuth (º)	Dip (º)	Total Depth (m)	Intercept From (m)	Intercept To (m)	Drilled Interval (m)	Grade (Cu %)
DDH151	21942.55	78052.89	4387.01	0	-90	504.75	232	504	272	0.54

The Quebrada Blanca mineral system is characterized by a distinct east–west to southeast–northwest-trending low magnetic response feature, interpreted to be a result of magnetite-destructive phyllic alteration. Immediately to the west of the Quebrada Blanca pit, across the Quebrada Blanca Fault, is a northwest-trending ~3 x 2 km area of the same magnetic low character. In outcrop, the host rock is a Paleozoic granodiorite with local tourmaline-bearing hydrothermal breccias and small Eocene intrusions. The host rocks exhibit propylitic alteration. As such, an interpretation of the “west magnetic low” feature is that a hypothesized porphyry system may be located at some depth and be fully preserved. The target area currently has no effective drill tests.

Extending down topography to the southwest and to the southwest of the QB1 pit is a historically-tested target area known as El Colorado. Eighteen drill holes tested alteration features consistent with epithermal and porphyry features. There is an area of ~3 x 2 km essentially extending from the southwest side of the QB1 pit toward El Colorado, referred to as El Colorado Norte, where outcrop is characterized by variable intensities of biotite–albite, biotite–magnetite–trace copper sulfides and sericite alteration. Given that there are open bornite and chalcopyrite grade shells outlined in the southwest area of the QB pit and a lack of any drilling to close these off, the area between Quebrada Blanca and El Colorado represents a key exploration opportunity.

The La Cruz target to the northeast is similar to La Colorado. The La Cruz target is located ~2–3 km northeast of the QB1 pit and extends to Teck’s tenure boundary, where the Rosario and Rosario Oeste deposits are 0.5 to 3 km further east and northeast. Hydrothermal breccias, epithermal vein textures and mineralogy (such as alunite), small-volume Eocene intrusive bodies, geochemical anomalism in elements characteristics of epithermal and porphyry systems and a chargeability feature at depth with characteristics similar to the Quebrada Blanca hypogene system are all present in the La Cruz target area. No effective drilling has been undertaken in this area.

9.7 Review of Proposed Concentrator Site for Exploration Potential

9.7.1 Concentrator Site Area

A compilation of all available geological, geophysical and geochemical data, plus information from the shallow geotechnical holes, together with field mapping, was undertaken to evaluate whether the area planned for the concentrator and its associated infrastructure could host significant mineralization to be exploited by open pit methods. A five-hole condemnation drill program was initiated but cancelled during the first hole. The results of the first drill hole were taken into account in the following summary for the concentrator site. Results of this work indicate that the site:

- Is primarily underlain by rocks of the Collahuasi Formation, which are the host unit to the Quebrada Blanca intrusive complex;
- Has no evidence for outcropping intrusions nor, specifically, Eocene-aged rocks; such aged rocks are the causative intrusions of the Quebrada Blanca porphyry system;
- Is located over a magnetic high feature; this characteristic is inconsistent with features of Quebrada Blanca;
- Has weak hydrothermal alteration, dominated by epidote veins, at surface and in the geotechnical holes; this alteration is consistent with distal porphyry systems features;
- Lacks "proximal" hydrothermal indicators such as high-temperature potassic facies alteration, veins or stockworks. However, at surface, there are spatially limited hydrothermal breccias.

Together, the above interpretations indicate that the area of the proposed concentrator site has low potential to host significant mineralization near surface that could be exploited by open pit methods.

9.7.2 Concentrator Site Area (Southeast and South Sectors)

The review identified a northeast–southwest trending magnetic low feature situated immediately to the southeast of the proposed concentrator site. This feature has a similar geophysical texture and intensity to the known magnetic low associated with the mineralization being exploited through the current Quebrada Blanca pit. Field assessment and surface sampling in this area identified outcrops of a single, spatially restricted, Eocene intrusion. Quartz veins are present over the magnetic low feature; however, rock chip sampling of these veins showed a lack of elevated metals and associated pathfinder elements indicating low potential for associated copper sulphide mineralization of potentially economic interest. Historic IP survey results were also reviewed, and no elevated chargeability (a proxy for conductive minerals such as sulphides) was modelled.

The most prospective area for additional exploration targeting is considered to be to the south of the proposed concentrator infrastructure where there is a moderate magnetic feature, elevated chargeability, some copper geochemical anomalism, and the presence of quartz veins with glassy limonite and quartz–biotite veins hosted in the same type of quartz monzonite intrusion that hosts the Quebrada Blanca porphyry copper mineralization.

9.8 Comments on Exploration

Exploration programs conducted have been appropriate for the mineralization type. The Project area retains exploration potential.

10.0 DRILLING

10.1 Drill Summary

Drilling completed up to 31 December, 2018 on the Quebrada Blanca Project includes 867 core drill holes (256,738 m) and 1,512 reverse circulation (RC) drill holes (204,960 m) for a total of 2,379 drill holes (461,1698 m). A summary of the various drilling programs is provided in Table 10-1. Figure 10-1 shows the collar locations of all completed drill holes.

The main objective of the latest drilling program executed in between July 2017 and April 2018 was to provide support for potential confidence category upgrade of Indicated Mineral Resources to Measured Mineral Resources and to provide additional technical information for the metallurgical and geotechnical models.

A drilling program is currently underway to:

- Support potential upgrade of material currently classified as Inferred to Indicated and Measured categories;
- Identify shallower mineralization in and around the current pit shell;
- Confirm continuity of mineralization at depth.

The Mineral Resource estimate in Section 14 is supported by 740 core holes (211,957 m). Drilling that does not support estimation was either completed after the database cut-off date, had assay results pending as of the cut-off date, or were completed for purposes other than estimation support, such as geotechnical facilities drilling. RC drilling is not used to support estimation of hypogene mineralization as that drill type was used to define and confirm oxide and supergene mineralization in the QB1 pit.

10.2 Drill Methods

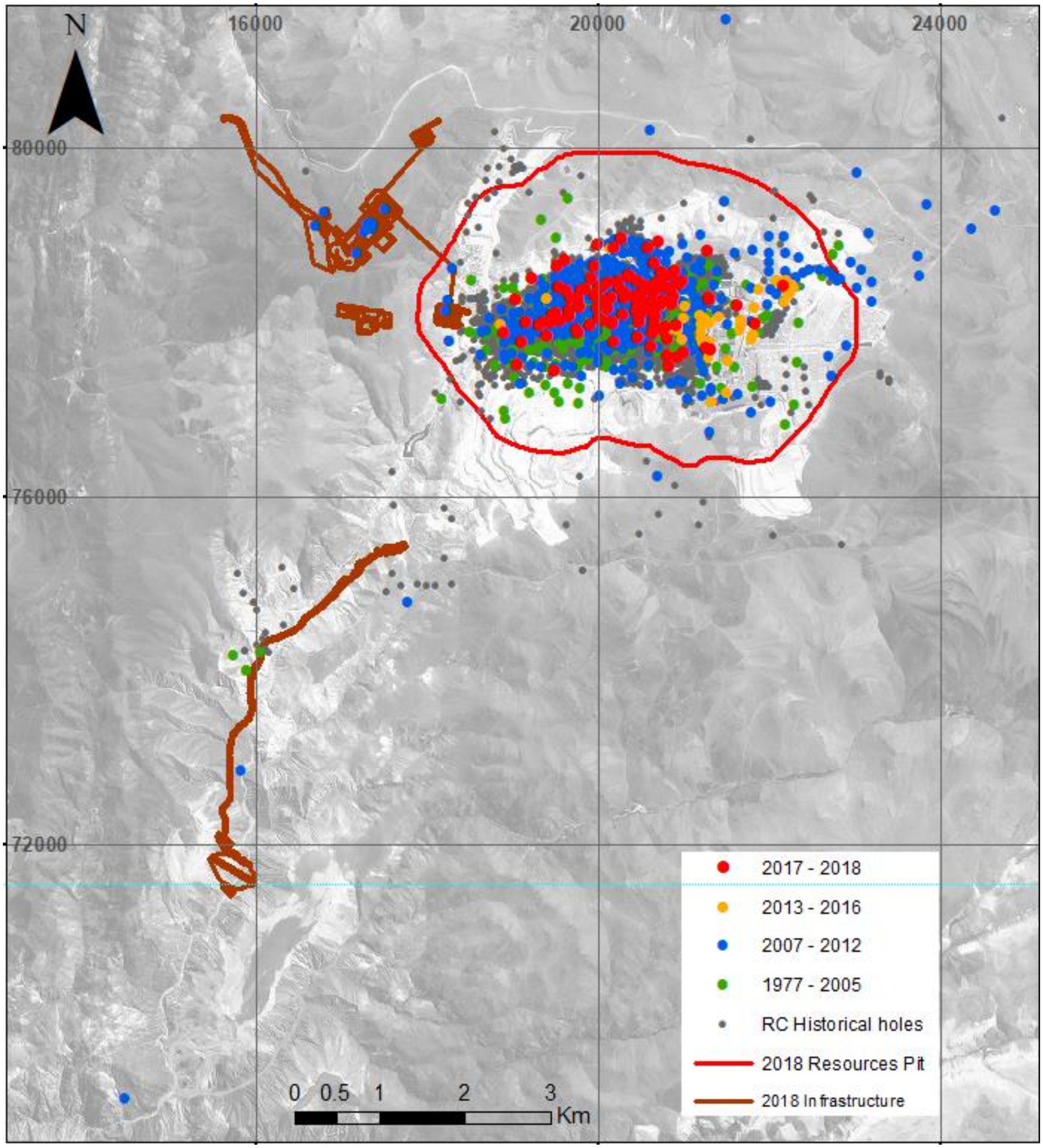
A number of core diameters have been employed over the history of the operations, including BX (36.6 mm core diameter), NX (54.9 mm), HX (76.2 mm), NQ3 (47.6 mm), HQ3 (63.5 mm) and PQ core (85 mm) sizes. HQ3 core represents around 70% and NQ3 core represents around 10% of the total core drilling programs.

Table 10-1: Drill Summary Table

Date	Core				RC				Total		Operator
	Metres	# Holes	From Hole	To Hole	Metres	# Holes	From Hole	To Hole	Metres	# Holes	
1975*	unknown	1								1	Codelco
1977–1982	44,643	235	DDH-001	DDH-229					44,643	235	Exploradora Doña Inés
1990	2,394	5	DDH-230	DDH-234					2,394	5	
1994					2,887	26	RC001	RC026	2,887	27	
1995					3,627	20	RC027	RC046	3,627	19	QBSA
1997					7,486	47	RC047	RC093	7,486	47	
2000	3,035	15	DDH-235	DDH-249	14,069	92	RC094	RC185	17,104	107	
2001					16,954	107	RC186	RC292	16,954	107	
2002					20,988	192	RC293	RC484	20,988	193	
2003					40,149	233	RC485	RC717	40,149	232	
2004					26,176	140	RC718	RC857	26,176	140	Aur
2005	1,962	6	DDH-250	DDH-255	10,397	83	RC858	RC939	12,359	89	
2006					5,106	45	RC940	RC984	5,106	45	
2007	9,732	36	DDH-256	DDH-288					9,732	36	
2008	29,927	64	DDH-289	DDH-346					29,927	64	
2009	17,900	34	DDH-347	DDH-380					17,900	36	
2010	49,084	120	DDH-377	DDH-494	9,492	76	RC985	RC1057	58,576	195	
2011	31,119	116	DDH-491	DDH-605	14,888	172	RC1058	RC1226	46,007	287	
2012	20,647	63	DDH-601A	DDH-662	21,135	176	RC1227	RC1396	41,601	242	
2013	5,589	28	DDH-663	DDH-689	7,519	61	RC1385	RC1450	13,108	86	Teck
2014					836	10	RC1451	RC1459	836	10	
2015	1,804	10	DDH-690	DDH-699	2,980	23	RC1460	RC1476B	4,784	33	
2016	1,931	11	DDH-700	DDH-709	240	8	RC1478	RC1485	2,171	21	
2017	19,920.1	84	DDH-710	DDH-786	30	1	RC1477	RC1477	19,950	89	
2018	17,231	40	DDH-637A	DDH-818					17,231	38	
Total	***256,738***	***867***			***204,960***	***1,512***			***461,698***	***2,379***	

Note: * not included in drill hole totals.

Figure 10-1: Drill Collar Location Plan



Note: Figure prepared by Teck, 2018.

10.3 Geological Logging

Diamond core drill holes have been geologically logged for lithology, structure, alteration, and copper–iron mineralization. Geological logging of RC chips records similar information to that described for the core programs.

Percentage core recovery, rock quality designation (RQD), fracture frequency, and hardness were recorded for all drill cores to establish a geotechnical database.

10.4 Recovery

Drill core recovery at Quebrada Blanca has been acceptable, averaging 95% or more. Approximately 10% of the data included in the database have recovery percentages that are less than 85%. Most of these low recovery intervals are related to the presence of faults and gravel.

10.5 Collar Surveys

From the 1990s to 2005, a theodolite Wild Model T-1 was used to survey drill hole collars. Between 2005 and 2010, a Trimble GPS R7 and R6-2 and Trimble S6-3" Total Station, with a precision of ±5 mm was used. After 2010, the mine has used a Trimble GPS R8 (± 3 mm accuracy), and NET R9 and S6-2" and S6 3" Total Stations have been used as control stations.

Drill protocols in place since 2004 require that the initial drill collar location is surveyed prior to drilling, and after hole completion, the location is picked up by a survey crew. The requirement for two surveys is to ensure that there are minimum differences in the database between original and final collar locations.

10.6 Downhole Surveys

Limited information is available on the 1977–1982 core drill programs. A Single Shot instrument is known to have been used in the programs; however, the data available do not clearly differentiate drill holes with actual downhole surveys, and drill holes that use the collar inclination.

No surveys are known to have been performed on the six holes from the 1990 drill program.

From 2000 to date, a gyroscopic instrument has been used, with data collected at 10–20 m intervals down the core hole.

10.7 RC Drilling

The RC drilling that was shown in Table 10-1 was primarily used for in-pit infill drill programs, as well as for leachable material exploration drilling.

RC drilling has been excluded from the geological interpretations and Mineral Resource estimation.

10.8 Blast Hole Drilling

The blast hole drilling programs were executed only to support the supergene mining operation. The drilling grid spacing varies from a regular distance of 10 by 10 m, at the beginning of the operation, to a variable distance of between 8 by 8 m and 10 by 10 m in the last years of operation.

Blast hole data are not used for Mineral Resource estimation purposes.

10.9 Geotechnical and Hydrological Drilling

Between 2008 and 2015, a total of 435 drill holes were completed to assess the geotechnical characteristics of the QB open pit. The drill holes were completed using a combination of NQ, HQ, and PQ drilling methods providing a total of 155,890 m of drill core, of which 112,591 m was logged for geomechanical parameters. Approximately 8,802 m of the geotechnical drilling was oriented for geotechnical structure using either manual methods or the acoustical or optical televiewer (ATV/OTV) geophysical system. Point load index (PLI) testing was completed on 3,761 samples of rock core obtained from the drilling and samples were collected for unconfined compressive strength (UCS) testing, Brazilian tests, triaxial compression tests, and direct shear testing. Additionally, from 2009 to 2015, 40 standpipe and vibrating wire piezometers were installed within and around the QB1 open pit for determination of pore pressure conditions.

During late 2017 and early 2018, 14 core drill holes (3,432.8 m) were completed using HQ3 triple tube drilling methods to obtain geotechnical information to support the geotechnical design for the QB2 open pit. Each of the 14 core drill holes was logged geotechnically and manually oriented using the ACTII (1,124 m) system and/or acoustic or optical teleleviewers (ATV/OTV). An additional four core drill holes (1,217 m) that were completed for infill purposes were also logged geotechnically and oriented for structure using the ATV/OTV system. PLI testing was completed on 1,491 samples of rock core obtained from the drilling and samples were collected for UCS, Brazilian, triaxial compression, and direct shear tests. Thirteen hydraulic (Packer) tests were also completed during the drilling program within the core drill holes to assess the hydraulic properties of the fractured rock mass. Each of the 14 geotechnical core drill holes were completed via the installation of two to three vibrating wire piezometers to establish pore pressure condition (39 piezometers in total).

10.10 Metallurgical Drilling

Historical metallurgical drilling programs specific to hypogene material were completed from 2002 to 2012, to support the FS2016. Drill sizes included PQ and HQ core. Drill holes were located throughout the deposit, with locations selected to represent the initial five years of the FS2012 mine schedule, and to intersect the major geological and mineralogical domains.

During 2017 to 2018, a new metallurgical drilling program was completed. The main objective of this program was to increase confidence in the metallurgical performance to support the Mineral Resource and Mineral Reserve estimates. Drill sizes included PQ and HQ core. Drill holes were located throughout the deposit, with special emphasis in the first five production years, considering the contribution of lithologies and ore zones to the FS2016 mine schedule.

10.11 Drill Coverage

The central portion of the Quebrada Blanca deposit has been delineated along 100 m spaced north–south-oriented sections, with drill holes spaced approximately 60–80 m along the sections. Outside this central portion of the deposit, drilling grid spacing increases to about 100–150 m.

Drill holes completed prior to 2000 were typically vertical drill holes. From 2000 to date, most drill holes are inclined. Drill depths in pre-2000 programs were shallow, as they targeted supergene mineralization. During these programs, only five drill holes were drilled at a vertical depth greater than 500 m (2% of the drill holes). Later programs (post-2000), extended coverage at depth, and a total of 136 drill holes have depths greater than 500 m (22% of the drill holes). There is very limited drill data at depths greater than 700 m (15 drill holes); however, the available drilling information suggest that mineralization remains open at depth.

10.12 Drilling Completed Subsequent to the Mineral Resource Database Close-out Date

A total of 20 core holes (12,433 m) were completed after the database close-out date (March 2018) and until 31 December, 2018. These drill holes included:

- Geotechnical holes, completed to support of geotechnical model;
- Metallurgical twin holes;
- Deep drilling;
- Exploration drilling for shallower copper mineralization within the current conceptual open pit shell.

10.13 Sample Length/True Thickness

Drilling prior to Teck's Project interest consisted of vertical drill holes. Teck drill programs use inclined drill holes. The general orientation and trend of the porphyry system is to the northeast, and the majority of the drill sections are oriented north–south, principally to the north. In general, most drill holes intersect mineralized zones at an angle, and the drill hole intercept widths reported for the Project are typically greater than the true widths of the mineralization at the drill intercept point. Drill holes are not drilled exactly perpendicular to the orientation of the mineralization (northwest), because this is the direction of the predominant northwesterly-trending structures.

10.14 Comments on Drilling

Collection of the drill data on the Project is a team effort, with data collected between 1977 and 2016. The majority of the core data supporting the resource estimate for the hypogene mineralization was collected from 2007 onward.

The current drill database consists of 867 core drill holes of which 740 core holes are used in estimation. Core holes not included in the estimates did not have assays either because of laboratory turnover time or have never been sampled and assayed as they had purposes to support engineering studies. RC drilling is not used to support estimation.

Drill spacing in the deposit centre is at 60 x 80 m to 80 x 100 m, and is wider on the deposit margins, from 100 x 150 m to 150 x 150 m. The drill spacing is typical of that used in delineation of porphyry copper systems.

The general orientation and trend of the porphyry system is to the northeast, and the majority of the drill sections are oriented north–south, principally to the north. In general, most drill holes intersect mineralized zones at an angle, and the drill hole intercept widths reported for the Project are typically greater than the true widths of the mineralization at the drill intercept point.

Logging, recovery, and survey data collected during Teck's core drill programs are considered acceptable to support Mineral Resource and Mineral Reserve estimation, and can support mine planning.

11.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

11.1 Sampling Methods

11.1.1 Reverse Circulation (RC)

The RC samples were typically taken on 1 m or 2 m intervals. A small representative sample of rock cuttings for each interval was kept in labelled chip trays as a record of the interval.

Dry samples were collected at the drill rig, weighed, and halved or quartered in a riffle splitter. A rotary wet splitter was employed in extreme wet conditions, and two smaller splits were recovered in porous sample bags at the rig, labelled, and dried.

11.1.2 Blast Holes

The blast hole samples were collected using a 51 mm diameter ribbed tube. A total of 12 portions were collected from each blast hole cone using a cone-and-quartering method to form one complete sample. All material was placed into a polyethylene bag which contained a sample tag listing: date, bench number, blast number, and drill hole number.

11.1.3 Core

Sampling was generally performed at fixed 2 m intervals. This is considered acceptable as changes in lithology, mineralogical types, and grade are generally transitional, which is typical for a porphyry copper deposit, and breaking the sampling at specific geological or other boundaries is not warranted.

Samples were historically halved using core sawing when core was sufficiently competent; when core was broken, a hydraulic split was used. Since 2017 core has been halved using a semi-automatic saw, eliminating the use of hydraulic split. One half of the sawn core was placed back into the pertinent core box in depth order, and the other half was placed in a plastic sample bag. After each 2 m sampling interval was completed, a sample tag was attached to the bag, and the bag was sealed.

11.2 Metallurgical Sampling

Metallurgical variability and composite samples were selected following internal geometallurgical guidelines to ensure spatial distribution, with special emphasis in the first six years or payback period according to the FS2016 mine plan (official plan at the time of sampling), variability in lithology, minzone, and grade. A total of 250 variability samples were collected from the 2017–2018 drill core. These variability samples consist of contiguous 2 m samples with intervals varying from 14 to 20 m, depending on the geological characteristics of the individual drill intercepts. Core handling (bagging of whole core) was completed on site under the supervision of a geometallurgist and samples were shipped to the SGS metallurgical laboratory facilities in Santiago.

In addition, six annual composites were selected, each one representing the spatial distribution for each year of material to be extracted during the first six years of production using the FS2016 mine plan as reference. A global composite for a pilot plant test representing the first six years of the mine plan was also collected.

Comminution samples include the 250 variability samples described above as well as six drop weight test (DWT) samples, the latter being selected using lithological characteristics in the primary minzone.

11.3 Density Determinations

Density samples were taken approximately every 20 m or at a clear lithology change, to ensure sufficient representation of all lithology types. Geological information for each sample was entered into the acQuire database, together with information on the physical sample properties, and core diameter.

The samples were usually shipped to Andes Analytical Laboratories (Andes Analytical) in Santiago for measurement. Since 2017, samples have been sent to the ALS Global (ALS) laboratory in La Serena, Chile. Data are stored in acQuire and density determination certificates are stored on the server. A check calculation was performed using the database data as a verification step on the values supplied by Andes Analytical and the ALS laboratory in Patagonia, Chile (ALS Patagonia).

The database contains 5,493 density measurements within the deposit area, all obtained from post-2007 drill programs, including 888 measurements added since the last estimation model. Values for the key lithologies used in the Mineral Resource interpolation correspond to the averages calculated in 2013 (Table 11-1). Additional data were not considered for the current resource estimate because those data were not available at the date the database was closed for estimation.

11.4 Analytical and Test Laboratories

A summary of the sample preparation, analytical and test labor Table 11-2.

The grade control sample preparation and analysis were usually carried out at the mine laboratory which has no accreditation and is not independent. The mine laboratory performed sample preparation and analytical procedures for selected RC campaigns.

Table 11-1: Density Determinations

Lithology	Mintype	Number of Samples	Minimum (t/m^3)	Maximum (t/m^3)	Co-efficient of Variation	Median - Density at 50th Percentile (t/m^3)
All	Leach	165	2.03	2.7	0.0553	2.48
Gravel	Oxide, Enriched, Transition and Primary	—	—	—	—	2.21
FCOLL		229	2.43	3.09	0.0358	2.65
DIO		672	1.56	3.15	0.0383	2.68
QMZ		1,322	2.01	3.16	0.0367	2.59
FP		669	1.35	2.88	0.0379	2.6
FPLG		18	2.5	2.68	0.0167	2.58
IBX		1,249	2.05	4.01	0.0446	2.59
TBX		63	2.23	3	0.0489	2.58
		4,387				

Table 11-2: Sample Preparation and Analytical Laboratories

Program	Laboratory	Accreditation	Purpose	Independent
1975	Chuquicamata	Unknown	Sample preparation and primary analysis	Unknown
1977 to date	Quebrada Blanca site laboratory	None	Sample preparation for selected programs, primary analysis for blast hole samples	No
1977–1983	Centro de Estudios de Medición y Certificación de Calidad S.A (CESMEC), Iquique, Chile	Unknown	Primary analysis	Yes
	Union Assay, Salt Lake City, USA	Unknown	Check analysis	Yes
	Assayers Canada, Vancouver, Canada	Unknown	Check analysis	Yes
1994	Centro de Investigaciones Minero Metalúrgicas Technologies & Services S.A. (CIMM), Calama	Unknown	Sample preparation and primary analysis	Yes
1995	CIMM, location unknown	Unknown	Sample preparation and primary analysis	Yes
1997	CIMM, Antofagasta	Unknown	Sample preparation and primary analysis	Yes

Program	**Laboratory**	**Accreditation**	**Purpose**	**Independent**
2000	Actlabs Chile S.A.	Unknown	Sample preparation and primary analysis	Yes
2001	CESMEC	Unknown	Primary analysis for RC samples; pulp reanalysis	Yes
2002–2003	Quebrada Blanca site laboratory	None	Sample preparation	No
	Geoanalitica Ltda (Geoanalitica)	Unknown	Primary analysis for RC samples	Yes
2004–2005	Quebrada Blanca site laboratory	None	Sample preparation for selected samples	No
	Acme Santiago (Acme Santiago)	ISO 9001:2000	Sample preparation and primary analysis	Yes
2007–2008	Andes Analytical Laboratories, Santiago (Andes Analytical)	ISO 9001:2000 from 2006	Sample preparation and primary analysis	Yes
2009 to December 2012	Acme Santiago and Acme Copiapó	Santiago: ISO 9001:2000 from 2005 Copiapó: ISO 9001:2000 from 2010	Acme Copiapó: sample preparation; Acme Santiago: primary analysis	Yes
2010–2012	Quebrada Blanca site laboratory	None	Sample preparation for selected samples	No
	Geoanalitica	9001:2008	Primary analysis for RC samples	Yes
2013	Acme Santiago and Acme Copiapó	Santiago: ISO 9001:2000 from 2005 Copiapó: ISO 9001:2000 from 2010	Acme Copiapó: sample preparation; Acme Santiago: primary analysis	Yes
2015–2018	ALS Patagonia and ALS Lima (Peru)	Chile: ISO9001: 2015 Lima: 17025	ALS Patagonia: sample preparation; ALS Lima: primary analysis	Yes
2015–2018	Bureau Veritas, Reno	ISO 9001	Umpire analysis	Yes

Drilling completed prior to 2007 is a minority of the drill holes used in Mineral Resource estimation of the hypogene mineralization, and in the opinion of the QP, the fact that the laboratory accreditations are not known for the majority of the laboratories at the time is not considered to be material to the estimate.

11.5 Sample Preparation and Analysis

Sample preparation and analytical procedures, where known, are summarized in Table 11-3.

The site laboratory prepared and analyzed blast hole samples on a daily basis, and was equipped to perform total copper and sequential soluble copper analyses. The most common methods used by the laboratory included sample preparation, three-acid digestion with AAS finish, and determination of copper, molybdenum, CuSH, and CuCN.

11.6 Quality Assurance and Quality Control

Although drill programs prior to 2007 were not routinely subject to an onsite quality assurance and quality control (QA/QC) program, the laboratories selected during this period included internal quality control programs that conformed to international norms for the time.

All submissions of core drilling post-2008, have included QA/QC samples. From 2008–2013, the QA/QC insertion rates consisted of 5% coarse blanks, 5% standard reference materials (SRMs), and 5% half-core duplicates. After 2015, this rate was changed to an insertion rate of 4% coarse blanks, 2% fine blanks, 6% SRMs, 4% field duplicates, 2% crush duplicates and 2% pulp duplicates.

The QA/QC samples consisted of:

- Blanks
  - The blanks initially consisted of barren coarse quartz generally containing <40 ppm Cu, or 0.004% Cu;
  - 2011–2013: certified blanks were purchased from Acme;
  - Since 2017, coarse blanks purchased from ALS and certified fine blanks purchased from Ore Research & Exploration Pty Ltd (OREAS) have been incorporated in the QC process

Table 11-3: Sample Preparation and Analysis

Program	Sample Preparation	Analysis	Comment
1977–1983	Site laboratory: crush to -6 mm; pulverize to -100 mesh	CESMEC: total copper, CuS and molybdenum analysis by atomic absorption spectroscopy (AAS). Assayers Canada: 49 element suite by mass spectrometry	Union Assay: check total copper analysis using potassium iodide method
1990–1997	Unknown	Unknown	
1994 to date	Site laboratory: crush to -10 mesh, pulverize to -150 mesh.	Total copper by AAS; sequential soluble copper	Blast hole sampling
2000	Unknown	Unknown method. Assayed for total copper, CuS, CuCN, total non-soluble copper in the residue after the cyanide soluble analysis, and molybdenum	Used for core and RC
2001	Unknown	Total copper, sequential soluble copper (acid and cyanide), and molybdenum	RC only
2002	Unknown	Sequential soluble copper	RC only
2004–2005	Unknown	Unknown	
2007–2008	Crush to 80% passing -10 mesh, pulverize to 95% passing -150 mesh	Copper and molybdenum by AAS	
2009 to date	Crush to 80% passing -10 mesh, pulverize to 85% passing -200 mesh; crush to 70% passing -10 mesh, pulverize to 85% passing -200 mesh	Copper and molybdenum by AAS Total copper using sequential soluble copper method	Samples within the oxide, supergene, and transition zones were also analyzed for soluble copper

- SRMS
  - Between 2007 and 2013, the mine used 13 separate SRMs. Teck purchased certified SRMs from CDN Resource Laboratories Ltd. The SRMs are certified for total copper and molybdenum by a four-acid digest with either an inductively coupled plasma (ICP) or an atomic absorption spectroscopy (AAS) finish. No standards are in use for soluble copper;
  - Since 2015, the mine has been using four new certified SRMs and preserved two historical SRMs as a transition process. All SRMS in use were grouped into the three grade ranges at any given time. The recent SRMs were purchased from OREAS and are certified by all current analysis methods, copper, molybdenum and gold assays, geochemistry and soluble copper.

- Duplicates
  - Field duplicates consisted of halved drill core.
  - Since 2015, Teck has included crush and pulp duplicates in the QC process, which are independent samples to the laboratory´s internal duplicate program.

Reviews conducted on the QA/QC results indicated:

- Blanks: no significant contamination problems with either copper or molybdenum at the primary laboratory;
- SRMs: acceptable ranges of accuracy for the total copper and molybdenum values;
- Duplicates: reasonable correlations for total copper; however, molybdenum showed significant variability. This was attributed to the nugget and veinlet mineralization style of the molybdenite.

Acme also included crusher and pulp duplicates in the analytical sample stream. Reviews of the both the internal laboratory and Teck´s crusher and pulp duplicate data indicated that sample preparation and analytical precision were acceptable.

QA/QC for the RC drilling completed prior to 2008 included submission of rig duplicates, coarse reject duplicates, and pulp checks. Post-2008, the same QA/QC protocols as used for core were applied to the RC programs. To date, sample preparation and analytical precision have been acceptable for the RC programs.

The current QA/QC protocol for blast hole sampling was initiated in 2011, and includes submission of field duplicates, standards (high, medium and low grade), field blank samples, crusher reject duplicates, pulp duplicates and check samples that are sent to an umpire (check) laboratory. Results to date indicate the sample preparation and analysis are acceptable.

11.7 Check and Re-assay Programs

An independent QA/QC checking procedure is in place for the mine site laboratory, and consists of sending about 1% of the total drill campaigns analysed by the site laboratory each year to two external laboratories, Geoanalitica and Andes Analytical. To date, the sample preparation and analysis have been shown to be acceptable.

Since 2015, an umpire assay program of 5% of all samples across the grade range has been added to the QC process.

11.7.1 Check Assays

A total of 5% of the 2007 drill core was sent for re-assay. Copper assays were found to be acceptable. There was some evidence of possible overestimation of molybdenum with the historical assays in the upper grade ranges (>0.05% Mo); however, there was good correlation around the average grade (0.02%) of the deposit.

A quality control check on the 2007 drilling campaign consisted of a check analysis program on 343 pulps at the Acme laboratory. Ten samples had a greater than 20% difference from the original assays; almost all of these samples were traced back to two drill holes from two job lots. These samples and at least 10 adjacent samples in the corresponding job lots were returned to Andes Analytical for re-analysis. The results of this check process were considered satisfactory.

Together with the results of the full re-assay program, it was determined that there was sufficient support for using all of the historical core drilling data in resource estimation.

In the most recent drill campaigns, as part of the umpire program, a total of 835 pulp samples was sent to Bureau Veritas Reno for copper and molybdenum check assays, geochemistry and soluble copper assays. The number of samples sent corresponds to about a 5% sample check. The umpire program included QC samples. This check program included drill holes from 2015 to 2018, but the samples were prepared and analysed from 2017–2018. The results were considered satisfactory, as about 99% of samples had an analytical difference of <10%.

11.7.2 Re-assays

In 2002, a selection of 2,461 sample pulps was re-analyzed from the 1977–1983 drilling campaigns. The re-analysis showed that the original program results were acceptable, but that the original samples may have had a slight positive copper bias. About 2.5% of the samples had a > 20% difference, and the average copper grade of the original assay was 1.6% higher than the check assays.

In 2011, a re-assay program of 23 historical drill holes from the 1977 to 1983 drilling campaign was undertaken, with the objective of confirming the historical assay results. Based on acceptable results from the re-assay program, Teck decided to use all of the core drilling from these early programs in the FS2016 model.

11.8 Databases

Until 2001, surface geological mapping and core and RC drill data were recorded within Excel spreadsheet tables. In 2002, a MS Access database was built, and the Excel tables were uploaded into it. The current acQuire database was constructed in 2009.

Geological logging data are uploaded by the database administrator from the original logging tablet. Pit mapping data are also captured and migrated into acQuire. Down hole and collar survey data are provided in electronic format by the drillers and surveyors respectively, and imported into the database. Assay data are received directly from the laboratory. QA/QC protocols (i.e. lower detection limits compliance, etc.) are completed after the results have been imported into the database, but prior to release of the data for use in Mineral Resource estimation.

As a check on the database, assay results can be plotted in section and plan view to confirm that they acceptably match with historical data. Lithology sections are typically plotted after each drill hole is logged to highlight any inconsistencies. Drill core is visually re-checked if necessary.

The database is under the control of the geological group, a senior geologist with experience in QA/QC and databases is responsible for the process, and the daily management is undertaken by two database administrators. The acQuire database is backed-up on a regular basis in accordance with Teck protocols.

The historical (pre-2009) geological and drilling information that were originally captured on paper are stored by the mine geological department, and its usage is restricted and controlled by the database administrator.

11.9 Sample Security

There is no information available on the sample security measures in place for the 1975, 1977–1982, 1990, 2000, and 2005 drill programs.

From 2007 onward, samples have been stored in a secure area under 24-hour security. Teck staff prepare samples for transport to the laboratory, and maintain a list of the samples in each load. All samples remain in the custody of Teck on Teck property under the supervision of the sample supervisor, until they are transferred by a contract transportation company, Cargotrans SA, to the independent laboratory for preparation and analysis. Samples are checked on arrival at the laboratory and any issues with the delivery are advised to Teck.

No significant security issues have been identified.

11.10 Sample Storage

After the core sampling process was completed, core was placed in tagged metal trays. Historically drill core trays, pulps and rejects samples were stored in the open on site. Drill core boxes trays were also placed in racks or in wooden or plastic pallets. About 110,000 m of drill core remains stored in this manner at the mine site. As the core trays are exposed to high altitude weathering conditions, there is some risk of sample degradation.

About 124,000 m of core has been transported to a core storage facility in Pozo Almonte, a location closer to the town of Iquique. There are plans to continue transporting the remaining drill core on site to this facility.

11.11 Comments on Sample Preparation, Analyses and Security

Collection of the analytical and QA/QC drill data on the Project is a team effort, with assay data collected between 1977 and 2018, and QA/QC data collected after 2008.

No formal site-based QA/QC programs were in place prior to 2007. As a result, the core drilling prior to 2007 was evaluated using a combination of re-assay and check assay programs in 2002 and 2011.

The QA/QC core data obtained from 2008 onwards were regularly monitored. Where outlier assays were encountered, for example blank samples with elevated copper values, the samples were returned to the laboratory and reanalysed.

No major areas of bias or errors are considered to remain in the core sample database for copper for those drill holes used in resource estimation. Repeated duplicate sampling of drill core has indicated that there are lower levels of sampling precision for molybdenum when duplicate sampling results are reviewed. This has been attributed to the nugget and veinlet mineralization style of the molybdenite.

Sample preparation and analytical methods are appropriate to the mineralization style. Sample security measures are considered acceptable.

Overall, the copper, silver and molybdenum data generated from drill cores from those core drill programs that were used in estimation are considered acceptable for supporting Mineral Resource and Mineral Reserve estimates.

12.0 DATA VERIFICATION

12.1 External Data Verification

A number of external checks have been performed on the data estimation, and third-party reports were prepared on the audits and checks, including:

- Satchwell, S., and Sullivan. J, 2011: Quebrada Blanca Database Audit;
- Nowak, M., Doerksen, G., Pilotto, D., Murphy, B., Dance, A., 2012: SRK Database Audit, Quebrada Blanca.

These reviews consisted of an examination of the digital database at the time of examination, followed by a comparison of the digital database with physical logs and/or folders stored at the mine for approximately 10% of the data. Integrity and logical checks were performed for the individual database tables, to check for “from/to” interval mismatches, missing intervals, and records extending beyond the recorded end of hole depth. The checks included a review of the downhole survey measurements based on a maximum 3D angle deviation tolerance.

In each review, the quality and completeness of the database at the time was found sufficient to support estimation.

12.2 Internal Data Verification

12.2.1 Laboratory Visits

A visit to Andes Analytical Assay laboratory by Al Samis and Neil Barr (Regional Manager for Teck Cominco at that time) in early 2008 did not identify any irregularities in the Andes Analytical procedures. It was considered that the Andes Analytical internal quality control measures and laboratory information management system (LIMS) sample management software ensured that errors were minimized.

Prior to contracting ALS as the main laboratory for the mine, every preparation laboratory in Chile and the analytical laboratory in Lima were visited by Mr Iain Dalrymple (Principal Geochemist with Teck’s Advanced Project group). In early 2017, Mr Dalrymple and the senior geologist responsible for the QA/QC process visited ALS Patagonia, where samples are currently prepared. Two surprise laboratory visits were conducted during 2018.

12.2.2 QA/QC

A summary of the QA/QC evaluations are described in Section 11.6 and Section 11.7.

12.2.3 Annual Mineral Resource and Mineral Reserve Reports

Teck prepares an annual “Resource and Reserve” report for the Quebrada Blanca operation. Each report provides a review of the data used to support that year’s estimates, includes an annual summary of the results and interpretations of the QA/QC performed on exploration and blast hole data, and a discussion of the reconciliation trends and observations.

No issues with the exploration data collected each year that would materially affect the Mineral Resource and Mineral Reserve estimates were noted during these annual reviews, conducted from 2009 to 2018.

12.2.4 Annual Process Audits

Teck’s Reserve Evaluation Group conducts an annual process review at each operation, including the Quebrada Blanca mine. The reviews check that the processes set out corporately in terms of data collection, data verification and validation, and estimation procedures are being appropriately followed. The audits also review the results of the processes. The QP has been involved with every review of Quebrada Blanca from 2013 to date.

No issues that would materially affect the Mineral Resource or Mineral Reserve estimates were noted during these annual reviews.

12.2.5 NI 43-101 Technical Reports

Four technical reports have been filed on SEDAR on the Quebrada Blanca deposit and operations:

- Marinho, R., and Nelson, M., 2017: NI 43-101 Technical Report on Quebrada Blanca Phase 2 Feasibility Study 2016, Región de Tarapacá, Chile: report prepared for Teck Resources Inc., effective date February 3, 2017;
- Allan, M.J., Yuhasz, C., Witt, P., and Baxter, C., 2012: National Instrument 43-101 Technical Report, Quebrada Blanca Phase 2 Project, Region I, Chile: report prepared for Teck Resources Inc., effective date April 24, 2012;
- Barr, N.C., 2008: NI 43-101 Technical Report on Hypogene Mineral Resource Estimate, at Dec 31, 2007, Quebrada Blanca Region I, Chile: report prepared for Teck Cominco Limited and Compañía Minera Quebrada Blanca S.A, filing date 31 March, 2008;
- Barr, N.C. and Reyes, R., 2004: Report on Mineral Resources and Mineral Reserve Estimates at Dec. 31, 2003, Quebrada Blanca Copper Mine, Region I, Chile, report prepared for Aur Resources and Compañía Minera Quebrada Blanca S.A, filing date 31 March 2004.

These reports require that sufficient data verification is performed to support the Mineral Resource and Mineral Reserve estimate current at the time the reports were prepared. A combination of Teck staff and the Qualified Persons for the reports provided information on the verification programs performed. No issues that would materially affect the estimates were noted in any of the four reports.

A draft update to the 2008 technical report was prepared in 2009, but was not filed:

- Barr, N.C., 2009: NI 43-101 Technical Report on Supergene Mineral Resource and Mineral Reserve Estimates at Dec. 31, 2008, Quebrada Blanca Copper Mine, Region I, Chile: draft report prepared for Teck Cominco Limited and Compañía Minera Quebrada Blanca S.A, effective date 31 March 2009.

The report included a review of data collected during 2008. No issues that would materially affect the Mineral Resource or Mineral Reserve estimates were noted.

12.2.6 Production Monitoring

The data collected in the supergene zone is supported by about 24 years of production data (1994 to 2018). No significant issues have been noted during reconciliation with the exploration information that was collected. Although the hypogene mineralization has not been processed to date, similar methodologies were used from 2007 onwards in collection of the supergene information to that of the hypogene data.

12.3 Comments on Data Verification

The checks performed by Teck staff, including the continuous QA/QC checks conducted by the database administrator and Project geologists, annual QA/QC reviews, and verification conducted as part of compilation of NI 43-101 technical reports, in particular from 2008 to date, are in line with industry standards for data verification and have identified no material issues with the data or the Project database.

Two external audits were conducted on the drill database that supported the FS2012 resource estimate, and identified no material issues with the information at the time.

The QP has participated in every annual process review for the Quebrada Blanca Mineral Resources and Mineral Reserves from 2013 to date.

Overall, in the QP’s opinion, the level of review has adequately verified the quality of the core database as sufficient for use in estimating Mineral Resources and Mineral Reserves, and for use in mine planning.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

A series of metallurgical test work programs have been conducted by Teck's third-party consultants throughout the Project's development history. To date, the consultants performing and overseeing or reviewing the test work have included:

- Aminpro, Garibaldi Highlands, BC, Canada;
- DJB Consultants Inc. (DJB), North Vancouver, BC, Canada;
- G&T Metallurgical Services Ltd. (G&T), Kamloops, BC, Canada;
- Inspectorate PRA Group (PRA), Richmond, BC, Canada;
- Phillips Enterprises (Phillips), Golden, Colorado, USA;
- SGS Canada, Lakefield and Vancouver, Canada;
- SGS Santiago, Chile;
- JKTech Pty. Ltd (JKTech), Brisbane, Australia;
- SimSAGe Pty. Ltd. (SimSAGe), Brisbane, Australia;
- Bear Rock Solutions Pty. Ltd. (Bear Rock), Melville, Australia;
- Castro Ingeneiria, Santiago, Chile.

Supplemental work conducted during these programs included test work by vendors on process materials produced during pilot plant operation, in order to establish and validate equipment sizing criteria.

13.2 Metallurgical Test Work

A substantial body of test work and assessments were undertaken to support the 2010 pre-feasibility study and the FS2012 study (Allan et al., 2012); the majority of this work is superseded. Test work that is superseded included flotation, hardness and pilot plant testing and aspects of the comminution circuit design.

Additional test work was completed in 2012–2013 and in 2017–2018 to support the design criteria, which is discussed in this section.

13.2.1 Sample Selection

Samples were generated from 63 HQ and PQ sized drill core; seven HQ cores drilled in 2012 and 56 HQ and PQ cores drilled in 2017–2018. The drill hole locations were selected by Teck to represent the mineralization to be treated over the life-of-mine

(LOM) and to intersect the major geological and mineralogical ore domains, with sample selection weighted to provide detailed representation of the initial five years of the mine schedule.

Table 13-1 summarizes the mineralization domains, and whether or not the mineralization in these domains will be recoverable through the proposed concentrator. Mineralized zones were defined based on sequential copper leach assay data, supported by information from the drill logs in areas where sequential copper assays were not available.

The core was split in order to facilitate sample selection, and intervals with consistent lithology were selected for the variability sample test work. Discrete interval lengths ranged from 10–20 m, with geological review and oversight to ensure that sample selection was representative of the mineralization domains, lithologies and alteration types in the mine plan. In 2017–2018, half core was used for the comminution test work, flotation test work, and metallurgical assays, and drop weight tests were completed on six whole core intervals to support throughput analysis (Nelson and Marinho, 2017). In the 2012 program, ¾ of the core was used for the variability samples, with half-core used for comminution tests and quarter-core utilized for flotation tests and assays.

Composite and pilot plant samples were generated with consideration of the mineralization domains, lithology and alteration types represented in the life-of-mine plan (LOMP). These samples consisted of surplus variability sample charges and additional select intervals of half core.

Table 13-1: Mineralization Domains

Mineralization	Interpretation	QB2 Concentrator
Oxide	Oxide copper minerals	Not recoverable
Leached	Leached zone	Not recoverable
Enriched	Secondary chalcocite replacement	Recoverable
Transitional	Chalcopyrite with chalcocite coatings	Recoverable
Primary	Chalcopyrite, pyrite and bornite	Recoverable

13.2.2 Mineralogical Characterization

Mineralogical examination of samples was carried out using quantitative evaluation of materials by QEMSCAN particle mineral analysis (PMA). Three size fractions (+106, -106/+53 and -53 µm) per sample were submitted in the 2012 program and for the global composite sample from the 2017–2018 program. The 2017–2018 variability samples were analyzed as a single fraction following grinding to 150 µm.

Composite Samples

Pyrite and chalcopyrite are the dominant sulphide species, with minor levels of molybdenite and other copper sulphides present. Chalcopyrite is well liberated at the 150 µm primary grind size P_{80}, with 75–85% reporting as liberated. The remainder of the chalcopyrite is predominantly locked with non-sulphide gangue.

Chalcopyrite is not commonly associated with pyrite and shows minor levels of locking. This indicates that the separation of pyrite and chalcopyrite should not be influenced by liberation.

Variability Samples

Pyrite and chalcopyrite are the most common sulphide minerals in the variability samples. The pyrite content ranges from 0–17% and averages 2%; similar to that observed in the composite samples. The chalcopyrite content ranges from 0.1–8%, and averages 1.5%. The average ratio of pyrite to chalcopyrite is 1.5.

The major non-sulphide gangue minerals are quartz, feldspar, plagioclase, and sericite/muscovite. Clay content averaged 3%, with a range of 0.7–15%.

Copper is chiefly accounted for by chalcopyrite, with an average value of 95%. Minor levels of bornite were present in several samples. Two samples from the enriched mineralization zone showed notable levels of chalcocite and/or covellite.

Chalcopyrite is well liberated at the primary grind size P_{80} of 150 µm. Liberation ranges from 35–91%, and averages 74%. The unliberated chalcopyrite is predominantly associated with non-sulphide gangue, with an average locking value of 13%. Chalcopyrite locking with pyrite is uncommon. The occurrence of chalcopyrite locked with pyrite ranges from 0–9%, and averages 1%.

13.2.3 Comminution

Comminution test work included Bond ball mill work index (BMWi) and the SMC Test® for semi-autogenous grinding (SAG) mill comminution analysis. Results of the comminution test work are provided in Table 13-2.

The SMC test results indicated that the majority of Quebrada Blanca samples fall in the medium to hard categories with respect to resistance to impact breakage (Axb). The average value of abrasion index (t_a) was 0.38, categorizing the material as having medium resistance to abrasion breakage. The SMC tests were calibrated against the JKTech database to correct for the size effect.

Table 13-2: Comminution Test Results

Parameter	SMC Parameters		BMWi
	Axb	t_a	kWh/t
Average	38	0.38	13.0
Median	36	0.36	12.9
Std. Dev.	10	0.10	1.2
Minimum	22	0.20	9.9
Maximum	113	1.16	18.3

The BMWi results ranged from 9.9 to 18.3 kWh/t, and averaged 13.0 kWh/t. This indicates a medium hardness in terms of ball milling. The average BMWi test P_{80} value was 167 µm, in line with the primary grind target of 150 µm.

The comminution results were reviewed against:

- Geological characteristics (lithology and alteration);
- Assay and mineralogy (lithogeochemical and QEMSCAN);
- Geotechnical characteristics (RQD).

The review was designed to determine the drivers of ore hardness and support the selection of geometallurgical (geomet) units that could be reflected in the resource model and mine plan. Grouping the test results according to lithology proved effective, although the results have a narrow distribution between the P25 and P75 percentiles.

A consistent throughput value was used for mine planning purposes and financial evaluation due to the distribution of comminution test results and projected throughput rates.

13.2.4 Flotation

The flotation programs that support the metallurgical projections included the following stages:

- Flowsheet development;
- Pilot plant campaigns;
- Variability testing;
- Copper–molybdenum separation test work.

Flowsheet development focused on establishing the flotation circuit flowsheet, developing design criteria and establishing the metallurgical response to baseline conditions. The pilot plant campaigns were undertaken to generate bulk products for additional testing and to demonstrate flowsheet stability.

Variability testing was used to assess variation in metallurgical performance across the orebody under baseline conditions, and to support development of the geometallurgical units and metallurgical performance projections. Subsequent flotation chemistry optimization was completed based on selected variability samples, leading to the development of flotation driver groups that further refined the metallurgical projections.

The results from the flotation test programs supported the development of metallurgical projections for concentrate grades and metal recoveries.

Water Quality

The flotation test programs were carried out using synthetic process water. The purpose of the synthetic process water was to approximate the Project's water quality during Year 5 of the operation with desalinated water as the makeup water source. Teck selected the process water characteristics based on water quality modelling undertaken for a similar project.

Flowsheet Development

The composite samples were used for flowsheet development and optimization work. These programs included rougher, open-circuit cleaner and locked-cycle tests:

- Rougher tests were undertaken to confirm the selection of the primary grind size, retention time, and reagent addition scheme. The rougher test conditions were used as the basis for the remainder of the flowsheet development program and the variability testing program;
- Open-circuit cleaner tests were used to assess the number of cleaning stages, regrind target particle size, and reagent addition. Two stages of dilution cleaning and a cleaner–scavenger stage were selected for the open-circuit tests. The cleaning circuit parameters were used as the basis for the locked-cycle tests and the subsequent variability testing;
- Triplicate locked-cycle tests were completed on the composite sample from the 2012 program, resulting in a copper recovery of 91.6% at a concentrate grade of 27.1% Cu to the bulk concentrate. The recovery of molybdenum to the bulk concentrate was 83.9%, at a grade of 0.82% Mo. The cleaning efficiency was 97.6% for copper and 93.8% for molybdenum.
- Locked-cycle tests in the 2017–2018 program were completed on composite samples representing the first six years of the 2017–2018 mine plan to confirm concentrate quality and flowsheet stability. The six annual composite locked cycle

tests averaged a bulk concentrate grade of 26.7% Cu and 0.61% Mo at 88.6% Cu and 61.3% Mo recovery at elevated pH conditions.

- Subsequent test work was completed as part of the variability test program to further optimize pH according to the pyrite content and other geometallurgical drivers.

Pilot Plants

Pilot plants were operated as part of both the 2012 and 2017–2018 programs. The flowsheet and operating conditions determined in the flowsheet optimization stage were used as the operational basis for both programs. The objective of the 2012 pilot plant was to confirm flowsheet stability and generate a bulk concentrate for copper–molybdenum separation and ancillary equipment sizing test work. In 2017–2018, the objectives were to generate bulk rougher concentrate for staged flotation reactor (SFR) cleaner testing, and bulk concentrate and tails samples for ancillary test work to further validate the established design criteria and equipment size.

Methodology

The 2012 pilot plant consisted of a single-stage ball mill with screen classification at a 300 µm aperture. Oversize material was returned to the mill and undersize material was directed to rougher flotation. This arrangement was selected to target a P_{80} of 135 to 150 µm.

The flotation circuit consisted of a rougher stage, a concentrate regrind mill in closed circuit with a hydrocyclone, two stages of dilution cleaning, and a cleaner-scavenger stage. Synthetic process water was added to the circuit and no process water was recycled.

Approximately five tonnes of ore were processed through the pilot plant over a period of six days at a feed rate of 99 kg/h. The feed material head assays averaged 0.53% Cu and 0.021% Mo, with 91% Cu recovery to the bulk concentrate at a 28% Cu grade, and 59% Mo recovery to the bulk concentrate at a 0.64% Mo grade.

The 2017–2018 pilot plant consisted of a single-stage ball mill with spiral size classification followed by rougher flotation. Oversize material was returned to the mill and undersize material was directed to rougher flotation. This arrangement was selected to target a P_{80} of 150 µm. Synthetic process water was added to the circuit.

Approximately seven tonnes of ore were processed through the pilot plant over a period of seven days at a feed rate of 90 to 100 kg/h. The feed material head assays averaged 0.51% Cu and 0.017% Mo.

The bulk rougher concentrate was collected for SFR flotation test work to confirm first and second cleaner equipment sizing and performance. The SFR test work produced a high-grade concentrate with copper stage recovery exceeding 90% and molybdenum stage recovery exceeding 80%. The concentrate grade averaged 27% Cu, with the best test producing a bulk concentrate of 31% Cu and 0.48% Mo.

Bench-Scale Tests

In the 2012 pilot plant, rougher tailings, first cleaner–scavenger tailings, and bulk concentrate were collected as separate products throughout the six-day operating period.

Bench-scale rougher, cleaner, and locked-cycle tests were completed on the pilot plant composite prior to commencing operations:

- The single locked-cycle test yielded a copper recovery of 92.6% at a grade of 23.8% Cu in the bulk concentrate. Molybdenum recovery was 75.4% at a grade of 0.69% Mo. The cleaning efficiency values were 96.5% and 87.0% for copper and molybdenum, respectively;
- The copper flotation results were similar to the laboratory results. The pilot plant returned a copper recovery of 90.9% at a concentrate grade of 27.9%. The copper cleaning efficiency was 93.9%, in line with the laboratory tests. In the case of molybdenum, the pilot plant recovery was poor compared to the bench-scale tests. Molybdenum recovery to the bulk concentrate was 58.8% at a concentrate grade of 0.64% Mo. The results indicated that molybdenum losses were concentrated in the rougher tailings. The pilot plant rougher mass recovery was low (6.5%) compared to the locked-cycle test (16.0%). This appeared to have impacted molybdenum, although not copper, recovery. The molybdenum cleaning efficiency was 85.1%, in line with laboratory results.

In the 2017–2018 program, rougher feed samples were collected during pilot plant operation and cleaner feed samples were collected during SFR pilot test work for bench-scale testing to validate metallurgical performance. Results included:

- The target rougher concentrate grade of 4.0% was achieved in the bench scale with a copper recovery of approximately 92% and molybdenum recovery of approximately 84%. The pilot plant recovery was lower at 84% Cu and 71% Mo, indicating that collector distribution to the ore was insufficient;
- Bench cleaner flotation tests produced concentrates with an average grade of 25% copper and approximately 0.5% molybdenum.

Overall, the pilot plants met the established criteria for success. The flowsheet was stable and Teck considered the metallurgical performance results acceptable, with suitable products generated for further testing.

Copper–Molybdenum Separation

The copper–molybdenum separation program included rougher, cleaner and locked cycle tests. The bulk concentrate generated from the 2012 pilot plant was used as feedstock for the program. Tests were conducted in synthetic process water and nitrogen gas was used for flotation.

A series of rougher and open-circuit cleaner tests were completed for the purposes of flowsheet development. The parameters targeted for optimization were flotation time, rougher concentrate regrind size, cleaning configuration, solution chemistry (Eh, pH), and reagent dosage. The selected cleaning circuit consisted of four stages of dilution cleaner. The first cleaner tailings were recycled to the rougher stage.

Following the completion of rougher and cleaner optimization tests on bulk concentrate, two duplicate locked-cycle tests were conducted. The locked-cycle test results indicate that on average 97.4% of the molybdenum was recovered to the final molybdenum concentrate, with a grade of 49.6% Mo. The average copper recovery to the final copper concentrate was 99.9%, at a grade of 25.7% Cu.

The results from the copper–molybdenum separation locked-cycle tests are the basis for the selective stage factor applied in the recovery models to determine the global molybdenum recovery.

Variability Tests

The 2012 program included lock cycle tests on 57 variability samples. The 2017–2018 program evaluated the rougher kinetics for 250 variability samples, and locked-cycle performance for 62 variability samples to support an update to the metallurgical projections.

Samples which yielded poor recovery or bulk concentrate copper grades were investigated and the following trends observed:

- Copper recovery was linked with head grades, pyrite content, alteration minerals and chalcopyrite liberation;
- Bulk concentrate copper grade was linked with head grades, pyrite content, alteration minerals and chalcopyrite liberation;
- Molybdenum recovery was weakly linked with clay content and head grade.

In terms of copper performance, it was proposed that there were two factors at work, which were the amount of pyrite present, together with the type and intensity of alteration. These factors were investigated and geometallurgical driver groups (DGs) were developed based on the amount of clay minerals, sericite/muscovite and pyrite, as shown in Table 13-3. The differentiation of high from low concentrations was determined through statistical analysis of the copper rougher recovery results.

Table 13-3: Limits Defining High and Low Occurrence for Each Driver Group

Driver	High	Low
Montmorillonite/Fe-Mg clays	≥ 3.7%	< 3.7%
Sericite/muscovite	≥ 14.5%	<14.5%
Pyrite	≥ 2.3%	< 2.3%

Molybdenum performance was variable. Factors impacting the metallurgical performance included the molybdenum head grade and the presence of clay minerals.

The DGs were defined using a matrix of mineral contents, with relation to the mineral occurrence in the mine plan. Eight DGs were defined (DG1 through DG8), complimenting the geometallurgical units that form the basis of the metallurgical projections.

Locked-cycle flotation test work was completed on selected variability samples to evaluate the effect of high and low pH and to determine the optimum pH for the DGs that comprise the majority of the mine plan. The metallurgical performance was evaluated and results incorporated into the metallurgical projections.

The DG with low contents of all three drivers DG1 (with low clays, low sericite/muscovite and low pyrite) and DG4 (with high clays but low sericite/muscovite and low pyrite) were found to have better flotation performance at low pH. The DGs with high pyrite were found to have better performance with elevated cleaner pH. Untested DGs, which are minor constituents in the mine plan, are conservatively assumed to have better performance at higher pH.

13.2.5 Ancillary Tests

A series of ancillary tests to support process equipment selection have been completed. Results from the 2012 program are summarized in Table 13-4 and results from the 2017–2018 program are summarized in Table 13-5. The results of the ancillary test work have validated the design criteria for thickening and filtration.

13.3 Recovery Estimates

The geometallurgical evaluation of the recovery model domains (UG Rec) considered all available metallurgical and geological information, including lithology, mineral zonation, spatial distribution, structural blocks, quantitative evaluation of materials by QEMSCAN, metallurgical results and assays from the 2012 and 2017–2018 programs.

Table 13-4: Ancillary Test Work, 2012 Program

Test Work	Results Summary
Concentrate regrind	The installed power of the selected regrind equipment ranges from 5.8 to 7.5 kWh/t for the balance case and the design case
Bulk concentrate and copper concentrate thickening	Bulk concentrate: Solids loading rates of 0.04 to 0.15 t/(m^2·h) were reported without the use of flocculants. The selected bulk concentrate thickener yields solids loading rates at 0.09 to 0.12 t/(m^2·h) for the balance case and design case, respectively. The test work yielded a thickener underflow density up to 68.1% solids without the use of flocculants. The targeted bulk concentrate thickener underflow density is 55% to 60% solids. Teck believes that the use of desalinated water will result in similar operational performance to the test work results for saline water Copper concentrate: The test work indicated a minimum unit area of 0.05 (m^2·d)/t, and a flocculant dose of 15 to 20 g/t. The underflow density was 71% solids. The selected copper concentrate thickener yielded a unit area of 0.40 (m^2·d)/t. The flocculant dosing rate is 15 to 20 g/t and the underflow density target is 60% to 65% solids.
Concentrate filtration	Filtration rates of 150 to 300 kg/(m^2·h) could be achieved. However, these tests were conducted with saline process water. The use of seawater extended the cycle time. Teck believes that the use of desalinated water will result in both higher filtration rates and lower moisture contents than the test work results for saline water. The filtration equipment (with two of three filters in operation) yields required filtration rates of 169 to 277 kg/(m^2·h) for the balance case and design case.
Transportable moisture limit	The targeted moisture value for the copper concentrate is <10.0%
Tailings thickening	Feed density: 8% to 16.2% on a fully diluted basis Flocculant dosing: 15 to 40 g/t of anionic flocculants Underflow density: 56% to 62% solids Minimum unit area: 0.04 to 0.08 (m^2·d)/t (Outotec), and 0.05 (m^2·d)/t (FLSmidth) Flocculant dosing rate of 20 to 30 g/t Underflow density of 50% to 59% solids Minimum unit area of 0.065 (m^2·d)/t

Table 13-5: Ancillary Test Work, 2017–2018 Program

Test Work	Results Summary
Bulk concentrate and tails thickening	Bulk concentrate: test work without the use of flocculants resulted in unit area of 0.3360 $m^2/(t/d)$ and a density of 83%. The targeted bulk concentrate thickener underflow density is 55% to 60% solids. Tails: test work with flocculant resulted in unit areas ranging from 0.0750 to 0.0375 $m^2/(t/d)$, with flocculant doses of 15–25 g/t achieving densities of 70%. The design considers an underflow density range of 50– 59%.
Bulk concentrate filtration	Filtration rates of 300 to 370 $kg/h/m^2$ were achieved with moistures of 9–10%. The design considers a filtration rate of 214 $kg/h/m^2$.
Transportable moisture limit	The bulk concentrate was tested, resulting in a flow moisture of 11.45% and a transportable moisture limit of 10.30%. Vendor analysis indicates that the selected equipment can achieve 9% moisture at the design availability; however, the filter plant design value for copper concentrate has been retained at 10% moisture.

The metallurgical projections are based on rougher recovery variability results for 306 variability samples, complemented by 63 locked-cycle tests to determine the cleaner stage recovery, called the cleaner factor. Copper–molybdenum separation efficiency, called the selective stage factor, was an outcome from the 2012 program.

In addition to the cleaner factor, the results from the DG evaluation indicated that certain DGs will benefit from flotation at higher pH, which is incorporated into the metallurgical projections as the pH factor. The pH factor is provided in Table 13-6 for copper and Table 13-7 for molybdenum.

13.3.1 Recovery Equations

The general equations for the global copper and molybdenum recovery models are shown in Table 13-8. The metallurgical projections demonstrate that the copper and molybdenum rougher recoveries are in line with the recoveries reported for the variability tests, and global recovery is in line with results from lock cycle tests.

13.3.2 Copper Global Recovery Models

For copper rougher recovery, 10 domains (UG Rec Cu) were defined from the mineral zones, total copper head grade (Cu), lithology, Cu/S assay ratio and spatial occurrence (elevation). Table 13-9 shows the definition of the 10 UG Rec Cu considered for the copper recovery model.

Table 13-6: Factors Applied to the Copper Recovery Model

DG	Cleaner Factor	pH Factor
DG1, DG4	0.976	1
Other DGs		0.975

Table 13-7: Factors Applied to the Molybdenum Recovery Model

DG	Cleaner Factor	pH Factor	Selective Stage Factor
DG1	0.947	1	0.95
DG4	0.882	1	
Others	0.882	0.858	

Table 13-8: Recovery Equations

$$\boldsymbol{Cu\ Global\ Rec. = Cu\ Rougher\ Rec._{(pH\ 8.5)} * Cleaner\ Factor * pH\ Factor}$$

$$\boldsymbol{Mo\ Global\ Rec. = Mo\ Rougher\ Rec._{(pH\ 8.5)} * Cleaner\ Factor * pH\ Factor * Select. Stage\ Factor}$$

Where:

***Cu Rougher Rec.** (pH 8.5)*	Cu rougher recovery model at pH 8.5
Cleaner Factor	Recovery factor in the cleaning stage
pH Factor	pH adjustment factor
***Mo Rougher Rec.** (pH 8.5)*	Mo rougher recovery model at pH 8.5
Select. Stage Factor	Flotation selective stage factor for Mo

Table 13-9: Domain Definition (UG Rec Cu) for Copper Recovery Model

<table>
<tr><th>UG Rec Cu</th><th>MinZone</th><th>Cu</th><th>Lithology</th><th>Z (m)</th><th>Cu/S</th></tr>
<tr><td>1</td><td>Enriched</td><td>All</td><td rowspan="4">All</td><td rowspan="4">All</td><td rowspan="4">All</td></tr>
<tr><td>2</td><td>Transitional</td><td>All</td></tr>
<tr><td>3</td><td rowspan="8">Primary</td><td><0.1%</td></tr>
<tr><td>4</td><td>0.1% - 0.2%</td></tr>
<tr><td>5</td><td rowspan="6">≥0.2%</td><td>Breccia</td><td rowspan="2">≥ 3,925</td><td rowspan="4"><0.75</td></tr>
<tr><td>6</td><td>QMZ</td></tr>
<tr><td>7</td><td>Diorite</td><td>All</td></tr>
<tr><td>8</td><td>Breccia, QMZ</td><td><3,925</td></tr>
<tr><td>9</td><td>FP</td><td rowspan="2">All</td><td>All</td></tr>
<tr><td>10</td><td>All</td><td>≥0.75</td></tr>
</table>

In order to generate robust rougher recovery models with a better prediction for each UG Rec Cu, some samples with unusual behaviour in their respective domains (outliers) were examined for geological differences. A geological characterization and evaluation was completed for each outlier. The outliers were generally located in fault zones with higher than average clay content and with actual metallurgical performance below the expected theoretical recovery. Outlier samples were removed from the dataset during regression analysis, then reinserted prior to evaluating the correlation coefficient of the proposed regression. If no geological justification for an outlier existed, the sample was retained in the dataset for the entire regression analysis process. The final outlier set corresponds to 8% of the variability samples for copper rougher recovery.

Equations for the copper rougher recovery model corresponding to each of the UG Rec are shown in Table 13-10. The maximum global recovery was capped according to mineralization zone with a maximum copper recovery of 85.0% for enriched, 90.9% for transitional and 93.6% for primary ore (Table 13-11).

13.3.3 Molybdenum Global Recovery Models

For molybdenum rougher recovery, eight domains (UG Rec Mo) were defined from the mineral zones, lithology and spatial occurrence (structural blocks). Table 13-12 shows the definition of the eight UG Rec Mo considered for the molybdenum recovery model.

In order to generate robust rougher recovery models with a better prediction for each UG Rec Mo, some samples with unusual behaviour in their respective domains (outliers) were examined for geological differences.

Geological characterization and evaluation were completed for each outlier.

Table 13-10: Copper Rougher Recovery Model Equations

UG Rec Cu	Rougher Recovery*
1	Ro Rec = 0.874 + 0.0482 Ln(Cu/S) - 0.0091 S
2	Ro Rec = 0.858 + 0.0126 Ln(Cu/S) + 0.0340 S
3	Global = 54%
4	Ro Rec = (0.4755 x Ln(Cu) + 1.6579) / f(cleaner)
5	Ro Rec = 0.952 + 0.0303 Ln(Cu/S) + 0.00985 S
6	Ro Rec = 0.968 + 0.0406 Ln(Cu/S) + 0.00284 S
7	Ro Rec = 1.01 + 0.0525 Ln(Cu/S) - 0.0062 S
8	Ro Rec = 0.955 + 0.00974 Ln(Cu/S) + 0.00405 S
9	Ro Rec = 1.54 - 0.0006 Ln(Cu/S) + 0.0021 S – 0.000156 z
10	Global = 93.3%

Note: * Cu = total copper, S = Sulphur, z = elevation.

Table 13-11: Maximum Recovery Value by Mineralization Zone

MinZone	Cu Recovery (%)	Mo Recovery (%)
Enriched	85.00	62.36
Transitional	90.91	59.31
Hypogene	93.60	86.37

Table 13-12: Domain Definition (UG Rec Mo) for Molybdenum Recovery Model

<table>
<tr><th>UG Rec Mo</th><th>Minzone</th><th>Structural Blocks</th><th>Lithology</th></tr>
<tr><td>1</td><td>Enriched</td><td>All</td><td>All</td></tr>
<tr><td>2</td><td>Transitional</td><td>All</td><td>All</td></tr>
<tr><td>3</td><td rowspan="6">Primary</td><td rowspan="3">1 and 2</td><td>DIO + FP</td></tr>
<tr><td>4</td><td>QMZ</td></tr>
<tr><td>5</td><td>Breccias</td></tr>
<tr><td>6</td><td>3</td><td>All</td></tr>
<tr><td>7</td><td>4</td><td>All</td></tr>
<tr><td>8</td><td>5 and 6</td><td>All</td></tr>
</table>

The outliers are generally located in fault zones with higher than average clay content and with actual metallurgical performance below the expected theoretical recovery. Outlier samples were removed from the dataset during regression analysis, then reinserted prior to evaluating the correlation coefficient of the proposed regression. If no geological justification for an outlier existed, the sample was retained in the dataset for the entire regression analysis process. The final outlier set corresponds to 3% of the variability samples for molybdenum rougher recovery.

Molybdenum recovery is impacted in part by the molybdenum head grade and the level of clay present in the sample. The resource model does not incorporate an estimation of clay material; therefore, molybdenum recovery is predicted as a function of molybdenum and sulphur assays. The results of the copper–molybdenum separation test program indicated that a molybdenum concentrate grade of 49.6% Mo with a stage recovery of 97.4% could be achieved. The projections assume a constant grade of 50% Mo to the molybdenum concentrate and a copper–molybdenum separation efficiency of 95%.

Equations for the molybdenum rougher recovery model corresponding to each of the UG Rec are shown in Table 13-13. The maximum global recovery was capped according to mineralization zone (shown in Table 13-11), with a maximum molybdenum recovery of 62.4% for enriched, 59.3% for transitional and 86.4% for primary ore.

13.3.4 Concentrate Grade Models

The copper and silver concentrate grade models were based on 94 lock cycle tests, 56 completed during the 2012 program and 38 from the 2017–2018 program. Three copper concentrate grade domains were defined based on Cu head grades and the Cu/S ratio, Table 13-14. In the case of the silver grade in the concentrate, two domains were defined based on the silver head grades (Table 13-15).

Different models were evaluated with the objective of generating robust models that are consistent with test data. The validation criterion was to achieve the highest possible adjusted correlation coefficient while using all available information. Based on results from locked-cycle tests evaluating pH, it was determined that the concentrate grade for DG1 is affected by pH, and therefore DG1 was modelled with a different equation from the other DGs.

The copper concentrate grade is capped at 18.0% Cu for low head grades and at 30.0% Cu for elevated head grades and Cu/S ratio. The concentrate grade projections align with the results from the lock cycle tests.

Table 13-13: Molybdenum Rougher Recovery Model Equations

UG Rec Mo	Mo Rougher Recovery
1	19.268 * Ln (Mo) - 15.848
2	5.9533 * Ln (Mo) + 51.009
3	6.2438 * Ln (Mo/S) + 79.942
4	25.863 * Ln (Mo/S) + 60.56
5	3.313 * Mo + 66.421
6	4.3083 * Ln (Mo/S) + 84.21
7	3.2719 * Ln (Mo) + 86.688
8	4.9322 * Ln (Mo) + 60.677

Table 13-14: Copper Concentrate Grade Domains and Models

DG	Cu	Cu/S	Cu Concentrate Model
All	<0.2%	All	18%
DG1	≥0.2%	<1	30.194 + 6.4596 x Ln (Cu/S)
	≥0.2%	≥1	30%
DG2 to DG8	≥0.2%	<0.75	30.317 + 4.2516 x Ln (Cu/S)
	≥0.2%	≥0.75	30%

Table 13-15: Silver Concentrate Grade Domains and Models

Ag (ppm)	Ag Concentrate Model*
≤ 4	Ag ∗ (0.6734 ∗ (Cu_Con / Cu) + 4.7913)
> 4	8 * Ag

Note: * Cu_Con = Cu concentrate grade.

13.4 Metallurgical Variability

The metallurgical test work completed to-date is based on 306 samples that adequately represent the variability of the proposed mine plan.

13.5 Deleterious Elements

The copper and molybdenum concentrates generated in the copper–molybdenum separation program were submitted for detailed concentrate quality analysis.

No elements are present at penalty levels in the copper concentrates. Credits may be obtained for silver; however, the average value (47.8 ppm) is considered to be only marginally above the payable value. Gold is not present at payable levels.

The average copper grade in the molybdenum concentrates is 1.4% Cu. Copper grades >1% Cu are expected to impact the molybdenum concentrate payment structure. No additional penalty elements are expected. The rhenium content of the molybdenum concentrate would, at minimum, make the molybdenum concentrate more marketable, and is also considered to be a Project upside opportunity.

13.6 Comments on Mineral Processing and Metallurgical Testing

Metallurgical test work performed is appropriate to the mineralization type, and is based on 306 samples that adequately represent the variability of the proposed mine plan.

The maximum global recovery was capped according to mineralization zone with a maximum copper recovery of 85.0% for enriched, 90.9% for transitional and 93.6% for primary ore. There are no elements present at penalty levels in the copper concentrates. There is some minor upside potential for silver credits in the copper concentrates.

The maximum global recovery was capped according to mineralization zone, with a maximum molybdenum recovery of 62.4% for enriched, 59.3% for transitional and 86.4% for primary ore.

There will be a minor penalty payable for copper contained in the molybdenum concentrate. No additional penalty elements are expected. Rhenium in the molybdenum concentrates may be a Project upside opportunity.

14.0 MINERAL RESOURCE ESTIMATES

14.1 Introduction

The 2018 resource block model for the QB deposit represents a significant update based on improved lithological and structural understanding of the deposit, and over 23,676 metres of new drilling information. In relation to the FS2016 model, the updated 2018 model includes additional infill and exploration data from drill campaigns completed in the period 2012–2018, an update of the structural trends with mining data, lithological units and an updated algorithm for mineral zone definition. Re-logging campaigns were incorporated into the estimation domain definitions. This updated model is supported by 740 core drill holes.

14.2 Geological Models

The process of interpreting three-dimensional (3D) geological boundaries was based on conceptual interpretations undertaken in sections and plans. The database used in the 3D modelling consist of 242,676 m of drill holes coded with lithology, and 221,815 m with mineralogical zone logging, as well as 93,014 m with sequential copper grades. Based on the geological sections, structural controls and sequence of geological events, along with drill hole and surface mapping data, 3D geological features were interpreted using commercially-available Leapfrog Geo software. Throughout the model construction, continuous feedback was received from the site geology team to ensure consistency of the resulting models.

The geological features interpreted to support the Mineral Resource estimate are lithology, mineral type and structural domains. Leapfrog Geo, with geological conceptual sections and control points, was used to construct 3D wireframe models for each geological variable of interest. Manual manipulation was applied to each 3D geological model if and where required.

14.2.1 Oxidation Domains

The oxidation domains or "min-type" used for interpretation and modelling is based on a calculation applying sequential copper assays. The algorithm used was updated from that used for the feasibility study calculations due to some inconsistencies in the original formula, particularly for the transition and hypogene zones. Min-types were calculated in the acQuire database, and exported to Leapfrog without any data manipulation. Where a drill hole lacked sequential copper analysis, input from geological mapping was used to address the gaps.

14.2.2 Structural Domains

The emplacement and geometry of intrusions, breccias and mineralization are controlled by two "structural corridors" oriented northeast and east–northeast, and to a lesser extent by northwest-oriented faults that controlled a late-stage alteration and are pre-supergene enrichment. From the information obtained in the pit and drill core, four structural domains were established (refer to discussion in Section 7).

14.2.3 Lithological Domains

The lithological model was prepared considering the intrusive sequence, the preferential direction of the unit emplacement related to the northeasterly-trending structures, and the subsequent dislocation associated due to northwesterly-trending faults, logging data, and information from sections and plans.

A set of geological conceptual sections and plans was interpreted at 300 m spacing using all available drill hole data and historical surface geological mapping as support. The geological wireframes were subsequently reviewed on sections to compare to preliminary sectional interpretations and the model spatial consistency.

14.2.4 Alteration Model

A preliminary set of alteration models were generated for pyrite, sericite/muscovite, and smectites (montmorillonite and iron–magnesium clays), primarily for geometallurgical purposes. For each of these models, only the occurrence above a certain modal abundance has been interpreted; and each modal abundance criterion was selected based on geometallurgical guidance.

The hydrothermal alteration model was not directly used to constrain the resource estimate; however, the discussion on the model preparation is included in this Report since it is used in geometallurgical characterization.

14.3 Exploratory Data Analysis

Exploratory data analysis (EDA) was performed on different combinations of oxidation state, lithology, and structural domains with histograms, log probability plots, and box and whisker plots. Contact analysis plots were also prepared to analyze grade trends and contact relationships between the units.

Copper, molybdenum, silver and sulphur values were analyzed for grade trends, domain correlations, and contact relationships to establish the final estimation domains.

The majority of boundaries were considered to be hard. Soft boundaries could be used where the contact analysis warranted.

14.4 Specific Gravity Assignment

The assigned block model specific gravity (SG) values were based on average SG measurements for mineralization and lithology domains.

14.5 Compositing

The most common assay interval is 2 m (comprising approximately 97% of the data), with a small percentage of 1 m assays (approximately 5% of the data) from historical drilling. A 4 m composite length was chosen to preserve vertical variability for the sub-horizontal oxidation zones. Composites were split out by estimation domain, based on back flagging codes from the block model, with the option of adding a maximum of 2 m to the composite to improve geological continuity.

14.6 Grade Outlier Control

No direct grade capping was done; the extended influence of the high-grade outlier composites was restricted in the kriging plans where necessary using an "influence area" methodology. This methodology takes into account the metal at the top of cumulative probability plots, uses a spatial control driven by geological knowledge and avoids metal losses that would otherwise occur through underestimation of enriched zones. The impact of this restriction was assessed by interpolating auxiliary block models without outlier restriction and by close visual inspection of the results. Nearest-neighbour (NN) reference models were also obtained with and without outlier restriction and served as reference for checking for global bias.

Outlier controls applied to acid soluble copper ranged from 0.24 to 0.58%, to cyanide-soluble copper ranged from 0.13 to 4.8%, to total copper ranged from 0.37 to 4.7%, to molybdenum ranged from 0.022 to 0.54%, to silver ranged from 1.8 to 19 ppm, and to sulphur ranged from 1.768 to 8.276%.

14.7 Variography

Commercially-available Supervisor V.8.8 software was used for calculating and modeling the experimental semivariograms for total copper, sequential copper, molybdenum, silver, and sulphur composites. There are two major stages to analyzing continuity.

In general, variograms maps and experimental variograms were implemented for all estimation domains. A semi-variogram model was fitted for each experimental semi-variogram in the three main directions of anisotropy. When directional semi-variograms did not show structured patterns, omni-horizontal semi-variograms were used in conjunction with a vertical semi-variogram, or, in the worst case, omnidirectional semi-variograms were adopted. The nugget effect was obtained using a downhole semi-variogram.

For a few domains, it was not possible to find an adequate continuity model due to the limited number of available composites. In these domains, it was necessary to use inverse distance weighting (IDW) as the interpolation method, because that method does not require a variogram model.

Once the variographical analysis was finished, a kriging neighborhood analysis (KNA) was carried out with the aim of defining the correct number of samples to use within the search volume or "kriging neighborhood".

14.8 Sub-Block Model

Modelling considered sub-block proportions for the structural model, oxidation zones and lithology. Models were constructed using the original mine topography, so that past production reconciliation validation studies could be undertaken.

Sub-blocking to a minimum 5 m x 5 m x 5 m was used in commercially-available Vulcan software to better honour the variability of the geological models. The estimation model was re-blocked to the parent 20 m x 20 m x 15 m block size saving the proportion of each domain. Grades were estimated using the proportion of each of them. The parent block size is considered to be appropriately aligned with mine selectivity and equipment size requirements.

14.9 Estimation/Interpolation Methods

Total copper, molybdenum, silver and sulphur were estimated into the model using ordinary kriging (OK). The kriging parameters applied to the estimates were customised for each parameter and within each domain, based on the results of an iterative estimation, validation, and update process.

Estimation was undertaken into parent cells and applied to the sub-cells in order to maintain uniform discretization and volume representivity for each estimate. A three-or four-pass estimation approach was used for the metal estimates. The purpose of the multiple passes is to ensure strong local support to estimates in well-informed parts of the model while allowing an appropriate search to find enough samples in less informed model areas. The maximum and minimum number of samples used in each estimate was revised based on the results of the model validation.

Where estimates could not be made within the kriging pass criteria described above, values were interpolated using IDW in two passes. The first pass used short distances to ensure strong local support and a second pass with longer distances was used to inform all distant blocks. Where this approach was not possible due to a lack of adjacent data, values were assigned to blocks using the mean estimated value obtained for the third kriging pass or the second IDW pass.

The block grade dilution related to the geology boundaries was taken up in the final block grades by considering the proportion of each geological population within each block. This approach accounts for grade dilution related to geological contacts and provides similar results to what is normally referred to as “partial block” grade interpolation. The proportion of the geological population in each estimation domain is stored on a block by block basis from the interpreted solids. For the interpolation of total grades, each domain had its own interpolated variable that was used to derive the final block grade by weighting the interpolated grades based on the proportions of each domain within the block. Interpolation parameters used are summarized in Table 14-1.

14.10 Block Model Validation

Various measures were implemented to validate the resource block model, and are summarized in Table 14-2.

The validation process showed that the model does an acceptable job of matching the source data. No global bias was observed as the OK model generated the same tonnes and grade as the NN model at a zero cut-off, with no shift in the mean value on histogram comparisons.

14.11 Classification of Mineral Resources

Porphyry copper deposits are characterized by large volumes of continuous grades over large distances that are radially distributed around and within the source intrusion; this is also true of the QB deposit.

Only core drill holes have been used to estimate and classify Mineral Resources. Legacy RC drill holes were removed from the database for this purpose. Resource classification parameters were developed based on geological models, updated variography and findings from a conditional simulation study.

As a result of the reviews of the historical data quality control processes, holes drilled prior to the 2007 campaign were not used to classify Measured Mineral Resources (261 of the oldest drill holes). However, these supergene evaluation holes could be used when classifying blocks as either Indicated or Inferred.

The resource classification methodology consists of an interpolation plan set up specifically to assess the level of information of each individual block in relation to the location and density of drill holes available in the block neighbourhood. Table 14-3 summarizes the classification criteria.

Table 14-1: Estimation Parameters

Element	Pass 1	Pass 2	Pass 3	Pass 4	Comment
Copper	Minimum of three drill holes and nine samples	Minimum of two drill holes and seven samples	At least one drill hole	At least one drill hole	When blocks were not estimated, a value was assigned using the grade average of the third estimation pass. The block with values assigned <1% of the estimated Mineral Resource blocks
Molybdenum	Search distances (i.e. Between 80–100 m) related to 60–80% of the total variance observed in the semi-variograms models and a minimum of nine composites based on the kriging neighborhood analysis	Search distances between 100–200 m reaching 90% of the total variability observed in the semi-variograms models, and using at least six composites	Long distances (i.e. 400–500 m) was undertaken with the aim of estimating all remaining non-estimated blocks	—	When blocks were not estimated, a value was assigned. The block with values assigned are <1% for the majority of the classified Mineral Resource blocks. The exception is domain 100 where 5% of blocks have an assigned value within the blocks classified as Measured and Indicated
Silver	Minimum of nine samples, minimum of three drill holes	Minimum of six samples. Depending on domain, minimum of one or two drill holes	Minimum of four samples. Depending on domain, minimum of one or two drill holes	Minimum of four samples	
Sulphur	Minimum of nine samples, minimum of three drill holes	Minimum of six samples. Depending on domain, minimum of one or two drill holes	Minimum of four samples. Depending on domain, minimum of one or two drill holes	Minimum of four samples	Where estimates could not be made within the kriging pass criteria, values were interpolated in two passes using IDW
Sequential copper (CuS and CuCN)	Minimum of three drill holes and nine samples	Minimum of two drill holes and seven samples	At least one drill hole	At least one drill hole	Soluble copper was not estimated in the primary zone, instead a low grade was assigned

Table 14-2: Validation Procedures

Procedure	Comment
Visual validation	The copper, molybdenum, silver and sulphur composites and resulting estimates were visually inspected in Vulcan on cross sections and in plan view to ensure there were no obvious errors in the local estimates compared to the input samples. The visual checks indicated the samples are well represented by the block model values. Over-extrapolation of high-grade intercepts was being appropriately controlled using the minimum and maximum sample search parameters and the three-pass interpolation approach. Grade smearing and grade smoothing across zones was appropriately controlled by the use of hard and soft boundaries and multiple passes during the interpolation process
Statistical comparisons	The statistical validation compares the OK estimate principally against NN values in the block model. The NN model is used as a representation of the declustered values from the input composites (i.e. NN_Model). The data used for this validation are based on all three estimation passes. The importance of this validation is to determine if the OK model provides a reasonable estimate of the composite data based on the differences between the mean grade value and the mean grade value estimated
Swath plot analysis (drift analysis)	The drift analysis was evaluated using swath plots. Swath Plots are used to ensure that the estimates are a reasonable reflection of the input data by calculating the mean grade in the estimates, samples and NN values along swath corridors of a given width throughout the deposit. The plots are typically examined in all three dimensions, either by domain or across the entire deposit. Swath plots were constructed between the OK estimates and the NN data, using all three kriging passes, and separately created for each domain and element. The plots were developed using Snowden Supervisor software. This software uses the final block model exported from Vulcan to compare against the composite dataset. Overall the swath plots show a good agreement between the estimates and the composites, indicating no bias between the model estimate and the samples. Larger variations between the means can be correlated with a reduction in the number of samples.

Table 14-3: Mineral Resource Classification Considerations.

Mineral Zone	Resource Category	Num DH	Search Radius (m)		
			Major	Semi Major	Minor
Leach	Measured	-	-	-	-
	Indicated	3	60	60	60
	Inferred	1	140	140	140
Oxide	Measured	3	40	40	40
	Indicated	3	60	60	60
	Inferred	1	140	140	140
Enrichment	Measured	3	40	40	40
	Indicated	2	55	55	55
	Inferred	1	140	140	140
Transition	Measured	3	50	50	50
	Indicated	2	60	60	60
	Inferred	1	140	140	140
Primary	Measured	3	70	70	70
	Indicated	2	110	110	110
	Inferred	1	175	175	175

A smoothing algorithm was set up to reduce the “mixed blocks classification” situation to reasonable levels. The algorithm works by calculating on a block-by-block basis, a moving window which counts the number of blocks of each category within that window and finally assigns the final category to the majority of blocks based on probability of each. The final window size selected was 40 m by 40 m by 17 m; this size was selected empirically by implementing various runs until an acceptable level of smoothing was reached.

14.12 Reasonable Prospects of Eventual Economic Extraction

The evaluation of reasonable prospects of eventual economic extraction assumes a conventional open pit mining method, and an assumed mining rate of 100 Mt/year for the first five years of operation. From year 6, it was assumed that the total movement would be increased to 120 Mt/year.

Teck used commercially-available Geovia Whittle software to define a resource pit shell. The ultimate pit was created based on the same parameters (costs, prices, metallurgical recoveries and pit slope angles) that were used for defining Mineral Reserves (see Section 15 and Section 16); however, the pit outline selected for Mineral Resources represents the revenue factor (RF) 1 pit. The metallurgical recovery equations used were a function of head grade, copper-to-sulphur ratio, and mineralization type.

The QB2 optimization is based on a net smelter return (NSR) variable, based on blocks net revenue for copper and molybdenum, less the treatment and freight cost of both commodities.

The NSR optimization variable is estimated using the following equations:

$$NSR\ CU = \left(\frac{CUT}{100} \times \frac{RCU}{100} \times TonLb \times CPF\right) \times CUP - ((RC \times (Conc_{cu} \times CPF \times TonLb)) + TC + OF) * \left(\frac{CUT/_{100} \times RCU/_{100}}{Conc_{cu}}\right)$$

$$NSR\ MO = \left(\frac{MO}{100} \times \frac{RMO}{100} \times TonLb\right) \times MPF\ X\big(MOP - (MOP * RCH)\big) - TFR * \left(\frac{MO/_{100} \times RMO/_{100}}{Conc_{MO}}\right)$$

$$NSR\ = NSR\ MO + NSR\ MO$$

where:

- TonLb: Lb/tonne (2204.62 lb/t);
- CUP: Copper ($/lb);
- MOP: Molybdenum ($/lb);
- CPF: Payable copper;
- TC: Treatment charge ($/dmt);
- RC: Copper refining ($/lb);
- OF: Total copper freight ($/dmt);
- MPF: Payable molybdenum;
- RCH: Roasting charge (% of price per lb);
- TFR: Total freight ($/dmt);

The mine plan uses a variable cut-off grade strategy to maximize the value of the material delivered to the concentrator and averages $19.86/t NSR. Material below the operation cut-off and above $24/t is sent to the high-grade stockpile. Material below the operational cut-off and between $24/t and $13/t is sent to the low-grade stockpile and will be processed towards the end of the mine plan. In any given year if the operational cut-off drops below the grade of material available in the stockpiles, the corresponding material can be fed from the stockpiles to the plant. The material below the operational cut-off of $13/t is deposited in the WRSFs and not re-handled. Input parameters to the Whittle shell are summarized in Section 16.

14.13 Existing Hypogene Stockpile

Hypogene mineralization was exposed while mining the supergene ore, and was stockpiled when encountered. Tonnages and copper grades were tracked and recorded as part of grade control practices. These existing stockpiles are classified and reported as Indicated Mineral Resources and are not scheduled in the current life-of-mine (LOM) plan.

The molybdenum grade of the stockpile is unconfirmed as it was not tested at the time of extraction.

14.14 Mineral Resource Statement

The Mineral Resource estimate is reported exclusive of those Mineral Resources that have been converted to Mineral Reserves, and uses the 2014 CIM Definition Standards. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo., Technical Director Reserve Evaluation, a Teck employee. Mineral Resources have an effective date of 30 November, 2018. Table 14-4 summarizes the Measured, Indicated and Inferred Mineral Resources for the Project.

14.15 Factors That May Affect the Mineral Resource Estimate

Factors which may affect the Mineral Resource estimates include:

- Metal price and exchange rate assumptions;
- Changes to the assumptions used to generate the NSR cut-off;
- Changes in local interpretations of mineralization geometry and continuity of mineralized zones;
- Density and domain assignments;
- Changes to geotechnical, mining and metallurgical recovery assumptions;
- Changes to input and design parameter assumptions that pertain to the conceptual Whittle pit design constraining the estimate;
- Assumptions as to the continued ability to access the site, retain mineral and surface rights titles, maintain environmental and other regulatory permits, and maintain the social licence to operate.

Table 14-4: Mineral Resource Summary Table

Category	Tonnage (x 1,000 t)	Grade			Contained Metal		
		Cu	Mo	Ag	Cu	Mo	Ag
		(%)	(%)	(g/t)	(x 1,000 t)	(x 1,000 t)	(Moz)
Measured	36,200	0.42	0.014	1.23	152	5	1.433
Indicated	1,558,000	0.40	0.016	1.14	6,218	247	56.965
Measured & Indicated	**1,594,200**	**0.40**	**0.016**	**1.14**	**6,370**	**252**	**58.398**
Inferred	3,125,200	0.38	0.018	1.14	11,880	555	114.791

Notes to Accompany Mineral Resource Tables:

1. Mineral Resources are reported effective 30 November, 2018. The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo, a Teck employee.
2. Mineral Resources are reported exclusive of those Mineral Resources converted to Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
3. Mineral Resources are reported on a 100% basis using a net smelter return cut-off of US$11/t, which assumes metal prices of US$3.00/lb Cu and US$9.40/lb Mo. As at November 30, 2018, Teck had a 90% interest, with ENAMI holding a 10% interest.
4. Mineral Resources are contained within a conceptual pit shell that is generated using the same economic and technical parameters as used for Mineral Reserves but at a selected revenue factor of 1. Direct mining costs are estimated at US$3.37/t of material moved. Processing costs are US$11.02/t of material milled and include concentrator, tailings management facility, port, and desalination costs. Infrastructure of US$0.60/t include desalination plant (US$0.37/t) and port operating costs ($0.23/t). G&A costs are US$1.36/t. Metallurgical recoveries average around 91% for Cu and 76% for Mo, but are variable by block. Pit slope inter-ramp angles vary from 30–44º. Mineral Resources also include mineralization that is within the Mineral Reserves pit between NSR values of US$10.36/t and US$15.07/t which has been classified as Measured and Indicated, as well as all material classified as Inferred that is within the Mineral Reserves pit. In addition, Mineral Resources include 23.8 Mt of hypogene material grading 0.54% copper that has been mined and stockpiled during our existing supergene operations.
5. Tonnage and contained copper and molybdenum tonnes are reported in metric units and grades are reported as percentages.
6. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal content.

14.16 Comments on Mineral Resource Estimates

Mineral Resources are reported using the 2014 CIM Definition Standards.

There are no other known environmental, legal, title, taxation, socioeconomic, marketing, political or other relevant factors that would materially affect the estimation of Mineral Resources that are not discussed in this Report.

15.0 MINERAL RESERVE ESTIMATES

15.1 Introduction

The Mineral Reserve estimates for the Project are based on the block models outlined in Section 14, and the detailed "design reserve pit" and net smelter return block model discussed in Section 16. Metallurgical recoveries, operating costs, capital costs, commodity prices, and smelter terms are based on the information summarized in Sections 13, 17, 19, and 21 of this Report. The Project economics that support the Mineral Reserve statement are included in Section 22.

No internal or external mining dilution was added to the block model during the mine design process. The QP concluded that smoothing within the block model provided sufficient dilution.

The design reserve pit was based on a Lerchs–Grossmann (LG) optimization process using Whittle software and a detailed phased pit design. Nine mine phases were designed to prioritize the higher-grade zones within the mineral extraction plan, while maintaining suitable working widths that would enable high-productivity mining sequences using large-scale mining equipment. The mine plan was optimized by analyzing numerous scenarios that employed high and low-grade stockpiling strategies, as well as a variable cut-off grade profile. The size of the open pit and the production rate are controlled by the storage capacity of the TMF, which is in turn affected by site-specific constraints.

The mine plan was developed using Measured and Indicated Mineral Resources. Inferred Mineral Resources were set to waste for the pit optimization process and mine scheduling. Mining assumes conventional open pit operations using truck-and-shovel technology.

15.2 Mineral Reserve Statement

Proven and Probable Mineral Reserves are reported effective 30 November, 2018 using the 2014 CIM Definition Standards. The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo., Technical Director Reserve Evaluation, a Teck employee.

Mineral Reserves are summarized in Table 15-1.

Table 15-1: Mineral Reserve Statement

Category	Tonnage (x 1,000 t)	Grade			Contained Metal		
		Cu (%)	Mo (%)	Ag (g/t)	Cu (x 1,000 t)	Mo (x 1,000 t)	Ag (Moz)
Proven	476,300	0.51	0.018	1.4	2,411	84	21.466
Probable	923,800	0.47	0.019	1.2	4,350	173	37.174
Proven & Probable	**1,400,000**	**0.48**	**0.018**	**1.3**	**6,761**	**258**	**58.64**

Notes to Accompany Mineral Reserves Table:

1. Mineral Reserves are reported effective 30 November, 2018. The Qualified Person for the estimate is Mr. Rodrigo Alves Marinho, P.Geo, a Teck employee.
2. Mineral Reserves are reported on a 100% basis using an average net smelter return cut-off of US$13.39/t, which assumes metal prices of US$3.00/lb Cu and US$9.40/lb Mo. As at November 30, 2018, Teck had a 90% interest, with ENAMI holding a 10% interest.
3. Mineral Reserves are contained within operational phases defined with an optimized pit shell sequence. Mining will use conventional open pit methods and equipment, and use a stockpiling strategy. Direct mining costs are estimated at US$3.37/t of material milled. Processing costs are US$11.02/t of material milled and include concentrator, tailings management facility, port, and desalination costs. Infrastructure costs of US$0.60/t includes desalination plant (US$0.37/t) and port operating costs (US$0.23/t). General and administrative (G&A) costs are US$1.36/t. Metallurgical recoveries average around 91.04% for copper and 74.20% for molybdenum, but are variable by block. Pit slope inter-ramp angles vary from 30–44º, where the lowest slope angles are predicted in the gravel unit. The life-of-mine strip ratio is 0.41.
4. Tonnage and contained copper and molybdenum tonnes are reported in metric units and grades are reported as percentages.
5. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal content.

Reported hypogene Mineral Reserve estimates are constrained by two pit surfaces. Surfaces include the upper “leach 2019 life-of-mine reserve design” for the existing supergene dump leach operation and the lower “design reserve pit” (for the hypogene), which formed the basis of the mine plans, financial analysis, and Mineral Reserves disclosure used in the FS2016. Both the hypogene and supergene (leach) reserve pits were developed on Measured and Indicated blocks only. The estimated Mineral Reserves are reported using metal prices of $3.00/lb Cu and $9.40/lb Mo, and a variable grade cut-off approach based on NSR values that average $13.39/t over the planned LOM.

The NSR cut-off value was based on cost assumptions that were subsequently modified in the final base case economic model. The updated economic model assumes flotation using desalinated water, whereas the original NSR cut-off was based on costs associated with seawater processing. This change results in new values for average cost per tonne processed, site general and administrative (G&A), and mine G&A costs. Future updates to the Mineral Reserves should review the most applicable NSR cut-off, given the changes to the assumptions used.

15.3 Factors that May Affect the Mineral Reserves

Factors that may affect the Mineral Reserve estimate include:

- Commodity price assumptions;
- Changes to the input parameters to the NSR cut-off grade;
- Changes to the input parameters to the constraining pit shell, and the mine plan that is based on that pit shell;
- Changes to metallurgical recovery assumptions;
- Changes to the assumed permitting and regulatory environment under which the mine plan was developed;
- Ability to maintain mining permits and/or surface rights;
- Ability to maintain social and environmental license to operate.

15.4 Open Pit Assumptions and Considerations

Additional information on the pit design is provided in Section 16.

15.4.1 Key Assumption

The QB2 pit design is based on the final pit design surface of the existing Quebrada Blanca supergene pit (QB1) as projected in the 2018 LOM. Much of the overlying material either has been, or will be, excavated prior to commissioning QB2.

15.4.2 Ore Loss and Dilution

An analysis was carried out to review the resource model for individual blocks that were surrounded by waste (potential loss) and waste blocks that were surrounded by ore (potential dilution). The potential for losses and dilution are minimal, based on the homogeneity of the deposit, elevated cut-off grades, typically gradual transitions between ore and waste contacts, and the planned use of large rope shovels equipped with high-precision GPS instruments. Any potential impacts to ore feed that might arise due to ore loss or dilution were not considered material, and no provisions for ore loss or dilution were included in the mine plan.

15.4.3 Topography

Variables that were used for the mine optimization and planning were cut by the projected supergene final pit surface as projected in the supergene operation's Base Case 2018 LOMP.

Blocks above the projected supergene topography were set to "air." The projected waste and dump pads placed by the supergene operation were added as fill material with no economic value.

15.4.4 Optimization Considerations

Phase designs were developed using LG economic pit shell envelopes that were produced using Whittle software. Blocks classified as Measured or Indicated were considered during the optimization step, while the blocks classified as Inferred were treated as waste. Additional variables required for the mine scheduling process were added to the block model and were updated as required. A set of 88 pit shells was generated in Whittle that corresponded to break-even shell geometries based on incremental copper prices ranging from $0.42/lb to $3.00/lb Cu.

The mine plan was optimized to obtain the highest net present value (NPV) utilizing COMET, a commercially-available mine schedule optimization software program. The plans generated were based on ore availability, material types, cut-off grades, and phase sequencing restrictions. Some of the metrics analyzed during the optimization process included: high/low-grade stockpile cut-off grades and stockpile capacities; mine production capacities; phase production capacities; mill throughput rates, and NSR cut-off values.

Pit shell 46 was found to be the appropriate shell that provided Mineral Resources that most closely matched the available TMF capacity. The QB2 pit phase progression is as detailed in Section 16. This strategy produced initial mine phases with low strip ratios that are amenable to rapid access of higher-value ore material. The subsequent mine pit expansions successively occupy new areas, and the corresponding strip ratios gradually increase, allowing for sufficient time to increase the mining fleet to meet increasing production demands while keeping the head grade of the mill feed as constant as practicable. The TMF has a finite tailings capacity due to site constraints (about 1.40 Bt). This capacity dictated the low-grade stockpile cut-off because the direct feed mineral rock plus the low-grade and high-grade stockpile material had to align with the constrained LOM concentrator production. By a trial and error process, the low-grade stockpile NSR cut-off value was established at $13/t. Any remaining mineralized rock is not required to meet mill capacity is sent to the WRSF.

15.4.5 Infrastructure Considerations

The final mine plan assumes that during early mining activities, some of the existing supergene operational infrastructure would be used; however, as the mine continues to grow and active mining areas expand, decommissioning and removal of existing infrastructure and construction of new infrastructure would be carried out as necessary.

15.5 Comments on Mineral Reserve Estimates

Mineral Reserves are reported using the 2014 CIM Definition Standards.

There are no other known environmental, legal, title, taxation, socioeconomic, marketing, political or other relevant factors that would materially affect the estimation of Mineral Reserves that are not discussed in this Report.

16.0 MINING METHODS

16.1 Overview

Mining operations will continue to use open pit methods, and conventional truck-and-shovel operations. From an operational standpoint, QB2 represents a continuation of the existing supergene mine activities; however, there are significant differences between the two operations, such as the significant increase in the ultimate pit depth and width, the change in rock type from enriched supergene to hypogene, and increases in the mining extraction rate.

Teck prepared two mine plans for the Project:

- Base Case that includes only Measured and Indicated (MI) Mineral Resources and support reporting of Mineral Reserves. This plan schedules a total of 1.4 Bt of mill feed and 0.56 Bt of waste rock over a mine life of about 28 years at a 0.41:1 strip ratio.
- Sanction Case that includes Measured, Indicated, and Inferred (MII) Mineral Resources. The Sanction Case optimization, mine planning and financial analysis considered realistic mining conditions and the likely continuity of the ore body. The plan, used for Project evaluation purposes, generates a total mill feed of 1.4 Bt and 0.909 Bt of waste rock over a 28-year mine life at a 0.65:1 strip ratio.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

16.2 Supergene Operations

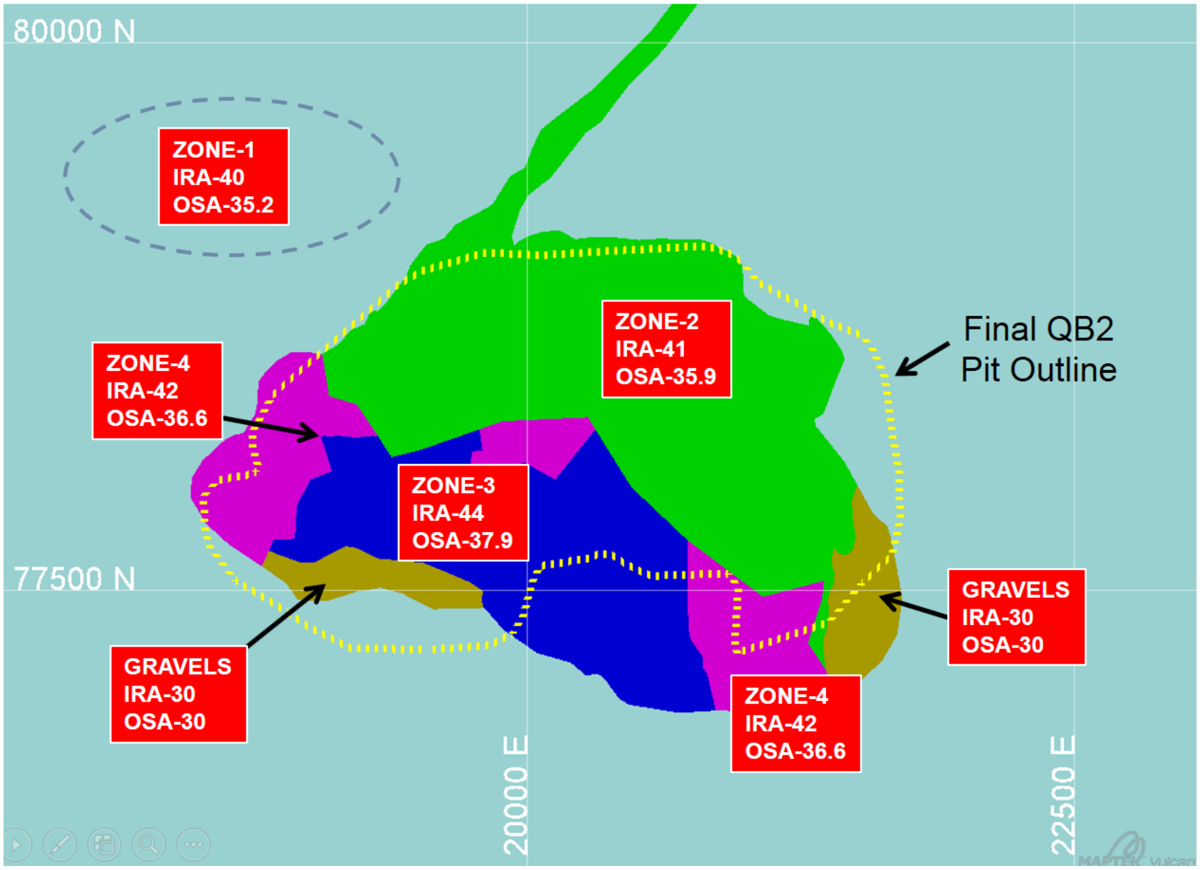
The conventional open pit supergene mining operation was completed in October 2018. The existing QB1 mining fleet will be used in pre-production and early works activities related to QB2, including the mass excavation required for the concentrator site, and mass earthworks associated with construction of the starter dam for the TMF.

16.3 Geotechnical Considerations

The geotechnical domain model for the FS2016 was based on work by E-Mining Technology S.A. in 2011 and updates by Piteau Associates (Piteau) from studies completed in 2015 and 2016.

To generate the required slope designs, the pit was subdivided into five geotechnical zones, each with different design inter-ramp slope angles (Figure 16-1).

Figure 16-1: Geotechnical Zones for Pit Design



Note: Figure prepared by Teck, 2016. North is to top of figure. IRA = inter-ramp angle, OSA = overall slope angle.

The inter-ramp angle values were input into a custom calculator that estimated the overall slope angles considering the inter-ramp angles, forecast the quantity of ramps embedded in the phase designs, and estimated the required geotechnical decoupling berms required. The shallower global wall angles were input into Whittle in order to more closely approximate the pit geometries that would result with the incorporation of items such as haul roads and geotechnical berms into the detailed phase designs.

The FS2016 final design pit was evaluated by Piteau using all available geotechnical data for the kinematic and overall global stability analyses. The majority of issues identified were considered operationally manageable. Additional review was recommended for the fourth pit phase, due to lower than expected safety factors for one of the evaluated sections in the phase; however, the recommendation was not considered to be design-limiting.

16.4 Hydrogeological Considerations

A total of 20 pumping wells, each extracting 2 L/s, would need to be implemented over the course of seven years to manage pit dewatering. After this period, wells would be replaced on an as-needed basis to ensure suitable dewatering capacity meets the requirements of the dynamic pit development. In total, 37 deep wells would be drilled, which would require installed pumps and discharge piping. A horizontal drill hole (HDH) campaign would be required each year for specific pit wall pore depressurization. A piezometer installation and monitoring program would be developed to support pit dewatering and would target new areas to be depressurized. A requirement of eight sumps has been estimated to provide temporary storage for different water sources (e.g., deep wells, HDH, and seepages). The water would subsequently be pumped to larger facilities. The pump design requires a pumping power load of 308 kW.

16.5 Open Pit Designs

Whittle optimization software was used to define intermediate phases and the final pit shell. Intermediate phasing was selected from a set of generated pit shells. Phase selection balanced delaying waste mining, sustaining ore release, and allowing for sufficient mining width. The final pit was selected using the Whittle skin analysis technique. This pit captures the largest incremental increases in discounted cash flows.

Pit optimization is based on the Measured and Indicated categories using a 20 x 20 x 15 m resource model and define the Base Case (MI Plan) outline; Inferred Mineral Resources are set to waste when creating this ultimate pit.

For the Sanction Case (MII Plan) an additional phase that includes Inferred Mineral Resources in the optimization was added beyond Phase 7.

No mining dilution was added to the block model and full mining recovery of mineralized material is assumed. The methodology used to build the geological block model for resource estimation is considered to have accounted for sufficient dilution effect.

A summary of the pit optimization considerations was provided in Section 15.4.

16.5.1 Smelter Contract Assumptions

Table 16-1 and Table 16-2 present the metal price and smelter contract assumptions used for the calculation of net smelter return (NSR) in the Whittle optimization. Teck's marketing group supplied these smelter contract terms, as well as freight and transportation costs. Price assumptions used for the Whittle optimization are the long-term metal prices from Teck's Commodity Price and Exchange Rates for Reserve and Resources Evaluations from November 2017 according to Teck's guidelines. These assumptions are independent of the prices used in the Project financial analysis.

Table 16-1: Whittle Shell Input Assumptions

Item	Prices and Cost	
	Unit	Amount
Copper	USD/lb	3.0
Molybdenum	USD/lb	9.4
Discount rate	%	8
Diesel cost	USD/kWh	0.61
Power cost	USD/kWh	0.1135

Table 16-2: Commercial Contract Assumptions

Category	Selling Costs	
	Unit	Amount
Cu concentrate	%	Variable (average 25.59%)
Payable Cu	%	96.5
Treatment charge	USD/t (dry)	90
Cu refining	USD/lb Cu	0.09
Ocean freight	USD/t (wet)	60
Moisture	%	10
Total copper freight	USD/t (dry)	66
Mo concentrate	%	50
Payable Mo	%	99
Roasting charge	%	15
Ocean freight	USD/t (wet)	140
Moisture	%	4
Total freight	USD/t (dry)	145.83

16.5.2 Operating Cost

Operating cost assumptions used in the Whittle optimization process are outlined in Table 16-3.

Process and mining costs were taken from the Project's operating cost model last updated in April 2018, which used existing consumable cost estimates based on the use of autonomous haul trucks. Additionally, the Whittle pit shell generation includes mining and processing costs for each individual block to identify the optimal pit shell geometries.

Table 16-3 - Pit Design Unit Cost Parameters

Category	Area Costs	
	Unit	**Amount**
Drill	USD/t	0.14
Blast	USD/t	0.29
Loading	USD/t	0.19
Sustaining capital	USD/t	0.32
Hauling	USD/t	Varies
Total mine costs	USD/t	Varies
Mine general and administrative (G&A)	USD/t milled	0.8
Process	USD/t milled	8.27
Port	USD/t milled	0.23
G&A	USD/t milled	1.36
Desalination	USD/t milled	0.37
Total process costs	***USD/t milled***	***11.03***

16.5.3 Design Criteria

The pit design criteria for each of the Base Case and Sanction Case are summarized in Table 16-4.

The detailed phased mine designs used the same geological, geotechnical, and metallurgical models as used in the pit shell development process. The pit shells were used to identify the logical pushback sequences for the detailed design, initiating in the center-west zone of the supergene pit and subsequently extending east and expanding outwardly. The location of the primary crusher at the western edge of the pit will generally allow for dual access on both the northern and southern pit walls. The inclusion of dual access will enable greater operational flexibility and reduce the risk of any operational disruption that could arise in the unlikely event of an access point becoming inaccessible.

Table 16-4: Pit Design Parameters

Area	Assumption/Comment
Ramp width	40 m, with a design grade of 10%
Minimum bench operational width	70 m
Bench face angle	65°
Inter-ramp angle	Varies from 30° to 44° depending on geotechnical zone
Bench height	15 m
Berm width	Typically 8 m, but adjusted for inter-ramp angle where necessary
Inter-ramp slope height	150 m
Geotechnical berm width	30 m (haulage ramps can replace geotechnical berms)

The stockpiles and WRSF for QB2 are planned to be located to the north and south of the pit. Care was taken to ensure a suitable offset was maintained such that a potential pit pushback could be implemented with minimal interaction from WRSFs or stockpiles in close proximity to the pit crest. Additionally, the area to the east of the pit was excluded as the mineralization is currently still open in this direction.

16.5.4 Phases

From an operational standpoint, QB2 represents a continuation of the existing mine activities; however, there are significant differences between the QB1 and QB2 operations, such as the large increase in the ultimate pit depth, the change in rock type from enriched supergene to primary, and the proposed increases in crusher throughput and mining extraction rate. These operational factors were taken into consideration during the iterative process of mine phase design.

The ultimate pit for the Base Case was designed to follow the pit shell that hosted a sufficient quantity of Measured and Indicated Mineral Resources that could meet plant feed requirements for a mine life of 28 years, and that aligned with the capacity of the TMF. Nine phases were designed and used in the mine plan, including the subdivision of the phases 4 and 6 into two stages, designated A and B. The Sanction Case differs from the Base Case in that it includes one additional pit phase, Phase 8.

Figure 16-2 and Figure 16-3 show the Base Case design in plan and section view respectively.

Figure 16-4 and show the design for the Sanction Case design in plan and section view respectively.

Figure 16-2: Plan View Phased Mine Designs, Base Case (MI)

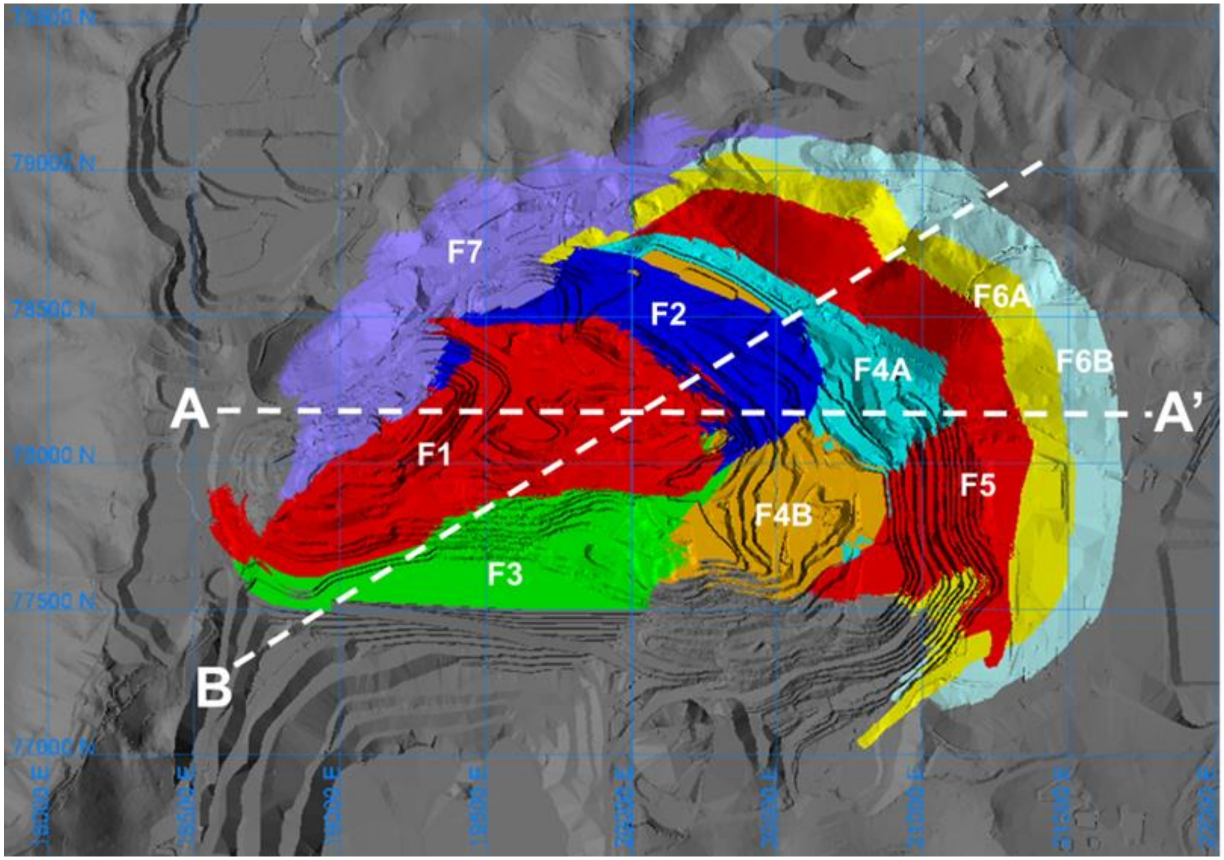


Figure prepared by Teck, 2018. Dashed white lines are the location of the sections presented in Figure 16-3. Map north is to the top of the figure.

Figure 16-3: Section View Phased Mine Designs (looking north)

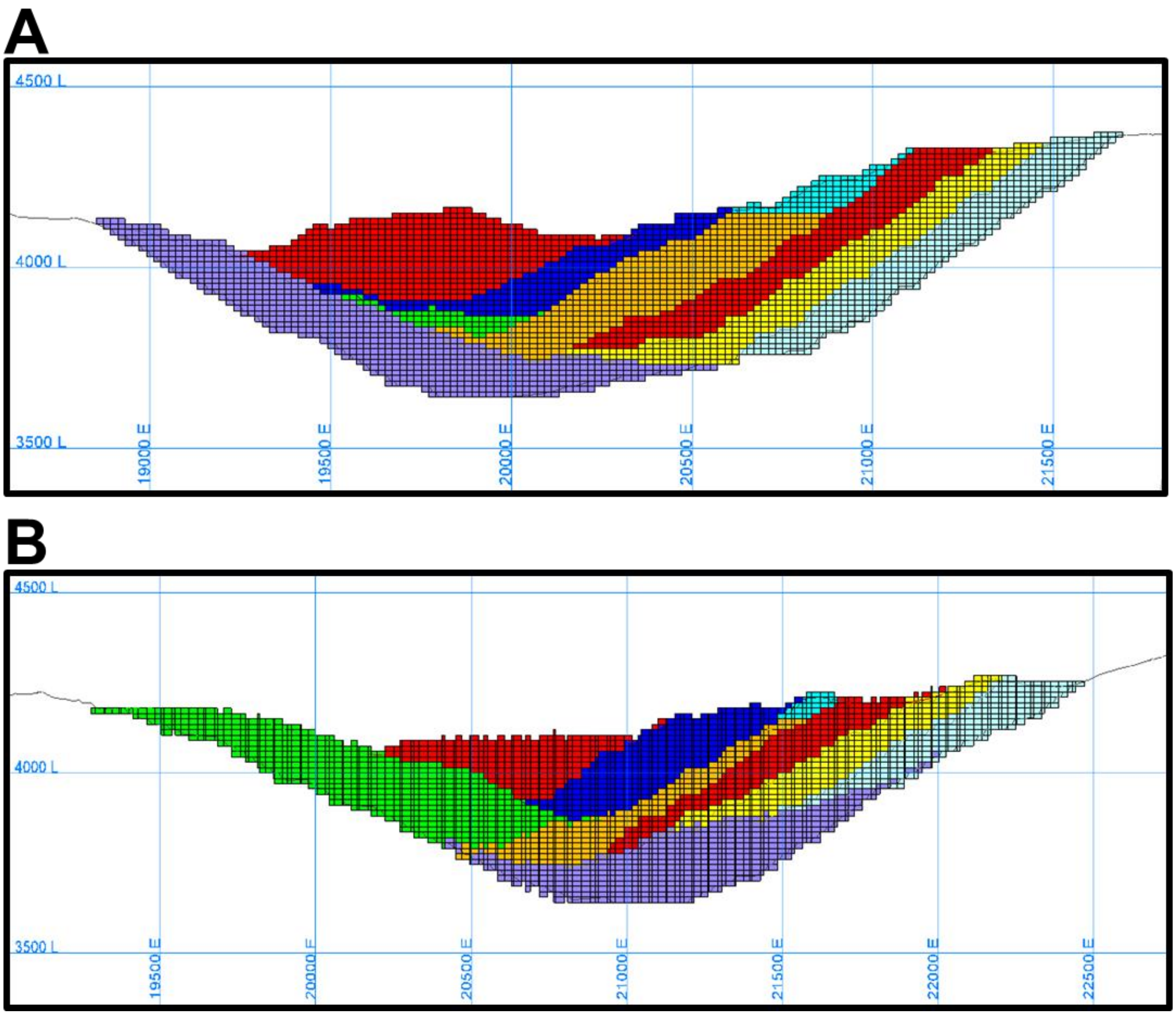


Figure prepared by Teck, 2018.

Figure 16-4: Plan View Phased Mine Designs, Sanction Case (MII)

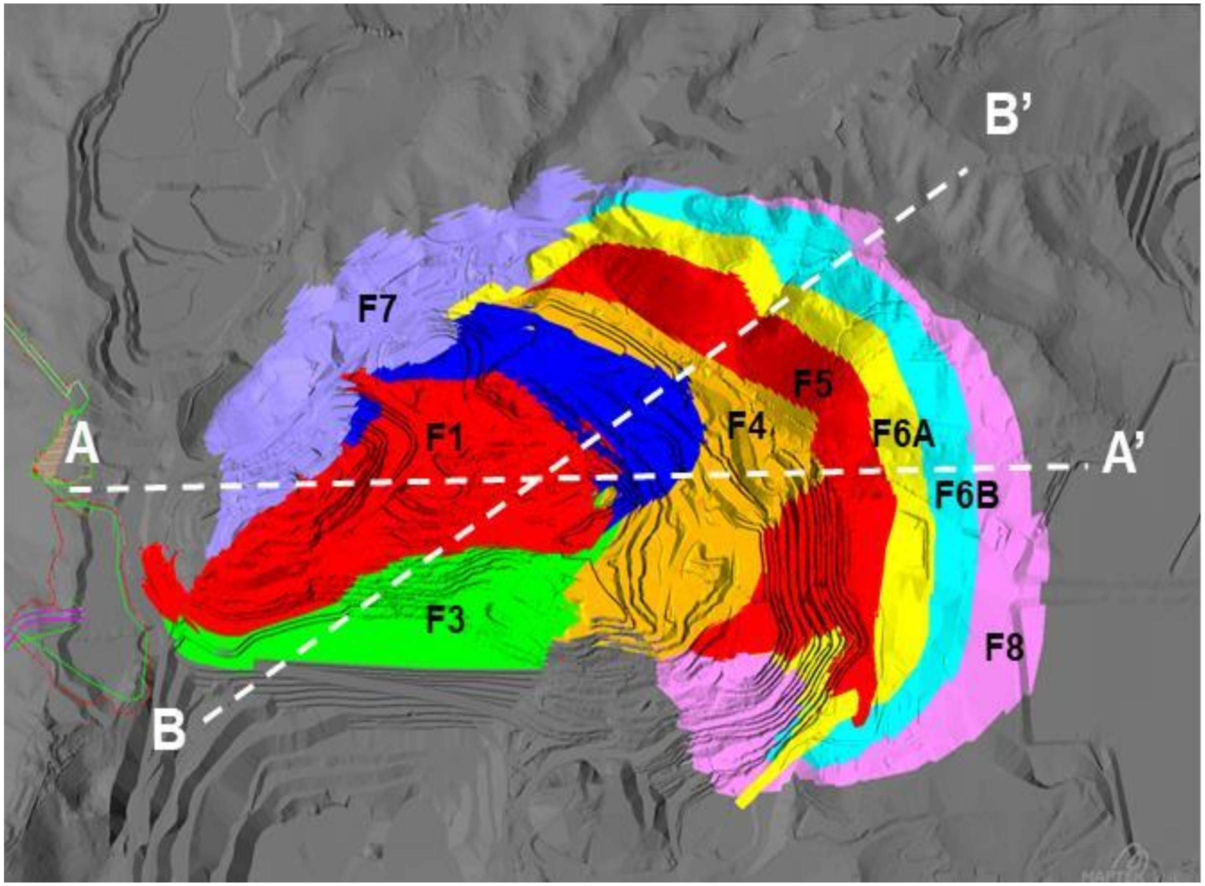


Figure prepared by Teck, 2018. Dashed white lines are the location of the sections presented in Figure 16-5. Map north is to the top of the figure.

Figure 16-5: Section View Phased Mine Designs, Sanction Case

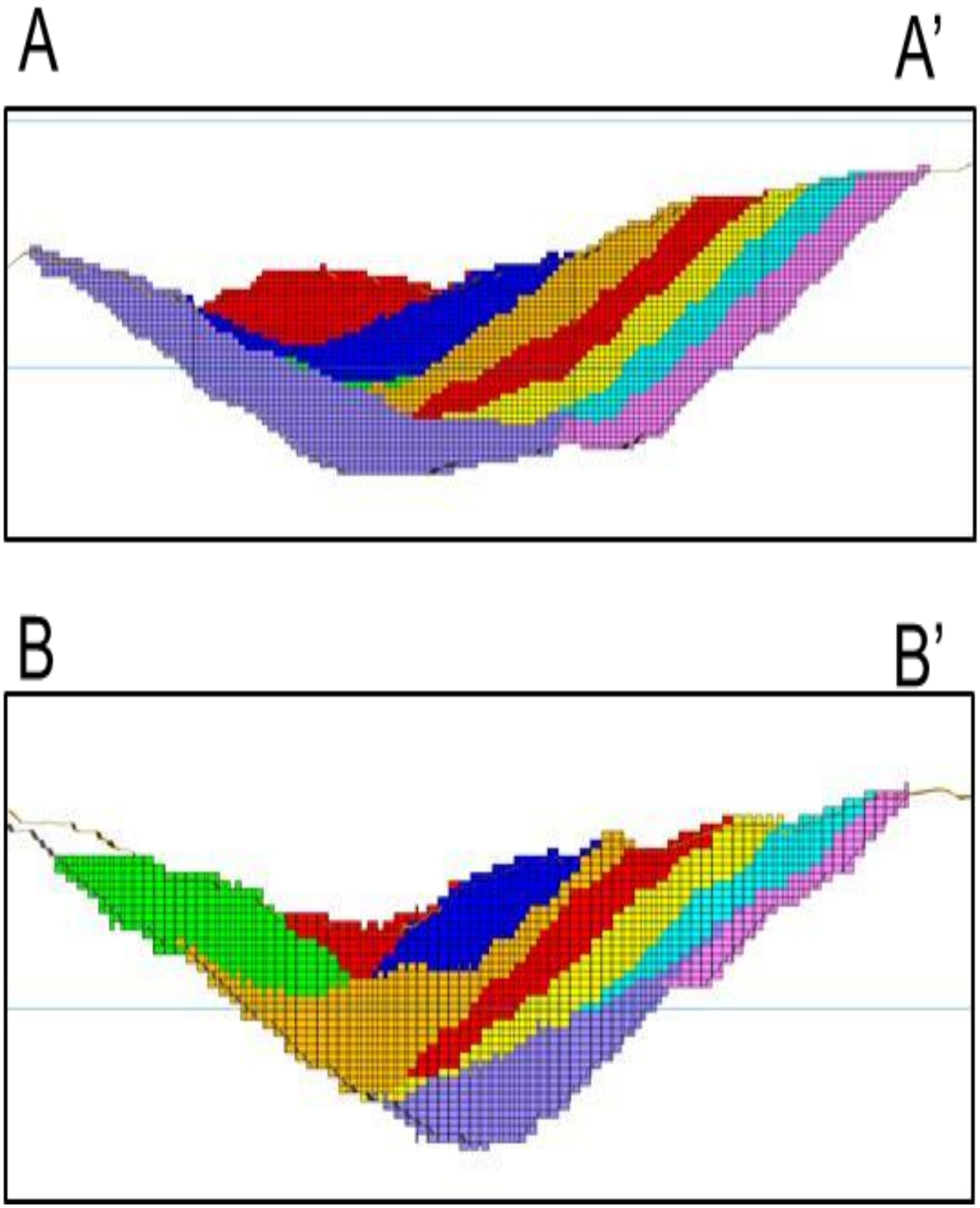


Figure prepared by Teck, 2018. Figure looking north

Table 16-5 describes the phases that are common to the Base Case and the Sanction Case.

The mine plan uses a variable cut-off grade strategy to maximize the value of the ore delivered to the concentrator. The actual NSR cut-off value ranges between $13.00/t and $27.55/t NSR (mineral value minus realization costs). The NSR value considers the copper and molybdenum revenues, projected metal recoveries, as well as transportation, refining, and other logistical costs.

The difference between the Base Case and Sanction Case in relation to pit phases is that the Sanction Case includes an additional Phase 8 that mines Inferred material to process 1.4 Bt of mill feed material. Phase 8 expands towards the southeast sector of the pit. This phase begins its development at bench 4390 to the 3700 level reaching a final depth of 690 m. The development of the main ramp starts at bench 4375 in a north–south direction reaching the 4300 level. As development continues, the main ramp system connects with the phase 7 ramp at the 3940 level. This connection allows for a more direct route for material mined from the lower benches, considerably reducing the distance to the primary crusher. The dimensions of the intermediate benches from level 4255 reach widths of operation of 220 m in the southern sector. However, towards the northern sector of the phase the operational width is reduced, maintaining an average of 60 m. Phase 8 contains approximately 219 Mt of mill feed material and has a strip ratio of 0.86.

16.6 Waste Rock Storage Facilities Design

The WRSFs and stockpiles were designed according to the requirements obtained in the mining plan. The facilities included are:

- High-grade stockpile;
- Low-grade stockpile;
- North WRSF;
- South WRSF.

A layout plan showing the WRSF and stockpile locations is included as Figure 16-6.

Table 16-5: Pit Phases

Pit Phase	Description
1	Phase 1 begins its development at bench 4150, ending at level 3910, reaching a final depth of 240 m. Its design contemplates the development of two main access ramps that are connected at level 4015. From this level to the bottom of the last bench a single ramp will be used. Contains approximately 140 Mt of mill feed material and has a stripping ratio of 0.06, which provides reserves from the first bench.
2	Phase 2 expands towards the northeast with respect to the phase 1, reaching a depth of 330 m at the 3865 level. Its main access ramp develops from the northern sector starting at bench 4150 and later connects with the south ramp of phase-1 at the 4015 level; this connection allows for a considerable reduction in the hauling distance to the primary crusher. Phase 2 contains approximately 100 Mt of mill feed material and has a stripping ratio of 0.27, which provides exposed ore starting from the third bench of the phase.
3	Is located on the south wall of phase 1. This phase undergoes an early pre-stripping that is supported with the loading fleet of the current QB1 operation, which is projected to remove 17.8 Mt of waste, reaching the 4180 level where it is later taken up by the development of QB2 from bench 4165. Phase 3 contains approximately 118 Mt of mill feed material and has a strip ratio of 0.46.
4	Phase 4 expands mainly towards the eastern sector of the pit. To start the development of this phase it is necessary to remove existing QB1 infrastructure (conveyor belt, pipes, power lines, secondary crusher, primary crusher and a stockpile). Phase 4 starts at bench 4315, ending its development at level 3745 reaching a final depth of 570 m. The operation of the first two benches is carried out with an auxiliary fleet due to the restricted operational spaces, taking down material to the lower sectors. From bench 4285, the necessary spaces are available to start the extraction with the loading and hauling fleet. Phase 4 contains approximately 190 Mt of mill feed material and has a strip ratio of 0.41.
5	Phase 5 expands towards the eastern sector of the pit. To start the development of this phase it is necessary to remove existing QB1 infrastructure of (electrowinning facilities, refining pools, truck workshop, power lines and any installation that is within a 100 m radius the pit phase limit). Phase 5 starts in the southern sector from bench 4360 to level 3775 reaching a final depth of 585 m. Phase 5 contains approximately 168 Mt of mil feed material, and has a strip ratio of 0.48.
6A	Phase 6A expands towards the eastern sector of the pit. This phase is started in the southern sector from bench 4360 to level 3730 reaching a final depth of 630 m. The development of the main ramp begins in the southern sector from bench 4330, reaching level 4120 where it connects with the north ramp of phase 6A which allows for egress to the north of the pit, considerably reducing the transport distance to the primary crusher and low-grade stockpile. Phase 6A contains approximately 168 Mt of mill feed material and has a strip ratio of 0.70.
6B	Phase 6B expands into the eastern sector of the pit. This phase is started in the southern sector from bench 4360 to level 3760 reaching a final depth of 600 m. Phase 6B contains approximately 130 Mt of mill feed material and has a strip ratio of 1.04.
7	Phase 7 expands towards the north sector of the pit. This phase begins its development on bench 4240 and ends at bench 3640 reaching a final depth of 600 m. The main ramp system is oriented to maintain egress of the materials for both the south and north sectors of the pit, which provides flexibility of haulage routes to the different destinations. Phase 7 contains approximately 238 Mt of mill feed material and has a strip ratio of 0.91.

Figure 16-6: Stockpile and WRSF Layout Plan

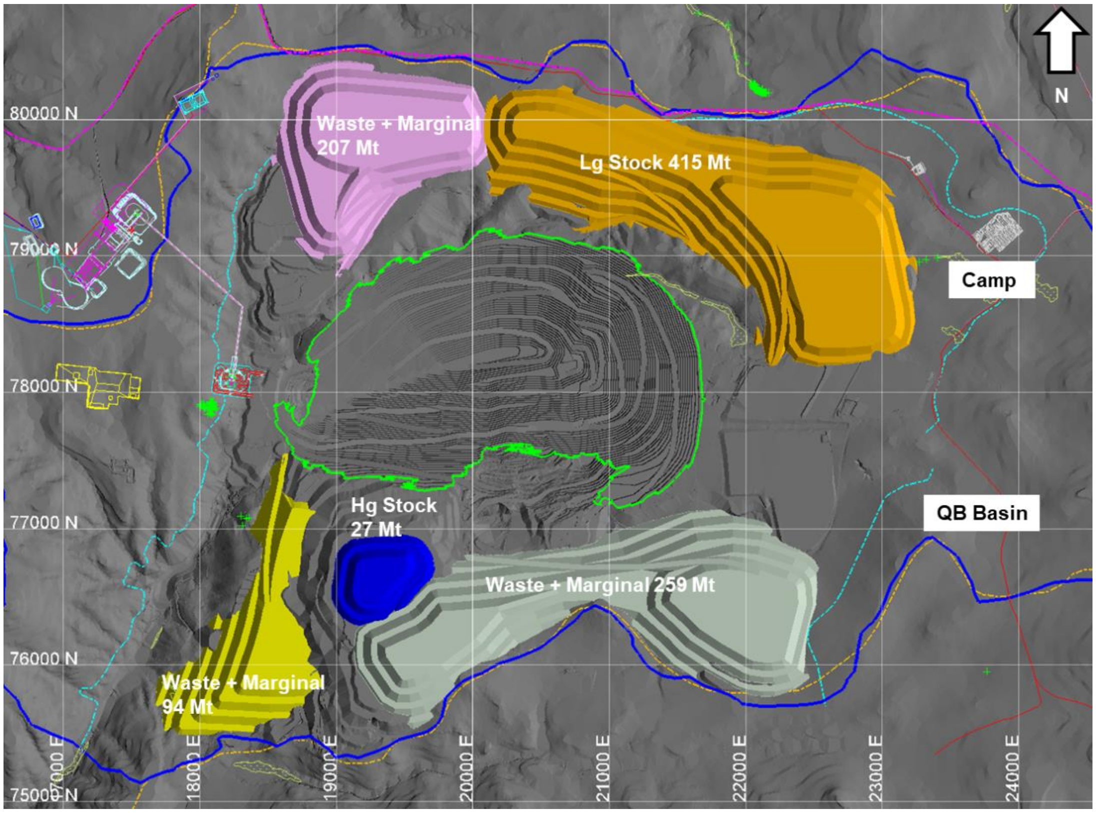


Figure prepared by Teck, 2018. Map north is to top of figure. LG = low-grade stockpile, HG = high-grade stockpile, Marg-sur = marginal ore stockpile south.

Marginal material identified and segregated in the FS2016 mining plan version has not been included in this version due to the following considerations:

- Segregating this material increases the mine cost by eliminating the flexibility in reducing cycle times;
- The increase of cut-off grade in relation to the FS2016 and the inclusion of waste from phase 8 requires more volume for the WRSFs, and the available area for the WRSFs must be optimized to stay within the QB watershed.
- This marginal material is never recovered in mine plan developed to accommodate the TMF capacity restriction, as in that scenario, it is more profitable to process mill feed material from the mine than to treat the stockpiled material.

16.6.1 High-Grade Stockpile Facility

The high-grade stockpile will be located in the southwestern corner of the pit, on top of the current South WRSF. The site was selected for its close proximity to the primary crusher location. The COMET mine scheduler assigned material to this stockpile for any material that had an NSR value > $24/t and that was not required to fill the mill capacity in the year it is mined. The stockpile capacity is 28 Mt, and all material from the stockpile is included in the LOMP. The stockpile will be built in two 45 m bench heights, with a maximum height of 90 m. The global slope angle will be 27º, and the stockpile will cover an approximate area of 386,000 m^2.

16.6.2 Low-Grade Stockpile Facility

The low-grade stockpile will be located north of the pit and is designed for a maximum 280 Mt capacity. The site was selected for its close proximity to the primary crusher location. The COMET mine scheduler assigned material to this stockpile for any available material that had an NSR value of $18.0/t–$24/t and that was not required to fill the mill capacity in the year it is mined. The lower bound range was set at $18.0/t because this stockpile would be the last material processed in the mine plan. Of the total material accumulated in these stockpiles, only 74% (209 Mt), is re-handled and sent to mill. This is because the available TMF capacity is exhausted from treatment of higher-grade material from the mine and the high-grade stockpile. The low-grade stockpile design assumes four 45 m high benches for a total final height of 180 m, a slope angle of 25º, and a maximum area of 2.2 Mm^2.

16.6.3 South WRSF1

The South WRSF1 will be located to the south of the pit. Material identified in the mine plan as waste would be scheduled to this location as assigned by the MineHaul© software, which identifies the optimal WRSF destination based on available WRSF capacity and the shortest hauling route. The facility is designed to have six 45 m benches, and a maximum global height of 250 m. The global slope angle will be 25º, and the facility will have a total area of 2.9 Mm^2.

16.6.4 South WRSF2

The South WRSF2 will be located southwest of the pit. Material identified in the mine plan as waste would be scheduled to this location as assigned by the MineHaul software, which identifies the optimal dump destination based on available WRSF capacity and the shortest hauling route. The South WRSF2 will be constructed in six 45 m benches, and a maximum global height of 270 m. The global slope angle will be 25º, and the facility will have a total area of 1.2 Mm^2.

16.6.5 North WRSF

The North WRSF would be located immediately north of the pit, on top of the current hypogene stockpile, north ripios, and heap leaching areas. Material identified in the mine plan as waste or marginal would be scheduled to this location. The facility will have seven 45 m benches, and a maximum global height of 320 m. The global slope angle will be 25º, and the facility will have a total area of 3.7 Mm^2.

16.7 Mine Plan

Once the detailed mine phase designs were engineered, 3D triangulations were produced that were used to update the geological block model to identify the blocks that are contained in the corresponding phases. All of the blocks that fall within the ultimate pit design were exported to a Microsoft® Access database. Within Access, the data were tuned to the appropriate input format for the COMET mine scheduling tool. For the purposes of generating a LOM schedule, blocks flagged as Inferred Mineral Resources were considered in the same manner as the Measured and Indicated blocks, and therefore are scheduled as mill feed material in the mine plan using the COMET algorithm.

Once the data were appropriately formatted for use in COMET, the scheduling process was performed. The mine plan was optimized using an NSR cut-off in the COMET software. NSR considers the copper and molybdenum revenues, projected metal recoveries, as well as transportation, refining, and other logistical costs. Within COMET, multiple scenarios were run.

Key metrics that were analyzed during the optimization process are:

- Total mine movement;
- Mill throughput;
- NSR cut-off grades;
- Recovered copper in first five years and in the LOM plan;
- Stockpile capacities;
- High/low-grade stockpile cut-off grades;
- Mine production capacities;
- Phase production capacities.

A systematic process was followed to determine the optimum mining rate, cut-off grade, and stockpile capacities, while using a range of mining constraints to ensure the mine plan is viable and achievable given the Project constraints.

The major inputs and constraints used in COMET included the following:

- Block model;
- Detailed mine phases;
- Economic parameters set by QB (same as those used in Whittle);
- Estimated capital expenditures (both initial and sustaining);
- Six months of pre-production activities (e.g., road improvements, pioneering, establishment of mine benches, etc.) in the pit prior to plant commissioning;
- Mill ramp-up curve, with full production reached in year 5;
- Mine production profile;
- Stockpile NSR cut-off grades;
- Stockpile capacities;
- Variable NSR cut-off to the mill;
- Maximum number of phases per period;
- Fixed costs for the plant, as well as general and administrative site costs;
- A maximum sinking rate per year for each phase.

Numerous scenarios were analyzed using the COMET software to better understand the key levers that drive project value. Through the software algorithm enables analyses of several input parameters, it became apparent that project value is limited by a few central project constraints. The TMF has a finite tailings capacity that corresponds to approximately 1.40 Bt of tailings. This tailings storage restriction causes cut-off grade optimization and stockpile capacity to become two of the key drivers of the value generated in mine planning.

The division between high-grade and low-grade material was established by considering the physical stockpile capacities and a cut-off was identified that resulted in an appropriate split between the two.

The low-grade stockpile NSR cut-off value is $13/t, and provides an appropriate mill feed profile for the LOM and ensures tailings production does not exceed the TMF capacity. The NSR cut-off for the high-grade stockpile is $24/t. Any remaining mineralized rock below the low-grade stockpile cut-off grade is sent to the WRSFs.

16.7.1 Base Case (MI Plan)

The annual material movements for Base Case mine plan are summarized in Figure 16-7. The highest copper production years occur in the first 10 years of operation due to the higher feed copper grades. A breakdown of the expected material types in the mill feed over the LOM is provided in Figure 16-8.

16.7.2 Sanction Case (MII Plan)

The Sanction Case (MII Plan) includes a total of 1.40 Bt of mill feed and 0.910 Bt of waste rock over a mine life of 28 years. The annual material movements for the Sanction Case mine plan are shown in Figure 16-9. The mill feed and materials for this mine plan are illustrated in Figure 16-10.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

16.8 Blasting and Explosives

Blasting services would be contracted to a third party. The mine plan assumes blast hole diameters of 270 mm in mineralization and 311 mm in waste. Mine pattern spacing varies for mineralization and waste material and depending on rock type with typical burdens ranging between 5.6–6.0 m and spacing ranging between 6.5–7.0 m for mineralization and burdens between 8.0–9.0 m and spacing between 9.0–12.0 m for waste.

For wet holes, Fortis Extra 65 (or similar), a traditional ammonium nitrate and emulsion mix, would be used while dry holes would use Fortan Advantage 50. Wet blasting conditions are expected to be encountered at times during mining operations.

16.8.1 Mining Equipment

Equipment requirements are identical for the Base Case and the Sanction Case.

The mine design and costing for the Base Case and Sanction Case currently assume the use of 291 t haulage trucks; however, actual equipment selection will be made based on pricing and performance considerations following commercial discussions with several equipment suppliers.

16.8.2 Loading

The primary loading units would be 58.1 m^3 ultra-class electric rope shovels, which are well-matched (three-pass loading) to 291 t haulage trucks. The existing 27 m^3 hydraulic shovel fleet (Komatsu PC5500) would continue to remain in service, given the units' availability and remaining available service lives. The existing 18 m^3 front-end loader fleet (Komatsu WA1200-6) would continue to serve the mine and would be replaced as necessary to ensure two units are available at all times to serve the mine.

Figure 16-7: Material Movement, Base Case (MI)

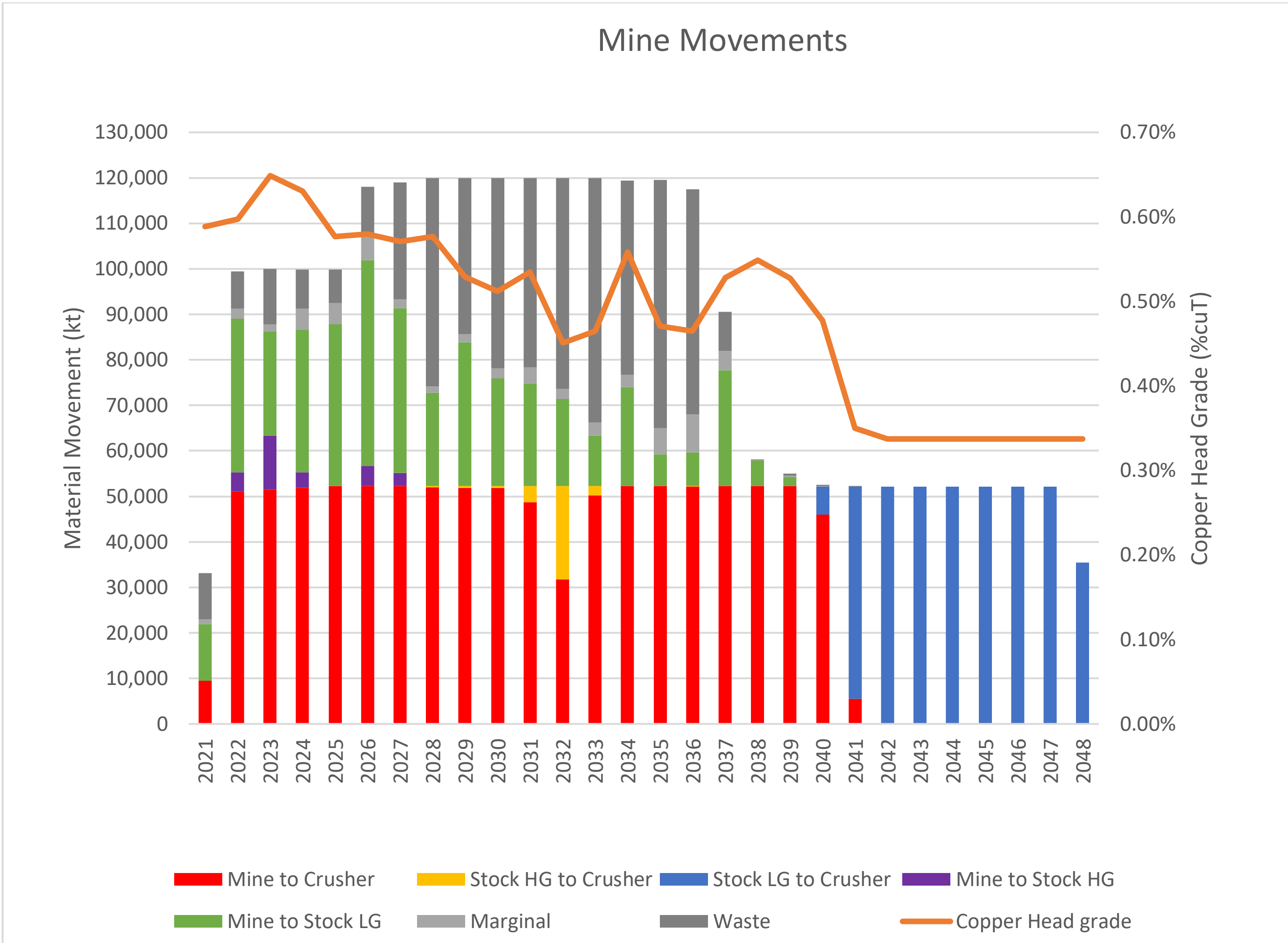


Figure prepared by Teck, 2018.

Figure 16-8: Supergene and Hypogene Material to Mill, Base Case (MI)

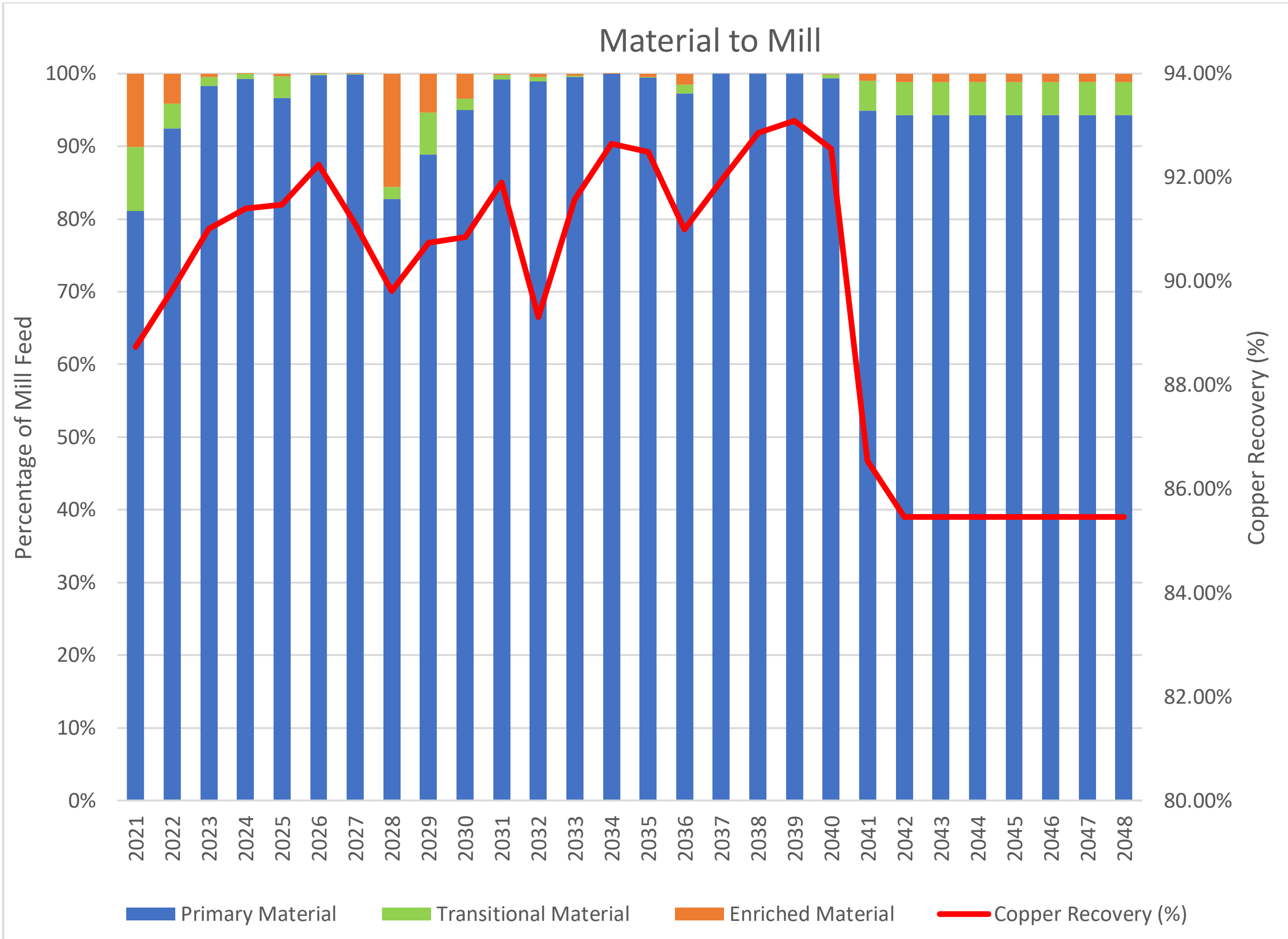


Figure prepared by Teck, 2018.

Figure 16-9: Material Movement, Sanction Case (MI+I)

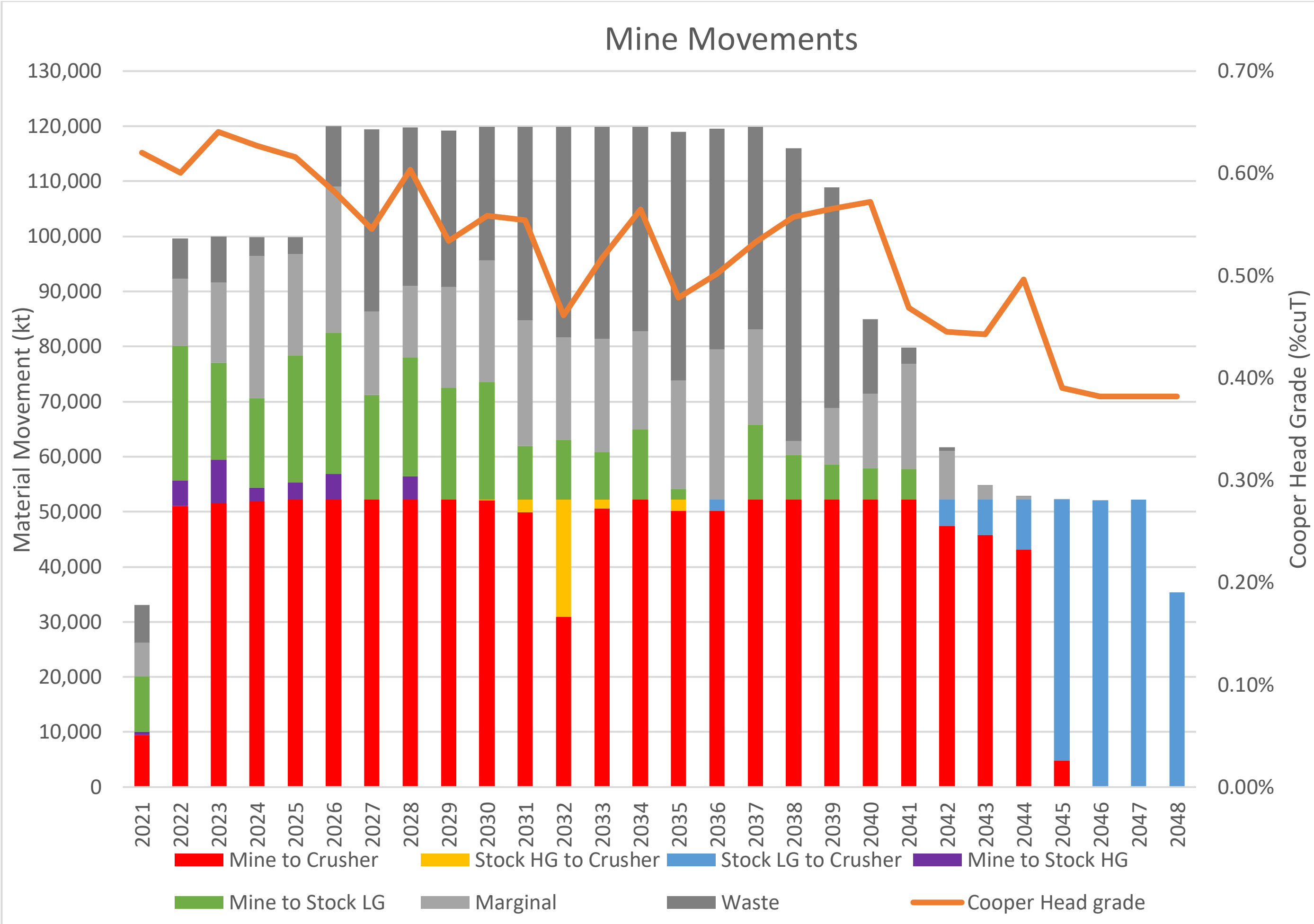


Figure prepared by Teck, 2018.

Figure 16-10: Supergene and Hypogene Material to Mill, Sanction Case (MI+I)

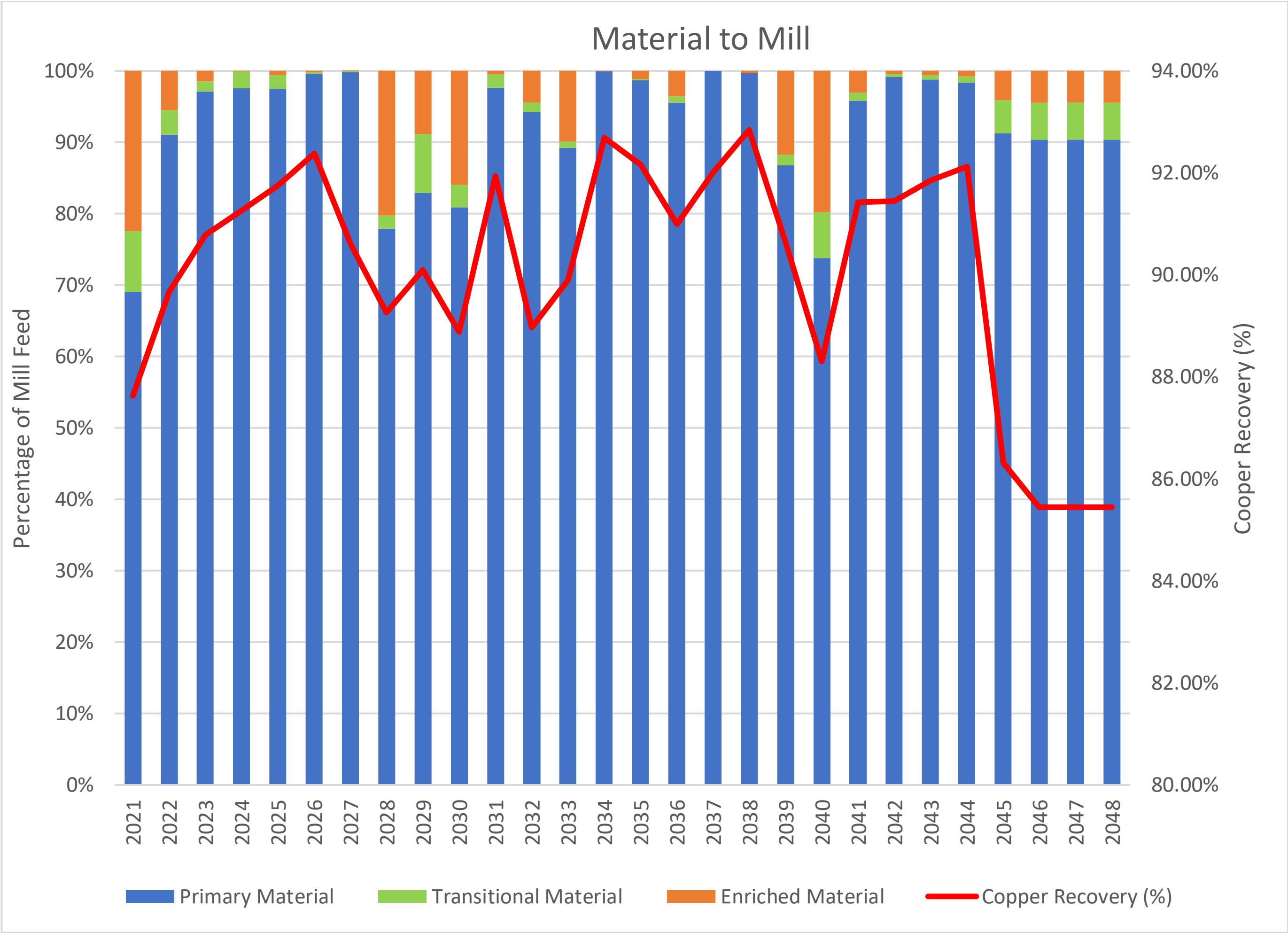


Figure prepared by Teck, 2018.

At its peak, the loading fleet would be four electric rope shovels, one hydraulic shovel, and two front-end loaders. All phases have been designed to achieve high productivity, taking advantage of double-side loading and working fronts in excess of 90 m in width.

16.8.3 Haulage

Eleven Komatsu 730E haul trucks and six Komatsu 830E haul trucks would remain from the supergene operations and would be used by the QB2 operations until reaching their expected service lifespan. As mine production rates will surpass the existing fleet capacity, 291 t capacity haul trucks (Komatsu 930E-4SE) will be purchased as necessary.

At the peak, the haulage fleet would require 34 haul trucks.

16.8.4 Support Equipment

At peak of operations, this will see equipment requirements will be four tracked dozers, four wheeled dozers, seven graders, five water trucks, one tracked excavator, three cable reelers and two mobile generators.

16.9 Dispatch

A mine dispatch system would be implemented to ensure the safe and efficient operation of the mine. The technological support of the system would include communications, GPS applications, and real-time monitoring of equipment components.

16.10 Maintenance

Mine equipment maintenance is assumed in the financial analysis to be carried out under a maintenance and repair contract (MARC) which will be serviced by a third party. However, Teck is evaluating the potential to self-perform maintenance activities.

16.11 Comments on Mining Methods

There is significant upside potential for the Project if the design limitations imposed by the TMF can be addressed. The current mine plan uses only a portion of the estimated Measured and Indicated Mineral Resources.

Project opportunities identified include:

- The pit shell analysis demonstrated that there are Mineral Resources available outside the final pit configuration that could be incorporated in a future mine plan, expanding the capacity of the TMF, and identifying areas that could host additional TMF and WRSF material;

- Opportunities have been identified to increase the concentrator plant throughput rates (e.g. 213, 243 or 286 kt/d) that would allow copper to be extracted in an accelerated manner from the sixth year of operation of QB2;
- In-pit crushing opportunities could reduce hauling costs, this could in turn reduce the mining unit cost, and potentially allow for mining of currently marginal material, thus extending the mine life;
- Ore sorting based on shovel instrumentation to improve the copper grades being mined, and thus increasing productivity.

17.0 RECOVERY METHODS

17.1 QB1

Active open pit mining activities related to the QB1 cathode production operation ceased in October 2018. The heap leach piles will continue to be irrigated and leached, and the SX/EW plant will continue to operate, producing copper cathode, until the process is uneconomical, which is expected to occur by 2020. The leaching facilities must be dismantled in the early years of the mine life in time to allow development of phase 3 of the QB2 open pit.

Supergene leachable ore was delivered from the pit to a primary crusher, crushed and then discharged by conveyor belt to a coarse ore stockpile. Ore was drawn from the coarse ore stockpile by conveyor belts feeding a vibrating screen with oversize in turn passing through a secondary standard cone crusher. The product was then conveyed to five surge bins, which feed five tertiary screens. The oversize product was passed through five tertiary crushers. Ore was received at the agglomeration drum from a conveyor belt discharging into a fine ore bin. Ore passed through one of two agglomeration drums. Agglomerated ore was transported by a system of overland conveyors, tripper, and grasshopper conveyors to a stacker in which ore was placed on the dynamic leach pads in 8 m high layers.

The heap leach was augmented by a run-of-mine dump leach.

Sulphuric acid leaching of ore is accomplished with a system of drip emitters placed on top of the leach pads. The pregnant leach solution (PLS) exiting the leach pads is stored in a pond prior to being sent to the SX/EW plant.

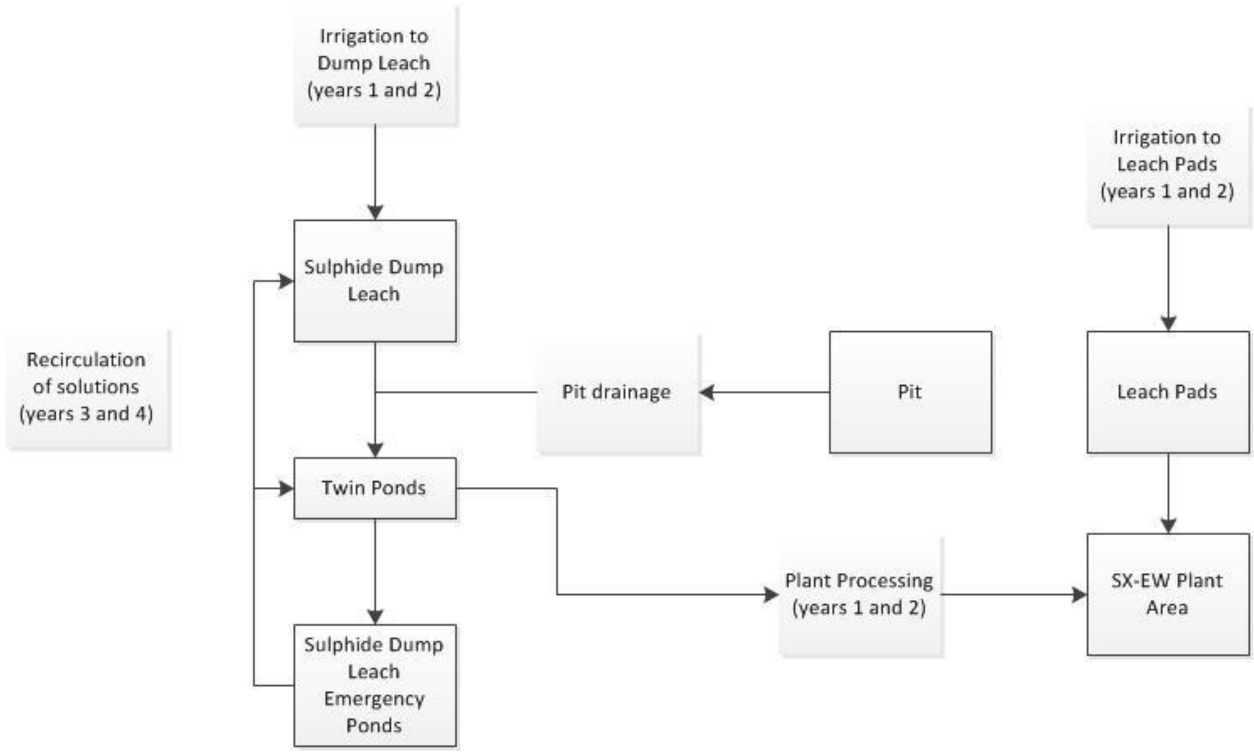
The PLS is mixed with organic and diluent to capture the copper and increase the concentration. The organic is stripped with spent electrolyte. Raffinate is sent to a raffinate storage pond to be recycled in the heap leaching process together with the dump leach PLS. The tank house consists of 264 cells containing 1 m^2 stainless steel cathodes. Cathodes are harvested 24 hours a day and are 100% LME grade A quality.

A process flowsheet showing the end of mine life operations for the supergene operation is included as Figure 17-1.

17.2 QB2

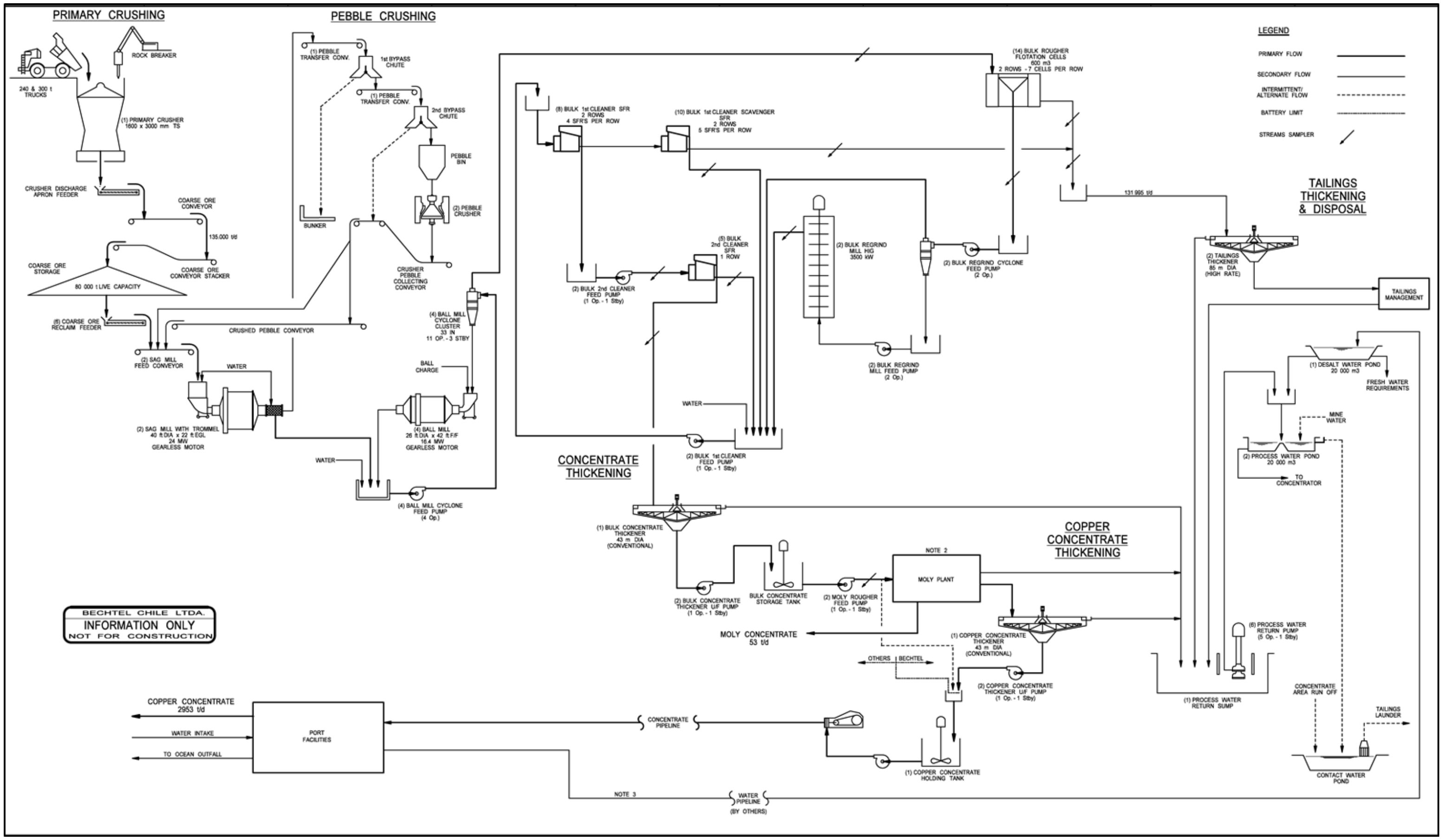
The proposed process flowsheet for QB2 is included as Figure 17-2.

Figure 17-1: Supergene Process Flow Sheet



Note: Figure prepared by Teck, 2016.

Figure 17-2: Proposed QB2 Process Flowsheet



Note: Figure prepared by a third-party engineering firm for Teck, 2016.

17.3 QB2 Plant Design

17.3.1 Primary Crusher

The primary crushing facility would contain a single gyratory crusher with a double-sided dump pocket for the mine haulage trucks. The crusher would be serviced by a mobile maintenance crane and the crusher station would be open on the discharge side with a mechanically stabilized earth (MSE) type retaining wall. The area would contain the following major equipment and structures:

- One 1,000 kW, 1,600 by 3,000 mm (63 by 118 inch) gyratory type crusher;
- One 3,150 mm wide by 12 m long variable speed apron feeder with hydraulic drive and two 185 kW motors;
- One hydraulic rock breaker;
- One dust suppression system.

17.3.2 Coarse Ore Conveyor

The coarse ore conveyor system would consist of two overland conveyors to transport the crushed ore from the primary crusher to the coarse ore stockpile. The area would contain the following major equipment and structures:

- One 260 m long by 1,830 mm wide steel cord, 10,000 t/h capacity coarse ore conveyor no. 1;
- One 1,216 m long by 1,830 mm wide steel cord, 10,000 t/h capacity coarse ore conveyor no. 2.

17.3.3 Coarse Ore Stockpile

The coarse ore stockpile is planned to be a conical shape fed by a fixed stacker conveyor fed from coarse ore conveyor no. 2, and will have a live capacity of 80,000 t, and an overall 270,000 t capacity. The coarse ore reclaim system would consist of two concrete coarse ore stockpile reclaim tunnels, reclaim apron feeders, and reclaim conveyors.

17.3.4 Storage Bins

Two 260 t capacity SAG mill ball storage bins with ball feeders and two 260 t capacity ball mill ball storage bins with ball feeders will be located on the south side of the grinding building.

17.3.5 Grinding Circuit

The concentrator facility would contain grinding mills, cyclone feed pumps, and cyclone clusters. The grinding equipment would be housed in a steel building. The area would contain the following major equipment and structures:

- Two 12.2 m diameter by 6.7 m effective grinding length (EGL), 24 MW SAG mills, driven by gearless type drives, each with a discharge trommel screen (6.2 m in diameter by 5.2 m long);
- Four 7.9 m diameter by 12.8 m flange-to-flange length, 16.4 MW ball mills, driven by gearless type drives;
- Four cyclone feed slurry pumps, rated at 8,817 m3/h and 2,000 kW, with adjustable frequency drives;
- Four cyclone clusters with eleven operating and three standby 838 mm diameter cyclones in each cluster;
- A 102 m wide by 114 m long by 47 m high steel grinding building.

17.3.6 Pebble Crushing

This facility would consist of the pebble transfer conveyors, storage bins, feeders, and crushers. The crushers would be housed in an open steel building. The area would contain the following major equipment and structures:

- One 1,067 mm wide, 169 m long pebble collecting conveyor with 185 kW motor and AFD;
- One 914 mm wide, 87 m long pebble transfer conveyor with 150 kW motor;
- One 914 mm wide, 140 m long crushed pebble collecting conveyor with 100 kW motor;
- One 914 mm wide, 44 m long crushed pebble conveyor with 45 kW motor and AFD;
- Two 750 kW cone crushers.

17.3.7 Flotation and Regrind

This area would contain the following major equipment and structures:

- Fourteen 600 m^3 bulk rougher flotation tank cells (two rows of seven cells);
- Two bulk rougher regrind cyclone clusters;
- Two 3,500 kW high-intensity grinding (HIG) regrind mills;

- Eight bulk first cleaner staged flotation reactor (SFR) “SFR-2200” cells (two rows of four cells);
- Ten bulk cleaner/scavenger SFR “SFR-2200” cells (two rows of five cells);
- Five bulk second cleaner SFR “SFR-1300” cells.

17.3.8 Concentrate Thickening

This facility would consist of the bulk concentrate and copper concentrate thickeners. The area would contain the following major equipment and structures:

- One 43 m diameter bulk conventional concentrate thickener with rakes and underflow pumps;
- One 43 m diameter copper conventional concentrate thickener with rakes and underflow pumps.

17.3.9 Molybdenum Plant

This facility would consist of the molybdenum rougher, first cleaner, second cleaner, and third cleaner flotation and regrind equipment, as well as the molybdenum concentrate thickener, filter, dryer and packaging equipment. The area would contain the following major equipment and structures:

- Seven 42.5 m3 molybdenum rougher cells (one row of seven);
- One 300 kW vertical molybdenum regrind mill;
- Six 14.2 m3 molybdenum first cleaners (one row of six cells);
- One 3 m diameter second cleaner column cell;
- Two 1.5 m diameter third cleaner column cells;
- One molybdenum flotation cell exhaust gas scrubber with fan;
- One 15 m diameter molybdenum concentrate thickener with rakes and underflow pumps;
- One automated pressure filter, one heated-oil screw dryer, a 42 t capacity dry molybdenum storage bin, and a bulk bag molybdenum packaging system;
- One molybdenum concentrate dryer exhaust gas scrubber with fan.

17.3.10 Reagent Facilities

This facility would consist of the systems for mixing, storing, and distributing the various reagents to their points of use, including:

- Lime;
- Frother;
- Primary collector;
- Secondary collector;
- Sodium hydrosulphide (NaHS);
- Fuel oil;
- Liquid carbon dioxide;
- Liquid nitrogen;
- Flocculant.

17.3.11 Tailings Thickening

This facility would consist of two tailings thickeners and the associated equipment. The final concentrator tailings (combined bulk rougher plus bulk cleaner/scavenger tailings products), at approximately 28% solids, would flow by gravity from the concentrator flotation area via a lined launder to the tailings thickener distributor box. The tailings thickening area would contain two 85 m diameter, high-rate tailings thickeners.

17.4 Power and Water

Power for the process plant will be sourced from the Chilean grid (see discussion in Section 18.12). Process make-up water will be from desalinated water (Section 18.10.3) with reclaim water from the TMF.

17.5 Comments on Recovery Methods

The process plant uses a conventional design, and equipment envisaged is also conventional.

18.0 PROJECT INFRASTRUCTURE

18.1 Oxide Operations

All infrastructure that was required to support the oxide mining operations is in place. This includes the SX/EW plant, maintenance shop, PLS and raffinate ponds, power plant, heap leach pads, dump leach pads, spent ore dumps, and WRSFs.

18.2 QB2 Overview

The facilities supporting the mine expansion will be located at three principal sites:

- Mine and concentrator at an elevation of approximately 4,300 masl;
- TMF at an elevation of approximately 3,900 masl and located about 7 km south of the concentrator site;
- Port and desalination plant at the coast.

In addition, there will be an overhead high voltage (HV) electric power transmission line, a concentrate pipeline system to the port, a tailings transport system to the TMF, reclaim water pipeline system from the TMF, a desalinated makeup water pipeline system, and access roads.

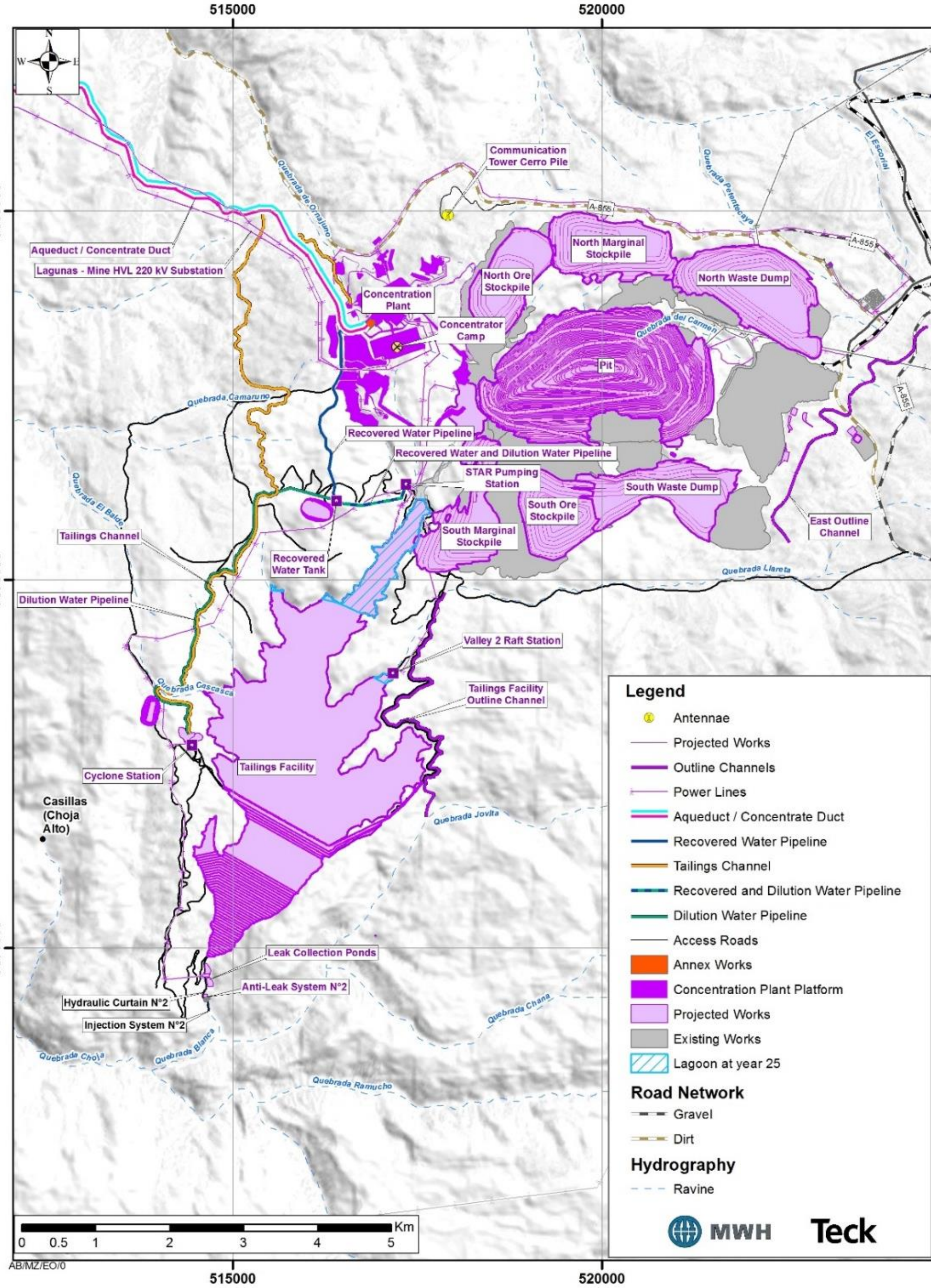
Figure 18-1, Figure 18-2 and Figure 18-3 show the layout of the principal infrastructure components for the planned operation.

18.3 Road and Logistics

A new, 22 km-long road will be constructed from public road A-97B to kilometre 120 of the Pintados private road. The design, performed by a third-party consultant, is stated to be in accordance with Chilean standards for unpaved roads, including road alignment, subgrade, sealing, drainage and signage. It will be a private, restricted-access road during construction, but following concentrator start-up, will be operated as an unrestricted public road and the construction access control at the junction with public road A-97B will be removed.

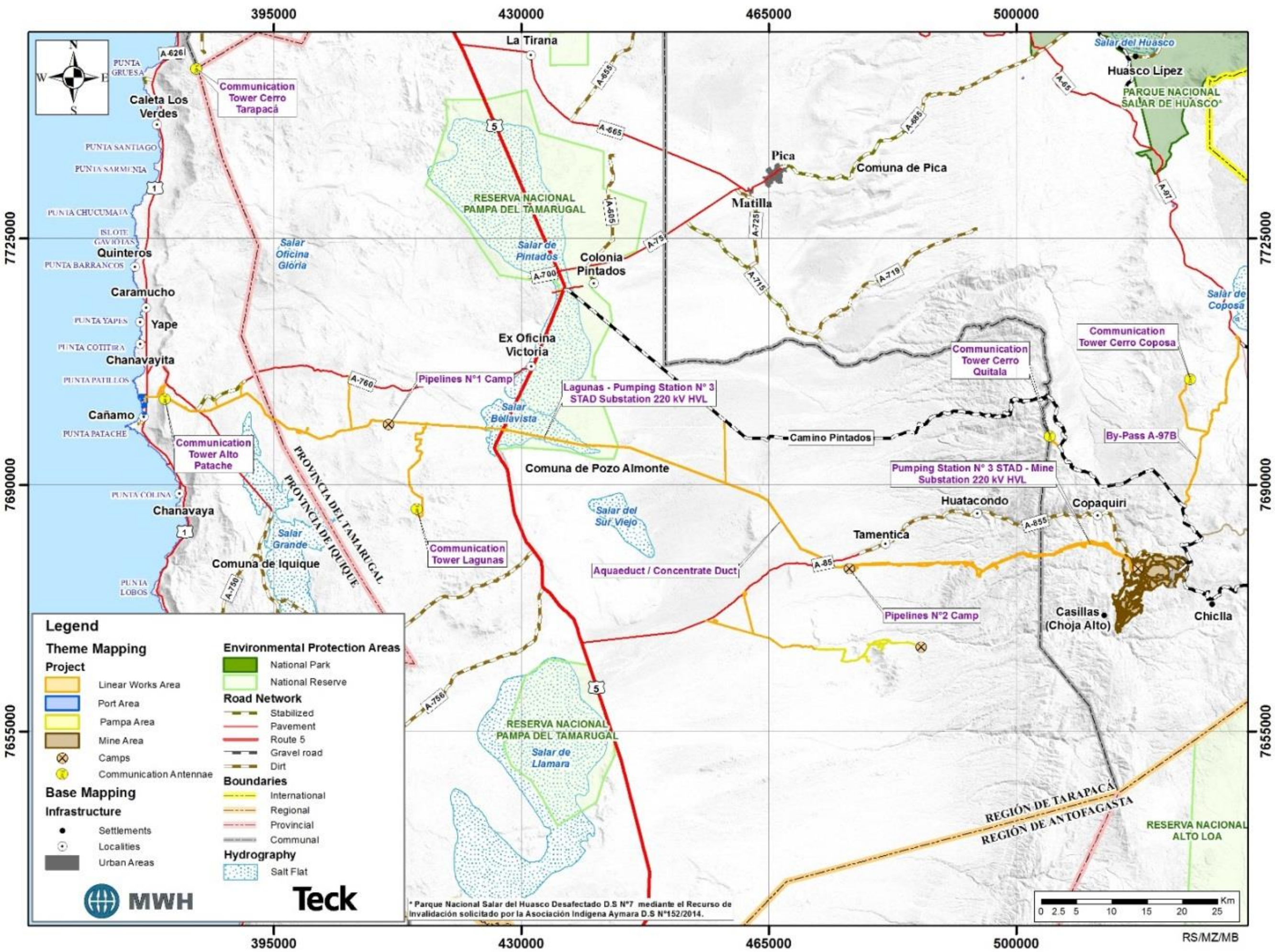
In addition, 12 km of the Pintados private road from kilometre 120 (A-97 bypass junction) to kilometre 132 (existing mine main gate) will be improved, including road re-alignment, subgrade improvements, sealing, improved drainage, and signage. A total of 8.7 km of public road A-855 from the main gate point planned for the mine expansion operations to the existing operations' main gate will also be improved.

Figure 18-1: Mine Area Infrastructure Layout Plan



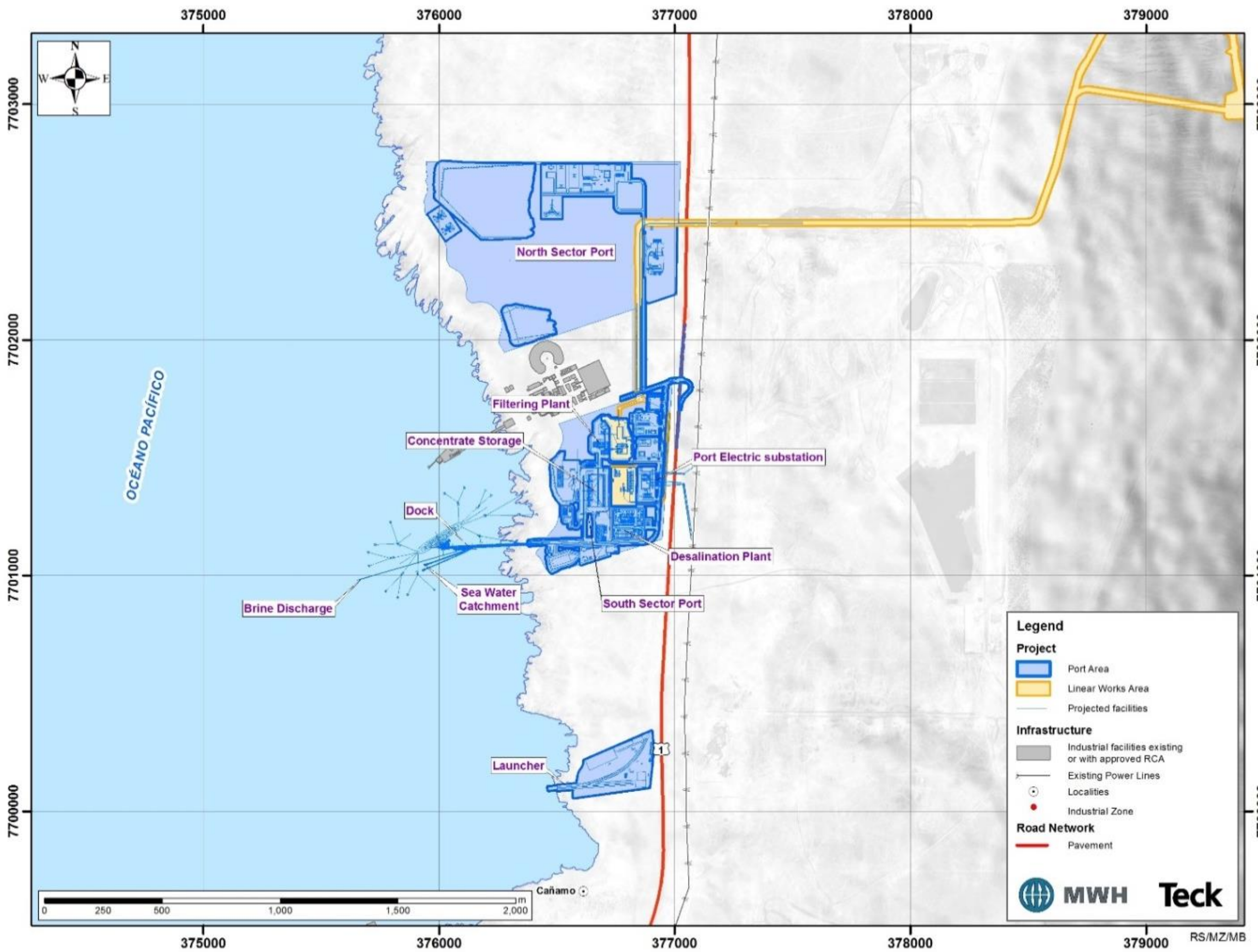
Note: Figure prepared by MWH and Teck, 2016.

Figure 18-2: Linear Works Infrastructure Plan



Note: Figure prepared by MWH and Teck, 2016.

Figure 18-3: Port Area Infrastructure Plan



Note: Figure prepared by MWH and Teck, 2016.

18.4 Borrow Pits

A number of borrow pits (canteras) are planned to provide graded stone, rock, construction aggregate, riprap, sand, and gravel for construction activities:

- Cantera 5 will be located 2 km south of the concentrator site;
- Cantera 5A will be located adjacent to the TMF tailings dam on the north side;
- Cantera 9 will be located 2 km northwest of the TMF;
- Cantera Norte will be located in the Choja area 30 km southwest of the concentrator site;
- The A-85/Choja Road gravel pits will be located in the Choja area 30 km southwest of the concentrator site.

18.5 Tailings Management Facilities

Tailings from the process plant would be transported by gravity to the TMF, where the tailings would be separated, through a cyclone station, into fine and coarse fractions. The coarse sand fraction would be used for tailings dam construction- by the centerline raise method, while the fines fraction would be deposited in the tailings impoundment.

The TMF site would be located in the Quebrada Blanca valley, approximately 7 km south of the process plant (refer to Figure 18-1). The TMF would have the capacity to store 1.37 Bt of tailings, representing 28 years of production.

The TMF is planned to be developed as a rockfill cofferdam, 120 m high rockfill starter dam, and then at the end of the mine life, this would have developed into a 310 m high tailings cyclone sand dam, and wing dam. The use of cycloned sand is a common practice in Chile, and has proven to be a safe and economical method of construction for large scale structures such as required for this site. Sand would be transported and placed hydraulically using cell construction. A drainage system at the base of the dam recovers the excess water and ensures a drained and unsaturated structure which eliminates the potential for sand to liquefy during a large earthquake.

A pumping system would also be installed in the TMF to recover water from the pond that will form during tailings deposition.

Foundation seepage control measures have been incorporated into the design to collect seepage to the foundation and impoundment of the facility. These measures include twin seepage collection ponds and a pump back station, as well as a downstream cut-off system.

18.5.1 Access

In late 2018, construction of the initial stages of the access/haul road between the south WRSF and the starter dam for hauling waste rock for starter dam construction began. Internal roads will also be constructed to access the dam crest and toe from the cyclone station, to access seepage ponds along the interception channel, for access to pumping and booster stations, and to allow access for construction and service of pipelines in the TMF.

Access roads linking the internal TMF roads to the concentrator and the existing supergene facilities will also be provided.

18.5.2 Cofferdam

The cofferdam will be a 25 m high rock fill structure (dam crest to natural ground on dam centreline) at crest elevation 3,768 masl, with upstream two-zone granular filters and the upstream surface lined with geomembrane. The crest width would be 36 m and slopes would be 2H:1V upstream and 2H:1V downstream. During the construction phase, the cofferdam would function as the upstream toe berm for the TMF starter dam. The liner will be extended several hundred metres upstream over natural ground to elevation 3,768 masl to provide storage and control gradients through the dam and foundation. Storage capacity will be approximately 500,000 m^3 and will protect excavation works for the starter dam foundation from flood events during construction.

18.5.3 Foundation Excavation

Trench excavations will be completed downstream of the cofferdam in the starter dam foundation for installation of a drainage system. The excavation will be in alluvial deposits and would be graded to drain to the south by gravity. The excavations will be lined with geotextile and filled with selected drain rock and pipes to promote drainage.

18.5.4 Starter Dam

The starter dam will be constructed as a compacted rock fill embankment with upstream two-zone granular filters and low permeability liner. The dam will be constructed using a concrete curb technique to facilitate the placement of filters. The liner will be linear low-density polyethylene (LLDPE) and will cover the upstream dam face and will be joined to the liner of the cofferdam, which will include an extension of the liner some several hundred metres upstream of the dam toe on natural ground as a partial upstream blanket to limit seepage and help with the formation of a start-up water pond. The LLDPE liner will be extended to line up to the 3,778 masl elevation upstream of the cofferdam and starter dam to provide an initial water pond volume of 1,500,000 m^3 prior to concentrator commissioning. The starter dam design life is anticipated to be less than one year, after which it will be buried with tailings (upstream) and sand (downstream).

The starter dam will have slopes of 1.4H:1V and would include upstream and downstream toe berms. The overall height of the starter dam will be 120 m.

18.5.5 Sand Dam

The sand dam will cross Quebrada Blanca and extend into a valley finger north-east of the starter dam. The sand dam in Quebrada Blanca will be raised above the starter dam over the mine life by the centreline raise method with local raises with upstream slopes of 2H:1V. The northeast portion of the dam will be raised by downstream raise method, with an upstream slope of 2H:1V.

Downstream slopes will be 3.5H:1V. Additional sand will be stacked in the downstream footprint of the sand dam for storage.

The sand will be placed hydraulically, using the underflow from the cyclones. Placement will follow common practice of a cycle of discharge from a sand header pipeline on the crest of the dam, drainage, then spreading and compaction, as required.

18.5.6 Cyclone Facility

The TMF cyclone facility will be located on the west abutment of the TMF dam and will consist of two fixed cyclone clusters, a dilution water tank, and three distribution boxes labelled the cyclone feed box, cyclone underflow box, and cyclone overflow box. The dilution water tank, cyclone clusters, and distribution boxes will be situated successively downhill to allow for an entirely gravity-operated system.

The cyclone overflow and underflow will be transported by pipelines for sand distribution (cyclone underflow) to the dam and as tailings (cyclone overflow) to the TMF. Overflow produced by the cyclone station will be discharged by gravity in a 1,220 mm diameter by 4.4 km long pipeline into the impoundment in accordance with the TMF deposition plan.

18.5.7 Tailings Distribution Pipelines and Corridors

A 20 in. diameter rubber-lined steel pipeline for sand (underflow) distribution will run from the cyclone station to the dam crest and would split to transport sand to the locations where it will be required. Sand transported to the crest of the dam will be deposited according to the dam construction schedule, and sand transported to the dam downstream areas will be used for dam construction and sand stacking. The same quality of sand will be used for dam construction and sand stacking. The sand transportation system will operate by gravity until approximately Year 25, when pumping will be required to transport sand to the farthest discharge points.

18.5.8 Tailings Transport System

A gravity-flow, open-channel tailings transport system will deliver concentrator tailings from the tailings thickener underflow collection box to the TMF south of the mine site. The total length of the tailings transport system will be 12.4 km.

18.5.9 Drainage System

From the seepage interception trench along the starter dam axis, a valley bottom basal drain trench of 25 m width and 2.0 m height will be constructed in the sand dam footprint.

Drainage from the sand dam will be collected at the seepage pond located to the south of the dam toe. The water will be pumped by vertical turbine pumps from the seepage intake structure to the dilution water tank at the cyclone station.

A downstream seepage cut-off and collection system will consist of a geomembrane-lined excavation through soil tied into a grout curtain installed in bedrock from a concrete plinth on bedrock. Wells will be installed upstream of the cut-off wall and actively pumped to lower the groundwater table. The function of the cut-off will be to impede seepage along the valley. Downstream of the cut-off, a series of wells will be installed that will be used to monitor water quality. The downstream wells will be located and sized so that they can be used as a secondary containment and collection system for groundwater flow.

The excavation will be approximately 13 m deep and 45 m long across the valley. The downstream face of the excavation will be lined with HDPE geomembrane. The excavation will be backfilled with selected rock fill to provide storage for seepage.

A pumping system will be included at the cut-off to actively lower the phreatic surface sufficiently to collect water flowing in the soil and shallow bedrock for pumping back to the seepage collection system, such that flow does not bypass the cut-off system. This system will be a series of pumped wells across the valley.

18.5.10 Seepage Pond

Sand transport water and seepage water will be transported to dual seepage collection ponds. Flow may be directed to either pond. The seepage collection ponds will be excavated in alluvial soils, and include earth-fill berms lined with high density polyethylene (HDPE) geomembrane. Each pond will include a leak detection system and with storage capacities of 35,000 m^3 and 45,000 m^3 or 24 hours of storage to store sand transport water, plus an allowance for seepage and precipitation. Use of the ponds will be alternated such that the non-operational pond could be cleaned and maintained.

A 508 mm diameter pipeline will follow the seepage pond access road back to the cyclone station.

18.5.11 Monitoring

The following instrumentation and methodologies are planned to be used:

- Accelerometers;
- Topographical survey;
- Vibrating wire piezometers;
- Inclinometers (practical limit of 200 m for inclinometer casing);
- Inclinometers in the starter dam continue in the sand dam;
- Monitoring wells.

18.6 Water Management

18.6.1 Mine Diversion Channel

In the mine area it is proposed that a cut-off channel be constructed to manage the non-contact (clean run-off) water that is collected during rainfall events in the surrounding water catchment valleys. The channel would be developed around the eastern sector of the Quebrada Blanca basin and would have a length of 4.8 km. The water would discharge into Llareta Creek.

18.6.2 TMF Diversion Channel

The TMF diversion channel would start in Quebrada Llareta and would have an approximate length of 5 km to its discharge point into Quebrada Jovita. The channel would discharge into the quebrada (ravine) through a discharge chute, designed with a trapezoidal section, rip-rap lining, and side slopes of 1.5H:1V. Erosion control measures would be implemented at the discharge point.

18.6.3 Contact Water Control Pond

A control pond is planned to collect contact water downstream of the sulphide leach WRF emergency pond, and on the upstream side of the leakage pond. It will also capture water leaching from the south WRF. The 25,000 m^3 capacity, high-density polyethylene (HDPE)-lined pond would include a reclaim pumping system to return the water to the process plant.

18.6.4 Pit Dewatering

The existing pit dewatering system would be utilized by the QB2 project, and system additions and replacement would be undertaken on an as-needed basis. The system comprises a water collection and pumping system to send excess water to the tailings pond. Water entering the pit is primarily a combination of direct seasonal rains, run-off, and infiltration water.

The system would include pit dewatering pumps constructed in a series configuration.

Additional discussion is included in Section 16.4.

18.6.5 TMF Water Recovery

The water reclaim system at Quebrada Blanca will consist of two main reclaim water barges, two booster pump stations, and one permanent booster station with a pipeline connecting these stations. Two main reclaim barges will allow for barge movement during the ramp-up period while maintaining uninterrupted water reclaim.

The water reclaim system at Quebrada Blanca will reclaim water from the main TMF operational pond. Water will be pumped in a closed system to the dilution water tank and then to the process plant area. The water reclaim barges will be moved periodically with the pond.

The reclaim water barges will initially pump to two successive booster pump stations installed within the TMF footprint to the permanent booster station. As the pond rises and the barges move closer to the permanent booster station, booster stations will be removed.

From the permanent booster station, water will be pumped through two separate carbon steel pipes, one to the dilution water tank located at the cyclone station, and a second pipe to the process plant.

Pipeline corridors will be installed in dedicated platforms along the bottom of Quebrada Blanca.

18.6.6 Concentrator Remediation Water Recharge System

Water will be delivered to a point downstream of the tailings dam wall and will meet the environmental criteria established for the expanded operations.

18.7 Accommodation and Support Buildings

The permanent camp is the section of the main construction camp that will remain for operations' use. It would comprise various buildings and installations for the allocation of 1,300 beds. The complex will include a mess, offices, fire station, sleeping quarters, medical clinic, recreation buildings, access gate, bathrooms, gymnasium, luggage store, bus parking areas, vehicle parking areas, mini-football fields, camp administration office, emergency generator, laundry, meeting and training rooms, store, and garbage disposal area.

The mine and process areas will require the following support buildings:

- Administration building: will house the operations offices and the plant control room;
- Workshop and warehouse (two buildings): will initially be used for construction purposes before being handed over to operations once the plant is nearing completion;
- Laboratory: will contain areas for offices, lavatories, sample preparation (e.g., for jaw crusher, screens, or pulverizer), chemical and sample storage, analytical equipment, wet laboratory, and fume extraction system;
- Change house and dining room facility: will be located near the concentrator and would service the operations staff. The change house has been designed to accommodate 425 employees. The dining room would accommodate 150 people and would be located adjacent to the change house. A separate lunchroom accommodating 10 people would be provided in the molybdenum processing area;
- Main gatehouse.

18.8 Mine Area Facilities

Figure 18-1 includes a layout plan for the mine-area infrastructure.

18.8.1 Roads

An established network of haul roads and infrastructure remaining from the supergene operation is available for the expansion project, and use of these will minimize many of the mine commissioning activities. Existing haul roads within the pit area will require widening to 40 m from the existing 30 m to support two-way traffic. A nominal amount of new haulage routes will be required to link the planned infrastructure, including the primary crusher, mine phase excavations, waste dump deposits, and stockpiles. Two additional haul roads will be required, one to link the pit to the mine equipment service shop location, and the second to enable construction material transport for the tailings starter dam.

18.8.2 Electrical

The majority of the mining equipment is planned to be electrical, including the rope shovels, rotary blast hole drills, and dewatering infrastructure. The power supply would be a 23kV overhead line loop supplied from the TMF main substation and from the primary crusher electrical substation as a backup.

18.8.3 Explosive Plant

The existing explosive plant would be modified to meet the LOM production requirements. During the fourth year, the explosive plant would be relocated to the east side of the existing heap leach pads.

18.8.4 Truck Shop

The existing mine mobile equipment maintenance building will continue to be used to service mine equipment for the first five years of operation until it becomes necessary to expand a new facility at a different location. An initial truck shop will be constructed at the new truck shop location, designed to be expanded in the future.

The permanent structure will include a truck wash, maintenance and service area, with a maintenance capacity for six mine haul trucks.

18.8.5 Sewage

The sewage treatment plant will be located behind the main mine truck shop. It will be constructed to serve the construction workforce of 5,250 people at a plant capacity of 1.050 m^3/d. Following the construction period, it will be resized to operate with a smaller operations workforce of 2,800 persons maximum with a capacity of 540 m^3/d.

18.8.6 Solid Residue Management

The solid residue management facility is be located at the Quebrada Blanca mine site and would be expanded to manage solid sewage waste and other solids waste from construction activities.

18.9 Process Plant

Infrastructure required for the process plant is discussed in Section 17.

18.10 Linear Works/Pipeline Systems

A plan showing the locations of the planned linear works was included as Figure 18-2.

18.10.1 Pipeline Corridors

The main corridor for the pipelines encompasses the ROW for the concentrate transport system (CTS) and the make-up water transport system (MWS), and runs mainly in an east-west direction, connecting the port facilities and the mine site. The pipeline ROWs have been acquired.

A 72-strand fibre optic cable main backbone will be buried along the corridor together with the pipelines in order to transmit communications and supervisory data and control for the transport systems.

Access to the pipelines will be from existing roads, and the ROWs would be graded as required for construction equipment, operation, and slope restrictions for the CTS. Each pipeline would have a number of ravine, road, railroad, and power line crossings.

18.10.2 ConcentrateTransport System

The CTS will commence at the concentrator pump station located at the mine site process plant and will terminate at the filter plant at the port site, a distance of 164 km. The capacity of the CTS will range from 97 to 165 t/h or 120 to 149 m^3/h (minimum to maximum).

The CTS pump station will be located at the concentrator area. The pump station will pump copper concentrate into the pipeline. The station will be the location of the primary control for the CTS flow.

CTS Choke Station No. 1 will be located at approximately kilometre 17.7 of the CTS pipeline; CTS Valve Station No. 1 at 30.1 km; CTS Choke Station No. 2 at 47.6 km; and CTS Valve Station No. 2 at 135 km. The function of the aboveground choke stations will be to control the pressure buildup with dynamic dissipation and the aboveground valve stations to control static pressure.

The CTS Terminal Station will be the delivery point of the CTS and will be located at approximately kilometre 164.4 of the CTS pipeline (at the port site). The function of this station will be to control static pressure.

Three pressure monitoring stations will be required to operate the CTS, and will be constructed at kilometre 69.7, kilometre 107.5, and kilometre 158.1. They will be solar-operated.

18.10.3 Make-up Water System

The MWS will transport desalinated water from the seawater treatment plant at the port site to the process water reservoirs at the concentrator. The transport system would have a capacity of 3,502 to 4,202 m^3/h (nominal/design values, respectively). The desalinated water would be pumped using a buried pipeline installed along the pipeline corridor.

MWS Pump Station No. 1 will be located within the port facility area, at kilometre 0.0, at an elevation of 65 masl; MWS Pump Station No. 2 at kilometre 26. at an elevation of 915 masl; MWS Pump Station No. 3 at kilometre 112.5 at an elevation of 1,621 masl; MWS Pump Station No. 4 at kilometre 130.0 at an elevation of 2,532 masl, and MWS Pump Station No. 5, the final station, at kilometre 142.6 at an elevation of 3,445 masl.

MWS pump station no. 1 will receive power from the port substation. MWS pump station no. 2 will receive its power from a 220/6.9 kV substation fed from a section substation installed in the existing Tarapacá–Lagunas 220 kV transmission line. MWS pump stations nos. 3, 4, and 5 will receive power from three 220/6.9 kV electrical substations fed from the new Lagunas–concentrator 220 kV transmission line.

The MWS terminal station is the delivery point for the MWS and will be located at the concentrator site at kilometre 159.0 of the MWS pipeline at an elevation of 4,370 masl.

18.11 Port Area Facilities

A plan of the proposed port area infrastructure is included in Figure 18-3.

18.11.1 Filter Plant

The copper concentrate will be filtered to produce a cake suitable for ocean transportation. The filter building will have two floors:

- The ground floor will contain the concentrate collection belt feeders, the tail end of the concentrate tripper conveyor, sump pumps, tanks, and filter air compressors;
- The top floor will host the pressure filters and a laydown area for filter maintenance.

The system will consist of three parallel filtration systems, with each system consisting of an automated concentrate filter press, concentrate filter feed pump, and a concentrate (filter cake) collection belt feeder to recover the product. The three filtration systems would share a common filtrate receiving tank, a set of operating filter cloth wash pumps, a set of operating/standby filtrate transfer pumps, and four sump pumps. Excess water would be sent to a clarifier, and clarified water would then be filtered and then injected into the makeup water pipeline, returning to the concentrator.

18.11.2 Concentrate Storage and Reclaim

The concentrate handling and storage facilities would consist of a concentrate tripper conveyor, which would transport filtered concentrate from the collection belt feeders to a 75,000 t capacity stockpile enclosed in the concentrate storage building. Space will be left for a future additional stockpile to the south of the building. The building would also include a dust collection and ventilation system for dust control.

The concentrate reclaim system will use front-end loaders to transfer reclaimed concentrate product from the stockpile through floor-level grizzly screens to two 1 m wide by 31 m long, 800 t/h capacity reclaim belt feeders. The reclaim belt feeders would feed concentrate onto a 1 m wide by 259 m long, 1600 t/h reclaim conveyor, which in turn would feed the concentrate loadout pipe conveyor. The reclaim facilities would include feed hoppers, dust collectors at the transfer points, a metal detector, concentrate sampler system, and a weigh scale installed on the reclaim conveyor.

18.11.3 Loadout Conveyor and Ship Loader

The reclaim loadout conveyor will discharge concentrate to a 400 mm diameter, 608 m long, 300 kW and 1,600 t/h capacity loadout pipe conveyor (mounted, in part, on trestles), and will transfer the concentrate to the radial ship loader for loading into ocean-going bulk carrier.

18.11.4 Marine Facilities

The marine facilities would include an onshore abutment, an access trestle, a pump station platform, a ship loader platform, a boat berth, a standoff spread mooring system, two protection dolphins, and a ship access gangway.

18.11.5 Seawater Intake/Treatment/Pumping

Seawater from the Pacific Ocean will be pumped by intake pumps to the desalination plant for processing. The various filter backwashes and seawater reverse osmosis brine will be directed by gravity flow back to the Pacific Ocean via the brine discharge outfall.

The seawater treatment plant will be fed with seawater from the seawater intake pumps and will produce desalinated and potable water via three main stages:

- Pre-treatment;
- Reverse osmosis;
- Post-treatment.

Brine will be the main waste product and will be discharged back into the ocean via the brine outfall pipeline from the brine outfall tank. The plant would also include a chemical and reagent storage and handling facility.

18.11.6 Offices and Warehouses

The following pre-engineered buildings will be required:

- Dining room;
- Administration building;
- Men’s change house;
- Women’s change house;
- Workshop and warehouse;
- Laboratory;
- Main gatehouse;
- Secondary gatehouse.

Access to these buildings will be provided by a new exit from Ruta 1 via the main entry gate. A guard house and parking area will be located at the entry gate.

18.12 Power and Electrical

18.12.1 Power Agreement

A number of power purchase agreements were signed with AES Gener in 2012 and thereafter, under which Teck would receive power in aggregate from a number of sources, including conventional and solar power plants.

18.12.2 Projected Usage

The projected power requirements for the key usage areas are summarized in Table 18-1.

18.12.3 Power Supply Requirements

The HV transmission system will consist of 220 kV transmission lines from various locations to the Quebrada Blanca 220 kV substations, including:

- HV Lagunas substation/switching station: includes the addition of two bays to the existing 220 kV Lagunas substation to feed the double-circuit HV transmission line to the concentrator;
- Concentrator HV transmission line: includes a double-circuit 220 kV transmission line from the Lagunas substation to MWS pump station nos. 3, 4, and 5 and the concentrator main substation. The HV transmission line would be carried on double-circuit transmission lines from the Lagunas substation to a location part-way between pump station nos. 4 and 5, then on parallel single-circuit transmission lines to pump station no. 5 and the concentrator;
- MWPS No. 2 HV transmission line: includes a deviation from the existing Tarapacá–Lagunas double-circuit 220 kV line to a new sectioning substation and double-circuit lines to the 220 kV substation at MWS pump station no. 2;
- RWPS HV transmission line: includes a double-circuit 220 kV transmission line from the concentrator 220 kV substation to the TMF 220 kV substation;

Table 18-1: Estimated Power Usage

Facility Description	Installed Load	Demand Load	Energy
	P (MW)	P (MW)	(GWh/year)
Port site facilities	33	16	107
Pipeline systems	102	60	501
TMF	42	24	176
Mine	54	20	47
Concentrator site	209	146	1189
Project Substations Total Load	440	266	2,020

- HV Tarapacá substation/switching station: includes the addition of a single bay to the existing 220 kV Tarapacá substation and connection to the existing unused circuit on the Tarapacá–Condores double-circuit 220 kV transmission line;
- Port HV transmission line: includes deviation of the existing Tarapacá–Condores double-circuit 220 kV line to a new sectioning substation and double-circuit lines to the port 220 kV substation.

18.12.4 Concentrator

The concentrator main substation will be located in the concentrator area to the south of the grinding building.

A new 220 kV double circuit transmission will be installed from the Lagunas substation to the concentrator with intermediate connections to substations for MWS pump stations 3, 4 and 5. New switchgear would be required in the Lagunas substation to feed this new line.

The power line will be installed parallel to the makeup water pipeline and will supply the individual pump station electrical substations.

The concentrator main substation will be a step-down type in which the 220 kV incoming voltage will be stepped down to 23 kV for primary distribution to the concentrator facilities, mine facilities, permanent camp, and ancillary facilities. Power distribution will be through a radial feed system using duct banks, overhead lines, and cable trays. This system will feed several electrical rooms around the concentrator and mine.

18.12.5 Tailings Management Facility

Power would be supplied to the 220/23Kv TMF substation at the concentrator via the 220kV switchgear.

Power would be supplied to the TMF permanent booster station via 23kV double-circuit overhead lines. Final distribution from the permanent booster station to the TMF equipment would be at 4.16kV to the barge pumps and 23KV to booster stations 1 and 2 via cables.

The TMF substation would be located adjacent to the concentrator substation. The TMF substation would be a step-down type in which the 220 kV incoming voltage would be stepped down to 23 kV for distribution to the TMF facilities. In addition, this substation would also supply the primary crusher and the mine supply loop via 23kV overhead lines.

18.12.6 Port

Electric power would be distributed at 23 kV from the port site main substation switchgear by a radial feeder using duct banks and cable trays to supply power to several electrical rooms around the port facilities. Medium voltage and low voltage power would be distributed within each area from the switchgear mounted in electrical rooms around the port facilities.

18.13 Control and Communication Systems

The following subsystems would be provided for process control and communications:

- Process control system;
- Controllers provided by third parties;
- Process network;
- IT network (outside of building);
- Advanced control systems;
- Plant information management system;
- Instrumentation and equipment integration;
- Process and security closed-circuit television;
- Fire detection systems integration;
- Electrical supervisory control and data acquisition (SCADA) system integration;
- Voice radio system (project-wide);
- Mine communication network: facility for the existing operations' mining offices and employee mess, which would continue to serve the existing operation and would be connected to electrical distribution and fibre optic network implemented for the expansion project.

18.14 Water Supply

18.14.1 Process Water

Process water will primarily be sourced from the desalination plant on the coast and transported to the concentrator site through the MWS (see Section 18.10.3).

A portion of the process water will be reclaim water sourced from the TMF. A water recovery system will reclaim water from the TMF main operational pond. This water will be pumped to the tailings cyclone station or to the concentrator. An initial lined start-up water pond of 1,500,000 m^3 behind the starter dam has been designed for water supply prior to concentrator commissioning.

18.14.2 Potable Water

The potable water plant will consist of a packaged reverse osmosis system that would provide potable quality water to the concentrator and camps. The capacity of the plant will be approximately 150 m^3/h and will be sized to include the feed to the main operations camp, as well as the local concentrator camp, cooling tower makeup, and remediation water system.

The system will be located adjacent to the feed source, which is the makeup water pond. It will include a 450 m^3 tank that will be used to distribute the treated water to the various consumer areas.

18.15 Comments on Infrastructure

Major infrastructure required for the QB1 open pit operations has been constructed and is operational. QB2 will require additional infrastructure in four areas, the mine site, the planned process plant site, linear works areas, and the port site.

19.0 MARKET STUDIES AND CONTRACTS

19.1 Market Studies

Teck staff performed a review of the estimated quality of, and potential markets for, the copper and molybdenum concentrates that would be produced by QB2.

19.1.1 Copper Market Forecasts

Copper smelter capacity has increased 45% in the last 10 years since 2008 to 23.9 Mt of copper metal per year in 2018. Wood Mackenzie (2018) expects the global copper smelter capacity to continue increasing by a further 10% out to 2028 where it could reach 25.7 Mt.

Globally capacity is not currently being fully utilized, in part because many new smelters in China built in the last two to three years are just starting to ramp up to full production. Current global smelter utilization is estimated to be running at 81% of capacity, producing only 19.6 Mt in 2018. Wood Mackenzie (2018) expects smelter production utilization rates to rise back to more normal levels above 88% which means that copper metal production will increase 23% between 2018 and 2028 rising to 23.4 Mt of metal production by 2028.

Wood Mackenzie (2018) believe that sufficient smelting capacity currently exists as either committed, currently being commissioned or highly probable to satisfy market requirements until at least 2030. The gap between available copper concentrates and copper smelter demand will continue to be a feature of the market with either smelter utilization rates continuing to fall or utilization rates continuing to remain below historically optimum levels for the next decade.

The lack of investment in copper mine projects over the past six years will likely have an effect on the copper markets ability to deliver copper units into the refined cathode metal market by 2028. Without additional new, as yet uncommitted, mine production Wood Mackenzie (2018) is forecasting a 5.8 Mt deficit in the copper market by 2028. They believe that some of this gap will be filled through additional new mine projects and increases in scrap availability, however, additional resources are estimated to be required to meet growing copper metal demand globally.

Copper ore grades at existing mines and new mine projects have been falling for several decades, with concentrates grades also falling over this period. With the reduction in concentrate and ore grades, the market has also seen an increase in impurities in the concentrates being delivered to the market. Whilst many of the smelters currently being commissioned in China are being designed to treat lower grade concentrates, environmental import restrictions are impacting the flow of low-grade high impurity concentrates around the world. In concentrate markets that move toward balance or surplus, low-grade, high impurity complex copper concentrates will attract unfavourable economic terms. The copper concentrate from the Project is forecast to be cleaner than that of a number of existing and projected mines.

19.1.2 Quebrada Blanca Copper Concentrate

Teck estimates that the average annual life-of-mine copper concentrate production will be approximately 946,000 dmt/a, with a peak annual production of 1,159,000 dmt/a occurring in operating Year 3. The marketing program would account for annual changes in this quantity and would anticipate that production would be greater in the earlier years of the mine life.

The Project's copper concentrate is clean as it contains low levels of deleterious elements. Key features of the concentrate include:

- An average 26% copper grade, which would be accepted by most copper smelters in the custom market;
- Low levels of deleterious elements such as arsenic, zinc, mercury and lead, providing a competitive edge in the concentrate market;
- The concentrate contains silver at payable levels.

19.1.3 Molybdenum Market Forecasts

With the downward trend of molybdenum prices continuing throughout 2016, interest from the investing community in financing risky new primary molybdenum projects has disappeared. However, with lower copper prices, copper mining companies have been running their molybdenum circuits in order to reduce overall cash costs at their operations. Going forward to 2025, there are still many large projects that could impact the global market if molybdenum prices were to recover by an appreciable amount.

Molybdenum concentrate demand is defined as the net feed requirement by the global molybdenum roasters, excluding feed from secondary or recycled inputs. Similar to the copper concentrate market, there is currently excess roasting capacity globally.

The CPM Group (CPM, 2018) estimates that global molybdenum roasting capacity is approximately 619 Mlbs annually. This does not include underutilized or idled capacity in China, for which CPM estimates approximately 220 Mlbs of active capacity in China, with another 200 Mlbs of capacity sitting idle. Some of this capacity is in the process of shutting down, but CPM also identifies a significant number of planned capacity increases or replacements that have yet to be approved for development. Getting an accurate picture of Chinese molybdenum roasting capacity is difficult. CPM (2018) has estimated that with new projects, the global molybdenum roasting capacity could reach 1 Blbs by 2028, but effectively the number is likely to be closer to 950 Mlbs. This suggests that currently there is more than sufficient molybdenum roasting capacity to treat the available mine production and the known mine production increases over the next 10 years.

Due to the 70% fall in prices in 2015, molybdenum mine production was curtailed by 50 Mlbs which represents approximately 10% of the global market in 2016. This production cutback at the mines was not matched by a change in molybdenum roasting capacity. Based on current assumptions by Teck and using CPM's data, it is unlikely that the gap between molybdenum concentrate production and molybdenum roasting capacity will be filled over the next 10 years. However, there is the potential if prices rise high enough that projected mine production and the probable projects could add more mine production to the market than is forecast to be necessary in the coming years.

19.1.4 Quebrada Blanca Molybdenum Concentrate

The molybdenum concentrate would be the product of differential copper–molybdenum flotation and would not be expected to require leaching for copper removal in order for it to be marketable. The molybdenum concentrates will be of average quality with above-normal copper contents (1.4% vs. 0.6%).

The estimated average annual LOM molybdenum concentrate production rate level would be approximately 16,356 dmt/a, or approximately 18 Mlb/a of contained molybdenum. The peak molybdenum concentrate production rate would be 22,590dmt/a, occurring in operating Year 24.

The molybdenum concentrates contain elevated levels of rhenium, in the order of 350 to 500 g/t Re. No credit is given to the rhenium content in the financial analysis in Section 22.

19.1.5 Proposed Marketing Strategy

QB2 will produce a typical chalcopyrite copper concentrate with low levels of deleterious elements. The objectives in marketing the project's copper concentrate are:

- Place a portion of the annual production with select Buyers in order to obtain import finance from the Buyer's national export-import agencies;
- Place a substantial portion of overall production under medium and long-term contract with the balance to be sold under short-term commitments;
- Achieve a diversified portfolio of customers;
- Maximize project economics.

Teck will target the sale of copper concentrates based on the following criteria:

- Finance facilitation: determined by ability and willingness of the smelter to facilitate and support obtaining import finance from their national bilateral agencies;

- Financial value: determined by the profitability of the contract with the customer;
- Commercial performance: determined by the smelter's ability to perform its obligation in the short and long term;
- Credit quality: based on historical credit performance;
- Environmental performance and compliance with statutory requirements: customer responsibility with regards to environmental stewardship and commitment to sustainability;
- Location: concentrates will be sold to smelters in geographically diversified locations that have competitive freight rates.

QB2 will produce unleached molybdenum concentrate with a copper content between 0.5% and 2.00% which is typical for unleached by-product molybdenum concentrates. The objectives in marketing the Project's molybdenum concentrate are:

- Place 85% to 90% of the annual production under medium and long-term contract with the balance to be sold under short-term commitments;
- Achieve a diversified portfolio of customers;
- Maximize project economics.
- Teck will target the sale of molybdenum concentrates based on the following criteria:
- Financial value: determined by the profitability of the contract with the customer;
- Commercial performance: determined by the smelter's ability to perform its obligation in the short and long term;
- Credit quality: based on historical credit performance;
- Environmental performance and compliance with statutory requirements: customer responsibility with regards to environmental stewardship and commitment to sustainability.

19.2 Commodity Price Projections

19.2.1 Copper Price

The methodology for development of the base copper price forecast for the financial analysis in Section 22 uses various approaches for long-term price determination. The long-term base copper forecast price is based on a weighted average approach using several specific components, with the fundamental inputs to the forecast being projection of industry supply and demand totals, along with consideration of global and country-specific economics. Cost structure and incentive price have been incorporated into the price forecast, together with industry market forecasts and historical prices.

19.2.2 Molybdenum Price

Molybdenum prices are still typically determined by negotiation between producers, trading houses, and end users, with supply and demand fundamentals in the background. Surveys are done by a number of independent publications such as Platts Metals Week, Metals Bulletin, and CRU Consulting (CRU) regarding these negotiations and the estimated transaction prices are published on a regular basis. This pricing system is fairly opaque, as the quantity and nature of the transactions used to set prices are not readily available. Molybdenum is traded in various forms, including raw molybdenum concentrates, molybdenum oxide, ferromolybdenum, ammonium molybdate, and molybdenum powders.

The increase in molybdenum price volatility over the past eight years has encouraged several attempts to establish a forward pricing market to allow industry participants to hedge their price exposure. Most of these have failed to provide the necessary liquidity to successfully trade any future positions. The launch of the London Metals Exchange (LME) contract has been seen as the longest running futures contract, but liquidity of the contract remains an issue and has not been adopted by the industry. The LME will in March 2019 cancel the physically-deliverable Molybdenum Contract that currently trades on the LME and replace it with a financially-settled contract based on the Platt's Price Assessments.

Teck's internal metals sales department uses the published prices from publications such as the Metals Bulletin in its contracts and negotiations with its customers. The price of future concentrate shipments would be based on the amount of molybdenum contained in the raw molybdenum concentrates. Teck also negotiates penalties, discounts, roasting charges, shipping fees, and delivery terms with each of its customers to obtain final settlement prices.

For molybdenum, there are essentially two markets for supply: these being supply from primary molybdenum producers and supply from by-product producers that produce molybdenum from copper mines. In the case of by-product producers, the cost of producing molybdenum is highly dependent on the price of copper and is less impacted by movements in the molybdenum price. Conversely, primary molybdenum producers, where molybdenum is the only source of revenue, are highly dependent on movements in molybdenum prices. For this reason, Teck looks at the 90th percentile costs of the primary producers as being the point where production should be rationalized. This is then used as one of the bases for estimating future price trends. However, as most of the global primary mine production is based in China and comes from extremely small operations, it becomes difficult to estimate actual costs of production for these small producers. Therefore, other market indicators must also be considered.

Teck estimates that basis the fundamental supply/demand view molybdenum prices will remain healthy; however, this level of pricing will not be sufficient to allow for the kind of return on investment necessary to develop any significant new primary molybdenum mine production outside of China. With significant underutilized mine capacity currently off-line in the West, and with several by-product projects still not operating at full capacity or as yet undeveloped, it is unlikely that a rise in molybdenum prices in the medium term would be sustained at previous historic levels. Without a significant increase in the price of oil, which would increase underlying molybdenum demand from the oil and gas sector, molybdenum prices are likely to remain subdued over the next five years, and potentially for the remainder of the period through 2028.

19.3 Contracts

19.3.1 Concentrates

QB2 will produce a typical chalcopyrite copper concentrate with low levels of deleterious elements which is expected to achieve, at minimum, standard market benchmark commercial terms. A typical long-term copper concentrate contract will specify the quantity, possibly with a range, and a term for the duration of the contract. The treatment charge, copper refining charge, and price participation, if any, would be negotiated periodically, such as on a calendar year basis. The remaining terms and conditions would be fixed for the duration of the contract.

QB2 will produce a typical unleached by-product molybdenum concentrate and is expected to achieve market terms. A typical contract structure for molybdenum concentrate sales will be for a fixed quantity for the contract duration, with roasting charges to be agreed annually. It is also commonplace in the molybdenum industry to fix the roasting charges for more than a one-year period. Typical long-term contracts are similar in structure to those for copper concentrates.

To date no sales contracts have been established for QB2's copper or the molybdenum concentrates but Teck plans to have 70% of the annual copper and molybdenum production under contract prior to the start of production. It is expected that any sales contracts signed would be within market norms; however, depending on negotiations with the specific buyers, the actual contractual terms may be different from what is typical in industry.

19.3.2 Freight

The Project's port facility near Punta Patache would be a dedicated and modern, high-speed loading terminal capable of berthing and loading Handymax and up to Panamax-sized vessels. It is expected this would prove attractive to vessel owners and promote competition for carrying the Project's copper concentrates. The primary constraints would be customer inventory and port capacity (especially in Asia). Therefore, it is expected to attract highly-competitive rate levels versus other concentrate producers in the region.

At the Project's start-up, Teck expects to arrange for spot vessels to handle the initial shipments to the marketplace, followed by multi-year contracts of affreightment (COAs) to lock in shipping terms, provide some protection from shipping cost fluctuations, and ensure the availability of quality vessels to carry the Project's product.

19.3.3 Other Contracts

Teck has multiple major contracts in place or under negotiation that support operations. These include contracts relating to fuel, transport, contractor mining, mine and plant maintenance, consumables and bulk commodity supply, operational and technical services, and administrative services. Contracts are negotiated and renewed as needed. Contract terms are considered to be in line with typical such contracts in Chile.

19.4 Comments on Market Studies and Contracts

A market review indicates that the copper and molybdenum concentrates will be saleable.

Metallurgical tests showed commercially substantial levels of rhenium in the molybdenum concentrate; however, there is no established basis for a rhenium payment structure in molybdenum concentrate that Teck considers prudent for use in the feasibility study. Therefore, rhenium is considered only as an opportunity. The rhenium would, at minimum, make the molybdenum concentrate more marketable.

The copper concentrate market is forecast to be in a deficit during the period of time that the Project will be commissioning and ramping up production. That would be helpful to market development for products of the Project. It represents medium-sized capacity, so it should be relatively easy to place in the market. This, in conjunction with projected timing, would potentially correspond with a favourable market.

Selected off-take agreements are under negotiation with potential buyers of QB2 products. Such agreements may offer the potential for project financing, under terms that reflect the long-term potential of the project.

Metal pricing is based on long-term price forecasts completed by Teck and external third-party consultants. The Qualified Person has reviewed the prices, the market studies and analysis completed by Teck, and is of the opinion that the results support the assumptions in this Report, and can be used to support the financial analysis in Section 22.

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 Introduction

Montgomery Watson Harza prepared the Estudio de Impacto Ambiental Proyecto Minero Quebrada Blanca Phase 2 report (the 2016 EIA) that was dated August 2016 and submitted to the Chilean environmental authorities on 26 September, 2016. The 2016 EIA report was completed before the 2016 feasibility study was finalised, and there may be, as a result, some variances between the project descriptions contained in this Report and those in the 2016 EIA.

The 2016 EIA was approved by the Chilean authorities in August 2018. During the approval process, three rounds of questions and answers took place, with minor changes to the Project scope. The main change is related to the QB2 access road to, which now shares part of the Collahuasi access road, reducing the environmental impact in the area. This change was made areas a result of community consultations. All other changes are minor and re typically related to environmental measures.

The final and legal document that summarizes the scope and all commitments of the Project is the “Resolucion de Calificación Ambiental” (RCA 74/2018).

20.2 Baseline Studies

Baseline studies and monitoring included:

- Climate and meteorology;
- Air quality;
- Noise;
- Geology, geomorphology, and geological risks;
- Soil;
- Vibrations;
- Hydrology;
- Hydrogeology;
- Water quality;
- Marine water resources;
- Terrestrial ecosystems;
- Continental aquatic ecosystems;

- Marine ecosystems;
- Cultural heritage;
- Landscape;
- Protected areas and priority conservation sites;
- Natural and cultural attractions;
- Land use and relationship with planning;
- Human environment.

Areas that were sensitive to changes were identified using cause–effect matrices. Where possible, the design strategy used impact minimization practices.

20.3 Environmental Considerations

Teck has proposed a number of measures to mitigate environmental risks to the environment and communities within the Project area of influence.

Teck will employ monitoring plans to help ensure that relevant environmental variables subject to environmental assessment are maintained as predicted. These plans will be prepared in accordance with the requirements defined in Resolución Exenta no. 223/2015 and RCA 74/2018. The monitoring plans will use standard formats and will cover the following key areas:

- Biodiversity (including plants, fauna, soil and continental aquatic ecosystems);
- Cultural heritage and archaeology;
- Human environment and socio-economics;
- Human environment and anthropology;
- Air quality;
- Noise;
- Vibration;
- Water;
- Marine resources;
- Marine ecosystem biota;
- Land use and roads.

A number of territorial planning instruments were identified, including instruments established and approved by the Región de Tarapacá government, and the local governments of the communities of Pica, Pozo Almonte, Alto Hospicio, and Iquique. Specific areas covered include:

- Exploitation of the hypogene mineralization;
- Construction of waste management facilities;
- Construction of port facilities;
- Construction of the desalination plant and use of the desalinated water in production processes;
- Use of Route A-855 and construction of Bypass A-97B;
- Connection to high-voltage power lines via a substation;
- Implementation of a water management plan;
- Implementation of a voluntary early public participation process in relation to the 2016 EIA;
- Creation of working groups with specific communities;
- Local hiring.

QBSA has also undertaken voluntary environmental commitments to contribute to the improvement of relations between the mine, neighbouring communities, and the environment. These commitments broadly cover fauna, cultural heritage, land use, and the human environment. Voluntary commitments also include co-monitoring of water quality with the surrounding communities.

The majority of the monitoring agreed to in the QB EIA (RCA 72/2016) will now be absorbed and included in the Integral Water Monitoring Planand the Air Quality Monitoring Plan that are included in RCA 74/2018.

20.4 Closure Plan

Closure is subject to separate sectorial regulatory requirements, and approval of the plan must be obtained from Sernageomin. Reclamation activities that would be required are summarized in Table 20-1.

Table 20-1: Reclamation Planning

Area	Considerations
Mine	The open pit and WRSF would be left in place. Closure activities would focus on stability control and maintaining safety measures such as access control to the open pit, and grading of the WRSF. All mine structures, buildings, and equipment would be removed with the exception of those planned to be used during the post-closure phase (e.g., concentrator area camp and support facilities). The majority of the non-contact water structures would be removed; however, the east contour channel in the mine and plant area would be enlarged to accommodate a 1:1,000-year return period design criteria for post-closure water diversion. The open pit would act as a reservoir for contact run-off from waste and other stockpiles. It is expected that a pit lagoon will form. Natural evaporation is expected to control the water level without risk of overtopping the pit walls. All contact water and recirculated process solution collection ponds that are not required for post-closure monitoring purposes would be emptied and backfilled.
TMF	The TMF impoundment and dam would be left in place. Closure activities would focus on stability control and maintaining safety measures, including placement of granular cover material, and a rock fill footwall for confinement of the downstream face. The tailings impoundment contour channel would be backfilled and covered. A concrete spillway will be constructed next to the sand wing wall in order to drain excess water from the impoundment basin towards Quebrada Jovita during extreme rainfall events. Downstream infrastructure will include rock surfacing of the spillway discharge channel, followed by an energy dissipation structure. As a contingency measure, provisions have been made for periodic lime treatment for pH control and metal precipitation from water accumulated in ponds formed on the impoundment surface. Part of the tailings impoundment water management infrastructure would be kept in use for downstream impoundment infiltration control. Other TMF infrastructure would be dismantled and removed from the site.
Linear Works	The closure plans for the concentrate transport pipeline and valve stations, desalinated water pipeline and pump stations, high-voltage power lines and accesses, electric power supply systems, Bypass A-97B road, access roads, emergency ponds, waste water treatment facilities, and communication systems assume buried infrastructure will remain in place, and surface infrastructure will be removed, dismantled and demolished. Where practicable, materials will be salvaged for reuse, recycle or scrap. No post-closure activity or monitoring is assumed to be required.
Port	The closure plans cover the concentration filtration plant, concentrate storage building, concentrate transport conveyor, ship loader, seawater intake structure, desalination plant, brine discharge structure, wharf, mooring structures, emergency ponds, electrical substations, internal roads, control gates, offices, lunchrooms, change rooms, first-aid rooms, warehouses, control-rooms, water reservoirs, waste water treatment plant, equipment maintenance workshops, laboratory, and waste storage facilities. Buried and sub-marine infrastructure will remain in place, and surface infrastructure will be removed, dismantled and demolished. Where practicable, materials will be salvaged for reuse, recycle or scrap. No post-closure activity or monitoring is assumed to be required.

Post-closure activities would be focused on maintenance, inspections, monitoring and operation of water management systems following closure. These activities would aim to ensure that management measures comply with objectives in relation to the preservation of life, health and safety of people and the environment. Applied criteria focus on a passive approach in order to minimize intervention requirements. Closure elements such as signage, fencing, berms, grading/profiling, granular covers, rock fills, and other similar actions would be maintained.

Facilities that would remain in use during the post-closure phase include:

- Concentrator area camp and associated support facilities including potable water and waste water treatment plant and the power transmission system;
- Contact water treatment plant and associated facilities to be operated and maintained indefinitely or until drainage in Quebrada Blanca quality shows a reduction in acidity, metals and salts, indicating that conditions have returned to original water quality;
- East contour channel;
- No. 2 infiltration control system in Quebrada Blanca, to be operated and maintained to ensure hydraulic restitution corresponding to pre-mining groundwater flow conditions;
- TMF to be maintained and monitored to provide ongoing tailings containment.
- Post-closure activities would include:
- Periodic lime treatment of tailings impoundment pond water for pH neutralization and metal precipitation;
- Supply of treated infiltration water to maintain base flow in Quebrada Blanca;
- Surface and groundwater monitoring as per the environmental monitoring plan that forms part of the 2016 EIA commitments;
- Inspection and maintenance of the TMF to ensure safety of structures and systems including dam wall and drains, infiltration control, and emergency spillway;
- Lime neutralization treatment of TMF pond water for pH and metal concentration control;
- Landfill leachate and groundwater monitoring.

Closure costs are incorporated in the cost estimates in Section 21.1.10.

The closure costs are established based on a methodology approved by the government. A bank guarantee needs to be provided to assure those costs over a 15-year period. The monetary amount in the guarantee can be reduced during closure based on implementation of the closure plan. The monetary value can also be reduced if partial closure activities are undertaken during the mine life.

20.5 Permitting

20.5.1 Environmental Sectorial Permitting

The environmental sectorial permits in Table 20-2 are included as part of the 2016 EIA and have associated environmental requirements.

There are two types of environmental sectorial permits within Chile:

- Permiso Ambiental Sectorial (sectorial environmental permit or PAS);
- Permiso Ambiental Sectorial Mixto (mixed content sectorial environmental permit or PASM).

The difference between the two sectorial permits is in the granting process, whereby environmental permits (PAS) only require a valid Resolución de Calificación Ambiental (environmental qualification resolution or RCA) because permit grant is based strictly on compliance with environmental requirements. Mixed permits (PASM), while also needing a valid RCA as a pre-requisite, are subject to additional requirements for specific technical content to be submitted as part of the application, and are subject to sectorial approval in a process that is independent from the 2016 EIA evaluation.

20.5.2 Other Sectorial Permits

After a major project has been approved by the SEIA, additional sector-specific applications to various governmental agencies and ministries are needed in order to construct or operate the proposed facilities.

Under current Chilean legal requirements, projects are subject to regulatory approvals through a global process that addresses environmental obligations, followed by sectorial requirements for which the environmental approval constitutes a pre-requisite. The first is achieved through submission of the 2016 EIA into the SEIA. Following receipt of the corresponding approval (the RCA), sectorial permits can be processed.

Table 20-2: Applicable Permits Subject to Environmental Requirements

Permit Number and Name	Required For	Responsible Chilean Authority
PAS 115: Permiso para introducir o descargar materias, energía o sustancias nocivas o peligrosas de cualquier especie a las aguas sometidas a la jurisdicción nacional	Effluent discharge from the Puerto Patache desalination plant using a sub-marine outlet	Directemar
PAS 119: Permiso para realizar pesca de investigación	Puerto Patache environmental monitoring plan	Sernapesca
PAS 126: Permiso para la construcción, reparación, modificación y ampliación de toda instalación diseñada para el manejo de lodos de plantas de tratamiento de aguas servidas	Sludge landfill from two waste water treatment plants (one in the mine area and the other in the pampa area).	Seremi de Salud
PASM 132: Permiso para hacer excavaciones de tipo arqueológico, antropológico y paleontológico	Investigation test pits	Consejo Monumentos Nacionales
PASM 134: Permiso para el emplazamiento de instalaciones nucleares y radiactivas	Radioactive material warehouse	Comisión Chilena de Energía Nuclear/Seremi de Salud
PASM 135: Permiso para la construcción y operación de depósitos de relaves	TMF	Sernageomin
PASM 136: Permiso para establecer un botadero de estériles o acumulación de mineral	Seven new facilities for waste rock storage and mineral stockpiles: • Rock storage facility (north, south) • Low-grade stockpile (south) • High-grade stockpile (north) • Marginal stockpile (north, south) • Run of mine (ROM) stockpile	Sernageomin
PASM 137: Permiso para la aprobación del plan de cierre de una faena minera	• Project closure plan for existing supergene facilities and new facilities for QB2.	Sernageomin
PASM 138: Permiso para la construcción, reparación, modificación y ampliación de cualquier obra pública o particular destinada a la evacuación, tratamiento o disposición final de desagües, aguas servidas de cualquier naturaleza	Construction or expansion of 10 waste water treatment plants or septic tanks: • Existing Tambo-Tarapacá waste water treatment	Seremi de Salud

Permit Number and Name	**Required For**	**Responsible Chilean Authority**
	plant (PTAS in the Spanish acronym) • Pipeline camp no. 1 PTAS • Pipeline camp no. 2 PTAS • Mine truck shop PTAS • Pampa PTAS • TMF PTAS • Concentrator PTAS • Port PTAS • Four satellite canteen septic tanks • Facility septic tanks (Lagunas substation)	
PASM 139: Permiso para la construcción, reparación, modificación y ampliación de cualquier obra pública o particular destinada a la evacuación, tratamiento o disposición final de residuos industriales o mineros	Desalination plant sub-marine effluent discharge outlet	Seremi de Salud
PASM 140: Permiso para la construcción, reparación, modificación y ampliación de cualquier planta de tratamiento de basuras y desperdicios de cualquier clase o para la instalación de todo lugar destinado a la acumulación, selección, industrialización, comercio o disposición final de basuras y desperdicios de cualquier clase	Seven waste management facilities: • Pampa area salvage yard • Pampa area debris trench (pit or ditch) • Pampa area industrial solid waste trench • Mine concentrator area debris trench • Mine concentrator area tire trench • Port area salvage yard • Port area debris trench	Seremi de Salud
PASM 141: Permiso para la construcción, reparación, modificación y ampliación de relleno sanitario	• Expansion of current mine site sanitary landfill • New sanitary landfill in Pampa area	Seremi de Salud
PASM 142: Permiso para todo sitio destinado al almacenamiento de residuos peligrosos	Four hazardous waste storage facilities: • Pampa area • Pipeline camp no. 1 • Pipeline camp no. 2 • Port area	Seremi de Salud

Permit Number and Name	Required For	Responsible Chilean Authority
PASM 146: Permiso para la caza o captura de ejemplares de animales de especies protegidas para fines de investigación, para el establecimiento de centros de reproducción o criaderos y para la utilización sustentable del recurso	Capture of fauna for investigation purpose as part of mitigation, repair, and compensation plans	Servicio Agrícola y Ganadero
PASM 151: Permiso para la corta, destrucción o descepado de formaciones xerofíticas	Cut, destruction, and grubbing of xerophytic formations at various locations in the mine, linear works, and pampa areas.	Corporación Nacional Forestal
PASM 155: Permiso para la construcción de ciertas obras hidráulicas	QB2's hydraulic works: • TMF and related works • East contour cannel • Tailings launder • Recovery water system: reclaim and dilution water systems	Dirección General de Aguas
PASM 156: Permiso para efectuar modificaciones de cauce	Watercourse streambed modifications for the following works: • TMF and related works • East contour channel • Contact water pond • Single and double corrugated steel drainage culvert • Concrete culverts • Armoured ford • Ford • Mine site infrastructure • Dumps for cut material from excavations	Dirección General de Aguas
PASM 160: Permiso para subdividir y urbanizar terrenos rurales o para construcciones fuera de los límites urbanos	Temporary and permanent buildings and installations located outside of urban territorial planning limits	Ministerio de Vivienda y Urbanismo (Minvu)/ Servicio Agrícola y Ganadero

Project permitting will follow the standard process of:

- Identifying which permits will be required and the associated regulatory agency;
- Identifying the technical and administrative requirements prior to applying for the designated permit;
- Reviewing permit submissions to identify any synergies or sequencing requirements;
- Preparing applications and submitting the documentation to the applicable regulatory authority;
- Processing applications;
- Receipt of approvals and authorizations;
- Setting up documentation and administrative phases for the granted approvals;
- Ongoing monitoring.

To date, a total of 198 types of permits have been identified as being required for QB2. Some of these permits are subject to environmental requirements and are therefore included in the 2016 EIA.

The number of permits is based on the project description included in the 2016 EIA, and could result in as many as 700 applications representing around 1,700 individual permits, depending on the adopted submission strategy, which can vary from single to combined applications. The strategy that will be followed will be dependent on Project needs, and will be governed by the application preparation and processing times in relation to the planned development schedule.

Currently Teck has presented more than 600 permits and has obtained approval for more than 300. Many permits are related to construction activities and include flora, fauna and archeology clearances. Other permits are related to major infrastructure, such as approval of the exploitation method and TMF construction permit.

The permitting strategy is currently aligned with the Project execution schedule.

20.6 Considerations of Social and Community Impacts

Teck has corporate policies and guidelines in place that address corporate sustainability. These define corporate expectations for sustainable conduct and sustainable development for all projects with which Teck or its subsidiaries become involved, and include:

- Providing a positive and transparent engagement environment and feedback system (including a participative environmental monitoring program) with local communities in order to obtain and maintain the social license for the expanded mining operation;

- Monitoring the effectiveness of the sustainable development plan and undertaking revisions as necessary;
- Avoiding mining operational impacts on local communities of interest where possible; and where impacts are unavoidable, seeking agreements on mitigation and compensation measures that may be required;
- Coordinating the mine's activities with those local communities potentially affected by those activities, including scheduling;
- Pursuing economic prosperity, environmental quality, and social equity within the mine's area of influence while also managing and effectively resolving conflicts that might arise between the competing goals of the mining operation and the communities of interest;
- Creating and promoting social, economic, and institutional strategic community programs designed for the enhancement and betterment of local and regional peoples, with special emphasis placed on the following vulnerable groups:
  - Indigenous peoples;
  - Children and youth;
  - Women;
  - Impoverished;
- Providing and promoting employment training for residents within the Región de Tarapacá;
- Fostering the development of and contracts with local businesses and local suppliers;
- Entering into strategic partnerships with schools, universities, non-governmental organizations, communities of interest, and local and regional governments for continuing development of and integration of the sustainable development plan for QB2 with community and regional plans;
- Establishing and maintaining programs, potentially with third-parties or partners, that are designed to promote and conserve the region's biodiversity; specifically, flora and fauna impact mitigation and compensation programs would be developed for those areas where the mine expansion is expected to have direct impacts on biodiversity;
- Introducing the sustainable development plan and its key requirements and commitments to all relevant mining operation employees, including contractors or sub-contractors that will be associated with the Project.

20.7 Comments on Environmental Studies, Permitting and Social or Community Impact

Baseline studies in support of the Project have been conducted.

An EIA was approved for the Project in 2016. To date, a total of 198 types of permits have been identified as being required for QB2. Some of these permits are subject to environmental requirements and are therefore included in the 2016 EIA. Other permits, however, are considered to be sectorial permits and are not part of the 2016 EIA.

Teck has corporate policies and guidelines in place that address corporate sustainability. These define corporate expectations for sustainable conduct and sustainable development for all projects with which Teck or its subsidiaries become involved.

Closure is subject to separate sectorial regulatory requirements, and approval of the plan must be obtained from Sernageomin.

21.0 CAPITAL AND OPERATING COSTS

21.1 Capital Cost Estimates

21.1.1 Basis of Estimate

The estimates have been prepared to a target accuracy of ±15% as per AACE International Level 3 study recommendations, and are based on second quarter 2017 pricing. The estimate is based on a 625 CLP:US$ exchange rate and does not include escalation.

A number of inputs were provided by third-party sources, including:

- Concentrator;
- TMF;
- Port onshore and offshore structures;
- Pipelines
- Infrastructure
- Indirect costs;
- Engineering, procurement and construction management (EPCM) services.

21.1.2 Labour Assumptions

Direct labour hourly rates reflect Chilean construction labour practice as of the second quarter of 2017 and include payroll additives, construction bonus, overtime premiums, and safety supplies.

The construction working hours at QB2 sites are currently based on 14 consecutive days on, at 11 hours per day, and 14 days off every four weeks. It is assumed that the prevailing Chilean labour laws and union agreements would allow this to apply.

21.1.3 Contingency

Contingency allowances were applied, as appropriate, and were based on evaluations of all major cost categories. The overall contingency allowance is approximately 12%.

21.1.4 Mine Capital Costs

Mine capital estimates were developed for the LOMP. These estimates include mine equipment (consisting of freight, safety systems, assembly, and additional options required to meet Teck operating standards) as well as mine area development costs (such as pioneering and pre-stripping requirements).

QB2 would employ the remaining mine equipment from the existing leach SX-EW operation until each unit reaches the end of its useful lifespan. This fleet would be used during construction for mass earthworks, all early works mining activities in the mine area, and would also be used during operations, alongside new fleet that would be purchased, thereby reducing the initial capital requirements for mine equipment.

All mine capital costs that occur prior to operations start are considered part of the initial mine capital, while all subsequent capital costs are considered mine sustaining capital (see Section 21.1.10).

The total initial capital cost for the mine is approximately $290 M.

21.1.5 Concentrator Capital Costs

The concentrator estimate includes the estimated capital costs for the procurement, construction, pre-operational testing, and start-up of all facilities within the third-party engineering firm scope allocation, which includes crushing, grinding, and flotation processes, and their ancillary operations and buildings.

Quantities for the process plant estimate were typically developed from scope documents, engineering drawings, models, sketches, and factoring. Quantities were supported by backup consisting of drawings, sketches, calculations, and/or takeoff sheets where applicable.

The estimate is divided into direct and indirect costs:

- Direct costs (plant equipment, bulk materials, and installation labour contracts): $1,077 M;
- Indirect costs (third-party engineering, common distributable costs, freight, vendor representative contracts, capital spare parts, initial fills, camp facilities and operations, and specialty contracts): $479 M.

The capital cost estimate for site development of the concentrator is based on approximately 80% of the mass excavation being performed by Teck using existing mine equipment.

Indirect costs for the concentrator also cover indirect costs for the TMF and infrastructure areas.

21.1.6 Infrastructure Capital Costs

The infrastructure estimate includes costs for offsite access roads, electrical substations, and buildings and camp construction.

The infrastructure estimate only includes direct costs; indirect costs are included in concentrator indirects. Direct costs consist of plant equipment, bulk materials, installation labour contracts, and specialty contracts, totalling $227 M.

TMF

The scope of the TMF estimate includes a starter dam foundation preparation, grout curtains, dam embankments, tailings sand cycloning, sands distribution, tailings distribution, and seepage and reclaim water systems. Subsequent dam raises during operations will be on a continual basis and are included in operating costs.

For the TMF, estimate quantities were based on existing survey information and dam design documents. Pricing of labour, materials, and equipment has been developed from information obtained from Chilean suppliers and contractors.

The estimate only includes direct costs; indirect costs are included in concentrator indirects. TMF direct costs include plant equipment, bulk materials, installation labour contracts, and specialty contracts for a total of $358 M.

Pipeline and Tailings Transport

This includes the concentrate transport system, makeup water transport system, reclaim water system, and the tailings transport system.

The pipelines and tailings transport system estimate was based on material take-offs from design drawings, preliminary calculations, material quotations. The construction costs for all three pipelines were estimated from an analysis of the physical characteristics of the pipeline and tailings transport system routes.

The estimate is divided into direct and indirect costs:

- Direct costs pipelines, pump stations and tailings transport system (plant equipment, bulk materials, installation labour, subcontracts, and contractor indirect): $449 M;
- Indirect costs (third-party engineering, common distributable costs, freight, vendor representative contracts, capital spare parts, initial fills, camp facilities and operations, and specialty contracts): $212 M.

Port Facilities

This area includes all concentrate dewatering and storage, marine structures, floating mooring system, the ship loader feed conveyor, ship loader, desalination plant and the seawater intake system that would feed the desalination plant.

Marine costs were based on material take-offs from the design drawings, calculations, material quotations, and equipment quotes from equipment suppliers and Chilean marine construction contractors.

The estimate is divided into direct and indirect costs:

- Direct costs (plant equipment, bulk materials, installation labour, subcontracts, and contractor indirect): $432 M;

- Indirect costs (third party engineering, common distributable costs, freight, vendor representative contracts, capital spare parts, initial fills, camp facilities and operations, and specialty contracts): $70 M.

21.1.7 Capital Cost Cash flow

The initial capital costs include EPCM, and pre-operational testing, and as spent in accordance with the project execution plan through to operations. Early works construction activities commenced on September 15, 2018, and based on the current execution schedule the project has an expected operational start date of Q4 2021 with an approximate six-month ramp-up curve to full production rates.

The estimate is in constant Q2 2017 dollars, not including working capital, escalation or interest during construction, and assuming a CLP/US$ exchange rate of 625. The initial capital costs cash flow is presented in Table 21-1.

21.1.8 Owner's Capital Costs

Owner's costs include the costs for items such as, but not limited to, Owner's project development team staffing and costs, Owner's operational readiness team staffing and costs, drilling, assays and other test work, permitting and community programs, land acquisition, initial fills and commissioning support, other construction and external support services, and insurances.

Project and operations development team job hours and costs were based on a staffing plan generated during the FS2016. Project and operations development speciality contractor costs were developed by identifying specific requirements and estimating the job hours associated with the specified items. Estimates of required quantities were made for construction utilities, including power, water, fuel, shop equipment, first fills, land acquisition, mining rights, insurance, scope allowance and contingency.

Owner's capital costs are estimated at $464 M.

21.1.9 Initial Capital Cost Summary

The overall capital cost estimate for the QB2 Project is $4,739 M as of January 1, 2019 as detailed in Table 21-2. The estimate is in constant Q2 2017 dollars, not including working capital, escalation or interest during construction, and assuming a CLP/US$ exchange rate of 625.

Table 21-1: Initial Capital Costs Cash Flow ($ M)

Project Area/Facility	2019	2020	2021	2022	Total
Total project	1,520	1,835	1,303	81	4,739

Note: totals may not sum due to rounding

Table 21-2: Initial Capital Cost Estimate Summary Table

Item	Cost Estimate ($ M)
Mine directs	290
Concentrator directs	1,077
TMF directs	358
Pipelines and pump stations directs	449
Port onshore and offshore structures directs	432
Infrastructure directs	227
Field indirects	779
EPCM services	290
Contingency and schedule growth allowance	510
Owner's cost	315
Late adjustment for cash expenditure timing	10
Estimated Total Capital Cost, Second Quarter 2017 *	***4,739***

Note: totals may not sum due to rounding.

21.1.10 Sustaining Capital

A replacement schedule was derived for all major mine equipment. Other major sustaining capital items include TMF area changes as the facility expands, an expansion of the new mine maintenance facilities as the mine fleet grows in size, and allowances for other sustaining capital requirements for the concentrator and general site and ancillary facilities.

Sustaining capital expenditures for the Base Case are identical to those of the Sanction Case, with the exception of the mine fleet costs which are estimated at $420 M.

The estimated total sustaining capital expenditures after the plant start-up period for the Sanction Case are estimated at:

- Mine fleet: $422 M;
- TMF area changes: $56 M;

- Mine maintenance facilities expansion: $50 M;
- Concentrator and general: $256 M.

The requirements for sustaining capital in the concentrator, port and pipelines has been assessed considering that the major equipment has been designed to last for the life of mine. Small equipment such as pumps, motors etc. are covered in the maintenance cost component of the operating cost estimate. An allowance of approximately $5–10 M/a through the life of the operation has been included to cover other sustaining capital requirements. Ongoing TMF sand dam raises are continual and covered under operating costs.

21.1.11 Closure Costs

Closure costs were estimated by a third-party consultant at $216 M based on a detailed analysis of the closure plan and commitments. The major items included are:

- Demolition of project facilities and disposal of demolished materials;
- Closure of the TMF; including stabilization of the external dam surfaces with locally borrowed coarse material;
- Diversion of waste dump surface and drainage water to the mine pit.

A post-closure cost estimate was developed using current regulatory requirements. The post-closure costs were calculated as $138 M over a period of 350 years following closure. This number includes value added tax (VAT) as per the current regulations.

21.2 Operating Cost Estimates

The operating cost estimate includes all operational activities required for the mining and processing of hypogene ore through the concentrator facilities and production of copper and molybdenum concentrates, including all services required to support these operations. The battery limits of the estimate are in-situ ore through to dewatered concentrate, loaded either onto a ship (in the case of copper concentrate) or bagged and waiting at the port (in the case of molybdenum concentrate).

Steady-state costs are based on an annual ore processing rate of 52,195,000 t/a, at an average of 143,000 t/d.

The general scope of each operating cost operating area includes:

- Mine: Costs associated with the open pit mining of ore and waste, including pit dewatering, haul road maintenance, and maintenance of the mining equipment and facilities;
- Concentrator: Costs associated with the primary crushing of ROM ore, coarse ore transport of the crushed ore to the coarse ore stockpile, coarse ore stockpile/reclaim

of the coarse ore to be fed to grinding, and concentrator operations including grinding, pebble crushing, bulk flotation, regrind, concentrate thickening, molybdenum plant, reagents, and tailings thickening;

- TMF: Costs associated with the tailings classification system, tailings distribution system to the dam, tailings placement, tailings sand dam construction, and reclaim water system;
- Port facilities and desalination plant: Costs associated with concentrate filtration and ship loading, and general port site offices and facilities, as well as costs associated with seawater intake, brine outfall, and seawater treatment;
- Pipelines: Costs associated with the pipeline systems, which include the concentrate transport system, make up water system and tailings transport system. Costs of the reclaim water system are covered under the TMF area;
- Infrastructure: Costs associated with access road maintenance and some oversight of high-voltage power lines;
- General and administration: Costs associated with indirect support of the operation, including site services and administration facilities, G&A personnel and functions, and off-site offices, and specific corporate service fees for direct support provided to the operation.

The operating cost estimate excludes:

- Escalation and exchange rate fluctuations;
- Exploration costs;
- Contingency for quantities or pricing;
- Import duty and taxes (not expected);
- First fill of reagents and consumables (included in development capital cost estimate);
- Working capital requirements, including payables, receivables, and inventory (included in the financial analysis);
- Costs incurred before plant start-up in the fourth quarter of 2021 (included in development capital cost estimate);
- Sustaining capital (included in sustaining capital cost estimate);
- Interest and financing charges;
- Concentrate shipping, insurance and marketing costs (included in the financial analysis);

- Treatment and refining charges (included in the financial analysis);
- Corporate head office costs or management fees and distributed overhead for general corporate management and administration, marketing and sales, exploration, project and technical development, and other centralized corporate services;
- Closure and rehabilitation activities (included in the financial analysis);
- Costs associated with the existing QB cathode operation, including operating activities, environmental commitments, layoffs, decommissioning, rehabilitation, and closure;
- Costs associated with the financial guarantees and re-sale of energy of the existing power purchase agreements which provide 261 MW for a period of 21 years.

Input was used from third-party consultants to derive some of the costs as follows:

- Concentrator facilities;
- TMF;
- Port and desalination plant;
- Pipelines and tailings launder.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

21.2.1 Basis of Estimate

The operating cost estimate includes all operational activities from mining and comminution of the QB2 ore, to production of a copper concentrate that would be transported via a pipeline to the port facilities at Punta Patache and a molybdenum concentrate that would be trucked to destinations as required. The estimate also includes the transport and impoundment of the final tailings produced by the concentrator, along with the requisite ancillary activities.

The estimate has been prepared on an annual basis for the project, from plant start-up to expected mine closure. Steady-state costs are based on a maximum annual ore treatment rate of 52,195,000 t/a, at an average of 143,000 t/d, with costs in years of ramp-up and ramp-down determined using key cost drivers and fixed and variable components of these costs.

The operating cost estimate has been prepared as annual costs for the project from plant start-up to mine closure. The life of the operation is 28 calendar years with the first and last years representing partial years, at an initial processing plant throughput rate of 140,000 t/d and reaching a rate of 143,000 t/d by the end of 2024.

Operating costs are generally the same between the two cases, with the main exception of mining costs due to differences in the mining plans between the two cases.

Prices for the main operating supplies were obtained from budgetary quotations during 2018 and were based on delivery to the point of usage.

21.2.2 Mine Operating Costs

The mine operating cost estimate includes provision for key elements such as fuel, electricity, lubricants, grease, tires, and explosives. It also considers variable haulage distances to WRSFs and stockpiles, labour costs, and a 5% re-handle of ore feed consideration.

The labour associated with the direct mine operating costs consists primarily of equipment operators and includes an absenteeism consideration of 15% to account for the remote high-elevation project location. All staff labour costs were estimated through reference to organization charts for the mine and the planning and development departments. The implementation of autonomous haulage systems (AHS) during the first seven years of operations reduces equipment operator requirements.

The estimated mine equipment maintenance costs were based on proposals for a full maintenance and repair contract (MARC) for haul trucks, shovels, drills, and mine support equipment. The existing mine fleet is currently serviced under a MARC and the existing maintenance facilities would continue to operate for the initial stages of the QB2 operation, with the construction of a new maintenance facility also considered. The option of Owner maintenance is being reviewed.

Life-of mine average costs are provided in Table 21-3 and Table 21-4 for the Base Case and Sanction Case respectively. Unit direct mining costs (i.e., drilling, blasting, loading, and hauling) are estimated to be $1.41/t of material moved for the Base Case and $1.42/t of material moved for the Sanction Case.

21.2.3 Mine Pre-production Costs

Mine pre-production costs are incorporated in the mine operating cost model and pertain to the cost of operating the mine equipment before commissioning of the concentrator to prepare the mine for operations. These costs are included in the initial capital costs.

Table 21-3: Base Case Mining Cost Summary

Area	LOM Total ($ M)	LOM Average ($/t)
Drilling	318	0.13
Blasting	641	0.27
Loading	474	0.20
Hauling	1,953	0.81
Subtotal direct mining costs	*578*	*1.41 $/t moved*
Mine general	429	0.42
Total	***4,384***	***1.83 $/t moved*** ***3.14 $/t milled***

Note: totals may not sum due to rounding

Table 21-4: Sanction Case Mining Cost Summary

Area	LOM Total ($ M)	LOM Average ($/t)
Drilling	360	0.14
Blasting	734	0.28
Loading	494	0.19
Hauling	2141	0.82
Subtotal direct mining costs	*3,729*	*1.42 $/t moved*
Mine general	1,032	0.39
Total	***4,760***	***1.82 $/t moved*** ***3.40 $/t milled***

Note: totals may not sum due to rounding

21.2.4 Concentrator Operating Costs

The operating cost estimate for the concentrator includes the following facility interfaces:

- Primary crushing of the ROM ore discharged from the mine trucks;
- Coarse ore transport of the crushed ore to the coarse ore stockpile;
- Coarse ore stockpile/reclaim of the coarse ore to be fed to grinding;
- Concentrator operations including grinding, pebble crushing, bulk flotation, regrind, concentrate thickening, molybdenum plant, reagents, and tailings thickening.

Future research and development costs, process royalties, and fees were excluded from the estimate.

The operating and maintenance labour requirements for the concentrator and the corresponding labour rates were supplied by Teck.

A third-party consulting firm estimated the electric energy consumption for the concentrator using the average power load adjusted for online operating time for each operating area and the load factors derived from balance throughput values that established the operating electric energy consumption.

Estimates for operating supplies were developed by Teck, and were based on the metallurgical test results for reagents and on Teck's experience with such items filter cloth replacements. Vendor quotes, including freight, for consumable unit costs were obtained from Chilean suppliers for each consumable category.

Maintenance supply cost estimates were developed by Teck and were based on Teck's experience for mill liner replacements, and estimated as 4.5–5% of the fixed mechanical and electrical equipment purchase price for all other parts requirements for the operating process areas and 2% for the general process areas such as reagents, auxiliary buildings, and power distribution.

Operating and maintenance labour requirements for the concentrator and the corresponding labour rates were supplied by Teck. Labour costs for indirect personnel (contractors) were charged to the contracts category.

Maintenance and service contracts were assumed to be entered into for mobile equipment, maintenance service (e.g., conveyors, feeders, crushers, liners), internal electrical maintenance and molybdenum concentrate transportation, and cost allocations were made for each contract.

An allowance was included for external or check assays, training, and process consultants' costs.

A summary of the estimated concentrator and process costs is provided in Table 21-5 and Table 21-6 for the Base Case and Sanction Case respectively.

Table 21-5: Base Case Concentrator and Process Cost Summary

Cost Category	($ M/year)
Process general	29
Crushing / conveying	12
Grinding	180
Flotation	56
Tailings thickener	9
Reagents	1
Molybdenum plant	7
Total	***295***
Total Operations	***230***
Total Maintenance	***65***

Note: totals may not sum due to rounding

Table 21-6: Sanction Case Concentrator and Process Cost Summary

Cost Category	($ M/year)
Process general	29
Crushing / conveying	12
Grinding	180
Flotation	56
Tailings thickener	10
Reagents	1
Molybdenum plant	7
Total	***297***
Total Operations	***231***
Total Maintenance	***66***

Note: totals may not sum due to rounding

21.2.5 TMF Operating Costs

The TMF operating cost centre includes:

- Tailings classification system;
- Tailings distribution system to dam;
- Tailings impoundment including sand dam raises;
- Reclaim water system.

The operating and maintenance labour requirements for the TMF were estimated by Teck. In addition, a portion of the pipeline systems' labour cost was assigned to the reclaim water system. Labour rates were also supplied by Teck. Labour costs for indirect personnel (contractors) were charged to the maintenance and service contracts category.

A third-party engineering firm estimated the electric energy consumption for the tailings management system using the average power load adjusted for online operating time for each operating area and load factors derived from balance throughput values that established the operating power consumption. The maintenance materials costs for the tailings management system were also estimated by the third-party engineering firm. The sand dam costs are based on an annual cost between 2% and 5% of the equipment capital cost for items such as sand delivery pipelines, pumps and pump parts, valves, cyclone linings, and electrical components.

Contracts were assumed to be entered into for topography and QA/QC, sand dam development, and support equipment, and cost allocations were made for each contract.

The estimated total annual operating cost for tailings management and water recovery would be approximately $59 M. Table 21-7 and Table 21-8 are TMF summary costs for the Base Case and Sanction Case respectively.

21.2.6 Port Facilities and Desalination Plant Operating Costs

Teck prepared the port operating cost estimate with input from a third-party engineering firm. The port facilities were divided as follows for the purpose of operating cost estimation:

- Filtration and ship loading;
- Seawater treatment and desalination.

Table 21-7: Base Case TMF Cost Summary

Cost Category	($ M/year)
Labour	6
Electricity	20
Maintenance supplies	4
Contracts	26
Other	3
Total	***60***
Total Operations	***44***
Total Maintenance	***16***

Note: totals may not sum due to rounding

Table 21-8: Sanction Case TMF Cost Summary

Cost Category	($ M/year)
Labour	6
Electricity	20
Maintenance supplies	4
Contracts	26
Other	3
Total	***59***
Total Operations	***43***
Total Maintenance	***16***

Note: totals may not sum due to rounding

The estimated operating and maintenance labour requirements for the port facilities and the corresponding labour rates were supplied by Teck and the third-party engineering firm. Labour costs for indirect personnel (contractors) were charged to the maintenance and service contracts category.

Estimated electric energy consumption for the port site operations was based on the third-party engineering firm's calculations of the electrical operating loads. Operating costs for consumables and reagents for the port filtering area were developed by a third-party engineering firm. Seawater treatment and desalination reagent consumptions are based on a proposal from a major supplier, while the unit costs were obtained from local suppliers by a third-party engineering firm and Teck. Maintenance supplies costs were estimated by the third-party engineering firm for the port facilities and desalination plant based on an allowance of between 2% and 5% of the mechanical and electrical equipment purchase price. The third-party engineering firm also included supplies for marine facilities maintenance.

Allocations were made to cover stevedores, tugs, and pilot boats contracts, and demurrage.

The estimated total annual direct operating cost for the port would be approximately $36 M. Breaking this down by port areas, the filtering and ship loading facilities would have an estimated annual cost of approximately $13 M, while the seawater treatment and desalination facilities would have an estimated annual cost of approximately $19 M for both the Base Case and Sanction Case.

21.2.7 Pipeline Transport Operating Costs

A third-party engineering firm estimated the operating costs for the pipeline systems (tailings, concentrate, and make-up water transport). These included labour, energy and fuels, supplies, and contracts. An allowance was included for training and other miscellaneous costs.

For the Base Case, the total annual operating cost for the pipeline transport systems is estimated to be approximately $66 M.

For the Sanction Case, the total annual operating cost for the pipeline transport systems is estimated to be approximately $65 M. Subdividing this by pipeline system, the concentrate transport system would have an estimated annual cost of about $3 M, the make-up water system would have an estimated annual cost of approximately $62 M, and the tailings transport system would have an estimated annual cost of about $1 M.

21.2.8 Infrastructure Operating Costs

The operating costs for infrastructure were estimated by Teck assuming labour, contracts, and supplies, and include:

- HV infrastructure;
- Access roads.

Allocations included provision for access road maintenance supplies and access road maintenance contracts. The total annual operating costs are about $2 M, and maintenance is estimated at approximately $1 M for both the Base Case and the Sanction Case.

21.2.9 General and Administrative Operating Costs

The estimated costs for the G&A area comprise of costs for indirect support of the operation which fall outside of the direct operating areas of mining, concentrator, TMF, port and desalination plant, pipeline, and infrastructure. This cost area includes costs associated with administration and finance, communications and external affairs, general management, health, safety, environment and community, human resources, technical engineering (sustaining capital projects) and technical services.

In addition to support and services at site, it includes the support and administrative personnel working as part of the QB2 organizational structure at the Teck office in Santiago in shared service and other support functions. Also included in these costs are the operating costs for ancillary installations, including:

- Administration building and offices;
- Operations camp;
- Cafeterias;
- Change houses;
- Other ancillary buildings;
- Service fees from services provided by other Teck affiliates.

The total estimated annual G&A operating cost is approximately $79 M. The majority of costs in the table are derived from labour and contracts costs.

21.2.10 Operating Cost Summary

Table 21-9 and Table 21-10 provide a summary of the estimated annual costs for a nominal year of operation for the Base Case and Sanction Case respectively.

21.3 Comments on Capital and Operating Costs

Initial capital costs are estimated at $4,739 M as of January 1, 2019. Sustaining capital costs are estimated at $782 M for the Base Case and $784 M for the Sanction Case.

Closure costs were estimated by a third-party consultant at $216 M. The post-closure costs were calculated as $138 M over a period of 350 years following closure.

Operating costs for the Base Case are estimated at $701 M/a. The operating costs for the Sanction Case are estimated at $715 M/a.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

Table 21-9: Base Case Estimated Annual Operating Cost Summary ($ M/a)

Cost Category	Mine	Concentrator	TMF	Pipelines	Port	Desalination Plant	Infrastructure	Site G&A	Global
Labour	17	21	6	4	6	3	1	14	73
Diesel / Gasoline	34	0	0	0	0	0	0	0	34
Electricity	5	133	20	57	3	9	0	2	229
Operating Supplies	42	81	0	0	0	3	0	1	128
Maintenance Supplies	34	43	4	3	3	4	0	1	92
Contracts	33	14	26	2	1	0	3	22	101
Other	0	2	3	0	0	0	0	38	44
Total	***165***	***295***	***59***	***66***	***13***	***19***	***3***	***79***	***701***

Note: Totals may not sum due to rounding. The operating costs shown reflect total operating costs which consist of site operating costs excluding concentrate transportation and ocean freight costs

Table 21-10: Sanction Case Estimated Annual Operating Cost Summary ($ M/a)

Cost Category	Mine	Concentrator	TMF	Pipelines	Port	Desalination Plant	Infrastructure	Site G&A	Global
Labour	17	22	6	4	6	3	1	14	74
Diesel / Gasoline	38	0	0	0	0	0	0	0	38
Electricity	6	133	20	56	3	9	0	2	228
Operating Supplies	46	81	0	0	0	3	0	1	131
Maintenance Supplies	37	43	4	3	3	4	0	1	95
Contracts	35	14	26	2	1	0	3	22	103
Other	0	2	3	0	0	0	0	38	44
Total	***179***	***297***	***59***	***65***	***13***	***19***	***3***	***79***	***715***

Note: Totals may not sum due to rounding. The operating costs shown reflect total operating costs which consist of site operating costs excluding concentrate transportation and ocean freight costs

22.0 ECONOMIC ANALYSIS

22.1 Forward-Looking Information

The results of the economic analysis conducted to support Mineral Reserves, and the Mineral Resource and Mineral Reserve estimates represent forward-looking information that is subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here.

Forward-looking statements in this Report include, but are not limited to, statements with respect to future metal prices, exchange rates, and concentrate sales contracts; taxation; smelter and refinery terms; assumed mining and metallurgical recovery factors; the estimation of Mineral Reserves and Mineral Resources; the realization of Mineral Reserve estimates; the timing and amount of estimated future production, costs of production relevant to a high-altitude mining operation in Chile; capital expenditures; operating costs; timing of the development of new open pit pushbacks; technological changes to the mining, processing and waste disposal activities outlined; permitting time lines for tailings storage facility raises; requirements for additional capital; government regulation of mining operations; environmental risks; ability to retain social licence for operations; unanticipated reclamation expenses; title disputes or claims; and limitations on insurance coverage.

Additional risk can come from actual results of active reclamation activities; conclusions of economic evaluations; changes in Project parameters as mine, process and closure plans continue to be refined, possible variations in Mineral Resources or Mineral Reserves, grade, dilution, or recovery rates; geotechnical and hydrogeological considerations during mining; failure of plant, equipment or processes to operate as anticipated; shipping delays and regulations; accidents, labour disputes and other risks of the mining industry; and delays in obtaining renewals to governmental approvals.

The foregoing list of risks and assumptions is not exhaustive. Other events or circumstances could cause our actual results to differ materially from those estimated or projected and expressed in, or implied by, our forward-looking statements. Except as required by law, we undertake no obligation to update publicly or otherwise revise any forward-looking statements or the foregoing list of factors, whether as a result of new information or future events or otherwise.

22.2 Methodology Used

The financial evaluation is based on a discounted cashflow (DCF) model. The DCF approach involves projecting yearly estimated revenues and subtracting yearly estimated cash outflows such as operating costs including mining costs, milling costs, G&A costs and associated maintenance costs, initial and sustaining capital costs, taxes and royalties to obtain the estimated net annual free cash flows. These net cash flows are discounted back to the valuation date using a real, after-tax discount rate of 8%, and then summed to determine the net present value (NPV_8) of the project. The 8% discount rate reflects Teck's estimated weighted average cost of capital. There are no additional project or country specific risk factors or adjustments considered. For the purposes of discounting, the model assumes that all revenues, operating and capital costs, taxes, and resulting free cash flows occur in the middle of each year.

The DCF model was constructed on a constant US dollar ($) basis and none of the inputs or variables were escalated or inflated. As described in Section 21, the pricing basis for the capital cost estimates is Q2, 2017, and the pricing basis for the operating cost estimate is Q2, 2018. For discounting purposes, 01 January 2019 is considered to be the first period (valuation date). All cash expenditures related to the project before this date have been excluded. The benefit of accumulated tax pools as well as the use of certain physical equipment acquired as a result of these prior expenditures has been incorporated in the evaluation. The primary outputs of the analysis are NPV_8, internal rate of return (IRR), payback period, annual earnings before interest, tax, depreciation and amortization (EBITDA) and annual free cash flow, all on a 100% project basis. Teck holds a 90% Project interest and ENAMI a 10% interest.

22.3 Financial Model Parameters

The financial model is based on the Mineral Reserves in Section 15, the mine plan in Section 16, the recovery plan in Section 17, infrastructure assumptions in Section 18, the marketing assumptions in Section 19, social, permitting and environmental considerations in Section 20, and the capital and operating costs in Section 21.

22.3.1 Mine Life

The DCF analysis is based on a 28-year operating life (2021–2048 with partial years in the first and last year of operation), with first mill production occurring in the fourth quarter of 2021 and nominal mill throughput of 143,000 t/d. Initial steady-state mill throughput of 140,000 t/d is expected to be achieved approximately five months after initial production, with nominal mill throughput of 143,000 t/d achieved by the end of 2024.

22.3.2 Smelting and Refining Terms

An estimated treatment charge cost of $83/dmt of copper concentrate and a refining cost of $0.083/lb of copper have been assumed, based on a long-term benchmark treatment charge of $90/dmt concentrate and refining cost of $0.090/lb copper, with certain discounts to benchmark terms applied to account for expected spot market sales, as well as for the high quality of QB2's copper concentrate.

22.3.3 Metal Prices

Base case metal price assumptions and exchange rate assumptions used are summarized in Table 22-1.

Table 22-1: Commodity Price and Exchange Rate Assumptions

Area	Item
Copper	$3.00/lb
Molybdenum	$10.00/lb
Silver	$18.00/oz
Initial capital exchange rate	$1 = CLP 625
Sustaining capital and operating costs exchange rate	$1 = CLP 600

22.3.4 Royalties

QB2 is not subject to any royalties held by third parties.

22.3.5 Working Capital

Certain physical working capital requirements, such as capital spares and first fills, were included in the Owner's cost component of the estimated initial capital expenditures. To account for expected timing considerations of receivables and payables during operations, as well as maintaining required operating supply and inventory levels, the financial model includes additional working capital allowances for receivables, operating supplies and inventories, and payables.

22.3.6 Taxes

The Project economics were modelled on an after-tax basis assuming project ownership by a Chilean-domiciled entity. The economics do not include any potential withholding tax for the repatriation of dividends outside of the country.

The Project economics are presented on an unlevered basis, both before and after giving effect to an optimized funding structure through the use of shareholder loans which create a tax shield and therefore improve the unlevered project returns. In addition, there are third-party debt and off-shore funding and structuring options available to the Project and Project sponsors which are not considered here. Inclusion of these options further improve Project returns over the scenario presented in this Report.

The analysis assumes access to $974 M of pre-existing income tax pools and $980 M of pre-existing mining tax pools related to Project expenditures prior to 2019 which have not yet been depreciated.

Taxes payable in Chile include the following:

- The mining tax rate is based on a sliding scale of operating margin, with a minimum rate of 5.0% and a maximum rate of 14.0%; there is no provision in the current mining tax code for carrying mining tax losses forward;
- The corporate income tax rate under the partially-integrated regime applicable to the Quebrada Blanca Operations is 27.0% of taxable income. Some notable features of the regime are:
  - Accelerated depreciation for mining plant and equipment is generally at straight-line over three years;
  - Corporate income tax losses can be carried forward indefinitely;
  - Mining tax is deductible for income tax purposes;
  - Dividends that are paid to TRCL, the Teck subsidiary that directly holds Teck's interest in QBSA, are not subject to any withholding tax;
  - Distributions made by TRCL to a non-resident corporate shareholder would be subject to a dividend withholding tax; the rate will depend on the country in which the corporate shareholder is domiciled and whether a tax treaty is in place between Chile and the country of domicile, among other things. Distributions to non-resident corporate shareholders are not considered in the financial analysis.

For the purposes of the financial analysis, capital expenditures are allocated into four depreciation asset classes and are depreciated over 6, 10, 20 and 50 years depending on the class using the straight-line method for mining tax purposes and are accelerated to three, three, six, and 16 years using the straight-line method for corporate income tax purposes. All capital assets relating to expenditures prior to mill start-up are assumed to be placed into service upon mill start-up in Q4 2021. Thereafter, all capital assets are assumed to be placed into service in the year the capital expenditure is incurred.

22.4 Financial Results

At base assumptions, and before giving effect to shareholder loans, the Base Case generates an IRR of 13.0% and an NPV at an 8% discount rate (NPV_8) of $1,808 M as of January 1, 2019, with payback before financing costs estimated to occur in March 2027, 5.5 years after first production.

At base assumptions, and before giving effect to shareholder loans, the Sanction Case generates an IRR of 13.6% and an NPV at an 8% discount rate (NPV_8) of $2,205 M as of January 1, 2019, with payback before financing costs estimated to occur in January 2027, 5.3 years after first production.

The key financial metrics for the Base Case are summarized in Table 22-2, while Table 22-3 summarizes the key financial metrics for the Sanction Case.

Giving effect to shareholder loans, which reduce the taxes payable, the Base Case generates an IRR of 13.5% and an NPV_8 of $2,030 M while the Sanction Case generates an IRR of 14.1% and an NPV_8 of $2,426 M.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

Table 22-2: Base Case -Summary of Key Metrics Estimated Economics

Category	Unit	Total (1)			Annual Average (2)		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Mining							
Total material moved	Mt	517	1,116	2,402	103.5	111.6	89.8
Processing							
Total ore processed	Mt	259	520	1,400	51.8	52.0	52.1
Head grade – copper	%	0.61	0.58	0.48	0.61	0.58	0.49
Head grade – molybdenum	%	0.018	0.020	0.018	0.018	0.020	0.019
Production							
Copper production	t x 1,000	1,431	2,722	6,092	286	272	228
Molybdenum production	t x 1,000	32	78	190	6.5	7.8	7.1
Silver production	Moz	10	17	40	1.9	1.7	1.5
Copper equivalent production (3)	t x 1,000	1,565	3,030	6,832	313	303	256
Financial Summary							
Revenues (Net TCRC)	$ M	9,121	17,609	39,617	1,824	1,761	1,486
Site operating costs	$ M	3,652	7,348	18,852	730	735	701
Concentrate transportation costs	$ M	276	531	1,213	55	53	45
EBITDA	$ M	5,193	9,730	19,552	1,039	973	740
Free cash flow	$ M	4,546	7,925	9,337	909	793	554
Cash Costs (5)							
Before by-product credits	$/lb Cu	1.52	1.60	1.79	1.52	1.60	1.77
After by-product credits	$/lb Cu	1.29	1.31	1.48	1.29	1.31	1.47
All-in sustaining costs	$/lb Cu	1.40	1.38	1.55	1.40	1.38	1.53

Category	Unit	Total (1)			Annual Average (2)		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Category	**Unit**	**Total (1) LOM**					
Capital Costs							
Development capital costs	$ M	4,739					
Sustaining capital costs	$ M	781					
Closure and post-closure costs (6)	$ M	234					
Economic Summary (unlevered – before shareholder loans)							
Net present value (8%)	$ M	1,808					
Internal rate of return	%	13.0					
Payback (from first production)	years	5.5					
Mine life/payback (7)	—	5.1					
Economic Summary (unlevered – after shareholder loans)							
Net present value (8%)	$ M	2,030					
Internal rate of return	%	13.5					
Payback (from first production)	years	5.7					
Mine life/payback (7)	—	4.9					

Notes to Accompany the Base Case Key Metrics Table:

1. Total numbers for first five years and first 10 years exclude the first partial year of operations in 2021;
2. Annual average numbers exclude the first partial year of operations in 2021 and in the case of the LOM annual average also exclude the last partial year of operations in 2048;
3. Copper equivalent figures are calculated by converting molybdenum and silver production into equivalent copper tonnages using base case metal price assumptions;
4. Cash costs before by-product credits allocate all costs, except for specific molybdenum concentrate freight costs and roasting charges and silver refining charges, to the payable copper produced. Cash costs after by-product credits deduct the revenue received from silver in copper concentrate and molybdenum concentrate sales, net of specific molybdenum concentrate freight costs and roasting charges and silver refining charges, from cash costs before by-product credits. Cash costs are inclusive of all stripping costs during operations.
5. Closure and post-closure costs presented here reflect $216 M in closure costs, plus the NPV at a 1.65% discount rate of post-closure costs of $138 M, spent over 350 years, which equates to a value of $19 M;
6. Mine life/payback ratio is the planned mine life in years divided by the number of years from first production that capital payback is achieved.
7. Information is presented on a 100% basis. As at January 1 2019, Teck had a 90% interest, with ENAMI holding a 10% interest.

Table 22-3: Sanction Case Summary of Key Metrics Estimated Economics

Category	Unit	Total (1)			Annual Average (2)		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Mining							
Total material moved	Mt	519	1,117	2,619	103.8	111.7	98.1
Processing							
Total ore processed	Mt	259	520	1,400	51.8	52.0	52.1
Head grade – copper	%	0.61	0.59	0.52	0.61	0.59	0.52
Head grade – molybdenum	%	0.017	0.020	0.021	0.017	0.020	0.021
Production							
Copper production	t x 1,000	1,448	2,764	6,590	290	276	247
Molybdenum production	t x 1,000	32	78	217	6.5	7.8	8.2
Silver production	Moz	10	17	41	1.9	1.7	1.5
Copper equivalent production (3)	t x 1,000	1,582	3,069	7,425	316	307	279
Financial Summary							
Revenues (Net TCRC)	$ M	9,219	17,846	43,103	1,844	1,785	1,617
Site operating costs	$ M	3,650	7,324	19,204	730	732	715
Concentrate transportation costs	$ M	278	538	1,292	56	54	48
EBITDA	$ M	5,292	9,983	22,607	1,058	998	854
Free cash flow	$ M	4,652	8,089	11,420	930	809	631
Cash Costs (5)							
Before by-product credits	$/lb Cu	1.51	1.57	1.70	1.51	1.57	1.69
After by-product credits	$/lb Cu	1.28	1.30	1.38	1.28	1.30	1.37
All-in sustaining costs	$/lb Cu	1.38	1.37	1.44	1.38	1.37	1.42
Category	**Unit**	**Total (1) LOM**					
Capital Costs							
Development capital costs	$ M	4,739					
Sustaining capital costs	$ M	783					
Closure and post-closure costs (6)	$ M	234					
Economic Summary (unlevered – before optimized funding structure)							
Net present value (8%)	$ M	2,205					
Internal rate of return	%	13.5					
Payback (from first production)	years	5.3					
Mine life/payback (7)	—	5.2					

Category	Unit	Total (1)			Annual Average (2)		
		First 5 Years	First 10 Years	LOM	First 5 Years	First 10 Years	LOM
Economic Summary (unlevered – after optimized funding structure)							
Net present value (8%)	$ M	2,426					
Internal rate of return	%	14.1					
Payback (from first production)	years	5.6					
Mine life/payback (7)	—	5.0					

Notes to Accompany the Sanction Case Key Metrics Table:

1. Total numbers for first five years and first 10 years exclude the first partial year of operations in 2021;
2. Annual average numbers exclude the first partial year of operations in 2021 and in the case of the LOM annual average also exclude the last partial year of operations in 2048;
3. Copper equivalent figures are calculated by converting molybdenum and silver production into equivalent copper tonnages using base case metal price assumptions;
4. Cash costs before by-product credits allocate all costs, except for specific molybdenum concentrate freight costs and roasting charges and silver refining charges, to the payable copper produced. Cash costs after by-product credits deduct the revenue received from silver in copper concentrate and molybdenum concentrate sales, net of specific molybdenum concentrate freight costs and roasting charges and silver refining charges, from cash costs before by-product credits. Cash costs are inclusive of all stripping costs during operations.
5. Closure and post-closure costs presented here reflect $216 M in closure costs, plus the NPV at a 1.65% discount rate of post-closure costs of $138 M, spent over 350 years, which equates to a value of $19 M;
6. Mine life/payback ratio is the planned mine life in years divided by the number of years from first production that capital payback is achieved.
7. Information is presented on a 100% basis. As at January 1 2019, Teck had a 90% interest, with ENAMI holding a 10% interest.

The annual and cumulative free cash flows are presented graphically in Figure 22-1 and Figure 22-2 for the Base Case and Sanction Case, respectively.

The cash flows on an annualized basis, post-tax, for a Chilean-domiciled entity, are included as Table 22-4 and Table 22-5 for the Base Case and in Table 22-6 and Table 22-7 for the Sanction Case.

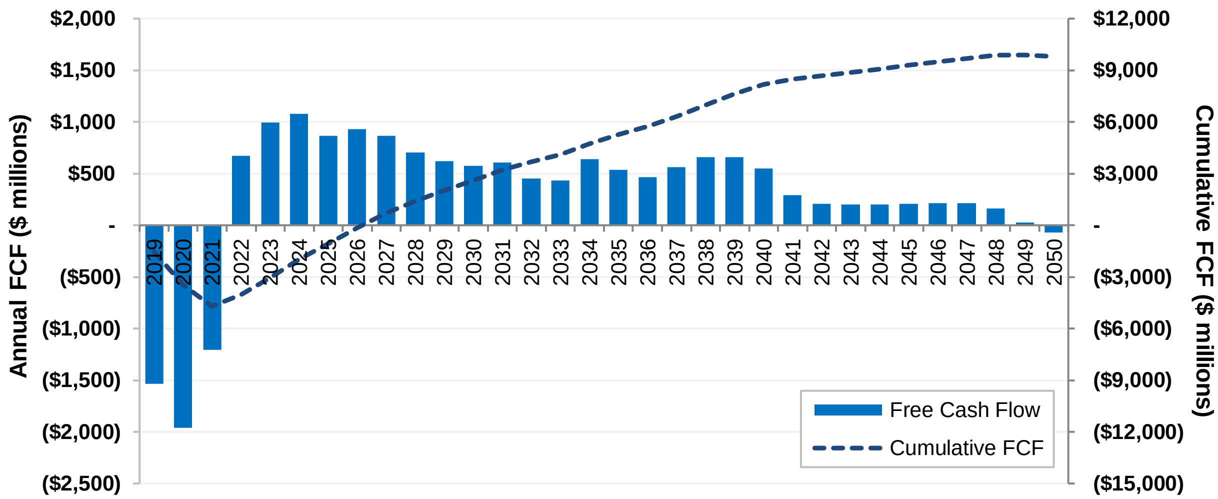
Information is presented on a 100% basis. As at November 30, 2018, Teck had a 90% interest, with ENAMI holding a 10% interest.

22.5 Sensitivity Analysis

Figure 22-3 and Figure 22-4 show NPV_8 sensitivity to changes in key model inputs, based on ±10% changes in the base case assumption for the Base Case and Sanction Case respectively.

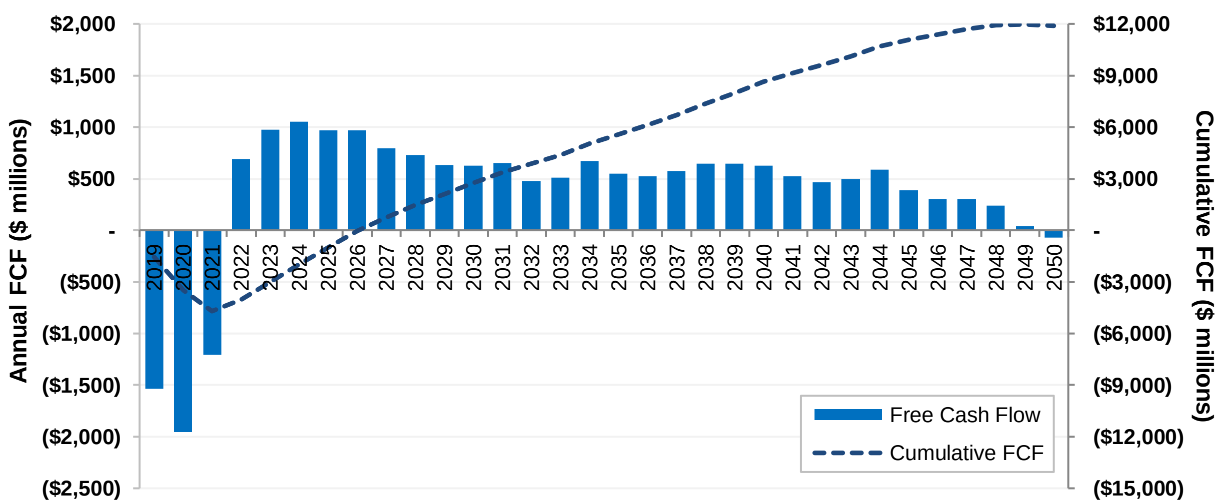
Of the factors assessed in Figure 22-5 and Figure 22-6, the NPV_8 is most sensitive to changes in copper price, and moderately sensitive to changes in operating costs, exchange rate, and initial capital.

Figure 22-1: Base Case Annual and Cumulative Estimated Free Cash Flow



Note: Figure prepared by Teck, 2018. FCF = free cash flow. Information is presented on a 100% basis. As at November 30, 2018, Teck had a 90% interest, with ENAMI holding a 10% interest.

Figure 22-2: Sanction Case Annual and Cumulative Estimated Free Cash Flow



Note: Figure prepared by Teck, 2018. FCF = free cash flow. Information is presented on a 100% basis. As at November 30, 2018, Teck had a 90% interest, with ENAMI holding a 10% interest.

Table 22-4: Base Case Cash Flow Summary (2019–2035)

QB2 Model Summary	Unit	LOM Sum / Avg.	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Commodity Prices																			
Copper	$/lb		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Molybdenum	$/lb		10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Silver	$/oz		18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Operating Summary																			
Total Material Moved	Mt	2,402	—	—	33.1	99.5	100.0	99.9	99.9	118.1	119.0	120.0	119.9	119.9	120.0	119.9	119.9	119.3	119.6
Ore Processed	Mt	1,400	—	—	9.5	51.1	51.5	51.8	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2
Copper Head Grade	%	0.48	—	—	0.59	0.60	0.65	0.63	0.58	0.58	0.57	0.58	0.53	0.51	0.53	0.45	0.46	0.56	0.47%
Moly Head Grade	%	0.018	—	—	0.019	0.018	0.019	0.020	0.015	0.016	0.023	0.024	0.022	0.023	0.024	0.017	0.023	0.026	0.024
Copper Production	kt	**6,092**	—	**—**	***50***	***274***	***304***	***299***	***275***	***279***	***271***	***270***	***250***	***243***	***257***	***210***	***222***	***270***	***227***
Moly Production	kt	190	—	—	1	6	7	7	6	6	9	9	9	9	10	6	9	11	10
Silver Production	Mozs	39.5	—	—	0.3	1.8	2.1	2.0	1.8	2.0	1.8	1.4	1.5	1.5	1.6	1.4	1.4	1.8	1.3
Copper Eq. Production	kt	6,832	—	—	55	300	333	329	299	305	305	305	284	277	293	235	256	310	264
C1 Cash Costs (before BPC)	$/lb	$1.79	—	—	2.38	1.54	1.45	1.48	1.57	1.58	1.62	1.61	1.72	1.75	1.68	1.97	1.88	1.62	1.89
C1 Cash Costs (net BPC)	$/lb	$1.48	—	—	2.13	1.30	1.22	1.23	1.35	1.35	1.31	1.30	1.39	1.40	1.33	1.68	1.50	1.25	1.49
Financial Summary																			
Revenues (Net of TC/RC)	$M	$39,617	—	—	317	1,743	1,935	1,914	1,747	1,782	1,770	1,766	1,650	1,606	1,697	1,364	1,484	1,801	1,530
[-] Site Operating Costs	$M	$18,852	—	—	215	704	728	734	732	753	743	736	748	734	735	732	734	747	758
[-] Transportation Costs	$M	$1,213	—	—	10	54	59	58	52	52	54	54	48	48	51	42	44	52	44
EBITDA	$M	**$19,552**	—	**—**	***91***	***984***	***1,147***	***1,122***	***963***	***977***	***972***	***976***	***854***	***824***	***910***	***589***	***706***	***1,002***	***729***
[-] Mining Taxes	$M	$749	—	—	—	16	23	21	13	14	18	22	16	25	52	27	37	64	39
[-] Cash Income Taxes	$M	$3,303	—	—	—	—	—	—	—	—	75	241	214	204	219	138	166	237	170
[-] ∆ Net Working Capital	$M	$0	—	—	39	175	25	-3	-23	4	-1	0	-16	-5	12	-46	17	43	-37
Operating Cash Flow	$M	$15,501	—	—	53	794	1,099	1,104	973	959	880	713	640	601	627	469	486	657	557
[-] Development Capital	$M	$4,739	1,520	1,835	1,303	81	—	—	—	—	—	—	—	—	—	—	—	—	—
[-] Staining Capital	$M	$781	—	—	72	59	104	26	103	30	13	10	18	23	18	18	53	17	19
[-] VAT Cash Flows	$M	($9)	13	123	(113)	(21)	1	(1)	1	(1)	0	0	0	0	0	0	1	0	0
[-] Closure Costs	$M	$234	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Free Cash Flow	**$M**	**$9,756**	***(1,533)***	***(1,958)***	***(1,209)***	***675***	***994***	***1,079***	***868***	***930***	***868***	***703***	***622***	***578***	***609***	***451***	***433***	***641***	***537***
Other Financial / Return Metrics – before shareholder loans																			
Net Present Value (8%)	$M	1,808																	
IRR	%	13.0%																	
Payback (from 1st production)	years	5.5																	
LOM / Payback	years	5.1																	

Table 22-5: Base Case Cash Flow Summary (2036–2053)

QB2 Model Summary	Unit	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Commodity Prices																			
Copper	$/lb	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Molybdenum	$/lb	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Silver	$/oz	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Operating Summary																			
Total Material Moved	Mt	117.5	90.5	58.1	55.1	52.5	52.2	52.2	52.2	52.1	52.2	52.2	52.2	35.5	—	—	—	—	—
Ore Processed	Mt	52.2	52.2	52.2	52.2	52.2	52.1	52.2	52.2	52.1	52.2	52.2	52.2	35.5	—	—	—	—	—
Copper Head Grade	%	0.46	0.53	0.55	0.53	0.48	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.34	—	—	—	—	—
Moly Head Grade	%	0.019	0.020	0.023	0.024	0.021	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	—	—	—	—	—
Copper Production	kt	221	253	266	256	231	158	150	150	150	150	150	150	102	**—**	**—**	**—**	**—**	**—**
Moly Production	kt	7	8	9	10	9	4	4	4	4	4	4	4	3	—	—	—	—	—
Silver Production	Mozs	1.4	1.6	1.7	1.6	1.5	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.7					
Copper Eq. Production	kt	249	284	302	294	263	176	167	167	167	167	167	167	113	—	—	—	—	—
C1 Cash Costs (before BPC)	$/lb	1.92	1.69	1.53	1.56	1.69	2.31	2.35	2.34	2.34	2.30	2.27	2.30	2.26	—	—	—	—	—
C1 Cash Costs (net BPC)	$/lb	1.59	1.39	1.20	1.19	1.34	2.02	2.08	2.07	2.06	2.02	2.00	2.02	1.98	—	—	—	—	—
Financial Summary																			
Revenues (Net of TC/RC)	$M	1,445	1,646	1,751	1,712	1,532	1,015	960	960	959	960	960	960	653	—	—	—	—	—
[-] Site Operating Costs	$M	743	730	686	678	675	656	635	631	629	618	610	617	411	—	—	—	—	—
[-] Transportation Costs	$M	44	50	52	49	43	34	33	33	33	33	33	33	22	—	—	—	—	—
EBITDA	$M	***657***	***866***	***1,014***	***986***	***814***	***326***	***293***	***296***	***298***	***310***	***317***	***310***	***220***	**—**	**—**	**—**	**—**	**—**
[-] Mining Taxes	$M	34	52	69	66	49	14	12	13	13	13	14	13	—	—	—	—	—	—
[-] Cash Income Taxes	$M	154	211	251	244	201	78	70	72	73	76	78	76	54	—	—	—	—	—
[-] ∆ Net Working Capital	$M	-12	28	16	(5)	(25)	(71)	(7)	0	0	0	0	0	(35)	(75)	—	—	—	—
Operating Cash Flow	$M	482	575	678	680	589	305	218	211	211	219	225	221	200	75	—	—	—	—
[-] Development Capital	$M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
[-] Staining Capital	$M	15	14	17	19	39	13	13	14	13	15	14	10	1	—	—	—	—	—
[-] VAT Cash Flows	$M	0	0	(1)	0	0	(1)	0	0	0	0	0	0	(3)	(6)	—	—	—	—
[-] Closure Costs	$M	—	—	—	—	—	—	—	—	—	—	—	—	41	54	71	50	19	—
Free Cash Flow	$M	***467***	***560***	***662***	***662***	***549***	***293***	***205***	***198***	***198***	***205***	***211***	***211***	***161***	***26***	***(71)***	***(50)***	***(19)***	**—**

Notes to accompany cashflow tables: BPC = by-product credits (i.e. Mo, Ag); TC/RC = toll treatment charges/refining charges; EBITDA = annual earnings before interest, tax, depreciation and amortization; VAT = value-added tax. Cashflows are presented on a 100% basis. As at January 1 2019, Teck had a 90% interest, with ENAMI holding a 10% interest.

Table 22-6: Sanction Case Cash Flow Summary (2019–2035)

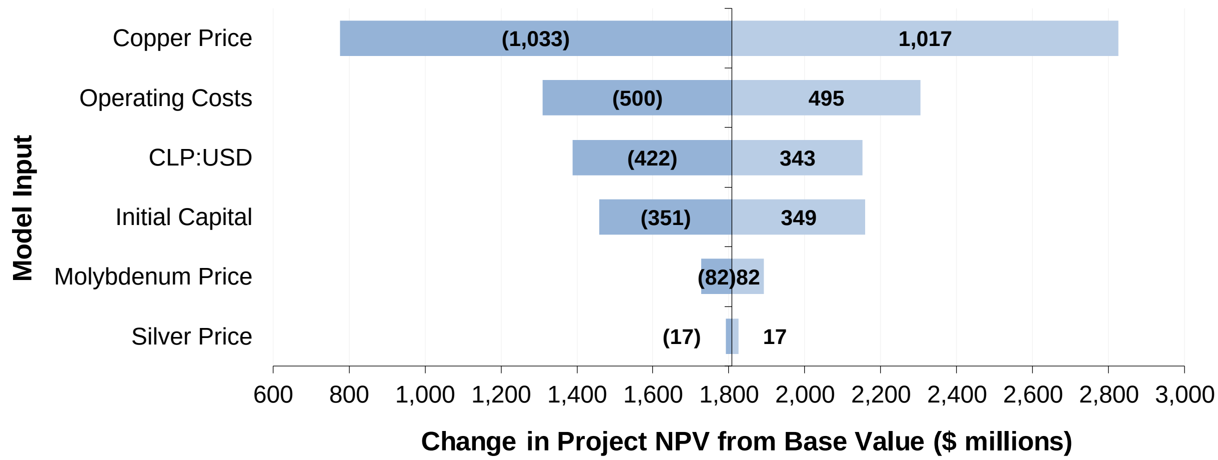
QB2 Model Summary	Unit	LOM Sum / Avg.	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Commodity Prices																			
Copper	$/lb		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Molybdenum	$/lb		10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Silver	$/oz		18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Operating Summary																			
Total Material Moved	Mt	*2,619*	—	—	33.1	99.6	100.0	99.8	99.8	120.0	119.5	119.8	119.2	119.9	119.9	119.9	119.9	119.9	119.0
Ore Processed	Mt	*1,400*	—	—	9.5	51.1	51.5	51.8	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2
Copper Head Grade	%	*0.52*	—	—	0.62	0.60	0.64	0.63	0.62	0.58	0.55	0.60	0.53	0.56	0.55	0.46	0.52	0.56	0.48
Moly Head Grade	%	*0.021*	—	—	0.018	0.018	0.018	0.019	0.017	0.016	0.024	0.024	0.021	0.022	0.024	0.01%	0.023	0.027	0.024
Copper Production	**kt**	***6,590***	—	—	**52**	**275**	**299**	**297**	**295**	**281**	**258**	**281**	**251**	**259**	**266**	**214**	**243**	**273**	**230**
Moly Production	kt	*217*	—	—	1	6	7	7	7	6	9	9	8	9	10	7	9	11	10
Silver Production	Mozs	*41.3*	—	—	0.3	1.8	2.0	2.0	2.0	2.0	1.7	1.4	1.4	1.4	1.7	1.3	1.3	1.8	1.3
Copper Eq. Production	kt	*7,425*	—	—	56	301	327	325	322	307	293	317	282	292	303	240	277	315	267
C1 Cash Costs (before BPC)	$/lb	*$1.70*	—	—	2.39	1.53	1.47	1.48	1.49	1.58	1.67	1.57	1.70	1.65	1.62	1.92	1.74	1.60	1.85
C1 Cash Costs (net BPC)	$/lb	*$1.38*	—	—	2.17	1.30	1.24	1.24	1.26	1.35	1.34	1.26	1.40	1.34	1.27	1.63	1.39	1.23	1.46
Financial Summary																			
Revenues (Net of TC/RC)	$M	*$43,103*	—	—	328	1,748	1,901	1,895	1,880	1,795	1,692	1,836	1,642	1,698	1,758	1,391	1,608	1,825	1,550
[-] Site Operating Costs	$M	*$19,204*	—	—	227	703	725	728	737	757	730	741	740	734	730	725	732	745	754
[-] Transportation Costs	$M	*$1,292*	—	—	10	54	59	57	56	52	53	55	48	50	53	42	48	53	44
EBITDA	$M	***$22,607***	—	—	***91***	***992***	***1,117***	***1,110***	***1,088***	***985***	***908***	***1,040***	***854***	***914***	***975***	***624***	***828***	***1,027***	***752***
[-] Mining Taxes	$M	*$947*	—	—	—	16	21	21	19	14	15	25	16	30	59	30	47	67	41
[-] Cash Income Taxes	$M	*$4,073*	—	—	—	—	—	—	—	—	87	257	213	226	234	147	196	244	177
[-] Δ Net Working Capital	$M	*$0*	—	—	40	174	20	(1)	(2)	(12)	(12)	19	(27)	8	9	(51)	30	30	(38)
Operating Cash Flow	$M	*$17,586*	—	—	51	801	1,076	1,090	1,071	984	819	738	651	650	673	497	555	687	573
[-] Development Capital	$M	*$4,739*	1,520	1,835	1,303	81	—	—	—	—	—	—	—	—	—	—	—	—	—
[-] Staining Capital	$M	*$783*	—	—	65	52	98	39	103	17	25	10	19	23	19	18	46	16	22
[-] VAT Cash Flows	$M	*($9)*	13	123	(113)	(22)	1	(1)	1	(1)	0	0	0	0	0	0	1	0	0
[-] Closure Costs	$M	*$234*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Free Cash Flow	**$M**	**$11,839**	(1,533)	(1,958)	(1,204)	689	977	1,052	966	968	794	728	632	627	655	479	508	671	550
Other Financial / Return Metrics – before shareholder loans																			
Net Present Value (8%)	$M	*2,205*																	
IRR	%	*13.6%*																	
Payback (from 1st production)	years	*5.3*																	
LOM / Payback	years	*5.2*																	

Table 22-7: Sanction Case Cash Flow Summary (2036–2053)

QB2 Model Summary	Unit	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Commodity Prices																			
Copper	$/lb	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Molybdenum	$/lb	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Silver	$/oz	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Operating Summary																			
Total Material Moved	Mt	119.5	119.9	116.0	108.9	84.9	79.8	61.7	54.7	52.8	52.2	52.1	52.2	35.4	—	—	—	—	—
Ore Processed	Mt	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.1	52.2	35.4	—	—	—	—	—
Copper Head Grade	%	0.50	0.53	0.56	0.57	0.57	0.47	0.45	0.44	0.50	0.39	0.38	0.38	0.38	—	—	—	—	—
Moly Head Grade	%	0.022	0.021	0.023	0.024	0.024	0.022		0.020	0.025	0.027	0.014	0.013	0.013	0.013	—	—	—	—
Copper Production	kt	***238***	***256***	***270***	***268***	***264***	***224***	***213***	***212***	***239***	***176***	***170***	***170***	***115***	**—**	**—**	**—**	**—**	**—**
Moly Production	kt	9	8	9	10	9	9	8	10	11	5	5	5	3	—	—	—	—	—
Silver Production	Mozs	1.5	1.6	1.7	1.5	1.4	1.5	1.5	1.4	1.5	1.2	1.1	1.1	0.8					
Copper Eq. Production	kt	271	288	307	304	298	258	244	250	280	196	188	189	128	—	—	—	—	—
C1 Cash Costs (before BPC)	$/lb	1.81	1.70	1.61	1.62	1.61	1.86	1.87	1.79	1.62	2.01	2.04	2.06	1.95	—	—	—	—	—
C1 Cash Costs (net BPC)	$/lb	1.47	1.40	1.28	1.29	1.28	1.47	1.50			1.35	1.19	1.72	1.77	1.79	1.68	—	—	—
Financial Summary																			
Revenues (Net of TC/RC)	$M	1,573	1,670	1,781	1,766	1,735	1,494	1,413	1,448	1,628	1,133	1,087	1,089	738	—	—	—	—	—
[-] Site Operating Costs	$M	751	748	742	743	724	726	697	664	664	621	609	617	391	—	—	—	—	—
[-] Transportation Costs	$M	47	51	52	51	51	44	42	42	45	36	36	36	24	—	—	—	—	—
EBITDA	$M	775	870	987	972	960	724	674	743	919	475	442	437	323	**—**	**—**	**—**	**—**	**—**
[-] Mining Taxes	$M	43	52	63	62	61	39	36	44	61	22	20	20	0	—	—	—	—	—
[-] Cash Income Taxes	$M	183	212	244	241	237	178	166	184	228	118	110	109	83	—	—	—	—	—
[-] Δ Net Working Capital	$M	3	13	16	(2)	(4)	(33)	(10)	7	25	(68)	(6)	0	(40)	(87)	—	—	—	—
Operating Cash Flow	$M	546	594	664	671	666	539	482	509	605	402	318	308	280	87	—	—	—	—
[-] Development Capital	$M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
[-] Staining Capital	$M	21	18	17	23	37	14	15	14	16	15	13	6	0	—	—	—	—	—
[-] VAT Cash Flows	$M	0	0	0	(0)	(0)	0	(0)	(0)	(0)	0	(1)	0	(3)	(5)	—	—	—	—
[-] Closure Costs	$M	—	—	—	—	—	—	—	—	—	—	—	—	41	54	71	50	19	—
Free Cash Flow	$M	525	576	647	648	628	526	468	495	589	388	305	301	241	38	(71)	(50)	(19)	—

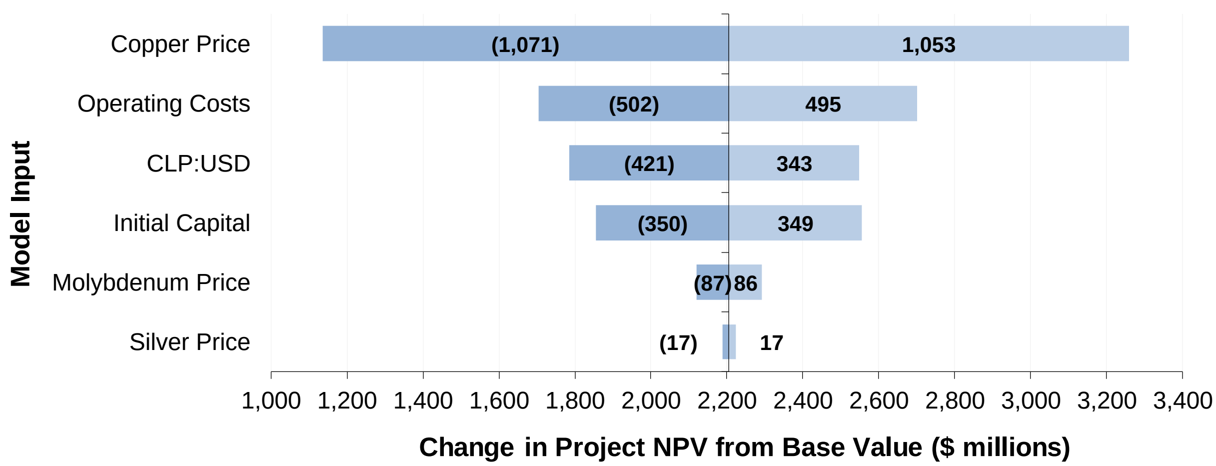
Notes to accompany cashflow tables: BPC = by-product credits (i.e. Mo, Ag); TC/RC = toll treatment charges/refining charges; EBITDA = annual earnings before interest, tax, depreciation and amortization; VAT = value-added tax. Cashflows are presented on a 100% basis. As at January 1 2019, Teck had a 90% interest, with ENAMI holding a 10% interest.

Figure 22-3: Base Case Sensitivity Analysis (10% Change)



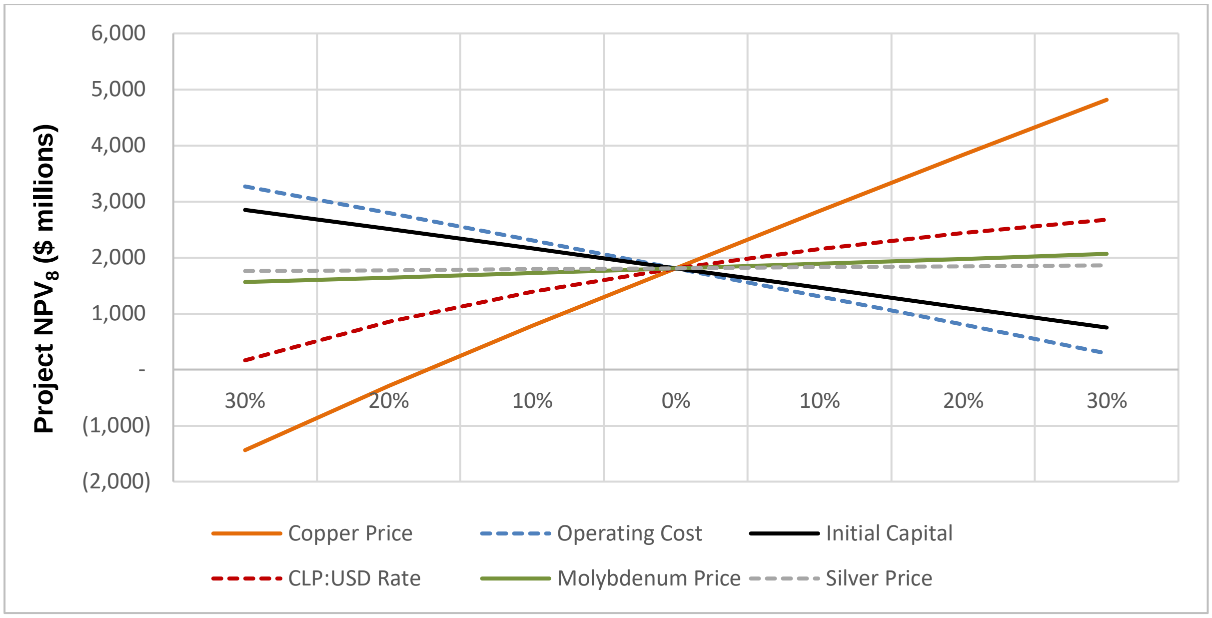
Note: Figure prepared by Teck, 2018

Figure 22-4: Sanction Case Sensitivity Analysis (10% Change)



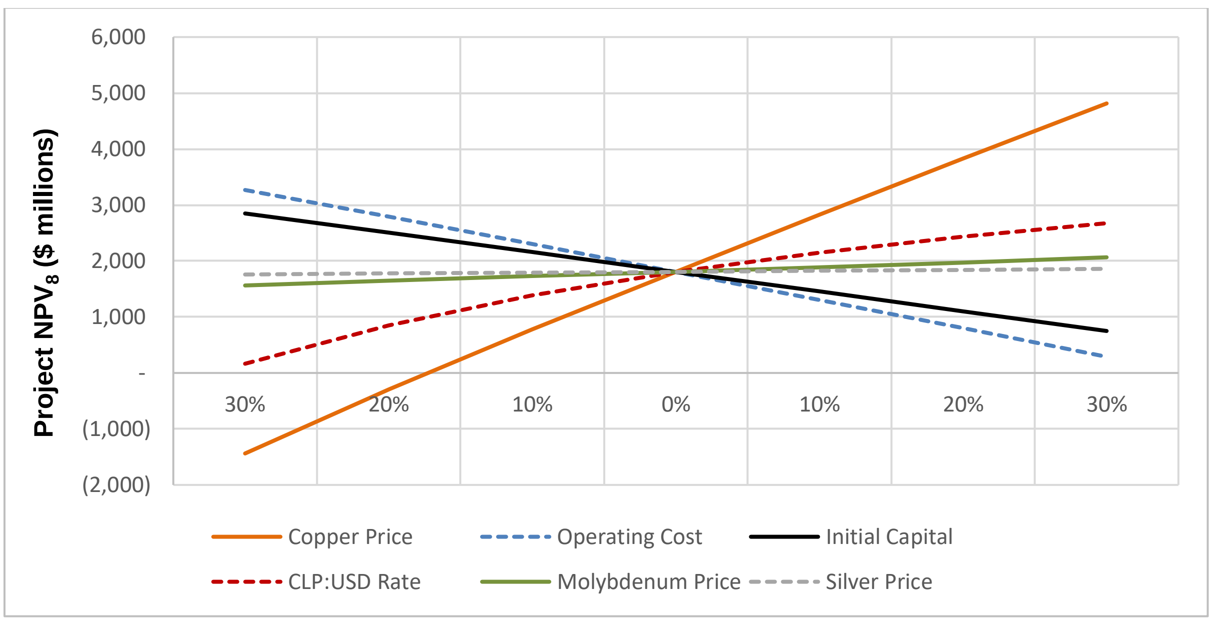
Note: Figure prepared by Teck, 2018

Figure 22-5: Base Case Change in NPV8 for Percent Changes in Model Inputs



Note: Figure prepared by Teck, 2018

Figure 22-6: Sanction Case Change in NPV8 for Percent Changes in Model Inputs



Note: Figure prepared by Teck, 2018

For the Base Case, a 1% change in copper recovery from the base assumption results in a change to QB2's NPV_8 of approximately $90 M. For every $0.25/lb change in copper price, over the range of sensitivities, QB2's NPV_8 changes by approximately $870 M; while every $0.25/lb change in molybdenum price changes the NPV_8 by approximately $21 M. A 10% change in initial capital and operating costs, on average across the range of sensitivities, results in changes to QB2's NPV_8 of approximately $350 M and $500 M, respectively.

For the Sanction Case, a 1% change in copper recovery from the base assumption results in a change to QB2's NPV_8 of approximately $100 M. For every $0.25/lb change in copper price, over the range of sensitivities, QB2's NPV_8 changes by approximately $900 M; while every $0.25/lb change in molybdenum price changes the NPV_8 by approximately $22 M. A 10% change in initial capital and operating costs, on average across the range of sensitivities, results in changes to QB2's NPV_8 of approximately $350 M and $500 M, respectively.

22.6 Comments on Economic Analysis

At base assumptions, and before giving effect to shareholder loans, the Base Case generates an IRR of 13.0% and an NPV at an 8% discount rate (NPV_8) of $1,808 M as of January 1, 2019, with payback before financing costs estimated to occur in March 2027, 5.5 years after first production.

At base assumptions, and before giving effect to shareholder loans, the Sanction Case generates an IRR of 13.6% and an NPV at an 8% discount rate (NPV_8) of $2,205 M as of January 1, 2019, with payback before financing costs estimated to occur in January 2027, 5.3 years after first production.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

23.0 ADJACENT PROPERTIES

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

24.0 OTHER RELEVANT DATA AND INFORMATION

Teck has commenced a preliminary evaluation of a further expansion scenario, termed "QB3", which would potentially double the QB2 throughput capacity. The material that could be used in an expansion scenario is that outside the QB2 Mineral Reserve pit limits.

The evaluation that is underway is based on assumptions that:

- Only a portion of the Mineral Resource estimate has been converted to Mineral Reserves and is included in the QB2 mine plan (refer to Table 14-4);
- Mining could continue using conventional equipment and mine planning, and would require only conventional mining industry pit phase laybacks and expansions;
- Existing WRSFs would have sufficient space to store waste rock that would be generated;
- Sites to provide additional TMF capacity for this expansion are being considered;
- The technology and design for the concentrator to be constructed for QB2 would be applicable for any expansion, so there is potential for simple twinning of concentrator design for the QB3 expansion scenario;
- Permits required could be readily obtained;
- Environmental and community considerations would be the same as those for QB2.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 Introduction

The QPs note the following interpretations and conclusions in their respective areas of expertise, based on the review of data available for this Report.

25.2 Mineral Tenure, Surface Rights, Water Rights, Royalties and Agreements

As at 1 January 2019, Teck has a 90% indirect Project interest, with Enami holding a 10% non-funding interest.

On 4 December 2018, Teck announced that SMM and SC would acquire a 30% indirect interest in QBSA, which is expected to close by 31 March 2019. In anticipation of closing, TRCL, the subsidiary who held the direct Teck interest in the Series A QBSA shares, contributed the shares to JVCo. Upon completion of the subscription by SMM/SC, JVCo will be directly two-thirds owned by TRCL and one-third owned by a Chilean entity that will ultimately owned by SMM and SC. This structure will result in effective ultimate QBSA ownership of 60% Teck, 30% SMM/SC and 10% ENAMI.

Information from Teck's land experts supports that the mining tenure held is valid and is sufficient to support the declaration of Mineral Resources and Mineral Reserves.

A significant portion of the required surface rights have been obtained in support of locations of Project infrastructure. Discussions are underway with remaining land holders to acquire the necessary surface rights for the planned pipelines. Discussions are either underway, or planned, with parties that hold mining concessions within some of the areas that are currently proposed to host Project infrastructure.

There are no other royalties or encumbrances currently known on the Project other than the requirement to pay the Chilean mining tax.

To the extent known, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the property that have not been discussed in this Report.

25.3 Geology and Mineralization

The porphyry-style mineralization at Quebrada Blanca is considered to be typical of a porphyry copper–molybdenum deposit.

The knowledge of the deposit settings, lithologies, mineralization style and setting, ore controls, and structural and alteration controls on mineralization is sufficient to support Mineral Resource and Mineral Reserve estimation.

The primary hypogene mineralization tested during 2018 still remains open to the immediate east–northeast of the FS2016 pit boundary. Exploration potential remains in the area to the east–northeast of the FS2016 pit boundary and additional exploration is warranted in this area.

A number of targets have been identified and tested since 2013. The majority are not considered to retain significant near-surface exploration potential; however, the potential for hypogene mineralization is still being investigated in the following areas: Las Arterias–Elena, West Mag Low, El Colorado Norte and La Cruz.

25.4 Exploration, Drilling and Analytical Data Collection in Support of Mineral Resource Estimation

Exploration conducted to date has been appropriate to the porphyry copper deposit model. Work completed has included surface geological mapping; pit mapping; geochemical sampling; ground magnetic and IP/resistivity geophysical surveys, airborne magnetic geophysical surveys; RC, core, and blast hole drilling; metallurgical test work; Drilling completed up to 31 December, 2018 on the Quebrada Blanca Project includes 867 core drill holes (256,738 m) and 1,512 RC drill holes (204,960 m) for a total of 2,379 drill holes (461,1698 m). The Mineral Resource estimate is supported by 740 core holes (211,957 m). RC and blast hole drilling are not used to support estimation.

Information collected from the core drilling campaigns, including geological logging, collar and down hole surveys, and core recoveries, supports the use of the data in Mineral Resource and Mineral Reserve estimation.

Drill orientations are appropriate for the mineralization style. In general, most drill holes intersect mineralized zones at an angle, and the drill hole intercept widths reported for the Project are typically greater than the true widths of the mineralization at the drill intercept point.

Collection of the analytical and QA/QC drill data on the Project is a team effort, with assay data collected between 1977 and 2018, and QA/QC data collected after 2008. No formal site-based QA/QC programs were in place prior to 2007. As a result, the core drilling prior to 2007 was evaluated using a combination of re-assay and check assay programs in 2002 and 2011. Repeated duplicate sampling of drill core has indicated that there are lower levels of sampling precision for molybdenum when duplicate sampling results are reviewed. This has been attributed to the nugget and veinlet mineralization style of the molybdenite. Overall, the sampling, sample preparation, assay and density data for the drill programs used are suitable to support Mineral Resource and Mineral Reserve estimation.

The checks performed by Teck staff, including the continuous QA/QC checks conducted by the database administrator and Project geologists, annual QA/QC reviews, reviews in support of the annual Mineral Resource and Mineral Reserve estimates, internal process audits, and verification conducted as part of compilation of NI 43-101 technical reports, in particular from 2008 to date, are in line with industry standards for data verification and have identified no material issues with the data or the Project database.

Two external audits were conducted on the drill database that supported the Mineral Resource estimate, and identified no material issues.

The QP has participated in every annual process review for the Quebrada Blanca Mineral Resources and Mineral Reserves from 2013 to date.

Overall, in the QP's opinion, the level of review has adequately verified the quality of the core database as sufficient for use in estimating Mineral Resources and Mineral Reserves, and for use in mine planning. Sample preparation, security, and analytical procedures are acceptable to support estimation.

25.5 Metallurgical Test Work

Much of the metallurgical test work completed prior to the FS2016 has been superseded. Test work that is superseded includes aspects of the comminution circuit design, and flotation, hardness, and pilot plant testing. Additional test work was completed in 2012–2013 and in 2017–2018 to support the current design criteria. The metallurgical test work completed to-date is based on 306 samples that adequately represent the variability of the proposed mine plan.

Metallurgical recovery estimates are based on evaluation of a combination of metallurgical and geological information, including lithology, mineral zonation, spatial distribution, structural blocks, QEMSCAN, metallurgical results and assays from the 2012 and 2017–2018 programs. The maximum global copper recovery was capped according to mineralization zone with a maximum copper recovery of 85.0% for enriched, 90.9% for transitional and 93.6% for primary ore. The maximum global molybdenum recovery was capped according to mineralization zone with a maximum molybdenum recovery of 62.4% for enriched, 59.3% for transitional and 86.4% for primary ore.

The copper concentrate grade is capped at 18.0% Cu for low head grades and at 30.0% Cu for elevated head grades and Cu/S ratio. The concentrate grade projections align with the results from the lock cycle tests.

No elements are present at penalty levels in the copper concentrates. Silver credits are expected, and are included in the financial model at an average grade of 47.8 g/t Ag, which is well above the payable value of 30 g/t Ag in the concentrate. Gold is not present at payable levels.

The average copper grade in the molybdenum concentrates is 1.4% Cu. Copper grades >1% Cu are expected to impact the molybdenum concentrate payment structure. No additional penalty elements are expected. The rhenium content of the molybdenum concentrate would, at minimum, make the molybdenum concentrate more marketable, and is also considered to be a Project upside opportunity.

25.6 Mineral Resource Estimates

The geological features interpreted to support the Mineral Resource estimate are lithology, mineral type and structural domains. Modelling considered sub-block proportions for the structural model, oxidation zones and lithology. The assigned block model SG values were based on average SG measurements for mineralization and lithology domains.

A 4 m composite interval was used. Outlier controls were imposed to limit the influence of high-grade assays.

Total copper, molybdenum, silver and sulphur were estimated into the model using OK. The kriging parameters applied to the estimates were customised for each parameter and within each domain. Where estimates could not be made within the kriging pass criteria, values were interpolated using IDW in two passes. Interpolation parameters varied by element by interpolation pass.

Estimates were validated using a combination of visual validation, statistical evaluations, and swath plots. The block model validation process showed that the model does an acceptable job of matching the source data.

The resource classification methodology consists of an interpolation plan set up specifically to assess the level of information of each individual block in relation to the location and density of drill holes available in the block neighbourhood.

The evaluation of reasonable prospects of eventual economic extraction assumes a conventional open pit mining method, and an assumed mining rate of 100 Mt/year for the first five years of operation. From year 6, it was assumed that the total movement would be increased to 120 Mt/year.

The mine plan uses a variable cut-off grade strategy to maximize the value of the material delivered to the concentrator and averages $19.86/t NSR.

Existing hypogene stockpiles are classified and reported as Indicated Mineral Resources and are not scheduled in the current LOMP. The molybdenum grade of the stockpile is unconfirmed as it was not tested at the time of extraction.

The Mineral Resource estimate is reported exclusive of those Mineral Resources that have been converted to Mineral Reserves, and uses the 2014 CIM Definition Standards. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Factors which may affect the Mineral Resource estimates include: metal price and exchange rate assumptions; changes to the assumptions used to generate the NSR cut-off; changes in local interpretations of mineralization geometry and continuity of mineralized zones; density and domain assignments; changes to geotechnical, mining and metallurgical recovery assumptions; changes to input and design parameter assumptions that pertain to the conceptual Whittle pit design constraining the estimate; and assumptions as to the continued ability to access the site, retain mineral and surface rights titles, maintain environmental and other regulatory permits, and maintain the social licence to operate.

25.7 Mineral Reserve Estimates

The mine plan was developed using Measured and Indicated Mineral Resources. Inferred Mineral Resources were set to waste for the pit optimization process and mine scheduling. Mining assumes conventional open pit operations using truck-and-shovel technology. No internal or external mining dilution was added to the block model during the mine design process.

Nine mine phases were designed to prioritize the higher-grade zones within the mineral extraction plan, while maintaining suitable working widths that would enable high-productivity mining sequences using large-scale mining equipment.

Proven and Probable Mineral Reserves are reported effective 30 November, 2018 using the 2014 CIM Definition Standards. The estimated Mineral Reserves are reported using metal prices of \$3.00/lb Cu and \$9.40/lb Mo, and a variable grade cut-off approach based on NSR values that average \$13.39/t over the planned LOM.

Factors which may affect the Mineral Reserve estimates include: commodity price assumptions; changes to the input parameters to the NSR cut-off grade; changes to the input parameters to the constraining pit shell, and the mine plan that is based on that pit shell; changes to metallurgical recovery assumptions; changes to the assumed permitting and regulatory environment under which the mine plan was developed; ability to maintain mining permits and/or surface rights; and ability to maintain social and environmental license to operate.

25.8 Mine Plan

Mining operations will continue to use open pit methods, and conventional truck-and-shovel operations.

The existing QB1 mining fleet will be used in pre-production and early works activities related to QB2, including the mass excavation required for the concentrator site, and mass earthworks associated with construction of the starter dam for the TMF.

Two mine plans, a Base Case and a Sanction Case, have been developed for QB2. The Base Case includes only Measured and Indicated (MI) Mineral Resources and supports reporting of Mineral Reserves. This plan schedules a total of 1.4 Bt of mill feed and 0.56 Bt of waste rock over a mine life of about 28 years at a 0.41:1 strip ratio. The Base Case plan is tailored to the current TMF constraints. The Sanction Case includes Measured, Indicated, and inferred Mineral Resources (MII). The Sanction Case optimization, mine planning and financial analysis considered realistic mining conditions and the likely continuity of the ore body. The plan, used for Project evaluation purposes, generates a total mill feed of 1.4 Bt and 0.909 Bt of waste rock over a 28-year mine life at a 0.65:1 strip ratio.

The mine plan uses a variable cut-off grade strategy to maximize the value of the ore delivered to the concentrator. For the purposes of generating a LOM schedule, blocks flagged as Inferred Mineral Resources were considered in the same manner as the Measured and Indicated blocks, and therefore are scheduled as mill feed material in the mine plan using the COMET algorithm.

The WRSFs and stockpiles were designed according to the requirements obtained in the mining plan.

Equipment requirements are identical for the Base Case and the Sanction Case.

25.9 Recovery Plan

The process flowsheet has evolved over time, and incorporates additional knowledge from test work conducted after the FS2012 was completed.

The planned process is conventional. It will consist of primary crushing, coarse ore conveying, a coarse ore stockpile, and coarse ore reclaim from the stockpile, before the ore proceeds to ore grinding, pebble crushing, bulk flotation, copper–molybdenum separation, concentrate thickening, and reagent facilities.

25.10 Infrastructure

Infrastructure to support QB2 will be required at the mine site (4,300 masl elevation), the proposed TMF site (3,900 masl elevation), located about 7 km south of the concentrator site) and at the port site.

The planned mine expansion requires significant supporting infrastructure, including an overhead HV electric power transmission line, a concentrate pipeline system to the port, a tailings transport system to the TMF, reclaim water pipeline system from the TMF, a desalinated makeup water pipeline system, and access roads.

25.11 Environmental, Permitting and Social Considerations

The EIA for QB2 was presented to the Chilean authorities on 26 September, 2016.

Teck will employ monitoring plans to help ensure that relevant environmental variables subject to environmental assessment are maintained.

Closure is subject to separate sectorial regulatory requirements and approval must be sought from SERNAGEOMIN.

To date, more than 198 types of permits have been identified as being required for the mine expansion project. Some of these permits are subject to environmental requirements and they are therefore included in the 2016 EIA. Other permits are considered sectorial permits only, because they do not have environmental requirements associated with them and they are not part of the 2016 EIA.

The Quebrada Blanca Operations subscribe to Teck's corporate policies and guidelines for corporate sustainability, which define the corporate expectations for sustainable conduct and sustainable development for all projects with which Teck or its subsidiaries become involved.

25.12 Markets and Contracts

Copper and molybdenum prices ($3.00/lb and $10.00/lb respectively) used for Mineral Resource and Mineral Reserve estimates and the economic analysis were long-term metal prices from Teck's Commodity Price and Exchange Rates for Reserve and Resources Evaluations dated May 2016. These prices are supported by research from independent forecasters and analysts Wood Mackenzie and CPM.

Teck staff performed a review of the estimated quality of, and potential markets for, the copper and molybdenum concentrates that would be produced by the Project.

- The Project's copper concentrate is clean and contains low levels of deleterious elements, but lacks any distinguishing characteristics, so it is anticipated that it is unlikely to obtain a premium over the market Benchmark commercial terms;
- Molybdenum concentrates will be of average quality, with above normal copper contents (1.4% Cu vs. 0.6% Cu), which implies paying a greater discount or penalty.

Teck's marketing strategy for copper concentrate would focus on the major custom smelting companies in the world that are logistically practical for the delivery of concentrates. Teck would look to contract with companies that have a strong business base and that would be strategic long-term customers for the entire Teck suite of mines. Some production may also be sold on the spot market.

No contracts are currently in place for the concentrates to be produced by the planned mine expansion. It is expected that any sales contracts signed would be within market norms.

The marketing approach is consistent with what is publicly available on industry norms, and the information can be used in mine planning and financial analyses for QB2 in the context of this Report.

Silver credits are expected, and are included in the financial model.

Teck has multiple major contracts in place or under negotiation that support operations. Contracts are negotiated and renewed as needed. Contract terms are considered to be in line with typical such contracts in Chile.

25.13 Capital Cost Estimates

The estimates have been prepared to a target accuracy of ±15% as per AACE International Level 3 study recommendations, and are based on second quarter 2017 pricing. The estimate is based on a 625 CLP:US$ exchange rate and does not include escalation.

Contingency allowances were applied, as appropriate, and were based on evaluations of all major cost categories. The overall contingency allowance is approximately 12%.

Initial capital costs are estimated at $4,739 M as of January 1, 2019. Sustaining capital costs are estimated at $782 M for the Base Case and $784 M for the Sanction Case.

Closure costs were estimated by a third-party consultant at $216 M. The post-closure costs were calculated as $138 M over a period of 350 years following closure.

25.14 Operating Cost Estimates

The operating cost estimate includes all operational activities from mining and comminution of the QB2 ore, to production of a copper concentrate that would be transported via a pipeline to the port facilities at Punta Patache and a molybdenum concentrate that would be trucked to destinations as required. The estimate also includes the transport and impoundment of the final tailings produced by the concentrator, along with the requisite ancillary activities.

The estimate has been prepared on an annual basis for the project, from plant start-up to expected mine closure. Steady-state costs are based on a maximum annual ore treatment rate of 52,195,000 t/a, at an average of 143,000 t/d, with costs in years of ramp-up and ramp-down determined using key cost drivers and fixed and variable components of these costs.

Operating costs for the Base Case are estimated at $701 M/a. The operating costs for the Sanction Case are estimated at $715 M/a.

25.15 Economic Analysis

The financial evaluation is based on a DCF model. The pricing basis for the capital cost estimates is Q2, 2017, and the pricing basis for the operating cost estimate is Q2, 2018. For discounting purposes, 1 January 2019 is considered to be the first period (valuation date). The primary outputs of the analysis are NPV_8, IRR, payback period, EBITDA and annual free cash flow, all on a 100% project basis. Teck holds a 90% interest and ENAMI holds a 10% interest.

The Project economics were modelled on an after-tax basis assuming project ownership by a Chilean-domiciled entity.

At base assumptions, and before giving effect to shareholder loans, the Base Case generates an IRR of 13.0% and an NPV at an 8% discount rate (NPV_8) of $1,808 M as of January 1, 2019, with payback before financing costs estimated to occur in March 2027, 5.5 years after first production.

At base assumptions, and before giving effect to shareholder loans, the Sanction Case generates an IRR of 13.6% and an NPV at an 8% discount rate (NPV_8) of $2,205 M as of January 1, 2019, with payback before financing costs estimated to occur in January 2027, 5.3 years after first production.

Giving effect to shareholder loans, which reduce the taxes payable, the Base Case generates an IRR of 13.5% and an NPV_8 of $2,030 M while the Sanction Case generates an IRR of 14.1% and an NPV_8 of $2,426 M.

Based on ±10% changes in the base case assumption for the Base Case and Sanction Case respectively the NPV_8 is most sensitive to changes in copper price, and moderately sensitive to changes in operating costs, exchange rate, and initial capital.

The Sanction Case includes inferred resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Inferred resources are subject to greater uncertainty than measured or indicated resources and it cannot be assumed that they will be successfully upgraded to measured and indicated through further drilling. See Section 1.2 for further details.

25.16 Other Relevant Data

Teck has commenced a preliminary evaluation of QB3, which would potentially double the QB2 throughput capacity. The material that could be used in an expansion scenario is that outside the QB2 Mineral Reserve pit limits.

25.17 Conclusions

Under the assumptions discussed in this Report, both the Base Case and the Sanction Case return a positive economic outcome.

26.0 RECOMMENDATIONS

A multidiscipline work program is planned to support both QB2 operations and the preliminary evaluation of the QB3 expansion scenario.

In the development of the program each discipline area was reviewed to determine if additional test work or investigative studies should be completed in support of the planned QB2 operations as well as the QB3 evaluation study.

A significant program of drilling (both infill and upside), re-logging, assaying and development of updated geological models is recommended and in portions are in progress including:

- Confirmation of the silver and molybdenum content of the current hypogene stockpile;
- Over 55,000 m of infill and step-out drilling to potentially support upgrade of Mineral Resource confidence categories and potential conversion to Mineral Reserves and to identify additional mineralization that could potentially support Mineral Resource estimation;
- Re-logging of ~20,000 m of historic drill core in support of refining and improving the geological models;
- Updating the geological models;

The QB3 evaluation study will address aspects of a further mine expansion, including mine and process design, permitting, environmental and community considerations and an assessment of associated costs and potential economics.

The total program cost is estimated at approximately $45 M based on historic cost performance and is expected to be incurred in a staged fashion.

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Appendix A

Summary

Sector/Area	Number of Concessions	Hectares
Mine	41	23,208
Road - Quebrada Blanca	26	4,586
Road - Coposa	4	1,000
Pampa	149	40,464
Alconcha	10	3,000
Port	12	1,786
Ramucho–Hundida	19	25,161
	261	***99,205***

Mine Area

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Blancado 10 1/60	Exploitation	300	Mine
Blancado 11 1/60	Exploitation	300	Mine
Blancado 12 1/60	Exploitation	300	Mine
Blancado 13 1/60	Exploitation	300	Mine
Blancado 14 1/60	Exploitation	300	Mine
Blancado 15 1/60	Exploitation	300	Mine
Blancado 2 1/60	Exploitation	300	Mine
Blancado 3 1/60	Exploitation	289	Mine
Blancado 4 1/29	Exploitation	128	Mine
Blancado 5 1/60	Exploitation	300	Mine
Blancado 6 1/60	Exploitation	300	Mine
Blancado 7 1/36	Exploitation	162	Mine
Blancado 8 1/60	Exploitation	300	Mine
Blancado 9 1/60	Exploitation	300	Mine
Carmen 1/4	Exploitation	20	Mine
Carolina 1/141	Exploitation	270	Mine
Emilio 1/400	Exploitation	2,000	Mine
Ester 1/288	Exploitation	1,440	Mine
Fiel 1/180	Exploitation	900	Mine

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Gertan	Exploracion	100	Mine
Hernan 1/283	Exploitation	132	Mine
Isabel 1 1/45	Exploitation	45	Mine
Isabel 2 1/100	Exploitation	100	Mine
Jaime 1/400	Exploitation	2,000	Mine
Loretto 1 1/32	Exploitation	315	Mine
Loretto 10 1/81	Exploitation	162	Mine
Loretto 2 1/12	Exploitation	120	Mine
Loretto 3 1/12	Exploitation	120	Mine
Loretto 4 1/12	Exploitation	115	Mine
Loretto 5 1/12	Exploitation	120	Mine
Loretto 6 A 1/40	Exploitation	400	Mine
Loretto 6 B 1/24	Exploitation	225	Mine
Loretto 7 A 1/20	Exploitation	195	Mine
Loretto 7 B 1/16	Exploitation	140	Mine
Loretto 9 1/16	Exploitation	150	Mine
Mauricio 1/655	Exploitation	3,275	Mine
Quebraditas 1/400	Exploitation	2,000	Mine
Sofia 1/500	Exploitation	2,500	Mine
Sonia 1/140	Exploitation	700	Mine
Teresa 1/294	Exploitation	1,405	Mine
Victoria 1/197	Exploitation	380	Mine
		23,208	

Road - Quebrada Blanca

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Blancado 1 1/60	Exploitation	300	Road - Quebrada Blanca
Pake Uno 1 AL 6	Exploitation	36	Road - Quebrada Blanca
Pica 13 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 15 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 16 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 17 1/20	Exploitation	200	Road - Quebrada Blanca

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Pica 18 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 19 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 2 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 26 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 29 1/20	Exploitation	200	Road - Quebrada Blanca
Pica 30 1/20	Exploitation	100	Road - Quebrada Blanca
Pica D 1/10	Exploitation	60	Road - Quebrada Blanca
Pica E 1/20	Exploitation	200	Road - Quebrada Blanca
Pica F 1/30	Exploitation	300	Road - Quebrada Blanca
Pica G 1/30	Exploitation	300	Road - Quebrada Blanca
Pica H 1/20	Exploitation	200	Road - Quebrada Blanca
Pica I 1/24	Exploitation	240	Road - Quebrada Blanca
Pica J 1/14	Exploitation	140	Road - Quebrada Blanca
Pica K 1/20	Exploitation	200	Road - Quebrada Blanca
Pica L 1/20	Exploitation	200	Road - Quebrada Blanca
Ramadas A 1/30	Exploitation	300	Road - Quebrada Blanca
Ramadas B 1/6	Exploitation	60	Road - Quebrada Blanca
Ramadas C 1/6	Exploitation	60	Road - Quebrada Blanca
Ramadas D 1/5	Exploitation	50	Road - Quebrada Blanca
Ramadas E 1/4	Exploitation	40	Road - Quebrada Blanca

Road - Coposa

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Alcala 15	Exploration	300	Road - Coposa
Cala	Exploration	300	Road - Coposa
Lautaro	Exploration	300	Road - Coposa
Quelen	Exploration	100	Road - Coposa

Pampa

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Charo	Exploration	300	Pampa
Milovan 1	Exploration	200	Pampa
Milovan 2	Exploration	200	Pampa
Angel	Exploration	200	Pampa
Atrel 46	Exploration	100	Pampa
Aurora 1	Exploration	300	Pampa
Aurora 2	Exploration	300	Pampa
Aurora 3	Exploration	300	Pampa
Aurora 4	Exploration	300	Pampa
Berfan	Exploration	300	Pampa
Berfani 1	Exploration	200	Pampa
Berfani 2	Exploration	200	Pampa
Cali	Exploration	300	Pampa
Ceronte 2	Exploration	100	Pampa
Chogan	Exploration	200	Pampa
Cose	Exploration	100	Pampa
Damala 1	Exploration	300	Pampa
Damala 2	Exploration	300	Pampa
Damil 1	Exploration	200	Pampa
Damil 2	Exploration	200	Pampa
Damil 3	Exploration	200	Pampa
Damil 4	Exploration	200	Pampa
Estela	Exploration	300	Pampa
Marti 1	Exploration	300	Pampa
Marti 10	Exploration	200	Pampa
Marti 11	Exploration	200	Pampa
Marti 12	Exploration	300	Pampa
Marti 13	Exploration	300	Pampa
Marti 14	Exploration	300	Pampa
Marti 15	Exploration	300	Pampa
Marti 16	Exploration	300	Pampa
Marti 17	Exploration	300	Pampa

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Marti 18	Exploration	300	Pampa
Marti 19	Exploration	300	Pampa
Marti 2	Exploration	300	Pampa
Marti 3	Exploration	300	Pampa
Marti 4	Exploration	300	Pampa
Marti 5	Exploration	300	Pampa
Marti 6	Exploration	300	Pampa
Marti 7	Exploration	300	Pampa
Marti 8	Exploration	300	Pampa
Marti 9	Exploration	300	Pampa
Maura 1	Exploration	300	Pampa
Maura 10	Exploration	100	Pampa
Maura 11	Exploration	100	Pampa
Maura 2	Exploration	300	Pampa
Maura 3	Exploration	300	Pampa
Maura 4	Exploration	300	Pampa
Maura 5	Exploration	300	Pampa
Maura 6	Exploration	300	Pampa
Maura 7	Exploration	300	Pampa
Maura 8	Exploration	200	Pampa
Maura 9	Exploration	200	Pampa
Mife 1	Exploration	300	Pampa
Mife 2	Exploration	300	Pampa
Mife 3	Exploration	200	Pampa
Nava 22	Exploration	300	Pampa
Nava 23	Exploration	300	Pampa
Nava 24	Exploration	300	Pampa
Nava 25	Exploration	300	Pampa
Nava 26	Exploration	300	Pampa
Nava 27	Exploration	300	Pampa
Nava 28	Exploration	300	Pampa
Nava 45	Exploration	300	Pampa
Nava 46	Exploration	300	Pampa
Nava 47	Exploration	300	Pampa

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Nava 48	Exploration	300	Pampa
Nava 49	Exploration	300	Pampa
Nava 50	Exploration	200	Pampa
Nava 51	Exploration	200	Pampa
Quipu 1	Exploration	300	Pampa
Quipu 2	Exploration	100	Pampa
Quipu 3	Exploration	300	Pampa
Quipu 4	Exploration	300	Pampa
Relt	Exploration	300	Pampa
Relta 1	Exploration	200	Pampa
Relta 2	Exploration	200	Pampa
Relta 7	Exploration	100	Pampa
Relta 8	Exploration	300	Pampa
Rita	Exploration	200	Pampa
Trela 2	Exploration	200	Pampa
Trela 3	Exploration	100	Pampa
Trela 4	Exploration	200	Pampa
Valencia 14	Exploration	200	Pampa
Valencia 15	Exploration	200	Pampa
Valencia 16	Exploration	200	Pampa
Vani	Exploration	200	Pampa
Alfa 3 1/26	Exploitation	260	Pampa
Amapola 1/30	Exploitation	300	Pampa
Atrel 44 1/14	Exploitation	140	Pampa
Atrel 44 1/14	Exploitation	140	Pampa
Atrel 45 1/10	Exploitation	100	Pampa
Atrel 45 1/10	Exploitation	100	Pampa
Aura 1, 1 AL 30	Exploitation	300	Pampa
Aura 10 1/30	Exploitation	300	Pampa
Aura 3, 1 AL 30	Exploitation	300	Pampa
Aura 4, 1 AL 30	Exploitation	300	Pampa
Aura 5, 1 AL 30	Exploitation	300	Pampa
Aura 6, 1 AL 30	Exploitation	300	Pampa
Aura 7, 1 AL 30	Exploitation	300	Pampa

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Aura 8, 1 AL 30	Exploitation	200	Pampa
Bravo 2 1/50	Exploitation	500	Pampa
Challacollo 1B 1/30	Exploitation	300	Pampa
Challacollo 2B 1/30	Exploitation	300	Pampa
Challacollo 3B 1/30	Exploitation	300	Pampa
Challacollo 4B 1/30	Exploitation	300	Pampa
Cristina 1/15	Exploitation	150	Pampa
Dalia 1/30	Exploitation	300	Pampa
Delta 2 1/60	Exploitation	600	Pampa
Doche 1/50	Exploitation	50	Pampa
Engañadora 5B 1/8(3_4_7_8)	Exploitation	14	Pampa
Engañadora 7 1/54(21 A_25_35_41 A 45)	Exploitation	60	Pampa
Estrella 32 1/30	Exploitation	300	Pampa
Estrella 33 1/10	Exploitation	100	Pampa
Estrella 44 1/20	Exploitation	200	Pampa
Estrella 45 1/20	Exploitation	200	Pampa
Estrella 46 1/10	Exploitation	30	Pampa
Estrella 47 1/30	Exploitation	300	Pampa
Estrella 48 1/20	Exploitation	200	Pampa
Famber 1 1/20	Exploitation	100	Pampa
Gela A 1/100	Exploitation	100	Pampa
Gela B 1/100	Exploitation	100	Pampa
Lima I 1/100	Exploitation	1,000	Pampa
Minfe 1 1/42	Exploitation	210	Pampa
Minfe 2 1/21	Exploitation	91	Pampa
Oscar 2 1/20	Exploitation	140	Pampa
Oscar I 1/20	Exploitation	50	Pampa
Romeo 1 1/50	Exploitation	10	Pampa
Rosario 1/90	Exploitation	10	Pampa
Rosario 1022/1046	Exploitation	250	Pampa
Rosario 271/360	Exploitation	900	Pampa
Rosario 361/450	Exploitation	900	Pampa

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Rosario 451/540	Exploitation	900	Pampa
Rosario 541/630	Exploitation	900	Pampa
Rosario 631/720	Exploitation	900	Pampa
Rosario 721/810	Exploitation	900	Pampa
Rosario 811/900	Exploitation	900	Pampa
Rosario 901/980	Exploitation	10	Pampa
Rosario 981/988	Exploitation	70	Pampa
Rosario 989/996	Exploitation	75	Pampa
Rosario 997/1018	Exploitation	220	Pampa
Sierra 1 1/20	Exploitation	200	Pampa
Sierra 2 1/20	Exploitation	200	Pampa
Tango 1/50	Exploitation	500	Pampa
Uniform 2 1/30	Exploitation	10	Pampa
Victor 2 1/30	Exploitation	294	Pampa
Yanqui 1/50	Exploitation	500	Pampa
Zoraida 1/30	Exploitation	300	Pampa
Zulu 1 1/28	Exploitation	280	Pampa

Alconcha

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Falcon 1 1/60	Exploitation	300	Alconcha
Falcon 10 1/60	Exploitation	300	Alconcha
Falcon 2 1/60	Exploitation	300	Alconcha
Falcon 3 1/60	Exploitation	300	Alconcha
Falcon 4 1/60	Exploitation	300	Alconcha
Falcon 5 1/60	Exploitation	300	Alconcha
Falcon 6 1/60	Exploitation	300	Alconcha
Falcon 7 1/60	Exploitation	300	Alconcha
Falcon 8 1/60	Exploitation	300	Alconcha
Falcon 9 1/60	Exploitation	300	Alconcha

Port

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Chepa 1	Exploration	200	Port Patache
Chepa 2	Exploration	200	Port Patache
Chepa 3	Exploration	200	Port Patache
Costa 2 1/18 (7-8-9-16-17-18)	Exploitation	60	Port Patache
Costa 3 1/19	Exploitation	185	Port Patache
Oscar 1 B 1/16	Exploitation	103	Port Patache
Oscar 2 A 1/12	Exploitation	90	Port Patache
Oscar 2 B 1/7	Exploitation	48	Port Patache
OSCAR 3 1/20	Exploitation	100	Port Patache
Pachedo 1	Exploration	200	Port Patache
Pachedo 2	Exploration	200	Port Patache
Pachedo 3	Exploration	200	Port Patache

Ramucho–Hundida

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Alex 1/1231	Exploitation	5,681	Ramucho–Hundida
Alex 1/200	Exploitation	1,000	Ramucho–Hundida
Collahuasi 1/500	Exploitation	2,210	Ramucho–Hundida
Hernan 1/283 Red 1 al 235	Exploitation	1,126	Ramucho–Hundida
Juan Alberto 1/1223	Exploitation	5,476	Ramucho–Hundida
Juan Alberto 1/1498	Exploitation	5,595	Ramucho–Hundida
Juan Jose 1 1/1088	Exploitation	2,095	Ramucho–Hundida
Maggita 1/107	Exploitation	375	Ramucho–Hundida
Maggy I 1/6	Exploitation	36	Ramucho–Hundida
Marianela 1 1/3	Exploitation	30	Ramucho–Hundida
Marianela 2 1/6	Exploitation	60	Ramucho–Hundida
Marianela 3 1/4	Exploitation	20	Ramucho–Hundida
Ricardo 1/18	Exploitation	74	Ramucho–Hundida
Ron 1/17	Exploitation	83	Ramucho–Hundida
Sotam 1	Exploration	200	Ramucho–Hundida
Sotam 2	Exploration	300	Ramucho–Hundida

Concession Name	Concession Type	Hectares (ha)	Sector/Area
Sotam 3	Exploration	200	Ramucho–Hundida
Sotam 4	Exploration	300	Ramucho–Hundida
Sotam 5	Exploration	300	Ramucho–Hundida