Technical Report – Preliminary Economic Assessment Study

La Negra Mine

Minera La Negra S.A. de C.V.

Cadereyta de Montes (Maconí), Querétaro, Mexico

20°50'10“N, 99°30'55"W

Submitted in accordance with the standards of National Instrument 43-101 “Standards of Disclosure for Mineral Projects”, including National Instrument 43-101F1, of the Canadian Securities Administrators

Report Contributors: Scott G. Britton – P.E. Mining Plus US, Kim Kirkland – FAusIMM Mining Plus Peru S.A.C., Glenn Zamudio – FAusIMM Mining Plus Australia, Steven Truby – P.E. Wood EIS

Effective date: March 31, 2022
Date of Issue: June 29, 2022

CERTIFICATE OF QUALIFIED PERSON

I, Scott G. Britton, P.E., do hereby certify that:

1. I am currently employed as Principal Mining Consultant by:

   Mining Plus US
   10185 Park Meadows Drive
   Lone Tree, Colorado 80124 U.S.A.

2. I am a graduate of the Virginia Polytechnic Institute and State University (Virginia Tech) and received a Bachelor of Science degree in Minerals Engineering in 1977.

3. I am a:
   - Licensed Professional Engineer in the State of Wyoming (PE-032064) with reciprocity for other states in the United States of America
   - Registered Member in good standing of the Society for Mining, Metallurgy, and Exploration (SME), Inc. (#037051RM)

4. I have worked as a Mining Engineer for a total of 43 years since graduation from the Virginia Tech, as an employee of various mining firms and consulting companies. I have in excess of 5 years of experience directly related to underground narrow vein mining for base and precious metals, and/or the economic sale of minerals, exploration and resource development, including resource estimation and interpretation, resource evaluation, and technical reporting.

5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43 101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

6. I personally inspected the Minera La Negra mine and plant on March 27 through March 30, 2022.

7. I am responsible for the preparation of the report titled Technical Report – Preliminary Economic Analysis Study La Negra Mine dated June 29, 2022 with an effective date of March 31, 2022, with specific responsibility for Sections 1, 2, 3, 4, 5, 6, 13, 16, 17, 20, portions of 18, 21.1, 21.1-21.4, 22.2-22.3, 23, 24, 25, 26, 27 of this report.

8. I have had no prior involvement with the property that is the subject of this Technical Report. 9. As of the date of this certificate and as of the effective date of the Technical Report, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information required to be disclosed to make the report not misleading.

10. I am independent of the issuer applying all of the tests in section 1.5 of NI 43-101.

11. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Dated June 29, 2022,

"Signed"

Scott G. Britton

CERTIFICATE OF QUALIFIED PERSON

Kim Kirkland, FAusIMM
Principal Mining Engineer
Mining Plus Peru S.A.C.
Avenida José Pardo 513, Office 1001
Miraflores, Lima 15074 Perú

I, Kim Kirkland, FAusIMM, am employed as a Principal Mining Engineer with Mining Plus Peru S.A.C. (Mining Plus), with an office address at Avenida José Pardo 513, Office 1001, Miraflores, Lima Perú.

This certificate applies to the technical report titled Technical Report – Preliminary Economic Analysis Study La Negra Mine dated June 29, 2022, with an effective date of March 31, 2022 (the "technical report").

I am a Fellow of AusIMM #309585 in good standing. I graduated with a Bachelor of Science degree in Geological Engineering from University of Utah 1987.

I have practiced my profession for 35 years. I have been directly involved in precious and base metal production, resource estimates, studies and management in North and South America during that timeframe.

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) for those sections of the technical report that I am responsible for preparing.

I have personally visited the La Negra mine and facilities on March 27-30 2022.

I am responsible for Sections 7, 8, 9, 10, 11, 12, and 14 of the technical report.

I am independent and have no prior involvement with Minera La Negra, as independence is described by Section 1.5 of NI 43–101.

I have been involved with the La Negra Mine Project since February 2022.

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 the technical report not misleading.

Dated: June 29, 2022,

"Signed"

Kim Kirkland, FAusIMM

CERTIFICATE OF QUALIFIED PERSON

I, Glenn Zamudio, FAusIMM, am employed as a Senior Principal Consultant with Mining Plus Australia, with an office address at Bravo Building, 1 George Wieneke Drive, Perth Domestic Airport, WA 6105.

This certificate applies to the technical report titled Technical Report – Preliminary Economic Analysis Study La Negra Mine dated June 29, 2022, with an effective date of March 31, 2022 (the "technical report").

I am a Fellow of AusIMM #3003821 in good standing. I graduated with a Bachelor of Science degree in Chemical Engineering and MBA from University of Cape Town, 1988 and 1994, and Chartered Financial Analyst, 2001.

I have practiced my profession for 35 years. I have worked in the Investment Banking division of a merchant bank and have been involved in mining for the last 15 years as a general manager projects and a mining executive.

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) for those sections of the technical report that I am responsible for preparing.

I am responsible for Sections 19, 21, 22 of the technical report.

I am independent and have no prior involvement with Minera La Negra S.A. de C.V., as independence is described by Section 1.5 of NI 43-101.

I have been involved with the La Negra Mine Project since February 2022.

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 the technical report not misleading.

Dated: June 29, 2022,

"Signed"

Glenn Zamudio, FAusIMM

CERTIFICATE OF QUALIFIED PERSON

I, Steven Truby, P.E, am employed as a Principal–Geotechnical Engineer with Wood Environment & Infrastructure Solutions, Inc. (“Wood”), with a business address at 2000 S Colorado Blvd Ste 2-1000, Denver, CO, 80222-7931.

This certificate applies to the technical report titled Technical Report – Preliminary Economic Analysis Study La Negra Mine dated June 29, 2022, with an effective date of March 31, 2022 (the “technical report”).

I am a Professional Engineer registered with the Department of Regulatory Authorities, Colorado, the Alaska State Board of Registration for Architects, Engineers, and Land Surveyors and the Nevada State Board of Professional Engineers and Land Surveyors. I graduated from the University of the Witwatersrand, Johannesburg, South Africa in 1991 with a B.Sc. in Civil Engineering, and from the University of the Witwatersrand in 1996 with a M.Sc. in Civil Engineering.

I have practiced my profession for 28 years. I have been directly involved in the design, construction and permitting of mine tailings storage facilities, water management infrastructure and leach pads.

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”) for those sections of the technical report that I am responsible for preparing.

I have not visited the Minera La Negra Project.

I am responsible for Sections 18.5.2 and 18.5.3 and portions of 21.1, 21.5, 22.1, 22.4, 25.3, and 27.4 of the technical report.

I am independent of Minera La Negra as independence is described by Section 1.5 of NI 43–101.

I have no previous involvement with the Minera La Negra Project.

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 the technical report not misleading.

Dated: June 29, 2022

“Signed”

Steven Truby, P.E.

Contents

1 Executive Summary

1.1 Introduction

This technical report has been prepared for Minera La Negra S.A. de C.V.

Minera La Negra ("MLN") is a base metals and silver producer focused on restarting its 100%-owned La Negra mine, located in the Maconí District of the Sierra Gorda range of the State of Querétaro, in central Mexico. La Negra will be a mid-scale, low-cost polymetallic underground mining operation with drift access using long hole, open stope methods along with conventional flotation, initially processing up to 2,500 tonnes per day (tpd) to produce lead, zinc, and copper concentrates with silver values, and is targeting annual production of 23.3 moz of payable silver equivalent (Ageq) over an initial 7.5-year mine life.

Mineralization in the vicinity of the La Negra mine was known in pre-Hispanic times, and small operations in the area were developed during the Spanish Colonial era. Although the La Negra orebody had been discovered previously by other operators, it was first developed in the 1960s by Industrias Peñoles S.A. de C.V. and achieved commercial production in 1971. Mining has proceeded to operate almost continuously since then as other deposits have been discovered and developed. The mine was closed in March of 2020 due to the government-mandated Covid-19 shutdown. The decision was made at that time not to reopen until certain pending had been resolved. These included: taxation issues, a new contract with the union, an extension of the land-use agreement with the local communities, a near-mine drilling program, and new resource and mine plan, which have all been resolved. All pending issues with the tax authority, SAT, were concluded in February of 2021, and a new labor contract went into effect in April of 2021, with a 15-year extension of the land-use agreement signed in July of 2021.

The Technical Report was completed by the authors with the assistance of the following independent consultants:

- A-Geommining – Core Logging, Surface Exploration, and Exploration Program QA/QC
- Think Data MX – Socioeconomic studies for Section 20
- Integración de Procesos para Minas Carrillo (IPMC) – Paste Backfill Plant preliminary design, Section 26.3

This report presents the results of the PEA using the guidance of the Canadian Securities Administrators' National Instrument (NI) 43-101 and Form 43-101F1 and Canadian Institute of Mining (CIM) guidance on Resource and Reserve Estimation. The authors of this report note that the information and detail presented significantly exceeds that normally found in a PEA. The reason for including this additional information is that Minera La Negra is not a greenfields site, but rather a former producer with 50 years of history that is being reactivated and has access to a large amount of readily available information.

A site visit by Mining Plus occurred between March 27, 2022 and March 30, 2022.

Minera La Negra owns 100% of the La Negra project and holds all of the titles, rights, benefits, and obligations to the La Negra project, consisting of fifteen mineral concessions with an aggregate area of approximately 82,878 hectares. Minera La Negra is 99.99% owned by Orion Mine Finance (Master) Fund LLP (Orion) but has an agreement with Grupo Desarrollador Migo, S.A.P.I. de C.V. (M Grupo), a private Querétaro-based company whose principal business is infrastructure, real estate, industrial lighting and agricultural commodities, to apportion to them a share of any sales proceeds based on a pre-agreed formula.

1.2 Property Description and Ownership

The La Negra project is located in central Mexico approximately 90km in a direct line to the northeast of Querétaro, capital of the state of the same name, or approximately 150km by paved road (Figure 1.1). The center of the property is located at approximately 20°51.1.' North Latitude and 99°30.9' West Longitude (UTM 14Q 2303950N / 426443E (WGS84 datum)). The State of Querétaro has a population of 2.4M inhabitants, based on the 2020 census, and the capital city has a population of 1.1M. The main industrial activities in the state include automotive and aerospace manufacturing, as well as logistics and distribution, given its location close to Mexico City. The state also has a burgeoning agricultural sector, and produces primarily specialty products such as triticale, roses, asparagus, chickpeas, carrots, as well as an emerging viticulture industry.

Figure 1.1 Project Location Map

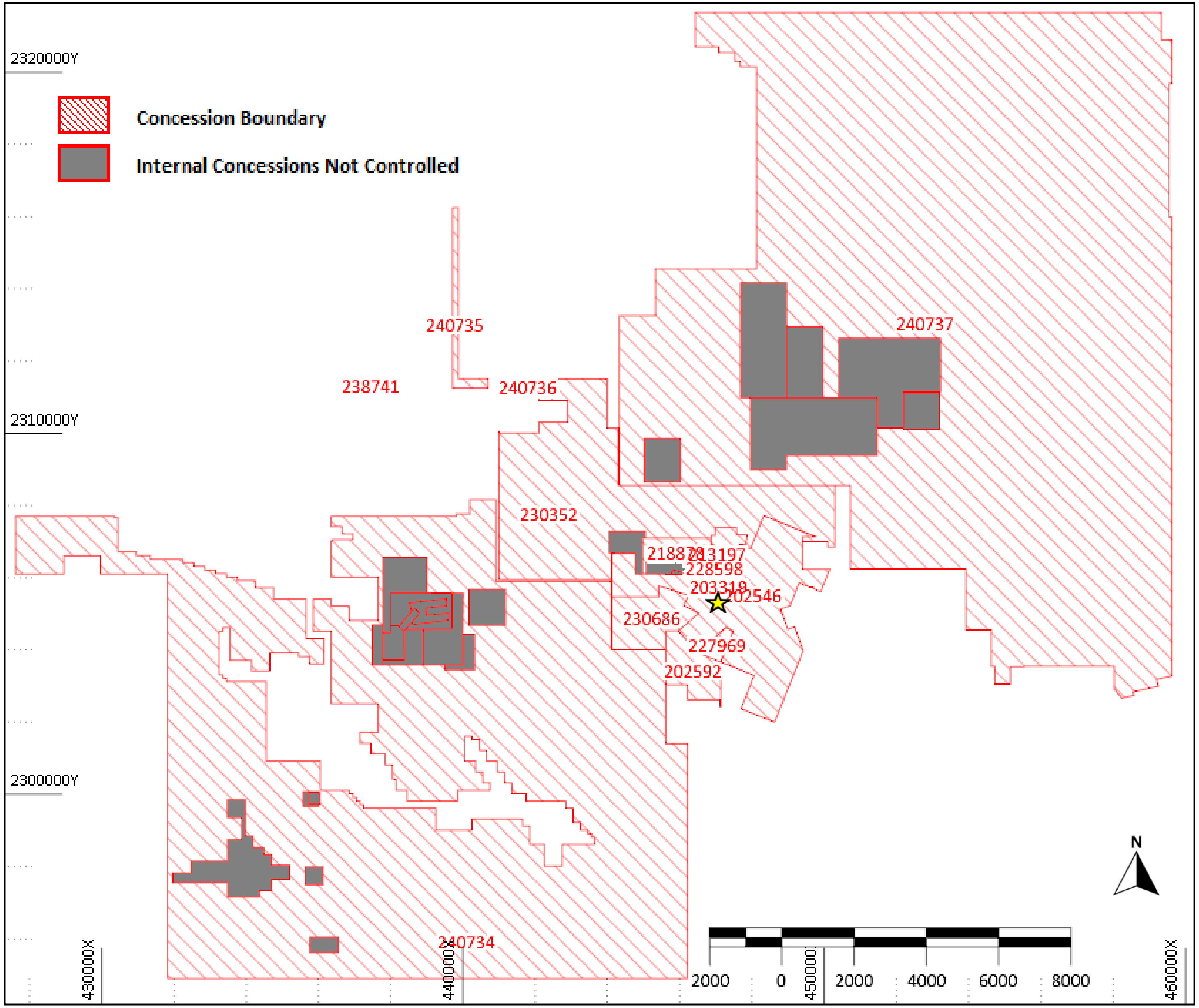
Source: MLN

The project is located in the district of Maconí, within the municipality of Cadereyta. Maconí and its environs have a population of approximately 3000 inhabitants, dependent primarily on the mine as well as on small-scale agriculture and small-scale business. In total, there are 21 communities in the vicinity of the mine, although most of these consist of only a handful of houses each. The mine site itself is 3.4 km east of the town of Maconí and is accessed by an all-weather gravel road.

Minera La Negra's concessions are shown overleaf in Figure 1.2 with the corresponding concession number placed next to or overlaying the concession. Figure 1.3 shows the mine's infrastructure and layout.

La Negra is located in a mountainous range known as the Sierra Gorda, consisting of rugged, steep topography with peaks up to 3100 m in altitude and deep river valleys at an elevation of 1700 m. The climate is temperate, but the region is semi-arid, and consists of scrubby vegetation and cacti, with deciduous forest (primarily oak) and pine trees in those areas that receive greater rainfall. The main portal for the mine is located at 1906 masl (although known as the 2000 level), with operations as high as 2300 m and as low as 1700 m. Figure 1.3 shows the layout of the mine.

Figure 1.2 La Negra Mining Concessions



Source: MLN

Figure 1.3 Minera La Negra Layout and Infrastructure

400 m

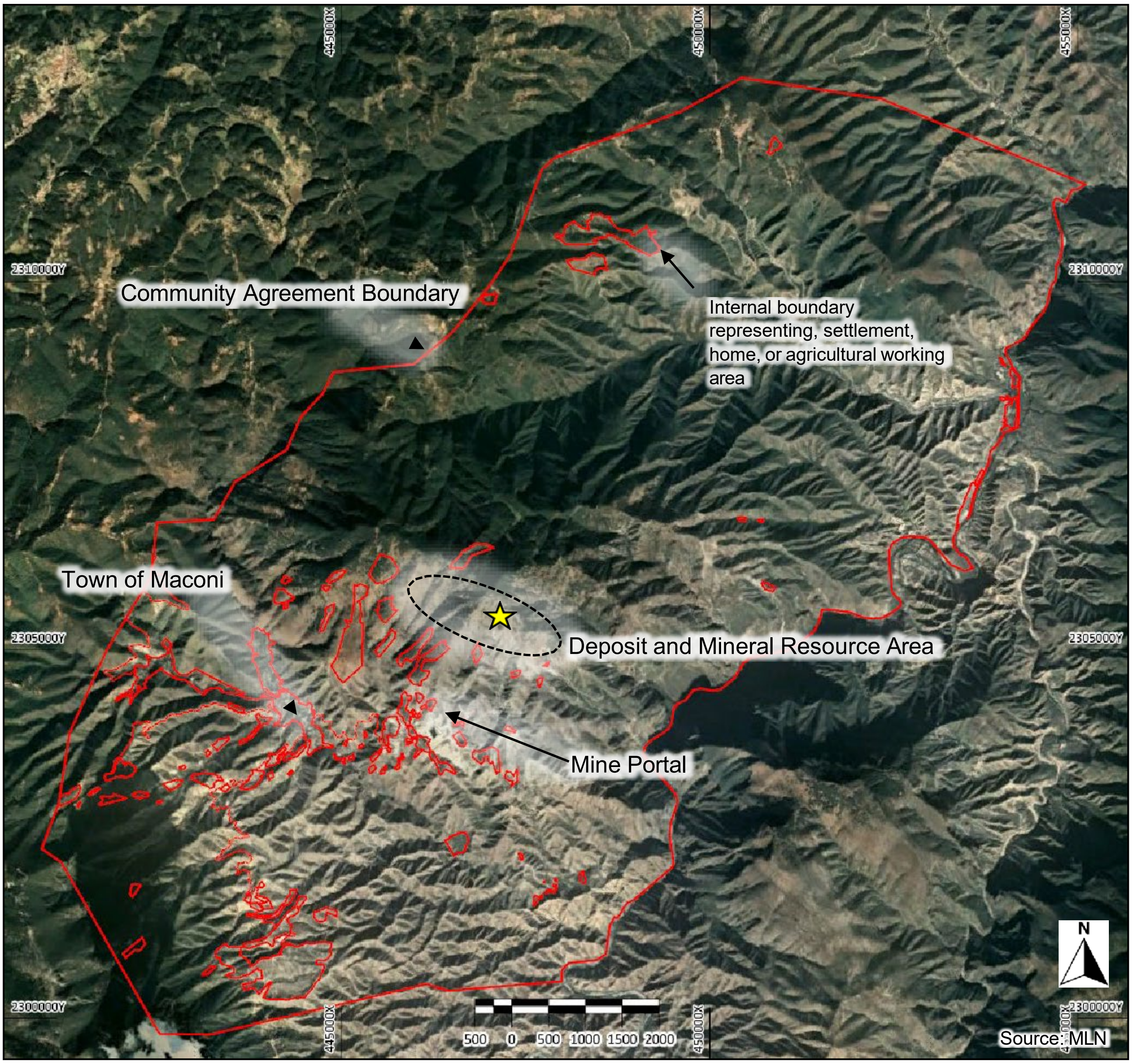
Source: MLN

The local workforce available to the mine include skilled miners and process operators with years of experience working at the mine.

As part of the company's commitment to adding value to the local communities and building capacity in Mexico, the entire workforce of the operation is composed of Mexican nationals. The majority of the workforce is from the local communities, including skilled mechanical and electrical tradesmen. The positions that cannot be filled by local workers, primarily senior geologists and engineers and administrative staff, will be staffed with suitably qualified nationals.

The total mine workforce at full operations after restart is estimated to be 229 employees, consisting of 164 unionized workers and 65 salaried staff.

Figure 1.4 Map of Surrounding Communities and Settlement Areas



1.3 History

The evidence suggests that the area around La Negra may have been mined for minerals used for cosmetic and decorative purposes for at least 2,000 years. The Spanish began mining in the district in the 1500s and in the area around Maconí in the late 1600s. Mining by private individuals continued in the 1800s and 1900s on an intermittent basis and by 1950 the property was owned by Compañía Minera Acoma, S.A., although their activities were apparently not successful.

Peñoles, which had operated a small smelter 10km away in the vicinity of El Doctor, acquired the property in the early 1960s and carried out a mapping, sampling, and magnetic survey program which resulted in the discovery of the La Negra and El Alacrán deposits. Mine development began in 1967 and production commenced in 1971. In the year 2000 the property was put on care and maintenance due to low metals prices, and the property was acquired by Aurcana in 2006. In 2016 ownership of the property passed to Orion as part of a court-sanctioned Plan of Arrangement. Orion entered into a joint venture with M Grupo in August of 2020; in early 2022 the joint venture was modified to entitle M Grupo to a share of proceeds from the sale of MLN subject to a pre-agreed formula.

1.4 Geology and Mineralization

The La Negra property is located in the Sierra Gorda range, belonging to the Sierra Madre Oriental physiographic province. The main sedimentary host rocks were laid down during the late Jurassic through early Cretaceous and consist of two carbonate platforms – El Doctor to the west and Valles-San Luis Potosí to the east – with the deep water Zimapán basin, consisting of basinal carbonates with minor clastic material in between.

The collision of the Guerrero Terrane with the southwest coast of North America and the beginning of subduction signaled the beginning of the formation of the Mexican Fold and Thrust Belt (MFTB) about 83 million years ago. The Paleozoic basement and resistant carbonate rocks of the El Doctor platform buckled and were thrust to the NE over the sediments of the Zimapán basin, which deformed plastically resulting in high-amplitude folds.

Subsequent to the end of the Laramide orogeny and the termination of the compressional regime that formed the MFTB, the region experienced a period of extension (43-25 Ma) that led to minor normal faulting. Intrusive bodies exploited the NW-trending fold axes created during the formation of the MFTB as well as subsidiary NE-trending structures.

The principal geologic unit in the vicinity of La Negra is the La Negra facies of the El Doctor Formation, which strikes N in the area of the mine but is interpreted to broadly follow the NW trend of the Piñón Anticline, the fold axis of which is a major throughgoing structure. To the west, and potentially hosting NW extensions of the mineralization, is the San Joaquín facies of the El Doctor Formation, which forms a N trending band approximately 150 m wide. To the west of this, and outside any zones of known mineralization, is the foreslope Socavón facies of the El Doctor Formation.

Four different phases of skarn mineralization have been identified with the economic mineralization formed in the final stage, which in addition to sulfides generated orthoclase, quartz, calcite and datolite. The principal minerals at La Negra consist of sphalerite (marmatite), galena, and chalcopyrite, with silver present as hessite [Ag_2Te] in association with galena and as argentite and pyrargyrite. Other common, non-mineral sulfides include pyrite, minor pyrrhotite, lloelingite [$FeAs_2$] and arsenopyrite. La Negra is classified as a Pb-Zn-Ag + Cu skarn.

1.5 Exploration and Data Management

MLN employs its own drillers and owns a variety of underground drill equipment, which is used primarily for definition drilling. The 2021 drill program, however, was caried out by an experienced independent drilling company. Underground drilling is generally controlled and monitored by mine geological staff, but for the 2021 exploration program this was managed by experienced geological contractors, who were tasked with confirming the surveys of the location of the drill collar and the azimuth and inclination of each hole. Core was delivered to the secure core sampling and storage facility at the main mine complex where it was recorded as received and entered into a control database that documented the process of logging and sampling. Prior to sampling, the core was checked for completeness and continuity, box numbering and length. The core was then cleaned and logged for lithology, mineralization, structure and alteration. All core was photographed to provide a digital record.

Intervals were selected for sampling on the basis of visual identification of mineralization. Sample lengths generally are one or two meters; barren intervals above and below mineralization are also sampled to ensure the limits of mineralization are captured by the sampling process. Core was cut with a saw and half was placed in a labelled plastic sample bag together with a corresponding sample tag. A sample tag was placed in the core box and a third copy was retained in the sample booklet. When sampling was completed, the samples were consigned to the mine assay lab through a chain of custody protocol. Samples were routinely assayed for silver, copper, lead, zinc, iron and arsenic and beginning in 2021 for antimony, bismuth, and cadmium. Umpire samples were sent to an independent lab.

The 2021 drill program consisted of 35 holes totaling 9,800 meters, the global database contains approximately 47,000 underground drillhole assays.

1.6 Metallurgical Testing and Mineral Processing

Minera La Negra initiated operations in 1971 and has been in continuous production for most of that time (see Figure 6.1).

Other than various throughput expansions over the years, the processing plant flowsheet has been well established and is little changed, and operating parameters and recoveries are well understood. Production data for the period 2011-2019 is shown in Table 13.1. Estimated LOM recoveries are as follows: Ag – 79.7%, Pb – 72.3%, Zn – 84.0%, Cu – 68.0%.

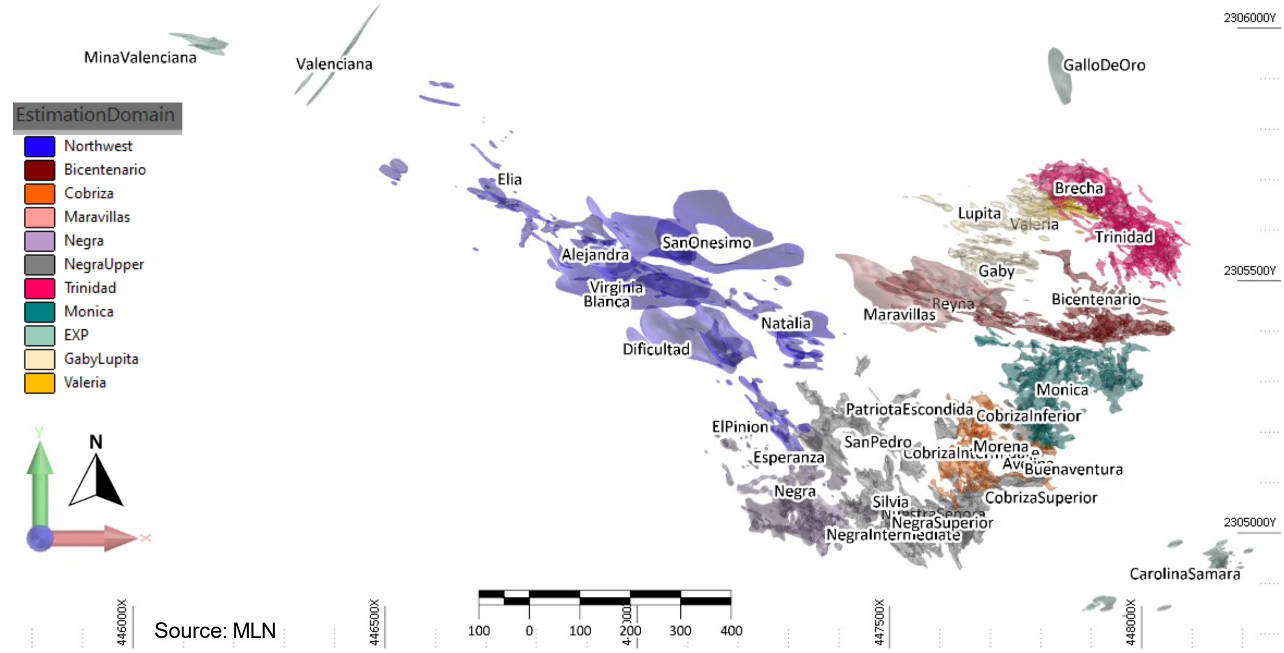
The most important aspect of the mine planning and mineral processing at La Negra is the correct calculation of the NSR for each tonne of rock in the model, as this directly drives the planning process for both the mine and the processing plant, as described in Sections13.2 through 13.12.

NSR is the dollar value of material after the metallurgical recovery, concentrate trucking charges, smelter payables, smelter deductibles, smelter penalties, and treatment charges have been accounted for. NSR does not account for mining cost, process cost, G&A, sustaining capital, dilution, royalties, VAT, or taxes. The purpose of the NSR is to compare material value to the breakeven costs of the mine.

1.7 Mineral Resource Estimate

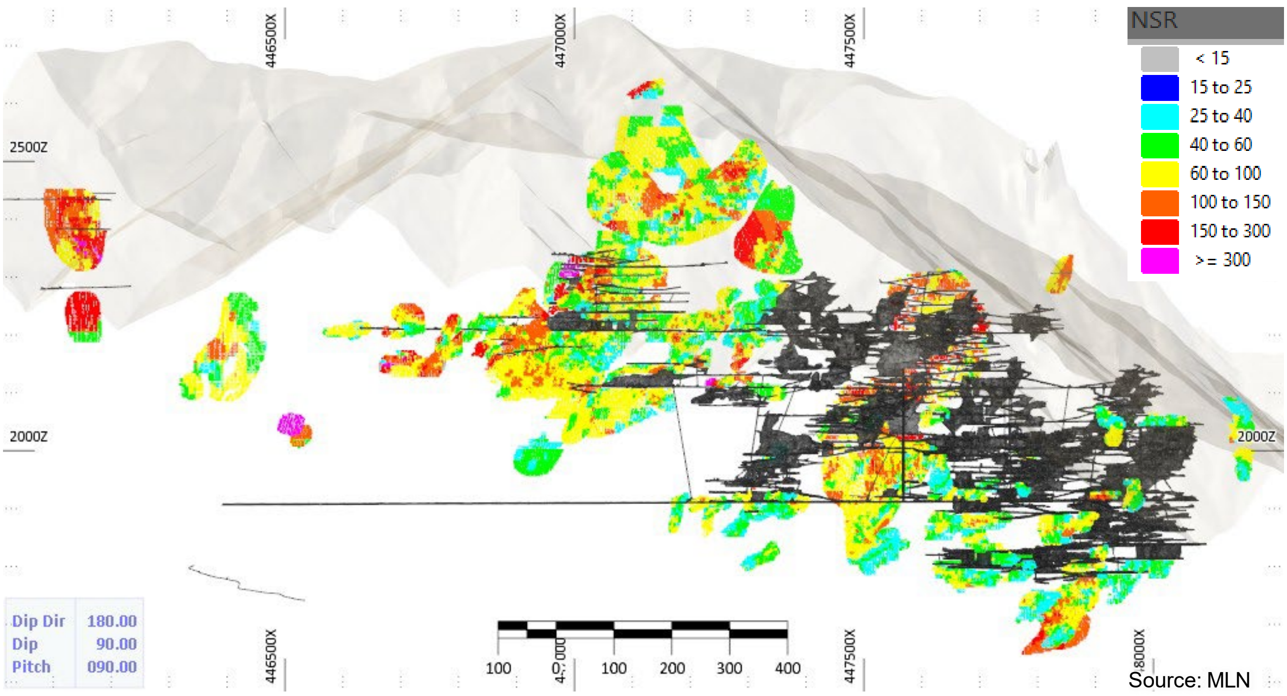
Resources for the La Negra mine have been estimated using Ordinary Kriging (OK), are wireframe constrained, and stated at a base case cut-off grade of US$28/t NSR accounting for value from Ag, Pb, Zn, and Cu and penalties from As and Fe (see Section 13 for a detailed description of the NSR model). Resources have been estimated from analyses of Ag, Pb, Zn, Cu, As, and Fe collected from diamond drilling, channel sampling, and long-hole production sampling. Samples have been selected and the block model has been defined by 35 mineral zone solids constructed via implicit modeling using a cut-off of US$20/t as a general guide. Grades have been estimated into the block model by grouping the 35 mineral solids into eleven estimation domains. Drill hole samples are composited to 2m, channel and production samples are independently declustered to a 4m cell size. Drill hole, channels and production samples have been globally capped, capped by datatype, and capped by estimation domain.

Figure 1.5 Mineral Solid Wireframes 3D Overview



Estimation employs: sample length weighting, three nested passes of 25, 50 and 80 meters, and sector declustering. Resource classification criteria account for: estimation pass range, distance to nearest sample, quantity of samples, sectors used, age and quality of data, type, and general reliability estimation. The block model has been depleted by existing mine cavities with an additional spatial buffer as well as manual removal of blocks near historic mining, no partially mined blocks are accounted for, and historically mined areas are mostly entirely removed from tabulation even if there are areas suspected to be remaining.

Figure 1.6 Overview Estimated Remaining Resources >US$28/t NSR (Looking North)



Mineral Resources are stated in the below table. Figure 1.6 is a grade tonnage curve of Indicated and Inferred Resources.

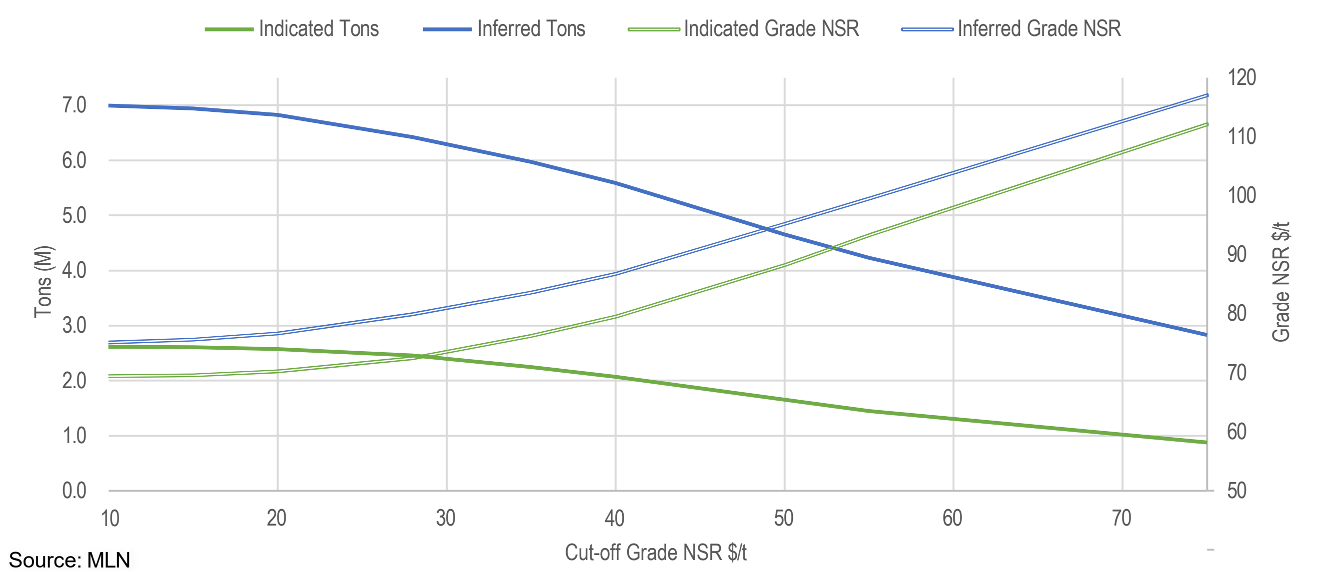
Table 1.1 La Negra Mineral Resource Statement at US$28/t NSR Cutoff

Classification	Cutoff Grade US$NSR/t	Tonnes (M)	Grade US$NSR/t	Grade Ag g/t	Grade Pb%	Grade Zn%	Grade Cu%
Indicated	28	2.46	73	64	0.27	1.95	0.50
Inferred	28	6.42	80	80	0.65	1.80	0.40

Source: MLN

Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. Resources are stated as undiluted. There is no certainty that all or any part of mineral resources will be converted to Mineral Reserves. Inferred Mineral Resources are based on limited sampling with assumed geologic continuity which suggests the greatest uncertainty for resource estimation. Quantity and grades are estimates and are rounded to reflect the fact that the resource estimate is an approximation. Resources are undiluted. NSR includes the following price assumptions: Ag US$20.0/oz, Pb US$0.90/lb, Zn US$1.10/lb and Cu US$3.30/lb based on the Q3 2021 Q3 long-term forecasts provided by Duff & Phelps (D&P). NSR includes varying recovery with the averages of 80% Ag, 68% Pb, 80% Zn, and 66% Cu.

Figure 1.7 Mineral Resource Grade-Tonnage Curve



Source: MLN

1.8 Mineral Reserve Estimate

No Mineral Reserves have been estimated as part of this study.

1.9 Mining

The mineralized zones that make up the La Negra project will be mined using as much of the existing mine infrastructure as possible, supplemented by new drift and ramp development, water handling and ventilation, as needed. Mining will take place with La Negra's existing mining fleet, supplemented with new and some used equipment that is expected to be available as required to meet the mine plan, which is based on the production of 2,500 tonnes per operating day, or 842,500 tpa. Any additional equipment is included in the capital budget and includes a 20% contingency. Any additional development and equipment required is included in the project's capital cost as described in 21.3. The mine plan envisions mining the zones corresponding to the mineralized bodies described in Section 14, with certain economic factors – such as mining recovery, dilution, capital and operating development, ventilation requirements, and operating costs – applied to these mineralized zones to present a reasonable prospect for economic extraction. This technical study does not present any Reserves (see Section 15).

All phases of mining, with the exception of haulage to surface, will be carried out by experienced La Negra personnel, with the latter being managed by a community-based contractor.

Each zone of mineralization was analyzed to determine the most optimum and practical mining method, which was then used along with the appropriate mine design criteria to develop a cut-off grade. As this is a PEA level study, all categories of resource were included in the optimization process.

For the purposes of the preliminary optimization, a mining cost of US$7.21/tonne mined was assumed for long-hole open stoping and was generated from first principles taking into account anticipated staffing levels, current wage levels plus anticipated bonuses, current equipment operating costs, and consumable costs from vendor quotation. An estimated development mining cost was also calculated at US$840 per m of advance, assuming a 4m x 4.5m drift size The cost of haulage from the mine to the crusher is US$1.18/tonne based on an active contract, which is carried out by a community-based contractor, is included in the mining cost quoted above. These costs are considered reasonable for this level of study and would be subject to revision and update as more detailed work is completed.

For the mining study the resource model was adjusted to account for expected mining dilution. Historically, dilution at La Negra has averaged 14%, for this study dilution of 15% has been accounted for.

Based on the parameters outlined in Section 16.11, as well as the first principle estimates of processing and G&A costs (see Section 22), a cutoff grade of US$28 per tonne was utilized for identifying potential mining areas.

1.9.1 Geotechnical Considerations

An initial geotechnical model suited to past operations was developed by A-Geommining in October of 2018. This work was considered by Mining Plus for this study. The mechanical properties for each mineralized zone were determined based on lithology and assigned a minimum, maximum and average Uniaxial Compressive Strength (UCS). Q-values (max, min, avg) were also determined for each zone for each lithology.

Based on site observations of the ground conditions at La Negra, the Geological Strength Index for the mine ranges between 40 and 80, with most of the readings between 60 and 75 and the lowest readings occurring only in faulted zones. This correlates very well with the Q values for the project as calculated by A-Geommining and reviewed by Mining Plus.

Excavation stability assessments were completed using industry-accepted empirical relationships, supported by historical experience. The rock mass conditions assessed in the range of Fair to Fair/Good or better are considered suitable for open stoping mining methods such as those that have been historically employed at La Negra. The ground conditions assessed within the Poor to Fair domain are considered adequate for open stoping methods, but with shorter length or width spans and with greater use of rib and sill pillars.

The recommended open stope geometry is 20 m long by 20 m high and 6 m wide, mined along the strike of the vein formation in a retreating sequence using a longitudinal orientation, although transverse mining will be considered in areas where the mineralization is greater than 6 m in width. Stability of the stope back is critical for maintaining stable mining conditions, and this design is expected to provide a factor of safety > 2.0.

Ground support design takes into consideration industry standard empirical guidelines and La Negra's experience with varying ground conditions within the mine. Historically very little in the way of ground support has been required given the competence of the country rock, although rock bolts and mesh have been utilized occasionally in areas with poorer ground conditions.

This study does not consider the use of backfill. Scoping level trade-offs and geotechnical assessment did not require the use of backfill. The absence of backfill does however, reduce resource recovery and the potential to utilize backfill to maximize resource recovery should be further considered in conjunction with current plans to filter tailings and deposit them over top of the existing (and permitted) TSF5/TSF5A and TSF3 facilities.

1.9.2 Mine Design and Mining Methods

The underground design for La Negra was based on industry-standard methodology for cut-off grade optimization, mine sequencing, and design at a scoping level. The main steps in the planning process are as follows:

- Assignment of economic criteria to the geologic resource model
- Definition of optimization parameters such as net smelter return ("NSR"), preliminary cost estimates, resource extraction, dilution, and metallurgical recovery estimates for each mineralized zone
- Calculation of economic stope limits for the various zones using stope optimization software
- Establishment of an economic scheduling sequence
- Identification of stoping areas and preliminary designs and mining sequence incorporating ventilation requirements

In recent history, two principal mining methods have been used at La Negra: long hole open stoping and mechanized room and pillar. While mechanized mining has predominated, some non-mechanized (jackleg mining) methods have been employed, primarily in the upper sections of the mine (i.e., above the main 2000 haulage level). Long-hole open stoping (LHOS) has been employed in areas where the mineralization is subvertical (but greater than 70 degrees to horizontal) while room-and-pillar was the method of choice for subhorizontal (but less than 30 degrees to horizontal) – and generally lower-grade – zones. Support pillars with dimensions of 8 by 8 meters were generally utilized in these zones.

The restart plan envisions utilizing a greater amount of long hole open stoping as the primary mining method, for the following reasons:

- Ground conditions allow for the use of this method
- The mine staff are familiar with this method given its use over almost 50 years
- The mine fleet is suitable for this extraction method
- It allows for low-cost extraction
- It provides the future potential for efficient backfilling.

Other variations of these mining methods will be considered in areas with poorer ground conditions, but only if such zones have a materially higher NSR, allowing for profitable extraction. The restart plan does not envision much use of jackleg mining for either stoping or development following the time when required initial slashing is complete.

1.9.3 Production Plan

The following criteria were used in the preparation of the production plan:

- The production plan has been developed on a monthly time period basis for the life-of-mine

- The mine will operate six days per week, with the exception of statutory holidays, or approximately 310 days per year
- Production will be primarily by sub-level long hole open stoping
- The process plant is scheduled to operate 337 days per annum
- The process plant has a theoretical capacity of 3,000 tpd but will be operated at 2,500 tonnes per operating day

The following table details the LOM production plan.

Table 1.2 LOM Production Schedule

		LOM	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Tonnes to the mill	(000's Tonnes)	6,223	843	843	843	843	843	843	843	326
Production and Throughput	(tpd)	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Ag Grade	(g/t)	63	47	53	62	63	63	55	81	96
Pb Grade	(%)	0.4	0.2	0.2	0.5	0.5	0.5	0.3	0.7	0.8
Zn Grade	(%)	1.5	1.3	1.4	1.8	1.6	1.7	1.6	1.3	1.4
Cu Grade	(%)	0.4	0.4	0.5	0.3	0.3	0.3	0.4	0.3	0.4
Fe Grade	(%)	8.6	9.8	8.9	8.6	8.2	8.2	8.7	8.7	6.3
As Grade	(%)	0.7	0.6	0.8	0.8	0.6	0.7	0.7	0.4	0.4

Source: MLN

1.9.4 Equipment

The underground mining activities at La Negra will be carried out with conventional equipment typical of smaller-scale underground mines, including single-boom drilling jumbos for drift and ramp access, ("simba") production drills for stope preparation, and scoop trams for mucking. The scoops are diesel fueled but the jumbos and production drills are electric. The existing fleet is detailed in 16.7.5.

La Negra historically relied on small, 2.5 and 3.5 cuyd scoop trams for mucking, but as the operation grew the smaller equipment was replaced with 4.0 and 6.0 cuyd scoops. Until the recent shutdown the smaller scoops were used in those areas with smaller headings but the redevelopment plan assumes that the smaller equipment will only be utilized as needed to help slash out the smaller headings and will then be retired.

Haulage from the loading pockets to the surface stockpile area outside the 2000 Level portal has historically been carried out by a community-based contractor utilizing 23 tonne trucks. This study assumes this arrangement will continue. The cost of contractor haulage is included in mining costs albeit shown as a separate line item.

1.10 Recovery Methods

The processing facility at Minera La Negra consists of a standard crushing, grinding, flotation, and filtration circuit producing lead-silver, copper-silver, and zinc concentrates (in that order). The concentrator has an operating capacity of 3,000 tonnes per day but is estimated in this document to be operated at a rate of 2,500 tpd after restart.

The crushing circuit consists of a 25" x 42" jaw crusher, followed by secondary and tertiary crushing with Symons 5 ½ ft standard and shorthead cone crushers, respectively, to produce a product with a p80 of 5/16". The material is conveyed to three fine ore storage bins with a capacity of 450 tonnes each. The grinding circuit consists of two parallel ball milling lines. The first consists of a 10' x 10' ball mill in a single grinding stage arrangement, while the second line consists of two ball mills, 9' x 11' and 7.5' x 11', in a two-stage milling arrangement, producing a p80 of 75μ.

The flotation circuit consists of three stages of flotation to recover lead, copper, and zinc concentrates, in that order. A variety of reagents are added throughout the process to maximize the recovery of the targeted metal, while suppressing unwanted materials such as iron and arsenic. The lead recovery circuit consists of four 350 ft^3 Outotec rougher flotation cells and four 50 ft^3 Denver scavenger/cleaner flotation cells. Sodium cyanide and zinc sulfate are added during the grinding stage to depress pyrite, arsenic and copper and zinc minerals, and AERO 7583 is added as a lead collector while CC1064 is added as a frother.

The copper recovery circuit consists of 10 160 ft^3 Denver flotation cells. Ammonium bisulfite is added as a pH modifier and Zn and Fe depressor, while S-7583 is added as a copper collector and CC1064 is added as a frother. Depending on the copper minerals sodium isopropyl xanthate is also added as a collector.

The zinc recovery circuit consists of four Denver 160 ft^3 rougher flotation cells and four Denver 160 ft^3 cleaner flotation cells. Lime is added as a pH modifier and copper sulfate is added to activate the zinc minerals. Aero 5160 is added as a collector, while CC1064 is added as a frother.

The concentrates are thickened and filtered to a moisture content of 10-12% with LOM concentrate grades of 60.2% Pb and 8,362 g/t Ag for the Pb-Ag concentrate, 44.1% Zn and 70 g/t Ag for the Zn concentrate, and 23.9% Cu and 1,740g/t Ag for the copper concentrate. See Table 1.2.

La Negra has a fully equipped laboratory to perform sample preparation and assays by ICP, atomic absorption and fire assay. The laboratory carries out assays for both exploration and concentrate samples.

Table 1.3 Minera Negra NSR Model

	Ag	Pb	Zn	Cu	Fe	As
Material Grade	63	0.46%	1.51%	0.35%	8.78%	0.71%
Gross Recovery (%)	79.7	72.3	84.0	68.0		
Concentration Ratio		193.1	34.5	99.9		
Concentrate Grade		**Pb**	**Zn**	**Cu**		
Moisture (%)		11.1	12.2	10.2		
Ag (g/t)		8,362	156	1,740		
Pb (%)		60.2	0.2	2.4		
Zn (%)		1.3	49.2	6.7		
Cu (%)		0.0	0.0	23.9		
Fe (%)		0.0	15.0	0.0		
As (%)		0.63	0.00	0.38		
Sb (%)		1.2	0.00	0.03		
Cd (ppm)		0.0	0.42	0.00		
Bi (%)		2.0	0.00	0.00		
SiO_2 (%)		0.0	0.00	0.00		
Cl (ppm)		0.0	0.00	0.00		
F (ppm)		0.0	0.00	0.00		
Payability						
Ag (%)		95%/50g/t ded	70%/100g/t ded	90%/31g/t ded		
Pb (%)		95%/3% ded	0.0	0.0		
Zn (%)		0.0	85%/8 % ded	0.0		
Cu (%)		0.0	0	96.5%/1% ded		
Deductions						
Treatment Charge (US$/t)		97	150	75		
Treatment Charge Escalation (US$/t)		0	0.12 > 1900/t	0		
Refining Charge Ag (US$/oz)		0.75	0.0	0.75		
Penalties						
As (US$/t)		0	0	2.5 > 0.2%		
Sb (US$.t)		0	0	2.5 > 0.1%		
Pb+Zn (US$/t)		0	0	2.5 > 2.0%		
Fe (US$/t)		0	2.5 > 5%	0.0		
As+Sb (US$/t)		2.5 > 0.3%	0.0	0.0		
Zn (US$/t)		2 > 5.0%	0.0	0.0		
F+Cl (US$/t)		2.00 > 500ppm	0.0	0.0		
NSR (US$/t)			**72.2**			

Source: MLN

1.11 Infrastructure

The infrastructure in and around Minera La Negra is fairly standard. The mine has access from the state capital city of Querétaro through a paved road to the town of Maconí. The last stretch to the plant site is via a well-maintained, year-round, 3.4 km long gravel road. Although it narrows to one lane locally it can handle all heavy equipment.

San Joaquín is the largest town close to Maconí, located 21 km to the north, with better services than Maconí. Local schooling is provided at Maconí through primary level, while San Joaquin provides secondary and high school equivalent levels. For technical and higher-level education, local people attend schools at Cadereyta, Ezequiel Montes or Querétaro.

Available transportation is limited to a private bus service from San Joaquín to Querétaro and other localities.

Electrical power is obtained from the national grid through a 34 kilovolt (kV) line to the process plant and mine facilities. Occasionally, power is delivered directly from the Ezequiel Montes sub-station. Electrical power is transformed at MLN's substation to 6.9 kV to be distributed to the process plant and mine facilities at 440 volts.

The site has both fixed land lines and satellite internet. Cellular phone service at the mine site and in the area around Maconí is limited.

Water for domestic sources comes from the Maconí River. Water for industrial purposes is obtained from several sources: water used within the mine is obtained from the small amount of surface rain and run-off water that infiltrates the mine; this water is recirculated from the lower levels using pumps to lift it to where it is needed. Historically, approximately 70% of the water used in the mill operation is recirculated from the tailings storage facility and the remaining 30% makeup water is obtained from the San Nicolás water well. With the planned introduction of filtered tailings, it is estimated that 90% of the water used in the plant will be recycled.

1.12 Environment and Social Impact

Minera La Negra has all the permits required to restart operations.

Minera La Negra operates under three separate environmental impact statements (*Manifestación de Impacto Ambiental – MIA*), two of which are currently valid and in effect. The third is for the TSF5 facility which is no longer in use. The initial MIA was issued for the mine, mill, and the original tailings facility. A second MIA was issued for the development of TSF5 (Tailings Storage Facility 5), and the third was an amendment that allowed the expansion of TSF 5, known as TSF5A.

These studies considered the impact of the operation on the environment and the social impact of the project. The area affected by the project is located in a region that had experienced significant historical impact, including past mining operations dating back to the pre-Columbian era as well as other human activities stretching back for hundreds of years.

The following table lists the key operating and environmental permits issued to Minera La Negra, and which allow the mine to engage in mining, processing, and tailings storage. MLN has all the permits required for startup.

Table 1.4 Minera La Negra Permits

License/Permit	Agency	Document Number	Status
Operating License	*SEMARNAT*	No. 0168 / 130.25 I. SE469, 27	Valid
Environmental License	*SEMARNAT*	LAU-22 / 000004-2016	Valid
Environmental Impact Statement (MIA) Mine, Plant and Tailings	*SEMARNAT*	F.22.01.01.01/1882/17	Valid
Environmental Impact Statement (MIA) TSF5	*SEMARNAT*	D.O.O. - 04853	Expired*
Environmental Impact Statement (MIA) TSF5A	*SEMARNAT*	F.22.01.01.01/1533/16	Valid
Environmental Impact Statement (MIA) Settling Pond	*SEMARNAT*	F.22.01.01.01/0070/2020	Pending
Hazardous Waste Register	*SEMARNAT, CONAGUA, STPS, SSC, SDS and municipal authorities*	22/EV-0040/10/18	Valid
Land Rezoning	*SEMARNAT, CONAGUA, STPS, SSA, SDS*	SRN/280/98	Valid
Federal Water Use Permit	*CONAGUA*	QRO100564	Valid
Wastewater Discharge Permit	*CONAGUA*	09QRO106300/26EDDL12	Valid
Waste Use Permit	*SEMARNAT, CONAGUA*	2S.3.21/00051-2020	Valid
Organic Residue Permit	*SEDESU*	-	Valid
Hazardous Waste Management Plan	*SEMARNAT*	22-PMG-I-3478-2019	Valid
Special Waste Management Plan	*SEDESU*	-	Pending
TSF5A Closure Plan	*SEMARNAT*	-	Pending
Explosives Permit	*SEDENA*	3121-Qro.	Valid

Source: Minera La Negra. *Not required for operations

There are 21 communities in the vicinity Minera La Negra and which together belong to the *Comunidad Agraria Maconí*. The largest of these is Maconí, with a population of over 900, but the majority consist of small communities with a population of less than 100 inhabitants, and the total population near the mine totals approximately 3,000 individuals. The location of these communities relative to Minera La Negra’s infrastructure is shown in Figure 1.4.

The project footprint consists of approximately 51 ha and constitutes the areas that are directly disturbed by existing infrastructure and earthworks, in addition to those that are projected as part of the longer-term operation of the mine.

Minera La Negra has developed a series of plans which outline its commitment to environmental and social management, monitoring and mitigation, and includes health and safety, security, environmental plans, and stakeholder engagement. These plans are reviewed and updated periodically, and will consider internal and external comments, stakeholder feedback, and third-party reviews, and of course any potential regulatory changes.

The following management plans have been developed and implemented:

- Stakeholder Engagement Plan (*Plan de Recuperación del Tejido Social*)
- Occupational Health and Safety Plan (*Programa de Seguridad e Higiene Industrial*)
- Emergency Preparedness and Spill Response Plan (*Plan de Contingencias por Residuos Peligrosos*)
- Emergency Preparedness Plan (*Programa Interno de Protección Civil*)
- Transport Management Plan (*Plan Interno de Seguridad Vial*)
- Cyanide Management Plan (*Procedimiento para el Manejo de Cianuro*)
- Reagent Management Plan (*Plan Específico de Seguridad e Higiene para el Manejo, Transporte y Almacenamiento de Sustancias Químicas Peligrosas*)
- Solid Waste Management Plan (*Plan de Manejo de Residuos Peligrosos*)
- Air Quality and Noise Management Plan (*Plan Anual de Protección y Conservación Atmosférica*)
- Dust Management Program (included in *Plan Anual de Protección y Conservación Atmosférica)*
- Surface Water Management Plan (*Plan Anual de Protección de Agua Superficial*)
- Soil and Tailings Management Plan (*Plan Anual para la Protección y Conservación de Suelos*)
- Biodiversity Management Plan (*Programa para el Rescate y Reubicación de Vegetación Forestal* and *Programa de Acciones para la Protección de la Fauna*)
- Physical and Property Security Plan (*Plan de Seguridad Patrimonial*)
- Cultural and Archeological Protection Plan *(Plan de Protección al Patrimonio Cultural, Paleontológico y Prehispánico)*
- Mine Closure Plan (*Guía para la Elaboración del Plan de Cierre de Mina y Planta de Beneficio*)
- TSF5 Closure Plan (*Plan de Obra Cierre del Depósito de Jales No. 5*)
- TSF5A Closure Plan (*Plan de Cierre de Depósito de Jales Proyecto Ampliación del Depósito de Jales no. 5*)
- TSF Emergency Management Plan (*Plan de Atención a Emergencias Depósito de Jales*)

Minera La Negra is located on land belonging to an agrarian community named *Comunidad Agraria Maconí*. This is not to be confused with a common form of communal land ownership unique to Mexico known as the *ejido* although in practice there are minimal differences between an *ejido* and an agrarian community.

Based on the latest agrarian census by Mexico's statistics agency, *INEGI*, completed in 2020, there are 29,793 *ejidos* in Mexico covering an area of just over 82.2 million ha, compared with 2,354 agrarian communities covering just over 17.5 million ha. For the state of Querétaro the comparative figure is 364 *ejidos* covering 0.48 million ha and 16 agrarian communities covering 58,288 ha.

The benefits and/or payments that the third party provides to the community are known as the *usufructo*, and the agreement between the *Comunidad Agraria* and the third party is known as the *Contrato de Usufructo por la Ocupación Temporal de Tierras Comunales*. Following Peñoles' sale of the property, a new 15-year *usufructo* was entered into between the community and Minera La Negra on July 18th 2006, covering an area of 42.5 ha. This agreement was later amended the 16th of February of 2016 following a series of negotiations that commenced in late 2014 designed to address certain grievances by the community with respect to the original agreement. The area covered by the *usufructo* was increased to 51.0 ha to allow for the construction of TSF 5A.

The latest amendment to the *usufructo* was completed in October 2021 and amends the terms of the agreement that expired on 18 July 2021. The agreement is valid for 15 years and covers the same 51.0 ha. In addition to the annual land payment, Minera La Negra has agreed to carry out certain infrastructure projects of importance to the community once the project is fully in production.

The company is subject to inspections and audits by several government agencies. At the Federal level the water agency CONAGUA inspects the site one to two times per year, while Profepa (*Procuraduría Federal de Protección al Ambiente*) which is the enforcement agency of SEMARNAT, inspects the mine three to four times per year.

At the State level Minera La Negra is subject to inspections by the sustainable development agency SEDESU (*Secretaría de Desarrollo Sustentable*) and by the State water commission CEA (*Comisíon Estatal del Agua*). Each of these agencies inspects the company on average once per year.

The municipality of Cadereyta de Montes also inspects the mine once to twice per year.

Proper closure preparation is important to ensure that a mining project will have a positive impact on a community or region. Minera La Negra's closure and reclamation goals are as follows:

- Future public health and safety are not compromised
- Environmental impacts are minimized and environmental resources in the region are not subject to additional deterioration over time
- Post-closure use of the site is beneficial and sustainable and acceptable to the community and regulators
- Adverse impacts on the local community is minimized
- Socioeconomic benefits are maximized
- Closure and rehabilitation are funded by MLN

In accordance with Mexico's regulatory requirements, a series of closure plans for La Negra were developed for each of the company's MIAs. The closure plan for TSF5 was developed in July 2019 by MLN in accordance with Mexico's mining law (*Ley Minera*) and in accordance with SEMARNAT regulations NOM-141-SEMARNAT-2003 and NOM-147-SEMARNAT/SSA1-2004. That same year the company developed the closure plan for TSF5A. Preliminary closure and rehabilitation costs including engineering planning and environmental monitoring were developed by Minera La Negra. A summary of the costs developed for this study are included in Chapter 21.

1.13 Capital Cost Estimate

The total estimated cost required to restart La Negra includes the cost of refurbishing the existing mining fleet and purchasing certain additional new and used equipment, as well as advancing mine development, partial refurbishment of process lines within the processing plant, a new filtered tailings facility, first fills, and owner's costs. Subject to further revisions as plan updates or details emerge, these costs are considered reasonable for this level of study.

Capital cost estimates are based on a combination of prices and quotations provided by equipment suppliers and estimates provided by Minera La Negra personnel based on historic operating experience. The following table (Table 1.5) summarizes the initial and sustaining capital cost estimate.

Table 1.5 LOM Capital Cost Estimate

Description	Restart Capital (US$m)	Sustaining Capital (US$m)	Closure (US$m)	LOM Total (US$m)
Processing Plant	2.41	2.38	-	4.79
TSF	13.55	4.11	-	17.66
Underground Development	0.57	18.18	-	18.75
Equipment Replacement/Refurb	0.46	12.31	-	12.77
Indirect Costs	2.03	-	-	2.03
Owner's Costs	1.63	-	-	1.63
Capitalized Exploration	0.29	4.57	-	4.85
Other	-	0.58	-	0.58
Closure	-	-	5.00	5.00
Total Capital	**20.94**	**42.13**	**5.00**	**68.06**

Source: MLN, Mining Plus, Wood

The underground development required for restart was developed with the support of Mining Plus, while the costs for the development of a filtered tailings plant were developed with the support of Wood.

1.14 Operating Cost Estimate

The life-of-mine (LOM) operating costs for La Negra average US$28.00/tonne and include the following:

- Mining
- Processing
- Tailings
- Technical Services
- General and Administrative Costs

The cost per tonne milled is based on an annual processing rate of 842,500 tonnes (2,500 tonne per operating day). These costs are considered to be reasonable for this level of study.

The LOM operating cost excludes offsite costs such as treatment charges, refining charges, other concentrate penalties/losses, and concentrate transportation. As described in Sections 13, 19, and 22 these costs are included in the NSR for each of the concentrates.

Table 1.6 Life of Mine and Annual Operating Cost Summary

Operating Costs	LOM Cost US$m)	Annual Cost (US$m)	US$/t milled
Mining			
Payroll (Staff and Union)	13,377,067	1,803,650	2.15
Diesel	14,119,966	1,903,816	2.27
Haulage	7,365,608	993,116	1.18
Mine Services	4,359,212	587,759	0.70
Drill Steel	3,677,070	495,785	0.59
Explosives	3,433,317	462,919	0.55
Mechanical Maintenance	2,903,624	391,500	0.47
Tools	1,337,625	180,354	0.21
Safety	659,493	88,920	0.11
Electrical Maintenance	238,197	32,116	0.04
Spare Parts	491,390	66,255	0.08
Gasoline	215,770	29,093	0.03
Other	42,066	5,672	0.01
Total Mining Costs	**52,220,404**	**7,040,953**	**8.39**
Processing			
Reagents	26,855,799	3,621,007	4.32
Labor (Staff and Union)	13,730,764	1,851,339	2.21
Power	13,035,814	1,757,638	2.09
Maintenance	10,798,238	1,455,942	1.74
Spare Parts	5,275,250	711,270	0.85
Haulage	2,314,997	312,134	0.37
Make-up Water	713,474	96,199	0.11
Lab	1,079,044	145,489	0.17
Fuel and Lubricants	887,969	119,726	0.14
Construction Materials	192,976	26,019	0.03
Tools	77,768	10,486	0.01
Other	144,981	19,548	0.02
Safety Equipment	34,849	4,699	0.01
Total Processing Costs	**75,141,922**	**10,131,495**	**12.07**
Tailings	**14,597,557**	**1,968,210**	**2.35**
G&A			
Labor (Staff and Union)	5,869,902	791,448	0.94
Outside Service Providers	7,208,736	971,964	1.16
Insurance	5,119,466	690,265	0.82
Mining Concessions/Community	4,048,782	545,903	0.65
Environmental	2,887,820	389,369	0.46
Safety/Security	1,664,406	224,414	0.27
Supplies/Other	545,057	73,491	0.09
Accommodations and catering	443,474	59,794	0.07
Total G&A	**27,787,644**	**3,746,649**	**4.47**
Technical Services	**4,975,345**	**670,833**	**0.80**
Total Operating Cost	**174,722,872**	**23,558,140**	**28.08**

Source: MLN

1.15 Economic Analysis

Table 1.7 outlines the metals prices and foreign exchange (FX) assumptions used in the economic analysis. Mine revenue will be derived from the sale of lead-silver, zinc, and copper-silver concentrates that will be sold to concentrate offtakers in the domestic and/or international markets. Although MLN has historically operated under offtake contracts with various offtakers there are currently no contractual arrangements.

Table 1.7 Commodity Price and FX Assumptions

Commodity	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Silver	US$/oz	22.50	22.50	22.13	22.00	22.00	22.00	22.00	22.00
Lead	US$/lb	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Zinc	US$/lb	1.18	1.16	1.15	1.15	1.15	1.15	1.15	1.15
Copper	US$/lb	3.95	3.76	3.78	3.65	3.60	3.60	3.60	3.60
MXN	per US$	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

Source: MLN

Table 1.8 shows the LOM and annual projected payable metals and average payability for each metal.

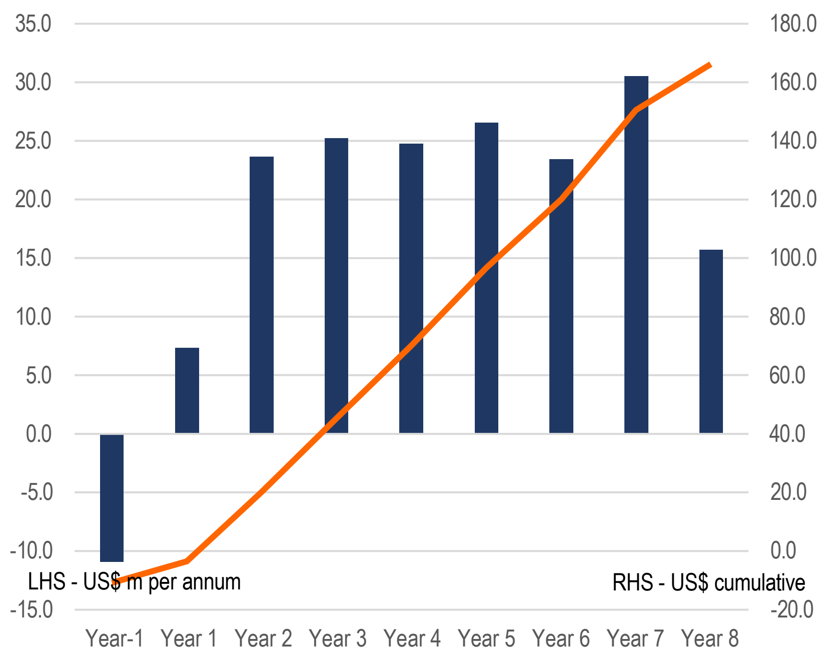
Table 1.8 LOM Payable Metals

Metal	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	LOM Total
Ag	koz	893	1,018	1,202	1,242	1,253	1,062	1,656	777	9,101
Pb	klb	1,920	2,201	5,747	6,347	9,220	3,624	8,334	3,569	40,960
Zn	klb	16,099	18,164	22,834	21,009	20,106	20,424	16,584	6,680	141,900
Cu	klb	5,075	5,866	3,675	3,603	3,629	4,568	3,555	1,653	31,623

Source: MLN

The project has an after-tax Net Present Value based on a 5% discount rate of US$132.4 m, based on the commodity price and FX assumptions detailed in Table 1.6 and Table 23.2. The figure below shows the annual projected cash flows for the project.

Figure 1.8 Annual and Cumulative After-Tax Cash Flow (US$ m)



Source: MLN

The following table summarizes the results of the financial analysis for the La Negra restart.

Table 1.9 Project Results Summary

	Unit	Value
AISC	US$/oz Ageq	12.95
LOM NSR	US$ m	449.2
LOM Operating Costs	US$ m	185.1
LOM Capital	US$ m	68.1
Pre-tax Cash Flow	US$ m	202.3
After-tax Cash Flow	US$ m	166.2
Pre-tax NPV (5%)	US$ m	160.5
After-tax NPV (5%)	US$ m	132.4

Source: MLN

The following table shows the NPV for the project at several discount rates.

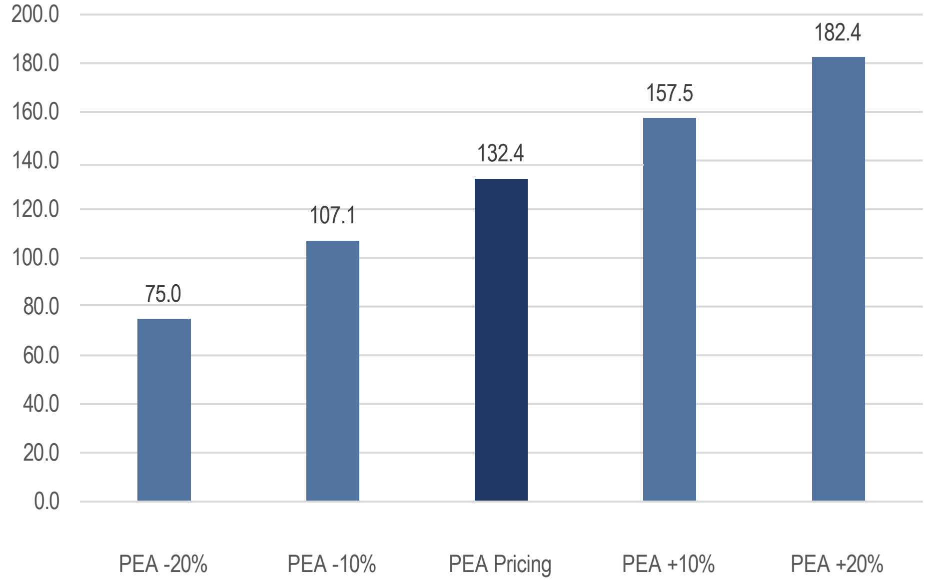
Table 1.10 Project NPV Discount Rate Sensitivity

Discount Rate (%)	Pre-tax NPV US$ m	After-tax NPV US$ m
0.0	202.3	166.2
2.5	179.8	148.0
5.0	160.5	132.4
7.5	143.9	119.0
10.0	129.5	107.3
12.5	117.1	97.1
15.0	106.2	88.2

Source: MLN

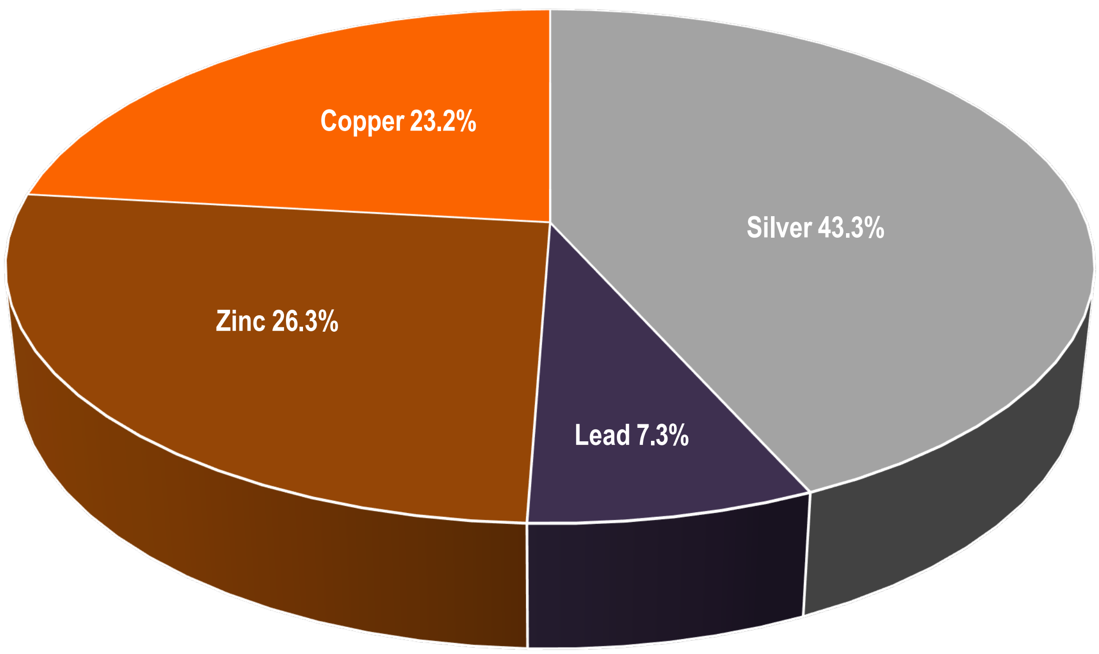
Figure 1.9 shows the project's sensitivity to metal prices, with prices of -20%, -10%, +10%, and +20% relative to the base case commodity price estimates used in this report. Figure 1.10 shows the distribution of revenue by payable metal.

Figure 1.9 La Negra NPV (US$ m) Metals Price Sensitivity



Source: MLN

Figure 1.10 NSR Distribution by Metal



Source: MLN

1.16 Project Execution

The La Negra site team, supported by the consultants listed in this report, have prepared a project restart execution plan, as shown in Figure 26.1.

1.17 Conclusions and Recommendations

The Preliminary Economic Assessment summarized in this technical report contains adequate detail and information to support the positive economic outcome and recommended restart of La Negra, particularly as this is a brownfields site with existing infrastructure, equipment, development, operating permits, and labor force. Standard industry practices, equipment and design methods were used.

The project contains sufficient resources to be mined by underground methods and recovered by differential flotation.

Based on the results of this study, both economic and technical, and considering that La Negra is a brownfields site, further advancement of La Negra is warranted.

1.17.1 Project Risks

In common with virtually all other mining projects, La Negra faces many risks that could affect the economic viability of the project. External risks are more difficult to predict and potentially impossible to control, such as political risks (including changes in regulations, legislation, ownership rules, and taxes), commodity prices, input prices (particularly reagents and energy), and exchange rates. Maintaining strong relationships with all stakeholders is critical to the success of the project, but these risks are reasonably predictable, and manageable, and form part of the company's Stakeholder Engagement and Environmental Management Plans.

The most significant potential risks include operating and capital cost escalation (including those caused by schedule delays), permitting and environmental compliance, ability to raise finance, commodity prices and exchange rates.

Figure 27.2 identifies the most significant risks associated with the project restart plan and ongoing operating activities. This table also details the measures implemented to avoid, minimize, mitigate and/or offset these risks.

1.17.2 Project Opportunities

Section 27.2 outlines the various opportunities that will be considered to improve the economics, timing, and operational performance of the mine. The most significant opportunity is to extend the life-of-mine beyond that outlined in this report. In addition, the mine plan presented in this report recovers only a portion of the resource due to the need to leave sufficient rib and sill pillars. The introduction of paste backfill later in the mine life could result in the recovery of a greater percentage of the overall resource, even after the operating and capital costs of paste backfill are incorporated.

Table of Contents

List of Tables

List of Figures

2 Introduction

This technical report has been prepared for Minera La Negra S.A. de C.V.

2.1 Terms of Reference and Purpose

In March of 2020 the owners of Minera La Negra determined it was necessary to suspend the operation to focus on a turnaround plan for the asset, including 1) exploration and the estimation of an updated resource, 2) right-sizing the workforce and restructuring the existing collective bargaining agreement, 3) renegotiation of existing liabilities, and 4) preparation of a restart plan for the mine. In early 2021 an ongoing tax litigation with SAT was resolved in favor or Minera La Negra and eliminated a significant potential tax liability. In April of 2021 the company reached an agreement with the union (*Sindicato Nacional de Trabajadores Mineros Metalúrgicos y Similares de la República Mexicana* – SNTMMSRM) de la to reduce the workforce through a negotiated severance process approved by the union and the labor courts, and a new contract with the union was agreed.

With these issues resolved, the company initiated the work required to update the resource estimate and develop a restart plan. In May 2021 the company initiated a surface sampling and mapping program and in June began an underground drilling program. In October 2021 Mining Plus was engaged to assist in the development of a mine plan to be the basis for a re-start plan. The mine plan is based on the updated resource estimate detailed in Section 14, although, as noted in Section 15, no reserve estimate has been calculated as part of this report. In addition, Wood PLC was tasked in July 2021 with considering alternatives for tailings storage/disposal, and the preferred alternative was then incorporated into the life of mine plan and economic model, as detailed in Section 24.

2.2 Section Contributors

Table 2.1 details the responsible contributors for each section of the report. The authors are considered Qualified Persons (QPs as defined in National Instrument 43-101) by virtue of their education and experience and are members in good standing of their respective professional associations. The QPs were assisted by the individuals noted in 2.2.1.

Table 2.2.1 List of Qualified Persons (QPs) and Responsibility

Qualified Person	Company	Independent	Report Sections Responsibility/Contributions
Kim Kirkland, P.Geo (QP)	Mining Plus US	Yes	7, 8, 9, 10, 11, 12, 14
Scott Britton, PE (QP)	Mining Plus US	Yes	1, 2, 3, 4, 5, 6, 13, 16, 17, 18, 20, portions of 21.1, 21.1-21.4, 22.2-22.3, 24, 25, 26, 27
Glenn Zamudio (QP)	Mining Plus US	Yes	19, 21, 22, 23
Steven Truby (QP)	Wood EIS	Yes	18.5, portions of 21.1, 21.5, portions of 22.1, 22.4, 25.3, 27.4

Source: MLN

2.2.1 Additional Contributors

The following individuals also contributed to the preparation of this report:

Luis Peloquin, PEng - Mining Plus

Chris Milne, PEng – Mining Plus

Calen Dubois, PEng – Mining Plus

José Ramón Colque – Mining Plus

Geoff Elson, PG – Orion Resource Partners

Victor Flores, CFA – Orion Resource Partners

Minera La Negra Staff

2.3 Site Visits

Kim Kirkland, FAusIMM – Principal Consultant, Mining Plus US, visited the property 27 to 30 March 2022

Scott Britton, PE, RM-SME – Principal Consultant, Mining Plus US, visited the property 27 to 30 March 2022

Luis Peloquin,PEng - Did not visit site

Glenn Zamudio,FAusIMM - Did not visit site

Steven Truby, PE – Did not visit site

2.4 Units, Currency and Rounding

Every effort has been made to display clearly the units employed throughout this report. The currency used throughout this report is US dollars (designated by US$) unless otherwise noted.

The calculation of, *inter alia*, totals, subtotals, weighted averages may result in rounding that could introduce a margin of error in such calculations. The authors do not believe that these are material or in any way compromise the results, conclusions, and recommendations presented in this report.

2.5 Coordinate System and Elevation

The mine currently operates in UTM WGS84 zone 14, but has historically used UTM Nad27 zone 14, and a local mine grid developed by Peñoles. The historic local mine grid was tied to a different elevation datum which is offset from the current elevation datum by +94m, as a result, the level names do not align with current graphical representation, for example the main 2,000 haulage level resides at 1,906 meters of elevation. Table 2.2 shows the conversions from the current coordinate system to previously used systems. The local grid remains in use with respect to named crosscuts and stopes and for level references but is not used for cartesian coordinates. Historic maps and charts in the mine office generated prior to Aurcana exclusively use the local mine grid. UTM Nad27 is the reference coordinate system for many of the concessions granted prior to Aurcana's involvement as well as some information supplied by the *Servicio Geológico Mexicano* ("SGM").

Table 2.2 Coordinate Conversion From Historic Mine Grid

Coordinate System	Easting (m)	Northing (m)	Elevation (m)
UTM WGS84 (current)	442,640.44	2,299,904.08	-94
UTM Nad27	442,644.21	2,299,725.76	-94
Local Mine Grid	0	0	0

Source: MLN

The topographic surface of the project area was generated by L3Harris, an informational technology services provider, from satellite imagery and has a vertical accuracy of +/-1.0 meter.

2.6 Sources of Information

Sources of information include data and reports provided or reviewed by the Qualified Persons, as listed in Sections 1.1 and 2.2, based on information provided by Minera La Negra and others. References can be found in Section 27. Background material was also sourced from previous technical reports prepared for this property.

3 Reliance on Other Experts

3.1 Ownership

Minera La Negra has received a legal opinion prepared by Durón Mila & Asociados, a Puebla-based firm specializing in matters related to mining law, dated June 2021, verifying the status of its title and concessions, and confirming the information presented in Section 4.2.

3.2 Environmental and Permitting

The Environmental, Permitting, and Socioeconomic Impact Section has been updated by Minera La Negra. Guillermo Barrera of MLN have reviewed this section for accuracy and consistency, which has also been verified by Mining Plus US qualified persons and is responsible for its content.

3.3 Taxes and Royalties

Information regarding taxes and royalties was provided by Minera La Negra. Álvaro Urquidez, CFO of Minera La Negra, reviewed this information which was verified by Mining Plus US qualified persons and is responsibility for this content.

4 Property Description and Location

4.1 Location

The La Negra project is located in central Mexico approximately 90km in a direct line to the northeast of Querétaro, capital of the state of the same name, or approximately 150km by paved road. The center of the property is located at approximately 20°51.1.' North Latitude and 99°30.9' West Longitude (UTM 14Q 2303950N / 426443E (WGS84 datum)).

Figure 4.1 Project Location Map

Source: MLN

Querétaro has a population of 2.4 m inhabitants, based on the 2020 census, and the capital city has a population of 1.1 m (Figure 4.1). The main industrial activities in the state include automotive and aerospace manufacturing, as well as logistics and distribution, given its location close to Mexico City. The state also has a burgeoning agricultural sector, and produces primarily specialty products such as triticale, roses, asparagus, chickpeas, carrots, as well as an emerging viticulture industry.

4.2 Property Description and Concessions

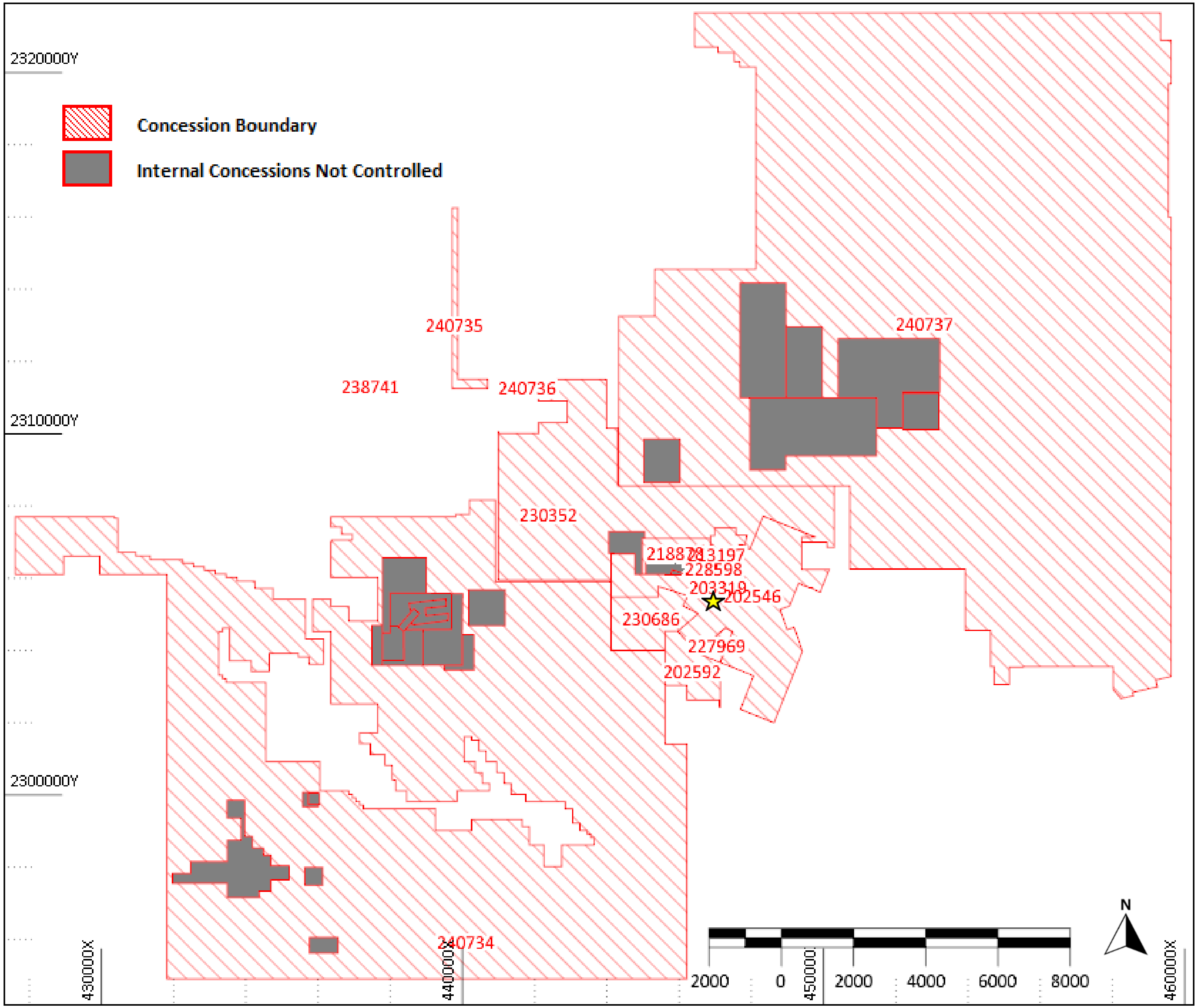
The property consists of 15 contiguous Mineral Concessions with an aggregate area of approximately 82,878 ha. Of this total, approximately 45,570 ha are under application, while the balance are concessions that are paid up and in good standing. There are no known factors or risks that may affect access, title, or the right or ability to perform work on the property.

Table 4.1 Minera La Negra Mining Concessions

Concession No.	Concession Name	Granted	Expires	Area (ha)
202546	LA NEGRA	1-Dec-95	19-Dec-32	1,350.79
213197	EL NEGRO	30-Mar-01	29-Mar-51	1.15
218878	EL PATRIARCA	23-Jan-03	22-Jan-53	110.33
203319	MARIANA	28-Jun-96	27-Jun-46	0.65
202592	LA YEGUA	8-Dec-95	7-Dec-45	203.39
230352	MACONI	17-Aug-07	16-Aug-57	2,281.12
230686	TICHI	3-Oct-07	2-Oct-57	293.53
227969	DIANA	20-Sep-06	19-Sep-56	43.02
228598	LIGIA	12-Dec-06	11-Dec-56	1.53
238741	EL SOL	18-Oct-11	17-Oct-61	20.65
240734	AURCANA 1 Fracción 1	26-Jun-12	27-Jun-62	13,814.08
240735	AURCANA 1 Fracción 2	26-Jun-12	27-Jun-62	100.2
240736	AURCANA 1 Fracción 3	26-Jun-12	27-Jun-62	32.25
240737	AURCANA II	28-Jun-12	27-Jun-62	19,055.98
Under application	AURCANA III	Pending approval		45,569.63
			TOTAL	**82,878.30**

Source: MLN

Figure 4.2 MLN Concession Areas



Source: MLN

4.3 Ownership

The Mineral Concessions are owned 100% by Minera La Negra. MLN is owned 50% by Dalú S.A.R.L., a corporation controlled by Orion, and 50% by Grupo Desarrollador Migo, S.A.P.I. de C.V., controlled by M Grupo.

The following sequence of agreements took place following Peñoles' decision to put the mine on care and maintenance in the year 2000, and eventually led to the current ownership structure:

- On 22 December 2005 Reyna Mining and Engineering, S.A. de C.V. (Reyna) signed a letter of intent with Peñoles to acquire MLN.
- On 22 February 2006, Aurcana entered into a letter of intent with Reyna to acquire MLN.
- On 24 March 2006 Aurcana entered into a joint investment contract with Reyna to acquire 80% of the capital of Real de Maconí.
- On 18 May 2006 Peñoles entered into a Sales and Purchase Agreement to sell its shares in MLN to Aurcana and Reyna.
- In July 2009 Aurcana increased its ownership in MLN to 92% and in February 2012 to 99.86%, in both instances due to Reyna failing to contribute its share of joint venture payments.
- On 7 January 2016 Orion acquired 100% of the shares owned by Aurcana (over 99.999% of the shares of MLN) as part of a court-sanctioned restructuring of Aurcana following its inability to pay certain amounts due to Orion. Orion entered into an agreement with Aurcana for the latter to operate the mine on behalf of Orion.
- In March 2019 Orion terminated the operating agreement with Aurcana and appointed its own General Manager.
- On 6 August 2020 Orion entered into a joint venture agreement with M Grupo, a Querétaro-based infrastructure and real estate company, whereby M Grupo could earn a 50% interest in MLN.
- In December 2021 M Grupo notified Orion that it would not be exercising its option to earn a 50% interest in MLN. In January 2022 the parties negotiated a revised agreement with Orion retaining 100% of the asset and M Grupo retaining a contingent interest depending on whether the asset is restarted or sold, according to a pre-set formula.

4.4 Land Use Agreement

MLN operates under a land-use agreement (*Contrato de Usufructo*), initially dated 4 December 1984, with the community of Maconí (*Comunidad Agraria de Maconí*) that provides payments to the community in exchange for the right to operate the mine on property belonging to the community. The agreement also requires MLN to contract certain services – namely concentrate haulage, personnel transport, housekeeping, and catering – to community-owned businesses. The agreement also requires MLN to perform certain remediation activities upon closing.

The agreement was amended in February 2016 and again in October of 2021. The October 2021 agreement provided for an uninterrupted 15-year extension of the land-use agreement.

4.5 Royalties and Taxes

As described in sections 4.5.1 – 4.5.3, inclusive, Minera La Negra has three distinct royalties. The first consists of the statutory royalty paid to the government (*derecho especial de minería*) and which is paid at the rate of 7.5% of gross income as described in the *Ley Federal de Derechos* article 168, with certain deductions allowable per the *Ley del Impuesto Sobre la Renta* article 25. The second is the *derecho extraordinario de minería* which levies a payment of 0.5% on precious metals, and which is also paid to the government. In addition, there is a royalty payable to Peñoles, which is currently 2.8% but subject to certain deductions.

4.5.1 Statutory Royalty

On 1 January 2014 Mexico introduced a mining royalty (*derecho especial de minería*) payable twice annually at a rate of 7.5% of gross income from mining activities, subject to certain allowable deductions per article 25 of the *Ley del Impuesto Sobre la Renta* (capital investment, financing costs and inflation adjustment cannot be deducted).

In addition, producers of gold, silver and platinum are also required to pay an additional, extraordinary mining royalty (*derecho extraordinario de minería*) equivalent to 0.5% of all revenues arising from the sale of gold, silver and platinum, and is payable in March of each year.

Idle concessions are also subject to an additional mining royalty (*derecho adicional sobre minería*) if the holder of the concession has not carried out any exploration or exploitation for two years within an eleven-year period.

4.5.2 Peñoles Royalty

Peñoles, the original vendor of the asset, is entitled to a royalty payment that is described in the 2006 purchase and sale agreement as a *prima por descubrimiento*, or discovery bonus, but is in essence a royalty on production from the following concessions: La Negra and Mariana (where the historic and current operations are centered), El Patriarca, La Yegua, and El Negro. The royalty was initially tied to the price of copper as follows:

- 3.5% when the price of copper is equal to or above US$1.60 per pound; or
- 3.0% when the price of copper is equal to or above US$1.30 per pound; or
- 2.5% when the price of copper is equal to or above US$1.00 per pound; or
- 0% when the price of copper is less than US$1.00 per pound.
- The royalty is payable after the deduction of all treatment charges, freight, penalties, and taxes.

MLN questioned the validity of the royalty and filed suit in 2014 requesting its annulment, arguing that the royalty was payable by Real de Maconí, and not by Aurcana, and MLN ceased payment of the royalty. Following appeals by both parties, the courts ultimately determined that MLN was subject to the royalty, but that Peñoles had miscalculated the royalty and had not taken into account the deductions that MLN was entitled to, thereby overcharging MLN. In April 2020 the parties reached a settlement and amended the royalty as follows:

- 2.8% when the price of copper is equal to or above US$1.60 per pound; or
- 2.4% when the price of copper is equal to or above US$1.30 per pound; or
- 2.0% when the price of copper is equal to or above US$1.00 per pound; or
- 0% when the price of copper is less than US$1.00 per pound.
- The royalty is payable after the deduction of US$16 per tonne of concentrate and the deduction of freight.

The royalty is payable on the same concessions as the original 2006 royalty.

4.6 Permitting

4.6.1 Mining Rights

Mexico's *Ley Minera* (Mining Law) grants concessions for a period of 50 years from the date of grant, with a requirement for minimum, annual work requirements – including semi-annual work reports – and the payment of semi-annual fees which are generally due in January and July of each year. The fees or mining duties (*Derecho Minero*) are calculated based on the size and age of the concession, but also depend on the annual adjusted quote published in the *Diario Oficial de la Federación* in accordance with Articles 59 through 66 of the *Reglamento de la Ley Minera* (Mining Law Regulations).

Minera La Negra has received a legal opinion prepared by Durón Mila & Asociados, a Puebla-based law firm specializing in matters related to mining law, verifying the status of its title and concessions, and confirming the information presented in Section 4.2.

Minera La Negra's surface rights are described in Sections 4.2 to 4.4.

4.6.2 Additional Permits

Exploration activities are regulated by the *Secretaría del Medio Ambiente y Recursos Naturales* (SEMARNAT) under a 1988 law known as the *Ley General del Equilibrio Ecológico y la Protección al Ambiente* (LGEEPA), which sets the framework for environmental legislation in Mexico. Depending on the amount of disturbance, NOM 120 SEMARNAT-2011 establishes the permitting and reporting requirements for exploration, which can range from no permitting for activities such as mapping, geochemical sampling, and geophysics, to the filing of an *Informe Preventivo* for activities such as trenching and access roads, to the need for a MIA in the case of significant surface disturbance.

Minera La Negra requires a number of permits and licenses in order to operate, as follows:

- Operating License No. 0168 required for mining and processing;
- *Manifestación de Impacto Ambiental* (MIA), the mine's Environmental Impact Statement, No. F.22.01.01.01/1882/17;
- Land Use License No. SRN/280/98;
- Tailings Dam MIA F.22.01.01.01/1533/16];
- Hazardous Waste Management Plan No. 22-PMG-I-3478-2019;

Table 4.2 Minera La Negra Permits

License/Permit	Agency	Document Number	Status
Operating License	*SEMARNAT*	No. 0168 / 130.25 I. SE469, 27	Valid
Environmental License	*SEMARNAT*	LAU-22 / 000004-2016	Valid
Environmental Impact Statement (MIA) Mine, Plant and Tailings	*SEMARNAT*	F.22.01.01.01/1882/17	Valid
Environmental Impact Statement (MIA) TSF5	*SEMARNAT*	D.O.O. - 04853	Expired*
Environmental Impact Statement (MIA) TSF5A	*SEMARNAT*	F.22.01.01.01/1533/16	Valid
Environmental Impact Statement (MIA) Settling Pond	*SEMARNAT*	F.22.01.01.01/0070/2020	Pending
Hazardous Waste Register	*SEMARNAT, CONAGUA, STPS, SSC, SDS* *and municipal authorities*	22/EV-0040/10/18	Valid
Land Rezoning	*SEMARNAT, CONAGUA, STPS, SSA, SDS*	SRN/280/98	Valid
Federal Water Use Permit	*CONAGUA*	QRO100564	Valid
Wastewater Discharge Permit	*CONAGUA*	09QRO106300/26EDDL12	Valid
Waste Use Permit	*SEMARNAT, CONAGUA*	2S.3.21/00051-2020	Valid
Organic Residue Permit	*SEDESU*	-	Valid
Hazardous Waste Management Plan	*SEMARNAT*	22-PMG-I-3478-2019	Valid
Special Waste Management Plan	*SEDESU*	-	Pending
TSF5A Closure Plan	*SEMARNAT*	-	Pending
Explosives Permit	*SEDENA*	3121-Qro.	Valid

Source: MLN. * Not required for operations

La Negra has all the permits required for startup and operations, even though there are three permits that are pending/in process. The MIA for the construction of a second water storage facility is pending, but there is already a water storage facility on site at the top of TSF5 with 20,000m^3 of capacity that is operational. The Special Waste Management Plan will be filed with the state once the warehouse required for the storage of this material has been built. TSF5 is no longer in use and is being reclaimed. The closure plan for TSF5A does not need to be filed until the facility is ready for closure.

4.7 Property Risks

Other than the information provided in Sections 4.1 to 4.8 there are no other significant factors or risks that might impact access, title, or the right or ability to perform work on the property or to operate the mine.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The La Negra project is located in central Mexico approximately 90km in a direct line to the northeast of Querétaro, capital of the state of the same name, or approximately 150km by paved road. The center of the property is located at approximately 20°51.1.' North Latitude and 99°30.9' West Longitude (UTM 14Q 2303950N / 426443E (WGS84 datum)).

Figure 5.1 Location Map for La Negra

Source: MLN

The state of Querétaro has a population of 2.4 m inhabitants, based on the 2020 census, and the capital city has a population of 1.1m (see Figure 5.1). The main industrial activities in the state include automotive and aerospace manufacturing, as well as logistics and distribution, given its location close to Mexico City. The state also has a burgeoning agricultural sector, and produces primarily specialty products such as triticale, roses, asparagus, chickpeas, carrots, as well as an emerging viticulture industry.

5.1.1 Airport

The closest international airport to the site is the *Aeropuerto Intercontinental de Querétaro* (Querétaro Intercontinental Airport), located approximately 30km to the east of the city of Querétaro, and 125km to the SE of La Negra. In addition to serving major domestic destinations, the airport has daily flights to Houston, Dallas and Atlanta.

The Querétaro airport also serves as a major transportation hub and transshipment point for freight destined for Mexico City and is the operations base for several international aerospace firms with operations in Mexico.

5.1.2 Port

The port of Manzanillo, in the state of Colima, is the main shipping port for concentrates destined for Asian smelters and is approximately 800 km WSW of the La Negra mine site. Manzanillo can be reached by paved road via Querétaro, west to Celaya, Irapuato, and Guadalajara, and then south through Colima and on to Manzanillo. The port of Guaymas, in the state of Sonora, is also a concentrate shipping port.

5.2 Physiography

La Negra is located in a mountainous range known as the Sierra Gorda, which is part of the Sierra Madre Oriental, consisting of rugged, steep topography with peaks up to 3100 m in altitude and deep river valleys at an elevation of 1700 m. The climate is temperate but the region is semi-arid, and consists of scrubby vegetation and cacti, with deciduous forest and pine trees in those areas that receive greater rainfall, primarily MW of the property area and locally in drainages and the margins of rivers. Although the region is arid, there are numerous springs throughout the area. The main portal for the mine is located at 1906 masl, with operations as high as 2400 m and as low as 1800 m. Figure 5-1 shows the layout of the mine.

Figure 5.2 Minera La Negra Layout and Infrastructure

400 m

Source: MLN

5.3 Climate

The Sierra Gorda blocks most moisture from the Gulf of Mexico, resulting in an arid climate with annual rainfall averaging only 80 cm per annum, most of which falls during the June-October rainy season. Due to the altitude the climate is temperate, with an average annual temperature of 16.7° C, with minimum and maximum temperatures generally in the range of 4° C and 27° C, respectively.

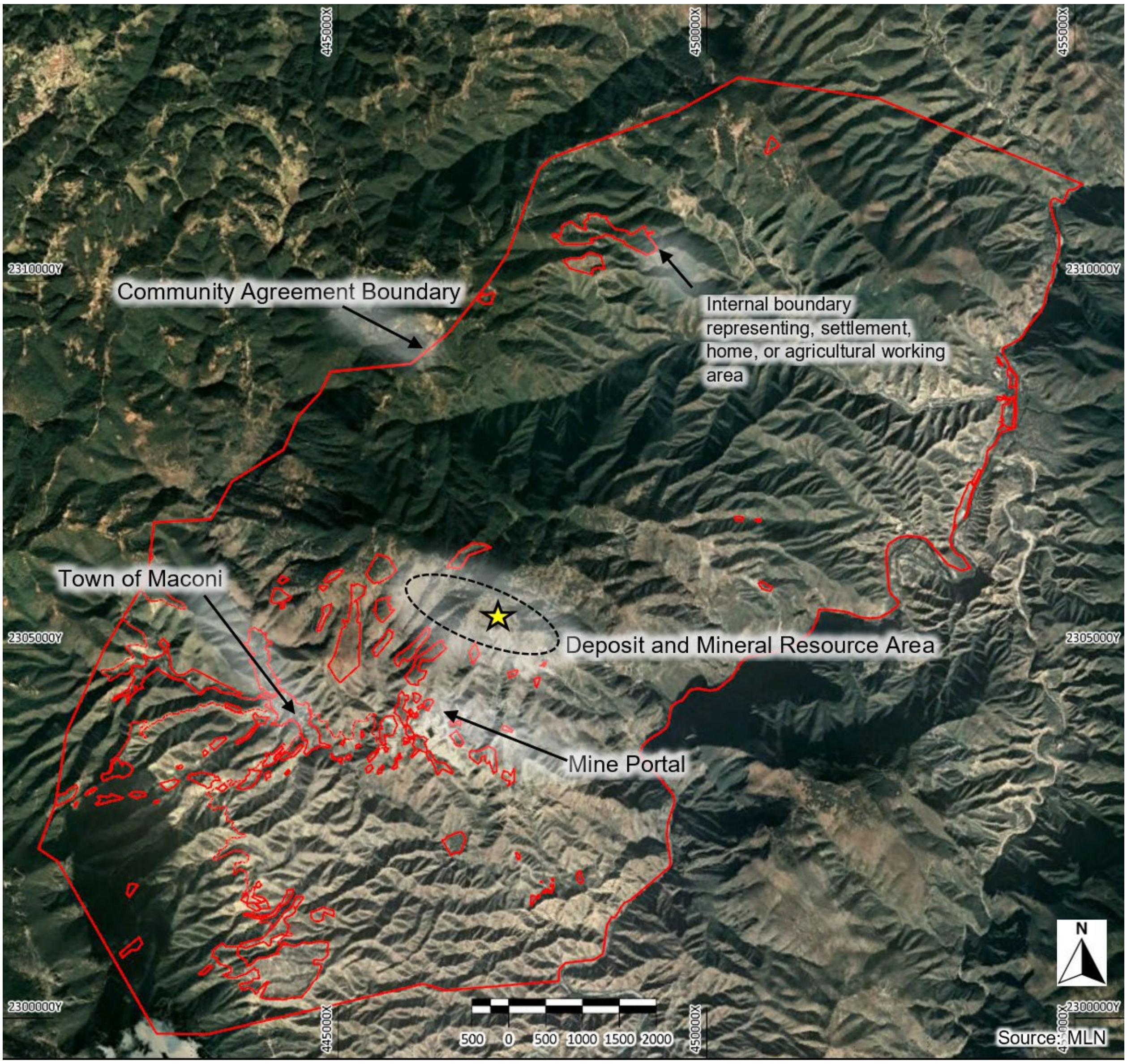
The mild climate allows for year-round operations. Water obtained during the rainy season and recycled water from the tailing facility provide sufficient water for year-around operations.

5.4 Local Resources and Infrastructure

The project is located in the district of Maconí, within the municipality of Cadereyta de Montes. Maconí has a population of approximately 900 inhabitants, dependent primarily on the mine as well as on small-scale agriculture and small-scale business. In total, there are 21 communities in the vicinity of the mine, Figure 5.3, although most of these consist of only a handful of houses each. The mine site itself is 3.4 km east of the town of Maconí and is accessed by an all-weather gravel road.

The general municipality of Cadereyta also hosts several cement producers and marble quarries.

Figure 5.3 Map of Surrounding Communities and Settlement Areas



5.4.1 Power

Power at site is provided by the Mexican Federal Electric Utility (*Comisión Federal de Electricidad – CFE*). A large hydroelectric facility, the Presa Fernando Hiriart Valderrama, generally known as the Presa Zimapán, with an installed capacity of 292 MW, is located only 19km to the south of the mine and impounds the Moctezuma River which divides the states of Querétaro and Hidalgo (and which also flows just south of La Negra).

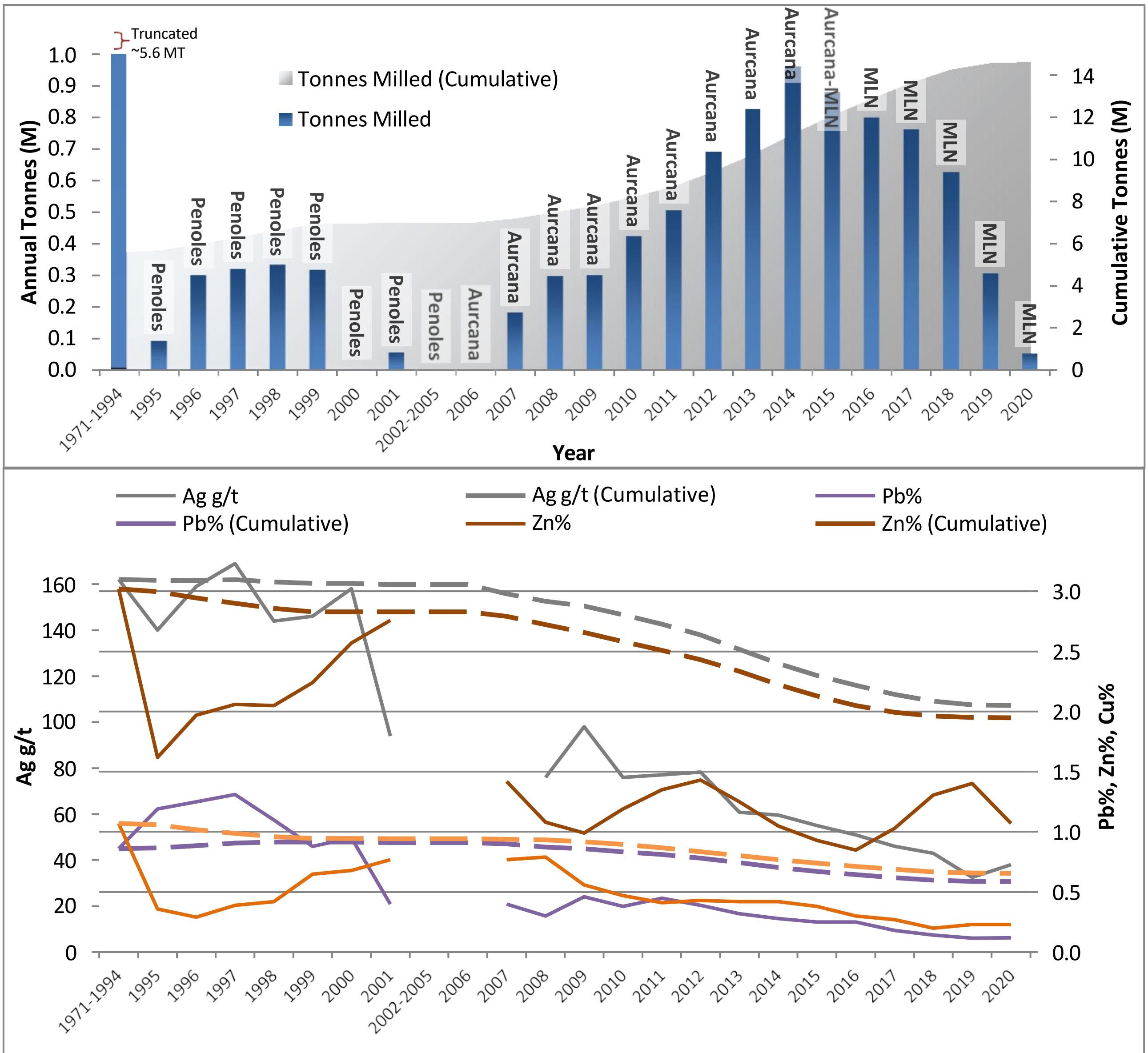
5.4.2 Human Resources

Given the 50-year history of the mine, an experienced workforce with good mining knowledge is available locally. In April of 2021 MLN entered into a new collective bargaining agreement (*Contrato Colectivo de Trabajo – CCT*) with the country's principal miner's union (*Sindicato Nacional de Trabajadores Mineros, Metalúrgicos, Siderúrgicos y Similares de la República Mexicana – SNTMMSSRM*) and with representatives of the local union, the *Sección 302* of the SNTMMSSRM, and which superseded a previous agreement dated June 7, 2018. The new CCT allowed for the right-sizing of the workforce, leading to a reduction in the union payroll from 311 to 198 employees, and eliminating those clauses that were impacting labor productivity at the mine.

6 History

The evidence suggests that the area around La Negra may have been mined for minerals used for cosmetic and decorative purposes for at least 2,000 years. The Spanish began mining in the district in the 1500s and in the area around Maconí in the late 1600s and several smelters were active in Maconí recovering lead with silver values. In the late 1800s the mine and smelter were operated by Victor Beaurang, consul general of Belgium in Mexico, and subsequently by his son, until he sold the asset to Oscar and Thomas Braniff in the early 1900s. The combined effect of the Mexican Revolution and the more complex metallurgy at depth led to a suspension of the operations. In 1950 the property was acquired from the Braniff's by Compañía Minera Acoma, S.A., which carried out an unsuccessful exploration program and later abandoned the project.

Figure 6.1 Historical Production 1971-2020



Source: Minera La Negra

Peñoles, which had operated a small smelter 10km away in the area of El Doctor, acquired the property in the early 1960s and carried out a mapping, sampling, and magnetic survey program which resulted in the discovery of the El Alacrán deposit and confirmed the previously known mineralization at La Negra. Mine development began in 1967 and production commenced in 1971.

In 2001 the property was put on care and maintenance due to low metals prices, and the property was acquired by Aurcana in 2006 and recommenced mining in the second quarter of 2007 at a mill production rate of 1,000 tpd, increasing to 1,500 tpd in 2007, to 2,000 tpd in April 2012, and to 2,750 tpd capacity in April 2013.

In 2016 ownership of the property passed to Orion as part of a court-sanctioned Plan of Arrangement, following Aurcana's inability to repay certain amounts owed to Orion. The mine operated continuously during 2016 and 2017 but was closed from November of 2018 to August of 2019 while some remediation was carried out on the TSF5A facility and permission was obtained from CONAGUA to restart. In early 2019 the operation was closed due to the government-mandated Covid-19 shutdown. A decision was made not to restart when the mining sector was reopened, but rather to focus on resolving several outstanding issues and to carry out an exploration program and new technical study before restarting the mine. In 2021 Orion entered into a joint venture with M Grupo, a Querétaro-based infrastructure and real estate company, whereby M Grupo could earn a 50% interest in MLN. In November of 2021 M Grupo notified Orion that it would not be exercising its option and the parties negotiated a profit-sharing agreement in January of 2022 which entitles M Grupo to a share of the profits from the sale or restart of Minera La Negra according to a pre-set formula.

Between 1971 and the end of 2020, the mine produced approximately 14.6 Mt with an average grade of 107 g/t silver, 0.59% lead, 1.95% zinc and 0.66% copper.

6.1 Historical Study and Evaluation Work

Peñoles operated La Negra between 1971 and 2000, and a summary of the available production records are shown in Figure 6.1. Peñoles, however, was not subject to the reporting requirements under NI 43-101, and no systematic record of Peñoles' resource estimates or technical work were preserved (although there is a significant amount of exploration-related information).

During the Aurcana period, five separate technical studies were published, beginning with an estimate of the El Alacrán deposit in 2008 (Aurcana reinitiated operations at La Negra in 2007). Prior to the study presented in this document, the last property-wide resource study was completed in July of 2017. A summary of the available technical reports is shown in the table below.

Table 6.1 Historical Technical Studies for the La Negra Property

Date	Study	Author
February 2008	Technical Report on the Mineral Resources and Mineral Reserves of the El Alacrán Deposit	Wardrop
March 2008	Mineral Resource Estimate Monica Deposit La Negra Mine	GeoSim Services, Inc.
February 2010	Mineral Resource Estimate Maravillas Deposit La Negra Mine	GeoSim Services, Inc.
May 2013	Technical Report on the La Negra Mine Project	Behre Dolbear & Company (USA), Inc.
January 2015	Technical Report Minera La Negra Property	AMC Consultants
July 2017	Resource Estimate Technical Report	GMRS

Source: MLN

6.2 Historical Mineral Resource and Reserve Estimates

Several technical studies and resource updates have been published since Aurcana acquired the property from Peñoles in 2006. In 2008 Aurcana published two separate resource estimates isolated to the El Alacrán and the Monica deposits, the former in February 2008 and the latter in March. Both were based on a US$30/t cutoff, as seen in the tables below.

Historic Resource and Reserve estimates have not been independently verified by the author of this report and should not be relied on. A qualified person has not done sufficient work to classify these historical estimates as current mineral resources or reserves. The issuer is not treating these historical estimates as current mineral resources or reserves. The reader should note the Resource Statement in Section 14 has been independently calculated and does not rely on any historic resource estimates.

Table 6.2 Maiden Reserve Estimate – La Negra and El Alacrán Deposits 1967 (Cutoff Unknown)

Category	Tonnes (M)	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Proven+Probable	1.37	254	1.4	3.3	1.5

Source: Gaytán Rueda, 1975

The reader is cautioned that the reserve estimate presented in table 6.2 is a historical reserve estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

The information presented in Table 6.2 above was prepared for Peñoles by staff geologist José Eligio Gaytán Rueda in 1975 and was included in his Master's Thesis for the University of Arizona titled Exploration and Development at the La Negra Mine, Maconí, Querétaro, Mexico. While he includes a polygonal calculation for the La Negra deposit in Appendix A of the thesis, there is no such calculation for El Alacrán. It is unclear what cutoff or commodity assumptions were utilized in the calculation.

Table 6.3 Peñoles Estimate of Mineral Reserves for La Negra January 1980 (US$19/t Cutoff)

Category	Tonnes (M)	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Proven+Probable	1.63	151	1.0	2.2	0.8

Source: Rafael Gaytán M, 1980

The reader is cautioned that the reserve estimate presented in Table 6.3 is a historical reserve estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

Table 6.3 presents a reserve estimate for La Negra dated January 1980 and prepared by staff geologist Rafael Gaytán. This reserve is based on a cutoff grade of US$19.28 per tonne and commodity price assumptions of US$0.28/g, US$5.1/%Pb, US$0.34/%Zn, and US$12.10/%Cu, an exchange rate of 23:1 pesos to the dollar, and had an overall NSR of US$54.21. This estimate incorporated dilution of 15% of La Negra, 10% for Alacrán, 10% for Escondida, and 20% for Maravillas, Valenciana and Gallo de Oro.

Tables 6.4 and 6.5 present resource and reserve estimates, respectively, for the El Alacrán deposit, as presented in Technical Report on the Mineral Resources and Mineral Reserves of the el Alacrán Deposit of the La Negra Silver, Lead, Zinc, Copper Mine Querétaro Mexico, dated February 2008 and prepared by Wardrop. The resource was based on the following commodity price assumptions: Silver US$12.00/oz, Lead US$0.70/lb, Zn US$1.50/lb, and Cu US$2.80/lb. Recovery assumptions were as follows: Silver 83%, Lead 72%, Zn, 81%, and Cu 90%. A cutoff factor of US$30/tonne was used in the estimation of the mineral reserve while the stockpiles were estimated to have a value greater than US$19.59/tonne.

Table 6.4 El Alacrán Deposit 2008 Mineral Resource Estimate

Category	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Measured	188,801	86	0.27	1.20	0.96
Indicated	149,538	82	0.30	1.07	0.86
M&I	338,339	84	0.29	1.14	0.92
Stockpiles	36,900	110	0.42	1.34	1.23
Inferred	181,239	69	0.30	1.55	0.66

Source: Wardrop

The reader is cautioned that the resource estimate presented in Table 6.4 is a historical resource estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

Table 6.5 El Alacrán Deposit 2008 Mineral Reserve Estimate (US$30/t Cutoff)

Category	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Measured	188,801	86	0.27	1.20	0.96
Indicated	149,538	82	0.30	1.07	0.86
M&I	338,339	84	0.29	1.14	0.92
Stockpiles	36,900	110	0.42	1.34	1.23
Inferred	181,239	69	0.30	1.55	0.66

Source: Wardrop

The reader is cautioned that the reserve estimate presented in Table 6.5 is a historical reserve estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

Table 6.6 presents a resource estimate completed in 2008 for the Monica deposit only, as detailed in Mineral Resource Estimate Monica Deposit La Negra Mine Queretaro State Mexico prepared by GeoSim Services Inc. The following prices were used in the calculation of the resource: Silver US$13.50/oz, Zinc US$1.00/lb, and Copper US$2.85/lb. Lead was not used in the calculation as at that time it was considered that the treatment costs would exceed its value in the concentrate.

Table 6.6 Monica Deposit 2008 Mineral Resource Estimate (US$30/t NSR Cutoff)

Category	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Measured	403,497	127	0.79	0.94	0.48
Indicated	184,201	128	0.85	1.40	0.31
M&I	587,698	127	0.81	1.08	0.43
Inferred	42,442	102	0.65	1.89	0.35

Source: GeoSim Services, Inc.

The reader is cautioned that the resource estimate presented in Table 6.6 is a historical resource estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

In February of 2010 Aurcana filed a technical report for the Maravillas deposit only, Mineral Resource Estimate Maravillas Deposit La Negra Mine Queretaro State Mexico, prepared by GeoSim Services Inc., with a resource as shown in the table below. Unlike previous resources, the 2010 Maravillas resource was based on a US$35/t NSR cutoff, compared with US$30/t for previous studies.

Table 6.7 Maravillas Deposit 2010 Mineral Resource Estimate (US$35/t NSR Cutoff)

Category	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Measured	98,848	112	0.54	3.73	0.75
Indicated	90,093	116	0.58	3.72	0.75
M&I	188,941	114	0.55	3.73	0.75
Inferred	38,442	98	0.42	3.62	0.89

Source: GeoSim Services, Inc.

The reader is cautioned that the resource estimate presented in Table 6.7 is a historical resource estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

The following prices were used in the calculation of the 2008 Maravillas resource: Silver US$16.00/oz, Zinc US$1.00/lb, and Copper US$2.90/lb. Lead was again excluded from the calculation as it was considered that the treatment costs would exceed its value in the concentrate.

In May of 2013 Aurcana filed a technical report prepared by Behre Dolbear for the entire La Negra property, using a US$40/t NSR cutoff (Technical Report on the La Negra Mine Project Queretaro, Mexico). This resource incorporated the following mineralized zones: El Alacrán, Bicentenario, Brecha-Cristo Rey, Cobriza-La Luz, Dificultad, Maravillas, Monica, La Negra, Nuestra Señora, San Pedro, Trinidad, and Virginia-Blanca.

Table 6.8 La Negra Project-Wide 2013 Mineral Resource Estimate (US$40/t Recovered Metal Cutoff)

Category	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Measured	11,862,000	133.42	0.90	2.60	0.50
Indicated	15,159,000	130.12	0.92	2.19	0.41
M&I	27,021,000	131.31	0.91	2.36	0.49
Inferred	13,278,000	126.05	0.88	2.14	0.42

Source: Behre Dolbear & Company (USA), Inc.

The reader is cautioned that the resource estimate presented in Table 6.8 is a historical resource estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

The Behre Dolbear study cited above modeled most mineralized zones separately, resulting in mineral resources for 12 zones, namely Alacrán, Bicentenario, Brecha-Cristo Rey, Cobriza-La Cruz, Dificultad, Maravillas, Monica, La Negra, Nuestra Señora, San Pedro, Trinidad and Virginia-Blanca. The resource was based on the following commodity prices and recoveries: Silver US$28.29/oz and 84.87%, Lead US$0.88/lb and 74.62%, Zinc US$0.84/lb and 70.66%, Copper US$3.33/lb and 81.02%

The January 2015 technical report (Technical Report Minera La Negra Property, Querétaro, Mexico) and resource update, prepared on behalf of Aurcana by AMC Consultants, excluded some of the zones included in the 2013 resource. In addition, the 2015 resource was based on a lower NSR cutoff of US$30/t. The 2015 study included the following mineralized zones: Bicentenario, Brecha, Cobriza, Dificultad, Gaby, La Negra, Maravillas, Natalia, San Buenaventura, Trinidad, and Virginia.

Table 6.9 La Negra 2015 Mineral Resource Estimate (US$30/t Recovered Metal Cutoff)

Category	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Measured	1,977,000	107	0.50	2.23	0.61
Indicated	2,748,000	54	0.22	1.04	0.45
M&I	4,724,000	76	0.34	1.54	0.52
Inferred	642,000	55	0.18	1.54	0.55

Source: AMC Consultants

The reader is cautioned that the resource estimate presented in Table 6.9 is a historical resource estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

The AMC resource used the following commodity prices and recoveries: Silver U$21.50/oz and 83%, Lead US$0.95/lb and 78%, Zinc US$1.00/lb and 80%, Copper US$3.10/lb and 75%. These values were used to calculate a recovered metal value. It would not appear that the recovered metal value calculation accounted for smelter charges, penalties, or concentrate freight.

In 2017 MLN commissioned GMRS to carry out a resource update, which was completed in July of that year (Resource Estimate Technical Report La Negra Mine). This resource was based on a lower cutoff of US$25/t.

Table 6.10 La Negra 2017 Mineral Resource Estimate (US$25/t Recovered Metal Cutoff)

Category	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)
Measured	10,553,000	56	0.26	1.11	0.34
Indicated	7,879,000	46	0.19	1.23	0.34
M&I	18,462,000	52	0.23	1.16	0.34
Inferred	533,000	50	0.20	1.98	0.42

Source: GMRS

The reader is cautioned that the resource estimate presented in Table 6.10 is a historical resource estimate and has not been reviewed by a qualified person to classify this historical estimate as either a current resource or reserve. The issuer is not treating the historical estimate as current.

The 2017 resource incorporated 18 different zones, as follows: Avelina, Bicentenario, Blanca, Brecha, Cobriza Inferior, Cobriza Superior, Dificultad, Gaby, Lupita, Maravillas, Monica, Natalia, Negra Intermedia, Negra Principal. San Pedro, Trinidad, Valeria, and Virginia. Although the 2017 resource estimate included several new zones that were not included in the 2015 estimate, the 2017 resource for those zones that were also included in the 2015 estimate increased by over 6.6 million tonnes, or a 134% increase in tonnage for the same zones.

The 2017 resource was also based on a recovered metal value calculation, using the following parameters, respectively, for price and recovery: Silver US$19.83/oz and 85%, Lead US$0.93/lb and 86%, Zinc US$1.06/lb and 92%, Copper US$2.91/lb and 79%.

In June of 2021, Respec Company, LLC (“Respec”) was engaged by Minera La Negra to provide a re-start mine plan and assess mining strategies. Respec personnel visited the site in July 2021 and assisted in the development of a new mine plan during the period July – October 2021. The objective was to incorporate a preliminary Indicated and Inferred Resource estimate and the initial results of the drill program into an updated mine plan that would support a business case for restarting the operation.

The mine plan was further updated by Mining Plus US Consultants ("Mining Plus") in October – November 2021, to better reflect the scoping level of stoping and mine design opportunities based on the updated resource model. The resulting economic model was also updated to incorporate current commodity prices, capital expenditures required for restart and sustaining capital, and updated operating expense estimates, as the last technical study for the project dates to 2017.

6.3 Historical Operating Costs

Table 6.11 details the historical Total Cash Costs ("TCC") and All-in Costs ("AIC") for Minera La Negra for the period January 2015 to December 2019. TCC includes operating costs and royalties,and is expressed in terms of silver-equivalent ounce produced. AIC includes all operating costs, royalties and capital costs, and is also expressed in terms of silver-equivalent ounce produced.

Table 6.11 Historical TCC and AIC (US$ per Silver Equivalent Ounce)

Month	TCC/Ageq	AIC/Ageq	Month	TCC/Ageq	AIC/Ageq
Jan-15	16.95	18.45	Feb-17	14.69	17.90
Feb-15	16.56	18.46	Mar-17	14.73	17.31
Mar-15	16.20	17.99	Apr-17	15.05	16.81
Apr-15	15.81	17.55	May-17	17.79	22.16
May-15	15.80	18.01	Jun-17	17.42	19.56
Jun-15	12.60	13.73	Jul-17	15.92	17.27
Jul-15	10.32	11.10	Aug-17	11.42	13.03
Aug-15	10.25	11.64	Sep-17	14.15	18.08
Sep-15	10.82	11.86	Oct-17	15.02	17.10
Oct-15	12.19	13.27	Nov-17	11.85	12.83
Nov-15	11.10	13.85	Dec-17	15.02	16.85
Dec-15	12.96	18.62	Jan-18	9.19	10.99
Jan-16	17.49	19.86	Feb-18	13.02	16.18
Feb-16	16.17	22.03	Mar-18	11.58	13.10
Mar-16	15.86	17.68	Apr-18	12.09	13.50
Apr-16	31.24	32.60	May-18	12.66	14.54
May-16	16.90	18.34	Jun-18	16.00	18.68
Jun-16	13.27	14.24	Jul-18	26.81	28.10
Jul-16	18.15	20.04	Aug-18	20.55	23.38
Aug-16	18.84	21.44	Sep-18	19.33	24.23
Sep-16	15.01	15.71	Aug-19	10.31	10.82
Oct-16	18.32	21.39	Sep-19	9.64	10.61
Nov-16	17.86	20.17	Oct-19	10.99	12.23
Dec-16	17.46	20.23	Nov-19	14.54	15.81
Jan-17	12.10	14.45	Dec-19	15.84	18.19

Source: MLN

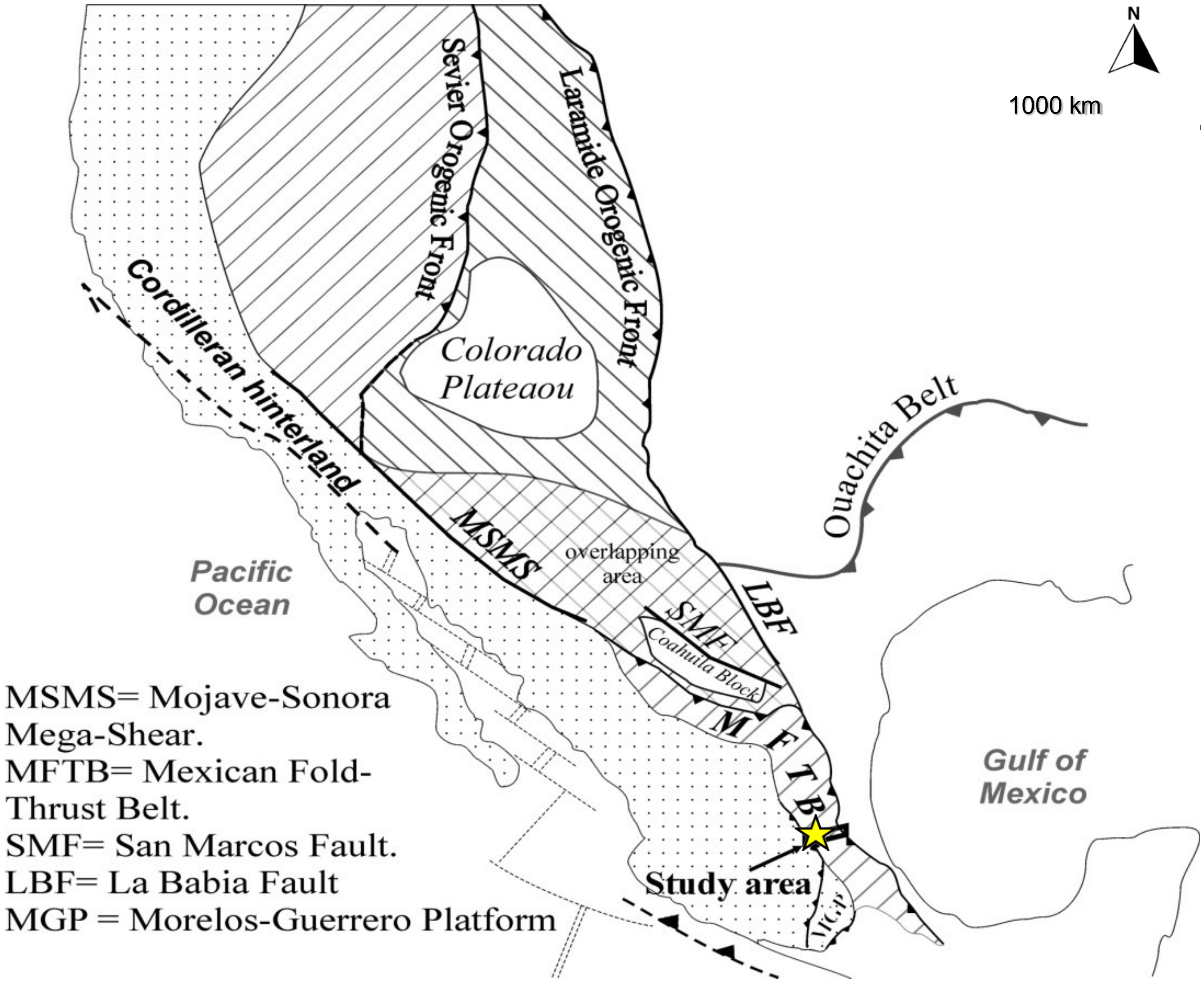
The mine historically reported its costs in terms of silver equivalent ounces. For a restart, it is considered more accurate to quote the NSR per tonne of concentrate and costs per tonne as guide to profitability. It should be noted that historical costs are not a guide to future performance.

7 Geological Setting and Mineralization

7.1 Regional Geology

The La Negra property is located in the Sierra Gorda range, belonging to the Sierra Madre Oriental physiographic province, which is the outermost segment of the Cordilleran fold belt in central Mexico. The main host rocks were deposited during the late Jurassic through early Cretaceous and consist of two carbonate platforms – El Doctor to the west and Valles-San Luis Potosí to the east – with the deep water Zimapán basin, consisting of basinal carbonates with minor clastic material in between.

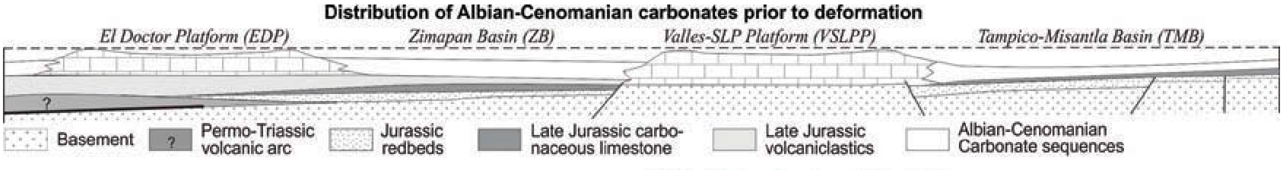
Figure 7.1 Generalized Tectonic Map of the North American Cordillera



Source: Fitz-Díaz (2010)

The collision of the Guerrero Terrane with the southwest coast of North America and the beginning of subduction resulted in regional uplift to the west which ultimately led to the shedding of turbidic sediments that eventually covered the carbonate sediments to the east.

Figure 7.2 Carbonates of Central Mexico Prior to Deformation

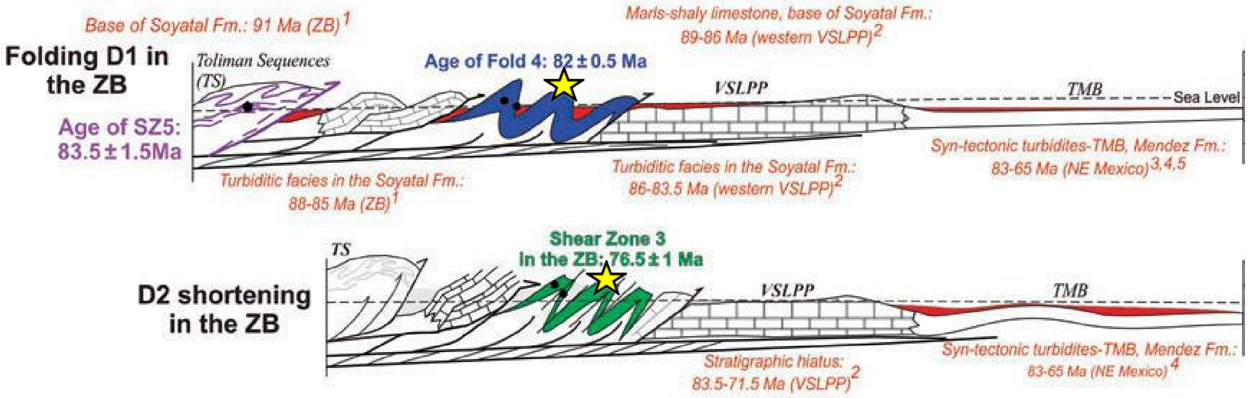


Source: modified from Fitz-Díaz et al (2014)

The subduction also signaled the beginning of the formation of the Mexican Fold and Thrust Belt (MFTB) about 83 million years ago (Fitz-Díaz et al, 2014), a progressive, episodic event that migrated from west to east and consisted of four principal deformation events (the first two of which are shown in Figure 7.3). In the first deformation event (D_1 84-80 Ma) the Paleozoic basement and resistant carbonate rocks of the El Doctor platform buckled and were thrust to the NE over the sediments of the Zimapán basin, which deformed plastically resulting in high-amplitude folds. This first deformation event also led to the shortening of the basin by 70% and to a significant thickening of the basinal sediments. The second deformation event (D_2 77 Ma) affected the rocks of the El Valle-San Luis Potosí platform, although the effects of this episode are not evident at La Negra.

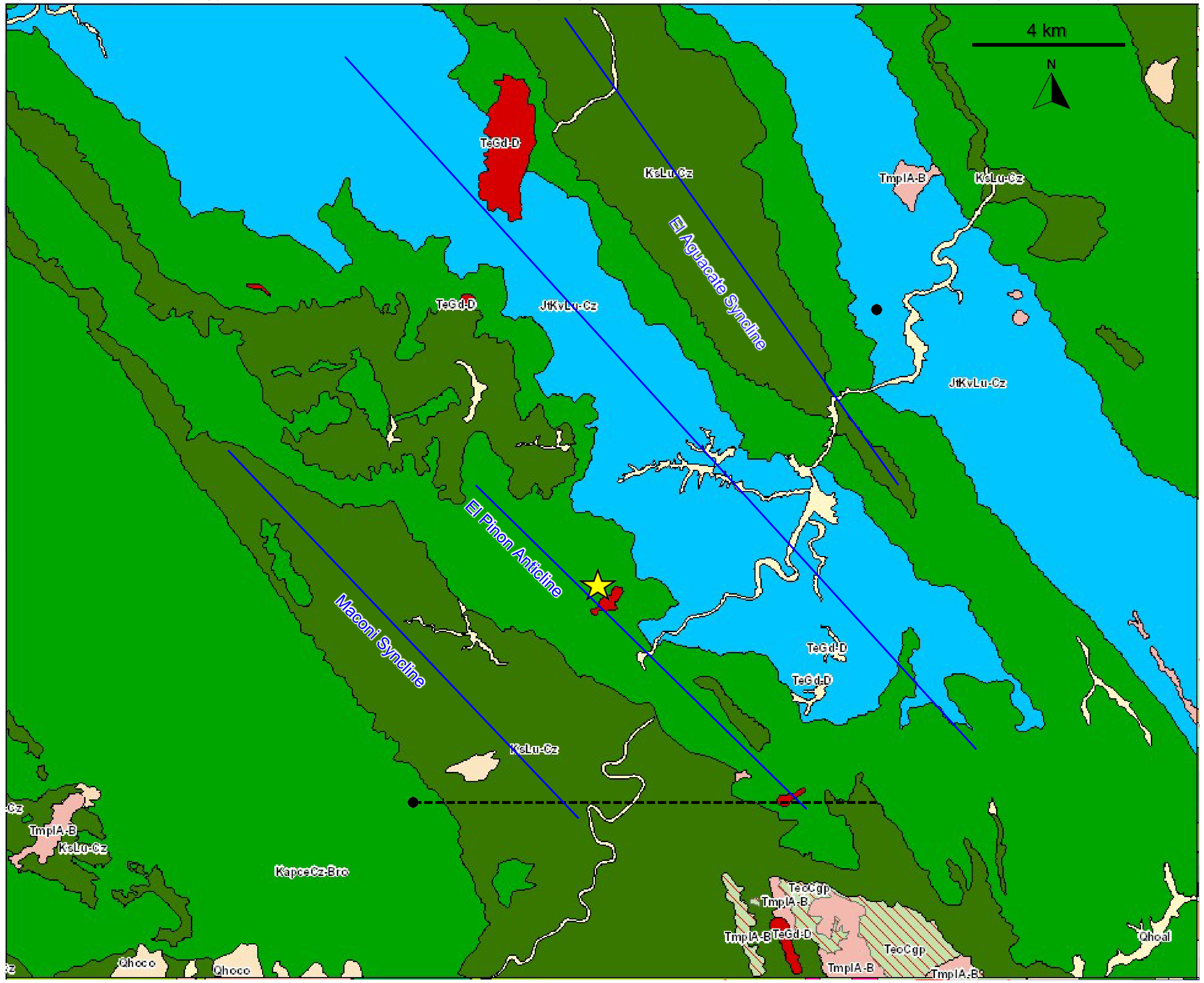
Subsequent to the end of the Laramide orogeny and the termination of the compressional regime that formed the MFTB, the region experienced a period of extension (43-25 Ma) that led to minor normal faulting. Intrusive bodies exploited the NW-trending fold axes created during the formation of the MFTB as well as subsidiary NE-trending structures.

Figure 7.3 Initial Spatial and Temporal Deformation of the Mexican Fold Thrust Belt

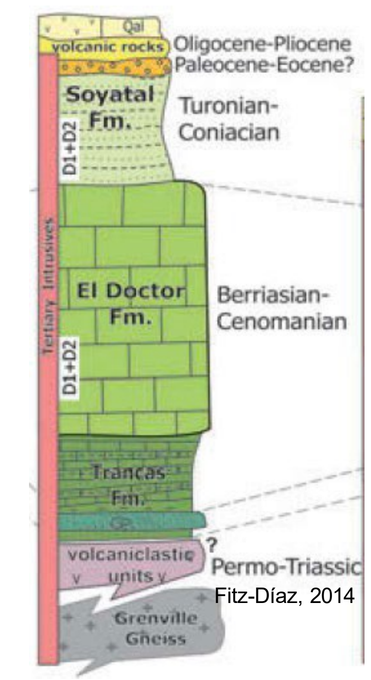


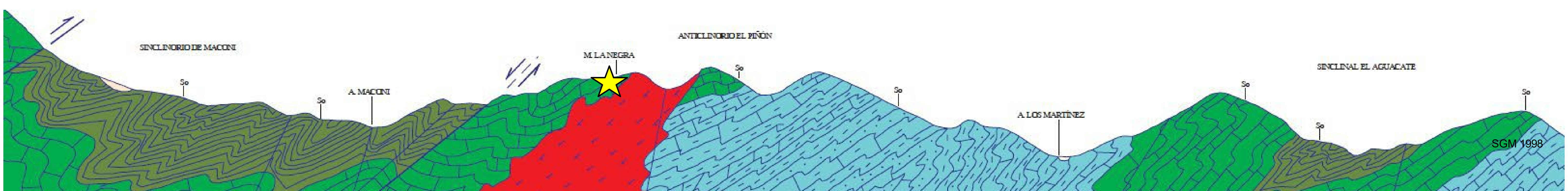
Source: Modified from Fitz-Díaz et al (2014)

Figure 7.4 Regional Surface Geology San Joaquín F14-C58 (SGM 1998) Regional Surface Geology San Joaquín F14-C58 (SGM 1998)



Legend	Description
Qal	Alluvium: Quaternary, Sedimentary, Alluvium
TnA-B	Las Espinas: Tertiary-Miocene, Volcanic, Andesitic-Basalt
TpgCgp	Cenozoic, Tertiary-Paleogene, sedimentary, polymictic conglomerate
TpgGd-D	El Yontbe: Tertiary-Paleogene, Intrusive, Granodiorite-Diorite
KtmLu-Cz	Soyatal-Mezcala: Mesozoic, upper Cretaceous, sedimentary, shaly/silty limestone
KapceCz	El Doctor: Mesozoic, lower to upper Cretaceous, sedimentary, limestone. Mineralization hosted in La Negra Facies.
JkKbMg-Cz	Las Trancas: Mesozoic, late Jurassic to early Cretaceous, sedimentary, limestone thinly bedded with shaly mudstone





7.2 Property Geology

The area around La Negra is dominated by thick packages of carbonate rocks belonging to the El Doctor Formation, which as noted were heavily folded and deformed during the late Cretaceous and subsequently intruded by granodioritic stocks of Eocene age.

The basement rocks in the area of La Negra consist of limestones containing lenses or dark gray quartzite, although these are not generally observable.

7.2.1 Stratigraphy

7.2.1.1 Las Trancas Formation

The Las Trancas Formation sits unconformably over the basement schists and consists of two distinct shale units with a total thickness of 200 to 400 m, divided almost equally between both units. The lower black shale contains interbeds of graywacke while the uppermost red phyllitic shale contains lenses of bentonite and conglomerate. This unit has been dated to the late Jurassic – early Cretaceous (Kimmeridgian-Barremian) based on fossil dating, although García and Querol (1985) suggest it dates to the Tithonian.

7.2.1.2 El Doctor Formation

The El Doctor Formation consists of four coeval units representing the transition from the El Doctor near shore carbonate platform to the deepwater facies of the Zimapán basin and is dated to the early Cretaceous (middle Albian – lower Cenomanian). Given its large surface extent and the effects of deformation, it has been estimated to range in thickness from 150 m to as much as 1500 m (although in the vicinity of the mine it is closer to the latter), and there is disagreement as to whether it sits conformably or disconformably over the Las Trancas Formation (Morrison 1982, García y Querol 1985). The Cerro Ladrón facies is a massive gray limestone containing lenses of dark chert and can be further divided into facies with abundant rudistids, a micritic subfacies, and a pebble conglomerate subfacies. Cerro Ladrón represents the foreslope of the carbonate platform.

The El Socavón facies consist of an arenite of carbonate composition and represents the foreslope of the carbonate platform and transitions into the San Joaquín facies, which consists of a dark gray lime mud with numerous chert nodules and evidence of syndepositional slumping that is approximately 60 m thick. The contact between the San Joaquín facies and the La Negra facies is gradational, and the latter represents a deepwater facies. La Negra consists of thinly bedded units with interbedded red shale and lenses of black chert, mainly at the bottom of the formation. The total thickness of the La Negra facies is estimated at 300 m and is believed to correlate with the Cuesta del Cura limestone in northern Mexico. The La Negra facies is the main host rock at the La Negra mine.

The Tamaulipas Formation is the equivalent of the El Doctor Formation in the Zimapán district.

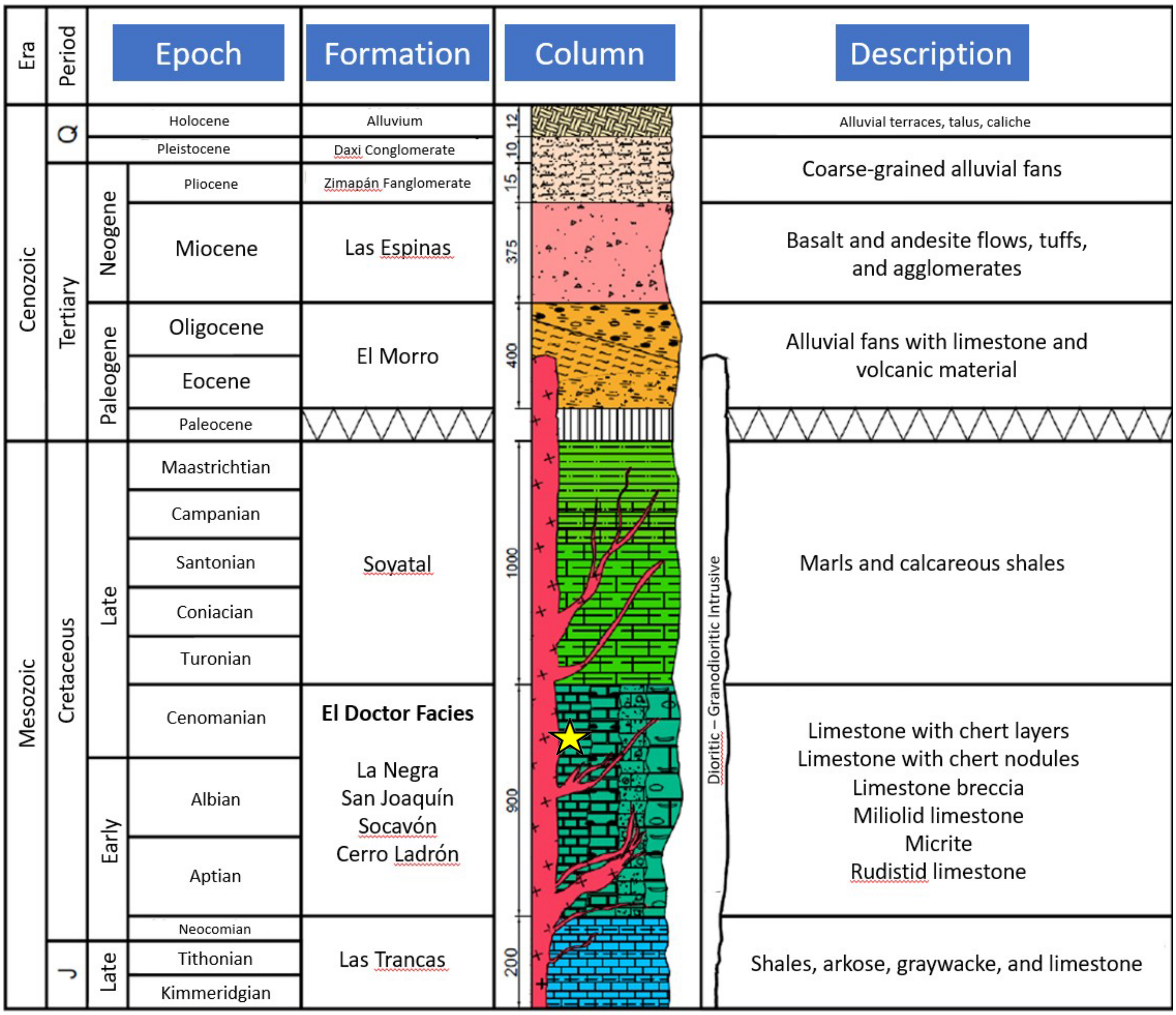
7.2.1.3 El Soyatal and Mezcala Formations

The units of the El Doctor Formation are conformably overlain by the Soyatal Formation, which has been dated to the upper Cretaceous (Turonian-Campanian) and consists of thin beds of lime mud, discontinuous chert and thicker beds of gray shales. The Soyatal Formation transitions gradually to the more clastic Mezcala Formation, which consists of limestones and increasingly shales of terrigenous origin and represents the impact of the uplifted Guerrero terrane shedding clastic material into the basin. The Soyatal and Mezcala Formations signal the beginning of the uplift and compression that led to the creation of the MFTB.

7.2.1.4 El Morro Conglomerate

The El Morro Conglomerate dates to the Tertiary and consists of 50 m (up to 350 m in the Zimapán area) of angular carbonate and volcanic cobbles/boulders sourced from the underlying Mesozoic units and cemented with red calcareous clay matrix. It sits unconformably over the Soyatal and Mezcala Formations.

Figure 7.5 La Negra Stratigraphic Column



Source: modified from Saldaña 2016, Gaytán Rueda 1975

7.2.2 Intrusives

Evidence from the field and from core indicates that several phases of intrusive have taken place at La Negra, although the relationship between these and their relative ages is not well understood. From field observations it is evident that there were at least three intrusive phases that exploited the same structures. The first appears to be a dioritic phase, followed by a granodioritic phase that was subsequently altered (silicified) by a third, probably more felsic, phase. The nature of this/these felsic phase/phases is marginally understood, although it is assumed that these are later given their impact on other intrusive phases. Still, their composition is not exactly known and it is not known whether there is a genetic association with the mineralization.

Some of these intrusives are district-scale. For example, the aplite dyke in the footwall of the Maravillas zone is known to extend to the Zimapán district and generally trends N45W with a dip between 70^{o} SW and subvertical.

The intrusives in the area of La Negra have been dated (K/Ar) to 38.7 to 39.6 Ma (Vassallo, et al, 2001) and consist of granodiorite stocks and quartz monzonite dikes with aphanitic to porphyritic texture, with rare dikes of andesitic composition which are considered post-mineral. Morrison 1982 describes a groundmass consisting of quartz and plagioclase with subhedral crystals of andesine and augite, with subsequent pulses from the same stock becoming more sodic. Interestingly, the age and composition of the intrusives in the area of La Negra are younger and more mafic than those in the nearby Zimapán district (40.8 to 43.6 Ma, quartz-monzonite and lamprophyre, Vassallo, et al, 2001).

Detailed petrography carried out for Peñoles by Juan Randall in 1980 on samples from the Silvia orebody described a sample of altered granodiorite skarn containing disseminated sulfides, iron oxides, with gray silica phenocrysts 2 – 4 mm in a fine-grained (0.2 – 0.4 mm) mass of white silicates devoid of carbonates. A detailed analysis of the sample indicates that it is composed primarily of andesine phenocrysts (An_{35}) 10% with clear albite twins, perthite phenocrysts 10% with euhedral replacement crystals, anhedral and interstitial quartz 10%, fibrous wollastonite 3%, grossularite 3%, pyrite 3%, clay 2%, and 1% or less of fine-grained euhedral diopside replacing grossularite garnet and anhedral to subhedral clinozoisite, with the latter indicating retrograde alteration. The paragenesis for this sample is detailed in Section 7.4.1.

Randall also described a sample of post-mineral andesite from the Maravillas orebody, which he describes as having a texture more akin to basalt than to andesite, a feature that was also observed in an outcrop breccia with altered limestone clasts at a prospect some 5 km north of the mine. Randall speculates that this rock might actually be a Ca + Mg deficient tholeiite. The andesite consists of 50% subhedral to euhedral calcic andesine (An_{45-50}) with some clay alteration, 8% disseminated magnetite with hematite alteration, 5% biotite with 50-75% replacement by hexagonal to rectangular prehnite crystals, 5% quartz as anhedral crystals filling vugs, and 1% subhedral hypersthene interstitial to andesine.

Some of these intrusives are district-scale. For example, the aplite dyke in the footwall of the Maravillas zone is known to extend to the Zimapán district and generally trends N45W with a dip between 70^{o} SW and subvertical.

7.3 Local Geology

The principal geologic unit in the vicinity of La Negra is the La Negra facies of the El Doctor Formation, which strikes N in the area of the mine but is interpreted to broadly follow the NW trend of the Piñón Anticline, the axis of which is a major through going structure. To the west, and potentially hosting NW extensions of the mineralization is the San Joaquín facies of the El Doctor Formation, which forms a N trending band approximately 150 m wide. To the west of this, and outside any zones of known mineralization is the foreslope Socavón facies of the El Doctor Formation.

There are several surface expressions of the intrusive, which are believed to be part of a larger regional batholith (although age dating has shown that the intrusive in the area of Zimapán is both older and deeper than the intrusives in the area of La Negra) and which tend to have a NE orientation. The four phases of skarn formation documented by Morrison have created a complex architecture which juxtaposes different styles of alteration. Thus, in the field, it is possible to see spurrite both within the intrusive and distal to it, and both in association with mineralized zones and away from them. Morrison (1982) observed a zonation pattern with proximal hedenbergite skarn transitioning to wollastonite exoskarn and distal garnet skarn in contact with recrystallized limestone, which contravenes the generally accepted zonation pattern for Pb-Zn skarns. This is possibly due to the aforementioned structural complications. Another important feature is the WNW trending Maravillas dike, which has a more felsic composition and is directly associated with zones of mineralization.

Although several authors (Gaytán Rueda 1975, Fraga 1984) have indicated that the orebodies of La Negra display clear metal zonation, with higher Pb-Zn + Ag at higher elevation giving way to more Cu-rich ores with minor amount of silver at depth, more recent work has led to the conclusion that this zonation is more apparent than real, and is complicated by mineralizing controls, such as bedding, proximity to vertical structures. Some bodies in isolation show clear patterns of zonation, but deposit-wide trends are not clear.

7.3.1 Structure

The units in the area tend to follow the regional architecture, striking NW with fold axes along the same orientation, and dipping variably (40^{o}-70^{o}) to the SW. The main feature is the Piñón Anticline which strikes NW-SE and extends from the Zimapán district to the SE through the La Negra district and beyond to the NW. There are also minor NE trending structures that dip 40^{o} to the SE but these are not well documented and it is unclear whether these have experienced much movement.

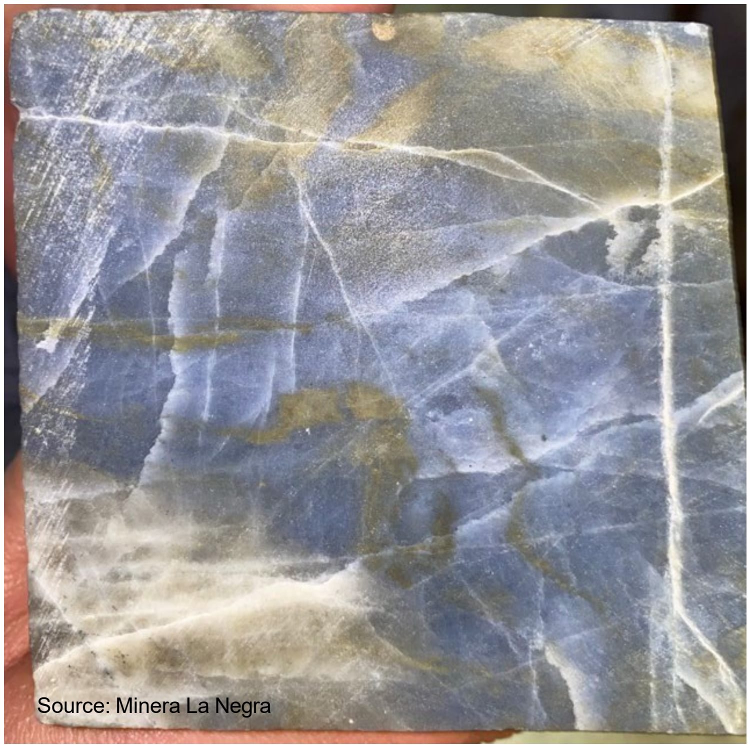
Recent work has also documented the occurrence of a series of faults that are interpreted as radial faults formed by the emplacement of the intrusives into the limestone country rock.

7.4 Alteration and Mineralization

Four stages of skarn formation were documented by Morrison (1982). The earliest phase consisted entirely of fine-grained subidioblastic spurrite, $Ca_5(SiO_4)2CO_3$, an uncommon mineral of the nesosilicate group which entirely replaced the calcareous protolith. Significantly, spurrite is not present in the Zimapán district but is pervasive around La Negra, and points to shallower environment of formation. The second stage consists of a dense, albeit thin, zone of hedenbergite developed due to the diffusion of Ca into the intrusive, while the introduction of silica created a diffuse zone of diopside. The third stage of skarn formation took place under higher ffO_2 conditions leading to the formation of andradite, hematite, and wollastonite. The economic mineralization was formed in the final stage of skarn formation, which in addition to sulfides generated orthoclase, quartz, calcite and datolite, $CaBSiO_4(OH)$, another uncommon nesosilicate.

A polished thin section of unmineralized spurrite-wollastonite skarn was analyzed by Randall (1980). The skarn mineralization has completely replaced the original carbonates with subhedral wollastonite 40%, colorless low-Fe diopside 20%, anhedral to subhedral spurrite replacing wollastonite 8%, and euhedral porphyroblastic grossularite 5%.

Figure 7.6 Sample of Spurrite Alteration Replacement of Limestone



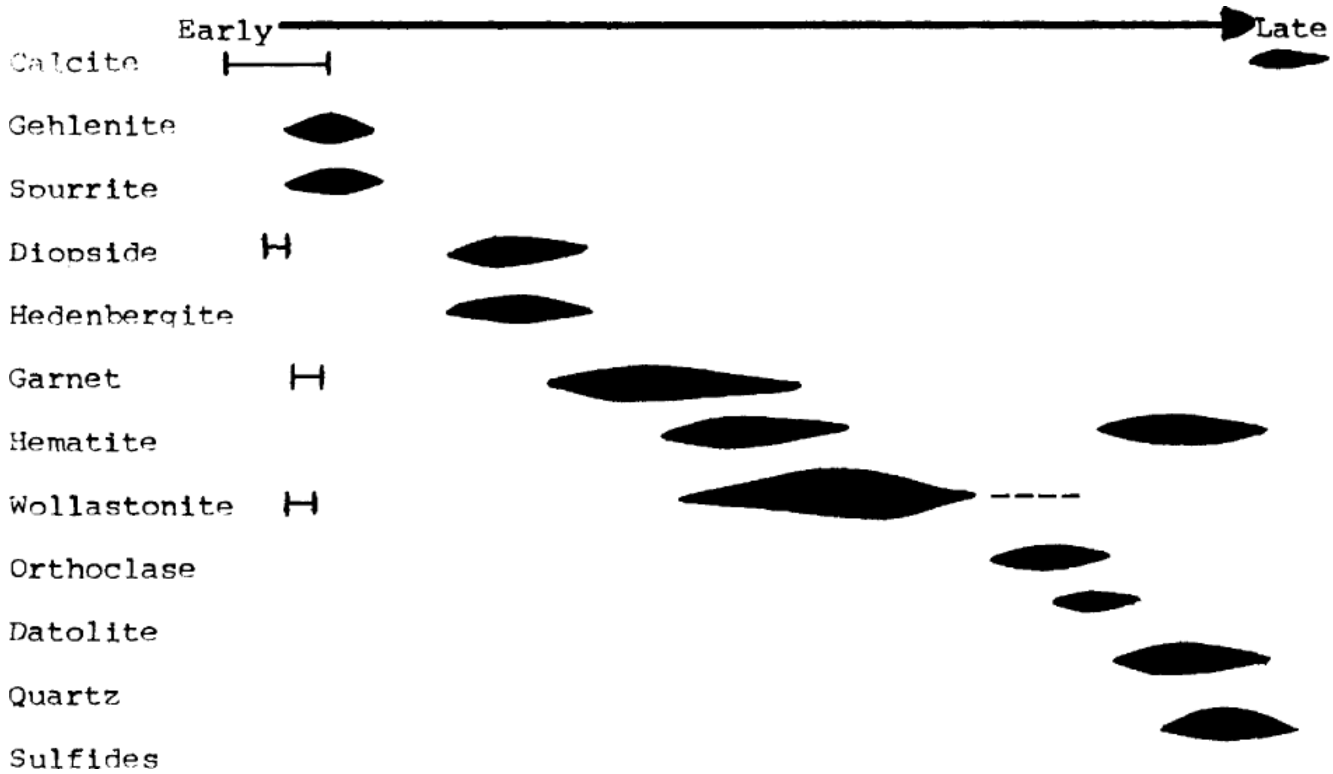
A more detailed petrographic analysis of a polished thin section of an (unmineralized) wollastonite skarn by Randall (1980) from the Maravillas orebody indicates a prevalence of subhedral to euhedral wollastonite 30%, 30% anhedral quartz filling voids, highly birefringent anhedral to subhedral diopside 20%, grossularite partially replaced by wollastonite and diopside 15%, and 5% amorphous clay.

The principal minerals at La Negra consist of sphalerite (marmatite), galena, and chalcopyrite, with silver present as hessite [Ag_2Te] in association with galena, although Le Couteur (2009) also identified argentite [Ag_2S] and pyrargyrite [Ag_3SbS_3] in samples from the Monica zone. Other common, non-mineral sulfides include pyrite, minor pyrrhotite, lloelingite [$FeAs_2$] and arsenopyrite, with Vassallo and Solorio-Munguía also reporting pentlandite, cubanite [$CuFe_2S_3$], freibergite [$(Ag,Cu,Fe)_{12}(Sb,As)_4S_{13}$], polybasite [$[(Ag,Cu)_6(Sb,As)_2S_7][Ag_9CuS_4]$], lillianite [$Pb_{3-2x}Ag_xBi_{2+x}S_6$], and native bismuth (as 2µ grains/blebs entrained in galena). Le Couteur also identified needles of boulangerite [$Pb_5Sb_4S_{11}$] in photomicrographs from the Luisa zone.

7.4.1 Paragenesis

Morrison (1982) outlined the paragenesis of the calcsilicates at La Negra, starting with the recrystallization of calcite and the formation spurrite and of small amounts of diopside, followed by the formation of hedenbergite and the replacement of calcite by garnet. This was followed by the formation of wollastonite, which replaced garnet in areas where it was strongly developed, and the overprinting of garnet and wollastonite onto the hedenbergite endoskarn. The final of skarn alteration resulted in the formation of hematite, wollastonite, orthoclase, datolite, quartz, sulfides, and calcite.

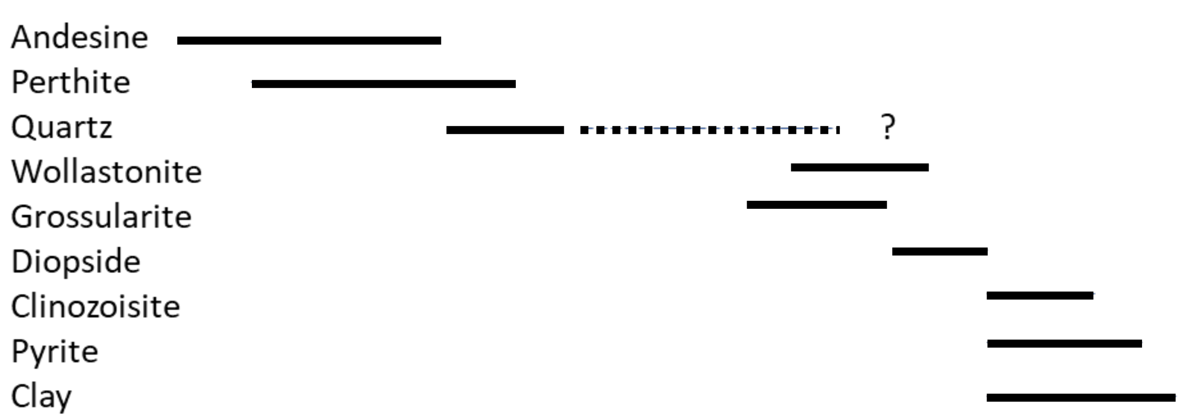
Figure 7.7 Skarn Mineral Paragenesis at La Negra



Source: Morrison (1982)

As described in Section 7.2.2 Randall (1980) carried out petrographic studies of intrusive samples from the Silvia orebody and determined the following paragenetic sequence for a granodiorite from the Silvia orebody. The following figure details the paragenesis for the altered granodiorite described in Section 7.2.2.

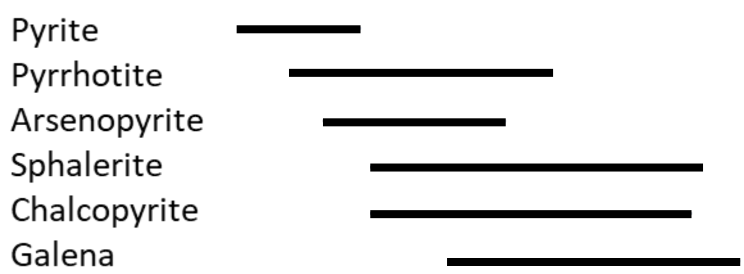
Figure 7.8 Intrusive Paragenesis for Silvia Orebody Granodiorite



Source: Modified from Randall (1980)

Gaytán Rueda (1975) based on previous studies identified the following paragenetic sequence: following the formation of calcsilicates the first sulfide to form was pyrite, followed partially contemporaneously by pyrrhotite. Arsenopyrite formation began after pyrrhotite formation began but ended while the latter was still being formed. Sphalerite (as marmatite, an Fe-rich variant) began soon thereafter, and occurred contemporaneously with chalcopyrite. The last minerals to form were galena and associated silver-bearing minerals.

Figure 7.9 Sulfide Mineral Paragenesis at La Negra



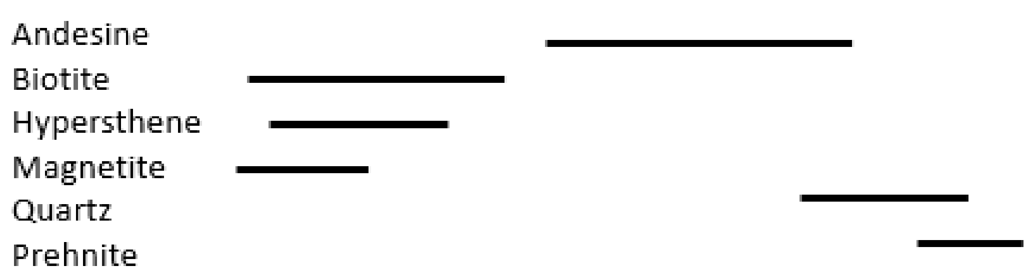
Source: Gaytán Rueda (1975)

Detailed petrography of a polished thin section by Randall (1980) of a sample of sulfide skarn from La Negra indicates the presence of euhedral andradite crystals (0.2 – 1.0 mm, probably after grossularite) 30%, anhedral to subhedral pyrrhotite 20%, porous sphalerite with exsolved chalcopyrite, perhaps replacing pyrrhotite, 15%, 5% each of galena and chalcopyrite, with less than 0.5% hessite (silver telluride) and traces of native silver.

It is currently believed that the andesite dykes occasionally seen at La Negra are post-mineral, and subsequently intruded along the same structures that were exploited by the earlier, mineralizing intrusive phases. Still, a sample of this intrusive was subject to detailed petrographic analysis by Randall (1980), as shown below.

The following figure details the paragenesis for the andesite described in Section 7.2.2

Figure 7.10 Paragenesis of Post-Mineral Andesite from the Maravillas Orebody



Source: Randall (1980)

7.4.2 Geochemistry

According to Lang, Baker, and Lewis (1998) fluid inclusions from La Negra document a trend of decreasing temperature, salinity (50 to eq wt%) and chemical composition (decreasing KCl, increasing $CaCl_2$) over time. Pre-mineral fluids were 400°C and hypersaline with up to 69 wt% total salinity, with mineralization forming from non-boiling fluids at 250-410°C and NaCl equivalent salinity of 12-14% by weight at less than 500 bars of pressure. All isotope studies indicate a predominance of magmatic fluids, although fluid inclusion studies demonstrate that there was subsequent mixing with meteoric fluids.

7.4.3 Mineralized Trends

The mineralization at La Negra displays a variety of orientations and dimensions and depends on the interplay between the intrusive and the surrounding limestones, but mantos and sheets appear to be the predominant morphology. The mineralized skarns can be narrow bodies that are less than one-meter wide, broad, lenticular zones of mineralization that are more than 20 m wide or, as in the case of the La Negra orebody, extensive tabular, subvertical orebodies that follow the contact between the intrusive and the limestone. There are also zones of mineralization that are tabular but subhorizontal, and broadly which follow the orientation of the bedding. These zones tend to have disseminated mineralization and lower grades.

Three, broad NW-trending zones of mineralization define the areas with higher grades. These are, from south to north, the so-called Northwest Trend that connects the La Negra orebody to the Alejandra/Blanca/San Onésimo areas and on to Valenciana, the Maravillas Trend that connects Bicentenario to Maravillas and the Cristo Rey trend that currently consists of El Alacrán and Trinidad but is unexplored to the NW. These zones are interpreted to follow the axial plane of the Piñón Anticline, with both intrusives and fluids exploiting these structures.

The (generally) lower-grade zones occur in between the three NW trends and are associated with subhorizontal limestone units in or near the fold nose. These zones include Gaby, Monica, Cobriza, Reyna, San Pedro and Buenaventura. These areas can be amenable to bulk mining methods, primarily room and pillar.

The image below (Figure 7.11) shows the contact between largely unaltered granodiorite (left) and garnet skarn to the right, showing replacement of the intrusive with (primarily) grossularite and sulfides.

Figure 7.11 Alteration Styles in the Intrusive

Source: MLN

The following image (Figure 7.12) was taken at the contact between altered limestone and altered intrusive (at lower right, showing surface oxidation) near the site of the original La Negra discovery. While individual units are still visible, they have been partially silicified and replaced by disseminated sulfides.

Figure 7.12 Alteration Styles in the Limestones

Source: MLN

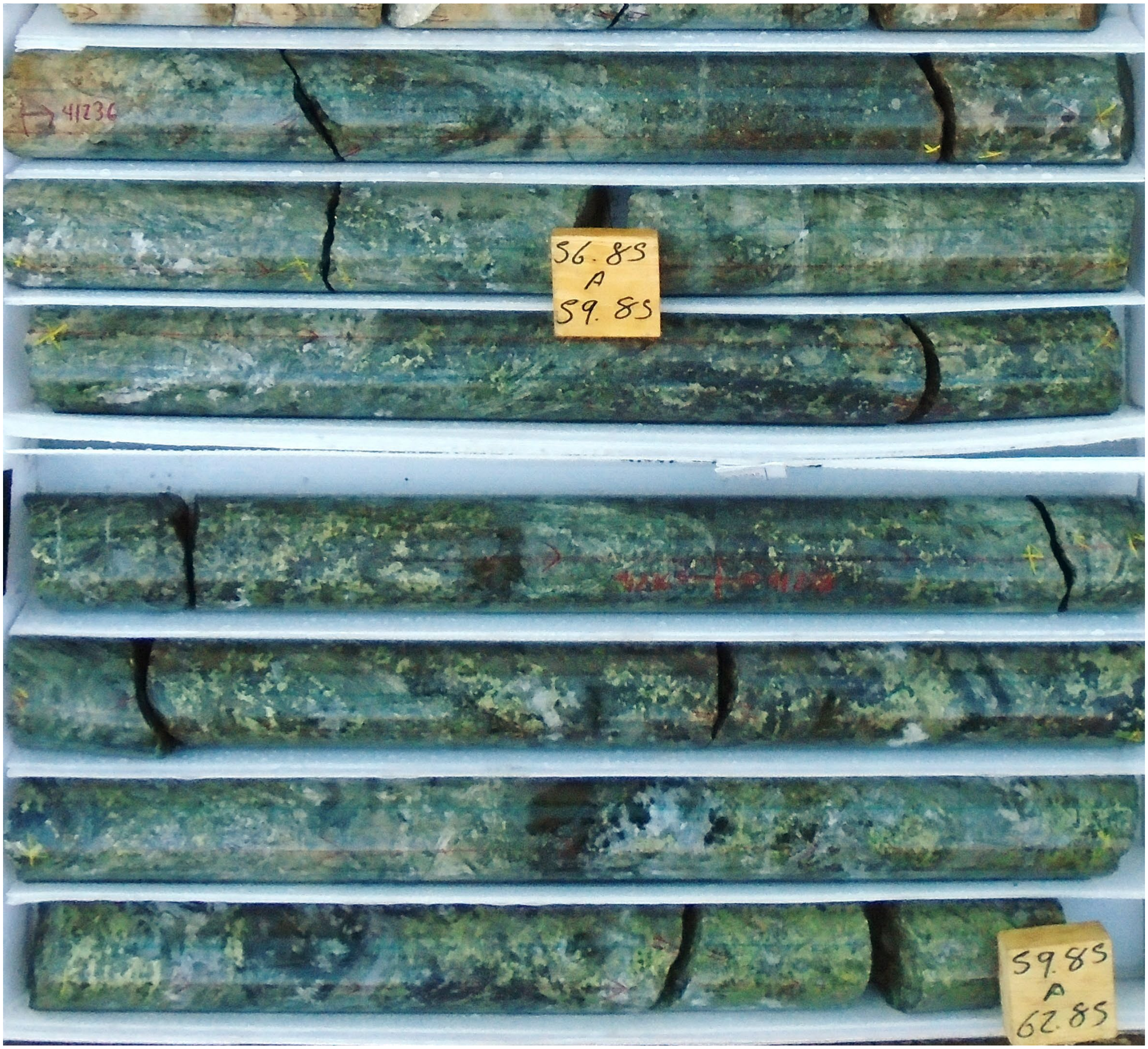
The following image from drill hole TRD-001-2021 in the Trinidad Zone showing bands of grossularite skarn and marble exoskarn with minor calcite and gypsum veinlets.

Figure 7.13 Grossularite-Marble Skarn from Trinidad Zone

Source: MLN

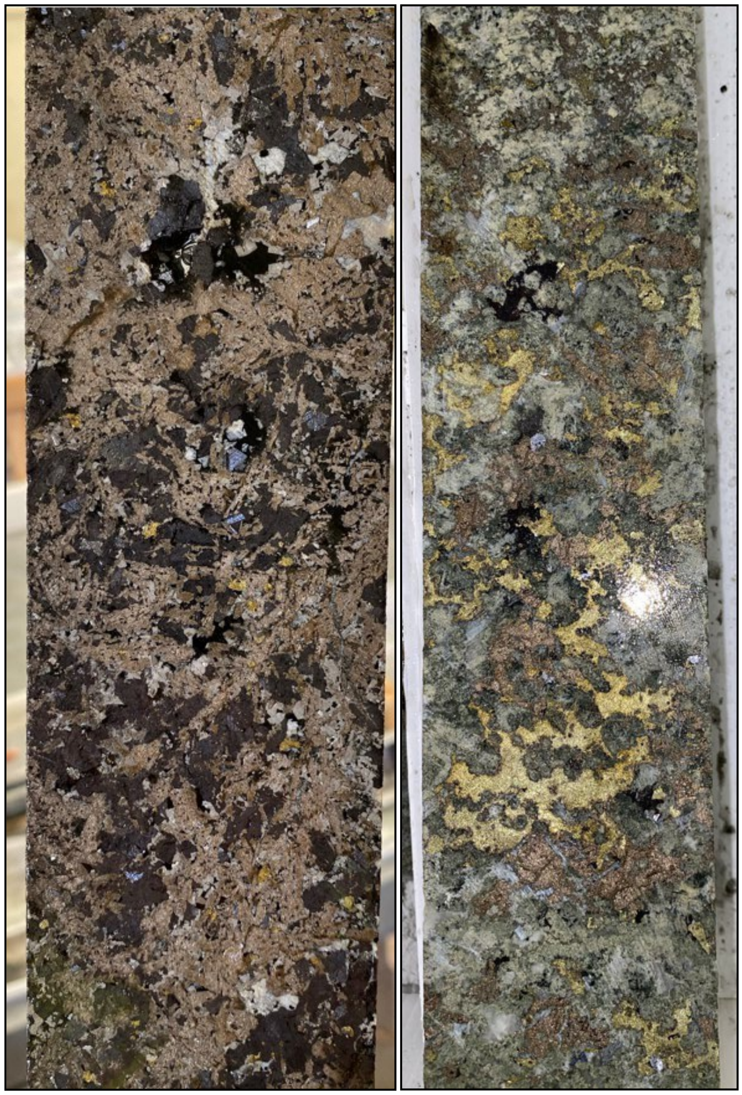
The figure below shows two intercepts of massive sulfide mineralization from drill hole 2021-009-DIF drilled in the Dificultad area, showing massive sulfide replacement of garnet/wollastonite skarn. Grossularite (~20%) > andradite (~5%) > wollastonite within a calcite matrix with some calcite veinlets. Mineralization consists of amorphous to semi-prismatic chalcopyrite (~40%), semi-amorphous to cubic marmatite associated with sphalerite (~15%), amorphous to disseminated patches of arsenopyrite and pyrrhotite (~3% each) and disseminated silver sulfosalts (~2%). Total intercept of 6.1 m grading US$270/t NSR.

Figure 7.14 Massive Sulfide Mineralization From 2021 Drill Program



Source: MLN

Figure 7.15 Various Half-Core Massive Sulfide Mineralization From 2021 Drill Program



Source: MLN

7.5 Mineralized Zones

The following table summarizes the known zones of mineralization at La Negra, including both those that have been exploited and those that are identified prospects. The nomenclature is complex; zones often have multiple interchangeable names, historic names or are sometimes grouped as regions. Table 7.1 details the zones and prospects that have been identified in the immediate vicinity of the mine, dozens of prospects and named occurrences exist throughout the totality of the concession package and have not all been identified in the table.

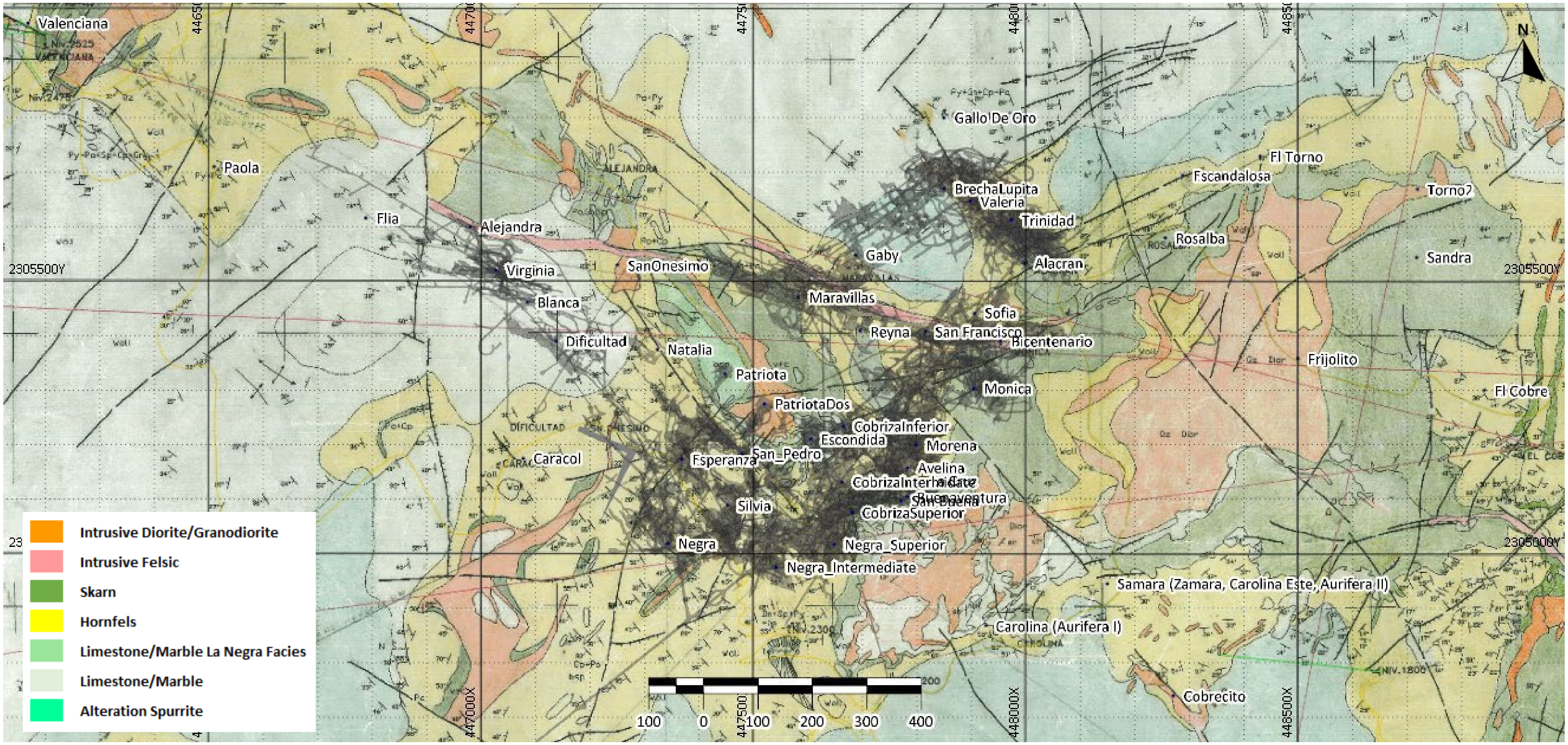
Table 7.1 Mineralized Zones at La Negra

Body/ Prospect Name	Deposit Style Comment	Mapping	Soil Sampling	Rock Chip	Channels	Drilling	Drifting/Shaft	Resource	Mining	Mined Out	Associated Names
Buenaventura	Chimney, skarn raft within intrusive	X	X	X	X	X	X	X	X	X	
Morena	Bedding dominated	X	X	X	X	X	X	X	X	X	
Esperanza	Chimney, steep, contact skarn	X	X	X	X	X	X	X	X	X	
Negra Intermediate	Chimney, steep, contact skarn	X		X	X	X	X	X	X	X	
Negra Superior	Chimney, steep, contact skarn	X	X	X	X	X	X	X	X	X	
SanPedro	Complex, structural, skarn raft	X	X	X	X	X	X	X	X	X	
Silvia	Chimney, steep, contact skarn	X			X	X	X	X	X	X	
Cobriza Superior	Chimney, steep, contact skarn	X			X	X	X	X	X	X	
Brecha	Associated with high-angle felsic dike, bedding influence in lower mine	X			X	X	X	X	X		
Lupita	Low angle bedding dominated with high-grade in steep structures	X			X	X	X	X	X		Brecha
Gaby	Low angle bedding dominated with high-grade in steep structures	X			X	X	X	X	X		Brecha
Trinidad	Associated with high-angle felsic dike, bedding influence in lower mine	X	X	X	X	X	X	X	X		Trinidad, Alacrán
Valeria	Associated with high-angle felsic dike, bedding influence in lower mine	X			X	X	X	X	X		Trinidad
Bicentenario	Associated with high-angle felsic dike, bedding influence in lower mine	X	X	X	X	X	X	X	X		
Maravillas	Associated with high-angle felsic dike	X	X	X	X	X	X	X	X		
Reyna	Associated with high-angle felsic dike, bedding influence in lower mine	X			X	X	X	X	X		Bicentenario Extention
Avelina	Complex, structural controlled, and bedding related	X			X	X	X	X	X		
Cobriza Intermidate	Complex, structural controlled, and bedding related	X			X	X	X	X	X		
Cobriza Inferior	Complex, structural controlled, and bedding related	X			X	X	X	X	X		
Monica	Complex, moderately steep, structural controlled, and bedding related	X			X	X	X	X	X		Monica
Negra	Chimney, steep, contact skarn	X			X	X	X	X	X		
Patriota/ Escondida	Skarn raft within intrusive	X			X	X	X	X	X		Patriota, Escondida
Alejandra	Associated with high-angle felsic dike, enrichment in bedding structures	X			X	X	X	X	X		Northwest
Blanca	Associated with high-angle felsic dike, enrichment in bedding structures	X			X	X	X	X	X		Northwest
Dificultad	Associated with high-angle felsic dike, enrichment in bedding structures	X			X	X	X	X	X		Northwest
Elia	Associated with high-angle felsic dike, enrichment in bedding structures	X			X	X	X	X	X		Northwest, Dios te Guie
Natalia	Associated with high-angle felsic dike, enrichment in bedding structures	X			X	X	X	X	X		Northwest
San Onésimo	Associated with high-angle felsic dike, enrichment in bedding structures	X	X	X	X	X	X	X			Northwest
Virginia	Associated with high-angle felsic dike, enrichment in bedding structures	X			X	X	X	X	X		Northwest
Valenciana	Contact skarn	X	X	X	X	X	X	X			

Natalia Alta	Contact skarn	X	X	X							
Caracol	Contact skarn	X	X	X		X					
Gallo De Oro	Fault related, likely related to high-angle felsic intrusive	X	X	X	X	X	X				
Carolina	Contact skarn	X	X	X	X	X					Aurífera I
Samara	Contact skarn	X	X	X	X	X					Samara, Carolina Este, Aurífera II
Cobrecito	Related to high-angle intrusive	X	X	X							
El Cobre	Related to high-angle intrusive	X	X	X		X	X				
Frijolito	Contact skarn	X	X	X	X	X					
Sandra	Skarn	X	X								
El Torno	Contact skarn	X	X			X					
Torno II	Contact skarn	X	X								Torno 2, Torno
Escandalosa	Contact skarn	X	X			X					
Rosalba	Contact skarn	X	X			X					

Source: Minera La Negra

Figure 7.16 La Negra Mineralized Zones (Plan View)



Source: MLN/Peñoles

8 Deposit Types

La Negra is classified as a Pb-Zn-Ag + Cu skarn. The word “skarn” is an old Swedish term used to describe very hard calcsilicate rocks that accompanied the alteration assemblage associated with iron and copper deposits. Today the term skarn is used to describe the metasomatic replacement of carbonate rocks by calcsilicate mineral assemblages (Ca-rich garnet, pyroxene, amphibole, and epidote) due to contact or regional metamorphism. Deposits formed through this process are known as skarn deposits and are usually the result of contact metamorphism and the associated metasomatism associated with the intrusion of a magma of granitic composition into (Fe or Mg rich) carbonate rocks.

Many different types of deposits can be classified as skarns, including those containing W, Sn, Mo, Cu, Fe, Pb-Zn, and Au mineralization. The different metals encountered in skarn deposits is the result of various factors, primarily among which are the composition of the intrusive, the crystallization dynamics of the intrusive and the composition of the derived magmatic hydrothermal fluids, the oxidation state of both the intrusive and the wallrock, and the depth and temperature of formation. These factors are also important determinants of the zonation of skarn deposits (Robb 2005, Chang and Meinert 2008).

As shown in Figure 8.1, adapted from Robb 2005, there is a general relationship between granitoid composition and skarn deposit type. Cu, Pb-Zn and W skarn are associated with calcalkaline, magnetite-bearing, oxidized (I-type) granites, although in the case of Zn skarns the igneous rocks can span a wide range of compositions from dioritic to high-Si granites. Fe and Au skarns tend to be related to intermediate to mafic intrusives, while Mo and Sn skarns tend to be associated with more differentiated granites that could be reduced (S-type) and ilmenite bearing.

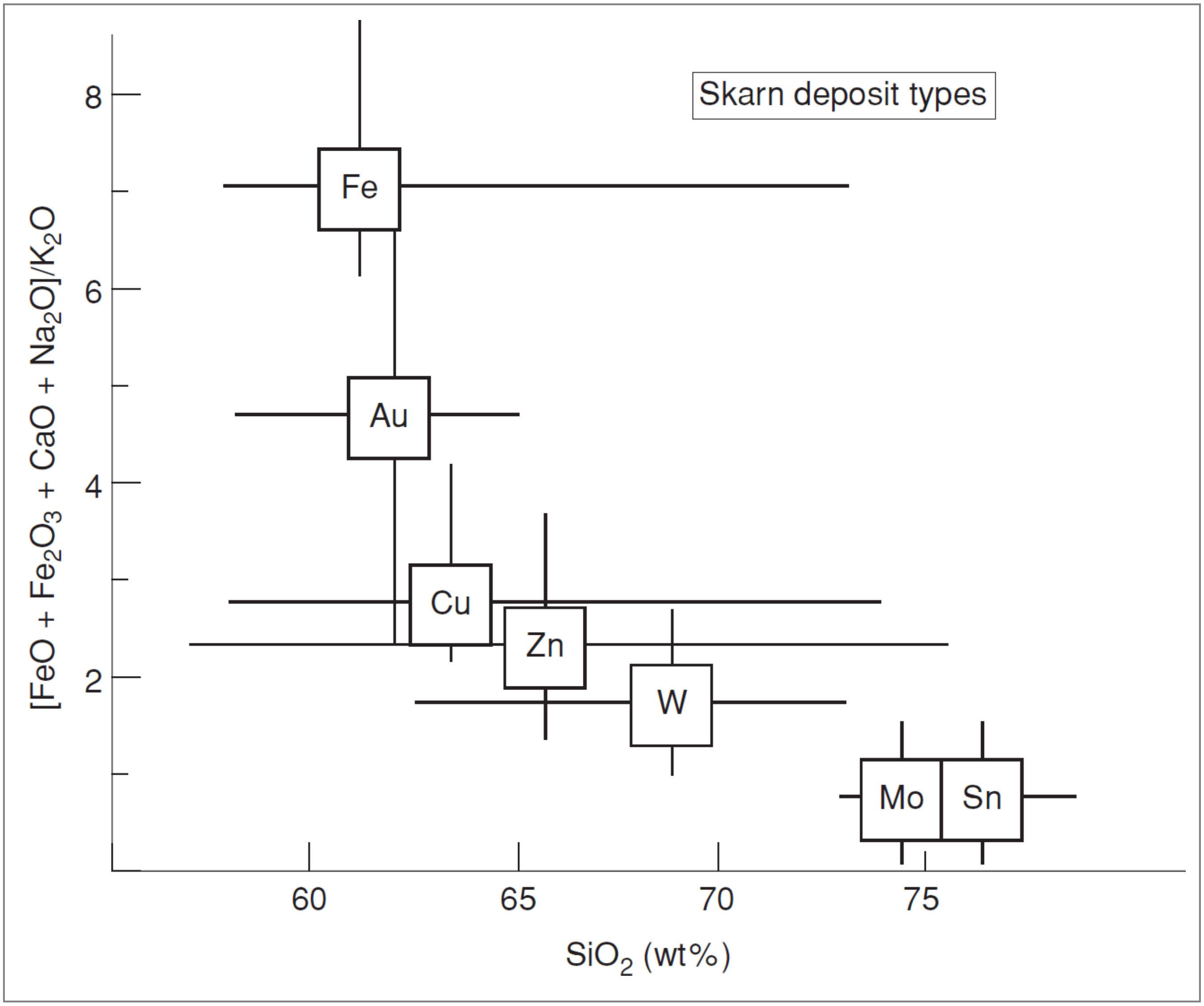
Zinc skarns occur mostly in continental settings, whether in association with subduction or rifting, but can span diverse geologic environments from deep-seated batholiths to shallow dike-sill complexes. They are, however, generally distal to the associated igneous rocks, and can be recognized by their distinctive Mn- and Fe-rich mineralogy. An increasing ratio of pyroxene to garnet and an increasing Mn content in pyroxene tend to follow the fluid flow path (Meinert 1987).

As with most skarns, there is a general zonation pattern with proximal garnet, distal pyroxene and vesuvianite (or a pyroxenoid such as wollastonite, bustamite, or rhodonite) at the contact between skarn and marble (Meinert). Zn skarns, being shallower and cooler, appear to form from fluids that have traveled far from the intrusive contact, leading to a more pronounced zonation and greater mineralogical variation.

The principal minerals are sphalerite ± galena ± pyrite ± magnetite ± arsenopyrite ± chalcopyrite ± bornite. Minor minerals include scheelite, bismuthinite, stannite, cassiterite, tetrahedrite, molybdenite, fluorite, and native gold.

The surface exploration program described in Section 9 was designed with this deposit type in mind, focusing on the geochemistry of elements associated with mineralization, as well as elements that can help define the boundary between intrusives and the surrounding carbonate rocks.

Figure 8.1 Igneous Composition Versus Dominant Skarn Metal



Source: Robb 2005

9 Exploration

9.1 Introduction

There have been several phases of modern exploration at La Negra during its more than 50-year history, starting with the work carried out by in the 1950s by Compañía Minera La Campaña and then by Peñoles prior to initial production until they closed the operation in 2001. Subsequently, Aurcana conducted some work in the period when they held ownership from 2006 to 2016, although minimal work was completed from 2006 through 2020. The 2021 program signals the first meaningful and methodical exploration on this project since it was held by Peñoles.

9.2 Peñoles

Initial exploration centered on the surface expression of the La Negra orebody, consisting of gossanous zones of altered intrusive in contact with indurated limestone showing selective bedding replacement. It was in this period that the Alacrán orebody was discovered. The facilities built by Peñoles at the time are still there, as are remnants of the small-scale core used at the time.

Once in production Peñoles continued its exploration efforts in the near-mine area and also began to conduct more regional exploration primarily to the east and south of the current operations, consisting of mapping and surface geochem. Many of the zones discovered at the time were considered uninteresting due to the (at the time) low grades, and no follow-up work was carried out.

Peñoles also identified the NW trend that includes deposits such as Blanca, Virginia, and Elia, as well as zones of mineralization such as San Onésimo and Valenciana which were never developed, and which currently represent valid exploration targets (and which are also included in the resource used in this study).

9.3 Minera La Negra

9.3.1 2021 Mapping

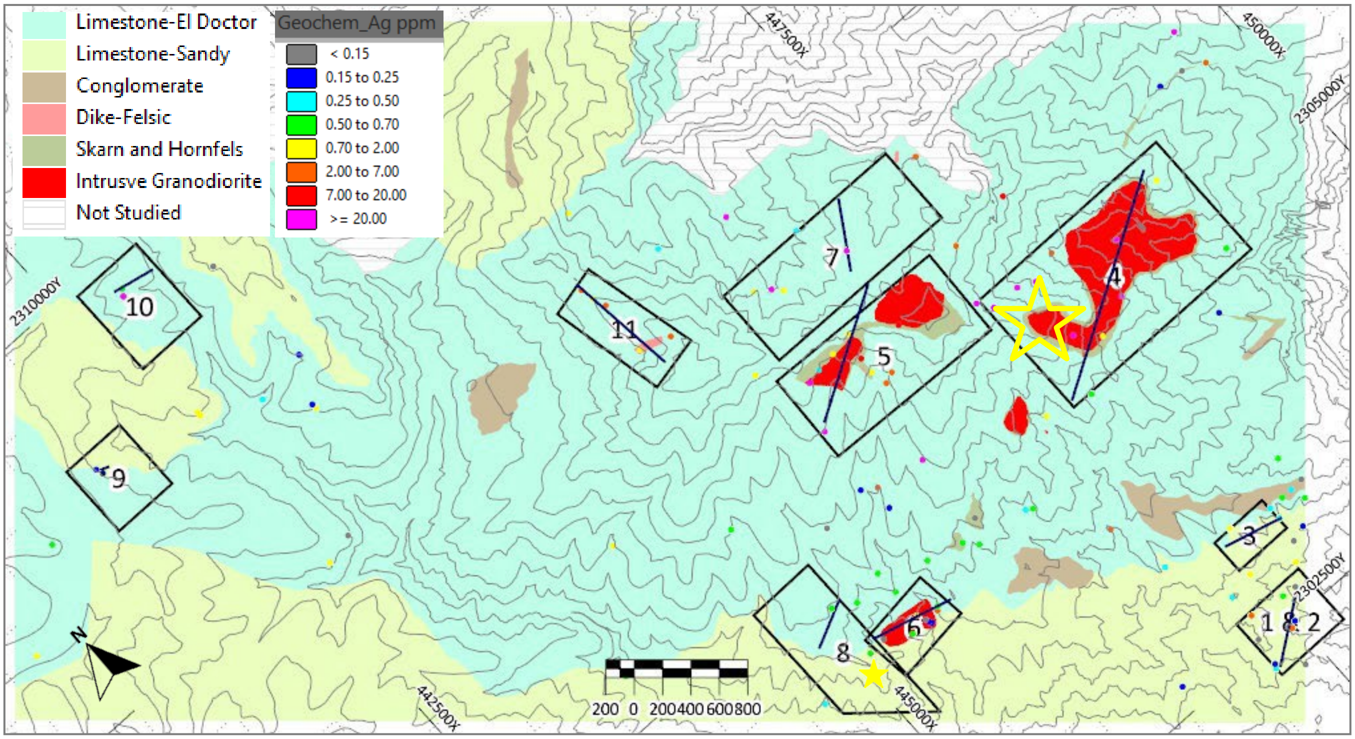
The 2021 field mapping program encompassed an area of 4,480 ha primarily to the northwest and east of the current mine site (yellow star in the figures below) and was completed by an experienced independent geologic contractor, A-Geommining. The program was designed to develop grassroots targets along the NW trending El Piñón Anticline building out from the current project area. Along with surficial mapping, the contractor collected soil samples on a 200 m grid and rock samples when potential metalliferous anomalies were encountered. The map area of the 2021 program represents only 11% of MLN’s concessions. The program illustrated the value of systematic exploration for demonstrating the prospectivity of the land package.

Based on the field mapping, 11 different priority zones of interest were identified and will form the basis for further work. Idealized cross-sections were also developed for each of these priority zones. The following figure details the mapping area, the priority zones identified and the orientation of the sections. A brief description of each of the 11 zones follows. Note, the zones names are based on the order that they were encountered and not priority of the target.

The 2021 field mapping program confirms that the influence of the intrusive rocks is pervasive throughout the mapping area, even though major outcropping is evident primarily only in the near-mine area. This suggests that there is near-surface potential along the belt, as evinced by the presence of outcropping skarn occurrences, and old workings throughout the mapping area.

Future work will focus on a more detailed assessment of each of the priority zones identified during the 2021 field program, incorporating the results of the surface sampling program.

Figure 9.1 Priority Zone Map and Cross-Section Locations



Source: MLN

9.3.1.1 Zones 1 and 2

Zones 1 and 2 are located in the SW corner of the mapping area and encompass an area with heavily folded, thin- to medium-interbedded fine-grained shales (0.20 to 3 m thick) and fine-grained, gray limestones (0.50 to 4.5 m thick) with marked NW-SE faulting. An intrusive of possibly granodioritic composition with quartz and plagioclase phenocrysts and disseminated traces of pyrite and chalcopyrite outcrops in the NE of this area. The central portion of Zones 1 and 2 display thin calcite veining with acicular wollastonite crystals, indicating a possible intrusive which has generated an alteration aureole.

9.3.1.2 Zone 3

Zone 3 consists predominantly of a conglomerate layer with subangular fragmental matrix-supported limestone with lime cement overlaying fine-grained, thin-bedded limestone with calcite veining and finely textured, heavily fractured reddish-brown shale. The shale displays oxides including limonite, hematite, and pyrolusite and consists of beds 1 -3 m thick. This sedimentary package belongs to the Mezcala Formation. Mineralization is evident in a layer within one of the shale units and has a thickness of 10-15 m and consists of areas of strong oxidation (hematite > limonite > pyrolusite) and pervasive silicification with disseminations and veinlets with 2-3% pyrrhotite > pyrite. This unit is oriented NW-SE and dips at 25-50^{o}.

9.3.1.3 Zone 4

Zone 4 is one of the most important, as it encompasses the area around the mine. The central part of Zone 4 displays several granodioritic outcrops in contact with limestones and pervasive mineralized skarn with evidence of pyrite, chalcopyrite, marmatite, arsenopyrite and pyrrhotite. The sulfides are generally associated with grossular garnet exoskarn. At higher elevations Zone 4 consists of thick units of gray, highly stratified limestone generally dipping SW with faulting at a NW-SE strike. The skarn is emplaced in limestone and consists of brown (andradite) and green (grossularite) garnet and variable texture, including massive, bands and patches.

The intrusive displays a phaneritic texture with plagioclase phenocrysts in a light green matrix consisting of plagioclase and ferromagnesian minerals and low quartz content.

9.3.1.4 Zone 5

This zone is located at the top of a large package of dark gray limestones with variable recrystallization and medium to low levels of folding. A (possibly) granodioritic intrusive outcrops over a large portion of this area. The skarn at the contacts is massive to banded and contains both brown and green garnet, with sulfides (including massive sulfides) in contact with the grossular exoskarn.

9.3.1.5 Zone 6

This zone consists of thick packages of fine-grained dark gray limestone with weak calcite veining and finely textured dark gray to reddish-brown shale interbedded with limestones. Two ancient workings were discovered in Zone 6. The first is in the east of the zone and consists of 10 m of development and a 6m shaft with evidence of massive sulfides and hematite, limonite, pyrite and traces of chalcopyrite and arsenopyrite in a garnet skarn with associated wollastonite.

The second working is in the central portion of Zone 6 and is associated with an 0.5 m outcrop following a fault trending N140E with strong oxidation (hematite, malachite, limonite) and abundant pyrite in a wollastonite skarn with traces of garnet.

9.3.1.6 Zone 7

The stratigraphy in this zone consists primarily of light-gray, fine-grained limestones with calcite veining and occasional disseminated pyrite interbedded with fine-grained, dark gray calcareous shale (with evidence of mineralization) both probably belonging to the Mezcala Formation. The mineralization is exclusive to the shales and consists of disseminated to massive aspy-py. The presence of sulfides and sharp changes in the orientation of the strata implies that they are proximal to the intrusive. A small intrusive outcrop contains surficial oxidation consisting of hematite > goethite.

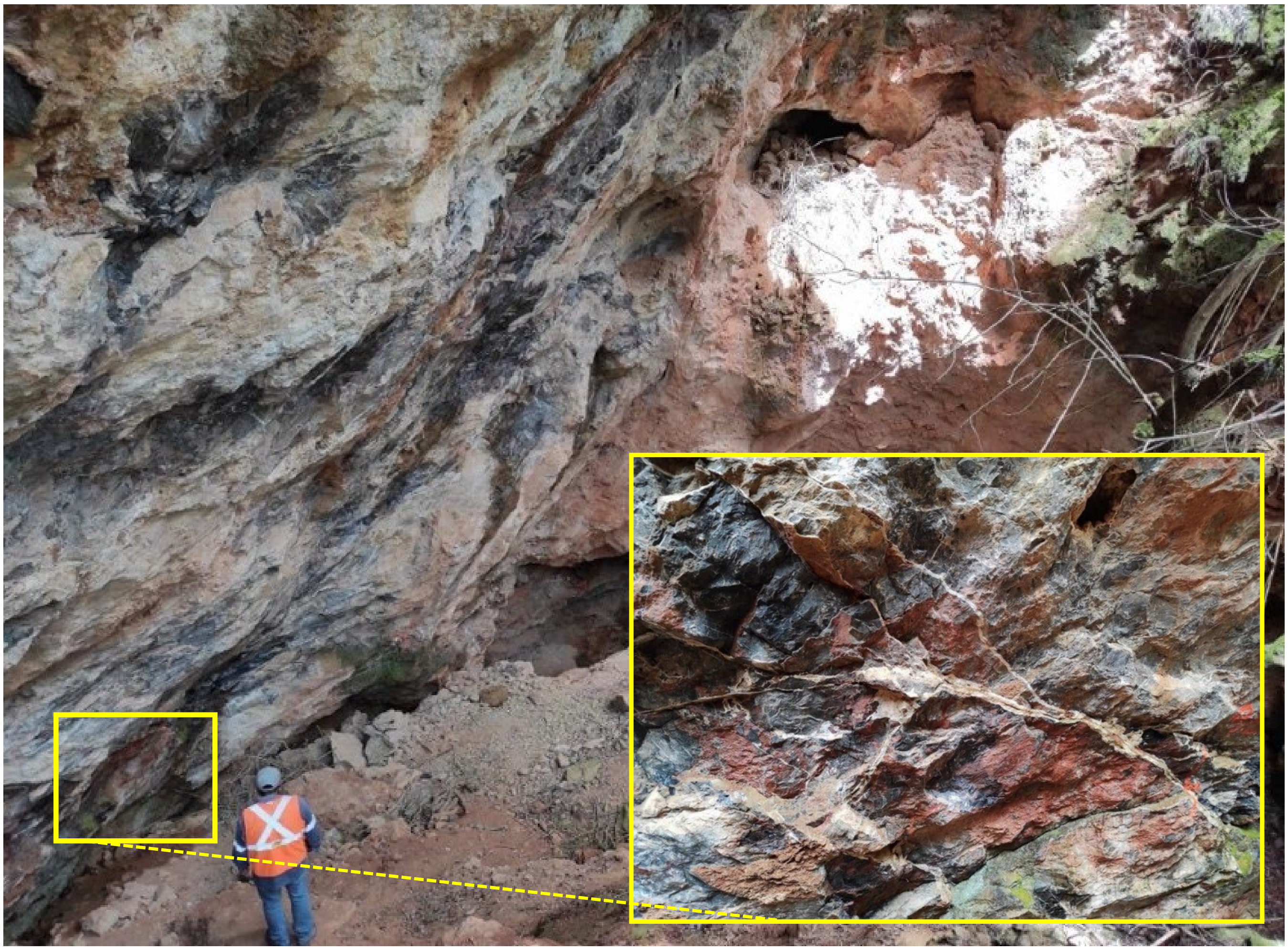
9.3.1.7 Zone 8

The limestones in this zone are fine- to medium-grained with karstic texture and most likely recrystallized limestone of the El Doctor Formation. There is also a calcareous breccia consisting of 5-20 cm subrounded to subangular limestone clasts in an iron oxide (goethite > hematite) and limestone micro fragments, bounded by normal faults, one of which displays an outcrop of sulfide carbonaceous brown garnet exoskarn. The exoskarn displays moderate to strong oxidation and pyrite and chalcopyrite veinlets.

9.3.1.8 Zone 9

Zone 9 is in an area dominated by fine-grained, dark-gray carbonaceous shale with interbeds of fine-grained limestone with calcite veinlets and oxides. A latter breccia consists of subrounded to angular limestone and carbonaceous shale clasts with a matrix of calcite and oxides. Several small old workings were observed with the largest consisting of a 15 m heading and a 9 m wide incline shaft of undetermined depth associated with the carbonaceous shale and wollastonite.

Figure 9.2 Zone 9 Workings



Source: MLN

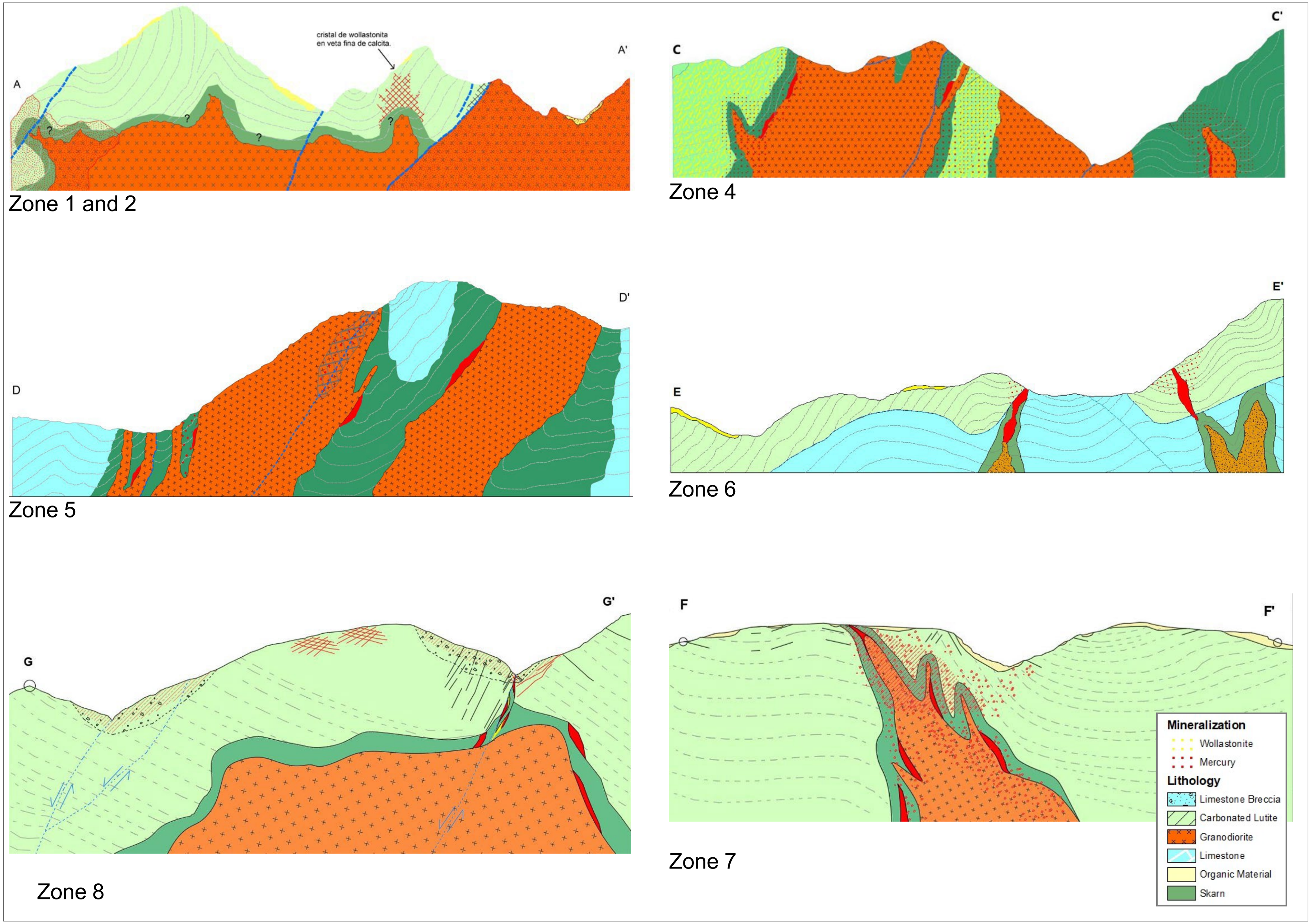
9.3.1.9 Zone 10

The lithology in the Zone 10 area consists of a matrix-supported carbonaceous polymictic breccia containing angular limestone clasts with a calcite cement which includes a reddish mineral, possibly cinnabar, and a fine-grained recrystallized calcite with some share interbeds and weak calcite veining. Zone 10 also contains numerous old workings.

9.3.1.10 Zone 11

The stratigraphy in this area consists of packages of heavily folded, gray recrystallized limestone, oriented NW with associated NW-SE parallel faults. Outcrops of fine-grained dioritic intrusive with plagioclase phenocrysts in a matrix of light green plagioclase and ferromagnesian matrix. minerals.

Figure 9.3 Idealized Cross Sections 2021 Zones of Interest

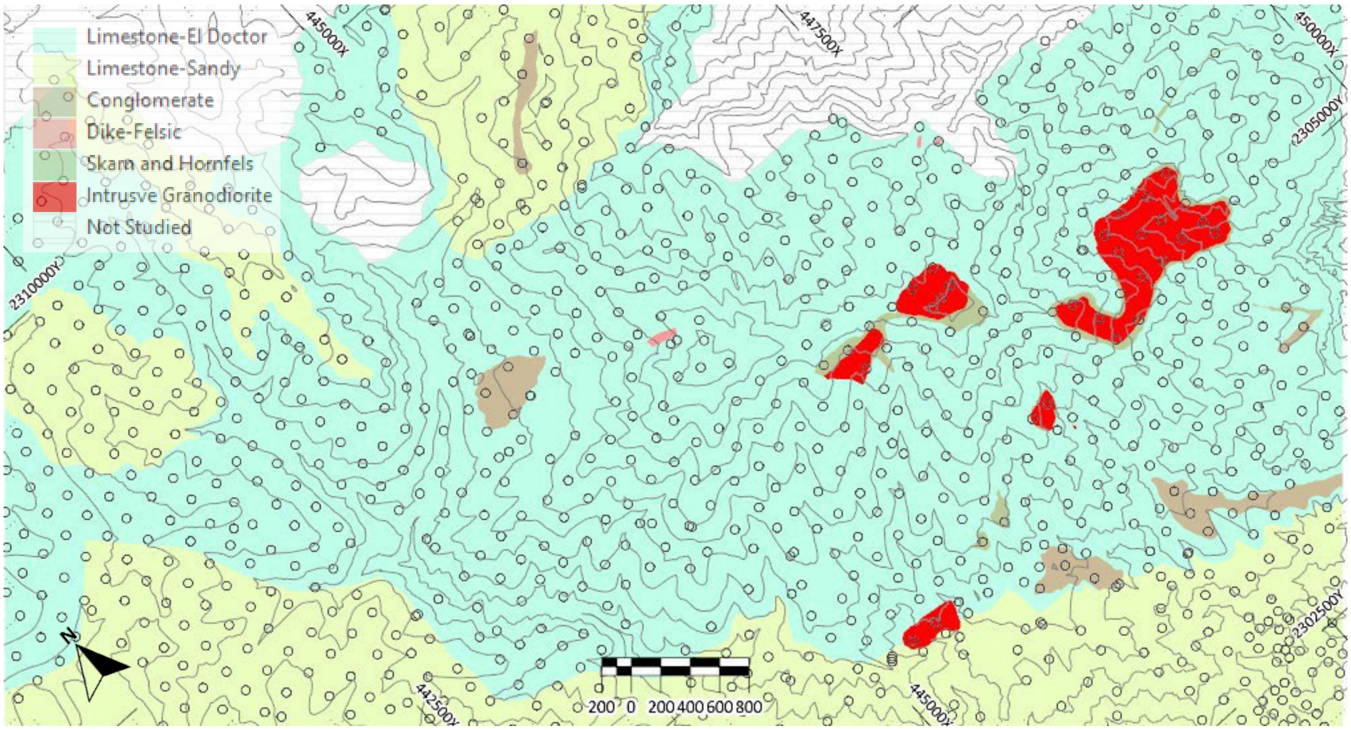


Source: A-Geommining

9.3.2 2021 Soil Sampling

The 2021 soil sampling program consisted of grid sampling an area of 4,480 ha on 200 m centers, resulting in the collection of 976 soil samples and 124 rock samples, with the latter chosen in those areas that showed evident mineralization at surface.

Figure 9.4 Soil Sample Locations 2021



Source: A-Geommining

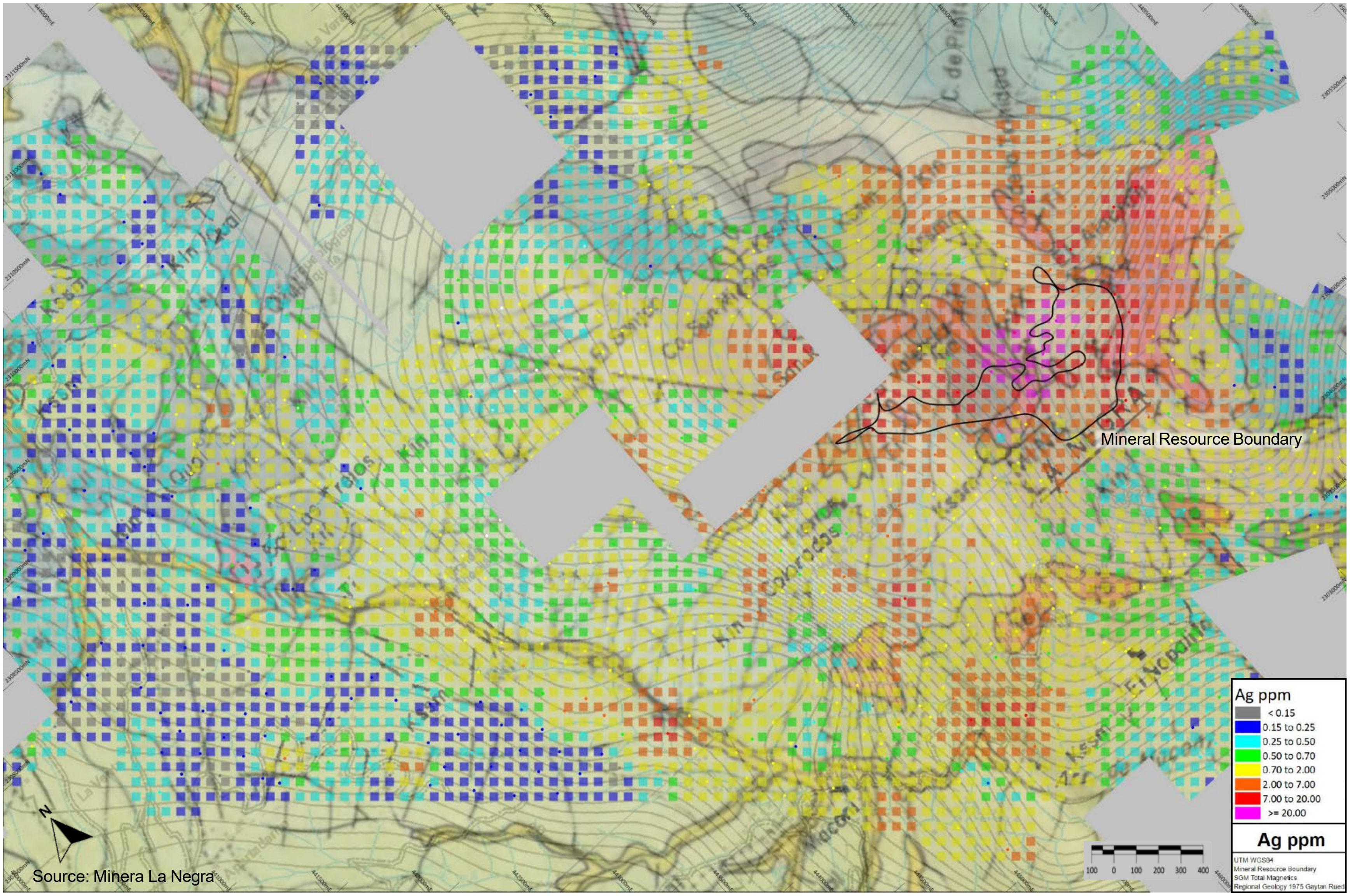
The soil samples were analyzed for 33 different elements and grids developed from the individual samples. The most relevant soil sample grid for Ag is presented in Figure 9.5, and the remainder is incorporated by reference herein.

The results of the soil sampling program outlined extensive Ag, Pb, Zn, and Cu anomalism centered on the existing footprint of the known mineralization (shown as the black outline in the following figure), but with the principal potential located north and northeast of the current resource. In addition to enrichment in the elements described above, the area to the N and NE of the current resource are also enriched in Bi, Cd, Co, and Cr. Elevated Bi is common in Zn skarns and values above 50 ppm are considered anomalous and are present to the east and north of the main resource area. In addition, four small Bi anomalies occur to the WSW of the main resource. Cadmium with values above 10 ppm are considered anomalous in Zn skarns. There is a significant Cd anomaly to the east of the resource area and is coincident with the Bi anomaly. There is a second Cd anomaly to the NW along the main structural trend. Co is elevated in calcic Fe-Cu skarns with which La Negra shares many similarities and values above 50 ppm are considered anomalous. Co anomalies are present directly to the east of the resource area (and coincident with Bi and Cd), but also to the west and to the south. There is another zone of high Co some 4 km to the WNW of the resource. Cr is an important indicator mineral because it replaces Al and Fe in spinel and pyroxene. Values above 25 ppm are considered anomalous. There is a significant Cr anomaly (coincident with Bi, Cd, and Co) directly to the east of the resource area.

A second zone of Cr anomalism occurs some 4 km NW of the known resource. This area shows significantly enhanced values of Cr and appears to trace known structures within the overall NW trend. In addition to Cr, this area is also anomalous in Ba and Mn. Barium replaces K in felspar and the presence of a significant Ba anomaly to the NW of the project area may signify the presence of another intrusive phase. This zone is also coincident with elevated levels of Mn, which is a common element in skarn-forming minerals such as vesuvianite and johannsenite.

A third zone of anomalism was discovered to the WNW of the resource area, showing anomalous values of Hg, Sc, and V. This area is slightly distal to the Ba, Mn anomaly noted above. Hg in skarn is considered anomalous above 250 ppm and is generally distal. This area also shows elevated levels of Sc; Sc/Rb ratios display a linear relationship that decreases progressively through Au, Cu, Zn and W Skarns (Meinert). Finally, this area also has elevated V levels, although V anomalism is quite widespread. V tends to demonstrate the same pattern as Sc.

Figure 9.5 Soil Sampling Program 2021 - Soil Grid Ag



Source: Minera La Negra

9.3.3 2021 Channel Sampling Program

Channel samples were cut from outcrop faces that had been cleared of vegetation, talus, and loose rock. A rock saw with diamond saw blades was used to cut a channel in the rock face, and perpendicular cuts were made to facilitate the sampling. This was completed with a hand chisel and a hammer. The average sample length of the channels is approximately 2 m. Samples from the channeling were bagged and labeled on site by the contractor and treated with the same chain of custody protocols as would drill holes (see Section 10 for more detail on QA/QC procedures).

The following table summarizes the results of the channel sampling program. For Ag the channel samples ranged from 4 – 6 ppm, with 5ppm generally considered anomalous for this type of skarn deposit. For Pb the values obtained in channel samples ranged from 33 – 288 ppm, with values greater than 100 ppm considered anomalous. For Zn, values greater than 200 ppm are considered anomalous and the values derived from the channel samples range from 60 p 607 ppm. Finally, the results for Cu ranged from 21 – 119 ppm, with values above 100 ppm considered anomalous. Overall, as shown in Table 9.1 the best overall results were obtained in CNL-001 and CNL-006.

The intent of the 2021 channel sample program was to refine targets along the SE skarn contact and assess the potential for a continuation of the La Negra chimney in the opposite direction than the mine has been developed. The program demonstrated that the trend was mineralized, however economic grade mineralization was not encountered.

Figure 9.6 2021 Channel Sample Locations

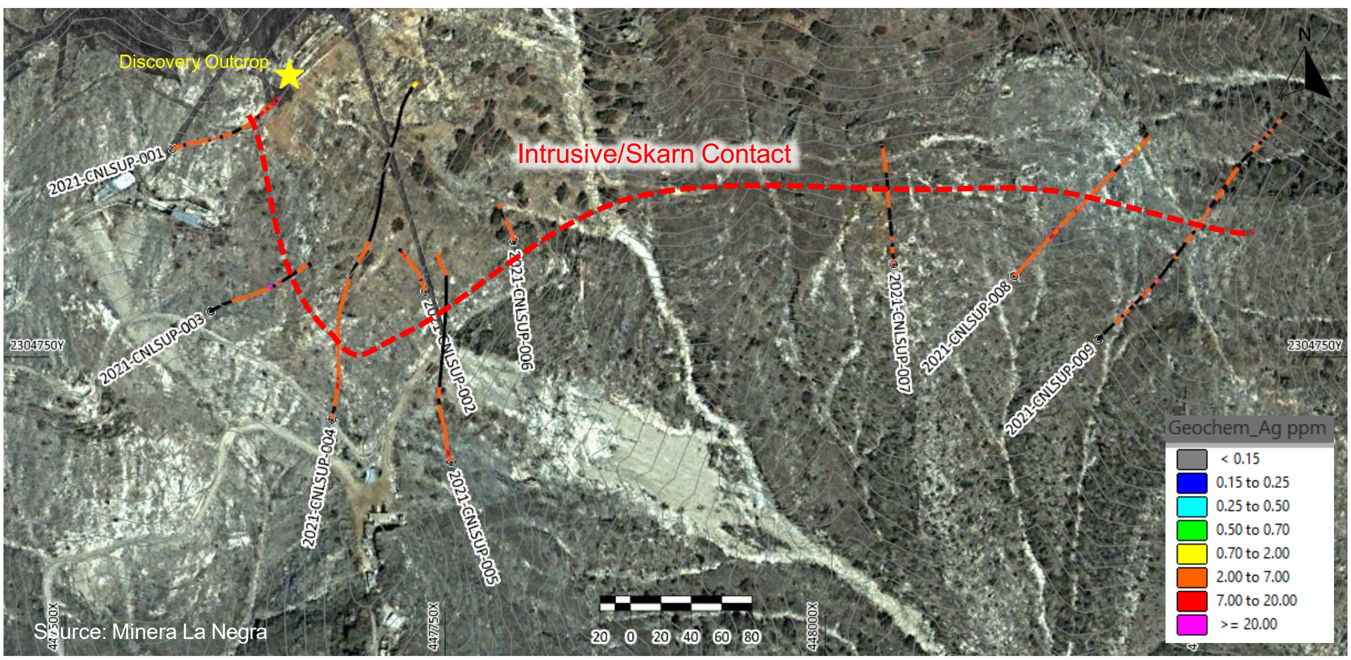


Table 9.1 Channel Sample Results

Channel	Meters	Samples	Azimuth	Ag ppm	Pb ppm	Zn ppm	Cu ppm
CNL 001	82.9	31	50	6	288	607	113
CNL 002	41.4	18	320	4	132	176	80
CNL 003	88.5	32	60	6	33	60	27
CNL 004	75.8	62	38	4	59	83	27
CNL 005	155.6	35	345	5	100	272	34
CNL 006	28.3	12	335	6	138	580	119
CNL 007	98.1	26	346	4	79	134	30
CNL 008	138	65	46	4	167	267	23
CNL 009	229.3	55	41	5	119	82	21
Total	**937.9**	**336**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Source: MLN

9.3.4 Data Recovery

With, a significant portion of La Negra's 50 years of operating history occurring before the advent of modern geological database management, much of the data that had been compiled had not been digitized. Among this information are drill logs with extensive details, including collar and orientation information, full geologic logging, assays, and sections. As a result, MLN engaged a third-party geologic contractor to sift through all existing paper records, confirming the completeness of the data and incorporating it into the drillhole database.

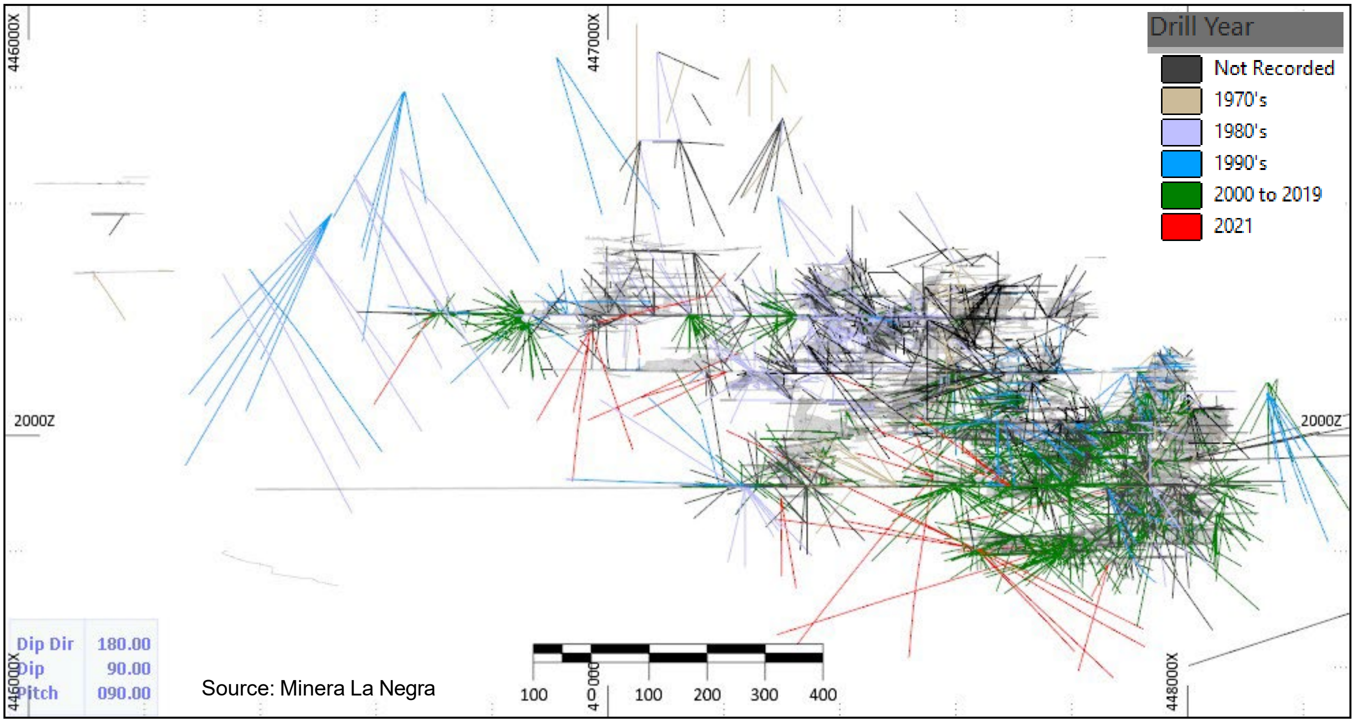
9.3.5 2021 Drill Program

The procedures, results, and interpretation for the 2021 drill program are detailed in Section 10.

10 Drilling

The project database contains 2,851 holes drilled from 1950's to 2021 with a total length of 227,063 m. Figure 10.1 shows the project drilling in relation to underground workings. MLN has conducted underground drilling since the acquisition of the Property in 2006 from Peñoles, both to find extensions of known mineralization, and to discover new zones but primarily drilling after 2006 has been near existing development.

Figure 10.1 Drilling by Year (Looking North)



Source: Minera La Negra

Table 10.1 MLN Drilling by Year

Year	# Holes	Meters
2006	1	79
2007	25	1938
2008	60	4326
2009	59	3762
2010	203	10574
2011	220	13231
2012	188	12467
2013	180	15102
2014	170	12582
2015	93	5696
2016	45	1431
2017	41	3101
2018	39	3597
2019	13	364
2020	-	-
2021	35	9800

Source: MLN

MLN employs its own drillers and owns a variety of underground drill equipment, which are used primarily for definition drilling. The 2021 drill program, however, was caried out by an experienced independent drilling company. Underground drilling is generally controlled and monitored by mine geological staff, but for the 2021 exploration program this was managed by experienced geological contractors, who were tasked with confirming the surveys of the location of the drill collar and the azimuth and inclination of each hole. Core was delivered to the secure core sampling and storage facility at the main mine complex where it was recorded as received and input into a control database that documented the process of logging and sampling. Prior to sampling, the core was checked for completeness and continuity, box numbering and length. The core was then cleaned and logged for lithology, mineralization, structure, and alteration. All core was photographed to provide a digital record.

Intervals were selected for sampling based on visual identification of mineralization. Sample lengths generally are one or two meters; barren intervals above and below mineralization are also sampled to ensure the limits of mineralization are captured by the sampling process. Core was cut with a saw and half was placed in a labelled plastic sample bag together with a corresponding sample tag. A sample tag was placed in the core box and a third copy was retained in the sample booklet. When sampling was completed, the samples were consigned to the mine assay lab through a chain of custody protocol. Samples were routinely assayed for silver, copper, lead, zinc, iron, and arsenic and beginning in 2021 for antimony, bismuth, and cadmium.

The majority of underground drillcore assays that have been collected by MLN have been incorporated into the database that is described in Section 14 of this report and has been used for the resource estimate also described in Section 14. The global database contains approximately 16,450 longhole assays that are a source of information for the Resource estimation.

The host rocks of the mine are typically very competent, core recoveries are consistently high. There are no drilling, sampling, recovery or other factors that appear to materially impact the accuracy and reliability of the assay results obtained.

Holes are drilled at a variety of angles with respect to the true thickness of the mineralization encountered. This is true both within zones and from one zone to another because the morphology of the mineralization is variable at both scales. The discrepancies between true and intersected thickness of mineralization are addressed in the resource estimate shown in Section 14.

The 2021 drill program consisted of 35 holes totaling 9,705 m, shown in Figure 10.2 and detailed in Table 10.2.The following table presents the most significant intercepts encountered in the 2021 drill program, showing the depth to intercept from the drill collar, actual intercept, and Ag, Pb, Zn, and Cu grades, as well as the estimated NSR for the intercept based on metal grades and estimates of penalty metals. The results obtained from the 2021 drill program validate the existing geological model, with mineral intercepts corresponding to the anticipated extensions of known mineralized zones.

Figure 10.2 2021 Drill Program Collar Location Map

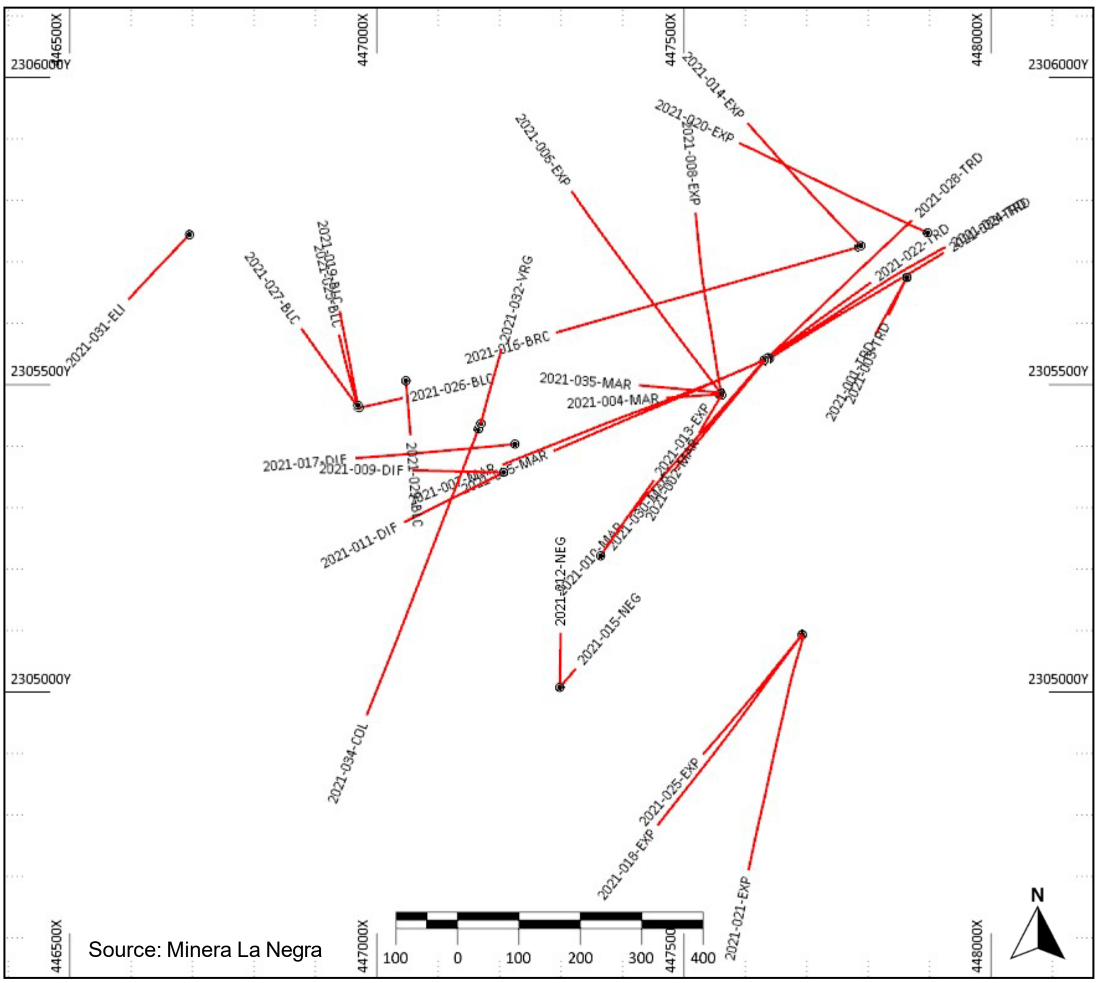


Table 10.2 2021 Drill Program Collar Locations

Hole ID	Easting	Northing	Elevation	Depth	Azi	Dip
2021-001-TRD	447,863	2,305,675	1,777	212	209.2	-59.4
2021-002-MAR	447,561	2,305,483	1,927	116	210.9	51.6
2021-003-TRD	447,863	2,305,675	1,777	89	207	-39.5
2021-004-MAR	447,558	2,305,485	1,930	102	266.1	31.4
2021-005-MAR	447,630	2,305,540	1,806	377	246.5	8.9
2021-006-EXP	447,560	2,305,487	1,927	507	322.9	-34.6
2021-007-MAR	447,631	2,305,540	1,807	502	247.6	23.5
2021-008-EXP	447,561	2,305,487	1,927	429	348.6	-42.5
2021-009-DIF	447,206	2,305,358	2,110	156	270.6	-16.5
2021-010-MAR	447,631	2,305,539	1,806	345	222.6	9.5
2021-011-DIF	447,206	2,305,357	2,110	197	240.6	-22
2021-012-NEG	447,298	2,305,008	1,893	163	0	-56
2021-013-EXP	447,364	2,305,222	2,110	154	33.6	-11
2021-014-EXP	447,788	2,305,726	1,811	273	314.6	-0.5
2021-015-NEG	447,298	2,305,007	1,893	162	39.6	-75
2021-016-BRC	447,785	2,305,724	1,810	535	254.6	-15.5
2021-017-DIF	447,225	2,305,404	2,142	286	263.6	-24
2021-018-EXP	447,693	2,305,093	1,913	402	220.6	14.2
2021-019-BLC	446,969	2,305,467	2,179	211	349.6	-41.5
2021-020-EXP	447,897	2,305,747	1,911	346	293.6	-10.5
2021-021-EXP	447,694	2,305,093	1,913	400	191.6	10
2021-022-TRD	447,636	2,305,543	1,803	273	58.6	-40
2021-023-BLC	446,969	2,305,465	2,179	286	346	-64
2021-024-TRD	447,637	2,305,544	1,803	380	62.6	-28
2021-025-EXP	447,692	2,305,094	1,914	280	219.1	26
2021-026-BLC	446,971	2,305,463	2,179	216	78	-69.5
2021-027-BLC	446,968	2,305,465	2,179	219	324	-45
2021-028-TRD	447,637	2,305,544	1,803	393	45.9	-32.7
2021-029-BLC	447,047	2,305,507	2,191	104	174.7	-30.8
2021-030-MAR	447,631	2,305,539	1,806	242	219	16.5
2021-031-ELI	446,695	2,305,744	2,209	214	223	-47
2021-032-VRG	447,170	2,305,437	2,240	132	15	17.5
2021-033-TRD	447,639	2,305,543	1,805	360	58	-21.5
2021-034-COL	447,166	2,305,428	2,239	503	201	-5
2021-035-MAR	447,560	2,305,487	1,929	140	274	18

Source: MLN

Table 10.3 2021 Drill Program Significant Intercepts

Hole ID	From	To	Intercept	Ag (g/t)	Pb (%)	Zn (%)	Cu (%)	NSR (US$/t)
2021-001-TRD	29.2	45.2	16.0	79	0.23	1.66	0.66	79.9
	57.2	77.2	20.0	132	0.51	1.47	1.28	136.6
	95.2	103.2	8.0	50	0.14	1.57	0.28	44.4
2021-002-MAR	45.1	50.2	5.1	63	0.06	3.13	1.03	96.0
	91.3	94.6	3.3	66	0.56	3.78	0.14	57.8
2021-003-TRD	25.1	30.3	5.2	85	0.23	1.30	0.23	58.1
2021-004-MAR	53.8	57.8	4.0	75	0.26	0.35	0.09	45.5
2021-005-MAR	142.9	149.9	7.0	81	0.14	0.73	0.32	58.4
2021-007-MAR	252.0	255.0	3.0	53	0.30	1.03	0.26	44.8
2021-008-EXP	256.9	261.2	4.3	58	0.02	0.69	0.67	59.7
2021-009-DIF	57.0	63.1	6.1	204	0.13	2.49	3.50	270.0
2021-012-NEG	108.5	114.0	5.5	71	0.23	0.38	0.50	58.4
2021-015-NEG	15.9	20.2	4.4	90	0.53	2.57	0.31	79.8
2021-017-DIF	187.6	193.3	5.7	59	0.02	1.16	1.24	92.0
	203.3	209.3	6.0	140	0.04	0.40	3.27	217.8
	246.9	250.3	3.3	44	0.08	8.37	0.32	69.2
2021-016-BRC	58.0	61.0	3.0	60	0.26	0.74	0.22	46.0
	137.0	140.0	3.0	127	0.21	0.68	0.21	79.8
	200.5	203.5	3.0	39	0.03	2.32	0.56	56.2
2021-019-BLC	5.4	7.8	2.5	159	1.09	1.47	0.20	113.5
	45.1	53.6	8.6	71	0.12	4.42	0.98	105.5
	69.6	73.8	4.2	46	0.04	3.48	0.91	86.4
2021-022-TRD	9.0	12.0	3.0	55	0.10	0.89	0.75	65.6
	231.2	234.3	3.1	208	0.92	6.46	0.73	161.2
2021-023-BLC	6.0	9.0	3.0	109	1.20	1.68	0.08	83.3
	22.0	28.0	6.0	62	0.13	3.94	0.56	80.8
	30.0	36.0	6.0	87	0.20	5.39	1.05	119.3
	197.3	200.0	2.7	58	0.17	0.23	0.70	59.3
2021-024-TRD	5.0	8.5	3.5	89	0.16	1.33	1.07	102.7
	251.5	269.8	18.3	96	0.28	3.94	1.09	117.2
2021-026-BLC	22.6	25.0	2.4	218	0.63	1.25	0.64	153.9
	30.3	32.6	2.4	86	0.11	2.22	1.36	116.7
	35.9	43.9	8.0	43	0.05	3.22	0.53	65.9
2021-027-BLC	32.0	37.8	5.8	73	0.15	6.56	0.88	100.8
	62.3	66.3	4.0	78	0.21	6.62	0.39	86.8
2021-028-TRD	9.9	11.9	2.0	77	0.18	2.31	0.74	89.1
	106.9	109.6	2.7	57	0.05	2.00	0.99	84.7
2021-032-VRG	9.8	13.0	3.3	37	0.03	0.38	0.91	58.6
2021-033-TRD	4.4	14.0	9.6	103	0.26	2.97	0.90	109.0
	63.2	66.5	3.4	56	0.10	0.25	0.52	51.3
	86.3	90.3	4.0	106	0.24	0.51	0.47	78.1
	173.3	177.3	4.0	103	0.07	0.49	1.55	122.5
	205.4	209.4	4.0	102	0.18	1.10	0.31	71.8
	214.1	285.4	71.3	62	0.12	1.06	0.71	70.3
2021-035-MAR	102.4	108.4	6.0	124	0.27	0.86	0.58	95.7
	110.4	113.9	3.5	89	0.18	2.15	1.27	116.3

Source: MLN

11 Sample Preparation, Analyses and Security

The project dataset includes two primary databases, one consisting of sampling collected during operations and the other consisting of drill core sampling. The operational database largely contains information collected after Aurcana purchased the property; some Peñoles operational data exists but is mostly relevant to mined out areas and is not as relevant to remaining Resource areas. The drill core database contains significant quantities of Peñoles drilling, with exploration drilling outside of the immediate mining area nearly exclusively from Peñoles. A minor amount of exploration drilling was completed by Aurcana in the Carolina and Samara area in 2015. Except for the 2021 drill program, the drilling since Peñoles has largely been focused on mining related definition of immediately available areas. The goal of the 2021 drill program was to expand Inferred Resource and promote near mine discovery with little focus on incremental near mine expansion.

Peñoles completed several rock and soils programs, however, very little tabular data is available. Aurcana conducted an extensive rock sample program in 2012 that is described in previous technical reports. In 2021, assisted by geologic services contractor A-Geommining, MLN completed a systematic soil sample program and rock sample prospecting. The 2021 soil and rock program samples were prepared at the onsite laboratory and pulps were analyzed at ALS Chemex.

All core is logged and sampled at a secure core logging facility located on the property. Other samples such as surface and underground channel samples are submitted by the geologists responsible for their collection to the onsite assay laboratory for analysis. In both cases the samples are prepared according to formal protocols that have been developed by the Mine Geology and Exploration Department. These protocols are summarized in Section 11.3.

11.1 Peñoles and Previous Explores

Peñoles actively explored and operated the property up to 1999. Although modern concepts of QA/QC were not common at that time, analytical testing was completed by the onsite laboratory responsible for mine operating data. A reasonable assumption has been made that the mine was financially incentivized to maintain an accurate facility. The quality of reports, maps, and logs, indicates Peñoles operated the mine and exploration at a high profession standard. Information regarding QA/QC from this period has not been located and is suspected not to exist. The production sample database does not contain significant quantities of blast-hole and channel sampling completed by Peñoles. The drill hole database does contain significant quantities of Peñoles exploration and operational core drilling. This information is considered reliable and verified by the operating history of the mine. Weakness of the historically collected drillhole samples include smaller diameter core that contributes to increased variability. Grade bias has not been observed with this dataset except for bias generated from absence of sampling. Historic sampling procedures did not include shoulder sampling, often did not include the sampling of internal waste intervals, and generally ignored grades suspected to be lower than the current operating cut-off grades. Discussed further in the Resource section of this report, unsampled historic intervals within the modeled mineralized zones were assigned ‘0’ grade for payable attributes which is the most appropriate option but also the most conservative approach. Historic sampling has frequently been confirmed through mining, resampling, and adjacent testing; no issues with historically collected data have been suggested or encountered.

11.2 Aurcana

Ownership by Aurcana, a publicly listed Canadian mining company, was accompanied by improvements and modernization of QA/QC protocols. The initiation of QA/QC sample insertion is described in Aucana’s

2008 technical report authored by GeoSim Services Inc and extensive verification sampling is described in the 2013 Behre Dolbear technical report. Aurcana frequently employed umpire check sampling at SGS and ALS Chemex.

11.3 Sample Preparation

11.3.1 Surface Sampling

Sample size varies with the sample medium (soil or rock), but for all sample types the project number, sample number, date of collection, location and description, including, if appropriate, lithology, structure and alteration are recorded. The sample is placed into either a cloth or canvas sample bag that is tied shut. The sample location is marked and photographed. Samples are submitted to the assay laboratory by the responsible geologist.

11.3.2 Mine Sampling

Samples are collected from working faces, backs and ribs. Sample lines are marked at 5 m intervals along the strike of the mine development with spray paint and are divided into sample intervals, typically 3 m in length. Samples are collected either with a chisel and hammer or by saw, and the sample material is caught on a tarp placed on the floor of the area being sampled. Samples are collected in numbered plastic bags and a sample tag is also placed in the bag. Bags are closed with ties. Sample numbers are inscribed on aluminum tags that are nailed to the midpoint of the sample interval. The sample numbers and locations are recorded manually and subsequently transcribed to a database. Samples are transported to surface as collected and are submitted to the assay laboratory by the responsible geologist.

In addition to samples taken from the surface of workings, samples are also taken from production long holes (blast holes) and used for grade control. Blast holes are drilled both down and up and a single sample is collected for each hole from the cuttings generated by the drill. Holes are laid out in parallel lines 1.5 m apart and drilled at a spacing of 1.2 m. Each hole is assigned a unique, consecutive identification number that is in turn applied to the collected sample. Holes, and hence samples, vary in length, normally from 8.0 to 13.0 m, but at Trinidad are up to 22 m long. Samples from down-holes are collected using a shovel from the pile of cuttings that surrounds the hole on the floor of the working; material is taken from at least five points around the pile by digging through the full vertical profile of the cuttings to obtain a representative sample. For up-holes, a boot is installed on the drill to capture the cuttings from the hole and the sample is taken from the material collected in the boot. The boot is cleaned after each hole before re-use. The location of each blast hole is surveyed, and all holes are laid out on a plan map used for identification and notation of sample numbers. Between 3.0 to 4.0 kg of cuttings are collected in plastic bags from each hole; each is accompanied by a sample tag also placed within or attached to the bag. Bags are closed with ties. The sample numbers and locations are recorded manually and subsequently transcribed to a computer database. Samples are taken under the supervision of a geologist and the same day are transported to surface as collected and submitted to the assay laboratory by the responsible geologist.

11.3.3 Drill Core Sampling

This procedure applies to core obtained by both surface and underground drilling but, in practical terms, almost all core drilling has been, and is, carried out underground. Core is placed into synthetic cardboard core boxes by the drill crew. The interval drilled is marked with wooden blocks showing the depth of the hole at the location of the block. Core is washed and measured for recovery. In transporting core to the core processing facility on surface, care is taken to avoid any contaminants that may compromise the integrity of the core boxes or the quality of the contained core.

At the core processing facility, the core is logged and marked for sampling by the geologist in charge of the facility. After the core is marked for sampling, and prior to cutting, the core is photographed in lots of two boxes. Core intervals to be sampled are selected on the basis of visual inspection for mineralization. Intervals of mineralization are bracketed by samples of unmineralized wall rock, 1 – 3 m in length, on both sides of the mineralized interval.

Core is sampled by cutting with diamond saws. The saws are located immediately adjacent to the table on which the core is logged. Core is sawn in half and the portion to be analyzed is placed in a plastic bag that is marked with the sample number. In addition, a tag with the sample number is placed in the bag, which is then shut with a plastic tie. The bagged samples are placed in trays for transportation to the assay laboratory and the boxes containing the other half of the core are placed on racks in the core processing and storage facility.

Routine measurement of bulk densities is part of the drill core sampling protocol with samples measured at three-meter intervals along the drillcore.

11.4 Sample Security

All types of samples are collected, prepared and transported by, or under, the supervision of, qualified personnel and their movement is controlled by a formal chain-of-custody protocol. The core sampling and storage facility is accessible only to qualified personnel. Given the sample handling and preparation protocols, there is very limited opportunity for any mishandling, accidental or otherwise, of any samples.

11.5 Sample Analysis

With the exception of the 2021 surface drill samples, all samples from all sources are prepared and analyzed in the on-site assay laboratory. Prior to processing, samples are checked for origin, number of samples and sample numbers. Samples are then dried, crushed and then pulverized using a ring pulverizer. Crushing reduces the samples to minus ¼ inch. Every 10^{th} sample is split with a Jones splitter to obtain a duplicate check sample. Two hundred grams of crushed sample is reduced to minus 100 mesh (0.0059 inches or 150 microns) in a ring centrifugal pulverizer. The crushing and pulverizing equipment is cleaned between samples, using compressed air. A 100-gram pulp sample is placed in an envelope and sent for assay. One duplicate pulp sample is collected for every 10 samples.

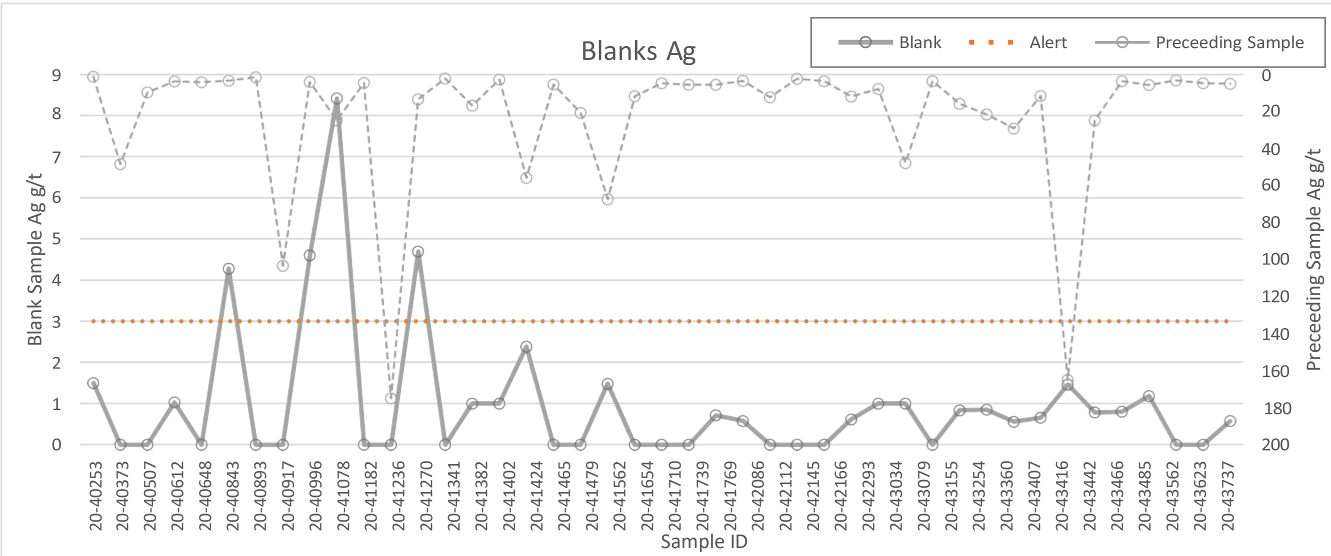
Samples are routinely analyzed for lead, zinc, copper, silver, iron and arsenic. Pulp samples are dissolved in aqua regia (hydrochloric and nitric acid). Silver content is determined by fire assay; lead, zinc, copper and arsenic are assayed by Atomic Absorption (AAS). Analyses are copied manually from the screen of the atomic absorption unit into a journal and subsequently are entered into an electronic database.

11.6 QA/QC-2021 Drill Hole Program

The 2021 drill program consisted of 2,718 core samples submitted to and analyzed by the on-site laboratory, accompanied by 43 blank samples, 73 standards, 37 field half core duplicates, and 129 pulp duplicates submitted in the sample stream blind to the laboratory. In-stream QC samples accounted for 5.6% of the core samples submitted. Additionally, 667 standards and 119 blanks were tested as part of the laboratory's procedures. Further verification was completed by sending 239 mineral zone sample pulps and coarse duplicates to ALS for Umpire sampling. Except for one hole, every interval from the 2021 drill program within mineral resource estimate has been umpire tested.

QA/QC performance from the 2021 program is shown in the below figures. Figure 11.1 shows adequate performance of locally sourced blank material, with very few, minor failures. Prior sample analysis demonstrates minor amounts of contamination are likely due to elevated natural background Ag that is typical with non-certified blank material and not contamination from the preceding sample.

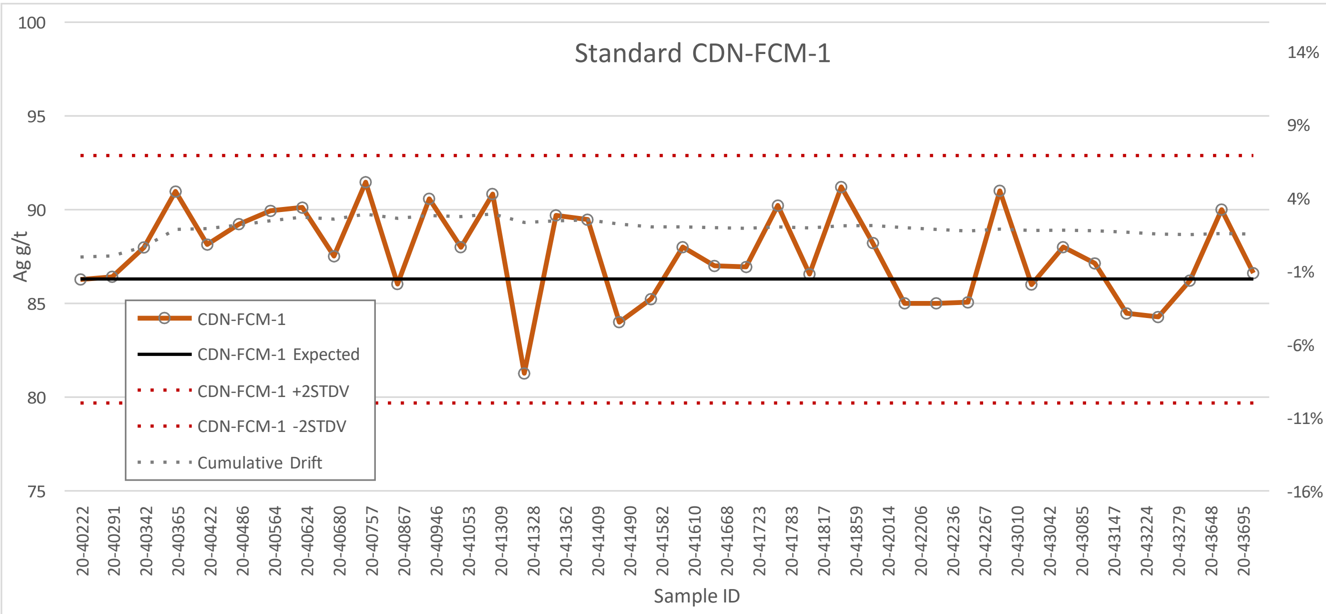
Figure 11.1 In-Stream Ag Blanks - 2021 Drill Program



Source: MLN

Figure 11.2 shows no failures for 38 in-stream submittals of standard CDN-FCM-1. A minor amount of cumulative drift, within one standard deviation was observed over the sample range.

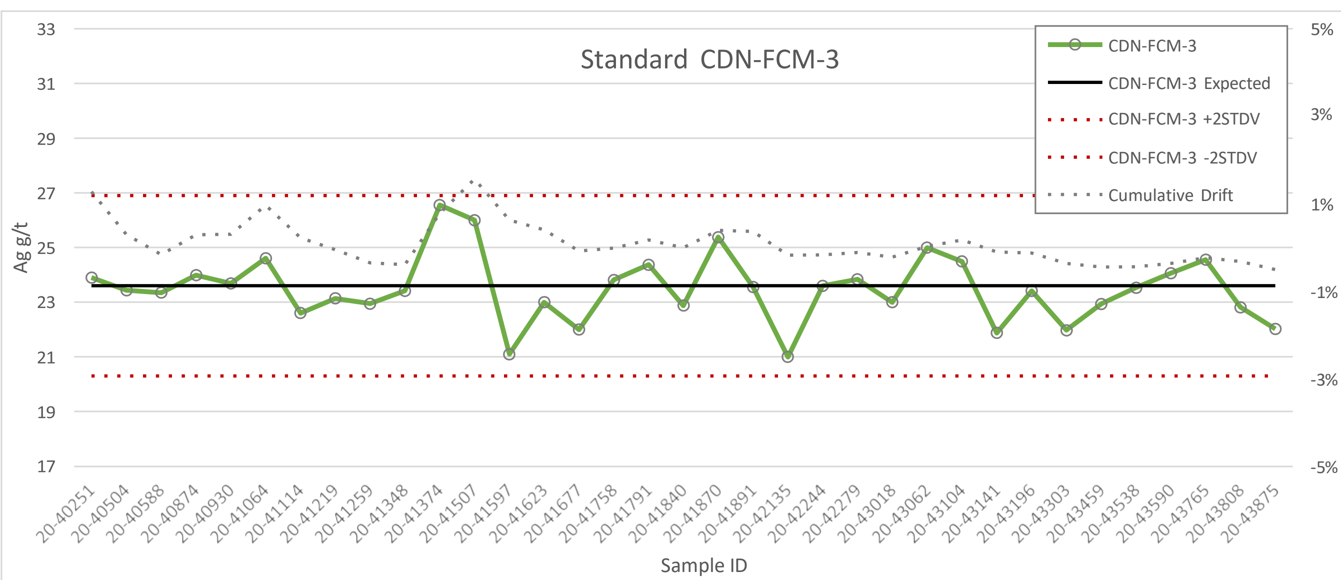
Figure 11.2 In-Stream Ag Standard CDN-FCM-1 - 2021 Drill Program



Source: MLN

Similarly, the 35 in-stream submittals of standard CDN-FCM-3, show no failures with very little cumulative drift (See Figure 11.3).

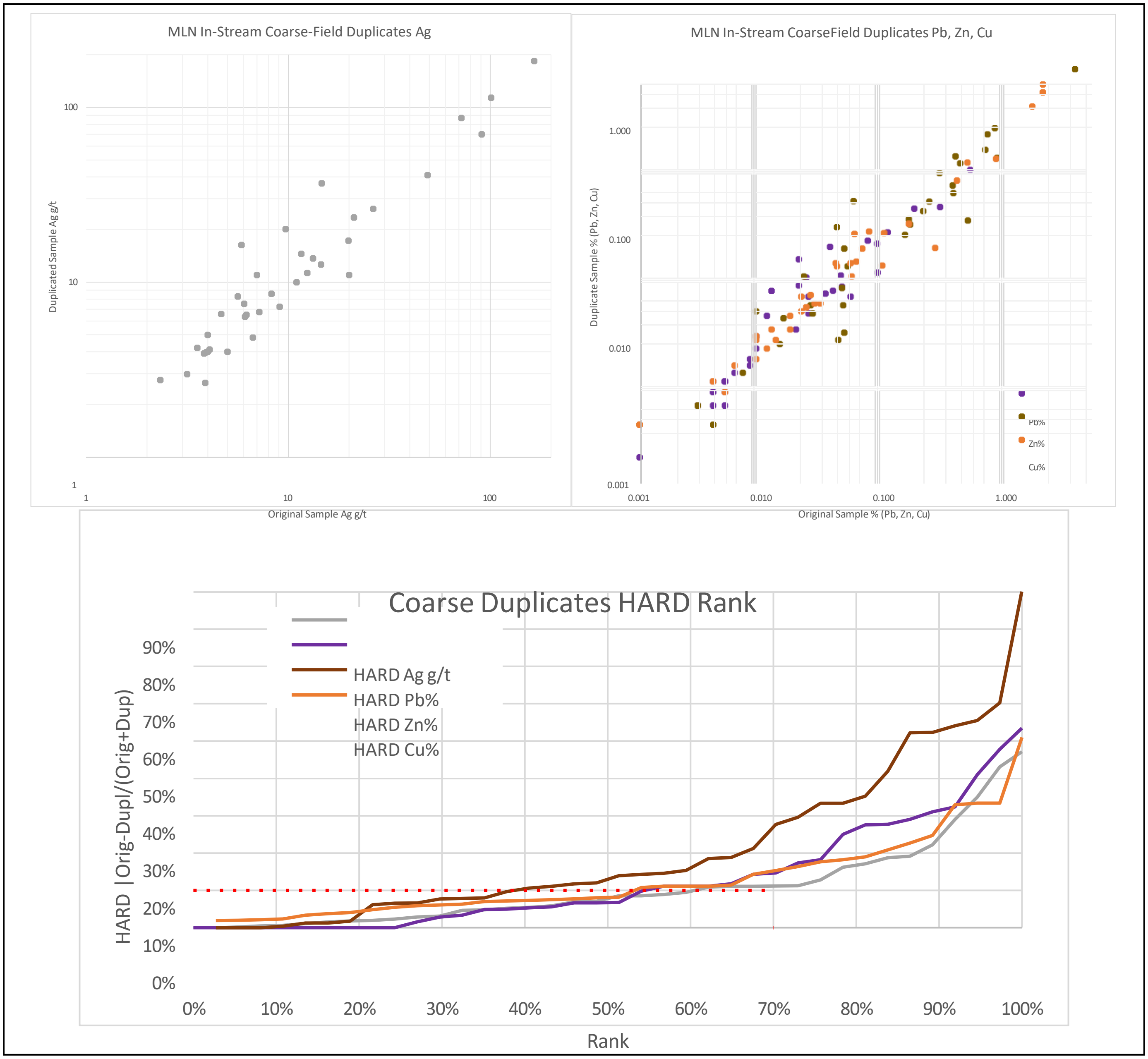
Figure 11.3 In-Stream Ag Standard CDN-FCM-3 - 2021 Drill Program



Source: MLN

Figure 11.4 shows the field duplicate performance for in-stream quarter-core duplicates. Half Absolute Difference Analysis suggests that Zn is lower precision compared to Ag, Pb, Cu, possibly as a result of the coarser metallic nature.

Figure 11.4 In-Stream Field (Coarse) Duplicates - 2021 Drill Program



Source: MLN

11.7 Opinion of Qualified Person

It is the opinion of the Qualified Person that the dataset is suitable to support the estimate of Resources. Data collected nearest to the immediate operating areas is modern and sample streams have included

QA/QC samples and analysis. Historically collected samples have been partially confirmed through operating statistics, historically sampled drill core supporting Inferred areas of the block model will be continually tested with definition drilling. Initial block model estimates created prior to the 2021 drillhole program utilized historically collected sampling, the 2021 intercepts in these areas demonstrated the reasonable accuracy of the historic information.

12 Data Verification

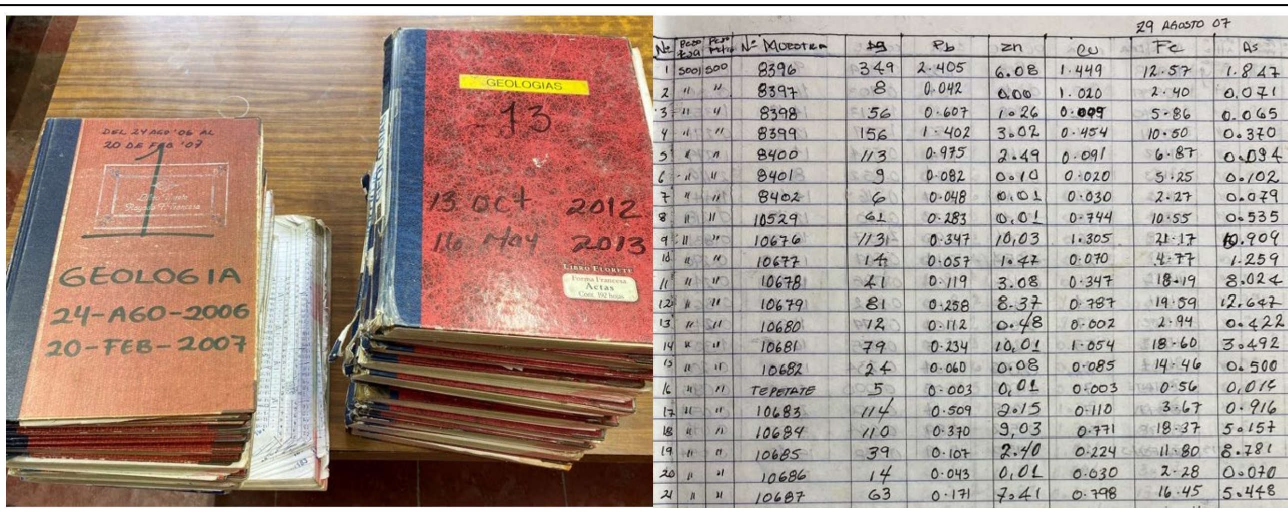
12.1 Data Sources and Records Maintenance

The following data sources directly and indirectly inform the mineral resource estimate. These data are actively maintained and stored by mine staff were made available for review by the Qualified Person:

- Paper assay records. Example shown in Figure 12.1.
- Surface lithology and alteration mapping.
- Level plans generated in AutoCad that record detailed geologic information and well as mining areas and development headings. Example shown in Figure 12.2 (Negra 1930 m elevation).
- Schematic and detailed geologic cross-sections and long sections. Example shown in Figure 12.3 (Alacrán mineral body).
- Mined our cavity and development heading shapes.
- Production and channel sampling.
- Recent drill hole sampling and drill hole sampling from previous operators.
- Recent QA/QC information and QA/QC information from previous operators.
- Surface soils, channel and rock sampling.
- Satellite collected surface topography.
- Mine survey control points.

These data sources collectively in digital and physical form have been used to corroborate the data adequacy.

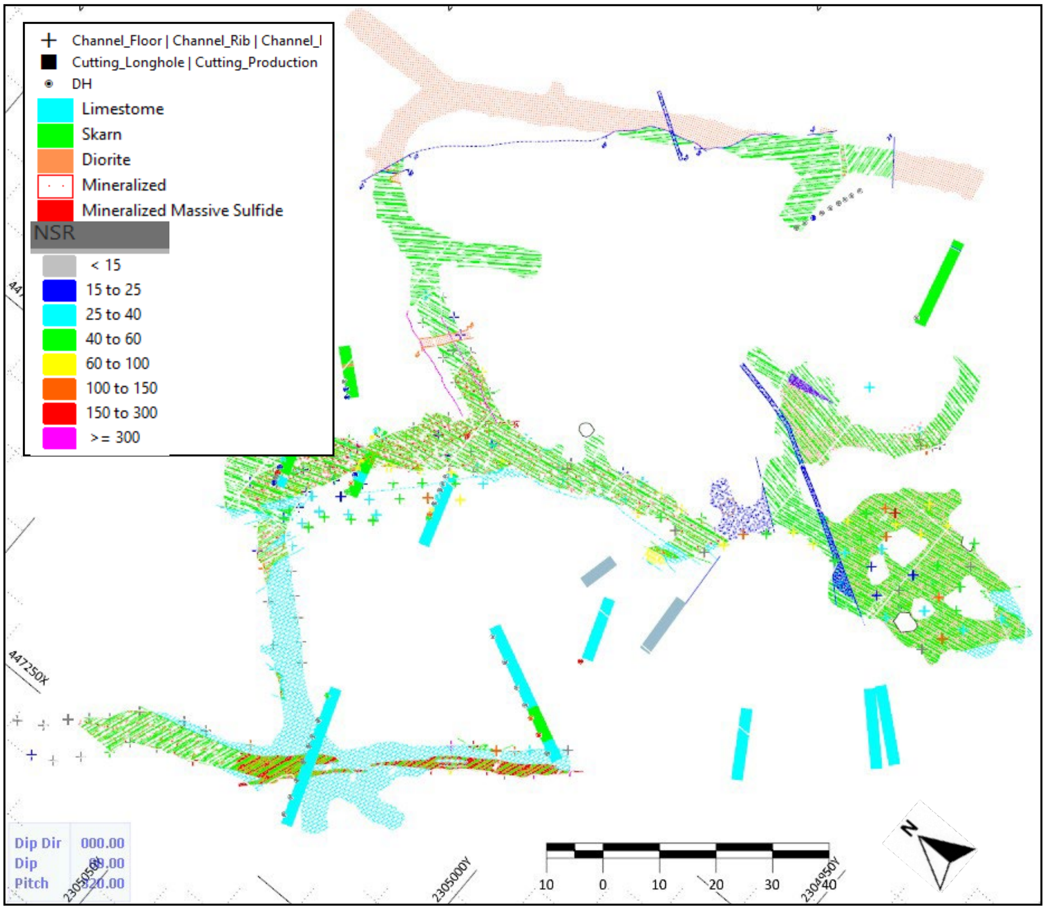
Figure 12.1 Verifiable Records Paper Assay Records



Nº	Peso Pza	Peso Patrón	Nº Muestra	Ag	Pb	Zn	Cu	Fe	As
1	500	500	8396	349	2.405	6.08	1.449	12.57	1.847
2	"	"	8397	8	0.042	0.00	1.020	2.40	0.071
3	"	"	8398	56	0.607	1.26	0.009	5.86	0.065
4	"	"	8399	156	1.402	3.02	0.454	10.50	0.370
5	"	"	8400	113	0.975	2.49	0.091	6.87	0.094
6	"	"	8401	9	0.082	0.10	0.020	5.25	0.102
7	"	"	8402	6	0.048	0.01	0.030	2.27	0.079
8	"	"	10529	61	0.283	0.01	0.744	10.55	0.535
9	"	"	10676	113	0.347	10.03	1.305	21.17	10.909
10	"	"	10677	14	0.057	1.47	0.070	4.77	1.259
11	"	"	10678	41	0.119	3.08	0.347	18.19	8.024
12	"	"	10679	81	0.258	8.37	0.787	19.59	12.647
13	"	"	10680	12	0.112	0.48	0.002	2.94	0.422
14	"	"	10681	79	0.234	10.01	1.054	18.60	3.492
15	"	"	10682	24	0.060	0.08	0.085	14.46	0.500
16	"	"	TEPETATE	5	0.003	0.01	0.003	0.56	0.014
17	"	"	10683	114	0.509	2.15	0.110	3.67	0.916
18	"	"	10684	110	0.370	9.03	0.771	18.37	5.157
19	"	"	10685	39	0.107	2.40	0.224	11.80	8.781
20	"	"	10686	14	0.043	0.01	0.030	2.28	0.070
21	"	"	10687	63	0.171	7.41	0.798	16.45	5.448

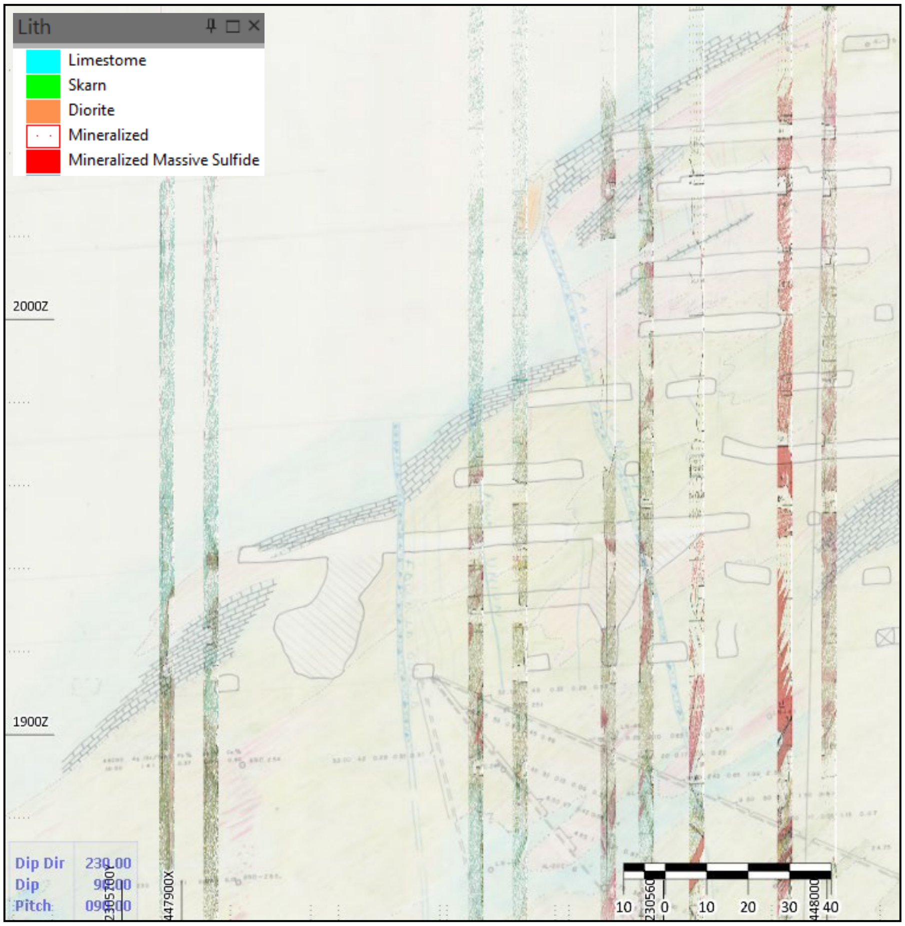
Source: MLN

Figure 12.2 Operational Level Plan Mapping Example Negra Elevation 1930 m



Source: MLN

Figure 12.3 Interpretive Long-Section and Intersecting Cross-Sections for Alacrán (Looking NE 50° azi)



Source: MLN

12.2 Verification Completed as Part of the Mineral Resource Process

Data collected by previous operators is verified for consistency by utilizing multiple data sources to cross check geology, mineralization, location, bearing, and orientation. Assayed intervals have been verified from drill hole log annotations, maps, sections, paper records, and various archived sources. Verification has not been systematically completed but thousands of intervals have been checked against the various data sources. Most of the historic original drill hole logs are available for physical review in the mine office records as well as pdf scans. The laboratory has independently maintained paper copies of assay results since 2006. Digital certificates became the method of record beginning with the 2021 drill program.

The qualified person conducted a site visit March 28th and 29th of 2022 during which the following activities were conducted to verify data adequacy:

- Core logs and assay intervals were compared against physical core in drill holes 2021-01-TRD, 2021-033-TRD, and 2021-017-DIF.
- The storage and description quality of paper downhole logs were reviewed.
- Drilling stations from the 2021 underground were visited.

- Previous working areas were spot-checked against level plan geologic interpretations.
- Development headings were travelled to gain a sense of the mineralization.
- Several channel sample collection sites and annotations were observed (see Figure 12.4). The depth and consistency of the channel sample cuts were noted.
- The laboratory preparatory and analysis areas were toured.

Figure 12.4 Example Channel Sample Location

Source: MLN

12.3 Qualified Person's Opinion of Data Adequacy

Based on the above field verifications, the Qualified Person is of the opinion that the various data sources available are adequate to support the estimation of mineral resources, are reliable, and verifiable. Certain limitations of the datasets have been considered and are reflected and accounted for in resource classification and mineral body interpretations. The sources of data, consistent with a mine that has a long operating history, are confirmed and corroborated by continual collection of operational and exploration sampling. Current data collection techniques and archiving are at modern best practices standards. For most of the mined-out areas the core and pulp packets have been discarded over the years, and while this could be concerning for a newer operation, these same areas are physically accessible with ease in geologic context which could be considered better than core. The mine has a decades long history of production and most of the Resource considered in this report are immediate down dip extensions, and the extension along strike to the northwest and are classified as Inferred.

13 Mineral Processing and Metallurgical Testing

13.1 Introduction

Minera La Negra initiated operations in 1971 and has been in continuous production for most of that time (see Table 6.1). Other than various throughput expansions over the years, the processing plant flowsheet has been well established and is little changed, and operating parameters and recoveries are well understood. Production data for the period 2011-2019 is shown in Table 13.1.

Table 13.1 MLN Production Data 2011-2019

	2019	2018	2017	2016	2015	2014	2013	2012	2011
Ore tonnes mined	204,726	685,594	764,885	811,222	883,447	846,785	869,027	670,516	538,750
Ore tonnes processed	303,311	643,871	759,358	799,055	880,189	961,840	825,013	691,260	505,965
Head grade									
Zinc (%)	1.4	1.3	1.0	0.8	0.9	1.1	1.3	1.4	1.4
Copper (%)	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Silver (g/t)	33	43	46	51	56	60	61	78	77
Lead (%)	0.1	0.1	0.2	0.3	0.2	0.3	0.3	0.4	0.5
Recovery to concentrate									
Zinc (%)	84.1	81.1	73.2	73.9	75.6	77.5	72.0	74.2	55.7
Copper (%)	67.4	64.6	65.9	67.9	77.9	74.6	71.2	71.8	78.9
Silver (%)	72.4	75.0	76.8	77.2	82.2	82.5	80.8	82.6	82.8
Lead (%)	62.1	71.9	68.5	71.4	74.6	74.6	77.2	80.6	69.5
Concentrate produced									
Zinc concentrate (tonnes)	6,944	15,283	13,265	10,937	13,584	18,023	16,287	15,442	10,063
Containing: Zinc (tonnes)	2,838	6,789	6,097	4,972	6,209	8,060	7,471	7,159	4,345
Containing: Zinc (%)	41.9	44.4	46.3	45.5	45.8	44.7	45.9	46.4	43.2
Containing: Silver (g/t)	79	106	99	125	95	N/A	N/A	N/A	N/A
Copper concentrate (tonnes)	2,158	3,900	5,697	7,570	11,916	13,137	11,030	9,473	8,155
Containing: Copper (tonnes)	377	839	1,318	1,610	2,595	2,882	2,553	2,217	1,584
Containing: Copper (%)	21.8	21.5	22.5	21.3	21.8	21.9	23.1	23.4	19.4
Containing: Silver (g/t)	1,237	1,363	1,520	1,241	1,211	1,233	1,250	1,304	1,529
Lead concentrate (tonnes)	410	1,303	1,628	2,459	2,733	3,242	3,101	3,433	2,343
Containing: Lead (tonnes)	191	671	927	1,429	1,643	1,958	1,953	2,101	1,408
Containing: Lead (%)	55.4	51.5	56.9	58.1	60.3	60.4	63	61.2	60.1
Containing: Silver (g/t)	9,679	11,406	10,206	6,362	8,968	8,658	8,108	8,844	8,043
Payable Metal									
Silver (oz)	213,576	649,235	813,105	805,430	1,252,510	1,424,100	1,255,445	1,374,166	1,007,256
Zinc (Oz Ag Eq)	400,333	1,240,071	931,918	612,600	778,230	931,429	618,036	446,350	351,791
Copper (Oz Ag Eq)	148,083	317,046	406,197	460,358	885,312	1,076,853	813,504	561,803	314,376
Lead (Oz Ag Eq)	26,015	93,030	125,096	154,705	188,185	220,625	177,073	141,126	68,279
NSR US$ per tonne	$ 28.71	$ 40.20	$ 38.78	$ 28.97	$ 29.01	$ 41.64	$ 52.26	$ 80.64	$ 89.90

Source: MLN

An important aspect of mine planning and mineral processing at La Negra is the correct calculation of the NSR for each tonne of rock in the model, as this directly drives the planning process for both the mine and the processing plant, as described in Sections13.2 through 13.12.

13.2 NSR – Net Smelter Return

NSR is the dollar value of material after the metallurgical recovery, concentrate trucking charges, smelter payables, smelter deductibles, smelter penalties, and treatment charges have been accounted for.

NSR does not account for mining cost, process cost, G&A, sustaining capital, dilution, royalties, VAT, or taxes. The purpose of the NSR is to compare material value to the breakeven costs of the mine. If the NSR per tonne is lower than the C1 cash cost per tonne operating cost (mining, processing, and G&A) mining and processing the material will result in a loss.

Therefore, there is no short-cut calculation: NSR must be calculated accurately for use in Resource and mine-planning. NSR cannot be calculated using a summary factor for the following reasons:

- Proper NSR calculation is common best practice for multi-concentrate mines.
- Different grades of material have different metallurgical recoveries. Using average recoveries factors provides misleading results and artificially inflates the value of low-grade material.
- Different material sources have different ratios of metal which changes the portion of metals that report to each concentrate.
- Different material sources have different concentrations of penalty elements and economic evaluation may require optimization of penalty vs contained value. There is direct and recent experience at La Negra where arsenic had to be managed prior to sending to the smelter.
- Different concentrate grades have different payables and deductions.
- A factor is linked to a fixed metal price.
- Factors do not account for the concentration ratio and therefore excludes trucking costs.
- Summary factors only work at the average grade and not at the extremes of grade or penalties, which will lead to incorrect decision-making.
- There is conditional logic that makes calculation impossible in a single cell equation in Excel; a script employing logic is required.

NSR is recalculated at each stage of use and is never be added, averaged, spatially estimated, or otherwise weighted. The basis grades (Zn, Pb, Cu, Ag, Fe, As) are carried at every step in the planning process and the NSR recalculated. For example, NSR should be calculated for drill results, for estimated blocks, stope shapes, monthly mined grade, yearly mined grade, and cash flow models. The average NSR of blocks is never used as a monthly average or similar calculation. When As and Fe grades are not known, a best guess average based a regression to other metals for each domain are applied, As and Fe are important elements to the calculation of NSR for La Negra.

Small amounts of gold have consistently reported to both the lead and copper concentrates and have provided a small boost to the past NSR payments. As gold is not recorded in the sample database it is not included in the resource model, and therefore the financial model does not include any assumed gold values.

13.3 NSR-Calculation

An NSR calculation for the La Negra mine requires calculating and accounting for the following:

- Tonnage
  - This can be '1' for drill hole results, or the block tonnage for block models, the stope tonnage for stopes, and monthly tonnage for mine plans.

- Head Grade
  - Drill hole assay values, block grades, stope grades, monthly grades, yearly grades.
- Recovery
  - For La Negra, recovery is based on head grade and is a function of the constant tail grade and a fixed recovery is never used. See support for recovery regression in the recovery section of this document.
  - Both total recovery to concentrate and the portion of the recovery to each concentrate is required. For example, silver goes to the zinc, copper and lead concentrate with significantly different payables and deductions.
- Concentration Ratio (Mass Pull)
  - The ratio by which the head grade tonnage is reduced and transformed to concentrate is required to determine the quantity of concentrate produced to calculate the amount and cost of the concentrate that is trucked to the smelter.
- Moisture (Wet weight)
  - Concentrate is delivered from the mine to the smelter with moisture. Contained metal, however, is calculated on a dry basis. Trucking of concentrate requires wet tonnage. Smelters may also reject material that is not sufficiently dry, usually required to be below 15% moisture.
- Concentrate Trucking
  - The cost per tonne to deliver the material to the smelter from the mine is subtracted from the material value.
- Smelter Terms
  - Grade Payability: Most terms either have a percentage of the available grade or a minimum deduction of grade. For example, for the 2019 Zn concentrate, zinc grade payability is the lesser of: 85% of the available zinc or the zinc concentrate grade minus 8 percentage points of the grade.
  - Treatment Charge: The cost per tonne of concentrate treated.
  - Treatment Charge Basis Price: There is often a treatment charge escalation based on the basis metal prices. If the actual price of the metal is greater than the basis price a $/t escalation factor is applied to the treatment charge.
  - Penalties: Depending on the concentrate, penalty charges are added for non-desirable elements.

13.4 Tonnage

- The basis for the tonnage factor used at the mine is variable by mineral zone but ranges from 3.03 up to 3.47 gm/cm^3 with an assumed average of 3.2 gm/cm^3.

13.5 Head Grade (Grade)

- Drill hole assay values, block grades, stope grades, monthly grades, yearly grades.
- Must include: Ag, Pb, Zn, Cu, As, and Fe.
- There has been historically minimal smelter credit for gold, and this has become more impactful given the increase in the gold price; however, there is no dataset for this element.

13.6 Recovery

As a recently operating mine with a fixed flowsheet and existing plant, the absence of metallurgical testwork is not considered an obstacle to recovery determination and meets the requirements for supporting a Resource estimate and LoM plan. As noted in Section 13.1 La Negra has been in almost continuous operation since 1971 and has well-developed metallurgical protocols.

Recovery estimates are based on regression equations of actual operating data. In the past, the mine has forecasted using fixed recovery assumptions, leading to planning for artificially high recovery of lower grades and artificially low recovery of higher grades.

As noted, fixed recovery is not the correct approach. Fixed recovery by area has the same issues as overall fixed recovery. It has been postulated that recovery is a function of retention time where decreased throughput increases retention time and therefore recovery. While this is partially true, it is not relevant as this mine will be planned to be operated at the optimal maximum throughput.

Weekly historic information from October 2016 to January 2020 was reviewed and regressed to determine recovery. The limitations and considerations to this dataset for estimating recovery are:

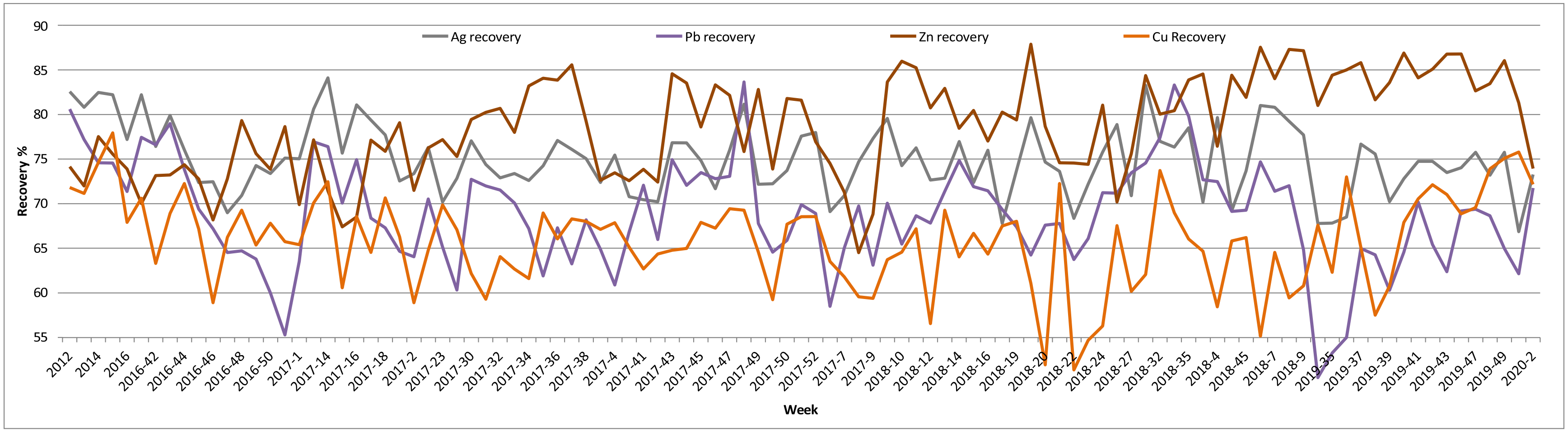
- Periods following restart, which is typically one week, have artificially low recovery because the plant is not in steady state and chemistry is not balanced.
- Weekly operating periods averaging less than 1,800 tpd (tonnes per calendar day) were not included in the analysis for the following reasons:
    - They largely represent time periods of working outside of steady and are often related to exogenous factors, like inadequate consumables, breakdowns, etc.
    - They could have falsely high recovery due to increased retention time.
    - They could have falsely low recovery due to inadequate access to material and a blend of material caused by in-mine issues.

The recovery periods analyzed are shown in Figure 13.1 below, Figure 13.2 shows the recovery regression equations compared to the actual recovery achieved.

Plant recovery is a function of head grade, the higher the grade the higher recovery. More specifically, the constant tail (inverse of recovery) is a function of head grade. There are of course countless considerations when operating the plant day to day, these equations assume good operating practices and steady state chemistry.

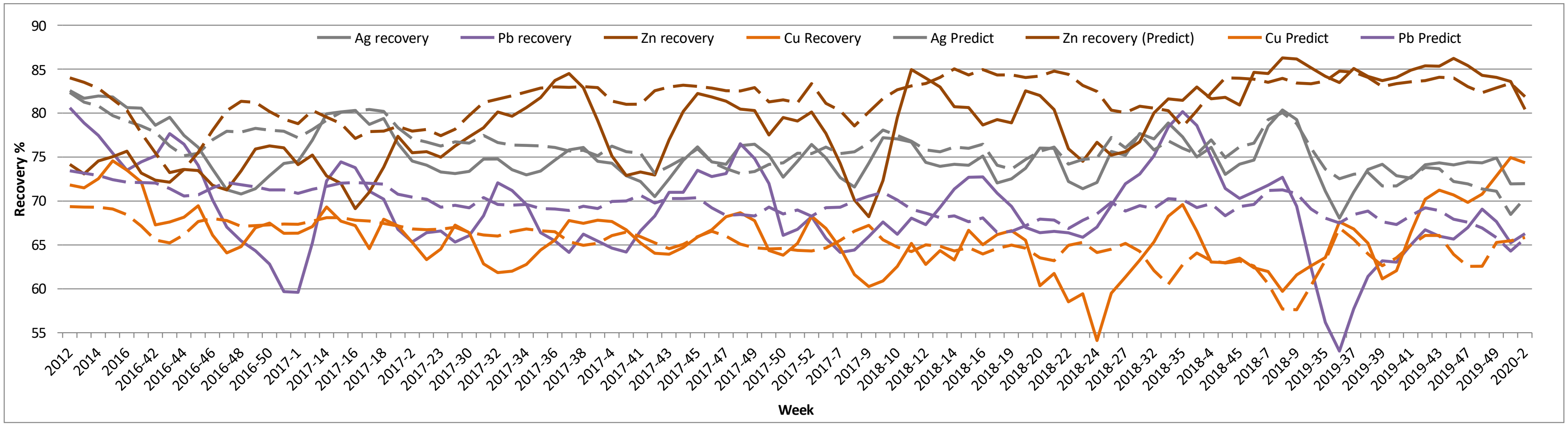
The constant tails at various head grades were compared and regressions were established. The constant tail scatter plots are shown in Figure 13.3.

Figure 13.1 La Negra Weekly Actual Recoveries 2012-2020



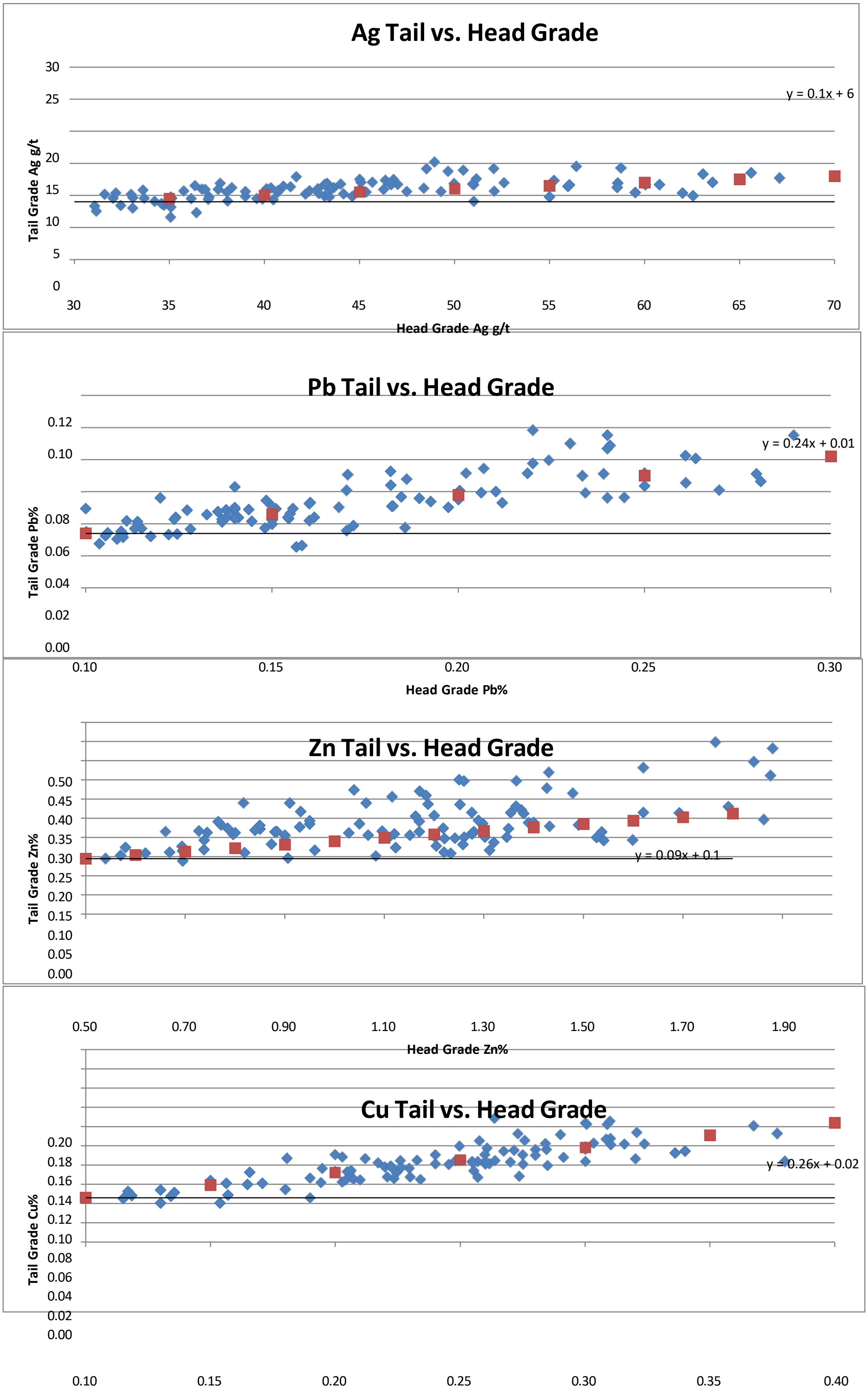
Source: MLN

Figure 13.2 La Negra Weekly Three Week Average Actual Recoveries Compared to Recovery Model 2012-2020



Source: MLN

Figure 13.3 La Negra Variable Recovery Basis-Constant Tail vs Head Grade Scatter Plots



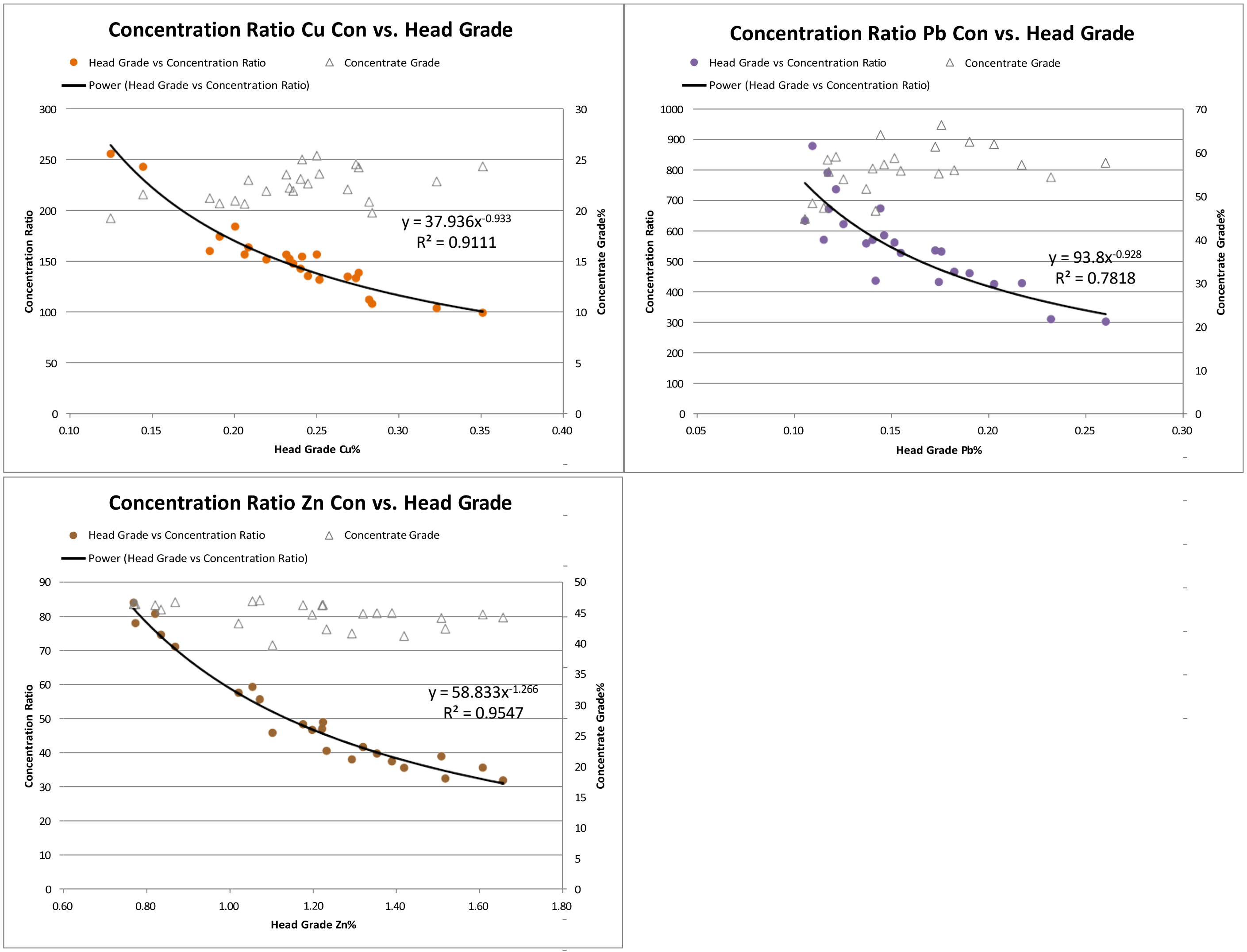
Head Grade Cu%

Source: MLN

13.7 Concentration Ratio (Mass Pull)

The actual mass pull or concentration ratio demonstrates that head grade impacts the production of concentrates; the three figures below show relatively constant concentrate grade despite the wide range of head grades. However, the mass pull or concentration ratio at different head grades is quite variable and is directly related to head grade. With lower grades flotation requires increased mass pull to achieve desired concentrate grade.

Figure 13.4 Head Grade vs Mass Pull and Head Grade vs Concentrate Grade



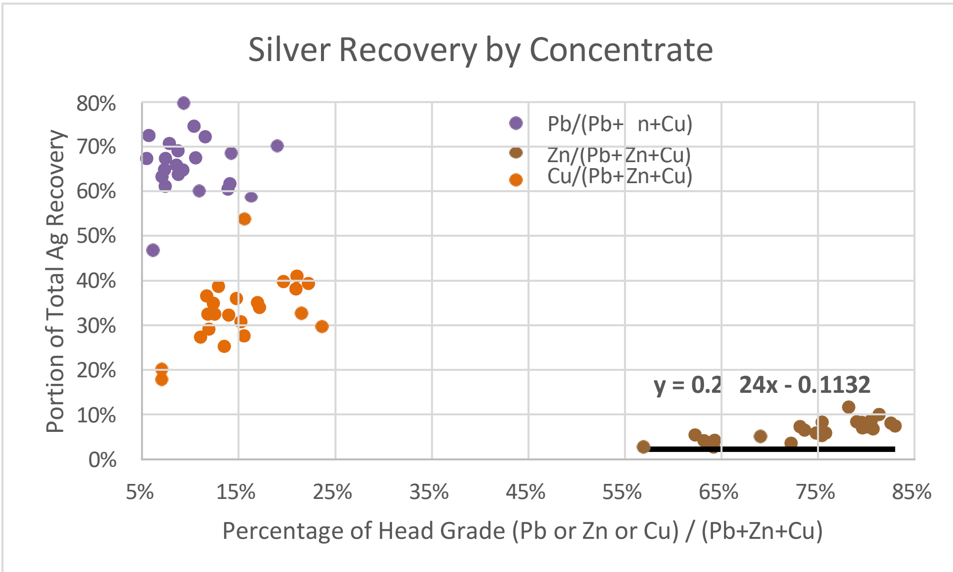
Source: MLN

13.8 Silver Recovery Total and by Concentration

Monthly actuals for silver recovery represent total plant recovery of silver, meaning the combined silver contained in the lead, zinc, and copper concentrates. It is important that the amount of silver reporting to each concentrate be predicted because each have different payables and deductions.

Total silver recovery (all three concentrates) is first calculated as discussed above using the constant tail regression method. Silver recovery to the concentrates is determined by first looking at the recovery to the zinc concentrate. An equation established using the zinc grade to the total recovered base metals and the achieved silver recovery to the zinc concentrate. The remaining portion of the silver recovery (total silver recovery-zinc concentrate silver recovery) is then split between the copper and lead concentrates, with 67% of the remaining silver reporting to the lead concentrate and 33% to the copper concentrate. This fraction is based on the average reporting when zinc concentrate silver recovery is removed.

Figure 13.5 Silver Recovery by Concentrate



Source: MLN

13.9 Arsenic Recovery to Copper and Lead Concentrates

Arsenic recovery was subjected to exploratory data analysis but no clear relationships were present other than the tendency for higher combined head grades to have higher arsenic concentrations. Arsenic recovery is determined by a fixed recovery of 0.8% to the copper and lead concentrates combined, with 36.6% reporting to the lead concentrate and 63.4% to the copper concentrate; therefore, fixed recoveries were used, and 0.29% of total arsenic reports to the lead concentrate and 0.51% of total arsenic is recovered to the copper concentrate.

While there are known mineralogical differences for each orebody, there is insufficient information to determine independent arsenic recoveries. However, the resource model does allow for the calculation of arsenic concentration by orebody. Orebodies with higher known concentrations of arsenic typically have higher grades and require blending or scheduling with lower arsenic areas. The upper bound for arsenic grade in concentrate is 1% for lead and 0.5% for copper, although for the former higher levels of arsenic are generally acceptable if accompanied by high precious metals credits. Amounts slightly above these thresholds are acceptable but special dispensation from the buyer/smelter is required. In the date range shown in the above table the arsenic grade in lead concentrate was 0.77% (with five occurrences over 1%) and the arsenic grade in copper concentrate averaged 0.39% (with four occurrences over 0.5%).

Table 13.2 As in Pb and Cu Concentrate Jan 2017 – November 2019

Month	As Recovery% to Pb+Cu Con	PbCon As Portion	CuCon As Portion
2017-01	0.9%	26%	74%
2017-02	0.7%	39%	61%
2017-03	1.1%	48%	52%
2017-04	1.0%	40%	60%
2017-05	0.8%	38%	62%
2017-06	0.8%	46%	54%
2017-07	0.9%	44%	56%
2017-08	0.5%	35%	65%
2017-09	0.5%	33%	67%
2017-10	0.5%	30%	70%
2017-11	0.5%	34%	66%
2017-12	0.4%	39%	61%
2018-01	0.7%	52%	48%
2018-02	0.8%	54%	46%
2018-03	0.6%	40%	60%
2018-04	1.2%	20%	80%
2018-05	0.6%	47%	53%
2018-06	1.3%	19%	81%
2019-01	0.8%	38%	62%
2019-08	0.9%	13%	87%
2019-09	0.8%	29%	71%
2019-10	0.9%	37%	63%
2019-11	0.9%	41%	59%
Average	**0.79%**	**36.6%**	**63.4%**

Source: MLN

13.10 Other Deleterious Elements

Other elements that incur penalties include: combined As and Sb in the lead concentrate, Fe in the Zn concentrate, As in the copper concentrate, Sb in the copper concentrate, and combined Pb and Zn in copper concentrate. On a percentage basis Fe in the Zn concentrate is most impactful. Arsenic in the lead and copper concentrates is not impactful on a percentage basis but this concentrate could become unattractive to some traders if too far above thresholds discussed above.

13.11 Trucking

The cost to truck concentrate to the smelters is included in the NSR. For the most recent Cu, Pb, and Zn contracts the cost to truck the zinc con to Torreón is MXN 700 per wet tonne ("/wt"), and for the copper and lead concentrates to Manzanillo the cost is MXN 1,078/wt. Transportation to San Luis Potosí is MXN530/wt. Moisture (humidity) of the concentrates is accounted for because the trucking contract is on a wet tonnes basis.

13.12 Model Results and Conclusions

The NSR calculation for the expected concentrate production at La Negra is based on empirical formulas that were derived from historical plant results, as detailed in Section 13.2 to Section 13.11. The key formulas that go into the NSR calculation are the following:

- Overall metal recovery for silver, lead, copper, and zinc – these are determined by the fixed-tail formulas as described in Section 13.3 which are in turn based on empirical data based on historic plant performance.

- Distribution of silver to lead, copper, and zinc concentrates as described in Section 13.8 and based on empirical formulas derive from historic plant performance.
- Concentration ratios (mass pull) for each of lead, copper, and zinc into concentrate as described in Section 13.7, as well as the concentration of silver into concentrate based on the distribution determined in Section 13.8.
- Recovery of As to (primarily) lead and copper concentrates does not display a clear trend; fixed assumptions have been made as described in Section 13.9.
- Recovery of other penalty elements, either individually or in combination, into the three final concentrates, as described in Section 13.10.
- Payability of each of lead, copper, and zinc for each of the three final concentrates. The payability for each metal depends on the grade of the material and assumption of standard industry payable factors for each concentrate as described in Section 13.3.
- Treatment and refining charges ("TC/RC") as well as price participation assumptions for each of the three concentrates are based on long-term assumptions based on both current and historical TC/RCs. See Section 13.3.
- Silver refining charges in lead and copper concentrates, and price participation assumptions, are based on long-term assumptions based on both current and historical refining charges.
- Penalty charges were also determined from both current and historical charges for certain percentages of deleterious elements. See Section 13.3.
- The anticipated humidity for each concentrate it based on historical plant performance.
- Concentrate trucking charges are based on historic charges. Concentrate trucking has historically been performed by a locally based contractor.
- Although historically small amounts of payable gold have reported to both the lead and zinc concentrates, the financial model does not make any assumption about gold recoveries.

The key formulas for recovery are shown in Table 13.3

Table 13.3 Metallurgical Recovery by Concentrate

Metal	Recovery Equation
Ag to Pb, Zn, and Cu Con	(AgGrade – ((0.1 * AgGrade)+ 6))/ AgGrade
Ag to Zn Con	Ag Total Recovery * ((0.242 * (ZnGrade / (ZnGrade + PbGrade + CuGrade))) - 0.113)
Ag to Pb Con	0.67 * (Ag Total Recovery - Ag Recovery to Zn Con)
Ag to Cu Con	0.33 * (Ag Total Recovery - Ag Recovery to Zn Con)
Pb to Pb Con	(PbGrade – (0.01 + (0.24 * PbGrade))/PbGrade
Zn to Zn Con	(ZnGrade – (0.1 + (0.09 * ZnGrade))/ZnGrade
Cu to Cu Con	(CuGrade – (0.02 + (0.26 * CuGrade))/CuGrade

Source: MLN

The following table summarizes the parameters that go into the calculation of the NSR model and shows the relationship between grade and NSR for an idealized tonne of material from La Negra.

Table 13.4 La Negra NSR Model

	Ag	Pb	Zn	Cu	Fe	As
Material Grade	63	0.46%	1.51%	0.35%	8.78%	0.71%
Gross Recovery (%)	79.7	72.3	84.0	68.0		
Concentration Ratio		193.1	34.5	99.9		
Concentrate Grade		**Pb**	**Zn**	**Cu**		
Moisture (%)		11.1	12.2	10.2		
Ag (g/t)		8,362	156	1,740		
Pb (%)		60.2	0.2	2.4		
Zn (%)		1.3	49.2	6.7		
Cu (%)		0.0	0.0	23.9		
Fe (%)		0.0	15.0	0.0		
As (%)		0.63	0.00	0.38		
Sb (%)		1.2	0.00	0.03		
Cd (ppm)		0.0	0.42	0.00		
Bi (%)		2.0	0.00	0.00		
SiO_2 (%)		0.0	0.00	0.00		
Cl (ppm)		0.0	0.00	0.00		
F (ppm)		0.0	0.00	0.00		
Payability						
Ag (%)		95%/50g/t ded	70%/100g/t ded	90%/31g/t ded		
Pb (%)		95%/3% ded	0.0	0.0		
Zn (%)		0.0	85%/8 % ded	0.0		
Cu (%)		0.0	0	96.5%/1% ded		
Deductions						
Treatment Charge (US$/t)		97	150	75		
Treatment Charge Escalation (US$/t)		0	0.12 > 1900/t	0		
Refining Charge Ag (US$/oz)		0.75	0.0	0.75		
Penalties						
As (US$/t)		0	0	2.5 > 0.2%		
Sb (US$.t)		0	0	2.5 > 0.1%		
Pb+Zn (US$/t)		0	0	2.5 > 2.0%		
Fe (US$/t)		0	2.5 > 5%	0.0		
As+Sb (US$/t)		2.5 > 0.3%	0.0	0.0		
Zn (US$/t)		2 > 5.0%	0.0	0.0		
F+Cl (US$/t)		2.00 > 500ppm	0.0	0.0		
NSR (US$/t)		72.2				

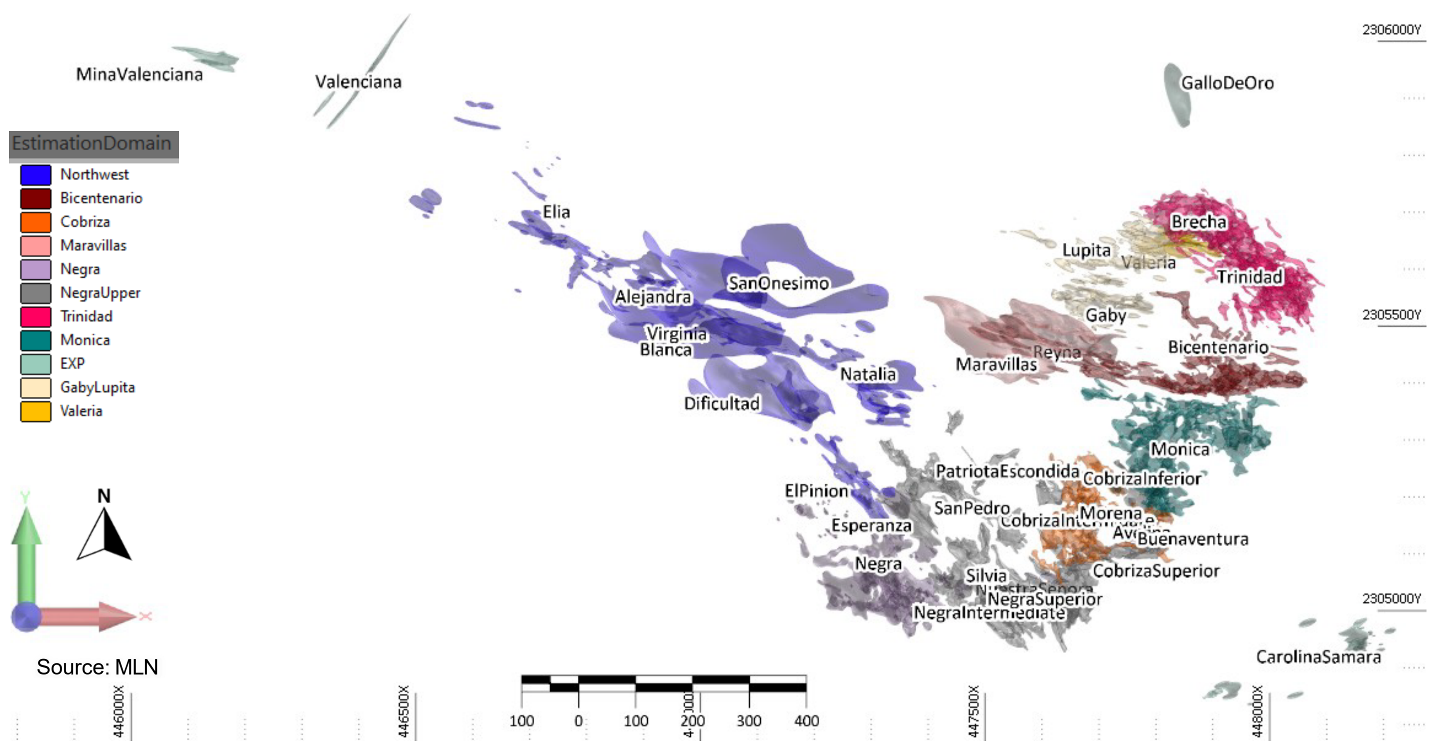
Source: MLN

14 Mineral Resource Estimates

14.1 Summary

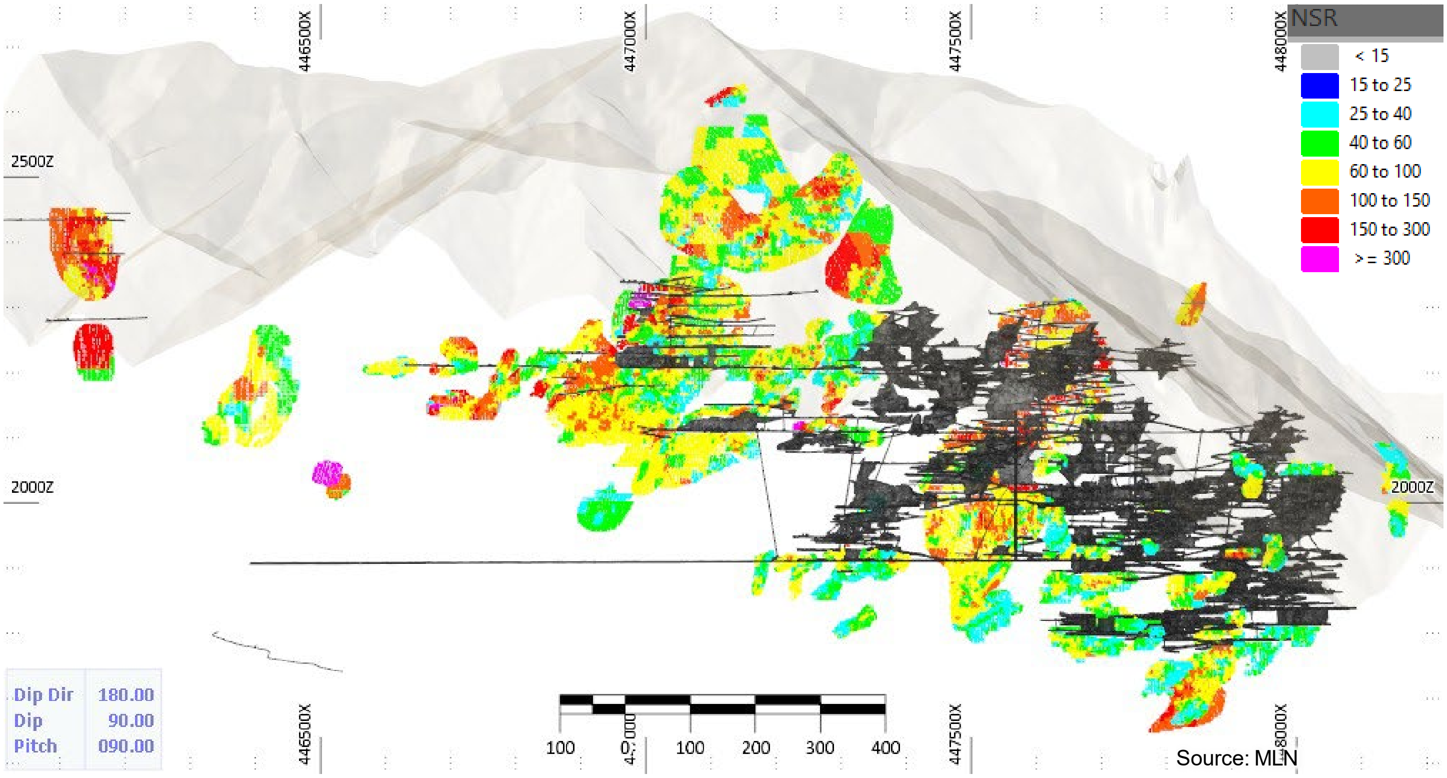
Resources for the La Negra mine have been estimated using Ordinary Kriging (OK), are wireframe constrained, and stated at a base case cut-off grade of US$28/t NSR accounting for value from Ag, Pb, Zn, and Cu and penalties from As and Fe (see Section 13 for a detailed description of the NSR model). Resources have been estimated from analyses of Ag, Pb, Zn, Cu, As, and Fe collected from diamond drilling, channel sampling, and long-hole production sampling. Samples have been selected and the block model has been defined by 35 mineral zone solids constructed via implicit modeling using a mineral domain spatial cutoff of approximately US$20/t. Grades have been estimated into the block model by grouping the 35 mineral solids into eleven estimation domains. Drill hole samples are composited to 2m, channel and production samples are independently declustered to a 4m cell size. Drill hole, channels and production samples have been globally capped, capped by datatype, and capped by estimation domain.

Figure 14.1 Mineral Solid Wireframes 3D Overview



Estimation employs: sample length weighting, three nested passes of 25, 50 and 80 meters, and sector declustering. Resource classification criteria account for: estimation pass range, distance to nearest sample, quantity of samples, sectors used, age and quality of data, type, and general reliability estimation. The block model has been depleted by existing mine cavities with an additional spatial buffer as well as manual removal of blocks near historic mining, no partially mined blocks are accounted for, and historically mined areas are mostly entirely removed from tabulation even if there are areas suspected to be remaining.

Figure 14.2 Overview Estimated Remaining Resources >US$28/t NSR (Looking North)



Source: MLN

Mineral Resources are stated in the below table, Figure 14-1 is a grade tonnage curve of Indicated Resources as well as Inferred Resource.

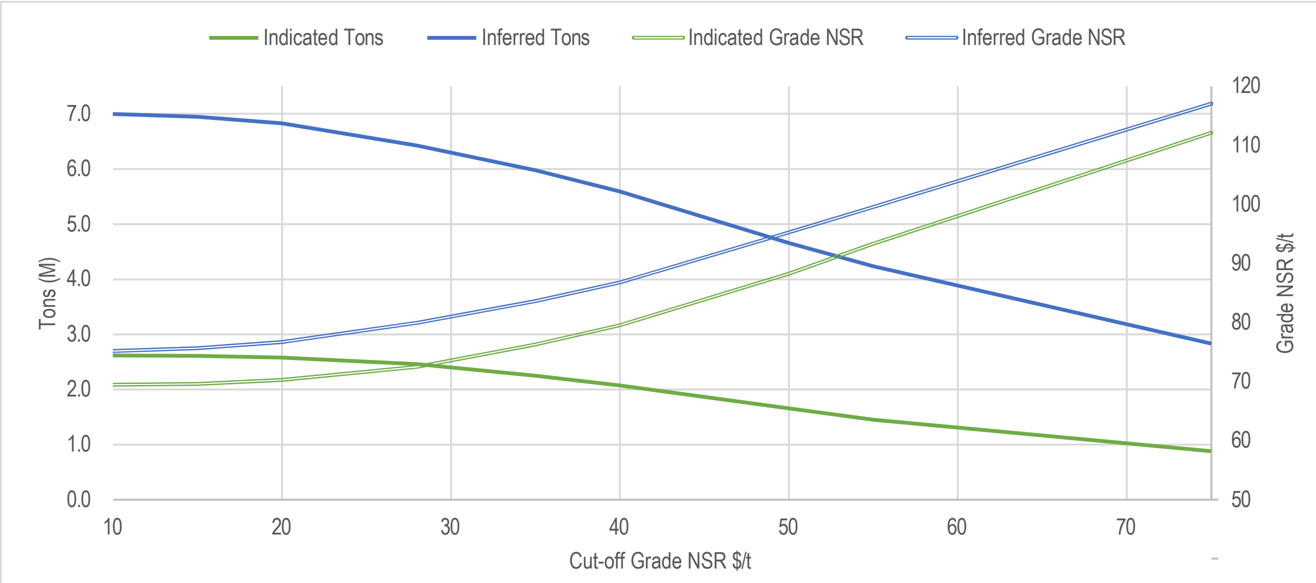
Table 14.1 La Negra Mineral Resource Statement at US$28/t NSR Cutoff

Classification	Cutoff Grade US$NSR/t	Tons (M)	Grade US$NSR/t	Grade Ag g/t	Grade Pb%	Grade Zn%	Grade Cu%
Indicated	28	2.46	73	64	0.27	1.95	0.50
Inferred	28	6.42	80	80	0.65	1.80	0.40

Source: MLN

Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. Resources are stated as undiluted. There is no certainty that all or any part of mineral resources will be converted to Mineral Reserves. Inferred Mineral Resources are based on limited sampling with assumed geologic continuity which suggests the greatest uncertainty for resource estimation. Quantity and grades are estimates and are rounded to reflect the fact that the resource estimate is an approximation. Resources are undiluted. NSR includes the following price assumptions: Ag US$20.0/oz, Pb US$0.90/lb, Zn US$1.10/lb and Cu US$3.30/lb based on the Q3 2021 Q3 long-term forecasts provided by Duff & Phelps (D&P). NSR includes varying recovery with the averages of 80% Ag, 68% Pb, 80% Zn, and 66% Cu.

Figure 14.3 Mineral Resource Grade-Tonnage Curve



Source: MLN

14.2 Supporting Data Quality

There are three primary sources of data for the estimate: drill sampling, channel sampling and production sampling. All diamond drilling is stored in an Access database and channel and production sample is stored together in another database. Collectively the two databases can be referred to as the project 'database'.

The retention of data has been limited to constituents of concern in terms of concentrate payability and penalties: Ag, Pb, Zn, Cu, Fe, and As. The value of other indirect elements was previously underappreciated and not available for modeling purposes. From mid-2021 onward the element suite was expanded to include: Bi, Cd, Sb but the data set is not sufficient for Resource estimation. In 2021, Au was added however the results were above the AA detection limit and below the FA detection limit, so no useable data was collected for Au, however, it was learned that many high-grade Ag intercepts contain at least 0.2 g/t Au but less than 1 g/t Au.

14.2.1 Data Types

Misunderstanding the data types, from a resource perspective, has caused estimation issues in the past. The application of different data sources is nuanced and can lead to over-estimation if not applied correctly. This estimate draws on the wealth of data without overleveraging it. Issues with past estimates have come from the following:

- Unsampled drill hole intervals used as null or blank values. Discussed in further detail below, these should be treated as waste.
- Projection of channel samples beyond immediate vicinity of mined out shapes. The ribs of stopes are often sampled, where grade is present the projection of this grade should be extremely limited due to the presence of a mining boundary.
- Production and long hole cuttings over-represented and projected beyond a useful distance. These often represent the best grades, these samples are also clustered.

The above have been mitigated by:

- Treating unsampled drill hole intervals during wireframe construction and Resource estimation as waste (detection limit).

- Mineralized shapes have been constructed tightly around mined out workings and only extended beyond cavities where multiple sample points demonstrate remaining material exists above cutoff, this limits the projection of channel and long hole samples.
- The clustering of production data has been handled first through cell declustering and during search through octant and quadrant declustering with limitations of samples per sector.

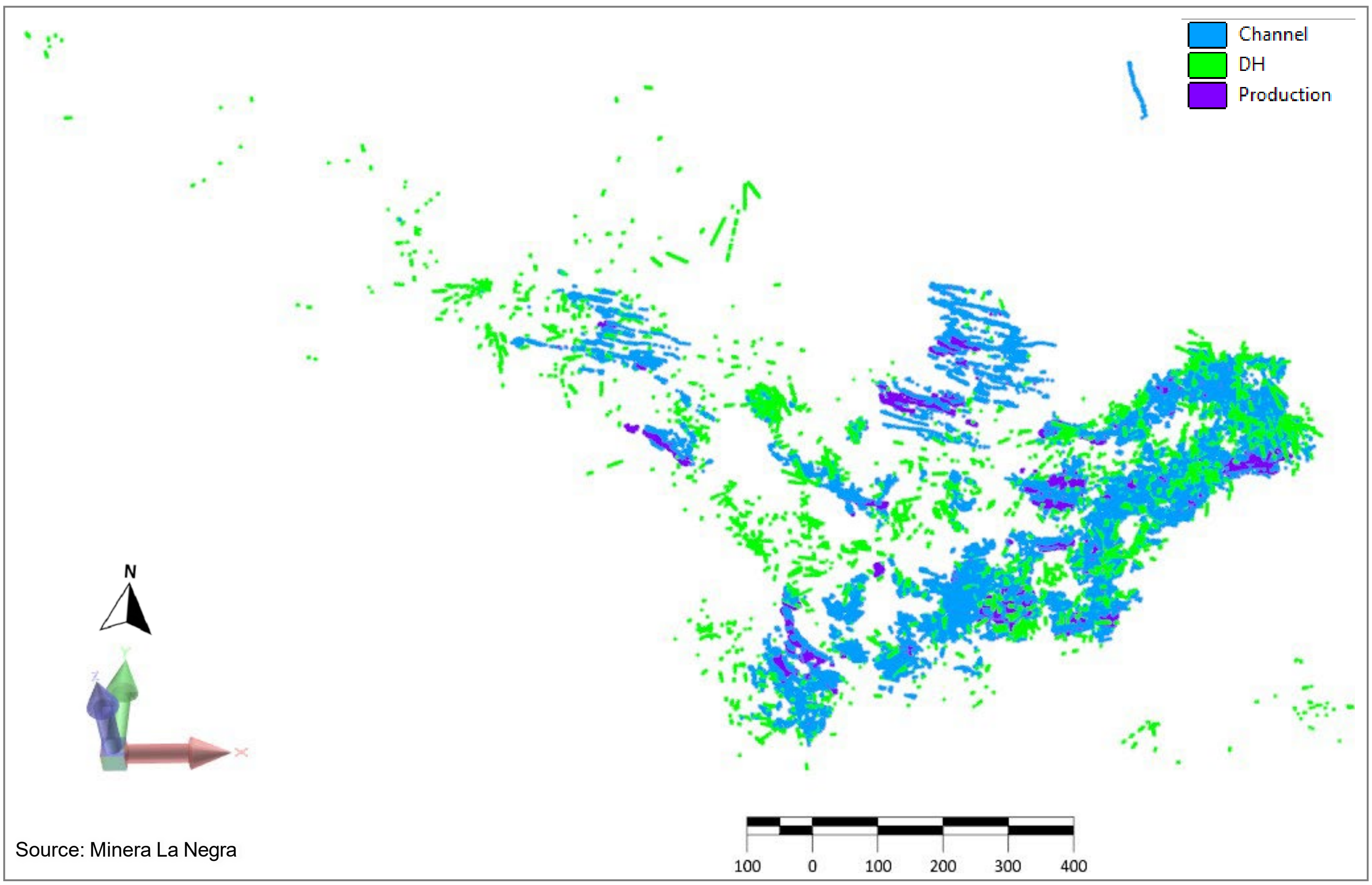
Due to the varying data types and lengths, conventional compositing for all data is not possible, drill holes have been composited to 2m and channels and production samples have been cell declustered, the three data types were then combined into one estimation sample set. Sample length retained and used for weighting to assess statistics and during the estimation process.

Table 14.2 Raw Sample Length Statistics (by Sample Type)

Data Set	Interval Count	Mean	Mode	Min	Max
Drill Holes	16,728	1.5	2	0.05	25
Channels	25,274	2.2	2	0.2	12.9
Production	13,113	11.3	10	1	27

Source: MLN

Figure 14.4 Overview of Samples (by Sample Type) Within Mineral Solids



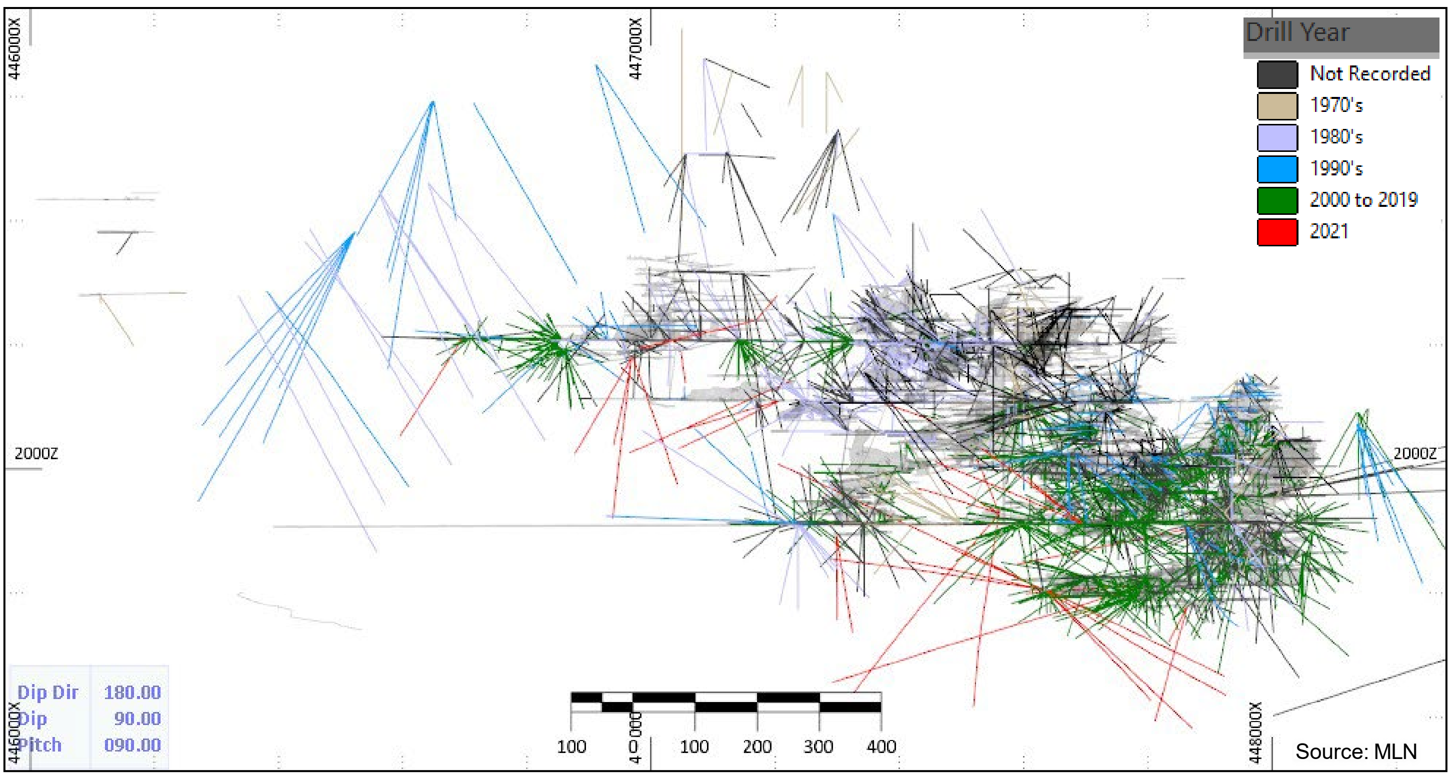
Source: Minera La Negra

14.2.2 Drilling by Era

Due to historic cutoff grade differences and a perceived 'cost savings' by previous operators, there are drill holes where significant sections were not sampled where material was expected to be lower grade and often drill core was unsampled on shoulders of older higher-grade intervals. Pre 2000's drilling contains many examples of extreme high-grade with no surrounding samples. Unfortunately, there is no mitigation for missing shoulders due to the destruction of historic core. Internal missing intervals have been mitigated by inserting 2 m composites at detection limit for economical valuable elements and assumed absent (null) for deleterious elements, which is discussed below. As additional drilling is collected, areas currently supported by older generation drilling will be phased out, and it is expected that the new data will demonstrate a more typical skarn continuum from low to high-grade that is seen elsewhere in the mine. As the cutoff grade lowered in recent years, the sampling became more continuous and is not as much of an issue.

Figure 14.5 below shows the drilling by age. The deeper portions of the mine are supported by more recent drilling and therefor better data quality, the most viable resources are on depth extensions in these areas. Resources that remain in the upper mine are estimated in greater quantity by older data, these areas have been classified primarily as Inferred for that reason.

Figure 14.5 Drilling by Year (Looking North)



14.2.3 Deleterious Element Coverage

The database has nearly full coverage for Ag, Pb, Zn, and Cu but there are areas where data Fe and As are absent. Fe and As are missing in historic areas of the mine that are primarily mined out, such as Negra Upper and Negra Intermediate, as well as some regions in the Northwest, and entirely missing from the San Onésimo portion of the Northwest domain and missing from data capture from drill hole logs that did not annotate Fe and As values. Of approximately 55,000 samples within the resource model shapes, ~7% have absent Fe values. Similar to Fe, the As dataset is incomplete with a few clusters throughout the mine where As information is missing. Regressions for both Fe and As against Ag, Pb, Zn, and Cu were investigated but reliable correlations were not possible. Much of the stated Resources have reasonable coverage for Fe and As; where Fe and As are absent, values have been left blank and the surrounding information was used to inform blocks. This primarily affects the San Onésimo body in the Northwest domain. Of approximately 55,000 samples within the resource model shapes ~9% have absent As values.

14.2.4 Density

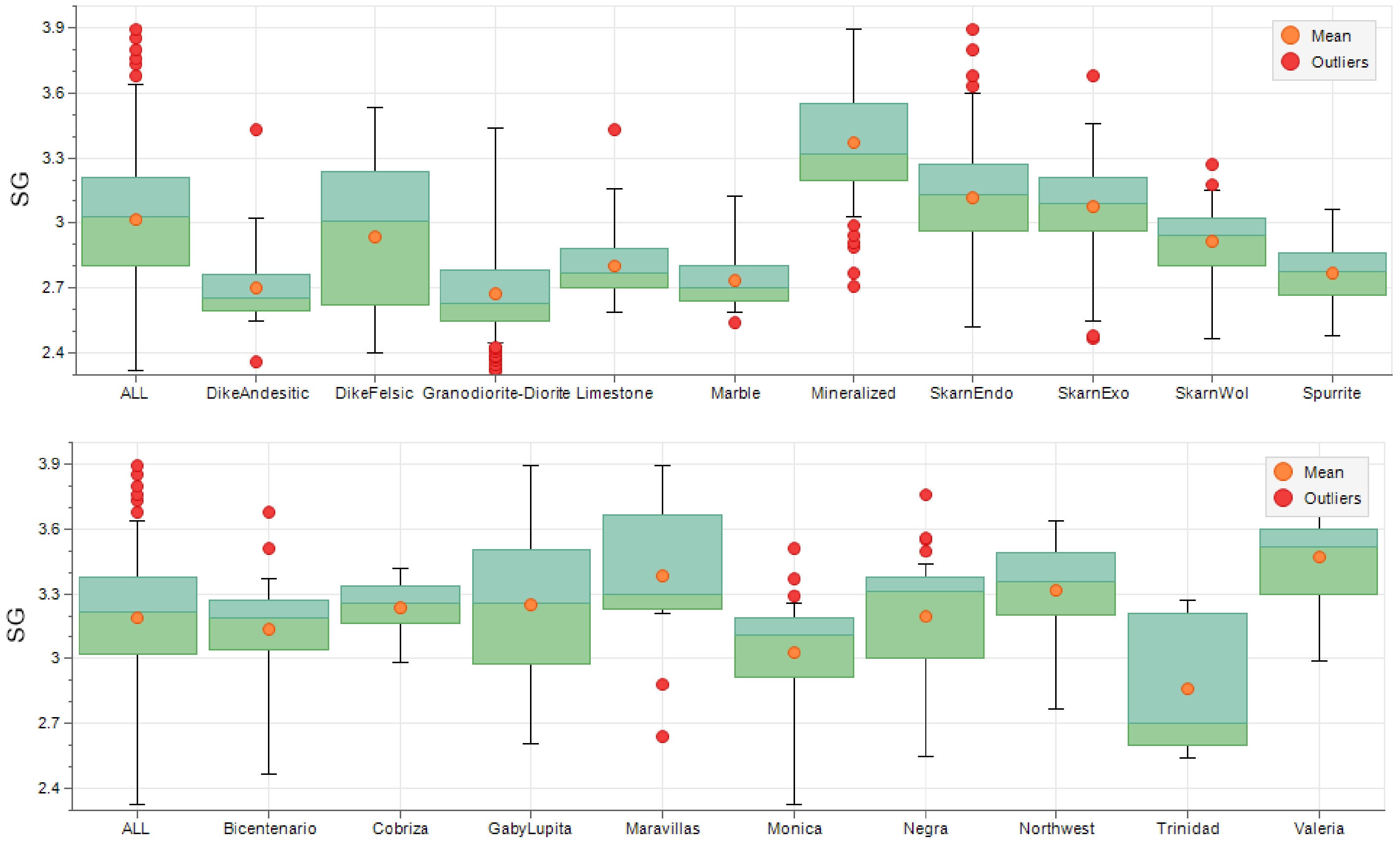
Plant belt measurements and historic estimates have assumed 3.2 g/cm^3 for all mineral bodies. In 2017, 898 density measurements were made on drill core from the LNH series of drill holes. Density measurements were made using the air and water hanging weight method, core was wrapped. Of the 898 measurements, 107 measurements are within the mineral interpretations and therefore relevant to this estimate. As part of the 2021 drill program 347 samples were measured using a MH-300A electronic density meter. The instrument uses the Archimedes but at a volume precision of +/- 0.01 cm^3. Density values from both programs were grouped by area and box plots were used to determine density by zone. Although waste blocks outside of the mineral zone are not accounted for in the block model the box plots provided insight into appropriate values for waste. Density studies demonstrate that mineralizing system is extremely rich in iron which is responsible for the generally high density values. Zones absent of direct measurement were assigned a value of 3.2 g/cm^3.

Table 14.3 Density Values by Estimation Domain

Estimation Domain	Density g/cm3
Northwest	3.32
Maravillas	3.39
Negra	3.19
Trinidad	3.20
Bicentenario	3.14
Cobriza	3.32
NegraUpper	3.20
GabyLupita	3.25
Monica	3.03
Valeria	3.47
EXP	3.20

Source: MLN

Figure 14.6 Project Density Measurements by Domain and Lithology



Source: MLN

14.3 Modeling of Mineral Bodies

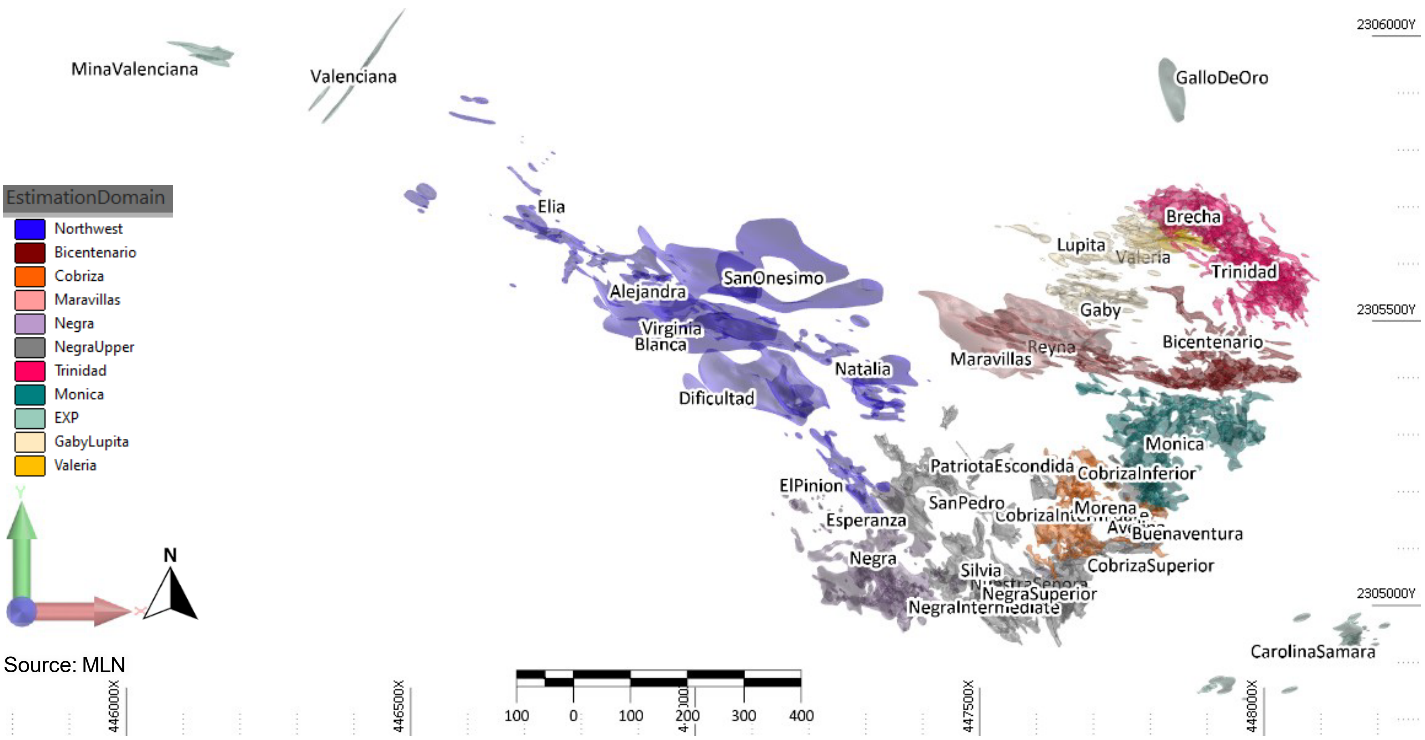
The mineralization styles at La Negra range from structurally controlled to bedding-dominated mantos; and often a mix of types. Mineralization often manifests where high angle structures intersect amenable sedimentary horizons and are a mix of structurally controlled and bedding replacement. For example, the Maravillas zone and the zones collectively called Northwest are primarily thin and vertically oriented and strongly associated with felsic dikes and steep structural conduits, but thickening occurs locally based on bedding and likely related to fluid trapping in complex folds. Mineralization at Gaby and Lupita mostly resides within amenable bedding horizons, is lower-grade and more diffuse but is enriched where vertical structures are cross-cutting. The Brecha and Trinidad areas grade from vertically influenced mineralization where it is proximal to the Cristo Rey dike to bedding-controlled as it wraps around toward the Gaby zone further from the influence of the dike. The zones have been modelled where spatial continuity and similarity of mineralization style exists. Further separations have been made to improve ease of wireframe construction and estimate quality. In some instances, individual wireframe domains have been grouped where geostatistics permit, this is discussed under the heading Domaining and Data Grouping.

Zones that are dominated by vertical structural control have been modeled using planar approximate hangingwall and footwall surfaces that are combined to make thin, more well-behaved zones. Points are snapped to the drill hole entry and exits where possible. Other zones were modelled using a mix of drill hole interval tags and polyline as needed, or by level plan interpretations are drawn of the hangingwall and footwall. All construction was aiding by implicit modeling.

Zones dominated by bedding or a mix of vertical control and bedding have been constructed using closed level plan strings or drill hole intervals with construction strings that are fed to the implicit model function in MicroMine. The implicit modeler is also provided anisotropy parameters to guide the construction of the wireframe.

There were 35 wireframe models created in support of this resource estimate shown in Figure 14.9. Note there are some additional colloquial sub area names often used at the mine. Table 14.3 details the zones that were modeled, and the corresponding methods described above.

Figure 14.7 Overview of Mineral Zone Models



Source: MLN

Table 14.4 Wireframe Construction Type by Mineral Body

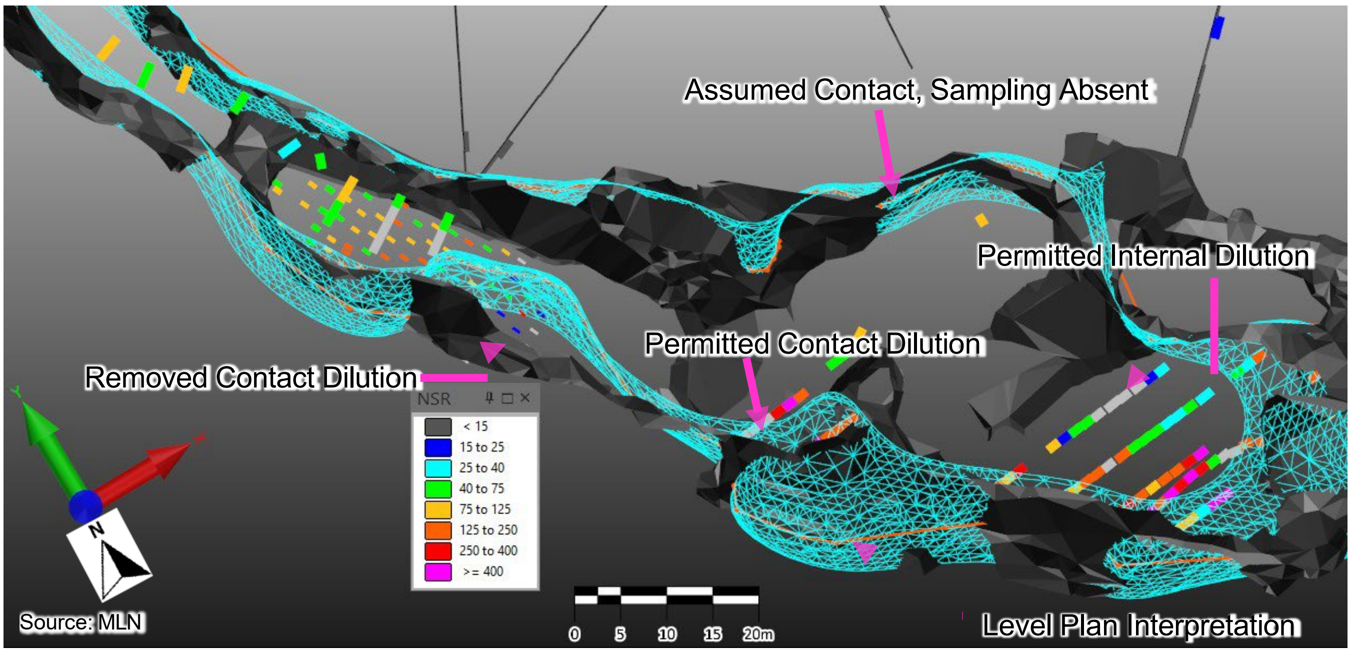
Body (Wireframe)	Construction Type
Gaby	Drill Hole Implicit
Lupita	Drill Hole Implicit
Monica	Level Plan Implicit
GalloDeOro	Hangingwall Footwall Implicit
CarolinaSamara	Drill Hole Implicit
MinaValenciana	Hangingwall Footwall Implicit
Negra	Drill Hole Implicit
NuestraSenora	Drill Hole Implicit
Maravillas	Hangingwall Footwall Implicit
Alejandra	Hangingwall Footwall Implicit
Blanca	Hangingwall Footwall Implicit
Dificultad	Hangingwall Footwall Implicit
Elia	Drill Hole Implicit
San Onésimo	Hangingwall Footwall Implicit
Virginia	Hangingwall Footwall Implicit
Valenciana	Hangingwall Footwall Implicit
Natalia	Drill Hole Implicit
ElPinion	Drill Hole Implicit

Body (Wireframe)	Construction Type
Negra Superior	Level Plan Implicit
Negra Intermediate	Level Plan Implicit
Esperanza	Level Plan Implicit
Patriota/Escondida	Level Plan Implicit
San Pedro	Level Plan Implicit
Silvia	N Level Plan Implicit
Avelina	Level Plan Implicit
Buenaventura	Level Plan Implicit
CobrizaInferior	Level Plan Implicit
CobrizaIntermediate	Level Plan Implicit
Cobriza Superior	Level Plan Implicit
Morena	Level Plan Implicit
Bicentenario	Level Plan Implicit
Reyna	Level Plan Implicit
Trinidad	Level Plan Implicit
Brecha	Level Plan Implicit
Valeria	Drill Hole Implicit

Source: MLN

Mineral bodies were constructed using an NSR value of US$20/t (note the Resource reporting cut-off is US$28/t NSR). Given the nature of the skarn mineralization, it was not possible to make rational interpretations that honored US$20/t as a strict boundary. Internal waste was permitted in the same fashion as it has been mined. In addition, the edges of the interpretation were not constructed to eliminate edge dilution; lower grade edge dilution was considered more of a desirable grade moderator at the skarn boundary. However, large swaths of low-grade were not included to force continuity. The models were generated to approximate a boundary for geologic continuity but lower than the reasonable economic extraction limit. The interpretations contain internal dilution. Boundaries of past mining where production sampling was absent were assumed to represent a boundary of geologic continuity greater than US$20/t and modeled as such. The boundaries of the wireframes were generally limited at approximately 30 m of extrapolation and often 15m if limited support existed. As with boundary cut-offs, this was not a completely strict criteria but rather a guideline, typically only not adhered to in the case of interpolated continuity and more consistently respected in terms of extrapolation. As such, any block within a wireframe and the 80 m maximum search range was classified as Inferred, notwithstanding pillar and mined out classifications. The adherence to extrapolation guidelines can be confirmed using the distance to nearest sample attribute in the block model. Figure 14.8 shows and example of the grade boundary interpretation.

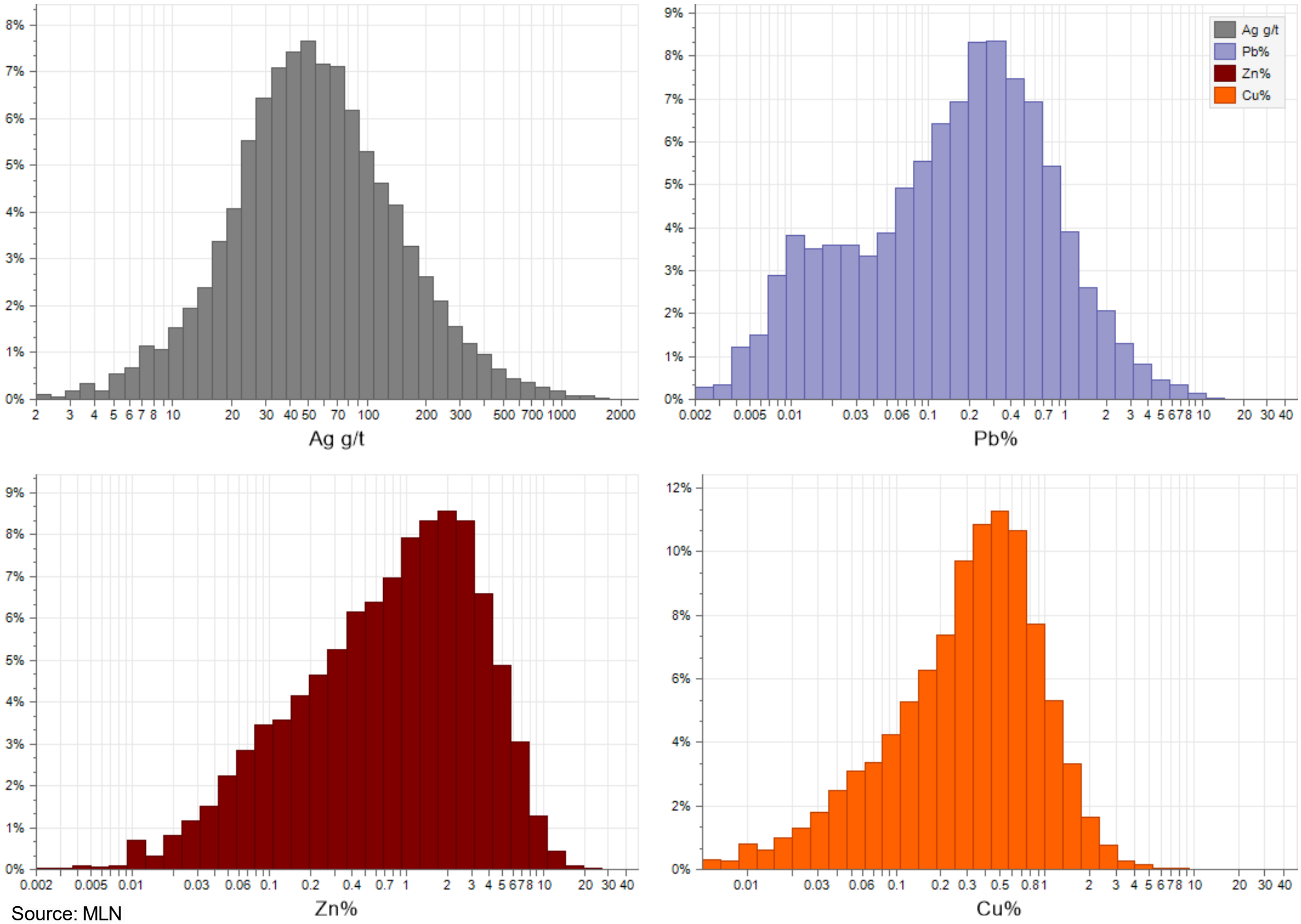
Figure 14.8 Example of Level Plan Interpretation of the La Negra Zone



14.4 Domaining and Data Grouping

Figure 14.9 shows the grade distributions of Ag, Pb, Zn, and Cu for raw length-weighted samples within all the mineral wireframes. Ag shows the best log-normal form whereas the Pb, Cu, and Zn do not display log-normal distribution on a mine scale. Distributions improve when separated by estimation domain but are often not well-formed log-normal distributions. Spatial distribution, correlations, and ratios were examined but patterns of metal zoning are elusive. This is likely a result of difficult to discern bedding preferences, structural controls, metal pulses and preferential fluid conduits.

Figure 14.9 Grade Distribution in All Mineral Solids



Source: MLN

The wireframes modeled were grouped based on broader spatial areas, deposit styles and in some instances, grade. Figure 14.10 shows the wireframes colored by estimation domain. Table 14.5 shows the assigned estimation group for each of the wireframes.

Table 14.5 Estimation Assignments of Mineral Bodies

Body (Wireframe)	Estimation Domain
Gaby	GabyLupita
Lupita	GabyLupita
Monica	Monica
GalloDeOro	EXP
CarolinaSamara	EXP
MinaValenciana	EXP
Negra	Negra
NuestraSenora	Negra
Maravillas	Maravillas
Alejandra	Northwest
Blanca	Northwest
Dificultad	Northwest
Elia	Northwest
San Onésimo	Northwest
Virginia	Northwest
Valenciana	Northwest
Natalia	Northwest
ElPinion	Northwest

Body (Wireframe)	Estimation Domain
Negra Superior	NegraUpper
Negra Intermediate	NegraUpper
Esperanza	NegraUpper
Patriota/Escondida	NegraUpper
San Pedro	NegraUpper
Silvia	NegraUpper
Avelina	Cobriza
Buenaventura	Cobriza
Cobriza Inferior	Cobriza
Cobriza Intermidate	Cobriza
Cobriza Superior	Cobriza
Morena	Cobriza
Bicentenario	Bicentenario
Reyna	Bicentenario
Trinidad	Trinidad
Brecha	Trinidad
Valeria	Valeria

Source: MLN

14.4.1 Estimation Groups

The eleven estimation groups were created with the following rationale:

14.4.1.1 Negra Upper

The Negra Upper area is essentially mined out, with areas of considerable grade, such as Negra Superior. These areas are best segregated from other data. The bodies in this group dip at around 70 degrees and strike with the limb of the regional antiform. Mineralization is steep and appears bedding-controlled where it is not in chimneys. It is speculated that near vertical bedding obliquely intersecting the plane of the antiform has structural prepped the area, allowing for fluid flow and deposition, making this area one of most mineralized on the property. Negra Superior appears to be near the apex of the anticline and where fluids from the intrusive have been concentrated.

14.4.1.2 Negra

The Negra zone is comprised only of the Negra body wireframe. Although the Negra zone is a lower extension and geologically like the Negra Upper Domain, the grade difference in the upper zone and the resource upside in this area warrant special handling and has therefore been domained and estimated by itself.

14.4.1.3 Cobriza

Structurally complex, this area is between the southern limb of the anticline the forms the Negra area trend and the Maravillas dike. The Cobriza area appears to be bedding controlled with bedding primarily dipping to the west/northwest with chimneys as well as frequent post and pre- mineral offsets. The northern limb of the antiform is not readily observed in this area and was possibly consumed by the intrusive or obscured by faulting. The silver population in this zone is log-normal but the base metal populations are not log-normal with several populations; likely, this is due to varying metal enrichments based on elevation, stratigraphic preferences, and proximity to the intrusive. The less-than-ideal base metal populations were tolerated in this zone due to the complexity and limited remaining virgin resource. Down-dip extensions of this zone are not apparent, and the upside is limited. The 2021 drill program does not focus in this area.

14.4.1.4 Bicentenario

Bicentenario represents a confluence between bedding and the Maravillas dike structure. Mineral enrichment in this zone is strongest nearer the structure which is a suspected fluid pathway. Mineralization follows bedding but diffuses toward the north. This area provides visual evidence for the importance the vertical structures as a requirement for fluid transport and bedding as an amenable trap. The zone follows the dip of the basin to the west toward Maravillas but loses mineral grade; the down dip extent is called Reyna.

14.4.1.5 Trinidad

Similar to Bicentenario, the Trinidad area represents a confluence between bedding and the Cristo Rey dike structure, with the best mineral enrichment nearest to the vertical structure. The upper portions of this area are primarily mined out but the depth extent, dipping to the west and locally called Valeria, shows upside. Bedding between Bicentenario and Trinidad appear continuous but lack a fluid conduit, causing a disruption in mineralization. The absence of mineralization on the northside of the Cristo Rey structure is currently unexplained.

14.4.1.6 Brecha

The eastern extent of the Brecha area is combined with the western area of Trinidad but has been separated for ease of wireframe construction. The area is comprised of bedding and vertical structure related mineralization of good grade. Moving down dip toward the west and away from the Cristo Rey structure, mineralization intensity lessens, and the mineralization becomes more flat-lying and primarily bedding controlled, with the best grade oriented on the prevailing vertical trend. The Cristo Rey structure continues to the west/northwest but a meaningful continuation of mineralization along it has yet to be demonstrated. Similarly, the termination of the lower Brecha zone down dip is also unexplained.

14.4.1.7 Maravillas

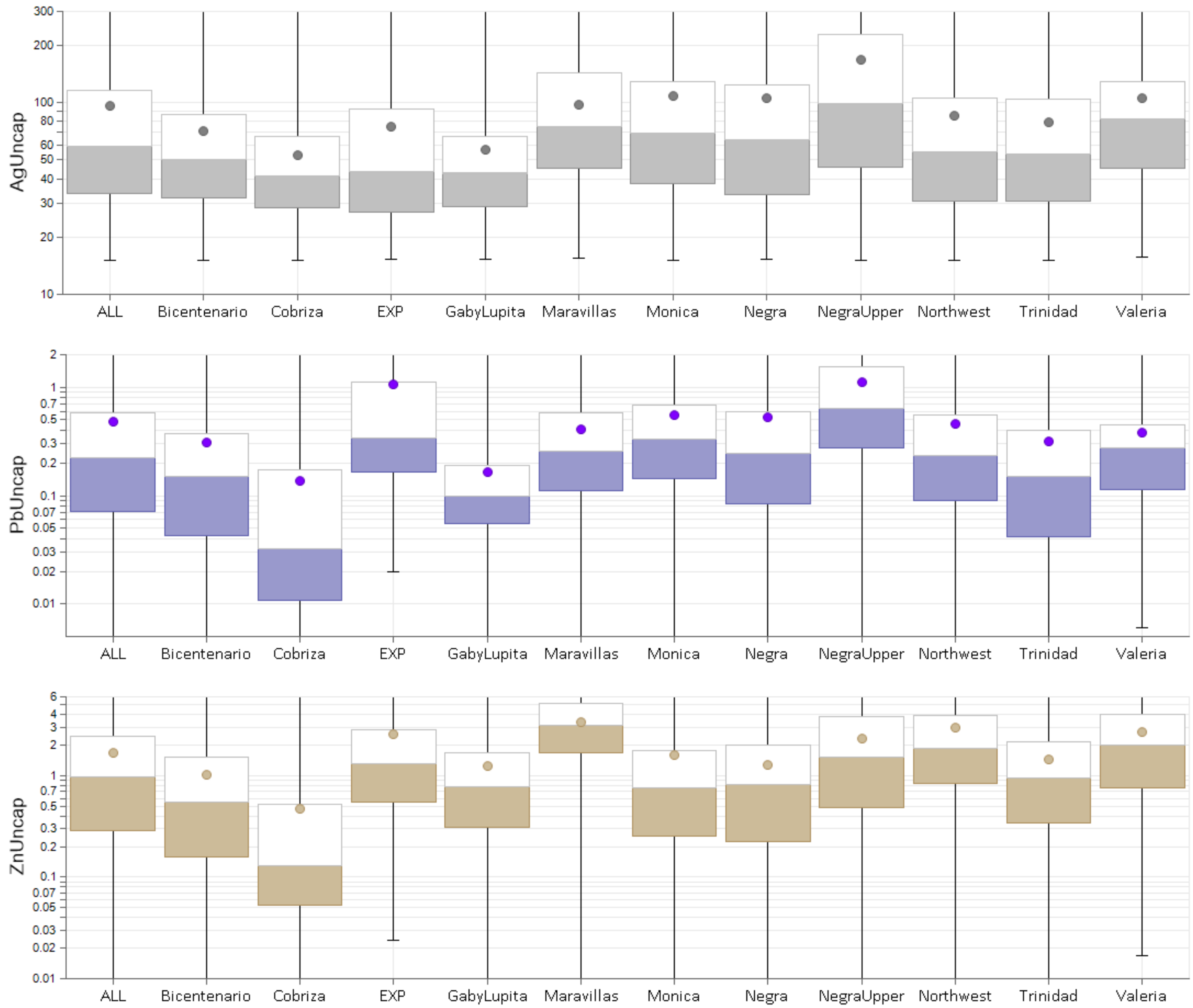
The Maravillas zone is isolated in the central area of the mine and is somewhat unique in its planar continuity not showing significant enrichment where the structure intersects bedding. The mineralized skarn in the Maravillas zone is vein like, consistently paralleling or replacing the felsic intrusive dike referred to as the Maravillas dike. The zone is higher-grade than other virgin resource areas but also higher in deleterious elements such as As. For these reasons it’s best estimated as its own domain.

14.4.1.8 Northwest

The Northwest domain contains several steeply dipping higher-grade zones with similarities to Maravillas but 300 m to the west. The zone differs from Maravillas because the felsic dikes that are present are possibly the extension of the Maravillas dike, but the association of mineralization with the dike is less consistent than at Maravillas. The domain is a confluence of the Negra anticline trend and at least two dike systems, forming a horsetail structural zone. The plunge line formed from the confluence of structural plans could be an important feature in mineral enrichment.

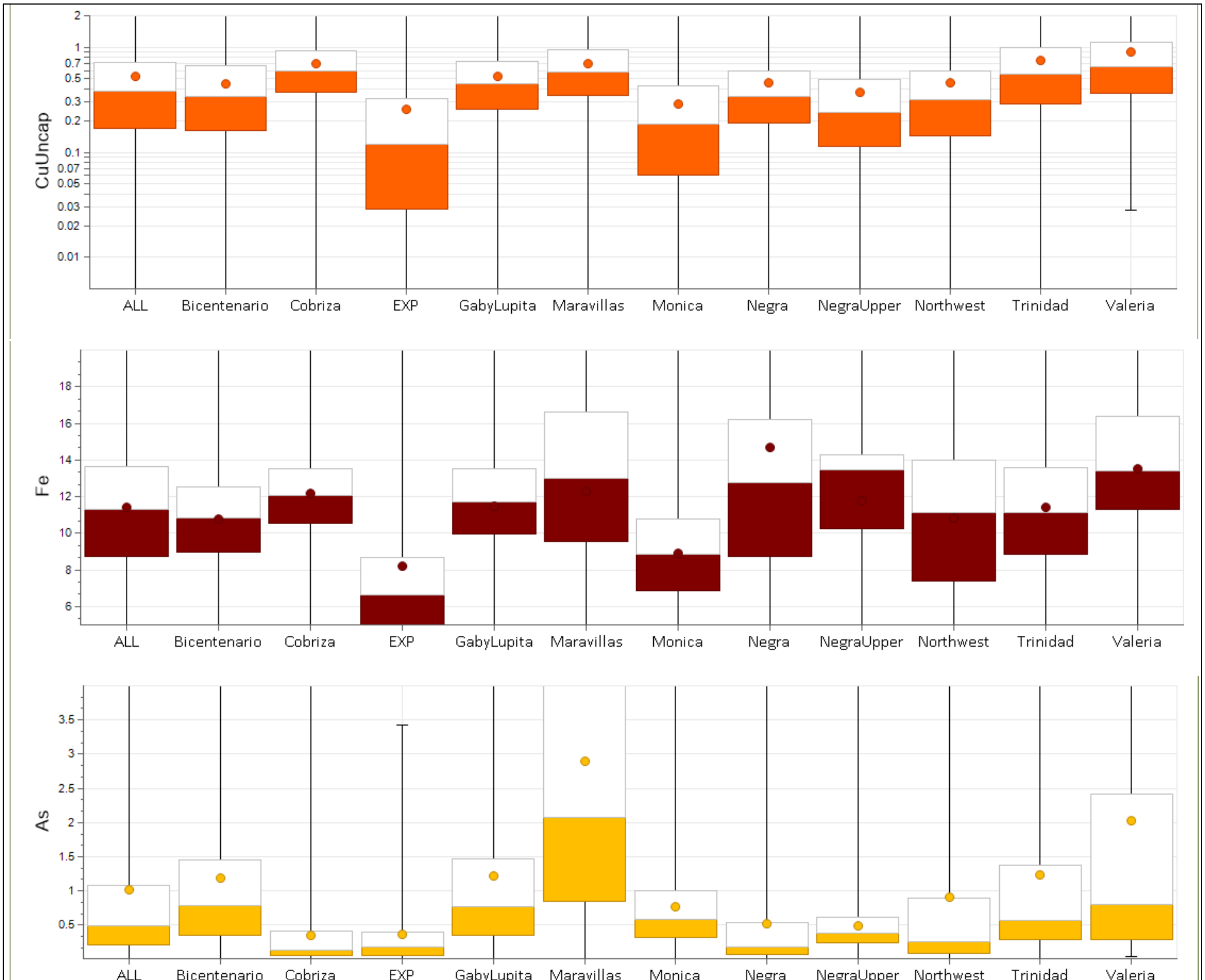
The following figures show box plots for Ag, Pb, Zn, Cu, Fe and As by domain as well as the total data set.

Figure 14.10 Box Plots for Ag, Pb, Zn by Estimation Domain



Source: MLN

Figure 14.11 Box Plots for Cu, Fe, As by Estimation Domain

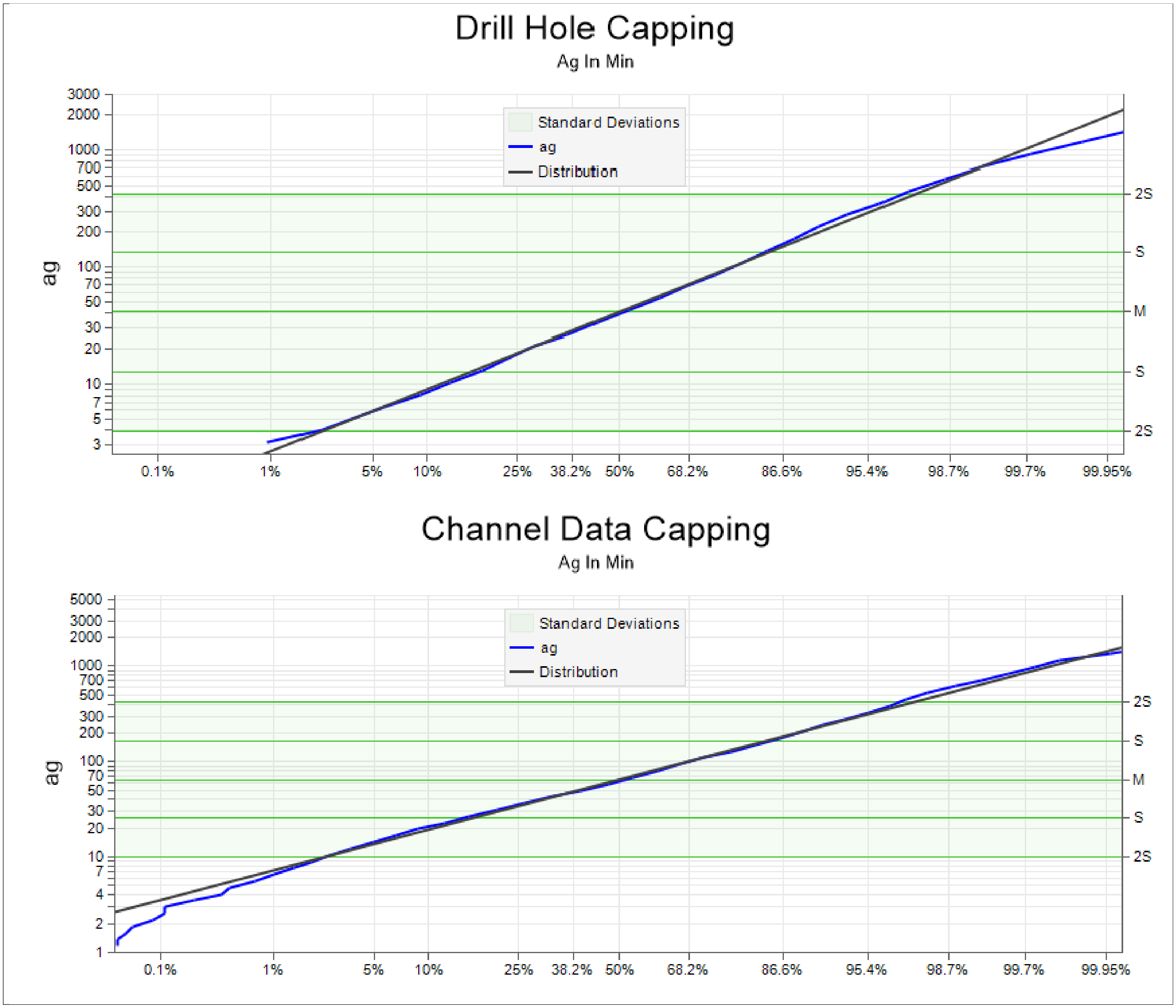


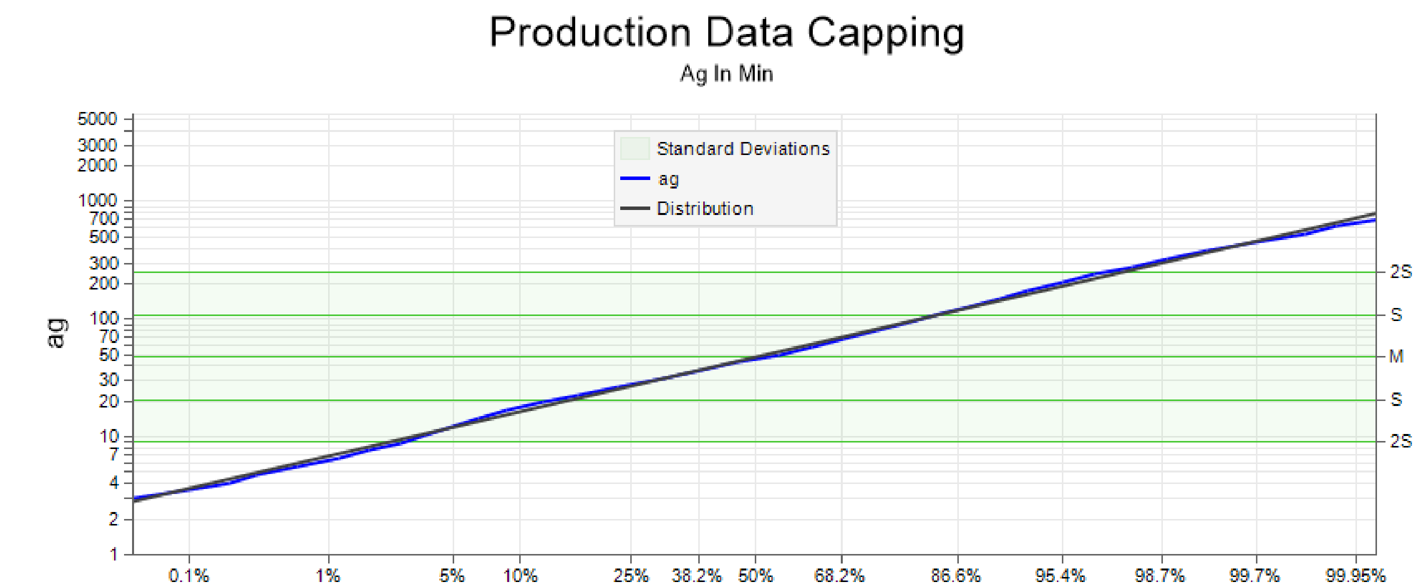
Source: MLN

14.5 Capping and Compositing

Capping was evaluated by type, drill hole, channel or production sample and estimation domain, using histograms and probability plots for Ag, Pb, Zn, and Cu. Fe and As were not capped. Capping thresholds are shown in Table 14.6. Outliers were assessed in the composited and declustered datasets for drill hole, channels and the production data set and capped. All distributions are assessed as length weighted. Figure 14.13 shows the raw Ag probability plot for the drill holes, channels, and production samples; the same method was used for domains and metals.

Figure 14.12 Capping Assessment by Data Type Raw Ag





Source: MLN

Table 14.6 Capping-Upper Thresholds Restrictions by Estimation Domain

Estimation Domain	Data Set	Ag g/t	Pb%	Zn%	Cu%
Global	DH	800	9.5	11.5	6.0
Northwest	DH	450	3.5	8.0	2.5
Northwest	Channel	450	4.0	11.0	2.5
Northwest	Production	175	0.6	9.0	1.5
Maravillas	DH	500	2.0	10.0	2.5
Maravillas	Channel	600	2.5	9.5	2.5
Maravillas	Production	300	1.0	7.0	2.3
Negra	DH	400	3.5	7.5	1.5
Negra	Channel	700	5.0	12.0	2.5
Negra	Production	500	2.0	7.5	2.0
Trinidad	DH	350	4.0	7.5	3.5
Trinidad	Channel	600	3.0	8.5	3.5
Trinidad	Production	150	0.6	4.5	1.0
Cobriza	DH	400	3.0	7.0	2.0
Cobriza	Channel	400	2.5	7.0	3.0
Cobriza	Production	200	1.3	7.0	2.0
Bicentenario	DH	400	3.0	6.0	2.0
Bicentenario	Channel	350	2.5	6.0	2.5
Bicentenario	Production	275	2.0	4.5	1.8

Estimation Domain	Data Set	Ag g/t	Pb%	Zn%	Cu%
GabyLupita	DH	300	1.5	8.0	2.5
GabyLupita	Channel	300	1.0	6.5	2.5
GabyLupita	Production	150	0.6	4.0	0.9
Monica	DH	500	4.0	7.5	1.8
Monica	Channel	500	3.0	8.0	2.0
Monica	Production	375	2.0	8.0	1.5
NegraUpper	DH	800	6.0	10.0	2.0
NegraUpper	Channel	900	9.0	14.0	2.0
NegraUpper	Production	250	1.8	5.5	1.0
EXP	DH	450	3.5	8.0	2.5
EXP	Channel	450	4.0	11.0	2.5
EXP	Production	175	0.6	9.0	1.5
Valeria	DH	325	2.5	10.0	3.5
Valeria	Channel	325	2.5	10.0	3.5
Valeria	Production	325	2.5	10.0	3.5

Source: MLN

Following capping, drill holes were composited to the mode length of 2m. Raw drill hole intervals were selected where their centroid was inside the mineral shapes. Compositing started and finished with respect to the mineral boundary. Samples outside of the wireframes were not composited and not used for estimation. The minimum composite length was 1m, residuals less than 1m were added to the previous composite. For long-unsampled intervals, 2 m intervals at the detection limit were inserted. Undesirably, samples greater than 2 m were split into two-meter segments, the split samples were reviewed and determined to be overwhelmingly very low grade, internal waste or occasionally from old sampling series in the upper mine in areas that are mined out. The issue was deemed non-material; sample per hole restrictions further reduce the impact.

Metal removed from capping was assessed by model sensitivity runs utilizing uncapped samples. Table 14.7 details the relative percentage of metal reduction as a result of capping at the base case cut-off.

Table 14.7 Metal at Risk Sensitivity

Class/Body	% of Ag Metal Removed	% of Pb Metal Removed	% of Zn Metal Removed	% of Cu Metal Removed
All	7.5	10.2	3.5	5.1

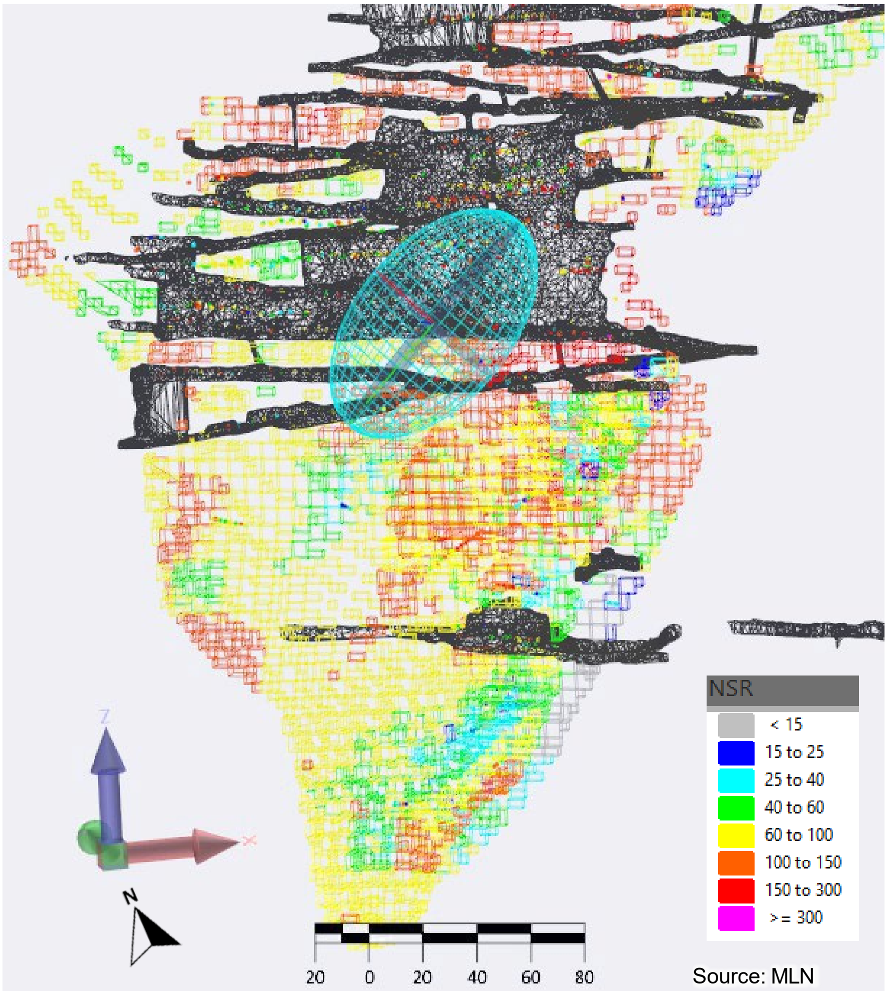
Source: MLN

14.6 Variogram Modelling and Search Orientation

14.6.1 Search Ellipse Orientation

Search ellipses were initially fit to the strike and dip of the predominant observed spatial properties of each estimation domain and spun on the strike dip plane where grade trends or secondary control was observed in past mining or suspected based on intersections with bedding or other structures. As discussed above, most areas are a mix of deposit styles and search orientations were often a best fit compromise. The figure below shows the Maravillas estimation domain with the search ellipse fit to suspect pitch based on bedding intersections and suspected grade trends.

Figure 14.13   Maravillas Search Ellipse Fitting



Anisotropies of the ellipses were also approximated based on observations. As discussed below, experimental variography was not successful in validating search ellipse anisotropies. Table 14.7 details the orientations and anisotropies used for each estimation domain.

Table 14.8   Estimation Domain Orientation and Anisotropies

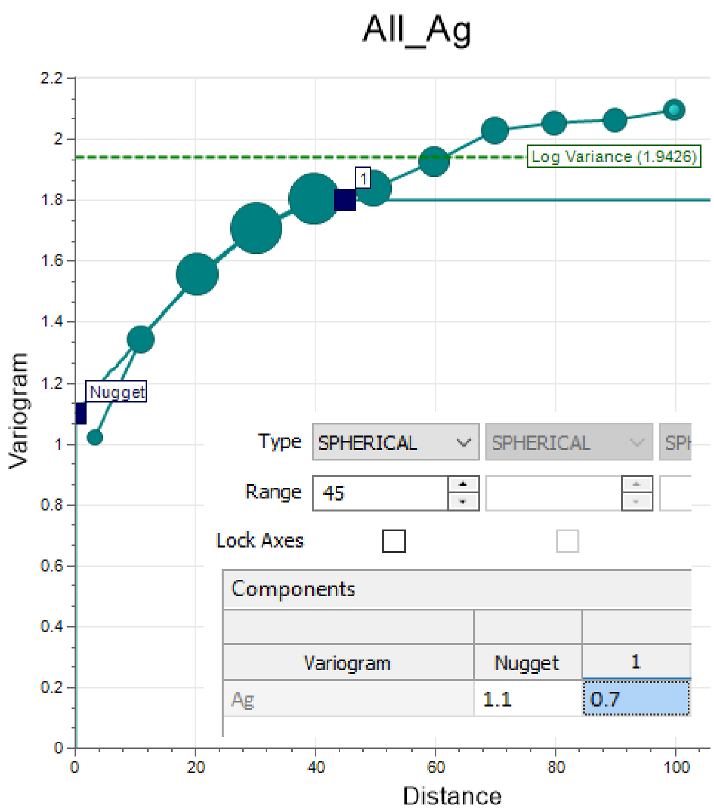
Domain Group (Estimation)	Strike	Dip	Pitch	Sense of Pitch	Axis 1 Factor	Axis 2 Factor	Axis 3 Factor
Bicentenario	275	85	60	West	1	0.5	0.2
GabyLupita	100	5	0	West	1	1	0.2
Cobriza	N/A	N/A	N/A	N/A	1	1	1
Maravillas	120	75	50	West	1	0.8	0.5
Monica	225	70	20	West	1	0.6	0.2
Negra Upper	150	65	80	West	1	0.6	0.2
Northwest	107	70	45	West	1	0.3	0.2
Negra	145	50	10	South	1	0.7	0.3
Trinidad	295	75	60	West	1	0.5	0.2
Valeria	100	85	37	West	1	0.5	0.3
EXP	N/A	N/A	N/A	N/A	1	1	1

Source: MLN

14.6.2 Experimental Variography

Experimental variograms were generated for Ag, Pb, Zn, Cu, As, and Fe for each estimation domain along the axis of the above discussed search ellipses. Anisotropy demonstrated by experimental variograms was elusive. Due to this, a single log-transformed omni-directional modelled variogram for each estimation domain was used for each metal. Non-transformed omni-directional modelled variograms were used for Fe. The variogram ranges for the six elements are generally similar in the range of 35-50 m with Zn and Fe often having 20-30% longer ranges. A combined log-transformed omni-directional variogram model, shown in Figure 14.15, was the basis for pass and classification criteria discussed below.

Figure 14.14 Combined Omni-Directional Experimental Variogram and Model for Ag



Source: MLN

Following combined omni-direction variogram modeling, each estimation zone was modelled for estimation. Models were aligned to maximum continuity where trends were observable in experimental variograms but omni-directional variograms were used for estimation. All models are log-transformed (except for Fe), spherical, omni-directional, single component, and single structured.

Table 14.8 details the model variogram parameters for each zone and metal. In general, the ranges for each domain were similar and nuggets were high relative to the total sill of one.

Table 14.9 Modeled Variograms by Estimation Domain

Estimation Domain	Metal	Range (m)	Nugget	Partial Sill	Total Sill
Negra	Ag	35	0.58	0.42	1
Northwest	Ag	50	0.5	0.5	1
Cobriza	Ag	30	0.31	0.69	1
Bicentenario	Ag	45	0.61	0.39	1
GabyLupita	Ag	35	0.65	0.35	1
Monica	Ag	60	0.52	0.48	1
NegraUpper	Ag	55	0.5	0.5	1
Trinidad	Ag	45	0.66	0.34	1
Maravillas	Ag	50	0.5	0.5	1
Valeria	Ag	45	0.66	0.34	1
EXP	Ag	35	0.58	0.42	1
Negra	Pb	55	0.42	0.58	1
Northwest	Pb	60	0.45	0.55	1
Cobriza	Pb	14	0.32	0.68	1
Bicentenario	Pb	30	0.33	0.67	1
GabyLupita	Pb	55	0.36	0.64	1
Monica	Pb	75	0.56	0.44	1
NegraUpper	Pb	35	0.53	0.47	1
Trinidad	Pb	45	0.68	0.32	1
Maravillas	Pb	55	0.54	0.46	1
Valeria	Pb	45	0.68	0.32	1
EXP	Pb	60	0.45	0.55	1
Negra	Zn	45	0.41	0.59	1
Northwest	Zn	40	0.37	0.63	1
Cobriza	Zn	55	0.33	0.67	1
Bicentenario	Zn	30	0.3	0.7	1
GabyLupita	Zn	50	0.41	0.59	1
Monica	Zn	75	0.59	0.41	1
NegraUpper	Zn	40	0.5	0.5	1
Trinidad	Zn	35	0.71	0.29	1
Maravillas	Zn	85	0.47	0.53	1
Valeria	Zn	35	0.71	0.29	1
EXP	Zn	40	0.37	0.63	1

Estimation Domain	Metal	Range (m)	Nugget	Partial Sill	Total Sill
Negra	Cu	80	0.31	0.69	1
Northwest	Cu	45	0.32	0.68	1
Cobriza	Cu	55	0.46	0.54	1
Bicentenario	Cu	40	0.58	0.42	1
GabyLupita	Cu	50	0.41	0.59	1
Monica	Cu	50	0.63	0.37	1
NegraUpper	Cu	45	0.84	0.16	1
Trinidad	Cu	35	0.6	0.4	1
Maravillas	Cu	55	0.54	0.46	1
Valeria	Cu	35	0.6	0.4	1
EXP	Cu	45	0.32	0.68	1
Negra	Fe	85	0.19	0.81	1
Northwest	Fe	70	0.17	0.83	1
Cobriza	Fe	50	0.5	0.5	1
Bicentenario	Fe	30	0.42	0.58	1
GabyLupita	Fe	30	0.43	0.57	1
Monica	Fe	50	0.74	0.26	1
NegraUpper	Fe	35	0.57	0.43	1
Trinidad	Fe	45	0.68	0.32	1
Maravillas	Fe	90	0.71	0.29	1
Valeria	Fe	45	0.68	0.32	1
EXP	Fe	70	0.17	0.83	1
Negra	As	45	0.46	0.54	1
Northwest	As	45	0.6	0.4	1
Cobriza	As	60	0.22	0.78	1
Bicentenario	As	25	0.72	0.28	1
GabyLupita	As	30	0.38	0.62	1
Monica	As	50	0.64	0.36	1
NegraUpper	As	20	0.68	0.32	1
Trinidad	As	30	0.57	0.43	1
Maravillas	As	75	0.46	0.54	1
Valeria	As	30	0.57	0.43	1
EXP	As	45	0.6	0.4	1

Source: MLN

14.7 Search Parameters

Each estimation domain was estimate using blocks and samples within the corresponding domain. Estimation was completed in three Kriging passes of 25, 50, and 80 m. As the pass range increased the sample selection criteria became less strict. For example, pass 1 has a maximum range of 25 m, with a minimum of 9 sample points that come from at least 5 octants, whereas pass 3 has a maximum range of 80 m with a minimum of 1 sample point. Kriging was completed at the parent block size of 6x6x6 with a discretization of 2x2x2, the parent size in pass 3 was increased to 3 times the pass 1 and 2 size. The pass parameters are shown in table 14.8.

Table 14.10 Estimation Pass and Sample Selection Parameters

Domain Group (Estimation)	Pass 1 Max Range	Pass 2 Max Range	Pass 3 Max Range	Pass 1 Sectors	Pass 2, 3 Sectors	Pass 1 Max Per Sector	Pass 2 Max Per Sector	Pass 3 Max Per Sector	Pass 1 Max Points	Pass 2 Max Points	Pass 3 Max Points	Pass 1 Min Points	Pass 2 Min Points	Pass 3 Min Points	Pass 1 Max Per DHole	Pass 2 Max Per DHole	Pass 3 Max Per DHole	Pass 3 Parent Multiplier
Bicentenario	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
GabyLupita	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
Cobriza	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
Maravillas	25	50	80	Quadrants	Quadrants	3	2	6	12	8	24	6	3	1	2	3	3	3
Monica	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
Negra Upper	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
Northwest	25	50	80	Quadrants	Quadrants	3	2	6	12	8	24	6	3	1	2	3	3	3
Negra	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
Trinidad	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
Valeria	25	50	80	Octants	Quadrants	2	3	6	16	12	24	9	3	1	2	3	3	3
EXP	25	50	80	Octants	Quadrants	3	2	6	12	8	24	6	3	1	2	3	3	3

Source: MLN

14.8 Block Model Structure

Project resources are estimated with one block model that is not rotated and has a parent cell size of 6x6x6 m. One sub cell division was permitted in each direction; therefore, the smallest size sub-block is 3x3x3 m. Sub-blocking was based on the mineral body wireframes. Estimation occurred only at the parent block size. Table 14.9 below describes the physical structure of the block model.

Table 14.11 Block Model Structure and Setup

Parameter	Value
Origin (Corner) X	445,720.0
Origin (Corner) Y	2,305,740.0
Origin (Corner) Z	1,600.0
1st Parent Centroid X	445,724.0
1st Parent Centroid Y	2,305,741.0
1st Parent Centroid Z	1,603.0
Parent Block Size X	6
Parent Block Size Y	6
Parent Block Size Z	6
Max Sub Divisions X	2
Max Sub Divisions Y	2
Max Sub Divisions Y	2
Smallest Sub Block Size X	3
Smallest Sub Block Size Y	3
Smallest Sub Block Size Z	3
Model Length X	2,658
Model Length Y	1,302
Model Length Z	1,062
Blocks X	443
Blocks Y	217
Blocks Z	177
Rotation (Clockwise about corner)	30 Degrees

Source: MLN

14.9 Resource Classification

Mineral resource classification is initially based on the estimation pass criteria shown in Table 14.9 above. Blocks estimated in pass 1 are eligible to be classified as Indicated so long as further polishing criteria are met. Blocks estimated in pass 2 are eligible to be classed as Indicated so long as further criteria are met, blocks in pass 2 that do not meet the additional criteria are down-classed to Inferred. All blocks estimated in pass 3 are classified as Inferred. Blocks cannot be up-classed. Measured classification was initially contemplated but it was ultimately decided to relegate all blocks to either Indicated or Inferred. This decision will be revisited as the estimate is tested through additional drilling and reconciliation.

Classification criteria applied to passes:

- Measured: Additional to pass 1; closest sample less than 10m, an average distance of samples less than 20m, 4-8 sectors, and at least 12 samples of a total of octants.
- Indicated: Pass 1, or pass 2 with closest sample less than 25m and 3 or more sectors.
- Inferred: From pass 3 or not meeting Indicated criteria from pass 2.

Classifications are also ‘polished’ and down-classed to Inferred due to lack of confidence determined by the professional judgement of the estimator. These decisions are influenced by data quality and other forms of non-quantifiable uncertainty. For example, the totality of the San Onésimo mineral body is classified as Inferred given the age of information used to inform the estimate and current absence of level development. The additional Inferred down-class criteria are listed below. Note it is important to revisit these criteria as the data set is expanded these criteria meet the current conditions and are not intended to permanent rules.

- Body = San Onésimo
- Body = Maravillas & X < 447436
- Body = Maravillas & X > 447730
- Body = Maravillas & Z > 2236
- Body = Maravillas & Z < 1972
- Body = Negra & X < 447256
- Body = Negra & Z < 1838
- Body = Bicentenario & ((Y > 2305430 & X > 447972) OR (Z < 1920 & Y > 2305465) OR (X > 447949 & Z < 1945 & Y > 2305417))
- Body = Reyna & Z < 1867.5
- Body = Trinidad & Z < 1740
- Domain = GabyLupita & Z < 1780
- Body = Alejandra & Z > 2250
- Body = Alejandra & Z < 2165
- Body = Virginia & Z > 2305 & X < 447015
- Body = Elia & Z < 2161
- Body = Cobriza Intermediate & Z < 1994.6 & Y > 2304970 & Y < 2305050
- Body = NuestraSenora
- Body = Natalia & (X < 447268 OR Z > 2300)
- Domain = EXP

The originally conceived threshold for Measured classification (ultimately abandoned) described above is exceptionally high compared to many base metal projects and reflects the estimator’s assessment of the short-range continuity of the deposit. Rapid changes in both metal grade and zone thickness are observed on the level-to-level scale. To achieve Measured class future drilling will be required at a spacing of approximately 10-15 m; Indicated will requires a spacing of 20-25 m, and Inferred 50-60 m. Classification criteria, however, should be reassessed if and when the project is drilled off using a regularized infill drill grid as part of standard mine operations.

Figure 14.24 below shows the estimation Classification assignments for only remaining and reportable blocks. Figure 14.25 shows a cumulative frequency by Resource Classification of distance to the nearest sample of reportable blocks. Figure 14.26 shows a cumulative frequency by Resource Classification of number of samples used to estimate each reportable block.

Figure 14.15 Overview of Mineral Classification of Remaining Blocks (Looking North)

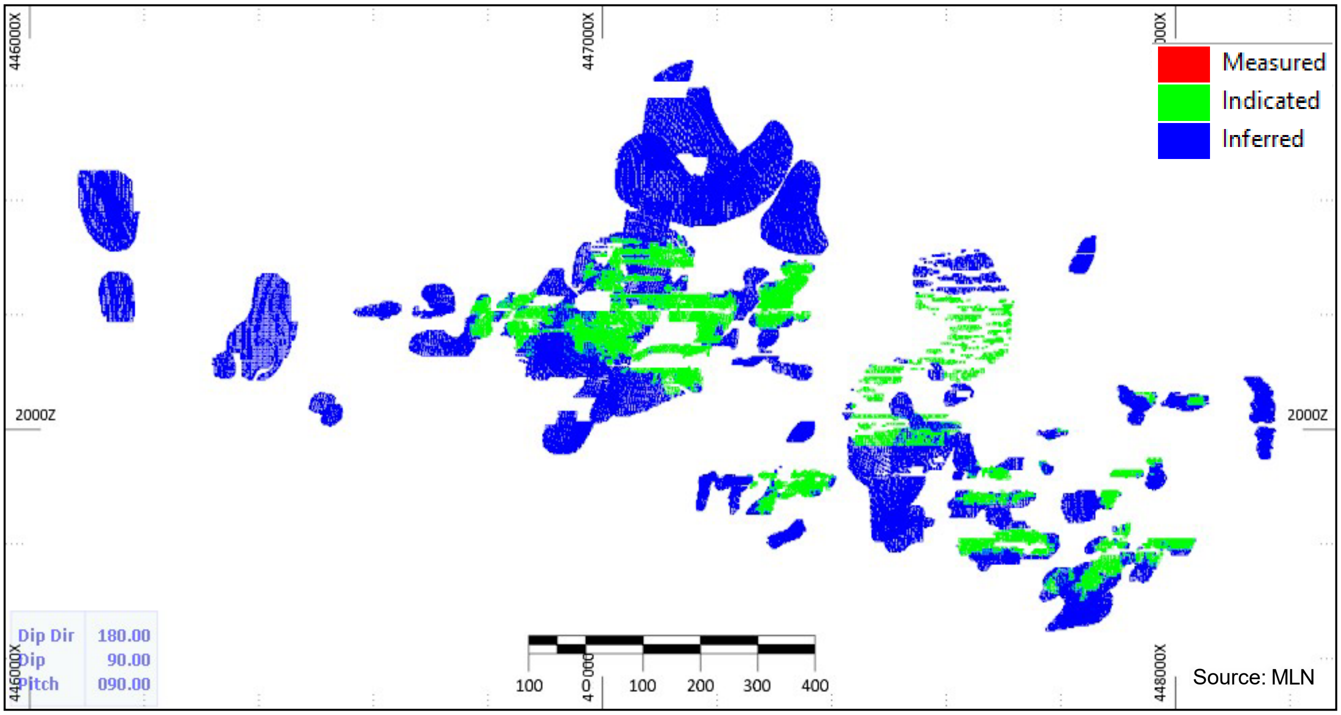


Figure 14.16 Distance to Nearest Sample by Classification, Cumulative Frequency

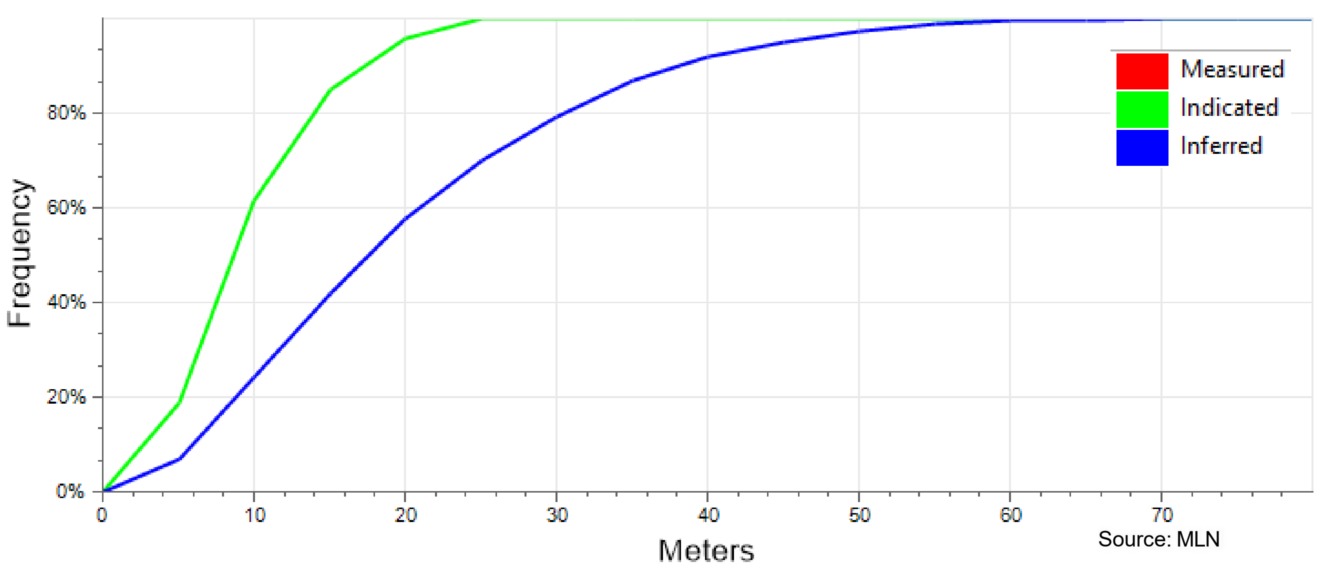
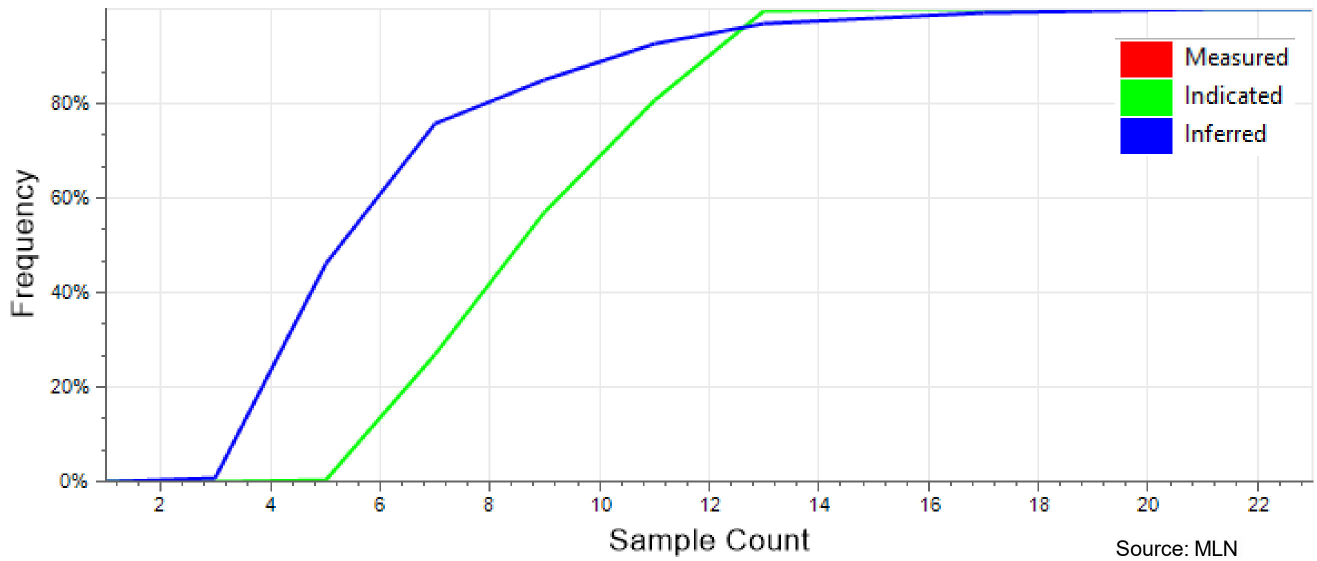


Figure 14.17 Sample Count by Classification, Cumulative Frequency



Source: MLN

14.10 Depletion of Historic Mining

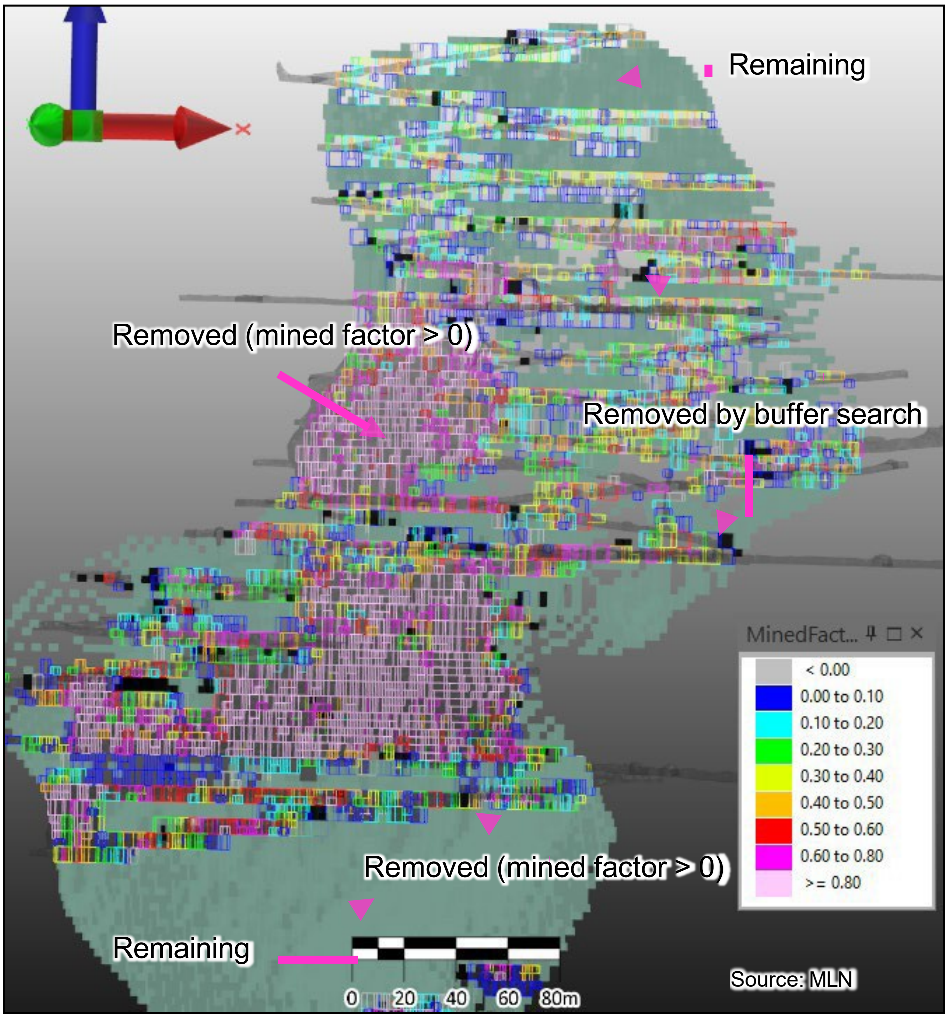
Block models are initially populated with all blocks, mined and in-situ, that fall within the mineralized interpretation; grades are also estimated in all blocks. The purpose of this is to model the mineralization as a complete mineral system using mined areas as information to guide interpretations, allow for conceptual investigations into pillar retrieval using unclassified material, and to estimate with the assumption that historic areas are an important aspect to the geostatistical understanding of the mineral system.

Following grade estimation, mining is accounted for in three passes. First, the mine cavity database is used to make a precise calculation of the fraction of a block that is within the mined-out solids. The portion of the block that is mined is assigned to the attribute “Mined Fact”, where 1 is totally mined and 0 or absent is not mined. All blocks with any fraction greater than 0 are given a “Mined_Likely” code of ‘1’. Second, an inverse distance search is used from each block centroid to apply a buffer of 12 meters in the x and y direction and 1.2 meters in the z direction around the mined-out workings. Blocks that satisfy the buffer search are also given a “Mined_Likely” code of ‘1’. Finally, blocks are manually removed by visual inspection; the “Report Remaining” code of ‘1’ is overwritten to ‘0’ where blocks are visually suspected to be reasonably mined out. Figure 14.27 shows the above explanation graphically for Maravillas (no manual removals were required at Maravillas due to modern record keeping). Resource reporting tables only include blocks with a “Report_Remaining” code equal to ‘1’ as well as a “Report Final” code equal to ‘1’ that accounts for RPEEE as discussed below.

Records beginning in 1971 up to yearend 2020 account for 14.6mt mined at 107 Ag g/t, 0.6% Pb, 2% Zn, and 0.7% Cu. Grades from within the historically mined out areas reconcile with 3% for Ag and Pb, 8% for Zn and 27% for Cu. The dataset is incomplete is theses area and there are many historic areas that have not been completely modeled, but the comparison provides a reasonable level of confirmation of the modeling methods and dataset. (Historic mining is not an indication of Resource or potential mineability).

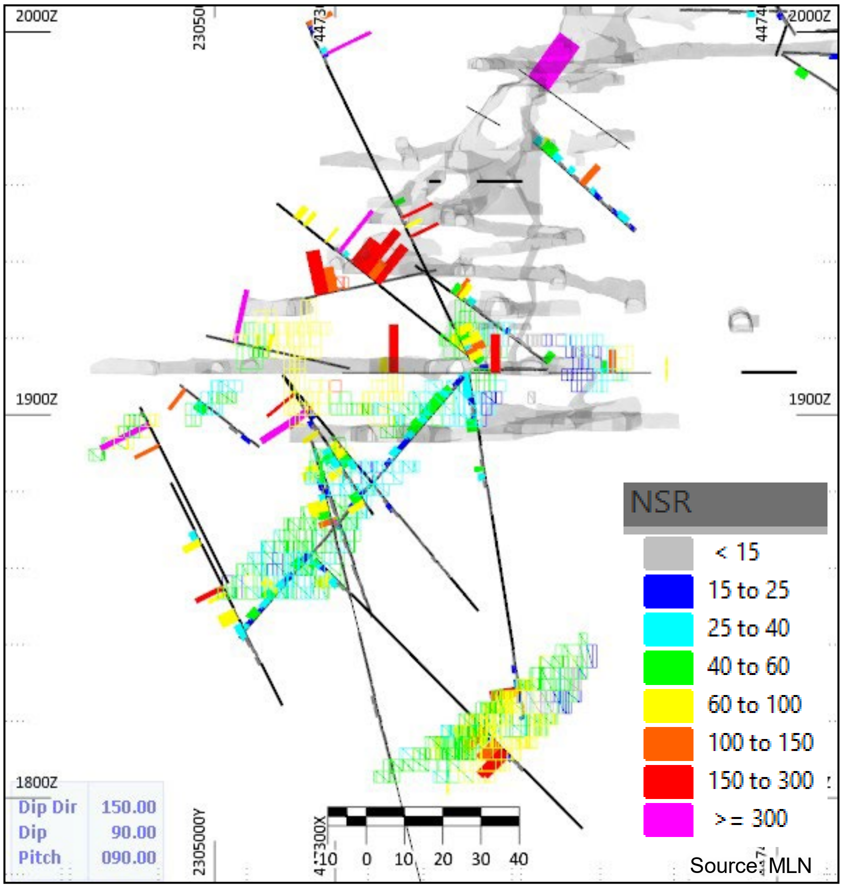
There is little risk that the current estimate accounts for mined areas for the following reasons: the current estimate is primarily extensions of recently mined out areas with good, recent, spatial record keeping, or in areas that are completely virgin. Portions of recent mining that fall below US$20/t have not been included in the mineral interpretation. Mining from 1971 to 1994 has been assumed to be 5.6 mt with no year-to-year records available. If there were any doubts the default assumption was that material has been mined. Blocks that have any percentage in contact with mined out solids are not reported as Resource.

Figure 14.18 Explanation of Block Model Depletion by Mined Workings



The following zones were overwritten and assumed to be completely mined out, meaning no Resources of any class are reported from these zones: most of the Cobriza domain (Cobriza Superior, Buenaventura, Morena), the entire Negra Upper domain (Esperanza, Patriota/Escondida, San Pedro, Silvia, Negra Intermediate, and Negra Superior). As well as the following logic: Negra above 1927 m classified initially as Inferred, Trinidad above 1840 m, Brecha above 1912 m, and Monica above 2005 m. The figure below shows the reported remaining resources in the Negra body.

Figure 14.19 Negra Zone Remaining Resources Looking NW 300°



14.11 Cut-off Grade and Reasonable Prospects for Eventual Economic Extraction

The Resource cut-off grade for La Negra has been approximated at US$28/t NSR and is based on the first principle operating cost estimate generated with input from site mine planers and is a reasonable approximation. The cash cost to mine and process 760kt of material in 2017 was US$25.8 M or $34/t and since that time updated labor agreements have reduced estimated costs.

An NSR cut-off grade has been used because the La Negra mine has historically generated revenue from four metals contained in three flotation concentrates and any reasonable potential future mining scenario would use the same plant arrangement. Metal equivalent grades are not appropriate for evaluating Resource material cut-off grade because metallurgical recovery to concentrate, concentrate grades, concentrate penalties and payables, and concentrate trucking and smelter costs are dynamic and partially based on head grade. NSR grade is subject to the following parameters (outlined in Section 13 but restated below):

- Commodity pricing,
- Metallurgical flotation recovery and deportment to concentrate,
- Concentrate trucking costs,
- Concentrate grade, moisture, and losses,
- Concentrate treatment charges,
- Concentrate metal payables, deductions, and penalties,

14.11.1 Commodity Pricing

Commodity prices used for the NSR and cutoff grade determination were provided by an independent firm that provides advice on valuation, taxation and transfer pricing. The prices shown below correspond to the long-term price forecast as updated for Q3 2021.

Table 14.12 Commodity Prices for Resource Estimation

Parameter	Unit	Value
Silver (Ag) Price	US$/oz	20.00
Lead (Pb) Price	US$/lb	0.90
Zinc (Zn) Price	US$/lb	1.10
Copper (Cu) Price	US$/lb	3.30

Source: MLN

14.11.2 Metallurgical Flotation Recovery and Deportment to Concentrate

Metallurgical recovery has been estimated using operating data from the La Negra mill and is discussed in detail in Section 13. Table 14.11 shows the equations for reference. The equations are based on White's rule and the constant tail relationships that have been observed and regressed from operating data.

Table 14.13 Metallurgical Recovery by Concentrate

Metal	Recovery Equation
Ag to Pb, Zn, and Cu Con	(AgGrade – ((0.1 * AgGrade)+ 6))/ AgGrade
Ag to Zn Con	Ag Total Recovery * ((0.242 * (ZnGrade / (ZnGrade + PbGrade + CuGrade))) - 0.113)
Ag to Pb Con	0.67 * (Ag Total Recovery - Ag Recovery to Zn Con)
Ag to Cu Con	0.33 * (Ag Total Recovery - Ag Recovery to Zn Con)
Pb to Pb Con	(PbGrade – (0.01 + (0.24 * PbGrade))/PbGrade
Zn to Zn Con	(ZnGrade – (0.1 + (0.09 * ZnGrade))/ZnGrade
Cu to Cu Con	(CuGrade – (0.02 + (0.26 * CuGrade))/CuGrade

Source: MLN

14.11.3 Smelter Terms

Smelter terms and charges are discussed in Section 13 and have been based on long term treatment charges and actual payables, deductions and penalties schedules from the most recent smelter contracts.

14.12 Resource Statement

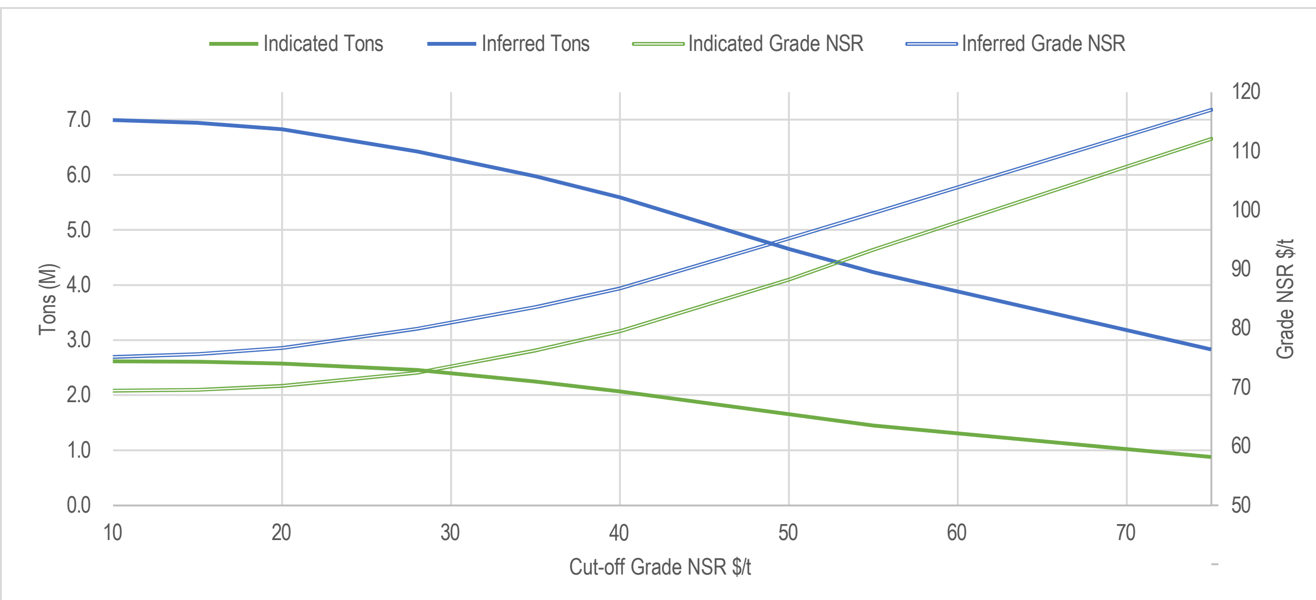
Table 14.14 La Negra Mineral Resource Statement at US$28/t NSR Cutoff

Classification	Cutoff Grade US$NSR/t	Tons (M)	Grade US$NSR/t	Grade Ag g/t	Grade Pb%	Grade Zn%	Grade Cu%
Indicated	28	2.46	73	64	0.27	1.95	0.50
Inferred	28	6.42	80	80	0.65	1.80	0.40

Source: MLN

Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. Resources are stated as undiluted. There is no certainty that all or any part of mineral resources will be converted to Mineral Reserves. Inferred Mineral Resources are based on limited sampling with assumed geologic continuity which suggests the greatest uncertainty for resource estimation. Quantity and grades are estimates and are rounded to reflect the fact that the resource estimate is an approximation. Resources are undiluted. NSR includes the following price assumptions: Ag US$20.0/oz, Pb US$0.90/lb, Zn US$1.10/lb and Cu US$3.30/lb based on the Q3 2021 Q3 long-term forecasts provided by Duff & Phelps (D&P). NSR includes varying recovery with the averages of 80% Ag, 68% Pb, 80% Zn, and 66% Cu.

Figure 14.20 Mineral Resource Grade-Tonnage Curve



Source: MLN

Table 14.15 Indicated Mineral Resources Statement at US$28/t NSR Cutoff by Mineral Body

Body	Class	Cutoff Grade US$NSR/t	Tonnes (k)	Grade US$NSR/t	Grade Ag g/t	Grade Pb%	Grade Zn%	Grade Cu%	Grade Fe%	Grade As%
Alejandra	Indicated	28	54	73	80	0.44	2.34	0.21	6.5	0.32
Avelina	Indicated	28	6	51	49	0.17	0.41	0.54	10.5	0.56
Bicentenario	Indicated	28	76	66	65	0.24	0.93	0.56	9.8	0.77
Blanca	Indicated	28	299	75	65	0.34	2.34	0.44	9.1	1.35
CarolinaSamara	Indicated	28	-	-	-	-	-	-		-
CobrizaInferior	Indicated	28	60	53	44	0.07	0.43	0.67	10.7	0.19
Dificultad	Indicated	28	292	66	54	0.22	2.44	0.38	8.6	0.65
Elia	Indicated	28	137	81	88	0.53	2.00	0.34	6.9	1.31
ElPinion	Indicated	28	-	-	-	-	-	-		-
Gaby	Indicated	28	121	52	45	0.13	1.36	0.39	11.0	0.62
GalloDeOro	Indicated	28	-	-	-	-	-	-		-
Lupita	Indicated	28	55	45	45	0.12	0.63	0.43	11.1	0.72
Maravillas	Indicated	28	316	102	85	0.30	2.80	0.76	13.3	2.44
MinaValenciana	Indicated	28	-	-	-	-	-	-		-
Monica	Indicated	28	-	-	-	-	-	-	-	-
Natalia	Indicated	28	305	51	43	0.14	1.24	0.43	14.2	0.22
Negra	Indicated	28	176	49	41	0.16	1.30	0.38	8.2	0.28
NuestraSenora	Indicated	28	-	-	-	-	-	-		-
Reyna	Indicated	28	75	58	33	0.03	1.84	0.58	9.4	0.41
SanOnesimo	Indicated	28	-	-	-	-	-	-		-
Trinidad	Indicated	28	86	47	30	0.04	1.35	0.49	10.2	0.36
Valenciana	Indicated	28	-	-	-	-	-	-		-
Valeria	Indicated	28	197	92	83	0.27	1.68	0.77	13.0	1.47
Virginia	Indicated	28	203	105	108	0.59	2.94	0.49	10.1	1.01

Source: MLN

Table 14.16 Inferred Mineral Resources Statement at US$28/t NSR Cutoff by Mineral Body

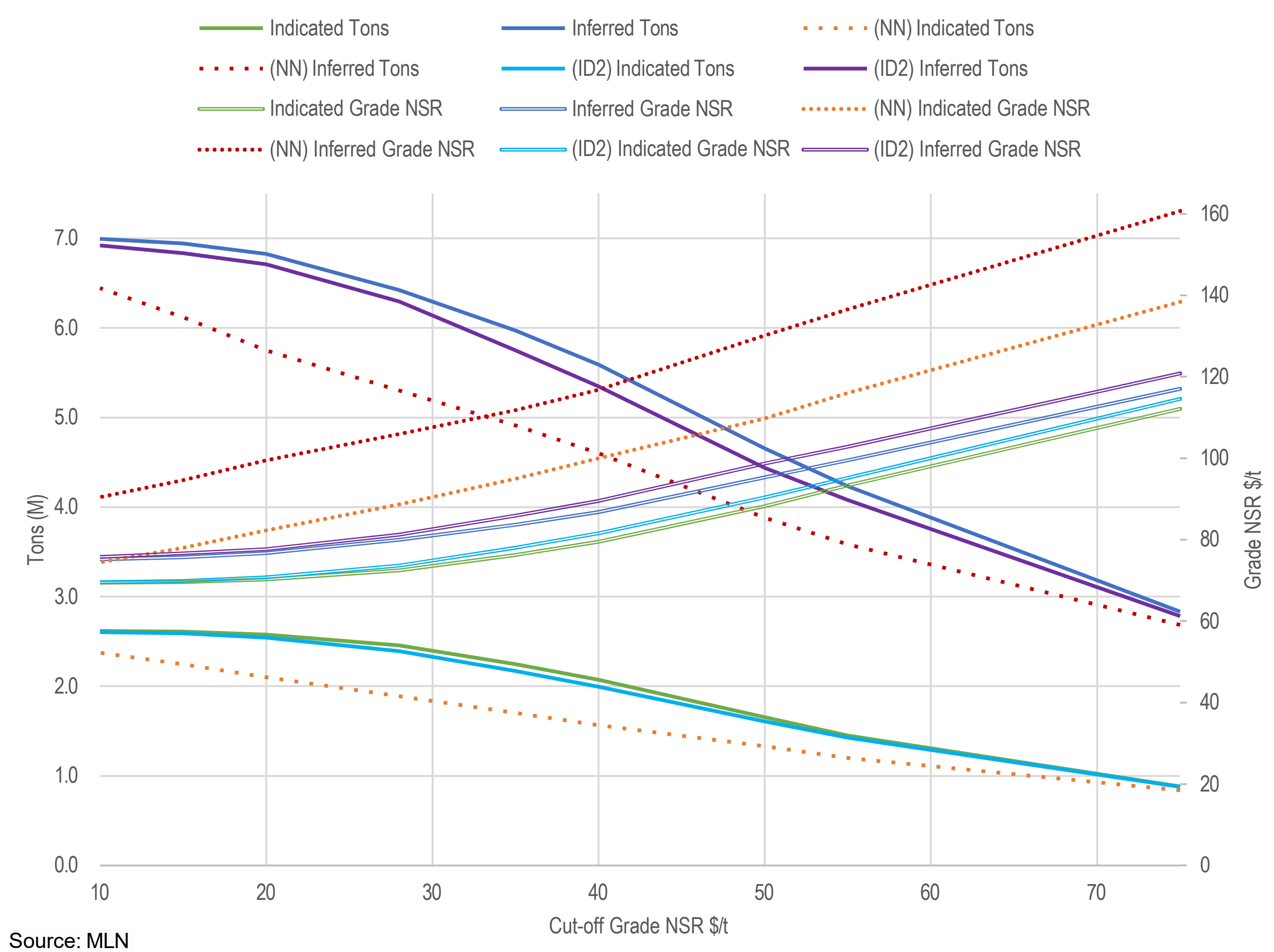
Body	Class	Cutoff Grade US$NSR/t	Tonnes (k)	Grade US$NSR/t	Grade Ag g/t	Grade Pb%	Grade Zn%	Grade Cu%	Grade Fe%	Grade As%
Alejandra	Inferred	28	515	53	46	0.24	1.18	0.45	8.9	0.64
Avelina	Inferred	28	10	41	40	0.15	0.34	0.46	11.2	0.41
Bicentenario	Inferred	28	175	58	58	0.27	1.69	0.31	10.5	1.04
Blanca	Inferred	28	217	93	79	0.42	2.94	0.56	9.5	0.72
CarolinaSamara	Inferred	28	152	51	46	0.28	2.01	0.21	6.3	0.21
CobrizaInferior	Inferred	28	19	65	53	0.16	0.17	0.87	11.4	0.15
Dificultad	Inferred	28	253	76	53	0.08	1.99	0.75	10.1	0.39
Elia	Inferred	28	523	100	114	0.70	2.18	0.38	5.7	0.46
ElPinion	Inferred	28	39	138	176	1.12	2.88	0.31	11.1	0.72
Gaby	Inferred	28	118	55	46	0.13	1.19	0.48	11.3	0.52
GalloDeOro	Inferred	28	43	98	62	2.14	5.21	0.01	14.1	0.83
Lupita	Inferred	28	8	44	47	0.10	0.48	0.41	12.1	0.49
Maravillas	Inferred	28	475	87	75	0.25	2.42	0.63	12.3	1.96
MinaValenciana	Inferred	28	335	138	164	1.68	1.38	0.49	5.9	0.33
Monica	Inferred	28	58	53	46	0.15	0.82	0.55	9.0	0.33
Natalia	Inferred	28	522	93	103	0.94	1.69	0.34	12.4	0.44
Negra	Inferred	28	318	49	44	0.12	0.90	0.46	8.7	0.21
NuestraSenora	Inferred	28	133	56	77	0.39	0.25	0.32	13.4	0.17
Reyna	Inferred	28	247	46	37	0.05	1.82	0.30	9.2	0.54
SanOnesimo	Inferred	28	1,358	75	78	1.21	1.68	0.16	11.2	0.78
Trinidad	Inferred	28	41	41	23	0.08	1.37	0.40	8.7	0.53
Valenciana	Inferred	28	272	69	82	0.74	1.43	0.18	6.5	0.35
Valeria	Inferred	28	468	109	99	0.31	2.65	0.81	14.7	3.23
Virginia	Inferred	28	126	93	92	0.44	2.65	0.50	10.1	1.00

Source: MLN

14.13 Validation

Validation of the estimates

Figure 14.21 Grade-Tonnage Curve Comparison by Check Estimate Type



Source: MLN

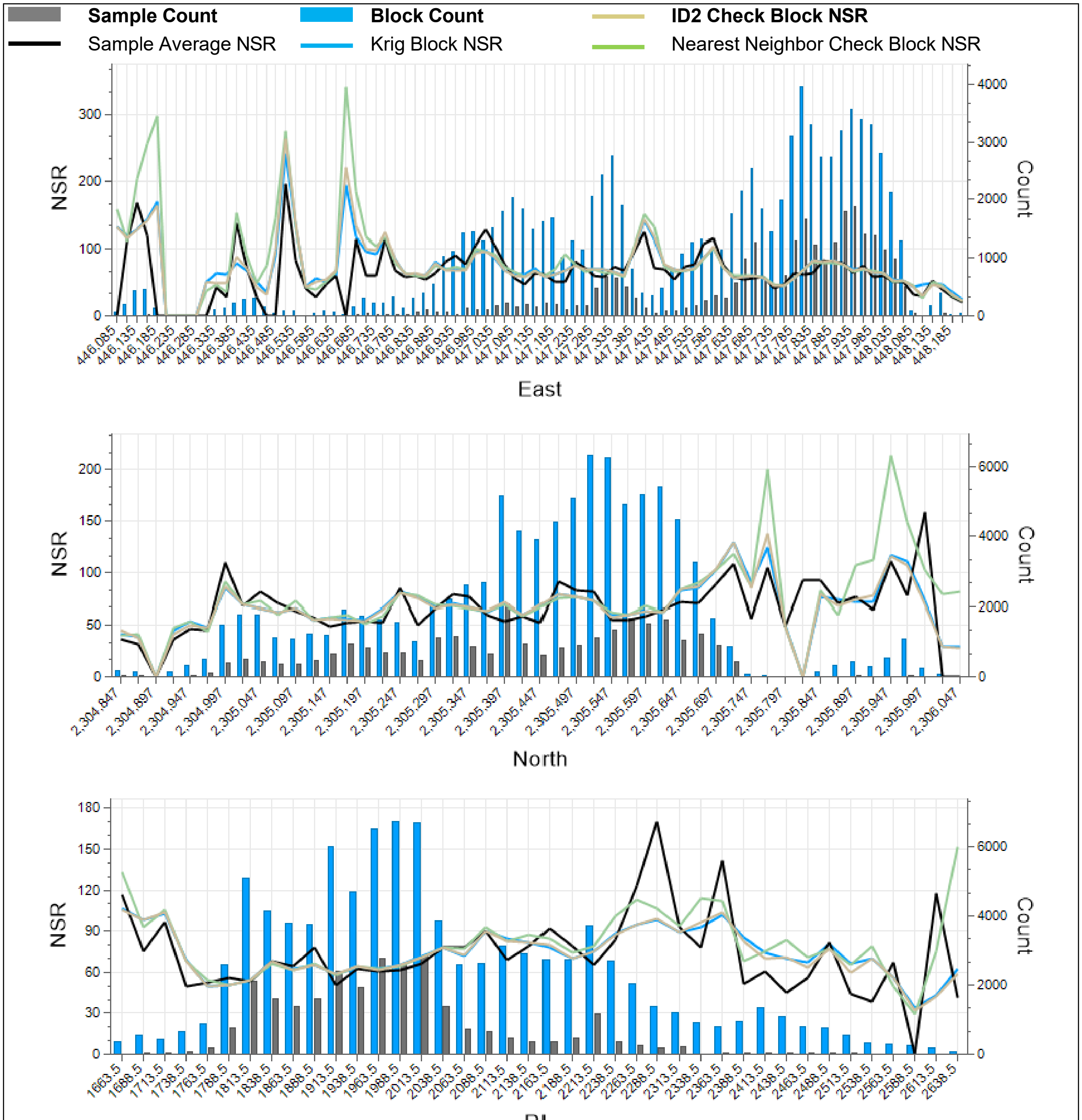
Table 14.17 Block Model Global Relative Difference (%) Against Kriged Estimate

Method	Classification	Cutoff Grade US$NSR/t	Tonnes	Grade US$NSR/t	Grade Ag g/t	Grade Pb%	Grade Zn%	Grade Cu%	Grade Fe%	Grade As%
Kriging	All	28	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Inverse Distance Squared	All	28	-2.1%	1.5%	2.0%	1.3%	1.1%	1.8%	0.1%	0.6%
Nearest Neighbor	All	28	-19.0%	30.2%	33.6%	36.7%	24.3%	28.8%	0.9%	5.4%

Source: MLN

Swath plots are shown below for zones with Resources reporting (meaning the entire Negra Upper domain, the bodies Buenaventura, Cobriza Superior, and Morena were excluded).

Figure 14.22 Mineral Resource Block Model Swath Plots (East, North, and Elevation)



Source: MLN

14.14 Item 14(d) Form NI 43-101 and Estimation Risks

Mineral resource estimates could be materially affected by the following known relevant factors:

Environmental: There are no known environmental conditions that would materially affect project Resources. The company is required to monitor concentrations of various elements in groundwater at the base of tailings dam 5 and 5a.

Permitting: The mine operates under an active mine permit that expires September 5th, 2047. Permitting of a new tailings facility or a new method of mine tailings disposal (e.g., dry-stack or paste) will be required for the mine to operate in the future, as less than one year of space remains in tailings dam 5a and the facility is not expected to support continued operations.

Title: The mine license in which the Resources stated here is located is valid until December 2032. The land use agreement (*usufructo*), relevant to the surface disturbance (plant area) with the local community was recently renewed for 15 years and expires in July 2036.

Marketing: Recent smelter contracts for the Pb, Zn, and Cu concentrates have lapsed therefore NSR assumptions of treatment charges, penalties and payables are generalized and not based on active contracts. Market conditions can cause significant changes to assumed treatment charges and assumed material value. Lead and Copper concentrates from the mine have historically contained significant concentrations of As. General refusal limits for copper concentrates are 0.5 As% and 1% As for lead concentrates. Historically the concentrates are managed below these limits but do exceed them on occasion. Head grade blending and concentrate stockpile blending have been the management strategies. Further use of As conditioning and suppressants during flotation are being investigated as a permanent solution. With sophisticated blending and flotation improvements arsenic management appears to be achievable.

There are no other known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors that could be materially affect the mineral Resource estimate.

Technical risks that could potentially affect the Resource estimate are the following:

Cut-off grades chosen to state resources, as discussed above, are reasonable given the current information available, however, the Resources stated in this report are extensions of current mining areas up and down-dip and can generally be characterized as thinner (less massive) than the areas mined in recent history and mostly require additional development to access. As such, cutoff grades to mine these areas and the operating and capital costs associated with mine layouts may materially change and therefore alter cut-off grade assumptions.

14.15 Reasonable Prospects for Eventual Economic Extraction

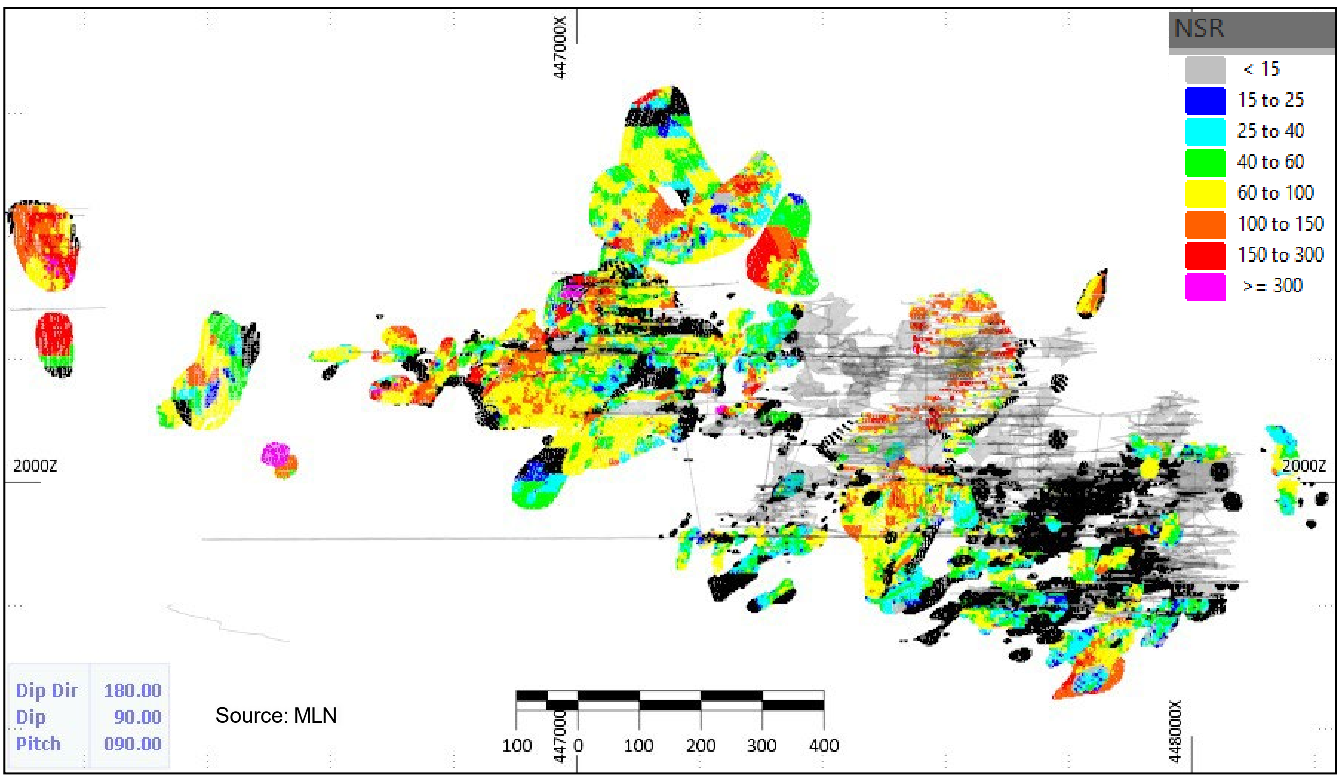
The following factors significant to reasonable prospects for eventual economic extraction (RPEEE) have been considered in this resource statement.

- Concession size and legal tenure: Concession boundary limits and title opinions supplied by MLN are spatially sufficient and fully enclose the Mineral Resource.
- The mining methods and extraction selectivity has been considered through:
    - The use of economically bounded grade shells,
    - A minimum grade shell thickness of 2 m,

- Parent estimation block size minimum of 6x6x6 m and a minimum child sub-block of 3x3x3 m which are consistent with block sizes previously utilized at the mine.
- Proximity to existing development allowing for reasonable potential accessibility and the removal of material that is too close to existing development that could lead to geotechnically difficult or uneconomic extraction scenarios.
- Relegation of material to Inferred classification.
- Continuity above the base-case cut-off and shape that is reasonable to eventually apply mining modifying factors. Figure compares material that is stated as part of the Mineral Resource estimate (shown in the NSR color scale) and material that is within the mineralized body interpretation remaining but has been removed from reporting for considerations of RPEEE (shown in black).

- The process method and expected recoveries have been demonstrated from past operating history and the production of saleable concentrates.
- Metal price forecasts have been considered as well as estimated concentrate market terms, payability and deleterious qualities.
- Cut-off grades consider, reasonable operating costs, metallurgical recovery, and NSR payability and treatment charges.

Figure 14.23 PREEE Material Removal (Looking North)



There are currently no known permitting, legal, environmental, title, taxation, socio-economic, marketing, or political factors that would prevent Minera La Negra from restarting its operations.

15 Mineral Reserve Estimates

This section does not currently apply. No Mineral Reserves have been estimated as part of this study.

The LOM Production Schedule included is preliminary in nature and includes Inferred Mineral Resources that are considered geologically speculative. There is no certainty that the LOM Production Schedule included in this preliminary economic assessment will be realized. Mineral resources are not Mineral Reserves and do not have demonstrated economic viability.

16 Mining Methods

16.1 Introduction

The mineral zones that make up the La Negra project will be mined using as much of the existing mine infrastructure as possible, supplemented by new planned drift and ramp development, water handling, and ventilation, as needed.

The mine has been in production since the early 1970's on a largely continuous basis, creating historic mined out stopes of varying size and shape that have been taken into account in the resource modeling. The mine has used long hole open stoping and benching to produce most of the mineralized material for processing but has also used jackleg mining to develop in and around the production stopes. Peñoles conducted geological mapping, sampling, magnetic surveys and drilling that resulted in the discovery of the La Negra and El Alacrán deposits of which the Negra deposit is still actively mined by MLN. Mine development commenced in 1967, and mining in 1971. Between then and 2000, Peñoles is reported to have mined approximately 6.6 million tonnes with an average grade of 169 g/t silver, 1.1% lead, 2.2% zinc and 0.48% copper. In 2000, Peñoles put the mine on care and maintenance because of low metal prices. Aurcana acquired an indirect interest in the Property in 2006 and recommenced mining in the second quarter of 2007 at a mill production rate of 1,000 tpd, increasing to 1,500 tpd in 2007, to 2,000 tpd in April 2012 and to 3,000 tpd capacity in April 2013. Between 2007 and the end of 2016, the mine produced approximately 5.8 million tonnes at an average grade of 69 g/t silver, 0.32% lead, 1.13% zinc and 0.42% copper. Between 1971 and the end of 2016, the mine produced approximately 12.4 Mt with an average grade of 122 g/t silver, 0.73% lead, 1.70% zinc and 0.45% copper.

Mining will take place with La Negra's existing fleet, supplemented with new equipment as required to achieve the mine plan, which is based on the production of 2650 2500 tonnes per operating day, or 842,500 tpa. Any additional development and equipment required is included in the project's capital cost as described in Section 21.3. The mine plan envisions mining many of the zones corresponding to the mineralized bodies described in Section 14, with certain economic factors – such as mining recovery, dilution, and operating costs – applied to these mineralized zones to present a reasonable prospect for economic extraction. As this technical study does not present any Reserves (see Section 15) the term mineralized material, when used, is meant in a generic sense and does not mean to imply that reserves have been calculated.

It is envisaged that all phases of mining, except for haulage to surface, will be carried out by La Negra personnel, with the latter being managed by a community-based contractor.

The LOM Production Schedule included is preliminary in nature and includes Inferred Mineral Resources that are considered geologically speculative. There is no certainty that the LOM Production Schedule included in this preliminary economic assessment will be realized. Mineral resources are not Mineral Reserves and do not have demonstrated economic viability.

16.1.1 Basis of Estimate

Each zone of mineralization was analyzed to determine the optimum and most practical mining method, which was then used along with the appropriate mine design criteria to develop a cut-off grade for each zone. As this is a PEA level study, all categories of resource were included in the optimization process.

16.1.2 Mining Method and Mining Costs

For the purposes of the preliminary optimization, a mining cost of US$7.21/tonne mined was assumed for long-hole open stoping and was generated from first principles considering anticipated staffing levels, current wage levels plus anticipated bonuses, current equipment running costs, and consumable vendor quotes. The cost of haulage, at US$1.18/tonne, which is carried out by a community-based contractor, is included in the mining cost quoted above.

16.1.3 Dilution

For the mining study the resource model was adjusted to account for expected mining dilution. Historically, dilution at La Negra has averaged 14%. For this study a dilution of 15% has been used.

16.1.4 Cutoff grade

Based on the parameters outlined in Sections 16.11, as well as the first principle estimates of processing and G&A costs (see Section 22), a cutoff grade for each payable mineral varies with the resource block and not one equivalent cutoff grade is easily calculated, so a representative cutoff grade cost of US$28 per tonne was utilized in this study.

16.2 Geotechnical Considerations

The original geotechnical model for Minera La Negra was developed by A-Geommining in October of 2018 and this work was reviewed by Mining Plus. The mechanical properties for each mineralized zone were determined based on lithology and assigned a minimum, maximum and average Uniaxial Compressive Strength (UCS). Q-values (max, min, avg) were also determined for each zone for each lithology.

Based on site observations of the ground conditions at La Negra, the Geological Strength Index for the rock mass ranges between 40 and 80, with the majority of the readings between 60 and 75 and the lowest readings occurring only in faulted zones. This correlates very well with the Q values for the project as shown in Figure 16.1.

As shown in Table 16.1 the rock mass quality shows two distinct populations, with a portion of the mineralized zones with an RMR of Poor to Fair and Q-values <10 and a second population with Q-values >10 and RMR of Fair to Good. Based on historical experience, the former are zones that are hosted at the contact of the intrusive and the limestone with faulting in the footwall of the deposit or, as in the case of Maravillas, with a crosscutting structure bisecting the mineralization. The intact rock strength is highly dependent on lithology, with the diorite intrusive averaging >140 MPa and the skarn averaging ~90 MPa. While the unaltered limestone host rock is generally quite competent, particularly where it has been indurated in the distal area of the metamorphic aureole, it can be quite weak where it has been highly altered, due to the mechanical and chemical degradation occurring during mineralization. This results in average UCS in the mineralized zones of ~30 MPa.

For those zones which do not have access, and for which detailed geotechnical information is not available, values were estimated on the basis of geologic similarity with known zones.

16.2.1 Stability Assessments

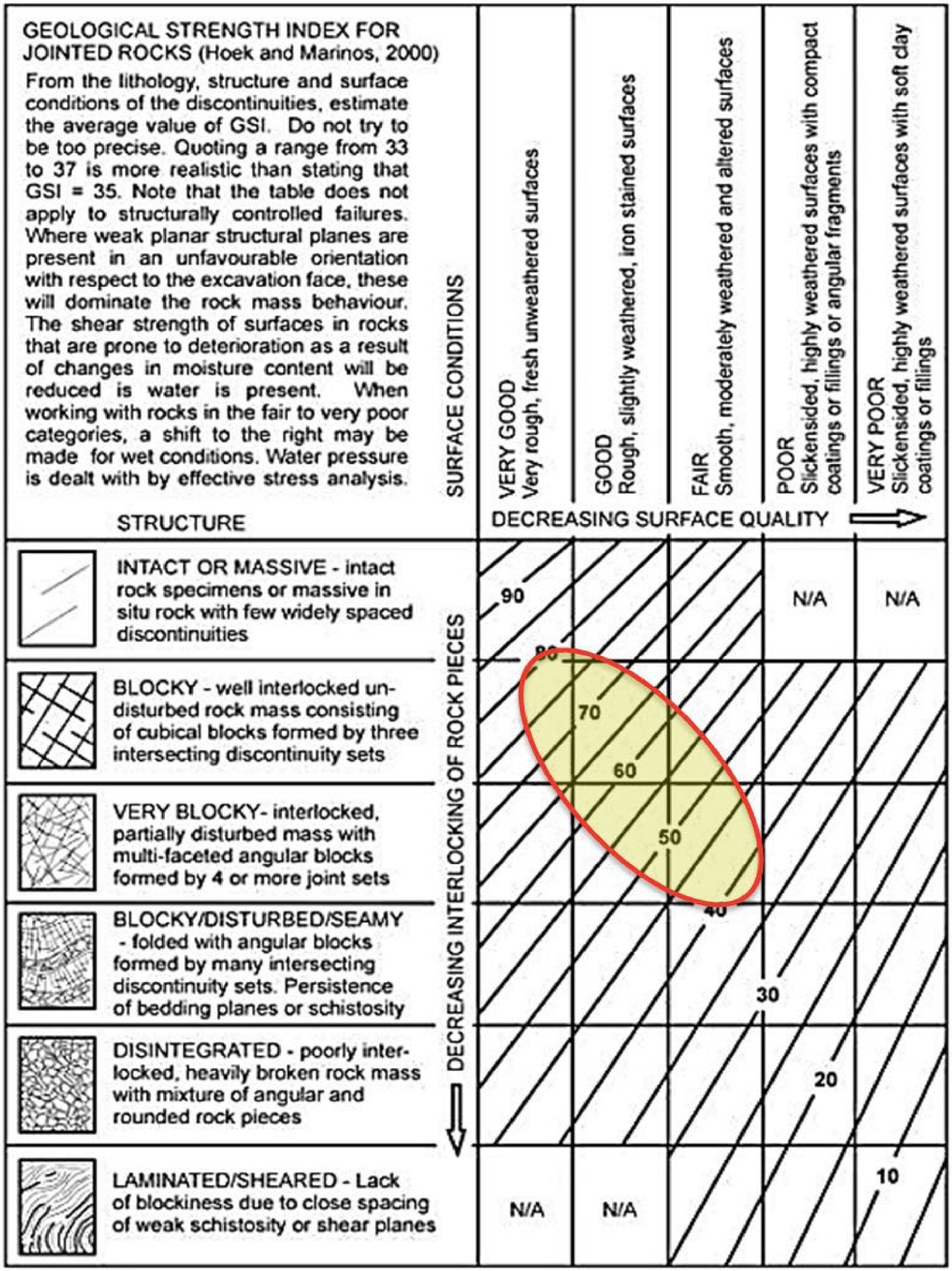
Excavation stability assessments were completed using industry-accepted empirical relationships and software calculations, supported by historical experience. The rock mass conditions in the Fair and Fair to Good are considered suitable for open stoping mining methods such as those that have been historically employed at La Negra. The ground conditions within the Poor to Fair domain are considered adequate for open stoping methods, but with shorter spans and great use of rib and sill pillars.

The planned open stope geometry is 20 m long by 20 m high and 6 m wide, mined in a longitudinal orientation. Transverse mining will be considered in areas where the mineralization is greater than 20 m in width. Stability of the stope back is critical for maintaining stable mining conditions, and this design is expected to provide a development pillar height to width > 1.0 and factor of safety > 2.0. As additional geotechnical data is accumulated and studied, more detailed planning will occur and these parameters may change, however, these are considered reasonable at this level of study.

Based on the prevailing ground conditions the 4.5 m by 4.0 m headings that have been used in the lower levels of the mine are considered adequate for use throughout the mine.

The upper levels of the mine have been accessed from the lower levels by using smaller drift sizes (2m x 2.5m) and have been driven in mineralization to create a “switchback” ramp system that larger equipment cannot navigate efficiently. Slashing out to the 4m x 4.5m sizing of these drifts is planned for execution in the first 2 years of operation. This is further discussed in Section 16.5.4.

Figure 16.1 Qualitative Assessment of La Negra Geotechnical Conditions



Source: Hoek and Marinos (2001)

Table 16.1 Geotechnical and Mechanical Properties by Mineral Zone

		Mechanical Properties UCS (Mpa)			Geotechnical Properties (Q-value)			
Zone	Lithology	Min	Max	Avg	Min	Max	Avg	RMR
Valeria	Skarn	108.3	108.3	108.3	4.6	43.5	24.1	Fair - Good
	Diorite	103.0	182.2	142.6				
Lupita	Skarn	108.3	108.3	108.3	4.6	43.5	24.1	Fair - Good
Trinidad	Skarn	80.2	102.2	91.2	4.9	34.6	19.8	Fair - Good
Gaby	Sulfide skarn	50.7	108.3	79.5	3.4	27.9	15.7	Fair - Good
	Limestone	54.7	54.7	54.7				
Brecha	Skarn	50.7	108.3	79.5	3.4	27.9	15.7	Fair - Good
La Negra	Skarn	16.5	161.6	89.1	5.7	24.8	15.3	Fair - Good
	Diorite	103.0	103.0	103.0				
	Limestone	7.7	54.7	31.2				
Monica	Sulfide skarn	111.8	125.7	118.7	4.5	25.0	14.7	Fair - Good
	Limestone	55.0	55.0	55.0				
	Felsic dike	66.1	133.0	90.5				
Bicentenario	Sulfide skarn	111.8	125.7	118.7	3.5	24.1	13.8	Fair - Good
	Limestone	55.0	55.0	55.0				
	Felsic dike	66.1	133.0	99.5				
	Diorite	103.0	182.2	142.6				
San Pedro	Skarn	16.5	161.6	89.1	1.9	21.3	11.6	Fair - Good
	Limestone	40.8	47.2	44.0				
Cobriza	Skarn	16.5	161.6	89.1	3.2	19.9	11.5	Fair - Good
	Diorite	103.0	182.2	142.6				
Avelina	Skarn	16.5	161.6	89.1	3.1	18.2	10.7	Fair - Good
	Diorite	103.0	182.2	142.6				
	Limestone	7.7	55.0	31.4				
Blanca	Skarn	16.5	161.6	89.1	1.1	10.8	6.0	Fair
	Limestone	7.7	55.0	31.4				
	Felsic dike	66.1	133.0	99.5				
	Diorite	103.0	182.2	142.6				
Natalia	Skarn	16.5	161.6	89.1	1.1	10,8	6.0	Fair
	Diorite	103.0	182.2	142.6				
	Limestone	7.7	54.7	31.2				
Virginia	Skarn	16.5	161.6	89.1	1.1	10,8	6.0	Fair
	Diorite	103.0	182.2	142.6				
	Limestone	7.7	54.7	31.2				
Dificultad	Skarn	16.5	161.6	89.1	1.2	9.6	5.4	Poor - Fair
	Diorite	103.0	182.2	142.6				
	Limestone	7.7	54.7	31.2				
Maravillas	Skarn	16.5	161.6	89.1	1.0	7.1	4.1	Poor - Fair
	Limestone	40.8	47.2	44.0				

Source: A-Geommining

16.2.2 Backfill

This study does not consider the use of backfill in the first eight years of operations, given that the geotechnical conditions do not require it. While resource extraction is reduced without the use of fill, the current restart plan envisions filtering the tailings and depositing them in the existing (and permitted) TSF5/TSF5A and TSF3 facilities. As described in Section 18.5.2 the decision could be made to either proceed with paste backfill in year 8 or develop a new surface facility to receive filtered tailings.

16.3 Hydrogeological Considerations

16.3.1 Groundwater Conditions

Small amounts of groundwater have been reported to flow at rates between 2 - 8 lps into the underground mine through fractures in the country rock and through geological structures, but the total groundwater inflow has been dealt with historically by localized in-mine pumping as described in the following section. Water inflows have historically never had an impact on mining activities. Although the mineralized material is potentially acid generating the buffering qualities of the carbonate country rock results in mine water that does not require further treatment (except for removing suspended solids) before discharge.

16.3.2 Dewatering and Mine Drainage

La Negra is a dry mine. Water throughout the lower levels of the mine drains by gravity and is channeled to a sump heading (5700 ramp) at the 1870 level (there is an active heading, the 5663 ramp which would be used for development at depth). There is currently one 15 hp pump with a capacity of 16 l/s which pumps the mine drain water to a settling sump located at the 1905 level. A second pump would be required for operations going deeper in depth.

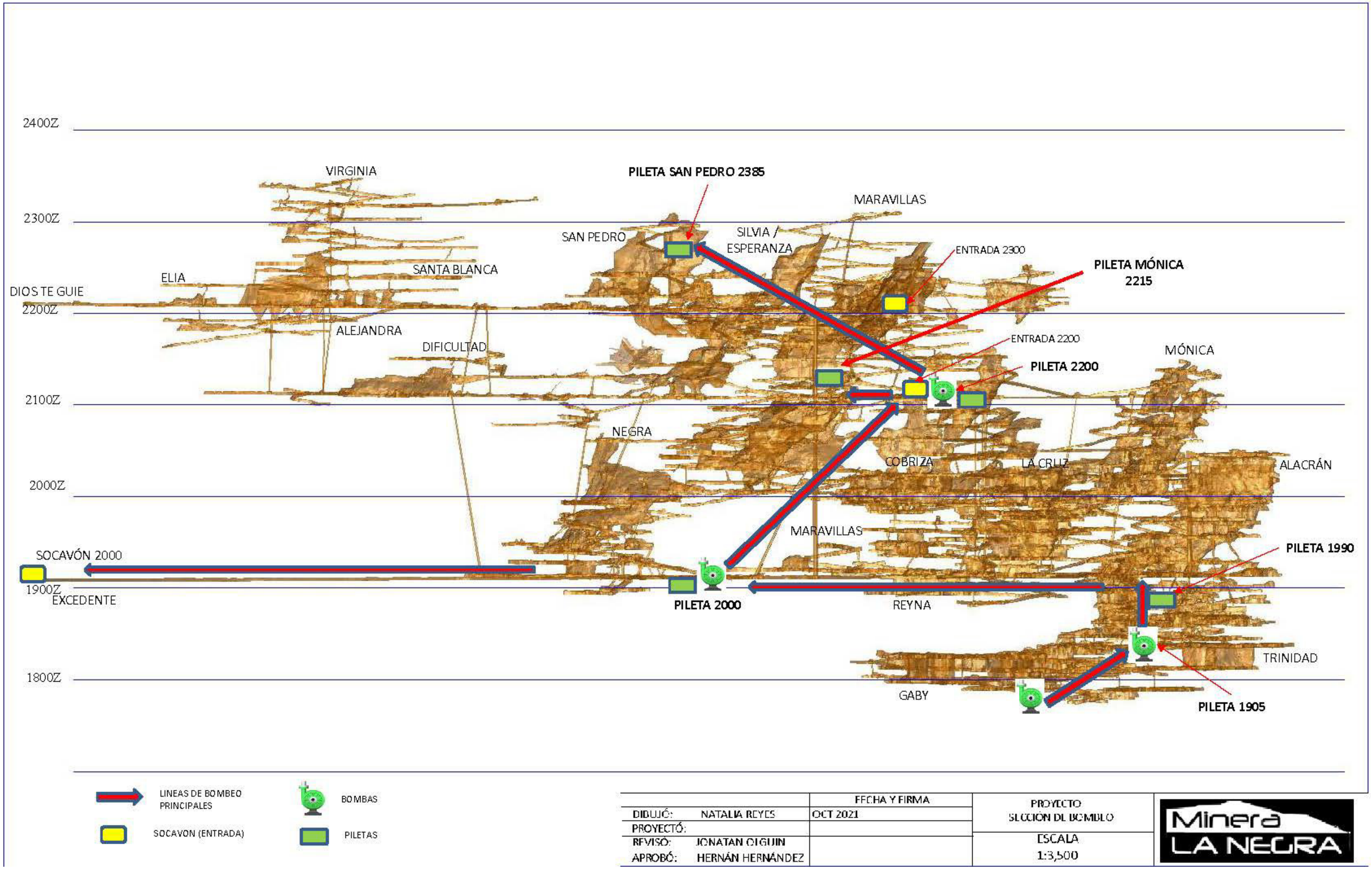
From the 1905 Level settling sump the water is pumped to the 2000 Level via a 3" pipe with a single 25 hp pump with a capacity of 5 l/s (replacing a smaller pump with insufficient capacity) and out to a settling pond at the main portal. From there a 5 l/s pump takes a portion of the water to settling ponds at the 2200 and 2215 Levels, which are then pumped at up to 5 l/s to the 2300 and 2400 levels. The remainder of the water not pumped to the upper levels for use in operations flows by gravity to a series of two settling ponds 800 from the portal. The clarified water, suitable for agriculture, is pumped into an arroyo from which the communities draw water.

16.3.2.1 Pumps

As mentioned above, there is a 15 hp pump at the 1870 level, which will need to be supplemented with a second similar pump for operations. A 25 hp pump with greater vertical lift capacity located at the 1905 level transports water to the portal, as described above. The pumps in the upper levels of the mine are also rated at 25 hp. It is estimated that a third 25 hp pump will be required for normal operations.

The mine also utilizes two Wilden pneumatic pumps to assist dewatering during jumbo operations.

Figure 16.2 La Negra Existing Pumping Infrastructure (Looking North)



Source: MLN

16.3.2.2 Pumping Rates and Projections

MLN does not have a comprehensive record of mine water pumping rates, but these have not exceeded the 5 l/s capacity of the main 25 hp pump at the 1905 level.

16.3.2.3 Water Treatment and Usage

As described above, water is clarified in settling sumps at the 1905 level before leaving the mine and again outside the mine before being drained into the arroyo.

16.3.2.4 Potable Water

Potable water is delivered in 20-liter containers for use in the underground facilities.

16.4 Mine Safety

16.4.1 Mine Rescue Equipment

The principal mine rescue equipment consists of Drager PSS BG4 and PSS BG4 Plus closed-circuit breathing apparatus used by the mine rescue team. As part of the restart plan, this equipment will be given the required maintenance.

16.4.2 Refuge Chambers

Minera La Negra operates one MineARC MS-ND4-20-ELV-36 Refuge Chamber with capacity for up to 20 people and O_2 capacity for 36 hours. Some maintenance and resupply is required for startup which is included in the capital budget.

16.4.3 Mine Ambulance

The mine has two mine ambulances, a Ford F-450 used in the lower mine (which has the larger headings) and a small profile diesel pickup that has been adapted to enter the smaller headings in the upper mine.

16.4.4 Fire Protection Systems

The mine does not operate with a fire suppression system, but the mine does have an operating stench gas system that can flood the mine in the event of a fire.

The scoops, jumbos, and simbas utilize the Ansul fire suppression system, in addition to carrying conventional hand-held fire extinguishers. There are also 31 Ansul 4.5, 6 and 9-kilo fire extinguishers for use throughout the mine and a 70 kilo Ansul extinguisher in the workshop/fuel depot area. The mining fleet and light vehicles are equipped with 6 kilo fire extinguishers.

16.5 Underground Mine Design

The underground design for La Negra was based on industry-standard methodology for cut-off grade optimization, mine sequencing, and design. The main steps in the planning process are as follows:

- Assignment of economic criteria to the geologic resource model
- Definition of optimization parameters such as NSR, preliminary cost estimates, resource extraction, dilution, and metallurgical recovery estimates for each mineralized zone
- Calculation of economic stope limits for the various zones using stope optimization software
- Establishment of an economic scheduling sequence
- Development of conceptual stope designs and mining sequence incorporating the required development and ventilation

16.5.1 Stope Design Criteria

Mining Plus was able to work with the updated resource model and develop stopes and development designs to support the LOM plan for all remaining measured, indicated, and inferred (MII) resources. The commercial software, Deswik© was used to work up the design for the remaining resources in terms of schedule timing, grades, and tonnes which honors the operational constraints framing the scoping level design. Model inputs or assumptions to this work included:

- Development dilution factor: 15%
- Equivalent meters – Profile Factor: 20%
- Mining dilution factor: 15%
- Stope-Pillar recovery factor: 61.538%
- Jumbos #:3 – 1 Starting at restart and after finishing the slashing. Rate: 6 m/day/jumbo
- Scoops #: 7 - Rate 500 tonnes/day/scoop
- Long hole drills#: 4 - Rate 200 m/day/drill
- Vertical Development rate: 3 m/day
- Marginal Cut-off Value: $28.28/tonne
- Target Production rate: 70,200 tonnes/month
- Target Development rate: 540 m/month
- Priority for scheduling development strategy:
    - 1st Valeria Area,
    - 2nd Central Area,
    - 3rd West Area
- Interrogation fields: From the Block Model, Zn, Ag, Pb, Cu, Fe, AS, NSR, Density, MndFct
- Prioritize predecessors: 65
- Quantity constraint: Annual production target

Mine design key assumptions and inputs to this effort included:

- All remaining resources have been included in the design work including “orphaned” blocks and narrow veins (dilution >28%).
- Ventilation constraints can be identified and managed to meet production plans. Six (6) vertical raises are required for ventilating and escapeway purposes as mine development advances, reflecting the addition of all mineral blocks. The need for additional bulkheads, face fan locations, and air doors will be evaluated in future designs.
- Recovery for the unit mining method - 100%
- Stoping completed by the uphole drilling method.
- No extra dilution is included in the calculation.
- No delays are considered in procuring equipment.

- A contractor is secured to perform the “slash mining” requirements prior to unit mining.

The recommended stope design parameters that emerged from this analysis are summarized in Table 16.2 and were used to develop the optimized stope development schedule. Mining Plus performed a stope design calculation based on manually adjusting the Deswik© mine model to create updated stope shapes based on a quick analysis of mineable blocks, potential dilution, overall mineral recovery, and then removing the “orphaned” blocks.

Based on a review of work by A-Geommining, minimum stope dimensions up to 20 m high by 20 m long by 6 m wide were planned in the LOM, with sill pillars of 6 m thick and rib or setoff (barrier) pillars of 4 m, resulting in a recovery loss of 38%, as shown in the table below.

Table 16.2 Stope Design Parameters

	Stope Dimension (m)	Pillar Dimension (m)	Mining Loss (%)
Sill Pillar	26	6	23
Rib Pillar	20	4	20
Mining Loss to Pillars			38

Source: Mining Plus

16.5.2 Mining Methods

16.5.2.1 Historical Mining Methods

Historically, mining at La Negra was based on two principal mining methods, long hole open stoping (LHOS) and mechanized room and pillar. While mechanized mining has predominated, some non-mechanized (jackleg mining) methods have been employed, primarily in the upper sections of the mine (i.e., above the main 2000 haulage level). LHOS has been employed in areas where the mineralization is subvertical (but greater than 70 degrees to the horizontal) while room and pillar was the method of choice for subhorizontal (but less than 30 degrees to the horizontal) – and generally lower-grade – zones. Support pillars with dimensions of 8 by 8 m were generally utilized in these zones.

Development was achieved with electro-hydraulic single-boom jumbos taking 3.6 m rounds with 45 mm diameter holes. The holes were loaded with ANFO-based explosive and the blasting initiated with non-electric detonators. A smooth perimeter drilling and blasting technique was utilized to reduce damage to the walls and back. Historically, minimal ground support has been employed at most locations in the mine due to the nature of the underground rock quality, as described in Section 16.2.

Sublevels were developed at 4 m height in mineralization. Raises with dimensions of 1.8 by 1.8 m connect each sublevel and were used for ventilation and services; some are equipped with ladders and platforms and used as manways to provide secondary egress from the mine in emergency situations. Down-hole production drilling in long-hole stopes, 64 mm in diameter, was accomplished by an Atlas Copco Simba drill rig or a PLH pneumatic rig. Lateral drilling for development and mining was performed by Atlas Copco Boomer electric-hydraulic jumbos and, in certain areas, with pneumatic jack legs. Broken mineralized material was mucked with a fleet of 2.5, 3.0, 4.0 and 6.0 cuyd scoop trams which loaded a fleet of contractor-operating 20 t dump trucks which would haul mineralized material out at the 2000 level to the surface stockpile outside the main portal.

Historically the mine generated very little waste, and the mine has no surface waste dumps. Small amounts of waste were used strategically to provide access for mineralized material production (e.g., raising the floor where a back has been slashed) but generally the small amount of waste generated was disposed of in empty inactive, stopes. Some underground waste has also been crushed for road repair, maintenance, and other construction needs. Starting in 2019 waste rock was hauled to surface for use in the construction of the TSF5A buttress.

16.5.2.2 Proposed Mining Methods

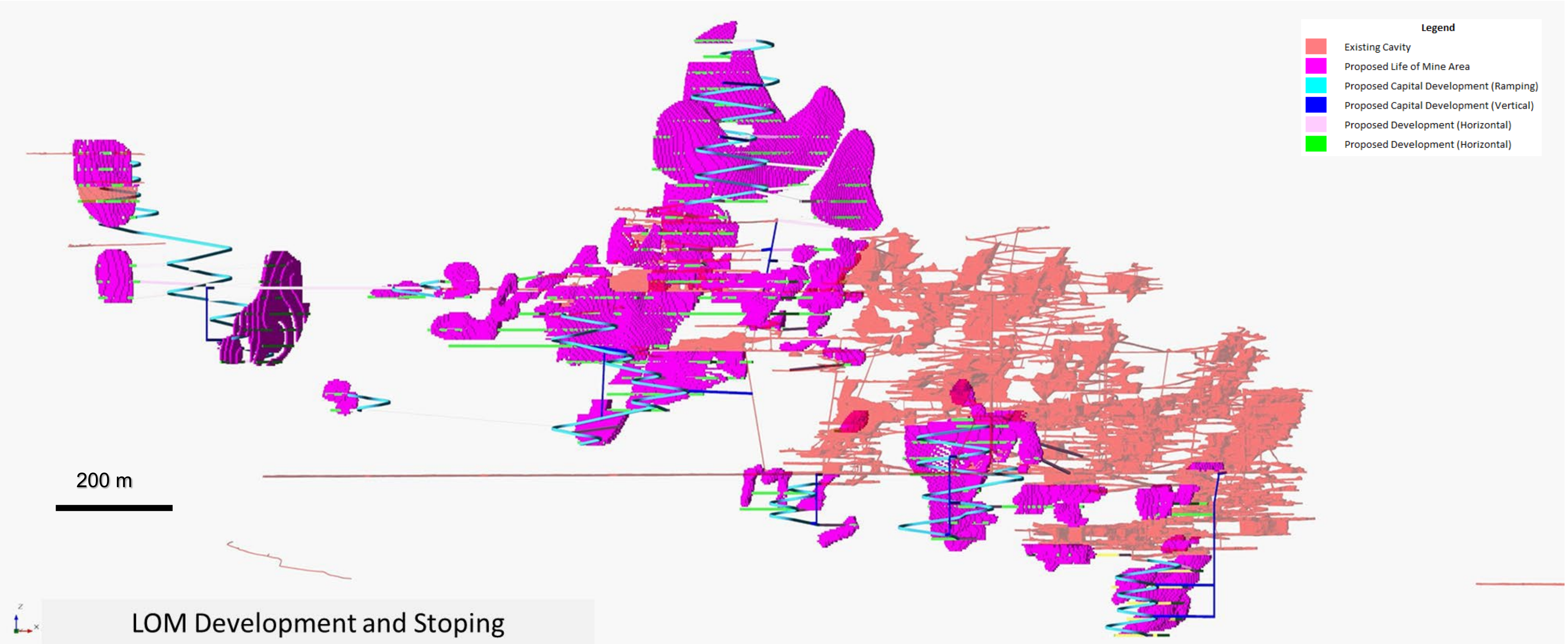
The restart plan envisions utilizing LHOS as the primary mining method, for the following reasons:

- Ground conditions and rock quality allow for the use of this method
- The geometry of the mineralization is suitable for the use of this method
- The mine staff are familiar with this method given its use over almost 50 years
- The mine fleet is suitable for this extraction method
- It allows for low-cost extraction

Other mining methods will be considered in areas with poorer ground conditions, but only if these zones have a materially higher NSR, allowing for profitable extraction. The restart plan does not envision the use of jacklegs other than to aid in slashing the smaller headings.

Figure 16.3 shows a vertical long section of the overall required development and stopes that are scheduled under the current LOM plan for La Negra. Essentially working off the level 2000 haulageway, the mine will progress both downward and upward (after slashing is complete) to stopes based on a declining NSR value calculated for each resource block. In the figure below, mined-out areas are shown in the shaded salmon color, while new stoping areas are shown in bright pink. Ramps and drifts are shown in green and aqua.

Figure 16.3 Schematic Long Section of LOM Development and Extraction (Looking North)



Source: Mining Pus, MLN

16.5.3 Resource Extraction

16.5.4 Mine Workings

Some of the existing workings, particularly in the upper mine, were developed using small headings (2.0 m by 2.5m and 2.5 m by 3.0 m) and created a "switchback" ramp system that prevents most large equipment from navigating the drifts efficiently. These areas were typically developed using jacklegs and 2.5 cuyd and 3.0 cuyd scoops. The redevelopment strategy will see these smaller headings slashed to 4.5 m by 4.0 m to allow integration with the lower mine and the use of larger, standardized equipment throughout the operation. The jacklegs and smaller equipment will be retired.

The slashing project represents a major development project for La Negra and is scheduled to occur in year 1 of the mine schedule. This will involve slashing approximately 1,945 m totaling 19,300 m^3 and is scheduled to take approximately 250 days, including mobilization and demobilization, with an estimated advance rate of 8 m per day (assuming work progresses from both ends of the drift). Changing the switchback design to a ramp design will require further design and excavation work to ensure the larger equipment can negotiate the turns required for efficient travel.

16.5.5 Pillars

Based on a review of the geotechnical work carried out by A-Geommining in 2018 the QP has concluded that supporting pillars (crown, sill, setback, and barrier) with dimensions of 6 m by 4 m by stope height are adequate. This would provide an estimated factor of safety > 2.0. A review of the data suggests that reasonably sized stopes not exceeding 40 m in length and 30 m in height are stable.

16.6 Mine Production Schedule

16.6.1 Production Schedule Criteria

The LOM production schedule for La Negra was based on the following criteria:

- Maximize the NPV of the mine
- Optimize the development of higher-grade zones while minimizing overall development costs
- Develop an As-leveling strategy
- Deliver sufficient material to the stockpile to allow blending before feeding the plant at 2,500 tpd

16.6.2 Production Schedule

The sequencing of material movement corresponds to the conceptual designs described in Section 16.6.4 with sequencing focused on achieving the required feed to the mill while delivering the best combination of high-grade, low-As possible with the least amount of capital development.

16.6.3 Production Plan

The following criteria were used in the preparation of the production plan:

- The production plan has been developed on a monthly basis for the life-of-mine
- The mine will operate six days per week, except for statutory holidays, or approximately 310 days per year
- The plant is scheduled to operate 337 days per annum
- Production will be primarily sub-level open stoping
- The process plant has a capacity of 3,000 tpd but will be operated at 2,500 tonnes per operating day

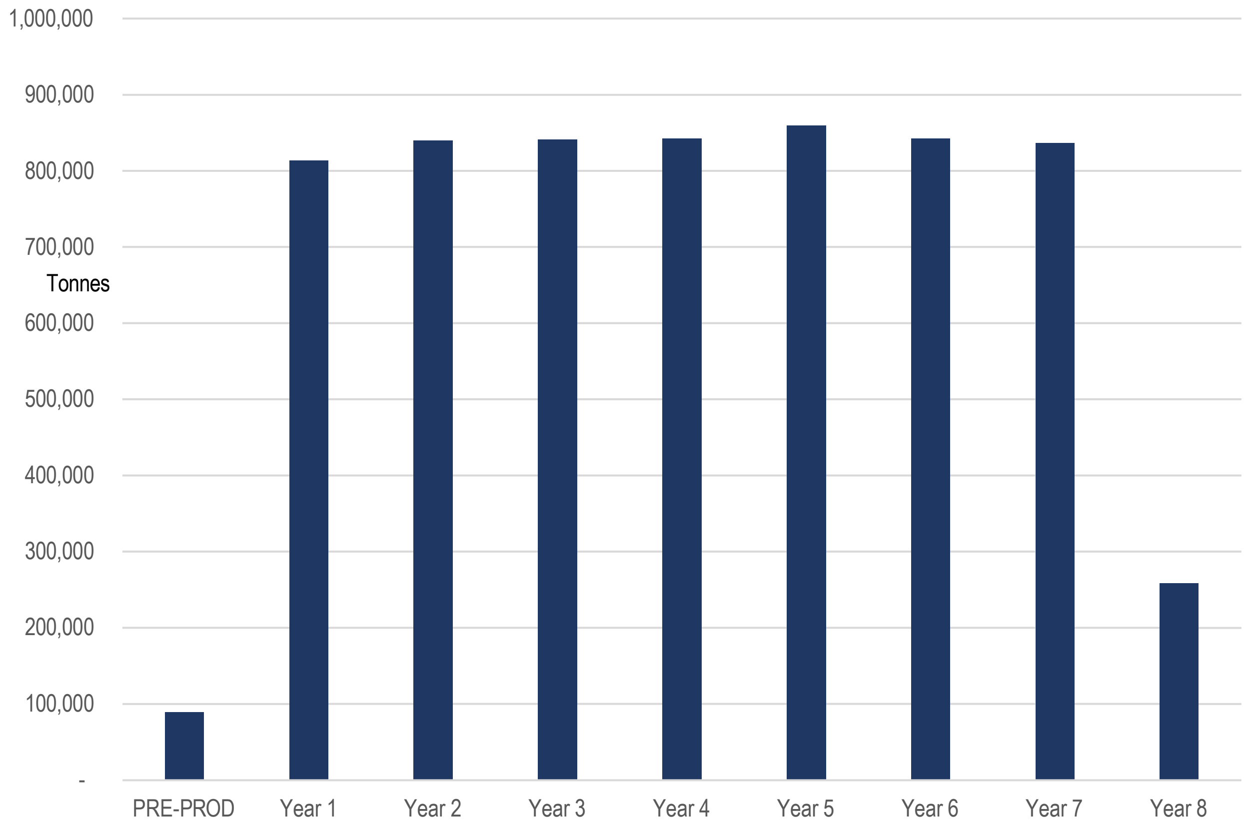
Table 16.3 summarizes the anticipated LOM production schedule by year and by mineralized zone.

Table 16.3 LOM Production Schedule

		LOM	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Tonnes to the mill	(000's Tonnes)	6,223	843	843	843	843	843	843	843	326
Production and Throughput	(tpd)	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Ag Grade	(g/t)	63	47	53	62	63	63	55	81	96
Pb Grade	(%)	0.4	0.2	0.2	0.5	0.5	0.5	0.3	0.7	0.8
Zn Grade	(%)	1.5	1.3	1.4	1.8	1.6	1.7	1.6	1.3	1.4
Cu Grade	(%)	0.4	0.4	0.5	0.3	0.3	0.3	0.4	0.3	0.4
Fe Grade	(%)	8.6	9.8	8.9	8.6	8.2	8.2	8.7	8.7	6.3
As Grade	(%)	0.7	0.6	0.8	0.8	0.6	0.7	0.7	0.4	0.4

Source: Mining Plus

Figure 16.4 LOM Annual Material Movement (Mineral Tonnes)



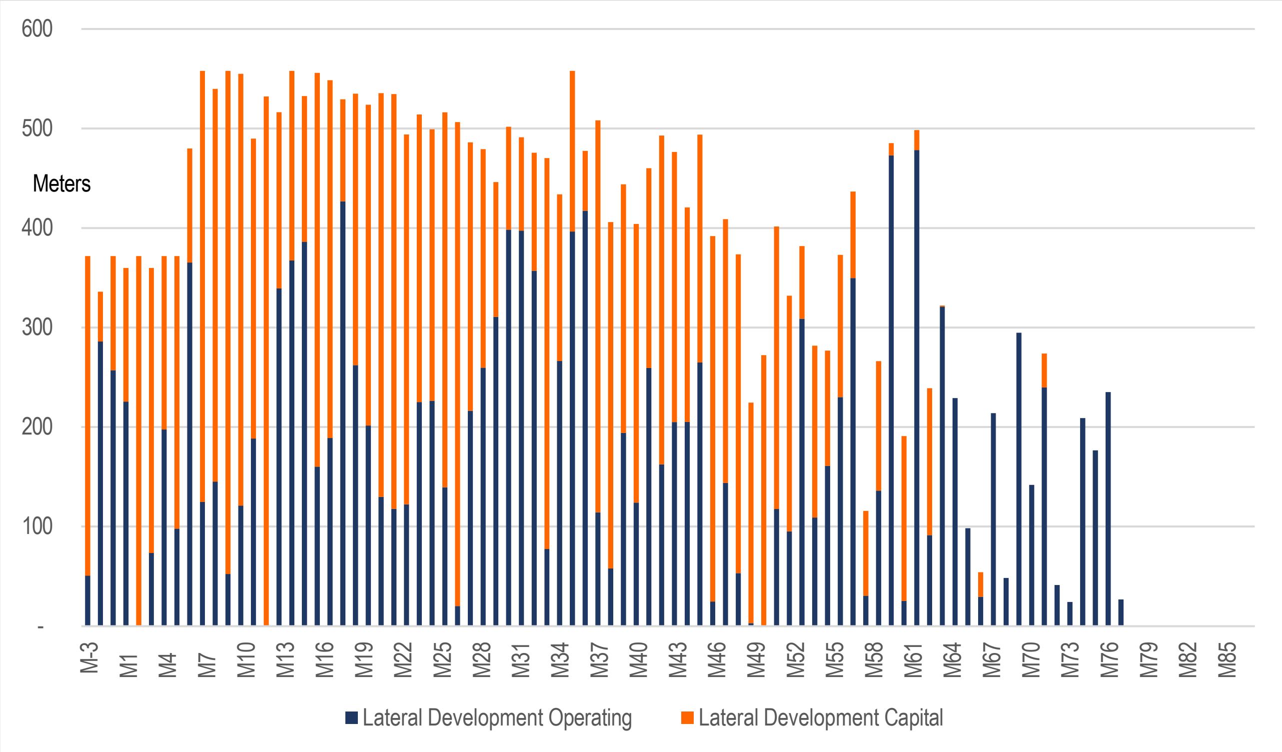
Source: MLN

16.6.4 Underground Development

The LOM plan for the restart of development of La Negra requires a total of 31,800 meters m of development, which have divided into capital development (16,400 m) and operational development (15,400 m), as shown in Figure 16.5. The development plan assumes that all headings will be 4.5 high m by 4.0 m wide. This includes the slashing that will take place in the upper levels of the mine in Year 1 to allow the current, narrower headings to accommodate larger equipment prior to bringing the required stopes online. The development plan also envisions connecting the lower levels of the mine with the upper to allow direct travel of personnel, materials and equipment between the two.

The development plan also includes a total of 730 meters of vertical development, required primarily to improve the ventilation throughout the mine. This consist of six separate vent raises, 232 m in length at Valeria, 125 m at Maravillas, 78 m at Negra, two raises at Northwest totaling 231m, and a final 84 m raise at Valenciana. As additional mine planning occurs, this vertical development for ventilation may change.

Figure 16.5 Monthly Development (in Meters)

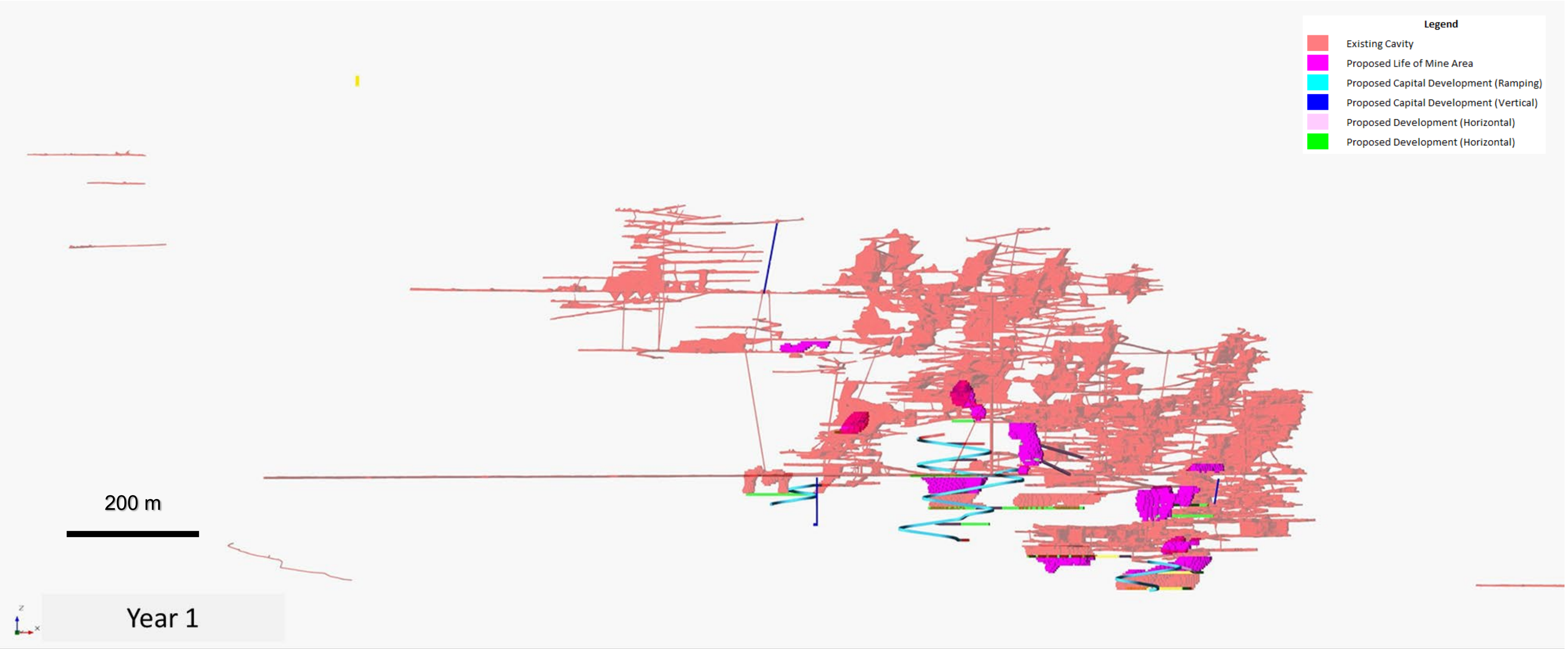


Source: Mining Plus

The following, Figure 16.6 to Figure 16.13, outline the yearly development for La Negra. Mining and development progress from the lower level of the mine in the areas of Maravillas, Trinidad and Valeria, and progresses upwards throughout the LOM. In Year 4 development progresses at San Onésimo and in the NW extension. In Year's 5 and 6 Elia and Natalia Upper are developed, and much of the development into Valenciana and Mina Valenciana is established, with ongoing work at San Onésimo. In the final year mining takes place at Valenciana and Mina Valenciana. In these figures, mined-out areas are shown in the shaded salmon color, while new stoping areas are shown in bright pink. Ramps and drifts are shown in green and aqua.

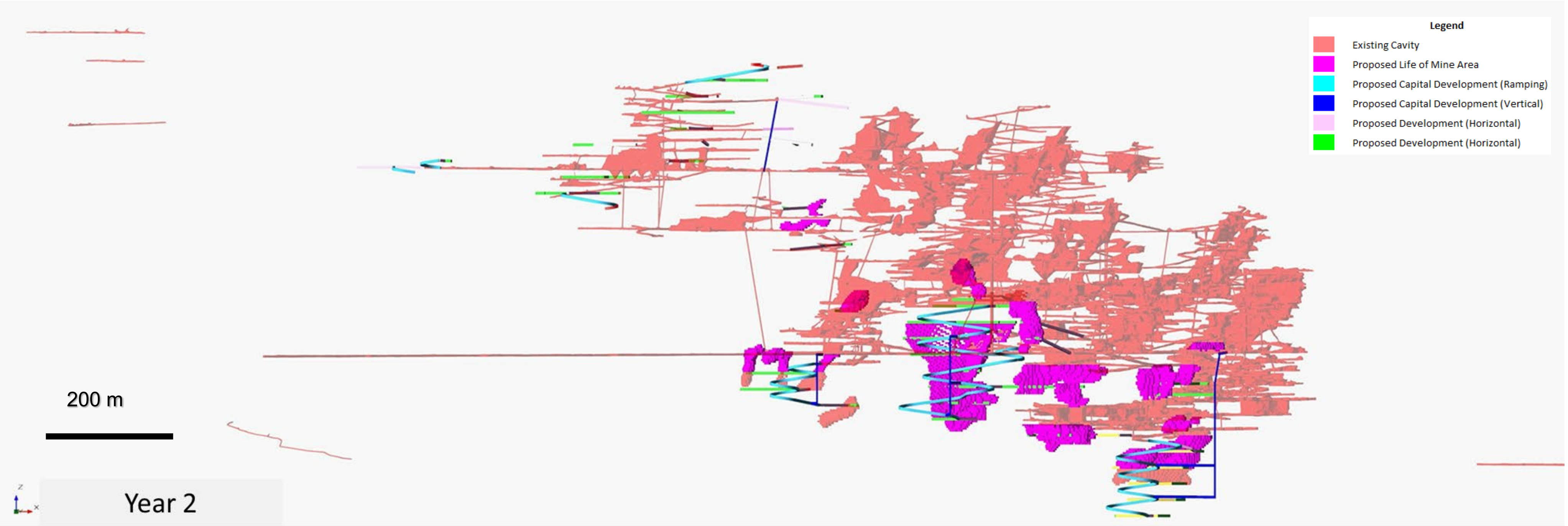
The development of ventilation raises commences in Year 2, with raises required at Valeria, Negra, Maravillas and Northwest. In Year 4 a fifth raise is required at Northwest, with the final raise at Valenciana developed in Year 5.

Figure 16.6 La Negra Development and Mining Year 1 (Looking North)



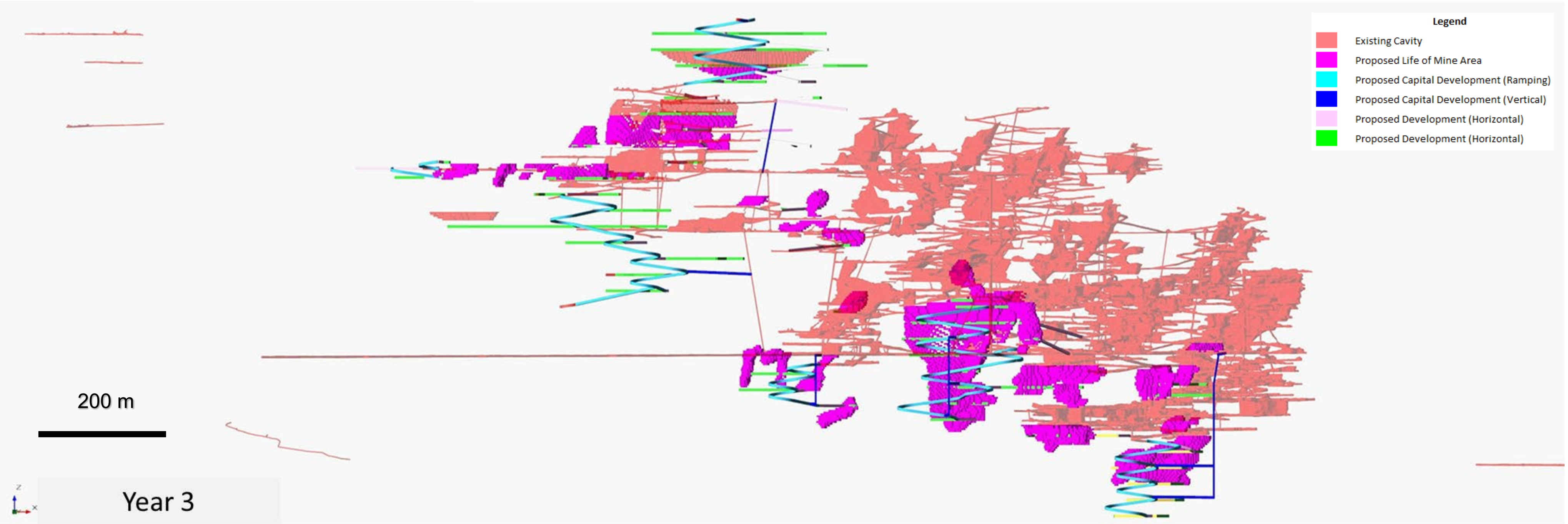
Source: MLN

Figure 16.7 La Negra Development and Mining Year 2 (Looking North)



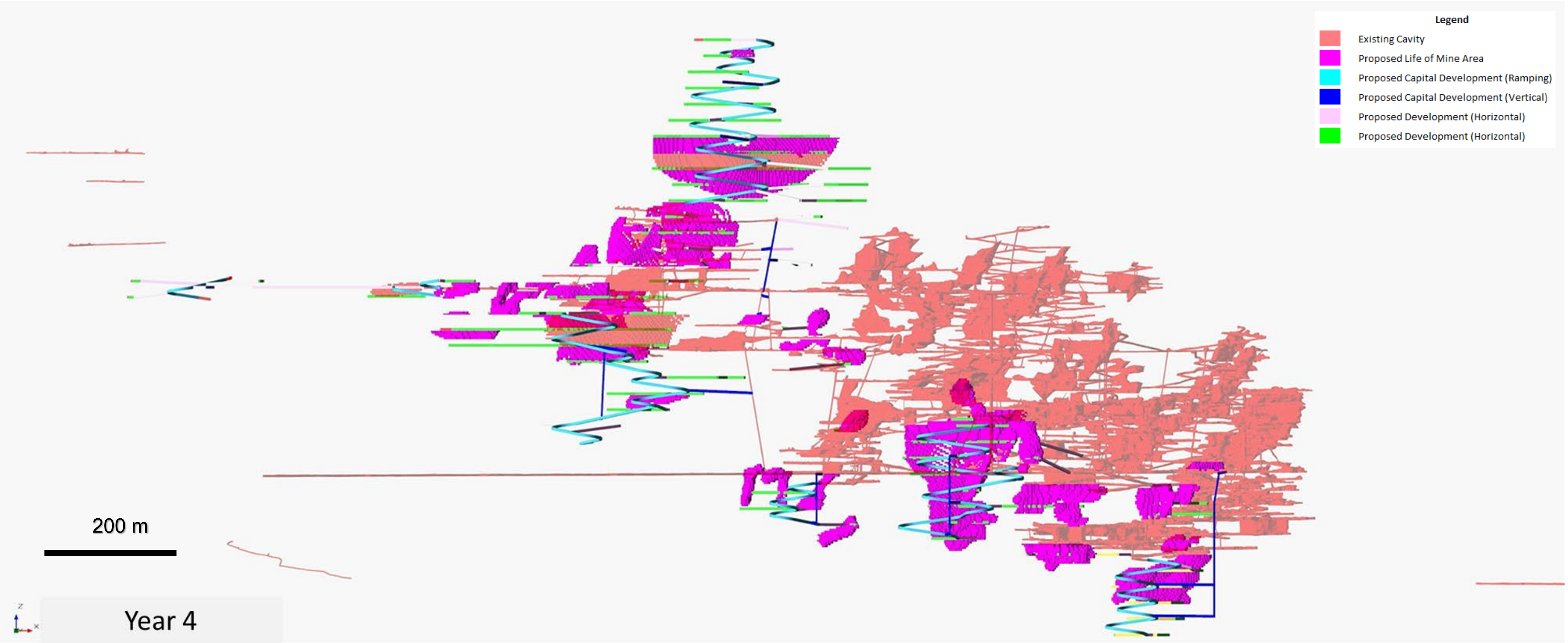
Source: MLN

Figure 16.8 La Negra Development and Mining Year 3 (Looking North)



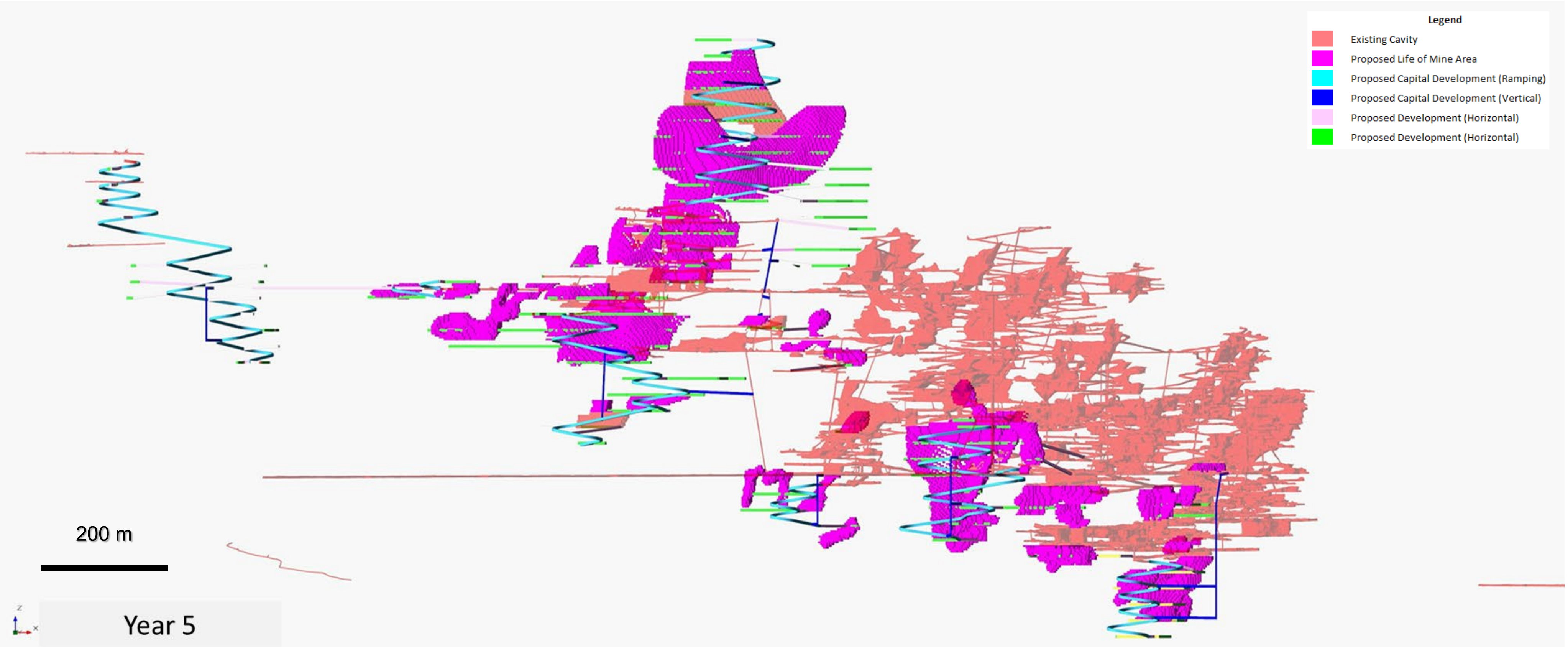
Source: MLN

Figure 16.9 La Negra Development and Mining Year 4 (Looking North)



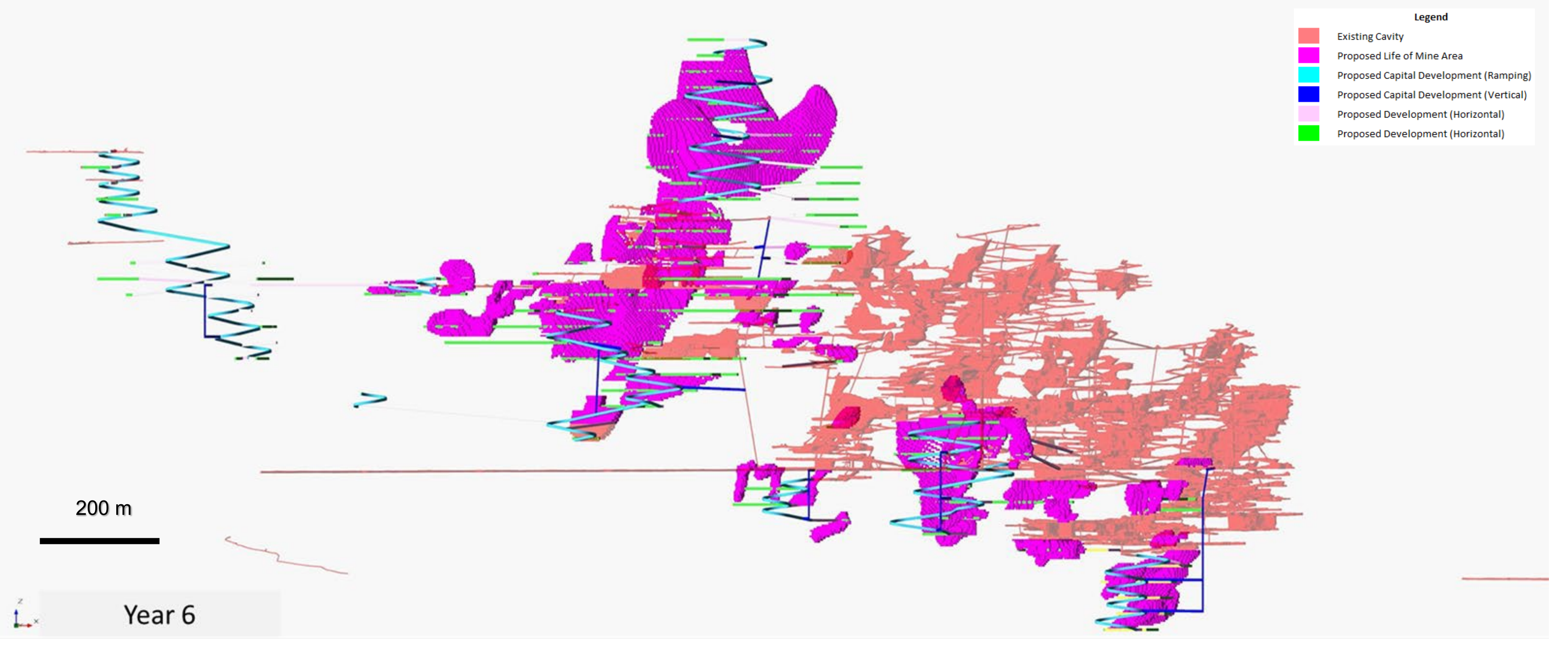
Source: MLN

Figure 16.10 La Negra Development and Mining Year 5 (Looking North)



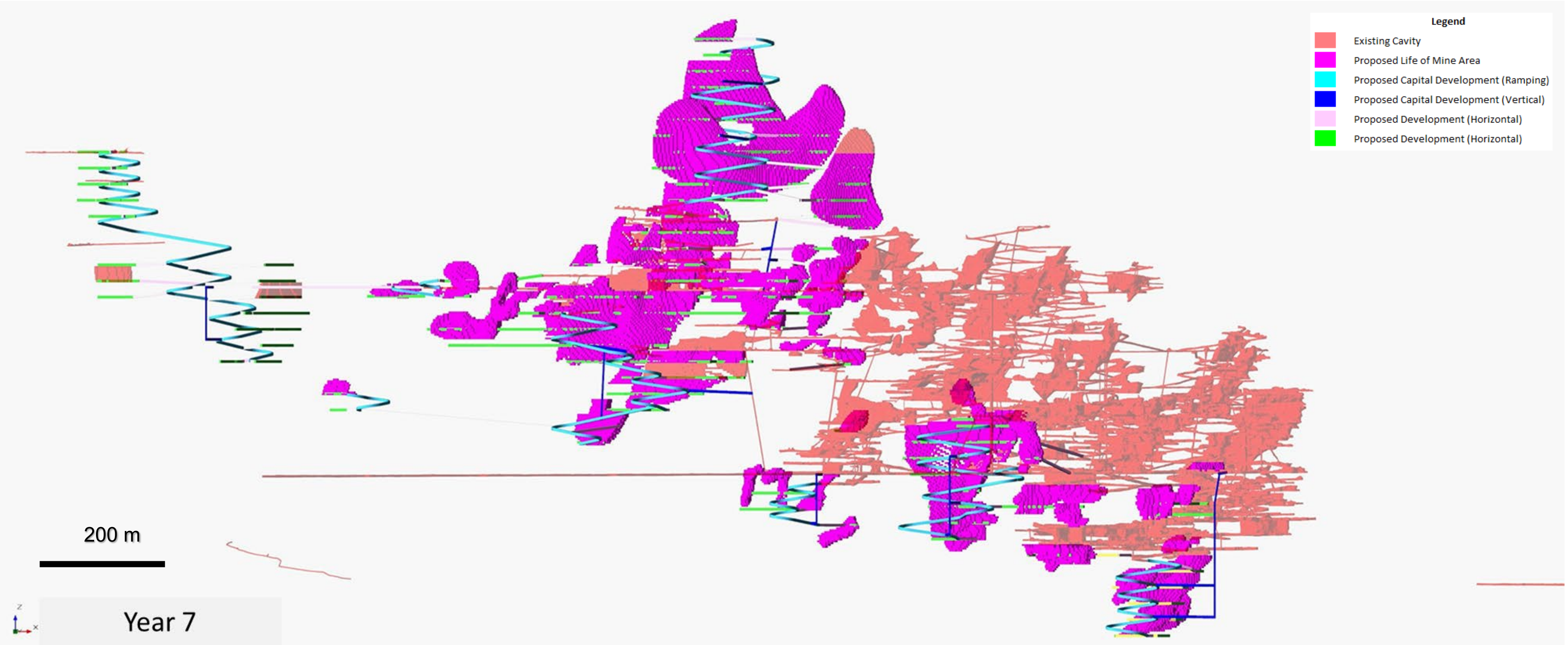
Source: MLN

Figure 16.11 La Negra Development and Mining Year 6 (Looking North)



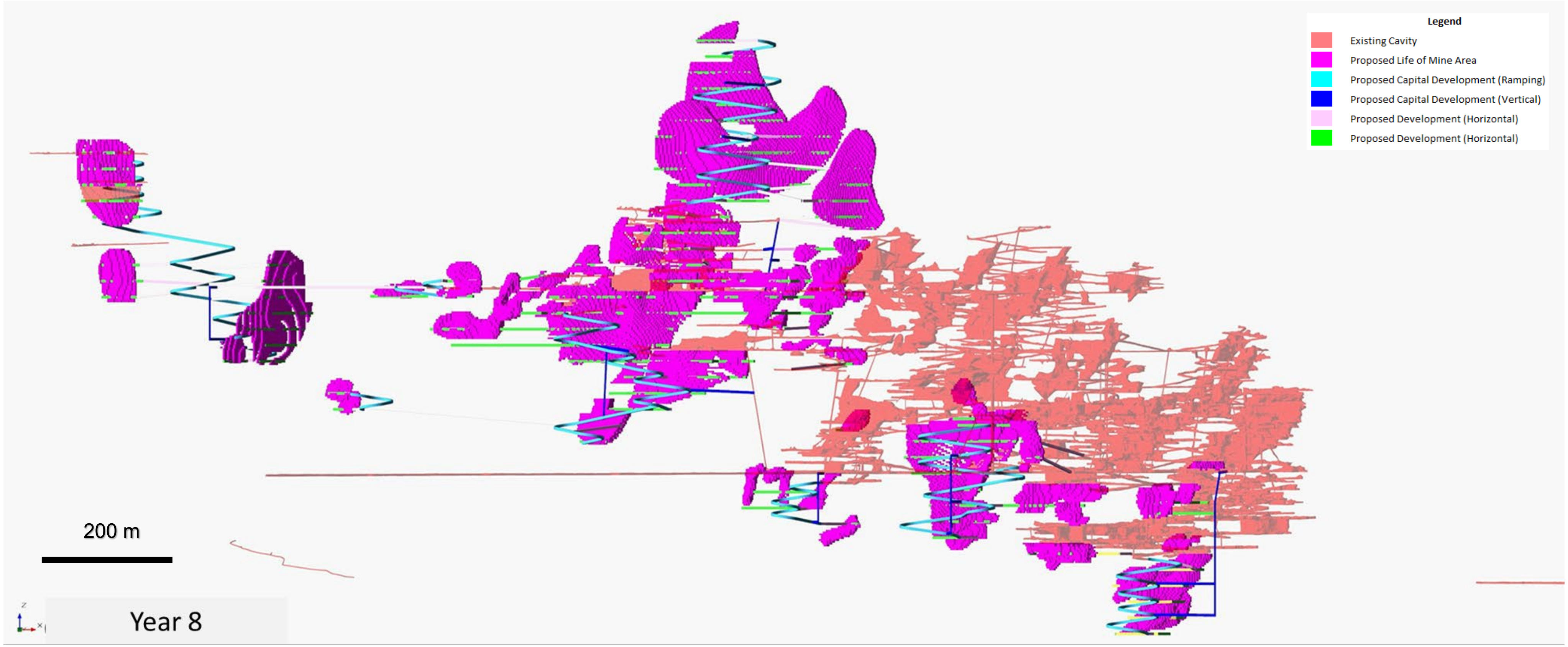
Source: MLN

Figure 16.12 La Negra Development and Mining Year 7 (Looking North)



Source: MLN

Figure 16.13 La Negra Development and Mining Year 8 (Looking North)



Source: MLN

16.7 Mine Equipment

16.7.1 Introduction

The underground mining activities at La Negra will be carried out with conventional equipment typical of smaller-scale underground mines, including jumbos for drift and ramp access, production drills for stope preparation, and scoop trams for mineralized material mucking. This equipment is all diesel fueled. The existing fleet is detailed in Section 16.7.8.

16.7.2 Time Definitions and Work Schedules

The definitions used in the time model are:

- Total available hours – hours in a calendar year, 8760 hours per year based on 24 hours per day and 365 days per year
- Available hours – total available hours less maintenance hours per piece of equipment
- Maintenance hours – actual maintenance time plus waiting time for equipment and/or spare parts and travel time to and from shop
- Standby hours – equipment is not utilized even though it is mechanically operable (shift changes, meals, refueling, etc.)
- Operational hours – available hours less standby time (idling at ready, tramming to workplace, etc.)
- Operational loss hours – equipment is operating but not performing its specific duty
- Effective hours – Operational hours less standby time and operational loss time
- Mechanical availability – available hours divided by total available hours
- Use of availability – operational hours divided by available hours
- Operating efficiency – effective hours divided by operational hours
- Overall effective utilization – product of mechanical availability, utilization, operator efficiency and operational losses

16.7.3 Ground Support

Ground support design takes into consideration industry standard empirical guidelines and La Negra's experience with varying ground conditions within the mine. Historically very little in the way of mechanical ground support, such as, 1.8 m point anchor rebar bolts (gr 60), bearing plates, and wire mesh has been required given the competence of the country rock, although rock bolts and mesh have been utilized occasionally in areas with poorer ground conditions that display "slabbing" potential or a high degree of fracturing. The use of mechanical arches or beams, shotcreting of hanging wall rock, or spot cribbing has not been used in the history of the mine and is not anticipated going forward in the LOM plan. Further evaluation of ground support techniques and systems will be performed going forward as new or updated geotech information and mining plans are advanced.

16.7.4 Drilling and Blasting

16.7.4.1 Drilling

Production and development drilling will be handled by existing fleet equipment. Single boom jumbos and simbas have been maintained in a care and maintenance state to allow for quick return to serve. The production rates of the machines have been presented previously and are matched to the capabilities of the models of the machines at site, given their operation by skilled labor and their state of readiness from good maintenance practices.

16.7.4.2 Explosives

ANFO and non-electric detonators and boosters have historically been used for development and production blasting. Explosives and detonation supplies (detonators, electrical caps, detonating cords, etc.) will be each stored in separate magazines underground. Underground explosive and detonator magazines are located on 2000 Level. The suppliers of each of these blasting materials will deliver them separately to the mine portal from where mine workers will transport these materials by truck directly to one of two underground magazines.

All underground personnel will be evacuated from the mine prior to blasting; sometimes and depending on the area to be blasted, personnel will remain in the 2000 level shop, a designated Safe Work Area, during blasting. All loaded development headings and production stopes will be initiated at the end of the shift.

The same detonators, caps, and explosives that have traditionally been used at La Negra will be employed as part of the startup plan.

16.7.5 Mucking

La Negra historically relied on small, 2.5 and 3.5 cuyd scoop trams for mucking, but as the operation grew the smaller equipment was replaced with 4.0 and 6.0 cuyd scoops. Until the recent shutdown the smaller scoops were used in those areas with smaller headings but the redevelopment plan assumes that the smaller equipment will only be utilized to help slash out the smaller headings and will then be retired.

16.7.6 Haulage

Haulage from the loading pockets to the surface stockpile area outside the 2000 Level portal has historically been carried out by a community-based contractor utilizing 23 tonne trucks. This study assumes that this arrangement will continue. The cost of contractor haulage is included in mining costs albeit shown as a separate line item.

16.7.7 Support and Auxiliary Equipment

In addition to the main development and production fleet, the mine utilizes a 16-tonne low profile haul truck, a Deere 310 for surface work and a fleet of light vehicles.

16.7.8 Equipment Summary

The following table shows the summary of the existing equipment that MLN intends to use for the restart.

In addition to the existing mining fleet, the LOM budget has an allowance for the purchase of additional equipment, consisting of a new Sandvik jumbo in year one; a new Sandvik 6 cuyd scoop and a used grader in year 2; a new Sandvik jumbo, an Atlas Copco longhole drill, and a low-profile truck in year 3; a new 6 cuyd scoop in year 4; and a used Atlas Copco longhole drill in year 5.

Table 16.4 Minera La Negra Existing Mine Equipment List Included in Restart Plan

EQUIPMENT	TYPE	AREA	BRAND	MODEL	CAPACITY		DRILL LENGTH FT	SERIAL #	MOTOR	
					YD³	TONNES			BRAND	MODEL
ST-13	SCOOP TRAM	UG	WAGNER	LH-307	3.5	-	-	AV006X163/ 8997077100	DEUTZ	F8L 413FW
ST-15	SCOOP TRAM	UG	SANDVIK	LH-307	4	-	-	L807D218	MERCEDES	OM906LA
ST-19	SCOOP TRAM	UG	MTI	LT-650	4	-	-	S/N: 11-4129	DEUTZ	BF6M1013EC
ST-21	SCOOP TRAM	UG	SANDVIK	LH-410	6	-	-	L210D779	MERCEDES	OM926LA
ST-24	SCOOP TRAM	UG	JOY	LT-650	6	-	-	4570	MERCEDES	OM906LA
ST-26	SCOOP TRAM	UG	JOY	LT-1051	6	-	-	4669	MERCEDES	OM926LA
ST-27	SCOOP TRAM	UG	JOY	LT-1051	6	-	-	4700	MERCEDES	OM926LA
BOOMER	JUMBO	UG	ATLAS COPCO	281	-	-	14	AVO07A038	DEUTZ	F5L912W
DD311-40	JUMBO	UG	SANDVIK	DD311-40	-	-	16	L11D5607	MERCEDES	OM904LA
SIMBA #1	LONG HOLE DRILL	UG	ATLAS COPCO	H-157	-	-	12	AVO06A411	DEUTZ	F4L904W
SIMBA #2	LONG HOLE DRILL	UG	ATLAS COPCO	S7D	-	-	12	AVO13A092/ 8999085700	DEUTZ	F4L912W
TRACK DRILL	LONG HOLE DRILL	UG	INGERSOLL RAND	ECM-350	-	-	4	242883	-	-
PLH 1	LONG HOLE DRILL	UG	CMAC	PLH 146	-	-	4	SFR-4464	-	-
PLH 2	LONG HOLE DRILL	UG	CMAC	PLH 146	-	-	4	2018-162	-	-
JOHN DEERE 310J	LOADER	SURFACE	JOHN DEERE	310J	1	-	-	TO310JX152899	JOHN DEERE	4045D
CAT 950H	LOADER	SURFACE	CATERPILLAR	950H	3	-	-	HJK5K01123	CATERPILLAR	C7
LOW PROFILE	TRUCK	SURFACE	MTI	DT-1604	-	10	-	11 4192	DEUTZ	BF6M1013EC

Source: MLN

16.8 Power and Ventilation

16.8.1 Cabling

Historically, the mine had cabling only in the lower levels of the mine (i.e., below the 2000 Level). As part of the investment in the mine exploration in 2021, additional cable was purchased to service the drill rigs operating in the upper levels of the mine. This cable will be utilized to power the jumbos and production drills following the restart.

16.8.2 Substations and Transformers

Power arrives at site via a 30,000 kVA line and is stepped down to 6,000 kVA at the main substation near the processing plant. From there a line delivers power to the substation and transformer at the Negra zone at 2000 Level, where it is split and stepped down further, to 500 kVA. The first line travels to the substation at Alacrán at 2000 Level, and then up to the 2141 Level, also in the Alacrán area, where it provides power to one of the exhaust fans. The lower line travels to the Diana substation at 1900 Level, where the power is stepped up to 1,000 kVA.

Power from the substation at La Negra 2000 also feeds the substation at Maravillas 2200 Level, which is used for operations at 2100 and 2200 Levels, and to power the exhaust fan at 2200 Level, also in the Maravillas area.

A surface substation at 2300 Level at La Blanca provides power at 500 kVA for powering pumps and compressors.

A line running from surface enters thought a vent raise at San Onésimo and feeds a substation location at the Virginia 2300 Level and which provides power for this area of the upper mine, including Virginia, Dificultad, and Santa Blanca Levels 2200 to 2350.

The eight substations throughout the mine are shown in the following table.

Table 16.5 La Negra Electrical Substations

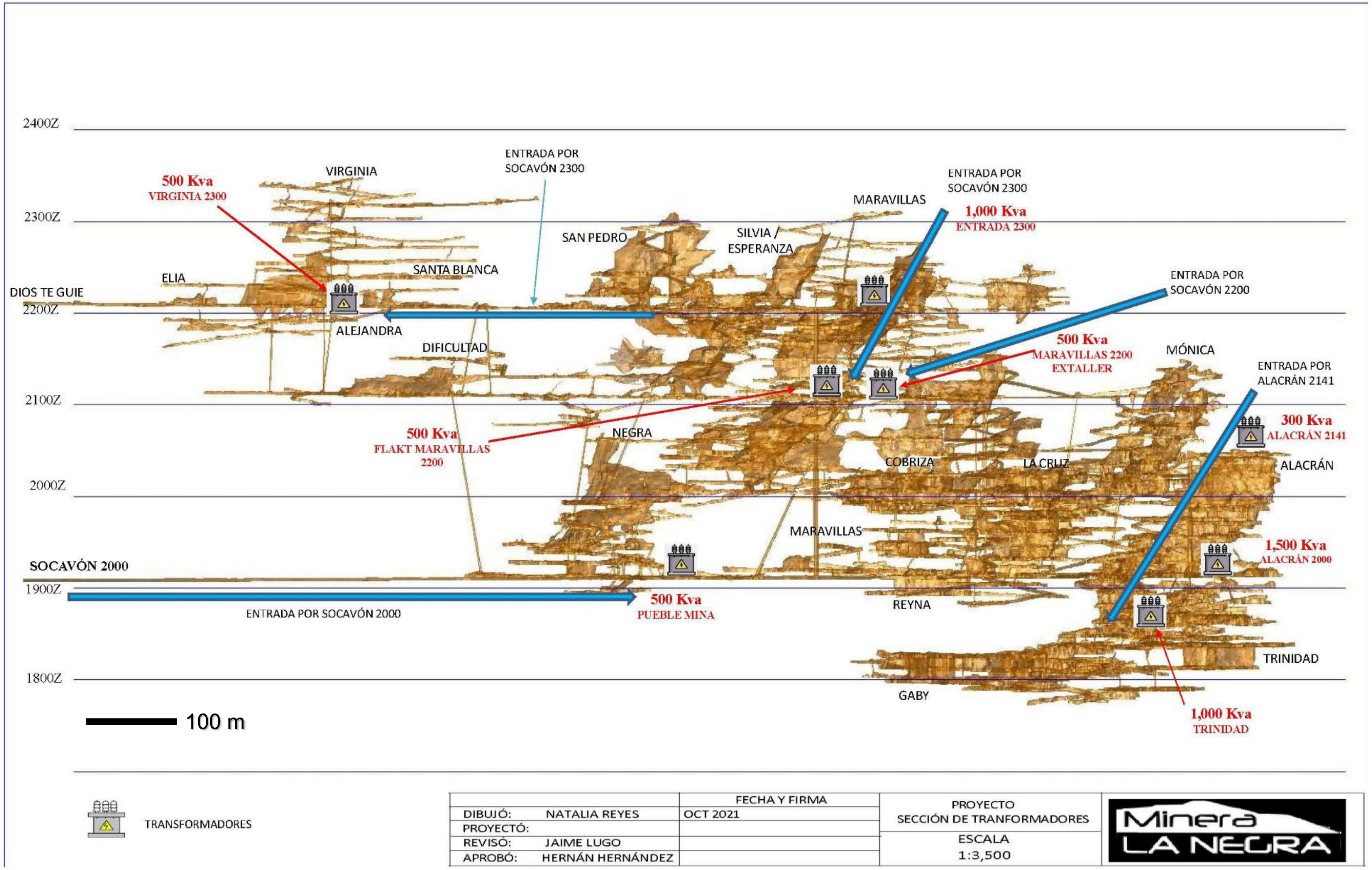
Location	Capacity	Delivers power to:
Negra 2000 Level	500 KVA	Level 2000 and 2200 Level Pumping
Alacrán 2000	1500 KVA	Alacrán and Maravillas 2000 Level
Alacrán 2141	300 KVA	Zitron Exhaust Fan
Diana 1900	1000 KVA	1800 to 1950 Levels
Maravillas 2200	500 KVA	Feeds 2100 to 2200 Levels
Maravillas 2200	500 KVA	Flakt Exhaust Fan
La Blanca 2300	500 KVA	2300 Level Compressors and Pumping
Virginia 2300	500 KVA	Dificultad 2200 to Santa Blanca 2300

Source: MLN

These substations feed a series of 5kVA and 10 kVA transformers used to power the workshops, compressors, dining mess, lighting, and provide electric power for mine operations.

The power distribution throughout the mine is shown in Figure 16.14.

Figure 16.14 La Negra Existing Power Distribution and Mine Substations (Looking North)



Source: MLN

16.8.3 Ventilation

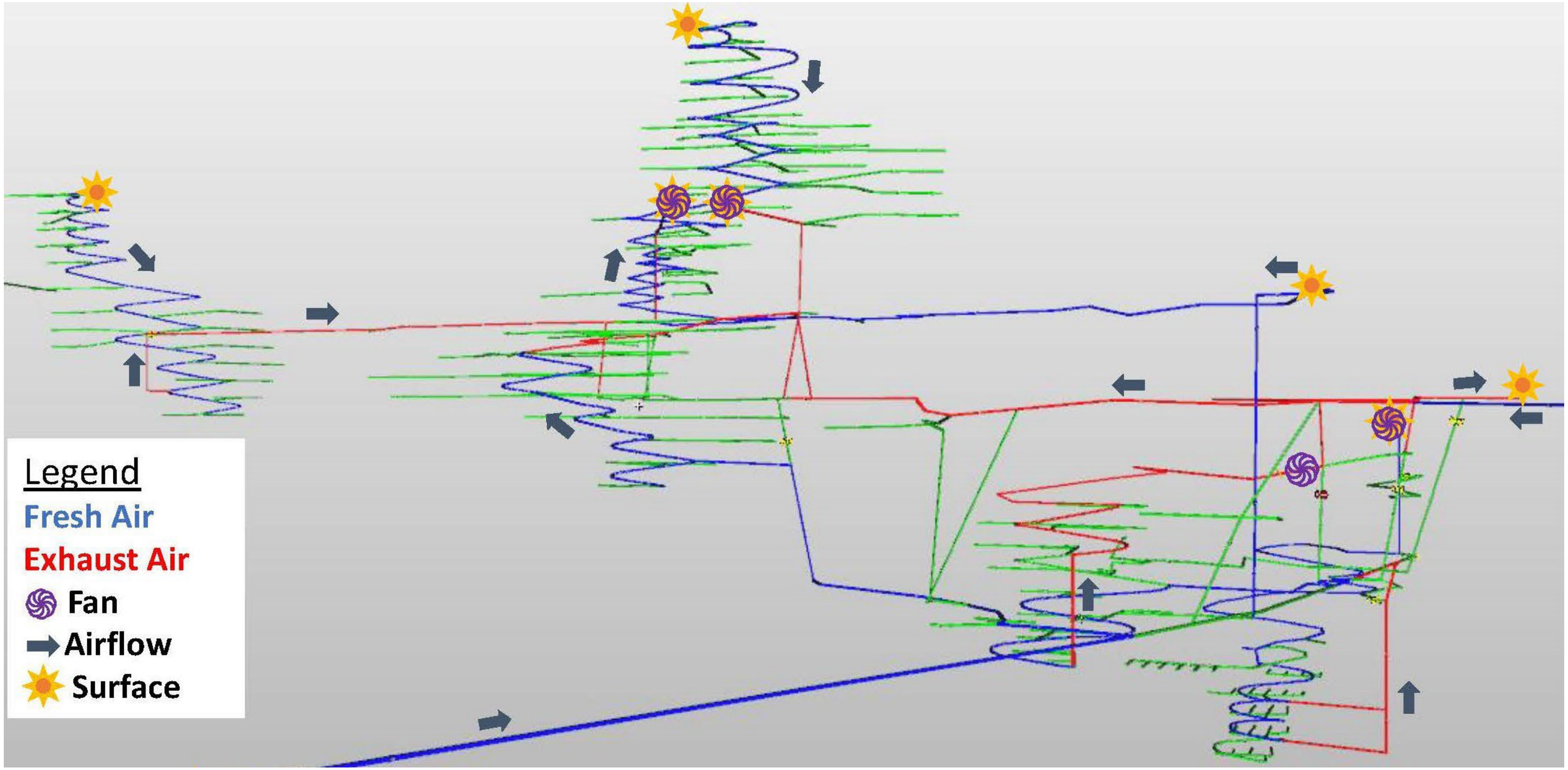
The La Negra mine has largely relied on natural airflow to provide ventilation for mining activities, with three main intake airways at 2000, 2200, and 2300 levels and return airways at 2140 and 2200. Mexican mining regulations require a minimum ventilation rate of 2.13 m^3/min/HP (0.048 m^3/s/kW or 75.6 cfm/bhp) and 1.50 m^3/min/person (0.034 m^3/s/person or 53.2 cfm/person). Current international best practice requires 0.06 m^3/s/kW engine power to effectively mitigate the hazard from diesel particulate matter (DPM). The target production rate of 2,500 tonnes/day requires 180-233 m^3/s of airflow circulating within the mine. This will account for diluting, rendering harmless, and carrying away all dusts, mists, and DPM generated from the mining and hauling processes.

The mine currently has 10 fans of various sizes with total rated capacity of 1025 hp (764 kW), ranging from 20 hp to 300 hp, with a capacity to deliver approximately 368 kcfm, which is based on a recent analysis. This quantity should provide sufficient ventilation for the mine restart. Based on a requirement of (0.06 m^3/s/kW) 108 – 135 m^3/s (229 – 286 kcfm) this amount would be required to adequately ventilate the mine at a production rate of 2,500 tpd. However, over time, the ventilation system would require two additional 250 kW fans, one additional 100 kW fan and one additional 75 kW fan. While most of the fans were historically located in the lower mine, these will be repositioned as needed to provide better ventilation in the upper mine. For the life-of-mine it is estimated that six vent raises will be required, servicing the Valeria, Negra, Maravillas, Northwest and Valenciana zones (noted in red in Figure 16.). Although further study is needed to determine the mine's ventilation needs with greater precision, the use of more efficient equipment, eliminating the jacklegs, and an optimized workforce should reduce the mine's overall ventilation requirements.

The following schematics show the current air flow within the mine and the proposed location of the fans.

Additional, detailed ventilation modeling will be required prior to production to account for airflow to specific mining areas, ensuring that drifts and raises are free of obstructions, the impact of leakage from historic workings and open stopes, and the need to install brattices, bulkheads, and vehicle doors.

Figure 16.15 La Negra Proposed Ventilation Schematic



Source: MLN

16.8.4 Compressors

Historically, a series of compressors were used throughout the mine to deliver compressed air to the jacklegs. With the new mine plan jacklegs will no longer be used other than for slashing and following that the mine will only require three compressors to feed the workshop and the two PLH production drills.

16.9 Underground Mine Infrastructure

The following sections described the project's principal infrastructure.

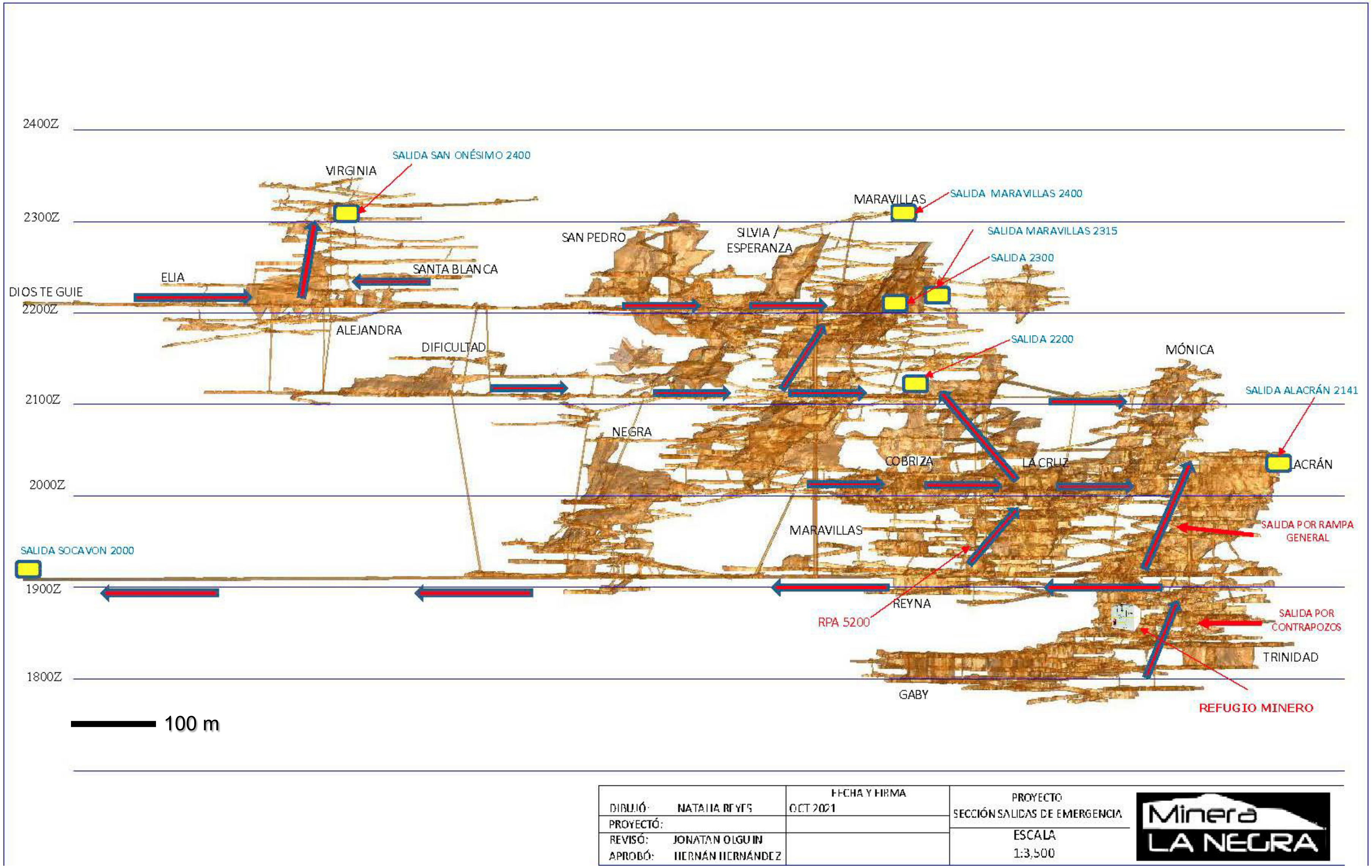
16.9.1 Underground Infrastructure

16.9.1.1 Access, Egress and Evacuation Routes

The main access at Minera La Negra is the 2000 level adit (located at 1906 masl). The portal is located near the processing plant on a level area which sits on top of the former TSF1. The 2000 Level access has a 4.5 x 4.0m cross-section and runs NE in a straight line for approximately 2 km. There are in addition two minor access levels at 2200 level and 2300 level with a 2.5 x 2.5 m profile. The 2400 Level access has a 3.5 x 3.5m profile.

The mine has several egress points. Vent raises equipped with ladders provide access from the lower mine to the main 2000 Level, which is the main ingress/egress level. There is, if needed, access from 2000 Level, also via raises and ladders to exits at the 2100, 2140, 2200, 2300, 2315, and 2400 Levels. As part of the development of San Onésimo, Mina Valenciana, and Valenciana, additional ramps to surface will be developed, providing additional point of egress when those zones are mined later in the LOM plan.

Figure 16.16 La Negra Existing Evacuation Routes (Looking North)

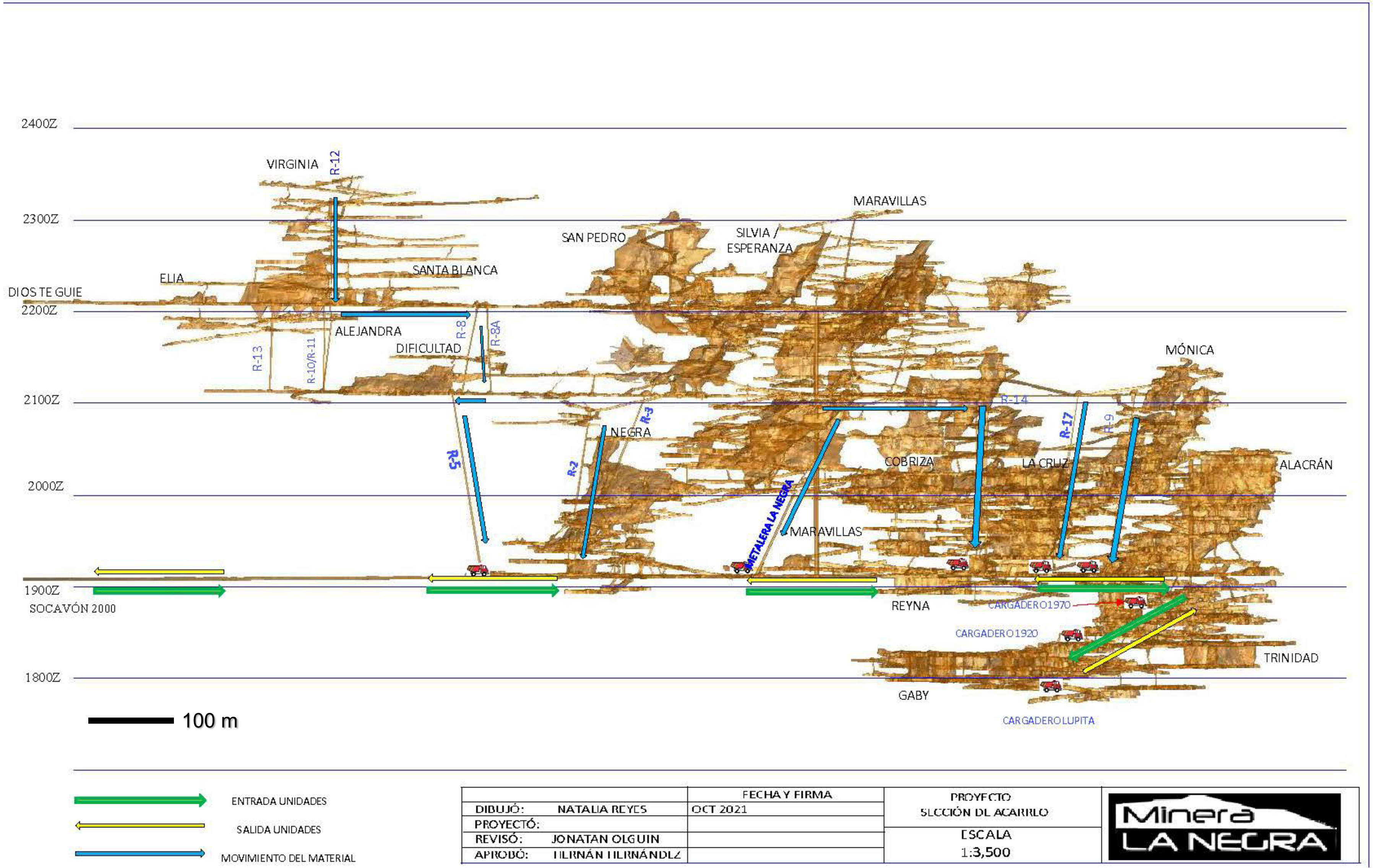


Source: MLN

16.9.1.2 Ore Passes

The following long section shows the current location of ore passes and loading stations throughout the mine. There are six ore passes on the 2100 Level that drop mineralized material to the 2000 Level, which is the main haulage level. There is a single ore pass at 2300 Level in the Virginia area that drops to the 2100 Level and requires rehandling to get to the 2200 Level ore pass. Mineralized material that is extracted from levels below the 2000 Level is hauled to the 2000 Level and out the main portal.

Figure 16.17 La Negra Existing Ore Passes and Loading Stations (Looking North)



Source: MLN

16.9.1.3 Magazines and Warehouses

The main storage for mine spares is located at surface. Explosives are stored in two magazines on the 2000 Level, as described in Section 16.7.4.1.

16.9.1.4 Workshops

The mine has two workshops, both located on the 2000 Level. One is used for electrical and mechanical maintenance of the mine fleet, and the other used for soldering activities.

16.9.1.5 Fuel Supply and Storage

Diesel fuel is stored in a 5,000-liter tank located on 2000 Level next to the maintenance workshops.

16.9.1.6 Compressed Air

Compressed air was historically used to operate jacklegs, which were used for development of 2.5 x 3.0 m headings in the upper (northwest) section of the mine. With the redevelopment of the mine based on 4.5 x 4.0 m headings throughout the mine, jacklegs will only be utilized for slashing and the need for compressed air will become largely unnecessary, and only a few compressors will remain in service to provide compressed air for the PLH production drills.

16.9.1.7 Active Workings/Pathways

The active pathways include the four main access levels, 2000, 2200, 2300, and 2400, with the remaining pathways only used for emergency egress.

The main operating ramps are the 5200, 5448, 5530, 5663, 5700, Maravillas 2000, 7604, San Onésimo, 5368 and 5401.

16.9.1.8 Closed Workings/Pathways

The La Negra 2000 to 2200, the 5-1/2 ramp, and the ramps at Alacrán, San Pedro and San Buenaventura are no longer operative.

16.9.2 Surface Infrastructure

The main surface infrastructure consists of the offices and contractor workshop outside the main portal, the scale, two guard shacks, and the truck scale.

At the 2200 Level there is a guard shack and a settling pond, while at the 2300 Level there is a guard shack, the compressor enclosure, and a workshop.

16.10 Mine Personnel

16.10.1 Basis

The mine will be operated on a 24-hour/day, 6-days per week schedule, implying approximately 310 operating days per year when holidays are taken into account. Salaried staff will operate on a 12-hour, two shifts per day schedule. The hourly (unionized) workforce will operate on both three, daily eight-hour shifts and two daily ten-hour shifts, depending on the job description.

The labor complement for equipment operation is based on the mine plan operating requirements and the number of units needed to meet the plan, adjusted for shift rotations. The maintenance complement is based on the number of units to be maintained, estimates of mechanical availability, and historic experience of the ratio of personnel to the number of units for each type of underground equipment.

Mine operations will be responsible for development, stope preparation and blasting, mucking, and dewatering. A separate team will be responsible for mechanical and electrical maintenance. All mining and maintenance activities will be carried out by Minera La Negra personnel except material haulage, which will be carried out by a community-based contractor.

16.10.2 Hourly (Union) Workforce

The total unionized workforce for the mine consists of 67 employees, responsible for development drilling, production drilling, blasting and mucking, and electrical and mechanical maintenance. The union workforce operates under a collective bargaining agreement (*Contrato Colectivo de Trabajo*) which was last updated by agreement (*Convenio*) in April of 2021. This agreement provides for an hourly wage based on the work performed, in addition to certain additional benefits, the year-end *aguinaldo* (thirteenth month) and contributions to a savings fund (*Fondo de Ahorro*). In addition, Minera La Negra agreed to implement productivity-linked bonuses at startup and an estimate has been included in both mining operating costs and in the financial model.

The current mine plan assumes that the hourly workforce will total 67 employees, of which 43 will be responsible for mining activities, 14 will be responsible for mechanical maintenance, and 10 for electrical maintenance. The production workforce will consist of 14 scoop tram operators, 6 production drill operators, 4 jumbo operators and support staff. The mechanical maintenance workforce consists of 7 mechanics and 7 support staff. The electrical maintenance staff consists of 5 electricians and 5 support employees. There are in addition 14 hourly employees dedicated to assisting the Technical Services Group.

16.10.3 Salaried (Staff) Workforce

Mining operations will be headed by the Mine Superintendent, reporting to the mine General Manager, and will consist of a team of 18, including 10 devoted to mine operations, 5 dedicated to mechanical maintenance, and 3 for electrical maintenance.

The mine operations and maintenance staff will be supported by the Technical Services group, consisting of 4 geologists responsible for ore control and updating the resource/reserve models and 5 engineers responsible for short, medium and long-term planning.

The following table details the mine’s annual personnel requirements.

Table 16.6 Annual Personnel Requirements

		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Union	Scoop Tram Operator	14	14	14	14	14	14	14	14	14	14
	Jumbo Operator	4	4	4	4	4	4	4	4	4	4
	Production Drill Operator	4	4	4	4	4	4	4	4	4	4
	PLH Operator	3	3	3	3	3	3	3	3	3	3
	Services	5	5	5	5	5	5	5	5	5	5
	Blasting	2	2	2	2	2	2	2	2	2	2
	Mine Support	11	11	11	11	11	11	11	11	11	11
	Maintenance Mechanic	7	7	7	7	7	7	7	7	7	7
	Mechanic Support	7	7	7	7	7	7	7	7	7	7
	Maintenance Electrical	5	5	5	5	5	5	5	5	5	5
	Electrical Support	5	5	5	5	5	5	5	5	5	5
	Tech Services Support	17	17	17	17	17	17	17	17	17	17
Staff	Mine Operations	10	10	10	10	10	10	10	10	10	10
	Mechanical Maintenance	5	5	5	5	5	5	5	5	5	5
	Electrical Maintenance	3	3	3	3	3	3	3	3	3	3
	Tech Services Manager	1	1	1	1	1	1	1	1	1	1
	Geologist	4	4	4	4	4	4	4	4	4	4
	Engineer	4	4	4	4	4	4	4	4	4	4

Source: Mining Plus, MLN

17 Recovery Methods

17.1 Introduction

The concentrator at Minera La Negra has an operating capacity of 3,000 tonnes per day and is based on a conventional crushing, grinding and differential flotation process to produce lead-silver, copper-silver, and zinc concentrates, in that order. Historically, the processing facility has operated on the basis of three, eight-hour shifts for 336 calendar days per year, while the reopening plan assumes three, eight-hour shifts for 337 operating days per year. The present technical study is based on the assumption that the processing plant will treat 2,500 tonnes per day, or 842,500 tonnes per annum.

As outlined in Section 15 of this report, Minera La Negra is not declaring any reserves and the mine plan is based on Indicated and Inferred Resources. Therefore, the term "ore" as applied in this section is being used in a generic or descriptive sense consistent with industry terminology.

17.2 Flowsheet Diagram

The following figure (Figure 17.1) shows the flowsheet for the processing plant at Minera La Negra.

17.3 Process Description

17.3.1 Mobile Crusher

The processing section features a 200 tph, 150 hp 30" x 42" mobile jaw crusher for bespoke jobs, including batch processing for certain material types as required by the geology team, and producing construction material, including crushed rock for the TSF buttress. The product of this crusher ranges between 4" and 7" but also produces finer material that is fed to an Allis Chalmers vibrating grizzly that produces material less than 1" and greater than 3/8".

17.3.2 Primary Crushing

Product is delivered to the plant site in 23 tonne trucks operated by a community-based contractor. After blending to control for grade and arsenic content, the mineralized material is tipped into a 60 tonne coarse ore hopper with a 25" x 25" grate; oversize material is broken with a BT200 hydraulic breaker. A new breaker has been included in the start-up capital estimate. This material is fed into a Gator 30" x 42" primary jaw crusher with a 150 hp motor which produces a product with P_{80} of -4 inches. The primary crusher has an availability of 88% and is projected to operate 3334 hours per annum and crush at a rate of 220 tonnes per hour.

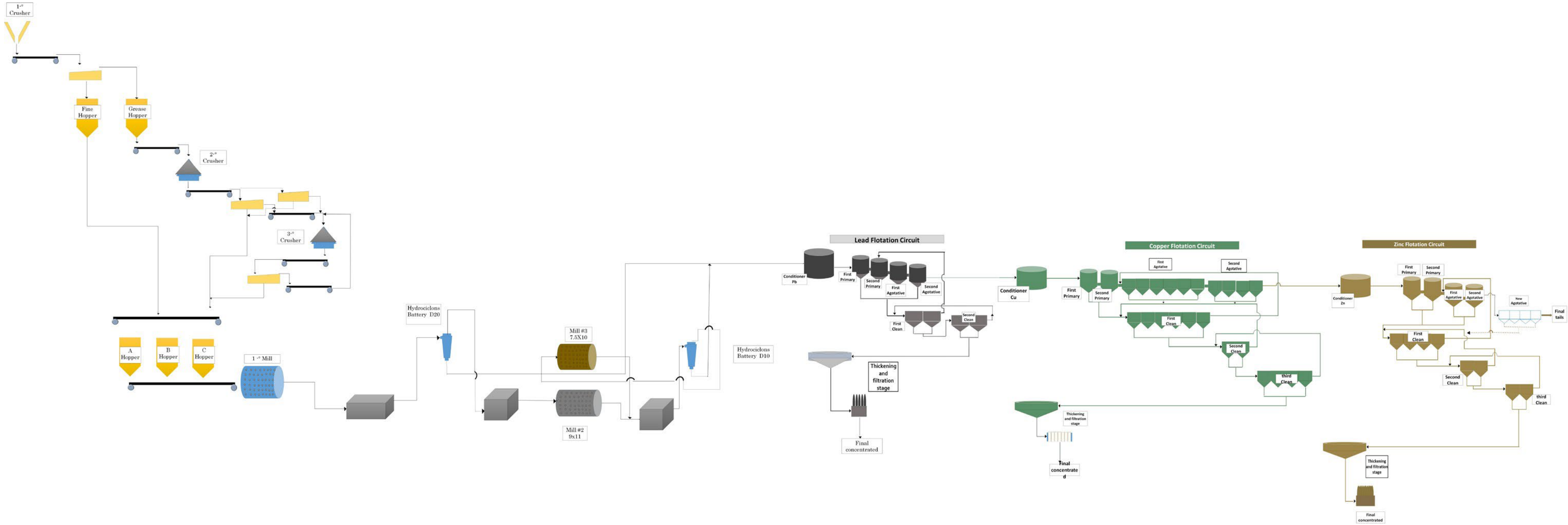
17.3.3 Screening Area

The product from the primary crusher is fed by a series of belts to a 25 hp grizzly in closed circuit that produces material ranging from 5/16" to 4". Material greater than 4" and less than 7" is fed to a 400 tonne coarse ore bin, while material less than 5/16" goes to a 100-tonne capacity fine ore hopper.

17.3.4 Secondary Crushing

The secondary crusher consists of a 5 ½ ft Symons standard head cone crusher with a 200 hp motor that has a historical an availability of 86% and is projected to operate at an average of 4350 hours per annum. The crushing is estimated at a rate of 300 - 340 tonnes per hour to produce a product with a P_{80} of 1½ inches. The crushed material is fed to two, parallel 6" x 12" vibrating grizzlies, with material greater than 5/16" fed to the tertiary crusher and material finer than 5/16" fed to the fine ore bin.

Figure 17.1 La Negra Processing Plant Flowsheet



Source: MLN

17.4 Plant Operating Design Criteria

Table 17.1 Process Operating Design Criteria

Operating Schedule	Unit	Balance	Design
Mine Life	years		7.5
Crushing Availability	%	86-88	
Crushing Operating Days per Year	days	337	
Crushing Hours per Day	h	24	
Mill Availability	%	90-99	
Milling Operating Days per Year	days	337	
Milling Hours per Day	h	24	
Ore Characteristics			
Ore % Moisture	%	1.5-2.0	
Ore Specific Gravity	g/cm^3	3.1-3.5	
Feed Particle Size			
Primary Crusher Feed P80	mm	635	
Secondary Crusher Feed P80	mm	102	
Tertiary Crusher Feed P80	mm	38	
Bond Work Index	KWh/t	13	
Abrasion Index	g	0.41	
Ball Mill Feed P80	mm	8	
Ball Mill Product P80	µ	75	
Production Rates			
Annual (balance)	tpa	842,500	
Crushing Daily	tpa	2,500	3,000
Crushing Hourly	tph	150-190	200
Mill Daily	tpa	2,500	2,500
Mill Hourly	tph	105	105
Silver			
Grade (LOM Average)	g/t	76.3	
Recovery (LOM Average)	%	82.1	
Lead			
Feed Grade (LOM Average)	%	0.5	
Recovery (LOM Average)	%	73.9	
Concentrate Grade (LOM Average)	%	60.2	
Silver in Lead Concentrate	g/t	8,362	
Zinc			
Grade (LOM Average)	%	1.51	
Recovery (LOM Average)	%	84.4	
Concentrate Grade (LOM Average)	%	44.1	
Silver in Zinc Concentrate	g/t	70	
Copper			
Grade (LOM Average)	%	0.35	
Recovery (LOM Average)	%	68.3	
Concentrate Grade (LOM Average)	%	23.9	
Silver in Copper Concentrate	g/t	1,740	

Source: MLN

17.4.1 Tertiary Crushing

The tertiary crusher consists of a 300 hp 5½ ft Symons short head cone crusher which produces a product with a P_{80} of 3/8" inches that has an availability of 86% and is projected to operate 4349 hours per annum and crush at a rate of 150 – 190 tonnes per hour.

17.4.2 Ore Storage

Crushed material is stored in three fine material silos each with a capacity of 450 tonnes.

17.4.3 Milling

Mineralized material is fed from the fine ore bins to the milling circuit. The grinding circuit consists of two parallel ball milling lines each in closed-circuit with a bank of hydrocyclones to deliver a P_{80} of approximately 75 µm. The first line includes a Marcy 10' x 10' ball mill with an 800 hp motor and 46 tph capacity in a single grinding stage arrangement in closed circuit with two D20 hydrocyclones. The second line includes two ball mills: an Allis Chalmers 9' x 11' mill with 36 tph capacity and a Taylor 7½' x 11' regrind mill with 22 tph capacity in a two-stage milling arrangement, with motors of 500 hp and 450 hp, respectively. The ground material is fed to a bank of six D10 hydrocyclones. The overflow from both the ball milling circuits pass to the differential flotation circuit. Zinc sulfate and sodium cyanide are added at a 2:1 ratio as conditioners during the milling stage to activate lead and to depress zinc, copper, pyrite, arsenic and iron.

17.4.4 Flotation

The flotation circuit consists of three stages of flotation to recover lead, copper, and zinc concentrates, in that order. A variety of conventional reagents are added throughout the process to maximize the recovery of the targeted metal, while suppressing unwanted materials such as iron and arsenic. The lead recovery circuit consists of a 12' x 12' conditioning tank with a retention time of 12 minutes; Aero 404 is added as a promoter and the pulp fed to four 350 ft^3 Outotec BC-10 flotation cells with CC-1064 as a frother in the first lead flotation cell. Four Denver 50 ft^3 flotation cells are used for two stages of cleaning.

Tails from the lead flotation circuit are fed to a 10' x 10' conditioning tank ahead of the copper flotation circuit. Retention time is 10 minutes and ammonium bisulfite is added as a pH modifier and to depress zinc and iron. S-7583 is added as a promoter to activate copper. The copper recovery circuit consists of two Wemco 300 ft^3 flotation cells and the product of primary flotation can be sent to the concentrate thickener or, at the operator's discretion, to secondary flotation. The scavenger flotation consists of ten Denver 160 ft^3 flotation cells followed by three stages of cleaning in Denver 50 ft^3 cells, which can be used to deliver final product or used to recirculate material.

The tails of the copper circuit are fed to a 12' x 12' conditioning tank; milk of lime is added to increase the pH to 9.0 – 10.0 and as an iron depressant. Copper sulfate is also added to activate zinc. The zinc recovery circuit consists of four Denver 160 ft^3 cells followed by three stages of cleaning in Denver 50 ft^3 cells.

Table 17.2 describes the reagents utilized in the flotation circuit at La Negra and their estimated consumption. The consumption figures form the basis for the inputs into the cost model as shown in Section 22.3.4 and are based on historic consumption rates and operating experience.

Table 17.2 La Negra Processing Plant Reagents and Consumption

Reagent Addition Point	Reagent	Consumption (kg/t milled)	Application
Grinding Circuit	Sodium Cyanide	300	Depression of pyrite, Cu, and Zn minerals
	Zinc Sulfate	400	
	Sodium Hydroxide	280	pH modifier
Lead Flotation Circuit	AERO 404	20	Lead mineral collector
	CC1064	13	Frother
Copper Flotation Circuit	S-7583	25	Copper minerals collector
	Ammonium Bisulfite	2764	Depression of Zn and Fe minerals and pH modifier
	CC1064	13	Frother
	Xanthate	10	Collector
Zinc Flotation Circuit	Lime	520	pH modifier
	Aero5160	10	Zinc minerals promotor
	Copper Sulfate	410	Zinc minerals activator
	CC1064	13	Frother

Source: MLN

17.4.5 Thickening and Filtration

Each of the three concentrate streams is pumped to a thickener. The lead thickener consists of an 18' x 6' thickener which increases the concentrate to 30 - 40% solids. The pulp is dosed with flocculant (Zetag 4125) depending on the level of sedimentation. The material is fed to two (one operating, one standby) PIPSA 5' x 4' disc filters that operate in a vacuum to produce material with a humidity range of 18 - 20%. Subsequent aeration reduces the moisture content to a nominal 10.8%.

The copper thickener consists of a 30' x 10' thickener which increases the concentrate to 65 - 70% solids; Zetag flocculant is added to aid in sedimentation. The pulp is fed to a Clever 1000 x 1000 plate filter which produces material with a humidity of 15 - 20%, with a nominal humidity of 10.9% after aeration and rehandling.

The zinc concentrate is fed to a 12' x 12' thickener. Zetag 4125 is added as a flocculant and the material is fed to two, PIPSA 6' x 5' disc filters that increase the material to 80 - 82% solids, with a nominal humidity of 10% after aeration.

Each of the concentrates is stored in a compartmentalized shed awaiting shipment (by truck) to the concentrate offtaker. Concentrates were historically shipped in 35 tonne trucks to the port of Manzanillo on the Pacific Coast by a local contractor. It is assumed that concentrate from La Negra will be shipped to Manzanillo once the mine is restarted, given that this is where the major offtakers have their warehousing and overseas shipping facilities.

17.5 Tailings

The status of the existing tailings impoundment facilities and the preferred alternative for tailings disposal following a restart are discussed in Section 18.5.

17.6 Laboratory

Minera La Negra has an onsite laboratory that is used to assay samples from exploration sampling and drilling, definition drilling, mill samples, and to verify concentrate specifications. Although the lab is owned by MLN, for operational purposes it is treated the same as an offsite lab and is required to meet the same standards as an independent certified facility. The lab follows the same procedures as an independent lab requiring the use of blanks, reference material and duplicates.

There are detailed procedures for each step in the assaying process, including procedures for receiving and logging the samples, sample prep, and assaying. The samples are received at the lab and logged and ordered for preparation. The samples are then weighed with an Ohaus Adventurer Pro scale and dried in a GRIEVA SB-550 oven. The prep area has two draw bells to remove any dust from the work area. The dried samples are crushed in a Terminator jaw crusher and the material is split in a Jones riffle splitter to produce a ~600 g sample which is then ground in an ESSA (FLSmidth) pulverizer. The ground material is quartered with a spatula and passed through a 200-mesh sieve. All the equipment is cleaned between each sample to prevent cross-contamination. The final particle size fraction is determined in a Ro-Tap® sieve shaker.

To prepare for either AA or ICP analysis, the samples are then subject to acid digestion. A 0.5 g sample is weighed and then combined with 2.5 ml of nitric acid, which is then heated for 15 minutes at 150°C ±5°C. 7.5 ml of hydrochloric acid is then added and heated for an additional 30 minutes, after which an additional 10 ml of HCl is added. The flask is covered and agitated to ensure full dissolution of the material.

The laboratory at La Negra can conduct both atomic absorption and ICP analyses, with one Agilent atomic absorption spectrometer (AA240FS) and one Varian atomic absorption spectrometer (AA240). The induced coupled plasma machine is an Agilent 4210 MP-AES atomic emission spectrometer.

The lab can also conduct traditional fire assays for Au and Ag. The samples are then prepared for assay by weighing a 30 g sample with a Mettler Toledo XS104 analytical balance and then combined with 120 g of flux in a crucible, which is then placed in a muffle furnace for 45 minutes at 1050°C. The metals are separated from the slag and placed in a cupel, which is then heated at 920°C in the muffle furnace for 45 to 60 minutes.

18 Project Infrastructure

18.1 Introduction

The infrastructure in and around Minera La Negra is fairly conventional. The highway which connects Querétaro to Maconí is fully paved and in excellent condition; only the last 3.4 km from Maconí to the mine site is unpaved. There are high voltage power lines to site, high-speed internet, and year-round water.

Figure 18.1 shows access road and the location of the main haulage adit (2,000 level), process plant, stockpile and waste dumps areas and the currently active tailings storage facility (TSF) No 5A.

Figure 18.1 MLN Project Infrastructure

Source: MLN

18.2 Existing Infrastructure and Services

18.2.1 Road and Site Access

The mine has access from the state capital city of Querétaro through a paved road to the town of Maconí. The last stretch to the plant site is via a well-maintained, year-round, 3.4 km long gravel road. Although it narrows to one lane locally, it can handle all heavy equipment. Because the road to the mine from Maconí is a local access road only, there is little traffic using the road outside of the mine related activities.

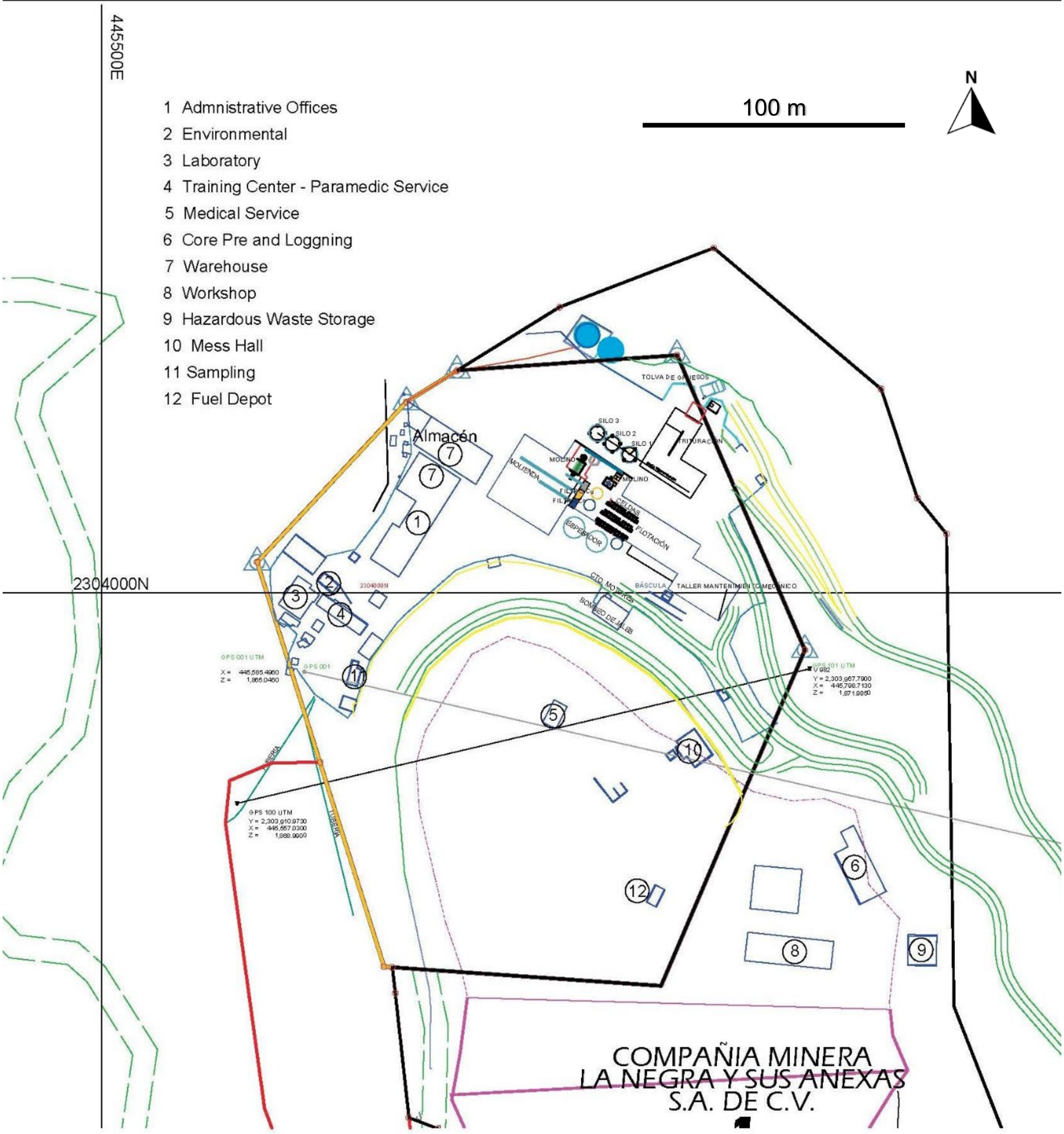
San Joaquín is the largest town close to Maconí, located 21 km to the north, with better services than Maconí. Local schooling is provided at Maconí through primary basic level, while San Joaquin provides secondary and high school equivalent levels. For technical and higher-level education, local people attend schools at Cadereyta, Ezequiel Montes or Querétaro.

Public transportation is limited to a private bus service from San Joaquín to Querétaro and other localities. Transportation to San Joaquín is privately arranged.

18.2.2 Buildings

As show in the figure below the main building and structures at La Negra consist of the administration building and adjacent warehouses, and the nearby assay laboratory, medical facilities, and training center. These are located to one side of the processing facilities. On the other side of the process facility, outside the main entrance gate is the mess hall. And slightly further away is the location of the core prep and logging area, hazardous waste storage and (surface) maintenance workshop buildings.

Figure 18.2 Minera La Negra Surface Infrastructure



Source: MLN

18.2.3 Power Supply and Distribution

Electrical power is obtained from the national grid through a 34 kilovolt (kV) line to the process plant and mine facilities. Occasionally, power is delivered directly from the Ezequiel Montes sub-station. Electrical power is transformed at MLN's substation to 6.9 kV to be distributed to the process plant and mine facilities at 440 volts.

18.2.4 Communications

The La Negra mine site and the staff accommodations (hacienda) both have fixed land lines as well as satellite internet, the latter providing hi-speed wifi. Cell phone service outside the site and the hacienda is limited.

18.3 Site-Wide Water Management

18.3.1 Potable Water Supply

Water for domestic sources comes from the Maconí River and is the source for the water consumed in the staff housing area (hacienda).

18.3.2 Operations Phase Water Management

Water for industrial purposes is obtained from several sources: Water used within the mine is obtained from the small amount of surface rain and run-off water that infiltrates the mine; this water is recirculated from the lower levels using pumps to lift it to where it is needed. Historically, approximately 70% of the water used in the mill operation is recirculated from the tailings storage facility and the remaining 30% makeup water was obtained from the San Nicolás water well. With the introduction of filtered tailings, it is estimated that a greater portion of the mill's needs will come from recycled water.

Water use and consumption is regulated by the national water authority, CONAGUA, and Minera La Negra operates under a take-or-pay contract with CONAGUA. Most of the water consumed by the mine is makeup water required for plant operations, estimated at 0.4 m^3 per tonne milled, and is included in the processing plant operating cost estimate.

18.4 Waste Disposal

Non-hazardous waste is removed from site by the municipality of Cadereyta de Montes, while hazardous waste is removed by a licensed contractor. The cost of both these services is included in mine G&A costs.

18.5 Tailings Disposal

This section was prepared and qualified by Steven Truby of Wood EIS PLC

The following sections describe the existing tailings storage facilities and summarize the findings of a tailings alternatives study that was commissioned to determine the preferred outcome for future tailings storage. Wood understands from MLN that the tailings is non-acid generating, that it has significant acid mitigation potential and that there is little potential for metal leaching. The conceptual civil designs presented in this PEA study have made that assumption. This must be verified before any of the designs discussed or presented in this study are taken to the next stage of study.

18.5.1 Existing Tailings Facilities & Historical Operations

Until closure the zinc flotation tails were pumped to the only active tailings facility on site, tailings dam 5A, with reclaimed water pumped back to the process plant (the relative location of the mill and tailings facility can be seen in Figure 18.1). Tailings storage facilities 1,2, and 4 are no longer in use; TSF1 and TSF4 are fully reclaimed and TSF 2 is undergoing reclamation with arid species plant cover. TSF5 reached its capacity in January 2018 and the expansion of this facility, known as TSF5A began in November 2016 and was operational in early 2018 when TSF5 ceased operations. The top of TSF No. 3 continues to be used as an emergency overflow pond for plant discharge.

Figure 18.3 View of TSF5A (Looking Southwest - June 2021)

Source: MLN

The tailings were transported 920 m via a 10” diameter pipe by four pipes, two BCH 8x10 and two BCH 8x6, of which one of each is on standby. The material consisted of 30% to 38% solids. A D20 hydrocyclone at the crest of the dam separated the coarser fraction at 85% solids that was used to build the dam’s berm, while finer material was sent to the interior of the dam. The dams at La Negra were built by the upstream method.

The 5A dam was designed with a built-in drainage system that collects seepage at the foot of the dam and stores it in a storage pond with capacity of 20,000m^3. Water is recovered from the dam and recirculated to the plant via a series of four, 300 hp, 900 gpm pumps which are fed by a dedicated substation and equipped with a 2.5 x 48 diesel-powered backup pump. There are two additional water storage tanks at the mill site with 500 m^3 capacity each.

Tierra Group International (“TGI”) serve as engineer of record (“EOR”) for TSF 5A. Until recently TGI had a representative on site that supervised the dam monitoring process. By mutual agreement conditions in the dam are now monitored daily by MLN personnel and this information is reviewed by Tierra Group. The dam is monitored with piezometers and flowmeters, and daily survey measurements are taken. TGI produces monthly reports In the status of the TSF for the management and owners of MLN.

TSF5A has limited capacity, estimated at seven months of conventional cyclone tailings (without the need for additional buttressing). To increase capacity and stability filtered tailings are proposed moving forward (see Sections 18.5.2).

18.5.2 Filtered Tailings Approach

To achieve sufficient storage at the steep La Negra site, a filtered tailings approach was chosen at existing facilities following Wood PLC's alternatives analysis (see Section 25 and TSF Siting Study, Scoping Level Design and Preliminary Economic Assessment, Wood EIS, December 2021). Wood considered several nearby locations for the development of a greenfields, conventional cyclone tailings facility with centerline or downstream construction, but all but one – known as Site 4 – were eliminated for logistical, cost, and/or environmental/social reasons. Site 4 is in a small valley below the mine's metallurgical lab and while technically suitable for cyclone tailings deposition was ultimately discarded as a repository for conventional tailings due its low capacity (2.3 million tonnes, or approximately three years of production). Site 4, however, could be a longer-term site for filtered tailings storage with a capacity of 5.3 million tonnes, or seven years of production. Site 4 was not considered in the short-term due to the permitting timeline required.

The preferred alternative for near-term storage at La Negra is the sequential deposition of filtered tailings at the mine's existing tailings facilities, TSF5/TSF5A and TSF3 and, if additional capacity is required, paste (to be deposited underground). MLNs tailings properties are suitable for filtered tailings stacking, with the filtered tailings being placed over the existing tailings facility. In the case of TSF5/TSF5A the filtered tails will complement the buttressing that has already taken place. Per the TSF Siting Study, TSF5/TSF5A could store 3.8 million tonnes of filtered tailings, sufficient to accommodate just over five years of production, while TSF3 could store an additional 2.3 million tonnes, sufficient for a further three years of production. This is sufficient storage for the LOM plan developed for the current resource. Should additional capacity become necessary, Wood is recommending moving to paste that would be placed underground.

Ultimately the decision as to whether to proceed with paste or to develop a greenfields facility at Site 4 does not need to be made for several years, and will depend on myriad factors, namely the expected mine life, capital and operating costs, and social, environmental, and permitting conditions at the time. Design criteria for the facilities is presented in Table 18.1.

Table 18.1 Tailings Storage Facility Design Criteria

Criterion	Unit	Value	Reference
Filter TSFs			
Upstream Slope	Horizontal:Vertical	N/A - Filter TSF	Wood
Downstream Inter-Bench Slope	Horizontal:Vertical	2.5:1	Wood
Bench Width	m	8	Wood
Inter-Bench Height	m	10	Wood
Overall Downstream Slope	Horizontal:Vertical	3.0:1	Wood
Crest Width	m	N/A - Filter TSF	Wood
Factors of Safety Note: Only preliminary long term static stability assessments were performed for this scoping level study. No deformation assessments have been performed.			
During and Immediately Following Construction Downstream Slope	N/A	1.3 Downstream and upstream slopes *Not assessed for the Scoping Level Study*	CDA, 2019
Long Term: Steady state seepage, normal pond level Downstream Slope	N/A	1.5 Downstream and upstream slopes	CDA, 2019
Rapid Drawdown Upstream Slope	N/A	1.3	CDA, 2019

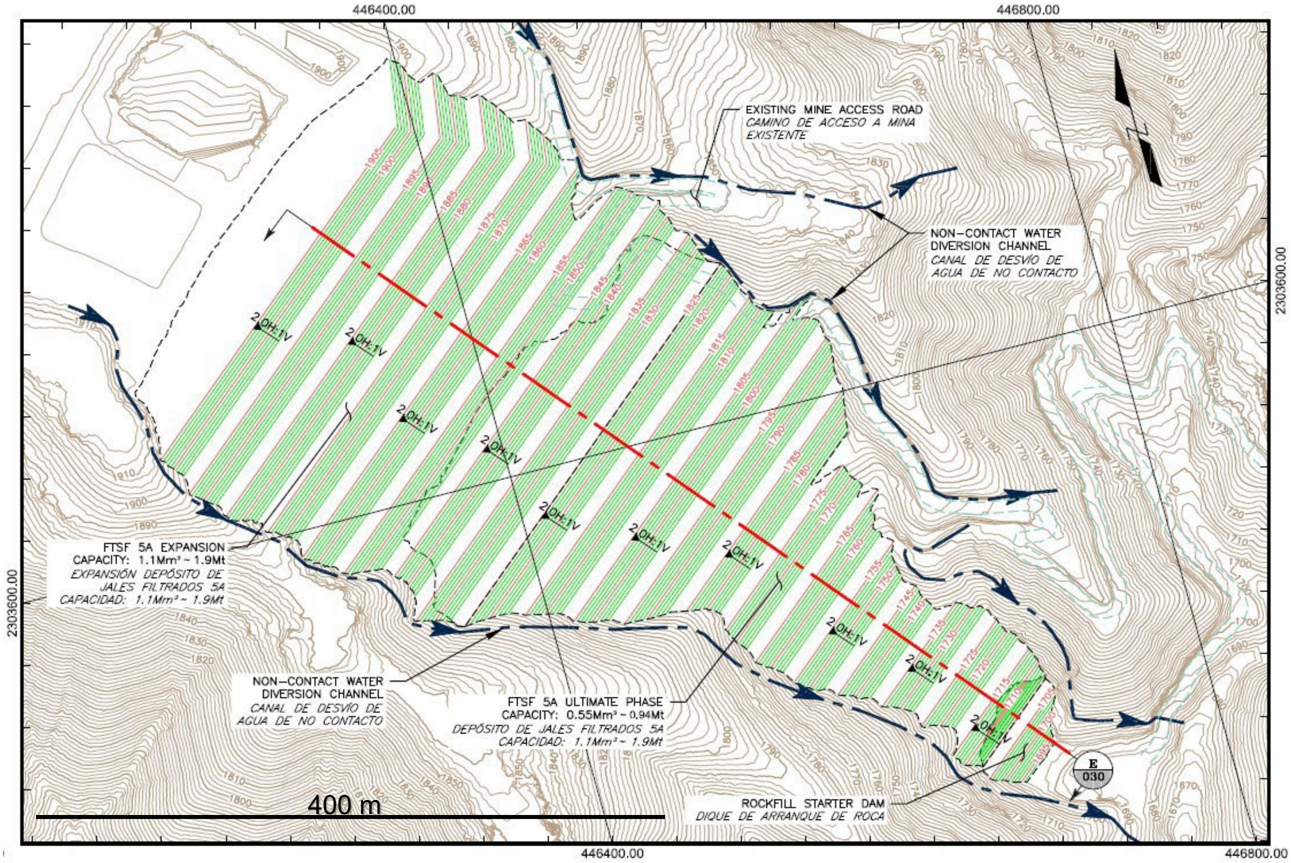
Criterion	Unit	Value	Reference
		Upstream slope *Not assessed for the Scoping Level Study*	
Pseudo Static Condition Downstream Slope	N/A	1.0 Downstream and upstream slopes *Not assessed for the Scoping Level Study*	CDA, 2019
Post-Earthquake Downstream Slope	N/A	1.2 Downstream and upstream slopes *Not assessed for the Scoping Level Study*	CDA, 2019
Tailings and Beach Parameters			
Tailings Sub-Aerial Slope	%	0.7	Wood – assumed
Tailings Sub-Aqueous Slope	%	2.5	Wood – assumed
Tailings Specific Gravity	N/A	3.20	TGI Based on laboratory testing
Slurry Solids Content	%	35	MLN
Tailings In-Situ Density	Metric tonnes/m^3	1.7 for compacted tailings at filter TSFs 1.4 for average density at centerline TSFs	Wood
Freeboard Requirements			
Minimum Freeboard			
Freeboard for Centerline TSFs	m	3	Mexican regulation as the TSF is in an area impacted by hurricane generated precipitation.

Source: Wood

The benefit of placing filtered tailings on the existing facility is the minimal additional disturbance required, as well as a shortened permitting timeline: the only permitting required will be a modification of the MIA required for the construction of the filtered tailings facility. Figure 18.4 shows the preliminary design for the placement of filtered tailings on TSF5/TSF5A.

The bulk of the capital required to develop the filtered tailings facility is devoted to the filtration plant and the conveyor, with the remaining capital required for site preparation, starter embankment earthworks, underdrain system, seepage collection and pumpback, and instrumentation. The capital and operating costs for the filtered tailings system are outlined in Sections 21 and 22.

Figure 18.4 TSF5/TSF5A Filtered Tailings Layout



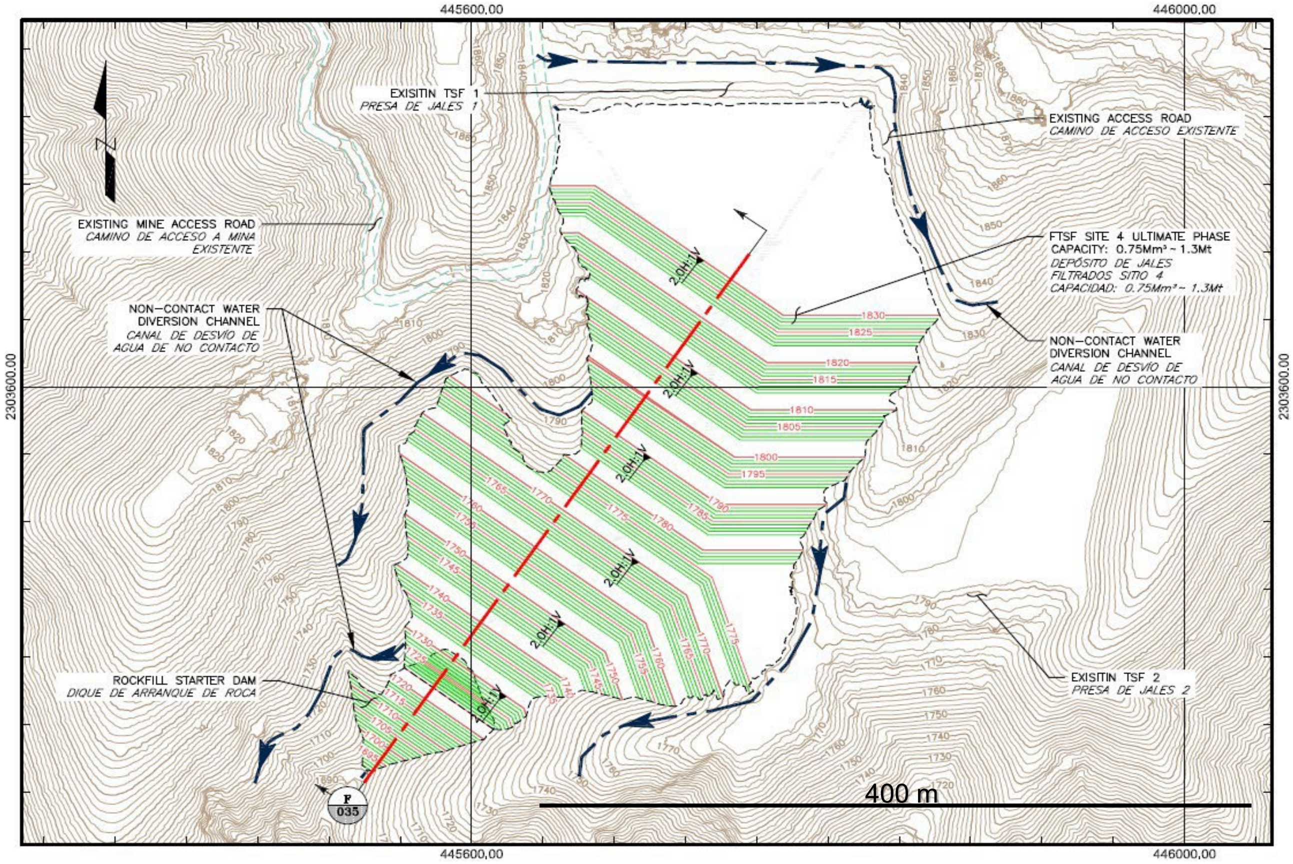
Source: Wood

The capital for TSF3 consists of similar infrastructure to that required for the development of filtered tailings of TSF5/TSF5A, namely site preparation, starter embankment earthworks, the installation of an underdrain, seepage collection pond and pumpback systems, and upstream stormwater channels. This capital, however, would be incremental, as the filter plant and part of the conveyor would have already been purchased. Development of the TSF3 filtered tailings facility would require moving the conveyor and extending it by approximately 600 m.

The ultimate development of Site 4, if warranted, would require significant more capital given that it is a greenfields site but, as in the case of TSF3, this capital would be incremental and consist of site preparation and infrastructure. The conveyor from the plant to Site 4 would have a length of 1785 m. Although Site 4 could also be developed as a site for cyclone tailings, this has several disadvantages, principally its lower capacity, 2.3 million tonnes vs 5.3 million tonnes for filtered tailings, higher capital for the development of the starter embankment, and higher remediation costs. Moreover, if the filter plant and conveyor have already been purchased for us at TSF5/TSF5A, it makes greater sense to develop Site 4 as a filtered tailings site.

Figure 18.5 is a schematic of the preliminary design for the placement of filtered tailings on TSF3.

Figure 18.5 TSF3 Filtered Tailings Layout



Source: Wood

Figure 18.6 below shows the preliminary layout for the development of a potential filtered tailings storage facility at Site 4.

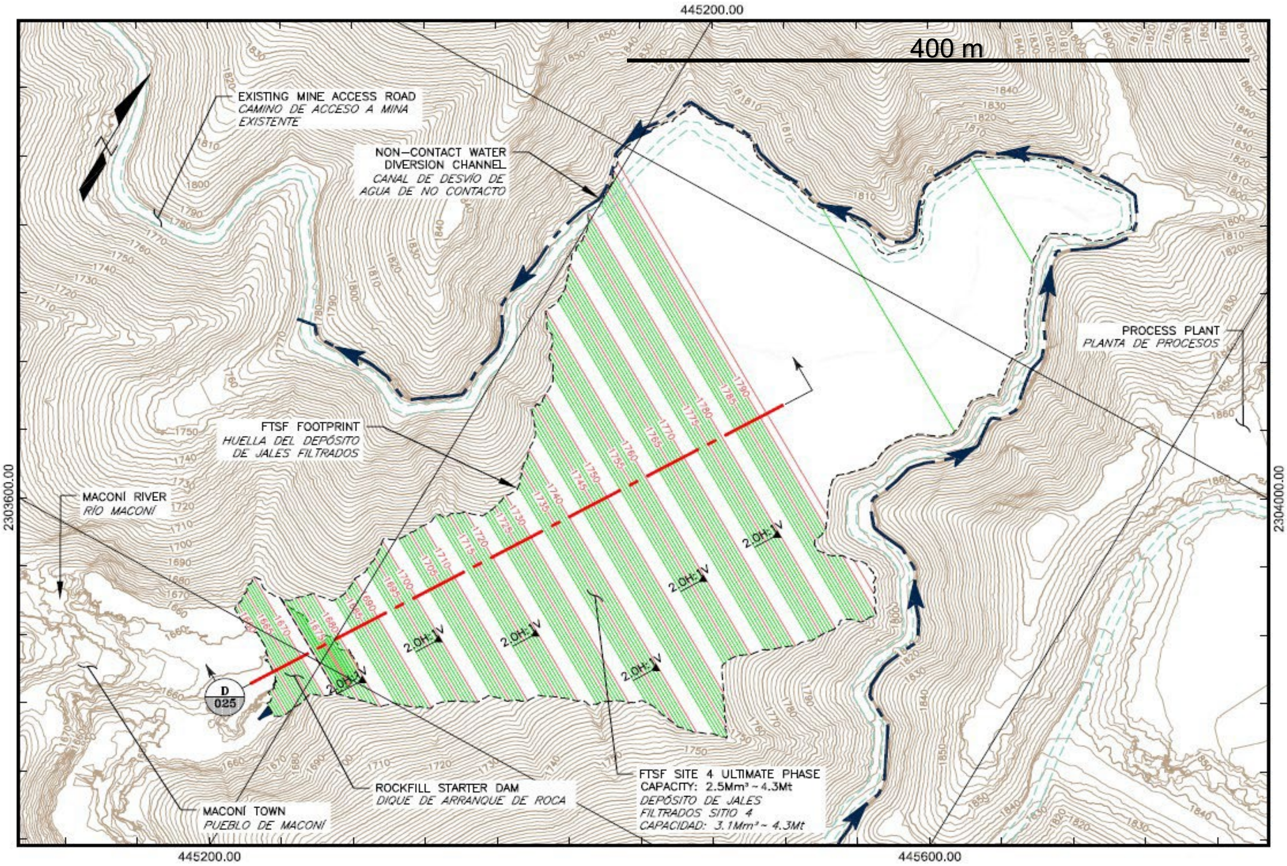
18.5.3 Filter Plant

The TSF Siting Study includes a PEA-level estimate for the cost of installing and operating a filter plant capable of producing filtered tailings with a moisture content suitable for deposition in the existing TSF5/TSF5A and TSF3 facilities. These estimates have been included in Sections 21 and 22 of this report.

MLN plans to filter tailings to a moisture content of approximately 11% (geotechnical basis) and the use of a conveyor to deliver the filtered tailings to the base of TSF5A.

The filtration facility would be built in the yard outside the main 2000 Level portal, a large flat area with plenty of space to accommodate the plant and close to the top of TSF5A. Tailings with approximately 35% solids will be pumped to the filter plant site using the equipment used to pump tailings to TSF5A, from which a conveyor of approximately 950 m will transport the dry tailings to the toe of TSF5A.

Figure 18.6 Site 4 Filtered Tailings Layout



Source: Wood

19 Market Studies and Contracts

19.1 Marketing Studies

Minera La Negra will produce three, high quality saleable products: lead concentrate containing the bulk of the silver, zinc concentrate, and copper concentrate with significant silver values. Each concentrate shipment will be assayed by the laboratory at La Negra prior to shipping for reconciliation and settlement once the concentrate has arrived at the smelter or offtaker depot. The weight of the concentrate and the assays values will then be used to calculate the value of each shipment. If Minera La Negra and the purchaser are within the agreed splitting limits, the payable value of the concentrate will be based on the average of the two assays. Should the two assays fall outside the agreed splitting limits, an independent umpire assay will be obtained, and the assay closest to the umpire will be used to determine concentrate value. Concentrate will be trucked from site to the entrepot indicated by the offtaker; historically, concentrate was trucked by a local contractor to the port of Manzanillo on the Pacific coast.

19.2 Contracts

Mexico is a large global producer of concentrates, and the country has a deep, actively traded and highly competitive market for concentrates.

MLN does not currently have concentrate sales contracts. The mine has historically sold its concentrates to international and domestic concentrate traders. Treatment, payables, penalties, and refining of previous concentrate contracts have been reflective of prevailing market conditions with no abnormal premiums or penalties applied to the material historically produced from the mine.

For the purposes of this study, the following assumptions were made with respect to concentrate offtake terms:

Table 19.1 Minera La Negra Concentrate Marketing Assumptions

	Ag	Pb	Zn	Cu	Fe	As
Material Grade	63	0.46%	1.51%	0.35%	8.78%	0.71%
Gross Recovery (%)	79.7	72.3	84.0	68.0		
Concentration Ratio		193.1	34.5	99.9		
Concentrate Grade		**Pb**	**Zn**	**Cu**		
Moisture (%)		11.1	12.2	10.2		
Ag (g/t)		8,362	156	1,740		
Pb (%)		60.2	0.2	2.4		
Zn (%)		1.3	49.2	6.7		
Cu (%)		0.0	0.0	23.9		
Fe (%)		0.0	15.0	0.0		
As (%)		0.63	0.00	0.38		
Sb (%)		1.2	0.00	0.03		
Cd (ppm)		0.0	0.42	0.00		
Bi (%)		2.0	0.00	0.00		
SiO_2 (%)		0.0	0.00	0.00		
Cl (ppm)		0.0	0.00	0.00		
F (ppm)		0.0	0.00	0.00		
Payability						
Ag (%)		95%/50g/t ded	70%/100g/t ded	90%/31g/t ded		
Pb (%)		95%/3% ded	0.0	0.0		
Zn (%)		0.0	85%/8 % ded	0.0		
Cu (%)		0.0	0	96.5%/1% ded		
Deductions						
Treatment Charge (US$/t)		97	150	75		
Treatment Charge Escalation (US$/t)		0	0.12 > 1900/t	0		
Refining Charge Ag (US$/oz)		0.75	0.0	0.75		
Penalties						
As (US$/t)		0	0	2.5 > 0.2%		
Sb (US$.t)		0	0	2.5 > 0.1%		
Pb+Zn (US$/t)		0	0	2.5 > 2.0%		
Fe (US$/t)		0	2.5 > 5%	0.0		
As+Sb (US$/t)		2.5 > 0.3%	0.0	0.0		
Zn (US$/t)		2 > 5.0%	0.0	0.0		
F+Cl (US$/t)		2.00 > 500ppm	0.0	0.0		
NSR (US$/t)			**72.2**			

Source: Minera La Negra

19.3 Commodity Pricing

The following commodity price assumptions were used in the preparation of this study.

Table 19.2 Commodity Price Assumptions

Commodity	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Silver	US$/oz	22.50	22.50	22.13	22.00	22.00	22.00	22.00	22.00
Lead	US$/lb	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Zinc	US$/lb	1.18	1.16	1.15	1.15	1.15	1.15	1.15	1.15
Copper	US$/lb	3.95	3.76	3.78	3.65	3.60	3.60	3.60	3.60
MXN	per US$	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

Source: MLN

19.3.1 Silver

Although silver prices corrected sharply following the beginning of Covid-related shutdowns, the metal rebounded as a safe-haven asset, driven by the sharp decline in real interest rates and the concurrent rally in gold prices. Although silver corrected towards the end of 2021 from its summer highs, the metal has rebounded sharply in early 2022 in response to Russia's invasion of Ukraine.

Figure 19.1 Silver Price Chart (US$/oz)

Source: Bloomberg

Fundamentally, silver has benefited from a decline in production coupled with an increase in demand for investment purposes and for applications in solar panels. According to the Silver Institute, global silver production peaked in 2016 at 899.4 million ounces (moz) but by 2020 had declined to 784.4 moz, driven primarily by declining production from Peru, although also affected by a 5.8% decline due to production curtailments in 2020 due to Covid. Silver production is expected to rebound in 2021, with the Silver Institute/Metals Focus estimating a rebound in silver production to 848.5 moz. Mexico remains the world's preeminent silver producer, with 2020 estimated production of 178.1 moz, followed by Peru with output of 109.7 moz and China which produced an estimated 108.6 moz in 2020.

Silver remains essentially a by-product metal, with only some 27% of production from primary sources, with the balance coming as a by-product of lead-zinc, copper, and gold production. Scrap supplies have remained steady for the past several years at about 170 moz per year, a trend that is expected to continue despite the recent run up prices.

Table 19.3 Silver Mine Production by Source (moz)

Region	Lead/Zinc	Primary Ag	Copper	Gold	Other
North America	26.8	117.3	16.2	58.3	0.6
Central & South America	66.0	43.0	73.8	37.3	0.0
Europe	13.2	1.6	44.8	1.3	0.0
Africa	2.9	5.7	2.8	3.3	0.0
CIS	15.3	20.2	24.4	8.1	3.0
Asia	100.9	7.7	31.0	9.5	1.5
Oceania	23.2	13.9	5.4	5.5	0.0
Total	**248.3**	**209.4**	**198.3**	**123.3**	**5.1**

Source: Metals Focus

On the demand side, silver had benefited from increasing industrial demand, primarily for use in photovoltaic cells and telecommunications, with the former accounting for 101 moz of demand in 2020 out of total physical demand of 896.1 moz, according to the Silver Institute. Net physical investment demand reached 200.5 moz in 2020, plus an additional 331.1 moz of demand from exchange-traded products, resulting in a market deficit of 251.0 moz for 2020.

Table 19.4 Silver Supply and Demand

Million ounces	2018	2019	2020	2021E	2022E	2023E	2024E	2025E	2026E
SUPPLY									
Mine Supply	848	833	784	827	897	958	973	1,003	989
Scrap/Recycling	168	171	182	195	189	184	178	173	173
Official Sector	1	1	1	2	1	1	1	1	1
Total Supply	1,017	1,005	968	1,023	1,087	1,143	1,152	1,176	1,163
DEMAND									
Industrial	513	515	487	521	538	550	561	570	581
Photovoltaics	93	99	101	114	118	119	118	116	117
Automotive	0	58	50	56	61	64	68	70	73
5G	0	7	9	11	13	15	17	19	20
Other Electrocnis	229	153	145	148	151	154	157	160	163
Other Industrial	192	198	183	193	196	199	202	205	208
Photography	34	33	28	26	25	24	23	21	20
Jewelry	202	200	149	176	189	196	203	211	220
Silverware	68	62	33	40	58	62	66	71	76
ETFs	-21	83	331	40	2	67	79	43	24
Net hedging	7	0	0	0	0	0	0	0	0
Other Physical Investment	166	186	201	255	242	230	219	208	208
TOTAL Demand	990	995	896	1,018	1,052	1,062	1,071	1,080	1,104
Surplus (Deficit)	49	-60	-251	-35	33	15	2	53	34

Source: BMO

Mine supply is expected to increase in the next few years as new projects come into production even as demand for industrial uses continues to grow. A decline in investment demand would bring the market closer to balance over the period, but this remains a significant imponderable given the uncertain economic environment. While the onset of the pandemic led to a significant rise in demand for silver from exchange-traded funds in 2020 – on the order of 330 to 350 moz – it is unclear whether this level of demand is sustainable. Both the Silver Institute/Metals Focus and private banks are forecasting a decline in ETF silver demand in 2021, but the ranges are quite wide, and it is likely that ETF demand will rebound sharply in 2022.

19.3.2 Lead

The lead price has traded in a descending range over the past three years but more recently was rather unscathed by the Covid downturn before recovering throughout the latter part of 2020 and into 2021. The metal has benefited from both stable sources of supply and a stable source of demand, with the latter benefiting from China's increased demand for e-bike batteries.

Figure 19.2 Lead Price Chart (US$/lb)

Source: Bloomberg

The shift to a less carbon-intensive economy could have longer-term ramifications for lead, given its predominant use in automotive lead-carbon batteries. While in the near- to medium-term lead batteries will continue to be dominant and lithium-ion batteries are a distant and complementary technology, over the longer term these two will be in competition. Lead benefits from a well-developed recycling network developed over decades, but concern over its toxicity in an ESG-driven world could result in reduced demand.

Table 19.5 Lead Supply and Demand

Tonnes '000	2018	2019	2020E	2021E
Global Production	12,755	13,202	12,677	13,160
Global Consumption	12,771	12,873	12,201	12,967
Balance	-16	329	476	193
Market inventories	437	766	1,243	1,436
Weeks of world demand	1.8	3.1	5.3	5.8

Source: BofA Global Research

19.3.3 Zinc

The price of zinc declined by some 50% from the beginning of 2018 to mid-2020 before rebounding sharply since then, driven partially by low inventories, production shutdowns, and a less developed recycling life cycle. Zinc has benefitted – like most industrial metals – from the rebound in activity which has taken place after the initial round of Covid-driven lockdowns abated. Zinc benefits from its role as a key element in galvanized steel, with demand growing in line with global economic growth. With the onset of hostilities in Ukraine, zinc has rallied sharply.

Figure 19.3 Zinc Price Chart (US$/lb)

Source: Bloomberg

Recently, spot zinc premiums have continued to climb in Europe and the U.S. amid an acute shortage of physical metal available for delivery. This despite Nyrstar announcing the restart of operations at its Auby smelter in France. Northern Europe premiums have risen to $430-475/t, while the Midwest U.S. premium has jumped to 26-30c/lb. In addition to the tight physical market, reports of spiking freight costs due to rising gasoline and diesel prices have also driven the delivered premium higher.

While the outlook for zinc may not be as intriguing as the demand for EV metals, demand is expected to grow consistently, providing a solid backdrop for the metal. Although the project pipeline appears robust on paper, actual project development is likely to fall short. Moreover, many of the projects on the drawing board are not meant to come into production until the 2024-25 timeframe.

Table 19.6 Zinc Supply and Demand

Tonnes '000	2018	2019	2020	2021E	2022E	2023E	2024E	2025E	2026E
SUPPLY									
Mine Supply	12,855	12,881	12,259	13,043	13,228	13,531	13,546	13,665	13,858
Total Refined Supply	13,247	13,400	13,740	13,913	14,100	14,476	14,738	14,963	15,099
CONSUMPTION									
China	6,800	6,879	6,971	7,355	7,502	7,614	7,690	7,767	7,845
United States	1,026	984	889	943	957	966	971	966	961
Europe	2,403	2,282	2,034	2,196	2,262	2,296	2,308	2,296	2,285
India	701	673	554	601	631	663	696	737	785
Japan	477	458	401	419	423	419	413	406	400
Other Asia	1,346	1,317	1,209	1,270	1,333	1,387	1,442	1,478	1,508
RoW	1,351	1,229	1,134	1,191	1,221	1,254	1,276	1,302	1,328
TOTAL Consumption	14,104	13,822	13,192	13,975	14,329	14,599	14,796	14,952	15,112
Surplus (Deficit)	-857	-422	548	-62	-229	-123	-58	11	-13

Source: BMO

19.3.4 Copper

The outlook for copper in the months leading up to the Covid outbreak was uninspiring, with the metal trading in a narrow range between US$2.50 and $3.00 per pound before succumbing to panic when China entered lockdown. But the swift reopening not only presaged a rebound in copper but also ushered in a potential new era for copper, with investors now beginning to worry about how the metal of choice for the new, green economy is going to be supplied in the necessary quantities.

Figure 19.4 Copper Price Chart (US$/lb)

Source: Bloomberg

Unlike the outlook for other base metals, clouded by concerns over sustainability of demand and the lack of new applications, there is general agreement that one of the main obstacles to the development of the green economy (both EVs and renewable energy) will be developing sufficient new copper mines to keep up with burgeoning demand. The supply side is exacerbated by several factors, notably the uncertainties facing two key producers, Chile and Peru. For the former, the concerns center on increasing environmental regulation and lack of access to water and power. For the former, the recent election of a president with an unclear stance towards large-scale mining has raised the risk of for producers considering large-scale capital investments in this country. And, globally, capital pressures are being felt as they have not been for a decade.

There are, however, several new projects in progress, although a number of these are replacements of existing production. In Chile Codelco has projects ongoing at Chuquicamata, Andina, and El Teniente, and Anglo American expects to being production at Quellaveco in 2022. Antofagasta expects to complete expansions at Los Pelambres, Esperanza Sur and Zaldívar, also in 2022. In the DRC Glencore is planning to restart the Mutanda mine, while Ivanhoe continues the ramp-up of Kamoa-Kakula. All together these projects, plus projects in Panama, Indonesia, Poland, and Mongolia could add up to 3.6 million tonnes over the coming years, according to research from BofA.

Table 19.7 Copper Supply and Demand

Tonnes '000	2018	2019	2020	2021E	2022E	2023E	2024E	2025E	2026E
SUPPLY									
Chile	5,851	5,861	5,787	5,700	5,829	6,063	6,218	6,180	6,180
Peru	2,392	2,425	2,132	2,270	2,523	2,813	2,952	2,837	2,657
United States	1,277	1,308	1,243	1,336	1,456	1,429	1,435	1,474	1,476
China	1,615	1,694	1,754	1,862	1,869	1,901	1,944	1,951	1,951
Australia	905	910	861	865	841	816	744	705	622
Indonesia	659	363	518	742	959	1,066	940	936	898
DRC	1,384	1,489	1,697	1,940	2,201	2,440	2,581	2,530	2,546
Zambia	846	791	850	932	1,052	1,079	1,033	1,019	904
Russia	805	825	874	926	1,021	1,113	1,135	1,141	1,118
RoW	5,103	5,304	5,296	5,377	5,755	6,055	6,121	6,023	5,982
Mine Supply	20,837	20,970	21,012	21,950	23,506	24,775	25,103	24,796	24,334
Smelter Supply	19,584	19,751	20,340	20,774	21,496	22,573	23,361	24,051	23,851
Total Refined Supply	23,565	23,584	24,036	24,263	25,083	26,026	26,813	27,630	27,577
CONSUMPTION									
China	11,820	12,038	12,614	12,677	12,829	13,214	13,610	14,018	14,439
Japan	996	966	839	907	925	934	943	953	962
India	508	537	459	491	515	536	557	574	597
Other Asia	2,221	2,223	2,068	2,234	2,305	2,420	2,541	2,668	2,802
United States	1,827	1,856	1,781	1,941	1,980	2,030	2,080	2,132	2,186
Europe	3,813	3,637	3,554	3,910	4,027	4,127	4,231	4,336	4,423
RoW	2,469	2,424	2,213	2,324	2,417	2,465	2,551	2,634	2,723
REFINED Consumption	23,654	23,681	23,528	24,482	24,997	25,726	26,514	27,316	28,132
SRB Stock Change	0	0	520	-120	0	100	100	100	0
Surplus (Deficit)	-89	-97	-12	-99	86	200	199	213	-555

Source: BMO

19.4 Royalties

As described in section 4.5 Minera La Negra is subject to the two statutory production royalties and to one private royalty owned to Peñoles.

The statutory mining royalty (*derecho especial de minería*) is payable twice annually at a rate of 7.5% of gross income from mining activities, subject to certain allowable deductions as described in the Ley del *Impuesto Sobre la Renta* article 25 (but excluding capital investment, financing costs and inflation adjustment). In addition, producers of gold, silver and platinum are also required to pay an additional, extraordinary mining royalty (*derecho extraordinario de minería*) equivalent to 0.5% of all revenues arising from the sale of gold, silver and platinum, and is payable in March of each year.

When Aurcana acquired La Negra in 2006 Peñoles retained a royalty on certain concessions. Following a lengthy legal dispute over the terms of the royalty, the parties agreed to amend the royalty In April 2020 follows:

- 2.8% when the price of copper is equal to or above US$1.60 per pound; or
- 2.4% when the price of copper is equal to or above US$1.30 per pound; or
- 2.0% when the price of copper is equal to or above US$1.00 per pound; or
- 0% when the price of copper is less than US$1.00 per pound.
- The royalty is payable after the deduction of US$16 per tonne of concentrate and the deduction of freight.

Although tied to the price of copper, the royalty is payable on all minerals produced from the following concessions: La Negra and Mariana (where the historic and current operations are centered), El Patriarca, La Yegua, and El Negro.

20 Environmental Studies, Permitting and Social or Community Impact

20.1 Corporate Governance

Minera La Negra is committed to carrying out all of its activities in compliance with sustainable development principles. The company has established a series of policies covering a range of environmental and community issues and which guide the company's activities.

- Code of Conduct
- Anti-bribery/Anti-corruption Policy
- Environmental Policy
- Human Resources Policy
- Occupational Health and Safety Policy
- Security Policy
- Social Policy, and
- Gender Equality Policy

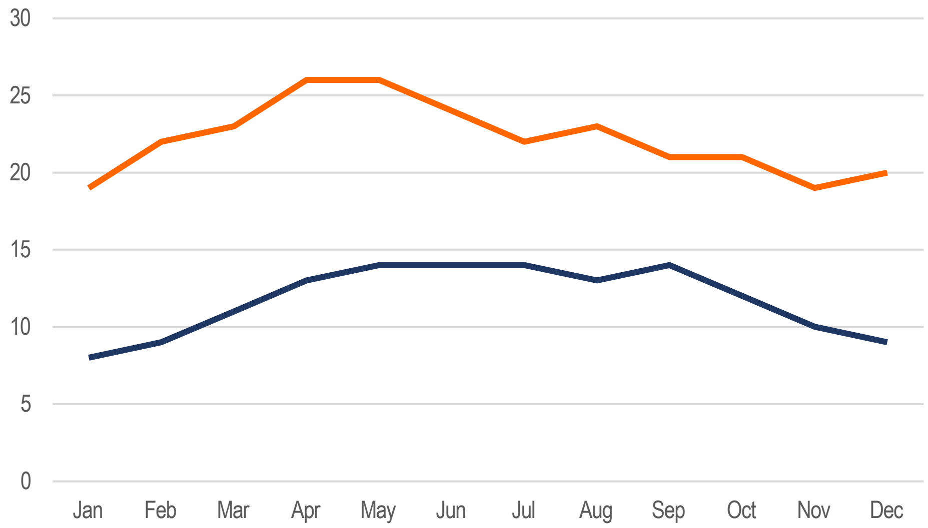
These policies are currently being updated for review and approval by the owners.

20.2 Location, Environmental and Social Setting

The La Negra mine is located in the state of Querétaro and is entirely within the municipality of Cadereyta de Montes. The mine's social footprint, however, extends into the adjacent municipality of San Joaquín, which is a source for part of the company's workforce. The Moctezuma River, which delimits the company's concessions to the east, is also the border between the state of Querétaro and the state of Hidalgo. The project area is open but characterized by very steep topography. The climate is semi-arid but temperate due to the altitude, with a period of heavier rainfall in May-September. Figure 20.3 below shows a typical view of the project area.

The known mineral deposits identified at La Negra are located at an elevation of 1800 masl to 2400 masl, although the local peaks reach 2700 masl and mineralization is known to outcrop at surface. The area is steep, mountainous and contains a series of high peaks separated by narrow valleys and/or drainages. Surface water run-off from the slopes surrounding the project area flow south into the Maconí River. The land within the mine's footprint is characterized by cacti, scrubland and bush typical of a semi-arid environment, with more abundant vegetation in drainages and catchments. There is local subsistence grazing and farming in the area around the project.

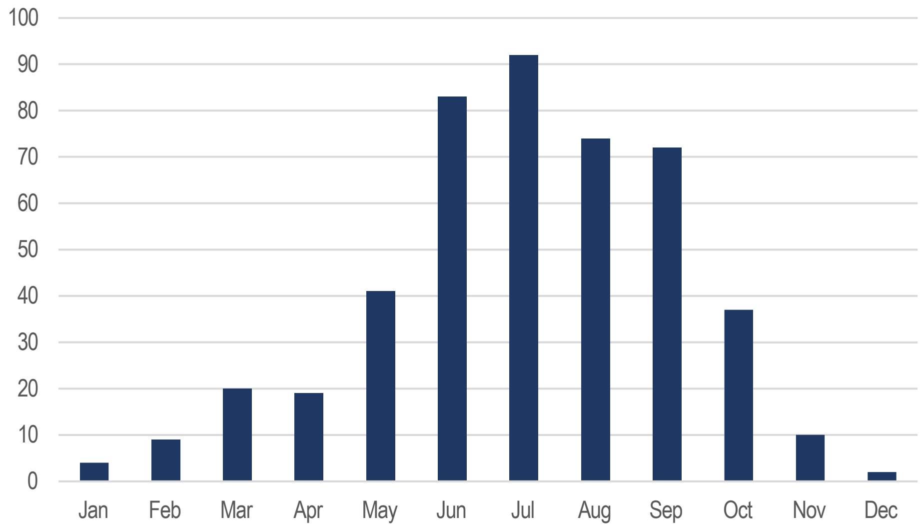
Figure 20.1 Average Maximum and Minimum Temperature at La Negra (°C)



Source: MLN

The climate in the project area is generally mild, with little variation in temperature at different elevations and only slightly warmer temperature conditions during April and May and slightly cooler conditions during the winter. The yearly maximum temperate averages 22.2°C and the yearly minimum is 11.8°C. The average annual rainfall totals 463mm, of which an average of 362mm falls in the May to September period.

Figure 20.2 Average Monthly Rainfall at La Negra (mm)



Source: MLN

The closest town to the mine is Maconí which sits approximately 3.4 km west of the plant site and administrative offices, and 4.1 km from the main mine portal. Maconí has a population of approximately 900 inhabitants many of which depend on the mine. In addition, there are another 20 communities surrounding the mine site. Most of these are extremely small, consisting of just a handful of families.

Figure 20.3 Typical Landscape

Source: MLN

The following table lists the 21 communities surrounding Minera La Negra and which together belong to the *Comunidad Agraria Maconí*. The largest of these is Maconí, with a population of over 900 inhabitants, but the majority as shown below consist of small communities with a population of less than 100 inhabitants.

Table 20.1 Minera La Negra Surrounding Communities

Community	Population
Maconí	916
Los Piñones	195
Barrio Solares	143
Rancho la Honda (San Nicolás)	133
El Huizache	126
La Mora	125
El Divino Pastor	106
Rancho Viejo	88
Los Lirios	83
Santo Tomás	83
Cerro Colorado	62
La Blanca	48
La Mesa	36
El Hortelano	32
El Timbre	30
Las Joyas	30
El Torno	27
Los Martínez	20
Molinas	6
Rancho la Luz	5
Mezquital (Alamos)	N/A
Total	**2,294**

Source: INEGI

20.3 Permitting, MIA

The following sections detail Minera La Negra's existing permits and licenses and describe Mexico's environmental permitting regime.

20.3.1 Permits and Licensing

The following table lists the key operating and environmental permits issued to Minera La Negra, and which allow the mine to engage in mining, processing, and tailings storage.

Table 20.2 Minera La Negra Permits

License/Permit	Agency	Document Number	Status
Operating License	*SEMARNAT*	No. 0168 / 130.25 I. SE469, 27	Valid
Environmental License	*SEMARNAT*	LAU-22 / 000004-2016	Valid
Environmental Impact Statement (MIA) Mine, Plant and Tailings	*SEMARNAT*	F.22.01.01.01/1882/17	Valid
Environmental Impact Statement (MIA) TSF5	*SEMARNAT*	D.O.O. - 04853	Expired*
Environmental Impact Statement (MIA) TSF5A	*SEMARNAT*	F.22.01.01.01/1533/16	Valid
Environmental Impact Statement (MIA) Settling Pond	*SEMARNAT*	F.22.01.01.01/0070/2020	Pending
Hazardous Waste Register	*SEMARNAT, CONAGUA, STPS, SSC, SDS and municipal authorities*	22/EV-0040/10/18	Valid
Land Rezoning	*SEMARNAT, CONAGUA, STPS, SSA, SDS*	SRN/280/98	Valid
Federal Water Use Permit	*CONAGUA*	QRO100564	Valid
Wastewater Discharge Permit	*CONAGUA*	09QRO106300/26EDDL12	Valid
Waste Use Permit	*SEMARNAT, CONAGUA*	2S.3.21/00051-2020	Valid
Organic Residue Permit	*SEDESU*	-	Valid
Hazardous Waste Management Plan	*SEMARNAT*	22-PMG-I-3478-2019	Valid
Special Waste Management Plan	*SEDESU*	-	Pending
TSF5A Closure Plan	*SEMARNAT*	-	Pending
Explosives Permit	*SEDENA*	3121-Qro.	Valid

Source: Minera La Negra. *Not required for operations

20.3.2 Mexican Republic MIA

Minera La Negra operates under three separate environmental impact statements (*Manifestación de Impacto Ambiental – MIA*), two of which are currently valid and in effect. The third is for the TSF5 facility which is no longer in use. The initial MIA was issued for the mine, mill, and the original tailings facility. A second MIA was issued for the development of TSF5 (Tailings Storage Facility 5), and the third was an amendment that allowed the expansion of TSF 5, known as TSF5A.

These studies considered the impact of the operation on the environment and the social impact of the project. The area affected by the project is located in a region that had experienced significant historical impact, including past mining operations dating back to the pre-Columbian era as well as other human activities stretching back for hundreds of years.

20.4 Significant Project Consumption and Releases

20.4.1 Project Footprint

The project footprint consists of approximately 51 ha and constitutes the areas that are directly disturbed by existing infrastructure and earthworks, in addition to those that are projected as part of the longer-term operation of the mine. Most of the area impacted by the mine had been subject to previous disturbance.

20.4.2 Particulate Matter (PM10 and PM 2.5) and Dust

Dust emissions are measured as Total Suspended Particulate matter (TSP). Of greatest concern for human health and the environment is the finer size fraction or suspended particulate matter (PM10 and PM2.5) as well as dust with a larger particle size. PM10 refers to material with an upper size of 10 μ that can lodge in the upper respiratory tract, while PM2.5 refers to material with an upper size of 2.5μ that can be inhaled deep into the lungs.

Minera La Negra's main sources of TSP will be the result of mining activities, including drilling, blasting, haulage, tipping, conveying (especially transfer points), crushing, as well as vehicular traffic. As most of these activities take place underground, they do not represent a risk to nearby communities, but measures are in place to reduce the risk to the workforce, particularly that segment of the workforce engaged in underground activities or in activities with a potential for exposure to particulate matter, such as the assay lab.

TSP measurements are taken by an independent contractor every six months from both point sources within the mine and from randomly chosen community locations in the vicinity of the mine. The former must comply with the requirements of SEMARNAT rule NOM-043-SEMARNAT-1993, while the latter must comply with the requirements of NOM-25-SSAI-2014.

La Negra operates under an annual atmospheric conservation plan (*Plan Anual de Protección y Conservación de la Atmósfera*).

20.4.3 Greenhouse Gas Emissions

Minera La Negra will generate greenhouse gas (GHG) emissions, which are emitted as a result of the direct or indirect use of fossil fuels in the process of mining and processing. For corporate reporting purposes GHG emissions are divided into three categories, or scopes. Scope 1 emissions are those that are owned or controlled by the company. Such activities include the operation of scoops and haulage vehicles, the vehicles used to transport employees, explosives utilized in mining, and the diesel consumed by backup electrical generation. Scope 2 emissions are those that result from the purchase of electricity, primarily used in the processing plant and to power the jumbos and production drills, fans, compressors, and pumps. The power consumed at La Negra (other than during blackouts) is provided by the hydroelectric facility at the Fernando Hiriart Valderrama Dam. Scope 3 emissions are not emitted or controlled by the company but result indirectly from inputs and material that the company purchases. The GHG emitted in the production of processing plant reagents would be an example of Scope 3 emissions.

The company is required to report its annual emissions of GHG as part of its *Cédula de Operación Anual*. Mineral La Negra reported GHG of 12.79 t of CO_2eq in 2019 and 2.83 t of CO_2eq in 2020, both years with limited operations. These figures include Scope 1 and Scope 2 emissions.

It is estimated that a total of 11,000 tonnes of CO_2eq will be emitted on an annual basis during normal operations, based on historical operating experience. Further opportunities to reduce the emissions of GHG will be considered.

20.5 Environmental Context

20.5.1 Geology and Soils

As noted in Section 7, the geology of the area of La Negra is characterized by thick sequences of near shore to deep water calcareous rocks of predominantly late Cretaceous age which were subsequently folded and intruded by Eocene magmas of mostly granodioritic composition. These underlying rocks directly impact the composition of the soils in the area.

In the project area the main soil type is a poorly developed and poorly stratified calcaric regosol, reflecting the composition of the underlying rocks. In addition to the calcaric regosol, the central and southern extensions of the Maconí micro watershed also contains lithosol and rendzina. The northern and western reaches of the Maconí micro watershed consists of chromic luvisol, chromic cambisol and ferric acrisol.

20.5.2 Earthquakes and Seismic Hazard

Mexico is located within the North American Plate near the boundary of the Pacific and Cocos Plates. Most seismic activity takes place along the southern coast of the country where the Cocos Plate and the associated Rivera microplate are in contact with the North American Plate.

According to Mexico's Geological Survey (*Servicio Geológico Mexicano*) the northeastern part of the state of Querétaro, where La Negra is located, has a low seismic risk profile. The country's national disaster prevention agency, Cenapred (*Centro Nacional de Prevención de Desastres*) rates the seismic risk as medium.

The SGM has recorded only three noteworthy earthquakes in the period 1902 to the present in the area. The most recent of these took place on 23 September 2020, with a magnitude of 3.9. The epicenter was 8 km NE of Zimapán and occurred at a depth of 2 km. On 3 October,1996 a 3.8 magnitude earthquake was recorded 9 km W of Zimapán at a depth of 57 km. Also in 1996, on 22 September, a 4.2 magnitude earthquake occurred 8 km N of Zimapán at a depth of 20 km.

The last seismic survey carried out on the property was completed in August of 2019 by Tierra Group International.

20.5.3 Water Resources

Minera La Negra operates under an annual plan for the protection of surficial water (*Plan Anual de Protección de Agua Superficial).* The plan requires routine water sampling in the Maconí River and its tributaries, effluent from the bioreactors in the processing plant and San Ignacio Hacienda, and from random points adjacent to the mine. This sampling is carried out by a certified, independent contractor in compliance with regulation NOM-001-SEMARNAT-1996. The company's surficial water plan also requires the installation and maintenance of diversion channels to keep water out of the tailings dam.

20.5.3.1 Groundwater

The Maconí micro watershed belongs to the Moctezuma Aquifer which extends for 240 km^2 and partially underlies the municipality of Cadereyta de Montes and a small portion of the municipality of San Joaquín. It is hosted by fractured and/or karstic limestone and is considered highly permeable. The aquifer is considered largely untapped, with only minimal water drawn primarily for domestic use.

The groundwater in the area around La Negra displays a typical high-elevation pattern with deep water levels at the mountain tops and discharge zones in the valleys below. At lower elevations, seeps and springs indicate that much of the area is a groundwater discharge area, with an annual discharge estimated by CONAGUA at 6.5 million m^3. There are both ephemeral and perennial springs in the region.

20.5.3.2 Surface Water

Minera La Negra is located within the Río Pánuco watershed (*Región Hidrológica* No. 26), which is Mexico's fourth largest by surface area and fifth largest by flow volume. The Moctezuma River watershed encompasses over 6,500 km^2 and is the largest in the state of Querétaro. The Maconí micro watershed has a surface area of just under 7,000 ha and drains into the Moctezuma River and consists mostly of the Maconí River and seasonal arroyos.

The main source of surface water is the Maconí River, which flows to the south of La Negra and through the town of Maconí and which drains to the east into the Moctezuma River which divides the state of Querétaro from the state of Hidalgo. These rivers flow year-round, although the flow rate is significantly higher during the rainy season, which peaks from June to September (see Figure 20.3).

20.5.3.3 Community Water Supplies

The source of domestic and municipal water in the town of Maconí is the Maconí River, which runs through the town. In the furthermost communities, especially those that are at higher elevations, water is sourced from springs that is then pumped to each community. MLN has agreements in place to pump water to communities at high elevation from springs within the mine.

20.5.4 Biodiversity

The Mexican government's biodiversity agency CONABIO classifies the area around La Negra as primarily scrubland (*matorral submontano*), which encompasses a variety of different types of vegetation which are generally less than 4 m in altitude and thrive in arid to semi-arid conditions. There are also stands of deciduous and evergreen arboreal vegetation in areas of higher rainfall, dominated by pine and oak. The following table outlines the various types of vegetation encountered in the Maconí micro watershed.

Table 20.3 Maconí Micro Watershed Vegetation Types

Vegetation Type	Surface (ha)	%
Annual rainfed agriculture	565.13	8.18
Permanent and semi-permanent rainfed agriculture	22.13	0.32
Oak forest	476.13	6.89
Oak and pine forest	456.28	6.60
Pine and oak forest	167.26	2.42
Submontane scrub	2226.13	32.21
Pasture land	525.09	7.60
Secondary oak forest scrub	1437.84	20.80
Secondary oak and pine forest scrub	571.63	8.27
Secondary pine and oak forest scrub	263.33	3.81
Secondary juniper forest scrub	200.9	2.91
Total Surface Area	**6911.85**	**100.00**

Source: INEGI

The following table describes the principal plants species belonging to the submontane scrub classification (*matorral submontano*) identified in the Maconí micro watershed. The only protected plant species in the area is the biznaga guamichera (*echinocactus platyacanthus*) or giant barrel cactus, which is subject to a strict rescue and relocation program when identified.

Table 20.4 Submontane Scrub Species in the Maconí Micro Watershed

Family/Subfamily	Scientific Name	Common Name	SEMARNAT Status
Agavaceae	*Agave lechugilla*	Lechuguilla	NA
	Agave Salmiana	Maguey	NA
	Agave striata	Estoquillo	NA
	Yucca filifera	Palma	NA
Aspargaceae	*Dasylirion acrotriche*	Chucharilla	Threatened, endemic
	Dasylirion longissimum	Junquillo	Threatened, non-endemic
Asteraceae	*Porophylum linaria*	Venadita	NA
	Stevia sp	Yerva dulce	NA
Cactaceae	*Cylindropuntia imbricata*	Cardón	NA
	Echinocactus platyacanthus	Biznaga guamichera	Protected, endemic
	Mammillaria elongata	Biznaga	NA
	Mammilaria sp	Biznaga	NA
	Opuntia gosseliniana	Nopal	NA
	Opuntia lasiacantha	Nopal	NA
Convulvaceae	*Ipomoea arborescens*	Cazahuate	NA
	Ipomoea purpurea	Quiebraplatos	NA
Euphorbiaceae	*Jatropha dioica*	Sangregado	NA
Lamiaceae	*Salvia sp*		NA
Leguminosae	*Acacia farnesiana*	Huizache	NA
	Eysenhardtia polystachya	Palo azul	NA
	Mimosa sp	Uña de gato	NA
	Castilleja arvensis		NA
Poaceae	*Muhlenberghia sp*	Zacatón	NA
Rhamnaceae	*Condalia velutina*	Granjeno	NA
	Karwinskia humboldtiana	Sangoi	NA
Scrophulariaceae	*Leucophyllum ambiguum*	Poleo blanco	NA
Selaginellaceae	*Selaginella lepidophylla*	Doradilla	NA

Source: SEMARNAT

While the area around La Negra presents a varied flora, the fauna in the region is not diverse. A series of transects was carried out to identify the predominant megafauna in the area as well as to count the number of individuals of a given species. This work identified a total of 41 bird species, among which the most common was the white-throated swift (*Aeronautes saxatalis*), with other sighted species including mockingbirds, robins, orioles, hummingbirds, swallows, flycatchers, doves, roadrunners, hawks, eagles, crows, and turkey vultures. Based on this data, a Shannon-Wiener index of bird diversity of 2.71 was calculated, indicating medium diversity. For mammal species the predominant species is the gray fox (*Urocyon cinereoargentus*), but other species identified in the region include field mice, weasels, squirrels, rabbits, hares, opossums, badgers, ringtails and bats. Based on the results of the transect, a low diversity index for mammals of 0.68 was calculated.

The diversity of reptiles and amphibians was even lower, at 0.22 and 0.10 respectively. The most common reptile species identified in the transect was the crevice swift (*Sceloporus torquatus*), but other known reptiles include tortoises, chameleons, and several species of snakes, including coral snakes, whipsnakes, and rattlesnakes. The predominant amphibian species is the spadefoot toad

(*Spea multiplicata*) although the small-eared treefrog (*Ecnomiohyla miotympanum*) has also been recognized.

The list of Mexico's protected species is contained in regulation NOM-059-SEMARNAT-2010 and guides the company's policy for the rescue and relocation of endangered vegetation.

20.5.5 Ecosystems Services

The project does not significantly impact any ecosystems which provide important ecosystem services to the local communities. There are no pastures, meadows or grasslands within the project footprint, or areas of native vegetation which are a source of herbs or medicinal plants. Soils are poorly developed and the area is semiarid, which makes it unsuitable for anything other than subsistence agriculture.

20.5.6 Air Quality

There are no significant sources of urban or industrial sources of emissions in the project area, and existing levels of related gases (SO_2, NO_x) and particulates are generally low.

The most significant impact from the project are the emissions from the concentrate haul trucks and the potential dust generated by their activity.

Given that Minera La Negra's overall emissions of GHGs are below the 25,000 t CO2eq threshold mandated by law, the company is not required to break out its specific emissions of SO_2 and NO_x (see Section 20.4.3).

20.5.7 Noise and Vibration

There are no significant industrial activities or major urban areas in the region that would lead to meaningful levels of noise. The baseline noise environment is typical of a rural setting, with low background levels throughout day and night.

The regulation of noise is established by rules NOM-081-SEMARNAT-1994, which sets the maximum permissible noise limits for fixed sources and their measurement, and NOM-080-SEMARNAT-1994 for maximum permissible noise limits for mobile vehicles. Minera La Negra employs an independent environmental consultant to take noise measurements at several locations in the vicinity of the operation to ensure compliance with maximum allowable noise levels.

The company's plan for managing noise is included in the annual atmospheric conservation plan (*Plan Anual de Protección y Conservación de la Atmósfera*).

20.5.8 Archeology and Cultural Heritage

The Toluquilla Archeological Zone (*Zona Arqueológica de Toluquilla*) is located approximately 10km NE of the La Negra operations and is an active outdoor museum site open to the public. It is surrounded by the company's concessions but is, however, off limits to any mining activity. The site consists of a series of 120 prehispanic monuments and habitations dating to two periods, 300BC to 500-600AD and 650AD to 1350AD, of which the construction from the second period is in an excellent state of preservation. The area includes ceremonial and administrative buildings, as well as four ball game courts. It is believed that this was predominantly a mining center which controlled the production of pigments made of cinnabar, garnet, and iron oxides, but also had an important ceremonial/religious role (unlike a similar mining oriented-settlement, Las Ranas, which is 6 km NW of Toluquilla and which is believed to have had an important political/administrative function).

Figure 20.4 Toluquilla Archeological Zone

Source: Instituto Nacional de Antropología e Historia (INAH)

20.5.9 Visual and Landscape

The closest settlement to Minera La Negra is Maconí, located 3.4 km to the west of the operation. Given the distance and the topography the surface mine infrastructure is not visible from the town. There are isolated hamlets near to the operations which have a direct visual to either the processing plant and/or the tailings facility.

20.5.10 Reagent Management

Minera La Negra employs a number of potentially hazardous substances, primarily in the processing plant and laboratory, that include reagents such as sodium cyanide, sodium hydroxide, hydrochloric acid, and nitric acid, among others. To properly mitigate the potential hazards that these chemicals present, Minera La Negra has developed management plans for hazardous substances (*Plan Específico de Seguridad e Higiene para el Manejo, Transporte y Almacenamiento de Sustancias Químicas Peligrosas)* as well as a separate plan for the safe transportation and handling of cyanide (*Procedimiento para el Manejo de Cianuro*), even though the consumption of the latter is limited. Minera La Negra only purchases cyanide from a certified distributor that is a signatory of the International Cyanide Management Code.

20.5.11 Waste Management

Minera La Negra has enacted a plan for the management and disposal of hazardous waste, in accordance with rule NOM-157-SEMARNAT-2009 which establishes the procedures for the management, storage and disposal of mining waste (*Plan de Manejo de Residuos Peligrosos*). The plan includes both solid and liquid wastes, such as used lubricants, expired chemicals and reagents, batteries, aerosol containers, filters, fluorescent lamps, biological waste, empty bags which were in contact with reagents or other mineral products, impregnated solids, and used PPE. Each year in October/November the company prepares a budget with the expected amounts of each waste category, how it is to be handled, labelled and stored, and how it will be disposed of.

20.6 Social Context and Baseline

20.6.1 Demographic, Family Structure and Migration Patterns

La Negra is located in the municipality of Cadereyta de Montes in the northeastern part of the state of Querétaro, bordering with the state of Hidalgo, and has a population of approximately 69,100 inhabitants, based on the 2020 census, with a median age of 26. Some of the mine's workforce also hails from the municipality of San Joaquín, directly to the north of Cadereyta, and has a population of some 8,400 inhabitants with a median age of 25.

Migration levels in the area are low. Based on data from the 2020 census, only 3.4% of the population of San Joaquín migrated in the period 2015-2020, mostly for work or family reasons. For the municipality of Cadereyta, the equivalent figure is 3.6%, with work and family also being the main drivers.

Based on data from INEGI (*Instituto Nacional de Estadística y Geografía*), the education index in the two municipalities is 6.1 years, equivalent to a primary education, although there are regional and local differences (the equivalent figure for the state of Querétaro is 9.6). In the municipality of San Joaquín, only 7.2% of the population has a university degree, and only 17.9% have a high school education. Some 59.8% of the population only have a primary or secondary education (grade and middle school equivalent) and 14.8% have no schooling. In the municipality of Cadereyta, 8.2% have no schooling but 9.2% have a university degree, with a majority having a primary education or middle school education (64.9%). Significantly, in the area around Maconí, the town closest to the mine (population 900), 19% have a primary education and 48% have completed middle school, with 5% each with a high school and university education.

Internet penetration is also low, with 41.3% of the households in San Joaquín connected to the internet, and only 26.4% in the municipality of Cadereyta. This compares to internet penetration of 64.4% for the state of Querétaro as a whole and 83.1% for the city of Querétaro.

Although there has been some improvement, both the municipalities of Cadereyta and San Joaquín rank in the middle of the UNDP's Human Development Index, and in the area of the mine suffer due to the lack of access to education and health care. The nearest hospital to the mine is in the town of Cadereyta, over an hour and half from the mine site. Based on the 2020 census, over 99% of the population of both Cadereyta and San Joaquín depend on government-provided healthcare. In the municipality of San Joaquín, only 49% of the population is connected to a water main, although 96.8% are connected to power. The figures for the municipality of Cadereyta were slightly better, at 55.7% and 97.7%, respectively.

A 2018 study by UN Habitat, Mexico's *Secretaría de Desarrollo Agrario, Territorial y Urbano* (SEDATU), and the *Instituto del Fondo Nacional de la Vivienda para los Trabajadores* (INFONAVIT) ranked the municipality of Cadereyta at 51.1 on a scale of 0 to 100, or middle-weak, in its City Prosperity Ranking. The CPI is a blended score taking into account productivity, urban legislation and governance, development infrastructure, environmental sustainability, equity and social inclusion, and quality of life. Significantly, the area suffers from a high level of poverty, ranked by the percentage of the population living on less than US$1.25 per day, ranking only 18.2 on that score, and equivalent to a poverty level of 40.6%. The adjacent municipality of San Joaquín was not part of the UN habitat study, but according to 2015 data by Coneval (*Consejo Nacional de Evaluación de la Política de Desarrollo Social*) the poverty rate in San Joaquín was 40.8%.

In the area around Maconí, the principal concern is a lack of employment (30% of respondents), followed by a lack of public services (25%), access to water (20%), and 10% each concern about lack of government support and poor telecommunications. This is in stark contrast to the overall municipality of Cadereyta, where the primary concern is security (21%). When asked what areas the municipal government should focus its expenditures on, the residents of Maconí ranked the need for schools first, followed by employment creation, hospitals, sewage, housing, and fighting corruption. Overall, concerns over security were only highlighted as an issue by a small minority of the residents of Maconí, although a plurality believes that the security situation has deteriorated.

20.6.2 Household Income

The socioeconomic evaluation of the region is based on the 7 levels outlined by the *Asociación Mexicana de Agencias de Inteligencia de Mercado y Opinión Pública*, which ranges from A/B for households with professional degrees (82%) and a low percentage of disposable income dedicated to foodstuffs (28%), to E for households where some 95% of the breadwinners have only a primary education and a majority (63%) of disposable income is dedicated to foodstuffs, transportation, and communications. For the state of Querétaro as a whole, 9% of the inhabitants are in the highest A/B socioeconomic category, 15% are in C+, 18% in the C category, 16% in the C-, 13% in the D+, 22% in the D category, and 6% in the lowest E category. For the municipalities of Cadereyta and San Joaquín the socioeconomic rating averages C-, with most of the population in the areas near the mine at D or E.

In the vicinity of the mine, 70% of those surveyed indicated that they can barely make ends meet and a further 5% indicated they face great financial issues. Only 25% indicated that they live well.

20.6.3 Land Use

The region in which the mine is located is semiarid, and agricultural activity is primarily limited to subsistence farming of corn, beans, sorghum, and legumes. There is some livestock grazing, primarily caprine and porcine. The main industries, aside from mining, consist of cement works and marble quarrying.

20.6.4 Social Impact Assessment

The communities in the vicinity of La Negra have become highly dependent on the mine and are generally very supportive of the operation, but while the potential benefits and employment are welcome, community expectations remain high, and there is often resentment because the company is unable to satisfy the many needs of the communities.

The principal positive impact relates to the direct employment opportunities that the mine offers, followed by the knock-on effects provided by local procurement, land use agreement payments and projects (*usufructo*), taxation, and the multiplier effect.

20.7 Cumulative Impacts

Cumulative impacts are those that result from the incremental impact of a project when combined with other existing projects and/or other developments that are the planning stages or can be reasonably projected to take place. This also includes the potential impacts of climate change.

20.8 Environmental and Social Management

20.8.1 Environmental and Social Management System

Minera La Negra has developed a series of plans which outline its commitment to environmental and social management, monitoring and mitigation, and includes health and safety, security, environmental plans, and stakeholder engagement. These plans are reviewed and updated periodically, and routinely take into account the internal and external comments, stakeholder feedback, and third-party reviews, and regulatory changes.

The following management plans have been developed and implemented:

- Stakeholder Engagement Plan (*Plan de Recuperación del Tejido Social*)
- Occupational Health and Safety Plan (*Programa de Seguridad e Higiene Industrial*)
- Emergency Preparedness Plan (*Programa Interno de Protección Civil*)
- Emergency Preparedness and Spill Response Plan (*Plan de Contingencias por Residuos Peligrosos*)
- Transport Management Plan (*Plan Interno de Seguridad Vial*)
- Cyanide Management Plan (*Procedimiento para el Manejo de Cianuro*)
- Reagent Management Plan (*Plan Específico de Seguridad e Higiene para el Manejo, Transporte y Almacenamiento de Sustancias Químicas Peligrosas*)
- Solid Waste Management Plan (*Plan de Manejo de Residuos Peligrosos*)
- Air Quality and Noise Management Plan (*Plan Anual de Protección y Conservación Atmosférica*)
- Dust Management Program (included in *Plan Anual de Protección y Conservación Atmosférica)*
- Surface Water Management Plan (*Plan Anual de Protección de Agua Superficial*)
- Soil and Tailings Management Plan (*Plan Anual para la Protección y Conservación de Suelos*)
- Biodiversity Management Plan (*Programa para el Rescate y Reubicación de Vegetación Forestal* and *Programa de Acciones para la Protección de la Fauna*)
- Cultural and Archeological Protection Plan *(Plan de Protección al Patrimonio Cultural, Paleontológico y Prehispánico*
- Physical and Property Security Plan (*Plan de Seguridad Patrimonial*)
- Mine Closure Plan (*Guía para la Elaboración del Plan de Cierre de Mina y Planta de Beneficio*)
- TSF5 Closure Plan (*Plan de Obra Cierre del Depósito de Jales No. 5*)
- TSF5A Closure Plan (*Plan de Cierre de Depósito de Jales Proyecto Ampliación del Depósito de Jales no. 5*)
- TSF Emergency Management Plan (*Plan de Atención a Emergencias Depósito de Jales*)

20.8.2 Stakeholder Engagement Plan

Minera La Negra's Stakeholder Engagement Plan (*Plan de Recuperación del Tejido Social*) governs the stakeholder engagement for the project and includes all interactions between the mine and the 21 communities in the vicinity of the project, the local and national mineworker's union, community contractors, the municipalities of Cadereyta de Montes and San Joaquín, and the State and Federal governments.

Community engagement is carried out directly and formally through the twice weekly and *ad hoc* meetings between the company and the leadership of the *Comunidad Agraria Maconí*. Any issues or grievances from the community are filtered through the leadership so that these can then be formally presented to the company, and solutions and action plans agreed.

Similarly, the company holds weekly meetings with the local union leadership to discuss matters pertaining to the relationship between the company and the union, and any issues regarding work practices, schedules, or other are discussed directly between the company and the union. If needed, discussions are also held with the national union leadership, but in practice this generally only takes place pertaining to the collective bargaining agreement.

The company also liaises on a regular basis with representatives of the municipal, State and Federal government, as sometimes their intervention is required to address issues brought up by the communities and other stakeholders.

The fact that union employees and community contractors are also part of the community requires having an integrated Stakeholder Engagement Plan that deals with the multifaceted relationships in the region.

20.8.3 Environmental Monitoring Plan

Minera La Negra has a robust environmental and social baseline monitoring program, which is designed to outline and evaluate the environmental and social performance of the project. The overall objectives of the plan are to ensure that regulatory requirements are met; to ensure that impacts do not exceed project, national and international standards; to obtain real time measurements and to verify that mitigation measures are being implemented correctly and are effective; to identify, track and provide early warning of potential environmental impacts; and to provide feedback for the implementation of continuous improvement of the project's environmental and social management.

Minera La Negra carries out routine sampling of the soils in the vicinity of the mine, in accordance with the company's annual soil conservation plan (*Plan Anual para la Protección y Conservación de Suelos*). This sampling is conducted by an independent, third-party contractor, and the results provided in the company's reports to SEMARNAT. Sampling is carried out routinely in both the tailings dams and in other locations throughout the property, and the samples are tested for *inter alia* pH, oils, suspended solids, potentially toxic metals, inorganic parameters, cyanide and microbiology in accordance with rules NOM-141-SEMARNAT-2003 and NOM -147-SEMARNAT/SSA1-2004 for the management of tailings facilities, and NOM-004-SEMARNAT-2002 and NOM-052-SEMARNAT-2005 for the disposal of organic solids and hazardous substances, respectively.

Table 20.5 Soil Sampling Parameters

ITEM	SAMPLING	PARAMETERS	UNITS	REGULATION	SAMPLING POINT
SOILS AND TAILINGS	CHARACTERIZACION OF WET AND DRY TAILINGS	Arsenic	mg/l	NOM-052-SEMARNAT-2005	TSF3, TSF5 and TSF5A
		Barium	mg/l		
		Cadmium	mg/l		
		Mercury	mg/l		
		Silver	mg/l		
		Lead	mg/l		
		Selenium	mg/l		
		Chrome	mg/l		
		pH	Units	NOM-141-SEMARNAT-2003	
		Neutralization Potential (NP)	Kg $CaCO_3$/t		
		Acid Potential (AP)	Kg $CaCO_3$/t		
		Acid Drainage NP/AP			
	SOILS	Corrosiveness	Positive or Negative	NOM-052-SEMARNAT-2005	Streams and TSF underdrainage.
		Reactivity			
		Flammability			
		Atmospheric Toxicity			
	STREAM SOILS AND TSF UNDERDRAINAGE	Arsenic	mg/kg	NOM-147-SEMARNAT/SSA1-2004	TSF supernatant waters and underdrainage
		Barium	mg/kg		
		Beryllium	mg/kg		
		Cadmium	mg/kg		
		Chrome	mg/kg		
		Mercury	mg/kg		
		Nickel	mg/kg		
		Silver	mg/kg		
		Lead	mg/kg		
		Selenium	mg/kg		
		Thallium	mg/kg		
		Vanadium	mg/kg		
		pH	mg/kg		

Source: MLN

The company also carries out a comprehensive water sampling program in accordance with the company's Surface Water Management Plan (*Plan Anual de Protección de Agua Superficial*). Sampling is carried out routinely in both the tailings dams and in other locations throughout the property in accordance with rule NOM-001-SEMARNAT-1996.

Table 20.6 Water Sampling Parameters

ITEM	SAMPLING	PARAMETERS	UNITS	REGULATION	SAMPLING POINT
WATER	SURFACE WATER	Temperature	°C	NOM-001-SEMARNAT-1996	Residual water discharge. TSF supernatant water and underdrainage. TSF5A drainage, settling ponds, and industrial water storage.
		pH	Units		
		Electric conductivity	µmho/cm		
		Suspended Material	Presence/Absence		
		Lubricants	mL/liter		
		Sediment	mL/liter		
		Total Suspended Solids	mL/liter		
		Biochemical Oxygen Demand	mL/liter		
		Chemical Oxygen Demand	mL/liter		
		Total Nitrogen	mL/liter		
		Total Phosphorous	mL/liter		
		Arsenic	mL/liter		
		Cadmium	mL/liter		
		Cyanide	mL/liter		
		Copper	mL/liter		
		Chrome	mL/liter		
		Mercury	mL/liter		
		Nickel	mL/liter		
		Lead	mL/liter		
		Zinc	mL/liter		
		Fecal coliform	MPN/100 ml		
		Helminth Eggs	HE/L		

Source: MLN

Minera La Negra's atmospheric sampling program is carried out according to its *Plan Anual de Protección y Conservación Atmosférica* and is guided by the regulations detailed in the table below.

Table 20.7 Atmospheric Sampling Parameters

ITEM	SAMPLING	PARAMETERS	UNITS	REGULATION	SAMPLING POINT
ATMOSPHERE	FIXED AND NON-FIXED PARTICULATE SOURCES	Perimeter Study of TSS	Ug/m3	NOM-035-SEMARNAT-1993 NOM-025-SSA1-1993	4 points near the mill and TSF
		Collector emissions	kg/hr	NOM-043-SEMARNAT-1993	Dust collector and gas scrubber
		Collector emissions	mg/m3		
		Scrubber emissions	kg/hr		
		Scrubber emissions	mg/m3		
		Diurnal perimeter noise	dB	NOM-081-SEMARNAT-1994	4 points on the mill perimeter
		Nocturnal perimeter noise	dB		

Source: MLN

20.8.4 Community Land Use Agreement (*Usufructo*)

Minera La Negra is located on land belonging to an agrarian community named *Comunidad Agraria Maconí*. This is not to be confused with a more common form of communal land ownership common (and unique to) Mexico known as the *ejido*. While *ejidos* and, to a lesser extent, agrarian communities are the product of agrarian reforms that took place in 1934 and 1992, agrarian communities as such date back to the colonial period, when the king of Spain would issue a royal charter granting certain towns legal status and allowing them to own land communally (and confusingly known as *exidos*). Most of the original agrarian communities were forced to become *ejidos* during the agrarian reform of 1934, which is why agrarian communities are rare today.

In practice, there are minimal differences between an *ejido* and an agrarian community, with the principal difference being that in an agrarian community title cannot be issued to an individual even if the land is worked individually and members of the community cannot sell their land (allowing *ejidatarios* to take title and sell parcels was only signed into law in 1992). However, a majority of the community can vote to become an *ejido*, which would then allow for title to be issued and for a sale to take place if the assembly approved it by a 2/3 majority.

Based on the latest agrarian census by Mexico's statistics agency, *INEGI*, completed in 2020 there are 29,793 *ejidos* in Mexico covering an area of just over 82.2 million ha, compared with 2,354 agrarian communities covering just over 17.5 million ha. For the state of Querétaro que comparative figure is 364 *ejidos* covering 0.48 million ha and 16 agrarian communities covering 58,288 ha.

While the law does not allow the sale of parcels of land held by the *Comunidad Agraria*, there are certain instances where the community can enter into an agreement with an outside party to carry out certain activities, such as mining, on land owned by the community in exchange for compensation. The benefits and/or payments that the third party provides to the community is known as the *usufructo*, and the agreement between the *Comunidad Agraria* and the third party is known as the *Contrato de Usufructo por la Ocupación Temporal de Tierras Comunales*. Following Peñoles' sale of the property, a new 15-year *usufructo* was entered into between the community and Minera La Negra on the 18th of July 2006, covering an area of 42.5 ha. This agreement was later amended the 16th of February of 2016 following a series of negotiations that commenced in late 2014 designed to address certain grievances by the community with respect to the original agreement. The area covered by the *usufructo* was increased to 51.0 ha to allow for the construction of TSF 5A.

The latest amendment to the *usufructo* amends the terms of the agreement that expired on 18 July 2021. The new agreement is valid for 15 years (July 2036) and covers the same 51.0 ha. In addition to the annual land payment, Minera La Negra has agreed to carry out certain, minor infrastructure projects of importance to the community once production commences. These activities have been accounted for in the capital spending plans and are incorporated in Table 21.1.

20.8.5 Government Inspections and Audits

The company is subject to inspections and audits by several government agencies. At the Federal level the water agency CONAGUA inspects the site one to two times per year, while Profepa (*Procuraduría Federal de Protección al Ambiente*) which is the enforcement agency of SEMARNAT, inspects the mine three to four times per year.

At the State level Minera La Negra is subject to inspections by the sustainable development agency SEDESU (*Secretaría de Desarrollo Sustentable*) and by the State water commission CEA (*Comisíon Estatal del Agua*). Each of these agencies inspects the company on average once per year.

The municipality of Cadereyta de Montes also inspects the mine once to twice per year.

20.8.6 Review, Audit and Continuous Improvement

20.9 Reclamation, Closure and Rehabilitation

Proper closure preparation is important to ensure that a mining project will have a positive impact on a community or region. Minera La Negra's closure and reclamation goals are as follows:

- Future public health and safety are not compromised
- Environmental impacts are minimized and environmental resources in the region are not subject to additional deterioration over time
- Post-closure use of the site is beneficial and sustainable and acceptable to the community and regulators
- Adverse impacts on the local community is minimized
- Socioeconomic benefits are maximized
- Closure and rehabilitation are funded by MLN

In accordance with Mexico's regulatory requirements, a series of closure plans for La Negra were developed for each of the company's MIAs. The closure plan for TSF5 was developed in July 2019 by MLN in accordance with Mexico's mining law (*Ley Minera*) and in accordance with SEMARNAT regulations NOM-141-SEMARNAT-2003 and NOM-147-SEMARNAT/SSA1-2004. That same year the company developed the closure plan for TSF5A. Preliminary closure and rehabilitation costs including engineering planning and environmental monitoring were developed by Minera La Negra.

21 Capital Cost Summary

The LOM capital for the La Negra mine is estimated at US$68.1 million as shown in Table 21.1.

21.1 Capital Cost Summary

The capital cost estimate for La Negra was prepared by Minera La Negra with specific input from Mining Plus for mining equipment and development, and Wood EIS for tailings. The capital required for restarting the processing plant was developed by Minera La Negra based on a detailed maintenance review and using actual vendor quotes.

The total LOM capital consists of the following three phases

- Pre-production capital costs – All costs required to restart the mine until first concentrate is produced and commercial production is achieved. This cost is estimated at US$21.0 million. This phase is anticipated to take three to four months for construction, excluding the time required for geotechnical field programs, detailed design and acquisition of items which may required a lead time (such as the filter plant and other mechanical equipment).
- Sustaining capital costs – All costs required to sustain operations during the life of the mine, including underground development and the acquisition, replacement and/or major overhaul of assets, and tailings management. LOM sustaining capital is estimated at US$42.1 million.
- Closure and rehabilitation costs – All costs required for the progressive and final closure of the mine. These costs are estimated at US$5 million and are expended in year 8.

Table 21.1 presents the capital cost estimate for Minera La Negra, including restart, sustaining, and closure capital converted to 4Q 2021 United States dollars with no escalation, based on a MXN to US$ exchange rate of 21:1.

Table 21.1 LOM Capital Cost Estimate

Description	Restart Capital (US$m)	Sustaining Capital (US$m)	Closure (US$m)	LOM Total (US$m)
Processing Plant	2.41	2.38	-	4.79
TSF	13.55	4.11	-	17.66
Underground Development	0.57	18.18	-	18.75
Equipment Replacement/Refurb	0.46	12.31	-	12.77
Indirect Costs	2.03	-	-	2.03
Owner's Costs	1.63	-	-	1.63
Capitalized Exploration	0.29	4.57	-	4.85
Other	-	0.58	-	0.58
Closure	-	-	5.00	5.00
Total Capital	**20.94**	**42.13**	**5.00**	**68.06**

Source: MLN

21.2 Basis of Estimate

The project capital estimate includes all costs required to restart the mine to commercial production status and to sustain operations and responsibly close the mine at the end of its life. No allowance has been made for any historical capital expenditure.

The following key assumptions have been made in the preparation of this capital estimate:

- The capital estimate is based on the Project Execution Plan described in Section 26.1 of this report which details the execution strategy and key dates for the restart plan
- Underground development and construction will be performed by Minera La Negra

- Detailed designs and engineering for a filtered tailing plant will be provided by a third party but construction will be performed by Minera La Negra
- Working capital is based on the first two months of operating costs

The following key parameters apply to the capital estimate:

- Estimate Class: The overall level of project definition is considered a Class 5 estimate, primarily because the LOM plan is based entirely on Indicated and Inferred Resources, with the majority Inferred Resource. Per Wood, the capital cost estimates for the TSF Class 5. The estimated capital cost to restart the process plant, however, is based on a detailed assessment and detailed costing of the spare parts required. Similarly, the cost of restarting mining operations and the initial development requirements to achieve first production are relatively well established.
- Estimate Base Date: The base date for the capital estimate is 4Q 2021. No escalation has been applied to the capital estimate for future costs. Proposals and quotations supporting the capital cost estimate were received in 3Q 2021.
- Units of Measure: The International System of Units (SI) is used throughout the capital estimate
- Currency: Capital costs are expressed in US dollars (US$). Quotes and estimates priced in Mexican Pesos (MXN) were converted at an assumed exchange rate of 21:1.

21.3 Mine Capital Cost Estimate

Capital cost estimates are based on a combination of prices and quotations provided by equipment suppliers and estimates provided by Minera La Negra personnel based on historic operating experience.

21.3.1 Underground Mine Development

Underground development costs include all labor, and consumables required to construct drifts, ramps and crosscuts required to initiate stoping activities. These costs were developed from first principles based on historical experience but adjusted for a reduced workforce and improved productivity based on the new labor contract.

21.3.2 Production and Support Equipment

The production and support equipment for underground development, mining and mucking were based on a planned buildup of activities and include assumed availability and utilization rates. Existing equipment will be maintained/refurbished and will be supplemented with new and some used equipment as needed. The cost of this equipment included in the financial model and is based on vendor quotes with an added contingency of 20%.

The following table summarizes the capital required to perform the necessary maintenance and refurbishment of the mining fleet.

Table 21.2 Mine Fleet Refurbishment Costs (US$)

Item	US$
BOOMER JUMBO	18,256
DD311-40 JUMBO	22,445
ST-21 SCOOP TRAM	109,844
SIMBA #1 LONG HOLE DRILL	42,461
SIMBA #2 LONG HOLE DRILL	14,842
PLH1 LONG HOLE DRILL	7,085
ST-26 SCOOP TRAM	7,619
ST-27 SCOOP TRAM	99,523
ST-15 SCOOP TRAM	35,355
ST-19 SCOOP TRAM	8,336
ST-24 SCOOP TRAM	17,710
TRACK DRILL LONG HOLE DRILL	19,466
ST-13 SCOOP TRAM	11,307
DEERE 310J LOADER	12,365
OTHER	29,763
Total	**456,376**

Source: MLN, Mining Plus

21.3.3 Ancillary and Fixed Equipment

Underground ancillary and fixed equipment include equipment and materials required for mining, such as maintenance vehicles, refuge chambers, dewatering pumps, survey equipment and tools. Requirements were determined based on the mine plan developed by Mining Plus and quotes are based on quotes provided by suppliers. As with the main production equipment, existing equipment will be maintained or refurbished, and only additional equipment required for sustained mining operations will be purchased.

21.3.4 Spare Parts

Spare parts for new equipment were based on vendor quotes.

21.4 Milling Facility Upgrades

The capital cost estimate for the processing plant was developed by Minera La Negra and was based on a detailed assessment of the work required to restart the plant. Every component of the processing plant from comminution through concentrate filtration was disassembled and, if possible, serviced and then reassembled. Crusher and mill components requiring additional work or spare parts unavailable in stores were inventoried and vendors contacted for quotes to replace/service damaged equipment. This assessment forms the basis of the capital cost estimate for plant restart.

Restart capital for the processing facility is detailed in Table 21.3

Table 21.3 Mill Restart Capital

Item	MXN	US$
Mechanical		
Primary Crusher	4,612,000	219,619
Secondary/Tertiary Crushing	3,855,882	183,613
Milling	7,342,005	349,619
Flotation	4,701,863	223,898
Filtration	5,412,072	257,718
Tailings	752,000	35,810
Spares/Mechanical First Fills	7,473,692	355,890
Total Mechanical	**34,149,514**	**1,626,167**
Electrical		
Primary Crusher	371,910	17,710
Secondary/Tertiary Crushing	634,748	30,226
Milling	746,060	35,527
Flotation	1,289,002	61,381
Filtration	53,616	2,553
Tailings	1,567,399	74,638
Spares/Mechanical First Fills	1,379,745	65,702
Total Electrical	**6,042,481**	**287,737**
Instrumentation		
Flotation	800,234	38,106
Filtration	2,535,924	120,758
Tailings	637,500	30,357
Spares/Mechanical First Fills	33,457	1,593
Total Instrumentation	**4,007,116**	**190,815**
Working Capital		
First Fills	4,251,490	202,452
Wear Parts	5,387,053	256,526
Reagents	9,815,748	467,417
Total First Fills	**19,454,291**	**926,395**
Total Mill Capital	**63,653,402**	**3,031,114**

Source: MLN

First fills were based on vendor quotes and include replacement parts for the primary, secondary and tertiary crushers sufficient for 210,000 hours of operation (three months), filter cloths for the disc and Clever concentrate filters (zinc and lead, and copper, respectively) sufficient to operate for one month, and reagents sufficient for two months of operation. For the three mills the first fills include a full set of liners for each, sufficient for 14 months of operation for the 10x10 mill, 16 months for the 9x11 and 18 months for the 7.5x10. Most of the capital items and working capital are priced in MXN.

21.5 Tailings

The alternatives for tailings were prepared by Wood EIS and the preferred alternative is described in Section 18.5 and in greater detail in the siting study. The PEA assumes the deposition of filtered tailings in TSF5/TSFA, followed by deposition of filtered tailings in TSF3. These two facilities would provide approximately eight years of tailings capacity and sufficient for the production envisaged in this document. Additional tailings capacity could be achieved by producing paste for use as mine backfill or, alternatively, developing Site 4 as a repository for filtered tailings.

The principal capital elements for the preferred tailings alternative are the filtered tailings plant and the conveyor required to transport the material to the TSF. Although both TSF5/TSF5A and TSF3 are brownfields sites, there will be some additional capital required for site preparation, starter embankment earthworks, underdrain, seepage collection pond and upstream stormwater channel systems, roads, and instrumentation and electrical distribution.

The capital costs for tailings management for developing a filter facility at TSF5/TSF5A are broken out in Table 21.4.

Table 21.4 Tailings Capital

LINE ITEM	DESCRIPTION	UNIT	UNIT COST	Starter Embankment		Years 1 to 5		Total Quantity	Total Cost ($)
				Quantity	Cost	Quantity	Cost		
1.0	**Mobilization/Demobilization**								
1.1	Earthworks Contractor	Percentage	3.0%		$ 250,059		$ 1,339	1	$ 251,398
1.2	Geosynthetics Contractor	Percentage	0.5%		$ 41,676		$ 223	1	$ 41,900
	SUBTOTAL				$ 291,735		$ 1,562		$ 293,297
2.0	**Site Preparation**								
2.1	Land Acquiston	ha	$ 78,000.00	0.0	$ -	0	$ -	0	$ -
2.2	Clearing and Grubbing	m^2	$ 1.00	48,000	$ 48,000	19,000	$ 19,000	67,000.0	$ 67,000
2.3	Topsoil Removal (150mm thick) - Truck Haul (Excavate, Haul and S	m^3	$ 4.05	7,200	$ 29,160	2,850	$ 11,543	10,050	$ 40,703
2.4	Develop Borrow Areas for Construction Materials	ea	$ 10,000.00	1	$ 10,000	0	$ -	1	$ 10,000
	SUBTOTAL				$ 87,160		$ 30,543		$ 117,703
3.1	**Starter Embankment Earthworks**								
3.1	Excavation (Embankment Foundation)	m^3	$ 5.06	4,800	$ 24,288	0	$ -	4,800	$ 24,288
3.2	Foundation Preparation	m^2	$ 0.50	1,600.0	$ 800	0.0	$ -	1,600.0	$ 800
3.3	Rockfill (Excavate and Load)	m^3	$ 3.00	16,200	$ 48,600	0	$ -	16,200	$ 48,600
3.4	Rockfill (Haul)	tonne-km	$ 3.00	24,300	$ 72,900	0	$ -	24,300	$ 72,900
3.5	Rockfill (Install)	m^3	$ 2.66	16,200	$ 43,059	0	$ -	16,200	$ 43,059
3.6	Coarse Filter (Excvate from Borrow)	m^3	$ 3.00	1,425	$ 4,275	0	$ -	1,425	$ 4,275
3.7	Coarse Filter (Crush, Screen, Load)	m^3	$ 2.18	1,425	$ 3,104	0	$ -	1,425	$ 3,104
3.8	Coarse Filter (Haul)	tonne-km	$ 3.00	2,138	$ 6,413	0	$ -	2,138	$ 6,413
3.9	Coarse Filter (Install)	m^3	$ 2.66	1,425	$ 3,788	0	$ -	1,425	$ 3,788
3.10	Fine Filter (Excavate from Borrow)	m^3	$ 3.00	1,425	$ 4,275	0	$ -	1,425	$ 4,275
3.11	Fine Filter (Crush, Screened, Load)	m^3	$ 2.18	1,425	$ 3,104	0	$ -	1,425	$ 3,104
3.12	Fine Filter (Haul)	tonne-km	$ 3.00	2,138	$ 6,413	0	$ -	2,138	$ 6,413
3.13	Fine Filter (Install)	m^3	$ 2.66	1,425	$ 3,788	0	$ -	1,425	$ 3,788
	SUBTOTAL				$ 224,807		$ -		$ 224,807
5.0	**Basin Underdrain System**								
5.1	4" Perforated Pipe (Supply and Install)	m	$ 3.04	120	$ 365	0	$ -	120	$ 365
5.2	12" Perforated Pipe (Supply and Install)	m	$ 8.13	100	$ 813	0	$ -	100	$ 813
5.3	10 oz Geotextile (Supply and Install)	m^2	$ 2.66	1,237	$ 3,287	0	$ -	1,237	$ 3,287
5.4	Fine Filter (Excavate from Borrow)	m^3	$ 3.00	289	$ 866	0	$ -	289	$ 866
5.5	Fine Filter (Crush, Screen, Load)	m^3	$ 2.18	289	$ 629	0	$ -	289	$ 629
5.6	Fine Filter (Haul)	m^3	$ 3.00	289	$ 866	0	$ -	289	$ 866
5.7	Fine Filter (Install)	m^3	$ 2.66	289	$ 767	0	$ -	289	$ 767
					$ 7,594		$ -		$ 7,594
4.0	**Seepage Collection Pond and Pumpback System**								
4.1	Excavation (Grading)	m^3	$ 3.00	4,388	$ 13,163	0	$ -	4,388	$ 13,163
4.2	80 mil HDPE Geomembrane Liner (Supply and Install)	m^2	$ 5.25	3,073	$ 16,131	0	$ -	3,073	$ 16,131
4.3	10 oz Geotextile (Supply and Install)	m^2	$ 1.50	3,073	$ 4,609	0	$ -	3,073	$ 4,609
4.4	Anchor Trench Excavation and Backfill	m	$ 4.50	180	$ 810	0	$ -	180	$ 810
4.5	Reclaim Pumps (Skid Mounted-Supply and Install	ea	$ -	1	$ -	0	$ -	1	$ -
4.6	Pump Station Electrical - Supply and Install	ea	$ -	1	$ -	0	$ -	1	$ -
	SUBTOTAL				$ 34,713		$ -		$ 34,713
5.0	**Upstream Stormwater Channel Channel Earthworks and Geosynthetics**								
5.1	Excavate Diversion Channel	m^3	$ 5.06	17,170	$ 86,880	0	$ -	17,170	$ 86,880
5.2	Install geotextile - Diverson Channel (Supply and Install)	m^2	$ 1.50	41,241	$ 61,862	0	$ -	41,241	$ 61,862
5.3	Supply and Install Riprap - Diversion Channel	m^3	$ 6.00	10,948	$ 65,690	0	$ -	10,948	$ 65,690
	SUBTOTAL				$ 214,432		$ -		$ 214,432
7.0	**Roads**								
7.1	Improving Existing Roads	m	$ 100.00	2,495	$ 249,500	0	$ -	2,495	$ 249,500
7.2	Construction of New Access Roads	m	$ 250.00	0	$ -	0	$ -	0	$ -
	SUBTOTAL				$ 249,500		$ -		$ 249,500
7.0	**Conveyor Line from Plant to TSF**								
7.1	Suppy 400 mm Wide Conveyor	LS	$ 529,853.70	1	$ 529,854	0	$ -	1	$ 529,854
7.2	Install Conveyor (assumed as 25% of Conveyor Cost)	LS	$ 26,492.69	1	$ 26,493	0	$ -	1	$ 26,493
7.3	Supply and Install Stacker	LS	$ 113,147.00	1	$ 113,147	0	$ -	1	$ 113,147
	SUBTOTAL				$ 669,493		$ -		$ 669,493
8.0	**Instrumentation/Electrical Distribution (Supply and Install)**								
8.1	Monitoring Wells	m	$ 7,200.00	0	$ -	0	$ -	0	$ -
8.2	Piezometers	ea	$ 1,545.32	4	$ 6,181	4	$ 6,181	8	$ 12,363
8.3	Inclinometers	ea	$ 1,750.00	2	$ 3,500	4	$ 7,000	6	$ 10,500
8.4	Settlement Monuments	ea	$ 150.00	0	$ -	6	$ 900	6	$ 900
8.5	Data Logging System	ea	$ 15,000.00	1	$ 15,000	0	$ -	1	$ 15,000
	SUBTOTAL				$ 24,681		$ 14,081		$ 38,763
9.0	**Construction Surface Water Management and Sediment Control**								
9.1	Construction Surface Water Management and Sediment Control	ls	$ 10,000.00	1	$ 10,000	0	$ -	1	$ 10,000
	SUBTOTAL				$ 10,000		$ -		$ 10,000
10.0	**Demolition of Exisitng Infrastruture**								
10.1	Demolition Costs	ls	$ 15,000.00	1	$ 15,000	0	$ -	1	$ 15,000
	SUBTOTAL				$ 15,000		$ -		$ 15,000
11.0	**Filter Plant**								
11.1	Supply and Install Filter Plant	ls	$ 7,500,000.00	1	$ 7,500,000	0	$ -	1	$ 7,500,000
	SUBTOTAL				$ 7,500,000		$ -		$ 7,500,000
	Total Direct Construction Costs				**$ 9,314,115**		**$ 46,186**		**$ 9,375,301**
10.0	**Indirect Costs**								
10.1	Construction Management	est	1.0%		$ 93,141		$ 462		$ 93,753
10.2	Engineering Design, Geotech, Procurement and Bid Support	est	1.0%		$ 93,141		$ 462		$ 93,753
10.3	Construction CQA	est	3.0%		$ 279,423		$ 1,386		$ 281,259
10.4	Contractor Overhead	est	2.0%		$ 186,282		$ 924		$ 187,506
10.5	Third Party Surveyor	est	0.3%		$ 23,285		$ 115		$ 23,438
10.6	Owners Cost (Assume 10% of Direct and EPCM)	est	0.0%		$ -		$ -		$ -
	Total Estimated Indirect Costs				$ 675,273		$ 3,348		$ 679,709
	Total W/O Contingency				**$ 9,989,389**		**$ 49,534**		**$ 10,055,010**
	CONTINGENCY		35%		$ 3,496,286		$ 17,337		$ 3,519,254
	Total With Contingency - TSF				**$ 13,485,675**		**$ 66,871**		**$ 13,574,264**

Source: Wood

21.6 Indirect Cost Estimate

Indirect costs are not directly attributable to a specific cost object or cost center. These are expected to be fairly minor in the case of La Negra because the mine infrastructure is fully built, and the current study is focused on a restart plan. There will therefore be no need for a construction camp, construction indirect costs, additional site services, or construction equipment related to mining or the processing plant.

Capital spares and first fills, totaling US$1.5 million are included in the indirect cost estimate.

21.7 Owners Cost Estimate

The main cost elements included in owner's costs are the General & Administrative costs incurred during the pre-production period and the commencement of processing operations. These costs include labor and other expenses such as safety, finance, security and purchasing that are incurred before commercial production is achieved and are estimated at US$1.6 million during the three-month pre-production period.

21.8 Closure Cost Estimate

Preliminary closure and rehabilitation costs were developed separately for the mine and plant, TSF5 and TSF5A. TSF1, TSF2 and TSF4 have been rehabilitated, while TSF 3 is partially rehabilitated and used as an emergency overflow facility.

22 Operating Cost Summary

22.1 Operating Cost Summary

Life of Mine (LOM) operating costs for Minera La Negra are estimated to average US$28.00 per tonne milled, including:

- Mining
- Processing
- Technical Services
- General and Administrative (G&A)

The cost per tonne of mineralized material processed is based on an annual throughput of 842,500 tonnes.

The LOM operating cost per tonne excludes royalties, which are estimated total US$29.4 million LOM, or approximately US$4.72 per tonne. Offsite costs such as shipping and treatment charges are already included in the net smelter return (NSR) calculation.

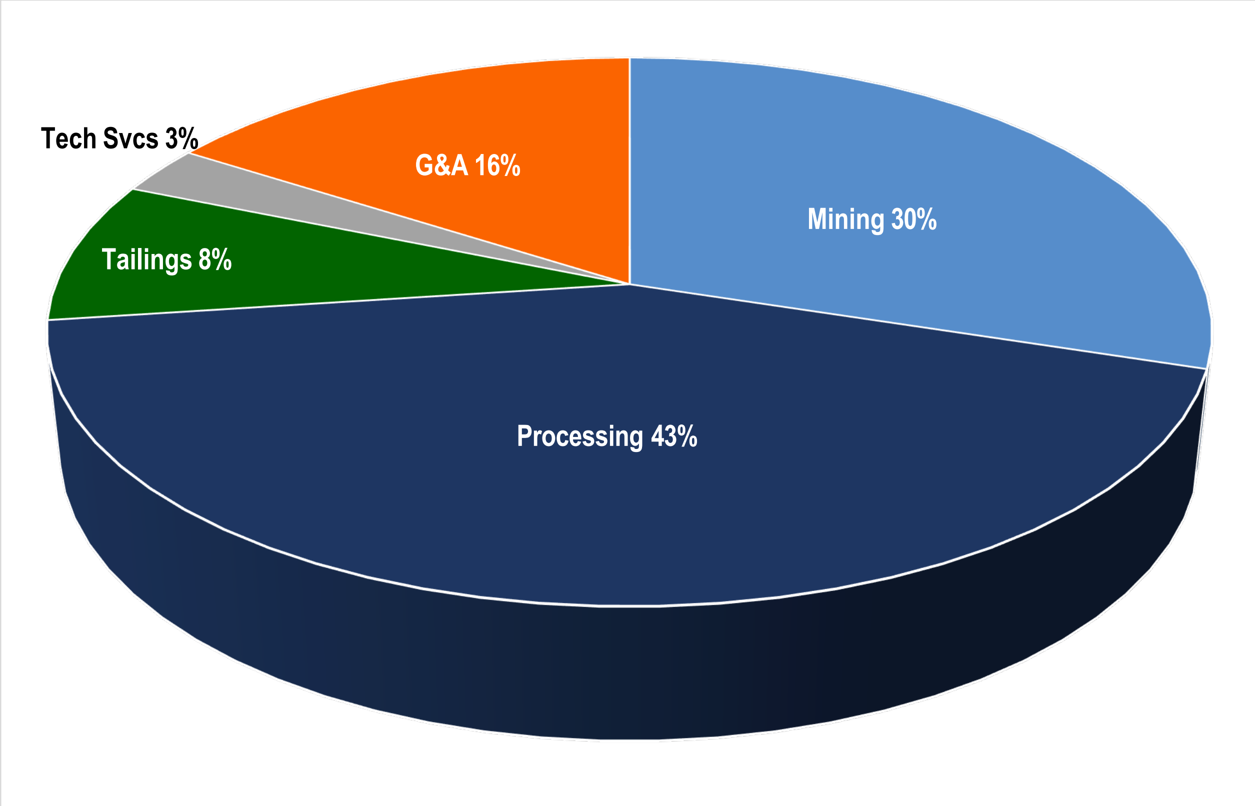
Table 22.1 presents a summary of La Negra's LOM's operating costs, in US$, with no escalation. Figure 22.1 shows the distribution of costs by cost sector.

Table 22.1 La Negra LOM and Annual Operating Cost Summary

Operating Costs	LOM Cost US$m)	Annual Cost (US$m)	US$/t milled
Mining			
Payroll (Staff and Union)	13,377,067	1,803,650	2.15
Diesel	14,119,966	1,903,816	2.27
Haulage	7,365,608	993,116	1.18
Mine Services	4,359,212	587,759	0.70
Drill Steel	3,677,070	495,785	0.59
Explosives	3,433,317	462,919	0.55
Mechanical Maintenance	2,903,624	391,500	0.47
Tools	1,337,625	180,354	0.21
Safety	659,493	88,920	0.11
Electrical Maintenance	238,197	32,116	0.04
Spare Parts	491,390	66,255	0.08
Gasoline	215,770	29,093	0.03
Other	42,066	5,672	0.01
Total Mining Costs	**52,220,404**	**7,040,953**	**8.39**
Processing			
Reagents	26,855,799	3,621,007	4.32
Labor (Staff and Union)	13,730,764	1,851,339	2.21
Power	13,035,814	1,757,638	2.09
Maintenance	10,798,238	1,455,942	1.74
Spare Parts	5,275,250	711,270	0.85
Haulage	2,314,997	312,134	0.37
Make-up Water	713,474	96,199	0.11
Lab	1,079,044	145,489	0.17
Fuel and Lubricants	887,969	119,726	0.14
Construction Materials	192,976	26,019	0.03
Tools	77,768	10,486	0.01
Other	144,981	19,548	0.02
Safety Equipment	34,849	4,699	0.01
Total Processing Costs	**75,141,922**	**10,131,495**	**12.07**
Tailings	**14,597,557**	**1,968,210**	**2.35**
G&A			
Labor (Staff and Union)	5,869,902	791,448	0.94
Outside Service Providers	7,208,736	971,964	1.16
Insurance	5,119,466	690,265	0.82
Mining Concessions/Community	4,048,782	545,903	0.65
Environmental	2,887,820	389,369	0.46
Safety/Security	1,664,406	224,414	0.27
Supplies/Other	545,057	73,491	0.09
Accommodations and catering	443,474	59,794	0.07
Total G&A	**27,787,644**	**3,746,649**	**4.47**
Technical Services	**4,975,345**	**670,833**	**0.80**
Total Operating Cost	**174,722,872**	**23,558,140**	**28.08**

Source: MLN

Figure 22.1 Operating Cost Distribution



Source: MLN

22.2 Mine Operating Cost Estimates

Mine operating costs were derived from vendor quotations and historical data collected by Mining Plus and MLN, and include labor maintenance, component repairs, fuel and consumables. The mining cost estimate includes the following:

- Drilling
- Blasting
- Mucking
- Hauling
- Rehandling
- Mine General

It should be noted that Technical Services, which includes geology, engineering, and projects, is not included in mining costs but is broken out separately in this section.

Operating hours on each piece of equipment has been estimated based on equipment capacity and the mine production schedule and efficiency estimated on the basis of project conditions. Local labor rates and diesel fuel prices were incorporated into the mining cost model. Unit hours were multiplied by hourly consumption rates and unit costs to calculate the total operating cost per year.

The mining costs do not include the cost of blending/rehandling material prior to crushing, which is included in processing costs.

Table 22.2 LOM and Annual Mining Cost Summary

Operating Costs	LOM Cost US$m)	Annual Cost (US$m)	US$/t milled
Mining			
Payroll (Staff and Union)	13,377,067	1,803,650	2.15
Diesel	14,119,966	1,903,816	2.27
Haulage	7,365,608	993,116	1.18
Mine Services	4,359,212	587,759	0.70
Drill Steel	3,677,070	495,785	0.59
Explosives	3,433,317	462,919	0.55
Mechanical Maintenance	2,903,624	391,500	0.47
Tools	1,337,625	180,354	0.21
Safety	659,493	88,920	0.11
Electrical Maintenance	238,197	32,116	0.04
Spare Parts	491,390	66,255	0.08
Gasoline	215,770	29,093	0.03
Other	42,066	5,672	0.01
Total Mining Costs	**52,220,404**	**7,040,953**	**8.39**

Source: Mining Plus, MLN

22.2.1 Mobile Equipment

The list of equipment required by Minera La Negra can be found in Section 16. The operating costs for each piece of equipment were calculated based on operating hours per year, fuel consumption (based on engine size), and lube, overhaul, and maintenance costs.

Spare parts, non-energy consumables, and miscellaneous operating costs are based on the mining fleet described in Section 16 and historical estimates.

22.2.2 Labor

Labor is the largest cost associated with mining at La Negra. Annual mining costs, including both unionized and salaried staff, are estimated to total US$1.8 million per annum, or US$2.15 per tonne.

The labor requirements used in the determination of mining costs for Minera La Negra are based on the company's historic experience, albeit adjusted for the reduced workforce and the terms of the agreement that was agreed in April of 2021. While this agreement did not include bonuses, a productivity-based bonus has been included in the mining cost estimate. As noted, Technical Services costs are broken out separately in Section 22.6. As shown in Table 22.3 mine labor costs are divided into mine operations and mine general. Mine operations refers to the union workforce, and includes equipment operators (excluding hauling, as this will be carried out by community contractors), while mine general refers to supervisory roles and other salaried staff.

Table 22.3 Mine Labor

Personnel	Maximum Employees
Mine Operations	**81**
Jumbo Operator	6
Production Drill Operator	8
Scoop Operator	14
Mechanics	10
Electricians	5
Explosives	2
Support	36
Mine General	**14**
Mine Operations	7
Mechanical Maintenance	4
Electrical Maintenance	3
Total	**95**

Source: Mining Plus, MLN

22.2.3 Explosives

A power factor of 0.96 kg/t was used to determine explosives quantities for development headings and 0.58 kg/t for stoping. These figures are based on historic consumption rates. Annual consumption was based on the mine plan detailed in Section 16.

The weighted-average cost of the various explosives used at La Negra has been estimated to total MXN15.40/kg, with a power factor of, respectively, 0.96kg/tonne for development, 0.58kg/tonne for stoping, and 2.72kg/tonne for raise development. This is equivalent to US$0.55/tonne milled.

22.2.4 Diesel

The cost of diesel in this study has been estimated at MXN18.53/liter, or approximately US$3.52 per gallon, and is based on the recent price for fuel delivered to site. Diesel is a major consumable and the annual cost is estimated at US$1.9m, based on the average consumption for each piece of equipment and the anticipated operating hours. This equates to a diesel cost of US$2.27/tonne milled.

Figure 22.2 Major Equipment Diesel Consumption

Item	Liters per hour
Scooptram 3.5cuyd	17.0
Scooptram 6cuyd	25.5
Jumbo	6.5
Simba	6.5
Low profile	23.8

Source: MLN

22.2.5 Drill Steel

Drill steel costs and consumption rates were calculated for each of the main pieces of equipment used at La Negra (16 ft jumbos, Simba and PLH production drills). The total average cost of drill steel is estimated at US$0.45m per annum, or US$0.50/tonne milled.

22.2.6 Power

All power costs consumed on site, including those used in mining, have been allocated to processing plant costs for the purpose of this study. The restart budget includes the amount required to install the equipment required to measure power consumption in the mine.

22.2.7 Cabling and Piping

Cabling, piping, and other services also represent a significant operating cost, with copper cable representing the bulk of this expenditure. Total annual costs are close to US$0.6m, or US$0.67/tonne milled.

22.2.8 Maintenance

For the restart plan a significant preventive maintenance plan has been introduced, including thrice-yearly maintenance for the mine fleet and compressors. Maintenance accounts for US$0.51/tonne milled.

22.2.9 Contractors

Mining operations at La Negra have been historically carried out by union personnel, including drilling, blasting, and mucking. Mineralized material haulage, however, has been carried out by a community-based contractor. The mine plan outlined in this study assumes that the same arrangement will continue with an average haulage cost of US$1.32 per tonne.

22.3 Process Operating Cost Estimate

Processing operating costs include all costs from the point at which material is tipped into the primary crusher through the production of concentrates (shipment costs are included in NSR). The processing cost estimate also includes the operation of the metallurgical lab and the tailings facility. The existing processing plant was designed to treat approximately 3,000 tpd but this plan envisions operating the plant at a nominal 2,500 tpd.

Table 22.4 LOM and Annual Processing Operating Costs

Processing Operating Costs	LOM Cost US$m)	Annual Cost US$m	US$/t milled
Reagents	26,855,799	3,621,007	4.32
Labor (Staff and Union)	13,730,764	1,851,339	2.21
Power	13,035,814	1,757,638	2.09
Maintenance	10,798,238	1,455,942	1.74
Spare Parts	5,275,250	711,270	0.85
Haulage	2,314,997	312,134	0.37
Make-up Water	713,474	96,199	0.11
Lab	1,079,044	145,489	0.17
Fuel and Lubricants	887,969	119,726	0.14
Construction Materials	192,976	26,019	0.03
Tools	77,768	10,486	0.01
Other	144,981	19,548	0.02
Safety Equipment	34,849	4,699	0.01
Total Processing Costs	**75,141,922**	**10,131,495**	**12.07**

Source: MLN

22.3.1 Mineral Processing Labor

Process plant operations and maintenance staffing levels are based on La Negra's historic experience, with union labor rates based on the April 2021 agreement, plus an estimated bonus allowance. For salaried staff labor rates are based on current, actual salaries. The labor force for the plant is estimated to total 93 employees, including a union workforce of 75 and 18 salaried employees. The labor cost estimate assumes [three] daily shifts of [eight] hours and 337 effective working days per year for the union employees and two, twelve-hour shifts for salaried staff.

Table 22.5 Processing Plant Labor

Personnel	Maximum Employees
Plant Operations	44
Plant Maintenance	20
Laboratory	11
Plant Salaried Workforce	18
Total	**93**

Source: MLN

22.3.2 Mineral Processing Power

Electrical power consumption has been based on historical operating experience, factoring in connected loads discounted for operating time and anticipated operating load levels. The annual process plant energy consumption is estimated at 27.2kWh/tonne, equivalent to an annual consumption of 22.9MWh. At an estimated power cost of MXN1.61/kWh the annual power cost is US$1.74 m/y, or US$2.09/ tonne milled. As part of this study, 100% of the power consumption from Minera La Negra is assigned to the processing plant operations, except for the power consumed in tailings operations. Surface mounted mine exhaust fans, required in future years to support increasing the mine ventilation as a result of mine growth, will be added to the power estimates in future plans.

Power from the backup generators, which are activated during blackouts to prevent tailings spillage, has been accounted for separately in other processing costs as shown in Table 22.4, and is a minor amount.

22.3.3 Consumables

The cost of mill liners, crusher bowls and mantles, grinding media, and filter cloths has been based on vendor quotes, while consumption rates are based on historical experience. Table 22.6 below presents a summary of annual estimated consumable consumption and costs.

Table 22.6 Consumable Consumption and Costs

Item	Consumption	Cost	US$/t
	Consumption (g/t milled)	**Cost (US$/kg)**	
Steel balls	540	1.37	0.74
	Consumption (units)	**Cost (US$/unit)**	
10x10 liners	1	171,626	0.20
9x11 liners	1	130,660	0.16
7.5x10 liners	1	94,974	0.11
30x42 - fixed	4	10,994	0.05
30x42 - mobile	4	10,153	0.05
Secondary liner	4	7,144	0.03
Secondary mantle	4	8,573	0.04
Tertiary liner	4	7,144	0.03
Tertiary mantle	4	8,573	0.04
Filter fabric	468	82	0.05
Total			**1.51**

Source: MLN

22.3.4 Reagents

The consumption of reagents is based on historical operating experience and has not been adjusted for the potential savings that could be obtained with the installation of the continuous analyzer. Unit prices are based on actual vendor quotes. The following table details the reagents utilized in the processing plant, unit costs, and per-tonne milled totals.

Table 22.7 Reagent Consumption and Costs

Reagents	Consumption (g/t milled)	Cost (USD/kg)	US$/t
Ammonium bisulfite	2764	0.41	1.12
Copper sulfate	410	2.03	0.83
Sodium hydroxide	280	2.70	0.76
Sodium cyanide	200	2.45	0.49
Zinc sulfate	400	0.99	0.40
S-7583	25	11.14	0.28
CC-1064	38	4.97	0.19
Aero 404	20	4.79	0.10
Lime	520	0.12	0.06
Xanthate	10	3.73	0.04
Aero 5160	10	4.10	0.04
Flocculant	2	7.84	0.02
Total			**4.32**

Source: MLN

22.3.5 Maintenance Parts

Annual maintenance parts such as valves, elbows, pumps, and other wear parts have been estimated by La Negra staff based on historical operating experience. Costs are based on quotes provided by suppliers.

22.4 Tailings Operating Cost Estimate

Tailings operating costs are considered independently of processing costs, except for labor costs, which are included in the processing cost estimates. The principal cost of tailings consists of the cost of operating the tailings filtration plant, the costs of operating and maintaining the conveyor, spreading, compaction, and dust suppression of the filtered tails, pump back system and general maintenance costs. Given the level of study, an additional contingency was added to the operating costs. The cost of operating the filtered tailings facility was estimated by Wood EIS at US$2.80 per tonne. The LOM cost it estimated at US$2.33 per tonne because lower cost conventional filtered tailings will be used for startup.

Table 22.8 Filtered Tailings Operating Costs

Description	US$ per annum	US$/t
Filter Plant Costs (USD)	**1,140,000**	**1.35**
Conveyor Costs (USD)		
Conveyor Maintenance	26,846	0.03
Conveyor Power	5,433	0.01
	32,279	**0.04**
Spreading and Compaction Costs (USD)		
Dust control	152,000	0.18
Spreading and compaction	299,394	0.36
	451,394	**0.54**
Materials		
Electrical Maintenance	18,705	0.02
Mechanical Maintenance	80,222	0.10
Maintenance Costs (USD)	63,538	0.08
	162,465	**0.19**
Contingency (USD)	**568,285**	**0.67**
Total Filtered Tailings Costs (USD)	**2,354,423**	**2.79**

Source: MLN

22.5 General and Administrative Operating Cost Estimate

General and administrative (G&A) costs include any cost not directly associated with mining, processing, and technical services and which are shared by these three areas for the benefit of the mine. These costs include staff dedicated to accounting and administration; health, safety, and security; environmental; and IT. G&A costs also include the cost of outside third-party providers such as catering, transportation, security, medical services, external environmental services, waste disposal, accounting and audit, legal and compliance, and other external consultants. Finally, this category also includes service providers such as insurance, software, communications (fixed and satellite), and other costs such as supplies, COVID management measures, travel, mining concessions, and community-related expenses. Table 22.9 illustrates the major components of La Negra's anticipated G&A costs.

Table 22.9 LOM and Annual General and Administrative (G&A) Costs

Description	LOM Cost US$m)	Annual Cost US$m	US$/t milled
Labor (Staff and Union)	5,869,902	791,448	0.94
Outside Service Providers	7,208,736	971,964	1.16
Insurance	5,119,466	690,265	0.82
Mining Concessions/Community	4,048,782	545,903	0.65
Environmental	2,887,820	389,369	0.46
Safety/Security	1,664,406	224,414	0.27
Supplies/Other	545,057	73,491	0.09
Accommodations and catering	443,474	59,794	0.07
Total G&A	27,787,644	3,746,649	4.47

Source: MLN

22.6 Technical Services Cost Estimate

Technical Services costs are broken out separately because they provide support to both mining and processing but are not properly a part of mine administration. While geology, for instance, is integral to the mining process, it also includes exploration, which is not a production function. Engineering and projects support both mining and processing and are also included in Tech Services. The costs of Technical Services are detailed in Table 22.10.

Table 22.10 LOM and Annual Technical Services Costs

Description	LOM Cost US$m)	Annual Cost US$m	US$/t milled
Labor (Staff and Union)	3,075,476	414,671	0.49
Equipment	1,899,869	256,162	0.31
Total Technical Services	4,975,345	670,833	0.80

Source: MLN

These costs were estimated by La Negra based on historical experience and current labor rates (fully loaded) and include the personnel (both staff and union) required both to support mining and processing operations, but also to aid in exploration and new project development.

22.7 Labor

The labor force at Minera La Negra is entirely national, with no expats on the payroll. The salaried staff will operate on two shifts of twelve hours each.

This study assumes that the mine will operate on two different shift rotations, with some unionized employees working on three shifts of eight hours each and some working two, ten-hour shifts, requiring a total complement of 65 staff and 164 unionized employees. These employees will be responsible for development drilling and blasting, stoping and mucking, plant operations (including lab and TSF), and general and administrative.

Labor rates include all benefits afforded to the professional staff, including housing and meals, medical and life insurance, and international travel (where applicable). For the union staff labor rates include all salaries and benefits, including the year-end *aguinaldo* top-up payment and contribution to the *Fondo de Ahorro* (savings plan) decreed by law, attendance payments and food coupons required by the collective bargaining agreement, and an estimated productivity bonus.

Community-based contractors are utilized to haul muck to surface and to haul mineralized material from the stockpile and blending area to the primary crusher. A local contractor is used to transport concentrate. The cost of material haulage is included in the mining cost estimate, while the cost of delivering it from the stockpile to the crusher is included in the processing cost estimate. The cost of concentrate haulage is included in the NSR estimate.

23 Economic Analysis

MLN developed an engineering economic model to estimate monthly cash flows for La Negra. The LOM plan utilized in the financial model was developed by MLN and updated by Mining Plus US, with mining operating costs and capital developed with the help of MLN. Process capital and operating costs were developed by MLN, as were the estimates for Technical Services. Tailings capital and operating costs were developed under the supervision of Wood. A univariate sensitivity analysis was performed for varying metal prices, operating costs, capital costs and discount rates to determine the importance and impact of each of these drivers.

The cash flow model includes both pre-tax and after-tax values, presented for illustrative purposes. It should be noted, however, that Mexico's tax code is complex and can be labyrinthine, such that the after-tax results presented in this study are approximations that may not be borne out during actual operations.

This technical report contains forward-looking information, including the commodity price assumptions, projected production rates and achieved head grades, recoveries, and concentrate offtake terms, and capital operating cost assumptions. Unlike greenfield sites, MLN has a fleet and well-developed underground infrastructure, a processing plant, and all the required permits for operation.

The capital and operating cost estimates were developed specifically for this project and summarized in Section 21. The economic analysis has been carried out on a constant basis (i.e. without inflation).

23.1 Assumptions

A summary of the mine plan and payable metals production is shown in Table 23.1.

Table 23.1 Life of Mine (LOM) Summary

Parameter	Unit	Value
Mine Life	Years	7.42
Total Ore Production	kt	6,223
Silver (Ag) Grade	g/t	63
Lead (Pb) Grade	%	0.46
Zinc (Zn) Grade	%	1.51
Copper (Cu) Grade	%	0.35
Process Rate	tpd	2493
Silver (Ag) Payable	LOM koz	9,101
	kozpa	1,227
Lead (Pb) Payable	LOM kt	40,960
	ktpa	5,521
Zinc (Zn) Payable	LOM kt	141,900
	ktpa	19,126
Copper (Cu) Payable	LOM kt	31,623
	ktpa	4,262

Source: MLN

Other economic factors are as follows:

- Discount rate of 5%
- Nominal 4Q 2021 Mexican Pesos
- MXN/USD exchange rate of 21:1
- Revenues, costs, and taxes are calculated for the period in which they occur rather than actual incoming revenues/outgoing payments
- Working capital was calculated as those expenditures required during the pre-production period (M-3 to M-1) based on individual items
- The financial model is based on 100% equity financing, with no allowance for debt financing or debt financing costs
- The financial model includes all capital costs beginning in month M-3 and excludes capital costs and/or owner costs incurred prior to that date
- The financial model includes a 35% contingency for the capital related to the filtered tailings facility, a 20% contingency for mining equipment, and a 10% contingency for the mill restart project

The long-term commodity price forecasts and FX assumptions used in this document are outlined in Table 23.2.

Table 23.2 Commodity Price and FX Assumptions

Commodity	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Silver	US$/oz	22.50	22.50	22.13	22.00	22.00	22.00	22.00	22.00
Lead	US$/lb	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Zinc	US$/lb	1.18	1.16	1.15	1.15	1.15	1.15	1.15	1.15
Copper	US$/lb	3.95	3.76	3.78	3.65	3.60	3.60	3.60	3.60
MXN	per US$	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

Source: MLN

The reader is cautioned that metals prices and FX rates have been estimated based of the best information currently available, but these can be volatile and difficult to project precisely over long periods.

23.2 NSR Model

Mine revenue will be derived from the sale of three different concentrates: lead concentrates with significant silver values; zinc concentrates with minor silver (not payable), and copper concentrates with silver values (see Sections 13 and 17). Each concentrate has different payable and deduction assumptions, treatment and refining charges, and limits for certain deleterious elements which may results in treatment penalties. Predicting actual treatment charges and penalties is difficult, as these are based on many factors which can and do change over time. The actual treatment and penalty charges used in this study are meant to be reasonable assumptions over the medium-term based on current market conditions.

Table 23.3 La Negra Concentrate NSR Model

	Ag	Pb	Zn	Cu	Fe	As
Material Grade	63	0.46%	1.51%	0.35%	8.78%	0.71%
Gross Recovery (%)	79.7	72.3	84.0	68.0		
Concentration Ratio		193.1	34.5	99.9		
Concentrate Grade		**Pb**	**Zn**	**Cu**		
Moisture (%)		11.1	12.2	10.2		
Ag (g/t)		8,362	156	1,740		
Au (g/t)		2.5	0.0	1.0		
Pb (%)		60.2	0.2	2.4		
Zn (%)		1.3	49.2	6.7		
Cu (%)		0.0	0.0	23.9		
Fe (%)		0.0	15.0	0.0		
As (%)		0.63	0.00	0.38		
Sb (%)		1.2	0.00	0.03		
Cd (ppm)		0.0	0.42	0.00		
Bi (%)		2.0	0.00	0.00		
SiO_2 (%)		0.0	0.00	0.00		
Cl (ppm)		0.0	0.00	0.00		
F (ppm)		0.0	0.00	0.00		
Payability						
Ag (%)		95%/50g/t ded	70%/100g/t ded	90%/31g/t ded		
Pb (%)		95%/3% ded	0.0	0.0		
Zn (%)		0.0	85%/8 % ded	0.0		
Cu (%)		0.0	0	96.5%/1% ded		
Deductions						
Treatment Charge (US$/t)		97	150	75		
Treatment Charge Escalation (US$/t)		0	0.12 > 1900/t	0		
Refining Charge Ag (US$/oz)		0.75	0.0	0.75		
Penalties						
As (US$/t)		0	0	2.5 > 0.2%		
Sb (US$.t)		0	0	2.5 > 0.1%		
Pb+Zn (US$/t)		0	0	2.5 > 2.0%		
Fe (US$/t)		0	2.5 > 5%	0.0		
As+Sb (US$/t)		2.5 > 0.3%	0.0	0.0		
Zn (US$/t)		2 > 5.0%	0.0	0.0		
F+Cl (US$/t)		2.00 > 500ppm	0.0	0.0		
NSR (US$/t)			**72.2**			

Source MLN

23.3 Royalties

As described in sections 4.5.1 – 4.5.3, inclusive, Minera La Negra has three distinct royalties. The first consists of the two, statutory royalties paid to the government. The first is the *derecho especial de minería* which is paid at the rate of 7.5% of gross income, subject to certain deduction as described in article 25 of the Ley del *Impuesto Sobre la Renta*. The second is the *derecho extraordinario de minería* which levies a payment of 0.5% on precious metals. In addition, there is a royalty payable to Peñoles, which is currently 2.8% but subject to certain deductions.

23.3.1 Statutory Royalty

On 1 January 2014 Mexico introduced a mining royalty (*derecho especial de minería*) payable twice annually at a rate of 7.5% of gross income from mining activities as described in the *Ley Federal de Derechos* article 268, subject to certain allowable deductions as described in article 25 of the Ley del *Impuesto Sobre la Renta* (but excluding capital investment, financing costs and inflation adjustment).

In addition, producers of gold, silver and platinum are also required to pay an additional, extraordinary mining royalty (*derecho extraordinario de minería*) equivalent to 0.5% of all revenues arising from the sale of gold, silver and platinum, and is payable in March of each year.

Idle concessions are also subject to an additional mining royalty (*derecho adicional sobre minería*) if the holder of the concession has not carried out any exploration or exploitation for two years within an eleven-year period.

23.3.2 Peñoles Royalty

Peñoles, the original vendor of the asset, is entitled to a royalty payment that is described in the 2006 purchase and sale agreement as a *prima por descubrimiento*, or discovery bonus, but is in essence a royalty on production from the following concessions: La Negra and Mariana (where the historic and current operations are centered), El Patriarca, La Yegua, and El Negro. The royalty was initially tied to the price of copper as follows:

- 3.5% when the price of copper is equal to or above US$1.60 per pound; or
- 3.0% when the price of copper is equal to or above US$1.30 per pound; or
- 2.5% when the price of copper is equal to or above US$1.00 per pound; or
- 0% when the price of copper is less than US$1.00 per pound.
- The royalty is payable after the deduction of all treatment charges, freight, penalties, and taxes.

MLN questioned the validity of the royalty and filed suit in 2014 requesting its annulment, arguing that the royalty was payable by Real de Maconí, and not by Aurcana, and MLN ceased payment of the royalty. Following appeals by both parties, the courts ultimately determined that MLN was subject to the royalty, but that Peñoles had miscalculated the royalty and had not taken into account the deductions that MLN was entitled to, thereby overcharging MLN. In April 2020 the parties agreed to amend to amend the royalty as follows:

- 2.8% when the price of copper is equal to or above US$1.60 per pound; or
- 2.4% when the price of copper is equal to or above US$1.30 per pound; or
- 2.0% when the price of copper is equal to or above US$1.00 per pound; or
- 0% when the price of copper is less than US$1.00 per pound.
- The royalty is payable after the deduction of US$16 per tonne of concentrate and the deduction of freight.

The amended royalty is payable on the same concessions as the original 2006 royalty.

23.4 Taxes

23.4.1 Income Tax

Mexico's income tax, or *Impuesto Sobre la Renta*, is assessed at a rate of 30%, and is applicable to earnings net of royalties, depreciation, amortization and interest.

23.4.2 Value Added Tax

For the purposes of this economic model, Mexico's value added tax – *Impuesto al Valor Agregado*, or IVA – has been excluded from this analysis. The prevailing IVA rate is 16% and is applied to all goods and services and is considered fully refundable. This financial model assumes that IVA paid and IVA credits will net out to zero over the life of the mine.

23.5 Production Schedule

Table 23.4 shows the LOM production of payable metals from La Negra.

Table 23.4 LOM Payable Metals

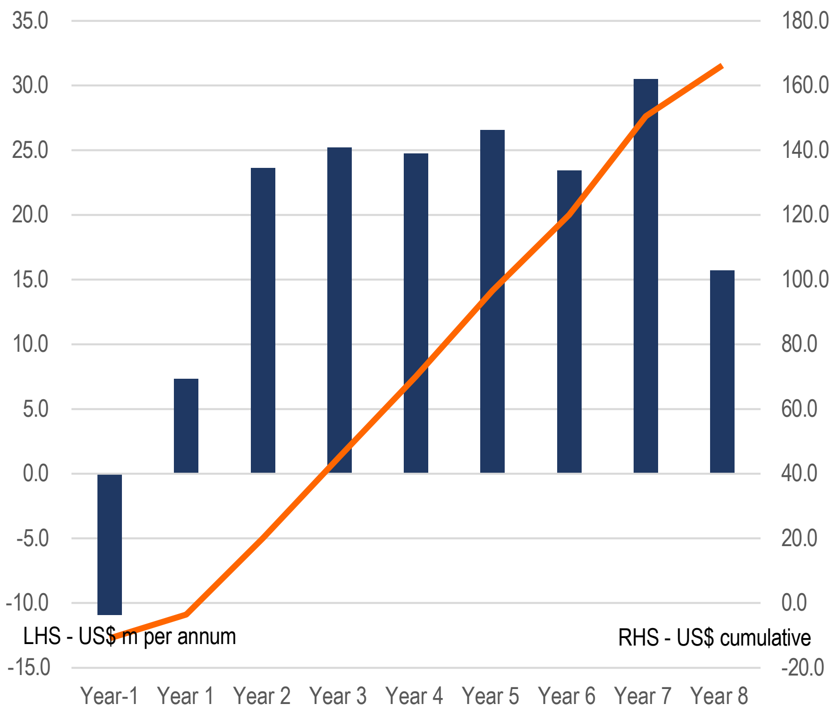
Metal	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	LOM Total
Ag	koz	893	1,018	1,202	1,242	1,253	1,062	1,656	777	9,101
Pb	klb	1,920	2,201	5,747	6,347	9,220	3,624	8,334	3,569	40,960
Zn	klb	16,099	18,164	22,834	21,009	20,106	20,424	16,584	6,680	141,900
Cu	klb	5,075	5,866	3,675	3,603	3,629	4,568	3,555	1,653	31,623

Source: MLN

23.6 Results

The project has an after-tax Net Present Value based on a 5% discount rate of US$132.4 m, based on the commodity price and FX assumptions detailed in Table 23.2. The figure below shows the annual projected cash flows for the project.

Figure 23.1 La Negra Annual After-Tax Cash Flow (US$ m)



Source: MLN

Table 23.5 summarizes the economic results of the project.

Table 23.5 Project Results Summary

	Unit	Value
AISC	US$/oz Ageq	12.95
LOM NSR	US$ m	449.2
LOM Operating Costs	US$ m	185.1
LOM Capital	US$ m	68.1
Pre-tax Cash Flow	US$ m	202.3
After-tax Cash Flow	US$ m	166.2
Pre-tax NPV (5%)	US$ m	160.5
After-tax NPV (5%)	US$ m	132.4

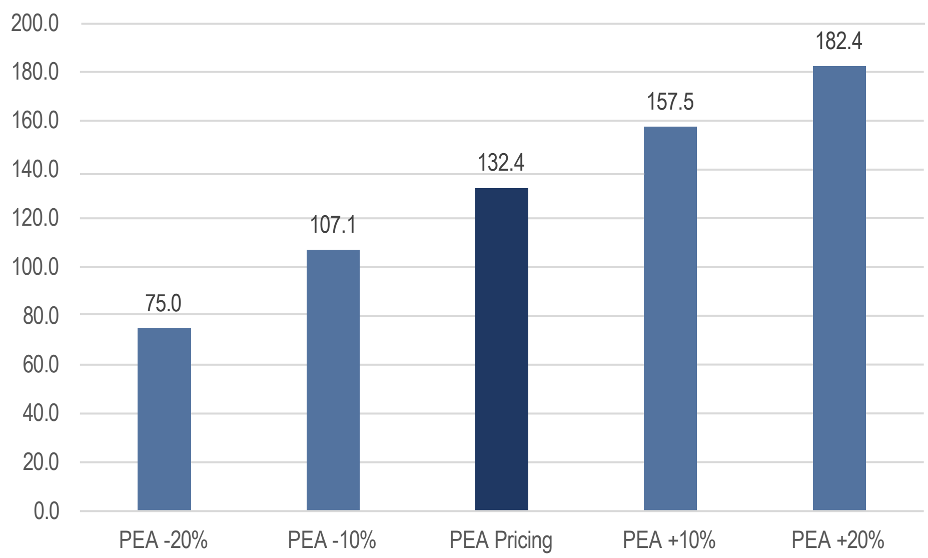
Source: MLN

23.7 Sensitivities

The following figures show the project's sensitivity to various key parameters, including metal and FX prices, operating costs and capital costs, and concentrate treatment charges.

Figure 23.2 shows the project's sensitivity to metal prices, with prices of -20%, -10%, +10%, and +20% relative to the base case commodity price estimates used in this report.

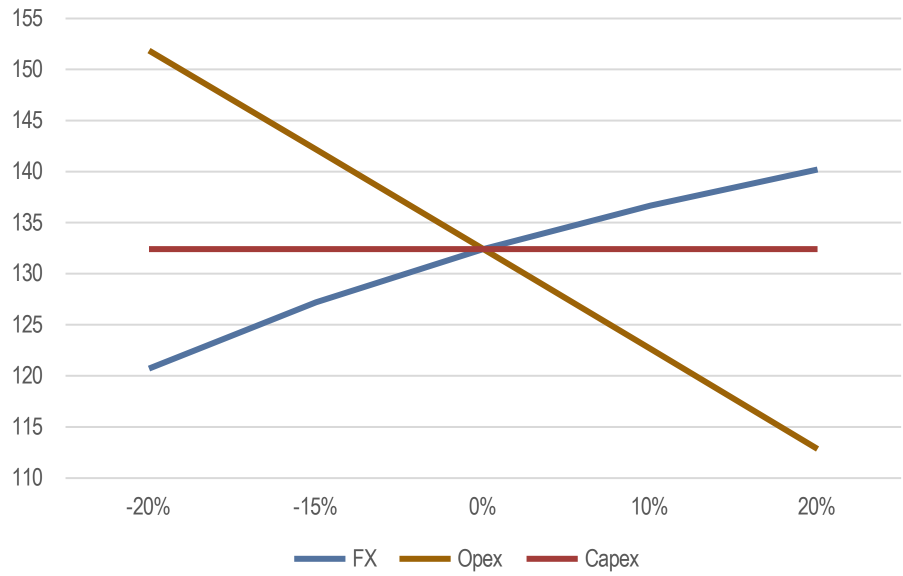
Figure 23.2 La Negra NPV (US$ m) Metals Price Sensitivity



Source: MLN

The following figure compares the project's sensitivity to changes in capital and operating costs, and FX. Virtually all of La Negra's input costs are denominated in MXN, which makes the project's US$ NPV particularly sensitive to changes in the exchange rate.

Figure 23.3 La Negra NPV (US$ m) Sensitivity to Capital and Operating Costs, FX



Source: MLN

The following table shows the NPV for the project at several discount rates.

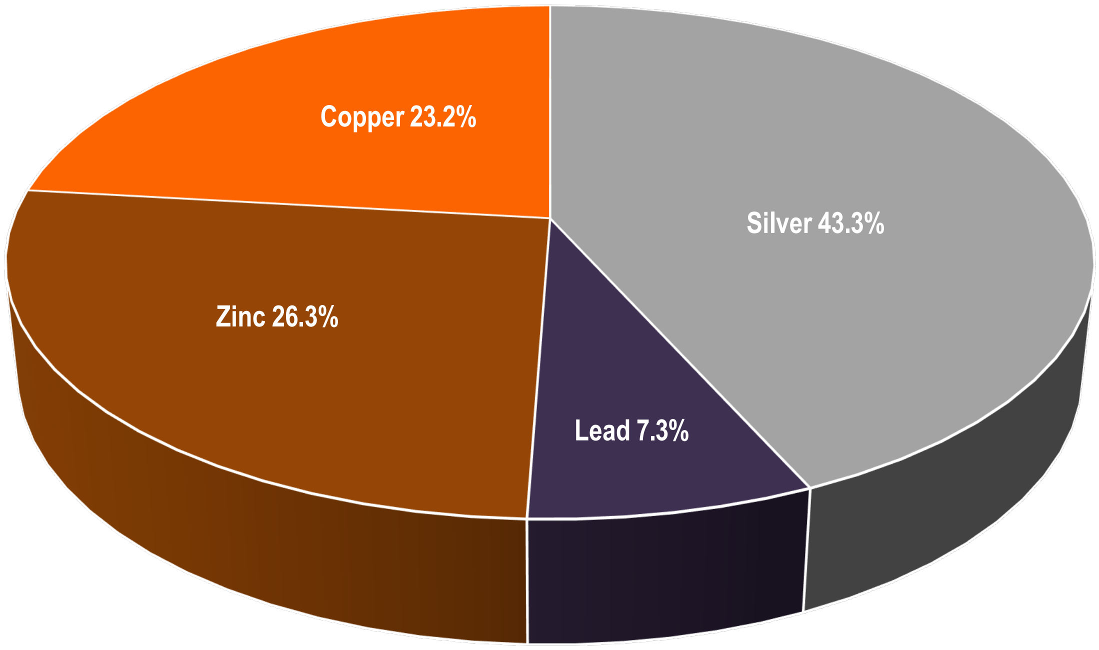
Table 23.6 Project NPV Discount Rate Sensitivity

Discount Rate (%)	Pre-tax NPV US$ m	After-tax NPV US$ m
0.0	202.3	166.2
2.5	179.8	148.0
5.0	160.5	132.4
7.5	143.9	119.0
10.0	129.5	107.3
12.5	117.1	97.1
15.0	106.2	88.2

Source: MLN

Figure 23.4 shows the distribution of revenue by payable metal.

Figure 23.4 NSR Distribution by Metal



Source: MLN

24 Adjacent Properties

24.1 Introduction

The Zimapán Property claims are adjacent to the primary La Negra mine claim, although Zimapán is located in the state of Hidalgo. The property hosts the Carrizal and El Monte mines which are about 10 km from the La Negra mine. Both mines are in current operation.

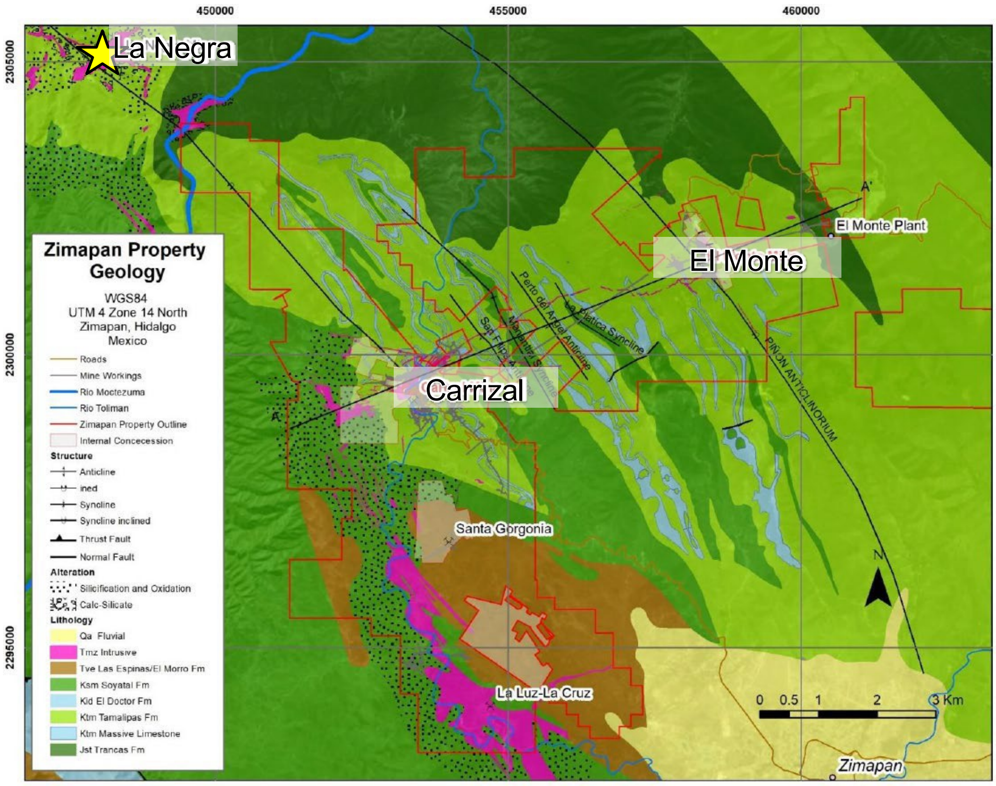
24.2 Ownership

The Zimapán project is 100% owned by SantaCruz Silver, a TSX-listed company (symbol SCZ.TO). Prior to 2021 the mine was owned by Peñoles, but SantaCruz was operating the mine under an option agreement. In April of 2021 SantaCruz exercised its purchase option and became the owner of the mine

24.3 Geology and Resources

The geologic setting of the Zimapán property is broadly the same as La Negra, with mineralization hosted in the same package of rocks as La Negra (locally the El Doctor Formation is known as the Tamaulipas Formation), and the same regional throughgoing structure, the NW-trending axial plane of the Piñón anticline, running through both La Negra and the Carrizal mine.

Table 24.1 Zimapán Property Geology (SantaCruz Silver, 2020)



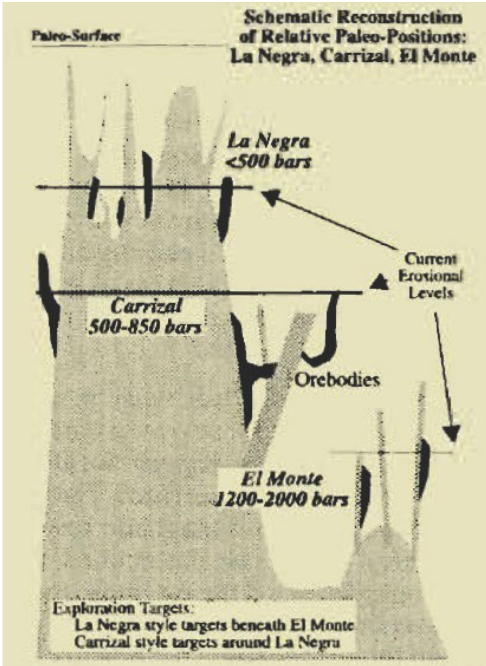
Source: SantaCruz Silver

While similar to La Negra, the mineralizing environment shows some differences. Lang, et al (1998), concluded that the La Negra and Zimapán mines share the same intrusive system, but dating by Vassallo, et al, demonstrated that the intrusive event at Zimapán is older than at La Negra (40.8 to 43.6 Ma at Zimapán vs 38.7 to 39.6 Ma at La Negra). There are, in addition, some compositional differences, with the intrusives at Zimapán consisting of quartz-monzonite and monzonite, while the intrusives at La Negra are more granodioritic. Lang and others have concluded that the mineralization at Zimapán is deeper and formed from higher salinity fluids (31 to 42% weight NaCl equivalent vs 12 to 24% weight NaCl equiv at La Negra). Mineralization occurred at similar temperatures in both systems. Interestingly, the initial spurrite alteration common at La Negra is absent at Zimapán.

The principal minerals are argentite (which is not present at La Negra), galena, sphalerite, and chalcopyrite.

Despite the similarities with La Negra, SantaCruz describes the deposits in the Zimapán district as Zn-Pb-Ag±Cu±Au Carbonate Replacement Deposits.

Figure 24.1 Schematic Reconstruction of Relative Paleo-Positions La Negra, Carrizal, El Monte, (Lang et al, 1998)



Source: Lang et al (1998)

Although Zimapán is currently operating, the technical report dated August 2020 does not include a resource estimate.

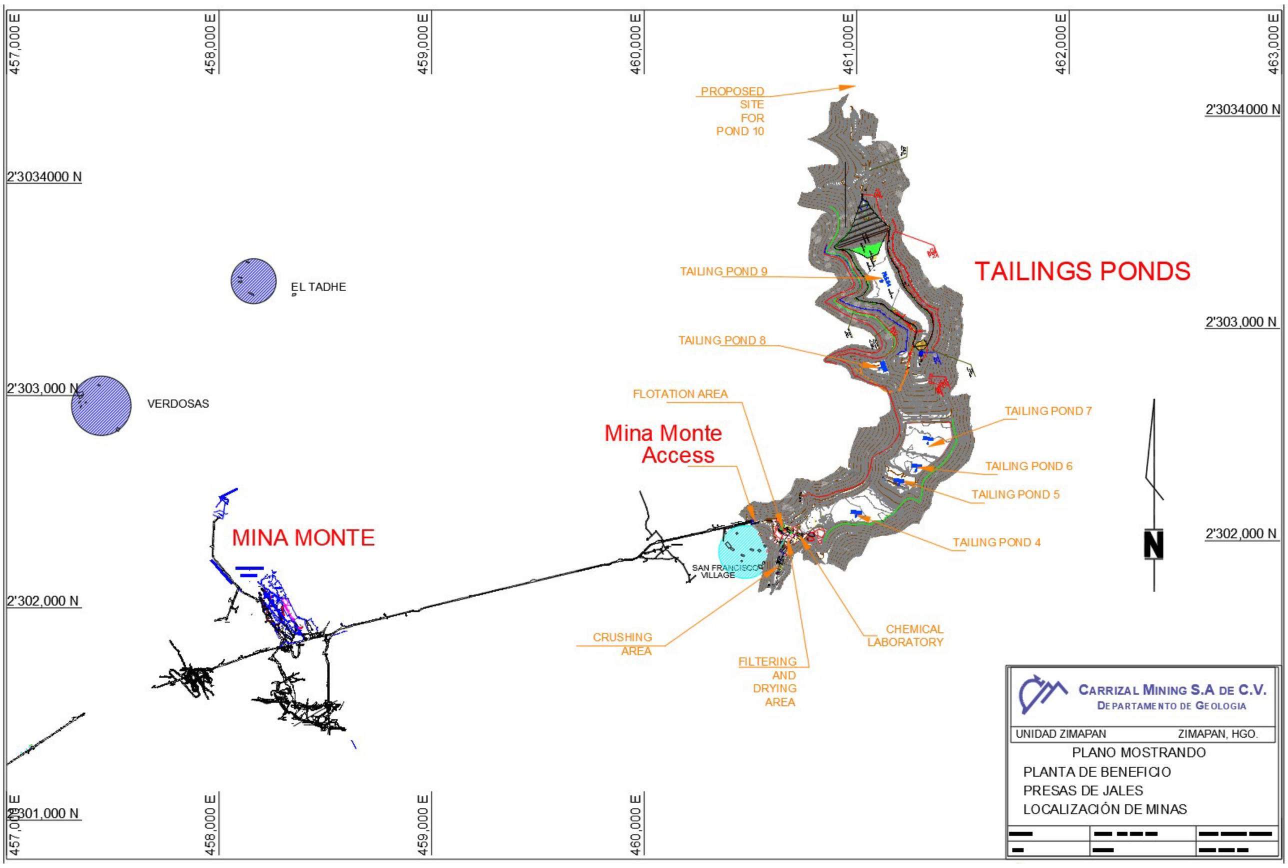
24.4 Mining and Processing

Mining at Zimapán is by mechanized, underground methods. The principal mining method employed at the Carrizal and El Monte mines is open stope mining, but variations are employed depending on the dip of the mineralization. For subvertical to inclined zones long hole stoping is supplemented with cut-and-fill and sub-level stoping, while for subhorizontal zones room and pillar mining is employed. Development waste is utilized as backfill where required. Blasted material is mucked with scooptrams and then loaded into 10 to 15-tonne vehicles for transport to the El Monte processing facility.

The processing plant at Zimapán uses conventional flotation to produce lead, zinc, and copper concentrates with precious metals values, and has a capacity of 75,000 tonnes per month. Material from Carrizal and El Monte are blended in a 2:1 ratio and fed to a three-stage crushing circuit which produces a product of approximately 3/8 inch which is then fed to three ball mills. Ground material passes to two froth flotation circuits: a lead-copper bulk flotation circuit and a zinc selective flotation circuit. Based on data for 2010-2019, the lead concentrate has a Pb grade of 64.1% and 34.5% of the Ag reports to the lead concentrate. The grade of the Zn con is 70.4% and 7.9% of the Ag reports to the zinc concentrate. For copper, the average Cu grade of the concentrate is 51.8% and 24.9% of the silver reports to the copper concentrate. Concentrate is shipped to the port of Manzanillo and delivered to Trafigura under an existing offtake contract. Tailings are fed by gravity to the tailings storage facility.

The Zimapán property and mine infrastructure are shown in the following figure.

Figure 24.2 Zimapán Mine Infrastructure



Source: SantaCruz Silver

25 Other Relevant Data and Information

25.1 Exploration Target

The following sources of information and project aspects have been considered in support of an exploration target:

- Soils and prospect sampling conducted during the 2021 field exploration program, Figure 9.1,
- Surface geologic mapping Figure 7.16 and Figure 6.1,
- Geophysical surveys covering the concession area, SGM Total Magnetics and First Derivates Magnetic map pane F14-C58,
- Size and intensity of the intrusive and corresponding alteration halo, Figure 7.4 and Figure 7.16,
- Depth extent of the mineralizing intrusive interpreted by SGM and suggested in fluid inclusion work by Lang, et al (1998), Figure 7.4 and Figure 24.1,
- Material that is currently below the threshold for Reasonable Prospects for Eventual Economic Extraction and requires additional analysis, Section 14, and
- The project's considerable mining history, Figure 6.1.

The potential quantity and grade of this exploration target is conceptual in nature, there has been insufficient exploration to define a mineral resource. It is uncertain if further exploration will result in the target being delineated as a mineral resource.

Based on the above considerations a reasonable exploration target, at the base case cut-off, for the project ranges from 50-100% of the current tonnage at 75-125% of the current grade presented in the resource section of this report.

Table 25.1 La Negra Mineral Exploration Target Range

Tonnage Range (M)	Grade Range Ag g/t	Grade Range Pb%	Grade Range Zn%	Grade Range Cu%
4 to 9	50 to 90	0.4 to 0.6	1.3 to 2.2	0.3 to 0.5

Source: MLN

25.2 Project Execution Plan

25.2.1 Introduction

As part of the process of restarting La Negra, a detailed Project Execution Plan will be developed that describes the strategies that will be utilized to organize the required engineering, procurement, and construction. This plan will also provide guidelines on the following:

- Promoting safety during the design and construction of the tailings filtration facility, and during the reinvestment and operational phases of the project
- Maintaining sustainable relations with the community during planning, execution, restart, and mine operations
- Maintaining constructive and cooperative relations with the labor union during the planning, restart, development and operational phases of the project
- Ensuring ongoing compliance with environmental rules and operational permit requirements during the planning, construction, and restart phases of the operation
- Negotiating contracts with suppliers, contractors, engineering and other third-party providers and ensuring that these comply with the company's HSE and Compliance guidelines.

25.2.2 Project Development Schedule

A preliminary execution schedule for the restart of La Negra will be developed and will be based on a review of the remaining project engineering, procurement, construction, and management tasks required for startup. The time to production – defined as M1 or the first month of full-scale processing plant operations – is estimated at four months after financing is obtained.

The critical path items consist of the following:

- Establish a La Negra project team and, if necessary, EPCM project team
- Initiate permitting for the construction of the filtered tailings facility
- Basic and detailed engineering of the FTF and conveyor, followed by construction
- Refurbishment of site fleet and commencement of development; purchase of new equipment as needed, estimated at three to four months
- Preparation of the processing plant for full-scale operations, estimated at three to four months

25.3 Tailings Alternatives Analysis

As detailed in Wood PLC's report, a Multiple Accounts Analysis (MAA) was developed to assess tailings storage options, allowing for the combined assessment of both intangible criteria, such as aesthetics, and tangible issues like safety and costs, to be incorporated into the decision-making process.

Four primary accounts were considered in development of the MAA (with associated weightings):

- Technical (25%),
- Biophysical (20%),
- Human environment (15%), and
- Economics (40%).

Each primary account is presented on a separate sheet within the MAA spreadsheet, with sub-accounts being listed in a table within the sheet. Weighting factors are provided for each sub-account to reflect their relative importance which are used to weight the values assigned to the sub-account. Each subaccount is ranked with a value between 1 and 6 for each option being considered, with a higher number indicating a preferred rating.

Figure 25.1 presents the summary of the MAA results for the base case. The set of tailings storage facilities proposed for each option are listed below for reference:

- Option 1: Filter TSF buttress at TSF 5, Filter TSF buttress at TSF 3, Paste backfill to provide balance of storage.
- Option 2: Filter TSF buttress at TSF 5, Filter TSF buttress at TSF 3, Filter TSF at Site 4.
- Option 3: Conventional tailings storage at TSF 5A, Centerline TSF at Site 4, Paste backfill to provide balance of storage.
- Option 4: Filter TSF at Site 4, Paste backfill to provide the balance of storage.
- Option 5: Filter TSF buttress at TSF 5, Filter TSF at Site 4.
- Option 6: Filter TSF buttress at TSF 5, Centerline TSF at Site 4, Paste backfill to provide balance of storage.

Figure 25.1 MAA Results and Rankings

Account	OVERALL RANKINGS - BASE CASE						Weighting
	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	
Technical	4.6	2.8	2.4	3.2	3.1	2.0	25.0%
Biophysical	5.3	4.1	3.0	4.7	4.3	2.7	20.0%
Human	5.0	3.4	3.2	3.4	3.4	3.0	15.0%
Economics	2.9	3.5	3.0	2.5	3.5	2.1	40.0%
Overall Score	4.1	3.4	2.9	3.3	3.5	2.3	100.0%

Option 1 is the preferred option for the base case. The second most preferred option is Option 5 which ranks significantly lower than Option 1, and only slightly above Options 2 and 4.

Options that include a greenfield development at Site 4 are penalized because of the proximity of the town of Maconí, the impact that developing Site 4 will have to the environment, and the flood risk associated with the relatively large upstream catchment.

Sites that include conventional tailings are penalized because of the additional risk posed by conventional slurry TSFs and the more difficult closure of those facilities.

26 Interpretation and Conclusions

26.1 Interpretation and Conclusions

The results of this study indicate that La Negra has the potential to be restarted as a profitable mining operation and further work to better define the project scope is warranted.

26.2 Risks

26.2.1 Project Risk Assessment

Minera La Negra uses an enterprise risk management (ERM) approach which identifies the top risks and procedures to mitigate them. The risk register is prepared by La Negra's compliance officer with the help of the senior staff and reviewed by the Board of Directors of Minera La Negra to ensure that the ERM method is being followed and risks identified and reported.

The primary risk breakdown structure was centered around nine primary risks, as follows:

- Mining
- Processing
- Growth
- Labor
- Civil Disturbance
- Permits and Operating Licenses
- Tailings
- Business Disaster Recovery
- Financial Irregularities

An additional matrix considers those risks that could impact Minera La Negra as a corporate entity, including Environmental, Social and Governmental risks.

26.2.2 Risk Evaluation

Risk evaluation requires assigning an impact and likelihood for each event to determine a measure of risk. This analysis considers the existing or proposed risk mitigation incorporated into the scope of work for the restart. The risk evaluation matrix used for the analysis is shown below.

Figure 26.1 Risk Evaluation Matrix

Likelihood rating			Consequence rating						
	E	1	Low	Medium	Medium	High	High	Very High	Very High
	D	2	Low	Low	Medium	High	High	Very High	Very High
	C	3	Low	Low	Medium	Medium	High	Very High	Very High
	B	4	Low	Low	Medium	Medium	High	High	Very High
	A	5	Low	Low	Low	Medium	Medium	High	High
			1	2	3	4	5	6	7

Level	Likelihood	Probability	Frequency
E	Almost certain	>95%	Is expected to occur in most circumstances, or Could occur within days to weeks
D	Likely	65-95%	Could occur in most circumstances, or could occur within weeks to months
C	Possible	35-65%	Has occurred before or could occur within months to years
B	Unlikely	5-35%	Has occurred before in a similar company, or could occur within the next few years
A	Very Rare	<5%	Requires exceptional circumstances and is unlikely, or could occur within decades

Source: MLN

The following table is an excerpt of the corporate risk matrix and identifies the most significant risks that are currently considered in the lead up to a restart of operations and during the mine's operating phase.

Figure 26.2 Project Risks Matrix Excerpt

Element	Functional Area	What could happen? (Risk / Opportunity Statement)	C	L	Level	Mitigation Actions
Process	Purchasing and Warehousing	Cyanide poisoning due to ingestion, spills or through direct exposure	4	C - Possible	High	Use of antidote, hospitalizaton of affected personnel and evacuation in case of spills
Mining	Mine	Explosives Theft	5	B - Unlikely	High	Constant surveillance and management of explosives inventory
Mining	Mine	Scaling	5	A - Very rare	High	Daily review of operations
Mining	Mine	Flooding	5	A - Very rare	High	Desilting and pump maintenance
Mining	Mine Maintenance	Crushing by equipment	4	C - Possible	High	Correct use of chocs, blocking bars
Mining	Mine Maintenance	Electrocution	4	C - Possible	High	Correct use of safety equipment, following procedures for handlng electrical equipment
Mining	Mine Maintenance	Theft	4	D - Likely	High	Security and surveillance
Mining	Processing Plant	Contamination with reagents	4	C - Possible	High	First aid, secure the area,
Mining	Processing Plant	Entrapment, pinching	4	C - Possible	High	Emergency stop
Mining	Processing Plant	Tailings dam saturation	4	C - Possible	High	Halt operations, take remedial action
Licenses and operating permits	Human Resources	Stoppage due to rupture with the community	6	D - Likely	Very High	Negotiate a solution to the issue, develop procedures to avoid future issues
Workers	Human Resources	Break with the union	6	C - Possible	Very High	Establish working groups with the union
Business Recovery Plan	Admin and Finance	Operations stoppage	7	C - Possible	Very High	Implementation of the Business Recovery Plan
Mining	Plant Maintenance	Entrapment or pinching with moving machinery	4	C - Possible	High	Halt operations, take remedial action
Mining	Plant Maintenance	Electrical discharge on power lines or substation	4	C - Possible	High	De-energize the power line, render attention
Mining	Plant Maintenance	Damage to synchronous motors	4	C - Possible	High	De-energize the equipment, investigate incident
					-	

Source: MLN

Figure 26.3 ESG, Legal, and Corporate Risks

Rating Level		Financial	Shareholder Value	Health & Safety	Environment	Society	Legal	Enabling / Efficiency
Measuring Criteria		***Operating Cash Flow***	***Net Present Value / Market Cap***	***Fatality / Illness / Disabilities***	***Environmental***	***Community, NGO, Government, Media***	***Legal***	***Work Effectiveness / Opportunity Impact***
7	**Significant (Severe)**	> 250m	> 1 b	▪ Many 10's of fatalities or severe irreversible disabilities or illness of 100's of people.	▪ Severe impact on a highly valued species, habitat or ecosystem.	▪ Complete loss of trust by affected, national and/or international community and/or government threatening the continued viability of the operation and/or company. Prolonged international condemnation. Systemic pattern of gross human rights violations affecting many 10's of people.	Prolonged litigation likely. Potential jail terms and/or high fines for executives and directors. Potential very high fines for the company.	▪ Positively impacts 4 or more Strategic Objectives or Site Wide Business Systems ▪ Significantly Improves relationships at an external level (including licence to operate) ▪ Sustainable duration of benefit > 15 years ▪ Significantly contributes to work effectiveness (includes leadership) at a Company wide level
6		>$50m <$250m	>$250m, <$1b	▪ Multiple fatalities or severe irreversible disability of 10's of people	▪ Significant impact on a highly valued species, habitat or ecosystem.	▪ Significant loss of trust by affected, national and/or international community and/or government threatening the continued viability of the operation. International and national government, NGO and media condemnation. Systemic pattern of gross human rights violations affecting 10's of people.	Prosecution of individuals and/or significant fines for individuals and/or company.	▪ Positively impacts 3 or more Strategic Objectives or Site Wide Business Systems ▪ Significantly Improves relationships at an Company wide level ▪ Sustainable duration of benefit > 10 years ▪ Significantly contributes to work effectiveness (including leadership) at a Site wide level
5		>$5m, <$50m	>$25m, <$250m	▪ Single fatality and/or severe irreversible disability or illness of one or more persons	▪ Extensive medium-long term impact to species, habitat or ecosystem of value.	▪ Community unrest and/or protest requiring intervention and substantial management attention. National and/or Regional media coverage over several days and/or NGO condemnation. Individual gross human rights violation or systemic severe negative human rights impacts.	Significant permit non-compliance or litigation likely resulting in substantial settlement costs and/or fines.	▪ Positively impacts 2 or more Strategic Objectives or Site Wide Business Systems ▪ Significantly Improves relationships at a Site Wide & Community level (including licence to operate) ▪ Sustainable duration of benefit > 8 years ▪ Significantly contributes to work effectiveness (including leadership) at a Departmental level
4		>$500k, <$5m	>$2.5m, <$25m	▪ Irreversible injury / illness or disability of one or more persons	▪ Localised medium term impact to species, habitat or ecosystem of value.	▪ Persistent community grievances, complaints, unrest or protests. National and/or Regional media coverage and/or NGO scrutiny. Systemic or severe individual negative	Permit non-compliance or litigation likely resulting in settlement costs and/or fines.	▪ Positively impacts 1 or more Strategic Objective or Site Wide Business System ▪ Improves relationships at a Site Wide level ▪ Sustainable duration of benefit > 5 years ▪ Has a high impact on work effectiveness
3		>$50k, <$500k	>$250k, <$2.5m	▪ Reversible injury or illness to one or more persons. Significant lost time and medical treatment required	▪ Localised medium term impact to species, habitat or ecosystem.	▪ Complaints and grievances from local communities. Local media coverage. Isolated negative impacts on human rights	Non-compliance with legislation or permits resulting in fine.	▪ Positively impacts departmental Business Systems ▪ Improves relationships at a departmental level ▪ Sustainable duration of benefit > 3 years ▪ Has a moderate effect on work effectiveness (potentially at a departmental or team level)
2		>$5k, <$50k	>$25k, <250k	▪ Recordable injuries or illnesses with up to one week of job restrictions or lost time.	▪ Localised short term impact to species or habitat.	▪ Short term community impact requiring no or very minor action. Potential for negative impacts on human rights.	Minor non-compliance with legislation or permits resulting in fine.	▪ Improves relationships at a sub team level ▪ Sustainable duration of benefit > 1 year ▪ Has a minor impact on work effectiveness (potentially at an individual level)
1	**Insignificant**	<$5k	<$25k	▪ Minor injury or illness, first aid or medical treatment without job restrictions	▪ Largely on-site impact to species or habitat.	▪ No community and/or media interest. No impact on human rights.	Minor non-compliance with legislation or permits.	▪ Minor improvement to relationships ▪ Sustainable duration of benefit < 6 months

Source: MLN

The following figure details the risk register for La Negra based on the project risks identified in Figure 26.2. The most significant risks faced by the project are social and financial, with the former dependent on good relations with the community and with the labor union, and the latter requiring an upgrade to the company's disaster recovery plan.

Figure 26.4 Minera La Negra Risk Register Map

MLN Risk Map

Likelihood		<$5k (1)	>$5k <$50k (2)	>$50k <$500k (3)	>$500k <$5M (4)	>$5M <$50M (5)	>$50M <$250M (6)	>$250M (7)
E -	Almost certain							
D -	Likely		[7]		[13]			
C -	Possible		[14]	[15] [22] [23] [24] [27] [36]	[11] [12] [17] [18] [19]			
B -	Unlikely		[28] [37] [39]	[20] [26]		[8]		
A -	Very Rare			[21] [25] [29]	[4] [5] [6]	[9] [10]		
		Consequence Level						

Source: MLN

26.3 Opportunities

There are significant opportunities to improve La Negra's operating performance, to reduce operating costs, improve safety, and to extend the life of the project. Once in production, an operational excellence program would be introduced to provide a systematic process for evaluating and implementing further projects and procedures to enhance the mine's operating, safety, and financial performance.

26.3.1 Paste Plant Study

One of the principal opportunities for increasing the recovery of the resource and improving the project's life-of-mine is the introduction of paste backfill. The mine plan presented in this study does not incorporate the use of paste, as the capital and operating costs of building the paste plant and associated pumping and reticulation infrastructure, and the significant cost of adding cemented paste backfill are prohibitive at present. The introduction of dry tailings and their disposal in fully permitted tailings facilities has a lower capital and operating cost.

It is possible, however, that the decision is made in the future to introduce paste backfill in order to incrementally recover the remainder of the resource, even at a higher operating cost, once the capital for the initial restart has been recovered.

26.3.2 Geology, Exploration and Mineral Resources

As detailed in Section 9, the surface and underground exploration programs, and the data capture program, completed during June – October 2021 were successful in increasing the known footprint of the resource and pointing to areas for further work.

Within the mine, further drilling is warranted in the Trinidad, Reyna, and Maravillas zones, as well as in the various zones comprising the NW extension, particularly Elia and Valenciana. Although higher risk, there is significant prospectivity in the Caracol zone.

At surface, the sampling and mapping programs identified a number of zones which should be the subject of further work, as outlined in Section 9.

26.3.3 Processing Plant

The processing plant has historically operated without the use of process control or continuous sampling equipment. La Negra owns an Outotec Courier 5i on-stream x-ray fluorescence analyzer which measures element concentrations in the process slurry. Installing this equipment could significantly speed up the analysis of both recoverable and deleterious element concentrations in the process stream and allow for quicker adjustments to reagent dosing, a process which currently relies on sending samples to the on-site lab with a turnaround time greater than one hour. A determination of the cost/benefits of installing this or another continuous sampler should also include an analysis of the pros and cons of installing an automated reagent dosing system.

Other opportunities for improvement in the processing plant include installing additional flotation cells which are an economical way of improving flotation recovery, optimizing the reagents that are being used in the plant to improve/replace those used historically as well as the dosing regime, and additional measures for recovering process water (although the introduction of filtered tailings will result in a material reduction in process make-up water).

27 Recommendations

The results of this PEA demonstrate the feasibility of restarting La Negra while generating positive, robust economics, and it is therefore recommended that additional studies should commence as soon as practically possible. Meanwhile, MLN should continue to advance key activities that will shorten and/or de-risk the project execution timeline, particularly any critical path items, and continue to analyze opportunities to improve the project's value.

27.1 Mining

The life-of-mine plan presented in this study is based on the updated resource model that includes all of the results of the 2021 drill and data capture programs and was based on a cutoff grade of US$28.30 per tonne. It is recommended that additional LOM plans be developed using a higher cutoff grade to determine if there is an improvement to NPV by enhancing grade. The LOM plan developed for this study has the highest grades occurring in the final year of operations; it is recommended that additional LOM plans be developed that consider the feasibility of mining these zones earlier in the mine life. The LOM plan was developed to minimize As values in concentrate. It is recommended that additional optimizations be carried out to reduce As levels.

In addition it is recommended that a further life-of-mine plan be developed to consider the feasibility of installing paste backfill later in the mine life to incrementally recover the remaining resource.

Restarting the mine will require maintenance and refurbishment of much of the mine fleet. It is recommended that this process commence as soon as possible so that development activities as spelled out in the mine schedule can begin and sufficient quantities of material be developed ahead of a plant restart.

Additional work is recommended to verify the geotechnical conditions in those areas that currently do not have access.

27.2 Geology, Exploration and Resources

Much of the resource included in this study is in the Inferred category. It is recommended that the required work be completed, as practical, to upgrade this material to the Measured and Indicated categories.

During operations Minera La Negra has focused primarily on drill definition of those areas scheduled for mining and has not consistently carried out any systematic in-mine exploration. It is recommended that a consistent mine exploration program be developed and implemented once production begins.

In addition, the results of the surface exploration program reveal that there is still significant exploration potential outside the footprint of the mine. It is recommended that an ongoing regional exploration be developed and implemented.

27.3 Processing

The process plant has undergone significant maintenance during the shutdown and plant personnel have clearly identified the capital and timeline required to put the plant in working order. Though not a critical path item to restart, it is recommended that process plant refurbishment commence as soon as possible, including ordering those capital items with a long-lead time, primarily the mill liners.

It is also recommended that a recommissioning program be carried out to minimize ramp-up risk.

Section 26.3.3 highlighted several opportunities for improvement in the process plant. It is recommended that additional work be undertaken to consider the feasibility and cost of implementing these improvements.

It is recommended that additional mineral deportment and geometallurgical characterizations studies be conducted, and that this information be then applied to improve reagent utilization. Ongoing studies on the use of alternate reagents and recovery vs mass pull dynamics should continue with the following goals: improving the grade of the Zn concentrate, reducing Ag in Zn concentrate, reducing As in Pb and Cu concentrates, reducing As and Pb+Zn in Cu concentrate. Ongoing characterization of penalty elements other than As – such as Bi, Cd, F, Cl – should continue.

27.4 Filtered Tailings

As highlighted in sections 18.5 and 25.1 the proper management of tailings is one of the critical path items for the restart of La Negra. The TSF5A facility currently has only approximately seven months of capacity for traditional cyclone tailings without adding significant, additional buttressing, and the life-of-mine plan envisioned in this study, and any further enhancement thereof, will require a long-term solution for tailings disposal. The initial restart of La Negra is based on the assumption that filtered tailings will be placed on the existing TSF5/TSF5A and TSF3 and that once these facilities reach capacity paste backfill will be implemented (or, alternatively, an additional filtered tailings impoundment will be developed at Site 4).

From the work completed over the course of this project Wood has developed the following conclusions and recommendations:

- Option 1, consisting of downstream buttresses constructed of filter tailings at TSFs 5/5A and 3, and then underground paste tailings storage is the preferred option for ongoing tailings storage at MLN.
- While Site 4 provides efficient tailings storage compared to other options, it is a greenfield site that has significant environmental and social impacts which makes it less preferred.
- Filter tailings is the preferred tailings technology at MLN as larger tonnages can be stored at the available sites using this technology, the filtered TSFs are safer than conventional slurry TSFs, and they are environmentally more friendly.
- Geotechnical investigations need to be completed downstream of both TSF 3 and 5 to characterize the foundation conditions if those facilities are to be constructed.
- More detailed, site-specific climate studies should be completed to determine design storm events for the site.
- Hydrological studies need to be completed at both TSF 3 and 5 to assess existing water management infrastructure, and to determine whether any upgrades are required.
- Additional testing is required on full tailings samples to determine accurate tailings properties for the design of a filter tailings storage facility.
- Mexican regulatory authorities should be consulted as to whether the use of small amounts of cyanide in the process is likely to impact the permitting process.
- Wood recommends that a realistic project schedule be developed once the option to be developed is finalized. This schedule needs to consider permitting, geotechnical investigations, material testing, the detailed design process and the procurement of equipment such as a filter plant, conveyor and stacker.

27.5 Personnel

The mine currently has a unionized workforce of 198, which is considered sufficient for a restart based on the rosters developed by the mine staff. However, the professional staff is currently only 32 out of 75 positions required for operations. It is recommended that the HR team at La Negra commence the process of vetting and interviewing candidates for the vacant professional staff positions.

27.6 Concentrate Offtake

Although historically Minera La Negra has worked with various third-party concentrate offtakers, the company at present does not have an offtake agreement. The NSR assumptions used in this study assume reasonable terms based on the expected content of payable metals and penalty elements in the concentrate, but it is necessary to establish with greater precision the actual terms that the concentrate would obtain in the present market environment. It is recommended that Minera La Negra engage third-party concentrate offtakers to determine the potential concentrate terms that could be obtained upon restart.

27.7 Estimated Recommendation Costs

The costs required to advance the recommendations above in support of the restart of the facility have not been fully estimated, but the following table summarizes the initial estimates as of this technical report.

Table 27.1 Estimated Recommendation Costs

Description	Estimated Cost US$ '000
Mining Plan	300
Geology, Exploration, and Resources	1,500
Processing	250
Filtered Tailings (Engineering & Design, Approvals)	500
Personnel	50
Concentrate Offtakers	10

Source: Mining Plus

28 References

AMC Mining Consultants (Canada) ltd., January 16, 2015 Technical Report Minera La Negra Property For: Aurcana Corporation

Barboza-Gudiño, José Rafael (2012). In: Sedimentary Tectonics and Stratigraphy: The Early Mesozoic Record in Central to Northeastern Mexico, Stratigraphic Analysis of Layered Deposits, Dr. Ömer Elitok (Ed.)

Chang, Z. and Meinert, L.D., 2008. Zonation in Skarns – Complexities and Controlling Factors. PACRIM Congress 2008.

English, Joseph M., and Johnston, Stephen T., 2004 The Laramide Orogeny: What Were the Driving Forces? International Geological Review, Vol. 46, pp 833-838.

Fitz-Díaz, Elisa, 2010. Progressive deformation, fluid flow and water-rock interaction in the Mexican Fold-Thrust Belt, Central Mexico, PhD Dissertation, University of Minnesota.

Fitz-Díaz, Elisa et al, 2014. Progressive, episodic deformation in the Mexican Fold-Thrust Belt (central Mexico): evidence from isotopic dating of folds and faults, International Geology Review.

Gaytán Rueda, J.E., 1975. Exploration and Development at the La Negra Mine, Maconí, Querétaro, Mexico. The University of Arizona Master's Thesis.

Lang, J.R., Baker, T., Lewis, P.D., 1998. Intrusive, Stratigraphic, Geochemical and Structural Controls on Skarn and Massive Sulphide Manto and Chimney Ores in the La Negra and Zimapán Districts, Central Mexico, The Gangue Issue, 59.

Le Couteur, P.C., 2009. Petrographic Report on Seven Samples from the La Negra Mine, Querétaro, Mexico. Report for Aurcana Corporation by Micron Geological Ltd, Vancouver.

Henry, Christopher D. and Aranda-Gomez, J. Jorge, 1992. The real southern Basin and Range: Mid- to late Cenozoic extension in Mexico, Geology, August 1992, pp 701-704

Meinert, L.D. Workshop on Exploration for Skarn Deposits.

Meinert, L.D., 1997. Application of Skarn Deposit Zonation Models to Mineral Exploration. Explor. Mining Geol., Vol. 6, No.2, pp. 185-208/

Morrison, G., 1982. Geology of the La Negra Mine Vicinity, State of Querétaro, Mexico. Colorado School of Mines Master's Thesis.

Randall, Juan, 1980. Descripción petrográfica de seis muestras de Minera La Negra. Reporte interno para Peñoles, Guanajuato, diciembre 1980.

Ray, G.E., 1995. Pb-Zn Skarns, in Selected British Columbia Mineral Deposit Profiles, Volume 1 - Metallics and Coal, Lefebure, D.V. and Ray, G.E., Editors, British Columbia Ministry of Employment and Investment, Open File 1995-20, pp 61-62.

Robb, Laurence, 2005. Introduction to Ore Forming Processes, Blackwell Publishing.

Saldaña Reyes, Eugenia, 2016. EXPLORACIÓN Y ESTUDIO GEOLÓGICO DE LA UNIDAD MINERA GUADALUPE, ZIMAPÁN, HIDALGO, Estudio para obtener el título de Ingeniero Geólogo, IPN Unidad Tecomán.

Suter, Max, 1980. Tectonics of the external part of the Sierra Madre Oriental Foreland Thrust-and-Fold Belt Between Xilitla and the Mocetezuma River (Hidalgo and San Luis Potosi States)Univ. Nat. Autón. México Inst. Geologia. Revista Vol V, Number 1, pp 19-31

Suter, Max, 1984. Cordilleran deformation along the eastern edge of the Valles-San Luis Potosi carbonate platform Sierra Madre Oriental fold-thrust belt, east-central Mexico.
Geological Society of America Bulletin v. 95, pp 1387-1397

Vassallo, L.F., Arkhipova, N.A., Shatagin, N.N., Sousa, J.E., Solorio, J.G., Ortega, M.A., 2001. Mineralogy, Age, and Control Setting of La Negra and Zimapán Skarn Ore Deposits, Central Part of Mexico. GEOS, Unión Geofísica Mexicana, A.C. Boletín Informativo, vol. 21 No.3. p. 192. Reunión Annual 2001, Puerto Vallarta, Jal., México.

Wood PLC, 2021. TSF Siting Study, Scoping Level Design and Preliminary Economic Assessment, Minera La Negra. Project # 3270GTK037.

29 Unit of Measure, Abbreviations and Acronyms

Measurements throughout this report are in metric units, unless otherwise specified.

Table 29.1 Frequently Used Acronyms, Abbreviations, Definitions and Units of Measure

Abbreviation	Definition
AA	Atomic Absorption spectrometry
Ag	Silver
Ageq	Silver equivalent
As	arsenic
Au	gold
$CaCl_2$	calcium dichloride
Cl	chlorine
Cu	copper
E	East
Fe	iron
F	fluorine
G&A	General and Administrative
g/cm^2	gram per cubic centimeter
g/t	gram per tonne
h	hours
HR	Hydraulic Radius
ICP	Induced Coupled Plasma
IRR	Internal Rate of Return
KCl	potassium chloride
km	kilometers
kt	thousand tonnes
kV	kilo-volt
kWh	kilowatt-hours
LOM	Life-of-mine
m	meters
mm	millimeter
M	million
masl	meters above sea level
MLN	Minera La Negra
MPa	Megapascal
µ	microns
Mo	molybdenum
mta	metric tonnes per annum (calendar days)
MXN	Mexican peso
N	North
NaCl	sodium chloride
NPV	Net Present Value
NSR	Net Smelter Return
NW	northwest
oz	troy ounce
PEA	Preliminary Economic Assessment
Pb	lead
QA/QC	Quality Assurance/Quality Control

RMR	Rock Mass Rating
S	South
Sb	antimony
Si	silicon
Sn	tin
t	metric tonne
tpd	tonnes per day
tph	tonnes per hour
TSF	Tailings Storage Facility
UCS	Uniaxial Compressive Strength
US$	United States dollars
US$m	Millions of United States dollars
UTM	Universal Transverse Mercator coordinate system
VAT	Value Added Tax
W	West
W	Wolfram (tungsten)
WGS	World Geodetic System
wt	Wet tonne
Zn	zinc

Source: MLN