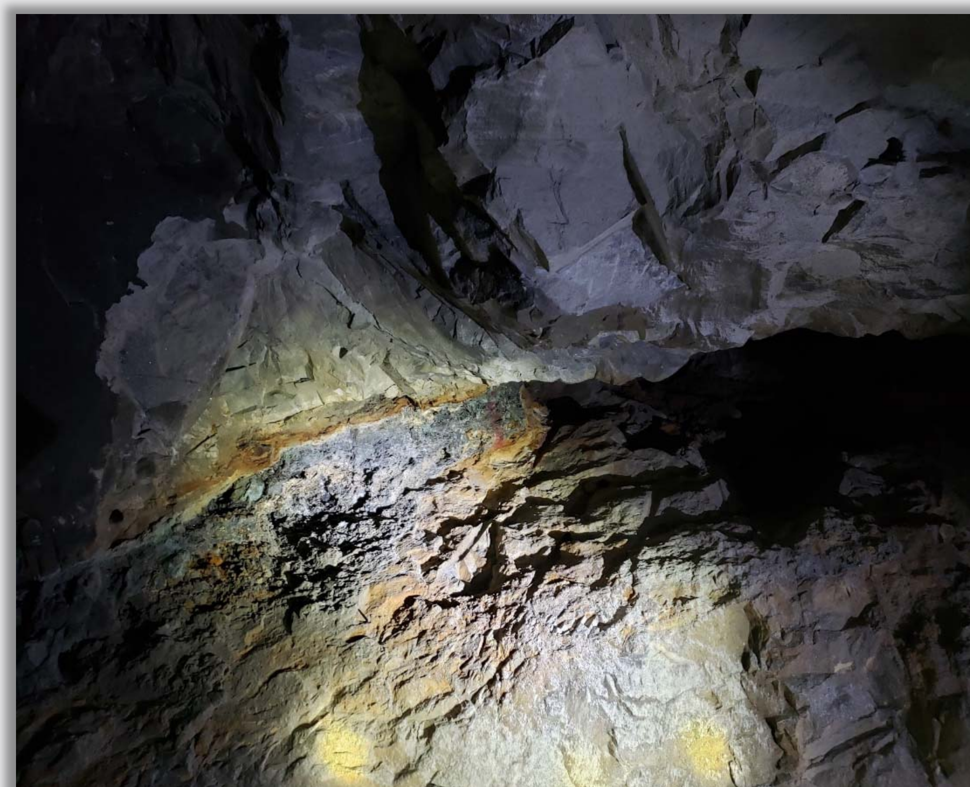
Exhibit 96.2

GOLDEN MINERALS COMPANY

Velardeña Project

Technical Report Summary

Durango State, Mexico



March 2022

Project No. 117-8133004

TETRA TECH

Velardeña Project

Technical Report Summary

117-8133004

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ACRONYMS & ABBREVIATIONS

3D	Three dimensional
Ag	Silver
Ar	Argon
As	Arsenic
ASARCO	American Smelting and Refining Company
Au	Gold
BAT	Batch amenability tests
BIOX	Bio-oxidation
CAPEX	Capital expenditures
CCD	Counter current decantation
cm	Centimeter
Cu	Copper
cu ft	Cubic feet
DMT	Dry metric tonne
Fe	Iron
ft	Feet
g/t	Grams/tonne
HP	Horsepower
IDW	Inverse distanced weighted
IMMSA	Industrial Minera de México S.A
in	Inch
IRR	Internal rate of return
k	Thousand
kg	Kilogram
km	Kilometer
kt	Thousand tonnes
lb	Pound
LOM	Life of mine
m	Meter
M	Million
MI	Measured and Indicated
MII	Measured, Indicated, and Inferred
mm	Millimeters
Mt	Million tonnes
MXN	Mexican Pesos
mya	Million years ago
NPV	Net present value
NSR	Net smelter return
OPEX	Operating expenditure
oz	Troy ounce
Pb	Lead
PEA	Preliminary Economic Assessment

PLS	Pregnant leach solution
QA/QC	Quality assurance/quality control
QP	Qualified Person
ROM	Run of mine
SEMARNAT	Secretaria del Medio Ambiente y Recursos Naturales
t	Tonnes
tpd	Tonnes per day
tpy	Tonnes per year
TRS	Technical Report Summary
TSF	Tailings storage facility
USD	United States dollars
yd	Yard
yr	year
Zn	Zinc

1. EXECUTIVE SUMMARY

This Technical Report Summary (TRS) is prepared for Golden Minerals Company (Golden Minerals) to report Mineral Resources for the Velardeña Project (the Project) in Velardeña, Durango, Mexico. The purpose of this report is to summarize the results of an Initial Assessment for the property as defined under the U.S. Securities and Exchange Commission's Regulation S-K 1300. This is the first TRS prepared for the Project under S-K 1300 guidelines.

1.1 Property Description and Ownership

The Project is held by Minera William S.A. de R.L. de C.V. (Minera William), a wholly owned subsidiary of Golden Minerals, and is comprised of two properties:

- The Velardeña property is centered on UTM grid coordinates 2774300 N and 632200 E (WGS 84 datum, zone 13). This property contains the Santa Juana mine which has been the focus of mining efforts since 1995, as well as the historical Terneras, San Juanes, and San Mateo mines.
- The Chicago property is located approximately 2 km south of the Velardeña property and is centered at UTM grid coordinates 2772480 N and 631867 E (WGS 84 datum, zone 13). This property contains the historical Los Muertos-Chicago mine. The Project's location relative to the major cities of Torreón and Durango is shown in **Figure 1-1**.

Figure 1-1: Velardeña Project location

The Project also has two processing plants. Plant 1 treats sulfide material by conventional crush, grind, and differential flotation technologies to produce Pb, Zn, and pyrite concentrates, and Plant 2 is a typical agitated leach plant for processing oxide Au-Ag material to produce Au-Ag doré by cyanide leach/Merrill-Crowe.

The Project consists of 28 claims covering the Velardeña and Chicago properties controlled by Golden Minerals through its Mexican subsidiary Minera William, with a total area of 315.51 hectares. Surface rights pertaining to the Project are held by Golden Minerals as well as two local ejidos (rural cooperative communities). Golden Minerals has entered into agreements with the ejidos to obtain rights for surface access and to perform work.

1.2 Geology and Mineralization

The Project is located at the easternmost limit of the Sierra Madre Occidental, near its boundary with the Sierra Madre Oriental (Mesa Central sub-province). The deposits of the Sierra de Santa María and Sierra San Lorenzo, like many other polymetallic, hydrothermal deposits in northern Mexico, are situated along this fundamental boundary which separates thick Tertiary volcanic sequences with Mesozoic basement rocks to the west from Mesozoic carbonates with Paleozoic and older basement to the east.

Regional Geology is characterized by a thick sequence of limestone and minor, calcareous clastic sediments of Cretaceous age, intruded by Tertiary plutons of mostly felsic to intermediate composition. During the Laramide geologic event, sediments were subject to an initial stage of compression which resulted in formation of large amplitude, upright to overturned folds generating the distinctive strike ridges of limestone, which dominate local topography. Fold axes trend northerly in the northern part of the region but are warped or deflected to west northwest azimuths in the south. The northeast trending hinge line or deflection which controls this fundamental change in strike passes through the Velardeña district.

Mineralization consists primarily of calcite-quartz veins with minor calc-silicate hosted (skarn) and massive sulfide replacement bodies. All mineralization is essentially polymetallic, Ag, Au, Pb, Zn plus or minus Cu. Individual veins are usually thin (0.2 m to 0.5 m) but remarkably consistent along strike and down dip. Coxcomb and rhythmically banded textures are common in some vein exposures. Historical production in the district has been primarily from the oxide portions of the veins that can extend to depths of several hundred meters.

1.3 Property Status

The mines at the Project are in advanced development stages. Production stopped in 2015 and the mines are currently in care and maintenance. The Project has been extensively explored from the surface using geologic mapping, vein mapping, and vein sampling. Underground exploration consisted of diamond drilling, geologic level mapping, vein level mapping, vein sampling, and drift and stope development. Underground development includes 10,122 meters of drift and ramp development and 2,278 meters of raise development.

Plant 1 is under care and maintenance after operation ceased in 2015. Historical operational results support the existing process flow sheet for potential future production at the plant. Plant 2 is in operation, processing material from Golden Minerals' Rodeo mine. Test work has indicated that pyrite concentrate produced at the Project could be successfully oxidized with a BIOX® process prior to cyanidation, potentially improving gold recovery and project economics. This TRS incorporates a bio-oxidation process as part of the assessment of the Project.

1.4 Mineral Resource Estimates

Estimated Mineral Resources with an effective date of March 1, 2022, for the Velardeña project are shown in **Table 1-1**. The Resource is reported by mineral type and Resource class for all veins. Resources were calculated as diluted to a minimum of 0.7 meters and are reported at a $175 NSR cutoff.

Table 1-1: Velardeña Project Resources

Classification	Mineral Type	NSR Cutoff	Tonnes	Grade Ag g/t	Grade Au g/t	Grade Pb%	Grade Zn%	Ag oz	Au oz	Pb lb	Zn lb
Measured	Oxide	175	128,800	268	5.69	1.74	1.53	1,108,000	23,500	4,936,000	4,333,400
Indicated	Oxide	175	280,300	262	5.06	1.73	1.45	2,361,200	45,600	10,681,500	8,936,600
Measured + Indicated	Oxide	175	409,100	264	5.26	1.73	1.47	3,469,200	69,100	15,617,500	13,270,000
Inferred	Oxide	175	351,400	417	4.95	2.55	1.45	4,714,600	56,000	19,729,500	11,248,200
Measured	Sulfide	175	256,200	357	5.52	1.56	1.91	2,942,800	45,500	8,819,300	10,769,700
Indicated	Sulfide	175	603,500	341	4.79	1.46	1.91	6,619,400	92,900	19,475,600	25,408,900
Measured + Indicated	Sulfide	175	859,700	346	5.01	1.49	1.91	9,562,200	138,400	28,294,900	36,178,600
Inferred	Sulfide	175	1,357,700	348	4.76	1.52	1.97	15,179,000	207,800	45,534,200	58,952,900
Measured	All	175	385,000	327	5.58	1.62	1.78	4,050,800	69,000	13,755,300	15,103,100
Indicated	All	175	883,800	316	4.88	1.55	1.76	8,980,600	138,500	30,157,100	34,345,500
Measured + Indicated	All	175	1,268,800	319	5.09	1.57	1.77	13,031,400	207,500	43,912,400	49,448,600
Inferred	All	175	1,709,200	362	4.80	1.73	1.86	19,893,600	263,800	65,263,700	70,201,100

Notes:
(1) Resources are reported as diluted Tonnes and grade to 0.7 m fixed width
(2) Metal prices for NSR cutoff are: US$23.70/troy ounce Ag, US$1,744/troy ounce Au, US$0.97/lb Pb, and US$1.15/lb Zn
(3) Columns may not total due to rounding

1.5 Mineral Reserve Estimates

Mineral Reserves have not been estimated for the Velardeña Project.

1.6 Capital and Operating Costs

Two capital and operating cost estimates were generated for the Project to support two economic analysis cases. One case considers Measured, Indicated, and Inferred (MII) Mineral Resources and the other considers only Measured and Indicated Mineral (MI) Resources. Capital and operating costs are based on Golden Minerals internal forecasts, which Tetra Tech has reviewed and found to be consistent with a mine of this type. Both capital and operating costs have a 10% contingency applied. Tetra Tech considers these cost estimates to be within 50%.

Capital costs total $21M for the case considering the MII material, and $18M for the MI case. Operating costs for the MII and MI cases total $300M and $106M, respectively.

1.7 Economic Analysis

Two economic models were prepared for the Project: one includes Inferred Mineral Resources in the analysis (MII case), and the second excludes the Inferred material (MI case). The economic model results are based on Mineral Resources that, unlike Mineral Reserves, do not have demonstrated economic viability.

The MII case has a mine life of 11 years and a pre-tax NPV of $119M with an IRR of 114%. The MI case has a mine life of 4 years and reports a pre-tax NPV of $48M with an IRR of 101%. Both cases were discounted at 8%.

1.8 Permitting Requirements

Areas with permitting requirements at the Project include the Velardeña mine, Plant 1, and Plant 2. Golden Minerals personnel report the Project holds and has retained the necessary permits to operate the mines and plants at Velardeña, and further there are no unresolved issues with the environmental regulatory agencies. They do not anticipate any limitations on the operations due to future inspections or evaluations by the environmental authorities. Details of the required permits and their status are contained in **Section 3.3**.

1.9 Conclusions and Recommendations

1.9.1 Geology & Resources

Drill hole and channel samples have been collected and analyzed using industry standard methods and practices and are sufficient to support the characterization of grade and thickness and further support the estimation of Measured, Indicated, and Inferred Resources.

Recommendations for future work include:

- Continue to collect specific gravity measurements and refine current estimations of specific gravity. Additional measurement should ideally be made with a paraffin wax or epoxy coating
- Implement procedures of duplicate channel sampling by secondary sampling teams of drifts prior to stope development to ensure grade and thickness characteristics and to serve as field duplication of channel samples
- Setup of strict control sample review procedures and tolerances involving review of control sample failure on receipt of each batch’s results, and automatic triggering of batch reanalysis immediately after being alerted to failures

- Improve sample data transcription methods to reduce control sample labeling errors and immediately resolve errors when encountered
- Perform a detailed model reconciliation on a completed stope early in the proposed mine life and alter the estimation methods if the result of the reconciliation suggest refinements should be made
- Continue to advance exploration drilling down dip of current Inferred Resources as new levels are established. Preferentially target the Terneras, San Mateo, Roca Negra, and A4 veins
- The costs for additional drilling have not been included in the TRS analysis but any further Resource expansion would be dependent on additional drilling

1.9.2 Mining

Results indicate mining is potentially economically viable with and without the Inferred Resources. The Inferred material accounts for approximately 57% of the total Resource, and, due to the nature of the mineralization and the scale of the operations, extensive Resource drilling of the deposit is not planned. For this reason, detailed long-term mine plans and schedules are not expected to be produced for the deposit. Consequently, residual risk remains for mining of the project.

The success of the proposed plan is sensitive to mining dilution, which could increase the costs of saleable products, but also provides opportunity as any potential reductions in dilution from the mining would greatly benefit the project. Test mining at the site has confirmed a minimum selective mining width of 0.7 m is achievable, which can contribute to reducing dilution.

It is recommended that Golden Minerals implements cut and fill mining where waste and vein material are blasted separately in order to reduce ore dilution. This practice would consider more total tonnes blasted in each section. Vein tonnes would be reduced, but the resulting grade would be higher. Recent tests on selective mining widths of 0.7 meters have proven to be achievable. Because this practice requires efficient operations control, Tetra Tech recommends having detailed control in drilling and blasting.

The mine plan developed for the study should be optimized and undertaken at a more detailed level, which will enable a greater understanding of mining constraints, costs and resulting mill feed. Currently, only sulfide material is being considered for the conceptual mine layout. In the future, it could be economical to include oxide material, as processing allows.

1.9.3 Metallurgy and Processing

There are no geological, lithological, or mineralogical changes in the process plant feed anticipated for the envisaged potential future production as compared to previous operations. Existing legacy operational data from Plant 1 and current processing of mineralized material from the Rodeo mine in Plant 2 supports the process flow sheet for future production.

The use of existing and refurbished equipment within the pre-existing facilities, and the production of marketable concentrates, is Golden Minerals’ preferred method of treating potential future production.

Antimony and arsenic are penalty elements in the lead and zinc concentrates and could be added to the database and spatially modeled. Additional metallurgical test work is recommended to investigate the depression of antimony and arsenic from the final lead and zinc concentrates, and zinc from the pyrite concentrate.

Potential of a new bio-oxidation plant to improve gold recovery warrants further test work to confirm previous encouraging results.

1.9.4 Economic Analysis

Based on the two separate economic analyses, including, and excluding the Inferred Resources, the findings of this study suggest the Project is conceptually economically viable. The study has been based on Mineral Resources, which by definition, are not Mineral Reserves and do not have demonstrated economic viability. Currently, it is anticipated the salvage sale of equipment will cover the cost of the reclamation costs. Due to changing parameters in the mine life and size, it is recommended to review this assumption in the future.

1.9.5 Significant Risk Factors

Factors that could affect the potential economic viability of the project could include underestimations of operating capital and declines in any or all the metal prices. Estimation of Resources could be affected by changes in metal prices and the actual mineralized shoot shapes and orientations. Successful implementation of the proposed mine plan is subject to the successful conversion of Inferred Resources to Indicated or Measured classification as well as conversion of Measured and Indicated Mineral Resources to Mineral Reserves, the prediction of stope layout and shape which is controlled by the actual shape of mineralized shoots and their orientations, and the ability of the mining operations to control waste dilution.

The performance of the BIOX® plant is key to the economics estimated in this study. If the expected results are not achieved, the BIOX® process would compromise an important part of the entire flow sheet.

2. INTRODUCTION

This Technical Report Summary (TRS) is prepared for Golden Minerals Company (Golden Minerals) to report Mineral Resources for the Velardeña Project (the Project) in Velardeña, Durango, Mexico. The Project is held by Minera William S.A. de R.L. de C.V. (Minera William), a wholly owned subsidiary of Golden Minerals. The purpose of this report is to summarize the results of an Initial Assessment level study for the property as defined under the U.S. Securities and Exchange Commission's Regulation S-K 1300. This is the first TRS prepared for the Velardeña Project.

All references to dollars in this report are to US dollars (USD) unless otherwise noted. Distances, areas, volumes, and masses are expressed using metric units unless indicated otherwise. All tonnages are in tonnes (1,000 kilograms), precious metal grade values are reported in grams per tonne (g/t), and precious metal quantities are presented as troy ounces (oz).

2.1 Sources of Information

This TRS summarizes the information contained in the Canadian National Instrument 43-101 compliant Preliminary Economic Assessment report entitled *Preliminary Economic Assessment Technical Report of the Velardeña Project, Durango State, Mexico* prepared by Tetra Tech, with an effective date of *March 1, 2022*. Additional sources of information include materials and comments provided to Tetra Tech by Golden Minerals personnel, as described in **Section 25**.

2.2 Site Inspection

Dr. Guillermo Dante Ramírez-Rodríguez, Mr. Randolph Schneider, and Ms. Kira Johnson visited the site on December 10, 2019. The visit included observations of geologic interpretations, mining, exploration drilling, channel sample locations, survey locations, underground mine accesses, the Santa Juana vein (San Mateo Ramp), the Chicago Veins (Chicago Ramp), drifts and stopes, stockpiled material, processing Plants 1 and 2, Golden Minerals Laboratory, and discussions with the mine staff regarding past estimation methods, database structure, and vein interpretations.

From January 18-21, 2022, Dr. Ramírez-Rodríguez and Ms. Johnson visited the assay laboratory, Plant 1, and Plant 2.

3. PROPERTY DESCRIPTION

The Project includes 28 mining concessions covering the Velardeña and Chicago mines controlled by Golden Minerals through its Mexican subsidiary Minera William and located within the Velardeña mining district. Processing Plants 1 and 2 are located within land owned by Golden Minerals. Surrounding ejido-owned land contains some of the associated installations and infrastructure. The project is comprised of two properties:

- The Velardeña property is centered on UTM grid coordinates 2774300 N and 632200 E (WGS 84 datum, zone 13). This property contains the Santa Juana mine which has been the focus of mining efforts since 1995, as well as the historical Terneras, San Juanes, and San Mateo mines.
- The Chicago property is located approximately 2 km south of the Velardeña property and is centered at UTM grid coordinates 2772480 N and 631867 E (WGS 84 datum, zone 13). This property contains the historical Los Muertos-Chicago mine.

The Project's location relative to the major cities of Torreón and Durango is shown in **Figure 3-1**.

Figure 3-1: Velardeña property location

3.1 Mineral Tenure

The Project consists of 28 claims covering the Velardeña and Chicago properties controlled by Golden Minerals through its Mexican subsidiary Minera William. Golden Minerals holds 315.51 hectares within all the concessions. Details of the concessions are shown in **Table 3-1.**

Table 3-1: Project Mineral Concessions

Location	Claim Name	Claim Owner	Concessions Title Nos.	Issue Date	Expiration Date	Concessions Area (Has)
Velardeña	AMPL. DEL ÁGUILA MEXICANA	Minera William	85580	10/13/1936	10/12/2061	19.86
Velardeña	ÁGUILA MEXICANA	Minera William	168290	4/2/1981	4/1/2031	18.94
Velardeña	LA CUBANA	Minera William	168291	4/2/1981	4/1/2031	2.55
Velardeña	TORNASOL	Minera William	168292	4/2/1981	4/1/2031	4
Velardeña	SAN MATEO NUEVO	Minera William	171981	9/21/1983	9/20/2033	8
Velardeña	SAN MATEO	Minera William	171982	9/21/1983	9/20/2033	4.61
Velardeña	RECUERDO	Minera William	171983	9/21/1983	9/20/2033	8.23
Velardeña	SAN LUIS	Minera William	171984	9/21/1983	9/20/2033	2.4
Velardeña	LA NUEVA ESPERANZA	Minera William	171985	9/21/1983	9/20/2033	9.93
Velardeña	LA PEQUEÑA	Minera William	171988	9/21/1983	9/20/2033	1
Velardeña	BUEN RETIRO	Minera William	172014	9/21/1983	9/21/2033	6.09
Velardeña	UNIFICACIÓN SAN JUAN EVANGELISTA	Minera William	172737	6/28/1984	6/27/2034	13.94
Velardeña	UNIFICACIÓN VIBORILLAS	Minera William	185900	12/14/1989	12/13/2039	46.43
Velardeña	BUENAVENTURA No. 3	Minera William	188507	11/29/1990	11/28/2040	6.01
Velardeña	EL PÁJARO AZÚL	Minera William	188508	11/29/1990	11/28/2040	15
Velardeña	BUENAVENTURA 2	Minera William	191305	12/20/1991	12/19/2041	5.37
Velardeña	BUENAVENTURA	Minera William	192126	12/19/1991	12/18/2041	30
Velardeña	LOS DOS AMIGOS	Minera William	193481	12/19/1991	12/18/2041	25.33
Velardeña	VIBORILLAS NO. 2	Minera William	211544	5/31/2000	5/30/2050	1.6
Velardeña	KELLY	Minera William	218681	12/3/2002	12/2/2052	3.91
Chicago	SANTA TERESA	Minera William	171326	9/20/1982	9/19/2032	22.34
Chicago	SAN JUAN	Minera William	171332	9/20/1982	9/19/2032	8.17
Chicago	LOS MUERTOS	Minera William	171986	9/21/1983	9/20/2033	3.53
Chicago	EL GAMBUSINO	Minera William	171987	9/21/1983	9/20/2033	6.65
Chicago	AMPLIACIÓN SAN JUAN	Minera William	183883	11/23/1988	11/22/2038	10.8
Chicago	MUÑEQUITA	Minera William	196313	7/16/1993	7/15/2043	15.45
Chicago	SAN AGUSTÍN	Minera William	210764	11/26/1999	11/25/2049	7.46
Chicago	LA CRUZ	Minera William	189474	12/6/1990	12/5/2040	7.91

3.2 Surface Rights

Surface rights pertaining to the Project are held by Golden Minerals and two local ejidos (rural cooperative communities).

Ejido Velardeña holds surface rights at the Project's Velardeña property. Golden Minerals reports it has an agreement with the ejido for surface access and to perform work related to exploration and mining on the property. As part of this agreement, Golden Minerals makes quarterly payments of $2,000 to the ejido. The agreement was formalized before a notary as required by law and, although the formal agreement expired in December 2021, Golden Minerals remains in good standing with the community and is finalizing renegotiation of the agreement.

Ejido Vista Hermosa holds surface rights for the Project's Chicago property. Golden Minerals reports it has an agreement with the ejido allowing access to the property to perform work related to mineral exploration and mining. The agreement was formalized before a notary and is valid until 2038. As part of the agreement, Golden Minerals makes a payment of $400,000 MXN plus applicable taxes by the 24th of March each year.

Golden Minerals owns the surface of the land underlying the oxide mill and owns the land in the areas of surface installations at the entrance of the Velardeña mine (San Mateo ramp), the sulfide plant (Plant 1), the concentrate warehouse, and a well that provides water to the mill.

3.3 Permitting

Areas with permitting requirements at the Project include the Velardeña mine, Plant 1, and Plant 2. Golden Minerals personnel report that the Project holds and has retained the necessary permits to operate the mines and plants at Velardeña, and further there are no unresolved issues with the environmental regulatory agencies. They do not anticipate any limitations on the operations due to future inspections or evaluations by the environmental authorities. Details of the permits required, and the status of the permits, are provided in **Section 17.3**.

In addition to these permits, Golden Minerals has enrolled in a voluntary National Environmental Auditing Program (NEAP) at Plant 1. Participation in the program was suspended when operations at the plant ceased; however, Golden Minerals is eligible to re-enroll in the program.

3.4 Encumbrances

There is a lien reported in favor of IIG bank on some concession titles within the Velardeña property regarding a loan made to B.L.M. Minera Mexicana S.A. de C.V., an entity owned by ECU (now a part of Golden Minerals). Golden Minerals reports this loan was repaid in 2001; however, the lien notation on the concession titles was never cleared following the repayment and still shows as an active lien in the Mexican Mining Registry. Golden Minerals states it is 100% confident all debts with IIG have been settled and is continuing to pursue the removal of the lien with the Mexican authorities.

3.5 Other Significant Factors and Risks

The author is unaware of any other significant risk factors that may affect access, title, or right or ability to perform work on the property.

4. ACCESSIBILTY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

4.1 Topography, Elevation, and Vegetation

The Project is located on the northwestern edge of the Mesa Central physiographical province on the eastern flank of the Sierra Madre Occidental mountain range, and is characterized by a mixed topography. The two properties that are the subject of this report are located within the Sierra San Lorenzo range at an elevation of approximately 1,680 to 2,000 meters above sea level.

According to INEGI's classification, the type of vegetation where the project is located corresponds to a vegetation type known as Desert Shrubland *rosetophilous* (rosette-forming vegetation) and sub montane scrub.

4.2 Access

The Project is in the State of Durango, approximately 65 km southwest of the city of Torreón, Coahuila, and 150 km northeast of the city of Durango, in the State of Durango. A four-lane toll highway connecting the cities of Torreón and Durango passes approximately 500 m east of the village of Velardeña. The village is connected to the mine site via a 7 km gravel road maintained in good condition for year-round use.

The major cities of Durango and Torreón have airports which are served by major regional and international carriers.

4.3 Climate

Climate at the Project is characterized as semi-arid, with a mean annual temperature of 21.1°C and an average annual rainfall of 243.7 mm/yr. Temperatures can drop below freezing in the winter and can reach the high 30s (°C) from July through September. The climate allows for a year-round operating season.

4.4 Infrastructure

The Project is located within an area with a long and active history of mineral exploration and mining. The nearby cities of Torreón, Gómez Palacio, and Lerdo de Tejada have an extensive history of manufacturing equipment for mining and metallurgical processing projects. Supplies and equipment are directly available from the cities of Monterrey, Chihuahua, and Durango, as well as from specialized suppliers elsewhere in Mexico, Canada, and the United States of America.

Fresh water for the Project is sourced from six wells which tap local aquifers. These wells are fully permitted and are fully controlled by Golden Minerals.

Golden Minerals owns two processing plants capable of processing mineralized material from the Velardeña mines. Plant 1 is a 300 tpd flotation mill which produces concentrates of Pb, Zn, and pyrite. The plant is located near the town of Velardeña and was upgraded in 2014. Plant 2 is a 550 tpd facility capable of treating oxide Au-Ag material using a Merrill-Crowe processing circuit to produce doré. The plant is currently processing mineralized material from Golden Minerals' Rodeo open pit mine at a rate of 500 tpd using the cyanide agitated leach Merrill-Crowe process.

The mines and processing plants are connected to the national electric grid via substations located near Plant 1 and the Peñoles Velardeña mine.

An experienced labor force is available in the town of Velardeña and in nearby cities and communities.

5. HISTORY

5.1 Early History

The earliest significant mining operation in the Velardeña District occurred in 1888 with the formation of the Velardeña Mining and Smelting Company. In 1902, the American Smelting and Refining Company (ASARCO) took over the operations and installed a new smelter processing 2,500 tpd from various mines in the area, with the most significant operations occurring in the Terneras and Santa Juana veins. ASARCO and various small independent operators worked the area until 1926.

In the 1960s, ASARCO became a minority shareholder in Industrial Minera de México S.A. (IMMSA), and exploration and development work recommenced in the Santa María and Reina del Cobre mines in 1968. In 1969 IMMSA abandoned several mining concessions, including those underlying the Terneras and San Diego mines, which were acquired by the Gaitán Group. Small-scale operations worked the concessions until 1992.

5.2 Mining and Exploration

William Resources acquired the concessions owned by the Gaitán Group via their Mexican affiliate BLM Minera in 1994. William Resources carried out surface mapping and sampling work on the concessions, with a focus on the Santa Juana vein system. William Resources also performed development work on the Terneras and Santa Juana mines and processed 600 tpd of dump material and development muck. Operations ceased in 1997.

In 1997 ECU Gold purchased 93.48% of BLM Minera and 100% of Minera William from William Resources, and in 2011 Golden Minerals merged with ECU. ECU resumed operations at the Project in 1998 and production continued through 2015 (as Golden Minerals after the merger), with a brief shutdown from July 2013 through June 2014. During the 2009-2011 period, ECU drove 8,030 m of drifts and ramps as well as 3,608 m of raises at the Project. Development work during the 2012-2014 period included a new ramp to access deeper levels of the Terneras and San Mateo veins, as well as the Roca Negra vein.

William Resources and ECU completed 10,714 m of surface and 6,278 m of underground exploration drilling during the period of 1995-2008. Exploration work during the period of 2009-2011 consists of underground drilling and sampling. This included 1,235 m of NQ drilling and 1,212 m of EX drilling. No surface drilling was conducted during this period. The NQ drill program yielded 483 samples and the EX drill program yielded 214 samples.

6. GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

The Project is located at the easternmost limit of the Sierra Madre Occidental, near its boundary with the Sierra Madre Oriental (Mesa Central sub-province). The deposits of the Sierra de Santa María and Sierra San Lorenzo, like many other polymetallic, hydrothermal deposits in northern Mexico, are situated along this fundamental boundary which separates thick Tertiary volcanic sequences with Mesozoic basement rocks to the west from Mesozoic carbonates with Paleozoic and older basement to the east.

6.1 Regional Geology

Regional geology is characterized by a thick sequence of limestone and minor, calcareous clastic sediment of Cretaceous age, intruded by Tertiary plutons mostly of felsic to intermediate composition. During the Laramide event, sediments were subject to an initial stage of compression which resulted in formation of large amplitude, upright to overturned folds generating the distinctive strike ridges of limestone which dominate topography. Fold axes trend northerly in the northern part of the region but are warped or deflected to west northwest azimuths in the south. The northeast trending hinge line or deflection which controls this fundamental change in strike passes through the Velardeña district. **Figure 6-1** illustrates the location of the Velardeña mining district with respect to regional lithologic and structural features.

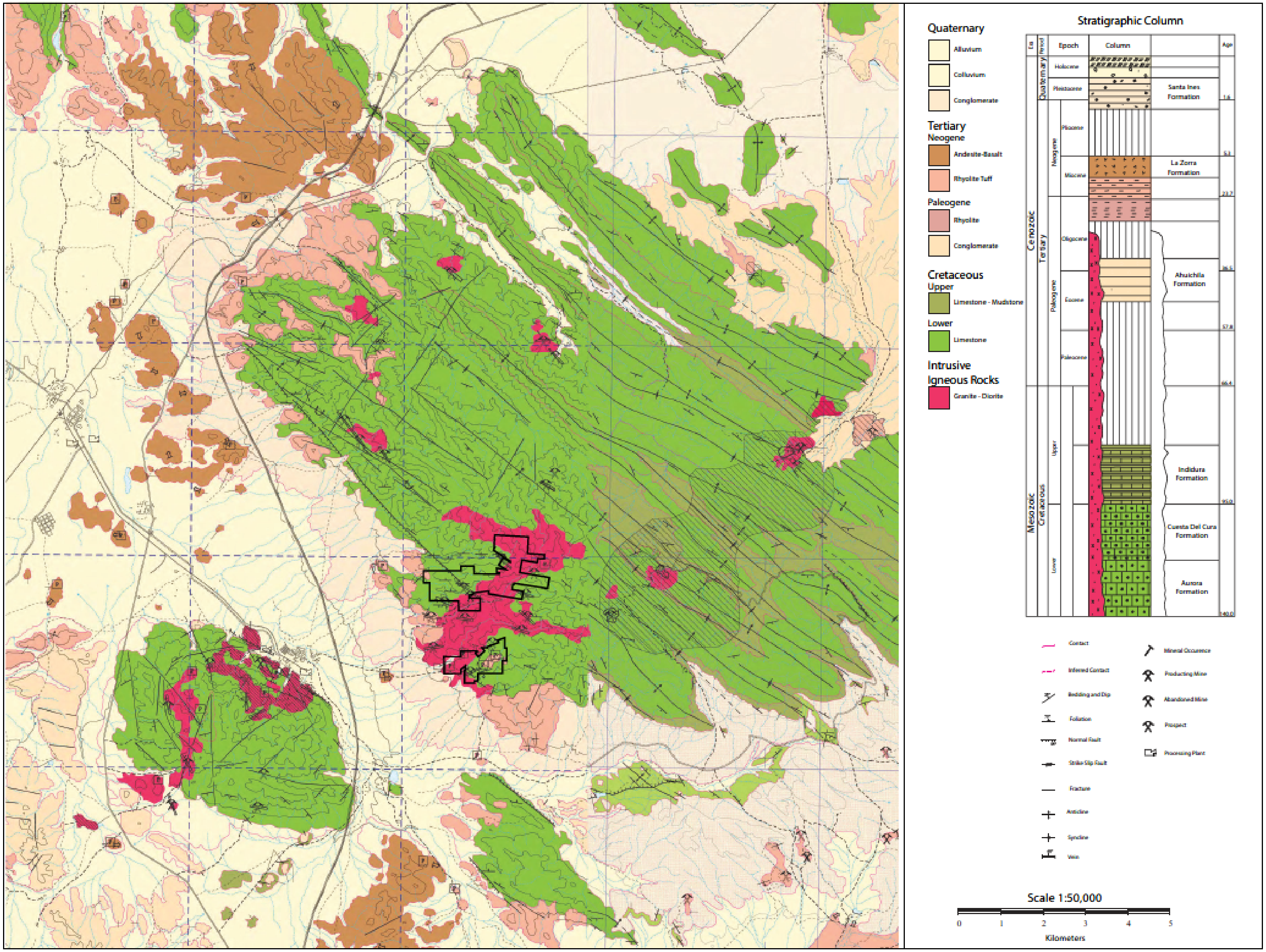

Figure 6-1: Velardeña regional geology

Tertiary volcanic and semi-consolidated alluvial sediments survive as erosional remnants on earlier basement rocks. The volcanic rocks may have been derived from an eruptive center located west of the pueblo of Velardeña where andesites have yielded age dates of 45 mya.

Tertiary stocks intruded the Cretaceous sediments in the Velardeña area along an axis subparallel to the hinge line described above, resulting in formation of a series of complex limestone domes cored by the younger intrusive rocks (i.e., the Sierra de Santa María, Sierra de San Lorenzo, and San Diego Dome). The Santa María quartz latite porphyry intrusion, west of the village of Velardeña, has yielded a potassium-argon (K-Ar) date of 33.1 mya.

Intrusions range in composition from mafic diorite to felsic alaskite and rhyolite. Thermal metamorphism of sediments at and near intrusive contacts is widespread, generating calc-silicates, hornfels, and bleached/marbleized limestone. Higher temperature, calc-silicate rocks are characterized by the prograde assemblage garnet - wollastonite and by the absence of pyroxene. The various mineral deposits of the Velardeña District occur near intrusive centers, contact aureoles, and accompanying alteration zones. Mineralization has been dated at approximately 31 mya, suggesting a genetic as well as spatial association with the intrusions.

Multiple, high angle, northwest trending faults have been mapped throughout the district; these are sub-parallel to the terrain boundary described above and are therefore likely candidates for deep, basement-penetrating structures which may have served as magma conduits. Reactivation of the northwest structures and formation of northeast trending faults resulted in a grid of younger, calcite-filled structures which off-set mineralized veins. This is well demonstrated at the Terneras mine where the northeast trending Tres Águilas fault offsets the mineralized northwest trending Santa Juana veins.

6.2 Property Geology

6.2.1 Velardeña Property

Medium to thick-bedded limestone of the Cretaceous Aurora Formation comprises basement rocks in the project area. Limestone was first folded then intruded by the multiphase diorite/monzo-diorite Terneras stock and related dikes of Tertiary age that outcrop over a strike length of approximately 2.5 km. In detail, intrusive contacts range from sharp to broad zones characterized by the presence of numerous large, partially metamorphosed blocks of limestone. Alteration of host carbonates consists of a broad front of bleaching and marble formation, with more localized calc-silicate and hornfels. Although intrusive rocks appear fresh in general, alteration and local endoskarn development occurs near contacts. The diorite stock and the contact zone between limestone and intrusive rock primarily host the veins of the Santa Juana, Terneras, San Juanes, and San Mateo deposits. Veins extend into relatively unaltered limestone especially in the northwestern portion of the Santa Juana veins and eastern portion of the San Juanes vein.

The Velardeña property is transected by a series of northeast to northwest striking, west dipping, post-mineral normal faults. From east to west these are the Tres Águilas, Los Bancos, Buenaventura and Ordenanza faults which are generally characterized by meters-thick banded calcite vein filling. These normal faults demonstrate west-side-down displacements with the result that veins in the western blocks are exposed in higher portions of the hydrothermal system, have a higher calcite content, and generally lower precious metal contents.

Two main vein systems are present on the Velardeña property. The first is the northwest striking system found in the Santa Juana deposit, while the second is the east-west trending vein array which includes the Terneras, San Juanes, Roca Negra, and San Mateo deposits. In **Figure 6-2** vein traces are projected to surface and do not cut alluvium.

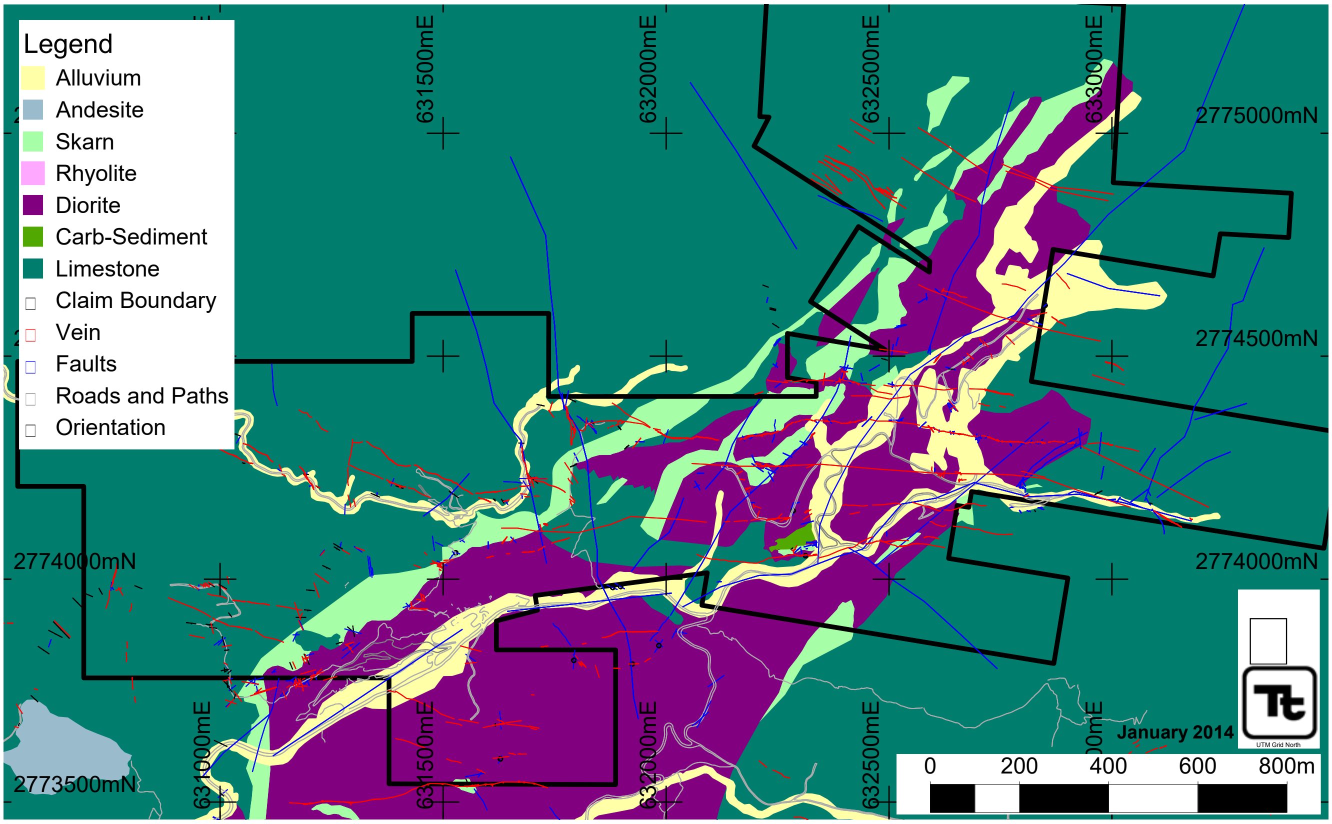

Figure 6-2: Velardeña property geology map

6.2.2 Chicago Property

The geologic setting of the Chicago property is similar to the geology at Velardeña. The oldest rocks outcropping at Chicago are folded limestone of the Aurora Formation, which were intruded by Tertiary diorite stocks and dikes. Intrusive rocks occupy the western portion of the property with a northeast orientation. The limestone-diorite contact exhibits widespread recrystallization and marble formation overprinted by a distinctive green calc-silicate alteration dominated by grossular garnet and lesser wollastonite.

As at Velardeña, a system of post-mineralization faults striking northwest-southeast cuts and locally displaces mineralized structures. These faults are normally filled with calcite and can have widths up to 10 m near the surface.

In the Chicago mine, rhyolitic volcanic rocks and calcareous conglomerate of the Ahuichila Formation unconformably overlie the mineralized sequence across the eastern half of the area. Mineralization is similar to that encountered at the Santa Juana mine in terms of mineralogy, host rocks, geometry of the structures and vein continuity. The difference between the two is orientation: northwest strike, dipping to the northeast for the Santa Juana system; instead of northeast strike, dipping to the southeast for the Chicago system. **Figure 6-3** shows the geology of the Chicago area with vein traces projected to their assumed surface intersection. Veins are not hosted in alluvial material.

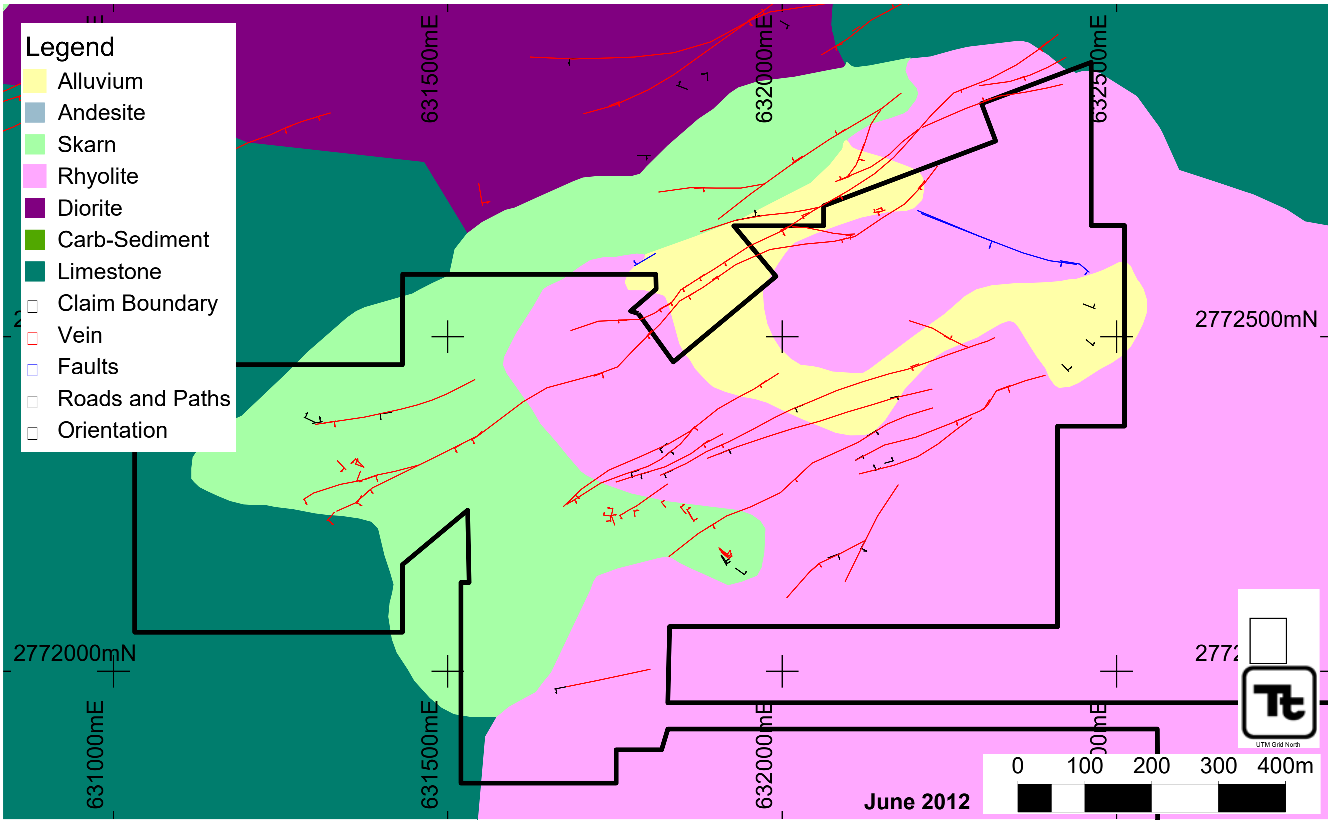

Figure 6-3: Chicago property geology map

6.3 Mineralization

Mineralization consists primarily of calcite-quartz veins with minor calc-silicate hosted skarn and massive sulfide replacement bodies. All mineralization is essentially polymetallic, Ag, Au, Pb, and Zn plus or minus Cu. Individual veins are usually thin (0.2 m to 0.5 m), but remarkably consistent along strike and down dip. Coxcomb and rhythmically banded textures are common in some vein exposures. Historical production in the district has been primarily from the oxide portions of the veins that can extend to depths of several hundred meters. Physical characteristics of the main vein sets at Velardeña are summarized in **Table 6-1**.

Table 6-1: Physical characteristics of select veins and vein sets at Velardeña

Vein	Orientation	Width	Minimum Dimensions Strike m x Vertical m	Host Rocks
Santa Juana NW Subset 1 (Santa Juana, A 5-7)	NW curvilinear	0.2 - 1.0	350 x 400	limestone, intrusive, skarn
Santa Juana NW Subset 2 (CO, CC, C1, G1, A 1-4, B's, D1, DD, E)	NW linear	0.2 - 1.0	Variable by vein, up to 600 x 1200 (CC)	limestone, intrusive, skarn
Trans Set	EW/steep S	0.2 - 1.0	100 x 600	limestone, intrusive skarn
Terneras	EW/70-85N	0.3 - 2	1500 x 650	Intrusive>limestone
San Juanes	EW/85N	0.05 - 1.9	950 x 600	limestone, intrusive, skarn
San Mateo	EW/75N	0.4 - 0.5	700 x 500	intrusive, skarn>limestone
Roca Negra	EW/75N	0.15 - 1.15	500 x 600	intrusive, skarn

Mineralization at the Chicago property is similar to the Santa Juana mine in terms of mineralogy, host rocks, geometry of the structures, and continuity.

The oxide portions of the veins are composed of oxides, halides, carbonates, and remnants of sulfide minerals. Within the sulfide zone, mineralization consists primarily of galena and sphalerite with lesser amounts of chalcopyrite, tetrahedrite, freibergite, and sulfosalts. Accessory sulfides including arsenopyrite, stibnite, pyrite, and pyrrhotite are locally abundant. Disseminated and stringer pyrite is common in all rock types below 500 m depth and persists to much shallower levels within intrusive and calc-silicate host rocks.

Veins in the district are localized in intrusive rocks and near contacts between intrusions and thermally metamorphosed country rocks but extend up to one kilometer away from these contacts. In detail, however, veins do not conform to these contacts, but in many cases cross at high angles to limestone, skarn/marble, and intrusive hosts. Observations summarized above suggest that, on average, veins within intrusive rocks are narrower, more regular in form, and higher grade than those in limestone. Skarn is typically a poor vein host with widths and grades less than in diorite or limestone hosts. Although data are sparse, it seems likely that at least some of the deeper, massive sulfide mineralization intersected in past drilling will possess more obvious control by stratigraphy, particularly skarn assemblages, than is typical at shallower levels.

Observations underground confirm at least some veins show an intimate relationship with brittle faulting. In the Santa Juana deposit, two main fracture sets are observed. The most economically significant is a steeply dipping, northwest-trending set which has created dilatant zones that acted as a major control for vein emplacement. A second more spatially extensive fracture swarm trends 110° and, although less obvious, appears to control the orientation of the Trans veins. These veins dip steeply south and, where they intersect the northwest-trending vein set, produce broader stockwork or breccia zones which can be up to seven meters in width. The east-west fracture set also controlled the localization of the parallel Terneras, San Juanes, San Mateo, and Roca Negra veins. Cross-cutting relationships between the two vein systems are ambiguous, indicating that the two vein sets probably formed contemporaneously as part of a conjugate fault system. A similar structural setting is reported to occur in the Santa María mine. **Figure 6-4** shows a cross-section of the Velardeña mineralization.

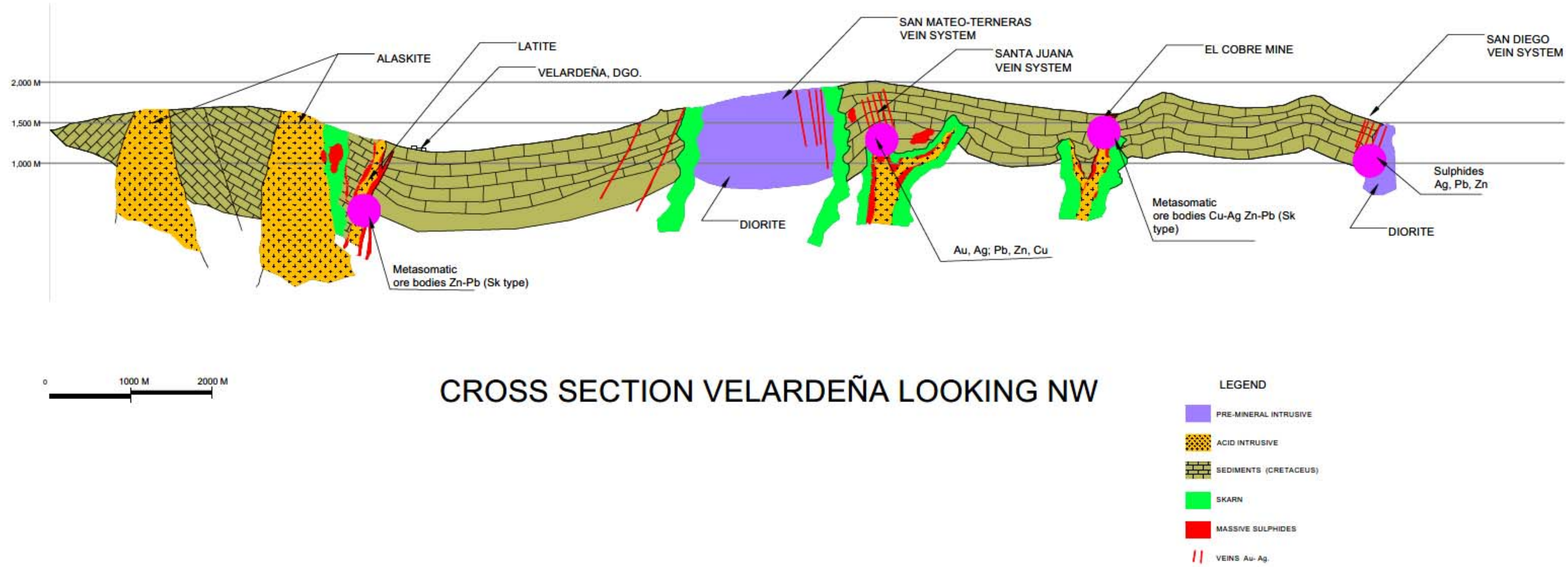

Figure 6-4: Velardeña section looking northwest

6.4 Deposit Types

Although detailed petrologic studies of veins in the Velardeña property have not been completed, individual deposits within the nearby Santa María dome have been studied in some detail and found to correspond to both shallow epithermal and deeper-seated mesothermal styles of mineralization. Epithermal veins, often displaying banded and open-space-filling quartz, describe the higher-level veins at Velardeña. Many veins, especially at deeper levels in the Santa Juana and Terneras mines, are dominated by high modal percentages of coarse and fine grained, polymetallic sulfides, have little silicate gangue, and occupy a position within and proximal to intrusions and their thermally metamorphosed aureoles.

True epithermal veins occur at Velardeña, but at depth most veins, breccias, and massive sulfide replacements are mesothermal in character, commonly contain arsenopyrite, and may be related to a deeper intrusive source.

7. EXPLORATION

The Project has been extensively explored from the surface using geologic mapping, vein mapping, and vein sampling. Underground exploration consisted of diamond drilling, geologic level mapping, vein level mapping, vein sampling, and drift and stope development. Underground development includes 10,122 meters of drift and ramp development and 2,278 meters of raise development. Channel samples are collected from drift faces, crosscuts, and stope walls and/or backs.

7.1 Channel Samples

Channel samples are collected using the following guidelines:

- During level mapping, geologists paint sample locations on the back or development face to guide samplers
- Samples are collected by chiseling out the painted area, ideally cutting a 5-7 cm wide sample. Often this is not achievable due to rock hardness
- The sample widths range from 0.2 m to 2.5 m
- The sample’s weight is usually between two kg and five kg. The sample contains a minimum of ten rock pieces (<20 cm in size) as well as fine material
- Sampling is carried out as perpendicular to the vein strike as possible and the true width is measured by sighting the vein dip and tilting the measuring tape accordingly
- Stope and face samples are collected at 3 m intervals across strike. Wall rock and vein material are sampled separately. When dictated by geological features, samples are taken at closer intervals
- Sampling along cross cuts is carried out continuously

The channel database contains 32,006 sample intervals, of which 14,534 intervals have been interpreted as intersecting a named vein. **Table 7-1** shows grade statistics for channel intervals within the database and those identified as on-vein.

Table 7-1: Channel sample data statistics

Dataset	Selection	Count	Mean Ag g/t	Mean Au g/t	Mean Pb%	Mean Zn%	Mean Apparent Thickness
Channel	All	32,006	281	5.1	1.6	1.6	0.66
Channel	On Vein	14,534	518	9.2	2.8	2.7	0.47

Channel sampling is subject to numerous sources of error, particularly relating to the differential hardness of material being sampled, and the tendency to include a disproportionate volume of softer rock. Diligent and systematic collection of channel samples generates a large data set which in most cases is statistically representative, but never completely free of errors or potential bias.

The collection of several channel samples was observed for previous studies in the Chicago mine and it was noted the procedures used conformed to those outlined above and follow accepted engineering practices for channel sampling. Due to the mine being in a state of care and maintenance, the author has not observed the collection of channels at the Project, but has spot checked sample locations throughout the mine and thoroughly discussed procedure with the mine staff. The author concludes channel sampling procedures used at the Project result in samples which are reasonably representative of the mineralization and meet industry best practice guidelines for this type of sampling. The resulting data is sufficient to support the estimation of Resources.

7.2 Drilling

Historic exploration drilling statistics for the period 1995-2008 are summarized in **Table 7-2**. These results have been summarized by Micon (2009) and have not been independently verified by the author.

Table 7-2: Summary of historic drilling on the Velardeña Properties (1995-2008)

Company	Drill Program	Number of Drill Holes	Total Length (m)
William Resources	Underground	94	6,438
William Resources	Surface	6	973
William Resources	Surface	3	282
William Resources	Surface	6	750
Total		**109**	**8,443**
ECU	Surface	14	8,709
ECU	Underground BQ	11	5,533
ECU	Underground EX	59	2,750
Total		**84**	**16,992**

Data taken and modified from Micon 2009 report.

The objectives of the 2009-2011 program conducted by ECU were to confirm the continuity of the known veins, to discover new veins, and to test for deep projections of massive sulfide veins in the Santa Juana area. The completed holes are summarized in **Table 7-3**. Based on a review of drill cores and data on-site, these objectives were at least partially achieved, notably with the discovery of deep, massive sulfide mineralization down dip of the A4 vein structure.

Table 7-3: Summary of ECU's drilling programs (2009-2011)

Description	Number of Drill Holes	Total Meters
Underground (NQ)	3	1,235
Underground (EX)	35	1,212
Total	**38**	**2,447**

Golden Minerals conducted drilling in 2012-2014 and drilled from underground targeting the San Mateo, Terneras, and Roca Negra veins. Four holes were drilled from underground in the Santa Juana area targeting primarily the A4 vein. **Table 7-4** shows the summary of the drilling from 2013-2014 completed by Golden Minerals. **Figure 7-1** shows the location of the drill holes at the site.

Table 7-4: Summary of Golden Minerals drilling (2012-2014)

Year	Description	Number of Drill Holes	Length (m)
2012	Underground	4	186
2014	Underground	43	8,875
Total		**47**	**9,062**

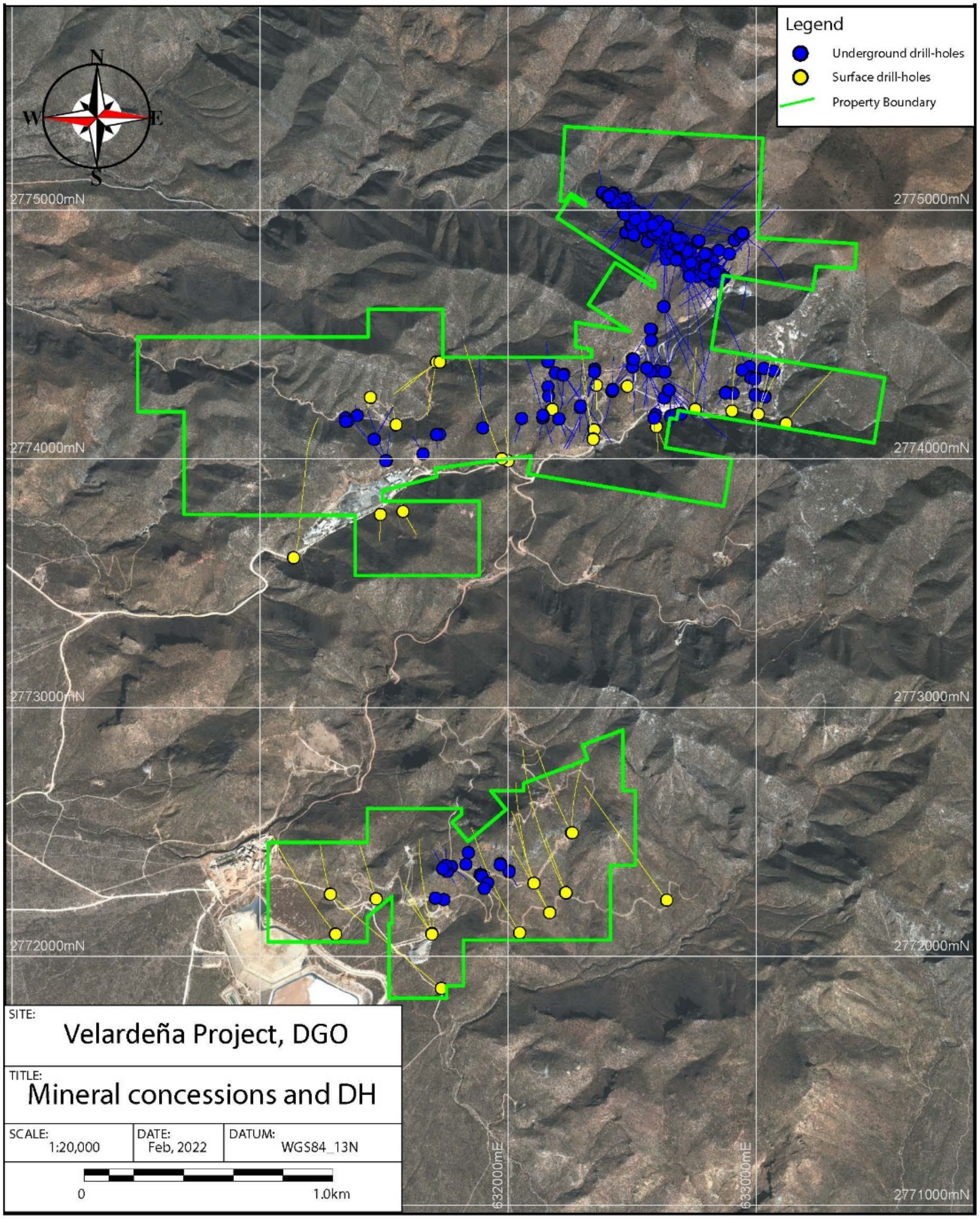

Figure 7-1: Drill hole locations for the Velardeña Project

Diamond drill core samples are taken according to the following criteria:

- Drill core is split using a manual rock splitting device or using a core saw
- Samples are taken from core sections with visible evidence of mineralization and from 1.5 to 2.0 m of surrounding wall rock
- Wall rock between two veins is sampled when the distance is less than 6 m

- The information recorded in the drill logs for each sample includes depth, length, core angle and rock/ore type

Mineralized sample intervals for either the HQ, NQ, or BQ size core have a minimum core length of 20 cm and a maximum length of 1 m. For areas sampled outside of the mineralization the maximum sample length for the NQ core is 1.20 m and for BQ core the maximum sample length is 1.50 m. In general, the maximum sample length is 1.50 m except for those areas in which two veins can be joined together in which case the maximum sample length is 2 m.

Sampling was conducted on core not only with visible evidence of mineralization, such as veins and stringers, but also on barren core to preserve the sampling continuity in between mineralized zones and to test for broad zones of lower grade material as well. The sampling of the wall rock next to the zone of mineralization also assists in understanding the grade of the external dilution associated with mining some of the mineralized zones on the Velardeña properties.

Manual splitting of the core can be subject to several sampling biases based usually on the hardness of the material being split. In the case of very hard core, the core may twist in the splitter which may result in uneven core fragments and in a slightly greater split than 50% being sent to the assay laboratory or left in the box as a representative sample. In the case of soft core, the core may crumble when being split or may split along natural fracture lines which again results in uneven core representation. Also, to prevent contamination, the splitter and pans used to collect the samples must be cleaned after each sample. Despite the potential to introduce a bias into the sampling procedure as a result of uneven sample sizes, the splitting of drill core continues to remain a common practice in the exploration and mining industries.

Bazooka drilling is undertaken from the development headings in order to identify the width of a zone where the hanging wall is not visible or where a secondary mineralized system is suspected as in the case of the sheeted veins. Cores obtained from these programs are not split and are sampled completely.

In the case of large diameter core (HQ, NX, BX), recoveries were reported to average around 60% in oxide mineralization and 90% - 97% in the sulfides. For the smaller Bazooka (EX) drill cores, overall recoveries ranged from 30% - 40%. Recovery for Bazooka cores are poor and may result in underestimation of mineralized widths and grades. In the case of bazooka drilling, drifting is usually conducted afterward to identify the true nature of the mineralization, especially if a secondary zone or vein is suspected.

7.3 Data Adequacy

These drill core sampling procedures are consistent with commonly practiced procedures used throughout the mineral industry. Along with in-house standards, blanks, and duplicates included in the sample stream, routine check assays are conducted on the samples by a certified, independent laboratory as well.

Drill core sampling practices are consistent with industry standards adequate for use in preparing a Mineral Resource estimate.

8. SAMPLE PREPARATION, ANALYSES, AND SECURITY

Sample preparation, analyses, and security procedures followed by Minera William meet industry common practice standards and are adequate to support the estimation of Resources. The quality control (QC) sampling results throughout the campaigns and laboratories are typical of an operation given the amount of throughput and data handling. Current drill hole analyses are completed by ALS Chemex in Vancouver, Canada (ALS Chemex) and mine channel and mill samples are tested at the on-site Labri laboratory facility (Labri), constructed in 2013. A review of QC samples analyzed from 2012-2017 suggested the on-site laboratory could benefit from further improvements and increased real-time review of performance. In 2017 a lab audit and review were conducted by both internal and external resources. Frequent annual and quarterly ongoing reviews, including and not limited to analytical and mechanical instruments, processes, and an enhanced rigorous QAQC protocol for all Velardeña samples are performed. Based on recent (2017-2021) QC sample review, the analytical results determined by the on-site laboratory are within tolerance to those determined by ALS Chemex.

Previous quality control procedures and results have been reviewed by previous authors and those reviews have resulted in improved protocols and performance, but ultimately previous authors concluded the data is sufficient to support estimation of Resources. The drill hole and channel analytical databases are extensive and include results from several campaigns and laboratories. **Table 8-1** details when each laboratory has been used, and the accompanying umpire laboratory.

Table 8-2 details the accreditation and the relationship to Golden Minerals of each laboratory used. Data within both databases, regardless of testing laboratory, is considered current and equivalent.

Table 8-1: Analytical laboratory listing

Time Period	Laboratory Used	Umpire Laboratory Used
Pre-2009	Labri (on-site), Ensayes y Representaciones, S.A. (ERSA)	Servicio Geológico Mexicano (SGM), ALS Chemex
2009 to 2013	Labri (on-site), Ensayes y Representaciones, S.A. (ERSA), SGS	SGS
2013 to Present	Labri (on-site), ALS Chemex	Pulp Duplicate Resubmittal to ALS Chemex

Table 8-2: Laboratory accreditation and independence

Laboratory	Accreditation	Relationship
Labri	Not Accredited	Not independent, operated by Golden Minerals
SGM	Not Accredited	Independent of Golden Minerals
ERSA	Not Accredited	Independent of Golden Minerals
SGS	ISO 17025	Independent of Golden Minerals
ALS Chemex	ISO 17025	Independent of Golden Minerals

Current drill hole analyses are completed by ALS Chemex and channel samples are tested on-site at the Labri laboratory. ALS Chemex is independent of the issuer and is ISO 17025 accredited: the accreditation of ALS Vancouver encompasses preparation processes completed at ALS Chihuahua. The on-site laboratory is not independent of the issuer and is not accredited. Tetra Tech inspected the on-site laboratory in January 2022 and found the facility and the procedures followed to be of adequate standard for the purpose of this study.

8.1 Sample Preparation and Analysis

8.1.1 Diamond Drill Core Samples

Drill hole samples are prepared by splitting the core with a manual rock splitting device or core saw using personnel who have been hired by Minera William for this purpose. The Minera William personnel who conduct the core splitting and sampling are supervised by Minera William's geological staff to ensure the integrity of the core splitting and sampling procedures. Half of the core remains in the core box with its identifying ticket while the other half is bagged with a matching ticket. The samples are delivered by mine staff to ALS Chemex's preparation laboratory in Chihuahua or Zacatecas where they are shipped to ALS Chemex in Vancouver for analysis.

Drill hole samples are analyzed by ALS Chemex initially for Au using fire assay with atomic absorption spectroscopy finish (AA24) with re-run for values exceeding 10 g/t Au using fire assay with gravimetric finish (GRA22).

Samples are initially analyzed for Ag, Pb, Zn, Cu, and 32 additional elements using aqua regia inductively coupled plasma - atomic emission spectroscopy (ICP41) with re-run for values exceeding 100 g/t Ag, and 1% Pb, Zn, or Cu using aqua regia digestion and inductively coupled plasma - atomic emission spectroscopy (OG46).

8.1.2 Underground Chip Samples

Development chip samples are collected by sampling support staff who are instructed to chip away sample transects painted by the geologist. Sampling is observed by geologic staff. Samples are bagged and transported to the on-site laboratory for preparation and analysis.

Channel samples are prepared and then analyzed by the on-site facility for Au, Ag, Pb, Zn, Cu, and As. Gravimetric fire assay is used to determine Au and Ag grade. Pb, Zn, Cu, and As are analyzed by atomic absorption spectroscopy with hydrochloric and nitric acid digestion.

8.2 Security, Storage, and Transport

The core is stored at the Santa Juana mine site in either a closed building, a shed, or on a prepared uncovered area (in which case durable plastic covering is provided) behind a fence. In each case the core remains in a securely locked area. Pulps and rejects are stored in closed areas and are individually packed in plastic bags to avoid contamination. The mine facility is guarded by security personnel 24 hours a day.

The chip sampling pulps and rejects are obtained from the assay laboratory and are stored in a secured area at the Santa Juana mine site in either a closed building or a shed. The chip sample rejects and pulps remain in a securely locked area.

8.3 Quality Control

For the current drill hole and channel sampling programs, Golden Minerals inserts standards, blanks, and duplicates in the sample stream. Quality control samples are inserted in a repeating order depending on the last digit of the sample identification (ID). The effective QC submittal for the drill core and channel campaign is approximately one control sample for ten collected samples. The control samples include standards, duplicates, and blanks, which is in line with industry best practices.

8.3.1 Standards

A total of four standards are utilized for QAQC. The high- and low-grade standards for 2014 were custom made and tested by SGS. The standard results were reviewed and demonstrate adequate performance. The few errors observed are likely attributed to sample ID mislabeling and should be addressed prior to performance analysis.

Two of the standards used in the drill hole stream are used in the channel sample stream as well, which provides a check of both labs. The standard results were reviewed and demonstrate reasonable performance.

Sampling and QAQC protocols were updated in 2017 using verified blank material and standards to better reflect the vein grades (low-, medium-, and high-grade) and deposit type. Additional sample analysis verification for blank and standard material is conducted on a routine basis to ensure the results are as expected. This review work led Golden Minerals to identify better performing standards, along with having more confidence in the QAQC program.

8.3.2 Duplicates

Pulp duplicates are analyzed within the drill hole sample stream. Review of the duplicates indicate good reproducibility. Noted issues in the standards and duplicates are infrequent and do not suggest invalidation of the results from the on-site laboratory.

8.3.3 Blanks

Blanks are inserted into the sample stream. Previous work indicated a contamination of low-grade Ag in the blank material. The material being used for blanks was replaced and was sourced from Abrasivos de Laguna SA de CV. Golden Minerals submitted five samples of the new blank material to both the Velardeña Lab and to ALS Chemex for analysis for Au and Ag to ensure that the material contained minimal Au and Ag. The results were within tolerance for blank material and both labs had similar results.

As part of the updated QAQC procedures, the QAQC data is reviewed continually to check for problems with the analytical data including reviewing the standard, blank, and duplicate samples. Scheduled analytical maintenance occurs regularly, with additional lab checks reviewed by lab management over short and long-term schedules.

To check potential contamination during sample preparation, a batch of high-grade samples from the Rodeo mine was submitted with a blank sample being inserted into the sample stream after each high-grade sample.

8.4 Adequacy of Data

The procedures followed by Minera William are within Industry Best Practices and the data is adequate for the use in this level of study.

9. DATA VERIFICATION

The data collected by the mine staff is in support of operations planning and many of the data inputs provided by Golden Minerals are supported by historic production actuals and, through this activity, have been verified. Additional verification procedures are described below.

9.1 Geologic Data Inputs

To verify geologic data inputs the qualified person reviewed provided digital data in context with other data provided along with physical observations while on site. For example: the level mapping was reviewed alongside selected vein samples, geologic mapping was reviewed in conjunction with drill hole geologic interval logging, on-vein development was compared to sample locations, mine stopes were compared to development and channel sampling.

Traditional drill hole database validation checks were run on the drill hole and channel database and errors were provided to Minera William staff for correction. Each provided on-vein interval for every modeled vein was reviewed in three-dimensional (3D) view, level plan, and in section during model construction and was checked for consistency of location and grade in context of nearby samples. The quantity of data provided is immense and is not free of errors and omissions, but is at a level of confidence to be utilized in a study of this level.

After the 2015 PEA was released, Minera William examined the database intervals that intercept the vein. Each interval was examined alongside the mine level maps, as well as existing wireframes. If it was deemed that the vein code was not correct, the database was corrected. Special attention was also given to intervals and whether they contain dilution or not in the sampling. This recoding of intervals was used for the Resource update in this study.

9.2 Mine Planning Data Inputs

Tetra Tech conducted a site visit to the Velardeña mine to verify parameters used in mine planning are adequate for use in this study. This included visiting underground workings, as well as test mining areas. This site visit allowed for verification of mining parameters used in the study, confirming the parameters are adequate.

9.3 Mineral Processing Data Inputs

Technical and cost data were obtained during the Project site visit and in subsequent communications with Golden Minerals personnel at the Velardeña site and in Golden Minerals' Golden, Colorado office. The data provided by Golden Minerals conforms to industry standards and is within the accuracy of this study and verified for use in this study.

At no time was there any limitation to, or failure to provide, the requested technical and cost data for the processing plants or infrastructure to Tetra Tech's metallurgical or infrastructure personnel during or after the Project site visit.

The technical and cost data for the processing plants and infrastructure collected during the site visit to Velardeña and subsequent communications with Golden Minerals are adequate for the assemblage and production of this study.

9.4 Economic Data Inputs

A technical economic model template and cost data were obtained in communications with Golden Minerals. The data provided by Golden Minerals conforms to industry standards and is within the accuracy of this study and verified for use in this study.

9.5 Environmental Information

A list of current permits was obtained from Golden Minerals. The information provided by Golden Minerals conforms to the requirements of Mexican environmental regulations; however, no information regarding an environmental monitoring program or adherence thereto was reviewed and the waste rock area permits will need to be updated before mining recommences.

9.6 Data Adequacy

At no time was there any limitation to, or failure to provide, the requested technical and cost data for the Rodeo mine during or after the site visit. Data provided was adequate for the assemblage and production of this study.

10. MINERAL PROCESSING AND METALLURGICAL TESTING

There are two processing plants at the Project. Plant 1 is designed to treat sulfide material by conventional crush, grind, and differential flotation to produce Pb, Zn and pyrite concentrates. Process Plant 2 is an agitated cyanide leach plant that produces Au-Ag doré by using a Merrill-Crowe circuit.

Operation of Plant 1 was discontinued in late 2015 due to a combination of low metal prices, dilution, and metallurgical challenges. Plant 2 was leased to Hecla Mining Company from July 2015 through November 2020, after which the lease expired. Mineralized material from the Golden Minerals Rodeo Project has been processed through Plant 2 since January 2021.

Because of the historical production for Plant 1, the liberation characteristics of the material and subsequent response to differential flotation are within typical design criteria and known by the operations personnel. There are no geological, lithological, or mineralogical changes in the process plant feed anticipated for the envisaged future production as compared to previous operations. Historical operational results support the existing process flowsheet for potential future production at Plant 1. Further, the use of existing and refurbished equipment within the pre-existing facilities is Golden Minerals' preferred method of future treatment.

In 2007 the potential to increase gold recovery from Plant 1 and improve project economics by installing a bio-oxidation circuit to treat pyrite concentrates on site and recover gold and silver to doré was explored by sending samples to SGS in South Africa for test work. Since then, in 2019 and 2020, two additional sets of representative gold-bearing iron pyrite concentrate samples were sent to Outotec in South Africa to confirm uniformity of the BIOX® process results and to further define the bio-oxidation residence time required for subsequent gold recovery by cyanide leaching. The Metso Outotec BIOX® process for the treatment of refractory gold concentrates has been in commercial operation for over 30 years with 13 successful plants commissioned worldwide. To date, over 22 million ounces of gold have been produced through this process. SGS and Outotec are independent of Golden Minerals.

An abbreviated Outotec description of the process follows:

- The BIOX® process was developed for the pre-treatment of sulfide refractory ores and concentrates ahead of a conventional cyanide leach for gold recovery. The gold in these ores is encapsulated in sulfide minerals such as pyrite, arsenopyrite and pyrrhotite thus preventing the gold from being leached by cyanide. The BIOX® process destroys the sulfide minerals and exposes the gold for subsequent cyanidation, thereby increasing the overall gold recovery that can be achieved.
- The heart of the BIOX® process is a mixed culture of naturally occurring microbes which, under controlled conditions, can oxidize gold-bearing sulfide ores or concentrates due to a chemo lithotrophic mode of metabolism. This means that they require inorganic compounds for the acquisition of both energy and carbon.
- The carbon requirements of the microbes for biosynthesis of cellular biomass are met by CO_2 in the atmosphere or from the dissolution of carbonate minerals in the ore.
- The microbial culture in the BIOX® reactors is not controlled, but rather allowed to adapt, to the concentrate and operating conditions.
- The species, viz. *Acidithiobacillus ferrooxidans*, *Leptospirillum ferrooxidans*, *Leptospirillum ferriphilum*, *Ferroplasma cupricumulans,* as well as many *archaea* species make up the dominant species of the BIOX® microbial consortia. Detailed laboratory and pilot plant studies have indicated that the microbes produce an acidic environment, a temperature of between 35°C and 45°C and a steady supply of oxygen and carbon dioxide for optimum growth and activity. The unusual operating conditions, which are optimal for the BIOX® microbes, are not favorable for the growth of most other microbes, thus eliminating the need for sterility during the BIOX® process. The BIOX® microbes

are non-pathogenic and incapable of causing disease. The microbes employed in the BIOX® process do not, therefore, pose a health risk to humans, animals, or plant life.

- The oxidation reactions are also highly exothermic. In addition to the direct oxidation of sulfide minerals, several indirect chemical and microbial assisted reactions occur.

Three series of Batch Amenability Tests (BAT) were performed on different samples of pyrite concentrate; in 2007 at SGS LAKEFIELD Research Africa and in 2019 at Outotec BIOMIN (Pty) Ltd RSA. Based on results of the test work, the reports concluded the refractory Velardeña Fe concentrate is amenable to bio-oxidation treatment and the results in the tests were uniform. The oxidized sulfides yielded improved gold and silver dissolutions in a cyanide leach from single digits before treatment to greater than 90% for Au, and from less than 20% to 90-95% for Ag.

Operating conditions, reagent consumptions and results for a BIOX® BAT treatment period of three days was chosen for evaluation in this assessment. **Figure 10-1** shows the increase in oxidation with time for the two series of BATs. The batch system delivers a different, protracted set of kinetics compared to the kinetics achieved in a continuous operating system. In continuous operation, maximum growth is sustained as the organisms receive fresh sulfur substrate continuously, while in batch mode, the culture must first progress through an initial lag phase before reaching an optimal growth phase. This high growth rate is only sustained for a short period. The 24-day bio-oxidation period shown in the graph is reduced to three days when the process is continuous. Gold dissolution approaching 90% was achieved in both test reports after sulfide oxidation to near 60%, corresponding to plateauing of the Gold Dissolution vs. Sulfide Oxidation curve **Figure 10-2**.

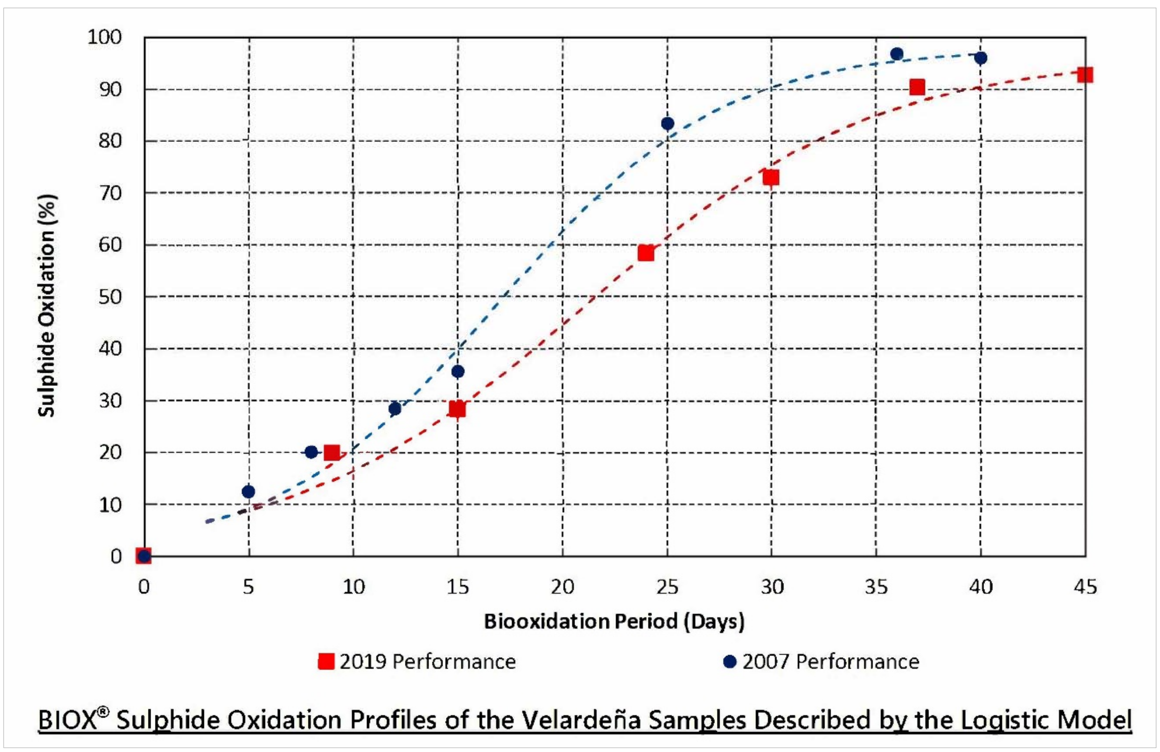

Figure 10-1: Oxidation vs. time

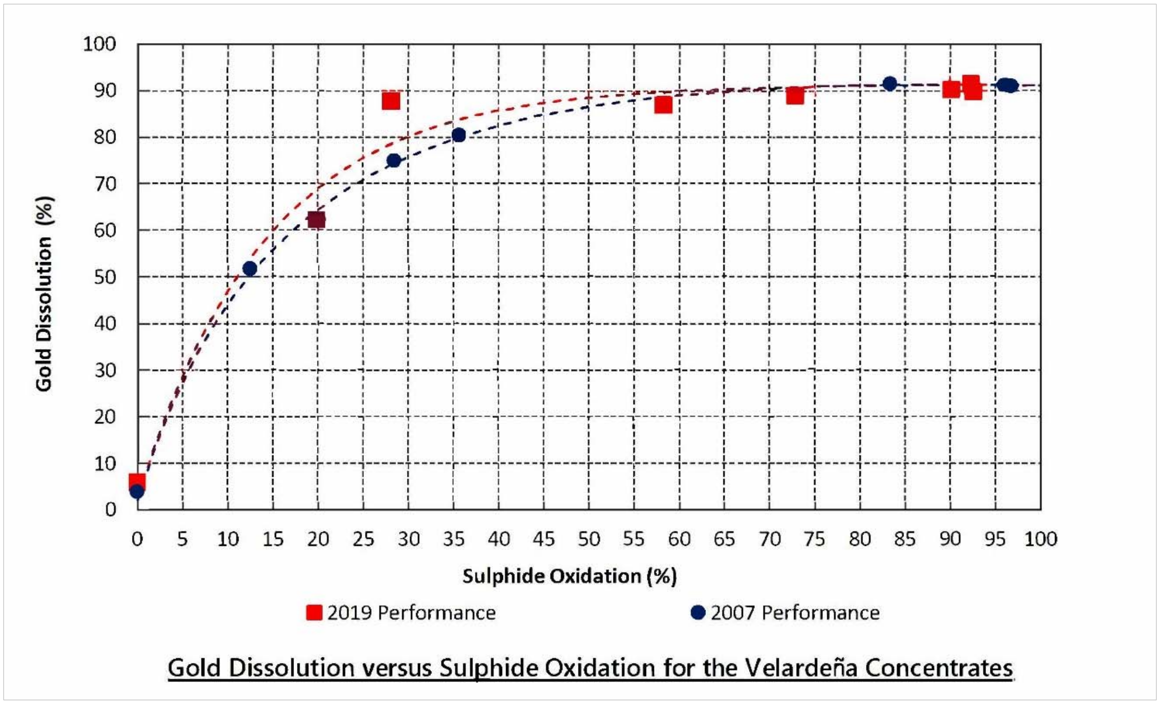

Figure 10-2: Dissolution vs. oxidation

With the success of the testing programs, this report includes a BIOX® circuit to oxidize the pyrite concentrate for recovery of the contained gold and silver to doré on-site.

10.1 Data Adequacy

The data provided by Golden Minerals conforms to industry standards and is within the accuracy of this study and verified for use in this study. Historic production from multiple veins at the mine demonstrates the capability of the plant to process the mineralized material. Pyrite concentrates tested for bio-oxidation amenability are typical of those produced at Velardeña.

11. MINERAL RESOURCE ESTIMATES

Initial vein intervals were provided by Golden Minerals as an attribute in the project database along with indicative vein surface models. The provided vein intervals and surfaces models were reviewed in 3D in context of the vein mapping and underground development mapping. Intervals were evaluated and coded by vein, which were used to create wireframe vein models. Resources have been estimated independently for 60 vein surfaces representing main veins, fault offsets, and splits of 39 known veins. The primary veins include CC, C1, A4, F1, G1, San Mateo, Roca Negra, Hiletas, Terneras, Chicago, and Escondida. Point models were used to estimate the Resource models for each vein. Attributes have been estimated using inverse distance to a power of 2.5 (IDW 2.5).

Block attributes were estimated in three passes from small to large. Estimation was completed using anisotropic inverse distance weighting for each block in the model in Micromine software. **Table 11-1** details the search ellipse sizes, orientations along with sample selection criteria, and classification. Resource classification was assessed by pass (maximum search), number of samples and the nearest composite and average distance. Measured or Indicated classification was only permitted in pass one, 75 m maximum search, and was primarily, but not exclusively, defined within blocks haloing the existing drifts and stopes.

Table 11-1: Pass parameters and classification

Pass	Method	Max Search	Ratio 1st:2nd:3rd	Sectors	Max Comp Per Sector	Comp Min	Comp Max	Classification
First	IDW 2.5	75	Variable	4	2	1	8	Inferred, Indicated if; comps >=3 and nearest comp <= 50m, Measured if; comps >=4 and nearest comp <= 16m and average comp distance <= 25
Second	IDW 2.5	150	1:0.25:0.5	1	2	1	2	Not classified, Inferred if; nearest comp <= 125m
Third	IDW 2.5	200	1:0.5:0.5	1	2	1	2	Not classified

Estimated Mineral Resources with an effective date of March 1, 2022 for the Velardeña project are shown in **Table 11-2**. The Resource is reported by mineral type and Resource class for all veins. Resources were calculated as diluted to a minimum of 0.7 meters and are reported at a $175 NSR cutoff.

Table 11-2: Velardeña Project Resources

Classification	Mineral Type	NSR Cut-off	Tonnes	Grade Ag g/t	Grade Au g/t	Grade Pb%	Grade Zn%	Ag oz	Au oz	Pb lb	Zn lb
Measured	Oxide	175	128,800	268	5.69	1.74	1.53	1,108,000	23,500	4,936,000	4,333,400
Indicated	Oxide	175	280,300	262	5.06	1.73	1.45	2,361,200	45,600	10,681,500	8,936,600
Measured + Indicated	Oxide	175	409,100	264	5.26	1.73	1.47	3,469,200	69,100	15,617,500	13,270,000
Inferred	Oxide	175	351,400	417	4.95	2.55	1.45	4,714,600	56,000	19,729,500	11,248,200
Measured	Sulfide	175	256,200	357	5.52	1.56	1.91	2,942,800	45,500	8,819,300	10,769,700
Indicated	Sulfide	175	603,500	341	4.79	1.46	1.91	6,619,400	92,900	19,475,600	25,408,900
Measured + Indicated	Sulfide	175	859,700	346	5.01	1.49	1.91	9,562,200	138,400	28,294,900	36,178,600
Inferred	Sulfide	175	1,357,700	348	4.76	1.52	1.97	15,179,000	207,800	45,534,200	58,952,900
Measured	All	175	385,000	327	5.58	1.62	1.78	4,050,800	69,000	13,755,300	15,103,100
Indicated	All	175	883,800	316	4.88	1.55	1.76	8,980,600	138,500	30,157,100	34,345,500
Measured + Indicated	All	175	1,268,800	319	5.09	1.57	1.77	13,031,400	207,500	43,912,400	49,448,600
Inferred	All	175	1,709,200	362	4.80	1.73	1.86	19,893,600	263,800	65,263,700	70,201,100

Notes:

(1) Resources are reported as diluted Tonnes and grade to 0.7 m fixed width
(2) Metal prices for NSR cutoff are: US$23.70/troy ounce Ag, US$1,744/troy ounce Au, US$0.97/lb Pb, and US$1.15/lb Zn
(3) Columns may not total due to rounding

Mineral Resources have been tabulated using a US$175/t NSR cutoff grade based on the price assumptions shown in **Table 11-3**. The Resource tabulation is presented based on the long-term average consensus prices from 40 banks. The prices used are US$23.70/troy ounce Ag, US$1,744/troy ounce Au, US$0.97/lb Pb, and US$1.15/lb Zn.

Table 11-3: Cutoff price assumptions

Assumption	Value
Ag Price $/oz	23.70
Au Price $/oz	1,744
Pb Price $/lb	0.97
Zn Price $/lb	1.15

NSR has been calculated with concentrate characteristics and marketing terms supplied by Golden Minerals. Metal contributions are dependent on the concentrate and mineral type, and the overall recoveries are shown in **Table 11-4**.

Table 11-4: NSR metallurgical recovery assumptions

Metal	Sulfide Metallurgical Recovery %
Au	67
Ag	90
Pb	72
Zn	77

For the oxide and mixed NSR equations the payable terms were combined as single factors with the recoveries and were provided by Golden Minerals. Oxide and mixed mineral types are not the subject of the subsequent sections of this report that assess preliminary economics. The sulfide NSR equation has been updated for proposed mining areas that are the subject of this report and is based on metallurgical testing from that area.

The qualified person considers the information provided for this Resource estimate to be at a level of detail to be used for an Initial Assessment. If subsequently converted to Reserves and mined, the inability to precisely predict the true shape and orientation of mineralized shoots could materially affect the Mineral Resources. The geologic controls dictating the extents of the mineralized shoots are not currently known in much of the Inferred Resource areas. Interpolation and extrapolation of channel and drill hole samples represent an unbiased approximation of mineralized shoot shape but will generally not predict the exact shape.

NSR calculations are based on reasonable price and contract assumptions. The inability to market concentrates or changes in prices or contract terms could materially affect the quantified Resources in relation to the NSR cutoff. The estimation of in-situ tonnage and grade attributes estimated would not be affected.

There are no additional environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that the author of this report is aware of that could materially affect the Mineral Resource estimate. The property has been in operation and many of the above factors have been studied in detail and addressed in the initial permitting process and have not affected the Resource estimates to date. It is possible complications with any or all the above-mentioned factors could arise in the future, but currently no material complications are known.

12. MINERAL RESERVE ESTIMATES

Mineral Reserves have not been estimated for the Velardeña project.

13. MINING METHODS

The Project is planned to be operated as an exclusively underground operation. The current mine plan includes only the sulfide material from the principal veins, which include veins CC, C1, A4, F1, G1, San Mateo, Roca Negra, Hiletas, Terneras, Chicago, and Escondida. The plan targets an annual maximum of 112,775 tonnes.

13.1 Geotechnical Analysis

A geotechnical analysis for the Project has not been conducted or reviewed by the author. The mine has historically operated without significant underground support. Several areas of the underground workings were inspected during the site visit, and it was observed that the rock mass is competent and self-supporting. No areas of concern were noted. It is recommended the services of rock engineering firms are engaged to provide expertise on stope layout and future potential rock mass stability concerns that may arise due to increased stress and/or depth.

13.2 Dewatering

Neither a water balance nor dewatering investigations were performed for this study. The water handing system currently in place relies on a chain of submersible dirty water pumps to evacuate the inflow from the mine. No significant water infiltration was noted at the underground mine site during the site visit. Seepage and dewatering are not expected to be of concern, and it is not anticipated that excessive dewatering costs will be incurred during the life of mine, but further studies are recommended to confirm this.

13.3 Mine Layout Parameters

Tetra Tech has conceptually planned stopes for two scenarios to determine potentially mineable Resources, targeting a mill feed of 325 tonnes per day. Scenario 1 includes Measured, Indicated, and Inferred Resources, and Scenario 2, excluding the Inferred material. Scenario 1 contains a potentially Minable Resource totaling 1.24 Mt tonnes for mining over 11 years, from and stope development. Scenario 2 contains a potentially Mineable Resource of 443 kt for mining for 4 years.

An underground site visit was conducted on December 10, 2019. The past extraction methods observed during the visit were Mechanized Cut and Fill stoping and Mechanized Resuing Cut and Fill stoping. These two techniques are considered for the conceptual plan and are suitable for the steeply dipping veins found at the Project.

Resue mining methods considered a minimum width of 0.7 meters, which was demonstrated in recent test mining at the site. Main access ramps will be 4 meters high by 4 meters wide. Cross Cuts and footwall development were considered in the plan. The loss of Resources available to mining through mining extraction losses has been considered. The considerations include stoping with both shrinkage and resue mining which require the leaving of rib, sill, and crown pillars. For the conceptual plan rib, sill, and crown pillars have been included as 3 m in width.

A mining loss of 5% has been included, which accounts for blasted material left in-situ in stopes, above pillars and in stope drifts after stope completion.

13.4 Other Mining Requirements

13.4.1 Ventilation

The current underground workings at the Project are naturally ventilated, with the main ramp used as an intake airway and the old Santa Juana mining areas and shafts for exhausting air. However, Golden Minerals is installing a booster fan which will force air from the San Mateo and Terneras areas, down the main adit, and out of the old Santa Juana mining areas.

Access to the old shafts within the Santa Juana Mine is still possible and provides access for inspections to ensure the old excavations remain open to provide exhaust.

Ventilation circuits are created in stoping areas through forced ventilation, via fans and ducting of various sizes. Stopes are set up to have a minimum of two entrances, which when connected provide for thorough ventilation.

No further evaluation on the ventilation has been performed, but it is expected the main booster fan, once installed, will be adequate for mine ventilation.

13.4.2 Access and Development

Existing underground development includes 10,122 meters of drift and ramp development and 2,278 meters of raise development. Development requirements to restart mining are minimal.

The main access ramps are 4 meters high by 4 meters wide. The ramps are driven at slopes no greater than 15%. The ramps are equipped with HDPE lines carrying compressed air, drill water, and mine water drainage. The Velardeña planned advance rate for ramps is 4.4 meters per day. Single boom hydraulic jumbos will be used to drill and 6 cubic yard capacity LHD units will be used to muck.

Cross cuts and footwall development are required to access each stope. Stope size will vary by vein width.

13.5 Mining Equipment and Personnel

Golden Minerals owns the equipment required for mining. The key pieces of equipment include scoop-trams, underground trucks and drilling jumbos. The current equipment fleet is expected to be adequate to achieve the targeted 373 tpd of mill feed for processing and, as such, no additional equipment is expected to be purchased. Golden Minerals also owns the jacklegs required for stoping and underground development (narrow drifts) and ventilation equipment in use underground. **Table 13-1** shows the required mine personnel. Shift personnel manpower is required to be 1.5 men on payroll per man on shift.

Table 13-1: Mine personnel requirements

Staff Title	Number
Mine operations	52
Maintenance	16
Stope miners	140
Development crew	18
Raise Crew	18
Loaders and haul trucks	24
Total	**268**

14. PROCESSING AND RECOVERY METHODS

There are two existing process plants, Plant 1 and Plant 2, at the Project. Plant 1 is designed to treat sulfide material to produce Pb, Zn and pyrite concentrates and is located near the village of Velardeña, approximately eight kilometers from the mining operations. Plant 1 has an operating capacity of 340 tpd with net capacity of 325 tpd at 95% operating time, equal to 112,775 tonnes per year (tpy) on a 347-day schedule. Plant 2 is an agitated leach plant for treating oxide Au-Ag mineralized material to produce Au-Ag doré. Plant 2 was purchased by William Resources in 1996. Operations were suspended at both plants in June 2013. In July 2014, Golden Minerals restarted mining operations to feed Plant 1, which started production on November 3, 2014. During the shutdown, Golden Minerals completed several capital projects at Plant 1 prior to restart including: overhauling the electrical system, installing new concentrate filters, and refurbishing the flotation cells. Operation of Plant 1 was discontinued in late 2015 due to a combination of low metal prices, dilution, and metallurgical challenges. Plant 2 was leased to Hecla Mining Company from July 2015 through November 2020. Mineralized material from the Golden Minerals Rodeo Project has been processed through Plant 2 since January 2021.

14.1 Plant 1

Plant 1 is designed to process sulfide material in a conventional flow sheet of crushing, grinding, and differential flotation to produce three separate concentrates: Pb-Ag, Zn, and pyrite.

Figure 14-1 shows the processing flow sheet for Plant 1, and **Figure 14-2** shows a layout of Plant 1 and the tailings dams. **Table 14-1** and **Table 14-2** list the major equipment and process materials in use at Plant 1. Reagents used in Plant 1 include lime, collectors, depressants, and frothers.

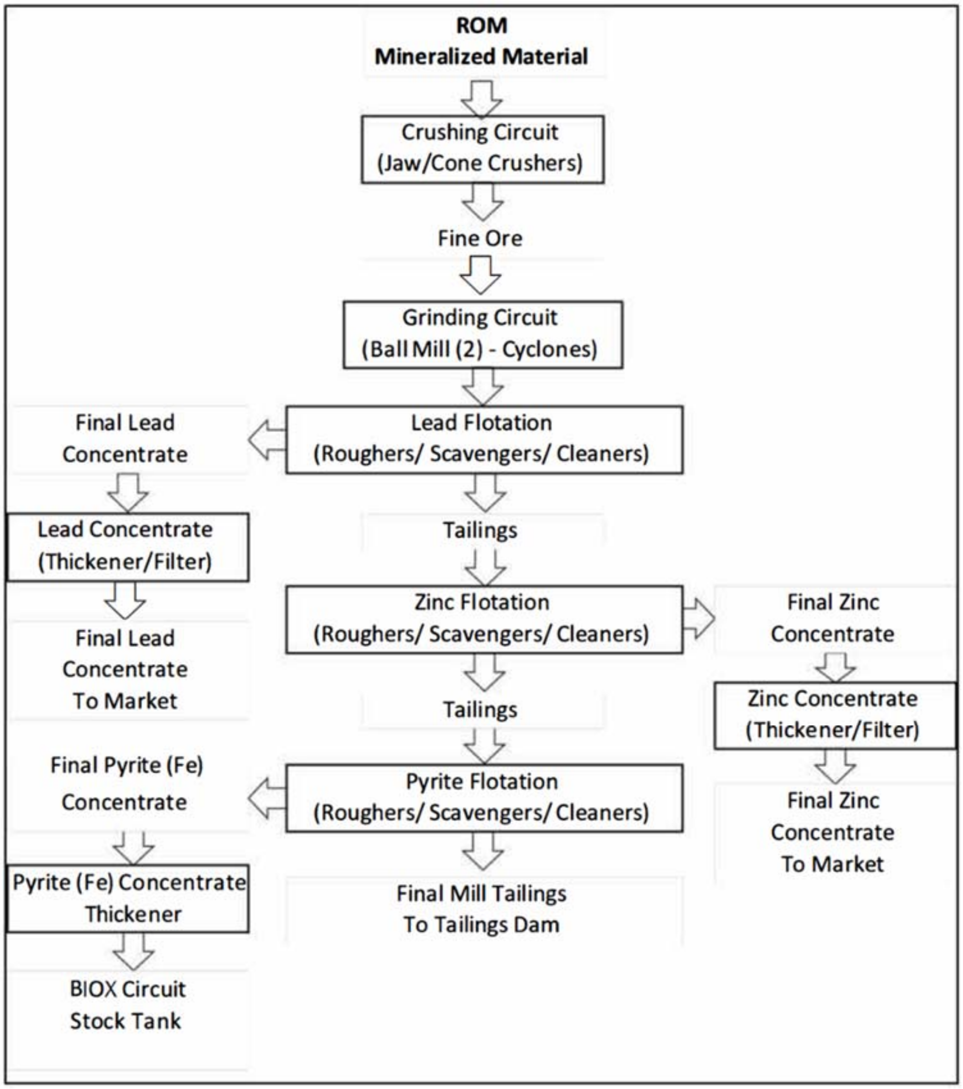

Figure 14-1: Process plant flow sheet for Plant 1

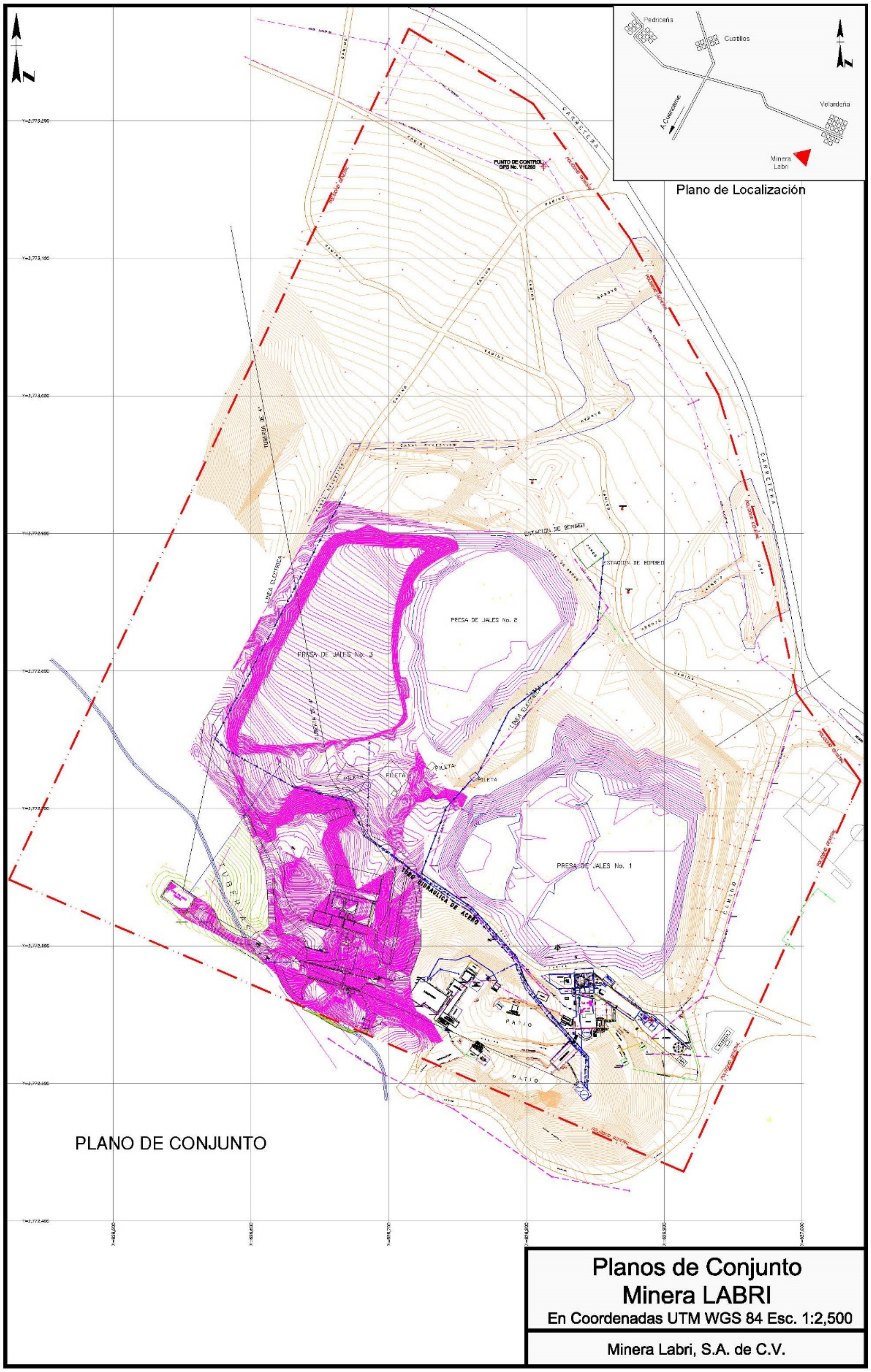

Figure 14-2: Site layout for Plant 1

Table 14-1: Major process plant equipment for Plant 1

Description	Quantity	Function
Coarse Ore Bin; 120 t Capacity	1	ROM Feed Ore Bin
Jaw Crusher; 10 in. by 30 in.; 100 HP	1	Primary Crusher
Cone Crusher; Sandvik Model H3800; 200 HP	1	Secondary Crusher
Vibrating Screen; FIMSA 4 ft by 6 ft; 10 HP	1	Size Classification
Fine Ore Bin; 350 t Capacity	1	Surge Capacity
Ball Mill #1; FIMSA; 7 ft by 10 ft; 200 HP	1	Ore Grinding
Ball Mill #2: MERCY; 5 ft by 8 ft; 125 HP	1	Ore Grinding
Cyclones; D6	3	Size Classification
Lead Conditioning Tank; 6 ft by 6 ft; 10 HP	1	Conditioning
Lead Rougher Flotation Cells; FIMSA; 100 cu ft; 60 HP	4	Lead Rougher Flotation
Lead Scavenger Flotation Cells; FIMSA; 100 cu ft; 20/30 HP	4	Lead Scavenger Flotation
Lead Cleaner Flotation Cells; FIMSA; 3 stages; 24 cu ft; 7.5/10 HP	6	Lead Cleaner Flotation
Lead Concentrate Thickener; 25 ft diameter; 2 HP	1	Thicken Final Lead Concentrate
Lead Concentrate Filter; SEW; 6 ft diameter; 3 Discs; 2 HP	1	Filter Lead Concentrate
Zinc Conditioning Tank; 6 ft by 6 ft; 10 HP	1	Conditioning
Zinc Rougher Flotation Cells; Denver; 100 cu ft; 15 HP	6	Zinc Rougher Flotation
Zinc Primary Scavenger Flotation Cells; Denver; 50 cu ft; 15 HP	6	Zinc Scavenger Flotation
Zinc Secondary Scavenger Flotation Cells; Denver; 50 cu ft; 15 HP	4	Zinc Scavenger Flotation
Zinc Cleaner Flotation Cells; Denver; 3 stages; 24 cu ft; 7.5 HP	6	Zinc Cleaner Flotation
Zinc Concentrate Thickener; 25 ft diameter; 2 HP	1	Thicken Final Zinc Concentrate
Zinc Concentrate Filter; Filter Press; 0.25 HP	1	Filter Zinc Concentrate
Pyrite Conditioning Tank; 6 ft by 6 ft; 10 HP	1	Conditioning
Pyrite Rougher Flotation Cells; MINPRO; 100 cu ft; 30 HP	4	Pyrite Rougher Flotation
Pyrite Scavenger Flotation Cells; Denver; 50 cu ft; 25/30 HP	5	Pyrite Scavenger Flotation
Pyrite Cleaner Flotation Cells; Denver; 2 stages; 25 cu ft; 7.5 HP	8	Pyrite Cleaner Flotation
Pyrite Concentrate Thickener; 25 ft diameter; 2 HP	1	Thicken Final Pyrite Concentrate
Pyrite Concentrate Filter; 0.25 HP	1	Filter Pyrite Concentrate

Table 14-2: Process materials for Plant 1

Process Materials	Consumption Rate (kg/t processed)
Grinding Balls - 2.5 in. diameter	0.83
Grinding Balls - 2 in. diameter	0.72
Grinding Balls - 1.5 in. diameter	0.17
Lime	1.16
Sodium Cyanide	0.07
Sulfate	0.88
Xanthate 350	0.8505
Aeropromoter 211	0.02
Aeropromoter 3416	0.0675
Aerofloat 31	0.054

Process Materials	Consumption Rate (kg/t processed)
Frother 1065	0.0945
Aerofloat 70	0.01
P404	0.03
P242	0.04
Copper Sulfate	0.92

Run of Mine (ROM) material is received from the underground mines by truck and unloaded onto a small area near the Plant 1 crushing circuit. The ROM material is reclaimed by a front-end loader and fed to a jaw crusher for primary crushing. The primary crushed material is sized by a vibrating screen operating in closed-circuit with a secondary cone crusher. The crushed fine material is conveyed to a 350-t fine ore bin ahead of the grinding circuit. The fine material is ground in two ball mills operating in parallel. The ball mill discharge is classified by cyclones, with the cyclone underflow (oversize material) returned to the ball mills and the cyclone overflow (product), at 80% minus 200 mesh, advances to a conditioning tank ahead of Pb flotation. After conditioning, the slurry is fed to the Pb flotation circuit comprised of rougher, scavenger, and three stages of cleaner cells. The Pb concentrate from the cleaner cells represents the final Pb concentrate, which is then thickened and filtered to a moisture content of 10-12%, by weight, for shipment. The final Pb concentrate has a low projected grade of 35-40% Pb, which is rich in Au and Ag byproducts. The Pb and Ag recoveries to the Pb concentrate are projected to be over 65% and about 70% respectively.

The tailings from the Pb flotation circuit are fed to a conditioning tank ahead of the Zn flotation circuit. The conditioned slurry is fed to the Zn flotation circuit comprised of rougher, scavenger, and three stages of cleaner cells. The Zn concentrate from the cleaner cells represents the final Zn concentrate, which is then thickened and filtered to a moisture of 10-12%, by weight, for shipment. The final Zn concentrate is projected to contain over 40% Zn. The Zn recovery to the Zn concentrate is projected to be over 70%. Both the Pb and Zn concentrates contain levels of As and Sb impurities.

Tailings from the Zn flotation circuit are fed to a conditioning tank ahead of the pyrite flotation circuit. The conditioned slurry advances to the pyrite flotation circuit comprised of roughers, scavengers, and two stages of cleaner cells. The concentrate from the cleaners represents the final pyrite concentrate, containing high Au and Ag values, and would be thickened for transport as a slurry to a BIOX® plant constructed near Plant 2 for oxidization, leaching, and recovery of the precious metals into doré.

The tailings from pyrite flotation represent the final flotation plant tailings that are pumped to Tailings Dam #3 located adjacent to Plant 2. Tailings Dam 3 has sufficient capacity to hold 3.9 years of tailings from Plant 1. Any additional capacity in Tailings Dam 3 would need to be permitted.

Plant 1 obtains power from the national Comisión Federal de Electricidad (CFE) power grid. The nominal electrical consumption for Plant 1 is approximately 33 kWh/t of material processed. Fresh water for Plant 1 is obtained from existing water wells located near Plant 1 and Plant 2 at an average consumption rate of 184 cubic meters per day. Historically, some fresh water has been trucked from Plant 2 to Plant 1 during periods of insufficient water flow. Golden Minerals plans to construct a 4-in diameter water line from Plant 2 to Plant 1, approximately five kilometers.

Nine personnel are required for day shift operations along with eight mechanics, and night shifts require seven operators.

14.2 Plant 2

Plant 2 is a conventional 550-tpd agitated cyanide leach facility that includes crushing and grinding circuits to process ROM mineralized material that would not be utilized for the treatment of pyrite concentrates from Plant 1. **Figure 14-3** shows the processing flow sheet for Plant 2. **Table 14-3** and **Table 14-4** list the major equipment and reagents at Plant 2. Plant 2 is located approximately four kilometers from Plant 1. Oxidized pyrite concentrate from a BIOX® plant constructed nearby would be slurried and fed to the eight-tank agitation unit. Slurry from the agitation tanks passes to a four-unit counter-current decantation circuit where the pregnant solution is recovered and passed to storage tanks before filtering and processing in the Merrill-Crowe circuit. The pregnant solution is filtered in horizontal pressurized disk filters using diatomaceous earth as the filtering medium. Zn dust is used to precipitate precious metals in the Merrill-Crowe circuit. Underflow of the counter-current decantation circuit is pumped to the plant's Tailings Storage Facility (TSF), which is a lined constructed impoundment. Solution is recovered from the TSF and pumped back to the plant for re-use. The precipitate from the Merrill-Crowe circuit is refined to bars of Au-Ag doré in an on-site refinery with a single 100-kg charge induction furnace. Reagents used in the Plant 2 leach and Merrill-Crowe circuits are cyanide, Zn dust, diatomaceous earth, flocculants, and lime.

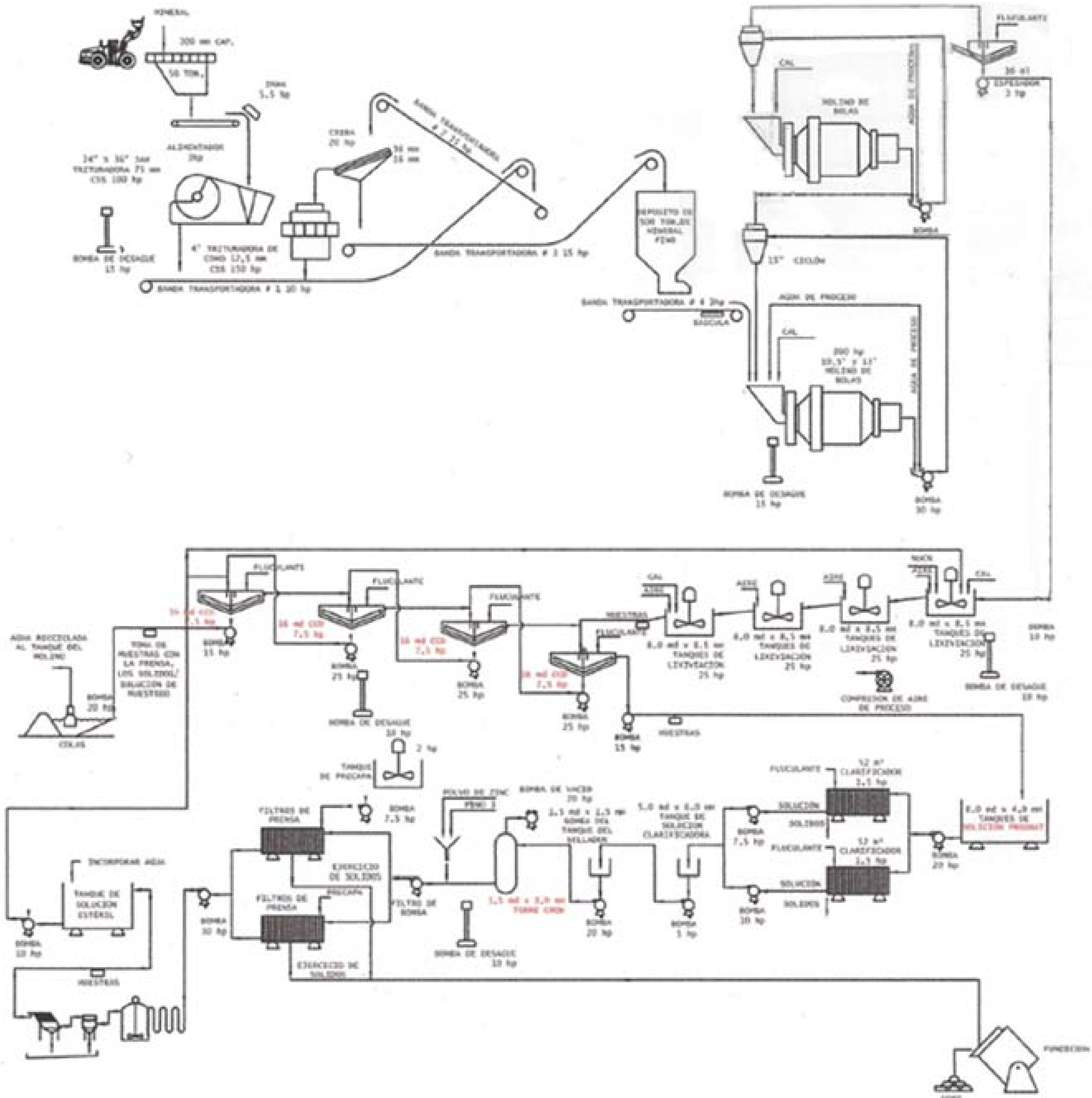

Figure 14-3: Process plant flow sheet for Plant 2

Table 14-3: Major Process plant equipment for Plant 2

Description	Number	Function
Coarse Ore Bin; 7 ft by 11 ft by 14 ft; 50 t Capacity	1	ROM Feed Ore Bin
Coarse Ore Apron Feeder; 4 ft by 17 ft; 3 HP	1	Feed Jaw Crusher
Jaw Crusher; 24 in. by 36 in.; Allis-Chalmers; 100 HP	1	Primary Crusher
Cone Crusher; 4 ft diameter Standard; Symons; 100 HP	1	Secondary Crusher
Vibrating Screen; Double-Deck; TYLER, 6 ft by 10 ft; 20 HP	1	Size Classification
Fine Ore Bin; 8 m by 9 m; 500 t Capacity	1	Surge Capacity
Ball Mill; Allis-Chalmers; 10.5 ft by 13 ft; 800 HP	1	Ore Grinding
Cyclones; Krebs D6	10	Size Classification
Ball Mill; 8 ft by 22 ft	1	Secondary Ore Grinding
Cyclones		Size Classification
Primary Thickener; 16 m diameter by 3 m high; 3 HP	1	Thicken Cyclone Overflow
Leach Tanks; Agitated; 8 m by 8.5 m; 25 HP	8	Cyanide leach Au and Ag
CCD Thickeners; 60 ft diameter; 5 HP	4	Solid-liquid separation; PLS
PLS Tank; 8 m diameter by 4 m high	1	PLS Surge Tank
Clarifiers; 52 sq. m; Diatomaceous Earth; 1.5 HP	2	Clarify PLS
Clarified PLS Tank; 5 m diameter by 6 m high	1	Clarified PLS Surge Tank
Zinc Filter Presses; 1.84 m diameter by 1.84 m high; 4.89 cu m	2	Filter Zinc Precipitate
Primary Flotation Cells; WEMCO; 75 cu m; 15 HP	3	Au-Ag rougher flotation
Cleaner Flotation Cells; First Stage; DENVER; 25 cu ft; 5 HP	2	First stage cleaners
Cleaner Flotation Cells; Second Stage; DENVER; 45 cu ft; 10 HP	4	Second stage cleaners
Conditioner; 1.7 m diameter by 2 m high; 25 HP	1	Conditioning
Concentrate Thickener; 6.84 m diameter by 2.45 m high; 3 HP	1	Thicken Final Concentrate
Concentrate Filter; Vacuum; Komline-Sanderson	1	Concentrate Filter
Smelting Furnace; INDUCTOTHERM, 650 kg charge; 150 KW	1	Precipitate Smelting
Filter Presses; DURCO/PERRIN/HYSTAR	3	Filter

Table 14-4: Process reagents for the leach circuit at Plant 2

Process Materials	Consumption Rate (kg/t processed)
Lime	4.4
Sodium Cyanide	7.5
Flocculant	0.05

The plant is currently processing material from Golden Minerals’ Rodeo mine. Water consumption at Plant 2 averaged 0.80 m^3/t from January through December 2021. Average power consumption at the plant was 831,000 kWh for the same period. The plant employs 98 workers.

14.3 Proposed BIOX® Plant

Plant 2 is a conventional 550-tpd agitated cyanide leach facility that includes crushing and grinding circuits to process ROM mineralized material that would not be utilized for the treatment of pyrite concentrates from Plant 1. **Figure 14-3** shows the processing flow sheet for Plant 2. **Table 14-3** and **Table 14-4** list the major equipment and reagents at Plant 2. Plant 2 is located approximately four kilometers from Plant 1. Oxidized pyrite concentrate from a BIOX® plant constructed nearby would be slurried and fed to the eight-tank agitation unit. Slurry from the agitation tanks passes to a four-unit counter-current decantation circuit where the pregnant solution is recovered and passed to storage tanks before filtering and processing in the Merrill-Crowe circuit. The pregnant solution is filtered in horizontal pressurized disk filters using diatomaceous earth as the filtering medium. Zn dust is used to precipitate precious metals in the Merrill-Crowe circuit. Underflow of the counter-current decantation circuit is pumped to the plant's Tailings Storage Facility (TSF), which is a lined constructed impoundment. Solution is recovered from the TSF and pumped back to the plant for re-use. The precipitate from the Merrill-Crowe circuit is refined to bars of Au-Ag doré in an on-site refinery with a single 100-kg charge induction furnace. Reagents used in the Plant 2 leach and Merrill-Crowe circuits are cyanide, Zn dust, diatomaceous earth, flocculants, and lime.

Table 14-5 is a list of the major equipment that will be required in the construction of the BIOX® plant.

Table 14-5: Major process plant equipment for BIOX® plant

Description	Number	Function
500 kW Prime Diesel Generators; 440/277 volt, 3-phase	3	Backup Power
CCD Thickeners; 20 ft diameter; 5 HP	1	Solid-liquid separation; Fe Con
BIOX® Tanks; 9 m diameter x 9 m high Standard; Agitator; 25 HP	3	Bio-oxidation
CCD Thickeners; 20 ft diameter; 5 HP	3	Solid-liquid separation; Slurry
CCD Thickener; 30 ft diameter; 5 HP	1	Solid-liquid separation; WRT
pH Adjustment tanks; 3 m Dia. X 3 m high; Agitator; 10 HP	2	Slurry pH Conditioning
Water Conditioning Tanks; 4 m Dia. X 5 m high; Agitator; 25 HP	6	Water Recovery Circuit (WRT)
High Volume Blowers;	3	Bio-oxidation Air
Evaporative Cooling Towers;	4	Bio-oxidation/Blower Cooling
BIOX® Transfer Tank; 6 m diameter x 6 m high Standard; Agitator; 15 HP	1	Temp. Storage Fe Con
BIOX® Transfer Tank; 2 m diameter x 2 m high Standard; Agitator; 5 HP	2	Temp. Storage Nutrients
BIOX® Transfer Tank; 1.5 m diameter x 1.5 m high Standard; Agitator; 5 HP	2	Temp. Storage Reagents
100-DMT Limestone/Lime Silos	3	Lime Slurry Circuit
Process Pumps; Various sizes	30	Slurry and Solution handling

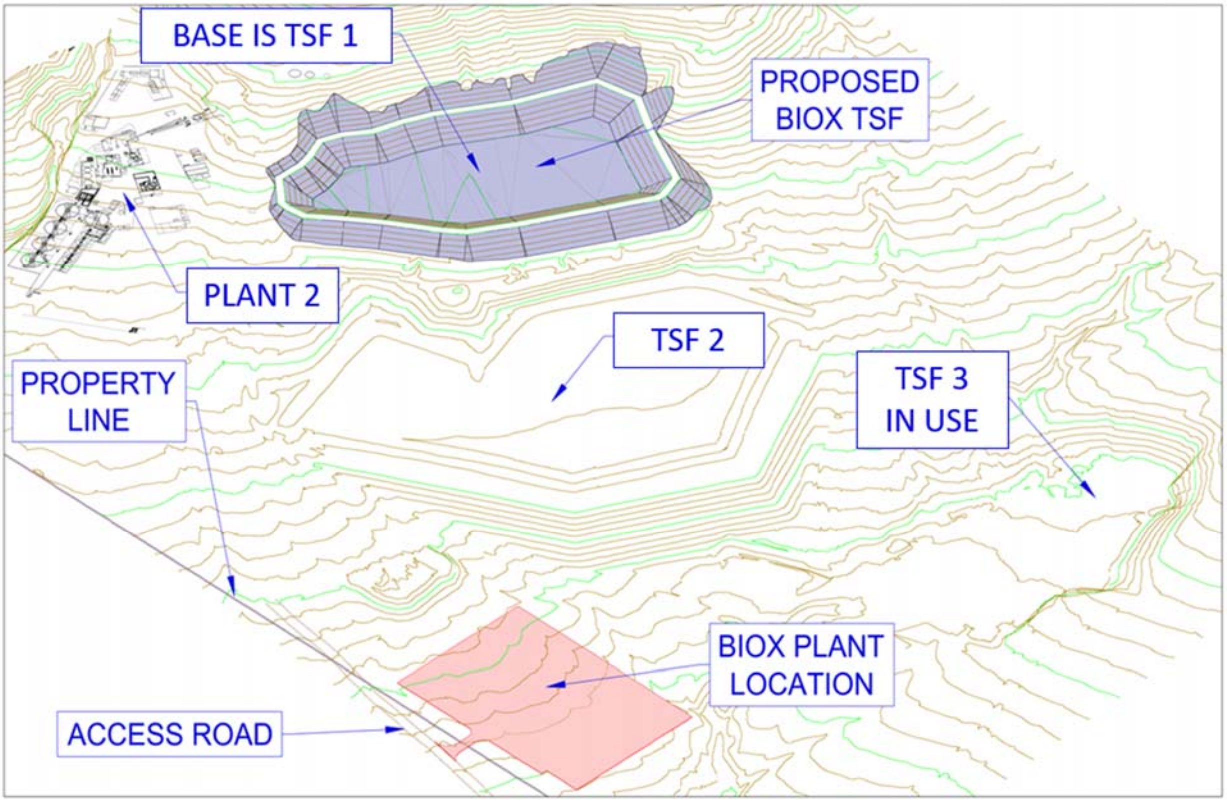

Figure 14-4: Proposed BIOX® Plant location, relative to Plant 2 and the required TSF

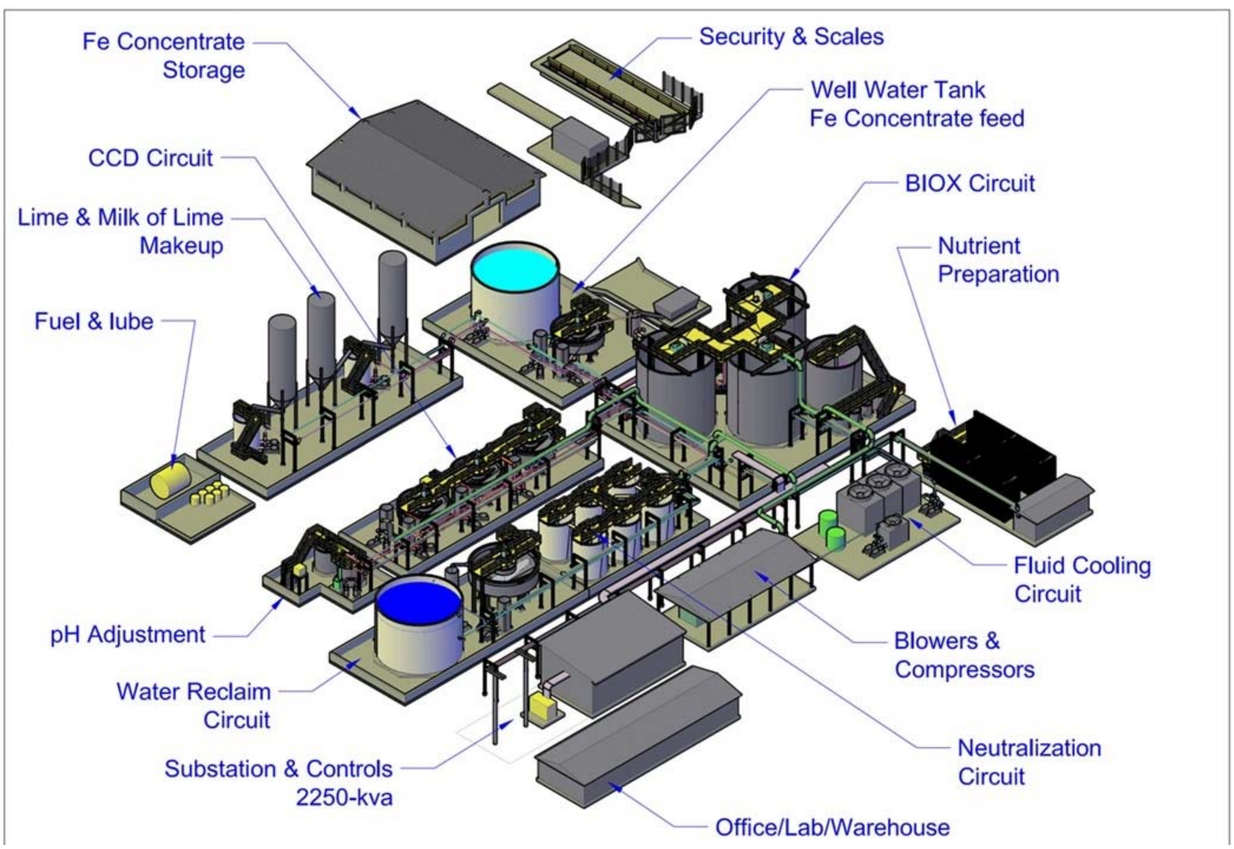

Figure 14-5: Conceptual BIOX® Plant proposed for Velardeña

15. INFRASTRUCTURE

Infrastructure for the project currently includes access roads, power, ancillary buildings, and water wells. No additional infrastructure is required for the site to resume production. **Figure 15-1** shows the site infrastructure.

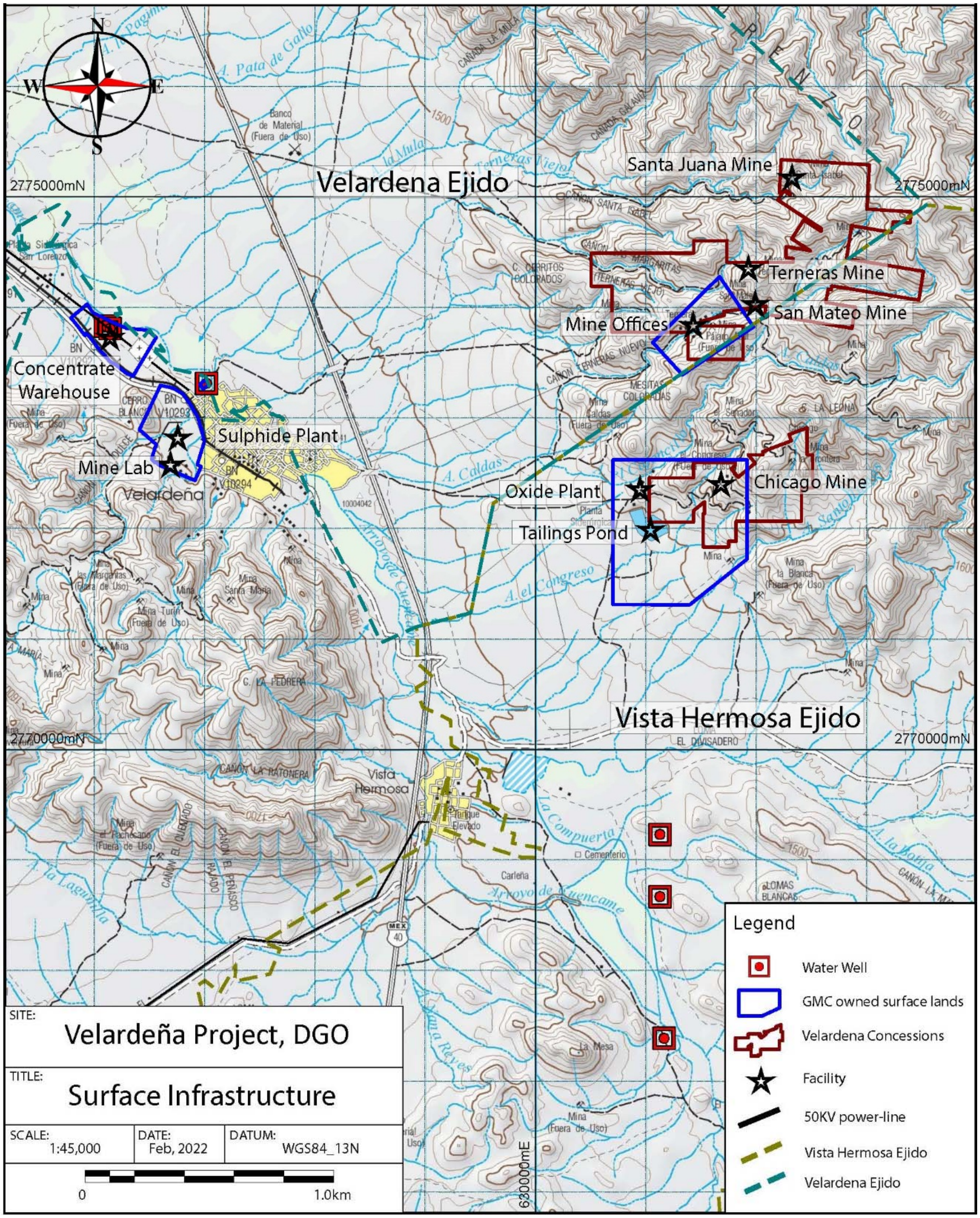

Figure 15-1: Surface infrastructure

15.1 Access Roads

The Project is located in the Mexican state of Durango, approximately 65 kilometers southwest of the city of Torreón and 150 kilometers northeast of the city of Durango. A major 4-lane highway, Highway 40, connects these cities. Plant 1 is located adjacent to the village of Velardeña, which is approximately 500 meters west of the highway. The Velardeña mines are located about eight kilometers from Plant 1 via a gravel road. Plant 2 is located approximately 3.5 kilometers from the Velardeña mine, also via gravel roads.

15.2 Waste Rock

Waste rock from the underground mine consists of tonnage from the ramp, lateral development, and stopes. Since the mining methods include cut and fill, the waste from the stopes would either be stored underground in mined out stopes, hauled to the surface, or transported to the mill with the diluted mined material. Currently limited cut and fill mining is undertaken and, as such, most of the waste rock is planned for surface storage.

The waste rock not stored underground will be deposited along the valley between the San Mateo adit and the Santa Juana adit.

15.3 Tailings

The dry tailings from Plant 1 are suitable for spreading on the fill of each cut to eliminate or reduce the dilution and losses associated with blasting and mucking process grade material on coarse placed fill. Tailings will be hauled from Plant 1 to the active mine and dumped at a central area. Trucks will then haul the tailings underground to a stope area where an LHD will spread the material on top of the recently placed coarse fill, a cover of approximately 15 centimeters. The planning and calculated production rates used in this estimate contain time for placing the tailings cover.

15.4 Power

The underground power is available from a primary substation located at the portal. The power taken into the mine is stepped down at the substation to 4,160 volts. The 4,160 is stepped down to a typical working voltage of 440 volts using mobile mine load centers or pad mount transformers set on concrete. The power is stepped down to 120/240 single phase in many locations at the load centers. The mine power system was modernized in 2011.

15.5 Water Wells

There are six existing water wells (three associated with Plant 1 and three associated with Plant 2) for extracting water from local aquifers. These wells are authorized, regulated, and permitted by CONAGUA, the Mexican *Comisión Nacional del Agua*.

16. MARKET STUDIES

Detailed market studies have not been performed for the Velardeña project. Markets for the Pb and Zn concentrates include metal brokers and direct sales to smelters. Doré produced at Plant 2 can be sold to downstream metal refiners. The concentrates and doré produced are typical within the Mexican mining industry and the concentrate and doré markets within Mexico and worldwide are liquid. For purposes of this study, it is assumed that Golden Minerals will be successful in securing buyers for its concentrates and doré.

The metal prices used for this study are an average of the long-term consensus pricing forecasts from 40 global banks. The prices used are US$23.70/troy ounce Ag, US$1,744/troy ounce Au, US$0.97/lb Pb, and US$1.15/lb Zn.

16.1 Doré

Golden Minerals currently has a contract to sell doré produced from processing material from the Rodeo mine at Plant 2 to a refinery based in the USA. It is expected the doré resulting from processing material from Velardeña will be of similar quality, and Golden Minerals expects it will be able to secure a similar contract. For the purposes of this TRS, the bars produced are expected to contain approximately 85-90% silver and 4-6% gold. It is assumed the Velardeña Operations will be paid for 97% of the contained gold and silver in the doré, with a treatment charge of $5 per kilogram of doré and a refining charge of $6 per ounce of gold and $0.60 per ounce of silver. Marketing studies with potential buyers of doré have not been completed and therefore have not been reviewed by the author of this section.

16.2 Concentrates

The lead and zinc concentrates are expected to be sold to various customers under annual contracts which are generally re-negotiated each calendar year. Marketing studies with potential buyers for lead and zinc concentrates have not been completed, however the quality of the concentrates is expected to be typical of those produced in Mexico and it is expected Golden Minerals will be able to secure a buyer for these products.

16.2.1 Lead Concentrates

The lead concentrates have typical assays as follows: 35-40% lead, 8,000-10,000 g/t silver, and 40-50 g/t gold. After metal deductions, the company is generally paid for 90-95% of the contained lead, silver, and gold. Concentrate treatment charges are negotiated annually and generally reflect market terms for the industry for similar products. For the purposes of this TRS, it is assumed the lead concentrates will be subject to a treatment charge of $200/t, an Au refining charge of $15.00/oz-payable, and an Ag refining charge of $0.95/oz-payable.

16.2.2 Zinc Concentrates

The zinc concentrates have typical assays as follows: 40-45% zinc, 90-100 g/t silver, and 5-6 g/t gold. After metal deductions, the Company is generally paid for approximately 85% of contained zinc and 60-70% of silver with lesser amounts payable for the contained gold. Concentrate treatment charges are negotiated annually and generally reflect market terms for the industry for similar products. For the purposes of this TRS, it is assumed the zinc concentrates will be subject to a treatment charge of $300/t, with no additional refining charges.

17. ENVIRONMENTAL STUDIES, PERMITTING, AND PLANS, NEGOTIATIONS, OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

17.1 Environmental Baseline Studies

A variety of studies have been completed to characterize the natural environment of the Project area. The most recent Environmental Impact Statement for the Project was completed in April 2013.

According to INEGI-INE classification, the type of vegetation in the Project area corresponds to Desert Shrubland (rosette-forming vegetation) and sub-montane scrub, however; there is no demarcation that determines the separation between the ecosystems, so it is possible to find species from both. The vegetation in the vicinity of the Project is diverse and abundant but has been deteriorated in areas with significant traffic. The arid ecosystem provides for a predominately shrub vegetation cover which contributes to soil stability. An indication of the stability maintained in this environment is shown by the abundance of various cacti species. Of the 24 species of flora recorded for the Project area, only one species is reported within a risk category: Mammillaria candida (snowball cactus), which falls under the category of endangered according to SEMARNAT.

Mammal species identified in the Project area include two species considered threatened, *Vulpes macortis*, (kit fox) and *Peromyscus boylii* (brush mouse); and one species considered endangered, *Erethizon dorsatum* (North American porcupine). Of the bird species identified at the Project, four are under special protection (red-tailed hawk, peregrine falcon, pine siskin, and Townsend's solitaire); one is considered endangered (*Falco mexicanus* or prairie falcon); and one is considered threatened (black-capped vireo). Of the amphibian and reptile fauna in the Project area, two are considered threatened (black racer and coachwhip snake) and two are identified under special protection (New Mexico whiptail and rock rattlesnake).

17.2 Requirements and Plans for Waste and Tailings Disposal

As part of the Environmental Impact Statement for the Project and in compliance with environmental regulations, Minera William has established an Environmental Monitoring Program that identifies potential impacts during each of the phases of the project along with actions to prevent, mitigate, and compensate the effects. The program requires internal control and periodic reporting to verify compliance with the program. Golden Minerals has retained an independent consultant to evaluate compliance with current environmental reporting and requirements.

The waste rock not stored underground will be contained along the valley between the San Mateo adit and the Santa Juana adit.

The dry tailings from Plant 1 are suitable for spreading on the fill of each cut to eliminate or reduce the dilution and losses associated with blasting and mucking process grade material on coarse placed fill.

17.3 Permitting Requirements and Status

Permitting requirements and status are shown in **Table 17-1** below. There is no reclamation bond required for this operation.

Table 17-1: Permitting requirements

Authorization, Procedure, or Project	Number	Authorization Date	Comment
Plant 1 Permitting			
Environmental Risk Study	NA	Aug. 27, 2008	Valid
Accident Prevention Program	DGGIMAR.710/004071	May 21, 2021	Valid
Single Environmental License (LAU)	SG/130.2.1/001312	Jul 4, 2008	Valid
Special Conditions for Ducts and Chimneys	DGGCARETC/0418/2011	Aug 19, 2011	Valid as long as the conditions of the equipment do not change
La Discordia Well	B00-L-0459-21-09-15	Dec 4, 2015	Valid through December 5, 2025
El Rancho Well	B00.909.01.02/1508	Jul 7, 2018	Valid through July 8, 2028
La Noria Well	BOO.E.231.1/0478 002927	Sep 29, 2014	Valid
Plant 2 and Velardeña Mine Sites Permitting			
Environmental Impact Study for the Production and Operation of the Velardeña Mines	SG/130.2.1.1/002387/13	Aug 29, 2013	Valid
Environmental Impact Study for Plant 2 and Tailings Dam IV	SG/130.2.1.1/001783/12	Jul 16, 2012	Valid for operations through June 2025 and for closure to June 2028
Environmental Risk Assessment – Plant 2	NA	Oct 30, 2015	Valid but must be modified if the hazardous substances or quantities to be used at the plant change
Accident Prevention Program	DGGIMAR.710/006062	Jul 27, 2016	Valid but must be modified if the hazardous substances or quantities to be used at the plant change
Single Environmental License	SG/130.2.1/002086	Nov 3, 2009	Valid
Single Environmental License Update	SG/130.2.1/001398/17	May 24, 2017	Valid
Special Conditions for Ducts and Chimneys	DGGCARETC/774/2017	Dec 19, 2017	Valid
Mine Waste Management Plan	DGGIMAR.710/0006148	Jul 31, 2018	Valid through July 31, 2048
Hazardous Waste Management Plan	DGGIMAR.710/0004490	Jun 13, 2018	Valid
Water Well #1	B00.E.23.1.1/0481002930	Sep 17, 2014	Valid
Water Well #2	B00.E.23.1.1/0479002928	Sep 17, 2014	Valid
Water Well #2	B00.3.23.1.1/0480002929	Sep 17, 2014	Valid
Environmental Impact Statement for Tailings Dam III	SG/130.2.1.1/002292/11	Dec 7, 2011	Valid for operations through July 2031 and for closure to July 2033
Preventive Report of the Tailings Dam Expansion Phase 2A and 3A	SG/130.2.1.1/2126/16	Nov 28, 2016	Valid through September 2024, including closure stage
Technical Justification Study for Change of Land Use for Tailings Dam III Phase 2A and 3A	SG/130.2.2/000098/16	Jan 12, 2017	Currently valid; a request was submitted to SEMARNAT for a 2-year extension at time of authorization

Authorization, Procedure, or Project	Number	Authorization Date	Comment
Extension Authorization	SG/130.2.2/0053/2020	Jan 13, 2020	Valid
Explosives Permit	4596-Dgo	Oct 15, 2021	Valid; renewable each year

17.4 Plans, Negotiations, or Agreements with Local Individuals or Groups

Surface rights to some of the Project's concession areas are held by local ejidos (rural co-operative communities).

Ejido Velardeña holds surface rights at the Project's Velardeña property. Golden Minerals reports that it has an agreement with the ejido for surface access and to perform work related to exploration and mining on the property. As part of this agreement, Golden Minerals makes quarterly payments of $2,000 to the ejido. The agreement was formalized before a notary as required by law and, although the formal agreement expired in December 2021, Golden Minerals remains in good standing with the community and is finalizing renegotiation of the agreement.

Ejido Vista Hermosa holds surface rights for the Project's Chicago property. Golden Minerals reports that it has an agreement with the ejido allowing access to the property to perform work related to mineral exploration and mining. The agreement was formalized before a notary and is valid until 2038. As part of the agreement, Golden Minerals makes a payment of $400,000 MXN plus applicable taxes by the 24th of March each year.

17.5 Mine Closure Plans and Costs

Golden Minerals has developed closure plans for the mines and processing plants presented in this TRS in conjunction with an independent consulting firm.

Closure and reclamation costs for the Plant 1 area are estimated to total $1.5M, and the estimated closure costs for Plant 2 are estimated to total $2.4M.

17.6 Qualified Person's Opinion on Adequacy of Current Plans

The information provided by Golden Minerals contains legal documentation related to environmental compliance, and SEMARNAT, the governmental office in charge of the environmental aspects. Golden Minerals also has provided documents that support operations from the permitting side, which are official files for mine operations, haulage, waste, and water aspects. There are also documents related to agreements with the communities for other related activities that are described next. The data provided is in good standing to the knowledge and understanding of the QPs of this report

18. CAPITAL AND OPERATING COSTS

Two capital and operating cost estimates were generated for the Project to support two economic analysis cases. One case considers Measured, Indicated, and Inferred (MII) Mineral Resources and the other considers only Measured and Indicated Mineral (MI) Resources. Capital and operating costs are based on Golden Minerals internal forecasts, which Tetra Tech has reviewed and found to be consistent with a mine of this type. Both capital and operating costs have a 10% contingency applied. Tetra Tech considers these cost estimates to be within 50%.

18.1 Capital Costs

Capital costs for the two cases are summarized in **Table 18-1** and **Table 18-2**. The capital cost estimate for the plan including Inferred Mineral Resources contains a tailings expansion provision of $0.3M that is not required for the plan based on Measured and Indicated Resources only.

Table 18-1: Capital cost estimates - MII plan

Item	Total $000s
Mine Development	$788
Process Plant	$17,248
Contingency and Other	$3,130
Total Capital	**$21,166**

Table 18-2: Capital cost estimates - MI plan

Item	Total $000s
Mine Development	$788
Process Plant	$15,384
Contingency and Other	$2,174
Total Capital	**$18,345**

18.2 Operating Costs

Operating costs for the two cases are summarized in **Table 18-3** and **Table 18-4**.

Table 18-3: Operating cost estimates - MII plan

Item	Total ($000s)	Unit Cost ($/t-milled)
Mining Costs - Stoping	$131,261	$106.09
Mining Costs - Development	$33,653	$27.20
Milling costs	$105,234	$85.05
Mine & Process	**$270,148**	**$218.34**
Contingency and Other	$27,015	$21.83
Precious Metal Royalty	$2,532	$2.05
Total Operating	**$299,695**	**$242.23**

Table 18-4: Operating cost estimates - MI plan

Item	Total ($000s)	Unit Cost ($/t-milled)
Mining Costs - Stoping	$47,214	$106.64
Mining Costs - Development	$12,043	$27.20
Milling costs	$36,453	$82.33
Mine & Process	**$95,710**	**$216.17**
Contingency and Other	$9,571	$21.62
Precious Metal Royalty	$935	$2.11
Total Operating	**$106,216**	**$239.90**

19. ECONOMIC ANALYSIS

Two economic models were prepared for the Project: one includes Inferred Mineral Resources (MII Plan) in the analysis, and the second excludes the Inferred material (MI Plan). The economic model results are based on Mineral Resources that, by definition, are not Mineral Reserves, and do not have demonstrated economic viability. The economic assumptions shared between both models are summarized in **Table 19-1**. For both economic analyses, reclamation costs are assumed to be canceled by salvage value and are therefore not included. Economic results are reported pre-tax.

Table 19-1: Economic model input parameters

Description	Value	Units
Market Prices:		
Gold (Au)	$1,744.00	/oz
Silver (Ag)	$23.70	/oz
Lead (Pb)	$0.97	/lb
Zinc (Zn)	$1.15	/lb
Taxes:		
Federal Precious Metal Royalty	0.50	%
Financial:		
Discount Rate	8	%

19.1 Economic Model Results – MII Plan

Economic model results for the mine plan including Measured, Indicated, and Inferred Mineral Resources are summarized in **Table 19-2**. The life of mine is 11 years, with a pre-tax NPV of $119M.

Table 19-2: Economic model results - MII

Item	Total ($000s)	Pb Concentrate	Zn Concentrate	Doré
Gross Payable	**$556,905**	$311,680	$59,772	$185,453
TCs, RCs, and penalties	**($35,939)**	($19,791)	($14,663)	($1,485)
Freight & Insurance	**($14,512)**	($5,885)	($5,195)	($3,432)
NSR	**$506,454**	**$286,004**	**$39,914**	**$180,536**
Operating Costs				
Mining Costs - Stoping	**($131,261)**			
Mining Costs - Development	**($33,653)**			
Milling costs	**($105,234)**			
Contingency and Other	**($27,015)**			
Federal Mining Royalty	**($2,532)**			
	($299,695)			
$/t-milled	**($242.23)**			
Operating Margin	**$206,759**			
Capital Costs	**Full LOM**	**Pre-Production**	**LOM**	
Pre-Production Development	**($788)**	($788)	$0	
Process Plant	**($17,248)**	($14,498)	($2,750)	
Contingency and Other	**($3,130)**	($1,755)	($1,375)	
Cash Flow	**$185,594**			
Pre-Tax $NPV_{8\%}$	**$118,933**			
IRR	**114%**			
Payback (years)	**1**			

Annual cash flow for the Project is summarized in **Table 19-3**.

Table 19-3: LOM cash flow - MII plan

Item	Total	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
NSR													
Gross Payable	$556,905		$50,312	$52,463	$55,817	$62,526	$52,967	$52,776	$48,695	$43,629	$49,314	$42,240	$46,166
TCs, RCs, Freight	($50,451)		($6,831)	($4,464)	($6,776)	($5,338)	($4,933)	($4,674)	($4,167)	($3,456)	($3,213)	($3,375)	($3,225)
NSR	**$506,454**		**$43,481**	**$47,998**	**$49,041**	**$57,188**	**$48,035**	**$48,102**	**$44,528**	**$40,173**	**$46,101**	**$38,865**	**$42,941**
Operating Costs													
Mining Costs - Stoping	($131,261)		($11,965)	($11,965)	($11,965)	($11,965)	($11,965)	($11,965)	($11,965)	($11,965)	($11,965)	($11,965)	($11,615)
Mining Costs - Development	($33,653)		($3,067)	($3,067)	($3,067)	($3,067)	($3,067)	($3,067)	($3,067)	($3,067)	($3,067)	($3,067)	($2,979)
Milling Costs	($105,234)		($8,140)	($9,388)	($8,711)	($11,021)	($9,067)	($9,471)	($9,329)	($10,080)	($10,275)	($10,059)	($9,693)
Contingency and Other	($27,015)		($2,317)	($2,442)	($2,374)	($2,605)	($2,410)	($2,450)	($2,436)	($2,511)	($2,531)	($2,509)	($2,429)
Precious Metal Royalty	($2,532)		($217)	($240)	($245)	($286)	($240)	($241)	($223)	($201)	($231)	($194)	($215)
Operating Costs	**($299,695)**		**($25,706)**	**($27,102)**	**($26,363)**	**($28,944)**	**($26,749)**	**($27,194)**	**($27,020)**	**($27,825)**	**($28,068)**	**($27,795)**	**($26,930)**
Operating Margin	**$206,759**		**$17,775**	**$20,897**	**$22,679**	**$28,244**	**$21,286**	**$20,908**	**$17,508**	**$12,349**	**$18,033**	**$11,070**	**$16,011**
Capital Costs													
Pre-production Development	**($788)**	($788)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Process Plant	**($17,248)**	($14,498)	($226)	($226)	($226)	($501)	($226)	($226)	($226)	($226)	($226)	($226)	($219)
Contingency and Other	**($3,130)**	($1,755)	($133)	($133)	($133)	($160)	($133)	($133)	($133)	($133)	($133)	($133)	($22)
Pre-Tax Cash Flow	**$185,594**	**($17,041)**	**$17,417**	**$20,539**	**$22,321**	**$27,583**	**$20,928**	**$20,550**	**$17,150**	**$11,991**	**$17,675**	**$10,712**	**$15,770**
Pre-Tax $NPV_{8\%}$	**$118,933**												
IRR	**114%**												
Payback (years)	**1**												

Sensitivity analyses were performed on gold price, capital costs, and operating costs, and are shown in **Figure 19-1**.

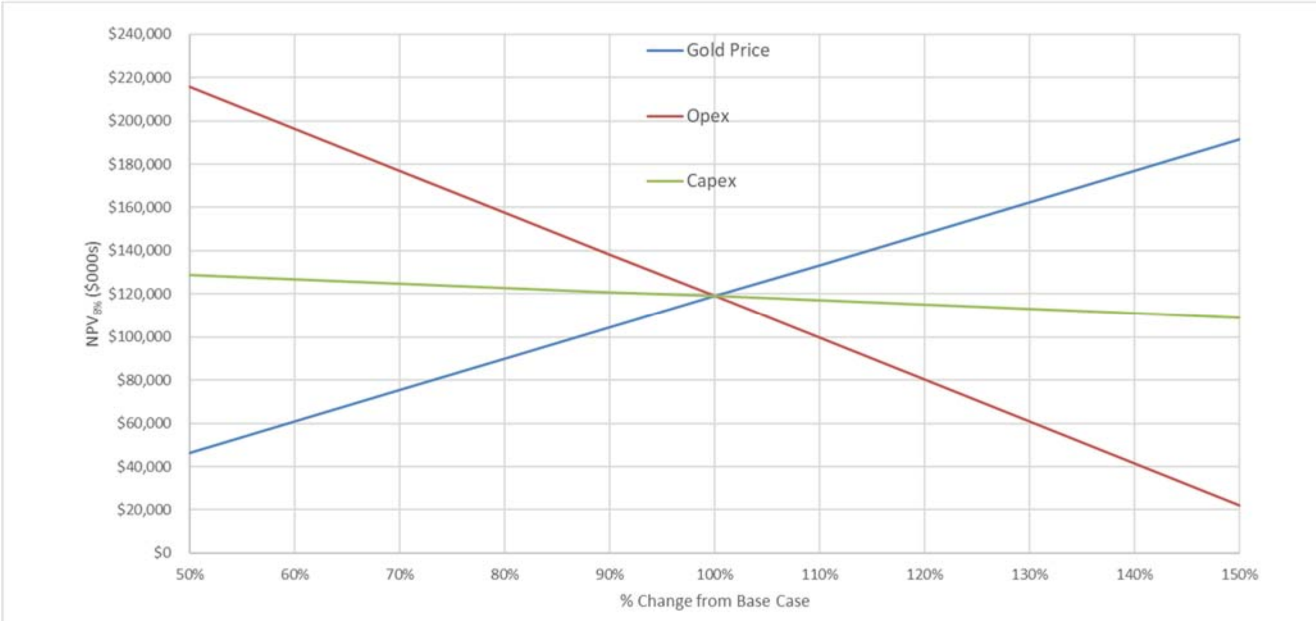

Figure 19-1: Sensitivity study results-MII plan

Results of the sensitivity analyses show the project is most sensitive to operating costs and gold price. A 10% increase in operating costs results in a 16% reduction in project NPV. Due to the sensitivity to operating costs, efforts to control or reduce the operating costs are material to the economic success of the Project.

19.2 Economic Model Results – MI Plan

Economic model results for the mine plan including Measured and Indicated Mineral Resources are summarized in **Table 19-4**. The life of mine is four years, with a pre-tax NPV of $48.3M.

Table 19-4: Economic model results - MI

Item	Total ($000s)	Pb Concentrate	Zn Concentrate	Doré
Gross Payable	**$208,950**	$120,237	$23,997	$64,715
TCs, RCs and penalties	**($15,795)**	($8,773)	($6,522)	($500)
Freight & Insurance	**($6,205)**	($2,722)	($2,298)	($1,185)
NSR	**$186,951**	**$108,742**	**$15,178**	**$63,031**
Operating Costs				
Mining Costs - Stoping	**($47,214)**			
Mining Costs - Development	**($12,043)**			
Milling costs	**($36,453)**			
Contingency and Other	**($9,571)**			
Federal Mining Royalty	**($935)**			
Total	**($106,216)**			
$/t-milled	**($239.90)**			
Operating Margin	**$80,735**			
Capital Costs	**Full LOM**	**Preproduction**	**LOM**	
Mine Development	**($788)**	($788)	$0	
Process Plant	**($15,384)**	($14,498)	($886)	
Other Non-Operating Costs	**($2,174)**	($1,755)	($419)	
Cash Flow	**$62,390**			
Pre-Tax $NPV_{8\%}$	**$48,265**			
IRR	**101%**			
Payback (years)	**1**			

Annual cash flow for the Measured and Indicated plan is summarized in **Table 19-5**.

Table 19-5: LOM cash flow - MI plan

Item	Total	Year -1	Year 1	Year 2	Year 3	Year 4
NSR						
Gross Payable	$208,950		$48,628	$52,041	$59,151	$49,131
TCs, RCs, Freight	($22,000)		($5,838)	($6,004)	($5,396)	($4,761)
NSR	**$186,951**		**$42,790**	**$46,037**	**$53,754**	**$44,369**
Operating Costs						
Mining Costs - Stoping	($47,214)		($11,965)	($11,965)	($11,965)	($11,320)
Mining Costs - Development	($12,043)		($3,067)	($3,067)	($3,067)	($2,840)
Milling costs	($36,453)		($8,609)	($8,933)	($10,186)	($8,725)
Contingency and Other	($9,571)		($2,364)	($2,397)	($2,522)	($2,289)
Precious Metal Royalty	($935)		($214)	($230)	($269)	($222)
Total	**($106,216)**		**($26,220)**	**($26,592)**	**($28,009)**	**($25,396)**
Operating Margin	**$80,735**		**$16,571**	**$19,445**	**$25,746**	**$18,974**
Capital Costs						
Pre-Production Development	**($788)**	($788)	$0	$0	$0	$0
Process Plant	**($15,384)**	($14,498)	($226)	($226)	($226)	($209)
Contingency and Other	**($2,174)**	($1,755)	($133)	($133)	($133)	($21)
Pre-Tax Cash Flow	**$62,390**	**($17,041)**	**$16,213**	**$19,087**	**$25,387**	**$18,744**
Pre-Tax $NPV_{8\%}$	**$48,265**					
IRR	**101%**					
Payback (years)	**1**					

Sensitivity analyses were performed on gold price, capital costs, and operating costs, and are shown in **Figure 19-2**.

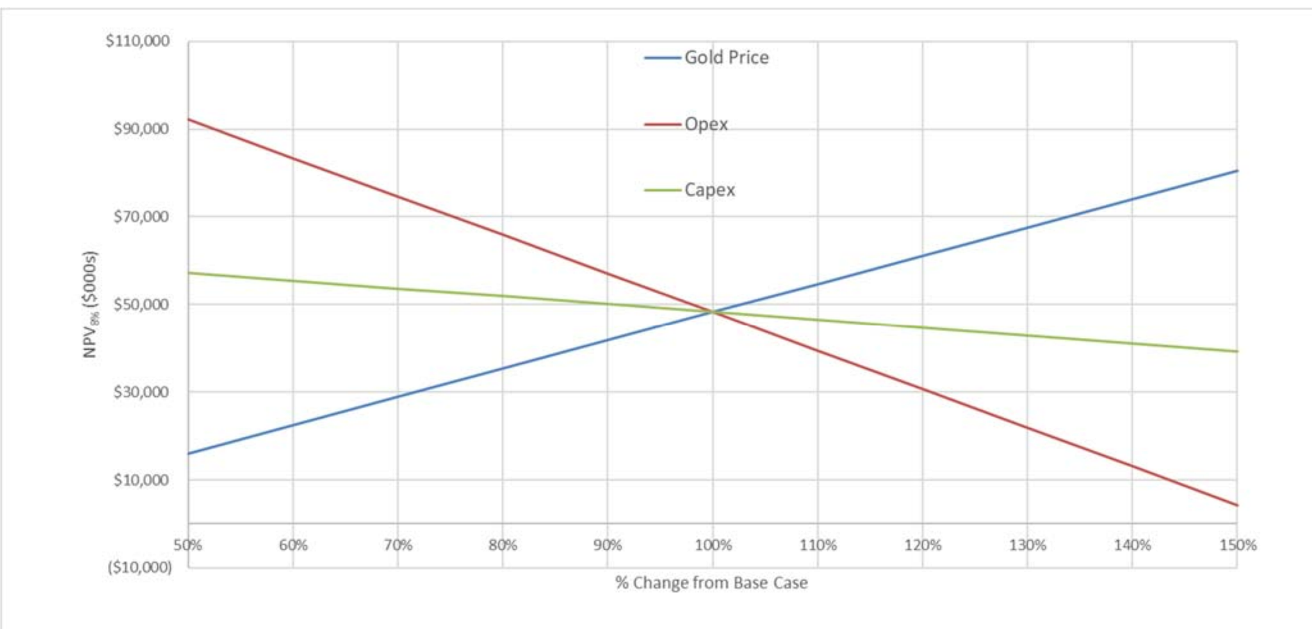

Figure 19-2: Sensitivity results - MI plan

Results of the sensitivity analyses show the project is most sensitive to operating costs and gold price. A 10% increase in operating costs results in a 18% reduction in project NPV. Due to the sensitivity to operating costs, efforts to control or reduce the operating costs are material to the economic success of the Project.

20. ADJACENT PROPERTIES

The Project is surrounded by claims held by various entities, with the most significant holdings controlled by Industrias Peñoles, S.A.B. de C.V. (Peñoles) and Grupo México S.A.B. de C.V. (Grupo Mexico). Publicly available data regarding exploration results, Mineral Resources, and Mineral Reserves for adjacent properties were not located.

The Velardeña property is located within a broader district of the same name, which is host to a number of significant, past-producing Ag-Au-Pb-Zn mines. The most important of these cluster within the Santa Maria Dome, west of the pueblo of Velardeña, and include the Santa Maria, Industria, San Nicholas, and Los Azules mines.

21. OTHER RELEVANT DATA AND INFORMATION

Relevant data pertaining to the Project is detailed in the other sections of this TRS and the authors do not consider any additional information necessary to provide a balanced and complete description of the Project.

22. INTERPRETATIONS AND CONCLUSIONS

22.1 Geology & Resources

Drill hole and channel samples have been collected and analyzed using industry standard methods and practices and are sufficient to support the characterization of grade and thickness and further support the estimation of Measured, Indicated, and Inferred Resources.

22.2 Mining

Results indicate mining is potentially economically viable with and without the Inferred Resources. The Inferred material accounts for approximately 57% of the total Resource, and, due to the nature of the mineralization and the scale of the operations, extensive Resource drilling of the deposit is not planned. For this reason, detailed mine plans and schedules are not expected to be produced for the deposit. The consequence of this is that residual risk remains for mining of the project and planning of grades and stope tonnages can only be completed on a short-term basis.

The success of the proposed plan is sensitive to mining dilution, which could increase the costs of saleable products, but also provides opportunity as any potential reductions in dilution from the mining would greatly benefit the project. Recent test mining at the site has confirmed a minimum selective mining width of 0.7 m is achievable, which can contribute to reducing dilution.

22.3 Metallurgy & Process

There are no geological, lithological, or mineralogical changes in the process plant feed anticipated for the envisaged potential future production as compared to previous operations. Existing legacy operational data and current processing of mineralized material from the Rodeo mine supports the process flow sheet for future production.

The use of existing and refurbished equipment within the pre-existing facilities, and the production of marketable concentrates, is Golden Minerals' preferred method of treating potential future production.

22.4 Economic Analysis

Based on the two separate economic analyses, including and excluding the Inferred Resources, the findings of this study suggest the Project is conceptually economically viable. The study has been based on Mineral Resources, which by definition are not Mineral Reserves and have not demonstrated economic viability.

22.5 Significant Risk Factors

Factors that could affect the potential economic viability of the project could include underestimations of operating capital and declines in any or all the metal prices. Estimation of Resources could be affected by changes in metal prices and the actual mineralized shoot shapes and orientations. Successful implementation of the proposed mine plan is subject to the successful conversion of Inferred Resources to Indicated or Measured classification as well as conversion of Measured and Indicated Mineral Resources to Mineral Reserves, the prediction of stope layout and shape which is controlled by the actual shape of mineralized shoots and their orientations, and the ability of the mining operations to control waste dilution.

The performance of the BIOX® plant is key to the economics estimated in this study. If the expected results are not achieved, the BIOX® process would compromise an important part of the entire process.

23. RECOMMENDATIONS

The following recommendations are made to refine the current operation but are not integral to the implementation of the plan proposed in the study. **Table 23-1** outlines estimated significant costs if the following recommendations were completed.

Table 23-1: Estimated costs associated with recommendations

Description	$USD
Exploration Drilling ($100/m)[1]	500,000
Mining Trade-off Studies	35,000
Metallurgical Test work	100,000
Total	**635,000**

Note
[1] Assuming 5,000 m drill program.

23.1 Geology & Resources

- Continue to collect specific gravity measurements and refine current estimations of specific gravity. Additional measurement should ideally be made with a paraffin wax or epoxy coating
- Implement procedures of duplicate channel sampling by secondary sampling teams of drifts prior to stope development to ensure grade and thickness characteristics and to serve as field duplication of channel samples
- Setup of strict control sample review procedures and tolerances involving review of control sample failure on receipt of each batch's results, and automatic triggering of batch reanalysis immediately after being alerted to failures
- Improve sample data transcription methods to reduce control sample labeling errors and immediately resolve errors when encountered
- Perform a detailed model reconciliation on a completed stope early in the proposed mine life and alter the estimation methods if the results of the reconciliation suggest refinements should be made
- Continue to advance exploration drilling down dip of current Inferred Resources as new levels are established. Preferentially target the Terneras, San Mateo, Roca Negra and A4 veins
- The costs for additional drilling have not been included in the TRS analysis but any further Resource expansion would be dependent on additional drilling

23.2 Mining

It is recommended that Golden Minerals implements cut and fill mining where waste and vein material are blasted separately in order to reduce ore dilution. This practice would consider more total tonnes blasted in each section. Vein tonnes would be reduced, but the resulting grade would be higher. Recent tests on selective mining widths of 0.7 meters have proven to be achievable. Because this practice requires efficient operations control, Tetra Tech recommends having detailed control in drilling and blasting.

The mine plan developed for the study should be optimized and undertaken at a more detailed level, which will enable a greater understanding of mining constraints, costs and resulting mill feed. Currently, only sulfide material is being considered for the conceptual mine layout. In the future, it could be economical to include oxide material, as processing allows.

23.3 Metallurgy & Process

Antimony and arsenic are penalty elements in the lead and zinc concentrates and could be added to the database and spatially modeled. Additional metallurgical test work is recommended to investigate the depression of antimony and arsenic from the final lead and zinc concentrates, and zinc from the pyrite concentrate.

Potential of a new bio-oxidation plant to improve gold recovery warrants further test work to confirm previous encouraging results.

23.4 Economic Analysis

It is anticipated that the salvage sale of equipment will cover the cost of the reclamation costs. Due to changing parameters in the mine life and size, it is recommended to review this assumption in the future.

24. REFERENCES

Tetra Tech. 2022. "Preliminary Economic Assessment - Velardeña Project." NI 43-101 Technical Report, Golden, CO.

25. RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

Tetra Tech is relying on documents and statements provided by Golden Minerals personnel regarding:

- Resource block model estimation
- Mine and plant production data
- Status of mineral concessions
- Status and timelines of permits, contracts, and agreements required for operation
- Capital and operating cost estimates
- Mine and plant closure plans and associated costs