Preliminary Economic Assessment, Yauricocha Mine, Yauyos Province, Peru

Effective Date: March 31, 2021
Report Date: February 25, 2022

Prepared for

Sierra Metals Inc.

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Prepared by

srk consulting

SRK Consulting (Canada) Inc.
CAPR001101
February 2022

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Project No: CAPR001101

File Name: Yauricocha_PEA_CAPR001101_20220225.docx

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1 Executive Summary

The purpose of this Preliminary Economic Assessment (PEA) is to present an update on Resources by SRK Consulting (Canada), Inc. (SRK) for Sierra Metals, Inc. (Sierra Metals or the Company) on the Yauricocha Mine (Yauricocha or Project), which is located in the eastern part of the Department of Lima, Peru. Sierra engaged various specialist groups to evaluate how, on a conceptual level; mining, mineral processing, and tailings management could be adapted at the Property to achieve a sustainable and staged increase in mine production and mill throughput to 5,500 tpd (2.0 Mt/y) in 2024.

This PEA report provides a Mineral Resource Estimate and a classification of resources prepared in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum Standards on Mineral Resources and Reserves: Definitions and Guidelines, May 10, 2014 (CIM).

This PEA report is not a wholly independent report as some sections have been prepared and signed off by qualified personnel (QP) from SRK, Sierra Metals, the project owner, and Redco Global Peru S.A.C. (Redco), a Chilean mining consulting firm, with the term QP used here as it is defined under Canadian Securities Administrator's National 43-101 (43-101) guidelines. The QPs responsible for this report are listed in Sections 2.1, 2.2 and 2.3.

1.1 Property Description and Ownership

The Yauricocha Mine is in the Alis district, Yauyos province, Department of Lima, approximately 12 km west of the Continental Divide and 60 km south of the Pachacayo railway station. The active mining area within the mineral concessions is located at coordinates 421,500 m east by 8,638,300 m north on UTM Zone 18L on the South American 1969 Datum, or latitude and longitude of 12.3105º S and 75.7219º W. It is geographically in the high zone of the eastern Andean Cordillera, and within one of the major sources of the River Cañete which discharges into the Pacific Ocean. The mine is at an average altitude of 4,600 masl (Gustavson, 2015).

The current operation is an underground polymetallic sulfide and oxide operation, providing material for the nearby Chumpe process facility. The mine has been operating continuously under Sociedad Minera Corona S.A. (Minera Corona) ownership since 2002 and has operated historically since 1948. Sierra purchased 82% of Minera Corona in 2011.

1.2 Geology and Mineralization

The Yauricocha mine features several mineralized zones which have been emplaced along structural trends, with the mineralization itself related to replacement of limestones by hydrothermal fluids related to nearby intrusions. The mineralization varies widely in morphology from large, relatively wide, tabular manto-style deposits, to narrow, sub-vertical chimneys. The mineralization features economic grades of Ag, Cu, Pb and Zn, with local Au to a lesser degree. The majority of the mineralization is related to the regional high-angle NW-trending Yauricocha fault, or the NE-trending and less well-defined Cachi-Cachi structural trend. The mineralization generally presents as polymetallic sulfides but is locally oxidized to significant depths or related to more Cu-rich mineralization.

1.3 Status of Exploration, Development and Operations

The mine is concurrently undertaking surface and underground exploration, development, and operations. Exploration is ongoing near the mine along the regional geological and structural mineralized trends and is supported predominantly by drilling and exploration drifting. The mine is also producing several types of metal concentrates from the underground mine areas.

1.4 Mineral Processing and Metallurgical Testing

Yauricocha is consistently producing commercial quality copper concentrate, zinc concentrate, and lead concentrate. Due to the small tonnage and/or lower grades, the lead concentrate, when produced in the oxide plant, is blended in the plant with the concentrate produced from the polymetallic circuit to generate a lead concentrate of commercial quality.

The plant has been subject to continuous improvements in recent years to improve recovery and deportment of metals. Recent improvements to the processing facilities include:

- Addition of one OK-50 flotation cell to add capacity to the Cu-Pb bulk flotation stage.
- Installation of x-ray slurry analyzer for six streams: flotation feed, middling Zn feed, copper final concentrate, lead final concentrate, zinc final concentrate and final tailings.
- Mechanical rod feeder for primary rod mill grinding for improved safety and production.
- Installation of 5 DR-180 cells in the Second Zn Cleaning Flotation Stage; 4 DR-180 cells in the Third Zn Cleaning Flotation Stage to improve the Zn concentrate grade.
- Installation of 10 DR-180 cells in the Bulk Cleaning Flotation Stage arranged in three banks to increase flotation retention time from 9 minutes to 17 minutes:
- First Cleaning Flotation Stage (comprising 5 cells)
- Second Cleaning Flotation Stage (comprising 3 cells)
- Third Cleaning Flotation Stage (comprising 2 cells)

Table 1-1 shows the mill's feed tonnages and head grades for the period of January 2019 to March 2021. In this period, there was no treatment of any oxide mineralized material. Table 1-2 shows the plant's performance from January 2013 to March 2021.

Table 1-1: Mill Tonnage and Head Grades, January 2019 to March 2021

Period	Mineralized Material (tonnes)	Head Grade					
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	As (%)
2021 Mar	111,007	0.47	55.36	1.1	0.6	3.3	0.13
2021 Feb	101,203	0.43	53.19	1.3	0.5	3.6	0.13
2021 Jan	110,273	0.42	53.81	1.6	0.5	4.2	0.15
2020 Dec	92,351	0.47	45.10	0.9	0.8	3.2	0.17
2020 Nov	114,503	0.53	49.45	1.0	1.0	3.6	0.15
2020 Oct	105,092	0.63	60.03	1.6	0.7	3.9	0.16
2020 Sep	100,989	0.49	56.30	1.5	0.8	4.0	0.18
2020 Aug	110,286	0.58	63.45	1.4	1.1	3.9	0.19
2020 Jul	103,000	0.58	65.94	1.7	1.1	4.2	0.18
2020 Jun	78,080*	0.63	60.96	1.5	1.0	3.7	0.18
2020 May	64,364*	0.68	69.65	2.0	1.1	3.9	0.17
2020 Apr	60,090*	0.53	69.69	1.4	1.6	2.7	0.29
2020 Mar	78,553*	0.63	70.85	1.6	1.2	3.9	0.21
2020 Feb	103,764	0.66	66.01	1.6	1.1	3.8	0.19
2020 Jan	102,908	0.75	61.89	1.5	1.1	4.1	0.18
2019 Dec	110,939	0.70	59.33	1.5	1.2	4.0	0.20
2019 Nov	101,862	0.55	58.74	1.7	0.9	4.1	0.16
2019 Oct	108,900	0.56	62.27	1.5	1.0	4.1	0.16
2019 Sep	100,030	0.51	63.02	1.5	1.1	3.6	0.17
2019 Aug	106,988	0.59	66.77	1.8	1.1	3.9	0.22
2019 Jul	100,221	0.64	69.25	1.7	1.1	3.9	0.25
2019 Jun	99,588	0.55	68.84	1.8	1.1	3.6	0.21
2019 May	101,502	0.65	59.55	1.5	0.9	3.3	0.19
2019 Apr**	53,075	0.61	59.25	1.3	1.1	3.0	0.18
2019 Mar**	51,707	0.59	64.91	1.5	1.2	3.3	0.20
2019 Feb	88,010	0.59	63.08	1.3	1.1	3.6	0.20
2019 Jan	94,097	0.50	63.15	1.6	0.9	3.7	0.20
Averages	**94,570**	**0.57**	**61.48**	**1.5**	**1.0**	**3.7**	**0.19**

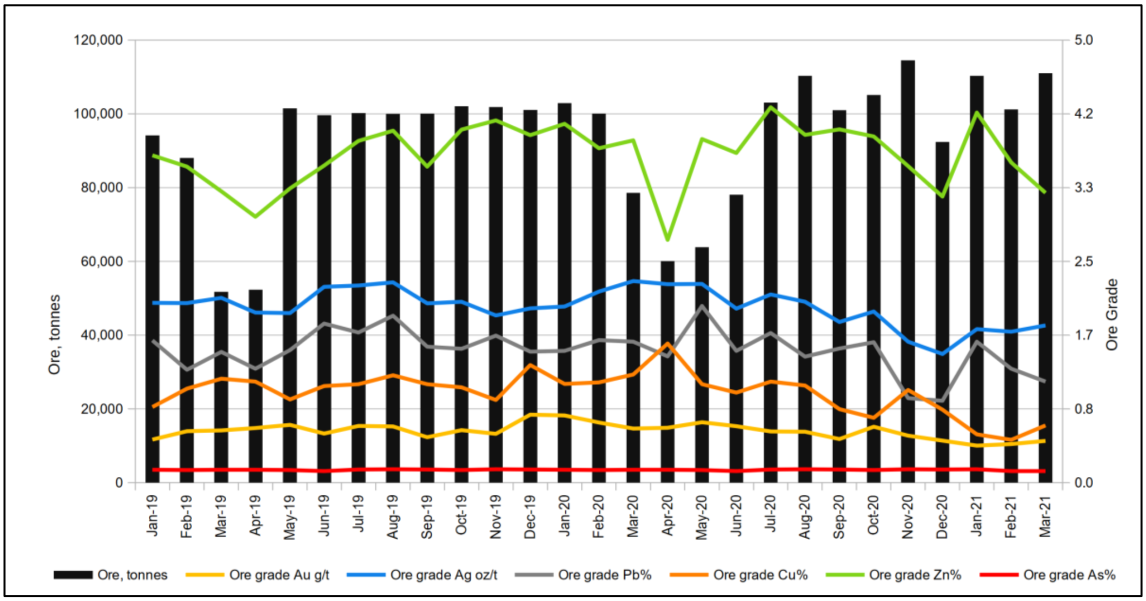
Source: Sierra Metals, 2021
* Production was affected by the Covid-19 pandemic.
** Production was affected by a strike at the mine.

Table 1-2: Yauricocha Metallurgical Performance, 2013 to 2021

Period	Stream	Tonne	Tonnes/day (@ 365 d/y)	Concentrate Grade					Metal Recovery				
				Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
2013	Mineralized Material	641,268	1,757		83	1.5	0.7	4.1		100	100	100	100
	Cu Con.	12,728	35		1,058	2.8	23.2	6.4		25.2	3.7	70.6	3.1
	Pb Con.	14,258	39		1,300	53.4	1.8	5.9		34.7	80	6.3	3.2
	Zn Con.	45,412	124.4		122	0.6	1	50.8		10.4	3	10.8	88.7
2014	Mineralized Material	703,713	1,928		84	1.8	0.7	4		100	100	100	100
	Cu Con.	12,782	35		1,115	2.1	26.4	6.8		24.2	2.1	68	3.1
	Pb Con.	18,055	49		1,398	58.6	1.5	4.9		42.8	83.9	5.3	3.2
	Zn Con.	48,657	133		115	0.8	1.4	50.6		9.5	3.1	13.2	88.5
2015	Mineralized Material	618,460	1,694		79	1.6	0.6	3.4		100	100	100	100
	Cu Con.	8,145	22		1,278	2.3	27.8	4.1		21.4	1.8	65.3	1.6
	Pb Con.	14,463	40		1,656	59.5	1.1	4.3		49.3	85.7	4.7	2.9
	Zn Con.	37,587	103		91	0.6	1.2	50.7		7.1	2.1	13.4	90.1
2016	Mineralized Material	698,872	1,915	0.5	80.3	1.8	0.6	3.9	100	100	100	100	100
	Cu Con.	9,068	25	3.1	1362.6	2.1	26.3	6.8	8.1	22	1.5	61.3	2.3
	Pb Con.	18,014	49	1.7	1470.8	59	1.2	4.8	9.1	47.2	86.3	5.6	3.1
	Zn Con.	47,573	130	0.4	95.2	0.7	1.2	51.5	4.9	8.1	2.6	14.2	88.9
2017	Mineralized Material	966,138	2,647	0.6	66	1.5	0.7	3.9	100	100	100	100	100
	Cu Con.	16,412	45	2.7	920.5	2.4	26.9	7.6	8.4	23.7	2.8	67.3	3.3
	Pb Con.	21,731	60	1.8	1242.3	56.8	2.5	5.5	7.4	42.3	86.9	8.4	3.2
	Zn Con.	65,671	180	0.4	110.8	0.9	1.4	51.4	5.3	11.4	4	14.2	89.4
2018	Mineralized Material	985,679	2,700	0.6	58.4	1.3	0.9	3.8	100	100	100	100	100
	Cu Con.	21,940	60	2.2	677.4	2.3	28.1	7.5	8.4	25.8	3.8	70.1	4.4
	Pb Con.	20,146	55	2.2	1087.5	56.1	3.3	5.7	7.6	38.1	85.8	7.5	3
	Zn Con.	65,823	180	0.5	101.4	0.8	1.8	50.9	5.2	11.6	4.1	13.4	88.7
2019	Mineralized Material	1,092,410	2,993	0.6	63.9	1.6	1.1	3.7	100	100	100	100	100
	Cu Con.	30,931	85	2.3	593.9	1.8	29.4	6	11	26.3	3.2	76.9	4.6
	Pb Con.	26,574	73	2.1	1131.6	57.6	2.4	5.5	8.4	43.1	88.8	5.4	3.6
	Zn Con.	69,863	191	0.5	90.6	0.6	1.7	51	4.9	9.1	2.6	10.1	88
2020	Mineralized Material	1,109,730	3,040	0.6	61.0	1.5	1	3.8	100	100	100	100	100
	Cu Con.	29,235	80	2.25	558.43	2.0%	29.8%	7.6%	9.9%	27.0%	3.9%	74.8%	5.5%
	Pb Con.	24,777	68	2.41	1,069.00	57.2%	2.1%	5.1%	9.1%	43.6%	87.8%	4.6%	3.1%
	Zn Con.	73,583	202	0.51	84.42	0.6%	1.9%	49.9%	5.7%	10.2%	2.9%	12.4%	87.6%
2021*	Mineralized Material	322,483	3,534	0.44	54.1	1.3%	0.6%	3.7%	100	100	100	100	100
	Cu Con.	4,723	52	2.84	643.9	2.1%	25.2%	8.5%	9.6%	19.6%	2.4%	66.3%	3.7%
	Pb Con.	6,884	75	1.93	1,136.80	56.4%	1.4%	5.7%	9.5%	49.6%	89.8%	5.5%	3.3%
	Zn Con.	20,964	230	0.41	77.55	0.5%	1.6%	50.9%	6.2%	10.3%	2.4%	19.0%	89.6%

Source: Sierra Metals, 2021
* January to March 2021

The fresh feed profile is shown in Figure 1-1. In terms of head grade, except for zinc, all other metals (Pb, Cu, Au, Ag) in the mill feed show a downward trend. As shown in Table 1-2, the polymetallic circuit operated at an average of 3,040 tonnes per day of fresh feed in 2020 (assuming operation of 365 days per year) and in Q1 2021, the average processing rate increased to 3,534 tonnes per day.

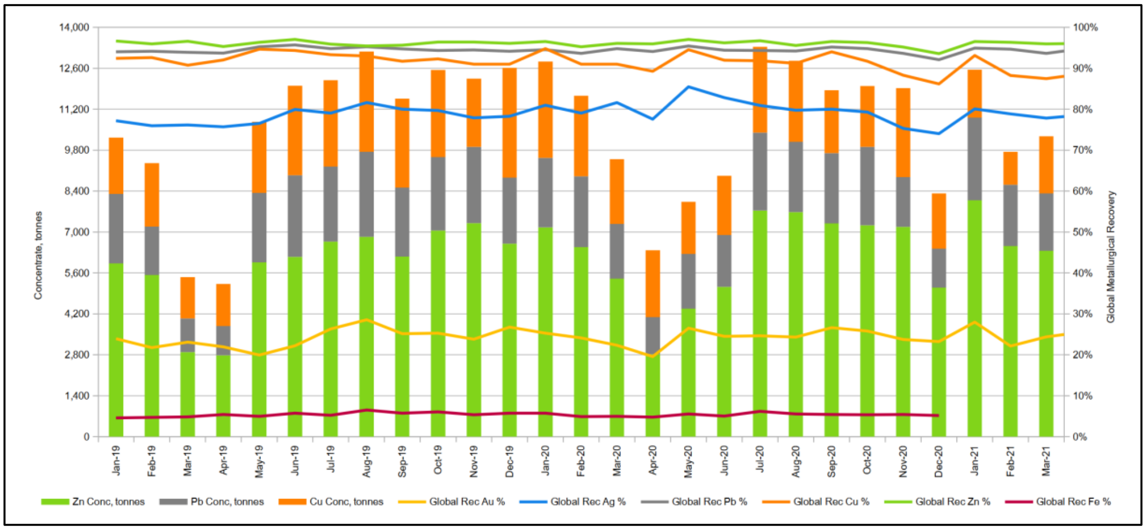


Source: SRK, 2021

Figure 1-1: Yauricocha Mill Feed – January 2019 to March 2021

Yauricocha's concentrate production included lead concentrate, copper concentrate, and zinc concentrate as shown in Figure 1-2. Total production totalled 287,535 tonnes of combined concentrate or 11.4% mass pull. Zinc concentrate accounted for 6.5% of the total mass pull, copper concentrate reached 2.6% and 2.3% for lead concentrate.

Global recovery to concentrates reached 24.8% gold, 80.2% silver, 95.7% lead, 92.8% copper, and 96.4% zinc.



Source: SRK, 2021

Figure 1-2: Yauricocha, Global Concentrate Production – January 2019 to March 2021

In 2020, silver is preferably recovered with the lead sulfide concentrate and accounts for approximately 43.6% of the total silver recovered at Yauricocha. Copper concentrate recovers approximately 27% of the silver, and zinc concentrate recovers 10.2%. The overall silver recovery at Yauricocha totaled 80.9% in 2020 and 79.5% during the first three months of 2021.

Yauricocha's metallurgical laboratory has been testing samples from multiple sources, including polymetallic material from Esperanza, Cuerpo Contacto Occidental, from Mina Mario among others. In most of the cases the metallurgical test results show good amenability to conventional processing and potential to achieve commercial quality concentrates. Some samples show arsenic presence, while others achieve lower concentrate grades because of their higher oxides content. In all cases, laboratory personnel are continuously investigating improved process conditions for treating the new sources of mineralized material.

1.5 Mineral Resource Estimate

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

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

The "reasonable prospects for economic extraction" requirement generally implies that the quantity and grade estimates meet certain economic thresholds and that the Mineral Resources are reported at an appropriate cut-off value, taking into account extraction scenarios and processing recoveries. To assess this at Yauricocha, the QP has calculated an economic value for each block in terms of US dollars based on the grade of contained metal in the block, multiplied by the assumed recovery for each metal, multiplied by pricing established by Sierra Metals for each commodity. Costs for mining and processing are taken from data provided by Sierra for their current underground mining operation.

The QP is of the opinion that the mineral resource estimations are suitable for public reporting and are a fair representation of the in-situ contained metal for the Yauricocha deposit.

The March 31, 2021, consolidated Mineral Resource statement for the Yauricocha Mine is presented in Table 1-3. The detailed, individual tables for the various Yauricocha mining areas are presented in Section 14 of this report.

Table 1-3: Consolidated Yauricocha Mine Mineral Resource Statement as of March 31, 2021 – SRK Consulting (Canada), Inc. (1) (2) (3) (4) (5) (6) (7) (8) (9)

Classification	Volume (m^3) '000	Tonnes (K t)	Density (t/m^3)	Ag (g/t)	Au (g/t)	Cu (%)	Pb (%)	Zn (%)	As (%)	Fe (%)	NSR (USD/t)	Ag (M oz)	Au (K oz)	Cu (M lb)	Pb (M lb)	Zn (M lb)	As (K t)	Fe (M t)
Measured	1,262	4,241	3.36	59.41	0.58	1.08	0.92	2.62	0.19	25.02	131	8.1	79.3	100.8	86.2	245.3	7.9	1.1
Indicated	2,929	10,069	3.44	37.07	0.50	1.17	0.51	1.88	0.13	25.89	109	12.0	161.1	259.9	113.0	417.2	12.9	2.6
Measured + Indicated	4,191	14,310	3.41	43.69	0.52	1.14	0.63	2.10	0.15	25.86	116	20.1	240.4	360.7	199.2	662.5	20.8	3.7
Inferred	3,337	11,566	3.47	29.04	0.44	1.40	0.32	1.03	0.07	26.38	103	10.8	161.8	358.1	82.7	261.9	8.3	3.1

Source: SRK, 2021

Notes

(1) Mineral Resources have been classified in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM") Definition Standards on Mineral Resources and Mineral Reserves, whose definitions are incorporated by reference into NI 43-101.

(2) Mineral Resources are reported inclusive of Mineral Reserves. Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. All figures are rounded to reflect the relative accuracy of the estimates. Silver, gold, copper, lead, zinc, arsenic (deleterious) and iron assays were capped / cut where appropriate.

(3) The consolidated Yauricocha Resource Estimate is comprised of Measured, Indicated, and Inferred material in the Mina Central, Cuerpos Pequeños, Cuye, Mascota, Esperanza and Cachi-Cachi mining areas.

(4) Polymetallic Mineral Resources are reported at Cut-Off values (COV) based on 2021 actual metallurgical recoveries and 2021 smelter contracts.

(5) Metal price assumptions used for polymetallic feed considered CIBC November 2021 long term consensus pricing (Gold (US$1,598/oz), Silver (US$21.02/oz), Copper (US$3.39/lb), Lead (US$0.91/lb), and Zinc (US$1.10/lb).

(6) Lead Oxide Mineral Resources are reported at COVs based on 2021 actual metallurgical recoveries and 2021 smelter contracts.

(7) Metal price assumptions used for lead oxide feed considered July 2021 long term consensus pricing (Gold (US$1,598/oz), Silver (US$21.02/oz) and Lead (US$0.91/lb).

(8) The mining costs are based on 2021 actual costs and are variable by mining method.

(9) The unit value COVs are variable by mining area and proposed mining method. The marginal (incremental) COV ranges from US$31.7 to US$36.7 for a 5,500t/d operation.

1.6 Mineral Reserve Estimate

A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Resource. It includes diluting material and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Prefeasibility or Feasibility level as appropriate that include the application of Modifying Factors.

A Mineral Reserve has not been estimated for the Project as part of this PEA.

The PEA includes Inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves.

1.7 Mining Methods

1.7.1 Mining

The Yauricocha Mine is a producing operation with a long production history. Most of the mining is executed through mechanized sub-level caving with a relatively small portion of the mining using overhand cut and fill. The mine uses well-established, proven mining methods and is planning to increase the production rate to 5,500 tpd (2.0 Mt/y) in 2024.

The LOM production schedule is shown in Section 16, Table 16-36.

Polymetallic sulfide mineralized material accounts for more than 99% of the material mined at Yauricocha. Material classified as lead oxide can also be encountered, but it is a minor component of the overall tonnage in the mineralized zones currently being mined.

The mine is accessed by two shafts, Central shaft and Mascota shaft, and the Klepetko and Yauricocha tunnels. Mineralized material and waste are transported via the Klepetko tunnel at the 720 level (elevation 4,165 masl) which runs east-northeast from the mine towards the mill and concentrator, and the 4.7 km Yauricocha tunnel, commissioned in 2018, that also accesses the mine at the 720 level. The Yauricocha tunnel was added to increase haulage capacity and serves as a ventilation conduit. The Yauricocha shaft, currently under construction, will provide access down to 1270 level and is expected to be in production in 2025.

1.7.2 Geotechnical

The level plans and accompanying development profile and installation procedures are well developed and appropriate for operational application. Also, the understanding of in-situ and induced stress for the current mining areas is satisfactory, but for the deeper planned mining areas, site specific stress measurements and stress modeling were needed. Following these observations, Sierra and Redco jointly developed a mining study designed to support a growth scenario for the Yauricocha mine. Preliminary 3D geomechanical and numerical models were constructed, and a geotechnical data collection campaign was established, with a focus on deeper areas of the mine, to support future studies and estimations.

Based on the proposed campaign to strengthen the geomechanical information database, a field information collection program was conducted in the second half of 2021 which consisted of logging diamond drill core and geomechanical mapping of the rock mass. The program sought to validate the geotechnical quality of the rock through Bieniawski's "RMR" and Barton's "Q" classifications, as well as the measurement of in-situ efforts through acoustic emissions, all carried out in the areas of Mina Central and Esperanza.

A total of 4,770 meters (accumulated) of geomechanical logging was conducted in drill holes for already drilled resources and included 30 UCS tests and 15 TX tests (cumulative). In addition to this, 850 meters (cumulative) of logging of geomechanical drilling with oriented core was undertaken to determine the orientation of the discontinuities (measurement of angles α and β), rock mass characterization (RMR, Q, GSI) and obtain samples for laboratory tests and acoustic emissions. Finally, different stations were mapped to identify the arrangement of discontinuities and joints in each domain.

The current understanding of the conditions leading to a mud rush and the mitigation measures put in place are reasonable; however, the potential occurrence of a mud rush event is an ever-present risk, particularly when entering new mining areas. Dewatering practices need to be maintained, existing drawpoints monitored, and new areas investigated prior to being developed.

1.7.3 Hydrogeology

Past effort has been made to control or reduce water inflows. A large amount of data is available that could be used to understand the source of water, but the data is not compiled in a manner that would permit this to be easily done.

In the past, drainage tunnels and exploratory test drill holes have been completed to control or reduce water inflows. Drain holes were completed in the 920 and 870 levels in Antacaca Sur, 920 level in Antacaca, 920 and 970 levels in Catas, and 870 and 920 levels in Rosaura. All these water management features were oriented into the granodiorite to intercept water flows before reaching the subsidence zone. Some of drillholes were later cemented to reduce inflows into mining zones.

During drilling, inflows were observed to decrease on the 820 and 870 levels, and post drilling, decreasing inflows were observed on the 920 level. Inflows in Antacaca Sur and Rosaura have been reduced over time, but inflows appear to be increasing in Catas and Esperanza.

The Yauricocha mine has developed a conceptual hydrogeological-structural model that has allowed the mine to better understand the regional movement of groundwater and to understand how water enters the mineralized bodies. This model has made it possible to understand the dynamics of the groundwater flow, as correlated with the geological, structural and subsidence information produced. In addition, the execution of two drainage chambers at the extremes of Central Mine. Esperanza (Phase III) and Antacaca Sur (phase I) mineralized zone is planned for 2022 to support ongoing data collection. This additional data will permit refinements to the conceptual hydrogeological-structural model.

In conclusion, the mine has been able to manage water inflows sufficiently well to allow mining to safely proceed. As the mine expands, water inflows should be expected to increase. Mitigation efforts should continue to be assessed and tested, but operational management plans should continue to assume that inflows and mud rush potential will increase until such a time that the effectiveness of mitigation efforts can be proven, or decisions are made to address water-related risks through other management plans.

1.8 Project Infrastructure

The Project is a mature producing mine and mill and all required infrastructure is fully functional. The Project has highway access with two routes to support the Project's needs, and the regional capital Huancayo (population 340,000) is within 100 km. Personnel travel by bus to the site and are accommodated in four camps. There are currently approximately 1,460 personnel on-site with 400 employees and 1,060 contractors.

The on-site facilities include the processing plant, mine surface facilities, underground mine facilities, tailings storage facility (TSF), and support facilities. The processing facility includes unit processes such as crushing, grinding, flotation, dewatering and concentrate separation, concentrate storage, and thickening and tailings discharge lines to the TSF.

The underground mine and surface facilities include headframes, hoist houses, shafts and winzes, ventilation structures, mine access tunnels, waste storage facilities, powder and detonator magazines, underground shops, and diesel fuel and lubrication storage. The support facilities include four accommodation camps where personnel live while on site, a laboratory, change houses and showers, cafeterias, medical facility, engineering and administrative buildings, and miscellaneous equipment and electrical shops to support the operations.

The site has existing water systems to manage the Project's water needs. Water is sourced from Acococha Lagoon, Mishquipuquio and Huacuypacha Spring, Klepetko tunnel and recycle/overflow water from the TSF, depending on end use. Water treatment systems treat the raw water for use as potable water or for service water in the plant. Additional systems treat the wastewater for further consumption or discharge.

Energy for the site is available through electric power, compressed air, and diesel. The electric power is supplied by contract over an existing 69 kV line to the site substation. The power is distributed for use in the underground or at the processing facility. The current power load is 10.92 MVA with approximately 70% of this being used at the mine and the remainder at the plant and other facilities. The power system is planned to be expanded to approximately 14 MVA by the end of 2023. A compressed air system is used underground with an additional 149 kW compressor system being added, and diesel fuel is used in the mobile equipment and in the 895-kW backup electrical generator.

The site has permitted systems for the handling of waste including a TSF, waste rock storage facility, and systems to handle other miscellaneous wastes. The TSF was expanded in 2021 with another lift to provide one more year of capacity. Two additional lift stages in total will provide the Project with approximately 4.5 years of additional capacity.

The site has an existing communications system that includes a fiber optic backbone with internet, telephone, and paging systems. The security on-site is managed through checkpoints at the main access road, processing plant, and at the camp entrances.

Logistics to the site are primarily by truck with the three primary concentrate products being shipped by 30 t to 40 t trucks to other customer locations in Peru. Materials and supplies needed for Project operation are procured in Lima and delivered by truck.

The infrastructure is well developed and functioning as would be expected for a mature operation. The TSF continues to develop and will require ongoing monitoring to assure the construction of the next lift is timely to support the operation. Ongoing monitoring of the stability of the embankment and operations practices is recommended to conform to industry best practices.

1.9 Environmental Studies and Permitting

Sierra has all relevant permits required for the current mining and metallurgical operations. Sierra also has a Community Relations Plan that includes annual assessment, records, minutes, contracts and agreements. An Environmental Impact Assessment (EIA) was obtained on February 11, 2019.

1.10 Capital and Operating Costs

The capital and operating costs presented here are for a production rate of approximately 3,800 tpd in Q2-Q4 2021 and 2022, reaching 5,500 tpd in 2024. Capital and operating cost estimates are shown in Section 21. Capital and operating costs are based upon forward-looking information. This forward-looking information includes forecasts with material uncertainty which could cause actual results to differ materially from those presented herein.

Table 1-4 and Table 1-5 show the capital and growth capital cost (capex) summaries. Table 1-6 shows the operating cost (opex) summary.

Table 1-4: Estimated Sustaining Capital Costs

Estimated Sustaining Capital	Total (US$ 000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Exploration & Development												
Exploration	$4,825	1,513	712	500	-	350	350	350	350	350	350	-
Development	$5,464	4,454	223	649	-	138	-	-	-	-	-	-
Equipment	$13,142	4,014	373	3,871	242	473	231	231	3,245	231	231	-
Facilities	$2,683	608	266	201	201	201	201	201	201	201	201	201
Mine Support Areas	$3,115	-	3	862	8	227	702	190	3	862	51	207
Projects												
Central Shaft Rehab	$1,700	729	971	-	-	-	-	-	-	-	-	-
Mine Camp	$6,759	5,190	1,299	30	30	30	30	30	30	30	30	30
Mascota Shaft	$892	57	335	250	250	-	-	-	-	-	-	-
Concentrator Plant	$4,836	1,131	405	300	-	1,000	500	-	-	-	1,000	500
Shotcrete Plant	$3,389	89	-	-	-	1,000	2,300	-	-	-	-	-
Drainage System	$3,358	1,210	532	239	116	132	176	532	173	116	132	-
Ventilation	$4,845	3,235	289	42	92	31	578	-	-	578	-	-
Personal transportation	$770	-	-	770	-	-	-	-	-	-	-	-
Water Plant Treatment	$2,300	-	10	10	10	1,010	1,210	10	10	10	10	10
Environmental	$345	-	45	50	50	50	50	50	50	-	-	-
Fuel Distribution System	$350	-	5	5	5	305	5	5	5	5	5	5
TDR Cable Installation	$350	-	350	-	-	-	-	-	-	-	-	-
Tailing Dam	$0	-	-	-	-	-	-	-	-	-	-	-
Closure	$11,607	-	-	-	-	-	277	277	277	277	277	10,222
Total Estimated Sustaining Capital	**$70,730**	**22,229**	**5,819**	**7,779**	**1,003**	**4,948**	**6,611**	**1,876**	**4,345**	**2,660**	**2,287**	**11,174**

Source: Sierra Metals, Redco, 2021
Note: Totals do not necessarily equal the sum of the components due to rounding.

Table 1-5: Estimated Growth Capital Costs

Estimated Growth Capital	Total (US$ 000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Exploration & Development												
Drilling Exploration	$4,221	-	1,031	700	-	700	700	700	130	130	130	-
Regional Exploration	$4,720	1,577	366	300	-	300	300	300	-	-	-	1,577
Development	$39,620	-	8,479	8,077	5,081	8,233	3,861	1,393	2,269	1,403	824	-
Cross-Cut 500	$3,590	1,795	-	-	-	-	-	-	-	-	-	1,795
Equipment	$17,787	-	1,662	3,021	3,719	1,467	202	1,265	1,265	3,719	1,467	-
Projects												
Yauricocha Shaft	$24,413	3,987	4,403	4,696	2,840	4,500	-	-	-	-	-	3,987
Integration Access to Yauricocha Shaft CX0545	$7,595	2,122	2,271	-	-	1,080	-	-	-	-	-	2,122
Tailing Dam	$81,490	8,401	4,995	5,871	8,935	7,427	11,303	7,427	7,427	11,303	-	8,401
New Road, Access	$7,000	-	-	-	-	-	3,500	3,500	-	-	-	-
Comedor Esperanza	$118	59	-	-	-	-	-	-	-	-	-	59
Mine Camp	$5,940	-	140	1,500	2,800	1,500	-	-	-	-	-	-
Concentrator Plant to increase prod.	$47,423	-	18,969	28,454	-	-	-	-	-	-	-	-
Ventilation	$853	-	141	-	288	-	424	-	-	-	-	-
Studies (trade off, SAG, Met, Auto, Permits)	$6,999	1,977	2,067	978	-	-	-	-	-	-	-	1,977
1592 Mascota - Esperanza Ramp	$0	-	-	-	-	-	-	-	-	-	-	-
Waste Dump	$6,488	-	-	-	-	3,244	-	3,244	-	-	-	-
Total Estimated Growth Capital	**258,258**	**19,919**	**44,522**	**53,597**	**23,663**	**28,451**	**20,290**	**17,829**	**11,092**	**16,555**	**2,422**	**19,918**

Source: Sierra Metals, Redco, 2021
Note: Totals do not necessarily equal the sum of the components due to rounding.

Table 1-6: Estimated Operating Costs (LoM)

Opex Total	Total (US$ 000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Mine	521,400	36,068	45,838	44,635	59,367	57,277	62,504	57,989	51,258	50,023	43,922	12,518
Plant	151,816	9,598	12,804	9,683	19,493	18,160	19,223	18,356	17,892	11,731	10,475	4,399
G&A	93,688	6,132	8,111	7,954	10,210	9,776	10,123	9,841	9,688	9,636	8,604	3,613
Total	**766,904**	**51,799**	**66,753**	**62,272**	**89,069**	**85,213**	**91,851**	**86,186**	**78,839**	**71,389**	**63,002**	**20,531**

Source: Sierra Metals, Redco, 2021
Note: Totals do not necessarily equal the sum of the components due to rounding.

1.11 Economic Analysis

The 5,500 tpd (2024) proposed mine plan has a capital requirement (initial and sustaining) of US$ 312.1 M over the 11-year LOM; efficiencies associated with higher throughputs are expected drive a reduction in operating costs on a per tonne basis. This PEA indicates an after-tax NPV (8%) at 5,500 tpd (in 2024) of US$ 273.1 M. Total operating cost for the LOM is US$ 766.9 M, equating to a total operating cost of US$ 44.01 per tonne milled and US$ 1.30 per pound copper equivalent.

Economic estimates are based upon forward-looking information. This forward-looking information includes forecasts with material uncertainty which could cause actual results to differ materially from those presented herein.

The PEA is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Mineral resources that are not mineral reserves do not have demonstrated economic viability. There is no certainty that inferred resources can be converted to indicated or measured resources or mineral reserves and, as such, there is no certainty that the results of the PEA will be realised.

Instances of the word ‘economic’ are intended to be conceptual only, and prospects for economic extraction have not been demonstrated. The proposed mine plan is conceptual in nature and would benefit from further, more definitive, investigation.

1.12 Conclusions and Recommendations

1.12.1 Geology and Mineral Resources Estimation

The QP has the following recommendations for the geology and Mineral Resources at Yauricocha:

- Standardize and document the transformation between the UTM Zone 18S WGS84 datum used for exploration, and the Local mine grid used for underground geology, mineral resources, and mining coordinate systems. There are currently several sightly different transformations, which could be related to different coordinate systems historically used by the mine and exploration staff.
- Construct and compile a single reliable secure drilling and sampling database for the entire mine area, which can be easily verified, audited, and shared internally. This can be accomplished through commercially available SQL database management tools.
- Long-term exploration should be focused on areas such as the possible intersection of the Yauricocha fault and the Cachi-Cachi structural trend, where recent geophysical data are currently being generated to assist in targeting.
- Exploration should continue underground in the Esperanza area which is locally open along strike and at depth.
- Channel samples should be collected on a representative basis and collected across the entire exposed thickness of a mineralized zone. In addition, they should be weighed for each sample

to ensure that appropriate quantities of material are sampled from both the harder, more difficult material, and the higher-grade, softer material.

- Reviewing the performance of the QA/QC program as soon as batches of results are returned. If any failures occur, investigation and re-analysis of these samples and +/- five adjacent samples on either side of the respective failure should be completed as soon as possible to prevent any sample preparation or laboratory issues.
- Select several duplicates to be analyzed by an umpire laboratory for analytical results completed between July 2020 to March 2021, to establish whether there are any material issues and biases with respect to the analytical results received and not QA/QC'ed.
- Umpire coarse and pulp reject duplicates sampling be implemented as standard practice. No umpire duplicates have been submitted since 2019.
- Density measurements of drillhole core to be implemented as a standard practice, to improve density relationships in mineralized and non-mineralized rock.
- Exploration, mine geology and mining should be supported by a detailed litho-stratigraphic and structural model for the area, based on all the available information, to aid in exploration targeting for surface and underground, to improve the mineral resource domaining and to provide structural detail that can be used for geotechnical engineering studies.
- A standardized workflow is applied to the geological modelling to prevent significant changes in mineralized shape forms with minor additions of drillhole information. The integration of structure, stratigraphy and mineralized zone into a global model is essential in developing a comprehensive exploration and mining model. This will prevent inconsistencies and overlap between mineralized zones modelled.
- Developing and documenting internal standards and procedures for geological interpretation, modelling, estimation and reporting of Mineral Resources, especially since there has been a significant staff turnover during in 2021.
- Modelling variogram anisotropy for each of the mineralized domains can be improved by considering relevant transformation, e.g., gaussian or log transforms of the composites before producing the experimental variograms. Ideally, modelled variograms should be back transformed, before the grade estimation is done. Certain commercially available software can complete this process seamlessly.
- Local and global grade anisotropy occur within the larger mineralized bodies. The sensitivity of utilizing a local anisotropy in highly informed data areas, whereas utilizing a global trend in poorly informed areas, should be investigated.
- Minera Corona implement short term grade control models to track and reconcile with the resource models and mine production.

1.12.2 Mineral Processing and Metallurgical Testing

SRK makes the following conclusions and recommendations for the mineral processing at Yauricocha:

- Yauricocha's processing facility is reasonably well operated and shows flexibility to treat multiple mineralized material sources. The metallurgical performance, i.e., metal recovery and concentrate grade has been consistent throughout the period evaluated allowing the mine to produce commercial quality copper concentrate, lead concentrate, and zinc concentrate.
- The spare capacity in their oxide circuit is an opportunity to source material from third-party mines located in the vicinity.
- The presence of arsenic is being well managed by blending mineralized material in order to control arsenic concentration in the final concentrates.
- Gold deportment seems an opportunity that Yauricocha may want to investigate, particularly by evaluating gravity concentration in the grinding stage, or alternatively in the final tails, or both.

1.12.3 Mining

Redco makes the following conclusions and recommendations for the mining at Yauricocha:

- Standardize the operational practices of sublevel caving (SLC), considering a traditional exploitation in a fan pattern (radial drilling), drilling the entire crown, and extracting in reverse, modifying the current form of operation based on extraction by lateral "pockets". To guarantee this, field tests must be carried out and a robust design for the initial slot must be considered to ensure the initial swelling and flow of the broken material.
- Evaluate the increase in mining dimensions for the SLC, this would mean a significant reduction in development and preparation, considering an opportunity to achieve column heights close to 25 meters and spacing between extraction galleries of 9 meters according to preliminary analysis. To support this, it is suggested to carry out more detailed studies at a numerical and operational level, accompanied by pilot tests to guarantee the safety and operational feasibility of mining.
- The ramp-up to 5,500 tpd needs to be studied in an operative point of view, considering the capacity of the whole haulage system and operational philosophy. Simulation modelling could be developed to evaluated different scenarios and strategies to reach the final production rate.
- Evaluate the application of new mining methods in mineralized bodies of greater width, as is the case of shrinkage caving for the Esperanza mineralized body, which would improve operational performance, reduce costs by minimizing the number of preparations and mining developments, and deliver greater productivity to the Yauricocha mine. This must be numerically evaluated at the geomechanical level and complemented with gravitational flow models which must be calibrated with pilot tests.

- The current fleet of load and haul equipment is of 2.5 yd3 size and it is recommended to migrate to larger capacity equipment (4 yd3 or more) to reduce the quantity of equipment inside the mine, avoid saturation of production levels, and achieve the increase in extraction rates. This must be accompanied by a standardization of the loading points in sublevels so that these locations have adequate work dimensions.
- One of the main challenges Yauricocha currently faces is related to the construction of the production galleries in the sublevel caving method. Given the poor quality of the rock (low RMR), the production galleries require the use of steel arches, and this imposes greater construction times and costs. It is recommended to study alternatives that allow mechanizing the advancement of the sublevel caving production tunnels to improve the safety of mine personnel and to increase the production rates at each face.
- Analyze alternatives for haulage to surface for deeper sectors of the mine in order to make the extraction of materialized and waste material viable at the anticipated levels in the case of the 5,500 tpd production rate; doing so will allow decongesting the shafts which are expected to be near maximum capacity during the peak years of mining 5,500 tpd.
- For future studies and reporting, it is recommended that the Yauricocha mine standardize the support of the modifying factors used in the mining planning processes for its different mining methods. For this, volumetric and mine/plant reconciliation processes should be considered to verify the operational behavior between what is planned and what is extracted, in addition to accompanying it with gravitational SLC flow models calibrated with operational data, in order to deliver a robust recovery and dilution factors per zone.
- The New Yauricocha shaft project should be monitored closely to ensure timely access to mineralized zones below 1070 level.
- A consolidated infill drilling plan needs to be developed accord in the deeper areas of the mine to support the LoM plan execution.
- For the application of operational improvements incorporating new mining methods and technologies, it is necessary to have an established culture of operational discipline with standards that integrate the information from the different areas within the short-, medium- and long-term plans.
- Further technical-economic evaluations of the production rate expansion options should be undertaken.

1.12.4 Geotechnical and Hydrogeological

Redco makes the following geotechnical conclusions and recommendations:

- Regarding the new data campaign conducted in 2021, update the 3D geomechanical and numerical preliminary models to verify the quality of the rock mass projected in deeper areas of the mine. Use this updated information to support improvements with the mining methods, production sequencing, and rock support estimation for different stress modeling scenarios.

- Develop gravity flow 3D models for the different areas/condition of sublevel caving to support the dilution and recovery planned per zone and per level. This work could be expanded upon to simulate possible mud rushes or determine critical areas.
- Continue collecting geotechnical characterization data from mined drifts and exploration drillholes.
- Maintain a central geotechnical database.
- Continue the program of stress measurement in the deeper planned mining areas.
- Conduct numerical stress analyses of mining-induced stress effects on planned mining.

Redco makes the following hydrogeological conclusions and recommendations:

- Continue a short-term to long-term dewatering programs with drainage systems.
- Continue to actively dewater ahead of production mining and monitor for conditions that could lead to mud rushes.
- Update the current conceptual hydrogeological model considering the new data collection campaign.
- 3D Hydrogeological-structural modelling should be considered for further stages of mine development.
- Develop studies to apply new methodologies to reduce the water inflows to the current and future mining zones.
- Revisit the current ground control management plans to check that they are appropriate for the deeper mining areas.

1.12.5 Infrastructure

Ongoing monitoring of the stability of the TSF embankment and operations practices is recommended to conform to global industry best practices.

1.12.6 Recovery Methods

SRK recommends that Yauricocha improve its control of plant operations by installing more instrumentation and an automation control system. Doing so could lead to more consistent plant operation, reduced electrical energy and reagent consumption, and ultimately initiate a continuous improvement of the plant's unit operations and overall performance.

1.12.7 Environmental Studies and Permitting

Social and environmental activities are currently of high importance in Peru; therefore, SRK recommends that the company's commitments and agreements be fulfilled in detail and in a timely manner. Reputational and legal risks can arise due to this issue.

1.13 Recommended Work Program Costs

Table 1-7 lists the estimated costs for the recommended work that is not considered to be covered by on-going operating expenditures.

Table 1-7: Summary of Costs for Recommended Work

Category	Work	Units	Cost US$
Geology and Resources	Infill Drilling (1)	13,000 m	1,300,000
	Exploration Drilling - Yauricocha Expansion (1)	25,000 m	2,500,000
	Structural and litho-stratigraphic model	1	100,000
	Training	1	10,000
	QA/QC and re-analysis	500	12,500
Geotechnical	Annual data collection and laboratory analysis	N/A	120,000
	Integrated Gravity Flow Model	1	150,000
	Sublevel Caving (25m) Pilot Test	1	400,000
	Shrinkage Caving Pilot Test	1	500,000
Hydrogeological	3D hydrogeological-structural numerical model & study	1	275,000
Production Rate Increases	Pre-feasibility(2) & Feasibility studies	1	2,000,000
Total			**7,367,500**

Source: Sierra, Redco, SRK, 2021

(1) Drilling costs assume US$100/m drilling costs.

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2 Introduction and Terms of Reference

This Technical Report is not a wholly independent report as some sections have been prepared and signed off by qualified personnel (QP) from SRK, Sierra Metals, the project owner, and Redco Global Peru S.A.C. (Redco), a Chilean mining consulting firm, with the term QP used here as it is defined under Canadian Securities Administrator's National 43-101 (43-101) guidelines. The QPs responsible for this report are listed in Sections 2.1, 2.2 and 2.3.

This report presents a Preliminary Economic Assessment (PEA) designed to give an indication of the economic viability of the Yauricocha property. The assessment is based on Indicated and Inferred Resources estimated by SRK and is effective as of March 31, 2021. The mine plan presented in this Technical Report considers the Mineral Resources depleted to March 31, 2021.

The reader is reminded that PEA studies are indicative and not definitive and that the Mineral Resources used in the proposed mine plan include Inferred Resources as allowed for by the CSA NI 43-101 in PEA studies. The PEA is preliminary in nature; it includes Inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves, and there is no certainty that the results of the PEA will be realized.

2.1 Qualifications of Consultants (SRK)

The consultants preparing this Technical Report are specialists in the fields of geology, exploration, Mineral Resource estimation and classification, underground mining, geotechnical, environmental, permitting, metallurgical testing, mineral processing, processing design, capital and operating cost estimation, and mineral economics.

None of the SRK consultants and associate consultants employed in the preparation of this report has any beneficial interest in Sierra Metals or its subsidiaries. The consultants are not insiders, associates, or affiliates of Sierra Metals or its subsidiaries. The results of this Technical Report are not dependent upon any prior agreements concerning the conclusions to be reached, nor are there any undisclosed understandings concerning any future business dealings between Sierra Metals and the consultants. The consultants are being paid a fee for their work in accordance with normal professional consulting practice.

The following individuals, by virtue of their education, experience and professional association, are considered Qualified Persons (QPs) as defined in the NI 43-101 standard, for this report, and are members in good standing of appropriate professional institutions. QP certificates of authors are provided in Appendix A. The QPs are responsible for specific sections as follows:

- Andre Deiss, B.Sc. (Hons), Pr.Sci.Nat., MSAIMM, SRK Principal Consultant (Resource Geology), is the QP responsible for geology and Mineral Resources, Sections 7 through 12, 14 and portions of Sections 1, 25 and 26 summarized therefrom, of this Technical Report.

- Carl Kottmeier, B.A.Sc., P. Eng., MBA, SRK Principal Consultant (Mining), is the Project Manager for the study and the QP responsible for Sections 2 through 6, 27, 28 and portions of Sections 1, 25 and 26 summarized therefrom, of this Technical Report.
- Daniel H. Sepulveda, BSc, SME-RM, SRK Associate Consultant (Metallurgy), is the QP responsible for mineral processing, metallurgical testing and recovery methods Sections 13, 17, and portions of Sections 1, 25 and 26 summarized therefrom, of this Technical Report.

2.2 Qualifications of Consultants (Sierra Metals)

The following individuals from Sierra Metals, by virtue of their education, experience, and professional association, are considered Qualified Persons (QP) as defined in the NI 43-101 standard for this Technical Report and are members in good standing of appropriate professional institutions. QP certificates of authors are provided in Appendix A. The QPs are responsible for specific sections as follows:

- Américo Zuzunaga, Vice-President Corporate Planning, is the QP responsible for Sections 18, 19, 20, 23 and 24, and portions of Sections 1, 25 and 26 summarized therefrom, of this Technical Report.

2.3 Qualifications of Consultants (Redco Global Peru S.A.C.)

The following individuals from Redco, by virtue of their education, experience, and professional association, are considered Qualified Persons (QP) as defined in the NI 43-101 standard for this Technical Report and are members in good standing of appropriate professional institutions. QP certificates of authors are provided in Appendix A. The QPs are responsible for specific sections as follows:

- Enrique Rubio, Ph.D. Executive Director, is the QP responsible for Sections 15, 16, 21, 22 and portions of Sections 1, 25 and 26 summarized therefrom, of this Technical Report.

2.4 Details of Inspection

Table 2-1 shows recent site visit participants.

Table 2-1: Site Visit Participants

Personnel	Company	Expertise	Dates of Visit	Details of Inspection
Andre Deiss	SRK	Resource Geology, Mineral Resources	April 28 – May 3, 2019	Reviewed geology, resource estimation methodology, sampling, and drilling practices, examined drill core.
Daniel Sepulveda	SRK	Metallurgy and Process	April 28 – May 3, 2019	Reviewed metallurgical test work, tailings storage, and processing plant.
Enrique Rubio	Redco	Mining Engineering	January 5, 2019	Review areas of high probability of wet muck, ground support, material handling system, shaft, ramp and vent raises development
Américo Zuzunaga	Sierra	Infrastructure, Environmental	January 2020	Mine, tailings dam, planning, geology.

Source: SRK, 2021

2.5 Sources of Information

The sources of information used in the preparation of this report include data and reports supplied by Sierra Metals personnel as well as documents cited throughout the report and referenced in Section 27.

2.6 Effective Date

The effective date of this report is March 31, 2021.

2.7 Units of Measure

The metric system has been used throughout this report. Tonnes (t) are metric, comprising of 1,000 kg, or 2,204.6 lb. All currency is in U.S. dollars (US$ or USD) unless otherwise stated.

3 Reliance on Other Experts

This Technical Report is not a wholly independent report as some sections have been prepared and signed off by qualified personnel (QP) from Sierra Metals, the project owner, and Redco, with the term QP used here as it is defined under Canadian Securities Administrator's National 43-101 (43-101) guidelines. Section 2 of this Technical Report explains which report sections were prepared by SRK and which were prepared by Sierra Metals.

The consultant's opinion contained herein is based on information provided to the consultants by Sierra Metals throughout the course of the investigations. SRK has relied upon the work of other consultants in the project areas in support of this Technical Report.

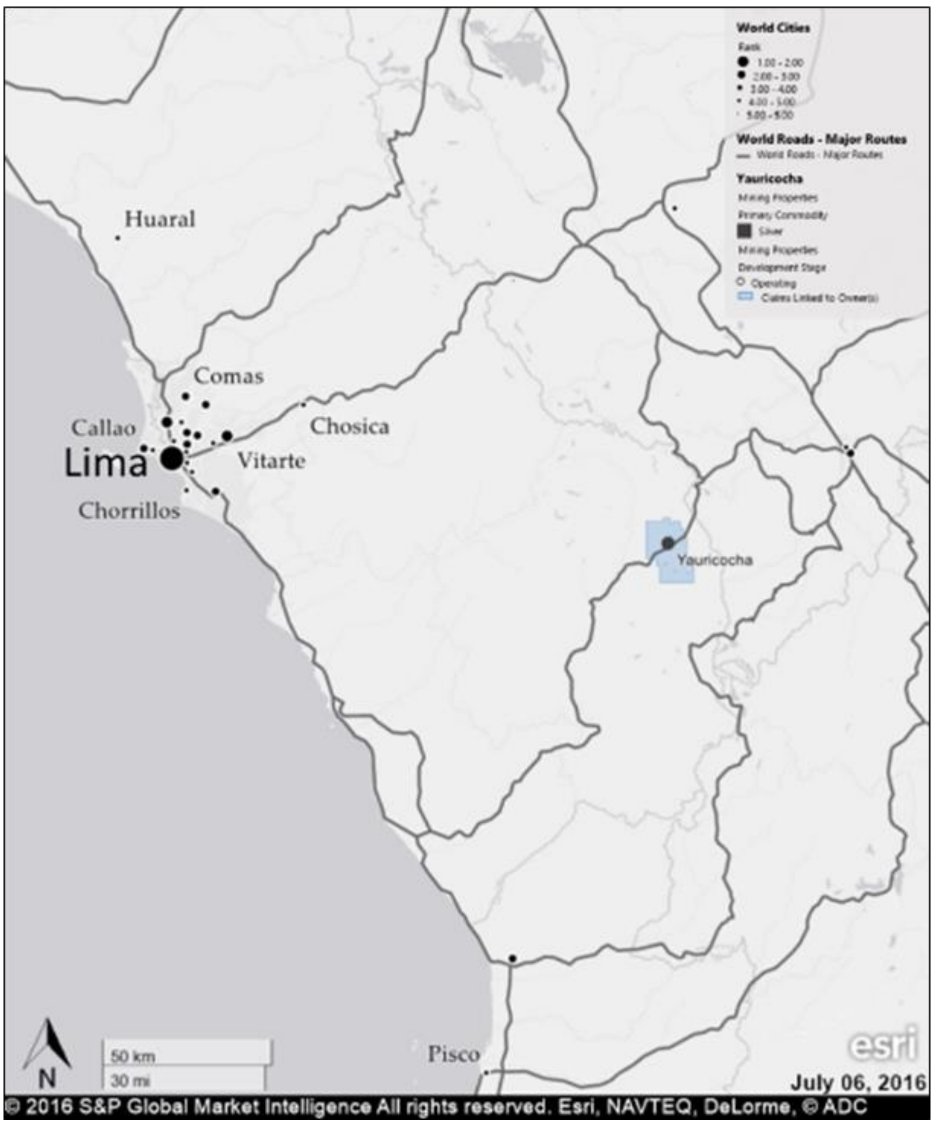
The Consultants used their experience to determine if the information from previous reports was suitable for inclusion in this technical report and adjusted information that required amending. This report includes technical information, which required subsequent calculations to derive subtotals, totals, and weighted averages. Such calculations inherently involve a degree of rounding and consequently introduce a margin of error. Where these occur, the Consultants do not consider them to be material.

SRK received statements of validity for mineral titles, surface ownership and permitting for various areas and aspects of the Yauricocha Mine and reproduced them for this report. These items have not been independently reviewed by SRK and SRK did not seek an independent legal opinion of these items.

4 Property Description and Location

4.1 Property Location

The Yauricocha Mine is in the Alis district, Yauyos province, department of Lima approximately 12 km west of the Continental Divide and 60 km south of the Pachacayo railway station. The active mining area within the mineral concessions is located at coordinates 421,500 m east by 8,638,300 m north on UTM Zone 18L on the South American 1969 Datum, or latitude and longitude of 12.3105.3 S and 75.7219º W. It is geographically in the high zone of the eastern Andean Cordillera, within one of the major sources of the River Cañete, which discharges into the Pacific Ocean. The mine is at an average altitude of 4,600 masl. Figure 4-1 shows the project location. Figure 4-1 shows the project location.



Source : Sierra Metals, 2021

Figure 4-1: Yauricocha Location Map

4.2 Mineral Titles

The mining rights that make up the mining concession Acumulación Yauricocha were transferred to Minera Corona in 2002 (Empresa Minera, 2002) by Empresa Minera del Centro del Peru S.A. (CENTROMIN), as part of the privatization of such sate owned company, for the sum of US$4,010,000, plus an agreement to invest US$3,000,000 to project development, or for social works executed, or handed over to the surrounding communities to the operation; a commitment that has already been thoroughly completed.

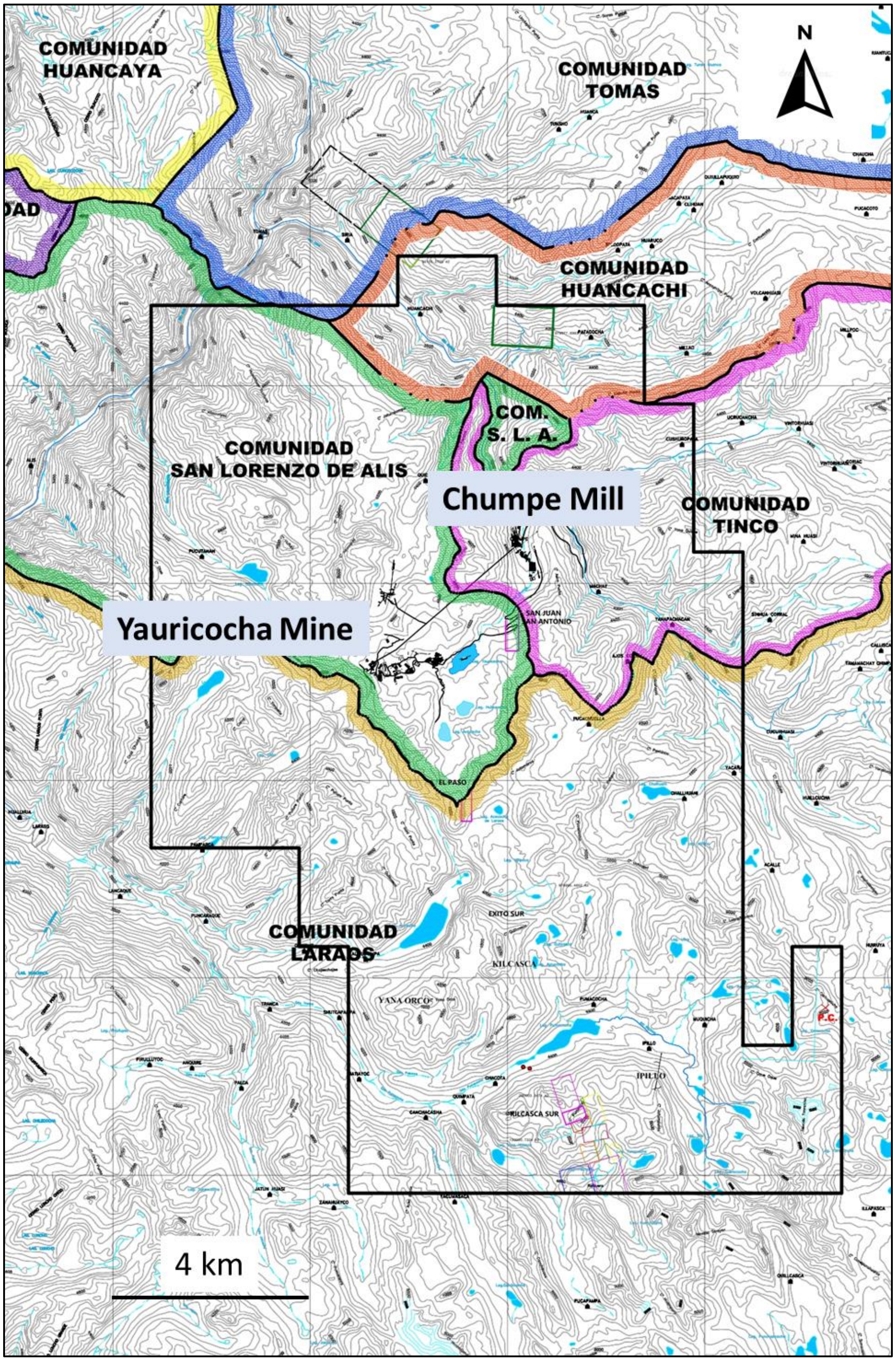
The mining concession Acumulación Yauricocha, constituted in favor of Minera Corona through Presidential Decree No. 1277-2008-INGENMET/PCD/PM dated 22 May 2008, has a total extension of 19,204.57 hectares, and an available area of 18,777.92 hectares for the execution of mining activities of exploration and exploitation. It is located on superficial land which belongs to the peasant communities of San Lorenzo de Alis, santo Domingo de Laraos, Tinco, Huancachi, and Tomas (Figure 4-2).

In May 2011, Dia Bras Peru S.A.C., a subsidiary of Sierra Metals Inc., purchased 82% of Minera Corona, which includes the mining concession Accumulation Yauricocha. According to information provided by Sierra, the mineral concessions are not subject to an expiration date and remain in effect, as long as the following conditions are fulfilled:

1. Compliance with an annual payment of the right of renewal, which condition is established by Peruvian law to keep the validity of the mining right, calculated in the amount of US$3.00 per year and per hectare (ha) granted.
2. Compliance with a minimum yearly production, which condition is established by law, and which will not be inferior to the equivalent of one Unidad Impositiva Tributaria (UIT) per year and per hectare. The UIT is an annual value in soles established by the Peruvian State to determine taxes, infractions, penalties, fines, and other taxation purposes.

Minera Corona has possession of, similarly, the processing site concession of the processing plant of Chumpe, which is in the land of the peasant community of San Lorenzo de Alis, with a total area of 166.383 hectares and a capacity of current processing authorized of 3,600 TM/d as per Directorial Resolution No. 241-2021-MINEM-DGM/V dated 14 June 2021.

The concession of benefit does not have an expiration date; however, similar to the mining concession, its validity is subject to the compliance of the annual obligation of payment of the right of validity, which, for this type of concessions is calculated in respect to the installed capacity for treatment and the UIT in force the corresponding year, in accordance with the scale established in article 46 of the Texto Unico Ordenado de la Ley General de Mineria (General Law of Mining), approved by Supreme decree No. 014-92-EM.



Source: Sierra Metals, 2021

Figure 4-2: Yauricocha Mineral Title Map

4.2.1 Nature and Extent of Issuer's Interest

As part of the process of privatization and of the transference of mining concessions as referred to in Section 4.2, Minera Corona purchased 63.6151 hectares from CENTROMIN in a zone denominated Chumpe-Tinco, (expropriated from the peasant community San Lorenzo de Alis), and 18.9760 hectares in an area called Alis-Tinco-Yauricocha (expropriated from the peasant community Tinco), as well as 6.4134 hectares in an area called Huacuypacha, the latter destined to camp sites for employees, all this land located in the district of Alis, province of Yauyos, department of Lima.

Additionally, Minera Corona has in place several land surface agreements by means of which the title holders of the land surfaces within the area of the Acumulación Yauricocha mining concession, grant the Company the right to use the superficial surface and execute mining activities. The agreements entered by the Company in this regard, are the following:

Contract of Usufruct: Yauricocha

In August 2007, Minera Corona entered an agreement with the peasant community of San Lorenzo de Alis (Villaran, 2009) called Extrajudicial Transaction and Lease Contract, by which Minera Corona is given the exclusive right of a piece of land of 676.6870 hectares, for mining activities in the most ample and possible manner construed, and without limitations whatsoever, until August 2, 2037, or until decommissioning of the mine, whichever occurs first.

In exchange, Minera Corona is mandated to pay the community of San Lorenzo de Alis an annual tariff of S/. 220,000. Initially, in accordance with the terms of the contract, Minera Corona used to pay a tariff of S/. 100,000 in installments of S/. 200,000 every two years; however, in February of 2013, through an addendum to the contract it was established that such payment would be the amount currently in effect of S/. 220,000, to be paid annually. This lease right (beneficial usage) has been duly registered in folio 21000574 of the registry of Land in the registry of Land in the city of Cañete – Lima Site (Public records of Lima et al, 2013).

Lease Agreement: Cachi-Cachi

In March 2012, Minera Corona entered a lease agreement with the Family Varillas, by which the latter granted the right of use of a piece of land of 56.00 hectares called Cachi Cachi to Minera Corona, so that they can carry out their mining activities of exploration and exploitation. The contract, with a validity of 10 years, computed from March 8, 2021, is currently in force until March 7, 2022. This land has not been registered in the public records Office.

Through this agreement, the proprietor granted the use of such land in favor of Minera Corona for a total payment of S/. 210,000.00, whose payment was done in advance and for an only time for all the period of the validity of the contract. In addition to such payment, Minera Corona has agreed to comply with the obligation of attending all environmental passives that their activities may generate.

Contract of Usufruct: Yauricocha Fault

In November 2016, Minera Corona entered a contract of use of land with the peasant community Santo Domingo de Laraos, by which the community granted Minera Corona the exclusive right for using and benefiting from the usage of 5 pieces of land, totaling 1,293.65 hectares in the zones denominated Yauricocha Fault (442.80 hectares), Yauricocha Fault II (222.10 hectares), Exito-El Paso (295.40), Kilcaska (109.30), and Yana Orco (224.05), for the development of exploration activities, and afterwards exploitation activities. The contract, in accordance with the addendum entered by said parties, has a term of 6 years, computed from November 14, 2016, until November 14, 2022, which, if determined that one or a few of the zones become viable for exploitation, the contract will be extended automatically for 2 more years or until the decommissioning plan is executed, whichever happens first. Minera Corona pays the community the sum of US$ 50,000 annually for the leasing contract; a sum that will be increased in US$ 50,000 additional in case of extension to the contract as previously mentioned. The land indicated has not been registered in the Office of Public Records.

Contract of usufruct: Cantera 1

In October 2017, Minera Corona entered an agreement with the peasant community of San Lorenzo de Alis called Extrajudicial Transaction and Lease Contract, by which Minera Corona is given the exclusive right of a piece of land of 12.89 hectares in the area denominated Cantera 1 (also known as Patachuclla), for mining activities in the most ample and possible manner construed, and without limitations whatsoever, from January 1, 2012 until January 1, 2035. For this lease Minera Corona has carried out an only payment in favor of the community of US$ 200,000.00, for all the period of validity of the contract.

The lease contract has been duly registered in folio 21000574 of the Registry of Land in the Registry Office in Cañete – Lima Site.

Lease Contract: VHF Antenna

In July 2018, Minera Corona entered a contract with the community of Tinco for the lease of a piece of land of 265.40 m2 denominated Terreno No. 2, for a term of 5 years computed from July 3, 2018 until July 3, 2023, for the relocation of an antenna of communications of the propriety of Minera Corona. As payment for all the term agreed upon, Minera Corona has carried out payment of US$ 6,000. This land has not been registered in the Office of Public records.

Contract of Easement: Chacapata

In September 2019, Minera Corona entered a contract with the family of Juan de Dios for the right of use over a piece of land of 21.02 hectares, located in the sector denominated Chacapata, by which Minera Corona is granted the right of use for the purposes of gaining access to the land of their property located in the zone denominated Chumpe, for a term of 35 years, computed from March 1, 2002, until March 1, 2037. Minera Corona has carried out an only payment of S/. 38,000.00 for all the term of this contract. This land has not been registered in the Office of Public records.

Lease Contract: Huacuypacha, family Vilchez Yucra

In November 2014, Minera Corona entered a leasing contract with the family Vilchez, by which they granted 04 areas of land of 0.14, 0.13, 0.08, and 0.20 hectares, adjacent to the land denominated Huacuypacha, property of Minera Corona, located in Tinco, property of Minera Corona, for the purposes of right of way and access to pumps and water wells, property of Minera Corona. This land has not been registered in the Office of Public records. The term of this contract is of 8 years expiring on December 31, 2021. Minera Corona has made an only payment in the sum of S/. 30,000 for the term indicated.

Lease Contract: Huacuypacha Novato Basurto,

In August 2018, Minera Corona entered a leasing contract with Mr. Novato Basurcto Arauco, by which he granted a piece of land of 1.36 hectares, adjacent to the land denominated Huacuypacha, property of Minera Corona, located in Tinco, property of Minera Corona, where poles that support the electrical wiring, wells, and conductor pipe are located, property of Minera Corona. This land has not been registered in the Office of Public records. The term of this contract is of 8 years expiring on August 15, 2026. Minera Corona has made an only payment in the sum of S/. 30,000 for the term indicated.

4.3 Royalties, Agreements and Encumbrances

4.3.1 Debt

On March 11, 2019, the Company entered into a new six-year senior secured corporate credit facility (“Corporate Facility”) with Banco de Credito de Peru that provides funding of up to $100 million effective March 8, 2019. The Corporate Facility provides the Company with additional liquidity and will provide the financial flexibility to fund future capital projects as well as corporate working capital requirements. The Company will also use the proceeds of the new facility to repay existing debt balances. The most significant terms of the agreement were:

* Term: 6-year term maturing March 2025

* Principal Repayment Grace Period: 2 years

* Principal Repayment Period: 4 years

* Interest Rate: 3.15% + Inter-banking bid of London at 3 months (LIBOR)

The Corporate Facility is subject to customary covenants, including consolidated net leverage and interest coverage ratios and customary events of default. The Company is complying with all covenants as of March 31, 2019. On March 11, 2019, Dia Bras Peru drew down $21.4 million from this facility. Interest is payable quarterly and interest payments will begin on the drawn and undrawn portions of the facility starting in June 2019.

Principal payments on the amount drawn from the facility began in March 2021. The Company repaid the amount owed on the Corona Acquisition Facility on May 11, 2019, using funds drawn from the new facility. The loan is recorded at amortized cost and is being accreted to face value over 6 years using an effective interest rate of 5.75%.

4.3.2 Royalties and Special Taxes

In September of 2011, the Peruvian Congress passed Law 29789. Under this law, a Special Tax for Mining is introduced, as well as Law 29788 that modifies Law 28258, Law of Mining Royalties. In accordance with these norms, applicable from the last quarter in 2011, the calculations for such concepts are carried out over the basis of operational margins in the mining producing companies, being its compliance mandatory, as indicated, from 2012 onwards. The rates of margins for a given interval of profits before interests and taxes (EBIT) are shown on Table 4-1. The royalty is the sum of the special mining tax and the mining royalty.

Table 4-1: Royalty and Special Tax Scale

EBIT Margin	Special Mining Tax – Margin Rate	EBIT Margin	Mining Royalty – Margin Raw
0.00% 10.00%	2.00%	0.00% 10.00%	1.00%
10.00% 15.00%	2.40%	10.00% 15.00%	1.75%
15.00% 20.00%	2.80%	15.00% 20.00%	2.50%
20.00% 25.00%	3.20%	20.00% 25.00%	3.25%
25.00% 30.00%	3.60%	25.00% 30.00%	4.00%
30.00% 35.00%	4.00%	30.00% 35.00%	4.75%
35.00% 40.00%	4.40%	35.00% 40.00%	5.50%
40.00% 45.00%	4.80%	40.00% 45.00%	6.25%
45.00% 50.00%	5.20%	45.00% 50.00%	7.00%
50.00% 55.00%	5.60%	50.00% 55.00%	7.75%
55.00% 60.00%	6.00%	55.00% 60.00%	8.50%
60.00% 65.00%	6.40%	60.00% 65.00%	9.25%
65.00% 70.00%	6.80%	65.00% 70.00%	10.00%
70.00% 75.00%	7.20%	70.00% 75.00%	10.75%
75.00% 80.00%	7.60%	75.00% 80.00%	11.50%
80.00% 85.00%	8.00%	More than 80%	12.00%
More than 85%	8.40%		

Source: Sierra, 2021

4.4 Environmental Liabilities and Permitting

The mine known as “Acumulación Yauricocha Unit” is located on the property of the San Lorenzo de Alis and Laraos Communities and in the buffer zone of the Nor Yauyos-Cochas landscape reserve. It was established by the Supreme Decree N° 033-2001-AG (06/03/2001). The landscaping reserve Nor-Yauyos-Cochas has in place a Master Plan 2006-2011, approved by Presidential Decree No. 207-2016-SERNANP, of the National Institute of Natural Resources Natural Protected Area Office (INRENA, Instituto Nacional de Recursos Naturales, IANP, Intendencia de Áreas Naturales Protegidas), which, as of today, has not been updated.

Sierra has managed its operations in Acumulación Yauricocha based on:

- Program of Adequacy and Environmental Management (PAMA) of the Unit of Production Yauricocha, presented by CENTROMIN (approved by Directorial Decree No. 015-97-EM/DGM,13/01/1997).
- First modification of PAMA in the Production Unit in Yauricocha (approved by Directorial Resolution No. 331-1997-EM/DGM, 14/10/1997).
- Second modification to the PAMA of the Unit of Production Yauricocha (approved by Directorial resolution No. 419-2001-EM/DGAA of 28 December 2001).
- Modification of PAMA in connection to the Project No.7, keeping the schedule of activities and investments of nine projects of PAMA of the production Unit of Yauricocha, presented by CENTROMIN (approved by Directorial Resolution No. 159-2002-EM-DGAA, 23/05/2002).
- Approval of the execution of the PAMA “Yauricocha” Economic Administrative Unit, presented by Sierra (approved by Directorial Resolution No. 031-2007-MINEM-DGM, 02/08/2007).
- Plan for the closure of mines (PCM) at the level of feasibility of the Production unit of Yauricocha, presented by Sierra (approved by Directorial Resolution No. 258-2009-MINEM-AAM, 24/08/2009).
- Authorization to operate Plant No. 4 (8’ x 10’), and the modification of the concession of benefit “Yauricocha Chumpe” to the extended capacity of 2,500 TMD, presented by Sierra (approved by Resolution No. 279-2010-MINEM-DGM-V, 14/07/2010).
- Updating of the plan for the Closure of the Mine in the Mining Unit Yauricocha (approved by Directorial Resolution No. 495-2013-MEM-AAM of 17 December 2013).
- Technical Report of Support to the PAMA (First Technical Report of Support-ITS of the PAMA) for the extension of the capacity of the plant of benefit Chumpe of the Mining Unit Accumulation Yauricocha from 2,500 to 3,000 TMD (approved by Directorial Resolution No. 242-2015-MINEM-DGAAM, 06/09/2015).
- Mining Technical Report (ITM), Authorization of construction and operation of civil works and installation of new equipment in the plant Chumpe for a capacity of 3,000 TMSD (approved by Directorial Resolution No. 0460-2015-MINEM-DGM/V, 14/10/2015).
- Second Technical Report of Support to the PAMA (Second Supporting Technical Report -ITS to the PAMA) for the “System for the treatment of domestic residual waters” in the Unit of Accumulation Yauricocha (approved by Directorial resolution No. 486-2015-MINEM-DGAAM of 12 November 2015).
- Modification to the Plan for the Closure of the Mining Unit Yauricocha (approved by Directorial Resolution No. 002-2016-MEM-DGAAM of 08 January 2016).
- Second modification to the Plan for the Closure of the Mining Unit Yauricocha (approved by Directorial Resolution No. 063-2017-MEM-DGAAM of 28 February 2017).

- Third Supporting Technical Report to the PAMA (Third Supporting Technical Report – ITS) for the "Addition of new equipment and infrastructure in the process of the concentrator plant Chumpe" in the Accumulation Unit Yauricocha, (approved by Directorial Resolution No. 176-2017-MEM-DGAAM of 03 July 2017.
- Mining Technical Report (ITM), for the addition of new equipment and auxiliary installations, and for the expansion of the area of the concession of benefit "Plant of Benefit Chumpe, Yauricocha, without the modification of the installed capacity of 3,000 TM/day (approved by Directorial Resolution No. 0366-2017-MINEM-DGM of 29 August 2017, rectified by Directorial Resolution No. 0039-2018-MEM/DGM of 15 February 2018, and Directorial Resolution No. 058-2019-MEM/DGM of 13 March 2019).
- Study of Environmental Impact in the Accumulation Mining Unit Yauricocha for the regrowth of the Tailings Deposit in Yauricocha, (approved by Directorial Resolution No. 028-2019-SENACE-PE/DEAR, of 11 February 2019).
- Fourth Supporting Technical Report to the PAMA (Fourth Supporting Technical Report – ITS) of the Unit of Accumulation Yauricocha, (approved by Directorial Resolution No. 051-2019/MEM-DGAAM of 05 April 2019).
- First Supporting technical report to the EIA (First Supporting Technical Report to the EIA) of the Mining Unit Accumulation Yauricocha to specify the disposition of sterile material within the interior of the mine, (approved by Directorial Resolution No. 078-2020-SENACE-PE/DEAR of 07 July 2020).
- Authorization to operate the tailings facilities of Yauricocha up to 4531 meters in altitude (phase 5 – Stage 1) (approved by Directorial Resolution No. 326-2020-MINEM-DGM/V, 20/11/2020).
- Second update of the plan for the closure of the mine of the Mining Unit Yauricocha (approved by Directorial Resolution No. 111-2020/MINEM-DGAAM, 01/09/2020).
- Second Technical Report of Support to the EIA (Second Supporting Technical Report - ITS to the EIA), for the extension of the capacity of the processing plant Chumpe of the Unit Accumulation Yauricocha, from 3,000 to 3,600 TMD (approved by Directorial Resolution No. 041-2021-SENACE-PE/DEAR, 12/03/2021.
- Mining Technical Report (ITM), Authorization of construction and Operation of additional installations in the processing plant for a capacity of 3,600 TMSD, (approved by Directorial Resolution No. 0241-2021-MINEM-DGM/V, 14 June 2021).

The Supporting Technical Reports (ITS) are prepared in compliance with the Supreme Decree N° 054-2013-PCM (article Art. 4) and Ministry Resolution N° 120-2014-MEM/DM and apply to the modification or expansion of mining components, or technological improvements in operations of exploration and exploitation when the environmental impacts are not significant.

Environmental liabilities and permitting are discussed in further detail in Section 20.

4.5 Other Significant Factors and Risks

SRK is not aware of any additional significant factors or risks that affect access, title, right, or ability to perform work on the property.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

Sections 5.1, 5.2, 5.3 and 5.4 of this Report have been excerpted from NI 43-101 Technical Report on the Yauricocha Mine, prepared by Gustavson Associates, report date May 11, 2015 and are shown in italics. Standardizations have been made to suit the format of this report; any changes to the text have been indicated using [brackets].

5.1 Topography, Elevation and Vegetation

The topography of the Yauricocha mining district is abrupt, typical alpine terrain. Pliocene erosion is clearly recognizable in the undulating, open fields to the northeast of the Continental Divide while to the southeast the terrain is cut by deep valleys and canyons. The extent of this erosion is evidenced by mountain peaks with an average elevation of 5,000 masl.

To the southeast of the Continental Divide, the high valleys are related to the Chacra Uplift. Below 3,400 m elevation, this grand period of uplift is clearly illustrated by deep canyons that in some cases are thousands of meters deep. Valleys above 4,000 masl clearly demonstrate the effects of Pliocene glaciations, with well-developed lateral and terminal moraines, U-shaped valleys, hanging valleys and glacial lakes.

Vegetation in the Yauricocha area is principally tropical alpine – rain tundra. The flora is varied with species of grasses, bushes, and some trees. The biological diversity is typical of Andean alpine communities.

5.2 Accessibility and Transportation to the Property

The principal access to the Mine is the main Lima – Huancayo – Yauricocha highway. The highway is paved (asphalt) for the first 420 km, along the Lima – Huancayo – Chupaca interval. From Chupaca to the Mine the road is unpaved.

Another important access route is along the southern Pan-American Highway from Lima through Cañete to Yauricocha, through the valley of the Rio Cañete, for a distance of 370 km. The road is paved (asphalt) from Lima to Pacarán, and from Pacarán to the mine it is unpaved.

5.3 Climate and Length of Operating Season

The climate in the region is cool, with two well-demarcated seasons with daytime temperatures above 20º C; the nights are cool with temperatures below 10º C. Operations are carried out year-round. The wet season extends from November to April, and during April and May there is broad vegetative cover. The dry season covers the remainder of the year.

During the wet season, snow and hail feed the glaciers, which subsequently feed streams that descend the mountainsides and feed the lakes below.

The climate factors do not affect the length of the operating season, and the mine operates continuously year-round.

5.4 Sufficiency of Surface Rights

Overall, the property position including mineral concessions and surface rights are expected to be sufficient for foreseeable mine activities. The project infrastructure is located within the area where Sierra Metals has surface rights. The Cachi-Cachi mine is located within the area of mineral rights, but outside of the area of surface rights. Cachi-Cachi is an underground mine, and surface access to Cachi-Cachi is located within the area of surface rights.

Of the 20 km length of the property along strike, approximately 4 km have been developed near the center of the property.

5.5 Infrastructure Availability and Sources

5.5.1 Power

The primary power is provided through the existing power system, Sistema Interconectado Nacional (SINAC) to the Oroya Substation. A three phase, 60 hertz, 69 kV power line owned and operated by Statkraft (SN Power Peru S.A.) through its subsidiary, Electroandes S.A. delivers electricity from the Oroya Substation to the Project substation at Chumpe. Power is transformed to 69 kV line voltage and approximately 9 MVA is supplied to the mine and 3.75 MVA is supplied to the processing plant.

5.5.2 Water

Water is sourced from Ococha Lagoon, Cachi-Cachi underground mine, and recycle/overflow water from the TSF depending on end use.

5.5.3 Mining Personnel

The largest community in the area is Huancayo located approximately 100 km to the east-northeast. Huancayo and the surrounding communities have a combined population of approximately 340,000. Huancayo is the capital of the Junin Region of Peru.

Project employees live on-site in four accommodation camps: Esperanza, Vista Alegre, Chumpe y Huacuypacha, plus a hotel, with total accommodation facilities for approximately 1,460 people. The camps include the supervisory camp, the mill camp, and the mining camp that also houses mining contractors. There are approximately 1,460 people (400 employees/1,060 contractors) currently working on the site. The camps include, dining facilities, exercise facilities, and housing facilities.

Other general facilities include engineering and geology, safety, and environmental offices and buildings. A health clinic on-site is staffed by a National Health Service doctor. There are additional underground shops, explosives and detonator magazines, and fuel and oil storage facilities. The mine is currently working on a conceptual study of the New Camp in Chumpe with a capacity for 1,700 people, where the staff of Camp Esperanza will be relocated.

5.5.4 Potential Tailings Storage Areas

Tailings from the Chumpe mill are stored in on-site tailings facilities. The tailings undergo flocculation and sedimentation and are then processed through a thickener and channeled to the existing permitted TSF. The dam up to Stage 7 has a capacity of 5,766 k m^3 Currently, Stage 5 Phase 2 (4,533 masl) is under construction for a capacity of 2,046 k m^3. The construction of Stage 6 will occur in 2022 and Stage 7 in 2024.

5.5.5 Potential Waste Rock Disposal Areas

The Project site has existing permitted waste disposal areas as well as systems to handle miscellaneous wastes.

5.5.6 Potential Processing Plant Sites

The site has an existing mineral processing site that has been in use for several years.

6 History

6.1 Prior Ownership and Ownership Changes

The silver of Yauricocha was initially documented by Alexander von Humboldt in the early 1800s. In 1905, the Valladares family filed the claims of what is today the Yauricocha Mine. The Valladares family mined high grade silver mineralized material for 22 years and in 1927, Cerro de Pasco Corporation acquired the Yauricocha claims. In 1948, Cerro de Pasco commenced mining operations at Yauricocha until the Peruvian Military Government nationalized Cerro de Pasco Corporation and Yauricocha became a production unit of State-owned Centromin Peru S.A. for 30 years. In 2002, the Yauricocha unit was privatized and purchased by Minera Corona. Dia Bras (Sierra Metals) acquired 82% of the total equity of Corona in May 2011.

Sierra Metals retains a 100% controlling ownership status in the Yauricocha Mine, through their subsidiary Sociedad Minera Corona S.A. (SMCSA). An unnamed private interest holds 18.16% equity ownership in Yauricocha, with Sierra Metals holding the remaining 81.84%.

6.2 Exploration and Development Results of Previous Owners

Prior to the 1970s detailed production records are unavailable. Since 1973, Company records indicate that Yauricocha has produced 13.6 Mt of mineralized material containing 63 Moz of silver as well as 378 kt of lead, 117 kt of copper and nearly 618 kt of zinc. Since 1979, Yauricocha has averaged 413,000 t of production per year. The historical estimates presented below predate CIM and NI 43-101 reporting standards and therefore cannot be relied upon. These estimates were not used as a basis for the current resource and/or reserve estimates, as the material has already been mined and processed.

Table 6-1 summarizes exploration and mining statistics under Corona ownership prior to Dia Bras acquiring the majority equity from Corona. Mineral inventory is derived from Company reports to Peruvian regulatory Authorities and are not CIM compliant. Mine production is derived from actual mine production records.

Table 6-1: Prior Exploration and Development Results

Year	Exploration (m)	Development and Infill (m)	Exploration & Development (m)	Drilling (DM) By Company (m)	Drilling (DDH) Contractor (m)	Mine Production (t)	Mineral Inventory[1] (t)
2002	2,726	1,160	3,886	1,887		124,377	344,630
2003	3,307	1,648	4,955	3,415		212,677	571,520
2004	1,778	2,245	4,023	2,970		233,486	1,001,350
2005	2,004	2,030	4,034	3,160	8,043	373,546	702,524
2006	788	1,998	2,786	2,999	10,195	487,909	6,371,845
2007	826	1,640	2,466	4,751	6,196	546,652	4,773,198
2008	796	1,584	2,380	5,379	13,445	690,222	4,720,606
2009	872	1,040	1,912	4,955	13,579	802,737	4,974,593
2010	454	632	1,086	4,615	3,527	837,389	5,379,526

Source: Sierra Metals, 2021
Mineral Inventory included Proven and Probable Reserves and Indicated Resources as reported to the Peruvian Exchange and is not CIM compliant. These numbers are for historic information purposes only.

6.3 Historic Production

Historic production is shown in Table 6-2 and is based on Yauricocha Mine production reports.

Table 6-2: Historic Yauricocha Production (From Mine Production Reports)

Fiscal Year	Data Source	Date Ended	Mineralized Material Processed (t)	Ag (oz)	Cu (t)	Zn (t)	Pb (t)
2001	Reported Actual	12/31/2001	235,000	1,124,086	530	15,136	8,402
2002	Reported Actual	12/31/2002	124,000	592,538	356	7,736	4,965
2003	Reported Actual	12/31/2003	213,000	898,066	803	11,389	6,540
2004	Reported Actual	12/31/2004	356,800	643,000	1,046	14,952	996
2005	Reported Actual	12/31/2005	374,642	868,000	2,491	22,657	6,883
2006	SNL Standardized Estimate	12/31/2006	269,333	915,717	3,902	20,620	7,070
2007	Reported Actual	12/31/2007	NA	NA	5,330	NA	NA
2008	Reported Actual	12/31/2008	NA	1,832,550	5,456	20,466	11,560
2009	Reported Actual	12/31/2009	790,743	NA	NA	NA	NA
2010	Reported Actual	12/31/2010	837,839	NA	NA	NA	NA

Source: Sierra Metals, 2021

7 Geological Setting and Mineralization

Sections 7.1, 7.2 and 7.3 of this Report has been excerpted from NI 43-101 Technical Report on the Yauricocha Mine, prepared by Gustavson Associates, report date May 11, 2015 and are shown in italics. Some new information has also been provided by Sierra Metals. Standardizations have been made to suit the format of this report; any changes to the text have been indicated by the use of [brackets].

7.1 Regional Geology

Most of the stratigraphy, structure, magmatism, volcanism and mineralization in Peru are spatially- and genetically-related to the tectonic evolution of the Andean Cordillera that is situated along a major convergent subduction zone where a segment of the oceanic crust, the Nazca Plate, slips beneath the overriding South American continental plate. The Andean Cordillera has a metamorphic rock basement of Proterozoic age on which Hercynian Paleozoic sedimentary rocks accumulated and were, in turn, deformed by plutonism and volcanism to Upper Paleozoic time. Beginning in the Late Triassic time, following Atlantic Ocean rifting, two periods of subduction along the western margins of South America resulted in the formation of the present Andes: the Mariana-type subduction from the Late Triassic to Late Cretaceous and Andean-style subduction from the Late Cretaceous to the present. Late Triassic to late Cretaceous Mariana-type subduction resulted in an environment of extension and crustal attenuation producing an oceanic trench, island arcs, and back arc basin from west to east. The back-arc basin reportedly has two basinal components, the Western Basin and Eastern Basin, which are separated by the Cusco – Puno high, probably part of the Maranon Arch. The basins are largely comprised of marine clastic and minor carbonate lithologies of the Yura and Mara Groups overlain by carbonates of the Ferrobamba Formation. The western back-arc basin, called the ‘Arequipa Basin’, is the present Western Andean Cordillera of Peru; the site of a Holocene magmatic belt that spans the Andes and was emplaced from Late Oligocene to 25 Ma.

The Western Andean Cordillera is recognized for its world class base- and precious-metal deposits, many of which have been intermittently mined since Incan time. Most of the metal deposits in Peru are spatially and genetically associated with metal-rich hydrothermal fluids generated along magmatic belts that were emplaced along convergent plate tectonic lineaments. Furthermore, many of these primary base-metal deposits have undergone significant supergene enrichment due to uplift and weathering over the last 30 Ma.

Radiometric studies have correlated the igneous host rocks and attendant hydrothermal alteration for some of the largest and richest porphyry copper deposits in the world along the Western Andean Cordillera from 6° to 32° south, including the Chalcobamba – Tintaya iron-gold-copper skarn and porphyry belt (30 to 35 Ma) in the main magmatic arc, southward through the Santa Lucia district (25 to 30 Ma) and into Chile. The Andahuaylas-Yauri Porphyry Copper Belt, a well-known 300 km long porphyry copper belt related to middle Eocene to early Oligocene calc-alkaline plutonism, is situated along the northeastern edge of the Western Andean Cordillera.

7.2 Local Geology

The local geology of the Yauricocha mine has been well understood by Minera Corona personnel for a number of years and is summarized as follows. Figure 7-1 and Figure 7-2 show the local surface geology of the Yauricocha area.

Goyllarisquizga Formation

The oldest rocks exposed in the area are the lower Cretaceous Goyllarisquizga arenites. This formation is approximately 300 m thick and comprises thick gray and white arenites, locally banded with carbonaceous lutites as well as small mantos of low-quality coal beds and clay. In the vicinity of Chaucha, these arenites have near their base interbedded, red lutite. The arenites crop out in the cores of the anticlines southwest of Yauricocha, as beds dispersed along the Chacras uplift, and isolated outcrops in the Éxito zone.

Jumasha Formation

The mid-Cretaceous Jumasha Formation consists of massive gray limestone, averages 700 m thick, and concordantly overlies the Goyllarisquizga Formation. Intercalations of carbonaceous lutites occur at its base near the contact with the arenites. These layers are succeeded by discontinuous lenses of maroon and grey limestone, occasionally with horizons of lutite and chert about 6 m thick. Also present are pseudo-breccias of probable sedimentary origin and a basaltic sill.

Celendín Formation

The Celendín Formation concordantly overlies the Jumasha Formation and contains finely stratified silicic lutites with intercalations of recrystallized limestone of Santoniana age as well as the France Chert. The average thickness in the Yauricocha area is 400 m.

Casapalca Red Beds

The Casapalca red beds lay concordantly on the Celendín Formation with a gradational contact. It has been assigned an age between upper Cretaceous and lower Tertiary, but because of the absence of fossils its age cannot be precisely determined. It is composed primarily of calcareous red lutites, pure limestones, and reddish arenaceous limestone. Lava flows and tuffaceous beds have been occasionally reported.

Intrusions

Major intrusive activity occurred during the Miocene period. Radiometric K-Ar ages derived from biotite samples taken in the Yauricocha and Éxito areas yield an average age of 6.9 Ma. The intrusives cut the sediments at a steep angle and exhibit sharp contacts, as well as a tendency to follow the regional strike and dip of the structure. The intrusions vary in size from bodies of several hundred square meters to large masses that cover several square kilometers. Small intrusive compositions vary from granodiorite to quartz monzonite at margins and are typically porphyritic with phenocrysts of plagioclase, orthoclase, biotite, hornblende and quartz. The plagioclases vary from orthoclase to andesine.

Metamorphism

All of the intrusions have produced metamorphic aureoles in the surrounding rocks. The extent, type, and grade of metamorphism vary greatly with the type of rock intruded. The rocks have been altered to quartzites, hornfelsed lutites, and recrystallized limestones. Locally, the intrusions have produced narrow zones of skarn of variable width. These skarn zones contain epidote, zoisite, tremolite, wollastonite, phlogopite, garnet, chlorite and diopside.

Structure

The Andean Cordillera uplift has dominated the structural evolution of the Yauricocha area through episodes of folding, fracturing, and brecciation associated with the local structure having a general NW-SE strike principally expressed as follows:

Folds

Various folds make up the principal structures of the Yauricocha area. The Purísima Concepcíon anticline and the France Chert syncline occur in the Mina Central area, while the Cachi-Cachi anticline and Huamanrripa al Norte syncline and the Quimpara syncline occur immediately to the south of Lake Pumacocha, north of Mina San Valentíne.

The Purísima Concepcíon anticline, located southwest of the Yauricocha Mine in the Mina Central area, is well defined by a tightly folded basaltic sill 17 m thick. The axial trace trends approximately N50W with a gentle SE plunge of 20°. In the axis of this anticline and towards Flanco East, the basaltic sill contains occurrences of disseminated gold in horizontal, silicic breccias.

The France Chert syncline is a tight fold, also in the Mina Central area, but located northeast of the mine. Its axial trace changes trend from N35W in the south to N65W in the north and has a SE40 plunge. The Yauricocha mineral deposit is found in the west flank of this fold and in banded limestones without subsidiary folding.

In the Mina Central area, the NW strike of the folded sediments was rotated about 30° clockwise horizontally. This distortion can be attributed to a basement shear fault that strikes NE-SW. The axial trace of the Cachi-Cachi-Prometida anticline strikes approximately N80W to N70W and its flanks dip to the north (Prometida) and south (Cachi-Cachi) with a plunge to the east. Mineralization in the vicinity of the major North Intrusive located 2 km north of Mina Central is associated with this fold.

The Quimpara syncline, located 1 km south of the discharge stream of Pumacocha Lake, has an axial trace that strikes N45W. Its east flank is in contact with the intrusive at an angle dipping 70° to 75°W. Its west flank dips about 80°E conformably with beds of dark gray limestone that are recrystallized in the vicinity of the contact. Garnets, magnetite and copper oxides occur in the same contact.

Fractures

Diverse systems of fractures were developed during episodes of strong deformation.

Folding occurred before and/or contemporaneous with intrusive emplacement. Primary fractures developed during folding along with longitudinal faults parallel to the regional strike of the stratigraphy. These faults combined to form the Yauricocha Fault along the Jumasha limestone-Celendín lutite contact. The Yauricocha Fault extends a great distance from the SE of the Ipillo mine continuing to the north behind Huamanrripa hill, parallel to and along Silacocha Lake.

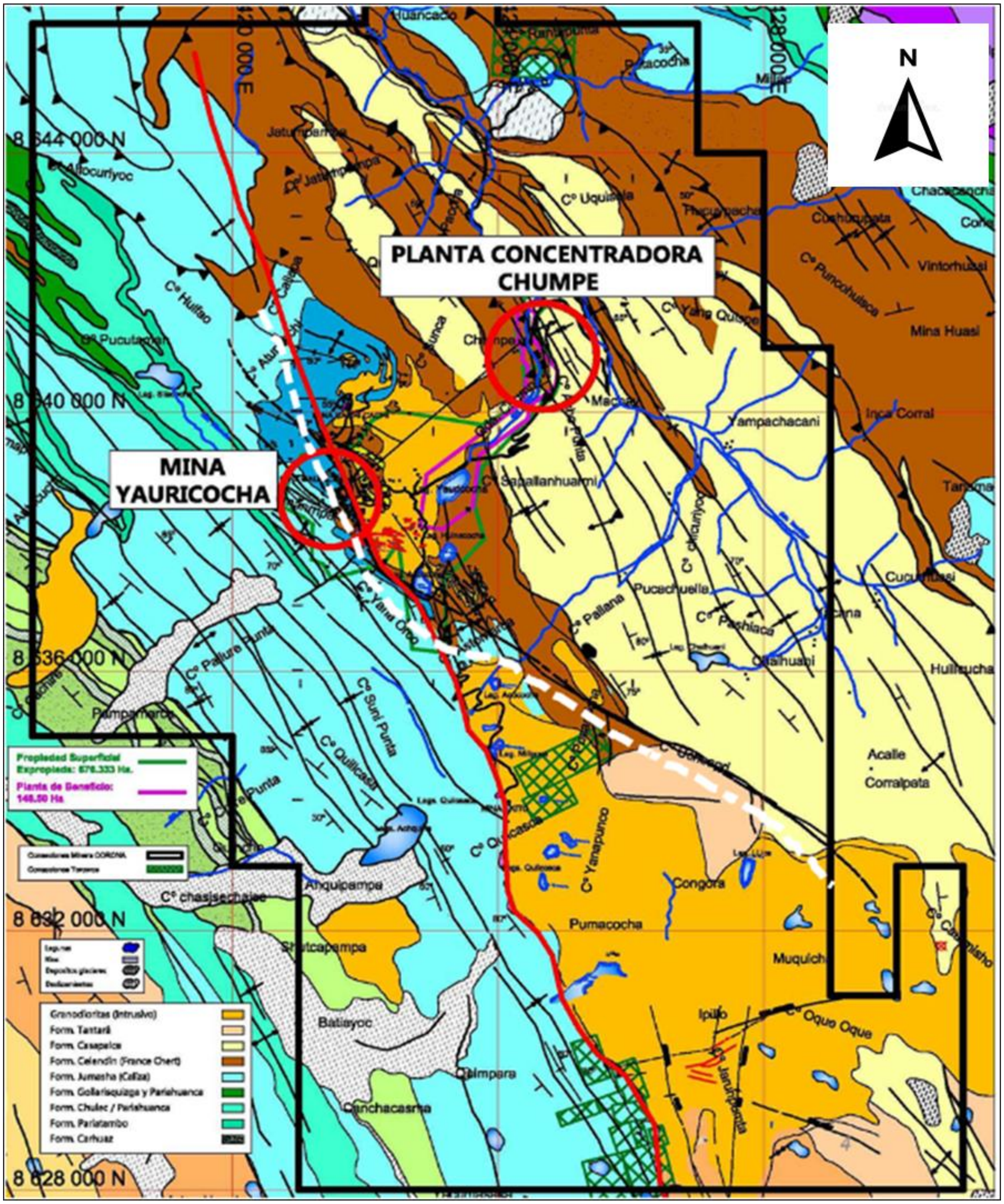
After the intrusions were emplaced, the strike of the folds NW of the mine was rotated by strong horizontal forces some 30°. As a result of this rotation, three sets of shears and joints were developed: NW-SE, NE-SW and E-W with dips of 50-80° NE or SW first, then 60-85° SE or NW, and finally N or S with nearly vertical dips. This set of fractures forms fault blocks that cut the dominant lithologies of the area and join with the Yauricocha Fault. The Yauricocha Fault is the most significant fault in the mining district and is a strong control on mineralization.

Contacts

The contacts of the Jumasha limestone-Celendín lutite, the Jumasha limestone-intrusions, and Celendín lutite-intrusions had major influence on the development of folds, fractures and ascension of mineralizing fluids.

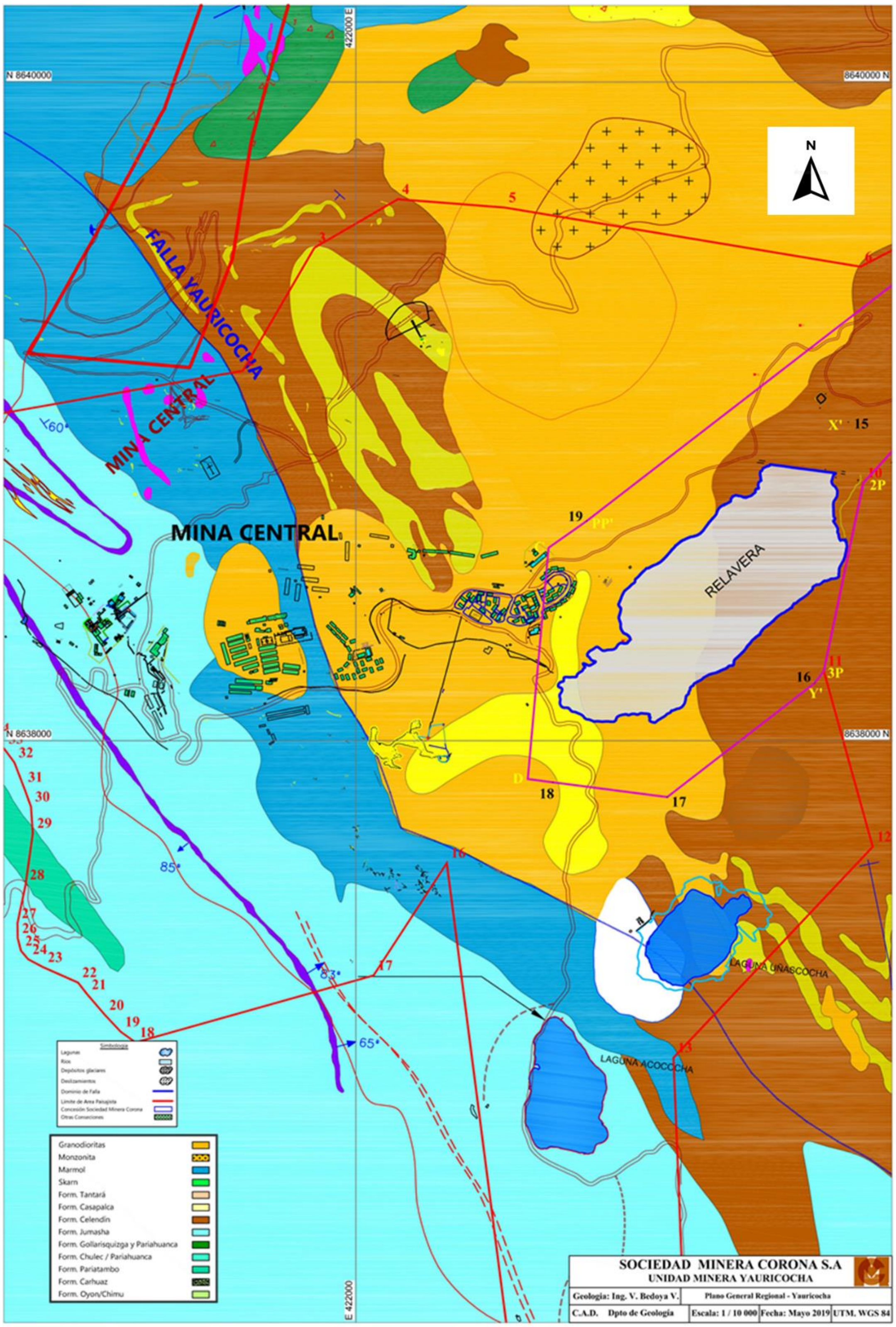
Breccias

The breccias that occur in the Yauricocha area typically follow structural lineaments and occur predominantly in the limestones associated with contacts and intersections of fractures. They form tabular and chimney-like bodies. Tectonic breccias, forming near intrusions or contacts, constitute some of the principal receptive structures for mineralization.



Source: Sierra Metals, 2021

Figure 7-1: Local Geology Map



Source: Sierra Metals, 2021

Figure 7-2: Geologic Map of Yauricocha Mine Area

7.3 Significant Mineralized Zones

Mineralization at the Yauricocha Mine is represented by variably oxidized portions of a multiple-phase polymetallic system with at least two stages of mineralization, demonstrated by sulfide veins cutting brecciated polymetallic sulfide mineralized bodies. The mineralized bodies and quartz-sulfide veins appear to be intimately related and form a very important structural/mineralogical assemblage in the Yauricocha mineral deposit. Comments herein made regarding the characteristics of the Yauricocha district apply directly to the Minera Corona Yauricocha Mine.

All parts of the property with historic exploration or current production activity are in the current area of operations. This area is nearly centered within the concession boundary and there is both space and potential to expand the resources and the operation both directions along the strike of the Yauricocha Fault.

Minera Corona has developed local classifications describing milling and metallurgical characteristics of mineralization at Yauricocha: polymetallic, oxide, and copper. “Polymetallic” mineralization is represented by Pb-Zn sulfides, often with significant Ag values, “oxide” refers to mineralization that predominantly comprises oxidized sulfides and resulting supergene oxides, hydroxides and/or carbonates (often with anomalous Au), and the “copper” classification is represented by high values of Cu with little attendant Pb-Zn.

8 Deposit Types

Section 8.1 of this Report have been excerpted from NI 43-101 Technical Report on the Yauricocha Mine, prepared by Gustavson Associates, report date May 11, 2015, and are shown in italics. Some new information has also been provided by Sierra Metals. Standardizations have been made to suit the format of this report; any changes to the text have been indicated by the use of [brackets].

8.1 Mineral Deposit

Mineralization in the Yauricocha district is spatially and genetically related to the Yauricocha stock, a composite intrusive body of granodioritic to quartz monzonitic composition that has been radiometrically dated at late Miocene (approximately 7.5 million years old) (Giletti and Day, 1968). The stock intrudes tightly folded beds of the late Cretaceous Jumasha and Celendín Formations and the overlying Casapalca Formation (latest Cretaceous and Paleocene?). Mineralized bodies are dominantly high-temperature polymetallic sulfide bodies that replaced limestone. Metal-bearing solutions of the Yauricocha magmatic-hydrothermal system were highly reactive and intensely attacked the carbonate wall rock of the Jumasha and Celendín Formations, producing the channels in which sulfides were deposited. Base and precious metals were largely precipitated within several hundred meters of the stock (Lacy, 1949; Thompson, 1960). Skarn is developed adjacent to the stock but does not host appreciable amounts of economic mineralization (Alverez and Noble, 1988). Mineralization typically exhibits both vertical and radial zoning and there is a pronounced district zoning, with an inner core of enargite (the principal copper mineral) giving way outward to an enargite-chalcopyrite-bornite zone, which in turn is succeeded to the west by zones characterized by sphalerite, galena and silver (Lacy, 1949; Thompson, 1960).

The mineralized zones at Yauricocha are partially to completely oxidized and extend from the surface to below level 1220. Supergene enrichment is closely related to oxidation distribution. Supergene covellite, chalcocite and digenite are found where the sulfide minerals are in contact with oxidized areas.

Mineralization at Yauricocha very closely resembles that typified by polymetallic Ag-Au deposits, which comprise quartz-sulfide-carbonate fissure vein equivalents of quartz-sulfide and carbonate-base metal deposits. These deposits are best developed in Central and South America, where they have been mined since Inca times as important Ag sources. Quartz and pyrite of the quartz-sulfide Au +/- Cu mineralization suite typically occur early in the paragenetic sequence; carbonate-hosted mineralization and some polymetallic Ag-Au veins evolved at a later stage. Predominant controls on mineralization are structural, where dilatational structures, voids resulting from wall rock dissolution, and/or rheologic dissimilarities at contacts between units serve as enhanced fluid pathways for mineralizing solutions.

8.2 Geological Model

The geological model used for the Yauricocha deposit has been developed and verified through extensive exploration and mining activities during more than 50 years of mining. The QP is of the opinion that the geological model is appropriate and will continue to serve the company going forward.

9 Exploration

Since 2016, surface exploration has focused more on areas surrounding the Central mine, mainly to the south of the mine in the areas of Doña Leone, El Paso, Success, Kilcaska and the South Yauricocha Fault. The work has consisted of detailed geological mapping, sampling for geochemical interpretation and focusing on areas with strong anomalies. During 2017, the Canadian company, Quantec Geoscience Ltd., was contracted to perform a surface geophysical study using the Titan 24 DC resistivity induced polarization (DCIP) & Magnetotelluric (MT) methods.

The Yauricocha mining district contains multiple polymetallic deposits represented by skarn and carbonate replacement bodies and intrusion-hosted veins related to Miocene-era magmatism. Mineralization is strongly structurally controlled with the dominant features being the Yauricocha Fault and the contact between the Jumasha limestones and the Celendín Formation (especially the France Chert). Exploration is being conducted to expand the mineralized zones currently being exploited as well as on prospects in the vicinity of the operations.

Exploration in or close to the mining operations is of higher priority since it is performed under existing governmental and community permits. Any exploration mineralization discovery can be quickly incorporated into defined mineral resources and reserves and therefore the mine’s business plan.

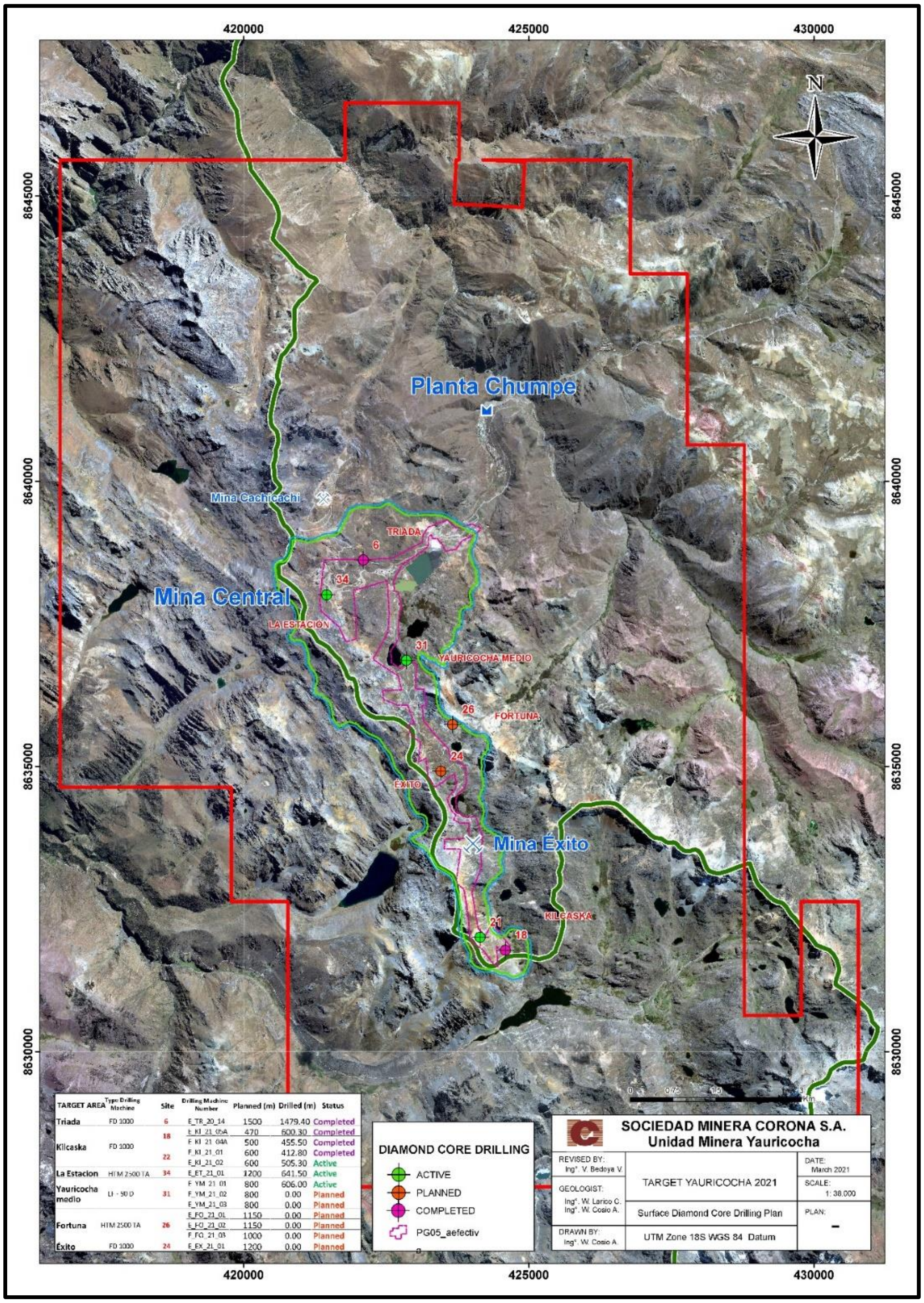
9.1 Relevant Exploration Work

Exploration in the district has been ongoing and work has been successful in delineating several targets (described above) for future drilling or exploration development. This work has included detailed geological mapping of the areas, surface rock chip sampling, and limited trench / channel sampling.

The 2021 planned underground and surface drilling programs have been revised due to the impact of the Covid Pandemic. Planned diamond core drilling for 2021 is focused on the areas of Kilcasca, Éxito, Fortuna, Yauricocha Medio and La Estación (Figure 9-1). A total of 11,770 m of surface drilling comprising 13 drillholes is planned for 2021, budgeted at US$1.2 million.

During the period of June 3, 2017, to September 6, 2017, a geophysical survey was carried out with the Titan-24 DCIP & MT Survey method. A total of 20 DCIP-MT profiles (23 differentials) were carried out, ranging from 400 m to 500 m covering 54.2 km. Based on this work, several anomalous areas were identified, and priority has been given to diamond drilling these areas from surface. The most relevant geophysical targets in order of priority are Doña Leona, El Paso-Éxito, Victoria and Alida.

Kilcaska is situated 7.5 km southeast of the Yauricocha mine. Historically, the polymetallic Francolina and Felicidad mineralized bodies were exploited in the Kilcaska area. El Paso-Éxito is located 3.5 km southeast of the Yauricocha mine, in the vicinity of the Éxito and Antonia mines. Éxito and Antonia mines are historical Pb, Zn, Cu and Ag producers. Fortuna is located 3.5 km southeast of Central Mine within the Yauricocha fault zone. Yauricocha Medio is located 2.2 km southeast of Central Mine, where historical mining took place. La Estación is a historical mined area located 350 m west of Central Mine, where sulfide mineralization has been noted during geological mapping.



Source: Sierra Metals, 2021

Figure 9-1: Yauricocha Surface Exploration Drilling Areas

9.2 Sampling Methods and Sample Quality

Sampling of exploration targets generally features rock chip or hand samples taken by geologists from surface outcrops using rock hammers and chisels. These samples are point samples and should be considered indicative of mineralization rather than representative of any volume or tonnage.

In cases where channel or trench samples are collected, these are done so using pickaxes, shovels, chisels, hammers, and other hand tools, and are likely more representative of the mineralization as they are taken across the strike of mineralization observed at surface.

Regardless, the results of exploration related sampling in this context are used as guides for future drilling programs, rather than resource estimation.

9.3 Significant Results and Interpretation

There have been satisfactory results with exploration diamond drilling in the Cuye mineralized area where additional mineralization has been identified and designated as Cuye iii and Cuye Sur respectively. Similarly, in the Esperanza area additional polymetallic mineralization was identified and designated as Esperanza ii. Neither of these zones have been included in the 2021 mineral resources as they require additional drilling to define the mineralized zones' morphologies and grade distribution.

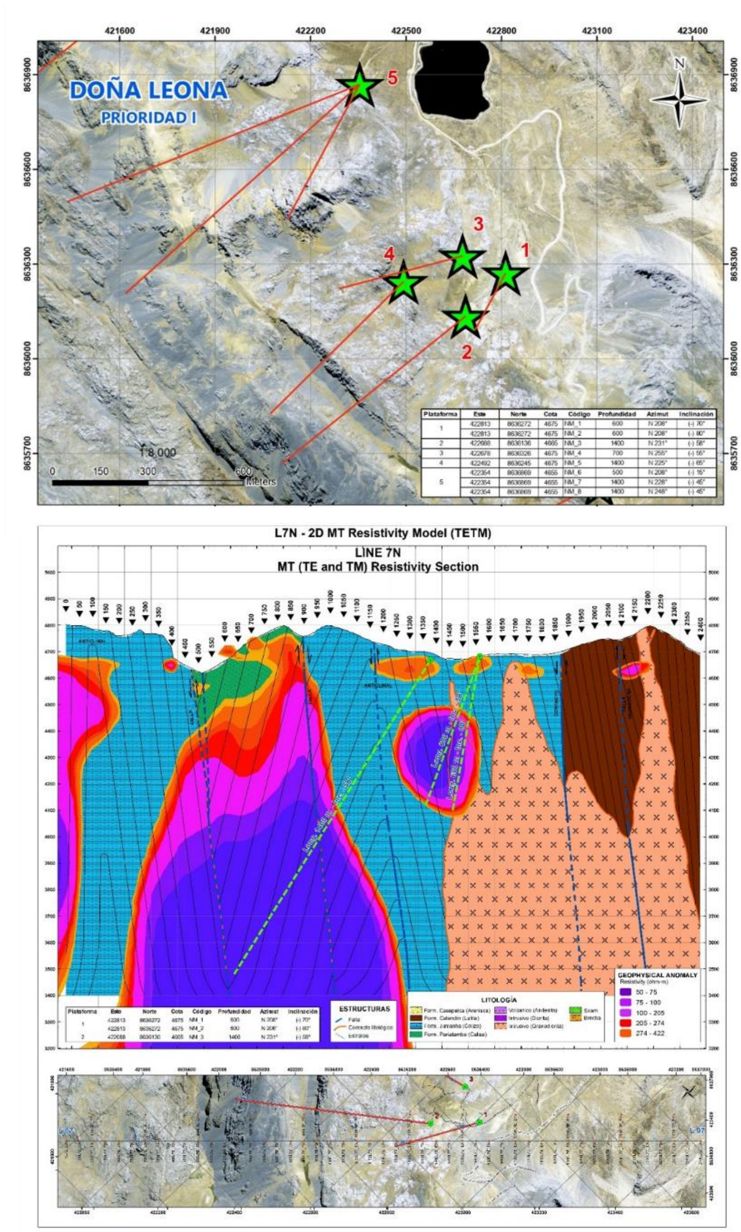
The 2017 surface geophysical survey interpretation has identified several resistivity anomalies in the Doña Leona, El Paso-Éxito and Victoria areas located within less than 10 km of the current Yauricocha mine area.

Replacement-type alteration within the Jumasha limestones, intense brecciation, silicification and localized skarns have been observed during surface mapping of the Doña Leona area. Doña Leona's interpreted low resistivity geophysical anomalies (less than 205 ohm/p) are the focus of exploration drilling (Figure 9-2). A low resistivity anomaly can be indicative of metallic mineralization, whereas a narrow high resistivity zone surrounding a very low resistivity zone can be an indication of alteration such as silicification. Surface geochemical sampling of non-mined areas' structure have yielded results as high as 22.36% zinc, 11.45% lead, 0.19% copper and 43.5 ppm silver. Historically mined areas' re-sampling has yielded values as high as 10.78% zinc, 5.36% lead, 0.01% copper and 58.8 ppm silver. No exploration drilling is planned for 2021 in this area. However, potential exploration drilling sites for 2022 have been planned.

In the El Paso-Éxito granodiorite and diorite intrusives were observed during geological mapping within the limestones and marbles of the Jumasha and Pariatambo Formations. The Chonta Fault lies to the extreme west of the area. Contact metasomatism and skarn development have been observed at contacts between the intrusives and the limestones. Therefore, these contacts are the focus of the current exploration drilling. The geophysical resistivity anomalies are not as prominent as those interpreted at Doña Leona (Figure 9-3). Furthermore, the most prominent anomaly is significantly deeper below surface. The historical Éxito mine yielded grades of 14.00% zinc, 3.00% lead, 0.60% copper and 37.3 ppm silver. El Paso was historically mined by Cerro de Pasco

Corporation and Centro Min Perú who exploited oxidized mineralization. The average grade mined at El Paso has been recorded as 183.0 ppm silver, 17.93% lead, 7.40% zinc, 0.96% copper and 0.20 ppm gold.

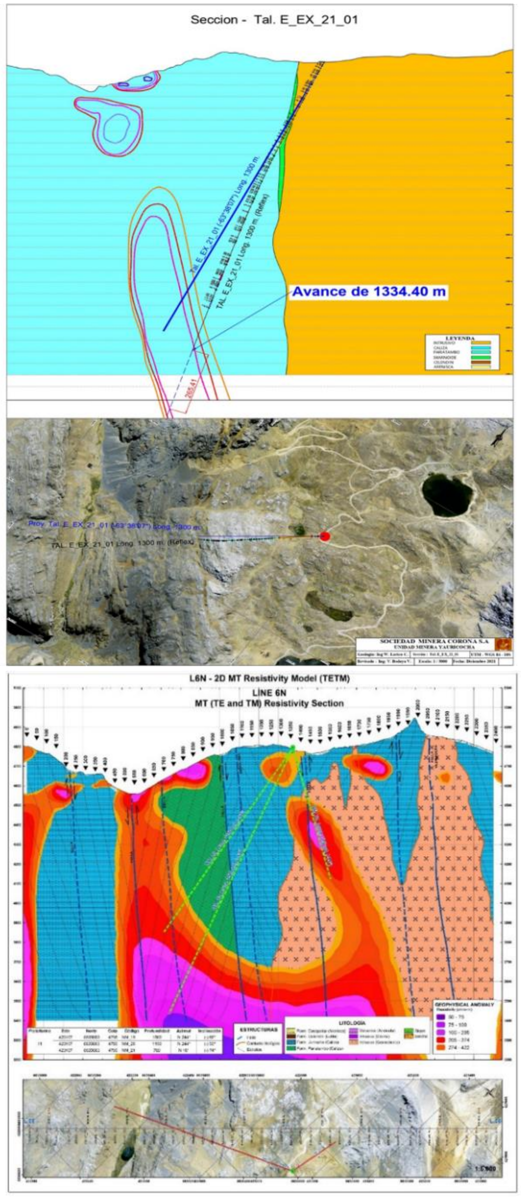
In the surrounding area geochemical sampling have yielded results of 95 to 10,000 ppm lead, 76 to 10,000 ppm zinc and 50 to 490 ppm copper. These geochemical results are lower than the results at other exploration targets and the largest geophysical anomaly is significantly deeper than the other exploration target areas. Therefore, the El Paso-Éxito exploration target is of a lower priority for exploration. However, exploration drilling in the Éxito area is planned in 2021.



srk consulting	Sierra Metals Inc.	Doña Leona low resistivity exploration target
	Yauricocha Mine	Date: 21/12/2021

Source: Sierra Metals, 2021

Figure 9-2: Doña Leona Exploration Target Areas and Conceptual Drilling Plan

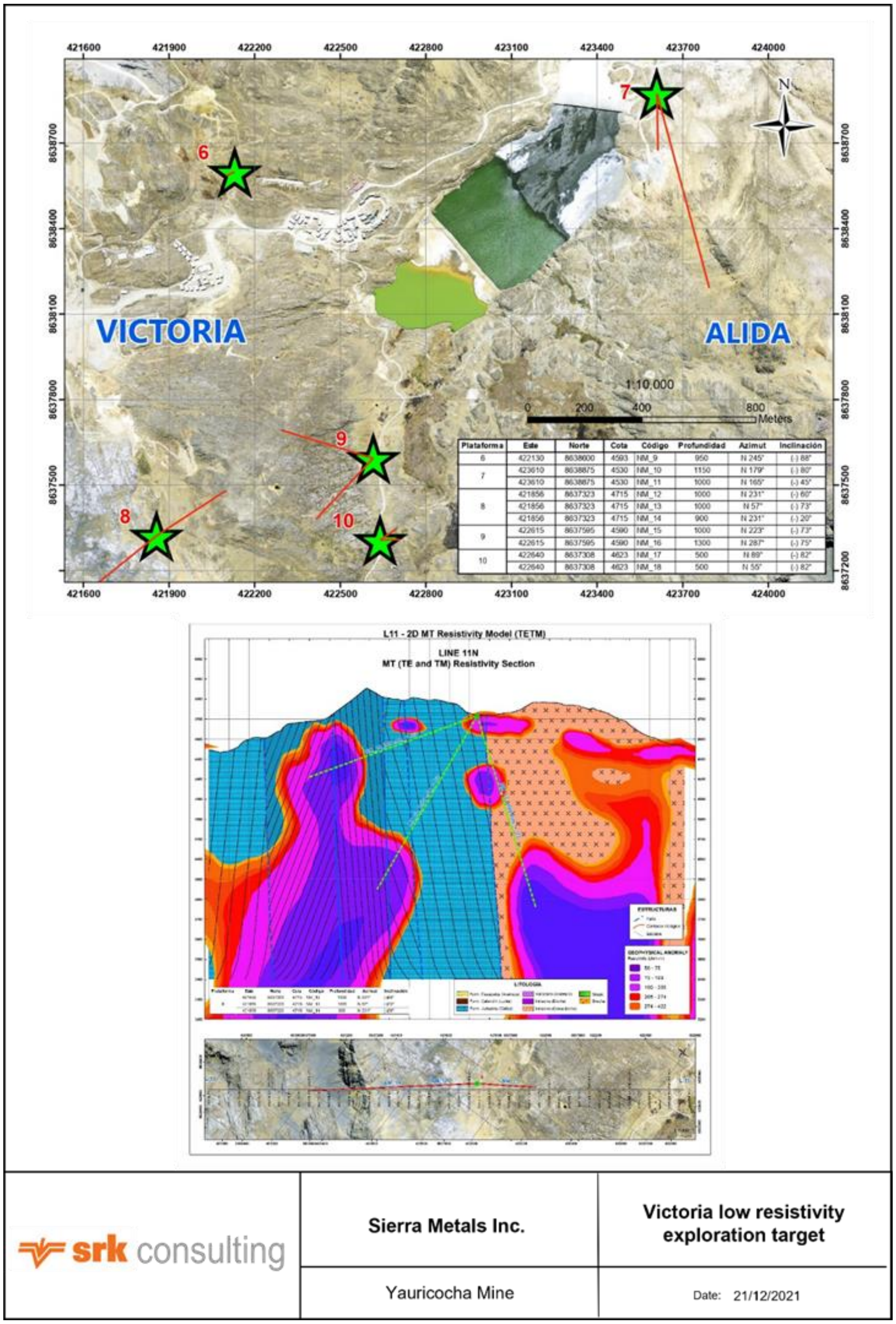


srk consulting	Sierra Metals Inc.	El Paso-Éxito low resistivity exploration target
	Yauricocha Mine	Date: 21/12/2021

Source: Sierra Metals, 2021

Figure 9-3: El Paso-Éxito 2021 Exploration Target Area and 2021 Drilling Plan

The Victoria and Alida exploration areas are in the proximity to the northwest – southeast trending Yauricocha Fault. Extensive outcrops of granodiorites have been observed in contact with the Jumasha Formation limestones. Argillic and phyllic alteration occur at these contacts. Historically, narrow veins were mined in the area yielding grades in the region of 2.80% copper, 0.70% zinc, 0.60% lead and 6.00% arsenic. The arsenic values could pose a future mining issue as it is a deleterious element. Surface quartz veins and stockwork have been geochemically sampled producing grades as high as 3.00% zinc, 1.00% lead and 0.60% copper. Marble and skarn outcrop geochemical sampling have yielded values as high as 8.30% lead, 6.80% zinc, 0.80% copper and 93.3 ppm silver. A large low resistivity geophysical anomaly is an exploration drilling target area to be considered in the future (Figure 9-4) and therefore, not part of the 2021 exploration drilling program.

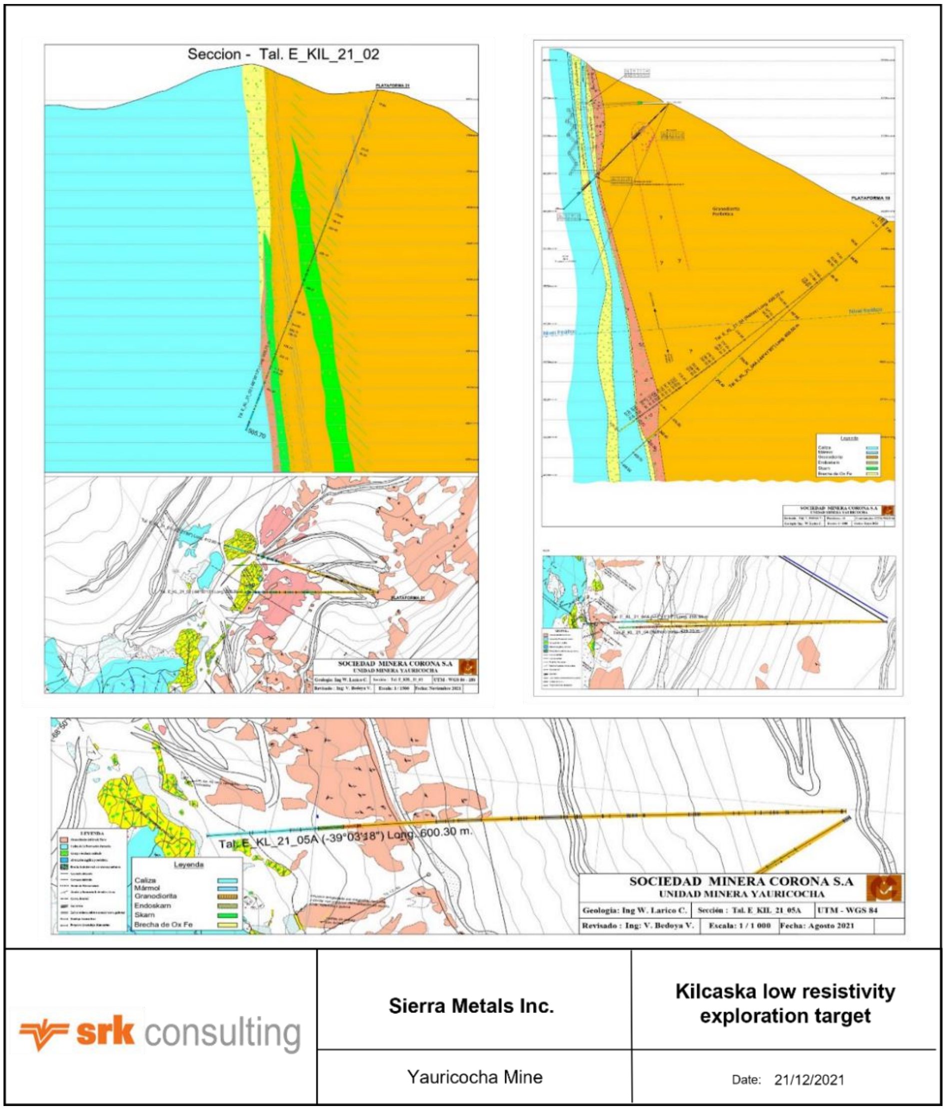


Plataforma	Este	Norte	Cota	Código	Profundidad	Azimut	Inclinación
6	422130	8638600	4593	NM_9	950	N 245°	(-) 88°
7	423610	8638875	4530	NM_10	1150	N 179°	(-) 80°
	423610	8638875	4530	NM_11	1000	N 165°	(-) 45°
8	421856	8637323	4715	NM_12	1000	N 231°	(-) 60°
	421856	8637323	4715	NM_13	1000	N 57°	(-) 73°
	421856	8637323	4715	NM_14	900	N 231°	(-) 20°
9	422615	8637595	4590	NM_15	1000	N 223°	(-) 73°
	422615	8637595	4590	NM_16	1300	N 287°	(-) 75°
10	422640	8637308	4623	NM_17	500	N 89°	(-) 82°
	422640	8637308	4623	NM_18	500	N 55°	(-) 82°

Source: Sierra Metals, 2021

Figure 9-4: Victoria and Alida Exploration Target Areas and Conceptual Drilling Plan

Additional mapping and sampling have been conducted in the South Yauricocha Fault and South Kilkaska areas (Figure 9-5). The Éxito granodiorite intrusives are in contact with the calcareous rocks of the Jumasha Formation.

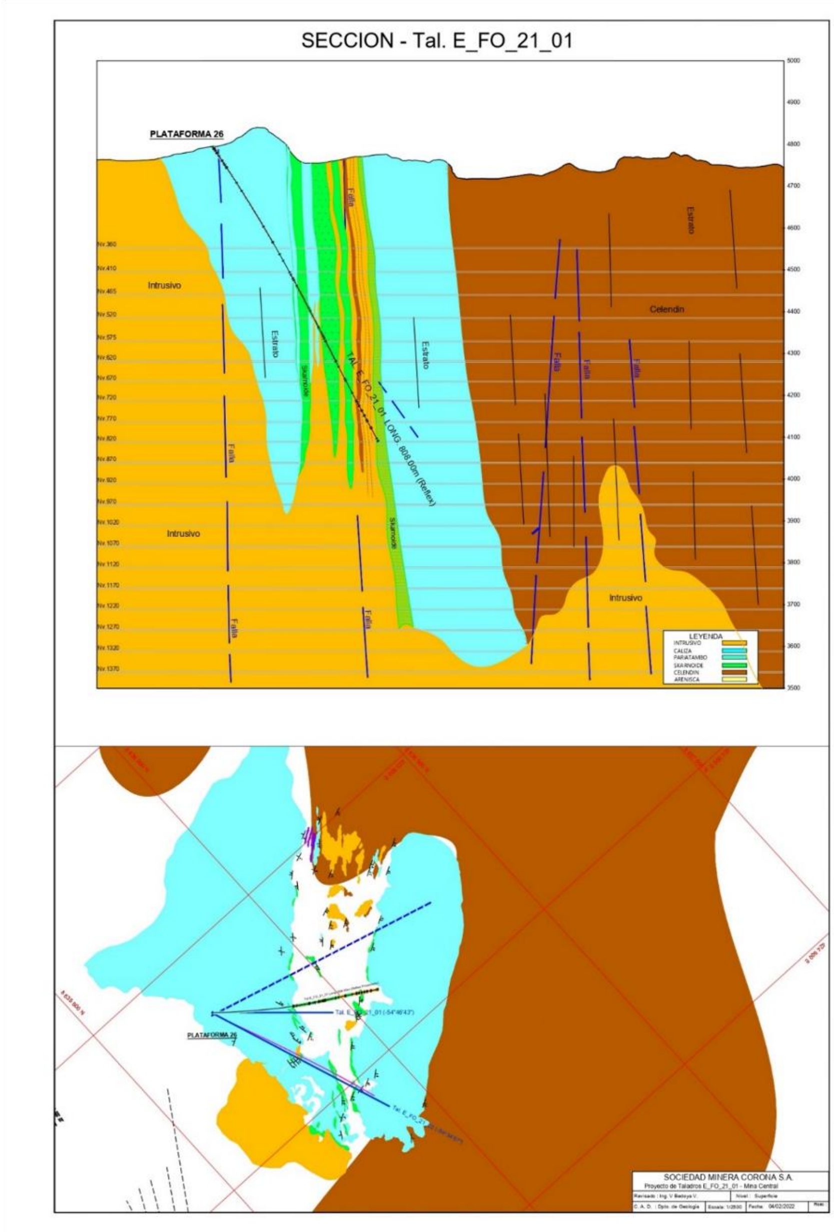


Source: Sierra Metals, 2021

Figure 9-5: Kilcaska 2021 Exploration Target Area and 2021 Drilling Plan

Hydrothermal breccias in conjunction with the development of marbles and skarns within the limestones have been observed in the area. Argillic and phyllic alteration occurs along vein contacts. The hydrothermal breccias outcrop and are intensely oxidized and leached. Historically, the mineralized bodies of Francolina and Felicidad have been mined at average grades of 4.27% zinc, 2.15% lead, 0.30% copper and 23.30 ppm silver. Recent surface geochemical sampling results yielded values as high as 0.99% lead, 0.97% zinc, 1.00% copper and 97.0 ppm silver. Polymetallic mineralization similar to the Éxito mine is the focus of the exploration drilling at Kalcaska and has been included in the 2021 surface exploration drilling program.

The geological exploration area at Fortuna is focused on the contact between the Jumasha Formation and granodiorite intrusions associated with the Yauricocha fault, where garnet rich skarns have been identified in rock outcrop (Figure 9-6). The 2021 planned exploration drilling is targeting an interpreted geophysical anomaly at approximately 1,000 m below surface.

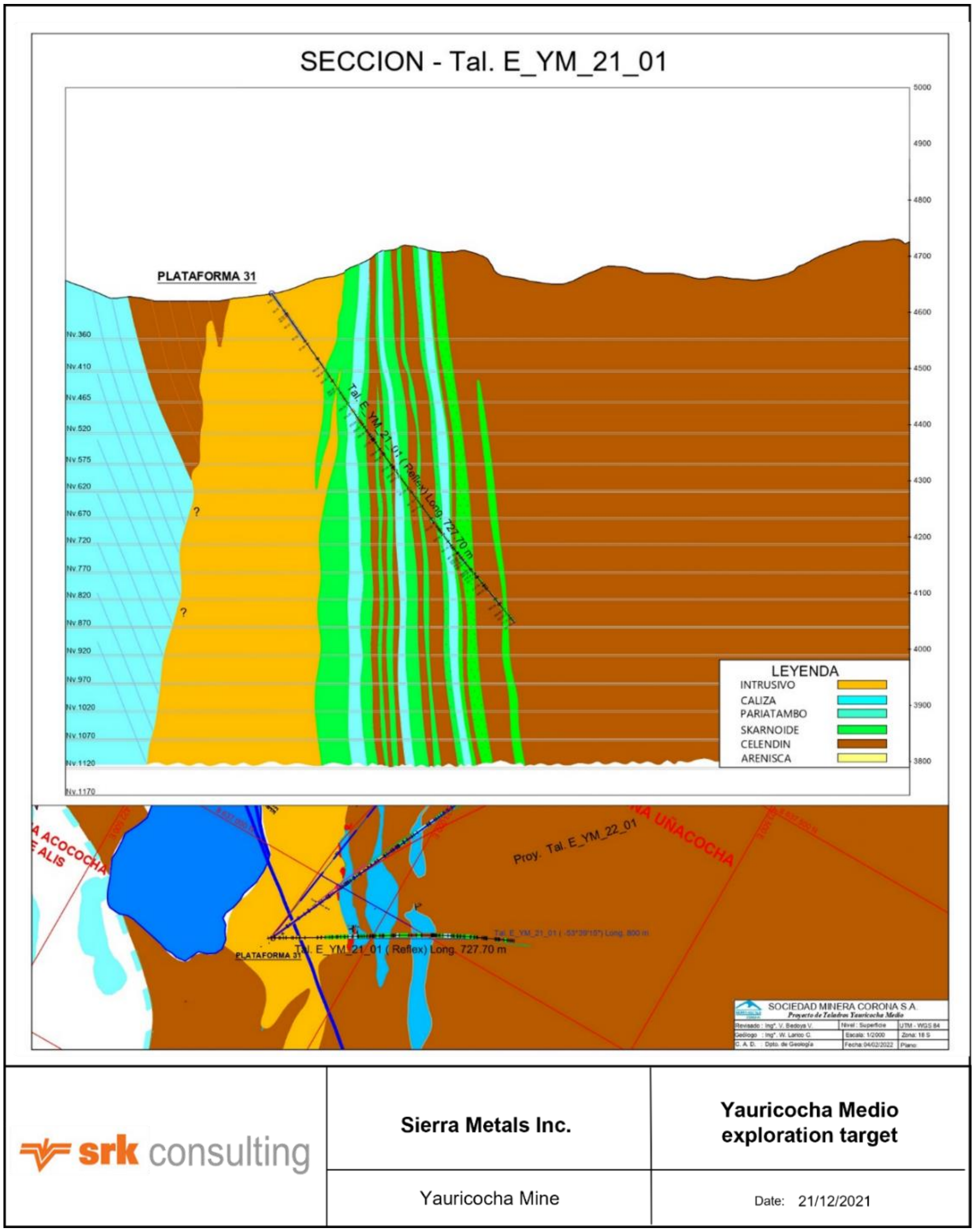


srk consulting | Sierra Metals Inc. | Fortuna exploration target
Yauricocha Mine | Date: 21/12/2021

Source: Sierra Metals, 2021

Figure 9-6: Fortuna 2021 Exploration Target Area and 2021 Drilling Plan

The Yauricocha Medio exploration target area is focussed on the contact between the Celendín Formation and granodiorite intrusion associated with the Yauricocha fault, exploring for sulfide polymetallic mineralization (Figure 9-7). Skarns containing oxidized copper mineralization is apparent in rock outcrop at this contact zone on surface. Historical mining in the area yielded average grades of 1.60% copper, 2.6% zinc, 1.02% lead and 71.5 ppm silver.

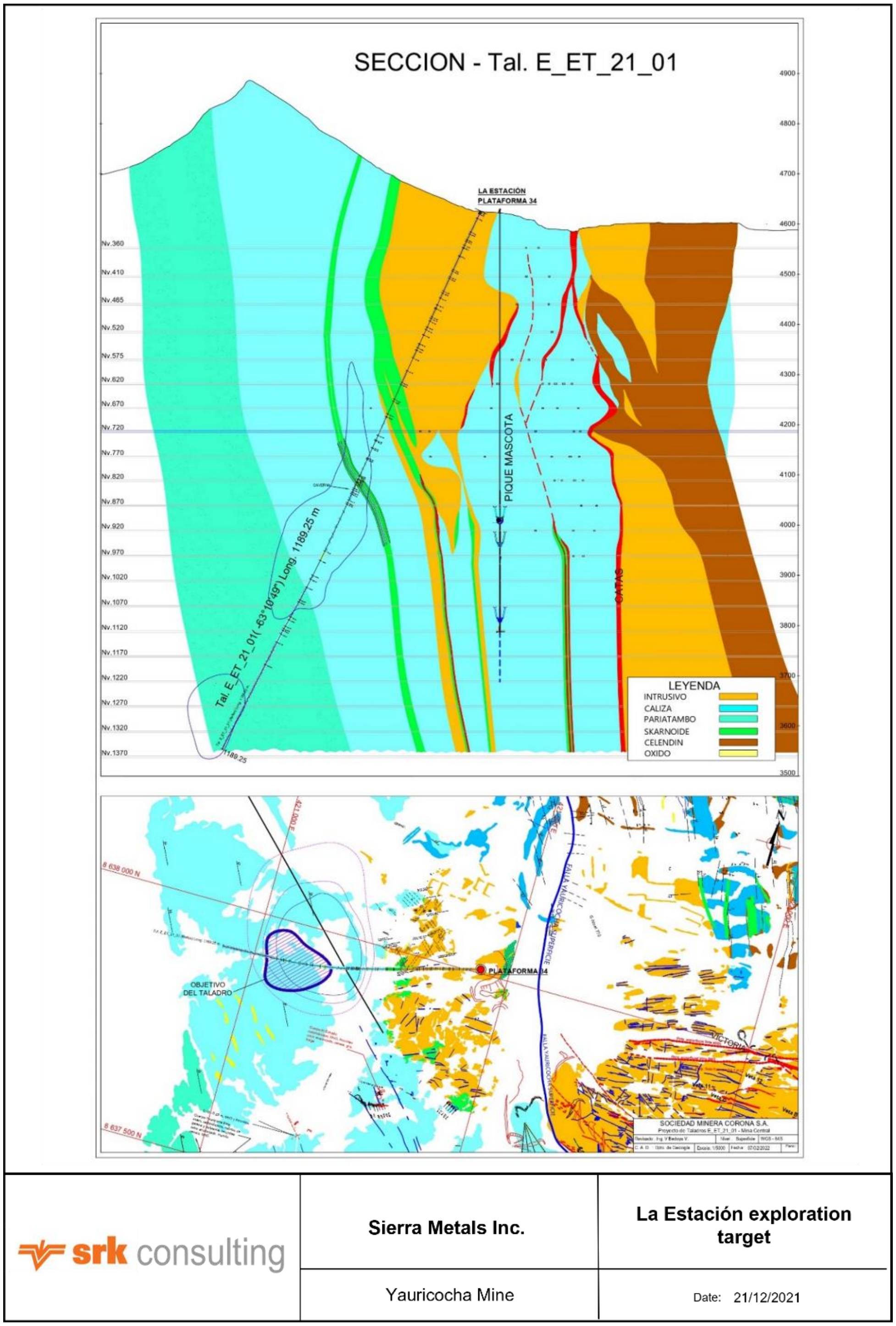


Source: Sierra Metals, 2021

Figure 9-7: Yauricocha Medio Exploration Target Area and 2021 Drilling Plan

The La Estación exploration area is focussed between the contact of the Jumasha Formation limestones and granodiorite intrusions (Figure 9-8). Skarns with polymetallic sulfide mineralization have been identified in small bodies within the historical mine by Yauricocha staff. Historical mining produced average grades of 248.8 ppm silver, 15.00% zinc, 9.00% lead and 0.20% copper. The

2021 exploration drilling is targeting a magnetic geophysical anomaly at depth, which could be indication of sulfide mineralization in the proximity to the Yauricocha fault.



Source: Sierra Metals, 2021

Figure 9-8: La Estación Exploration Target Area and 2021 Drilling Plan

The QP considers the exploration techniques employed by Yauricocha mine suitable in exploration for oxide and sulfide polymetallic mineralization i.e., primarily Ag, Au, Cu, Pb and Zn hosted in skarns, carbonate replacement bodies and veins. It should be noted that exploration results indicate exploration potential only and, in such form, do not have any reasonable prospects of eventual economic extraction.

10 Drilling

10.1 Type and Extent

Minera Corona's Geology Department owns and operates two electro-hydraulic drills, the reach of which varies between 80 m and 150 m with a core diameter of 3.5 cm. The mine also utilizes, or has previously utilized, the services of drilling contractors (MDH and REDRILSA) for deeper drillholes reaching up to 900 m in length. Core diameters are generally HQ and NQ, although selected infill drilling within the mine is drilled using a TT-46 (46mm) diameter.

Exploration (establishing continuity of mineralization) and development (reserve and production definition) drilling conducted by Minera Corona from 2002 to 2021 is detailed in Table 10-1.

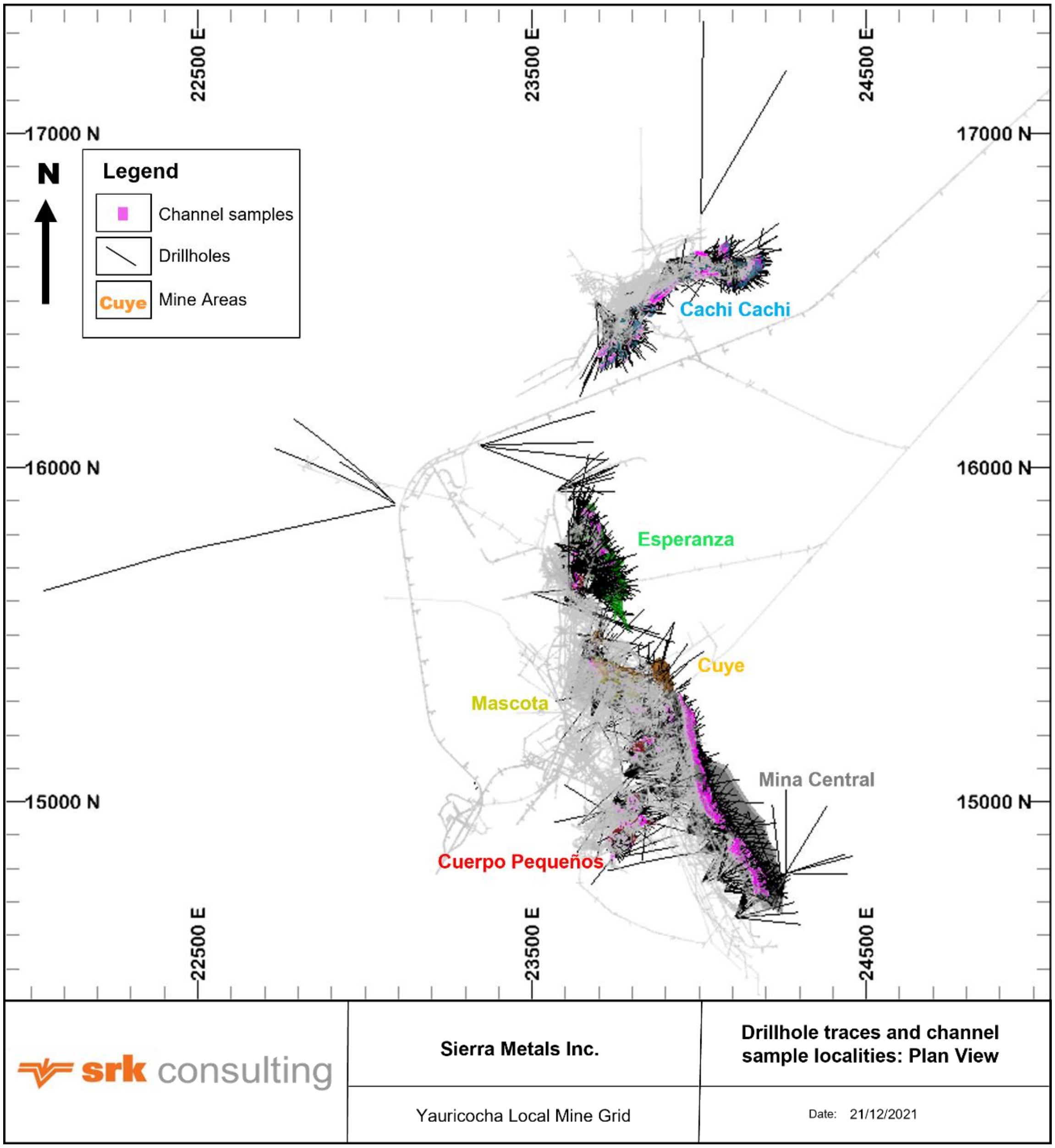
Table 10-1: Yauricocha Exploration and Development Drilling

Year	Exploration and Development (m)	Drilling (DDH) by Company (m)	Drilling (DDH) by Contractor (m)
2002	3,886	1,887	-
2003	4,955	3,415	-
2004	4,023	2,970	-
2005	4,034	3,160	8,043
2006	2,786	2,999	10,195
2007	2,466	4,751	6,196
2008	2,380	5,379	13,445
2009	1,912	4,955	13,579
2010	1,086	4,615	3,527
2011	1,611	5,195	9,071
2012	1,530	11,532	31,257
2013	2,569	10,653	16,781
2014	1,011	9,357	30,455
2015	342	9,735	33,214
2016	6,239	9,145	42,020
2017	8,520	7,384	49,715
2018	6,193	5,103	36,771
2019	4,182	4,653	45,983
2020	2,712	1,076	18,693
2021*	431	0	8,270

Source: Sierra Metals, 2021
* Q1 2021

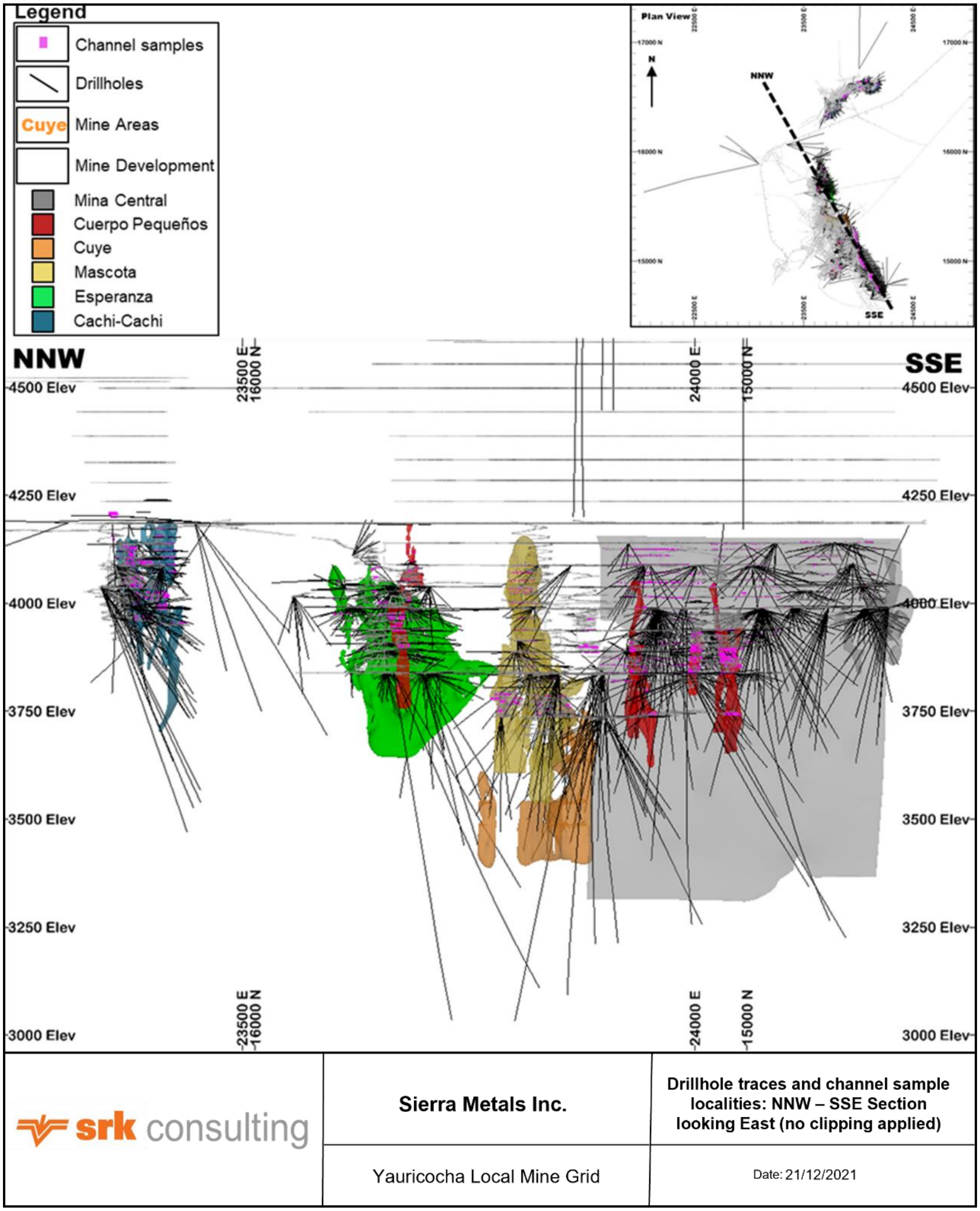
Approximately 13,000 m of infill diamond drilling is planned for 2021 reserve and production definition purposes.

In addition to the drilling at Yauricocha, extensive channel sampling of the mineralized bodies is completed for grade control and development purposes. Channel sampling is conducted on perpendicular lines crossing the various mineralized bodies. Spacing between the samples is variable, but generally the spacing is 2 m to 4 m. Material is collected on tarps across the channel sampling intervals and is then transferred to bags marked with the relevant interval. These data points are utilized in the Mineral Resource estimation. The general distribution of drilling and channel samples is shown in Figure 10-1 and Figure 10-2.



Source: SRK, 2021

Figure 10-1: Extent of Drilling and Sampling Plan View



Source: SRK, 2021

Figure 10-2: Extent of Drilling and Sampling Sectional View

10.2 Procedures

10.2.1 Drilling

Modern drill collar locations are surveyed underground by the mine survey team. Where these types of surveys have been completed, collar locations are assumed to be accurate to less than 0.1 m. Historic drilling was not surveyed to the same level of detail, potentially decreasing the accuracy of the collar positions in space compared to modern holes. This effect would potentially decrease the accuracy of the geological model and resource estimation in these areas, but QP notes that the majority of the areas supported by this historic drilling have already been mined.

While drill holes are currently surveyed down-hole for all new exploration drilling, this has not always been the case. Historic drill holes, as well as selected more recent holes that were not deemed to be long enough or otherwise designated non-critical for surveying, were not surveyed down-hole and the collar azimuth and dip are the only points of reference for the drill hole. The QP notes that all new holes now have down-hole surveys, and that most of these are in areas which are incorporated in the current update to the Mineral Resource estimation. While the nominal spacing of the survey has been 50 m, several newer holes have been surveyed every 5 m to discern any potential risk of deviation affecting the accuracy of the interpretation.

An SRK study in 2019, conducted on the deviation for the drillholes which had been downhole surveyed, highlighted that the average deviations (of more than 3,500 measurements) down-hole are only -0.06° bearing and 0.09° inclination. This would indicate that the lack of down-hole survey information is not necessarily a risk at Yauricocha, although the QP recommends continuing the practice of surveys and nominal intervals of 25 to 50 m to ensure quality of information.

SRK visited the core logging and sampling facilities at the mine site in early 2015, mid-2017, and by the current QP in April 2019. The QP noted that the logging facility are clean and sufficiently equipped. Logging is conducted on paper and transferred to Excel® worksheets. Details recorded include geotechnical information such as recovery and RQD, geologic information (lithology, alteration, mineralization, etc.), sampling information, as well as other parameters, which may not get incorporated into the digital database. Samples, along with a bar-coded sample ticket for tracking, are selected by the geologist and placed in numbered plastic bags. Bags are tied tightly to prevent contamination during handling and transport.

Drill core recovery is generally over 97%, and there appears to be no relationship between grade distribution and recovery.

Drill holes are split by hydraulic or manual methods where core is broken or poorly indurated, and is sawn by rotary diamond saw blade when the core is competent. In both scenarios, care is taken to ensure that the sample is collected in a consistent and representative manner. The QP notes that sampling is only conducted in segments of core that are noted as having obvious mineralization during logging. This results in several occurrences where the first sample in a drillhole may be a very high grade one, or that there may be multiple high-grade samples with un-sampled intervals in between. These intervals have been considered as un-mineralized based on the assumptions made for the sampling or lack thereof and are flagged with a lowest-limit-of-detection value. For arsenic (AS), which is regarded as a deleterious element the intervals were left blank as well as for iron (FE), which is utilized to establish polymetallic mineralized zones in-situ density.

10.2.2 Channel Sampling

Underground channel samples are collected by the geology staff. Samples are collected via hammer and chisel, with rock chips collected on a tarp for each sample and transferred to sample bags. Typical sample intervals are 1 m along the ribs of crosscuts within stopes for the large, mineralized zones, and 2 m across the back of the stopes for the small, mineralized zones. Ideal sample weights are between 2.5 kg and 3 kg. The samples are placed in a plastic bag labeled with a permanent marker on the outside. A sample ticket displaying the number and bar code is then inserted into the bag. The bags are securely tied to prevent outside contamination during their handling and transportation to the assay lab.

The QP notes that samples are not weighed to ensure representativeness, but geologists are involved in the channel sampling efforts to direct samplers to collect samples which visually are representative of the mineralization.

10.3 Interpretation and Relevant Results

Drilling and sampling results are interpreted by Minera Corona site geologists and are reviewed in cross sections and plan / level maps. The relevant results featuring significant intervals of geologic or economic interest are then followed-up by further drilling or exploration development. The QP has reviewed this approach and finds it acceptable for the development of any reasonable exploration and geological model for the Yauricocha mine.

The QP notes that other sampling types are described in the documentation at Yauricocha mine, such as point samples, muck samples, and others. These sampling types are used for specialized purposes only and are not used in the resource estimation.

11 Sample Preparation, Analyses, and Security

11.1 Security Measures

Core and channel sample material is stored at the mine site in a secure building and the boxes are well labeled and organized. The entire mine site is securely access-controlled. Samples submitted to third-party laboratories are transported by mine staff to the preparation laboratory in Lima. The channel samples are processed at Minera Corona's Chumpe laboratory located in the Concentrator Plant under the supervision of company personnel.

The on-site laboratory currently is not independently certified. Channel sample locations are surveyed underground by mine survey staff. Sample start and end-point locations are assumed to be accurate to centimeter accuracy.

11.2 Sample Preparation for Analysis

Samples are generally prepared by a primary and secondary laboratory:

- Primary: Chumpe Laboratory –Yauricocha Mine Site; Non-ISO Certified
- Secondary: ALS Minerals (ALS) – Lima; ISO 9001:2008 Certified

The majority of the sample preparation is completed at the Chumpe laboratory, except in cases where checks on the method of preparation are desired and ALS conducts sample prep on duplicate check assays.

11.2.1 Chumpe Laboratory

Most historical core samples, and effectively all channel samples, have been prepared and analyzed by the Chumpe laboratory. Detailed procedures have been documented by Minera Corona and are summarized below (in italics).

Sample Reception

Channel samples and selected mine infill drilling are collected in the field by the geology staff and transported by Yauricocha personnel from the Yauricocha Mine or Klepetko Adit and are received at the reception counter at the Chumpe laboratory entrance. A log entry is made to record the number of samples being received. These samples are generally between 1.5 and 3.0 kg; are damp and received in plastic bags.

Preparation

Equipment used in sample preparation includes:

- 1 – Primary Jaw Crusher (Denver), Jaw capacity – 5” x 6”, Output – 70%, passing ¼ inch
- 1 – Secondary Jaw Crusher (FIMA), Jaw capacity – 5” x 6”, Output –80%, passing No. 10 mesh
- 1 – Pneumatic Pulverizer, Make – Tmandina

- 2 – Sample Dryers, with temperature regulator
- 1 – ½” Stainless steel splitter, Make – Jones
- Five compressed air nozzles
- Stainless steel trays, 225 x 135 x 65 mm
- Stainless steel trays, 300 x 240 x 60 mm
- Plastic or impermeable cloth; and
- 2” brushes.

Preparation Procedure

Prior to beginning sample preparation, workers verify that:

- The equipment is clean and free from contamination;
- The crushers and pulverizers are functioning correctly; and
- The numbering of the sample bags that all bags are unique and identifiable.

The procedure at Chumpe to reduce the sample to a pulp of 150 gm, at 85% passing 200 mesh is:

- Transfer the sample to the appropriate tray, depending on the volume of the sample, noting the tray number on the sample ticket;
- Insert a blank sample (silica or quartz) in each batch;
- Place in the Sample Dryer at a temperature of 115ºC;
- Code the sample envelopes with the information from the sampling ticket noting the sample code, the tray number, date and the quantity of samples requested on the sample ticket;
- Once dry, remove and place the tray on the worktable to cool;
- Pass 100% of the sample through the Primary Jaw Crusher when particle sizes exceed 1 inch, the resulting product is 70% passing ¼ inch;
- Pass the sample through the secondary crusher, the resulting product 80% passing -10 mesh;
- Clean all equipment after crushing of each sample using compressed air;
- Weigh the -10-mesh coarse material and record;
- Dump the complete sample into the Jones Splitter and split/homogenize to obtain an approximate 150 g split. Clean the splitter after each sample with compressed air;
- Put the 150g sample in numbered envelopes in the tray for the corresponding sample sequence;

- Pulverize sample using the cleaned ring pulverizer until achieving a size fraction of 85% - 200 mesh. Clean the ring apparatus after each sample with the compressed air hose;
- Transfer the pulverized sample to the impermeable sample mat, homogenize and pour into the respective coded envelope; and
- Clean all materials and the work area thoroughly.

11.2.2 ALS Minerals

For core samples, bagged split samples are transported by the internal transport service from the core logging facility. Samples are transported by truck to Lima for submission to the ALS Minerals laboratory in Lima. ALS records samples received and weights for comparison to the Yauricocha geologist’s records for sampling.

Samples prepared at ALS Minerals exclusively include the 2016 to present exploration diamond drilling. The QP has not visited the ALS Minerals lab in Lima but notes that ALS Minerals-Lima is an ISO-Certified preparation and analysis facilities and adheres to the most stringent standards in the industry. The PREP-31 method of sample preparation was used for all samples processed through ALS Minerals. This includes jaw crushing to 70% less than 2 mm, with a riffle split of 250 g, then pulverized using ring pulverizers to >85% passing 75 micrometers. Samples are tracked in barcoded envelopes throughout the process using internal software tracking and control measures. ALS is an industry leader in sample preparation and analysis and uses equipment that meets or exceeds industry standards.

11.3 Sample Analysis

Samples are generally analyzed by a primary and secondary laboratory:

- Primary: Chumpe Laboratory –Yauricocha Mine Site; Non-ISO Certified; and
- Secondary: ALS Minerals – Lima; ISO 9001:2008 Certified;
- Note: ALS is the primary laboratory for all diamond exploration drilling samples.

The Chumpe Laboratory provides all analyses used in the drilling / sampling database supporting the Mineral Resource estimation, whereas the ALS Laboratory is used exclusively as an independent check on the Chumpe laboratory for these samples.

11.3.1 Chumpe Laboratory

Core and channel samples from the mine are assayed utilizing two procedures. Silver, lead, zinc, and copper are assayed by atomic absorption (AA) on an aqua-regia digest. Gold is assayed by fire assay (FA) with an AA finish. Lower limits of detection (LLOD) are shown in Table 11-1, and are higher than those for ALS Minerals as Chumpe does not run the same multi-element analysis.

Table 11-1: Chumpe LLOD

Element	LLOD	Unit
Ag	3.43	ppm
Au	0.03	ppm
Cu	0.01	%
Pb	0.01	%
Zn	0.01	%

Source: Sierra Metals, 2021

11.3.2 ALS Minerals Laboratory

The core samples analyzed at ALS are analyzed for a suite of 35 elements using inductively coupled plasma atomic emission spectroscopy (ICP-AES) on an aqua-regia digest, generally used to discern trace levels of multiple elements. Samples are also analyzed using an AA method on an aqua-regia digest for accuracy at mineralized material grade ranges. Au is analyzed using FA (gravimetric finish) with an AA finish. Lower limits of detection for the critical elements are shown in Table 11-2.

Table 11-2: ALS Minerals LLOD

Element	LLOD	Unit
Ag	0.2	ppm
Au	0.005	ppm
Cu	0.0001	%
Pb	0.0001	%
Zn	0.0001	%

Source: Sierra Metals, 2021

11.4 Quality Assurance/Quality Control Procedures

Part of this section has been excerpted from NI 43-101 Technical Report on the Yauricocha Mine, prepared by Gustavson Associates, report date May 11, 2015 and is shown in italics. Standardizations have been made to suit the format of this report; any changes to the text have been indicated by the use of [brackets].

Prior to 2012, Minera Corona did not utilize the services of an independent lab for data verification. The company used an internal QA/QC procedure at its assay lab (Chumpe) located in the Concentration Plant. Historically, the results have compared well with the metal contained in concentrates and further work on a formal external QA/QC procedure had not been pursued. Beginning in 2012, Minera Corona began to use external check assays as part of the validation system for the Chumpe lab data stream.

The current procedure includes certified standards, blanks, pulp duplicates, and sample preparation size review. These are processed at approximately one per 20 samples. External labs receive approximately one sample for each 15 processed internally. Gustavson did not have the opportunity to fully observe the laboratory operation; however, Gustavson has examined QA/QC records of certified standards for 2011 through 2014.

The results of the historical QA/QC show that the Chumpe laboratory generally performed well with respect to the standard blanks and duplicates submitted from the exploration department, but the QP notes that this has not been the case over the entire project history, with the Chumpe lab consistently missing targets for certain types of QA/QC. This resulted in a limited program of pulverized duplicate samples for every sample interval being submitted to ALS Minerals in Lima as a check on the Chumpe lab, where the results showed a consistent bias. Historically, Chumpe lab appeared to under-report Ag compared to ALS duplicates, although other metals appeared to be relatively consistent. For this reason, the mine abandoned the use of the Chumpe lab for the new exploration drilling, with all samples being sent to ALS Mineral in Lima prior to 2018. Several improvements were implemented since 2018 at the Chumpe laboratory to improve the historical poor performance and increase its sample through put. There is a noticeable improvement in the Chumpe laboratory performance since 2018. Samples where last sent to ALS Chemex in late 2019 and no samples were analyzed by ALS Chemex in 2020 or 2021. Yauricocha has not completed any umpire laboratory QA/QC checks of the Chumpe laboratory samples for 2020 or 2021.

Currently, Minera Corona uses a very aggressive program of QA/QC for new exploration areas to mitigate uncertainty in analytical results. A subsequent and more detailed review of the QA/QC applied to new exploration efforts focused on underground Esperanza and Cuye areas, as well as Doña Leona and Kilcaska surface exploration target areas are discussed in Sections 11.4.1 through 11.4.3.

11.4.1 Standards

Minera Corona currently inserts standards or certified reference materials (CRM) into the sample stream at a rate of about 1:20 samples, although the insertion rate is adjusted locally to account for particular mineralogical observations in the core. Ten standards have been generated by Minera Corona and certified via round robin analysis for the current exploration programs. These standards have been procured from Yauricocha material, and homogenized and analyzed by Target Rocks Peru S.A., a commercial laboratory specializing in provision of CRM to clients in the mining industry.

Each CRM undergoes a rigorous process of homogenization and analysis using aqua-regia digestion and AA or ICP finish, from a random selection of 10 packets of blended pulverized material. The six laboratories participating in the round robin for the Yauricocha CRM are:

- ALS Minerals, Lima;
- Inspectorate, Lima;
- Acme, Santiago;
- Certimin, Lima;
- SGS, Lima; and
- LAS, Peru.

The mean and between-lab standard deviations (SD) are calculated from the received results of the round robin analysis, and the certified means and tolerances are provided in certificates from Target Rocks. The certified means and expected tolerances are shown in Table 11-3.

Table 11-3: CRM Expected Means and Tolerances

CRM	Certified Mean				Two Standard Deviations			
Element	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)
MAT-04	29.1	0.70	0.16	0.28	2.1	0.03	0.01	0.01
MAT-05	128.2	2.37	0.58	2.50	7.7	0.06	0.02	0.12
MAT-06	469.0	7.75	2.53	7.98	13.0	0.20	0.12	0.23
MCL-02	40.8	0.65	1.58	2.49	3.4	0.05	0.08	0.09
PLSUL-03	192.0	3.09	1.03	3.15	4.0	0.08	0.04	0.13
PLSUL-04	6.7	0.09	0.24	0.23	0.5	0.01	0.01	0.01
PLSUL-05	13.6	NA	0.49	0.47	1.0	NA	0.03	0.02
PLSUL-06	30.3	1.94	0.21	1.60	2.9	0.04	0.01	0.11
PLSUL-07	79.2	5.94	0.45	4.67	4.5	0.27	0.02	0.20
PLSUL-08	248.0	12.46	0.98	12.54	14.0	0.39	0.04	0.55

Source: Sierra Metals: 2021

During the 2017, 2018 and 2019 drilling campaigns an additional 11 CRMs were inserted into the sample stream at the Chumpe laboratory, one of which was designed specifically for Au inspection (MRISi81). The additional CRMs and their expected tolerances are shown in Table 11-4. No additional CRMs were added during the 2020 drilling campaign.

The QP notes that the CRMs are adequate for QA/QC monitoring and that in 2018 a rigorous QA/QC program was set in place and maintained, including a recently included CRM for Au. Minera Corona has submitted 177 CRM to ALS Minerals in 2015-2017 for new drilling with an average insertion rate of about 5%. Between 2018 and 2019, a total of 435 CRM's was sent to ALS for independent checking and the Chumpe laboratory analyzed a total of 6,319 during that same timeframe. These two sets of CRMs were reviewed independently by the QP in 2019.

Table 11-4: 2017 – 2019 CRM Means and Tolerances

CRM	Certified Mean					Two Standard Deviations				
Element	Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)
MRISi81	1.79									0.048
PLSUL-10		85.0	5.70	0.608	5.39	6.0	0.13	0.032	0.22	
PLSUL-14		25.5	0.857	0.032	5.17	0.9	0.06	0.0003	0.16	
PLSUL-15		22.7	0.60	0.041	0.97	1.7	0.02	0.002	0.04	
PLSUL-22		83.0	1.22	0.147	3.13	4.8	0.08	0.010	0.16	
PLSUL-24		114.0	3.69	0.272	7.72	4.0	0.19	0.016	0.26	
PLSUL-32		42.5	0.53	0.429	1.04	3.6	0.04	0.020	0.03	
PLSUL-33		51.1	0.65	0.738	2.35	3.7	0.03	0.038	0.10	
PLSUL-34		109.0	1.60	1.454	5.19	5.3	0.06	0.070	0.30	
ST1700013 (Oz/Tc)		0.799	0.167	0.226	0.467	0.052	0.008	0.012	0.028	
ST1700014 (Ox/Tc)		3.478	2.664	0.803	5.178	0.074	0.042	0.024	0.206	

Source: SRK, 2021

Performance: ALS Minerals

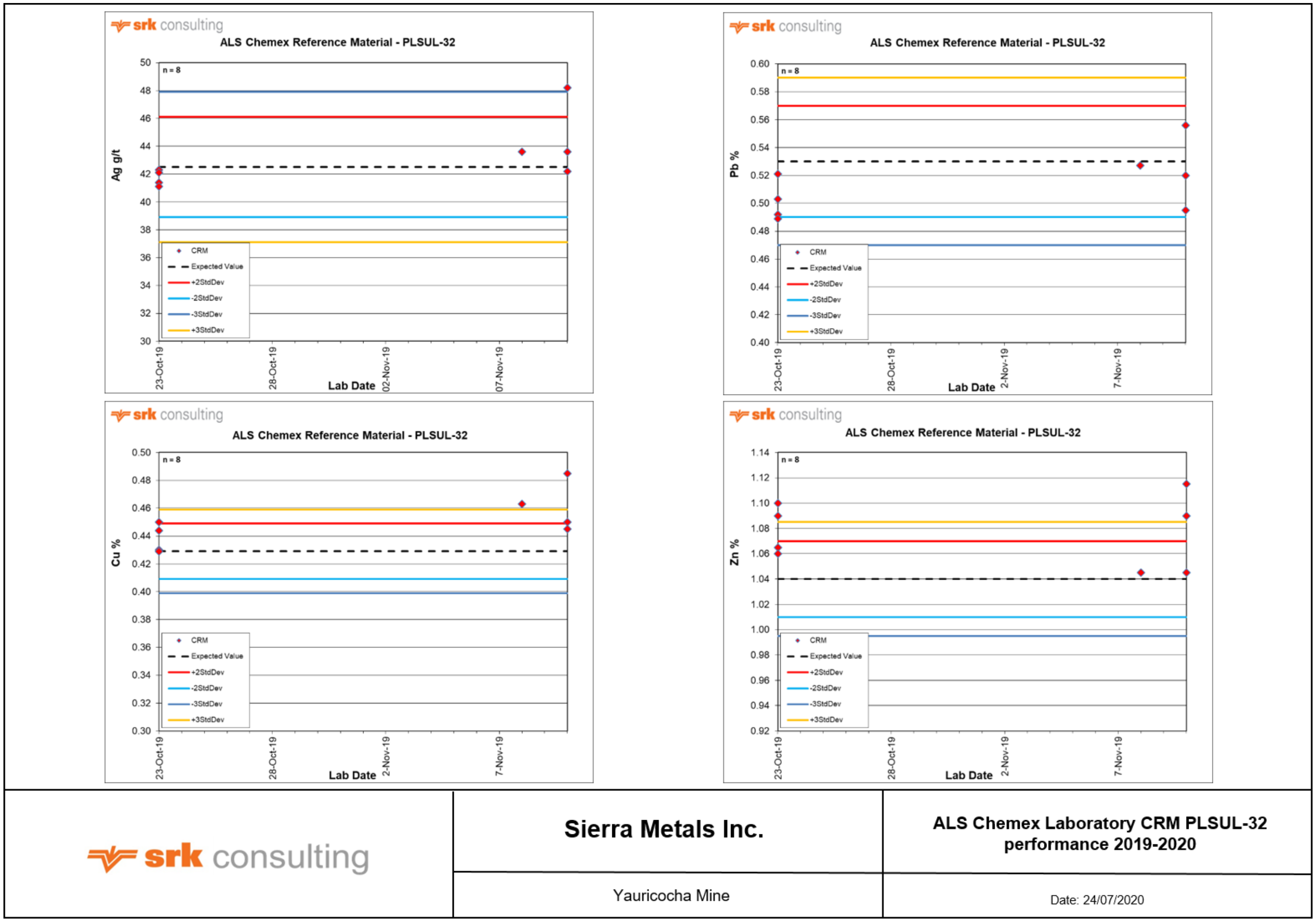
The QP generally uses a nominal +/-3 SD criteria for evaluating failures of the CRM. The SD used is the between lab SD, as provided in the certificates from Target Rocks. The QP notes that failure rates for the CRM as provided are very high for Cu, which are due to rounding differences between lab certificates and CRM values. All other elements have minimal failure results, although CRM PLSUL-10 reports low results for Pb, which will need to be monitored in future.

The tabulated QA/QC results for the 2018 drilling campaign using ALS as the testing laboratory are shown in Table 11-5. In 2018, Corona submitted a total of 435 samples to ALS laboratories for independent checking. As is evident in Figure 11-1, PLSUL-32 (8 samples) shows an increasing positive bias for Ag, Pb and Cu over time. Zn generally is positively biased throughout with 4 samples lying above the upper 3rd standard deviation limit. Additional CRM's used during the specified period include; PLSUL-33 (7 samples) and PLSUL-34 (6 samples). Limited samples were sent to ALS in 2019, with the bulk of samples analyzed and tested at the Chumpe laboratory. No samples were sent to ALS in 2020 and 2021.

Table 11-5: 2018 CRM Performance Summary – ALS Minerals

STD	Total	Low 3SD	High 3SD	Failure % Low	Failure % High
Ag					
PLSUL-22	99	0	0	0.00%	0.00%
PLSUL-24	109	2	0	1.83%	0.00%
PLSUL-10	13	0	0	0.00%	0.00%
PLSUL-14	36	0	34	0.00%	94.44%
PLSUL-15	12	0	0	0.00%	0.00%
All Ag	**269**	**2**	**34**	**0.74%**	**12.64%**
Pb					
PLSUL-22	99	0	0	0.00%	0.00%
PLSUL-24	109	2	0	0.00%	0.00%
PLSUL-10	13	9	1	69.23%	7.69%
PLSUL-14	36	0	0	0.00%	0.00%
PLSUL-15	12	1	0	8.33%	0.00%
All Pb	**269**	**12**	**1**	**3.72%**	**5.77%**
Cu					
PLSUL-22	99	0	6	0.00%	6.06%
PLSUL-24	109	1	19	0.00%	17.43%
PLSUL-10	13	0	1	0.00%	7.69%
PLSUL-14	36	36	0	100.00%	0.00%
PLSUL-15	12	0	1	0.00%	8.33%
All Cu	**269**	**37**	**27**	**13.38%**	**10.04%**
Zn					
PLSUL-22	99	1	2	1.01%	2.02%
PLSUL-24	109	4	1	3.67%	0.92%
PLSUL-10	13	1	0	7.69%	0.00%
PLSUL-14	36	2	1	5.56%	2.78%
PLSUL-15	12	2	0	16.67%	0.00%
All Zn	**269**	**10**	**4**	**3.72%**	**1.49%**

Source: SRK, 2021



Source SRK, 2021

Figure 11-1: ALS Chemex laboratory CRM (PLSUL-32) performance

Performance: Chumpe Laboratory

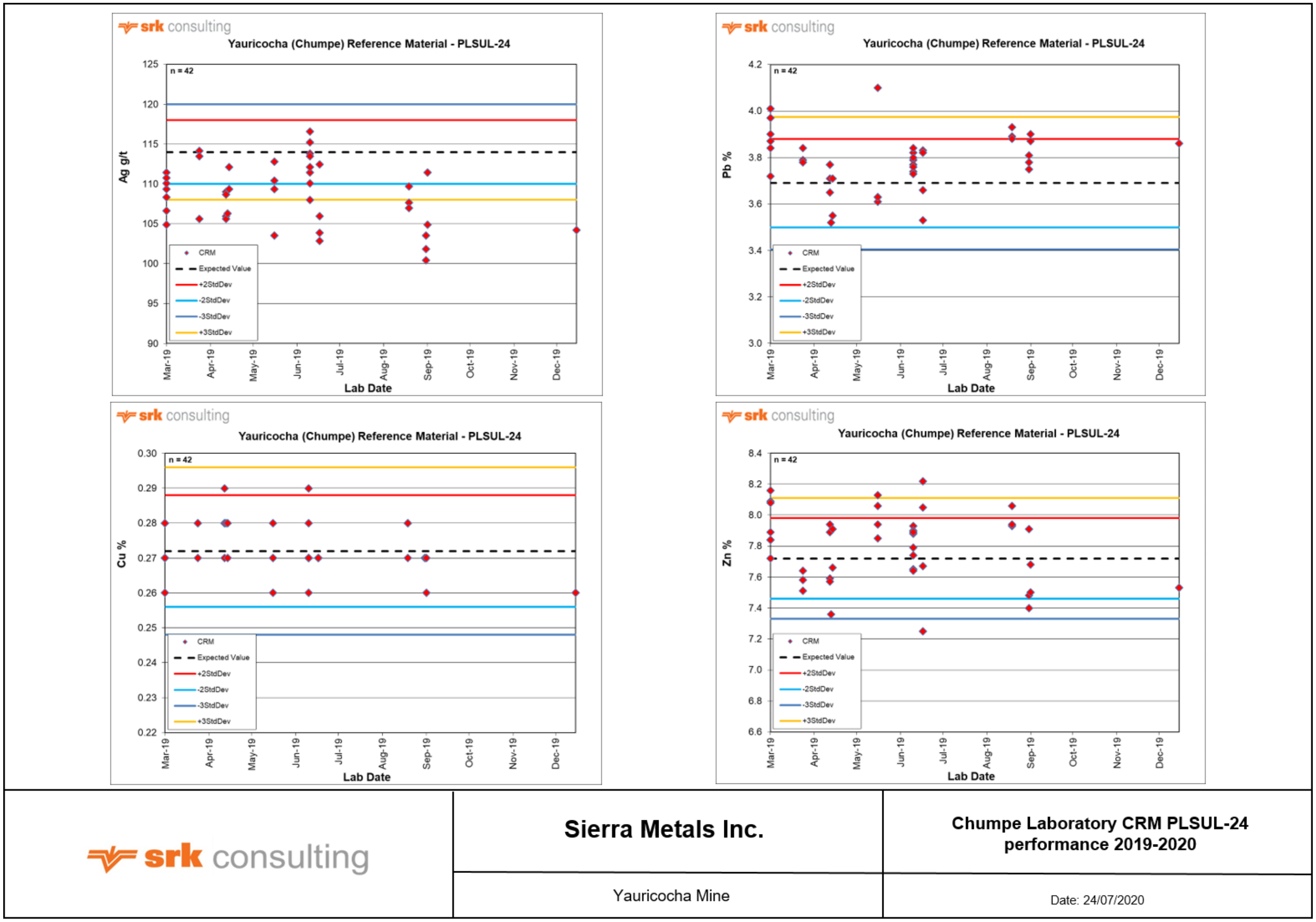
In 2018 Corona instigated a rigorous QA/QC program whereby Standards, Duplicates (Core and Pulp) and Blanks were routinely inserted into the assay sample stream. Monthly QA/QC reports were generated onsite, and the results confirm the improved performance of the Chumpe laboratory in more recent years whereby CRM failure rates have been significantly reduced. The performance of the 2019 and 2020 CRMs at the Chumpe Laboratory are summarized in Table 11-6. Significant under reporting of Pb, Cu and Zn were, however, still a problem for certain CRMs in 2018. CRM results in 2019 - 2020 appear to be significantly improved. However, Ag continues to return negative bias results for 3 of the 4 CRM in use at Yauricocha. Laboratory reporting limits account for most of the Cu discrepancies, whereas CRM sample mix-ups also accounted for several of the failures.

Figure 11-2 tracks the performance of PLSUL-24 (42 samples), a polymetallic CRM, which was a CRM used during the 2019 and 2020 underground definition and exploration drilling campaigns. Silver results indicate a slight negative bias, with the negative bias increasing over time. This indicates that the instrumentation may require additional calibration for the determination of the Ag analyte. The remaining sample batches are unbiased and distributed evenly about the Expected value. Two Pb and three Zn values lie slightly above the upper 3rd standard deviation limit. However, this is not deemed to be material. Additional CRMs used during the specified period include PLSUL-22 (39 samples), PLSUL-32 (10 samples), PLSUL-33 (8 samples) and PLSUL-34 (3 samples). These CRMs performed in a similar manner to PLSUL-24. CRM samples that repeatedly occur above or below the 3 standard deviations limit (+/-3SD) should be repeated along with +/- 5 samples above and below the erroneous CRM interval.

Table 11-6: 2018 to 2020 CRM Performance Summary – Chumpe Lab

2018					
STD	**Total**	**Low 3SD**	**High 3SD**	**% Low**	**% High**
Ag					
PLSUL-10	97	1	0	1.03%	0.00%
PLSUL-14	77	0	58	0.00%	75.32%
PLSUL-15	94	0	3	0.00%	3.19%
All Ag	**268**	**1**	**61**	**0.37%**	**22.76%**
Pb					
PLSUL-10	97	87	0	89.69%	0.00%
PLSUL-14	77	0	0	0.00%	0.00%
PLSUL-15	94	0	1	0.00%	1.06%
All Pb	**268**	**87**	**1**	**32.46%**	**0.37%**
Cu					
PLSUL-10	97	30	0	30.93%	0.00%
PLSUL-14	77	76	1	98.70%	1.30%
PLSUL-15	94	3	48	3.19%	51.06%
All Cu	**268**	**109**	**49**	**40.67%**	**18.28%**
Zn					
PLSUL-10	97	1	1	1.03%	1.03%
PLSUL-14	77	0	2	0.00%	2.60%
PLSUL-15	94	85	4	90.43%	4.26%
All Zn	**268**	**86**	**7**	**32.09%**	**2.61%**
2019 - 2020					
Ag					
PLSUL-22	39	4	0	10.26%	0.00%
PLSUL-24	41	16	2	37.50%	5.00%
PLSUL-32	10	0	0	0.00%	0.00%
PLSUL-33	8	1	0	33.33%	0.00%
PLSUL-34	5	4	0	100.00%	0.00%
All Ag	**103**	**25**	**2**	**25.00%**	**2.27%**
Pb					
PLSUL-22	39	0	0	0.00%	0.00%
PLSUL-24	41	2	3	5.00%	7.50%
PLSUL-32	10	0	0	0.00%	0.00%
PLSUL-33	8	0	0	0.00%	0.00%
PLSUL-34	5	0	0	0.00%	0.00%
All Pb	**103**	**2**	**3**	**2.27%**	**3.41%**
Cu					
PLSUL-22	39	0	3	0.00%	7.69%
PLSUL-24	41	0	2	0.00%	5.00%
PLSUL-32	10	0	1	0.00%	0.00%
PLSUL-33	8	1	0	33.33%	0.00%
PLSUL-34	5	0	1	0.00%	50.00%
All Cu	**103**	**1**	**7**	**1.14%**	**6.82%**
Zn					
PLSUL-22	39	0	7	0.00%	17.95%
PLSUL-24	41	3	3	7.50%	7.50%
PLSUL-32	10	1	5	0.00%	50.00%
PLSUL-33	8	1	0	0.00%	0.00%
PLSUL-34	5	0	0	0.00%	0.00%
All Zn	**103**	**5**	**15**	**3.41%**	**13.64**

Source: SRK, 2021



Source SRK, 2021

Figure 11-2: Yauricocha mine Chumpe laboratory CRM (PLSUL-24) performance

11.4.2 Blanks

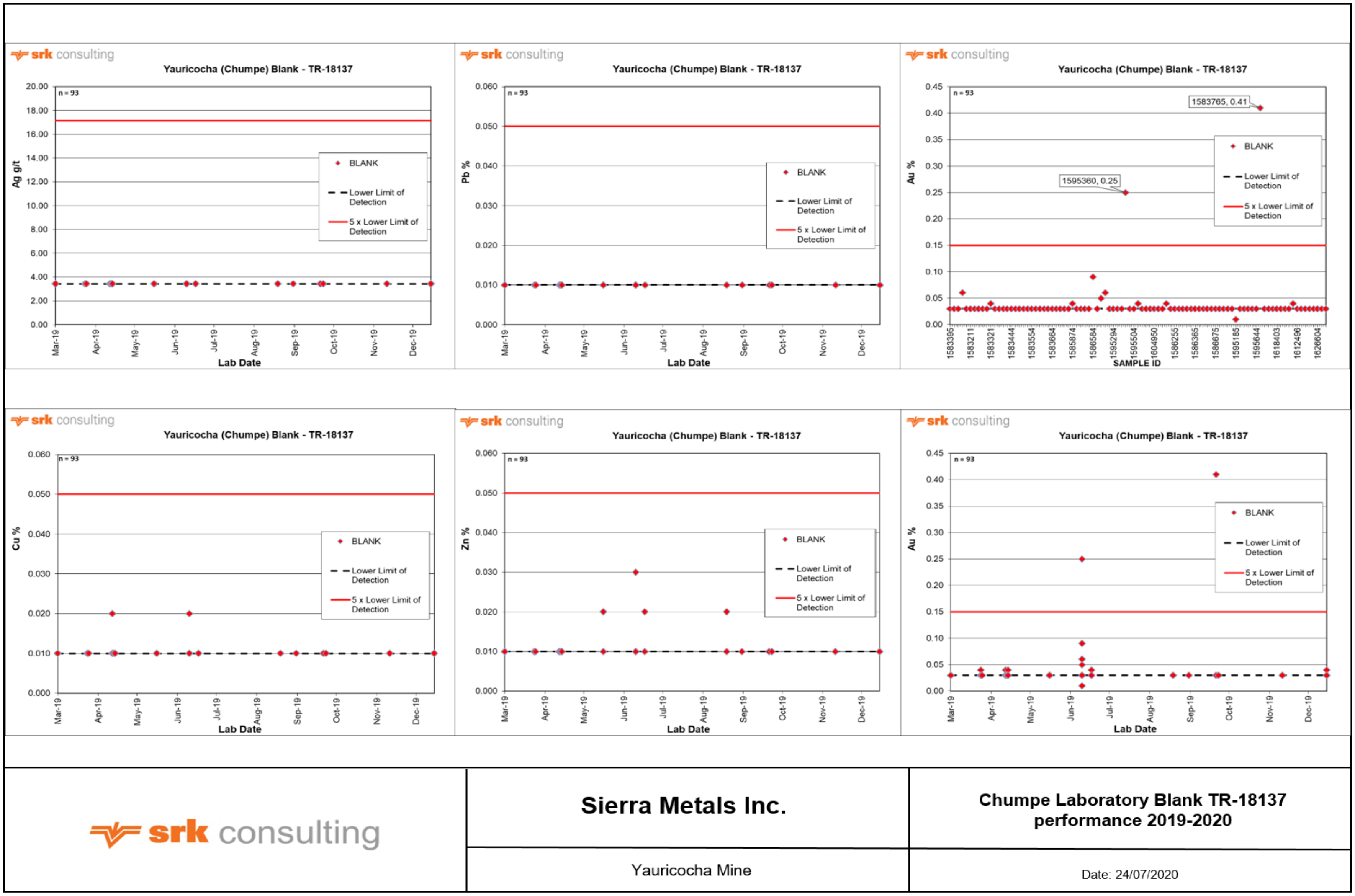
Minera Corona currently inserts unmineralized quartz sand blanks into the sample stream at a rate of 1:20 samples, or adjusted as necessary, to ensure smearing of grade is not occurring immediately after higher grade intervals. Blanks are generally about 0.5 kg of silica sand, bagged and submitted in the sample stream along with the normal core samples. The results of the Blank analysis in 2019 and 2020, show that based on a failure criterion of 5 times the LLOD, there are only two gold systematic failures for the Chumpe diamond drilling samples (Table 11-7). LLOD data for the Chumpe laboratory is presented in Table 11-1.

Between 2017 and 2020, a total of 6,897 Blanks were inserted into the sample stream at the Chumpe laboratory. Figure 11-3 tracks the performance of 93 blank samples used during exploration and definition drilling completed within lead, zinc and copper dominant mineralization, all of which are well below the 5 times LLOD failure criteria, except Au which has two failures, indicating possible contamination. This contamination is not evident in the primary metals.

Table 11-7: 2019 - 2020 Chumpe Blank Failures

Lab	Count	Failures				
		Ag	Pb	Cu	Zn	Au
Chumpe	93	0	0	0	0	2

Source: SRK, 2021
Failures assessed on a 5X LLOD basis.



Source SRK, 2021

Figure 11-3: Yauricocha mine Chumpe laboratory Blank (TR-18137) performance

11.4.3 Duplicates (Check Samples)

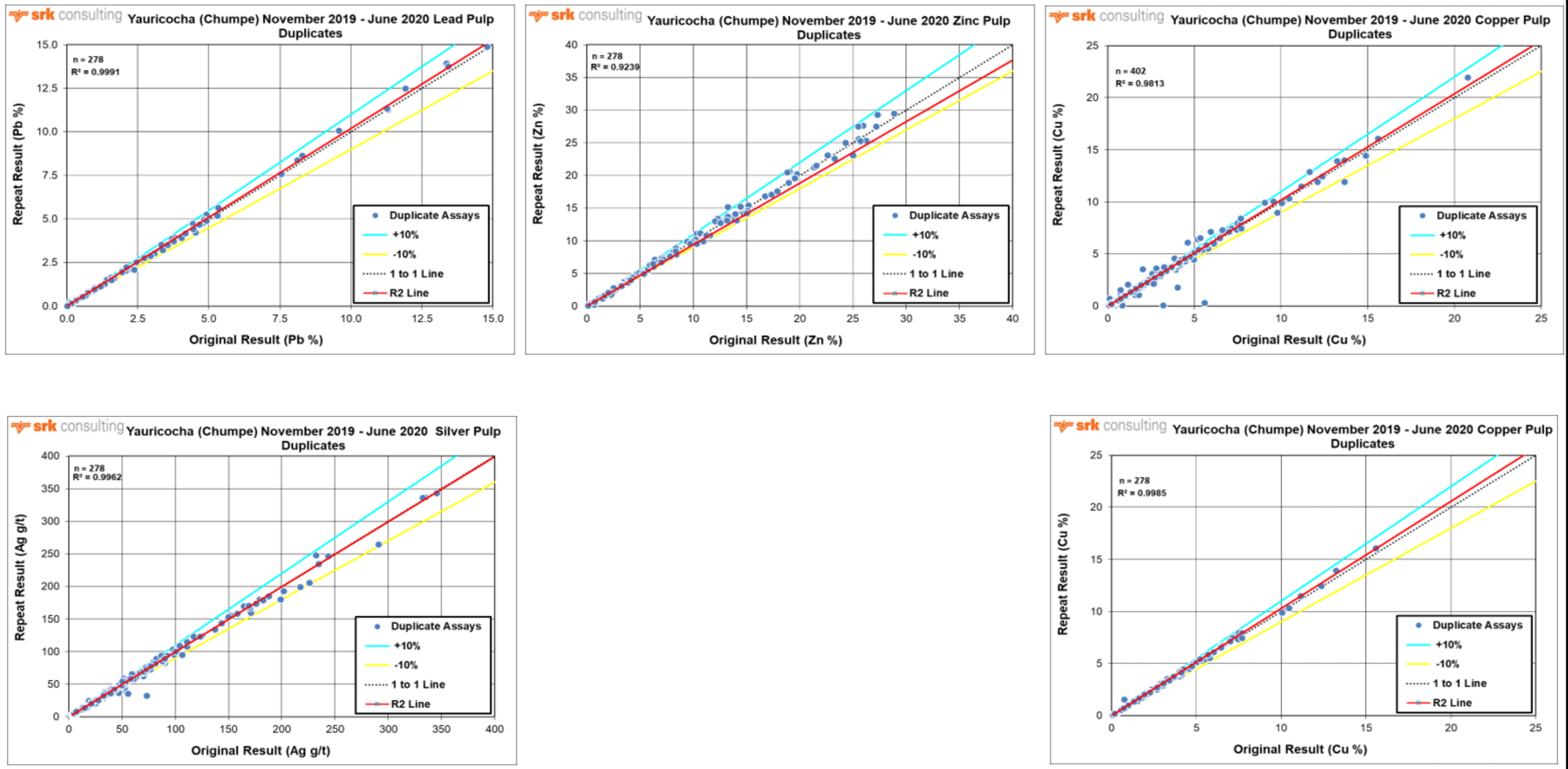
The QP was provided with sample duplicate data for 2019 and 2020. No duplicate samples where available for the later part of 2020 and the beginning of 2021 due to the impact of the Covid Pandemic on the Yauricocha operation.

True duplicate samples such as the other half of split core or a crushed/pulverized sample resubmitted to the same laboratory are common practice for normal QA/QC programs but become less critical once development and mining continues. These samples are designed to check the primary assay laboratory’s ability to repeat sample values or to check the nugget effect of the deposit very early on, but the inherent variability of the deposit is typically known at the production stage.

While Minera Corona did not submit true duplicate samples for the years preceding 2017, these intra-lab repeatability checks were instigated for the 2018 and 2019 drilling campaigns, for a combined total of 2,652 samples.

Minera Corona uses three types of check samples in the QA/QC program. These include twin (core) duplicates, coarse duplicates (crushed), and pulp duplicates (pulverized) to assess repeatability at the different phases of preparation between the site lab and third-party ALS lab.

In 2018 and 2019, pulp and core duplicate samples were routinely performed on all assay batches submitted to both ALS and Chumpe laboratory, for a total of 7,517 samples. Agreement between original samples and duplicate samples were found to be within acceptable limits for Ag, Pb and Zn. For the period November 2019 to June 2020, 278 pulp (Figure 11-4) and 125 core duplicates where processed. Agreement between original samples and duplicate samples were found to be within acceptable limits for Ag, Pb, Zn and Au for both types of duplicates.



srk consulting

Sierra Metals Inc.

Yauricocha Mine

Chumpe Laboratory Pulp Duplicates performances 2019-2020

Date: 24/07/2020

Source SRK, 2021

Figure 11-4: Yauricocha mine Chumpe Duplicate analyses' performances

11.4.4 Actions

The QP notes that the actions taken by the exploration team at Yauricocha is documented in the QA/QC procedures for the mine. In the event that a failure is noted, the laboratory is contacted, and the source of the failure is investigated. There is no formal documentation for procedures involving re-runs of batches at this time, but the QP understands that this is the process being used. The QP notes that the QA/QC reports are not amended to reflect the new passing QA/QC and batch, and only reflect the initial failure and batch to track laboratory performance rather than the performance of reruns.

It is the QP's opinion that these actions are not consistent with industry best practice, which generally features a program of reanalysis upon failure of a CRM in a batch of samples. Subsequent to this was the incorporation of the revised samples into both the database and QA/QC analysis. The QP notes that this program is implemented at other Sierra Metals sites but is not well documented at Yauricocha.

11.4.5 Results

The results of the recent QA/QC program described above show relatively high incidence of failures for CRM samples. The QP notes that the CRM failures are potentially due to ongoing sample mix-ups, but that this inherently represents a failure in the process that must be reviewed. The QP evaluated the CRM performance using more lenient tolerances than the CRM themselves recommend (+/-3SD vs +/-2SD) as the recommended certified performance ranges result in extreme failure rates.

If the SD and performance criteria for the CRM as calculated by Target Rocks is considered to be reasonable, and it is determined that the laboratories should be able to meet the performance criteria, then this is a more serious matter. The laboratories are not capable of analyzing to the precision needed for these CRM, and the laboratory practices should be reviewed. Uncertainty in the accuracy and precision of the analyses would be introduced through this process, requiring some action in terms of the classification of the Mineral Resources.

The QP is aware that the bias of the Chumpe laboratory compared to ALS has been noted and that changes in procedures and hardware are still being implemented at Chumpe to better approximate the preparation and analysis methodology employed by ALS. QA/QC methods have been adjusted in recent years and the results from the 2018 to 2021 reflect the positive change.

11.5 Opinion on Adequacy

In the QP's opinion, the database is supported by adequate QA/QC to have reasonable confidence to estimate Mineral Resources. The QP recommends that QA/QC failures be addressed as soon as possible through review of the original CRM / Blanks and their performance limits, as well as reasons for consistent bias observed between the site Chumpe lab and ALS Minerals. The QP notes that these biases are conservative given that Chumpe is the source for the historical drilling database and current channel samples, and that the nature of the bias is not such that the entire resource would be under or over-stated.

The QP did not observe any consistent performance issues over time (2015-2021) at either lab, but rather noted isolated and apparently random failures for the CRM and blanks. As noted, many of these can be attributed to sample mixing during QA/QC submittal or potential issues with the CRM, both problems in and of themselves. The QP continues to recommend that more attention be given to sampling and QA/QC in the future to continue to mitigate potential uncertainty in the analyses supporting the Mineral Resource. The QP also notes that any bias from the Chumpe analyses will likely be conservative due to the significant under reporting of Ag for Chumpe compared to ALS.

Although the performance and monitoring of the QA/QC samples is not consistent with industry best practices, the QP notes that the lack of precision in certain analyses (Ag, Zn, Pb, Cu) is less critical due to the nature of the mineralization and mining criteria at Yauricocha mine. Precision issues between 0.1% to 0.2% in the base metals is likely not enough to cause material issues in deciding whether material is mined or not, and these decisions are generally made with ongoing development samples and grade control entirely unsupported by detailed QA/QC. Thus, much of the risk associated with the analyses has already borne by the active mining of multiple areas at Yauricocha and mitigated by ongoing profitable production.

No QA/QC was performed for the latter part of 2020 and the beginning of 2021 due to the impact of the Covid Pandemic on the Yauricocha mining operation. The QP recommends that a duplicate sample program be initiated for the non-QA/QC drillhole samples returned in the latter half of 2020 and the first quarter of 2021, with the relevant QA/QC protocols, to check that there are no significant biases related to these non-QA/QC sample batches. The QP is of the opinion that while these issues should be addressed going forward; they represent little risk to the statement of Mineral Resources at this time.

12 Data Verification

Independent consultants such as Gustavson and Associates, and SRK have verified the data supporting Mineral Resource estimation at Yauricocha since 2012. The QP reviewed all the data supporting the 2019 Mineral Resource estimation during a Yauricocha mine site visit, by observing and verifying geologically related procedures and data chain of custody, comparing several physical drillhole cores in the core yard to logged values recorded in the mine Excel spreadsheet, inspecting drillhole collar sites and comparing locations to recorded locations, cut-off values and assumptions, comparing laboratory result spreadsheets to the values utilized for the Mineral Resource estimation process. The drillholes, channel samples, mine development and the respective geological models were visually inspected in Datamine Studio RM™ version 1.6.87 (Datamine) by the QP to determine whether there were any material issues with respect to interpretation, data location or grade values. The QP found no material differences, except as outlined in Section 12.1 and corrected for the 2019 Resource estimation.

In 2021, the QP completed a desktop review of the data utilized to support the Mineral Resource estimate as reported in this Report. This included the review of the interpretation, data location and grade values related to drillholes, channel samples, cut-off values and assumptions, mine development and the respective geological model built in Leapfrog GeoTM.

The QP notes that the data verification process is made difficult due to the lack of a compiled and well-ordered database for the Yauricocha mine and surrounding exploration areas. Furthermore, the verification is also hampered by the different coordinate systems employed by Yauricocha. The exploration areas' information is generally georeferenced in UTM Zone 18S WGS84 datum, whereas the mine information is georeferenced in a historical mine local grid. The information used for the mineral resource estimate is all georeferenced in the mine local grid; therefore, the QP does not consider this having any material impact on the mineral resources as reported in this report.

12.1 Procedures

For data prior to 2016, Gustavson reviewed the drill hole and underground channel samples databases for the Yauricocha project and compared the assay database with a separately maintained database of assay data which is described as 'laboratory data'. Chumpe lab does not provide a separately maintained database, nor are there assay certificates with which to compare the database.

For the 2019 drillhole and channel sample database, the QP compared approximately 5% of the Chumpe Laboratory results for the period 2018 to 2019 back to the Chumpe Laboratory supplied Excel spreadsheets. No errors were noted between the two sources of results for silver, gold, lead, zinc and copper analytes. However, there were instances where arsenic and iron analytes where not available in the geological drillhole database. The entire analytical database was checked for further such instances and this information was sourced and updated where it was analyzed and available. For the period November 2019 to June 2020 the QP compared approximately 4% of the Chumpe Laboratory results back to the Chumpe Laboratory supplied Excel spreadsheets and no errors or omittances were noted. For the period July 2020 to March 2021 the QP compared approximately 10% of the Chumpe Laboratory results back to the Chumpe Laboratory supplied Excel spreadsheets and no errors or omittances were noted.

12.2 Limitations

The QP has not reviewed 100% of the analyses from the Yauricocha against the relevant assay certificates.

12.3 Opinion on Data Adequacy

The QP has relied upon the verification conducted by others previously and has conducted independent verification of assays to analytical certificates from ALS Minerals for the recent project history. The QP notes that much of the risk associated with potential version control issues, database contamination or transposition, is borne-out through daily production in the currently operating underground mine.

The QP recommends that a dedicated database management platform be implemented on the mine allowing for the compilation and validation of the analytical database used in future mineral resource estimations against the actual certificates received from Chumpe and any umpire laboratory utilized to analyze drillhole and channel samples in future. Furthermore, this would facilitate an auditable reliable QA/QC management system and produce a verified analytical database for mineral resource estimates. The ability to process QA/QC in real time would allow for the identification of laboratory or sampling issues long before the mineral resource estimation process.

The QP has reviewed and accepted the supplied information and considers it to be geologically appropriate and adequate for use in the mineral resource estimate as outlined in this report.

13 Mineral Processing and Metallurgical Testing

13.1 Testing and Procedures

Yauricocha's on-site facilities include a metallurgical laboratory and a chemical laboratory. Sampling and testing of samples are executed on an as-needed basis. The metallurgical laboratory uses conventional industry-standard equipment and practices to carry out the metallurgical investigation.

Yauricocha's chemical laboratory performs all chemical assays for metallurgical testing as well as supporting the normal operation including geology, mining, process, and metallurgical investigations. The chemical laboratory is equipped with suitable equipment and instrumentation, and it follows standard industry practices and procedures.

Additionally, when more specialized equipment and techniques are required, Yauricocha sends samples to third-party laboratories for specific investigations in specialized areas like comminution, mineralogy, and microscopy analysis. Table 13-1 shows investigations carried out between 2018 to this date on samples from the processing circuit as well as samples from multiple areas of the mining operation including Angelita, Mascota, Esperanza, Catas, and Cachi-Cachi.

Table 13-1: Yauricocha Metallurgical Testing Using Third-Party Laboratories

Date	Author	Title	Scope
2018 Jun	Metso Process Optimization	Comminution Metallurgical Testing	Sag Mill Comminution testing, Bond Ball Mill Wi, Bond Rod Wi on polymetallic ore, two samples
2018 Aug	BizaLab	Optical Microscopy of Head Sample	Optical microscopy of a polymetallic sample
2018 Aug	BizaLab	Optical Microscopy of six	Six scavenger concentrate samples from the Bulk from the Pb-Cu circuit
2019 Mar	Metso Process Optimization	Comminution Metallurgical Testing	Bond Ball Mill Wi on a polymetallic ore sample
2019 Sep	BizaLab	Optical and Electronic Microscopy of Grinding Product and Final Tail Samples	Mineralogical analysis of two samples usin XRD
2020 Jul	BizaLab	Mineralogical Analysis of Copper and Lead Minerals	Mineralogical analysis of six samples usin XRD
2020 Aug	SGS	Electronic Microscopy, Particle Mineral Analysis (PMA)	A total of six (6) ore samples from multiple area including: Angelita, Mascota, Esperanza, Catas, Cachi Cachi. Samples were subject to analysis of metal deportment, liberation and association
2021 Mar	Applied Water Treatment (AWT)	Yauricocha Copper Removal	Removing, recovering dissolved copper effluent water

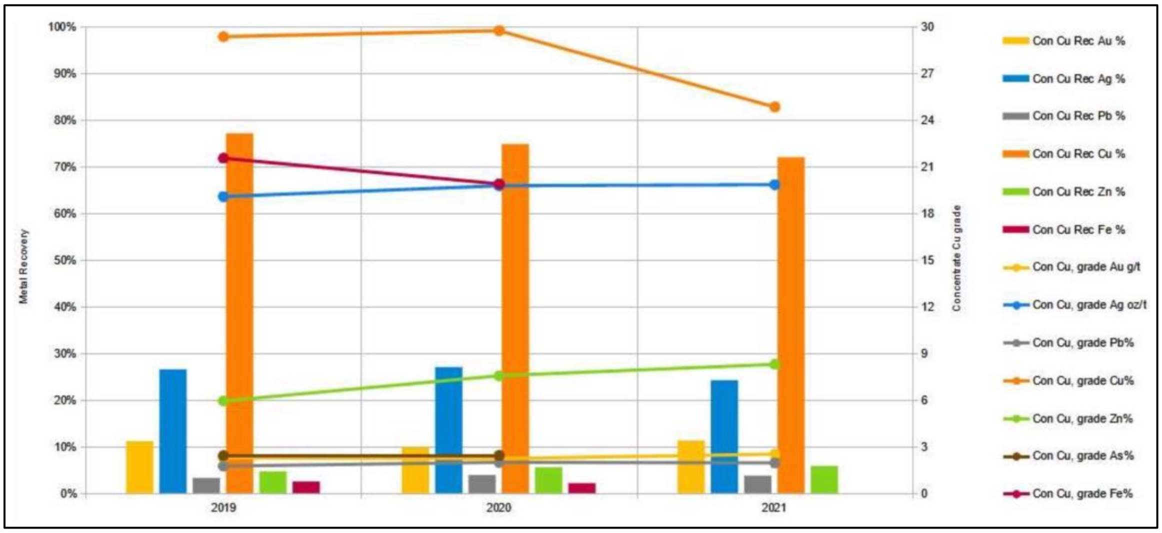
Source: Sierra, 2021

13.2 Recovery Estimate Assumptions

Mineralized material feed and final concentrate grades and recovery for the period of January 2019 to March 2021 are shown in Table 13-2 and Figure 13-1, Figure 13-2, and Figure 13-3.

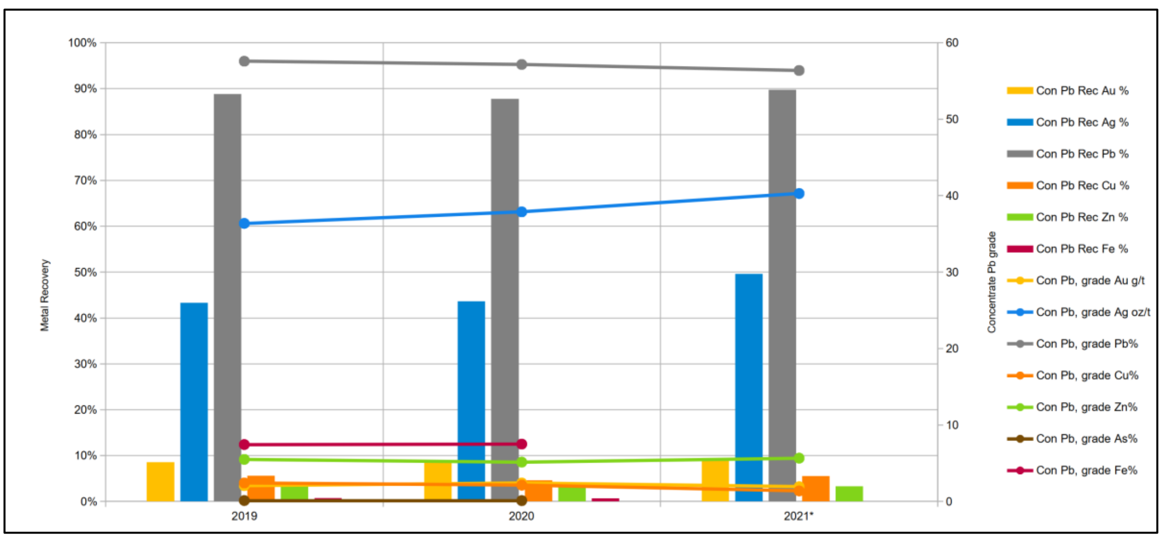
Oxide mineralized material was processed until 2018 only, therefore starting in 2019, the final concentrate production includes only the three mineral concentrates from the polymetallic plant, namely lead sulfides concentrate, copper sulfides concentrate, and zinc concentrate.

The copper concentrate has consistently achieved typical commercial copper grades and ranged from 25.2% Cu in the first quarter of 2021, to 29.85% Cu in 2020 (Figure 13-3).



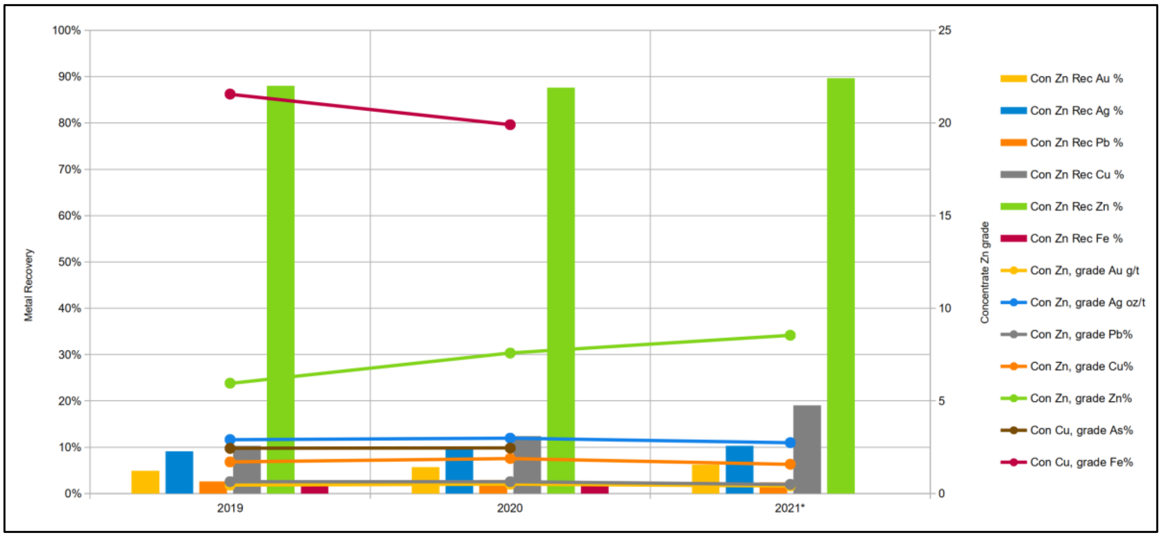
Source: SRK, 2021

Figure 13-1: Copper Concentrate, Recovery and Grades



Source: SRK, 2021

Figure 13-2: Lead Concentrate, Recovery and Grades



Source: SRK, 2021

Figure 13-3: Zinc Concentrate, Recovery and Grades

Copper recovery showed an average of 75.3% that ranged from a low of 66.3% to a high of 74.8%. The recovery of lead in the copper concentrate ranged from 2.4% to 3.3%, translating to grades ranging from 1.8% Pb to 2.1% Pb which may or may not trigger penalties because they are just above the typical threshold observed in concentrate sales contracts.

Gold recovery in the copper concentrate ranged between 9.9% to 11.1% translating to grades ranging from 2.3 g/t up to 2.8 g/t; these are just above the typical deduction limit in contracts and therefore may trigger minor credits. Silver recovery to copper concentrate ranged between 19.6% to 27.0% translating to grades ranging from 593.9 g/t up to 709.8 g/t, which likely triggered credit payments. Arsenic recovery is not reported, but arsenic grade is tracked in copper concentrate with values consistently just below 2.5% which is likely to trigger penalty payments.

Table 13-2: Yauricocha Recovery and Grades

Period	Stream	Tonne	Tonne/day (365 d/y)	Grades							Metal Recovery					
				Au g/t	Ag g/t	Pb %	Cu %	Zn %	As %	Fe %	Au %	Ag %	Pb %	Cu %	Zn %	Fe %
2019	Mineralized Material	1092410	2993	0.6	63.9	1.6%	1.1%	3.7%	0.1%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Con. Cu	30931	85	2.3	593.9	1.8%	29.4%	6.0%	2.4%	21.6%	11.1%	26.5%	3.3%	77.1%	4.7%	2.5%
	Con. Pb	26574	73	2.1	1131.6	57.6%	2.4%	5.5%	0.1%	7.4%	8.5%	43.3%	88.9%	5.6%	3.7%	0.7%
	Con. Zn	69863	191	0.5	90.6	0.6%	1.7%	51.0%	0.1%	8.9%	4.9%	9.1%	2.6%	10.3%	88.0%	2.3%
2020	Mineralized Material	1109730	3040	0.6	61	1.5%	1.0%	3.8%	0.1%	24.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Con. Cu	29235	80	2.3	615.6	2.0%	29.8%	7.6%	2.5%	19.9%	9.9%	27.0%	3.9%	74.8%	5.5%	2.2%
	Con. Pb	24777	68	2.4	1178.4	57.2%	2.1%	5.1%	0.1%	7.5%	9.1%	43.6%	87.8%	4.6%	3.1%	0.7%
	Con. Zn	73583	202	0.5	93.1	0.6%	1.9%	49.9%	0.1%	9.6%	5.7%	10.2%	2.9%	12.4%	87.6%	2.6%
2021*	Mineralized Material	322483	3583	0.4	54.1	1.3%	0.6%	3.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Con. Cu	4723	52	2.8	709.8	2.1%	25.2%	8.5%	0.0%	0.0%	9.6%	19.6%	2.4%	66.3%	3.7%	0.0%
	Con. Pb	6884	76	1.9	1253.1	56.4%	1.4%	5.7%	0.0%	0.0%	9.5%	49.6%	89.8%	5.5%	3.3%	0.0%
	Con. Zn	20964	233	0.4	85.5	0.5%	1.6%	50.9%	0.0%	0.0%	6.2%	10.3%	2.4%	19.0%	89.6%	0.0%
Global	Mineralized Material	2524623		0.6	61.4	1.5%	1.0%	3.7%	0.1%	21.7%						
	Con. Cu	64890		2.3	612.1	1.9%	29.2%	6.9%	2.3%	19.2%	10.5%	26.2%	3.5%	75.3%	5.0%	2.2%
	Con. Pb	58235		2.2	1165.8	57.3%	2.2%	5.4%	0.1%	6.6%	8.9%	44.2%	88.5%	5.2%	3.4%	0.6%
	Con. Zn	164411		0.5	91.1	0.6%	1.8%	50.5%	0.1%	8.1%	5.4%	9.8%	2.7%	12.4%	88.0%	2.1%

Source: Sierra, 2021

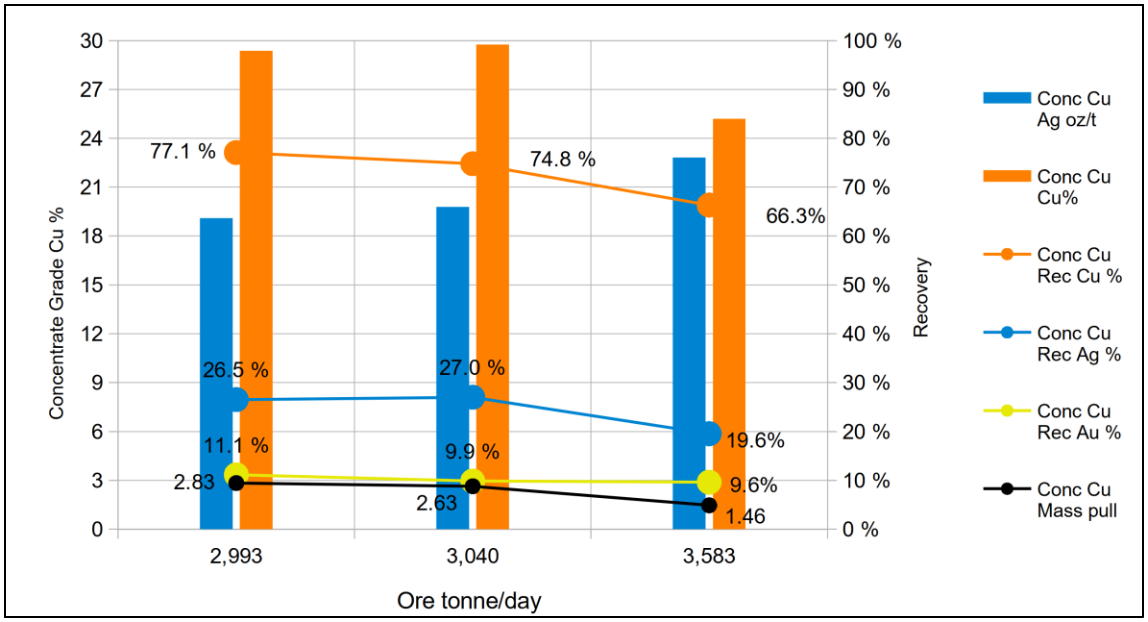
* Q1 2021

Lead concentrate is consistently achieving commercial lead grades ranging from 56.4% Pb in the first quarter of 2021 to 57.2% Pb in 2020. Lead recovery has been also consistent throughout the period averaging 88.5% within a low 87.8% to a high 89.8% in Q1 2021. Recovery of copper in the lead concentrate averaged 5.2% which translates to grades in the concentrate ranging from 1.4% to 2.4%. These values lead may trigger some penalty payments during the concentrate sales. Similarly, zinc recovery in the lead concentrate has been consistently in the 3% to 4% range resulting in concentrate grades ranging from 5.1% Zn to 5.7% zinc, which will likely result into minor penalty payments. Gold deportment to the lead concentrate ranged from 8.5% to 9.5%, with an average of 8.9% during the period which translates to concentrate grades ranging from 1.9 g/t to 2.4 g/t. At these grades, gold may be just above the deduction levels and may trigger minor credit payments. Silver is preferentially recovered in the lead concentrate with an average of 44.2% and ranging from a low 43.3% to a high 49.6%. Silver grades in the lead concentrate consistently reached over 1 kg per tonne with an average of 1,165.8 grams per tonne.

Zinc concentrate is consistently reaching recovery of zinc averaging 88.0% and commercial zinc grades around 50%. Recovery of copper in the zinc concentrate averaged 12.4% translating to concentrate grades ranging from 1.6% to 1.9%, which is close to typical penalty thresholds in sales contracts and therefore may trigger penalty payments. Similarly, lead recovery in the zinc concentrate has ranged between 2% and 3% resulting in concentrate grades around 0.6% Pb which is likely to be below the threshold for a penalty. Gold recovery in the zinc concentrate ranges between 5% and 6% approximately and translates to approximately 0.5 g/t Au which is below the typical threshold for credit payments. Silver recovery to the zinc concentrate is low at around 10%, translating to approximately 90 g/t in concentrate which may add some minor credit to the value of the Zn concentrate.

Overall, gold's combined recovery into final concentrates reaches only 24.8% and its deportment is similarly spread among all three concentrates; consequently, the gold grade in each concentrate is unlikely to achieve payable levels. The highest gold grade achieved was 2.8 g/t in Q1 2021 which is just above the typical deduction values applied by smelters and/or concentrate traders. Yauricocha may want to look for opportunities to improve gold recovery by deporting the metal into a single final concentrate, or to attempt alternative concentration methods like gravity concentration around the grinding stage and/or gravity concentration of the final flotation tails.

Additional analysis of the copper concentrate suggests that its metallurgical performance has been negatively impacted by either throughput increase, reduction in mass pull, or a combination of both, as shown in Figure 13-4.



Source: Sierra, 2021

Figure 13-4: Copper Concentrate – Recovery, Grade and Mass Pull vs Throughput

SRK makes the following observations:

- in Q1 2021 the fresh feed increased from approximately 3,000 tonnes/day up to 3,600 tonnes per day, an increase of approximately 20%.
- During the same period, the copper concentrate mass pull was lowered from 2.83% to 1.46% copper.
- The result of increased throughput and reduced mass pull negatively impacted metals recovery in the copper concentrate. Reductions in mass pull averaged 6% for copper, 7% for gold, and approximately 1% for silver.

The observed lower recoveries in the copper concentrate could be the resulting from modifications or operational adjustments to upstream stages in the concentration plant. As such, it is in Yauricocha's best interest to thoroughly review the drivers and economics of its operating practices and of any modifications to the processing circuit.

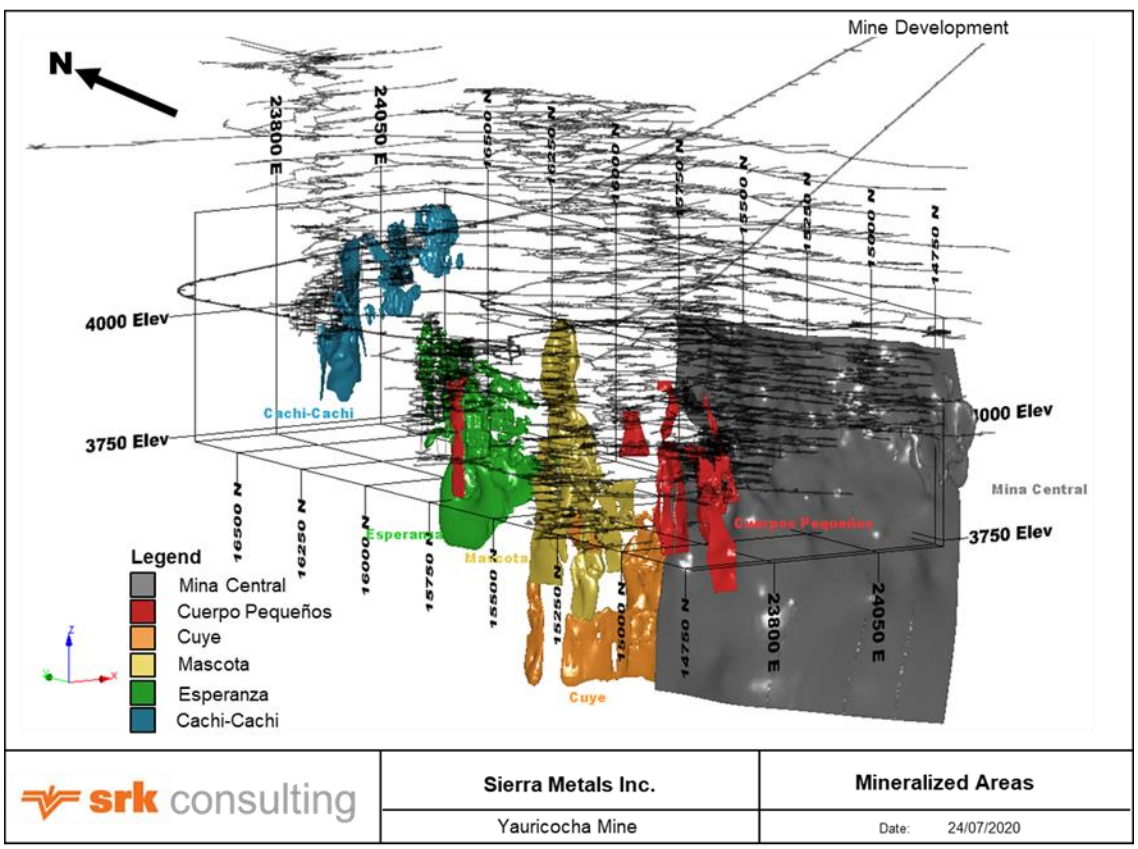
14 Mineral Resource Estimates

Mineral Resource estimations have been conducted by the following Qualified Person using various industry-standard mining software:

- Andre Deiss, Principal Resource Geologist of SRK Consulting (Canada) Inc., Datamine Studio RM™ version 1.6.87.

SRK completed Mineral Resource estimations for the following mineralized areas (Figure 14-1):

- Mina Central;
- Esperanza;
- Mascota;
- Cuye;
- Cuerpos Pequeños; and
- Cachi-Cachi.



Source: Sierra Metals, 2021

Figure 14-1: Modeled Mineralized Areas Estimated at Yauricocha Mine

14.1 Drillhole/Channel Database

The QP received a drillhole database in digital Microsoft ExcelTM (Excel) format. The QP notes that Minera Corona maintains their own database in an individual unprotected spreadsheet, without a clear chain of custody record. However, the use of a single repository Excel sheet is an improvement on the historical practice of utilizing individual Excel files for each mineralized zone respectively. No record is kept of the original source information as edits are made directly in the current spreadsheet tabs.

The QP is of the opinion that one of the largest and most critical deficiencies at Yauricocha is the lack of a well-maintained and protected geological relational database which has the capability to track changes. This type of database would facilitate multi-faceted interrogations of the original and interpreted drillhole information available. Furthermore, it would permit flexibility and speed in manipulation and extraction of data for use in any mineral resource estimation. QA/QC results would be seamlessly available to allow for timely interrogation and intervention on assay result failures.

14.2 Geologic Model

The geologic model was developed by Minera Corona geologists, primarily using Leapfrog® Geo software (Leapfrog). Three dimensional (3D) models were derived from both drilling and channel samples lithological logging and analytical results, as well as incorporating mapping from mine levels and structural observations. Significant expansion and infill drilling between the end of 2017 and the effective date of the Mineral Resource (March 31, 2021), has resulted in net changes in many areas of the Yauricocha deposit thus improving the definition of the mineralized zones. Minera Corona geologists are responsible for the generation of the mineralized solids, allowing for the incorporation of detailed local geological information and hence producing more accurate representations of the mineralized zones as they are exposed on the mine.

The QP noted that the mineralized zones at depth more closely resemble the actual mapped and recorded mineralization morphology in mined-out areas, which was not the case prior to 2018. Historically, the less informed areas of the models tended to be extremely optimistic for the respective mineralization style. This issue has been addressed since 2018 with additional infill drilling and the modification of the implicit modelling parameters used in Leapfrog. This has reduced the volumes of the respective mineralized bodies significantly in areas with a lower density of drilling intercepts.

There is currently no detailed structural or lithological stratigraphic geology model available for the mine. A regional structural model was commissioned by the mine; however, the results were not readily available for the QP to evaluate or comment on the validity thereof. A lithostratigraphic model would facilitate the mine planning process with regards to the ability to apply a lithostratigraphic waste density for dilution purposes.

Mineralization at Yauricocha encompasses two main styles that are differentiated by scale, continuity, and exploration and development style, namely:

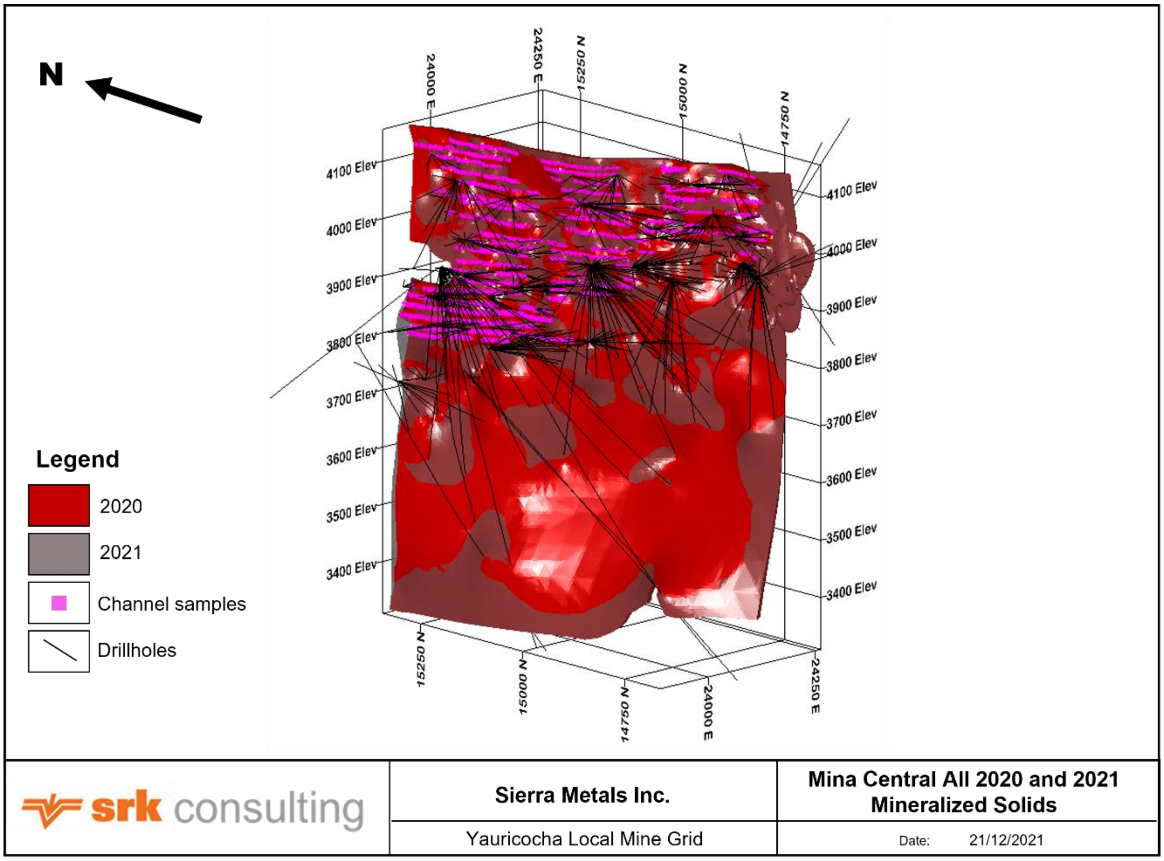
- Cuerpos Massivos (large bodies) are bodies formed along major structures of significant (several hundreds of meters) of vertical extent, consistent geometry, and significant strike length. Most of the tonnage mined at Yauricocha is from these bodies, as they are easily intersected by targeted drilling and are mined by bulk mining methods.
- Cuerpos Chicos (small bodies) are smaller mineralized bodies of high grades. They are often skarn bodies, are less continuous and less regular in form than the Cuerpos Massivos and are difficult to intersect, except with carefully targeted drilling. They are typically mined by overhand cut and fill or similar highly selective mining methods. The mine has historically drifted into these zones and delineated them using localized channel sample data.

14.2.1 Mina Central

The geology model for Mina Central has been constructed by Minera Corona site geologists. This model is based on implicit modelling of drilling and channel sampling, and encompasses the Antacaca, Catas, Rosaura, and Antacaca Sur areas, which are broken on geographic and infrastructure boundaries, rather than any mineralogic or geologic boundaries. The model is effectively continuous through all areas. The mineralization is domained using a steeply dipping, NW trending, tabular wireframe constructed in Leapfrog. Both channel sampling and drilling have been used to develop this model. The QP has reviewed and accepted the Mina Central wireframes. They are a reasonable representation of the polymetallic sulfide and oxide mineralization as logged and sampled in this area.

The QP noted overlaps between the Antacaca Sur Oxidos Cuye mineralized zones with the Mina Central mineralized zones; these were corrected for the 2021 estimation. The mineralized zone has been adapted at depth from the previous 2020 model, based on revised interpretation and expanded drilling. The 2021 Mina Central geological model in the context of the previous model is shown in Figure 14-2.

In addition to the expanded extents of the Mina Central area, Minera Corona geologists have modeled selected oxide zones in the Antacaca Sur area based on drilling and mine development data. This is a separate domain from the main Mina Central area for the purposes of data analysis and estimation.



Source: Sierra Metals, 2021

Figure 14-2: Mina Central Mineralized Model

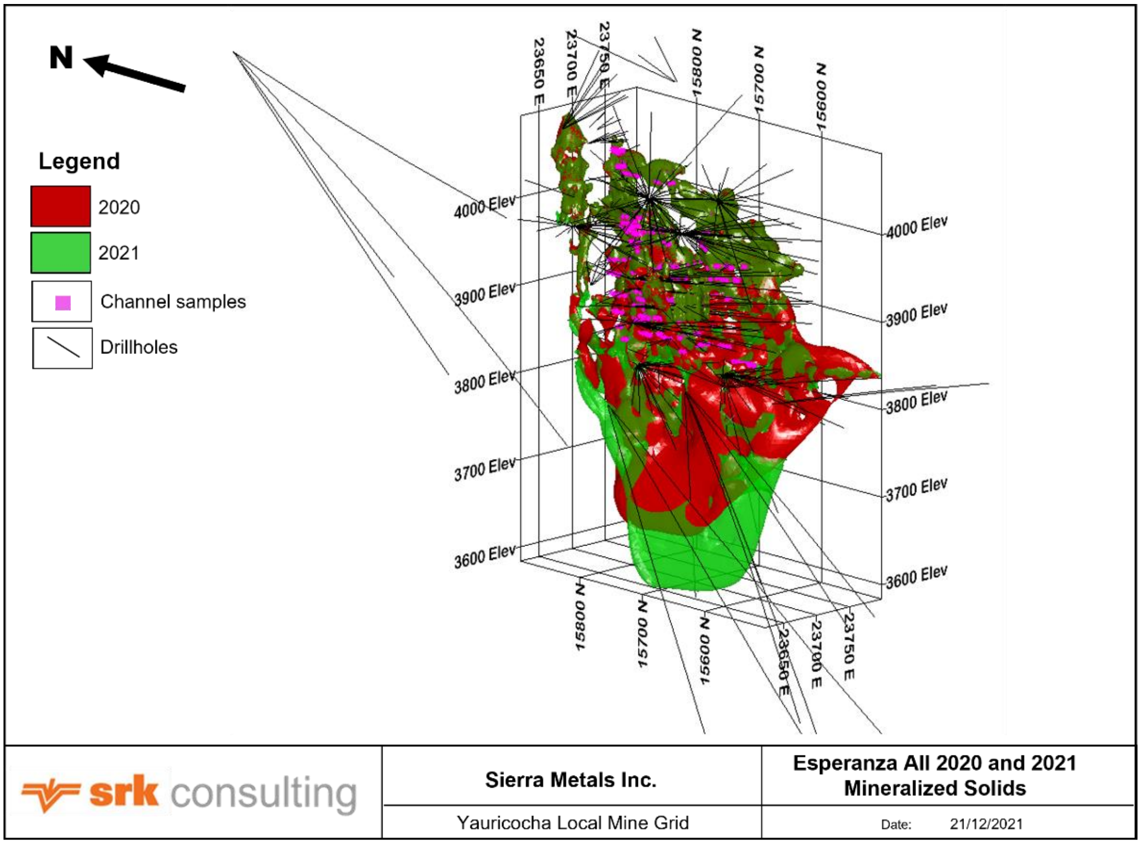
14.2.2 Esperanza

The geology model for Esperanza has been constructed by Minera Corona site geologists. This model is based on a detailed drilling program, as well as cross-sectional and level mapping, which is required to model the inherent complexity of this area. The model is implicitly modeled for a series of seven different areas identified within Esperanza based on mineralogy or textures. These include three breccia zones, one copper zone, Esperanza North, Esperanza Distal, and a lower grade pyrite-rich area. Three of the zones were not estimated namely:

- Esperanza Breccia 1 (mined out)
- Esperanza Breccia 2 (mined out)
- Esperanza Cobre (mined out)

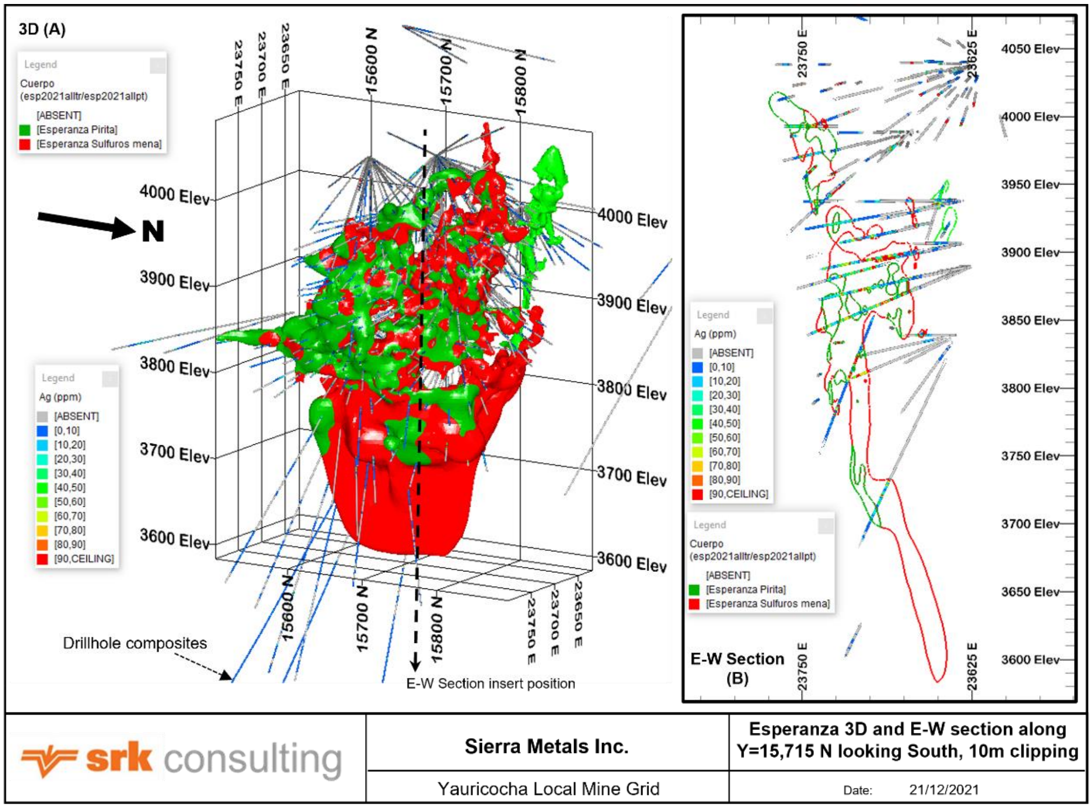
Esperanza ii is a newly discovered mineralized zone and was not estimated for the 2021 Mineral Resources. Since 2020, a pyritic lower grade envelope was modeled and estimated as part of the main Esperanza mineralized body. This pyritic-rich material is more friable and tends to cave with the planned mined material causing added mining dilution. The Esperanza model represents what appears to be a single primary feeder structure at depth, which splits into many “finger-like” smaller structures in the upper levels. With recent drilling this mineralization morphology has been substantiated.

Although general continuity along strike and down-dip is good, the QP notes that the mineralization varies dramatically in orientation and thickness, locally over short distances. The QP has reviewed and accepted the Esperanza geological wireframes. The 2021 Esperanza geological model, in the context of the previous geological model is shown in Figure 14-3. Figure 14-4 shows the relationship between the Ag (ppm) drillhole analytical results and the Esperanza geological model domains.



Source: Sierra Metals, 2021

Figure 14-3: Esperanza Mineralized Model



Source: Sierra Metals, 2021

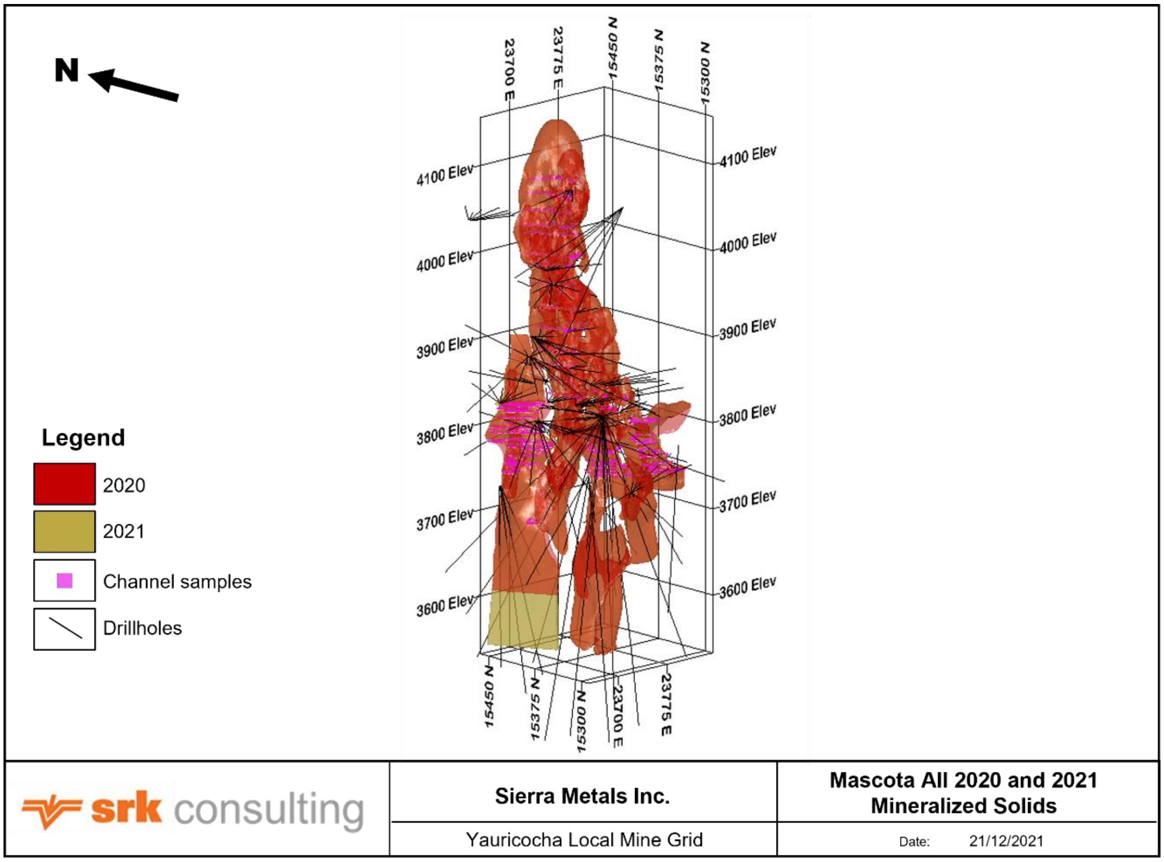
Figure 14-4: 3D (A) and E-W Cross-section (B) of the Esperanza Geological Model and Drilling

14.2.3 Mascota

The geology model for Mascota has been constructed by Minera Corona site geologists using implicit modelling in Leapfrog. The model is based on the grouped lithologies from drilling and sampling in the Mascota Mine area. The mineralization style is complex and many faceted. The geological models include copper-rich areas as well as the massive sulfide zones being explored at depth. These areas have been identified as Ag/Pb oxides, low-grade Ag/Pb oxides, Cu oxides, and polymetallic sulfides. They are considered as discrete by the Minera Corona geologists and have been domained separately for the purposes of estimation. The QP has reviewed and accepted the Mascota geological wireframes. The following mineralized areas were estimated independently in the Mascota area:

- Mascota Oxide Cu Pb-Ag
- Mascota Polymetallic North
- Mascota Polymetallic East
- Mascota Polymetallic (South) East
- Mascota Polymetallic South
- Mascota Sur Oxide Cu

The 2021 Mascota geological model in the context to the previous geological model is shown in Figure 14-5.



Source: Sierra Metals, 2021
Figure 14-5: Mascota Mineralized Model

14.2.4 Cuye

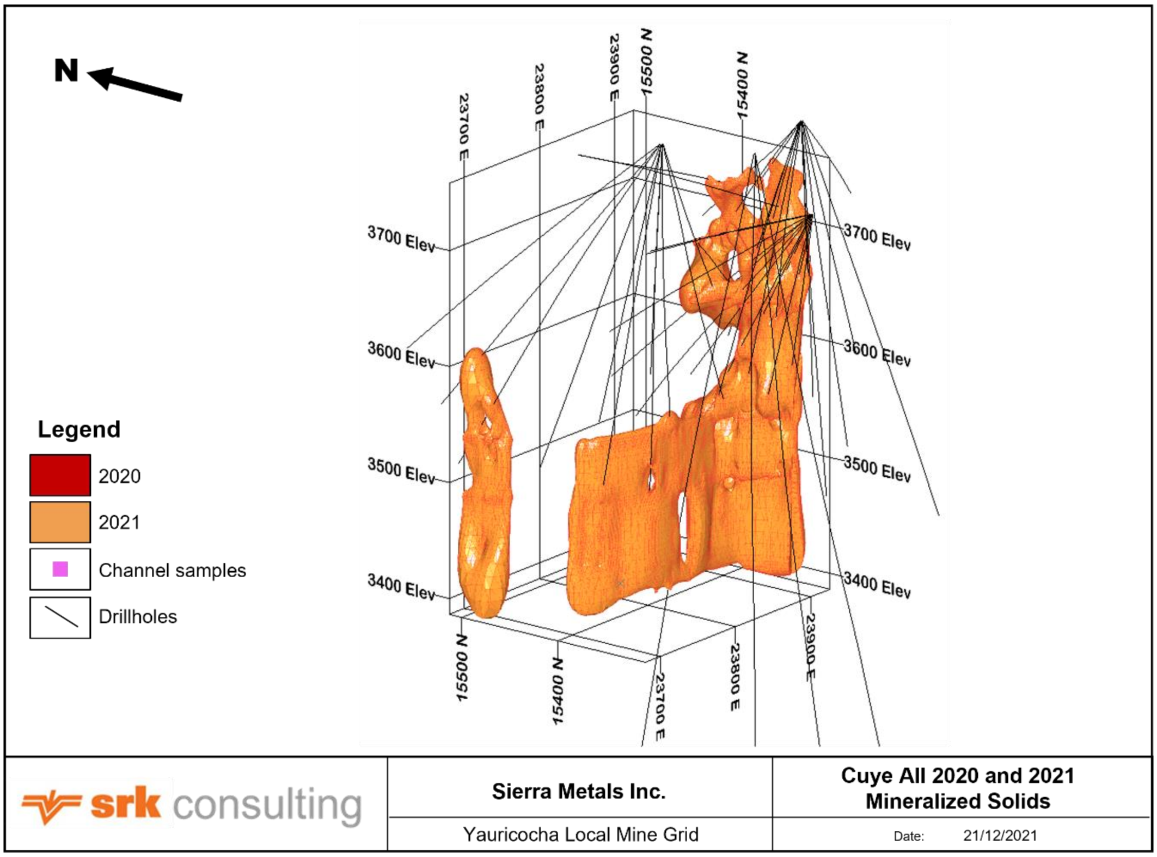
The Cuye mineralization has previously been reported as a series of smaller bodies situated between the Mina Central and Mascota areas. Unlike the smaller bodies, the new intersections are thicker, more continuous, and lower grade. Drilling has been unsuccessful in intersecting an extension of the Mina Central mineralization to the north. The size and morphology of the Cuye area matches closely to the tabular steeply dipping mineralization along the trend of the Mina Central and Esperanza areas. Cuye has only been sampled by relatively widely spaced drilling.

Cuye mineralization is similar to Esperanza, featuring pyrite-rich zones, which have been modeled separately within the greater Cuye mineralization. These areas have been excluded from the estimation as they are considered as waste rock for the mine.

The Cuye iii mineralized body, previously included in the 2019 Mineral Resources has not been included in the 2021 Mineral Resources as exploration mine development was unable to intersect the zone, previously identified by three sparsely spaced drillholes. In 2019 and 2020, drilling intersected poorly or non-mineralized lithologies that were previously consider as mineralized. The geological model and estimates were updated in 2020 to include these significant changes. No drilling has been done in the Cuye mineralization since the previous technical report. Therefore, no changes to the geological model or estimate were made in 2021 (Figure 14-6). The 2021 cut-off values were applied for resource declaration purposes. The QP reviewed and accepted the 2020 Cuye geological wireframes.

Exploration drilling has identified a new mineralized zone south of the main Cuye mineralized zone. It has been designated as Cuye Sur and it has not been included in the 2021 Mineral Resources as additional drilling is required to define the shape of the mineralization.

The 2021 Cuye mineralization has not changed compared to the previous model (Figure 14-6).



Source: Sierra Metals, 2021
Figure 14-6: Cuye Mineralized Model

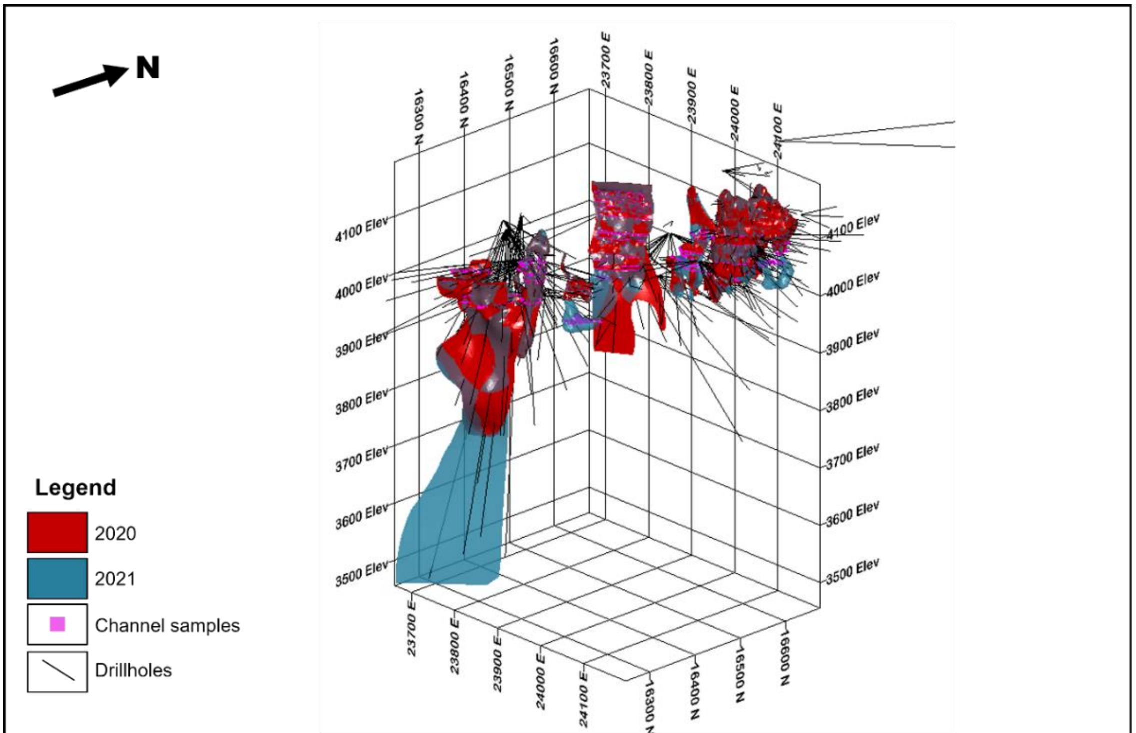
14.2.5 Cachi-Cachi

The geology model for Cachi-Cachi has been constructed by Minera Corona site geologists. This model is based on cross-sectional and level mapping, and encompasses the massive, mineralized bodies that follow:

- Angelita
- Carmencita
- Karlita

- Elissa
- Escondida
- Privatizadora
- Sulma
- Vanessa
- Yoselim

Cachi-Cachi comprises discrete mineralized bodies, with unique morphologies and mineralization. Carmencita, Sulma, Vanessa and Yoselim mineralized zones were discovered in late 2018 and early 2019. The Cachi-Cachi mineralization is domained using a variety of geometries and orientations, which are generally steeply dipping. Geological wireframes were implicitly modeled in Leapfrog. Both channel sampling and drilling have been used to develop these models. The QP reviewed and accepted the wireframes. They are a reasonable representation of the polymetallic sulfide mineralization as logged and sampled in this area. Cachi-Cachi 2021 geological models relative to the previous geological models is shown in Figure 14-7.



srk consulting	Sierra Metals Inc.	Mineralized Cachi-Cachi All 2020 and 2021 Solids
	Yauricocha Local Mine Grid	Date: 21/12/2021

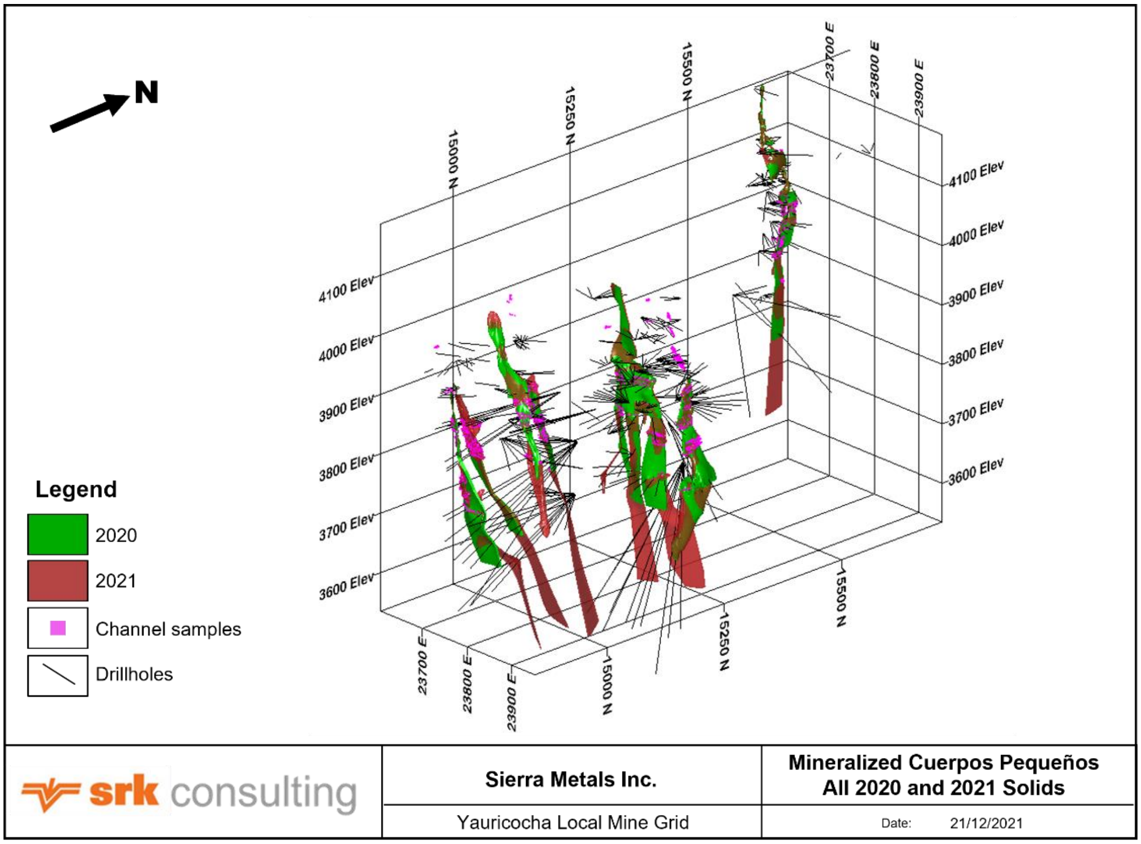
Source: Sierra Metals, 2021

Figure 14-7: Example of Cachi-Cachi Models

14.2.6 Cuerpos Pequeños

The geology models for the Cuerpos Pequeños has been constructed by Minera Corona site geologists. These models are based on cross-sectional interpretation and level mapping, as well as drilling and channel sampling. Models generally encompass small chimney-shaped massive sulfide mineralization which are considered discrete mineralized bodies with unique morphologies and mineralization. The models independently estimated include the following (Figure 14-8):

- Contacto Oriental
- Contacto Occidental
- Contacto Occidental Oxide (not estimated or mined)
- Contacto Sur Medio (TJ6060)
- Contacto Sur Medio I (TJ8167)
- Contacto Sur Medio II (TJ1590)
- Gallito



Source: Sierra Metals, 2021

Figure 14-8: Cuerpos Pequeños Mineralized Model

The mineralization is domained using a variety of geometries and orientations which are generally steeply-dipping. Model wireframes are implicitly modeled in Leapfrog. Both channel sampling and drilling have been used to develop these models. The QP reviewed and accepted the Cuerpos Pequeños geological wireframes. They are reasonable representations of the polymetallic sulfide mineralization as logged and sampled in this area.

The unpredictable nature of the mineralized bodies and the exploration methodology used to delineate them, poses a geological modelling risk during interpretation of these mineralized bodies as they tend to pinch and swell dramatically over short distances. Although they are an important source of Mineral Resources and mine production, they are not relied upon to the same degree as the more massive bodies, such as Mina Central and Esperanza. The QP notes that there are several of these Cuerpo Pequeño-type mineralized bodies that have not been modeled or estimated as a part of this update. Historically, modelling and estimating these smaller mineralized bodies was a challenge, as the mineralization is often significantly or completely depleted through mining, between the bi-annual modelling process cycles.

14.2.7 Geology Model as Resource Domains

The QP treated the geology model boundaries as hard boundaries for the purposes of the resource estimation process. However, for the purposes of exploratory data analysis (EDA), the QP grouped selected areas based on their geography or mineralogical relationships to ensure that the populations of data were sufficient to make informed decisions regarding compositing, capping, and variography.

For the EDA, the QP began with reviewing the sample distributions and mean grades for data within each local mineralization area. Based on the review of each local area, the QP elected to use each geologic domain (or subdomain) as a hard boundary to prevent estimation bias between adjacent smaller mineralized envelopes which was evident from the interim resource models produced by Corona resource geologists in 2018. The individual domains were grouped based on a combination of factors including proximity, relative data populations, and mineralization style. The length weighted raw sample mean grade (excluding absent values) for the respective domain, as well as the nomenclature and coding for the respective main domain groups are shown in Table 14-1.

In 2021 five domains were not re-estimated as no additional drilling or sampling was available for the respective mineralized bodies, for details see Table 14-2. Physical depletions for 2021 were applied, where applicable, and 2021 Net Smelter Return (NSR) cut-off values were applied for the 2021 Mineral Resource declaration.

Table 14-1: Raw Sample Mean Grades per Mineralized Zone

AREA	Model Prefix	Number of Samples	AG (ppm)	PB (%)	CU (%)	ZN (%)	AU (ppm)	AS (%)	FE (%)	Length (m)*
Mina Central	ASO	951	152.05	1.75	0.51	1.21	1.23	0.33	30.58	0.98
Mina Central	MINAC	18,250	51.63	0.72	0.93	2.97	0.70	0.17	29.18	0.96
Mascota	MAPE	552	122.62	2.13	1.34	13.09	0.80	0.11	25.10	1.73
Mascota	MAPN	807	209.25	12.69	0.34	22.05	0.64	0.08	9.63	1.64
Mascota	MAPS	503	89.55	0.50	0.32	5.36	0.49	0.12	28.39	1.76
Mascota	MAS	143	3.81	0.11	5.18	17.01	0.03	0.16	19.73	0.99
Mascota	MOX	3,869	269.56	8.85	2.72	2.06	1.94	0.28	21.11	0.99
Esperanza	ESP	12,126	74.42	0.88	2.52	2.26	0.72	0.31	32.95	0.97
Esperanza	ESPBX	66	116.24	2.86	0.59	8.72	0.20	0.08	11.51	0.96
Esperanza	ESPD	475	93.23	8.65	0.39	18.14	0.34	0.12	15.94	0.98
Esperanza	ESPN	928	90.26	3.28	1.45	7.40	0.72	0.74	26.37	0.97
Cuye	CUYE	1,184	31.18	0.14	1.60	1.87	0.67	0.15	31.44	0.97
Cuerpos Pequeños	COC	489	141.24	2.87	0.36	11.01	0.61	0.09	20.57	1.64
Cuerpos Pequeños	COR	752	118.45	2.65	0.58	12.52	0.59	0.21	19.67	1.77
Cuerpos Pequeños	CSM	305	437.33	16.30	0.24	17.66	0.66	0.08	12.09	1.82
Cuerpos Pequeños	CSMI	395	328.48	19.67	0.16	25.32	0.17	0.06	7.84	1.82
Cuerpos Pequeños	CSMII	954	361.10	11.72	0.22	13.90	0.40	0.26	13.55	1.74
Cuerpos Pequeños	GAL	799	101.28	5.74	0.98	13.36	0.38	0.23	21.20	1.51
Cachi-Cachi	ANG	2,685	17.09	0.39	0.54	5.32	0.30	0.11	30.87	0.99
Cachi-Cachi	CAR	377	70.69	0.98	0.31	2.89	0.72	0.14	21.70	1.87
Cachi-Cachi	CEL	679	22.82	0.30	0.60	2.61	0.43	0.18	27.33	1.07
Cachi-Cachi	ELI	1,046	118.24	2.62	0.23	10.47	0.56	0.33	23.60	1.99
Cachi-Cachi	ESC	736	89.88	2.83	0.30	6.64	0.72	0.12	30.75	1.63
Cachi-Cachi	KAR	1,875	80.98	1.21	0.76	4.85	0.80	0.20	32.64	1.34
Cachi-Cachi	PVT	360	75.07	2.78	0.12	8.62	0.62	0.12	27.29	1.15
Cachi-Cachi	SUL	42	65.49	4.54	0.28	5.53	0.48	0.25	23.74	1.55
Cachi-Cachi	VAN	262	101.29	4.42	0.34	13.61	0.57	0.14	20.88	1.63
Cachi-Cachi	YOS	243	134.49	3.81	0.13	10.20	0.96	0.54	24.27	1.59

* Length weighting not applied
Source SRK, 2021

Table 14-2: Summary of Main Resource Domain Groups in Geologic Models

Area	Model Prefix	Domain Description	Estimation Date
Mina Central	MINAC	Mina Central	2021
	ASO	Antacaca Sur Oxidos	2019**
Esperanza	ESP	Esperanza	2021
	ESPBX	Esperanza Breccia 3	2020**
	ESPD	Esperanza Distal	2021
	ESPN	Esperanza Norte	2021
Mascota	MAS	Mascota Sur Oxide Cu	2019**
	MAPN	Mascota Polymetallic North	2021
	MAPE	Mascota Polymetallic East	2021
	MAPS	Mascota Polymetallic South / South (East)	2021
	MOX	Mascota Oxide Pb-Ag / Cu	2019**
Cuye	CUYE	Cuye	2020*
Cuerpos Pequños	COR	Contacto Oriental	2021
	COC	Contacto Occidental	2021
	CSM	Contacto Sur Medio (TJ6060)	2021
	CSMI	Contacto Sur Medio I (TJ8167)	2021
	CSMII	Contacto Sur Medio II (TJ1590)	2021
	GAL	Gallito	2021
Cachi-Cachi	ANG	Angelica	2021
	CAR	Carmencita	2021
	CEL	Celia	2021
	ELI	Elissa	2021
	ESC	Escondida	2021
	KAR	Karlita	2021
	PVT	Privatizadora	2021
	SUL	Sulma	2021
	VAN	Vanessa	2021
	YOS	Yoselim	2021

* Not re-estimated in 2021 only 2021 physical depletion applied and 2021 NSR cut-offs applied for Mineral Resources
** Not re-estimated in 2021 only 2021 NSR cut-offs applied for Mineral Resources
Source: Sierra Metals, 2021

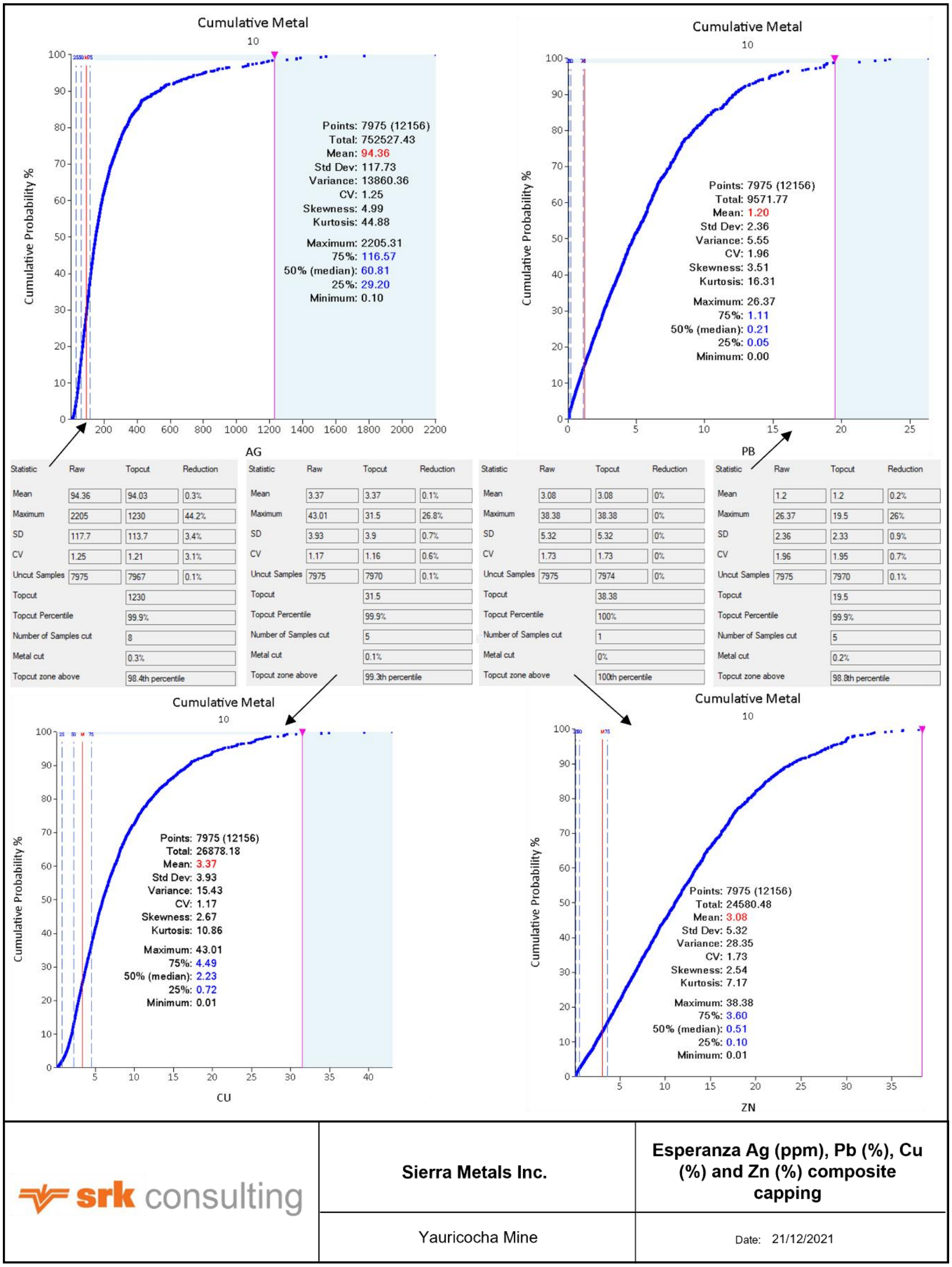
14.3 Assay Capping and Compositing

SRK conducted compositing and then capping for the drillhole and channel sampling databases supporting all the estimation domains.

14.3.1 Outliers

The QP reviewed the outliers for the original sample data in each area or domain using a combination of histograms, log probability plots, and descriptive statistics. Outliers are evaluated from the original, un-composited and composited data to establish their spatial influence. The QP decided to treat the outliers after compositing as there was no sample length to grade bias. The composites were flagged by the 3D geologic model wireframes. An example of the cumulative normal and log probability plots reviewed for Ag, Pb, Cu and Zn for Esperanza is shown in Figure

14-9. The capping values generally lie between the 98-99th percentile range. This capping analysis reviewed the impact of the capping with respect to the total reduction in contained metal, percentage of samples capped, and reduction to the Coefficient of Variation (CV). Capping limits were assigned to each of the individual volume solids. Table 14-3 records the dominant mineral resource volume capping threshold. Minor volumes may have different capping limits to prevent conditional bias in the grade estimation process.



Source: SRK, 2021

Figure 14-9: Cumulative Probability Plots for Capping Analysis – Esperanza

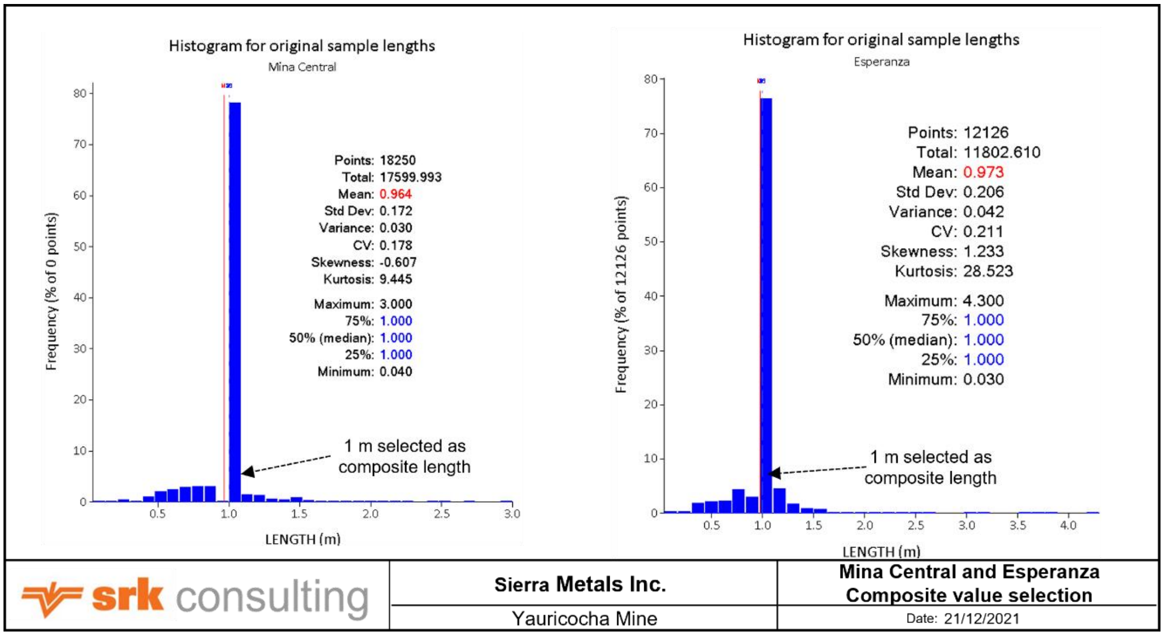
Table 14-3: Capping Limits for Dominant Volumes in Mineral Resource Areas

Area	Model Prefix	AGC (ppm)	PBC (%)	CUC (%)	ZNC (%)	AUC (ppm)	ASC (%)	FEC (%)
Mina Central	ASO	687	5.08	1.80	8.54	7.40	1.04	-
Mina Central	MINAC	1,035	19.00	15.00	38.30	18.50	5.00	59.00
Mascota	MAPE	444	20.40	9.85	43.00	3.90	0.49	-
Mascota	MAPN	978	-	4.90	-	7.40	0.27	-
Mascota	MAPS	408	3.65	1.99	36.00	3.91	0.57	-
Mascota	MAS	6	0.20	12.73	-	0.05	0.41	29.20
Mascota	MOX	1,991	59.70	5.04	14.50	22.90	2.48	-
Esperanza	ESP*	1,230	19.50	31.50	-	12.00	5.50	-
Esperanza	ESPBX	241	7.00	1.96	16.50	0.42	0.25	21.04
Esperanza	ESPD	-	25.00	2.30	-	1.62	0.61	-
Esperanza	ESPN*	780	-	16.00	-	8.80	10.50	-
Cuye	CUYE*	199	2.20	6.30	22.70	3.40	1.20	-
Cuerpos Pequeños	COC*	430	11.50	2.47	35.50	2.92	0.41	-
Cuerpos Pequeños	COR	798	26.00	5.30	37.00	6.90	2.00	-
Cuerpos Pequeños	CSM	900	34.80	0.92	32.70	2.00	0.22	-
Cuerpos Pequeños	CSMI	597	40.00	0.60	47.00	0.68	-	28.35
Cuerpos Pequeños	CSMII*	899	34.30	1.40	33.40	0.80	2.35	-
Cuerpos Pequeños	GAL*	372	23.00	9.50	35.00	2.10	1.85	-
Cachi-Cachi	ANG	530	12.70	5.80	25.00	2.80	0.60	-
Cachi-Cachi	CAR	500	6.80	2.70	15.70	5.80	0.84	-
Cachi-Cachi	CEL	165	5.80	2.80	17.20	4.50	2.50	-
Cachi-Cachi	ELI	595	12.00	3.00	-	3.20	2.20	-
Cachi-Cachi	ESC	825	19.50	7.40	36.20	4.70	-	-
Cachi-Cachi	KAR	662	28.50	7.50	33.60	10.30	1.50	-
Cachi-Cachi	PVT	466	12.70	1.50	22.00	3.00	1.20	-
Cachi-Cachi	SUL	-	9.10	0.35	17.00	1.50	-	
Cachi-Cachi	VAN	354	15.50	3.40	31.50	2.75	-	-
Cachi-Cachi	YOS*	415	10.40	0.48	27.60	2.80	2.80	-

* Dominant resource volume zone reported, where multiple zones exist
Source: SRK, 2021

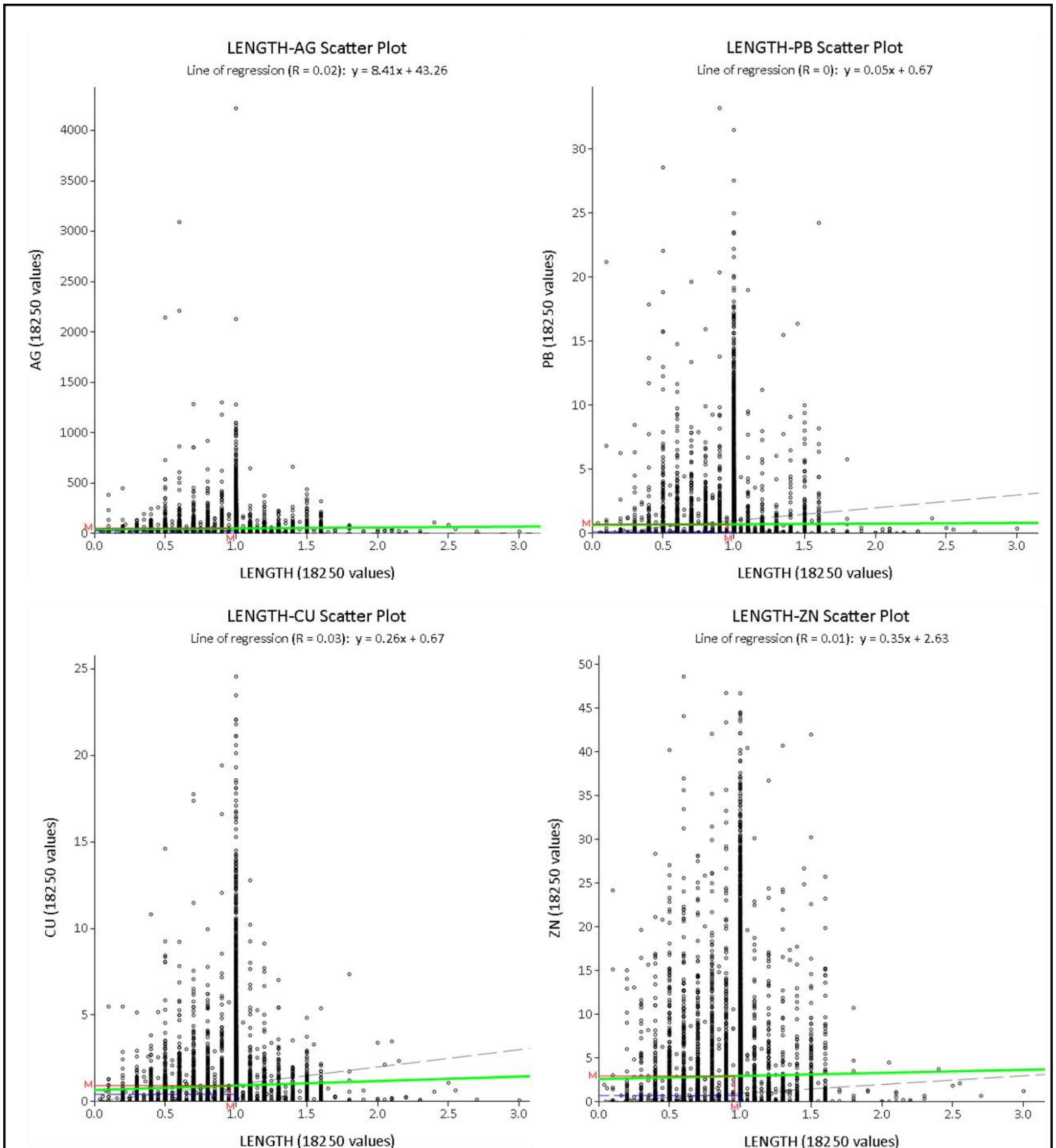
14.3.2 Compositing

The QP composited the raw sample data within the geologic wireframes using standard run lengths. These composite lengths vary between the various areas, but the analysis is the same to ensure that the composites are representative of the Selective Mining Unit (SMU) and minimize variance at the scale of the estimation. The compositing analysis generally features a review of the variable sample lengths in a histogram as well as review of the sample lengths vs. grade scatter plots (Figure 14-10 and Figure 14-11) to ensure that there are not material populations of high grade samples above the nominal composite length. Composite lengths for each area are summarized in Table 14-4. All intervals without values were populated with trace values as only mineralized material is sampled by the mine geological staff; however, two exceptions to this were the arsenic and iron values which were left blank. Arsenic is regarded as a deleterious element and iron is an integral part of the density relationship and is generally higher in mineralized zones. Initially, a mean value was considered rather than allowing the estimate to establish a value. However, estimation artifacts resulted, hence the missing value option was taken for arsenic and iron. Minor composite lengths were restricted in the compositing process by selecting MODE=1 in the Datamine's COMPDH process. Minor composite lengths greater than 10 cm and less than 50 cm were visually inspected to establish if the mineralized zone was defined by a single composite. In such instances, the respective composite was used within the estimation process.



Source: SRK, 2021

Figure 14-10: Raw Sample Length Histogram for Mina Central and Esperanza



srk consulting	Sierra Metals Inc.	Mina Central Length / Grade Bias Analysis for Ag (ppm), Pb (%), Cu (%) and Zn (%)
	Yauricocha Mine	Date: 21/12/2021

Source: SRK, 2021

Figure 14-11: Sample Length vs. Ag, Pb, Cu and Zn Plot for Mina Central

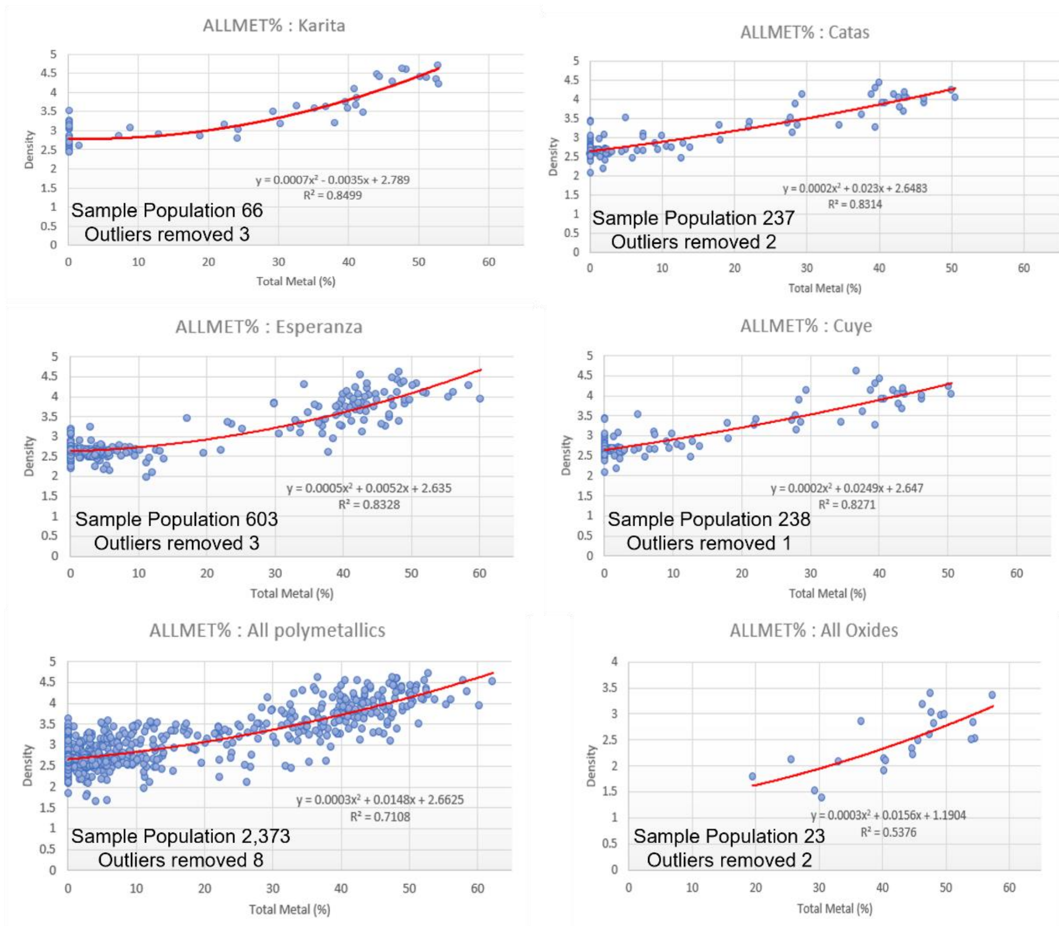
Table 14-4: Composite Statistics

Area	Model Prefix	Composite Length (m)	Minimum (m)	Mean (m)	Maximum (m)
Mina Central	ASO	1	0.50	0.99	1.20
Mina Central	MINAC	1	0.30	0.99	1.50
Mascota	MAPE	1	0.20	1.91	2.90
Mascota	MAPN	2	0.20	1.72	3.00
Mascota	MAPS	1	0.65	0.98	1.50
Mascota	MAS	1	0.80	0.99	1.30
Mascota	MOX	1	0.50	1.00	1.40
Esperanza	ESP	1	0.20	0.99	1.50
Esperanza	ESPBX	1	0.45	0.99	1.30
Esperanza	ESPD	1	0.87	1.00	1.50
Esperanza	ESPN	1	0.30	1.00	1.40
Cuye	CUYE	1	0.85	1.00	1.40
Cuerpos Pequeños	COC	1	0.20	0.95	1.50
Cuerpos Pequeños	COR	2	0.30	1.95	3.00
Cuerpos Pequeños	CSM	2	0.30	1.85	2.90
Cuerpos Pequeños	CSMI	2	0.20	1.82	3.00
Cuerpos Pequeños	CSMII	2	0.10	1.82	3.00
Cuerpos Pequeños	GAL	2	0.30	1.84	3.00
Cachi-Cachi	ANG	1	0.30	1.00	1.40
Cachi-Cachi	CAR	1	0.75	0.99	1.40
Cachi-Cachi	CEL	1	0.40	1.00	1.40
Cachi-Cachi	ELI	2	0.40	1.91	2.95
Cachi-Cachi	ESC	1	0.40	0.98	1.40
Cachi-Cachi	KAR	1	0.14	0.99	1.45
Cachi-Cachi	PVT	1	0.30	0.99	1.50
Cachi-Cachi	SUL	1	0.10	0.98	1.50
Cachi-Cachi	VAN	2	0.30	1.81	2.90
Cachi-Cachi	YOS	2	0.30	1.92	3.00

Source: SRK, 2021

14.4 Density

Density determinations are based on bulk density measurements taken from representative core samples or grab samples in each area. The volume displacement method is used to establish the density of a sample. Historically, mine personnel assigned a single bulk density to each mineralized area; however, this is an invalid assumption for mineral resources in polymetallic mineralization styles, as the density varies substantially from lower to higher grade metal content areas. The effect of applying a single density per mineralization zone, based on current mining results, poses a risk with respect to the accuracy of the expected tonnage. Whereas the grades vary significantly throughout the mineralized zones, substantiated by measurements taken by the mine site, as requested by the QP. The QP produced regression analyses of density versus total accumulated content i.e., silver, lead, copper, zinc, gold, arsenic, and iron, for specific mineralization styles and areas (Figure 14-12). A generalized polymetallic regression was used for polymetallic mineralization that did not have a statistical representative density sample population. Unfortunately, the relationship was not representative with respect to the oxide mineralization. All regressions were limited to a maximum content of 55% as the predicated value deviates exponentially past this threshold. Global values as supplied by Corona personnel, were applied to MAS (3.555), MOX (3.162) and ASO (3.162) respectively, due to lack of available representative density measurements for these domains. No additional density values have been added to the Yauricocha in-situ rock density values as provided in 2019 by Minera Corona. The QP recommends that routine density measurements be taken as part of the standard geological handling process for drillhole core.



srk consulting	Sierra Metals Inc.	2019 Density Regressions
	Yauricocha Mine	Date: 21/12/2021

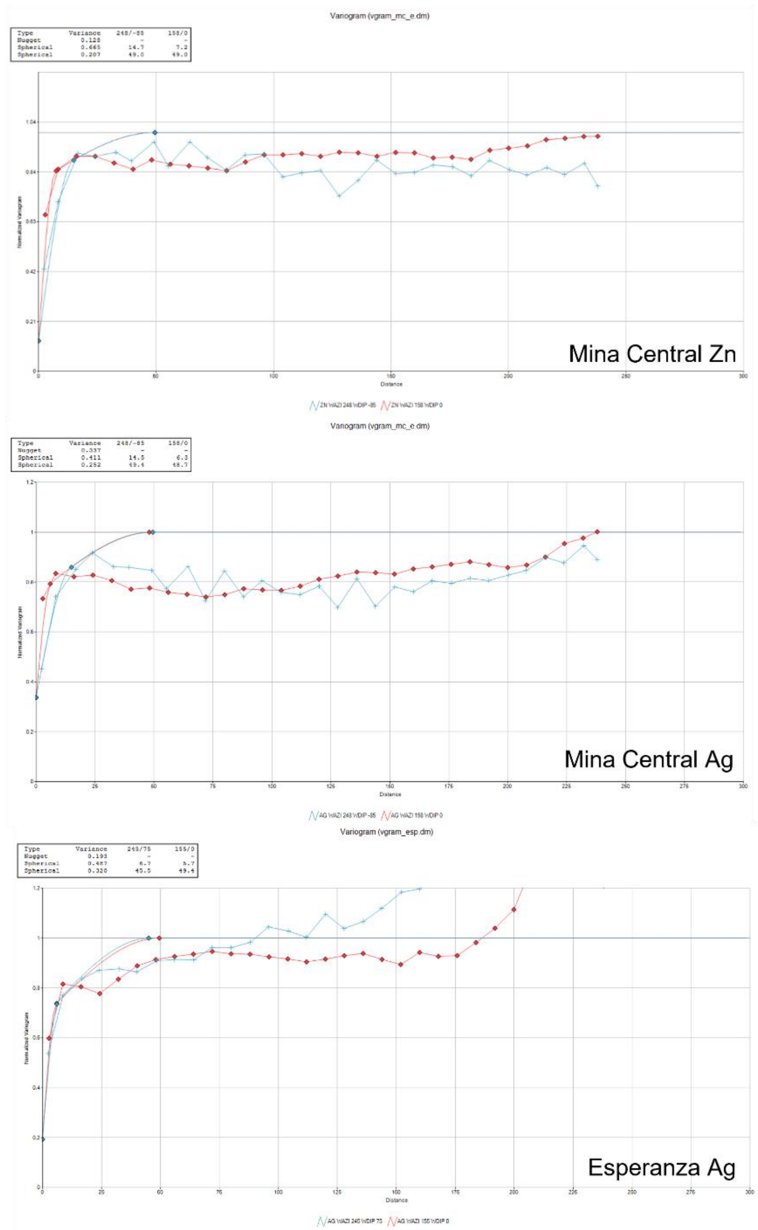
Source SRK, 2021

Figure 14-12: Total Metal Content (%) Versus Density (t/m3) Regressions

14.5 Variogram Analysis and Modelling

The QP conducted detailed variogram analysis to assess orientations and ranges of continuity within the mineralized bodies. Directional variograms were calculated for the primary mineralization areas of Mina Central and Mascota, as the quantities of data and orientations of the mineralized bodies are well-understood. Directional variograms defining an ellipsoid resulted in 3D continuity models for each element. In all cases, appropriate nugget effects were determined from downhole variograms then used in the directional variograms. A linear model of coregionalization was maintained for each continuity model, and the three variograms were plotted on a single graph to define the shape of the ellipsoid. The ellipsoids were reviewed against the data distribution to ensure reasonableness and consistency. The continuity parameters derived from the directional variography in each area and for each metal are used in the Ordinary Kriging estimation process.

A total of 182 variograms were modeled by Minera Corona staff. In the QP's opinion, the variogram models were reasonable fits to the experimental variograms. However, the QP noted in certain instances that more anisotropic definition could be achieved by gaussian or log transforming the composites for variogram modelling purposes, and then back transforming the variogram models for estimation purposes. Figure 14-13 shows examples of Minera Corona modeled variograms for Mina Central and Esperanza. Table 14-5 details a subset of modeled variogram models as examples from Esperanza, Cuye and Mina Central mineralized domains. These domains represent 88% of the Mineral Resources tonnage. All variograms were normalized for estimation purposes. The QP has reviewed and accepted the variogram models as prepared by Minera Corona.



srk consulting	**Sierra Metals Inc.**	**Mina Central and Esperanza variogram modelling examples**
	Yauricocha Mine	Date: 21/12/2021

Source Sierra Metals, 2020

Figure 14-13: Examples of Modelled Variograms for Mina Central and Esperanza

Table 14-5: Datamine Normalized Modeled Semi-Variogram Models

Model Prefix	VDESC	VREFNUM	VANGLE1	VANGLE2	VANGLE3	VAXIS1	VAXIS2	VAXIS3	NUGGET	ST1	ST1PAR1	ST1PAR2	ST1PAR3	ST1PAR4	ST2	ST2PAR1	ST2PAR2	ST2PAR3	ST2PAR4
CUYE	AG NORM	1	132	-90	0	3	2	1	0.044	1	9.3	9.3	3.0	0.486	1	36.4	26.9	6.0	0.469
CUYE	PB NORM	2	132	-90	0	3	2	1	0.138	1	7.7	7.5	3.0	0.487	1	36.5	25.6	5.5	0.375
CUYE	CU NORM	3	132	-90	0	3	2	1	0.117	1	7.5	7.0	3.0	0.577	1	37.3	26.4	5.6	0.306
CUYE	ZN NORM	4	132	-90	0	3	2	1	0.083	1	5.4	5.0	3.0	0.444	1	36.5	25.7	5.6	0.473
CUYE	AU NORM	5	132	-90	0	3	2	1	0.064	1	3.0	3.0	3.2	0.601	1	36.6	24.4	5.4	0.335
CUYE	AS NORM	6	132	-90	0	3	2	1	0.143	1	6.8	7.3	3.0	0.524	1	36.2	23.3	5.5	0.333
CUYE	FE NORM	7	132	-90	0	3	2	1	0.120	1	5.2	5.9	3.0	0.275	1	39.4	27.2	5.6	0.604
ESP	AG NORM	1	155	-75	0	3	2	1	0.149	1	4.7	4.5	3.6	0.486	1	49.5	50.4	8.1	0.365
ESP	PB NORM	2	155	-75	0	3	2	1	0.162	1	10.7	10.2	3.0	0.601	1	48.5	48.3	8.6	0.237
ESP	CU NORM	3	155	-75	0	3	2	1	0.085	1	6.7	6.3	4.6	0.677	1	45.6	44.9	9.9	0.238
ESP	ZN NORM	4	155	-75	0	3	2	1	0.202	1	7.6	6.7	5.0	0.404	1	46.2	47.0	9.4	0.395
ESP	AU NORM	5	155	-75	0	3	2	1	0.089	1	6.5	9.7	4.8	0.684	1	47.1	45.0	10.3	0.227
ESP	AS NORM	6	155	-75	0	3	2	1	0.145	1	8.9	10.8	3.5	0.702	1	49.8	44.7	9.5	0.153
ESP	FE NORM	7	155	-75	0	3	2	1	0.126	1	9.5	10.0	4.9	0.562	1	48.4	45.6	10.4	0.311
MINAC	AGC NORM	1	158	85	0	3	2	1	0.337	1	14.5	6.3	4.0	0.411	1	49.4	48.7	9.0	0.252
MINAC	PBC NORM	2	158	85	0	3	2	1	0.168	1	12.6	13.1	3.0	0.613	1	50.0	51.0	10.4	0.219
MINAC	CUC NORM	3	158	85	0	3	2	1	0.119	1	6.7	8.2	3.0	0.587	1	48.9	49.0	11.0	0.294
MINAC	ZNC NORM	4	158	85	0	3	2	1	0.128	1	14.7	7.2	4.0	0.665	1	49.0	49.0	11.0	0.207
MINAC	AUC NORM	5	158	85	0	3	2	1	0.185	1	11.8	5.1	3.0	0.619	1	50.7	49.3	10.6	0.196
MINAC	ASC NORM	6	158	85	0	3	2	1	0.150	1	5.3	11.1	3.0	0.550	1	50.5	49.5	10.0	0.300
MINAC	FEC NORM	7	158	85	0	3	2	1	0.204	1	8.8	9.6	4.1	0.613	1	49.2	49.6	11.0	0.183

Source: Sierra Metals, 2021

14.6 Block Model

Block models were generated by the QP in Datamine. Sub-blocking was used to approximate geologic contacts. Rotated block models were generated to assist in the mine planning process where mineralization solids crossed the orthogonal grid obliquely, facilitating less dilution for stope optimization studies. The QP notes a risk regarding the different orientations and the possible minor overlaps between adjacent models with different rotation parameters. The QP removed blocks where this occurred, however minor overlaps may still exist, but the QP does not deem these as material.

Blocks were flagged by mineralization area and domain. Details for the block models are summarized in Table 14-6.

Table 14-6: Block Model Parameters

	Parent			Range			Origin (minimum value block corner)			Rotation (Datamine, positive is clockwise rotation)	
Model Prefix	X (m)	Y (m)	Z (m)	X (m)	Y (m)	Z (m)	X Local (m)	Y Local (m)	Z Local (m)	Angle (°)	Axis
ANG	4	4	4	120	184	212	24,042	16,544	4,006	39	Z
ASO	4	4	4	72	204	292	24,227	14,640	3,827	-30	Z
CAR	2	2	2	120	94	166	23,784	16,430	3,870	-	Z
COC	2	2	2	158	178	556	23,768	15,098	3,520	-	Z
COR	2	2	2	98	106	330	23,876	15,146	3,600	-	Z
CSM	2	2	2	176	112	374	23,728	14,918	3,708	30	Z
CSMI	2	2	2	158	110	446	23,802	14,914	3,518	-30	Z
CSMII	2	2	2	224	146	450	23,786	14,792	3,514	-45	Z
CUYE	4	4	4	288	252	416	23,660	15,288	3,366	-	Z
ELI	2	2	2	70	148	292	23,814	16,506	3,874	50	Z
ESC	2	2	2	106	106	254	23,748	16,362	3,832	-	Z
ESP	4	4	4	192	460	532	23,740	15,434	3,602	-25	Z
ESPBX	2	2	2	64	48	268	23,656	15,666	3,884	-	Z
ESPD	4	4	4	56	88	172	23,656	15,644	3,800	-25	Z
ESPN	4	4	4	152	96	340	23,644	15,758	3,770	-50	Z
GAL	2	2	2	94	132	596	23,586	15,604	3,612	-	Z
KAR	2	2	2	130	156	222	23,984	16,580	3,956	34	Z
MAPE	2	2	2	76	96	356	23,755	15,319	3,524	-40	Z
MAPN	2	2	2	56	96	388	23,690	15,370	3,524	-30	Z
MAPS	2	2	2	92	96	228	23,838	15,286	3,618	-70	Z
MAS	2	2	2	40	52	78	23,721	15,297	3,697	28	Z
MINAC	4	4	4	200	760	848	24,180	14,620	3,308	-30	Z
MOX	4	4	4	92	152	520	23,750	15,298	3,645	-50	Z
PVT	2	2	2	104	244	580	23,598	16,302	3,434	55	Z
SUL	2	2	2	66	106	164	23,700	16,418	3,850	50	Z
VAN	2	2	2	92	128	220	23,920	16,610	3,938	70	Z
YOS	2	2	2	74	126	168	23,666	16,344	3,862	45	Z

Source: SRK, 2021

14.7 Estimation Methodology

The QP used either Ordinary Kriging (OK) or Inverse Distance to the Power 2 weighting (ID) to interpolate grade in all resource domain areas. The decision on the estimation type to use was based on the confidence of the geologist in the ability of the variography to reflect the continuity of grade within the mineralized body, as well as the need for some measure of declustering based on data spacing. In some cases where mineralized bodies could not be related to those with reasonable variograms, an ID method was used for estimation.

The estimation type and sample selection criteria were chosen to achieve a reasonably reliable local estimation of grade that does not bias the global resource estimation. The QP generally treated the geology model domains as hard boundaries in the estimation and estimated blocks within these boundaries using the capped composites in the same boundaries. Ranges for interpolation were derived from omni-directional variogram analysis or continuity assumptions from site geologists based on underground mining observations. All estimations used both channel and drillhole samples. The QP used three nested estimation passes for each domain. Local varying anisotropy (LVA) was used for several estimates as a static search orientation did not produce representative estimates.

The search parameters were optimized in the larger mineralized areas by completing a Qualitative Kriging Neighborhood Analysis (QKNA). The search parameters were focused on the major NSR contributing element for any mineralized zone. Samples were limited per channel / drillhole source (MAXKEY). Additional estimates were completed for cross validation purposes. These included, Nearest Neighbor (NN), Arithmetic Mean (AV) and Inverse Distance to the Power 2. The kriging efficiency and the geostatistical RSlope values were calculated per Ordinary kriged estimate. Relevant details for specific areas are summarized below, and the complete estimation parameters are summarized in Table 14-7.

Table 14-7: Estimation Parameters

Model Prefix	Classifier	SDESC	SREFNUM	METHOD	X	Y	Z	ANGLE1	ANGLE2	ANGLE3	AXIS1	AXIS2	AXIS3	PASS 1		PASS 2			PASS 3			MAXKEY
					SDIST1	SDIST2	SDIST3							MIN	MAX	FACTOR	MIN	MAX	FACTOR	MIN	MAX	
ANG	ZNOK	ZN	4	LVA	20	20	10	39	84	0	3	2	3	5	15	2	3	15	3	3	10	2
ASO	AGOK	AG	1	STATIC	20	20	8	-30	-80	0	3	2	1	5	15	2	3	15	3	3	10	2
CAR	ZNOK	ZN	4	LVA	12.5	12.5	5	104	-90	0	3	2	3	5	15	2	3	15	3	3	10	2
CEL	ZNOK	ZN	4	LVA	15	15	7.5	-50	75	0	3	2	3	5	15	2	3	15	3	3	10	2
COC	ZNOK	ZN	4	LVA	20	20	10	70	-90	0	3	2	3	5	15	2	3	15	3	3	10	2
COR	ZNOK	ZN	4	LVA	15	15	8	167	76	0	3	2	3	5	15	2	3	15	3	3	10	2
CSM	ZNOK	ZN	4	LVA	15	15	5	50	-80	0	3	2	3	5	15	2	3	20	7	2	25	2
CSMI	ZNOK	ZN	4	STATIC	15	15	10	-35	-75	0	3	2	1	5	15	2	3	15	3.5	3	15	2
CSMII	PBOK	PB	2	LVA	20	20	10	115	76	0	3	2	3	5	15	2	4	15	2.5	2	10	2
CUYE	CUOK	CU	3	LVA	25	25	5	132	-90	0	3	2	3	5	15	2	3	15	4	3	10	2
ELI	ZNOK	ZN	4	LVA	20	20	15	50	-90	0	3	2	3	5	15	2	3	15	3	3	10	2
ESC	ZNOK	ZN	4	LVA	15	15	5	210	-90	0	3	2	3	5	15	2	3	15	3	3	10	2
ESP	CUOK	CU	3	STATIC	25	25	10	155	-75	0	3	2	1	5	15	2	3	15	4	3	10	2
ESPBX	ZNID	ZN	4	LVA	12.5	12.5	7.5	-60	90	0	3	2	3	3	10	2	3	10	5	2	5	0
ESPD	ZNOK	ZN	4	STATIC	12.5	12.5	5	152	74	0	3	2	1	5	10	2	3	10	4	3	10	2
ESPN	ZNOK	ZN	4	STATIC	12.5	12.5	5	130	-74	0	3	2	1	5	10	2	3	10	4	3	10	2
GAL	ZNOK	ZN	4	LVA	15	15	10	-15	84	0	3	2	3	5	15	2	3	15	3	3	10	2
KAR	ZNOK	ZN	4	LVA	15	15	7.5	44	-90	0	3	2	3	5	15	2	3	15	3	3	10	2
MAPE	ZNOK	ZN	4	STATIC	15	15	5	137	-90	0	3	2	1	5	15	2	3	15	3	3	10	2
MAPN	ZNOK	ZN	4	STATIC	20	20	5	140	-83	0	3	2	1	5	15	2	3	15	3	3	10	2
MAPS	ZNOK	ZN	4	STATIC	12.5	12.5	6	110	80	0	3	2	1	5	15	2	3	15	3	3	10	2
MAS	PBID	PB	2	STATIC	20	20	8	28	-90	0	3	2	1	5	10	2	3	10	3	3	10	2
MINAC	CUOK	CU	3	LVA	25	25	10	158	85	0	3	2	3	5	15	2	3	15	4	3	10	2
MOX	PBOK	PB	2	STATIC	20	20	6	-90	210	0	2	1	3	5	15	2	3	15	3	3	10	2
PVT	ZNOK	ZN	4	LVA	20	20	10	230	-85	0	3	2	3	5	15	2	3	15	3	3	10	2
SUL	ZNOK	ZN	4	LVA	10	10	5	50	-90	20	3	2	3	5	15	2	3	15	3	3	10	2
VAN	ZNOK	ZN	4	LVA	15	15	5	70	-80	0	3	2	3	5	15	2	3	15	3	3	10	2
YOS	ZNOK	ZN	4	LVA	15	15	6	40	-90	0	3	2	3	5	15	2	3	15	2.5	3	10	2

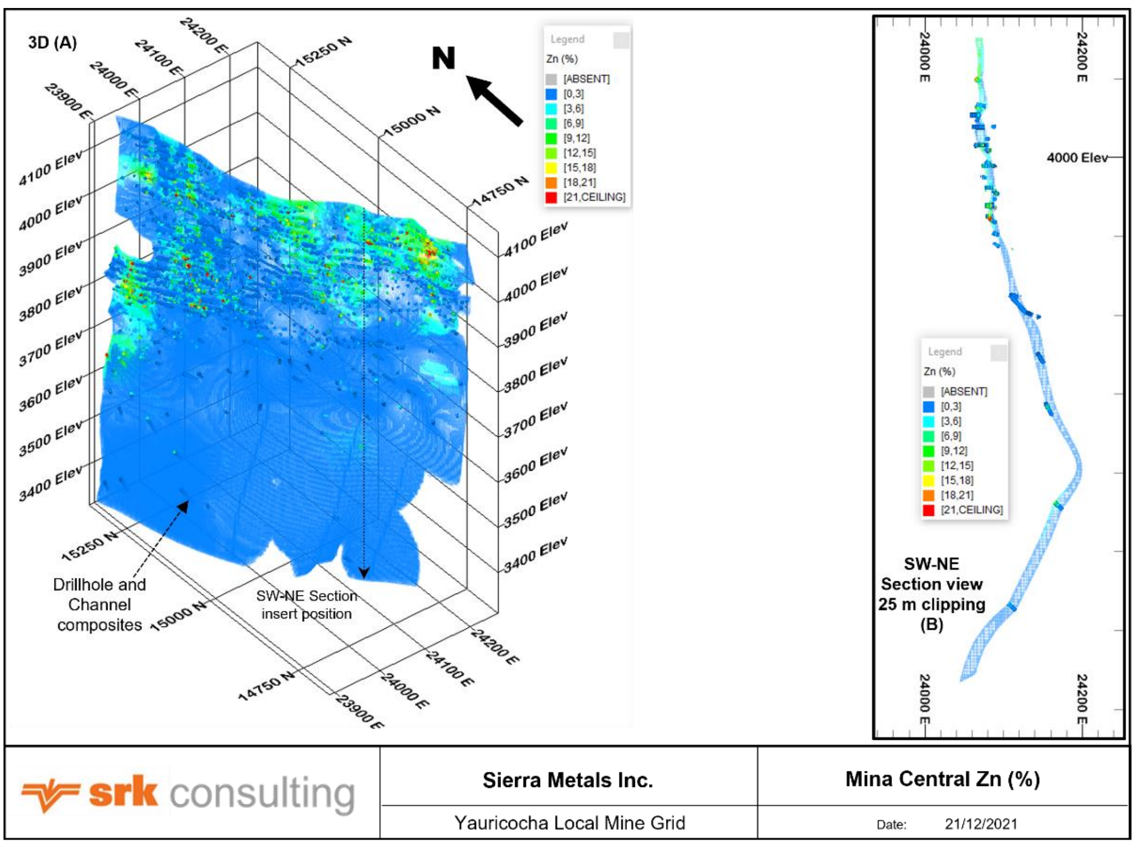
Source: SRK, 2021

14.8 Model Validation

All models have been validated utilizing visual and statistical measures to assess the probability of conditional bias in the estimation. Swath plots were also generated to validate the estimation. The QP is of the opinion that the validation of the models is sufficient for relying upon them as Mineral Resources. However, the QP notes that the ultimate validation of the models is in the fact that the mine continuously produces material from the areas modeled and projected by the mineral resource estimations. The QP notes that reconciliation of the production to the resource models is not a consistent part of the current validation methods but is under consideration by Sierra Metals for future models.

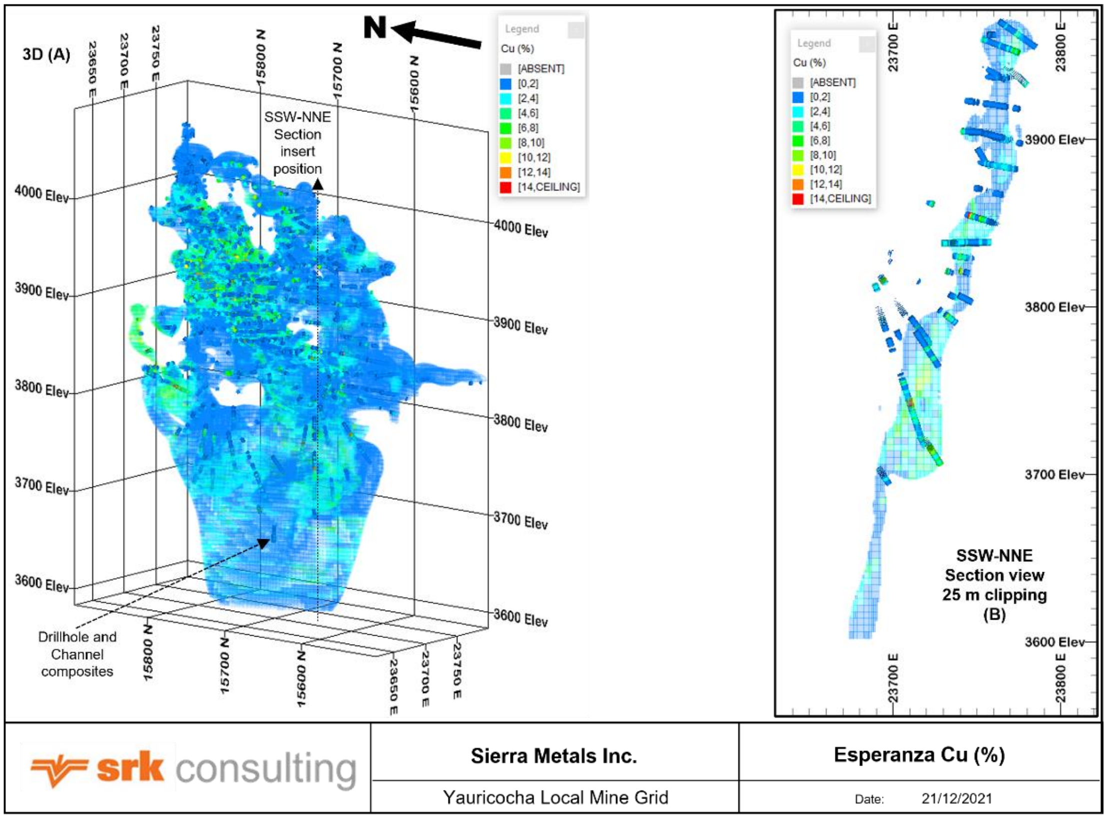
14.8.1 Visual Comparison

Both the QP and Minera Corona have conducted visual comparisons of the composite grades to the block grades in each model. In general, block grade distributions match well in 3D, level, and cross-section views through the various mineralized bodies. Some of these examples are shown in Figure 14-14 and Figure 14-15.



Source: SRK, 2021

Figure 14-14: Visual Block to Composite Comparison – Mina Central, (A) 3D view and, (B) SW-NE sectional view



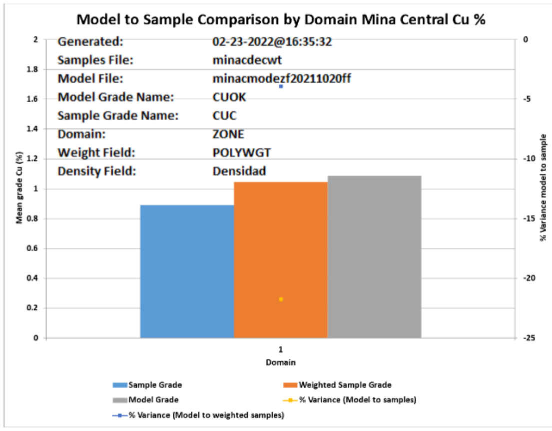
Source: SRK, 2021

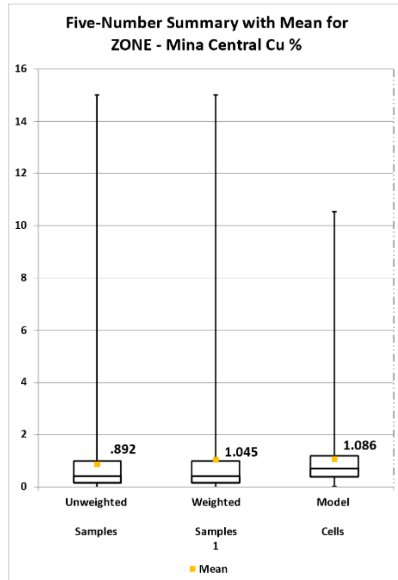
Figure 14-15: Visual Block to Composite Comparison – Esperanza, (A) 3D view and, (B) SSW-NNE sectional view

14.8.2 Comparative Statistics

The QP compared the estimated block grades to the composite grades used in the estimation for certain zones and volumes to ensure that both are representative. The QP weighted the statistics by composite length and polygonal declustering with mineralized envelope constraints for the composites, and by volume for the blocks. The results show that, in almost all cases, the blocks feature a lower or similar mean to the composite grades. An example of the estimate versus the composite statistics completed for Mina Central Zn (%) and Esperanza Cu (%) are shown in Figure 14-16. These analyses were completed for all estimated metal values in all mineralized zones, to establish whether there was any over / under estimation.

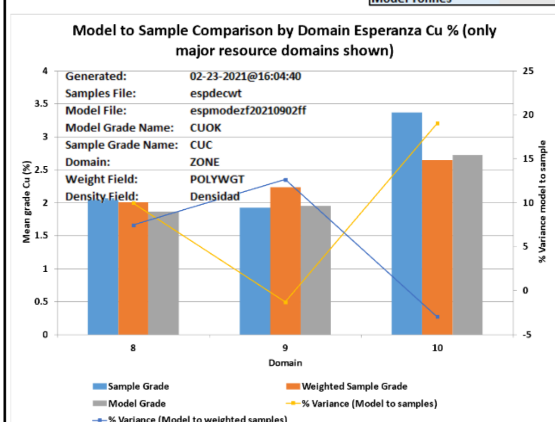
Where blocks locally exceed the composite grades, the QP notes that these appear to be limited occurrences, and generally the potentially over-estimated areas are in areas which have been mined previously or where very few samples occur within a respective mineralized envelope. An estimate should have a similar mean to the original composites. However, the estimates produce a smoothed result and the distribution of the estimated blocks relative to the original composites produce a narrower range histogram. This is evident from the box and whisker plots in Figure 14-16. The QP is of the opinion that these results show that there is reasonable agreement between the models and the supporting data, with a low risk for global over-estimation.

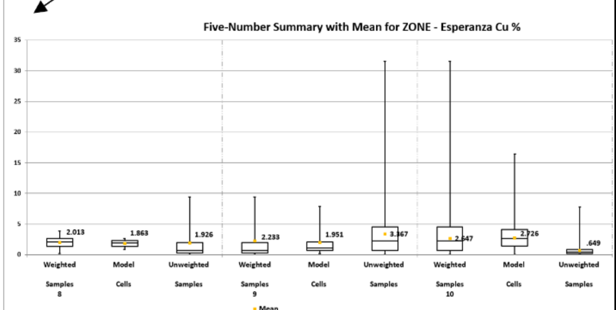




ZONE: Mina Central Cu % 2021	1 Unweighted Samples	Weighted Samples	Model Cells
No. of Records	18,370	18,370	1,916,632
No. of Samples	18,370	18,370	1,814,119
Minimum	0	0	0.01
Q1	0.15	0.15	0.39
Median	0.42	0.42	0.72
Q3	1	1	1.19
Maximum	15	15	10.55
Mean	0.89	1.05	1.09
Mean Diff v Model	-0.19	-0.04	-
%Mean Diff v Model	-21.75	-3.91	-
Std. Dev	1.45	1.2	0.8
Variance	2.1	1.44	0.64
%Coeff. Variation	162.42	114.64	73.82
MAD	0.72	0.72	0.54
Model Tonnes	-	-	20,483,577

ZONE: Esperanza 2021	8 Unweighted Samples	8 Weighted Samples	8 Model Cells	9 Unweighted Samples	9 Weighted Samples	9 Model Cells	10 Unweighted Samples	10 Weighted Samples	10 Model Cells
No. of Records	20	20	1,367	93	93	10,597	7975	7975	731,709
No. of Samples	20	20	1,367	93	93	10,597	7975	7975	731,499
Minimum	0.21	0.21	0.82	0.01	0.01	0.23	0.01	0.01	0.04
Q1	1.32	1.32	1.37	0.24	0.24	0.66	0.72	0.72	1.44
Median	2.07	2.07	1.91	0.66	0.66	1.11	2.23	2.23	2.61
Q3	2.64	2.64	2.28	1.97	1.97	2.1	4.49	4.49	4.07
Maximum	3.88	3.88	2.61	9.4	9.4	7.89	31.5	31.5	16.44
Mean	2.07	2.01	1.86	1.93	2.23	1.95	3.37	2.65	2.73
Mean Diff v Model	0.21	0.15	-	-0.03	0.28	-	0.64	-0.08	-
%Mean Diff v Model	9.96	7.48	-	-1.31	12.64	-	19.04	-2.98	-
Std. Dev	0.84	0.95	0.46	2.74	2.82	1.83	3.9	3.46	1.83
Variance	0.71	0.89	0.21	7.49	7.95	3.36	15.21	11.95	3.35
%Coeff. Variation	40.72	46.96	24.53	142.12	126.28	94.01	115.83	130.59	67.16
MAD	0.71	0.71	0.42	1.66	1.66	1.03	2.49	2.49	1.66
Model Tonnes	-	-	14,572	-	-	19,764	-	-	3,892,900





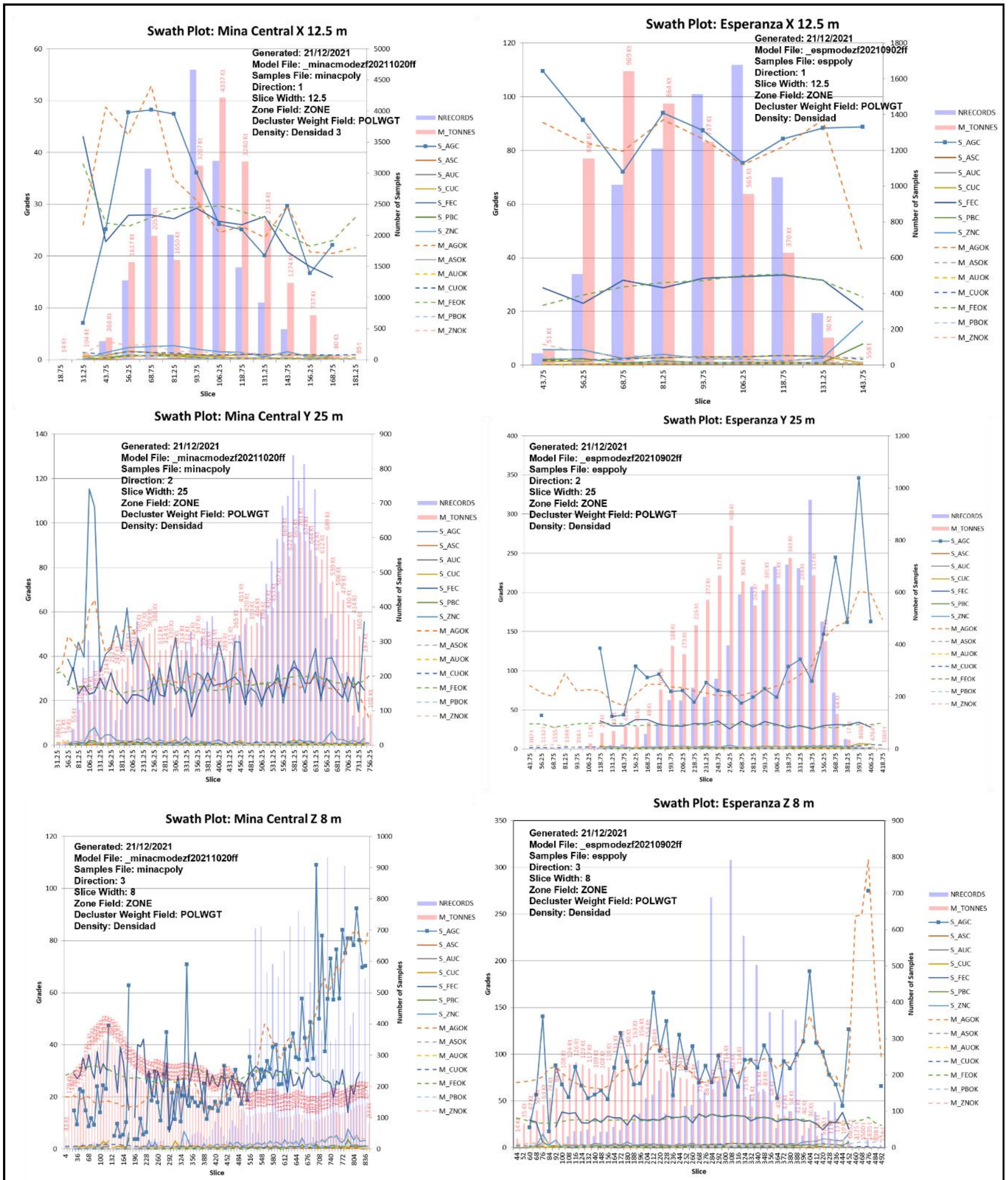
srk consulting	Sierra Metals Inc.	Mina Central (Zn %) and Esperanza (Cu %) Means Analyses
	Yauricocha Mine	Date: 21/12/2021

Source SRK 2021

Figure 14-16: Mina Central and Esperanza Ordinary Kriging Result Comparison to Declustered Capped Composite Values

14.8.3 Swath Plots

The QP has compiled swath plots to validate the estimation. A swath plot is a graphical display of the grade distribution derived from a series of thickness bands (12.5, 25 and 8 m width in this case), or swaths, generated in the X, Y, and Z orientations through the deposit. Grade variations from the block model are compared using the swath plot to the distributions derived from the composites or other estimation methods. An example of swath plots from Mina Central and Esperanza for all estimated grades is shown in Figure 14-17, illustrating the comparison between the OK estimation used for reporting to the original polygonal declustered composite grades. The QP notes that, in general the estimated grades represent a smoothed approximation of the composite grades.



srk consulting	Sierra Metals Inc.	Mina Central and Esperanza Swath Analysis
	Datamine Block Model Rotated Grid	Date: 21/12/2021

Source: SRK, 2021

Figure 14-17: Mina Central and Esperanza Swath Plots

14.9 Resource Classification

The QP is satisfied that the geological modelling honors the current geological information and knowledge. The location of the samples and the assay data are sufficiently reliable to support mineral resource evaluation. The sampling information was acquired primarily by core drilling or limited channel sampling.

The estimated blocks were classified according to:

- Confidence in interpretation of the mineralized zones
- Number of data (holes or channel samples) used to estimate a block
- Average distance to the composites used to estimate a block

In order to classify mineralization as a Measured Mineral Resource, the following statement must be considered: “quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support detailed mine planning and evaluation of the economic viability of the deposit” (CIM Definition Standards on Mineral Resources and Mineral Reserves, May 2014).

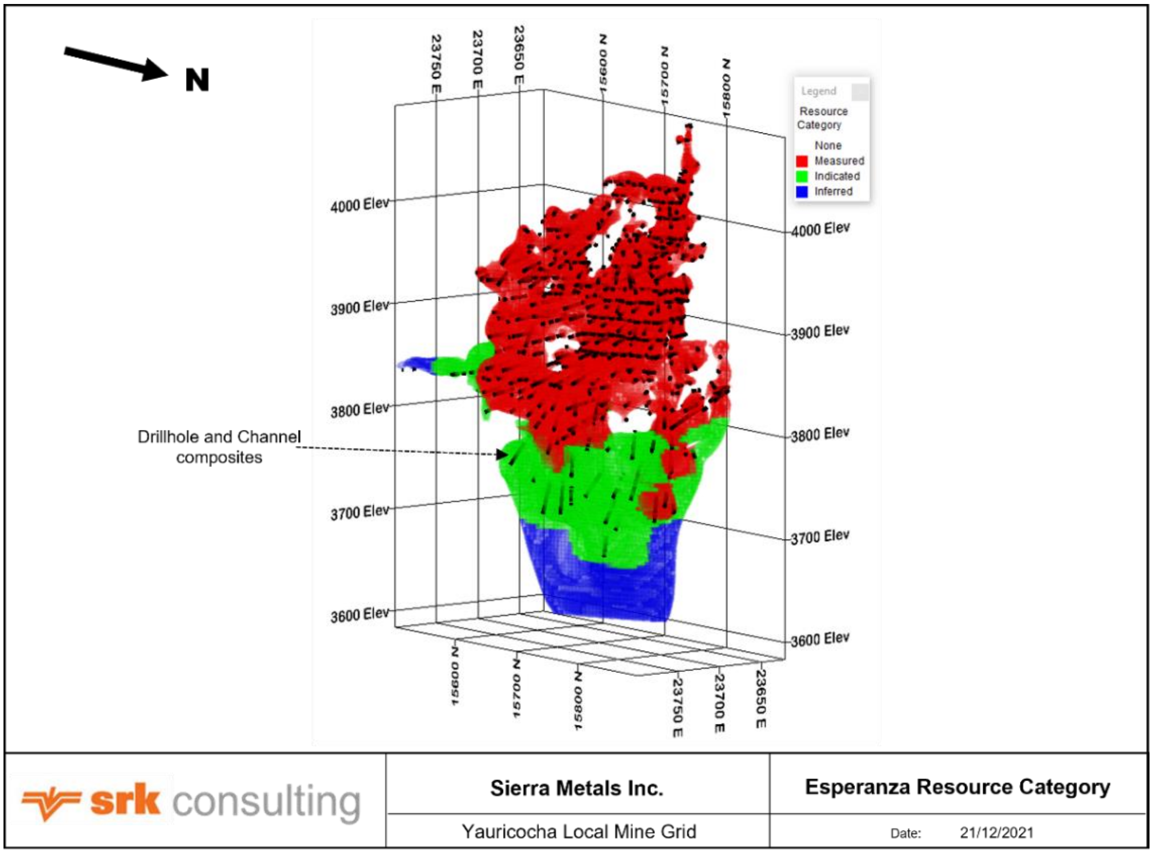
For the classification of Indicated Mineral Resources the CIM standard requires the following: “quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit”.

The QP used the following general criteria for classification of the Mineral Resource:

- Measured: Blocks estimated within a distance of 10 to 25 m and informed by at least three drillholes
- Indicated: Blocks estimated within a distance of 20 to 50 m and informed by at least two drillholes
- Inferred: Blocks estimated within a distance of 30 to 100 m and informed by at least two drillholes

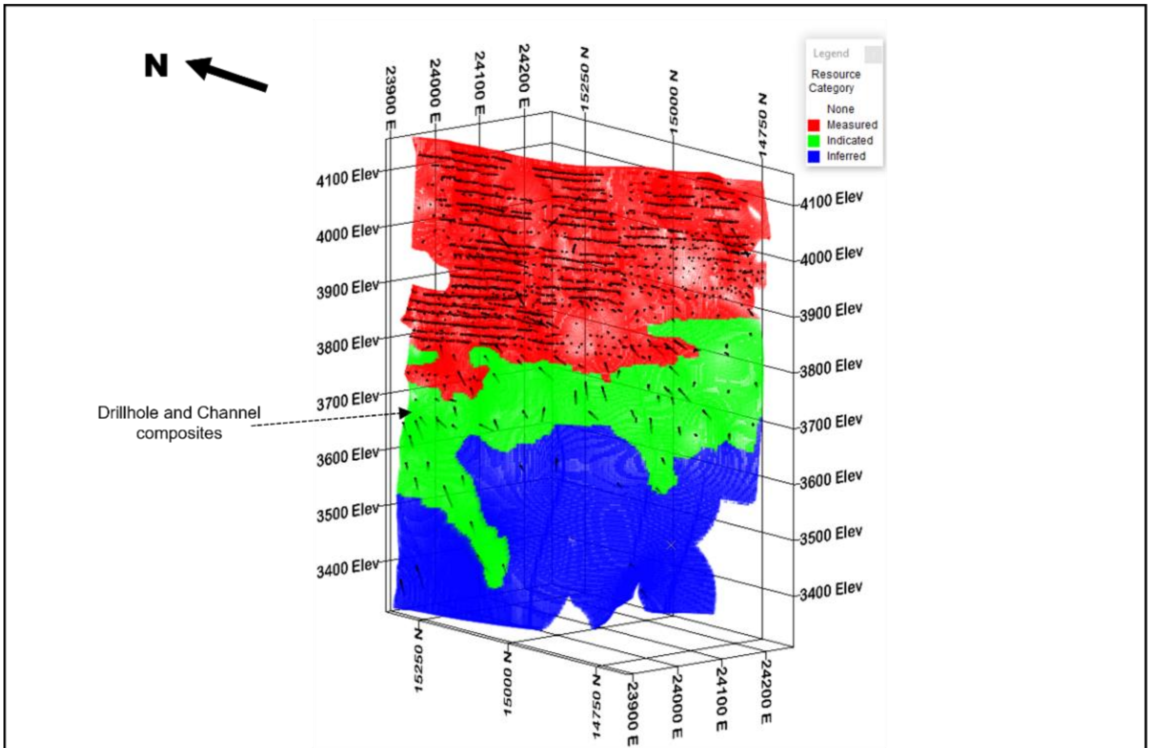
All solid envelopes containing two or less drillholes were excluded from mineral resources. These areas should be considered as exploration target areas that require additional drilling to satisfy CIM Definition Standards for inclusion as mineral resources. The resource classification was initially scripted based on the range of influence of the dominant Net Smelter Return (NSR) contributor, generally zinc or copper. A manual override of the isolated resource category blocks was completed in the Datamine’s graphical interface by selecting the respective parent cell centroids and assigning a representative / realistic resource category.

Examples of this scripted resource classification scheme are shown in Figure 14-18, Figure 14-19 and Figure 14-20. The QP notes that this scripted method is not perfect, and locally results in some classification artifacts along the margins of wide-spaced drilling, or in areas where data spacing varies significantly. The QP notes that this could be improved upon as additional drilling (currently underway) infills some of these areas.



Source: SRK, 2021

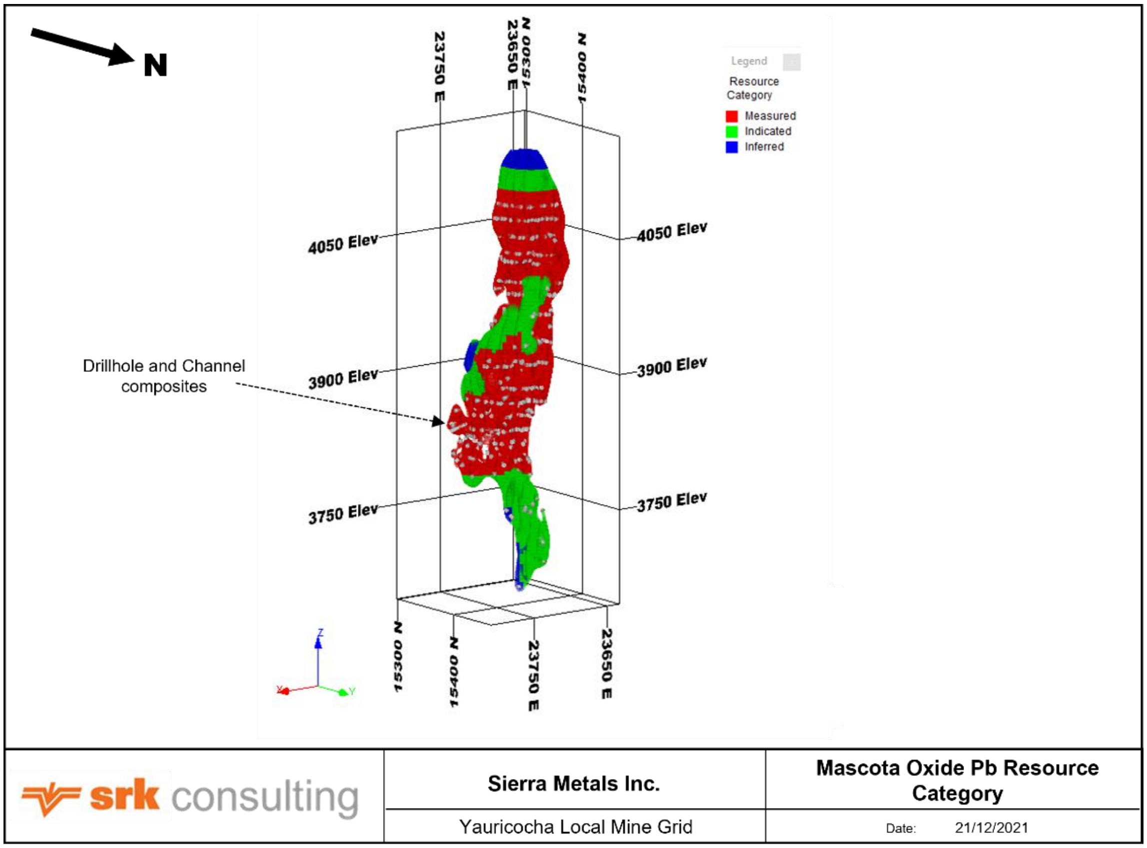
Figure 14-18: Example of Scripted and Re-classed Resource Classification for Esperanza



srk consulting	Sierra Metals Inc.	Mina Central Resource Category
	Yauricocha Local Mine Grid	Date: 21/12/2021

Source: SRK, 2021

Figure 14-19: Example of Scripted and Re-classed Resource Classification for Mina Central



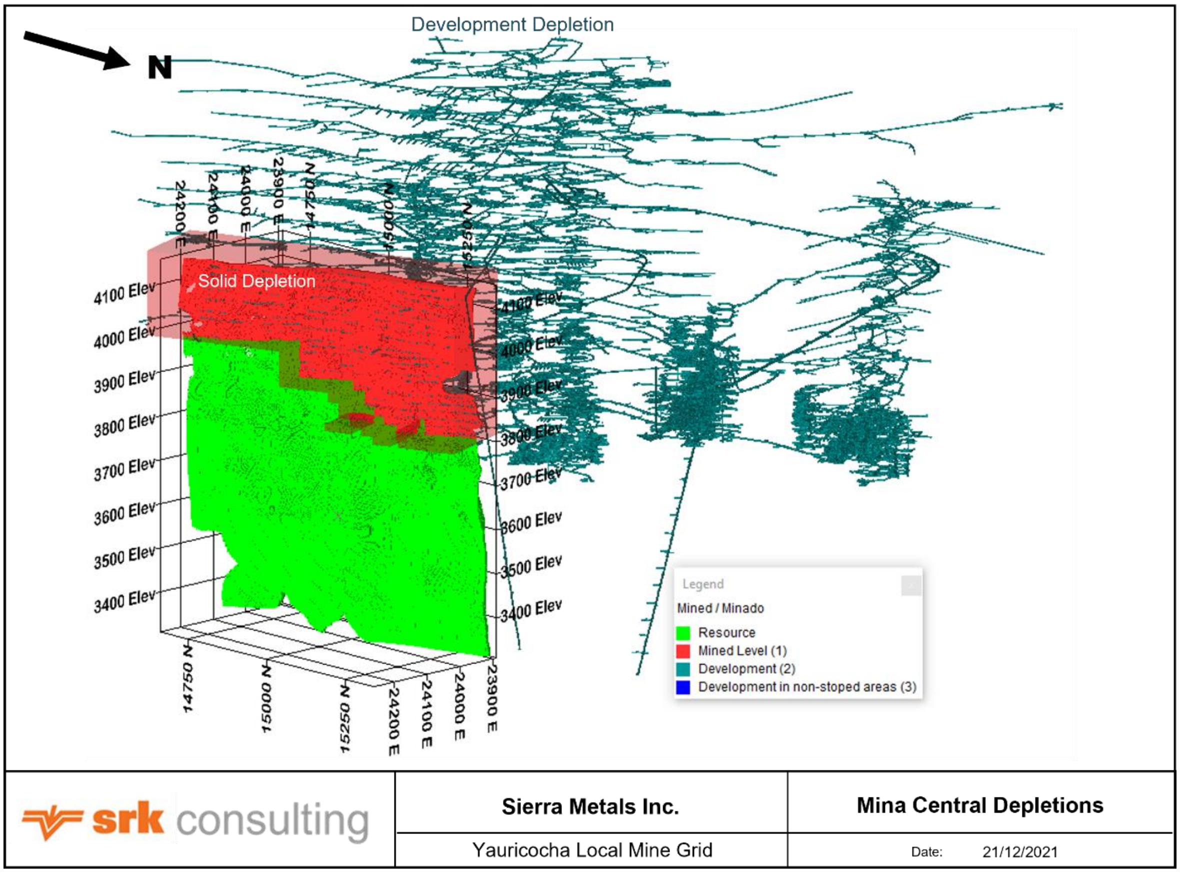
Source: SRK, 2021

Figure 14-20: Example of Scripted and Re-classed Resource Classification for Mascota Oxide Cu Pb-Ag

14.10 Depletion

The QP depleted the block models using provided wireframe solids based on digitized polygons projected on long sections and cross-sections from Minera Corona. The QP notes that this is a conservative approach, given that it effectively ignores pillars or other areas which are known to have not been completely mined. However, the QP agrees with this approach and notes that extensive surveying of previously mined areas would need to be done to reasonably incorporate the remaining material above these levels. All material within each solid was flagged with a mined variable (MINED or Minado) in the block model, with 1 representing completely mined, and 0 representing completely available. Depletions were applied to the resource models in areas where drift and development ends intersect the resource model. For mine development that intersects mined out areas, a MINED=2 value was assigned and where mine development intersects the resource models in non-mined areas, a MINED=3 value was assigned.

An example of the mining depletions being applied to the Mina Central mineral resources is shown in Figure 14-21.



Source: SRK, 2021

Figure 14-21: Example of Mining Depletion of Block Models – Mina Central

14.11 Mineral Resource Statement

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

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

The "reasonable prospects for economic extraction" requirement generally imply that the quantity and grade estimates meet certain economic thresholds and that the Mineral Resources are reported at an appropriate cut-off value (COV) considering extraction scenarios and processing recoveries. The QP is of the opinion that the costs provided by Minera Corona represent the approximate direct marginal mining and processing cost for various mining methods.

To satisfy the criteria of reasonable prospect for economic extraction, the QP has calculated unit values for the blocks in the models based on the grades estimated, metal price assumptions, and metallurgical recovery factors in the form of an NSR (net smelter return) value. The NSR values take into consideration deleterious elements As, Sb, Bi, and Mn, which are considered as deleterious elements as per current smelter contracts. Generally, As is the major grade contributor related to deleterious element penalties, within the respective metal concentrates produced by the mine. All the mineralized zone block models are regularized to their respective parent cell dimensions and diluted at zero grade. This allowed for isolated sub-cells to fall below the COV and hence, to be removed from the Mineral Resource, as these particular blocks do not satisfy the "reasonable prospects for eventual economic extraction" (RPEEE) as stated in the CIM definitions. Since the Mineral Resources at the respective NSR cut-offs for each of the mineralized zone form large, consolidated volumes of blocks, it is the opinion of the QP's that no Mineable shape optimizer (MSO) is required to establish RPEEE (Figure 14-22).

The metal price assumptions have been derived from CIBC, November 2021 Consensus Commodity prices and are reasonable for the statement of Mineral Resources. These prices are generally higher than the previous technical report filed in 2020 and reflect the relative increase in commodities prices since that report. These prices are summarized in Table 14-8.

Table 14-8: Unit Value Price Assumptions

Consensus Pricing	Gold (US$/oz)	Silver (US$/oz)	Copper (US$/lb)	Lead (US$/lb)	Zinc (US$/lb)
Long Term 2021	1598	21.02	3.39	0.91	1.10

Source: CIBC, November 2021

The metallurgical recovery factors are based on actual to-date metallurgical recoveries for the various processes and concentrates produced by the Yauricocha mine. The QP has considered that the mineralized bodies stated in Mineral Resources fall into one of three general categories in terms of process route: polymetallic sulfide, lead oxide, and copper sulfide. The copper oxide process was abandoned in 2017. The overwhelming majority of the mineralized zones are considered as polymetallic sulfide, with very limited production from Pb Oxide areas, and effectively no consistent production from Cu-oxide areas. Measured and Indicated Oxide material constitutes 2.5% of the total declared Measured and Indicated Mineral Resource for 2021. 0.6% of the Inferred Mineral Resources are regarded as oxide material. A summary of the recovery factors applied during the unit value calculation are shown in Table 14-9. The QP notes that the recoveries stated for the unit value calculations do not consider payability or penalties in the concentrates, as these are variable and may depend on contracts to be negotiated.

Table 14-9: Metallurgical Recovery Assumptions

Date	Process Recovery	Ag (%)	Au (%)	Cu (%)	Pb (%)	Zn (%)
2021	Polymetallic	68.4	19.5	75.0	88.5	88.0
	Pb Oxide	51	53	0	65	0
2020	Polymetallic	76	22	75	89	89
	Pb Oxide	51	53	0	65	0
2019	Polymetallic	76	17	80	89	89
	Pb Oxide	51	53	0	65	0
2017	Polymetallic	67	16	65	85	89
	Pb Oxide	51	54	0	66	0
	Cu Oxide	28	0	39	0	0

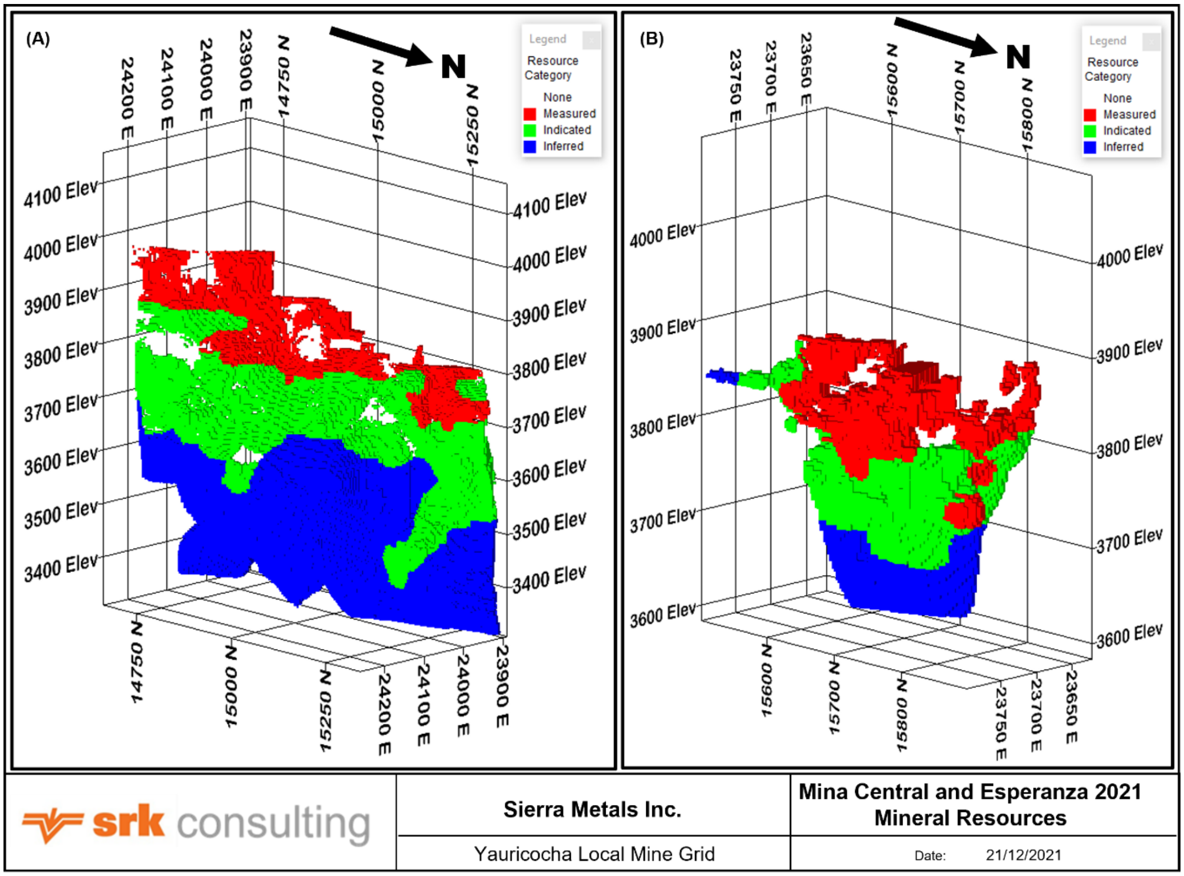
Source: Sierra Metals, 2021

The general unit value calculation can then be summarized as the estimated grade of each metal, multiplied by the price (US$/g or US$/%), multiplied by the process recovery. This yields a dollar value of the block per tonne, which can be used to report resources above the break-even variable costs for mining, processing, and G&A. Minera Corona has provided these costs to the QP, noting that they are generalized given the flexibility of the mining methods within each area or individual mineralized body. For example, several mineralized bodies feature a majority of a specific mining method, but will locally utilize others on necessity, or require adjusted pumping capacity or ground conditions, which may locally move this cost up or down. The QP considers the application of a single unit value cut-off to each mineralized body as reasonable. The unit value marginal NSR cut-offs based on marginal costs provided by Corona are summarized in Table 14-10.

Table 14-10: Unit Value Cut-off by Mining Method and Area (US$/t)

Description	Break-Even Cost 2020	Break-Even Cost 2021*
Sub-level Caving: Conventional (SLCM1)	25.0	31.7
Sub-level Caving: Mechanized, No Water (SLCM2)	27.0	32.5
Sub-level Caving: Mechanized, Low Water (SLCM3)	27.0	33.2
Cut and Fill: Overhead Conventional CRAM	36.0	36.7
Cut and fill: Overhead Mechanized	Not Utilized	Not Utilized
Cut and Fill: Overhead Mechanized w/ Pillars	Not Utilized	Not Utilized

* Based on a 5,500 t/d operation (2024)
Source: Sierra Metals, 2021



Source: SRK, 2021

Figure 14-22: (A) Mina Central (B) Esperanza 2021 Mineral Resources (mining depletions applied and NSR marginal cut-offs applied)

The March 31, 2021, consolidated Mineral Resource statement for the Yauricocha Mine is presented in Table 14-11. The grouped mineralized zones' Mineral Resource tabulations are presented in Table 14-12. There is a 1.68 Mt (6%) reduction in total Mineral Resources relative to the previous report effective June 30, 2020. Of this 1.68 Mt reduction, 0.88 Mt is attributable to mining depletion for the last two quarters of 2020 (3,038 t/d) and the first quarter of 2021 (5,532 t/d). The remaining 0.80 Mt tonnage reduction is mainly due to a 23% increase in marginal NSR cut-off values for sub-level caving mining methods and a 2% increase in the marginal NSR cut-off for the cut and fill mining method, driven essentially by increased costs. Minor tonnage reductions are due to localized changes in geological volumes because of additional infill core drilling, mapping, and sampling. The sub-level caving method has been proposed for approximately 90% of the available Mineral Resources.

Table 14-11: Consolidated Yauricocha Mine Mineral Resource Statement as of March 31, 2021 – SRK Consulting (Canada), Inc. (1) (2) (3) (4) (5) (6) (7) (8) (9)

Classification	Volume (m^3) '000	Tonnes (K t)	Density (t/m^3)	Ag (g/t)	Au (g/t)	Cu (%)	Pb (%)	Zn (%)	As (%)	Fe (%)	NSR (USD/t)	Ag (M oz)	Au (K oz)	Cu (M lb)	Pb (M lb)	Zn (M lb)	As (K t)	Fe (M t)
Measured	1,262	4,241	3.36	59.41	0.58	1.08	0.92	2.62	0.19	25.02	131	8.1	79.3	100.8	86.2	245.3	7.9	1.1
Indicated	2,929	10,069	3.44	37.07	0.50	1.17	0.51	1.88	0.13	25.89	109	12.0	161.1	259.9	113.0	417.2	12.9	2.6
Measured + Indicated	4,191	14,310	3.41	43.69	0.52	1.14	0.63	2.10	0.15	25.86	116	20.1	240.4	360.7	199.2	662.5	20.8	3.7
Inferred	3,337	11,566	3.47	29.04	0.44	1.40	0.32	1.03	0.07	26.38	103	10.8	161.8	358.1	82.7	261.9	8.3	3.1

Source: SRK, 2021

Notes

(1) Mineral Resources have been classified in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM") Definition Standards on Mineral Resources and Mineral Reserves, whose definitions are incorporated by reference into NI 43-101.
(2) Mineral Resources are reported inclusive of Mineral Reserves. Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. All figures are rounded to reflect the relative accuracy of the estimates. Silver, gold, copper, lead, zinc, arsenic (deleterious) and iron assays were capped / cut where appropriate.
(3) The consolidated Yauricocha Resource Estimate is comprised of Measured, Indicated, and Inferred material in the Mina Central, Cuerpos Pequeños, Cuye, Mascota, Esperanza and Cachi-Cachi mining areas.
(4) Polymetallic Mineral Resources are reported at Cut-Off values (COV)'s based on 2021 actual metallurgical recoveries and 2021 smelter contracts.
(5) Metal price assumptions used for polymetallic feed considered CIBC November 2021 long term consensus pricing (Gold (US$1598/oz), Silver (US$21.02/oz), Copper (US$3.39/lb), Lead (US$0.91/lb), and Zinc (US$1.10/lb).
(6) Lead Oxide Mineral Resources are reported at COVs based on 2021 actual metallurgical recoveries and 2021 smelter contracts.
(7) Metal price assumptions used for lead oxide feed considered November 2021 long term consensus pricing (Gold (US$1598/oz), Silver (US$21.02/oz) and Lead (US$0.91/lb).
(8) The mining costs are based on 2021 actual costs and are variable by mining method.
(9) The unit value COVs are variable by mining area and proposed mining method. The marginal (incremental) COV ranges from US$31.7 to US$36.7 for a 5,500t/d operation.

Table 14-12: Grouped Mineralized Zones' Mineral Resource Statement for Yauricocha Mine Areas as of March 31, 2021 – SRK Consulting (Canada), Inc. (1) (2) (3) (4) (5) (6) (7) (8) (9)

Zone	COV	32.5		Grades							Value	Contained Metal						
Mina Central (MINAC) - Polymetallic	Category	**Tonnes (K t)**	**Density (t/m^3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	1,007.9	3.47	22.31	0.61	0.88	0.11	1.87	0.16	25.84	85	723.1	19.673	19,471.5	2,352.3	41,512.8	1.595	260.4
	Indicated	3,971.6	3.52	19.20	0.50	1.17	0.07	1.02	0.09	27.74	84	2,451.9	64.296	102,072.3	6,560.4	89,571.4	3.587	1,101.8
	Measured+ Indicated	**4,979.5**	**3.51**	**19.83**	**0.52**	**1.11**	**0.08**	**1.19**	**0.10**	**27.36**	**84**	**3,175.0**	**83.969**	**121,543.8**	**8,912.7**	**131,084.2**	**5.182**	**1,362.2**
	Inferred	6,986.4	3.47	20.37	0.44	1.48	0.15	0.63	0.06	26.53	95	4,575.0	98.390	227,934.0	23,415.1	96,999.6	3.938	1,853.2
	Includes all Catas and Antacaca																	

Zone	COV	33.2		Grades							Value	Contained Metal						
Mina Central (MINAC) - Polymetallic	**Category**	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	669.4	3.30	35.43	0.47	0.65	0.54	1.91	0.12	20.18	86	762.5	10.185	9,666.2	7,975.8	28,222.6	0.821	135.1
	Indicated	1,126.0	3.33	25.21	0.40	0.76	0.14	0.93	0.10	22.73	65	912.5	14.469	18,878.8	3,472.1	22,968.0	1.078	255.9
	Measured+ Indicated	**1,795.4**	**3.32**	**29.02**	**0.43**	**0.72**	**0.29**	**1.29**	**0.11**	**21.78**	**73**	**1,675.0**	**24.654**	**28,545.0**	**11,447.9**	**51,190.6**	**1.899**	**391.0**
	Inferred	2,129.7	3.49	17.88	0.36	1.37	0.12	0.48	0.04	27.51	86	1,224.4	24.351	64,503.1	5,674.4	22,723.4	0.898	585.8
	Includes all Rosaura and Antacaca Sur																	

Zone	COV	33.2		Grades							Value	Contained Metal						
Mina Central (ASO) – Pb / Ag Oxide	**Category**	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	203.8	3.13	130.44	1.33	0.24	1.60	0.53	0.30	29.98	94	854.7	8.705	1,073.1	7,168.0	2,389.3	0.612	61.1
	Indicated	179.9	3.15	85.24	1.11	0.33	1.05	0.75	0.27	31.35	60	493.0	6.426	1,303.4	4,145.4	2,962.1	0.491	56.4
	Measured+ Indicated	**383.7**	**3.14**	**109.25**	**1.23**	**0.28**	**1.34**	**0.63**	**0.29**	**30.62**	**78**	**1,347.7**	**15.131**	**2,376.5**	**11,313.4**	**5,351.4**	**1.103**	**117.5**
	Inferred	23.7	3.08	140.56	1.65	0.33	0.68	0.74	0.26	31.22	112	107.1	1.259	172.2	355.3	388.4	0.062	7.4
	Includes all Antacaca Sur Oxidos																	

Zone	COV	36.7		Grades							Value	Contained Metal						
Cuerpos Pequeños (CSM, CSMI and CSMII) - Polymetallic	**Category**	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	66.5	3.28	189.29	0.17	0.14	6.54	10.06	0.11	7.07	332	404.7	0.372	199.5	9,594.8	14,744.3	0.073	4.7
	Indicated	98.8	3.19	142.33	0.21	0.12	4.21	8.98	0.09	8.20	262	452.1	0.652	263.0	9,162.0	19,564.8	0.092	8.1
	Measured+ Indicated	**165.3**	**3.22**	**161.22**	**0.19**	**0.13**	**5.15**	**9.41**	**0.10**	**7.74**	**290**	**856.8**	**1.024**	**462.5**	**18,756.8**	**34,309.1**	**0.165**	**12.8**
	Inferred	149.3	3.26	143.29	0.31	0.10	3.94	9.03	0.08	10.58	258	687.8	1.492	313.1	12,979.1	29,718.0	0.113	15.8
	Includes all Contacto Sur Medio: TJ6060, TJ8167 (I) and TJ1590 (II)																	

Cuerpos Pequeños (GAL) - Polymetallic	**COV**	**36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	15.5	3.16	90.30	0.21	0.93	2.35	5.69	0.21	13.55	204	45.0	0.104	318.5	803.4	1,944.4	0.033	2.1
	Indicated	26.9	2.92	32.84	0.10	0.07	2.56	4.68	0.07	5.58	127	28.4	0.083	44.4	1,518.1	2,774.3	0.020	1.5
	Measured+ Indicated	**42.4**	**3.01**	**53.84**	**0.14**	**0.39**	**2.48**	**5.05**	**0.13**	**8.49**	**155**	**73.4**	**0.187**	**362.9**	**2,321.5**	**4,718.7**	**0.053**	**3.6**
	Inferred	13.1	2.91	22.08	0.07	0.06	2.44	4.91	0.06	4.58	123	9.3	0.031	17.4	704.8	1,417.0	0.008	0.6
	Includes all Gallito																	
Cuerpos Pequeños (COR) - Polymetallic	**COV**	**36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	56.8	3.59	52.08	0.11	0.32	0.54	7.80	0.13	27.46	163	95.1	0.209	394.5	678.4	9,768.1	0.071	15.6
	Indicated	75.4	3.51	39.44	0.10	0.25	0.44	7.37	0.11	25.46	147	95.6	0.254	410.9	730.9	12,254.5	0.081	19.2
	Measured+ Indicated	**132.2**	**3.54**	**44.87**	**0.11**	**0.28**	**0.48**	**7.56**	**0.11**	**26.32**	**154**	**190.7**	**0.463**	**805.4**	**1,409.3**	**22,022.6**	**0.152**	**34.8**
	Inferred	113.2	3.20	63.33	0.20	0.14	1.02	5.11	0.04	17.93	126	230.5	0.721	360.1	2,553.6	12,741.0	0.050	20.3
	Includes all Oriental																	
Cuerpos Pequeños (COC) - Polymetallic	**COV**	**36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	23.2	3.14	58.86	0.49	0.20	0.95	5.06	0.06	13.79	126	43.9	0.367	102.8	485.4	2,586.7	0.015	3.2
	Indicated	53.2	3.11	54.49	0.24	0.25	0.53	5.30	0.07	13.72	123	93.2	0.409	292.2	626.2	6,211.8	0.036	7.3
	Measured+ Indicated	**76.4**	**3.12**	**55.82**	**0.32**	**0.23**	**0.66**	**5.22**	**0.07**	**13.74**	**124**	**137.1**	**0.776**	**395.0**	**1,111.6**	**8,798.5**	**0.051**	**10.5**
	Inferred	39.4	3.03	44.29	0.28	0.27	0.17	4.33	0.07	12.69	101	56.1	0.357	238.0	143.8	3,762.3	0.027	5.0
	Includes all Occidental																	
Cuye (CUYE) - Polymetallic	**COV**	**$31.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	0.0	-	-	-	-	-	-	-	-	-	0.0	0.000	0.0	0.0	0.0	0.000	0.0
	Indicated	2,176.9	3.60	19.83	0.54	1.36	0.10	1.14	0.12	28.59	96	1,387.9	38.061	65,034.8	4,863.4	54,506.6	2.589	622.4
	Measured+ Indicated	**2,176.9**	**3.60**	**19.83**	**0.54**	**1.36**	**0.10**	**1.14**	**0.12**	**28.59**	**96**	**1,387.9**	**38.061**	**65,034.8**	**4,863.4**	**54,506.6**	**2.589**	**622.4**
	Inferred	1,266.4	3.65	32.56	0.52	1.66	0.09	0.34	0.13	30.76	103	1,325.7	21.098	46,293.9	2,381.1	9,556.3	1.592	389.5
	Includes all Cuye																	
Ma sco ta (M	**COV**	**$31.7 + $36.7 (10)**		**Grades**							**Value**	**Contained Metal**						

Zone	Category	Tonnes (K t)	Density (t/m3)	Ag (g/t)	Au (g/t)	Cu (%)	Pb (%)	Zn (%)	As (%)	Fe (%)	NSR (USD/t)	Ag (K oz)	Au (K oz)	Cu (K lb)	Pb (K lb)	Zn (K lb)	As (K t)	Fe (K t)
	Measured	147.5	3.18	143.37	0.99	0.73	4.02	4.78	0.17	17.15	182	679.9	4.711	2,385.0	13,071.2	15,531.8	0.246	25.3
	Indicated	479.2	3.30	130.92	0.65	1.00	2.93	6.71	0.15	18.45	219	2,017.1	10.089	10,586.8	30,975.3	70,878.8	0.696	88.4
	Measured+ Indicated	**626.7**	**3.27**	**133.85**	**0.73**	**0.94**	**3.19**	**6.25**	**0.15**	**18.14**	**210**	**2,697.0**	**14.800**	**12,971.8**	**44,046.5**	**86,410.6**	**0.942**	**113.7**
	Inferred	255.3	3.44	144.02	1.09	0.60	2.54	4.93	0.09	24.01	196	1,182.1	8.926	3,400.4	14,321.4	27,745.3	0.223	61.3
	Includes all Mascota Oxidos Cu Pb-Ag, Mascota Polymetallic North, Mascota Polymetallic East, Mascota Polymetallic (South) East, Mascota Polymetallic South and Mascota Sur Oxidos Cu																	
Esperanza (ESP, ESPD, ESPN and ESPBX) - Polymetallic	**COV**	**$31.7 + $36.7 (10)**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	1,651.1	3.34	72.90	0.54	1.73	0.95	2.61	0.24	27.45	171	3,869.6	28.660	63,071.1	34,589.2	94,977.9	3.918	453.2
	Indicated	1,541.8	3.26	72.32	0.44	1.72	1.30	3.34	0.25	24.24	186	3,584.8	21.980	58,411.7	44,150.0	113,445.1	3.874	373.7
	Measured+ Indicated	**3,192.9**	**3.30**	**72.62**	**0.49**	**1.73**	**1.12**	**2.96**	**0.24**	**25.90**	**178**	**7,454.4**	**50.640**	**121,482.8**	**78,739.2**	**208,423.0**	**7.792**	**826.9**
	Inferred	502.9	3.16	78.34	0.26	1.32	1.69	4.66	0.27	19.41	193	1,266.6	4.240	14,596.1	18,780.3	51,659.7	1.344	97.6
	Includes all Esperanza, Esperanza Norte, Esperanza Distal, Esperanza Breccia 3																	
Cachi-Cachi (ANG) - Polymetallic	**COV**	**$32.5**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	55.3	3.37	15.19	0.27	0.88	0.13	1.18	0.08	26.76	71	27.0	0.484	1,071.6	156.7	1,442.0	0.043	14.8
	Indicated	39.9	3.44	12.16	0.21	0.98	0.05	0.62	0.06	29.57	64	15.6	0.265	859.1	43.0	541.4	0.025	11.8
	Measured+ Indicated	**95.2**	**3.40**	**13.92**	**0.24**	**0.92**	**0.10**	**0.95**	**0.07**	**27.94**	**68**	**42.6**	**0.749**	**1,930.7**	**199.7**	**1,983.4**	**0.068**	**26.6**
	Inferred	0.0	-	-	-	-	-	-	-	-	-	0.0	0.00	0.0	0.0	0.0	0.000	0.0
	Includes all Angelita																	
Cachi-Cachi (CAR) - Polymetallic	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	51.1	3.34	58.86	0.65	0.30	0.75	1.92	0.13	21.92	81	96.7	1.071	341.0	842.6	2,158.1	0.065	11.2
	Indicated	45.3	3.38	64.61	0.73	0.30	0.79	2.05	0.13	22.74	86	94.1	1.065	296.5	791.5	2,045.4	0.061	10.3
	Measured+ Indicated	**96.4**	**3.36**	**61.56**	**0.69**	**0.30**	**0.77**	**1.98**	**0.13**	**22.30**	**83**	**190.8**	**2.136**	**637.5**	**1,634.1**	**4,203.5**	**0.126**	**21.5**
	Inferred	0.9	3.00	65.66	1.00	0.04	1.55	3.94	0.22	11.11	116	1.9	0.029	0.8	30.7	78.1	0.002	0.1
	Includes all Carmencita																	
Ca chi- Ca chi	**COV**	**$32.5**		**Grades**							**Value**	**Contained Metal**						

Zone	Category	Tonnes	Density	Ag	Au	Cu	Pb	Zn	As	Fe	NSR	Ag	Au	Cu	Pb	Zn	As	Fe
		(K t)	(t/m3)	(g/t)	(g/t)	(%)	(%)	(%)	(%)	(%)	(USD/t)	(K oz)	(K oz)	(K lb)	(K lb)	(K lb)	(K t)	(K t)
	Measured	6.1	3.21	16.32	0.30	0.63	0.09	0.82	0.07	22.95	53	3.2	0.058	84.8	12.6	109.7	0.004	1.4
	Indicated	11.3	3.32	23.40	0.35	0.83	0.05	0.40	0.06	26.55	58	8.5	0.126	206.4	13.7	99.4	0.007	3.0
	Measured+ Indicated	17.4	3.28	20.91	0.33	0.76	0.07	0.55	0.06	25.29	56	11.7	0.184	291.2	26.3	209.1	0.011	4.4
	Inferred	0.0	-	-	-	-	-	-	-	-	-	0.0	0.000	0.0	0.0	0.0	0.000	0.0
	Includes all Celia																	
Cachi-Cachi (ELI) - Polymetallic	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	36.6	3.16	80.48	0.46	0.26	1.84	7.58	0.17	12.30	189	94.7	0.544	210.0	1,482.4	6,118.4	0.062	4.5
	Indicated	27.3	2.90	90.46	0.34	0.46	0.85	2.02	0.15	9.52	103	79.4	0.300	279.0	509.6	1,213.2	0.040	2.6
	Measured+ Indicated	**63.9**	**3.04**	**84.74**	**0.41**	**0.35**	**1.41**	**5.20**	**0.16**	**11.11**	**152**	**174.1**	**0.844**	**489.0**	**1,992.0**	**7,331.6**	**0.102**	**7.1**
	Inferred	1.3	2.60	47.85	0.12	0.32	1.10	0.71	0.08	7.69	62	2.0	0.005	9.1	31.5	20.4	0.001	0.1
	Includes all Elissa																	
Cachi-Cachi (ESC) - Polymetallic	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	17.2	3.51	51.36	0.27	0.23	2.09	5.84	0.06	25.00	153	28.4	0.150	86.7	791.9	2,213.6	0.010	4.3
	Indicated	41.2	3.24	37.82	0.25	0.23	0.95	4.75	0.06	19.17	114	50.1	0.326	211.7	858.4	4,317.0	0.023	7.9
	Measured+ Indicated	**58.4**	**3.32**	**41.81**	**0.25**	**0.23**	**1.28**	**5.07**	**0.06**	**20.89**	**125**	**78.5**	**0.476**	**298.4**	**1,650.3**	**6,530.6**	**0.033**	**12.2**
	Inferred	21.7	3.19	20.64	0.18	0.04	0.77	5.26	0.05	17.05	103	14.4	0.126	20.4	366.9	2,516.5	0.011	3.7
	Includes all Escondida																	
Cachi-Cachi (KAR) - Polymetallic	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes (K t)**	**Density (t/m3)**	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**As (%)**	**Fe (%)**	**NSR (USD/t)**	**Ag (K oz)**	**Au (K oz)**	**Cu (K lb)**	**Pb (K lb)**	**Zn (K lb)**	**As (K t)**	**Fe (K t)**
	Measured	122.8	3.97	48.05	0.63	0.72	0.37	2.67	0.11	33.88	104	189.7	2.478	1,961.7	1,007.8	7,220.2	0.141	41.6
	Indicated	26.9	3.84	31.91	0.53	0.58	0.26	2.65	0.11	30.86	88	27.6	0.460	343.6	155.2	1,571.9	0.029	8.3
	Measured+ Indicated	**149.7**	**3.95**	**45.15**	**0.61**	**0.70**	**0.35**	**2.66**	**0.11**	**33.33**	**101**	**217.3**	**2.938**	**2,305.3**	**1,163.0**	**8,792.1**	**0.170**	**49.9**
	Inferred	1.7	4.25	12.81	0.59	0.85	0.10	1.42	0.12	29.41	73	0.7	0.032	31.9	3.9	53.3	0.002	0.5
	Includes all Karlita																	
Ca chi-Ca chi	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes**	**Density**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**	**NSR**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**

		(K t)	(t/m3)	(g/t)	(g/t)	(%)	(%)	(%)	(%)	(%)	(USD/t)	(K oz)	(K oz)	(K lb)	(K lb)	(K lb)	(K t)	(K t)
	Measured	70.7	3.40	43.51	0.44	0.12	1.85	5.17	0.10	23.20	131	98.9	1.000	180.9	2,887.5	8,063.2	0.069	16.4
	Indicated	109.0	3.23	44.43	0.38	0.08	1.08	3.32	0.10	20.28	90	155.7	1.315	198.8	2,589.0	7,978.1	0.108	22.1
	Measured + Indicated	**179.7**	**3.30**	**44.07**	**0.40**	**0.10**	**1.38**	**4.05**	**0.10**	**21.42**	**106**	**254.6**	**2.315**	**379.7**	**5,476.5**	**16,041.3**	**0.177**	38.5
	Inferred	46.4	3.07	34.92	0.41	0.10	0.53	1.66	0.10	16.38	54	52.1	0.617	100.0	546.9	1,700.4	0.046	7.6
	Includes all Privatizadora																	
Cachi-Cachi (SUL - Polymetallic	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes**	**Density**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**	**NSR**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**
		(K t)	**(t/m3)**	**(g/t)**	**(g/t)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(USD/t)**	**(K oz)**	**(K oz)**	**(K lb)**	**(K lb)**	**(K lb)**	**(K t)**	**(K t)**
	Measured	3.9	3.25	38.28	0.25	0.05	2.40	3.36	0.18	17.95	106	4.8	0.031	4.1	206.6	288.5	0.007	0.7
	Indicated	9.0	3.21	50.46	0.37	0.06	2.49	4.06	0.21	17.78	123	14.6	0.106	11.8	494.9	805.2	0.019	1.6
	Measured + Indicated	**12.9**	**3.23**	**46.78**	**0.33**	**0.06**	**2.47**	**3.85**	**0.20**	**17.83**	**118**	**19.4**	**0.137**	**15.9**	**701.5**	**1,093.7**	**0.026**	**2.3**
	Inferred	4.4	3.14	49.48	0.35	0.06	2.55	4.13	0.18	13.64	125	7.0	0.050	5.9	247.5	400.4	0.008	0.6
	Includes all Sulma																	
Cachi-Cachi (VAN) - Polymetallic	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes**	**Density**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**	**NSR**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**
		(K t)	**(t/m3)**	**(g/t)**	**(g/t)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(USD/t)**	**(K oz)**	**(K oz)**	**(K lb)**	**(K lb)**	**(K lb)**	**(K t)**	**(K t)**
	Measured	18.5	3.19	68.26	0.37	0.23	2.57	8.59	0.10	12.43	209	40.6	0.218	93.6	1,046.7	3,501.9	0.018	2.3
	Indicated	16.4	3.15	58.03	0.32	0.41	1.75	4.63	0.09	15.85	141	30.6	0.171	149.8	633.7	1,673.9	0.015	2.6
	Measured + Indicated	**34.9**	**3.17**	**63.45**	**0.35**	**0.32**	**2.18**	**6.73**	**0.09**	**14.04**	**177**	**71.2**	**0.389**	**243.4**	**1,680.4**	**5,175.8**	**0.033**	**4.9**
	Inferred	7.1	3.38	25.85	0.41	0.81	0.13	0.93	0.07	26.76	68	5.9	0.093	126.6	19.7	146.3	0.005	1.9
	Includes all Vanessa																	
Cachi-Cachi (YOS) - Polymetallic	**COV**	**$36.7**		**Grades**							**Value**	**Contained Metal**						
	Category	**Tonnes**	**Density**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**	**NSR**	**Ag**	**Au**	**Cu**	**Pb**	**Zn**	**As**	**Fe**
		(K t)	**(t/m3)**	**(g/t)**	**(g/t)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(USD/t)**	**(K oz)**	**(K oz)**	**(K lb)**	**(K lb)**	**(K lb)**	**(K t)**	**(K t)**
	Measured	17.2	3.37	122.06	0.57	0.11	2.68	6.54	0.32	19.77	195	67.5	0.315	41.2	1,016.9	2,479.8	0.055	3.4
	Indicated	13.3	3.33	102.66	0.46	0.09	2.27	6.03	0.29	18.05	172	43.9	0.198	25.2	666.8	1,769.2	0.038	2.4
	Measured + Indicated	**30.5**	**3.35**	**113.60**	**0.52**	**0.10**	**2.50**	**6.32**	**0.30**	**19.02**	**185**	**111.4**	**0.513**	**66.4**	**1,683.7**	**4,249.0**	**0.093**	**5.8**
	Inferred	3.1	3.10	63.21	0.17	0.08	1.62	3.42	0.26	22.58	105	6.3	0.017	5.2	110.8	233.9	0.008	0.7
	Includes all Yoselim																	

Source: SRK, 2021

Notes

(1) Mineral Resources have been classified in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM") Definition Standards on Mineral Resources and Mineral Reserves, whose definitions are incorporated by reference into NI 43-101.

(2) Mineral Resources are reported inclusive of Mineral Reserves. Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.

(3) All figures are rounded to reflect the relative accuracy of the estimates. Splits requires more significant figures, to prevent rounded-off metal content values of 0 for minor mineralized zones Mineral Resources. Silver, gold, copper, lead, zinc, arsenic (deleterious) and iron assays were capped / cut where appropriate.

(4) The consolidated Yauricocha Resource Estimate is comprised of Measured, Indicated, and Inferred material in the Mina Central, Cuerpos Pequeños, Cuye, Mascota, Esperanza and Cachi-Cachi mining areas.

(5) Polymetallic Mineral Resources are reported at Cut-Off values (COV)s based on 2021 actual metallurgical recoveries and 2021 smelter contracts.

(6) Metal price assumptions used for polymetallic feed considered CIBC November 2021 long term consensus pricing (Gold (US$1,598.21/oz), Silver (US$21.02/oz), Copper (US$3.39/lb), Lead (US$0.91/lb), and Zinc (US$1.10/lb).

(7) Lead Oxide Mineral Resources are reported at COVs based on 2021 actual metallurgical recoveries and 2021 smelter contracts.

(8) Metal price assumptions used for lead oxide feed considered November 2021 long term consensus pricing (Gold (US$1,598.21/oz), Silver (US$21.02/oz) and Lead (US$0.91/lb).

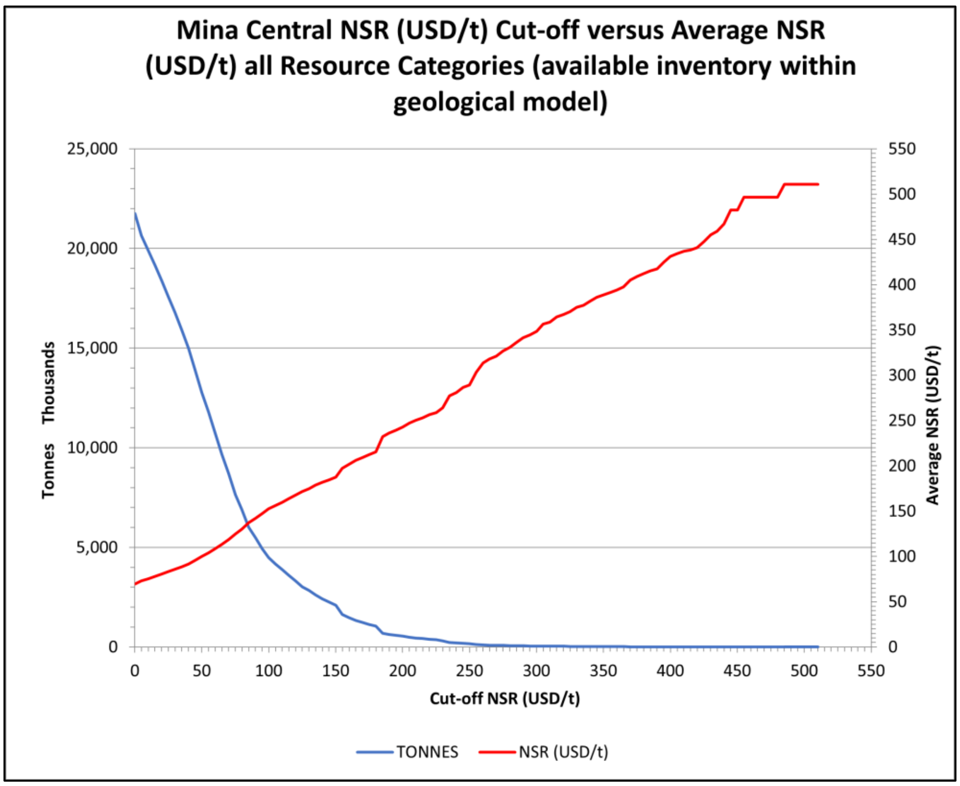
(9) The mining costs are based on 2021 actual costs and are variable by mining method.

(10) Two or more mining methods employed, hence several cut-offs applied to the respective regions.

(11) The unit value COVs are variable by mining area and proposed mining method. The marginal (incremental) COV ranges from US$31.7 to US$36.7 for a 5,500t/d operation.

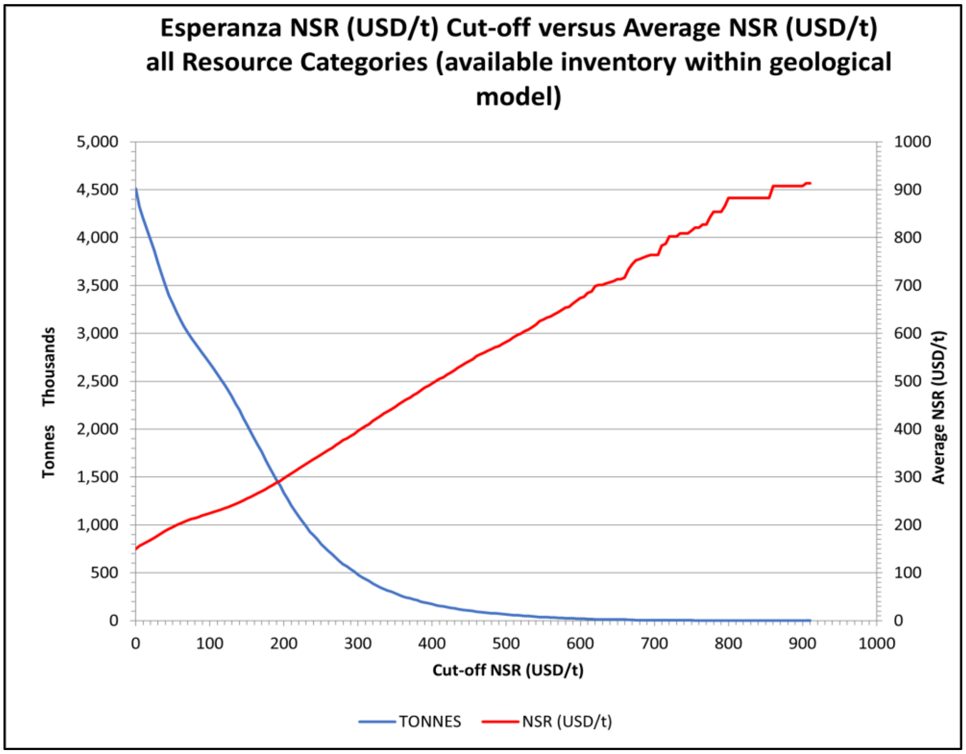
14.12 Mineral Resource Sensitivity

To demonstrate the sensitivity of the Mineral Resource estimations to factors such as changes in commodity prices or mining / processing costs, the QP has produced value vs. tonnage charts at various unit value cut-offs for each area, for all categories of Mineral Resources combined (Figure 14-23 through Figure 14-28). These show that most of the Mineral Resources defined in Mina Central, Esperanza, Mascota, Cuye, Cuerpos Pequeños and Cachi-Cachi show some sensitivity to the unit value cut-off (varying in degree between mineralized zones), and that this should be considered in the context of the impact on changing cost assumptions with respect to the contained Mineral Resources.



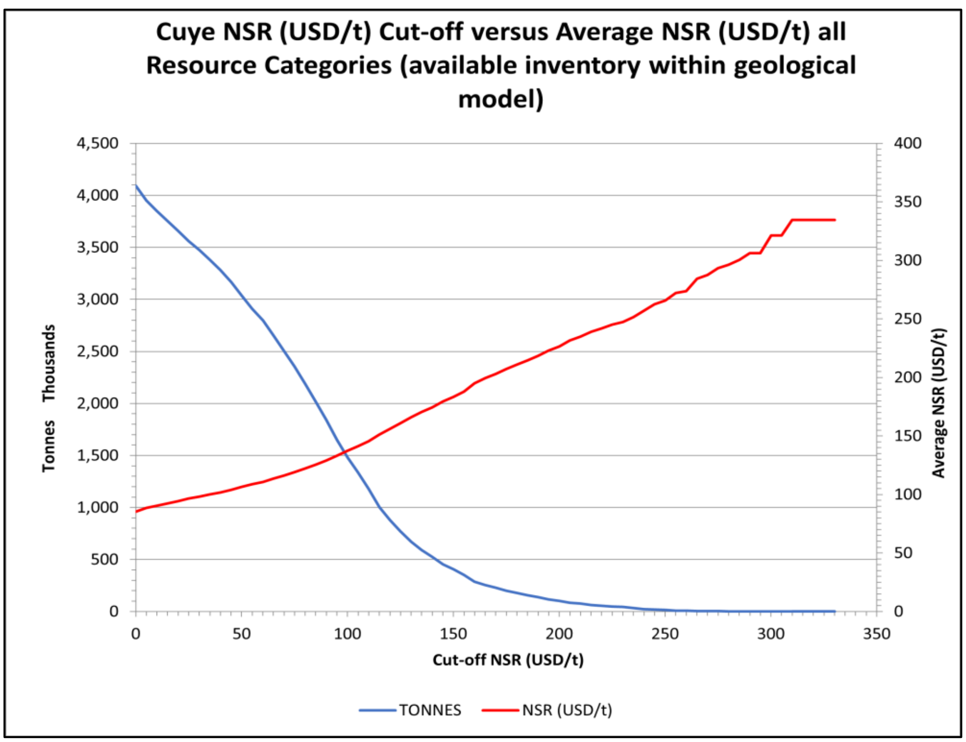
Source: SRK, 2021

Figure 14-23: Mina Central Value Tonnage Chart



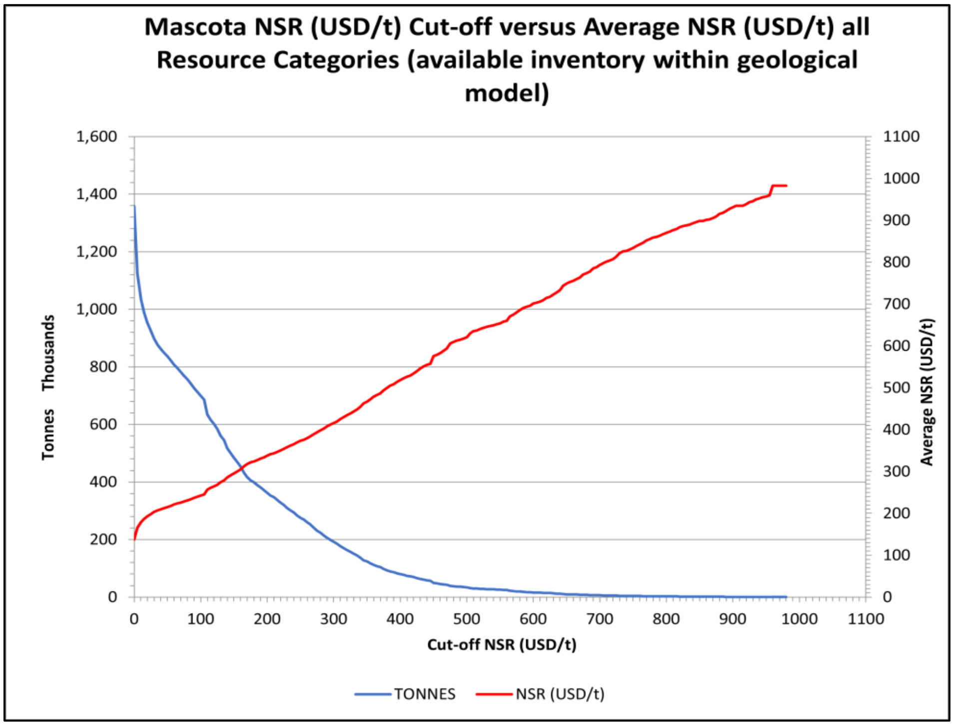
Source: SRK, 2021

Figure 14-24: Esperanza Value Tonnage Chart



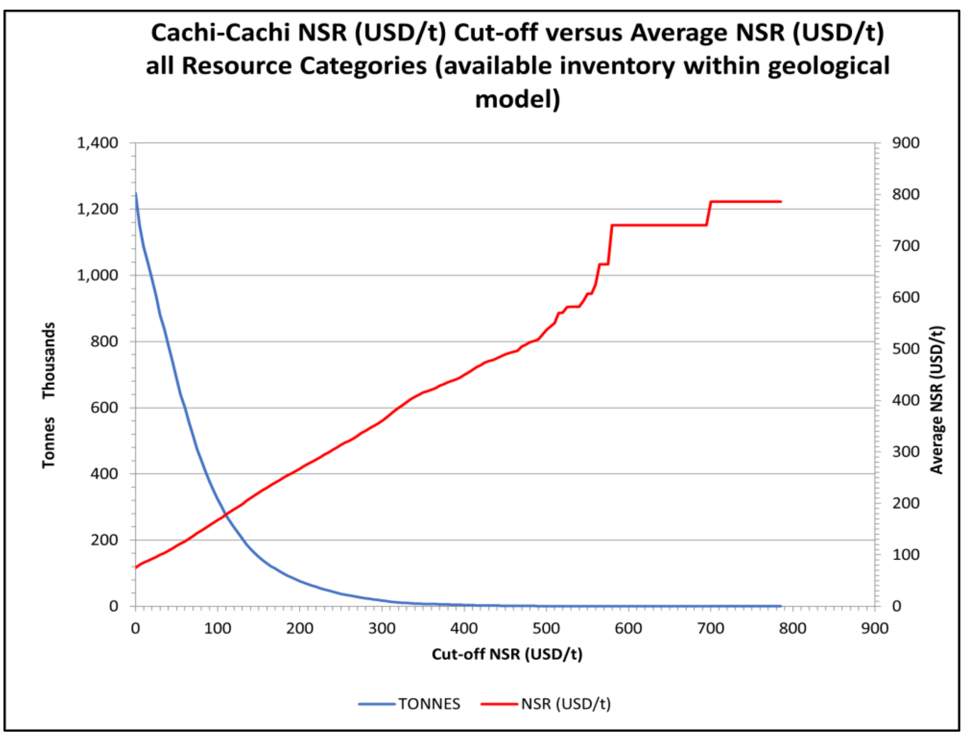
Source: SRK, 2021

Figure 14-25: Cuye Value Tonnage Chart



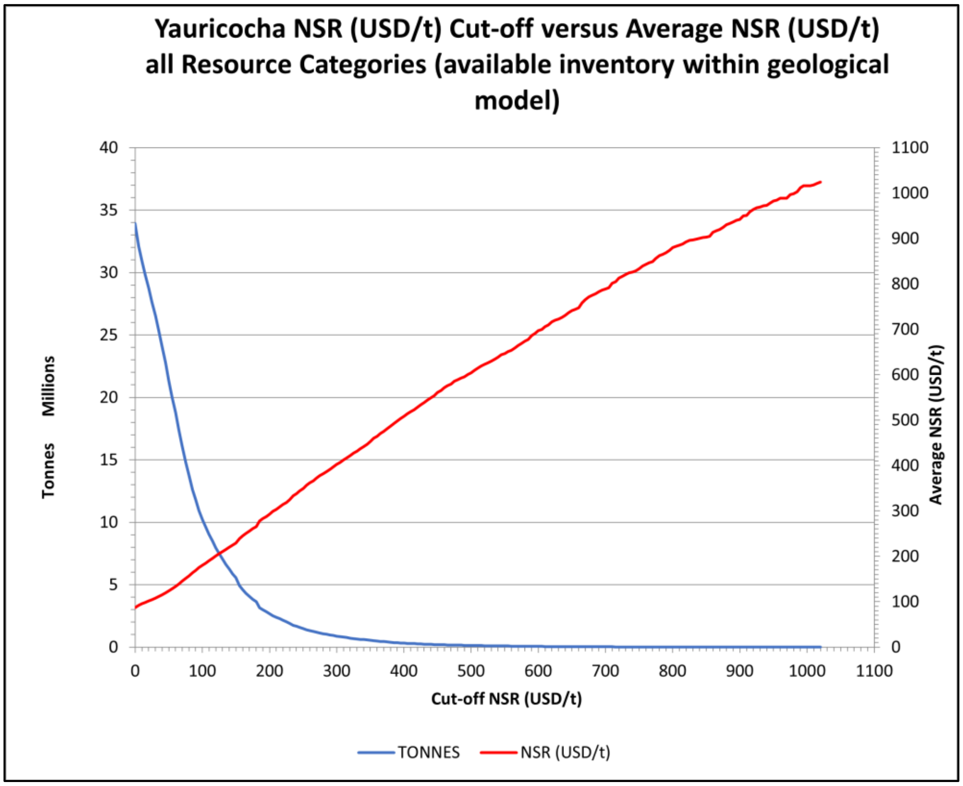
Source: SRK, 2021

Figure 14-26: Mascota Value Tonnage Chart



Source: SRK, 2021

Figure 14-27: Cachi-Cachi Value Tonnage Chart



Source: SRK, 2021

Figure 14-28: Cuerpos Pequeños Value Tonnage Chart

14.13 Relevant Factors

There are no other relevant factors that the QP is aware of that would affect the Mineral Resources.

15 Mineral Reserve Estimates

A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Resource. It includes diluting material and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Prefeasibility or Feasibility level as appropriate that include the application of Modifying Factors.

A Mineral Reserve has not been estimated for the Project as part of this PEA.

The PEA includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves.

16 Mining Methods

The conceptual mine plans considered in this PEA includes Inferred Mineral Resources that are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as Mineral Reserves, and there is no certainty that the results of the PEA will be realized.

16.1 Introduction

Mechanized sub-level caving (SLC) and overhand mechanized cut and fill (MCF) mining methods are currently used in the mine to achieve production with most of the production by SLC mining methods. The mining method used varies depending on geotechnical constraints, mineralization trends, dimensions, and mine production targets.

Using the most recent Mineral Resource estimate, Sierra analyzed how the Yauricocha Mine could achieve higher, sustainable production rates. The analysis determined that higher production rates are achievable through expansion by bringing areas into production using the SLC mining method. Additionally, existing SLC mining practices would benefit from modernizing the configuration of the SLC mining method to utilize the capabilities of modern equipment, thereby incrementally reducing costs, and increasing productivity.

The mine is grouped into six primary mining areas based on geographic location:

1. Mina Central
2. Esperanza
3. Mascota
4. Cuye
5. Cachi-Cachi
6. Cuerpos Pequeños (“small mineralized bodies”).

The mining areas Cuerpos Pequeños are shown in plan view in Figure 16-1

Source: Sierra, Redco, 2021

Figure 16-1: Yauricocha Mine Showing Mining Areas (Plan View)

16.2 Mine Access and Material Handling

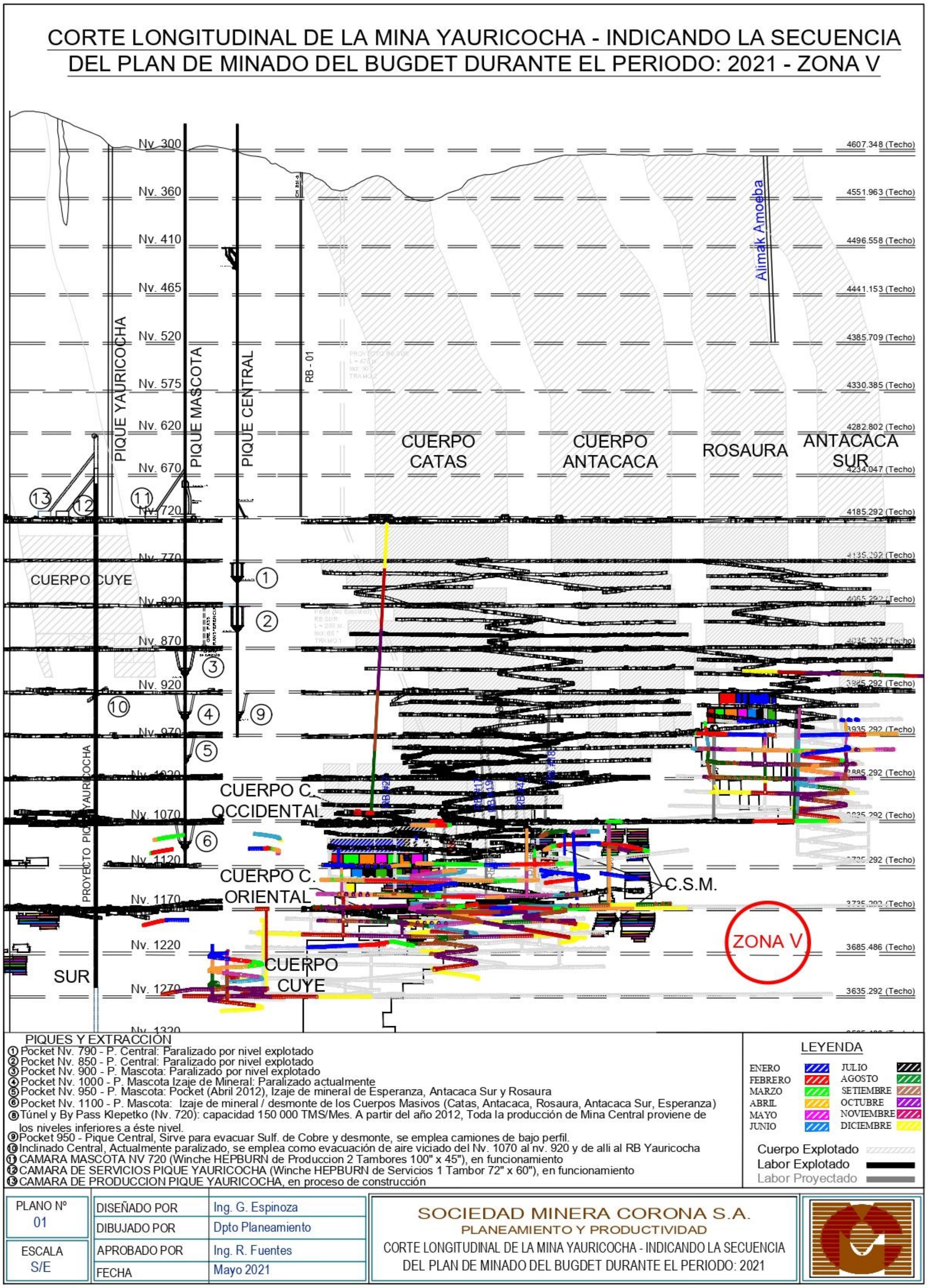
Current mine access includes two tunnels and three used for personnel access and materials movement:

- The Klepetko tunnel (3m x 3m) and the Yauricocha tunnel (3.5m x 3.5m) located at level 720 (Main transport level). These tunnels are used to delivered mineralized material directly to the Chumpe concentrator plant and also provide mine access for personnel.
- The shafts currently in service are the Central shaft, Mascota shaft and the Cachi-Cachi shaft.

- These shafts are typically used to move personnel and materials, as well as moving mineralized material and waste up to the 720-haulage level. They can move mineralized material and waste to surface if required.
- The Yauricocha shaft is currently being sunk to the 1270 level and is expected to be commissioned in 2025.

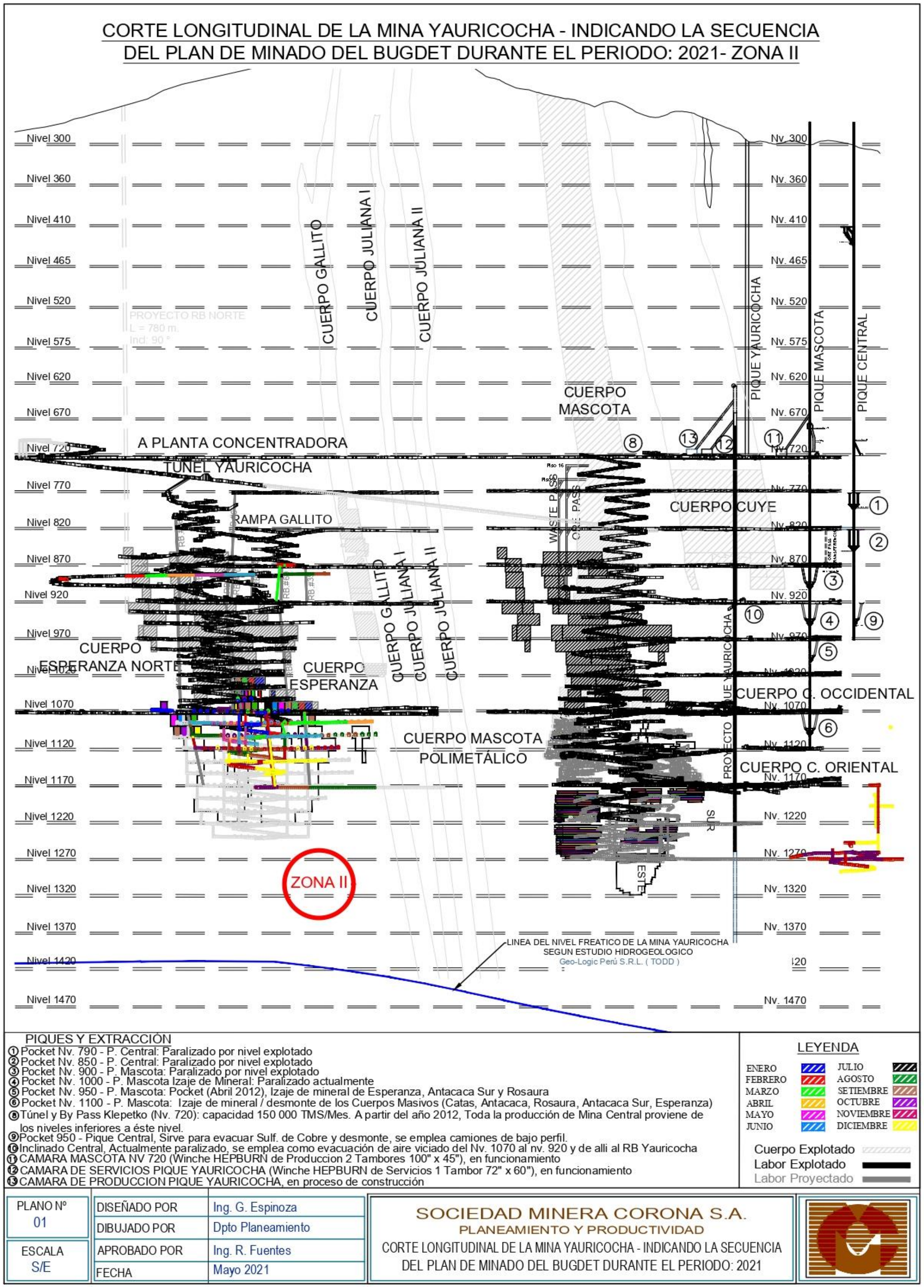
Personnel access to the mine is through the Mascota Shaft, Central Shaft, Yauricocha tunnel or Klepetko Tunnel at 720 level. Ramps connect levels and sub-levels in the primary mining areas as shown in Figure 16-2, Figure 16-3 and Figure 16-4, with main haulage levels at 50 m intervals, increasing to 100 m below 1070 level.

Previously mined out areas are shown in pink, existing development openings are black, and designed development is shown in blue. The LoM mining areas are shown for reference and are colored by production year.



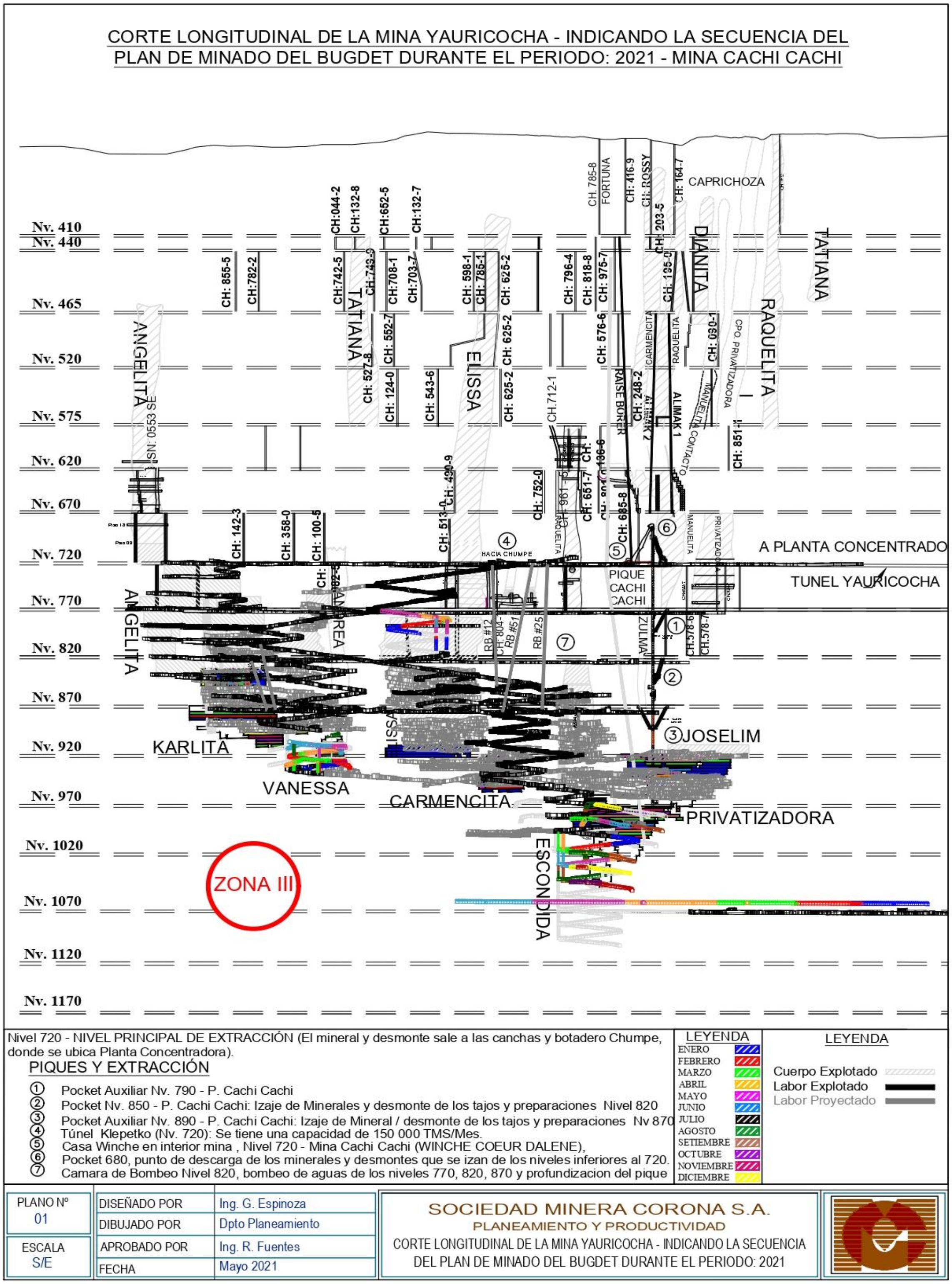
Source: Sierra, 2021

Figure 16-2: Yauricocha Long Section Showing Mining Areas and Mineralized Zones – Zone V (Looking NE)



Source: Sierra, 2021

Figure 16-3: Yauricocha Long Section Showing Mining Areas and Mineralized Zones – Zone II (Looking NE)



Source: Sierra, 2021

Figure 16-4: Yauricocha Long Section Showing Mining Areas and Mineralized Zones – Zone III (Looking NE)

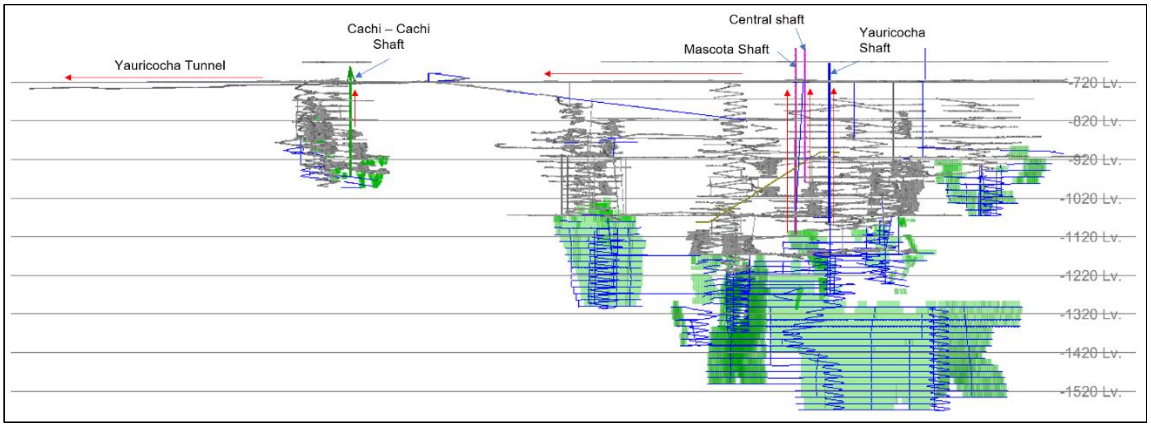
With all current and planned mining below the 720 level, the current material handling system is generally as follows:

- LHDs transport muck (mineralized material and waste) to mineralized material passes on the sub-levels with a portion of the development waste being used as backfill in the MCF stopes.
- Rail cars are loaded at the mineralized material passes and trammed by locomotive to the Mascota Shaft to be hoisted to the 720 main haulage level
- Muck is then trammed by rail through the Klepetko and Yauricocha tunnels to the mill
- Waste may be batched through the system for disposal on surface or use as construction material for tailings dams, etc.
- A winze at the Cachi-Cachi mineralized material body hoists production from the lower levels in that area to the 720 main haulage level.

For mining between the 1170 level to 1270 level, the Yauricocha Shaft (winze) is under construction and is expected to be commissioned in 2025. Future mining below the 1320 level is currently planned as truck haulage to level truck dump above 1320 level, into mineralized material passes. Rail cars will then be loaded and trammed to the Yauricocha shaft to be hoisted to the 720 main haulage level.

The Central shaft is currently only used to move personnel and materials. The Mascota shaft is currently the main hoisting shaft with the Yauricocha shaft being constructed to hoist mineralized material from below 1120 level. The Cachi-Cachi shaft is the hoisting shaft for all mineralized material produced from the Cachi-Cachi mineralized body. All shafts are used to transport personnel and supplies to the current working levels.

The location of the four shafts and the haulage tunnel are shown in Figure 16-5



Source: Sierra, 2021

Figure 16-5: Yauricocha Mine and Main Accesses - Isometric View

Currently, most of the development waste is transported by LHD to the MCF areas and used as backfill. The remaining material is batched to surface and placed in the waste dump or used as construction material.

The Central Shaft is 720 m deep; it was used to mine from 690 to 970 level with a rated capacity of 2,000 tpd. It is currently being rehabilitated from levels 410 to 465.

The Central Inclined Shaft is a small winze located between the 920 and 1070 levels used a 200 hp hoisting system equipped with three 1.5 t skips between levels. Currently paralyzed, it is used as fresh air to enter the operation.

The Mascota Shaft was commissioned in December 2016 and is 860 m deep. This shaft services from 680 level to 1100 level with a rated capacity of 3,500 tpd. This shaft was designed to be able to hoist approximately 3,500 tpd from the 1430 level but has not been deepened.

The Cachi-Cachi shaft provides access to level 910 of the Cachi-Cachi mineralized body only and handles only mineralized material and waste from Cachi-Cachi zone.

The Yauricocha shaft is currently under construction and is expected to enter service in 2025 with shaft bottom at the 1270 level. A loading pocket is being built on the 1210 level. The shaft has a rated capacity of 7,296 tpd and is expected to operate at 90% of its rated capacity to hoist both mineralized material and waste.

The Klepetko tunnel is 4 km long (3 m high x 3 m wide) and transported mineralized material and waste from the 720 level skip dumps to surface. It is equipped with an electric trolley system and used 20t electric locomotives to pull cars of mineralized material with volumes from 3.1 m3 to 4.5 m3 in size. Currently is only used as personnel access.

The Yauricocha tunnel is 4.7 km long (3.5 m high x 3.5 m wide) and transports mineralized material and waste from the 720 level skip dumps to surface using the same equipment as the Klepetko tunnel. The tunnel was added to increase haulage flexibility and eliminate bottlenecks that previously occurred outside the Klepetko tunnel.

Current operation parameters of these components are summarized in Table 16-1.

Table 16-1: Operation parameters of material handling system components

Parameter	Unit	Mascota Shaft	Central Shaft	Yauricocha Shaft	Cachi-Cachi Shaft	Yauricocha Tunnel (Locomotives)
Length	m	860	720	500	252	4,700
Capacity	tpd	3,500	2,000	7,296	1,700	5,500
Material	-	Mineralized Material Waste	Waste	Mineralized Material Waste	Mineralized Material Waste	Mineralized Material Waste
Zones	-	Esperanza Mina Central Mascota	Esperanza	Esperanza Mina Central Mascota Cuye	Cachi-Cachi	All
Haulage Level	-	770, 820	820, 870	970, 1070, 1170, 1270	820, 870	720

Source: Sierra, 2021

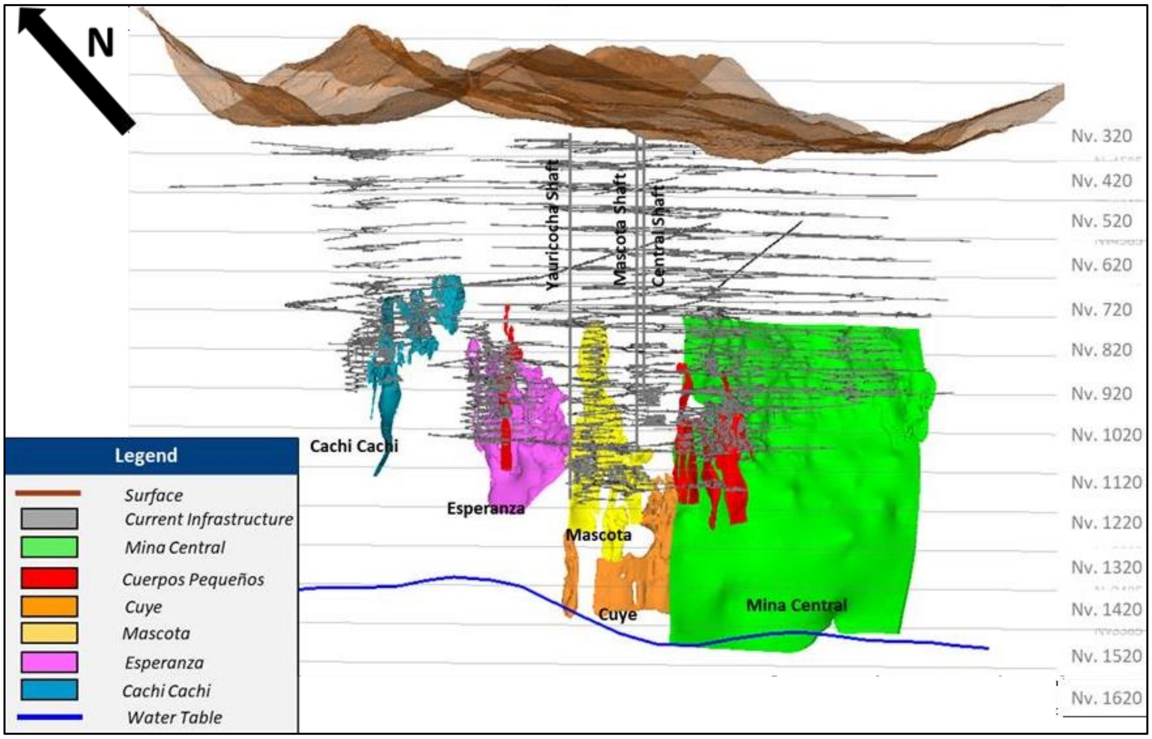
16.3 Current Mining Methods

The mining methods applied to the various mineralized bodies at Yauricocha is generally chosen based on the nature of the mineralization. Mineralized bodies at Yauricocha fall into two main types of mineralization, differentiated by scale, continuity, and mineralogy (polymetallic sulfides or oxide mineralized material).

- Cuerpos Massivos (large bodies) are mineralized bodies formed along major structures of significant strike length and vertical extent (several hundreds of meters) with a consistent geometry and sufficient widths to facilitate bulk mining methods. These are mined by SLC mining methods.
- Cuerpos Chicos (small bodies) are smaller, high grade mineralized bodies which are irregular in form and lack the continuity of the Cuerpos Massivos. They are typically mined by more selective mining methods, typically overhand MCF. Cuerpos Chicos in the Cachi-Cachi area are referred to by the area designation “Cachi-Cachi” and Cuerpos Chicos occurring in the vicinity of Mina Central are collectively referred to as the “Cuerpos Pequeños”.

SLC is the primary mining method at Yauricocha, representing 84% of the annual production. This method is in use Mina Central, Esperanza, Mascota, and Cuye areas. SLC and MCF is used for Cachi-Cachi, and MCF is used for Cuerpos Pequeños.

Table 16-2 shows the mining method used by mineralization area and zone and Figure 16-6 shows an isometric view of the mining areas and mineralized zones.



Source: Sierra, 2021

Figure 16-6: Yauricocha Isometric Showing Mining Areas and Mineralized Zones

Table 16-2: Mining Method by Mineralization Area and Zone

Area	Mineralized Zone	Mining Method	Mining Method Description
Mina Central	Catas	SLCM2	Mechanized Sub Level Caving – Some Water Present
	Antacaca	SLCM2	Mechanized Sub Level Caving – Some Water Present
	Rosaura	SLCM3	Mechanized Sub Level Caving – Water Present
	Antacaca Sur	SLCM3	Mechanized Sub Level Caving – Water Present
Esperanza	Esperanza	SLCM1	Mechanized Sub Level Caving – No Water Present
	Norte	SLCM2	Mechanized Sub Level Caving – Some Water Present
	Distal	SLCM1	Mechanized Sub Level Caving – No Water Present
Mascota	Oxide Ag-Pb	SLCM1	Mechanized Sub Level Caving – No Water Present
	Polymetallic (All)	CRAM	Mechanized Overhand Cut and Fill
Cuye	All	SLCM1	Mechanized Sub Level Caving – No Water Present
Cachi–Cachi	Angelita	SLCM2	Mechanized Sub Level Caving – Some Water Present
	Karlita	CRAM	Mechanized Overhand Cut and Fill
	Elissa	CRAM	Mechanized Overhand Cut and Fill
	Celia	SLCM2	Mechanized Sub Level Caving – Some Water Present
	Escondida	CRAM	Mechanized Overhand Cut and Fill
	Privatizadora	CRAM	Mechanized Overhand Cut and Fill
	Vanessa	CRAM	Mechanized Overhand Cut and Fill
	Yoselim	CRAM	Mechanized Overhand Cut and Fill
	Carmencita	CRAM	Mechanized Overhand Cut and Fill
Cuerpos Pequeños	Gallito	CRAM	Mechanized Overhand Cut and Fill
	Oriental	CRAM	Mechanized Overhand Cut and Fill
	Occidental	CRAM	Mechanized Overhand Cut and Fill
	Contacto Sur Medio(TJ 6060)	CRAM	Mechanized Overhand Cut and Fill
	Contacto Sur Medio I(TJ 8167)	CRAM	Mechanized Overhand Cut and Fill
	Contacto Sur Medio II(TJ 1590)	CRAM	Mechanized Overhand Cut and Fill

Source: Redco, 2021

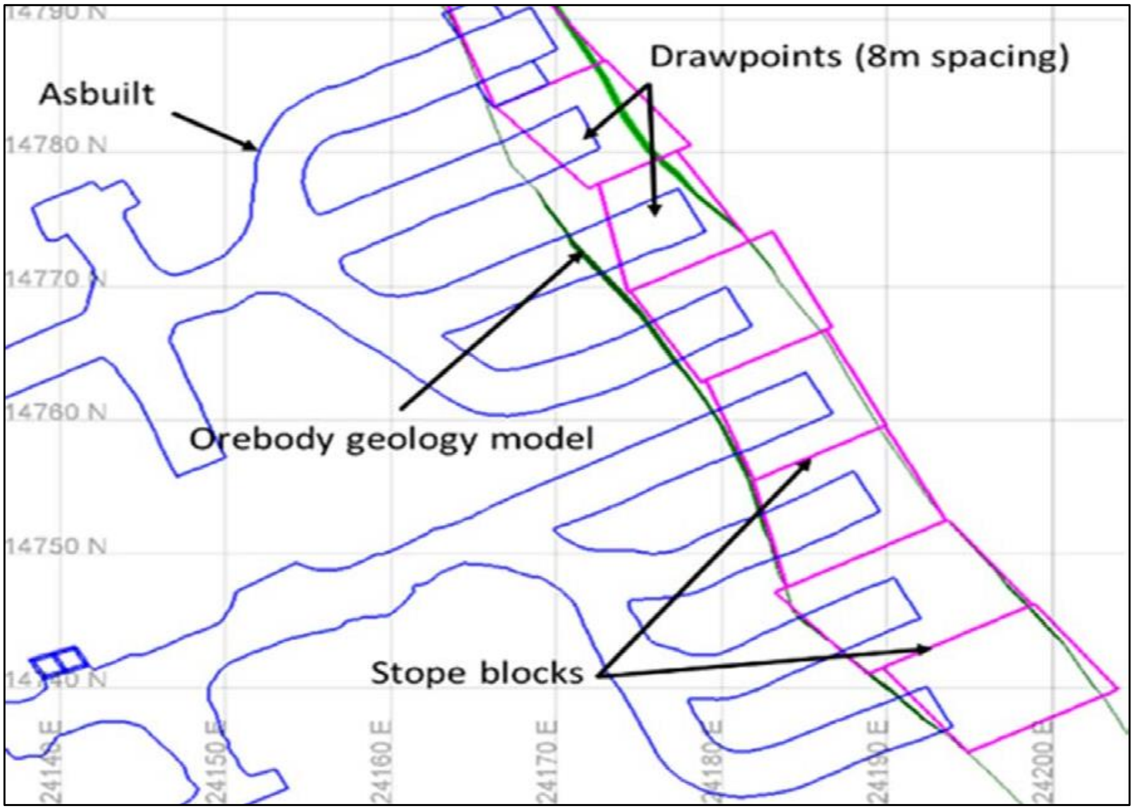
16.4 Mining Method Descriptions

16.4.1 Sub-Level Caving (SLC)

SLC mining areas have historically been established by developing three sub-levels for each 50m main level via ramps. This results in a planned 16.7 m sub-level spacing which are called pisos (floors). Below the 1070L, main level spacing will be increased to 100m, but the sub-level spacing remains the same. One aspect of modernizing the SLC practices will be to work towards increasing the sub-level spacing to 25 m which is typical of modern SLC mines. Geotechnical work and trial mining will be conducted as part of the program to phase in this change. Not all mineralized bodies will necessarily be converted due to geotechnical constraints.

On each sub-level, drawpoints are developed from the footwall to the hangingwall of the mineralized body, typically at 3.5 m wide x 3.0 m high and are spaced 8.0 m apart along the Footwall drift. Steel sets, shotcrete and bolting are used as ground support in the drawpoints and the length of each drawpoint varies with the thickness of the mineralized zone.

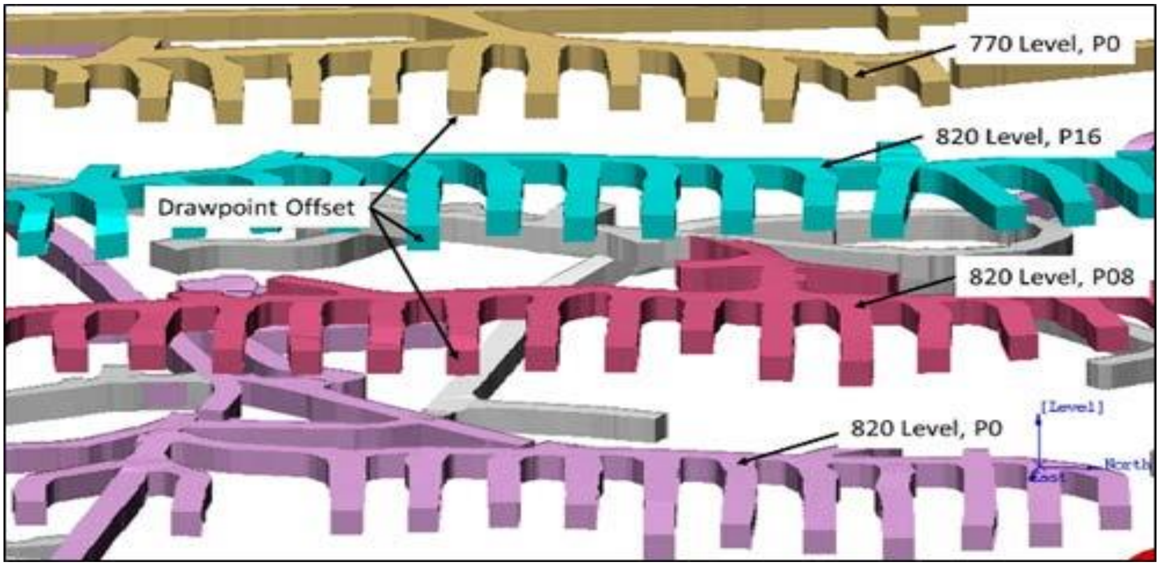
As the drawpoint is developed, samples of mineralized material are collected for grade control analysis from the left and right ribs. Upholes are drilled and blasted in stopes to initiate caving. Effective draw control is an important aspect to successfully extracting the expected tonnes and grades for this mining method. Figure 16-7 shows a typical level layout with footwall drift and drawpoints (labelled “As-built”), stope blocks, and geological model at the 870 level, piso (floor) 12 in the Antacaca Sur mineralized body. Drawpoints are staggered by 4.0 m horizontally between sub-levels.



Source: Sierra, Redco, 2021

Figure 16-7: Typical Sub-level Cave Layout, 870 Level - Piso 12 in Antacaca Sur (Plan View)

Figure 16-8 shows an isometric view of the footwall drifts and drawpoint ("as-builts") in Mina Central illustrating the typical drawpoint layout and offset.

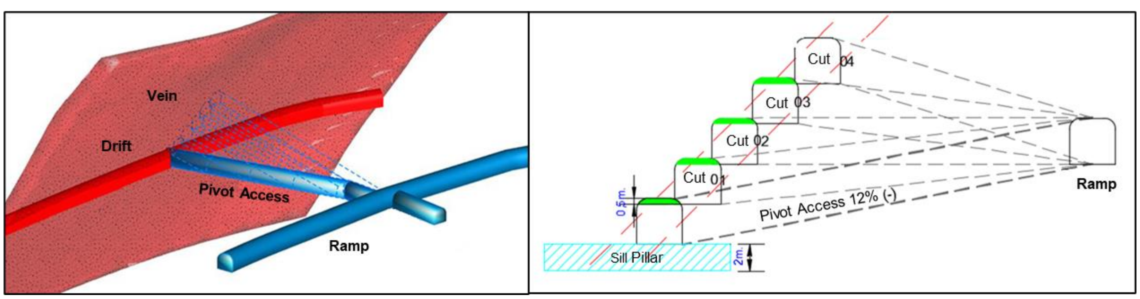


Source: Sierra, Redco, 2021

Figure 16-8: Isometric View of Drawpoints in Mina Central (Looking West)

16.4.2 Mechanized Cut and Fill (MCF)

MCF mining is employed in the smaller mineralized bodies. Typically, the 3.0 m high cuts are mined at a minimum width of 3.0 m in a bottom-up sequence (overhand) where the previous cut is filled with uncemented rock fill (URF) as mining progresses to the next sub-level above. Sill pillars are left between levels as mining comes up underneath the previously mined level. Based on geotechnical constraints, the sill pillars are typically a minimum of 2.0 m in thickness. The long section of the Elissa mineralized zone is shown in Figure 16-9 to show the method of overhand cut and fill.



Source: Sierra, Redco, 2021

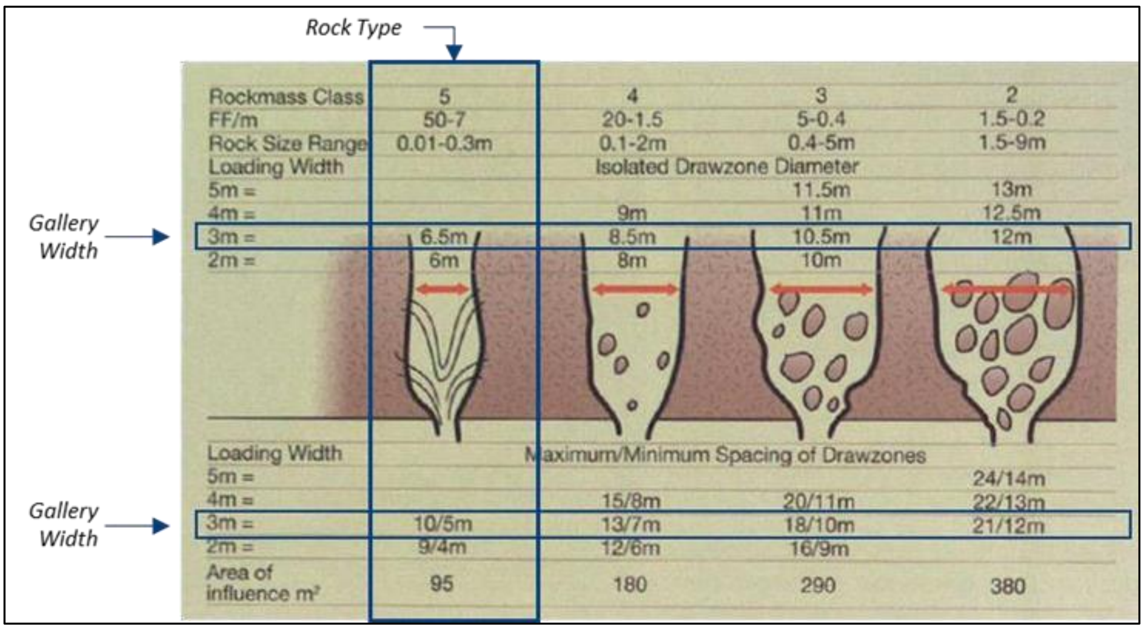
Figure 16-9: Schematic Showing Cut and Fill Mining in Elissa Mineralized Zone (Long Section)

16.5 Mine Method Parameters

SLC is the primary mining method at Yauricocha representing 84% of the production. This method is in use Mina Central, Esperanza and Cuye areas. SLC and MCF are used for Cachi-Cachi area, and MCF is used for Mascota area and Cuerpos Pequeños mineralized bodies.

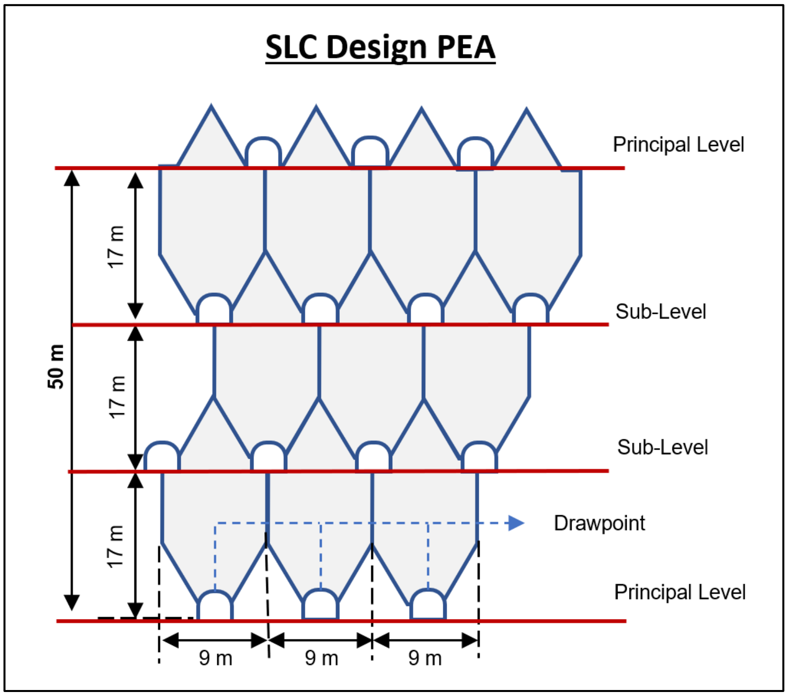
Considerations for SLC and MCF mining are made based on geotechnical and hydrogeology information. How massive the mineralized body is, rock mass characteristics and expected inflows of water are all important factors implementing the appropriate mining method and associated design parameters.

Currently, the mine uses horizontal distances of 8 m between the production windows, which translates into having effective pillars of 4.5 m. Figure 16-10 shows Laubscher's empirical design methodology, and Figure 16-11 shows the distribution of these dimensions on each level (50 m).



Source: Redco, 2021

Figure 16-10: Laubscher Estimating for Drawpoints Design



Source: Redco, 2021

Figure 16-11: SLC Ring Design based on Laubscher Empirical Methods

Following previous studies by Redco (Yauricocha_Technical_Report_PEA 2020) and based on the Laubscher's empirical design methodology, it was recommended that in order to increase the production rate, the recommended horizontal distance between the drawpoints should be 10 m and the vertical distance between sub-levels should be 25 m. These values were based on a design trade-off study considering dilution, recovery and an economic analysis using gravitational flow modelling. However, the recommended design parameters will be not yet implemented as additional geotechnical work and trial mining is recommended before widespread implementation. Not all mineralized bodies will necessarily be able to implement these recommended changes.

16.5.1 Sub-Level Caving (SLC)

As described on section 16.4.1, main haulage levels are developed at 50 m intervals and divided into three sub-levels of 16.7 m. The rock support of the drawpoint can be a mix of steel arches, shotcrete and/or bolts. The length of each drawpoint varies with the width of the mineralized body.

The current mine design parameters for SLC are shown in Table 16-3. The mine design presented in this PEA are based upon these parameters.

Table 16-3: Mine Design Parameters for SLC

Parameter	Value (m)
Haulage level spacing	50 m
Sub-level spacing	16.6 m – 16.8 m
Drawpoint spacing	8.0 m
Drawpoint width	3.5 m

Source: Sierra Metals, Redco, 2021

16.5.2 Mechanized Cut and Fill (MCF)

As described on section 16.4.2, main haulage levels are developed at 50 m intervals. Each 50 m high mining block is accessed by a ramp system with each block divided into 3 sections accessed by an attack ramp. Each mining block is mined from the bottom up in 3 m high cuts, 15 or 16 cuts per 50 m mining block with a sill pillar left as recommended by geotechnical engineers. Wider stopes may require that 5 m wide rib pillars be left within the stope. Ground support can be a mix of shotcrete and/or bolts and welded wire mesh.

Mine design parameters for MCF are shown in Table 16-4

Table 16-4: Mine Design Parameters for MCF

Parameter	Value (m)
Cut width	3.0 m – 5.0 m
Cut height	3.0 m
Cut length	100 m – 120 m
Number of Cuts	15-16 per 50m mining block
Sill Pillar	Minimum 2 m depending on mineralized body width and ground conditions
Rib Pillar	5 m (wider mineralized bodies only)

Source: Sierra, Redco, 2021

16.6 Parameters Relevant to Mine Designs

Considerations for SLC and MCF mining are made based on geotechnical and hydrogeology information. How massive the mineralized body is, rock mass characteristics and expected inflows of water are all important factors implementing the appropriate mining method and associated design parameters.

16.6.1 Geotechnical Data

This section presents details of the geotechnical data from previous studies, and additional data collected since, for this PEA study.

Field Investigations

Previous geotechnical field investigations focused primarily on the Antacaca Sur deposit (high mud-rush-risk area) and then extended to Antacaca, Catas, Rosaura and Mascota mining areas. As of 2015, the geotechnical investigations comprised 500 m of core logging and 6 km of mapping of the underground workings. In 2020, over 2,000 minor structures and discontinuities were mapped.

The geotechnical core logging was conducted to help delineate structural domains. SRK logged in accordance with the rock mass rating classification systems developed by Bieniawski (1976 and 1989). These classification systems are widely-used empirical methods for classifying the rock mass quality and internationally accepted practice. Data were collected on the following rock mass characteristics:

- lithology
- faulting and shearing
- orientation of structure for delineating joint sets
- estimating intact rock strength
- Rock Quality Designation (RQD)
- orientation of structure for delineating joint sets
- number of discontinuities (joints)
- average fracture frequency
- joint spacing

Data were also collected on the following discontinuity characteristics:

- openness/aperture
- planarity
- roughness
- infilling/coating
- evidence of groundwater staining

In the rock mass rating system, several of these characteristics have rating values which when summed together give a rock mass rating out of 100 points and an indication of the rock mass quality.

Summary rock mass rating results from the 6 km of underground mapping are presented, Table 16-5 shows the statistics of the RMRB89 data and Table 16-6 shows the statistics of the Geological Strength Index (GSI) data.

Table 16-5: Summary Statistics of RMRB89 from the Tunnel Mapping

RMR_B(89)	**Crystallized Limestone**	**Marble Limestone**	**Grey Limestone**	**Skarn Limestone**	**Granodiorite**	**Monzonitic Intrusive**
Mean	**60**	**59**	**60**	**59**	**56**	**63**
Standard Error	0.3	0.6	1	0.5	2.2	0.9
Standard Deviation	10	10	10	10	10	10
Sample Variance	2.9	11	10.9	1.2	24.8	8.3
Minimum	**56**	**51**	**56**	**58**	**48**	**60**
Maximum	**62**	**64**	**64**	**60**	**62**	**67**

Source: Sierra, Redco, 2021

Table 16-6: Summary Statistics of Geological Strength Index (GSI) from the Tunnel Mapping

GSI	Crystallized Limestone	Marble Limestone	Grey Limestone	Skarn Limestone	Granodiorite	Monzonitic Intrusive
Mean	**55**	**54**	**55**	**54**	**51**	**58**
Standard Error	0.3	0.6	1	0.5	2.2	0.9
Median	61	59	57	58	56	63
Standard Deviation	10	10	10	10	10	10
Sample Variance	2.9	11	10.9	1.2	24.8	8.3
Minimum	**51**	**46**	**51**	**49**	**45**	**55**
Maximum	**57**	**59**	**46**	**55**	**57**	**62**

Source: Sierra, Redco, 2021

The diamond cored drillholes (DDH) collared underground were geotechnically logged in accordance with RMRB(89) and GSI rock mass rating systems. Although rating systems can be converted, the correlations are sometimes variable and area specific. As such, best practice is to collect data for two different systems. SRK understands, based on discussion with Sierra, that logging for the Q’ (Barton, 1974) rock mass rating system is now also being conducted. The Q-system is most used for underground applications and there are numerous industry-standard empirical design charts (e.g., ground support) established for this system.

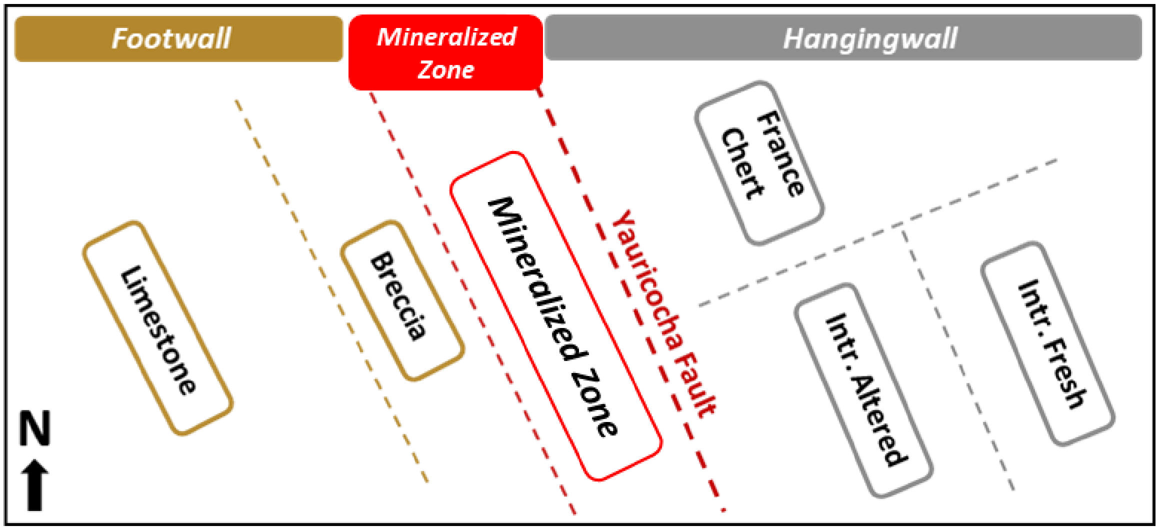
For this PEA, Sierra provided Redco with project geological models for the mining areas. The databases in each model contained details on each drillhole: collars, downhole survey, and lithology, but only 3,457 m of the drilling had geotechnical core logging available. Table 16-7 provides a summary of the DDH in the models that are dated after 2015.

Table 16-7: Summary of Diamond Cored Drillholes Since 2015

Mining Area	Diamond Cored Drillholes	
	Number	Total Meters
Cuerpos Chicos	218	12,630
Esperanza	322	22,387
Mascota	17	1,510
Mina Central	131	13,169
Mina Cachi-Cachi	133	11,277

Source: Sierra, Redco, 2021

Three extensive geotechnical units; i) Hangingwall, ii) Footwall, and iii) Mineralized zone (Figure 16-12) were identified. Each geotechnical domain was subdivided into different geotechnical sub-domains based on rock mass quality and rock mass strength.



Source: Sierra, Redco, 2020

Figure 16-12: Conceptual Geotechnical Model (Plan View)

The hangingwall domain also has two sub-domains, i) Intrusive, and ii) Weathered Intrusive. The intrusive is fresh and characterized as good to very good quality rock. The information collected from drainage drillholes indicates that the RMRB(89) ranges between IIIB to IIB.

The weathered intrusive sub-domain is an altered intrusive with low rock quality and low intact rock strength. This material is located on the immediate hangingwall of the mineralized material on the contact with the Yauricocha fault. This sub-domain is characterized by cubic blocks of intrusive material with clay infilling, which significantly reduces its rock mass strength. Closer to the fault there is more clay infill between blocks. Field observations and core logging indicate that the highly weathered intrusive hangingwall extends up to about 20 m from the Yauricocha fault.

The footwall limestone domain is massive and covers most of the underground workings. Even though geologically there are different types of limestones, the RMRB(89) and the laboratory test results suggest that various limestones have similar mechanical behavior and can be grouped into a single geotechnical unit, referred to as “fresh limestone”. The altered breccia sub-domain is located along the immediate footwall contact with the mineralized zone. This sub-domain comprises weak altered material. Field observations indicate the footwall breccia is discontinuous and with variable thickness.

The mineralized material has been defined as a separate geotechnical domain because of its distinctly weaker characteristics. The data (i.e., field observations, core logging and laboratory tests) indicate that this unit behaves as granular material. To understand the effect of the strength parameters under different moisture levels, five remolded multi-stage undrained triaxial tests were conducted at different moisture levels (2%, 3%, 4.8%, 6%, and 8%). The test results indicate reduction in strength with increasing moisture. The mineralized material has significantly lower cohesion at higher moisture contents, but the internal friction angle is only reduced slightly.

Mapping and Logging

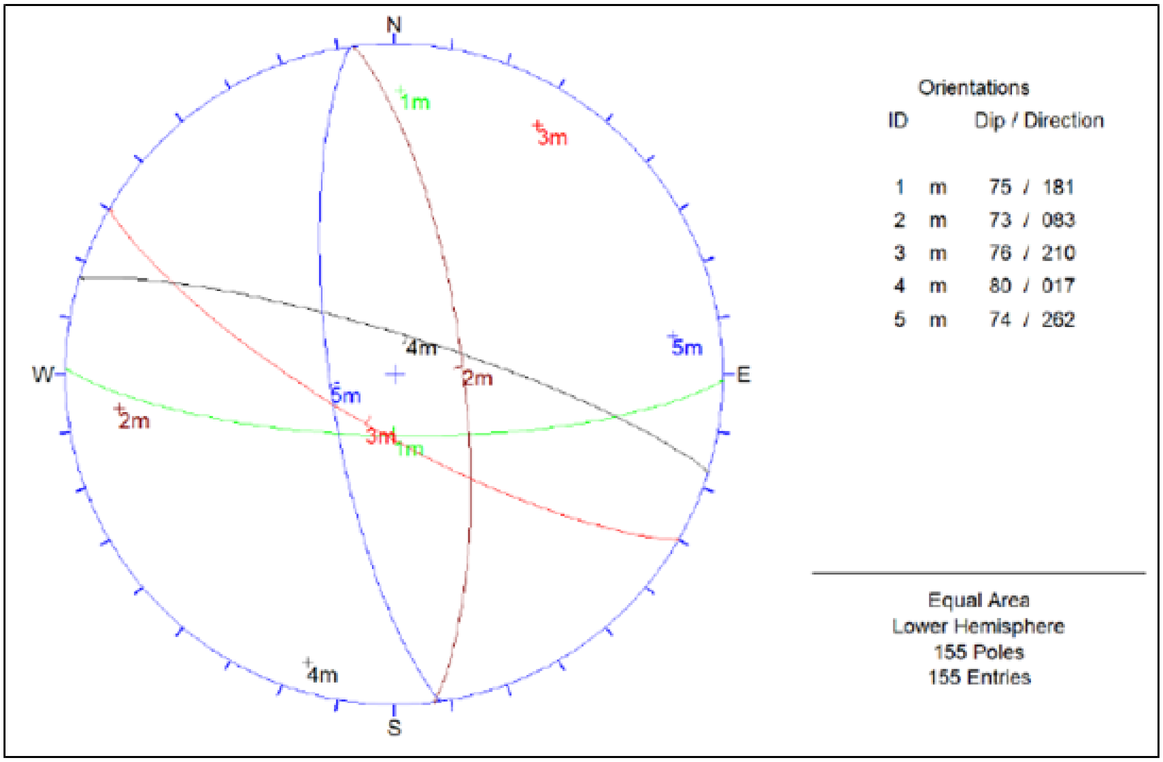
For the 2015 technical study, the geotechnical field investigations focused primarily on the Antacaca Sur deposit (high mud-rush-risk area) and then extended to Antacaca, Catas, Rosaura and Mascota mining areas. As of 2015, the geotechnical investigations comprised 500 m of core logging, and 6 km of mapping of the underground workings. Then in 2020, over 2,000 minor structures and discontinuities were mapped.

For this PEA, the main source of information for rock characterization comes from the underground characterization by DCR Ingenieros. DCR Ingenieros mapped in accordance with the rock mass rating classification systems developed by Bieniawski (1976 and 1989). These classification systems are widely-used empirical methods for classifying the rock mass quality and internationally accepted practice. Data were collected on the following rock mass characteristics:

- lithology
- type of joint set
- orientation of structure for delineating joint sets
- joint spacing
- persistence
- openness / aperture
- roughness
- infilling / coating
- weathering
- evidence of groundwater staining

For interpretation of structural data, the joint sets registered in geological plans developed by the Geology Department of the Yauricocha Mine and data registered by DCR Ingenieros were used. To establish the joint sets distribution, data were processed in the software DIPS. The results indicate the existence of two main systems of joint sets and three secondary systems of joint sets (Figure 16-13):

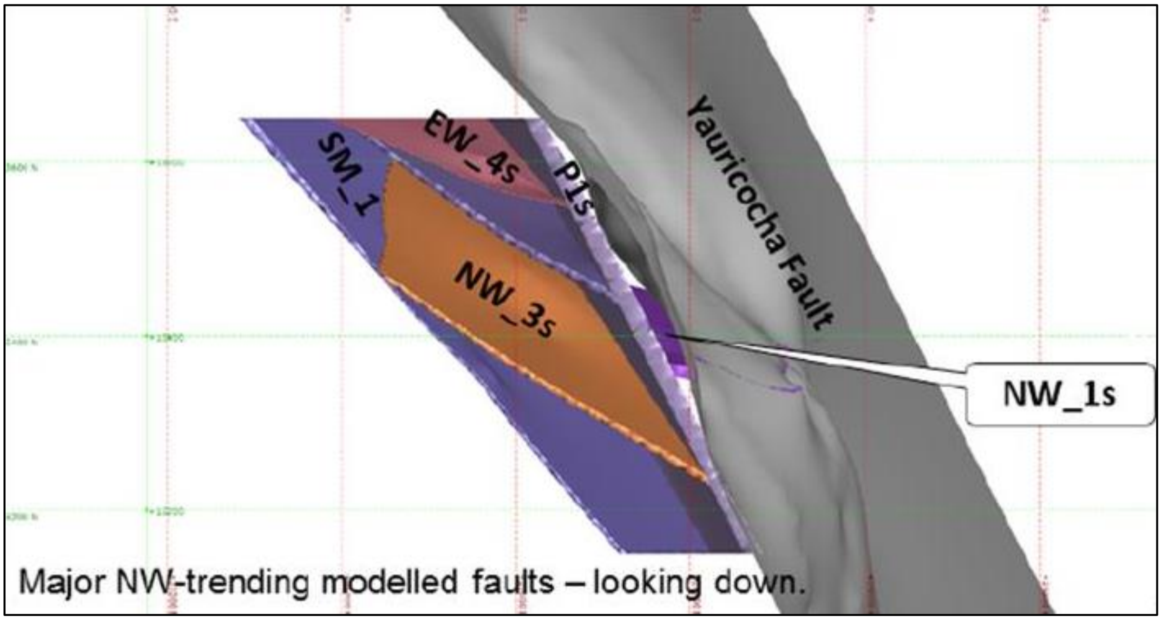
- System 1, azimuth EW and high dip to S;
- System 2, azimuth NS and high dip to E;
- System 3, azimuth NWW and high dip to SW;
- System 4, azimuth NWW and high dip to SE; and
- System 5, azimuth NNW and high dip to SW.



Source: DCR Ingenieros, 2019

Figure 16-13: Stereogram of Main Joint Families

Faults have a spacing of 20 m and a persistence between tens and hundreds of meters generally. These faults are located generally parallel to the Yauricocha fault. In the case of faults with infilling materials like clays and oxides, the aperture is between 10 to 50 cm. These faults are the conduit for the transport of underground water. Based on historical mapping and logging historical information, a 3D Model of 13 main faults was developed as shown in Figure 16-14.



Source: Sierra, 2021

Figure 16-14: Major Fault (Isometric View)

The source of information to classify the rock mass was the underground mapping in different levels of the mine. Also, it considered past information obtained from the upper levels of the mine developed by the Geomechanics Department of the Yauricocha Mine.

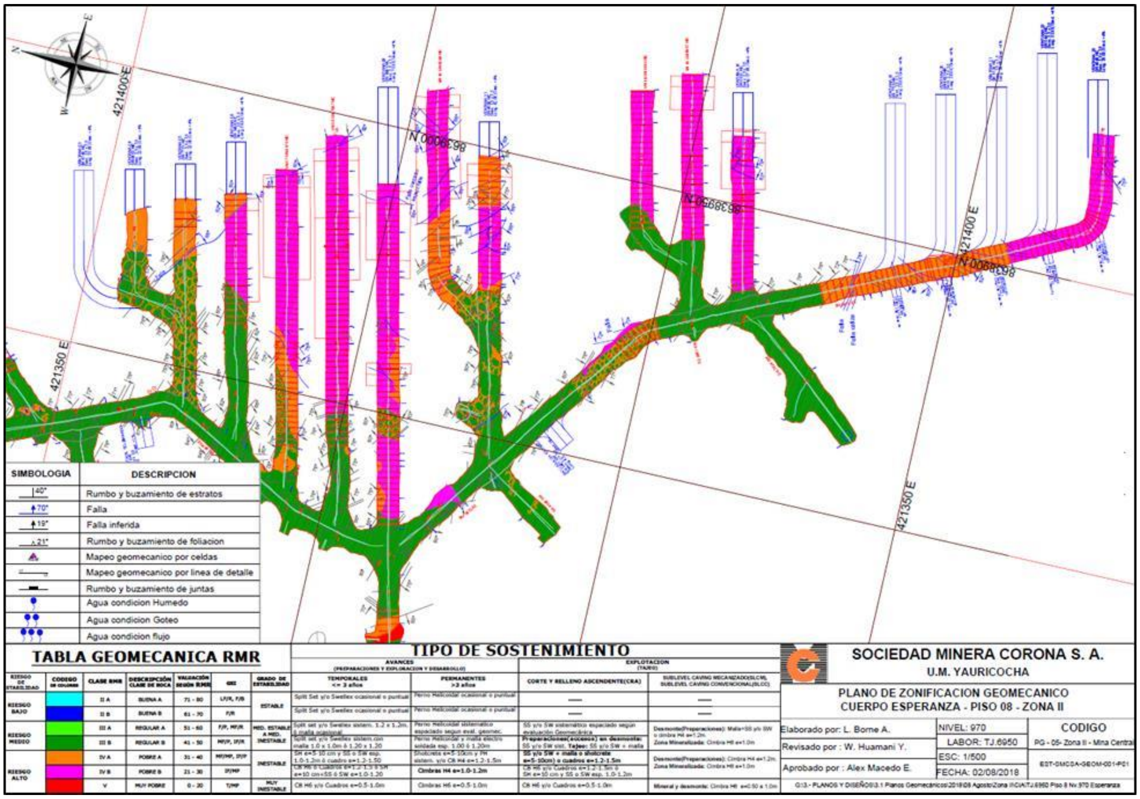
Results are shown in Table 16-8 as ranges of RMR for the domains mentioned above.

Table 16-8: Rock Mass Characterization for Domain

Domain	RMR Range	Rock Mass Characterization
Limestone	**43 – 54**	**IIIB & IIIA**
Mineralized Material	**<21 – 22**	**V & IVB**
Intrusive	**47 – 53**	**IIIB &**

Source: Sierra, 2021

An example ground control management level plan showing the footwall development and mining access is shown in Figure 16-15. Consistent with the conceptual rock mass model, openings in the mineralized zones are shaded pink representing poor quality rock, development openings in the fresh limestone sub-domain are shaded green representing medium quality rock, and the limestone/mineralized zone contact is an intermediate (i.e., between pink and green) rock quality zone shaded orange.



Source: Sierra, 2021

Figure 16-15: Example Ground Control Management Level Plan

Laboratory

Between 2012 and 2019 SRK, Minera Corona and DCR Ingenieros collected rock samples for laboratory strength testing. SRK defined the laboratory specifications according to international testing standards and prepared several memorandums specifying testing requirements. The intact rock tests were conducted for intrusive and limestone domains, and the Soil mechanics test were conducted for the mineralized material due to its granular behavior.

The intact rock tests were for physical properties, point load test, uniaxial compression strength, triaxial compression strength, Brazilian indirect tensile, direct shear, and elastic modulus. Soil tests measured physical properties, uniaxial compression strength and triaxial compression strength.

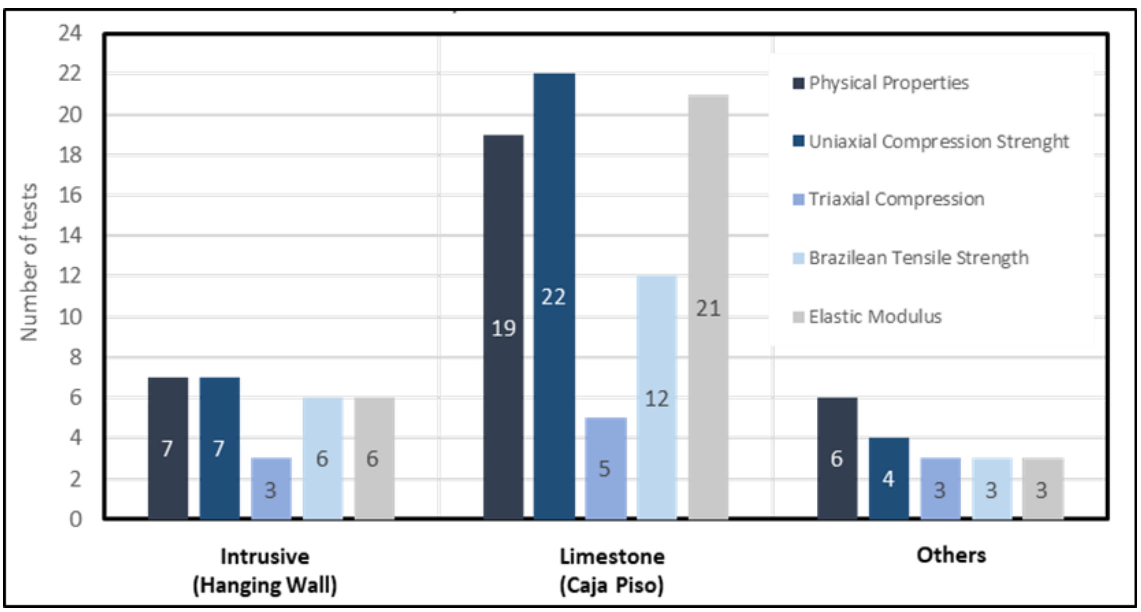
The laboratory testing timeline is shown in Figure 16-16 and the specific number of tests by domain is shown in Figure 16-17 and Figure 16-18. The spatial locations of samples collected for laboratory tests are shown in Figure 16-19.

	Test	2012	2013	2015	2019	Total
Intact Rock	PF	4	2	21	9	36
	PLT	5	-	20	9	34
	UCS	-	2	25	6	33
	TX	3	2	5	3	13*
	TI	-	-	12	9	21
	CD	5	-	5	3	13
	PE	-	2	25	3	30
Soil	PF	-	-	64	-	64
	UCS	-	-	20	-	20
	TX	-	-	20	-	20

Quantity (#) — Timeline

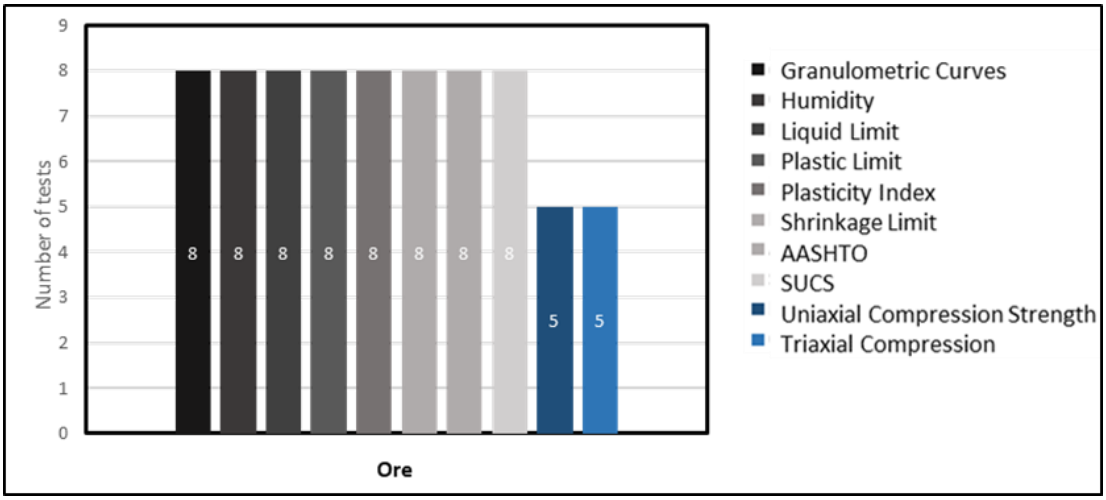
Source: Sierra, Redco, 2021

Figure 16-16: Timeline for Laboratory Test



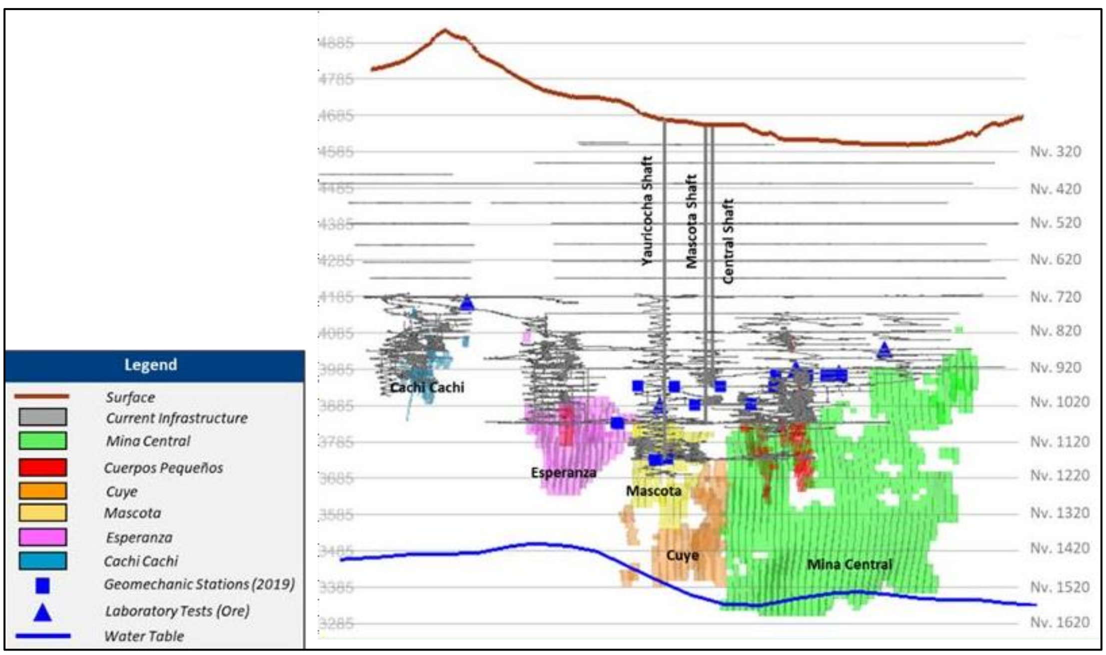
Source: Sierra, Redco, 2021

Figure 16-17: Rock Mechanics Laboratory Tests (Intrusive and Limestone) Between 2012 to 2019



Source: Sierra, Redco, 2021

Figure 16-18: Soil Mechanics Laboratory Tests (Mineralized Material) Between 2012 to 2019



Source: Sierra, Redco, 2021

Figure 16-19: Laboratory Tests Spatially Georeferenced (Northeast View)

Table 16-9, Table 16-10, and Table 16-11 show the Uniaxial Compressive Strength (UCS), Elastic Modulus (E), and Poisson Ratio (PR) by rock domain.

Table 16-9: Summary of Uniaxial Compressive Strength (UCS) by Domain

Uniaxial Compressive Strength (UCS)					
Domain	**Minimum**	**Maximum**	**Mean**	**Std. Dev.**	**Var. Coef.**
Limestone	22	74	52	12	22%
Intrusive	107	193	155	34	22%

Source: Sierra, Redco, 2021

Table 16-10: Summary of Elastic Modulus (E) by Domain

Elastic Module (E)					
Domain	**Minimum**	**Maximum**	**Mean**	**Std. Dev.**	**Var. Coef.**
Limestone	6	21	15	4	25%
Intrusive	20	26	22	2	11%

Source: Sierra, Redco, 2021

Table 16-11: Summary of Poisson Ratio (PR) by Domain

Poisson Ratio (PR)					
Domain	**Minimum**	**Maximum**	**Mean**	**Std. Dev.**	**Var. Coef.**
Limestone	0.2	0.3	0.3	0	9%
Intrusive	0.2	0.2	0.2	0	5%

Source: Sierra, Redco, 2021

16.6.2 Rock Mass Characterization

Rock Mass Strength

For the definition of the resistance parameters that characterize the rock mass, the Generalized Hoek and Brown (2002) failure criterion has been used; for the scaling of properties (resistance envelope of the rock mass), the uniaxial compressive resistance parameters (UCS) of the intact rock, the intact rock parameter “mi” (which is estimated from the triaxial compression laboratory tests), the GSI of the rock mass and the disturbance factor “D” (as a measure of grade of disturbance product of the blasting) have been used.

The UCS defined for each geomechanical domain of the Yauricocha Mine has been obtained as a result of UGC laboratory tests to estimate the UCS of the intact rock. The representative samples considered for each domain were contrasted with the predominant lithologies and the spatial location of the samples within each established geomechanical domain.

The parameter "mi" is related to the slope of the resistance curve of the intact rock; this curve is generated by graphing the confinement and the breaking load of the intact rock cores as results of the triaxial compression tests.

The GSI value describes the quality of the rock mass and this is obtained using the results of the three-dimensional model of rock mass qualities RMR described in the previous section for each domain. Since the mapping log results indicate wet conditions, the correction formula (Hoek and Brown 1997) described below is used to estimate the GSI based on the RMR.

$$GSI = RMR'_{89} - 5$$

This correction is made due to the fact that the RMR calculated for the boreholes uses the criterion of Bieniaswki 89 (whose assessment of the presence of water for dry conditions is 15) and the GSI must be estimated from the RMR Bieniaswki 76 (whose weighting of water for dry conditions has a maximum score of 10).

The disturbance factor “D” is related to the degree of disturbance on the excavations caused by the blasting. This factor is measured by field observations; it should be noted that since it is a simplified model and considering that the rocky environment on which it is will carry out the excavations has not been disturbed, therefore, a “D” value equal to zero (0) is considered.

The equations that describe the Generalized Hoek and Brown 2002 failure criterion are detailed below.

$$\sigma'_1 = \sigma'_3 + \sigma_{ci} \left(m_b \frac{\sigma_3}{\sigma_{ci}} + s \right)^a$$

Where:

σ'_1 and σ'_3 are the major and minor effective principal stresses.

"σ_{ci}" is the uniaxial compressive strength of the intact rock.

"m_b" is the reduced value of the rock constant m_i and is given by:

$$m_b = m_i \times e^{\left(\frac{GSI-100}{28-14D}\right)}$$

"s" and "a" are constants for the rock mass given by the following relationships:

$$s = e^{\left(\frac{GSI-100}{9-3D}\right)}$$

$$a = \frac{1}{2} + \frac{1}{6}\left(e^{-\frac{GSI}{15}} - e^{-\frac{20}{3}}\right)$$

To estimate the modulus of elasticity (E), the equations proposed by Hoek and Diederichs are used, in which the factor "MR" (Modulus Ratio proposed by Deere) is used to estimate the E of the intact rock to subsequently scale to rocky massif according to the following equations:

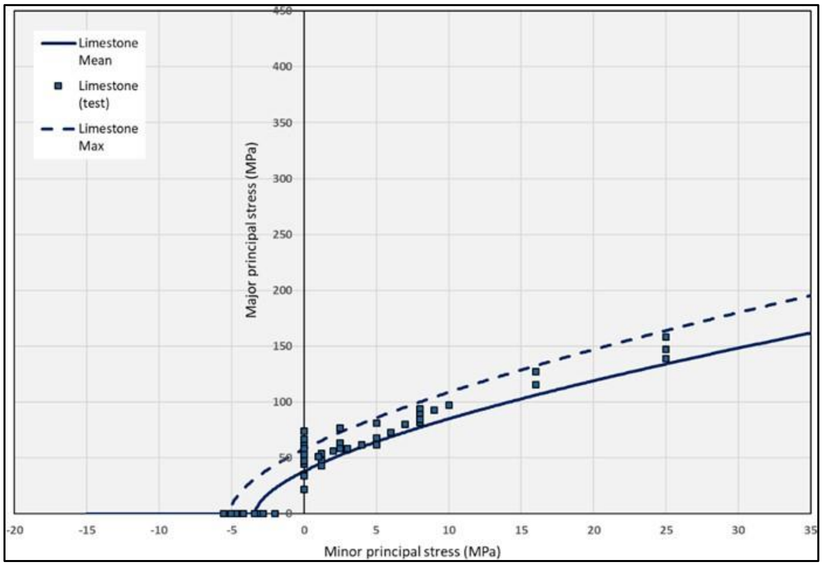
$$E_i = M \times R \times \sigma_i$$

$$E_{rm} = E_i \left(0.02 + \frac{1 - D/2}{1 + e^{-\frac{60+15D-GSI}{11}}} \right)$$

The “MR” parameter is calculated using the empirical table proposed by Deere, defining value ranges according to the type of rock.

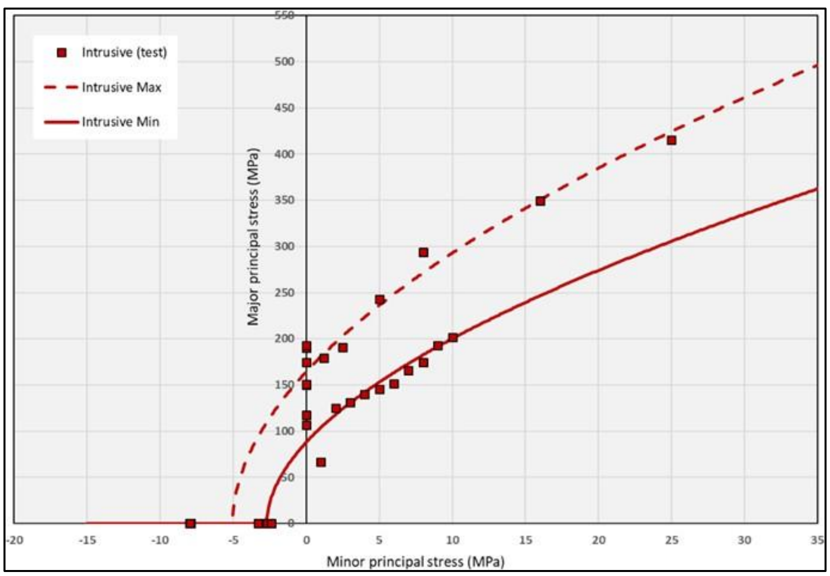
The Poisson's Ratio (PR) is part of the elastic constants that measures the relationship between lateral strain and axial strain and considers a value between 0.2 and 0.3.

Figure 16-20 and Figure 16-21 show the envelopes of limestone and intrusive as a result of laboratory tests.



Source: Sierra, Redco, 2021

Figure 16-20: Intact Rock Strength Envelope Hoek – Brown (Limestone)



Source: Sierra, Redco, 2021

Figure 16-21: Intact Rock Strength Envelope Hoek – Brown (Intrusive)

Based on the failure envelopes for each lithology, the following parameters are defined at the intact rock level per domain (Table 16-12)

Table 16-12: Intact Rock Strength Parameters

Domain	UCS (MPa)	mi
Limestone	42	13
Intrusive	128	30

Source: Sierra Metals, Redco, 2020

The following describes the characterization parameters of the rock mass under study according to the defined domains. This information is supported by information from laboratory tests and observations of rock mass qualities identified in the underground mapping work.

For the limestone and intrusive rock domains, the Hoek and Brown criterion is used. Table 16-13 shows the rock strength parameters.

Table 16-13: Rock Mass Strength Parameters

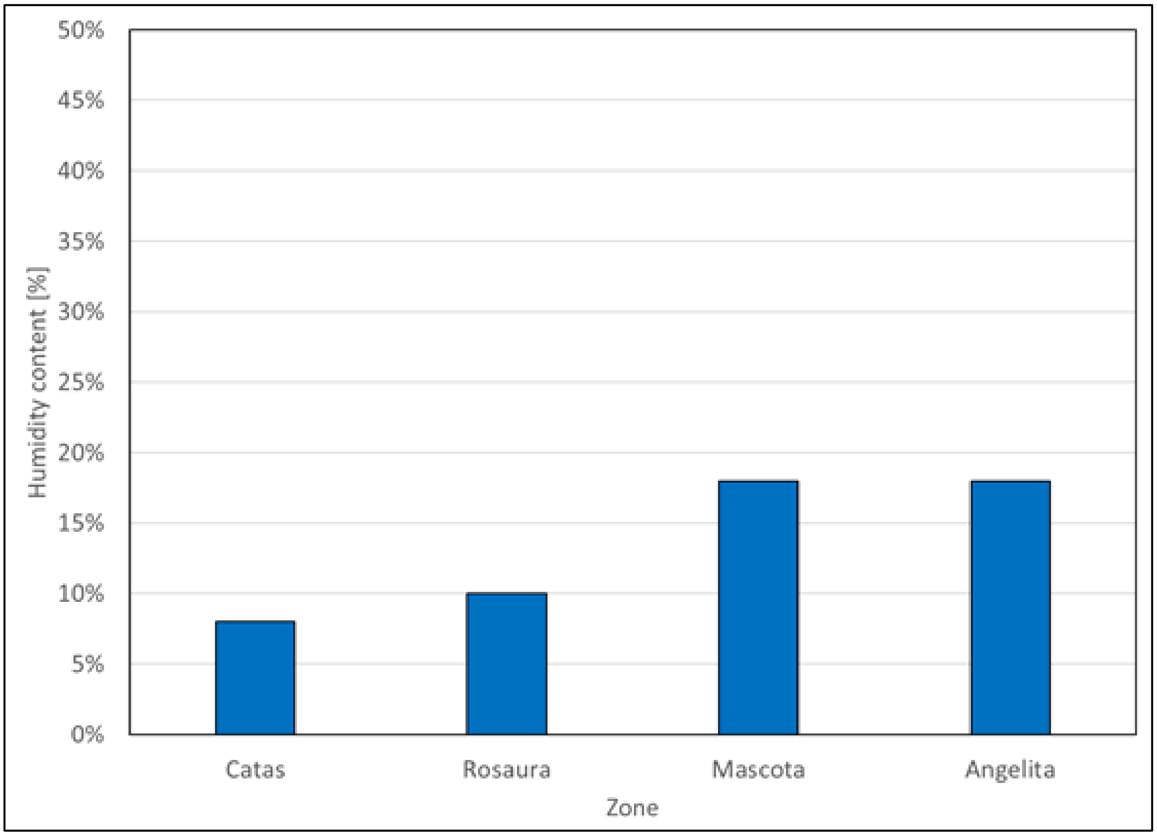
Parameters	Limestone (Footwall)	Intrusive (Hanging Wall)
Unit Weight (MN/m^3)	2.7	2.6
UCS (MPa)	42	128
RMR_B(89)	54	53
GSI	49	48
D	0	0
mi	13	30
mb	2.5	5.6
s	0.006	0.005
a	0.50	0.51
Ei (Gpa)	16	22
Erm (Gpa)	5	6
v	0.3	0.2

Source: Sierra, Redco, 2021

Mineralized Material Strength

Given that the mineralized material has soil-like behavior, parameters were calculated with laboratory soil tests of triaxial compression strength, uniaxial compressive strength, humidity content, the results of which are shown in the figures below.

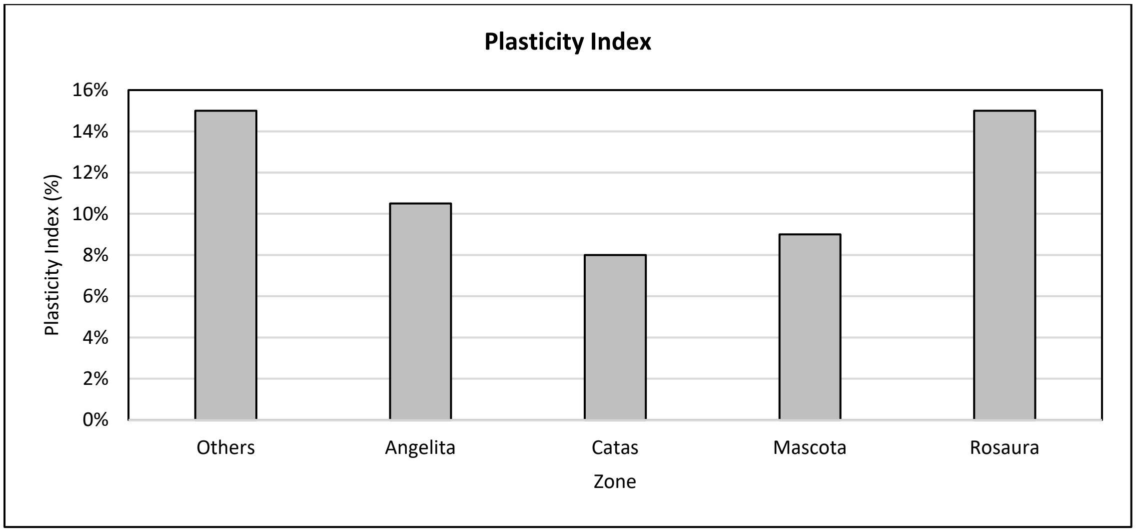
Based on the moisture content tests, it is determined that the mineralized areas of Mina Central have an average moisture content of 10% while the Cachi-Cachi and Mascota areas have an average natural moisture content of 18% (Figure 16-22).



Source: Sierra, Redco, 2021

Figure 16-22: Humidity Content Test

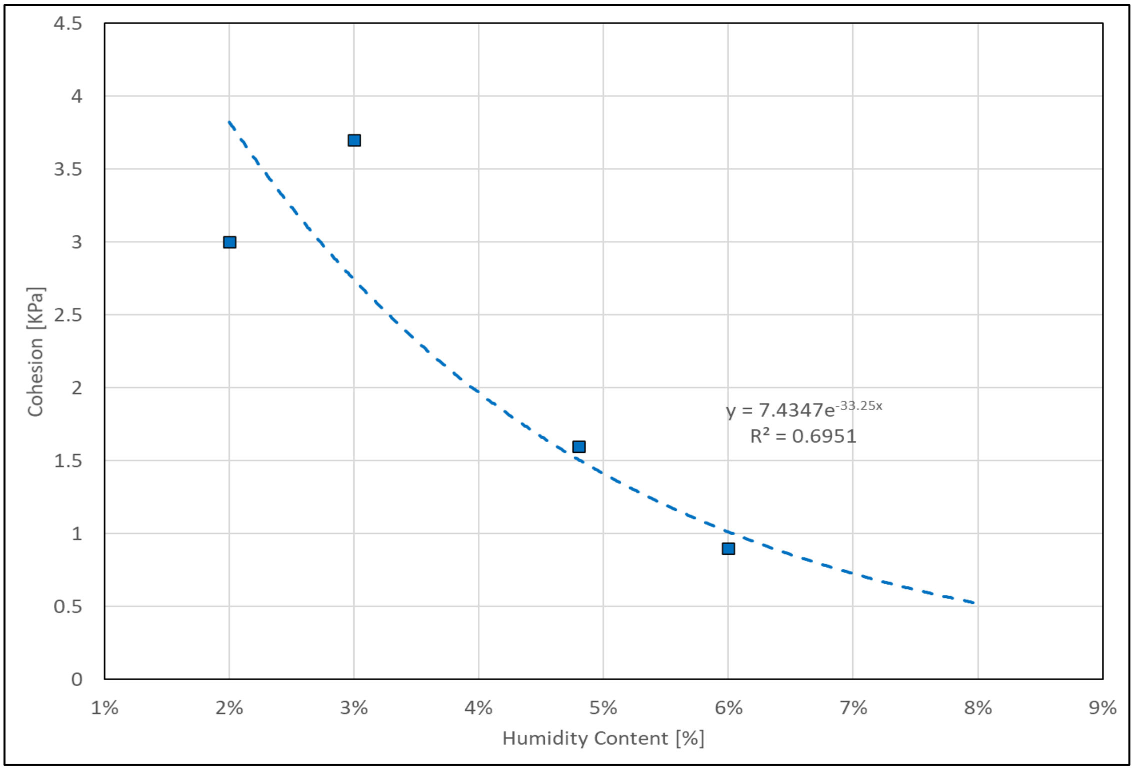
As a result of soil physic properties tests, the liquid limit (LL), plastic limit (PL) and the plasticity index (PI) was calculated and shown in the Figure 16-23. The mean plasticity index is 11.



Source: Sierra Metals, Redco, 2020

Figure 16-23: Plasticity Index per Zone

A regression was performed based on the results of the triaxial compression tests, which allows the cohesion (from the Mohr-Coulomb criterion) to be defined based on the moisture content of the material (Figure 16-24).



Source: Sierra Metals, Redco, 2020

Figure 16-24: Cohesion vs Humidity (Mineralized Material)

For the internal frictional angle, Table 16-14 shows the values for different moisture contents.

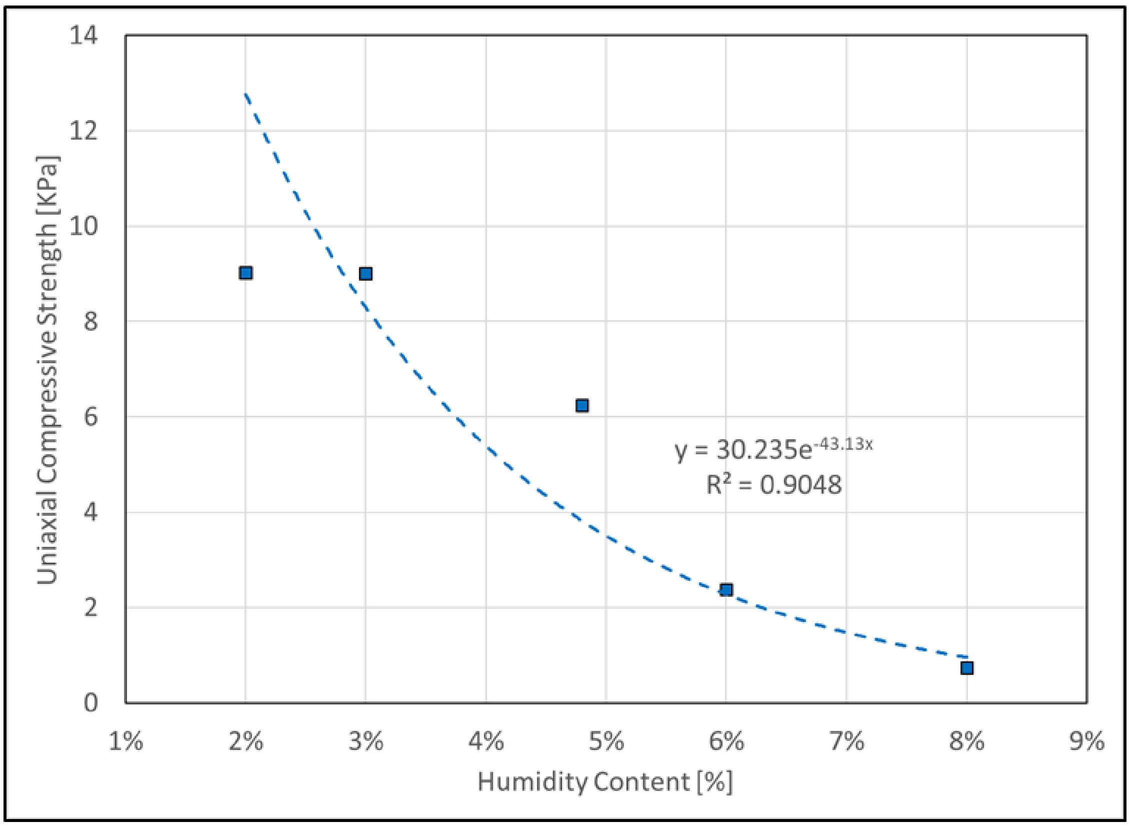
Table 16-14: Historical results of internal friction angle for different humidity contents

Humidity Content (%)	Frictional Angle (°)
2%	41
3%	37
5%	44
6%	39

Source: Sierra, Redco, 2021

According to the study "Effect of different moisture content and triaxial test methods on shear strength characteristics of loess" (Yong Wang, Wanli Xie, and Guohong Gao, 2019), the internal friction angle did not decrease significantly with the change of water content, which is inconsistent with the result of the internal friction angle presented for a moisture content of 8% whose internal friction angle is equal to 2.4° (CISMID Geotechnical Laboratory, August 2015).

In addition, unconfined uniaxial compressive tests were carried out for the mineralized material samples, according to the regression it is estimated that the UCS is 0.4 KPa for a moisture content of 10% which is a representative value for the Mina Central area (Figure 16-25).



Source: Sierra Metals, Redco, 2020

Figure 16-25: Uniaxial Compressive Strength vs Humidity (Mineralized Material)

Cohesion values was estimated with the regression of Cohesion vs Moisture Chart (Figure 16-23) and results are shown in Table 16-15.

Table 16-15: Rock Mass Strength Parameters

	Mineralized Material	
Parameters	**Mina Central (10% moisture content)**	**Mascota and Cachi Cachi (18% moisture content)**
Cohesion (KPa)	0.24	0.02

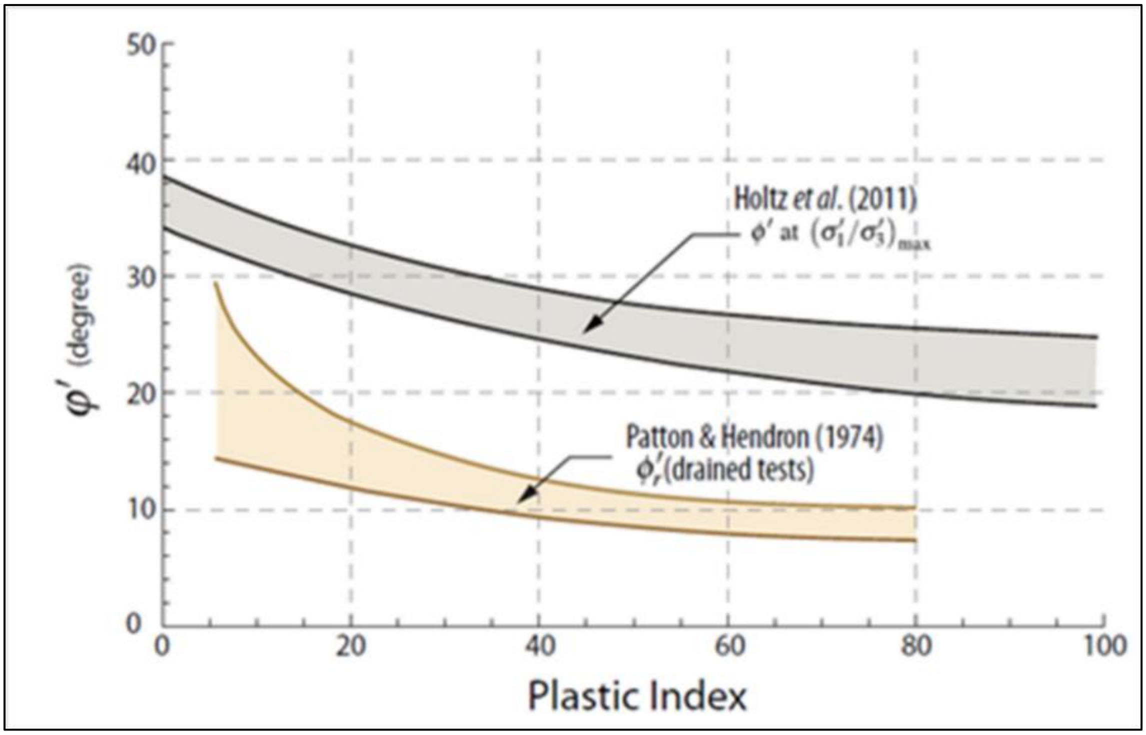
Source: Sierra, Redco, 2021

Table 16-16: Rock Mass Strength Parameters

	Mineralized Material	
Parameters	**Mina Central (10% moisture content)**	**Mascota and Cachi Cachi (18% moisture content)**
Cohesion (KPa)	0.24	0.02
Friction angle (°)	2.80	0.10

Source: Sierra, Redco, 2021

Friction angle was estimated using the Attemberg limits for Angelita, Catas, Mascota, Rosaura and other zones of Yauricocha mine according to their Plasticity Index. In Table 16-17, a range and a mean internal friction angle was estimated according to the Patton & Hendron (1974), Holtz et al. (2011) chart (Figure 16-26).



Source: Patton & Hendron (1974), Holtz et al. (2011)

Figure 16-26: Friction angle vs Plastic Index Chart

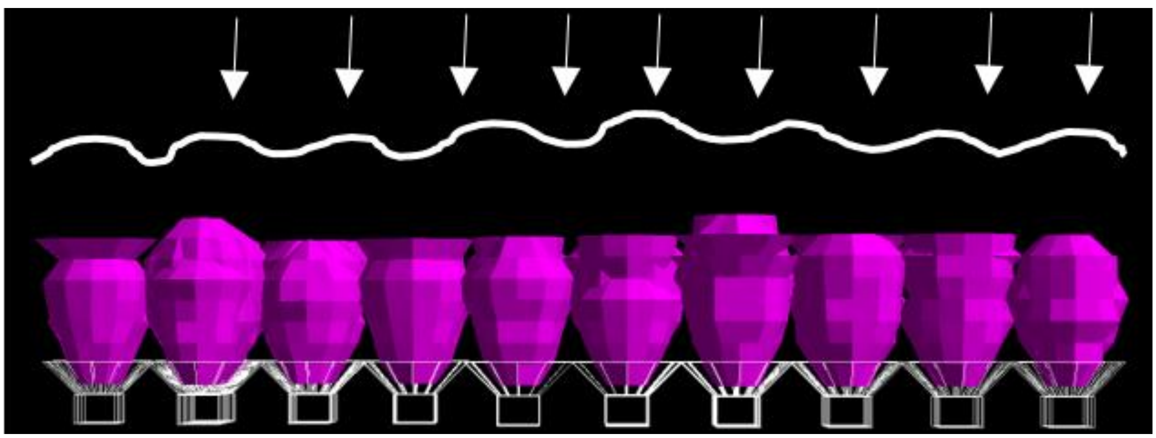
Table 16-17: Results of Internal Friction Angles for Yauricocha mine zones

Zone	Plasticity Index (%)	Range of Internal Friction Angle (°)	Average Internal Friction Angle (°)
Angelita	11%	13-35	24
Catas	8%	14-36	25
Mascota	9%	14-36	25
Rosaura	15%	12-34	23
Others	15%	12-34	23

Source: Sierra, Redco, 2021

Gravity Flow Model

A gravity flow model was carried out, using as input the geomechanical parameters of the mineralized material (soil), hanging wall and foot wall (rock mass). The model was calibrated according to operative data and allows the estimation of dilution and mining recovery for validate the current values of Yauricocha Mine. Figure 16-27 shows the result of the modelling of a sublevel with the ellipsoids of draw (magenta), and the representation of the dilution entry (white lines).



Source: Sierra, Redco, 2021
Figure 16-27: Gravity Flow Model of Yauricocha mine

As a result of this gravity flow model, a range between 10-25% of dilution was and a range between 70-90% of mining recovery were estimated. The detailed values of mining recovery and dilution per zone are shown in Chapter 16.7.1. The gravity flow model presented was constructed at the level of a PEA.

Ground Control

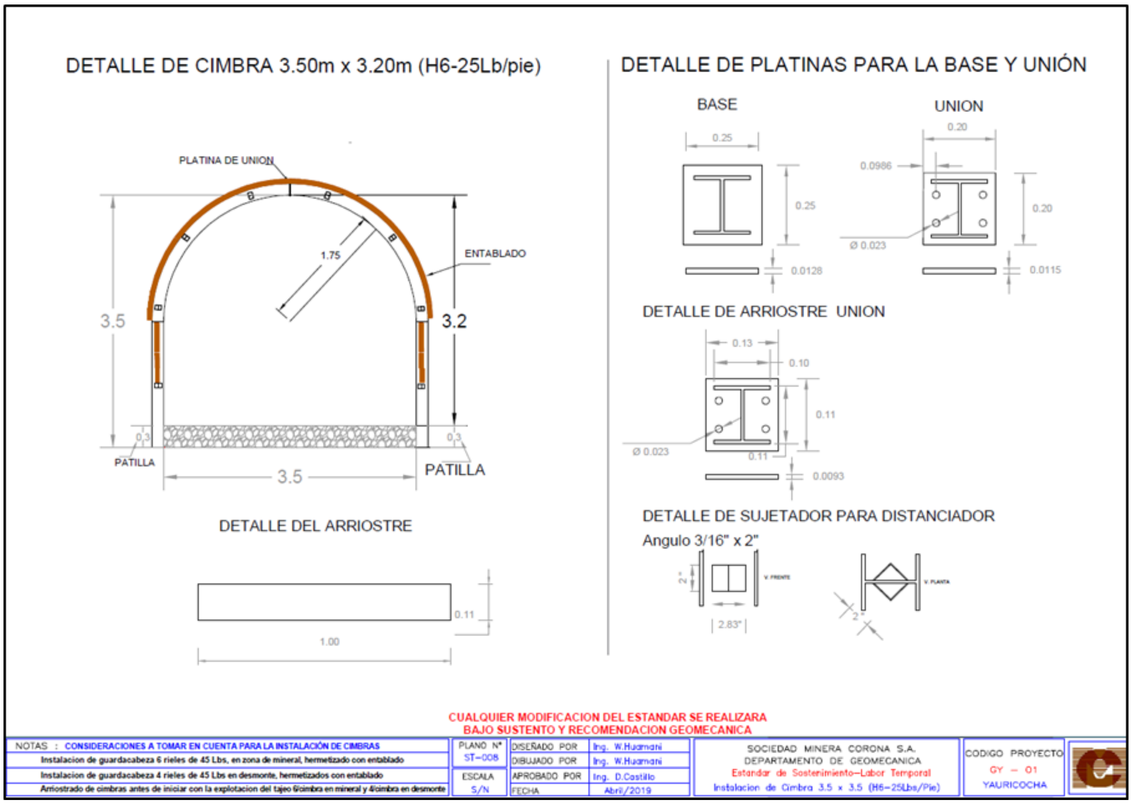
Corresponding to the categories of rock mass quality, the ground control management plans have a table of the ground support types (Figure 16-28). The ground support requirements are defined by development type, design life; temporary (<3 years) or permanent (>3 years), and mining method. Ground support for access development ranges from spot bolting using split sets in very good ground to steel sets, blocking and lagging for very poor ground.

TIPO DE SOSTENIMIENTO			
AVANCES (PREPARACIONES Y EXPLORACION Y DESARROLLO)		**EXPLOTACION** (TAJEO)	
TEMPORALES <= 3 años	**PERMANENTES** >3 años	**CORTE Y RELLENO ASCENDENTE(CRA)**	**SUBLEVEL CAVING MECANIZADO(SLCM), SUBLEVEL CAVING CONVENCIONAL(SLCC)**
Split Set y/o Swellex ocasional o puntual	Perno Helicoidal ocasional o puntual	—	—
Split Set y/o Swellex ocasional o puntual	Perno Helicoidal ocasional o puntual	—	—
Split set y/o Swellex sistem. 1.2 x 1.2m. ó malla ocasional	Perno Helicoidal sistematico espaciado segun eval. geomec.	SS y/o SW sistemático espaciado según evaluación Geomecánica	**Desmonte(Preparaciones):** Malla+SS y/o SW o cimbra H4 e=1.2m. **Zona Mineralizada:** Cimbra H6 e=1.0m
Split set y/o Swellex sistem.con malla 1.0 x 1.0m ó 1.20 x 1.20	Perno Helicoidal y malla electro soldada esp. 1.00 ó 1.20m	**Preparaciones(accesos) en desmonte:** SS y/o SW sist. **Tajeo:** SS y/o SW + malla	
SH e=5-10 cm y SS o SW esp. 1.0-1.2m ó cuadro e=1.2-1.50	Shotcrete e=5-10cm y PH sistem. y/o CB H4 e=1.2-1.5m	SS y/o SW + malla o shotcrete e=5-10cm) o cuadros e=1.2-1.5m	**Desmonte(Preparaciones):** Cimbra H4 e=1.2m. **Zona Mineralizada:** Cimbra H6 e=1.0m
CB H6 ó Cuadros e=1.2-1.5 ó SH e=10 cm+SS ó SW e=1.0-1.20	Cimbras H4 e=1.0-1.2m	CB H6 y/o Cuadros e=1.2-1.5m ó SH e=10 cm y SS o SW esp. 1.0-1.2m	
CB H6 y/o Cuadros e=0.5-1.0m	Cimbras H6 e=0.5-1.0m	CB H6 y/o Cuadros e=0.5-1.0m	**Mineral y desmonte:** Cimbra H6 e=0.50 a 1.0m

Source: Sierra, 2021

Figure 16-28: Ground Support Types

Ground support design profiles for different ground categories and development types have been developed to accompany the ground control management plans. An example profile showing the mining cross-cut ground support is shown in Figure 16-29. Ground support installation and mining procedures also support these documents.



Source: Sierra, 2021

Figure 16-29: Example of Ground Support Design Profile

Hydrogeological Conditions

Hydrogeological and hydrological information is available from multiple sources, including mine records and many investigations or data compilations by external consultants. Mine operations have compiled significant information on flow rates and field water quality parameters (e.g., color, pH, conductivity, temperature) across much of the mine and developed maps summarizing locations and data. Numerous hydrogeological and hydrological studies have also been completed by external consultants (Geologic, 2014, 2015; Hydro-Geo Consultores, 2010, 2012, 2016;

Geoservice Ingenieria 2008, 2014, 2016; Helium, 2018). Data have been collected from underground observations, pump tests, tracer tests, and surface water features.

Hydrogeological Conceptual Model:

- Annual average precipitation of 1010 mm (measured at Yauricocha station);
- Runoff of 268 mm (27% of the total precipitation);
- Depth of infiltration of 265 mm (26% of the total precipitation); and
- Actual depth of the evapotranspiration of 477 mm (47% of the total precipitation).

Current Mine Inflow

Cumulative inflow into the mine was on the order of 100 L/s in 2017 (Helium, 2018). Inflow measurements have been collected at many locations (drainage drill holes and discrete inflows) and at different times, but data is somewhat inconsistent. Water enters the mine in widely distributed areas and drainage drill holes located on various levels.

Water comes from two sources:

1. Infiltration of water coming from fluvial precipitation through the subsidence zone that covers the mine; and
2. Discharge of underground waters from the east to the west (from the intrusive toward the cone of subsidence).

Infiltration related to subsidence includes flows into both the subsidence depressions themselves as well as tensional features associated with them. A diversion channel redirects a portion of runoff away from subsidence depressions but water that is not diverted can be expected to flow towards drawpoints through the subsidence zone. Lateral groundwater inflow into the subsidence zone also contributes.

Surface infiltration into the subsidence zone was estimated to be 11 L/s before 2015 and could increase to between 30 and 46 L/s by 2029 (Geologic, 2015).

Potential Future Mine Inflow

As mining advances, mine inflows can be expected to increase, at least in part due to increase in size of the subsidence cone.

- Surface inflows could increase by between 20 and 35 L/s by 2029 (Geologic, 2015; Geoservice, 2017)
- Groundwater inflows were estimated to increase by up to 330 L/s when the mining reaches 3600 m elevation (Geologic, 2015)

Mitigation measures should continue to be considered to reduce inflow or at least control the way water enters and is controlled throughout the mine.

Future Mine Water Management Considerations

Current observations and analyses suggest that inflow to both the subsidence (caving) zone and the mine will increase as the mine expands. Mitigation and management efforts should continue to understand the distribution of water and value in efforts to control or reduce inflow. Uncontrolled water inflow can lead to a risk of mud rush events.

Past efforts have been made to control or reduce inflows. A large amount of data is available that could be used to understand the source of water, but it is currently not compiled in a manner to allow this to be easily done.

In the past, drainage tunnels and exploratory test drill holes have been completed in efforts to control or reduce inflow to mining areas. Drain holes were completed in the 920 and 870 levels in Antacaca Sur, 920 level in Antacaca, 920 and 970 levels in Catas and 870 and 920 levels in Rosaura. All of these water management features were oriented into the granodiorite to intercept flow before reaching the subsidence zone. Some of drillholes were later cemented to reduce inflows into mining zones.

During drilling, inflows were observed to decrease on the 820 and 870 levels, and post drilling decreasing inflows were observed on the 920 level. Inflows in Antacaca Sur and Rosaura have been reduced over time, but inflows appear to be increasing in Catas and Esperanza.

In conclusion, the mine has in the past, or currently, been able to manage water sufficiently to allow mining to proceed. As the mine expands, water inflows should be expected to increase. Mitigation efforts should continue to be assessed and tested, but operational management plans should continue to assume that inflows and mud rush potential will increase until such a time that the effectiveness of mitigation efforts can be proven, or decisions are made to address water-related risks through other management plans.

16.7 Stope Optimization

Stope optimization was done using the Mineable Stope Optimizer (MSO) algorithms provided within the suite of Datamine™ Studio UG software. MSO requires the input of several key parameters include cut-off grade or value and interrogates the resource block model against permutations of simplified mining shapes to outline a potentially economic Mineral Resource (insitu) at a given cut-off value.

16.7.1 Dilution and Mining Recovery

Measured, Indicated and Inferred Mineral Resources were converted to potentially mineable resources by applying the appropriate modifying factors, as described below, to the final MSO shapes created during the mine design process. The mining recovery and external dilution factors used in this report are based on historical Yauricocha data and are the factors used in the planning processes currently implemented at the site.

The in-situ tonnage and grade of each potential mining block is based on the resource block models. All mineral resource estimates are expressed as "dry" tonnes (i.e., no moisture) and are based on the density values stored in the block model.

The dilution factor represents external dilution and varies between 10% to 25% based on mining method, geomechanical characteristics of the mineralized zone, and the amount of water present. These factors account for material mined from outside of the MSO shapes including overdraw of cave material and is in addition to any internal dilution.

Internal dilution is included within the MSO shapes generated and is therefore included in the in-situ tonnes and grades. External dilution is assigned a zero grade for mine planning purposes.

The mining recovery factors represents how much of the diluted stope material will reach the mill and ranges between 70% to 90% based on historical data and accounting for the mining method, geomechanical characteristics of the mineralized zone, and the amount of water present as this affects the mining recovery.

The generalized formula for calculating the potentially mineable tonnage in each mining block is:

- Potentially Mineable Tonnes = MSO insitu tonnes x Mining Recovery % X (1 + Dilution %)

The generalized formula for calculating the potentially mineable grade is:

- Potentially Mineable Grade = MSO insitu grade / (1 + Dilution %)

Note that this generalized formula is only correct if the dilution grade is zero.

Table 16-18 lists the mining recovery and external dilution factors applied to each mineralized zone based on the mining method.

Table 16-18: Mining Recovery and Dilution Factors

Area	Zone	Mining Method	Mining Method Description	Mineralization	Mining Recovery (%)	External Dilution (%)
Mina Central	Catas	SLCM2	SLC – Some Water Present	Sulfide	80	20
	Antacaca	SLCM2	SLC – Some Water Present	Sulfide	80	20
	Rosaura	SLCM3	SLC – Water present	Sulfide	70	25
	Antacaca Sur	SLCM3	SLC – Water present	Sulfide	70	25
Esperanza	Esperanza	SLCM1	SLC – No Water Present	Sulfide	90	20
	Norte	SLCM2	SLC – Some Water Present	Sulfide	80	20
	Distal	SLCM1	SLC – No Water Present	Sulfide	90	20
Mascota	Oxide Ag-Pb	SLCM1	SLC – No Water Present	Oxide	90	20
	Polymetallic (All)	CRAM	MCF	Sulfide	90	10
Cuye	All	SLCM1	SLC – No Water Present	Sulfide	90	20
Cachi-Cachi	Angelita	SLCM2	SLC – Some WaterPresent	Sulfide	80	20
	Karlita	CRAM	MCF	Sulfide	90	10
	Elissa	CRAM	MCF	Sulfide	90	10
	Celia	SLCM2	SLC – Some WaterPresent	Sulfide	80	20
	Escondida	CRAM	MCF	Sulfide	90	10
	Privatizadora	CRAM	MCF	Sulfide	90	10
	Vanessa	CRAM	MCF	Sulfide	90	10
	Yoselim	CRAM	MCF	Sulfide	90	10
	Carmencita	CRAM	MCF	Sulfide	90	10
Cuerpos Pequenos	Gallito	CRAM	MCF	Sulfide	90	10
	Oriental	CRAM	MCF	Sulfide	90	10
	Occidental	CRAM	MCF	Sulfide	90	10
	Contacto Sur Medio (TJ6060)	CRAM	MCF	Sulfide	90	10
	Contacto Sur Medio I (TJ 8167)	CRAM	MCF	Sulfide	90	10
	Contacto Sur Medio II (TJ 1590)	CRAM	MCF	Sulfide	90	10

Source: Sierra, 2021

16.7.2 Net Smelter Return Estimation

There are several different strategies available to determine if a particular block in a block model is economic or not, these include:

- Cut-off grade – typically applied to mines producing a single metal or where secondary metals are not material, i.e., gold mines

- Cut-off grade expressed as a metal equivalent – older method of dealing with mines producing more than one metal of significant value, does not reflect the metallurgical differences in each metal
- Net Smelter Return (NSR) – current accepted method of dealing with complex polymetallic operations such as Yauricocha which has five metals which contribute to the revenue stream by produces three concentrates from sulfide mineralized material. The site has also historically produced two concentrates from oxide mineralized material.

NSR calculations are a method of estimating the revenue to be received from the smelter by taking into account:

- Metal price assumptions.
- Metallurgical recoveries to different concentrates, concentrate grades and transportation losses.
- Smelter terms including treatment costs, refining costs, payable metal content, penalties and price participation.
- Other commercial agreement such as freight, insurance and representation.

The results are expressed as USD per percent per tonne milled ($/%/tonne milled) for base metals and USD per gram per tonne milled for precious metals ($/g/tonne milled). These are the unit values (UV) or point values of each metal. These unit values are coded into the block model to determine the value of each block in the block model. The MSO algorithm will compare the Cut-off Value (see section 16.7.3) against the NSR value for each block when developing the insitu MSO shapes.

The general formula for calculating the NSR for sulfide mineralized material at Yauricocha is as follows:

$$\mathrm{NSR}\left(\frac{\$}{\mathrm{t}}\right) = \mathrm{Grade\ Cu} \times \mathrm{UV_{Cu}} + \mathrm{Grade\ Pb} \times \mathrm{UV_{Pb}} + \mathrm{Grade\ Zn} \times \mathrm{UV_{Zn}} + \mathrm{Grade\ Ag} \times \mathrm{UV_{Ag}} + \mathrm{Grade\ Au} \times \mathrm{UV_{Au}}$$

Where UVs have the following nomenclature:

UVCu: Copper Unit Value ($/t/%)

UVPb: Lead Unit Value ($/t/%)

UVZn: Zinc Unit Value ($/t/%)

UVAg: Silver Unit Value ($/t/g)

UVAu: Unit Gold Value ($/t/g)

The same formula applied to the Oxide mineralized material, but the UV for each metal will be different with the lead and zinc not being payable for the Oxide concentrates.

Below are the variables used to calculation the NSR unit values used for this PEA.

Metal Prices and Exchange Rate

The metal price assumptions are shown in Table 16-19 and are based on long-term consensus pricing. The metal price assumptions have been derived from CIBC Global Mining Group Consensus Commodity prices dated November 2, 2021, provided by Sierra Metals.

Table 16-19: Unit Value Metal Prices

Ag	Au	Cu	Pb	Zn
(US$/oz)	(US$/oz)	(US$/lb)	(US$/lb)	(US$/lb)
21.02	1,598	3.39	0.91	1.10

Source: Sierra, 2021

Metallurgical Recoveries and Concentrate Grades

Metallurgical recoveries and concentrate grades for mineralized materials are summarized in Table 16-20 and Table 16-21.

Table 16-20: Metallurgical Recoveries

Metal	Unit	Copper Concentrate	Lead Concentrate	Zinc Concentrate	Total Recovery
Copper	%	75.0	5.0	-	80.0
Lead	%	-	88.5	-	88.5
Zinc	%	-	-	88.0	88.0
Silver	%	25.4	43.0	9.3	77.7
Gold	%	10.5	9.0	-	19.5

Source: Sierra, Redco, 2021

Table 16-21: Concentrate Grades – Polymetallic Mineralized Material

Metal	Unit	Copper Concentrate	Lead Concentrate	Zinc Concentrate
Copper	%	37.5	-	-
Lead	%	-	20.1	-
Zinc	%	-	-	28.6
Silver	oz/t	13.23	25.45	1.92
Gold	oz/t	0.07	0.07	-

Source: Sierra, Redco, 2021

Note that the concentrate grade assumptions used in the NSR calculations for polymetallic mineralized materials are not the same as used in the economic evaluations later in the process. The NSR assumptions are generally more conservative except for the copper concentrate grade in the copper concentrate.

Metallurgical recoveries and concentrate grades for oxide mineralized material are summarized in Table 16-22 and Table 16-23.

Table 16-22: Metallurgical Recoveries Oxide Mineralized Material (Payable Metals)

Metal	Unit	Copper Concentrate	Lead Concentrate	Zinc Concentrate	Total Recovery
Copper	%	75.0	5.0	-	80.0
Lead	%	-	88.5	-	88.5
Zinc	%	-	-	88.0	88.0
Silver	%	25.4	43.0	9.3	77.7
Gold	%	10.5	9.0	-	19.5

Source: Sierra, Redco, 2021

Table 16-23: Concentrate Grades Oxide Mineralized Material (Payable Metals)

Metal	Unit	Copper Concentrate	Lead Concentrate	Zinc Concentrate
Copper	%	37.5	-	-
Lead	%	-	20.1	-
Zinc	%	-	-	28.6
Silver	oz/t	13.23	25.45	1.92
Gold	oz/t	0.07	0.07	-

Source: Sierra, Redco, 2021

Smelter Terms and Other Contracts

Contract terms were based on the typical terms from existing contracts over the last 5 years as provided by Sierra Metals, including:

- Treatment Charges and Refining Charges (TC/RC)
- Payable metals
- Penalties for deleterious elements
- Price participation clauses
- Freight charges and transportation losses
- Insurance and representation

Treatment Charges and Refining Charges are summarized in Table 16-24

Table 16-24: Treatment and Refinement Charges

TC/RC	Unit	Polymetallic Concentrates			Oxide Concentrates	
		Copper Concentrate	Lead Concentrate	Zinc Concentrate	Sulfide Concentrate	Oxide Concentrate
Treatment Cost	$/dmt	210.00	141.00	205.00	115.31	225.00
Cu Refining	$/t	462.97	-	-	-	-
Ag Refining	$/oz	0.35	1.05	0.50	1.72	1.57
Au Refining	$/oz	6.00	15.00	-	15.00	15.00

Source: Sierra, Redco, 2021

The payable metal within a concentrate is typically expressed as:

$$\text{Payable Metal (\%)} = \text{Minimum}\left(\text{Payable(\%)}; \frac{\text{concentrate grade} - \text{deduction}}{\text{concentrate grade}}\right)$$

The exception is gold in the copper concentrate where the historic smelter terms specify that payable metal is 90% if concentrate grade is greater than 1 gpt Au/dmt.

Base metal payable assumptions and minimum deductions are summarized in Table 16-25 and Table 16-26.

Table 16-25: Base Payable Metal Assumptions

Metal	Unit	Polymetallic Concentrates			Oxide Concentrates	
		Copper Concentrate	Lead Concentrate	Zinc Concentrate	Sulfide Concentrate	Oxide Concentrate
Copper	%	96.5	-	-	-	-
Lead	%	-	95	-	95	95
Zinc	%	-	-	85	-	-
Silver	%	90	95	70	95	95
Gold	%	90	95	-	95	95

Source: Sierra, Redco, 2021

Table 16-26: Minimum Deductions Assumptions

Metal	Unit	Polymetallic Concentrates			Oxide Concentrates	
		Copper Concentrate	Lead Concentrate	Zinc Concentrate	Sulfide Concentrate	Oxide Concentrate
Copper	%	1.0	-	-	-	-
Lead	%	-	3.0	-	3.0	3.0
Zinc	%	-	-	8.0	-	-
Silver	g/t	50.0	50.0	93.3	50.0	50.0
Gold	g/t	90% if Au>1gpt	1.0	-	1.0	1.0

Source: Sierra, Redco, 2021

Smelter terms regarding penalties for deleterious elements are summarized on Table 16-27 with only the polymetallic copper concentrate triggering penalties under the current assumptions. Terms for the zinc concentrate and the two oxide concentrates are similar to those shown for the lead concentrate, no penalties are triggered under the current assumptions.

Table 16-27: Penalties for Deleterious Elements in Concentrates

Penalty Element	Polymetallic Concentrates					
	Copper Concentrate			Lead Concentrate		
	Limit	Typical Grade	Penalty Cost	Limit	Typical Grade	Penalty Cost
Arsenic (As)	0.2%	2.90%	USD 3.0 / 0.1%	0.5%	0.30%	USD 2.0 / 0.1%
Bismuth (Bi)	0.1%	0.20%	USD 4.5 / 0.1%	0.3%	0.025%	USD 1.0 / 0.1%
Antimony (Sb)	0.1%	0.10%	USD 4.5 / 0.1%	0.5%	0.10%	USD 2.0 / 0.1%
Lead + Zinc	4.0%	4.76%	USD 3.0 / 1%	-	-	-

Source: Sierra, Redco, 2021

Price participation clauses are included for the Copper and Zinc concentrates only with the Copper concentrate clause being triggered. This clause increases the TC by $0.1 for every $1 increase in copper price above $5,900/t payable copper.

The inputs into the selling costs include freight costs, moisture content, freight losses, insurance and representation costs, these are summarized in Table 16-28.

Table 16-28: Selling Expenses

Parameter	Unit	Polymetallic Concentrates	Oxide Concentrates
Moisture Content	%	8.0	8.0
Transportation Losses Cu Concentrate	%	0.3	-
Transportation Losses Other Concentrates	%	0.2	0.2
Total Selling Expenses	$/dmt	30.4	Included in TC/RC

Source: Sierra, Redco, 2021

Calculation of Unit Values

The overall value of each metal in each concentrate was calculated using the parameters discussed above and expressed in terms of USD per unit per tonne milled as shown in Table 16-29.

Table 16-29: Unit Value by Concentrate

Material	Ag (US$/g/t)	Au (US$/g/t)	Cu (US$/%/t)	Pb (US$/%/t)	Zn (US$/%/t)
Polymetallic Mineralized Material	**0.377**	**4.939**	**39.629**	**7.470**	**8.082**
Cu Concentrate	0.139	2.858	39.629	-	-
Pb Concentrate	0.238	2.082	-	7.470	-
Zn Concentrate	-	-	-	-	8.082
Oxide Mineralized Material	**0.209**	**21.018**	**-**	**9.978**	**-**
Sulfide Concentrate	0.082	12.589	-	1.187	-
Oxide Concentrate	0.127	8.429	-	7.791	-

Source: Sierra, Redco, 2021

The unit value for each metal from the two types of material were then added together to determine the aggregate unit value for each metal by material type. These aggregate unit values are used in the NSR equation coded into the block model for the two material types.

The NSR equation coded into the polymetallic block models was:

$$NSR = 39.629 \times Cu_{Grade} + 7.470 \times Pb_{Grade} + 8.082 \times Zn_{Grade} + 0.377 \times Ag_{Grade} + 4.939 \times Au_{Grade}$$

The NSR equation coded into the oxide block models was:

$$NSR = 9.978 \times Pb_{Grade} + 0.209 \times Ag_{Grade} + 21.018 \times Au_{Grade}$$

These NSR values use used in MSO as the optimization field by comparing to the Cut-off Value (COV) for the selected mining method for each zone.

16.7.3 Cut-off Value (COV) Estimation

The cut-off value calculation used in the PEA LOM plan is based on the mine's 2021 budget provided by Sierra Metals and considers increasing production rates and modernizing the SLC mining practices to incrementally reduce overall production costs. The overall operating costs based on the 2021 budget at a mining rate of 3,780 tpd are shown in Table 16-30. Using 2020 actual costs was considered unreliable due to Covid-19 impacts.

Table 16-30: Operating Costs ($/t)

Cost	Value
Mine Cost ($/t)	36.4
Plant Cost ($/t)	9.2
G&A ($/t)	5.0
2021 Budget ($/t)	**50.6**

Source: Sierra, Redco, 2021

The mining costs were reviewed and broken down into unit operations and the fixed cost/variable cost split for each unit operation estimated with the following considered:

- Mine design and mining method parameters
- Equipment performance ratios
- Material and supplies consumption
- Personnel requirement

This provides a cost model of the operating costs by unit operation and mining method at 3,780 tpd as shown in Table 16-31.

Table 16-31: Cut-Off Values by Mining Method (US$/t)

Mining Method	Mining (US$/t)	Processing (US$/t)	G&A (US$/t)	Total (US$/t)	Economic COV (US$/t)	Marginal COV (US$/t)
SLCM1	33.0	9.2	5.0	47.2	47.2	34.1
SLCM2	34.2	9.2	5.0	48.3	48.3	35.0
SLCM3	35.2	9.2	5.0	49.4	49.4	35.7
CRAM	39.9	9.2	5.0	54.1	54.1	39.1

Source: Sierra, Redco, 2021

From the 2021 budget data, the variable and fixed costs for each unit operation making up the mining operating costs at the planned 3,780 tpd mining rate was estimated. The fixed and variable costs at various production rates including 5,500 tpd were then estimated including the impact of SCL design changes to modernize the SLC practices at Yauricocha using the formula below.

$$COV = \sum\left(FC * \left(\frac{tpd_A}{tpd_B}\right) + VC\right)$$

tpd_A: Tonnes per day - Base Case

tpd_B: Tonnes per day – Scaled Case

FC: Fixed Cost ($/t)

VC: Variable Cost ($/t)

Processing costs at 3,780 tpd from the 2021 budget serve as an estimation basis for 2021 through 2023 in the PEA. Processing cost estimates provided by KeyPro Ingenieria S.A. were used as the 5,500 tpd processing costs. These costs were based on a 2021 processing plant expansion study.

G&A cost from the 2021 budget were used for 3,780 tpd and scaled for the ramp-up of the production rates based on fixed/variable cost splits in the same manner as the mining costs.

The economic COV varies by mining method, and includes direct and indirect mining costs, processing costs, and general and administrative costs. The marginal COV also varies by mining method and includes only the variable mining and processing costs as the economic material covers the fixed costs. Additionally, all mining zones are subject to an economic check to ensure that the stopes can cover not only the operating costs, but the capital costs to develop the zone.

Mining blocks with an average NSR value above the economic COV, that have defined access, and pass an economic check to ensure the zone will pay the capital costs to access it, are classified as economic and included in the mineable resource. In some cases, marginal blocks are included in the mineable resources if they are in between or immediately adjacent to economic blocks, and it is reasonable to expect that no significant additional development would be required to extract the marginal block. Mining blocks with an NSR value below the marginal cut-off are classified as waste.

Table 16-32 summarizes the COVs used in the PEA at 5,500 tpd.

Table 16-32: Cut-Off Values at 5,500 tpd by Mining Method (US$/t)

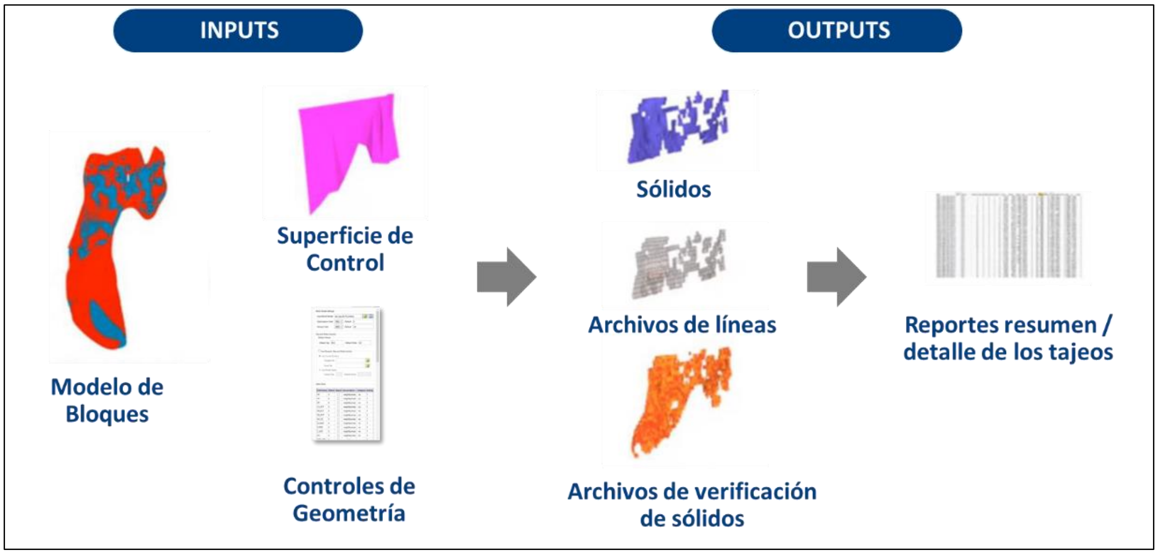
Mining Method	Mining (US$/t)	Processing (US$/t)	G&A (US$/t)	Total (US$/t)	Economic COV (US$/t)	Marginal COV (US$/t)
SLCM1	28.6	8.9	4.5	42.0	42.0	31.7
SLCM2	29.6	8.9	4.5	43.0	43.0	32.5
SLCM3	30.5	8.9	4.5	43.9	43.9	33.2
CRAM	35.2	8.9	4.5	48.6	48.6	36.7

Source: Sierra, Redco, 2021

16.7.4 Stope Optimization

The economic envelopes for each mineralized body were developed using the Mineable Shape Optimizer (MSO) module of the Datamine ™ Studio UG software based on mining method.

MSO looks for optimal mineable shapes considering the cut-off value and geometry of the mineable resource using the NSR values coded into the block model. The MSO provides stope shapes that maximizes the value of the recovered resource above the COV using practical mining parameters such as minimum and maximum mining width, HW/FW dilutions, minimum pillar dimensions, etc. Figure 16-30 outlines the MSO procedure.



Source: Redco, 2021

Figure 16-30: MSO Inputs and Outputs

The basic inputs for the MSO configuration applied to each mining method are summarized on Table 16-33.

Table 16-33: Basic Mineable Stope Optimization Inputs

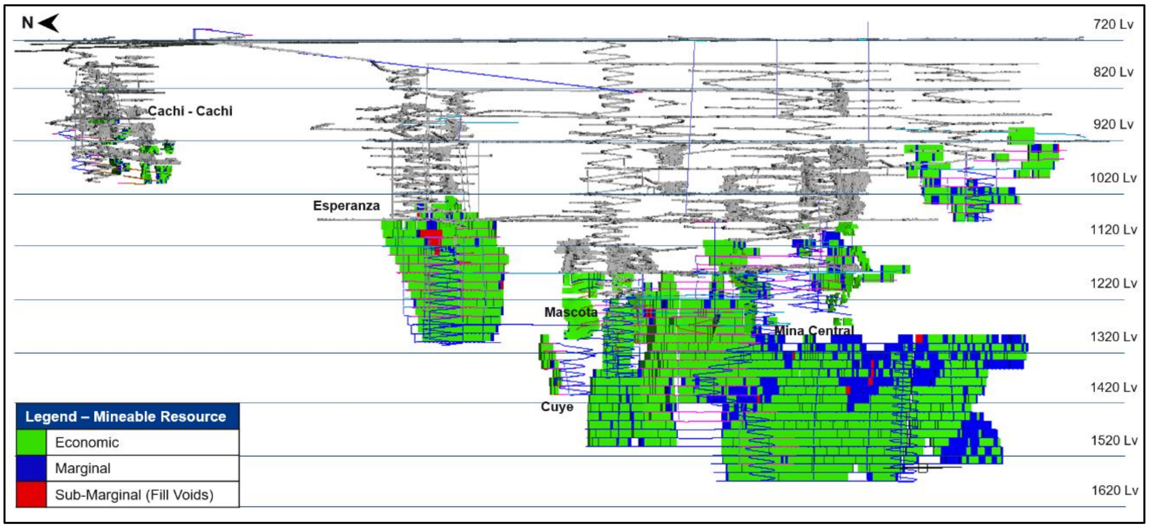
MSO Input	SLCM (1,2 or 3)	CRAM
Economic Cut-off value	\$42/t, \$43/t, \$43.9/t	\$48.6/t
Marginal Cut-off value	\$31.7/t, \$32.5/t, \$33.2/t	\$36.7/t
Level spacing (floor to floor)	16.6 m	50m
Stope length	9 m	8m
Minimum mining width	3.5 m	4m

Source: Sierra, Redco, 2021

The tonnes and grade for each stope shape generated by MSO shapes brought into Deswik, filtered to remove outliers and those that fail economic checks, also voids between mining zones were completed in order to maintain mining continuity, then scheduled with dilution and recovery factors added in Deswik (zero-grade dilution).

External dilution and mining recovery factors are variable by mining method and summarized in Table 16-18.

Blocks were classified as economic, marginal, or waste based on the NSR value of the mining block and mining method COV for the area. The blocks meeting the mineable resource criteria were visually inspected and isolated blocks were identified and removed from the economic envelope. Marginal blocks immediately adjacent to economic blocks, were considered and included in the economic envelop if it was reasonable to expect that no significant additional development would be required to exploit the marginal block. Figure 16-31 shows an overall view of the mineable economic envelop by value.



Source: Redco, 2021

Figure 16-31: Minable Economic Envelope

As a result of the mine design and scheduling work for the 28 mineralized bodies distributed across 6 zones, 17.43 Mt of mineable resources with an average NSR value of $74.22/t have been outlined as the basis of this PEA. The results are shown in Table 16-34

Table 16-34: PEA Mineable Resource Base by Zone

	Central Mine	Esperanza	Cuye	Mascota	Cuerpos Pequeños	Cachi-Cachi
Tonnes [t]	**9,148,243**	**3,777,624**	**3,359,498**	**434,016**	**417,489**	**290,751**
Measured	609,728	1,557,176	0	30,172	206,128	253,918
Indicated	2,771,527	1,717,765	2,239,041	284,569	113,435	36,832
Inferred	5,766,988	502,683	1,120,457	119,275	97,926	0
% Measured	7%	41%	0%	7%	49%	87%
% Indicated	30%	45%	67%	66%	27%	13%
% Inferred	63%	13%	33%	27%	23%	0%
Cu [%]	1.2	1.3	1.2	0.7	0.2	0.3
Pb [%]	0.1	0.9	0.1	2.5	1.8	1.3
Zn [%]	0.8	2.5	0.6	7.0	3.9	4.2
Ag [g/t]	18.18	56.87	19.35	101.68	86.87	54.42
Ag [g/t]	0.40	0.34	0.42	0.49	0.55	0.45
NSR [$/t]	63.37	101.91	61.41	145.09	88.23	77.89

Source: Redco, 2021

16.8 Mine Production Schedule

Historical performance at Yauricocha from 2012 to the end of Q1 2021 is shown on Table 16-35 including reported mine production and mill tonnes processed.

Table 16-35: Reported Mine and Mill Production, 2012 to March 2021

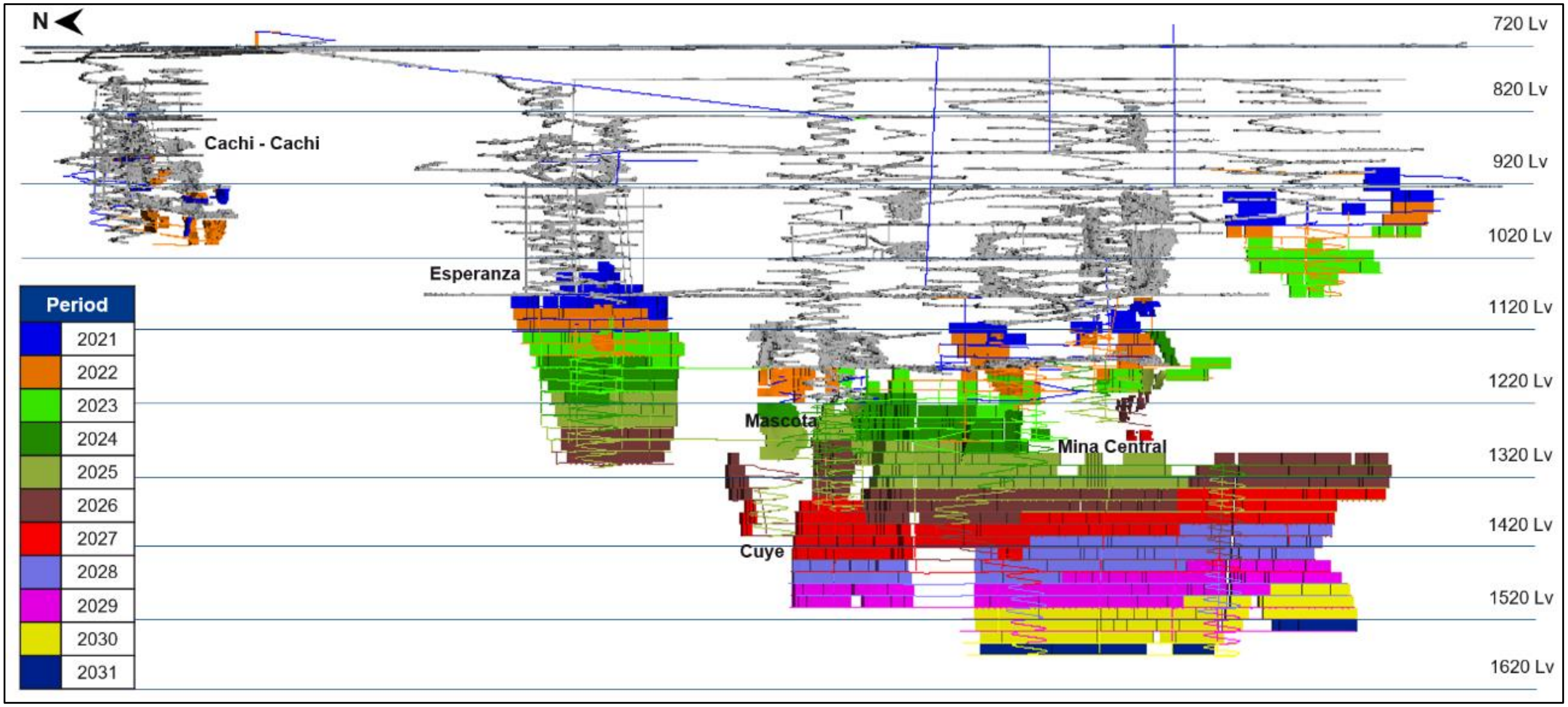
Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021(1)
Mined (kt)	849.6	858.4	929.3	820.0	847.5	1,009.6	1,074.5	1,127.5	1,081.0	320.4
Processed (kt)	872.9	837.5	890.9	829.8	897.2	1,023.5	1,106.6	1,116.9	1,117.9	326.2

Source: Sierra, 2021
(1) Production for January to March 2021 inclusive

Production schedules were generated for each mineralized body and then combined into the Yauricocha Life of Mine (LoM) production schedule. Assuming a 365 day/year operation, the Yauricocha Mine processed 3,040 tpd in 2020 and achieved a 16.3% increase in 2021 to process 3,534 tpd according to Sierra's year-end reporting.

Sierra expects to continue the current operational improvement efforts to achieve 3,780 tpd in 2022 and 2023. The PEA considers future mine expansion work to increase production to 5,500 tpd starting in 2024. The current permit will need to be amended to increase production beyond 3,780 tpd.

The production schedule is shown in Table 16-36 and Figure 16-32. The oxide mineralized material tonnage accounts for less than 1% of Yauricocha's total tonnage overall, which is not material to the operation and therefore was not included in the economic analysis.



Source: Sierra, 2021

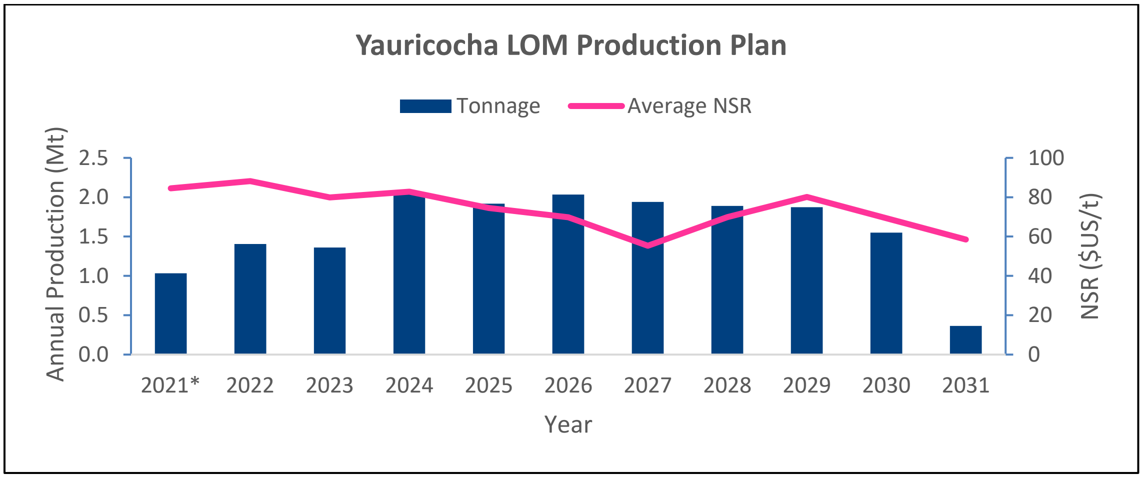
Figure 16-32: Longitudinal view of LOM Production Schedule

Table 16-36: LOM Production Schedule (5,500 tpd in 2024)

Mine Production	Unit	Total	Q2-Q4 2021(1)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Polymetallic Sulfide Mineralized Material	kt	17,209	946	1,293	1,340	2,062	1,918	2,033	1,939	1,889	1,872	1,550	365
Lead Oxide Mineralized Material	kt	219	86	112	20	-	-	-	-	-	-	-	-
Tonnes Mineralized Material	kt	17,428	1,033	1,405	1,360	2,062	1,918	2,033	1,939	1,889	1,872	1,550	365
Tonnes Waste	kt	4,811	412	509	511	553	596	592	478	417	369	312	62
Tonnes Total	kt	17,429	1,034	1,914	1,871	2,615	2,514	2,625	2,417	2,307	2,242	1,862	427
Cu	%	1.2	0.9	0.9	1.1	1.1	1.0	0.9	1.0	1.4	1.7	1.4	1.2
Pb	%	0.4	0.9	1.0	0.5	0.6	0.5	0.5	0.1	0.1	0.1	0.1	0.1
Zn	%	1.4	2.2	2.7	1.8	2.2	2.1	1.8	0.5	0.4	0.4	0.6	0.6
Ag	g/t	31.12	54.62	53.29	41.04	38.84	35.97	33.23	20.95	18.4	17.62	15.86	15.55
Au	g/t	0.39	0.514	0.447	0.403	0.338	0.362	0.397	0.372	0.405	0.446	0.379	0.355
NSR	$/t	74.22	84.50	88.18	79.87	82.80	74.53	69.81	55.31	69.87	80.08	69.30	58.46
Production Rate	tpd	-	3,591	3,780	3,780	5,500	5,500	5,500	5,500	5,500	5,500	4,200	4,200
Cu Concentrate	%	24.5%	24.5%	24.5%	24.5%	24.5%	24.5%	24.5%	24.5%	24.5%	24.5%	24.5%	24.5%
	dmt	620,097	29,461	39,684	46,019	70,291	56,220	58,439	60,392	82,987	96,681	67,010	12,912
Pb Concentrate	%	55.1%	55.1%	55.1%	55.1%	55.1%	55.1%	55.1%	55.1%	55.1%	55.1%	55.1%	55.1%
	dmt	114,486	14,304	22,794	11,339	18,818	16,380	16,034	4,482	3,577	3,440	2,935	382
Zn Concentrate	%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
	dmt	432,512	40,474	66,615	43,615	81,304	72,089	63,898	17,686	13,136	14,439	15,620	3,636
Cu (Metal Recovery) 2	%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
	t	162,052	7,699	10,371	12,026	18,369	14,692	15,272	15,782	21,687	25,266	17,512	3,374
Pb (Metal Recovery)	%	88.5%	88.5%	88.5%	88.5%	88.5%	88.5%	88.5%	88.5%	88.5%	88.5%	88.5%	88.5%
	t	63,059	7,879	12,555	6,246	10,365	9,022	8,832	2,468	1,970	1,895	1,617	211
Zn (Metal Recovery)	%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%
	t	216,342	20,245	33,321	21,816	40,668	36,059	31,962	8,847	6,571	7,223	7,813	1,819
Ag (Metal Recovery)	%	77.7%	77.7%	77.7%	77.7%	77.7%	77.7%	77.7%	77.7%	77.7%	77.7%	77.7%	77.7%
	koz	13,549	1,409	1,870	1,395	2,001	1,724	1,687	1,015	868	824	614	142
Au (Metal Recovery)	%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%
	koz	43.5	3.3	3.9	3.4	4.4	4.4	5.1	4.5	4.8	5.2	3.7	0.8

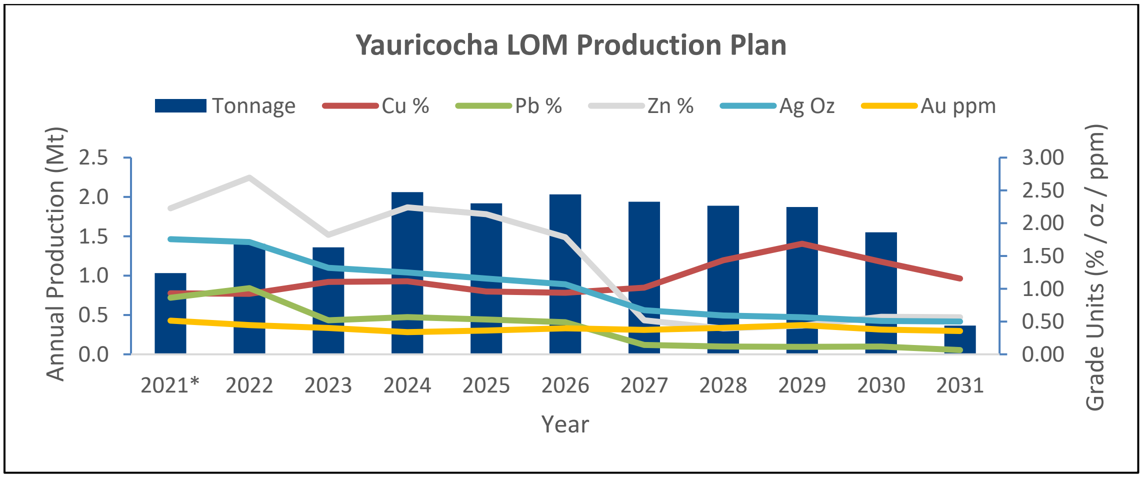
Source: Sierra, 2021
(1) April to December 2021
(2) Includes recovered Cu in Pb concentrate

LOM production and development figures are provided in Figure 16-33, and Figure 16-34.



Source: Sierra, 2021

Figure 16-33: PEA LOM Production Profile and NSR – 5,500 Tonnes per Year (2024)



Source: Sierra, 2021

Figure 16-34: PEA LOM Production Profile with Grades – 5,500 Tonnes per Year (2024)

16.9 Mine Development

The mine design is formulated to integrate the main areas of the mine. Currently the mine has two tunnels and three entrance shafts for truck and personnel access:

- The Klepetko tunnel (3 m high x 3 m wide) and the Yauricocha tunnel (3.5 m x3.5 m) located at level 720 (Main transport level). These tunnels are used for the movement of mineralized material delivered directly to the Chumpe concentrator plant.
- The shafts in service are the Central shaft, Mascota shaft and the Cachi-Cachi shaft. The Yauricocha shaft is currently in sinking project and plans to reach level 1270 as the final stage. These shafts are typically used for the movement of personnel and materials, but also for the

movement of mineralized material and waste if necessary. These are also used to move mineralized material and waste from depth to the 720 level.

The distribution of development by typical development criteria are described below:

- Ramps have a typical section of 4.5 x 4.5 m (width x height), in some areas this is reduced to 4.0 x 4.0 m. Maximum ramp gradient of 14%.
- Access to some areas of the mine such as bypasses have a section of 3.0 x 3.0 m, cross cuts have a section of 3.0 x 3.0 m or 3.5 x 3.5 m (width x height).
- Vertical development has a typical section of 2.4 x 2.4 m.
- Raisebored ventilation raises have a typical diameter of 3.6 m.
- Truck loading stations and sumps are typically installed in the main sub-level access drift.

All lateral and vertical development was design in 3D using Deswik.CAD software to determine the development quantities. Lateral capital and operating development are scheduled at 1,250 meters per month.

The development quantities and historic advance rates achieved in the mine were used to generate LOM development schedule and are listed in Table 16-37 and Table 16-38.

Table 16-37: PEA LOM Development Schedule (metres)

Description	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Raise	3,892	407	743	477	544	572	238	376	150	256	114	14
Crosscut	20,246	4,402	3,586	3,722	1,887	3,148	1,347	721	554	519	349	12
Refuge	285	85	71	34	42	51	3	-	-	-	-	-
Raise borer	1,603	1,134	103	301	-	64	-	-	-	-	-	-
Ramp	13,173	1,381	2,176	1,509	1,730	2,798	1,299	547	875	600	258	-
Sublevel Access	20,895	1,577	2,108	1,898	2,121	2,822	4,625	1,171	1,707	1,661	1,206	-
Drawpoints	72,797	2,122	4,506	6,256	8,500	6,881	9,058	10,743	8,587	7,470	6,946	1,727
Pivot Access	3,754	509	1,075	344	896	613	274	43	-	-	-	-
Shaft	196	89	106	-	-	-	-	-	-	-	-	-
Total	**136,842**	**11,706**	**14,476**	**14,541**	**15,719**	**16,950**	**16,844**	**13,600**	**11,873**	**10,506**	**8,874**	**1,752**

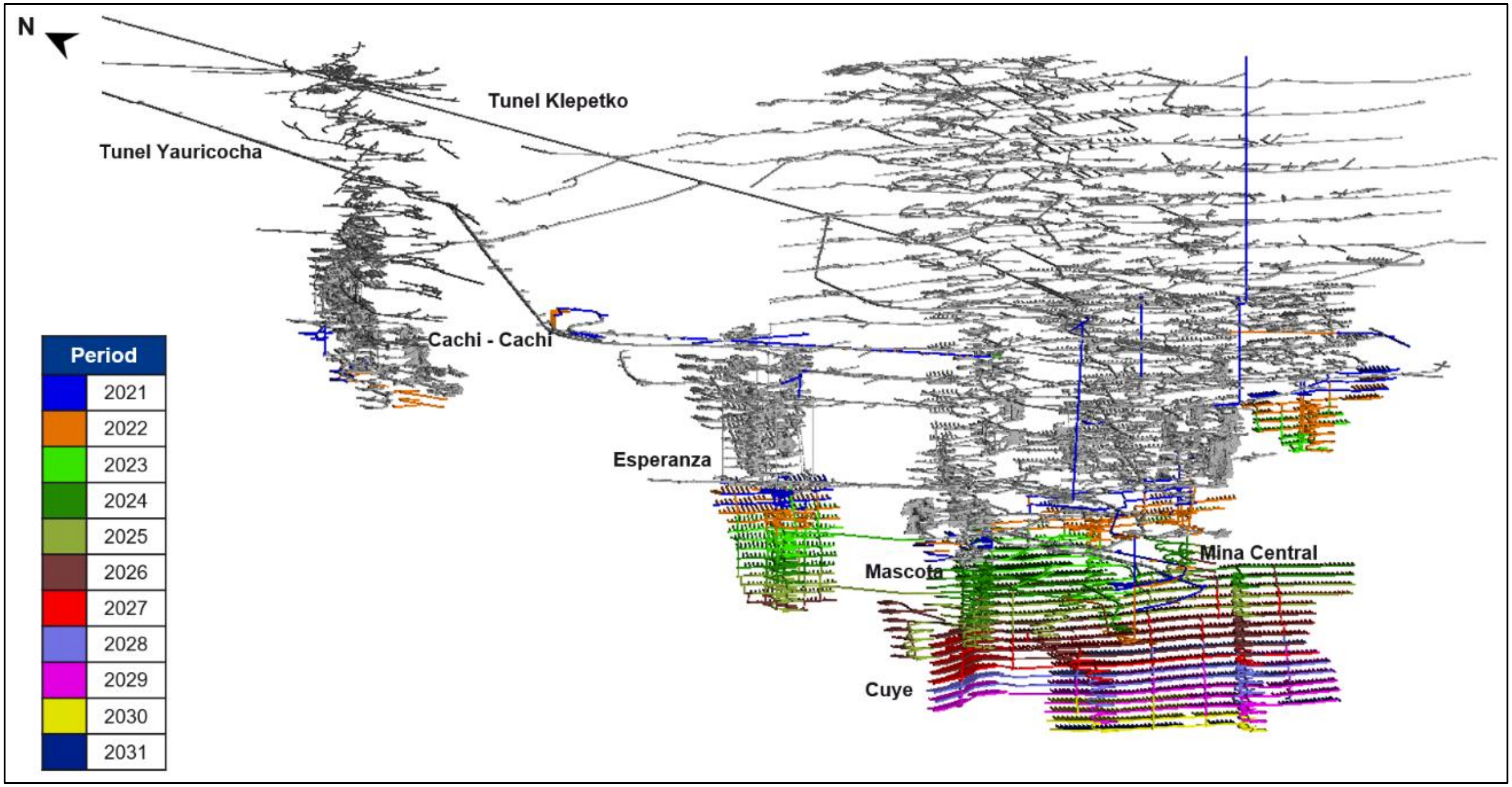
Source: Sierra, Redco, 2021

Table 16-38: Total PEA LOM Lateral and Vertical Development

Item	Unit	Value
Horizontal Development	m	131,151
Vertical Development	m	5,690
Total	m	**136,842**

Source: Sierra, Redco, 2021

Figure 16-35 shows the distribution of mine workings and mineralized areas, and the current and planned mine development.



Source: Sierra, Redco, 2021

Figure 16-35: PEA LOM Development Distribution by Mineralized Body and Year

Table 16-39, Table 16-40 and Table 16-41 show the LOM capital development, operating development, and total waste development for the 5,500 tpd mining plan.

Table 16-39: LOM Capital Development Schedule

Item	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Horizontal	m	**7,445**	**7,941**	**7,163**	**5,779**	**8,819**	**7,274**	**2,439**	**3,136**	**2,780**	**1,813**	**12**
Vertical	m	**1,630**	**953**	**778**	**544**	**637**	**238**	**376**	**150**	**256**	**114**	**14**
Total	**m**	**9,075**	**8,894**	**7,941**	**6,323**	**9,456**	**7,512**	**2,814**	**3,286**	**3,035**	**1,927**	**25**

Source: Sierra, Redco, 2021

Table 16-40: LOM Operating Development Schedule

Item	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Total	**m**	**2,631**	**5,582**	**6,600**	**9,396**	**7,494**	**9,332**	**10,786**	**8,587**	**7,470**	**6,946**	**1,727**

Source: Sierra, Redco, 2021

Table 16-41: LOM Development Waste Schedule

Item	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Total	**kt**	**292**	**386**	**356**	**390**	**453**	**451**	**291**	**279**	**245**	**198**	**33**

Source: Sierra, Redco, 2021

16.10 Waste Storage

Currently, development waste material is hauled by LHD and placed into mined zones, resulting in an approximately 40% to 60% fill factor. Consideration should be given to investing in equipment to pack the waste rock into the stope to improve the fill factor and to increase the amount of underground storage capacity. For future development, waste material will be hauled to mined out areas for storage to reduce transportation costs. Any residual waste not stored underground must be hoisted by shaft to surface and placed on the waste dump.

Further analysis of the development waste handling and storage strategy is required to increase the backfill factor and optimize the transportation costs.

16.11 Mining Equipment

Equipment performance was estimated based on current operational performance data for similar equipment. The equipment performance was used to estimate the quantity of equipment required to support the production and development plans. The maximum number of pieces of equipment required to meet the production plans is listed by year and shown in Table 16-42. The number of underground personnel required to operate the equipment is also listed for reference.

Table 16-42: Main Planned Underground Mining Equipment (5,500 tpd - 2024)

Equipment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Drill Jumbo - Development	8	8	8	8	8	8	8	8	8	8
Drill Jumbo - MCF	4	1	1	2	2	1	-	-	-	-
Long hole jumbo	4	5	7	7	7	7	7	7	6	6
LHD 2.5 yd	9	9	13	12	13	12	12	12	10	9
LHD 4 yd	18	18	18	18	18	18	18	18	18	18
Dumper 15T	3	3	3	3	3	3	3	3	3	2
Dumper 20 T	6	5	9	8	9	9	8	8	7	7
Bolter	5	5	5	5	3	3	3	3	3	3
Transmixer 4.5 M3	2	2	2	2	2	2	2	2	2	2
Shotcrete Sprayer	3	3	3	3	3	3	3	3	3	3
Skid steer	4	4	4	4	4	4	4	4	4	4
Grader	3	3	3	3	3	3	3	3	3	3
Utility vehicle	5	5	5	5	5	5	5	5	5	5
Telehandler	3	3	3	3	3	3	3	3	3	3
Personnel Vehicle	10	10	10	10	10	10	10	10	10	10
Front Loader	4	4	4	4	4	4	4	4	4	4
Backhoe	1	1	1	1	1	1	1	1	1	1
Lift Truck	3	3	3	3	3	3	3	3	3	3
Tractor	1	1	1	1	1	1	1	1	1	1
Railway	6	5	8	7	8	7	7	7	6	6
Mascota Winze	1	1	1	1	1	1	1	1	1	1
Central winze	1	1	1	1	1	1	1	1	1	1
Cachi-Cachi Winze	1	1	1	1	1	1	1	1	1	1
Yauricocha Winze	1	1	1	1	1	1	1	1	1	1
Personnel	281	281	299	347	368	368	368	368	368	368

Source: Sierra, Redco, 2021

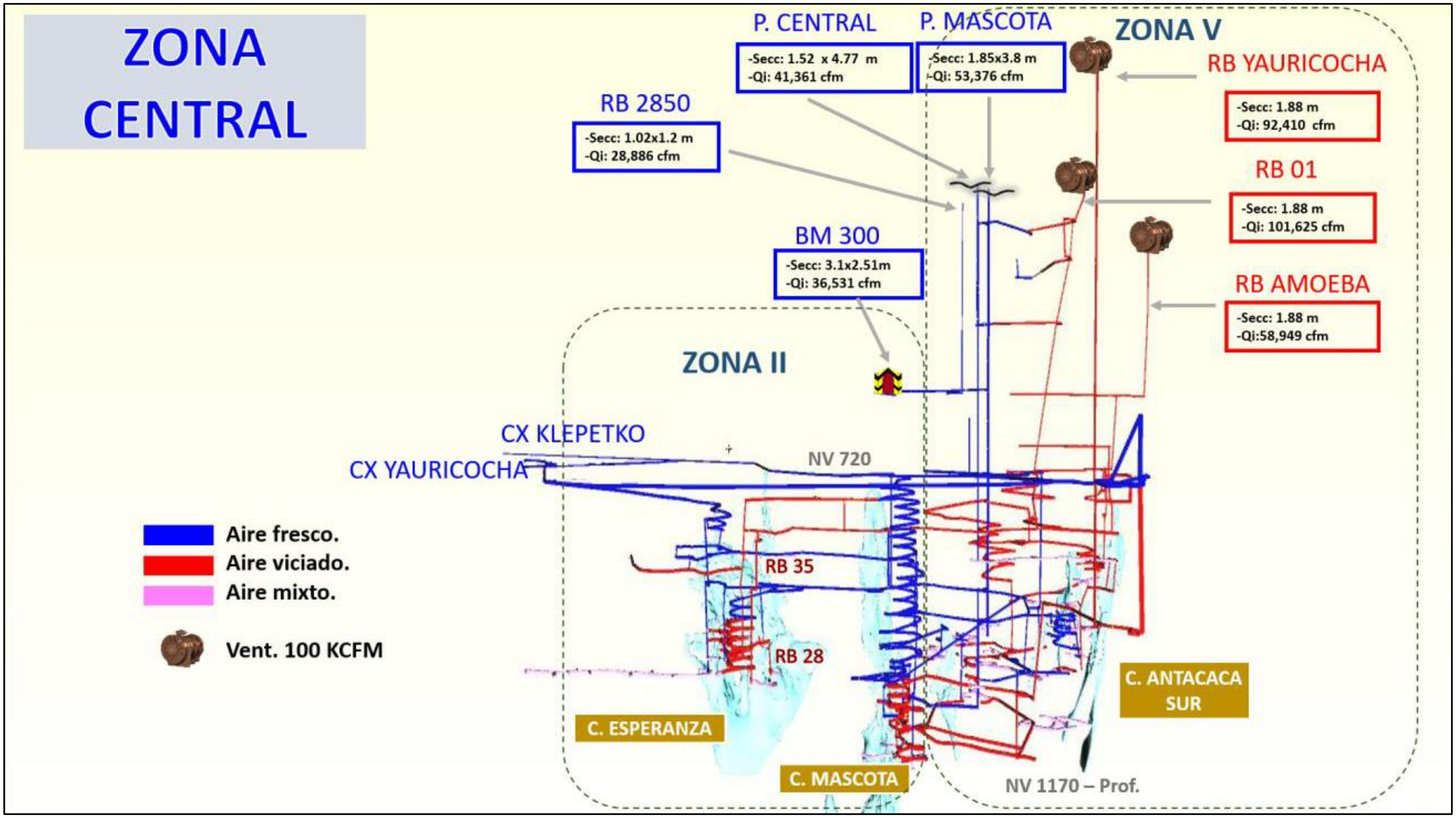
16.12 Ventilation

The underground mine has a ventilation system that supports the Cachi-Cachi mine and a separate ventilation system that supports the Central mine (Mina Central).

Mina Central has three main fresh air circuits: Central Shaft, Mascota Shaft and Klepetko Tunnel, these distribute air at 720 Lv, feeding the circuit of Mascota, Esperanza, CSM, Catas, Antacaca and Rosaura zones, and continue through Rp Mascota and Rb Yauricocha to deeper levels. The system also has other air intake circuits such as the Yauricocha Tunnel, the Rb 2850 and the Bocamina 300.

The evacuation of exhaust air from Mascota in deepening is through the RB-40, RB-29, RB-24 and RB Yauricocha, which reaches the surface. In Esperanza is evacuated by RB-28 at 920 Lv, through RB-35 at 820 Lv to be directed to RB 01.

The evacuation of exhaust air of Antacaca and Catas at 1070 Lv to 970 Lv is through RB-18, then channeled to Rp Catas up to 720 Lv, where connects with Rb Amoeba up to 520 Lv to be directed for Alimak Amoeba towards the surface. Exhaust air from CSM is evacuated through RB-23, which is located at 1070 Lv to 970 Lv, and directed to RB-03, then channeled to a conventional chimney that reaches the surface. Figure 16-36 shows an isometric view of the ventilation circuit in Mina Central.

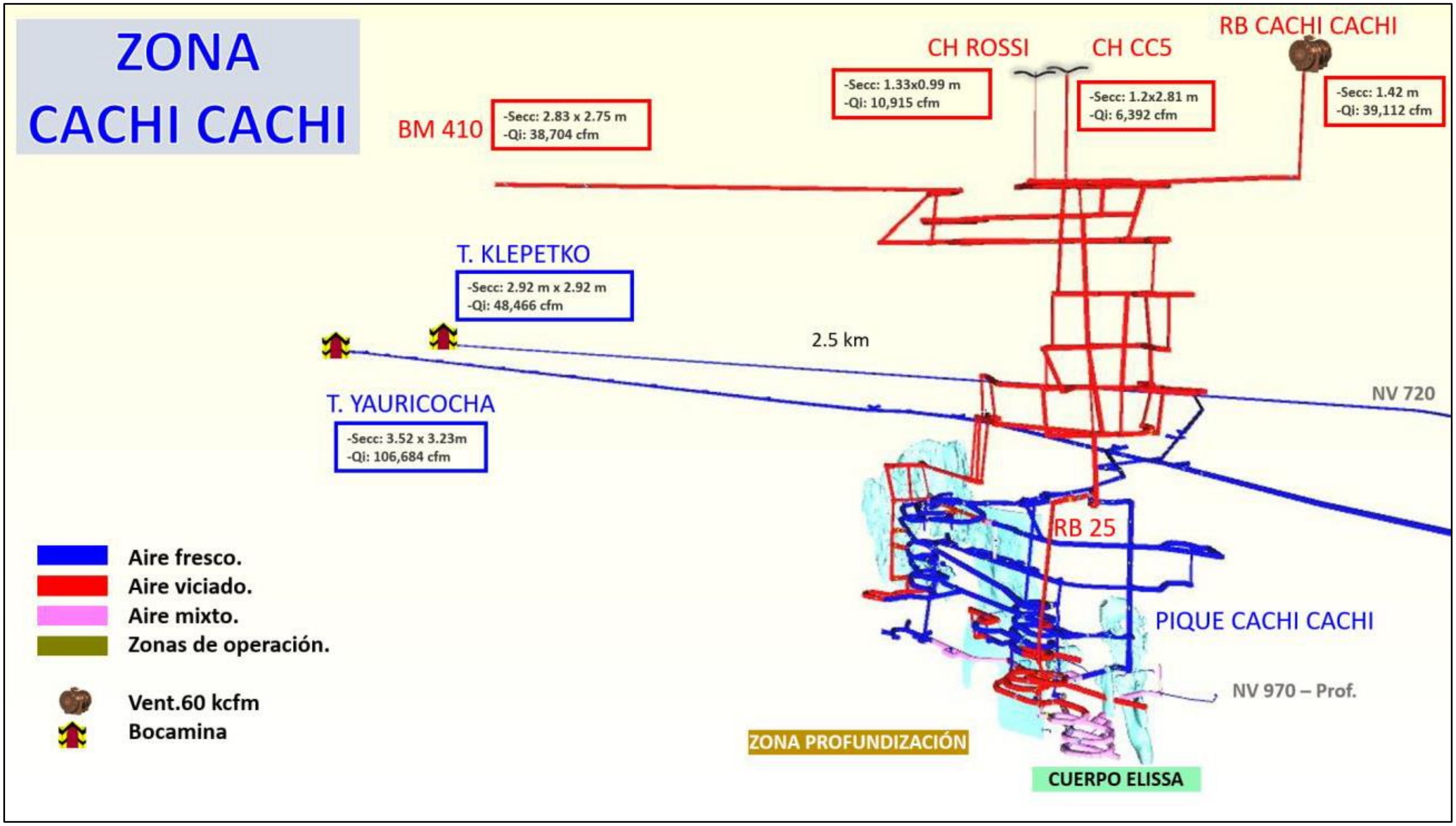


Source: Sierra, 2021

Figure 16-36: Ventilation circuit – Mina Central

The Cachi-Cachi Zone has two main fresh air supply routes, the Yauricocha Tunnel (106,684 CFM) and the Klepetko Tunnel (48,466 CFM), of which the Yauricocha tunnel has the highest incidence for fresh air flow for and is directed by the XC 3470NE and then distributed towards the Cachi-Cachi Shaft and XC 5130, which is the main route for the supply of fresh air by the Rp. Tatiana (-) (RP 5130) to 820 Lv, where the flow splits by the Rp. Karlita (RP 7235) and the Rp. Escondida, up to level 870 Lv to supply air to the Angelita, Karlita and Elissa bodies, the flow is subsequently channeled by the RP Karlita (-) and RP Escondida (-) towards the deepening zone of these bodies.

The exhaust air from the deepening zone of the Elissa body is evacuated by RB 25 to level 720 where the flow is captured and channeled again by CH 416-9 towards the surface; on the other hand, the exhaust air from the bodies Angelita and Karlita is evacuated through conventional chimneys to 670 Lv and are channeled, managing to join the air of the Elissa body in CH 416-9, and goes to 410 Lv through CH 416-9 from which the exhaust air reaches the surface through different points, these being the Bocamina 410 (XC 1724S), CH 416-9 that connects to the surface and CH 785-8 which it is forced by a 60 kCFM fan. There are also two conventional chimneys, CH Camino and CH Rossi, which extract all the remnants of 670 Lv directly to the surface. Figure 16-37 shows an isometric view of the ventilation circuit in Cachi-Cachi.



Source: Sierra, 2021

Figure 16-37: Ventilation circuit – Cachi-Cachi area

Fresh air is supplied through the Yauricocha tunnel, Mascota shaft, Central shaft, Klepetko tunnel, and through the Bocamina 300. Exhaust air is mainly evacuated by RB Yauricocha and Alimak Amoeba. Table 16-43 lists the current fresh air intake and exhaust airway capacities.

Table 16-43: Yauricocha Mine Intake and Exhaust Airway Capacities

N°	Intake Airway	Volume (1) (CFM)
1	Yauricocha Tunnel	106,684
2	Klepetko Tunnel	48,466
3	Mascota Shaft	53,376
4	Central Shaft	41,361
5	RB 2850	28,886
5	Bocamina Level 300	36,531
	Total	**315,305**
N°	**Exhaust Airway**	**Volume (1) (CFM)**
1	Alimak Amoeba	58,949
2	RB 01	101,625
3	RB. Yauricocha	92,410
4	RB Cachi-Cachi	39,112
5	CH. Rossy	10,915
6	CH CC5	6,392
7	Bocamina Nv. 410	38,704
	Total	**348,105**

Source: Sierra, Redco, 2021
(1) Volumes are based on measured values and are not corrected for auto-compression or system calibration.

16.12.1 Fresh Air Requirement

The mine's fresh air requirements for personnel and equipment are shown in Table 16-44 and Table 16-45 respectively.

Table 16-44: Fresh Air Personnel Requirement– 5,500 Tonnes per Year

Item	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Personnel	#	281	281	299	347	368	368	368	368	368	368	368
Required (1)	**CMS**	6	6	6	6	6	6	6	6	6	6	6
Total CMS	**CMS**	**1,686**	**1,686**	**1,794**	**2,082**	**2,208**	**2,208**	**2,208**	**2,208**	**2,208**	**2,208**	**2,208**
Total CFM	**kCFM**	**59.5**	**59.5**	**63.4**	**73.5**	**78.0**	**78.0**	**78.0**	**78.0**	**78.0**	**78.0**	**78.0**

Source: Sierra, Redco, 2021
(1) According with Peruvian Legislation (DS-024-EM & DS-023-EM)

Table 16-45: Fresh Air Equipment Requirement– 5,500 Tonnes per Year

Item	HP	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
LHD 2.5 yd	**120**	4	2	2	6	5	6	5	5	5	3	2
LHD 4 yd	**165**	18	18	18	18	18	18	18	18	18	18	18
Dumper 15 T	**182**	3	3	3	3	3	3	3	3	3	3	2
Dumper 20 T	**300**	6	6	5	9	8	9	9	8	8	7	7
Drill Jumbo	**75**	4	4	1	1	2	2	1	0	0	0	0
Drill Jumbo	**95**	8	8	8	8	8	8	8	8	8	8	8
Long-hole Jumbo	**75**	2	4	5	7	7	7	7	7	7	6	6
Bolter	**95**	5	5	5	5	5	3	3	3	3	3	3
Shotcrete Sprayer	**145**	2	2	2	2	2	2	2	2	2	2	2
Transmixer	**140**	3	3	3	3	3	3	3	3	3	3	3
Skid Steer	**74**	4	4	4	4	4	4	4	4	4	4	4
Telehandler	**74**	3	3	3	3	3	3	3	3	3	3	3
Utility Vehicles	**100**	5	5	5	5	5	5	5	5	5	5	5
Total HP		**9,521**	**9,431**	**8,981**	**10,811**	**10,466**	**10,696**	**10,501**	**10,126**	**10,126**	**9,511**	**9,209**
Availability		89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%
Utilization		42%	41%	41%	43%	42%	44%	44%	44%	44%	43%	43%
Altitude Factor		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total HP		**3,563**	**3,489**	**3,307**	**4,175**	**3,975**	**4,158**	**4,098**	**3,925**	**3,925**	**3,654**	**3,530**
Required (1)	CMS/HP	3	3	3	3	3	3	3	3	3	3	3
Total CMS	CMS	**10,690**	**10,467**	**9,922**	**12,525**	**11,924**	**12,473**	**12,294**	**11,776**	**11,776**	**10,961**	**10,589**
Total CFM	**kCFM**	**489.5**	**493.6**	**475.8**	**593.2**	**573.9**	**596.2**	**589.0**	**567.9**	**567.9**	**534.8**	**519.7**

Source: Sierra, Redco, 2021
(1) According with Peruvian Legislation (DS-024-EM & DS-023-EM)

17 Recovery Methods

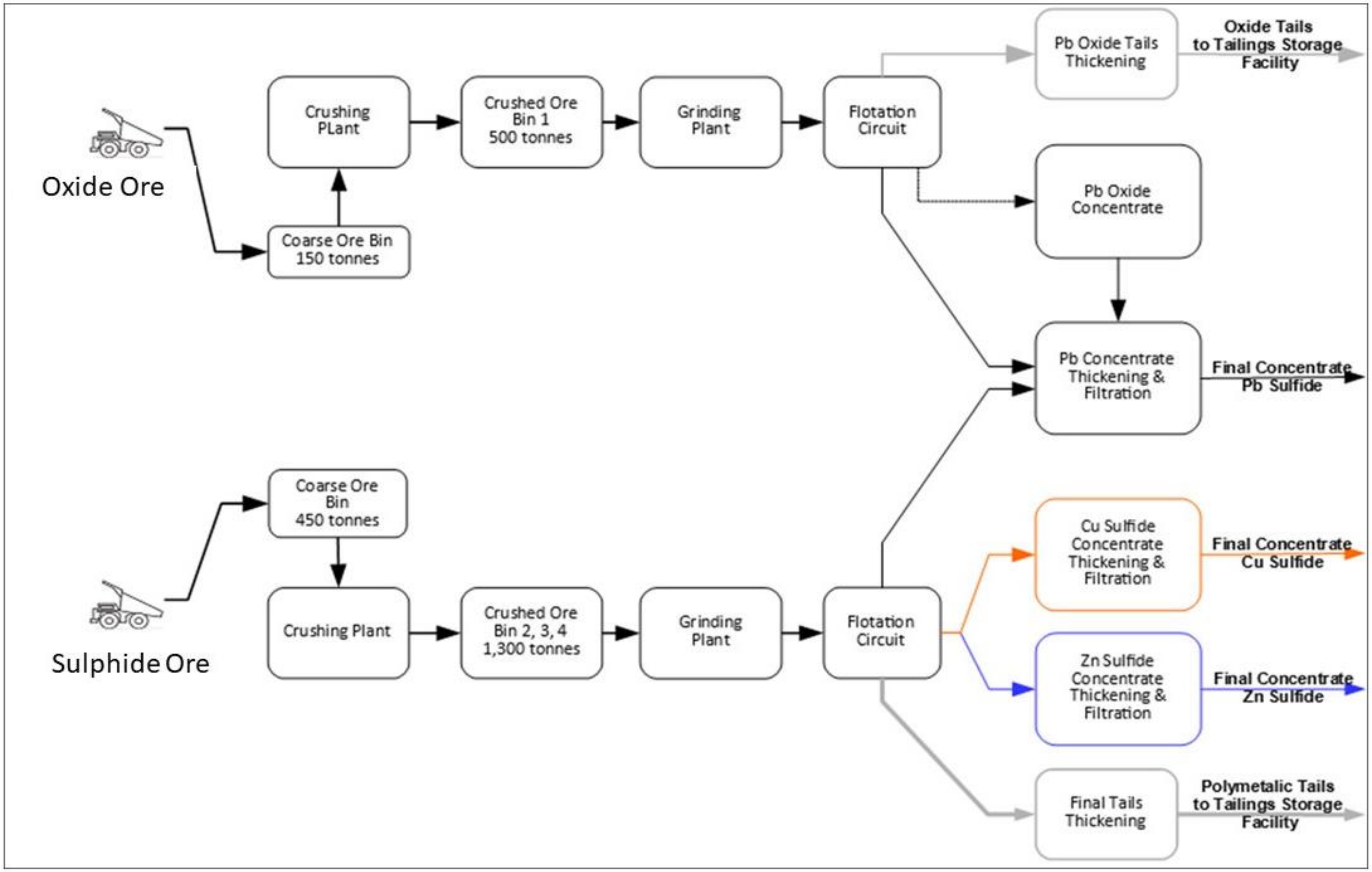
Yauricocha operates a conventional, multi-stage differential flotation plant that includes two parallel processing circuits, one to process polymetallic mineralized material, and the second to process oxide mineralized material. Each processing circuit consists of a crushing stage, grinding, sequential differential flotation, dewatering of the concentrates, thickening and disposal of the flotation tails (Figure 17-1).

Yauricocha's original combined capacity of the two processing circuits totals 3,600 tonnes per day. The polymetallic circuits nominal capacity has historically been 3,000 tonnes per day and the oxide circuit 600 tonnes per day, however ongoing improvements to the circuits have been increasing daily throughput.

No oxide mineralized material has been processed since 2018 and current plant production includes only three mineral concentrates: lead sulfides concentrate, copper sulfides concentrate, and zinc concentrate.

Recent improvements to the processing facilities include:

- Addition of one OK-50 flotation cell to add capacity to the Cu-Pb bulk flotation stage.
- Installation of x-ray slurry analyzer for six streams: flotation feed, middling Zn feed, copper final concentrate, lead final concentrate, zinc final concentrate and final tailings.
- Mechanical rod feeder for primary rod mill grinding for improved safety and production.
- Installation of 5 DR-180 cells in the Second Zn Cleaning Flotation Stage; 4 DR-180 cells in the Third Zn Cleaning Flotation Stage to improve the Zn concentrate grade.
- Installation of 10 DR-180 cells in the Bulk Cleaning Flotation Stage arranged in three banks to increase flotation retention time from 9 minutes to 17 minutes:
  - First Cleaning Flotation Stage (comprising 5 cells)
  - Second Cleaning Flotation Stage (comprising 3 cells)
  - Third Cleaning Flotation Stage (comprising 2 cells)

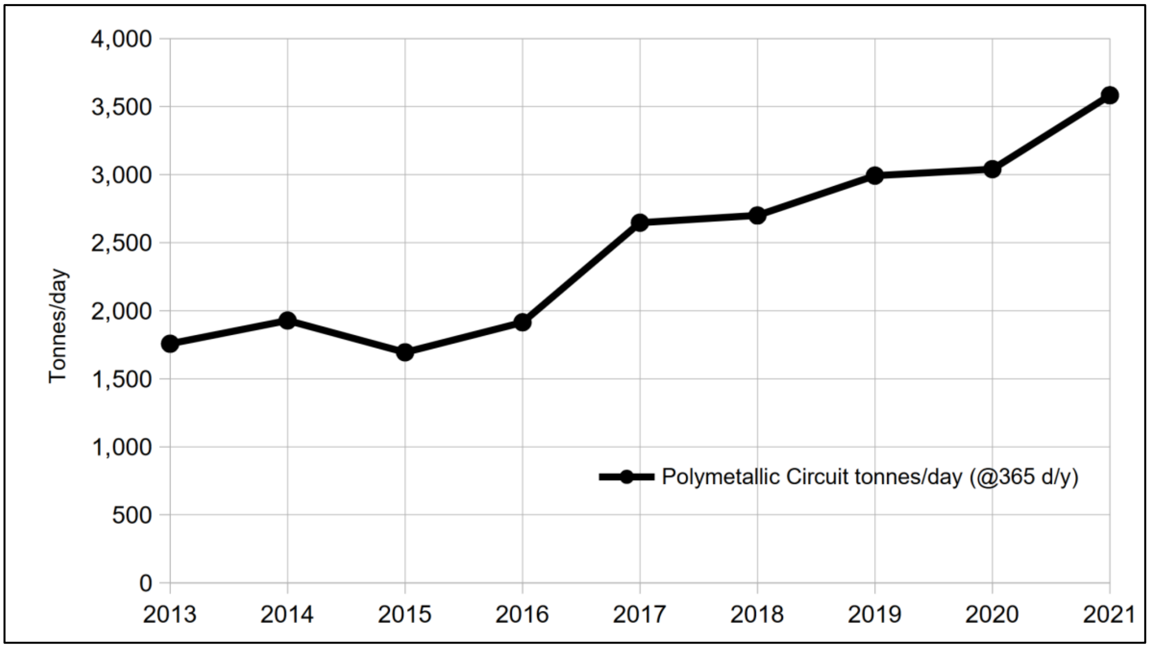


Source: SRK, 2021

Figure 17-1: Yauricocha Overall Block Flow Diagram

17.1 Operational Results

The processing plant shows a consistent upward trend in mill feed as shown in Figure 17-2 and Figure 17-3: Yauricocha Mill Feed – January 2019 to March 2021.



Source: SRK, 2021

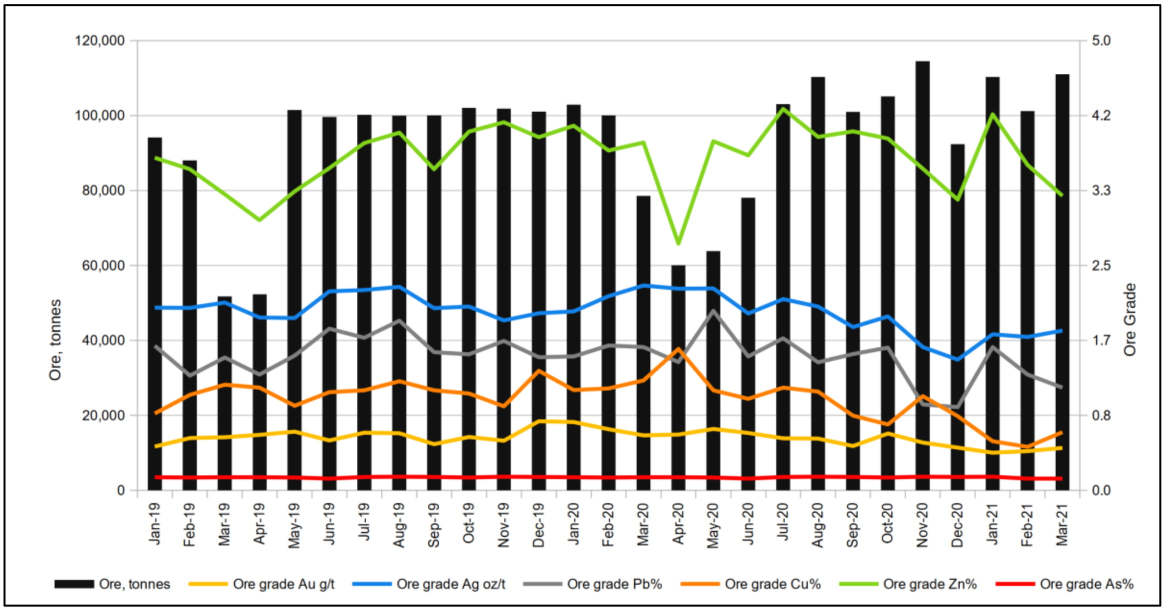
Figure 17-2: Polymetallic Circuit, Mill Feed Mineralized Material 2013 to March 2021

Table 17-1: Mill Tonnage and Head Grades, January 2019 to March 2021

Period	Mineralized Material (tonnes)	Head Grade					
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	As (%)
2021 Mar	111,007	0.47	55.36	1.1	0.6	3.3	0.13
2021 Feb	101,203	0.43	53.19	1.3	0.5	3.6	0.13
2021 Jan	110,273	0.42	53.81	1.6	0.5	4.2	0.15
2020 Dec	92,351	0.47	45.10	0.9	0.8	3.2	0.17
2020 Nov	114,503	0.53	49.45	1.0	1.0	3.6	0.15
2020 Oct	105,092	0.63	60.03	1.6	0.7	3.9	0.16
2020 Sep	100,989	0.49	56.30	1.5	0.8	4.0	0.18
2020 Aug	110,286	0.58	63.45	1.4	1.1	3.9	0.19
2020 Jul	103,000	0.58	65.94	1.7	1.1	4.2	0.18
2020 Jun*	78,080	0.63	60.96	1.5	1.0	3.7	0.18
2020 May*	64,364	0.68	69.65	2.0	1.1	3.9	0.17
2020 Apr*	60,090	0.53	69.69	1.4	1.6	2.7	0.29
2020 Mar*	78,553	0.63	70.85	1.6	1.2	3.9	0.21
2020 Feb	103,764	0.66	66.01	1.6	1.1	3.8	0.19
2020 Jan	102,908	0.75	61.89	1.5	1.1	4.1	0.18
2019 Dec	110,939	0.70	59.33	1.5	1.2	4.0	0.20
2019 Nov	101,862	0.55	58.74	1.7	0.9	4.1	0.16
2019 Oct	108,900	0.56	62.27	1.5	1.0	4.1	0.16
2019 Sep	100,030	0.51	63.02	1.5	1.1	3.6	0.17
2019 Aug	106,988	0.59	66.77	1.8	1.1	3.9	0.22
2019 Jul	100,221	0.64	69.25	1.7	1.1	3.9	0.25
2019 Jun	99,588	0.55	68.84	1.8	1.1	3.6	0.21
2019 May	101,502	0.65	59.55	1.5	0.9	3.3	0.19
2019 Apr**	53,075	0.61	59.25	1.3	1.1	3.0	0.18
2019 Mar**	51,707	0.59	64.91	1.5	1.2	3.3	0.20
2019 Feb	88,010	0.59	63.08	1.3	1.1	3.6	0.20
2019 Jan	94,097	0.50	63.15	1.6	0.9	3.7	0.20
Averages	**94,570**	**0.57**	**61.48**	**1.5**	**1.0**	**3.7**	**0.19**

Source: Sierra, 2021
* Production was affected by the Covid-19 pandemic.
** Production was affected by a strike at the mine.

The fresh feed profile is shown in Figure 17-3. In terms of head grade, except for zinc, all other metals (Pb, Cu, Au, Ag) in the mill feed show a downward trend. As shown in Table 17-2, the polymetallic circuit operated at an average of 3,040 tonnes per day of fresh feed in 2020 (assuming operation of 365 days per year) and in Q1 2021, the average processing rate increased to 3,534 tonnes per day.



Source: SRK, 2021

Figure 17-3: Yauricocha Mill Feed – January 2019 to March 2021

Table 17-2: Yauricocha Metallurgical Performance, 2013 to 2021*

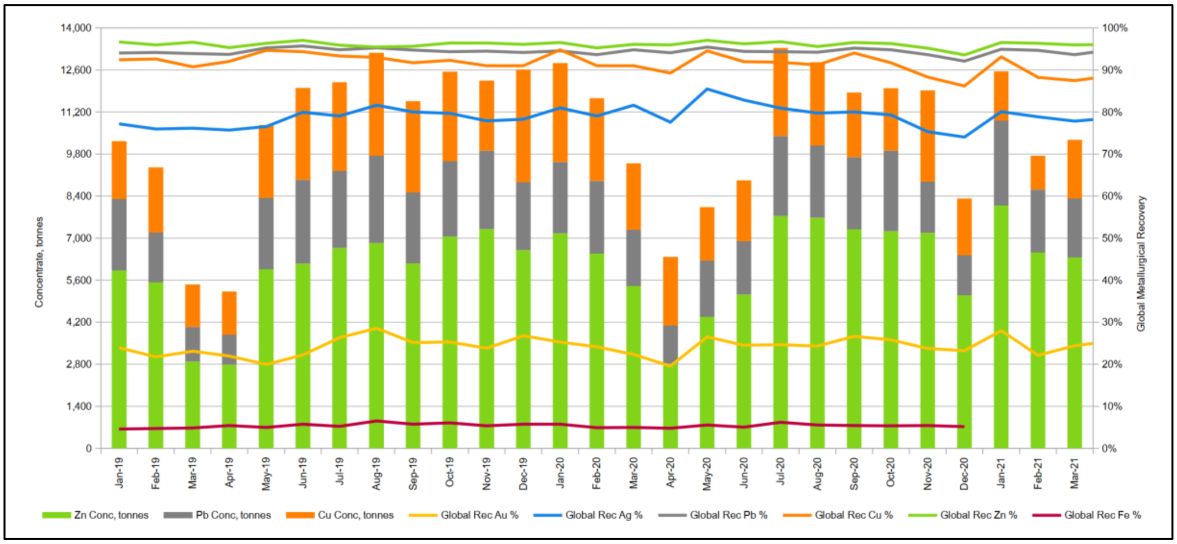
Period	Stream	Tonne	Tonnes/day (@ 365 d/y)	Concentrate Grade					Metal Recovery				
				Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
2013	Mineralized Material	641,268	1,757		83	1.5	0.7	4.1		100	100	100	100
	Cu Con.	12,728	35		1,058	2.8	23.2	6.4		25.2	3.7	70.6	3.1
	Pb Con.	14,258	39		1,300	53.4	1.8	5.9		34.7	80	6.3	3.2
	Zn Con.	45,412	124.4		122	0.6	1	50.8		10.4	3	10.8	88.7
2014	Mineralized Material	703,713	1,928		84	1.8	0.7	4		100	100	100	100
	Cu Con.	12,782	35		1,115	2.1	26.4	6.8		24.2	2.1	68	3.1
	Pb Con.	18,055	49		1,398	58.6	1.5	4.9		42.8	83.9	5.3	3.2
	Zn Con.	48,657	133		115	0.8	1.4	50.6		9.5	3.1	13.2	88.5
2015	Mineralized Material	618,460	1,694		79	1.6	0.6	3.4		100	100	100	100
	Cu Con.	8,145	22		1,278	2.3	27.8	4.1		21.4	1.8	65.3	1.6
	Pb Con.	14,463	40		1,656	59.5	1.1	4.3		49.3	85.7	4.7	2.9
	Zn Con.	37,587	103		91	0.6	1.2	50.7		7.1	2.1	13.4	90.1
2016	Mineralized Material	698,872	1,915	0.5	80.3	1.8	0.6	3.9	100	100	100	100	100
	Cu Con.	9,068	25	3.1	1362.6	2.1	26.3	6.8	8.1	22	1.5	61.3	2.3
	Pb Con.	18,014	49	1.7	1470.8	59	1.2	4.8	9.1	47.2	86.3	5.6	3.1
	Zn Con.	47,573	130	0.4	95.2	0.7	1.2	51.5	4.9	8.1	2.6	14.2	88.9
2017	Mineralized Material	966,138	2,647	0.6	66	1.5	0.7	3.9	100	100	100	100	100
	Cu Con.	16,412	45	2.7	920.5	2.4	26.9	7.6	8.4	23.7	2.8	67.3	3.3
	Pb Con.	21,731	60	1.8	1242.3	56.8	2.5	5.5	7.4	42.3	86.9	8.4	3.2
	Zn Con.	65,671	180	0.4	110.8	0.9	1.4	51.4	5.3	11.4	4	14.2	89.4
2018	Mineralized Material	985,679	2,700	0.6	58.4	1.3	0.9	3.8	100	100	100	100	100
	Cu Con.	21,940	60	2.2	677.4	2.3	28.1	7.5	8.4	25.8	3.8	70.1	4.4
	Pb Con.	20,146	55	2.2	1087.5	56.1	3.3	5.7	7.6	38.1	85.8	7.5	3
	Zn Con.	65,823	180	0.5	101.4	0.8	1.8	50.9	5.2	11.6	4.1	13.4	88.7
2019	Mineralized Material	1,092,410	2,993	0.6	63.9	1.6	1.1	3.7	100	100	100	100	100
	Cu Con.	30,931	85	2.3	593.9	1.8	29.4	6	11	26.3	3.2	76.9	4.6
	Pb Con.	26,574	73	2.1	1131.6	57.6	2.4	5.5	8.4	43.1	88.8	5.4	3.6
	Zn Con.	69,863	191	0.5	90.6	0.6	1.7	51	4.9	9.1	2.6	10.1	88
2020	Mineralized Material	1,109,730	3,040	0.6	61.0	1.5	1	3.8	100	100	100	100	100
	Cu Con.	29,235	80	2.25	558.43	2.0%	29.8%	7.6%	9.9%	27.0%	3.9%	74.8%	5.5%
	Pb Con.	24,777	68	2.41	1,069.00	57.2%	2.1%	5.1%	9.1%	43.6%	87.8%	4.6%	3.1%
	Zn Con.	73,583	202	0.51	84.42	0.6%	1.9%	49.9%	5.7%	10.2%	2.9%	12.4%	87.6%
2021*	Mineralized Material	322,483	3,534	0.44	54.1	1.3%	0.6%	3.7%	100	100	100	100	100
	Cu Con.	4,723	52	2.84	643.9	2.1%	25.2%	8.5%	9.6%	19.6%	2.4%	66.3%	3.7%
	Pb Con.	6,884	75	1.93	1,136.80	56.4%	1.4%	5.7%	9.5%	49.6%	89.8%	5.5%	3.3%
	Zn Con.	20,964	230	0.41	77.55	0.5%	1.6%	50.9%	6.2%	10.3%	2.4%	19.0%	89.6%

Source: Sierra, 2021

* January to March 2021

Yauricocha's concentrate production included lead concentrate, copper concentrate, and zinc concentrate as shown in Figure 17-4. Total production totalled 287,535 tonnes of combined concentrate or 11.4% mass pull. Zinc concentrate accounted for 6.5% of the total mass pull, copper concentrate reached 2.6% and 2.3% for lead concentrate.

Global recovery to concentrates reached 24.8% gold, 80.2% silver, 95.7% lead, 92.8% copper, and 96.4% zinc.



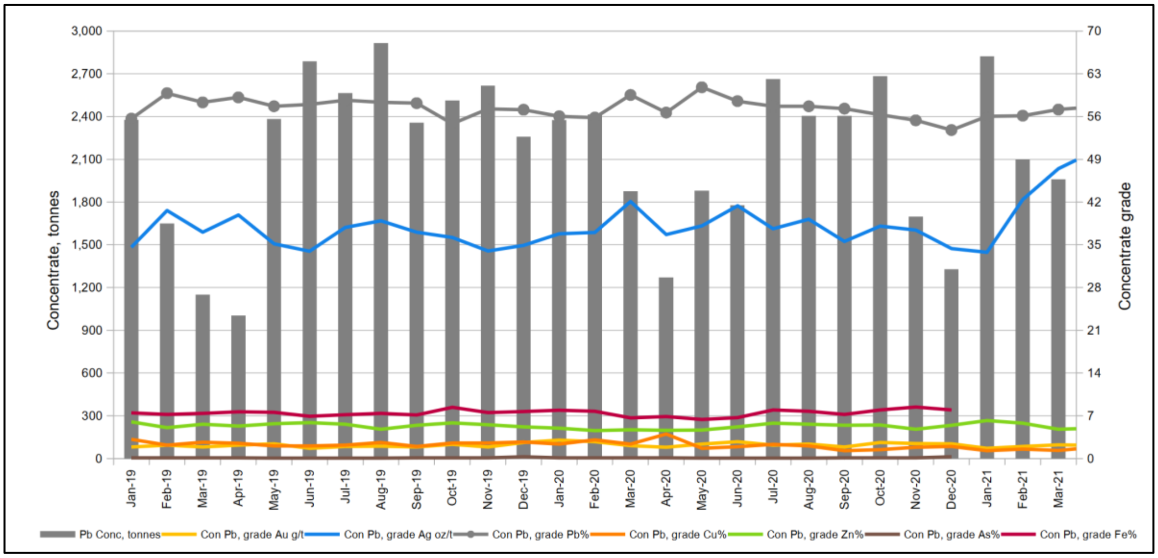
Source: SRK, 2021

Figure 17-4: Yauricocha, Global Concentrate Production – January 2019 to March 2021

In terms of lead concentrate production, its tonnage profile shows a consistency with the seasonal drop in mill feed around the second quarter of each year as shown in Figure 17-5. Additionally, concentrate tonnes production is showing a sustained drop in production in 2021. During the period, lead concentrate production averaged the equivalent to 2.3% mass pull and ranged from 2.1% to 2.4%. Lead concentrate quality reached consistent and commercial grade averaging 57.3% in the period. Additionally:

- Gold grade in concentrate averaged 2.2 grams per tonne and ranged from 1.93 g/t up to 2.41 g/t. At these grades, gold may trigger credit payments.
- Silver grade in concentrate averaged 1,166 grams per tonne, and ranged from 1,132 g/t up to 1,253 g/t. In these observed ranges, silver is likely triggering credit payments.
- Copper grade in concentrate averaged 2.2% and ranged from 1.4% up to 2.4%. In this range, copper is likely triggering minor penalty charges.
- Zinc grade in concentrate averaged 5.4% and ranged from 5.1% up to 5.7% which is likely triggering penalty charges.

- Arsenic grade in concentrate averaged 0.12% which is below typical the threshold for penalty payments. No data was available for 2021.

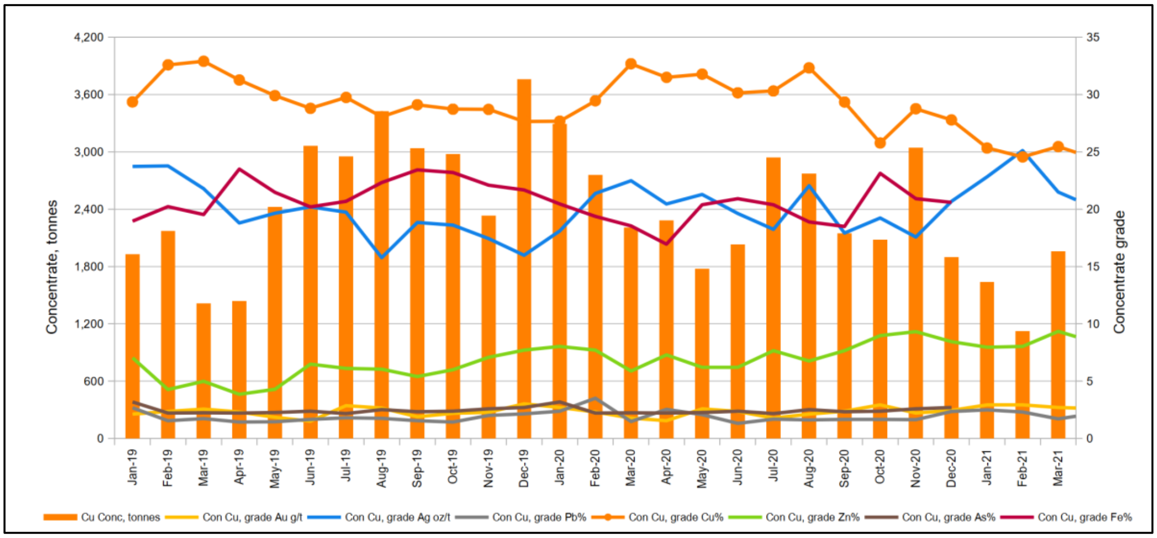


Source: SRK, 2021

Figure 17-5: Yauricocha, Lead Concentrate Production – January 2019 to March 2021

In terms of copper concentrate production, its tonnage profile shows a similar monthly profile to that of lead concentrate with a seasonal drop in mill feed around the second quarter of each year as shown in Figure 17-6. Concentrate production shows a sustained drop in production starting June 2021. During the period, copper concentrate production averaged the equivalent to 2.6% mass pull and ranged from 1.5% to 2.8%. Copper quality reached consistent and commercial grade averaging 29.2% in the period. Additionally:

- Gold grade in concentrate averaged 2.3 grams per tonne and ranged from 2.25 g/t up to 2.84 g/t. At these grades, gold may trigger credit payments because is around or just above the typical threshold for metallurgical deductions.
- Silver grade in concentrate averaged 612 grams per tonne, and ranged from 594 g/t up to 710 g/t. In the observed ranges, silver is likely triggering credit payments.
- Lead grade in concentrate averaged 1.9% and ranged from 1.8% up to 2.1%. In this range, copper is likely triggering minor penalty charges.
- Zinc grade in concentrate averaged 6.9% and ranged from 6.0% up to 8.5% which is likely triggering penalty charges.
- Arsenic grade in concentrate averaged 2.45% which is above the typical threshold for penalty payments therefore likely triggering penalty payments. No data was available for 2021.

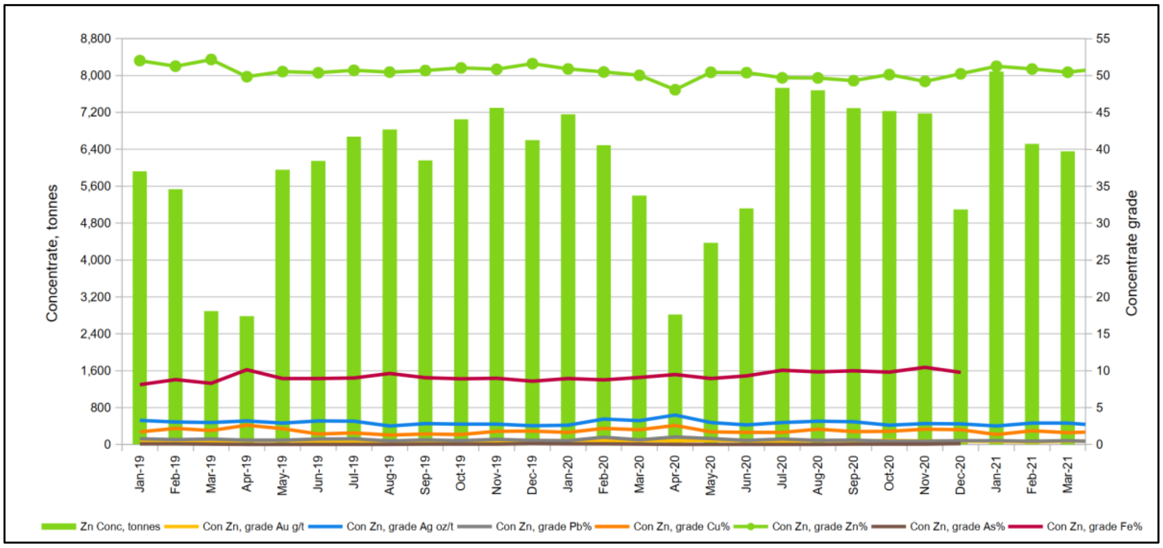


Source: SRK, 2021

Figure 17-6: Yauricocha, Copper Concentrate Production – January 2019 to March 2021

In terms of zinc concentrate production, its tonnage profile follows the same monthly profile to that of lead concentrate, that is, a seasonal drop in mill feed around the second quarter of each year, see Figure 17-7 Concentrate production is showing a sustained drop in production starting July 2021. During the period, copper concentrate production averaged 200 tonnes/day or equivalent to 6.5% mass pull and ranged from 6.4% to 6.6%. Zinc concentrate quality reached consistent and commercial grade averaging 50.5% in the period. Additionally:

- Gold grade in concentrate averaged 0.47 grams per tonne, and ranged from 0.41 g/t up to 0.51 g/t. At these grades, gold is below the deduction values and is not triggering credit payments.
- Silver grade in concentrate averaged 91 grams per tonne and ranged from 85 g/t up to 93 g/t. In the observed ranges, silver may trigger credit payments.
- Lead grade in concentrate averaged 0.6% and ranged from 0.5% up to 0.6%. In this range, copper is unlikely triggering penalty charges.
- Copper grade in concentrate averaged 1.8% and ranged from 1.6% up to 1.9% which is likely triggering penalty charges.
- Arsenic grade in concentrate is consistently low averaging 0.005 therefore likely triggering penalty payments. No data was available for 2021.



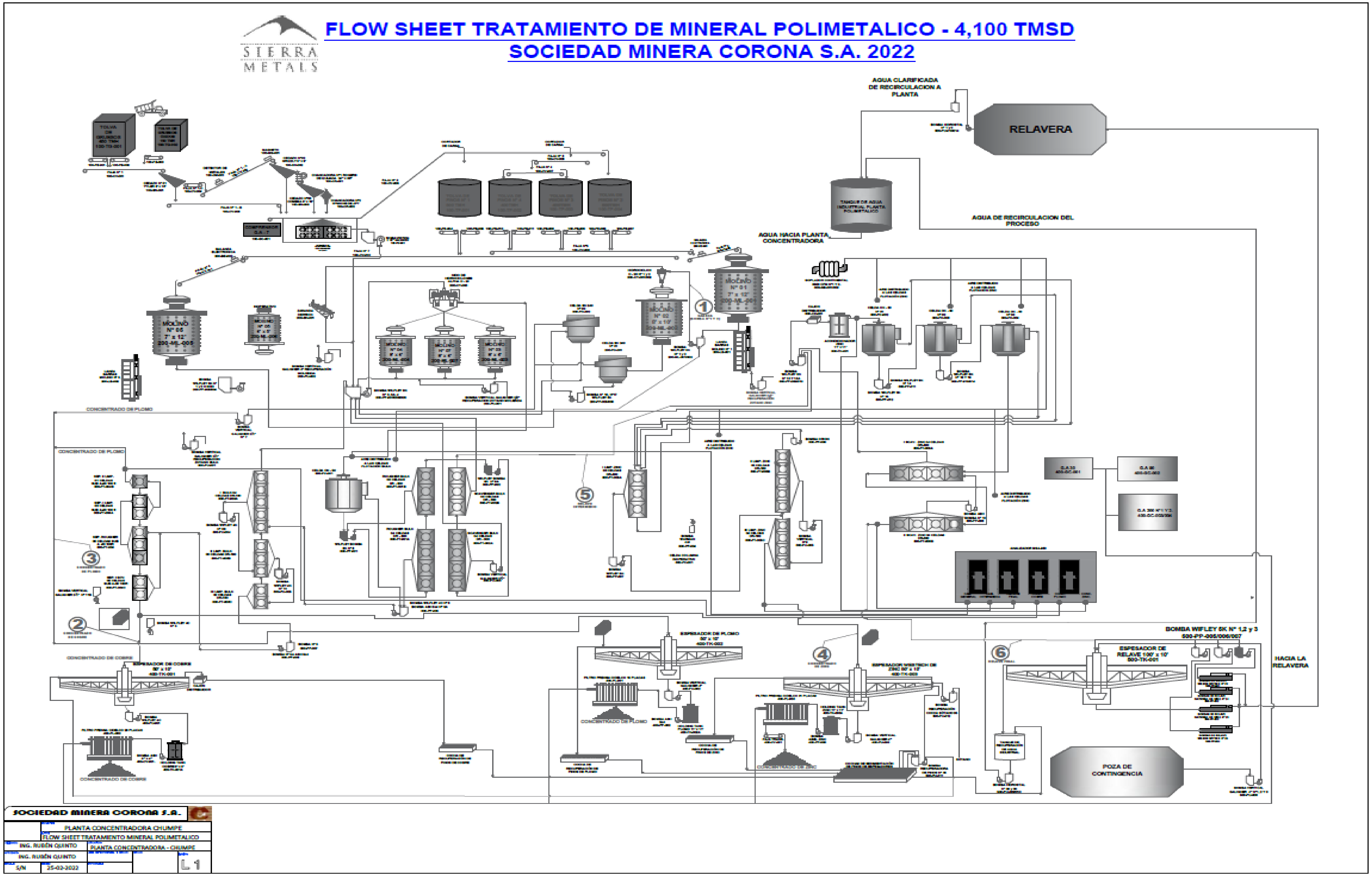
Source: SRK, 2021

Figure 17-7: Yauricocha, Zinc Concentrate Production – January 2019 to March 2021

17.2 Plant Design and Detailed Flowsheets

Yauricocha operates a conventional concentrator flowsheet. Mine haulage trucks deliver polymetallic mineralized material and oxide mineralized material to their dedicated coarse mineralized material bins. The single crushing plant batches mineralized material that is delivered to dedicated mineralized material bins to each processing line. Each process line includes a grinding stage and a sequential differential flotation plant. Concentrate streams are diverted to a dedicated thickener that feeds a concentrate filter.

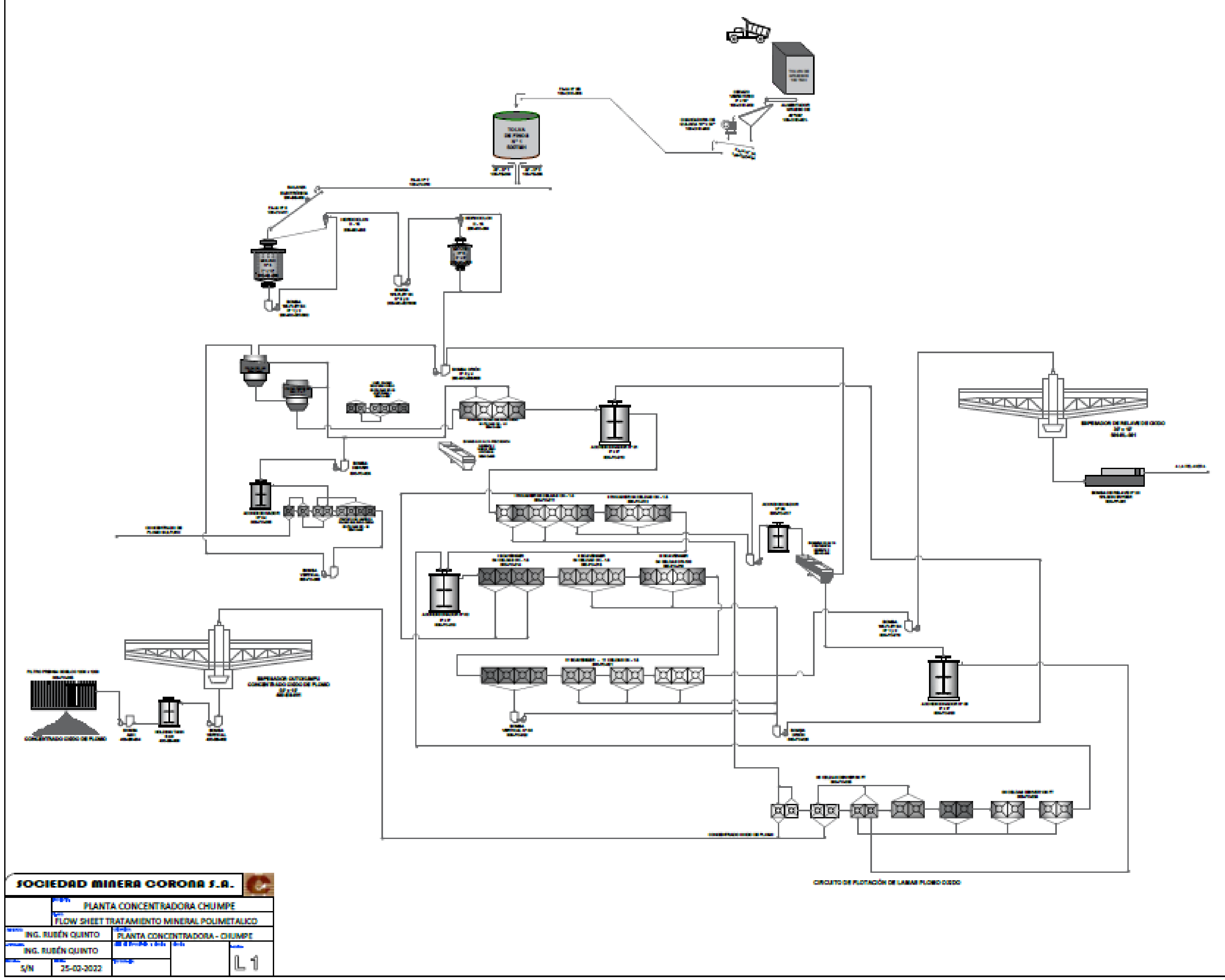
The detailed flowsheets for the polymetallic and oxide plants are shown in Figure 17-8 and Figure 17-9, respectively.



Source: Sierra, 2021

Figure 17-8: Yauricocha - Polymetallic Circuit Flowsheet

FLOW SHEET TRATAMIENTO DE MINERAL DE ÓXIDO DE PLOMO - 500TMSD - SOCIEDAD MINERA CORONA S.A.



ITEM	TAG.	CANTIDAD	DESCRIPCION
1.-	100-CHO-001	1	Alimentador de gruesos de 48"x50'.
2.-	100-CHO-002	1	Cedazo Vibratorio 6' x 16'.
3.-	100-CHO-003	1	Chancadora de Quijada 10" x 24".
4.-	100-CHO-004	1	Faja Transportadora N°2A
5.-	100-CHO-005	1	Faja Transportadora N°2B.
6.-	100-FE-004	1	Alimentador de Finos N°1
7.-	100-FE-005	1	Alimentador de Finos N°2
8.-	100-CV-010	1	Faja Transportadora N°7.
9.-	100-CV-011	1	Faja Transportadora N°8
10.-	200-BE-002	1	Balanza Electronica.
11.-	200-ML-005	1	Molino de Barras 7' x 12'. (Primario)
12.-	200-ML-006	1	Molino de Bolas 5' x 6' (Secundario)
13.-	200-MO-001	1	Bomba Wifley 5K N°1.
14.-	200-MO-002	1	Bomba Wifley 5K N°2.
15.-	200-MO-003	1	Hidrociclon Primario D-15 N°1.
16.-	200-MO-004	1	Hidrociclon Secundario D-15 N°2.
17.-	200-MO-005	1	Bomba Wifley 5K N°3
18.-	200-MO-006	1	Bomba Wifley 5K N°4
19.-	200-MO-007	1	Bomba Wifley 5K N°5
20.-	200-MO-008	1	Bomba Wifley 5K N°6
21.-	300-FO-001	1	Celda SK-80.
22.-	300-FO-002	1	Celda Circular SW 7' x 7'.
23.-	300-FO-003	1	Limp. Plomo Sulfuro Banco de 6 celdas SP-18.
24.-	300-FO-004	1	Banco de 4 celdas OK- 1.5
25.-	300-FO-005	1	Bomba Denver.
26.-	300-FO-006	1	Acondicionador 8' x 8' N°4.
27.-	300-FO-007	1	Circuito de Limpieza Banco de 8 celdas SP-18.
28.-	300-FO-008	1	Bomba Vertical.
29.-	300-FO-009	1	Zaranda de alta frecuencia Derrik.
30.-	300-FO-010	1	Acondicionador 8' x 8' N°1.
31.-	300-FO-011	1	Rougher I Banco de 6 celdas OK-1.5
32.-	300-FO-012	1	Rougher II Banco de 4 celdas OK-1.5
33.-	300-FO-013	1	Acondicionador 8' x 8' N°2.
34.-	300-FO-014	1	I Scavenger Banco de 4 Celdas OK- 1.5
35.-	300-FO-015	1	II Scavenger Banco de 4 Celdas OK- 1.5
36.-	300-FO-016	1	III Scavenger Banco de 4 Celdas OK- 1.5
37.-	300-FO-017	1	Acondicionador 8' x 8' N°5.
38.-	300-FO-018	1	Zaranda de alta frecuencia Derrik 2.
39.-	300-FO-019	1	Bomba Wifley 5 K
40.-	300-FO-020	1	Acondicionador 8' x 8' N°3.
41.-	300-FO-021	1	IV Scavenger Banco de 11 Celdas OK- 1.5
42.-	300-FO-022	1	Bomba Vertical.
43.-	300-FO-023	1	Bomba Orion.
44.-	300-FO-024	1	4 Celdas Denver 100 ft Limpieza.
45.-	300-FO-025	1	6 Celdas Denver 50 ft Limpieza.
46.-	400-ES-001	1	Espesador Outokumpo 50' x 10'
47.-	400-ES-002	1	Bomba Vertical.
48.-	400-ES-003	1	Holdink Tank 6 m3
49.-	400-ES-004	1	Bomba Ash.
50.-	400-ES-005	1	Filtro Prensa Cidelco 1200 x 1200
51.-	500-RL-001	1	Espesador de relave 30' x 10'
52.-	500-PP-001	1	Bomba de relave N°23

Source: Sierra, 2021

Figure 17-9: Yauricocha - Oxide Circuit Flowsheet

17.3 Plant Equipment

Yauricocha uses conventional concentration equipment, and the operation is completely manual. An online x-ray analyzer is being installed that will allow for real-time control of the process. Both circuits have a flotation feed target of approximately P80 = 104 micrometers, which is monitored manually using a Marcy scale.

Yauricocha is increasing the Pb-Cu bulk flotation time by installing one OK-50 flotation cell and replacing smaller, older cells in the zinc circuit. Overhaul of the concentrate thickener with a torque monitoring and a rake positioning system was implemented in 2020 to improve underflow slurry density and increase concentrate filtration capacity. Work continues to de-bottleneck the plant to maximize capacity. Table 17-3 summarizes the major process equipment.

Table 17-3: Yauricocha Plant - Major Process Equipment

Area	Equipment	Specification	# Units	kW
Crushing	Jaw crusher	10 inch x 24 inch	1	45
Oxide	Rod mill	7 ft x 12 ft	1	360
Oxide	Ball Mill	5 ft x 6 ft	1	63
Oxide	Flotation cell	7 ft x 7 ft	1	30
Oxide	Flotation cell	Denver 60	22	11
Oxide	Flotation cell	OK 1.5	33	22
Oxide	Flotation cell	SP 18	14	7
Oxide	Flotation cell	Denver 100	8	45
Oxide	Pb Ox Con. Thickener (Con. Cu)	50 ft x 10 ft	1	6
Oxide	Pb Ox Press filter (Con. Cu)	1,200 x 1,200	1	
Polymetallic	Jaw crusher	24” x 36”	1	45
Polymetallic	Cone crusher	4 ft	1	75
Polymetallic	Ball Mill	8 ft x 10 ft	1	360
Polymetallic	Ball Mill	8 ft x 6 ft	3	186
Polymetallic	Rod mill	7 ft x 12 ft	1	186
Polymetallic	Flotation cell	SK 240	2	
Polymetallic	Flotation cell	OK 30	3	
Polymetallic	Scavenger Flotation cell (Zn)	DR-300	8	238.6
Polymetallic	First Cleaning Flotation cell (Zn)	DR-300	3	89.5
Polymetallic	Second Cleaning Flotation cell (Zn)	DR-180	5	111.9
Polymetallic	Third Cleaning Flotation cell (Zn)	DR-180	4	89.5
Polymetallic	Column cell		1	
Polymetallic	Conditioner	14 ft x 14 ft	1	
Polymetallic	Flotation cell (Pb/Cu)	DR-180	10	223.7
Polymetallic	Flotation cell	Sub-A 30	12	45
Polymetallic	X-Ray Slurry Analyzer	Multi-Stream Analyzer 330	1	
Polymetallic	Cu Con. Thickener	30 ft x 10 ft	1	4
Polymetallic	Pb Con. Thickener	50 ft x 10 ft	1	1.11
Polymetallic	Zn Con. Thickener	50 ft x 10 ft	1	1.11
Polymetallic	Tails thickener	100 ft x 10 ft	1	
Polymetallic	Pb Press filter	1,200 mm x 1,200 mm	1	
Polymetallic	Zn Press filter	1,500 mm x 1,500 mm	1	

Source: Sierra, 2021

17.4 Plant Consumables

The consumables statistics for 2020 are shown in Table 17-4 for the polymetallic circuit. All consumables arrive at the Yauricocha mine site by truck, mostly from Callao Port in Lima.

Table 17-4: Polymetallic and Oxide Circuits – Consumables

Area	Item	kg/ton of Fresh Feed
Polymetallic	S04Zn	0.75
Polymetallic	NaCN	0.333
Polymetallic	Z-11	0.033
Polymetallic	Z-6	0
Polymetallic	MIBC	0.053
Polymetallic	FROTHER-70	0
Polymetallic	Lime	0.666
Polymetallic	CuSO4	0.566
Polymetallic	Sodium Metabisulfite	0.2
Polymetallic	Phosphate Monos.	0
Polymetallic	Z-14	0.033
Polymetallic	Sodium Dic.	0
Polymetallic	Zn Oxide	0.166
Polymetallic	Steel balls 1 ½” Ø	0.333
Polymetallic	Steel balls 2” Ø	0.466
Polymetallic	Steel rods 3” Ø	0.4

Source: Sierra, 2021

18 Project Infrastructure

The Project is a mature producing mine and mill, and all required infrastructure is fully functional. The Project has highway access with two routes to support the Project's needs, and the regional capital Huancayo (population 340,000) is within 100 km. Personnel travel by bus to the site and are accommodated in one of four camps. There are currently approximately 1,460 personnel on-site with 400 employees and 1,060 contractors.

The on-site facilities include the processing plant, mine surface facilities, underground mine facilities, tailings storage facility (TSF), and support facilities. The processing facility includes unit processes such as crushing, grinding, flotation, dewatering and concentrate separation, concentrate storage, and thickening and tailings discharge lines to the TSF. The underground mine and surface facilities include headframes, hoist houses, shafts and winzes, ventilation structures, mine access tunnels, waste storage facilities, powder and detonator magazines, underground shops, and diesel fuel and lubrication storage. The support facilities include four accommodation camps where personnel live while on site, a laboratory, change houses and showers, cafeterias, medical facility, engineering and administrative buildings, and miscellaneous equipment and electrical shops to support the operations.

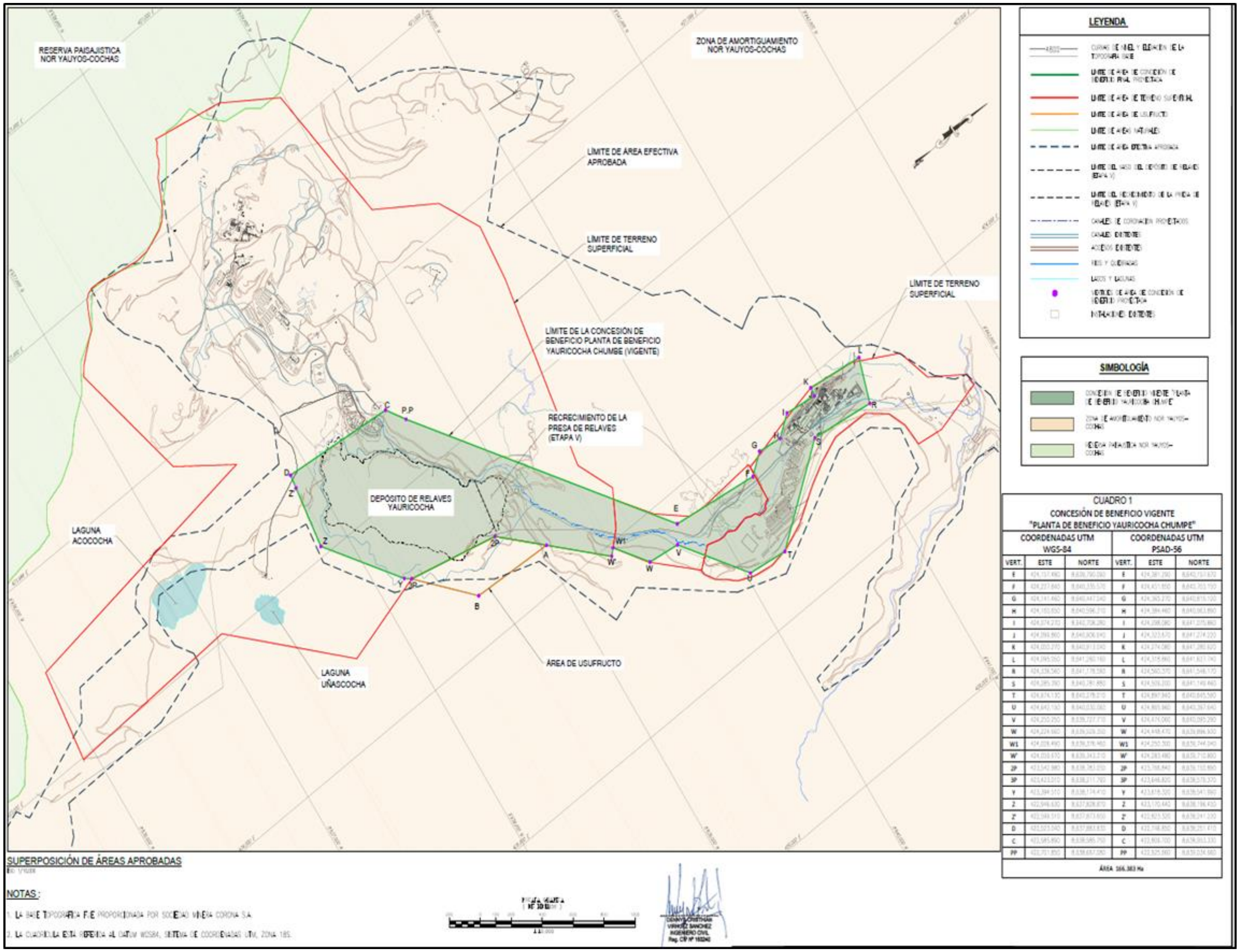
The site has existing water systems to manage the Project's water needs. Water is sourced from Acococha Lagoon, Mishquipuquio and Huacuypacha Spring, Klepetko tunnel and recycle/overflow water from the TSF, depending on end use. Water treatment systems treat the raw water for use as potable water or for service water in the plant. Additional systems treat the wastewater for further consumption or discharge.

Energy for the site is available through electric power, compressed air, and diesel. The electric power is supplied by contract over an existing 69 kV line to the site substation. The power is distributed for use in the underground or at the processing facility. The current power load is 10.92 MVA with approximately 70% of this being used at the mine and the remainder at the mill and other facilities. The power system is planned to be expanded to approximately 14 MVA by the end of 2023. A compressed air system is used underground with an additional 149 kW compressor system being added, and diesel fuel is used in the mobile equipment and in the 895-kW backup electrical generator.

The site has permitted systems for the handling of waste including a TSF, waste rock storage facility, and systems to handle other miscellaneous wastes. The TSF was expanded in 2021 with another lift to provide one more year of capacity. Two additional lift stages in total will provide the Project with approximately 4.5 years of additional capacity.

An on-site industrial landfill is used to dispose of the Project's solid and domestic waste. The Project collects waste oil, scrap metal, plastic, and paper which are recycled at off-site licensed facilities.

The site has an existing communications system that includes a fiber optic backbone with internet, telephone, radio and paging systems. The security on-site is managed through checkpoints at the main access road, processing plant, and at the camp entrances.

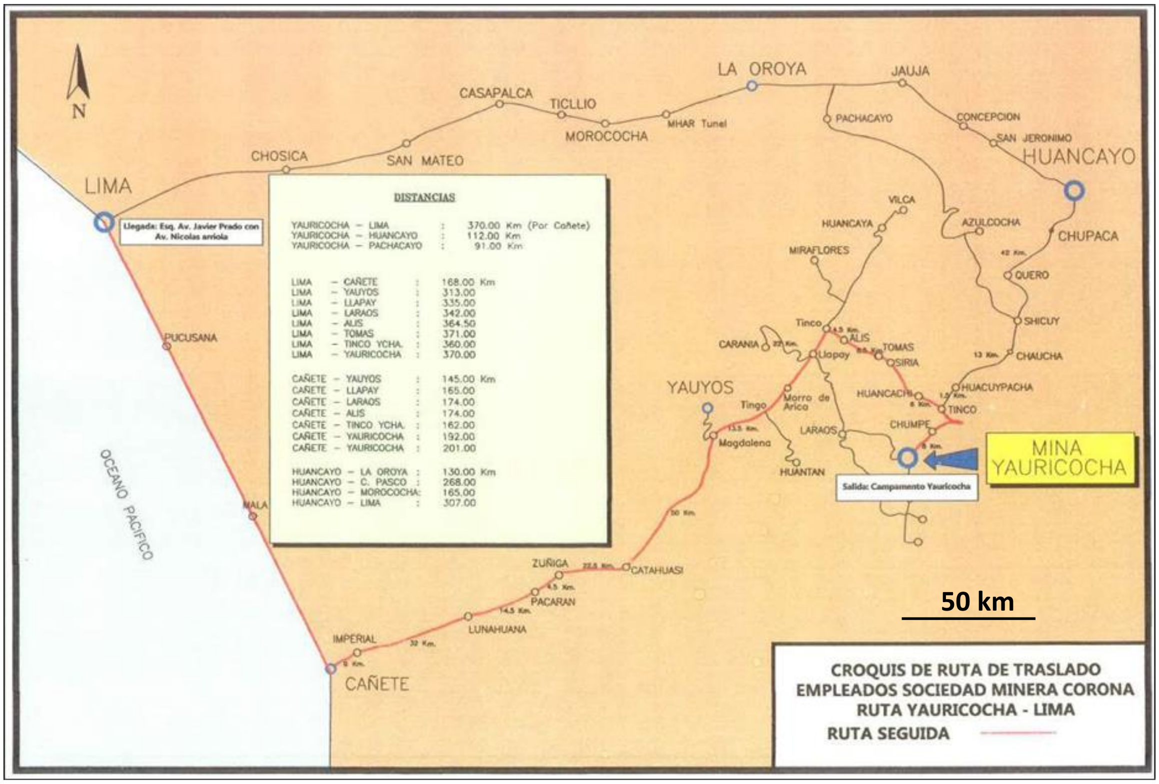


Source: Sierra Metals, 2021

Figure 18-1: Project Infrastructure Location

18.1 Access, Roads, and Local Communities

The Project site is remote in the mountains of Peru and is accessed by road from Lima on the Lima-Huancayo-Yauricocha Highway; this route is approximately 392 km long and the final section of the road is unpaved. A second access uses the paved Pan-American Highway from Lima for about 137 km, and then the old Pan-American Highway and the Cañete-Yauyos highway on to Yauricocha; this route is approximately 370 km. The site has developed several gravel secondary roads for access to the mine area (to the west), mill (to the east), and tailings areas (centrally located) as well other areas of the Project. Figure 18-2 shows the routes.



Source: Sierra Metals, 2021

Figure 18-2: Routes from Lima to the Project

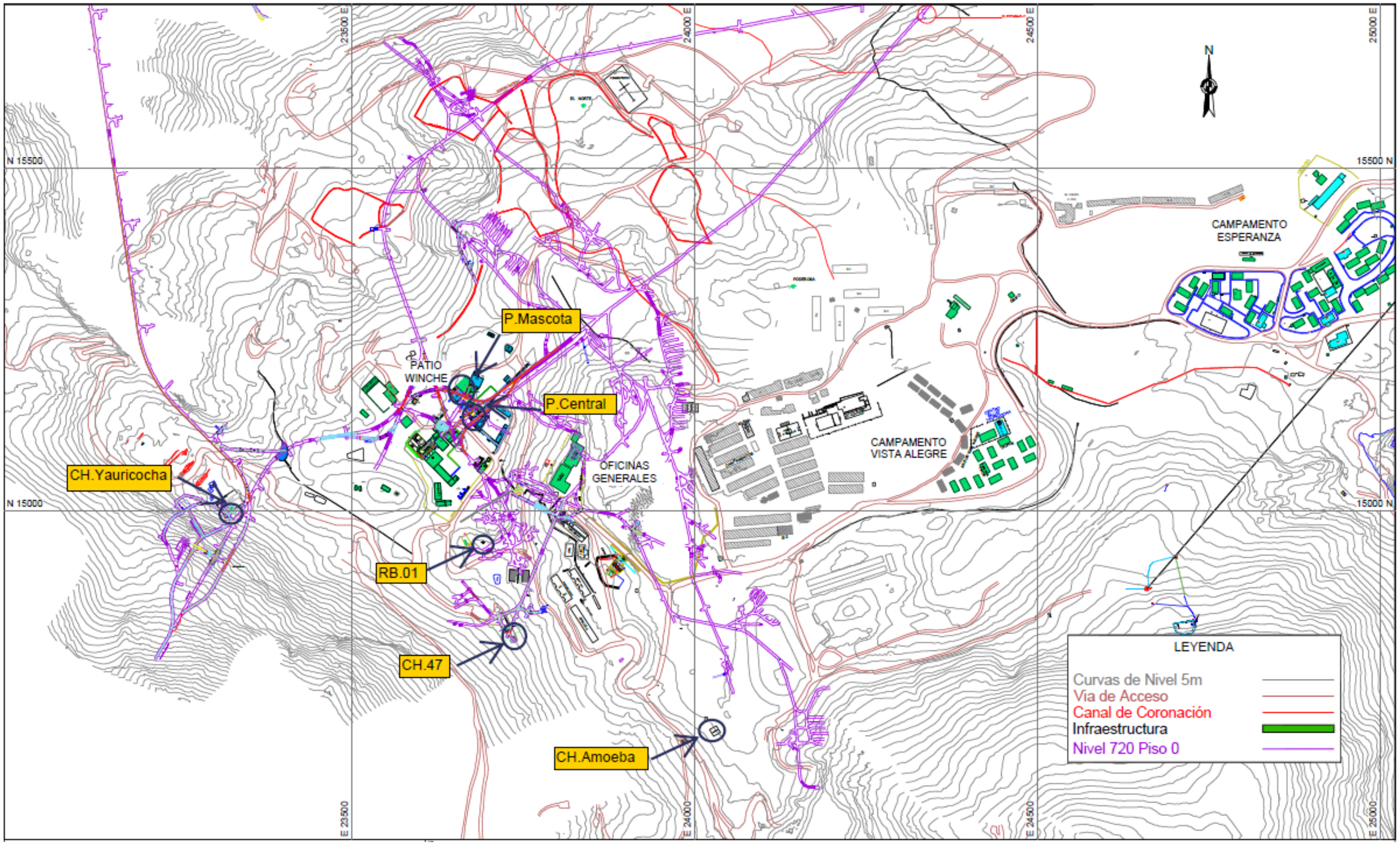
The Pachacayo railway station is located approximately 100 km north of the Project. The largest community nearest to the mine is Huancayo which is located approximately 100 km to the east-northeast. Huancayo, and the surrounding communities, have a combined population of approximately 400,000 people. Huancayo is the capital of the Junin Region of Peru.

18.2 Process Support Facilities

A fully developed processing facility with required support facilities exists on-site and is discussed in detail in Section 17. The plant facility includes crushing, grinding, flotation, dewatering and concentrate separation, concentrate storage, and thickening and tailings discharge lines to the TSF. The processing facility also has shops, sample laboratory, change house and shower, and engineering/administration facilities.

18.3 Mine Infrastructure – Surface and Underground

The mine surface facilities include the hoists and headframes that support the operation of the shafts on-site. Additionally, the change house and dry facilities, shops, engineering, and mine administrative facilities are in place. The mine area layout is shown in Figure 18-3.



Source: Sierra Metals, 2021

Figure 18-3: Mining Area Infrastructure

18.3.1 Underground Access and Haulage

The underground mine access is through existing shafts and tunnels. The site currently has three shafts in service: The Central shaft, the Mascota shaft and the Cachi-Cachi shaft. A new Yauricocha shaft is currently under construction.

The shafts are typically used to move men and materials but can also move mineralized material and waste to the surface if necessary. The shafts are also used to move mineralized material and waste from depth to the 720-haulage level where the material is then hauled by rail from underground tunnels to the surface. All mineralized material and waste hauling to the surface is currently moved through the tunnels only.

18.3.2 New Yauricocha Shaft

The Yauricocha shaft project is located to the southwest of the Mascota / Central shaft, the depth of 630m, from level 640 (upper level - production hoist pulley) to level 1270 (bottom level - shaft pumping system). The excavation section of the Yauricocha shaft is 4.8m x 4.8m, with timber sets. The shaft has 4 compartments: (2) for the skips, (1) for the personnel cage and (1) for services and a ladder escapeway.

For the mineralized material and waste movement in the shaft, several loading zones have been established. There are loading zones located at the 1170 and 1210 levels with main components such as: grizzly, pockets, chutes, apron feeder, conveyor, bins, and spill pocket. There are also loading zones located at the 660 and 680 levels; each of these levels provide feed to the 720-haulage level where the material is then hauled by rail from underground tunnels to the surface. The new Yauricocha shaft is currently under construction and is expected to be commissioned in 2025. In 2020, following work stoppage from the pandemic, construction work has been rescheduled from 2021 until the conclusion of the project.

18.3.3 Central Shaft and Central Incline Shaft

The 810 m deep Central Shaft currently is used to hoist personnel and materials from Surface until 980 level. In August 2021, the 96 "x 56" CIR hoist equipment that previously operated the Mascota Shaft was repaired and replaced the 84”x48” Nordberg hoist equipment of the Central Shaft, guaranteeing greater mechanical availability and reliability in the hoisting of personnel and materials. The Central Shaft is currently being rehabilitated from the 465 to 520 levels by a mining contractor, Los Andess. The rehabilitation of the 1st phase ended in March 2021, the 2nd phase is planned for completion by March 2022 and the 3rd phase will be completed later in 2023. The reinforcement of this 2nd phase consists of ring sets of reinforced concrete and H beams, shotcrete with bolts and mesh.

18.3.4 Mascota Shaft

The Mascota shaft can move 135 t/h of mineralized material and 110 t/h of waste. The 920 m deep Mascota shaft services the 1120 to 720 levels. The Mascota shaft utilizes a new Hepburn hoist and is able to move approximately 105,000 t/month. Commissioning was completed in December 2016. The Mascota shaft timber sets were refurbished in 2018 with shaft timber sets cleaned of mineralized material and timber sets reinforced and any missing wall liners replaced. Additionally, the 1120 development drift was excavated in 2018 for shaft bottom clean-up.

18.3.5 Cachi-Cachi Shaft

The Cachi-Cachi shaft provides access to the 870-level shaft bottom at 910 level and handles only Cachi-Cachi zone waste and mineralized material.

18.3.6 Subsidence in Central and Mascota Zones

The subsidence associated with the SLC extraction method currently impacts the central shaft, which is why it is in rehabilitation by a mining contractor, Los Andess, from the 465 to 520 levels as the 2nd phase and will finish in 2022 with a continuation of the 3rd phase from Surface to the 520 level. There is constant monitoring of the deformation and inclination of the shaft with two inclinometers of 150 m each installed parallel to the axis of the shaft. Additionally, settlement and displacement vectors are superficially monitored with a TM50 Leica robotics equipment. The Mascota Pique Impact has been eliminated to date; therefore, the surface winch has been relocated to level 720 where no subsidence impact has yet been shown.

18.3.7 Tunnel Haulage

The existing primary haulage is through the 4 km Klepetko tunnel (3 m high x 3 m wide) located on level 720. The haulage is achieved by 20 t electric trolley locomotive with cars of 3.1 to 4.5 m3 size.

The new Yauricocha tunnel excavation (3.5 m x 3.5 m) was completed from the surface (Chumpe) in April 2017. The tunnel is 4.7 km in length and accesses the mine at the 720 level. The tunnel was added to increase the flexibility of haulage and to de-bottleneck haulage that previously could only occur out of the Klepetko tunnel. The new Yauricocha tunnel also serves as a ventilation conduit. The tunnel infrastructure was installed with tunnel commissioning and close out was completed in December 2018. The Project cost was US$4.85 million.

18.3.8 Ventilation

The underground mine has a ventilation system that supports the Cachi-Cachi mine and an independent ventilation system that supports the Central mine.

The ventilation system in Cachi-Cachi has as fresh air inlet the Yauricocha tunnel and the main crossing (Bocamina 410) in Cachi-Cachi. Stale air is extracted through three surface shafts, the (Chimney) 919, the Rossy, and Raquelita shaft. A SIVA 139 HP primary fan is located at well 919 (level 300) and draws approximately 60,000 cfm. Air enters the mine through the main crossing and descends to the lower levels of the mine through the shaft to where production is in progress, then the air is expelled through the vents and ducts to the surface. Additionally, secondary and auxiliary fans are used throughout the mine to maintain air volume and quality.

The ventilation system at the Central mine intakes air from the Mascota, and Central Shafts, 300 main crossing and the Klepetko tunnel. The intake air is approximately 160,000 cfm. Stale air exits through Raise Borer Yauricocha, Amoeba Chimney and Raise Bore # 1. Main fans are located at these locations with an 400 HP Airtec fan on Raise Bore Yauricocha, a 180 HP Joy fan on the Amoeba Chimney, and a 200 HP Joy fan at Raise Bore # 1. Air is blown through the ramps and crossovers, directed with secondary and auxiliary fans to maintain air volume and quality in sufficient quantities for the mining operation. The mine is currently developing the construction of Chimney 47 that will be used as an air extractor with the support of 2 fans jointly having 150,000 cfm.

18.4 Additional Support Facilities

Project employees live on-site in four accommodation camps: Esperanza, Vista Alegre, Chumpe y Huacuypacha, plus a hotel, with total accommodation facilities for approximately 1,460 people. The camps include the supervisory camp, the mill camp, and the mining camp that also houses mining contractors. There are approximately 1,460 people (400 employees/1,060 contractors) currently working on the site. The camps include, dining facilities, exercise facilities, and housing facilities.

Other general facilities include engineering and geology, safety, and environmental offices and buildings. A health clinic on-site is staffed by a National Health Service doctor. There are additional underground shops, explosives and detonator magazines, and fuel and oil storage facilities. The mine is currently working on a conceptual study of the New Camp in Chumpe with a capacity for 1,700 people, where the staff of Camp Esperanza will be relocated.

18.5 Water Systems

18.5.1 Water Supply

Water is sourced from Uñascocha Lagoon, Acococha Lagoon, Mishquipuquio Spring, Huacuypacha Spring, Klepetko tunnel and recycle/overflow water from the TSF, depending on end use. The location of the two lakes can be seen in Figure 18-1. The quality of water and general use is summarized in Table 18-1.

Table 18-1: Makeup Water Source and Use

Source	Volume (L/sec)	Use
Acococha Lagoon, Uñascocha Lagoog	4	Mining compressor and offices: 1.5 L/sec
		Yauricocha Camp: 1.5 L/sec
Mishquipuquio Spring	2	Chumpe Camp: 1.5 L/sec
Huacuyacha Spring	10	Huacuypacha Spring
Klepetko Tunnel	40	Concentrator Plant: 1.3 L/sec

Source: Sierra Metals, 2021

18.5.2 Potable Water

The water from the Mishquipuquio and Huacuypacha springs are destined to supply the Chumpe and Huacuypacha camps respectively, after treatment. The water treatment system consists in the filtration process as a first step, making use of automatic multimedia filter, with the aim of correcting any problems such as the presence of sediments and other forms of suspended solids and the disinfection of the water by injecting chlorine through a dosing pump, enabled with the average concentration of sodium hypochlorite. Both systems have sanitary authorization for potable water consumption and the treatment capacity of the system is 1.3 L/ s.

The water treatment system to supply Esperanza (Esperanza and Vista Alegre Camp), consists of infrastructure installed for the pre-treatment for As precipitation, and O_2 water purification systems similar to the one installed in Chumpe. The purification systems are installed to work in parallel, and the treatment capacity of the system is 1.3 L/s.

18.5.3 Service Water

Service water is used primarily at the Chumpe mill and small quantities are used for dust control on the mine surface operations. Water collected inside the mine is brought to the surface for treatment. Water used in the compressor cooling system is recirculated. The Chumpe processing plant recirculates as much water as possible.

18.5.4 Water Treatment

Water from the mine and water from the tailings are treated at the Minawater treatment plant. The plant has a capacity of 1,000 l/sec. Treated effluent is discharged into the Tinco River after complying with the treatment process and the authorized volume of discharge is 427.9 L/s.

Domestic wastewater from the camps is treated by on one of the two treatment plants with an activated sludge system. The plants have a total capacity of 1.7 l/sec. Part of the treated water enters the continuous wastewater recirculation system, so no effluent is released to the environment and there is an authorization to reuse water (for operations in concentrator plant). The quality control of the treated water is continually monitored by environmental personnel to ensure compliance with the maximum permissible limits

18.6 Energy Supply and Distribution

18.6.1 Power Supply and Distribution

The current total electrical load for the Project is 10.92 MVA. The primary power is provided through Sistema Interconectado Nacional (SEIN) to the Oroya Substation. A three phase, 60 hertz, 60 kV power line owned and operated by Statkraft (SN Power Peru S.A.) through its subsidiary, Electroandes S.A., delivers electricity from the Oroya Substation to the Project substation at Chumpe. Power is delivered at line voltage to the mine and processing plant substations and approximately 5.09 MVA is supplied to the mine, 4.87 MVA is supplied to the processing plant and 0.97 MVA is supplied to the camp.

The load will increase by approximately 3 MVA due to the installation of a new pumping system in 2023. In the process plant, the demand will increase by 0.15 MVA due to the entry into operation of the Zinc super conditioner in 2022. The additional power will be addressed by installation of 2 transformers of 10 MVA and 12 MVA capacity. The power supply requirements can be met by the existing 69 kV power system.

Statkraft owns, operates, and is responsible for maintenance of the Chumpe substation. 895 kW of backup generation is available through a CAT 3512B backup generator. The Project completed the addition of a 12.6 kV overhead ring line that allows the mine backup generator to be used for emergency loads in the processing plant and the Cachi-Cachi Zone. The Project has a 10-year power supply contract that was signed in November of 2013 and runs through October 2023.

18.6.2 Compressed Air

The mine uses compressed air for powering air chutes, drilling equipment, small pumps, and miscellaneous tools. The system includes compressors and tanks at the surface with piping distributing the compressed air throughout the mine. A 149 kW Compressor was added in 2018 to improve the compressed air system. The mill has a smaller compressed air system for control air and miscellaneous tools.

18.6.3 Fuel

The Project has diesel storage tanks on-site that store fuel for use in surface mining equipment and can be transferred to the underground fuel storage facilities. These tanks have been in use for several years and there are two sets of fuel tanks with a total capacity of approximately 104,000 L. The first group of tanks is located at the Chumpe plant and have a total capacity of just over 68,000 L. The Chumpe tanks provide approximately 30 days of fuel supply at an average consumption of 2,100 L/d. The second set of four tanks is located near the Yauricocha Mine and has a total capacity of approximately 36,000 L. Approximately 5,700 L/d are used from the mine tanks that provide approximately six days of storage.

Fuel is purchased from vendors in Huancayo and transported to the site by truck. The 2020 fuel cost was US$2.91/gal. Table 18-2 and Table 18-3 show storage capacities of the two fuel storage areas.

Table 18-2: Chumpe Diesel Storage Capacity (US Gallons and Litres)

Chumpe Location	US Gallons	Litres
Tank 01	3,384	12,810
Tank 02	1,127	4,266
Tank 03	2,230	8,441
Tank 04	2,230	8,441
Tank 05	3,064	11,598
Tank 06	6,000	22,712
Total Chumpe Capacity	**18,035**	**68,270**

Source: Sierra Metals, 2021

Table 18-3: Yauricocha Location Diesel Storage Capacity (US Gallons and Litres)

Yauricocha Location	US Gallons	Litres
Tank 07	4,354	16,482
Tank 08	1,643	6,219
Tank 09	1,457	5,515
Tank 10	2,042	7,730
Total Yauricocha Capacity	**9,496**	**35,946**

Source: Sierra Metals, 2021

18.7 Tailings Management Area

Tailings from the Chumpe mill are stored in on-site tailings facilities. The tailings undergo flocculation and sedimentation and are then processed through a thickener and channeled to the existing permitted TSF. The dam up to Stage 7 has a capacity of 5,766 k m^3 Currently, Stage 5 Phase 2 (4,533 masl) is under construction for a capacity of 2,046 k m^3. The construction of Stage 6 will occur in 2022 and Stage 7 in 2024. Table 18-4 shows some of the parameters of the expansion of Stage 5, Phase 02.

Table 18-4: Tailings Storage Facility (Stage 5 Expansion)

Description	**Stage 5 Phase 2**
Berm level	4,533.00 masl
Level of storage	4,531.50 masl
Projected level of final berm (Stage 6)	4,537.00 masl
Maximum storage level	4,535.00 masl
Freeboard	2.50 m
Berm width	8.00 m
Upstream slope	vertical
Downstream slope	2.5H:1V
Volume of dam fill material	6,931.6 m^3
Horizontal projection area of the TSF	430,812.39 m^2
Volume of stored tailings material	2,046,385. m^3
Horizontal projection area of dike footprint	32,745.31 m^2
Growth Phases (Stage 5)	Phase 01: 4,531 masl
	Phase 02: 4,533 masl
Additional life of TSF - Phase 02	2.1 years
Description	Stage 6
Berm level - Stage 5	4,533.00 masl
Maximum tailings level – prior to Stage 5	4,531.00 masl
Projected level of final berm Stage 6	4,537.00 masl
Maximum storage level	4,535.00 masl
Freeboard	2.50 m
Berm width	8.00 m
Upstream slope	Vertical
Downstream slope	2.5 H:1V
Horizontal projection area of the TSF	453,348 m^2
Volume of stored tailings material	1,789,140 m^3
Horizontal projection area of dike footprint	
Volume of dam fill material	172,105.5 m^3

Source: Sierra Metals, 2021

18.7.1 Expansion of TSF (Stage 5 and 6)

Sierra Metals engaged Geoservice Ingenieria (GI) to design the TSF expansion for Stages 5 to 7 with a priority on Stage 5, which will resume Phase 2 in February 2021. SRK didn’t undertake a review of the designs. GI was contracted in 2013 by Sierra Metals to design approximately 10 years of additional capacity. The future tailings storage for the Project will incorporate three additional 4 m raises to the existing TSF. The three raises are called Stage 5, 6, and 7. GI reviewed the previous design study by Klohn Crippen Berger (April 2009) and the GI report from October 2013. A topography surface was provided by Sierra in 2013. GI reviewed the site hydrology, geology, hydrogeology, seismic risk, and designed the TSF facility raises.

The TSF key design elements are summarized in Table 18-5.

Table 18-5: Yauricocha Key Design Elements for TSF Expansion Stages 5, 6, and 7

Design Item	Units	Stage 5	Stage 6	Stage 7
Altitude of crest, previous stage	masl	4,529	4,533	4,537
Maximum altitude of tailings, previous stage	masl	4,526	4,531	4,535
Height of extra elevation, this stage	m	4	4	4
Altitude of crest, this stage	masl	4,533	4,537	4,541
Maximum level of storage	masl	4,531.50	4,535	4,539
Freeboard	m	2.5	2.5	2.5
Width of crest	m	8	8	8
Length of Dam	m	305	372	425
Inclination of Upstream	grade	Vertical (strengthened ground)	Vertical (strengthened ground)	Vertical (strengthened ground)
Inclination Downstream	grade	2.5H: 1.0V	2.5H: 1.0V	2.5H: 1.0V
Volume of excavation/conformation	m^3 excavation/ m^3 fill	13,170 / 383,006.7	13,170 / 386,006.7	13,170 / 383,006.7
Storage	m^3/t	2,046,385 / 2,864,939	1,789,140/ 2,504,796	1,930,550/ 2,702,770
Useful Life	years - (months)	2.1 (25.2)	1.9 (22.8 months)	2.0(24)

Source: Sierra Metals, 2021

The designs of Stages 5, 6, and 7 yield a total storage of approximately 5.8 M m^3 or 8.1 Mt of tailings, which yields approximately nine years of storage at the projected annual tailings deposition rate of 938,571.423 m^3/y and an average tailings density of 1.4 t/m^3.

Table 18-6 summarizes the results of the study and projected direct capital cost of the raises.

Table 18-6: Yauricocha Summary Design Results for TSF Expansion Stages 5, 6, and 7

Stage	Volume (m^3)	Capacity (t)	Years	Direct Capital Cost (US$)	Unit Cost per Ton Tailings (US$/t)
5	2,046,385	2,864,939	2.1	$3,736,749	$1.30
6	1,789,140	2,504,796	1.9	$4,884,663	$1.95
7	1,930,550	2,702,770	2	$6,174,823	$2.28
Total	**5,766,075**	**8,072,505**	**6**	**$11,059,486**	**$1.37**

Source: Sierra Metals, 2021

18.8 Waste Rock Storage

Waste rock generated by the Project is used as backfill underground with the remainder transported to the surface, primarily through the Klepetko tunnel. There is an existing 1.2 M m^3 waste rock storage area on the surface, and in historic open pits, that are proximate to the shaft area that will be backfilled as a reclamation requirement. Some development materials will be hoisted through the shafts to backfill the pit. The trucking of waste from the plant location into an open pit is ongoing with 2018 tonnage of 454,528 t, 434,006 t in 2019, and 324,665 t in 2020. There is a borrow area on site for general construction purposes and to support tailings construction.

18.9 Other Waste Handling

Two on-site landfills are used to dispose of the Project industrial and sanitary waste. The Project collects waste oil, scrap metal, plastic, and paper which are recycled at off-site facilities.

18.10 Logistics

Materials and supplies needed for the Project operation are procured in Lima and delivered by truck. Labor is bussed to the site on the existing highways and roads from Lima or Huancayo. The concentrates are sold to different traders or the refinery. Currently, the mine's concentrates are delivered to warehouses assigned by our clients in Callao and to the Cajamarquilla refinery near Lima, Peru. The transport of the concentrates is done with 31 t trucks. The mine uses approximately 70-80 trucks per week to move the concentrates.

18.11 Off-Site Infrastructure and Logistics Requirements

The Project has no off-site infrastructure of significance and the 3 concentrate products produced at the mine are trucked to customer locations in Peru. The products consist of lead concentrate, copper concentrate and zinc concentrate.

18.12 Communications and Security

The site has an existing communications system that includes local internet, a fiber optic backbone, a telephone system, also underground telephone system and digital radio system. A paging system is also available at the plant and mine.

There are 6 security checkpoints at the main access road, the mill site, and at the camp entrances.

19 Market Studies and Contracts

Yauricocha is a polymetallic operation that currently produces lead, zinc and copper concentrates, which are sold to various smelters with slightly different specifications. Yauricocha currently holds contracts for the provision of its various concentrates, these contracts were not reviewed by SRK, but their terms were included in the provided technical economic model. The terms appear reasonable and in line with similar operations SRK is familiar with. No material concentrate contract changes are expected in the foreseeable future.

The payable metals produced from the Yauricocha concentrates are zinc, copper, silver, lead and gold. These commodities are traded on various metals exchanges. Long term (LT) metal prices were provided by Sierra Metals and have been derived from the November 2021 CIBC Global Mining Group Analyst Consensus Commodity Price Forecast.

In SRK's opinion the prices used are reasonable for the statement of Mineral Resources. The metal price assumptions are presented in Table 19-1.

Table 19-1: Metal Price Forecast

Metal	Unit	2021	2022	2023	2024	LT
Au	$/oz	1,809	1,806	1,754	1,706	1,598
Ag	$/oz	25.53	24.56	23.51	22.59	21.02
Cu	$/lb	4.16	3.99	3.75	3.84	3.39
Pb	$/lb	0.97	0.95	0.92	0.91	0.91
Zn	$/lb	1.31	1.24	1.17	1.16	1.10

Source: CIBC Global Mining Group, Analyst Consensus Commodity Price Forecast, November 2021

Metal price forecasts are based upon forward-looking information. This forward-looking information includes forecasts with material uncertainty which could cause actual results to differ materially from those presented herein.

20 Environmental Studies, Permitting, and Social or Community Impact

20.1 Required Permits and Status

20.1.1 Required Permits

Sierra has all relevant permits required for the current mining and metallurgical operations to support a processing rate of 3,600 tpd. The current regulation allows the operation to have a 5% additional as an average through the year, which allows the operation to process a maximum average of 3,780 tpd. These permits include operating licenses for the plant as well as for the waste disposal facility (tailings dam), mining and process concessions, exploration permits, water use license, discharge permits, sanitary treatment plants permit, and environmental management instruments, among others.

Sierra also has an Environmental Management Plan and a Community Relations Plan, both approved in the current 2019 Environmental Impact Assessment (EIA). Among the relevant permits, the following are highlighted:

- Land ownership titles.
- Public registrations (SUNARP) of:
  - Process concession.
  - Mining concession.
  - Constitution of “Acumulación Yauricocha”; and
  - Land ownership and Records owned property (land surface) and lease.
- Water use licenses from the Huacuypacha spring (1994), Klepetco tunnel (2004), Acococha and Uñascocha lagoons (2004), and Misaspuquio spring (2005)
- Environmental Permits
  - The Environmental Adjustment and Management Plan (PAMA) (1997),
  - EIA (2019),
  - EIA´s Technical Reports (N °1, N °2 and N°3) for the expansion of the processing capacity to 3600 tpd and expansion of the mine until 2024 (2021).
  - Second Update of the Closure Plan of the Yauricocha Unit (2020).
- Mining Permits
  - Mining Technical Report (ITM), for the construction and operation of the plant at a capacity of 3,600 tpd (2021).

– Authorization to operate the Yauricocha tailings facility up to 4531 m in altitude (Phase 5-Stage 1) (2020).

20.1.2 State of Approved Permits

Table 20-1 lists Sierra's permits and licenses which has been prepared based on reports of the Ministry of Energy and Mines (MINEM), National Environmental Certification Service (SENACE), National Water Authority (ANA), Public Registry of Mining (current INGEMMET), National Water Authority (ANA), National Public Registry Authority (SUNARP), General Directorate of Environmental Health (DIGESA), notary and information provided by Sierra.

The following permits were not available for review:

- 2019 Closure Plan financial guarantee accreditation.
- 2019 mining concessions proof of payment; and
- 2019 processing concession proof of payment.

Table 20-1: Approved Operation and Closure Permits

Date	Expiry date	Status	Issued By	Permits/Licensees	Document
Environmental Management Instruments					
Plan de Adecuación y Manejo Ambiental (PAMA), Informe Técnico Sustentatorio (ITS) and Environmental Impact Assessment (EIA)					
1/13/1997		Valid	MINEM	Approval of the PAMA (*Plan de Adecuación y Manejo Ambiental*), Environmental Adjustment and Management Program of the Yauricocha Production Unit of CENTROMIN located in the district of Alis, province of Yauyos and department of Lima	Directorate Resolution N° 015-97-EM/DGM
5/23/2002		Valid	MINEM	Approval of the modification of the implementation of the PAMA of the Yauricocha Production Unit by CENTROMIN	Directorate Resolution N° 159-2002-EM-DGAA
2/8/2007		Valid	MINEM	Approval of the implementation of the PAMA "Yauricocha" Administrative Economic Unit by Sierra.	Directorate Resolution N° 031-2007-MINEM- DGM Report N° 963-2006-MINEM-DGM-FMI-MA
6/9/2015		Valid	MINEM	Conformity of the Supporting Technical Report (ITS, *Informe Técnico Sustentatorio*) to the PAMA for "Expanding the capacity of the Processing Plant Chumpe of the Accumulated Yauricocha Unit from 2500 to 3000 TMD", presented by Sierra.	Directorate Resolution N° 242-2015-MINEM-DGAAM Report N° 503-2015-MINEM.DGAAM-DNAM-DGAM-D
11/12/2015		Valid	MINEM	Conformity of the second Supporting Technical Report (ITS) to the PAMA for "Technological improvement of the domestic wastewater treatment system " PAMA Accumulation Unit Yauricocha presented by Sierra.	Directorate Resolution N° 486-2015-MINEM-DGAAM Report N° 936-2015-MINEM-DGAAM-DNAM-DGAM-D
7/3/2017		Valid	MINEM	Approval of the third amendment of the ITS to the PAMA for "Addition of new equipment and infrastructure in the Chumpe concentrator plant process" of the Yauricocha Mining Unit, presented by Sierra	Directorate Resolution N° 176-2017-MINEM-DGAAM Report N° 288-2017-MINEM-DGAAM-DNAM-DGAM-D
4/5/2019		Valid	MINEM	ITS 4 from PAMA presented by Sociedad Minera Corona S.A.	Directorate Resolution N° 051-2019/MEM-DGAAM Report N° 174-2019/MEM-DGAAM-DEAM-DGAM
6/17/2019		Valid	MINEM	DIA approval for Yauricocha regional exploration activities.	Directorate Resolution N° 091-2019/MINEM-DGAAM Report N° 301-2019/MINEM-DGAAM-DEAM-DGAM
2/11/2019		Valid	SENACE	EIA for update of mining components, presented by Sociedad Minera Corona S.A.	Directorate Resolution N° 028-2019-SENACE-PE/DEAR Report N° 126-2019/SENACE-PE-DEAR
7/7/2020		Valid	SENACE	Conformity of the Supporting Technical Report (ITS, *Informe Técnico Sustentatorio*) to the EIA for disposal of waste in the mine.	Directorate Resolution N° 078-2020/SENACE-PE/DEAR Report N° 399-2020/SENACE-PE/DEAR
12/03/2021		Valid	SENACE	Conformity of the Second Technical Report to expand the capacity of the Processing Plant from 3000 to 3600 tpd	Directorial resolution N°041-2021-SENACE-PE/DEAR
13/09/2021		Valid	SENACE	Conformity of the Third Technical Reports to expand the mine util 2024	Directorial resolution N°00121-2021-SENACE-PE/DEAR Report Nº 00616-2021-SENACE-PE/DEAR,

Date	Expiry date	Status	Issued By	Permits/Licensees	Document
Environmental Management Instruments					
Mine Closure Plan					
8/24/2009		Valid	MINEM	Approval of the Mine Closure Plan (PCM) at feasibility level of the Yauricocha Mining Unit, presented by Sierra	Directorate Resolution N° 258-2009-MINEM- AAM Report N° 999-2009-MINEM-AAM-CAH-MES-ABR
12/17/2013		Valid	MINEM	Approval of the Yauricocha Mining Unit Mine Closure Plan Update, presented by Sierra	Directorate Resolution N° 495-2013-MINEM- AAM Report N° 1683-2013-MINEM-AAM-MPC-RPP-ADB-LRM
1/8/2016		Valid	MINEM	Approval of the amendment of the Closure Plan of the Yauricocha Mining Unit, presented by Sierra	Directorate Resolution N° 002-2016-MINEM-DGAAM Report N° 021-2016-MINEM-DGAAM-DNAM-DGAM-PC
1/15/2016	1/17/2017	Expired	Sierra	Proof of payment for Mine Closure Plan guarantee. Amount 14'346,816.00 USD-Period 2016	Report N° 2570612
2/28/2017		Valid	MINEM	Approval of the second amendment of the Closure Plan of the Yauricocha Mining Unit, presented by Sierra	Directorate Resolution N° 063-2017-MINEM-DGAAM Report N° 112-2017-MINEM-DGAAM-DNAM-DGAM-PC
12/29/2016	1/17/2018	Valid	Sierra	Proof of payment for Mine Closure Plan guarantee. Amount $14,458,801.00 USD (2017)	Report N° 2669957
9/1/2020		Valid	MINEM	Approval of the Second Update of the Mine Closure Plan of the Yauricocha Mining Unit, presented by Sierra	Directorate Resolution N° 111-2020-MINEM-DGAAM Report N° 339-2020-MINEM-DGAAM-DEAM-DGAM

Date	Expiry Date	Status	Issued By	Permits/Licensees	Document
Mineral Process Concession					
4/18/1996		Expired	MINEM	Definite authorization to operate the "Yauricocha Chumpe Processing Plant" at an installed capacity of 1350 TMD, CENTROMIN	Report N°164-96-EM-DGM-DPDM
9/4/2008		Valid	MINEM	Authorization to operate the "Yauricocha Chumpe Processing Plant", including an additional lead circuit and expanding its capacity to 2010 TMD, Sierra	Resolution N° 549-2008-MINEM-DGM-V Report N° 178-2008-MINEM-DGM-DTM-PB
9/16/2009		Valid	MINEM	Authorization to raise the Yauricocha tailings deposit dam crest by an additional 20 m in 4 stages, Sierra	Resolution N° 714-2009-MINEM-DGM-V Report 242-2009-MINEM-DGM-DTM-PB
7/14/2010		Valid	MINEM	Authorization to operate the Mill No. 4 (8' x 10') and the amendment of the "Yauricocha Chumpe" Benefit Concession to the expanded capacity of 2500 TMD, Sierra	Resolution N°279-2010-MINEM-DGM-V Report N° 207-2010-MINEM-DGM-DTM-PB
3/4/2011		Valid	MINEM	Operating license for the Ball Mill (5' x 6') for regrinding, installed in "Yauricocha Chumpe Processing Plant, Sierra	Resolution N°088-2011-MINEM-DGM-V Report N° 075-2011-MINEM-DGM-DTM-PB
4/3/2012		Valid	MINEM	Authorization to operate the "Yauricocha" tailings deposit up to 4519 m in altitude (second stage) with a free board of 2 m, Sierra	Resolution N° 112-2012-MINEM-DGM-V Report N° 112-2012-MINEM-DGM-DTM-PB
4/29/2014		Valid	MINEM	Authorization to operate the raised "Yauricocha- Chumpe" tailings deposit up to 4522 m in altitude, Sierra	Resolution N° 0159-2014-MINEM-DGM-V Report N° 128-2014-MINEM-DGM-DTM-PB
8/3/2015		Valid	MINEM	Authorization to operate the raised "Yauricocha- Chumpe" tailings deposit up to 4524 m in altitude (third stage)	Resolution N° 0344-2015-MINEM-DGM-V Report N° 240-2015-MINEM-DGM-DTM-PB
10/14/2015		Valid	MINEM	Authorization to build, implement equipment and operate the Chumpe Process Plant Extension Project 2500 to 3000 TMD of the "Yauricocha Chumpe" benefit concession, Sierra	Resolution N° 0460-2015-MINEM-DGM-MV Report N° 326-2015-MINEM-DGM-DTM-PB
8/29/2017		Valid	MINEM	Approval of the extension of the "Yauricocha Chumpe" benefit concession area. It was increased by 17,887 Ha. Also, authorization to build and operate civil and electromechanical works of the new equipment and auxiliary facilities of the "Yauricocha Chumpe" benefit concession	Resolution N° 0366-2017-MEM-DGM Report N° 229-2017-MEM-DGM-DTM-PB
03/09/2019		Valid	MINEM	Request for extension of benefit concession	Directorial Authorization. N° 437-2019-MINEM-DGM/DTM
04/11/2019		Valid	MINEM	Authorization to construction the Yauricocha tailings facility up to 4533 m in altitude (Phase 5- Stage 2).	Directorial Resolution N° 0535-2019-MEM-DGM/V (Exp. 2910746)
20/11/2020		Valid	MINEM	Authorization to operate the Yauricocha tailings facility up to 4531 m in altitude (Phase 5- Stage 1).	Directorial Resolution N°326-2020-MINEM-DGM/V,
14/06/2021		Valid	MINEM	Mining Technical Report, Construction and Operation Authorization of additional facilities in the process plant for a capacity of 3600 tpd.	Directorial Resolution N°0241-2021-MINEM-DGM/V.
Land Ownership					
--	12/21/2021	Valid	Sierra	Vílchez Yucra family (way of passage and installations)	--
--	3/7/2022	Valid	Sierra	Varillas Vílchez family (56 ha for mining use)	--

--	7/31/2037	Valid	Sierra	San Lorenzo de Altis Community (696,6630 ha for mining use)	--

Date	Expiry Date	Status	Issued By	Permits/Licensees	Document
Land Ownership					
--	Indefinite	Valid	Sierra	Mineral processing concession: Yauricocha Chumpe processing plant (148.5 ha for mining use and an authorized capacity for 2500 TMD)	
--	Indefinite	Valid	Sierra	Mining concession: "Acumulación Yauricocha" (18,777.9238 ha for mining use)	--
Water: Use, Discharge and Sanitation Facilities					
2004		Valid		Water use license for population purposes in the Yauricocha Production Unit, whose collection point is the Laguna Acococha – Uñascocha	Administrative resolution N°249-2004-GR-LP- DRA-MOC
1994		Valid		Water use license for population purposes in the Yauricocha Production Unit whose collection point is the Huacuypacha spring	Administrative resolution N° 013-1994-AG/DRA-LC/ATDR-MOC
2004		Valid		Water use license for industrial purposes in the Yauricocha Production Unit, whose collection point is the Klepetko Tunnel.	Administrative resolution N° 042-2004-AG/DRA-LC/ATDR-MOC
2005		Valid		Water use license for population purposes in the Yauricocha Production Unit whose collection point is the Misaspuquio spring	Administrative resolution Nº 225-2005-GR.L-DRA/ATDR-MOC
2017	1/31/2021	Valid		Authorization for the discharge of mine water from the Yauricocha Production Unit.	Administrative resolution N° 217-2017-ANA/DGCRH

Source: Sierra, 2021

The Environmental Adequation and Management Program (PAMA), as established by the Supreme Decree Nº 016-93-EM, was the first environmental management tool that was created for mines and metallurgical operations existing before 1994 to adopt technological advances and / or alternative measures to comply with maximum permissible limits for effluent discharge and emissions of mining and metallurgical activities. Since then, many environmental regulations have been enacted updating and/or replacing older regulations.

In 2013, Sierra began the preparation of an EIA for the deepening of the mine and the expansion of the tailings deposit. This study was developed under the normative framework of the environmental regulation approved by Supreme Decree No. 016-1993-EM. In this study the environmental and social baseline was updated, the environmental monitoring program was adjusted and updated, and the environmental management plan and community relations plan of the mining unit were approved. This report also includes an archaeological survey report for the certificate of nonexistence of archaeological remains (CIRA, certificado de inexistencia de restos arqueologicos). The EIA was finally approved in February 2019, however during the preparation and approval of the EIA, new regulations were approved such as the new environmental protection regulation for mining activities (DS N ° 040-2014-EM) and SENACE was designated as the competent environmental authority in the case of mining projects (December 2015).

Although the EIA has covered a large part of the requirements of the new environmental regulation for mining activities (S.D. N ° 040-2014-EM), there is a gap that must be covered related to the evaluation and management of environmental and social impacts. In that sense, the Peruvian environmental legislation contemplates that mine owners perform several studies to adjust to these new regulations, such as:

- Environmental Quality Standards Compliance for Soils (Estudio de Calidad Ambiental-ECA de Suelos). Sierra submitted this study to MINEM in compliance with the Supreme Decree N° 002-2014-MINAM, with register N° 2488477 (04/10/2015).
- Adequation plan for the liquid effluents discharge permissible limits (Plan Integral para la Adecuación e Implementación de sus actividades a los Límites Permisibles para la descarga de efluentes líquidos). Sierra submitted this study to MINEM in compliance with the Supreme Decree N° 015-2015-MINAM, with register N° 2706233 (19/05/2017).
- Deposition to the Department of Environmental Mining l Affairs (DGAAM), and Environmental Enforcement Agency (OEFA) of the activities and/or processes and/or extensions and/or existing components to regularize (Declaración Jurada de los componentes por Regularizar).
- In compliance with the Supreme Decree Nº 040-2015-EM all those activities, extensions, and/or components that have not been included in any Environmental Management Instrument had to be declared. Sierra did not declare any component. The submittal of this type of study is not available at present.

Between 2019 and 2021, Sierra has three Supporting Technical Reports which authorize the construction of the technological improvement of the domestic wastewater treatment system, the addition of new equipment and infrastructure in the concentrator plant process to increase capacity to 3,600 tpd, and to expand underground mining until 2024. This last Supporting Technical Report (ITS) was approved in 2021 by Directorate Resolution N°00121-2021-SENACE-PE/DEAR.

It's important to mention that in the case of operations that have a PAMA, it has the category of an environmental certification similar to an environmental impact assessment. In the case of Yauricocha, there is a PAMA and an EIA approved in 2019, so that currently both constitute the main environmental certifications for the Yauricocha operation, while the ITS only modify specific aspects of the operation contemplated within the environmental certifications. It should be noted that in accordance with the provisions of Supreme Decree No. 040-2014-EM, operations must integrate and update the environmental impact assessment of their operations with the objective that each operating unit has a single environmental management tool updated.

In this sense, and for the implementation of the 5.5 ktpd project, that includes the expansion of the Tailings Storage Facility, mine expansion, a waste dump implementation, and the expansion of the process plant capacity; Sierra is developing a modification of its EIA (EIA Modification). Currently, the preparation of the study has been formally started with the authority and the initial citizen participation process with the communities of the area of influence has been completed.

Additionally, it has completed the collection of information on the environmental baseline of the dry season (July to September) and the development of wet season field works is planned between December 2021 and January 2022. Sierra expects to present the EIA modification to the authority in the third quarter of 2022 for their evaluation. The authority in charge of evaluating the EIA Modification is SENACE with the participation of other authorities such as ANA, MINAGRI, MINEM and others.

20.2 Environmental Study Results

Sierra has updated its environmental base line and environmental monitoring program according to current regulation through different environmental permits and documents. These documents are mainly ITS to the initial PAMA, followed by the approval of an EIA (2019) and three ITS approved in July 2020, March and September 2021. The site has also submitted other documents such as the Water Standards Adequation Plan, the Soils Contaminated sites, and approved other significant documents such as the Closure Plan (September 2020)

The current monitoring plan is the one included in the EIA approved in February 2019, which is implemented by the site. The EIA includes different information encompassing multiple disciplines in the Baseline. From those, the following are noted:

- Land use capacity - Soils are suitable for cold climate grassland and protection.
- Actual land use - Is limited to urban (private or government), natural pastures and unproductive land.
- Wetlands: In the area there are some extensions of wetlands and according to the approved EIA there is a potential impact due to the expansion of the tailing's storage facility. For this, there are some specific environmental management measures.

- Soil quality - 32 samples from disturbed areas were analyzed and the results compared to the environmental quality standards for soil (Supreme Decree N° 002-2013-MINAM): arsenic, cadmium, lead and total petroleum hydrocarbons (TPH) exceed the environmental standards, as well as to a lesser extent also: benzene, xylene, naphthalene, toluene and ethylbenzene; This indicates that the area where the site operates is a mineralized area with high levels of metals identified since the baseline.
- Geology - There is predominantly sedimentary rock such as sand-, silt- and claystone, conglomerates, limestones, and dolomites.
- Biology - Terrestrial biology has been assessed in a dry and a wet season:
  - Flora - 12 species were identified listed as protected by Supreme Decree N° 043-2006-AG, among which categorized as Critical Endangered (CR): Ephedra rupestris, and as Endangered (EN): Nototriche tovari, as well as three species belonging to the CITES category II;
  - Birds - Four species were identified listed as protected by Supreme Decree N° 004-2014-MINAGRI, among which categorized as Endangered (EN): Vultur gryphus (Condor), seven species in the IUCN Red List and four species belonging to the CITES category I and II;
  - Mammals - Two species were identified listed as protected by Supreme Decree N° 004-2014-MINAGRI, among which categorized as Endangered (EN): Puma concolor (Puma), Vicugna (Vicuña) and two species belonging to the CITES; and
  - Reptiles and amphibians - Three endemic species were identified (gender: Lioalemus), but none is listed as protected.
- Hydrobiology - Indicates that in both wet and dry season for most monitoring stations the diatom pollution tolerance index IDG results in moderated polluted water (eutrophication), while the EPT and BMWP indicate in wet season bad water quality with presence of organic matter and in the dry season good water quality with presence of trout (Onchorynchus mykiss). In some, trout elevated concentrations of mercury and cadmium were found while in others retention of P, Na, Mg, K and Ca. Successive regular monitoring should be performed in the same five surface water quality monitoring stations for phytoplankton, zooplankton, benthos, periphyton and nekton.
- Hydrology - The Yauricocha project is in eight micro-watersheds belonging to the Alis and Laraos rivers sub-watersheds which include mountain tops with elevations as high as 4,800 and 5,300 meters above sea level.
- Springs - The water of the Laraopuquio and Quilcasa springs are slightly acidic while the water from the Chumpe 1 spring exceeds the environmental quality standards for copper, lead and manganese according to the Supreme Decree N° 002-2008-MINAM, category 3 (irrigation of tall and short stem crops and animal’s beverage).
- Surface water quality monitoring – The Monitoring is performed at seven monitoring stations: M-2, M-4 (707), PM-11, PM-12, PM13, PMZ-01 and PMZ-02. In the case of stations M-2 and M-4 (707), the sampling and analysis is carried out monthly, while in the rest of the stations it

is quarterly. Reports to the authority are made on a quarterly basis.. The water quality results are compared with the national environmental quality standards for Category 4: Conservation of the aquatic environment, subcategory E-2 rivers (Supreme Decree N° 004-2017-MINAM). In the third quarter of 2021, the field parameters (temperature, conductivity and dissolved oxygen) presented values within the ranges established in the ECA. However, in stations M-02 and M-04 (707) the pH slightly exceeded the ECA value, which is due to the geological characteristics of the soil (presence of limestone). Regarding the physicochemical parameters, all were found below the ECA. Total metals registered concentrations below the ECA except for the following: Lead registers values above the ECA at stations M-2 and M-4 in July and September. Station M-4 presented a manganese concentration above the ECA in August. At the PM-11 station, copper reported a value above ECA category N ° 4. However, all values are below or in accordance with the EIA baseline concentrations.

- Underground water quality monitoring - Groundwater quality monitoring is performed monthly for water levels and quarterly for quality. There are eleven approved stations, three of them under implementation (approved in the ITS). The quality results are referentially compared with the Category 3 ECA (irrigation and animal drinking) for surface water since there are no approved standards for groundwater. In the third quarter of 2021 the field parameters (pH, temperature and conductivity) registered values within the ranges of the reference ECA, except the pH in the DR-03-13 station, which registered a value slightly above. The dissolved oxygen of all the stations registered values outside the range of the reference ECA, which is usual in groundwater. All the physicochemical and microbiological parameters reported concentrations below the reference ECA values. Regarding total metals, they reported concentrations below the reference ECA values, except for arsenic in station DR-03-13, manganese in stations PB-02-13, PB-03-13 and DR-03- 13; and lead in all seasons.

- Effluent water quality - Monitoring is performed monthly, in one monitoring station: V-1 (705) and its quality is compared to Supreme Decree N° 010-2010-MINAM. Current Environmental Monitoring Report show that the effluent water quality complies with the maximum permissible limits for effluent discharge of metallurgical mining activities.

- Air quality - The monitoring is performed in five stations: CA-01 (704) CA-02, CA-03, CA-06 y CA-06b. The monitoring is performed in accordance with Supreme Decree N° 003-2008-MINAM. According to the EIA, the frequency of monitoring and delivery of reports to the MEM is every six months. All monitoring results are within the environmental air quality standards

- Noise: The monitoring is performed in five monitoring stations: R-1, R-2, R-3, R-4 and R-6 in accordance with Supreme Decree N° 085-2003-PCM. According to the EIA, the frequency of monitoring and delivery of reports to the MEM is every six months. All monitoring results are within the environmental air quality standards

- Soil quality monitoring - Monitoring is performed in four (04) stations: “MI-01-UY, MI-03-UY, MI-06-UY and PMS-01”. The results are compared with the National Environmental Quality Standards for soil (S.D. No. 002-2013-MINAM), ECA Soil. The frequency of monitoring and reporting to MINEM is quarterly. In the third quarter of 2021, all the physicochemical parameters and total metals complied with the Soil ECA, except for Arsenic in the MI-06-UY station.

20.3 Environmental Aspects

Data and information for this section is based on the successive environmental permits submitted and approved by the authority, as explained in the previous sections. The most recent and main environmental permit is the Yauricocha EIA approved in February 2019. This section describes the main activities at the site related to environmental management for the extraction and processing of mineralized material.

The Yauricocha Mine is an underground mine operated by the method of OCF stoping to extract its polymetallic mineralized material (sulfides) of lead, silver, copper, zinc and iron and lead silver oxide mineralized material.

- Mineralized material transport - The mineralized material is transported from the Klepetko tunnel to the hopper of the Chumpe mineral processing plant.
- Waste rock: The waste rock is disposed inside the mine; as fill material in construction activities, such as the implementation of the tailings dam; and in some closure activities. The mining unit has around 17 additional facilities for waste rock disposal that do not have additional capacity, at the moment, and are in the process of being closed. The current Closure Plan and the following updates consider two types of covers for the closure of waste dumps. The covers are designed for non-generating material for acid rock drainage (NAG) and for generating material for acidic rock drainage (PAG). There is currently no full study on ARD potential available to review whether different waste rock deposits are NPAG or PAG. However, as part of the EIA Modification studies, a geochemical characterization of the materials to be disposed of in accordance with the project's mining plan at 5.5 ktpd is being developed.

  Additionally, to prevent rain runoff from coming into contact with the waste rock, the site has built diversion and water management channels and plans to implement additional channels as indicated in the latest closure plan. Mineralized material processing - The mineralized material is processed in the Chumpe processing plant. The process is conventional with stages of crushing, grinding, regrinding, selective flotation, and filtration, dispatch of concentrates and transport, and tailings storage. Currently the plant has authorized a processing of 3,600 tpd, however the current regulation allows the operation to have a 5% additional as an average through the year, which allows the operation to process a maximum average of 3,780 tpd.
- Tailings - The tailings deposit is located at an elevation of 360 m and 2.6 km upstream of the existing processing plant and several camps and installations, in the location that was the Yauricocha Lake, however the waterbody was occupied in the early stages of the operation, several decades ago. The current tailings dam was built with compacted granular material of intrusive and metamorphic origin. Sierra has the environmental permit for the construction of the tailings dam up to stage VII. Currently, the construction of stage 5 - Phase 2 is being completed and for 2021 the construction of stages VI and VII is planned
- Sierra has obtained the authorization to operate the fifth stage of the tailings deposit, which has been divided in two substages. The first (5-1) is in operation and Sierra is currently completing the construction of the second phase (5-2). Phase 5-2 will provide a capacity to store around 2,262,507.46 m3 of tailings and a projected crown level of 4,533 meters above

sea level. The initial PAMA and early versions of the closure plan update indicate that the tailings are considered PAG, as tailings deposited from 1979 to 1988 contains 31.4% of pyrite and tailings deposited from 1989 to 1996 contains 17.6% pyrite. Currently, some studies are being carried out to expand the knowledge regarding the mineralogical composition and the quality of the drainage in the short, medium, and long term of the tailings. With the results of these studies, it is expected to have a better understanding of the geochemical characteristics of these materials as well as their environmental implications. However, it is estimated that some complementary studies will be necessary to confirm the assumptions and design the proper final closure of the facility.

- Regarding water management:
  - Water in the tailings pond is mainly composed of water from the tailings pulp, direct and rainfall; the clarified water from the tailings pond is pumped to tanks and returned to the processing plant by gravity, closing the circuit.
  - Filtrations are captured by a system of underdrains and sent towards the underdrain sump and pool for recirculation; and
  - Channels on the right and left of the tailings deposit capture the rainfall runoff preventing them to enter in contact with the tailings. Further expansions of the tailing’s facility will follow the same design.
- Regarding its management and control: Sierra monitors the design parameters, the physical stability by piezometers installed in the tailings dam, and the cleaning of the rainfall runoff channels.
- Domestic and industrial solid waste - Sierra operates a landfill for domestic wastes and has warehouses for temporary storage of recyclable waste. Recyclable non-hazardous solid waste and hazardous solid waste are delivered to an authorized company, complying with the Regulations of the General Law of Solid Waste.
- Effluent, surface and groundwater management and control:
  - Mine water - The mine water from the Klepetko tunnel is collected in a channel and directed to the water treatment plant at Chumpe where it is physically treated by adding lime and flocculants.
  - Sewage control - Sierra operates three domestic sewage treatment plants called PTARD (the Spanish acronym) for residual domestic wastewater treatment plant:
- One with a capacity of 17 m3/day, installed in the area Chumpe, and another with a capacity of 40 m3/day, installed in the La Esperanza areas, operate by activated sludge and multiple aeration. The treated water seeps into the subsoil. Nowadays, in the ITS (Geoservice Ambiental S.A.C., 2017), ITS Report N° 288-2017-MEM/DGAAM/DNAM/DGAM/D, Sierra indicate the replacement of these two PTARD for one PTARD with capacity of 50 m3/day,

- One with a capacity of 100 m3/day, installed in the Chumpe area, operates by means of sequential biological reactors. The treated water is incorporated in the mineral processing plant (zero effluent).
  - Surface water quality control - Monthly monitoring of water for quarterly reporting to the MINEM and ANA includes verification of the compliance with Maximum Permissible Limits (Supreme Decree N°010- 2010-MINAM) and Environmental Quality Standards for Water (Supreme Decree N° 0004-2017-MINAM); and
  - Groundwater quality control - Quarterly is monitored by eleven piezometers, three of them under implementation (approved in the ITS N°1 and ITS N°2).
- Emissions and dust control:
  - biannual monitoring of five monitoring stations. Dust prevention by wetting the road surfaces (dirt roads) during the dry season (vehicle traffic).

The following tables (Table 20-2, Table 20-3,Table 20-4) describe the current Environmental Monitoring program, as described in the current approved EIA.

Table 20-2: Air Quality Monitoring (EIA extract)

Station	Description	Location UTM, WGS 84, Zona 18		Regulation
		Este	Norte	
CA-01(704)	Sotavento de la planta concentradora Chumpe	424264	8641159	Supreme decree N° 003-2017-MINAM
CA-02	Barlovento del campamento Chumpe	424469	8640080	
CA-03	Barlovento Relleno Sanitario	422046	8639278	
CA-06	Barlovento Deposito de Relaves	422776	8637816	
CA-06-b	Centro Poblado Tinco	424848	8641704	

Source: Sierra, EIA 2019

Table 20-3: Environmental Noise Monitoring (EIA extract)

Station	Description	Location UTM, WGS 84, Zona 18		Regulation
		Este	Norte	
R-1	Pie de la catarata de la Quebrada Chumpe	424464	8641381	Supreme decree Nº 085-2003-PCM
R-2	Ex estadio Chumpe, a 100 del campamento Chumpe	424469	8640080	
R-3	Parte alta del patio Winche, sobre el tajo Cculle	421377	8638782	
R-4	Al lado sur del depósito de relaves Yauricocha	422776	8637816	
R-6-b	Centro Poblado Tinco	424848	8641704	

Source: Sierra, EIA 2019

Table 20-4: Water Quality Monitoring (EIA extract)

Station	Description	Location UTM, WGS 84, Zona 18		Regulation
		Este	Norte	
M-2	Rio Tinco, 100m aguas arriba del vertimiento V-1 (705)	4244581	8641772	Decreto Supremo Nº 004-2017- MINAM
M-4 (707)	Río Tinco, 150m aguas abajo del vertimiento V-1 (705)	424487	8641837	
PM-11	Quebrada Chumpe aguas arriba de la planta de beneficio	424373	8640006	
PM-12	Quebrada Chumpe (200m antes de desembocar al Río Tinco)	424673	8641583	
PM-13	Rio Tinco (70m aguas arriba de la desembocadura de la quebrada Chumpe)	424920	8641735	
PM-14	Poza de captación Chumpe (casa de bombas)	424153	8640718	Decreto Supremo Nº 004-2017-MINAM
PMZI-01*	50 m aguas arriba de la descarga del efluente EF-ZI (Río Rodiana)	427196	8 63 0610	Decreto Supremo Nº 004-2017-MINAM
PMZI-02*	100 m aguas abajo de la descarga del efluente EF-ZI (Río Rodiana)	427081	8 63 0638	

Source: Sierra, EIA 2019

20.4 Operating and Post Closure Requirements and Plans

Sierra has a closure plan with three approved amendments:

- Yauricocha Mine Unit Closure Plan, approved by Directorate Resolution N°258-2009-MEM/AAM (08/24/2009) and Report N°999-2009-MEM-AAM/CAH/ MES/ABR.
- Yauricocha Mine Unit Closure Plan Update, approved by Directorate Resolution N°495-2013-MEM-AAM (12/13/2013) and Report N°1683-2013-MEM-AAM/ MPC/ RPP/ADB/LRM.
- Yauricocha Mine Unit Closure Plan Modification, approved by Directorate Resolution N°002-2016-MEM-DGAAM (01/08/2016) and Report N°021-2016-MEM-DGAAM/DNAM/DGAM/ PC.
- Yauricocha Mine Unit Second Amendment of the Closure Plan, approved by Directorate Resolution N°063-2017-MEM-DGAAM (02/09/2017) and Report N° 112-2017-MEM-DGAAM/DNAM/DGAM/ PC.
- Second update of the Closure Plan of the Yauricocha Mining Unit approved by Management Resolution No. 111-2020-MINEM-DGAAM (09/01/2020) and Report No. 339-2020-MINEM-DGAAM / DEAM / DGAM.

In 2007, a first feasibility-level Closure Plan for the Yauricocha Mining Unit was developed by CESEL S.A. following the requirements of the Peruvian legislation for mine closure, “Ley de Cierre de Minas", Law N° 28090 and its Regulation, Supreme Decree N° 033-2005-EM and its amendments Supreme Decree N° 035-2006-EM and Supreme Decree N° 045-2006-EM. and based on the content recommended by the DGAAM in the Guideline for Preparation of Mine Closure Plans approved by Resolution R.D. N° 130-2006-AAM, dated April 2006.

This Closure Plan considers eight areas as follows: Central, Cachi-Cachi, Éxito, El Paso, Ipillo, Chumpe, Yauricocha and Florida.

In 2012, pursuant to Peruvian regulations, the Mine Closure Plan was updated by Geoservice Ingeniería S.A.C. and approved in 2013.

In 2015 and in 2017, the time schedule of the Closure Plan has been modified in accordance with the mine's life by its Closure Plan modification and second amendment, respectively.

Finally, last version of an update was approved in September 2020, including the modifications approved in the EIA 2019.

20.5 Post-Performance Reclamation Bonds

In January 2021, the bank's guarantee will be renewed for compliance with the Second Update of the Closure Plan of the Yauricocha Mining Unit (approved by Management Resolution No. 111-2020-MINEM-DGAAM) for US $ 18,357,305.

The current update of the Closure Plan designates that the mining operator must register the guarantee for variable annuities the first days of each year, in a manner that the total amount required for the final and subsequent closing is recorded in January 2028 as shown in Table 20-5.

Table 20-5: Closure Plan – Annual Calendar for Guarantee Payment

Year	Annual	Accumulated	Situation
2020		13,418,970	Constituted
2021	-392,599	13,811,569	to constitute
2022	-450,262	14,261,831	to constitute
2023	-520,938	14,782,769	to constitute
2024	-611,174	15,393,943	to constitute
2025	-734,063	16,128,006	to constitute
2026	-922,342	17,050,348	to constitute
2027	1,306,957	18,357,305	to constitute

Note: The amount includes tax (VAT, 18%)
Source: Sierra, 2021, Report Nº 033-2020-MINEM-DGM/DTM/PCM

20.6 Social and Community

Sierra maintains a relationship with the communities of San Lorenzo de Alis, Huancachi, Santo Domingo de Laraos, Tomas and Tinco, and have subscribed to various agreements with those communities. The company assists with various projects but have not subscribed to any agreement as Santo Domingo de Laraos do no permit developing mining activities in their community. Currently, the company has a Community Relations Plan approved in the latest EIA (February 2019). The main activities are shown in Table 20-6.

Table 20-6: Community Engagement Activities

Plan	Program	Subprogram /Activity
Community Relations Plan	Communications and Consultation Plan	Implementation of Permanent Information offices, located in Alis and Tinco
		Workshops and Information Meetings
	Economic and Productive Development Program	Local capacities development subprogram
		Local acquisition subprogram
		Acquisition of products and services
	Social Development Program	Education subprogram
		Health support subprogram
		Agriculture, cattle, local tourism, infrastructure and innovations program
		Local employment subprogram
	Preservation and Support of Local Culture	Tourism subprogram
		Local cultural heritage conservation subprogram
		Technical support to local authorities on efficient use of mining canon
		Effective communications
		Environmental participative monitoring

Source: Sierra Metals, 2021

20.7 Mine Closure

This section has been prepared based on the Yauricocha Mine Unit Closure Plan Update´s Report N°1683-2013-MEM-AAM/MPC/RPP/ADB/LRM, the Second Amendment of the Closure Plan, approved by Directorate Resolution N°063-2017-MEM-DGAAM (02/08/2017) and Report N° 112-2017-MEM-DGAAM/DNAM/DGAM/ PC, and the second update of the closure Plan approved under DR N° 339-2020/MINEM-DGAAM-DEAM-DGAM in September 2020.

Sierra is committed to perform progressive closure activities starting in 2019 and finishing in 2027, final closure in a span of two years and post-closure in five years (this latter is the minimum period required to achieve physical, geochemical, and hydrological stability of the area occupied by the mining unit as per Peruvian legislation).

The mine closure objective is to recover conditions like pre-mining conditions and/or uses compatible with the surrounding environmental conditions.

Specific objectives are:

- Human health and safety - Ensure public health and safety implementing measures to eliminate risks such as pollution caused by acid rock drainage or waste, that could be transported to populated areas by water or wind.

- Physical stability - Implement environmental and technical measures to maintain physical stability of the mining components in the short, medium and long term (including mine entrances, chimneys, waste rock dumps, tailings deposits, etc.) that must withstand seismic and hydrological extraordinary events.
- Geochemical stability - Implement measures to maintain chemical stability of the mining components in the short, medium and long term (including mine entrances, chimneys, waste rock dumps, tailings deposits, etc.) that must withstand ordinary and hydrological extraordinary hydrological events.
- Land use - Implement measures to enhance post-mining beneficial land use, restoring gradually soil fertility for agriculture, livestock, landscape and / or recreational use, considering the topographical conformation and integration into the landscape.
- Water use - Implement measures in the Production Unit Acumulación Yauricocha to prevent contamination of superficial and underground water, and focusing on restoring those water bodies, which have been potentially affected, by means of a strategic recovery for post-mining use.

It should be noted that Sierra considers necessary to develop a modification and update of its current closure plan to include the components approved in ITS N°1, N°2 and N°3 and update the progressive and final closure measures of the mining unit. This study is expected to be developed in 2022.

20.8 Reclamation Measures During Operations and Project Closure

20.8.1 Reclamation Measures During Operations and Project Closure

The Second update of the Closure Plan (2020) considers:

- Incorporating new mining components that were approved by the Directorate Resolution N° 028-2019-SENACE-PE-DEAR.
- Include all of the closing activities aligned with the EIA 2019.
- Include the improvement of central pit stability through the construction of a buttress (489000 m3); and
- Reprogramming the progressive, final and post closures schedules.

20.8.2 Temporary Closure

In case of a temporary closure (for a period less than three years), ordered or not by the competent authority, Sierra will develop a detailed care and maintenance plan considering future operations and evaluating the social impacts associated with it.

The temporary closure considers:

- Remove and save mobile equipment.

- Demolition, salvage, and disposal - not applicable during temporary closure.
- Physical stability - maintain mine entrances, chimneys, tailing deposit, waste rock dumps, and infrastructure.
- Geochemical stability - maintain tailings deposit and waste rock dumps sedimentation ponds to capture any drainage.
- Hydrological stability - maintain canals and ditches in an operative state.
- Landform - profiling the outer slope of the tailing deposit; and
- Social programs - mitigate impacts on local employment and local development implementing the following programs:
  - Communication, culture, and participation program.
  - Environmental education and training program.
  - Health and responsible environmental management program; and
  - Citizenship: leadership, institutional strengthening, and project transfers program.

The following preventive measures will be adopted:

- Communicate to DGAAM any temporary closure program (indicating the causes).
- Final closure must be made if the closure needs to be prolonged over three years.
- Designate responsibilities for the safety and cleanliness of the facilities.
- Instruct the surrounding population on risk related to temporary closed facilities.
- Seal all areas that are potentially dangerous to the environment and the population, placing signs and symbols that indicate their danger for containing materials that could affect the environment.
- Perform facility inspections and establish a periodic schedule to perform the necessary maintenances (including wind erosion and sediment transport control, channels, ditches, and sediment ponds), safety and environmental inspections, water quality monitoring and progressive reclamation monitoring.
- Perform safety inspections to prevent risks associated to the physical stability of underground workings and surfaces exposed to weathering, such as tailings deposits slopes; and
- Implement measurements to prevent accidents (environmental or public) by:
  - implementing security berms.
  - blocking accesses to mine entrances; and
  - profiling slopes if needed.

20.8.3 Progressive Closure

Progressive closure is performed simultaneously during operation and considers the following:

- Dismantling - All materials in disuse will be dismantled.
- Demolition, salvage, and disposal - Not applicable during progressive closure.
- Physical stability:
  - Open pits in disuse - the Mascota, Juliana, Pawac and Poderosa pits will be partially filled with surrounding waste rock and pit slopes will be stabilized by benching and the Central, Amoeba and Maritza pits will be closed.
  - Mine entrances - four mine entrances will be closed by a masonry wall without drainage, and in one land forming using waste rock and a proper cover will be applied (Type 2, see geochemical stability).
  - Waste rock dumps:
    - Waste rock from the Mascota, Juliana and Triada dumps will be removed to the Central pit.
    - Waste rock from the Mariela dump will be removed to the Central pit and Mariela mine entrance.
    - Waste rock from the Pawac dump will be removed to the Pawac pit.
    - Waste rock from the Poderosa dump will be removed to the Poderosa pit; and
    - The passive Triada waste rock dump and the Cachi-Cachi waste rock dump will be stabilized and covered.
- Geochemical stability - implementing covers considering the material to be covered (i.e. its mineralogy, net neutralization potential, presence of acid drainage, granulometry, topography and slopes) considering two types:
  - Type 1, to cover non-acid generating materials: 0.20 m of organic material, revegetated; and
  - Type 2 to cover acid generating materials: 0.20 m of organic material, overlaying a layer of 0.20 m draining material, overlaying a layer of 0.20 m clay material, overlaying a 0.20 m thick layer of limestone; and revegetated.
- Hydrological stability - implementing collector channels considering two types:
  - Type 1 - trapezoidal masonry channel with base and height of 0.50 m and 0.50 m and slope of 1H: 2V (flow 0.45 m3/sec); and
  - Type 2 - trapezoidal masonry channel with base and height of 0.60 m and 0.65 m and slope of 1H: 2V (flow 0.90 m3/sec).

- Landform - consist of leveling, re-contouring and organic soil coverage.
- Revegetation - planting native grasses such as Stipa ichu and Calamagrostis sp; and
- Social programs - programs are designed year by year considering the following topics:
  - Education.
  - Healthcare.
  - Local sustainable development.
  - Basic infrastructure.
  - Institutional and capabilities empowerment; and
  - Culture promotions.

Table 20-7 lists components that have been closed as of October 2013 (as per report N°1683-2013-MEM-AAM/MPC/ RPP/ADB/LRM), and February 2017 (as per report N°112-2017-MEM-AAM/MPC/ RPP/ADB/LRM).

Table 20-7: Closed Components

Type	Component	Description
Mine		
Open pit	Central mine	24 de Junio Open pit [(1)]
		Cuye Open pit [(1)]
		Poderosa Open pit [(1)]
	Éxito mine	Éxito Open pit [(1)]
Mine entrance	Central mine	Level 260 Mine entrance 6565-NW (Mascota)
		Level 300 Mine entrance 247-49-NW [(2)] (Tajo Central)
		Level 360 Mine entrance 4554-NW [(2)] (Tajo Central)
		Level 360 Mine entrance 1523-SW [(2)] (Tajo Central)
		Level 360 Mine entrance 1287-S [(2)] (Tajo Central)
		Level 260 Mine entrance 5460-S (Juliana)
		Level 230 Mine entrance 2575-N (Mariela)
		Level 230 Mine entrance 8047-NW (Mascota)
		Level 210 Mine entrance 6050-NE (Carmencita)
	Éxito mine	Level 300 Mine entrance Rampa 7052-N
	El Paso mine	Level 250 Mine entrance 3522-NW
		Level 210 Mine entrance 4010-NW
Chimneys	Central mine	Chimneys 782-0 - surface
	Éxito mine	Chimneys 215-5 – surface [(1)]
		Chimneys 801-6 – surface [(1)]
Waste handling facilities		
Waste Rock Dumps	Central mine	Waste deposit Mascota [(1)]
		Waste deposit Carmencita
		Waste deposit Juliana [(1)]
		Waste deposit Mariela
		Waste deposit Pawac
		Waste deposit Poderosa [(1)]
		Waste deposit Triada [(1)]
	Cachi Cachi mine	Waste deposit level 410
	Éxito mine	Waste deposit Éxito
	El Paso mine	Waste deposit Level 250[(1)]
Water handling facilities		
Water Treatment System	Éxito mine	Effluent treatment plant [(2)]
	Chumpe	Domestic wastewater treatment plant PTAR 17m3/día
	Yauricocha	Domestic wastewater treatment plant PTAR 40m3/día
Other project facilities		
Facilities	Central mine	Industrial fill [(2)]

(1) Components declared in the Yauricocha Mine Unit Closure Plan Update´s report N°1683-2013-MEM-AAM/MPC/ RPP/ADB/LRM

(2) Components declared in the report N° 112-2017-MEM-DGAAM/DNAM/DGAM/ PC

Source: Yauricocha Mine Unit Closure Plan Update´s report N°1683-2013-MEM-AAM/MPC/ RPP/ADB/LRM and report N° 112-2017-MEM-DGAAM/DNAM/DGAM/ PC

20.8.4 Final Closure

For Final Closure, a final Updated Closure Plan must be presented detailing the closure specifications and process of public consultation. Table 20-8 shows which components must be closed according to the last approved closure plan and its amendment.

Table 20-8: Components for Future Closure

Component	Zone	Description
Mine		
Shaft	Central mine	Pique Central
		Pique Mascota
Mine Entrance	Central mine	Level 300 – Mine entrance 0280-NW
	Cachi Cachi mine	Level 410 – Mine entrance - 1724-S
	Ipillo mine	Level 280 – Mine entrance 2015-SW
		Level 430 – Mine entrance 9249- S
		Central mine
	Central mine	Level 35 – Victoria
Tunnel	Chumpe	Level 720 – Klepetko tunnel
		Yauricocha tunnel – 2815-SW
Chimneys	Central mine	Chimney 473-6 – Surface
		Chimney 427-14 – Surface
		Chimney 568-8 – Surface
		Chimney 789-5 – Surface
		Chimney Yauricocha (raise bore)
		Chimney Amoeba - Surface
		Chimney 906-7
	Cachi Cachi mine	Chimney 316-6 - Surface
		Chimney 350-9 - Surface
		Chimney 211-1 - Surface
		Chimney 928-2 - Surface
		Chimney 825-0 - Surface
		Chimney Fortuna
	Ipillo mine	Chimney 578-3 - Surface
Processing Facilities		
Plant	Chumpe	Processing Plant
		Inclusion of new equipment in the Plant Profit
Waste Rock Dumps	Central mine	Yauricocha tailings deposit
		Regrowth of the Yauricocha deposit
	Ipillo mine	Waste rock dumps - Level 280
		Waste rock dumps – Level 430
		Waste rock dumps – Level 480
	Chumpe	Waste rock dumps – Chumpe

Component	Zone	Description
Processing Facilities		
Sistema de Tratamiento de Aguas	Chumpe	Effluent treatment plant
	Chumpe	Effluent treatment plant
	Chumpe	Domestic wastewater treatment plant – Chumpe (100m3)
	Chumpe	Water pumping system for Esperanza
	Chumpe	Domestic wastewater treatment plant – Chumpe (50m3)
	Chumpe	Pumping system – Aldrich / Chumpe – Yauricocha (Pool N°2)
Borrow Material		
Quarries	Yauricocha	Yauricocha High
		Yauricocha C. L.
	Chumpe	Chumpe
		Chumpe
Other Infrastructure for The Project		
Other Facilities	Yauricocha	Mine facilities: (warehouse, compressors, shaft, winch, maintenance workshop, carpentry, offices, chemical laboratory)
	Chumpe	Adjoining facilities processing plant (central warehouse, warehouse of fuel, junkyard)
	Central mine	Landfill
		Expansion of the sanitary landfill
		Composting area
	Central mine	Hazardous waste warehouse
	Ipillo mine	Concrete slab Nº 1
		Concrete slab Nº 2
		Trench
Housing and Services for Workers		
Camp	Central Mine	Yauricocha camps (Miraflores, Florida, Vista Alegre, Esperanza, Hotel Americano, casa de obreros y otros)
	Chumpe	Chumpe camps (Chumpe y Huacuypacha – workers houses, employees houses, stadium, school, market)
Dining rooms	Central mine	Dining rooms - Esperanza
	Chumpe	Dining rooms - Chumpe

Source: Yauricocha Mine Unit Closure Plan Update´s report N°1683-2013-MEM-AAM/MPC/ RPP/ADB/LRM and report N° 112-2017-MEM-DGAAM/DNAM/DGAM/ PC

20.9 Closure Monitoring

Operational monitoring continues until final closure is achieved.

20.10 Post-Closure Monitoring

According to the Yauricocha Mine Unit Closure Plan Update under Report N° 339-2020/MINEM-DGAAM-DEAM-DGAM all post closure monitoring activities shall be performed as follows:

- Physical stability monitoring - Monitoring of possible displacements and settlements, cracks, slip surfaces control in mine entrances, open pits, tailings deposit, waste rock dumps, camps and auxiliary related installations by topographic landmarks control (fixed concrete bases and stainless plates). The established monitoring frequency for the first two years is bi-annual, and for the following three years annually.
- Geochemical monitoring - Monitoring of tailings deposit, waste rock dumps, and open pits inspecting the cover´s surface for cracks and slip surfaces. The established monitoring frequency is bi-annual for the first two years and annually for the following three years.
- Hydrological monitoring - Inspection of the hydraulic components of the tailings deposit, waste rock dumps, and open pits for (structural) fissures, settlements, collapsing and flow obstructions. The established monitoring frequency for the first two years is bi-annual, and for the following three years annually.
- Water quality monitoring - In three monitoring stations (MA-1, MA-2, MA-3, see footnote 1) for: pH, electrical conductivity, total suspended solids, total dissolved solids, nitrates, alkalinity, acidity, hardness, total cyanide, cyanide wad, ammonium, sulfates, total metals (Al, As, Cd, Ca, Cu, Fe, Pb, Hg, Mo, Ni, Se and Zn), DBO5, DQO, dissolved oxygen. The established monitoring frequency for the first two years is quaternary, and for the following three years bi-annual. No groundwater quality monitoring has been contemplated.
- Sediment monitoring - Data from three monitoring stations (MA-1, MA-2, MA-3, see footnote 1) is analyzed for: total metals (Al, As, Cd, Ca, Cu, Fe, Pb, Hg, Mo, Ni, Se and Zn), total cyanide. The data collected shall be compared with reference values for the National Oceanic and Atmospheric Administration of the USA. The established monitoring frequency for the first two years is bi-annual, and annual for the following three years.
- Hydrobiological monitoring - In three monitoring stations (MA-1, MA-2, MA-3, see footnote 1) for: phytoplankton, zooplankton, bentos, macrophytas. The established monitoring frequency for the first two years is bi-annual, and annual for the following three years.
- Biological monitoring - Vegetation control to verify the effectiveness of the plant cover systems evaluating the extent of engraftment of the species, the success of the revegetation systems and the need for complementary planting, seeding, fertilization and vegetation control. The established monitoring frequency for the first two years is bi-annual, and annual for the following three years.
- Social monitoring - Monitoring to ensure the quality and accuracy of the information collected in the field, ensure the compliance with the goals and achievements of the objectives of the social activities and programs, and achieve its sustainability. The closure social program monitoring is summarized in this section.

Social monitoring - Consists of the development of a set of actions that will allow Sierra to verify the efficiency of social programs related to closure stages, in accordance with each specific objective established for each activity described in the plan, and with the aim to correct if deemed necessary. This program is implemented in the surrounding communities in the social influence area. The main objectives of this program are to provide organization, measurement, and information capabilities to the communities which will enable them to participate with the impact monitoring activities. The KPIs mostly used are related to:

Environmental perception surveys in the education centers:

- Dissemination of the operation's public information in the most representatives' buildings as well as internet.
- Closure schedule and progress per month.
- Roles and responsibilities.
- Resource requirements: Local transport;
- Quality control procedures; and
- Reports presentation.

Sierra will hire a specialist group of professionals with experience in social and communities' relations. This team will be onsite twice a year to the area and will submit a report, scheduling all the potential activities to develop.

1

[1] 1 MA-1: Tingo river (UTM: N 424,650; E 8,642,250), MA-2: Milpoca Lake (UTM: N 423,975; E 8,634,588), MA-3: Rodiana creek wetland (UTM: N 427,310; E 8,631,000).

20.11 Reclamation and Closure Cost Estimate

Table 20-9 shows the estimated mine closure costs.

Table 20-9: Closure Plan – Summary of Investment per Periods (US$)

Description	US$ without tax	US$ with taxes	Periods (years)
Progressive closure	11,127,444	13,130,384	Until 2027
Final Closing	11,643,732	13,739,604	2028 – 2029
Post-Closing	900,487	1,062,574	2030 – 2034
Total Closing	23,671,663	27,932,562	
Total amount of the guarantee		14,802,178	
Cost reference date 2019			

Note: The amount includes tax (VAT, 18%)
Source: Sierra 2021, Report Nº 033-2020-MINEM-DGM/DTM/PCM

21 Capital and Operating Costs

21.1 Basis of Cost Estimate

Capital and operating cost estimates for underground mining were prepared by Sierra Metals and REDCO to support the proposed LoM plan.

The cost estimate was generated from supporting engineering quantities and cost information derived from the following sources:

- Historical cost information sourced from in-house and commercial databases
- Quotations from equipment suppliers
- Rates from local service providers
- Client derived data from current operation

Both capital and operating cost estimates were prepared in mixed currencies and reported in United States dollars (USD).

The estimated costs have a +15 % / -15% accuracy.

21.1.1 Assumptions

The project currently assumes additional land acquisition and surface rights will be obtained in the future to accommodate proposed infrastructure such as access roads and conveyors, as well as additions to the processing facilities. The potential costs of such an acquisition are not included within the estimated costs presented in this report.

21.1.2 Exclusions

These estimates have been prepared based on the mine's current budget. No allowance has been made for estimation. The following items were excluded from the cost estimate analysis:

- Taxes
- Working capital costs during project development
- Costs derived from exchange rate fluctuations (FOREX)
- All-risk insurance
- Construction permits & royalties, strikes and force majeure events
- Sunk Costs

21.1.3 Contingency

Contingency is a cost element of the estimate used to cover the uncertainty and variability associated with unforeseeable elements not defined in the project scope. A preliminary risk identification and assessment process was conducted, and the following four types of risks were identified for the project:

- Country / Political Risks – political instability and in country politics.
- Technical Risks – rehabilitation and closure design and reserve risks.
- Construction and Operating Risks – skills availability and working at high altitudes.
- Performance Risks – power and water supply.

A 15% contingency has been allocated to the direct costs.

A contingency of 0 % has been applied to the project operating costs as they are based on actual costs from the operating mine.

21.2 Capital Cost Estimate

An estimate was made of the capital required to sustain the mining and processing operations. This capital estimate is broken down into the following main areas:

- Mine development
- Ventilation
- Equipment
- Facilities and Support Areas
- Infill drilling and exploration
- Plant
- Tailing Storage Facilities (TSF)
- Mine closure

Capital for mine development is based on site specific cost data from Yauricocha.

Equipment sustaining capital includes the costs to maintain and replace mine equipment, while plant and TSF sustaining capital costs account for the expansion of the TSF. Additional capital costs have been included to account for processing plant improvements.

Exploration capital will be used in the exploration of future mining opportunities within the company's mining and exploration concessions.

Growth capital includes the investments to achieve the production rate proposed in the LoM plan.

21.2.1 Mining Capital Cost Estimate

The capital cost estimate for mine operation is based on using contractor for development and additional fleet required for the production of mineralized material.

The capital cost estimate for the underground operation is based on the scheduled plant throughput in the LoM production schedule.

21.2.2 Processing Capital Cost Estimate

Plant capital costs estimated by Keypro Ingeniería S.A. (Keypro), a mineral processing consultant hired by Sierra, was classified in the Prefeasibility level corresponding to Class 4 as stated by the AACE Cost Classification System, prepared in a consistent manner and within an expected accuracy range B: -15% to -30%; A: +20% to +50%; and an expected contingency of 20-30%. Estimation of the plant investment costs (5,500 t/d SAG Mill) was made according to standard criteria proposed by Keypro and parameters provided by Sierra Metals.

In summary, estimate of the investment cost contemplates an improvement in the construction contracts and purchase prices of the main equipment in addition to a rationalization of the project's indirect costs. The estimate considers price improvements for the project's main equipment achieved through improvements in Sierra’s equipment and construction bid processes.

21.2.3 TSF Capital Cost Estimate

As part of the proposed design, the quantities for the movement of earth and materials have been determined. The calculation of the volumes of earthworks includes the volume to be cut for the construction of the diversion channels and overflow spillway. It also considers the fill volume for the canal lining, lining of the main dam, south dam and reservoir, and the lower drainage system. In the case of estimating quantities of earth movement, an allowance of 15% was considered.

The estimated cost calculation has been prepared in accordance with the information available in the Tierra Group (TSF consultant) database that has been used in similar projects. Preliminary works costs include the costs of dismantling and dismantling the La Esperanza camp and the Americano dining room, as well as road maintenance during construction.

21.2.4 Infrastructure Capital Cost Estimate

Infrastructure costs are associated with the site electrical system and accommodation. The camp-based accommodation costs are based on approximately 110 operational staff, with provision for sewerage, power, laundry, mess, and some recreational facilities. There are several projects related to general infrastructure, such as mine camps, lunchroom, among others; these capital costs have been estimated by Sierra.

There are no additional access road costs. The costs of the buildings which form part of the administration and maintenance areas, have been calculated using benchmark data.

21.2.5 Phased Costs

Initial capital costs have been distributed across the period of the project expansion, assuming a three-year period (2021-2023).

Annual sustaining capital costs include an allowance for tailings. Once the detailed tailings design is completed, it is recommended that periodic extension of an overland conveyor over the tailings heap be investigated.

Capital cost for rehabilitation and closure of operations is included at the end of the project including the capping of tailings and monitoring. The total cost of the decommissioning of the project needs to be reevaluated once an environmental study and closure management plan has been developed.

Future studies that include greater project definition will allow for more accurate phasing of sustaining capital costs. Sustaining capital has been considered at a high level only to better define the financial model, the results of which are described in Section 22.

The economic life of the underground mining fleet has been estimated and where an extension of economic life is intended for use, a major overhaul of 40% of the original equipment capital amount has been estimated.

21.2.6 Working Capital

Working capital has been estimated as approximately 1 month of an average year’s net sales. Preliminary calculations suggest this is the minimum number.

21.3 Operating Cost Estimate

The estimated is based on site specific historical data. The costs were broken down into three main areas:

- Mine
- Plant
- G&A

The average operating cost estimates were prepared based on the LoM costs. This enabled the estimation of unit rates for the operating costs per tonne. This approach was used as most operating costs were variable rather than fixed.

Fixed costs included general and administration costs and labour costs, with the remainder of costs being variable. The variable costs for the mining operation are driven by the total amount of material mined, including waste. The variable costs for the processing plant are a function of the tonnes processed.

Tables Table 21-1 to Table 21-3 summarize the capital and operating cost estimates for the LoM plan.

Table 21-1: Estimated Sustaining Capital Costs

Estimated Sustaining Capital	Total (US$ 000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Exploration & Development												
Exploration	$4,825	1,513	712	500	-	350	350	350	350	350	350	-
Development	$5,464	4,454	223	649	-	138	-	-	-	-	-	-
Equipment	$13,142	4,014	373	3,871	242	473	231	231	3,245	231	231	-
Facilities	$2,683	608	266	201	201	201	201	201	201	201	201	201
Mine Support Areas	$3,115	-	3	862	8	227	702	190	3	862	51	207
Projects												
Central Shaft Rehab	$1,700	729	971	-	-	-	-	-	-	-	-	-
Mine Camp	$6,759	5,190	1,299	30	30	30	30	30	30	30	30	30
Mascota Shaft	$892	57	335	250	250	-	-	-	-	-	-	-
Concentrator Plant	$4,836	1,131	405	300	-	1,000	500	-	-	-	1,000	500
Shotcrete Plant	$3,389	89	-	-	-	1,000	2,300	-	-	-	-	-
Drainage System	$3,358	1,210	532	239	116	132	176	532	173	116	132	-
Ventilation	$4,845	3,235	289	42	92	31	578	-	-	578	-	-
Personal transportation	$770	-	-	770	-	-	-	-	-	-	-	-
Water Plant Treatment	$2,300	-	10	10	10	1,010	1,210	10	10	10	10	10
Environmental	$345	-	45	50	50	50	50	50	50	-	-	-
Fuel Distribution System	$350	-	5	5	5	305	5	5	5	5	5	5
TDR Cable Installation	$350	-	350	-	-	-	-	-	-	-	-	-
Tailing Dam	$0	-	-	-	-	-	-	-	-	-	-	-
Closure	$11,607	-	-	-	-	-	277	277	277	277	277	10,222
Total Estimated Sustaining Capital	**$70,730**	**22,229**	**5,819**	**7,779**	**1,003**	**4,948**	**6,611**	**1,876**	**4,345**	**2,660**	**2,287**	**11,174**

Source: Sierra Metals, Redco, 2021
Note: Totals do not necessarily equal the sum of the components due to rounding.

Table 21-2: Estimated Growth Capital Costs

Estimated Growth Capital	Total (US$ 000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Exploration & Development												
Drilling Exploration	$4,221	-	1,031	700	-	700	700	700	130	130	130	-
Regional Exploration	$4,720	1,577	366	300	-	300	300	300	-	-	-	1,577
Development	$39,620	-	8,479	8,077	5,081	8,233	3,861	1,393	2,269	1,403	824	-
Cross-Cut 500	$3,590	1,795	-	-	-	-	-	-	-	-	-	1,795
Equipment	$17,787	-	1,662	3,021	3,719	1,467	202	1,265	1,265	3,719	1,467	-
Projects												
Yauricocha Shaft	$24,413	3,987	4,403	4,696	2,840	4,500	-	-	-	-	-	3,987
Integration Access to Yauricocha Shaft CX0545	$7,595	2,122	2,271	-	-	1,080	-	-	-	-	-	2,122
Tailing Dam	$81,490	8,401	4,995	5,871	8,935	7,427	11,303	7,427	7,427	11,303	-	8,401
New Road, Access	$7,000	-	-	-	-	-	3,500	3,500	-	-	-	-
Comedor Esperanza	$118	59	-	-	-	-	-	-	-	-	-	59
Mine Camp	$5,940	-	140	1,500	2,800	1,500	-	-	-	-	-	-
Concentrator Plant to increase prod.	$47,423	-	18,969	28,454	-	-	-	-	-	-	-	-
Ventilation	$853	-	141	-	288	-	424	-	-	-	-	-
Studies (trade off, SAG, Met, Auto, Permits)	$6,999	1,977	2,067	978	-	-	-	-	-	-	-	1,977
1592 Mascota - Esperanza Ramp	$0	-	-	-	-	-	-	-	-	-	-	-
Waste Dump	$6,488	-	-	-	-	3,244	-	3,244	-	-	-	-
Total Estimated Growth Capital	**258,258**	**19,919**	**44,522**	**53,597**	**23,663**	**28,451**	**20,290**	**17,829**	**11,092**	**16,555**	**2,422**	**19,918**

Source: Sierra Metals, Redco, 2021
Note: Totals do not necessarily equal the sum of the components due to rounding.

Table 21-3: Estimated Operating Costs (LoM)

Opex Total	Total (US$ 000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Mine	521,400	36,068	45,838	44,635	59,367	57,277	62,504	57,989	51,258	50,023	43,922	12,518
Plant	151,816	9,598	12,804	9,683	19,493	18,160	19,223	18,356	17,892	11,731	10,475	4,399
G&A	93,688	6,132	8,111	7,954	10,210	9,776	10,123	9,841	9,688	9,636	8,604	3,613
Total	**766,904**	**51,799**	**66,753**	**62,272**	**89,069**	**85,213**	**91,851**	**86,186**	**78,839**	**71,389**	**63,002**	**20,531**

Source: Sierra Metals, Redco, 2021
Note: Totals do not necessarily equal the sum of the components due to rounding.

22 Economic Analysis

22.1 Summary

All of information used in the economic analysis has been taken from work completed by REDCO, Sierra Metals, and other consultants as described in previous sections of this PEA report. The total period of analysis is 11 years which includes 3 years of investment and 8 years of production at 5,500 tpd (2024). The major inputs to the analysis are shown in Table 22-1.

Table 22-1: Estimated Economic Evaluation Summary

Description	Value	Unit
Life of Mine	11	Years
Market Prices (Long Term)		
Copper	3.39	$/lb
Lead	0.91	$/lb
Zinc	1.10	$/lb
Silver	21.02	$/oz
Gold	1,598	$/oz
Net Sales		
Sales Copper	1,147.2	$US M
Sales Lead	121.2	$US M
Sales Zinc	462.8	$US M
Sales Silver	244.7	$US M
Sales Gold	32.9	$US M
Gross Revenue	**2,008.9**	**$US M**
Charges for TC/RC + Selling	234.6	$US M
Gross Revenue After Selling and TC/RC	**1,774.3**	**$US M**
Operation Costs		
Mine	521.4	$US M
Plant	151.8	$US M
G&A	93.7	$US M
Total Operating Costs	**766.9**	**$US M**
EBITDA	**1,007.4**	**$US M**
Royalty and Mining Permits	51.1	$US M
Gross Revenue After all Costs	**956.3**	**$US M**
LoM Capital Costs + Sustaining Capital Costs	**312.1**	$US M
Working Capital	8.1	$US M
Employee Profit Sharing+ FCJMM	58.3	$US M
Cash flow before Taxes	**594.0**	**$US M**
Income Taxes	186.3	$US M
Cash flow after Taxes	**407.7**	**$US M**
Discount Applied to Cash Flow		
Discount Applied to Cash Flow at 5%	93.0	$US M
Discount Applied to Cash Flow at 8%	134.7	$US M
Discount Applied to Cash Flow at 10%	158.1	$US M
Discount Applied to Cash Flow at 12%	178.7	$US M
Discounted Cash Flow (Net Present Value)		$US M
NPV @5%	314.8	$US M
NPV @8%	**273.1**	**$US M**
NPV @10%	249.6	$US M
NPV @12%	229.1	$US M

Source: Sierra Metals, Redco, 2021

22.2 Methodology

Project economics were evaluated using a discounted cash flow (DCF) method. The DCF method requires that annual estimated cash inflows and outflows be converted to equivalent dollars in the year of evaluation. Considerations for this analysis include the following:

- The cash flow model was prepared by REDCO with input from Sierra Metals on taxes and depreciation and other consultants working on the Project.
- Recoveries and concentrates grades are assumed as constant on LoM Plan.
- All cash flow amounts are in US dollars (US$). All costs are first quarter 2021 costs. Inflation is not considered in this model.
- The Internal Rate of Return (IRR) is calculated as the discount rate that yields a Net Present Value (NPV) of zero.
- The NPV is calculated by converting annualized cash streams to Year 1 at different discount rates. All annual cash flows are assumed to occur at the end of each respective year.
- Working capital is considered in this model in all periods.
- Applicable taxes have been included in the model. A sales tax rate of 7.75% has been applied to material supply costs for all construction periods. State income taxes and federal income taxes are applied at a rate of 8.84% and 21%, respectively, to income after allowed deductions are applied.
- 100% ownership financing is assumed.
- Sustaining Capital, Reclamation and Closure costs are included in the model.

The economic analysis is performed on a before and after-tax basis in constant dollar terms, with the cash flows estimated on a project basis.

Based on the estimated production parameters, revenue, capital cost, operating costs, taxes, and royalties, a cash flow model was prepared by REDCO for the economic analysis of the PEA with an increase in the production rate to 5,500 tpd in 2024.

22.3 General Assumptions

A description of the general assumptions for cost inputs, parameters, royalties, and taxes used in the economic analysis are included in the following subsections.

22.3.1 Project Timing

The financial analysis assumes that spending begins in 2021. The mill expansion will be constructed in 2022 and 2023. Reclamation and closure will take place over the last five years.

22.3.2 Smelting and Refining Terms

The payable metals produced from the Yauricocha concentrates are zinc, copper, silver, lead and gold. The smelting and refining terms have been estimated based on information provided by Sierra Metals.

Copper concentrate has a treatment cost (TC) of $ 80 per dry metric ton (dmt). The copper returned from the refinery is to be 96.5% payable (or 1 unit deduction). A refining charge of $0.08 per pound has also been applied. The silver returned from the refinery is to be 90% payable. A refining charge of $0.35 per ounce has also been applied. The gold returned from the refinery is to be 90% payable. A refining charge of $6.00 per ounce has also been applied.

Lead concentrate has a treatment cost (TC) of $ 100 per dry metric ton (dmt). The lead returned from the refinery is to be 95% payable (or 3-unit deduction). There is some copper recovered on this concentrate which is payable as lead. The silver returned from the refinery is to be 95% payable. A refining charge of $1.05 per ounce has also been applied. The gold returned from the refinery is to be 95% payable. A refining charge of $15.00 per ounce has also been applied.

Zinc concentrate has a treatment cost (TC) of $ 130 per dry metric ton (dmt). The zinc returned from the refinery is to be 85% payable (or 8-unit deduction). The silver returned from the refinery is to be 70% payable. A refining charge of $0.50 per ounce has also been applied.

Penalties for Arsenic (As), Bismuth (Bi) and Antimuonium (Sb) has also been applied according to the limits on contracts and the typical grades from the metallurgical balance.

Selling expenses, which includes transportation and insurance costs are $30.40 per dmt, are applied to each concentrate.

Table 22-2: Summary of Smelting and Refining Terms

Copper Concentrate		
Treatment Cost	US$/dmt	80
Cu Refining Cost	US$/lb	0.08
Ag Refining Cost	US$/oz	0.35
Au Refining Cost	US$/oz	6
Minimum Deduction Cu	%	1.00%
Cu Payability Factor	%	96.50%
Minimum Deduction Ag	g/t	50
Ag Payability Factor	%	90.00%
Minimum Deduction Au	g/t	1
Au Payability Factor	%	90.00%
Lead Concentrate		
Treatment Cost	US$/dmt	100
Ag Refining Cost	US$/oz	1.05
Au Refining Cost	US$/oz	15
Minimum Deduction Pb	%	3.00%
Pb Payability Factor	%	95.00%
Minimum Deduction Ag	g/t	50
Ag Payability Factor	%	95.00%
Minimum Deduction Au	g/t	1
Au Payability Factor	%	95.00%
Zinc Concentrate		
Treatment Cost	US$/dmt	130
Ag Refining Cost	US$/oz	0.5
Minimum Deduction Zn	%	8.00%
Zn Payability Factor	%	85.00%
Minimum Deduction Ag	oz/t	3
Ag Payability Factor	%	70.00%
Selling Expenses		
Transportation and Insurance Cost	US$/dmt	30.4

Source: Sierra Metals, 2021

22.3.3 Prices and Revenues

Long term (LT) metal prices were provided by Sierra Metals and have been derived from November 2021 CIBC Global Mining Group Analyst Consensus Commodity Price Forecast.

Table 22-3: Commodity Price Forecast by Year

Metal	Unit	2021	2022	2023	2024	LoM
Cu Price	US$/lb Cu	4.16	3.99	3.75	3.84	3.39
Pb Price	US$/lb Pb	0.97	0.95	0.92	0.91	0.91
Zn Price	US$/lb Zn	1.31	1.24	1.17	1.16	1.10
Ag Price	US$/oz Ag	25.5	24.6	23.5	22.6	21.0
Au Price	US$/oz Au	1,809	1,806	1,754	1,706	1,598

Source: Sierra Metals, CIBC, 2021

All of the metal recoveries and revenues from mineralized material processed in the processing plant is assumed to be realized in the year the mineralized material is processed.

22.3.4 Estimated Operating Costs

Operating costs were developed on an annual basis based on the production schedule and other operating parameters. The life-of-mine average operating costs per tonne of mineralized material are $29.92/tonne for mining, $8.71/tonne for processing and $5.38/tonne for G&A, for a total average operating cost of $44.01/tonne of mineralized material. The specific annual operating costs as applied to the cash flow model are included in the overall cash flow model which is presented in section 21.

22.3.5 Estimated Capital Costs

The distribution of the estimated project capital costs (including expansion investments and reclamation & closure costs) is shown in Table 22-4

Table 22-4: Estimated Capital Cost Summary

Description	Unit	Value
Growth Capital	US$ M	213
Sustaining Capital	US$ M	100
Total Capital Cost	**US$ M**	**312**

Source: Sierra Metals, Redco, 2021.
Note: Totals do not necessarily equal the sum of the components due to rounding.

22.3.6 Royalties and Taxation

The Peruvian Government has various taxes, duties and levies that may be applicable to mining operations depending on profit margin established at the time of exploitation and laws applicable at the time. A list of some taxes, duties and fees that could be applicable are listed in Table 22-5.

Table 22-5: Royalties and Taxation

Royalties and taxation	Unit	Value
Income taxation	%	30%
Royalties	%	Variable (Depends on Operating Margin
Especial Mining Tax (IEM)	%	Variable (Depends on Operating Margin
Employee Profit Sharing	%	8.0%
FCJMM	%	0.5%

Source: Sierra Metals, Redco, 2021.

22.3.7 Reclamation and Closure costs

Reclamation and closure costs were taken from work completed by REDCO and other consultants as described in previous sections of this report. An allowance of $11.6 M was included in the economic analysis for mine closure and reclamation. Closure costs have been estimated based on the disturbed area taken from the EIA (2019).

22.3.8 Depreciation

Depreciation of capital items have been based on asset classes as defined in Table 22-6. Depreciation of the capital in the year it is incurred is allowed for all capital costs.

Table 22-6: Depreciation Asset Groups

Depreciation	Unit	Value
Buildings & Infrastructure	years	10
Equipment	years	5

Source: Sierra Metals, Redco, 2021

22.3.9 Working Capital

Working capital is included in the model for expansion to ensure sufficient funds for operations before enough revenue is generated to cover all applicable operating costs. A working capital of 30 days of revenues discounting selling expenses and TC/RC. The total LoM working capital estimate is $147.9 million.

22.4 Financial Model and Results

A discounted cash flow (DCF) method was used to evaluate the economics of the Yauricocha project. The DCF method measures the Net Present Value (NPV) of future cash flow streams. This financial model has been developed by REDCO with input from Sierra Metals for the tax and depreciation model, Keypro Ingeniería S.A. (Keypro), a mineral processing consultant hired by Sierra, for process costs (capital and operating) and Tierra Group for TSF costs, other were assumed from the available data provided by Sierra Metals.

The key financial parameters derived from the cash flow analysis are:

- Discount rate of 8%.
- LoM average grades of Cu 1.16%, Pb 0.41%, Zn 1.41%, Ag 31.12 g/t and Au 0.40 g/t.
- Ordinary Mining Entitled Royalty rate dependent on the operating margin.
- Extraordinary Mining Entitled Royalty rate dependent on the operating margin.
- Taxes rate of 29.5%.
- Numbers are presented on a 100% ownership basis and do not include financing costs.

The metallurgical recoveries used in the evaluation are 75.0% Cu, 88.5% Pb, 88.0% Zn, 68.4% Ag, and 19.5% Au. The source of this information is Sierra Metals and was reviewed by REDCO and SRK.

The after-tax, discounted (8%) NPV for the project is estimated to be $US 273.1 M.

22.5 Sensitivity Analysis

A sensitivity analysis was performed for each mining plan presented to analyze the impact of the change on the main drivers: metal grades, operating cost, gross income, cost of capital and discount rate.

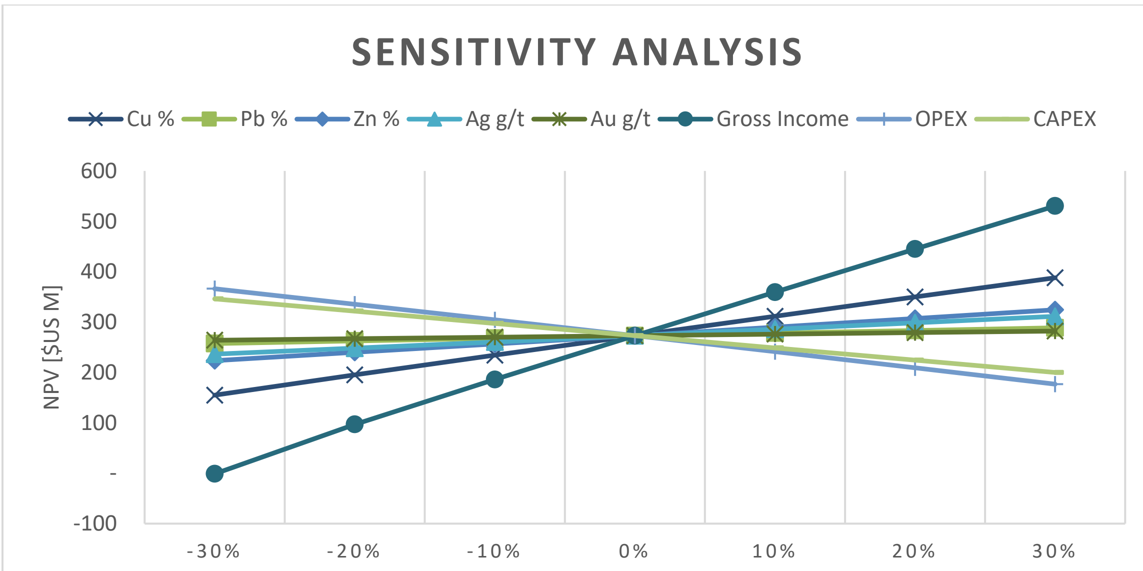
The sensitivities are based on +/- 30% of the base case. The after-tax sensitivity analysis is presented in Table 22-7, and in Figure 22-1 and Figure 22-2. The economic indicators chosen for sensitivity evaluation are the internal rate of return (IRR) and NPV at 8% discount rates.

The sensitivity analysis indicates that the project is robust and is most sensitive to revenue (copper grade), and operating costs.

Table 22-7: Sensitivity Analysis NPV (US$)

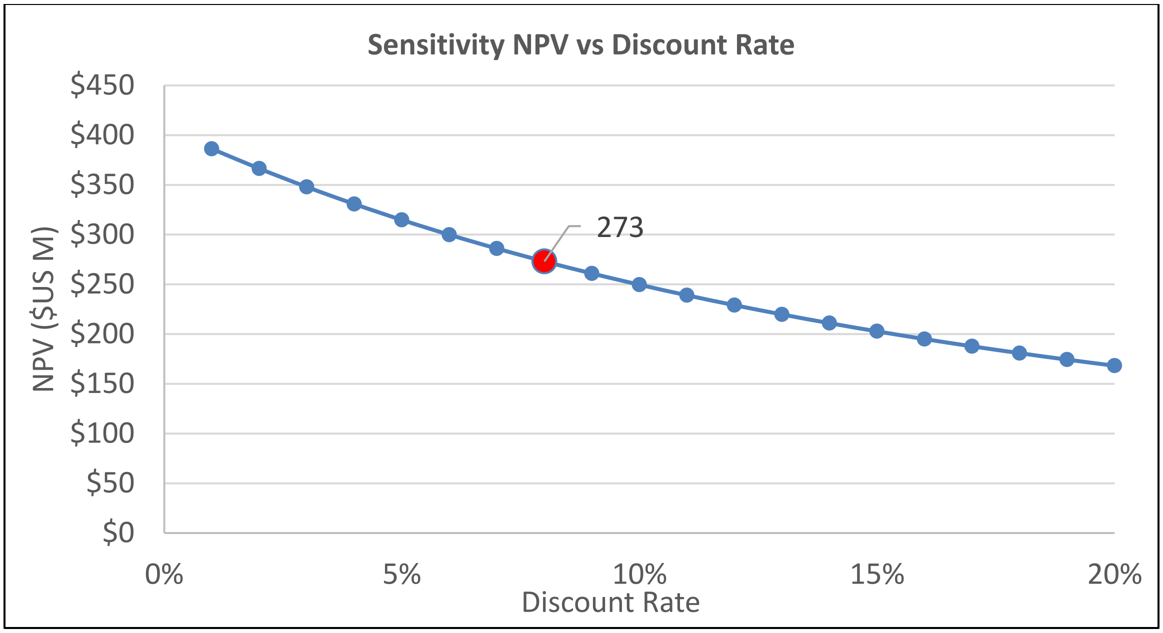
Sensitivity	-30%	-20%	-10%	0%	10%	20%	30%
Cu %	155	195	234	273	312	350	388
Pb %	257	263	268	273	278	283	289
Zn %	223	240	256	273	290	307	324
Ag g/t	236	248	261	273	286	299	311
Au g/t	264	267	270	273	276	279	282
Gross Income	-1	97	186	273	359	445	530
OPEX	366	335	304	273	241	209	177
CAPEX	346	322	297	273	249	224	200

Source: Sierra Metals, Redco, 2021



Source: Sierra Metals, Redco, 2021

Figure 22-1: Sensitivity Analysis – NPV



Source: Sierra Metals, Redco, 2021

Figure 22-2: Sensitivity NPV Vs Discount rate

23 Adjacent Properties

SRK is not aware of any adjacent properties to the Yauricocha Mine as defined under NI 43-101.

24 Other Relevant Data and Information

There is no other relevant information or explanation necessary to make the Technical Report understandable and not misleading.

25 Interpretation and Conclusions

25.1 Geology and Exploration

The geology QP is of the opinion that the exploration at Yauricocha is being conducted in a reasonable manner and is supported by an extensive history of discovery and development. Recent underground exploration success at Esperanza and the Cachi-Cachi will continue to develop in the near term and the QP notes that other areas near the current mining operations remain prospective for additional exploration will be prioritized based on the needs and objectives of the Yauricocha mine. The interpretation and estimation of Sulma, part of the Cachi-Cachi mineralization area and style, is the most recent addition to the Yauricocha Mineral Resources in 2021. However, this zone only represents 0.07% of the total Mineral Resources.

Regional exploration for polymetallic mineralization associated with skarns, carbonate replacement bodies and intrusive veins continues in areas where historical mining occurred, interpreted geophysical anomalies have been identified, geochemical sample anomalies occur, and geological mineralization has been mapped. The 2021 surface exploration areas include Kilcaska (7.5 km southeast of the Yauricocha mine), Éxito (3.5 km south-southeast of the Yauricocha mine), Fortuna (3.5 km southeast of the Yauricocha mine), Yauricocha Medio (2.2 km south-southeast of the Yauricocha mine) and La Estación (350 m west of the Yauricocha mine. The QP considers the exploration techniques employed by Yauricocha mine suitable in exploration for oxide and sulfide polymetallic mineralization hosted in skarns, carbonate replacement bodies and veins.

The understanding of the geology and mineralization at Yauricocha is based on a combination of geologic mapping, drilling, and mine development sampling. Furthermore, these data sources guide the mine's grade control. The QP has reviewed and accepted the methods and procedures for data collection and notes that they are generally reasonable and consistent with industry standard practice. The validation and verification of data and information supporting the Mineral Resource estimation has historically been deficient, but strong efforts are being made to modernize and validate the historic information using current, aggressive QA/QC methods and more modern practices for drilling and sampling. The QP notes that the majority of the remaining resources in areas such as Mina Central and Cachi-Cachi are supported by more modern data validation and QA/QC, and that new areas like Esperanza feature extensive QA/QC and third-party analysis.

The current QA/QC program is aggressive and should be providing very high confidence in the quality of the analytical data. Unfortunately, the results from both ALS and the Chumpe laboratories continue to show significant failures which could be related to several factors that may be out of the control of the laboratory. No QA/QC results are available for the period July 2020 to March 2021 due to the effects on mine staffing during the Covid Pandemic. However, the QP does not consider this material as most of the drilling and channel sampling was associated with grade control efforts to ensure that the Yauricocha mine continued to produce metal concentrates. The QP reconciled the 2020 and 2021 resource estimations in the affected areas and no material changes have been noted.

The QP is of the opinion that the current procedures and methods for the data collection and validation are reasonable and consistent with industry standard practices, but there are opportunities to improve this going forward. For example, the current management of the drillhole and channel sampling “database” is effectively maintained through an individual Excel file, without user access control, or details of the original source information, or a record of changes made and by whom, which is not consistent with industry best practice. Current best practices generally feature a unified database software system with all the information compiled and stored in one place, with methods and procedures in place to verify the data, prevent tampering and track any changes.

25.2 Mineral Resource Estimate

The procedures and methods supporting the Mineral Resource estimation have been developed in conjunction with Minera Corona geological personnel, and the resource estimations presented herein have been conducted by an independent consultant using supporting data generated by Minera Corona personnel. In general, the geological models are defined by the Minera Corona geologists using manual and implicit 3D modeling techniques based on drilling, geological mapping, and mine development channel sampling information. These models are used to constrain block models, which are flagged with bulk density, mine area, mine depletion, etc. Ag (ppm), As (ppm), Au (ppm), Fe (%), Pb (%), and Zn (%) grades are estimated into these block models using both drillhole and channel samples and applying industry-standard estimation methodologies. Mineral Resources are categorized in a manner consistent with industry best practice and are reported above reasonable unit value cut-offs, based on actual mine performance and CIBC long term consensus commodity pricing.

The QP notes that the procedures used for geological interpretation, modelling, and estimating the Mineral Resources at the mine (i.e., Minera Corona) are in development and are far more advanced than in previous years. The QP found the models to be reasonable approximations of the input data and supported by the mine’s understanding of the regional and local geology as encountered during exploration and mining of the Yauricocha mineralization styles.

The QP is of the opinion that the resource estimations are suitable for public reporting and are a fair representation of the in-situ contained metal for the Yauricocha mine.

25.3 Mineral Processing and Metallurgical Testing

SRK is of the opinion that Yauricocha’s processing facility is reasonably well operated and shows flexibility to treat multiple sources of mineralized material. The metallurgical performance, i.e., metal recovery and concentrate grade, has been consistent throughout the period evaluated allowing the mine to produce commercial quality copper concentrate, lead concentrate, and zinc concentrate.

The spare capacity in their oxide circuit is an opportunity to source material from third-party mines located in the vicinity. The presence of arsenic is being well managed by blending mineralized material in order to control arsenic concentration in the final concentrates. Gold deportment seems an opportunity that Yauricocha may want to investigate, particularly by evaluating gravity concentration in the grinding stage, or alternatively in the final tails, or both.

25.4 Mineral Reserve Estimate

A Mineral Reserve has not been estimated for the Project as part of this PEA.

25.5 Mining Methods

25.5.1 Mining

The Yauricocha Mine is a producing operation with a long production history. Most of the mining is executed through mechanized sub-level caving with a relatively small portion of the mining using overhand mechanized cut and fill. The mine uses well-established, proven mining methods and is anticipated to continue to maintain a 3,780 tpd (1.4 Mt/y) production rate for the remainder of 2021 & 2022.

Polymetallic sulfide mineralized material accounts for more than 99% of the material mined at Yauricocha. Material classified as lead oxide can also be encountered, but it is a minor component of the overall tonnage in the mineralized zones currently being mined.

Yauricocha's main production zones are divided in 6 areas, Mina Central, Esperanza, Cachi-Cachi, Mascota, Cuye and "Cuerpos Pequeños" (Small Mineralized Bodies), where more than 70% of the mineable material is expected to be mined from Mina Central and Esperanza via the sublevel caving mining method.

One of the main challenges Yauricocha currently faces is related to the construction of the production galleries in the sublevel caving method. Given the poor quality of the rock (low RMR), the production galleries require the use of steel arches, and this imposes greater construction times and costs.

All of the mineralized material and waste is hauled to surface by a complex of shafts and locomotives to the Chumpe processing plant. There are currently 3 different shafts in operation: the Central Shaft, Mascota Shaft, Cachi-Cachi Shaft, and for the deeper zones of Mina Central, a new shaft (Yauricocha Shaft) is in construction and is expected to be finalized in 2025. The shaft will reach level 1270 (shaft bottom) and a loading pocket is being built on level 1210. The shaft will use a hoist with 7,296 tpd capacity that will be operated at 90% of its capacity and will handle both mineralized and waste material.

Currently, mine planning is conducted by industry-standard processes that could be improved with a more sophisticated reconciliation process to continuously record dilution and recovery data per sector. In addition, mine planning would benefit from a centralized database of the operational and economical key performance indicators (KPIs) that are used as primary mine planning inputs.

Redco note that the staged increase in the production rate is a highly viable option for the Yauricocha mine; however to achieve the higher production rates, different operative and technological drivers need to be studied and further changes may be required involving the mining methods, operating philosophy, haulage systems, equipment fleet (type and quantity), management plans and related operational readiness processes.

25.5.2 Geotechnical

A current industry standard is to utilize geotechnical databases within three-dimensional modeling software such as Leapfrog Geo. The first Leapfrog Geo models provided to SRK before 2020 did not contain geotechnical data and were largely focused on the zones of mineralization.

Considering the data before 2020, it was determined by SRK that the ground control management level plans reviewed present a rock mass quality regime that is consistent with the conceptual geotechnical rock mass model, as well as the description of the domains and sub-domains from the 2015 Technical Report. The level plans and accompanying development profile and installation procedures are well developed and appropriate for operational application. Also, the understanding of in-situ and induced stress for the current mining areas is satisfactory, but for the deeper planned mining areas, site specific stress measurements and stress modeling were needed.

Following these observations, Sierra and Redco jointly developed a mining study designed to support a growth scenario for the Yauricocha mine. Preliminary 3D geomechanical and numerical models were constructed and a geotechnical data collection campaign was established, with a focus on deeper areas of the mine, to support future studies and estimations.

Based on the proposed campaign to strengthen the geomechanical information database, a field information collection program was conducted in the second half of 2021 which consisted of logging diamond drill core and geomechanical mapping of the rock mass. The program sought to validate the geotechnical quality of the rock through Bieniawski's "RMR" and Barton's "Q" classifications, as well as the measurement of in-situ efforts through acoustic emissions, all carried out in the areas of Mina Central and Esperanza.

A total of 4,770 meters (accumulated) of geomechanical logging was conducted in drill holes for already drilled resources and included 30 UCS tests and 15 TX tests (cumulative). In addition to this, 850 meters (cumulative) of logging of geomechanical drilling with oriented core was undertaken to determine the orientation of the discontinuities (measurement of angles α and β), rock mass characterization (RMR, Q, GSI) and obtain samples for laboratory tests and acoustic emissions. Finally, different stations were mapped to identify the arrangement of discontinuities and joints in each domain.

The current understanding of the conditions leading to a mud rush and the mitigation measures put in place are reasonable; however, the potential occurrence of a mud rush event is an ever-present risk, particularly when entering new mining areas. Dewatering practices need to be maintained, existing drawpoints monitored, and new areas investigated prior to being developed.

25.5.3 Hydrogeology

Past effort has been made to control or reduce water inflows. A large amount of data is available that could be used to understand the source of water, but the data is not compiled in a manner that would permit this to be easily done.

In the past, drainage tunnels and exploratory test drill holes have been completed to control or reduce water inflows. Drain holes were completed in the 920 and 870 levels in Antacaca Sur, 920 level in Antacaca, 920 and 970 levels in Catas, and 870 and 920 levels in Rosaura. All these water management features were oriented into the granodiorite to intercept water flows before reaching the subsidence zone. Some of drillholes were later cemented to reduce inflows into mining zones.

During drilling, inflows were observed to decrease on the 820 and 870 levels, and post drilling, decreasing inflows were observed on the 920 level. Inflows in Antacaca Sur and Rosaura have been reduced over time, but inflows appear to be increasing in Catas and Esperanza.

The Yauricocha mine has developed a conceptual hydrogeological-structural model that has allowed the mine to better understand the regional movement of groundwater and to understand how water enters the mineralized bodies. This model has made it possible to understand the dynamics of the groundwater flow, as correlated with the geological, structural and subsidence information produced. In addition, the execution of two drainage chambers at the extremes of Central Mine. Esperanza (Phase III) and Antacaca Sur (phase I) mineralized zone is planned for 2022 to support ongoing data collection. This additional data will permit refinements to the conceptual hydrogeological-structural model.

In conclusion, the mine has been able to manage water inflows sufficiently well to allow mining to safely proceed. As the mine expands, water inflows should be expected to increase. Mitigation efforts should continue to be assessed and tested, but operational management plans should continue to assume that inflows and mud rush potential will increase until such a time that the effectiveness of mitigation efforts can be proven, or decisions are made to address water-related risks through other management plans.

25.6 Recovery Methods

Yauricocha operates a conventional processing plant that has been subject to continuous improvements in recent years, including a crushing stage for the oxide circuit and installation of multiple flotation cells in the polymetallic circuit to improve recovery and deportment of metals.

25.7 Infrastructure

The infrastructure is well developed and functioning as would be expected for a mature operation. The TSF continues to develop and will require ongoing monitoring to assure the construction of the next lift is timely to support the operation. Ongoing monitoring of the stability of the embankment and operations practices is recommended to conform to industry best practices.

25.8 Environmental Studies and Permitting

Sierra has all relevant permits required for the current mining and metallurgical operations. Sierra also has a Community Relations Plan including annual assessment, records, minutes, contracts and agreements.

Sierra applied to SENACE to start the evaluation process of the “Environmental Impact Study of the Metallurgical Mining Components Update Project” (Geoservice Ambiental S.A.C., 2017) within the framework of the Supreme Decree N° 016-1993-EM, as this study was initiated before the enforcement of the D.S N° 040-2014-EM and in application of an exceptional procedure established by it. The EIA was obtained on February 11, 2019.

25.9 Economic Analysis

The PEA study considered a growth scenario of Yauricocha Mine from the current 3,780 tpd production rate to 5,500 tpd reached in 2024. The 5,500 tpd production rate is considered as a maximum capacity of the mine due to the results and conclusions of different studies conducted between 2020 and 2021. Increased production rates beyond 5,500 tpd may be possible once Yauricocha has resolved the mineralized material and waste haulage issues, in addition to the application of improvements of current mining method practices.

The 5,500 tpd (2024) proposed mine plan has a capital requirement (initial and sustaining) of US$ 312 M over the 11-year LOM; efficiencies associated with higher throughputs are expected drive a reduction in operating costs on a per tonne basis. This PEA indicates an after-tax NPV (8%) at 5,500 tpd (in 2024) of US$ 273 M. Total operating cost for the LOM is US$ 767 M, equating to a total operating cost of US$ 44.01 per tonne milled and US$ 1.30 per pound copper equivalent.

The PEA is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Mineral resources that are not mineral reserves do not have demonstrated economic viability. There is no certainty that inferred resources can be converted to indicated or measured resources or mineral reserves and, as such, there is no certainty that the results of the PEA will be realised.

Instances of the word ‘economic’ are intended to be conceptual only, and prospects for economic extraction have not been demonstrated. The proposed mine plan is conceptual in nature and would benefit from further, more definitive, investigation.

25.10 Foreseeable Impacts of Risks

Environment, Social and Permitting

Future expansions or modifications could be delayed due to permitting regulations and the requirement for evaluating environmental and social impact assessments with respect to environmental protection and management regulation for operating, profit, general labour, and mining storage activities (Supreme Decree N° 040-2014-EM, 11/12/2014).

Other

SRK and Redco are unaware of any other significant factors and risks that may affect access, title, or the right or ability to perform the work recommended for the Project.

26 Recommendations

26.1 Recommended Work Programs

SRK and Redco note that the Yauricocha Mine is currently in operation and has an extensive past production history. Thus, the recommendations that follow are aimed at improving operational performance, data collection and grade per tonne reconciliation.

26.1.1 Geology and Mineral Resource Estimation

The QP has the following recommendations for the geology and Mineral Resources at Yauricocha:

- Standardize and document the transformation between the UTM Zone 18S WGS84 datum used for exploration, and the Local mine grid used for underground geology, mineral resources, and mining coordinate systems. There are currently several sightly different transformations, which could be related to different coordinate systems historically used by the mine and exploration staff.
- Construct and compile a single reliable secure drilling and sampling database for the entire mine area, which can be easily verified, audited, and shared internally. This can be accomplished through commercially available SQL database management tools.
- Long-term exploration should be focused on areas such as the possible intersection of the Yauricocha fault and the Cachi-Cachi structural trend, where recent geophysical data are currently being generated to assist in targeting.
- Exploration should continue underground in the Esperanza area which is locally open along strike and at depth.
- Channel samples should be collected on a representative basis and collected across the entire exposed thickness of a mineralized zone. In addition, they should be weighed for each sample to ensure that appropriate quantities of material are sampled from both the harder, more difficult material, and the higher-grade, softer material.
- Reviewing the performance of the QA/QC program as soon as batches of results are returned. If any failures occur, investigation and re-analysis of these samples and +/- five adjacent samples on either side of the respective failure should be completed as soon as possible to prevent any sample preparation or laboratory issues.
- Select several duplicates to be analyzed by an umpire laboratory for analytical results completed between July 2020 to March 2021, to establish whether there are any material issues and biases with respect to the analytical results received and not QA/QC'ed.
- Umpire coarse and pulp reject duplicates sampling be implemented as standard practice. No umpire duplicates have been submitted since 2019.
- Density measurements of drillhole core to be implemented as a standard practice, to improve density relationships in mineralized and non-mineralized rock.

- Exploration, mine geology and mining should be supported by a detailed litho-stratigraphic and structural model for the area, based on all the available information, to aid in exploration targeting for surface and underground, to improve the mineral resource domaining and to provide structural detail that can be used for geotechnical engineering studies.
- A standardized workflow is applied to the geological modelling to prevent significant changes in mineralized shape forms with minor additions of drillhole information. The integration of structure, stratigraphy and mineralized zone into a global model is essential in developing a comprehensive exploration and mining model. This will prevent inconsistencies and overlap between mineralized zones modelled.
- Developing and documenting internal standards and procedures for geological interpretation, modelling, estimation and reporting of Mineral Resources, especially since there has been a significant staff turnover during in 2021.
- Modelling variogram anisotropy for each of the mineralized domains can be improved by considering relevant transformation, e.g., gaussian or log transforms of the composites before producing the experimental variograms. Ideally, modelled variograms should be back transformed, before the grade estimation is done. Certain commercially available software can complete this process seamlessly.
- Local and global grade anisotropy occur within the larger mineralized bodies. The sensitivity of utilizing a local anisotropy in highly informed data areas, whereas utilizing a global trend in poorly informed areas, should be investigated.
- Minera Corona implement short term grade control models to track and reconcile with the resource models and mine production.

26.1.2 Mining

Redco makes the following recommendations for the mining at Yauricocha:

- Standardize the operational practices of sublevel caving (SLC), considering a traditional exploitation in a fan pattern (radial drilling), drilling the entire crown, and extracting in reverse, modifying the current form of operation based on extraction by lateral “pockets”. To guarantee this, field tests must be carried out and a robust design for the initial slot must be considered to ensure the initial swelling and flow of the broken material.
- Evaluate the increase in mining dimensions for the SLC, this would mean a significant reduction in development and preparation, considering an opportunity to achieve column heights close to 25 meters and spacing between extraction galleries of 9 meters according to preliminary analysis. To support this, it is suggested to carry out more detailed studies at a numerical and operational level, accompanied by pilot tests to guarantee the safety and operational feasibility of mining.
- The ramp-up to 5,500 tpd needs to be studied in an operative point of view, considering the capacity of the whole haulage system and operational philosophy. Simulation modelling could be developed to evaluated different scenarios and strategies to reach the final production rate.

- Evaluate the application of new mining methods in mineralized bodies of greater width, as is the case of shrinkage caving for the Esperanza mineralized body, which would improve operational performance, reduce costs by minimizing the number of preparations and mining developments, and deliver greater productivity to the Yauricocha mine. This must be numerically evaluated at the geomechanical level and complemented with gravitational flow models which must be calibrated with pilot tests.

- The current fleet of load and haul equipment is of 2.5 yd3 size and it is recommended to migrate to larger capacity equipment (4 yd3 or more) to reduce the quantity of equipment inside the mine, avoid saturation of production levels, and achieve the increase in extraction rates. This must be accompanied by a standardization of the loading points in sublevels so that these locations have adequate work dimensions.

- One of the main challenges Yauricocha currently faces is related to the construction of the production galleries in the sublevel caving method. Given the poor quality of the rock (low RMR), the production galleries require the use of steel arches, and this imposes greater construction times and costs. It is recommended to study alternatives that allow mechanizing the advancement of the sublevel caving production tunnels to improve the safety of mine personnel and to increase the production rates at each face.

- Analyze alternatives for haulage to surface for deeper sectors of the mine in order to make the extraction of materialized and waste material viable at the anticipated levels in the case of the 5,500 tpd production rate; doing so will allow decongesting the shafts which are expected to be near maximum capacity during the peak years of mining 5,500 tpd.

- For future studies and reporting, it is recommended that the Yauricocha mine standardize the support of the modifying factors used in the mining planning processes for its different mining methods. For this, volumetric and mine/plant reconciliation processes should be considered to verify the operational behavior between what is planned and what is extracted, in addition to accompanying it with gravitational SLC flow models calibrated with operational data, in order to deliver a robust recovery and dilution factors per zone.

- The New Yauricocha shaft project should be monitored closely to ensure timely access to mineralized zones below 1070 level.

- A consolidated infill drilling plan needs to be developed accord in the deeper areas of the mine to support the LoM plan execution.

- For the application of operational improvements incorporating new mining methods and technologies, it is necessary to have an established culture of operational discipline with standards that integrate the information from the different areas within the short-, medium- and long-term plans.

- Further technical-economic evaluations of the production rate expansion options should be undertaken.

26.1.3 Geotechnical and Hydrogeological

Redco makes the following geotechnical recommendations:

- Regarding the new data campaign conducted in 2021, update the 3D geomechanical and numerical preliminary models to verify the quality of the rock mass projected in deeper areas of the mine. Use this updated information to support improvements with the mining methods, production sequencing, and rock support estimation for different stress modeling scenarios.
- Develop gravity flow 3D models for the different areas/condition of sublevel caving to support the dilution and recovery planned per zone and per level. This work could be expanded upon to simulate possible mud rushes or determine critical areas.
- Continue collecting geotechnical characterization data from mined drifts and exploration drillholes.
- Maintain a central geotechnical database.
- Continue the program of stress measurement in the deeper planned mining areas.
- Conduct numerical stress analyses of mining-induced stress effects on planned mining.
- Redco makes the following hydrogeological conclusions and recommendations:
- Continue a short-term to long-term dewatering programs with drainage systems.
- Continue to actively dewater ahead of production mining and monitor for conditions that could lead to mud rushes.
- Update the current conceptual hydrogeological model considering the new data collection campaign.
- 3D Hydrogeological-structural modelling should be considered for further stages of mine development.
- Develop studies to apply new methodologies to reduce the water inflows to the current and future mining zones.
- Revisit the current ground control management plans to check that they are appropriate for the deeper mining areas.

26.1.4 Infrastructure

Ongoing monitoring of the stability of the TSF embankment and operations practices is recommended to conform to industry best practices.

26.1.5 Recovery Methods

SRK makes the following recommendations for the mineral processing at Yauricocha:

- Yauricocha's processing facility is reasonably well operated and shows flexibility to treat multiple mineralized material sources. The metallurgical performance, i.e., metal recovery and concentrate grade has been consistent throughout the period evaluated allowing the mine to produce commercial quality copper concentrate, lead concentrate, and zinc concentrate.
- The spare capacity in their oxide circuit is an opportunity to source material from third-party mines located in the vicinity.
- The presence of arsenic is being well managed by blending mineralized material in order to control arsenic concentration in the final concentrates.
- Gold deportment seems an opportunity that Yauricocha may want to investigate, particularly by evaluating gravity concentration in the grinding stage, or alternatively in the final tails, or both.

26.1.6 Environmental Studies and Permitting

Social and environmental activities are currently of high importance in Peru; therefore, SRK recommends that the company's commitments and agreements be fulfilled in detail and in a timely manner. Reputation and legal risks can arise due to this issue.

26.2 Recommended Work Program Costs

Table 26-1 lists the estimated costs for the recommended work described in Section 26, and that is not considered to be covered by ongoing operating expenditures.

Table 26-1: Summary of Costs for Recommended Work

Category	Work	Units	Cost US$
Geology and Resources	Infill Drilling (1)	13,000 m	1,300,000
	Exploration Drilling - Yauricocha Expansion (1)	25,000 m	2,500,000
	Structural and litho-stratigraphic model	1	100,000
	Training	1	10,000
	QA/QC and re-analysis	500	12,500
Geotechnical	Annual data collection and laboratory analysis	N/A	120,000
	Integrated Gravity Flow Model	1	150,000
	Sublevel Caving (25m) Pilot Test	1	400,000
	Shrinkage Caving Pilot Test	1	500,000
Hydrogeological	3D hydrogeological-structural numerical model & study	1	275,000
Production Rate Increases	Pre-feasibility(2) & Feasibility studies	1	2,000,000
Total			**7,367,500**

Source: SRK, Redco, 2021
Drilling costs assume US$100/m drilling costs.

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28 Glossary

The Mineral Resources have been classified according to CIM (CIM, 2014). Accordingly, the Resources have been classified as Measured, Indicated or Inferred.

28.1 Mineral Resources

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

An **Inferred Mineral Resource** is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

An **Indicated Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation. An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve.

A **Measured Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve.

28.2 Definition of Terms

The following general mining terms may be used in this report.

Table 28-1: Definition of Terms

Term	Definition
Assay	The chemical analysis of mineral samples to determine the metal content.
Capital Expenditure	All other expenditures not classified as operating costs.
Composite	Combining more than one sample result to give an average result over a larger distance.
Concentrate	A metal-rich product resulting from a mineral enrichment process such as gravity concentration or flotation, in which most of the desired mineral has been separated from the waste material in the ore.
Crushing	Initial process of reducing ore particle size to render it more amenable for further processing.
Cut-off Grade (CoG)	The grade of mineralized rock, which determines as to whether or not it is economic to recover its gold content by further concentration.
Dilution	Waste, which is unavoidably mined with ore.
Dip	Angle of inclination of a geological feature/rock from the horizontal.
Fault	The surface of a fracture along which movement has occurred.
Footwall	The underlying side of an mineralized zone or stope.
Gangue	Non-valuable components of the ore.
Grade	The measure of concentration of gold within mineralized rock.
Hangingwall	The overlying side of an mineralized zone or slope.
Haulage	A horizontal underground excavation which is used to transport mined ore.
Hydrocyclone	A process whereby material is graded according to size by exploiting centrifugal forces of particulate materials.
Igneous	Primary crystalline rock formed by the solidification of magma.
Kriging	An interpolation method of assigning values from samples to blocks that minimizes the estimation error.
Level	Horizontal tunnel the primary purpose is the transportation of personnel and materials.
Lithological	Geological description pertaining to different rock types.
LoM Plans	Life-of-Mine plans.
LRP	Long Range Plan.
Material Properties	Mine properties.
Milling	A general term used to describe the process in which the ore is crushed and ground and subjected to physical or chemical treatment to extract the valuable metals to a concentrate or finished product.
Mineral/Mining Lease	A lease area for which mineral rights are held.
Mining Assets	The Material Properties and Significant Exploration Properties.
Ongoing Capital	Capital estimates of a routine nature, which is necessary for sustaining operations.
Ore Reserve	See Mineral Reserve.
Pillar	Rock left behind to help support the excavations in an underground mine.
RoM	Run-of-Mine.
Sedimentary	Pertaining to rocks formed by the accumulation of sediments, formed by the erosion of other rocks.
Shaft	An opening cut downwards from the surface for transporting personnel, equipment, supplies, ore and waste.
Sill	A thin, tabular, horizontal to sub-horizontal body of igneous rock formed by the injection of magma into planar zones of weakness.

Term	Definition
Smelting	A high temperature pyrometallurgical operation conducted in a furnace, in which the valuable metal is collected to a molten matte or doré phase and separated from the gangue components that accumulate in a less dense molten slag phase.
Stope	Underground void created by mining.
Stratigraphy	The study of stratified rocks in terms of time and space.
Strike	Direction of line formed by the intersection of strata surfaces with the horizontal plane, always perpendicular to the dip direction.
Sulfide	A sulfur bearing mineral.
Tailings	Finely ground waste rock from which valuable minerals or metals have been extracted.
Thickening	The process of concentrating solid particles in suspension.
Total Expenditure	All expenditures including those of an operating and capital nature.
Variogram	A statistical representation of the characteristics (usually grade).

28.3 Abbreviations

The following abbreviations may be used in this report.

Table 28-2: Abbreviations

Abbreviation	Unit or Term
AA	atomic absorption
Ag	silver
Au	gold
AuEq	gold equivalent grade
bhp	brake horsepower
°C	degrees Centigrade
CoG	cut-off grade
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
cfm	cubic feet per minute
°	degree (degrees)
dia.	diameter
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
g	gram
gal	gallon
g/L	gram per liter
g-mol	gram-mole
gpm	gallons per minute
g/t	grams per tonne
ha	hectares
HDPE	Height Density Polyethylene
hp	horsepower
ICP	induced couple plasma
ID2	inverse-distance squared
ID3	inverse-distance cubed
kg	kilograms

Abbreviation	Unit or Term
km	kilometer
km^2	square kilometer
koz	thousand troy ounce
kt	thousand tonnes
kt/d	thousand tonnes per day
kt/y	thousand tonnes per year
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
kWh/t	kilowatt-hour per metric tonne
L	liter
L/sec	liters per second
L/sec/m	liters per second per meter
lb	pound
m	meter
m^2	square meter
m^3	cubic meter
masl	meters above sea level
mg/L	milligrams/liter
mm	millimeter
mm^2	square millimeter
mm^3	cubic millimeter
Moz	million troy ounces
Mt	million tonnes
MW	million watts
m.y.	million years
NI 43-101	Canadian National Instrument 43-101
OSC	Ontario Securities Commission
oz	troy ounce
%	percent
ppb	parts per billion
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RC	rotary circulation drilling
RoM	Run-of-Mine
RQD	Rock Quality Description
SEC	U.S. Securities & Exchange Commission
sec	second
t	tonne (metric ton) (2,204.6 pounds)
t/h	tonnes per hour
t/d	tonnes per day
t/y	tonnes per year
TSF	tailings storage facility
µm	micron or microns
V	volts
W	watt
XRD	x-ray diffraction
y	year

Appendix A – Certificates of Qualified Persons