# Report

:: Geological Survey and Reserve Estimation

La Plateada Mine

***Commune of Combarbala- Limari Province***

***Region of Coquimbo***

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ambientalchile

Asesoría & Proyectos para la Sustentabilidad

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***Written for:***

***Foreign Commerce***

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# 1. Abstract

On behalf of Foreign Commerce, during the months of February and March 2014 one Geologic survey and Reserve Estimation Study was performed.

The deposit is located in the Region of Coquimbo, Choapa Province, Chile. The deposit is especifically located 13.5 km to the north of the town of Combarbala. In the UTM northing it is 6,562,703 m and to the east it is 306,437 m referred to this datum PSAD 56 and an average height of 900 masl. In the area there are several structures with vein shapes, with sulfide mineralization, and with oxidized copper. Furthermore, some of them are being exploited particularly in the areas of enjoyment and remnants of veins.

The exploitation is specific and restricted to the mixed zone, where there are sectors with high grades associated with chalcopyrite, chalcocite, bornite and silver minerals.

The aim of the work was to define the geometry of the ore bodies, their control, their type of mineralization, their spatial distribution and their mineral genetics association. Also, the purpose of this study was to assess the potential economic resources of the site, in addition to defining prospective guidelines for determining resources, and propose a new survey work in order to assess the resources of the site.

The rocks exposed in the district are a stratified volcanic sequence formed by amygdaloidal andesitic lavas, volcanic branch with some intrusive diorite bodies and andesitic porphyry.

The mineralization is mainly of copper and silver, with subordinate gold, silver is mainly linked to the bodies of high grade.

Currently the site is being exploited. Furthermore, the current mining tasks are restricted to a sector located south west of the projection surface of the main body, where some structures emerge of higher grade.

Detailed geological study was conducted in an area of 1,100 by 500 m, considering surface, exploitation and recognition tasks. Surface and underground sampling supplemented the study.

A total of 27 samples of chips channel type in structures and favorable rocks were collected. They were sent to *Activation Labs* laboratories in the city of Coquimbo. Consequently, Cu Total, Cu Soluble and Au, Ag and acid consumption in some samples requested analysis.

The zones of greatest interest in the mine area are the bodies located in the central west sector under the level 1. Likewise, these areas were heavily exploited, thus now it has remaining and enjoy the exploited bodies.

Additionally, there is a second mineralized sector that has not been exploited in depth. It is located at the southern end of the main body and is a body “lenticular” veined of high grade.

Resources were evaluated in:

- The quality “measured” in the order of 26,000 tons with average grades 1.80% Cu T, 1.02% Cu Sol, and 0.79 Insoluble Cu.
- The quality “indicated” in the order of 112,000 tons grade assigned with average of 2% Cu T, 0.5% Cu Sol, and 1.5% Insoluble Cu.
- Finally, the quality “inferred” resource a total of 31,000 tons.

Mining reservoir prospects are interesting, if the continuity of the main body under level 1 and the southern projection of the body are satisfied. Specific recommendations for assessing the resources defined in this study and recognize some prospective interest sectors are given. Also, a

economic/technical analysis at profile level is performed to determine the profitability of developing an optimized exploitation of the deposit.

# 2. Conclusions and recommendations

In the area there are mineralized structures, mainly associated to vein shapes.
The mineralization is cooper with subordinate silver with a strong structural control. According to the analysis of the results of the geological survey, it can be mentioned that the site La Plateada is part of a system of copper mineralization associated with vein shapes of northeast direction. The existence of chalcocite and bornite associated to the mixed zone of the reservoir indicates a large zone of secondary enrichment.

The copper mineralization is controlled by a system of vein “lenticular” shapes of north-northeast and northwest directions. In general, this system is possibly associated with a structural district type system.

The areas of interest in the area of the mine, are the bodies located in the central or east sector under the Level 1, which are those that were heavily exploited. In consequence, there is now remaining of those bodies. Furthermore, there is a second mineralized sector that has not been exploited in depth. This is located at the southern end of the main body and represents a lenticular body veined of high grade.

Resources of measured quality of the order of 26,000 tons with average grades 1.80% Cu Total, 1.02% Cu Soluble and 0.79 Cu Soluble Insoluble Cu were evaluated. Also, in the quality of indicated a total of 112,000 tons with average grades assigned of 2% Cu Total, 0.5% Cu Soluble, and 1.5% Cu insoluble. Finally, as inferred resource a total of 31,360 tons with uncertain grade were evaluated.

The mining reservoir prospects are favourable, not only restricted to the area of the body in operation, because there are other areas with similar mineralization exploited, which could generate a search pattern in the volcanic and intrusive structural unit associated guidelines in the northeast direction.

Thus, in order to recognize the mineralized block under the Level 1, it is recommended to perform an inspection by program based on three drilling pilots in order to recognize the projected mineralized block to the Level 2. In addition to the drilling, it is suggested to continue the development of Level 1 in the southern sector, in order to test the continuity and quality of the ore body at this level. Furthermore, in areas where there are new manifestations of copper in surface, it is recommended to plan ditches in order to recognize possible structures in depth.

According to the results of the drilling program, it is recommended to continue and redirect the inspection of Level 2 and test the resources evaluated under Level 1.

Moreover, in the direction of a project of investment, the reservoir economic analysis of the proposed method shows us that this is a project suitable option. The project implies an initial investment of up to U.S. $ 1,295,000. This value equals the actualized net flows making the NPV (Net Present Value) equal to zero and project return of 15%.

It worth mentioning that in the evaluation the revenue regarding Silver and Gold minerals has not been recovered. These positive values represent a margin to withstand a drop of insoluble copper law, an excessive mining dilution, and a decrease of tonnage.

The Project Risk, as in all mining projects, might be:

- The certainty of the volume of Geological Resources that can affect the life of the project.
- The Reserves Act, which would affect the project revenues.
- The price of copper on the international market.

The law of balance in insoluble copper in the evaluation of the project is of 1.1%.

Considering that the process of concentration of minerals by flotation is a technique known over 100 years ago and widely developed in our country, it is not assumed as a technical risk for the recovery of copper, silver and gold residual.

It is relevant for evaluation of the project with interest in sulphide mineral copper, to consider that mineralogical species are mostly primary sulphide, such as chalcocite and to secondary sulphide such as bornite. These species in the chemical analyses show a high degree of solubility, which skew the results; these species are feasible to recover in the flotation concentration process.

Finally, the consultant team believes that the greatest opportunity to increase business value is to install a Concentration Plant in the area, wherein invest first in an exploration campaign, find new mines and create buying power.

# 3. Introduction

## 3.1 General overview

On behalf of Foreign Commerce, during the months of February and March 2014 a Geological Survey of Land and Reserves Estimation of La Plateada Mine was conducted to assess the mineral resources, define areas of economic interest, and make an economic evaluation of a optimized exploitation method.

A geological recognition in detail in an area of 1,100 for 500 m was performed, for this purpose a geological mapping of the surface and underground in a scale of 1:1.000 was made. Adittionally, as a support a topography of surface detail was drafted, and topographically were raised all the underground workings at 1:1000 scale.

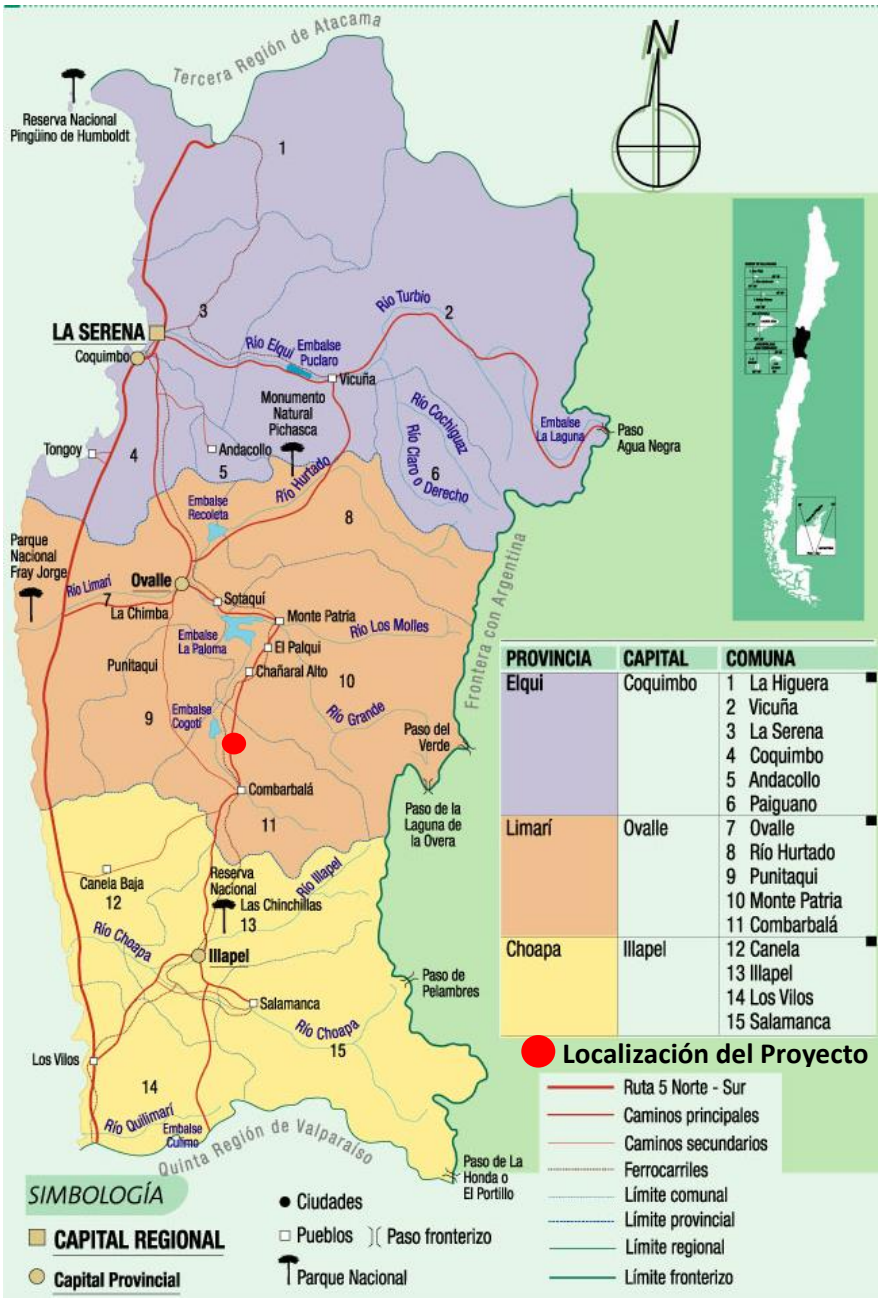
A total of 27 samples of type chips channel in structures and favorable rocks were collected. They were sent to *Activation Labs* laboratories in the city of Coquimbo and analysis of Cu Total, Cu Soluble and Au, Ag and acid consumption in some samples were requested.

Currently the site is being exploited promptly. Also, the more thorough exploitation was restricted to a sector where surface outcrops and in the most important area in underground structures pocket.

## 3.2 Location and Access

The propriety La Plateada is located in the religion of Coquimbo, Province of Choapa, Chile. The property is located 13,5 km to the north of the city Combarbalá and in the UTM coordinates in the north 6.562.703 m y east 306.437 m referred to Datum PSAD 56 and at an average height of 900 masl (Figure 1).

**Figure 1: Regional Project Location**



## 3.3 Infraestructure

In general, there are only minor typical mining camps facilities with capacities for 5-10 people, in sectors communication can be done via cell phone.

There is no resource availability of electricity and water sector. For that reason, the basic inputs for the operation of the task must be brought from the city of Combarbalá.

## 3.4 Objectives and Scope

The aim of this work is to perform a specific Geologic study of the area covering the property of the site, aimed at evaluating the resource potential, define the shape and occurrence of mineralized demonstrations, control, type of mineralization, spatial distribution and mineralogenetic association and forward to define guidelines for the identification of new resources, as surveys suggest, perform it by drilling and/or tunnel. Moreover, referring to recognition results of the site, propose and evaluate the performance of an appropriate operation method to maximize the benefit of the identified resources.

## 3.5 Methodology

The methodology considered:

- Background Checks and planning of work: as part of the background it was considered extracts of the Diagnostic Study of the Geological District Report, District La Ligua, Referred to La Plateada Mining Property.
- Fieldwork: Geological mapping of the surface of the study area. The geological mapping was performed in a scale of 1:1000 complemented by sampling structures and favorable rocks, 3 cross sections (A-A1, B-B2 and C-C2). Three open pits and its lateral underground workings sides were mapped.

- Sampling: 27 samples of ore bodies and host rocks were removed and were sent for analysis to the laboratory Activation Labs, that is a laboratory that operates internationally and has quality certificates. Analyses were Cu total, soluble Cu, Au and Ag.
- The fieldwork was supported by topographical survey in the surface and inside the mine and, in turn, the sampling points were recorded topographically.
- Structures and photographic record of sampling points were performed.
- Development and geological interpretation of all the information collected in the terrain stage.
- Selection a method of underground mining that was selective and adjusted to the powers of the ore body.
- Evaluation of the method of exploitation identifying the technical and economic variables involved in the process and its future projections.

The work was conducted according to the schedule in Table 1.

**Table 1: Work Schedule**

| Activity | February 2014 | | | March 2014 | | | |
|---|---|---|---|---|---|---|---|
| | Week 2 | Week 3 | Week 4 | Week 1 | Week 2 | Week 3 | Week 4 |
| Land Survey | | | | | | | |
| Collection and Review of Existing Information | | | | | | | |
| Local Geological Survey and Identification of Sampling Points | | | | | | | |
| Sample Preparation and delivery of Chemical Tests | | | | | | | |
| Testing and Delivery of Results | | | | | | | |
| Geological Report and Reserve Estimation | | | | | | | |
| Selection and Evaluation Method of Operation | | | | | | | |

# 4. District and Regional Geology

## 4.1 Stratigraphy

The exposed rocks in the study area are mainly a volcanic sedimentary sequence formed by andesites interbedded with clastic and calcareous sedimentary, this sequence is assigned to the formation Quebrada Marquesa, and it is of Early Cretaceous age.

The volcanic sequence consists of porphyritic andesites lavas of greay color. The sedimentary units include levels of limestone and limestone breccias, these units are cut by dikes of tonalitic and dioritic composition.

## 4.2 Intrusive rocks

The only intrusive units are located to the northeast of the study area. These are small stock of andesitic and dioritic porphyry, fine-grained of green color. The intrusive are of Cretaceous age and belong to the Upper San Lorenzo unit.

Numerous andesitic dykes cut the volcanic and intrusive units and partly control the copper mineralization in the district.

In the east field it is possible to recognize quite moderated and consolidated deposits. Their origin is mainly alluvial including; boulders, gravel, sand and gravel, with interbedded silts.

### 4.3 Structures

The main features and structural are failures and lineaments in direction to northeast, north-northeast and northsouth, which generally control the volcanic units in the district. Moreover, it is located to the east of the study area, and affects mostly the volcanic levels.

It also recognized a secondary failure system and minor lineaments on the direction to northwest, apparently it is posterior to the first one and they are mainly in the western sector of the District.

### 4.4 Tectonics

In general, the tectonic are a tectonic block with normal faults and subsidence. It generates monoclines and synclinal structures in layered rocks with gentle cloaks to the southeast.

To the northeast some folds of anticlinal type in direction to the north-northeast are recognized. They are mainly affecting the Bandurrias formation, which could represent to a compressive tectonic phase.

# 5. Economic Geology

## 5.1 Mining Geological Description of Study Area

La Plateada Mine is located in an area where emerges a layered volcanic sequence. Thin andesitic and breccia levels form it. Furthermore, this unit is arranged in a monoclinal attitude with decline inclination to the northeast and east. The axis of the monocline has directions between north-northwest and northsouth.

Small stock and dikes of diorite and andesitic porphyry composition form the stratified units, which generate a slight halo of argillic and hematic alteration to its edges.

In the area several copper deposits of similar characteristics than La Plateada Mine are recognized, they are located in the volcanic sequence.

Additionally, some irregular areas of copper oxides in the surface are recognized. They are possibly associated with some mineralized structures at depth.

The most important economic sectors are those located in the central areas, where sub vertical structures in direction to north-northeast and northeast exist. They have been exploited (La Plateada Mine) and are located in a strip of direction northeast.

## 5.2 Reservoir geometry

The ore bodies are mainly the sub vertical structures in direction to north-northeast and cloaks between 75 and 85 º to the northwest, with power between 1 and 3 m. They are located in the upper part of the andesitics lavas. In addition, these bodies are irregular and wedge in projection controlled by structures of direction from northeast to north-northeast (see Plane 2 "Planta Superficie" in Appendix 1).

There are some secondary structures on northwest direction that form a mineralized system. They are of smaller magnitude but may contribute to the formation of wider zones at the intersection with the main bodies. They are of lower projection and width than the main bodies and possibly posterior to the principal system.

The main bodies are generally lenticular and of great development on projection above 500 m and recognized depths between 30 and 85 m. They produce higher impregnation zones in the intersection failure and structural lineaments zones.

## 5.3 Mineralization and gangue

The supergene mineralization is mainly of chrysocolla, atacamite, antlerita, azurite and chenevixita. It is presented in guides, disseminated, core, cavity fillings and fractures.

The hypogene mineralization is of chalcopyrite, chalcocite and bornite. Also, as gangue mainly pyrite, quartz and calcite are recognized.

## 5.4 Structures

In general, structural lineaments recognized in the reservoir area are fault and/or fractures in direction northeast, north-northeast and some lineaments on northwest.

The ore bodies are mainly associated to the north-northeast system, which are partly controlled by the failures o similar conditions. In addition, minor failures located in northwest are mainly recognized in the northwest section of the study area (see Plane 5 and 6 of Annex 1).

The northwest lineament is more local and occurs in the central area. This is the most recent and moves the main lines.

## 5.5 Mining work

The main tasks of the field are work surface and two underground workings performed on the main ore bodies. Also, they are recognized with greater intensity in the central sector. In the central sector

there are underground workings of about 80 m deep and some are located between 3-8 m, the latter are located in the superficial work and develop in the direction of the structures dip.

In the north there is a level of recognition of about 30 m, this work aims to identify the mineralized zone located below the projection of the exploited bodies in the top level (see Plane 6 "Planta Nivel 2" in Appendix 1).

### 5.5.1 Level 1 (Nivel 1)

Level 1 is located on Hill 850 m and consists of a series of horizontal and vertical underground opening, their location can be seen in Plane 5 "Planta Nivel 1" in Appendix 1.

The task of access represents a mining level with sourthwest orientation and presents a development of 405 m. This mining level cuts the vein at 150 m of development, which is the Base Level of the old workings, leaving only remnant ore pillars of support. Thus, the access requires improving floors and especially all the old wains-cotting supporting roofs.

According to mine safety regulation, DS 132/2004, supervised by SERNAGEOMIN, these tasks cannot be used in the condition risk that exist currently.

The main tasks are the following:

- Machine vertical work (Pique Maquina): It is located 175 meters from the entrance of the mining level. It can be seen that it had a vertical extraction system, ski type car driven by an electric winch. This work is currently with water at 22 feet deep, thus hindering the access.

**Figure 1: Pique Máquina**

- Other vertical labor: Throughout the mining level there are several vertical labors built for exploration, which cannot be accessed because they were flooded.

- Crosscut: These transverse to the mineralized structure work, built for the recognition, are found along the mining level at all points that are thought to exist veinlets of interest.

### 5.5.2 Level 2 (Nivel 2)

Level 2 is located on Hill 780 and presents a development of 30 m. The beginning of this mining level will allow us to recognize, develop and to exploit the areas under Level 1 and Level 2. Its location can be seen on Plane 6 "Planta Nivel 2 "in Appendix 1.

**Figure 2: Entrance to the mining level of access level 2**

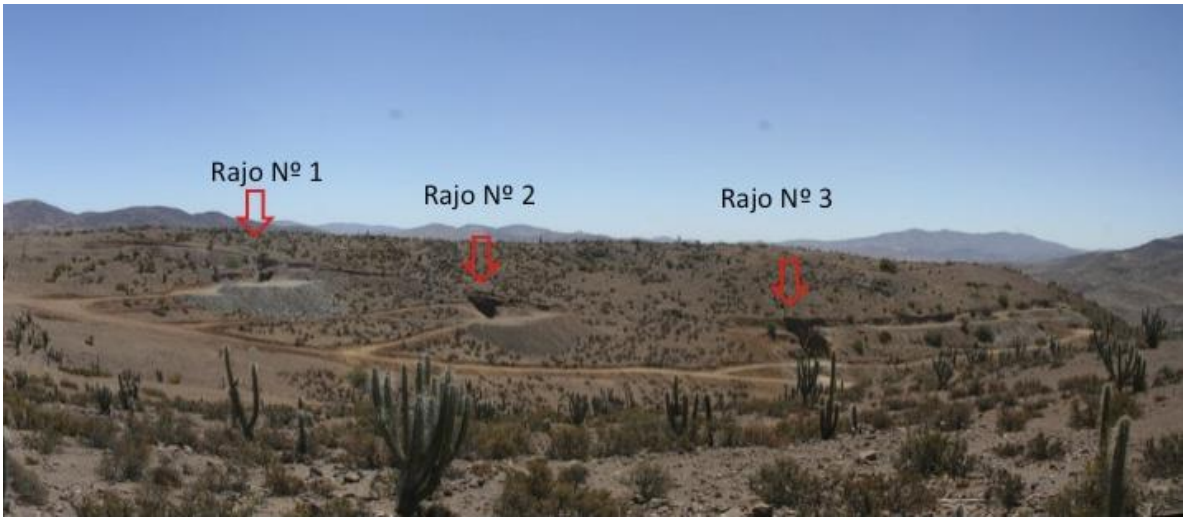

**Figure 3: Labor Interior Level 2**

### 5.5.3 Open Pit

The Open Pit Sector comprises an area of 400 meters long by 4 meters wide. Three open pit who has underground workings having different lengths. They show an advanced level of exploitation.

In the Plane 2 "Planta Superficie" in Appendix 1 it can be seen its location. In Figure 4 an overview is shown indicating location.

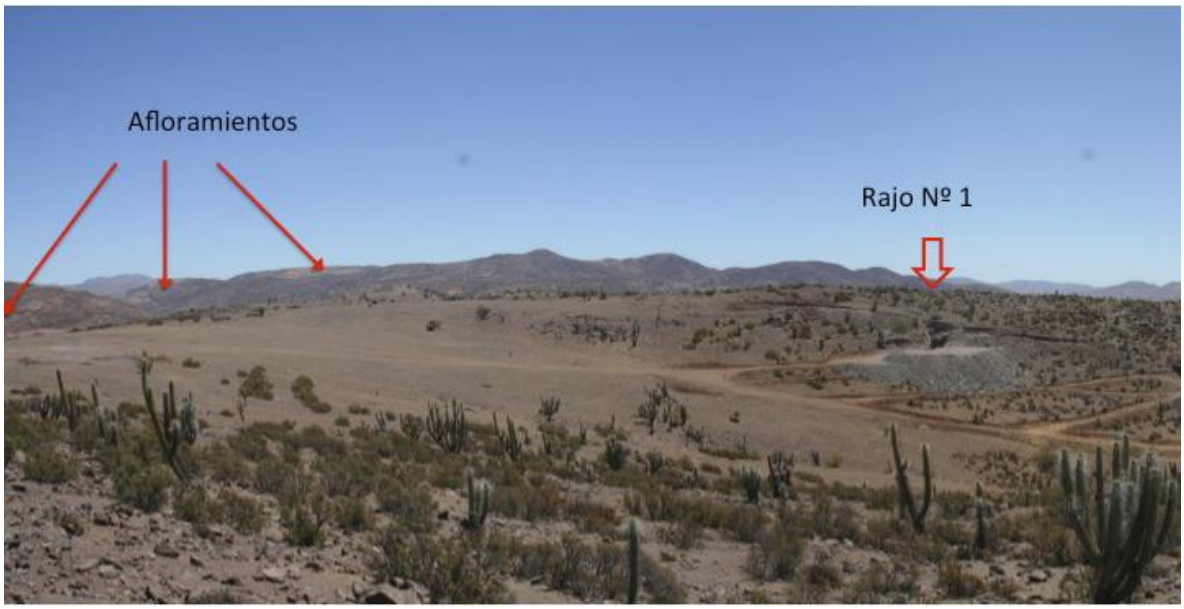
**Figure 4: Panoramic location of Open Pit (Rajos)**




### 5.5.4 Outcrops (Afloramientos)

In the southern part of the job it has been detected three outcrops that show that mineralization continues according to the indicated direction. This area has not been exploited yet. In Figure 5, the location is indicated.

**Figure 5: Outcrops location**




## 5.6 Sampling

A total of 37 structures samples and favorable rock were requested analysis for Cu Total, Insoluble Cu, Au and Ag. Also, consumption of acid per kilogram of copper required in all samples older than 1% of Soluble Cu was taken.

Table 2 shows the summary of the results of the chemical tests indicated and in the Annex 2 "Chemical Analysis" reports submitted by the laboratory are attached.

## Table 2: Chemical Analysis Mine La Plateada

| Nº SAMPLE | Nº Remission | Width (m) | Cu Total (%) | Cu Soluble (%) | Cu Insoluble (%) | Silver (g/t) | Gold (g/t) |
|---|---|---|---|---|---|---|---|
| **M-1** | 1364 | 0,56 | 0,858 | 0,737 | 0,121 | | |
| **M-2** | 1365 | 0,56 | 7,750 | 0,622 | 7,128 | | |
| **M-3** | 1366 | 0,57 | 1,193 | 1,071 | 0,122 | 38,600 | 0,140 |
| **M-4** | 1367 | 0,42 | 2,480 | 2,433 | 0,047 | 55,000 | 0,210 |
| **M-5** | 1368 | 0,34 | 0,937 | 0,920 | 0,017 | | |
| **M-6** | 1370 | 0,53 | 0,745 | 0,743 | 0,002 | | |
| **M-7** | 1374 | 0,67 | 0,856 | 0,850 | 0,006 | | |
| **M-8** | 1372 | 0,54 | 1,248 | 1,219 | 0,029 | 25,400 | 0,080 |
| **M-9** | 1373 | 0,56 | 1,487 | 1,412 | 0,075 | 53,200 | 0,040 |
| **M-10** | 1371 | 0,26 | 0,314 | 0,278 | 0,036 | | |
| **M-11** | 1369 | 0,37 | 0,873 | 0,860 | 0,013 | | |
| **M-12** | 1363 | 0,63 | 0,024 | 0,012 | 0,012 | | |
| **M-13** | 1362 | 0,3 | 1,381 | 1,359 | 0,022 | 28,600 | 0,020 |
| **M-14ª** | 1359 | 0,26 | 0,192 | 0,113 | 0,079 | | |
| **M-14B** | 1360 | 0,3 | 0,265 | 0,247 | 0,018 | | |
| **M-15** | 1361 | 0,4 | 0,329 | 0,326 | 0,003 | | |
| **M-16** | 1358 | 0,43 | 1,741 | 1,237 | 0,504 | 50,700 | 0,100 |
| **M-17** | 1357 | 0,72 | 1,611 | 0,443 | 1,168 | | |
| **M-18** | 1356 | 0,8 | 0,595 | 0,131 | 0,464 | | |
| **M-19** | 1355 | 0,9 | 0,466 | 0,072 | 0,394 | | |
| **M-20** | 1354 | 0,45 | 0,164 | 0,074 | 0,090 | | |
| **M-21** | 1352 | 0,52 | 0,028 | 0,020 | 0,008 | | |
| **M-22** | 1353 | 0,62 | 0,697 | 0,138 | 0,559 | | |
| **M-23** | 1351 | 0,72 | 0,641 | 0,184 | 0,457 | | |
| **M-24** | 1375 | 0,38 | 0,191 | 0,103 | 0,088 | | |
| **M-25** | 1376 | 0,23 | 0,748 | 0,581 | 0,167 | | |
| **M-26** | 1377 | 0,34 | 0,154 | 0,152 | 0,002 | | |

**Figure 6: Sampling Record**


The sampling result defined an average for all the grade of 1.08% Cu Total, 0.57% Cu Soluble and 0.51% Cu Insoluble.

A total of 6 silver and gold samples were analysed. The results indicate an average of 120 g/t Ag and 0.28 g/t Au, and acid consumption composite in samples with higher grades than 1% Cu Soluble. It gave an average of acid consumption of 67 kg of acid per kg of copper.

The reason Insoluble Cu / Cu soluble is 0.05, indicating that the old farm was in the mixed zone of the reservoir.

Considering only the major grade to 1% of Total Copper, the average was 2.41% Total Cu, 1.14% Cu and 1.27% Cu Soluble Insoluble.

## 5.7 Geological Model

Considering the background related to the metallogenesis of copper deposits in the district, the closest geological model is the hydrothermal model of medium depth, associated with some hydrothermal events generated by the Cretaceous intrusive bodies.

In general, these sites have a structural control related to high-angle faults associated with igneous activity and tardimagmatic post events derived from locations of these bodies' phases. The morphology of the outcropping ore bodies is mainly vein structures. Usually, they are spatially related to sub vertical mineralized structures, which generate in the intersect sectors lateral impregnation zone.

The genesis of these deposits is related to an early magmatic solidification, which creates a gassy liquid phase with certain elements in solution. This liquid phase when go up to the surface loses up to temperature and pressure, precipitating the substances in solution generating concentrations or mineral deposits.

The mineral deposits which are produced by the filling mechanism has the form of a duct shaped, as most conduits are fault and joints, the most common geometry ore bodies are veins and tabular bodies.

In the district the recognized mineralization is associated with hydrothermal events related to possible intrusive bodies at depth. They produce groundwater solutions generated by copper ore bodies.

**Figure 6: Dialling Geological Points**


## 5.8 Resources

The resource estimation for the copper mineralization was performed considering the geometry of the mineralized projection and width bodies. Moreover, it was considered a density of 2.8 for the mineralized units was estimated.

It is inferred a depth of 140 m for the continuity of mineralization from the surface elevation.

4 mineralized blocks, Block 1 in the Measured category, Block 2 in the Indicated category, Block 3 in the Indicated category and Block 4 in the Inferred category were defined. Additionally, the definition of the blocks was estimated considering the existing geological information in the reservoir.

**Table 3: Resources Block 1**

| Category | Maximum Length (m) | Maximum Deep (m) | Section ($m^2$) | Density ($t/m^3$) | Width (m) | Tons | Grade (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cu Total | Cu Soluble | Cu Insoluble |
| Measures | 336 | 69 | 20.511 | 2,8 | 1,5 | 86.146 | 1,81 | 1,02 | 0,79 |
| | | | | | Total | 86.146 | | | |
| | | | | | Exploited 70% | 60.302 | | | |
| | | | | | **Total** | **25.844** | | | |

**Table 4: Resources Block 2**

| Category | Maximum Length (m) | Maximum Deep (m) | Section ($m^2$) | Density ($t/m^3$) | Power (m) | Tons | Grade (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cu Total | Cu Soluble | Cu Insoluble |
| Indicated | 295 | 80 | 26.175 | 2,8 | 1,5 | 109.935 | 1,50 | 0,30 | 1,20 |
| | | | | | Total | 99.120 | | | |
| | | | | | Exploited 10% | 9.912 | | | |
| | | | | | **Total** | **89.208** | | | |

**Table 5: Resources Block 3**

| Category | Maximum Length (m) | Maximum Deep (m) | Section ($m^2$) | Density ($t/m^3$) | Width (m) | Tons | Grade (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cu Total | Cu Soluble | Cu Insoluble |
| Indicadas | 140 | 65 | 11.162 | 2,8 | 1 | 31.254 | 1,50 | 1,00 | 0,50 |
| | | | | | Total | 25.480 | | | |
| | | | | | Exploited 10% | 2.548 | | | |
| | | | | | **Total** | **22.932** | | | |

**Table 6: Resources Block 4**

| Category | Maximum Length (m) | Maximum Deep (m) | Section ($m^2$) | Density ($t/m^3$) | Width (m) | Tons | Grade (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cu Total | Cu Soluble | Cu Insoluble |
| Inferred | 140 | 80 | 13.108 | 2,8 | 1 | 36.702 | | | |
| | | | | | Total | 31.360 | | | |
| | | | | | Exploited 0% | 0 | | | |
| | | | | | **Total** | **31.360** | | | |

**Table 7: Resource Box**

| Grade | Tons | Cu Total (%) | Cu Soluble (%) | Cu Insoluble (%) | Observation |
|---|---|---|---|---|---|
| Measures | 25.844 | 1,81 | 1,02 | 0,79 | Sampling Grade |
| Indicated | 112.140 | 1,5 | 0,5 | 1,0 | Assigned Grade |
| Inferred | 31.360 | | | | |
| TOTAL | **169.344** | | | | |

The assignation of grade is restricted only to the sampling of surface and, particularly, to samples taken underground, mainly to boxes of the mineralized body, because of the non-existent of sampling sites in the structure (is exploited). However, the exploitation must choose greater grade than 1.5% of soluble and insoluble copper in order to establish a profitable unit, which could reduce the resources evaluated by 50%.

# 6. Sectors of Mining Interests

The areas of greatest interest in the mining area of La Plateada mine are the bodies located below the exploited area (Level 1).

A second area of interest is located immediately south of the main structure, where there are openings projection surface of the main body. This body, according to the geological mapping of Level 1, has not been exploited.

There are some areas of outcropping veinlets outside the southern projection of the main body, which could possibly represent a marginal event and the edge of the main event. Still, there are copper oxides grade of relative importance considering that they are superficial and could be related to structures of depth interest. Consequently, this could be considered as a prospective target.

## 6.1 Mining prospects

The mining prospects reservoirs are interesting in order to the recognition of new resources in areas under the main work zones and some lateral structures in operation.

The existence of areas with evidence of copper and silver anomalous mineralization economically associated with structures in north-northeast in the district, could indicate an extensive system of copper-silver mineralization that could be developed outside the belongings and related possibly with some dioritic intrusive stock.

The possibility of finding ore bodies in areas where coincide spatially the volcanic units, intrusive, areas with evidence of argillic alteration associated with a northeast tectonics are favorable, considering that these features are the ones with the exploited vein sectors.

## 6.2 Recommendations for the exploration work

According to this study it is recommended to explore the lower block and the southern projection of the main structure. To this effect the continuity of the work of recognition located in the northwest of the site is recommended to recognize the lower block of the site. Still, before that it is indicated three drilling pilots with reverse air under the most exploitative sectors at Level 1 in order to test the continuity of the main body of the reservoir under the deposit plans. Moreover, the drilling might indicate whether there are parallel structures to the main vein.

In the southern sector it is recommended to continue the development of Level 1 in order to test the continuity and quality of the ore body at this level. Also, in marginal areas (southern sector) make openings and / or ditches where some ore bodies emerge in order to recognize the projection of possible bodies under the covering surface.

## 6.3 Investment Program Rating

The recommended drilling is of reverse air inclined to an average depth of about 200 meters. The following table indicates their specifications and Plane 1 "Floor Area" of Annex 1 its location is indicated.

**Table 8: Projected drilling**

| Drilling | East (m) | North (m) | Length (m) | Inclination (degrees regarding direction) |
|---|---|---|---|---|
| S-1 | 306.120 | 6.532.680 | 180 | -60°E |
| S-2 | 306.255 | 6.652.660 | 170 | -50°W |
| S-3 | 305.970 | 6.562.065 | 210 | -55°E |
| | | Total Meter Program | 560 | |

Note: Coordinates in zone PSAD 56 19s.

**Table 9: Drilling program costs**

| Profile | N° of drillings | Total (m) | Unitary cost (US$/m) | Total cost (US$) |
|---|---|---|---|---|
| A-A´ | 1 | 180 | 50 | 9.000 |
| B-B´ | 1 | 170 | 50 | 8.500 |
| C-C´ | 1 | 210 | 50 | 10.500 |
| **Total** | **3** | **560** | **50** | **28.000** |

Moreover, the recognition tasks of 210 meters at Level 2 continuing the existing mining level are recommended. Also, at Level 1, it is suggested, to continue the mining level development at 130 meters, with approximately 150 chemical assays.

**Table 10: Exploration work costs**

| Level | Projected Labor Meters (m) | Cost (US$ /m) | Total (US$) |
|---|---|---|---|
| Level 2 | 210 | 600 | 126.000 |
| Level 1 | 130 | 600 | 78.000 |
| N° estimated samples 150 Preparation and Chemical Analysis | | 24 US$ / samples | 3.600 |
| | | **Total** | **207.600** |

# 7. Exploitation Method Proposal

According to the analysis of the results of the geological survey, it can be mentioned that the site La Plateada is part of a system of copper mineralization associated with veined bodies of northeast direction. Furthermore, the existence of chalcocite and bornite associated to the mixed reservoir zone suggests a large zone of secondary enrichment.

The copper mineralization is controlled by a system of lenticular veined bodies located in north-northeast and northwest directions. This system is possibly associated with a structural system of district type.

The areas of interest in the area of the mine are the bodies are located in the west central sector under Level 1, which are those that were heavily exploited, and now have some residuals of the exploited bodies.

A second mineralized sector that has not been exploited in depth is located at the southern end of the main body and corresponds to a lenticular body veined of high grade.

Resources were evaluated in the quality measured on the order of 26,000 tons with average grades 1.80% Cu T, 1.02% Cu Sol and 0.79 Cu Insoluble. In the indicated quality a total of 112,000 ton with average grades assigned 2% Cu T, 0.5% Cu Sol and 1.5 Cu Insoluble. As inferred resource the evaluation gave a total of 31,000 tons.

The mining prospects of the reservoir are favorable. In addition, it is projected the realization of a Basic Engineering Development and Preparation of an Underground Mining System.

The main purposes of the mining operations are to determine the size, shape, exposure limits, continuity of mineralization and ore mineralogy and physical characteristics of rock box, perform the opening, and preparing the deposit for further exploitation.

The mine has a set of workings located in the area of outcrop some chopped type and other of higher intensity in all cases has allowed them to have an overview of the deposit.

## 7.1 Preliminary work

The first works to be performed must be aimed at improving the category of Mineral Resources; From Inferred to Indicated and from Indicated to Measured. Also, it must be considered to explore new areas in order to increase the Inferred Resources, and so forth.

Geology has proposed the developing of three exploratory drillings (whose location are in the plans). These are intended to recognize the mineralized structure under Level 1 and 2; but especially found parallel to the main vein. This is mainly because the fracturing system advises it.

It is recommended to drain the machine vertical work and enable its access. Consequently, this can be recognized and sample the mineralized column. Also, it can be possible to improve the quality of resources, then build drift (horizontal or nearly horizontal underground opening), and prepare new blocks to explode.

The ending of the mining Level 1 presents good grade, still having low width. Hence, we recommend you further development, the superficial works in the outcrop of the vein, located in the same column, the mineralization advise this work.

All this preliminary work in the development of the mining Level 2, are to be built with strong orientation in the Plane for the Geologist.

## 7.2 Proposed Mining Method

A mining method that can be implemented in La Plateada mine is proposed in a conceptual level. This mining system is conditioned according to practices that are common in this type of mining, combined with the mining rules and some basic engineering concepts.

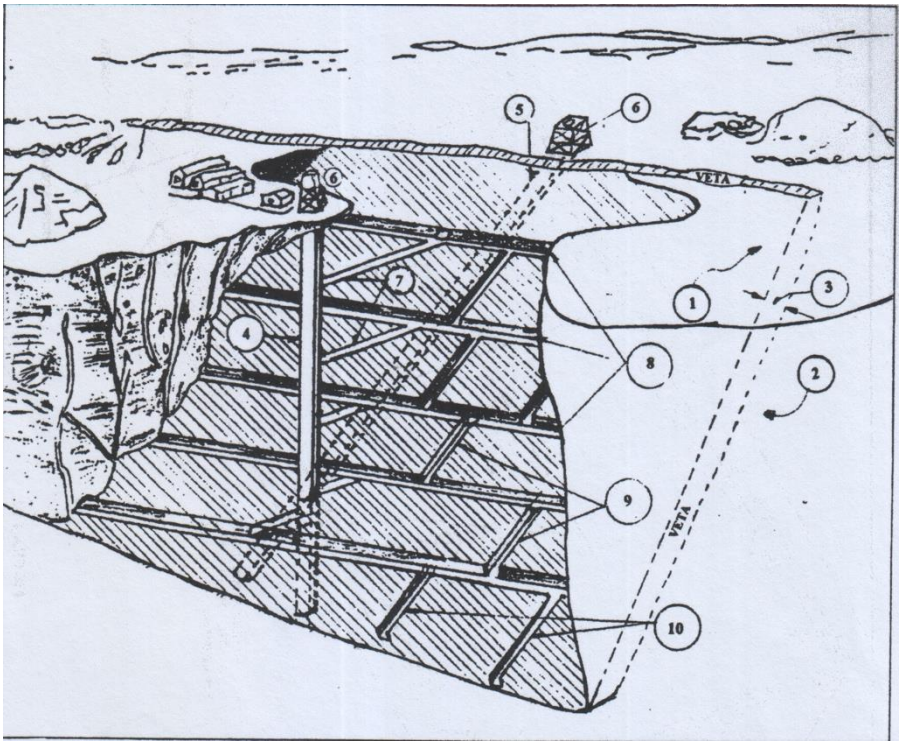
The method fits Mina La Plateada because it is a tabular vein type deposit, of small power, great run, and cloak steep (75 ° to 80 °). It has an irregular distribution of grade both in run and depth. Also, there are some sectors more wider or lenticular structures. Both the rock and the ore boxes present geo-mechanical characteristics of medium strength.

### 7.2.1 General Description

The reservoir is accessed through the mining level run by vein. From a lower level works are raise shaft that communicate two consecutive levels. then has to be broken in the shaft (vertical or inclined underground opening through which a mine is worked) direction.

Before the benching it will be necessary to plan and coordinate access to the chamber exploitation, with fronts in development, including the extraction points construction of the fragmented ore, as well. See Figure 7.

**Figure 7: General Method Outline**

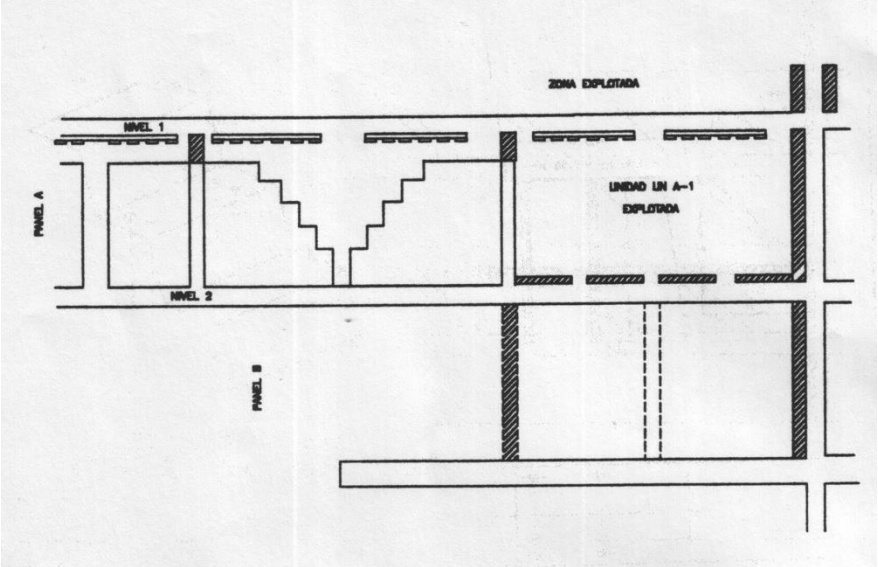



In the design of the place it is recommended to have into consideration the current infrastructure of the mine, especially regarding the access and spacing of old workings. Naturally, they must have the necessary elements to achieve the planned exploitation rates.

## 7.2.2 Starting with chimney line of maximum slope

Once constructed the different levels that form the area of the mine to explode, it is time for defining the operating units (or chambers or mansions), these units will be limited by two rib pillars and the space between two consecutive levels (see Figure 8). The distance between the pillars depends on the difference in elevation between levels.

**Figure 8: Chiming method for LMP**




The chiming will work as slot located by definition in the centre of the large irregular work and with the consequent deposit tilt.

The starting will occur through lateral development block, burning into the hollow formed by the chiming.

### 7.2.3 Evolution Method

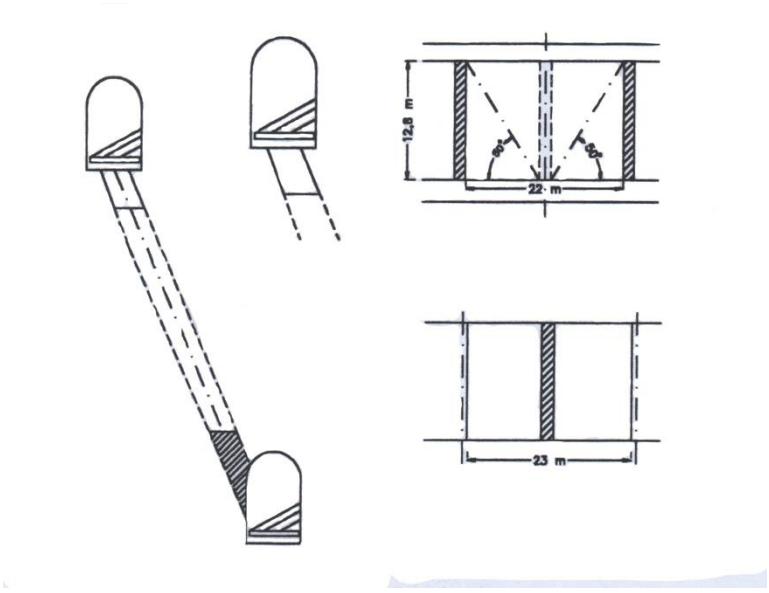
The method considers the following operations: recess floor, mining work mailbox, construction of the upper slab and exploitation by benching, more details are described below:

a) **Recess of floor:** The operation is initiated by a recess in the floor of the upper level (chamber ceiling), with a cut height similar to that of mentioned banks. The planned recess is achieved with 2 or 3 shots. These operations require transportation with marine trucks to the chiming.

b) **Mining work mailbox:** On the bottom of the chiming extraction the extraction points are located, including the construction of the mailbox, this has to download it to height of the transport unit.

c) **Construction of the Upper Slab:** After making the recess, the construction of an artificial slab that will be the ceiling of the chamber will take place. This will be made with eucalyptus logs of 6" in diameter and the same wooden planks 2" x 10", see Figure 7 that shows the general method outline (Figure 9). The slab should include the staff entrance to the camera located in one side of the pillars.

**Figure 9: Construction of the Upper Slab**




d) **Exploitation by benching:** The starting of the ore is done through block, which are dumped into the chiming, and it is removed from the operating Mailboxes.

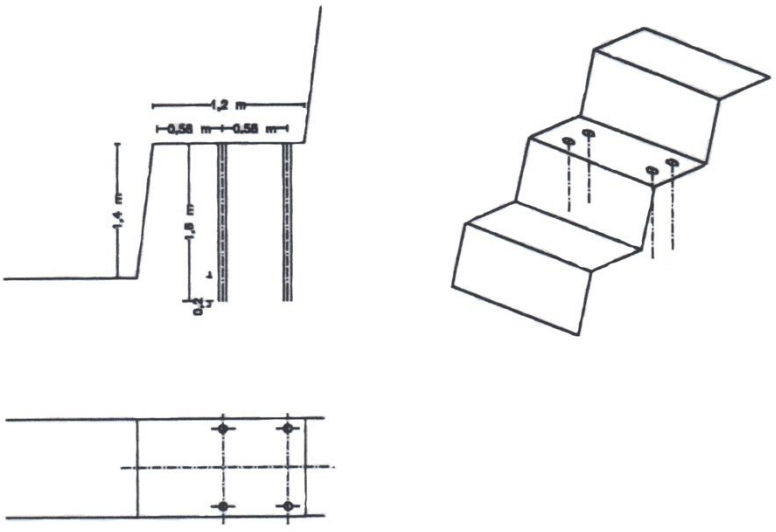
In this method comes to a time when some of the material will be projected into the chiming work, and the other will not have gravity drainage, in this case one must manually transfer it by shove toward the chiming.

When the transaction becomes tedious and counterproductive, it will be opened new extraction points to the level of exploitation. Thus, this method works in an interactive way until all the units of the panel are used up.

## 7.3 Bench design

Assuming a certain uniformity of starting, strictly engineering speaking, here it is presented below the design of a bench (Figure 10).

**Figure 10: Sizing Exploitation Bench**




Considering the following equipment:

- Light perforation of Type YT 27 or 28
- Drill rods series 12
- Explosives: An alternative is ANFO, dynamite, explosive and fire guides.

The design parameters of the bench are:

- Burden (B):

  Burden (cm) = 2,54 * d

  Where: d = drilling diameter in millimeters

  If d = 38 mm ; B = 2,54 * 38 = 96 cm

- High of the bank (H ) = 2B = 1,92 m
- Drilling depth = 2B + 0,3 B = 2,3 B = 2,20 m

These values conjugated to the width of the large irregular work, which would be the spacing, it can be appreciated that these are discordant. Therefore, the results should be adjusted to reality. Added to this design it requires a particle size of about 6" diameter of the rock.

## 7.4 Method Considerations

This method has a number of important design considerations to notice, namely:

- Entrance to the camera from the top part.
- Access to the development, it is exploiting and developing.
- Privilege to natural ventilation.
- Use of lightweight equipment.
- Selectivity.
- Increased productivity.
- Minimizing the cost of operation.
- Experienced teamwork.
- It can be possible to work in small width structures, 60 cm.
- The recovery of the panels is around 90% and the recovery block can reach 95%.
- The highest incidence in the mine is the construction cost of the preparatory work.
- With distances of 15 m between levels, it has an index "Metro development tonnage ratio" of 11.0 t/m.

# 8. Economic Viability of Proposed Method of Mining

The following section aims to discuss alternatives of commercialization of minerals, once the stage of development, preparation and exploitation has begun considering the mining method that the engineering team has considered the most appropriate the most suitable options to reservoir characteristics and volumes of reserves.

## 8.1 Possible channels of commercialization

For the location of the mine the following channels to market their minerals are presented:

- The minerals Above 12% of Total Copper, called "Minerals Direct Smelter" can be marketed directly to the Fundición Las Ventanas CODELCO - Chile, and can be delivered to Buying Agencies Empresa Nacional de Minería (Enami ), which offers the applicable purchase price. The Ventanas smelter is located approximately 300 kilometers from the mine.
- The copper minerals with lower sulfur grade and oxidized minerals can be marketed in the DELTA Enami plant in Ovalle. In the case of the oxides, as beneficiation methods considered by Enami, Silver and Gold are not recovered so Enami does not pay its value. In the process undergo sulfide minerals, flotation concentration, and if they allow the recovery of gold and silver, Enami will pay its value. Plant DELTA Enami is located approximately 100 kilometers from the mine.
- Plant Mineral Processing Flotation Concentrated near Combarbalá allow an alternative concentration of copper sulfide minerals (Copper Grade Insoluble) found in the primary zone, which can then be marketed in Las Ventanas Smelter and earn revenue by Silver and Gold products in this situation the business relationship with the plant is paying a rate (process value plus a utility), minerals are brought into court floor reception and after processing deliver the product obtained to the owner.

As a general rule, the operating viability of low grade ores is having its own mineral processing plant. Separating the species of interest from those without commercial value or contaminate the final product.

The criteria to consider are:

- Analyze the situation of Mineral Resources (tonnage and grade)
- Initial investment (Io).
- Balances Metallurgical Process.
- Areas or sites that allow the installation of the Plant and Tailings Deposits (products with no commercial value).
- Presence of industrial water.
- Electricity.
- Feasibility of government permits for installation.

## 8.2 Production Rate Estimate Project

The intensity of exploitation of the mine, is given mainly by the type of site (mainly width), volume resource and reserves life, capital and technology to use.

There is some empirical rules, like the Taylor`s rule, showing us the Mine Life expectations regarding resource:

Mine life (years) $= 0{,}20\ Er^{0{,}25}$

Where:

Er = Expectations of resources

The expectation of resources was obtained from Table 6, "Resource Box" that has seen the "measures" and "indicated" and metallurgical criteria are listed below, allowing a project expectations Resources 100,000 tonnes grading Cu 1.5% Insoluble.

Replacing a mine life of 3.6 years is obtained ($0,20 * 100.000^{0,25}$) .

- This shows that the project can have a production rate of 2,343 t /month or 28,117 t / year.
- A program of work 25 days / month we have a daily output of approximately 100 t.
- 100 tonnes of ore density 2.8 $t/m^3$.
- There are 35.7 $m^3$, if we consider a width of 1.00 of exploitation.
- Area to intervene daily: 35.7 $m^2$.
- Development in run daily 7.0 m and 5 m in the vertical (see Chapter 7 "Operating Method).

**Table 11: Rate Exploitation Scenarios**

| Scenarios | Production | | Mine Life |
|---|---|---|---|
| | t/day | t/month | (years) |
| Optimistic Value | 100 | 2.500 | 3,5 |
| Modal Value | 75 | 1.875 | 4,5 |
| Pessimistic Value | 50 | 1.250 | 6.5 |

For the economic analysis considers the Modal Value 75 t /day.

## 8.3 Determination of Equilibrium Points

The relevant points determined in this analysis are:

- The balance of Business Grade.
- The price per pound of copper in the market.

The analysis assumes the benefit of minerals in plants in Combarbalá and the sale of concentrates in the Smelter "Las Ventanas".

It is also considered to combine a set of variables in the light of experiences in the mine, previous studies, standards, preset values and experience of the evaluators.

### 8.3.1. Considered Values for Copper Prices

Considering the values of projections of COCHILCO – CHILE[1].

**Table 12: Schedule of Copper Prices**

| Schedule | Copper Prices (US$/pound) |
|---|---|
| Optimistic Value | 3,33 |
| Modal Value | 3,00 |
| Pessimistic Value | 2,80 |

For the economic analysis considers the Modal Value 3,00 US$/pound.

[1] http://www.cochilco.cl/estudios/info-cobre.asp.

### 8.3.2. Grade Concentrate and Recoveries Minerallurgy

Industrial experiences concentration exist which concentrate grades about 43% copper was obtained with 90% recovery.

**Table 13: Copper Concentrates Grade ( Lp )**

| Schedule | % Cu |
|---|---|
| Optimistic Value | 45 |
| Modal Value | 43 |
| Pessimistic Value | 40 |

**Table 14: Recovery Minerallurgy**

| Schedule | % |
|---|---|
| Optimistic Value | 93 |
| Modal Value | 90 |
| Pessimistic Value | 87 |

For the economic analysis considers the Modal Value of concentrate grade of 43% copper and mineralúrgicas 90% recovery.

## 8.4 Determination of Annual Benefit

The function to determine the annual income is the amount of concentrate production for the value of the product.

- Concentrate Production:

  Q= H/(c/(h*R))

  Is: h = Input Grade Insoluble Copper

R= Recovery Minerallurgy ( 90 % )

c = Concentrates Grade ( 43,0 % of Copper )

H = Tonnage processed (Mine Exploitation)

Q1 = Concentrate Production

Replacing:

Q = 22.500 / ( 43 / ( h * 0.90 ) )

= 22.500 / ( 43 / ( h * 0.90 ) )

= 471 * h ; Annual Tons of Concentrate

- Determine Product Value (VP )

  Production of copper concentrate will be sold in Enami-Ventana, and the value of a tonne of concentrate was determined according to the model used by the Company to determine their rates.

  The parameter values corresponding to data from the Sociedad Nacional de Minería (SONAMI).

  VP = 22,046 ( p – g ) ( Lp – Pm ) - MFC

  Where:

  p = Copper prices in Market, in US$ /pound

  g = Charge for Refining (12,0 CUS$ /pound)

  Pm = Metallurgical losses (3,8 % Grade Product)

  MFC = Charge Fusion Convert (121,8 US$ / Ton of Product)

  Replacing:

  **VP = US$ ( 911,955 p – 231,2346 ) t of concentrated**

- Estimation of benefits

  Benefits = Annual Production of Concentrates * VP

  = ( 471 * h ) * ( 911,955 p – 231,2346 )

= US$ ( 429.530, 81 * p * h – 108.911,50 * h )

## 8.5. Estimate Annual Costs

The costs were estimated based on historical costs Mining Operations of equal characteristics and standards used in evaluating projects at prefeasibility stage.

The values shown correspond to OPERATIONAL COSTS, therefore not include depreciation, amortization, interest and other.

**Table 15: Parameters and Estimated Costs**

| Item | Unit Value | Annual Value |
|---|---|---|
| 1. Mine Cost | US$ 23,0 /t of Ore | US$ 517.500 |
| 2. Transport Mine-Plant | US$ 6,0 /t of 0re | US$ 135.000 |
| 3. Plant Cost | US$ 18,0 /t of Ore | US$ 405.000 |
| 4. Transport Plant - Smelter | US$ 15,0 /t of Concentrate | US$ 7.650 * h |
| 5. General Administration | 20 % of the Costs | US$ 211.500 |
| | **TOTAL ANNUAL COSTS** | US$ 1.269.000 + 7.650 * h |

- Mine Operation: 22.500 t/year
- Cost includes mine development and preparation.

## 8.6. Contribution Margin ( MC )

The value is subject to Input Grade Insoluble Copper (h) and copper prices in the market (p) according to the following relationship:

**Mc = Operating Benefit – Operating Costs**

= [( 429.530, 81 * p * h – 108.911,50 * h ) – (1.269.000 + 7.650 * h )]

## 8.7 Net Flow (NF)

The Mining firm under the Rent Act may be taxed as Rental Income or based in Alleged Rent, currently can be taxed under the regime of Small Mining (2.0% of Gross Sales).

Therefore not considered: depreciation, amortization and interest.

Net Flow (NF), is equal to the contribution margin minus taxes.

NF = MC – [ ( 429.530, 81 * p * h – 108.911,50 * h ) * 0.02]

## 8.8. Present Value of Net Cash Flows (PV)

A discount rate of 15% and a project life of 4 years, which has been punished in 0.5 years as a way to introduce the concepts of Recovery Mining Reserves and dilution factors are considered.

Update Factor Flows = ( P/A, 15 %, 4 )

= 2,85498

## 3.9. Net Present Value (NPV )

Whereas modal values indicated in previous paragraphs.

NPV **= - Io + FN ( P/A, 15 % , 4 )**

p = Copper Prices, Modal Value: 300 CUS$ por Pound of Copper

h = Mina Extraction Media Grade = 1,5 % Insoluble Copper.

Parameters determined in previous points:

- Concentrate Production: 706,5 t/year
- Value Product: US$ 2.504,63 t of Concentrate
- Annual Benefit: US$ 1.769.521, 34
- Annual Cost: US$ 1.280.475,00

- Contribution Margin: US$ 489,046.-
- Net Flow: US$ 453.655,6
- Present Value of Net Cash Flows: US$ 1.295.177,60

With an investment of $ 500,000 is obtained:

**NPV = - Io + FN ( P/A, 15 % , 4 )**

**= US$ 795.178**

# 9. List of Professionals

| Nombre | Nivel profesional | Experiencia |
|---|---|---|
| Belisario Gallardo A. | Implementation Engineer, specialist in assessment of mining projects and design of processing plants. | 25 years of work experience, Director of G & G Engineering, 20 years of academic experience at the University of La Serena in project engineering of numerous minerals exploitation and plants. |
| Jaime Villagrán Torres | Geólogo Senior | Geologist with over 40 years of experience doing work for small, medium and large mining project related to evaluation, geological modelling, and reserve estimation. |
| Rodrigo Gallardo N. | Mining Engineer, Master in Integrated Engineering, Exp. Sernageomin Cat. A. | 15 years of experience. Director of Ambiental Chile and Grupo ANP. 10 years of years of academic experience in the Catholic University of the North (Universidad Católica del Norte) |
| Natalia Rojas | Mining Engineer, junior specialist in projects and in studies of geomechanical stability | 3 years experience in developing mining projects. |
| Marcelo Gallardo N. | Topography and cartography | Topographic and drafting of engineering. Mapping support in environmental projects. |
| Carla Callejas | Project coordinator | Biologist, Master in Environmental©. |

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