# MINERA PORTREE DE ZACATECAS, S.A. DE C.V.

MINING AND GEOLOGICAL REPORT ON
THE PARROQUIA MINE
MUNICIPALITY OF ZACATECAS, ZAC;
MEXICO.

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## SUMMARY

Parroquia mine is located on a geological structure in the west central part of the Zacatecas district and in the north-east sector of the oldest metamorphic rocks in the area. This structure outcrops at surface for more than 1,500 meters, striking NW 55° SE with an average dip of 65° to 75° NE and a width of 1.5 to 2,0 meters. This mine has been developed along strike for about 1,100 meters down to the 270 meter level. 40% of the total ore is estimated to have been extracted. This mine has been worked for over a century. An estimated 550.00 m.t. of ore with an estimated average grade of 2 % Cu, 3% Zn and 100 grs Ag per m.t. has been extracted. The majority was mined from the western part of the vein. Approximately 300,000 m.t. of mine dumps are present, with a probable grade of about 0.5% to 1 % Cu per m.t.

The current mining claims cover 1.500 meters of strike, to a maximum depth of 320 meters with an average width of 1.5 meters. Discounting the tonnage already extracted, the reserves potential that this mine may contain is in the vicinity of 1,500,000 m.t. This potential could be increased if the mine is developed at a greater depth and other structures foud in the area are explored.

## BACKGROUND

a) Location an access

The Parroquia mine is located 2.5 km. NW of the City of Zacatecas, in the west central portion of the mining distict of the same name. The mine is on the western side of the Zacatecas Sierra and on the SW side of the Magistral mountain. (see Map No. 1)

Acces to the mine is by road via the El Bote mine, or from the Zacatecas-Fresnillo road, where there is a 3.5 km. dirt road to the mine NE of the village of La Pimienta.

b) Physiography and Geomorphology

The district of Zacatecas is part of the physiographic province of the Mesa Central and within the sub-province LLanos y Sierra Potosino - Zacatecas. The present

day topography consists of intermittent creeks and shallow gullies, with escarpments formed by differential erosion. The promontories are capped by rhyolitic dikes and overflows which are resistant to erosion (see Map No. 2)

c) Climate and vegetation

The climate in this region varies from mild to cold with an average temperature of 18° C and has an irregular rainy season during the months of June through September, with average yearly rainfall of 367 mm. The vegetation is of semidesert type, consisting mainly of xerophytes ( cactae, maguey, and thorn bushes ).

d) Minig history

The Zacatecas mining district is as old as the founding of the City itself, dating from 1546. Several mines started at this time and some of them still have mining potential. In 1806, there were 238 mines in operation which had produced some 2,463,160 m.t. of silver. There were also several silver processing sites.

The mining area was most active during colonial times. The majority of population centres were founded around the mines, which probably worked continuosly until the Independence war of 1810.

After 1910, mining operations were irregular. There were periods of stoppages related to the political instability of the country and low metal prices, which is the case today.

The Parroquia mine worked for more than a century. About 550,00 m.t. of Cu ore were extracted, with an average grade of 2 % Cu., 3% Zn and 100 g. Ag per m.t. The mining was concentraded between the Capilla and Centinela shafts, down to the 270 meter level. About 300,000 m.t. remain in mine dumps with a probable grade of 0,5 to 1% Cu.

## GEOLOGY

a) Regional Geology

Igneous, sedimentary and metamorphical rocks outcrop, ranging in age from the Upper Paleozoic to the Pliocene, are found within the Zacatecas mining district.

This report will only describe the stratigraphy of the northern part of the district, where the Parroguia mine is located.

The oldest rocks in the district belong to a highly metamorphosed lithological unit, composed of grey-green to reddish phyllite and sericitic schists with some quarts nodules. These rocks are located in the western part of the district between El Bote mine and Parroquia mine. This lithological unit can be placed in the Upper Triassic ( Carnian-Zacatecas formation ).

Overlaying the phyllites and schists is a sequence or suite of metasediments, consisting of highly fractured sillicified lutites with argillitic alteration. These are stressed in the proximity of the mineralized structures or when in contact with the andesitic intrusive. Stratified andesitic flows are present which were formed underwater. This unit, the Chilitos formation, is Upper Jurassic/Lower Cretaceous in age.

During and immediately after the deposition of the Chilitos Formation, a formation of basic igneous andesites can be found throughout the district. They are known as the "green rocks of Zacatecas". Within this unit, three members can be easily differentiated, although having the same composition.

1. Extrusive andesitic unit

This litho-stratigraphic unit can be found inter-bedded and overlying the Chilitos Formation. It is a fine to medium grained, highly pophyritic green rock, with occasional strong thermo-dynamic metamorphism. It is the largest lithological unit, both at the surface and at depth. The most favourable conditions for mineralization are found with this unit as the host rock.

2. Andesitic pillow lavas

This member overlays the extrusive unit, and it is formed by fine grained, fast cooling, olive green andesitic flows, deposited underwater. It takes the form of pillows which varies in size from 10 cm to 1 meter on the long axes.

3. Andesitic porphyry (intrusive)

This member occasionally resembles diorite. It consists of large-grained, green to dark brown porphyry andesites, occasionally with characteristic abundant calcites branches.

This unit intrudes all of the above in form of dikes, sills, stocks and as a major regional laccolith in the largest part of the Zacatecas sierra. It causes contact metamorphism and alteration in the previously described units, (argillic alteration, fracturing and intense silicification).

This member overlies a large part of the stratigraphic column, specially in the northern section of this mining distict. It appears to be the mineralogical base of the ore deposits located in this area, which have an average depth of 200 meters. When the majority of veins reach this lithological unit, laterally and at deph, they lose their structural characteristics, becoming less consistent, erratic and losing their capacity for mineralization, as it was the less favourable environment for the deposition of mineralized solutions.

The last geological event registered in the south central part of the district, was the volcanic activity of rhyolitic acid igneous rocks, which gave rise to a series of flows, dikes and volcanoclastic deposition. Fine grain rhyolites, porphory and volcanic breccias are present. Towards the central part of the district, there is a greater frequency of these dikes an rhyolitic porphory, which have largely affected several mineralized structures (for example, Cantera, Parroquia, Mala Noche) whether by truncating or displacing them through fractures or faulting.

b) Local Geology (Map Nº 5)

In the Parroquia mine area, the main structure, the Magistral Vein, is hosted mainly by the Zacatecas Formation at the surface. In the east side it is truncated by a rhyolitic dike. Towards the NE portion of the area, it is hosted at depth by andesites as well as the andesitic porphory, as these units are present at surface, on the upper side of the structure.

The contact between phillites and schists of the Zacatecas Formation is irregularly determined by the rhyolitic dike which has a general trend NW 30° SE. To the NE andesites and the andesitic porphory outcrop with little evidence of mineralization.

## STRUCTURAL GEOLOGY (Map Nº 5)

The structural geology of the area is highly complex. Triassic deformation is present as well as the intense fracturing and alteration that produced the andesitic porphory in the same rocks.

The main fracturing system has a general trend that varies from NW 65° SE to E-W. This is the most important trend since it corresponds to the most significant mineralized ore bodies. It consists of faults and fractures which dip both NE an SW, from 55° to 75°. A second phase of post-mineralization faulting and fracturing is initially parallel to the first phase, then diverges. This causes a major effect on the mineralized structures. The dip increases, the veins narrow and are displaced, and there is a notorious decrease in ore grades.

The main structure found in Parroquia mine is the Magistral Vein with a general trend NW 55° SE and an average dip of 65° to 75° NE. It has an average width of 1.5 to 2.0 meters. This structure outcrops for over 2 kilometres, and is cut by a rhyolitic dike to the east. The structure may continue for about 500 meters beyound the dike, which would correlate with some of the structures of El Grillo mountain or with structures to the SW in the Vicochea and Calicanto mines. This has not yet been verified in the field.

There is another structure outcropping to the north of the Magistral vein, on the Magistral hill. It can be recognised for about 400 meters and may continue for another 400 meters as far as the contact between the andesites. The structure has widths of up to about 20 meters, narrowing at each end to about 1 meter. It has the same trend as the Magistral vein, but with lower dips of between 35° to 45° NE. This is probably due to the influence of the rhyolitic dike, which is likely to affect the structure at depth.

In addition to these two structures, other discontinuous mineralised outcrops can be observed. These are related to the presence of the rhyolitic dike in the andesites, which affected some of the structures outcropping to the NE.

## ORE BODIES

### a) Genesis and type of ore body

The ore body at Parroquia belongs to the fracture filling type, forming tabular veins varying in width from a few centimetres to several meters.

The mineralization is Tertiary in age, and is found inside the belt of argentiferous bodies, related to the acid vulcanism at that time.
The ore body is a high temperature (300-500 °C) hydro-thermal deposit.

Chalcopyrite is the predominantly Cu ore. Marcasite, pyrite and pyrrhotite, all high temperature minerals are abundant.

b) Mineralogy

The primary ore in this vein is chalcupyrite, followed by bornite, with secondary azurite, malachite and crysocolla. Sphalerite, galena and argentite can also be found as primary minerals.

The mineral gangue is pyrite, marcasite, pyrrhotite, quartz and calcite.

c) Alteration

There is hydro-thermal alteration of the host rock, as seen in the pervasive argillation and sillification adjacent to the strongest structures. Pyritisation and chlorification zones are present as distance increases from the structure.

## ORE RESERVES

(Maps Nº 8 and 9)

a) History

The Magistral vein in the Parroquia mine, was developed for a length of about 1,150 meters and to a depth of 320 meters (see the enclosed longitudinal section). 5 shafts were sunk varying in depth from 180 to 340 meters. From west to east, they are named Capilla, Parroquia, Centinela, Magistral and Interior shaft. At least 8 levels have been developed. The most exploited zone is located between the Capilla and Centinela shafts, to the 320 meter level, and approximately 500 meters along strike. It is probable that below the 200 meter level, there are some remaining blocks of in-situ economic grade ore. This may be an enriched zone that should be explored at depth.

To the east of Centinela shaft lies the eastern mining zone, where there are several levels that were prepared for mining by the Fresnillo Mining Company (circa 1930). It is likely that they were not mined as the grades were not as high as in the mined out area. This lower grade, together with a drop in the price of copper resulted in the Fresnillo company abandoning the mine. Subsequent mine owners did not mine in this area and preferred to continue minig pillars, floors and mine dumps in the rich areas. These activities were carried out without any mining system or with any regard to safety.

During the different stages of development, exploration and exploration, some 550,000 m.t. of ore were extracted, with a probable grade of 2% Cu, 3% Zn and 100 grs Ag per m.t. and some selection was made to increase the grades. This resulted in 300-350,000 m.t. of mine dumps being left behind with a Cu grade of less than 1%.

b) Proven and Probable Reserves

According to the information obtained from Consejo de Recursos Minerales, it is possible that between the Capilla and Magistral shafts, there are several blocks of proven and possible reserves, from level 175 to level 310 and below, as can be observed in the Longitudinal section (Map Nº 9), prepared by CRM. Also, according to verbal information from several persons that worked in this mine, said reserves are still intact since the evaluation was made (1985).

These blocks of proven and probable reserves are as follows:

| | PROVEN | PROBABLE | AVERAGE | AVERAGE GRADE PER TON | | | | |
|---|---|---|---|---|---|---|---|---|
| BLOCK | RESERVES | RESERVES | WIDTH | Au (g/t) | Ag (g/t) | Pb (%) | Zn (%) | Cu(%) |
| I | 11,520 | | | | | | | |
| II | 15,840 | | | | | | | |
| III | 12,420 | | | | | | | |
| IV | 8,100 | | | | | | | |
| V | 20,700 | | | | | | | |
| VI | 6,864 | | | | | | | |
| VII | 19,536 | | | | | | | |
| VIII | 9,600 | | | | | | | |
| IX | | 90,048 | | | | | | |
| | 104,580 | 90,048 | 1.8 m. | 1.5 | 213 | 0.2 | 5.96 | 2.75 |

c) Potencial Reserves

Based on 1,500 meters in length of the Magistral vein, 1,150 meters developed at the 320 meter level, and taking an average width of 1.5 meters, the following can be inferred with regards to the ore reserve potential that lies within the mining claims:

| Length of Vein | Depth | Average width | S.W. | Tonnage |
|---|---|---|---|---|
| 1,500 m. | 320 m. | 1.5 m. | 2.7 | 1,944,000 |
| Less the ore extracted to the 270 meter level | | | | |
| 500 m. | 270 m. | 1.5 m. | | 546,750 |
| | | | | **1,397,250** |

## ORE POTENTIAL

If furher exploration is carried out, this reserve potential can be increased by about 600,000 m.t. for each 100 meters of depth.

Exploration of the other mineralized areas to the NE of Parroguia may also increase the ore reserves on the property.

## CONCLUSIONS AND RECOMMENDATIONS

1) The Parroquia mine has yielded good grade ore since its inception. Smelter refuse was found in the Refugio area, east of the El Bote mine, which indicates the existence of a smelter on that site which treated first class ore from Parroquia.

2) A number of existing mine dumps in the area have been highgraded over the years. By high grading, it is still possible to obtain ore with grades ranging from 10 to 12% Cu. It is also possible to speculate that the ore grade fed to El Refugio smelter was similar.

3) The mine has been extensively worked mostly in the areas near the Capilla and Centinela shafts which indicates the presence of an enrichment zone in this section of the vein.

4) Based in the observation of known maps, the less worked area lies to the east of the structure. This could be due to lower grades than those of Capilla and Centinela, or to an unknown reason that prevented the exploitation of the vein, even though preparations were made to mine this area. It has been speculated that the Fresnillo Company stopped work here due to low Cu prices and concentrated all their efforts at their mine in Fresnillo.

5) The geological estimates of the reserves potencial, which are soundly based on all past developments in this mine, are as follows.

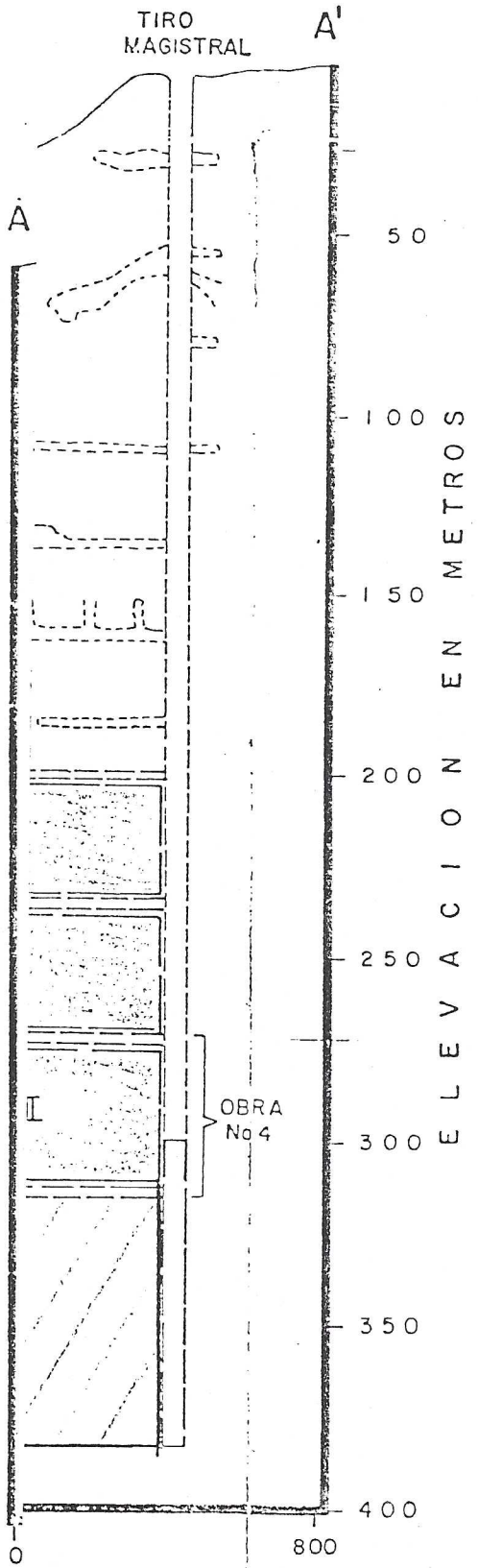
6) Any further speculation or interpretation about the potential of this mine would be out of context without more information gathered in the field.

| | |
|---|---|
| Potential to 320 meters | 1,397,250 m.t. |
| Potential for each additional 100 meters of depth | 600,000 m.t. |

TABLA DE CALCULO DE RESERVAS

| No. DE BLOCK | RESERVAS POSITIVAS Ton | RESERVAS PROBABLES Ton |
|---|---|---|
| I | 11 520 | |
| II | 15 840 | |
| III | 12 420 | |
| IV | 8 100 | |
| V | 20 700 | |
| VI | 6 864 | |
| VII | 19 536 | |
| VIII | 9 600 | |
| IX | | 90 048 |
| TOTAL = | 104 580 | 90 048 |

| ANCHO Mts | Au grs / ton | Ag grs / ton | Pb % | Zn % | Cu % |
|---|---|---|---|---|---|
| LEY MEDIA CALCULADA | | | | | |
| 1.80 | 1.5 | 213.42 | 0.204 | 5.96 | 2.75 |




# EXPLICACION

- PERFIL TOPOGRAFICO
- TIRO
- REBAJE
- OBRA PROYECTADA
- OBRA PROGRAMADA
- RESERVAS POSITIVAS
- RESERVAS PROBABLES

ESCALA 1 : 2,000

0 50 100 150

METROS

CONSEJO DE RECURSOS MINERALES

SUBGERENCIA ZONA NORESTE

MUNICIPIO DE ZACATECAS, ESTADO DE ZACATECAS

# PROYECCION LONGITUDINAL DE LA VETA PARROQUIA DEL BAJO

MOSTRANDO CUBICACION DE RESEVAS Y OBRAS PROGRAMADAS

| FECHA | REVISO Ing. | SUPERVISO Ing. | ELABORO Ing. |
|---|---|---|---|
| OCT-85 | J. ANDRADE | E. OSORIO | R. GUERECA M. |