PIEDRA AMARILLA PROJECT

TITANIUM & BYPRODUCTS STUDY

C.S.I. - MINEXCO

TABLE OF CONTENTS

Introduction.

Two years have passed since Parsons first completed a pre-feasibility study on the Piedra Amarilla Properties. The study concluded that a proposed mining venture for the extraction and processing of Sulfur was viable. The study was based on trenching of ore reserves, site visits, and a preliminary 21 page report from Intec-Chile showing basic concentration of Sulfur via flotation.

A number of metallurgical and economic studies completed since the Parsons report have made it necessary to update progress of the proposed Piedra Amarilla Project. This study, while not pretending to be a feasibility study, does offer concrete evidence in support of project viability. C.S.I. Ag offers this report as a kind of interim post pre-feasibility study.

In the last two years, Intec-Chile has published more than 400 pages of reports which summarize the results of intensive metallurgical testing and analysis of economic criteria. In addition, several hundred pages of test results are due to be published in January and March of 1991 upon completion of the already successful pilot-scale beneficiation and economic analysis program.

The results of studies undertaken to determine the feasibility of Sulfur extraction and processing have had the curious effect of changing the scope of the proposed mining venture. Large ore reserves containing important amounts of Titanium were discovered during subsequent metallurgical testing, the Titanium content having a market value more than three times that of the Sulfur values found in the ore.

C.S.I. has logically decided to emphasize as the number one priority the extraction and production of Titanium products, with Sulfur recovered as a byproduct. Additional byproducts to be recovered include low grades of Gold and Silver, and manufacture of Silicon products from a portion of the high grade silica tailings to be discharged after mineral extraction.

With the advent of Titanium and other byproducts, the proposed mining venture has acquired an enhanced economic attractiveness and added the important element of product diversification. The intent of this report is to outline the various methods of ore reserve calculations, mining, process extractions and summarize a projected base-case economic evaluation.

C.S.I. is committed to finishing feasibility work during 1991. Aspects of on site field work will be accomplished during the December - March summer months. Pre-feasibility lab work has been largely finished on Titanium and Gold-Silver values. Intec-Chile will begin feasibility lab work on Titanium in December 1990, and twenty tons of trenched samples have already been delivered for pilot scale testing. Gold-Silver feasibility will begin in January 1991, although some of the trenched samples (5 tons) have already been delivered. Feasibility for production of Silicon will be outlined and contracted during November 1990.

Executive Summary

Properties.

Since the Parsons pre-feasibility study was published, all of the nine Piedra Amarilla properties have been fully constituted and titled to C.S.I. Ag. The nine properties comprise 2500 hectacres. Four of the properties are used for ore reserve calculations, although large amounts of titanium and sulfur have been detected through random sampling in the other five properties.

An additional five new properties have been claimed in the eastern portions of the nearby (3 miles) Piedra Parada Salar, known as the Sanson properties. Constitution of these properties is expected to take approximately one more year and will contribute an additional 1300 hectacres of mineral property to the Piedra Amarilla Project

Ore Reserves.

The discovery of titanium has added an exciting new dimension to the proposed Piedra Amarilla Project. Because the titanium is found as an accessory mineral associated with the hostrock, new reserve calculations were able to include entire sections of altered volcanic structures within the Piedra Amarilla properties. As a result, mineable reserves have been increased sevenfold to nearly 174,000,000 metric tons grading 2.7% TiO_2, more than 90% of which is found as the mineral Rutile, the most economically desireable of all titanium minerals because of ease in processing.

The overall grade of sulfur is diminished by stretching the reserves from 25,000,000 to 174,000,000 tons. Sulfur mineralization occurs as high grade pockets and veins within the caliche structure, the grade diminishing with distance from the high grade veins. Overall sulfur content has been calculated at 15.1%

Recoverable gold and silver content per ton has been calculated at 0.26g and 4.9g respectively. Silica (SiO_2) makes up more than 72.5% of the hostrock, and more than 90% of discharged tailings, a portion of which will be selected as feed for production of various silicon products.

The addition of the nearby Sanson properties have added an additional 100,000,000 metric tons of reserves grading 2.0% TiO_2, 10% sulfur (contained in gypsum and anhydrite), 0.33g gold and 13.22g silver. Important amounts of lead and strontium are also present.

Project Development.

The conceptual mining plan and process plant have been expanded threefold to process a total of 25,000 metric tons per day. Mining activity will be year-round, as the winter climatic conditions are less harsh than comparable mining projects in Canada or the Northern U.S.

The 9,000,000 tons of ore processed annually will make this the largest mining project in the 3rd Region, and the largest non copper-iron ore project in Chile. Ore reserves on the four Piedra Amarilla properties are sufficient for a project life of 19.3 years.

Financial Considerations.

Capital costs used in this study employed prior economic studies from both Parsons and Intec in projecting costs for an expanded mining project. Capital cost estimates are +/- 25%.

Direct and Indirect Costs, Engineering:	$529,020,000
10% Contingency:	$ 52,902,000
	============
Total Capital Costs:	$581,922,000

Operating Costs vs. Value - Mineral Extraction.

Operating costs are based on feasibility lab work done on sulfur extraction, and preliminary pre-feasibility work on titanium, gold and silver. Costs for mining are projected from contract mining operators in Chile and from historical data provided by Intec. The costs included for silicon production are best estimates based on furnace feed as a low cost byproduct.

Mining and Processing Costs/Ton

Mine Extraction	$ 1.30
Consumables-Energy	$27.42
Labor-Management	$ 6.69
Port Cost	$ 0.56
Maintenance	$ 1.00
Office, Legal, Ins.	$ 1.99
Contingency 7.5%	$ 2.77
	======
Total:	$41.73

Value Mineral Extraction-Ton of Ore Processed

TiO2 Pigment	$36.12
Ti Sponge	$12.17
Prilled Sulfur	$13.36
Sulfuric Acid	$ 0.84
Silicon Metal 98.5%	$38.03
Silicon Metal 99.85%	$ 8.03
Gold	$ 3.05
Silver	$ 0.69
	======
Total:	$112.29

A basic financial analysis has been made using the same financial criteria as found in Section 11 of the Parsons study, except that no sensitivity analysis was prepared here. Average <u>after</u> tax and royalty cash; available for distribution is $313,806,000 in production years 1-11 and $342,806,000 in years 12-19, yielding an after tax and royalty return on investment (ROI) of 53.8% and 58.9% respectively.

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Basic Geography.

The north-central portion of Chile is located between 22o - 30o South Latitude and bordered by the Pacific Ocean on the west and a common mountainous border with Argentina on the east. Some of the worlds largest known reserves of important industrial minerals are found in this region. These include copper and its byproducts (rhenium, molybdenum, etc.), lithium, iodine and nitrates. Also of importance but on a lessor scale are gold, native sulfur, and iron ore. Figure 1 shows some geographical locations.

Mining has been the main industrial activity in the region over the past 200 years. Copper production continues to dominate. With the advent next year of the huge Escondida project copper production in this area of Chile alone will top the 1 million mtpy mark.

In the Copiapó area, gold production has replaced copper as the dominant mineral activity. Annual gold production in the Maricunga Gold Belt should top the 1 million Troy Oz. mark by the middle of the decade. Ten years ago, there were no large scale gold prospects or operations in the Copiapó area. Prospecting was limited to areas below 4,000 meters, and geological models for disseminated gold in deposits like those now being exploited had yet to be developed. A list of some of the most important mining operations in the Copiapó area can be found in Table 2, with Figure 2 showing geographical locations.

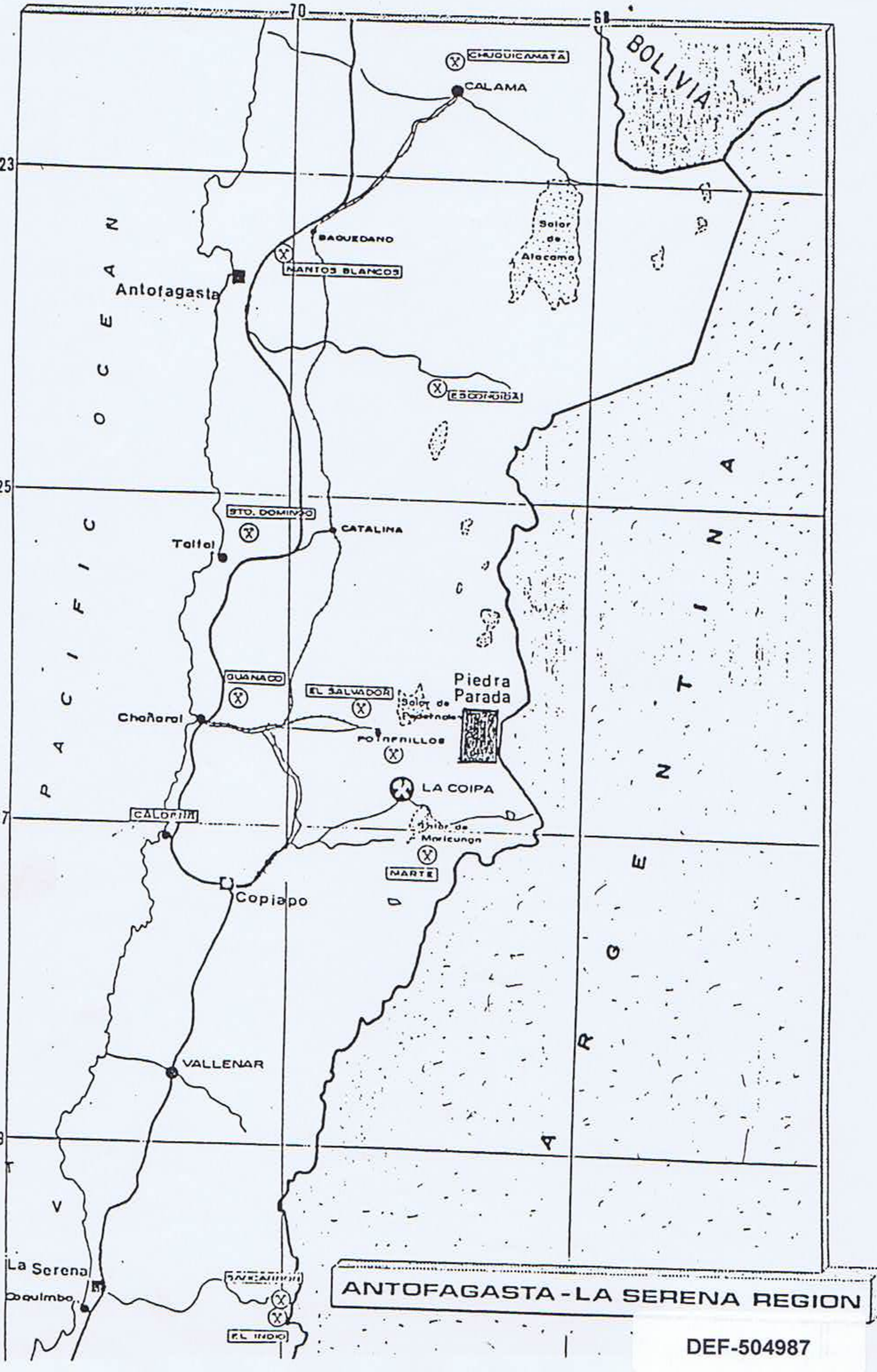
C.S.I. has been actively prospecting in the Copiapó area since 1986. Most of the exploration efforts have been concentrated in a remote area known as the Piedra Parada Basin, which is located some 250 kms northeast of Copiapó. A number of important mineral claims containing titanium, sulfur, and gold have since been constituted, and additional claims are presently in the process of being constituted. (See Figures ~~2~~ & 3, Table 2)

Location - Piedra Parada Basin.

The Piedra Parada Basin is located at 26o 20' S Latitude and 68o 45' W Longitude. The basin region is bordered on the south and to the east by large caldera formations, some 20 kms in diameter, including the Wheelwright, Laguna Escondida, and Trident (Argentina) calderas.

To the west of the Piedra Parada Salar is found the Cordillera Claudio Guy, the oldest regional geologic formation, the northern portion of which is formed by two volcanic structures which either eroded or subsided into caldera structures.

To the north of the Piedra Parada Basin lie a string of volcanoes known collectively as Cerros Colorados. Together these natural boundaries form a rectangular area of interest 50 kms north-south by 30 kms east-west, equivilent to 1500 kms2. Within this geographical area are located the mineral properties. A large majority of the properties are located between the Piedra Parada Salar and Lagunas Bravas, a 25 km north-south by 18 km east-west area (400 kms2). General information is shown in Table 1.


70
68
BOLIVIA
CHUQUICAMATA
CALAMA
23
BAQUEDANO
MANTOS BLANCOS
Salar de Atacama
Antofagasta
PACIFIC OCEAN
25
STO. DOMINGO
CATALINA
Taltal
GUANACO
EL SALVADOR
Piedra Parada
Chañaral
POTRERILLOS
LA COIPA
27
Salar de Maricunga
MARTE
Copiapo
VALLENAR
29
La Serena
Coquimbo
EL INDIO
ARGENTINA
ANTOFAGASTA - LA SERENA REGION

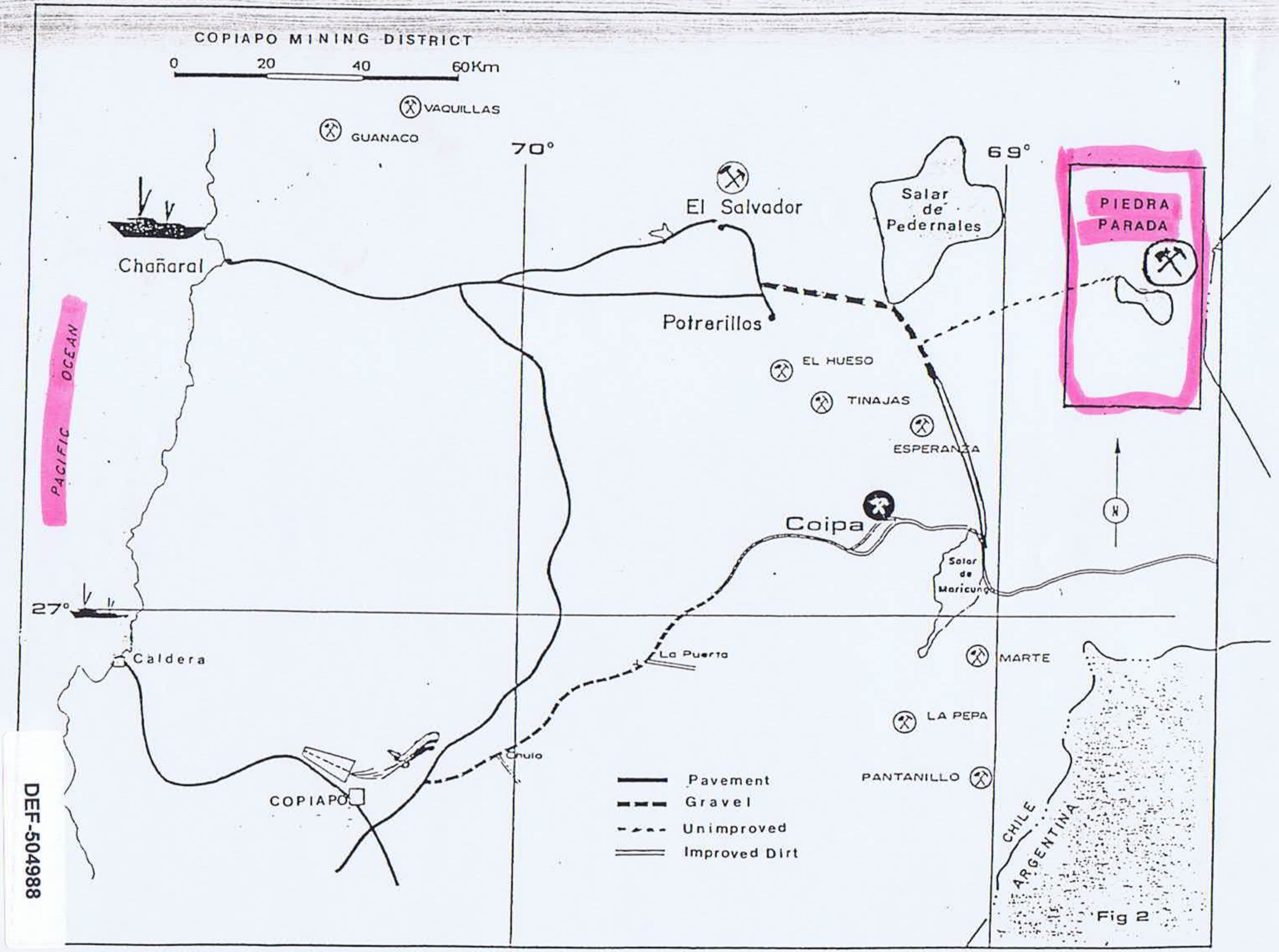


Fig 2

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TABLE 1

PIEDRA PARADA MINING DISTRICT

Geographic Designation:	Altiplano
Location:	26o 20' S Latitude 68o 45' W Longitude
Area of Interest:	50 kms North-South 30 kms East-West (1500 kms2)

Altitude - Piedra Amarilla Properties:

Average Maximum Altitude	4,703 Meters
Average Minimum Altitude	4,443 Meters
Mean Altitude	4,573 Meters
Average Grade Western Slopes	20%
Average Grade N-S Slopes	9%

Road Distances:

Rail Road	90 kms
El Salvador	130 kms
Chañaral	210 kms
Copiapó	300 kms
Santiago	1,100 kms

Road Conditions Copiapó-Piedra Parada:

Class	Distance	Quality
Asphalt	200 kms	Good
Gravel	55 kms	Fair
Dirt	45 kms	Poor-Bad

Climate:

Temperature

Summer Maximum Average	65o F
Summer Minimum Average	25o F
Winter Maximum Average	40o F
Winter Minimum Average	10o F
Coldest Recorded Temp.	-22o F
Warmest Recorded Temp.	80o F

Precipitation

Rainfall	-
Snowfall Annual Average	30 cm. (1988-1990)

Wind (Western Slopes)

Mean Afternoon Velocity	40 kph (estimated)
Mean Nighttime Velocity	3 kph (estimated)
Maximum Velocity	100 kph

Seismology

Maximum 10 Year S Wave	6.8 Richter
Maximum 10 Year P Wave	6.3 Richter

Vegetation

Altiplano Grasses

Regional Wildlife at 4,000 Meters (Scarce)

Guanaco, Vicuna, Fox, Birds, Rats

Table 2. Mining Operations - Copiapó District

Location	Company	Mineral	Annual Production
El Salvador	Codelco	Copper	(130,000mt)
Potrerillos	Codelco	Refinery	130,000 mt
El Hueso	Homestake	Gold	75,000 Toz.
La Coipa	TVX-Placer Dome	Gold-Silver	200,000 Toz.(Au Eq.)
Marte	Cominco-Anglo Amer.	Gold	150,000 Toz.
Lobo	Cominco-Anglo Amer.	Gold	200,000 Toz.
Refugio	Bema Gold	Gold	200,000 Toz.
La Pepa	Consortium	Gold	30,000 Toz.
Candelaria	Phelps Dodge	Copper	110,000 mt
Paipote	Enami	Smelter (Cu)	50,000 mt

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History of Piedra Parada.

Prior to exploration by C.S.I., there were no constituted mineral properties in the area. Mining activity has in large part been limited to exploration activities by C.S.I. and Codelco, although Anglo American and Gold Fields both have a few exploration claims in the basin.

Native Indians were the first explorers in the basin area, an ancient Indian cemetery at the foot of the Piedra Parada hill being of remnant of the earliest known activities.

The first access roads were built by Andes Copper Company, developer of the Potrerillos-El Salvador copper complex in the 1920's. First access was made to the current pumping station at La Ola, which pumps water from the Rio Negro-Jorquera river to Potrerillos via aqueduct for industrial use. The road later accessed the Rio Negro hot springs area, which was used as a recreational facility and from where access was had into the Piedra Parada basin.

Andes Copper did some exploration in the Cuyanos Range in the 1920's and reported blocked out sulfur reserves of 500,000 metric tons, grading 50% sulfur. Two adits were driven into the caliche, and a few hundred tons of high grade sulfur extracted, presumably for use in copper processing. The adits and remnants of a mining camp (cabin) are still visible.

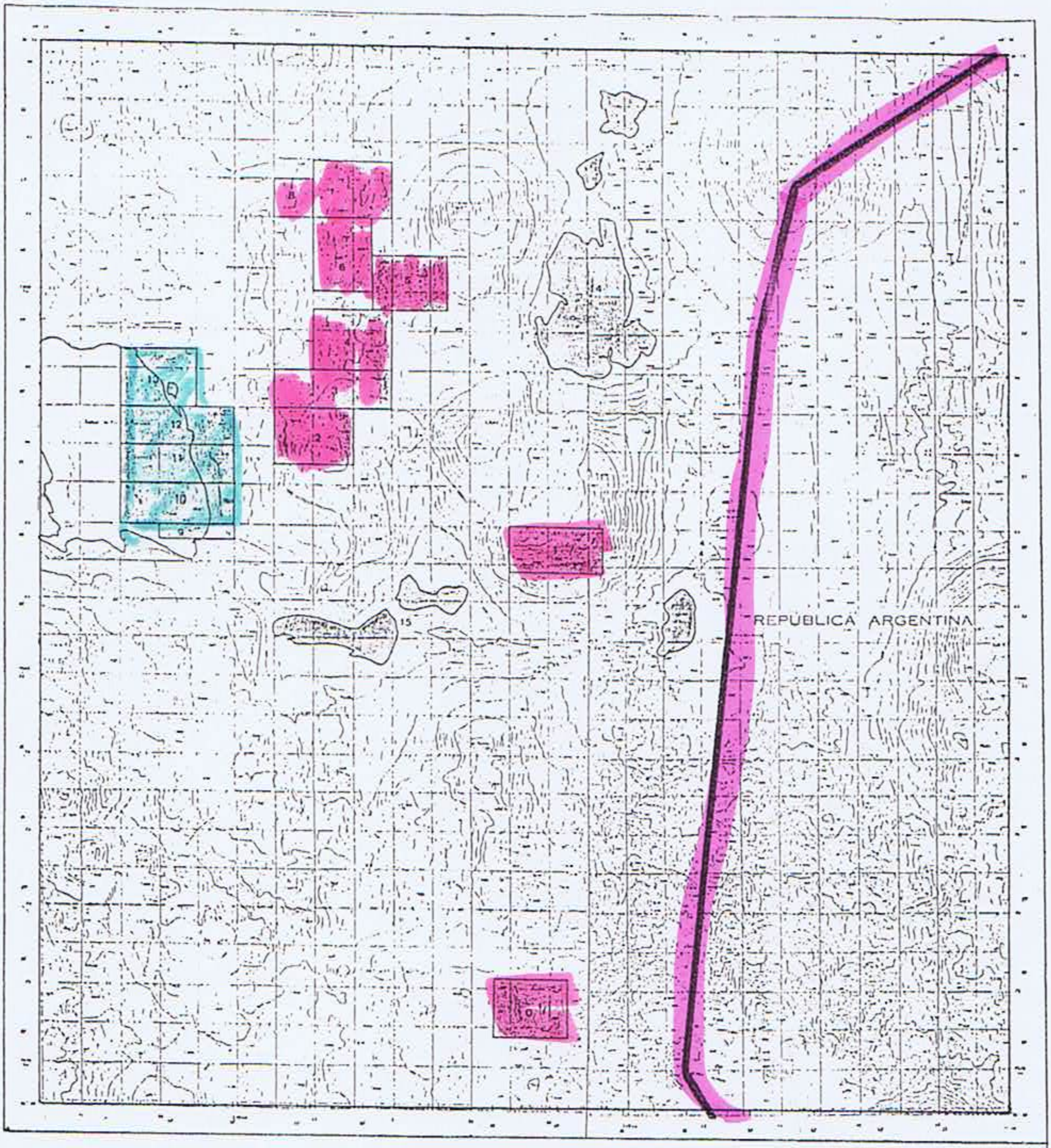
In 1986, Codelco constructed a road up the southern half of the Cuyanos Range, and completed a modest drilling program whose results are not known. About the same time, Codelco extended a road northward of the Panteon de Aliste volcano, to the Cerros Colorados area. Some trenching was done at the Azufrera Tres Puntos, and other areas.

Current Mineral Properties.

A number of mineral properties were explored and claimed by C.S.I. in 1987. Other properties were claimed by Brimstone-Chile in 1986, an afilliated company which has C.S.I. as its largest shareholder. Initial mineral interest was centered in native sulfur and possible gold values found in a number of areas within the Piedra Parada basin.

Basic geological prospection was enhanced by the use of aerial photography, taken at 10,000 meters, at scales of 1:50,000 and 1:40,000. Also incorporated were satellite Lansat photographs, including the infrared series.

Figure 3 is an acompanying plot map which shows the geographical location of the mineral properties in this study. The Piedra Amarilla properties are fully constituted, while the Sanson properties are in this process of constitution, which should take approximately one more year.



1.- Piedra Amarilla	71	9.- Sanson I	1-10
2.- Piedra Amarilla	101	10.- Sanson II	1-30
3.- Piedra Amarilla	131	11.- Sanson III	1-30
4.- Piedra Amarilla	161	12.- Sanson IV	1-30
5.- Piedra Amarilla	191	13.- Sanson V	1-30
6.- Piedra Amarilla	221	14.- Lake Brava	
7.- Piedra Amarilla	251	15.- Lake Jilguero	
8.- Piedra Amarilla	281		

Fig 3

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Regional Geology.

The north-central portion of the Chilean Andes, from the Pacific Ocean to the Argentina border can be subdivided into four distinct geographic units:

- The coastal ranges, which reach 1,500 meters in elevation.
- The interior ranges, which are generally below 3,000 meters.
- The Pre-cordillera, which ranges from 3,000 to 4,000 meters but may have occasional peaks which reach above 5,000 meters.
- And the Cordillera, which is above 4,000 meters and whose peaks may reach elevations above 6,000 meters.

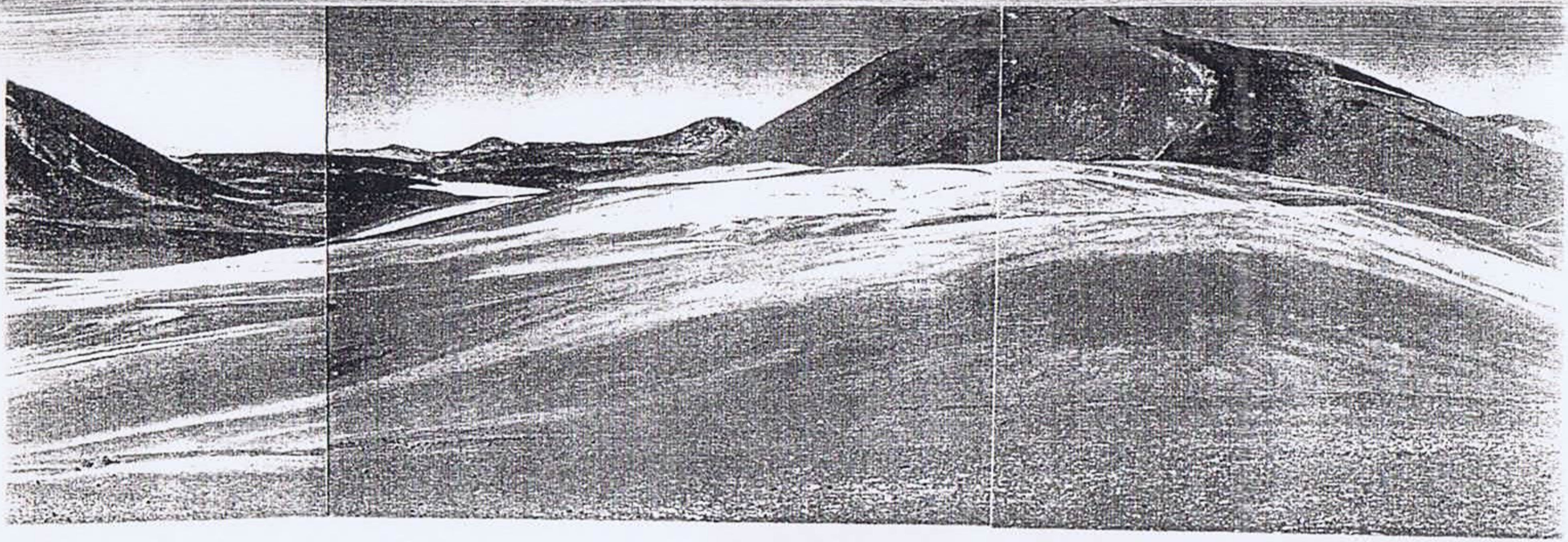
These morphological units are found in general north-south patterns, and elevational increases are west-east. The main geological features in this area of Chile run south-north, such as the fault systems (Atacama fault) and interior basins (Maricunga-Pedernales). Some important perpendicular west-east fault systems originating offshore in the Pacific crosscut this area, creating drainage for the Copiapo and Salado rivers, as well as for the Paipote canyon area. These drain large areas of the Pre-cordillera and interior ranges. The Cordillera generally has closed basins with most drainage running south-north into brine lakes and salars.

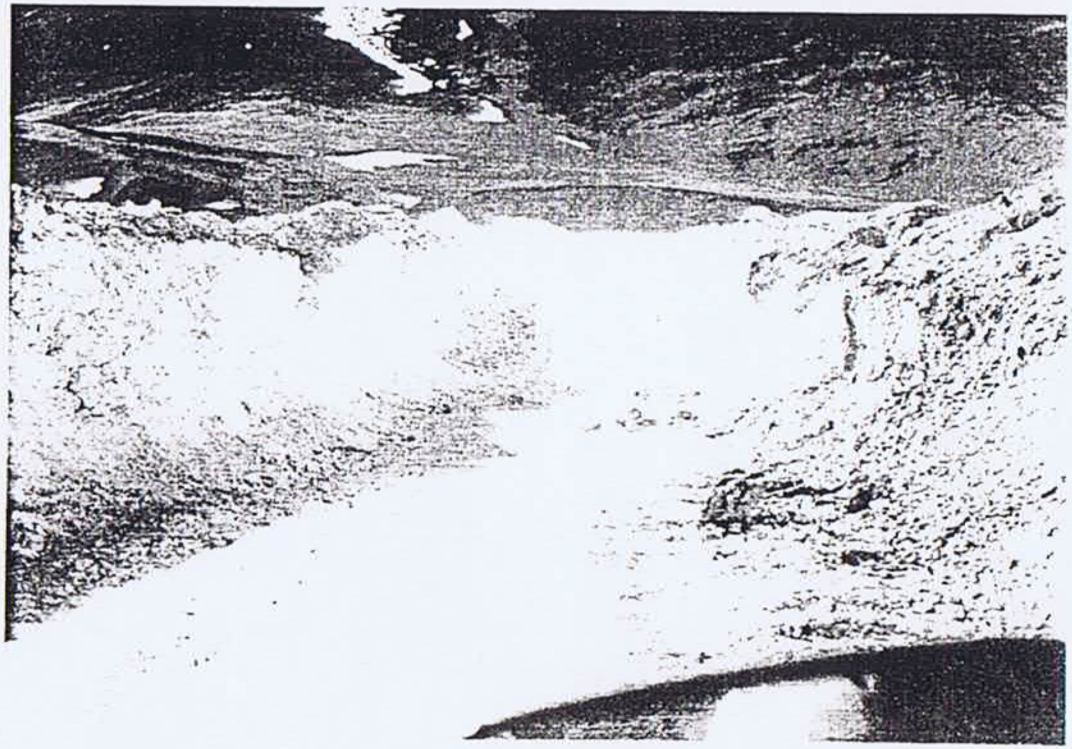
The Pre-cordillera between 26o-27o S Latitude is dominated by Mesozoic Era volcanic and sedimentary deposits. The Cordillera above 4,000 meters is dominated by volcanics of Tertiary to Quaternary age, which followed interregional fault systems through which surfaced the plutonic magmas. (See Figure 4)

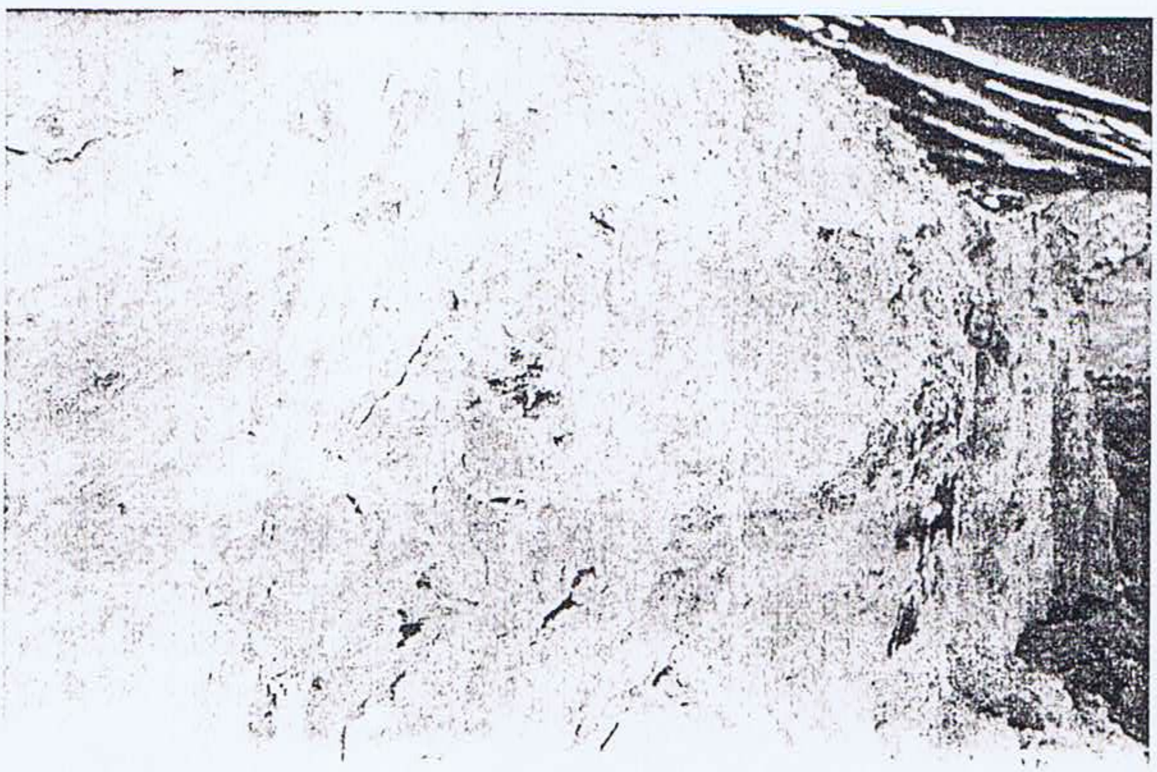
The plutonic magma orogen in the central Andes is largely influenced in the Pacific ocean along the Atacama Trench, where the Pacific Nazca tectonic plate collides with the Continental South American plate. The Nazca plate dives underneath the Continental plate, forming a deep offshore trench which reaches below -8,000 meters, the deepest trench in the Americas. The trench extends from Antofagasta to Caldera.

As a result of the tectonic collision, the South American Plate inclines toward the Pacific at a slight angle. The plates grind laterally across each other, the South American plate faulting upward (producing seismic activity), and supressing the Nazca plate. The tremendous friction and pressures cause the orogen to melt into magmatic material.

The highest volcanic peaks in this portion of Chile owe their height in part due to the incline of the Continental plate, which has helped to create an Altiplano. Atop the Altiplano in this area of Chile were deposited large amounts of lava and ash flows, much of which is rhyolitic material of Triassic age. The flows have been compacted into semi-metamorphic tuffs. In some areas, these tuffs are several hundred meters thick, further building up the Altiplano and forming the basement atop which are found the present volcanic structures. Most of the volcanic structures in the Piedra Parada area rise no more than 1,000 to 1,500 meters above the surrounding basin.







Local Geology.

There are no detailed geological studies of the Piedra Parada area. Because of the remotness and lack of mining activity, only skeletal information exists. Minexco's geological studies have been limited to photogeological mapping based on aerial photographic interpretations. Most of the basin area has been mapped by Minexco Senior Geologist Carolos Ulrikesen on a 1:50,000 scale. Despite the lack of detailed field studies, the aerial photographs are of a quality that permit basic geologic interpretations. (See Figure 5.)

Local Volcanics.

The majority of the volcanics in the Piedra Parada area are of Dacitic to Dacitic-Andesitic composition (intermediate chemistry) characterized by low or modest iron content and dominant quartz-silica content. The volcanics are believed to have originated from a large granitic batholith of Paleozoic age. The batholith is exposed as ocassional laccoliths along the entire Cordillera route of the 3rd Region, dominating the southern half of the 3rd Region border with Argentina. The batholith in the Piedra Parada area underwent a process known as isostatic compensation, and the lower portions of the batholith sank to sufficient depth to melt its components into mass magma which surfaced through deep faults and cracks, forming volcanic structures. The lack of basaltic flows, which have higher iron content and predominate throughout much of Chile, eliminates primary magma as the source of the Piedra Parada volcanics.

Age.

No rock dating has been done to determine formative ages of the different volcanics. The regional geologic maps (Fig. 4) show a dominance of Quaternary volcanics in the Piedra Parada area. Field observations indicate that these are more likely of Tertiary age. Figure 7 is a relative time scale of the Piedra Amarilla properties and shows different periods of volcanic activity. Many of the older features in the Piedra Parada basin were changed or reworked by the continuous introduction of newer volcanics. It is common to observe these newer volcanics partially covering older structures.

Volcanic Classification.

The volcanoes within the Piedra Parada Basin can be classified into two catagories: Cinder Cone and Strato-volcanoes.

1. Strato-volcanoes are the dominant structures in terms of mass and height within the basin area. These consist of alternating layers of pyroclastic material and lava flows. The volcanic slopes are steep at the top, exceeding 30o, and modest at the bottom. The layered strata are indicitive of cyclical changes in the nature of the eruptions. The Strato-volcanoes in the southern portion of the basin (Cuyanos and Sierra Nevada Ranges) have a predominance of lava flows, while those in the northern portion are more evenly built by pyroclastic ejecta and lava flows (Panteon de Aliste, Cerros Colorados).

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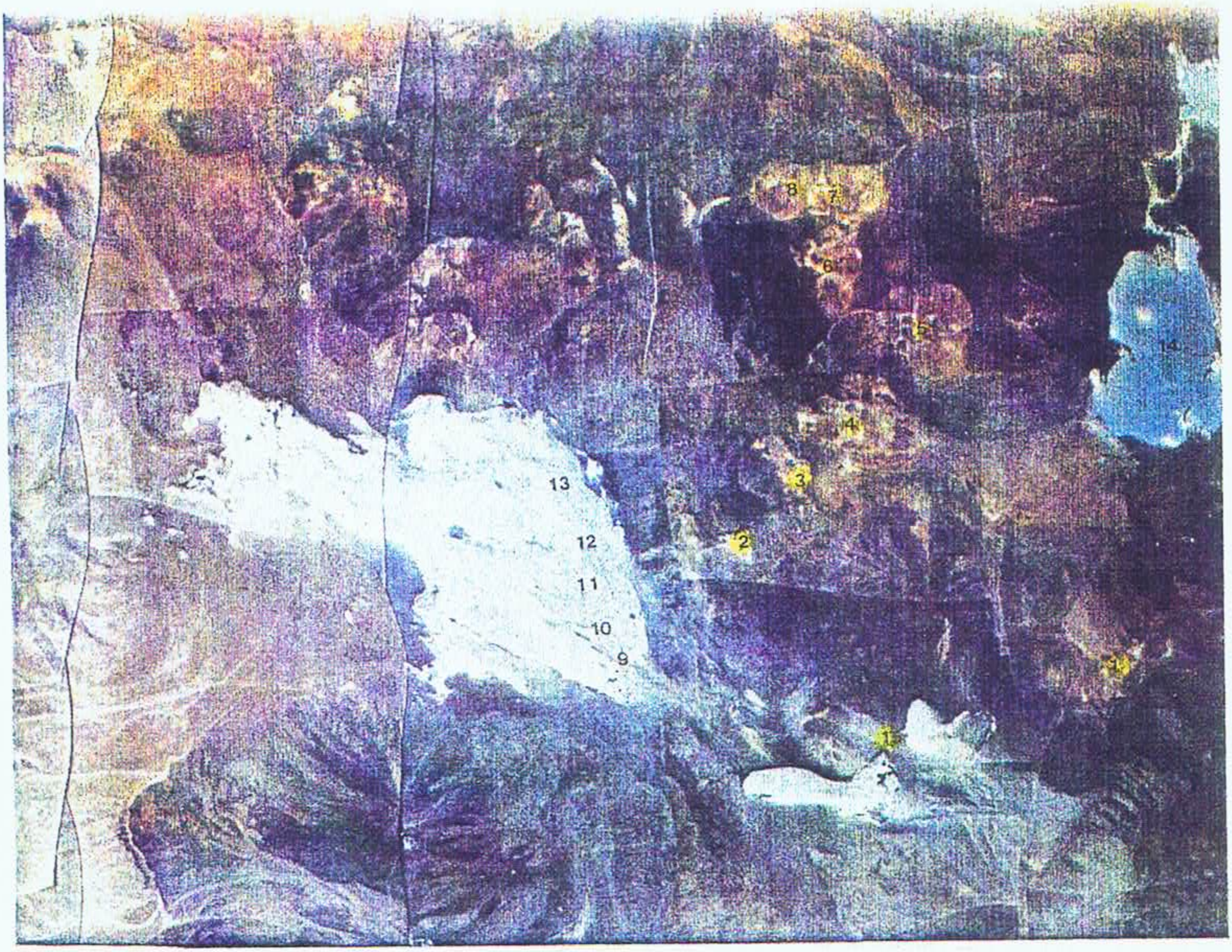

P I E D R A   P A R A D A   B A S I N

Aerial Photo   Scale 1:[illegible]

1.- Piedra Amarilla [illegible]
2.- Piedra Amarilla [illegible]
3.- Piedra Amarilla [illegible]
4.- Piedra Amarilla [illegible]
5.- Piedra Amarilla [illegible]
6.- Piedra Ama[illegible]
7.- Piedra Amarilla [illegible]
8.- Piedra [illegible]

9.- Sanson [illegible]
10.- Sanson [illegible]
11.- Sanson [illegible]
12.- Sanson [illegible]
13.- Sanson [illegible]
14.- [illegible]
15.- [illegible]

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Fig 5

2. Cinder Cone volcanoes are common throughout the middle areas of the basin, and are formed largely from tephra or ejecta in the form of ash, dust, lapilli, and larger volcanic blocks, which are blown out of the volcanic conduit by gasses as pyroclastic material. Lava flows are intermittent and comprise only a small portion of total volcanic material. The pyroclastic material compacts into breccia tuffs near the cone and finer tuffs away from the cone. The tuffs are often layered, indicating cyclical ash deposition. The Piedra Amarilla properties comprise volcanics of this category, and an understanding of the formative processes is essential.

Piedra Amarilla Properties.

The Cinder Cone volcanics which comprise the Piedra Amarilla properties have been chemically altered by hydrothermal intrusions of gas and super-heated liquids. Although all three states of matter - solid, liquid, and gas, are ejected from most volcanic structures, the nature of the volcano produced depends largely upon the proportion of each of these and the order in which they are expelled.

The Piedra Amarilla properties consist of a string of related volcanic domes of Tertiary age which were created largely by Dacitic flows of ash and lapilli atop a basement formation not well identified. During several separate periods of hydrothermal mineralization, super-heated solutions, charged with steam and other gasses escaped from the congealing magma in enormous quantities, carrying with it mineral matter which was deposited at higher levels where the pressure and temperature were less intense.

Fissures and cracks in the dome formations provided channelways for the movement of these solutions, and became the sites where deposition took place. The gas and liquid phases were intimately associated, but some predominantly gaseous activity occured separately.

Water vapor (super-heated steam) proves to be the main component of magmatic gasses. Magma typically contain up to 11% steam and other gasses under pressure. Besides steam, the chief volcanic gas is carbon dioxide. Other gasses include compounds of sulfur (sulfur dioxide, hydrogen sulfide), chlorine (ammonium chloride, hydrochloric acid), fluorine and boron. Temperature of the gasses can exceed 650o C.

The hydrothermal activity has altered large areas of the volcanic tuffs, changing the texture and composition into what is known in Chile as caliche. Most of the original orthoclase feldspars have been decomposed into white argillus kaolinite, giving a whiteness to the silicate minerals which is distintive and distinguishes these deposits from the surrounding countryrock. Original prospecting activities incorporated caliche as a key prospecting tool in locating alterations of titanium and sulfur, both in the field and via aerial photo.

Mineralization.

Minerals deposited within the structures of the Piedra Amarilla properties have been identified and in many cases quantified using a variety of analytical means. These include fire assay, atomic absorption, x-ray fluoresence, x-ray diffraction, wet chemical analysis, and basic microscopic studies. 99.6% of all extrusive material has been tentatively identified as shown in Table 3, which indicates average content of minerals and elements found in the Piedra Amarilla deposit.

Hostrock.

The hostrock for the Piedra Amarilla deposit is considered dacitic tending to rhyolitic in composition, consisting largely of hydrothermally altered ash flows and pyroclastic breccia material compacted into tuffs. The morphology is similar to what is known as the Coipa Formation, whose acid volcanics are composed of altered breccia tuffs overlying a sedimentary bed. The basement of the Piedra Amarilla deposit is not known but is assumed to be a combination of Rhyolitic flows mixed with sediments overlying the granitic batholith.

Analysis indicate that silicates comprise the vast majority of the hostrock material. Diffraction analysis has identified Quartz and its polymorphs Cristobolite and Tridymite as the hostrock components (72.5%). The ratio of Quartz-Cristobolite-Tridymite is not known. The presence of Cristobolite indicates a very hot formative environment, as crystallization of Cristobolite begins above 1,470o C.

A number of feldspar minerals are present, with the calcium-sodium-plagioclase feldspars dominating the potassium-orthoclase feldspars, which have been largely altered to Kaolinite by intrusions of sulfur and carbonate solutions. The feldspars include alumina as a component, and together with Kaolinite make up approximately 3.5% of the hostrock as accessory silicates.

Because silicates comprise over 76% of the hostrock (90% if elemental sulfur is excluded), the deposit is geologically classified as acid volcanics, terminology not related to pH bur signifying a silica content greater than 65%. It should be noted, however, that the overall pH of the deposit is slightly acidic due to the presence of solutions which decomposed from the elemental sulfur (0.2% H2SO4). Most of the unaltered areas within the basin are basic in pH due to the prevailing chloride and carbonate content within the countryrock.

Economic Minerals.

- Titanium -

Miscroscopic analysis has identified Rutile (TiO2) as the principal titanium mineral in the Piedra Amarilla deposit, accounting for 90% of all titanium present. Rutile is the most economically desireable of all titanium minerals because of ease of conversion into commercial grade pigments. Other titanium minerals present but accounting for less than 10% of titanium

TABLE 3 .

Piedra Amarilla Properties (131 & 161) Average Mineral Content.

Mineral - Element	Symbol	Content	
Silica (Cristobolite-Tridymite)	SiO_2	72.56 %	
Silicates (Kaoline, clays, etc)	SiO_2	2.40 %	Est.
Sulfur (Elemental)	S	15.10 %	
Acidity	H_2SO_4	0.20 %	Est.
Ignition Losses 950 Celsius	See 1	3.89 %	Est.
Titanium Dioxide (Rutile)	TiO_2	2.56 %	
Other Titanium (Illmenite)	$FeTiO_3$	0.24 %	
Moisture Content 70 Celsius	H_2O	0.75 %	Est.
Alumina	Al_2O_3	0.68 %	
Carbon	C	0.45 %	Est.
Calcium	CaO	0.25 %	
Iron	Fe	0.23 %	
Sodium	NaO	0.08 %	
Magnesium	MgO	0.06 %	
Potassium	K_2O	0.05 %	
Chlorine	Cl	0.034%	
Tin	Sn	0.023%	
Copper	Cu	0.006%	
		========	
	SubTotal:	99.563%	

1. Includes sulfates, hydrates, and carbonates (not water, acidity, or elemental sulfur). Est. is estimated content based on information from prior tests or assays.

Arsenic	As	36 ppm
Barium	Ba	<12 ppm
Bismuth	Bi	15 ppm
Boron	B	Yes
Chromium	Cr	12 ppm
Cobalt	Co	< 3 ppm
Gold	Au	0.316 g/t
Iridium	Ir	No
Lead	Pb	6 ppm
Lithium	Li	Yes
Manganese	Mn	22 ppm
Molybdenum	Mo	34 ppm
Nickle	Ni	< 4 ppm
Osmium	Os	No
Palladium	Pd	Yes
Phosphorus	P	Yes
Platinum	Pt	Yes
Rhodium	Rh	Trace
Rubidium	Rb	Yes
Ruthenium	Ru	No
Selenium	Se	26 ppm
Silver	Ag	7 g/t
Strontium	Sr	Yes
Tellurium	Te	26 ppm
Tungsten	W	<200 ppm
Vanadium	V	< 45 ppm
Zinc	Zn	5 ppm
Zirconium	Zr	<200 ppm

*Yes-No values measured via XRF but not calculated in ppm's.

mineralization include Illmenite (FeTiO3), Sphene (SiO5TiCa), and possibly Perovsquite (CaTiO3). The Rutile mineralization is intimately associated with the silica mineralization, overlying the quartz crystals as clasts and elongated prismatic inclusions.

It is presumed that the titanium minerals are accessory minerals of the silica hostrock. The titanium is distributed over an immense area, and the grade distribution is much to even to have developed from hydrothermal intrusions alone.

Rutile and Sphene (also called Titanite) are known to be accessory minerals of extrusive volcanics, especially acid volcanics which have cut through intrusive batholiths. Much of the original titanium may have been in the form of Sphene which is very common in acid volcanics. Post intrusions of sulfur and carbonate solutions may have transformed the Sphene into Rutile by releasing the calcium to form Anhydrite-Gypsum and Calcium Carbonate as found in the lower basin areas.

- Sulfur -

Deposition of elemental sulfur occurs as a result of hydrogen sulfide and sulfur dioxide gasses combining under pressure. The reaction precipitates the sulfur with water (steam) given off as a byproduct. Unlike the titanium mineralization, the sulfur deposits are localized, following the fissures and channelways, creating veins that give the mineralization a style reminicent of pegmatite-dike formations. Channelways of nearly pure sulfur can be found, ranging from a few centimeters to over 4 meters in width. The mineralization generally penetrates into the porous areas of the caliche, with a corresponding decrease in grade as one moves away from the main channelways.

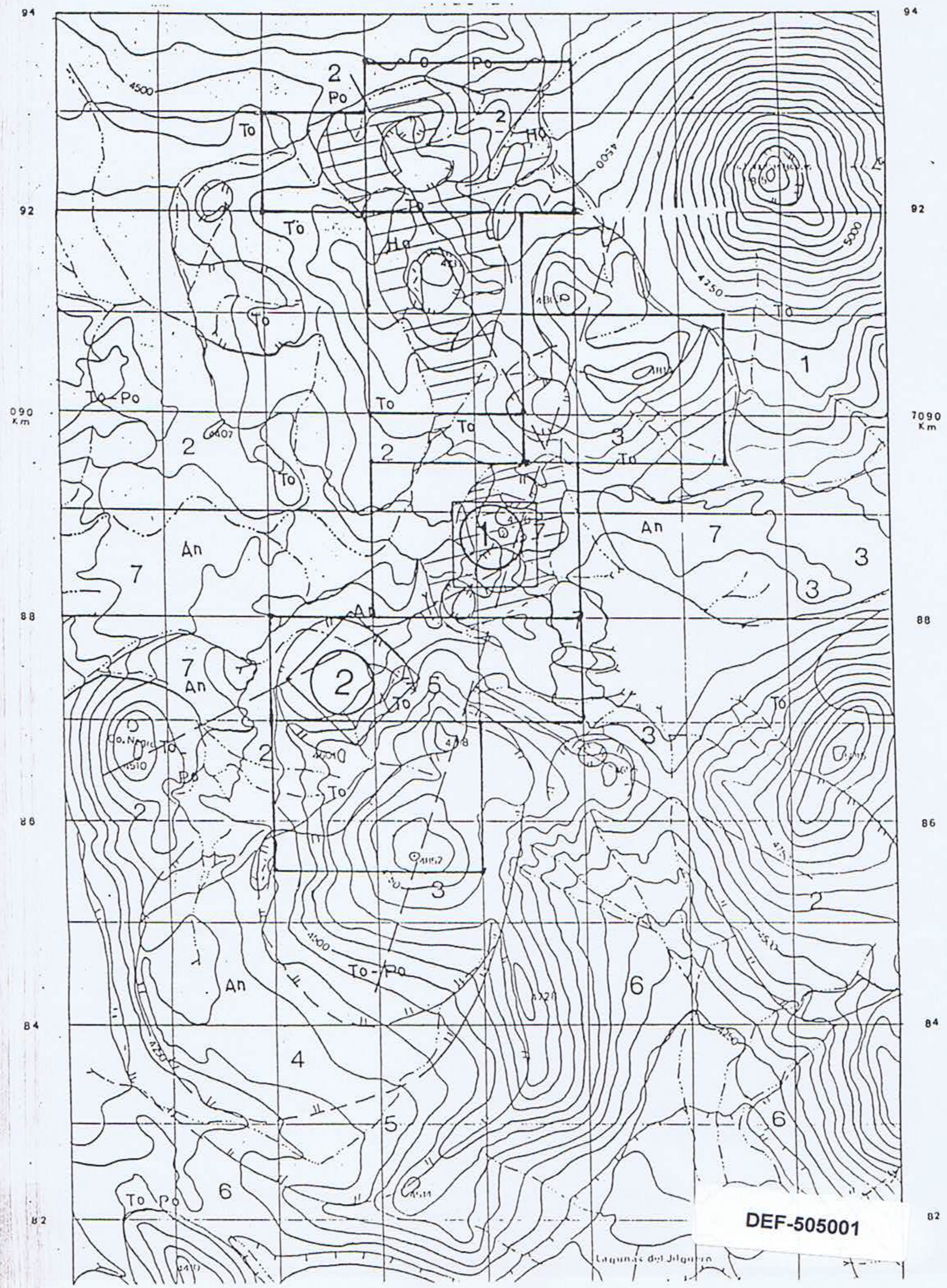
Deposition of sulfur is among the last expressions of volcanic activity. The process may be multi-stage, occuring over several different gaseous periods. Caliche deposits are thought to be generally parallel to sub-parallel to the surrounding terrain, having been formed in mushroom fashion with roots extending into the volcanic conduit. The deposits thin with distance away from the cones.

- Gold -

The principal source of the worlds gold mineralization occurs as a result of hydrothermal deposition within intrusive and extrusive igneous rocks. Most of the major gold reserves are found in sediments or placers or as disseminations adjacent to weathered igneous formations. Gold is common in distinctive types of volcanic rocks, often associated in tuffs with manganese or altered quartz minerals.

Primary gold mineralization in the Piedra Amarilla deposit is assumed to have taken place during the liquid phases of hydrothermal activity. Gold mineralization is associated with Tellurium and Selenium abundant in the deposit.

Secondary gold mineralization is assumed to have occurred according to various mineralization models which require abundant subsurface water and leaching of gold values from nearby volcanic ranges. Warm hydrothermal waters charged with chloride leach the gold values from the surrounding countryrock into the basin areas. Volcanic activity at Piedra Amarilla created capillary actions which drew the enriched solutions into the deposit where gold precipitated as a result of the change in pH, as the solutions move from a basic environment into one that was acidic. Secondary gold mineralization of this type may still occur, but at a much reduced rate.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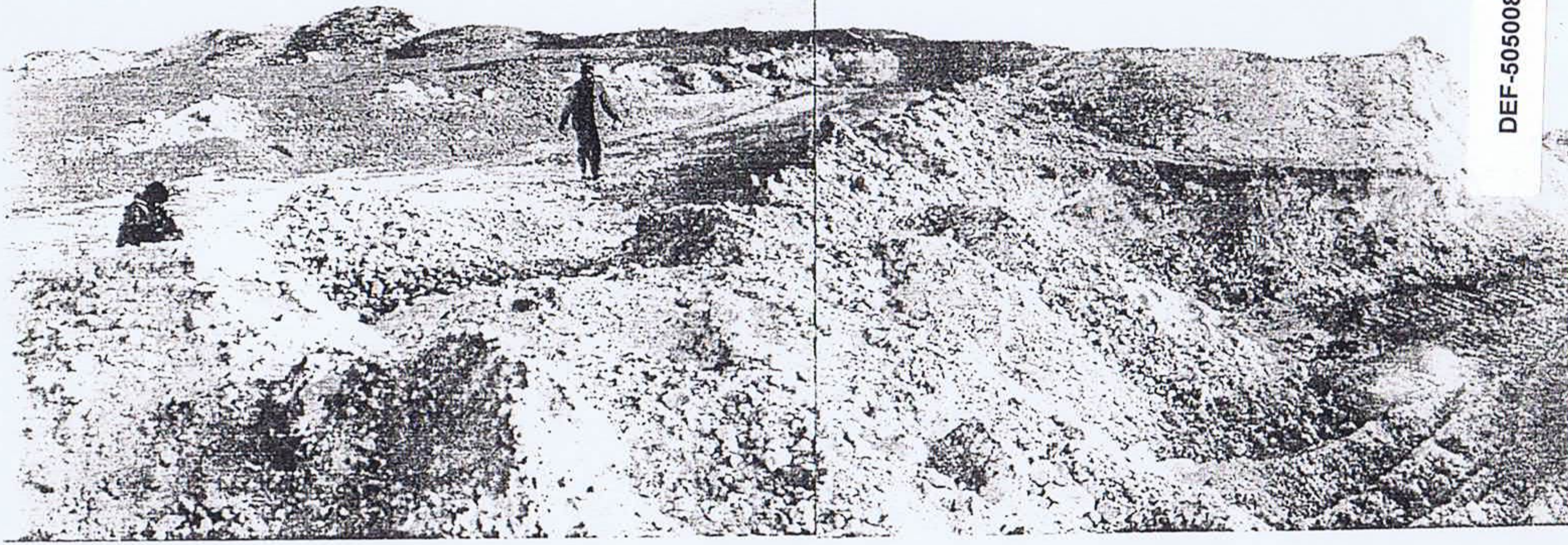

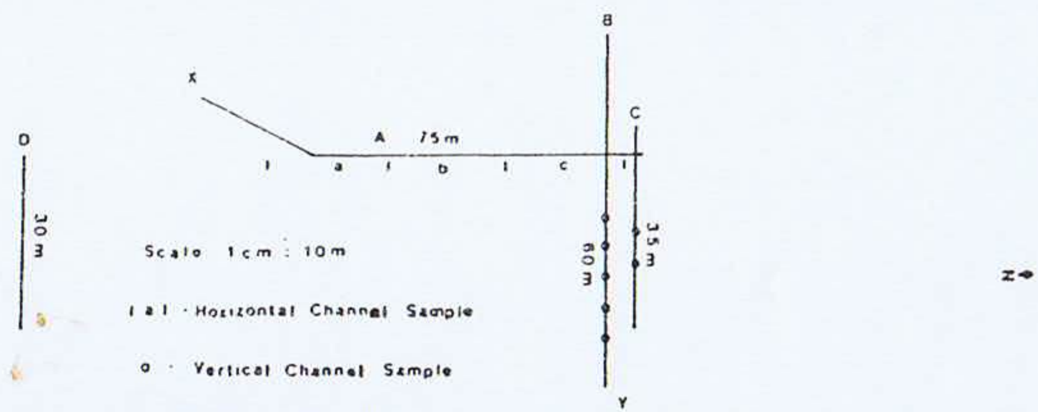

SECTION 1 TRENCHING SCHEMATIC · AREA 1 (Piedra Amarilla 161 - SE Corner)

X-Y Vertical Drop 8m

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Ore Reserves.

Titanium ore reserves have been quantified in three different mineralized areas within the core of the Piedra Amarilla properties group. Inferred ore reserves of 173,800,000 metric tons have been identified and contaim the following mineral averages per ton of ore:

TiO2	Sulfur	Gold	Silver
2.7%	18.72%	0.32g	6.78g

The mineralized areas are divided into Sections and are designated as follows:

Section #	Name	Piedra Am. Properties	Ore Reserves
Section 1	Portezuelo	161	46,200,000
Section 2	Media Luna	131	55,000,000
Section 3	Triangulo	221, 251	72,600,000
		Total Ore Reserves:	173,800,000

Potential ore reserves were preliminarily identified by use of aerial and satellite photographs. Caliche formations were mapped on a 1:40,000 scale (see Fig 7-8). A modest exploration program was outlined in early 1988 in conjunction with the R.M. Parsons engineering company in Pasadena, California who was commissioned to execute a pre-feasibility study on the mineral properties. Field exploration was carried out by Minexco in June and July of 1988. Ore reserves in Sections 1 and 2 were quantified using trenching techniques which allowed extraction of bulk samples from the walls and floors of the trenches. Although no trenching was done on Section 3, a number of shallow pits were dug. Bulk samples were extracted from these and from several large outcrops which are exposed as hardened tuffs.

The reserves quantified in the Piedra Amarilla Sections are classified as Inferred Reserves according to the Mineral Resource Classification System of the U.S. Bureau of Mines (see Table 4). Additional treching and a larger number of samples will permit these reserves to move into the Indicated Reserves Category.

Section 1 - Portezuelo.

Trenching done in Areas 1, 2, and 3 was combined with sampling of surface outcrops. A surface area of 750 meters x 1250 meters was blocked out, which covers an altered volcanic dome formation and its slopes. (See Figures 8, 9, and 10)

Average depth is computed at 20 meters, based on an X -Y verticle drop of 8 meters in trenches cut in Area 1 (Figure 11) and on an estimated verticle drop of 35 meters between Areas 1 and 3. (Figure 9) The ore is assigned an in-place mineral weight of 2.2 Tons/Meter3 (Parsons) based on an average extracted weight of 2.0 Tons/Meter3.

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Trenching in Areas 4 and 5 has blocked out an additional reserve area of 300 meters x 750 meters. An average vertical depth of 10 meters is assigned. (See Figure 14) Blocked out reserves in Section 1 are calculated as follows:

Area	Dimension - Meters	Computed Tonnage
1, 2, 3	750 x 1250 x 20	41,250,000 MT
4, 5	300 x 750 x 10	4,950,000 MT
		==========
	Total:	46,200,000 MT

A bulk sample was taken on a one meter deep trench in Area 3, cut on the bottom slope of the volcanic dome. The trench failed to reach the main caliche body because of ground ice and deeper alluvium at the base of the dome. Although the sampled alluvium contained no native sulfur, the TiO2 content was only slightly lower than the average for the Section. The alluvial trench is marked "AT" in Figure 9. Parsons pre-feasibility study calculated prestripping requirements for alluvial material at 1:7 - one ton of alluvium for each 7 tons of ore extracted. Even this modest stripping requirement may be modified considering that the alluvium contains significant amount of TiO2. All sampled material in Section 1, including outcrops, trenches, and alluvium showed high TiO2 values.

A significant portion of the reserves blocked out in Section 1 are outlined in sufficient detail to allow their inclusion in the Indicated Reserves Category. The initial trenching report submitted to Parsons in September 1988 allowed for 5,811,000 tons of ore in Section 1 to be classified as Indicated Reserves. Parsons chose to classify these as Inferred Reserves, in part due to a small sample base, and due to the conservative nature of the mining business where geological work done by third parties is seldom endorsed or certified unless hands-on supervision of all aspects of exploration is assured.

More than 18 tons of samples have been extracted from the trenches in Section 1 for chemical analysis and metallurgical testing. Average mineral content per ton for Section 1 is as follows:

TiO2	Sulfur	Gold	Silver
2.7%	15.1%	0.33g	7.0g

Titanium values reflect averages from atomic absorption testing. Sulfur values indicate native sulfur extracted via chemical leaching. Gold values indicate that portion of gold leached in bulk sample leaching tests. Silver values were arrived at via fire assay.

Titanium values are generally stable and vary little from one spot to another, while Sulfur values vary greatly. In Section 1, Sulfur ranged from 7.28 % to 20.1 %.

TABLE 4

MINERAL RESOURCE CLASSIFICATION SYSTEMS

U. S. BUREAU OF MINES

- **Measured.**- Reserves or resources for which tonnage is computed from dimensions revealed in outcrops, trenches, workings, and drill holes and for which the grade is computed from the results of detailed sampling. The sites for inspection, sampling, and measurement are spaced so closely and the geologic character is so well defined that size, shape, and mineral content are well established. The computed tonnage and grade are judged to be acurate within limits which are stated, and no such limit is judged to be different from the computed tonnage or grade by more than 20 percent.

- **Indicated.**- Reserves or resources for which tonnage and grade are computed partly from specific measurements, samples, or production data and partly from projection for a reasonable distance on geologic evidence. The sites available for inspection, measurement, and sampling are too widely or otherwise inappropriately spaced to permit the mineral bodies to be outlined completely or the grade established throughout.

- **Inferred.**- Reserves or resources for which quantitative estimates are based largely on broad knowledge of the geologic character of the deposit and for which there are few, if any, samples or measurements. The estimates are based on an assumed continuity or repetition, of which there is geologic evidence; this evidence may include comparison with deposits of similar type. Bodies that are completely concealed may be included if there is specific geology evidence of their presence. Estimates of inferred reserves or resources should include a statement of the specific limits within which the inferred material may lie.

Section 2 - Media Luna.

Section 2 lies south of Section 1, and the mineral bodies are adjacent to one another, though Section 2 comprises a different volcanic unit. Geological evidence for reserve calculations is very strong, particularly on the western slope which has been exposed through wind erosions from the prevailing northwesterlies. Trenching in Section 2 was limited to the western slope area and a few shallow trenches on the eastern portions of the formation. Ground ice prevented a deepening of the eastern trenches, but some caliche was nevertheless exposed. The trenching combined with outcrop sampling helped in blocking out a surface area some 500 meters x 1250 meters which covers the bulk of the volcanic dome. A depth of 40 meters is computed for the vertical depth; the western slope exposes more than 100 meters of vertical mineralization, and the eastern slope has similar showings. (See Figures 15, 16) The mineral tonnage is computed as follows:

Area 1 500m x 1250m x 40m = 55,000,000 MT

Extremely high TiO2 values were found here (XRF analysis - 7.04%) and are considered anamolous for grade calulations in Section 1, which use the more precise atomic absorption value of 2.7%. Sulfur values, which average 30.9% are unduly influenced by several extremely high grade sulfur veins which crosscut the western slope (perpendicular) and thus the overall grade for the entire property is probably somewhat lower. Gold values are not well enough defined to assign a value until leaching tests are completed. Silver values are comparable to those in Section 1. Preliminary mineral averages for Section 2 may be established as follows:

TiO2	Sulfur	Gold	Silver
< 7.04%	< 30.9%	?	6.55g

Several hundred kilos of sampled material has been removed from the trenches - outcrops in this section for analysis and testing.

Section 3 - Triangulo.

Section 3 has the largest Titanium reserves and the most abundant surface showings of high grade (+20%) Sulfur. The reserve consists of four medium sized volcanic domes and a line of small tuffted outcrops, which from the air give the alteration a triangular appearance - hence the name. (See Figure 5)

No trenching was done in this Section. Samples were obtained by removing bulk samples from 6 large outcrops and several smaller outcrops, and from a few hand-dug pits (50 cms). Approximately 4 tons of sampled material was removed for analysis and testing.

Titanium content in this Section was analyzed using XRF, which values are generally 30% below the more precise atomic absorption. TiO2 averages are about the same as those in Section 1 analyzed via XRF and atomic absorption.

Sulfur content in Section 3 averaged 35.17% on the bulk samples extracted from the outcrops and pits. Overall sulfur content on the mineralized reserves is expected to remain high.

Leaching tests have been done for gold, with leach extractions of 0.315g/t.

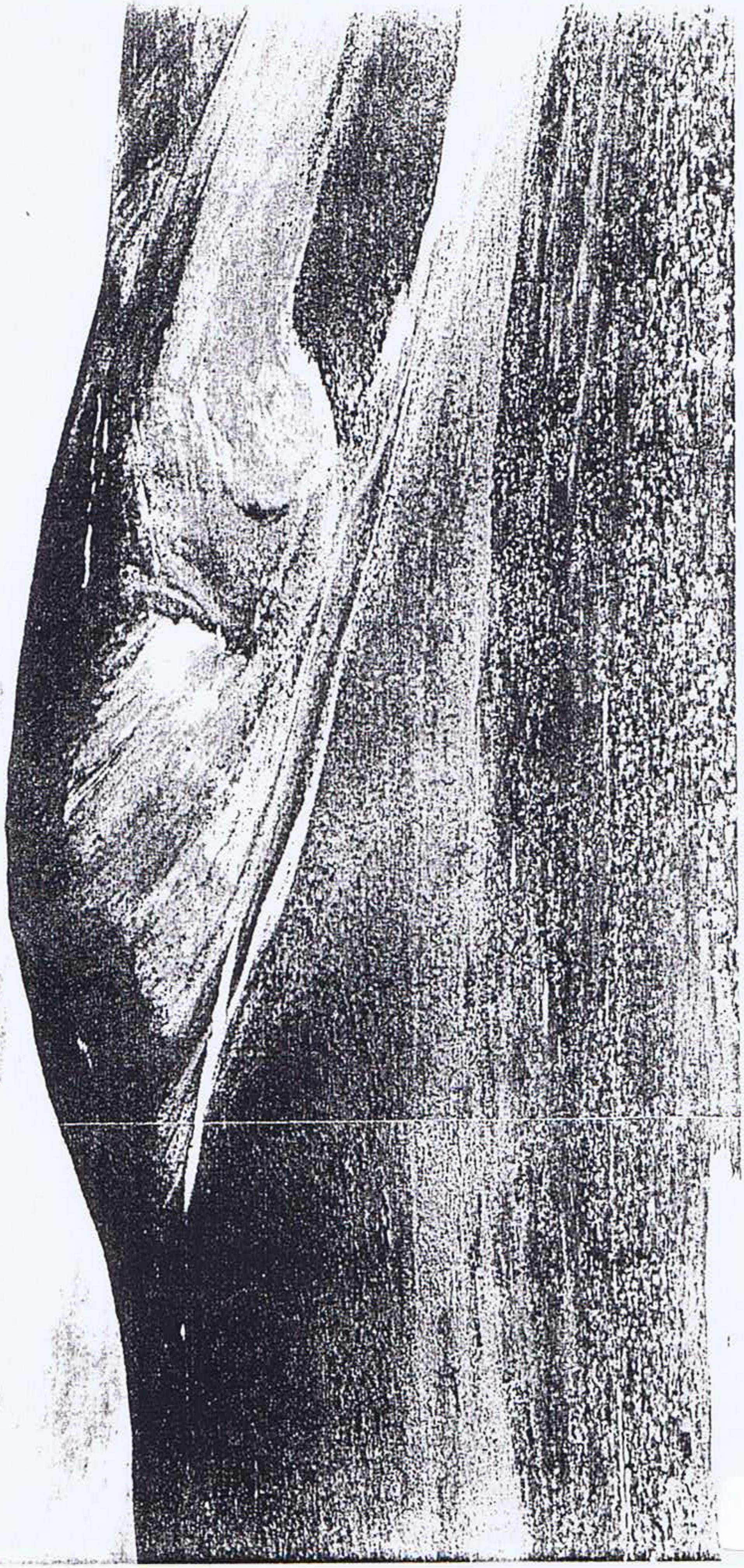
Based on the sampled areas, a reserve of mineral ore was blocked out 2000 meters by 1100 meters. A vertical depth of 15 meters was assigned which is about the averaged exposed depth of the larger outcrops. The ore reserves are calculated as follows:

Area 1	2000m x 1100m x 15m	=	72,600,000 MT

The average mineral content per ton is expressed as follows:

TiO2	Sulfur	Gold	Silver
* 2.7%	35.17%	0.315g	7.0g

* TiO2 values are averaged against atomic absorption testing of samples from section 1 to compensate for semi-quantitative readings of XRF.



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Geology - Piedra Parada Salar

The Piedra Parada Salar is an active evaporite body which drains 750 km2 of the north-central Cordillera. Although some of the salars in Chile have been extensively studied, we know of no work done on the Piedra Parada salar.

The salar receives water inflow in the form of semi-warm thermal waters from a half dozen different sources including the Cuyanos Range, Cerro Negro, Cerro Piedra Parada, Cerro Panteon de Aliste, and Claudio Guy Range. The thermal waters enter the salar at the margins as can be seen in the aerial photographs. (see Fig. 8)

The salars in this area of Chile have one of the worlds highest rates of evaporation. The intense solar heat created by the high altitude combines with a low relative humidity, strong afternoon winds, and mostly clear skies to produce the high rate of evaporation. In addition, annual precipitation is usually modest, so that most of the surface area of the salar is usually covered during periods of melted runoff only to very shallow depths.

The thermal waters feeding into the salar have leached large amounts of mineral components from the surrounding countryrock. The minerals have precipitated into sedimentary formations as a result of the evaporative process. Some of the dominant minerals have compacted into layers interbedded one with another in a type of loose arenite formation. The prevailing easterly winds have concentrated much of the loose minerals into the eastern and south-eastern portions of the basin, much as sand dunes.

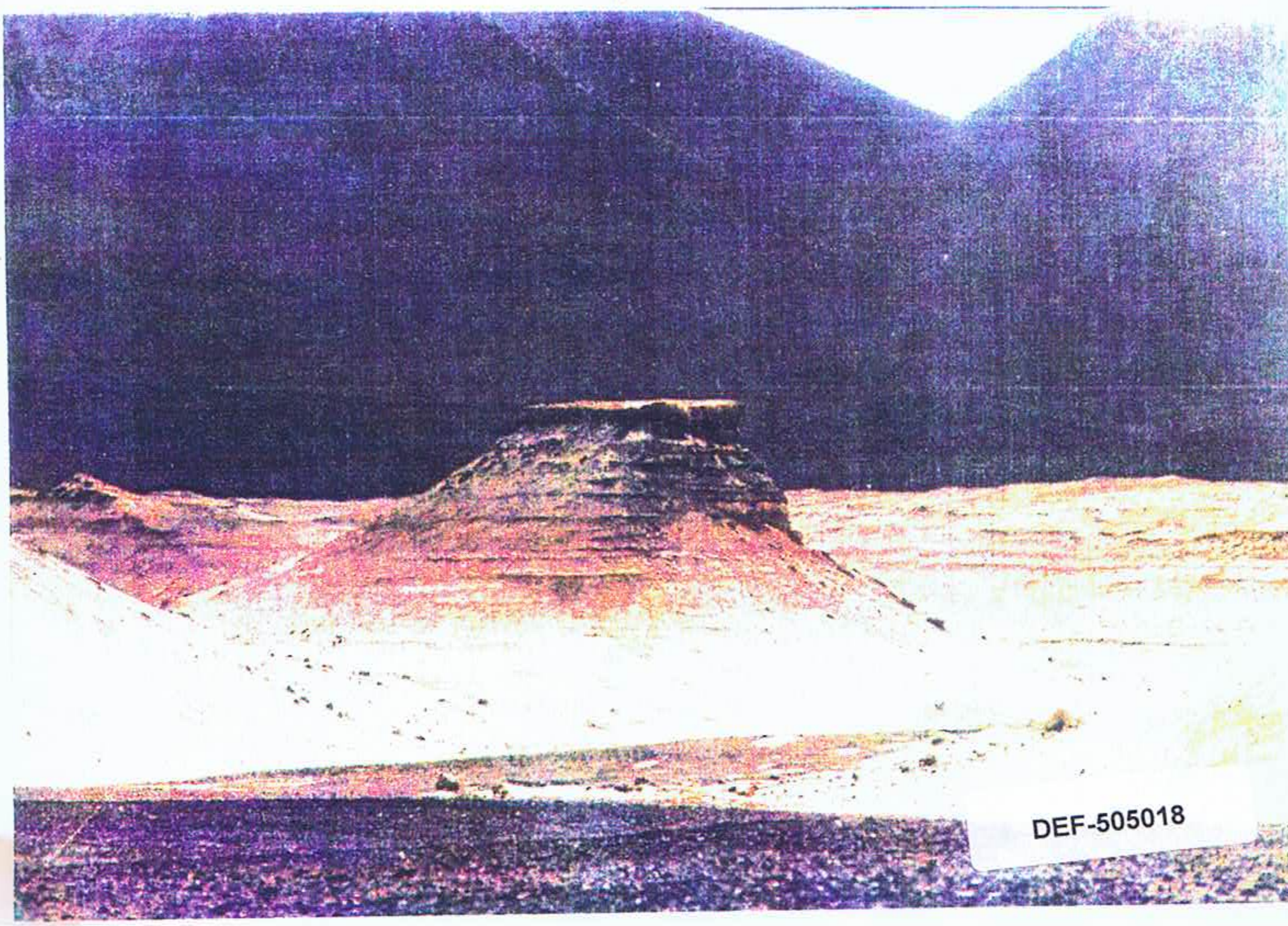
The salar is slightly tilted toward the northwest as a result of regional block faulting action, elevating the eastern portions of the salar. The winds have carved the mineral layers into low scarps, 10 meters and more in height. (see Fig. 18) The terraces are formed mainly by gypsum, clay (Kaolin), some silica-quartz, fine grained sandstone, limonite, and siltstone. The mineral beds lie horizontally, the different minerals interbedded one with another. The upper portions of the terraces consist mainly of gypsum, both pure and clayed. A typical profile, top to bottom, is as follows:

Gypsum-Kaolin	(white bed)	3.0 meters
Iron Oxide	(limonite)	0.5 meters
Gypsum-Clay		3.5 meters
Limonite-Iron Oxides		1.0 meters
Gypsum		2.0 meters

A number of other mineral crystals typical of evaporite bodies can be observed. These include Ulexite, Anhydrite, Halite, Calcite, etc. The saline waters found in the central area of the salar contains dissolved minerals of carbonates, low lithium values, and other chlorides and sulfates not yet precipitated. The sediment depth of the salar is not known but may be as much as 100 meters, the lower portions containing minerals in ancient sedimentary bodies. The water and mud depth from the surface is probably only a few meters in the center of the salar.

DEF-505017

18



Economic Minerals.

The Sanson properties are located just west of the Piedra Amarilla property group. Only a limited sampling program has been done thus far. A number of economic minerals have been identified using XRF and atomic absorption methods. Minerals of importance include gold, silver, titanium, lead, and strontium. Sulfur is found as a mineral compound in conjunction with gypsum and anhydrite. Table 5 shows average sample values, and their distribution is found in Figure 19.

Reserves.

The various mineral units sampled represent visible tonnage of +/- 10,000,000 metric tons. Potential above ground tonnage in the eastern portion of the Piedra Parada Salar is estimated at 100,000,000 metric tons. This includes a central "corridor" which runs NW-SE and averages 2.5 kms length by 1.2 kms width, and an average height of 12 meters. An average "in place" mineral weight of 1.8 tons/m3 has been assumed. Thus the reserves in the central corridor are quantified as follows:

2500 m x 1200 m x 12 m x 1.8 tons/m3 = 64,800,000 mt

TABLE 5

SAMPLE #	WEIGHT	%TiO2	% Pb	% Sr	Au g/t	Ag g/t
1	10 KILOS	2.0	0.9	3.7	0.2	18
2	10 KILOS	1.83	1.2	2.1	TRACE	16
3	10 KILOS	1.67	1.2	3.5	TRACE	13
4	10 KILOS	2.00	0.6	1.7	0.2	15
5	10 KILOS	1.83	0.6	1.5	0.1	13
6	10 KILOS	1.67	0.7	2.4	0.3	10
7	10 KILOS	1.67	0.7	1.6	0.8	9
8	10 KILOS	1.83	1.4	2.3	0.7	9
9	10 KILOS	1.67	1.4	2.4	0.7	16
10	5 KILOS	1.00	0.1	0.8	NOT	TESTED
11	5 KILOS	1.36	NOT	TESTED	NOT	TESTED
12	5 KILOS	1.27	NOT	TESTED	NOT	TESTED
TOTAL AVERAGE	105 KILOS	1.65	0.88	2.2	0.33	13.22

TiO2, Pb and Sr were analyzed using x-ray fluoresence.

Au, Ag were analyzed via Atomic Absorbtion.

Samples 1-9 were taken by verticle channel cuts.

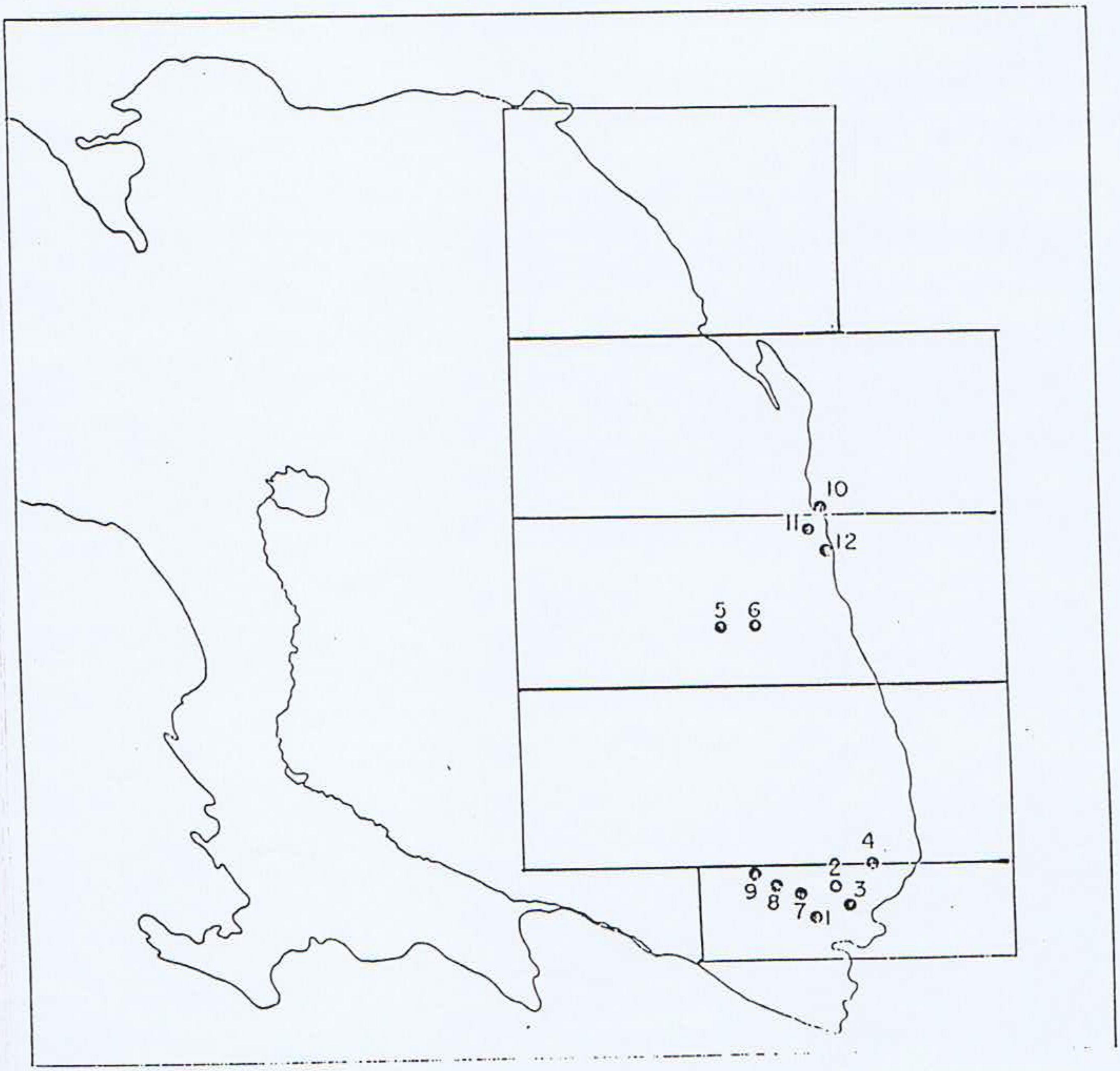
Samples 10-12 were taken horizontally along the marging of the salar.

PIEDRA PARADA SALAR

Sample Location Map

Scale Approx. 1:40000

Figure 19



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Mining Plan.

The conceptual mining plan calls for extraction of 25,000 metric tons per day of caliche ore for mill beneficiation. This work will be sub-contracted to a reputable Chilean mining company which currently does extraction work at several high altitude mines for such companies as Cominco and Anglo American. A preliminary bid price has been established for delivery of ore to the mill which includes all mining equipment and trucks, labor and supervision, and consumables such as fuel, etc. C.S.I. has added a 20% contingency to the bid price in its operational costs estimation to compensate for possible fluctuating oil prices. Sub-contracting the mine extraction will save $15,000,000 in initial capital outlay for mining equipment, although this cost was not deducted in our capital cost forecast.

Pre-stripping and stripping requirements are minimal. Parsons has estimated an overall stripping ratio of wasterock to ore of 1:7. Initial pit preparation has been budgeted at $500,000. Mining will begin at the top of the volcanic domes, where overburden is light, and work downward and outward.

Parsons used a sulfur cutoff grade of 20% for determining initial pit parameters. No cutoff grade will be used in the new mining plan, and overall sulfur grades will drop to an average of 15.1%

Parsons identified two pit areas denominated Parsons North Pit and Parsons South Pit (see Fig. 8). These will be developed into mine extraction areas, contributing 8,350 metric tons per day each for beneficiation. The South Pit encompasses ore reserves of the Media Luna, and the North Pit covers the ore reserves in the Triangulo. Additional extracted ore totaling 8,300 metric tons per day will come from a third pit area to be developed in the Portezuelo area, which lies roughly half-way between the North and South Pits. Pit parameters and extraction machinery will be developed in conjuntion with the mining subcontractor, but will include much of the equipment listed in the pre-feasibility study.

Metallurgy.

Metallurgical recoveries and flowsheet diagrams are based on the laboratory and economic studies listed in Table 6. Mineral products are recovered separately as shown in Figures 20 - 22. Because sulfur flotation can begin at the relatively coarse grind of -35 mesh, sulfur is recovered first.

Comminution. Mine feed is classified with oversize material feeding into a primary jaw crusher. Secondary and tertiary crushing are accomplished with back-to-back centrifugal rock against rock mills, in place of rod or hammer mills. Reduction of ore for primary flotation feed will take place near the mining pits. Ore will then be blended into a pulp of 20 to 25 percent, depending on sulfur grades, and then follow the basic processing diagram shown in Figure 20.

Sulfur Flowsheet.

Ore will be ground in a large SAG mill to -35 mesh. Grinding media will come from the nearby Carolina properties and will consist of hardened quartz tuffs which also contain 2% TiO_2 and low grades of sulfur and precious metals. Overflow pulp will be processed via rougher flash flotation and then through a similar downsized cell for cleaning. Approximately 40% of recovered sulfur will be obtained from this first step.

Tailings will run through scavenger flotation, and a low grade (36%) scavenger concentrate representing 28% of total feed will be sent for differential grinding to -100 mesh and then repeat the flotation process. The secondary flotation provides approximately 33% of recovered sulfur.

Tailings then feed through an additional scavenger flotation which produce low grade concentrates (37%) representing 14% of total feed and is sent for further regrinding, to -200 mesh. The flotation step is repeated, with tertiary feed providing 27% of recovered sulfur.

Recovered sulfur concentrates are sent to a continuous autoclave for melting and separation of coarse impurities. Total sulfur recoveries to this point average 85%, producing a sulfur product of 99.5% purity. A portion of the autoclave rejects representing the agglomerate are recirculated as a continuous charge to primary flotation feed. Scavenger tailings in secondary and tertiary flotation are fed into large volume spiral gravitational separators, with sulfur concentrating in the lighter portion of the tailings fraction, which is split and sent as a continuous charge to tertiary feed flotation. Recirculation of agglomerate and spiral rejects will increase overall sulfur recoveries to nearly 93%

Filtration of the final autoclave product will produce molten sulfur in excess of 99.9% purity, free from commercial contaminants. The molten sulfur will be sent to a forming plant for production as prills or slates. During filtration of molten sulfur, a filter cake will be produced which will be stockpiled for future processing of precious metals and residual sulfur.

The stockpiled filter cakes will provide an additional 10,000 metric tons per year of sulfur. Also, the grinding media used in the SAG mills will provide 10,000 metric tons or more of sulfur. These amounts were not included in the flowsheet recoveries or in economic evaluations.

Titanium Flowsheet.

Tailings totaling 20,951 metric tons from the different sulfur flotation areas will be fed into the titanium recovery plant (Fig. 21) With the extraction of sulfur, the titanium ore values will have undergone a slight concentration, increasing in grade from 2.7% to 3.2% TiO_2. Pulp from sulfur flotation will be classified - approximately 45% will be -200 mesh - with overflow feeding a -200 mesh SAG mill. Underflow will feed a complex gravity concentration plant. The gravity system is designed to give the pulp several passes through large capacity spiral concentrators, especially the different middlings and rougher tailings. A final gravity concentrate of 55% TiO_2 is produced and sent to a simple flotation process for further concentration.

Final flotation concentrate is sent to magnetic separation where impurities are removed as a concentrate and sent to a stockpile for future removal of precious metal values. A final concentrate of 95% TiO_2 is produced. It should be noted that a final concentrate of 35% is acceptable since it will be subjected to acid digestion and subsequent precipitation. Termination of the current feasibility study outlined by Intec will indicate the appropriate concentrate grade.

A final pigment product will be produced after precipitation and roasting. A portion of the TiO_2 concentrate or final pigment product will be sent to a chlorination plant for conversion into sponge metal (Fig. 22).

Some of the rescavenger middlings from the gravity plant will be used for processing silicon metal. The prior gravity concentration will have removed most of the heavy titanium and iron minerals, and removing a large cut of the tailings portion during rescavenger concentration will remove most of the lighter contaminants such as sulfur, slimes, etc.

The middlings fraction will be further purified with a mild acid leach and then fresh water rinse, producing a silicon product 98.7% SiO_2 (Fig. 22). The product will then be blended with petroleum coke for metal reduction, producing a final silicon metal product 98.5% Si. It is conceivable that the final silicon product will be blended with scrap-iron to produce grades of ferro-silicon, depending on market demand.

A portion of the silicon metal will be sent to a chlorination plant for eventual hydrogen reduction into high purity electronics grade silicon. C.S.I. is investigating the possibility of using substantial portions of the titanium sponge chlorination facilities for production of high purity silicon. The processes are similar in key aspects. A dual plant would give the company flexibility in setting production by producing more of one product or of another, depending on current market conditions.

The projected daily product recoveries for each of the mineral compounds, and the annual value derived from the sale of the products are shown in Tables 7 and 8.

TABLE 6

Metallurgical Studies.

Date	Title of Study	Laboratory
July 1987	Concentration of Sulfur	Intec-Chile 21pp.
Oct. 1988	Flotability of Sulfur Caliche	Intec-Chile 19pp.
Jan. 1989	Flotability of Sulfur Caliche and Control of Impurities	Intec-Chile 21pp.
May 1989	Flotation of Sulfur Caliche - Work Proposal	Intec-Chile 10pp.
Oct. 1989	Technology for Production of Sulfur on a Large Scale (Reference Conditions)	Intec-Chile 12pp.
Dec. 1989	Flotation of Sulfur Caliche - 111 Region	Intec-Chile 290pp
Present -	Pilot Flotation of Caliche Sulfur and Melting of Concentrates in Continuous Autoclave - Forming of Sulfur	Intec-Chile

Economic Studies.

Nov. 1988	Chile Sulfur Project Prefeasibilty Study	R.M. Parsons 157pp Pasadena, Ca.
Oct. 1989	Technology for Production of Sulfur on a Large Scale (Prepared for CORFO)	Intec-Chile 28pp.
Aug. 1990	Recovery of Industrial Minerals from Sulfur Caliche (Prepared for CORFO)	Intec-Chile 30pp.

FIG. 20

SULFUR METALLURGICAL FLOWSHEET

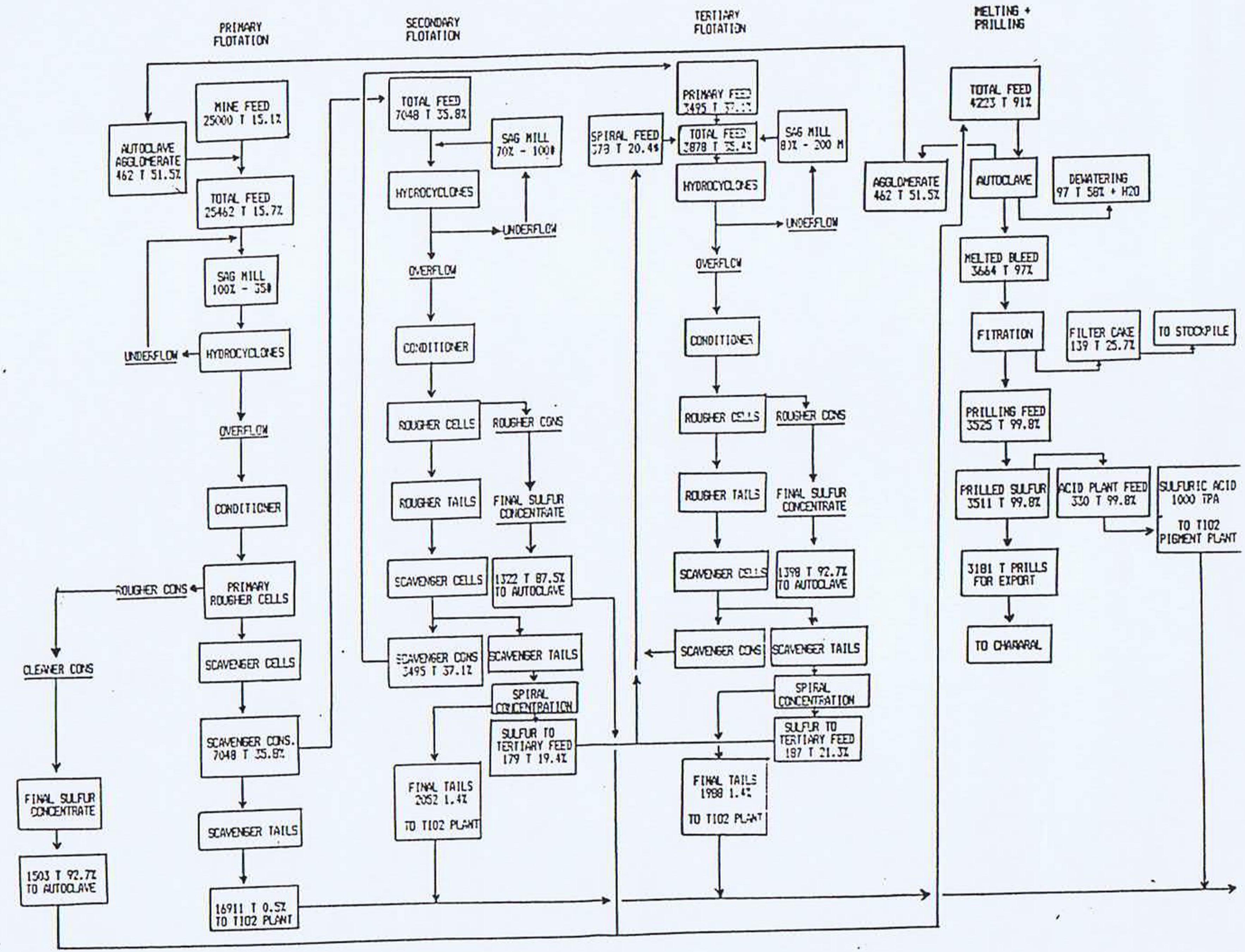

FIG. 21

TiO2 PIGMENT PROCESS FLOWSHEET

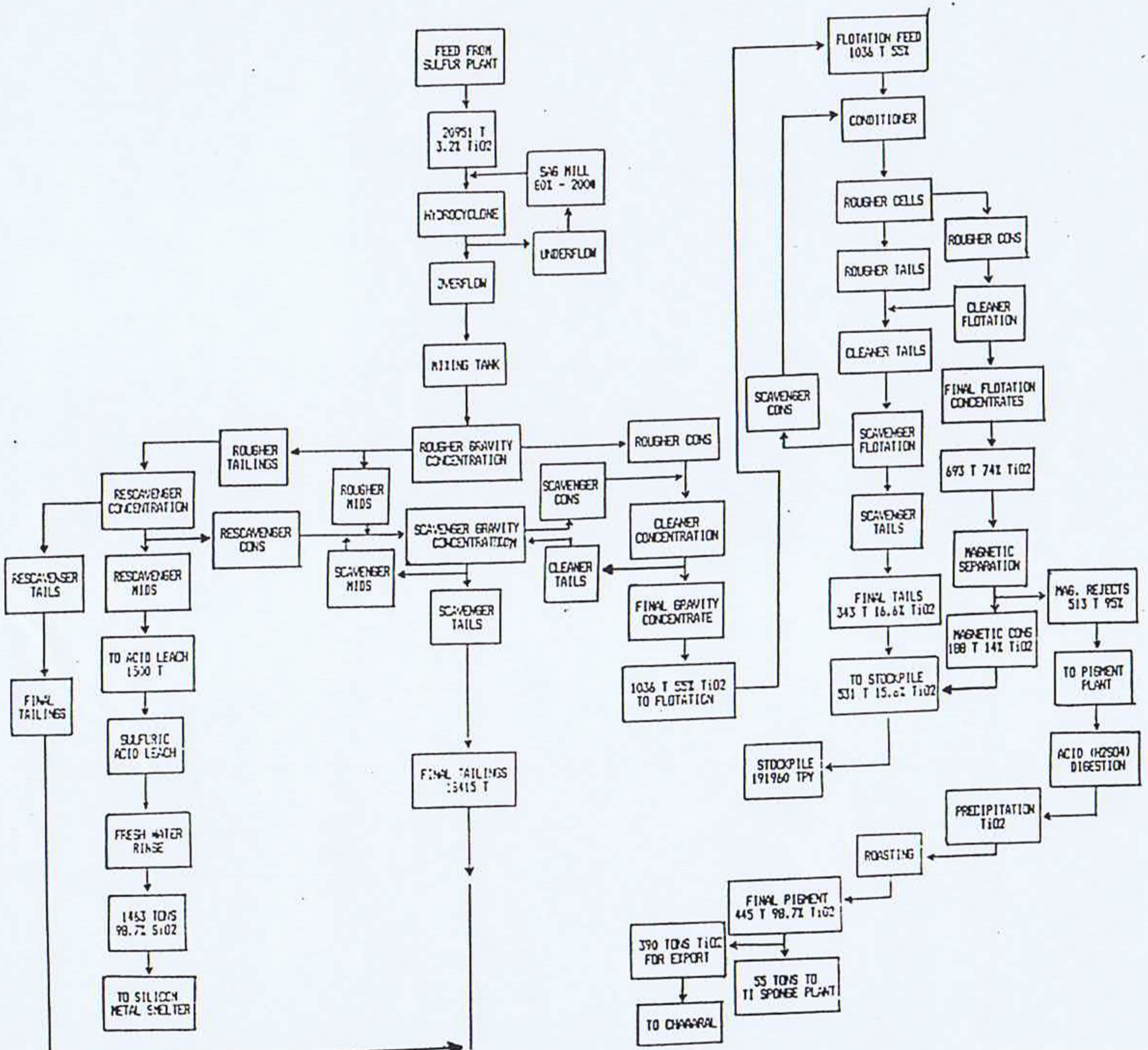

FIG. 22

SILICON METAL AND TITANIUM SPONGE FLOWSHEET

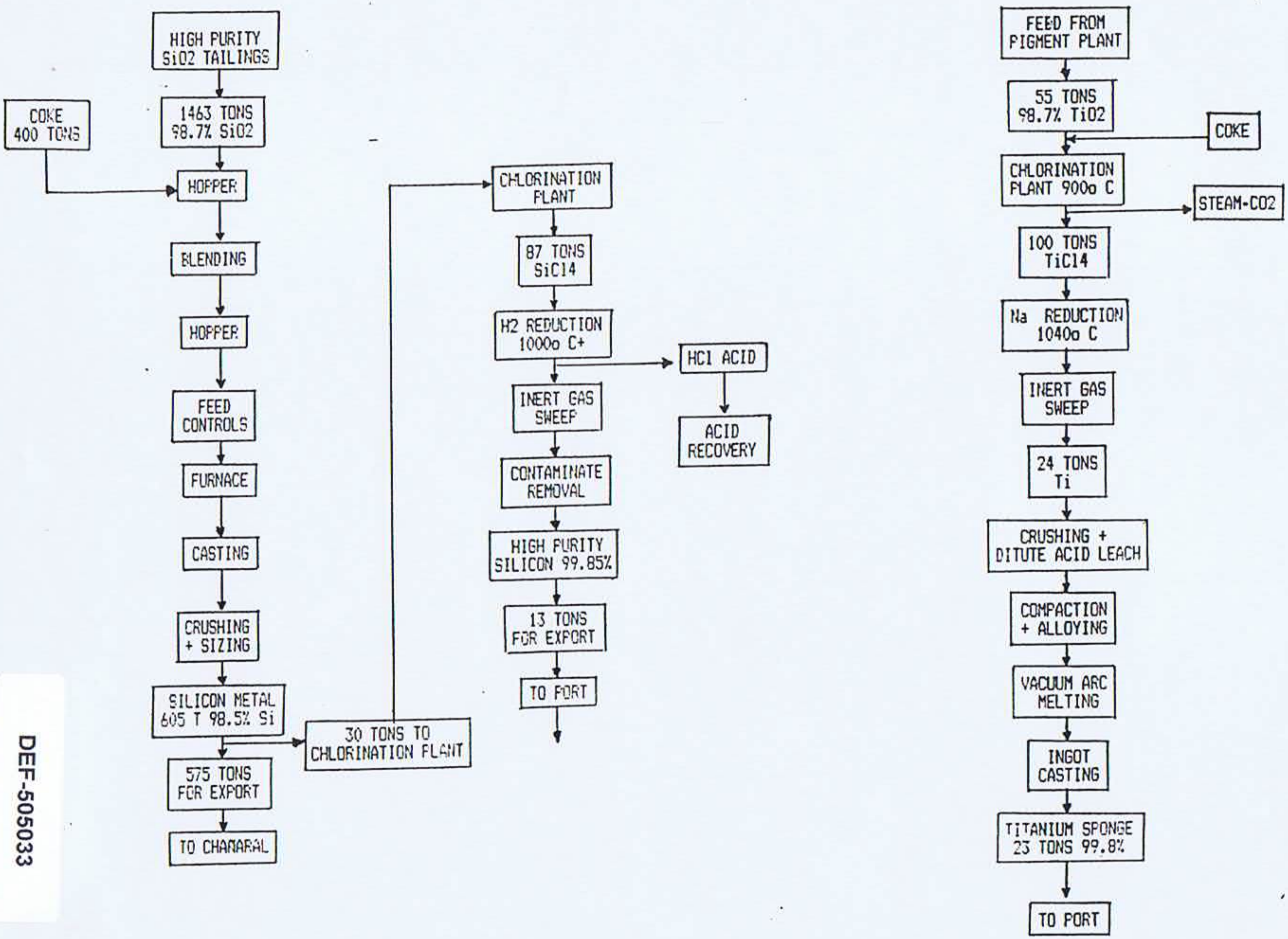

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TABLE 7

DAILY PRODUCT RECOVERIES

MINERAL	HEADORE CONTENT	FINAL PRODUCT	% MINERAL RECOVERY	DAILY PRODUCTION	AMOUNT IN BY PRODUCTS	NET DAILY PRODUCTION
TiO2	2.7%	PIGMENT	68%	445 TONS	55 TONS	390 TONS
		TI SPONGE	95%	23 TONS	-	23 TONS
SULFUR	15.1%	FRILLS 99.8%	93%	3511 TONS	330 TONS	3181 TONS
		H2SO4	99%	1000 TONS	500 TONS	500 TONS
SILICA	72.5%	SILICON METAL	8%	605 TONS	30 TONS	575 TONS
		SILICON 99.8%		13 TONS	-	13 TONS
GOLD	0.32 g	BULLION	80%	206 TOZ.	-	206 TOZ.
SILVER	7.0 g	BULLION	70%	3939 TOZ.	-	3939 TOZ.

TABLE B

ANNUAL PRODUCT VALUE

PRODUCT	NET ANNUAL PRODUCTION	VALUE PER UNIT	ANNUAL VALUE
TiO2 PIGMENT	140,400 MT	$ 1.05/lb	$ 325,061,100
Ti SPONGE METAL	8,280 MT	$ 6.0/lb	$ 109,544,400
TOTAL VALUE TITANIUM PRODUCTS:			$ 434,605,500
SULFUR PRILLED	1,145,160 MT	$ 105/MT	$ 120,241,800
SULFURIC ACID	180,000 MT	$ 42/MT	$ 7,560,000
TOTAL VALUE SULFUR PRODUCTS:			$ 127,801,800
SILICON METAL 98.5%	207,000 MT	$ 0.75/lb	$ 342,326,250
SILICON METAL 99.5%	4,680 MT	$ 7.0/lb	$ 72,235,800
TOTAL VALUE:			$ 414,562,050
GOLD	74,160 TOZ.	$370/TOZ	$ 27,439,200
SILVER	1,418,040 TOZ.	$4.40/TOZ	$ 6,239,376
TOTAL VALUE PRECIOUS METAL:			$ 33,678,578
TOTAL ANNUAL VALUE:			$1,010,647,926

ECONOMIC EVALUATION

TOTAL PROJECT CAPITAL COST	$ 581,922,000
DAILY PRODUCTION	25,000 M TONS
ANNUAL OPERATING DAYS	360
EXTRACTION VALUE PER TON OF ORE	$ 112.29
OPERATING COST PER TON OF ORE	$ 41.73

FINANCING ASSUMPTIONS

EQUITY	30%	$ 174,577,000
PREFERRED DEBT (1)	27.5%	$ 160,029,000
EXPORT CREDIT DEBT (2)	42.5%	$ 247,316,000

DEBT 1 - 10.5% ANNUAL WITH 10 YEAR REPAYMENT

DEBT 2 - 9.65% ANNUAL WITH 9 YEAR REPAYMENT

INTEREST PAYMENTS ONLY PRIOR TO PRODUCTION - INTEREST AND PRINCIPAL (LEVEL PAYMENT AMORTIZATION) FOR YEARS 3-12.

EFFECTIVE TAX RATE 37%

ANNUAL OPERATIONAL COSTS

1.- Labor

a)	1300 Workers x $1800/month x 12 months	$ 28,080,000
b)	150 Supervisores x $3000/month x 12 months	$ 5,400,000
c)	50 Managers x $8000/month x 12 months	$ 4,800,000
d)	Contract Labor - 35% of a-b-c	$ 13,398,000
e)	Contract Mining - $1.35 / ton x 9,000,000 TPY	$ 11,700,000
f)	Contract Services - Engineering, Drilling, etc.	$ 2,000,000
g)	Medical, travel, etc. 10% of a-f	$ 6,538,000
	Sub Total Labor:	$ 71,916,000

2.- Consumables + Maintenance

a)	Fuel - 400,000 m tons x $475/ton	$190,000,000
b)	Carbon Coke 150,000 mt x $120/ton	$ 18,000,000
c)	Autogenous Grinding Media 90,000 mt x $ 50/ton	$ 4,500,000
d)	Chemical Reagents 85,000 tons x $ 180/ton	$ 15,300,000
e)	Steel 4000 tons x $1000/ton	$ 4,000,000
f)	Special clothing, boots, gloves, etc.	$ 1,950,000
g)	Camp Services, food, laundry, transport, etc.	$ 13,050,000
h)	Plant + Process Maintenance - $ 0.75/ton processed ore	$ 6,750,000
i)	Rolling Stock Maintenance - $ 0.25/ton processed ore	$ 2,250,000
j)	Port Related Costs 0.56 c/ton processed ore	$ 5,000,000
	Sub Total:	$260,800,000

3.- Contingencies

a)	7.5% of 1+2	$ 24,954,000

4.- Office + Overhead

a)	Chilean office 1% of 1-3	$ 3,576,000
b)	U.S. office 1% of 1-3	$ 3,576,000
c)	Legal, Accounting, Insurance 3% of 1-3	$ 10,730,000
	Sub Total:	$ 17,883,000

Total Annual Operating Costs:	$375,553,000
Cost Per Ton of Processed ore:	$ 41.73

All figures x 1000

DEPRECIATION SCHEDULE (Accelerated for Mining Projects)

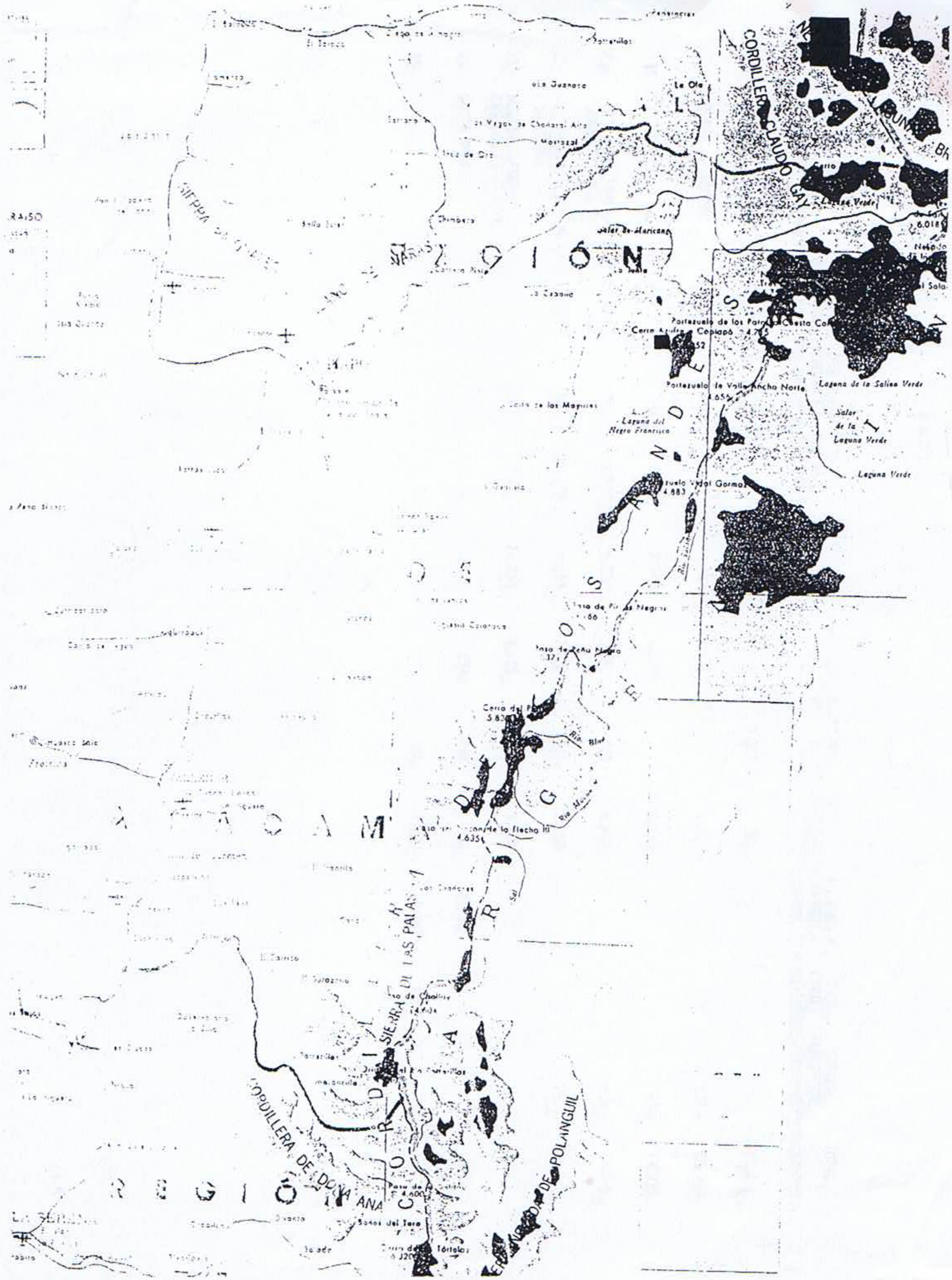
Property Class + % Capital Costs.	1	2	3	4	5	6	7	8
Heavy Machinery 27.7 %	53,731	53,731	53,731					
Installations 52.1%	303,181							
Buildings 6.4%	4,655	4,655	4,655	4,655	4,655	4,655	4,655	4,6554
Trucks-Transp 3.8 % ·	11,057	11,057						
Organizational 10 %	9,699	9,699	9,699	9,699	9,699	9,699		
TOTAL : 100 %	$ 382,323	79,142	68,085	14,354	14,354	14,354	4,655	4,655

DEF-505038

ECONOMIC EVALUATION

(000'S of dollars)

	1	2	3	4	5	6	7	8	9	10	11	12	1
ROSS REVENUE			1,010,648	1,010,648	1,010,648	1,010,648	1,010,648	1,010,648	1,010,648	1,010,648	1,010,648	1,010,648	1,01
PERATING EXPENSES			375,553	375,553	375,553	375,553	375,553	375,553	375,553	375,553	375,553	375,553	37
OYALTY PAYMENTS (9%)			90,958	90,958	90,958	90,958	90,958	90,958	90,958	90,958	90,958	90,958	9
ANAGEMENT FEES (EXCLUDED)													
PERATING INCOME			544,137	544,137	544,137	544,137	544,137	544,137	544,137	544,137	544,137	544,137	54
NTEREST EXP. DEBT 1			(16,803)	(15,772)	(14,638)	(13,380)	(11,990)	(10,456)	(8,559)	(6,886)	(4,817)	(2,528)	
NTEREST EXP. DEBT 2		(23,868)	(23,868)	(22,083)	(20,126)	(17,981)	(15,632)	(13,052)	(10,225)	(7,125)	(3,726)	0	
EPRECIATION (SEE SCHEDULE)		0	(382,323)	(79,142)	(68,085)	(14,354)	(14,354)	(14,354)	(4,655)	(4,655)	0	0	
OSSES BROUGHT FORWARD		0	(23,868)	0	0	0	0	0	0	0	0	0	
NCOME LESS DEDUCTIONS		(23,868)	97,275	427,140	441,288	498,422	502,161	506,275	520,698	525,471	535,594	541,609	5
OSSES CARRIED FORWARD		(23,868)	0	0	0	0	0	0	0	0	0	0	
AXABLE INCOME		0	97,275	427,140	441,288	498,422	502,161	506,275	520,698	525,471	535,594	541,609	5
AX - 37 %			(35,992)	(149,499)	(163,277)	(184,416)	(185,800)	(187,322)	(192,658)	(194,424)	(198,170)	(200,395)	(20
RINCIPAL - DEBT 1			(9,805)	(10,836)	(11,970)	(13,228)	(14,618)	(16,152)	(17,849)	(19,722)	(21,791)	(24,090)	
RINCIPAL - DEBT 2			(18,480)	(20,265)	(22,222)	(24,367)	(26,716)	(29,296)	(32,123)	(35,223)	(38,622)	0	
EQUITY	(174,577)												
DD BACK DEPRECIATION			382,323	79,142	68,085	14,354	14,354	14,354	4,655	4,655	0	0	
DD BACK LOSS BRT FWD			23,868	0	0	0	0	0	0				
CASH FOR DISTRIBUTION	174,577)	(23,868)	439,189	325,682	311,904	290,765	289,381	287,859	282,723	280,757	277,011	317,134	3



CORDILLERA CLAUDIO GAY
Laguna Verde
La Ola
Salar de Maricunga
Portezuelo de los Patos
Portezuelo de Valle Ancho Norte
Laguna del Negro Francisco
Laguna de la Salina Verde
Salar de la Laguna Verde
Laguna Verde
Paso de Peña Negra
SIERRA DE LAS PALAS
Paso de Chollay
CORDILLERA DE DOÑA ANA
Paso del Toro
Cerro de las Tórtolas

CAPITAL DEVELOPMENT COSTS

(in (000'S of dollars)

AREA	DESCRIPTION	MAJOR EQUIPMENT	M/E SUB CONTRACT	BULK MATERIAL	LABOR + INDIRECT	BUILDINGS	ROADS AND RAILROADS	SITE PREPARATION	PIPELINES + SLEEPERS	OTHER CIVIL	SPECIAL ELECTRICAL	TOTAL
05	MINE	15,118				40	3,363	500				19,021
10	CRUSHING+CONVEYING	15,358	6,601	19,484	8,348	3,164		1,232			133	53,780
15	GRINDING	6,717	846	6,873	2,947	1,119		1,146			67	19,715
20	FLOTATION-GRAVITY SEPARATION DRYING	12,980	250	12,964	5,558	2,880	560	1,947			366	37,505
25	ACID PRODUCTION AND RECOVERY	37,420	5,380	22,350	9,615	7,750	600	1,650			750	85,515
35	MELTING, FORMING, CASTING FILTRATION	46,831	2,314	49,491	21,210	4,615	2,130	3,835			195	130,621
40	WATER SUPPLY	1,389	2,501	4,260	1,841	150	300	350	13,005		33	23,829
45	TAILING DAM-RECLAIM WATER	1,605	386	2,241	962	30	150	1,532	4,662	4,163	33	15,764
50	POWER SUPPLY	540	490	575	245	2,300	200	850			38,720	43,920
60	AUXILIARY FACILITIES	503	110	293	127	10,623	1,250	1,765			167	14,838
65	RAIL ROAD	6,800	1,760	1,560	8,727	1,350	31,725	6,345		2,700	350	61,317
70	PORT	1,159		1,635	703	33	1,332	300		33		5,195
75	ENGINEERING									18,000		18,000
	SUB TOTAL	146,420	20,098	121,726	60,283	34,054	41,610	21,452	17,667	24,896	40,814	529,020
	CONTINGENCY 10%	14,642	2,010	12,173	6,028	3,405	4,161	2,145	1,767	2,490	4,081	52,902
	TOTAL	161,062	22,108	133,899	66,311	37,459	45,771	23,597	19,434	27,386	44,895	581,922

DEF-505040