

**REPORT
ON
THE COOPERATIVE MINERAL EXPLORATION
IN
THE REGION I AREA
THE REPUBLIC OF CHILE**

PHASE I

MARCH 2000

**JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN**

PREFACE

In response to the request of the Government of the Republic of Chile, the Japanese Government decided to conduct a Mineral Exploration Project consisting of analysis of existing data, analysis of satellite images, geological survey, geochemical survey, geophysical surveys, drilling exploration and other relevant work in the Region I area to clarify the potential of mineral resources, and entrusted the survey to Japan International Cooperation Agency (JICA). The JICA entrusted the survey to Metal Mining Agency of Japan (MMAJ), because contents of the survey belongs to a very specialized field of mineral exploration. The survey conducted during this fiscal year is the first-phase of a three-phase project to be completed in 2001, MMAJ sent a survey team headed by Mr. Masaaki SUGAWARA to the Republic of Chile from March 12, 2000 to March 24, 2000.

The field survey was completed on schedule with the cooperation of the Government of Republic of Chile and Corporación Nacional del Cobre de Chile (CODELCO). The team exchanged views with the officials concerned with CODELCO. After the team returned to Japan, further studies were made and a report on the first phase of the exploration project was prepared.

Results of the first-phase survey are summarized in this report which constitutes a part of the final report.

We wish to express our deep appreciation to the persons concerned of the Government of the Republic of Chile, the Ministry of Foreign Affairs, the Ministry of International Trade and Industry, the Embassy of Japan in Chile and the authorities concerned for the close cooperation extended to the team.

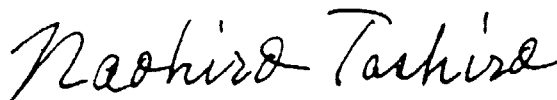
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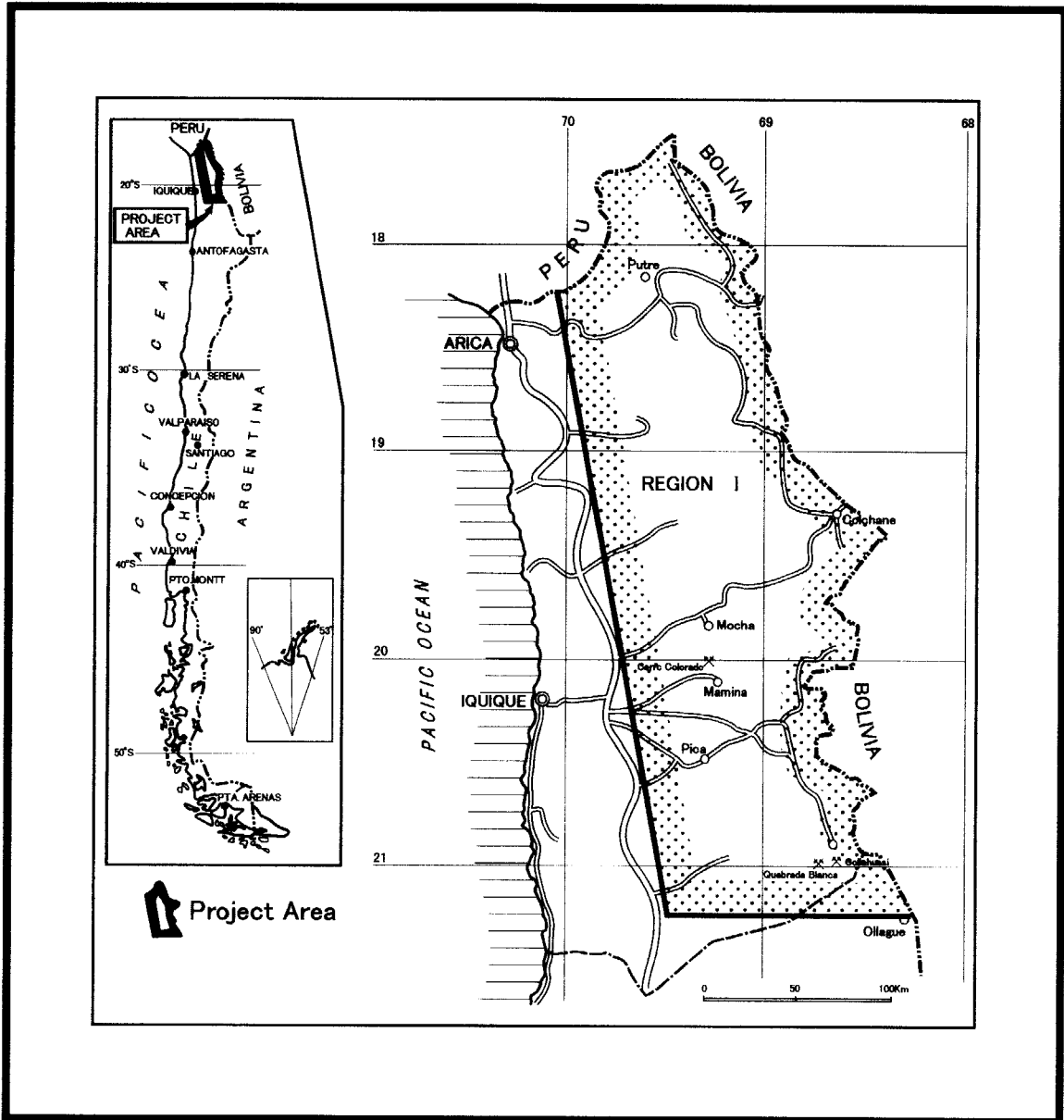


Fig. 1-1 Index Map of the Project Area

ABSTRACT

Analysis of existing data, analysis of satellite images, and geological and geochemical surveys were carried out during the first year of the Region I Survey. The results are summarized as follows.

Existing data analysis:

Mineralization of the known ore deposits and prospects was classified, and porphyry copper-type mineralization and those related closely to it were selected. These mineralized zones and prospects occur in Cretaceous-Paleogene intrusive bodies (plutonic and hypabyssal rocks) and in Paleogene and older rocks near them. The above mineralized zones and prospects occur in both Paleocene-early Eocene and late Eocene-early Oligocene porphyry copper belts. And in the northern to the central part of the study area, they probably occur overlapping the mineralized zone related to Miocene-Quaternary igneous activities.

Various images including visible near infrared to short-wave infrared, and short-wave infrared, and thermal infrared regions were prepared from GEOSCAN data. The analysis of these data extracted intermediate-acidic alteration zones in many localities by clarification of detailed geologic structure and the zoning of the alteration zones.

Satellite image analyses:

Many altered zones were extracted in the vicinity of the Paleogene and older formations and in the Miocene-Quaternary volcanic rocks. The arrangement of the altered zones is harmonious with the lineaments developed in the vicinity.

The porphyry copper mineralization occurs in the peripheries or centers of the zones where the lineaments are developed. The trend of the lineaments associated with ore deposits or prospects vary significantly.

In the central and southern parts of the survey area, many prospects including porphyry copper mineralized zones occur in the altered zones and their vicinity, but in the northern parts, many porphyry copper mineralized zones and possibly closely related prospects occur where altered zones are not extracted.

Geological and geochemical surveys:

Reconnaissance survey was carried out in parts of the promising zones extracted by the analysis of existing data and satellite images in order to investigate the geologic structure, mineralization, and alteration. Samples were collected for chemical analysis.

Results of integrated analysis and interpretation:

- ① It is assumed that hydrothermal activities occur within 4km of the altered zones and ore deposits or prospects. Then zones of hydrothermal activity of the survey area is distributed generally in the NNW-SSE direction, but activities in the E-W direction intersecting the NNW-SSE system are inferred to occur in the northern, central and southern areas. The known porphyry copper mineralized zones are distributed in this E-W hydrothermal system. The distribution of hydrothermal zones coincide mostly with those of lineament development in the central and southern parts. But in the northern part, the correlation with the lineament development is lower than in the central and southern parts, and the hydrothermal activities show better correlation with the distribution of the Miocene-Quaternary volcanoes.
- ② The criteria for selecting areas promising for porphyry copper occurrence are as follows.

- (i) Porphyry copper deposits, prospects and areas within 4km.
 - (ii) Prospects and altered zones closely associated with porphyry copper mineralized zones in Oligocene or older formations and within 4km radius thereof.
- ③ The following survey was proposed for the second year with the purpose of clarifying the occurrence of porphyry copper deposits.
- (i) Verification survey of the areas selected as promising during the first-year.
 - (ii) High-accuracy airborne magnetic survey in order to extract zones for further detailed survey in areas selected as promising during the previous year, and to select promising areas for blind mineralized zones buried under younger formations, which were not extracted during the first year.
 - (iii) Image analysis and geological reconnaissance of areas extracted by high-accuracy airborne magnetic survey.
 - (iv) Gravity survey in areas where occurrence of blind mineralization is inferred in order to estimate the thickness of the overlying formation.

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