

**REPORT ON THE MINERAL EXPLORATION
IN
THE EAST JAVA AREA
THE REPUBLIC OF INDONESIA
PHASE III**

MARCH 2004

**JAPAN INTERNATIONAL COOPERATION AGENCY
JAPAN OIL, GAS AND METALS NATIONAL CORPORATION**

MPN
JR
04-070

PREFACE

In response to the request by the Government of the Republic of Indonesia, the Japanese Government decided to conduct a mineral exploration project in the East Java Area and entrusted the survey to the Japan International Cooperation Agency (JICA). The JICA entrusted the project to Metal Mining Agency of Japan (MMAJ, current Japan Oil, Gas and Metal National Corporation) because contents of the survey belong to a very specialized field of mineral exploration.

The survey conducted during this fiscal year is the third-phase of a three-phase project. JICA and MMAJ sent survey teams to the Republic of Indonesia twice during the period from 30 June to 18 February 2004. The teams exchanged views with the officials concerned with the Government of the Republic of Indonesia and conducted cooperative field surveys in the East Java Area.

This volume is the report of the surveyed carried out during the present fiscal year and constitute a part of the final report. We hope that this report will serve the development of the Republic of Indonesia and contribute to the promotion of friendly relations between our two countries.

We wish to express our deep appreciation to the officials concerned of the Government of the Republic of Indonesia for close cooperation extended to the Japanese team.

March 2004

Tadashi Izawa
Vice President,
Japan International Cooperation Agency

Hidejiro Ohsawa
President,
Japan Oil, Gas and Metal National Corporation

SUMMARY

During the third year of the East Java Mineral Resources Exploration, geological survey was carried out for a total area of 260km² in four districts. These districts are; Temporary, Purwoharjo, Seweden, and Prambon Districts. The geology of all of these districts consists mainly of Tertiary and Quaternary volcanic and pyroclastic rocks, and limestone also occur in two districts. Gold, silver, copper, lead, and zinc mineralization is observed mainly in Oligocene to Miocene volcanic and pyroclastic units.

(1) Tempursari District

Pyrite dissemination and alteration minerals such as sericite are widely developed in Tertiary volcanic · pyroclastic rocks and intruding dioritic rocks. Gold, silver, copper mineralization was observed in parts of these alteration zones. Soil geochemical prospecting results show that parts of the high copper and gold anomalies overlap these alteration zones. Geophysical survey revealed that the chargeability in the area trends to be higher in the western part and lower in the eastern part. Some chargeability anomalies were detected in all four survey lines. The anomalous zones show vertical structure and would reflect pyrite dissemination in intruding rocks and silicified vein zones because of its high chargeability, high resistivity and vertical structure. It is interpreted from analysis of the distribution of diorite intrusive bodies and faults and the high chargeability that Ngrawan River Basin in the northern part has the highest mineral potential.

(2) Purwoharjo District

Results of the geological survey do not indicate the existence of mineralization in the Purwoharjo District, and the high copper content in the stream sediments discovered during the second-year survey is inferred to be the results of high copper in the source areas. Thus it was concluded that further survey is not warranted.

(3) Seweden District

In this district, wide spread white-colored argillization and pyrite dissemination is observed. Silicification and argillization are particularly strong in the dacite intrusive bodies and their vicinity in the Putih River Basin where copper and gold mineralization was observed. Also on the western side, although on small scale, quartz veinlets associated with copper, lead, and zinc mineralization are found and either epithermal gold-silver or mesothermal deposit of the porphyry copper type can be anticipated. Soil geochemical exploration of these zones shows concentration of high Au, Cu, Pb, Zn, As anomalies in the Putih Basin and the vicinity which was confirmed to largely coincide

with the silicified and argillized zones. From the above, it is concluded that Putih River Basin has the highest mineral potential in this District. Some chargeability anomalies exceeding 30 mV/V are detected in the central-eastern deep parts by geophysical survey. They form two north-south trending anomalous zones at the elevation of -100 m. Drilling Results show that argillic alteration continues from 37.30m depth, the lower boundary of oxidation zone, to the bottom of the hole. No significant base and precious metal mineralization was encountered by one hole that was drilled at the western high chargeability zone, while strong pyrite dissemination occurs quite consistently. The pyrite occurs as dissemination in altered andesitic rock or in-veinlets along hair cracks such as joints. A molybdenite-pyrite-quartz-clay occurs at deeper part, while copper mineral occurs only as exsolution mineral from pyrite under microscopy. However, these mineral phenomena are considered to be manifestations of porphyry copper deposits. It is recommended that the lateral extension of the wide alteration zones which were intercepted by one scout drilling should be followed.

(4) Prambon District

Many gold-silver-bearing quartz veins and silicified veins occur in the northern part of this district, and they all strike in the N-S to NNW-SSE direction, and those extending more than 1km can be divided into at least 4 zones. The highest gold assay result of rock samples is 3g/t Au, but gold mineralization is observed throughout the zones. Soil geochemical exploration shows that the high gold content of soil occurs intermittently and its distribution generally agrees with the surface occurrence of quartz and silicified veins. Considering the results of the survey of the southern part of the district carried out during the second year, the potential of vein deposits occurrence in the northern quartz-silicified vein zone is high in this District. Two holes of the four intercepted wide silicified and argillized zones. The assay results show the highest gold values 10.40g/t over 0.60m width intercepted by MJIE-P1. Three samples contained 1-5 g/t Au, and most samples contained less than 1 g/tAu. However, 14 samples among 16 polished samples contains sphalerite, chalcopyrite and galena, indicating these minerals may be related with gold mineralization. Acanthite is identified in two samples from MJIE-P2 adjacent to pyrite grains. The gangue and alteration minerals in and adjacent to veins are quartz, calcite, sericite, chlorite and mixed-layer minerals. The study of fluid inclusions in quartz or calcite veins show the homogenization temperatures of about 200 °C and salinities are low. Therefore, it is concluded that epithermal mineralization occurs widely, mainly in the northern part. The quartz veins in the northern extension of the vein that intercepted by two holes should be given higher priority. Also the zones on both eastern and western sides of the above two zones are also important targets and drilling should be carried out. Also the zones on both eastern and western sides of the above two zones are also important targets and drilling should be carried out

CONTENTS

CONTENTS

PREFACE	
SUMMARY	i
CONTENTS	i
LIST OF FIGURES AND TABLES	iii
LIST of PHOTOGRAPHS	viii
LIST of APPENDIX	ix
LIST of PLATES	ix
PART I OVERVIEW	1
Chapter 1 Introduction	1
1 - 1 Objectives of the Survey	1
1 - 2 Conclusions and Recommendations of Phase 2.....	2
1 - 3 Survey Methods	5
1 - 4 Members of the Survey Team	7
1 - 5 Duration of Survey	8
Chapter 2 Geography of the Survey Area	9
2 - 1 Survey area.....	10
2 - 2 Topography and Drainage.....	11
2 - 3 Climate and Vegetation.....	12
2 - 4 Administrative Districts	13
2 - 5 Mining Concessions	13
Chapter 3 Geology of Project Area	13
3 - 1 General Geology of the Vicinity of the Project Area.....	13
3 - 2 Geology of the Survey Area.....	14
3 - 3 Outline of the Mineral Showings in the Survey Area	15
Chapter 4 Analyses of Survey Results	19
4 - 1 Characteristics and Structural Control of Mineralization	19
4 - 2 Mineral potential	28
Chapter 5 Conclusions and Recommendations	30
5 - 1 Conclusions	30
5 - 2 Recommendations	34
PART II DETAILED DISCUSSIONS	43
Chapter 1 Geological Survey	43
1-1 Outline.....	43
1-2 Tempursari District	55

1-3 Purwoharjo District.....	103
1-4 Seweden.....	115
1-5 Prambon District.....	165
CHAPTER 3 GEOPHYSICAL SURVEY.....	213
2-1 Outline of Survey.....	213
2-2 Survey Method.....	213
2-3 Survey Results.....	223
Chapter 3 DRILLING SURVEY.....	273
3-1 Outline of Drilling Survey.....	273
3-2 Drilling Survey in the Prambon District.....	287
3-3 Drilling Survey in the Seweden District.....	296
3-5 Summary of Results of Drilling.....	298
PART III CONCLUSIONS AND RECOMMENDATIONS.....	369
Chapter 1 Conclusions.....	369
Chapter 2 Recommendations.....	373
REFERENCES.....	375

LIST OF FIGURES AND TABLES

FIGURES

- Fig. 1-1 Location Map of the Project Area
- Fig. 1-2 Compilation Map of the Phase 3 Survey Results (1): Tempursari District
- Fig. 1-3 Compilation Map of the Phase 3 Survey Results (2): Seweden District
- Fig. 1-4 Compilation Map of the Phase 3 Survey Results (3): Prambon District
-
- Fig. 2-1 Schematic Geologic Column of the Survey Area
- Fig. 2-2 Quality Control Diagram of the Soil Chemical Analysis
-
- Fig. 2-3 Geologic and Map and Profiles of the Tempursari District
- Fig. 2-4 Location Map of Rock Samples in the Tempursari District
- Fig. 2-5 Diagrams of Rock Forming Elements in Volcanic Rocks, Tempursari District
- Fig. 2-6 Homogenization Temperatures and Salinities of Fluid Inclusions, Tempursari District
- Fig. 2-7 Correlations between Temperatures and Salinities of Fluid Inclusions, Tempursari District
- Fig. 2-8 Mineralized and Alteration Zones of the Tempursari District
- Fig. 2-9 Mineralized Zones in the Tempursari District
- Fig. 2-10 Sketch of the Mineralized Zones along the K. Ngrawan in the Tempursari District
- Fig. 2-11 Location Map of Soil Samples in the Tempursari District
- Fig. 2-12 Histograms of Chemical Analysis Data of Soil Samples in the Tempursari District
- Fig. 2-13 Correlation between Elements of Soils Samples in the Tempursari District
- Fig. 2-14 Geochemical Anomaly of Soil Samples in the Tempursari District (Au)
- Fig. 2-15 Geochemical Anomaly of Soil Samples in the Tempursari District (Ag)
- Fig. 2-16 Geochemical Anomaly of Soil Samples in the Tempursari District (Cu)
- Fig. 2-17 Geochemical Anomaly of Soil Samples in the Tempursari District (Pb)
- Fig. 2-18 Geochemical Anomaly of Soil Samples in the Tempursari District (Zn)
- Fig. 2-19 Geochemical Anomaly of Soil Samples in the Tempursari District (As)
-
- Fig. 2-20 Geologic Map and Profiles of the Purwoharjo District
- Fig. 2-21 Location Map of Rock Samples in the Purwoharjo District
- Fig. 2-22 Diagrams of Rock Forming Elements in Volcanic Rocks, Purwoharjo District
-
- Fig. 2-23 Geologic Map and Profiles in the Seweden District
- Fig. 2-24 Location Map of Rock Samples in the Seweden District

- Fig. 2-25 Diagrams of Rock Forming Elements in Volcanic Rocks, Seweden District
- Fig. 2-26 Homogenization Temperatures and Salinities of Fluid Inclusions in the Seweden District
- Fig. 2-27 Correlations between Temperatures and Salinities of Fluid Inclusions in the Seweden District
- Fig. 2-28 Mineralized and Alteration Zones of the Seweden District
- Fig. 2-29 Sketch of the Mineralized Zones in the Seweden District (1): Kali Putih
- Fig. 2-30 Sketch of the Mineralized Zones in the Seweden District (2): K. Centung
- Fig. 2-31 Location Map of Soil Samples of the Seweden District
- Fig. 2-32 Histograms of Chemical Analysis Data of Soil Samples
- Fig. 2-33 Correlation between Elements of Geochemical Samples
- Fig. 2-34 Geochemical Anomaly of Soil Samples in the Seweden District (Au)
- Fig. 2-35 Geochemical Anomaly of Soil Samples in the Seweden District (Ag)
- Fig. 2-36 Geochemical Anomaly of Soil Samples in the Seweden District (Cu)
- Fig. 2-37 Geochemical Anomaly of Soil Samples in the Seweden District (Mo)
- Fig. 2-38 Geochemical Anomaly of Soil Samples in the Seweden District (Pb)
- Fig. 2-39 Geochemical Anomaly of Soil Samples in the Seweden District (Zn)
- Fig. 2-40 Geochemical Anomaly of Soil Samples in the Seweden District (As)
- Fig. 2-41 Geochemical Anomaly of Soil Samples in the Seweden District Sediments (Hg)
-
- Fig. 2-42 Geologic Map and Profiles of the Prambon District
- Fig. 2-43 Location Map of Rock Samples in the Prambon District
- Fig. 2-44 Diagrams of Rock Forming Elements in Volcanic Rocks, Prambon District
- Fig. 2-45 Homogenization Temperatures and Salinities of Fluid Inclusions of the Prambon District
- Fig. 2-46 Correlations between Temperatures and Salinities of Fluid Inclusions of the Prambon District
- Fig. 2-47 Mineralized and Alteration Zones of the Prambon District
- Fig. 2-48 Sketch of the Silicified Zones in the Prambon District (1)
- Fig. 2-49 Sketch of the Quartz Veins along the Suren River in the Prambon District (2)
- Fig. 2-50 Sketch of the Mineralized Zones along the Suren River in the Prambon District (3)
- Fig. 2-51 Location Map of Soil Samples: the Prambon District
- Fig. 2-52 Histograms of Chemical Analysis Data of Soil Samples in the Prambon District
- Fig. 2-53 Correlation between Elements of Soil Samples in the Prambon District
- Fig. 2-54 Geochemical Anomaly of Soil Samples in the Prambon District (Au)
- Fig. 2-55 Geochemical Anomaly of Soil Samples in the Prambon District (Ag)

- Fig. 2-56 Geochemical Anomaly of Soil Samples in the Prambon District (Cu)
- Fig. 2-57 Geochemical Anomaly of Soil Samples in the Prambon District (Mo)
- Fig. 2-58 Geochemical Anomaly of Soil Samples in the Prambon District (Pb)
- Fig. 2-59 Geochemical Anomaly of Soil Samples in the Prambon District (Zn)
- Fig. 2-60 Geochemical Anomaly of Soil Samples in the Prambon District (As)
- Fig. 2-61 Geochemical Anomaly of Soil Samples in the Prambon District (Hg)
-
- Fig. 3-1 Wave Form of Transmitter Current and Received Voltage
- Fig. 3-2 Location Map of IP Survey Lines and Rock Samples in the Seweden District
- Fig. 3-3 Location Map of IP Survey Lines and Rock Samples in the Tempursari District
- Fig. 3-4 Flow Chart of the Analytical Method
- Fig. 3-5 Apparent Resistivity Pseudo-sections of the Seweden District
- Fig. 3-6 Apparent Resistivity Map of the Seweden District (n=3)
- Fig. 3-7 Apparent Chargeability Pseudo-sections of the Seweden District
- Fig. 3-8 Apparent Chargeability Map of the Seweden District (n=3)
- Fig. 3-9 Resistivity Sections of the Seweden District
- Fig. 3-10 Resistivity Map of the Seweden District (SL=100m)
- Fig. 3-11 Resistivity Map of the Seweden District (SL=-100m)
- Fig. 3-12 Chargeability Sections of the Seweden District
- Fig. 3-13 Chargeability Map of the Seweden District (SL=100m)
- Fig. 3-14 Chargeability Map of the Seweden District (SL=-100m)
- Fig. 3-15 Apparent Resistivity Pseudo-sections of the Tempursari District
- Fig. 3-16 Apparent Resistivity Map of the Tempursari District (n=3)
- Fig. 3-17 Apparent Chargeability Pseudo-sections of the Tempursari District
- Fig. 3-18 Apparent Chargeability Map of the Tempursari District (n=3)
- Fig. 3-19 Resistivity Sections of the Tempursari District
- Fig. 3-20 Resistivity Map of the Tempursari District (SL=600m)
- Fig. 3-21 Resistivity Map of the Tempursari District (SL=400m)
- Fig. 3-22 Chargeability Sections of the Tempursari District
- Fig. 3-23 Chargeability Map of the Tempursari District (SL=600m)
- Fig. 3-24 Chargeability Map of the Tempursari District (SL=400m)
- Fig. 3-25 Geophysical Anomaly Map in the Seweden District
- Fig. 3-26 Geophysical Anomaly Map in the Tempursari District
-
- Fig. 4-1 Location Map of Four Drill Holes in Prambon District
- Fig. 4-2 Location Map of Drill Hole MJIE-S1 in Seweden District

- Fig. 4-3 Work Progress of Drill Hole MJIE-P1 in Prambon District
- Fig. 4-4 Work Progress of Drill Hole MJIE-P2 in Prambon District
- Fig. 4-5 Work Progress of Drill Hole MJIE-P3 in Prambon District
- Fig. 4-6 Work Progress of Drill Hole MJIE-P4 in Prambon District
- Fig. 4-7 Work Progress of Drill Hole MJIE-S1 in Seweden District
- Fig. 4-8 Geologic Profile of Drill Hole MJIE-P1 in Prambon District
- Fig. 4-9 Geologic Profile of Drill Hole MJIE-P2 in Prambon District
- Fig. 4-10 Geologic Profile of Drill Hole MJIE-P3 in Prambon District
- Fig. 4-11 Geologic Profile of Drill Hole MJIE-P4 in Prambon District
- Fig. 4-12 Geologic Profile of Drill Hole MJIE-S1 in Seweden District
- Fig. 4-13 Drill Hole Location and Geophysical Anomalies in Seweden District
- Fig. 4-14 Chargeability and Assay Results of Gold from MJIE-S1 in Seweden District
- Fig. 4-15 Chargeability and Assay Results of Copper from MJIE-S1 in Seweden District
- Fig. 4-16 Chargeability and Assay Results of Sulfur from MJIE-S1 in Seweden District
- Fig. 4-17 Homogenization Temperature of Fluid Inclusion, Prambon District

- Table 1-1 Amount of Work (a)-(b)
- Table 1-2 Coordinates of the Survey Area
- Table 1-3 Temperature and Precipitation in the Project Area
- Table 1-4 Simplified Stratigraphy of East Java
- Table 1-5 Mineral Occurrences in the Project Area
- Table 1-6 Summary of Geological Survey

- Table 2-1 Correlation of Geologic Units
- Table 2-2 Results of Chemical Analysis of Duplicate Soil Samples
- Table 2-3 Results of Microscopic Observation of Thin Sections, Tempursari District
- Table 2-4 Results of Whole Rock Analysis, Tempursari District
- Table 2-5 Results of X-ray Diffraction Analysis, Tempursari District
- Table 2-6 Results of Microscopic Observation of Polished Sections, Tempursari District
- Table 2-7 Chemical Analysis Results of Rock Samples, Tempursari District
- Table 2-8 Statistic Data of Chemical Analysis Results of Soil Samples, Tempursari District
- Table 2-9 Correlation Coefficients between Elements in Soil Samples, Tempursari District

- Table 2-10 Results of Microscopic Observation of Thin Sections, Purwoharjo District
- Table 2-11 Results of Whole Rock Analysis, Purwoharjo District
- Table 2-12 Chemical Analysis Results of Rock Analysis, Purwoharjo District

Table 2-13	Results of Microscopic Observation of Thin Sections, Seweden District
Table 2-14	Results of Whole Rock Analysis, Seweden District
Table 2-15	Results of X-ray Diffraction Analysis, Seweden District
Table 2-16	Results of Microscopic Observation of Polished Sections, Seweden District
Table 2-17	Chemical Analysis Results of Rock Samples, Seweden District
Table 2-18	Statistic Data of Chemical Analysis Results of Soil Samples, Seweden District
Table 2-19	Correlation Coefficients between Elements in Soil Samples, Seweden District
Table 2-20	Results of Microscopic Observation of Thin Sections, Prambon District
Table 2-21	Results of Whole Rock Analysis, Prambon District
Table 2-22	Results of X-ray Diffraction Analysis, Prambon District
Table 2-23	Results of Microscopic Observation of Polished Sections, Prambon District
Table 2-24	Chemical Analysis Results of Rock Analysis, Prambon District
Table 2-25	Statistic Data of Geochemical Analysis, Prambon District
Table 2-26	Correlation Coefficients between Elements in Soil Samples, Prambon District
Table 3-1	List of IP Survey Lines
Table 3-2	List of IP Survey Equipment
Table 3-3	Results of Laboratory Test
Table 4-1	Drill Hole Locations, Drilled Directions and Lengths
Table 4-2	Specification of Drilling Equipment (1)
Table 4-3	Specification of Drilling Equipment (2)
Table 4-4	Drilling meterage of Diamond Bits Used
Table 4-5	Consumables Used
Table 4-6	Summary of Working Hours
Table 4-7	Summary of Drilling Operation of MJIE-P1
Table 4-8	Summary of Drilling Operation of MJIE-P2
Table 4-9	Summary of Drilling Operation of MJIE-P3
Table 4-10	Summary of Drilling Operation of MJIE-P4
Table 4-11	Summary of Drilling Operation of MJIE-S1
Table 4-12	Records of Drilling Hours of MJIE-P1
Table 4-13	Records of Drilling Hours of MJIE-P2

Table 4-14	Records of Drilling Hours of MJIE-P3
Table 4-15	Records of Drilling Hours of MJIE-P4
Table 4-16	Records of Drilling Hours of MJIE-S1
Table 4-17	Major Intercepts of Drill Hole MJIE-P1, Prambon District
Table 4-18	Major Intercepts of Drill Hole MJIE-P2, Prambon District
Table 4-19	Major Intercepts of Drill Hole MJIE-P3, Prambon District
Table 4-20	Major Intercepts of Drill Hole MJIE-P4, Prambon District
Table 4-21	Geologic Log of Drill Hole MJIE-P1 (1)-(5)
Table 4-22	Geologic Log of Drill Hole MJIE-P2 (1)-(6)
Table 4-23	Geologic Log of Drill Hole MJIE-P3 (1)-(5)
Table 4-24	Geologic Log of Drill Hole MJIE-P4 (1)-(5)
Table 4-25	Geologic Log of Drill Hole MJIE-S1 (1)-(8)
Table 4-26	Chemical Analysis Results of Drill Core Samples, Prambon District
Table 4-27	Results of Microscopic Observation of Thin Sections, Prambon District
Table 4-28	Results of X-ray Diffraction Analysis, Prambon District
Table 4-29	Results of Microscopic Observation of Polished Sections, Prambon District
Table 4-30	Fluid Inclusion Study of Drill Core Samples, Prambon District
Table 4-31	Chemical Analysis Results of Drill Core Samples, Seweden District
Table 4-32	Results of Microscopic Observation of Thin Sections, Seweden District
Table 4-33	Results of X-ray Diffraction Analysis, Seweden District
Table 4-34	Results of Microscopic Observation of Polished Sections, Seweden District
Table 4-35	Fluid Inclusion Study of Drill Core Samples, Seweden District

LIST of PHOTOGRAPHS

Photo. 1	Micrographs of Thin Sections (1)
Photo. 2	Micrographs of Thin Sections (2)
Photo. 3	Micrographs of Polished Sections (1)
Photo. 4	Micrographs of Polished Sections (2)
Photo. 5	Outcrops and Survey Scenes (1)
Photo. 6	Outcrops and Survey Scenes (2)
Photo. 3-1	Geophysical Survey (1)
Photo. 3-2	Geophysical Survey (2)
Photo. 3-3	Geophysical Survey (3)

- Photo. 4-1 Drilling in Prambon District
Photo. 4-2 Drilling in Seweden District
Photo. 4-3 Drill Cores
Photo. 4-4 Thin Sections of Drill Core Samples
Photo. 4-5 Polished Section of Drill Core Samples

LIST of APPENDIX

- Table A-1 Results of Chemical Analysis of Soil Samples in the Tempursari District
Table A-2 Results of Chemical Analysis of Soil Samples in the Seweden District
Table A-3 Results of Chemical Analysis of Soil Samples in the Prambon District