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Evaluation of the Report

"Results of Surface Exploration for Primary Gold Mineralization"

prepared by

Empresa Minera Santa Maria S.A., Bolivia

by

Mitsui Mineral Development Engineering Co., Ltd.

September 1992

Summary

The report presented by Empresa Minera Santa Maria (EMSA S.A.) summarize the results of surface exploration on Paula Cecilia property of EMSA, which has been carried out from 1986 to 1991. Geological mapping to recognize the geological environment of mineralization and geochemical surveying by stream sediment, soil and hard rock to locate anomalous area for gold have been conducted.

Geological mapping revealed that the gold mineralization is related to the rocks of Santa Rosa schists and Naranjal group. The latter consist of greenstone, meta-sediments and felsic meta-volcanics. These formations have been intensely folded and faulted resulting the development of a numerous shear zone.

26 anomalies have been delineated by soil geochemical survey. The factors of "Geochemical Contrast" and "Anomaly Ranking" were calculated to rank the anomalies for further follow up exploration. The most prominent anomaly is 1690m in length, 520m in width and has maximum concentrations of 2.6 ppm for Au and 1790 ppm for As.

The EMSA's report conclude that the mineralization of this area is similar to that of the Archean Yilgarn block of Western Australia. Oxidation processes during paleo-lateritization may have remobilized the original trace element distribution, particularly Au and Ag, leading to near-surface depletion. The report recommend to continue gold exploration aiming at primary mineralization because of the promising results obtained during the previous surface investigations. The further exploration program should include trenching, reconnaisance drilling, magnetic survey and multi-element geochemical investigation.

By reviewing EMSA's report, our comments and recommendations are briefly summerized as follows;

EMSA's sampling method and data processing procedure to delineate geochemical anomalies are quite normal and reasonable. We do not see any problems with either the procedure employed or the results of the geochemical survey.

The factors of "Geochemical Contrast" and "Anomaly Ranking" were calculated on every anomalies to rank the anomalies. This seems like a unique and effective way of assessing geochemical anomalies quantitatively.

Regarding to the conclusions of EMSA's report, we agree that the character of mineralization of this area is similar to that of Yilgarn block of Western Australia. We are doubtful, however, that oxidation processes have depleted Au in the near-surface zone as a general rule.

Gold tend to concentrate in near surface oxidation zone to form secondary enrichment zones and residual deposits in some areas with arid climate. Many gold mines in Western Australia work only in the oxidation zone. This is because the grade of ore is higher in that zone and they can take advantage of adopting open cut mining method and carbon in pulp (C.I.P) method in gold extraction process.

From the above mentioned reasons and the result of trenching that no workable grade of ore has been found to date, we recommend that the further exploration be conducted step by step to avoid undue risk as described bellow.

(1) Trenching should be performed on the most promising geochemical anomalies (I, B, P-T, F, M) first, to reveal the geological feature of these anomalies and to search for concealed outcrops of ore deposits.

A total of 1369m of trenching has been completed on the anomalies in the previous investigation. It is not clear, however, to what degree these trenches have tested the anomalies, as the location and length of the trenches are not shown on the survey maps.

(2) If outcrops of ore deposits were exposed by trenching, the zones of promising outcrops should then be diamond drilled to find the grade and width of the ore zone. A few pilot drill holes to test for alluvial gold deposits should also be drilled at this stage.

(3) If the above drilling showed an economical size and grade of ore, the further drilling should be continued to delineate a whole ore bodies.

(4) In case a sizable tonnage of ore with economical grade was blocked out, a feasibility study should then be conducted.

Table of Contents

Attached Maps and Figures

1. Background Information

The Paula Cecilia property of Empresa Minera Santa Maria (EMSA S.A.) is located near San Ramon, approximately 150Km NNE of Santa Curz of the eastern Bolivia.

This region is known to have been actively mined for gold in the 1880's and in the period of 1980 to 82 by small placer operations.

The "Proyecto Precambrico", an Anglo-Bolivian technical cooperation project of the British Geological Survey and Servicio Geologico de Bolivia, carried out geological mapping and geochemical sampling of the region from 1976 to 1986.

EMSA S.A. has applied for Paula Cecilia claim after the annulment of fiscal reserves in August 1986 and they carried out surface exploration from 1986 to 1991.

2. Geological Setting

The property is situated in the southern end of the Proterozoic greenstone belt of the Bolivian shield. It consists of rocks of the Momene metamorphic complex, the Santa Rosa schist and the Naranjal group. The Naranjal group is subdivided into greenstone, meta-sediments and felsic meta-volcanics.

All of the rock units in the area have been intensely folded and faulted resulting the development of a number of N-S tectonic lineaments. (App.02)

Occurences of gold mineralization are primarily hosted by the greenstone and meta-sediments of the Naranjal group and Santa Rosa schists. A number of geochemical anomalies and alluvial placer deposits occur in these units.

3. Review of Geochemical Survey performed by EMSA

EMSA has conducted geological mapping and geochemical surveying of the area from 1986 to 1991. The geochemical survey included sampling of soil, stream sediments and whole rocks from trenches and floats.

The soil sampling was carried out in three stages. In the reconnaissance stage, soil samples were taken at 50m interval along E-W lines which were spaced 1Km apart. The sample interval and the line spacing were then gradually reduced to 6.25m and 125m in the final detail stage of the survey.

Stream sediments were taken only during the reconnaissance stage of the survey. (App.03)

Geochemical samples were analyzed in Canada by either fire assay, neutron activation analysis and atomic absorption according to the element for assay. Soil and stream sediment samples were panned during the reconnaissance stage of the survey and gold grains were counted to calculate the gold content of the samples.

The geochemical data were statistically analyzed on a personal computer to calculate threshold values for the elements and to delineate geochemical anomalies on the maps.

Based on the assay results of soil samples, 26 geochemical anomalies were delineated. The most prominent one of these anomalies is 1690m in length, 520m in width and has maximum concentration of 2.6ppm Au and 1790ppm As. (App.04)

Factors of "Geochemical Contrast" and "Anomaly Ranking" were calculated to evaluate and rank these geochemical anomalies. The geochemical contrasts of the elements are the ratio of the element's concentration to their threshold value. Anomaly ranking factors were then calculated from the size of the anomalies and their geochemical contrasts.

Trenching and whole rock sampling were then performed to reveal important geological features controling anomalous gold concentration and to find possible outcrops of gold mineralization. (App.05)

Two types of gold anomalies were recognized. They are related to different primary gold mineralization respectively. These were quartz vein type along sheared zone in greenstone and quartz vein or stockwork type in banded iron formations or gossan which may be accompanied by base metals such as Cu, Zn. The highest assay value of the trench samples over a length of 1m was only 1.5ppm Au, however.

Conclusions drawn from the EMSA survey are summarized as follows.

(1) The geological character of the gold mineralization of this area is quite similar to that of the Archean Yilgarn block of Western Australia.

(2) Oxidation processes during paleo-lateritization periods may have remobilized the original trace elements, particularly Au and Ag, leading to near-surface depletion.

(3) The most promising anomalies should be further investigated by multi-element geochemistry and tested by trenching and drilling for the presence of blind primary gold and base metal(?) ore bodies. Magnetic investigations may also help in locating mineralized silica-magnetite alteration zones.

4. Evaluation of the Survey Results

A. Evaluation of Geochemical Survey Methods and Data

(1) The EMSA's geochemical sampling procedures and data processing are briefly summarized as follows.

a) Stream sediments were taken only in the reconnaissance stage of the survey.

b) Soil samples were taken at wide intervals in the reconnaissance stage. The sampling interval was then gradually reduced to delineate anomalies.

c) Trenching and whole rock sampling were conducted in the detail stage of the survey to test the anomalies.

d) To classify anomalous value and establish background value for assay data, threshold values were determined for each elements by statistical method and anomalies were then delineated on the map.

e) The factors of "Geochemical Contrast" (concentration ratio of the elements to thier threshold value) and "Anomaly Ranking" (calculated from the size of anomalies and their geochemical contrast) were calculated to rank the anomalies and to assign priorities to them.

(2) Evaluation

EMSA's sampling procedures and data processing is quite normal and reasonable. Soil sample geochemical anomalies delineated by the procedures described above coincide well with the anomalies of stream sediments and whole rocks. We do not see any problems with either the procedure employed or the results of the geochemical survey.

Calculation of "Geochemical Contrast" and "Anomaly Ranking" seems like a unique and effective way of assessing geochemical anomalies quantitatively. Detail of the calculation, however, is not clear, as the attached table (Table 12 and Table 16) of EMSA report are missing.

B. Estimation of Potential Areas

(1) Five of the 26 anomalies by soil geochemical survey show high "Anomaly Ranking". They are anomalies I, B, P-T, F and M as shown in App. 04.

(2) In four areas of these five anomalous areas, concentrations of gold were also observed by whole rock survey as shown bellow.

Soil Survey Anomaly	Corresponding Whole Rock Survey Anomaly
I	IV
B	I
P-T	X
F	
M	III

(3) A total of 1369m of trenching has been completed on the anomalies to reveal the geological features in these areas. It is not clear, however, to what degree these trenches have tested the anomalies, as the location and length of the trenches are not shown on the survey maps.

In order to determine the potential of the area, it is most important to clarify the geological character of those anomalies and to locate possible concealed outcrops of ore deposits by trenching.

(4) Aside from the primary mineralization, the existence of alluvial gold deposits can be expected in this area as suggested in the EMSA report. The most potential area for such alluvial gold deposits is the lacustrine plain downstream of Las Limas, Clemente, Pejichi and Don Zoilo

creeks in the southwestern part of the property.

C. Comments and Views on As Content in Relation to Au Content

(1) Arsenic is associated with the gold mineralization in this area, as with many other gold deposits. While the correlation of arsenic and gold of the geochemical data has not been addressed in the EMSA's report, there is a close relationship between their distributions.

(2) In this study, the correlation of Au and As in the available data (360 soil data and 35 whole rock data) have been analyzed and the following results were obtained.

a) A very weak correlation (correlation coefficient 0.1820) between the logarithms of As and Au in the soil assay data was seen with one-tailed significance of 0.001%. These results are shown graphically in Fig.1.

b) A weak correlation (correlation coefficient 0.4523) was found between the logarithms of As and Au in the whole rock assay data with one-tailed significance of 0.01%. These results are shown in Fig.2.

(3) The minerals and paragenesis of Au and As are not yet known. This matter should be investigated in a future feasibility study.

5. Conclusion

Several anomalies have resulted from the geochemical survey which have been conducted by EMSA. This implies the possible existence of gold deposits in the area. It is impossible at this stage, however, to predict the tonnage and grade of such ore deposits, if they do indeed exist.

The information necessary to make this estimation will be obtained from the further exploration which will be described in the followings.

The EMSA's report concludes that the primary gold mineralization of this area is similar to that of Archean Yilgarn block of Western Australia. Oxidation processes during paleo-lateritization may have remobilized the original trace elements leading to depletion of Au in the near-surface zone. This may be the reason of aiming primary ore deposits in the further exploration. Investigation of the most promising anomalies should therefore be followed up by further geochemical sampling, trenching and drilling for the presence of blind primary gold and base metal(?) ore bodies.

We agree that the character of primary mineralization of this area is similar to that of Yilgarn block of Western Australia. Mineralization in that area is restricted to the shear zones within greenstone or banded iron formations. (Fig.3) We are doubtful, however, that oxidation processes have depleted Au in the near-surface zone as a general rule. Gold tend to concentrate in near surface oxidation zones to form secondary enrichment zones and residual deposits in some areas with arid climate. (Fig.4b) Gold deposits in laterite have been discovered in a few places of Western Australia. Many gold mines in Western Australia work only in the oxidation zone. This is because the grade of ore is higher in that zone and they can take advantage of adopting open cut mining method and carbon in pulp (C.I.P) method in gold extraction process.

From the above mentioned reasons and the result of trenching that no workable grade of ore has been found to date, we recommend that the further exploration be conducted step by step to avoid undue risk as described bellow.

Recommendation

(1) Trenching should be performed on the most promising geochemical anomalies (I, B, P-T, F, M) first, to reveal the geological feature of these anomalies and to search for concealed outcrops of ore deposits.

A total of 1369m of trenches has been completed on the anomalies in the previous investigation. It is not clear, however, to what degree these trenches have tested the anomalies, as the location and length of the trenches are not shown on the survey map.

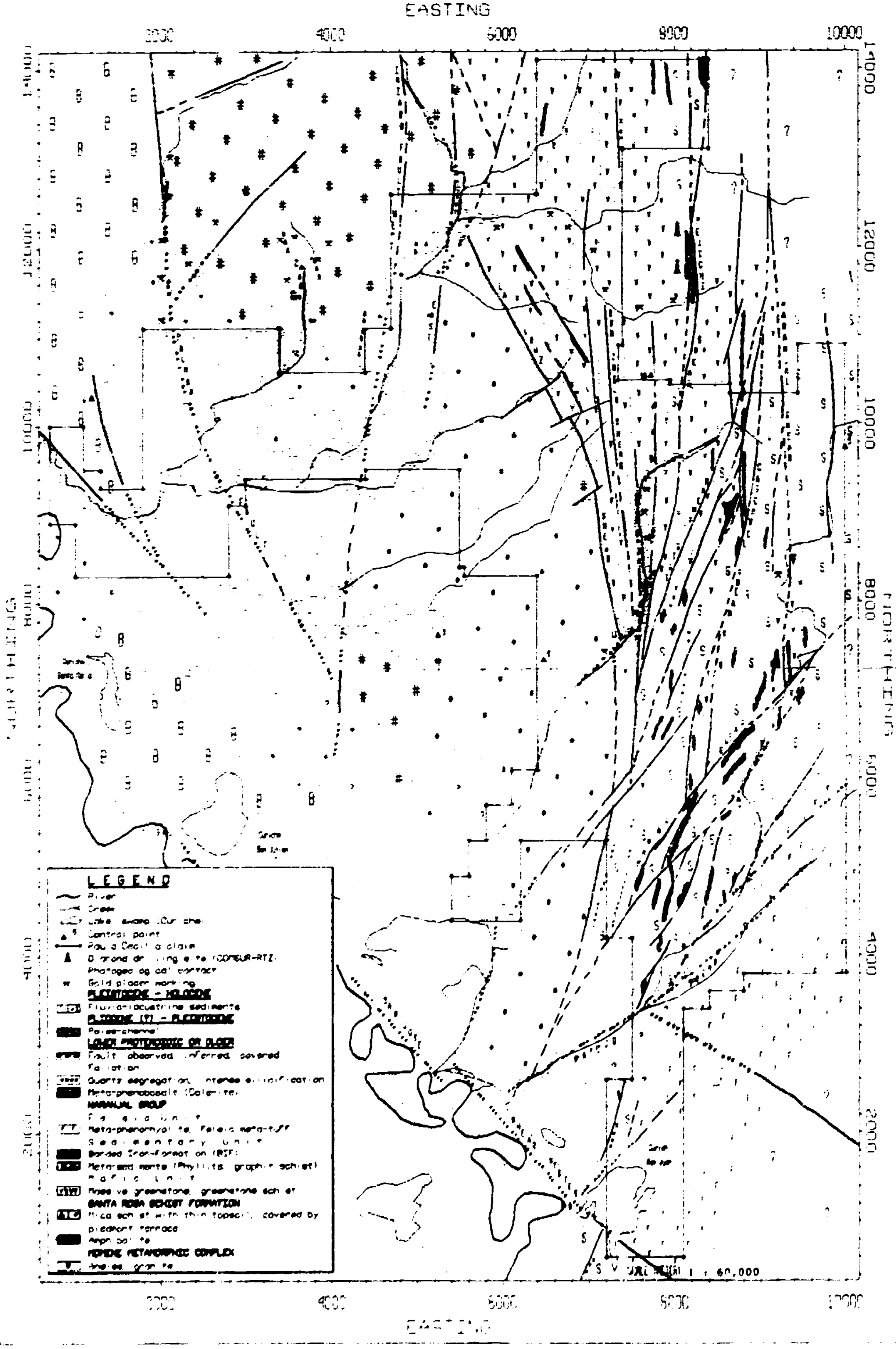
(2) If outcrops of ore deposits were exposed by trenching the zones of promising outcrops should then be diamond drilled to find the grade and width of the ore zone. A few pilot drill holes to test for alluvial gold deposits should also be drilled at this stage.

(3) If the above drilling showed an economical size and grade of ore, further drilling should be continued to delineate a whole ore bodies.

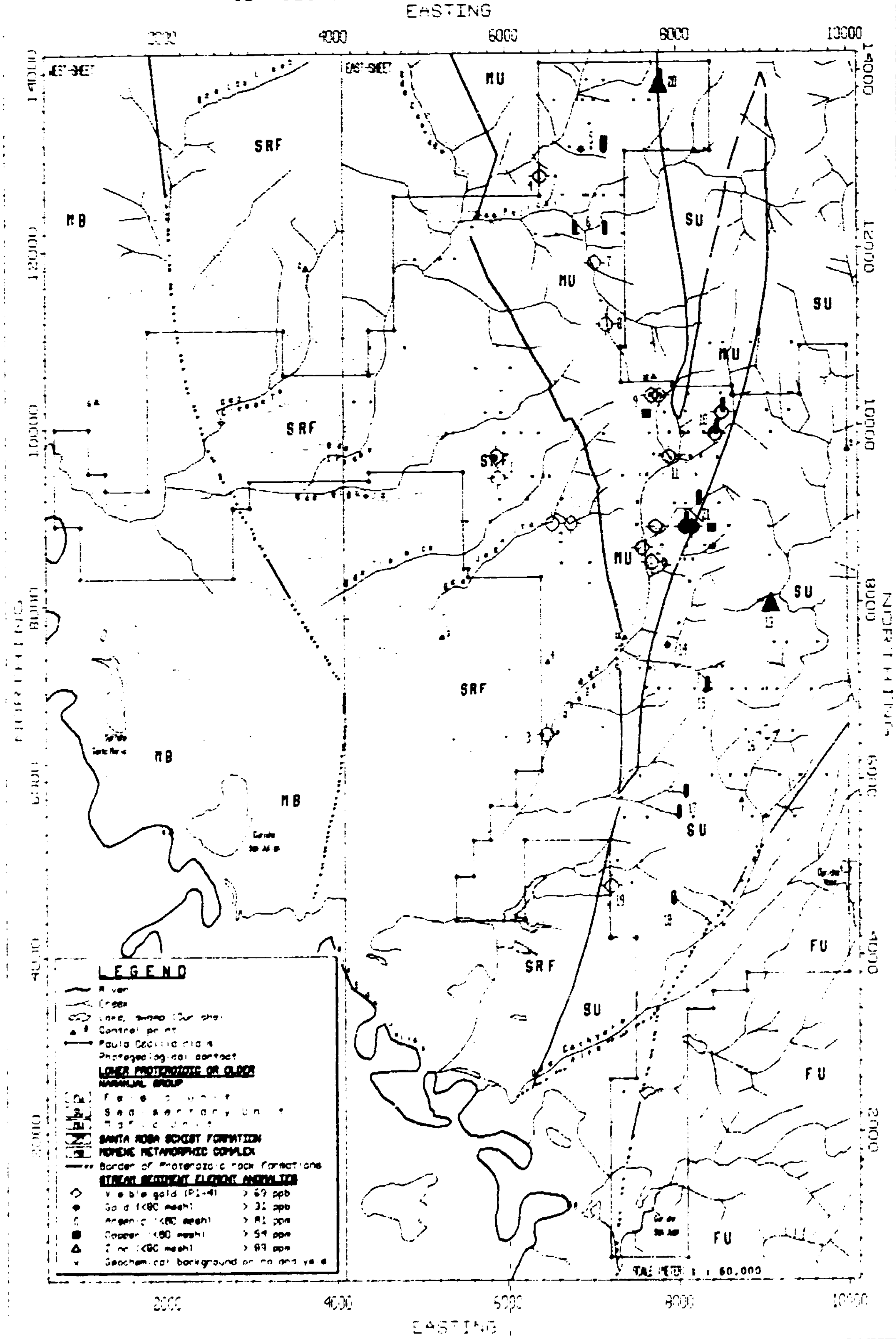
(4) In case a sizable tonnage of ore with economical grade was blocked out, a feasibility study should then be conducted.

APPENDIX 02 GEOLOGY

SAN RAMON GOLD DISTRICT (SOUTH ZONE)

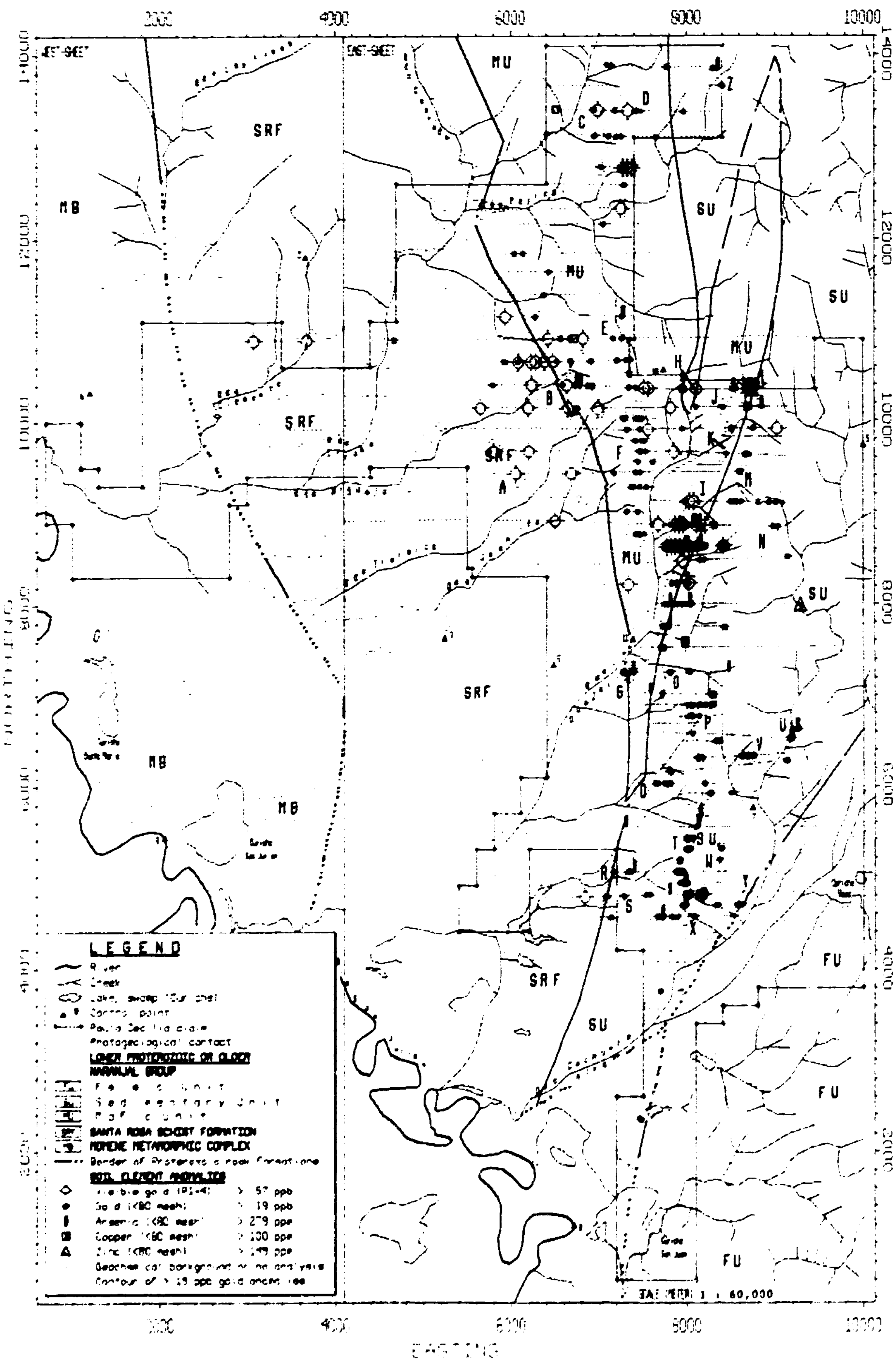


APPENDIX 3B STREAM SEDIMENT ELEMENT ANOMALIES
PAULA CECILIA PROPERTY - E M S A S A

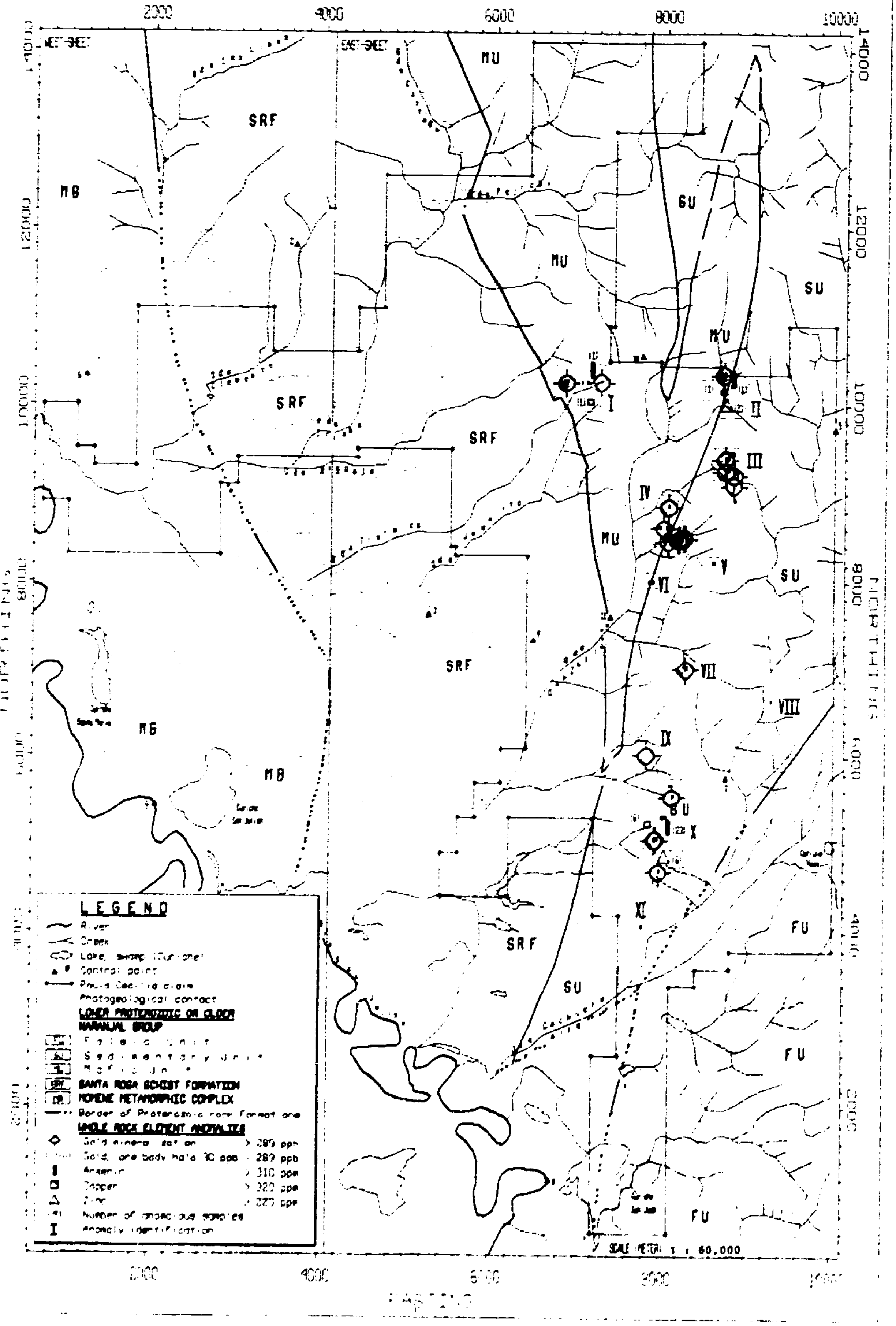


APPENDIX 04 SOIL ELEMENT ANOMALIES

PAULA CECILIA PROPERTY E M S A S A



APPENDIX 05 WHOLE ROCK ELEMENT ANOMALIES
PAULA CECILIA PROPERTY - E M S A S A



Soil

360 cases plotted.

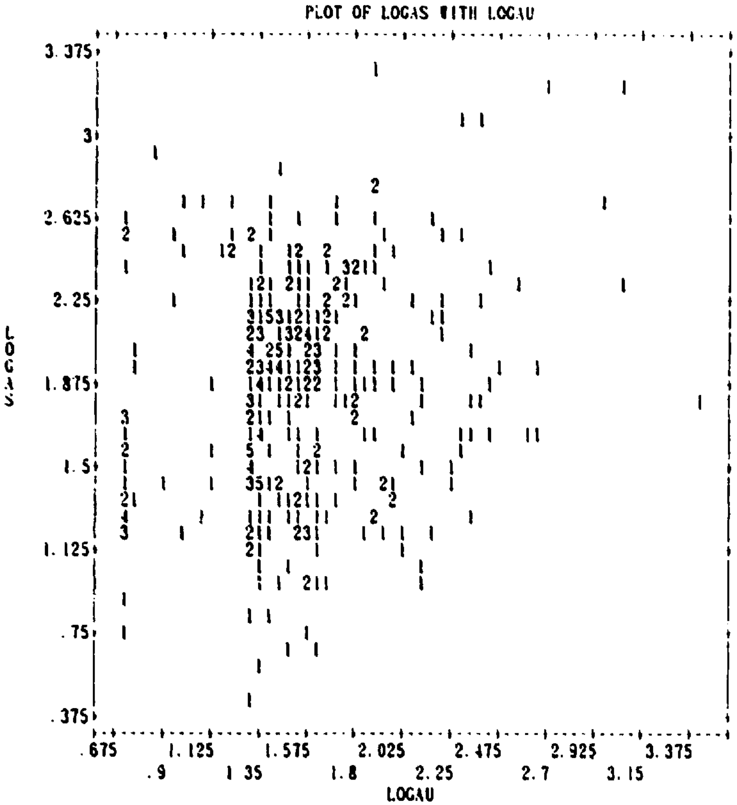


Fig. 1

Rock

35 cases plotted.

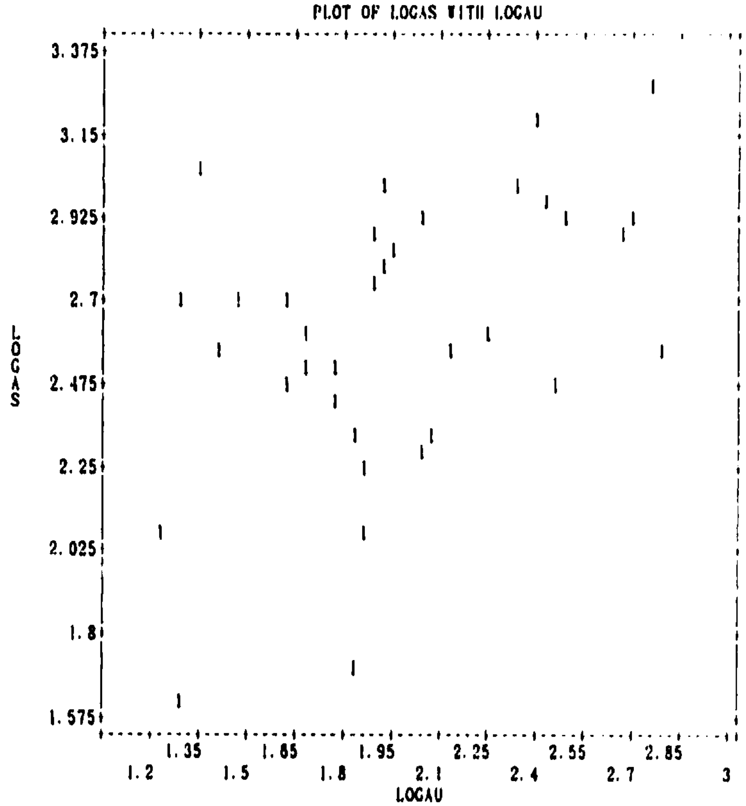


Fig. 2

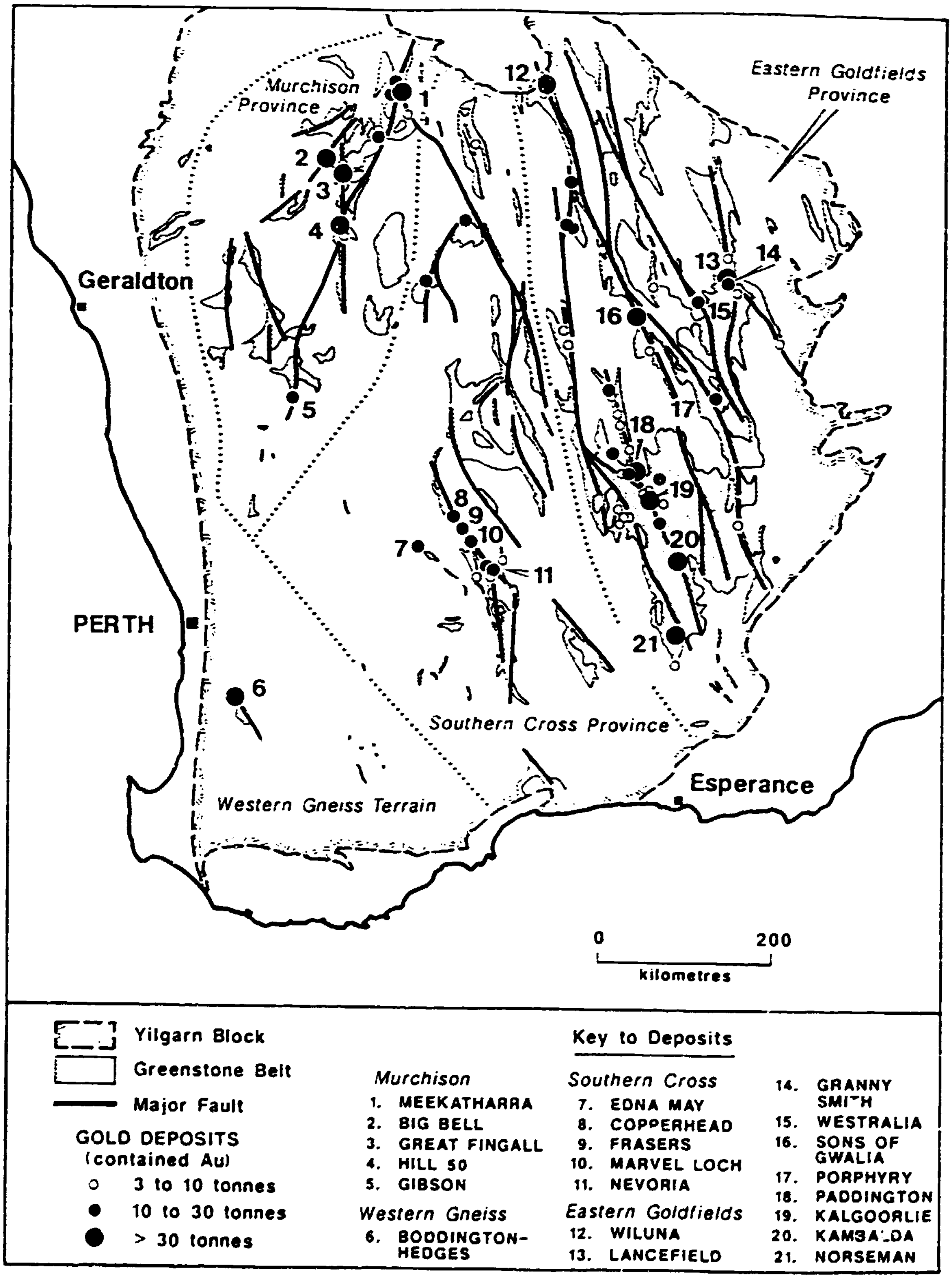


Fig. 3.—Gold deposits of the Yilgarn Craton (greenstone distribution, courtesy of Geological Survey of Western Australia).

From Woodall, R., 1990. Gold in Australia, in *Geology of the Mineral Deposits of Australia and Papua New Guinea* (Ed. F E. Hughes), pp. 45-67 (The Australasian Institute of Mining and Metallurgy: Melbourne).

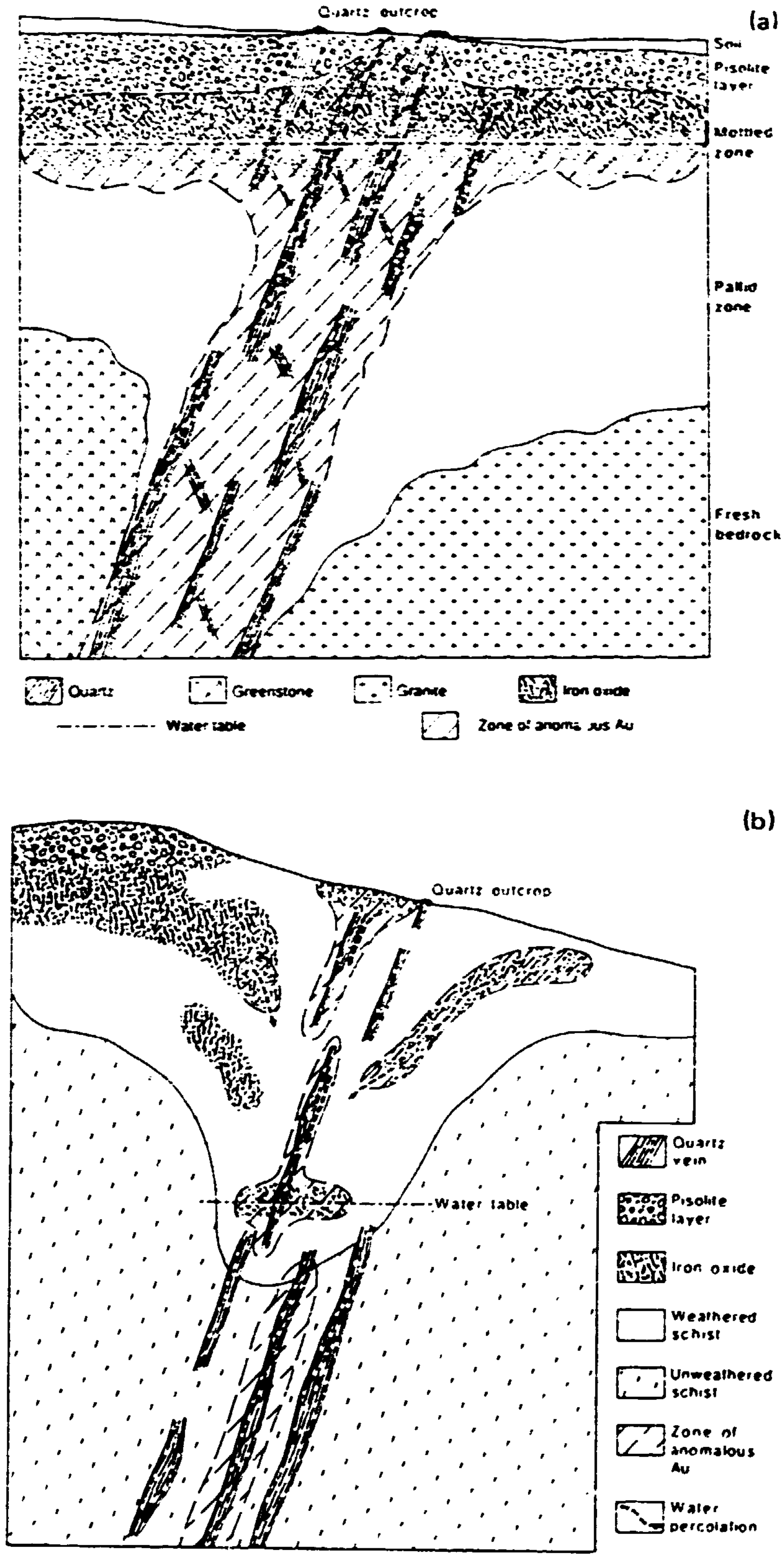


Fig. 4— Schematic cross sections through (a) an 'ideal' laterite profile and (b) a complex sheared or faulted weathering profile, overlying epigenetic quartz veins, showing the distribution patterns of secondary gold in each.

From Mann, A.W. and Webster, J.G., 1990. Gold in the exogenic environment, in *Geology of the Mineral Deposits of Australia and Papua New Guinea* (Ed. F.E. Hughes), pp. 119–126 (The Australasian Institute of Mining and Metallurgy: Melbourne)