part more than 20mV·sec/V. The low resistivity and high chargeability part are seen between station-600 and 700 about 750m above sea level. But the anomaly part is limited in the deep part, and it is difficult to specify as the promising part. As for the mineral occurrence, the gossaneous float is seen near station-600 and the rock sample shows high chargeability (27mV·sec/V). As for the measurement data and 2-D analysis of IP survey, the chargeability did not show the high value near the surface. It supposed that if the gossan exists, the measurement data shows anomaly, but the gossaneous float is not enough quantity to show anomaly in the IP survey.

3-5 Trenching survey

On the basis of the soil geochemistry in the Phase I exploration, two trenches put into practice in Phase II exploration at the anomaly containing several thousands ppm of zinc in soil.

The horizontal length of Trench No.1 is 100 meters. All work of Trench No.1 was made by hand because the site is very steep. The horizontal length of Trench No.2 is 102 meters. Trench No.2 was roughly made by a backhoe and then cleaned by hand.

3-5-1 Trench No.1

The dolomitized carbonate rock and weathered shale occur in Trench No.1. A boulder of 50 cm in diameter with galena-barite veinlets is discovered in the central part of the trench. A galena dissemination is also sporadically found at the bottom of the trench, but no sphalerite is observed in spite of the high zinc anomaly in soil. It is said that galena is stable whereas sphalerite is unstable in the weathering condition. The sphalerite may have decomposed or contain a very small amount and too minute grains to observe in the field.

Dark brown carbonate material is commonly observed as a replacement mineral and irregular veinlets of dolomite. This material is composed of dolomite crystals stained by a large amount of the secondary iron and manganese oxidized material under the microscope.

The Zn content of the rocks is rather lower than that of soil, and it generally ranges from 100 to 500 ppm, except for 1,800 ppm. The Pb content is generally near the background value, except two samples: 2,840 and 4,180 ppm. The irregular distribution of Pb content may indicate the irregularity of the density of galena-barite veinlets.

The channel samples contain much of Mn. All samples show over 1,000 ppm of Mn and one sample exceeds 1 %.

As only weak mineralization is found in Trench No.1, it appears that the high Zn anomaly of soil is not derived from the massive sulfide mineralization. There is a large possibility that the mineralization in Trench No.1 comes from a widespread low grade zone of veinlets or dissemination containing a small amount of sphalerite.

3-5-2 Trench No.2

The area included Trench No.2 is overlapped with the high Zn anomaly of the soil above 1,000 ppm. The drill hole MJTM-2 is also carried out in this area. The slightly recrystallized argillaceous limestone and phyllitic green shale occur in Trench No.2. The boundary between the argillaceous limestone and the shale is indistinct, because the argillaceous limestone contains a large amount of argillaceous lamina and grades into the phyllitic green shale. A boulder of 60 cm in diameter with galena-barite veinlets is discovered in the central part of this trench.

The Zn content of the rocks is rather lower than that of soil, and only two samples are obtained above 1,000 ppm, though the Zn contents in the soil were wholly above 1,000 ppm. The channel samples contain no anomalous Pb contents except two samples: 2,840 and 4,180 ppm.

As only weak mineralization is found in Trench No.2, it appears that the high Zn anomaly of soil is not derived from the massive sulfide mineralization, and it is also confirmed that the secondary Zn enrichment is not found in the site of Trench No.2. There is a large possibility that the mineralization in Trench No.2 came from the dissemination of sphalerite in the matrix of the brecciated or phyllitic portions of dolomite or the dissemination of the very fine-grained sphalerite in dolomite, observed as the mineralization in the drill hole MJTM-2, and zinc of decomposed sphalerite may have been highly concentrated to the soil in a weathering process.

3-6 Drilling survey

3-6-1 Outline of drilling survey

1.Outline

The drilling sites are shown in Fig. II-3-10.

In the Dong Noi area, the existence of Zn-Pb ore deposits hosted by carbonate rock has expected by the north-south trending geochemical anomaly of Zn, Pb and Cd and the same trending IP anomaly in the area of the Ordovician carbonate rock, based on Phase I exploration. The drilling work in Phase II program was carried out to confirm underground geological information and grasp an ore deposit and its mineralization type. The length of each drill hole ranges from 100 to 345 meters, and total drilling length is 840.00 meters.

In third phase, one drill hole was planed to confirm underground geological information and mineral occurrence on this anomaly north extension. The length of this hole is 187.50 m.

A drilling team consists of one operator and 3 to 4 workers per shift except movement and assembling, and dismantlement and withdrawal. Each hole was drilled 24 hours by three shifts as a rule.

2. Drilling method and used drilling machines

The drilling is carried out by a wire-line method using three size bits of PQ, HQ, and NQ.

For protection of loss circulation and wall sloughing, we prepared sufficient casing pipes and cased off it to drill hole. Also we used cementing for stopping loss circulation.

The types of drilling machines were the MPR-3 that was the caterpillar mounted type of the Drillcorp South East Asia, the VK-600 of the Vilkens Keo in Australia and the LY-38 of the Longyear Corp.

3-6-2 Consideration

Drill hole MJTM-1 was planed to confirm mineralization under the ground beneath Zn and Cd

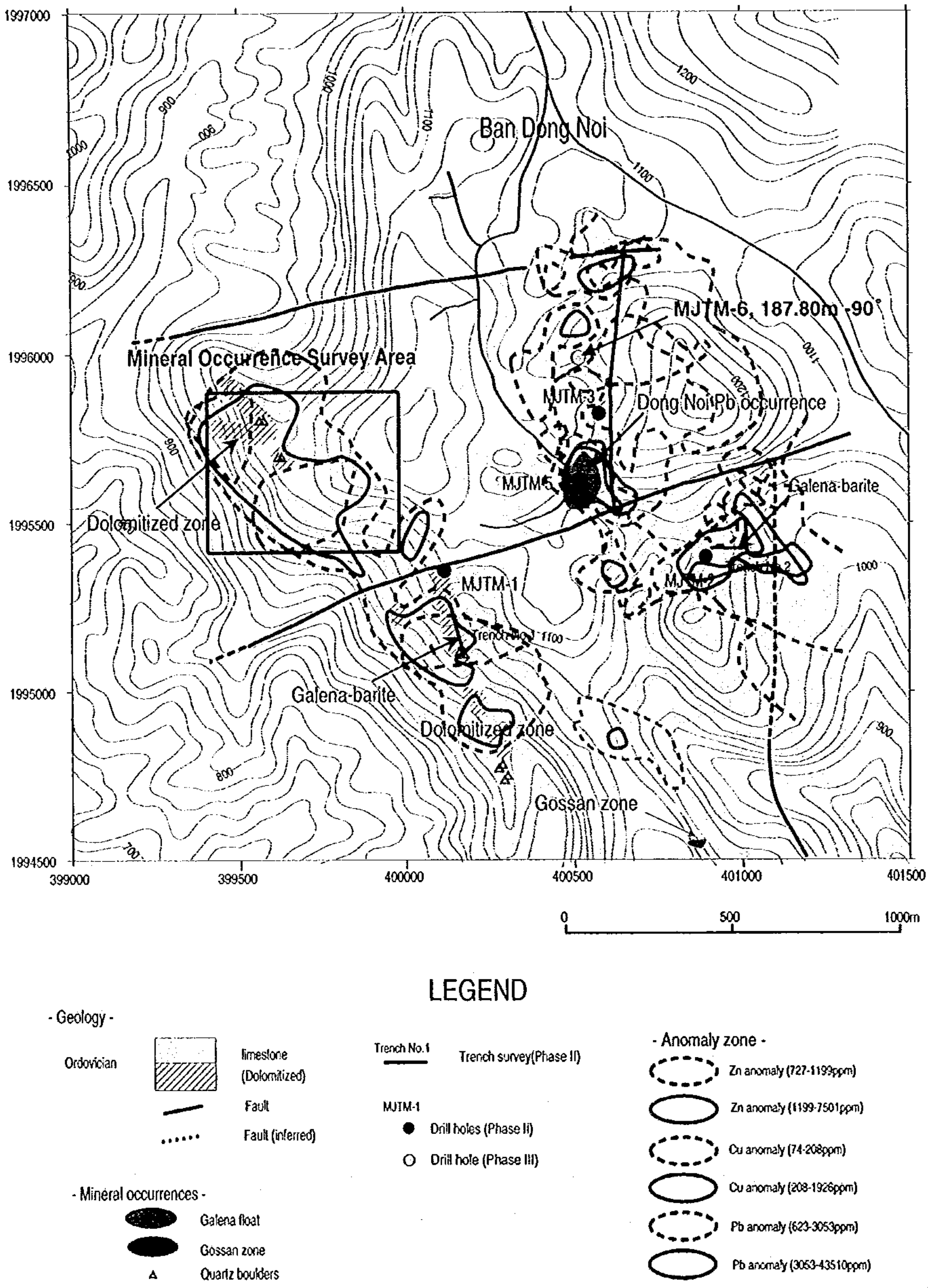


Fig.II-3-10 Location of drill holes in the Dong Noi area

geochemical anomaly distributed in carbonate rock of southwestern Dong Noi area [Fig. II-3-11]. The uppermost part of MJTM-1 is composed of alternation of shale and sandstone. The deeper part is dominated by dolomite. Granitic rock distributes about 400m from MJTM-1 in western side. Because of this, we supposed distribution of skarn rocks at the deeper part of this hole. Nevertheless, only pelitic hornfels is observed at 227～238 m. Dark brown carbonate vein developing in 60～100 m of MJTM-1 might deposit from hydrothermal solution that caused geochemical anomaly in this zone, because those carbonate veins often contains fragmentary quartz vein. The highest value of this assay is only 420 ppm Zn. It was not nearly so geochemical anomaly values that were up to several thousands ppm. X-ray diffraction analysis and microscopic observation revealed that that carbonate is a calcite containing very fine-grained goethite and oxidized manganese. Salinity of fluid inclusion of quartz veins closely relating with brown carbonate vein is very low. It suggests that the nature of hydrothermal solution forming these brown carbonate veins are much different from the chemical nature of solution forming stratiform type or massive type mineralization replacing carbonate rocks.

MJTM-2 was planed to grasp mineralization and to reveal geologic structure beneath Zn, Cd, Pb geochemical anomaly spreading at the southeastern end of Dong Noi area [Fig. II-3-12]. The upper part of this hole is impure muddy dolomite intercalating many seams of shale and chert. In this dolomite high-angled foliated shear zone and brecciated zone are well developed. Pyrrhotite, pyrite, sphalerite, galena and chalcopyrite occur in the matrix of these textures. Biotite hornfels is also developed in muddy part around mineralization. Assay results from these mineralized sections with 1 to 3m in length show high content of Pb, Zn that is 1.2 to 11.6 g/t Ag, 22 to 1,690 ppm Pb, 42 to 4,500 ppm Zn. Anomaly zone on the surface might be reflective of the distribution of these network-type mineralized zones. Nevertheless the volume of mineralized zone is little. The lower part of MJTM-2 deeper than 120 m is composed of magnetite skarn and garnet-magnetite skarn. Original sedimentary texture is often remained in skarnized rock in place. Sandstone bed and silicification zone are observed. Ore assay result is very low in skarn zone. Salinity and homogenized temperature of quartz vein are high. It might show the presence of high salinity hydrothermal solution.

MJTM-3 was planed to confirm the mineralization corresponding to IP anomaly beneath Pb and Cu geochemical anomaly [Fig. II-3-13]. It is composed of alternation for dolomite, sandstone and tuff from surface to 49.30 m. It is partly turned into skarn or hornfels without sulfide. At the deeper part more than 49.30 m, there is magnetite skarn and silicified green skarn. At 122.70 m it is cut by biotite granite. The uppermost part is low content of Cu, Pb and Zn. The assay of skarn corresponding to the highest IP anomaly shows high content of copper; 551～5,320 ppm Cu of 1 to 2 m in length, and maximum 1.64 % Cu in 30 cm.

MJTM-5 was planed to certify the occurrence of mineralization under lead mineralized outcrop [Fig.II-3-13]. Lead mineralized zone is only 30 cm in core after leveling of ground for preparation of drilling site. Clayey weathered rock containing boulder of galena disseminated green skarn distributes under this zone about 3.5 m in thick. This assay shows 224 g/t Ag, 2,660 ppm Cu,

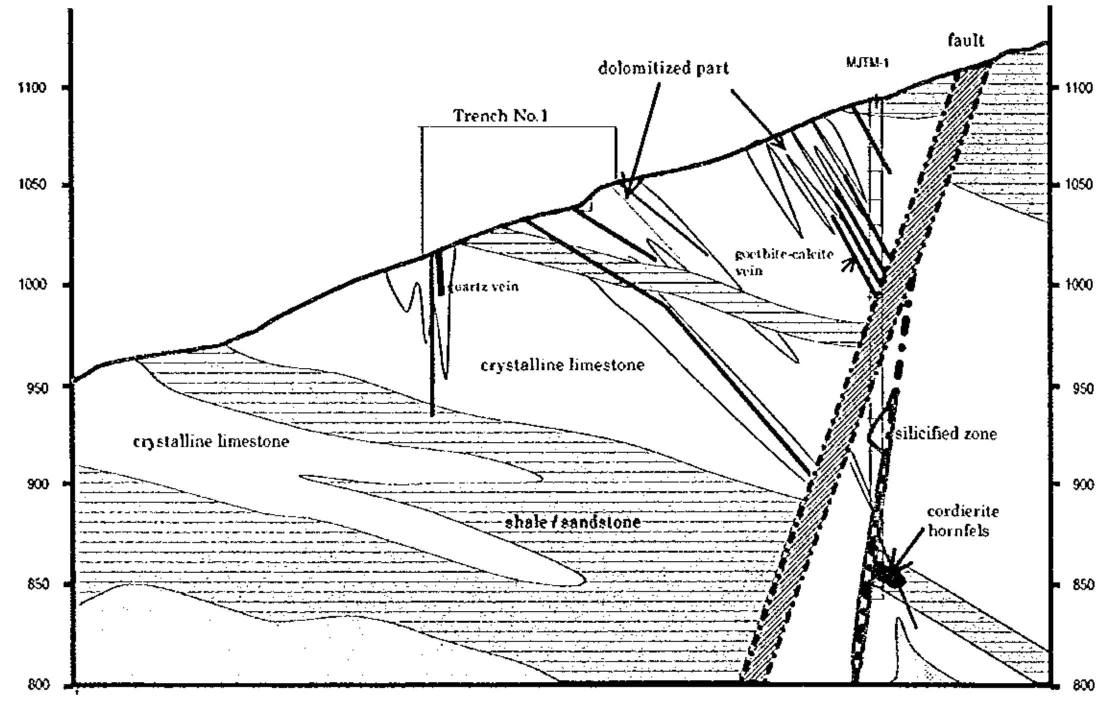


Fig. II-3-11 Interpretation profilearound MJTM-1 and Trench No.1 in the Dong Noi area

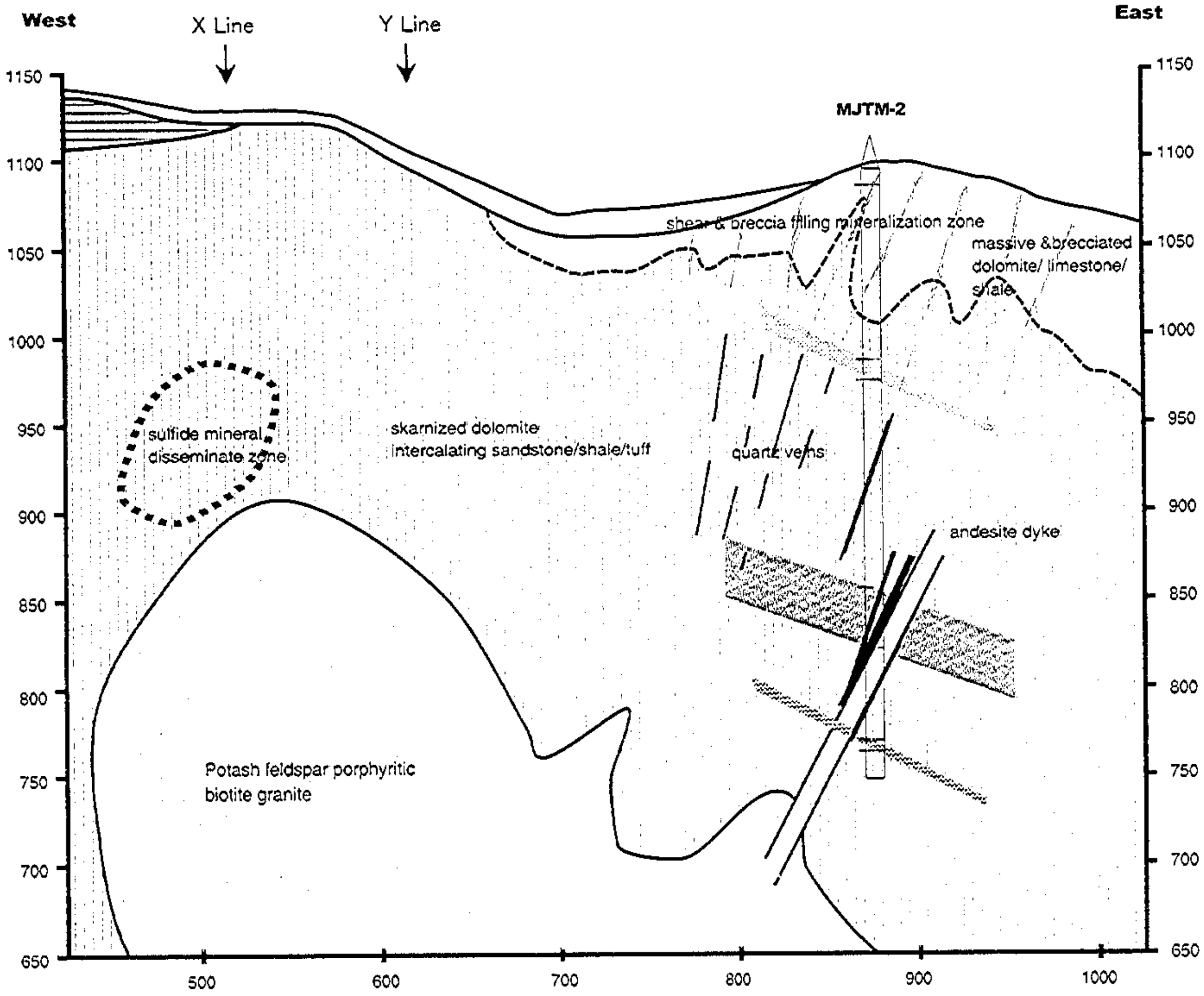


Fig. II-3-12 Interpretation profile around MJTM-2 in the Dong Noi area

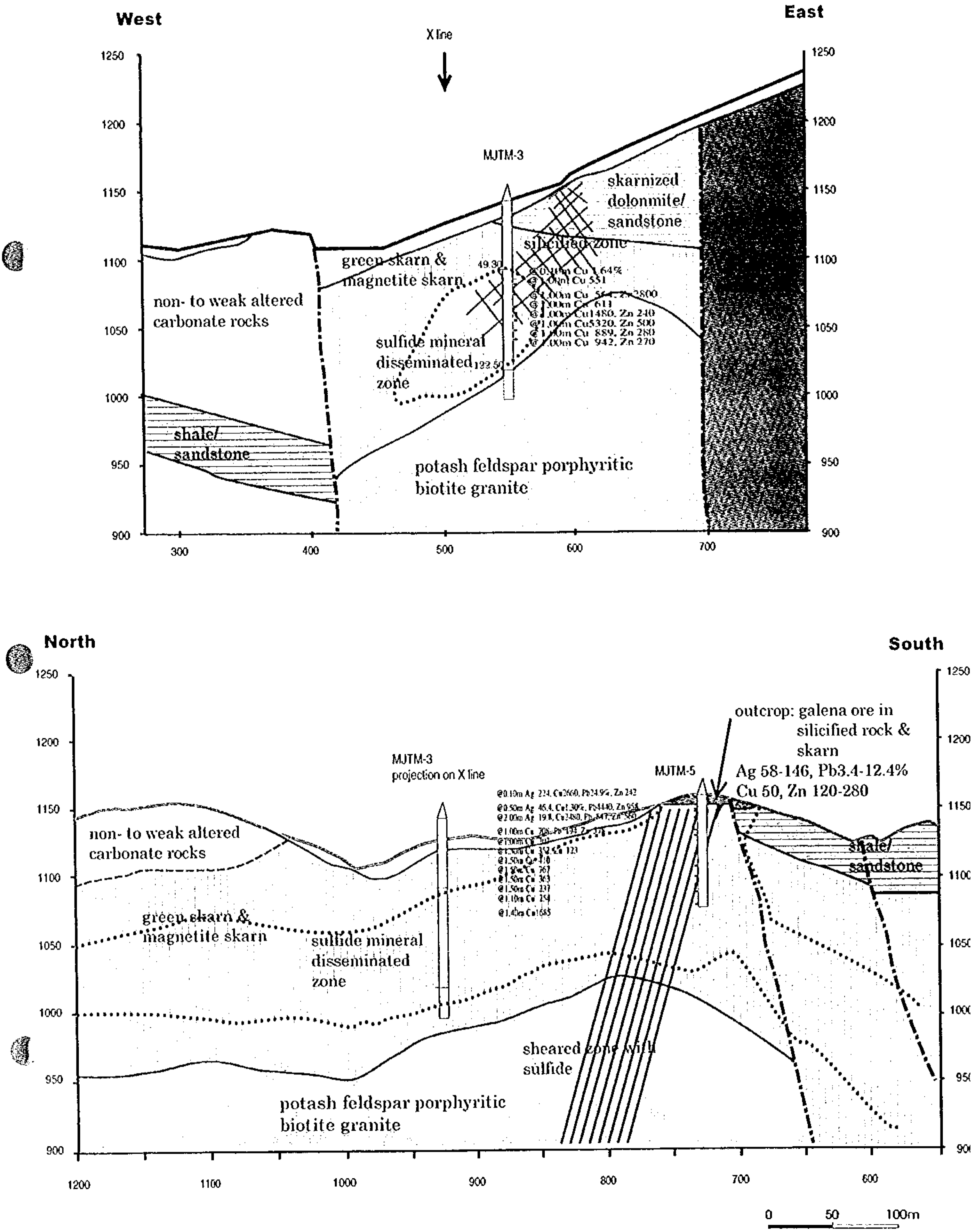


Fig. II-3-13 Interpretation profile between MJTM-3 and MJTM-5 in the Dong Noi area

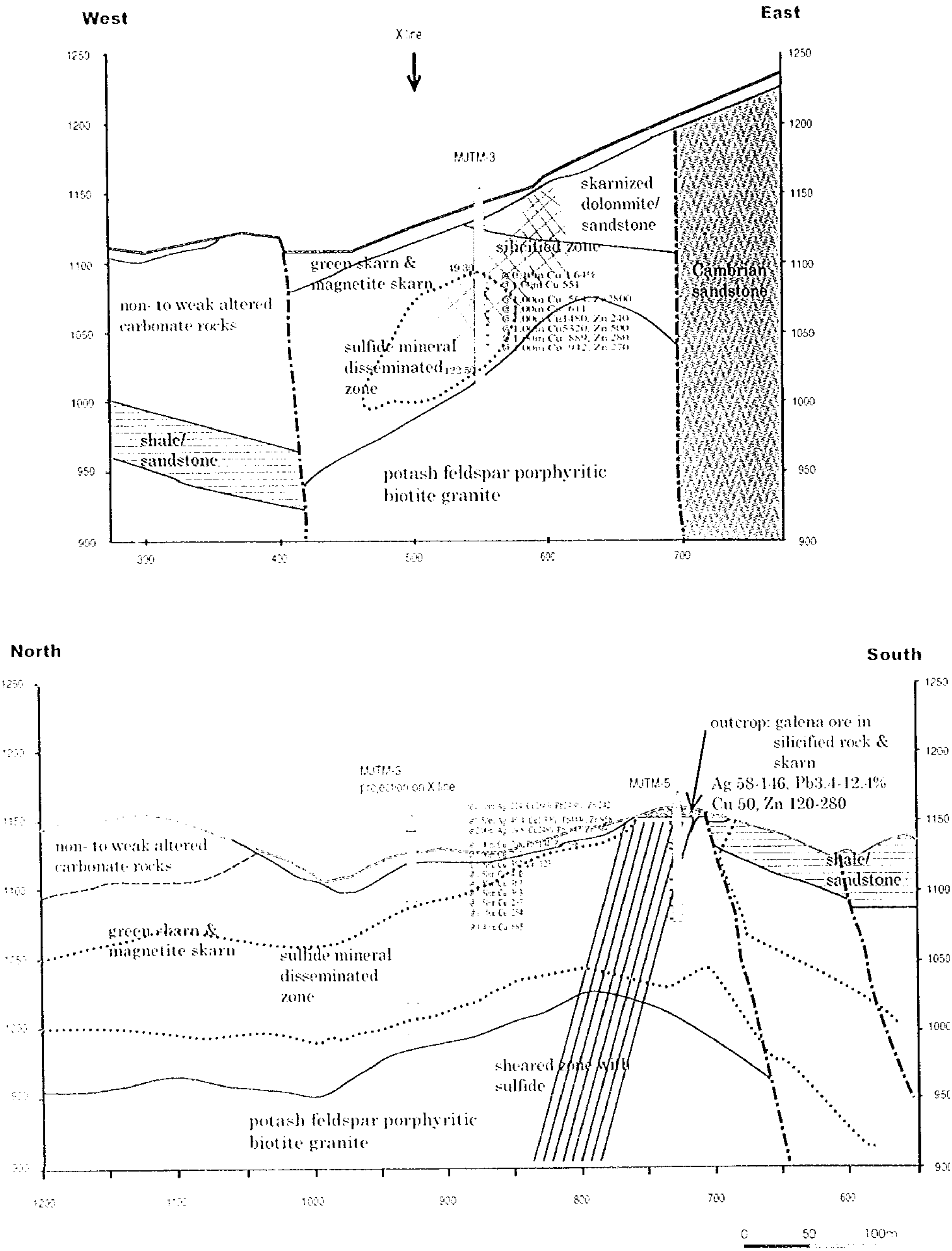


Fig. II-3-13 Interpretation profile between MJTM-3 and MJTM-5 in the Dong Noi area

24.9% Pb. At a depth of 3.85 to 11.00 m barren silicified rock and weathered rock overlie dolomite at 11.00 to 36.30 m. Dolomite shows remarkably sheared texture with high angle. Sheared texture is decreasing toward lower. Abundant sulfide minerals of pyrite, galena and chalcopyrite disseminate along shear plane with chlorite. Assay in the strongest sheared zone with 6 m length are 19.8~46.4 g/t Ag, 2480 ppm~1.30 % Cu, 874~4,440 ppm Pb, 560 and 958 ppm Zn. Below at a depth of 36.30m there is alternation of magnetite skarn and dolomite. Skarn rock is not mature and calcareous. In the skarn rock Pb and Zn content are low but Cu is 250~750 ppm.

Drilling survey reveals the contrast of geologic setting under the ground at western half and eastern half of Dong Noi area. The western half area is composed of dolomitized limestone intercalating shale and sandstone and is close to granite mass. But in this half it is not distinct mineralization and thermal effect such as skarnization and hornfelsization. On the other hand, in the central and eastern side of the Dong Noi area, skarn and its related mineralization of abundant magnetite and sulfide are well developed from surface to deeper part. Also IP anomaly zone in skarn has high contents of copper that is 0. 1 ~1.n %.

Mineral occurrence found in the upper part of MJTM-2 and MJTM-5 suggests the genesis as follows. Hydrothermal solution with high salinity and middle to high temperature was departed from skarnized zone and went up to upper dolomite. Simultaneously brecciated zone and foliated shear zone were formed in dolomite and mineralization of galena, sphalerite and chalcopyrite occurred in those textures. Nevertheless, stockwork-type mineralization zone around MJTM-2 is not so wide and is a small quantity of volume. If there exists high porosity part and/or easy to replacing part by high salinity hydrothermal solution in the carbonate rock of the Dong Noi area, big ore body may be existing in the Dong Noi area.

A lead occurrence at MJTM-5 is confirmed to the depth about 20m. Those assays show 19.8~224 g/t Ag, 30 ppm~1.30 % Cu, 874 ppm~24.9 % Pb, 242~3,000 ppm Zn. This mineralization is formed in shear or fractures zone that is 70 to 80 degrees. This fact suggests the hydrothermal solution rising area may not be directly under MJTM-5.

The survey on MJTM-6 Hole was planned to grasp in particular the state of copper and lead mineralization in the district where anomaly was found on the basis of the results of MJTM-3 and MJTM-5 Holes which had been excavated in the districts where IP and geochemical anomalies in copper, lead and zinc were observed in the first phase.

Like the case of MJTM-3 Hole, in MJTM-6 Hole dolomitic limestone was distributed under the land surface which was non-mineralized but argillized in part. In a deeper layer of 14.60 m or lower, magnetite skarn and green skarns were distributed. Existence of potassium feldspar porphyritic biotite granite which had been identified in MJTM-3 Hole was confirmed in the depth of 181.05 m(Fig.II-3-14).

The state of mineralization in the hole is summarized below from upper to lower layers. Around the depth of 50 m, existence of weak mineralization of galena and sphalerite accompanied by quartz-calcite vein was confirmed, and around the depth of 64 m, mineralization of chalcopyrite was identified together with quartz vein. Both in the depths of 85 m and 89-101m,

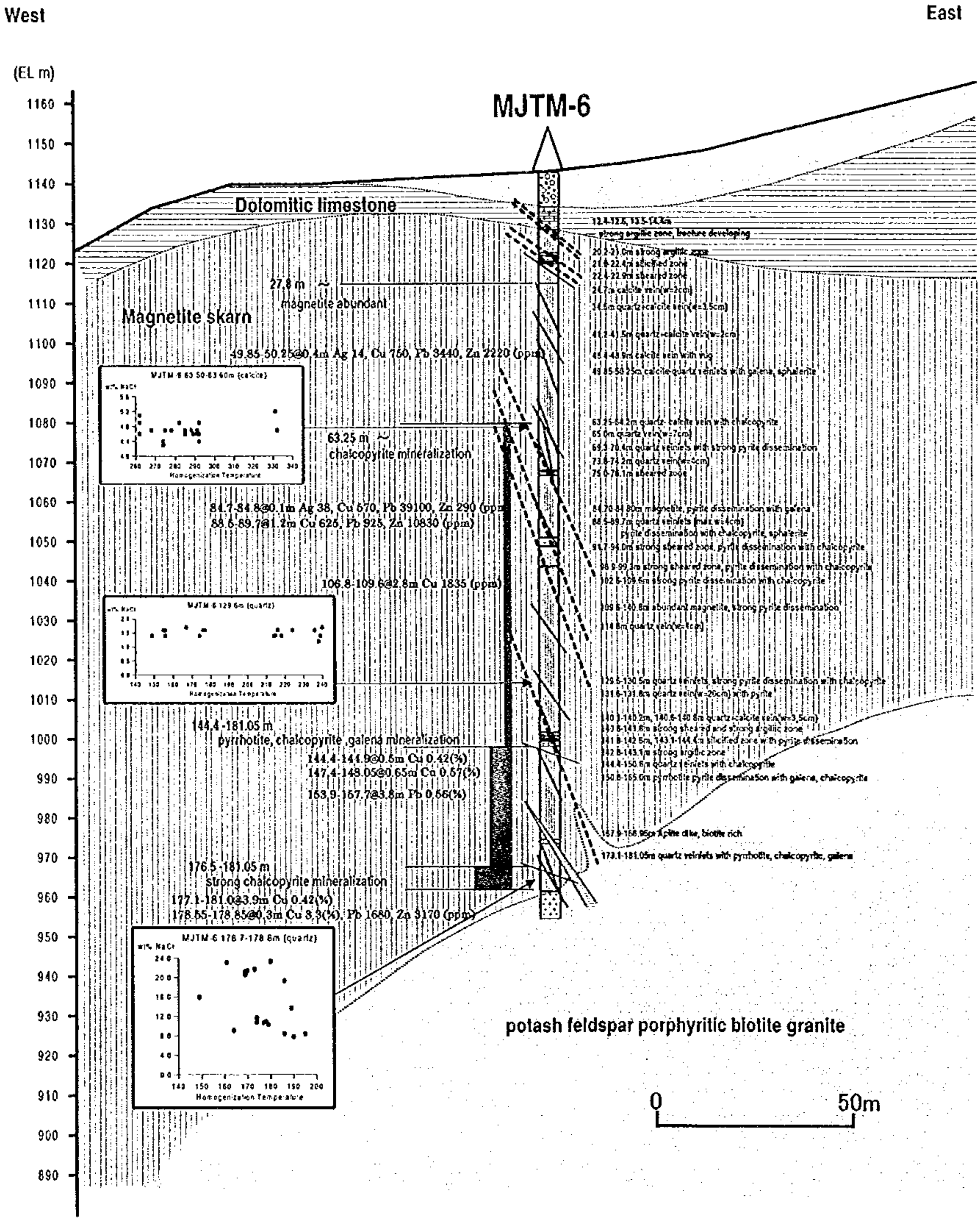


Fig. II-3-14 Geologic profile of MJTM-6

disseminated mineralization of galena and chalcopyrite/sphalerite was identified respectively. Pb of the former was 3.9%, and Zn of the latter was 1.1%. From the depth of around 100 m, more dissemination of pyrite was found accompanying scattered chalcopyrite. In the depth of 140 m and lower, not only pyrite but also pyrrhotite, chalcopyrite and galena increased. In the depths of 176 m to 181 m as the bottom of the hole, pyrite mineralization was the most intensified. The average copper grade in this section was 0.42%. Copper mineralization had a tendency to become larger toward the part in contact with granite, which suggests that such mineralization occurred simultaneously with skarn formation. However, in view of the low fluid inclusion homogenization temperature of 150-200℃ in the quartz existing in the depth of 178.80 m where copper mineralization was the most intensive, it is difficult to think that such mineralization occurred at the time when it was in contact with granite. On the other hand, the extremely high salinity of 8-24 wt%, it might have been possible that the mineralization was directly caused by residual magma of the granite.
The state of the depth around 64 m in MJTM-6 Hole where chalcopyrite occurred was almost consistent with that of the upper limit to the abnormal area whose value of 16m V-sec/V or more grasped as a result of IP exploration. The state of the depths of 140 m or deeper where mineral showing including chalcopyrite dissemination was intensive in general was consistent with the state of area with IP anomaly of 20 m V-sec/V or more. Fig. II-3-15 shows the cross section in the south to north direction including MJTM-3 and MJTM-5 Holes. As having been presumed from the result of the investigation conducted in the second year, the area with anomaly in IP is considered to represent the range where copper mineralization occurred. MJTM-5 Hole was excavated up to the depth of 100 m and it is not in touch with granite. However, around the hole bottom corresponding to 20m V-sec/V or more, copper grade had a tendency to become higher, i.e. 1,600 ppm or more, and from this we see a possibility of its grade becoming higher toward the place of granite existence. In view of the tendency of copper mineralization skarns to be distributed scatteredly, although it was difficult to definitely decide the specific location of ore shoots, existence of ore shoots might be possible in the area where anomaly in IP was observed. However, the highest grade was only 3.3%Cu in the 30 cm interval and 0.42%Cu in the 5 m interval including the above 30 cm interval, and at present the place is not considered as an object of the intended operation.

3-7 General Discussion

In the Dong Noi area, the state of mineral showing was investigated in its northwestern part, and additional boring survey was conducted in the spare part of the area with IP anomaly.

The Dong Noi area consists of Cambrian siliceous sandstone, Ordovician shale, sandstone and carbonate rocks, and Triassic granite which has intruded into them. As pointed out in the report of our investigation conducted in the second year, conditions of the eastern and western parts of the district were quite different from each other as divided by a border in almost the center of the district. In other words, in the eastern side, granitic stocks had been intruded into a shallow

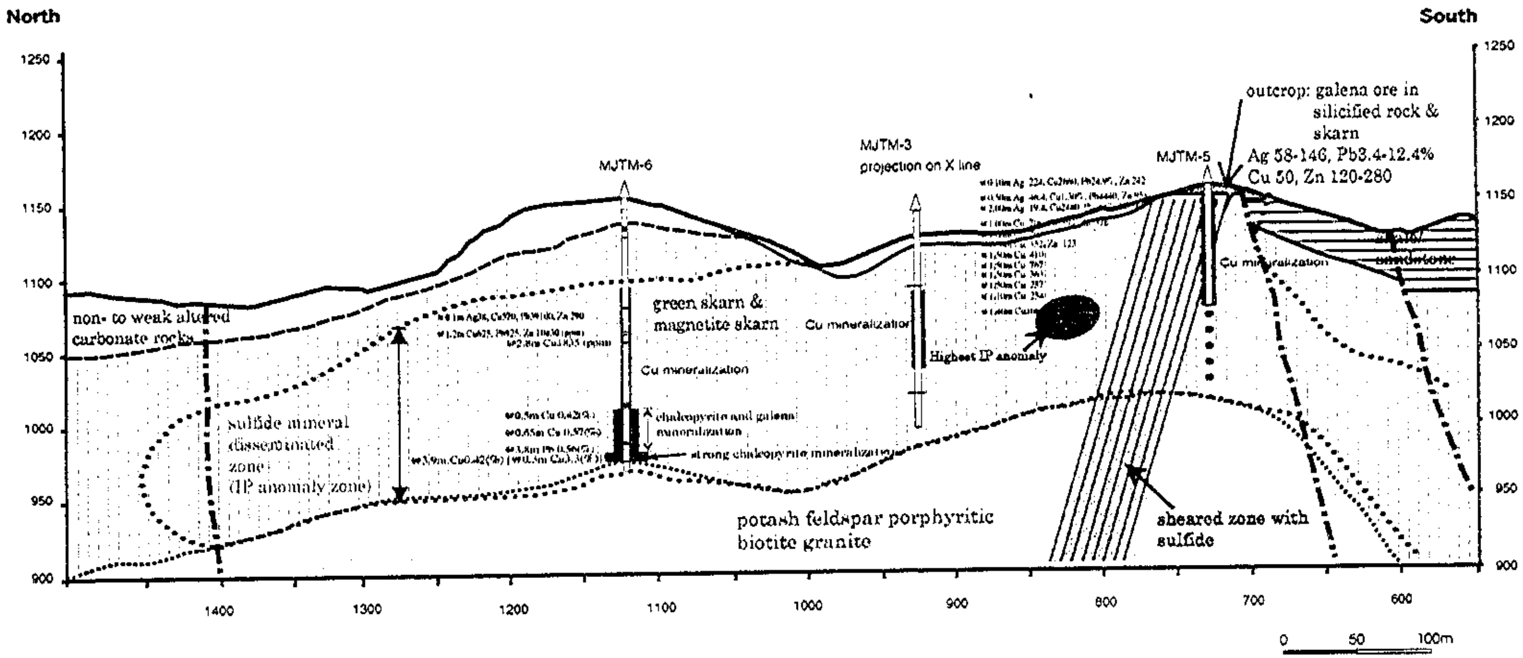


Fig.II-3-15 Geologic profile along IP anomaly zone at the center of the Dong Noi area part. Being influenced by this, most of the carbonate was replaced with magnetite skarn or hornblende skarn. In the western side, on the other hand, although a lot of quartz-calcite veins and calcite veins deriving from dolomitization and hydrothermal activities were developed, no skarnization was identified.

Through our geochemical survey, we observed a wide-ranged distribution of anomalies in lead, zinc, manganese and cadmium in both eastern and western sides. With regard to the eastern side, we reached a conclusion from the state of MJTM-1 Hole and Trench No.2 that the area with such anomalies was caused by zinc/lead mineralization, which was formed along small fractures accompanying loose brecciation having been developed like a network in the upper part of the skarnized zone.

With respect to the area with anomalies in the western side, we only observed slight galena dissemination in dolomite existed in MJTM-1 Hole and Trench No. 1 and no definite cause of anomalies was found. Through our investigation into mineral showings conducted this year on the district with geochemical anomalies in the northwestern part, it was clarified that ore solution rose up along joints, fractures or beddings in the limestone seams and formed quartz veins and silicificated zones in a relatively lower part. Around 1,000 ppm of zinc was contained in these quartz veins, but no dolomitization or high anomalies in zinc or lead values were observed in the surrounding limestone. However, when brown calcite veins containing large amounts of iron oxide and manganese were accompanied, then zinc contents of the sectional samples were increased.

In the upper part of this silicificated zone, a wide range of dolomitized zone was formed in the limestone, and the host rock itself was under the influence of mineralization as indicated in the values of Zn = 330 ppm – 1.6% and 50-970ppmPb. In the area where this dolomitized zone was developed, quartz veins containing silicificated small breccia and silicificated zone were distributed along joints and galena-sphalerite and a certain bedding replaced galena-sphalerite veins. Out of the samples representing these quartz veins, those of the highest grade was in a width of 80cm with values of 7.86%Zn and 2.82%Pb. The sample from the 20 m section in the periphery also showed high values of 1.60%Zn and 1.43%Pb.

As a characteristic of this mineralized zone, sulfide mineral was scarcely found in it except veins.

As characteristics of mineralization observed through our fluid inclusion test, although homogenized temperatures were 140-250 ℃ and there was scarcely any difference in their homogenized temperature between the silicificated and dolomitized zones, salinity of the former was 6-8% and that of the latter was 1-3%. From this we may guess that there seems to be some relationships between zinc/lead mineralization and reduction in salinity.

While our geochemical survey revealed a large-range of lead/zinc anomalies, such values of rock samples extracted from outcrops in the lower silicificated zone showed considerably low quality, and those from dolomitized zone were a little lower than the data of geochemical anomalies. On the other hand, their values obtained from the samples of quartz veins and silicificated rocks were on the same level or higher than the data of geochemical anomalies. However, because the amount of quartz veins and silicificated zone with high concentration and the portions with high concentration in dolomitized zone account for only a little percentage to the entire zones concerned, it is difficult to explain only from these data the range and intensification of the entire areas having geochemical anomalies.

From the results of our observation of this time, we consider that lead and zinc contained in quartz veins and dolomitized zones developed widely along joints and fissures in the limestone may probably have been absorbed into manganese oxide and remained on the land surface during the process of weathering when manganese contained in a similar manner as above changed to oxide.

In view of the fact that quartz veins containing sphalerite and galena were actually extracted from the northwestern part of the Dong Noi area, the possibility may be the highest in the Dong Noi area for determining lead/zinc ore exist in this part. On the other hand, since the structure of forming quartz veins may cause replacements in open joints and along bedding of specific horizon, assumption of the position of their existence will require more detailed explanation of the rock faces and geological structures.

As a result of excavation of MJTM-6 Hole in the remaining part of the area with IP anomalies, we came to judge more clearly that the district with high IP anomalies may have represented an area where copper/lead mineralized zones overlapped with skarn. We understood from our investigation in MJTM-6 Hole that copper mineralization started in the depth of around 60 m, extended scatteredly to lower layers and was most intensified in the position where it became in contact with granite. It might be considered from the fact that mineralization became more intensified as it extended to lower parts that mineralization may have been closely related with the time of skarn formation. However, from our examination of fluid inclusion, the homogenized temperatures of 149-195℃ were far lower than the temperature for skarn formation. On the other hand, extremely high salinity of 7.8-23% indicates a possibility of copper mineralization having been derived from the final solution of granite. From the state of copper mineralization in MJTM-5 Hole, we note that mineralization along the shear was developed by cutting a skarn. Consequently, we think it was caused by a mineralization which occurred far later than the time of mineralization of skarn.

From the state of mineralization in the three holes of MJTM-3, MJTM-5 and MJTM-6, no grade or reserve was found so far which may become an object of a possible operation. However, since copper grade in skarn tends to be unevenly distributed, it may be considered that there may be some room for further exploration in this district having abnormal IP values (16 mV-sec/V or more).

By generalizing the data obtained through our survey on the Dong Noi area conducted for a period of three years, we prepared a mineralization model of the Dong Noi area (see Fig. II-3-16). In the eastern half of the district, a wide-range skarn zone was formed because granitic rocks in the form of a stock had intruded into the Ordovician limestone. Later, accompanying the rise of

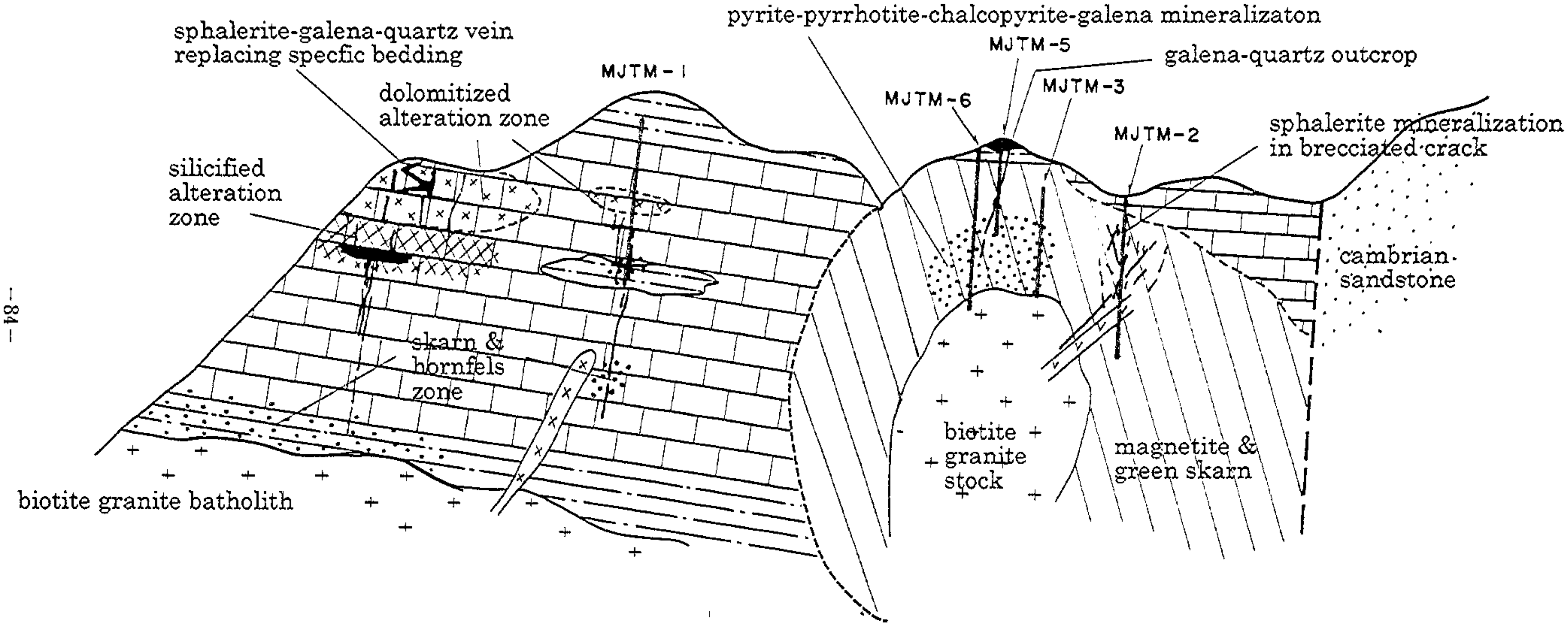


Fig. II-3-16 Schematic mineralization model in the Dong Noi area mineralization solution which was deeply associated with the final solution of granite, a mineralized zone in the form of a tube was formed mainly consisting of pyrite-pyrrhotite which extended in the south-to-north direction, and copper/lead precipitation took place simultaneously. A part of the ore solution rose along shears, precipitating copper and lead in part, and formed an ore body mainly consisting of galena in a border between skarn and mudstone. In the place away from the stock, ore solution moved along narrow cracks developed as a network, precipitating sphalerite in part along the cracks. However, no large ore body was formed because there was little porous part in skarn which was massive and compact. In the western half, on the other hand, no large-scaled skarn zone was contained in the upper part of batholith. The mudstone and sandstone in direct touch with it became hornfels, and slight skarnization was observed in the lower part of the limestone. Ore solution in low to medium temperatures and with high salinity rose through joints and cracks of limestone, formed a silicificated zone on a certain level, and the limestone was dolomitized in a wide range in the upper part, and at the same time lead/zinc dissemination took place. In the dolomitized zone, a specific single layer was replaced and sphalerite-galena-quartz veins were formed.

Chapter 4 Mae Kanai Area

4-1 Geology

4-1-1 Outline of Geology

The Mae Kanai area is widely underlain by the Paleozoic rocks. Triassic granite is distributed in the western part of the area as a large-scale batholith.

The Paleozoic rocks are mainly the Ordovician shale and sandstone, and limestone. The Silurian-Devonian sandstone occurs in the northern part and southern part of the area. It is in east-west trending fault contact with the Ordovician formation.

Shale and sandstone are predominant in the Ordovician sedimentary rocks at the surface, but in the central part of the area there is a large basin typically formed in the large limestone body. It is inferred that the central part mainly consists of the Ordovician limestone, though at the surface the distribution of outcrops and floats are very confined.

The basin is elongated to the north-south direction. It seems that the basin was formed by the dissolution of the limestone body influenced by a shear zone of the north striking fault.

Many large gossan zones with several hundreds meters in diameter occur in places in the Ordovician sedimentary rocks.

Fig. II-4-1 shows a geologic map and profiles of the Mae Kanai area.

4-1-2 Details of Geology

1. Sedimentary rocks

(1) Ordovician sedimentary rocks

The Ordovician sedimentary rocks are composed of two limestone units and interbedded shale

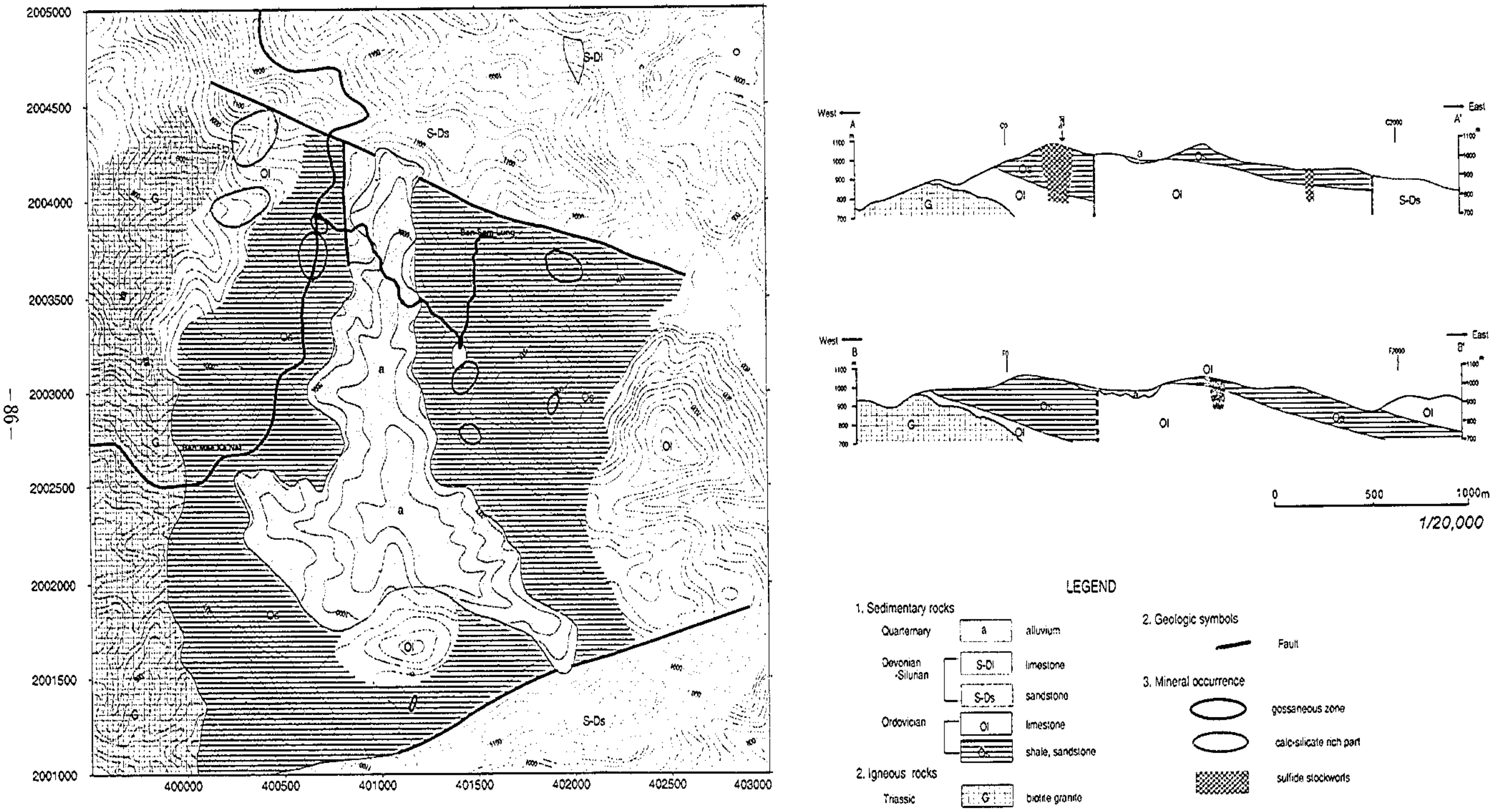


Fig. II-4-1 Geologic map and profile of the Mae Kanai area and sandstone unit.

The limestone unit generally contains a large amount of argillaceous thin layers and schlierens. The upper limestone in the western and southern parts of the area is crystalline and irregularly replaced by white massive dolomite, that rarely contains a disseminated galena. The lower limestone unit, in the northwestern part near the granite contact, has been widely metamorphosed to calc-silicate rocks composed of amphibole, hedenburgite and garnet. They are locally accompanied by a dissemination of magnetite or galena.

The shale and sandstone unit is widespread in the survey area centering the basin. Phyllitic black shale is dominant around Ban Sam Luang, whereas gray to white psammitic hornfels is dominant near Ban Mae Kanai.

Gossan zones occur in the shale and sandstone unit in many places. They are surrounded by white strongly silicified shale and sandstone. The silicified rocks are generally brecciated, and the matrix of the breccia is filled by secondary oxidized iron and manganese minerals.

(2) Silurian-Devonian sedimentary rocks

The Silurian-Devonian sedimentary rocks are distributed in the northern part and southern part of the area. It is in east striking fault contact with the Ordovician rock.

The rocks consist of sliliceous sandstone, with small-scale limestone lenses. Black shale is dominant at the lower part of the rocks as observed on the bank of Huai Mae Ho.

2. Granitic rocks (G)

Triassic porphyritic biotite granite widely exposes in the western part of the area. The granite is characterized by a large amount of euhedral phenocrysts of potassium feldspar. Though the granite facies normally uniform, an aplitic fine-grained biotite granite inferred as marginal facies of the porphyritic granite is distributed near the boundary between the biotite granite and sedimentary rocks.

4-1-3 Geological Structure

The Paleozoic is cut by two east-west striking faults at the southern part and northern part of the area. The Ordovician sedimentary rocks are separated from the Silurian-Devonian rocks by these faults.

The result of the geophysical program is assumed that several north-south striking faults are consistent with the direction of the basin in the central part of the area. But the details of its structure have not been clear at the surface because unconsolidated material widely covers on the basin.

It is inferred that the Ordovician formation gently dips east as a whole, judging from the relation of the limestone units and the shale and sandstone unit.

4-1-4 Mineral Occurrences

Fig. II-4-2 shows the location of mineral occurrences in the Mae Kanai area.

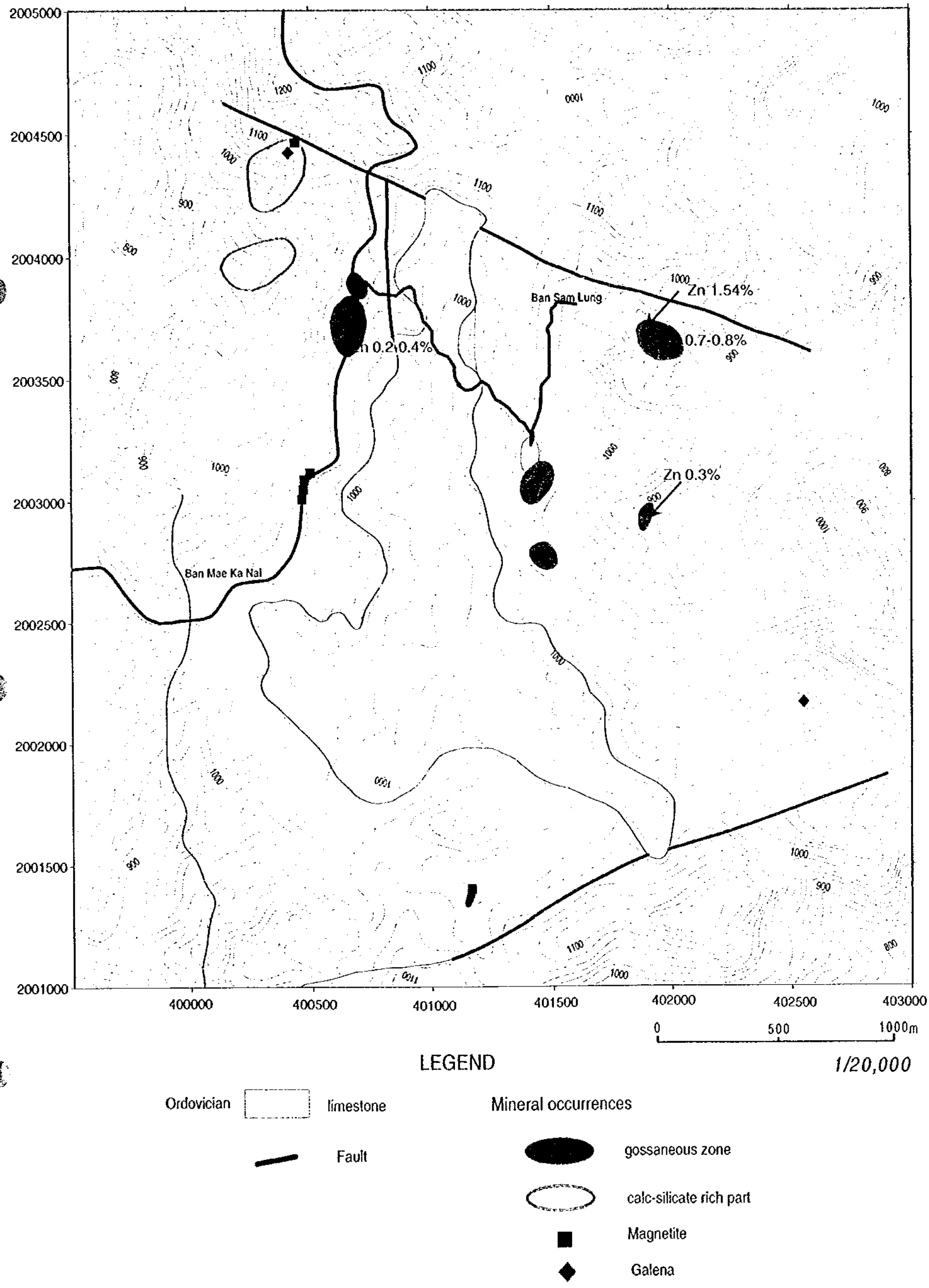


Fig. II-4-2 Mineral occurrences of the Mae Kanai Area

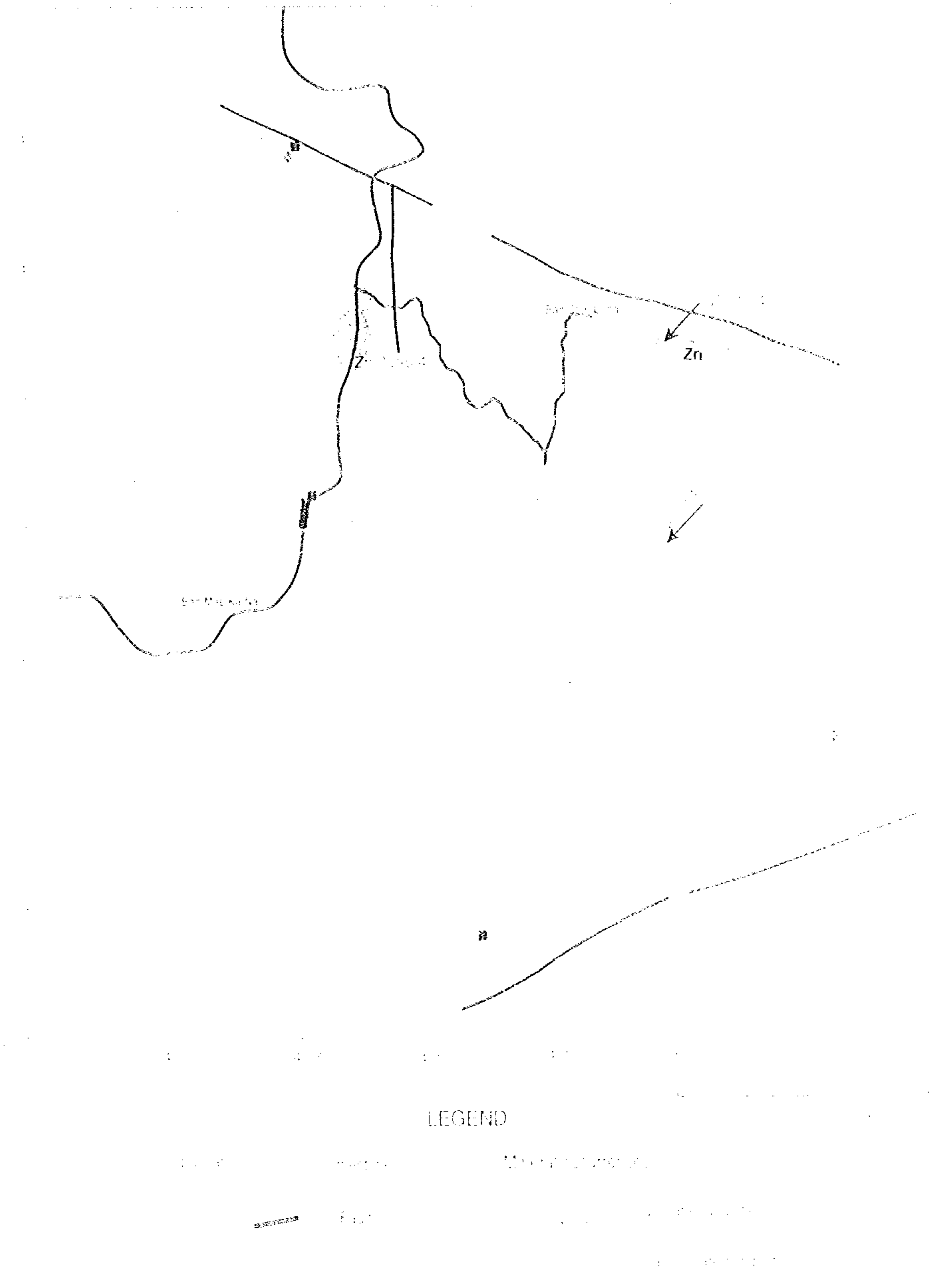


Fig. II-1-2 Mineral occurrences of the Mae Kanau Area

1. Gossan zone

More than seven gossan zones with usually several hundreds meters in diameter occur on the Ordovician shale and sandstone unit. These zones are composed of a large amount of boulder and sub-crop of massive limonite and hematite. Generally only oxide and hydroxide iron minerals are identified by X-ray diffraction examination and under the microscope. They are generally surrounded by silicified and brecciated shale and sandstone, and the matrix of breccia is filled by limonite and hematite.

The gossan zone in the southeast of Ban Sam Lung shows a rather high concentration of zinc. There is an outcrop as a waterfall in a small stream, and the dimension is about 7 meters wide and 7 meters high. The channel samples on this outcrop contain ranging from 0.7 to 0.8 % Zn. Also the samples of 5 meters channel interval on the boulder near Ban Sam Lung contains 1.54 % Zn. The samples collected in another zone 1.5 km south of Ban Sam Lung contains 0.3% Zn.

Another sample obtained from the southern most gossan zone is identified Woodruffite $[(Zn,Mn)_2Mn^{4+}{}_5O_{12}\cdot 4H_2O]$ by X-ray diffraction examination. It means that some portion of zinc in gossan is contained into the secondary manganese mineral.

2. Magnetite-quartz vein

Many floats of magnetite-quartz veins are scattered on the road near the Ban Mae Kanai, extending north-south direction about 200 meters. These veins are only composed of quartz, magnetite and secondary iron minerals under the microscope.

3. Other occurrences

A small amount of galena dissemination rarely occurs in the dolomite.

Calc-silicate rocks of the lower limestone unit are locally accompanied with a dissemination of magnetite or galena near the boundary between granite and sedimentary rocks in the northwestern part of the area.

4-2 Geochemical Survey

4-2-1 Ordinary soil geochemistry

1. Sampling and Data Processing

Samples are taken at spacing of 50 m by using geophysical survey traverse lines. The intervals between traverse lines are 200 m or 250 m. At the central area and the area near Ban Sam Lung, the density of sampling was increased to 50 × 50 m because of the occurrences of the silicified breccia or gossan zone.

The principal component analysis is made on the correlation coefficients matrix. On the basis of the principal component analysis, the elements are divided into two groups. One is Ag-As-Ba-Fe-(Hg)-Mn-Pb-Sb-Zn, and there is a strong correlation each other. The other is Ba-Cd-Mg. The variations of most pathfinder elements are integrated to the Z-01 factor of the principal component analysis.

2. Distribution of geochemical anomaly values

[Zn] The north-northwest trending Zn anomaly zone extends from the middle of Line C to the middle of Line F. The high anomaly values in the anomaly zone center on three sub-areas: the area around the intersection of Line C and the main road; the area around the intersection of Line F and the branch road to Ban Sam Lung; the area around the middle of Line F.

[Pb] The north-northwest trending Pb anomaly zone extends from the middle of Line D to the middle of Line G ranging from 100 to 250 meters wide. The shape of this zone is almost similar to that of Zn, but anomalous zone does not continue to the north of Line D.

[Cu] The north-northwest trending Cu anomaly zone extends from the middle of Line C to the middle of Line G. The shape is almost similar to that of Pb. The high values also overlap with the Silurian-Devonian sandstone in the northeast of the survey area. These values may reflect the high background of its sandstone area.

[Mg] The Mg anomaly values also center on the middle of Line C and the middle of Line D. The samples in the limestone area commonly show high Mg content because of the high Mg background of limestone.

4-2-2 MMI geochemistry

The Mae Kanai area is widely overlain by unconsolidated sediments and does not provide many outcrops. There is a large possibility that all deposits do not expose on the surface, even if a strata-bounded deposit embeds in the gentle-dipping beds. Therefore the Mobile Metal Ions (MMI) technique is also carried out in the Mae Kanai area, because some mineral indications may be missed by the ordinary soil geochemical technique. It is said that the MMI technique is useful in locating buried mineralization. The pathfinder elements are Zn, Pb, Cu and Cd in consideration of an expected deposit type in this area.

1. Sampling

It is said that the MMI element concentrations are more sensitive to its sampling depth than to its soil horizon. Therefore the samples were collected approximately 50 to 100 mm below the surface at a consistent depth taking no thought of soil horizon by using of plastic garden spades and plastic kitchen colanders, and put into plastic snap seal bags. Then the samples were dispatched to the laboratory.

2. Data processing

The MMI technique is a partial extraction technique of ions that have moved in the weathering zone and are only weakly or loosely attached to surface soil particles. Therefore the MMI analysis values are not the absolute values of elements in the samples. It means that the relative difference between background samples and anomalous samples is important.

For this purpose, the Response Ratio, that is an index of relative difference, is proposed in the manual of the MMI Technology. This is a simple index: the average of the data set that consists of the data less than the lowest qurartile is calculated as a background value; then each analysis value is standarized by dividing the background value.

According to this method, the data set of the Response Ratio of each element is made for the further interpretation.

3. Distribution of geochemical anomaly values

Generally the data of the MMI technique has a large contrast, therefore a sample with a response ratio of 2 or less is a background sample, and a sample with that of 2-5 is a low grade sample. Samples with response ratios greater than 5 are anomalous samples. Therefore samples are classified into 4 levels by response ratios 2, 5 and 10 in the charts. In this report, a sample with response ratios greater than 5 treats as a low anomaly sample, and that greater than 10 as a high anomaly sample.

[Zn] The MMI Zn anomaly values gather two areas: the area extending from the middle of Line B to the middle of Line G with the north-northwest trend, and the area around Ban Sam Lung. The former almost overlaps with the anomaly of the ordinary soil geochemistry, but the high MMI anomaly values center on the northern part between Line B and Line D. The latter MMI anomaly zone is not detected by the ordinary soil geochemistry.

[Pb] The north-northeast trending Pb MMI anomaly extends from the middle of Line C to the middle of Line F, and another anomaly is widespread in the basin. The former is almost consistent with the anomaly of the ordinary soil geochemistry, but the latter is not detected by the ordinary soil geochemistry. The MMI anomaly values also occur near Ban Sam Lung.

[Cu] The MMI anomaly values of Cu are distributed at the area extending from the middle of Line D to the middle of Line F and at the area around Ban Sam Lung.

[Cd] The distribution of MMI anomaly values of Cd is almost similar to those of Zn. Two MMI anomaly zones are detected: the area extending from the middle of Line B to the middle of Line G, and the area centering on Ban Sam Lung.

4-2-3 Geochemical anomaly map of the Mae Kanai area

The geochemical anomaly of major three elements, Zn, Pb and Cu are selected and integrated to Fig. II-4-3. The chart shows both results of the conventional soil geochemistry and the MMI geochemistry.

The Zn anomaly of ordinary geochemistry and those of MMI geochemistry overlap at the following five areas.

a) The gossan zone along the main road centering on the points ranging from C-200 to C-400.

b) The area between the points ranging from B-500 to B-700 and those ranging from D-700 to D-900.

c) The gossan zone centering on the points ranging from F-1000 to F-1200.

d) The gossan zone southeast of Ban Sam Lung crossing with Line C and Line D.

e) The area around the points from H-800 to H-900.

The Pb anomaly zones delineated by two soil geochemical techniques overlap at the following

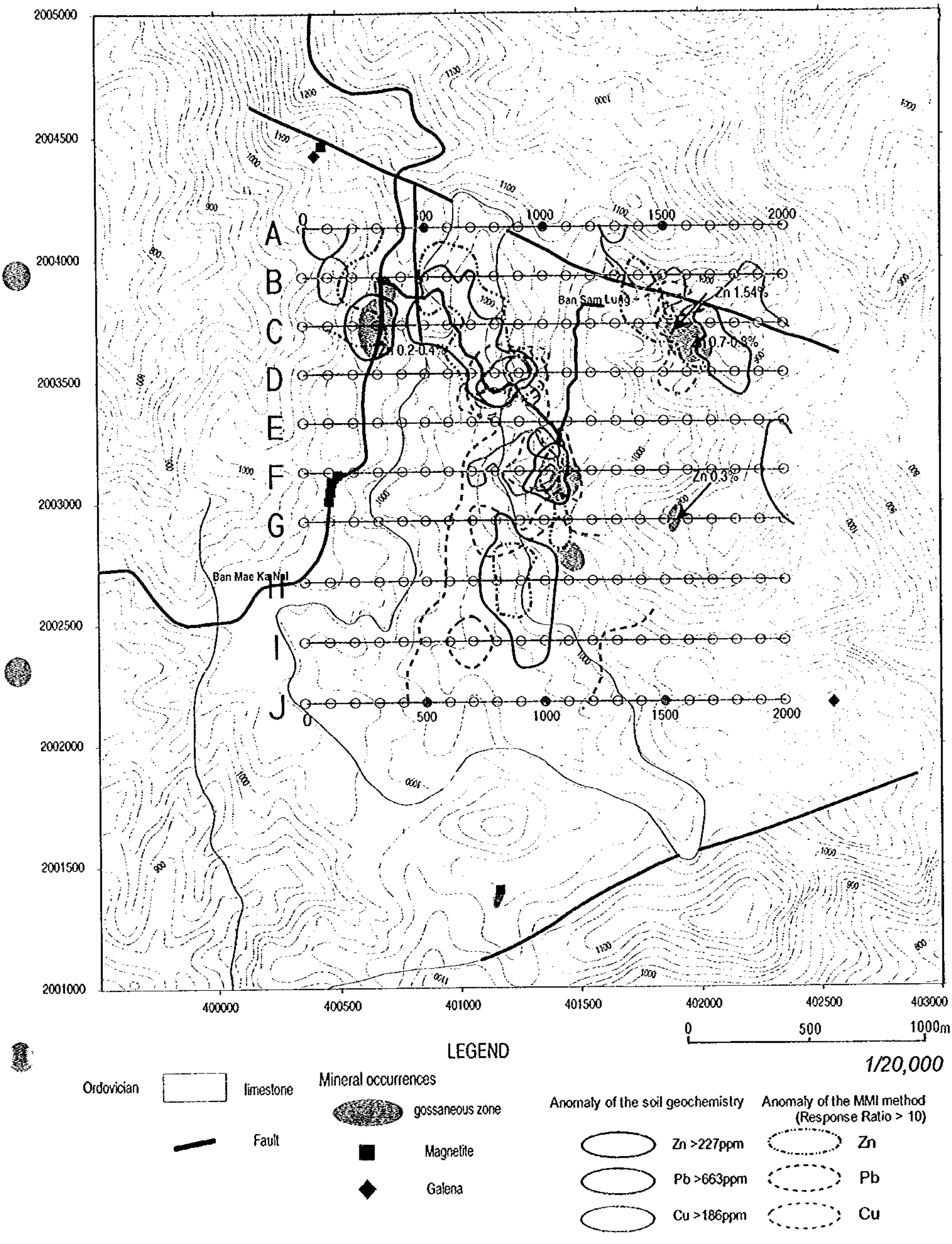


Fig. II-4-3 Geochemical interpretation map of the Mae Kanai Area two areas.

a) The area around the points ranging from D-800 to D-900.

b) The area between the periphery of F-1000 and Line E.

The Cu anomaly zones delineated by two soil geochemical techniques overlap at the following two areas.

a) The periphery of D-900.

b) The are between the points ranging from F-800 to F-1000 and Line E.

Therefore two promising areas are confined by the conventional and the MMI geochemical techniques as follows.

1) The area between the gossan zone around F-1000 point and Line E.

2) The periphery of the points ranging from D-800 to D-900.

At the thought of the relation with gossan zones, the gossan zone southeast of Ban Sam Lung is another high potential area. The gossans contain very high zinc contents, though this area is not an overlapping area between the anomaly of the ordinal soil geochemistry and that of the MMI geochemistry. The MMI high anomaly values surround this gossan. It appears that the area is a potential area for a fault-related mineralization, because high anomaly values run parallel with a north striking fault to the north of the gossan zone.

The west side of Line A, Line B and Line C is also potential area for the fault-related mineralization because several gossan zones occur and zinc anomaly values run parallel with a fault.

4-3 Geophysical Survey

4-3-1 Location and Amount of Survey

Ten survey lines are set in the Mae Kanai area. Each line is 2 km length with the E-W direction, i.e. total length of survey lines is 20 km.

Table II-4-1 Survey amounts of IP survey in Mae Kanai Area

Phase	Length	Number of lines	Number of points
Second Phase	20.0km	2.0kmx 10 lines	222

4-3-2 Result of the survey

The result of IP measurement and the 2-D analysis are shown in II-4-4 and II-4-5.

The apparent resistivity of this area ranges from 35 to 5486Ω·m, and the chargeability shows a maximum of 53mV·sec/V. As for the distribution of apparent resistivity, it shows different distribution from Line A to C, and from Line D to J. The distribution of apparent resistivity from Line D to J show the same pattern, and the resistivity structure extends N-S direction. The low apparent resistivity distributes N-S direction, which center is station 600, and this distribution is coincident with that of alluvium in geologic map. Both sides of alluvium, shale and sandstone are

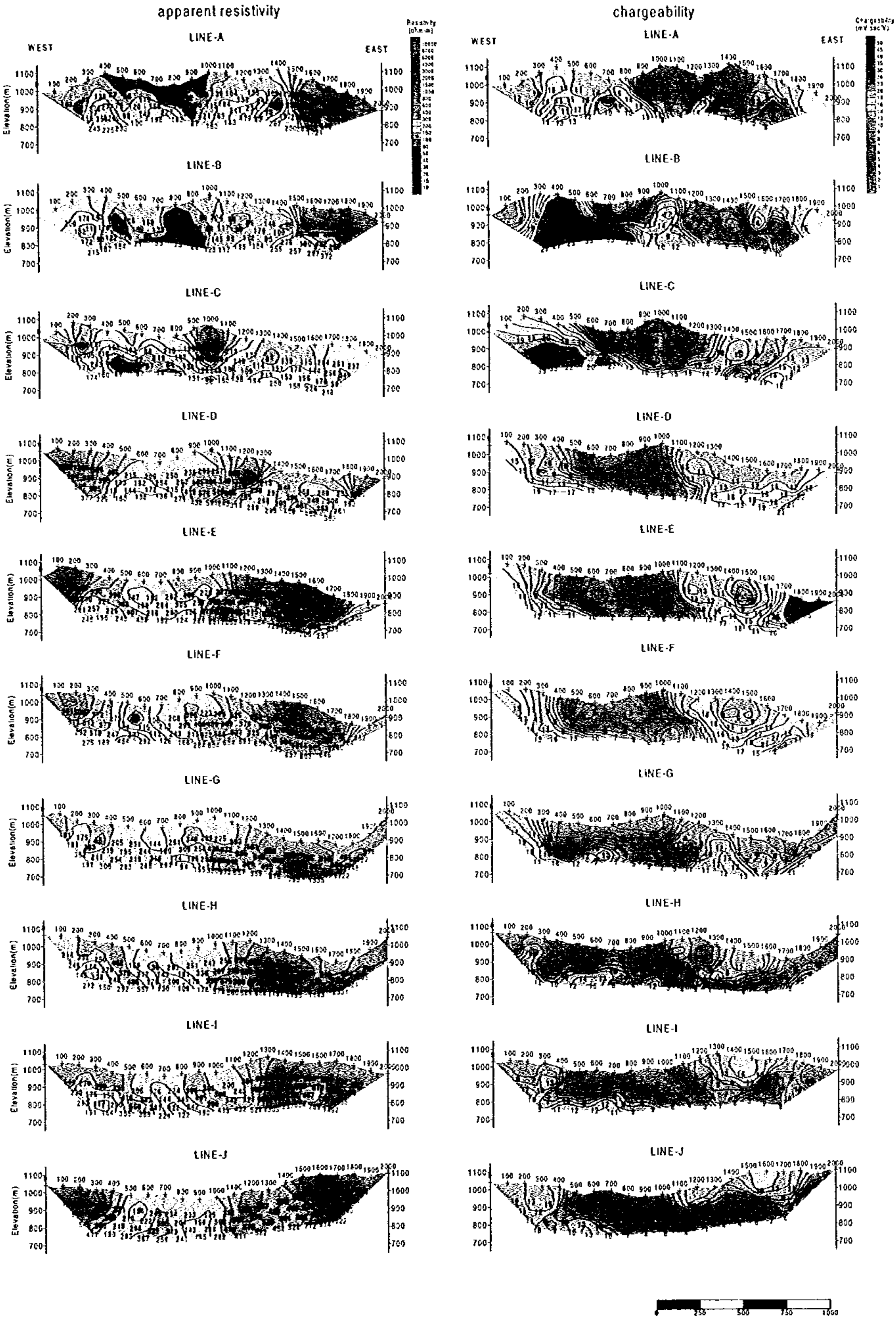


Fig.II-4-4 Pseudosection of apparent resistivity and chargeability of the Mae Kanai area

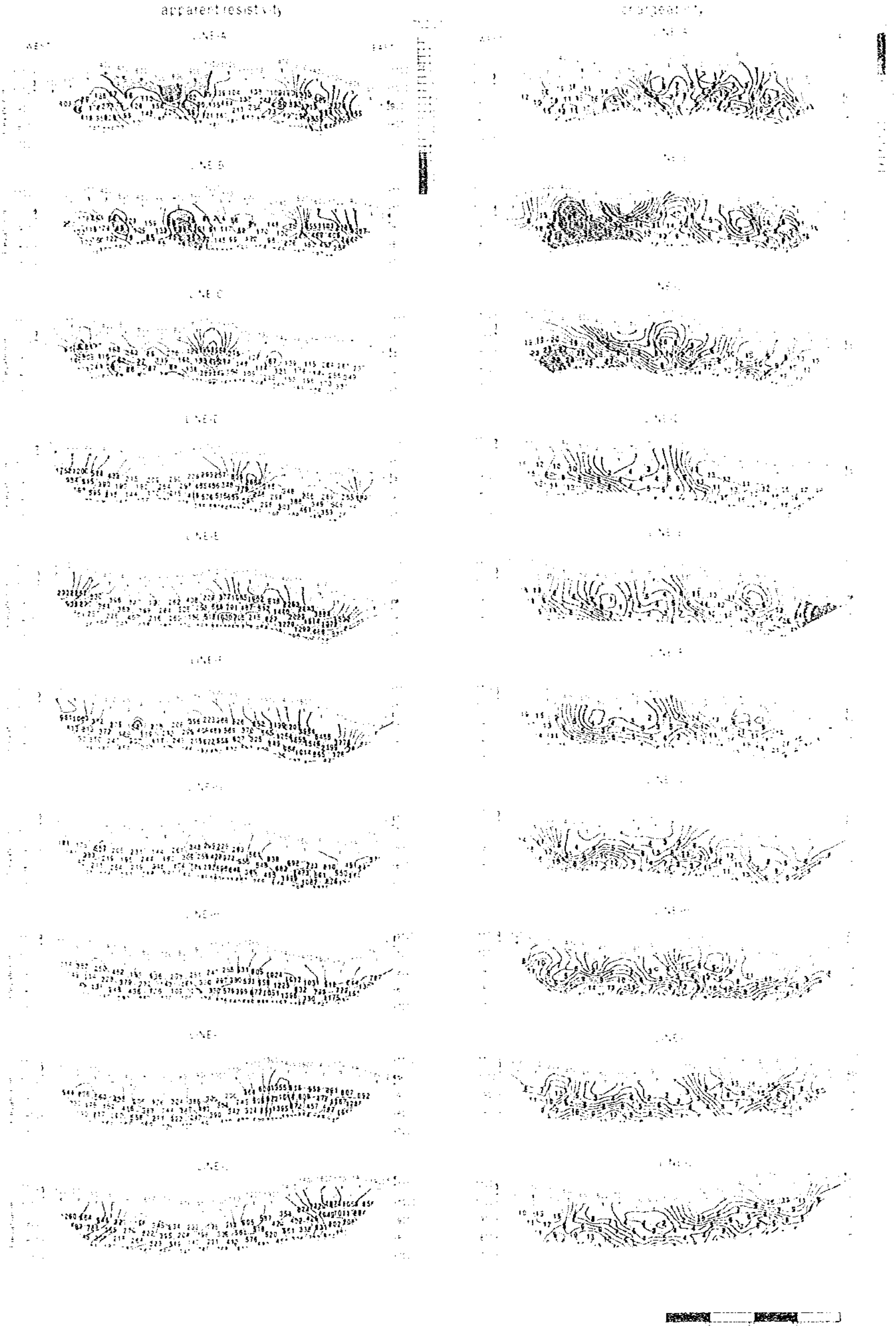


Fig.II-4-4 Pseudosection of apparent resistivity and chargeability of the Mae Kanai area

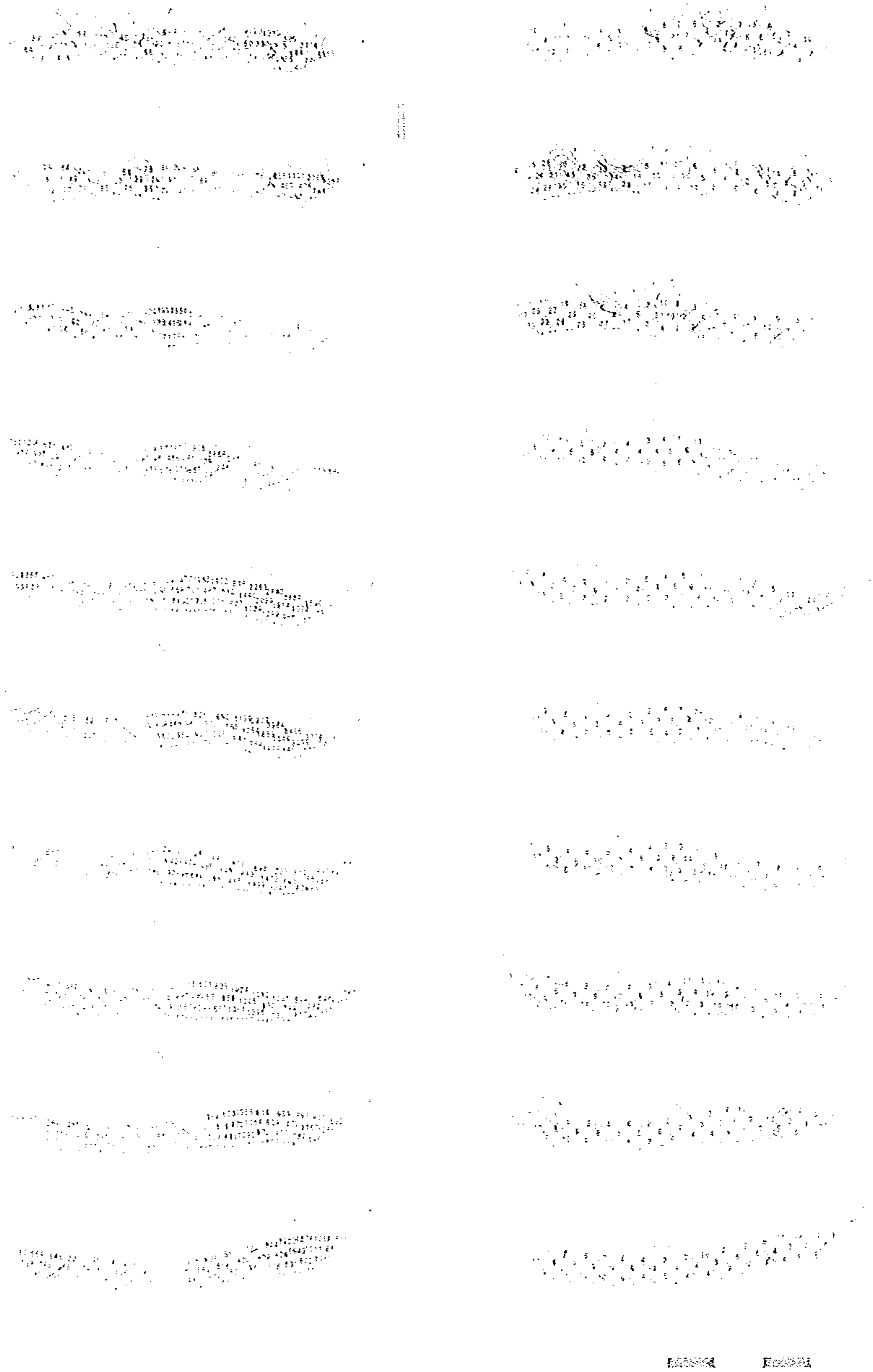


Fig. II-4-1 Pseudo-section of apparent resistivity and chargeability of the Mae Kanu area

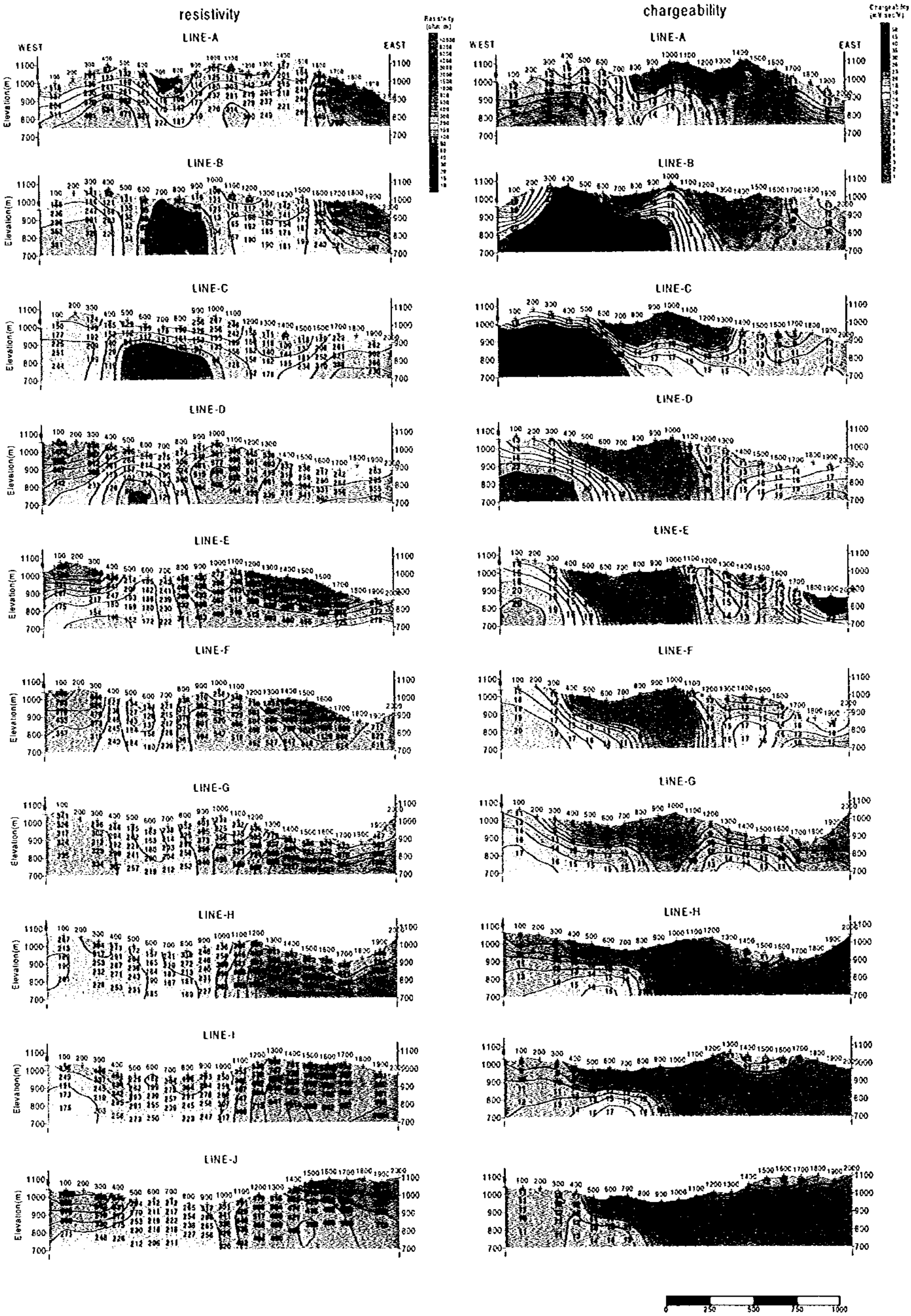


Fig.II-4-5 Results of model simulation of the Mae Kanai area

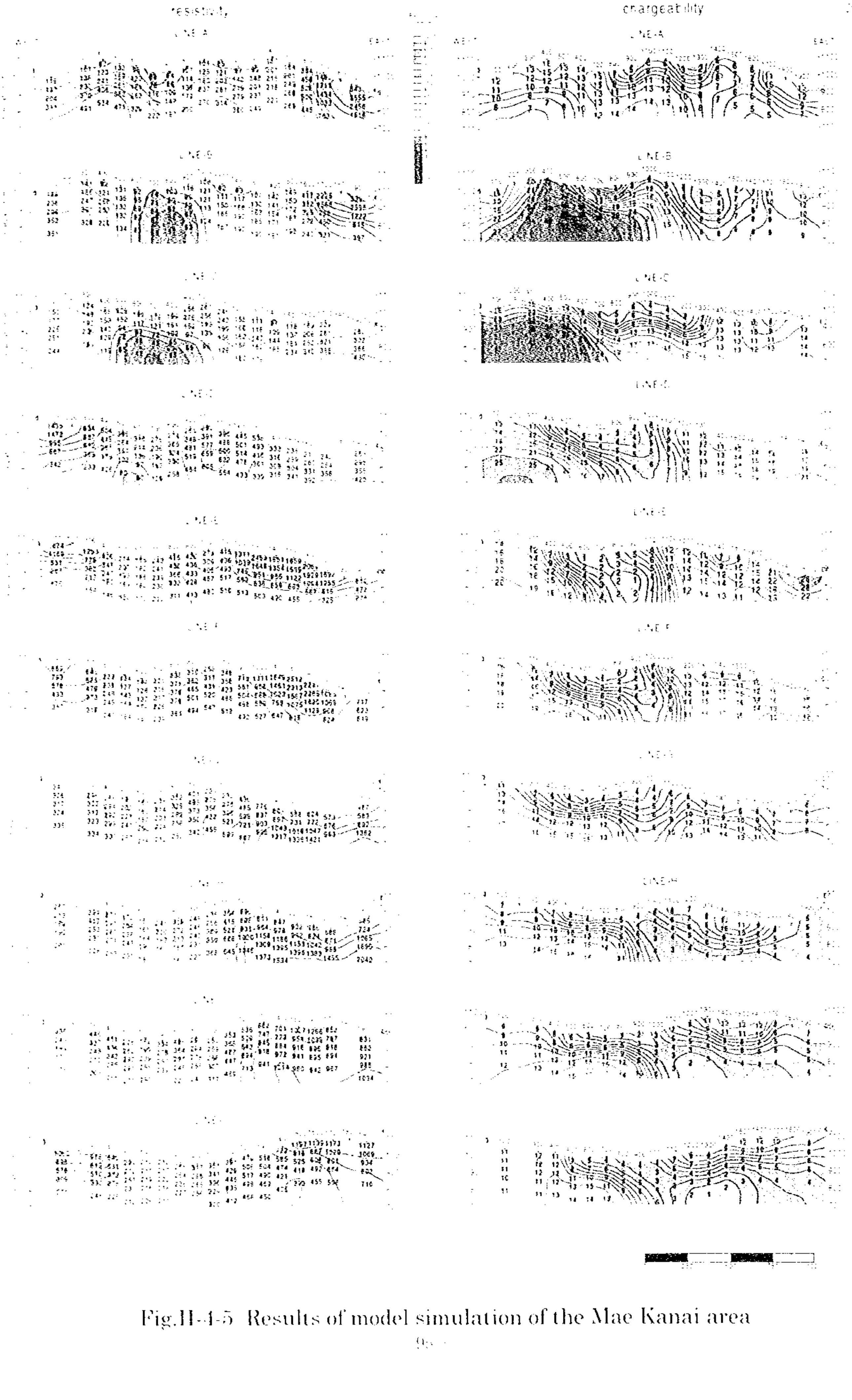


Fig.II-4-5 Results of model simulation of the Mae Kanai area

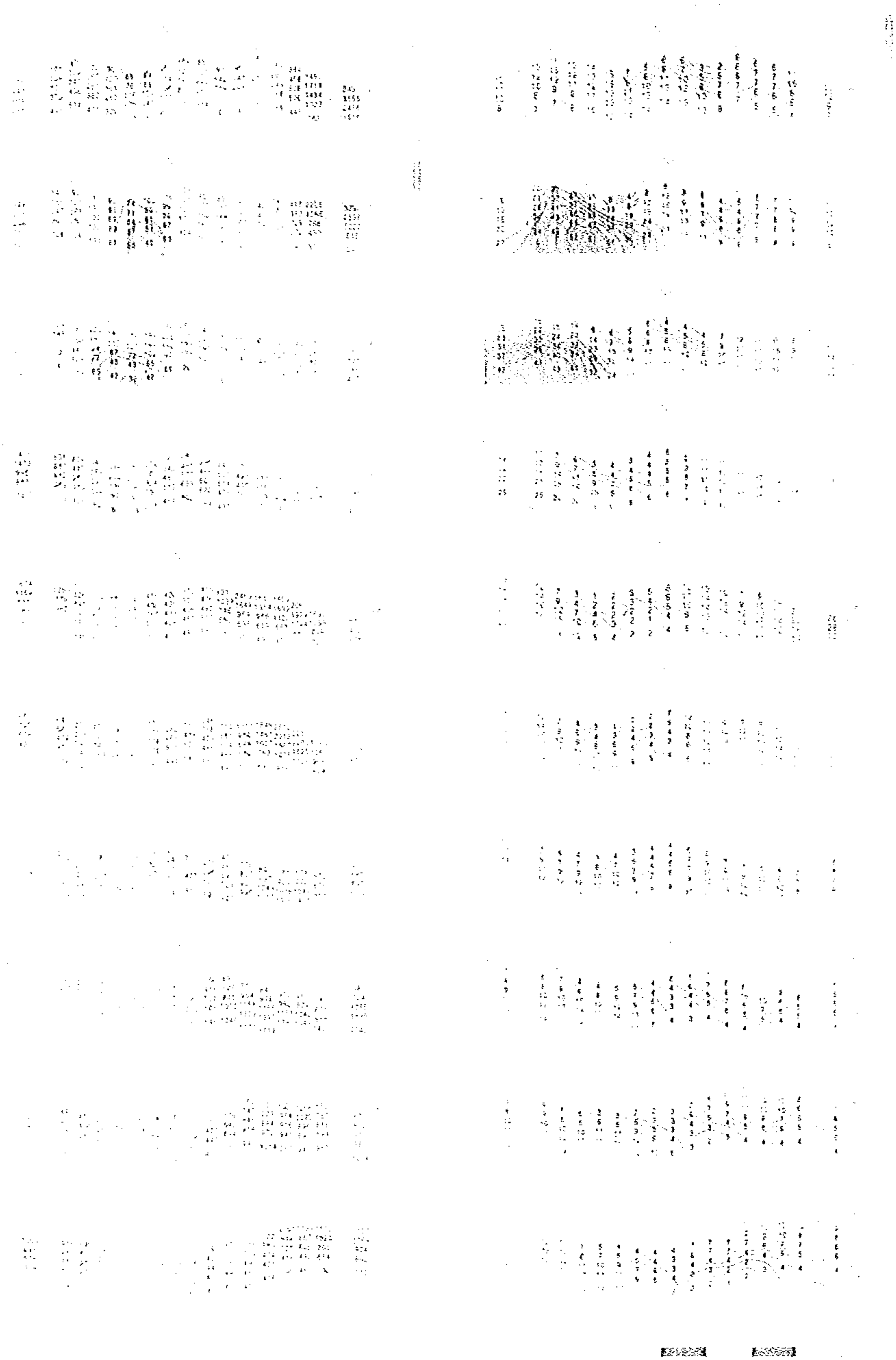


Fig.II-4.5 Results of model simulation of the Mae Kuang area distributed, and the apparent resistivity shows relatively high value. The low apparent resistivity distributes widely from Line A to C. As for the chargeability, the high value part distributes widely around station 500 of Line B. Also, the chargeability shows relatively high value at the east end of Line E.

In Fig.II-4-6, it is displaying the low apparent resistivity part (less than 150Ω·m), the high chargeability part (more than 15mV·sec/V) from the plan map of N=1. Also, it is displaying the faults and the mineral occurrences from the geologic map.

The low apparent resistivity distributes widely at Line A and B in the north part of survey area. This low apparent resistivity extends from station 1000 of Line B to station 1600 of Line C along the fault. The gossan occurrence is located near station 1600 of Line C. Also, the apparent resistivity shows low value from station 500 of line A to station 500 of Line C along the N-S fault. The low apparent resistivity from station 500 to station 600 of Line F are located in the alluvium, and it is supposed that there is no relation to mineralized zone.

The high chargeability zone is divided into two parts. One part is around the gossan and the N-S fault near station 300 of Line A and Line B, this high chargeability part extends to station 300 of Lime F. The mineral occurrence of magnetite is located near station 100 of Line F and this anomaly is related to this mineral occurrence, but it is located out of the survey area, then the details are obscure. The other part is from station 1800 of Line D to station 1800 of Line F, and the gossan is located around the high chargeability part, but this part is not coincident with the mineral occurrence. This high chargeability part is smaller as the depth increase. There are several small anomaly parts, but there are not coincident with the mineral occurrence.

As the result of 2-D analysis, the resistivity discontinuity is seen along the N-S fault from Line A to Line C, the low resistivity distributes at the east part of this discontinuity. The chargeability shows highest value near the station 500 of Line B, and the center of the high chargeability is shifting to the west compared with that of Line B.

As the results of these data, it is supposed that the promising part is around station 500 of Line B. In this part, the resistivity shows low value and the chargeability shows high value. Also, this part is around the fault and near the mineral occurrence, then this anomaly is related to the mineralized zone.

4-4 Drilling survey

4-4-1 drilling work

In the Mae Kanai area, MJTM-7 hole was planed to grasp an ore deposit and its mineralization type in the high IP anomaly area based on the result of the Phase II IP exploration. MJTM-8, MJTM-9 and MJTM-10 were planed to clear beneath the gossan zone of 0.3~0.8% Zn content and beneath the geochemical anomaly zones of Zn, Pb surrunding the gossan zone.

A drilling team consists of one operator and 3 to 4 workers per shift and the drilling is 24 hours by two shifts as a rule except mobilization, assembling, dismantlement and withdrawal.

The drilled four sites are shown in Fig.II-4-7.

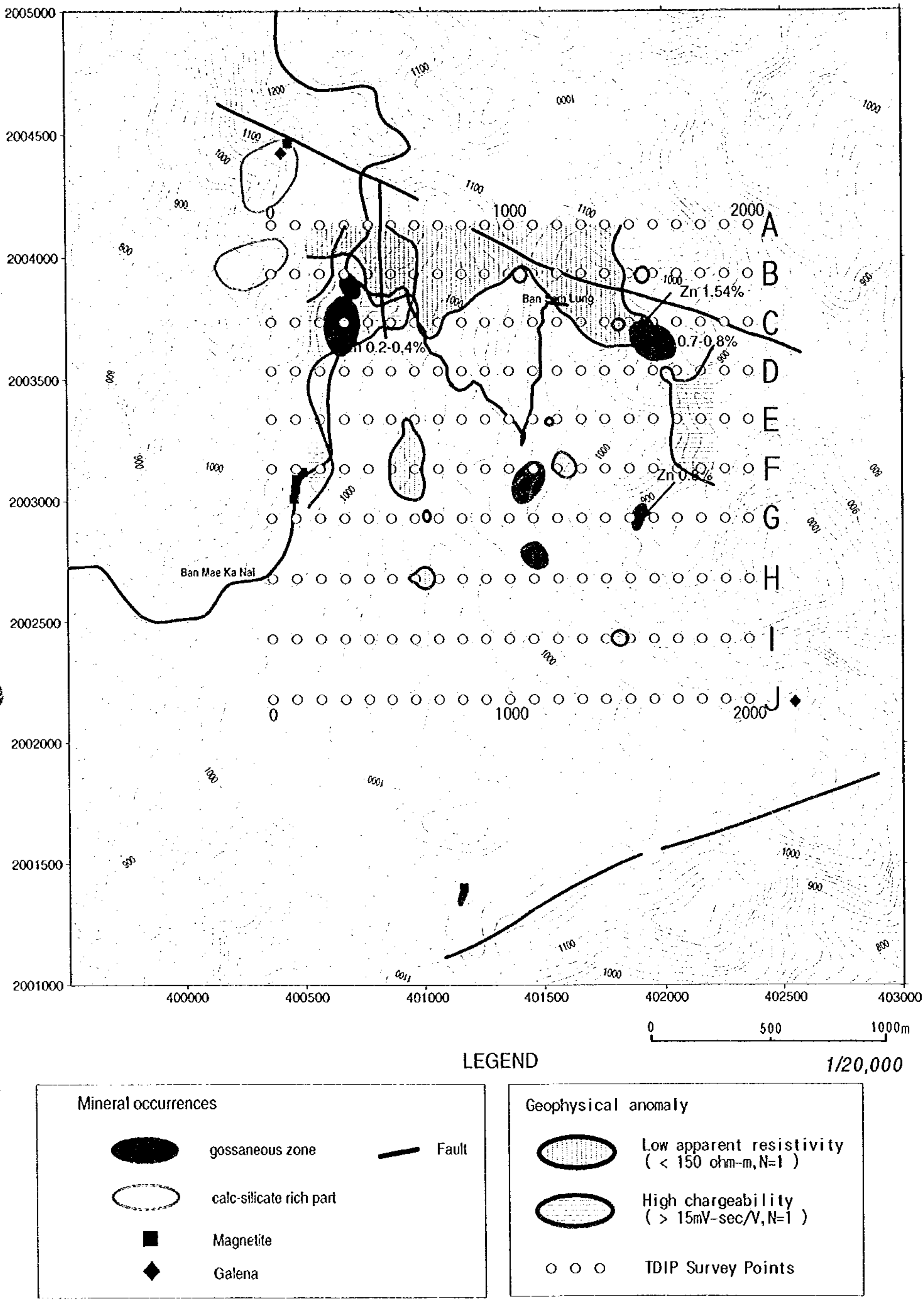


Fig. II-4-6 Integrated plan map of the Mae Kanai Area

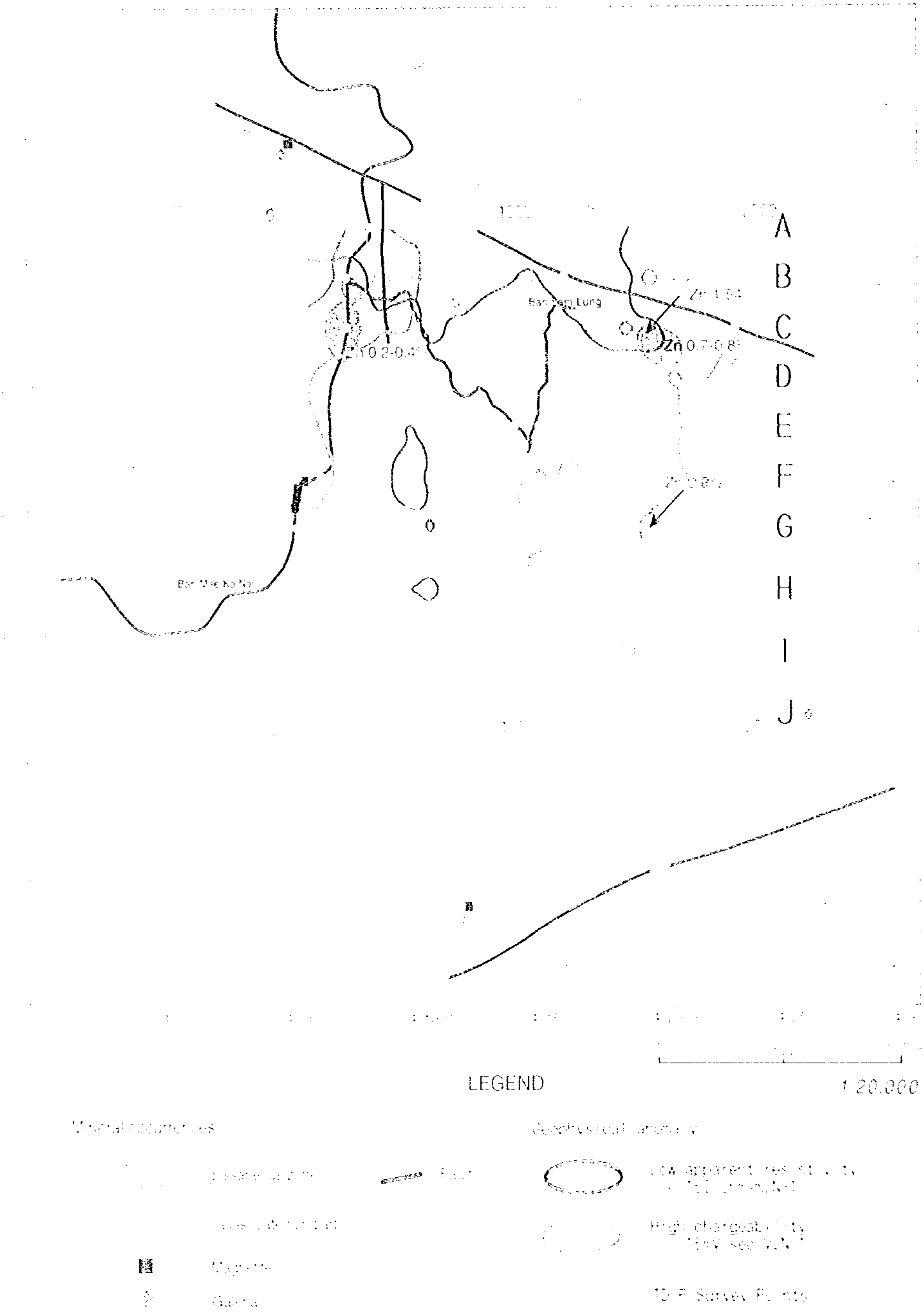


Fig. II-4-6 Integrated plan map of the Mae Kanai Area

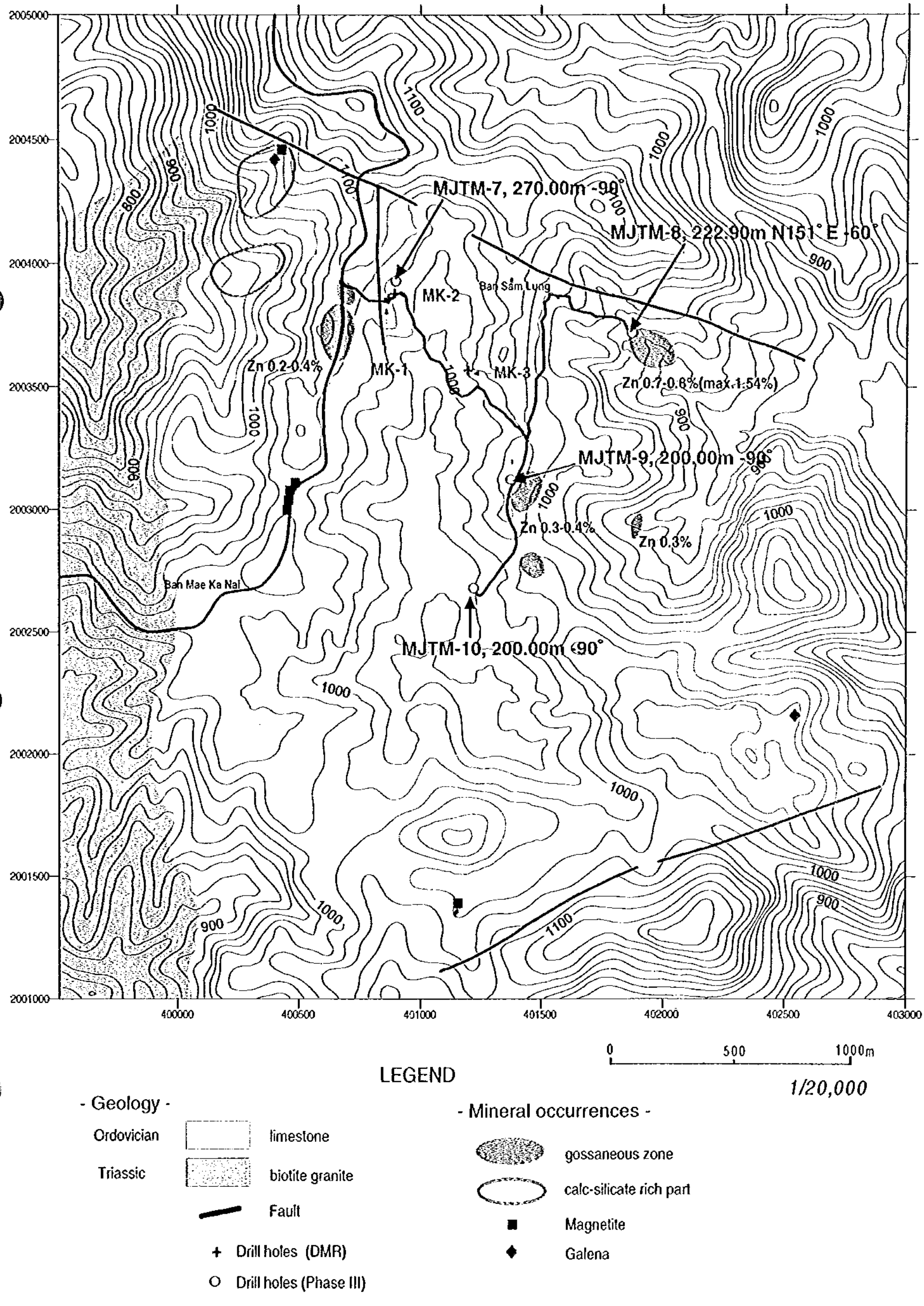


Fig.II-4-7 Location map of drill holes in the Mae Kanai area

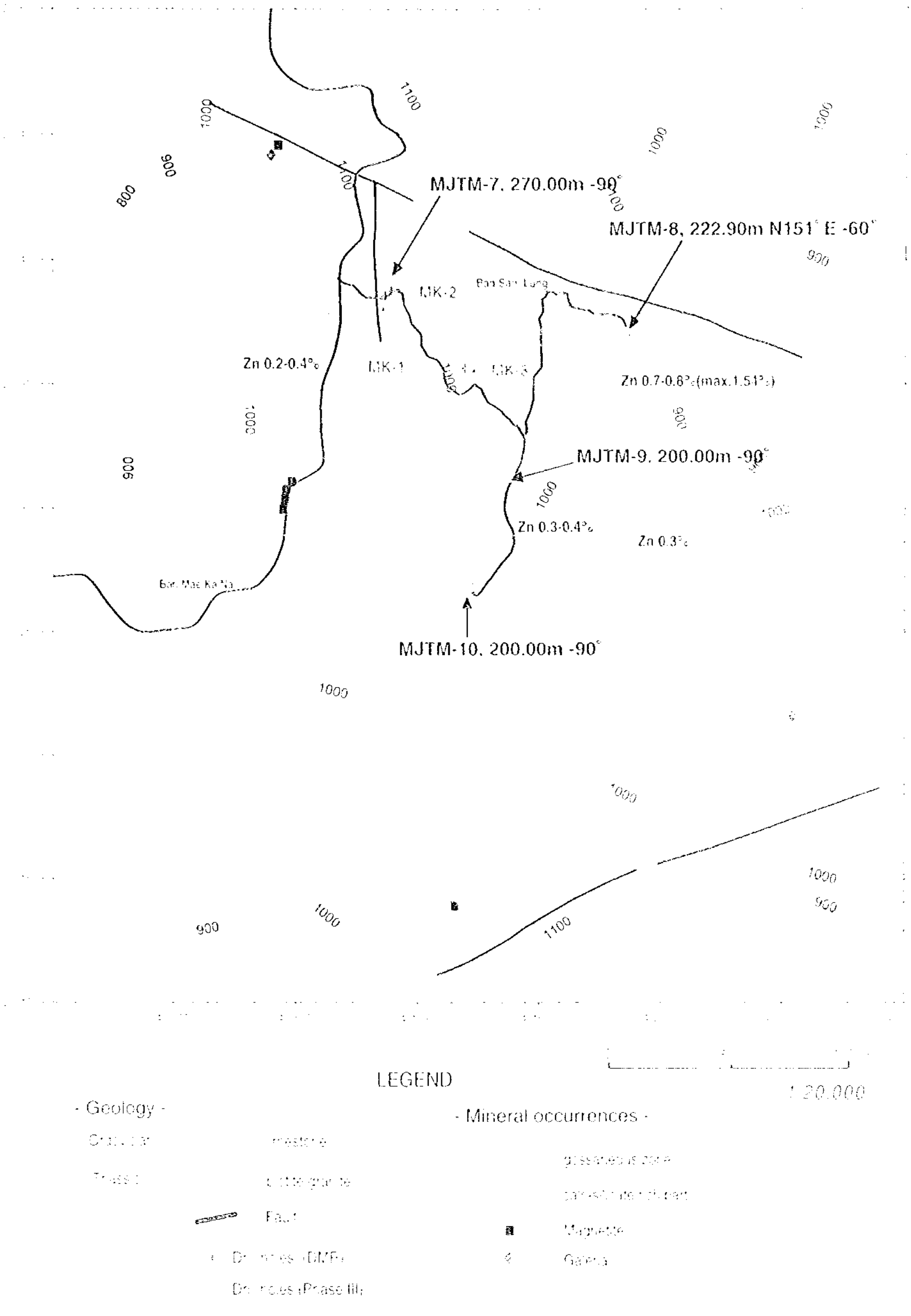


Fig.II-4-7 Location map of drill holes in the Mae Kanai area

4-4-2 Drilling method and used drilling machines

The drilling is carried out by a wire-line method using two size bits of HQ, NQ. The drilling was planed to that NQ is final bottom bit size, but the truth is that it was used properly by the rock condition and rock quality.

For protection of loss circulation and wall sloughing, we prepared sufficient casing pipes and cased off it to drilling hole.

Three using drilling machines were the VK-600 of the Australian Vilkens Keo Ltd., the MPR-3 of the Drillcorp South East Asia Ltd, and the LY-44 of the Longyear Corporation

4-4-3 Consideration

MJTM-7 Hole was excavated as a target of the highest IP anomaly in the Mae Kanai area(fig.II-4-8). In this hole, the surface soil and reworked soil along the swamp were distributed from the land surface to the depth of 4.20 m, and Ordovician fine-grained sandstone was distributed up to the depth of 8.60 m. In the depths of 8.60 m or deeper, green or light green slightly skarned limestone under the influence of chloritization and epidotization was distributed, and in the depths of around 120 to 140 m it existed surrounding mudstone and white unaltered limestone. Silicificated zone was developed in the depths of 91-120 m and 161-239 m. In the depths of 10-50 m, pyrite dissemination was universally confirmed and small amounts of magnetite were accompanied in four sections. Also, chalcopyrite films were observed along cracks. In the depths of 50-91 m, a lot of calcite (-quartz) veins were developed in general, but their mineralization seemed weak. In the depth of 87.20 m or deeper toward silicified skarn in a lower layer, pyrite and magnetite increased accompanying small amounts of chalcopyrite. Generally, mineralization of pyrite dissemination seemed weak in silicified zones, and in the depths of around 94 m existence of quartz vein was confirmed accompanying sphalerite. In the crashed skarn limestone distributed in the depths of 127.40-143.00 m, existence of a relatively large amount of pyrite dissemination was identified accompanying chalcopyrite. In the depth of 129 m, chalcopyrite-quartz vein existed in a width of 10 cm and 18.5%Cu was obtained as its grade. Also in the silicified zone at the depth of 174-200 m, existence of spotted chalcopyrite mineralization was confirmed. The most intensified mineralization in MJTM-7 Hole was pyrite dissemination zone existing from the depth of 239 m. However, no significant mineral showing was identifiable in this section. Near MJTM-7 Hole, there were two holes (MK-1 and MK-2) excavated for adjustment in the investigation conducted by DMR. Having examined the state of mineralization near MJTM-7 Hole including these data, we found that silicification was intensified in the nearby layer in the depth of 100 m or lower and that quartz vein was developed accompanying pyrite dissemination and chalcopyrite. From the result of IP investigation conducted in the second year, we observed a high possibility that the area with high IP anomaly near MJTM-7 Hole might have been distributed extending in the north-northeastern to south-southwestern direction and that the state of the above distribution might have been in conformity with the state of distribution of the silicified zone and pyrite dissemination zone. In other words, the area with high IP anomaly

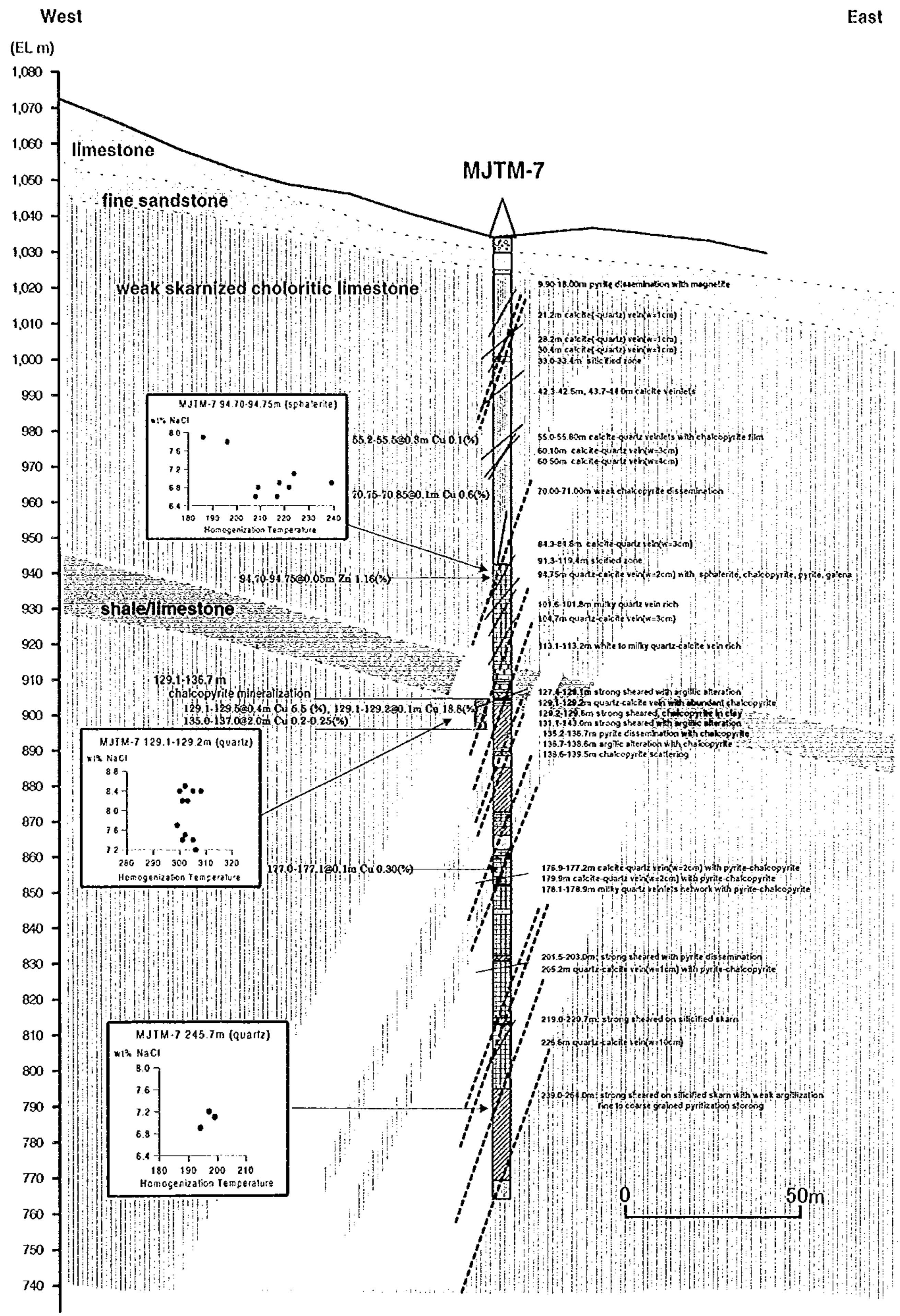


Fig.II-4-8 Geologic profile of MJTM-7

is presumed to represent the pyrite-chalcopyrite mineralized zone accompanied by the silicified zone and quartz vein. From the result of fluid inclusion test conducted in MJTM-7 Hole, the homogenized temperature near copper mineralization zone developed in the center of the said hole was 300-310℃, and mineralization of sphalerite existed in an upper layer is assumed to have been generated in temperatures of 180-230℃. Salinity of ore solution was constantly high, i.e. 6.8-8.4 wt% at times of both high and low temperatures.

MJTM-8 Hole and MJTM-9 Hole were excavated to grasp the state of mineralization of the lower gossan zone with high zinc content which was distributed on the land surface.

In MJTM-8 Hole, gossan was distributed in three thick and thin layers in alternation strata of sandstone and shale(Fig.II-4-9). Gossan mostly consisted of limonite, but relic mineral of pyrite was observed in part. Zinc contents of gossan obtained were 1.3% in the depths of 1.60-6.00 m and 0.5% in the depths of 10.25-11.95 m. The sedimentary rocks near the gossan toward the depth of 20 m were under strong hydrothermal alteration, and generation of chlorite, sericite and talc was observed. In the depths of 20-80 m, alternate layers of dolomite and siliceous shale were distributed. In this section, in addition to pyrite dissemination in general, only slight chalcopyrite dissemination was observed in brecciated and pulverized dolomite in the depths of 40.60-40.80 m. In the depth of 80-134 m, intensified foliated brecciation and disintegration were observed, and this was considered as a new fault zone and no mineral showing was accompanied. In the depth of 134 m or lower, two silicified zones existed, but no remarkable mineral showing was observed. However, small cracks in vertical directions were well developed in general, and pyrite and limonite were generated along the cracks. This indicates that ore solution that generated gossan may have risen in a lower part of gossan. From the liquid inclusion test conducted near copper showing in MJTM-8 Hole, low homogenization temperatures of 100-190℃ was obtained, and salinity were divided into two groups of 2.5% and around 8%.

In MJTM-9 Hole, thick layer of weathered soil was distributed and reaching the rock in the depth of 20.20 m(Fig.II-4-10). In the depths of 20.20-40.05 m, sandstone and shale were dominant, both being argillized because of hydrothermal alteration. In the depths of 34.35-35.10 m, gossan zone was distributed where cracks in brecciated mudstone were filled with limonite. Silicification, quartz vein and slight argillization were observed in the upper part of the gossan zone consisting of alternate layers of sandstone and mudstone. In its lower part, altered clay was distributed consisting of talc, smectite, sericite and chlorite. In the depths of 44 m and lower, no conspicuous alteration or mineral showing was observed except distribution of dolomitic limestone, argillaceous dolomite and dolomite as well as some portion of pyrite dissemination. In the areas surrounding quartz-galena vein and porous alteration under intensified alteration of oxidized shear zone accompanying a lot of gravels, tendency of intensicied pyritization was observed.

MJTM-10 Hole was excavated to identify the state of mineralization in the lower part of geochemical anomaly in zinc through soil geochemical exploration (of conventional method, MMI methods). In MJTM-10 Hole, limestone, alternate layers of limestone and dolomite, mudstone,

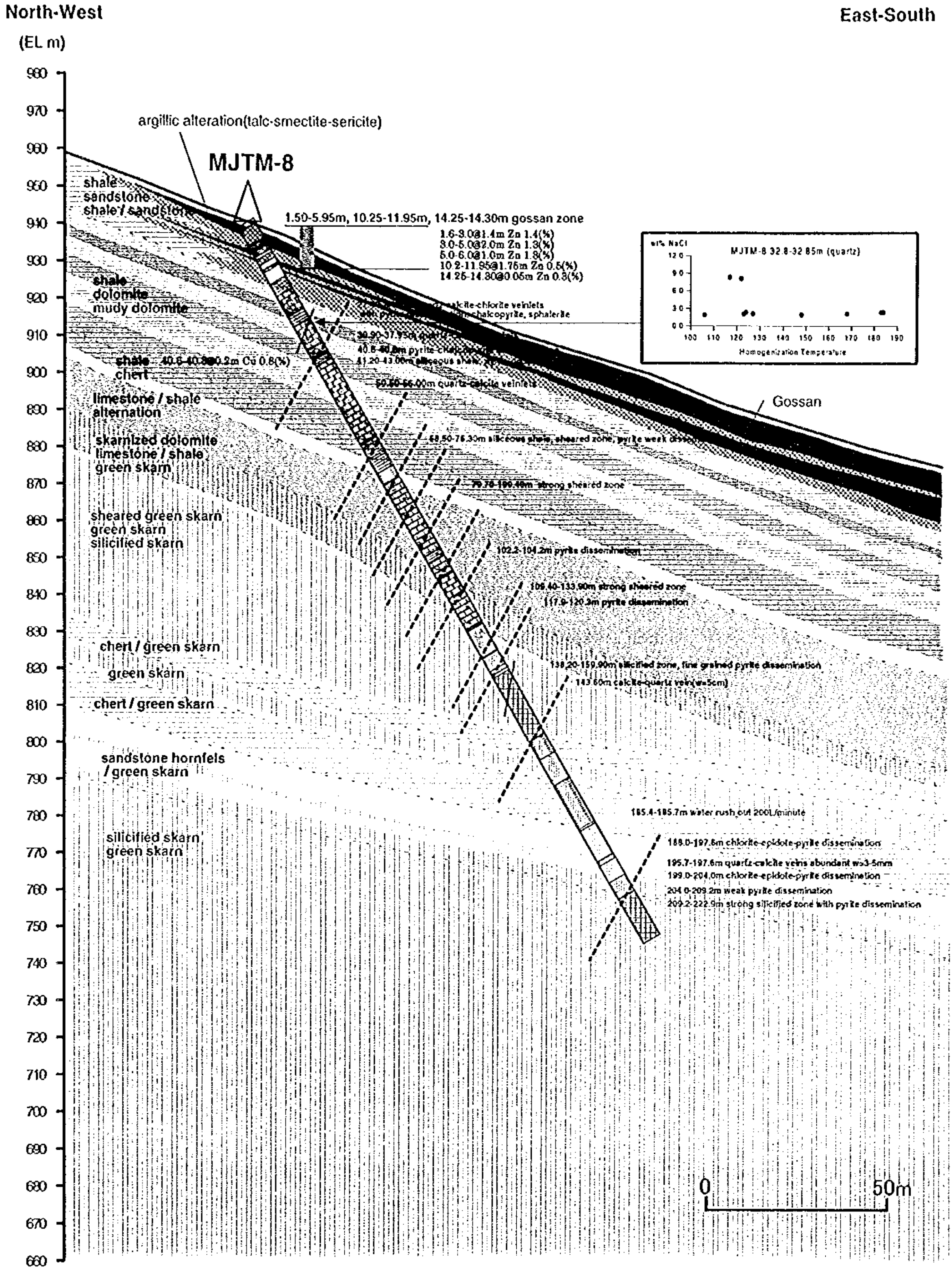


Fig.II-4-9 Geologic profile of MJTM-8

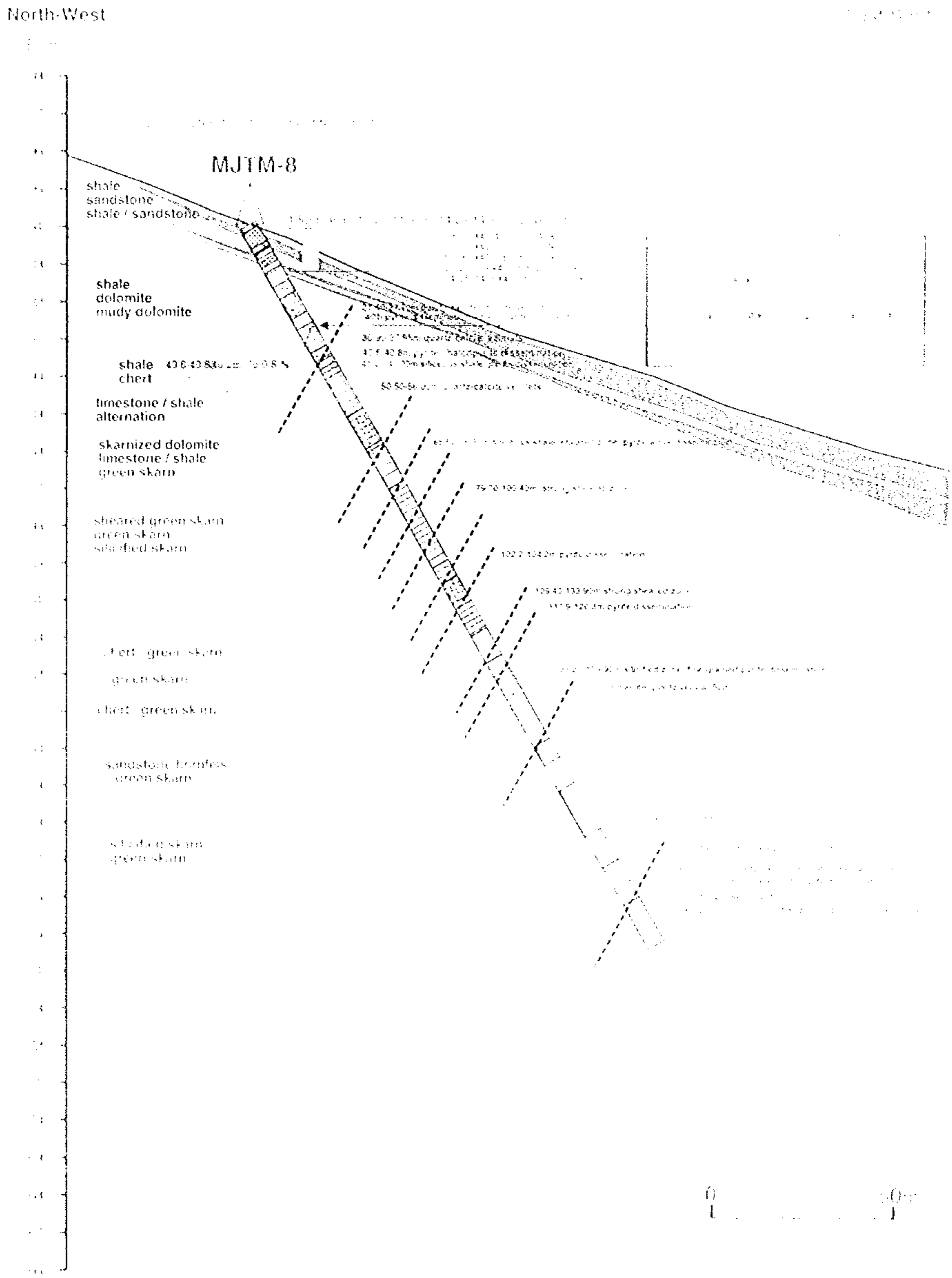


Fig.II-1-9 Geologic profile of MJTM-8

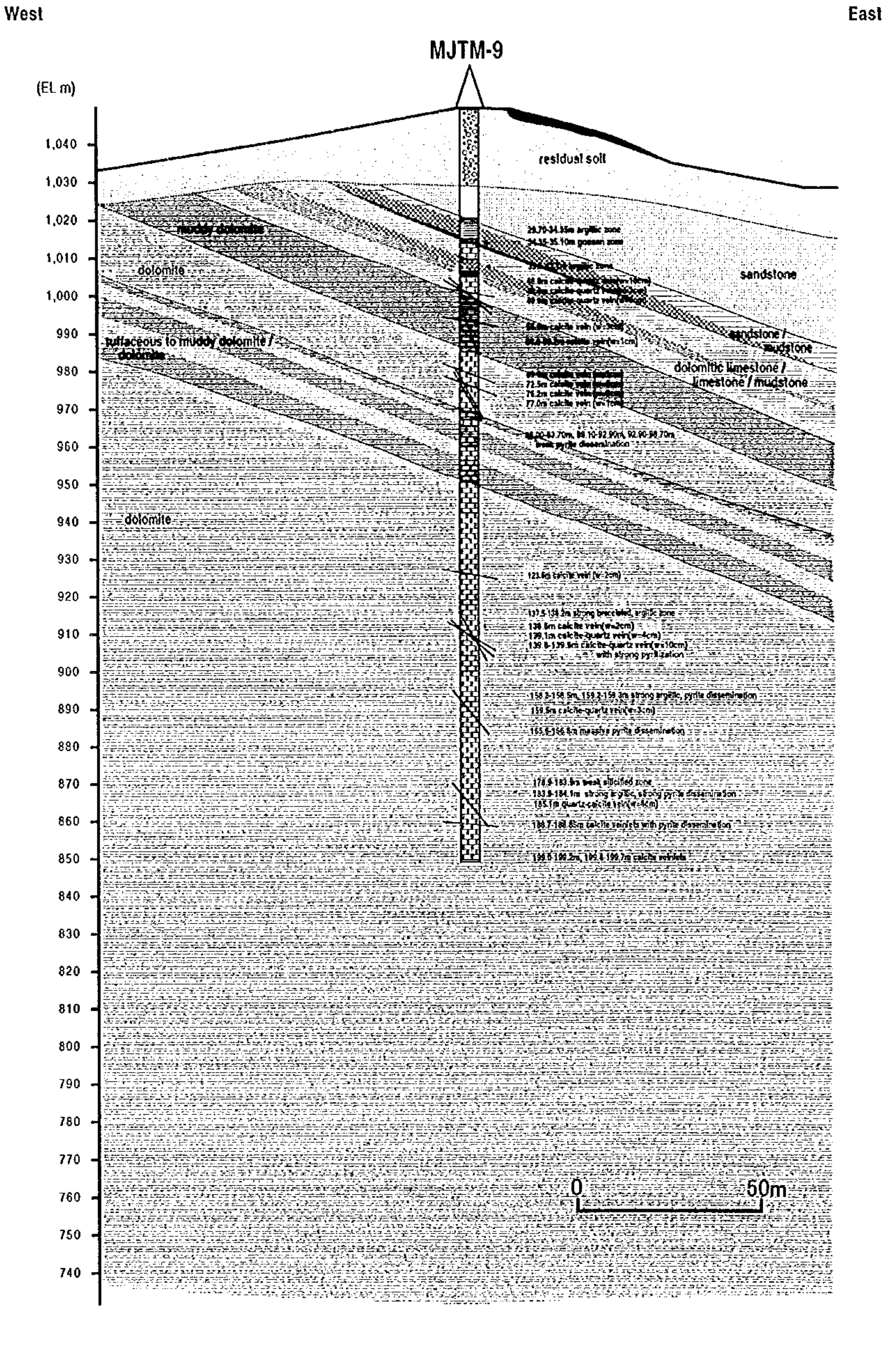


Fig.II-4-10 Geologic profile of the MJTM-9 and dolomite were distributed from upper to lower parts(Fig.II-4-11). Mineralization was weak in general. In front of and behind the shale in the depth of around 56.2 m, galena dissemination and quartz containing galena were observed. The grade obtained were 0.9%Pb in the 50 cm section and 1.3%Zn in the 30 cm section. Concerning the quartz vein in the section of 10 cm, 5.0%Pb and 0.3%Zn were obtained. Further, large-scaled pyrite dissemination was observed in the intermediate mudstone. In MJTM-10 Hole, on the other hand, a lot of alteration zones were seen not accompanying metallic ore but considered to have been a passage for ore solution. They were either porous alteration accompanying oxidation or brown carbonate mineral vein, which are often seen in the western part of Dong Noi area. Also, quartz-galena veins were frequently developed. Surrounding these alterations and vein, conspicuous graveling was observed indicating a proof that strong hydrothermal activities took place.

4-5 General Discussion

MJTM-7 Hole in the Mae Kanai area was excavated to check and confirm the state of mineralization associated with the highest IP anomaly, which was found in the district. In MJTM-7 Hole, remarkable pyrite dissemination and silicification were observed in the middle part, accompanying chalcopyrite showing. Chalcopyrite was the most prevailing in the depth of around 129 m. By referring to the results of DMR's surveys conducted in the past on MK-1 and MK-2 which were located near MTJM-7 Hole, the silicificated zone in MTJM-7 Hole accompanying pyrite was assumed to be extended in the NE-SW direction which was the same as the plane direction of IP anomaly extension, and we presumed that the silicificated zone represented a mineralized zone of hydrothermal type which had been formed along fractures running in the same direction as referred to above.

Based on the result of our survey conducted in the second year, we presumed that the gossan zone in the Mae Kanai area might have been extended in a vertical direction. Consequently, MJTM-8 Hole and MJTM-9 Hole were excavated to check and confirm the state of mineralization occurred in lower layers of the gossan zone. As a result of our investigation on the two holes, we found that the gossan zone was distributed almost along the land surface in thickness of more than 10 meters, and we confirmed that no remarkable mineral showing existed in the lower layers. The gossan zone was distributed between argillized mudstone and/or sandstone. Originally it was a massive sulfide mineral, abundant with pyrite and accompanying sphalerite. However, pyrite may have been oxidized and changed to limonite through weathering, while sphalerite may have been dissolved and flew out. The sedimentary rocks near the gossan were under intensified argillization of talc-sericite-chlorite-smectite especially on its lower wall. In MJTM-9 Hole, silicificated zone in the form of hydrothermal breccia and quartz veins were observed accompanying white argillization on the wall above the gossan zone.

The present gossan zone was distributed only along the surface ridge and on a slow eastern slope. Based on the fact that the bedding plane of this district was a slow slope inclined to the east as well as on the result of our drilling, the gossan zone is considered to have been formed a

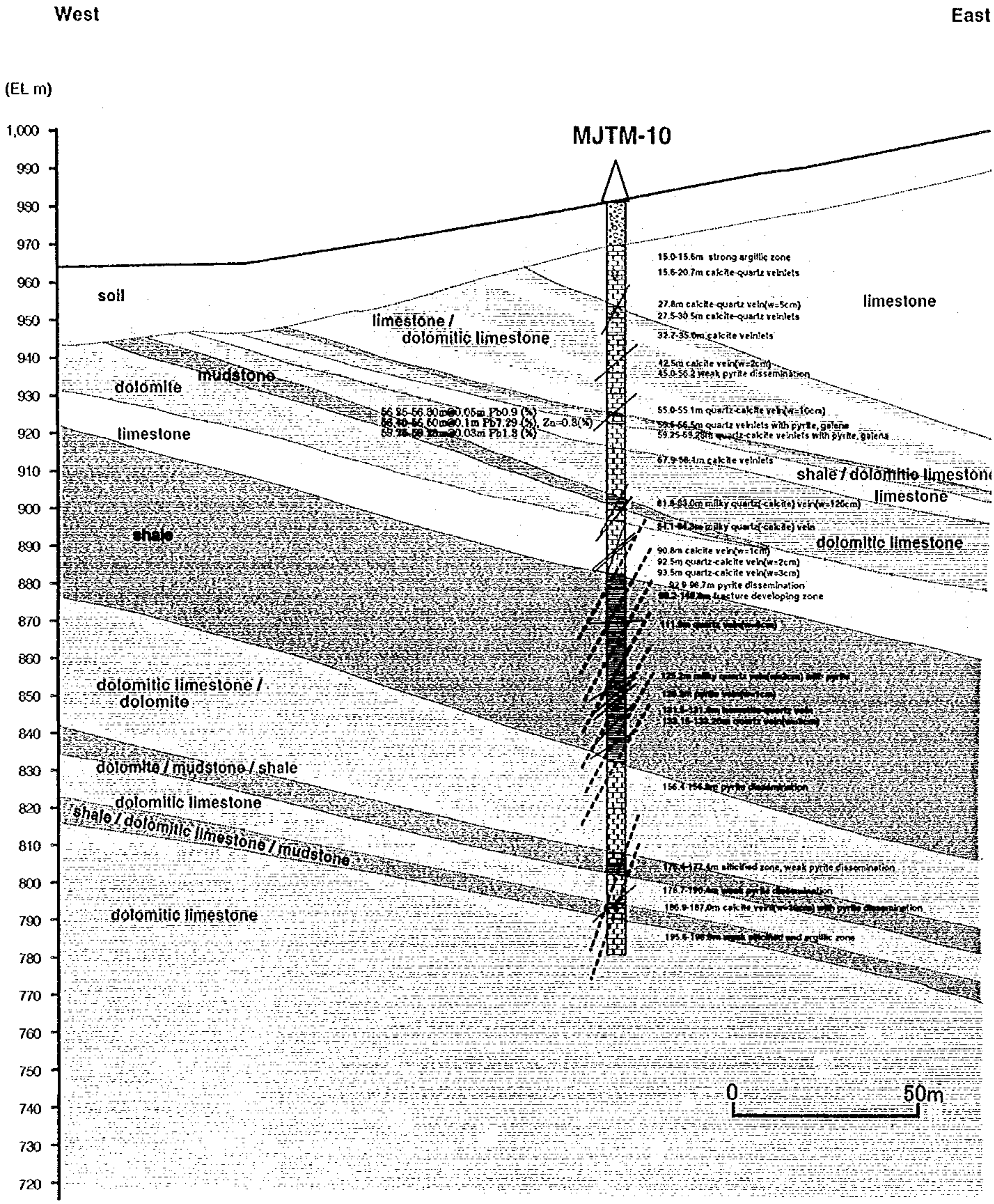


Fig.II-4-11 Geologic profile of MJTM-10

few to fifteen meters away from the border between limestone and general sedimentary rocks toward sedimentary rocks or on the border in some part and that the upper phase of the zone was almost in conformity with the land surface. No clear sign of mineralization was observed except for the quartz-calcite veins and slight dissemination of pyrite in lower layers of the gossan zone. In MJTM-9 Hole, the degree of dolomitization was very low. In view of the fact that gossan zones occur almost on the same level, we judge that the gossan, which occurred in sedimentary rocks, has been formed along a specific horizon of sedimentary rocks. From this we consider that in the district surrounded by MJTM-8 Hole, MJTM-9 Hole and MK-3 Hole, the horizon on which gossan occurred is under the land surface. Therefore, we note a high possibility of the gossan zone being hidden under the land surface. In the eastern side of MJTM-9 Hole especially in the area where silicificated zone was extended, it is quite possible that that gossan should exist underneath the silicificated zone. However, since no IP anomaly was grasped, there is little possibility of its being sulfide mineral. Further, in the east end of the profile lines E and D for geophysical exploration, the district with IP anomaly was distributed inclining to the east right beneath the land surface. Since this district corresponds to the extension of the gossan zone which was distributed in MJTM-8 Hole, we presume that massive sulfide mineral may possibly exist under the land surface (see Fig. II-4-12).

MJTM-10 Hole and MK-3 Hole of DMR were excavated to grasp the state of mineralization in lower layers of the district with geochemical anomalies of zinc, lead and copper. In both holes, existence of mineral showing such as galena and galena dissemination accompanied by quartz vein was observed. Further, strong oxidization was observed in MJTM-9 Hole, and a lot of porous and coarse silicificated zones in light brown to orange colors were identified. Since they frequently show brecciated texture, there is a high possibility of their having been the passage for predominant hydrothermal ore solution.

Fig. II-4-13 shows a mineralization model of the Mae Kanai area. From the results of our fluid inclusion tests in MJTM-7 Hole and MJTM-8 Hole, it was clarified that ore solution with high salinity was involved in mineralization also in the Mae Kanai area. A rather high value of 300℃ was obtained as the homogenized temperature of chalcopyrite-quartz vein in MJTM-7 Hole. The homogenized temperature of sphalerite-quartz vein observed in upper layers was 190-240 ℃, while that of lower layers of the gossan zone in MJTM-8 Hole was 105-185℃ which was near the homogenized temperatures of epithermal to mesothermal deposits. Based on the fact that the original sulfide ore body had been formed in replacement with a specific stratification which was nearer to the general sedimentary rocks from the border between limestone and mudstone/sandstone, we presume that these hydrothermal ore solutions rose along old fractures and fissures of silicificated zones and quartz veins identified in MJTM-7 Hole and porous silicificated zones in MJTM-10 Hole, and formed sulfide minerals by replacement only the specific horizon. Then, upon tilting, resumption of fault processes and land surface deprivation in the Mae Kanai area, the present space layout may have been established.

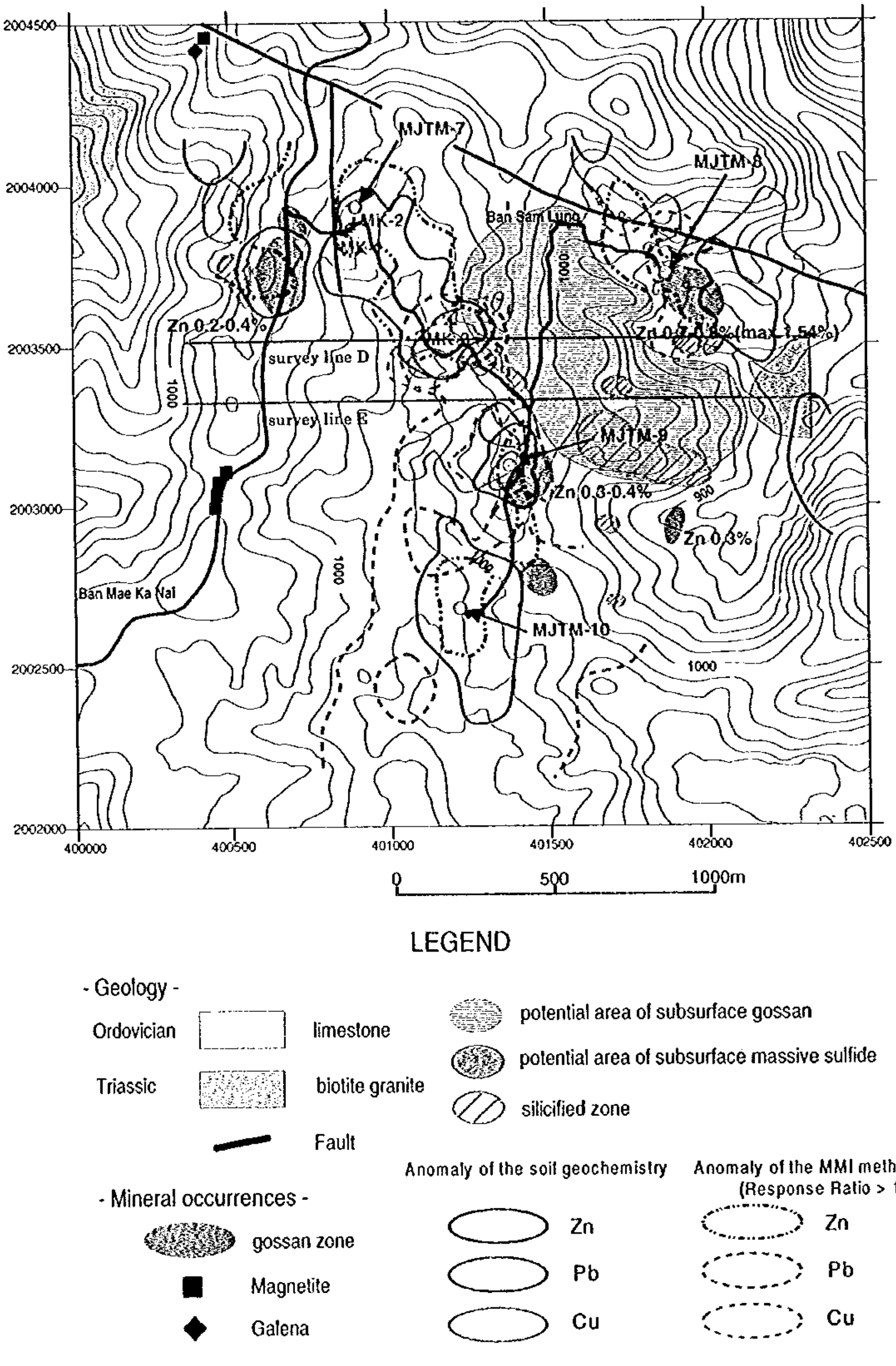
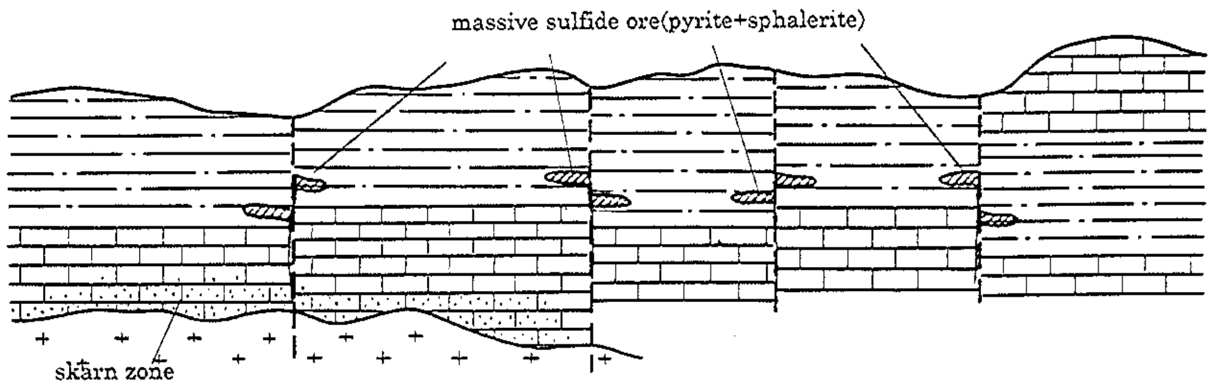
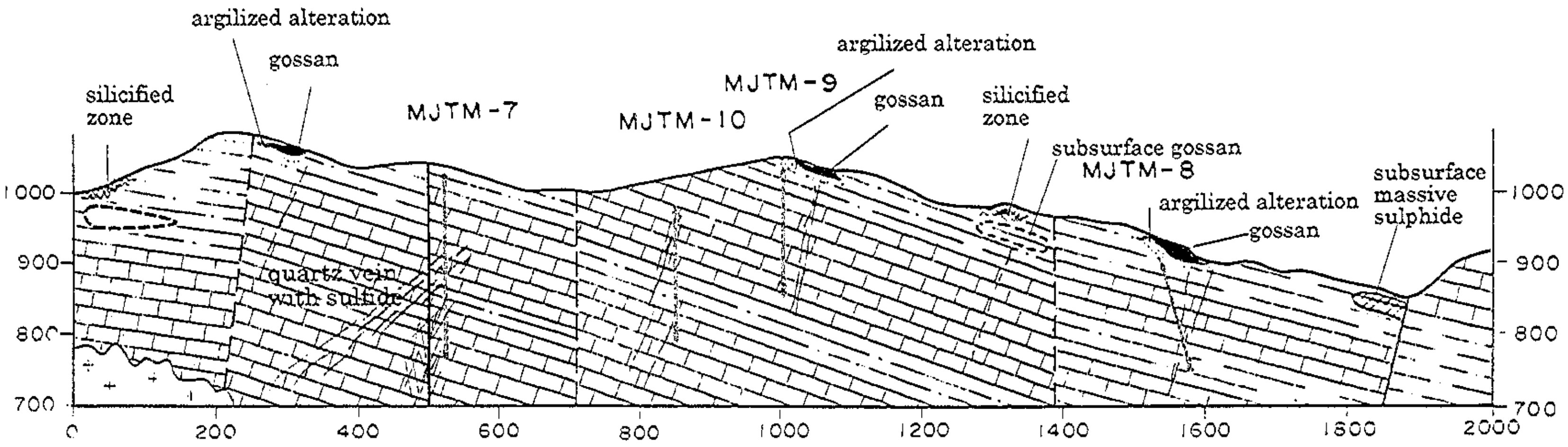


Fig.II-4-12 Potential area for subsurface gossan and massive sulfide ore



(a) primary mineralization of pyrite-sphalerite ore body



(b) mineral occurrence in the Mae Kanai area at the pesent

Fig.II-4-13 Schematic mineralization model in the Mae Kanai area