PART II DETAILED DISCUSSIONS

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CHAPTER 1 DRILLING EXPLORATION

1-1 Outline of Drilling

Drilling was carried out at three localities during this fiscal year. They are, from the north, Jabal Sujarah, the North Prospect, and the 4/6 Gossan. A total of eight holes, one, three and four holes were drilled in these localities respectively. The total length drilled was 2,152.05m as shown in the following table.

Drill Hole No.	Localities	Coordinates		Altitude	Direc-tion	Incli-nation	Drilling Length	Planed Drilling Length
MJSU-1	4/6 Gossan	N 2,617.501	E 708.478	955m	245°	-55°	251.60m	250.00m
MJSU-2	4/6 Gossan	N 2,617.686	E 708.524	958m	245°	-55°	250.00m	250.00m
MJSU-3	UAD North	N 2,619.288	E 709.596	957m	225°	-55°	250.00m	250.00m
MJSU-4	UAD North	N 2,619.582	E 709.167	958m	260°	-55°	304.25m	250.00m
MJSU-5	UAD North	N 2,619.738	E 709.148	963m	260°	-55°	346.20m	250.00m
MJSU-6	4/6 Gossan	N 2,617.812	E 708.555	964m	245°	-55°	250.00m	0m
MJSU-7	4/6 Gossan	N 2,618.171	E 708.792	956m	245°	-55°	250.00m	0m
MJSU-8	Jabal Sujarah	N 2,620.623	E 707.196	955m	25°	-70°	250.00m	0m
Total							2,152.05m	1,250.00m

UAD: Umm ad Damar

At the 4/6 Gossan, the original plan was to drill two holes MJSU-1 and MJSU-2, and further two holes MJSU-6 and MJSU-7 were added to the northeast of MJSU-2 after locating massive sulfide ores by MJSU-2. At the North Prospect, 250m-deep MJSU-4 and MJSU-5 holes were first planned to investigate the conditions of No. 2 Mineralized Zone below slag distribution area. But it was decided to simultaneously survey the downward extension of No. 1 Mineralized Zone to the west of No. 2, and the drilling depths were extended 54m and 96m respectively for MJSU-4 and 5. At Jabal Sujarah, it was first planned to carry out IP survey with 100m line intervals and TEM survey this fiscal year and to carry out drilling the following year. But the scale of the chargeability anomaly of this area was large and it was considered better to drill this fiscal year and MJSU-8 was the result.

Since the mineralized zones of the North Prospect and the 4/6 Gossan were inferred to be vertical, drilling was carried out at -55° which is the lowest inclination for a truck-mounted drilling machine. At Jabal Sujarah, the mineralized zone was considered to have low inclination from the results of the first-year surface geological survey, and the inclination was set at -70° , but MJSU-8 results showed it to be almost vertical.

Ore assay was carried out for 419 samples and contents of six elements Au, Ag, Cu, Pb, Zn, S were analyzed. The number of samples for thin section microscopy, polished section microscopy and X-ray diffractometry was 73, 27, and 28 respectively.

1-2 Kind of Ores Confirmed by Drilling

Vein-type Cu mineralization and volcanogenic massive sulfide-type Cu-Zn mineralization were confirmed by drilling this fiscal year.

The vein-type Cu mineralization formed pyrite-chalcopyrite network in the shear zones mainly in dacitic to andesitic pyroclastic rocks. Also the host rocks near the mineralized zones are strongly chloritized. The above type of mineralization was confirmed at MJSU-3, MJSU-4, and MJSU-5 of the North Prospect. Photographs of the ore from MJSU-3 and MJSU-4 are shown in Figure 2-1-1.

Volcanogenic massive sulfide-type Cu-Zn mineralization is observed at MJSU-2 and MJSU-6 of the 4/6 Gossan, MJSU-5 of the North Prospect and MJSU-8 of Jabal Sujarah. The host rocks are rhyodacitic pyroclastic rocks. The ores are divided into the following four types.

- Massive ores: Massive ores consisting of fine-grained sulfides such as pyrite, sphalerite, and chalcopyrite. Oxide and silicate minerals are almost non-existent.
- Breccia ores: Ores consisting of angular pebbles of fine-grained sulfide minerals. Pebbles are 10cm maximum and mostly less than 1cm. The matrices consist mainly of quartz and chlorite.
- Siliceous ores: Siliceous host rocks disseminated by sulfide minerals.
- Banded ores: Ores consisting of several-centimeters wide bands of fine-grained sulfide minerals and chlorite.

Photographs of drill cores from MJSU-2, MJSU-5, and MJSU-6 containing breccia ores and massive ores are shown in Figure 2-1-1.

Fig.2-1-1 Photographs of Ores

Pebbles of the breccia ores are mostly well sorted, and sedimentary structure is clear in finer-grained parts. Therefore the ores are inferred to have been transported and re-deposited.

The drilling results of each area are reported in the following sections.

1-3 Results of Drilling Exploration of Jabal Sujarah

1-3-1 Objectives

A strong chargeability anomaly exceeding 50 mV/V was detected by IP survey during the first year. The anomaly occurred around station 12 of IP traverse 98B at altitude of 800m (150m below surface) (Fig. 2-5-2). A hole (MJSU-8) was drilled this fiscal year to clarify the mineralization of the above anomaly.

1-3-2 Progress of drilling

Summary of drilling operation, record of drilling operation and chart of drilling progress are shown in Appendices.

The drilling of MJSU-8 started in October 30, and completed in November 13.

From the surface to 8.95m in depth, drilling was done by PQ size diamond bit, and HW casing pipes were inserted to the depth. Consequently, drilling was done by HQ diamond bit. But the drilling was stopped at 12.15m depth, because of heavy loss of circulation. Reaming to 11.95m was carried out, and HW casing pipes were extended to the depth. From 12.15m to 37.35m, drilling was done by HQ diamond bit, and NW casing pipes were inserted to 37.35m. From 37.35m to 250.00m, NQ diamond bit was used.

The drilling was carried out without problems with exception of the above water loss. The core recovery was 99.8%.

1-3-3 Geology and mineralization of drill hole

Geological log of MJSU-8 is shown in Figure 2-1-2, geological section of this hole is Figure 2-1-3. Geological Map of Jabal Sujarah is shown in Figure 2-5-1.

Results of ore assay, microscopic observation of thin sections and polished sections, and X-ray diffraction analysis of core samples obtained from MJSU-8 are shown in Appendices.

Drill Hole No.: MJSU-8

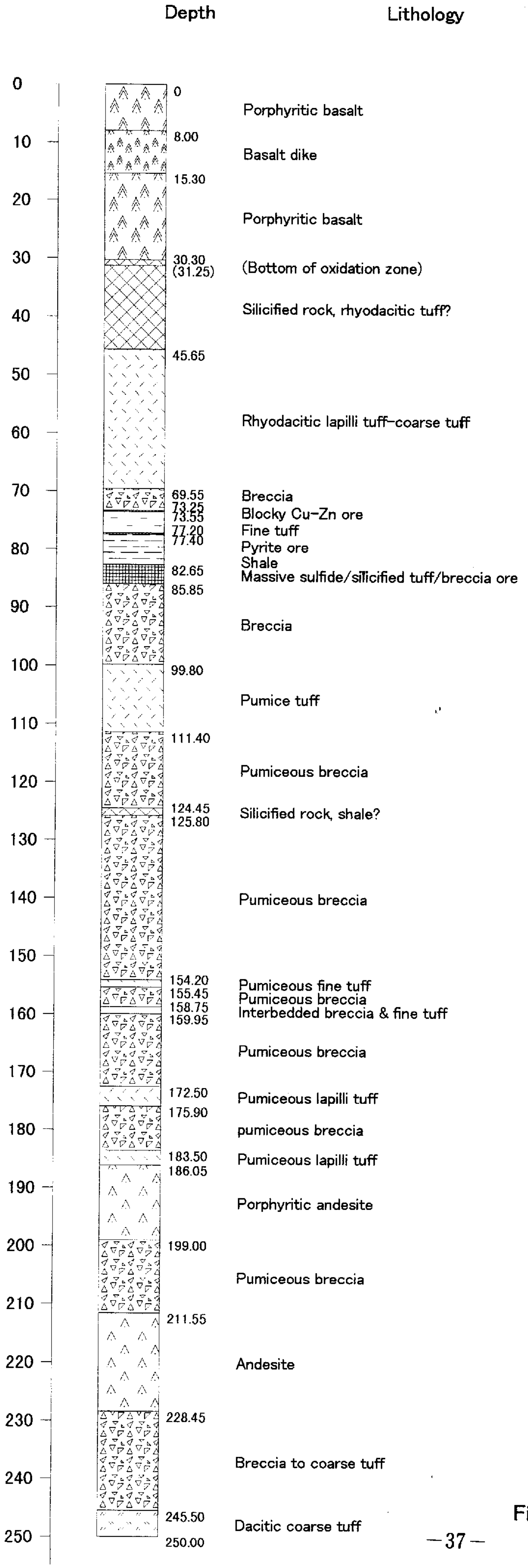


Fig.2-1-2 Geological Column of MJSU-8

(1) MJSU-8

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0—30.30m	Porphyritic basalt
30.30—69.55m	Rhyodacitic lapilli tuff—coarse tuff
69.55—73.25m	Tuffaceous breccia
73.25—85.85m	Shale, fine tuff, massive sulfide
85.85—99.80m	Tuffaceous breccia
99.80—111.40m	Pumice tuff
111.40—186.05m	Pumiceous breccia with intercalations of pumiceous lapilli tuff
186.05—199.00m	Porphyritic andesite (intrusive rock)
199.00—211.55m	Pumiceous breccia
211.55—228.45m	Andesite (intrusive rock)
228.45—245.50m	Breccia, coarse tuff
245.50—250.00m	Dacitic coarse tuff

Mineralization and Alteration

Mineralization was observed at the following two intervals.

	Drilling Depth (m)	Interval (m)	Assay Results			
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
①	73.25—73.55	0.30	<0.05	3.9	0.90	12.74
②	82.65—83.35	0.70	0.24	19.5	1.57	0.01

① Interval 73.25—73.55m: A 4 x 4 cm-chalcopyrite rich breccia ore occurs at 73.27m depth and a 7 x 7cm-sphalerite rich breccia ore at 73.55 cm. Microscopic examination of the former ore (MJSU-8, Sample 73P1 of Appendix 1-31) showed small amount of sphalerite and clausthalite together with pyrite and chalcopyrite. Also microscopic study of the latter ore (Sample 73P2) showed it to consist of pyrite, chalcopyrite, and sphalerite.

② Interval 82.65—83.35m: Massive ore consisting of pyrite and chalcopyrite occurs at this interval. Microscopic study of the ore from 83.0m (Sample 83P) showed the existence of small amount of chalcopyrite with abundant pyrite.

The rocks encountered in this hole are all silicified and pyritized with the exception of intrusive rocks (MJSU-8, 41X, 141X, and 184X of Appendix 1-32). Particularly, sericitization and carbonatization are notable at 73.25－85.85m interval where the above breccia and massive ores occur and pyrite is dominant (about 20%) (74X of Appendix 1-32).

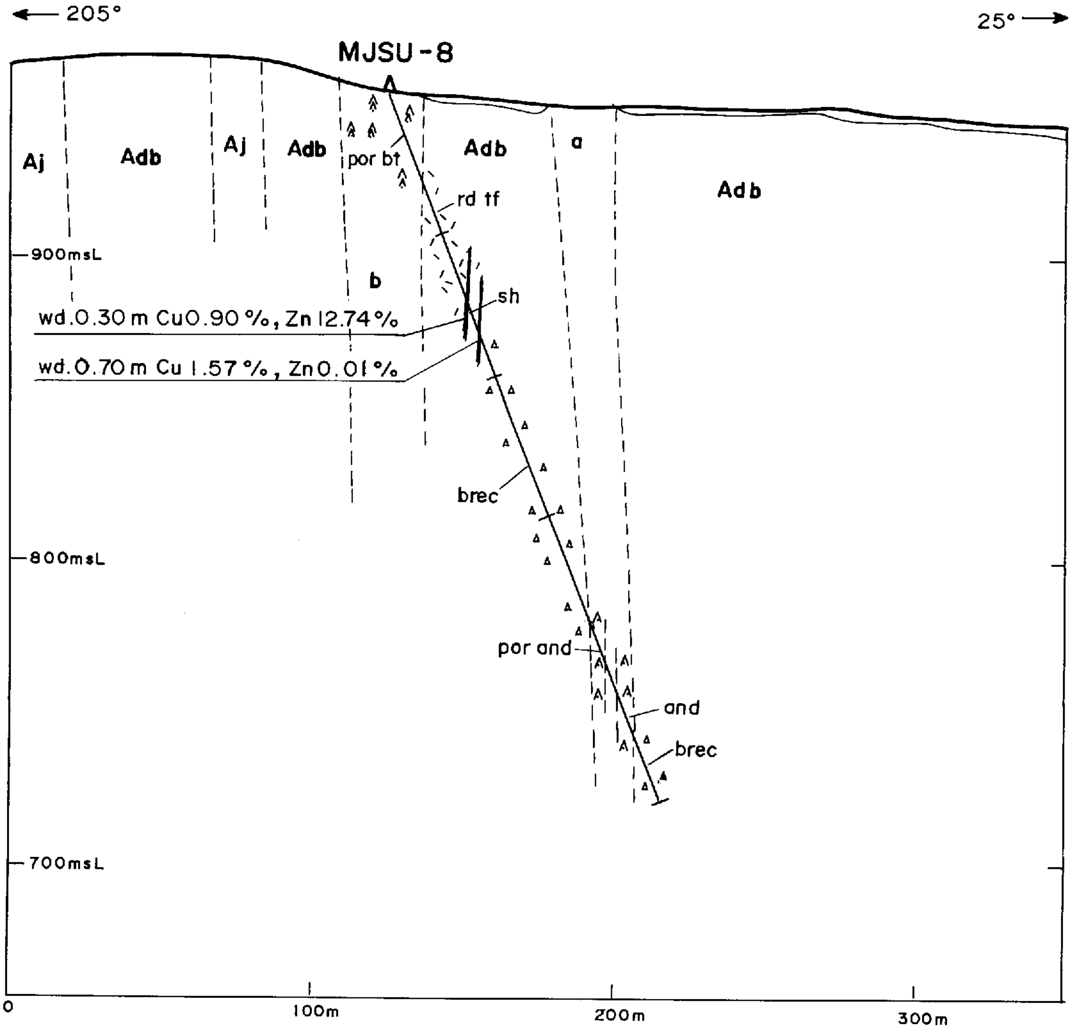


Fig.2-1-3 Geological Section of MJSU-8

1-3-4 Discussions

The geology of this hole consists mostly of breccia and rapid deposition is inferred to have taken place. However the zone between 73.25−85.85m consists of fine-grained tuff and shale indicating quiet depositional environment. The ores intercalated in this depth interval are massive to breccia-like indicating volcanogenic massive sulfide mineralization. Also from the inclination of the bedding of the core, it is inferred that this mineralized zone is almost vertical.

A thick jasper bed occurs to the west of this hole as shown in Figure 2-1-3. At the Jabal Sayid Deposit, which was formed by typical volcanogenic massive sulfide mineralization, the jasper bed occurs in the hanging wall, and thus it is inferred that MJSU-8 was drilled from the hanging wall to the footwall side.

The host rocks are widely disseminated by pyrite and the amount of pyrite is 5−10%. Thus the strong chargeability anomaly around point B-12 detected by IP survey during the first year is believed to have been caused by this pyrite dissemination.

1-3-5 Summary

The rock encountered in this hole is mainly breccia consisting of silicic rock fragments, which is intruded by porphyritic basalt.

Volcanogenic massive sulfide Cu-Zn mineralization was confirmed in this hole. The depth interval 73.25−85.85m contains thin pyrite beds and the amount of pyrite reaches 20%. Two ore beds, massive ores and breccia ores are observed in this interval. The penetrated each ore thickness is less than 0.70m and these ores are intercalated in fine-grained tuff and shale.

1-4 Results of Drilling Exploration of the Umm ad Damar North Prospect

1-4-1 Objectives

A wide chargeability anomaly was detected by IP survey during the first year. The anomaly occurred around J-25 (Fig. 2-1-7). A hole (MJSU-3) was drilled this fiscal year to clarify the mineralization of the above anomaly.

Also the surface survey of the first year indicated the existence of a mineralized zone (No. 2 Mineralized Zone) below the slag zone of this area. Two holes, MJSU-4 and MJSU-5 were drilled this fiscal year to clarify the above mineralization.

1-4-2 Progress of Drilling

Summary of drilling operation, record of drilling operation and chart of drilling progress of MJSU-3, MJSU-4 and MJSU-5 are shown in Appendices.

The drilling of MJSU-3 started in October 14, and completed in October 28. From the surface to 16.40m in depth, drilling was done by PQ diamond bit, and HW casing pipes were inserted to the depth. From 16.40m to 41.75m, drilling was done by HQ diamond bit, and NW casing pipes were inserted to 41.75m. From 41.75m to 250.00m, drilling was done by NQ diamond bit. During the drilling operation, breakdown of boring pump, change of rubber coupling of clutch, water loss at the depth between 84.30m to 94.50m occurred. The core recovery was 100%.

The drilling of MJSU-4 started in September 27, and completed in October 13. From the surface to 13.40m in depth, drilling was done by PQ diamond bit, and HW casing pipes were inserted to the depth. From 13.40m to 41.80m, drilling was done by HQ diamond bit, and NW casing pipes were inserted to 41.80m. From 41.80m to 304.25m, drilling was done by NQ diamond bit. During the drilling operation, drilling water loss at the depth between 29m to 30m, breakdown of rubber coupling and water loss at water swivel occurred. The core recovery was 99.5%. The planned drilling length of MJSU-4 was 250.00m. However, in order to confirm the downward extension of No.1 Mineralized Zone, the drilling length was extended to 54m.

The drilling of MJSU-5 started in September 28, and completed in October 12. From the surface to 11.90m in depth, drilling was done by PQ diamond bit, and HW casing pipes were inserted to the depth. From 11.90m to 38.80m, drilling was done by HQ diamond bit, and

NW casing pipes were inserted to 38.80m. From 38.80m to 346.20m, drilling was done by NQ diamond bit. During the drilling operation, oil leak occurred at the spindle. The core recovery was 100%. The planned drilling length of MJSU-4 was 250.00m. However, in order to confirm the downward extension of No.1 Mineralized Zone, the drilling length was extended to 96m.

1-4-3 Geology and mineralization of drill holes

Geological logs of MJSU-3, MJSU-4 and MJSU-5 is shown in Figure 2-1-4, and geological maps of the North Prospect is Figures 2-1-5 and 2-1-6. Geological sections of these drill holes are shown in Figures 2-1-8 to 2-1-10.

Results of ore assay, microscopic observation of thin sections and polished sections, and X-ray diffraction analysis of core samples obtained from these drill holes are shown in Appendices.

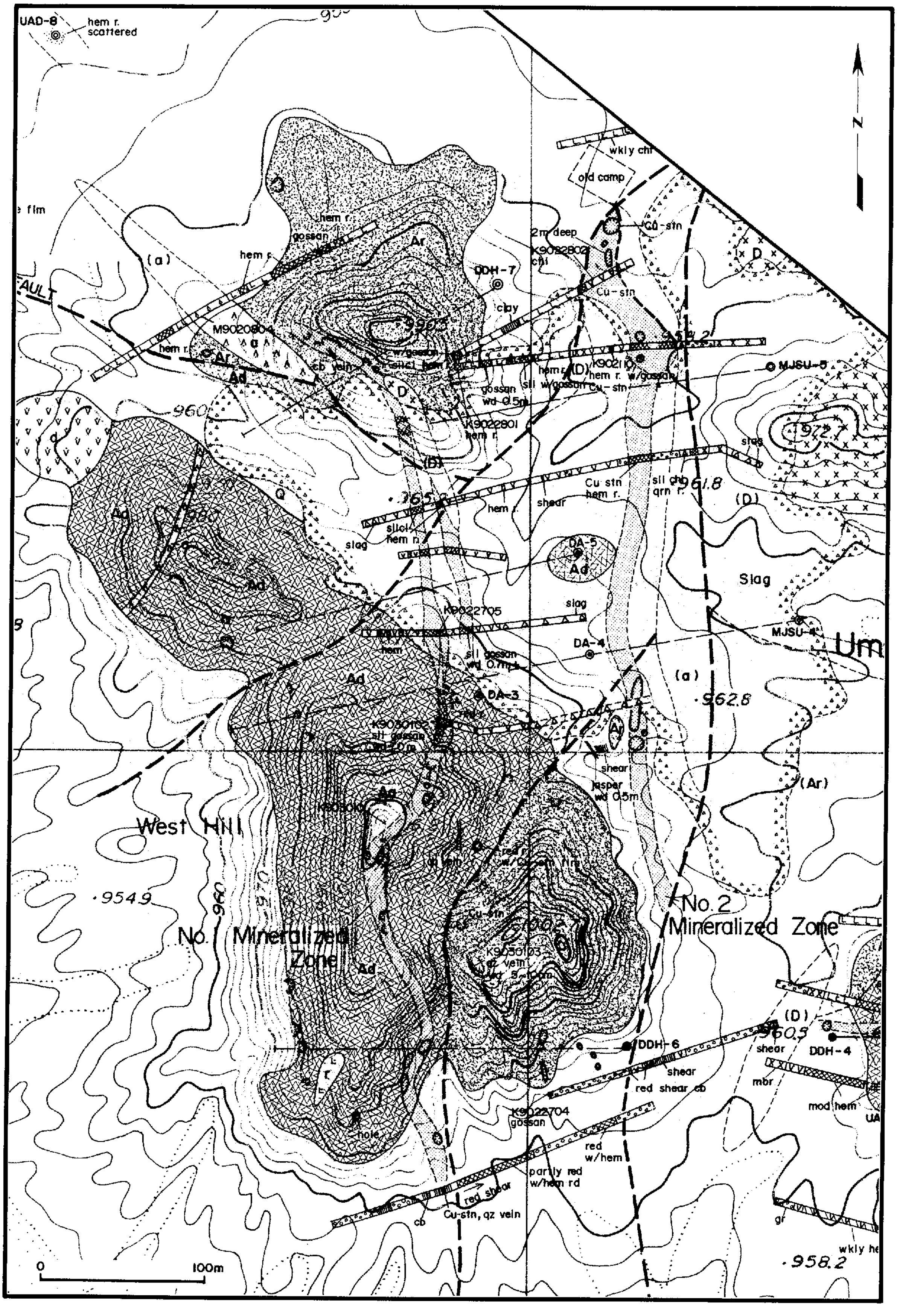


Fig.2-1-5 Detailed Geological Map of the Umm ad Damar North Prospect (West Hill)

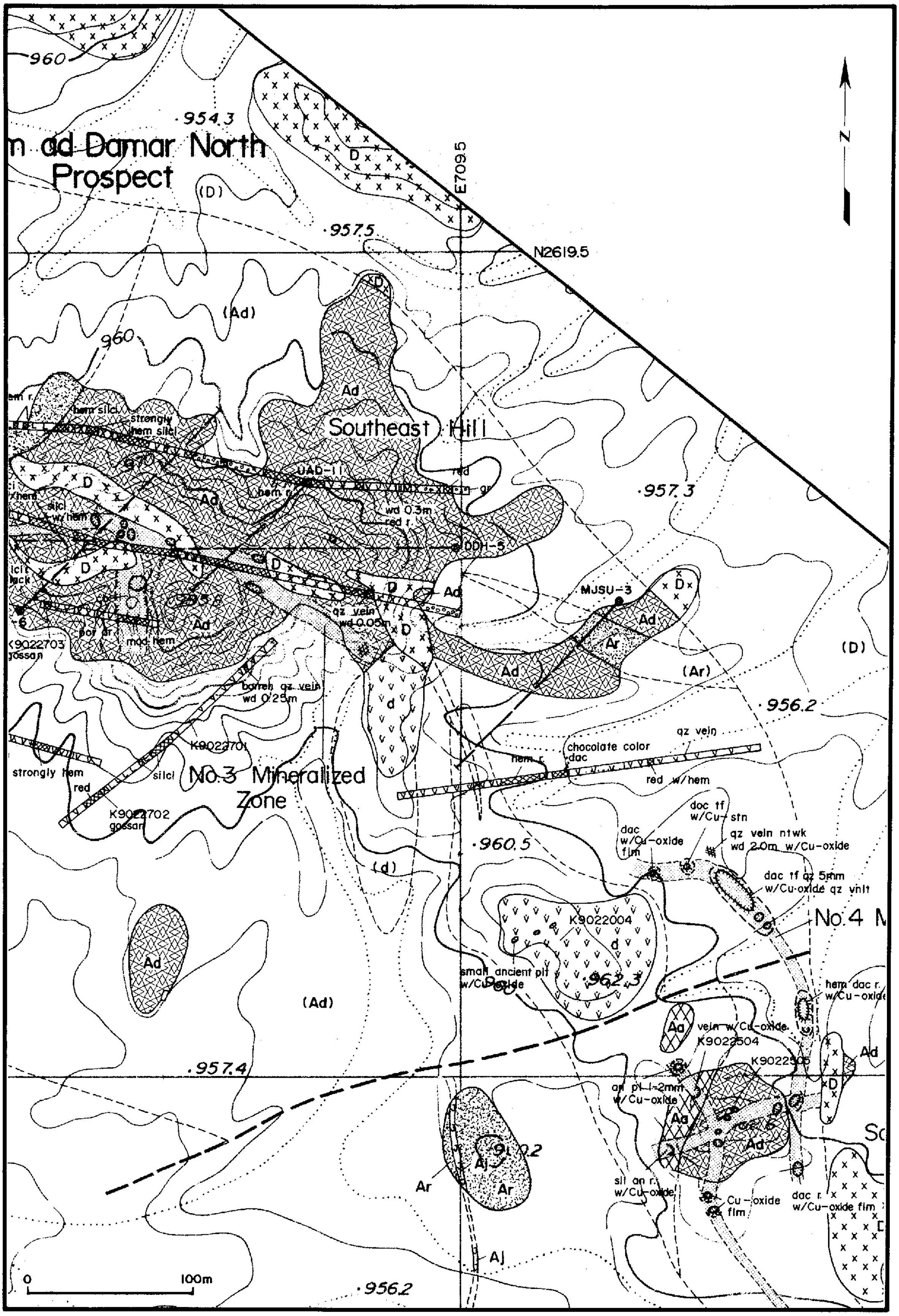


Fig.2-1-6 Detailed Geological Map of the Umm ad Damar North Prospect (Southeast Hill)

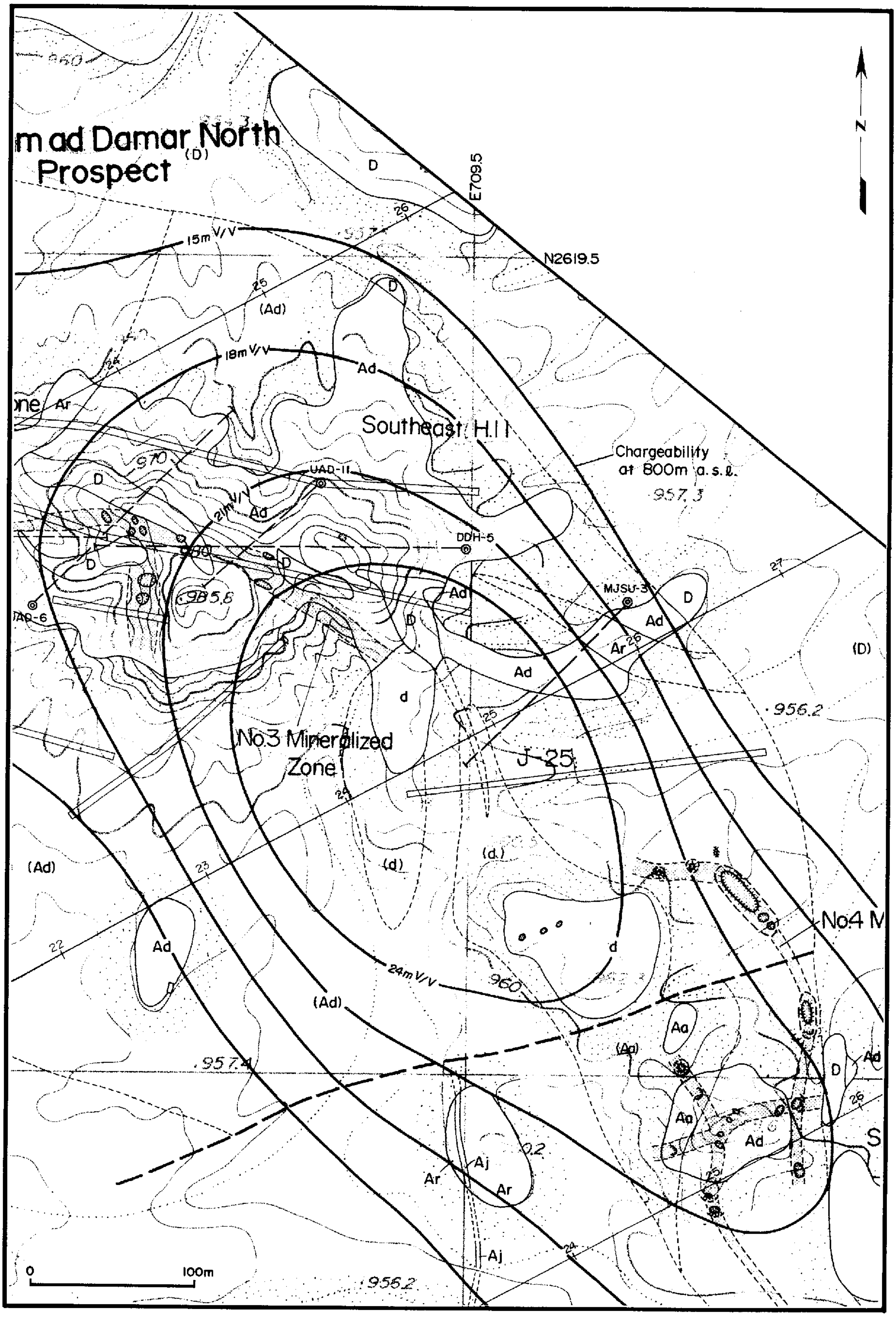


Fig.2-1-7 Integrated Interpretation Map of the Umm ad Damar North Prospect (Southeast Hill)

(1) MJSU-3

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0−2.00m	Sands and gravels (Quaternary)
2.00−14.40m	Dacite
14.40−46.20m	Rhyodacite
46.20−71.85m	Dacitic lapilli tuff
71.85−97.75m	Dacite
97.75−113.60m	Porphyritic dacite (intrusive rock)
113.60−124.50m	Dacite
124.50−147.65m	Porphyritic dacite (intrusive rock)
147.65−149.35m	Silicified rock
149.35−150.95m	Microdiorite
150.95−157.15m	Porphyritic dacite (intrusive rock)
157.15−178.10m	Dacitic lapilli tuff−coarse tuff
178.10−214.70m	Porphyritic dacite (intrusive rock)
214.70−220.10m	Rhyodacitic coarse tuff
220.10−226.30m	Rhyodacite
226.30−229.60m	Dolerite dike
229.60−236.40m	Dacite
236.40−250.00m	Porphyritic dacite (intrusive rock)

Mineralization and Alteration

In this hole, mineralization was observed at the following three depth intervals.

	Drilling Depth (m)	Interval (m)	Assay Result			
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
①	188.20−188.75	0.55	<0.05	3.9	1.57	0.02
②	214.70−215.05	0.35	<0.05	13.3	5.05	0.06
③	220.10−220.90	0.80	<0.05	6.6	2.48	0.03

① Interval 188.20−188.75m: This depth interval is a chloritized zone within a porphyritic dacite dyke and contains many chalcopyrite-pyrite veinlets.

② Interval 214.70−215.05m: This depth interval consists of chalcopyrite-pyrite network in the shear zone at the border of porphyritic dacite dyke and rhyodacitic coarse tuff. It is accompanied by chloritization. Microscopic study of a sample (Sample 214P) from 214.9m depth indicated the occurrence of sphalerite aside from pyrite and chalcopyrite.

③ Interval 220.10−220.90m: This depth interval is a chalcopyrite-pyrite network zone within a shear zone at the border between rhyodacitic coarse-grained tuff and fractured rhyodacite. Magnetite and hematite, aside from pyrite and chalcopyrite, were observed microscopically in a sample from 220.6m depth (Sample 220P).

Also porphyritic dacite, rhyodacitic coarse-grained tuff, and rhyodacite are silicified at 206.70−226.30m interval including the mineralized zones of ② and ③. A large amount of quartz and minor amounts of chlorite and sericite are observed by X-ray diffraction.

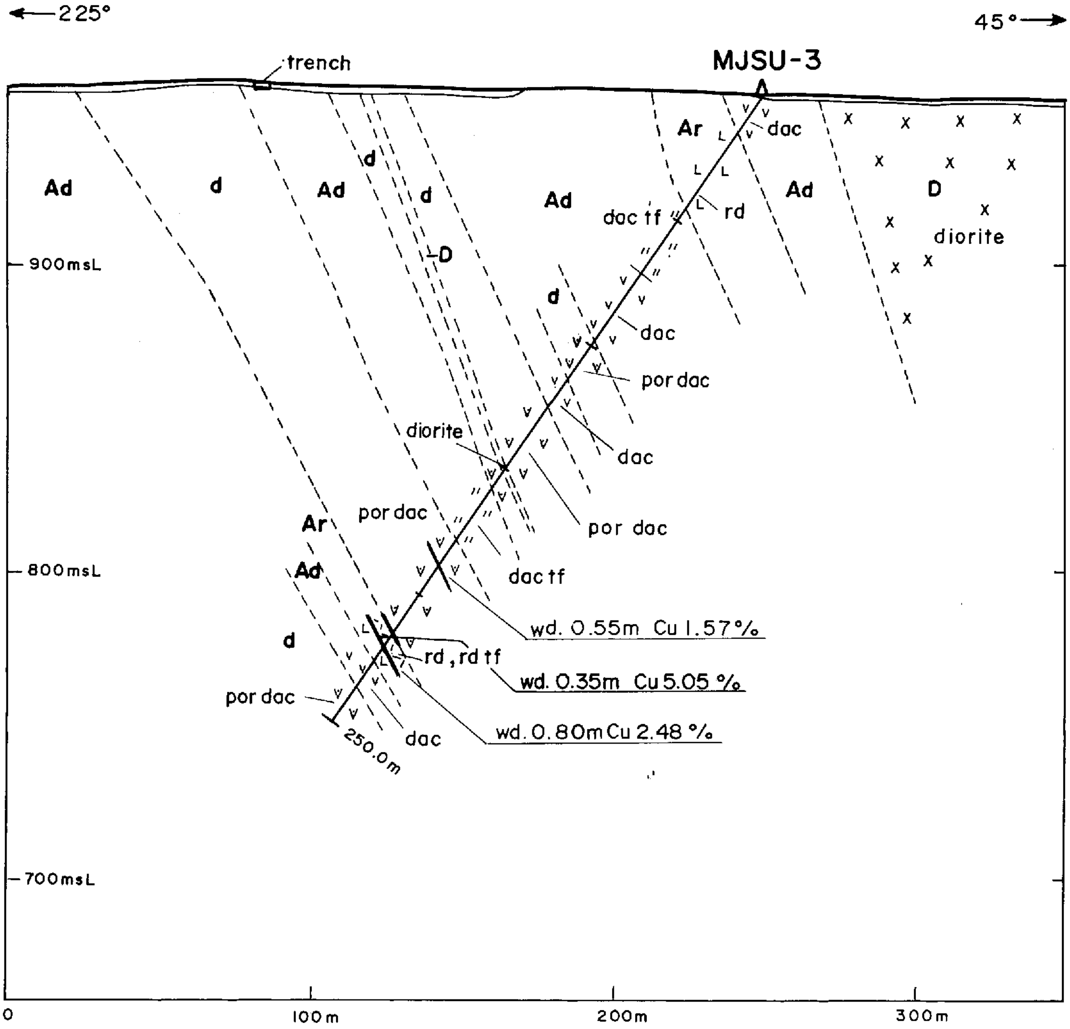


Fig.2-1-8 Geological Section of MJSU-3

(2) MJSU-4

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0−1.00m	Gravels (Quaternary)
1.00−43.00m	Diorite
43.00−47.80m	Andesite (intrusive rock)
47.80−70.75m	Rhyodacitic coarse tuff−lapilli tuff
70.75−104.55m	Porphyritic andesite (intrusive rock)
104.55−106.40m	Rhyodacitic lapilli tuff
106.40−111.10m	Porphyritic andesite (intrusive rock)
111.10−126.25m	Rhyodacitic lapilli tuff
126.25−127.60m	Basaltic dike
127.60−135.20m	Rhyodacitic lapilli tuff−coarse tuff
135.20−173.15m	Dacitic lapilli tuff−coarse tuff
173.15−180.45m	Andesite (intrusive rock)
180.45−239.20m	Andesitic lapilli tuff
239.20−277.35m	Dacitic lapilli tuff−coarse tuff
277.35−278.45m	Basalt dike
278.45−287.05m	Rhyodacitic coarse tuff
287.05−292.30m	Dacite
292.30−304.25m	Rhyodacitic tuff−lapilli tuff

Mineralization and Alteration

Mineralization was observed at the following five intervals.

	Drilling Depth (m)	Interval (m)	Assay Result			
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
①	140.50−147.80	7.30	<0.05	9.1	1.98	0.03
②	155.50−158.85	3.35	<0.05	6.3	2.19	0.07
③	162.85−163.40	0.55	<0.05	7.6	1.09	0.03
④	272.70−273.25	0.80	0.07	1.1	1.11	0.01
⑤	278.95−279.35	0.40	<0.05	6.9	2.72	0.03

① Interval 140.50−147.80m: In this depth interval, concentration of pyrite-chalcopyrite veinlets and chalcopyrite veins are observed at six localities within dacitic coarse-grained tuff. The veinlets are less than 1cm wide. The above occurrences are at; 140.50—142.00m (penetrated width 1.50m, Cu 5.54%), 143.10—143.40m (0.30m, Cu 10.40%, several chalcopyrite veins, shown in Fig. 2-1-1), 144.85—145.00m (0.15m, Cu 4.77%), 146.40—146.60m (0.20m, Cu 4.60%), and 147.30—147.80m (0.50m, Cu 1.37%). In the above veinlets and veins, oxide and silicate minerals are very scarce and the grain size of the sulfide minerals is very small. Sphalerite is observed to occur together with pyrite and chalcopyrite in a sample from 143.3m depth (Sample 143P).

② Interval 155.50—158.85m: In this depth interval, concentration of pyrite-chalcopyrite veinlets and chalcopyrite vein are observed at three localities within dacitic lapilli tuff—coarse-grained tuff. These occurrences are at; 155.50—156.20m (penetrated width 0.70m, Cu 6.06%, photograph of chalcopyrite vein at the depth of 156.05—156.20m is shown in Fig. 2-1-1), 157.45—158.25m (0.80m, Cu 1.82%), and 158.55—158.85m (0.30m, Cu 3.64%). In a sample from 156.1m (Sample 156P), sphalerite, galena, and clausthalite (PbSe) are observed microscopically aside from pyrite and chalcopyrite.

③ Interval 162.85—163.40m: In this depth interval, host rock is dacitic lapilli tuff and many pyrite-chalcopyrite veinlets occur at 162.85—163.00m depth and one chalcopyrite-bearing quartz vein at 163.30—163.40m depth.

④ Interval 272.70—273.25m: This depth interval corresponds to the chloritized zone within dacitic coarse-grained tuff, and contains many pyrite-chalcopyrite veinlets.

⑤ Interval 278.95—279.35m: In this depth interval, many pyrite-chalcopyrite veinlets occur in rhyodacitic coarse-grained tuff. Microscopic study of a sample from 279.1m (Sample 279P) shows the occurrence of small amount of sphalerite aside from pyrite and chalcopyrite.

X-ray diffraction studies were carried out on samples from the mineralized zones in the 140.50—147.80m depth interval. They are; rhyodacitic coarse-grained tuff (131.6m depth), dacitic coarse-grained tuff (138.0m), dacitic coarse-grained tuff (143.1m), and dacitic coarse-grained tuff (145.3m). Chlorite, sericite, and small amount of calcite were detected.

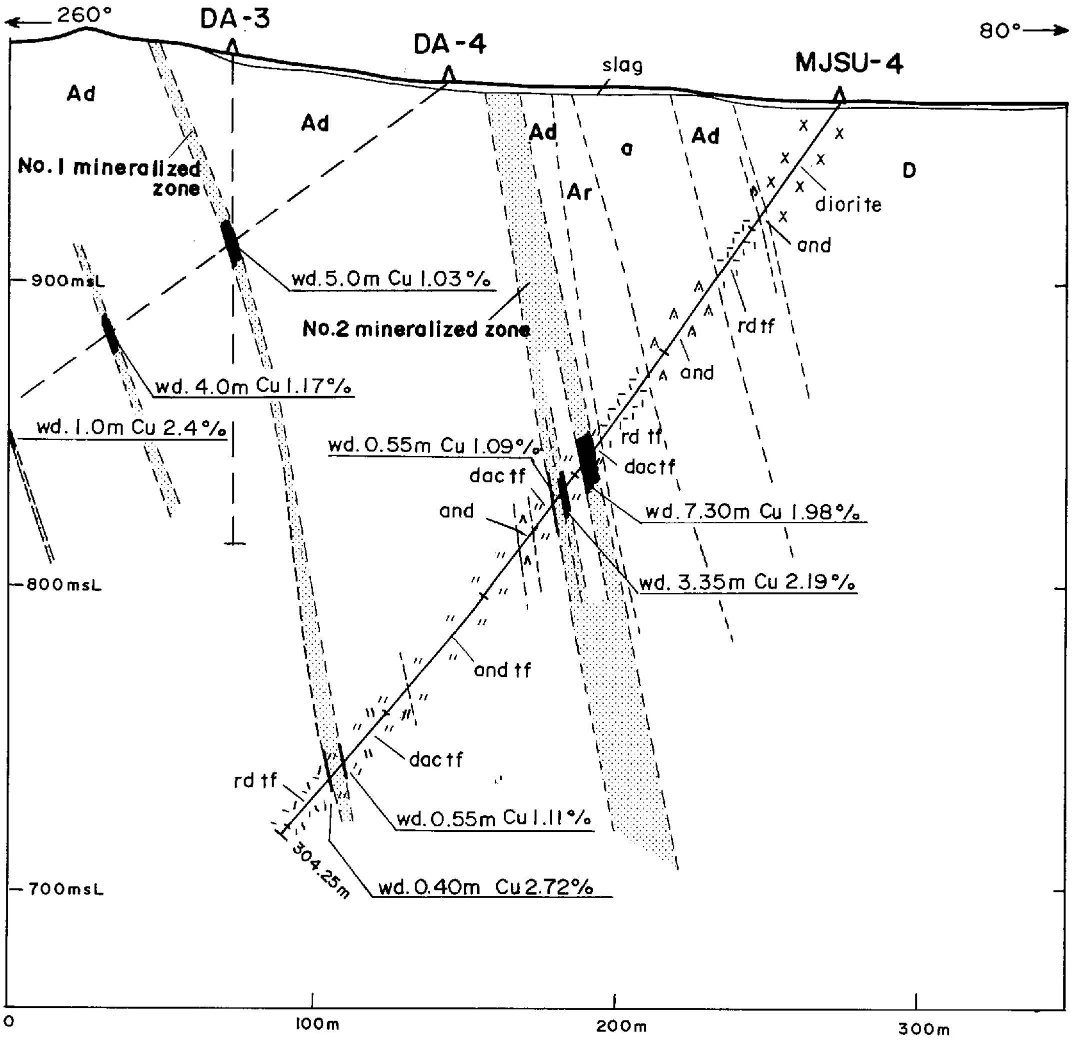


Fig.2-1-9 Geological Section of MJSU-4

(3) MJSU-5

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0−1.90m	Sands and gravels (Quaternary)
1.90−74.45m	Diorite, partly dolerite dike
74.45−121.70m	Dacitic lapilli tuff−coarse tuff
121.70−137.60m	Dacitic lapilli tuff, andesitic lapilli tuff
137.60−139.20m	Dolerite
139.20−143.15m	Dacite
143.15−218.90m	Andesitic lapilli tuff
218.90−226.75m	Interbedded lapilli tuff and coarse tuff
226.75−230.70m	Dacitic coarse tuff
230.70−259.55m	Rhyodacitic lapilli tuff
259.55−268.90m	Rhyodacite
268.90−275.40m	Massive ore
275.40−280.00m	Dacitic coarse tuff, andesitic lapilli tuff
280.00−306.90m	Rhyodacitic lapilli tuff−coarse tuff, partly dacitic tuff
306.90−346.20m	Dacitic lapilli tuff−coarse tuff

Mineralization and Alteration

In this hole, mineralization was observed at the following ten depth intervals. The results of assay are as follows.

	Drilling Depth (m)	Interval (m)	Assay Result			
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
①	79.40−82.55	3.15	0.07	15.4	2.25	0.06
②	88.90−93.20	4.30	<0.05	13.7	1.93	0.03
③	95.50−99.90	4.40	0.06	12.5	3.70	0.02
④	112.50−114.50	2.00	<0.05	1.6	0.71	0.01
⑤	233.90−240.45	6.55	0.05	2.1	0.59	0.01
⑥	245.65−247.70	2.05	<0.05	2.0	1.02	0.02
⑦	250.35−256.30	5.95	<0.05	4.3	0.81	0.01
⑧	268.90−275.40	6.50	<0.05	2.1	0.99	0.20
⑨	276.35−278.15	1.80	0.12	1.5	0.53	0.01
⑩	328.90−331.20	2.30	0.07	7.1	6.51	0.01

① Interval 79.40−82.55m: In this depth interval, concentration of chalcopyrite-pyrite veinlets and dissemination with small amount of oxide and silicate minerals occur at three depths in dacitic tuff. These ores are at; 79.40—79.90m depth (penetrated width 0.50m, Cu 1.86%), 80.55—80.95m (0.40m, Cu 4.62%), and 81.70—82.55m (0.85m, Cu 4.28%). Microscopic study of a sample from 81.8m depth (Sample 81P) shows pyrite, chalcopyrite, and small amount of sphalerite.

② Interval 88.90—93.20m: This interval consists of pyrite-chalcopyrite dissemination and veinlets in dacitic lapilli tuff.

③ Interval 95.50—99.90m: This interval consists of concentration of pyrite-chalcopyrite veinlets in dacitic lapilli tuff. Microscopic study of a sample from 96.8m depth (Sample 96P) shows the occurrence of small amount of sphalerite together with pyrite and chalcopyrite.

④ Interval 112.50—114.50m: In this interval, two less than 1cm-thick chalcopyrite-pyrite veins occur in dacitic coarse-grained tuff. They occur at, 112.60—112.70m and 114.35—114.50m depth intervals.

⑤ Interval 233.90—240.45m: In this interval, seven concentration of chalcopyrite-pyrite veinlets and chalcopyrite-pyrite dissemination occur in rhyodacitic tuff and dacitic lapilli tuff. They are at; 233.90—234.00m (penetrated width 0.1m, approximately Cu 3.0%), 235.30—235.65m (0.35m, Cu 3.24%), 236.05—236.20m (0.15m, Cu 1.06%), 237.30—238.55m (1.25m, Cu 0.66%, amount of pyrite 20%), 239.20—239.35m (0.15m, Cu 0.93%), 239.55—239.75m (0.20m, Cu 0.51%, amount of pyrite 35%), and 239.95—240.45m (0.50m, Cu 1.54%, amount of pyrite 30%). Microscopic study of a sample from 236.1m depth (Sample 236P) shows a small amount of pyrite aside from chalcopyrite.

⑥ Interval 245.65—247.70m: This interval consists of pyrite-chalcopyrite network in rhyodacitic lapilli tuff.

⑦ Interval 250.35—256.30m: In this interval, chalcopyrite is rich at two parts in rhyodacitic lapilli tuff—tuff. They are pyrite-chalcopyrite dissemination at the depth of 250.35—257.10m (penetrated width 1.35m, Cu 0.62%), and several chalcopyrite veins which cut the tuff containing 2—3mm-thick pyrite layers at the depth of 253.90—256.30m (2.40m, Cu 1.44%)

⑧ Interval 268.90—275.40m: A geologic column of this interval is shown in Figure 2-1-11. The column is, from footwall rock side to hanging wall rock side;

268.90—271.10m: Banded ore consisting of thin beds of pyrite-chalcopyrite, chlorite, and siliceous rock

271.10—271.55m: Massive ore consisting of pyrite and chalcopyrite

271.55−271.85m: Jasper

271.85−274.20m: Banded ore consisting of thin beds of pyrite-chalcopyrite, chlorite, and siliceous rock

274.20−275.40m: Banded ore consisting of thin beds of pyrite-sphalerite, chlorite, and siliceous rock

Also dacitic tuff is intercalated at 272.55−273.00m and 273.45−273.80m in the banded ore of 271.85−275.40m depth interval. Microscopic study of a sample of massive ore from 271.2m (Sample 271P) shows a small content of sphalerite aside from pyrite and chalcopyrite. And microscopy of a banded ore sample from 273.1m (Sample 273P) also shows chalcopyrite, sphalerite and pyrite.

⑨ Interval 276.35 − 278.15m: In this interval, two concentration of 1 − 3cm-thick chalcopyrite veins occur in dacitic coarse-grained tuff. They are at 276.35−277.15m (penetrated width 0.80m, Cu 0.70%) and 277.80−278.15m (0.35m, Cu 1.06%).

⑩ Interval 328.90−331.20m: This interval consists of chalcopyrite network in dacitic coarse-grained tuff to dacitic lapilli tuff. Microscopic study of a sample from 329.6m depth (Sample 329P) shows chalcopyrite, pyrite, and small amount of clausthalite (PbSe).

Altered rock samples were collected from the following depth intervals and examined by X-ray diffractometry. The above depth intervals are ①, ③, ⑤, ⑥, ⑧, and ⑩. Mineralization of the above, with the exception of ⑧ at 268.90−275.40m interval, is all vein-type Cu mineralization, and this will be mentioned in the following section. It is seen that from the results of 79X, 96X, 236X, 246X, and 331X (Appendix 1-32) the alteration associated with mineralization is silicification and chloritization. The mineralization at interval 268.90−275.40m is considered to be of volcanogenic massive sulfide type, but samples (270X and 274X) consists mainly of quartz and chlorite and associated alteration is not different from the other zones.

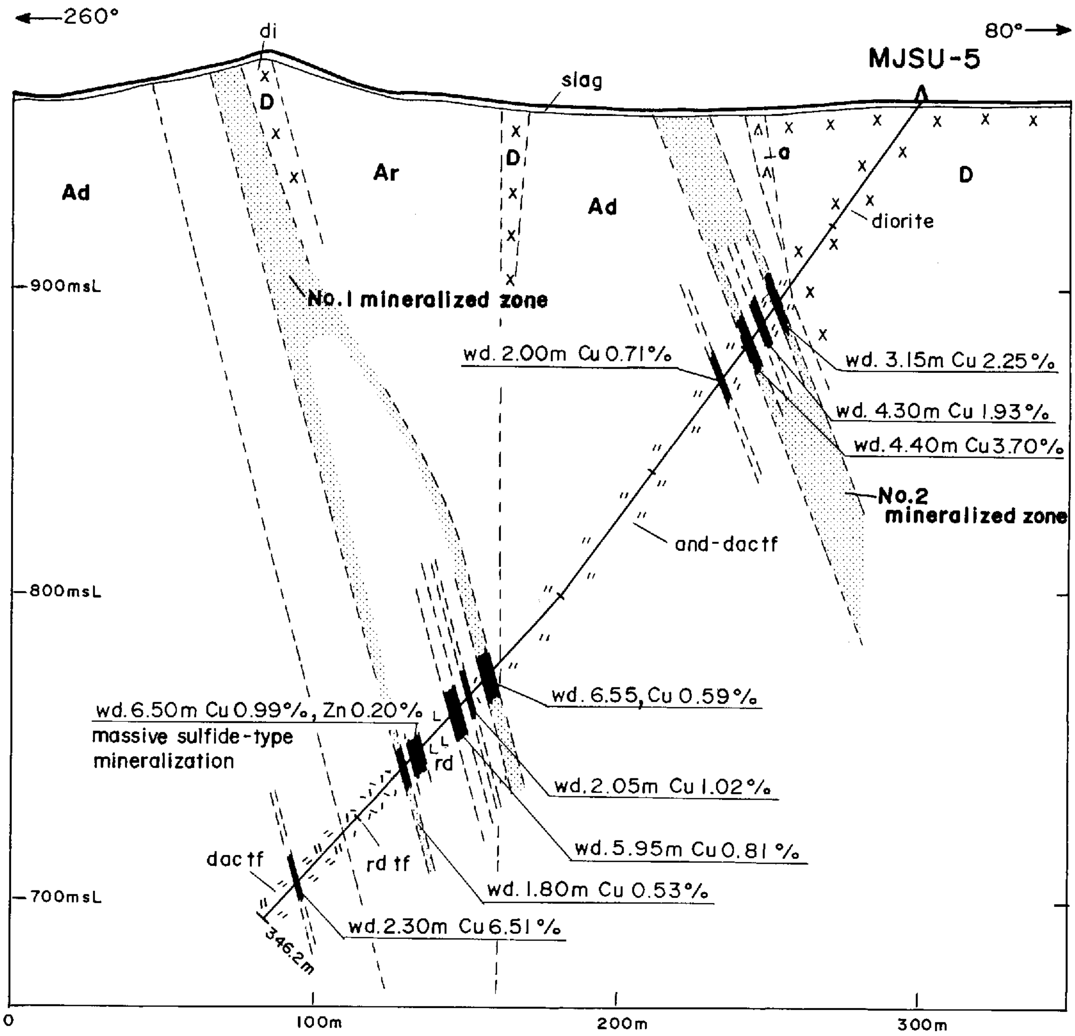
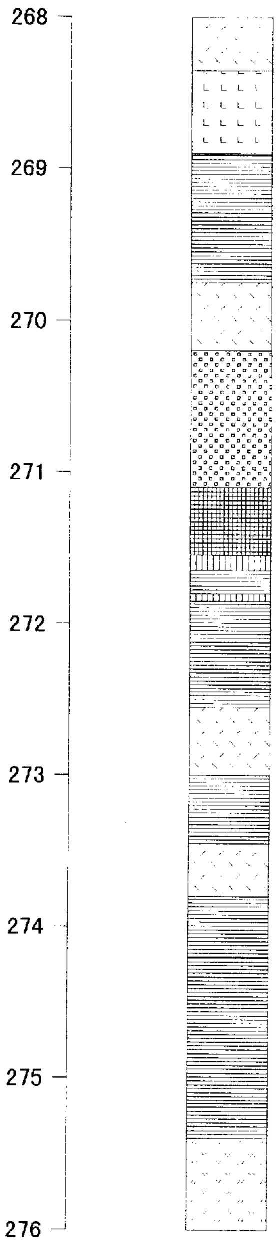


Fig.2-1-10 Geological Section of MJSU-5

Drill Hole No.: MJSU-5 (168-276m)



Depth	Lithology
	Rhyodacitic coarse tuff, dark green, dip 55.
268.35	Rhyodacite, greenish light gray.
268.90	Banded ore, thinly banded, consisting of pyrite, chlorite, and siliceous la yers, pyrite 15%, (Cu 0.95%).
269.75	Rhyodacitic tuff, light green, siliceous, hard.
270.20	
<270X	Banded pyrite ore, thinly banded, consisting of pyrite, chlorite, and silic eous layers, pyrite 30%.
271.10	Massive ore, consisting of pyrite-chalcopyrite, banded, containing thin chlorite layers, (Cu 1.06%).
<271P	
271.55	Banded jasper and chlorite layers.
271.65	Banded ore, consisting of chalcopyrite and chlorite layers, (271.55- .85 m: Cu 2.49%).
271.80	271.80- .85m: Jasper, reddish brown, hard.
271.85	Banded ore, consisting of chalcopyrite-pyrite, chlorite, and siliceous lay ers, (271.85-273.45m: Cu 1.48%).
272.55	Rhyodacitic tuff, silicified, dark gray.
273.00	
<273P	Banded ore, consisting of chlorite-chalcopyrite-pyrite and siliceous tuf f layers.
273.45	Rhyodacitic tuff, siliceous.
273.80	Banded ore, consisting of chlorite-chalcopyrite-pyrite and siliceous lay ers, (273.45-274.20m: Cu 2.01%).
274.20	
<274X	Banded ore, consisting of pyrite-sphalerite, chlorite, and siliceous layer s, (Zn 1.01%).
275.40	Dacitic tuff, banded with pyrite, chlorite and siliceous layers.

Fig.2-1-11 Geological Column of Mineralized Part of MJSU-5

1-4-4 Discussions

Mineralization confirmed at MJSU-3, MJSU-4, and MJSU-5 is mainly hydrothermal Cu veins and it occurs in the shear zone of dacitic pyroclastic rocks and rhyodacitic pyroclastic rocks. But the mineralization confirmed at 268.90−275.40m of MJSU-5 is different, the ores are mainly banded and contain massive ores and jasper, the host rocks are rhyodacitic pyroclastic rocks as in the case of the 4/6 Gossan. And thus it is believed to be volcanogenic massive sulfide mineralization.

At MJSU-4, it is believed that the mineralized zone confirmed at three locations in interval 140.50−160.40m is the lower extension of No.2 Mineralized zone, and that at two places in interval 272.70−279.35m is the lower extension of No.1 Mineralized Zone (Fig. 2-1-9). At MJSU-5, the three mineralized parts at interval 79.40 − 99.90m correspond to No.2 Mineralized Zone (Fig. 2-1-10). In this hole, however, it is not clear whether the three mineralized parts in 233.90−256.30m interval or that at 276.35−278.15m interval correspond to No.1 Mineralized Zone (Fig. 2-1-10).

The chargeability anomaly around J-25 is large, and existence of large-scale mineralization was anticipated. But only a small Cu vein mineralization was observed at 188.20−220.90m depth interval in MJSU-3 which was drilled toward the center of this anomaly. Many porphyritic dacite intrusions are observed at 97.75m depth downward. The lateral distribution of these intrusive bodies is harmonious with that of the chargeability anomaly, and it is possible that the anomaly was a reflection of weak pyrite dissemination in these intrusive rocks.

1-4-5 Summary

In the North Prospect, No.2 Mineralized Zone was confirmed by MJSU-4 and MJSU-5. This zone was inferred to occur below the slag distribution. The lower extension of No.1 Mineralized Zone was also confirmed simultaneously. These are both Cu vein mineralization with low content of Au and Ag.

In MJSU-5, low-grade Cu-Zn mineralization was observed at 268.90−275.40m interval, and this mineralization is considered to be volcanogenic sulfide from the texture of the ores. The host rocks of this mineralized zone is white rhyodacitic pyroclastic rocks which hosts the massive sulfide mineralization of the 4/6 Gossan. This will be mentioned in later sections.

MJSU-3 which was drilled toward the center of J-25 anomaly encountered only a small Cu vein at 188.20－220.90m depth.

1-5 Results of Drilling Exploration of the 4/6 Gossan Prospect and the Vicinity

1-5-1 Objectives

MJSU-1 and MJSU-2 were drilled in this Prospect. This Prospect was considered to be promising from the compilation of existing data and surface geological survey that were carried out during the first year. MJSU-2 was drilled in order to confirm the lower extension of mineralized body confirmed by drilling UAD-14 in 1983. MJSU-1 was drilled 150m SSW of MJSU-2 in order to confirm the mineralization of the lower part of blocky gossan bearing strongly silicified rocks found at trench (Sample K9021802, Cu 0.03%, Fe 11.29%).

Also MJSU-6 was drilled 100m north of MJSU-2 in order to confirm northern extension of the massive sulfide ores encountered by MJSU-2. Although weak, MJSU-6 confirmed the existence of volcanogenic massive sulfide-type mineralization. And thus MJSU-7 was drilled at the "L-14" chargeability anomaly (Fig.2-1-14) which was detected at the northeastern extension of the ore-bearing horizon of MJSU-6.

1-5-2 Progress of drilling

Summary of drilling operation, record of drilling operation and chart of drilling progress of MJSU-1, MJSU-2 , MJSU-6 and MJSU-7 are shown in Appendices.

The drilling of MJSU-1 started in September 11, and completed in September 26. From the surface to 11.90m in depth, drilling was done by PQ diamond bit, and HW casing pipes were inserted to the depth. From 11.90m to 32.75m, drilling was done by HQ diamond bit, and NW casing pipes were inserted to 32.75m. From 32.75m to 251.60m, drilling was done by NQ diamond bit. During the drilling operation, oil pressure and temperature gauges, and engine belts were changed. The core recovery was 99.8%.

The drilling of MJSU-2 started in September 11, and completed in September 27. From the surface to 14.90m in depth, drilling was done by PQ diamond bit, and HW casing pipes were inserted to the depth. From 14.90m to 39.80m, drilling was done by HQ diamond bit, and NW casing pipes were inserted to 39.80m. From 39.80m to 250.00m, drilling was done by NQ diamond bit. During the drilling operation, rubber coupling was exchanged. The core recovery was 100%.

The drilling of MJSU-6 started in October 14, and completed in October 26. From the surface to 11.95m in depth, drilling was done by PQ diamond bit, and HW casing pipes were inserted to the depth. From 11.95m to 42.00m, drilling was done by HQ diamond bit, and NW casing pipes were inserted to 42.00m. From 42.00m to 250.00m, drilling was done by NQ diamond bit. During the drilling operation, circulation loss occurred at the depth between 20m and 30m. The core recovery was 100%.

The drilling of MJSU-7 started in October 27, and completed in November 10. From the surface to 14.95m in depth, drilling was done by PQ diamond bit, and HW casing pipes were inserted to the depth. From 14.95m to 39.50m, drilling was done by HQ diamond bit, and NW casing pipes were inserted to 39.50m. From 39.50m to 250.00m, drilling was done by NQ diamond bit. The drilling was carried out without any trouble. The core recovery was 99.9%.

1-5-3 Geology and mineralization of drill holes

Geological logs of MJSU-1, MJSU-2 , MJSU-6 and MJSU-7 is shown in Figure 2-1-12, and geological maps of the 4/6 Gossan is Figure 2-1-13. Geological sections of these drill holes are shown in Figures 2-1-15, 2-1-16, 2-1-18 and 2-1-20.

Results of ore assay, microscopic observation of thin sections and polished sections, and X-ray diffraction analysis of core samples obtained from these drill holes are shown in Appendices.

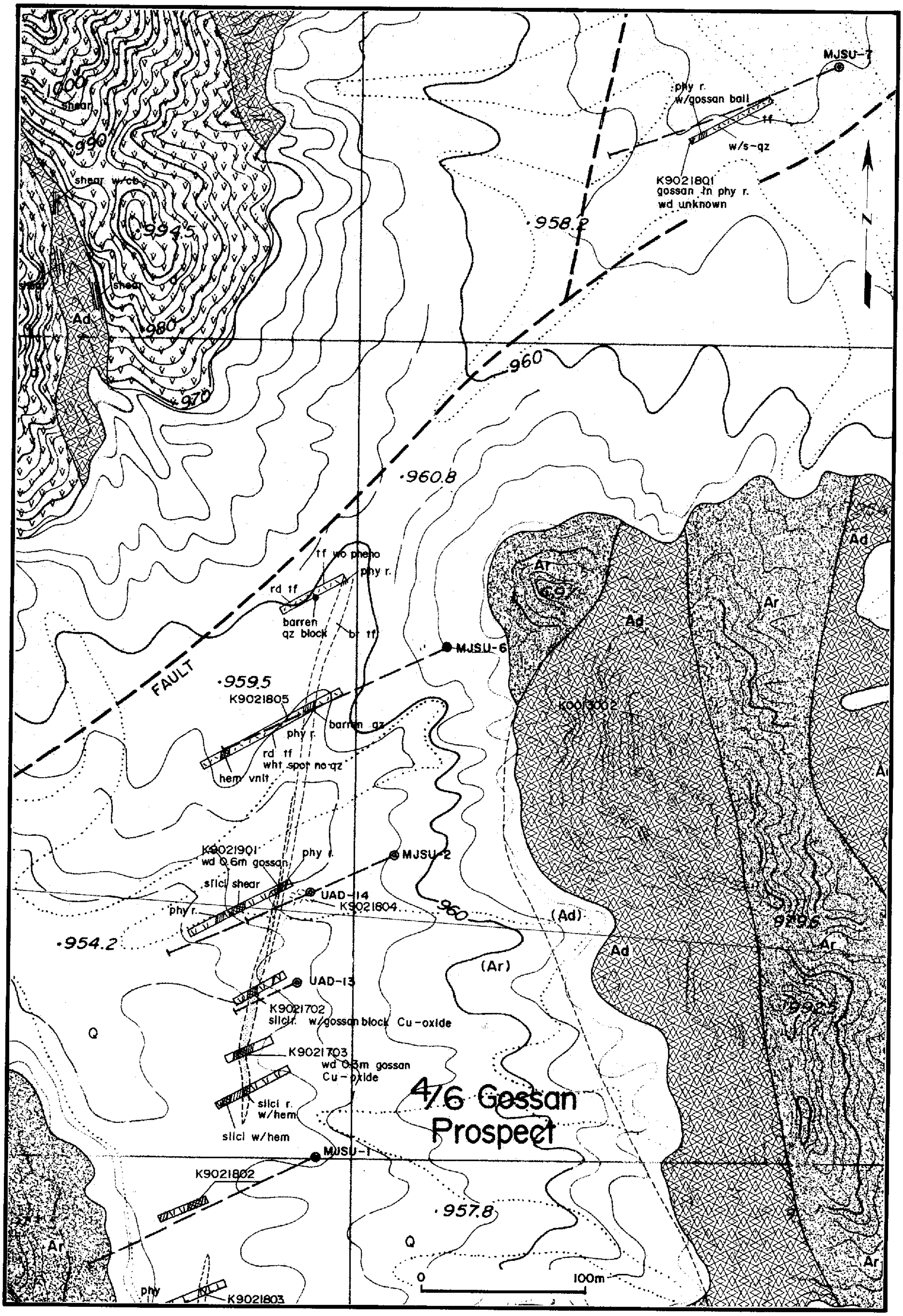


Fig.2-1-13 Detailed Geological Map of the 4/6 Gossan Prospect

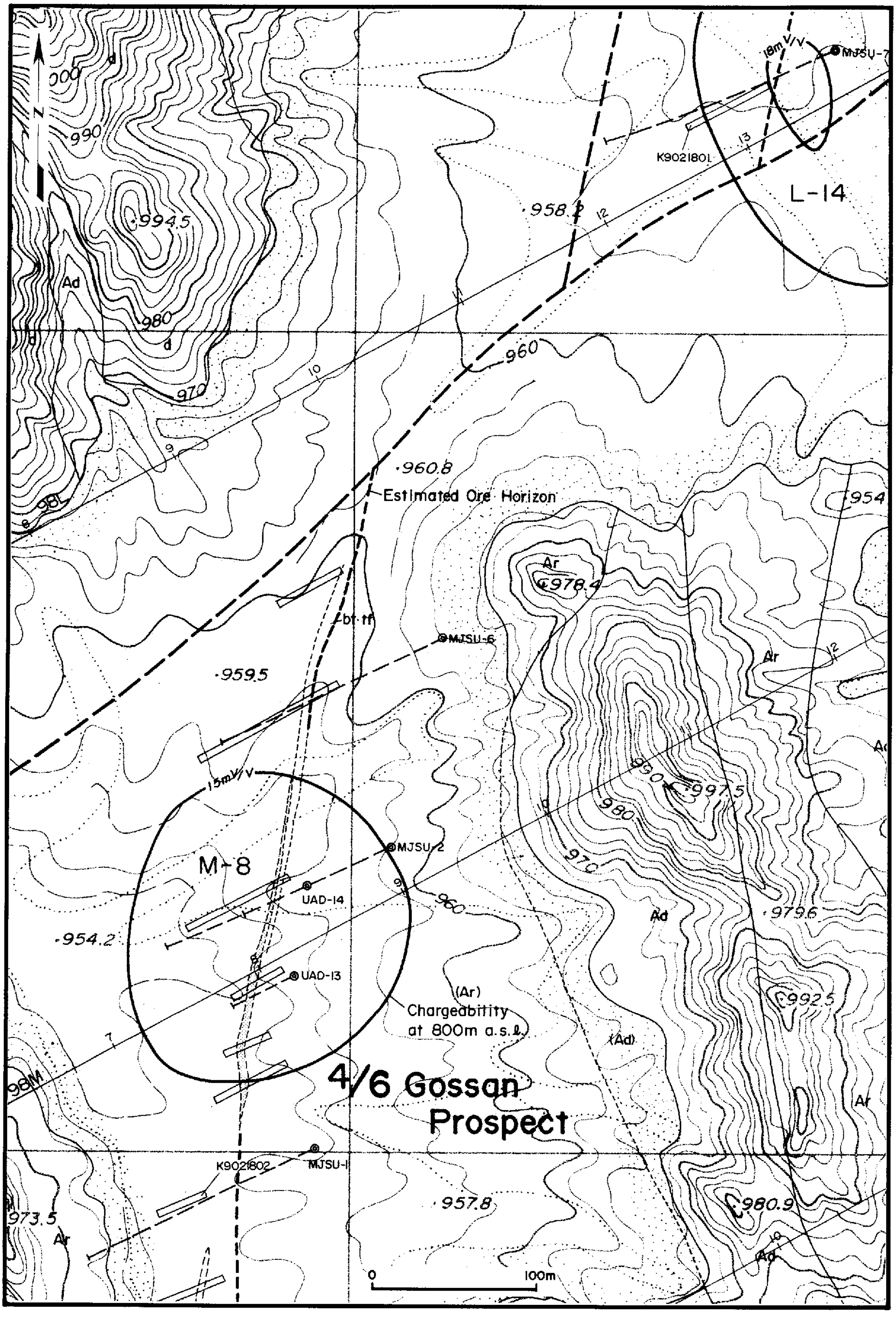


Fig.2-1-14 Integrated Interpretation Map of the 4/6 Gossan Prospect

(1) MJSU-1

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0—1.40m	Gravels (Quaternary)
1.40—25.75m	Rhyodacite
25.75—169.30m	Rhyodacitic tuff—tuff breccia
169.30—170.40m	Breccia
170.40—197.50m	Rhyodacitic lapilli tuff
197.50—200.30m	Interbedded siltstone and tuff
200.30—246.00m	Rhyodacitic lapilli tuff
246.00—250.00m	Breccia
250.00—251.60m	Rhyodacitic lapilli tuff

Mineralization and Alteration

Main mineralization of this hole was found at the following two depth intervals.

	Drilling Depth (m)	Interval (m)	Assay Result			
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
①	91.05—92.20	1.15	<0.05	2.7	0.01	0.51
②	122.50—123.10	0.60	<0.05	8.8	0.51	0.26

① Interval 91.05—92.20m: This interval consists of siliceous rock containing dissemination and thin beds of pyrite. The content of pyrite is about 20%.

② Interval 122.50—123.10m: In this interval, silicified zone containing many chalcopyrite veinlets (less than 1cm wide) occur at 122.50—123.00m, and 123.00—123.10m consists of chalcopyrite-bearing 1cm thick quartz vein in rhyodacitic tuff.

Aside from above, a low-grade silicified zone containing chalcopyrite-sphalerite-pyrite veinlets (Cu 0.09%, Zn 0.26%) occur in 153.40—154.10m interval. Galena was found microscopically in a sample from 153.5m depth (Sample 153P). Two chalcopyrite-pyrite-sphalerite veinlets were confirmed at 215.45—215.60m interval and a small amount of galena and hessite was found microscopically in a sample from 215.5m depth (Sample 215P). The silver content of 215.45—215.60m depth interval is high at 150.0g/t and the source is probably hessite. Pyrite-chalcopyrite veins (4cm wide) are observed at 212.75—212.85m depth interval and the Ag grade is 213.0g/t and high.

Notable alteration was not observed in this hole and X-ray studies have not been carried out.

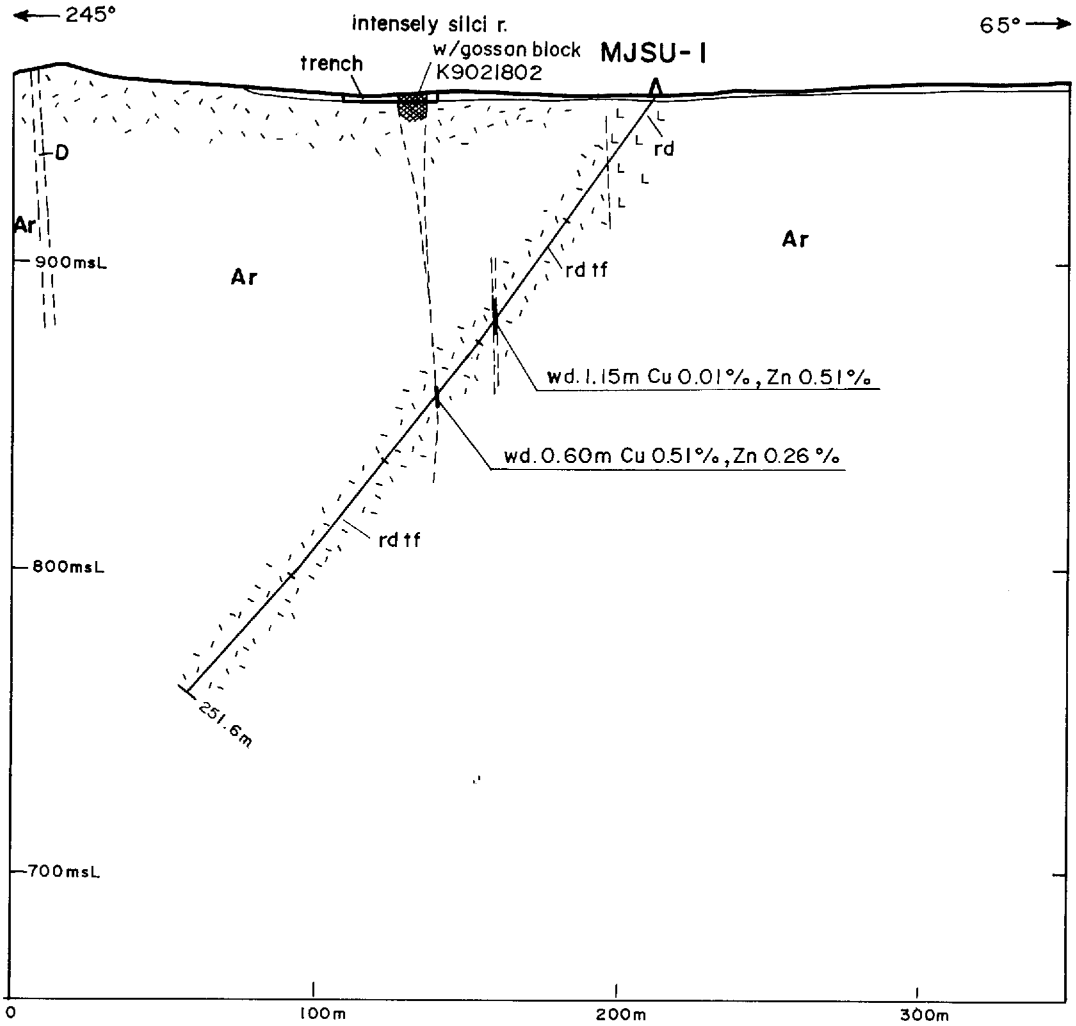


Fig.2-1-15 Geological Section of MJSU-1

(2) MJSU-2

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0—1.14m	Gravels (Quaternary)
1.14—40.00m	Rhyodacitic tuff—tuff breccia
40.00—41.45m	Quartz-calcite vein
41.45—50.50m	Basalt dike
50.50—57.25m	Rhyodacitic pyroclastic rocks
57.25—65.60m	Basalt dike
65.60—67.20m	Microdiorite
67.20—74.00m	Basalt dike
74.00—75.30m	Rhyodacitic lapilli tuff
75.30—77.80m	Basalt dike
77.80—104.20m	Rhyodacitic lapilli tuff
104.20—121.15m	Basaltic tuff. Pyrite thin layers are dominant at the interval between 106.25—109.05m.
121.15—125.40m	Interbedded massive ore, breccia ore, siliceous ore and shale
125.40—130.10m	Rhyodacitic lapilli tuff
130.10—142.25m	Interceded massive ore, breccia ore, siliceous ore and banded ore
142.25—168.25m	Rhyodacitic lapilli tuff—tuff breccia
168.25—169.40m	Interbedded breccia and siltstone
169.40—242.60m	Rhyodacitic lapilli tuff—tuff breccia
242.60—243.00m	Rhyodacitic tuff, containing pyrite layers(thickness: <1cm)
243.00—250.00m	Rhyodacitic tuff

Mineralization and Alteration

Mineralization was confirmed at the following two depth intervals in this hole.

	Drilling Depth (m)	Interval (m)	Assay Result				
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)
①	121.15—125.40	4.25	0.37	23.0	0.96	2.17	0.21
②	130.10—142.25	12.15	0.37	14.0	1.00	3.67	0.10

Geological columns of drill cores of these mineralized zones are shown in Figure 2-1-17.

The ores of ① and ② are massive ore, breccia ore, siliceous ore and banded ore. The grade of the mineralized zones of this hole is low as a whole because shale and tuff are intercalated in these mineralized zones. Of the mineralized zone of ①, 124.25−125.40m interval does not contain shale, and consists of breccia ores and siliceous ore. The ore grade of this interval is high as follows. Also, of the mineralized zone of ②, 130.50−134.90m interval does not contain tuff or conglomerate and consists of breccia ore, siliceous ore, and massive ore. The grade of this interval is high as follows.

	Drilling Depth (m)	Interval (m)	Assay Result				
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)
①	124.25−125.40	1.15	0.95	55.0	1.29	7.84	0.77
②	130.50−134.90	4.40	0.24	21.2	1.12	9.27	0.26

Samples for reflection microscopy were collected at depths of; 122.4m (sample 122P, breccia ore), 124.3m (124P, breccia ore), 131.2m (131P, massive ore), 132.1m (132P, massive ore), 135.7m (135P, breccia ore), and 141.2m (141P, massive ore). These ores generally consist of chalcopyrite-sphalerite-pyrite and small amount of galena, and altaite (PbTe) was found only in 124P.

The basaltic tuff at 106.25−109.05m interval contains many thin beds of pyrite constituting about 15%.

Alteration within the mineralized zones and the vicinity consists mainly of silicification and chloritization, and sericitization is weak (Samples 117X, 125X, 129X, 142X, and 144X of Appendix 1-32).

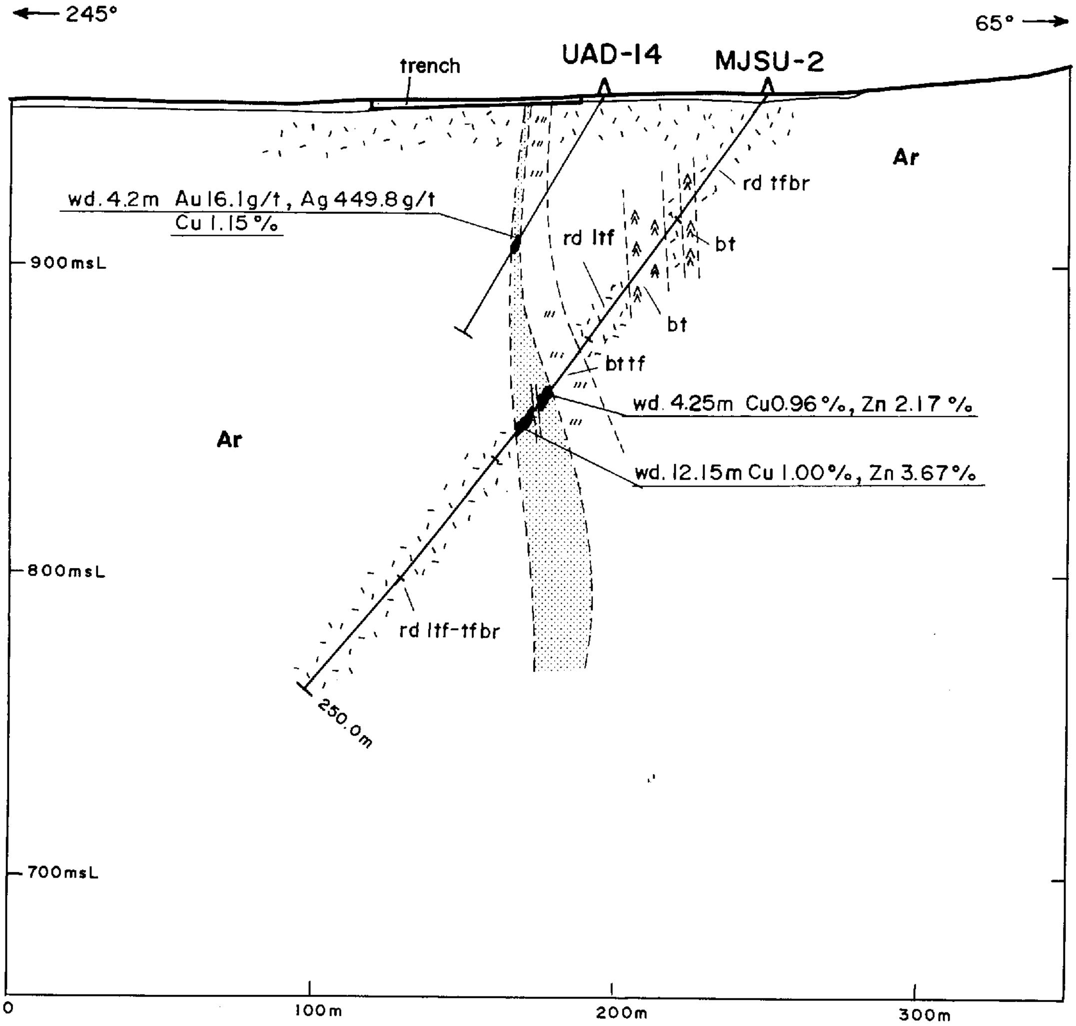


Fig.2-1-16 Geological Section of MJSU-2

(3) MJSU-6

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0—45.15m	Rhyodacitic tuff breccia
45.15—48.10m	Basaltic tuff
48.10—58.65m	Rhyodacitic lapilli tuff— coarse tuff
58.65—61.60m	Basaltic fine tuff
61.60—130.65m	Rhyodacitic lapilli tuff
130.65—141.50m	Interbedded tuff, shale, breccia ore and siliceous ore
141.50—152.75m	Basaltic fine tuff
152.75—220.70m	Rhyodacitic lapilli tuff
220.70—228.90m	Rhyodacitic tuff—lapilli tuff containing pyrite pebbles
228.90—250.00m	Rhyodacitic lapilli tuff—coarse tuff

Mineralization and Alteration

Mineralization was confirmed at the following two depth intervals in this hole.

	Drilling Depth (m)	Interval (m)	Assay Result				
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)
①	134.75—138.00 (134.75—135.35)	3.25 (0.60)	<0.05 <0.05	28.0 71.6	0.69 1.71	3.84 16.20	0.09 0.36
②	154.05—154.25	0.20	<0.05	1.5	0.05	0.22	0.00

① Geological column of drill core of 133.20—138.00m interval is shown in Figure 2-1-19. The mineralized zones in this depth interval consists of the following four types.

- Pyrite-bearing black shale: This is black organic shale containing large amount of pyrite pebbles and thin pyrite beds. The amount of pyrite is about 10% and the size of the angular to subangular pyrite is generally less than 1cm and the maximum is 3 x 7cm. A sample of organic shale was collected from 134.2m depth (Sample 134X) and was examined by X-ray diffraction, but the crystallinity was low and the material could not be identified. Thus the material has not been graphitized.
- Quartz-calcite vein: These veins constitute network containing small amount of pyrite. The veins occur intersecting the pyrite-bearing black shale and breccia ore.
- Breccia ore: The pebbles (less than 1cm) of this ore consists of combination of sphalerite-

pyrite-chalcopyrite and silicic rock fragments. Matrix is quartz and chlorite. The above high grade part is breccia ore at the depth of 134.75—135.35m. Microscopic study of a sample from 135.2m depth (Sample 135P) show that it consists of sphalerite, pyrite, and chalcopyrite, with small amounts of covelline, chalcocite, galena, and altaite. Altaite is also found in the breccia ores of MJSU-2.

・Siliceous ore: This is siliceous pyrite bed associated with small amount of sphalerite. The amount of pyrite is about 15%.

② In 154.05—154.25m depth interval, thin beds of pyrite-sphalerite are intercalated in chloritized black lapilli tuff. The amount of pyrite in this depth interval is about 10%.

Aside from the above, pyrite pebbles and thin bed are intercalated in rhyodacitic tuff—lapilli tuff at 220.70—228.90m depth interval. The amount of pyrite attains 20 %.

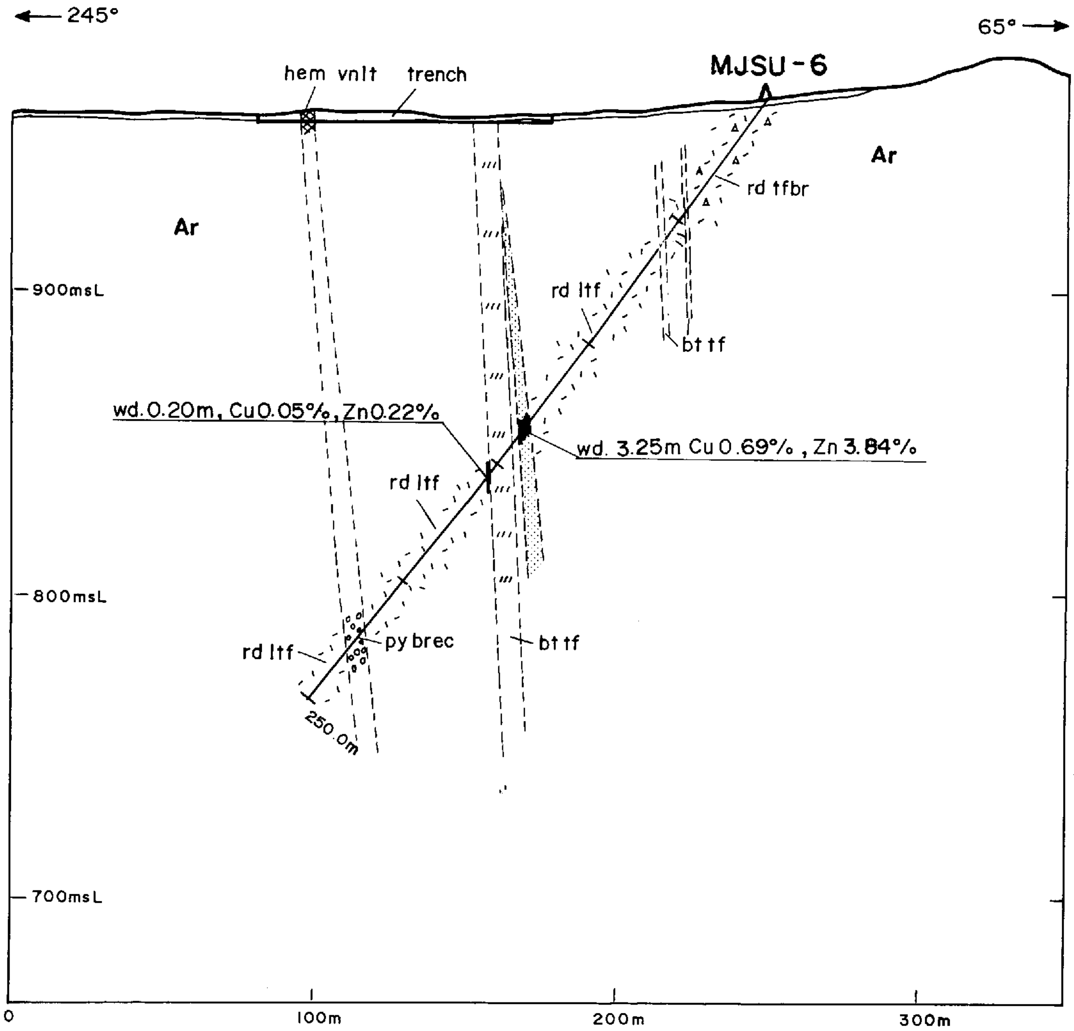
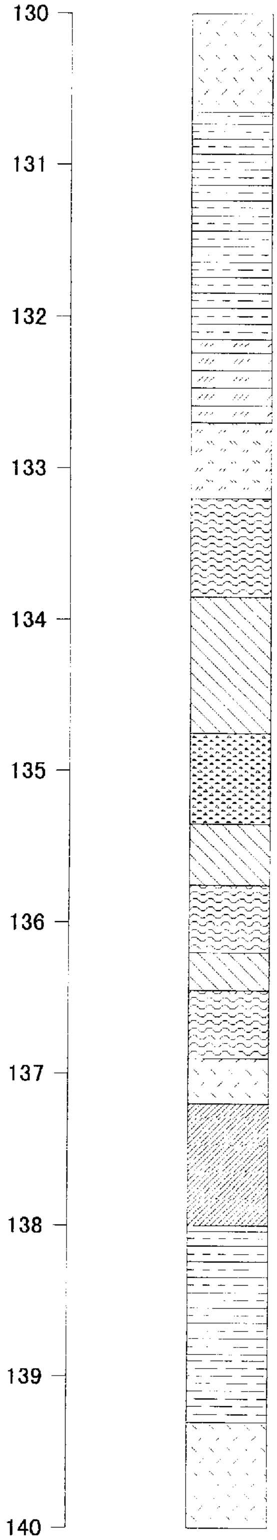


Fig.2-1-18 Geological Section of MJSU-6

Drill Hole No.: MJSU-6 (130–140m)



Depth	Lithology
130–130.65	Rhyodacitic lapilli tuff, greenish light gray.
130.65–132.15	Alternating bed of fine tuff and sandy tuff.
132.15–132.70	Muddy fine tuff, gray.
132.70–133.20 (<132T)	Fine tuff, black. 132T: Dacitic tuff, weakly meta, clastic to porphyritic.
133.20–133.85	Carbonaceous shale, containing pyrite fragments (size: <1cm) and silicic rock fragments, pyrite 10%.
133.85–134.75 (<134X)	Quartz–calcite vein network in carbonaceous shale, network:shale=50:50. Vein contains small amount of chalcopyrite.
134.75–135.35 (<135P)	Breccia ore, consisting of sphalerite, pyrite, and chalcopyrite, thinly ban ded, containing white rock fragments (size: <5cm), with calcite–quartz v eins, (Cu 1.71%, Zn 16.20%).
135.35–135.75	Quartz–calcite vein, white, barren, containing carbonaceous films.
135.75–136.20	Carbonaceous shale, containing pyrite layers, pyrite 10%. 136.10– .15m: contains pyrite nodule (3*7cm).
136.20–136.45	Calcite–quartz vein network, containing carbonaceous films and small a mount of chalcopyrite and sphalerite.
136.45–136.90	Carbonaceous shale, tuffaceous, containing tuff and pyrite fragments, (Cu 0.61%).
136.90–137.20	Fine tuff, light gray, silicified, containing carbonaceous thin layers.
137.20–138.00	Siliceous ore, containing sphalerite, pyrite 15%, (Cu 0.97%, Zn 3.17%).
138.00–138.85	Alternating bed of fine tuff and sandy tuff.
138.85–139.30	Alternating bed of shale and sandy to lapilli tuff, containing pyrite fragme nts, pyrite 5%.
139.30–140	Fine tuff, greenish gray.

Fig.2-1-19 Geological Column of Mineralized Part of MJSU-6

(4) MJSU-7

Geology

Geology of this hole is as follows.

(Depth)	(Geology)
0−2.70m	Sands
2.70−70.15m	Rhyodacitic lapilli tuff−tuff breccia
70.15−76.55m	Basaltic fine tuff
76.55−234.30m	Rhyodacitic lapilli tuff and pumice tuff
234.30−250.00m	Rhyodacite

Mineralization and Alteration

Mineralization was observed at the following three depth intervals.

	Drilling Depth (m)	Interval (m)	Assay Result			
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
①	62.85−63.50	0.65	<0.05	29.0	2.05	0.08
②	76.55−76.70	0.15	<0.05	4.3	0.38	0.45
③	174.55−176.00	1.45	<0.05	2.2	0.07	0.22

① Depth interval 62.85−63.50m consists of network of chalcopyrite-bearing 1−2cm wide quartz veins. Microscopic observation of a sample from 63.3m depth (Sample 63P) shows the occurrence of a large amount of pyrite, chalcopyrite, and small amount of sphalerite, clausthalite (PbSe), and naumanite (Ag_2Se).

② Depth interval 76.55−76.70m consists of siliceous rock containing fine-grained pyrite and the amount of pyrite is about 35%. Also chalcopyrite-bearing quartz veinlets occur at this depth. Microscopic examination of a sample from 76.6m depth (Sample 76P) shows the occurrence of large amount of pyrite and minor content of chalcopyrite, sphalerite, and clausthalite.

③ Depth interval 174.55−176.00m consists of rhyodacitic tuff breccia containing pyrite-chalcopyrite-sphalerite thin layers.

Aside from the above, a chalcopyrite-bearing 20cm wide white quartz vein occurs at 60.00−60.20m depth, and microscopic observation of a sample from 60.2m depth (Sample 60P) shows the occurrence of large amount of chalcopyrite and small amount of pyrite, tetrahedrtie, and sphalerite.

Notable alteration was not observed and X-ray diffraction studies were not carried out.

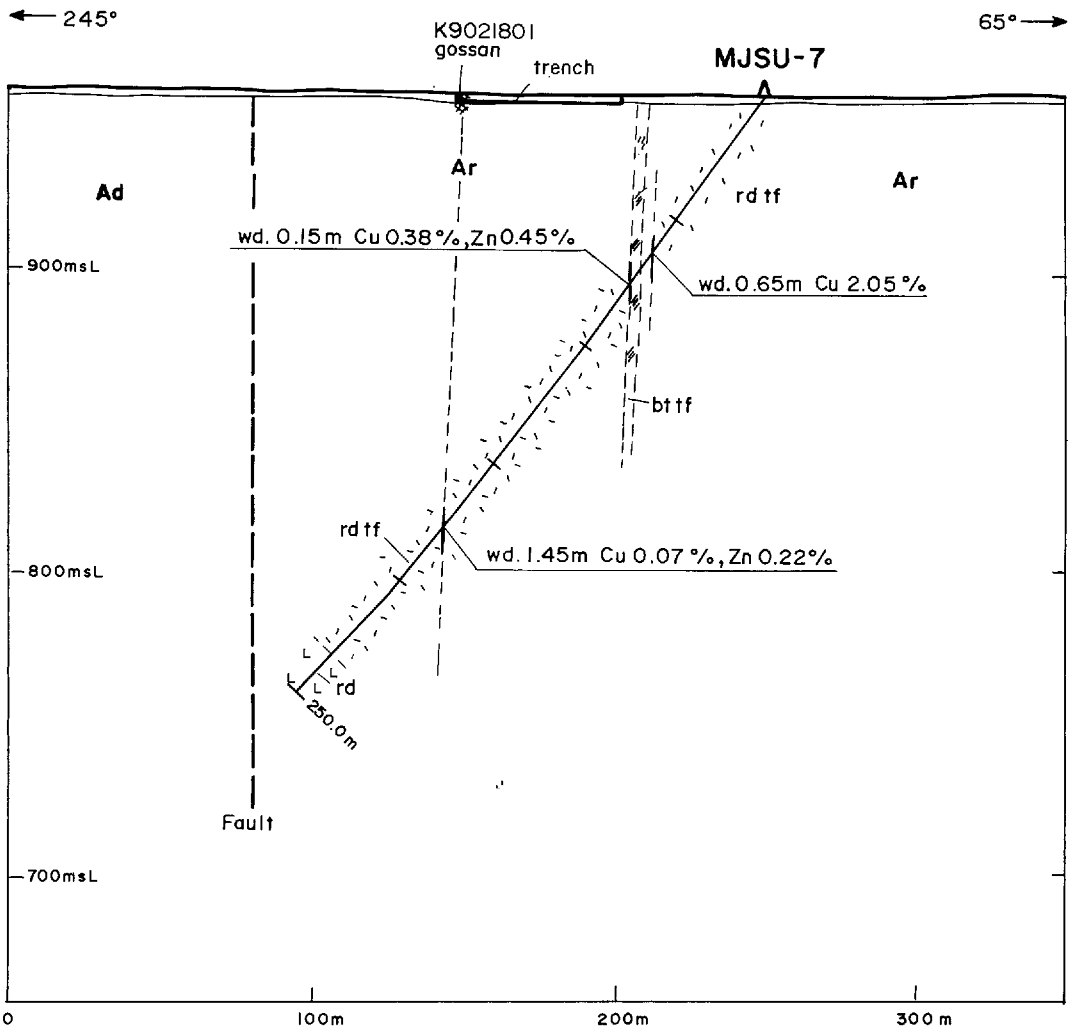


Fig.2-1-20 Geological Section of MJSU-7

1-5-4 Discussions

Although of small scale, volcanogenic massive sulfide mineralization is observed in MJSU-1 and MJSU-7 holes in this area as well as in the MJSU-2 and MJSU-6 holes. The mineralized zones confirmed in these four holes are correlated in Figure 2-1-21.

The basaltic tuff at 109.05—121.15m depth of MJSU-2 is believed to be correlated to the basaltic tuff at 141.50—152.75m of MJSU-6, and 70.15—76.55m depth of MJSU-7. The mineralized zone of 121.15—142.25m depth interval of MJSU-2 overlies the above basaltic tuff. This mineralized zone rapidly decreases its thickness and is believed to continue to the mineralized zones at 154.05—154.25m of MJSU-6 and 76.55—76.70m of MJSU-7. On the other hand, mineralized zone corresponding to that of 134.75—138.00m of MJSU-6 is not found in MJSU-7. In MJSU-2, depth interval 106.25—109.05m is rich in pyrite with hardly any chalcopyrite and sphalerite, and this is believed to correspond to the mineralized part at 134.75—138.00m interval of MJSU-6.

In MJSU-1, depth interval 91.05—92.20m is rich in pyrite, about 20%. This zone consists of bands of thin pyrite beds and chert and sedimentary process is believed to be the mode of formation. Basaltic tuff, however, does not occur near this zone and thus it is not clear whether the mineralized zone at 91.05—92.20m is stratigraphically higher or lower than the tuff.

1-5-5 Summary

The geology of this area is composed mainly of rhyodacitic pyroclastic rocks of the Late Proterozoic Arj Group with intercalation of basaltic tuff.

The mineralization of this area is divided into volcanogenic massive sulfide Cu-Zn mineralization and vein-type Cu-Ag mineralization. The latter type is of small scale and not important.

The volcanogenic massive sulfide Cu-Zn mineralization occurs both immediately above and below basaltic tuff. In MJSU-2 at 121.15—142.25m interval, the mineralized zone occurs at a horizon higher than the tuff, while it occurs below at 134.75—138.00m depth of MJSU-6.

During the first year of this project, the mineralization of the 4/6 Gossan was thought to be, from study of existing data and surface survey, only one epigenetic dissemination or network

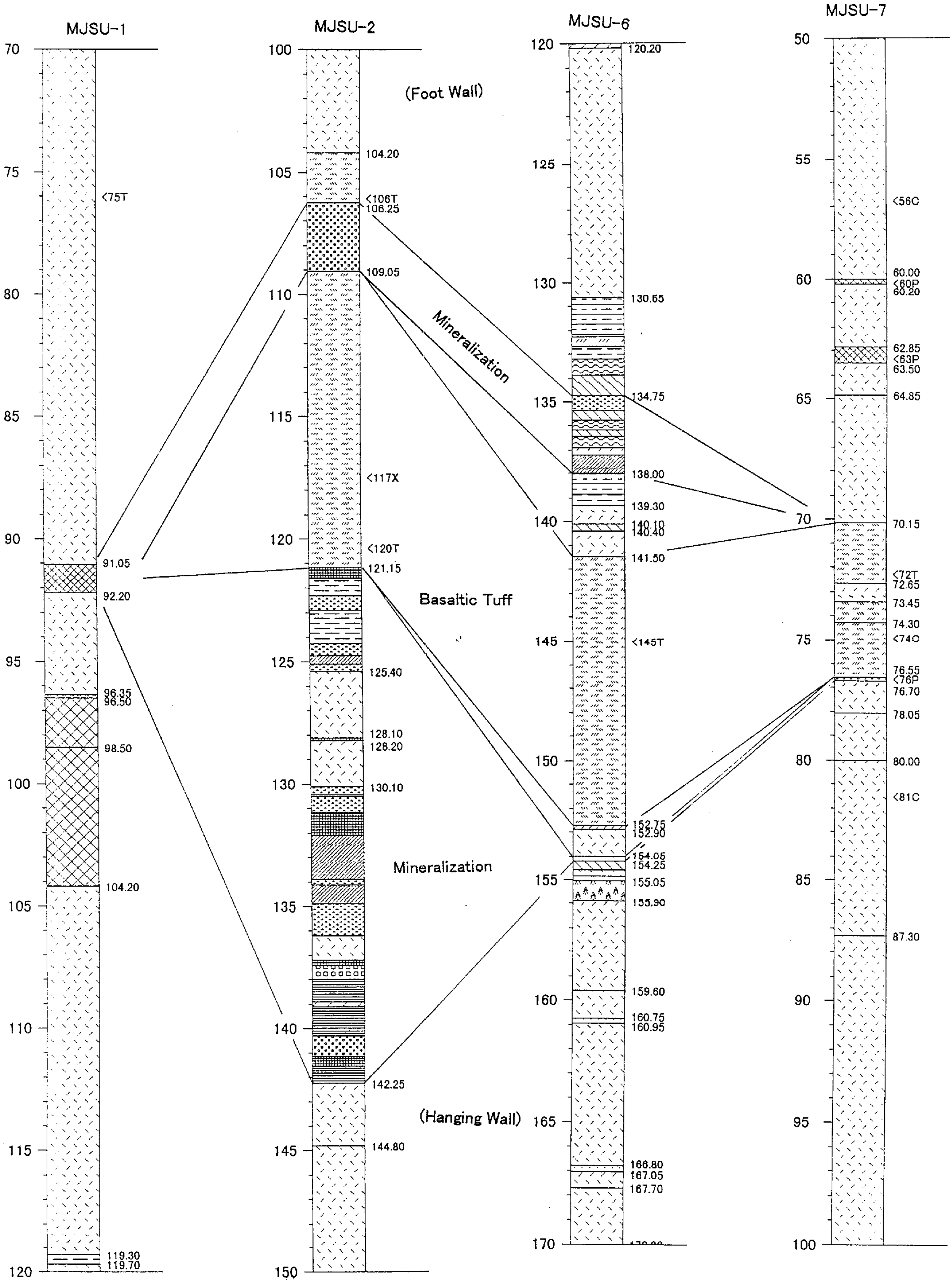


Fig.2-1-21 Correlation of Volcanogenic Massive Sulfide Mineralization

in a shear zone of Arj Group. But it is evident that it is volcanogenic massive sulfide and is syngenetic.

CHAPTER 2 DETAILED GEOLOGICAL SURVEY AND EXAMINATION OF OLD CORES

2-1 Detailed Geological Survey

Detailed geological survey of this fiscal year was carried out in the periphery of the target area in order to acquire data for geological interpretation of TEM survey over flat area covered by Quaternary sand and gravel. Also detailed geological survey was carried out in the North Prospect, the South Prospect, and the 4/6 Gossan. In these prospects, the results of drilling carried out this fiscal year was inconsistent with the geological survey of the first year. The results of these survey are shown in geological maps in Chapters 1 and 5. Thus in this chapter, the results of the detailed survey of silicified rocks at 750m southwest of West Hill of the North Prospect will be reported.

A geological map of the surveyed zone is shown in Figure 2-2-1. Here four trenches were dug from the summit of the E-W trending hills (altitude 1,008.9m) to the foot (altitude 960m) and another trench was made at the foot. The silicified rocks were derived from dacite and is reddish brown by its hematite content. Gold is often contained in hematitized silicified rocks and the following three samples were collected from the trenches and assayed. It is seen from the table below that Au content is almost nil in these samples.

	Sample No.	Rock Name	Analytical Result			
			Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
①	K0021401	40cm wide gossan-quartz vein	<0.05	<1.0	0.02	0.01
②	K0021402	Silicified rock, containing hematite	0.08	6.2	0.02	0.01
③	K0021403	Silicified and clayey rock, containing hematite	<0.05	<1.0	0.02	0.01

Trace of drilling was discovered on the southern slope of this hill, and this corresponds to UAD-9 drilled by SEREM/US Steel in 1977. This hole is 258.45m long, but the direction and the inclination is not known. The target of this hole is believed to be the silicified body in the northern side of the hill. Weak Cu-Zn mineralization (Cu+Zn<0.3%) at 53.0−84.0m and pyrite concentration (pyrite 90%) at 157.5−158.7m were the only sign of mineralization observed in this hole.

Not many samples were collected during the course of this study, but together with the results of UAD-9 drilling, the gold content in these silicified rocks are believed to be low.

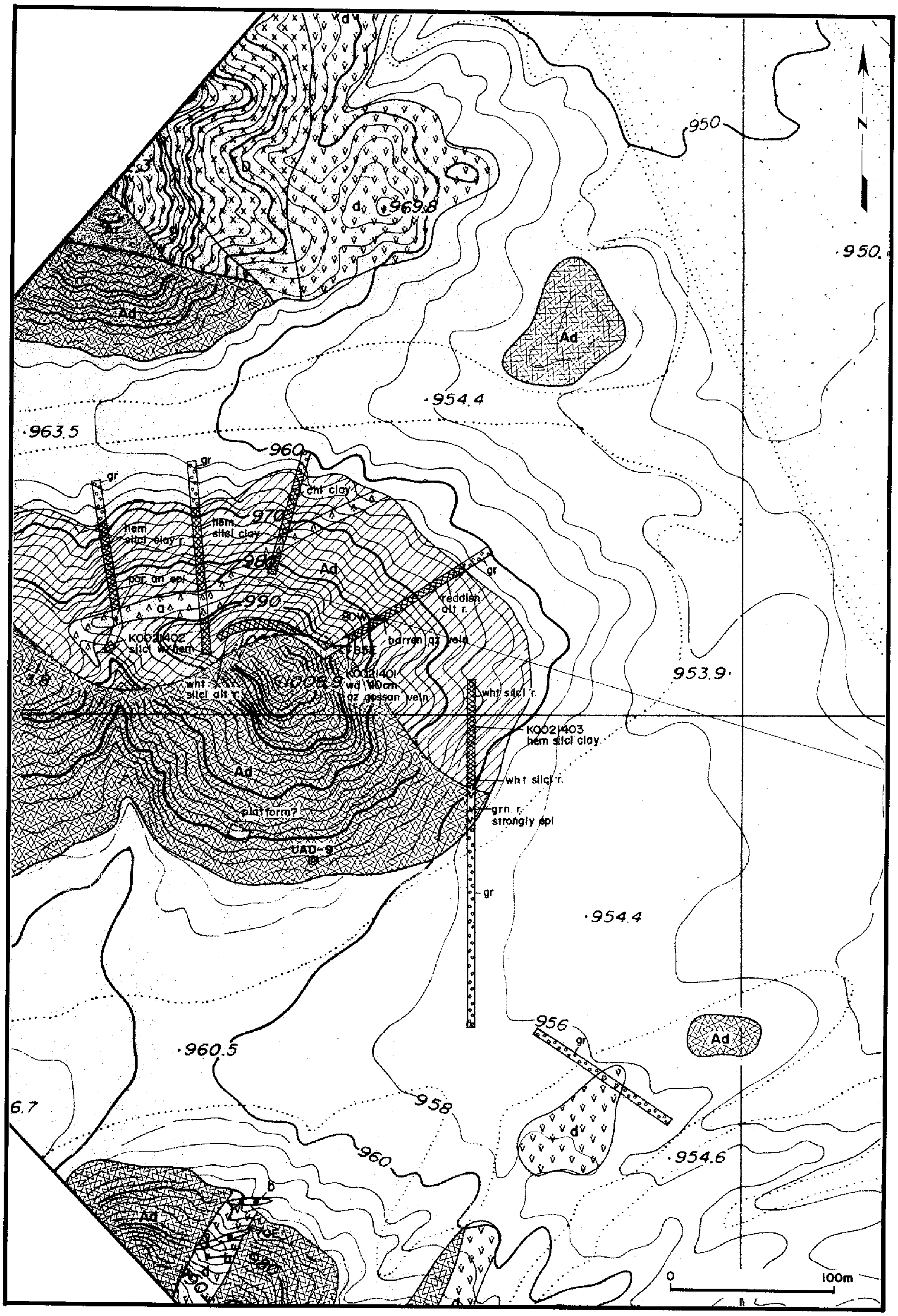


Fig.2-2-1 Geological Map of the Area around UAD-9

2-2 Examination of Old Cores

Old drill cores left in Jabal Sayid camp were reorganized and cores from UAD-3, UAD-4, UAD-6 and UAD-10 were examined. The geological columns of these drill holes are shown in Figure 2-2-2. The results of the re-examination of the old cores are as follows.

① The geology of the UAD-6 cores consists mostly of dacite, dacitic pyroclastic rocks, and porphyritic dacite (intrusive). This hole was drilled by SEREM/US Steel at Southeast Hill of the North Prospect in 1977. Rhyodacite and rhyodacitic pyroclastic rocks are not developed at Southeast Hill.

② The geology of the UAD-10 cores consists mostly of rhyodacitic pyroclastic rocks. This hole is located near TJ-18 sub-area where TEM survey was carried out and the geologic conditions of this sub-area is inferred to be similar to that of UAD-10.

③ The cores of UAD-4 at the South Prospect contain chalcopyrite-pyrite-quartz veins at 105.95—112.05m, and pyrite-chalcopyrite-sphalerite dissemination in chloritized zone in 112.05—115.00m depth. These zones were sampled and the results of assay are shown below.

Drilling Depth (m)	Interval (m)	Assay Result			
		Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)
105.95—112.05	6.10	0.34	22.9	1.97	0.23
112.05—115.00	2.95	1.14	39.2	3.72	3.07

The mineralization of the South Prospect is believed to be vein-type Au-Cu-Zn.

CHAPTER 3 IP SURVEY

3-1 Outline of Survey

3-1-1 Objective

The objective of IP survey is to clarify the continuity and the center of chargeability anomalies for the anomalous zones extracted by the first phase survey.

3-1-2 Exploration method

Time domain IP method

3-1-3 Amounts of IP survey

Amounts of IP survey are as follows.

Field survey	
Total length of lines	10 km
Survey lines	10 lines
Measuring points	260 points
Laboratory test	37 pcs

3-2 Survey Method

3-2-1 Methodology

The IP method is the exploration method to observe electric polarization effect (IP effect) in the earth. The IP effect is caused by the following phenomena.

When direct current flows through the rocks containing metallic minerals, electric potential difference is generated between the surface of metallic minerals and pore water around it. This electric potential causes a store of electric charges and induces electric polarization. The electric charges are discharged gradually after current is cut off. It forms the residual voltage decaying with the passage of time. However, the IP effect occurs not only in the rocks containing metallic minerals, but also in some sedimentary rocks containing graphite or clay.

In the time domain IP method, on and off alternating current in the shape of rectangular wave, as shown in Figure 2-3-1, is generally used as transmitter current. Received voltage is composed of the primary voltage Vp observed during current on and the decay voltage (secondary voltage Vs) observed during current off. Chargeability is calculated with received voltage as index to express quantity of IP effect. The chargeability M is defined by the following equation. It is the proportion of time integral of secondary voltage to primary voltage. Its unit is mV/V.

$$M = 1/Vp/(t2 - t1) \cdot \int_{t1}^{t2} Vs \; dt \qquad (3\text{-}1)$$

t1: Time at the beginning of Vs integration

t2: Time at the end of Vs integration

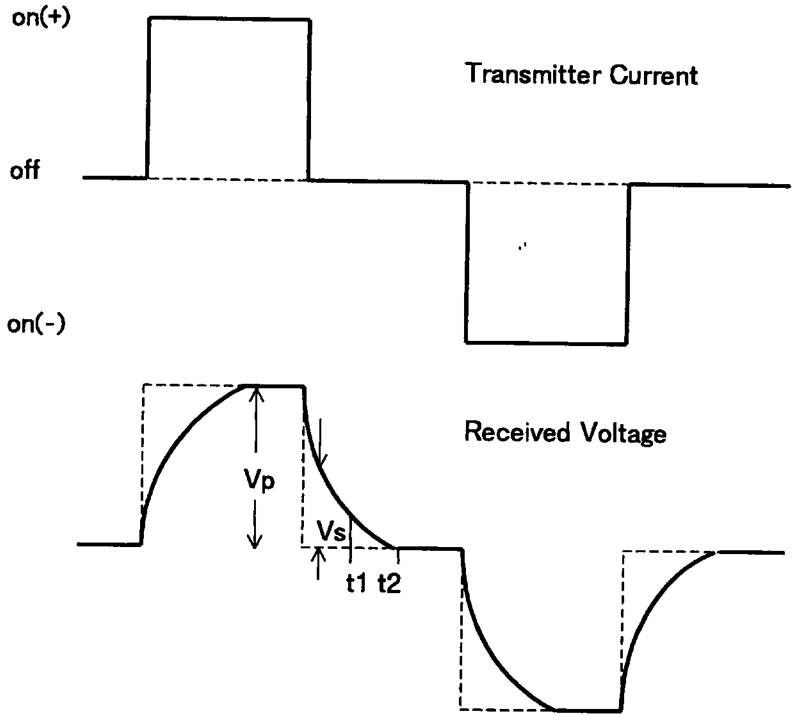


Fig. 2-3-1 Wave Form of Transmitter Current and Received Voltage

3-2-2 Field survey

The survey lines are laid out in high chargeability anomalous areas (around B-12, M-27 and P-18) as shown in Figure 2-3-2. The lengths of the survey lines are shown in Table 2-3-1. The interval of the survey lines is 100 m. The specifications of the measurement are as follows.

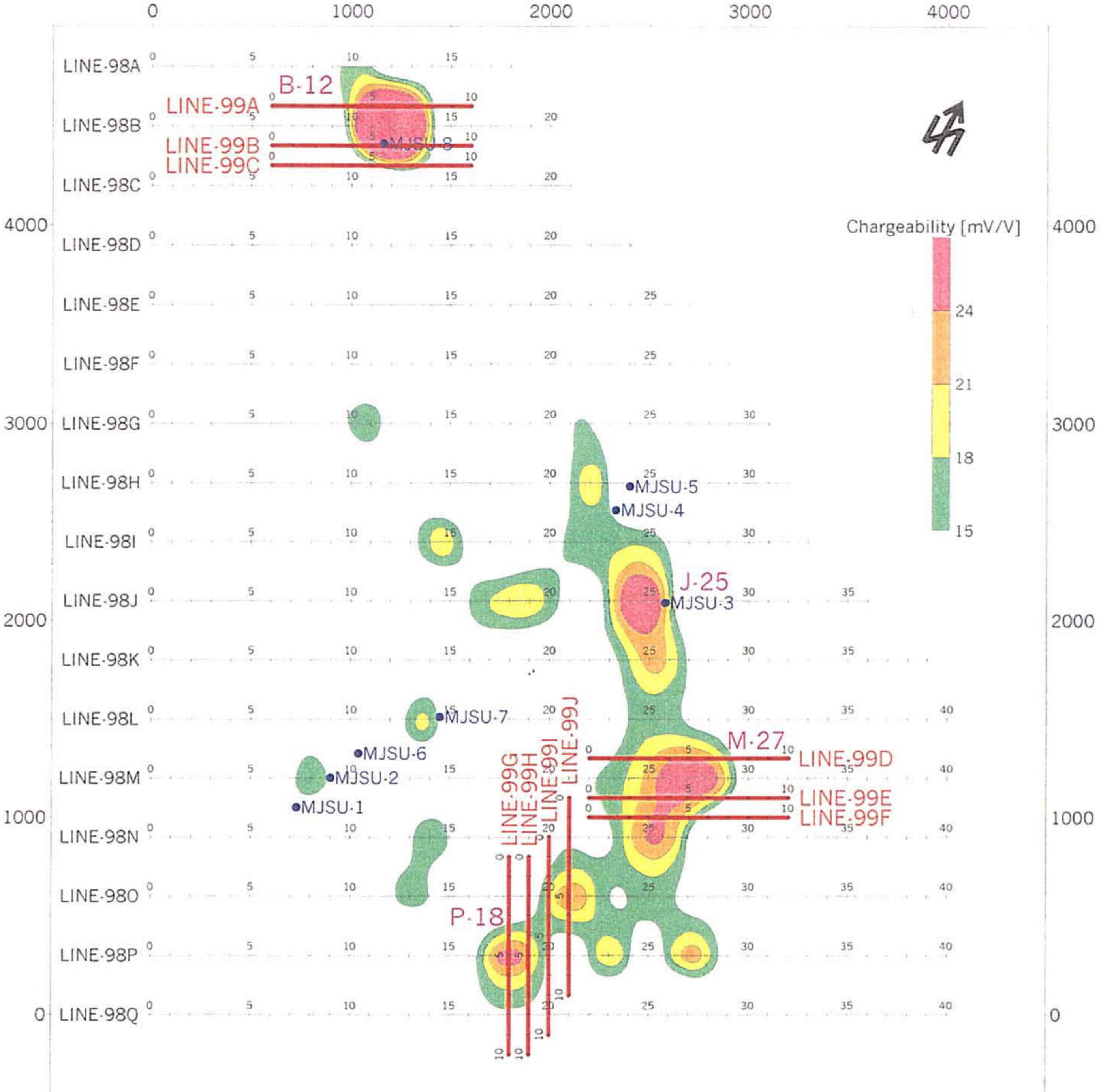


Fig.2-3-2 Location Map of IP Survey Lines

Electrode configuration	:	Dipole-dipole array
Interval of measuring points	:	100 m
Electrode separation index	:	1 to 4
Electrode spacing	:	100 m
Observed quantity	:	Electric potential and chargeability
ON / OFF time	:	2 s
Time at the beginning of Vs measurement	:	450 ms
Time at the end of Vs measurement	:	1,100 ms

The equipment used in this survey is shown in Table 2-3-2.

Table 2-3-1 List of IP Survey Lines

Line	Length [km]	Amount of Measuring Points
99A	1.0	26
99B	1.0	26
99C	1.0	26
99D	1.0	26
99E	1.0	26
99F	1.0	26
99G	1.0	26
99H	1.0	26
99I	1.0	26
99J	1.0	26
Total	10.0	260

Table 2-3-2 List of IP Survey Equipment

ITEM	MODEL	SPECIFICATION
Transmitter	Chiba CH-96T Transmitter Chiba CH-96A Power Controller	Output Voltage : 70, 120, 180, 250, 330, 420, 520, 630, 750, 880 V Output Current : 0~15 A Wave Form : Rectangular Wave Frequency Range : DC~10,000 Hz Weight : 67 kg
Engine Generator	Honda ET4500 Engine Generator	Output Power : 4.5 kW Output Voltage : 200 V Weight : 78 kg
Receiver	Scintrex IPR-12 Time Domain IP/Resistivity Receiver	On/Off Time : 1, 2, 4, 8, 16, 32 s Resolution (VP) : 10 μV Resolution (M) : 0.01 mV/V Power : 12V Battery Weight : 5.8 kg
Electrode		Current : Stainless Rod Potential : Non Polarization $CuSO_4$ Porous Pot

3-2-3 Laboratory tests

Resistivity and chargeability of rock samples in the survey area were measured in laboratory. The same method as in the field measurement was applied. Thirty-seven samples were measured.

3-2-4 Analytical method

The analysis was carried out according to the flow chart shown in Figure 2-3-3.

(1) Apparent resistivity pseudosection

In this section, apparent resistivity is plotted at the depth of a(n+1)/2 just under the middle point of the used electrodes for each line. In the above equation, a is electrode spacing and n is electrode separation index.

(2) Apparent resistivity map

In this map, the apparent resistivity of the specific electrode separation index is plotted.

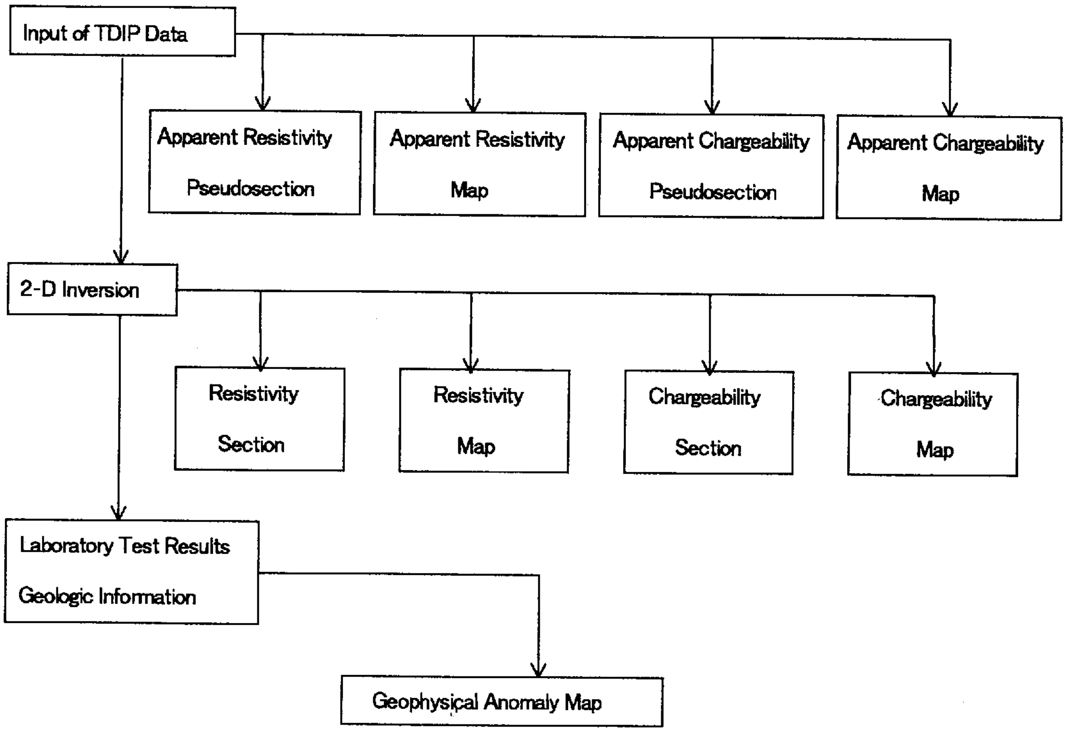


Fig. 2-3-3 Flow Chart of the Analytical Method

(3) Apparent chargeability pseudosection

In this section, apparent chargeability is plotted at the depth of a(n+1)/2 just under the middle point of the used electrodes for each line. In the above equation, a is electrode spacing and n is electrode separation index.

(4) Apparent chargeability map

In this map, the apparent chargeability of the specific electrode separation index is plotted.

(5) 2-D inversion

This analysis assumes that structure is two dimensional, and determines the optimum resistivity distribution of two-dimensional model for each line. The distribution of apparent resistivity calculated for the optimum model is best matched to that of the observed apparent resistivity. The finite element method is applied to the forward analysis and the non-linear least squares method with smoothness constraint is applied to the optimization of resistivity distribution.

After resistivity distribution is obtained, chargeability distribution is determined with the least squares method on the assumption that an observed chargeability is weighted average value of chargeability using the sensitivities of apparent resistivity as a weighting function.

(6) Resistivity section

In this section, the resistivity distribution below each line is drawn using the results of the 2-D inversion.

(7) Resistivity map

In this map, the resistivity distribution at the specific level is drawn using the results of the 2-D inversion.

(8) Chargeability section

In this section, the chargeability distribution below each line is drawn using the results of the 2-D inversion.

(9) Chargeability map

In this map, the chargeability distribution at the specific level is drawn using the results of the 2-D inversion.

(10) Geophysical anomaly map

In this map, the geophysical anomalies are extracted.

3-3 Survey Results

3-3-1 Observed data

(1) Apparent resistivity

The pseudosections of the apparent resistivity of every line are shown in Figures 2-3-4 to 2-3-5 and the maps of the apparent resistivity of n=2 and 4 are shown in Figures 2-3-6 and 2-3-7. The resistivity in this area is high on the whole, since the mean value of apparent resistivity is about 600 ohm-m. Resistivity is clearly higher in the deeper zone. Low resistivity of less than 100 ohm-m are distributed in the shallow zones. Roughly speaking, the resistivity of three anomalous sub-areas is lower than that of whole survey area.

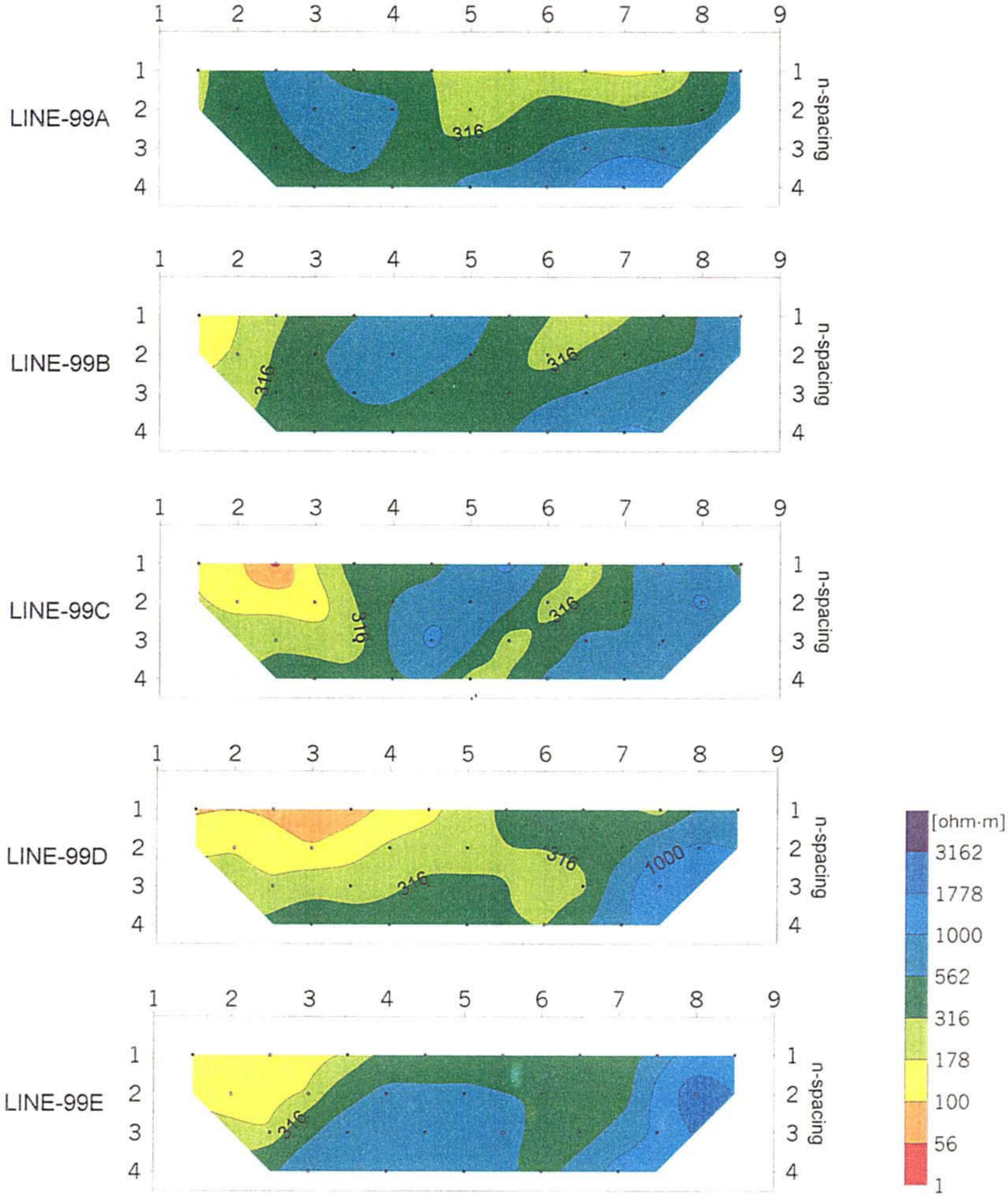


Fig.2-3-4 Apparent Resistivity Pseudosection (Line-99A,99B,99C,99D,99E)

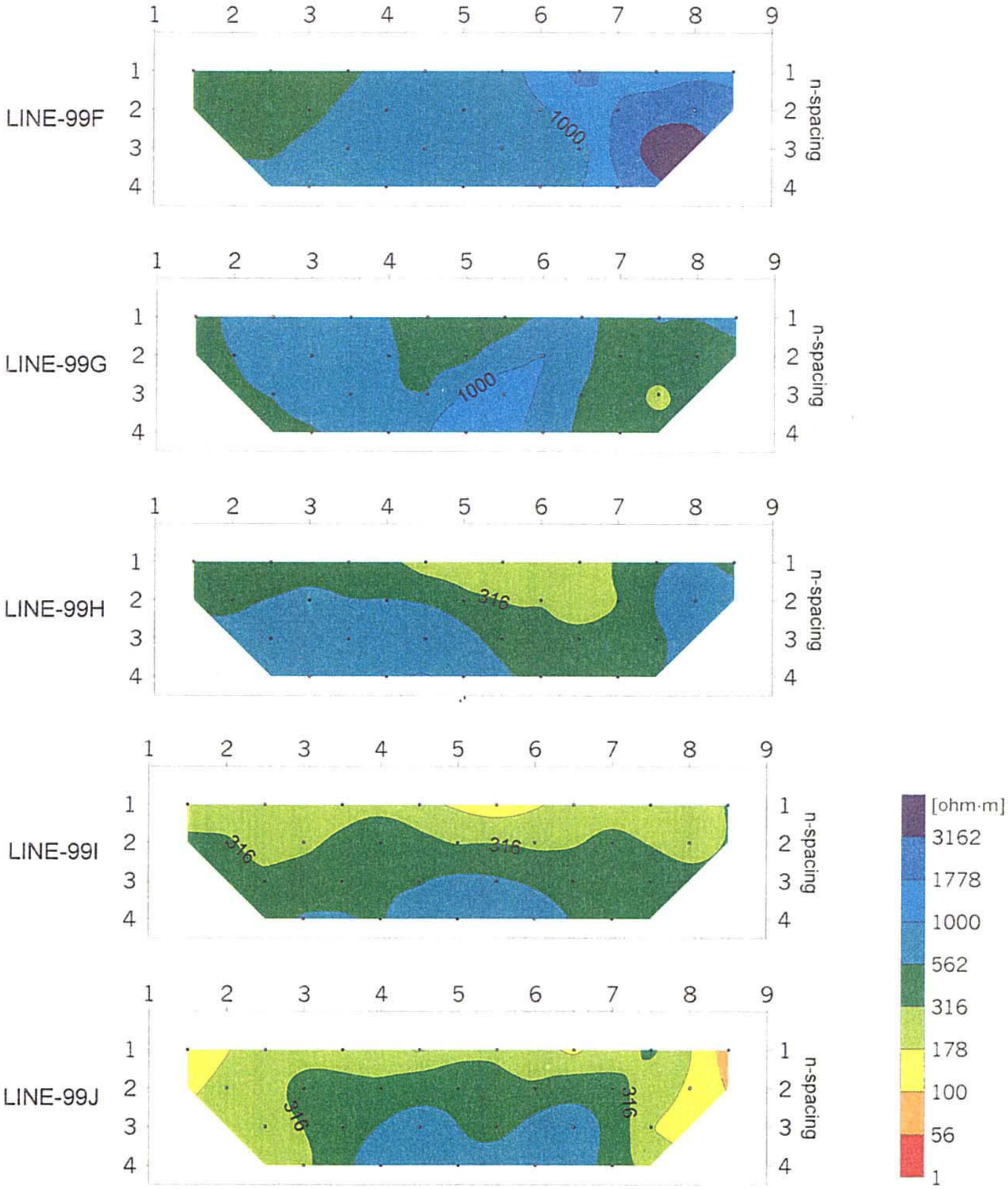


Fig.2-3-5 Apparent Resistivity Pseudosection (Line-99F,99G,99H,99I,99J)

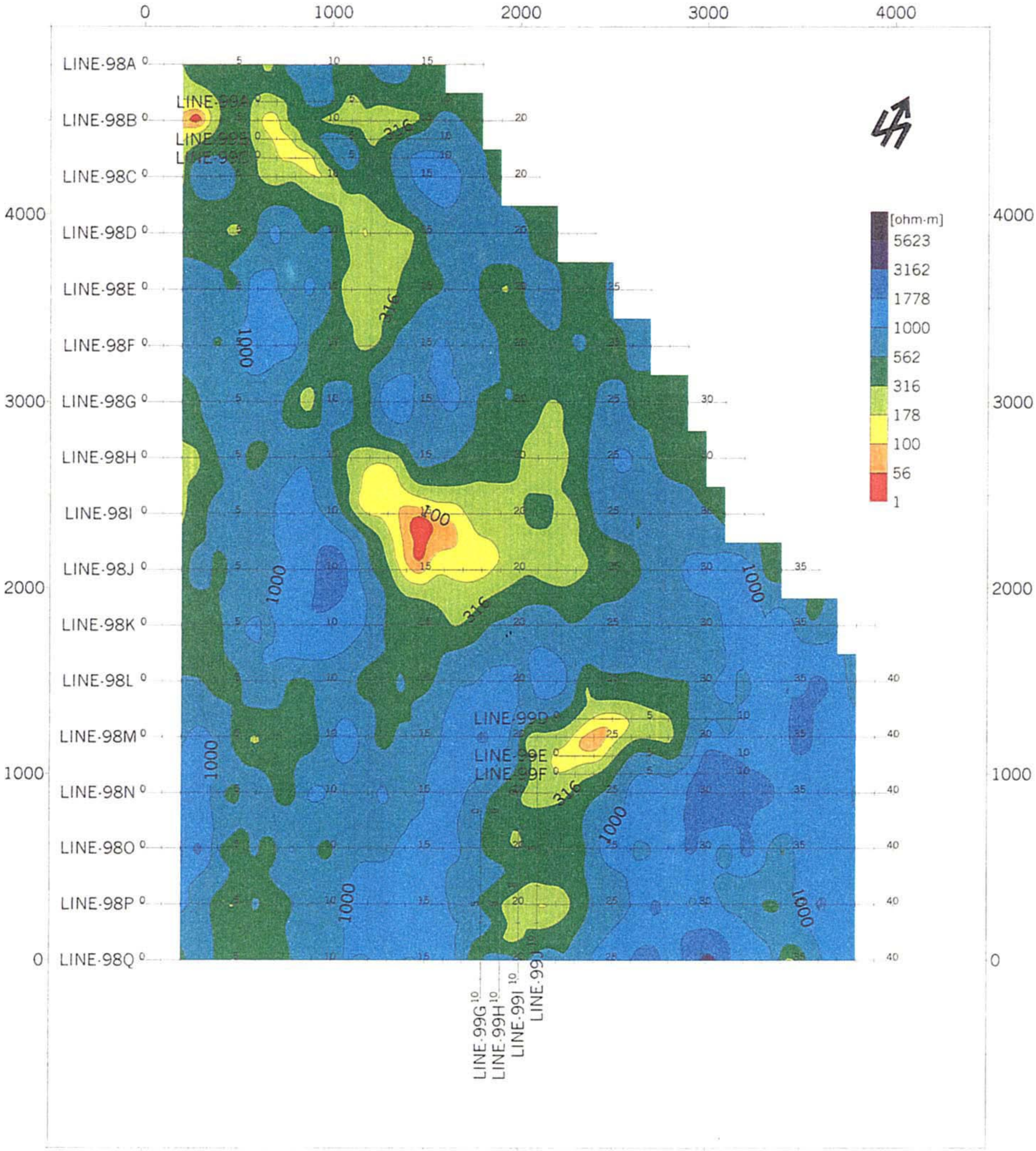


Fig.2-3-6 Apparent Resistivity Map (n=2)

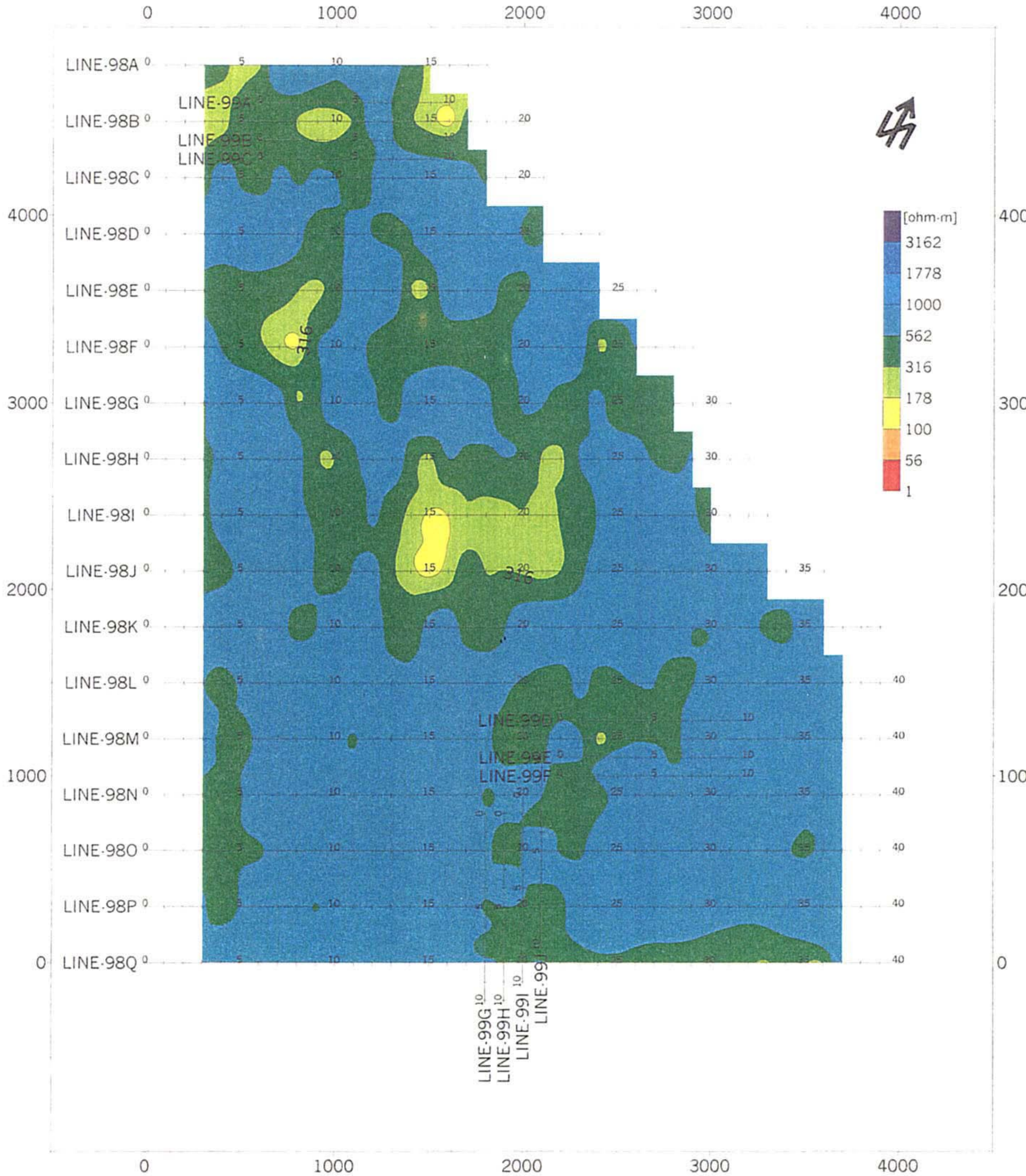


Fig.2-3-7 Apparent Resistivity Map (n=4)

(2) Apparent chargeability

The pseudosections of the apparent chargeability of every line are shown in Figures 2-3-8 to 2-3-9 and the maps of the apparent chargeability of n=2 and 4 are shown in Figures 2-3-10 and 2-3-11. The background value of chargeability in this area seems to be 3-5 mV/V, judging from the apparent chargeability. The chargeability anomalous zones exceeding 12 mV/V are detected from the shallow to the deep in the central part of line-99A and line-99B, and in the part of line-99H and line-99I.

3-3-2 Analytic results

(1) Resistivity

The resistivity sections drawn with the 2-D inversion are shown in Figures 2-3-12 to 2-3-14. The resistivity maps of 2 levels (SL 900 m and SL 800 m) are shown in Figures 2-3-15 and 2-3-16. The 2-D inversion led to the clear distribution and contrast of the resistivity in this area. The high resistivity zones of more than 500 ohm-m are distributed throughout the whole survey area, except in the shallow zone. The low resistivity zones of less than 100 ohm-m are distributed partly in the shallow. In the deep zone, low resistivity is detected only at station 98B-8.

(2) Chargeability

The chargeability sections drawn with the 2-D inversion are shown in Figures 2-3-17 to 2-3-19. The chargeability maps of 2 levels (SL 900 m and SL 800 m) are shown in Figures 2-3-20 and 2-3-21. Chargeability anomalies were extracted clearly in the three anomalous areas because of additional detailed IP survey of ten lines.

① B-12

The large and high chargeability anomaly detected in line-98B is also detected in line-99A and line-99B. The anomaly trends to extend in the WNW-ESE direction. The chargeability in the central part of the anomaly exceeds 50 mV/V.

② M-27

The high chargeability anomaly extending in the N-S direction detected in line-98M and line-98N forms two anomalies of northern and southern parts. The northern anomaly around station M-27 occurs in oval-shape extending in the NE-SW direction.

③ P-18

The high chargeability anomaly detected around station P-18 extends northward and continues to

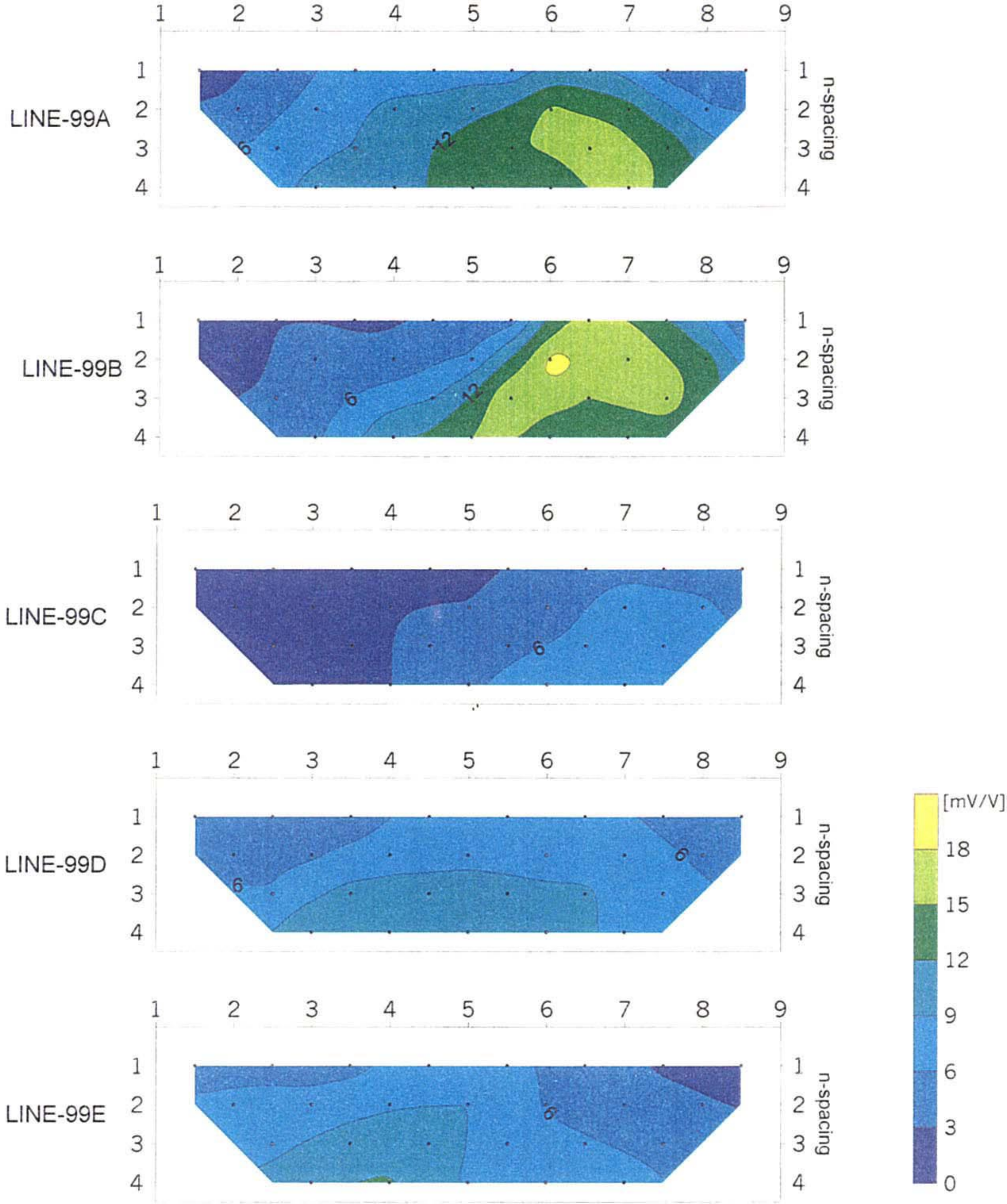


Fig.2-3-8 Apparent Chargeability Pseudosection (Line-99A,99B,99C,99D,99E)

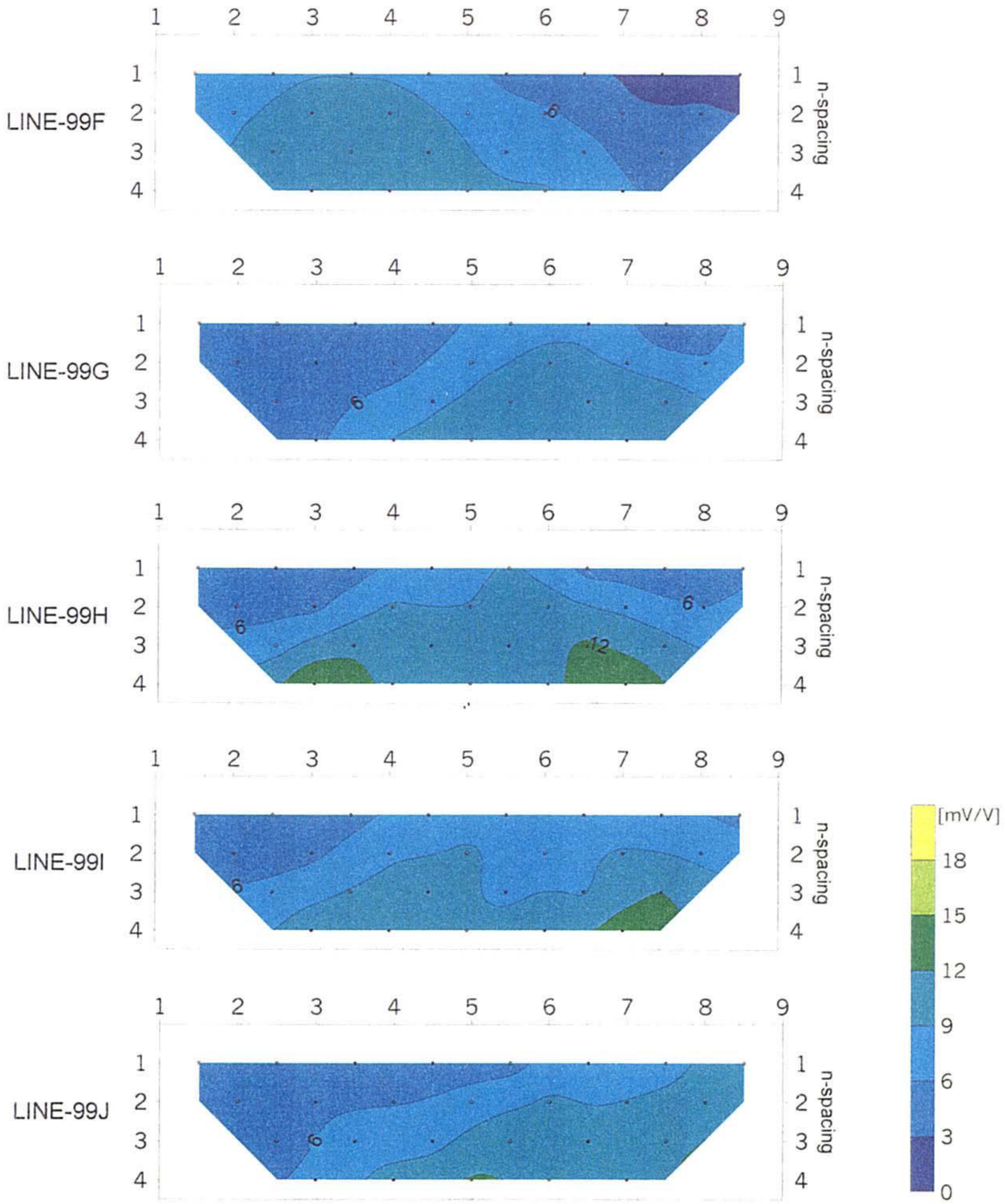


Fig.2-3-9 Apparent Chargeability Pseudosection (Line-99F,99G,99H,99I,99J)

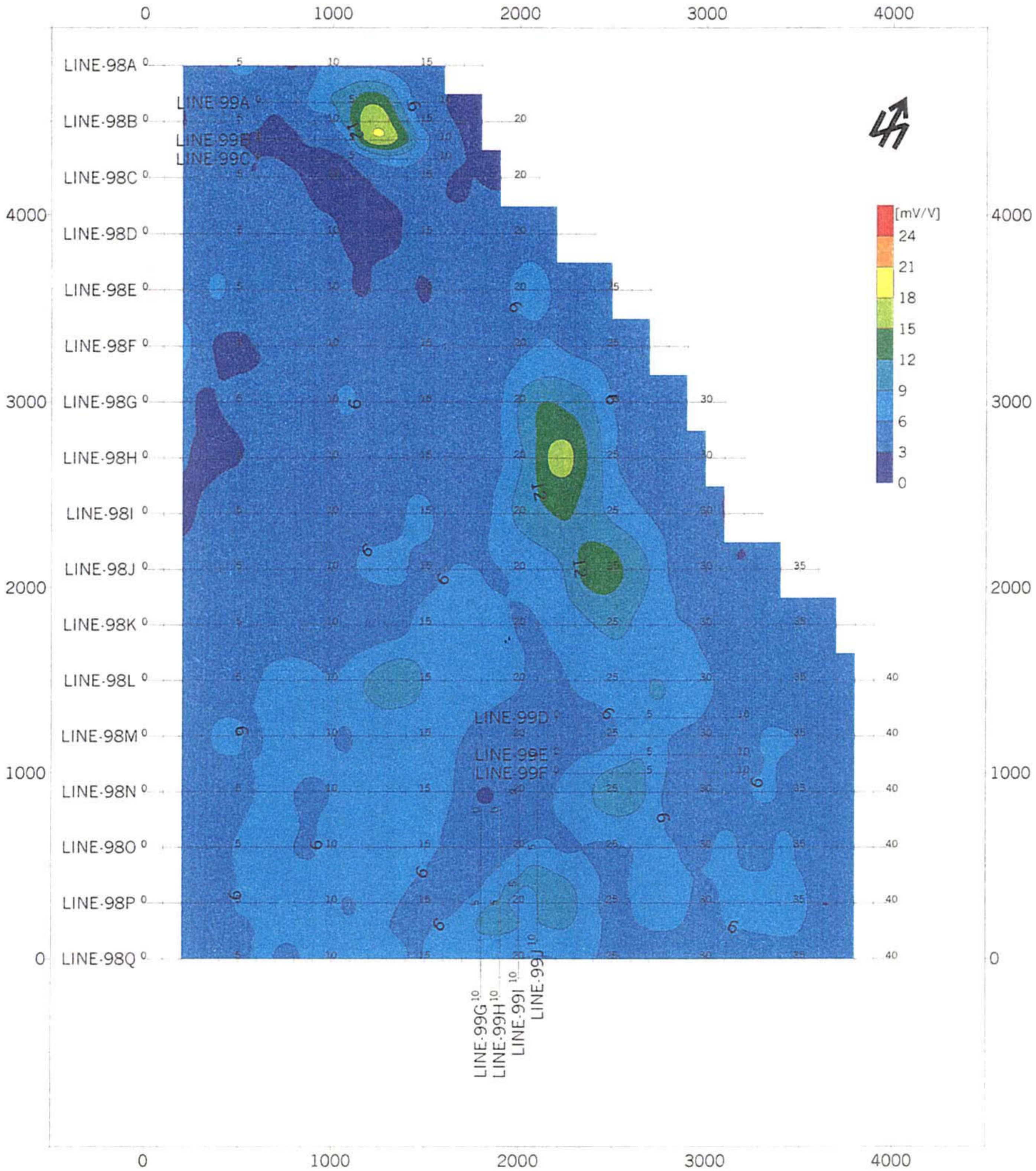


Fig.2-3-10 Apparent Chargeability Map (n=2)

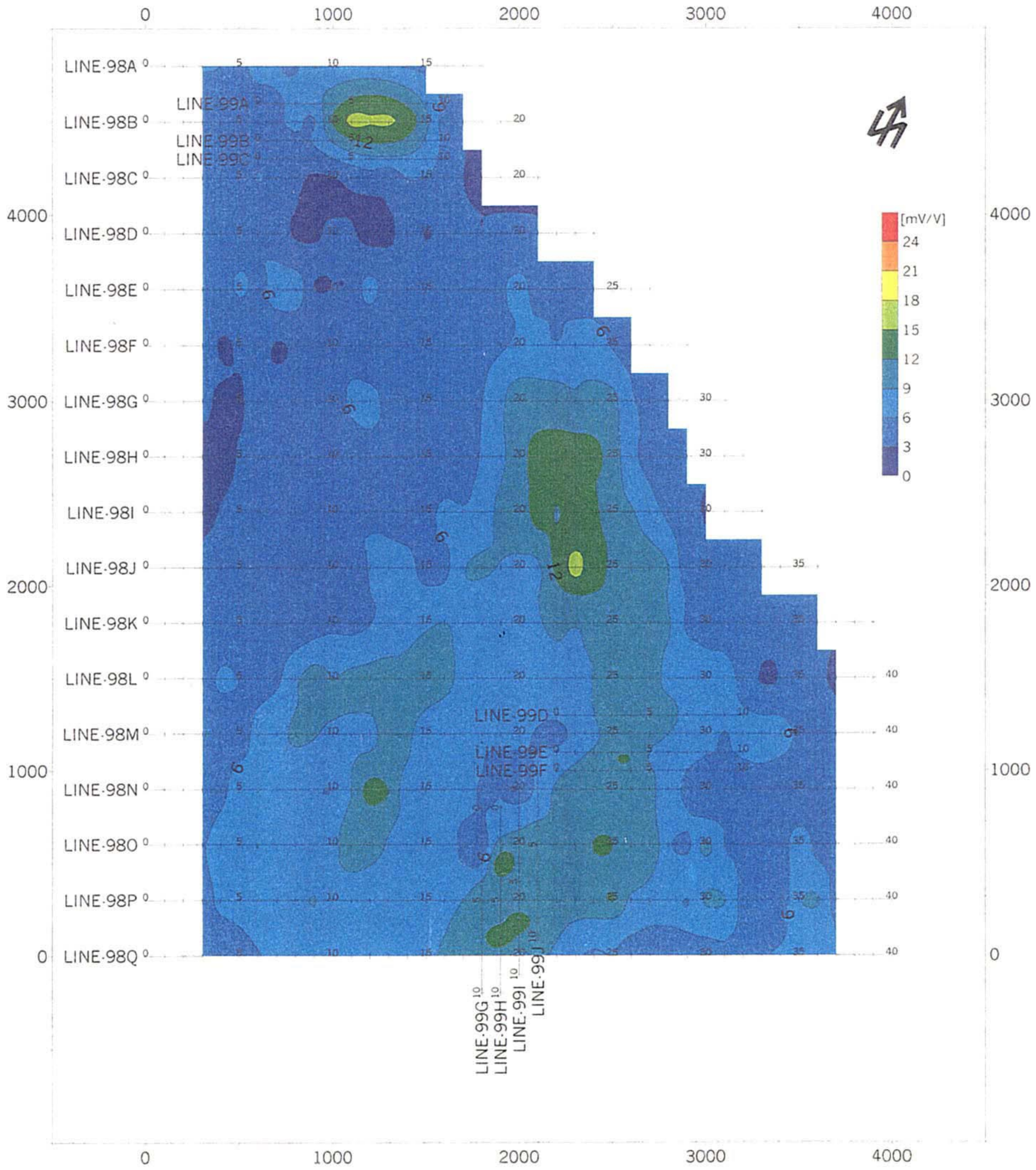


Fig.2-3-11 Apparent Chargeability Map (n=4)

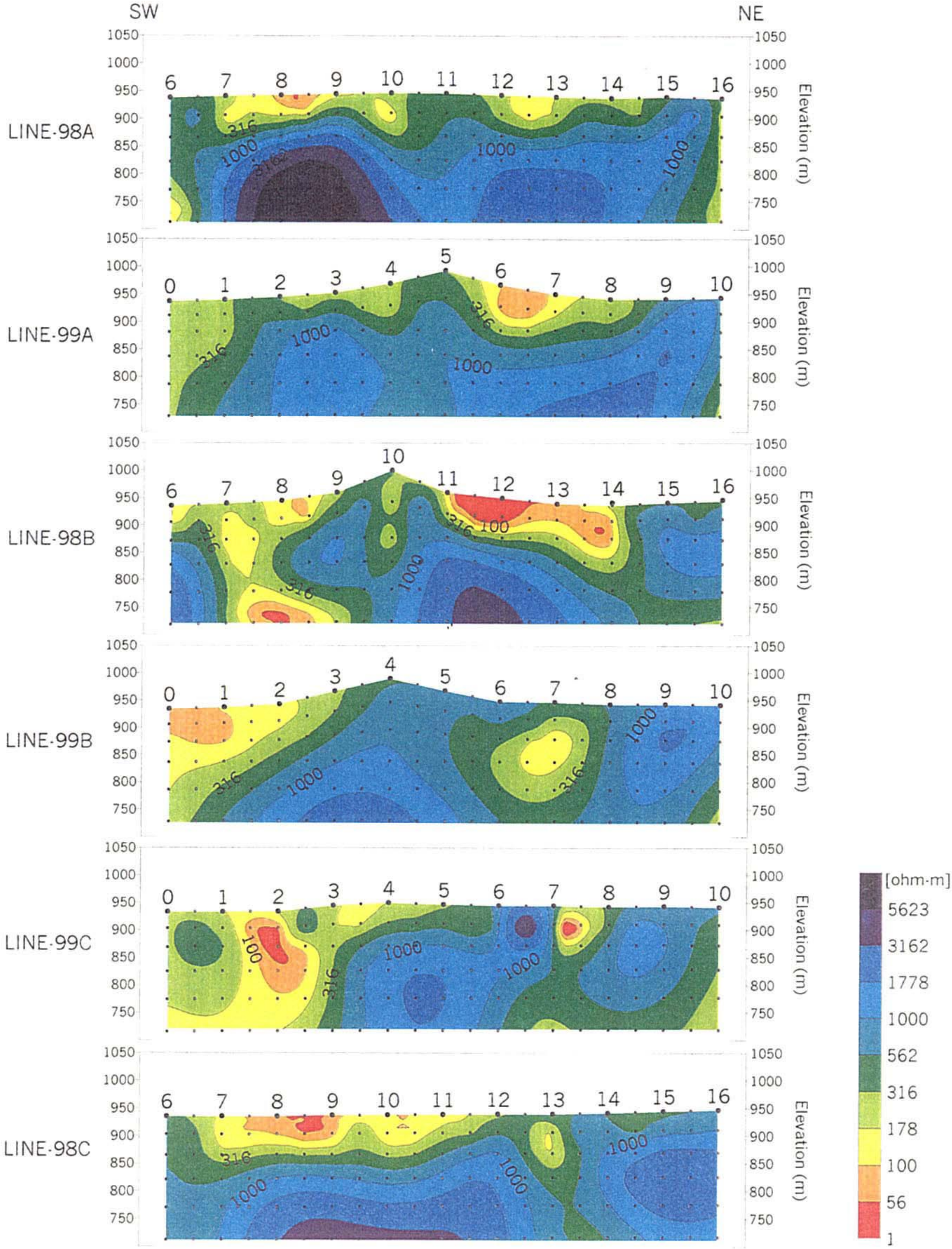


Fig.2-3-12 Resistivity Section (B-12)

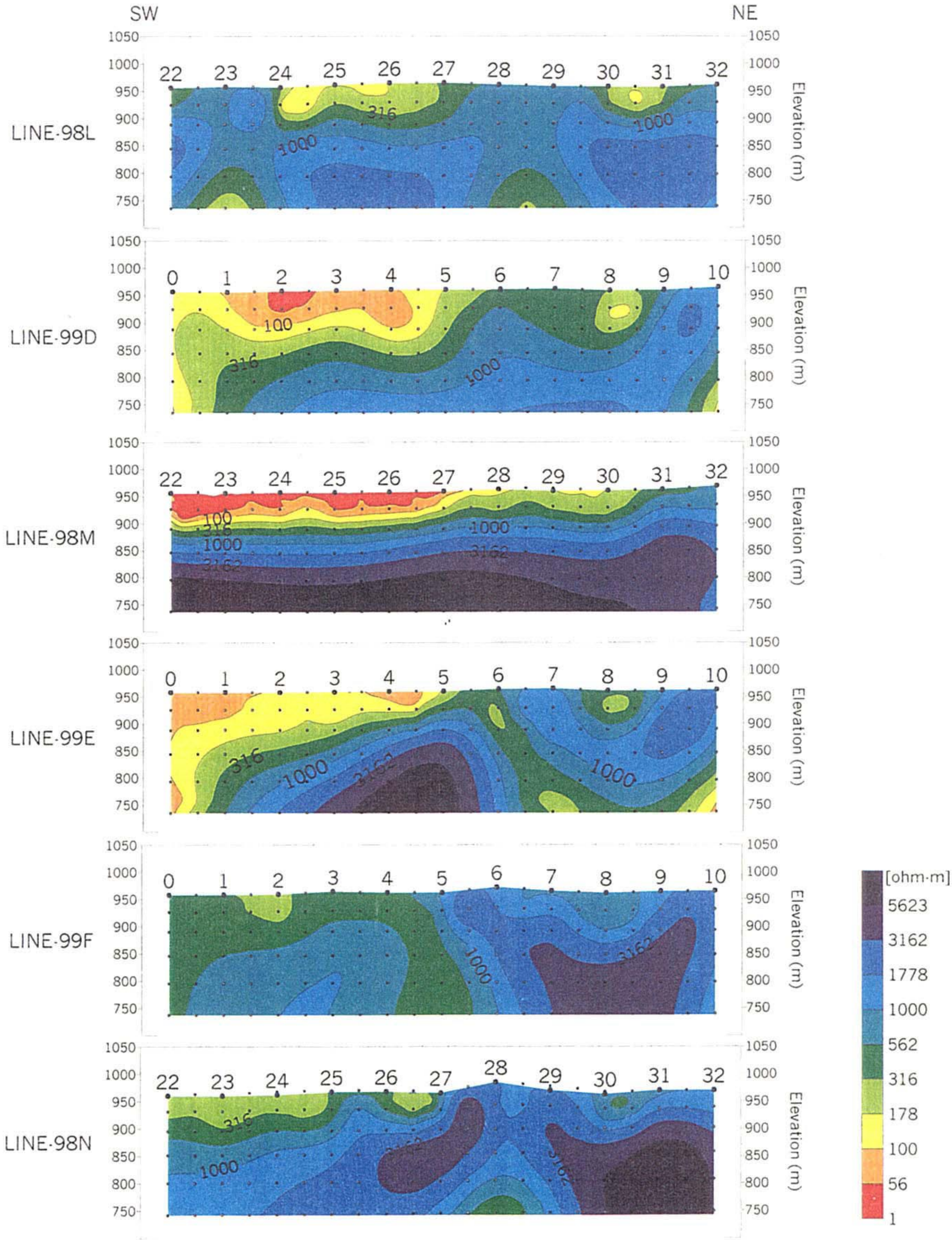


Fig.2-3-13 Resistivity Section (M-27)

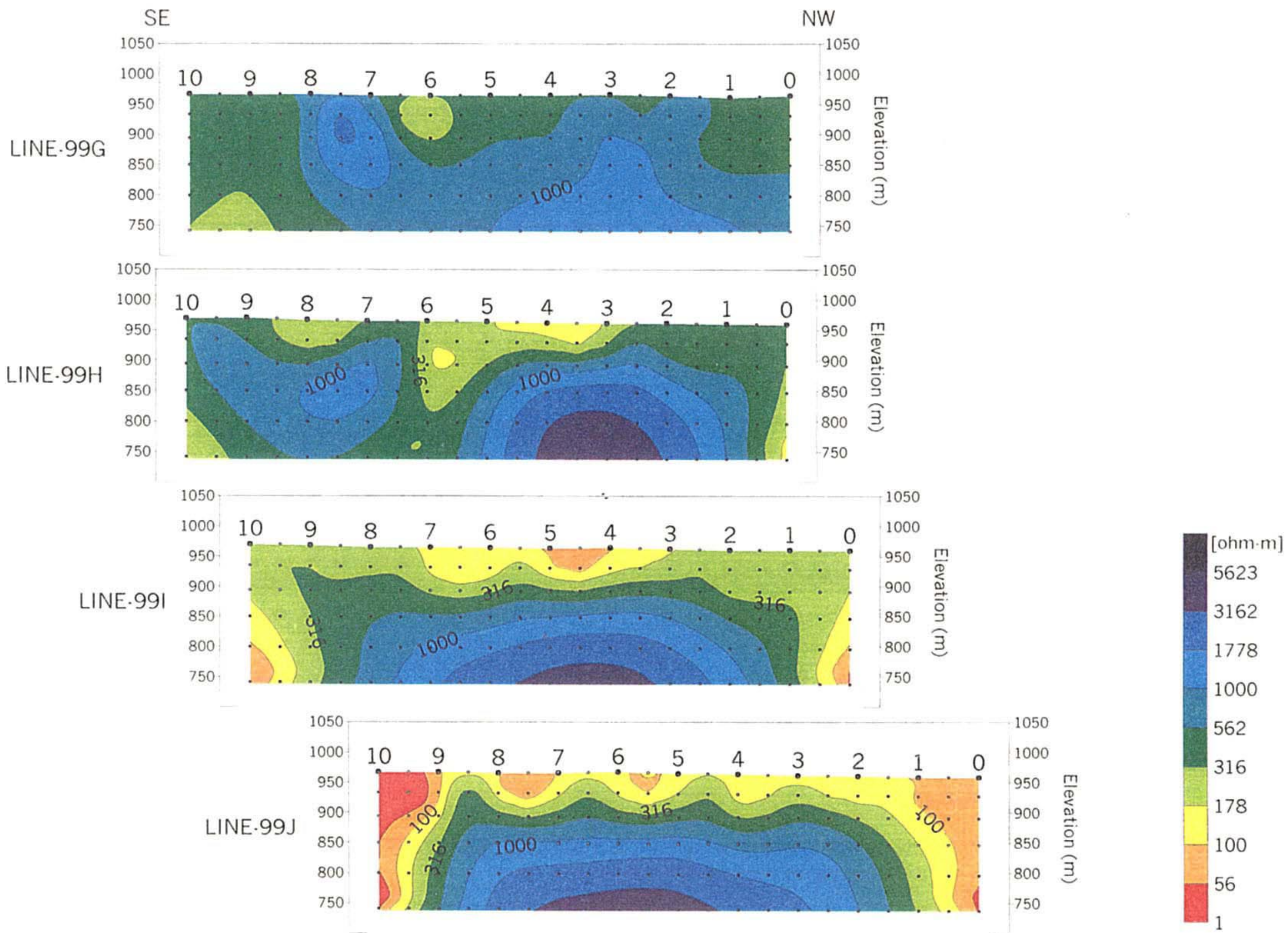


Fig.2-3-14 Resistivity Section (P-18)

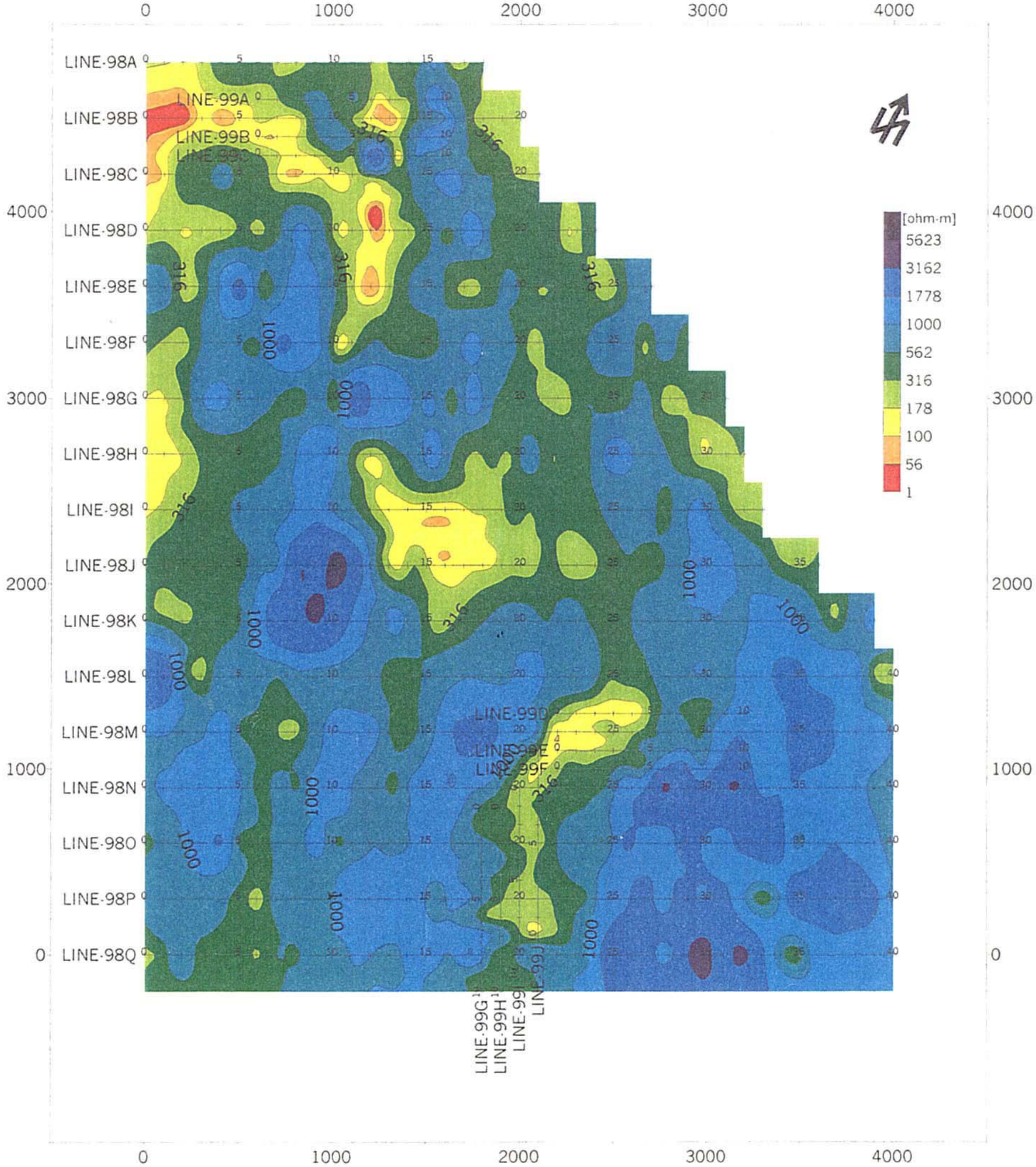


Fig.2-3-15 Resistivity Map (SL:900m)

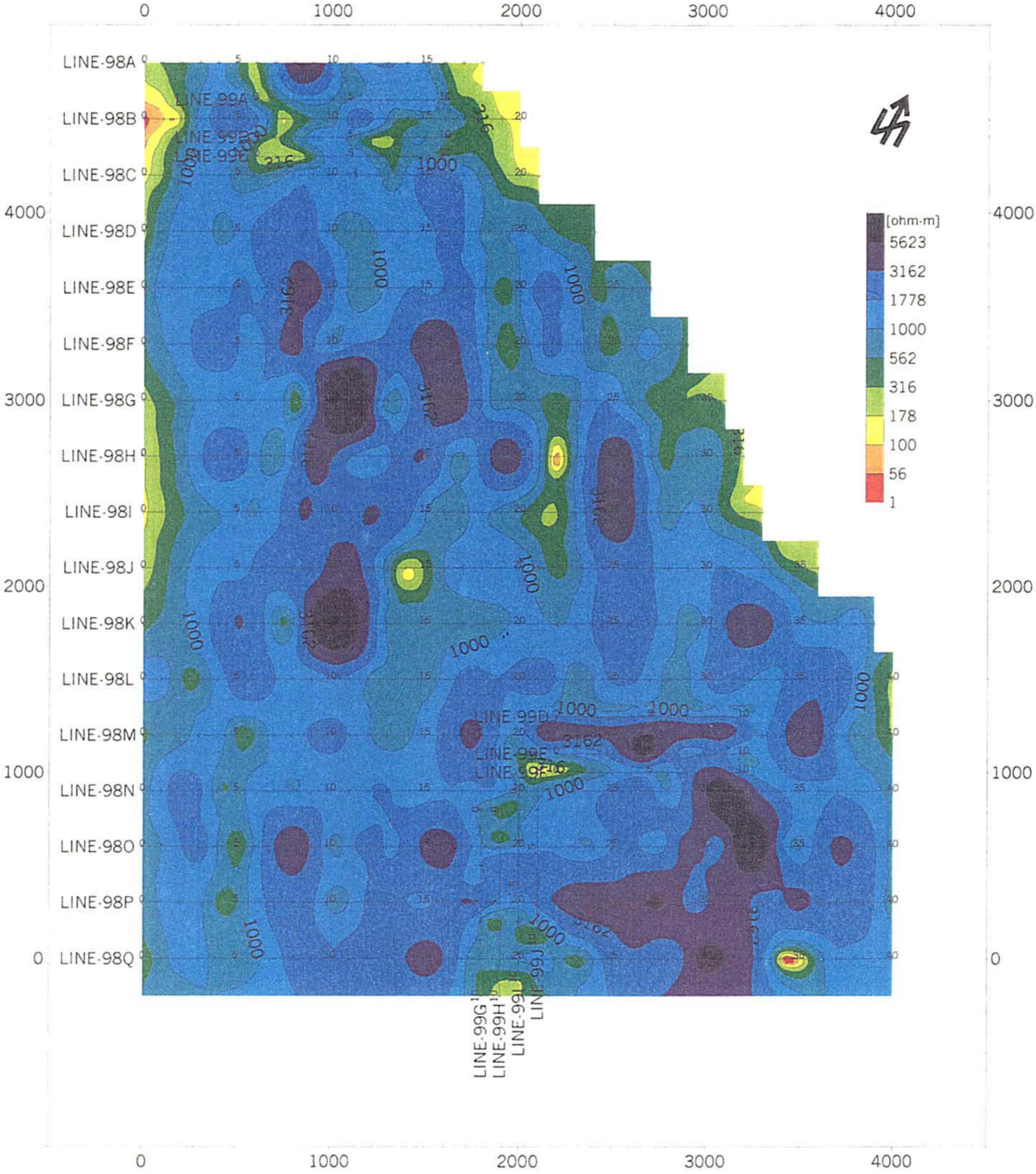


Fig.2-3-16 Resistivity Map (SL:800m)

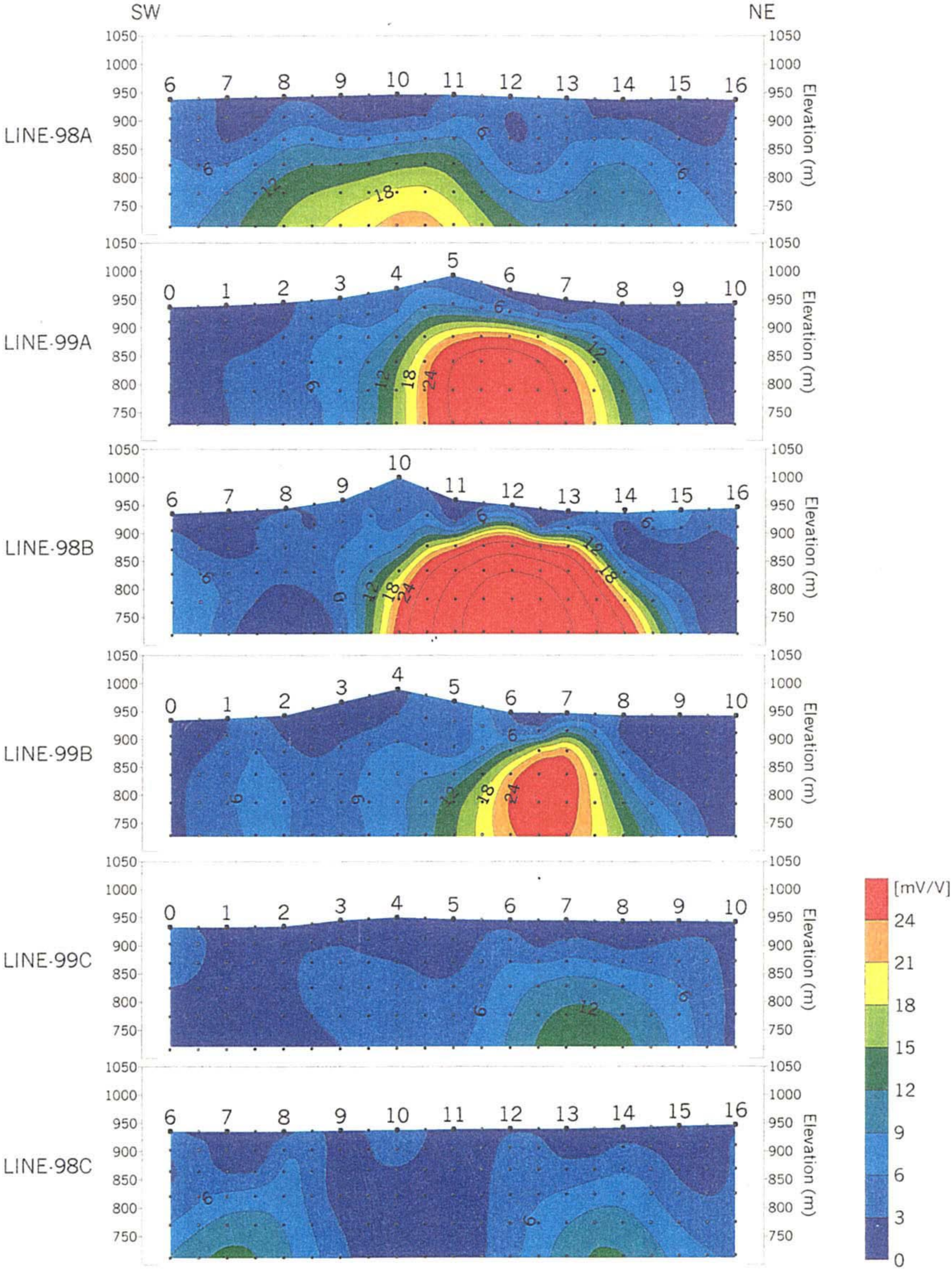


Fig.2-3-17 Chargeability Section (B-12)

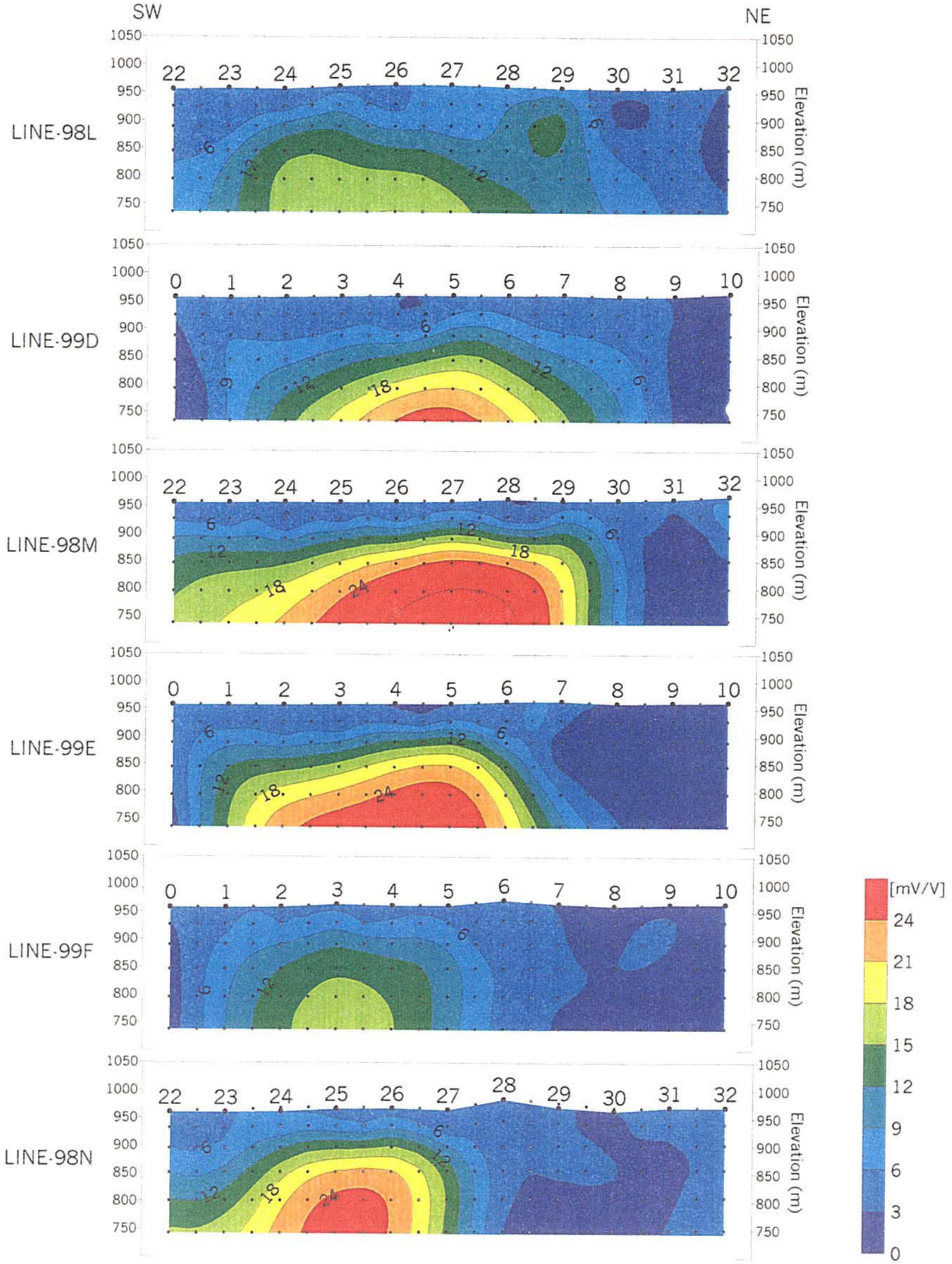


Fig.2-3-18 Chargeability Section (M-27)

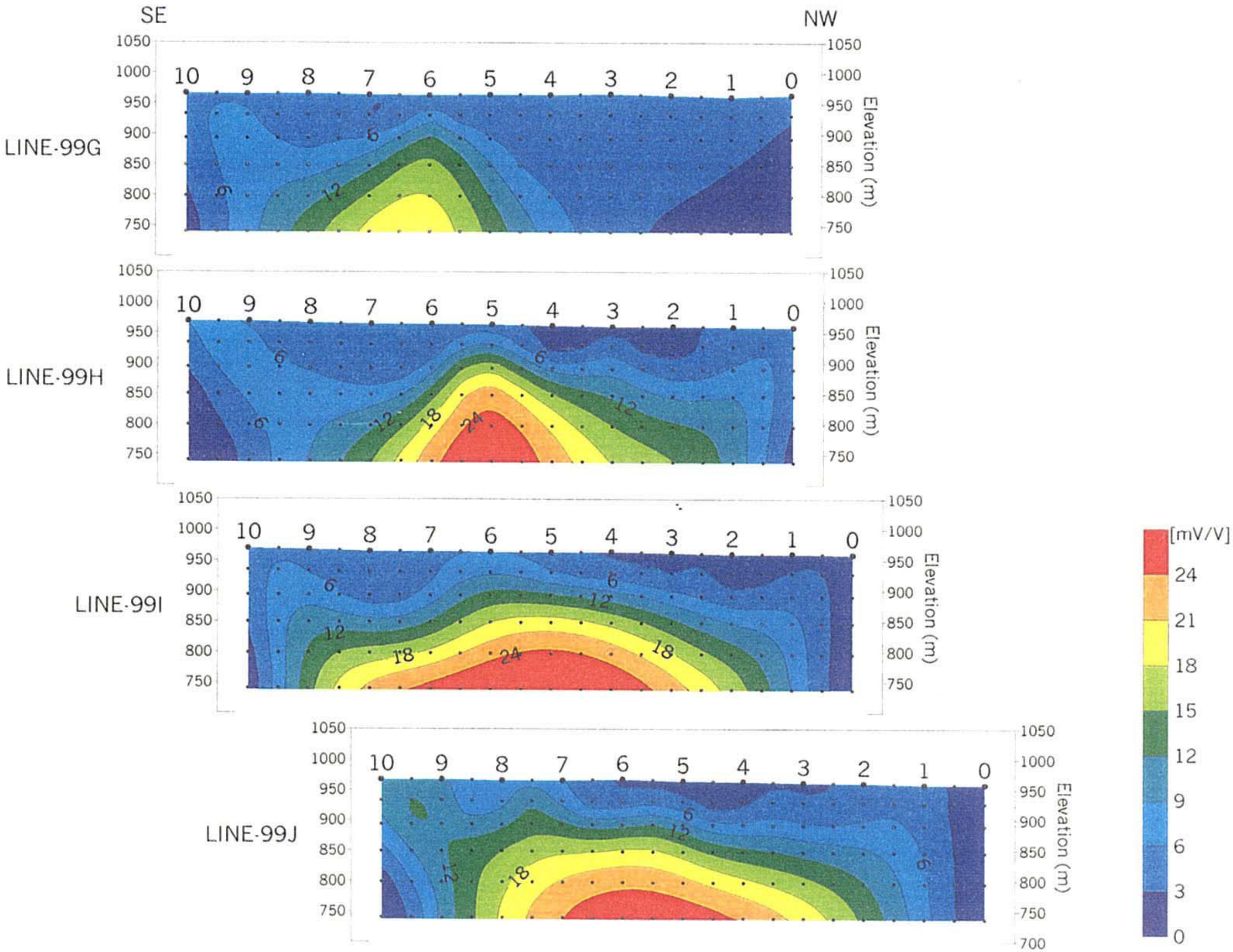


Fig.2-3-19 Chargeability Section (P-18)

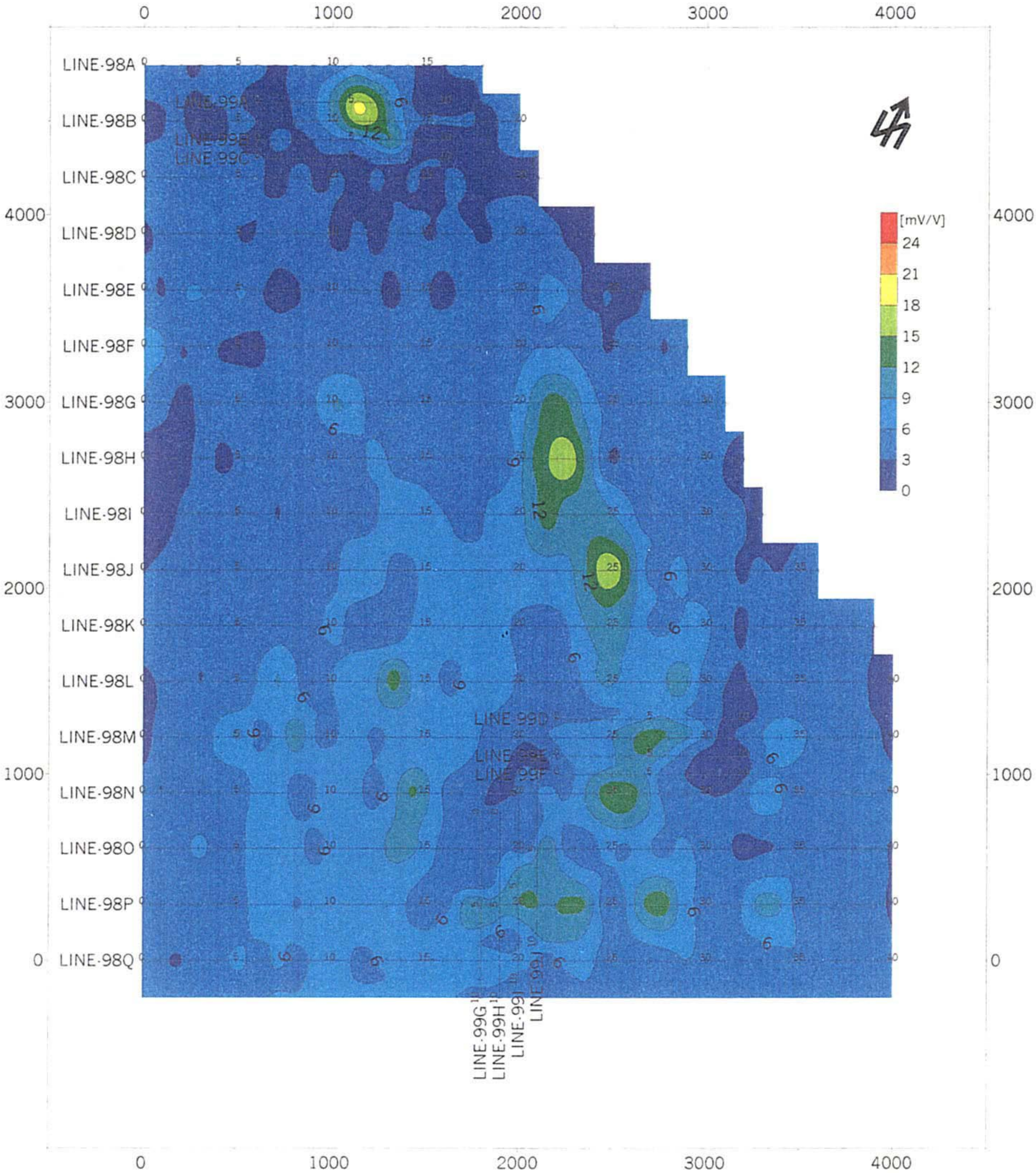


Fig.2-3-20 Chargeability Map (SL:900m)

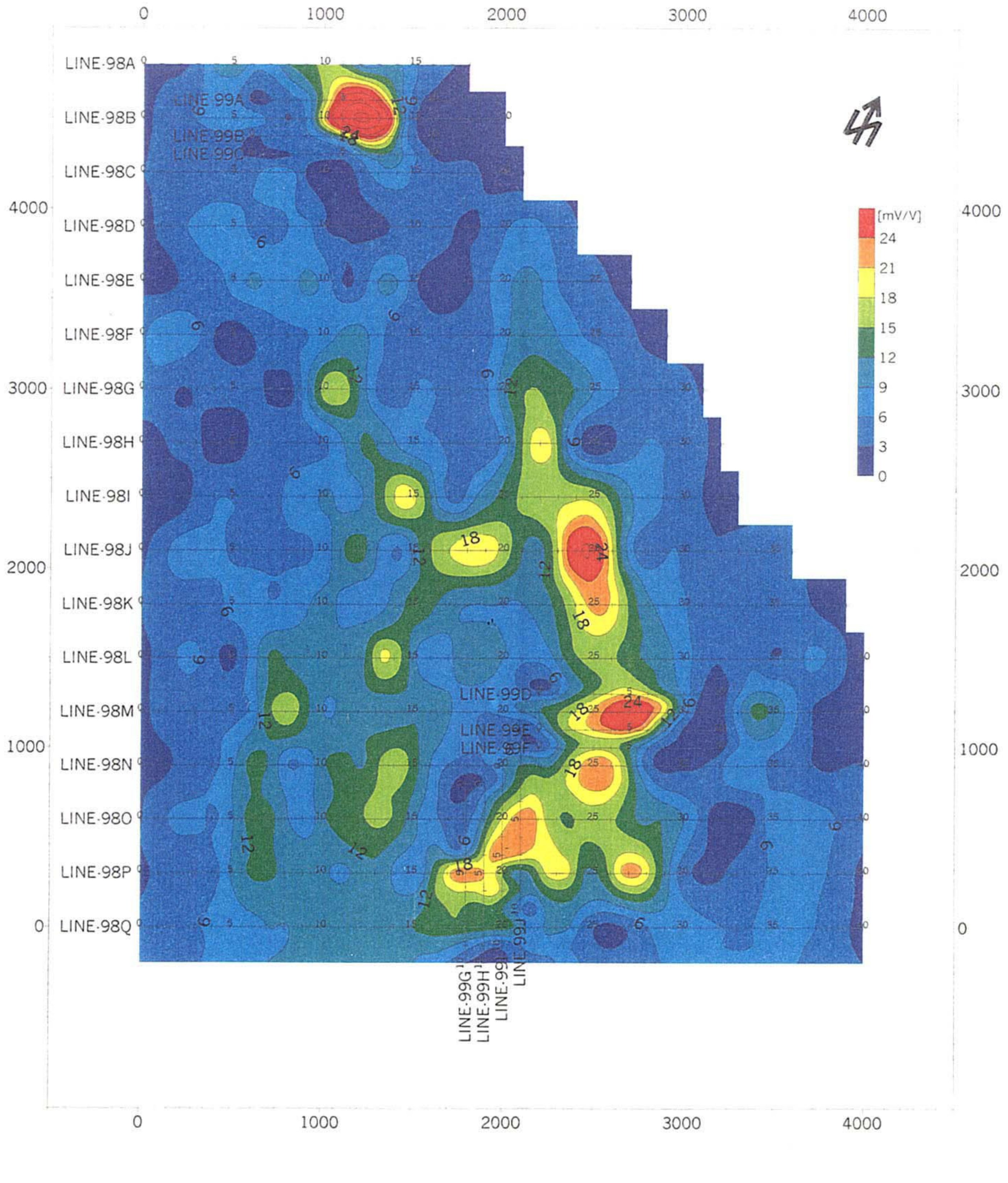


Fig.2-3-21 Chargeability Map (SL:800m)

station O-21.

3-3-3 Laboratory tests

The result of the laboratory tests is shown in Table 2-3-3. The mean values of resistivity and chargeability for main rocks in this area are as follows.

Rock	Resistivity [ohm-m]	Chargeability [mV/V]
Ore	25	559
Tuff	2,010	15
Breccia	3,670	34
Dacite	14,900	8.1
Andesite	22,400	2.3
Basalt	2,010	3.3
Diorite	33,300	3.4

The ore sampled from the drilling core (MJSU-2) have low resistivity of 25 ohm-m and high chargeability exceeding 500 mV/V. The host rocks in this area have high resistivity of more than 2,000 ohm-m and low chargeability of less than of 10 mV/V. However breccia containing pyrite and tuff have relatively high chargeability (mean value of 23 mV/V).

The laboratory test results show that rocks in this area generally have high resistivity and low chargeability, while the ore has low resistivity and high chargeability. Consequently the target for the geophysical survey in this area is low resistivity and high chargeability zone within high resistivity and low chargeability environment.

3-3-4 Discussions

Chargeability distribution is clarified in detail in three high chargeability anomalous zones (around B-12, M-27 and P-18). Chargeability anomalies exceeding 15 mV/V on SL 800m are shown in Figure 2-3-22.

The laboratory test results show that rocks in this area generally have high resistivity and low chargeability, while the ore has low resistivity and high chargeability. Consequently the target for the geophysical survey in this area is low resistivity and high chargeability zone within high resistivity and low chargeability environment.

Table 2-3-3 Result of Laboratory Tests

Drill Hole No.	No. of Samples	Depth From [m]	Depth To [m]	Rock Name	Resistivity [Ω－m]	Chargeability [mV/V]
MJSU-2	202G	122.40	122.45	Breccia ore	41	459.3
MJSU-2	204G-1	131.10	131.15	Massive ore	21	619.0
MJSU-2	204G-2	ditto	ditto	ditto	26	656.3
MJSU-2	205G-1	141.20	141.25	Massive ore	16	505.8
MJSU-2	205G-2	ditto	ditto	ditto	19	555.9
MJSU-2	201G	116.95	117.05	Basaltic tuff	1,503	5.6
MJSU-2	203G	129.00	129.10	Rhyodacitic lapilli tuff	221	2.5
MJSU-2	206G	144.50	144.60	Rhyodacitic lapilli tuff	2,515	4.1
MJSU-3	204C	204.00	204.10	Porphyritic dacite (intrusive)	3,952	9.1
MJSU-3	232C	232.55	232.65	Dacite	2,785	4.5
MJSU-3	241C	241.40	241.50	Porphyritic dacite (intrusive)	10,710	33.0
MJSU-7	40C	40.15	40.25	Rhyodacitic lapilli tuff	1,437	16.5
MJSU-7	56C	56.65	56.75	Rhyodacitic lapilli tuff	1,600	7.1
MJSU-7	74C	74.85	74.95	Basaltic fine tuff, with pyrite veinlets, pyrite20%	40	63.7
MJSU-7	81C	81.45	81.55	Rhyodacitic coarse tuff	1,487	7.8
MJSU-7	149C	149.45	149.55	Rhyodacitic lapilli tuff	852	4.5
MJSU-8	16C	16.65	16.70	Porphyritic basalt (intrusive)	2,361	3.5
MJSU-8	28C	28.50	28.55	Porphyritic basalt (intrusive)	1,662	3.1
MJSU-8	38C	38.35	38.40	Silicified rock, rhyodacitic tuff?, pyrite 10%	3,423	19.6
MJSU-8	58C	58.40	58.50	Rhyodacitic coarse tuff	8,364	6.7
MJSU-8	95C	95.80	95.85	Volcanic breccia, pyrite 10%	1,440	11.4
MJSU-8	124C	124.00	124.10	Pumiceous breccia, pyrite 10%	802	8.9
MJSU-8	143C	143.35	143.40	Pumiceous breccia, pyrite 10%	2,055	35.9
MJSU-8	167C	167.15	167.20	Pumiceous breccia, pyrite 10%	111	138.2
MJSU-8	181C	181.75	181.85	Pumiceous breccia, pyrite 5%	1,732	7.7
MJSU-8	193C	193.00	193.10	Porphyritic andesite (intrusive)	12,043	4.9
MJSU-8	206C	206.50	206.55	Pumiceous breccia, pyrite 5%	13,747	18.5
MJSU-8	218C	218.80	218.90	Andesite (intrusive)	2,038	2.2
MJSU-8	236C	236.30	236.40	Breccia, pyrite 5%, oxidized	1,417	8.4
MJSU-8	239C	239.40	239.50	Breccia	6,447	42.4

No. of Samples	Localities	Rock Name	Resistivity [Ω－m]	Chargeability [mV/V]
K0021406	Northeast of MJSU-7	Rhyodacite, glomeroporphyritic	31,691	2.6
K0021407	ditto	Porphyritic dacite	16,475	2.2
K0021408	East of MJSU-7	Rhyodacite, porphyritic	12,324	2.9
K0022401	M-27 chargeability Anomaly	Strongly silicified rock, w/hematite	482	1.7
K0022402	ditto	Porphyritic andesite	23,576	1.0
K0022404	ditto	Porphyritic dacite	26,451	2.5
K0022405	Umm ad Damar South Prospect	Epidotized andesite	47,839	0.8
K0022406	ditto	Andesitic pyroclastic rock	26,554	2.6
K0022407	ditto	Microdiorite	33,264	3.4

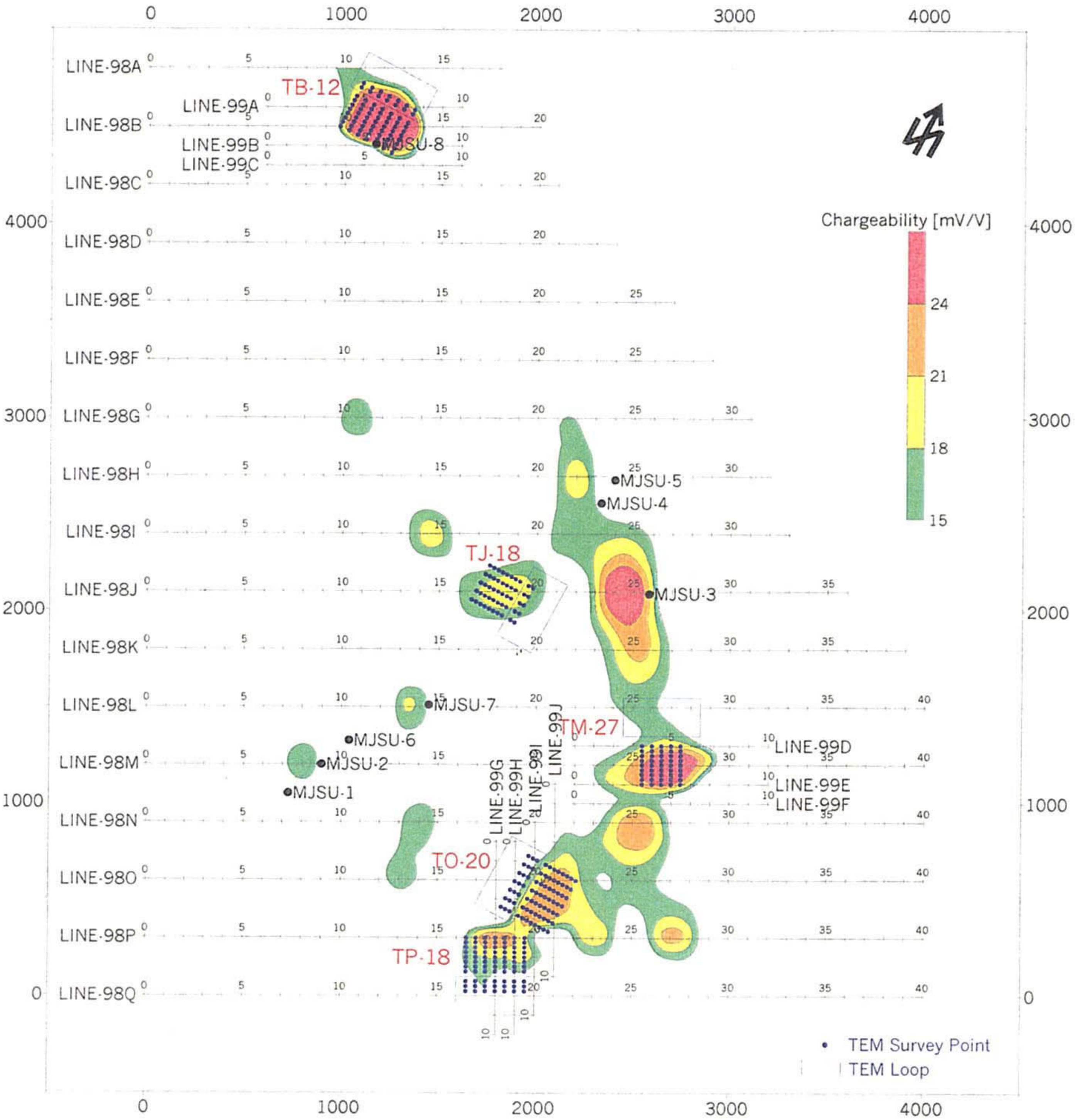


Fig.2-3-22 Geophysical Anomaly Map

TEM survey was applied to detect low resistivity zones in high chargeability anomalous areas extracted by IP survey. The following five areas were selected as TEM survey areas on the basis of the results of the IP survey and detailed geological survey.

- TB-12
- TJ-18
- TM-27
- TO-20
- TP-18