Chapter 4 Geochemical Detail Survey

4-1 Method

The survey was carried out in four areas: Salubosogin-Yakalan, Binangkawan-Taktak, Magasawan-Bato, and Exciban-Larap which were selected based on the results of the previous survey.

Soil samples were taken and ordinary geochemical analysis was conducted. The survey is for determining the areas with anomalies originated from mineralization, interpreting totally the distribution and geological structure, and finally estimating the location of expected ore deposits. Geological survey was simultaneously conducted with the geochemical survey.

The survey was basically carried out with 1/5,000 scale topographical map. Sampling density was basically 45 samples per 1 sq.km. The locations were set along the ridges in the expected areas by Ridge and Spar method. The intervals were projected less than 200m. The duplicate samples were simultaneously taken every 20 locations for checking the erro in sampling. The samples were dried in air and sieved under 80 mesh for ordinary geochemical analysis. The location, depth, color, topography, the kind of conglomerate, geology, and others were described. The sampling locations and the assay results are shown in Appendix 5-8 and Appendix 15-18 respectively.

During geological survey, geological description and rock sampling were conducted. Rock sampling density was basicaly 3 to 4 samples per 1 sq.km. Microscopical examination, X-ray diffraction analysis, polish thin section, and chemical analysis were conducted for the representative rocks in the area. Those samples were basically reserved in the form of 6cm×4cm×2cm with one original surface in plastic bags. The sampling locations of rock samples are shown in Appendix 1-4. The altered minerals determined by the thin sections, polish thin sections, and XRD, and the temperature of fluid inclusion are shown in Appendix 9-12. The assay results of rock samples are shown in Appendix 13. The assay results of ore samples are shown in Appendix 14.

The common logarithm value of each analysis value is used for data processing. As for the analysis value lower than detection limit value, the half of the value is adopted in the statistical processing. Also as for the analysis value higher than the maximum detection limit value, the limit value is adopted. In order to decide the threshold that sorts out the anomaly from the background level of geochemical data, the combination of the average and the standard deviation is taken as the criterion in consideration of the accumulated histogram distribution curve.

The elements showing values around or below detection limit and above 95% of values were below detection limit, were omitted.

4-2 Geochemical Survey on Soil

4-2-1 Salubosogin-Yakalan Alteration Zone

(1) Geology

This area consist of Pliocene, Macogon Formation and Susungdalaga Volcanics. Macogon Formation is distributed in the west and the south of the survey area. The relationship between Macogon formation and dacite-andesite of Susungdalaga volcanics are intrusive or faulted. Geological map is shown in Fig.II-4-1. The geological profile is shown in Fig.II-4-2.

Macogon Formation cosists of conglomerate, sandstone, siltstone, shale, lenses of shaly limestone, and coralline limestone under shallow marine environment, and basalt flows. Conglomerate member is situated at the basal part and is typically exposed along Palali River and Mayabuhin Creek. At the junction of Palali River and Mayabuhin Creek, the conglomerate is poorly sorted, moderately compacted, massive and composed of sub-rounded to rounded compornents of grayish to greenish indurated shale, light gray to dark basalt and porphyritic dacite embedded in sandy

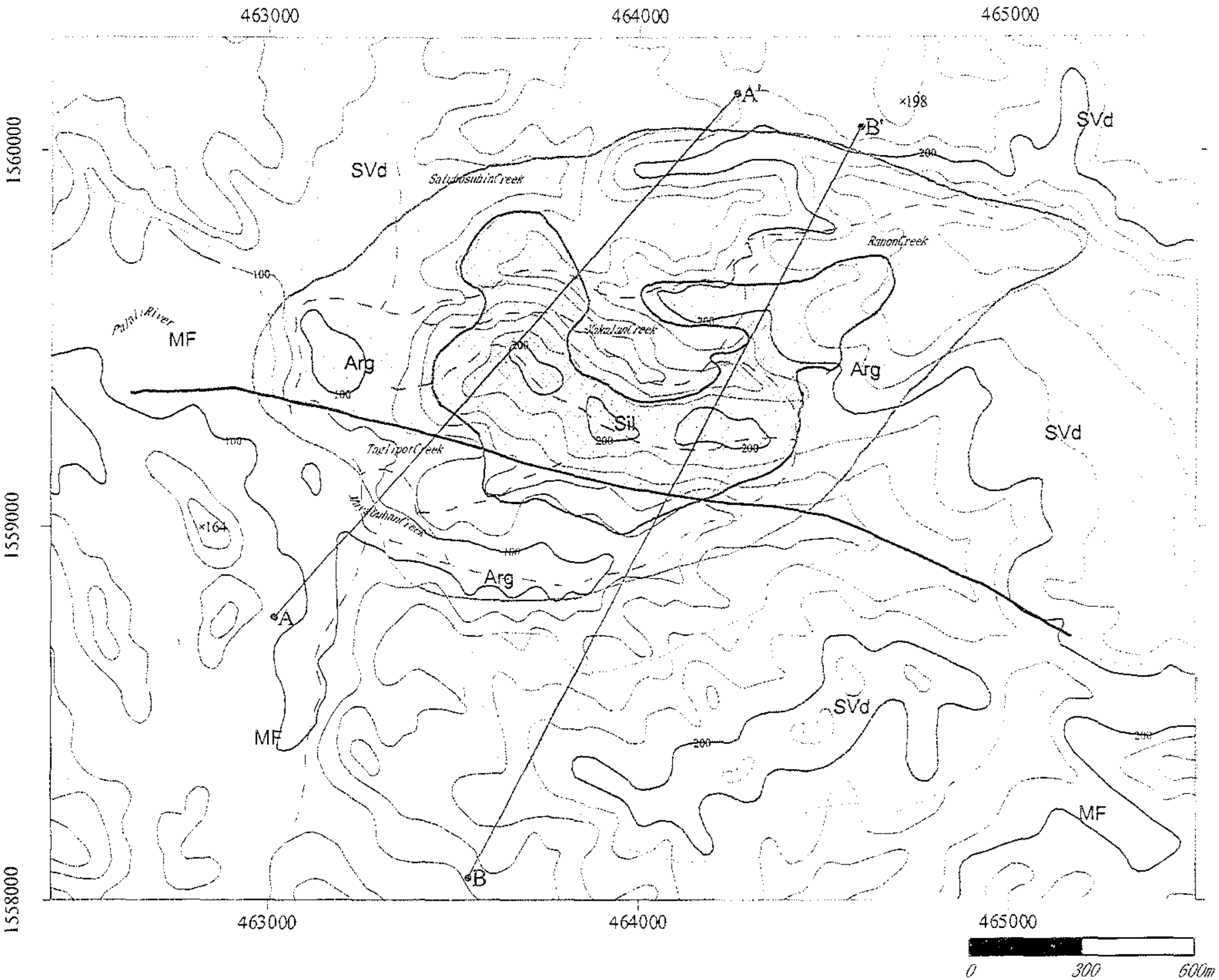
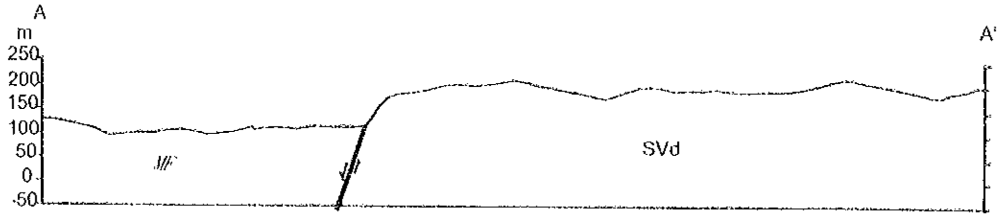
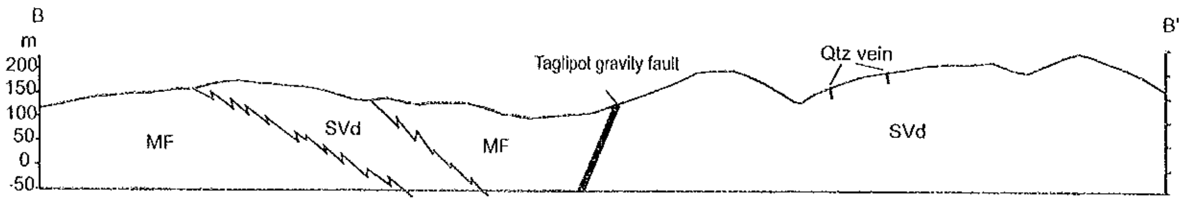


Fig.II-4-1 Geologic Map of the Salubosogin-Yakalan Area



Interpretative Profile along line A-A'



Interpretative Profile along line B-B'

Legend

	Q	sand and gravel
Susungdalaga Volcanics	SVv-f	Dacitic lava
	SVv-p	Dacitic tuff and pyroclastics
	SVd	Dacitic plug dome
Macogon F.	MF	Andestic pycroclastics and tuffaceous black shale with minor basaltic flow
Sta. Elena F.	SEF	Conglomerate, sandstone, shale and minor limestone
Universal F.	UF	Limestone, marl and calcareous shale

- Arg — Argillization
- Sil — SilicificationSil:
- Prop — Prophylization
- Chl — Chl:Chloritization
- Geologic boundary
- Fault
- A — A' Profile

Fig. II-4-2 Geologic profile of the Salubosogin-Yakalan Area matrix. Pyrite dissemination is observed. It is yellowish brown when deeply weathered. At around 30m downstream at the confluence of Palali River and Mayabuhin Creek, it overlies the shaly limestone which looks like pyroclastic agglomerate. Sandy cementing materials are highly calcarious. Dacite and andesite are angular. The sandstone and siltstone interbeds which are the most dominant in the sequence, are graded, medium to coarse grained and made-up mainly of sub-rounded to rounded feldspar, quartz, hornblende, and dark minerals probably magnetite. Igneous rocks are included in clastics, pumpellyite+epidote+actinolite minerals are formed (RYC-13). It is dark grayish and turns yellowish brown to reddish brown due to intense oxidation of the iron-bearing minerals mostly pyrite. Along Taglipot Creek, it grades into pebbly sandstone. The weathered portions are most often loosely compacted due to the removal of the binding materials in between the grains. The dark colored shale along Taglipot Creek contains abundant shell fragments, indicates the very shallow marine deposition. It is very fine grained, soft, sticky, and the glassy materials are difficult to be recognized.

The one meter thick coralline limestone observed along Palali River occurs as a lenticular body in the sandstone and shaly limestone. The limestone is massive, hard, inpure, buff color, crystalline, and contain minor amount of black fine materials. The shaly limestone outcrops exposed in the river are about 0.5 to 7.0m thick and traversed by networks of discontinous calcite veins and veinlets. It is dark gray, pitted and exibits uneven surface caused by the dissolution of river and rainwater.

The intercalated basaltic lava flows in the upstream section of Palali River is generally very massive, fine to medium grained, very dark in color and with essential minerals of feldspar laths associated with undertifiable mafic minerals. It is vesicular and amygdaloidal and with zeolites as the common amygdules.

Susundalaga Volcanics seems to be gradual uplift without accompanying several tectonic activities after the deposition of Macogon Formation. While weathering and erosion were going on, intrusion of dacite-andesite took place probably during the later part of Pliocene. Dacite of Susundalaga Volcanics which was influenced by tectonic activities such as fault, shear, and fracture resulting from the tilting, folding, and erosion of Macogon Formation was exposed.

The dacite which covers about 80% of the survey area, is easily recognized from Macogon Formation because of its rugged topograhic relief. The dacite is well exposed along Salubusugin and Yakalan Creek and the upstream section of Taglipot Creek. At the north of Mayabuhin Creek, it is in falt contact with Macogon Formation. The dacite is porphyritic, massive, medium to coarse grained, ash gray color and consists of principally phenocrysts of plagioclase and quartz, biotite, hormblende and fine crystals of magnetite. Lapilli tuff (RYD-04) with similar texture to andesite is present. The presence of limonite and hematite showing high oxidation is observed in fractures and at weathered surface. Silicification, argillization, and pyritization are quite extensive in outcrops transected by falt and shear stractures.

The andesitic phase encountered at the west slope of the semicircular hill at the west of the downstream is medium grained, light greenish gray to dark gray and hornblende laths are partly altered to chlorite. The weathered surfaces are heavily coated with limonite.

The recent river deposit is unconsolidated and poorly sorted. The materials of fine to boulder size fragments derived from the disintegration of the different rock formations.

(2) Geological Structure

The area has gone extensive faulting, shearing, jointing, and folding of underlying rock formations generated by intermittent tectonic and ignious activities. These events probably took place during the post emplacement of Susundalaga Volcanics. It continues up to the present time. Several sets of fault and joint systems with diverse orientations were observed. The most prominent is the northwest and southeast trending Taglipot Fault. The fault is tracable in the distance of 2km along its strike line. It is manifested by almost straight steep scarpment and straightening of the river course. The relative displacement of several meters downdip is found on the fault plane. Other miner faultings with variable displacements are evident with slickensides, gouge materials, and brecciation of quartz veins and veinlets. The fault systems along the upstream of Yakalan Creek strike to northeast and dip from 45 to 80 degrees either to northwest or southeast. Another set is northwest fault with northeast and southeast dip confined in the west of the area. Associated with these structures are joints and fractures. Majority of the joint patterns trend northeast with steep to vertical dip. Quartz veinlets were found in networks discontinous fractures.

The bedding structures in Macogon Formation are gently tilted as the result of the emplacement of Susungdalaga Volcanics. The bedding along Salubusugin Creek variably strikes northeast and northwest and dip 10 to 20 degrees either southwest or southeast. However, in Palali River around 30m from the confluence of Mayabuhin Creek, the bedding in the conglomerate and shaly limestone strikes northwest and dips 10 degrees to the southwest forming an eastwest trending synclinal structure.

(3) Alteration and Mineralization

Two types of hydrothermal alteration zones were recognized and delineated consisting *principally of silicification and argillization associated with minor chloritization. Theoblate shape* altered zone about 2km by 1km is concentrated mainly in the dacitic body that extends up to the fault and fine to coarse clastics of Macogon Formation. Quartz-pyrite-clay assemblage presummed to be the core of the alteration zone is at the center of the area. The country rock affected by the type of alteration is generally very massive, hard, and even the constituent essential minerals are rather difficult to be recognized. In the zone, numerous minute quartz veinlets are filled the disoriented fracture system. The zone is totally covered with banded, vuggy quartz and silicified rock boulders of different sizes and shapes. No outcrops of the deposits were found during the survey. Therefore, it seems that the main sources are large quartz veins eroded at higher elevation. Sulfied minerals mostly fine pyrite occur as dissemination and fracture fillings. However, the argillic alteration composed largely of clay mineral in the form of kaolinite (RCY-10) with associated minor pyrite dissemination occupies the outer zone underlain partly by dacite and fine to coarse clastics. In the area, the altered rocks are gougy, milky white, yellowish brown to reddish brown and with gray patches. The andesite outcrops around the semi-circular hill in the west of Salubusugin Creek is weakly chloritized and pyritized.

The assay results of rock samples and distribution map of the alteration zones are shown in Fig.II-4-3. The assay resilts of ore samples, XRD, and the homogenous temperature of fluid inclusion are shown in Fig.II-4-4.

The mineralization in the area occurs in the form of quartz vein and veinlets associated with sulphide disseminations concentrated mainly in the highly silicified, argillized, oxidized portions of

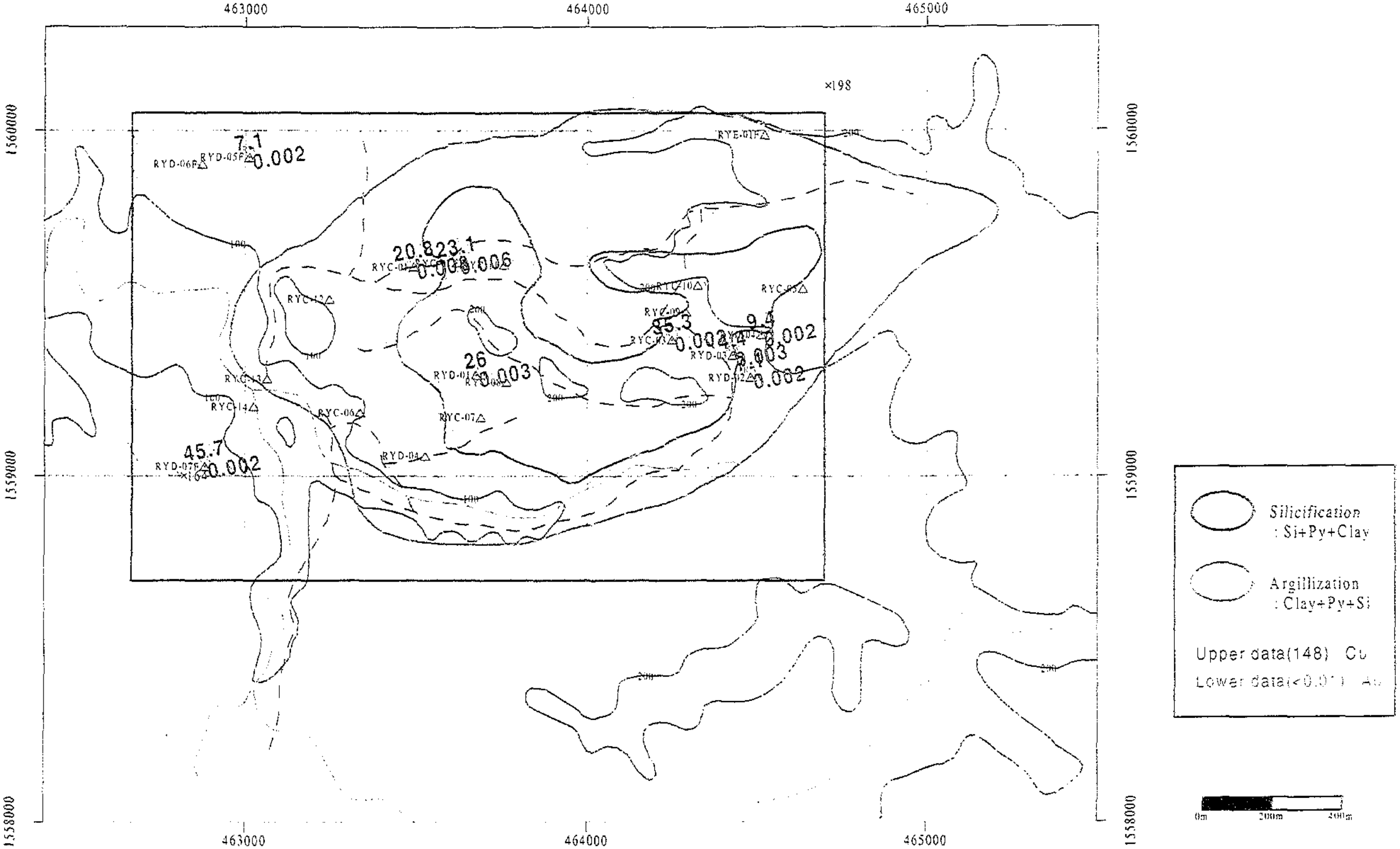


Fig.II-4-3 Whole Rock Analysis and Alteration Zone of the Salubosogin-Yakalan Area.

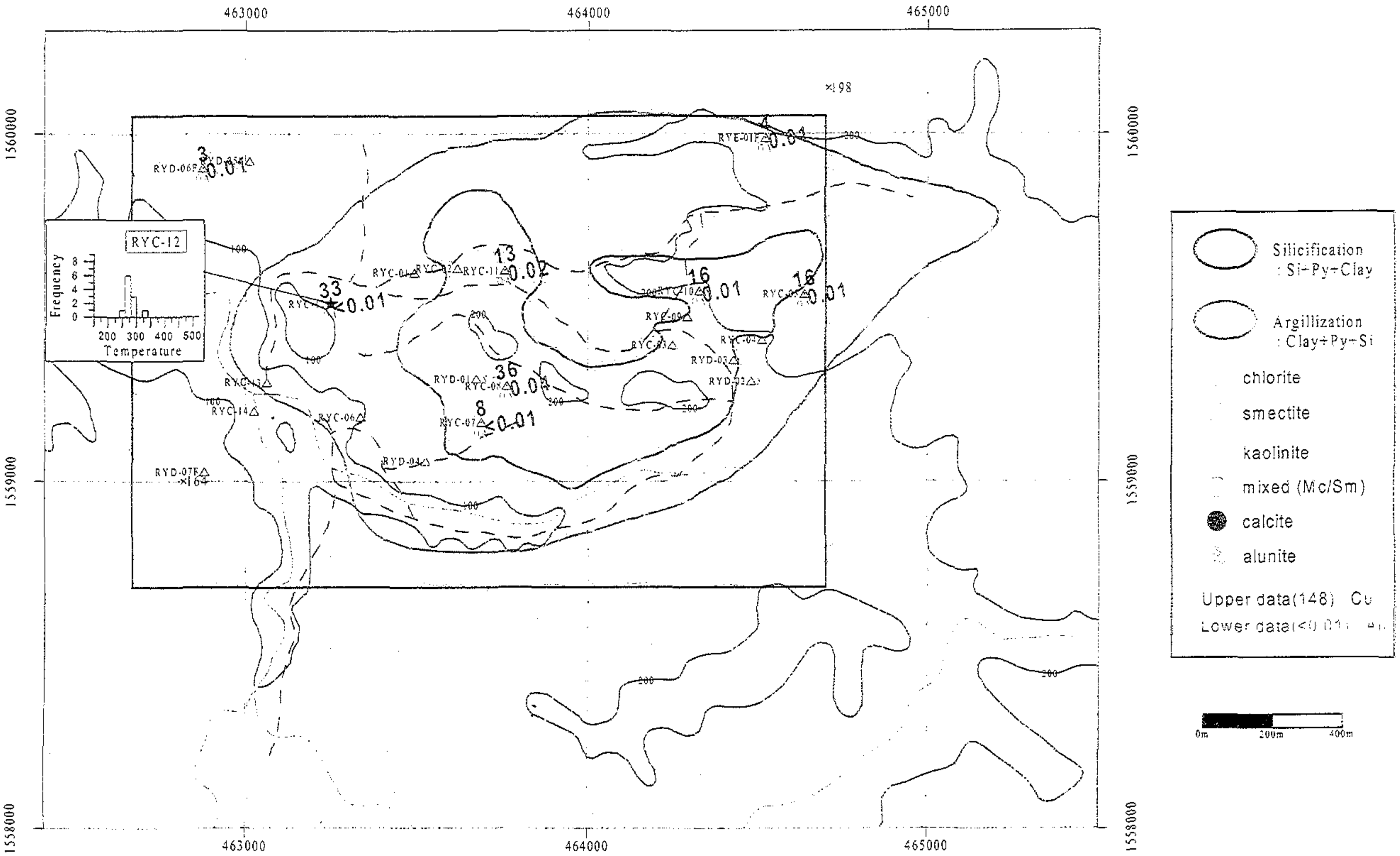


Fig.II-4-4 Ore Assay, XRD and Fluid Inclusion Result of the Salubosogin-Yakalan Area.

the coarse grained dacite of Susungdalaga Volcanics. The sulfide minerals are mainly pyrite±marcasite±chalcopyrite (RYC-12). The temperature of fluid inclusion of the sample is 260 to 300 degrees. At the place near the location, the sample (RYC-01) with Au; 0008ppm, Cu; 20.8ppm, Ag;37.9ppm,Pb;26.9ppm, and Zn;20ppm was taken. The ore sample (RYC-8) at the end of silicification zone shows Au; 004ppm, Cu;36ppm, Ag;5.3ppm, Pb;15ppm and Zn;23ppm. The minor disseminations of pyrite sulfide were observed in the oxidized clastic sequence of Macogon Formation, especially near the contact with the abovementioned dacitic rock. At the hill in the west of the area, basalt flow (RYD-07F) with high Cu;45.7ppm is present.

Along Yakalan and Taglipot Creeks, tributaries of Salubusugin Creek, majority of quartz veins are confined in the networks of discontinous fractures and along northeast trending fault or shear structures that dip steeply to either northwest or southeast. These vein -systems commonly pinches and swells both lataraIly and vertically can be traced in the distance of few meters along the strike lines. The individual thickness ranges from 2.0 mm to 17cm. However, due to renew movement along the fault planes, the quartz veins are often intensively brecciated and intermixed with the group materials of kaolinitic clay. The quartzs are most often massive, very hard, banded and vuggy with various shades of grayish white, greenish gray and bluish gray. The semi-rounded and elongated vugs or open cavities are lined with dog-tooth quartz crystals coated with limonitic and manganiferous materals.

No visible gold was observed in the quartz vein outcrops and in the quartz and silicified boulders that littered in the area. It is predicted that gold in the form of fine dust might be intimately associated with these materials.

(4) Geochemical Survey on Soil

The correlative coefficients among main elements of geochemical survey are shown in TableII-4-1. For stream sediments in Phase-II, the indicative elements of Au-Cu are Au, Ag, As, Cu, Hg, Mo, Pb, S, and Sb. Bi shows high correlation with Cu. Twenty eight elements which are included above mentioned indicative elements were analysed. The indicative elements of Au are As, Hg, Mo, and Sb. Co, Cr, Fe, Mg, Ni, and Sc show high correlation with Cu. Any correlation was not found between Au and Cu. Histogram and accumurated histogram distribution on probability are shown in Fig.II-4-5. The classification of histogram is 1/2 of standard deviation(σ). The threshold value of each element is shown on Fig.II-4-5. In consideration of the detective elements in Phase-II, the distribution of Au, Ag, As, Cu, Hg, Mo, and Sb are shown (Fig.II-4-6 to II-4-12).

The distribution of anomaly of each element is mentioned below.

(Au) Anomalous samples seem to be concentrated in silicfication zone along faults. The eyeball of high anomalous zone is devided into two, east area and central area. The maximum value is 0.01201ppm.

(Ag) Anomalous samples scatter in silicification zones. The maximum value is 0.781ppm.

(As) Anomalous samples concentrate in a little bit west of central area. The maximum value is 1356ppm.

(Cu) Anomalous samples distribut in basalt flow in southwest of the area. Any correlation with Au is found. The maximum value is 59.81ppm.

(Hg) Anomalous samples distribut in a little bit east of central area. The maximum value is 1.821ppm.

(Mo) Anomalous samples almost coincide with the distribution of Au. The maximum value is

TableII-4-1 Basic Statistics and Correlation Coefficient of Soil Samples in the Salubosogin-Yakalan Area

Original Data Information — Number of Component: 28; Number of Sample: 164

Result of Statistics (Logarithmic)

Elements	Au	Ag	Al	As	Ba	Bi	Ca	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sn	Sr	Ti	V	Zn
max_val	-1.9208	-0.1079	0.9469	3.1319	2.6335	-0.2596	-0.2757	1.8727	2.3201	1.7767	1.0550	0.2601	-0.6990	-0.1367	3.4900	0.7612	-2.0000	2.2601	2.8692	1.4871	-1.2218	1.7033	1.6274	-0.0969	2.1038	-0.6990	2.4362	1.8129
min_val	-3.3010	-2.3010	-0.0223	-1.0000	-1.0000	-2.3010	-2.3010	-0.3979	0.7782	0.7634	0.0253	-2.0000	-2.3010	-1.6990	0.6990	-1.6021	-2.3010	-1.0000	1.7782	0.7853	-2.0000	-1.6021	0.4472	-1.0000	-1.0000	-2.3010	1.3979	0.3010
average	-2.7950	-1.4464	0.4742	1.4182	1.8990	-1.7298	-1.7277	0.5630	1.4865	1.2720	0.5742	-0.7954	-1.5186	-1.1788	1.8984	-0.3584	-2.2808	0.9412	2.2760	1.1065	-1.6893	-0.1112	0.9549	-0.3520	1.0401	-1.4589	2.0091	1.1276
std_dev	0.2355	0.4114	0.1765	0.9642	0.4721	0.5676	0.4186	0.4472	0.3090	0.2110	0.1557	0.5071	0.3666	0.3804	0.4978	0.3960	0.0753	0.4829	0.2275	0.1198	0.1752	0.9577	0.2714	0.1433	0.6926	0.4005	0.1754	0.2818

Cov_mat	Au	Ag	Al	As	Ba	Bi	Ca	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sn	Sr	Ti	V	Zn
Au	0.0555	0.0193	-0.0027	0.0592	0.0110	0.0143	0.0025	-0.0173	-0.0028	-0.0002	-0.0027	0.0405	0.0025	-0.0090	-0.0256	0.0206	-0.0014	-0.0111	0.0051	0.0014	-0.0039	0.0407	-0.0106	-0.0016	0.0054	-0.0145	-0.0042	-0.0094
Ag	0.0193	0.1693	0.0002	0.1083	0.0290	-0.0416	0.0296	0.0130	-0.0009	-0.0067	0.0037	0.0812	0.0313	-0.0092	-0.0058	0.0476	0.0010	0.0138	0.0226	0.0019	0.0016	0.0779	-0.0170	0.0027	0.0260	-0.0145	0.0036	-0.0020
Al	-0.0027	0.0002	0.0312	-0.0846	0.0007	-0.0245	0.0216	0.0467	0.0342	0.0184	0.0165	-0.0299	-0.0308	0.0404	0.0456	-0.0177	0.0042	0.0518	0.0097	0.0006	0.0185	-0.0998	0.0334	0.0145	0.0308	0.0395	0.0182	0.0248
As	0.0592	0.1083	-0.0846	0.9297	0.0866	0.1135	-0.1213	-0.2868	-0.1521	-0.0751	-0.0412	0.3964	0.1887	-0.2857	-0.3464	0.2507	-0.0251	-0.2692	0.0362	0.0439	-0.0347	0.8302	-0.1744	-0.0424	-0.0117	-0.2223	-0.0555	-0.1674
Ba	0.0110	0.0290	0.0007	0.0866	0.2228	0.0181	0.0412	0.0127	0.0049	0.0014	-0.0016	0.0345	0.0735	-0.0067	0.0102	-0.0054	0.0073	0.0234	0.0488	0.0158	-0.0082	0.0971	-0.0137	-0.0045	0.0222	0.0075	0.0028	0.0133
Bi	0.0143	-0.0416	-0.0245	0.1135	0.0181	0.3221	-0.0668	-0.0726	-0.0217	-0.0012	-0.0182	0.0358	0.0474	-0.0566	-0.0826	0.0390	-0.0086	-0.0749	-0.0110	0.0124	-0.0288	0.1815	-0.0485	-0.0199	-0.1206	-0.0292	-0.0063	-0.0248
Ca	0.0025	0.0296	0.0216	-0.1213	0.0412	-0.0668	0.1736	0.0931	0.0550	0.0245	0.0133	-0.0340	-0.0108	0.0804	0.1033	-0.0018	0.0173	0.0914	0.0325	-0.0102	0.0080	-0.1474	0.0261	0.0046	0.0969	0.0385	0.0127	0.0527
Co	-0.0173	0.0130	0.0467	-0.2868	0.0127	-0.0726	0.0931	0.2000	0.0890	0.0532	0.0353	-0.1196	-0.0575	0.1285	0.2028	-0.0654	0.0165	0.1784	0.0285	-0.0146	0.0241	-0.2765	0.0851	0.0232	0.0422	0.1172	0.0419	0.1079
Cr	-0.0028	-0.0009	0.0342	-0.1521	0.0049	-0.0217	0.0550	0.0890	0.0955	0.0408	0.0365	-0.0694	-0.0543	0.0729	0.0905	-0.0160	0.0058	0.1104	0.0188	-0.0118	0.0199	-0.1712	0.0668	0.0242	0.0086	0.0752	0.0427	0.0575
Cu	-0.0002	-0.0067	0.0184	-0.0751	0.0014	-0.0012	0.0245	0.0532	0.0408	0.0445	0.0183	-0.0402	-0.0172	0.0435	0.0593	-0.0118	0.0033	0.0555	0.0222	-0.0039	0.0118	-0.0921	0.0365	0.0065	0.0121	0.0335	0.0171	0.0372
Fe	-0.0027	0.0037	0.0165	-0.0412	-0.0016	-0.0182	0.0133	0.0353	0.0365	0.0183	0.0242	-0.0252	-0.0278	0.0208	0.0391	-0.0033	0.0009	0.0420	0.0122	-0.0021	0.0167	-0.0535	0.0322	0.0166	0.0067	0.0373	0.0238	0.0225
Hg	0.0405	0.0812	-0.0299	0.3964	0.0345	0.0358	-0.0340	-0.1196	-0.0694	-0.0402	-0.0252	0.2571	0.0672	-0.1226	-0.1544	0.1413	-0.0079	-0.1173	0.0160	0.0203	-0.0081	0.3524	-0.0849	-0.0188	0.0162	-0.1093	-0.0310	-0.0788
K	0.0025	0.0313	-0.0308	0.1887	0.0735	0.0474	-0.0108	-0.0575	-0.0543	-0.0172	-0.0278	0.0672	0.1344	-0.0438	-0.0683	0.0247	-0.0003	-0.0601	0.0119	0.0080	-0.0305	0.1923	-0.0615	-0.0247	-0.0077	-0.0712	-0.0287	-0.0286
Mg	-0.0090	-0.0092	0.0404	-0.2857	-0.0067	-0.0566	0.0804	0.1285	0.0729	0.0435	0.0208	-0.1226	-0.0438	0.1447	0.1417	-0.0768	0.0131	0.1251	0.0134	-0.0179	0.0105	-0.2922	0.0685	0.0138	0.0392	0.0678	0.0235	0.0795
Mn	-0.0256	-0.0058	0.0456	-0.3464	0.0102	-0.0626	0.1033	0.2028	0.0905	0.0593	0.0391	-0.1544	-0.0683	0.1417	0.2479	-0.0937	0.0189	0.1901	0.0293	-0.0192	0.0273	-0.3290	0.0941	0.0261	0.0305	0.1386	0.0434	0.1196
Mo	0.0206	0.0476	-0.0177	0.2507	-0.0054	0.0390	-0.0018	-0.0654	-0.0160	-0.0118	-0.0033	0.1413	0.0247	-0.0768	-0.0937	0.1569	-0.0047	-0.0772	0.0104	0.0101	0.0058	0.1961	-0.0460	-0.0065	-0.0023	-0.0654	-0.0071	-0.0490
Na	-0.0014	0.0010	0.0042	-0.0251	0.0073	-0.0086	0.0173	0.0165	0.0058	0.0033	0.0009	-0.0079	-0.0003	0.0131	0.0189	-0.0047	0.0057	0.0143	0.0027	-0.0014	0.0005	-0.0248	0.0046	0.0003	0.0105	0.0078	0.0011	0.0086
Ni	-0.0111	0.0138	0.0518	-0.2692	0.0234	-0.0749	0.0914	0.1784	0.1104	0.0555	0.0420	-0.1173	-0.0601	0.1251	0.1901	-0.0772	0.0143	0.2332	0.0382	-0.0174	0.0232	-0.2706	0.0968	0.0297	0.0305	0.1324	0.0510	0.1131
P	0.0051	0.0226	0.0097	0.0362	0.0488	-0.0110	0.0325	0.0285	0.0188	0.0222	0.0122	0.0160	0.0119	0.0134	0.0293	0.0104	0.0027	0.0382	0.0518	0.0029	0.0107	0.0081	0.0133	0.0020	0.0351	0.0090	0.0100	0.0178
Pb	0.0014	0.0019	0.0006	0.0439	0.0158	0.0124	-0.0102	-0.0146	-0.0118	-0.0039	-0.0021	0.0203	0.0080	-0.0179	-0.0192	0.0101	-0.0014	-0.0174	0.0029	0.0144	0.0025	0.0414	-0.0071	-0.0005	0.0078	-0.0075	-0.0033	-0.0104
S	-0.0039	0.0016	0.0185	-0.0347	-0.0082	-0.0288	0.0080	0.0241	0.0199	0.0118	0.0167	-0.0081	-0.0305	0.0105	0.0273	0.0058	0.0005	0.0232	0.0107	0.0025	0.0307	-0.0499	0.0241	0.0135	0.0182	0.0267	0.0152	0.0107
Sb	0.0407	0.0779	-0.0998	0.8302	0.0971	0.1815	-0.1474	-0.2765	-0.1712	-0.0921	-0.0535	0.3524	0.1923	-0.2922	-0.3290	0.1961	-0.0248	-0.2706	0.0081	0.0414	-0.0499	0.9171	-0.1865	-0.0461	-0.0844	-0.1839	-0.0540	-0.1517
Sc	-0.0106	-0.0170	0.0334	-0.1744	-0.0137	-0.0485	0.0261	0.0851	0.0668	0.0365	0.0322	-0.0849	-0.0615	0.0685	0.0941	-0.0460	0.0046	0.0968	0.0133	-0.0071	0.0241	-0.1865	0.0737	0.0241	0.0213	0.0720	0.0329	0.0530
Sn	-0.0016	0.0027	0.0145	-0.0424	-0.0045	-0.0199	0.0046	0.0232	0.0242	0.0065	0.0166	-0.0188	-0.0247	0.0138	0.0261	-0.0065	0.0003	0.0297	0.0020	-0.0005	0.0135	-0.0461	0.0241	0.0205	0.0040	0.0343	0.0189	0.0119
Sr	0.0054	0.0260	0.0308	-0.0117	0.0222	-0.1206	0.0969	0.0422	0.0086	0.0121	0.0067	0.0162	-0.0077	0.0392	0.0305	-0.0023	0.0105	0.0305	0.0351	0.0078	0.0182	-0.0844	0.0213	0.0040	0.4798	-0.0290	-0.0110	0.0032
Ti	-0.0145	-0.0145	0.0395	-0.2223	0.0075	-0.0292	0.0385	0.1172	0.0752	0.0335	0.0373	-0.1093	-0.0712	0.0678	0.1386	-0.0654	0.0078	0.1324	0.0090	-0.0075	0.0267	-0.1839	0.0720	0.0343	-0.0290	0.1604	0.0498	0.0772
V	-0.0042	0.0036	0.0182	-0.0555	0.0028	-0.0063	0.0127	0.0419	0.0427	0.0171	0.0238	-0.0310	-0.0287	0.0235	0.0434	-0.0071	0.0011	0.0510	0.0100	-0.0033	0.0152	-0.0540	0.0329	0.0189	-0.0110	0.0498	0.0308	0.0260
Zn	-0.0094	-0.0020	0.0248	-0.1674	0.0133	-0.0249	0.0527	0.1079	0.0575	0.0372	0.0225	-0.0788	-0.0286	0.0795	0.1196	-0.0490	0.0086	0.1131	0.0178	-0.0104	0.0107	-0.1517	0.0530	0.0119	0.0032	0.0772	0.0260	0.0794

Cor_mat	Au	Ag	Al	As	Ba	Bi	Ca	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sn	Sr	Ti	V	Zn
Au	1.0000	0.1991	-0.0643	0.2608	0.0991	0.1073	0.0254	-0.1642	-0.0383	-0.0036	-0.0742	0.3392	0.0286	-0.1009	-0.2183	0.2210	-0.0776	-0.0975	0.0954	0.0497	-0.0945	0.1805	-0.1665	-0.0468	0.0330	-0.1533	-0.1018	-0.1413
Ag	0.1991	1.0000	0.0026	0.2730	0.1493	-0.1780	0.1726	0.0706	-0.0072	-0.0778	0.0577	0.3893	0.2073	-0.0591	-0.0283	0.2919	0.0329	0.0694	0.2415	0.0382	0.0227	0.1977	-0.1525	0.0465	0.0912	-0.0880	0.0492	-0.0171
Al	-0.0643	0.0026	1.0000	-0.4972	0.0085	-0.2445	0.2942	0.5917	0.6273	0.4953	0.5995	-0.3337	-0.4758	0.6015	0.5187	-0.2534	0.3182	0.6073	0.2408	0.0293	0.5986	-0.5904	0.6971	0.5743	0.2516	0.5589	0.5885	0.4988
As	0.2608	0.2730	-0.4972	1.0000	0.1902	0.2074	-0.3021	-0.6653	-0.5104	-0.3690	-0.2747	0.8108	0.5338	-0.7789	-0.7216	0.6565	-0.3455	-0.5782	0.1650	0.3800	-0.2054	0.8991	-0.6665	-0.3068	-0.0175	-0.5758	-0.3279	-0.6162
Ba	0.0991	0.1493	0.0085	0.1902	1.0000	0.0674	0.2096	0.0604	0.0335	0.0143	-0.0211	0.1442	0.4247	-0.0375	0.0435	-0.0290	0.2067	0.1025	0.4546	0.2797	-0.0992	0.2147	-0.1073	-0.0660	0.0678	0.0396	0.0333	0.1001
Bi	0.1073	-0.1780	-0.2445	0.2074	0.0674	1.0000	-0.2826	-0.2860	-0.1239	-0.0099	-0.2056	0.1245	0.2278	-0.2622	-0.2922	0.1735	-0.2010	-0.2732	-0.0854	0.1830	-0.2895	0.3339	-0.3146	-0.2443	-0.3069	-0.1286	-0.0632	-0.1549
Ca	0.0254	0.1726	0.2942	-0.3021	0.2096	-0.2826	1.0000	0.5000	0.4275	0.2782	0.2045	-0.1610	-0.0708	0.5075	0.4978	-0.0107	0.5499	0.4541	0.3429	-0.2046	0.1092	-0.3694	0.2310	0.0768	0.3359	0.2305	0.1741	0.4485
Co	-0.1642	0.0706	0.5917	-0.6653	0.0604	-0.2860	0.5000	1.0000	0.6443	0.5636	0.5074	-0.5273	-0.3510	0.7553	0.9109	-0.3694	0.4900	0.8263	0.2803	-0.2730	0.3078	-0.6457	0.7011	0.3625	0.1362	0.6545	0.5347	0.8563
Cr	-0.0383	-0.0072	0.6273	-0.5104	0.0335	-0.1239	0.4275	0.6443	1.0000	0.6262	0.7579	-0.4428	-0.4795	0.6205	0.5879	-0.1305	0.2512	0.7399	0.2669	-0.3181	0.3673	-0.5786	0.7966	0.5461	0.0401	0.6073	0.7877	0.6597
Cu	-0.0036	-0.0778	0.4953	-0.3690	0.0143	-0.0099	0.2782	0.5636	0.6262	1.0000	0.5561	-0.3756	-0.2221	0.5418	0.5646	-0.1418	0.2087	0.5449	0.4619	-0.1558	0.3200	-0.4559	0.6381	0.2141	0.0826	0.3954	0.4625	0.6257
Fe	-0.0742	0.0577	0.5995	-0.2747	-0.0211	-0.2056	0.2045	0.5074	0.7579	0.5561	1.0000	-0.3198	-0.4871	0.3512	0.5050	-0.0529	0.0789	0.5590	0.3456	-0.1105	0.6117	-0.3586	0.7614	0.7438	0.0618	0.5981	0.8729	0.5130
Hg	0.3392	0.3893	-0.3337	0.8108	0.1442	0.1245	-0.1610	-0.5273	-0.4428	-0.3756	-0.3198	1.0000	0.3615	-0.6356	-0.6117	0.7035	-0.2059	-0.4789	0.1387	0.3334	-0.0917	0.7256	-0.6167	-0.2586	0.0461	-0.5383	-0.3490	-0.5517
K	0.0286	0.2073	-0.4758	0.5338	0.4247	0.2278	-0.0708	-0.3510	-0.4795	-0.2221	-0.4871	0.3615	1.0000	-0.3144	-0.3744	0.1703	-0.0103	-0.3396	0.1428	0.1832	-0.4741	0.5478	-0.6181	-0.4701	-0.0302	-0.4846	-0.4457	-0.2768
Mg	-0.1009	-0.0591	0.6015	-0.7789	-0.0375	-0.2622	0.5075	0.7553	0.6205	0.5418	0.3512	-0.6356	-0.3144	1.0000	0.7480	-0.5101	0.4570	0.6810	0.1554	-0.3935	0.1579	-0.8022	0.6637	0.2531	0.1486	0.4450	0.3521	0.7420
Mn	-0.2183	-0.0283	0.5187	-0.7216	0.0435	-0.2922	0.4978	0.9109	0.5879	0.5646	0.5050	-0.6117	-0.3744	0.7480	1.0000	-0.4754	0.5036	0.7908	0.2586	-0.3213	0.3131	-0.6900	0.6962	0.3663	0.0885	0.6951	0.4966	0.8524
Mo	0.2210	0.2919	-0.2534	0.6565	-0.0290	0.1735	-0.0107	-0.3694	-0.1305	-0.1418	-0.0529	0.7035	0.1703	-0.5101	-0.4754	1.0000	-0.1592	-0.4035	0.1156	0.2120	0.0841	0.5171	-0.4275	-0.1144	-0.0085	-0.4121	-0.1027	-0.4388
Na	-0.0776	0.0329	0.3182	-0.3455	0.2067	-0.2010	0.5499	0.4900	0.2512	0.2087	0.0789	-0.2059	-0.0103	0.4570	0.5036	-0.1592	1.0000	0.3931	0.1560	-0.1555	0.0413	-0.3439	0.2264	0.0322	0.2005	0.2581	0.0861	0.4063
Ni	-0.0975	0.0694	0.6073	-0.5782	0.1025	-0.2732	0.4541	0.8263	0.7399	0.5449	0.5590	-0.4789	-0.3396	0.6810	0.7908	-0.4035	0.3931	1.0000	0.3476	-0.3002	0.2742	-0.5851	0.7384	0.4289	0.0911	0.6847	0.6025	0.8314
P	0.0954	0.2415	0.2408	0.1650	0.4546	-0.0854	0.3429	0.2803	0.2669	0.4619	0.3456	0.1387	0.1428	0.1554	0.2586	0.1156	0.1560	0.3476	1.0000	0.1053	0.2685	0.0374	0.2148	0.0628	0.2227	0.0987	0.2514	0.2771
Pb	0.0497	0.0382	0.0293	0.3800	0.2797	0.1830	-0.2046	-0.2730	-0.3181	-0.1558	-0.1105	0.3334	0.1832	-0.3935	-0.3213	0.2120	-0.1555	-0.3002	0.1053	1.0000	0.1213	0.3605	-0.2172	-0.0292	0.0944	-0.1567	-0.1582	-0.3085
S	-0.0945	0.0227	0.5966	-0.2054	-0.0992	-0.2895	0.1092	0.3078	0.3673	0.3200	0.6117	-0.0917	-0.4741	0.1579	0.3131	0.0841	0.0413	0.2742	0.2685	0.1213	1.0000	-0.2974	0.5077	0.5383	0.1504	0.3600	0.4939	0.2175
Sb	0.1805	0.1977	-0.5904	0.6991	0.2147	0.3339	-0.3694	-0.6457	-0.5786	-0.4559	-0.3586	0.7256	0.5478	-0.8022	-0.6900	0.5171	-0.3439	-0.5851	0.0374	0.3605	-0.2974	1.0000	-0.7174	-0.3361	-0.1273	-0.4795	-0.3218	-0.5622
Sc	-0.1665	-0.1525	0.6971	-0.6665	-0.1073	-0.3146	0.2310	0.7011	0.7966	0.6381	0.7614	-0.6167	-0.6181	0.6637	0.6962	-0.4275	0.2264	0.7384	0.2148	-0.2172	0.5077	-0.7174	1.0000	0.6196	0.1135	0.6626	0.6910	0.6936
Sn	-0.0468	0.0465	0.5743	-0.3068	-0.0660	-0.2443	0.0768	0.3625	0.5461	0.2141	0.7438	-0.2586	-0.4701	0.2531	0.3663	-0.1144	0.0322	0.4289	0.0628	-0.0292	0.5383	-0.3361	0.6196	1.0000	0.0403	0.5977	0.7527	0.2937
Sr	0.0330	0.0912	0.2516	-0.0175	0.0678	-0.3069	0.3359	0.1362	0.0401	0.0826	0.0618	0.0461	-0.0302	0.1486	0.0885	-0.0085	0.2005	0.0911	0.2227	0.0944	0.1504	-0.1273	0.1135	0.0403	1.0000	-0.1046	-0.0903	0.0166
Ti	-0.1533	-0.0880	0.5589	-0.5758	0.0396	-0.1286	0.2305	0.6545	0.6073	0.3964	0.5981	-0.5383	-0.4846	0.4450	0.6951	-0.4121	0.2581	0.6847	0.0987	-0.1567	0.3800	-0.4795	0.6626	0.5977	-0.1046	1.0000	0.7088	0.6845
V	-0.1018	0.0492	0.5885	-0.3279	0.0333	-0.0632	0.1741	0.5347	0.7877	0.4625	0.8729	-0.3490	-0.4457	0.3521	0.4966	-0.1027	0.0861	0.6025	0.2514	-0.1582	0.4939	-0.3218	0.6910	0.7527	-0.0903	0.7088	1.0000	0.5262
Zn	-0.1413	-0.0171	0.4988	-0.6162	0.1001	-0.1549	0.4485	0.8563	0.6597	0.6257	0.5130	-0.5517	-0.2768	0.7420	0.8524	-0.4388	0.4063	0.8314	0.2771	-0.3085	0.2175	-0.5622	0.6936	0.2937	0.0166	0.6845	0.5262	1.0000

TableII-4-2 Principal Component Analysis of Soil Samples in the Salubosogin-Yakalan Area

Result of PCA

No.	Eig_value	Eig_pct	Eig_sum
Z-01	11.2585	40.2089	40.2089
Z-02	3.0636	10.9415	51.1504
Z-03	2.651	9.4679	60.6183
Z-04	1.6833	6.0117	66.6299
Z-05	1.325	4.7321	71.362
Z-06	1.1208	4.0027	75.3648
Z-07	0.9327	3.331	78.6958
Z-08	0.858	3.0642	81.76
Z-09	0.7171	2.561	84.321
Z-10	0.6129	2.1889	86.51

Fact_Id	Z-01	Z-02	Z-03	Z-04	Z-05	Z-06	Z-07	Z-08	Z-09	Z-10
Sc	**0.9039**	0.0544	-0.2148	0.0178	-0.0645	0.1022	-0.0349	-0.1375	-0.0313	-0.008
Mn	**0.8773**	-0.1004	0.2426	-0.0568	-0.0082	-0.1077	-0.0626	0.0397	0.1517	-0.105
Co	**0.8689**	0.0042	0.2678	-0.0344	0.0378	-0.0907	-0.0269	0.0454	0.1975	0.0133
Ni	**0.8561**	0.0907	0.2012	-0.124	0.0766	-0.1115	0.0273	-0.0934	0.0431	0.0071
Zn	**0.8381**	-0.0368	0.2582	-0.2552	0.0688	-0.0333	-0.042	-0.029	0.1406	-0.0181
Cr	**0.8237**	0.2368	-0.0807	-0.1345	0.2306	0.1169	-0.0053	0.0676	-0.2163	0.1194
Mg	**0.8115**	-0.2513	0.2881	0.0676	0.0848	0.1417	0.0626	-0.0588	0.0569	0.1333
Ti	**0.7759**	0.0449	-0.1819	-0.2423	-0.0787	-0.2672	0.1686	0.105	0.029	-0.0974
Al	**0.7485**	0.2525	-0.1062	0.1907	-0.2243	0.1281	0.1816	0.0764	0.1178	0.1537
Fe	**0.7174**	0.4794	-0.3381	-0.0698	0.0448	-0.0191	-0.1192	-0.0479	-0.1504	0.0218
V	**0.7127**	0.4038	-0.3485	-0.2523	0.089	-0.1579	-0.0104	0.0541	-0.1749	0.0994
Cu	**0.6522**	0.1973	0.106	-0.2314	0.0599	0.4925	-0.2262	-0.1148	0.1384	0.0009
Sn	**0.5838**	0.3487	-0.4779	0.0771	-0.0551	-0.2738	0.1747	0.001	-0.1914	0.0991
S	0.4695	0.4508	-0.3742	0.3045	-0.2202	0.0645	-0.1269	0.1016	0.2015	-0.2257
K	-0.5621	0.0721	0.5328	-0.3	-0.1189	-0.1253	-0.1376	-0.1117	-0.0522	0.1734
Hg	-0.6835	**0.5459**	0.0916	0.1434	0.1508	-0.0188	0.0372	0.0913	0.1181	-0.057
As	-0.7839	**0.5233**	0.0256	-0.0728	0.0427	-0.0248	-0.1129	-0.0474	-0.0626	-0.0398
Sb	-0.7997	0.3734	0.0046	-0.2377	-0.0045	-0.1503	-0.0649	0.0114	-0.0532	-0.0318
P	0.2425	**0.6236**	0.4178	-0.1496	-0.1296	0.1995	-0.2386	-0.2359	0.0049	-0.1947
Mo	-0.4716	**0.5826**	-0.0664	0.1281	0.3345	0.1387	-0.1861	0.3793	0.0295	-0.004
Ag	-0.0819	**0.4883**	0.2887	0.1754	0.3392	-0.418	0.0634	-0.1874	0.3524	0.3354
Ca	0.4608	0.144	0.5915	0.2419	0.1559	0.0176	0.0076	0.2887	-0.2016	-0.0256
Na	0.4154	-0.0581	0.5611	0.1421	-0.0496	-0.0942	0.1041	0.4937	-0.0371	-0.1147
Ba	-0.0347	0.3615	0.5224	-0.3667	-0.3922	-0.1656	0.2154	-0.0631	-0.2462	-0.1156
Sr	0.1197	0.1881	0.3117	0.6095	-0.28	0.2437	-0.0088	-0.1293	-0.2734	0.3159
Bi	-0.3209	-0.0314	-0.1081	-0.6567	0.0342	0.3594	0.1329	0.3177	0.055	0.3174
Pb	*-0.33*	*0.3722*	*-0.0783*	*-0.029*	*-0.6571*	*0.0691*	*0.2259*	*0.128*	0.2986	0.0976
Au	-0.1883	0.2943	0.0994	0.0291	0.3904	0.3199	0.6985	-0.2221	0.0021	-0.2036

Eig_vec	Z-01	Z-02	Z-03	Z-04	Z-05	Z-06	Z-07	Z-08	Z-09	Z-10
Sc	0.2694	0.0311	-0.1319	0.0137	-0.056	0.0965	-0.0361	-0.1485	-0.037	-0.0102
Mn	0.2615	-0.0574	0.149	-0.0438	-0.0071	-0.1017	-0.0648	0.0429	0.1791	-0.1341
Co	0.259	0.0024	0.1645	-0.0265	0.0329	-0.0857	-0.0278	0.049	0.2333	0.017
Ni	0.2551	0.0518	0.1235	-0.0956	0.0665	-0.1053	0.0283	-0.1009	0.051	0.0091
Zn	0.2498	-0.0211	0.1586	-0.1967	0.0598	-0.0315	-0.0435	-0.0313	0.1661	-0.0231
Cr	*0.2455*	*0.1353*	*-0.0495*	*-0.1036*	*0.2003*	*0.1104*	*-0.0055*	*0.0729*	*-0.2554*	*0.1525*
Mg	0.2418	-0.1436	0.177	0.0521	0.0736	0.1339	0.0648	-0.0635	0.0672	0.1702
Ti	0.2312	0.0256	-0.1117	-0.1867	-0.0684	-0.2524	0.1746	0.1134	0.0342	-0.1245
Al	0.2231	0.1443	-0.0652	0.147	-0.1948	0.121	0.1881	0.0825	0.1391	0.1963
Fe	0.2138	0.2739	-0.2077	-0.0538	0.0389	-0.0181	-0.1234	-0.0517	-0.1776	0.0278
V	0.2124	0.2307	-0.2141	-0.1945	0.0773	-0.1491	-0.0107	0.0584	-0.2066	0.1269
Cu	0.1944	0.1127	0.0651	-0.1784	0.0521	0.4652	-0.2343	-0.124	0.1634	0.0012
Sn	0.174	0.1992	-0.2935	0.0594	-0.0479	-0.2586	0.1809	0.0011	-0.226	0.1265
S	0.1399	0.2575	-0.2298	0.2347	-0.1913	0.0609	-0.1314	0.1097	0.238	-0.2882
K	-0.1675	0.0412	0.3273	-0.2312	-0.1033	-0.1183	-0.1425	-0.1205	-0.0617	0.2215
Hg	-0.2037	0.3119	0.0563	0.1105	0.131	-0.0178	0.0385	0.0985	0.1394	-0.0728
As	-0.2336	0.299	0.0157	-0.0561	0.0371	-0.0234	-0.1169	-0.0511	-0.0739	-0.0508
Sb	-0.2383	0.2133	0.0028	-0.1832	-0.0039	-0.142	-0.0672	0.0123	-0.0629	-0.0407
P	0.0723	0.3563	0.2566	-0.1153	-0.1126	0.1884	-0.247	-0.2547	0.0058	-0.2487
Mo	-0.1406	0.3328	-0.0408	0.0987	0.2906	0.131	-0.1927	0.4095	0.0349	-0.0052
Ag	-0.0244	0.279	0.1773	0.1352	0.2947	-0.3949	0.0656	-0.2023	0.4162	0.4284
Ca	0.1373	0.0822	0.3633	0.1864	0.1355	0.0166	0.0079	0.3117	-0.2381	-0.0327
Na	0.1238	-0.0332	0.3446	0.1096	-0.0431	-0.089	0.1078	0.5329	-0.0438	-0.1465
Ba	-0.0103	0.2065	0.3208	-0.2827	-0.3407	-0.1564	0.223	-0.0682	-0.2908	-0.1477
Sr	0.0357	0.1075	0.1914	0.4698	-0.2433	0.2302	-0.0092	-0.1396	-0.3228	0.4035
Bi	-0.0956	-0.0179	-0.0664	-0.5062	0.0297	0.3395	0.1376	0.343	0.0649	0.4055
Pb	-0.0984	0.2127	-0.0481	-0.0224	-0.5709	0.0842	0.2339	0.1382	0.3527	0.1246
Au	-0.0561	0.1681	0.061	0.0224	0.3392	0.3022	0.7233	-0.2398	0.0025	-0.26

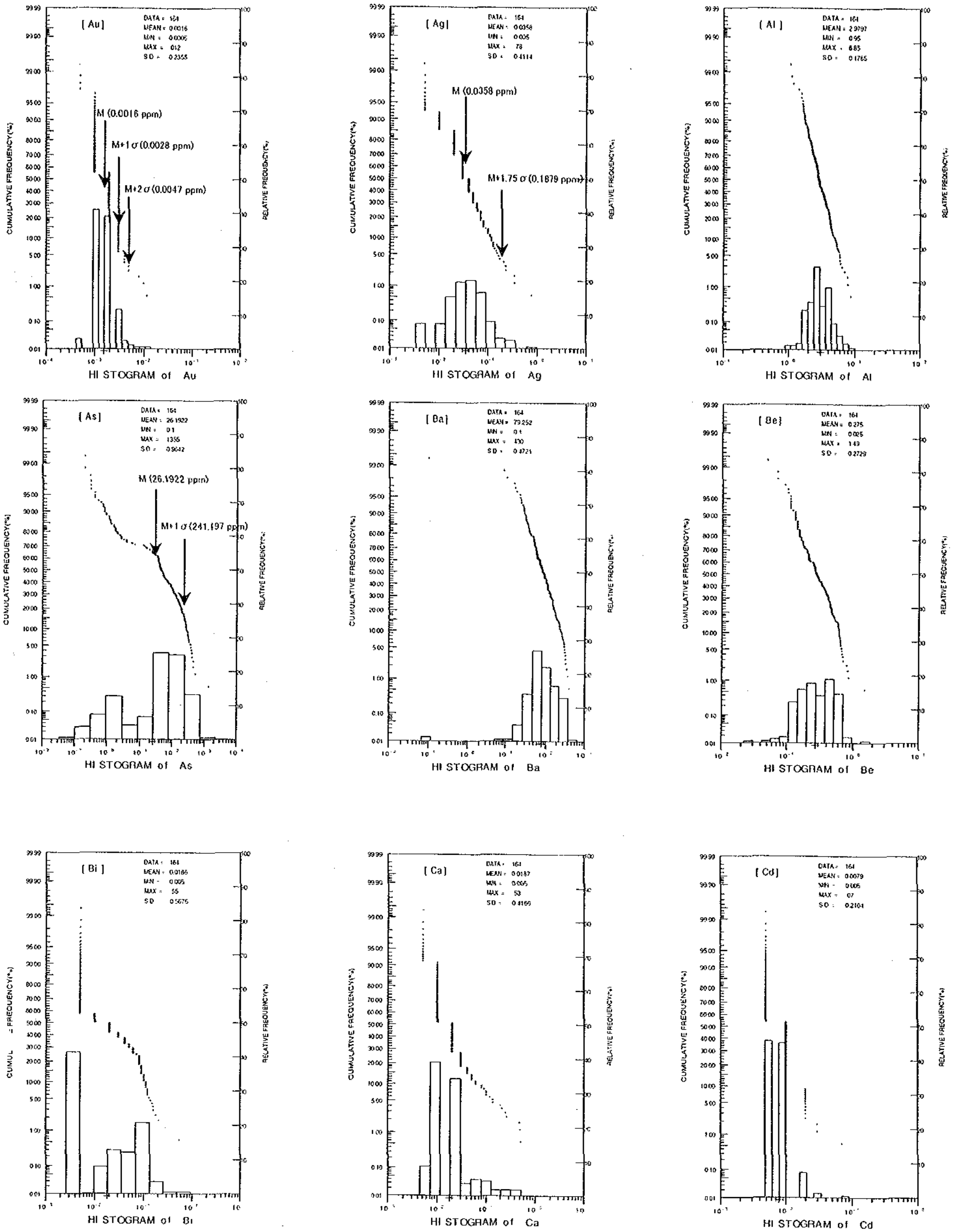


Fig. II-4-5. Probability Plot of Soil Samples in the Salubosogin-Yakalan Area (1)

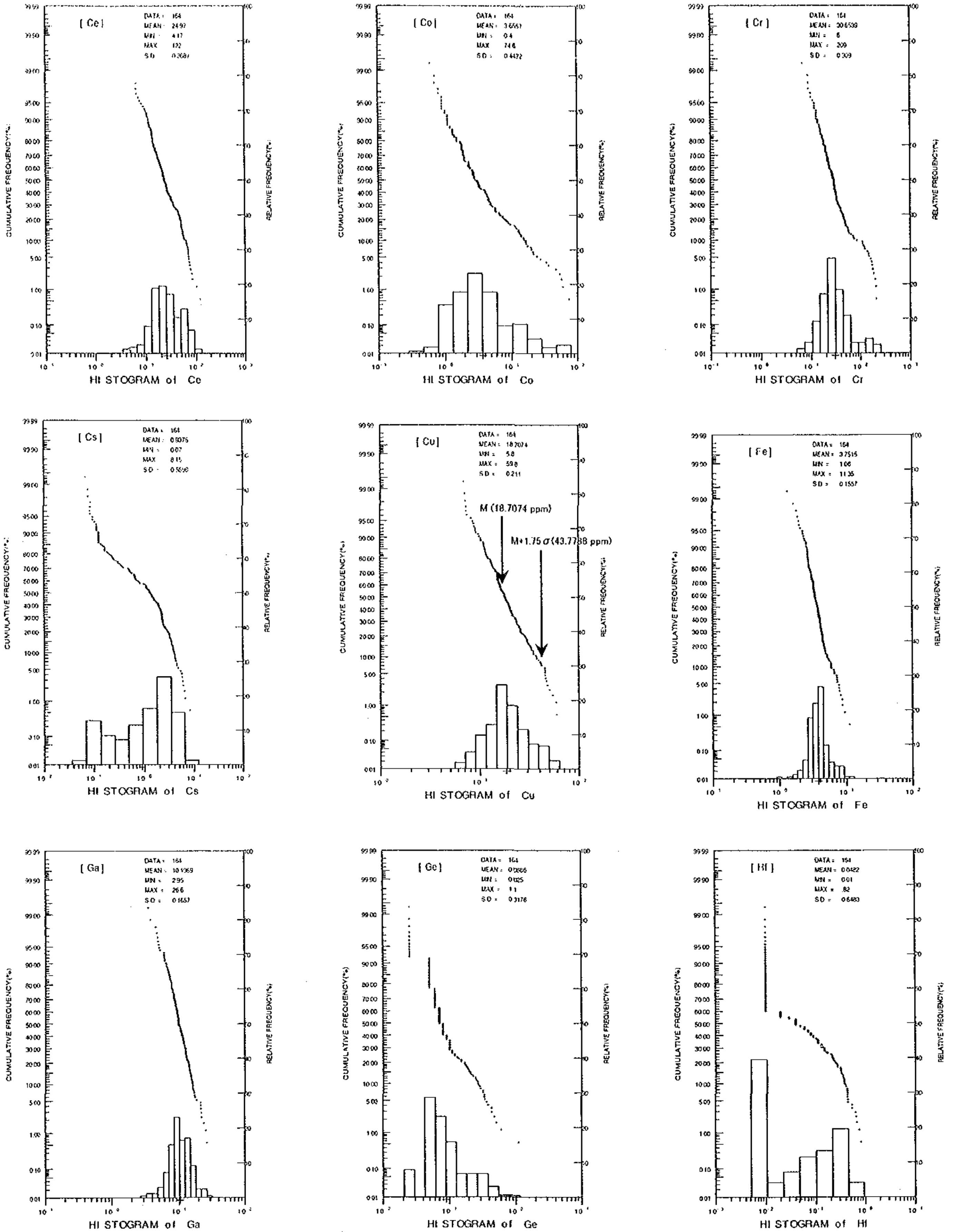


Fig. II-4-5. Probability Plot of Soil Samples in the Salubosogin-Yakalan Area (2)

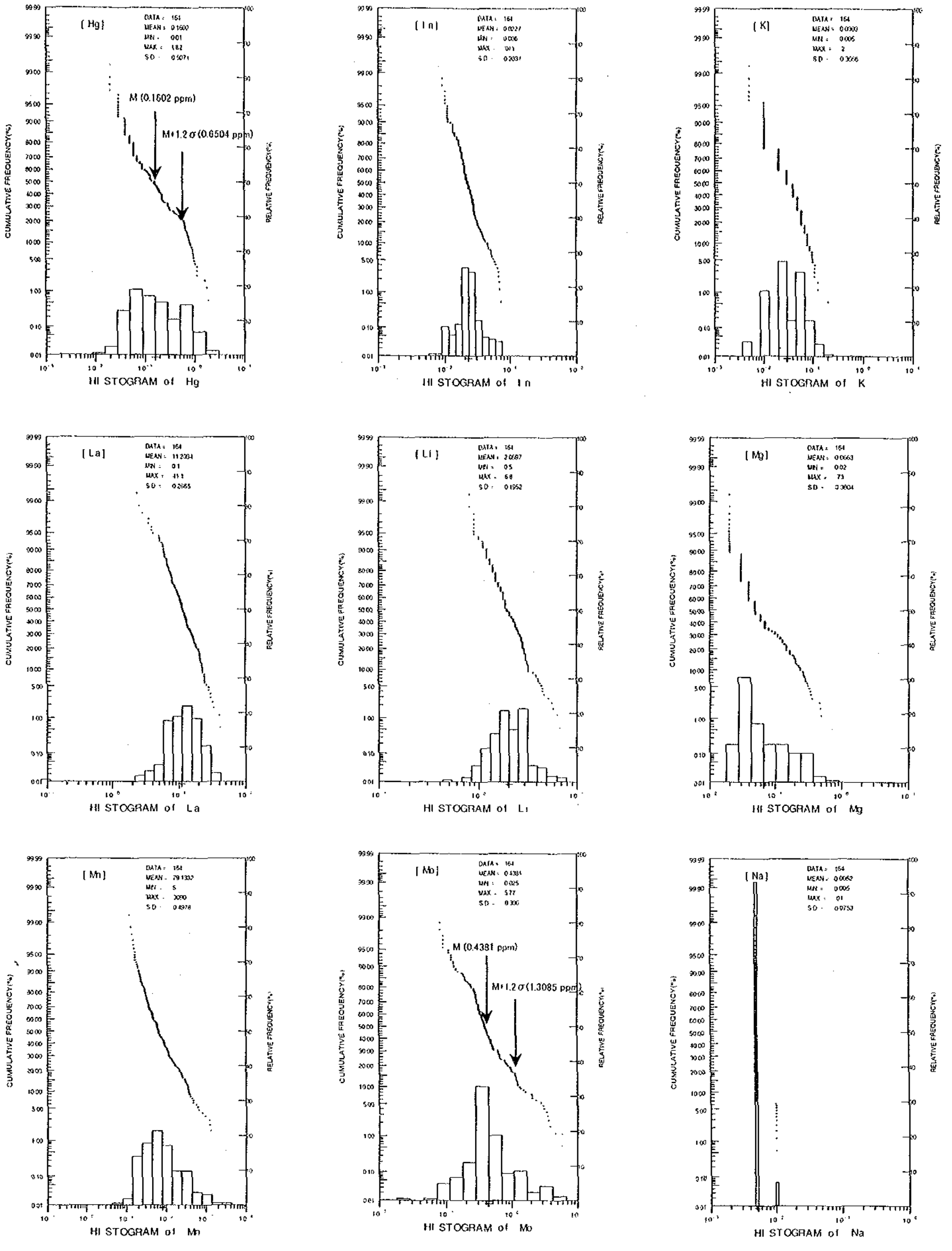


Fig. II-4-5. Probability Plot of Soil Samples in the Salubosogin-Yakalan Area (3)

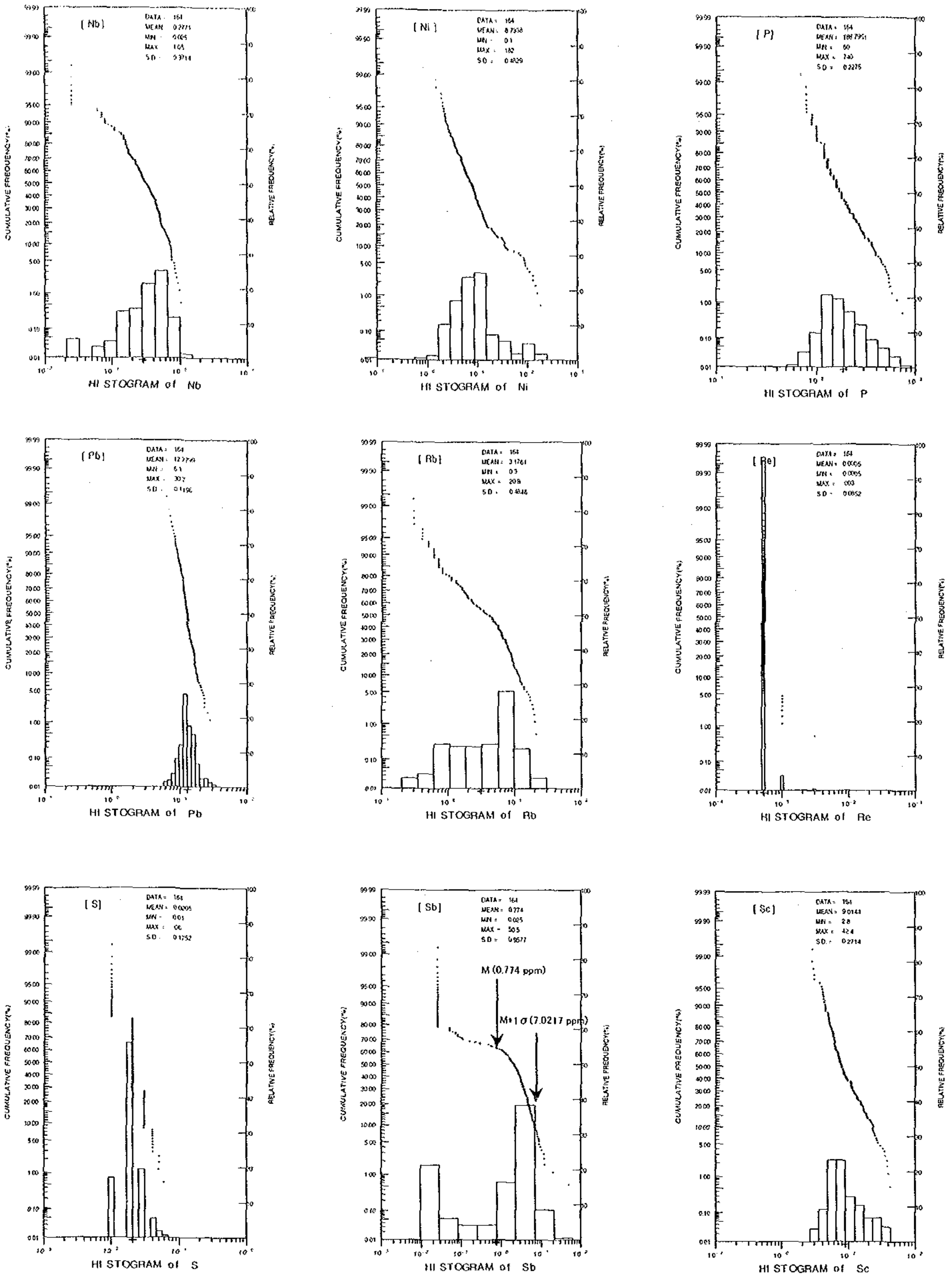


Fig. II-4-5. Probability Plot of Soil Samples in the Salubosogin-Yakalan Area (4)

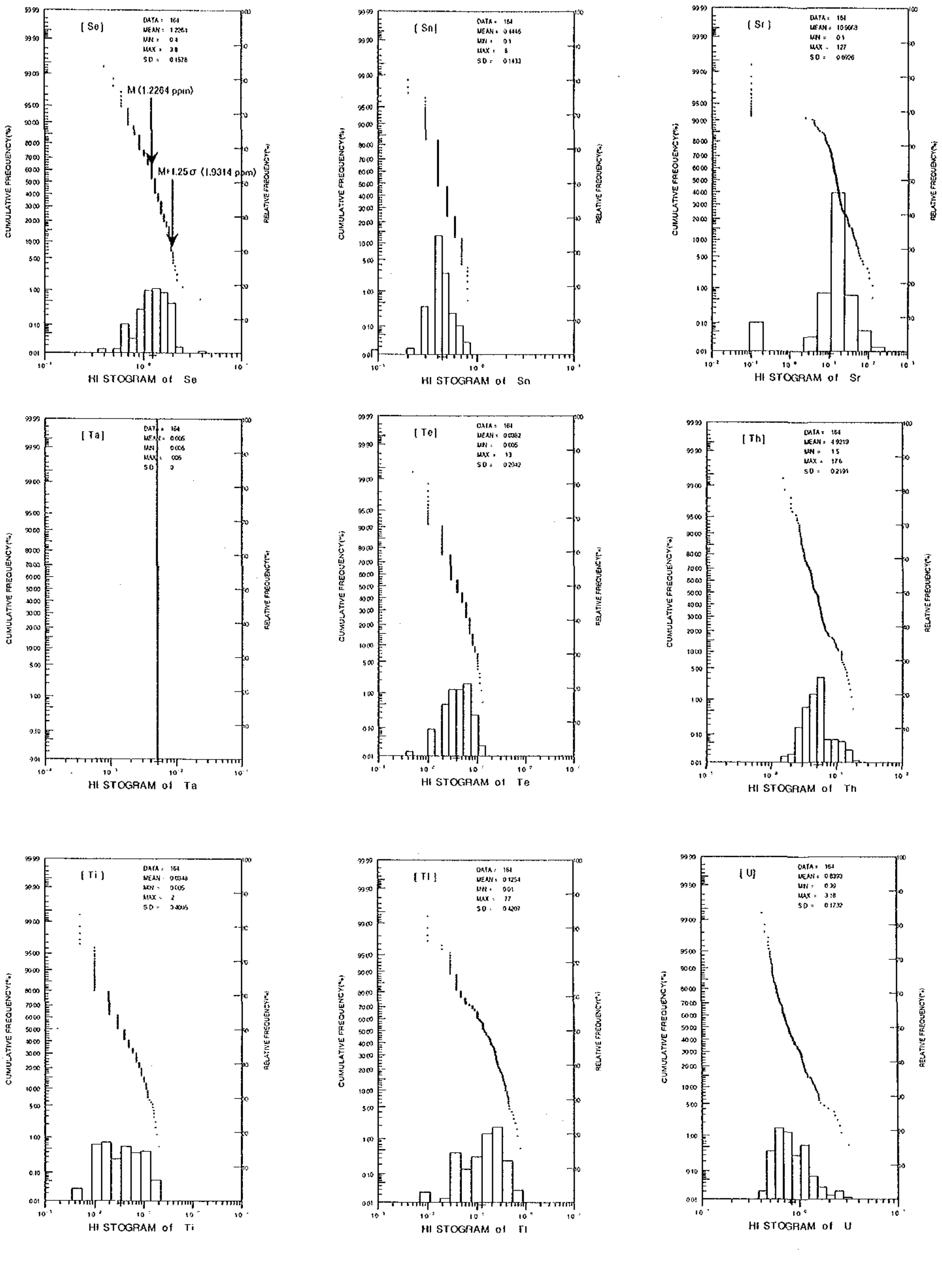
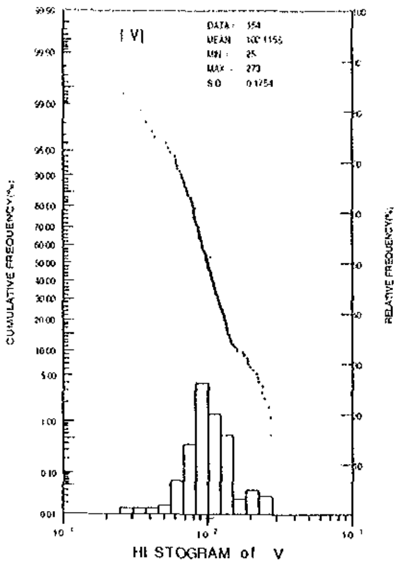
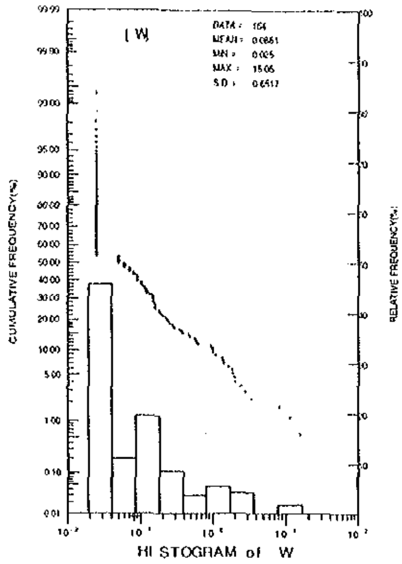
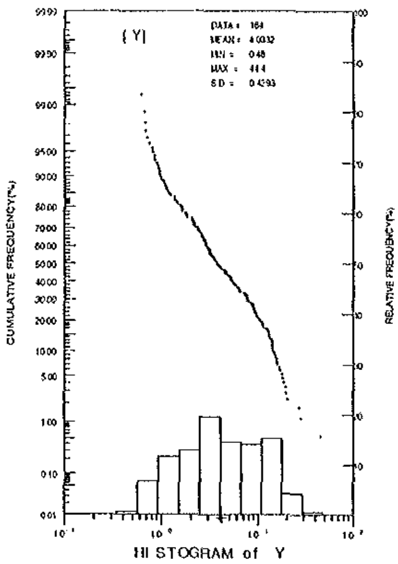
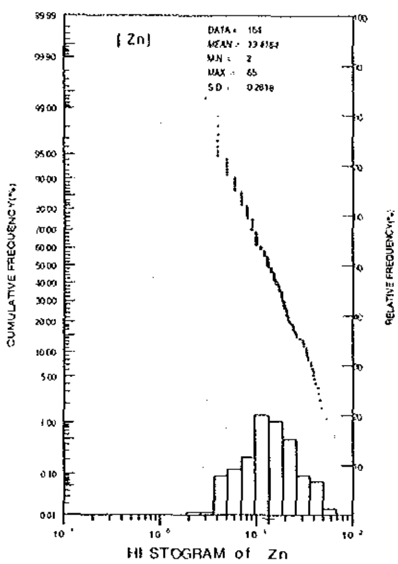


Fig. II-4-5. Probability Plot of Soil Samples in the Salubosogin-Yakalan Area (5)









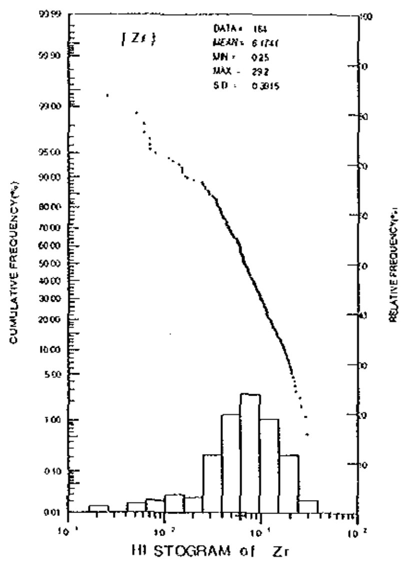


Fig. II-4-5. Probability Plot of Soil Samples in the Salubosogin-Yakalan Area (6)

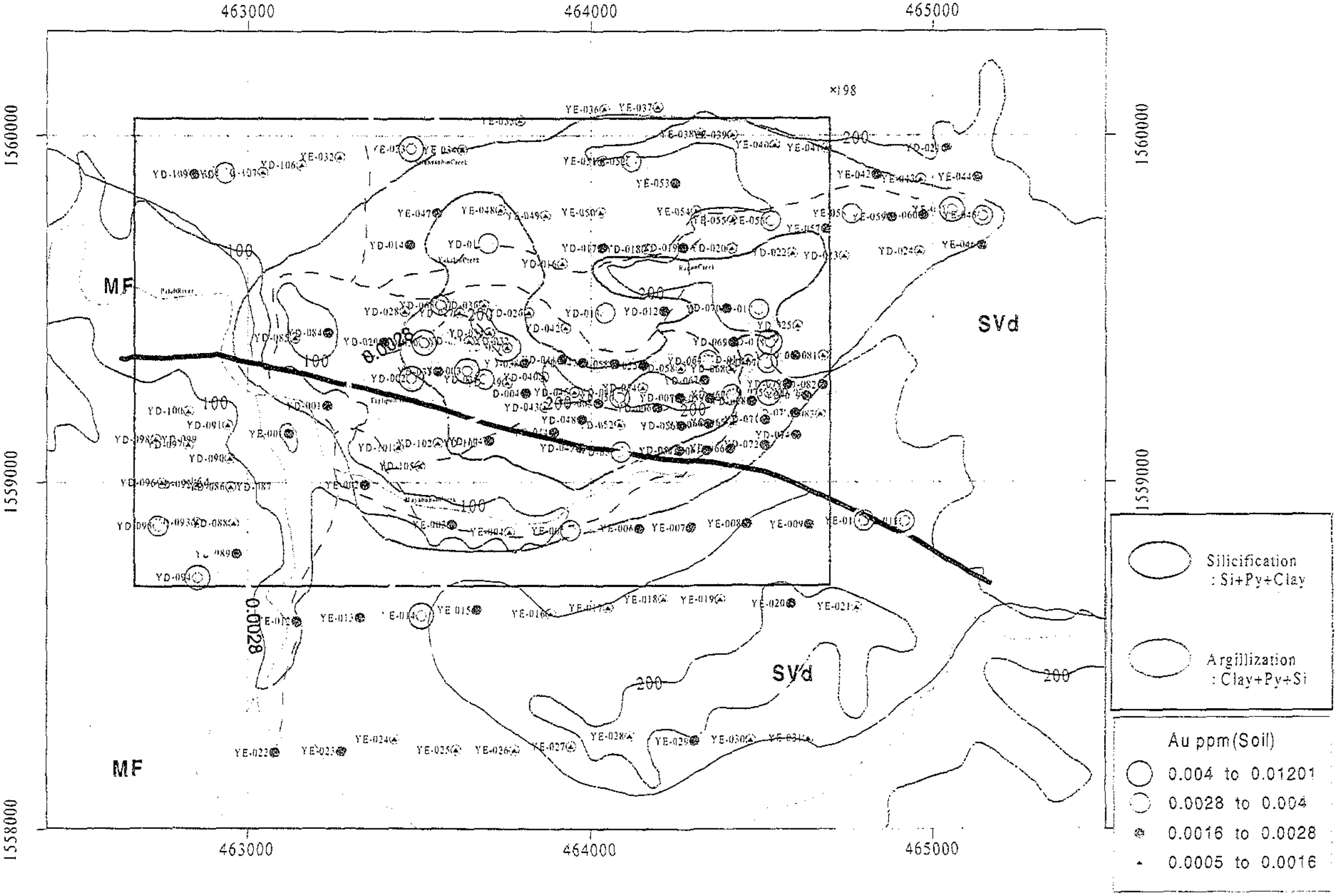


Fig.II-4-6 Au Content of Soil Samples in the Salubosogin-Yakalan Area.

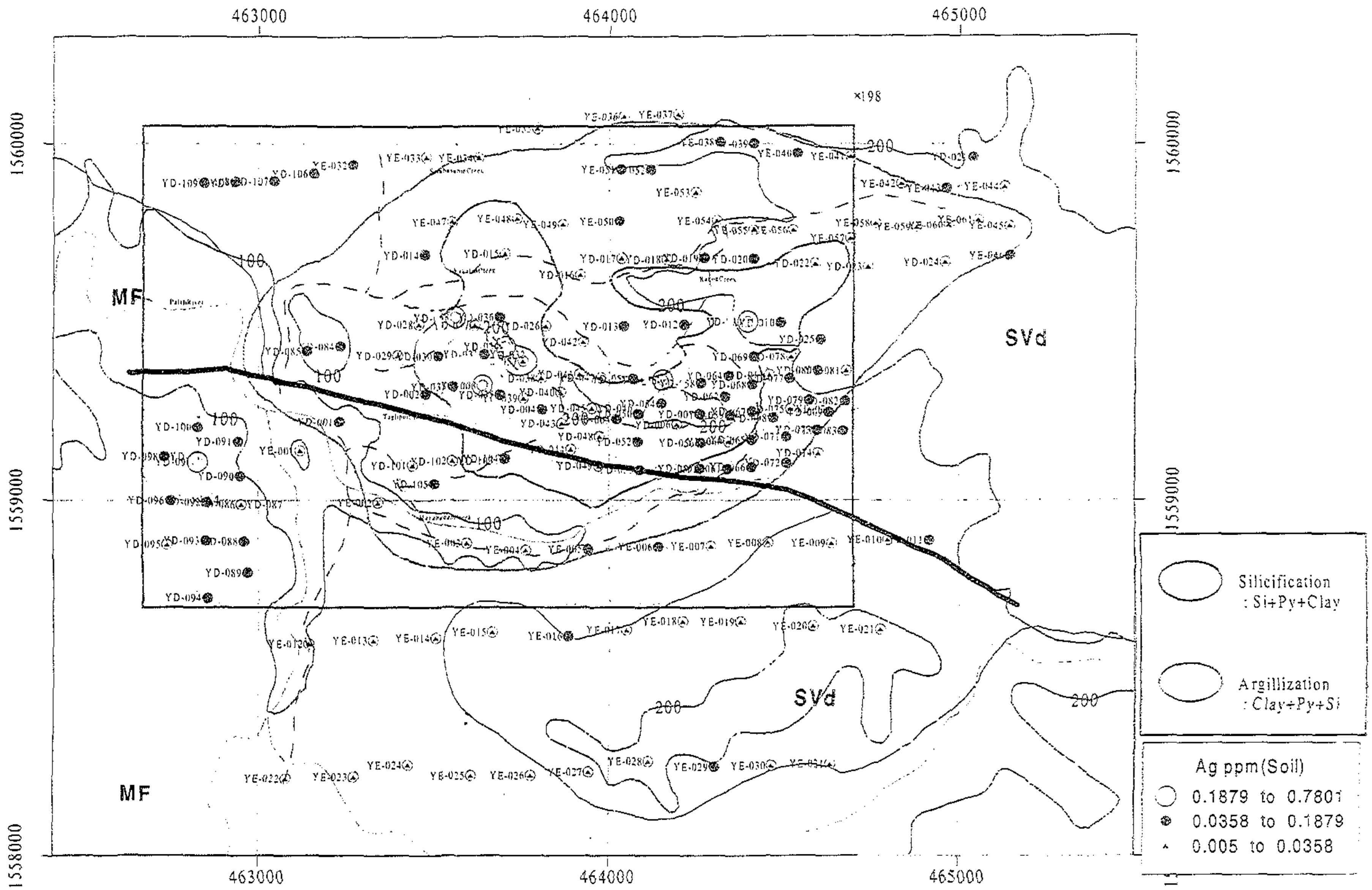


Fig.II-4-7 Ag Content of Soil Samples in the Salubosogin-Yakalan Area.

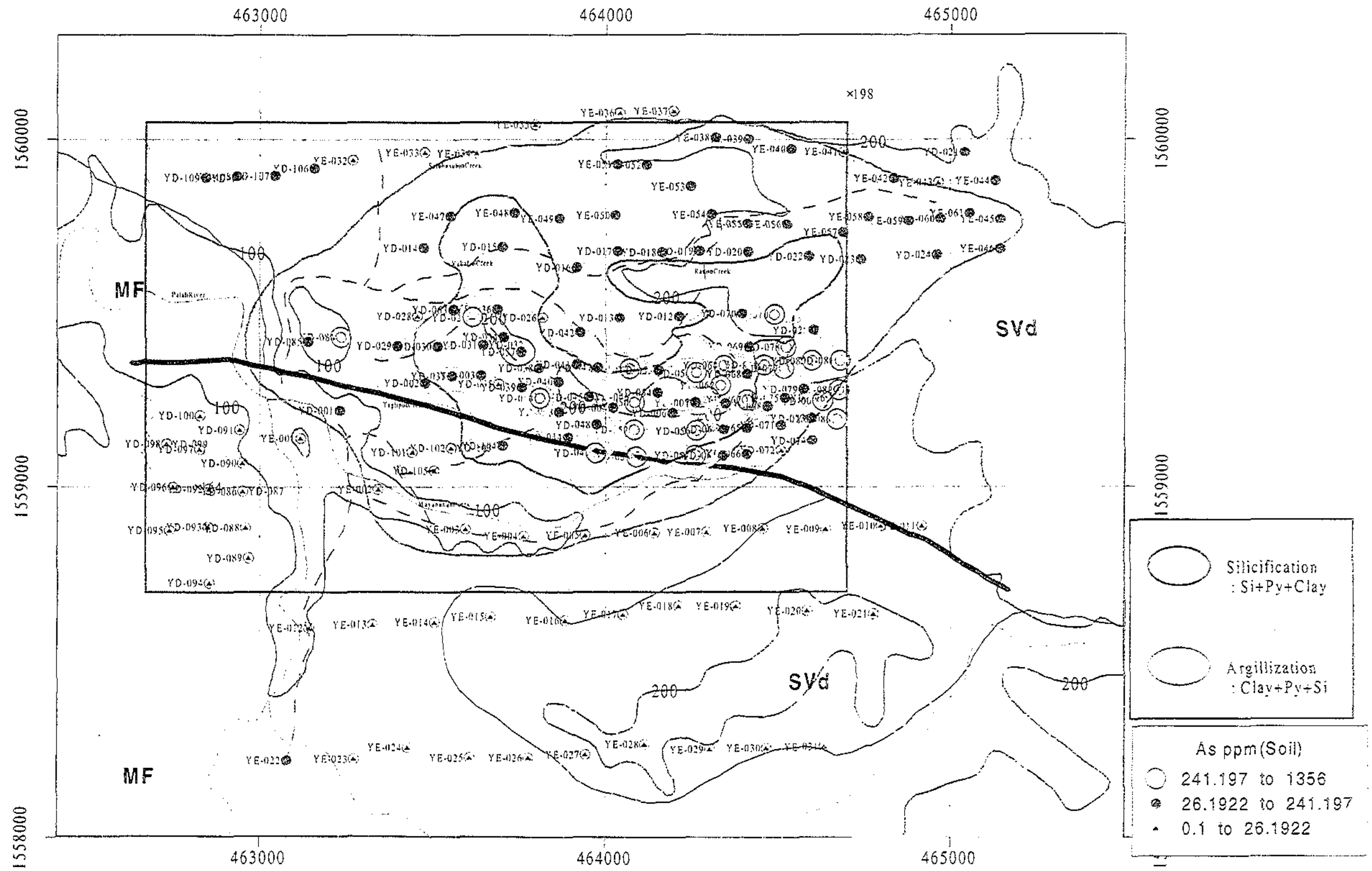


Fig.II-4-8 As Content of Soil Samples in the Salubosogin-Yakalan Area.

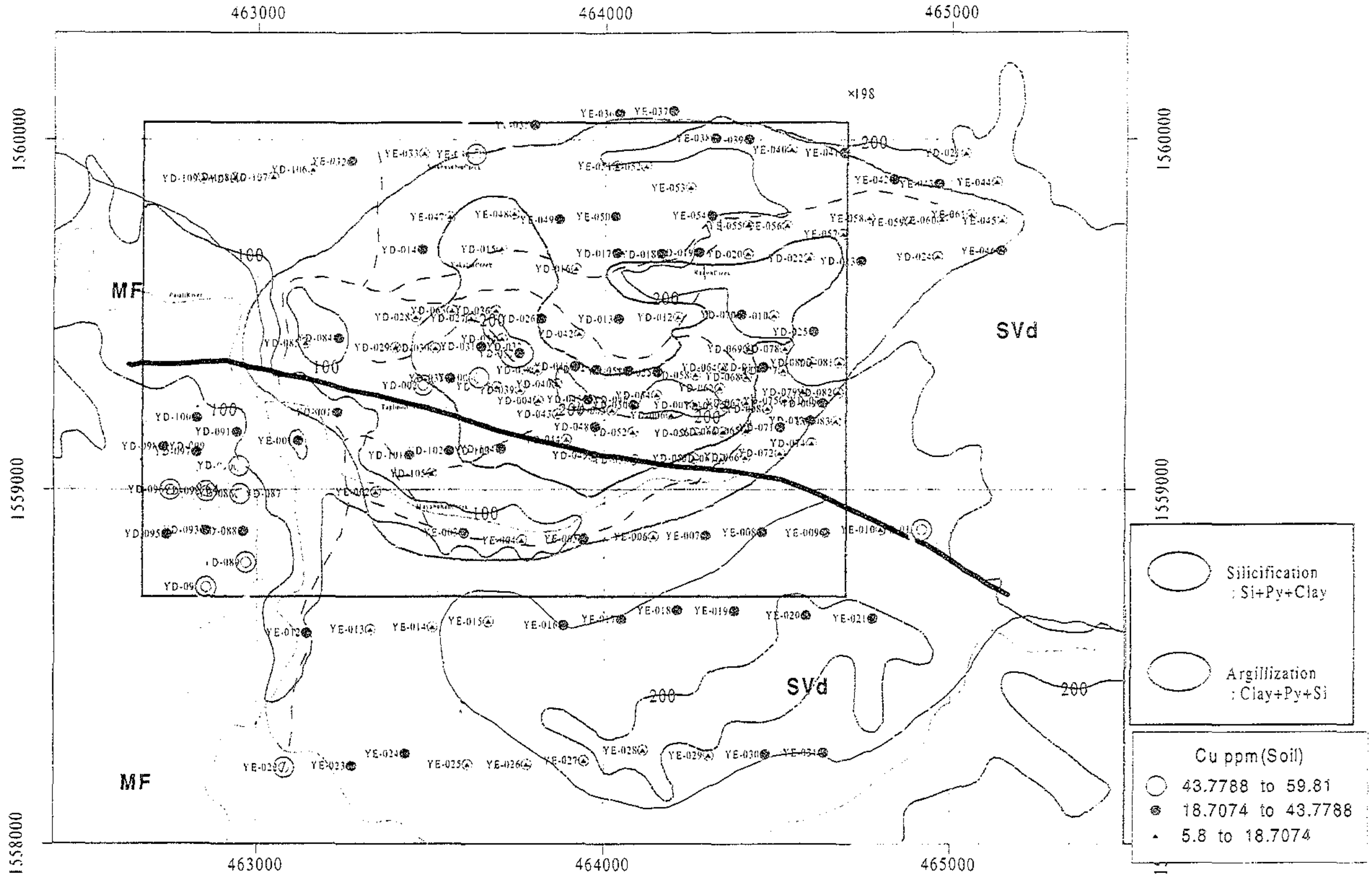


Fig.II-4-9 Cu Content of Soil Samples in the Salubosogin-Yakalan Area.

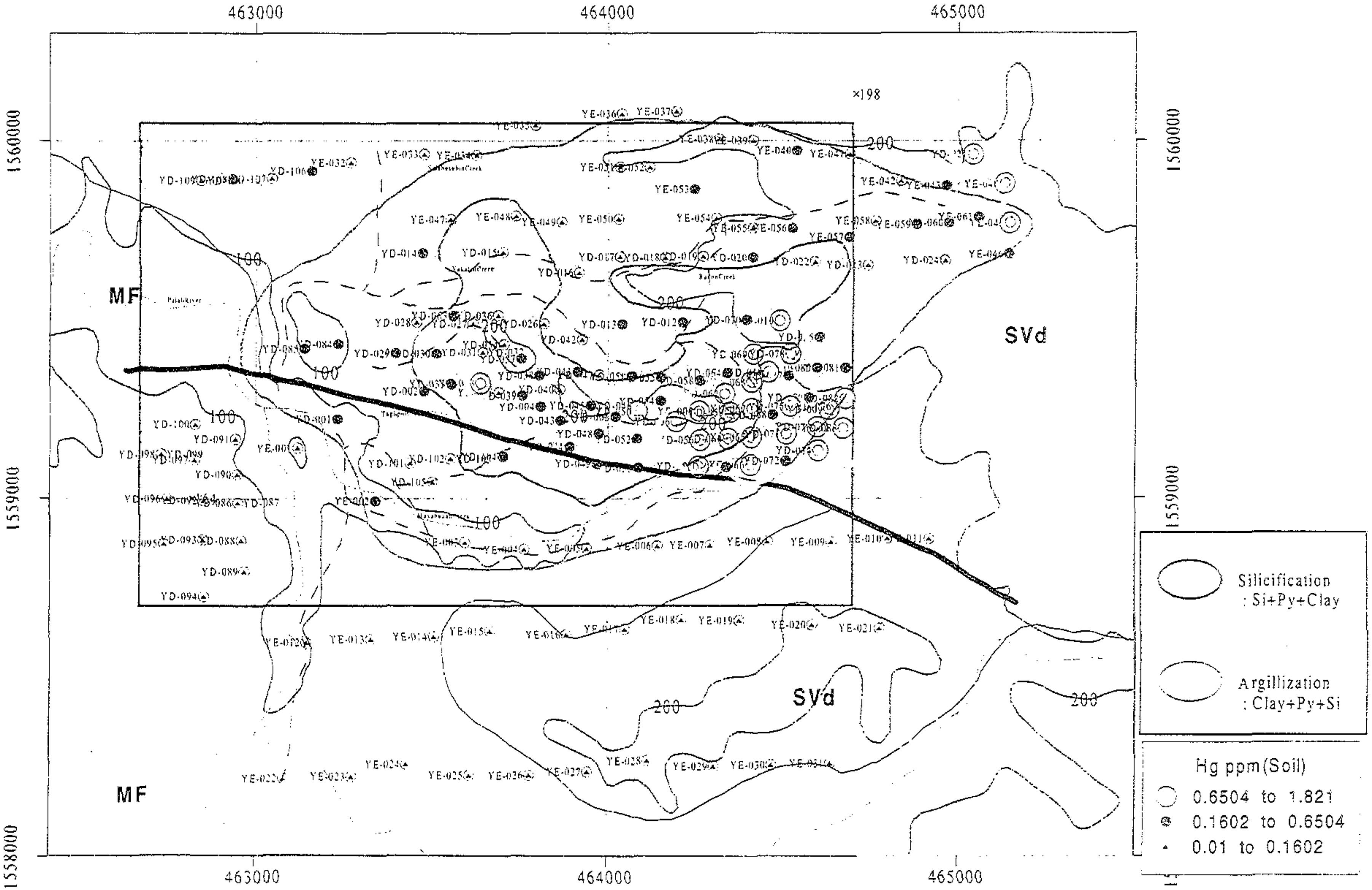


Fig.II-4-10 Hg Content of Soil Samples in the Salubosogin-Yakalan Area.

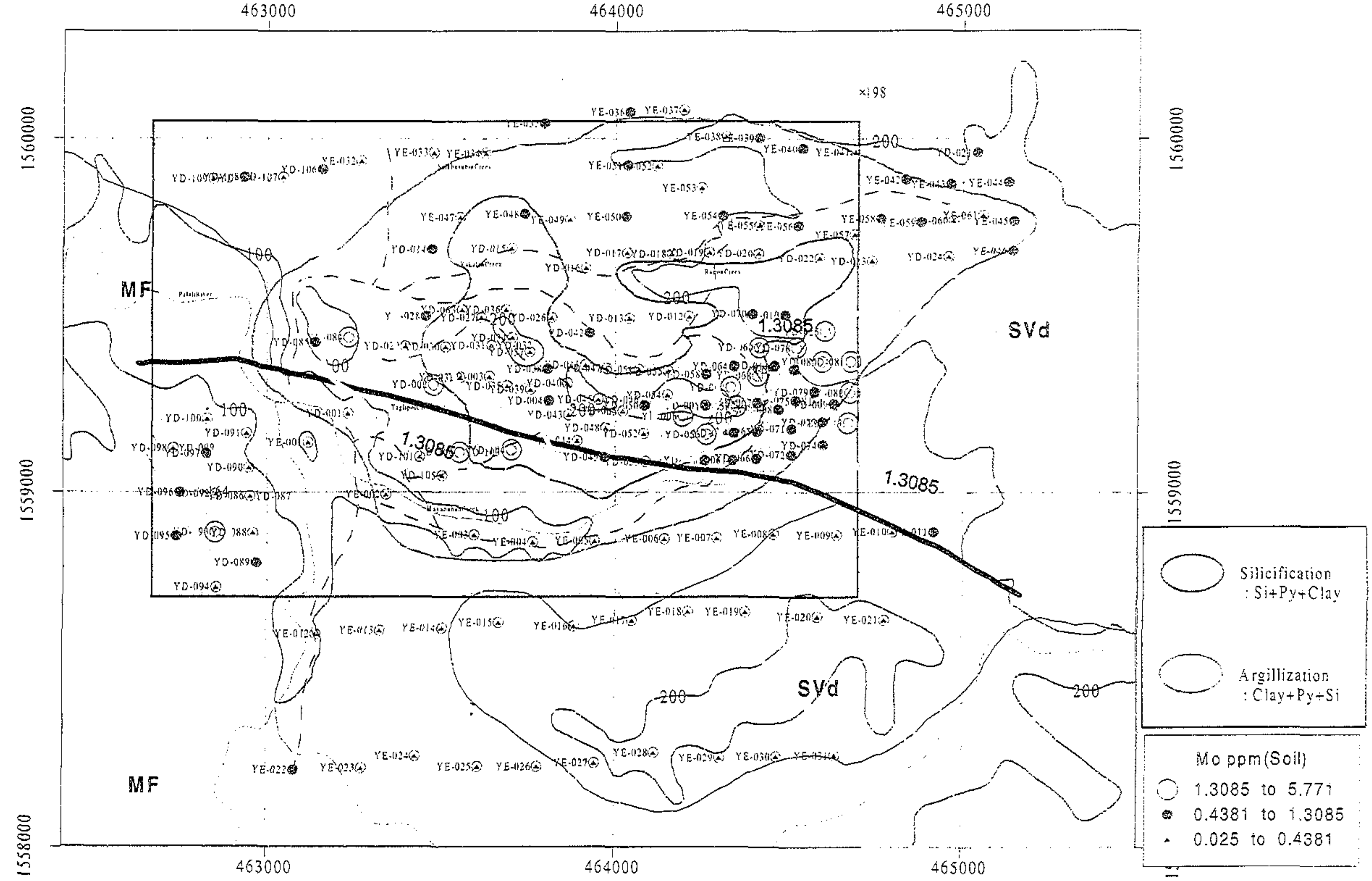


Fig.II-4-11 Mo Content of Soil Samples in the Salubosogin-Yakalan Area.

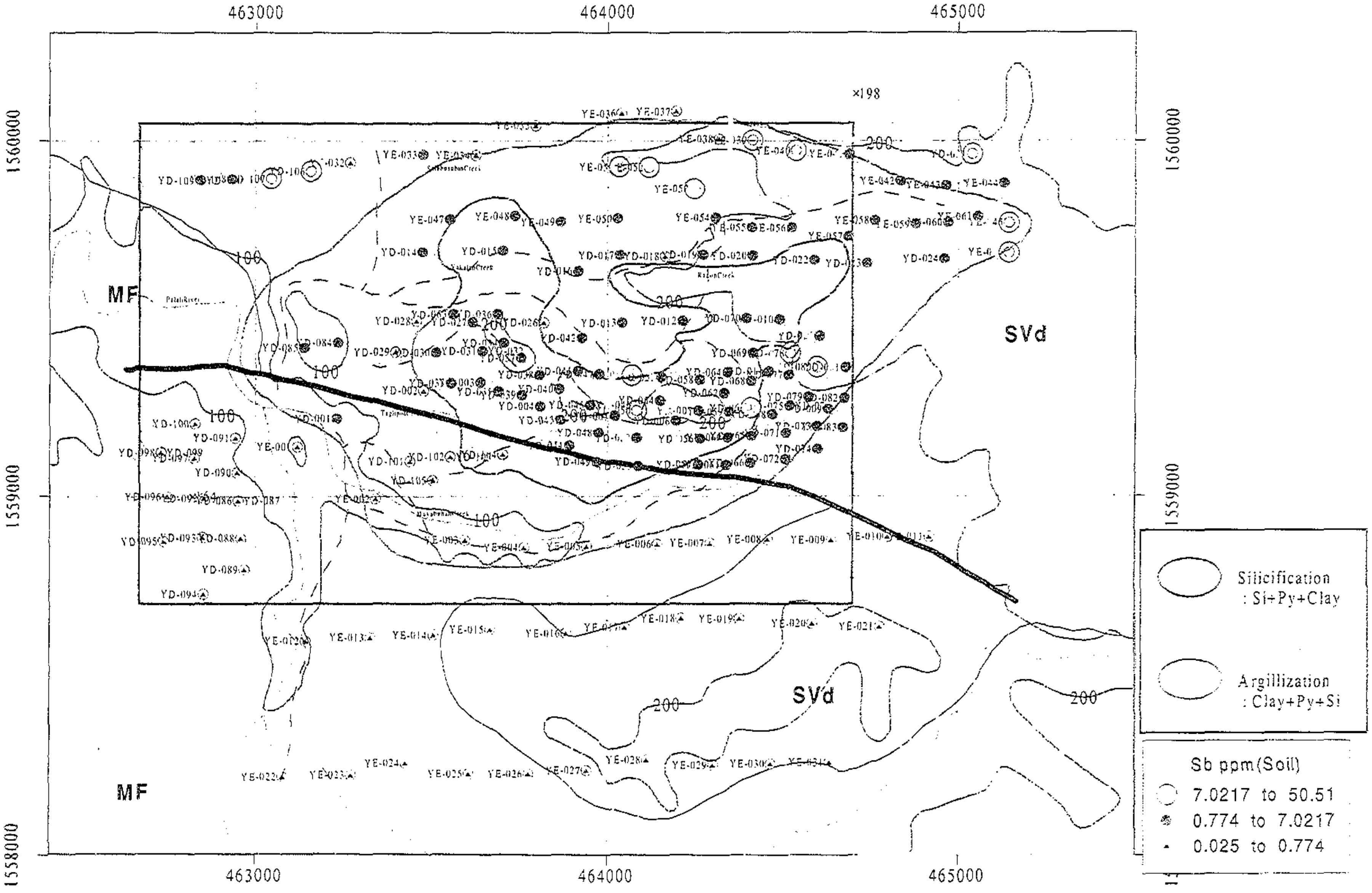


Fig.II-4-12 Sb Content of Soil Samples in the Salubosogin-Yakalan Area.

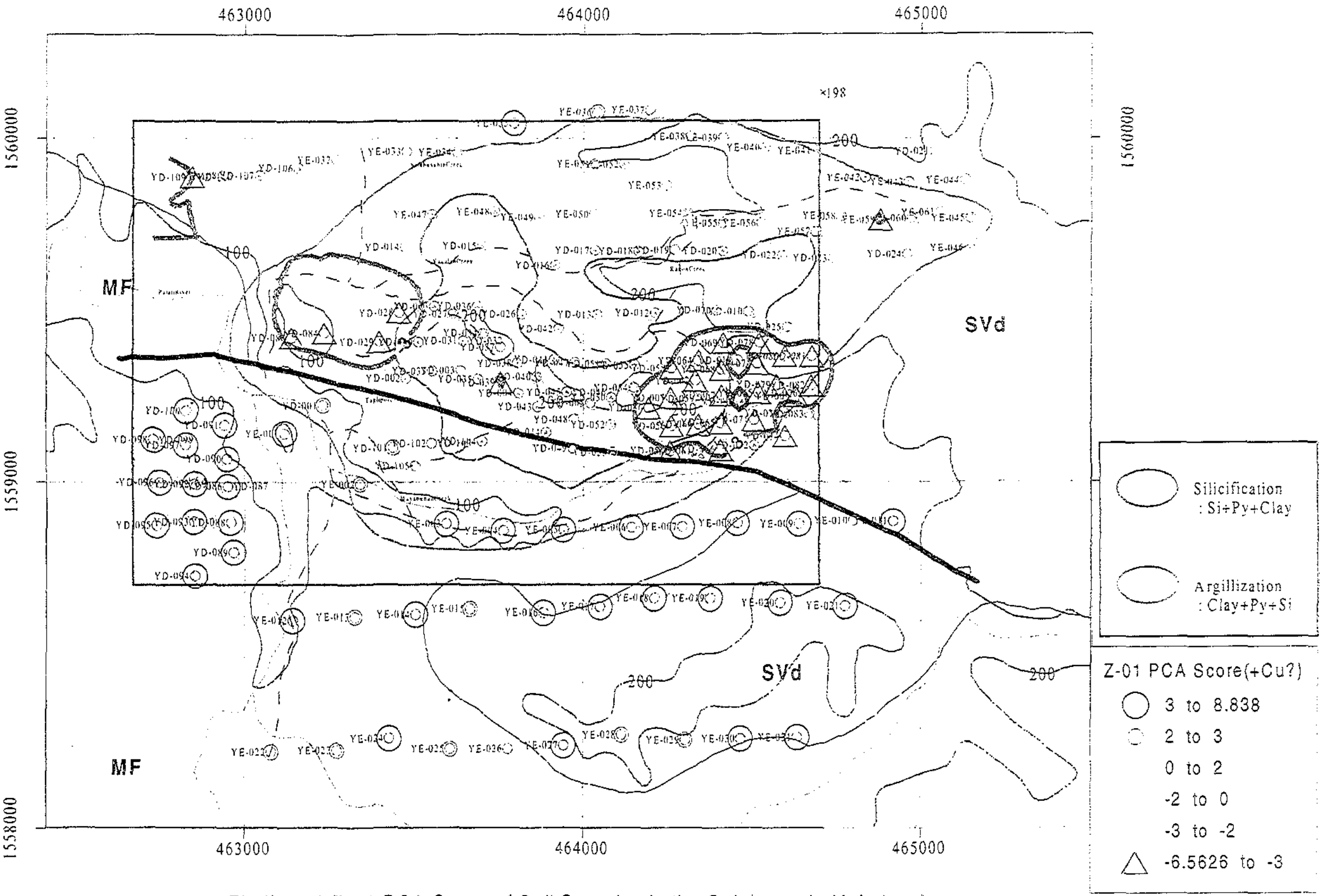


Fig.II-4-13 Z-01 PCA Score of Soil Samples in the Salubosogin-Yakalan Area.

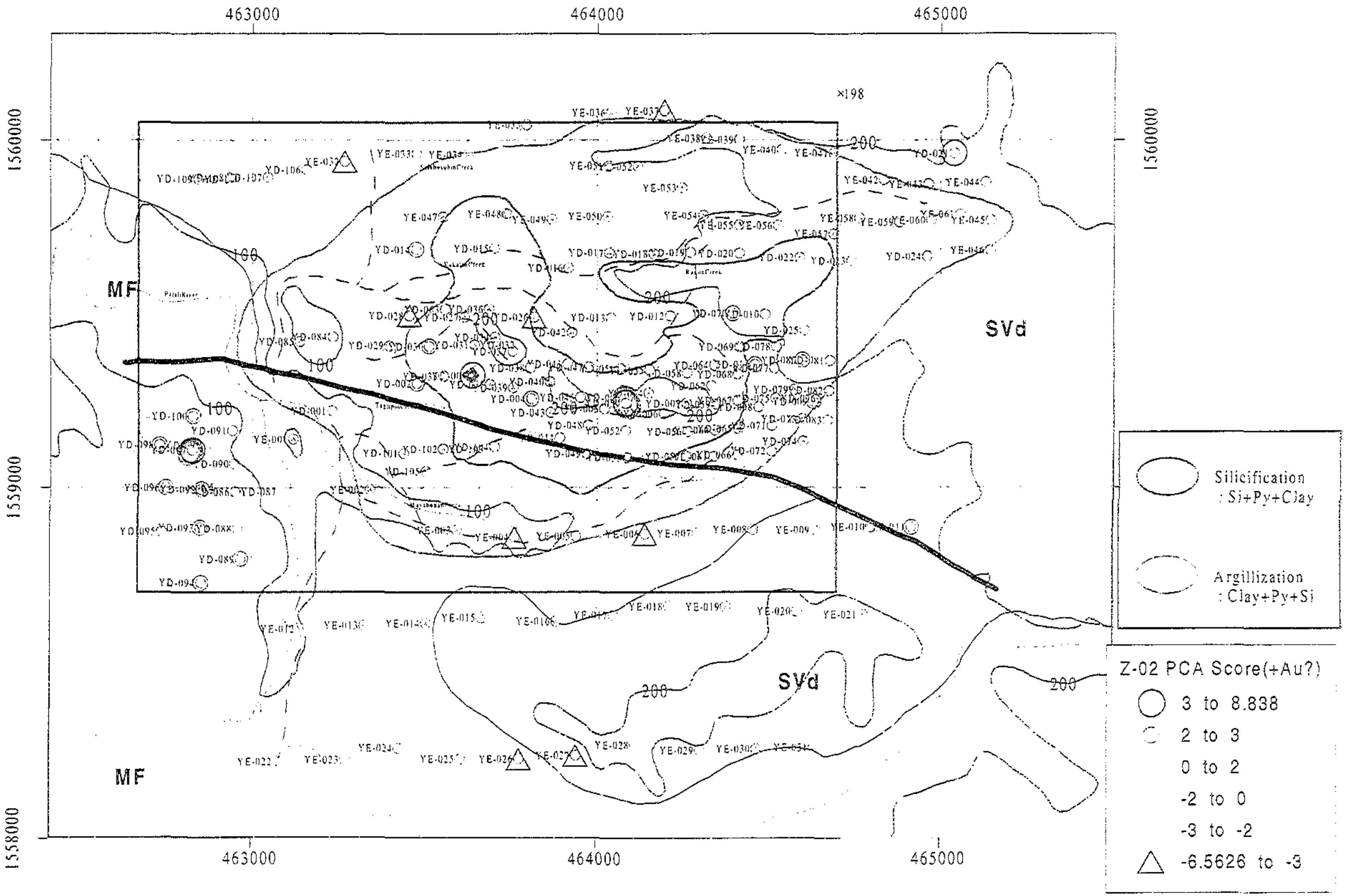


Fig.II-4-14 Z-02·PCA Score of Soil Samples in the Salubosogin-Yakalan Area.

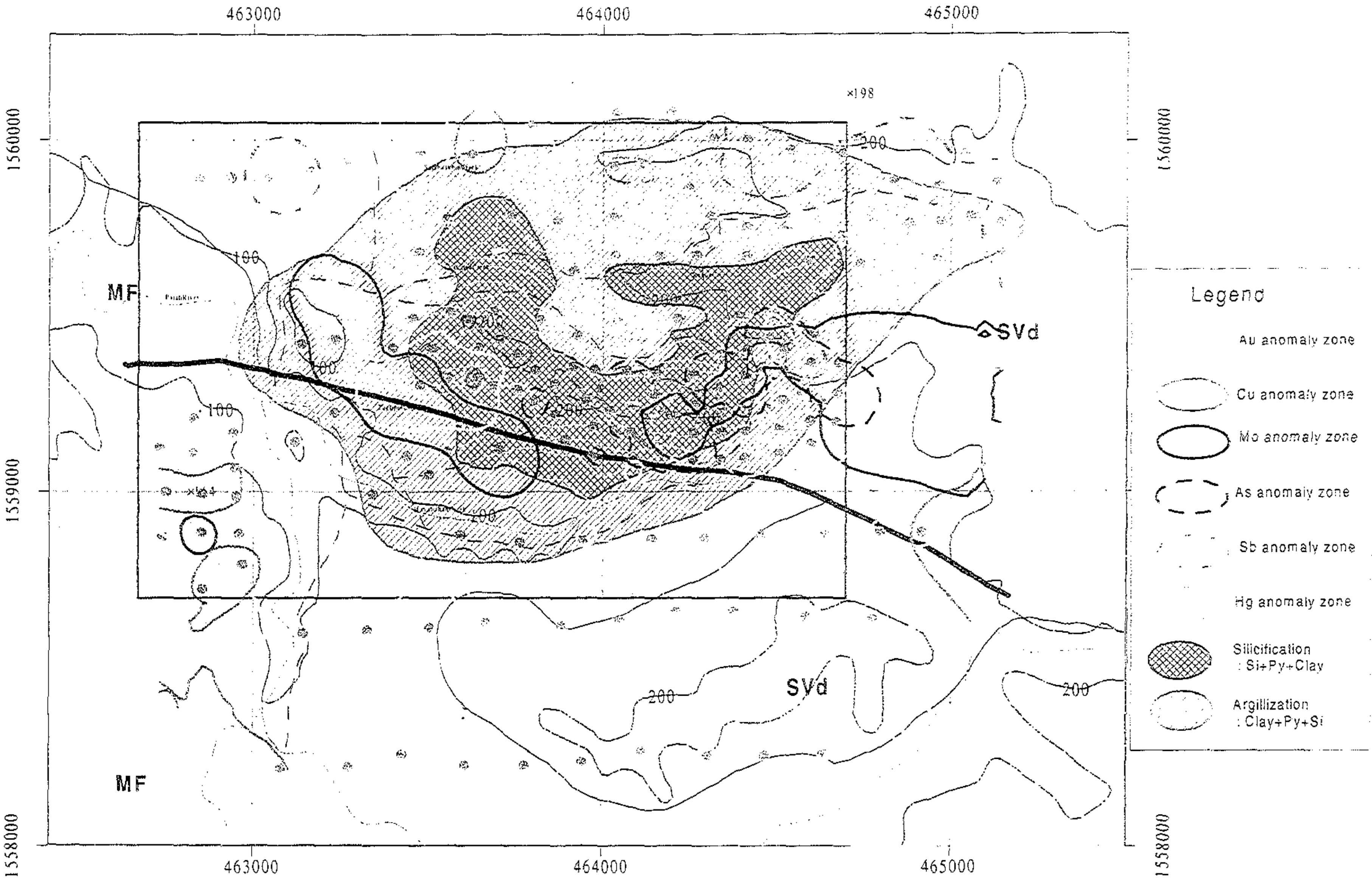


Fig.II-4-15 Geochemical Anomaly of Soil Samples in the Salubosogin-Yakalan Area.

5.771ppm.
(Sb) Anomalous samples concentrate in a little bit east of central area and scatters in the north area.

Principal components values were calculated by using the correlative determinant from logarithm value of soil analysis. The results are shown in TableII-4-4.

Eigenvalues was above 2 up to third principal components. The accumulated contribution ratio was 60% up to third principal components. The score distribution for first and second principal components are shown in Fig.II-4-13 to Fig.II-4-14.

(Z-01) About 40% of assay results can be explained by first principal components. For the elements related to first principal components, Sc, Mn, Co, Ni, Zn, Cr, Mg, Ti, Al, Fe, V, Cu, and Sn show positive scores and K, Hg, As, and Sb show negative scores. The behavior of the elements indicates epithermal gold deposit. It seems that the area with negative scores of first principal components concentrates in silicification zone along faults in the central area. The eyeball of high anomalous zone is devided into two, east and central in the area.

(Z-02) About 10% of assay results can be explained by second principal components. For the elements related to second principal components, Hg, As, P, Mo, and Ag show positive scores. The behavior of the elements indicates epitermal gold deposit. The correlation is not found but Mg and Mn show negative scores. It seems that the area with positive scores of second principal components scatters in silicification zone along faults in the central area. It also distributs in basalt flow in southwest of the area. The behavior of elements might not clearly indicate epitermal gold deposit.

The geochemical anomaly zone of each elements are superimposed in Fig.II-4-15. It seems that the anomaly distribution of epithermal gold deposit concentrates in the silicification zones both side of the fault in center of the area. Especially, the eyeball of anomaly is devided into two in the east and the central area, and the correlation between Au, and As, Hg, Mo and Sb is shown.

4-2-2 Magasawan-Bato Area

(1) Geology

In the area, the old unit, Late Miocene, Sta.Elena Formation located at the north of the area. In center and south area pyroclastics units of Susungdalaga Volcanics overlay uncomformably. The geological map is shown in FigII-4-16 and the geological profile is shown in Fig.II-4-17.

Sta, Elena Formation consists of altenated conglomeratic, arenaceous and silty sediments with some lenses of limestone. The polymictic conglomerate consists of basaltic and cherty clasts set in arenaceous to fine clastic groundmass. The sandstone is chloritized where mafic minerals abound. Some sparse pyrite can be detected, although no evident or significant hydrothermal alteration is present. One meter thick limestone overlies a mudstone member difining the bedding orientation of Sta. Elena Formation with west-north-west strike and 40 degrees dip to southwest.

Pliocene, Susungdalaga Volcanics consists of andesite-dacite agglomerates, lapilli tuff, volcaniclatic flow breccia, and laharic brecia. The agglomerates are poorly sorted and alternate with fine volcaniclatic units. The clasts range from centimeter-sized lithic fragment to 30 to 50cm boulders, set in moderately indurated tuffaceous matrix. The ratio of clast to matrix varies (50 to 80%) and clast is dominant. The lapilli tuff is sometimes friable but may exibit welding with weak flow orientation. Andesite to dacite fragments, as well as coarse crystals of plagioclase (1 to 6mm),

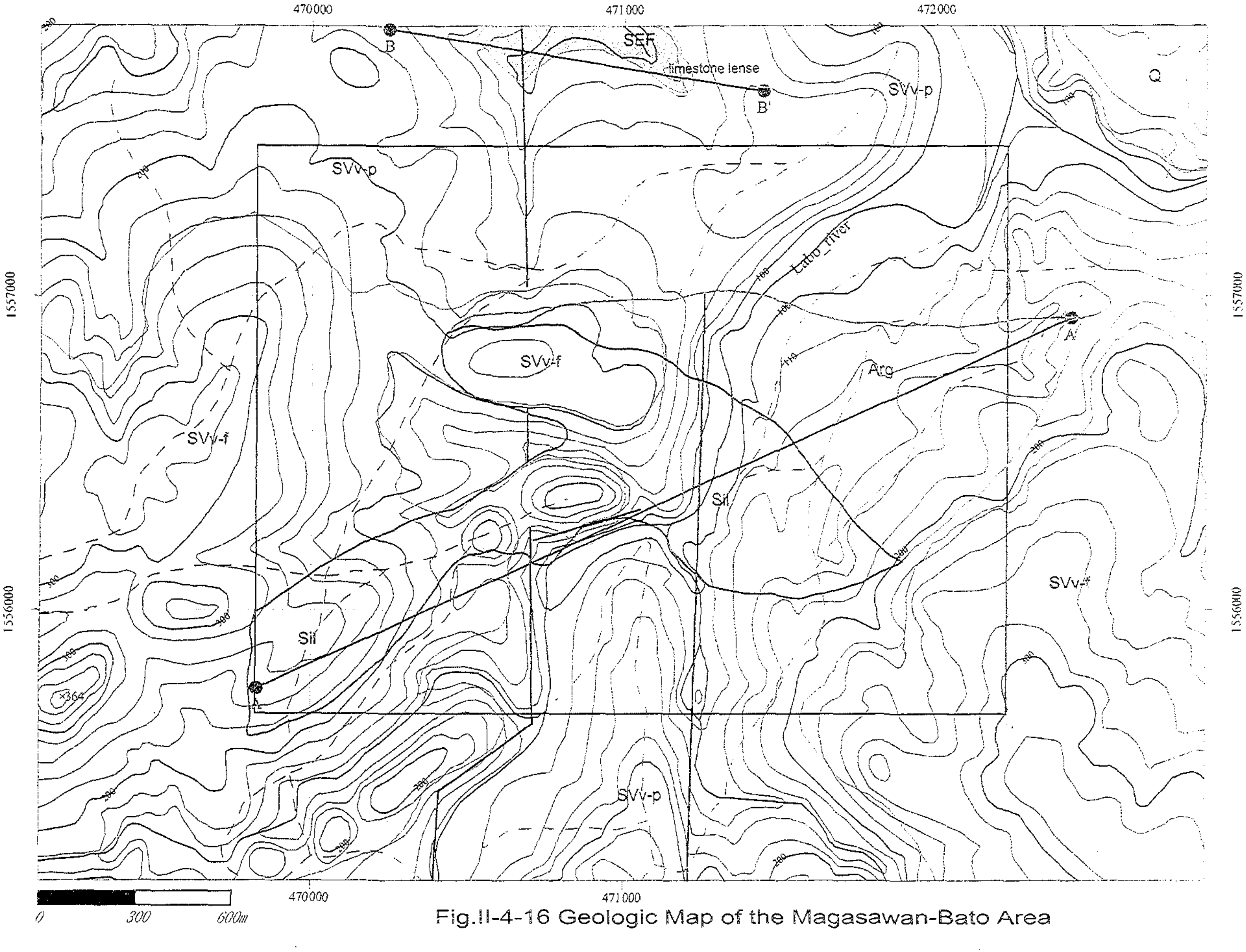
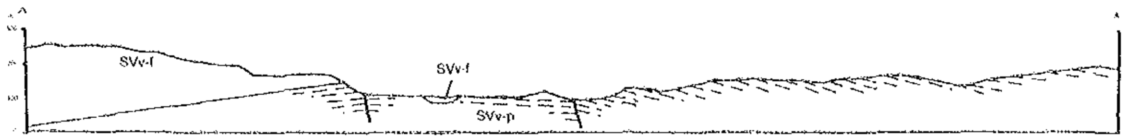
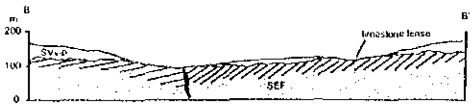


Fig.II-4-16 Geologic Map of the Magasawan-Bato Area



Interpretative profile along line A-A'



Interpretative profile along line B-B'

Legend

	Q	sand and gravel
Susungdalaga Volcanics	SVv-f	Dacitic lava
	SVv-p	Dacitic tuff and pyroclastics
	SVd	Dacitic plug dome
Macogon F.	MF	Andestic pycroclastics and tuffaceous black shale with minor basaltic flow
Sta. Elena F.	SEF	Conglomerate, sandstone, shale and minor limestone
Universal F.	UF	Limestone, marl and calcareous shale

Arg — Argillization

Sil — SilicificationSil:

Prop — Prophylization

Chl — Chl:Chloritization

Geologic boundary

Fault

A — A' Profile

Fig. II-4-17 Geologic profile of the Magasawan-Bato Area amphibole, and biotite are present in various proportions. Clasts of the laharic breccia are sub-angular to sub-round, poorly sorted, but weakly define some gently dipping flow orientation. Boulders along some ridges shows 0.5 to 1cm thick laminations. They resemble caldera lake deposit. In the north, the bedding is slightly disturbed which generally trend northwest with 5 to18 degrees dip to south.

The topographic highs are defined by massive to thinly laminated flows of andesite-dacite lava. It is dominantly plagiophyric with large zoned plagioclases attaining up to 7mm diameter. Amphibole and biotite are the characteristic ferromagnesians with biotite sometimes being more dominant mafic minerals. The groundmass is light to dark grey when fresh, and brownish grey when slightly weathered. The sample (RMF-9) contains clinopyroxine. The lava is often massive, and they form the elongate ridges and domes with steep slopes in the center and southwest of the area. Laminar flow with northsouth trending flow dipping 20 degrees, was observed in the outcrops along Libabayong Creek. Angular boulders of mafic (basaltic/andesitic?) rocks, 40 to 80 cm size, along the slopes of ridges in the east-central portion. They are fresh and fine grained, but slao porphyritic under a hand lens. Mafic minerals are olivine and pyroxene, and easily altered, rimmed or replaced by orange to brown Fe-oxide stains. No outcrop of the rock was found.

The northeast of the area is underlain by Pleistocene to Recent unindurated and poorly bedded conglomenates, probably coarse fluviatile sediments or reworked pyroclastic materials. Loose fluviatile recent sediments occupy the floodplains of Labo River. Boulders along streams and slopes consist of dacitic lava and pyroclastics, massively silicified boulders, basaltic/andesitic volcanics and pumice cobbles.

(2) *Geological Structure*

Northeast and east-north-east trending faults, and northsouth trending fault are dominant in the area. And older stractures with north-west trend, with 60 to 80 degrees dip to northeast and southwest, were observed. The structural line is defined the topography of the area. These are not dominant stractures and are mostly present as open joints with a little indication of movement. The northwest structural line is cut by major northeast to east-north-east faults. Some evidence of left-lateral movement is indicated by 5 cm displacement. The northeast trending fault with steep slope was observed along the direction of LaboRiver, ridges, and domes in the east of the area.

Northsouth trending faults were observed as the youngest set of major structures, displacing north-easterlies sinistrally by 500m to the left. The displacement developed the rectangular pattern currently exhibited by Labo River. The northerly faults have 70 to 80 degrees dip and often vertical.

(3) Alteration and Mineralization

In the center of the area, an intense silicification zone is present. It follows the trace of east-north-east trending fault controls the flow of Labo River. The alteration extends on the adjacent ridges as evidenced by abundant huge silicified rock boulders along the ridge slopes. Silicification affects the fine- grained member of the pyroclastic unit of Susungdalaga Volcanics. The medium to coarse grained pyroclastics are affected by both silicification and argillization. In the center of the area, fine tuff and medium grained lapilli tuff are present. The fine tuff is massive and hard, affected by chalcedonic quartz replacement and exhibiting yellow to orange reddish ochre coloration. Fine pyrite is sparsely disseminated. The medium grained pyroclastics are soft and contains a relatively rich amount of clay. The freshly chipped surfaces are whitish to beff or

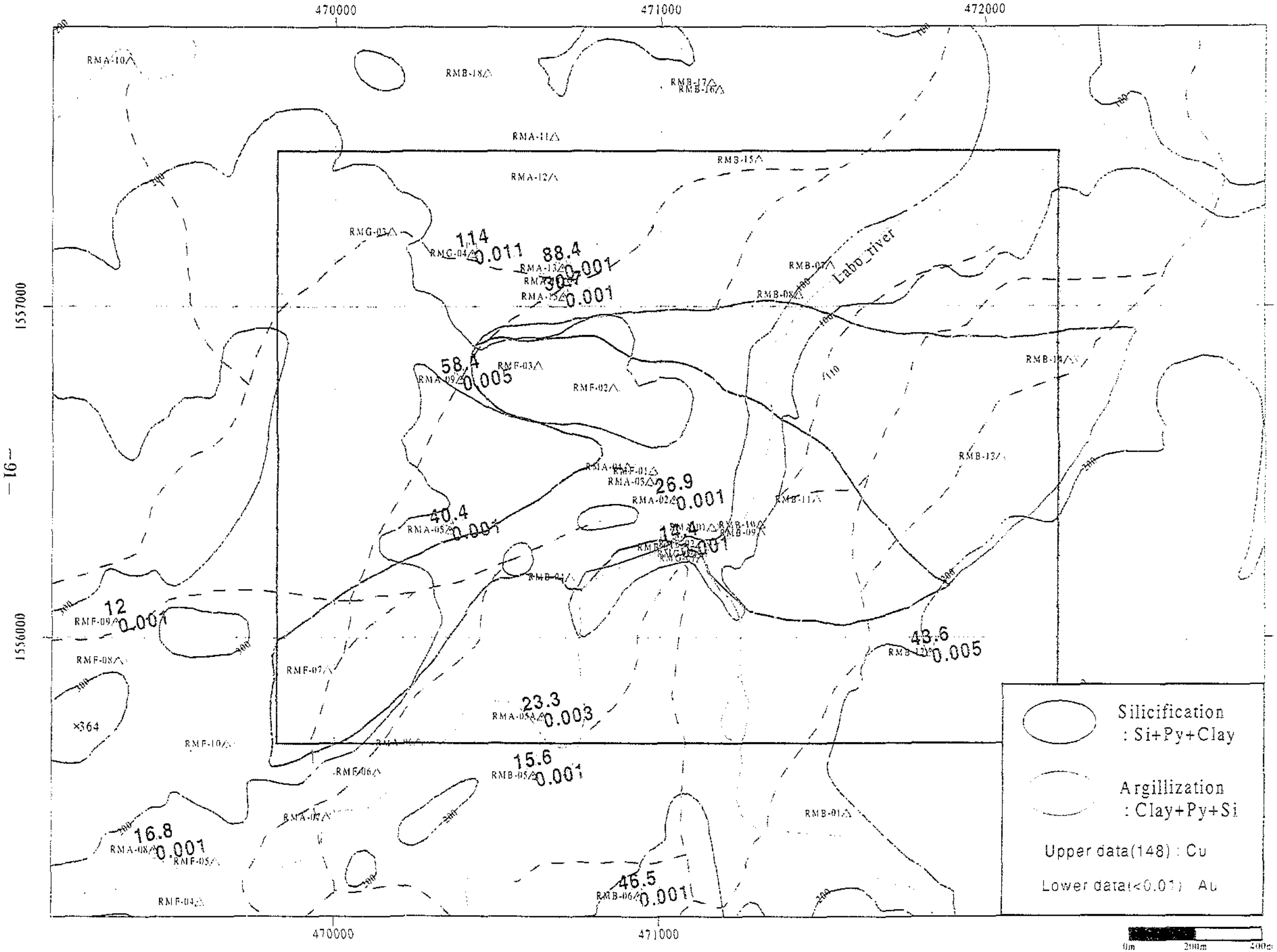


Fig.II-4-18 Whole Rock Analysis and Alteration Zones of the Magasawan-Bato Area.

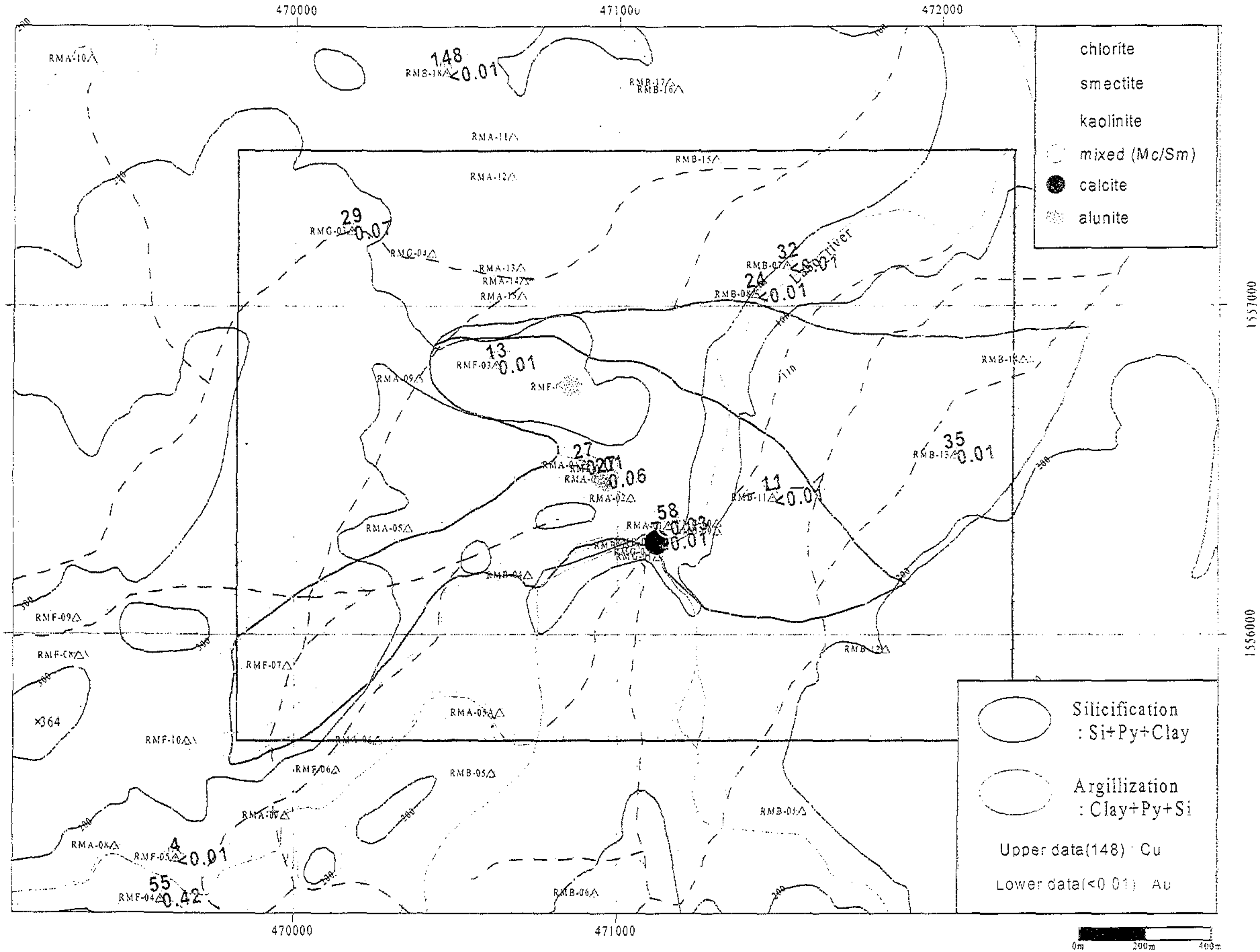


Fig.II-4-19 Ore Assay and XRD Result of the Magasawan-Bato Area.

light grey and preserve the original texture. Pyrite dissemination replacing mafic minerals is mostly abundant.

The assay results of rock samples and distribution of alteration zones are shown in Fig.II-4-18. The assay results of ore samples and XRD are shown in Fig.II-4-19.

The mineralized outcrops are influenced by north-south faults which develop clayey gouge zones as much as 20 cm thick. The faults occured later than the main alteration phase, although the gouge zones contain pyrite dissemination. As such, they show clay-pyrite veins.

Adjacent north of the silicified zone is a poorly defined argillized zone, probably reflecting a change in lithology. A few outcrops showing strong argillization are observed along the east slope of silicified zone of the northeast of Labo River. It is soft or friable, and a few fine pyrite disseminations are observed. As altered minerals, alunite (RMA-3, RMF-02), kaolinite (RMA-01, RMB-14), and smectite (RMA-14) were observed. The sample (RMA-1) nearby which located above mentioned samples shows Au; 0.03ppm, Cu; 58ppm, Ag;<0.2ppm, Pb;16ppm, and Zn;830ppm. In the silicification zone extending to upstream of Labo River, the sample (RMF-4) shows Au; 0.42ppm, Cu;55ppm, Ag;3.4ppm, Pb;690ppm, and Zn;32ppm.

The control of alteration and mineralization is east-north-east trending fault. Although the present erosion level is shallow and limited exposures of the altered rocks, hydrothermal fluids might come along the northeast trending fault and permiable beddings and lithologic horizons of the pyroclastics. Lava member is weakly altered and shows up along northsouth trending fault. The alteration in the area might be reflected by the shallow portion of hydrothermal system. The silicified rocks might be the massive silica capping that was developed during silica flooding at the middle to late stage of hydrothermal activity.

(4) Geochemical Survey on Soil

The correlative coefficients among main elements for geochemical survey are shown in TableII-4-3. For stream sediments in Phase-II, the indicative elements of Au-Cu are Au, Ag, As, Cu, Hg, Mo, Pb, S, and Sb. Bi shows high correlation with Cu. Twenty eight elements which are included above mentioned indicative elements were analysed. The indicative elements of Au are Ag, Hg, Pb, and Sb. Ag, Mo, and Sr show high correlation with Cu. Any correlation was not found between Au and Cu. The histogram and accumurated histogram distribution on probability are shown in Fig.II-4-20. The classification of histogram is 1/2 of standard deviation(σ). The threshold value of each element is shown on Fig.II-4-20. In consideration of the detective elements in Phase-II, the distribution of Au, Ag, As, Cu, Hg, Mo, and Sb are shown (Fig.II-4-21 to II-4-29).

The distribution of anomaly of each element is mentioned below.

(Au) Anomalous samples seem to be concentrated in silicfication zone along northsouth trending faults and the north area, and also along northeast trending fault in southwest area. The maximum value is 0.283ppm.

(Ag) Anomalous samples coincide with the distribution of Au and cocentrates in center and southwest of the area. The maximum value is 2.771ppm.

(As) Anomalous samples concentrate along northeast trending fault in southwest of the area. The maximum value is 872.1ppm.

(Bi) Anomalous samples distribut along north-south trending fault in silicification zone and the north of central area. The maximum value is 1.631ppm.

(Cu) Anomalous samples distribut along northsouth trending fault in silicification zone and the

Table II-4-3 Basic Statistics and Correlation Coefficient of Soil Samples in the Magasawan-Bato Area

Original Data Information

Number of Component 28
Number of Sample 208

Result of Statistics (Logarithmic)

Elements	Au	Ag	Al	As	Ba	Bi	Ca	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sn	Sr	Ti	V	Zn
max_val	-0.5482	0.4425	1.0473	2.9405	3.4082	0.2122	-0.4559	1.9063	2.7076	1.9315	0.9605	0.2455	-0.9566	-0.4318	4.0000	0.8376	-1.5229	2.4533	2.9668	2.9795	-1.0969	0.8149	1.7210	1.8488	2.2201	-0.4202	2.5224	1.9395
min_val	-3.3010	-2.3010	0.1271	-1.3010	-1.0000	-2.3010	-2.3010	-1.3010	0.8451	-1.0000	0.1987	-2.0000	-2.3010	-2.0000	1.4771	-1.6021	-2.3010	-1.0000	1.7782	-1.0000	-2.3010	-1.6021	-1.3010	-0.6990	-1.0000	-2.0000	1.6902	0.8451
average	-2.7599	-1.5419	0.6474	0.4573	2.0209	-1.0556	-1.5480	0.9672	1.5764	0.8831	0.6132	-1.0198	-1.8120	-1.0021	2.4736	-0.2198	-2.1569	1.1686	2.3958	1.2306	-1.5406	-1.1417	0.9264	-0.2436	0.8609	-0.9941	2.1206	1.4512
std_dev	0.5514	0.5082	0.1666	0.8098	0.3875	0.4210	0.4043	0.3805	0.3758	0.9288	0.1441	0.3386	0.3060	0.3534	0.4165	0.3536	0.1590	0.5320	0.2142	0.4668	0.1944	0.5544	0.6828	0.2258	0.7902	0.2856	0.1726	0.2060

Cov_mat	Au	Ag	Al	As	Ba	Bi	Ca	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sn	Sr	Ti	V	Zn
Au	0.3040	0.1331	-0.0225	0.1694	-0.0478	0.0723	-0.0511	-0.0743	0.0112	0.0355	0.0066	0.1011	-0.0178	-0.0648	-0.0706	0.0591	-0.0219	-0.0397	-0.0014	0.1948	-0.0020	0.1953	-0.0024	0.0181	0.0662	-0.0426	-0.0126	0.0036
Ag	0.1331	0.2582	-0.0016	0.1417	0.0009	-0.0015	0.0218	-0.0314	-0.0705	0.0769	-0.0131	0.1073	0.0097	-0.0128	-0.0011	0.1093	0.0104	-0.0727	0.0266	0.1177	0.0222	0.0989	0.0036	-0.0043	0.0749	-0.0149	-0.0199	0.0187
Al	-0.0225	-0.0016	0.0277	-0.0291	0.0136	0.0049	-0.0033	0.0247	-0.0126	-0.0069	0.0062	0.0044	-0.0002	0.0104	0.0221	0.0098	0.0086	0.0102	0.0132	-0.0172	0.0162	-0.0205	-0.0123	0.0111	-0.0108	0.0358	0.0122	0.0094
As	0.1694	0.1417	-0.0291	0.6557	0.0014	0.0071	-0.0470	-0.0527	-0.0034	0.0555	-0.0024	0.0856	-0.0309	-0.0707	-0.0716	0.0989	-0.0200	-0.0276	0.0123	0.1305	0.0100	0.1691	0.0079	-0.0157	0.0668	-0.0645	-0.0189	-0.0004
Ba	-0.0478	0.0009	0.0136	0.0014	0.1502	-0.0285	0.0608	0.0578	-0.0272	0.0323	-0.0020	-0.0246	0.0494	0.0409	0.0745	-0.0117	0.0312	0.0053	0.0301	-0.0241	-0.0177	-0.0106	-0.0185	0.0004	-0.0134	0.0240	0.0065	0.0355
Bi	0.0723	-0.0015	0.0049	0.0071	-0.0285	0.1772	-0.0439	-0.0301	0.0226	-0.0491	0.0246	0.0333	-0.0216	-0.0488	-0.0513	0.0201	-0.0087	-0.0033	-0.0115	0.0619	-0.0097	0.0156	-0.0217	0.0314	-0.0395	0.0111	0.0145	-0.0178
Ca	-0.0511	0.0218	-0.0033	-0.0470	0.0608	-0.0439	0.1634	0.0522	-0.0262	0.0206	-0.0282	-0.0266	0.0785	0.0962	0.0861	-0.0324	0.0320	-0.0109	0.0290	-0.0519	-0.0182	-0.0465	0.0288	-0.0295	0.0034	-0.0229	-0.0255	0.0301
Co	-0.0743	-0.0314	0.0247	-0.0527	0.0578	-0.0301	0.0522	0.1448	0.0147	-0.0210	0.0020	-0.0639	0.0434	0.0734	0.1195	-0.0351	0.0173	0.0891	0.0252	-0.0743	0.0033	-0.0519	0.0334	-0.0253	0.0080	0.0396	0.0103	0.0446
Cr	0.0112	-0.0705	-0.0126	-0.0034	-0.0272	0.0226	-0.0262	0.0147	0.1412	-0.0290	0.0273	-0.0250	-0.0284	-0.0103	-0.0162	-0.0479	-0.0236	0.0926	-0.0075	-0.0190	-0.0087	-0.0096	0.0790	0.0114	-0.0094	0.0058	0.0264	-0.0083
Cu	0.0355	0.0769	-0.0069	0.0555	0.0323	-0.0491	0.0206	-0.0210	-0.0290	0.8627	-0.0084	0.0232	-0.0294	-0.0428	-0.0105	0.0432	0.0014	0.0522	-0.0049	0.0433	-0.0180	0.0343	0.0675	-0.0224	0.1581	-0.0119	-0.0022	-0.0063
Fe	0.0066	-0.0131	0.0062	-0.0024	-0.0020	0.0246	-0.0282	0.0020	0.0273	-0.0084	0.0208	0.0098	-0.0190	-0.0245	-0.0089	0.0074	-0.0047	0.0170	-0.0030	0.0035	0.0026	-0.0081	-0.0003	0.0209	-0.0025	0.0238	0.0224	-0.0024
Hg	0.1011	0.1073	0.0044	0.0856	-0.0246	0.0333	-0.0266	-0.0639	-0.0250	0.0232	0.0098	0.1146	-0.0258	-0.0488	-0.0466	0.0848	-0.0046	-0.0496	0.0071	0.0870	0.0241	0.0612	-0.0193	0.0282	0.0095	-0.0019	0.0034	-0.0096
K	-0.0178	0.0097	-0.0002	-0.0309	0.0494	-0.0216	0.0785	0.0434	-0.0284	-0.0294	-0.0190	-0.0258	0.0949	0.0702	0.0668	-0.0266	0.0233	-0.0042	0.0157	-0.0225	-0.0136	-0.0042	0.0088	-0.0183	-0.0202	-0.0121	-0.0182	0.0294
Mg	-0.0648	-0.0128	0.0104	-0.0707	0.0409	-0.0488	0.0962	0.0734	-0.0103	-0.0428	-0.0245	-0.0488	0.0702	0.1249	0.0888	-0.0583	0.0223	0.0201	0.0232	-0.0727	-0.0049	-0.0452	0.0257	-0.0308	-0.0127	-0.0090	-0.0218	0.0352
Mn	-0.0706	-0.0011	0.0221	-0.0716	0.0745	-0.0513	0.0861	0.1195	-0.0162	-0.0105	-0.0089	-0.0466	0.0668	0.0888	0.1735	-0.0331	0.0310	0.0374	0.0435	-0.0723	0.0056	-0.0426	-0.0035	-0.0082	0.0044	0.0352	-0.0011	0.0587
Mo	0.0591	0.1093	0.0098	0.0989	-0.0117	0.0201	-0.0324	-0.0351	-0.0479	0.0432	0.0074	0.0848	-0.0266	-0.0583	-0.0331	0.1250	-0.0007	-0.0410	0.0072	0.0781	0.0266	0.0643	0.0002	0.0056	0.0285	0.0069	0.0031	-0.0118
Na	-0.0219	0.0104	0.0086	-0.0200	0.0312	-0.0087	0.0320	0.0173	-0.0236	0.0014	-0.0047	-0.0046	0.0233	0.0223	0.0310	-0.0007	0.0253	-0.0101	0.0141	-0.0175	-0.0009	-0.0218	-0.0201	0.0007	-0.0020	0.0108	-0.0009	0.0122
Ni	-0.0397	-0.0727	0.0102	-0.0276	0.0053	-0.0033	-0.0109	0.0891	0.0926	0.0522	0.0170	-0.0496	-0.0042	0.0201	0.0374	-0.0410	-0.0101	0.2830	0.0073	-0.0539	-0.0020	-0.0314	0.0866	-0.0218	0.0526	0.0264	0.0194	0.0169
P	-0.0014	0.0266	0.0132	0.0123	0.0301	-0.0115	0.0290	0.0252	-0.0075	-0.0049	-0.0030	0.0071	0.0157	0.0232	0.0435	0.0072	0.0141	0.0073	0.0459	-0.0043	0.0155	-0.0005	-0.0078	-0.0010	-0.0042	0.0119	-0.0010	0.0209
Pb	0.1948	0.1177	-0.0172	0.1305	-0.0241	0.0619	-0.0519	-0.0743	-0.0190	0.0433	0.0035	0.0870	-0.0225	-0.0727	-0.0723	0.0781	-0.0175	-0.0539	-0.0043	0.2179	0.0013	0.1560	-0.0197	0.0133	0.0419	-0.0345	-0.0125	-0.0053
S	-0.0020	0.0222	0.0162	0.0100	-0.0177	-0.0097	-0.0182	0.0033	-0.0087	-0.0180	0.0026	0.0241	-0.0136	-0.0049	0.0056	0.0266	-0.0009	-0.0020	0.0155	0.0013	0.0378	0.0070	-0.0080	0.0038	-0.0248	0.0183	0.0050	0.0017
Sb	0.1953	0.0989	-0.0205	0.1691	-0.0106	0.0156	-0.0465	-0.0519	-0.0096	0.0343	-0.0081	0.0612	-0.0042	-0.0452	-0.0426	0.0643	-0.0218	-0.0314	-0.0005	0.1560	0.0070	0.3074	-0.0095	-0.0121	0.0392	-0.0463	-0.0225	0.0093
Sc	-0.0024	0.0036	-0.0123	0.0079	-0.0185	-0.0217	0.0288	0.0334	0.0790	0.0675	-0.0003	-0.0193	0.0088	0.0257	-0.0035	0.0002	-0.0201	0.0866	-0.0078	-0.0197	-0.0080	-0.0095	0.4663	-0.0427	0.0039	-0.0140	0.0011	-0.0032
Sn	0.0181	-0.0043	0.0111	-0.0157	0.0004	0.0314	-0.0295	-0.0253	0.0114	-0.0224	0.0209	0.0282	-0.0183	-0.0308	-0.0082	0.0056	0.0007	-0.0218	-0.0010	0.0133	0.0038	-0.0121	-0.0427	0.0510	-0.0133	0.0331	0.0241	-0.0016
Sr	0.0662	0.0749	-0.0108	0.0668	-0.0134	-0.0395	0.0034	0.0080	-0.0094	0.1581	-0.0025	0.0095	-0.0202	-0.0127	0.0044	0.0285	-0.0020	0.0526	-0.0042	0.0419	-0.0248	0.0392	0.0039	-0.0133	0.6243	-0.0257	-0.0045	0.0027
Ti	-0.0426	-0.0149	0.0358	-0.0645	0.0240	0.0111	-0.0229	0.0396	0.0058	-0.0119	0.0238	-0.0019	-0.0121	-0.0090	0.0352	0.0069	0.0108	0.0264	0.0119	-0.0345	0.0183	-0.0463	-0.0140	0.0331	-0.0257	0.0816	0.0377	0.0117
V	-0.0126	-0.0199	0.0122	-0.0189	0.0065	0.0145	-0.0255	0.0103	0.0264	-0.0022	0.0224	0.0034	-0.0182	-0.0218	-0.0011	0.0031	-0.0009	0.0194	-0.0010	-0.0125	0.0050	-0.0225	0.0011	0.0241	-0.0045	0.0377	0.0298	-0.0009
Zn	0.0036	0.0187	0.0094	-0.0004	0.0355	-0.0178	0.0301	0.0446	-0.0083	-0.0063	-0.0024	-0.0096	0.0294	0.0352	0.0587	-0.0118	0.0122	0.0169	0.0209	-0.0053	0.0017	0.0093	-0.0032	-0.0016	0.0027	0.0117	-0.0009	0.0424

Cor_mat	Au	Ag	Al	As	Ba	Bi	Ca	Co	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sn	Sr	Ti	V	Zn
Au	1.0000	0.4750	-0.2448	0.3794	-0.2237	0.3117	-0.2293	-0.3544	0.0541	0.0694	0.0830	0.5410	-0.1051	-0.3324	-0.3075	0.3032	-0.2502	-0.1352	-0.0119	0.7568	-0.0189	0.6389	-0.0064	0.1457	0.1519	-0.2707	-0.1320	0.0315
Ag	0.4750	1.0000	-0.0185	0.3443	0.0043	-0.0068	0.1059	-0.1625	-0.3691	0.1629	-0.1789	0.6235	0.0621	-0.0713	-0.0053	0.6085	0.1283	-0.2688	0.2445	0.4961	0.2246	0.3511	0.0104	-0.0377	0.1865	-0.1028	-0.2267	0.1782
Al	-0.2448	-0.0185	1.0000	-0.2155	0.2105	0.0702	-0.0493	0.3900	-0.2013	-0.0445	0.2588	0.0786	-0.0036	0.1772	0.3180	0.1664	0.3240	0.1152	0.3711	-0.2213	0.4994	-0.2222	-0.1082	0.2942	-0.0819	0.7530	0.4234	0.2731
As	0.3794	0.3443	-0.2155	1.0000	0.0044	0.0208	-0.1437	-0.1709	-0.0112	0.0738	-0.0202	0.3119	-0.1238	-0.2469	-0.2122	0.3456	-0.1554	-0.0640	0.0711	0.3453	0.0634	0.3767	0.0143	-0.0856	0.1044	-0.2790	-0.1354	-0.0025
Ba	-0.2237	0.0043	0.2105	0.0044	1.0000	-0.1747	0.3884	0.3920	-0.1867	0.0898	-0.0362	-0.1877	0.4138	0.2989	0.4619	-0.0852	0.5061	0.0259	0.3629	-0.1334	-0.2354	-0.0493	-0.0701	0.0048	-0.0438	0.2169	0.0970	0.4442
Bi	0.3117	-0.0068	0.0702	0.0208	-0.1747	1.0000	-0.2580	-0.1881	0.1427	-0.1257	0.4047	0.2333	-0.1665	-0.3279	-0.2928	0.1349	-0.1294	-0.0148	-0.1271	0.3149	-0.1185	0.0666	-0.0756	0.3305	-0.1187	0.0925	0.1993	-0.2051
Ca	-0.2293	0.1059	-0.0493	-0.1437	0.3884	-0.2580	1.0000	0.3392	-0.1725	0.0548	-0.4846	-0.1943	0.6308	0.6736	0.5113	-0.2266	0.4972	-0.0505	0.3351	-0.2752	-0.2320	-0.2075	0.1044	-0.3231	0.0105	-0.1982	-0.3655	0.3614
Co	-0.3544	-0.1625	0.3900	-0.1709	0.3920	-0.1881	0.3392	1.0000	0.1028	-0.0595	0.0367	-0.4956	0.3700	0.5458	0.7541	-0.2611	0.2860	0.4400	0.3096	-0.4186	0.0445	-0.2460	0.1285	-0.2940	0.0266	0.3642	0.1575	0.5685
Cr	0.0541	-0.3691	-0.2013	-0.0112	-0.1867	0.1427	-0.1725	0.1028	1.0000	-0.0832	0.5033	-0.1963	-0.2452	-0.0773	-0.1032	-0.3605	-0.3946	0.4632	-0.0936	-0.1082	-0.1193	-0.0460	0.3080	0.1347	-0.0316	0.0538	0.4076	-0.1076
Cu	0.0694	0.1629	-0.0445	0.0738	0.0898	-0.1257	0.0548	-0.0595	-0.0832	1.0000	-0.0628	0.0738	-0.1026	-0.1303	-0.0270	0.1315	0.0093	0.1056	-0.0245	0.0998	-0.0998	0.0666	0.1064	-0.1066	0.2154	-0.0449	-0.0136	-0.0331
Fe	0.0830	-0.1789	0.2588	-0.0202	-0.0362	0.4047	-0.4846	0.0367	0.5033	-0.0628	1.0000	0.2008	-0.4283	-0.4817	-0.1485	0.1451	-0.2065	0.2220	-0.0982	0.0527	0.0927	-0.1008	-0.0033	0.6434	-0.0218	0.5787	0.8996	-0.0808
Hg	0.5410	0.6235	0.0786	0.3119	-0.1877	0.2333	-0.1943	-0.4956	-0.1963	0.0738	0.2008	1.0000	-0.2477	-0.4073	-0.3300	0.7084	-0.0862	-0.2752	0.0982	0.5502	0.3653	0.3260	-0.0832	0.3687	0.0356	-0.0197	0.0589	-0.1371
K	-0.1051	0.0621	-0.0036	-0.1238	0.4138	-0.1665	0.6308	0.3700	-0.2452	-0.1026	-0.4283	-0.2477	1.0000	0.6453	0.5204	-0.2440	0.4761	-0.0258	0.2378	-0.1563	-0.2273	-0.0247	0.0421	-0.2635	-0.0828	-0.1379	-0.3419	0.4640
Mg	-0.3324	-0.0713	0.1772	-0.2469	0.2989	-0.3279	0.6736	0.5458	-0.0773	-0.1303	-0.4817	-0.4073	0.6453	1.0000	0.6031	-0.4663	0.3972	0.1069	0.3059	-0.4409	-0.0714	-0.2305	0.1065	-0.3865	-0.0454	-0.0889	-0.3580	0.4841
Mn	-0.3075	-0.0053	0.3180	-0.2122	0.4619	-0.2928	0.5113	0.7541	-0.1032	-0.0270	-0.1485	-0.3300	0.5204	0.6031	1.0000	-0.2244	0.4685	0.1687	0.4880	-0.3719	0.0690	-0.1842	-0.0124	-0.0868	0.0133	0.2958	-0.0150	0.6845
Mo	0.3032	0.6085	0.1664	0.3456	-0.0852	0.1349	-0.2266	-0.2611	-0.3605	0.1315	0.1451	0.7084	-0.2440	-0.4663	-0.2244	1.0000	-0.0121	-0.2181	0.0947	0.4729	0.3868	0.3281	0.0008	0.0696	0.1022	0.0684	0.0514	-0.1626
Na	-0.2502	0.1283	0.3240	-0.1554	0.5061	-0.1294	0.4972	0.2860	-0.3946	0.0093	-0.2065	-0.0862	0.4761	0.3972	0.4685	-0.0121	1.0000	-0.1197	0.4128	-0.2352	-0.0277	-0.2475	-0.1854	0.0186	-0.0156	0.2378	-0.0329	0.3733
Ni	-0.1352	-0.2688	0.1152	-0.0640	0.0259	-0.0148	-0.0505	0.4400	0.4632	0.1056	0.2220	-0.2752	-0.0258	0.1069	0.1687	-0.2181	-0.1197	1.0000	0.0642	-0.2169	-0.0194	-0.1063	0.2383	-0.1816	0.1251	0.1736	0.2110	0.1537
P	-0.0119	0.2445	0.3711	0.0711	0.3629	-0.1271	0.3351	0.3096	-0.0936	-0.0245	-0.0982	0.0982	0.2378	0.3059	0.4880	0.0947	0.4128	0.0642	1.0000	-0.0431	0.3731	-0.0046	-0.0531	-0.0212	-0.0248	0.1945	-0.0277	0.4725
Pb	0.7568	0.4961	-0.2213	0.3453	-0.1334	0.3149	-0.2752	-0.4186	-0.1082	0.0998	0.0527	0.5502	-0.1563	-0.4409	-0.3719	0.4729	-0.2352	-0.2169	-0.0431	1.0000	0.0148	0.6028	-0.0618	0.1259	0.1136	-0.2586	-0.1551	-0.0550
S	-0.0189	0.2246	0.4994	0.0634	-0.2354	-0.1185	-0.2320	0.0445	-0.1193	-0.0998	0.0927	0.3653	-0.2273	-0.0714	0.0690	0.3868	-0.0277	-0.0194	0.3731	0.0148	1.0000	0.0648	-0.0599	0.0861	-0.1615	0.3291	0.1494	0.0419
Sb	0.6389	0.3511	-0.2222	0.3767	-0.0493	0.0666	-0.2075	-0.2460	-0.0460	0.0666	-0.1008	0.3260	-0.0247	-0.2305	-0.1842	0.3281	-0.2475	-0.1063	-0.0046	0.6028	0.0648	1.0000	-0.0252	-0.0968	0.0894	-0.2921	-0.2347	0.0816
Sc	-0.0064	0.0104	-0.1082	0.0143	-0.0701	-0.0756	0.1044	0.1285	0.3080	0.1064	-0.0033	-0.0832	0.0421	0.1065	-0.0124	0.0008	-0.1854	0.2383	-0.0531	-0.0618	-0.0599	-0.0252	1.0000	-0.2768	0.0072	-0.0718	0.0096	-0.0227
Sn	0.1457	-0.0377	0.2942	-0.0856	0.0048	0.3305	-0.3231	-0.2940	0.1347	-0.1066	0.6434	0.3687	-0.2635	-0.3865	-0.0868	0.0696	0.0186	-0.1816	-0.0212	0.1259	0.0861	-0.0968	-0.2768	1.0000	-0.0747	0.5139	0.6185	-0.0350
Sr	0.1519	0.1865	-0.0819	0.1044	-0.0438	-0.1187	0.0105	0.0266	-0.0316	0.2154	-0.0218	0.0356	-0.0828	-0.0454	0.0133	0.1022	-0.0156	0.1251	-0.0248	0.1136	-0.1615	0.0894	0.0072	-0.0747	1.0000	-0.1137	-0.0329	0.0167
Ti	-0.2707	-0.1028	0.7530	-0.2790	0.2169	0.0925	-0.1982	0.3642	0.0538	-0.0449	0.5787	-0.0197	-0.1379	-0.0889	0.2958	0.0684	0.2378	0.1736	0.1945	-0.2586	0.3291	-0.2921	-0.0718	0.5139	-0.1137	1.0000	0.7658	0.1994
V	-0.1320	-0.2267	0.4234	-0.1354	0.0970	0.1993	-0.3655	0.1575	0.4076	-0.0136	0.8996	0.0589	-0.3419	-0.3580	-0.0150	0.0514	-0.0329	0.2110	-0.0277	-0.1551	0.1494	-0.2347	0.0096	0.6185	-0.0329	0.7658	1.0000	-0.0248
Zn	0.0315	0.1782	0.2731	-0.0025	0.4442	-0.2051	0.3614	0.5685	-0.1076	-0.0331	-0.0808	-0.1371	0.4640	0.4841	0.6845	-0.1626	0.3733	0.1537	0.4725	-0.0550	0.0419	0.0816	-0.0227	-0.0350	0.0167	0.1994	-0.0248	1.0000

TableII-4-4 Principal Component Analysis of Soil Samples in the Magasawan-Bato Area

Result of PCA

No.	Eig_value	Eig_pct	Eig_sum
Z-01	6.2049	22.1602	22.1602
Z-02	4.3815	15.6483	37.8086
Z-03	3.5827	12.7955	50.6041
Z-04	2.0785	7.4234	58.0274
Z-05	1.6937	6.0490	64.0765
Z-06	1.4085	5.0303	69.1067
Z-07	1.0619	3.7924	72.8992
Z-08	0.9343	3.3368	76.2359
Z-09	0.8620	3.0784	79.3144
Z-10	0.7835	2.7981	82.1125

Fact_ld	Z-01	Z-02	Z-03	Z-04	Z-05	Z-06	Z-07	Z-08	Z-09	Z-10
Pb	**0.6534**	-0.3588	0.3073	0.2332	-0.2402	-0.0601	-0.0299	-0.0850	0.1566	-0.0935
Hg	**0.6309**	-0.1356	0.5729	-0.0579	0.0378	-0.0246	0.2500	-0.0623	-0.1811	-0.0193
Au	**0.6016**	-0.3404	0.2570	0.3931	-0.2875	-0.1643	-0.0224	-0.1790	-0.0198	-0.1353
Sb	0.4345	-0.4290	0.2177	0.3766	-0.0955	-0.1834	-0.2803	0.0861	0.2008	-0.2122
Ba	-0.5205	-0.0098	0.3367	0.0898	-0.3644	0.2936	-0.0369	0.4377	0.1246	0.0374
Zn	-0.5574	-0.0801	0.4571	0.3782	-0.1876	-0.1378	-0.1902	-0.0294	-0.0285	-0.1626
Na	-0.5627	-0.0781	0.4502	-0.2740	-0.2233	0.2081	0.1116	0.0156	-0.0132	0.1426
K	-0.6418	-0.3914	0.1254	0.0318	-0.3199	-0.1249	0.1615	-0.0441	0.0999	-0.0078
Ca	-0.6737	-0.4119	0.0753	-0.0165	-0.1473	0.0814	0.3432	-0.0417	-0.1966	0.0222
Co	-0.7413	0.2285	0.1359	0.3911	0.1164	-0.0468	-0.0943	-0.0528	0.2060	0.1448
Mn	-0.7870	0.0348	0.3354	0.1912	-0.0332	-0.0417	-0.0992	-0.0680	-0.0529	-0.0749
Mg	-0.8211	-0.2520	-0.0164	0.0414	0.0166	-0.2106	0.0926	-0.1687	-0.0820	-0.0324
V	0.1287	**0.8884**	0.1818	0.1339	-0.1064	0.1618	0.0610	0.1012	-0.0831	-0.0248
Fe	0.3484	**0.8132**	0.1344	0.2471	-0.2034	0.0521	0.0729	0.0498	-0.0682	0.0596
Ti	-0.1748	**0.7922**	0.4438	-0.0467	0.0390	0.0766	-0.0057	-0.0292	0.1167	-0.0808
Sn	0.3256	**0.5799**	0.3176	-0.1888	-0.4384	0.0147	0.0056	-0.0493	-0.2915	-0.1744
Ag	0.2678	-0.4780	0.6273	0.1064	0.0967	0.0924	0.1887	-0.1120	-0.1008	0.0215
P	-0.3796	-0.0529	0.5960	0.1585	0.1102	-0.1809	0.0151	0.1061	-0.2579	0.0479
Mo	**0.5171**	-0.1408	0.5945	-0.0474	0.2896	0.1580	0.1712	0.0667	0.1620	0.2030
Al	-0.2738	**0.5173**	0.5832	-0.1376	0.2232	-0.0580	-0.0202	-0.1578	0.2246	0.0089
Ni	-0.2266	0.3281	-0.2034	0.6162	0.2258	0.0418	-0.0442	-0.1068	0.1630	0.1354
Cr	0.0992	0.4460	-0.4371	0.5619	-0.0792	-0.1947	0.1425	0.0650	-0.3038	-0.0455
S	0.1155	0.1971	0.5031	-0.1131	0.6387	-0.3728	-0.0754	-0.0048	-0.0846	-0.0947
Bi	0.4074	0.2406	0.0488	0.0253	-0.4387	-0.2020	0.2682	-0.2519	0.3641	0.3112
Cu	0.0719	-0.1335	0.0502	0.1903	0.1660	0.7030	0.0756	0.0469	0.1610	-0.4208
Sr	0.0722	-0.1509	0.0238	0.2935	0.0745	0.5533	-0.2679	-0.5056	-0.2794	0.2797
Sc	-0.0570	-0.0290	-0.2251	0.4465	0.3001	0.0149	0.6536	0.0682	0.0494	-0.0932
As	0.3678	-0.3228	0.1903	0.3174	0.0600	0.0101	-0.1383	0.4906	-0.1355	0.3992

Eig_vec	Z-01	Z-02	Z-03	Z-04	Z-05	Z-06	Z-07	Z-08	Z-09	Z-10
Pb	0.2623	-0.1714	0.1623	0.1618	-0.1846	-0.0506	-0.0291	-0.0879	0.1687	-0.1057
Hg	0.2533	-0.0648	0.3027	-0.0402	0.0290	-0.0207	0.2426	-0.0645	-0.1951	-0.0219
Au	0.2415	-0.1626	0.1358	0.2726	-0.2209	-0.1385	-0.0218	-0.1852	-0.0214	-0.1528
Sb	0.1744	-0.2050	0.1150	0.2612	-0.0733	-0.1545	-0.2720	0.0891	0.2163	-0.2397
Ba	-0.2090	-0.0047	0.1779	0.0623	-0.2800	0.2474	-0.0358	0.4529	0.1342	0.0422
Zn	-0.2238	-0.0383	0.2415	0.2623	-0.1441	-0.1161	-0.1846	-0.0304	-0.0307	-0.1837
Na	-0.2259	-0.0373	0.2378	-0.1901	-0.1716	0.1753	0.1083	0.0162	-0.0143	0.1611
K	-0.2576	-0.1870	0.0663	0.0221	-0.2458	-0.1052	0.1567	-0.0456	0.1076	-0.0088
Ca	-0.2705	-0.1968	0.0398	-0.0115	-0.1132	0.0686	0.3330	-0.0431	-0.2117	0.0251
Co	-0.2976	0.1092	0.0718	0.2713	0.0894	-0.0394	-0.0915	-0.0547	0.2219	0.1636
Mn	-0.3159	0.0166	0.1772	0.1326	-0.0255	-0.0352	-0.0963	-0.0703	-0.0569	-0.0847
Mg	-0.3296	-0.1204	-0.0087	0.0287	0.0127	-0.1775	0.0898	-0.1746	-0.0883	-0.0366
V	0.0517	0.4244	0.0961	0.0929	-0.0818	0.1364	0.0592	0.1047	-0.0895	-0.0280
Fe	0.1399	0.3885	0.0710	0.1714	-0.1563	0.0439	0.0707	0.0516	-0.0735	0.0673
Ti	-0.0702	0.3785	0.2345	-0.0324	0.0300	0.0645	-0.0056	-0.0302	0.1257	-0.0913
Sn	0.1307	0.2770	0.1678	-0.1309	-0.3369	0.0124	0.0054	-0.0510	-0.3140	-0.1970
Ag	0.1075	-0.2283	0.3314	0.0738	0.0743	0.0778	0.1831	-0.1158	-0.1085	0.0243
P	-0.1524	-0.0253	0.3149	0.1100	0.0847	-0.1524	0.0147	0.1097	-0.2778	0.0541
Mo	0.2076	-0.0672	0.3141	-0.0329	0.2225	0.1332	0.1662	0.0690	0.1745	0.2293
Al	-0.1099	0.2471	0.3081	-0.0954	0.1715	-0.0489	-0.0196	-0.1633	0.2420	0.0100
Ni	-0.0910	0.1567	-0.1075	0.4274	0.1735	0.0352	-0.0429	-0.1105	0.1755	0.1529
Cr	0.0398	0.2131	-0.2309	0.3898	-0.0609	-0.1640	0.1382	0.0673	-0.3272	-0.0514
S	0.0464	0.0942	0.2658	-0.0785	0.4908	-0.3141	-0.0732	-0.0050	-0.0911	-0.1070
Bi	0.1635	0.1150	0.0258	0.0175	-0.3371	-0.1702	0.2603	-0.2606	0.3921	0.3516
Cu	0.0289	-0.0638	0.0265	0.1320	0.1276	0.5924	0.0733	0.0486	0.1734	-0.4754
Sr	0.0290	-0.0721	0.0126	0.2036	0.0573	0.4662	-0.2600	-0.5231	-0.3010	0.3160
Sc	-0.0229	-0.0139	-0.1189	0.3097	0.2306	0.0125	0.6342	0.0705	0.0533	-0.1053
As	0.1476	-0.1542	0.1005	0.2202	0.0461	0.0085	-0.1342	0.5076	-0.1459	0.4510

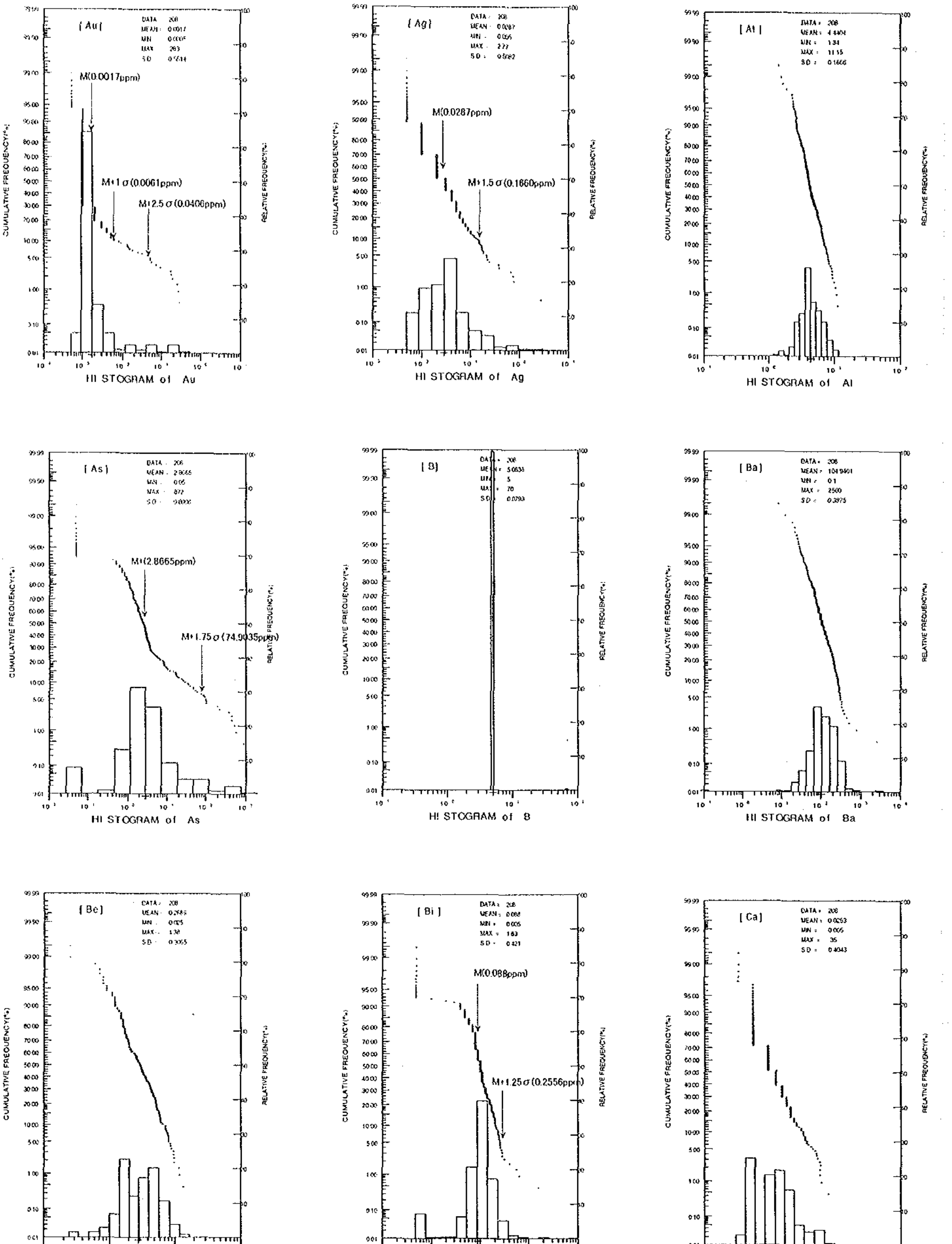


Fig. II-4-20. Probability Plot of Soil Samples in the Magasawan-Bato Area (1)

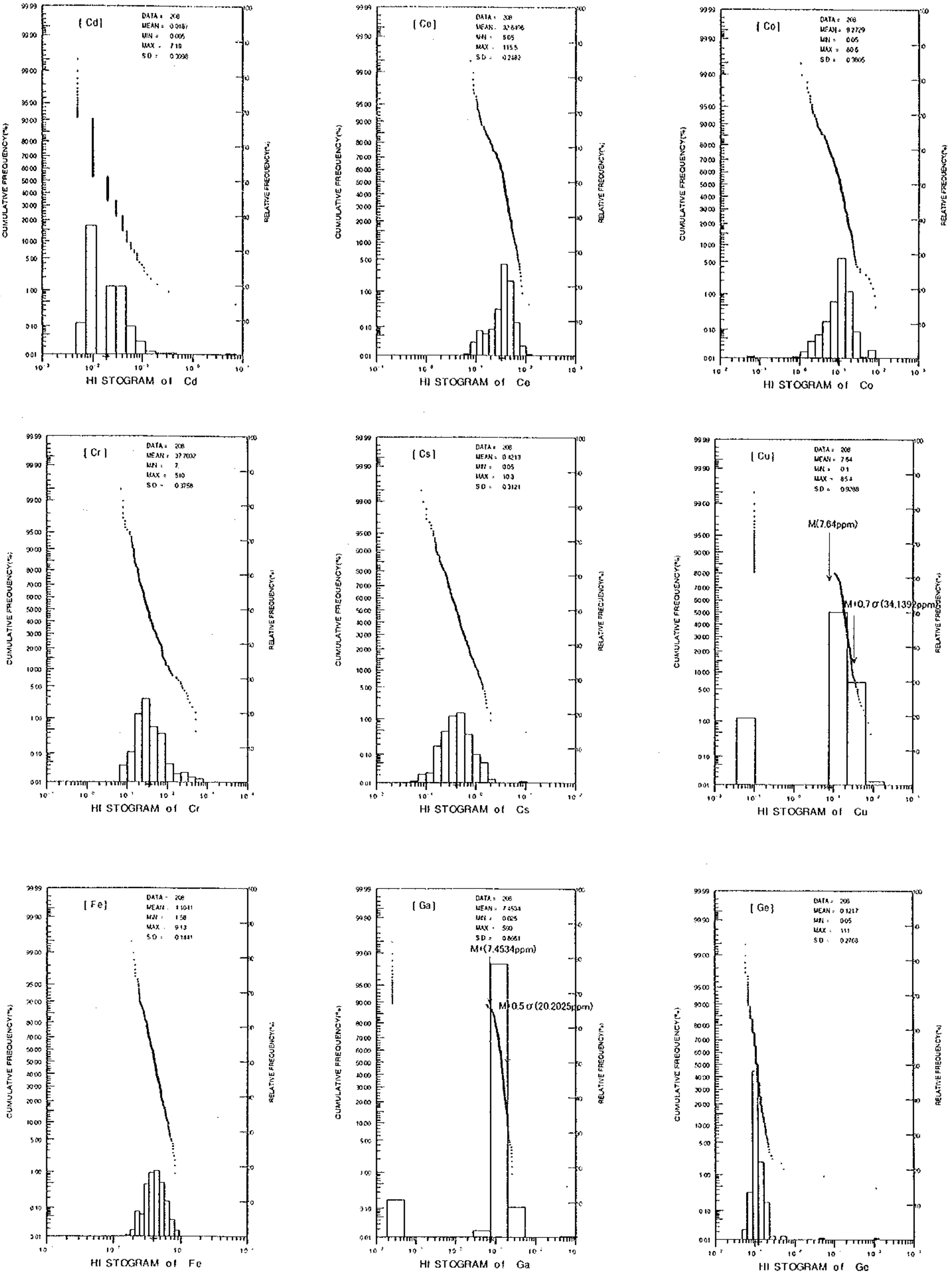


Fig. II-4-20. Probability Plot of Soil Samples in the Magasawan-Bato Area (2)

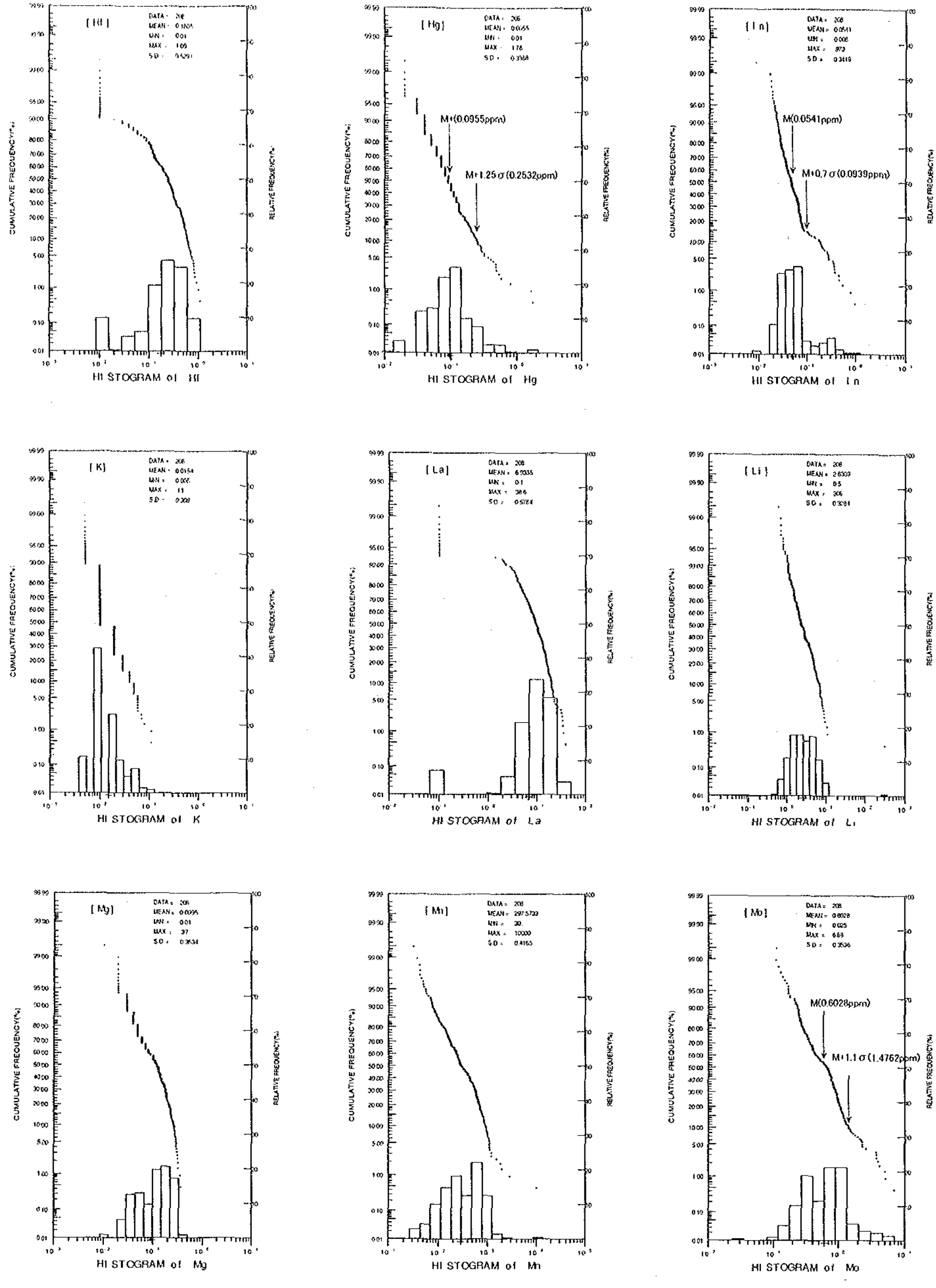


Fig. II-4-20. Probability Plot of Soil Samples in the Magasawan-Bato Area (3)

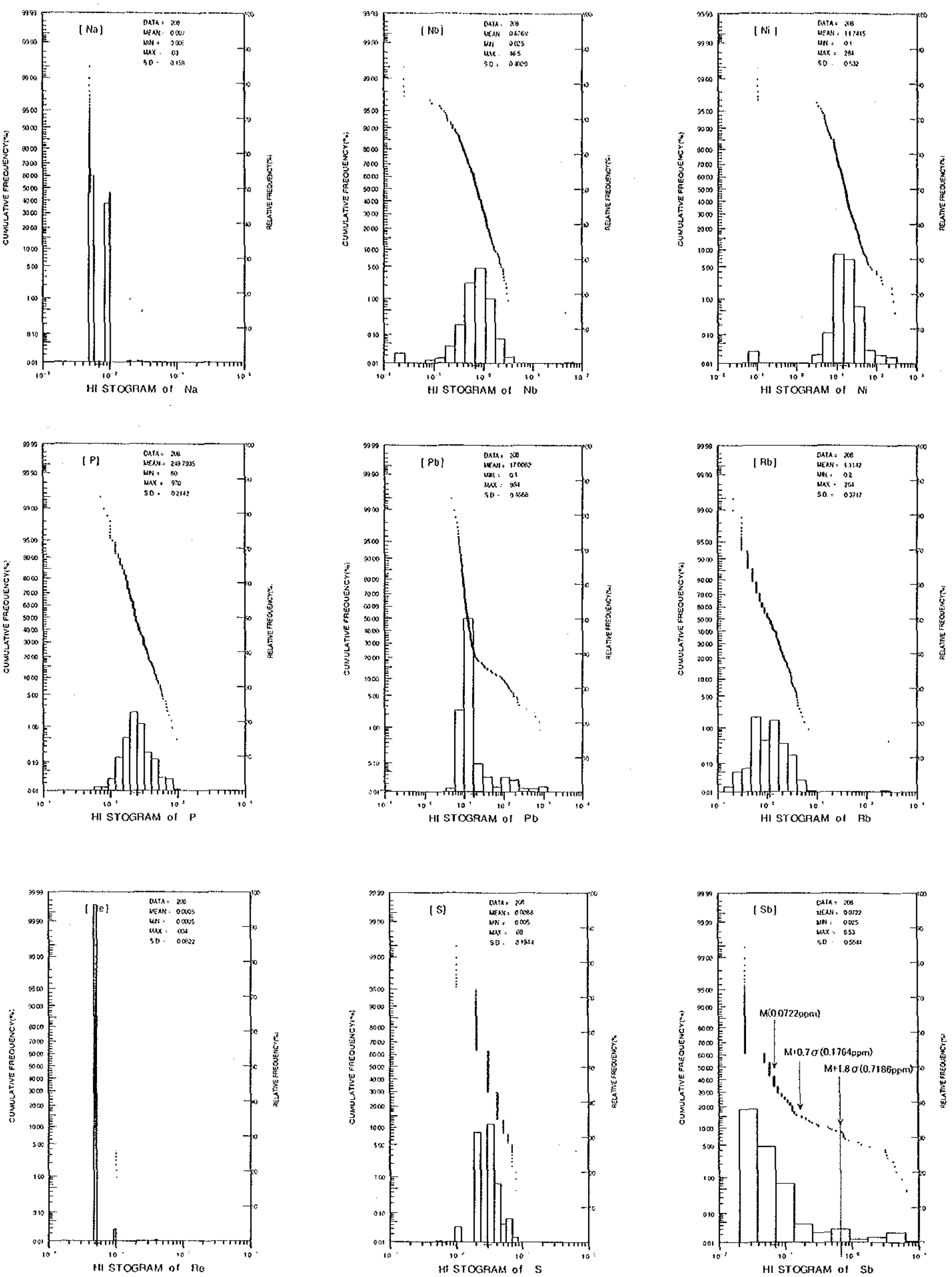


Fig. II-4-20. Probability Plot of Soil Samples in the Magasawan-Bato Area (4)

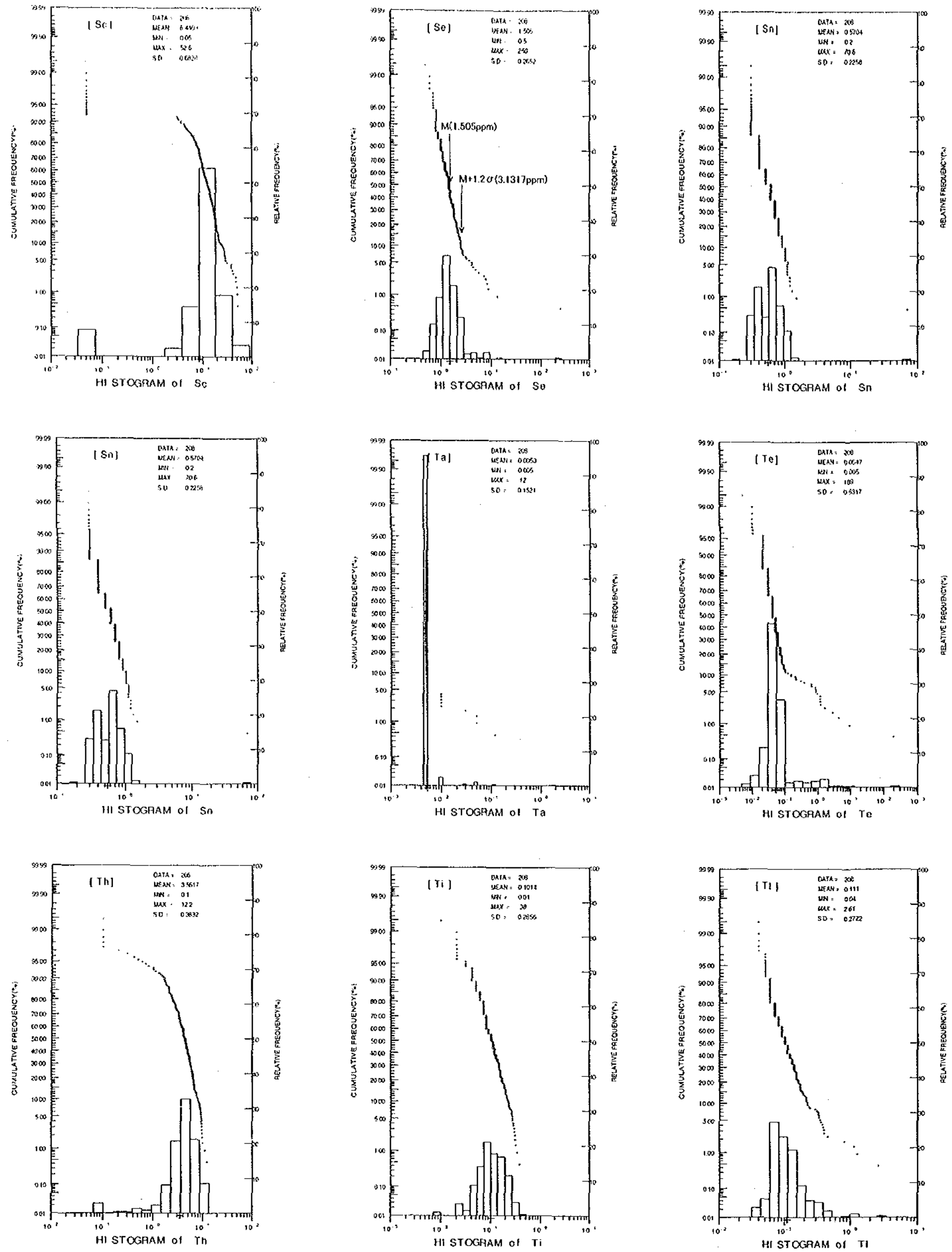


Fig. II-4.20. Probability Plot of Soil Samples in the Magagsawan-Bato Area (5)

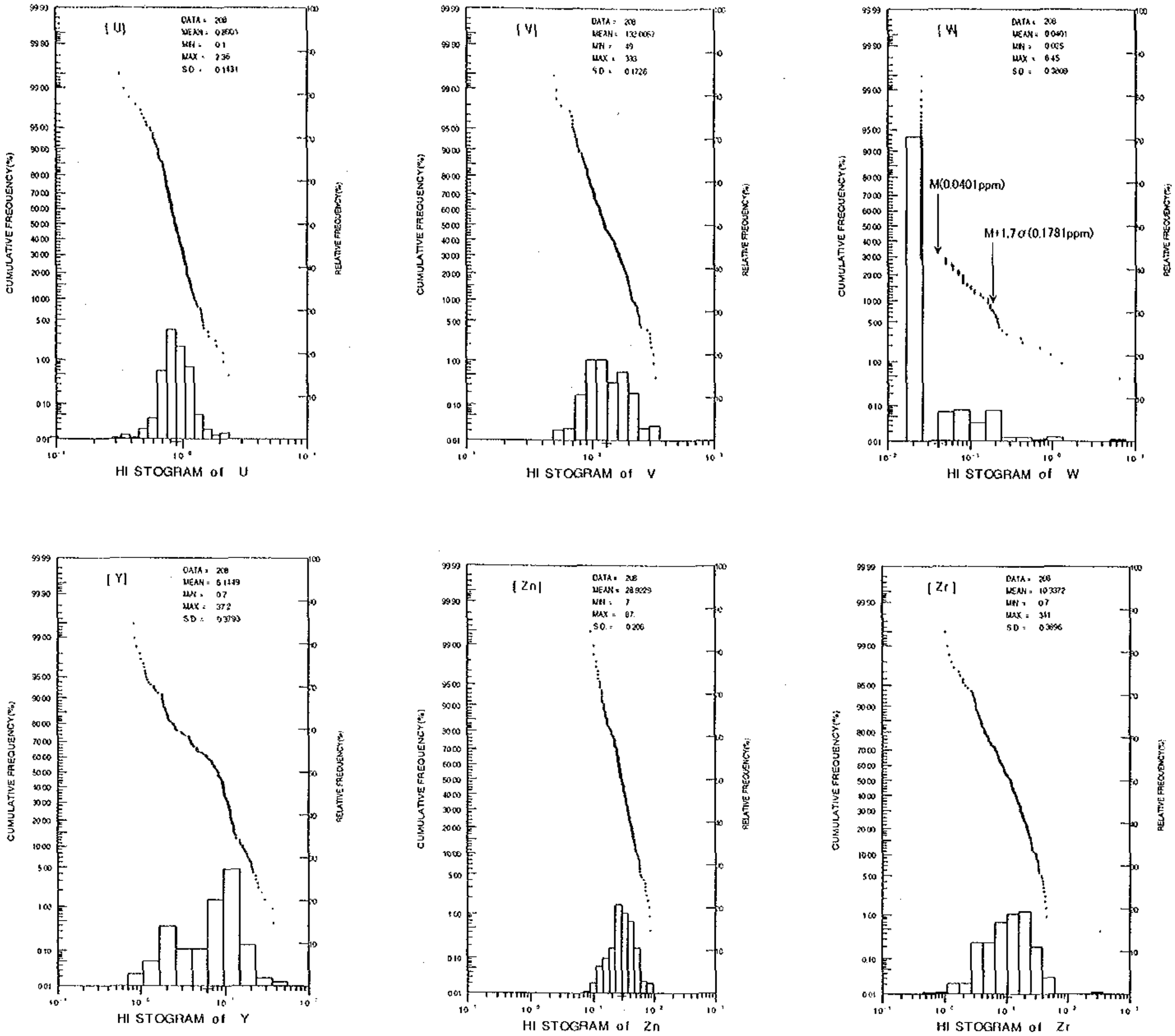


Fig. II-4-20. Probability Plot of Soil Samples in the Magasawan-Bato Area (6)

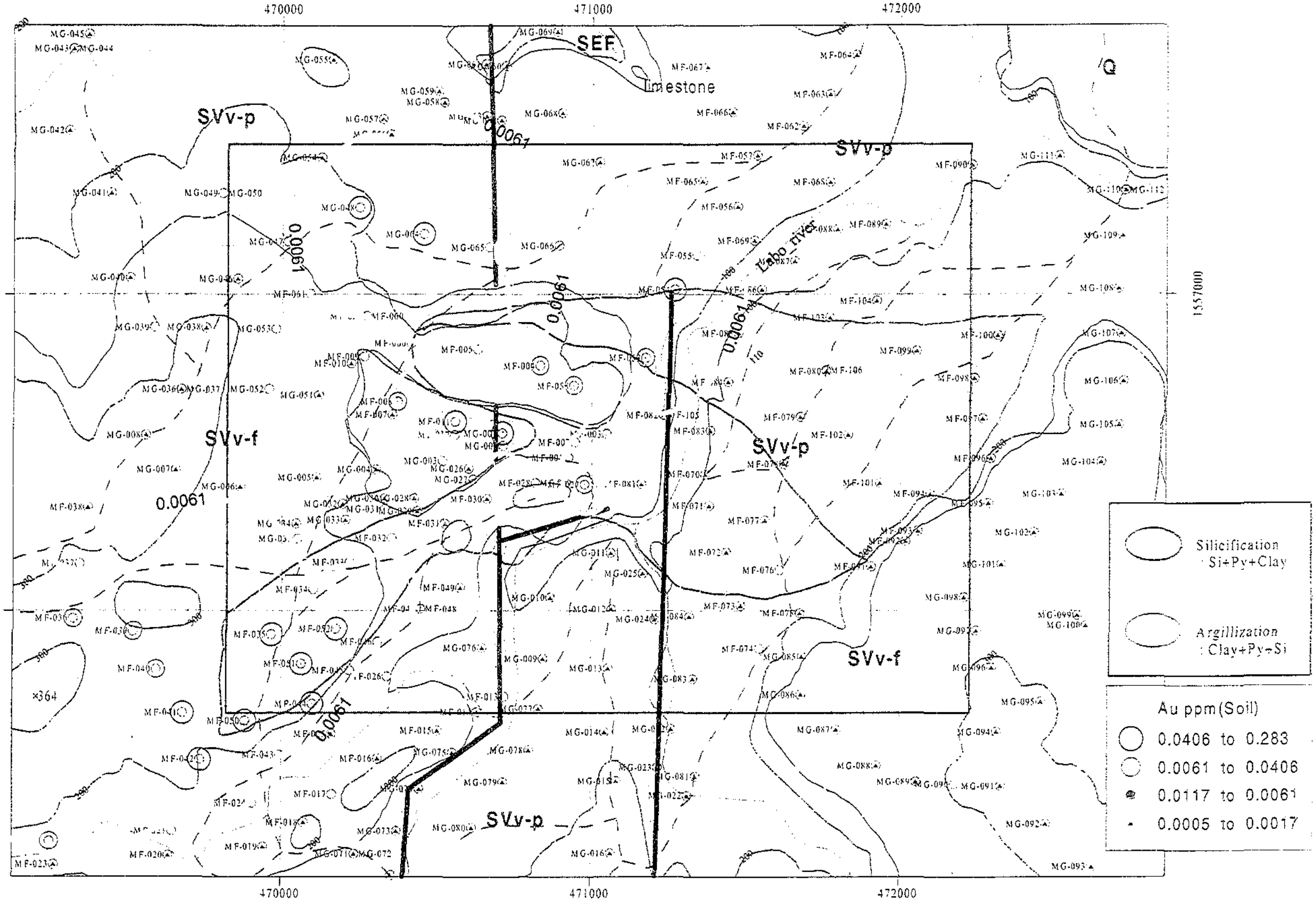


Fig.II-4-21 Au Content of Soil Samples in the Magasawan-Bato Area.

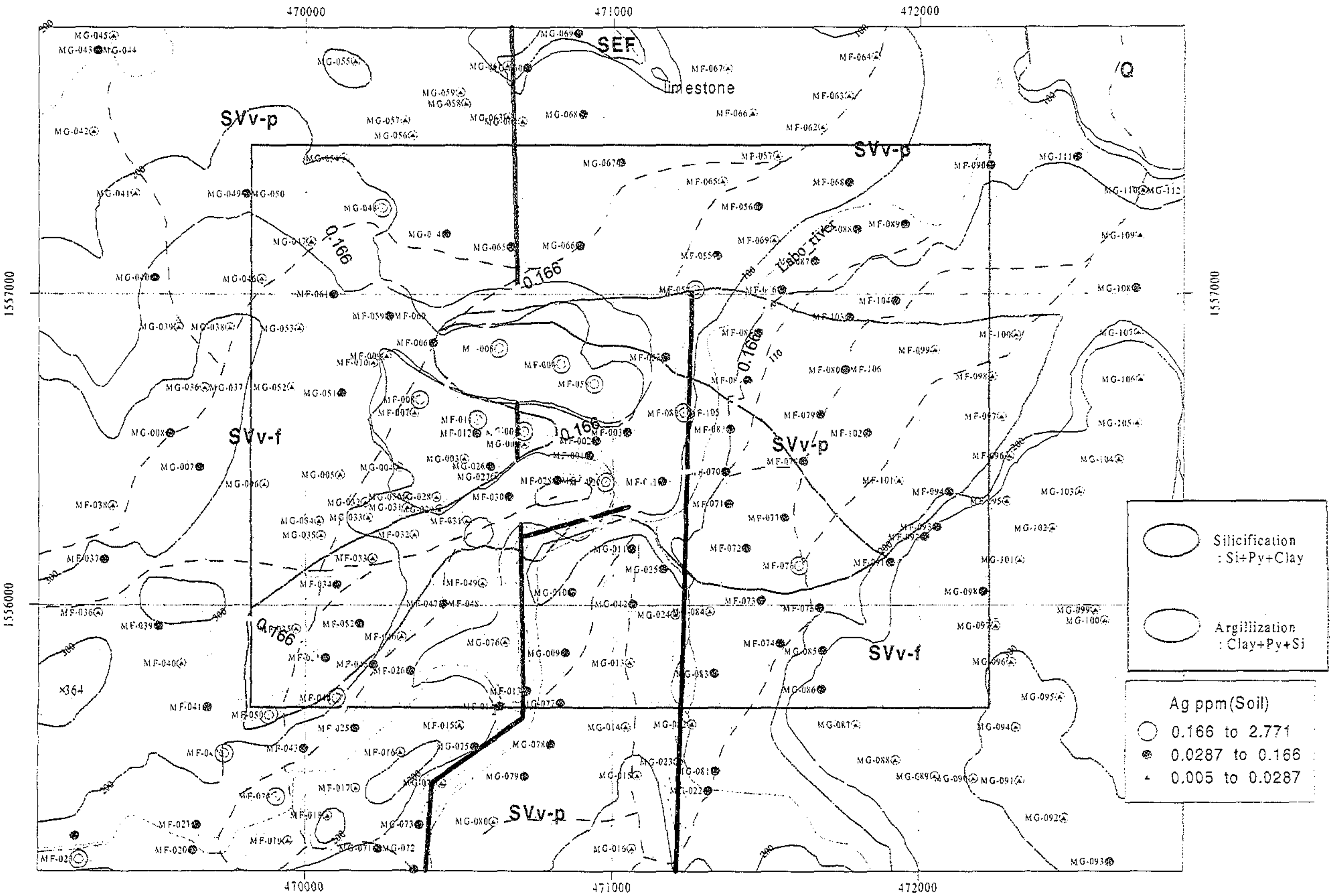


Fig.II-4-22 Ag Content of Soil Samples in the Magasawan-Bato Area.

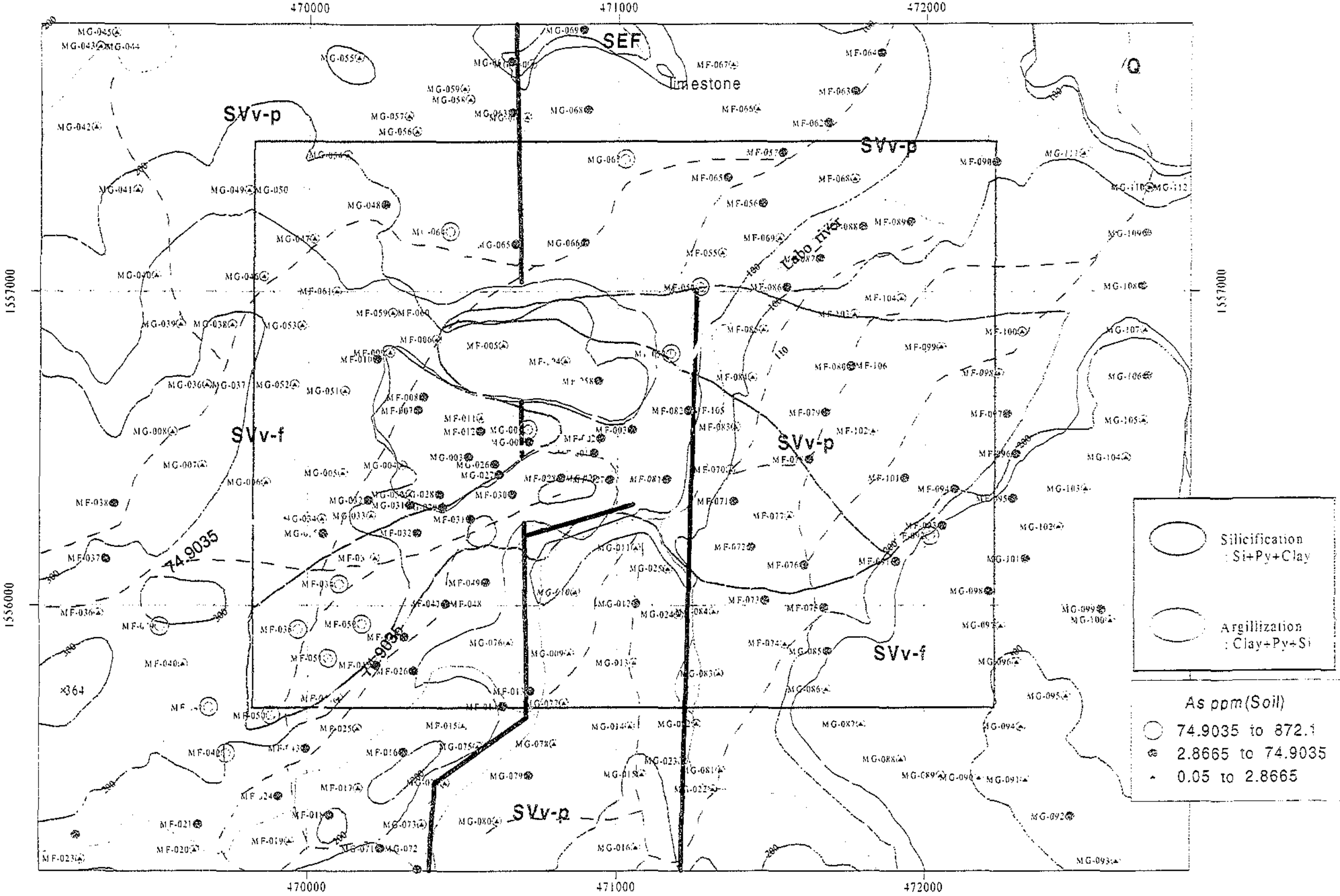


Fig.II-4-23 As Content of Soil Samples in the Magasawan-Bato Area.

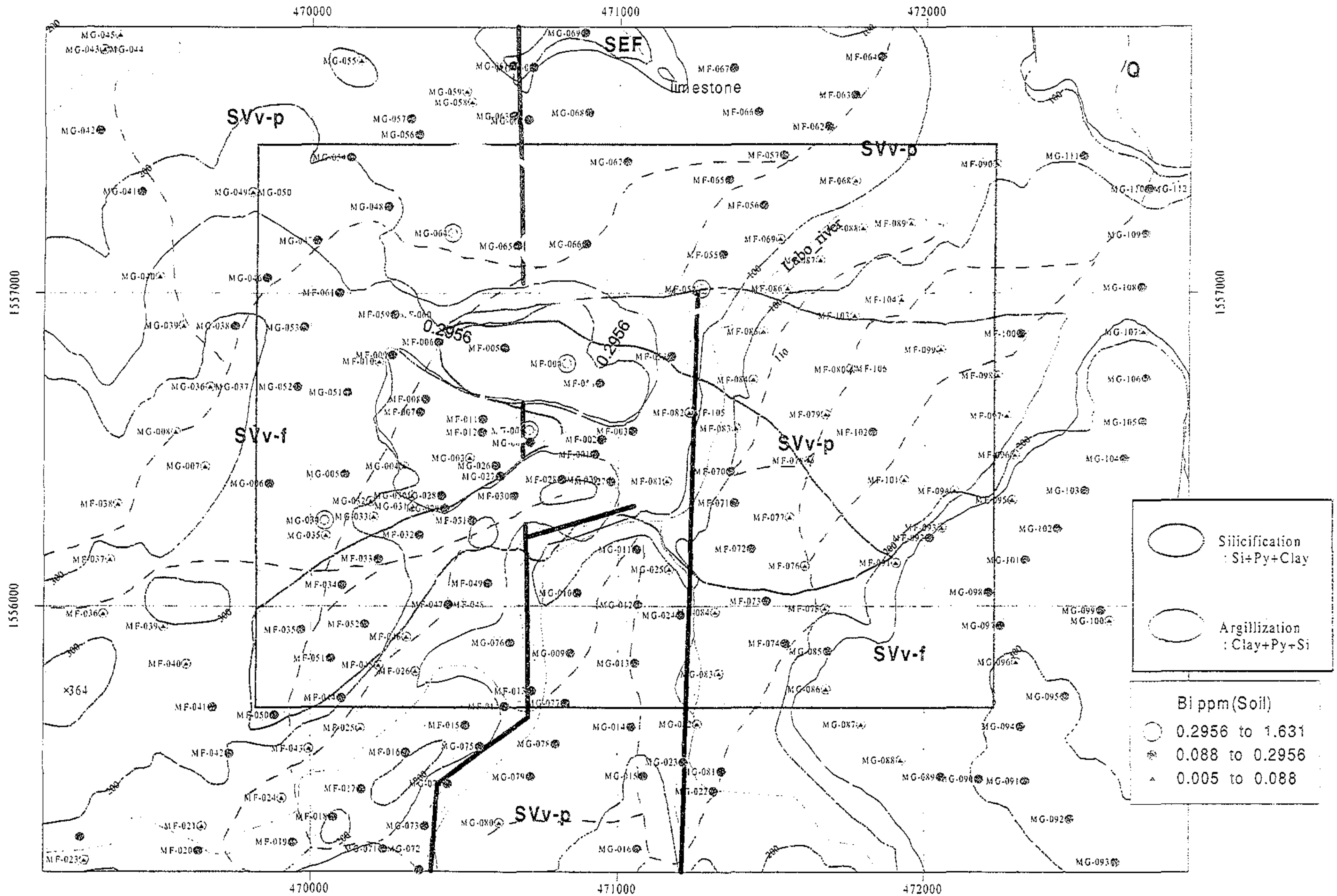


Fig.II-4-24 Bi Content of Soil Samples in the Magasawan-Bato Area.

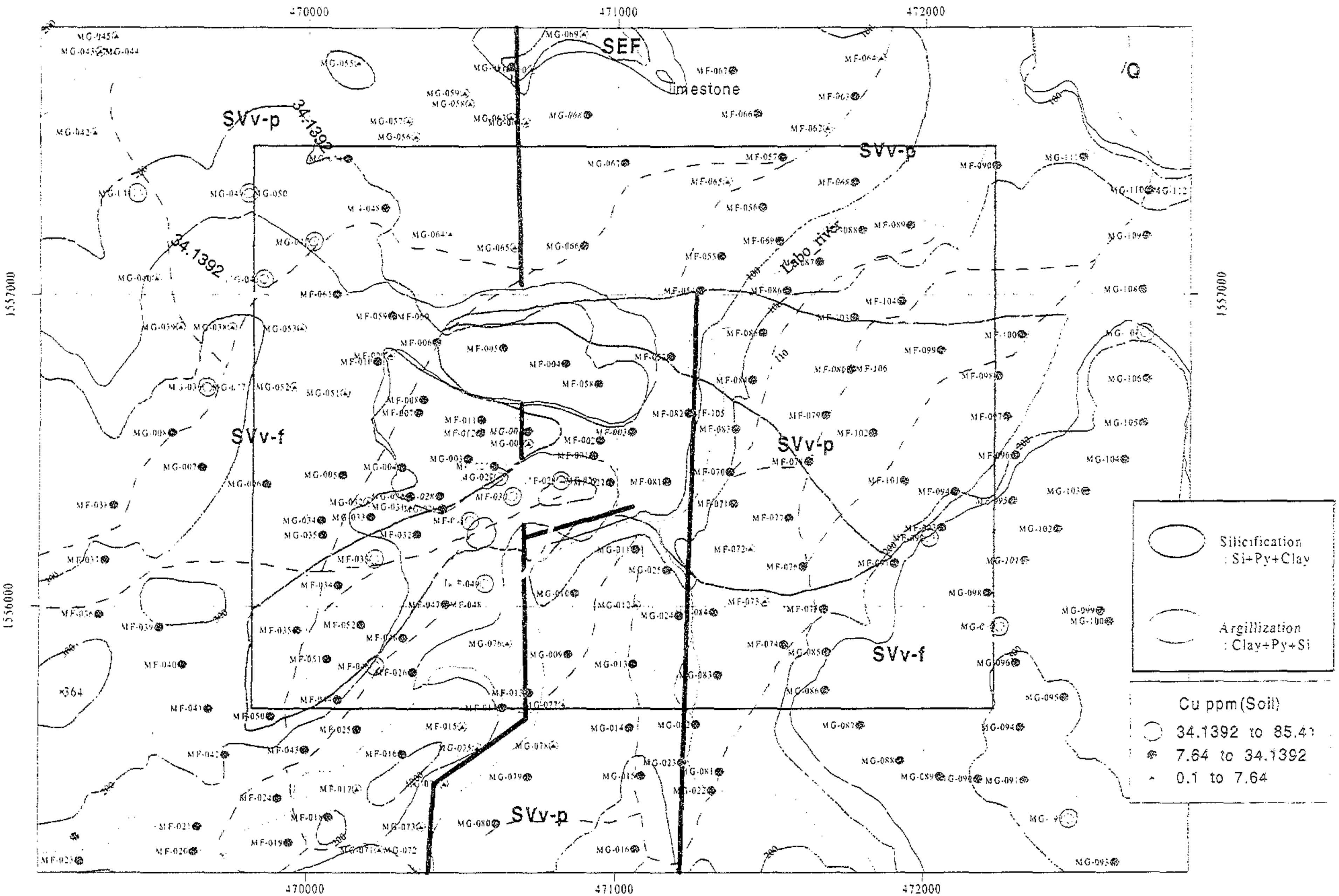


Fig.II-4-25 Cu Content of Soil Samples in the Magasawan-Bato Area.

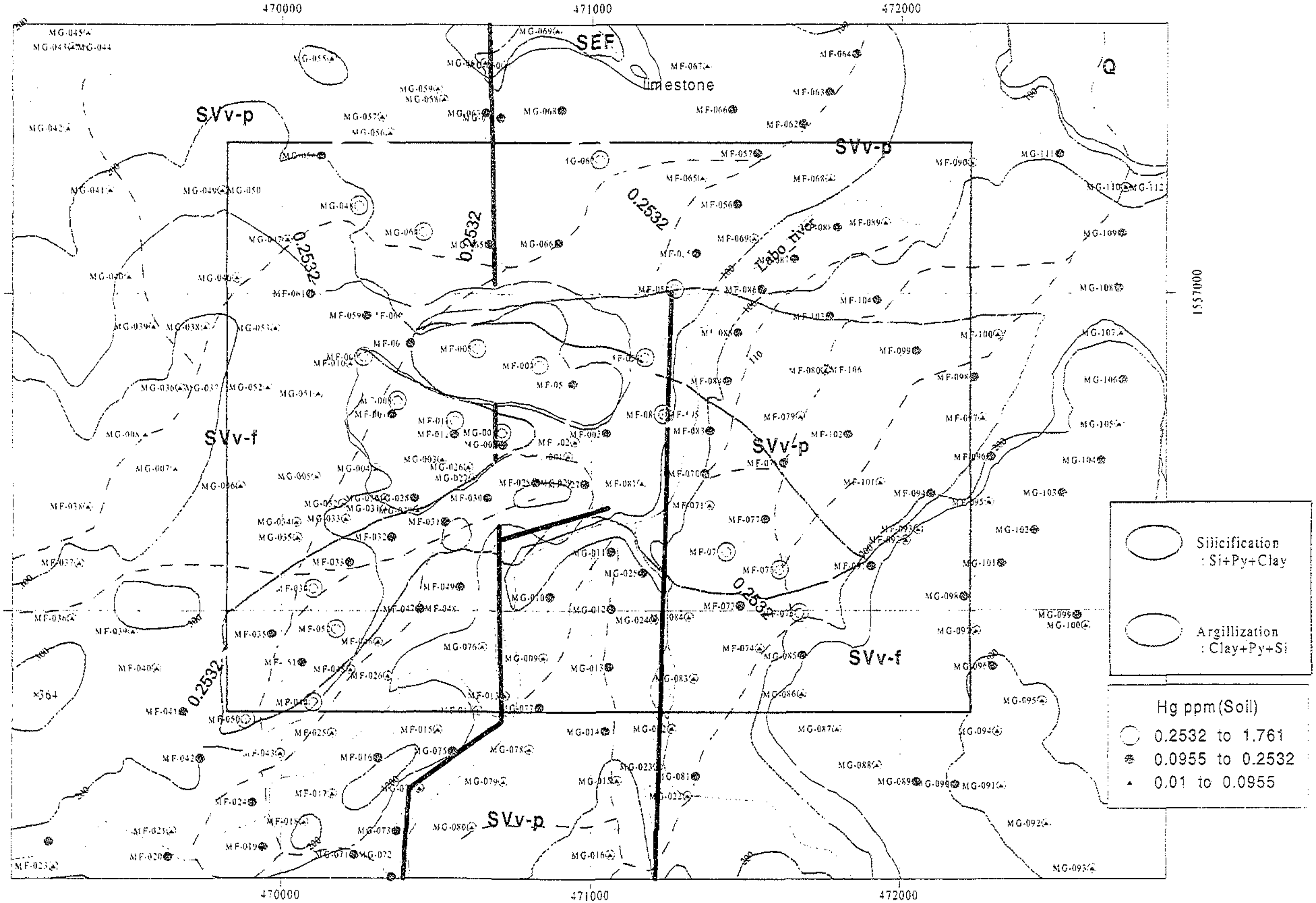


Fig.II-4-26 Hg Content of Soil Samples in the Magasawan-Bato Area.

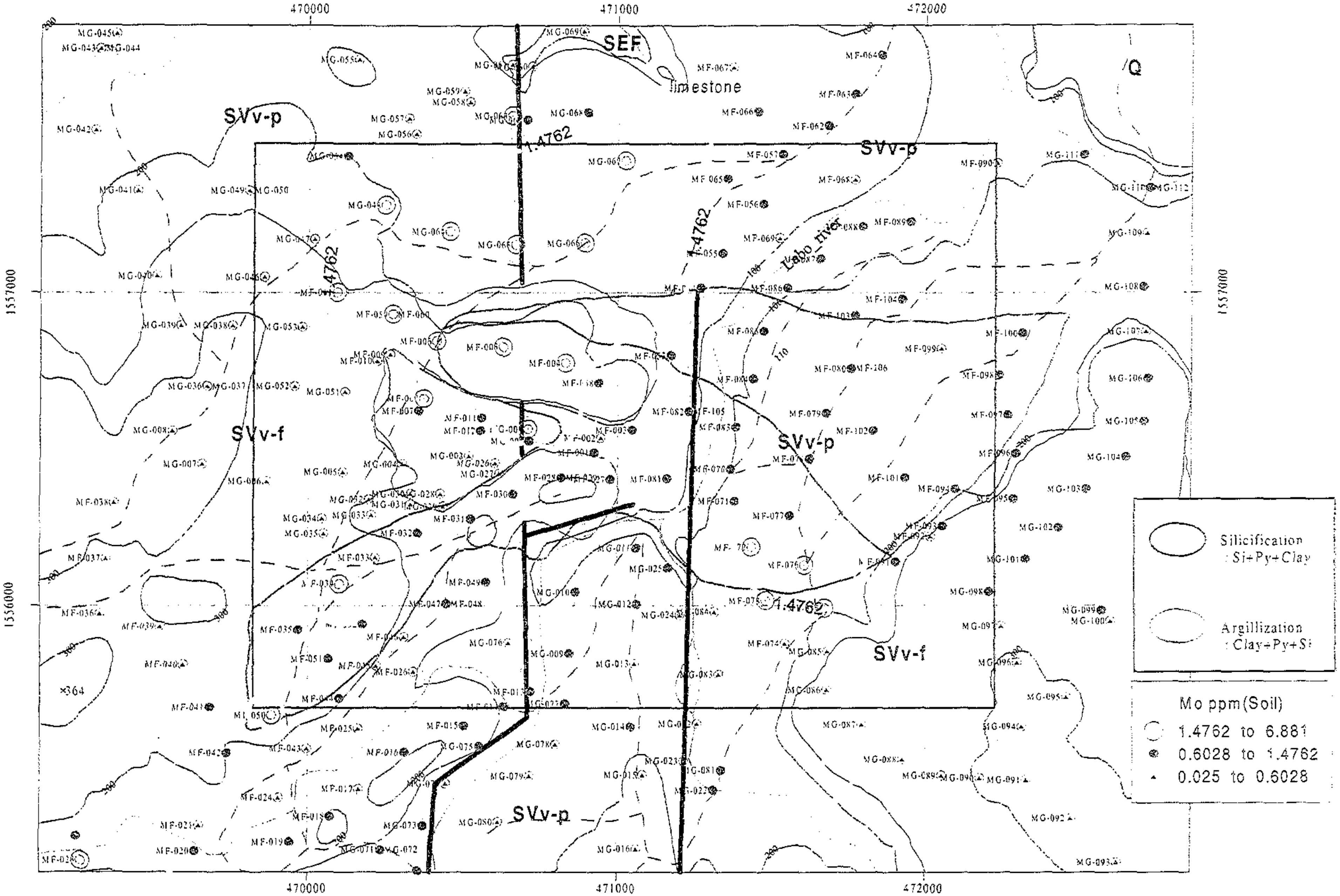


Fig.II-4-27 Mo Content of Soil Samples in the Magasawan-Bato Area.

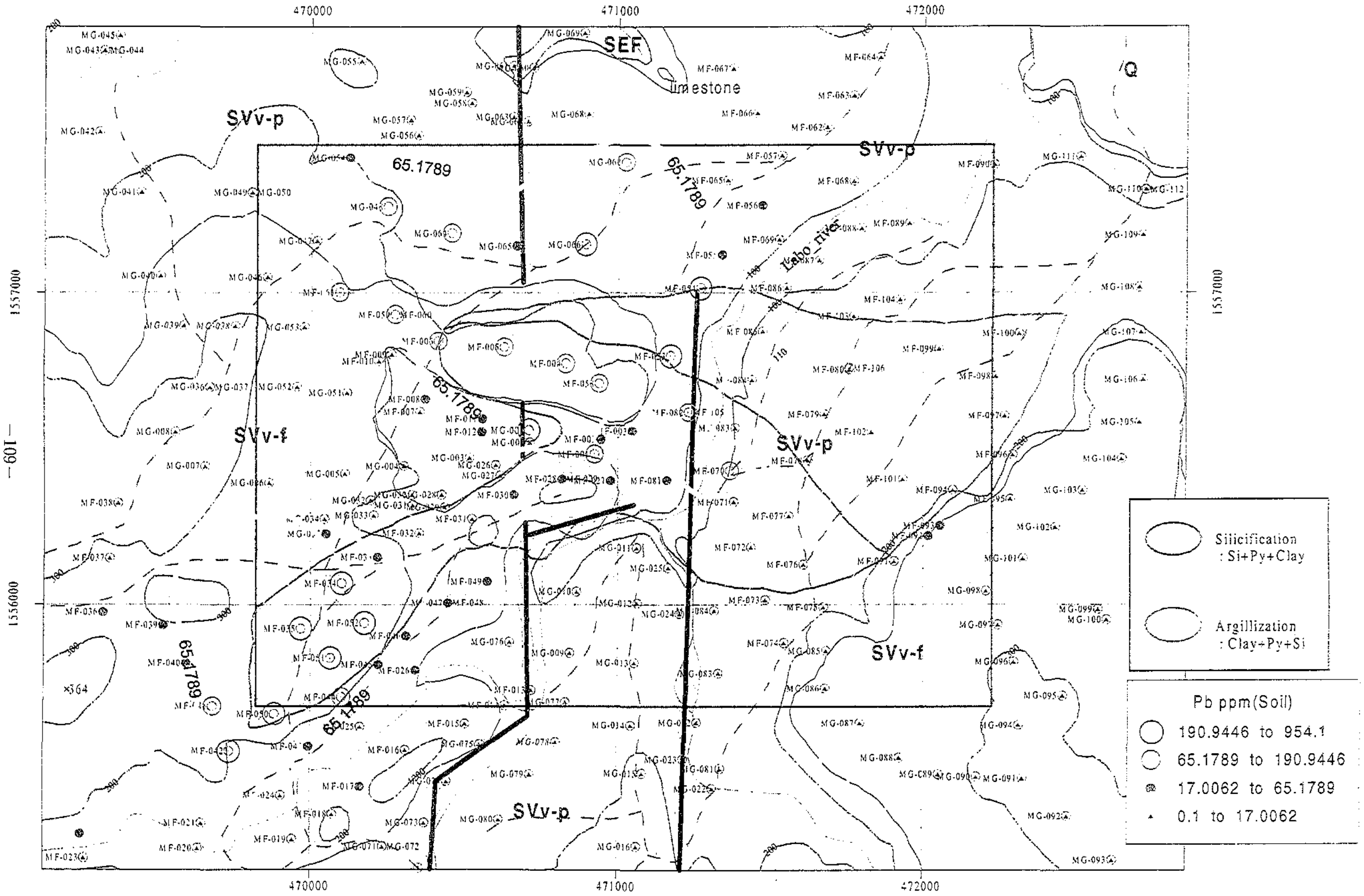


Fig.II-4-28 Pb Content of Soil Samples in the Magasawan-Bato Area.

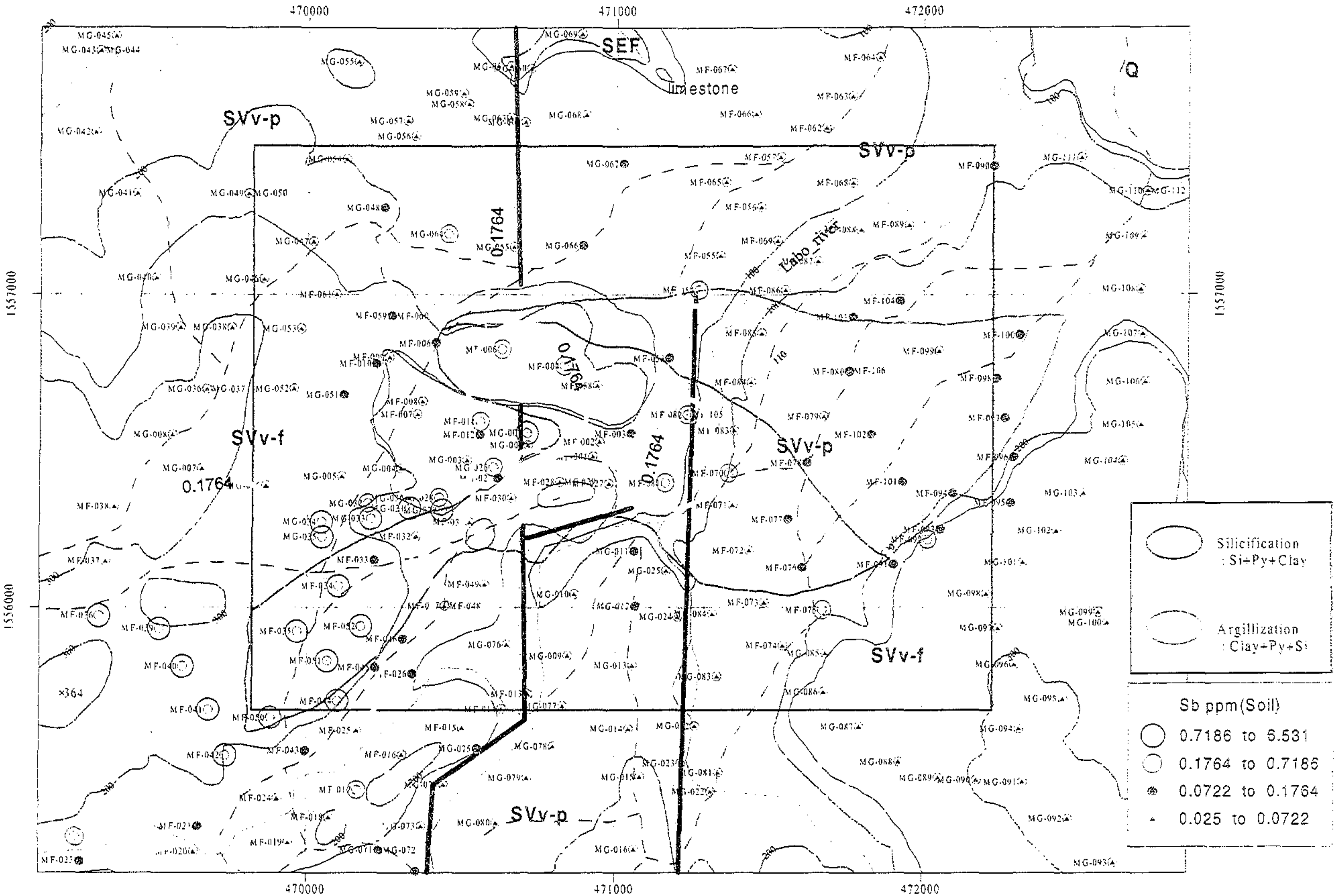


Fig.II-4-29 Sb Content of Soil Samples in the Magasawan-Bato Area.

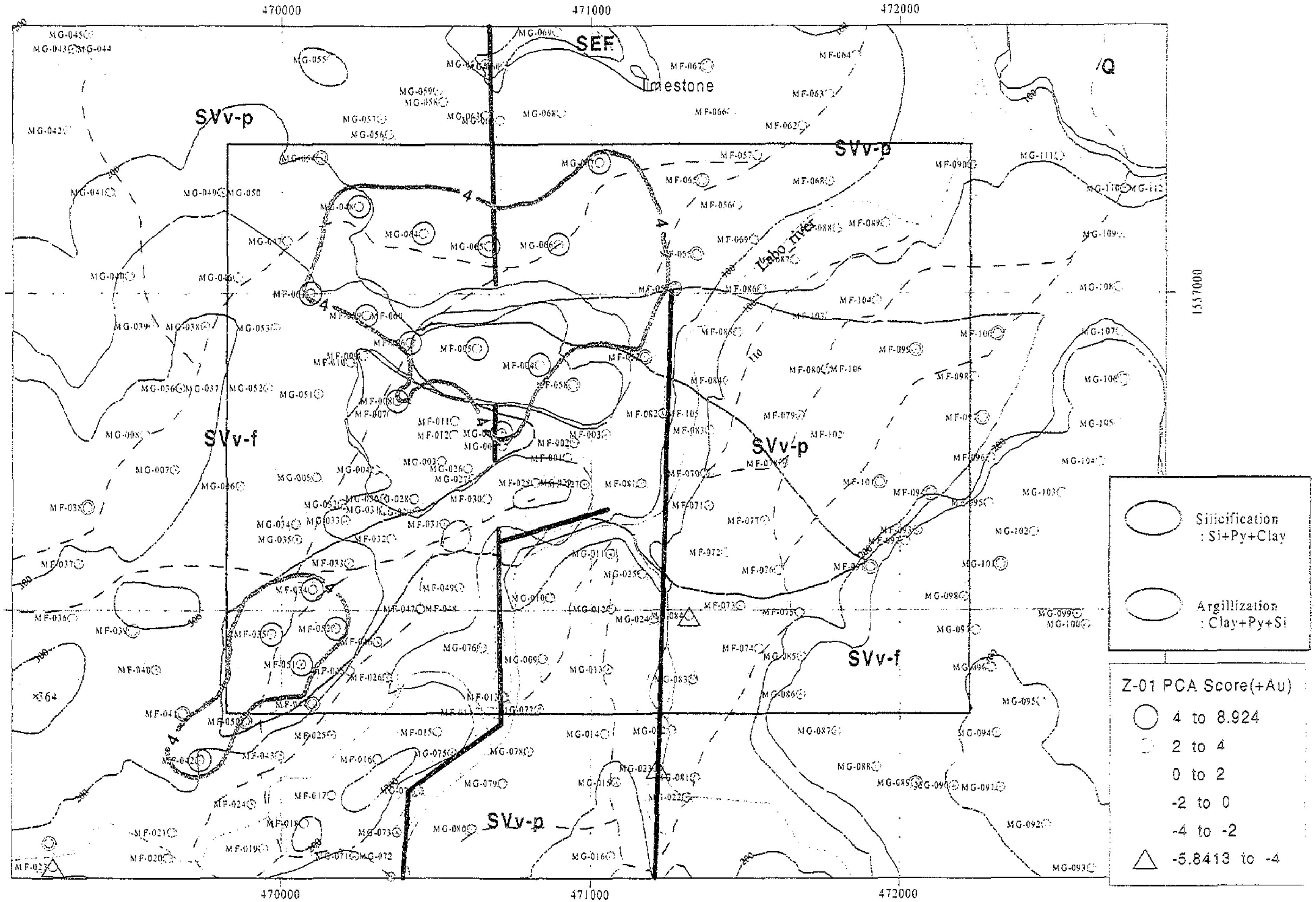


Fig.II-4-30 Z-01 PCA Score of Soil Samples in the Magasawan-Bato Area.

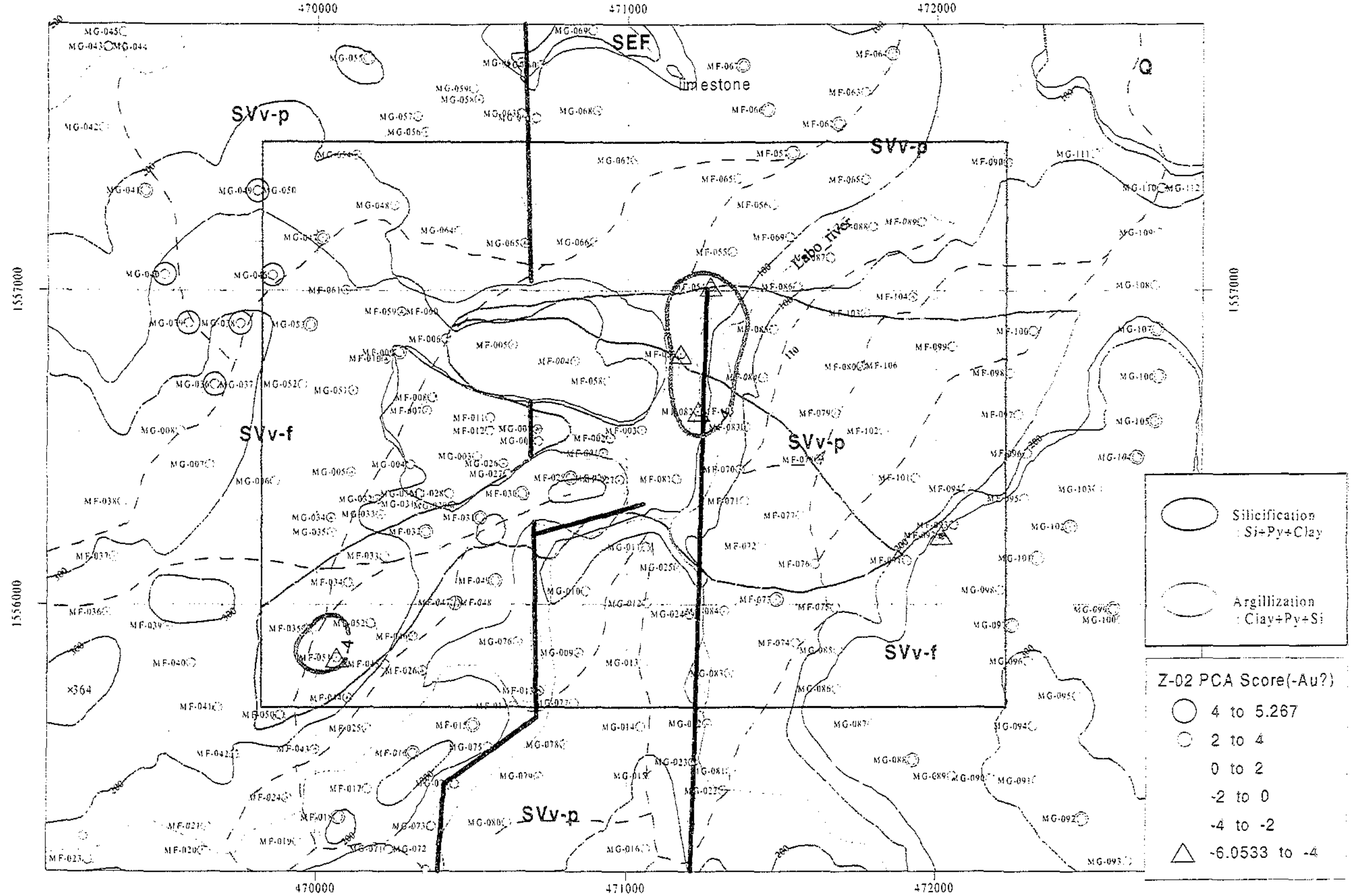


Fig.II-4-31 Z-02 PCA Score of Soil Samples in the Magasawan-Bato Area.

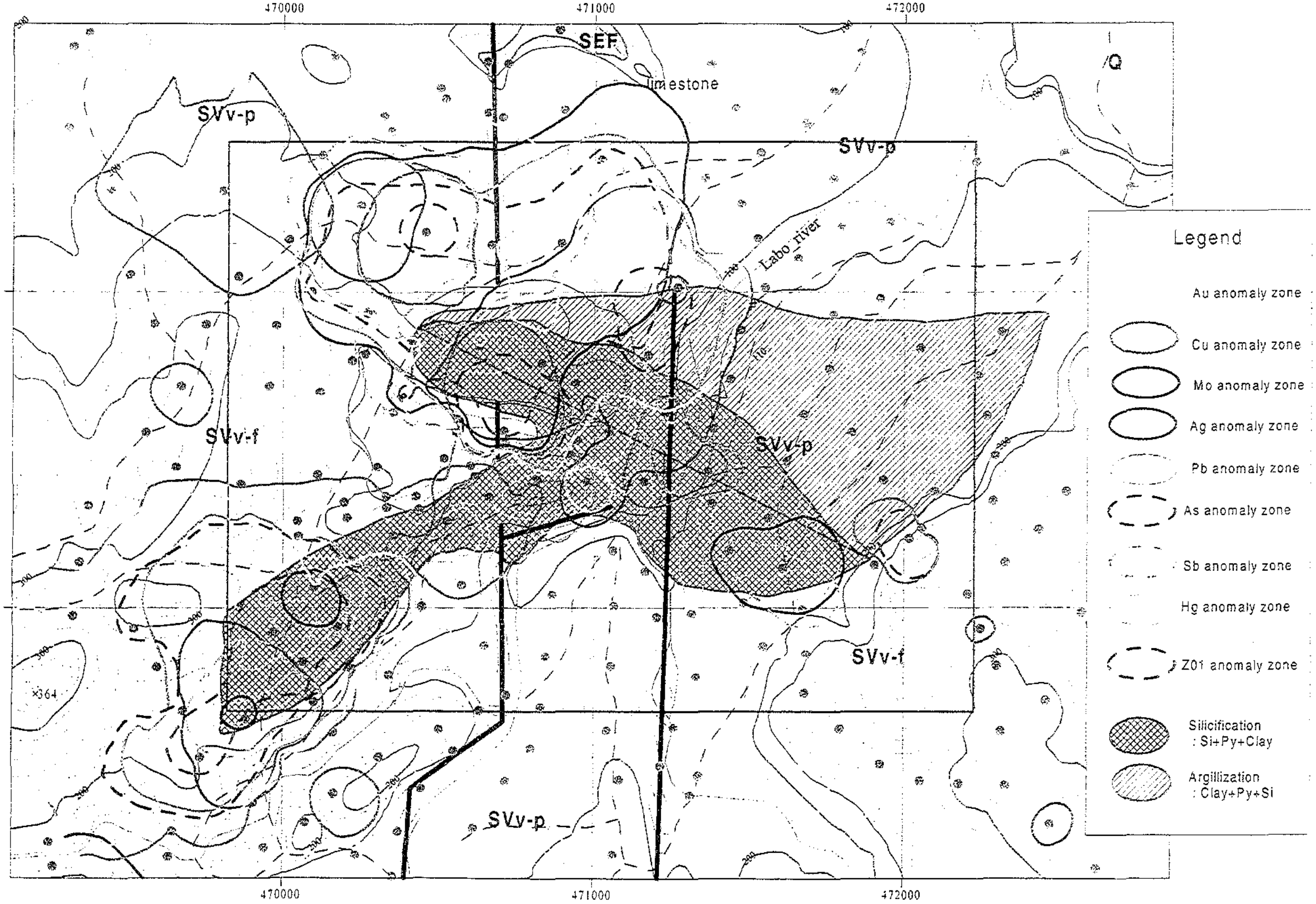


Fig.II-4-32 Geochemical Anomaly of Soil Samples in the Magasawan-Bato Area.