Chapter 3 Geological Survey

3 - 1 Method of Survey

An area of 2,000km^2 within a survey area of 5,000km^2 was selected for geological survey after eliminating areas where mining concessions had already been granted. Route maps were prepared based on 1: 25,000 topographic maps. Survey routes were set after examination of existing geological data and considering the sampling sites for geochemical survey. GPS was used for locating the position during the survey. The location of the mineralized zones and exposures were determined by simplified surveying as necessary. PIMA was used for identifying altered minerals in the field and made efforts to clarify the distribution of the altered minerals and the zoning of alteration zones. The results of the geological survey were, together with existing geological map data and satellite image analysis data, summarized into a 1:100,000 geological map and other material. The processing of collected samples was; rock thin sections 50 samples, ore polished sections 50 samples, X-ray powder refraction analysis 100 samples, ore assay 100 samples, fluid inclusion homogenization temperature and salinity measurement 5 samples, total rock analysis 20 samples, and rock age determination 10 samples.

3 - 2 Outline of Geology

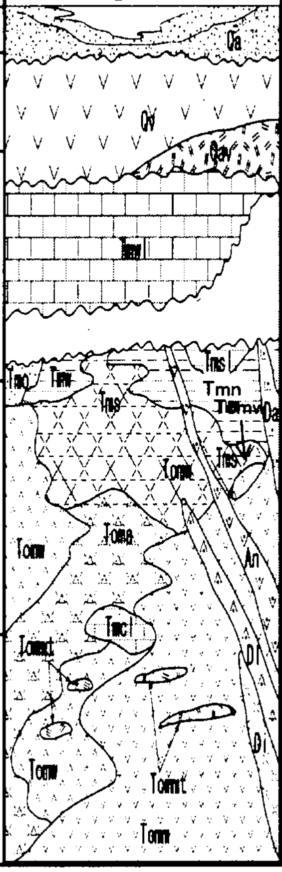
The geology of the survey area consists mainly of Eocene to Pleistocene volcanic rocks and pyroclastic rocks, and Oligocene-Miocene ~ Pliocene limestone occur from the northwestern to central southern part of the survey area. Intrusive bodies of dolerite-diorite, porphyry, and quartz porphyry were observed.

3 - 3 Stratigraphy

The basement of Cretaceous System is not exposed in the survey area, but is exposed in Central Java Province. It is composed of crystalline schist, chert, and basalt and it is believed to be a Cretaceous accretionary zone.

Oligocene-Lower Miocene Series consist predominantly of volcanic and pyroclastic rocks, and is grouped into 5 divisions. During the present survey, the past stratigraphic division was essentially used, but based on the results of the survey, the division was simplified by unifying units which cannot be divided by lithofacies-lithology. In simplifying the geologic units, the geologic structure interpreted from satellite images was considered in changing the boundary of the units. Namely in the geological map, Oligocene Series-Miocene Series-Pliocene Series were classified as follows, Mandalika Formation (Tomm, Tommt), Watupatok Formation (Tomw, Tomwt), Arjosari Formation (Toma), Sampung Formation (Tmsl), Campurudarat Formation (Tmcl), Semilir Formation (Tms), Wuni Formation (Tmw), Nampol Formation (Tmn), Oyo Formation (Tmo), and Wonosari Formation (Tmwl).

Fig. 2-9 Schematic Stratigraphic Column of the Survey Area



	Formation and Lithology	Intrusives
Holocene	Qa:Alluvium (Gravel,sand,mud)	
Pleistocene	Qv:Volcanics and pyroclastics	
	Qav:Andesitic pyroclastics	
Pliocene	Tmwl:Wonosari Formation (limestone)	
	Tmo:Oyo Formation (sandstone, mudstone)	
	Tmn:Nampol Formation (tuffuous sandstone, mudstone, limestone)	
	Tmw:Wuni Formation(pyroclastics, intercalation of sandstone, mudstone and limestone)	dacite
Miocene	Tmcl:Campurdarat Formation (intercalation of limestone and mudstone)	quartz porphyry
	Tmsl:Sampung Formation (marl,limestone)	
	Tms:Semilir Formation (tuff, tuffous sandstone)	andesite (porphyry)
	Toma:Arjosari Formation(conglomerate, sandstone, pyroclastics)	
Oligocene	Tomw:Watupatok Formation (basalt – andesite lava and pyroclastics)	dolerite
	Tomwt:Watupatok Formation (fine pyroclastics)	diorite
	Tommt:Mandalika Formation(fine pyroclastics)	
	Tomm:Mandalika Formation (andesite-basalt lava and pyroclastics)	

(1) Mandalika Formation (Tomm, Tommt)

Distribution: Distributed widely in the central part.

Composition: Composed of andesitic and basaltic lava and pyroclastic rocks. Generally massive pyroclastic rocks without bedding are abundant and stratigraphy and structure is difficult to clarify, but fine-grained pyroclastics are intercalated in some parts.

Structure: Strike N-S to NE-SW in the northeastern part, and ENE-WSW trending gentle anticline and syncline occur repeatedly southwestward from the northeast. On the other hand, WNW-ESE striking anticline structure occurs in the southwestern part.

Stratigraphy and correlation: The lowermost formation in the survey area and overlies unconformably Cretaceous metamorphic rocks to the northwest of this area. This formation is correlated to the Mandalika F., of the Pacitan and Ponogoro Quadrangle sheets, but includes the Arjosari F., (Toma) of the Pacitan sheet. The Arjosari F., is defined as consisting mainly of conglomerate, sandstone, and siltstone with intercalation of pyroclastic rocks and lava. But in the survey area, pyroclastic rocks and lava are possibly dominant, and is difficult to distinguish from Mandalika F. Thus the two nits were unified to Tomm. In the Ponoigoro sheet, this units is named Panggang F., (Tomp), but is named Mandalika F., in the adjoining Pacitan sheet and thus Panggang F., is included in the Mandalika F. Also Dayakan F., (Tomd) consisting of sandstone-mudstone alternation near G. Gembes is also included in the Mandalika F.

Thickness: More than 500m.

(2) Watupatok Formation (Tomw, Tomwt)

Distribution: Distributed in the southeastern and western parts.

Composition: This is composed of basalt-andesite similar to the Mandalika F., and the unit mainly composed of basalt was separated as Watupatok F. This formation is bedded with intercalation of green tuff and tuffaceous sandstone in the southeastern and western parts, but is generally non-bedded and massive.

Structure: This is harmonious with the Mandalika F. It has N-S to NE-SW strike in the northeastern ~ central part of the survey area, while in the western part it shows anticline structure with WNW-ESE strike.

Stratigraphy and correlation: This formation interfingers with Mandalika F. In the southern part, however, it is somewhat lower than Mandalika F. This is generally correlated with the Watupatok F., in the Ponorogo sheet in the east, but in the west in the Pacitan sheet basalt predominant part of the Mandalika F., is treated as Watupatok F.

Thickness: More than 500m.

(3) Arjosari Formation (Toma)

Distribution: This formation is distributed from the southeastern part to the eastern part of the survey area.

Composition: Pyroclastic-dominant part of the basalt-andesite area was named Arjosari F. Andesitic rocks are predominant in this unit similar to the Mandalika F. Thin section microscopy, however, showed that this formation is dacitic in the eastern part of the survey area. This formation is generally non-bedded, but green tuff and tuffaceous sandstone is intercalated and is bedded in the central southern and western parts of the area.

Structure: It is harmonious with the Mandalika F.

Stratigraphy and correlation: This unit interfingers with the Mandalika F. The main part of this formation is somewhat lower stratigraphically than Mandalika F., in the west, but is higher in the eastern part. Thus this perhaps should be treated as independent units in the east and that in the west, but it is presently interpreted as interfingering relation. This formation is, on the whole, correlated to the Arjosari F., of the Pacitan sheet in the west and to the Watupatok F., of the Ponorogo sheet in the east, but parts of the Arjosari F., of the Pacitan F., was described as Mandalika F.

Thickness: More than 150m.

(4) Semilir Formation (Tms)

Distribution: This formation is distributed from the northern to the western part of the survey area.

Composition: This consists of tuff and sandstone-mudstone alternation. Nature of tuff varies considerably, namely dacitic, andesitic, to basaltic. Bedding is generally clear.

Stratigraphy and correlation: The lower part of this units interfingers with Panggang F., Dayakan F., and Watupatok F., while the upper part is transitional to the Nglangglan F. In the south this is correlated to upper part of the Ajossari F., and is considered to be Upper Miocene Series.

Thickness: More than 750m.

(5) Sampung Formation (Tmsl)

Distribution: This occurs in a small zone in the northern part of the survey area.

Composition: This is composed of calcareous sandstone, marl, and limestone, and partly of conglomerate. This is shallow marine sediment.

Stratigraphy: This overlies Mandalika F.

(6) Campurdarat Formation (Tmcl)

Distribution: This occurs in a small zone in the eastern part of the survey area.

Composition: This unit consists of limestone and mudstone.

(7) Wuni Formation (Tmw)

Distribution: This formation is distributed in a narrow E-W trending zone in the northwest and southwest parts of the survey area.

Composition: This unit is composed of dacitic to andesitic pyroclastic rocks. The pyroclastic material contains green tuffaceous sandstone.

Stratigraphy and correlation: This interfingers with the lower Jaten F., and as pyroclastic rocks are dominant in the Jaten F., area in the Pacitan sheet, Jaten F., was included in this formation. This is stratigraphically above the Campurdarat F., and Sampung F. It is believed to belong to the Upper Miocene Series.

Thickness: 500m

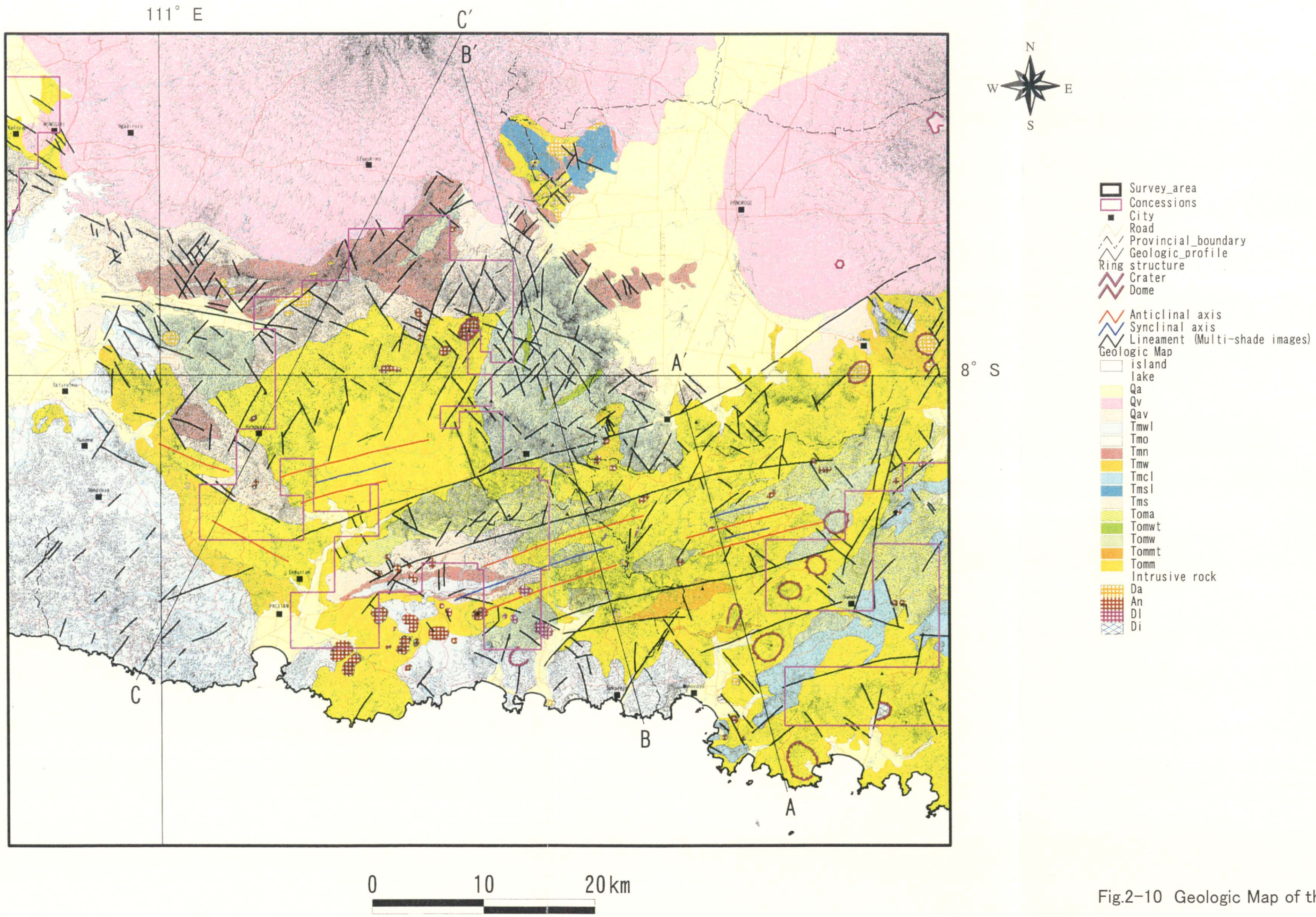


Fig.2-10 Geologic Map of the Survey Area

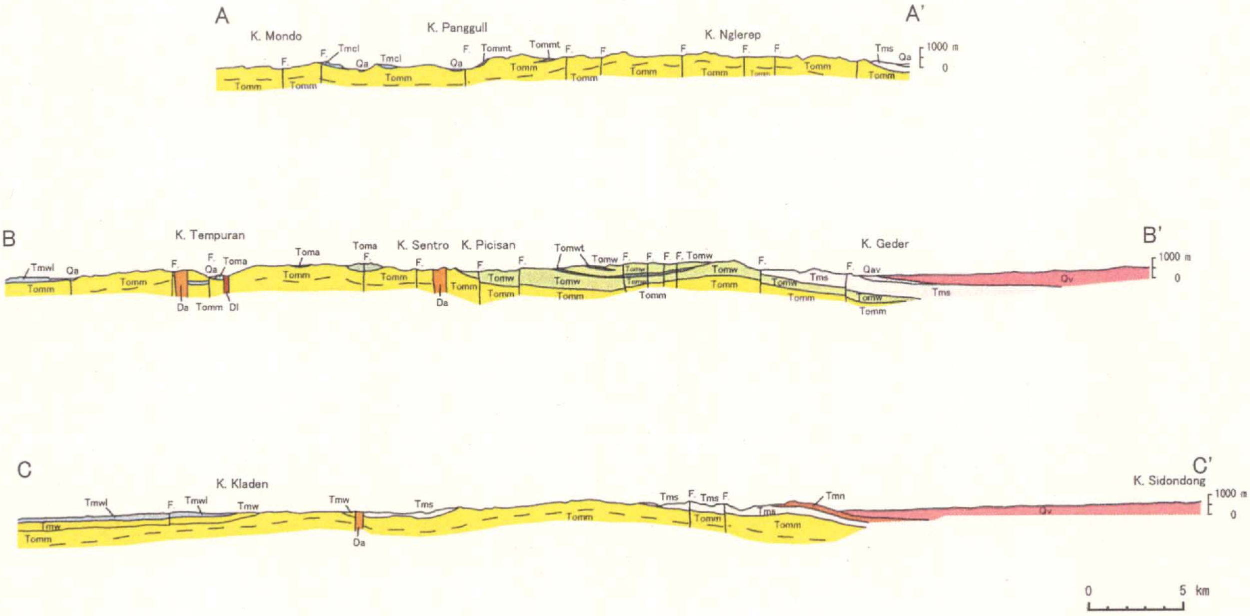


Fig. 2-11 Geologic Profiles of the Survey Area

(8) Nampol Formation (Tmm)

Distribution: This is distributed in the northwestern part of the survey area,

Composition: This unit is composed of tuffaceous sandstone, siltstone with intercalation of conglomerate and limestone.

Structure: Similar to the Wuni F., gently dipping and gently curving in the E-W direction.

Stratigraphy and correlation: Main part of this unit overlies and partly interfingers with Wuni F., and underlies the Wonosari F. It is believed to be Upper Miocene unit.

Thickness: 200m.

(9) Wonosari Formation (Tmwl)

Distribution: Mainly in the coastal zones.

Composition: This consists mainly of reefal limestone and calcareous limestone with intercalation of conglomerate and marl. It is correlated to upper Miocene to Pliocene Series. It is in structural contact with andesite, but has not been metamorphosed.

Stratigraphy: The main part of this unit is considered to be Pliocene.

(10) Quaternary volcanic rocks: This unit is distributed in the northern part of the survey area, and consists mainly of andesitic lava and pyroclastic rocks. In the Ponorogo sheet, the quaternary volcanics are divided into 12 units with total thickness of more than 2,000m. Quaternary units are not the object of the present survey and thus they are treated as one in the geological map. Those overlying the Tertiary units, which are the concern of this survey, are called Lahar and are mixed deposits of basalt, andesite and pumice, and volcanic ash.

Quaternary System-Alluvium: These occur mainly near Ponorogo and Wonogir, and along the rivers in the southern part. They consist of gravel, sand, and mud.

3 - 4 Intrusive Rocks

Dolerite, diorite, porphyry, andesite, dacite-quartz porphyry are the major intrusive rocks of the survey area. Fine-grained basalt-diorite and dacite-quartz porphyry are generally metamorphosed. The age of the intrusive rocks are; 22.8Ma for diorite, 17.3Ma for andesite in the western part, 18.1Ma for dacite in the central part, and 4.8Ma for dacite in the southern part.

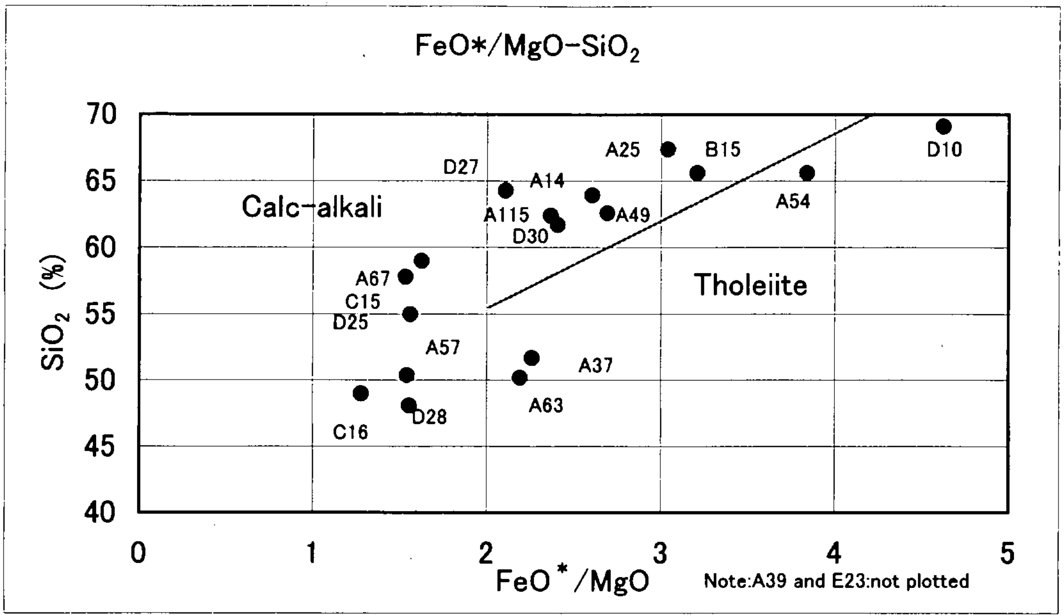
The shape of these intrusive bodies in existing documents and interpreted from DEM is generally circular. Of these, dolerite, diorite, porphyry, andesite, dacite-quartz porphyry were confirmed in the field, but parts of the andesite bodies in the east are considered to be remnants of lava hills rather than intrusive bodies. The age of these intrusive activities is not clear, but parts have intruded into Wonosari F., and the activity is inferred to have continued to Pliocene. The important results of microscopic study are as follows.

Dolerite (D28T): This has holocrystalline porphyritic texture, phenocrysts are coarse-grained subhedral to euhedral plagioclase and subhedral altered mafic minerals, and the matrix has intersertal texture and consists of medium-grained subhedral plagioclase and clinopyroxene (anhedral and grainy), and opaque minerals. Alteration is strong and is sericitized, and calcitization, silicification, epidotization, albitizaton are observed for plagioclase phenocrysts, and mafic minerals (clinopyroxene?) are characterized by epidotization and chloritization. Secondary epidote and calcite occur in parts of matrix.

Fine diorite (A63T): This is a plutonic rock with holocrystalline equigranular texture and is composed mainly of subhedral prismatic plagioclase, prismatic clinopyroxene, and amphibole, and other granular opaque minerals. Many mafic minerals are generally chloritized, but relatively fresh clinopyroxene occur occasionally and the altered minerals are possibly amphiboles. Zoning of plagioclase is weak and is homogeneous. Amphiboles are hornblende and also actinolite occurs which may be altered mineral.

Andesite-porphyry (A55T): This has clear porphyritic texture and the phenocrysts are single or aggregates of euhedral to subhedral plagioclase and coarse subhedral prismatic clinopyroxene closely associated with plagioclase. Plagioclase is weakly altered and relatively fresh, while the periphery of clinopyroxene is altered to chlorite or biotite. Glass inclusions are characteristic in plagioclase crystals. The matrix is cryptocrystalline and consists of acicular plagioclase and ameba-shaped quartz. Opaque minerals are medium-grained granular and fine-grained minerals in the matrix.

Dacite-quartz porphyry (A02T): Primary quartz phenocrysts (anhedral by corrosion), and small amount of plagioclase phenocrysts are observed. The rock is, as a whole, weakly sericitized. Mosaic quartz is dominant in the matrix and small amount of sericite is observed among the interstices. Pool aggregates of coarse mosaic quartz and vein quartz are developed in this rocks. The periphery of quartz phenocrysts is surrounded by secondary fine to micro-grained quartz. Also small amounts of chlorite and smectite are observed.



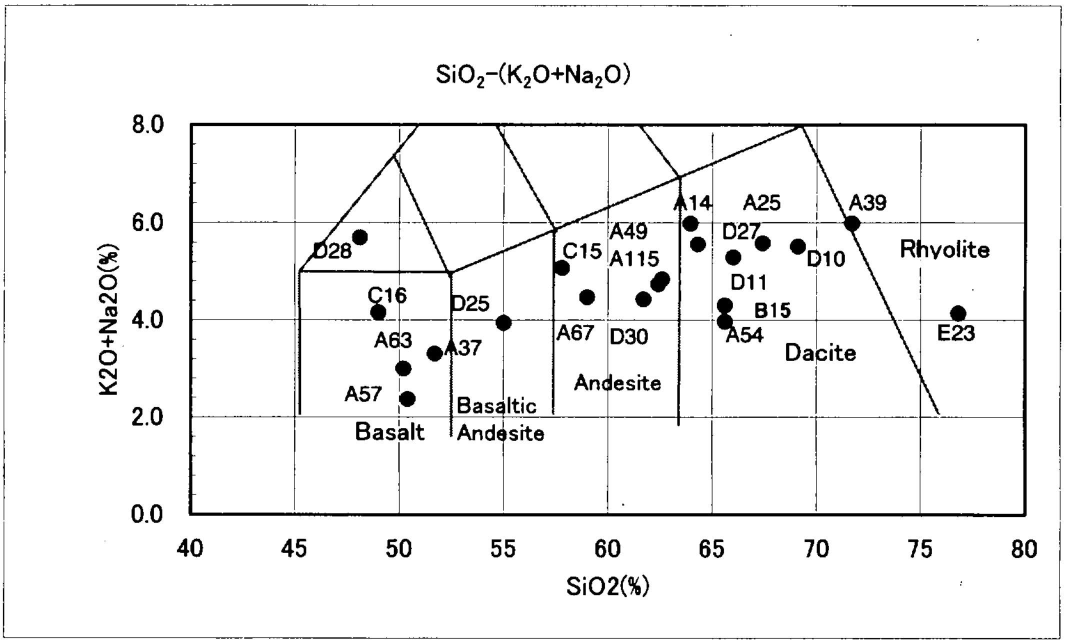


Table 2-12 Alkali-Silica Diagram of Volcanic Rocks in the Survey Area

3 - 5 Geologic Structure

The dominant geologic structure of the survey area trends in the NW-SE and NE-SW direction. Particularly large-scale structure consists of NE-SW faults, most notable of which is the Grendulu Fault, a left lateral fault cutting obliquely through the central part of the survey area. Parallel faults occur in the southern part of the area. There are many NW-SE faults, but their sense is not clear. Regarding fold structures, NE-SW fold is inferred to occur to the north of the Grendulu Fault while on the southern side the direction of the axis is closer to E-W or ENE-WSW.

The Tertiary System largely has E-W to ENE-WSW strike with low dip of less than 30°. Also existence of short wavelength gentle folds with E-W to ENE-WSW trending axis is inferred. But massive volcanic and pyroclastic rocks without bedding are dominant and bedded fine clastic rocks are rare in this area and clarification of the structure is difficult. But from the results of age determination and overall field observation such as distribution of alteration, the apparent structure appears to be, lower formations are distributed in the eastern part and the upper units in the western part of the survey area.

From the above fault and fold structures, it is believed that the structure of this area is controlled by the E-W trending structure of the Java Island. Namely the NE-SW and NW-SE faults and E-W folds are inferred to have formed by the N-S compressional field associated with the subduction of the Sunda Trench. Also the dip of the formations is generally low, and the occurrence of the Pliocene limestone is mostly limited to the southern part, and thus the folding activity after Late Oligocene is believed to have been relatively gentle.

3 - 6 Mineralization and Alteration

Mineralization occurs widely in the survey area with the exception of the Quaternary units. Particularly strong mineralization is observed in the zone from Grendulu River to Lorog River in the Grendulu Fault zone in the southern part of the survey area. Gold, silver, copper, lead, zinc bearing quartz veins occur in this zone. The wider veins containing chalcopyrite are, although low in gold grade, 1.6m and 1.9m wide Also pyrite dissemination, sericite-mixed layer clay minerals occur in this zone.

(1) Tegalombo-Slahung Prospect: The Grendulu Fault occurs along the road joining Ponorogo and Pacitan. Quartz veins are most developed along this fault in the survey area (Figs. 2-16 and 2-17). Also sericitization is observed in this zone. The vein samples show maximum of only 1.1g/t Au (rock chips). A 35cm-wide quartz vein containing chalcopyrite contains 2.2% Cu but the gold content is low. Thick veins with 1.6m and 1.9m widths contain a maximum of 0.1g/t Au, which is low. However, the average homogenization temperatures of the fluid inclusions are 186° C and 210° C, and as these are relatively low values, better conditions in the lower zones can be anticipated (salinity of 1 sample is 3.2%).

There is a skarn-type Kasihan Mineral Prospect to the southwest of the present prospect, and exploration had been carried out for copper and zinc. The mineralization of the present prospect is considered to have been lower temperature compared to that of Kasiha, and occurrence of epithermal deposits are expected (Fig. 2-18).

(2) Prospect to the south of Slahung: Although pyrite dissemination is developed on the surface here, the Au grades of the quartz veins at 3 localities are low at 42ppb and 56ppb (E10A, E13A). The distribution of sericitization and mixed-layer clay minerals indicates N-S extension for this mineralized zone.

(3) Lorog River Prospect: There are 2 alteration zones extending in the N-S~E-W and N-S directions respectively in the upper and lower reaches of the Lorog River. Kaolin minerals are observed in the downstream prospect and this is considered to have formed in relation to mineralization. A 10cm-wide pyrite-clay vein is associated with chalcopyrite and show Cu grade of 6.9% (F33A). White argillized and pyrite disseminated quartz porphyry intrusion is observed here. Fluid inclusions (A75F) in the quartz veins to the north of the Lorog River have somewhat high homogenization temperature of 250~319° C. There is a quartz porphyry-diorite intrusion in this prospect, and this may be related to mineralization (Figs. 2-19 and 20).

(4) East of Punung: Weak pyrite dissemination zones and quartz floats occur to the west of Kebonsari Prospect (existing concession), but mineral prospects were not discovered outside of the known concession. Mixed-layer clay minerals are the alteration minerals observed.

At the Kebonsari Prospect, gold is recovered from oxidized ores associated with quartz veins by small-scale open pit and underground mining. Samples of a 10cm-wide chalcopyrite-quartz vein were analyzed but the average gold content is low at 1.0g/t Au (Fig. 2-21).

(5) North of Candi-Pule Prospect: N-S trending quartz veins and silicified veins occur in the Candi-Pule Prospect. Check sampling of these veins was made during the course of the present survey and content of 4.4g/t Au and 1.2g/t Au were obtained from the Candi silicified vein (A40A) and Pule exposed vein (A45A) respectively. As and Cu geochemical anomalies were detected at NNE direction from the Candi-Pule Prospect. Also alunite and other acidic alteration minerals occur in alteration zones in the vicinity. Floats of quartz veins have been found to the north in the quaternary volcanic rock area in the eastern part of this area.

(6) Wonocoyo Prospect (geochemical anomaly zones): Au and Ag geochemical anomalies occur along the K. Konong drainage area. The Au grade of the quartz vein floats (F19A) was low (58ppb Au).

(7) Check samples from existing mining concessions

(a) Selogiri: Gold deposit associated with N-S trending pyrite-quartz veins (less than 10cm wide) in andesite (Fig. 2-22). There are at least 2 veins and extension in the strike direction is said to be 2km, but the worked zone is about 300m in length. The host rock is strongly disseminated by pyrite and altered by sericitization and chloritization. This is now being mined by a vertical shaft and adit at 20~40m below surface. The plunge of individual bonanza is in the dip direction and appears not to be continuous in the strike direction. The vein grade is said to be several tens to several hundred g/t Au. The maximum grade of the collected samples was, however, 2.0g/t (sampled in the adit). The ores are hand picked, ground by a small mill, and gold is recovered by amalgam method.

According to DMR documents, 5 holes with total of 820m were core-drilled, but the results are not shown. The reserves are calculated to be 206kg gold.

(b) Kedungwedi River Prospect: This known prospect could not be confirmed during the present survey, and there is a small gold mining operation confirmed to the east. Au anomaly was confirmed in 1 sample, but acidic alteration is distributed in the district.

(c) G. Gembes silicified rocks: There is a small hill protruding on the northern slope of the Mount Gembes. Andesitic tuff breccia has been silicified and the alteration is particularly strong near quartz veins. The size of the exposure is 1.6m wide and can be traced for 10m in the strike direction. The strike of the silicified rock is NW, but the attitude of the quartz veins is N45° E, 65° E, and the gold content is 10.9g/t Au. Sulfide minerals are oxidized, but their amount was probably small. Silicification is not observed in a tuff exposure 100m to the north. Also porphyry turned green by alteration is exposed.

(e) Gold mineralization at Randusari in the northern part of the survey area: Underground mining is carried out for gold in an existing mining concession. Host rock is andesite and is strongly disseminated by pyrite. The sample from near the shaft head contained 11.8g/t Au, but the details of the ore deposit are not clear.

The alteration minerals were identified in the field, and also at the base camp where a portable spectrometer was used. This was for reference purposes only and accurate identification was carried out on 100 samples by X-ray diffractometry in the laboratory.

Table 2-6 Specification of PIMA Spectrometer

Name	Integrated Spectronics PIMA Ⅲ (Portable Infrared Mineral Analyizer
Measured Wavelength	1,300～2,500nm
Sampling Interval	2nm
Control Computer	IBMlaptop computer
Software for Analysis	PIMA Viewer

Table 2-7 X-ray Diffractometry Conditions

Equipment	(1) Rigaku Electric RINT2100 (2) Max Science MO3XHF22E
Measured Angles	4° ～40°
Target (X ray Wavelength)	Cu (1.54056Å)
Slit Interval	1° – 1° – 0.15mm
Scanning Speed	2° /min

identified alteration minerals are shown in Table A-4. Of these the following minerals are considered to be related to mineralization. Sericite, mixed-layer clay minerals (smectite/sericite and smectite/chlorite), smectite, kaolin minerals (kaolinite), pyrophyllite and sulfate minerals (gypsum, alunite) and others. Chlorite and epidote are also considered to be a probable product of alteration related to mineralization.

・ Sericite: Sericite is often found in zones where mineralization is widely spread in the central southern part of the survey area.

- Mixed-layer clay minerals (smectite/sericite, smectite/chlorite): These minerals occur in zones overlapping or adjoining the distribution of sericite.
- Smectite: Smectite occurs paragenetically with mixed-layer minerals, but the distribution area is narrow.
- Kaolin mineral (kaolinite), pyrophyllite and sulfate minerals (gypsum, alunite): These minerals were detected in the western, eastern, and southern parts of the survey area, but the distribution is limited.

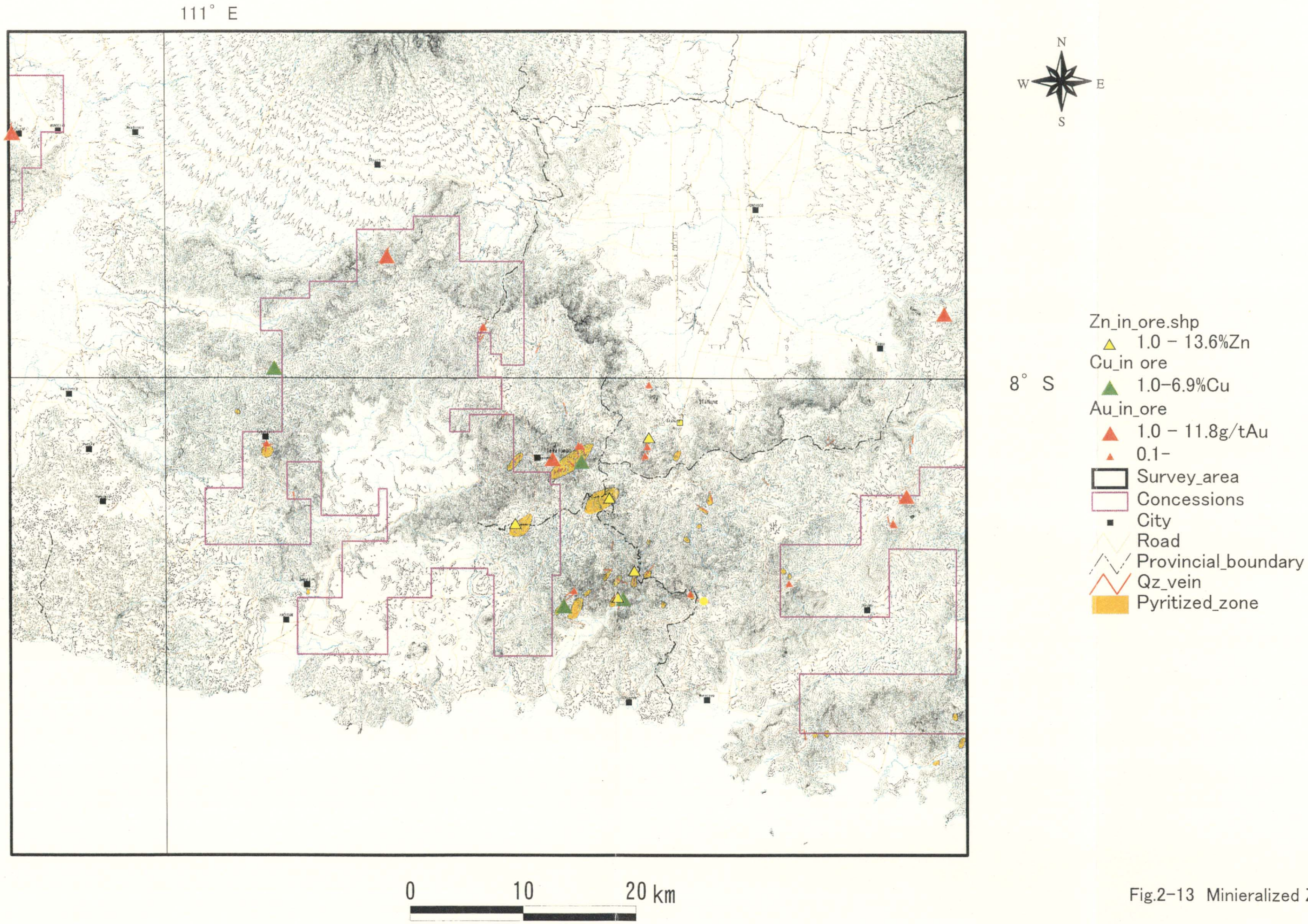
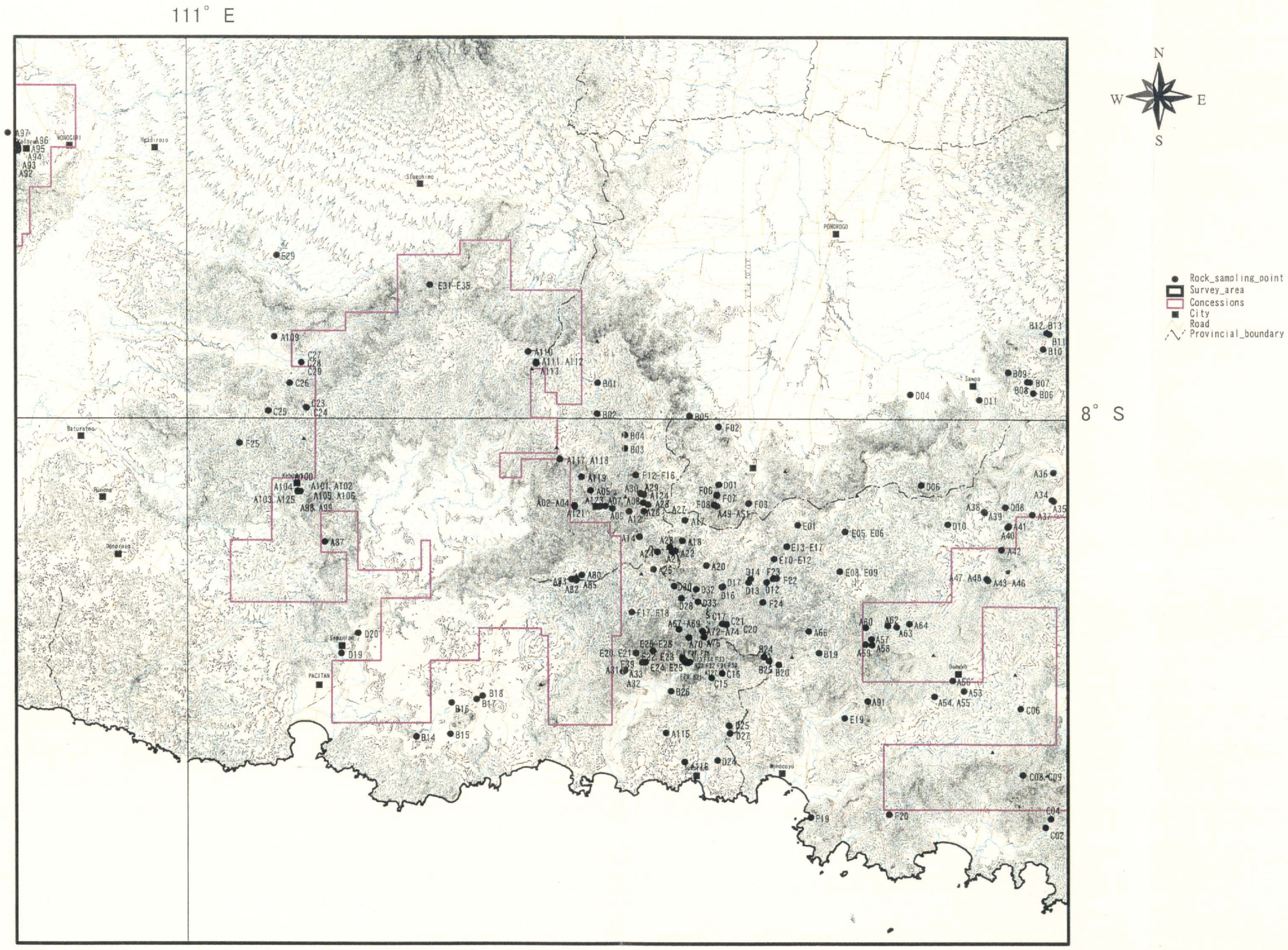


Fig.2-13 Minieralized Zones of the Survey Area



0 10 20 km

Fig. 2-14 Location Map of Rock Samples

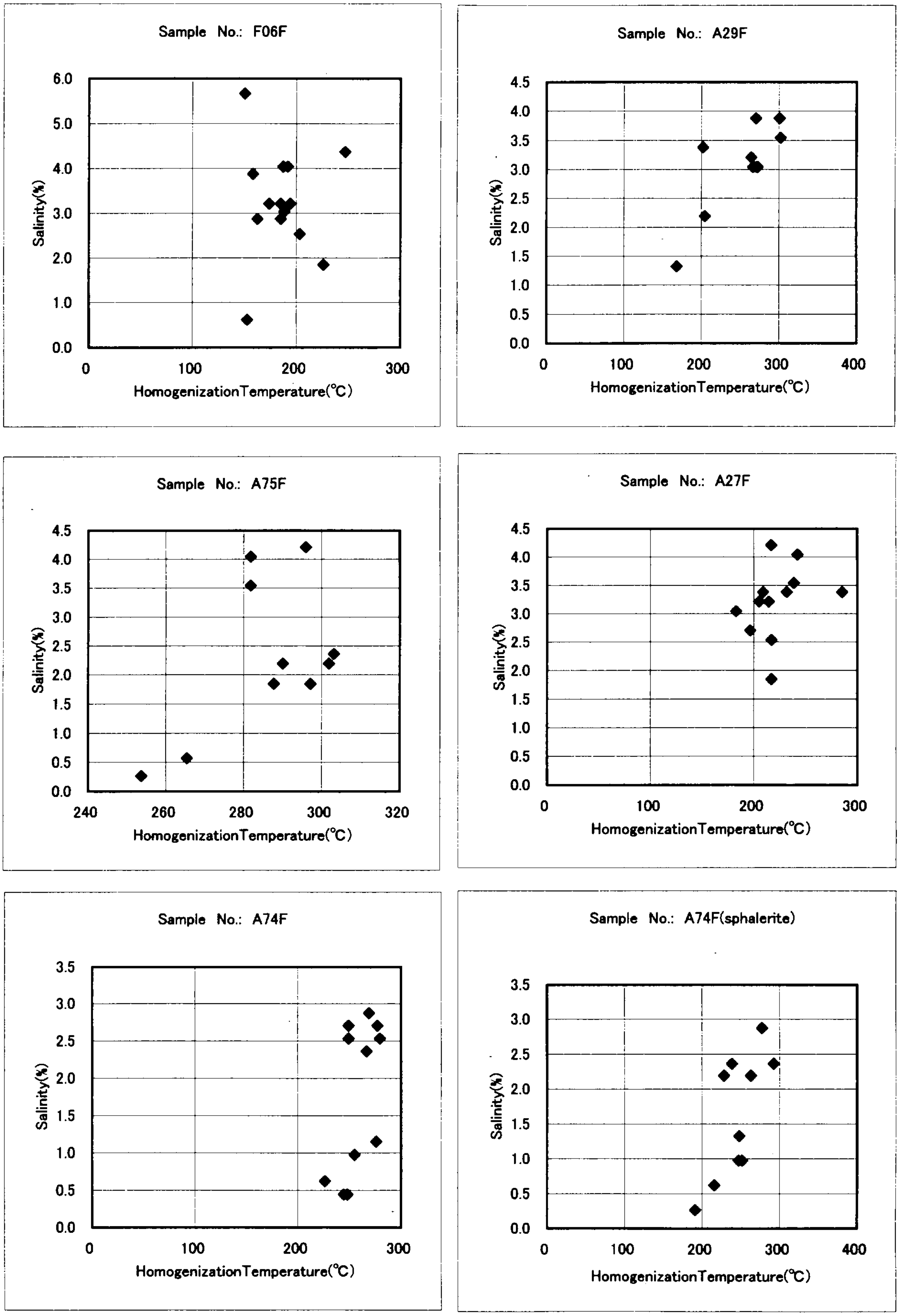


Fig. 2-15 Homogenization Temperatures and Salinities of Fluid Inclusions

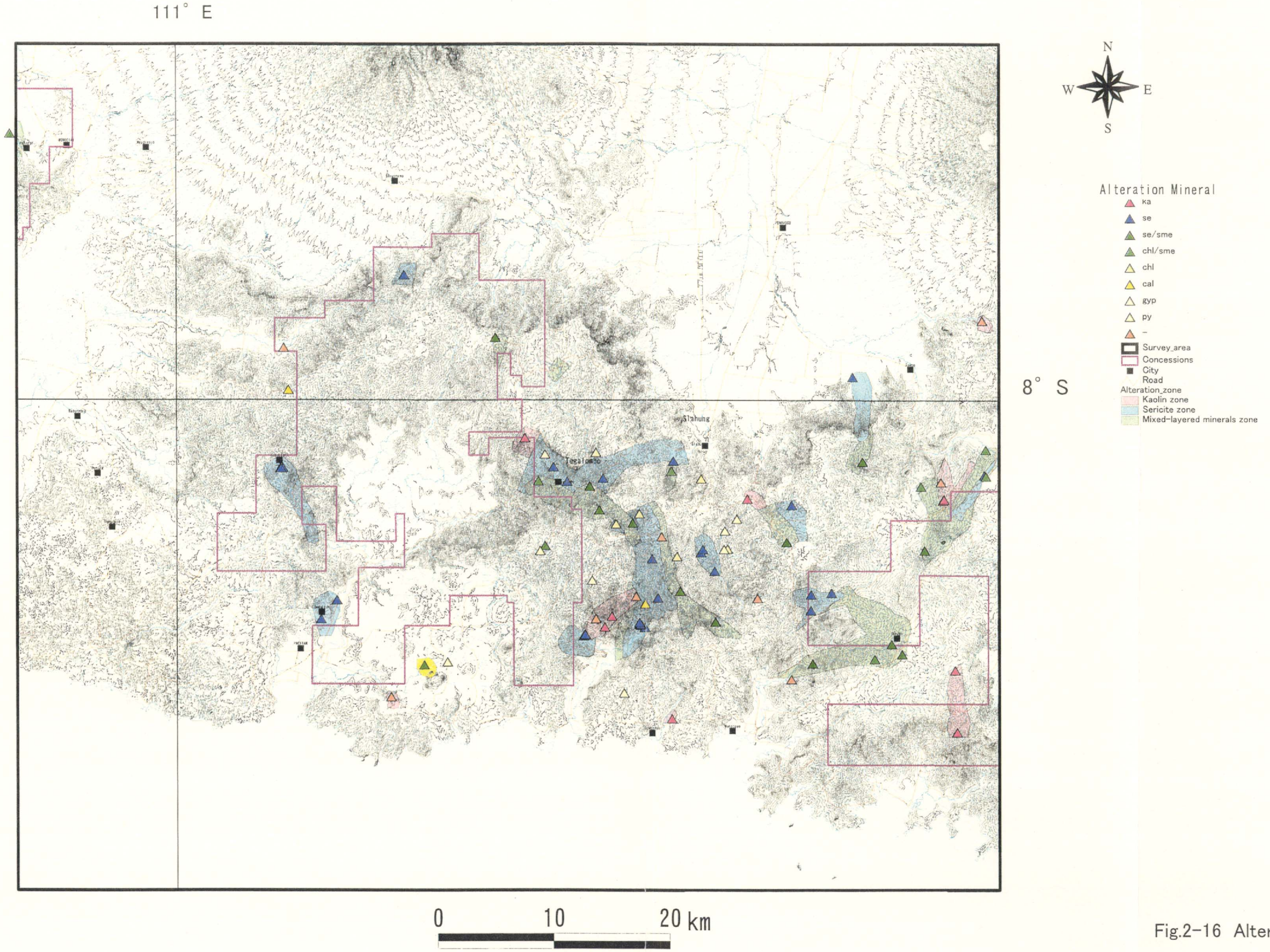
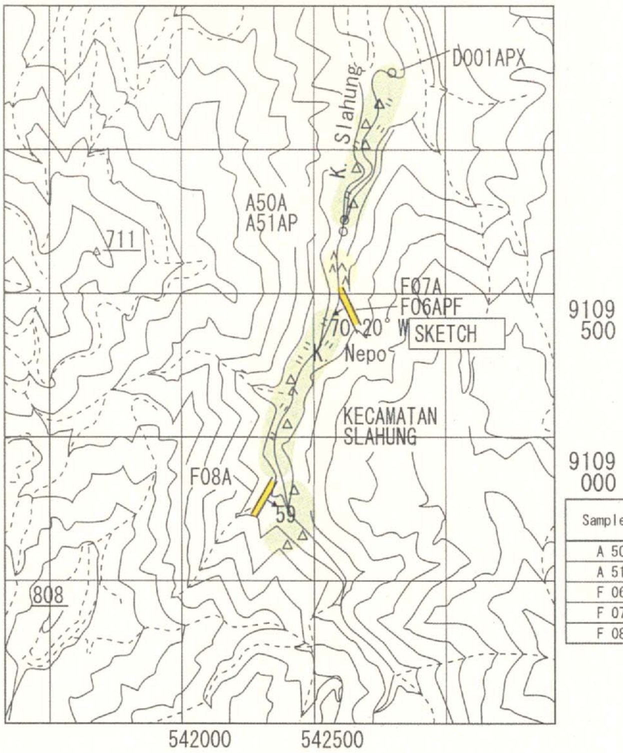


Fig.2-16 Alteration Map

K. Nepo Mineralized Area



Sample No.	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Sb (ppm)	Au (ppb)	Hg (ppb)	As (ppm)
A 50 A	117	184	589	3	1.25	16	404	<0.5
A 51 AP	379	145	48	4	1.0	20	250	4
F 06 APF	149	407	122	2	0.75	130	425	<0.5
F 07 A	99	144	441	2	2.5	48	325	<0.5
F 08 A	14	69	8	1	0.5	42	425	12

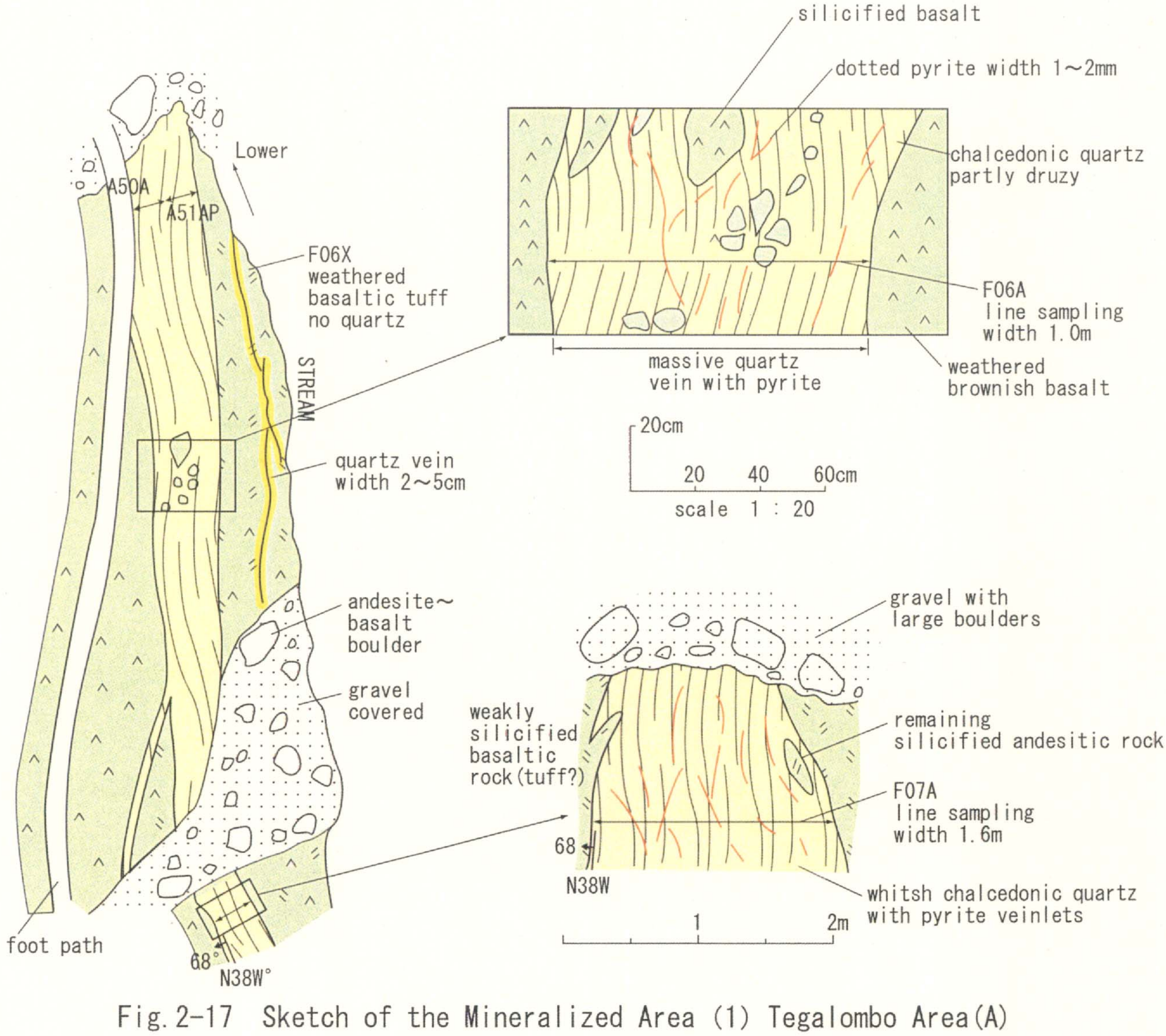
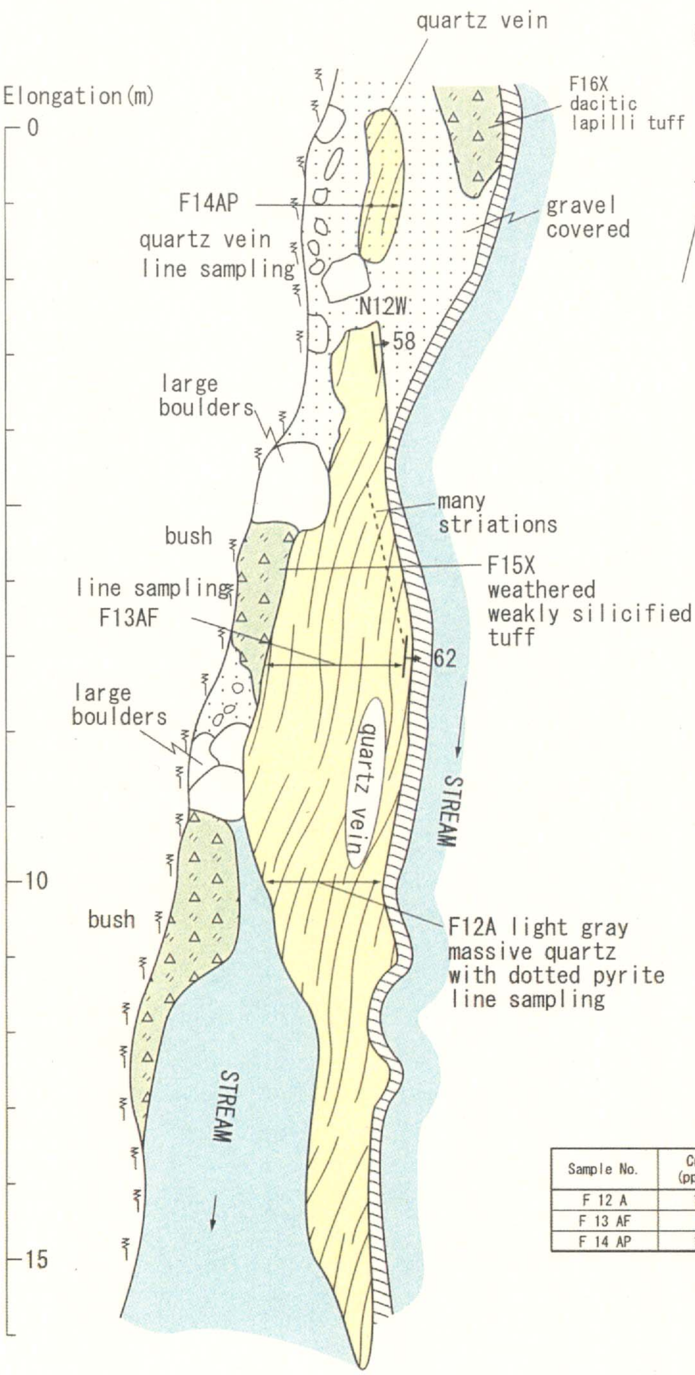
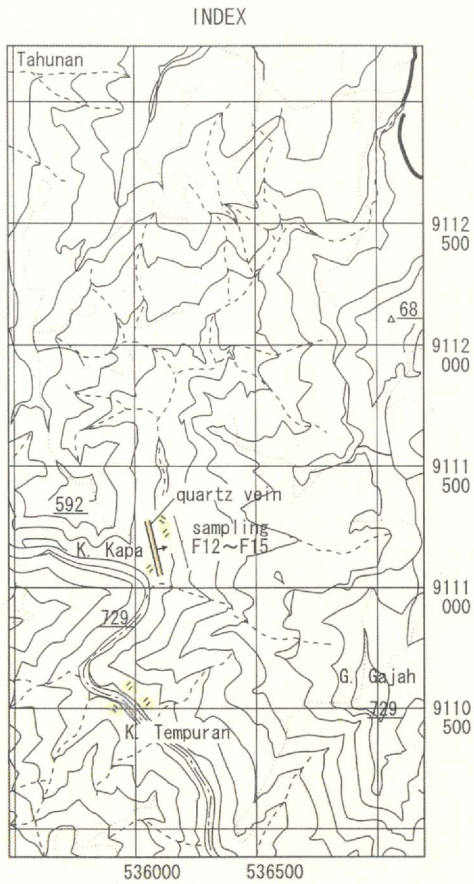


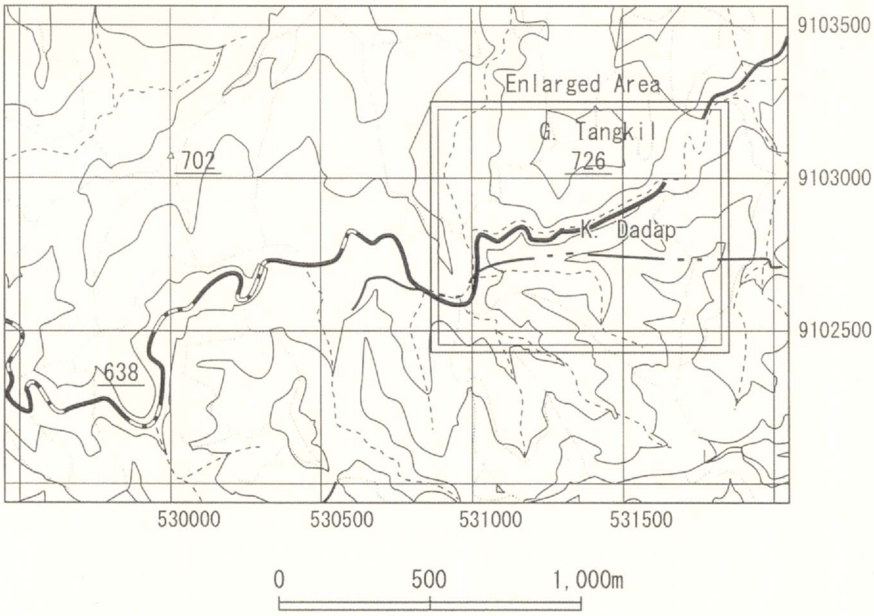
Fig.2-17 Sketch of the Mineralized Area (1) Tegalombo Area(A)





Sample No.	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Sb (ppm)	Au (ppb)	Hg (ppb)	As (ppm)
F 12 A	1441	47	177	4	1.0	52	75	4
F 13 AF	568	47	454	4	0.75	46	0.1	<0.5
F 14 AP	1375	127	964	3	1.25	42	0.1	<0.5

Fig. 2-18 Sketch of Mineralized Zone (2) Tegalombo Area (B)



Sample No.	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Sb (ppm)	Au (ppb)	Hg (ppb)	As (ppm)
A 82 AP	94	12	2253	2	<0.5	16	2925	16
A 83 AP	281	357	11210	6	1.25	30	793	12

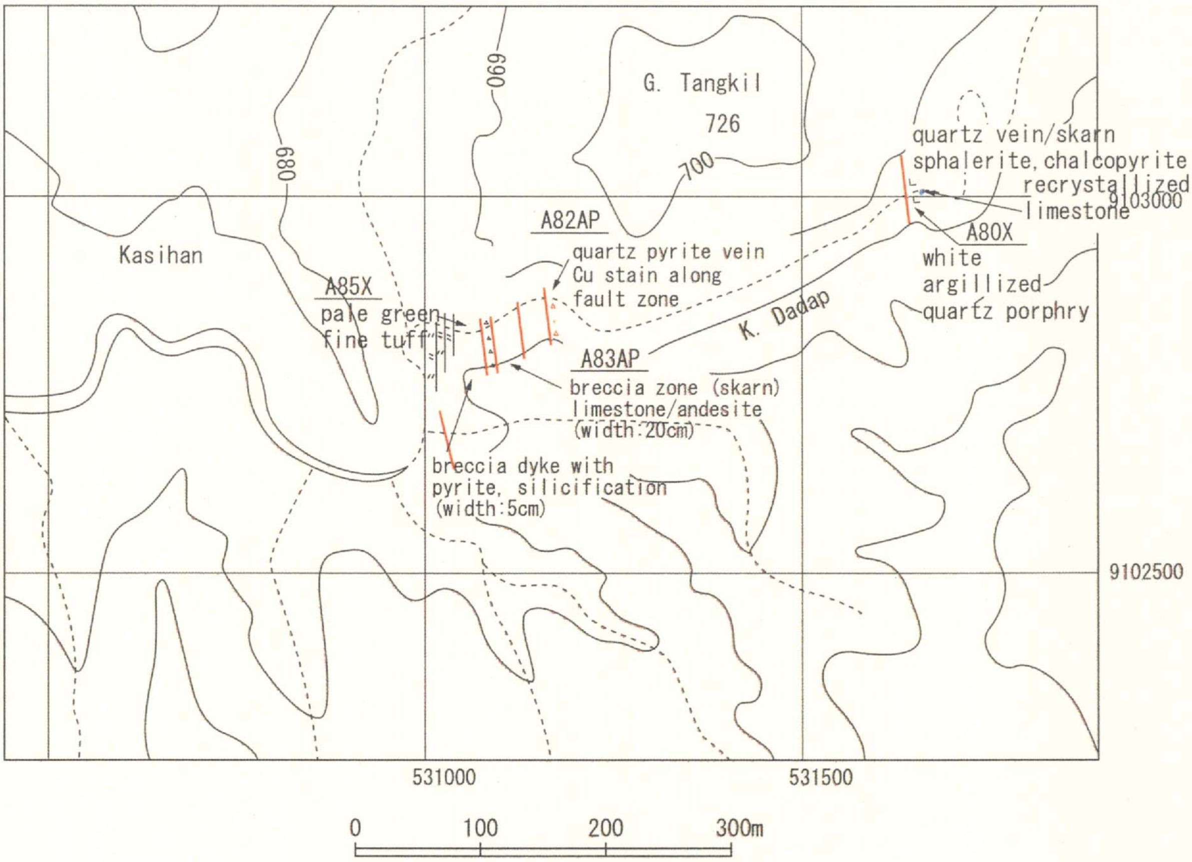
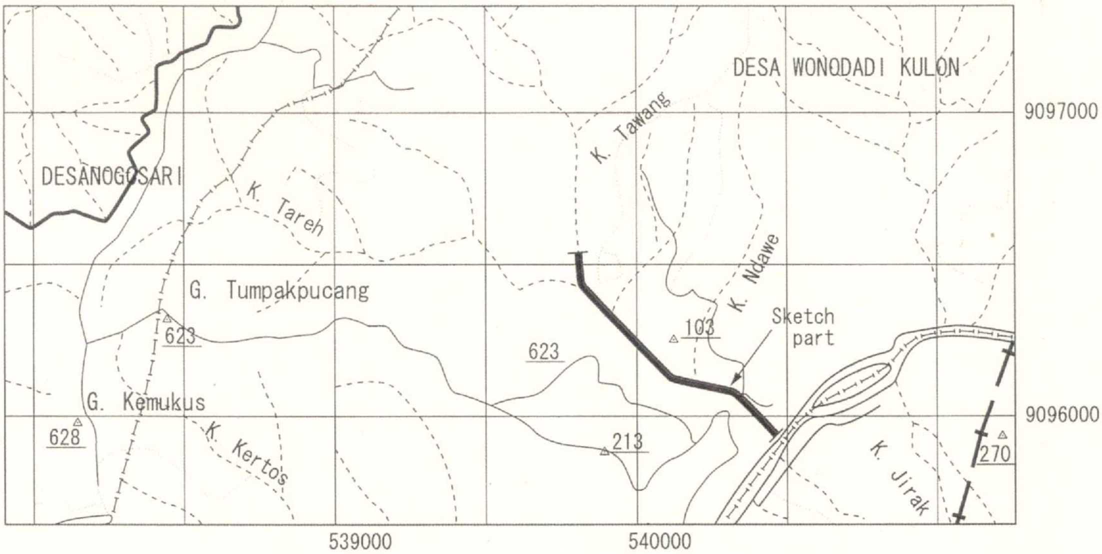


Fig. 2-19 Sketch of Mineralized Area (3) Kasihan Area



Sample No.	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Sb (ppm)	Au (ppb)	Hg (ppb)	As (ppm)
B 21 APX	20	48	96	2	1.25	42	250	24
B 23 APX	36	79	151	3	0.5	116	250	580
F 29 A	857	20	12	6	1.5	52	175	4
F 31 AX	865	4598	14160	18	1.25	288	1725	64
F 34 A	75	63	422	3	1.5	44	0	48
F 35 A	11	34	164	2	1.25	50	75	
F 38 A	68	43	408	5	1.0	58	0	88

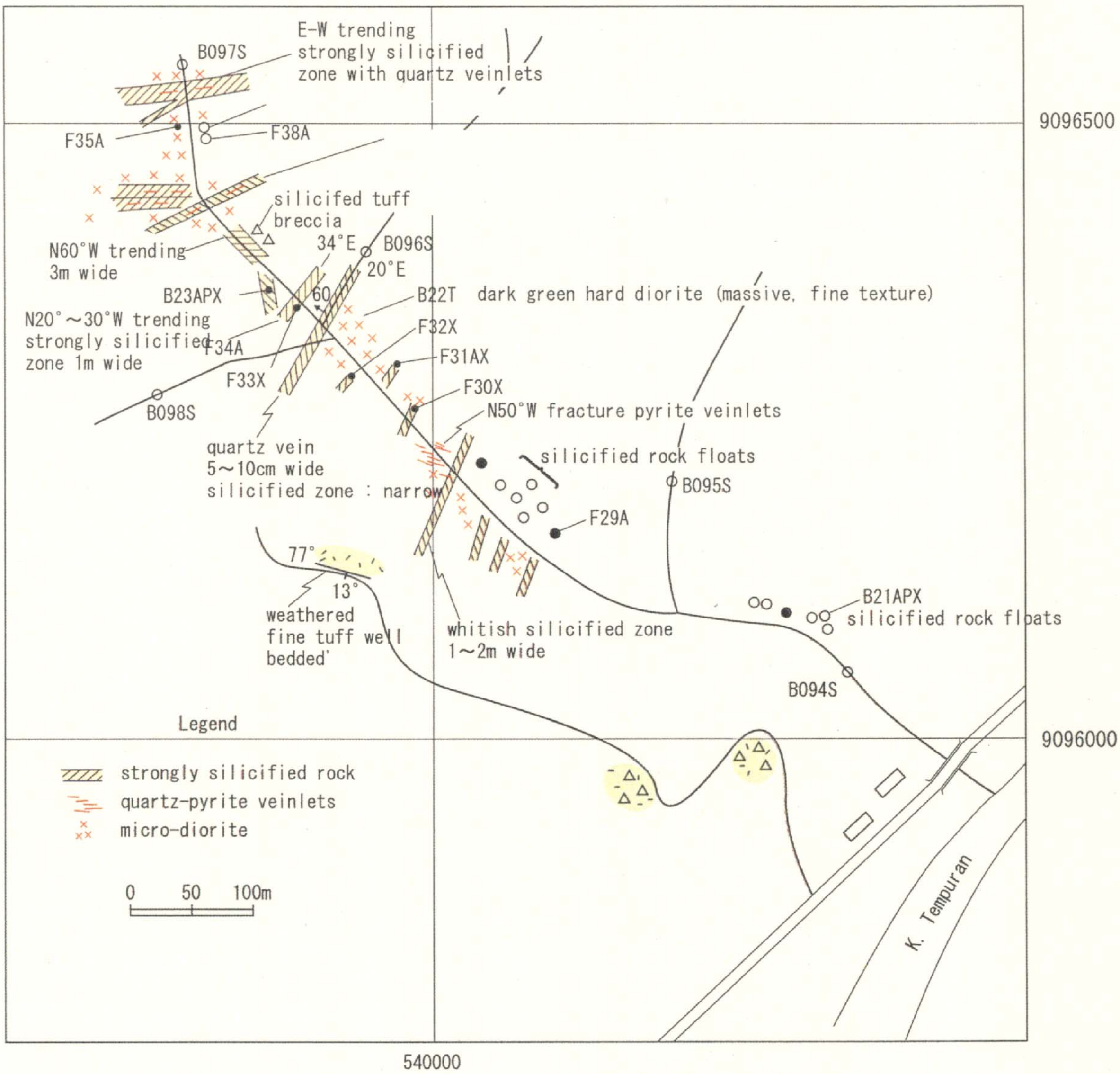
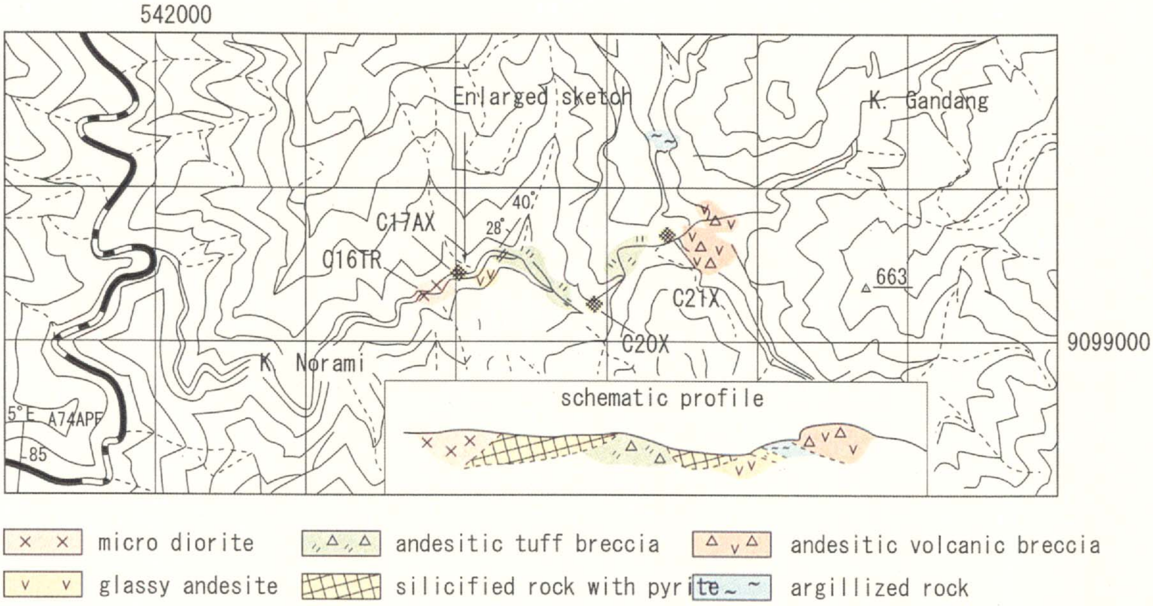


Fig. 2-20 Sketch of Mineralized Area (4) Lorog River Area (B)

K. Ngrami ~ K. Gandang Mineralized Area



Sample No.	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Sb (ppm)	Au (ppb)	Hg (ppb)	As (ppm)
A 74 APF	561	671	16960	4	1.25	78	942	24
C 17 AX	20	64	29	3	1.0	40	2075	4

Enlarged sketch (vertical profile)

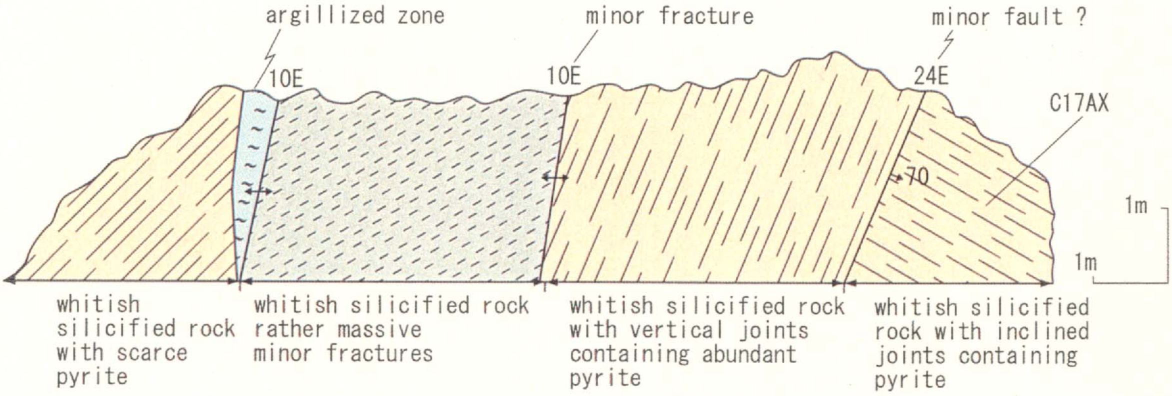
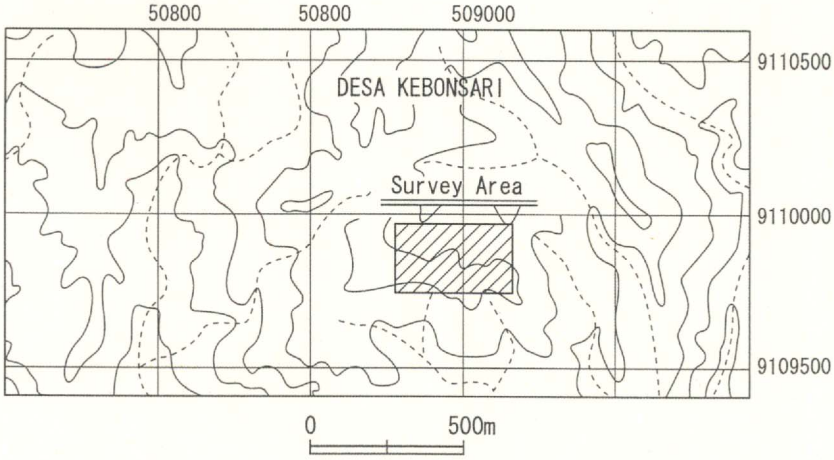
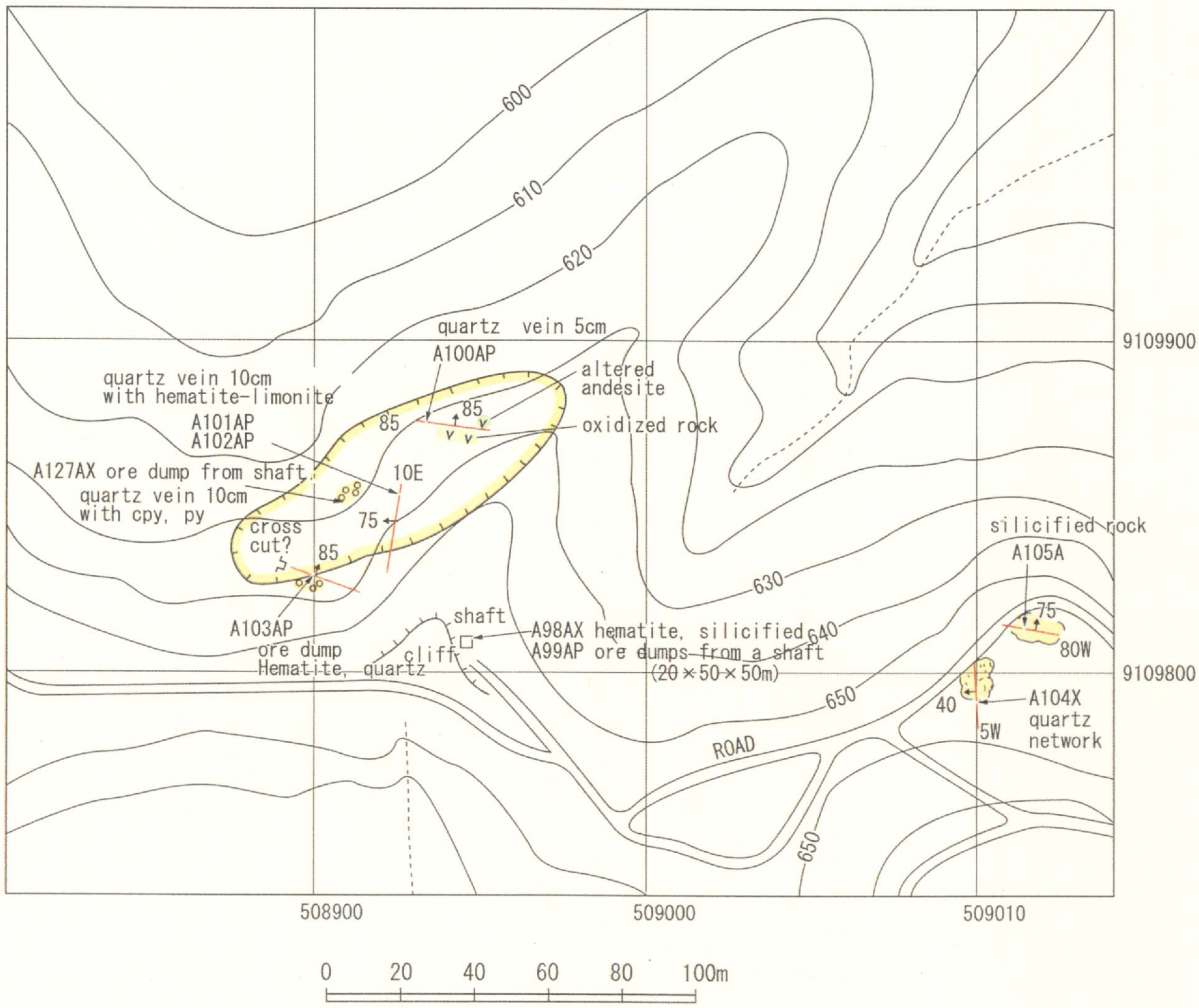


Fig. 2-21 Sketch of Mineralized Area (5) Lorog River Area(B)



Sample No.	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppb)	Sb (ppm)	Au (ppm)	Hg (ppb)	As (ppm)
A 98 A	16	14	26	2	1.25	18	981	<0.5
A 99 A	10	22	19	2	1.25	14	212	4
A 100 AP	558	18	39	2	1.5	700	226	8
A 101 A	3126	45	27	3	1.0	434	302	8
A 102 A	1219	17	73	2	2.0	28	906	4
A 103 AP	43	6	8	2	0.75	68	283	12
A 105 A	726	25	40	3	4.0	18	1340	4
A 127 A	23640	115	128	69	1.0	170	113	<0.5



Near Kebonsari

Fig. 2-22 Sketch of the Mineralized Area (6) Punung Area

Sample No.	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Sb (ppm)	Au (ppb)	Hg (ppb)	As (ppm)
A 92 A	226	169	1938	5	1.0	52	9135	56
A 93 A	30	52	82	6	1.0	970	208	20
A 94 A	20	73	69	10	1.75	1985	189	20
A 95 A	14	48	72	5	1.0	128	226	4
A 96 A	26	75	2093	5	1.0	376	1415	8

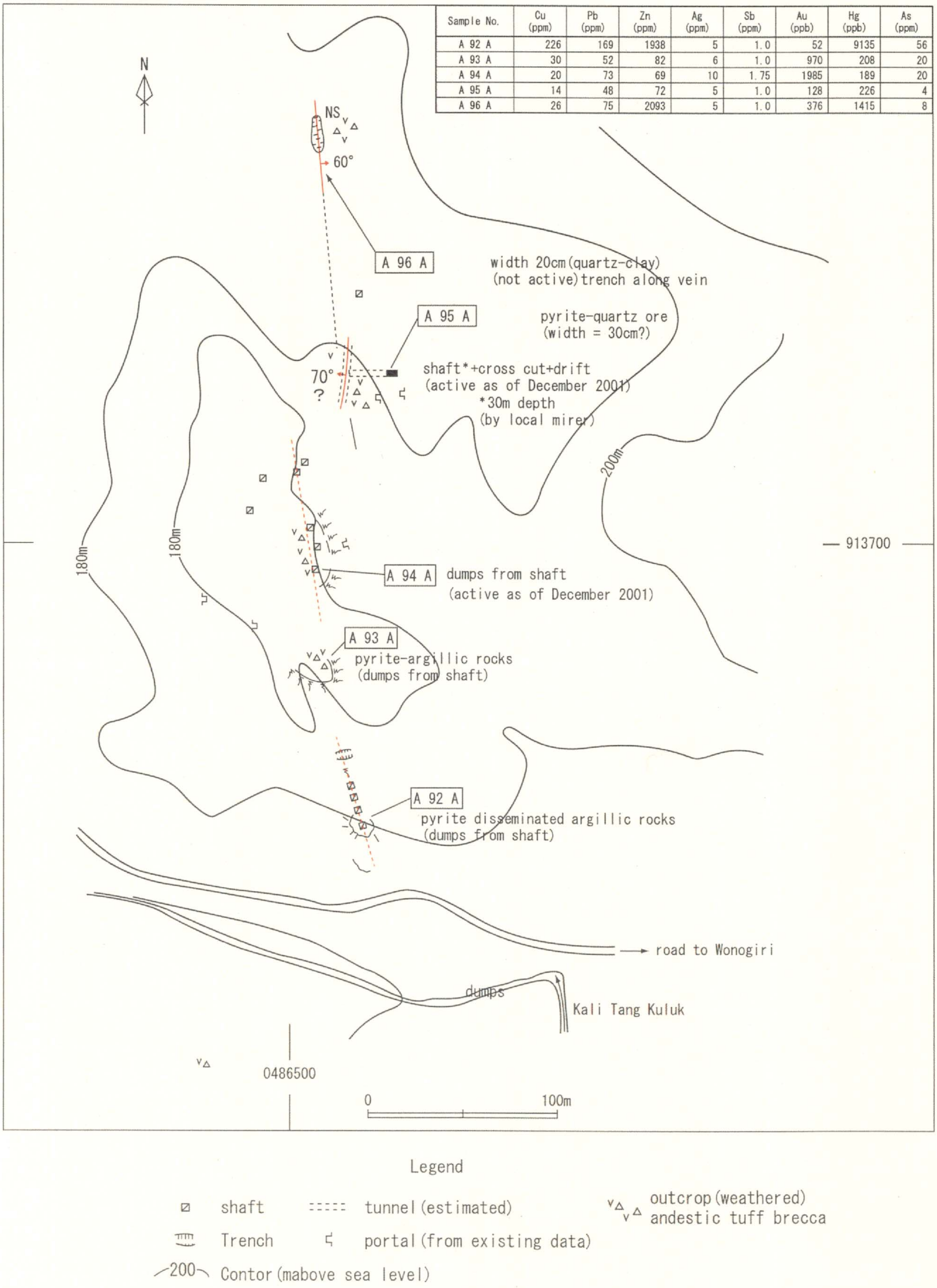


Fig. 2-23 Sketch of the Mineralized Area (7) Selogiri Area