of metamorphc rocks and granodiorite. They are fissure filling of shear fracture. There are no record of the distribution regulation type 3(NE system).

The results of the present survey shows that No.5 of type 3 (NE system) is considered to be the fissure filling of shear fracture since it is the alteration vein of sheared rock, however there are no sign that other systems(type 1, 2) suffered a shear. The widely distributed field of stress prior to the formation of quartz vein groups has its main stress running in E-W direction and the shear fracture occurred in NE system runs at an angle of 45 degrees to the main stress is represented by No. 5. The main vein and E-W system quartz veins of type 2 (NNW system) seems to be created along the tension fracture that occurred in the right angle to and nearly parallel to the main stress.

It may further be assumed that the dyke rocks such as quartz porphyry and lamprophyre had been regulated by the same field of stress although subject to the period of intrusion.

The distribution of quartz veins at the contact part of heterogenic rock may show that, even in the same field of stress, fractures are likely to occur.

1-3 Analysis and test

Analysis and test in a semi-detailed survey include the thin sections of rocks, X-ray diffraction, chemical analysis of rocks and ores, polished sections of ores and the radioisotopic dating.

On the other hand, the following detailed survey include the thin sections of rocks, X-ray diffraction, chemical analysis of ores, the polished sections of ores, radioisotopic dating of altered minerals and measurement of the homogenization temperature of fluid inclusions.

Some of the above are associated to both of the semi-detailed and detailed geological survey in describing. They are classified as follows and part of them is globally described. The results of the analysis and test of the drilling survey will be discussed in each chapter with exception of the measurement of the homogenization temperature of fluid inclusions.

Items described in this chapter are,	**Items described in the chapter of detailed survey**
Thin sections of rocks (global description)	X-ray diffraction of specimens sampled across quartz vein
X-ray diffraction (global description)	Chemical analysis of ores (global description)
Chemical analysis of rocks	Polished sections of ores (global description)
Radioisotopic dating	Measurement of the homogenization temperature of fluid inclusions.

1. Thin sections of rocks

Number of specimens: 32 in semi-detailed survey area

22 in detailed survey area

The results of the identification of the both areas are shown globally in Table II-1-2. The major findings are as discussed in the geological description (1-1 through 1-4).

2. X-ray diffraction of powder

Number of X-ray diffraction: Semi-detailed survey area: 22

Detailed survey area: 51

The thin sections of rocks are in general subjected to the x-ray diffraction test. The conditions of the X-ray diffraction are shown in Table II-1-3 and the results of mineral identification for the both area are shown together in Table II-1-4. For the quantitative description of mineral identified, quartz index from the calculation formula by Masao Kobayashi is used.

Table II-1-3 Conditions of X-ray diffraction

Item	Specification
X-ray diffraction analyzer	Geiger flex (RIGAKU DENKI Ltd.)
Counter cathode	Cu
Filter	Ni
Tube voltage	30 KV
Tube current	15 mA
Full scales of count	2000 cps
Time constant	1 sec
Scanning speed	2° /min
Recorder speed	2 cm/min
Divergence slit	1°
Scatter slit	1°
Receiving slit	0.3mm
Scanning range	$2\theta = 2 \sim 40°$

Identified alteration minerals are sericite, chlorite, smectite and calcite. Kaoline, pyrophillite and alunite that are characteristic to gold veins were not detected. Sericite are sometimes hard to distinguish from muscovite of rock-forming minerals. Rocks distributed in the region were subjected to the X-ray diffraction for several pieces of each kind of rock, the results of which were already described in the description of geology (1-1through 1-4). The summary for the entire region is as follows.

Sericite and chlorite were mostly found in gneiss excluding crystalline limestone. Chlorite, sericite (including rock form muscovite) were detected in two-mica granodiorite and biotite adamellite with a few exception.

Diorite has hardly shown a sign of being altered with the naked eye but some specimens were

Table Ⅱ-1-2 Result of microscopic observation of thin section (Semidetailed-detailed area) (1)

No.	Sample #	GPS Cordinate		Rock name	Mineral assemblages																	Texture	Alteration
		Longit.46N	Latit.100E	(determined)	Qz	Pl	Kf	Bi	Ms	Ho	Au	Hy	Ol	Cc	Ser	Chl	Ep	Gt	Sph	Apt	Opq		
1	960806004	9.12	10.37	Bi-Ms-Admlt	◎	◎	○	○	○										△			Holocrystalline equigranular	±: Argillization
2	960813038	8.25	9.04	Qz-vein	◎	·															·		
3	960818008	8.45	9.51	Ms-Gr-Dr	◎	·	·		·														+: Silicification
4	960820011	9.12	7.40	Bi-Gr-Dr	◎	◎	△	△												·			
5	960820014	9.05	7.37	Bi-Qz-Hobdt			△	△		◎					·	·	·			·	·		±: Argillization
6	960822008	8.63	6.10	Gt-Ampblt	△	△				◎								○			·		+: Regional metam.
7	960822012	8.43	6.04	Pegmt	◎					○													−: Argillization
8	960827013	8.11	9.42	Bi-Ms-Gr-Dr	◎	◎	△	△	△													Holocrystalline equigranular	±: Argillization
9	960827039	7.91	9.50	Qz-vein	◎									△									+: Silicification
10	960902023	7.56	11.96	Lamprophyre?																		Aphyric	+: Silicification
11	960902028	7.20	12.40	Gt-Bi-Admlt	◎	○	◎	△										△				Holocrystalline equigranular	
12	960902029	7.20	12.40	Psamt-Gneiss	◎	◎		△	△											·		Gneissose	+: Argillization
13	960902030	7.20	12.40	Psamt-Gneiss	◎	◎	○	△	△													Gneissose	+: Argillization
14	960902034	6.93	12.30	Au-Hy-Dr		◎	△	△		○	△	○									△	Holocrystalline hypabissal	
15	960902040	6.68	12.47	Bi-Porphrt	△	◎	△	◎												△	△	Porphyritic, subophytic	
16	960908015	7.43	10.88	Altered Rock	◎									△							·		+: Silicification
17	960908052	8.75	7.78	Bi-Admlt	◎	◎	◎	○							·	·	·		·	·	·	Holocrystalline equigranular	±: Argillization
18	960911018	7.32	11.91	Psamt-Gneiss	◎	◎	◎	△										△				Gneissose	−: Argillization
19	960918031	8.67	10.25	Ms-Admlt	◎	◎	◎		○													Equigranular	−: Argillization
20	960918033	6.10	11.44	Psamt-Gneiss	◎	◎								·		·	·		△	△			+: Argillization
21	960918034	6.54	13.16	Psamt-Gneiss	◎	◎		△	○									△		△	△		+: Argillization
22	960918035	6.61	12.22	Au-Hy-Dr	○	◎	○	○		○	○	○										Holocrystalline hypabissal	
23	960918037	7.00	12.64	Psamt-Gneiss	◎	◎	◎	△	△														±: Argillization
24	960918038	7.27	11.04	Qz-Porphyry	◎	◎	△																+: Argillization
25	960918041	7.53	11.96	Hornblendite		○			·	◎									·	·	○		−: Argillization
26	960918043	8.78	11.67	Bi-Admlt	◎	◎	◎	○	·												·	Holocrystalline equigranular	
27	960921005	8.45	10.72	Lamprophyre			△				△	△	△								△	Holocrystalline	
28	960921006	8.68	10.97	Qz-Porphyry	◎																		±: Argillization
29	960921007	9.04	11.81	Bi-Admlt	◎	◎	◎	△									△				·	Holocrystalline equigranular	±: Argillization
30	960921011	8.99	12.60	Bi-Admlt	◎	◎	◎	○	△													Holocrystalline equigranular	±: Argillization
31	960921014	8.47	12.66	Marble	·				·					◎							·	Saccharoidal	
32	960921019	8.42	12.84	Bi-Admlt	◎	◎	◎	○	△													Holocrystalline equigranular	
33	960921037	7.47	12.65	Gr-Porphyry	◎	○	◎	△	·									·				Porphyritic	
34	960921038	7.47	12.65	Psamt-Gneiss	◎	○		△													△		±: Argillization
35	960921039	7.47	12.65	Ms-Gneiss	◎	○	◎	△	△													Porphyroblastic gneissose	
36	960921049	6.89	12.82	Qz-Dr-Porpry		△																Holocrystallin felsitic	+: Silicification
37	960921050	6.96	12.80	Qz-Dr-Porpry	○	○																Porphyritic felsitic	+: Silicification
38	960921055	6.07	11.47	Psamt-Gneiss	◎	○	△	△											·	·		Gneissose	±: Argillization
39	960921067	8.12	12.56	Bi-Admlt	◎	◎	◎	△														Equigranular	±: Argillization

*◎: abundance ○: common △: minor ·: rare +: strong ±: medium −: weak GPS:global positioning system Longit.:longitude Latit.:latitude

Abbreviation of rock and mineral name

Adamlt:adamellite Gr-Dr:granodiorite Hobdt:hornblendite Ampblt:amphibolite Pegmt:pegmatite Psamt:psammitic Pelit:pelitic Bi:biotite Ms:muscovite Qz:quartz Gt:garnet Au:augite Hy:hypersthene Pl:plagioclase Kf:potassium feldspar Ho:hornblende Ol:olivine Cc:calcite Ser:sericite Chl:chlorite Ep:epidote Sph:sphene Apt:apatite Opq:opaque mineral metam.:metamorphism

Table Ⅱ-1-2 Result of the microscopic observation of thin section (Semidetailed-detailed area) (2)

No.	Sample #	GPS Cordinate Longit.46N	GPS Cordinate Latit.100E	Rock name (determined)	Mineral assemblages Qz	Pl	Kf	Bi	Ms	Ho	Au	Hy	Ol	Cc	Ser	Chl	Ep	Gt	Sph	Apt	Opq	Texture	Alteration
40	960921073	8.25	9.35	Bi-Ms-GR-Dr	◎	◎	○	△	○								·					Equigranular	±: Argillization
41	960921074	8.04	9.65	Bi-Ms-GR-Dr	◎	◎	○	△	○													Equigranular	±: Argillization
42	960921075	7.63	9.16	Adamellite	◎	◎	◎	△	△									△				Equigranular	±: Argillization
43	960921076	7.61	9.14	Marble	△				△												·	Saccharoidal	
44	960923001	8.59	6.51	Basalt		·	·				△		○								△	Porphyritic	
45	960923004	8.51	6.43	Amphibolite	△	△				◎											·		—: Argillization
46	960923006	8.44	6.38	Pelit Gneiss	○			△	○							○					△		+: Argillization
47	960923018	7.93	7.02	Marble	△				△					◎								Saccharoidal	
48	960923019	7.93	7.13	Bi-Gneiss	◎	◎	○	·													·	Porphyroblastic gneissose	±: Argillization
49	960923020	7.83	7.32	Porphyrite		◎				○												Porphyritic	—: Argillization
50	960923024	7.86	7.61	Psamt-Gneiss	◎	○	△	△			○						△		△			Gneissose	—: Argillization
51	960924012	8.03	11.75	Bi-Ms-GR-Dr	◎	◎	○	○	○													Equigranular hypabissal	
52	960924013	8.03	11.75	Bi-Qz-Dr	◎	◎		○	○													Equigranular hypabissal	+: Argillization
53	960924014	8.03	11.75	Psamt-Gneiss	◎	◎	△	○			○								·			Gneissose	
54	960924015	8.03	11.75	Ms-Gneiss	◎	◎	◎		○													Porphyroblastic gneissose	+: Argillization

*◎: abundance ○: common △: minor ·: rare +: strong ±: medium —: weak GPS:global positioning system Longit.:longitude Latit.:latitude

Abbreviation of rock and mineral name

Adamlt:adamellite Gr-Dr:granodiorite Hobdt:hornblendite Ampblt:amphibolite Pegmt:pegmatite Psamt:psammitic Pelit:pelitic Bi:biotite Ms:muscovite Qz:quartz Gt:garnet Au:augite Hy:hypersthene Pl:plagioclase Kf:potassium feldspar Ho:hornblende Ol:olivine Cc:calcite Ser:sericite Chl:chlorite Ep:epidote Sph:sphene Apt:apatite Opq:opaque mineral metam.:metamorphism

Table Ⅱ-1-4 Result of X-ray diffraction (semidetailed-detailed area) (1)

No.	Sample	GPS Cordinate		Rock name	Mineral assemblages															
		Longit.46N	Latit.100E		Ch	Ser	Sm	K	Ca	Qz	Pl	To	Ab	Kf	Bi	Hb	Hy	Aug	Do	An
1	960806004	9.12	10.37	Bi-Ms-Adamellite	<1	3			<1	41			20	11						
2	960813038	8.25	9.04	Qz-vein		<1				100			<1							
3	960818008	8.45	9.51	Qz-vein		<1				100			7	1						
4	960820011	9.12	7.40	Bi-Gr-Dr	<1					28	9			8	3					
5	960820014	9.05	7.37	Bi-Qz-Hornblendite	1					4			4	<1		8				
6	960822008	8.63	6.10	Gt-Amphibolite	2			<1		10			8			21				
7	960822012	8.43	6.04	Pegmatite	2					10		4	5							
8	960827013	8.11	9.42	Bi-Ms-Gr-Dr	1								20	10						
9	960827039	7.91	9.50	alt-vein					4	6										
10	960827040	8.14	9.42	alt-vein		<1			<1	6										
11	960902034	6.93	12.30	Au-Hy-Porphyrite						7	3				3	2	1	2		
12	960902040	6.68	12.47	Bi-Porphyriteor)	7	4			1	13			20				3			
13	960908015	7.43	10.88	alt-vein		1			2	6										
14	960908052	8.75	7.78	Bi-Adamellite	3	5				29			2	3						
15	960911059	6.58	12.49	Au-Hy-Porphyrite	1	<1							2							
16	960918031	8.67	10.25	Ms-Adamellite				5				7			20	4				
17	960918033	6.10	11.44	Psammitic Gneiss	2		2						9			1				
18	960918034	6.54	13.16	Psammitic Gneiss	<1	4			<1	32			15	9						
19	960918035	6.61	12.22	Au-Hy-Porphyrite						8	21				3	2	21	<1		
20	960918038	7.27	11.04	Qp-Porphyry		6		6		33			11	2						
21	960918041	7.53	11.96	Hornblendite	2	2		2					4			16				
22	960918043	8.78	11.67	Bi-Adamellite	1	5		5		31			20	8	5					
23	960921005	8.45	10.72	Lamprophyre dyke	3					6	6					3				
24	960921006	8.68	10.97	Qp-Porphyry dyke		8				34			2							
25	960921007	9.04	11.81	Bi-Adamellite	<1	2		<1		26			11	6						
26	960921011	8.99	12.60	Bi-Adamellite	4	2				17			20	7						
27	960921019	8.42	12.84	Bi-Adamellite	<1			<1	<1	30			13	9	2					
28	960921037	7.47	12.65	Gr-Porphyry	1	3			1	26			20	21						
29	960921038	7.47	12.65	Psammitic Gneiss	2	2				42				<1		2			1	
30	960921039	7.47	12.65	Ms-Gneis		3		<1	1	33			11	21						
31	960921050	6.96	12.80	Au-Hy-Porphyrite	3	1				21			20	7						
32	960921067	8.12	12.56	Bi-Adamellite	3	2			2	27	12			3						
33	960921073	8.25	9.35	Bi-Ms-Gr-Dr	1	2			<1	26			14	5						
34	960921074	8.04	9.65	Bi-Ms-Gr-Dr	1	2				27			20	8						
35	960921075	7.63	9.16	Adamellite	2				31			20	15	2						
36	960923001	8.59	6.51	Basalt-dyke							4						3	5		<1
37	960923004	8.51	6.43	Amphibolite	<1			<1		3			2			21				
38	960923006	8.44	6.38	Pelitic Gneiss	11	13				15			2							
39	960923018	7.93	7.02	Marble		<1			87	1										
40	960923019	7.93	7.13	Bi-Gneiss	<1	2			<1	25			12	21						
41	960923020	7.83	7.32	Porphyrite dyke	1	<1				17			20	4						
42	960924001	7.98	11.35	Bi-Ms-Gr-Dr	2	2				29			20	13	2					
43	960924002	7.98	11.39	Bi-Ms-Gr-Dr	<1	4		<1	1	31			20	14						

Gr-Dr:granodiorite Ms:muscovite Gt:garnet Ch:chlorite Ser:sericite Sm:Smectite K:kaolin-Mineral Ca:calcite Qz:Quartz Pl:plagioclase To:tourmaline
Ab:Albite Kf:potassium feldsper Bi:biotite Hb:hornblende Hy:hypersthene Aug:augite Do:Dolomite An:Anorthite

Table Ⅱ-1-4 Result of X-ray diffraction (semidetailed-detailed area) (2)

No.	Sample	GPS Cordinate		Rock name	Mineral assemblages															
		Longit.46N	Latit.100E		Ch	Ser	Sm	K	Ca	Qz	Pl	To	Ab	Kf	Bi	Hb	Hy	Aug	Do	An
44	950924003	7.99	11.43	Bi-Ms-Gr-Dr	1	2				24			20	15						
45	960924004	7.99	11.47	Bi-Ms-Gr-Dr	<1	3				29			16	11						
46	960924005	7.99	11.49	Bi-Ms-Gr-Dr	1	3			<1	29			20	13						
47	960924006	8.00	11.51	Bi-Ms-Gr-Dr	<1	3	<1		<1	26			20	7						
48	960924007	8.00	11.55	Bi-Ms-Gr-Dr	2	2			<1	22			20	9						
49	960924008	8.01	11.59	Bi-Ms-Gr-Dr	2	1			<1	44			20	13						
50	960924009	8.01	11.63	Bi-Ms-Gr-Dr	1	5			<1	33			20	10						
51	960924010	8.02	11.67	Bi-Ms-Gr-Dr	1	2			<1	24			20	9						
52	960924011	8.02	11.71	Bi-Ms-Gr-Dr	2	1			<1	22			20	10						
53	960924012	8.03	11.75	Bi-Ms-Gr-Dr	1	2			<1	30			20	16						
54	960924013	8.03	11.75	Bi-Gz-Dr	3	2				21			14							
55	960924014	8.03	11.75	Psammitic Gneiss	10	<1				10			11	9						
56	960924015	8.03	11.75	Ms-Gneiss	<1	1			1	32			8	1						
57	960924016	8.13	8.87	Bi-Ms-Gr-Dr	1	5				29			20	4						
58	960924017	8.14	8.91	Bi-Ms-Gr-Dr	1	4			<1	24			20	6						
59	960924018	8.14	8.95	Bi-Ms-Gr-Dr	2	3				26			20	8						
60	960924019	8.15	8.99	Bi-Ms-Gr-Dr	2	3				24			20	24						
61	960924020	8.15	9.03	Bi-Ms-Gr-Dr	2	3				26			20	8						
62	960924021	8.16	9.07	Bi-Ms-Gr-Dr	2	3			<1	19			20	7						
63	960924022	8.16	9.11	Bi-Ms-Gr-Dr	3	4				28			20	7						
64	960924023	8.17	9.15	Bi-Ms-Gr-Dr	2	4				38			20	5						
65	960924024	8.17	9.19	Bi-Ms-Gr-Dr	2	3			<1	25			20	6						
66	960924025	8.18	9.22	Bi-Ms-Gr-Dr	2	3				26			20	8						
67	960924026	8.18	9.26	Bi-Ms-Gr-Dr	2	5				30			20	4						
68	960924027	8.19	9.29	Bi-Ms-Gr-Dr	2	3			<1	26			20	14						
69	960924028	8.19	9.33	Bi-Ms-Gr-Dr	1	3			<1	23			20	6						
70	960924029	8.20	9.37	Bi-Ms-Gr-Dr	1	3				23			20	7						
71	960924030	8.20	9.39	Bi-Ms-Gr-Dr	2	2				36			20	8						
72	960924031	8.21	9.41	Bi-Ms-Gr-Dr	<1	5	<1		<1	26			20	4						
73	960924032	8.21	9.45	Bi-Ms-Gr-Dr	2	2				25			20	6						

Gr-Dr:granodiorite Ms:muscovite Gt:garnet Ch:chlorite Ser:sericite Sm:Smectite K:kaolin-Mineral Ca:calcite Qz:Quartz Pl:plagioclase To:tourmaline
Ab:Albite Kf:potassium feldsper Bi:biotite Hb:hornblende Hy:hypersthene Aug:augite Do:Dolomite An:Anorthite

strongly altered as mentioned earlier and produces chlorite and sericite.

Amphibolite produces chlorite and quartz porphyry produces sericite and lamprophyre produces chlorite respectively.

From the above, it is assumed that this region has been suffered widely by the hydrothermal alteration after the forming of quartz veins and the intrusion of dyke rocks.

The possibility of the alteration and the degree of alteration due to the forming of quartz vein is discussed in the next chapter from clay mineral survey by POSAM of the detailed survey areas I, II and the results of X-ray diffraction of specimens taken from sections across quartz veins.

3. Chemical analysis of rocks

A thorough chemical analysis was conducted on every kind of rocks distributed in this area. The results are shown in Table II-1-5. The result of calculation of seven normative minerals of the following hypabyssal-abyssal seven rocks is shown in Table II-1-6 and Harker diagram in Fig. II-1-6, alkali/SiO_2 diagram in Fig. II-1-7 and ACF diagram in Fig. II-1-8 respectively.

No.1	Two-mica granodiorite	(abbreviation in diagram: TW-mica Gr-Dr)
No.2	Diorite	(abbreviation in diagram: Diorite)
N0.3	Quartz porphyry	(abbreviation in diagram: Qz Porphyry)
No.4	Bi Adamellite	(abbreviation in diagram: Bi Adamellite)
No.5	Granite porphyry	(abbreviation in diagram: Gr-Dr dyke)
No.10	Pegmatite	(abbreviation in diagram: Pegmatite)
No.11	Tow-mica granodiorite	(abbreviation in diagram: Tw-mica Gr-Dr)

Table II-1-6 C I P W Classification (Norm. calculation)

No		Q	C	or	ab	an	ac	ns	mt	il
1	Tw-mica Gr-Dr	40.53	0	19.34	33.80	0	1	0.06	0	0.232
2	Diorite	8.495	0	18.21	37.50	13.64	0	0	5.657	2.793
3	Qz Porphyry	50.91	0	23.29	21.21	0	1.26	1.77	0	0.116
4	Bi Adamellite	27.96	0.461	17.36	39.39	7.961	0	0	0.512	0.767
5	Gr-Dr dyke	40.62	0.078	19.47	31.25	4.554	0	0	1.223	0.488
10	Pegmatite	34.92	0	33.85	20.23	9.133	0	0	0.044	0.097
11	Tw-mica Gr-Dr	51.34	0	22.90	17.97	0	0.64	4.41	0	0.115

No.	ap	wo-di	en-di	fs-di	en-hy	fs-hy	total
1	0.141	2.374	0.506	2.025	0	0	100.008
2	1.762	3.088	2.438	0.302	5.436	0.674	99.995
3	0.118	0.282	0.079	0.216	0.199	0.544	99.914
4	0.374	0	0	0	1.861	3.357	100.003
5	0.357	0	0	0	1.102	0.757	99.899
10	0.141	1.197	0.431	0.790	0	0	100.833
11	0.211	0.115	0.328	0.906	0	0	98.935

TableⅡ-1-5 Result of chemical analysis of whole rock (Semidetailed area)

No.	Sample#	GPS Cordinate		Rock name	Chemical compositions												
		46N	100E		SiO_2 (%)	Al_2O_3 (%)	Na_2O (%)	K_2O (%)	CaO (%)	MgO (%)	MnO (%)	TiO_2 (%)	Fe_2O_3 (%)	FeO (%)	P_2O_5 (%)	H_2O (%)	Ig. loss (%)
1	960827013	8.11	9.42	Tw mica Gr-Dr	78.25	9.95	4.09	3.22	1.43	0.20	0.44	0.12	0.34	0.75	0.06	0.12	0.85
2	960902034	6.93	12.30	Diorite	58.69	15.62	4.43	3.08	5.24	3.16	0.10	1.47	3.90	3.49	0.76	0.18	0.10
3	960918038	7.27	11.04	Qz Pophyry	81.48	8.26	3.52	3.88	0.20	0.11	0.02	0.06	0.43	0.44	0.05	0.17	1.14
4	960921011	8.99	12.60	Bi Adamellite	71.67	14.08	4.61	2.91	1.80	0.74	0.05	0.40	0.35	2.27	0.16	0.17	1.58
5	960921067	8.12	12.56	Gr-Dr dyke	75.59	11.09	3.59	3.22	1.09	0.43	0.03	0.25	0.82	0.96	0.15	0.18	1.48
6	960923001	8.59	6.51	Lamprophyre	45.62	14.13	3.73	1.77	8.38	9.11	0.17	2.22	3.57	8.28	0.77	0.38	1.50
7	960923004	8.51	6.43	Amphibolite	50.16	12.79	2.16	0.29	9.20	5.87	0.21	2.90	2.54	13.26	0.31	0.12	0.12
8	960923006	8.44	6.38	Pelit gneiss	65.40	17.04	1.06	3.77	0.36	2.17	0.04	1.26	1.01	5.17	0.05	0.22	3.12
9	960923018	7.93	7.02	Marble	1.60	2.46	0.44	0.10	52.53	0.40	0.03	0.01	0.04	0.12	0.03	0.09	42.49
10	960923019	7.93	7.13	Pegmatite	73.98	13.25	2.35	5.63	2.61	0.17	0.01	0.05	0.03	0.47	0.06	0.35	0.90
11	960924012	8.03	11.75	Tw mica Gr-Dr	81.41	7.60	4.40	3.83	0.78	0.13	0.04	0.06	0.22	0.50	0.09	0.09	0.40
12	960924014	8.03	11.75	Psamt Gneiss	70.15	11.51	2.35	1.84	5.41	2.23	0.07	0.81	1.21	2.30	0.16	0.24	1.95
13	960924015	8.03	11.75	Ms Gneiss	79.08	10.59	2.59	4.74	1.23	0.18	0.01	0.08	0.20	0.50	0.02	0.07	0.69

* Tw:Two Gr-Dr:Grano-Diorite Qz:Quartz Bi:Biotite Pelt:Pelitic Psamt:Psammitic Ms:Muscovite

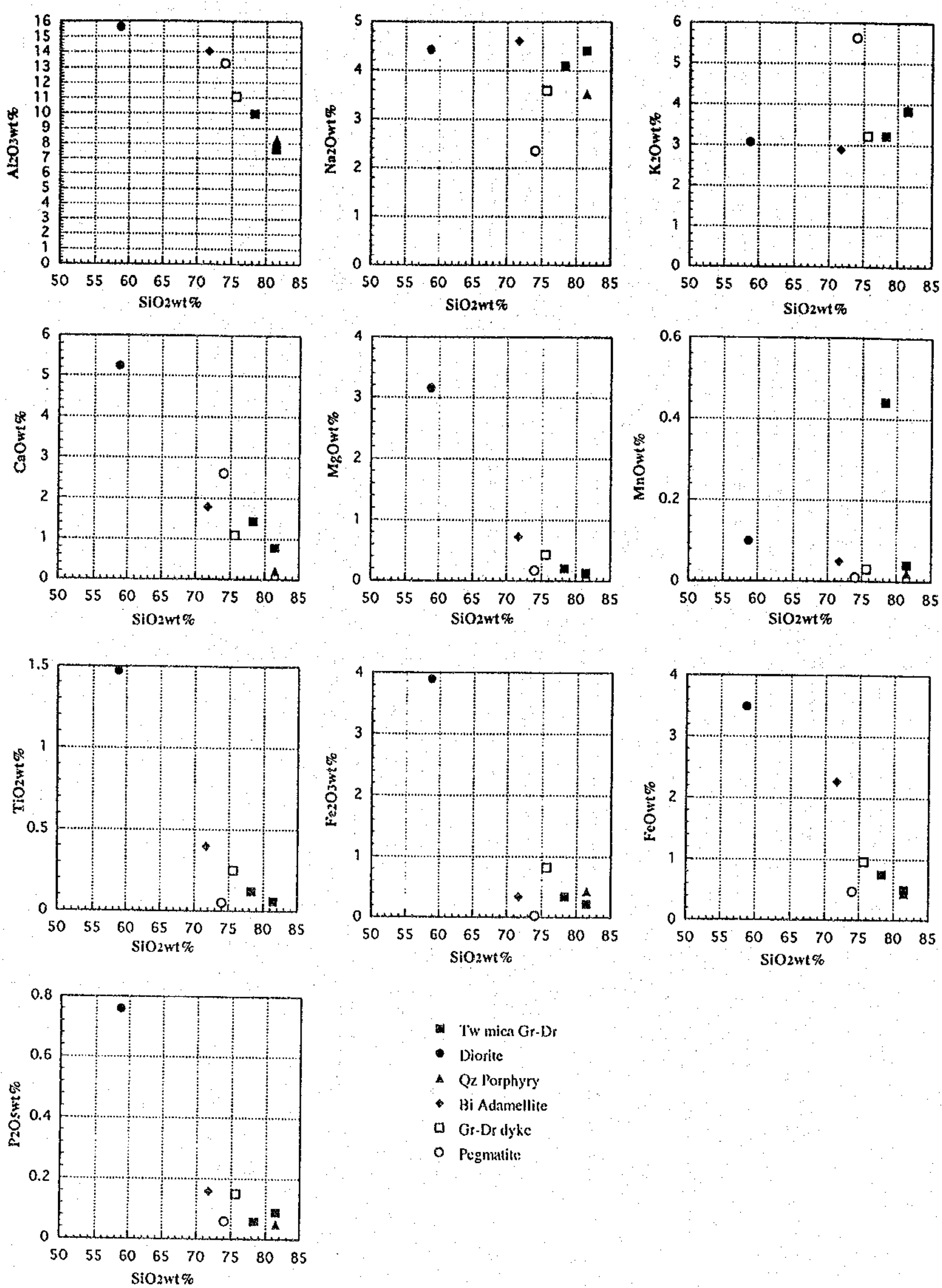
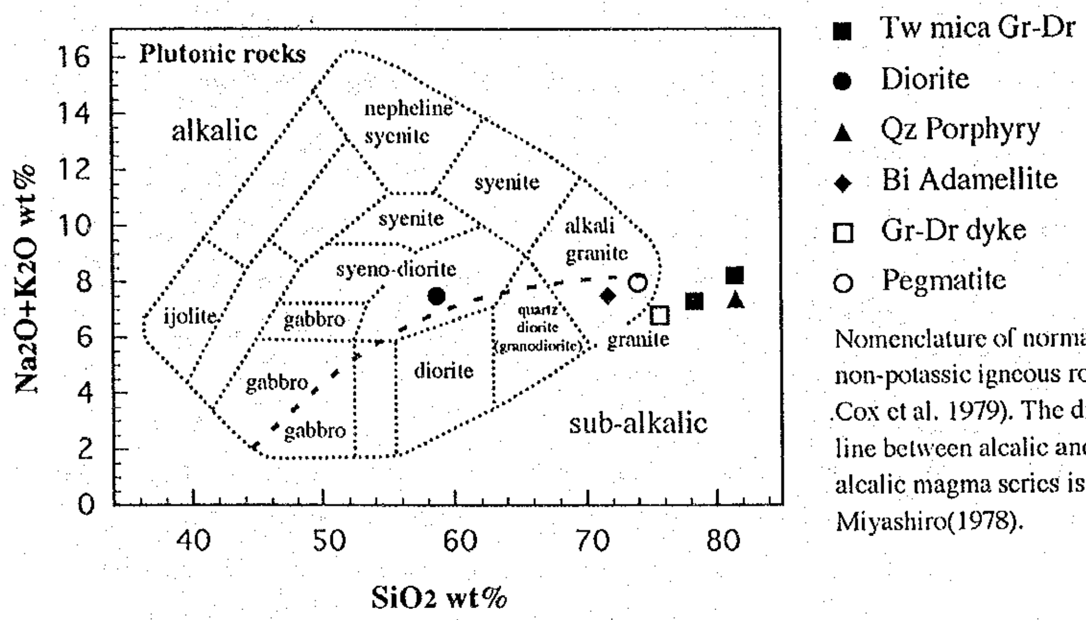
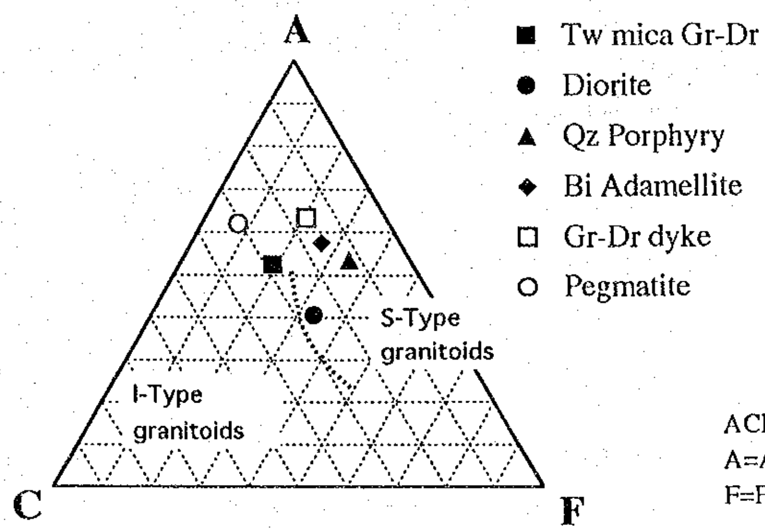


Fig. II-1-6 Harker variation diagram



Nomenclature of normal (i.e. non-potassic igneous rocks(after Cox et al. 1979). The divided line between alcalic and sub-alcalic magma series is from Miyashiro(1978).

Fig. II-1-7 Alkali (Na_2O+ K_2O)/SiO_2 diagram



ACF diagram (molar ratios, A=Al2O3-Na2O-K2O; C=CaO; F=FeO+MgO)

Fig. II-1-8 ACF diagram

The results of analysis indicate that the specimens excepted diorite are granitoids containing relatively rich amount of SiO_2 exceeding 80wt%.

The results of calculations of normative minerals indicate the probability that they belong to ilmenite-granitoids since they have a relatively high level of normative magnetite with a exception of diorite.

Especially those with high SiO_2 (around 80wt%) as shown in Harker variation diagram (Fig.II-1-6) that has low content of Al_2O_3, which may suggest silicification alteration but a microscopic observation of a thin section does not support the suggestion as discussed earlier.

The figure of alkali/SiO_2 shows that these rocks are the diorite-granitoids of the sub-alkalics considered from the relationship between alkali ($Na_2O + K_2O$) and SiO_2.

The ACF diagram shows the plot of these rocks. Plots are seen in four points in the generated region of granitoids originated from sedimentary rocks (S-type) (diorite, biotite adamellite,quartz porphyry, granodiorite), one point in the granitoids originated from igneous rocks region(I type) (pegmatite) and one point in the boundary composition region (two-mica granodiorite). (Note that No.11 Tw-mica Gr-Dr with low level of Al_2O_3 is not plotted here.)

4. Chemical analysis of ore minerals

This analysis are described globally in the chapter 2 as mentioned earlier.

5. Polished sections of ore minerals

This will be described globally in the chapter 2.

6. Radioisotopic dating

The classifications and quantities used in this measurement are as follows:

Area	Classification	Rocks	Quantity
Semi-detailed area	K-Ar	Whole rocks	2
	Rb-Sr	Whole rocks	2 sets
Detailed area	K-Ar	Altered minerals	2
	Rb-Sr	Altered minerals	2 sets

For Rb-Sr, in the case of rock body, three rock specimens were taken from a location several hundred meters apart and used as a set for the analysis of whole rock. For altered minerals, specimens taken from 4 different locations are used as a set. These specimens especially the later were assumed to have attained isotopic equilibrium.

For K-Ar, in the case of rock body, the most fresh rock specimens were taken in the area for the analysis of whole rock and for altered minerals, the same specimens as part of Rb-Sr altered minerals were used.

Among them the sericite was detected through X-ray diffraction conducted earlier from the specimens of altered mineral for the altered clay of the quartz veins Nos. 1, 5, 7 and clay vein of drilling MJMT-2.

Table II-1-7 shows the list of the specimens used in this measurement.

Table II-1-7 Sample list of radioisotopic age determination

No.	Method	Area	GPS coordinate		Rock name	Remark
			46N	100E		
RD1-1	Rb-Sr	Semi-det.	06.56	12.16	Diorite	whole rock
RD1-2	Rb-Sr	Semi-det.	06.63	12.31	Diorite	whole rock
RD1-3	Rb-Sr	Semi-det.	06.73	12.56	Diorite	whole rock
RD2-1	Rb-Sr	Semi-det.	08.86	11.26	Lamprophyre	whole rock
RD2-2	Rb-Sr	Semi-det.	08.92	11.36	Lamprophyre	whole rock
RD2-3	Rb-Sr	Semi-det.	09.02	11.60	Lamprophyre	whole rock
RD3-1	Rb-Sr	Detailed	08.25	09.04	Ser+Ab clay	alter. By No.1 Q v
RD3-2	Rb-Sr	Detailed	08.45	09.51	Ser+Ab clay	alter. By No.5 Q v
RD3-3	Rb-Sr	Detailed	08.14	09.42	Ser+Ab clay	alter. By No.1 Q v
RD3-4	Rb-Sr	Detailed	07.43	10.88	Ser+Ab clay	alter. By No.7 Q v
RD4-1	Rb-Sr	Detailed	MJMT-2	192.40m	Ser+Ab clay	argil.part of Gr-Dr
RD4-2	Rb-Sr	Detailed	MJMT-2	196.60m	Ser+Ab clay	clay vein
RD4-3	Rb-Sr	Detailed	MJMT-2	232.45m	Ser+Ab clay	clay vein
KD1	K-Ar	Semi-det.	08.10	09.42	Two-M- Gr-Dr	whole rock
KD2	K-Ar	Semi-det.	08.99	12.60	Bi-Adamellite	whole rock
KD3	K-Ar	Detailed	08.45	09.51	Ser+Ab clay	same sample with RD3-2
KD4	K-Ar	Detailed	07.43	10.88	Ser+Ab clay	same sample with RD3-4

Table II-1-8 shows the result of isotopic composition of Rb/Sr.

Table II-1-8 Isotopic composition of Rb/Sr

No.	Rb(ppm)	Sr(ppm)	87Rb/86Sr	87Sr/86Sr(2 σ)
RD1-1	101	972	0.3030	0.70640(1)
RD1-2	102	971	0.3025	0.70638(1)
RD1-3	107	942	0.3281	0.70648(1)
RD2-1	126	897	0.4075	0.70755(1)
RD2-2	133	904	0.4268	0.70763(1)
RD2-3	116	820	0.4089	0.70752(1)
RD3-1	28.7	38.6	2.1490	0.71709(1)
RD3-2	21.5	59.7	1.0450	0.71426(1)
RD3-3	36.5	19.2	5.5260	0.72583(1)
RD3-4	58.5	38.7	4.3830	0.72421(1)
RD4-1	75.6	219	1.0010	0.71400(1)
RD4-2	113	133	1.9720	0.71695(1)
RD4-3	98.5	208	1.3710	0.71596(1)

Fig II-1-9 shows the isochron diagram of RD1 series (diorite) and Fig. II-1-10 shows RD2 series (lamprophyre), Fig II-1-11 shows RD3series (altered minerals) and Fig. II-1-12 shows RD 4 series (core altered minerals) respectively.

The test results for 4 specimens of K-Ar are shown in Table II-1-9.

Among the results of Rb/Sr isotopic, the diorite and lamprophyre do not show good isochron because of the large margin of error due to the narrow range of Rb-Sr of the specimens. It is necessary to review the selection of specimens.

As for the altered clay in the field and the cores, there were a wide dispersion in contents of Rb, Sr and those isotopic ratios of individual specimen. It is therefore doubtful whether the isotopic equilibrium among the specimens has been attained.

On the other hand, the results of four K-Ar specimens are reliable because of the low content of air.

As described above, the result of Rb-Sr leaves some problems. The measured periods are as follows:

1) Diorite (Rb-Sr)	250.4 ± 85.7 Ma (Permian period)
2) Lamprophyre (Rb-Sr)	351.8 ± 236.7 Ma (Devonian to carboniferous period)
3) Quartz vein altered clay (Rb-Sr)	193.0 ± 27.3 Ma (Jurassic period)
4) Core clay vein (Rb-Sr)	208.3 ± 136.5 Ma (Permian period)
5) Two-mica granodiorite (K-Ar)	268.1 ± 5.6 Ma (Permian period)
6) Biotite adamellite (K-Ar)	384.7 ± 7.8 Ma (Devonian period)
7) Altered clay of quartz vein No.5 (K-Ar)	234.4 ± 4.9 Ma (Permian period)
8) Altered clay of quartz vein No. 7 (K-Ar)	225.8 ± 4.8 (Permian period)

According to the documents of former East Germany, K-Ar ages of two-mica granodiorite and diorite are 5.2-5.5 Ma and 3.1 Ma respectively. In the case of holocrystalline rocks, the regular method is to separate composite minerals into the same sizes for an isotopic analysis. Measurement values would differ whether or not minerals are separated or not. We do not know which method the former East Germany used.

Sample No.	$^{87}Rb/^{86}Sr$	ERR%	$^{87}Sr/^{86}Sr$	ERR%
RD1-1	0.303000	0.500	0.706400	0.010
RD1-2	0.302500	0.500	0.706380	0.010
RD1-3	0.328100	0.500	0.706480	0.010

CALCULATED RESULT!
Sample Numbers = 3
Best Slope = 3.56158984217964D-03
MSWD = 0.03
Age : 250.37±85. 65 Ma
Initial Ratio : 0. 705312±0.000380

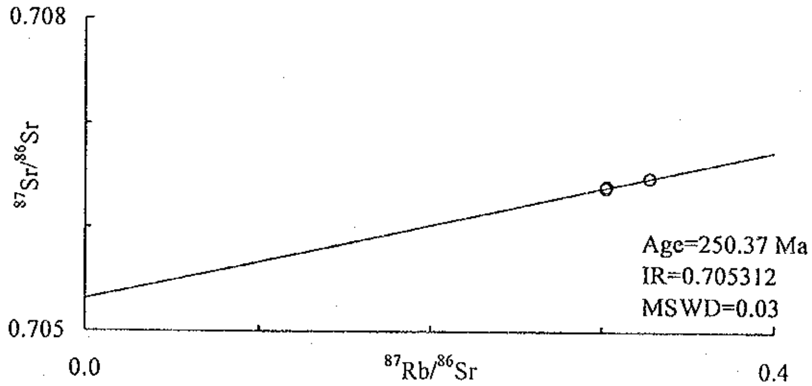


Fig. II-1-9 Isotopic age determination by Rb-Sr (Diorite)

Sample No.	$^{87}Rb/^{86}Sr$	ERR%	$^{87}Sr/^{86}Sr$	ERR%
RD2-1	0.407500	0.500	0.707550	0.010
RD2-2	0.426800	0.500	0.707630	0.010
RD2-3	0.408900	0.500	0.707520	0.010

CALCULATED RESULT!
Sample Numbers = 3
Best Slope = 5.00734014438708D-03
MSWD = 0.14
Age : 351.75±236. 69 Ma
Initial Ratio : 0. 705492±0.001400

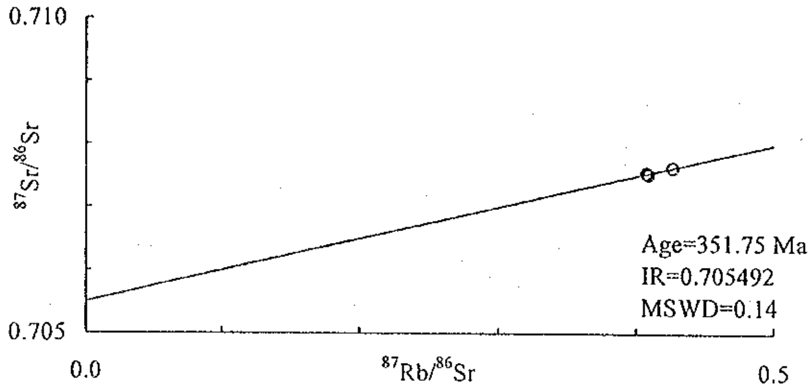


Fig. II-1-10 Isotopic age determination by Rb-Sr (Lamprophyre)

Sample No.	$^{87}Rb/^{86}Sr$	ERR%	$^{87}Sr/^{86}Sr$	ERR%
RD3-1	2.149000	0.500	0.717090	0.010
RD3-2	1.045000	0.500	0.714260	0.010
RD3-3	5.526000	0.500	0.725830	0.010
RD3-4	4.383000	0.500	0.724210	0.010

CALCULATED RESULT!
Sample Numbers = 4
Best Slope = 2.744843757418250-03
MSWD = 65.72
Age : 193.033±27.32Ma
Initial Ratio : 0.711372±0.001280

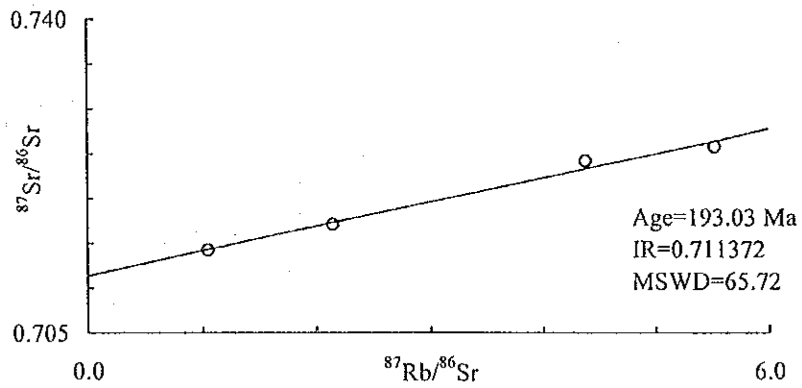


Fig. II-1-11 Isotopic age determination by Rb-Sr (Quartz vein clay)

Sample No.	$^{87}Rb/^{86}Sr$	ERR%	$^{87}Sr/^{86}Sr$	ERR%
RD4-1	1.001000	0.500	0.714000	0.010
RD4-2	1.972000	0.500	0.716950	0.010
RD4-3	1.371000	0.500	0.715960	0.010

CALCULATED RESULT!
Sample Numbers = 3
Best Slope = 2.961532429298864D-03
MSWD = 82.47
Age : 208.47±136. 51 Ma
Initial Ratio : 0. 711350±0.002880

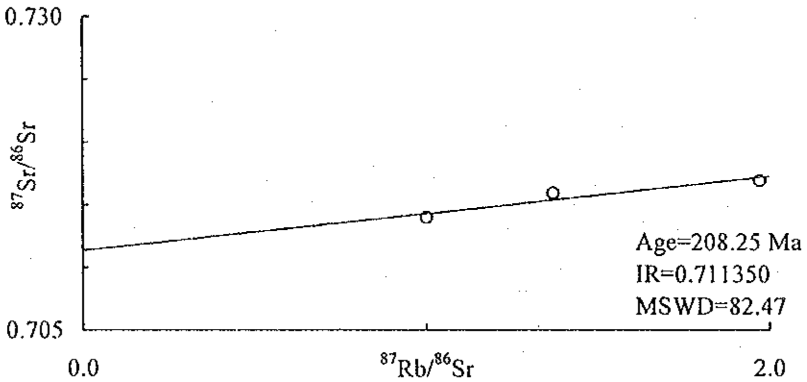


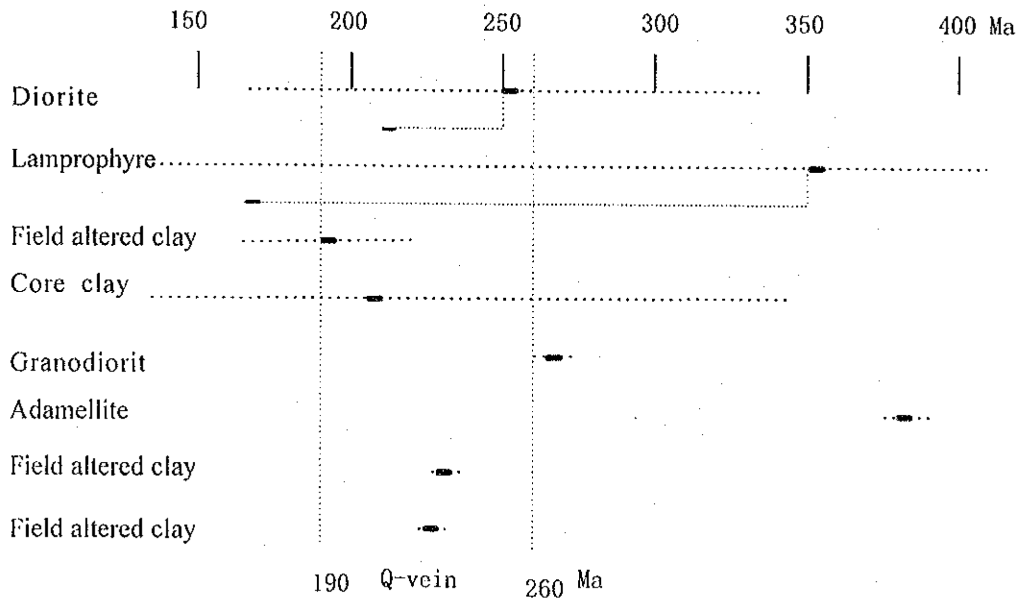
Fig. II-1-12 Isotopic age determination by Rb-Sr (Clay vein of drilling core)

Table II-1-9 Result of isotopic age determination by K-Ar

Sample	K (wt%)	Weight (g)	$[^{36}Ar]$ $(10^{-10}cm^3STP/g)$	$^{40}Ar/^{36}Ar$	$[^{40}Ar]rad$ $(10^{-8}cm^3STP/g)$	K-Ar age (Ma)	Air-fract. (%)
	2.69	0.0647	19.06 ± .51	15790. ± 366	3080.7 ± 31.0	273.3 ± 5.7	1.8
KD-1	(2.0%)	0.0486	18.93 ± .63	15766. ± 462	3003.9 ± 30.3	267.0 ± 5.6	1.8
		0.0521	25.66 ± .61	11663. ± 235	2967.2 ± 30.1	263.9 ± 5.5	2.5
	2.47	0.0560	30.87 ± .67	13094. ± 237	4031.3 ± 40.6	378.6 ± 7.6	2.2
KD-2	(2.0%)	0.0575	27.48 ± .60	14951. ± 279	4110.0 ± 41.4	385.2 ± 7.8	1.9
		0.0580	24.56 ± .59	16801. ± 352	4167.5 ± 42.0	390.1 ± 7.9	1.7
	0.560	0.0685	67.68 ± .81	1104.9 ± 5.1	548.19 ± 5.57	235.9 ± 5.0	26.8
KD-3	(2.0%)	0.0497	64.93 ± .89	1129.7 ± 7.4	541.92 ± 5.52	233.4 ± 4.9	26.2
		0.0531	64.19 ± .85	1140.5 ± 7.3	543.13 ± 5.53	233.9 ± 4.9	25.9
KD-4	1.27	0.0542	92.57 ± 1.09	1570.9 ± 7.4	1180.5 ± 12.0	225.6 ± 4.8	18.8
	(2.0%)	0.0607	91.66 ± 1.05	1576.4 ± 6.7	1174.6 ± 12.0	224.5 ± 4.7	18.8

7. Estimation of the age of quartz vein formation

The result of the radioisotopic dating described in the preceding clause is outlined as follows:



From the above figure, the age of the quartz vein formation based on Rb-Sr, is assumed to be 190 to 260 Ma and it is between 220 and260 Ma (Permian period) if limited to K-Ar.

Chapter 2 Geological detailed survey

The areas for the geological detailed survey consist of the following two areas:

	Survey areas
Area I	7.75 km^2
Area II	2.25 km^2
Total	10.00 km^2

2-1 Survey method

Survey was performed by using a map obtained by enlarging a 1/10000 topographic map to a 1/2000 map. Particularly, the quartz vein survey method is described later.

2-2 Geology

The geological map of the 2 areas of the detailed survey is shown in Fig. II-2-1 (1) and (2).

The geology of the two detailed survey areas are composed of metamorphic rocks, two-mica granodiorite, biotite adamellite, diorite, felsitic rock, quartz porphyry and lamprophyre.

As to the generation facies, lithofacies and microscopic observations of these rocks are already discussed in the chapter 1,this chapter only complements what had previously been explained.

1. Metamorphic rocks

Metamorphic rocks distribute mainly in the eastern peripheral of the Area I and also distribute small amount in the south-west part of the Area I and II. They are composed of the psammitic gneiss and, as described earlier, are penetrated by small scale irregular dike-sheet of biotite adamellite and pegmatite. The structure of psammitic gneiss is disturbed by the intrusion of two-mica granodiorite. In the north region of the Area 1, psammitic gneiss with a long diameter of 100m are caught in two-mica granodiorite.

2. Biotite adamellite

Biotite adamellite distribute in the north-east end of the area II. Relation with two-mica granodiorite do not clear but their color is whitish and contains little amount of muscovite. The geological boundary of these rocks is assumed to run in the north extension trend of the boundary of two-mica granodiorite and psammitic gneiss.

A micrcscopic observation shows that the biotite adamellite is granitic with larger amount of potassium feldspar but there are little difference between the both rocks by whole rock analysis.

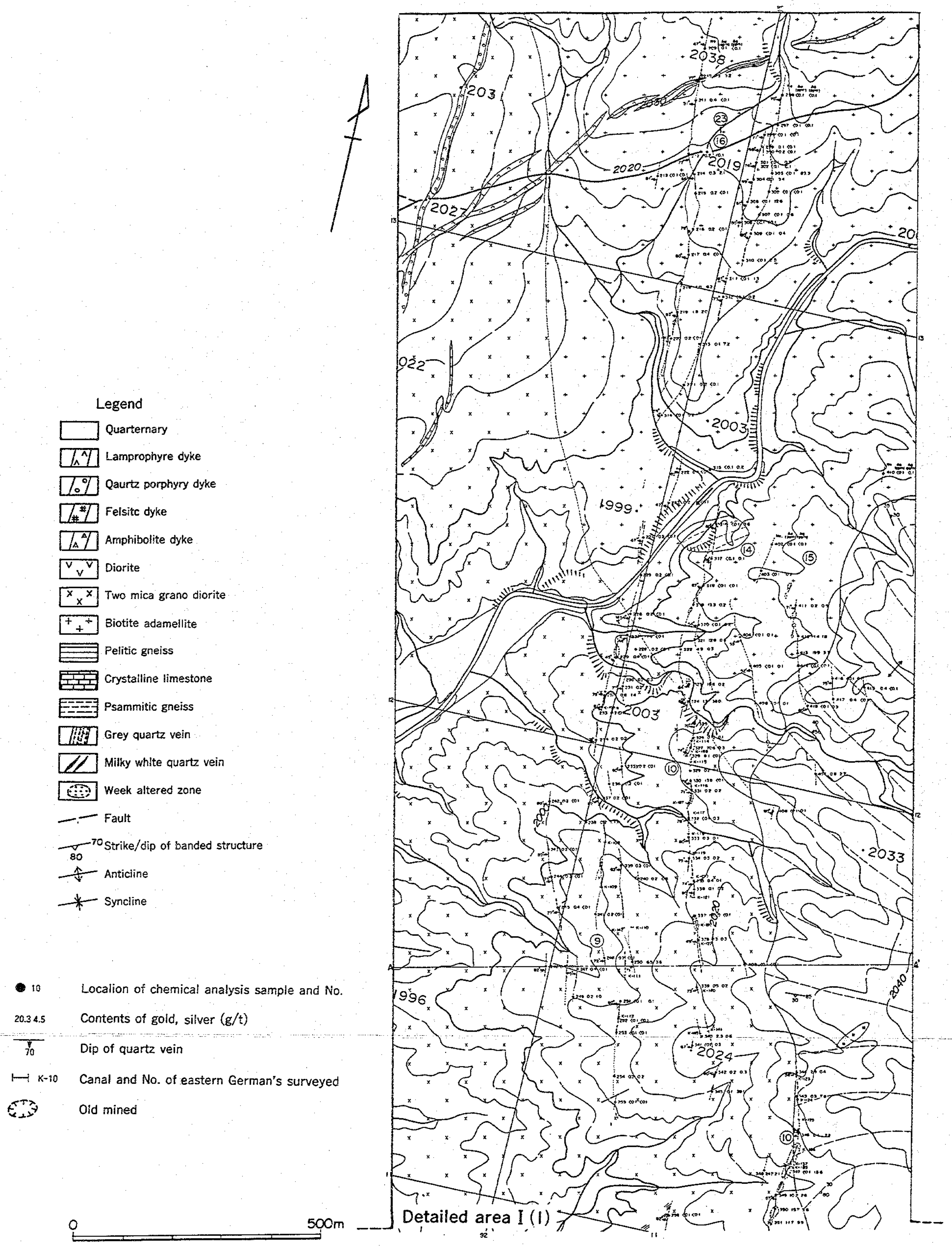


Fig. Ⅱ-2-1 Map of geological and quartz veins surveyed (Area I) (I)

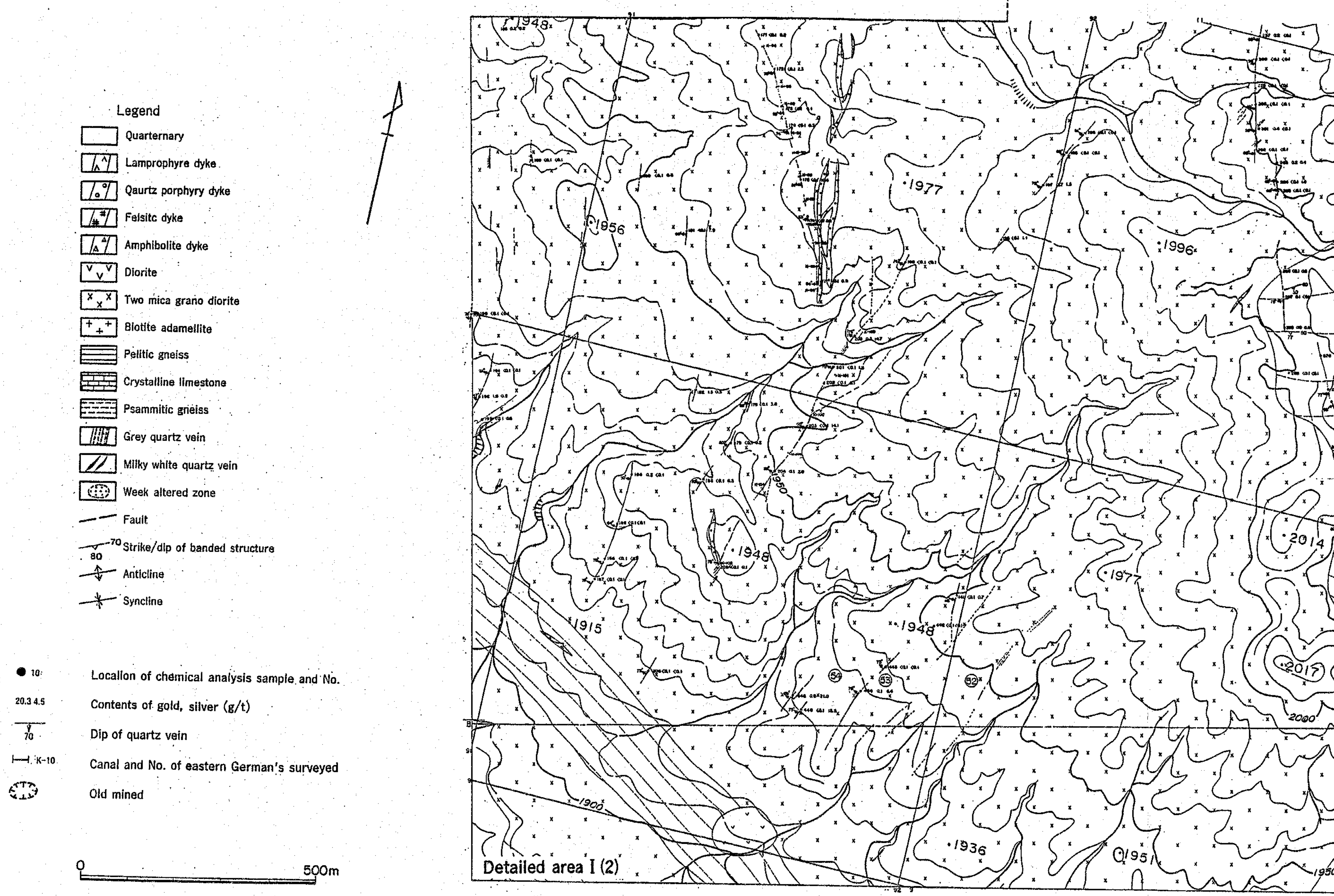


Fig. II-2-1 Map of geological and quartz veins surveyed (Area I) (2)

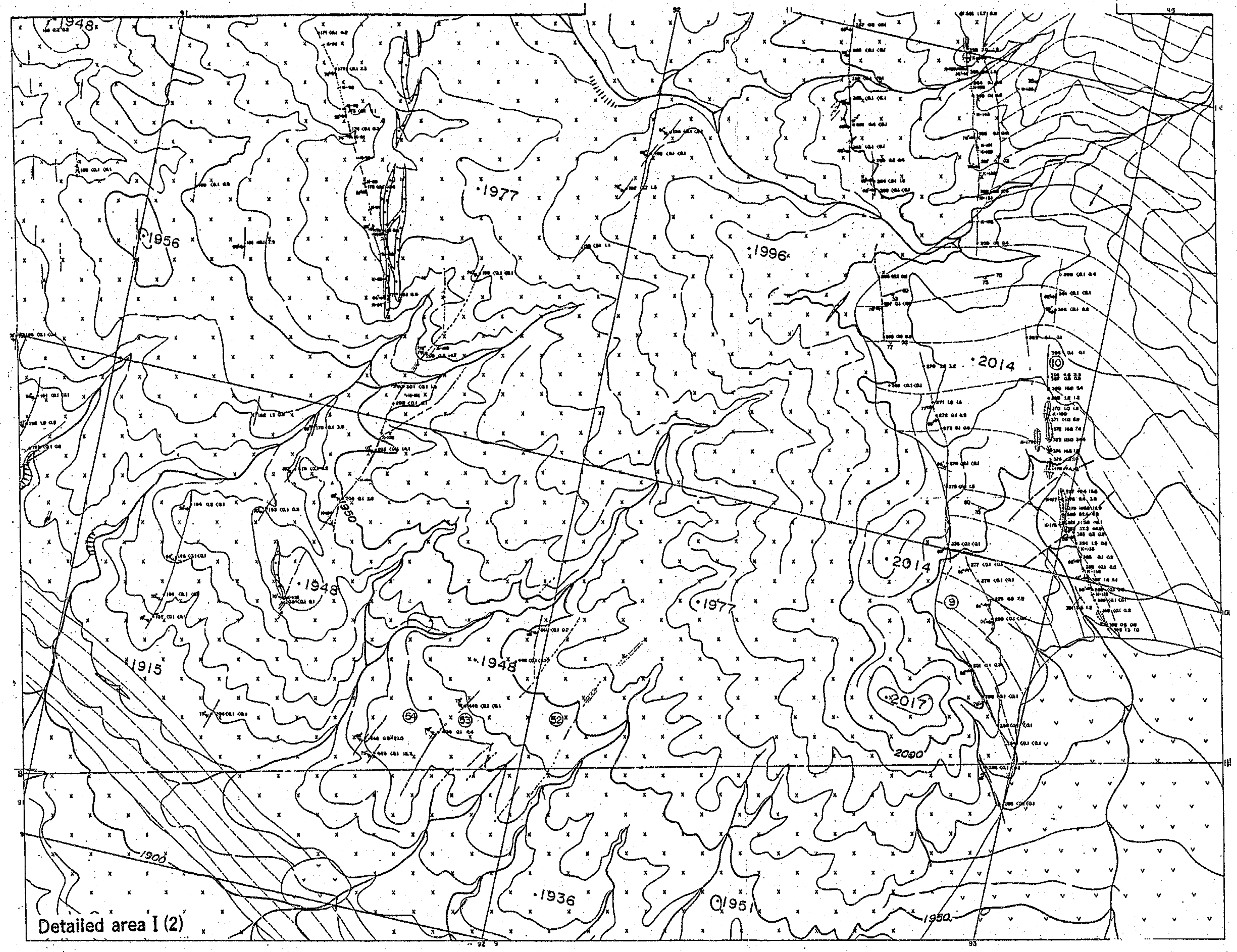


Fig. II-2-1 Map of geological and quartz veins surveyed (Area I) (2)

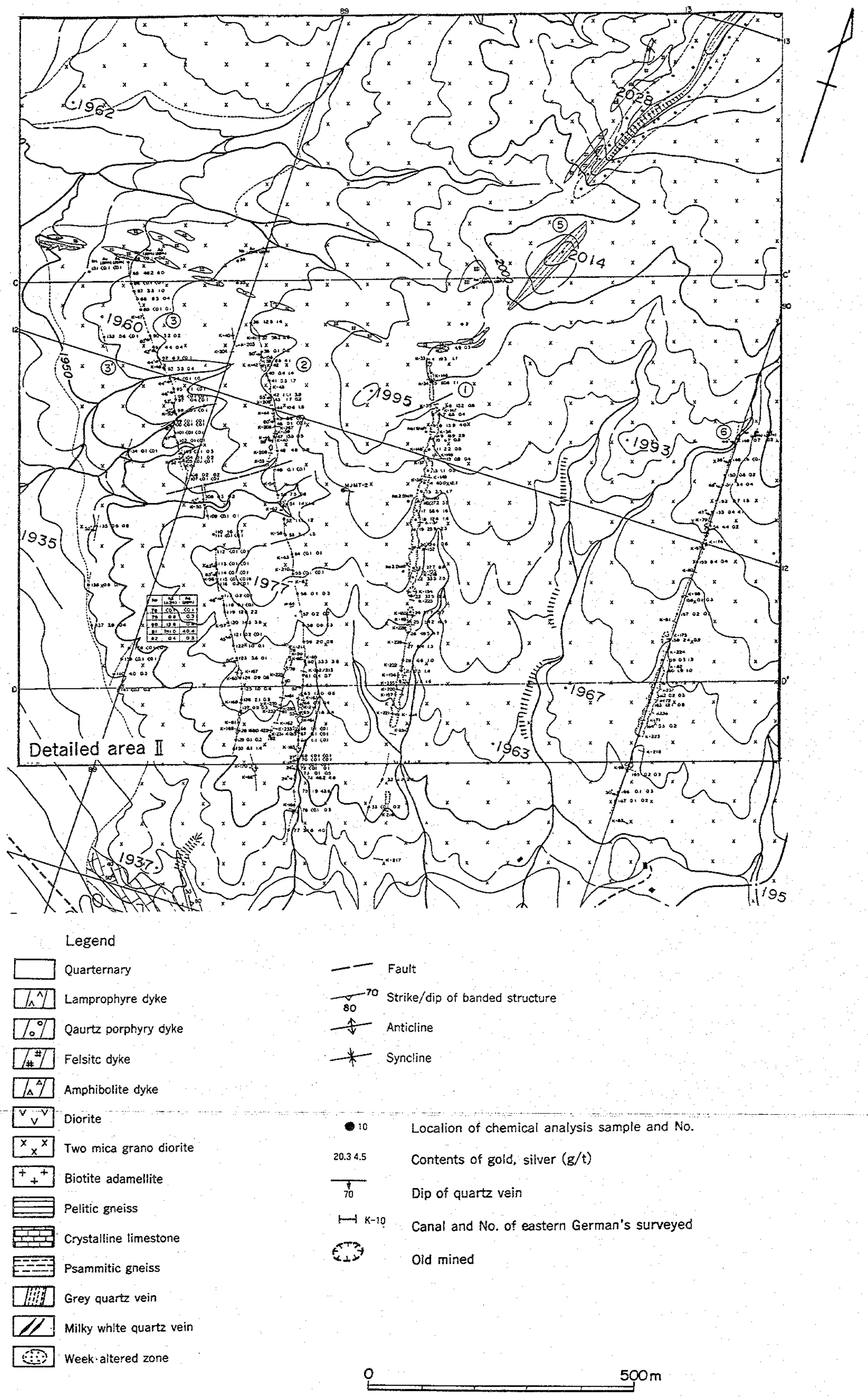


Fig. Ⅱ-2-2 Map of geological and quartz veins surveyed (Area Ⅱ)

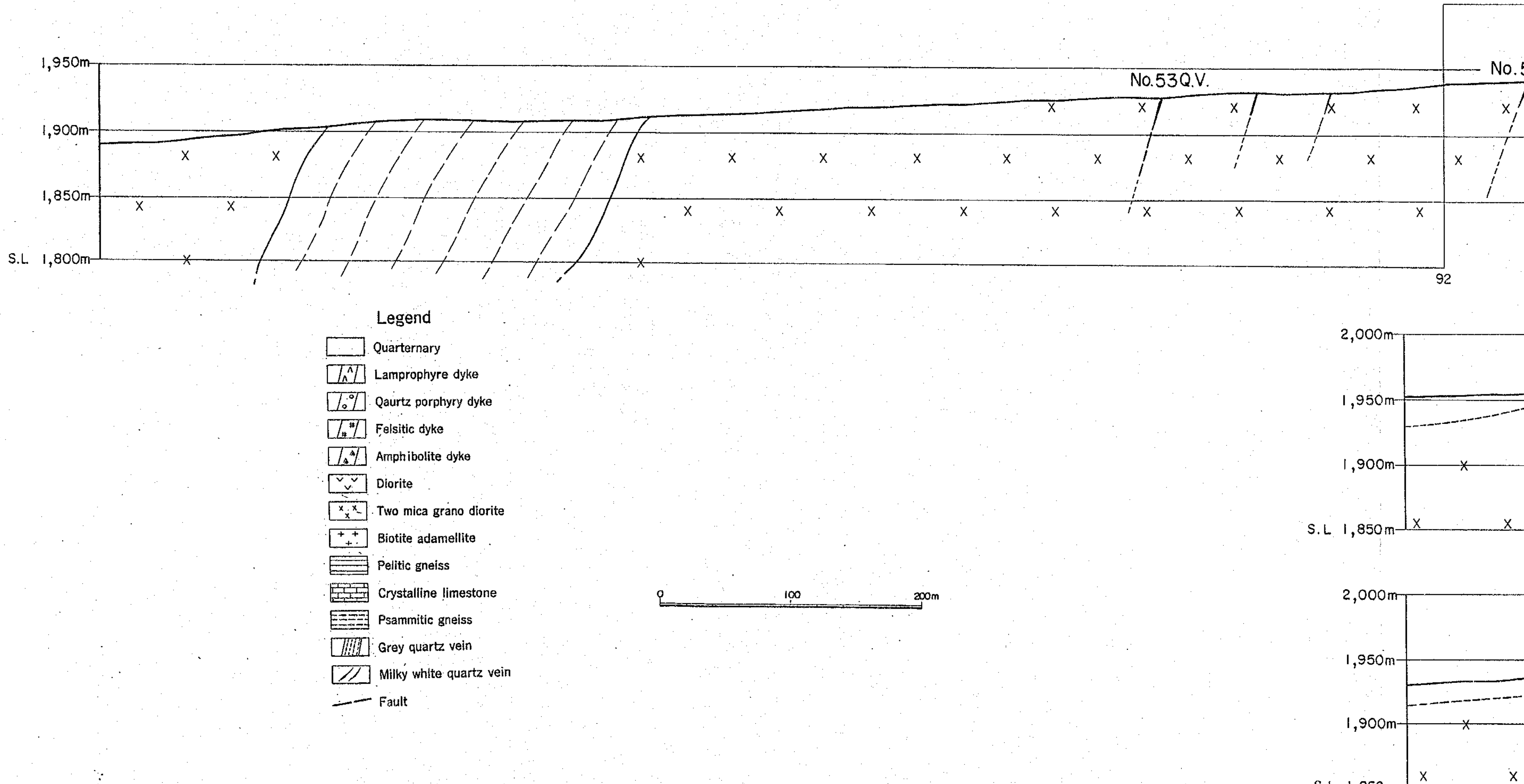
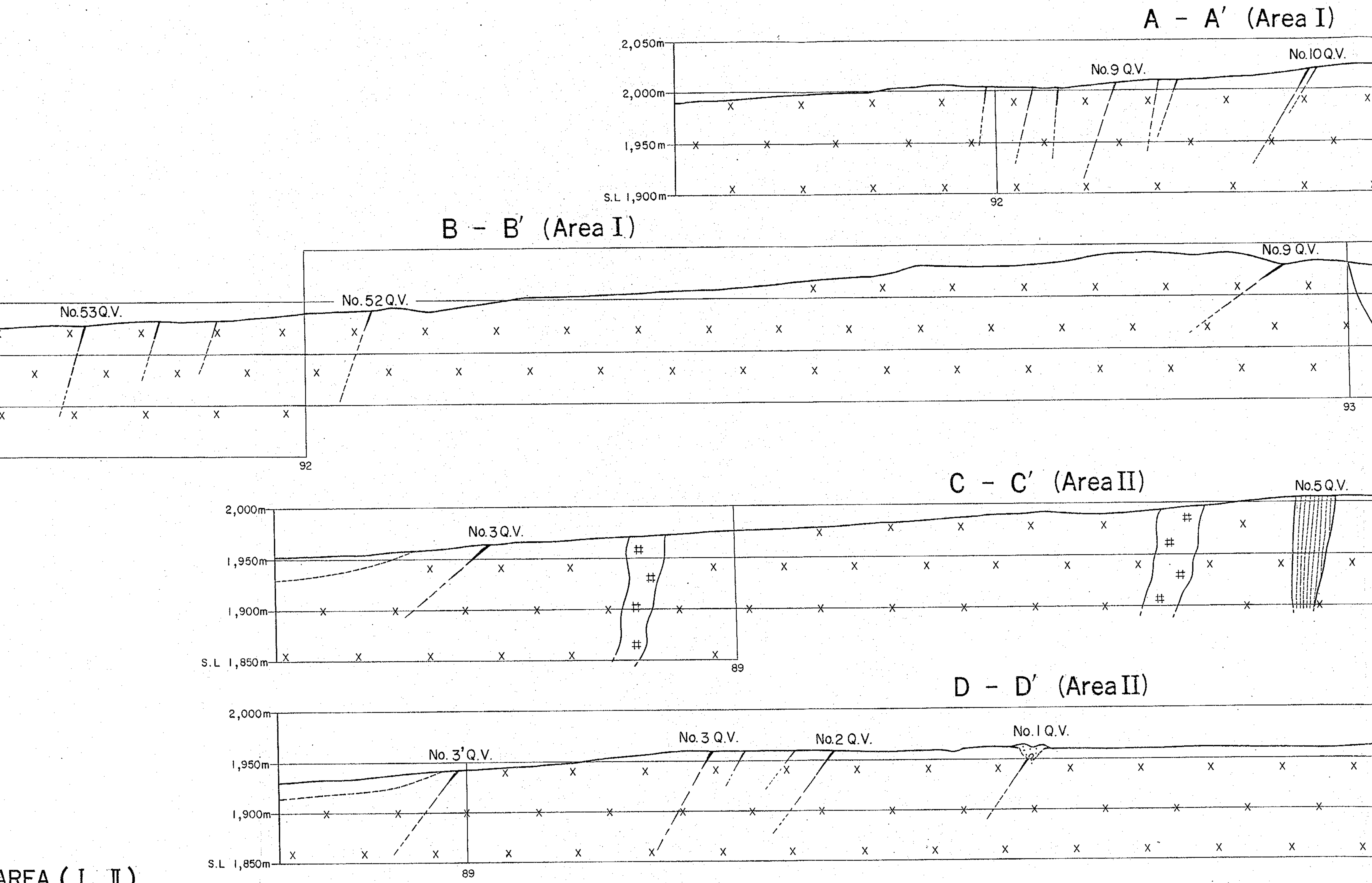
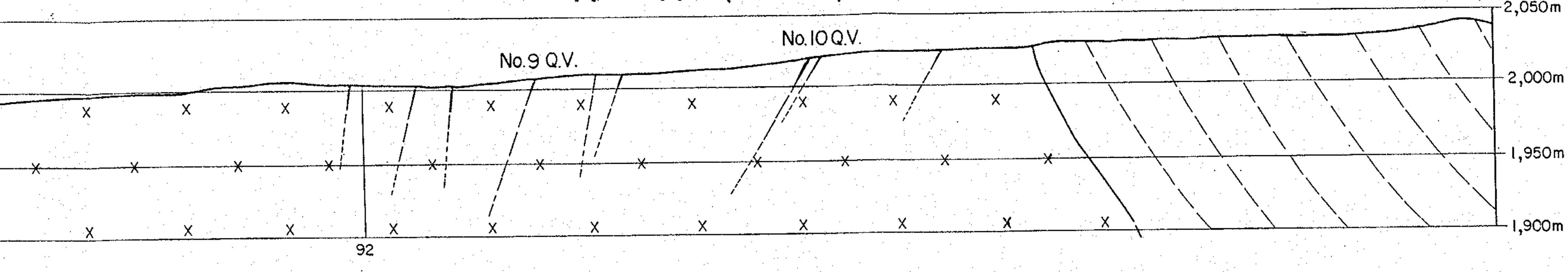


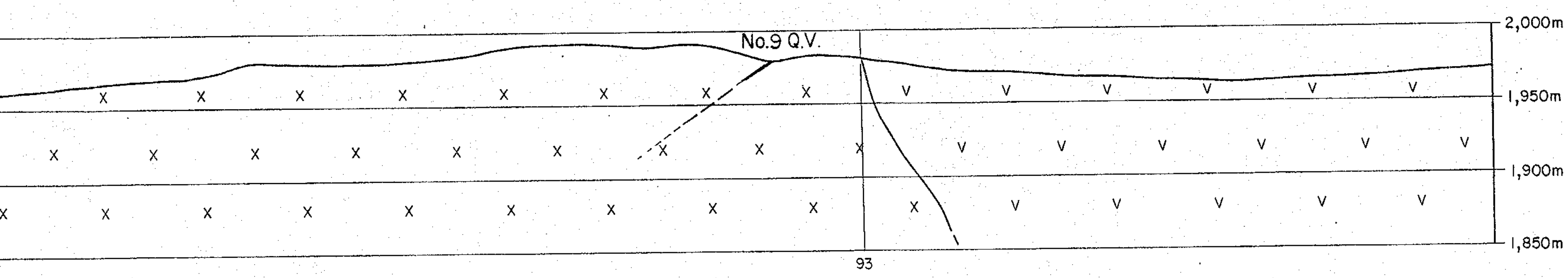
Fig. II-2-3 GEOLOGICAL PROFILE OF DETAILED AREA (I、II)


A - A′ (Area I)
2,050m
2,000m
1,950m
S.L 1,900m
No.9 Q.V.
No.10 Q.V.
92
B - B′ (Area I)
No.53 Q.V.
No.52 Q.V.
No.9 Q.V.
92
93
C - C′ (Area II)
2,000m
1,950m
1,900m
S.L 1,850m
No.3 Q.V.
No.5 Q.V.
89
D - D′ (Area II)
2,000m
1,950m
1,900m
S.L 1,850m
No. 3′ Q.V.
No. 3 Q.V.
No.2 Q.V.
No.1 Q.V.
89

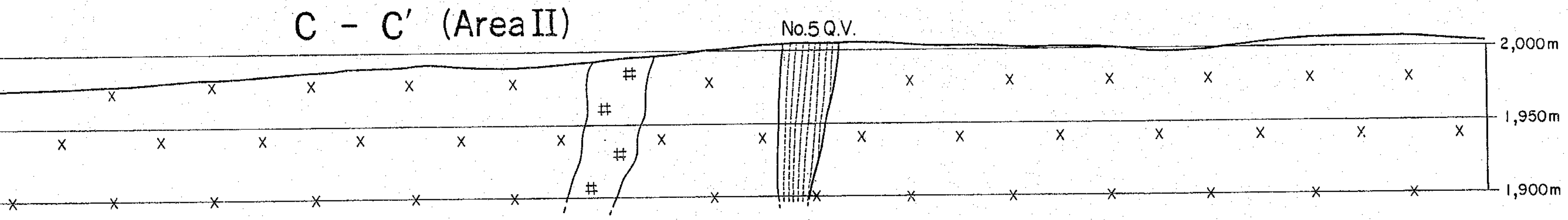
AREA (I、II)

A - A′ (Area I)

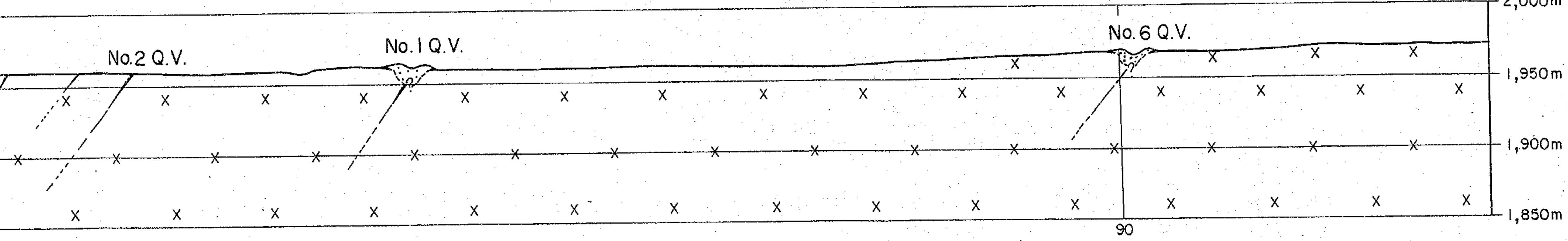




C - C′ (Area II)



D - D′ (Area II)



They belong to sub-alkalic granitoids as mentioned earlier.

If biotite adamellite that penetrated in psammitic gneiss is identical to this rock, then the rock is older than two-mica granodiorite as described earlier.

3. Two-mica granodiorite

Two-mica granodiorite distributes in the center through the northern part of the Area I and in all part of the Area II. At the point where they contact with metamorphic rocks outer than the south-west area II, there is so called the contact quenching facies where coarse granule of holocrystalline changes transitionally to medium granule semi-holocrystalline or fine granule porphyritic texture.

The description of rocks is omitted.

4. Diorite

Diorite distributes mainly along the south-east end of the area I forming the largest rocks among the present survey areas and there are also stock 100 meters in diameter in the south-western part of this area.

The description of rocks is omitted.

5. Felsitic rocks

Felsitic rocks distributes in the northern part of the area II with many small rocks in undefined or lenticular shapes at a distance of several to several ten meters to the north side of No. 5 quartz vein in parallel to the vein intermittently. The sizes of independent rocks are several meters to several ten meters in width and 10 to 100 meters in length.

The tone of color is dark gray to gray as compared to the white gray of No.5 quartz vein. The composition is entirely non phenocryst and heterogeneous compared to quartz veins. They may be hard to distinguish each other. We will have to make thin section out of these rocks.

If any case those felsitic rock and No.5 quartz vein are assumed to be formed in the same period.

6. Dykes

Quartz porphyry is distributed in the area I and in its peripherals. One to three dikes in S-N system run intermittently in echelons. There are two ladder shaped dikes in the southern part of the area.

Lamprophyre dike developed in NE-SW system trend in the northernpart of the area I and one dike outside the area branches out into several dikes in this area forming an echelon arrangement. As mentioned earlier this dike penetrates No.23 quartz vein (No.9 quartz vein system).

2-3 Survey of quartz vein

1. Survey and sampling method

The survey of quartz vein was carried out for both semi-detailed and detailed survey areas for all known quartz veins. The width (maximum, average), directions, inclinations and the extension of a single vein were recorded. For the width of veins, the outcrops and waste sample were distinguished, particularly in the case of goaves, were assumable in the waste have been recorded and those not assumable were excluded from the record.

At the same time, specimens for chemical analysis during the survey were collected. We used as reference the survey drawings (1/2000) along the vein made by the former East Germany. The locations of sampling were identified by GPS. The intervals of sampling in the precision survey area were determined as following for the average values of major veins which depend on the continuity of the outcrops. It is about 20 meters in the case of goaves.

Vein No.	Interval of sampling (m)
1	27
2	25
3	21
6	38
9	61
10	46

The sampling method of specimens is that the debris of 1 to 3 cm in diameters are taken out by striking the outcrops using hammers and chisels at several points in the direction right angle to the vein. One set of samples weight 800g to 1kg.

In the case of goaves, about 30 boulders remaining abundant in the waste in general were taken out at random from the area ranging two to three meters in width in the right angle to the vein running direction. They were then crushed and 1 kg of them was collected as one set of sample.

In the course of sampling, the survey for gold particles and sulfides was conducted as well. The gold particles were found, though very rarely, in almost all the goaves.

The results of this survey is shown in Table II-2-1 as the list of chemical analysis of the quartz veins. The sampling locations were showed already in Fig. II-1-4 together with other test specimens.

2. Mineralization through field observation

The result of the field survey for gold particles and sulfide minerals in major quartz vein using a magnifying glass is as follows. The gold particles were found in most cases near chalcopyrite and galena. However, these sulfide minerals do no always indicate the existence of the gold particles.

The gold particles and sulfide minerals are sporadically found in veins but have not banding structure or zonal arrangement.

1) No. 1 vein

The gold particles were often found in the goaves. Normally the gold particles occurred individually in the quartz veins. Their diameters are usually about 0.1mm. Sometimes the chalcopyrite and rarely the galena are also found. They rarely occurred with the gold particles in the same specimen but found in the specimen nearby. This was common to all veins. (They may be seen coexisting under a microscope.)

2) No. 2 vein

The gold particles were observed in many places in the branched vein goaves of the southern part of this vein. Occasionally the chalcopyrite and the galena were also found.

The gold particles were also found in the outcrops in the northern part of this vein, together with the chalcopyrite and the galena occasionally. When the chalcopyrite and the galena are found in the same specimen they are likely to co-exist. This is common to the other veins.

3) No. 3 vein

The gold particles are observed relatively frequent in southern part of the area but the mining is being conducted locally. The chalcopyrite are found generally.

In the northern part of this vein, the gold particles and the galena are found in a part of its northern most.

4) No. 3' vein

The gold particles are found in one point of the outcrop.

5) No. 6 vein

In the goaves of this vein, the gold particles are found individually or the chalcopyrite and the galena are found nearby.

6) No. 7 vein

No gold particles are found. As the mineralization of the chalcopyrite and the galena were found in a considerable scope of field. The results of the chemical analysis described later indicate that the content of gold is 0.1/g/t or less.

7) No. 8 vein

The mineralization of the galena was found in a considerable scope of field of this vein and the content of gold is 0.1g/t or less according to the result of analysis.

8) No. 9 vein

This vein extends 3 km long but contains no gold particles. Only the chalcopyrite and the galena are found in some places. The content of gold is low as the result of analysis shows.

9) No. 10 vein

The gold particles are found mainly in the goaves, alone or together with the chalcopyrite and the galena.

2-4 Analysis and test

1. Preparation of thin section of rocks

Since the microscopic observation of thin sections were explained generally in Chapter I, they are omitted in this section .

2. X-ray diffraction

This is also discussed in the chapter 1, omitted in this section.

In this section, the result of the X-ray diffraction test on samples traversing the quartz veins in order to study if any alteration occurred and the degree of the alteration due to the forming of the quartz vein.

A survey line was made at the right angle to the quartz veins in areas I and II to collect samples along the survey line. Sampling intervals were set equally 50m to identify the alterations of the entire peripherals of quartz veins since no alteration was found visually on the host rocks (granodiorite, etc.) as described earlier.

Identified clay minerals were chlorite and (sericite) in samples from every specimens of the both areas. However, it is very likely to presume that the most part of this sericite may be muscovite of rock-forming minerals.

Fig. II-2-4 shows a figure of the result of identification. The figure clarify that these two areas are in the chlorite zone and no relations were found between the levels of quartz index and the locations of quartz veins. Therefore, this chlorite zone is not related to the forming of the quartz

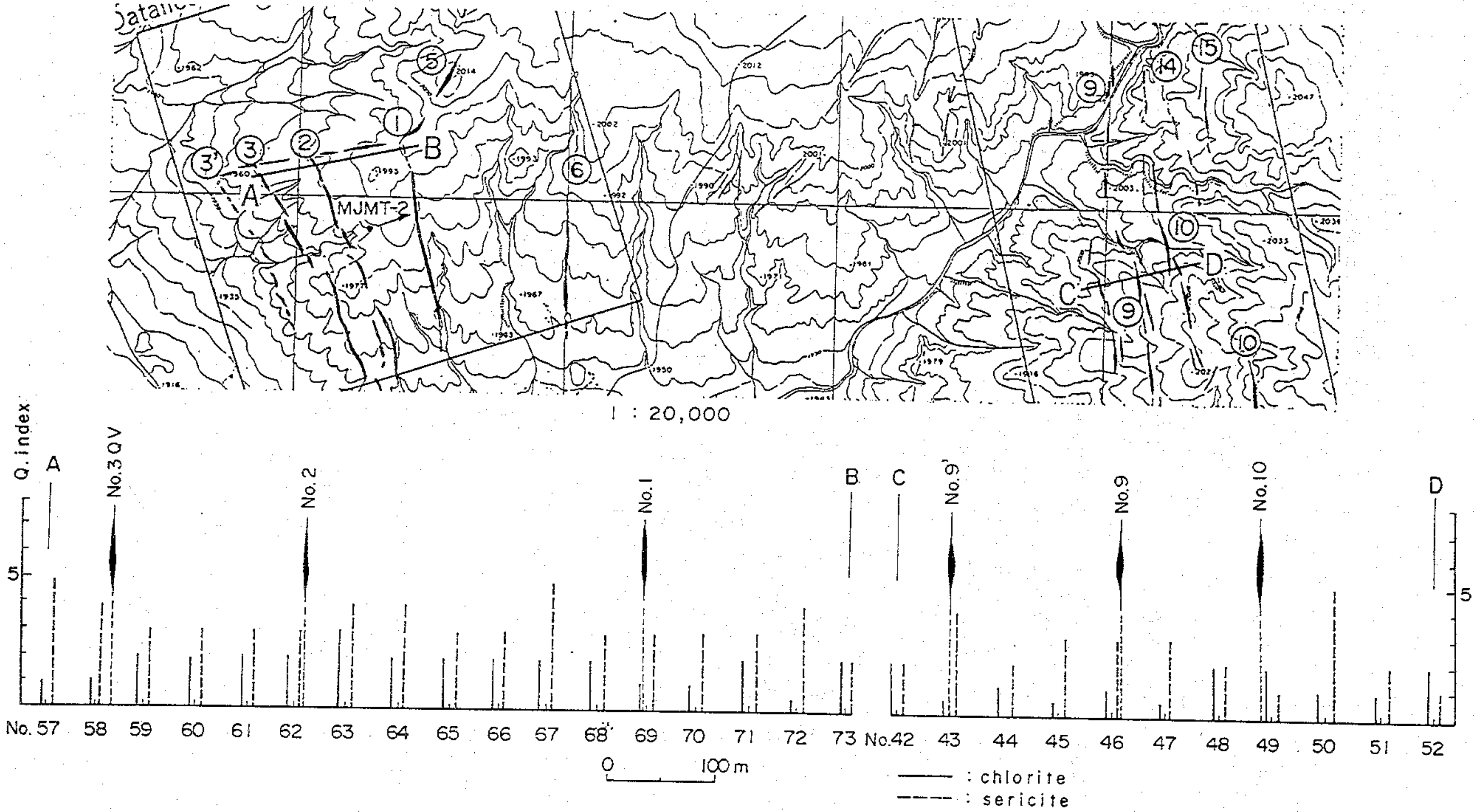


Fig. II-2-4 Result of X-Ray diffraction cross to quartz veins

veins. The zone is considered to be the alteration caused by regional hydrothermal alteration or by diagenesis.

3. Chemical analysis of ore minerals

	Number of samples to be analyzed
Semi-detailed survey area	46 samples
Detailed survey area	403 samples

Appendix A-3 shows the list of chemical analysis samples and Appendix A-4 shows the results of the analysis. For the detailed survey area, the grades of Au and Ag are shown in the geological map (1/2,000) of Fig. II-2-1 and Fig. II-2-2. As for the Au, the grades were classified for the detailed survey area and shown in Fig. II-2-5 (1/10,000), attached to the end of the report.

1) Abstract of the result of analysis

The five elements of Hg, Bi, Te, Se and Mo were mostly less than the detectable levels (Hg: 10ppb, Bi: 1ppm, Te, Se, Mo: 5ppm).

Au:

The content is high at the old mining zone (waste sample: several 10ppm) and less generally in the quartz veins outcrops. No. 1, 2, and 3 veins of the major vein have higher contents and No. 9 and 10 are locally higher.

Ag:

The Ag is often found together with Au and the ratio of Au/Ag contents is approximately 5:1. The maximum level of Ag was 83ppm (No.10) and the same sample had the Au content of less than 0.1ppm or less.

As:

The As is found alone or together with Au or Ag and the maximum level was 94ppm.

Sb:

The Sb is relatively in a good association with Au. It also associated with Ag and As. The level is mostly less than order of several 10 ppm, the maximum level being 400ppm.

Hg:

In No.1 quartz vein, the higher content is in a range of between 500 and 1,700ppb.

Bi:

The Bi is found in extremely limited parts of veins, the content is between 20 and 80ppm nothing to do with the gold grade.

Te:

The content is occasionally between 20 and 40ppm and is associated with the high grade portion of the gold.

Se:

Not detectable in all samples.

Mo:

The Mo is detectable in only 5 samples with the maximum level 44ppm. Gold content of those samples are less than 1 ppm.

2) Average content of Au

The average width of the major quartz veins, the average content of Au and the total length are shown in Table 11-2-1.

Table II-2-1 Gold content, thickness, length of main quartz veins

Area	No. of vein	Thickness (cm)	Gold content (g/t)	Total length (m)
I	7	12.6	0.03	750
I	7′	8.5	0.19	±500
I	8	15.3	0.27	1,500
I	9	26.6	0.71	3,000
I	9′	17.8	0.21	400
I	9″	13.0	0.26	400
I	10	42.3	10.01	2,800
I	14	19.7	0.10	400
I	15	10.8	2.43	400
I	16～23	13.2	0.66	> 1,500
II	1	20.7	21.97	900
II	2	18.9	7.78	1,000
II	3	23.6	6.15	1,000
II	3′	22.8	0.92	800
II	6	26.5	2.55	800

4. Polished sections of ore minerals

Quantity: Field samples 35

Drilling core 7

In the field, samples with the sign of mineralization (native gold, sulfide minerals) were collected. Cores had no sign of mineralization by naked eye excluding samples from the west vein of MJMT-1 No.10 vein (depth: 299.84m). Table II-2-2 shows the result of microscopic observation.

The ore minerals found through the microscopic observation were the primary minerals such as native gold, chalcopyrite, galena, the sphalerite, pyrite, tetrahedrite, and secondary minerals such as the covelline and the geothite. The altaite, tellurium sulfide, tellurium oxide minerals also may be found. The occurrence of the individual minerals are as follows:

Native gold

The average diameter of native gold is 0.01 to 0.05 mm and the maximum is 0.3 X 1.0mm. Most of the gold is found independently between quartz grain crystals. Some are found along the cracks of quartz or contained in chalcopyrite or with tetrahedrite.

Chalcopyrite

Co-exists with galena and pyrite or involves tetrahedrite. Chalcopyrite is secondarily replaced by covelline and sometimes by goethite.

Galena

Galena occurs between quartz grain crystals and involves chalcopyrite.

Sphalerite

Sphalerite is contained in tetrahedrite or associated with the chalcopyrite.

Pyrite

Pyrite is found in most of the samples and occurs between quartz grain crystals or together with the chalcopyrite or contained in it. In most cases, pyrite is replaced by goethite.

Tetrahedrite

Tetrahedrite occurs between quartz grain crystals or associated with chalcopyrite or sphalerite.

Table Ⅱ-2-2 Microscopic observation of polished sections (Semidetailed, Detailed & Drilling core)

No.	Sample# 960-	GPS Cordinate 46N	GPS Cordinate 100E	No. of Qz vein	Average width(m)	Mineral assemblages: Primary Au	Primary Cp	Primary Py	Primary Gn	Primary Sp	Primary Tet	Secondary Cv	Secondary Go	Remark
1	827011	8.12	9.42	1	0.20*	○	◎	·				◎	◎	*:
2	827019	8.04	9.44	1	0.20*	◎					+			waste
3	830036	7.75	9.39	2	0.02	·		·			·			sample
4	830041	7.74	9.38	2	0.10*	○		·						
5	830044	7.67	9.41	2	0.10*	◎								
6	830046	7.88	9.30	2	?	+		·			+		◎	
7	826041	7.81	9.25	3	0.20	·	○			+	◎	○		
8	826041	7.81	9.25	3	0.20		◎	·	○				◎	
9	919005	8.58	8.58	4	?	○		·					·	
10	901011	7.99	9.86	6	0.25*		○	·	◎			○	○	
11	901012	7.97	9.86	6	0.25*	·	◎	·				◎	○	
12	901012	7.97	9.86	6	0.25*	+		·			·		◎	
13	901016	7.92	9.85	6	0.30*	○								
14	907005	7.39	10.95	7	0.10			○	◎			○	○	
15	907008	7.27	11.03	7	0.20		◎	○	○			○	○	
16	909009	7.37	10.42	7′	0.20*			+					◎	
17	906008	7.03	11.10	8	0.25				◎					
18	912062	7.43	11.83	9	0.30	·	○	+				○	○	
19	912063	7.41	11.83	9	1.00	○		+					◎	
20	920027	6.38	12.38	none No.	?	○		+					◎	
21	920028	6.41	12.30	none No.	?		○	+				+	○	
22	903044	8.09	11.60	10	0.50*	·		·	+				+	
23	903047	8.03	11.61	10	0.30		○	○	◎			+	○	
24	903061	7.68	11.89	10	0.40*	○		·						
25	903064	7.63	11.89	10	0.40*	+	+	·						
26	903064	7.63	11.89	10	0.40*	·	◎	·	+		+	+	+	
27	903092	7.11	12.23	10	?	·	○	+			+			
28	903107	6.98	12.32	10	0.30*		◎	+				+	○	
29	903107	6.98	12.32	10	0.30*	·		·					◎	
30	920015	6.50	12.48	none No.	?		○			+	◎	○	○	
31	916003	8.28	11.72	15	0.20*	○		+	○				+	
32	919011	8.81	7.60	27	?	·	+				+		○	
33	919011	8.81	7.60	27	?			+	◎		○	+		
34	920011	6.55	12.95	48	?	+		+	○				+	
35	921007	9.04	11.81	silicif.	?								◎	
36	HJHT-1 202.98m~203.08m			10	0.067			◎						
37	HJHT-1 298.66m~298.84m			10(W)	0.04			◎	+					
38	HJHT-1 298.84m~299.04m			10(W)	0.05			◎	○	+				
39	HJHT-1 299.04m~299.24m			10(W)	0.05			◎	○					
40	HJHT-2 152.60m~152.70m			1	0.10			◎		·	·			
41	HJHT-2 152.80m~152.95m			1	0.14			◎						
42	HJHT-2 153.50m~153.55m			1	0.05			◎		·				

Au: native gold Cp: chalcopyrite Py: pyrite Gn: galena Sp: sphalerite Tet: tetrahedrite
Cv: covelline Go: goethite · except table mark, occurs altaite (○), unknown tellurium oxide(◎), unknown tellurium sulphide (○) . · Relative content grade : ◎>○>+>·

Covelline

Covelline replaced secondarily to chalcopyrite and tetrahedrite.

Goethite

Goethite mostly replaced to pyrite.

5. Measuring homogenization temperature of fluid inclusions

Homogenization temperatures were measured on 27 samples of major quartz veins and drilling cores. Samples were collected from the middle of veins not having the flow structure for the outcrops. Other samples were taken from the waste sample in old mining where native gold or sulfide minerals were found.

The diameter of the fluid inclusion are generally less than 2.5 to 10 micrometers and most of them are in the shape of egg or polygon. Most of them are of vapor-liquid phase and some are of vapor phase. The content ratio of vapor-liquid phase is generally as low as 2 to 5 % and 10% in some of them.

Measurements of homogenization temperature were multiplied by 2,000 due to their small grain diameter to see primary inclusions on CRT.(Television monitor).

The microscope and heating device TH-600 manufactured by LINCOME was used for temperature measurement with the final rate of temperature increase of 1.0 to 0.1℃ per minute. The inorganic reagents Benzanilide (163℃) and Sodium-nitrate (305℃) were used for the temperature correction.

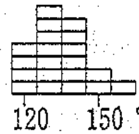
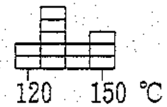
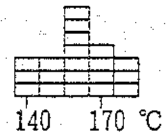
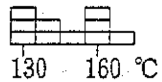
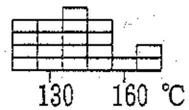
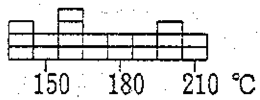
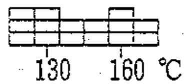
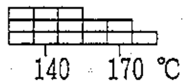
The histogram of these measurement result of samples have almost normal distribution although some samples have two peaks.

The results of the measurements are shown in Table II-2-3 (1) ~ (5). The average values of homogenization temperatures of these samples are shown respectively in Table II-2-4.

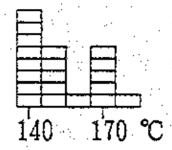
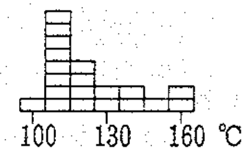
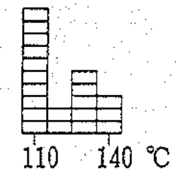
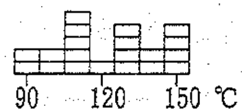
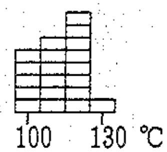
Table II-2-4 Average homogenization temperature of fluid inclusion of each veins

Q.V.No.	No. of sample	Homogenization temperature(℃)	Remark
1	2	139.5, 139.8	
2	2	165.0, 151.0	
3	1	145.0	
4	1	177.4	
5	2	147.5, 153.9	
6	1	157.5	
7	1	128.1	barren quartz
7'	1	125.3	barren quartz
9	3	122.2, 116.4*, 114.1*	* barren quartz
10	5	115.5*,133.6*,154.1, 118.4, 147.1	* barren quartz
none No.	2	127.0,115.6	barren quartz
1	3	155.8,146.6, 156.2	MJMT-2 152.60m ~153.65m
10	2	156.2,197.1	MJMT-1 202.78m ~203.20m
10W	1	147.6	MJMT-1 298.84m ~299.04m

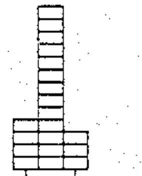
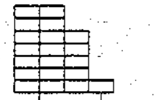
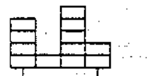
TableⅡ-2-3 Result of homogenization temperature mesured from fluid inclusion in quartz vein (detailed area, dril.core) (1)

No.	Sample #	GPS Cordinate		No. of Qz vein	Number of inclusions	Size of inclusions (mμ)	Homogenization temperature(℃)				Histogram
		Longit. 46N	Latit. 100E				Max.	Min.	Avg.	Std.	
1	960827011	8.12	9.42	1	primary(20)	<2.5～ 5.0	162	126	139.5	9.7	
2	960827019	8.04	9.44	1	primary(12)	<2.5～ 5.0	153	128	139.8	8.5	
3	960830041	7.74	9.38	2	primary(20)	<2.5～20.0	182	146	165.0	11.2	
4	960830044	7.67	9.41	2	primary(10)	<2.5～10.0	172	131	151.3	14.3	
5	960826041	7.81	9.25	3	primary(20)	2.5～12.5	177	120	145.0	15.6	
6	960919005	8.58	9.58	4	primary(20)	<2.5～10.0	219	142	177.4	23.5	
7	960806002	9.10	10.41	5	primary(15)	<2.5～ 5.0	173	127	147.5	16.3	
8	960813038	8.25	9.04	5	primary(14)	<2.5～ 7.5	186	133	153.9	15.6	

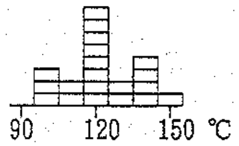
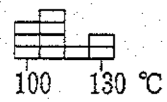
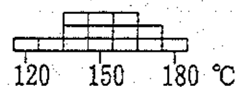
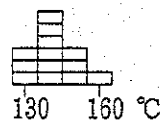
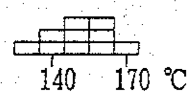
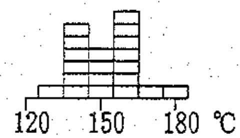
TableⅡ-2-3 Result of homogenization temperature mesured from fluid inclusion in quartz vein (detailed area, dril.core) (2)

No.	Sample#	GPS Cordinate		No. of Qz vein	Number of inclusions	Size of inclusions	Homogenization temperature(℃)				Histogram
		Longit. 46N	Latit. 100E				Max.	Min.	Avg.	Std.	
9	960901012	7.97	9.86	6	primary(20)	<2.5~ 5.0	189	141	157.9	13.5	
10	960907008	7.27	11.03	7	primary(20)	<2.5~10.0	165	108	128.1	17.0	
11	96909009	7.37	10.42	7′	primary(20)	<2.5~ 7.5	144	113	125.3	11.0	
12	960912005	9.08	11.29	9	primary(20)	2.5~32.5	152	96	122.2	18.0	
13	960912032	8.15	11.42	9	primary(20)	<2.5~ 7.5	131	103	116.4	8.6	

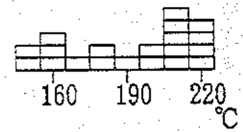
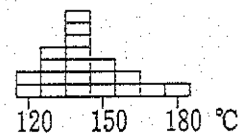
TableⅡ-2-3 Result of homogenization temperature mesured from fluid inclusion in quartz vein (detailed area, dril. core) (3)

No.	Sample#	GPS Cordinate		No. of Qz vein	Number of inclusions	Size of inclusions (m μ)	Homogenization temperature(℃)				Histogram
		Longit. 46N	Latit. 100E				Max.	Min.	Avg.	Std.	
14	960912062	7.43	11.83	9	primary(20)	<2.5～12.5	126	105	114.4	5.0	
15	960903007	9.09	11.46	10	primary(20)	<2.5～10.0	131	102	115.2	8.5	
16	960903009	8.96	11.50	10	primary(20)	<2.5～12.5	161	107	133.6	15.7	
17	960903044	8.09	11.60	10	primary(20)	<2.5～12.5	179	119	154.1	15.1	
18	960903064	7.63	11.89	10	primary(12)	<2.5～ 2.5	134	105	118.4	9.6	
19	960903092	7.11	12.23	10	primary(20)	<2.5～ 5.0	172	126	147.1	13.9	

TableⅡ-2-3 Result of homogenization temperature mesured from fluid inclusion en quartz vein (detailed area, dril. core) (4)

No.	Sample#	GPS Cordinate		No. of Qz vein	Number of inclusions	Size of inclusions (m μ)	Homogeneization temperature(℃)				Histogram
		Longit. 46E	Latit. 100E				Max.	Min.	Avg.	Std.	
20	96084040	7.05	13.01	none No.	primary(20)	<2.5～ 5.0	143	103	127.0	13.5	
21	960909016	6.83	10.63	none No.	primary(10)	<2.5～12.5	134	104	115.6	10.1	
22	MJMT-2 152.60m	—	—	1	primary(14)	<2.5～65.0	184	127	155.8	16.1	
23	MJMT-2 152.95m ～153.09m	—	—	1	primary(13)	<2.5～ 5.0	166	132	146.6	8.9	
24	MJMT-2 153.50m 153.65m	—	—	1	primary(10)	<2.5～25.0	172	138	156.2	9.6	
25	MJMT-1 202.78m ～202.88m	—	—	10	primary(20)	<2.5～10.0	181	138	156.2	11.1	

TableⅡ-2-3 Result of homogenization temperature mesured from fluid inclusion en quartz vein (detailed area, dril. core) (5)

No.	Sample#	GPS Cordinate		No. of Qz vein	Number of inclusions	Size of inclusions (mμ)	Homogeneization temperature(℃)				Histogram
		Longit. 46E	Latit. 100E				Max.	Min.	Avg.	Std.	
26	MJMT-1 203.08m ~203.20m	—	—	10	primary(20)	2.5~22.5	229	156	197.1	25.1	
27	MJMT-1 298.84m ~299.04m	—	—	10W	primary(20)	<2.5~15.0	182	123	147.6	14.8	

The homogenization temperatures of field samples, drilling core and barren vein are as follows:

Field quartz vein	165℃ to 118℃
Core quartz vein (Subsurface depth of 150m or more)	
	197℃ to 147℃
Field barren veins	137℃ to 114℃

The core samples are the highest and the field quartz vein and the barren vein had trends to be lower in this order. As a whole, these temperatures are extremely lower than those of Japan's epi-thermal gold vein deposits which range from 240 to 180℃ (Enjoji, Takeuchi, 1976).

The reason for this is not yet known. The homogenization temperature is related also to the pressure condition and the saline composition in inclusion when veins were formed. This will be the subject of future studies.

Examples of gold bearing quartz vein deposits having temperature ranges identical value to this area are as follows:

Todoroki mine	150 to 122℃ (Fujiwara, 1961)
Hikaritaki mine	180 to 140℃ (Fujiwara, 1961)
Teine mine	186 to 160℃ (Fijiwara, 1961)
Charters Towers gold field, Australia	140 to 192℃ (S.G. Peters and S.D. Golding, 1988)
(Host rock: Ordovician - Devonin Granitoids)	

Particularly, Charters Towers gold field is in the gold ore deposit area and one sample out of 11 measurement samples of 4 mines was 220 to 230℃ and others are approximately identic to the temperature range of the core quartz veins described above.

Chapter 3 Supplementary survey

In detailed area, altered zone survey by POSAM (Portable spectro radiometer for mineral identification) and sketch of trenches excavated by former East Germany were carried out.

The details of the surveys are as follows,

Alternation zone survey area:	282 samples of measurement (200m grid)
Trench survey:	220 locations, total length of 1,540m

3-1 Altered zone survey

Samples were collected along the geophysical survey line (will be explained later) for identifying altered minerals. The results are shown in Table II-3-1.

Identified clay minerals are chlorite, montmorillonite and (sericite). Although the sericite is not distinguishable from the rock-forming muscovite such as the granodiorite. Distribution map of the identified clay minerals shown in Fig. II-3-1.

In the detailed survey area I as shown in the figure, the sericite zone distributed in the granodiorite and the adamellite areas, and the chlorite or montmorillonite zone distributed mainly in the metamorphic areas. Particularly the diorite area is covered by chlorite zone.

In the sericite zone, distribute locally the chlorite or the montmorillonite zones but these have no structural relation to the quartz veins.

Detailed area II is mostly of the sericite zone corresponding to the geology and there are also the chlorite or the montmorillonite area locally but have not relation to quartz veins.

From the above mentioned, in the area of metamorphic rock, it is estimated that the chlorite or the montmorillonite zone was formed before the intrusion of granodiorites. The altered zone in granodiorite is also estimated that formed by regional alteration after intrusion of quartz veins..

The clay mineral survey by POSAM in the granitic field is made sure that may be not suitable.

3-2 Trench survey

The trench re-surveys were carried out in quartz veins No. 1, 2, 3, 6,7, 8, 9, and 10. They are classified as follows:

1) Those have excavated mainly for collecting samples from the waste at the old mining zone.

2) To confirm unclear exposed outcrops

3) To confirm the continuity of veins where there are no outcrops

Table Ⅱ-3-1 Identification of clay minerals by POSAM

1) Area Ⅰ (1)

No.	Line-No.	Rock name	Clay mineral	No.	Line-No.	Rock name	Clay mineral
1	A-13	Granodiorite	Ser	72	K-23	Granodiorite	Chl?
2	A-15	Granodiorite	Epi,Chl,Ser	73	L-13	Granodiorite	Ser>Mont
3	A-17	Granodiorite	Ser	74	L-15	Granodiorite	Ser,Mont
4	A-19	Granodiorite	Ser	75	L-17	Granodiorite	Ser
5	A-21	Granodiorite	Ser	76	L-19	Granodiorite	Ser
6	A-23	Basalt-dyke	Chl?	77	L-21	Granodiorite	Chl,Mont,Ser?
7	A-23	Granodiorite	Ser,Mont?	78	L-23	Granodiorite(si-alt)	Chl?
8	B-13	Granodiorite	Ser	79	M-13	Granodiorite	—
9	B-15	Quartz porphyry-dyke	Ser	80	M-15	Granodiorite	—
10	B-17	Granodiorite	Ser	81	M-17	Granodiorite	Ser
11	B-19	Basalt-dyke	Chl?	82	M-19	Granodiorite	Ser
12	B-19	Granodiorite	Ser?	83	M-21	Gneiss	Epi
13	B-21	Granodiorite	Ber	84	M-23	Gneiss	?
14	B-23	Granodiorite	Ser	85	N- 1	Granodiorite	Ser
15	C-13	Granodiorite	Ser	86	N- 3	Granodiorite	Ser,Chl
16	C-15	Basalt-dyke	Chl?	87	N- 5	Granodiorite	Ser
17	C-15	Granodiorite	Ser	88	N- 7	Granodiorite	Ser
18	C-17	Basalt-dyke	Chl?	89	N- 9	Quartz porphyry-dyke	Ser,Mont
19	C-17	Granodiorite	Ser,Mont	90	N- 9	Granodiorite	Ser
20	C-19	Granodiorite	Ser	91	N-11	Granodiorite	Ser,Mont
21	C-21	Granodiorite	Ser	92	N-13	Granodiorite	Ser
22	C-23	Granodiorite	Ser>Mont	93	N-15	Granodiorite	Ser?
23	D-13	Basalt-dyke	Chl	94	N-17	Granodiorite	Ser
24	D-13	Granodiorite	Ser,Mont	95	N-19	Granodiorite	Ser
25	D-15	Granodiorite	Ser	96	N-21	Granodiorite	Ser,Chl
26	D-17	Granodiorite	Ser	97	N-21	Gneiss	Chl
27	D-19	Granodiorite	Ser	98	N-23	Gneiss	—
28	D-21	Granodiorite	Ser,Chl	99	N-25	Granodiorite	Mont,Chl
29	D-23	Granodiorite	Ser,Mont,Chl	100	N-25	Gneiss	Epi>Chl
30	E-13	Quartz porphyry-dyke	Ser	101	O- 1	Granodiorite	Ser
31	E-19	Granodiorite	Ser	102	O- 3	Granodiorite	Ser
32	E-21	Granodiorite	Ser,Chl	103	O- 5	Granodiorite	Ser,Chl
33	E-23	Granodiorite	Ser	104	O- 7	Granodiorite	Ser
34	F-13	Quartz porphyry-dyke	Ser	105	O- 9	Granodiorite	Ser
35	F-15	Granodiorite	Ser	106	O-11	Granodiorite	Ser,Mont
36	F-17	Granodiorite	Ser	107	O-13	Granodiorite	Ser,Chl
37	F-19	Granodiorite	Ser	108	O-15	Granodiorite	Ser,Chl
38	F-21	Granodiorite	Ser	109	O-17	Granodiorite	Ser,Chl?
39	F-23	Granodiorite	Ser,Mont	110	O-19	Granodiorite	Ser
40	G-13	Quartz porphyry-dyke	Ser	111	O-21	Granodiorite	Ser
41	G-13	Granodiorite	Ser	112	O-23	Granodiorite	Ser,Chl,Mont
42	G-15	Granodiorite	Ser,Mont	113	O-23	Gneiss	Chl
43	G-17	Granodiorite	Ser>Mont	114	O-23	Gneiss	Chl
44	G-19	Granodiorite	Ser,Chl	115	O-25	Granodiorite	Ser?
45	G-21	Granodiorite	Ser	116	O-25	Gneiss	Ser,Chl
46	G-23	Gneiss	Chl	117	P- 1	Granodiorite	Ser,Mont,Chl
47	H-13	Granodiorite	Ser	118	P- 3	Granodiorite	Ser
48	H-15	Granodiorite	Ser<Mont	119	P- 5	Granodiorite	Ser
49	H-17	Granodiorite	Ser,Mont	120	P- 7	Granodiorite	Ser
50	H-19	Granodiorite	Ser	121	P- 9	Quartz porphyry-dyke	Ser
51	H-21	Granodiorite	Ser	122	P- 9	Granodiorite	Ser
52	H-23	Gneiss	Ser>Epi	123	P-11	Granodiorite	Ser
53	I-13	Granodiorite	Ser	124	P-13	Granodiorite	Ser
54	I-15	Granodiorite	Ser	125	P-15	Granodiorite	Ser
55	I-17	Granodiorite	Ser	126	P-17	Granodiorite	Ser
56	I-19	Granodiorite	Ser,Chl?	127	P-19	Granodiorite	Ser
57	I-21	Granodiorite	Chl,Ser	128	P-21	Granodiorite	Ser,Mont,Chl
58	I-21	Gneiss	—	129	P-23	Granodiorite	Ser,Mont,Chl
59	I-23	Granodiorite	Ser<Mont	130	P-23	Gneiss	Chl,Ser
60	J-13	Granodiorite	Chl?	131	P-25	Granodiorite	Ser
61	J-15	Granodiorite	Ser	132	Q- 1	Granodiorite	Ser
62	J-17	Granodiorite	Ser	133	Q- 3	Granodiorite	Ser
63	J-19	Granodiorite	Ser	134	Q- 5	Granodiorite	Ser
64	J-21	Granodiorite	Ser	135	Q- 7	Granodiorite	Ser
65	J-23	Granodiorite	Ser	136	Q- 9	Granodiorite	Ser
66	J-23	Granodiorite	—	137	Q-11	Granodiorite	Ser
67	K-13	Granodiorite	Ser	138	Q-13	Granodiorite	Ser
68	K-15	Granodiorite	Ser	139	Q-15	Granodiorite	Ser
69	K-17	Granodiorite	Ser	140	Q-17	Granodiorite	Ser
70	K-19	Granodiorite	Ser,Mont,Chl	141	Q-19	Granodiorite	Ser<Mont
71	K-21	Granodiorite	Ser,Mont,Chl	142	Q-21	Granodiorite	Ser,Chl?

si-alt:silicification Ser:sericite Chl:chlorite Epi:epidote Mont:montmorillonite Zeo:zeolite Cal:calcite

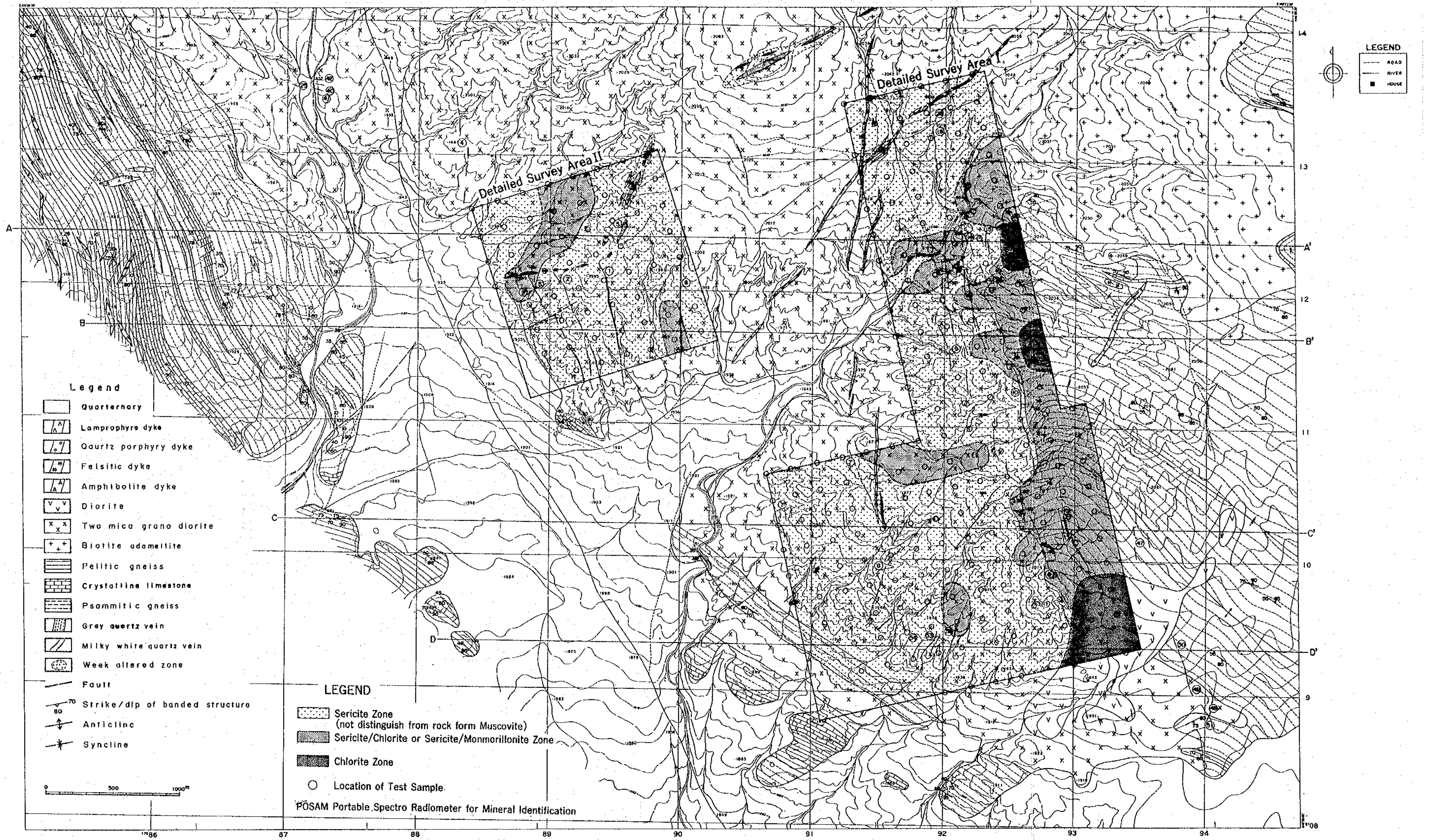
1) Area I (2)

No.	Line-No.	Rock name	Clay mineral	No.	Line-No.	Rock name.	Clay mineral
143	Q-23	Granodiorite	Ser?	183	T-11	Granodiorite	Ser
144	Q-25	Granodiorite	Ser,Mont,Chl	184	T-13	Granodiorite	Ser,Mont
145	R- 1	Granodiorite	Ser	185	T-15	Granodiorite	Ser
146	R- 3	Granodiorite	Ser	186	T-17	Granodiorite	Ser
147	R- 5	Granodiorite	Ser	187	T-19	Granodiorite	Ser
148	R- 7	Quartz porphyry-dyke	Ser	188	T-21	Granodiorite	Ser
149	R- 7	Granodiorite	Ser,Chl	189	T-21	Granodiorite(pelitic)	Ser
150	R- 9	Granodiorite	Ser	190	T-23	Gneiss	Ser
151	R-11	Granodiorite	Ser	191	T-25	Granodiorite	Ser
152	R-13	Granodiorite	Ser	192	T-25	Gneiss(pegmatite)	Ser
153	R-15	Granodiorite	Ser	193	U- 5	Quartz porphyry-dyke	Ser
154	R-17	Granodiorite	Ser	194	U- 5	Granodiorite	Ser
155	R-19	Granodiorite	Mont	195	U- 7	Granodiorite	Ser
156	R-19	Gneiss	—	196	U- 9	Granodiorite	Ser
157	R-21	Granodiorite	Chl,Ser?	197	U-11	Granodiorite	Ser
158	R-21	Gneiss	Chl,Epi,Mont	198	U-13	Granodiorite	Ser,Mont
159	R-23	Granodiorite	Ser	199	U-15	Granodiorite	Ser
160	R-23	Gneiss	Ser,Mont,Chl	200	U-17	Granodiorite	Ser
161	R-25	Granodiorite	Ser,Mont,Chl	201	U-19	Granodiorite	Ser
162	R-25	Gneiss	Chl,Ser	202	U-21	Granodiorite	Ser
163	S- 1	Granodiorite	Ser	203	U-23	Diorite	—
164	S- 1	Gneiss(pelitic)	Chl	204	U-25	Diorite	—
165	S- 3	Granodiorite	Ser	205	V- 5	Granodiorite	Ser
166	R- 5	Granodiorite	Ser	206	V- 7	Granodiorite	Ser
167	R- 7	Granodiorite	Ser	207	V- 9	Granodiorite	Ser
168	R- 9	Granodiorite	Ser	208	V-11	Granodiorite	Ser
169	R-11	Granodiorite	Ser	209	V-13	Granodiorite	Ser
170	R-13	Granodiorite	Ser	210	V-15	Granodiorite	Ser
171	R-15	Granodiorite	Ser	211	V-17	Granodiorite	Zeo,Ser
172	R-17	Granodiorite	Ser	212	V-19	Granodiorite	Ser
173	R-19	Granodiorite	Ser,Mont	213	V-21	Granodiorite	Ser,Mont
174	R-21	Granodiorite	Ser	214	V-23	Diorite	Chl?
175	R-21	Gneiss	Ser	215	V-25	Diorite	Chl?
176	R-23	Granodiorite	Ser,Mont	216	W- 1	Gneiss(marble)	Cal
177	R-23	Gneiss	Ser	217	W-11	Granodiorite	Ser
178	R-25	Gneiss	Ser	218	W-13	Granodiorite	Ser
179	T- 3	Granodiorite	Ser	219	W-15	Granodiorite	Ser
180	T- 5	Granodiorite	Ser	220	W-17	Granodiorite	—
181	T- 7	Granodiorite	Ser	221	W-21	Diorite	—
182	T- 9	Granodiorite	Ser	222	W-25	Diorite	Ser

2) Area II

No.	Line-No.	Rock name	Clay mineral	No.	Line-No.	Rock name	Clay mineral
1	A- 1	Granodiorite	Ser	31	C- 9	Granodiorite	Ser
2	A- 3	Granodiorite	Ser	32	C-11	Granodiorite	Ser
3	A- 5	Granodiorite	Ser?	33	C-13	Granodiorite	Ser
4	A- 7	Granodiorite	Ser,Chl?	34	D- 3	Granodiorite	Ser
5	A- 9	Granodiorite	Ser,Chl	35	D- 5	Granodiorite	Ser
6	A-11	Granodiorite	Ser	36	D- 7	Granodiorite	Ser
7	A-13	Granodiorite	Ser,Chl	37	D- 9	Granodiorite	Ser
8	A-15	Granodiorite	Ser	38	D-11	Granodiorite	Ser
9	A'- 1	Granodiorite	Ser	39	D-13	Granodiorite	Ser
10	A'- 3	Granodiorite	Ser,Chl?	40	D-15	Granodiorite	Ser
11	A'- 5	Granodiorite	Ser	41	E- 3	Granodiorite	Ser
12	A'- 7	Granodiorite	Ser,Chl	42	E- 5	Granodiorite	Ser
13	A'- 9	Granodiorite	Ser,Chl	43	E- 7	Granodiorite	Ser
14	A'-11	Quartz porphyry-dyke	Ser	44	E- 9	Granodiorite	Ser,Chl
15	A'-11	Granodiorite	Ser	45	E-11	Granodiorite	Ser
16	A'-13	Granodiorite	Ser	46	E-13	Granodiorite	Ser
17	A'-15	Granodiorite	Ser	47	E-15	Granodiorite	Ser
18	B- 1	Granodiorite	Ser	48	F- 3	Granodiorite	Ser
19	B- 3	Granodiorite	Ser	49	F- 5	Granodiorite	Ser
20	B- 5	Granodiorite	Ser>Mont	50	F- 7	Granodiorite	Ser
21	B- 7	Granodiorite	Ser,Mont,Chl	51	F- 9	Granodiorite	Ser
22	B- 9	Granodiorite	Ser	52	F-11	Granodiorite	Ser
23	B-11	Granodiorite	Ser	53	F-13	Granodiorite	Ser,Mont
24	B-13	Granodiorite	Ser	54	F-15	Granodiorite	Ser
25	B-15	Granodiorite	Ser	55	G- 5	Granodiorite	Ser
26	C- 1	Granodiorite	Ser	56	G- 7	Granodiorite	Ser
27	C- 3	Granodiorite(si-alt)	Ser,Mont	57	G- 9	Granodiorite	Ser,Chl
28	C- 5	Granodiorite	Ser	58	G-11	Granodiorite	Ser
29	C- 7	Granodiorite	Ser	59	G-13	Granodiorite	Ser,Chl
30	C- 9	Granodiorite(si-alt)	Chl,Eip,Ser	60	G-15	Granodiorite	Ser

si-alt:silicification Ser:sericite Chl:chlorite Epi:epidote Mont:montmorillonite Zeo:zeolite Cal:calcite



CARTOGRAPHY 1996
PHOTOGRAPHY 1983

Fig. Ⅱ-3-1 DISTRIBUTION OF ALTERED CLAY MINERALS BY POSAM

The quartz vein No. 1 is mostly falls under a).

The survey were carried out at 220 locations that had been confirmed (212 locations according to the reports of the former East Germany). The presentative sketches are described in Fig. II-3-2 (1) to (8) for 6 to 10 locations of each veins.

No chronological relations were clarified between the quartz veins No.3 and No. 5 in the current survey (Fig. II-3-2(1)).