

**Appendix 12 Core logging sheet**

Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	Brown Carbonate	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
0													Top soil	reddish brown pisolitic soil yellowish brown soil black shale fragment with limestone brown soil with limestone fragments limestone boulder and reddish brown cave soil		
9.40													limestone	light gray~ white argillic limestone argillic band showing pink to yellow		
17.30													limestone	light gray, massive, cave mud contained		
20.90													calcareous soil	weathered brown carbonate, clayey limestone fragments mixing		
24.50													black shale	24.50 - 27.50 strongly brecciated calcite network vein developing 27.50 - 32.60 oxidation remarkable 29.20 - 29.35 calcite - brown carbonate vein		
30													limestone	pale green, weak skarnized		
32.60													black shale	strongly sheared and oxidized calcite hairline and calcite-brown carbonate hairline abundant		
33.30													limestone	bluish gray, massive weak skarnized		
38.60													shale	light gray, cracky 41.80 - 44.00 quartz-calcite vein 45.60 - 46.00 quartz-calcite pool with brown carbonate 47.10 - 48.60 blocky, strong oxidation		
40													shale/ limestone	cracky, weathering along fracture		
40.90																
43.60																
50																

Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetic	galena	sphalerite	Brown Carbonate	Fe-sulphide	Sulfurization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
50.40													shale / calcite quartz veins	black shale / vertical calcite-quartz veins		
53.75														cracky - clayey core (fault zone) shale / limestone / brown carbonate mixing		
60																
60.40													limestone			
61.30													shale	black, brecciated		
62.00													sandstone			
63.70													calcareous soil	dark brown, weathered brown carbonate		
70																
70.30																
71.20													black shale	calcite veins rich		
72.00													br. carbonate			
74.60													dolomite	pinkish gray		
78.95													br. carbonate			
79.20													dolomite	pinkish gray, massive 77.10 - 77.40 wedge-shape brown carbonate		
80.80													br. carbonate	dark brown, quartz-calcite hairline network	TM1-1 64.55 64.70	Cu 3ppm Pb 32ppm Zn 116ppm
84.80													dolomite	white, coarse crystalline dark brown hairline along fracture		
90													br. carbonate	well weathered almost turn into soil like material at top part		
93.05													dolomite	dark gray 93.05 - 94.00 massive 94.00 - 94.70 banding with brown carbonate		
94.70													br. carbonate	94.95 - 95.35 white dolomite intercalating		
96.35													dolomite	brown carbonate spot remarkable	TM1-2 79.30 80.70	Cu 16ppm Pb 41ppm Zn 46ppm
99.80																
100																

Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	Brown Carbonat	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
102.55													dolomite	argillaceous 100.15 - 100.20 brown carbonate intercalating 101.10 - 101.55 random replacement by brown carbonate		
													limy dolomite	white, crystalline chert, shale seam interbedding		
110 110.10													dolomite	pinkish grey, argillaceous, crystalline		
112.60													dolomite	pale greenish gray, coarse crystalline shale string abundant, weak skarnized? 114.00 - 114.30 spongy brown carbonate vein		
120													dolomite	pinkish color deeper to bottom  123.80 - 124.00 brown carbonate vein and spot 124.50, 124.60 brown carbonate hairline		
128.50													dolomite	ocher, coarse crystalline shale strings abundant 129.40 brown carbonate (1 cm) 132.50 brown carbonate vein (1-3 cm) spongy texture distinguish along vein 134.80 brown carbonate vein with dolomite 137.10 brown carbonate vein		
130													dolomite	pale greenish gray, crystalline 139.90 chlorite vein with slickenside		
139.30 140.30													dolomite	pink and gray banded, crystalline, very coarse shale and chert seam abundant 142.50 chlorite - calcite vein (3 cm)  143.90, 144.60, 144.70 brown carbonate vein(w=5mm) 146.80 brown carbonate vein(w=6 - 10mm)		
147.60													dolomite			
150													dolomite			

Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	Brown Carbonate	Fossiliferous	Sulfidation	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
158.70													dolomite	dark gray banded, crystalline 152.10 - 152.15 brown carbonate network vein 153.40 - 154.00 brecciated texture with brown carbonate and fine sulfide		
159.90													black shale	calcite vein along bedding		
164.70													dolomite	pale green, massive 161.80 - 161.90 dark gray recrystalline dolomite vein with pyrite 161.90 - 162.00 ditto vein network		
167.30													black shale	silicification moderate with pyrite calcite - dolomite veins abundant		
169.90													dolomite	silicified 167.30 - 168.30 quartz - dolomite vein network		
172.80													shaly dolomite	highly contains shale lamina brecciated texture remarkable chloritization common		
174.90													black shale	silicified with pyrite		
180													dolomite	white, massive, fine crystalline tiny of pyrite dissemination		
													dolomite	chlorite strings banding		
190													dolomite	dark gray, coarse crystalline chert, chlorite seam common		
													dolomite	light gray, fine crystalline 193.20 - 194.50 massive 194.50 - 197.80 chlorite hairline remarkable 197.80 - 200.50 chert band rich		
200																

Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	Brown Carbonat	Fe-sulphide	Sulfurization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
205.00			∠50										dolomite	dark gray, coarse crystalline		
206.30			∠35										shaly dolomite	dark gray, fine grain		
208.65			∠38										dolomite	coarse crystalline, massive, weak silicified and argillized pyrite, pyrrhotite clots and strings along weak bedding with chert thin bed, weak silicified and pyritization below 208.75 strong crushing and pulverizing dolomite block or layer contains		
211.15			∠48										black shale			
217.90													dolomite	light gray, weakly to moderately silicified 212.40-212.70 dark brown carbonate and pink dolomite irregularly replacing 213.00-213.65 brown carbonate with breccia texture and fine sulfide 216.70-217.50 breccia texture with chlorite-quartz network	213.25 TM1-4 213.65	Cu 10ppm Pb 10ppm Zn 268ppm
220													limy dolomite	gray, crystalline, massive 218.40-218.60 chert and chlorite strings		
220.20			∠78-90										black shale	breccia texture with quartz-calcite vein, pyrite diss.		
221.30													dolomite/ chert/ shale	thin alternation chlorite-calcite vein irregularly developing pyrite dissemination remarkable	221.35 TM1-5 222.05	Cu 13ppm Pb 70ppm Zn 100ppm
223.80			∠55										dolomite	crystalline with chlorite lamina 224.40-224.45 shale bed pyrite dissemination along bedding		
225.50			∠35										chert	greenish gray to purple, with shale and dolomite lamina pyrite and fine sulfide dissemination along bedding		
227.40			∠28										pelitic hornfels	microblastic texture by cordierite, garnet 227.40-227.90 strongly crushing pyrite diss. and quartz hairline network remarkable partly observed sedimentary texture 232.30-232.60 garnet blast remarkable		
230			∠65											236.20 galena scattering 236.30 pyrite-galena-sphalerite diss. remarkable chlorite-sericite alteration strong	236.30 TM1-6 237.40	Ag 1.2g/L Cu 112ppm Pb 510ppm Zn5050ppm
238.00			∠85-90										chert	light gray, with dolomitic limestone and shale lamina pyrite diss. along bedding 238.50 calcite vein(w=5mm)		
240			∠65										dolomite	white to gray, coarse crystalline chert and chlorite strings		
240.10			∠32										black shale	with dolomite bed 242.50-242.60 quartz vein along bedding		
242.08			∠40													
243.25			∠28										dolomite	banding texture by white fine crystalline part and gray coarse crystalline part with graphite coarse grain part oftenly accompanied with pyrite dissemination		
250																

Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Stamization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
0 10 20 30 40 50													Top soil	reddish brown soil		
														limestone boulder		
														brown soil		
														grayish brown soil		
														brownish gray soil with limestone boulders		
													massive, gray, carbon spots scattering	dolomite		
													9.00-12.30 chlorite - calcite hairline network			
													12.70 calcite vein			
													13.00-13.20 chlorite vein			
													13.30-13.37 brecciated silicified part by ferruginous quartz			
13.50 chlorite-smectite-calcite vein	TM2-1	Ag 11.6g%, Cu 98ppm Pb 1680ppm Zn 1920ppm														
13.75-14.10 brecciated silicified part by ferruginous quartz with pyrite, chlorite, sphalerite, galena																
14.60-14.70, 15.00-15.05 ditto	17.00-20.50 brecciated texture remarkable calcite-quartz-fine sulfide cementing brecciated matrix	TM2-2	Ag 6.4g%, Cu 130ppm Pb 340ppm Zn 144ppm													
	21.60 - 22.80 brecciated texture remarkable fine sulfide (pyrite, galena>>sphalerite) cementing															
		TM2-3	Ag 5.0g%, Cu 243ppm Pb 224ppm Zn 72ppm													
	26.90 - 30.20 brecciated texture remarkable calcite-quartz-sulfide (pyrite, pyrrhotite>galena) cementing															
		TM2-4	Ag 1.2g%, Cu 37ppm Pb 835ppm Zn 42ppm													
	28.30 - 28.40 calcite-quartz-chlorite vein															
	impure dolomite with weak brecciated texture															
	33.60 ferruginous quartz vein with sphalerite, galena															
	36.10 calcite-chlorite-pyrite vein															
	37.70, 37.95 calcite-chlorite-pyrite vein															
	42.40 ferruginous quartz vein (5 mm) with sulfide															
	47.35 - 48.00 open crack along old quartz vein															

Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Sulfurization	Silicification	Argillization	Geologic Description		Results of Laboratory Test		
													Rock	Lithology	Sample Number		
				<10													
				<50													
60				<70									dolomite	53.10 - 54.00 calcite-quartz vein weak silicification along vein			
				<60										57.80 chlorite-calcite vein (w=5cm)			
				<50										57.85 - 58.50 brecciated texture with sulfide			
				<70										58.50 - 59.20 chlorite-quartz-calcite alteration with pyrite-galena (-sphalerite)			
				<60										61.50 - 63.30 shale and graphite seam interbedded			
				<50										63.30 - 63.55 brecciated with chlorite			
				<60										64.20 - 64.40 brecciated with chlorite			
66.70				<80									dolomite/	thin alternation			
				<70									chert	68.70 - 70.70 abundant sulfide disseminate	69.20		
69.20														massive, impure, shale sandstone interbedding	TM2-5	Ag 4.6g/t, Cu 2.7ppm, Pb 2.2ppm, Zn 450ppm	
70														72.00 - 73.30 breccia zone with chlorite, pyrite	70.70		
				<40										74.40 - 74.50 calcite-quartz vein with pyrite, chlorite (w=10 cm)			
74.60				<35									calcareous	dark gray, dolomitic			
76.50														77.00 - 80.20 brecciated texture remarkable fine sulfide with chlorite			
80														dolomite	dark gray, massive, impure argillie part turned into hornfels		
				<55													
86.50				<60										dolomite	much of mudstone and sandstone lamina interbedding irregularly chloritized		
				<70													
90														90.30 - 90.80 pale green, siliceous tufo origin?			
91.00																	
														dolomite	pale green, coarse crystalline, with some of shale		
														95.50 - 96.70 silicified with chlorite-pyrite			
														97.40 - 98.85 chlorite-zoisite alteration	97.60		
														98.85 - 98.95 chlorite-calcite vein	TM2-6	Ag 4.0g/t, Cu 6.8ppm, Pb 2.0ppm, Zn 980ppm	
98.95				<45										dolomite	weak replacing garnet-epidote skarn	98.50	
100																	



Depth (m)	Geol. Column	Core Shape	Structure	Ven	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test		
													Rock	Lithology	Sample Number		
100.30				∠30									dolomite	pale green, coarse crystalline with calc-silicate and pyrite dissemination 100.90 - open crack with quartz-calcite vein 101.90 - 106.30 siliceous part, tuff origin?			
107.60				∠28									chert / meta calcareous tuff	purple chert / pale green calcareous tuff tuff part silicified and chlorite-epidote alteration 109.85 - 110.10 pyrite, zoisite dense disseminate			
110													black shale / calcareous tuff	shale turned to hornfels tuff turned to epidote-diopside skarn			
114.20				∠15										skarnized calcite vein with chalcopyrite-galena			
114.80				∠35										114.95 - 115.10 pyrite-pyrrhotite-hematite dense diss.			
115.25				∠20										skarn			
115.40														black shale / calcareous tuff	118.00-118.10, 118.65-118.80 pyrite-pyrrhotite diss. 118.85 - 119.00 magnetite band with pyrite, galena, chalcopyrite		
119.00				∠25										limestone	weakly skarnized		
120															original texture remained green skarn with gamet, magnetite, hematite, pyrite, pyrrhotite 121.30 - 121.85 gamet skarn with pyrite, chalcopyrite 123.20 - 123.55 gamet phenocryst 126.80 - 127.25 gamet skarn with magnetite, pyrite		
121.30				∠20											130.40 - 130.55 gamet megacryst 131.05 - 131.10 pyrite disseminate		
130														green skarn	133.00 - 135.70 magnetite, pyrite banding along bedding, chalcopyrite scatter		
				∠15											137.40 - 137.50 magnetite band 138.95-139.10, 139.45-139.55 magnetite band 139.70 - 139.85 magnetite band with pyrite 140.60 - 140.75 magnetite with pyrite 141.20 - 141.30 magnetite with pyrite, pyrrhotite 142.20 - 142.30 pyrite, chalcopyrite diss. 142.30 - 142.65 magnetite-hematite band		
140															144.35 - 144.40 magnetite band		
															148.10 - 150.60 magnetite-hematite band with fine sulfide		
150																148.50 TM2-7 150.00	Ag +0.2g, Cu 12ppm Pb 8ppm, Zn 36ppm

Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	spinelite	chalcopyrite	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test		
													Rock	Lithology	Sample Number		
150.60													crushed rock, core shape likely aggregate all rocks stained by limonite				
150													weathered skarn rock	157.60 - 158.40 magnetite-garnet skarn remained			
163.40													magnetite garnet skarn				
165.30				∠70									quartz vein	with chalcopyrite, bornite			
166.10				∠70									amphibole green skarn	with magnetite-hematite band 166.20 - 166.50 chalcopyrite disseminate			
170																	
170.85				∠80									quartz vein	with chalcopyrite			
171.30				∠80									?	sandstone	silicified sandstone?, quartzose pale green massive		
175.35															so much magnetite-hematite band and garnet band 178.90 - 179.20 strong silicified		
180														amphibole magnetite skarn	181.00-181.20, 181.45-181.65 argillitic alteration (kaolinite-sericite)		
															187.70 - 188.20, 188.65 - 188.90 garnet rich		
190															190.10 - 191.30 garnet abundant		
192.70				∠75- 80										garnet skarn	dark green, massive calcite-ankerite hairline network developing 195.40 - 195.90 strong silicified		
196.60				∠75- 80 ∠10- 20										green skarn	brocciated texture remarkable with pyrite dissemination quartz vein and hairline network developing moderate silicification		
200																	

Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
209.50 210				∠50 ∠60									green skarn	202.25 - 204.50 broccia texture remarkable pyrite dense dissemination 202.70 - 202.90 brocciated quartz vein 206.00 - 207.60 quartz-dolomite network vein		
216.30													magnetite hematite skarn	209.50 - 209.80 shear zone, barite on surface pyrite hairline and nebulitic dissemination abundant		
218.40 220													sandstone	arkosic?, strong silicified with pyrite		
228.00 230													magnetite skarn	pyritization remarkable 221.90 - 222.50 strong silicified 227.50 - 227.60 strongly chloritized		
237.20 240													silicified skarn	crashed ore shape pyrite dissemination moderate skarnized part remain like as xenolith		
250													sandstone	pale green, silicified with pyrite 247.30 - 247.40 large idiomorphic pyrite abundant		



Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
304.20													green skarn	partly weak silicified		
309.60 310													gamet skarn	gamet megacryst rich pyrite disseminate abundant		
320													silicified skarn	316.00 - 316.20 idiomorphic pyrite abundant 316.80 - 316.85 magnetite band		
322.60 322.80													quartz vein	with small amount of chalcopyrite		
329.00 330													chert/ tuff	chert / sandy tuff alteration tuff part slightly replaced by epidote		
340													epidote skarn	origin: tuff or sandstone, sedimentary texture remain chlorite rich, slightly silicified  335.50 - 337.00 nebulitic pyrite dissemination		
344.70																

320.20  
TMZ-9  
Ag <0.2g/L, Cu 13ppm  
Pb 101ppm, Zn 92ppm



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													Rock	Lithology	Sample Number		
54.50																	
55.20														dolomite	pyrite disseminate		
															fine pyrite disseminate		
59.30 - 59.70															chalcopyrite-galena dissemination		
60.60 - 60.85															quartz pool with chalcopyrite		
63.10 - 64.20															large idiomorphic pyrite abundant		
68.90 - 69.05															pyrite-chalcopyrite dissemination	TM3-3	
69.00														greenskarn dike with quartz vein			Cu 1.64%, Pb 12ppm Zn 32ppm
70.00														green skarn	massive, abundant pyrite disseminate		
70.90														magnetite skarn	massive, abundant pyrite disseminate partly accompanied with galena	TM3-4	Cu 53ppm Pb 3ppm Zn 35ppm
74.65															massive, with large idiomorphic pyrite		
75.65-75.80, 76.60-76.80, 76.90-77.30, 78.50-79.00															magnetite band with small amount of galena		
81.00 - 84.00															pyrite dense disseminate	TM3-5	Cu 564ppm Pb 60ppm Zn 284ppm
88.50, 88.80															pyrite pool		
92.30															dark green, partly original bedding remains pyrite dissemination strong	TM3-6	Cu 61ppm Pb 4ppm Zn 52ppm
92.80-93.00, 93.50-93.90, 94.90-95.00, 95.90-96.00															chalcopyrite spot scattering		
97.30 - 102.50															large pyrite spot with chalcopyrite	TM3-7	Cu 1420ppm Pb 52ppm Zn 247ppm
99.30 - 102.30															strongly foliated		

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													Rock	Lithology	Sample Number			
100.30			Z80										magnetite gamet skarn	104.50-105.70	pyrite-chalcopyrite dissemination in meta-sandstone	TM3-8	Cu 5330ppm Pb 15ppm Zn 500ppm	
			Z85												105.70			
110																brecciated and clayey core, fault zone?		
113.60			Z90												113.60			
			Z85										green skarn		dark green with much of magnetite foliation remarkable	TM3-9	Cu 889ppm Pb 33ppm Zn 280ppm	
120															113.60 - 117.00	pyrite strongly diss.		
															121.50 - 122.70	strong pyritization	TM3-10	Cu 942ppm Pb 11ppm Zn 270ppm
122.70			Z60										quartz vein	122.70	pyrite abundant	TM3-11	Cu 45ppm Pb 120ppm Zn 22ppm	
122.95			Z60										aplitic granite		fine grained biotite aplitic with small amount of pyrite kaolinitization remarkable			
125.20													granite		potash feldspar porphyritic biotite granite with small amount of pyrite potash feldspar max. 4x2cm chloritization and kaolinitization remarkable			
130			Z75												130.60 - 131.50	quartz vein with pyrite (w=30cm)		
			Z80															
140																		
145.00																		
150																		Cu 1420ppm Pb 52ppm Zn 240ppm



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													Rock	Lithology	Sample Number	
0 - 9.00													Alluvium deposit	boulder to granule, sand		
9.00 - 11.65													black shale	black shale and gray shale alternation pyrite hairline along bedding and cleavage 11.65 quartz vein with pyrite-arsenopyrite-chlorite-smectite		
11.65 - 16.70													chert	jasperoid vein with chlorite-epidote-pyrite abundant 16.70 sphalerite on cleavage		
16.70 - 18.80														18.80 - 21.90 pyrite, arsenopyrite diss. abundant		
18.80 - 21.90													black shale	slumping texture abundant, pyrite-arsenopyrite diss.	21.90	
21.90 - 22.50													silicified rock	drusy texture, abundant sulfide dissemination with smectite	TM4-1	Au 100ppb, Ag 100g/t, Cu 146ppm, Pb 927ppm, Zn 84ppm
22.50 - 24.10													black shale	slumping texture remarkable 25.20 - 25.60 pyrite hairline	23.50	
24.10 - 25.70													sandstone	pale pinkish gray, slightly silicified 25.80-26.10 strongly sheared with chlorite-pyrite-galena	25.00	
25.70 - 27.10													quartz vein	pyrite, galena (± sphalerite, chalcopyrite)	26.00	
27.10 - 28.20													shale/sandstone	silicified	TM4-2	Au 45ppb, Ag 20.8g/t, Cu 310ppm, Pb 2.55%, Zn 700ppm, Sn 430ppm
28.20 - 29.20													quartz vein	pyrite, galena, arsenopyrite	28.20	
29.20 - 29.50													shale/sandstone	weak silicified, abundant pyrite dissemination	29.50	
29.50 - 31.40													sandy tuff	greenish gray, weak silicified with smectite pyrite vein network developing	31.40	
31.40 - 33.35													black shale	interbedded sandstone layer 33.35 - 34.80 calcite-quartz vein network with pyrite 35.50 calcite-chlorite vein with pyrite, pyrrhotite	TM4-3	Au 10ppb, Ag 15.8g/t, Cu 335ppm, Pb 8850ppm, Zn 66ppm, Sn 1000ppm
33.35 - 37.40													shale/sandstone	37.80 chlorite-pyrite on slickenside 37.80 - 38.10 weak silicified with galena diss. 39.00 calcite vein (w=1cm) 40.00 - 41.00 calcite hairline network	33.35	
37.40 - 40.00													black shale	45.00 - 46.00 calcite hairline network 48.00 - 48.10 calcite vein with pyrrhotite 48.90 - 49.00 calcite vein with pyrrhotite, pyrite		
40.00 - 42.25																
42.25 - 50.00																

Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
60				∠75										51.10 - 51.30 calcite vein(w=3cm)		
				∠55										52.40 - 52.55 interbedded sandstone		
				∠85 - 90										52.40 - 53.80 calcite veins(w=5 - 15mm)		
				∠65										54.50 - 54.70 calcite vein(w=3cm)		
				∠30										56.40 calcite vein hairline network		
				∠45 - 50										58.30 - 58.45 sandstone interbedding		
				∠10										58.90 - 60.70 crush and pulverized zone		
				∠10										60.70 - 61.90 sandstone / shale alternation		
														60.70 - 60.85 calcite-quartz vein with pyrrhotite		
				∠75										63.60 - 63.70 quartz-pyrrhotite vein(w=1cm)		
														64.00 - 64.10 pyrite hairline network to dissemination		
				∠80										68.70 - 69.70 calcite veins abundant(w=1 - 10mm)		
70				∠65												
70.90				∠30										sandstone: gray, massive, with small amount of shale seam		
74.00				∠45										chert: pale green banded		
				∠45										74.50 calcite-quartz-pyrite-pyrrhotite vein(w=3cm)		
				∠10 - 45										74.90 - 75.10 quartz vein with pyrite		
76.30				∠25										shale/ sandstone: small amount of calcite vein along bedding		
														78.90 pyrite-quartz vein(w=5mm)		
79.15				∠65										chert: pale green, massive		
80				∠5										79.50 - 79.70 pyrite-pyrrhotite diss		
				∠30										79.65, 79.85 pyrite-pyrrhotite-quartz		
81.10				∠27										80.95 pyrite hairline on crack		
														siliceous shale: weakly banded		
														81.80 - 82.40 quartz vein hairline with pyrite		
														83.90 quartz vein with pyrite		
85.40				∠20										interbedding small amount of chert bed		
				∠30										85.85 quartz vein with pyrite(w=8mm)		
				∠83										black shale: 88.15 quartz vein with pyrite(w=3mm)		
90														89.95 - 90.05 calcite vein (w=10cm)		
91.95				∠25										shale: gray and black alternation		
				∠20										slumping texture remarkable		
														93.10 pyrite-quartz vein(w=7mm)		
														93.90 pyrite-quartz vein(w=1 - 7mm)		
														97.30 - 97.50 calcite pool		
99.40														98.40 - 98.50 quartz vein hairline		
100														with pyrrhotite(w=1 - 3mm)		

Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
100.90			∠25	∠20.70									black shale	100.40 - 100.70 quartz vein with chlorite-pyrite		
			∠20										shale/ sandstone			
102.40			∠50	∠55.70									sandstone	with shale lamina 102.80 - 103.00 quartz vein with pyrite(w=2mm) 103.40-103.60 quartz-calcite vein with pyrite-light brown mineral, pyrite diss. remarkable around this vein 104.90 - 105.00 two calcite veins(w=3cm)	103.00	
			∠50	∠70											TMM-4	Ag 0.2g% Cu 90ppm Pb 3730ppm Zn 6.43ppm
105.60			∠45										black shale	107.40 - 107.50 pyrite hairline and dissemination 107.80 quartz vein with pyrite(w=8mm)	104.00	
			∠20	∠60												
108.80			∠50	∠50									quartz vein	brecciated texture with abundant pyrite-ether sulfide	TMM-5	
109.10			∠20	∠50									shale/ sandstone	alternation with calcite vein hairline	109.80	Ag 1.2g% Cu 22ppm Pb 3730ppm Zn 1.32%
110			∠60.00											110.10 chalcopyrite-brown mineral clot	109.10	
110.40			∠40	∠30.40										weak banded to massive 110.40-111.30 abundant calcite vein network 111.40 pyrrhotite clots(with sphalerite?) 111.90 quartz-calcite vein(w=1cm) with pyrite-pyrrhotite-magnetite 112.90-113.40 abundant calcite vein network 113.40-113.70 sandstone interbed 114.20-114.75 strongly foliated, pyrite diss. and veinlets along foliation, strong chloritization	114.00	
			∠20												TMM-6	Cu 1.53ppm Pb 226ppm Zn 160ppm
														116.30-117.80 dense pyrite dissemination with calcite	115.00	
			∠63											118.00 calcite vein with pyrite(w=2mm) 118.10 calcite vein with pyrite(w=3mm) 119.00-119.90 pyrite clots scattering and calcite-pyrite hairline 121.20-121.50 calcite vein(w=10-15mm)	116.50	Cu 90ppm Pb 187ppm Zn 130ppm
120			∠70	∠65										124.30 quartz-calcite vein(w=8mm) 124.80-125.10 quartz vein with pyrite-chlorite (w=5-15mm)	TMM-7	
			∠30											127.30 quartz-calcite vein with pyrite pyrite dissemination around vein 129.10 calcite vein, both side 2cm, strongly pyrite diss.	118.00	
130			∠10											131.20, 131.35 pyrite-quartz vein along bedding		
			∠20											134.00-134.30 calcite vein network with pyrite diss. 135.30-135.60 quartz-calcite vein network with pyrite diss. 136.10-140.00 pyrite clots scattering		
			∠17											140.15-140.20 calcite-quartz vein hairline network 142.00-142.40 pyrite dissemination with quartz vein 143.00 pyrite vein		
			∠10.25	∠80.00												
140			∠40	∠15												
			∠15													
			∠60	∠25												
143.60			∠45										argillitic dolomite	mud seam abundant		
144.80													shale	reddish brown, with fine limestone bed		
146.90			∠20.50										shale/ limestone	reddish brown shale, dolomitic limestone fine alternation calcite vein network remarkable		
			∠20	∠15.70												
149.40																
150																

Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
154.60			∠15										chert	reddish brown and gray, banding well calcite vein network abundant		
160			∠64 ∠20 ∠23 ∠20										chert/ dolomite	dolomite dominating to lower part		
163.00 163.40			∠15										silicified rock	silicified dolomite? pyrite abundant		
169.60 170			∠20 ∠20 ∠20										dolomite	impure, interbedded shale and chert seam 165.85-166.00 foliated, silicified zone with pyrite lower part slightly silicified		
172.20			∠20 ∠60										dolomitic shale	silicified, original texture remained abundant pyrite dissemination		
180			∠10 ∠20 ∠70 ∠17										black shale	172.40 calcite-quartz vein with pyrite(w=1cm) 172.80 pyrite vein with calcite quartz(w=6mm) 173.50-197.00 abundant pyrite dissemination some slickenside with remarkable chlorite		
190			∠20 ∠60 ∠15 ∠65 ∠80										black shale	182.00 calcite vein 185.70 dolomite vein (w=20cm) 188.95-189.40 dolomite vein with pyrite(w=3cm) 189.00-190.00 slightly silicified 190.40 dolomite-pyrite vein cutting pyrite vein(w=3cm) 190.95-191.10 dolomite-quartz pool with pyrite, pyrrhotite chlorite rich		
197.00 198.00			∠20 ∠46 ∠30 ∠66										black shale	193.90 bedding axis, plain angle 0 degree 196.00 quartz vein with pyrite(w=1cm)		
197.00 198.00													silicified rock	shale origin? chlorite-smectite alteration, abundant pyrite, pyrrhotite		
200			∠40										shale/ chert	weak silicified and argillized pyrite, pyrrhotite scattering 199.00-199.10 quartz vein with pyrite, pyrrhotite		

Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fe-sulphide	Stannite	Silicification	Argillization	Geologic Description		Results of Laboratory Test				
													Rock	Lithology	Sample Number				
201.40			Z25	201.80									shale/ chert	199.85-200.15 quartz vein network with pyrite, pyrrhotite 200.40-200.50 quartz vein network with pyrite, pyrrhotite	201.50				
202.50															silicified rock	some of quartz veins with pyrite, pyrrhotite	TM-8	Cu 63ppm Pb 16ppm Zn 54ppm	
205.70																shale/ dolomite	silicified and argillized 203.10-203.20 quartz vein network with pyrite, pyrrhotite 203.45-203.60 quartz vein network with pyrite, pyrrhotite	203.10	
210						225.50										chert/ shale	silicification and argillization weaker toward bottom 207.35-207.65 quartz vein with pyrite, pyrrhotite (w=8-15mm)		
220																			
230																			
240																			
250																			









Depth (m)	Geol. Column	Core Shape	Structure	Vein	magnetite	galena	sphalerite	chalcopyrite	Fesulphide	Skarnization	Silicification	Argillization	Geologic Description		Results of Laboratory Test		
													Rock	Lithology	Sample Number		
0.30													galena ore	galena in silicified rock	TMS-1		
													weathered soil	orange brown green skarn boulder with galena, magnetite (10-40 cm) skarn origin?	165		
3.85													silicified rock	white, massive, crackly tiny amount of pyrite, galena scattering	175	Ag 324g/t Cu 2660ppm Pb 349g/t Zn 247ppm	
8.40													weathered rock	almost turning to clay shale origin?			
11.10			∠50										sheared dolomite	greenish gray, foliated breccia and sheared texture very remarkable chloritization strong magnetite-pyrite-galena-chalcopyrite diss. abundant 12.00-12.50 crackly core, much of malachite 14.40, 14.95 chalcopyrite clot	12.00 12.50 14.00	Ag 46.4g/t Cu 1.30g/t Pb 4440ppm Zn 958ppm	
17.45			∠40 ∠80										dolomite	dark gray, so much argillaceous bands breccia and sheared texture remarkable chloritization strong along shear argillaceous band strongly replaced by magnetite fine sulfide diss. along shear and in breccia matrix 20.30, 20.40-20.45 sulfide vein 20.60-20.70 pyrite-chalcopyrite dissemination 22.50 chalcopyrite clot in calcite-quartz vein 23.50 open crack with abundant pyrite-quartz	16.00 20.00	Ag 19.8g/t Cu 2450ppm Pb 874ppm Zn 560ppm	
20			∠40 ∠80 ∠10												25.95-26.55 breccia texture with magnetite, fine sulfide 26.60-26.70 silicified fine sandstone lamina 27.00-27.80 crushing and chloritized core along quartz-calcite-chlorite vein(w=1cm)	21.00	Ag 1.4g/t Cu 708ppm Pb 194ppm Zn 378ppm
30			∠40 ∠20 ∠80-90 ∠65 ∠45 ∠65 ∠70 ∠20-30												dark gray, massive, magnetitized lamina remarkable breccia and sheared disappearing to below 28.00-32.00 many calcite-quartz veins hairline	31.00	Ag 0.4g/t Cu 703ppm Pb 26ppm Zn 80ppm
			∠50 ∠40 ∠55												33.50-35.00 open crack and calcite network vein with pyrite, pyrrhotite, strongly chloritized 35.70-36.30 breccia texture with much of fine sulfide and magnetite	32.00 35.50	
36.30			∠15 ∠10										magnetite skarn	black, massive, limy, origin: limy shale pyrite, pyrrhotite, chalcopyrite, galena(?) diss. interbedding brecciated dolomite	TMS-6	Ag 0.2g/t Cu 353ppm Pb 43ppm Zn 129ppm	
39.10			∠10										dolomite	banded structure, breccia texture and chloritization strong pyrite, pyrrhotite, chalcopyrite diss. in breccia matrix shale lamina replaced by magnetite 42.90-43.50 magnetite abundant with idiomorphic pyrite	37.00		
44.00			∠65 ∠65										magnetite skarn	limy, interbedding skarnized dolomite fine sulfide disseminate			
46.00			∠0										dolomite	coarse, crystalline, banded homilitic shale seams with much of disseminated magnetite 48.10-48.80 breccia texture, much of sulfide			
48.80			∠25										magnetite skarn				
50																	

Depth (m)	Geol Column	Core Shape	Structure	Vein	magnetite	galena	spalentic	chalcopyrite	Fe-sulphide	Skarnization	Sulfidation	Argillization	Geologic Description		Results of Laboratory Test	
													Rock	Lithology	Sample Number	
51.50														alteration of magnetite skarn and skarnized dolomite original sedimentary texture well remains	TMS-7	Ag 0.6g/L Cu 410ppm Pb 55ppm Zn 66ppm
52.00														to 59.00 calcite-quartz-chlorite vein abundant		
54.75-54.98														48.80-62.40 pyrite-pyrrhotite diss. moderate to weak homotitic layer		
62.40-62.70														calcite-quartz-chlorite vein	TMS-8	Ag 0.6g/L Cu 767ppm Pb 31ppm Zn 39ppm
62.70-75.20														pyrite-pyrrhotite diss. with chalcopyrite	64.00	
73.00-73.60														calcite-quartz-chlorite vein with barite (w=1-3 cm)	TMS-9	Ag 0.6g/L Cu 363ppm Pb 21ppm Zn 42ppm
75.20-77.35														dolomite dominant, breccia texture tiny amount of pyrite, pyrrhotite dissemination	73.00	
79.00																
80.50															TMS-10	Ag <0.2g/L Cu 237ppm Pb 23ppm Zn 27ppm
85.50-86.60														magnetite disseminated layer interbedded greenish gray, partly non-skarnized part remains	80.50	
85.50														skarnized dolomite breccia texture remarkable chloritization strong, pyrite-chalcopyrite rich	TMS-11	Ag <0.2g/L Cu 254ppm Pb 11ppm Zn 62ppm
87.60																
89.60														magnetite skarn black, massive, limy	86.60	
96.20														skarnized dolomite magnetized skarn rich, banded pale green tiny of pyrite dissemination		
97.50														magnetite skarn massive 97.00-97.50 chalcopyrite rich	97.20	
98.70														epidote skarn dark green, magnetite-pyrite-chalcopyrite diss	TMS-12	Ag 2.2g/L Cu 1685ppm Pb 14ppm Zn 22ppm
100														magnetite skarn	98.60	

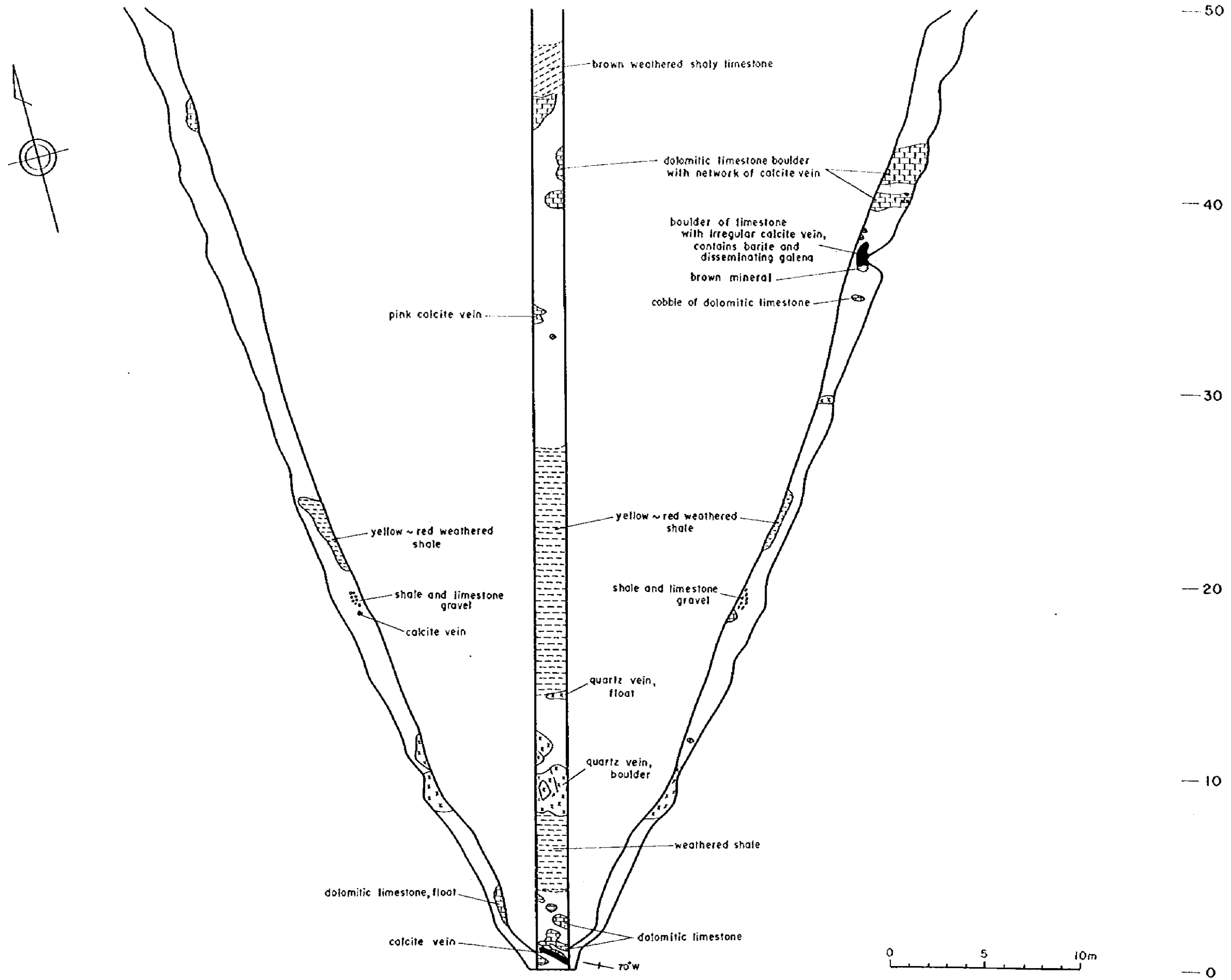
## Appendix 13 Sketch of Trenching survey

(Scale 1/200)

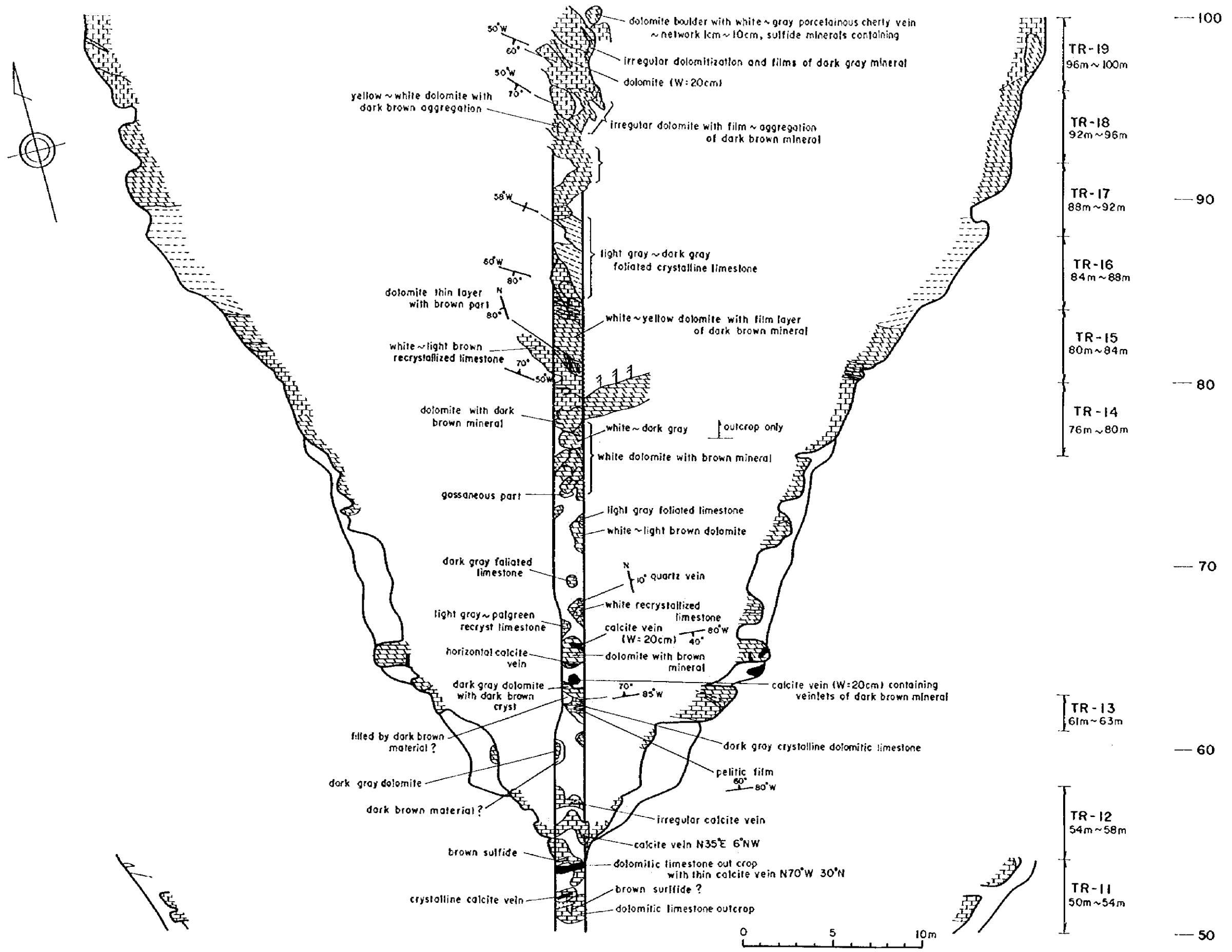
### LEGEND

	Soil
	Limestone
	Dolomite
	Shale
	Shaly limestone
	Quartz vein
	Calcite vein
	TR-11 50m~54m Channel sample

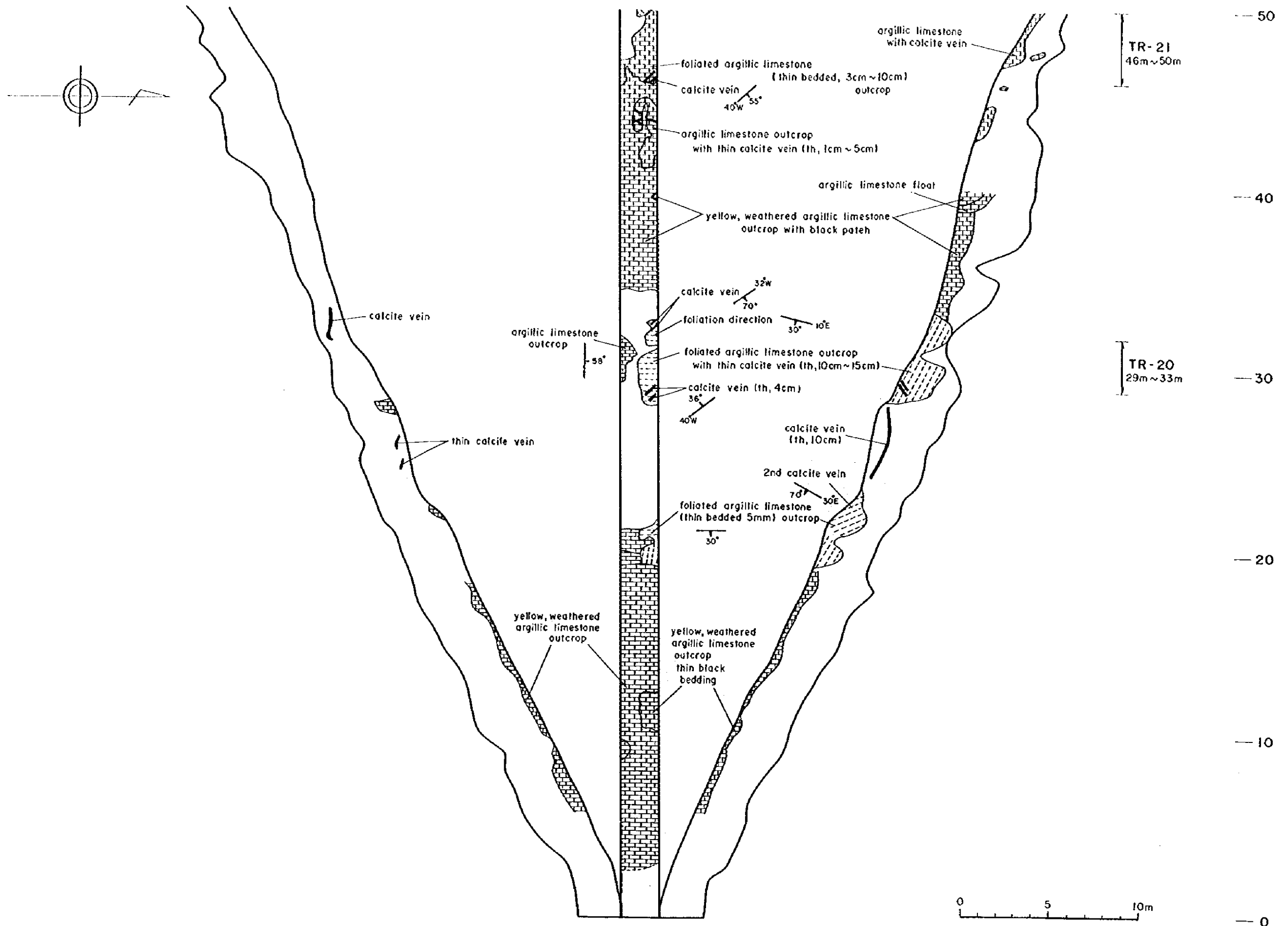




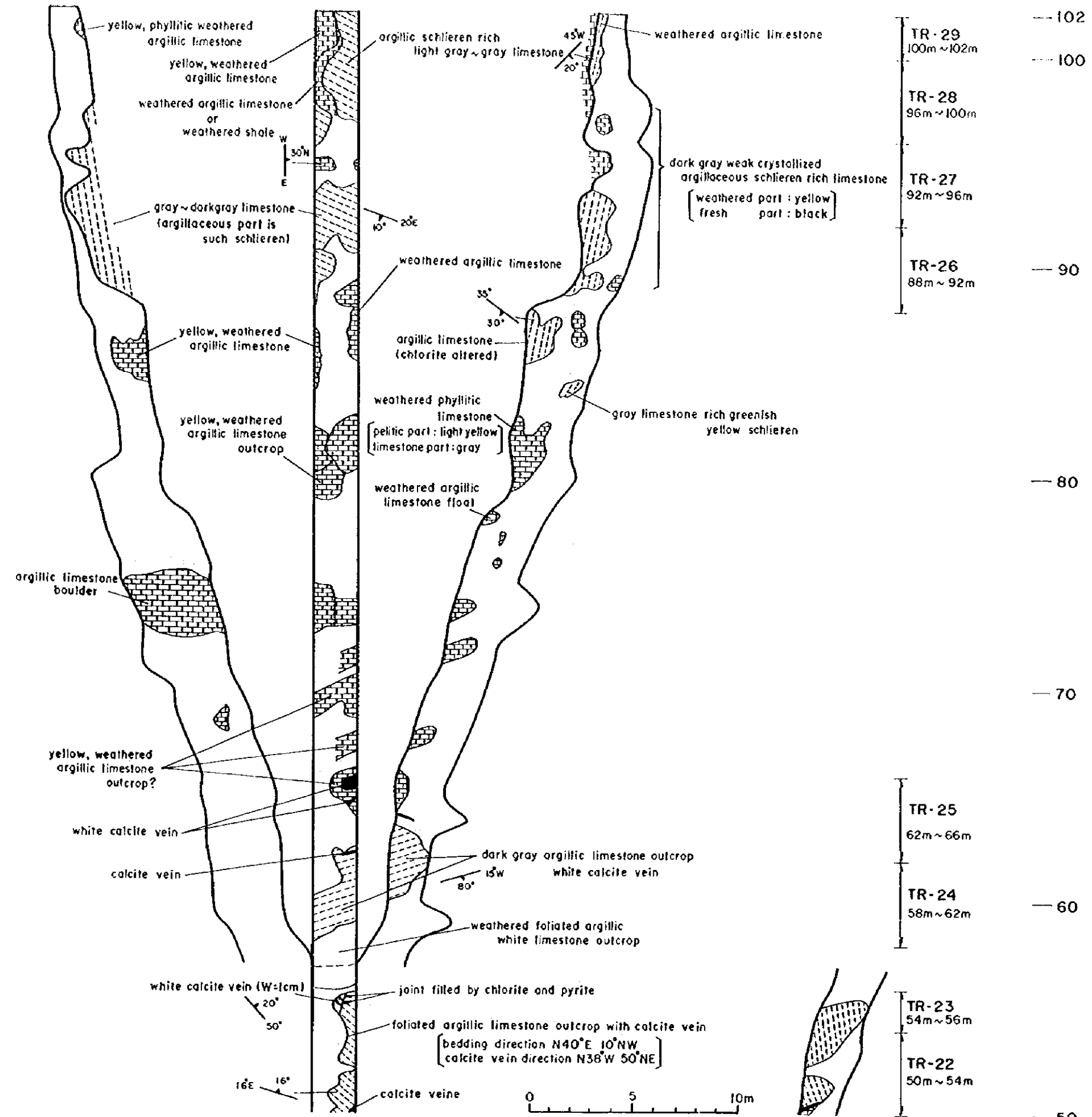
Trench - I (0m - 50m)



Trench - I (50m - 100m)



Trench - 2 (0m - 50m)



Trench - 2 (50m-102m)

# Appendix 14 Homogenized Temperature and Salinity of Fluid Inclusion

No.	Sample No.	Locality	Description	Mineral	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	MJTM-1 68.60-68.65	Dong Noi area		Quartz	155	191	159	153	280																				
2	MJTM-2 28.30-28.40	Dong Noi area		Quartz	22	21	21	1.0	2.4			113																	
3	MJTM-2 252.30-252.40	Dong Noi area		Quartz	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1																	
4	MJTM-3 60.60-60.70	Dong Noi area		Quartz	179	199	182	169	196	176	176	155	210	186	192	199	202	204	173	236	225	220	224	232					
5	MJTM-3 122.80-122.91	Dong Noi area		Quartz	194	183	189	183	182	189	166	162	183	189	182	181	181	185	171	195	195	185							
6	MJTM-3 122.80-122.91	Dong Noi area		Quartz	10.5	8.9		11.7	0.8	7.7																			
7	MJTM-3 103.40-103.43	Dong Noi area		Quartz	176	173	175	174	176	175	177	176	201	202	194	186	171	165	184	184									
8	MJTM-4 202.10-202.30	Dong Noi area		Quartz	1.0	1.0	1.2	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9	MJTM-5 31.15-31.20	Dong Noi area		Quartz	129	174	176																						
10	MJTM-5 73.00-73.50	Dong Noi area		Quartz	114	101	103	105	108	114	110	168	113																
11	DJ-13	Dong Noi area		Quartz	325	187	316	206	318	81	258	275	226	244	249	271	273	268	306	3340	339	275							
12	DKR-01	Dong Noi area		Quartz																									
13	JR-001	Southern I-4		Quartz																									
14	MM-02	Huai Wak		Quartz	168	168	157	304	161	177	154																		
15	MM-06	Huai Wak		Quartz																									
16	TR1-97	Dong Noi area		Quartz	171	169	168	155	169	189	187	258	187	199															

No fluid inclusions for measurement

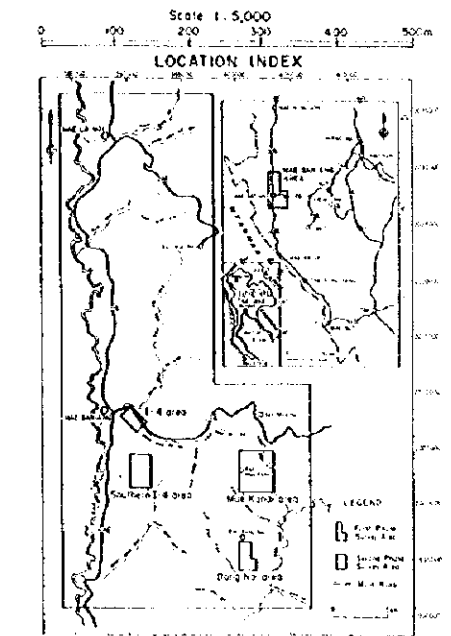
No fluid inclusions for measurement

Upper homogenized temperature unit: °C  
Lower salinity unit: wt% NaCl equivalent

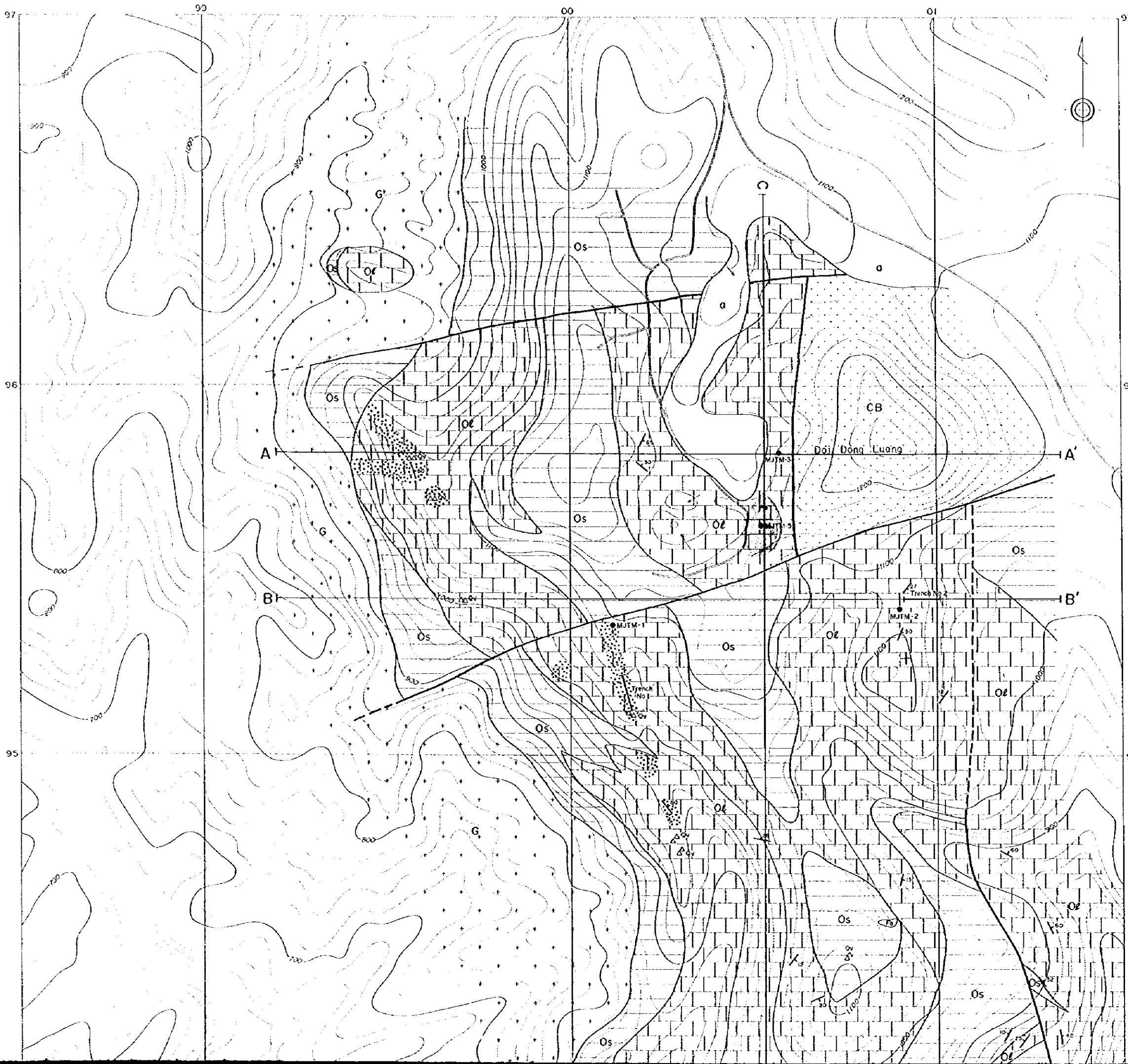
## Appendix 15 Result of Stable Isotope Analysis

Sp. No.	Description	Locality	$\delta^{13}\text{C}_{\text{POB}}$ (‰)	$\delta^{18}\text{O}_{\text{POB}}$ (‰)	$\delta^{18}\text{O}_{\text{SMOW}}$ (‰)
1	AR-011 muddy limestone, hornfelsic	Pha Deang, Mae Sod mine	+1.4	-12.3	+18.2
2	AR-013 muddy limestone	Pha Deang, Hua Long mine	+0.9	-10.0	+20.6
3	AR-015 grey recrystalline limestone	Tak Mining	+2.0	-6.2	+24.5
4	AR-009 beside of barite vein, white massive limestone	Chamrat barite mine	-2.1	-22.0	+8.2
5	AR-033 grey recrystalline massive limestone	Dong Noi area	-1.3	-14.1	+16.3
6	BR-032 light green banded marble	Dong Noi area	+1.0	-15.3	+15.1
7	AR-041 recrystallized calcite in cavity	I-4 area	-4.1	-5.8	+24.9
8	BR-047 dark grey banded limestone	I-4 area	-2.5	-13.0	+17.5
9	DR-028 light brown banded marble	I-4 area	-2.9	-11.1	+19.4
10	DJ-09 muddy dolomitic limestone	Dong Noi area	-2.7	-10.3	+20.3
11	DM-12 crystalline limestone	Dong Noi area	-0.4	-14.0	+16.4
12	MJ-04 muddy dolomitic limestone	Mae Kanai area	-1.8	-12.3	+18.2
13	MMR-04 calc-silicate rock	Mae Kanai area	-14.7	-19.8	+10.4
14	MMR-13 muddy limestone	Mae Kanai area	-0.8	-23.9	+6.3
15	MJTM-1 crystalline dolomite	MJTM-1 60.40-60.45	-4.1	-23.3	+6.9
16	MJTM-2D impure dolomite	MJTM-2 18.00-18.10	-2.1	-11.6	+19.0
17	MJTM-2S skarnized dolomite	MJTM-2 130.00-130.10	-4.4	-20.7	+9.6
18	MJTM-3 impure dolomite with hornfelsic seam	MJTM-3 15.00-15.20	-3.4	-15.7	+14.7
19	MJTM-4 massive dolomite	MJTM-4 104.50-104.60	-2.3	-18.5	+11.8

# MINERAL EXPLORATION OF MAE SARIANG OF Geologic map and profile in Dong Noi area

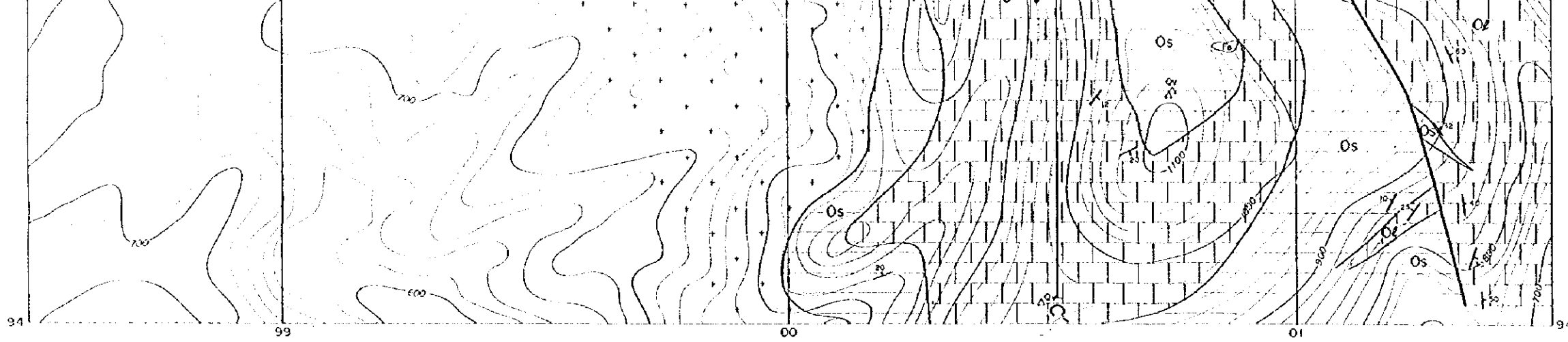


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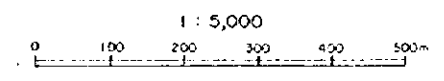
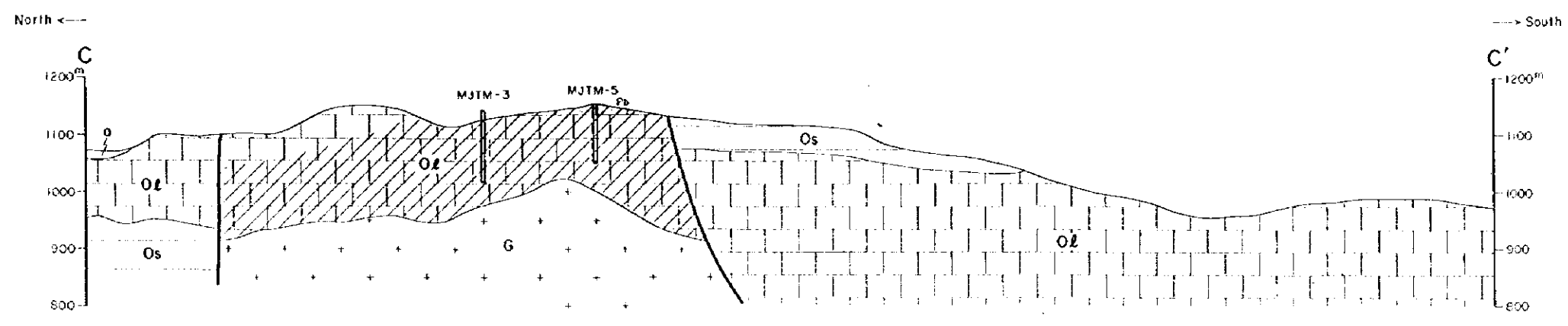
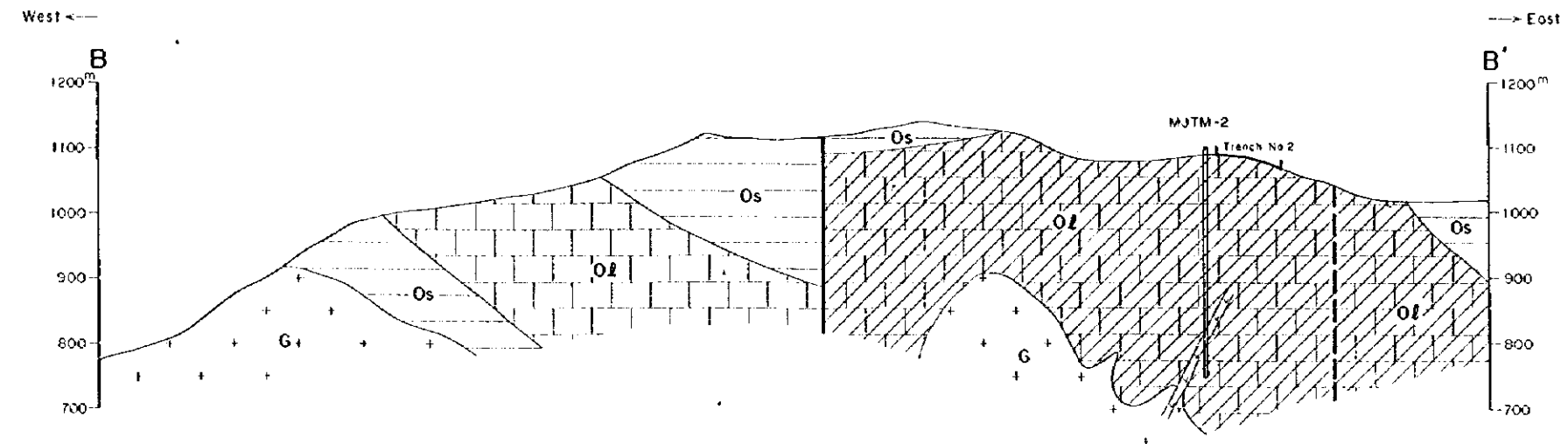
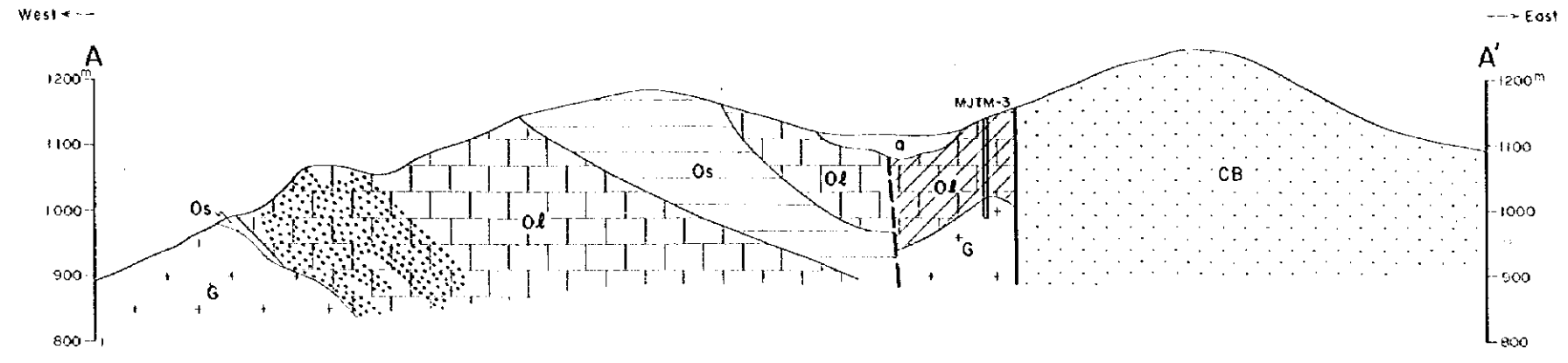
### LEGEND

- Sedimentary rocks
  - Quaternary: alluvium
  - Ordovician: limestone
  - Ordovician: shale
  - Cambrian: sandstone (quartz arenite)
- Igneous rocks
  - Triassic: biotite granite
  - Triassic: andesite dike
- Geologic symbols
  - Fault
  - Fault (inferred)
  - Strike and dip
  - MUTM-1 Drill hole
  - Trench No. 1 Trench survey
  - A-A' Profile line
- Mineral occurrence
  - Galena float
  - Gossanous float
  - Quartz boulders
  - Dolomitization
  - Skarnization



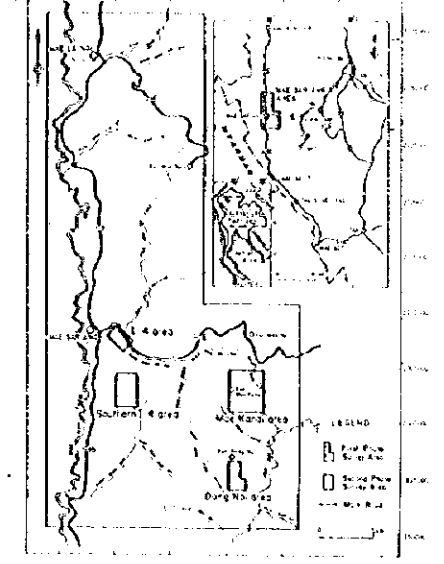
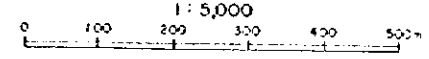
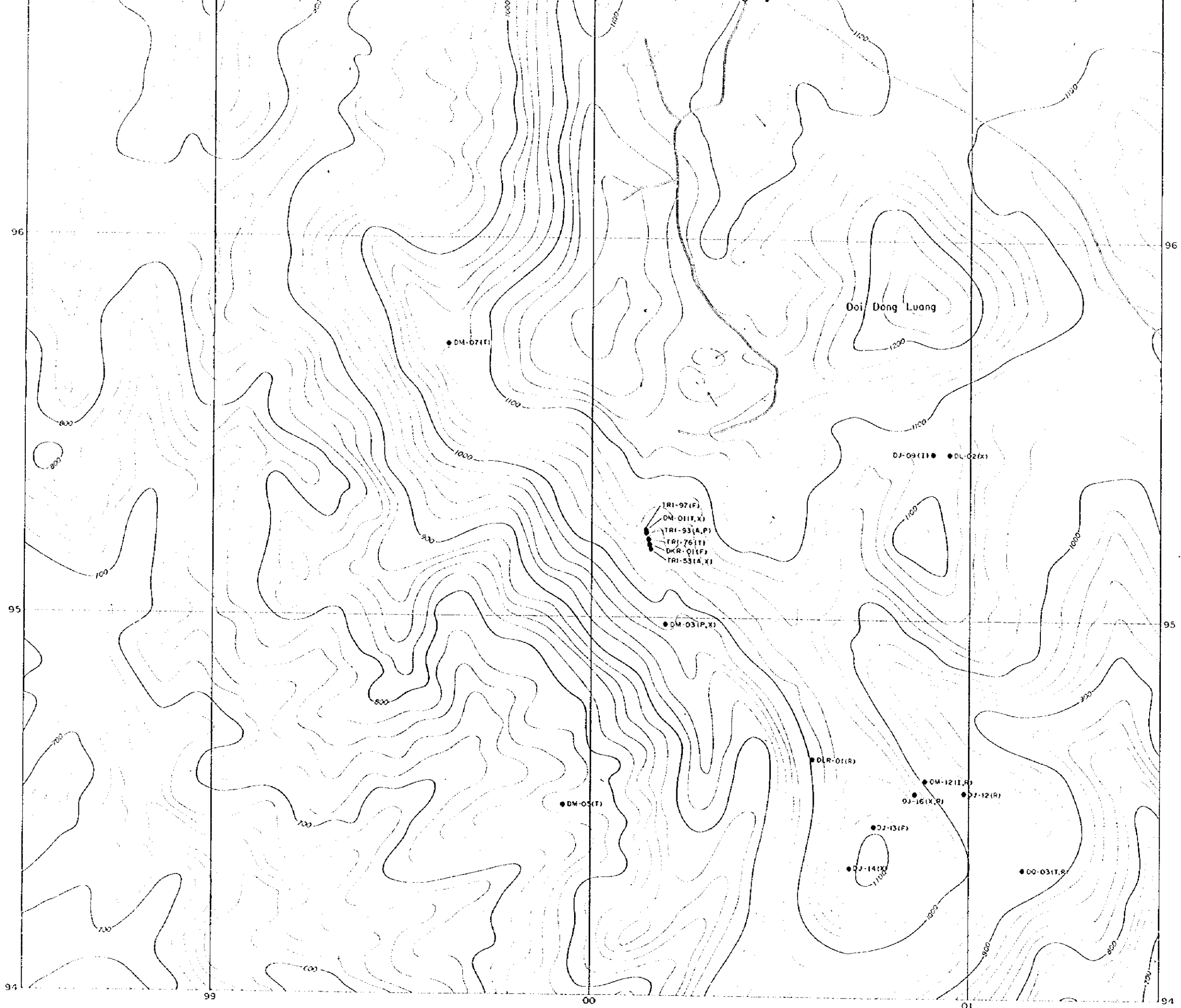
4. Mineral occurrence

- A' — A' Profile line
- Pe Galena float
- Fe Gossans float
- Qv Quartz boulders
- Dolomitization
- /// Skarnization









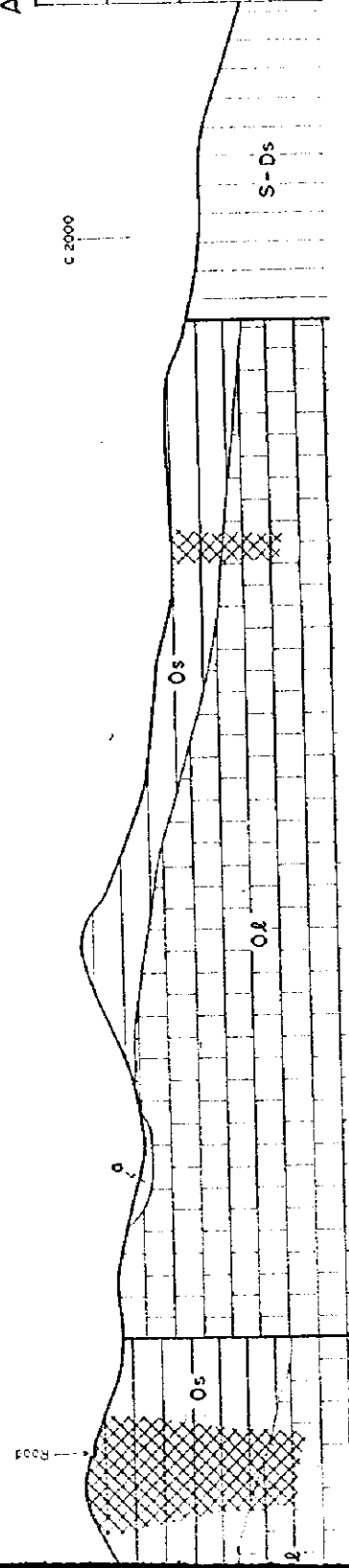
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 MARCH 1999

LEGEND

- Rock Sample ● DM-01 (A,P,T,X,I,E,R)
- A: Ore Analysis
  - P: Polished Section
  - T: Thin Section
  - X: X-ray Diffraction Test
  - I: Stable Isotope Analysis (δC, δO)
  - F: Fluid Inclusion Test
  - R: Resistivity and Chargeability Test

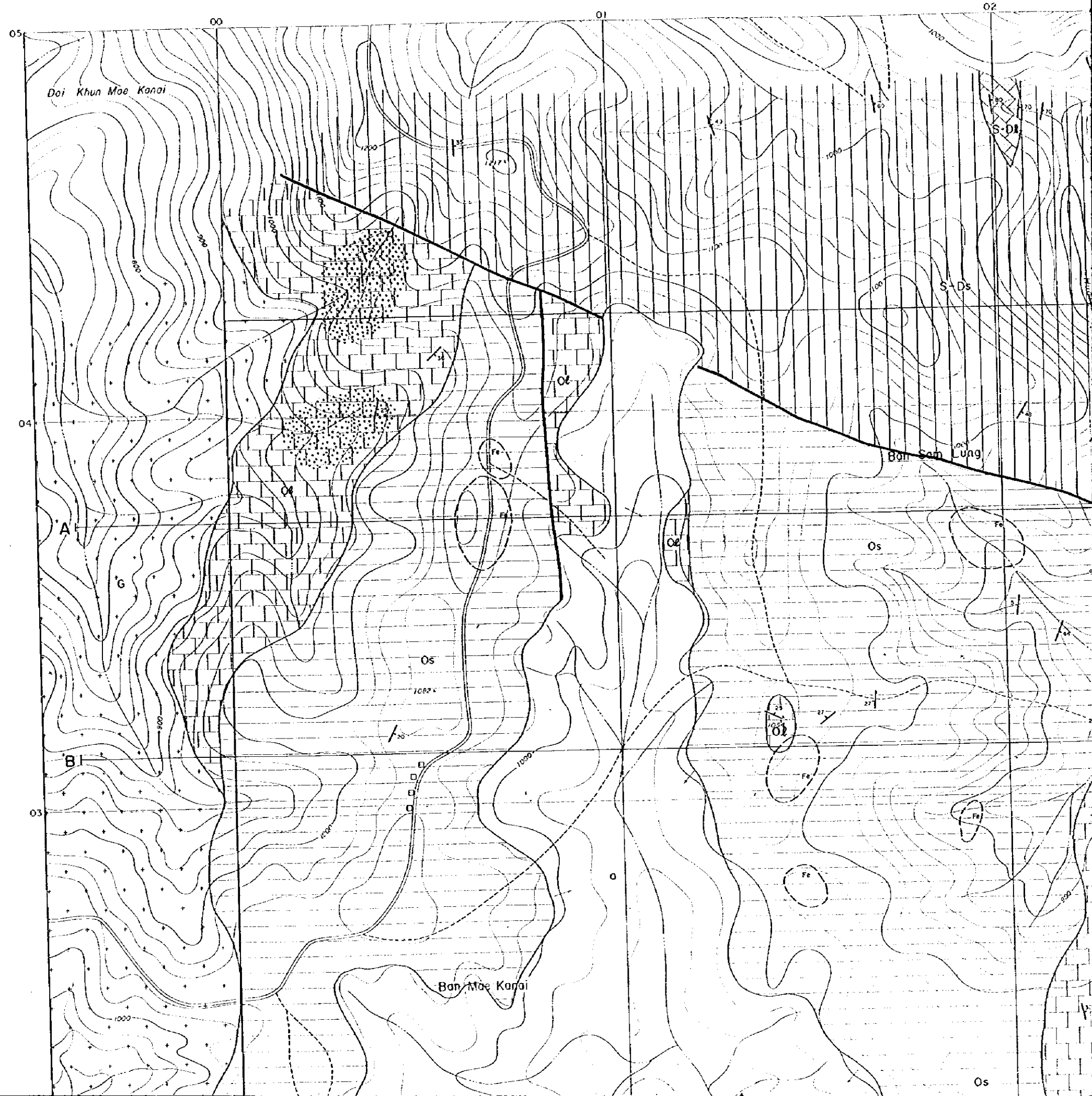
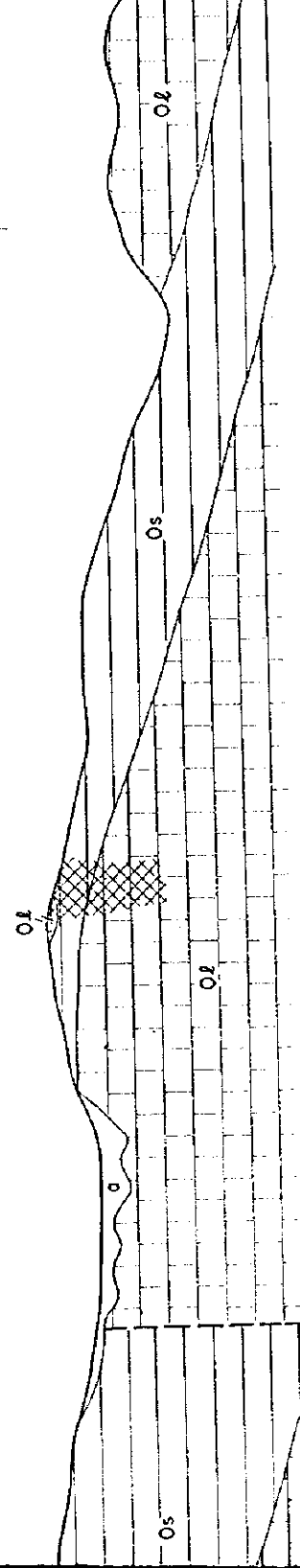
→ East  
A' 1100m  
1000  
900  
800  
700

c 2000



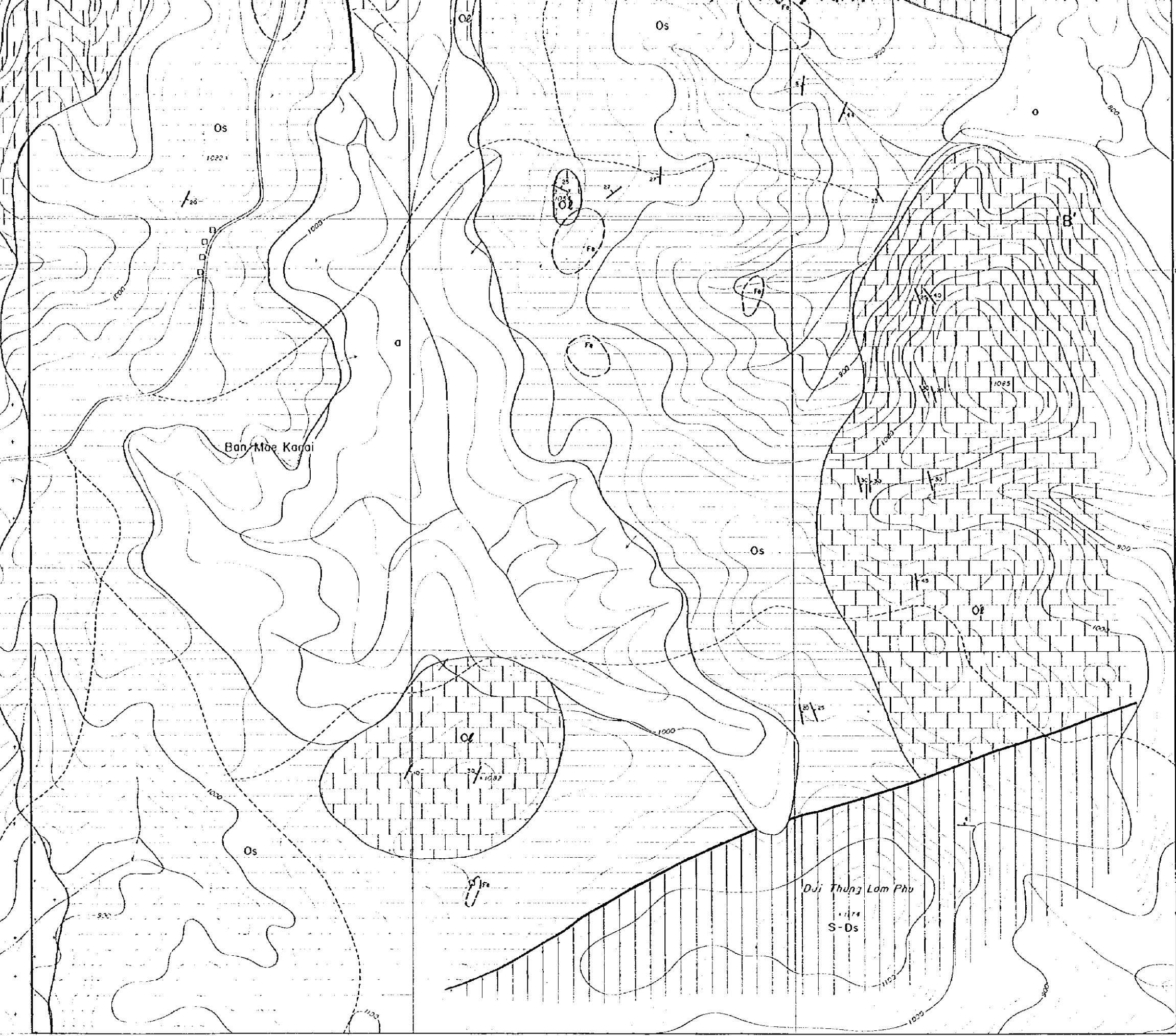
→ East  
B' 1100m  
1000  
900  
800  
700

r 2000



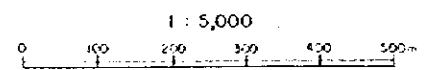




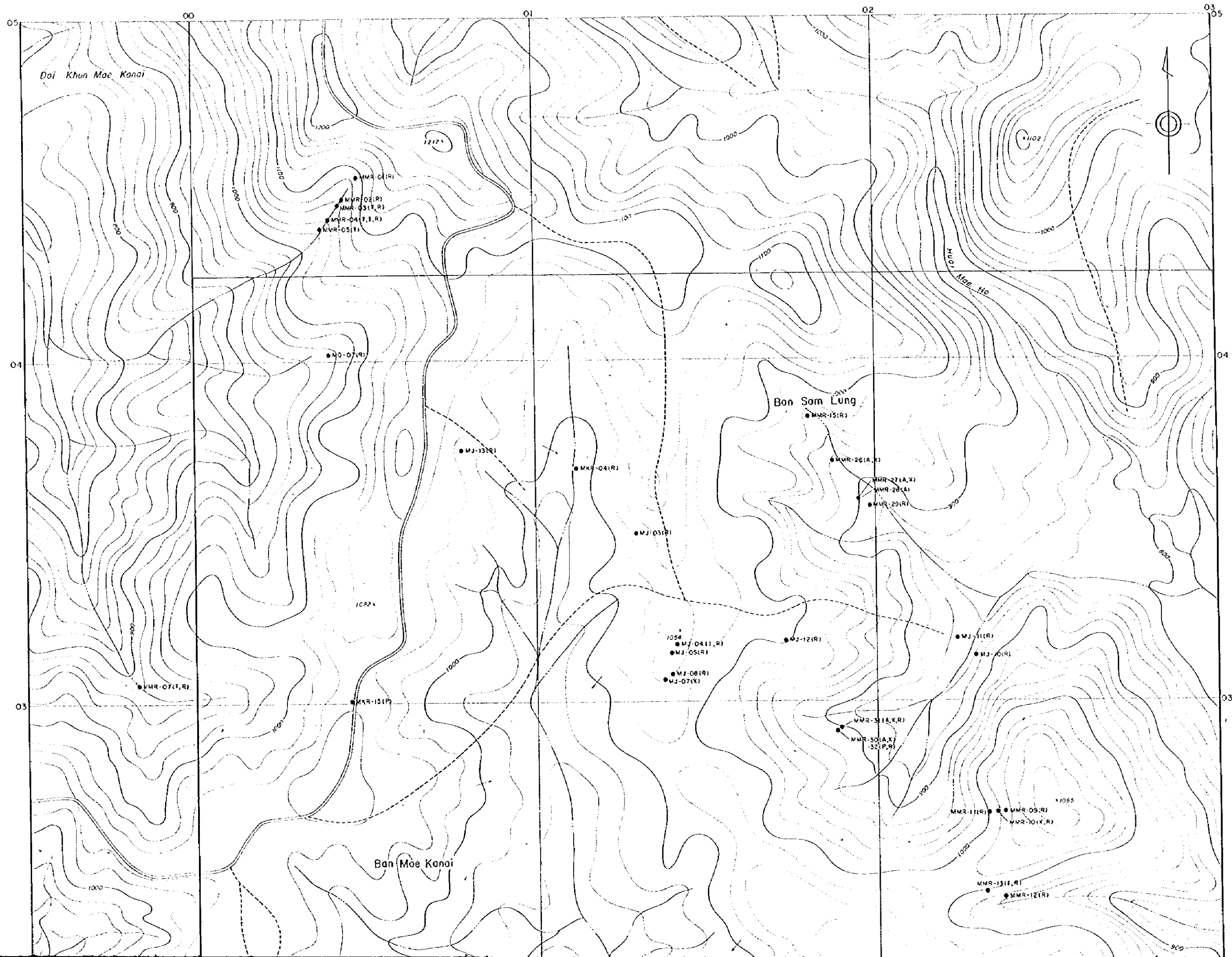


**LEGEND**

- 1. Sedimentary rocks**
  - Quaternary a alluvium
  - Devonian - Silurian S-Os limestone
  - S-Os sandstone
  - Ordovician O1 limestone
  - Os shale, sandstone
- 2. Igneous rocks**
  - Triassic G biotite granite
- 3. Geologic symbols**
  - Fault
  - Strike and dip
  - Profile line
- 4. Mineral occurrence**
  - calc-silicate rich part
  - Fe gossaneous zone
  - magnetite float
  - sulfide mineralization



00 01 02 03 01 02 03



MINERAL EXPLORATION OF MA  
OF

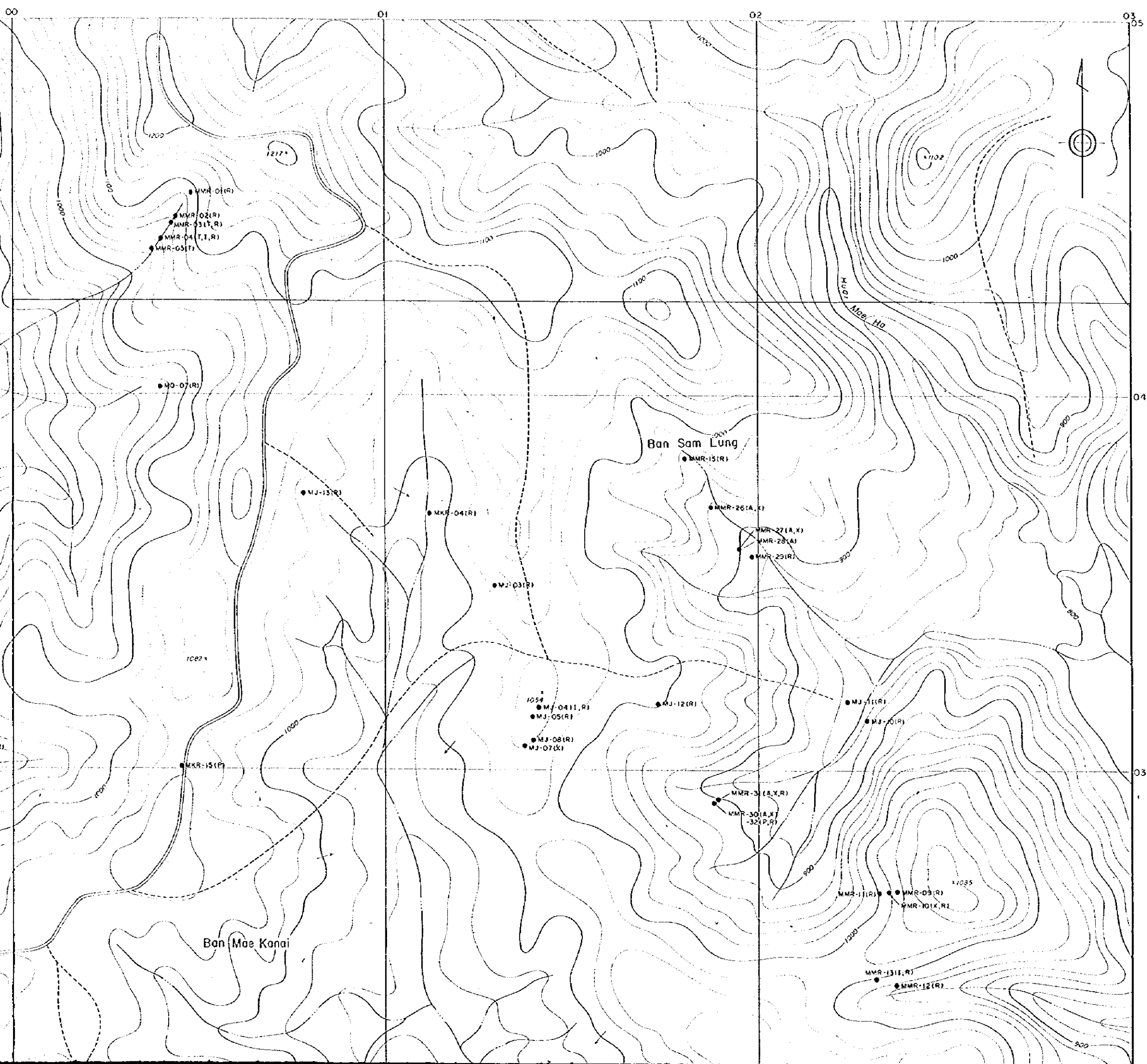
Locality map of Rock samples in M

Scale 1:5,000

LOCATION INDEX

JAPAN INTERNATIONAL COOPERATION  
METAL MINING AGENCY OF  
MARCH 1999

- LEGEND
- Rock Sample ● MMR-01(A,P,T,X)
  - A: Ore Analysis
  - P: Polished Section
  - T: Thin Section
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  - R: Resistivity and Chargeability Test



PL - 4

**MINERAL EXPLORATION OF MAE SARIANG  
OF**

Locality map of Rock samples in Mae Kanai area

Scale 1:5,000  
0 100 200 300 400 500m

LOCATION INDEX

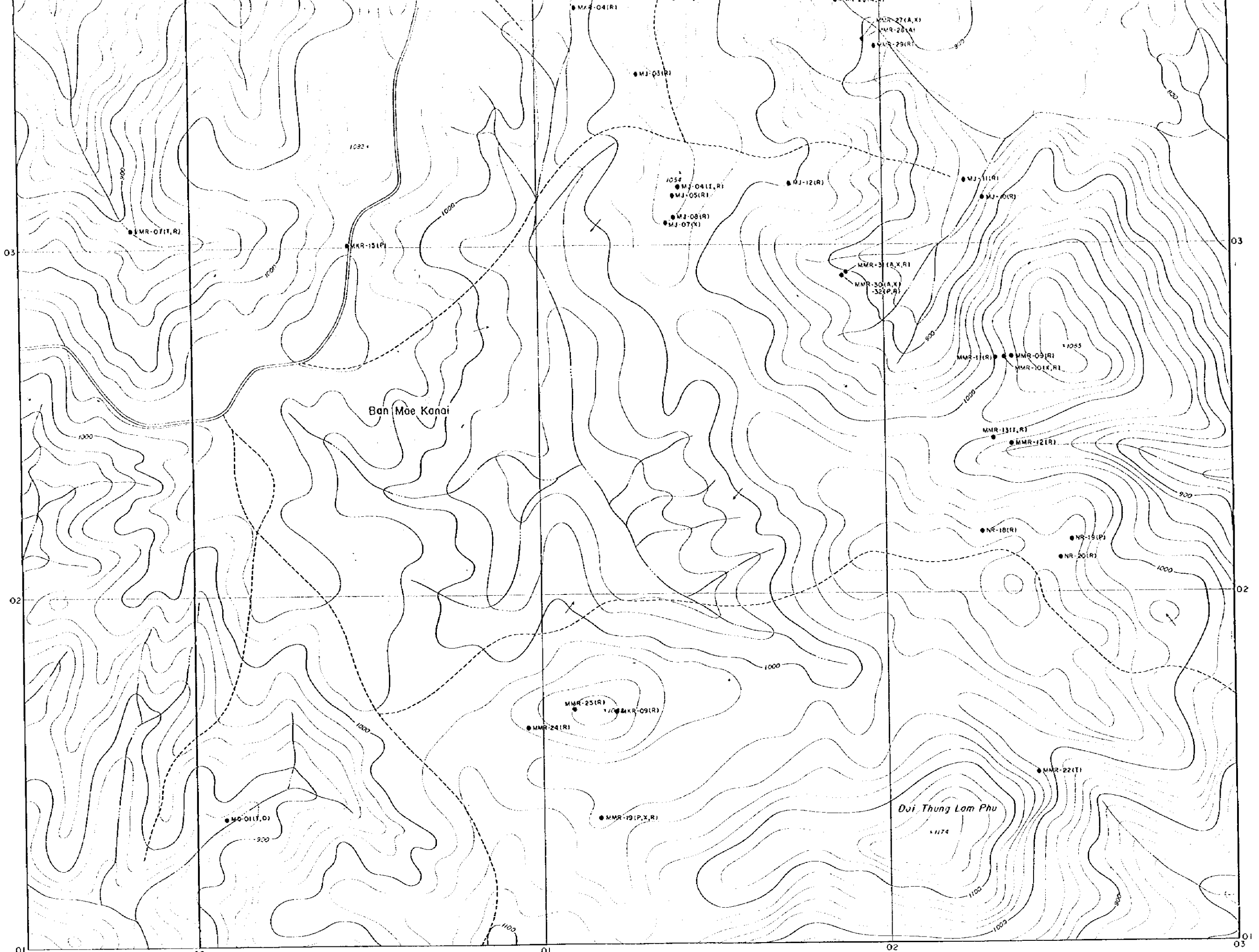
JAPAN INTERNATIONAL COOPERATION AGENCY  
METAL MINING AGENCY OF JAPAN  
MARCH 1999

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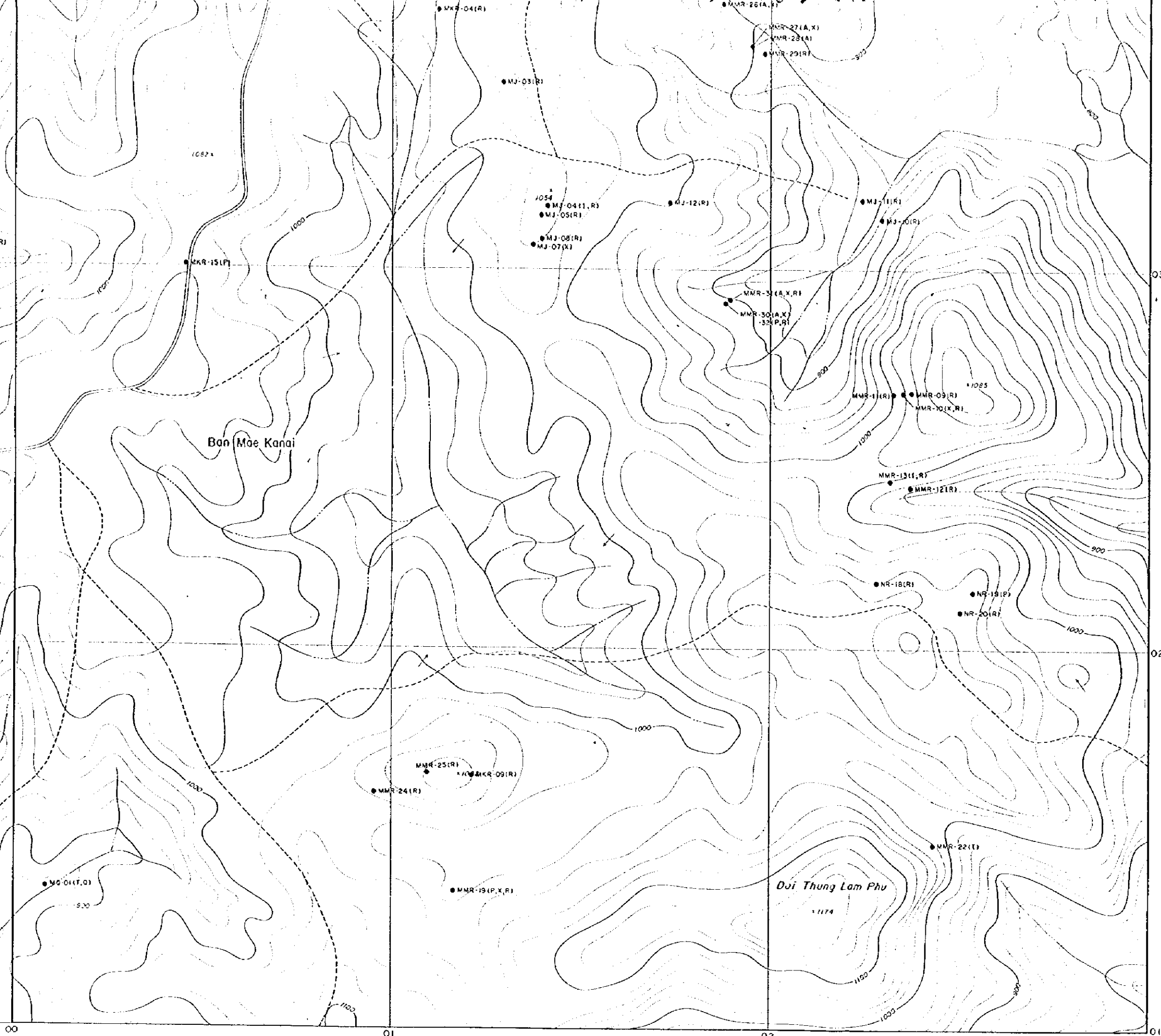


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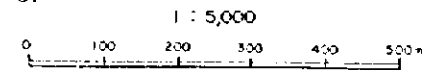


1 : 5,000  
0 100 200 300 400 500m



LEGEND

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Ban Mae Kanai

Dai Thung Lam Phu

MMR-01 (T, O)

MMR-24 (R)  
MMR-25 (R)  
MMR-09 (R)

MMR-19 (P, X, R)

MMR-3 (S, X, R)  
MMR-30 (A, X)  
32 (P, R)

MMR-1 (R)  
MMR-09 (R)  
MMR-10 (X, R)

MMR-13 (I, R)  
MMR-12 (R)

NR-18 (R)  
NR-19 (P)  
NR-20 (R)

MMR-22 (T)

MU-03 (R)

MJ-04 (I, R)  
MJ-05 (R)  
MJ-06 (R)  
MJ-07 (X)

MJ-12 (R)

MJ-11 (R)  
MJ-10 (R)

MMR-27 (A, X)  
MMR-28 (A)  
MMR-29 (R)

1082\*

1054

1025

1174

00

01

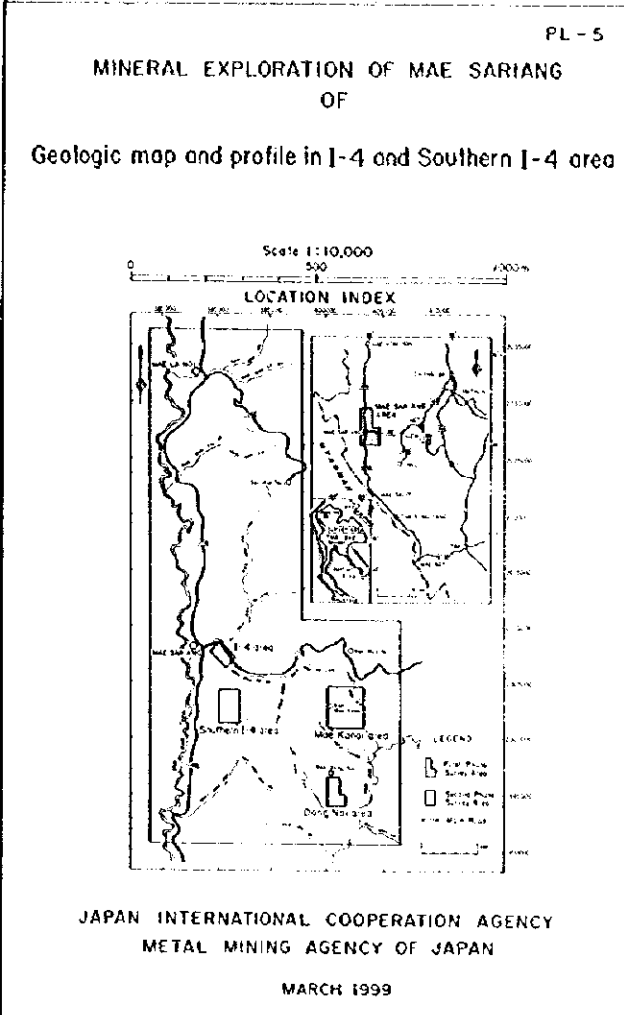
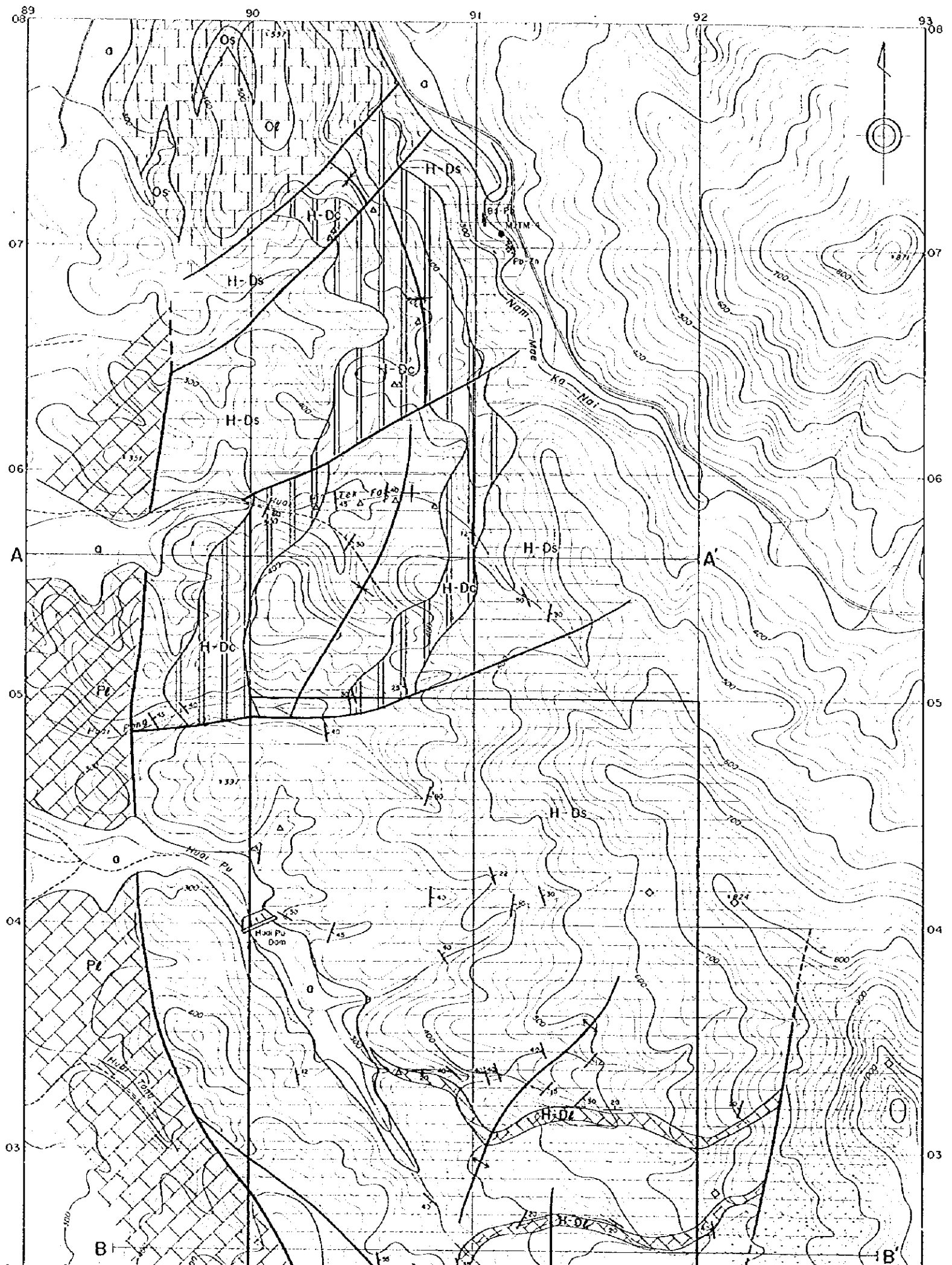
02

03

03

02

01



**LEGEND**

**1. Sedimentary rocks**

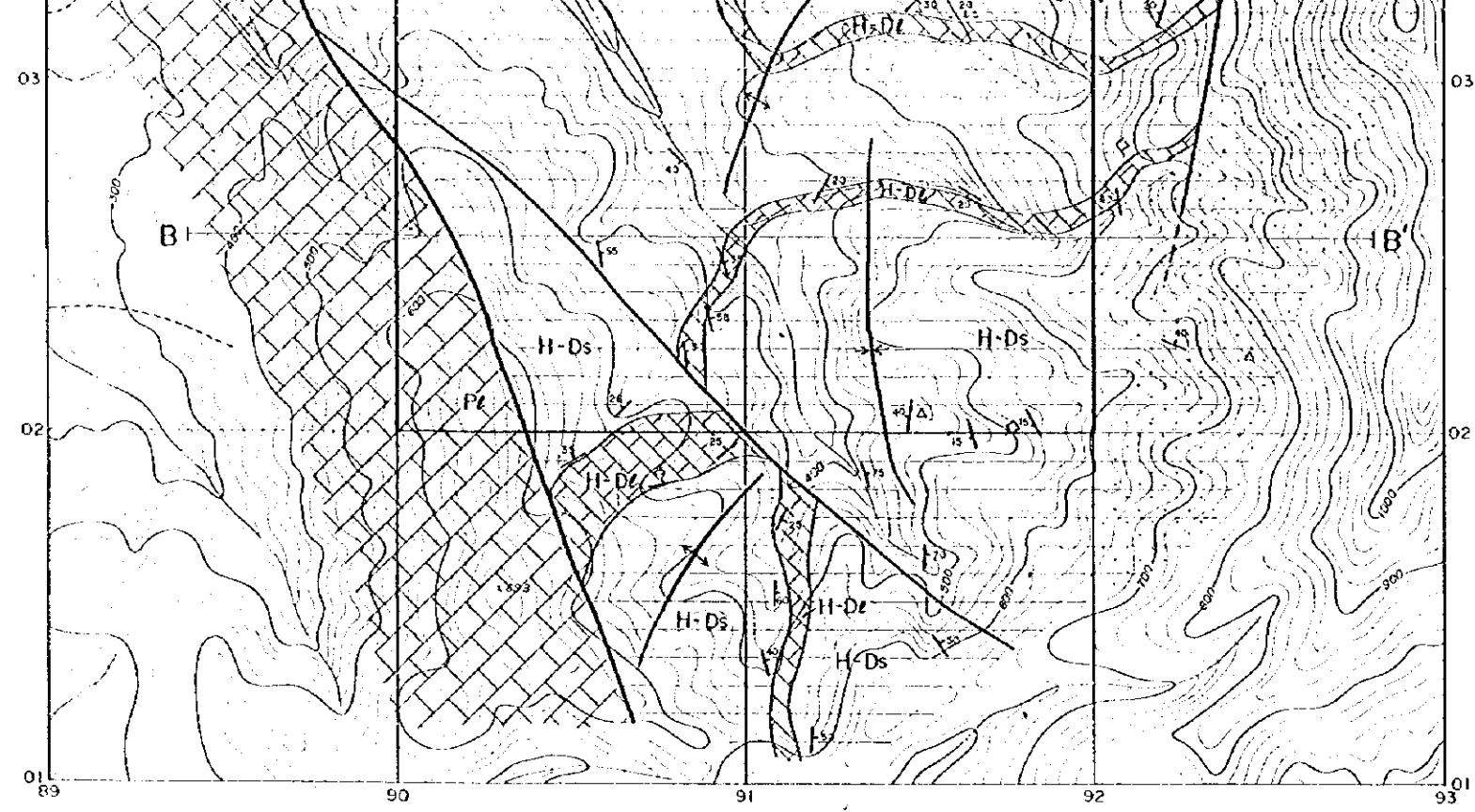
Quaternary		alluvium
Permian		limestone
Carboniferous-Devonian		shale, sandstone
		chert
		limestone/chert alternation
Ordovician		limestone
		shale, sandstone

**2. Geologic symbols**

	Fault
	Fault (inferred)
	Syncline
	Anticline
	Strike and dip
	Hornfels
	Drill hole
	Profile line

**3. Mineral occurrence**

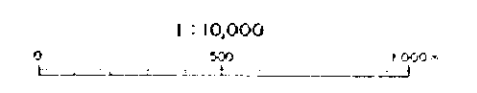
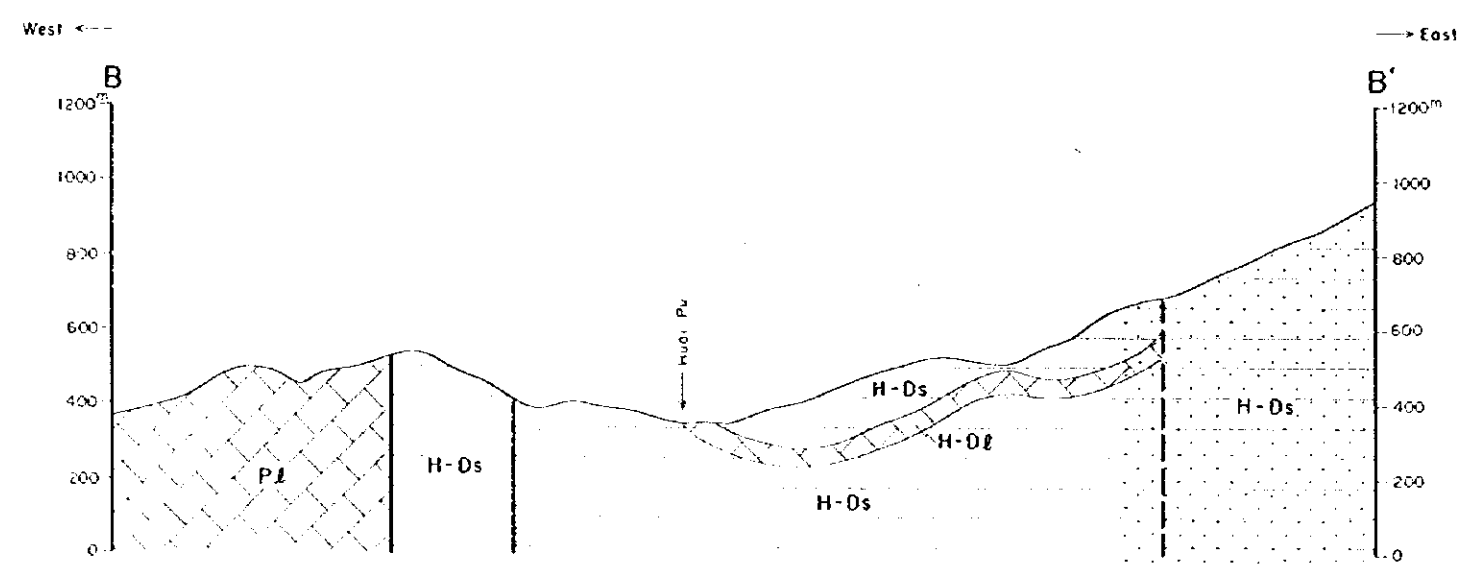
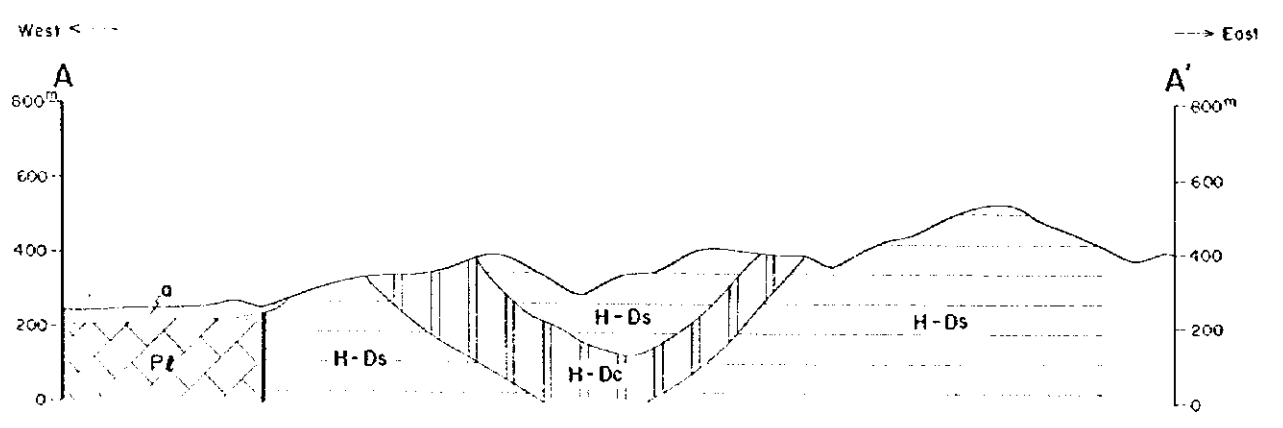
	galena-sphalerite outcrop
	barite-galena float

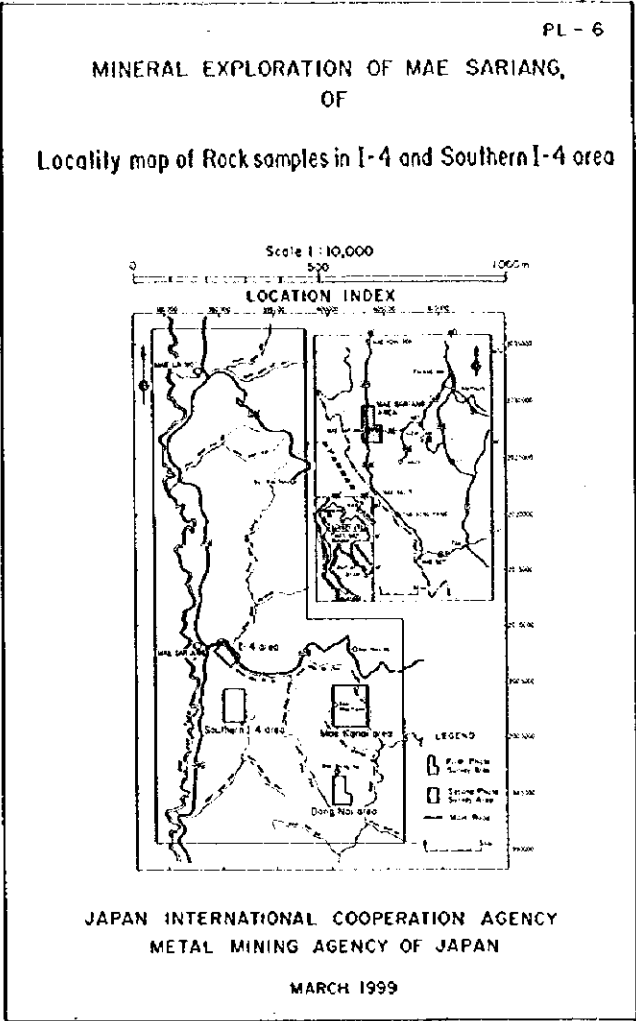


● MSTM-4 Drill hole  
 A-A' Profile line

3. Mineral occurrence

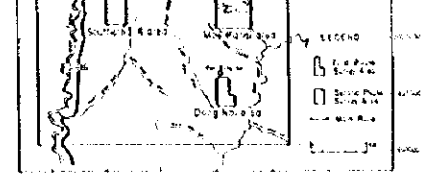
- galena-sphalerite outcrop
- △ borite & galena float
- ◇ quartz veinlets





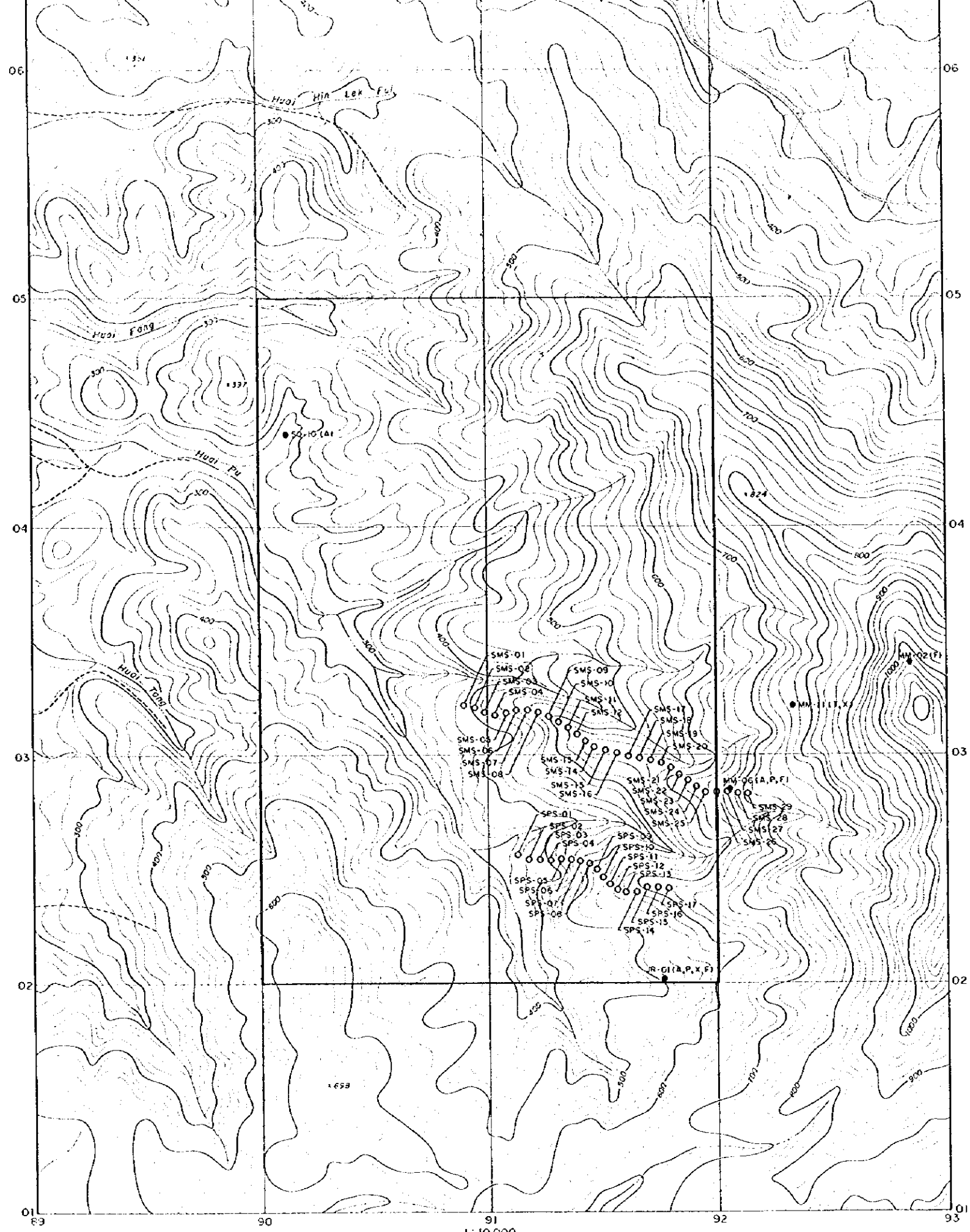
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  - R: Resistivity and Chargeability Test
- Soil Sample** ○ SMS-01



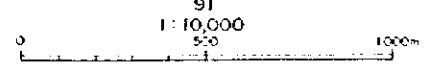
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MARCH 1999



LEGEND

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- F: Fluid Inclusion Test
- R: Resistivity and Chargeability Test
- Soil Sample ○ SMS-01









JICA