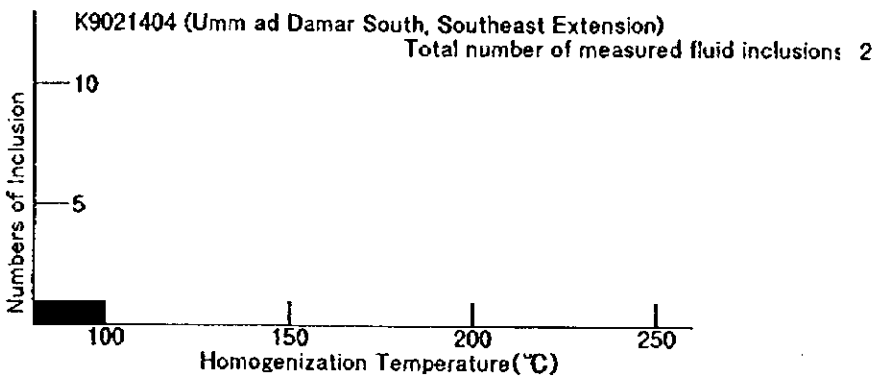
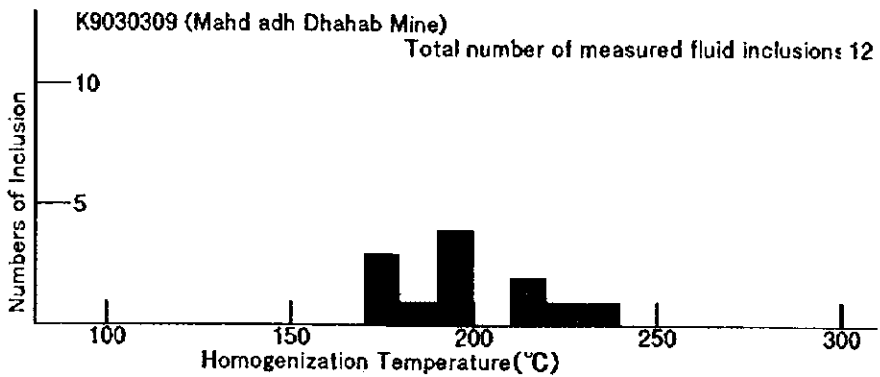
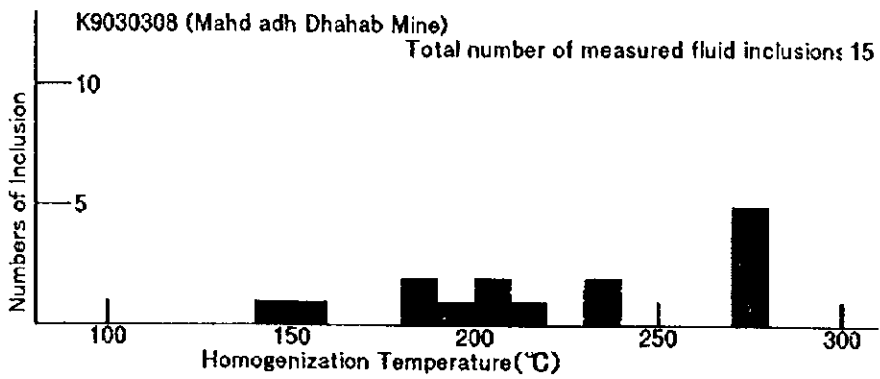
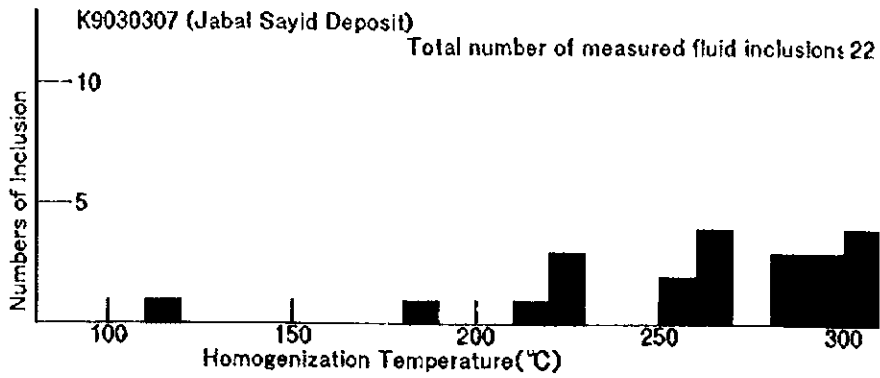
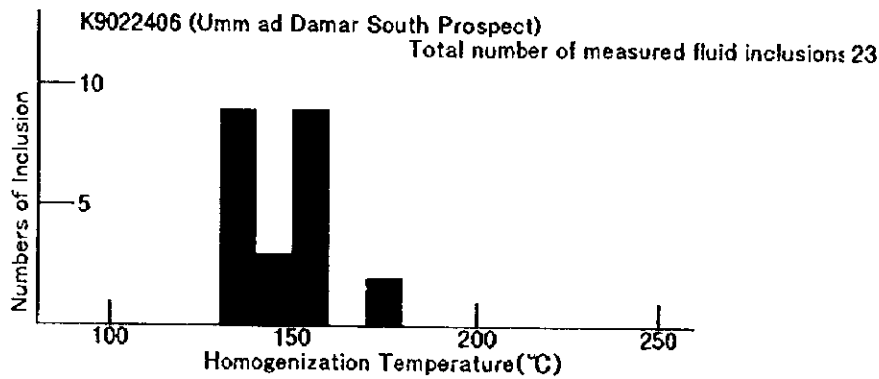
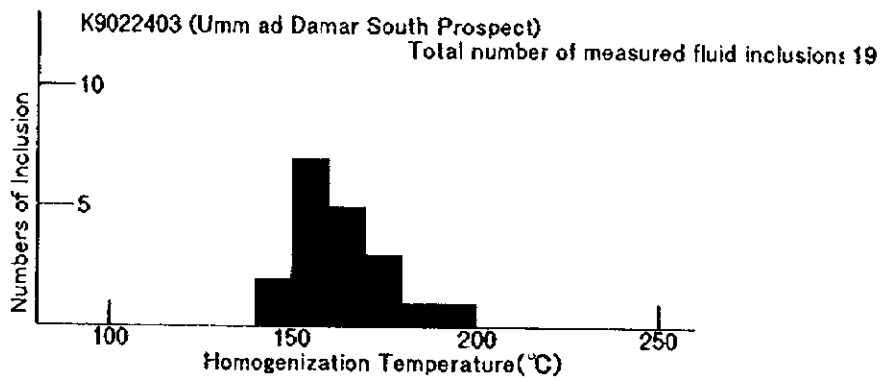
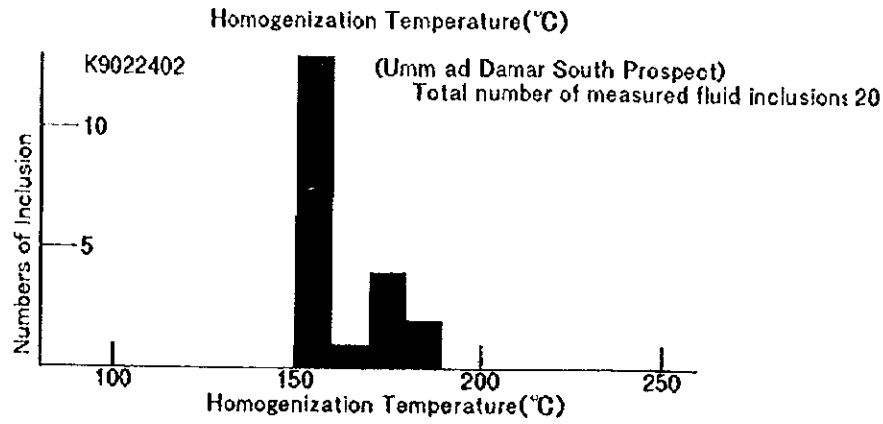


APPENDICES

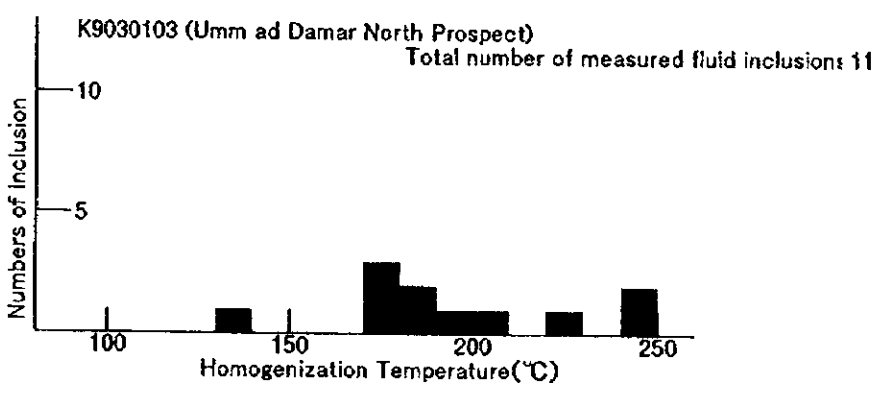
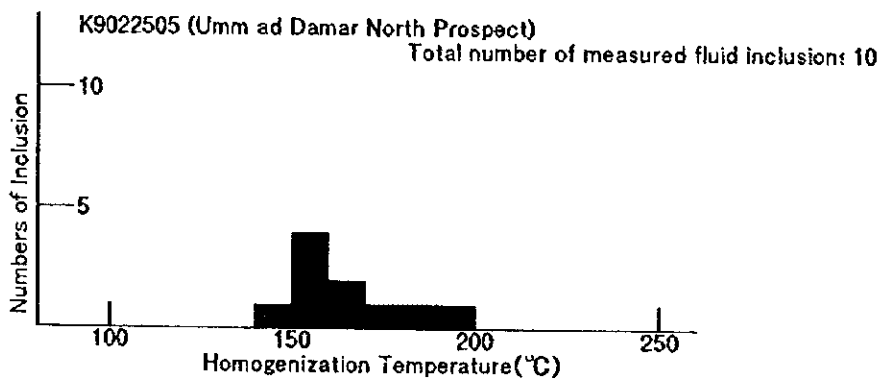
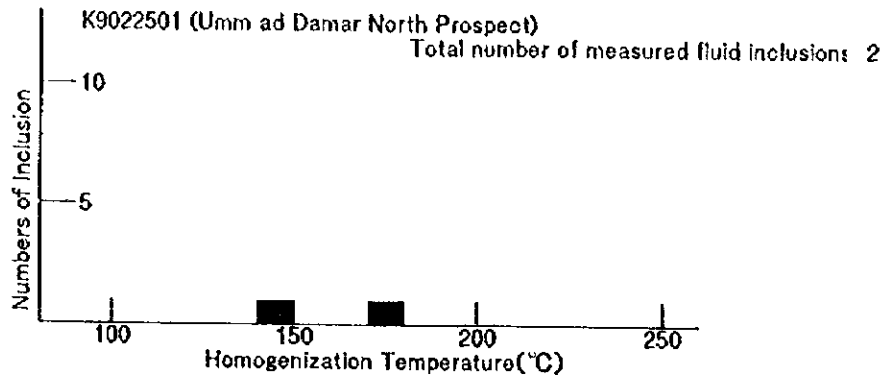
Appendix-1 Histogram of Homogenization Temperature (1/3)



Appendix-1 Histogram of Homogenization Temperature (2/3)



Appendix-1 Histogram of Homogenization Temperature (3/3)



Appendix-2 Characteristics of Measured Fluid Inclusions

1/7

Sample No.	Inclusion No.	Minerals	Size (major axis, mm)	Shape	Kind of inclusions	Homogenization temperature(°C)	Temperature of melting point of ice (below 0°C)	Salinity (NaCl wt %)	Remarks
K9022006	006-1	quartz	5	irregular	Liquid only		13.3	14.4	2-phase inclusion was not confirmed.
	006-2	quartz	5	irregular	Liquid only		11.6	12.3	
(Average of salinity) 13.3									
K9030102	102-1	quartz	5	irregular	Liquid only		11.8	12.5	2-phase inclusion was not confirmed.
	102-2	quartz	5	irregular	Liquid only		11.7	12.4	
	102-3	quartz	4	elliptical	Liquid only		11.1	11.7	
(STDEV of salinity) 1.5									
(Average of salinity) 12.2									
(STDEV of salinity) 0.4									
K9030103	102-1	quartz	3	irregular	Liquid only		7.6	6.8	Homogenized into a single liquid phase.
	102-2	quartz	5	irregular	Liquid only		7.7	7.0	
	102-3	quartz	3	elliptical	Liquid-rich 2-phase	183	6.4	4.9	
	102-4	quartz	3	irregular	Liquid-rich 2-phase	190	6.4	4.9	
	102-5	quartz	4	irregular	Liquid-rich 2-phase	220	7.7	7.0	
	102-6	quartz	5	elliptical	Liquid-rich 2-phase	179	7.6	6.8	
	102-7	quartz	3	irregular	Liquid-rich 2-phase	240	7.1	6.0	
	102-8	quartz	5	elliptical	Liquid-rich 2-phase	243	8.0	7.3	
	102-9	quartz	4	elliptical	Liquid-rich 2-phase	139	6.7	5.4	
	102-10	quartz	4	elliptical	Liquid-rich 2-phase	172			
	102-11	quartz	2	irregular	Liquid-rich 2-phase	174			
	102-12	quartz	4	irregular	Liquid-rich 2-phase	184	7.6	6.8	
	102-13	quartz	5	irregular	Liquid-rich 2-phase	202	6.9	5.7	
(Average of Homo. Temp.) 193									
(STDEV of Homo. Temp.) 31									
(Average of salinity) 6.2									
(STDEV of salinity) 0.9									

Sample No.	Inclusion No.	Minerals	Size (major axis, mm)	Shape	Kind of inclusions	Homogenization temperature (°C)	Temperature of melting point of ice (below 0°C)	Salinity (NaCl wt %)	Remarks
K9022501	501-1	quartz	8	irregular	Liquid only		12.6	13.5	
	501-2	quartz	5	irregular	Liquid only		12.5	13.4	
	501-3	quartz	5	irregular	Liquid only		12.3	13.1	
	501-4	quartz	2	elliptical	Liquid-rich 2-phase	175			Homogenized into a single liquid phase.
	501-5	quartz	3	elliptical	Liquid-rich 2-phase	147			
(Average of Homo. Temp.)						161	(Average of salinity)	13.4	
(STDEV of Homo. Temp.)						20	(STDEV of salinity)	0.2	
K9022505	505.1.1-1	quartz	4	irregular	Liquid-rich 2-phase	171	17.2	18.4	
	505.1.1-2	quartz	3	irregular	Liquid-rich 2-phase	181	12.0	12.8	
	505.1.1-3	quartz	4	irregular	Liquid-rich 2-phase	147	11.7	12.4	
	505.1.1-4	quartz	4	irregular	Liquid-rich 2-phase	150	14.2	15.3	
	505.1.1-5	quartz	3	elliptical	Liquid-rich 2-phase	164			Homogenized into a single liquid phase.
	505.1.1-6	quartz	3	irregular	Liquid-rich 2-phase	158			
	505.1.1-7	quartz	8	irregular	Liquid-rich 2-phase	191			
	505.1.1-8	quartz	3	irregular	Liquid-rich 2-phase	165			
	505.1.1-9	quartz	3	irregular	Liquid-rich 2-phase	156			
	505.1.1-10	quartz	3	irregular	Liquid-rich 2-phase	158			
(Average of Homo. Temp.)						164	(Average of salinity)	14.7	
(STDEV of Homo. Temp.)						14	(STDEV of salinity)	2.8	
	402.1.1-1	quartz	8	irregular	Liquid-rich 2-phase	154	0.9	1.5	
	402.1.1-2	quartz	3	elliptical	Liquid-rich 2-phase	150			
	402.1.1-3	quartz	3	irregular	Liquid-rich 2-phase	150			
	402.1.1-4	quartz	5	irregular	Liquid-rich 2-phase	152			
	402.1.1-5	quartz	4	elliptical	Liquid-rich 2-phase	173			
	402.1.1-6	quartz	4	irregular	Liquid-rich 2-phase	167			Homogenized into a single liquid phase.
	402.1.2-1	quartz	8	irregular	Liquid-rich 2-phase	172	5.3	3.1	

Sample No.	Inclusion No.	Minerals	Size (major axis, mm)	Shape	Kind of inclusions	Homogenization temperature (°C)	Temperature of melting point of ice (below 0°C)	Salinity (NaCl wt %)	Remarks
K9022402	402.1.2-2	quartz	3	elliptical	Liquid-rich 2-phase	150			
	402.1.2-3	quartz	3	elliptical	Liquid-rich 2-phase	150			
	402.1.2-4	quartz	3	elliptical	Liquid-rich 2-phase	152			
	402.1.2-5	quartz	5	irregular	Liquid-rich 2-phase	152			
	402.1.2-6	quartz	4	irregular	Liquid-rich 2-phase	179			
	402.1.3	quartz	9	irregular	Liquid only		5.5	3.4	
	402.1.4-1	quartz	6	irregular	Liquid-rich 2-phase	152	5.9	4.1	
	402.1.4-2	quartz	5	elliptical	Liquid-rich 2-phase	180	5.7	3.8	
	402.1.4-3	quartz	3	irregular	Liquid-rich 2-phase	152			
	402.1.4-4	quartz	4	elliptical	Liquid-rich 2-phase	150			Homogenized into a single liquid phase.
	402.1.4-5	quartz	3	irregular	Liquid-rich 2-phase	150			
	402.1.4-6	quartz	4	irregular	Liquid-rich 2-phase	175			
402.1.4-7	quartz	5	irregular	Liquid-rich 2-phase	156				
402.1.4-8	quartz	5	irregular	Liquid-rich 2-phase	181				
(Average of Homo. Temp.)						160	(Average of salinity)	3.2	
(STDEV of Homo. Temp.)						12	(STDEV of salinity)	1.0	
K9022403	403.1.1-1	quartz	6	irregular	Liquid-rich 2-phase	162	6.1	4.4	
	403.1.1-2	quartz	6	irregular	Liquid-rich 2-phase	176	5.9	4.1	
	403.1.1-3	quartz	5	elliptical	Liquid-rich 2-phase	149			
	403.1.1-4	quartz	5	irregular	Liquid-rich 2-phase	149			
	403.1.1-5	quartz	3	elliptical	Liquid-rich 2-phase	156			
	403.1.1-6	quartz	3	irregular	Liquid-rich 2-phase	157			
	403.1.1-7	quartz	3	elliptical	Liquid-rich 2-phase	158			
	403.1.1-8	quartz	3	irregular	Liquid-rich 2-phase	176			
	403.1.2-1	quartz	9	irregular	Liquid-rich 2-phase	167	6.1	4.4	Homogenized into a single liquid phase.
	403.1.2-2	quartz	4	irregular	Liquid-rich 2-phase	164	6.4	4.9	

Sample No.	Inclusion No.	Minerals	Size (major axis, mm)	Shape	Kind of inclusions	Homogenization temperature(°C)	Temperature of melting point of ice (below 0°C)	Salinity (NaCl wt %)	Remarks
	403.1.2-3	quartz	4	irregular	Liquid-rich 2-phase	191	5.8	3.9	
	403.1.2-4	quartz	3	irregular	Liquid-rich 2-phase	156			
	403.1.2-5	quartz	3	irregular	Liquid-rich 2-phase	179			
	403.1.2-6	quartz	3	irregular	Liquid-rich 2-phase	163			
	403.1.3-1	quartz	5	irregular	Liquid-rich 2-phase	154			
	403.1.3-2	quartz	3	irregular	Liquid-rich 2-phase	152			
	403.1.3-3	quartz	5	irregular	Liquid-rich 2-phase	184			
	403.1.3-4	quartz	4	irregular	Liquid-rich 2-phase	159			
	403.1.3-5	quartz	5	irregular	Liquid-rich 2-phase	163			
(Average of Homo. Temp.)						164	(Average of salinity)		4.4
(STDEV of Homo. Temp.)						12	(STDEV of salinity)		0.4
	406.1.1-1	quartz	8	elliptical	Liquid-rich 2-phase	150	6.7	5.4	
	406.1.1-2	quartz	4	irregular	Liquid-rich 2-phase	138	6.6	5.2	
	406.1.1-3	quartz	4	elliptical	Liquid-rich 2-phase	135	6.7	5.4	
	406.1.1-4	quartz	7	irregular	Liquid-rich 2-phase	139	6.5	5.1	
	406.1.1-5	quartz	3	irregular	Liquid-rich 2-phase	134			
	406.1.1-6	quartz	4	elliptical	Liquid-rich 2-phase	139			
	406.1.1-7	quartz	5	irregular	Liquid-rich 2-phase	138			
	406.1.1-8	quartz	5	irregular	Liquid-rich 2-phase	134			
	406.1.2-1	quartz	4	elliptical	Liquid-rich 2-phase	147	6.8	5.6	
	406.1.2-2	quartz	5	elliptical	Liquid-rich 2-phase	132	5.6	3.6	
	406.1.2-3	quartz	4	irregular	Liquid-rich 2-phase	148			
	406.1.2-4	quartz	5	irregular	Liquid-rich 2-phase	156			
	406.1.2-5	quartz	3	irregular	Liquid-rich 2-phase	132			
	406.1.2-6	quartz	4	irregular	Liquid-rich 2-phase	147			
	406.1.3-1	quartz	5	elliptical	Liquid-rich 2-phase	152			
K9022406	Homogenized into a single liquid phase.								

Sample No.	Inclusion No.	Minerals	Size (major axis, mm)	Shape	Kind of inclusions	Homogenization temperature(°C)	Temperature of melting point of ice (below 0°C)	Salinity (NaCl wt %)	Remarks
	406.1.3-2	quartz	4	elliptical	Liquid-rich 2-phase	175			
	406.1.3-3	quartz	5	irregular	Liquid-rich 2-phase	157			
	406.1.3-4	quartz	7	irregular	Liquid-rich 2-phase	153			
	406.1.3-5	quartz	3	elliptical	Liquid-rich 2-phase	159			
	406.1.3-6	quartz	3	irregular	Liquid-rich 2-phase	150			
	406.1.3-7	quartz	10	irregular	Liquid-rich 2-phase	153			
	406.1.3-8	quartz	3	irregular	Liquid-rich 2-phase	156			
	406.1.3-9	quartz	5	irregular	Liquid-rich 2-phase	175			
	(Average of Homo. Temp.)						148	(Average of salinity)	5.0
(STDEV of Homo. Temp.)						12	(STDEV of salinity)	0.7	
K9021402	402-1	quartz	10	irregular	Liquid only		3.8	0.5	2-phase inclusion was not confirmed.
K9021404	404-1	quartz	3	elliptical	Liquid-rich 2-phase	81			
	404-2	quartz	3	elliptical	Liquid-rich 2-phase	90			Liquid CO ₂ ?
(Average of Homo. Temp.)						85			
(STDEV of Homo. Temp.)						6			
K9030309	309-1-1	quartz	100	rectangular	Liquid-rich 2-phase		0.0	0.1	
	309-1-2	quartz	12	rectangular	Gas-rich 2-phase		0.1	0.3	Measurement of homo. temp. was impossible, because of disappearance of gas-phase after cooling.
	309-1-3	quartz	14	irregular	Liquid-rich 2-phase		0.0	0.1	
	309-1-4	quartz	11	irregular	Liquid-rich 2-phase		0.3	0.4	
	309-1-5	quartz	20	irregular	Liquid-rich 2-phase		0.0	0.1	
	309-1-6.1	quartz	8	irregular	Liquid-rich 2-phase	220			
	309-1-6.2	quartz	8	irregular	Liquid-rich 2-phase	213			
	309-1-6.3	quartz	5	irregular	Liquid-rich 2-phase	192			
	309-1-6.4	quartz	5	irregular	Liquid-rich 2-phase	198			

Sample No.	Inclusion No.	Minerals	Size (major axis, mm)	Shape	Kind of inclusions	Homogenization temperature (°C)	Temperature of melting point of ice (below 0°C)	Salinity (NaCl wt %)	Remarks
	309-1-6.5	quartz	6	irregular	Liquid-rich 2-phase	196			Homogenized into a single liquid phase. Too small to measure salinity.
	309-1-6.6	quartz	7	irregular	Liquid-rich 2-phase	219			
	309-1-6.7	quartz	4	irregular	Liquid-rich 2-phase	185			
	309-1-6.8	quartz	3	irregular	Liquid-rich 2-phase	174			
	309-1-6.9	quartz	3	irregular	Liquid-rich 2-phase	174			
	309-1-7.1	quartz	5	irregular	Liquid-rich 2-phase	198			
	309-1-7.2	quartz	4	irregular	Liquid-rich 2-phase	177			
	309-1-7.3	quartz	4	irregular	Liquid-rich 2-phase	233			
	(Average of Homo. Temp.)						198	(Average of salinity)	
(STDEV of Homo. Temp.)						19.0	(STDEV of salinity)	0.2	
K9030308	308-1	quartz	15	irregular	Liquid-rich 2-phase	183	0.5	0.8	Homogenized into a single liquid phase.
	308-2	quartz	20	irregular	Liquid-rich 2-phase	181	0.4	0.6	
	308-3	quartz	10	irregular	Liquid-rich 2-phase	147			
	308-4	quartz	20	irregular	Liquid-rich 2-phase	276	0.5	0.8	
	308-5	quartz	10	irregular	Liquid-rich 2-phase	275	0.6	1	
	308-6	quartz	10	irregular	Liquid-rich 2-phase	154	0.6	1	
	308-7	quartz	20	irregular	Liquid-rich 2-phase	203	0.5	0.8	
	308-8	quartz	20	irregular	Liquid-rich 2-phase	196	0.5	0.8	
	308-9	quartz	10	irregular	Liquid-rich 2-phase	233	0.6	1	
	308-10	quartz	10	irregular	Liquid-rich 2-phase	235	0.7	1.2	
	308-11	quartz	15	irregular	Liquid-rich 2-phase	275	0.6	1	
	308-12	quartz	10	irregular	Liquid-rich 2-phase	202	0.6	1	
	308-13	quartz	10	irregular	Liquid-rich 2-phase	276	0.7	1.2	
	308-14	quartz	10	irregular	Liquid-rich 2-phase	272	0.7	1.2	
	308-15	quartz	15	irregular	Liquid-rich 2-phase	210	0.6	1	
(Average of Homo. Temp.)						221	(Average of salinity)	0.9	

Sample No.	Inclusion No.	Minerals	Size (major axis, mm)	Shape	Kind of inclusions	Homogenization temperature (°C)	Temperature of melting point of ice (below 0°C)	Salinity (NaCl wt %)	Remarks
					(STDEV of Homo. Temp.)	46.0	(STDEV of salinity)	0.2	
K9030307	307-1	quartz	10	irregular	Liquid-rich 2-phase	264			
	307-2	quartz	7	irregular	Liquid-rich 2-phase	308			
	307-3	quartz	10	elliptical	Liquid-rich 2-phase	309			
	307-4	quartz	5	irregular	Liquid-rich 2-phase	309			
	307-5	quartz	7	irregular	Liquid-rich 2-phase	228	5.0	7.9	
	307-6	quartz	5	irregular	Liquid-rich 2-phase	216	4.5	7.1	
	307-7	quartz	20	irregular	Liquid-rich 2-phase	282	7.3	10.9	
	307-8	quartz	15	irregular	Liquid-rich 2-phase	300	5.7	8.8	
	307-9	quartz	4	irregular	Liquid-rich 2-phase	228			
	307-10	quartz	15	irregular	Liquid-rich 2-phase	224			
	307-11	quartz	6	irregular	Liquid-rich 2-phase	111			
	307-12	quartz	2	elliptical	Liquid-rich 2-phase	189			
	307-13	quartz	13	irregular	Liquid-rich 2-phase	290	4.2	6.7	
	307-14	quartz	10	irregular	Liquid-rich 2-phase	293			
	307-15	quartz	12	irregular	Liquid-rich 2-phase	294			
	307-16	quartz	10	irregular	Liquid-rich 2-phase	265			
	307-17	quartz	4	irregular	Liquid-rich 2-phase	261			
	307-18	quartz	18	irregular	Liquid-rich 2-phase	262			
	307-19	quartz	10	irregular	Liquid-rich 2-phase	256			
	307-20	quartz	9	irregular	Liquid-rich 2-phase	257			
	307-21	quartz	7	elliptical	Liquid-rich 2-phase	283			
	307-22	quartz	5	elliptical	Liquid-rich 2-phase	285			
					(Average of Homo. Temp.)	260	(Average of salinity)	8.3	
					(STDEV of Homo. Temp.)	47.0	(STDEV of salinity)	1.7	
K9030301	301-1	quartz	10	elliptical	Liquid-rich 2-phase	>430	3.7	6	Necking down?

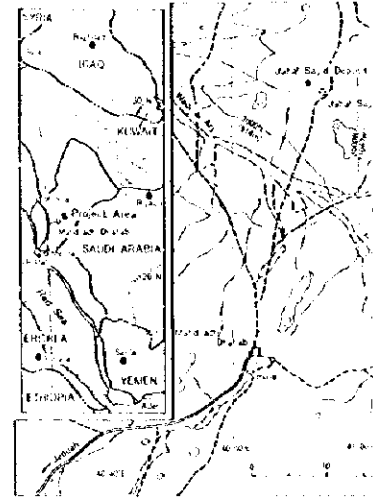
Homogenized into a single liquid phase.

Umm ad Damar Area



REPORT ON THE COOPERATIVE MINERAL EXPLORATION
 IN THE UMM AD DAMAR AREA
 THE KINGDOM OF SAUDI ARABIA
 PHASE I

GEOLOGICAL MAP OF THE SURVEY AREA

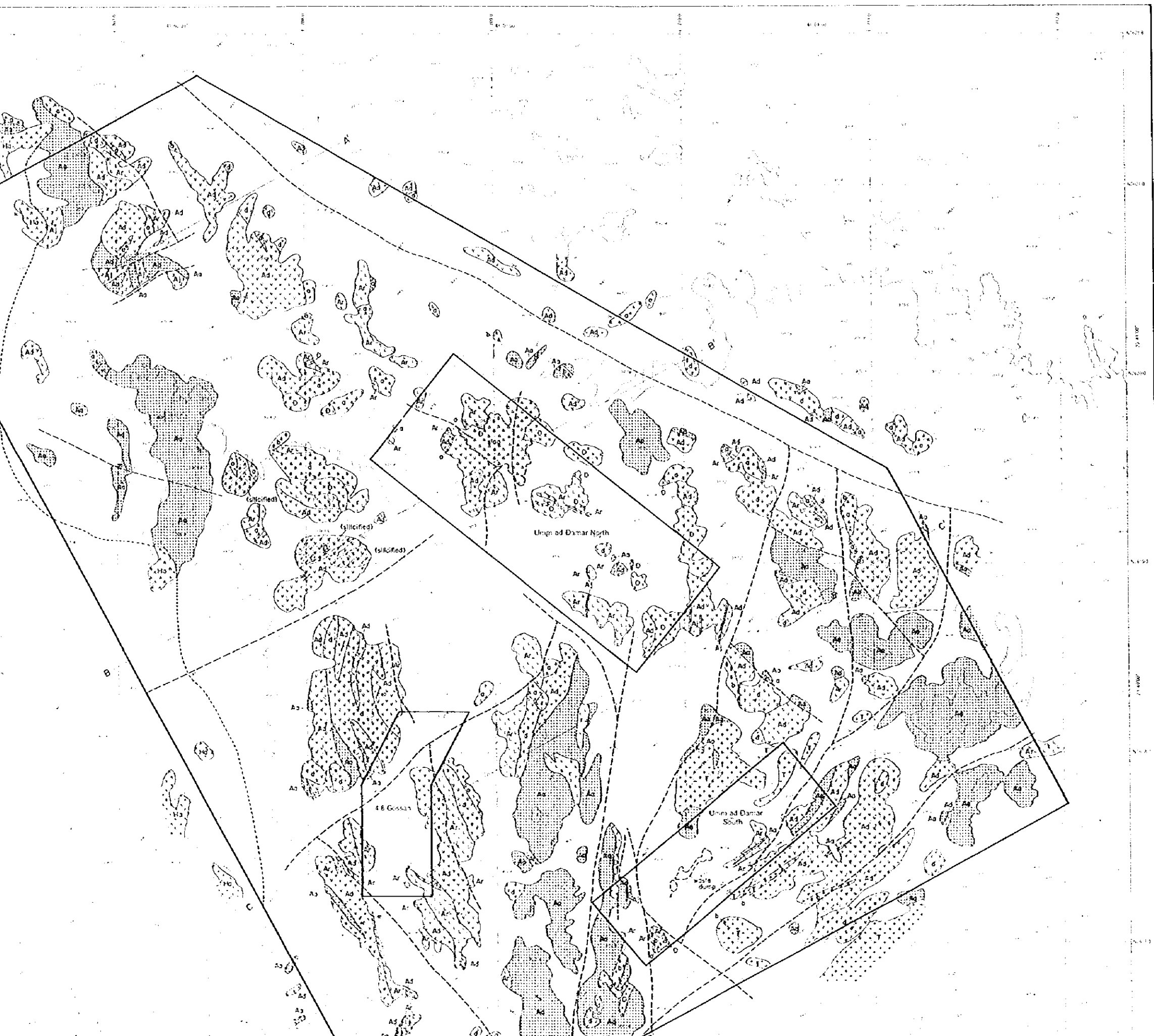


MARCH 1969

JAPAN INTERNATIONAL COOPERATION AGENCY
 METAL MINING AGENCY OF JAPAN

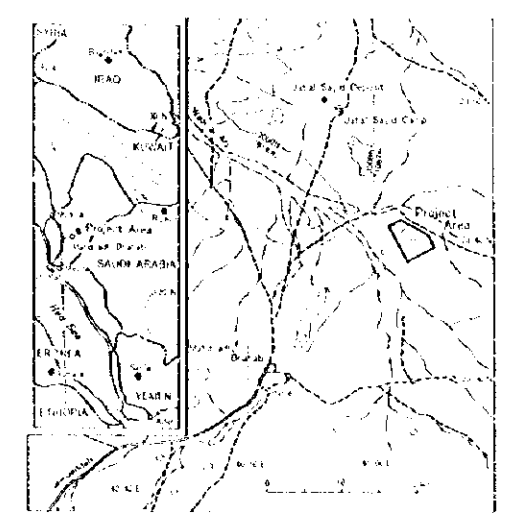
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GENOZOIC	QUATERNARY	Q sand, gravel
	MAHO GROUP (Ma) (Formation)	andesite, andesitic volcaniclastic rocks, conglomerate
LATE PROTEROZOIC	BARI GRANODIORITE, HUFAYRIYA TONALITE	
	ARJ GROUP (Jabal Azlam & Sayd Formations)	[Ad] andesite, andesitic volcaniclastic rocks [Ad] dacite, dacitic volcaniclastic rocks [Ar] rhyodacite, rhyodacitic volcaniclastic rocks [A] jasper

Fault



REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

GEOLOGICAL MAP OF THE SURVEY AREA (1:50,000)



MARCH 1959
JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

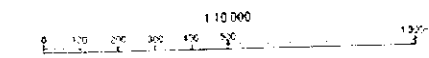
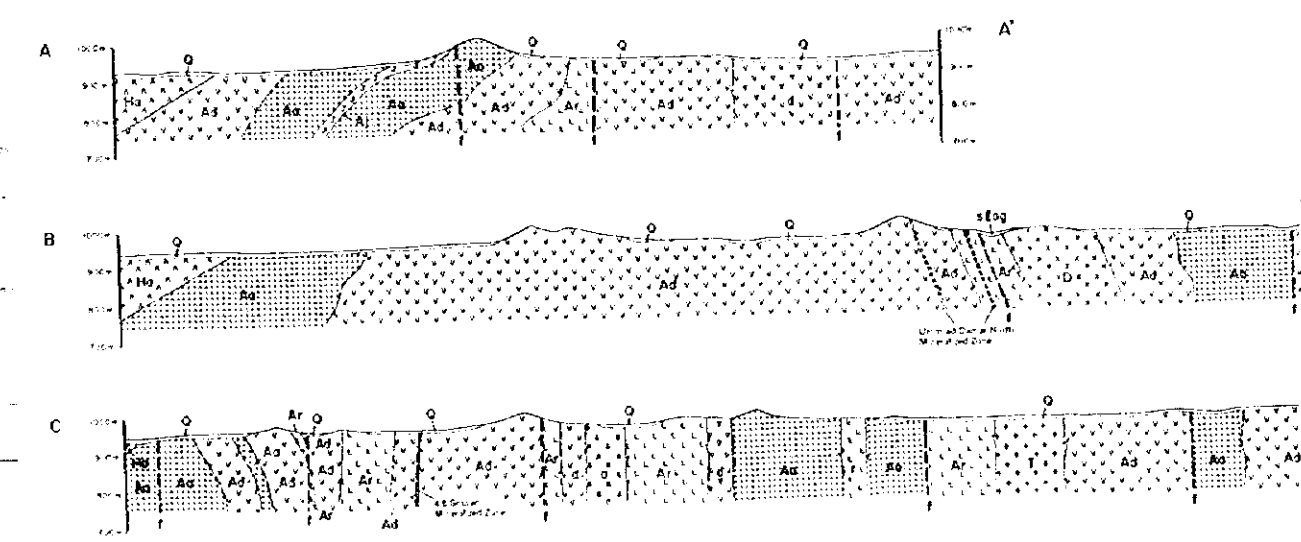
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CENOZOIC QUATERNARY	[Q] sand, gravel	
	MAHDI GROUP [Ma] andesite, andesitic [Ma] volcaniclastic rocks, [Ma] conglomerate	
LATE PROTEROZOIC		[T] tonalite
	BARI GRANODIORITE, HUFAYRIYA TONALITE	[D] quartz diorite, diorite
		[b] basalt
		[a] andesite
		[d] dacite
		[r] rhyodacite
	ARJ GROUP Jabal Azam & Sayid Formations	[Aa] andesite, andesitic volcaniclastic rocks
	[Aj] dacite, dacitic volcaniclastic rocks	[A] jasper

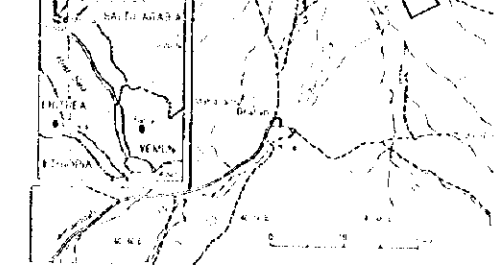
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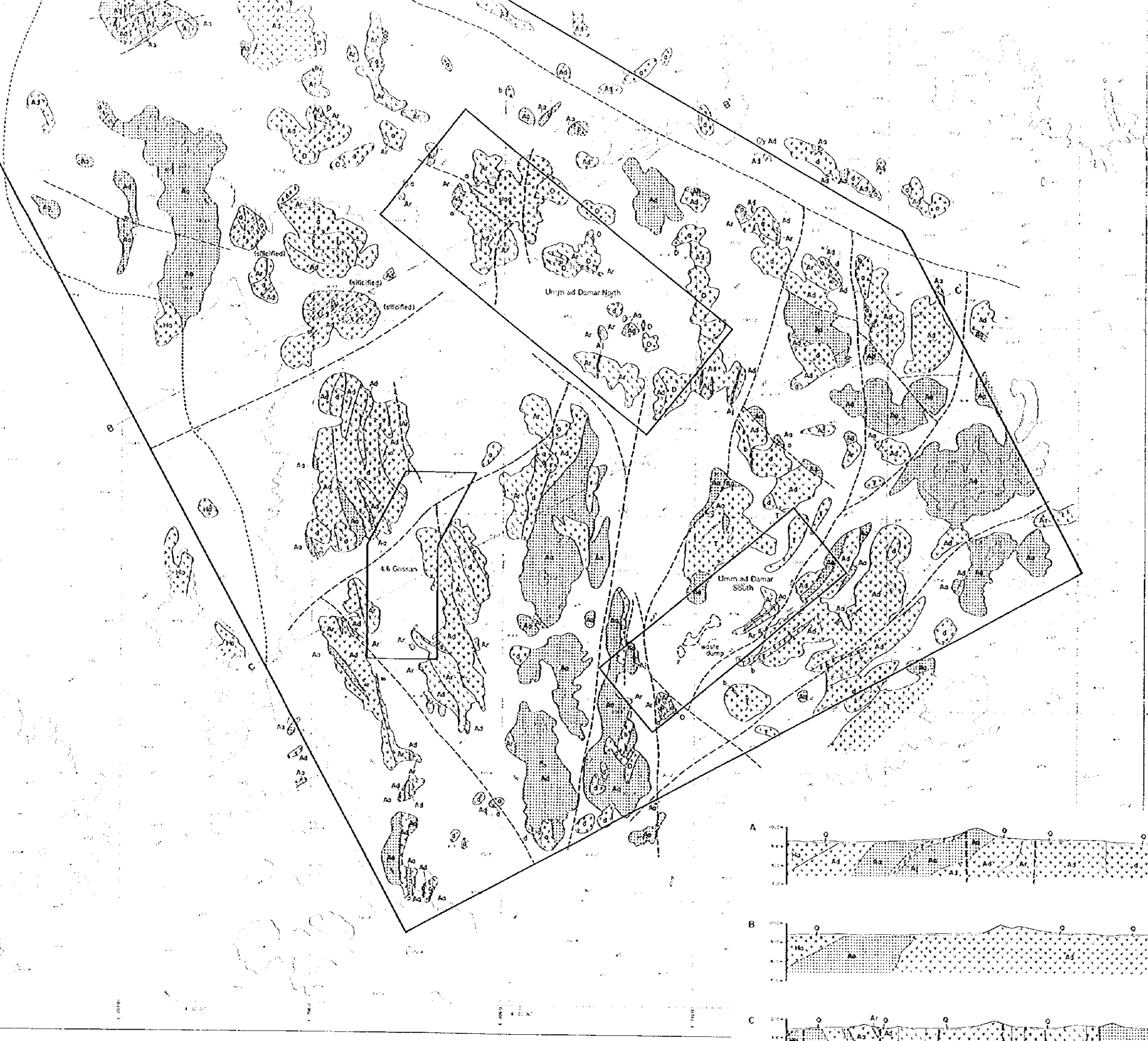
AGE	SEDIMENTARY AND VOLCANIC ROCKS
CENOZOIC	QUATERNARY
	Q sand, gravel
MAHD GROUP (Jabal Azlam & Sayid Formations)	Ma andesite, andesitic volcaniclastic rocks, conglomerate
	BARI GRANODIORITE, HUFAYRIYA TONALITE
LATE PROTEROZOIC	Aa andesite, andesitic volcaniclastic rocks
	Ad dacite, dacitic volcaniclastic rocks
	Ar rhyolite, rhyodacitic volcaniclastic rocks
	Aj Jasper

— Fault



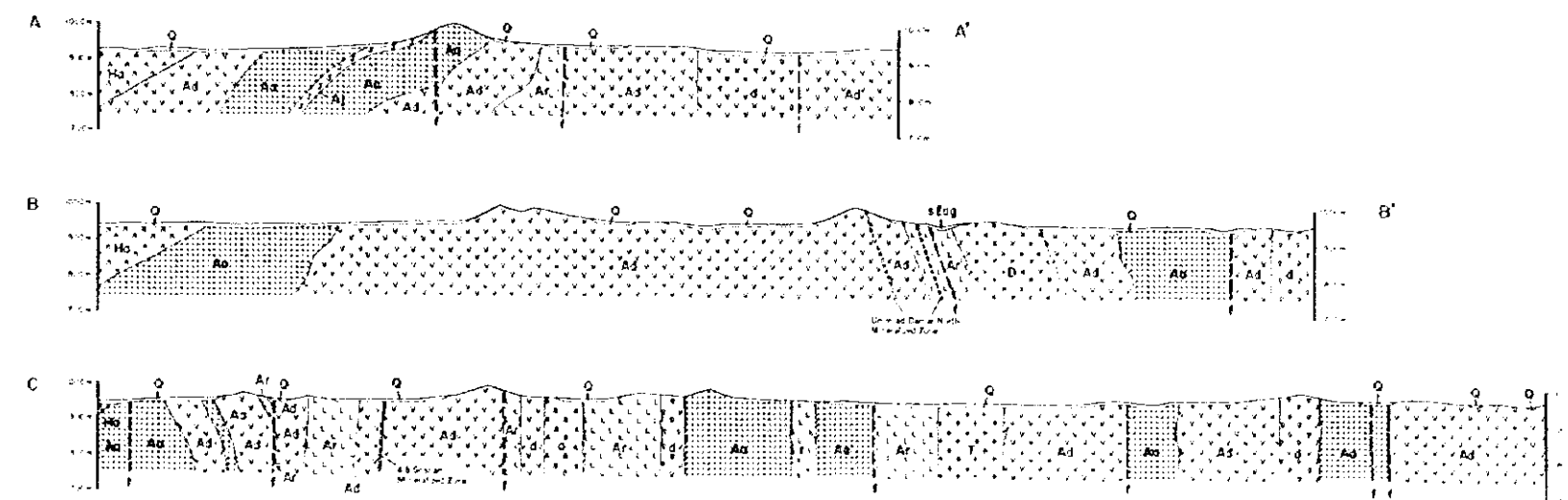
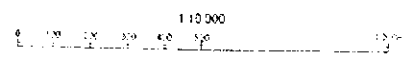


MARCH 1999
 JAPAN INTERNATIONAL COOPERATION AGENCY
 METAL MINING AGENCY OF JAPAN

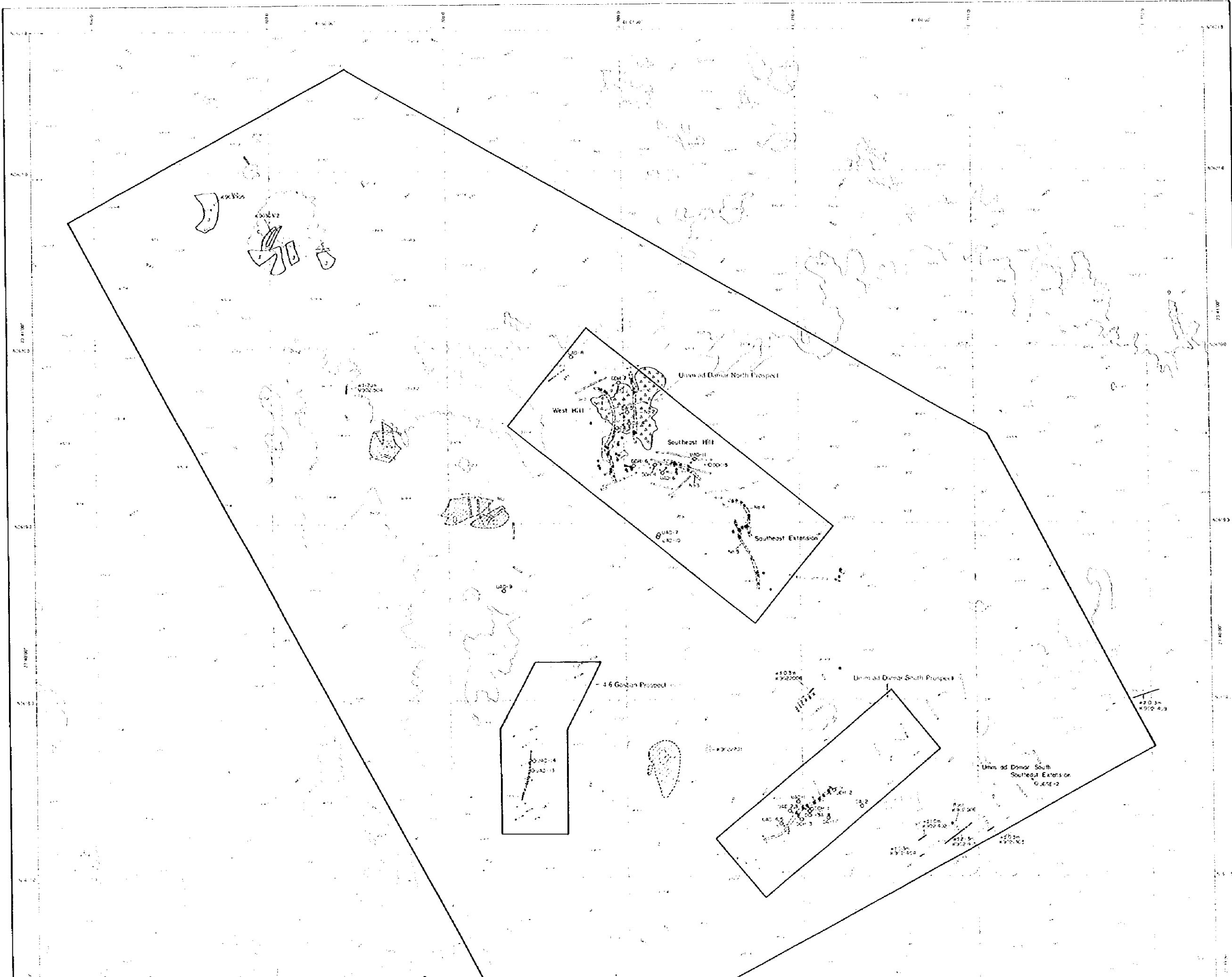


AGE	SEDIMENTARY AND VOLCANIC ROCKS	INTRUSIVE ROCKS
CENOZOIC QUATERNARY	[Q] sand, gravel	
	MAHO GROUP (Jabal Azam & Sayid Formation) [He] andesite, andesitic volcaniclastic rocks, conglomerate	
LATE PROTEROZOIC		[T] tonalite
	BARI GRANODIORITE, HUFAYRYA TONALITE	[O] quartz diorite, diorite
		[b] basalt
		[a] andesite
		[d] dacite
		[r] rhyodacite
	ARJ GROUP (Jabal Azam & Sayid Formation)	[Aa] andesite, andesitic volcaniclastic rocks
	[Ar] rhyodacite, rhyodacitic volcaniclastic rocks	[Aj] jasper

--- Fault



Umm ad Damar Area



REPORT ON THE COOPERATIVE MINERAL SURVEY IN THE UMM AD DAMAR AREA OF THE KINGDOM OF SAUDI ARABIA PHASE I

MINERALIZATION MAP OF THE SURVEY

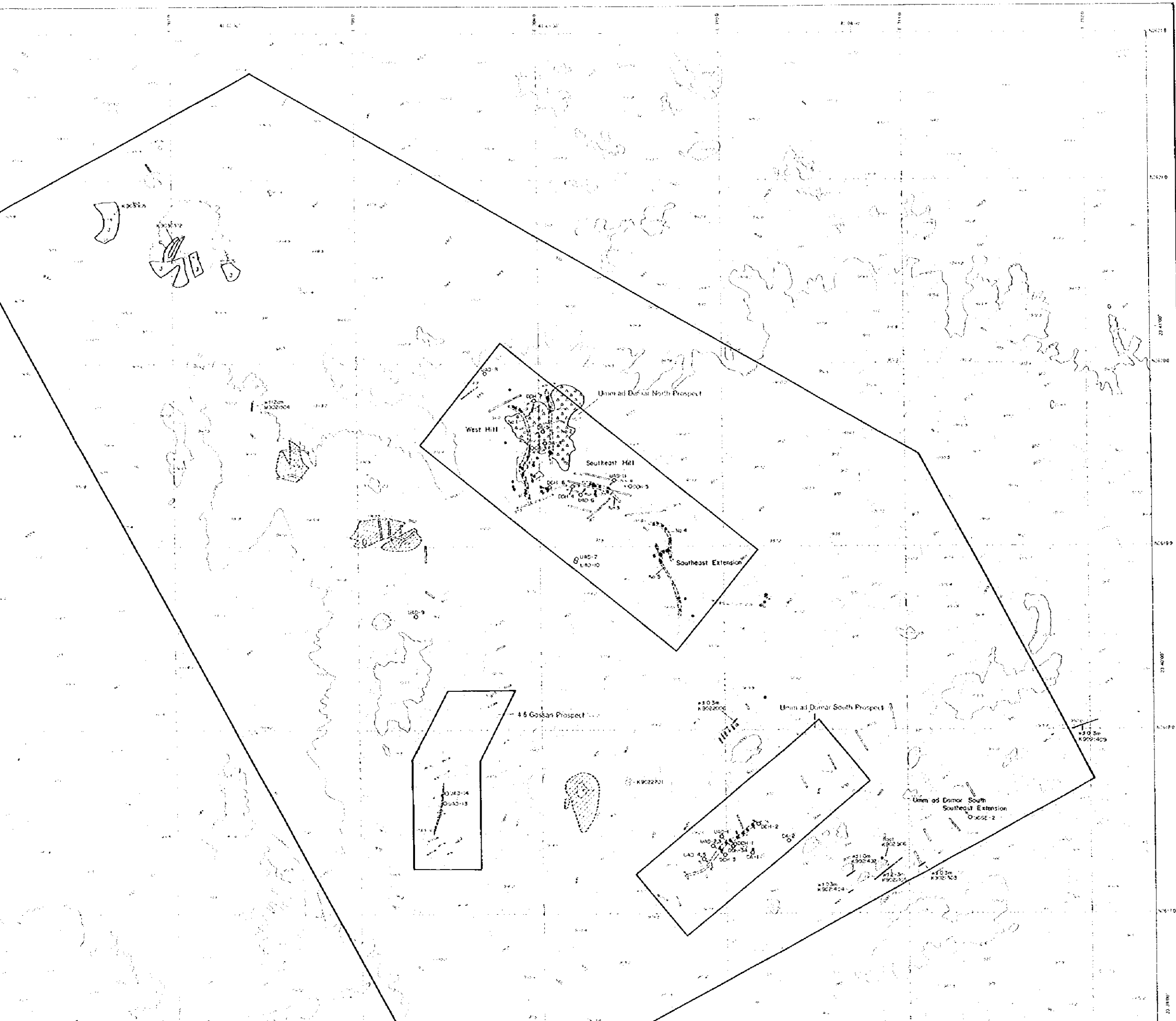
MARCH 1990

JAPAN INTERNATIONAL COOPERATION AGENCY METAL MINING AGENCY OF JAPAN

LEGEND

- Arj Group Jasper
- slag
- Carbonatization
- Silicification
- Epidolization & weak Silicification
- Mineralized zone
- Drill hole
- Ancient working
- Quartz vein
- Trench

Damar Area



PL 2

REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

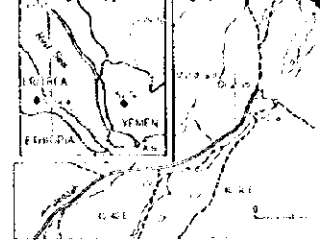
MINERALIZATION MAP OF THE SURVEY AREA (1:50,000)

MARCH 1993

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

LEGEND

- Ag Group Jasper
- slag
- Carbonatization
- Silicification
- Epidotization & weak Silicification
- Mineralized zone
- Drill hole
- Ancient working
- Quartz vein
- Trench



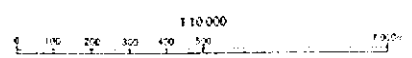
MARCH 1999

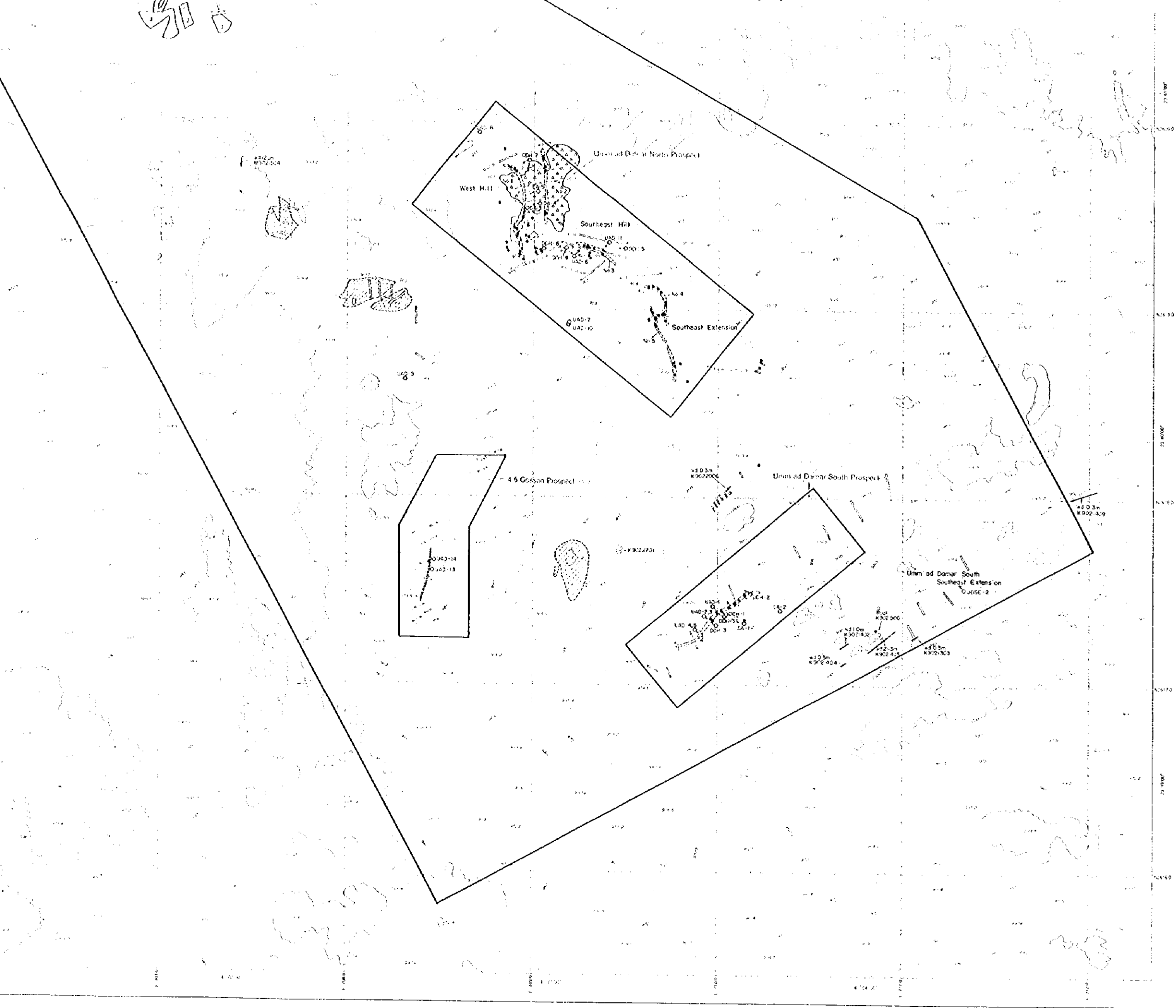
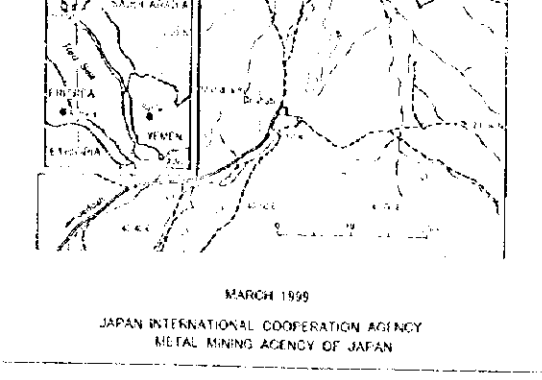
JAPAN INTERNATIONAL COOPERATION
METAL MINING AGENCY OF JAPAN



LEGEND

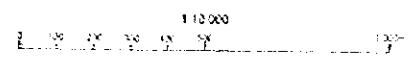
- Arj Group jasper
- slag
- Carbonization
- Silification
- Epidolization & weak Silification
- Mineralized zone
- Drill hole
- Ancient working
- Quartz vein
- Trench

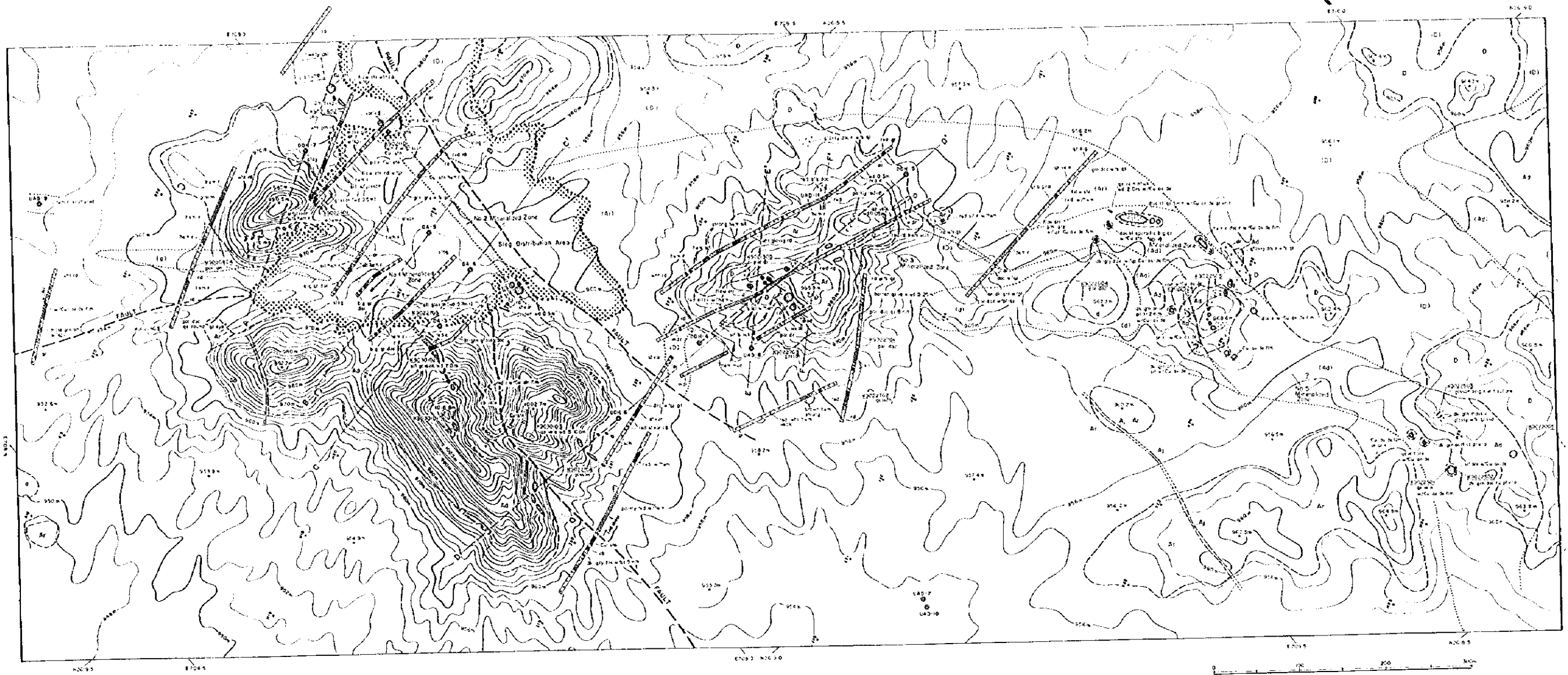




LEGEND

- Aij Group Jasper
- slag
- Carbonatization
- Silicification
- Epithermal & weak Silicification
- Mineralized zone
- Drill hole
- Ancient working
- Quartz vein
- Trench

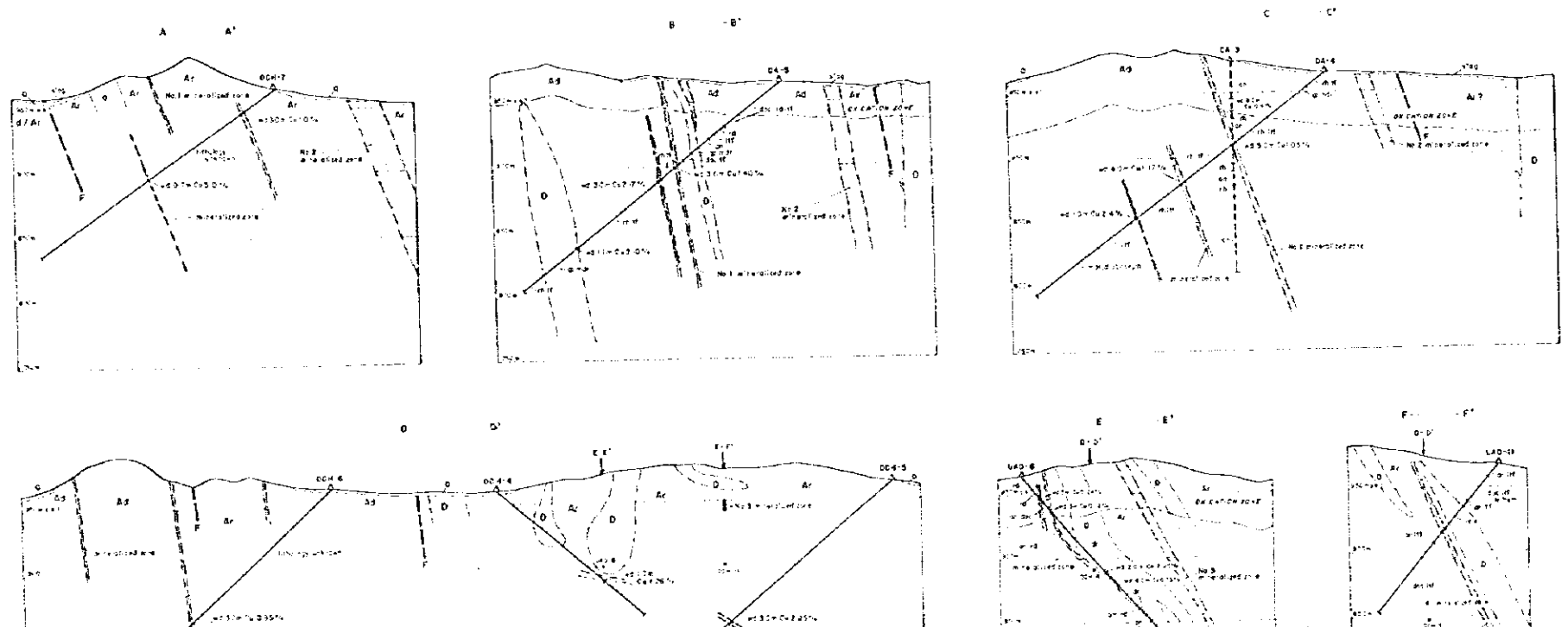




REPORT ON THE COOPERATIVE
 IN THE UMM AD DAN
 THE KINGDOM OF SAUDI
 ARABIA
 PHASE

DETAILED GEOLOGICAL MAP OF
 NORTH PROSPECT

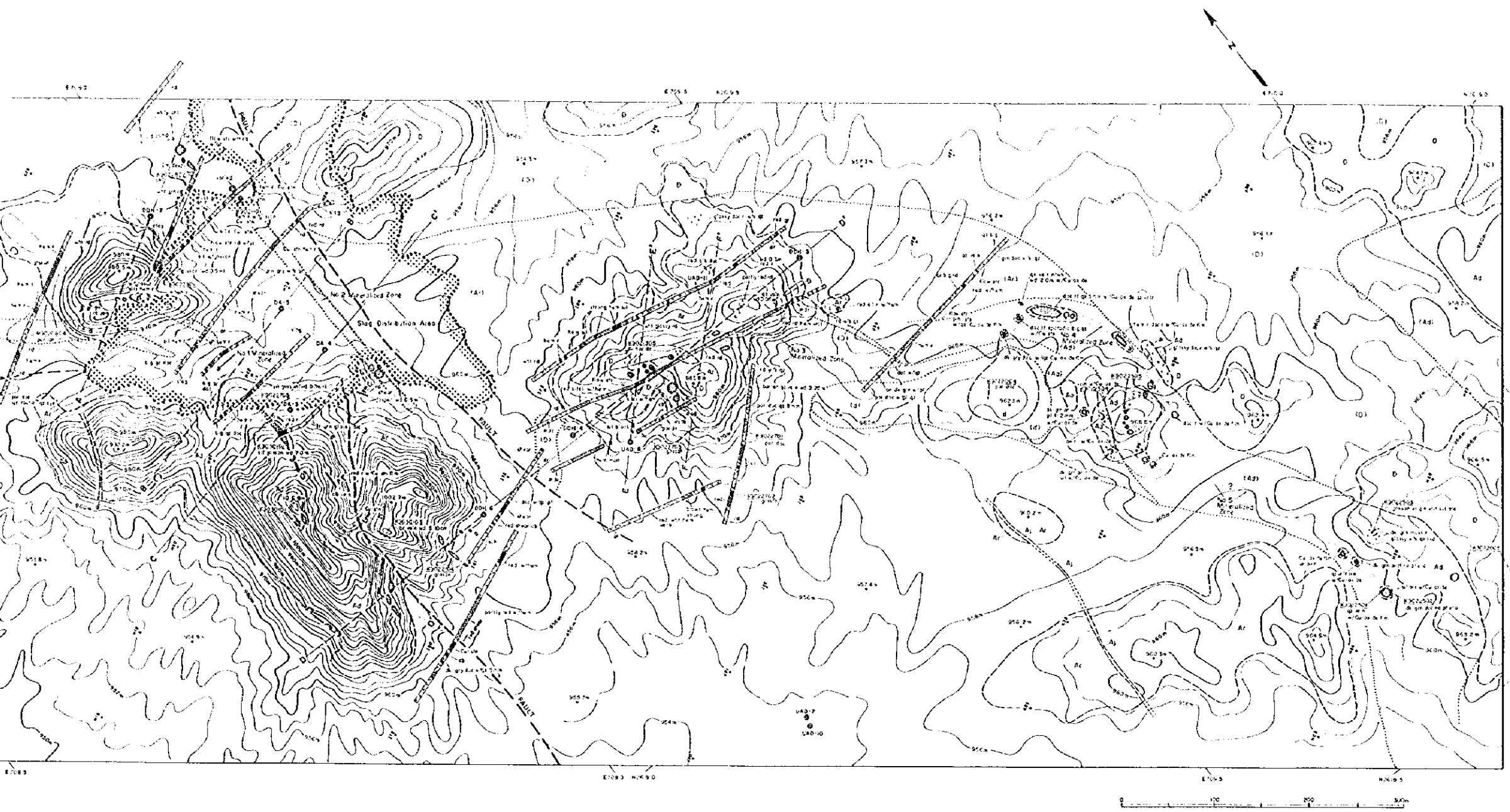
MARCH 1960
 JAPAN INTERNATIONAL COOPERATIVE
 METAL MINING AGENCY



AGE	SEDIMENTARY AND VOLCANIC ROCKS	INTRUSIVE ROCKS
LATE MESOZOIC	[G] sandstone	
	[H] andesite, andesitic trachyte, dacite, rhyolite	
	[I] granite	
	[J] quartz diorite, diorite	
	[K] basalt	
	[L] diorite	
	[M] gabbro	
	[N] andesite, andesitic volcanic rocks	
	[O] dacite, diorite, volcanic rocks	
	[P] gabbro, rhyolite, volcanic rocks	
EARLY MESOZOIC	[Q] sandstone	
	[R] granite	

Abbreviation

agglomerate	ag	moderate	mod
amphibole	amp	network	ntwk
andesite	an	opaque minerals	op
andesitic	an	phanocryst	phcr
aprite	ap	phylic	phy
basic	ba	plagioclase	pl
breccia	br	porphyritic	por
brachioid	brcd	pyrite	py
carbonate	cb	quartz	qtz
chert	ch	rhyolite	rd
chlorite	chl	rock	rk
chlorite	chl	rounded	rnd
clay mineral	cl	sandstone	st
chromite	chr	schist	sch
conglomerate	cgr	sericite	ser
dacite	dc	shale	sh
dike	dk	shale	sh



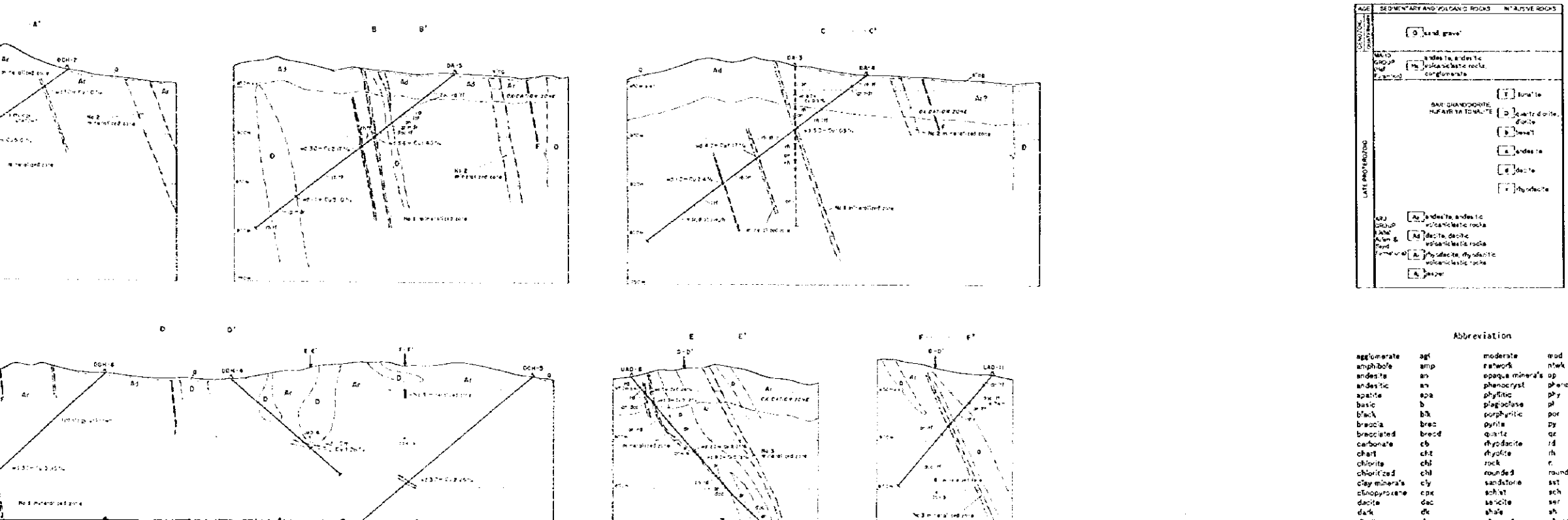
PL 3

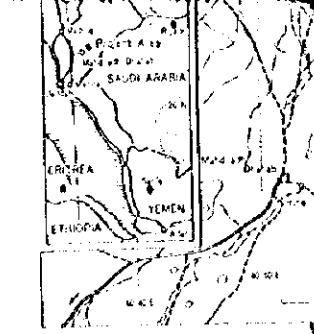
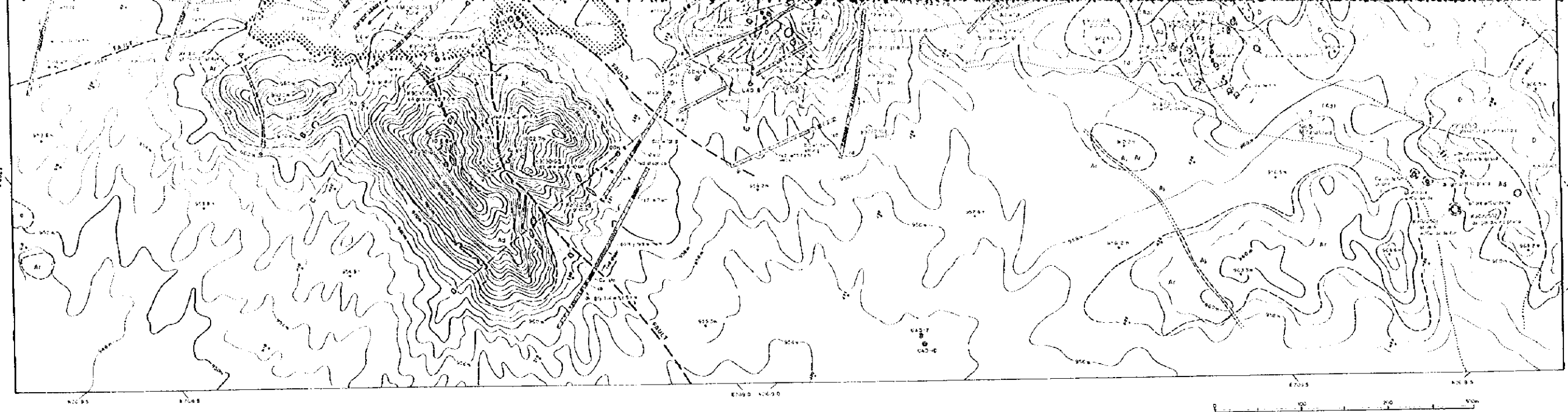
REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

DETAILED GEOLOGICAL MAP OF THE UMM AD DAMAR
NORTH PROSPECT (1:2500)

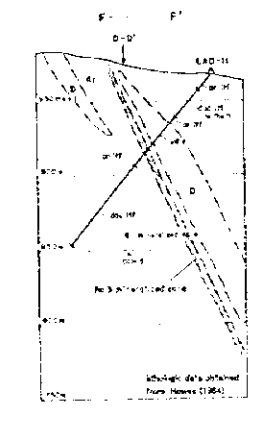
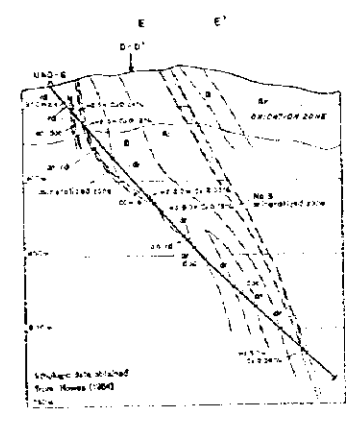
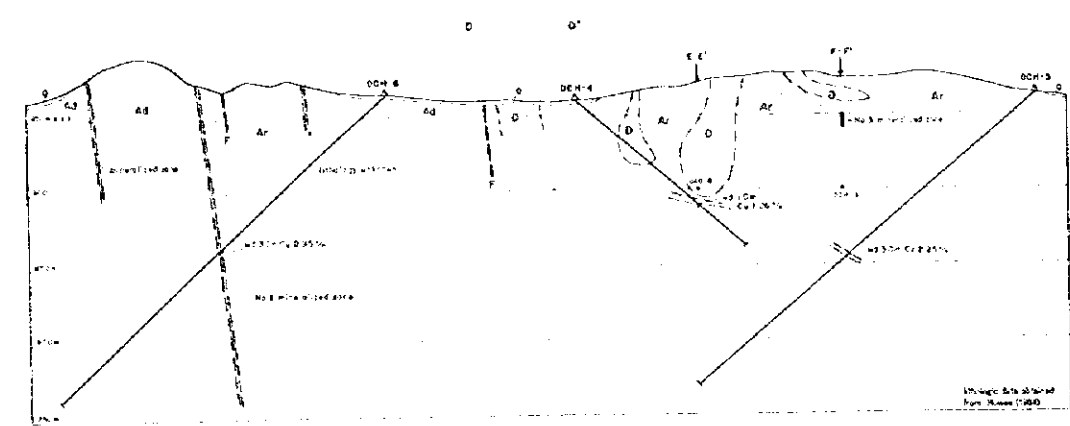
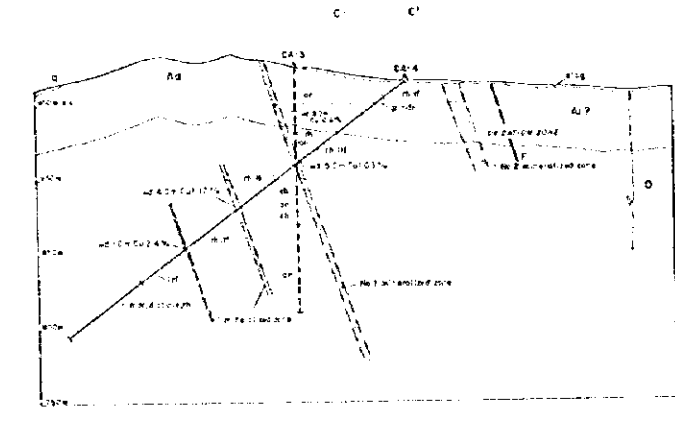
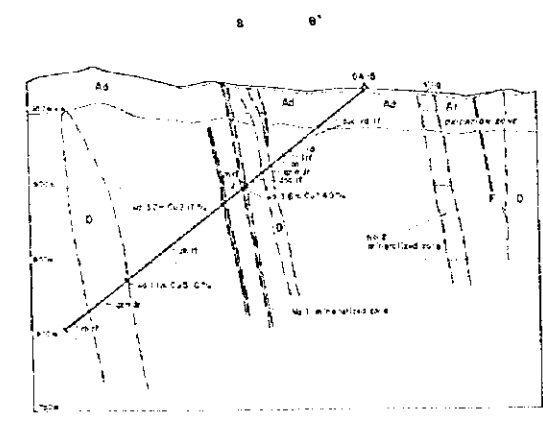
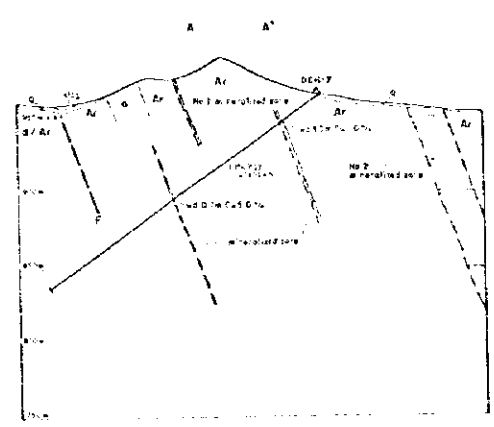
MARCH 1959

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN



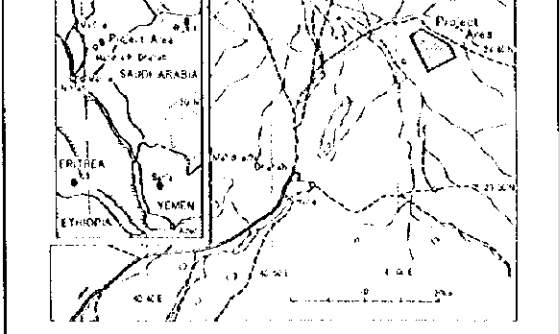
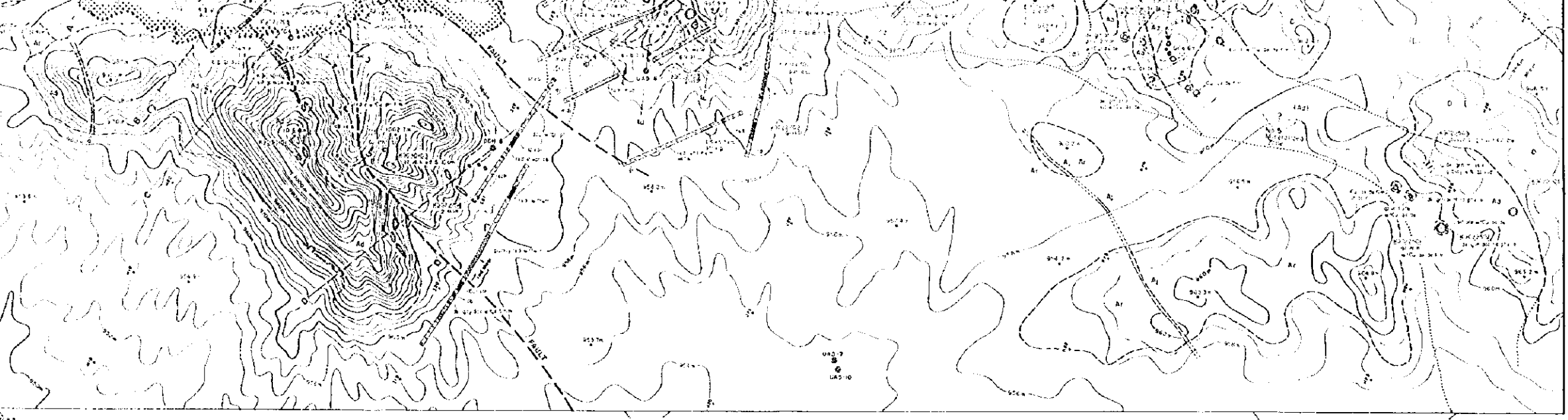


MARCH 1999
 JAPAN INTERNATIONAL COOP.
 METAL MINING AGENCY

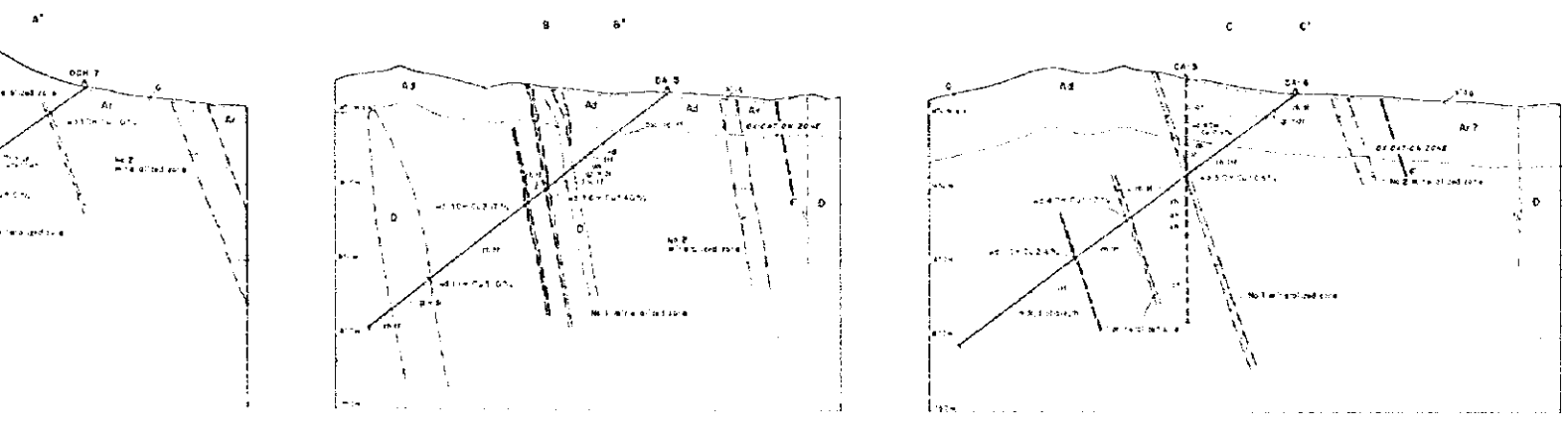


SYDNEY AND VOLCANIC ROCKS	[D]	and gravel	MYRISTIC ROCKS
	[Ar]	andesite and/or volcanic rocks	
	[Ad]	dacite and/or volcanic rocks	
LAST UNIDENTIFIED	[T]	tuffite	
	[D]	diorite	
	[G]	granite	
	[R]	rhyolite	
NEW GROUP	[Ar]	andesite and/or volcanic rocks	
	[Ad]	dacite and/or volcanic rocks	
	[R]	rhyolite and/or volcanic rocks	
	[A]	gneiss	

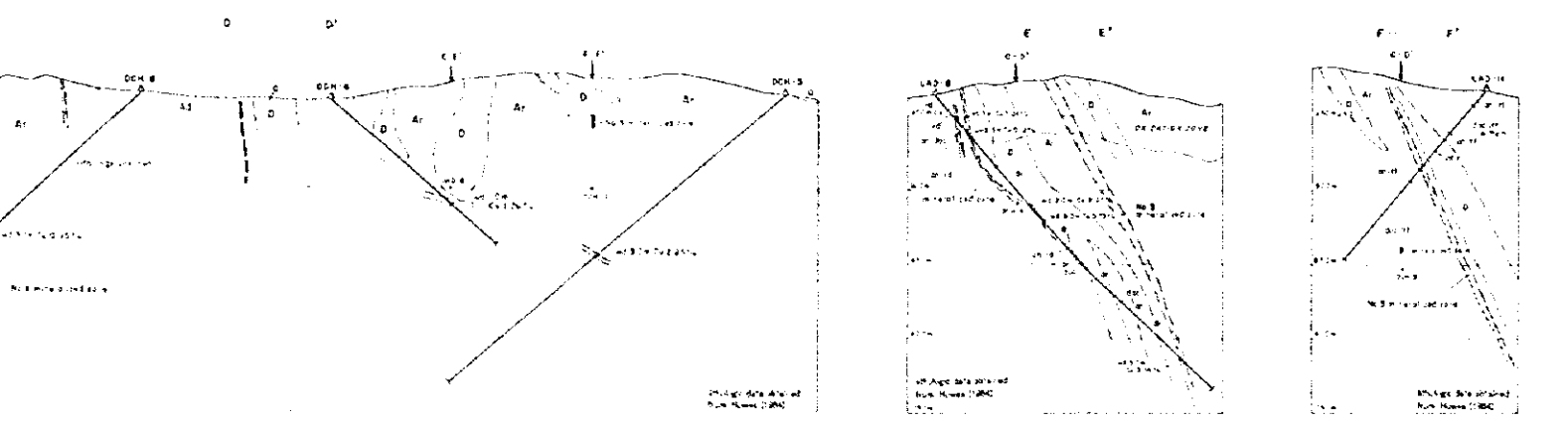
Abbreviation			
agglomerate	agl	moderate	mod
amphibole	amp	network	ntwk
andesite	an	opaque mineral	op
apatite	apa	phenocryst	pheno
basic	b	phylic	phy
black	bl	phylocast	pl
breccia	brcc	porphyroblast	por
brecciated	brcc	pyrite	py
carbonate	cb	quartz	qtz
chart	cht	rhyolite	rd
chlorite	chl	rhyolite	rh
chloritized	chl	rock	r
clay mineral	cl	rounded	round
clinopyroxene	cxp	sandstone	sst
dacite	dac	schist	sch
dark	dk	sericite	ser
diorite	di	shale	sh
dissiminated	dss	sheared	shear
dotted	dott	sliteous	sl
epidote	ep	sluffed	sluff
fin	fm	spotted	spot
gravel	gr	stau	stn
gray	gy	structure	str
green	gm	sulfide	su
hornblende	hb	taconite	ta
intrusive	in	tuff	tu
K-feldspar	kf	unit	unit
light tuff	lt	weakly	wkly
light	lt	white	wh
massive	mas	width	wd
microfite	mdr	with	w/



MARCH 1999
 JAPAN INTERNATIONAL COOPERATION AGENCY
 METAL MINING AGENCY OF JAPAN



SEMINARY AND VOLCANIC ROCKS		INTRUSIVE ROCKS	
[B]	and. gneiss	[T]	granite
[D]	andesite andesite	[D]	quartz diorite
[M]	volcaniclastic rocks	[S]	basalt
[C]	conglomerate	[A]	andesite
		[D]	diorite
		[T]	trachyte
		[R]	ryholite
[S]	andesite andesite		
[M]	volcaniclastic rocks		
[A]	andesite diorite		
[V]	volcaniclastic rocks		
[R]	ryholite, rhyolite		
[A]	basalt		

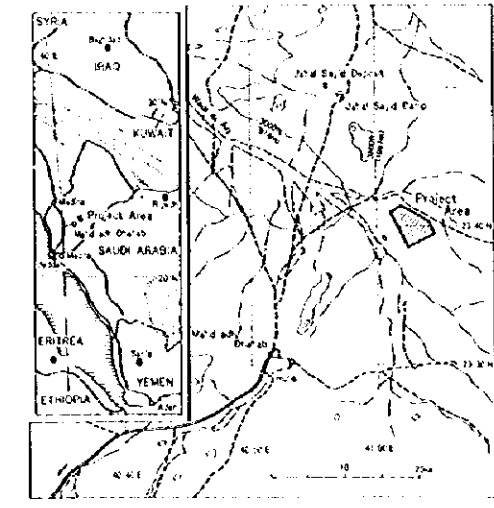


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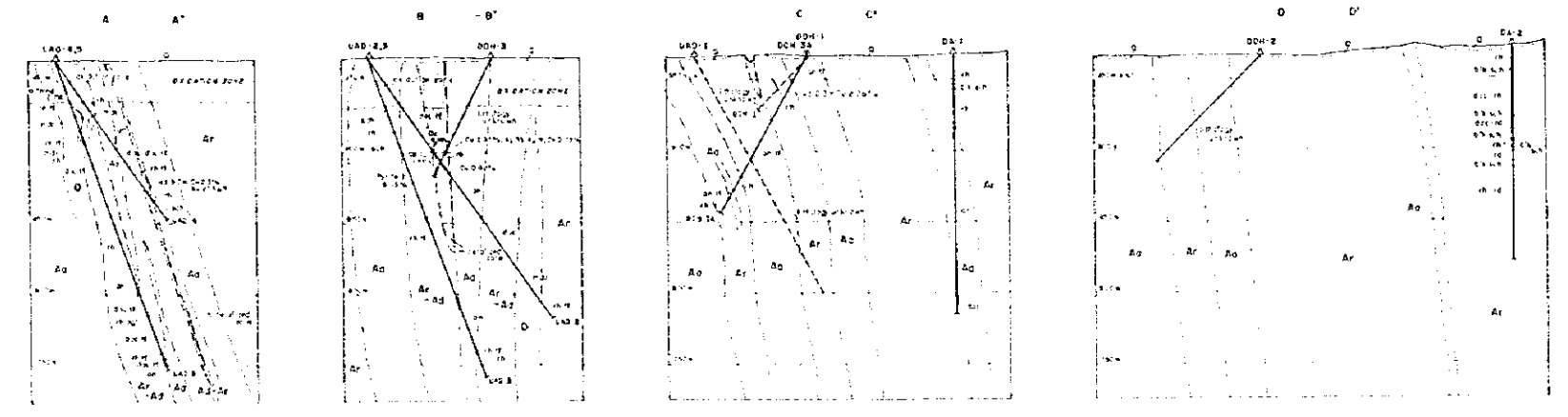
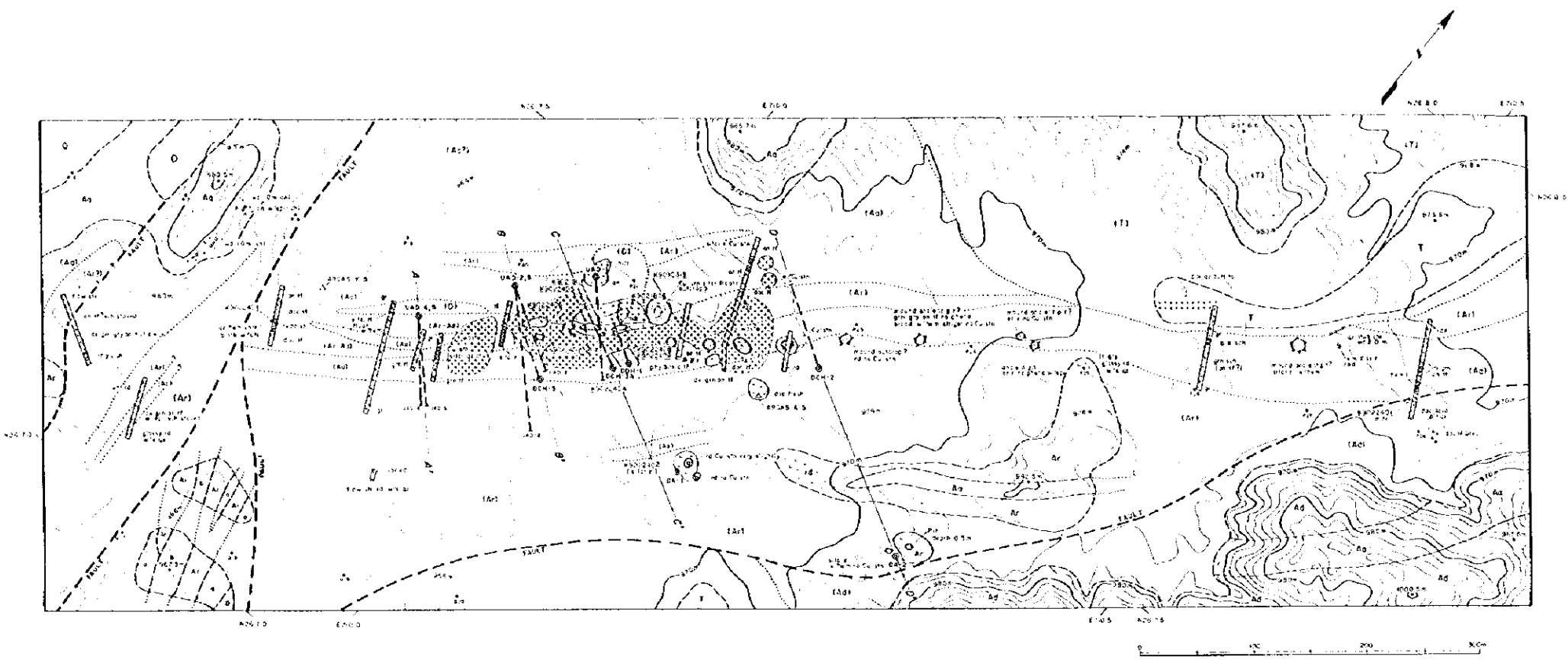
agglomerate	agl	moderate	mod
amphibole	amp	network	netw
andesite	an	opaque minerals	op
andesitic	an	phenocryst	phno
apatite	apa	phyllitic	phy
basalt	b	plagioclase	pl
black	bk	periphytic	per
brachi	brac	pyrite	py
brachioid	brac	quartz	qt
carbonate	cb	rhodochrosite	rd
chant	cht	rhinite	rh
chlorite	chl	rock	r
chloritized	chl	rounded	round
clay minerals	cl	sandstone	st
chrysotile	chr	schist	sch
dacite	dac	sericite	ser
dark	dk	shale	sh
diorite	dr	sheared	shear
dissiminated	dis	siliceous	sl
dotted	dott	splined	spl
epidote	epi	spotted	spot
feldspar	fm	stain	stn
gray	gr	structure	str
green	grn	striae	str
hematite	hem	tuffite	tt
hornblende	hb	tuff	tt
intrusive	int	vent	ven
K-feldspar	kt	weath	wth
light	lt	white	wh
massive	mas	width	wd
microcline	mic	width	wr

REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

DETAILED GEOLOGICAL MAP OF THE UMM AD DAMAR
SOUTH PROSPECT (1:25000)



MARCH 1999
JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN



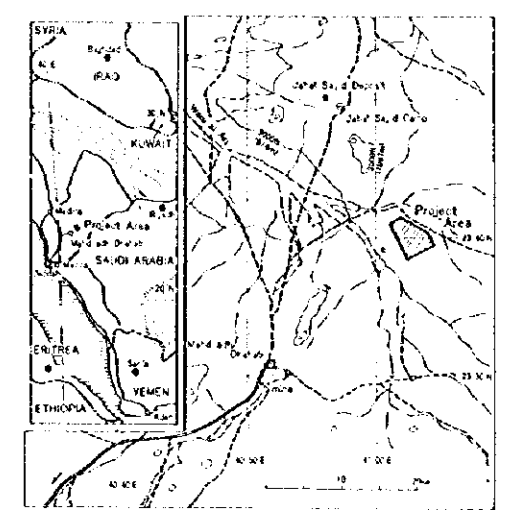
UNIT	SEDIMENTARY AND VOLCANIC ROCKS	INTRUSIVE ROCKS
SEDIMENTARY AND VOLCANIC ROCKS	Gravel	
	Andesite andesitic volcanic rocks, conglomerate	
	Basalt	
	Basalt	
	Andesite	
	Diorite	
	Hydrolite	
	Andesite andesitic volcanic rocks	
	Diorite, diorite	
	Hydrolite, hydrolite	
INTRUSIVE ROCKS		

Abbreviation

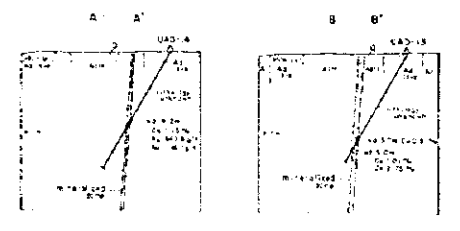
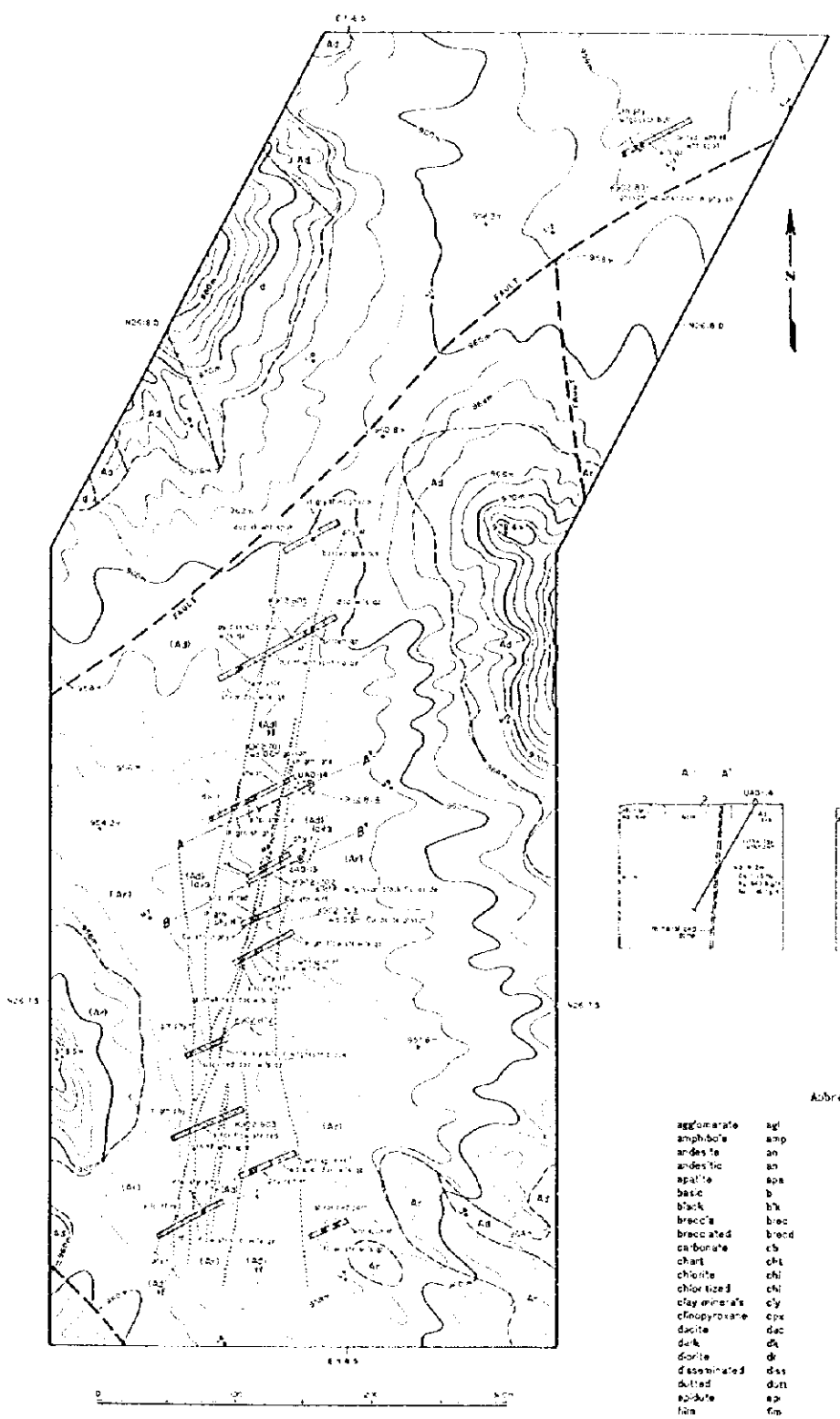
agglomerate	agl	moderate	mod
amphibole	amp	network	netk
andesite	an	opaque mineral	op
andesitic	an	phenocryst	phno
apatite	apa	phyllitic	phy
basalt	b	plagioclase	pl
black	bl	porphyritic	por
breccia	brcc	pyrite	py
brecciated	brcc	quartz	qtz
carbonate	cb	rhodochrosite	rd
chert	cht	rhodite	rh
chlorite	chl	rock	r
chloritized	chl	rounded	round
clay mineral	cl	sandstone	sat
clinopyroxene	cp	schist	sch
diabase	dac	sericite	ser
diorite	di	shale	sh
diorite	di	sheared	shear
dissiminated	dss	siliceous	sil
dotted	dtt	sliced	slic
epidote	ep	spotted	spol
lim	lim	stun	stn
garnet	gr	structure	str
gypsum	gs	sulfide	sulf
gypsum	gs	illite	ill
hematite	hem	lignite	lit
hornblende	hb	hill	h
illite	ill	veinlet	ven
illite	ill	woolly	wol
light sulf	l	white	wh
light	l	width	wid
massive	mas	with	w
microcline	mc		

PL 5
 REPORT ON THE COOPERATIVE MINERAL EXPLORATION
 IN THE UMM AD DAMAR AREA
 THE KINGDOM OF SAUDI ARABIA
 PHASE 1

DETAILED GEOLOGICAL MAP OF THE A.B. GOSSAN PROSPECT (1:2500)



MARCH 1999
 JAPAN INTERNATIONAL COOPERATION AGENCY
 METAL MINING AGENCY OF JAPAN

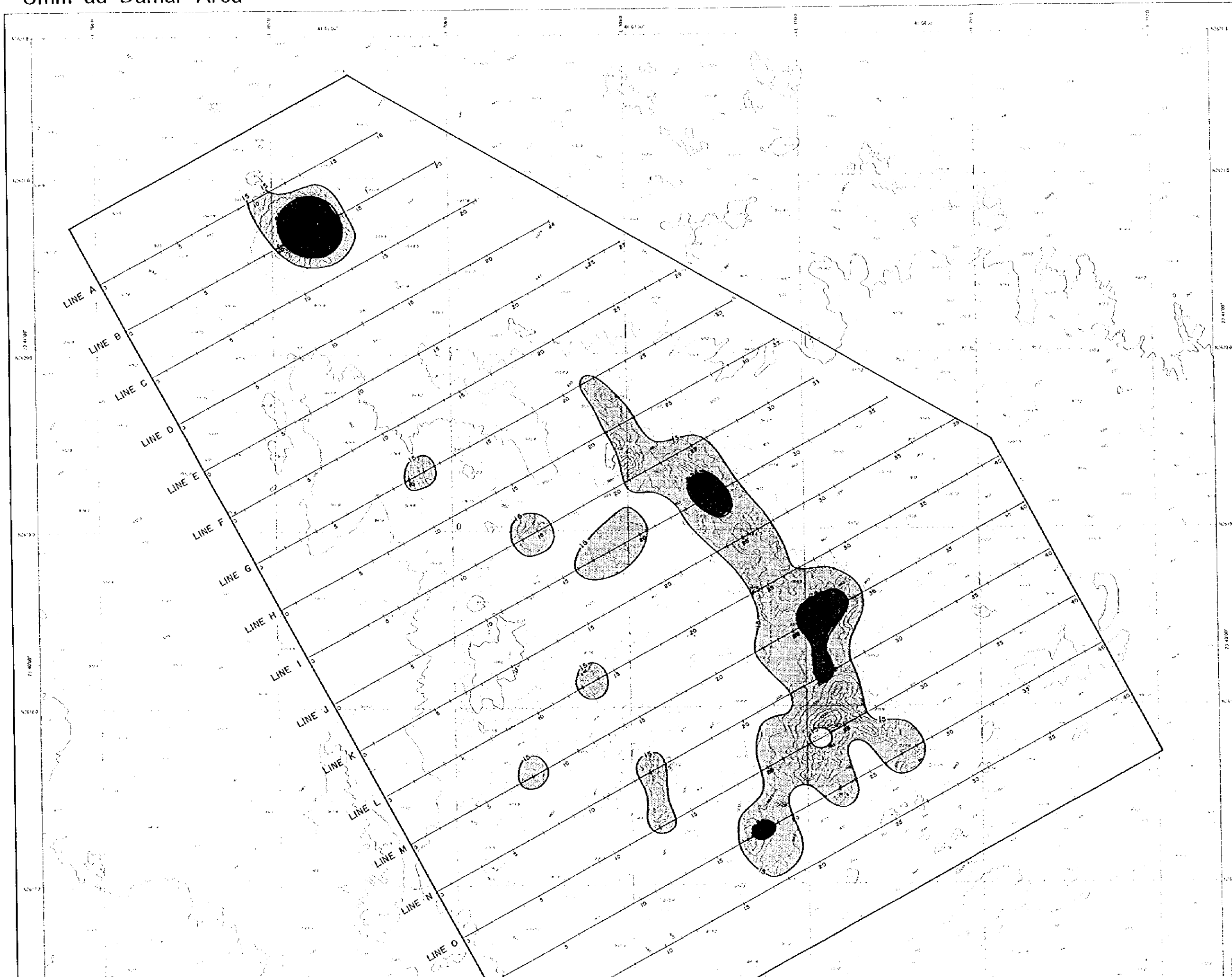


Abbreviation

agglomerate	ag	moderate	mod
amphibole	amp	network	netk
andesite	an	opaque minerals	op
andesitic	an	phenocryst	phno
apatite	apa	phyllite	phy
basalt	b	plagioclase	pl
black	bl	porphyritic	por
breccia	brec	pyrite	py
brecciated	brecd	quartz	qtz
carbonate	cb	rhyncholite	rd
chant	cht	rhynite	rh
chlorite	chl	rock	r
chloritized	chl	rounded	round
clay mineral	cl	sandstone	sst
clinopyroxene	cpx	schist	sch
dacite	dac	sericite	ser
dark	dk	shale	sh
diorite	di	sheared	shear
dissiminated	dss	siccous	sf
dotted	dut	stuffed	stf
epidote	ep	spotted	spot
felsic	fm	stn	stn
granite	gr	structure	str
gray	gy	sulfide	su
green	grn	tanite	ta
hematite	hem	tanite	to
hornblende	hb	tanite	tr
intrusive	int	varietal	vnt
K-feldspar	kt	waxy	wxy
lapilli	lp	white	wh
light	li	with	wi
massive	mas	with	wi
microdiorite	md		

LATE PROTEROZOIC	(10) andesite
	(11) andesitic rocks, conglomerate
EARLY PROTEROZOIC	(12) granite
	(13) quartzite, diorite
	(14) andesite
	(15) dacite
	(16) rhyolite
EARLY PROTEROZOIC	(17) andesite, andesitic volcanite rocks
	(18) dacite, dacite
	(19) andesitic rocks
	(20) andesite, andesitic volcanite rocks
(21) andesite	

Umm ad Damar Area



REPORT ON THE COOPERATIVE MINERAL
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

GEOPHYSICAL ANOMALY MAP OF THE SURFACE

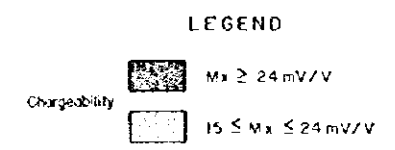
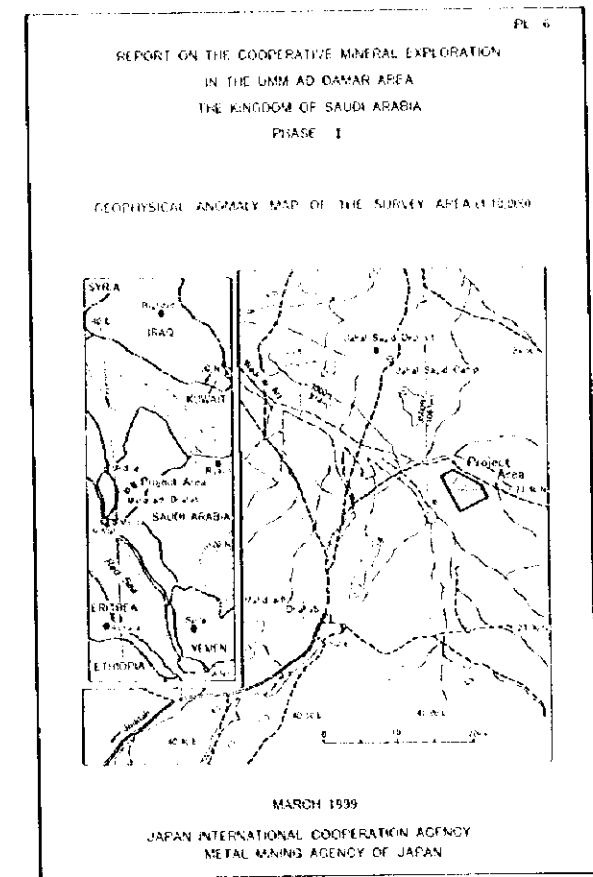
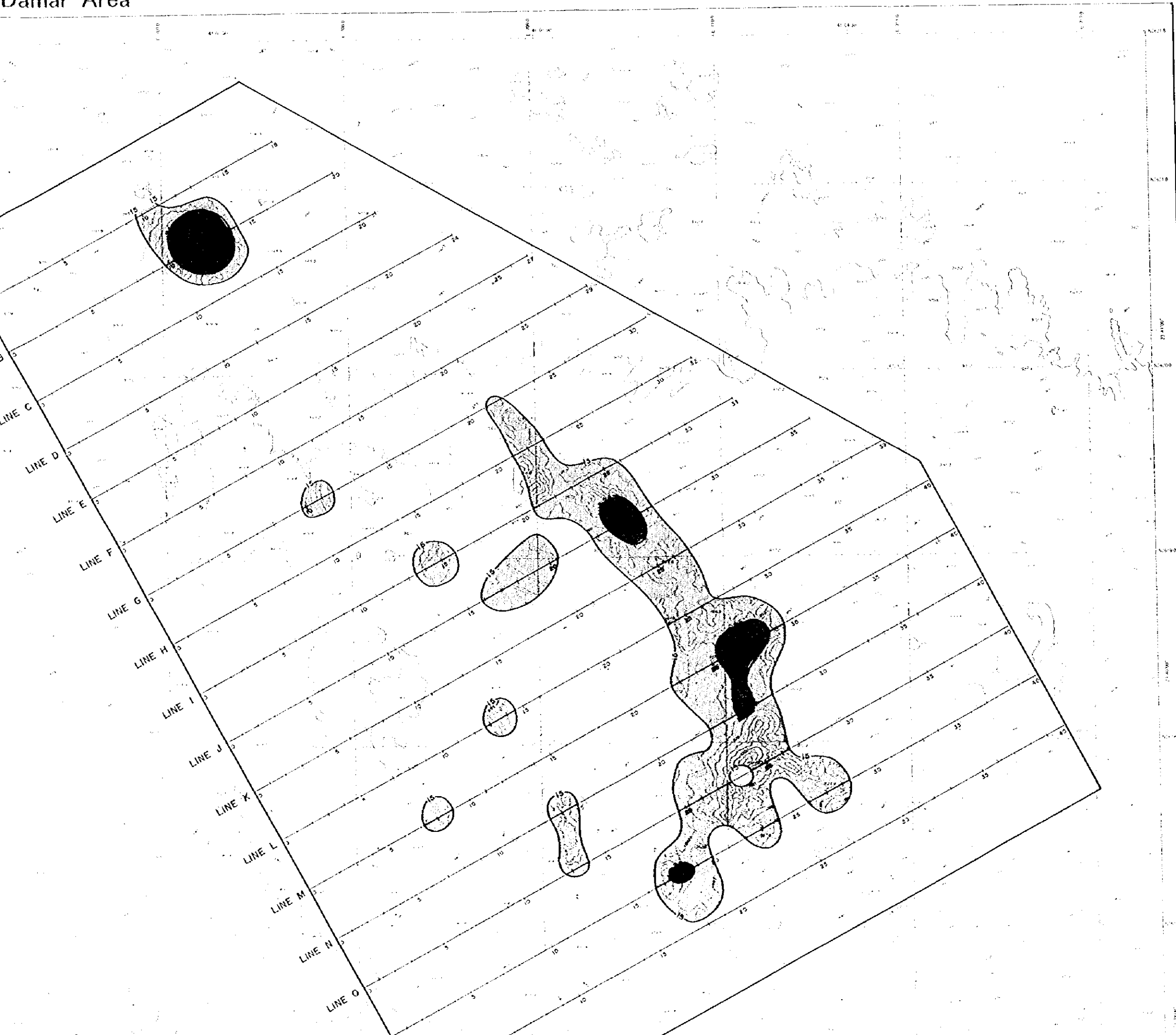
MARCH 1999
JAPAN INTERNATIONAL COOPERATION
METAL MINING AGENCY OF JAPAN

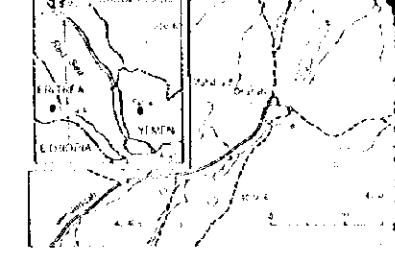
LEGEND

Chargeability

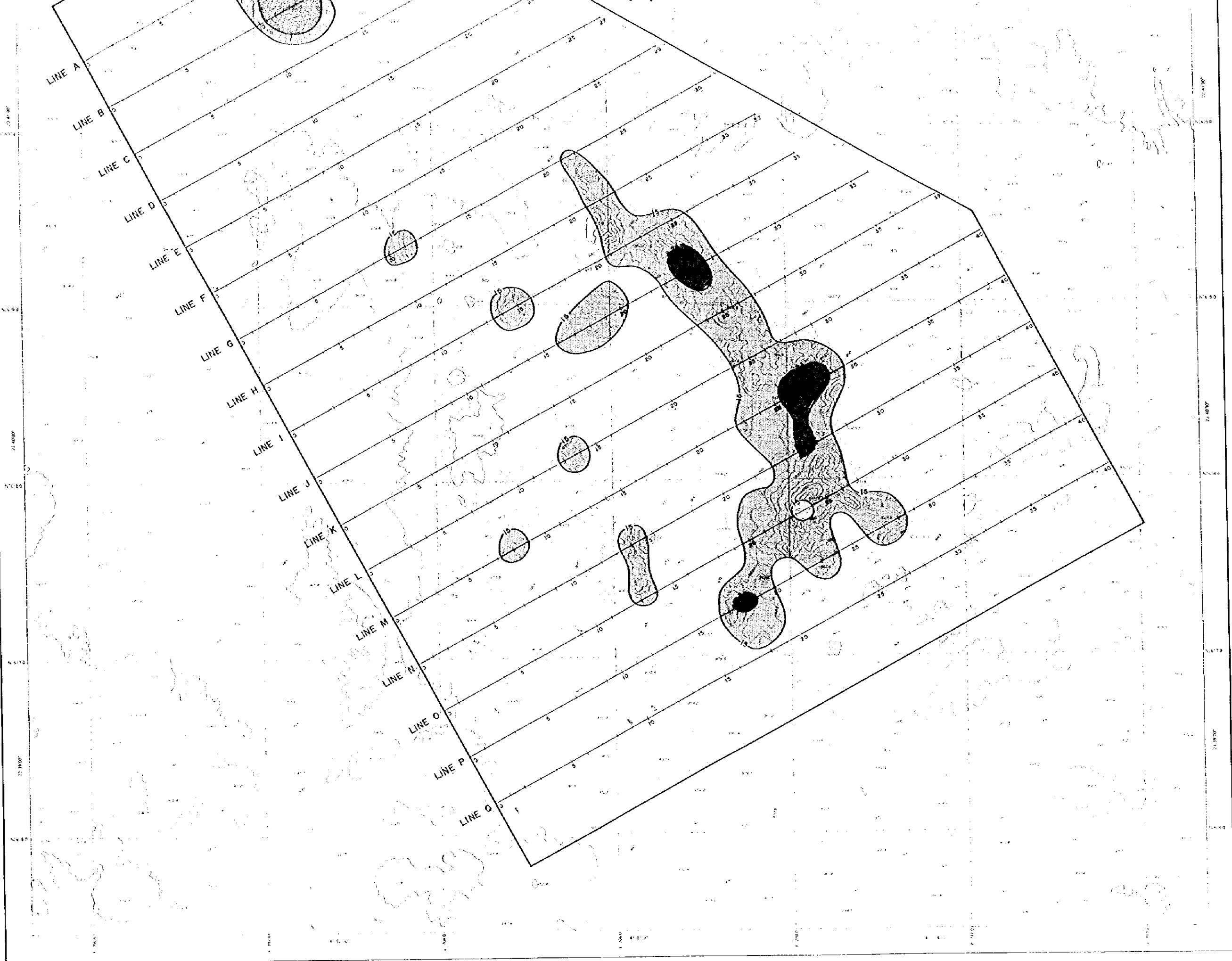
- Mx ≥ 24 mV/V
- 15 ≤ Mx ≤ 24 mV/V

Damar Area





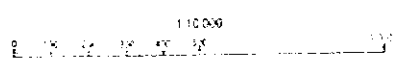
MARCH 1979
JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

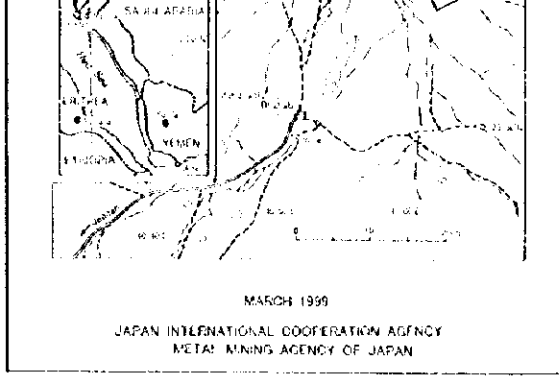
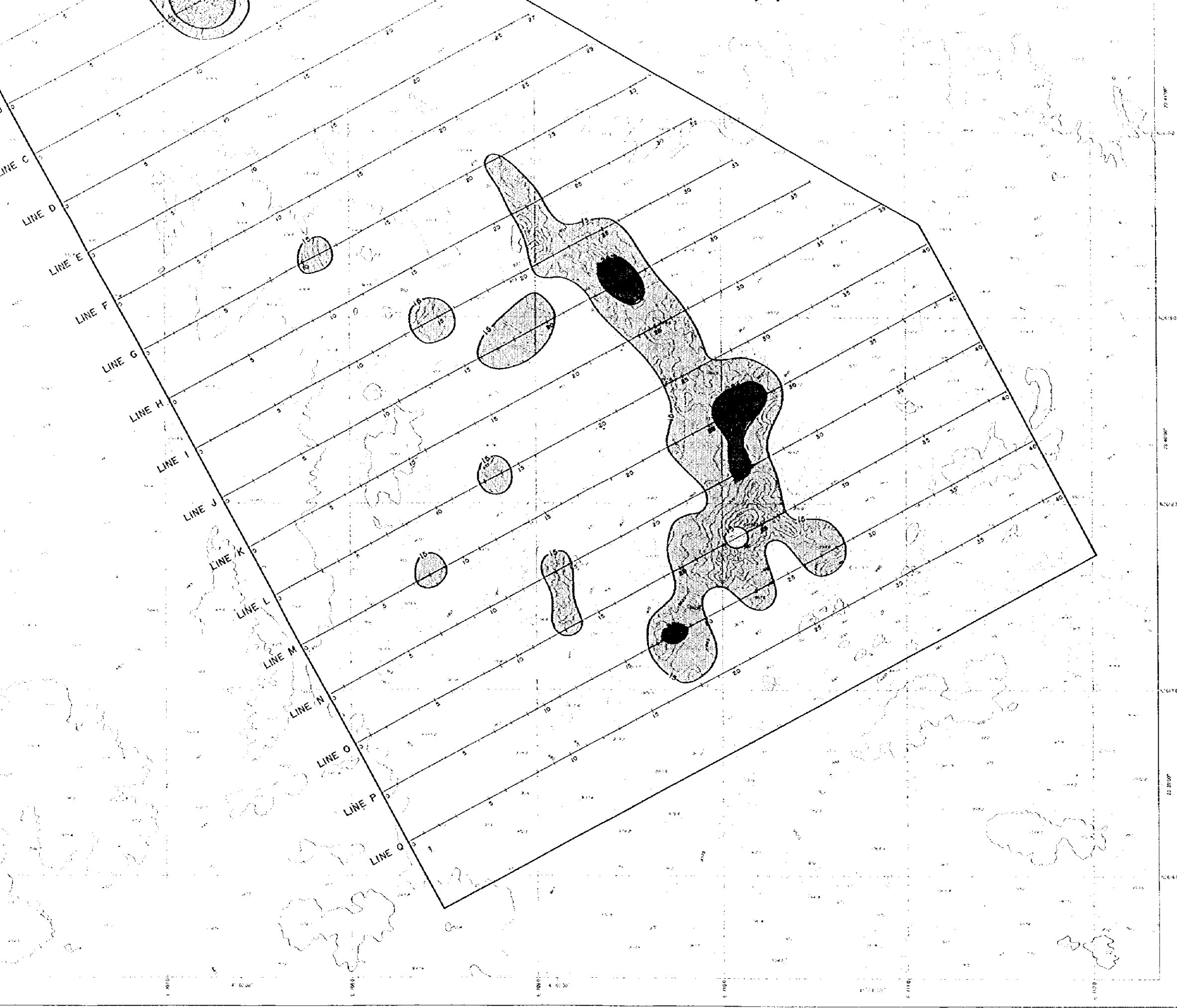


LEGEND

Chargeability

- $M_x \geq 24 \text{ mV/V}$
- $15 \leq M_x \leq 24 \text{ mV/V}$

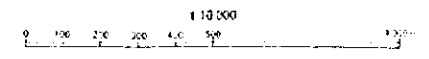




LEGEND

Chargeability

- $M_x \geq 24 \text{ mV/V}$
- $15 \leq M_x \leq 24 \text{ mV/V}$



Umm ad Damar Area



REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

INTEGRATED INTERPRETATION MAP OF THE SURVEY

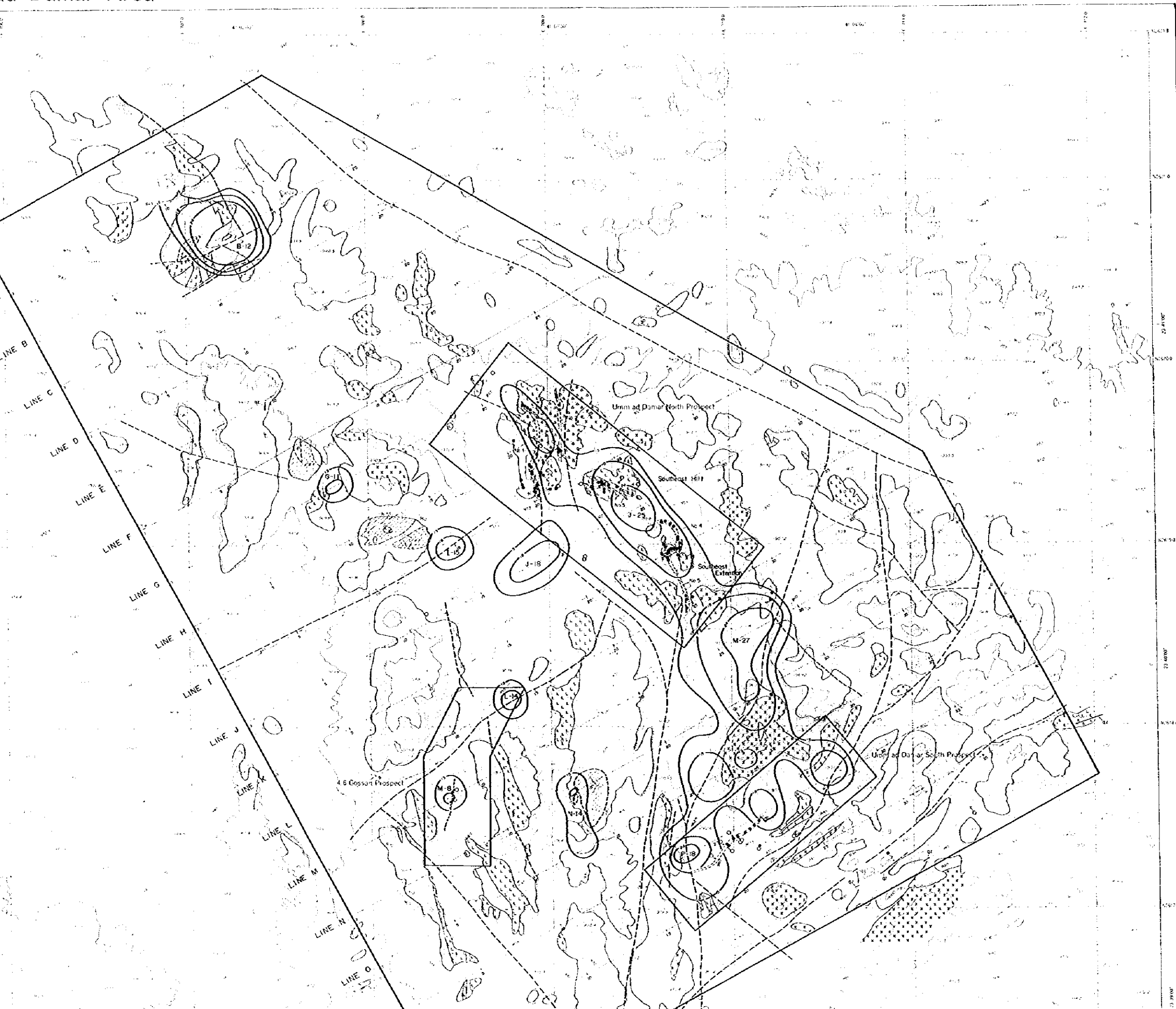
MARCH 1993

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

LEGEND

- Chargeability
- Ordinary gravel & sand
- A3 Group rhyolite
- A3 Group gneiss
- Diabase, tonalite
- Other rocks
- Slag
- Fault
- Carbonatization
- Silicification
- Epithermal & rock silicification
- Mineralized zone
- Drill hole

ad Damar Area



PL 7

REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

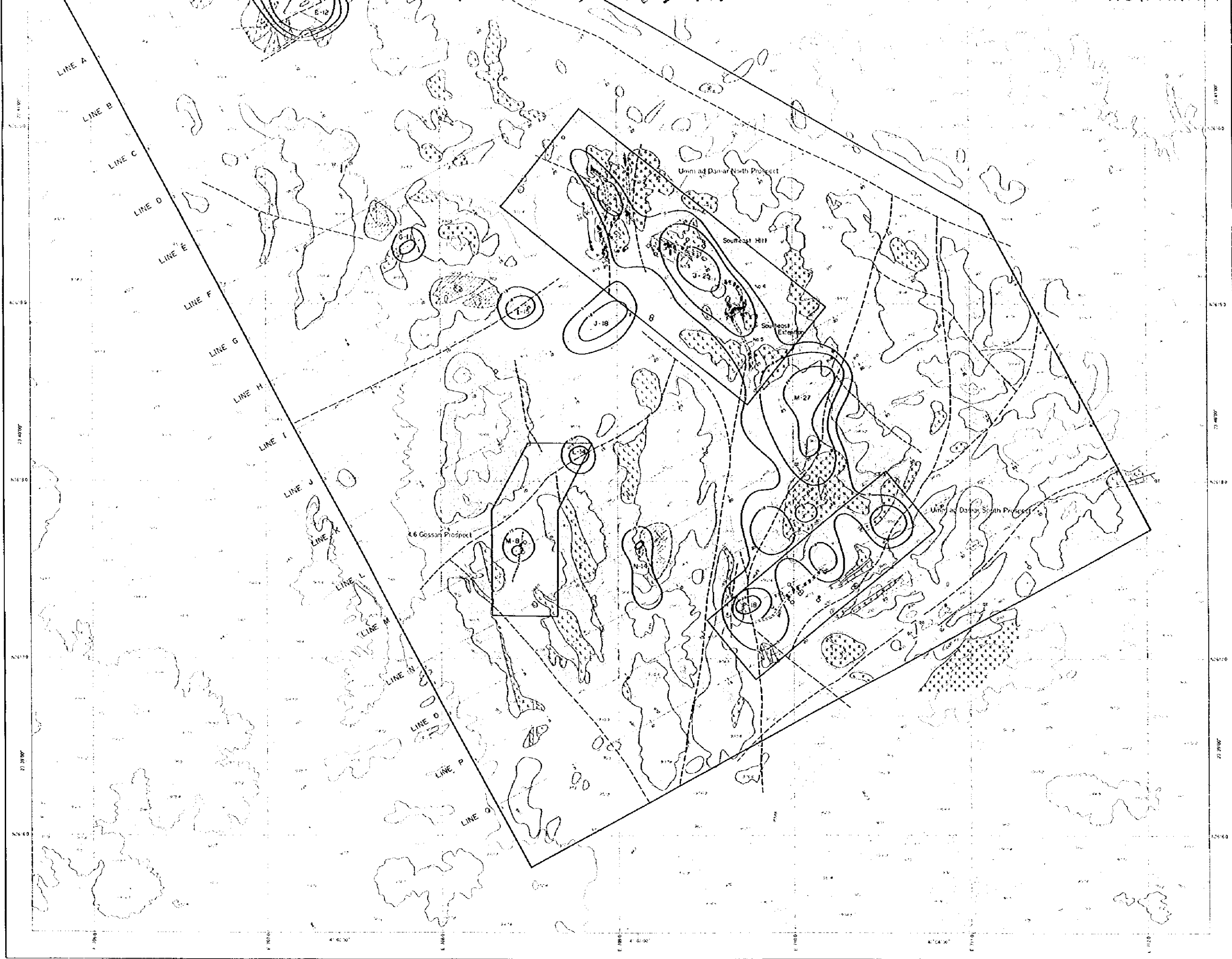
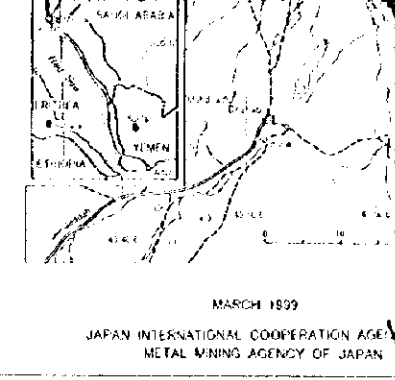
INTEGRATED INTERPRETATION MAP OF THE SURVEY AREA (1:50,000)

MARCH 1999

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METAL MINING AGENCY OF JAPAN

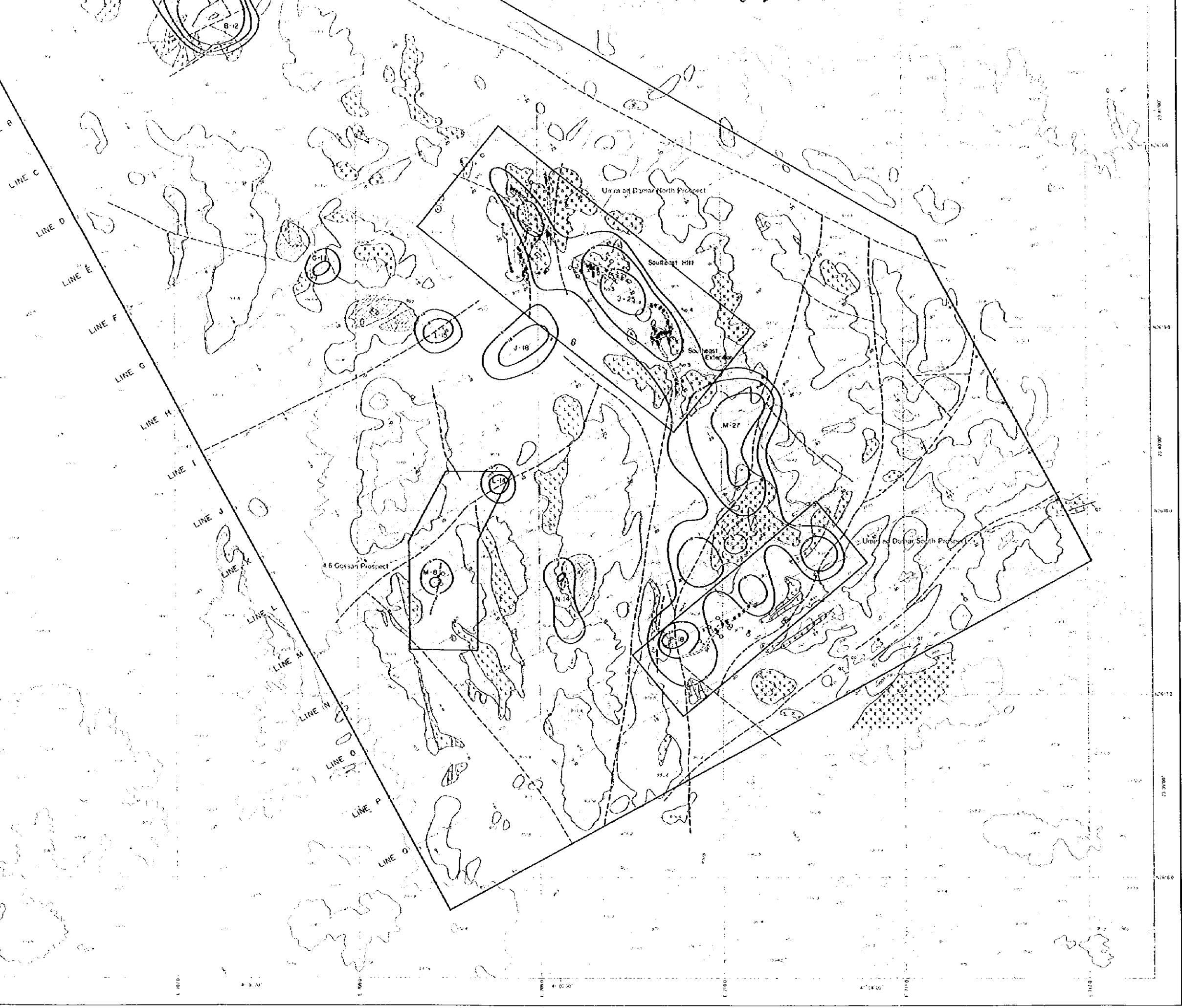
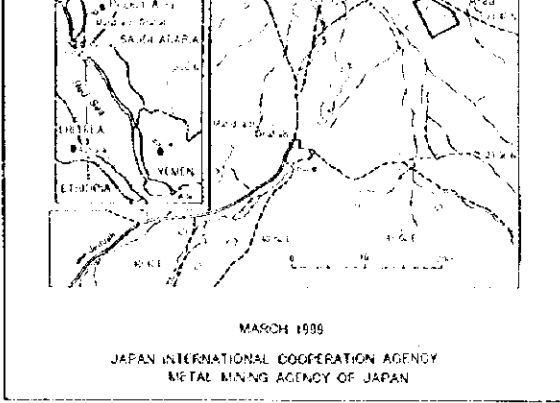
LEGEND

- Chargeability
- Quaternary gravel & sand
- Aq Group rhyodacite
- Aq Group jasper
- Diorite, tonalite
- Other rocks
- Slag
- Fault
- Carbonatization
- Sulfidation
- Epithermal & weak sulfidation
- Mineralized zone
- Drill hole



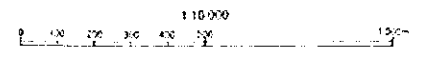
LEGEND

- Chargeability
- Quaternary gravel & sand
- Arj Group rhyodolite
- Arj Group jasper
- Diorite, tonalite
- Other rocks
- Slag
- Fault
- Carbonatization
- Silification
- Epidotization & weak silification
- Mineralized zone
- Drill hole
- Ancient working
- Quartz vein
- IP survey line

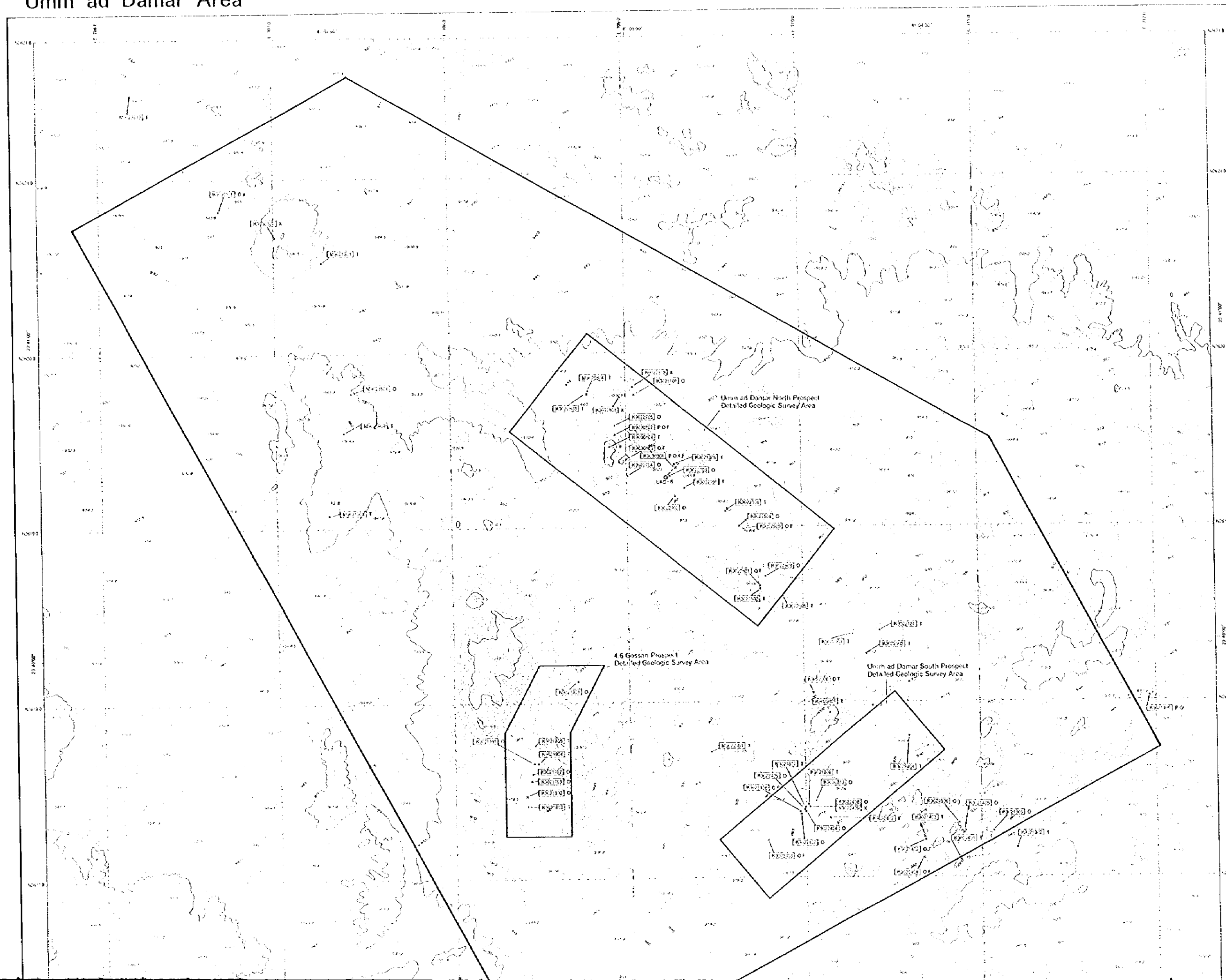


LEGEND

- Chargeability
- Quaternary gravel & sand
- Arj Group rhyodacite
- Arj Group jasper
- Diorite, tonalite
- Other rocks
- Slag
- Fault
- Carbonatization
- Sulfidation
- Epidotization & weak sulfidation
- Mineralized zone
- Drill hole
- Ancient working
- Quartz vein
- IP survey line

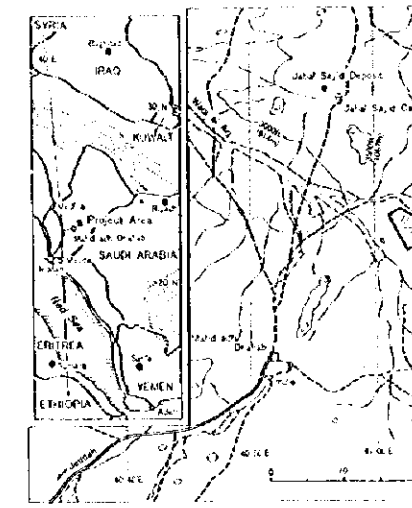


Umm ad Damar Area



REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

SAMPLING LOCATION MAP (1:10,000)



MARCH 1999

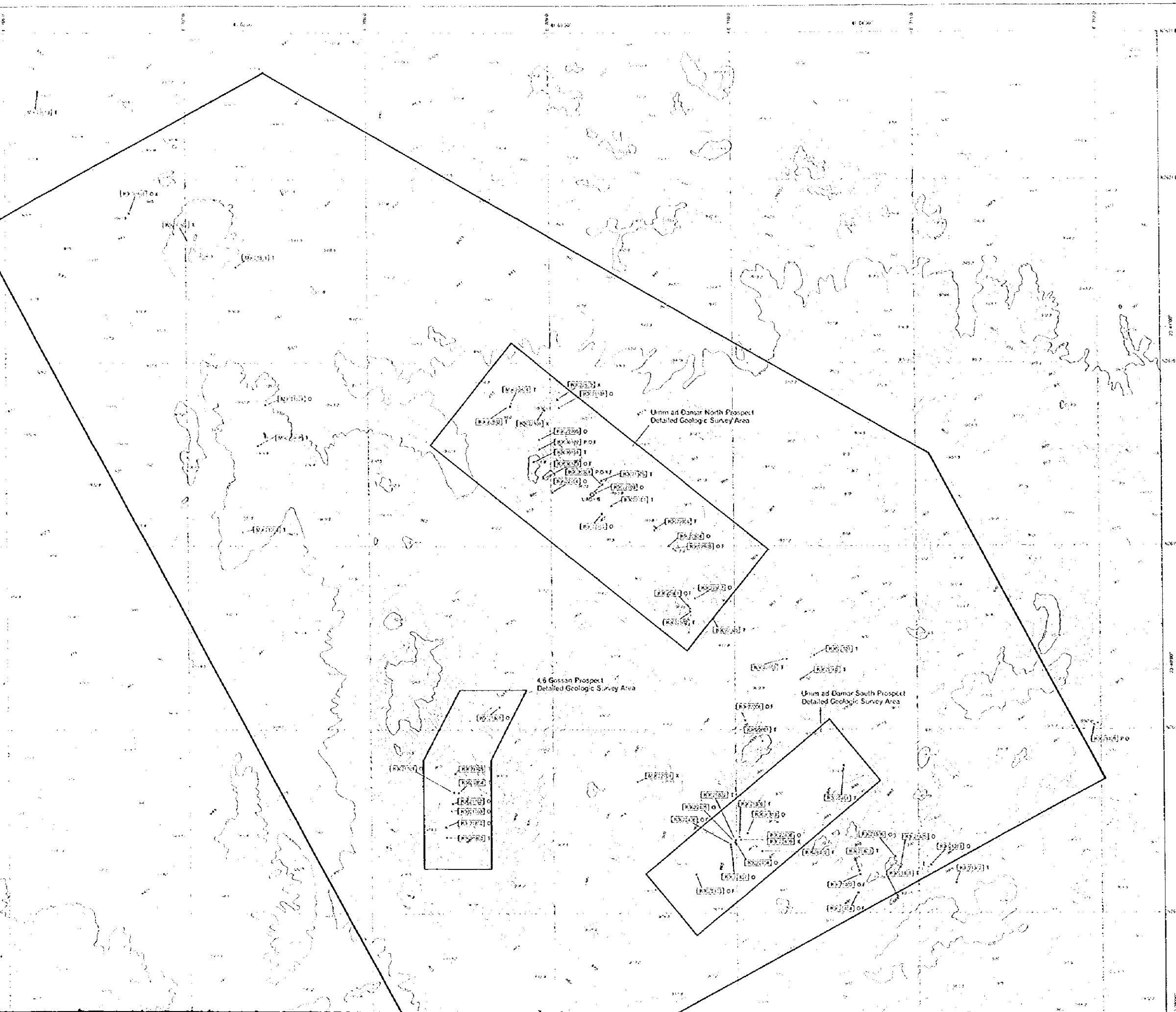
JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

LEGEND

- T : Thin Section
- P : Polished Section(Ore Microscopy)
- O : Ore Assay
- X : X-ray Diffraction Analysis
- F : Fluid Inclusion Study

- Other Samples
- [K9030303] X
 - [K9030305] P
 - [K9030306] P
 - [K9030307] P, F
 - [K9030308] P, F
 - [K9030309] X, F
 - [K9030310] P, X
- Collected from
Jabal Sayd Deposit
- Collected from
Mahj adh Dhabab Mine

Umm ad Damar Area



Pl. 8

REPORT ON THE COOPERATIVE MINERAL EXPLORATION
IN THE UMM AD DAMAR AREA
THE KINGDOM OF SAUDI ARABIA
PHASE I

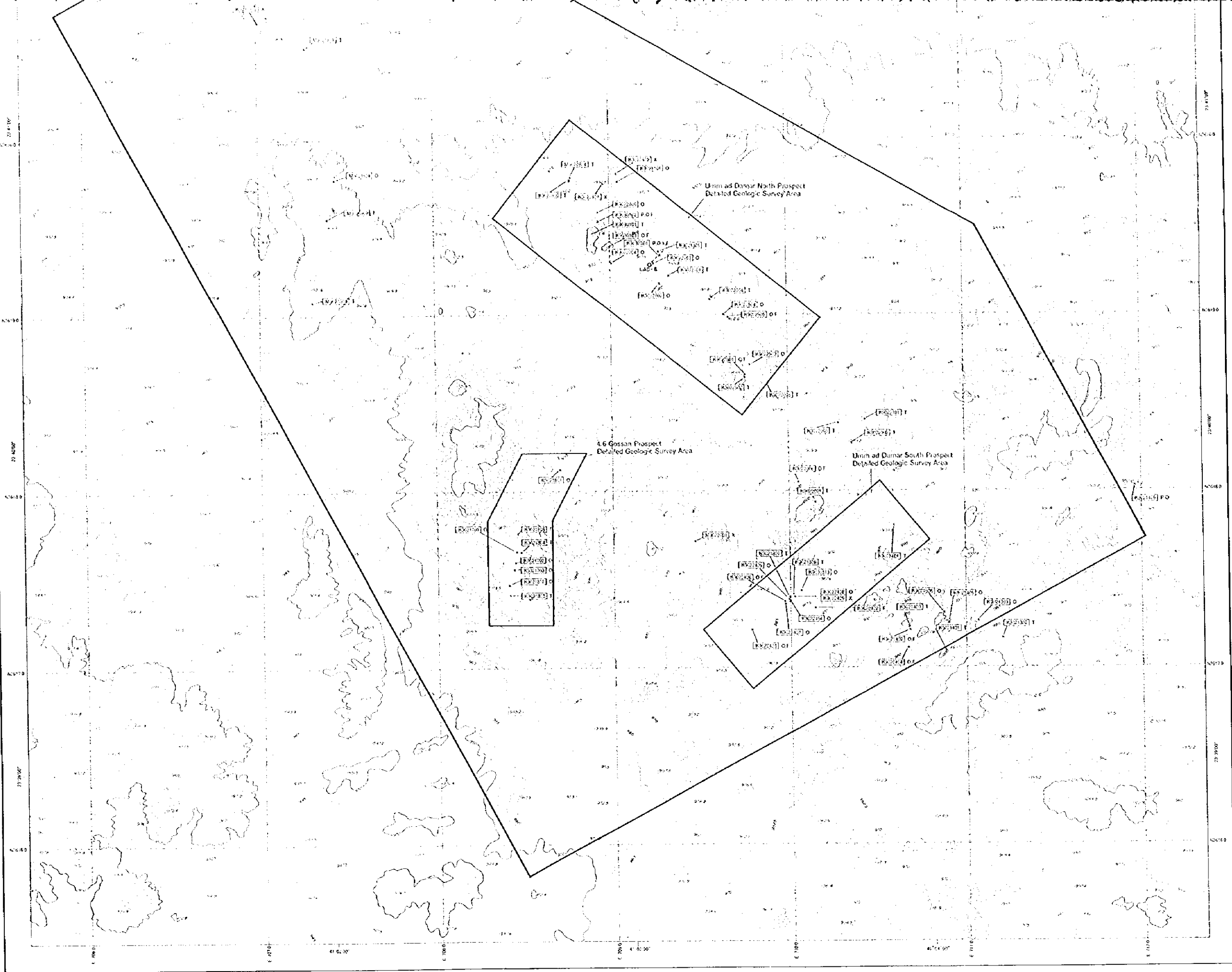
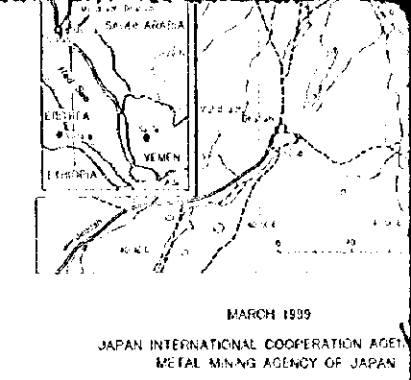
SAMPLES LOCATION MAP (1:10,000)

MARCH 1980
JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

LEGEND

- T : Thin Section
- P : Polished Section (Ore Microscopy)
- O : Ore Assay
- X : X-ray Diffraction Analysis
- F : Fluid Inclusion Study

- Other Samples
- [K9030303] X
 - [K9030305] P
 - [K9030306] P
 - [K9030307] P, F
- } Collected from
Jabal Sayid Deposit
- [K9030308] P, F
 - [K9030309] X, F
 - [K9030310] P, X
- } Collected from
Mabd alih Dhabab Mine

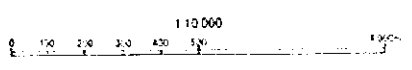


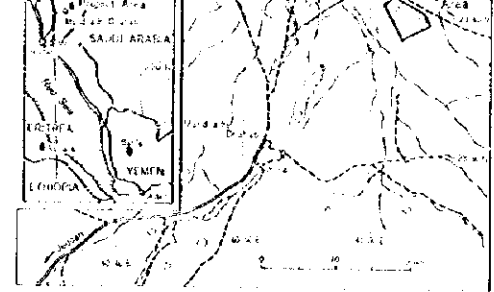
LEGEND

- T : Thin Section
- P : Polished Section(Ore Microscopy)
- O : Ore Assay
- X : X-ray Diffraction Analysis
- F : Fluid Inclusion Study

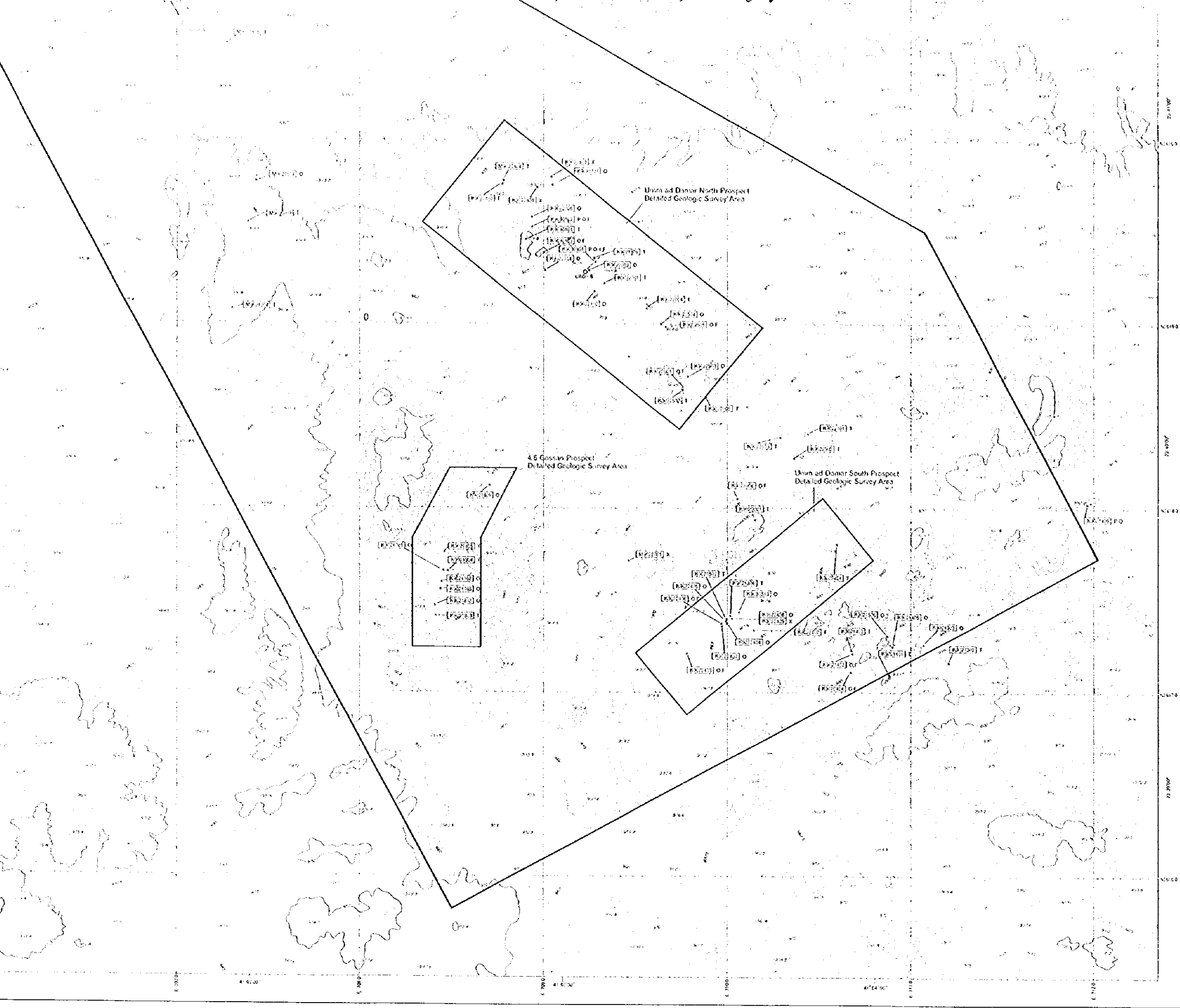
Other Samples

- [K9030303] X
 - [K9030305] P
 - [K9030306] P
 - [K9030307] P, F
- } Collected from
Jabal Sayid Deposit
- [K9030308] P, F
 - [K9030309] X, F
 - [K9030310] P, X
- } Collected from
Mahd adh Dhaheb M.





MARCH 1999
 JAPAN INTERNATIONAL COOPERATION AGENCY
 METAL MINING AGENCY OF JAPAN

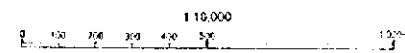


LEGEND

- T : Thin Section
- P : Polished Section(Die Microscopy)
- O : Ore Assay
- X : X-ray Diffraction Analysis
- F : Fluid Inclusion Study

Other Samples

- [K9033003] X
 - [K9033005] P
 - [K9033006] P
 - [K9033007] P, F
- } Collected from
Jabal Sayid Deposit
- [K9033008] P, F
 - [K9033009] X, F
 - [K9033010] P, X
- } Collected from
Mahd adh Dhahab Mine





JICA