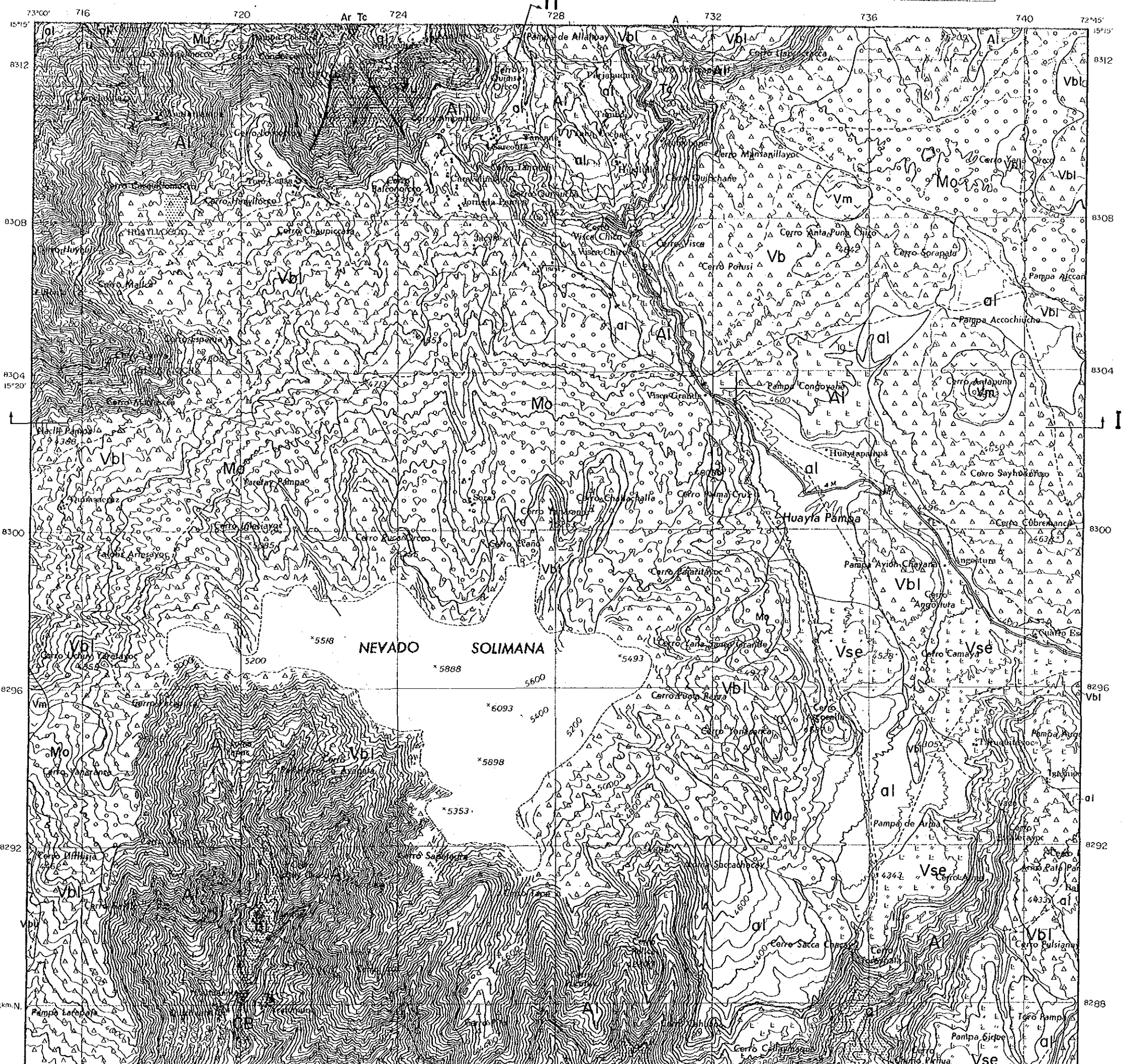
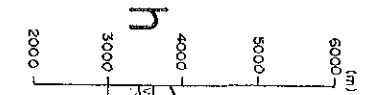


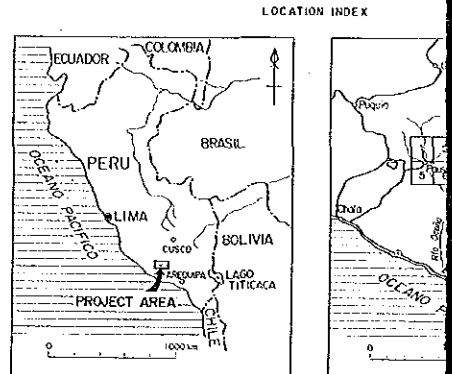
COTAHUASI

1	2	3	4
5	6	7	8



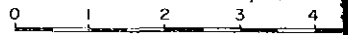
MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

GEOLOGICAL MAP THE REGIONAL SURV (7)



JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986

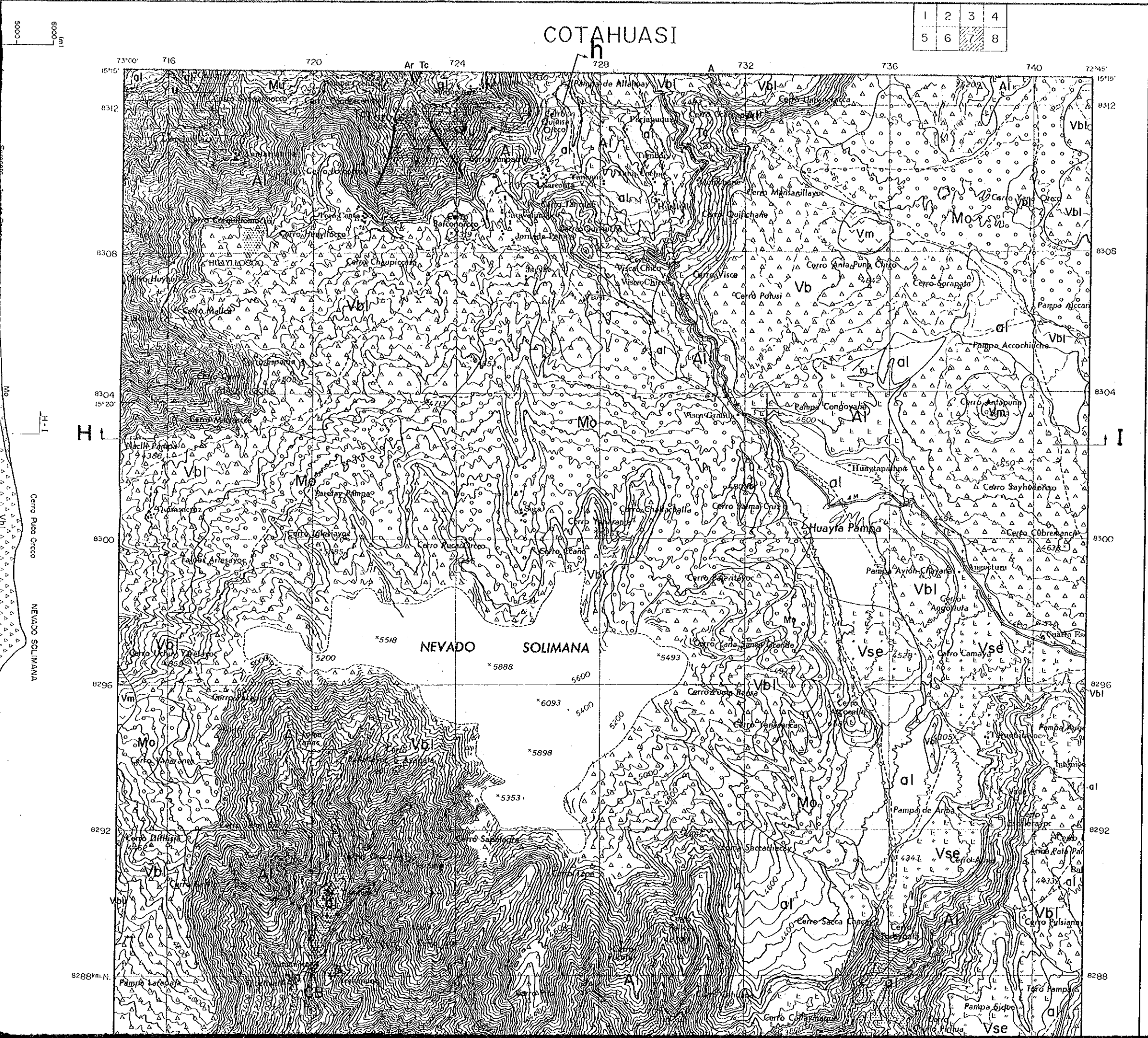
Scale 1 : 50,000



LEGEND

Quaternary	Holocene	Alluvium	al	Sand, mud and gravel	
		Mollebamba Volcanic Rocks	Vm	Andesite lava and welded tuff	
		Volcanic Sediment of Pausa	Vsp	Volcanic ash, sand and tuff	
		Lampa Volcanic Rocks	Vla	Andesite (basaltic), welded tuff	
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and mud	
		Barroso Group	Vb	Acidic tuff	
	Tertiary	Pliocene	Seneca Volcanic Rocks	Vsc	Hornblende-biotite and welded tuff and tuff
			Huayllitas Formation	Hy	Dacitic tuff (partly welded)
		Miocene	Alpabamba Formation	Al	Dacitic tuff, lapilli and welded tuff (partly with dacite lava)
			Tacaza Formation	Vtc	Andesitic tuff breccia and dacitic tuff breccia
Huanca Formation			Vhc	Andesitic volcanic and tuffaceous sands	
Mesozoic	Cretaceous	Acurquina Formation	Acr	Limestone and marl and chert nodules	
		Murco Formation	Mu	Red shale and sandstone bearing conglomerate	
	Jurassic	Yura Group	Yu	Quartzite, siliceous sandstone and alternation of quartzite	
		Socosani Formation	So	Black shale, limestone	
		Chocolate volcanic rocks	Cho	Andesitic tuff breccia and tuffaceous sandstone	
Precambrian		Gn	Gneiss, gneissose granite		

Intrusive Rocks
(Stock and Dyke) Vv Hornblende andesite



1	2	3	4
5	6	7	8

PL 3-(7)

MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

15151
国務院地質研究所

GEOLOGICAL MAP OF THE REGIONAL SURVEY AREA (7)

LOCATION INDEX

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986

Scale 1 : 50,000

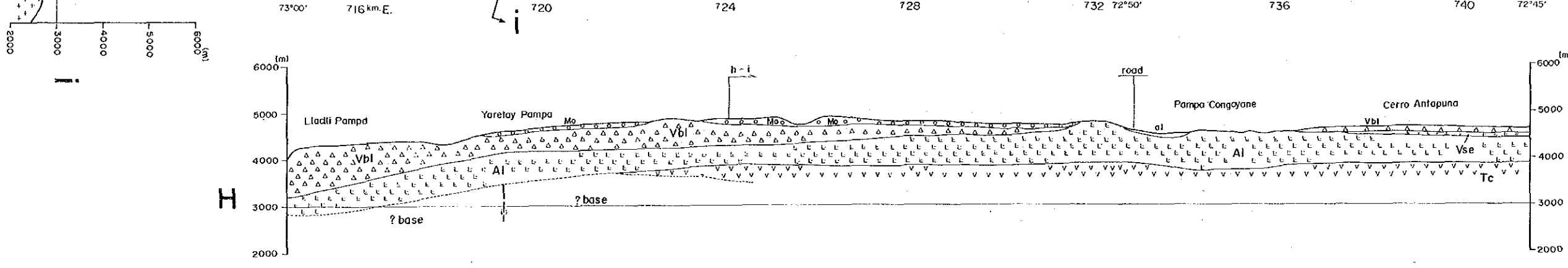
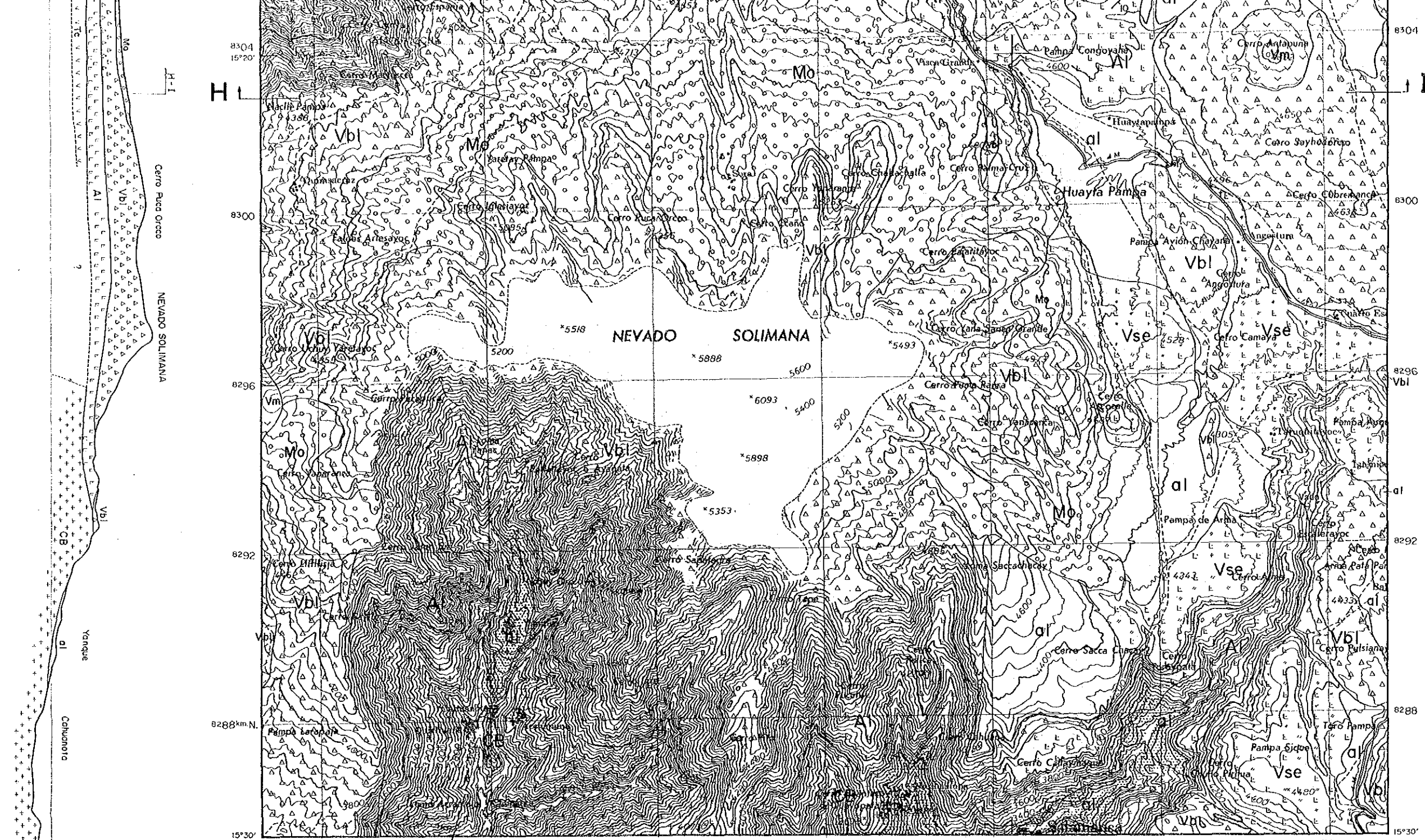
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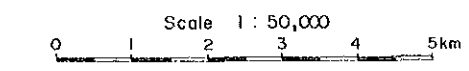
LEGEND

Mesozoic	Cretaceous	Arcurquina Formation	[Symbol]	Limestone and marl with sandstone and chert nodule		
		Murco Formation	[Symbol]	Red shale and sandstone with gypsum bearing conglomerate		
		Yura Group	[Symbol]	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale		
	Jurassic	Socsoni Formation	[Symbol]	Black shale, limestone with sandstone and tuff		
		Chocolate volcanic rocks	[Symbol]	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone		
		Intrusive Rocks (Stock and Dyke)	[Symbol]	Hornblende, andesite, andesite		
	Cenozoic	Quaternary	Alluvium	[Symbol]	Sand, mud and gravel	
			Mollebamba Volcanic Rocks	[Symbol]	Andesite lava and volcanic ash	
			Volcanic Sediment of Pisco	[Symbol]	Volcanic ash, sand and gravel	
			Lampa Volcanic Rocks	[Symbol]	Andesite (basaltic), volcanic breccia	
		Pliocene	Moraine Sediment	[Symbol]	Gravel, sand and mud	
			Barroso Group	Upper	[Symbol]	Acidic tuff
				Lower	[Symbol]	Andesite lava and pyroclastic rocks
		Tertiary	Pliocene	Sencca Volcanic Rocks	[Symbol]	Hornblende-biotite dacite lava, welded tuff and tuff
				Huayllillas Formation	[Symbol]	Dacitic tuff (partly pumice bearing)
Miocene			Alpabamba Formation	[Symbol]	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff	
	Tacaza Formation		[Symbol]	Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)		
Oligocene	Huancá Formation	[Symbol]	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)			
	Pliocene	Alpabamba Formation	[Symbol]	Limestone and marl with sandstone and chert nodule		
		Murco Formation	[Symbol]	Red shale and sandstone with gypsum bearing conglomerate		

LEGEND

Cenozoic	Quaternary	Quaternary	Alluvium	al	Sand, mud and silt
		Holocene	Mollebamba Volcanic Rocks	Vm	Andesite lava and tuff
			Volcanic Sediment of Pausa	o.vsp	Volcanic ash, sand and tuff
			Lampa Volcanic Rocks	Alv	Andesite (basaltic)
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and silt	
		Barroso Group	Upper	Vbu	Acidic tuff
			Lower	vbl	Andesite lava
		Pliocene	Sencca Volcanic Rocks	Vse	Hornblende-biotite welded tuff and dacite
			Huayllillas Formation	Hy	Dacitic tuff (partly with dacite)
		Tertiary	Alpabamba Formation	Al	Dacitic tuff, lapilli and welded tuff (partly with dacite)
Tacaza Formation	Tc		Andesitic tuff and dacitic tuff		
Mesozoic	Cretaceous	Huanca Formation	Hc	Andesitic volcanic rocks and tuffaceous sand	
		Arcuquina Formation	Ac	Limestone and chert nodules	
	Jurassic	Murco Formation	Mu	Red shale and bearing conglomerate	
		Yura Group	Yu	Quartzite, siliceous and alternation	
	Triassic	Socosani Formation	So	Black shale, limestone	
		Chocolate volcanic rocks	Cho	Andesitic tuff and tuffaceous sand	
	Precambrian		Gn	Gneiss, gneissoid	
	Tertiary	Intrusive Rocks	Stock and Dyke	v.v.v.v	Hornblende and quartz diorite
			Accho Stock	x.x.x.x	Diorite and quartz diorite
Cretaceous		La Costa Batholith	++cb	Quartz diorite and granite	

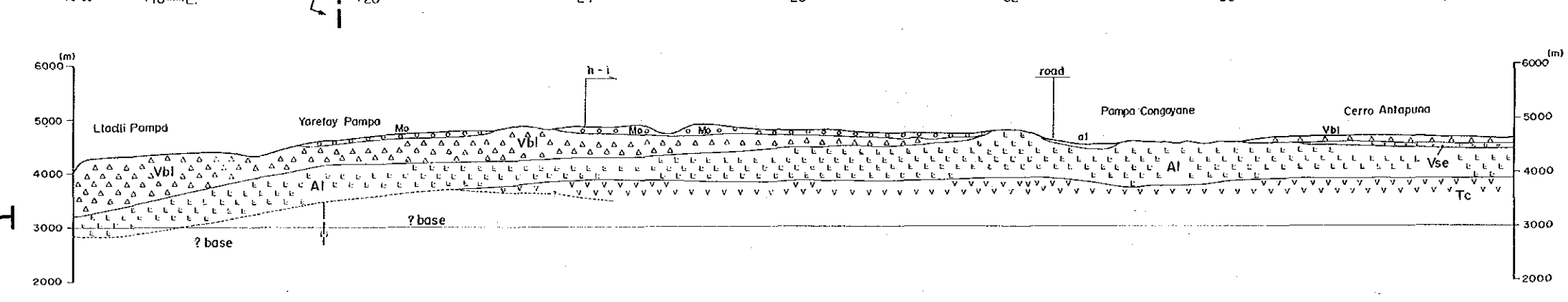
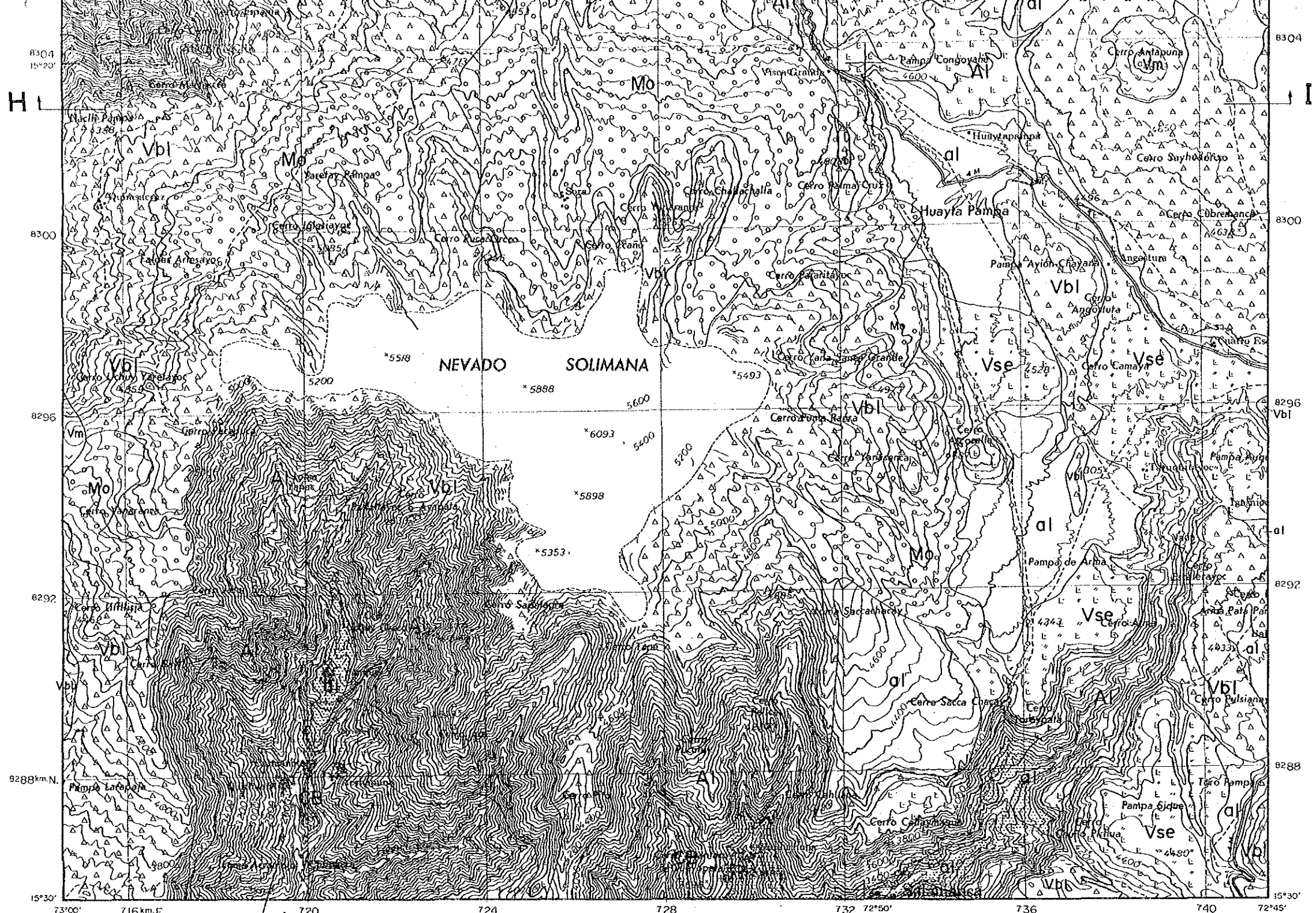


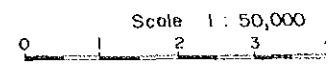


LEGEND

Quaternary	Holocene	Alluvium	al	Sand, mud and gravel	
		Mollebamba Volcanic Rocks	Vm	Andesite lava and volcanic ash	
	Lampo Volcanic Rocks	Volcanic Sediment of Pausa	oovsp	Volcanic ash, sand and gravel	
		Andesite (basaltic), volcanic breccia	Vbl		
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and mud	
		Barroso Group	Upper	Vbu	Acidic tuff
	Lower		Vbl	Andesite lava and pyroclastic rocks	
	Tertiary	Pliocene	Sencca Volcanic Rocks	Vse	Hornblende-biotite dacite lava, welded tuff and tuff
			Huayillas Formation	Hy	Dacitic tuff (partly pumice bearing)
		Miocene	Alpabamba Formation	Al	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff (partly with dacite lava or andesite lava)
Tacaza Formation			Tc	Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)	
Palaioene		Huanca Formation	Hc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)	
	Arcurquina Formation	Arc	Limestone and marl with sandstone and chert nodule		
Mesozoic	Cretaceous	Murco Formation	Mu	Red shale and sandstone with gypsum bearing conglomerate	
		Yura Group	Yu	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale	
	Jurassic	Socosani Formation	So	Black shale, limestone with sandstone and tuff	
		Chocolate volcanic rocks	Cho	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone	
Precambrian		Gn	Gneiss, gneissose granite and diorite		
Tertiary	Intrusive Rocks	Stock and Dyke	An	Hornblende andesite, andesite	
		Accha Stock	DI	Diorite and quartz diorite	
	Cretaceous	La Costa Batholith	CB	Quartz diorite and granodiorite	

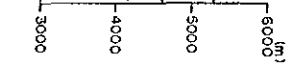
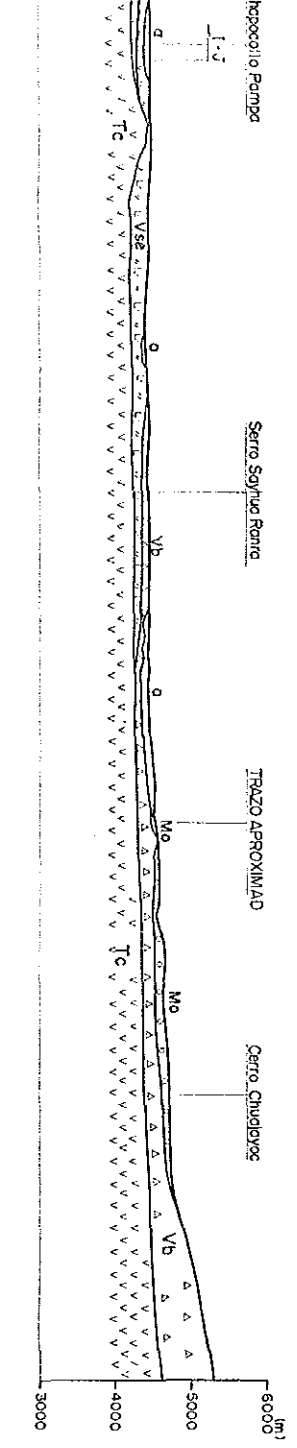
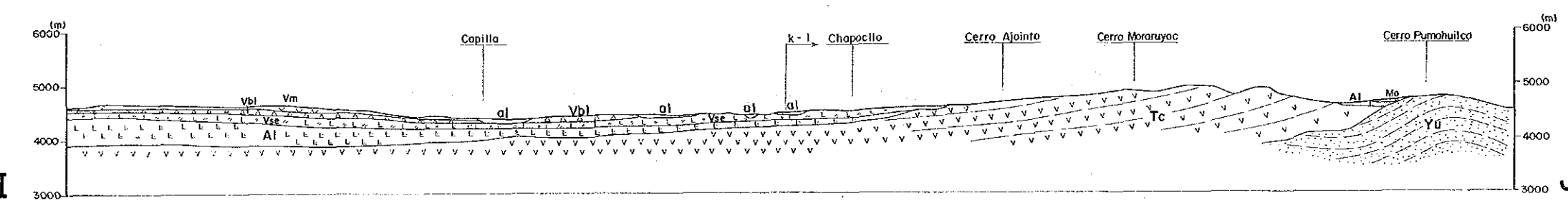
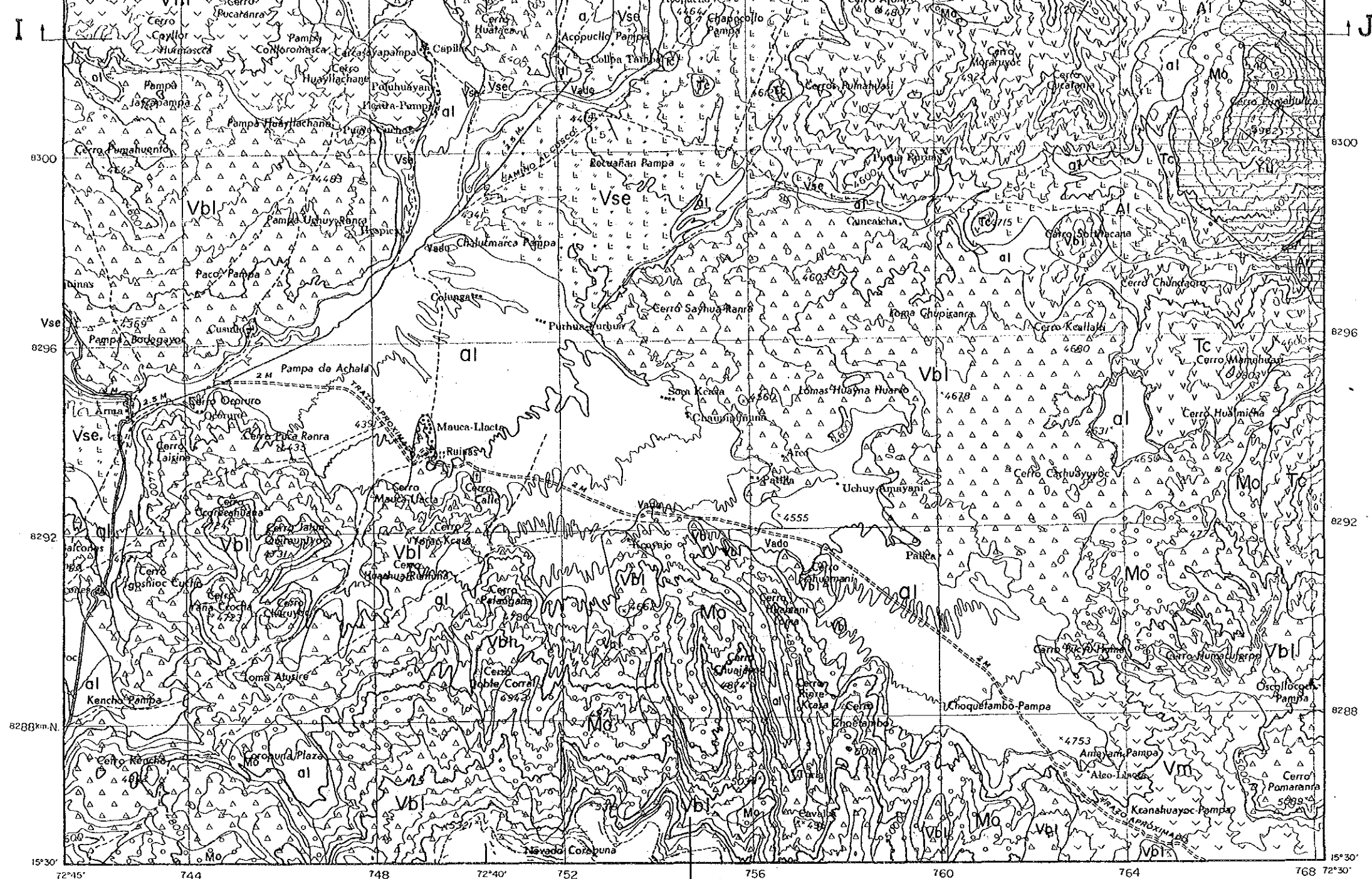
- Fault
- - - Inferred fault
- ∧ Anticline
- ∩ Syncline
- Geological boundary
- Geological profile line
- 30° Strike and dip of bedding
- 50° Strike and dip of foliation
- Strike and dip of flow structure
- X Mine (working or closed)
- ⊕ Hot spring

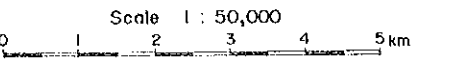




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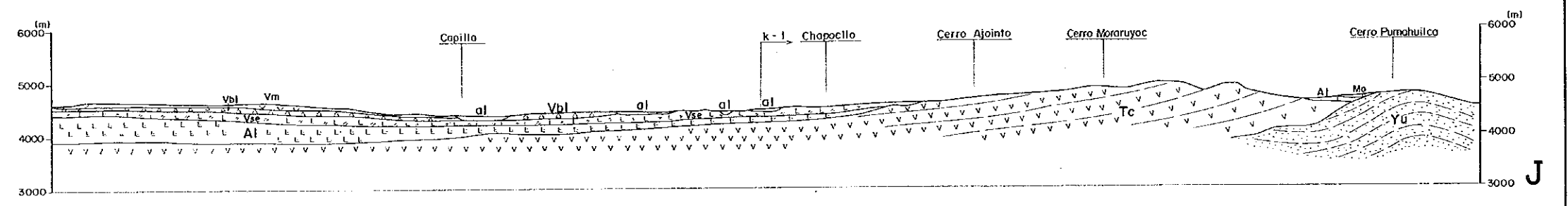
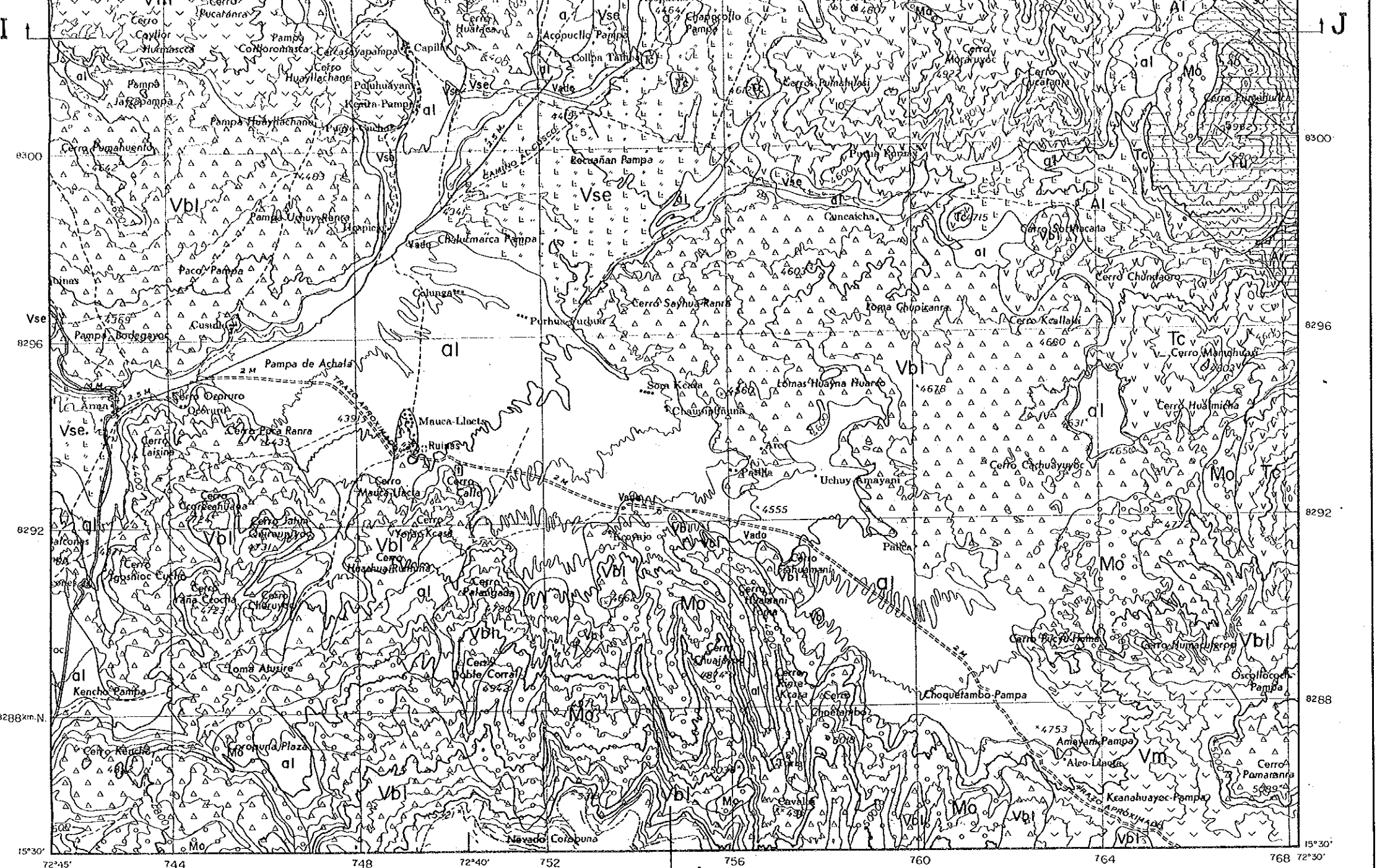
Cenozoic	Quaternary	Alluvium	al	Sand, mud and silt	
		Mollebamba Volcanic Rocks	Vm	Andesite lava and tuff	
		Volcanic Sediment of Pausa	Vsp	Volcanic ash, sand and tuff	
		Lampa Volcanic Rocks	Vlo	Andesite (basaltic) lava and tuff	
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and silt	
		Barroso Group	Upper	Vbu	Acidic tuff
	Lower		Vbl	Andesite lava and tuff	
	Tertiary	Pliocene	Sencca Volcanic Rocks	Vse	Hornblende-biotite welded tuff and tuffaceous sand
			Huayllillas Formation	Hy	Dacitic tuff (partly welded)
		Miocene	Alpabamba Formation	Al	Dacitic tuff, lapilli and welded tuff (partly with dacite)
Tacaza Formation			Tc	Andesitic tuff breccia and dacitic tuff	
Oligocene		Huonca Formation	Vhc	Andesitic volcanic and tuffaceous sand	
	Arcurquina Formation	Ar	Limestone and marl and chert nodules		
	Murco Formation	Mu	Red shale and sand bearing conglomerate		
Mesozoic	Cretaceous	Yura Group	Yu	Quartzite, siliceous and alternation of sandstone and shale	
		Socosani Formation	So	Block shale, limestone and sandstone	
	Jurassic	Chocolate volcanic rocks	Cho	Andesitic tuff breccia and tuffaceous sands	
			Gn	Gneiss, gneissose	
Precambrian	Intrusive Rocks	Stock and Dyke	An	Hornblende and quartz diorite	
		Accha Stock	Di	Diorite and quartz diorite	
		La Costa Batholith	CB	Quartz diorite and granite	
		Fault		—	
		Inferred fault		- - -	
		Anticline		∩	
		Syncline		∪	
		Geological boundary		—	
		Geological profile		—	
		Strike and dip of 30°		30	
		Strike and dip of 50°		50	
		Strike and dip of 60°		60	
		Mine (working or abandoned)		X	
		Hot spring		⊕	

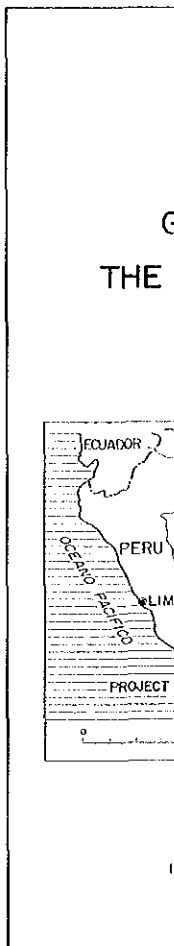
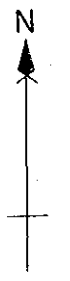
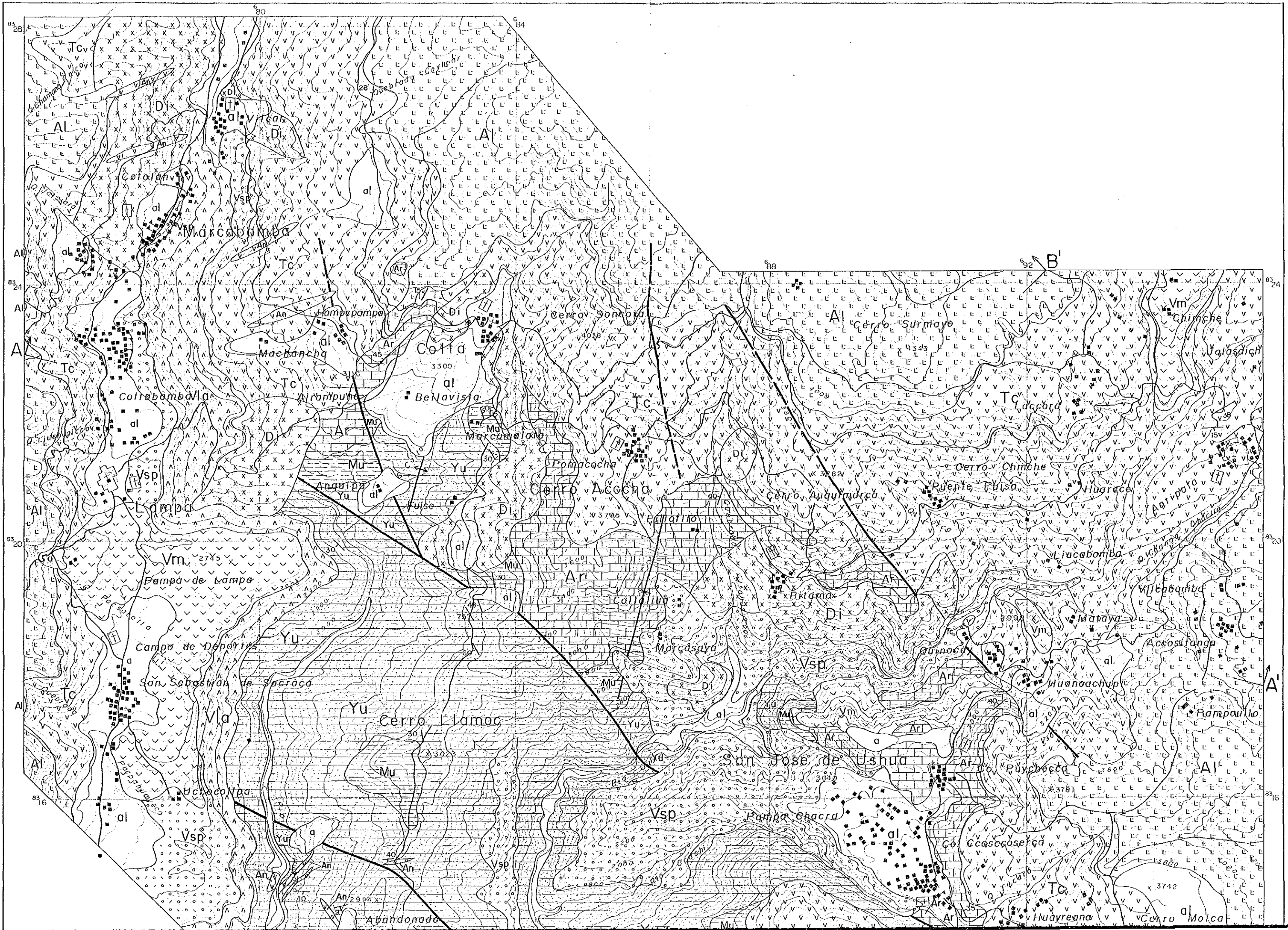




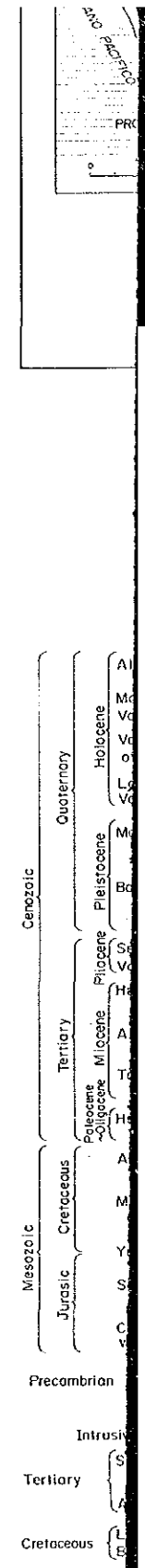
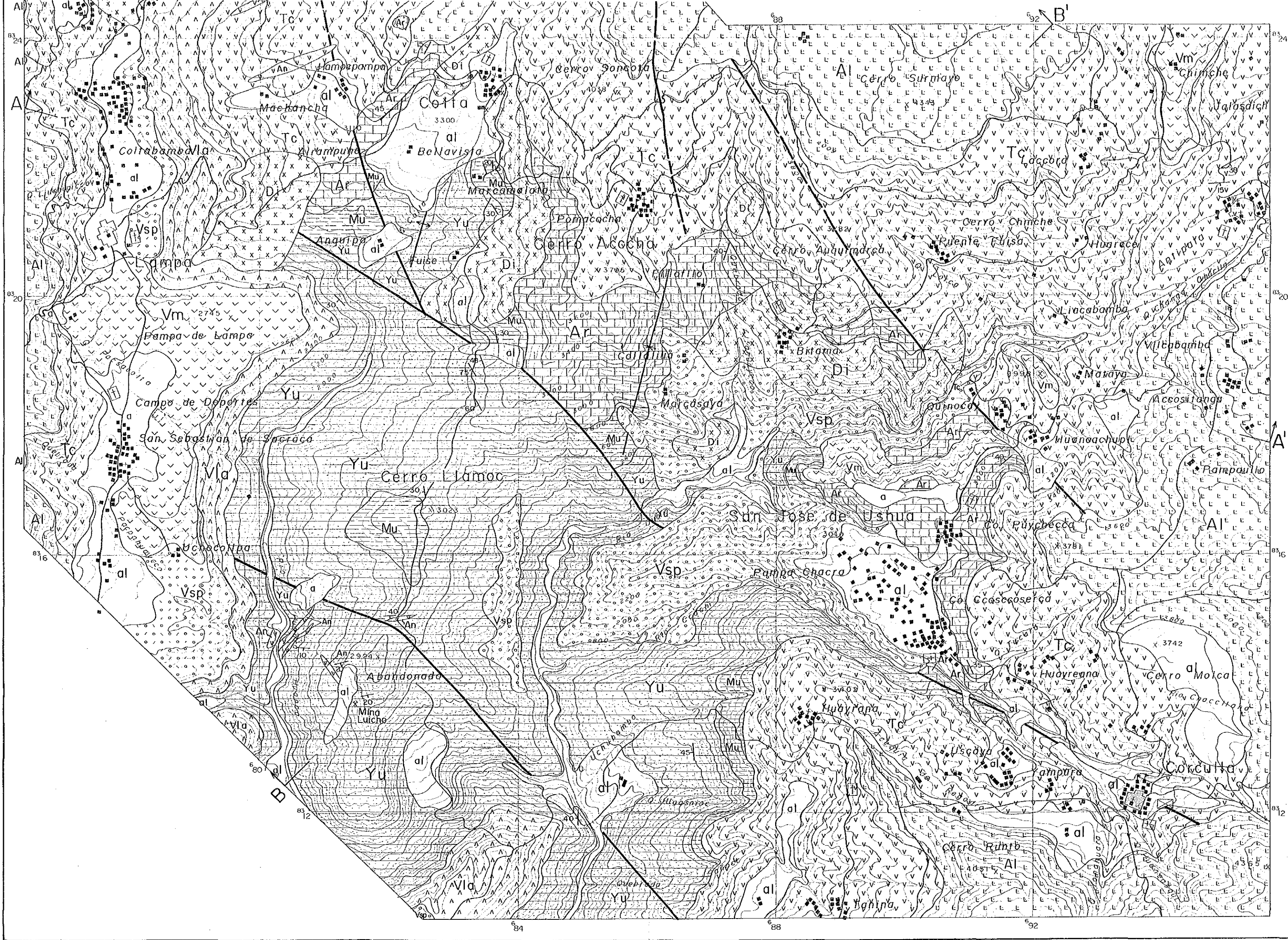
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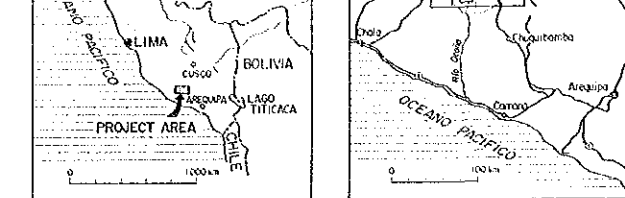
Cenozoic	Quaternary	Alluvium	al	Sand, mud and gravel		
		Mollebamba Volcanic Rocks	Vm	Andesite lava and volcanic ash		
		Volcanic Sediment of Pausa	Vsp	Volcanic ash, sand and gravel		
		Lampa Volcanic Rocks	Vl	Andesite (basaltic), volcanic breccia		
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and mud		
		Barroso Group	Upper	Vbu	Acidic tuff	
			Lower	Vbl	Andesite lava and pyroclastic rocks	
		Tertiary	Pliocene	Sencca Volcanic Rocks	Vse	Hornblende-biotite dacite lava, welded tuff and tuff
				Huayllitas Formation	Hy	Dacitic tuff (partly pumice bearing)
			Miocene	Alpabamba Formation	Al	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff (partly with dacite lava or andesite lava)
Tacaza Formation	Tc			Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)		
Paleocene-Oligocene	Huanca Formation	Hc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)			
		Hu	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)			
	Arcuquina Formation	Ar	Limestone and marl with sandstone and chert nodules			
	Murco Formation	Mu	Red shale and sandstone with gypsum bearing conglomerate			
Mesozoic	Cretaceous	Yura Group	Yu	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale		
		Sacosani Formation	So	Black shale, limestone with sandstone and tuff		
	Jurassic	Chocolate volcanic rocks	Ch	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone		
		Gn	Gneiss, gneissose granite and diorite			
Tertiary	Intrusive Rocks	Stock and Dyke	An	Hornblende andesite, andesite		
		Accha Stock	Di	Diorite and quartz diorite		
	La Costa Batholith	CB	Quartz diorite and granodiorite			
Structural	Fault	—				
	Inferred fault	- - -				
	Anticline	∩				
	Syncline	∪				
	Geological boundary	—				
	Geological profile line	A—B				
	Strike and dip of bedding	30°				
Strike and dip of foliation	50°					
Strike and dip of flow structure	—					
Mine (working or closed)	X					
Hot spring	⊕					





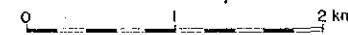
Mesozoic	Jurassic	Sacosani Form.	
	Cretaceous	Murco Form.	
Cenozoic	Tertiary	Pliocene	Huanca Form.
		Miocene	Alpbarni Form.
	Quaternary	Pleistocene	Huayllilla Form.
		Holocene	Sencca Volcanic





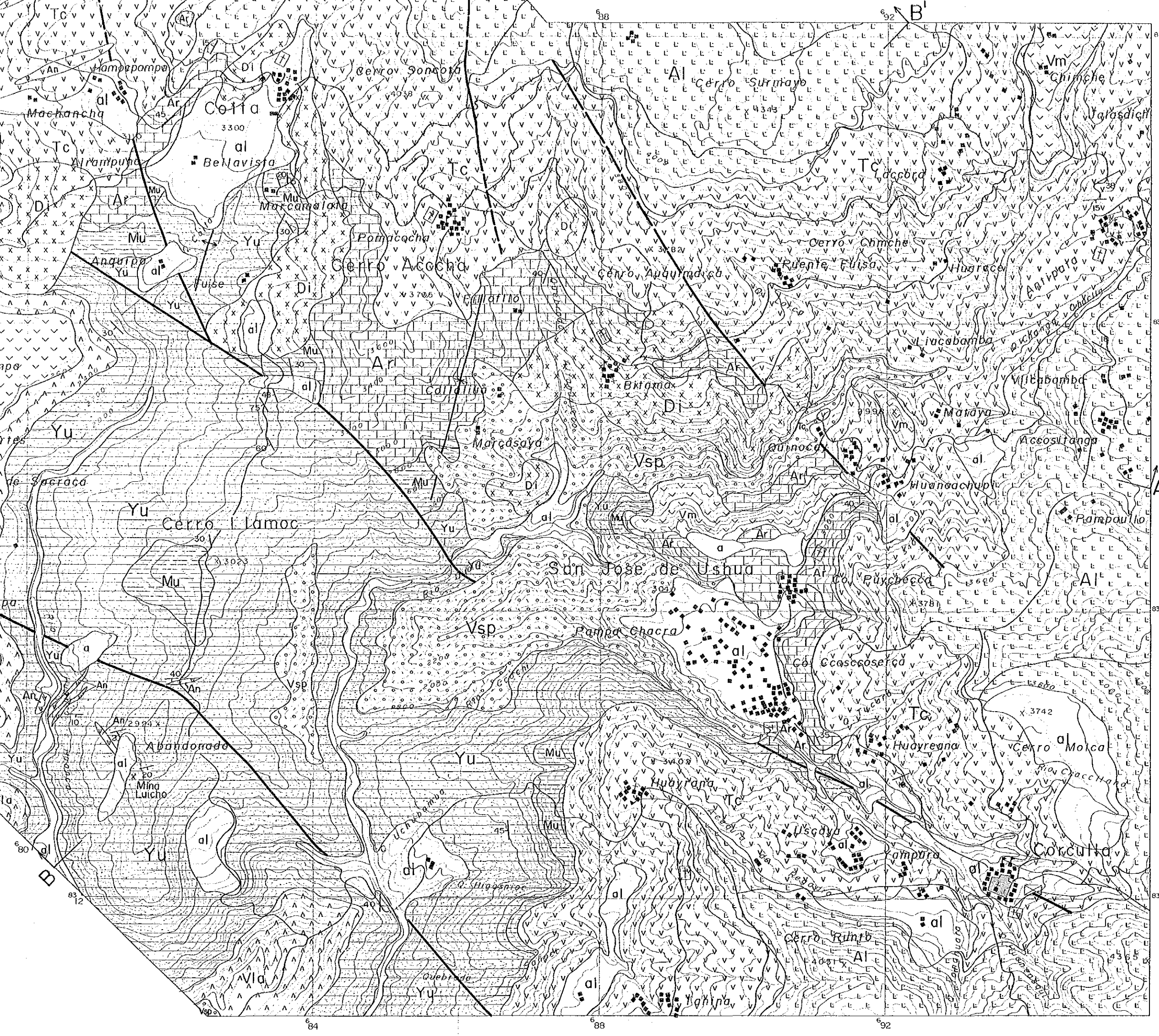
JAPAN INTERNATIONAL COOPERATION AGENCY
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 INSTITUTO GEOLOGICO MINERO Y METALURGICO
 February 1986

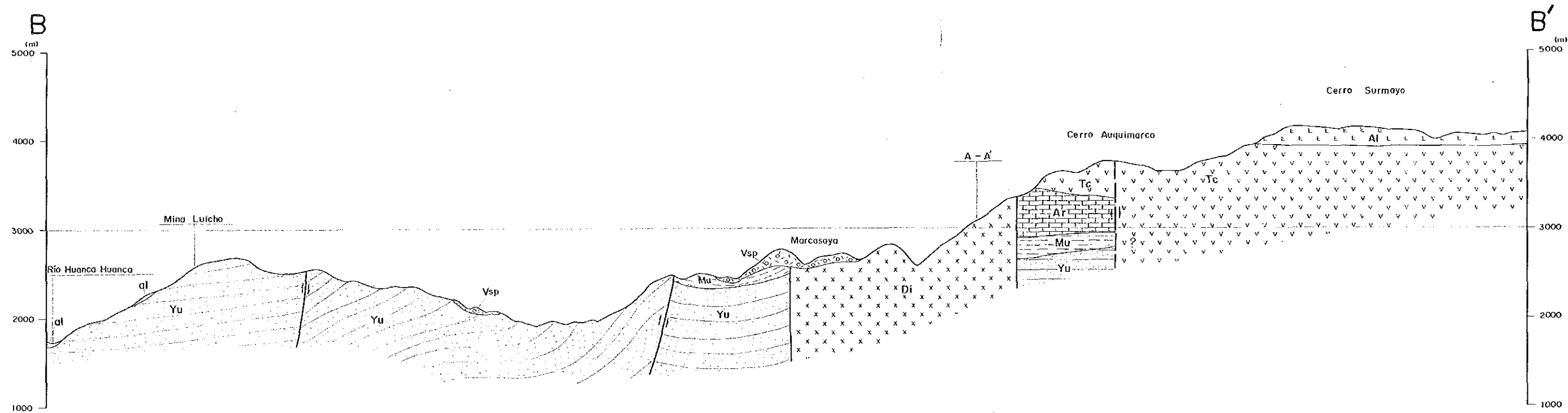
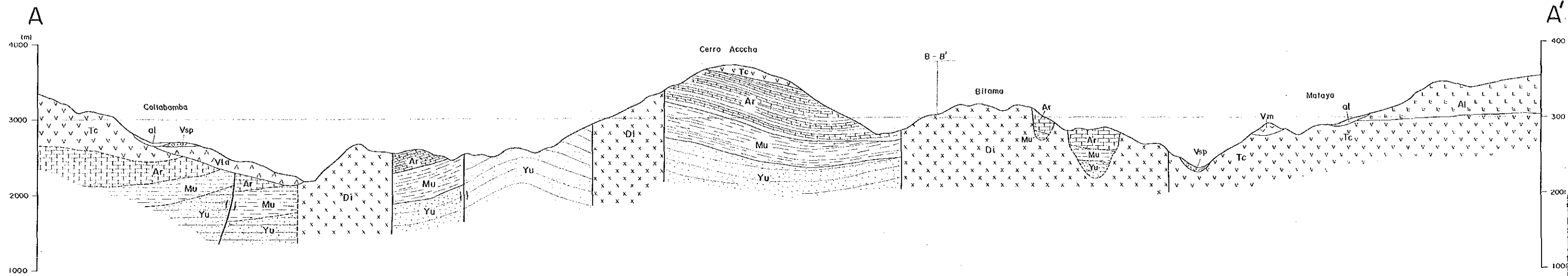
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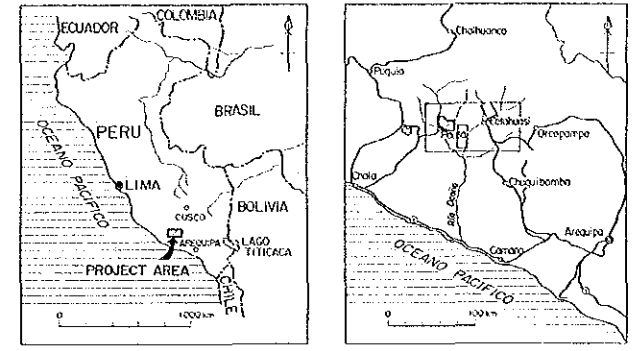
Cenozoic	Quaternary	Alluvium	al	Sand, mud and gravel	
		Mollebamba Volcanic Rocks	Vm	Andesite lava and volcanic ash	
		Volcanic Sediment of Pausa	ovsp	Volcanic ash, sand and gravel	
		Lampa Volcanic Rocks	Ala	Andesite (basaltic), volcanic breccia	
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and mud	
		Barroso Group	Upper	Vbu	Acidic tuff
	Lower		Avl	Andesite lava and pyroclastic rocks	
	Tertiary	Pliocene	Sencca Volcanic Rocks	Vse	Hornblende-biotite dacite lava, welded tuff and tuff
			Huayllitas Formation	Hy	Dacitic tuff (partly pumice bearing)
		Miocene	Alpabamba Formation	Al	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff (partly with dacite lava or andesite lava)
Tacaza Formation			Tc	Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)	
Huanca Formation			Hc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)	
Mesozoic	Cretaceous	Arcurquina Formation	Ar	Limestone and marl with sandstone and chert nodule	
		Murco Formation	Mu	Red shale and sandstone with gypsum bearing conglomerate	
	Jurassic	Yura Group	Yu	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale	
		Socosani Formation	So	Black shale, limestone with sandstone and tuff	
		Chocolate volcanic rocks	Cho	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone	
Precambrian		Gn	Gneiss, gneissose granite and diorite		
Tertiary	Intrusive Rocks	Stock and Dyke	An	Hornblende andesite, andesite	
		Accha Stock	Di	Diorite and quartz diorite	
	Cretaceous	La Costa Batholith	CB	Quartz diorite and granodiorite	
				Fault	
				Inferred fault	
				Anticline	
				Syncline	
				Geological boundary	
				Geological profile line	
				Strike and dip	
				Mine (working or closed)	





GEOLOGICAL PROFILES OF THE
DETAILED SURVEY AREA
(A)

LOCATION INDEX



JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986

Scale 1 : 25,000
0 1 2 km

LEGEND

Quaternary	Alluvium	al	Sand, mud and gravel
Cenozoic	Matibamba Volcanic Rocks	vm	Andesite lava and volcanic ash
	Volcanic Sediments of Puno	vs	Volcanic ash, sand and gravel
Cenozoic	Volcanic Rocks	vr	Andesite/basaltic, volcanic breccia
	Moraine Sediment	ms	Gravel, sand and mud
Cenozoic	Barro Colorado Group	bcg	Acidic tuff
	Seneca Volcanic Rocks	sv	Andesite lava and pyroclastic rocks
Tertiary	Huachipaeri Formation	hf	Andesite-tuff breccia, welded tuff and tuff
	Altoabamba Formation	af	Dacitic tuff (partly pumice bearing) and welded tuff
Tertiary	Isosca Formation	if	Andesite tuff breccia, dacitic tuff and dacitic tuff breccia (greenish grey)
	Muzco Formation	mf	Andesite volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)
Mesozoic	Atacama Formation	at	Limestone and marl with sandstone and chert nodules
	Marco Formation	ma	Red shale and sandstone with gypsum bearing conglomerate
Mesozoic	Yura Group	yg	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale
	Sorapan Formation	sf	Black shale, limestone with sandstone and tuff
Precambrian	Chocolate volcanic rocks	cv	Andesite tuff breccia, tuff, andesite and tuffaceous sandstone
		ca	Gneiss, gneissic granite and diorite
Intrusive Rocks	Stock and Dyke	sd	Microcline andesite, andesite
	Acana Stock	as	Quartz and quartz diorite
Cretaceous	La Costa Gneiss	lc	Quartz diorite and gneissite
Structural Features			
Fault			
Inferred fault			
Anticline			
Syncline			
Geological boundary			
Strike and dip of bedding			
Strike and dip of foliation			
Strike and dip of flow structure			
Mine location or structure			
Hot spring			

