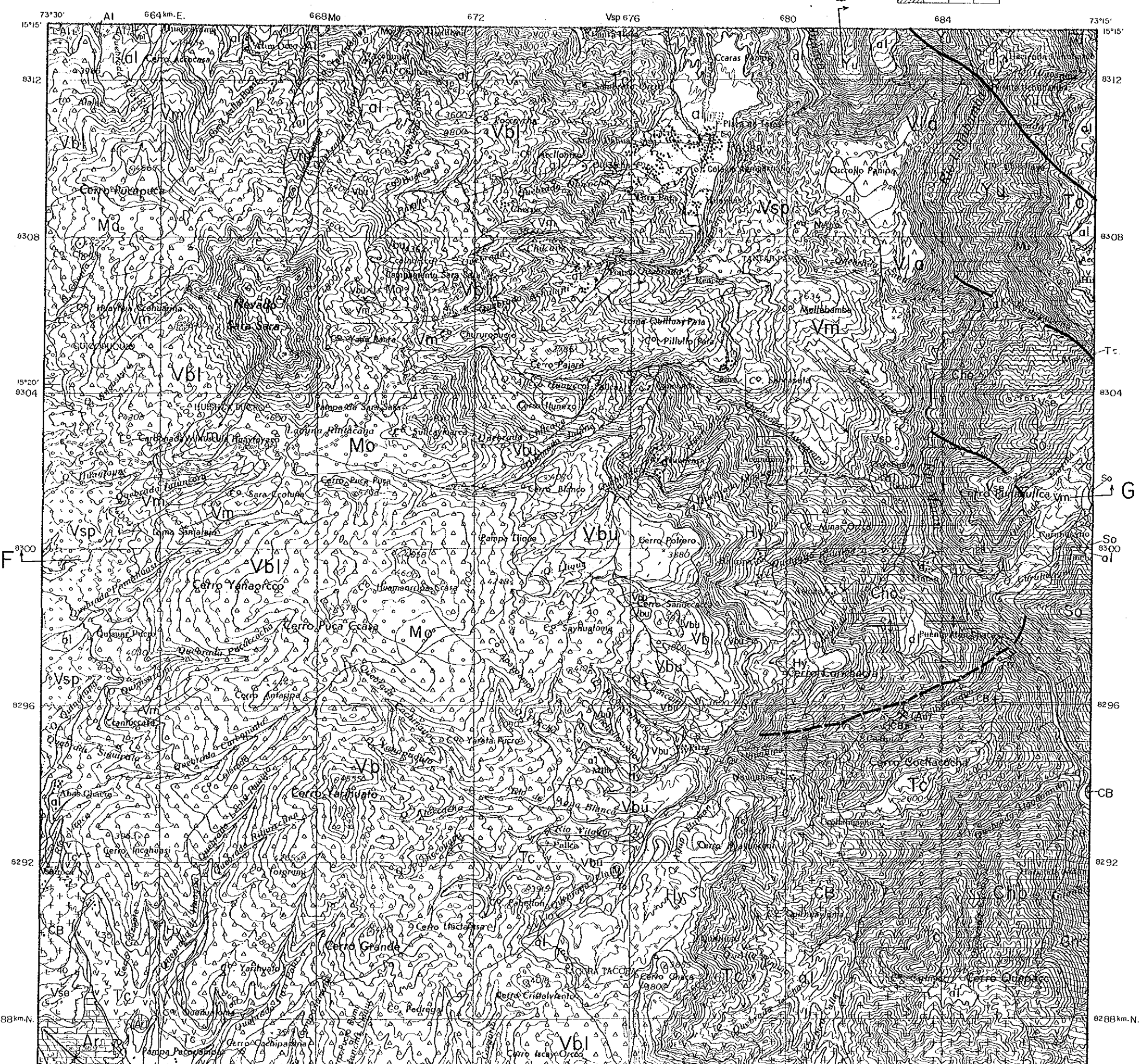
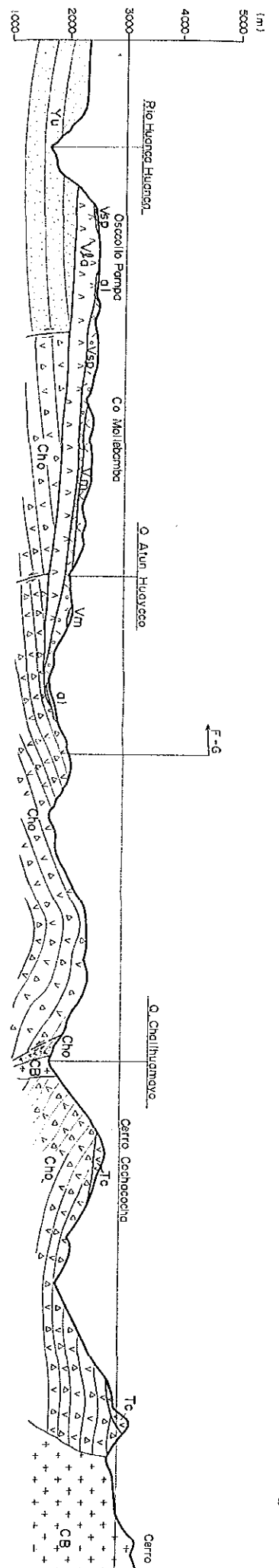


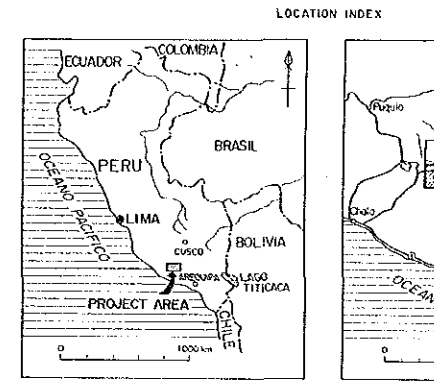
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MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE 1)

GEOLOGICAL MAP OF THE REGIONAL SURVEY (5)



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

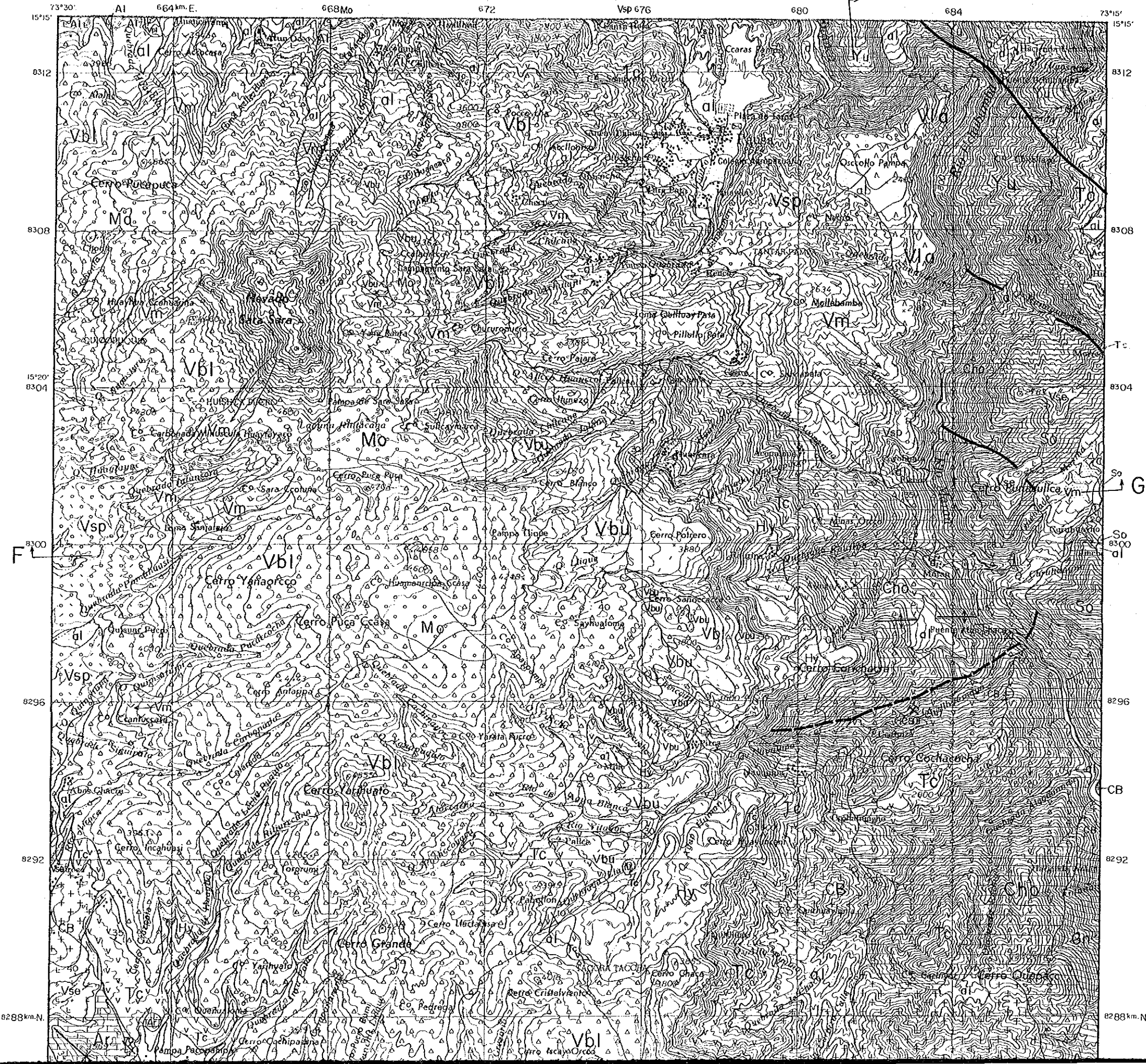
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LEGEND

Cenozoic	Quaternary	Alluvium	al	Sand, mud and gravel	
		Mollebamba Volcanic Rocks	Vm	Andesite lava and tuff	
		Volcanic Sediment of Pausa	Vsp	Volcanic ash, sand and tuff	
		Lampa Volcanic Rocks	Vla	Andesite (basaltic) lava and tuff	
	Tertiary	Pleistocene	Moraine Sediment	Mo	Gravel, sand and silt
			Barroso Group	Upper	Vbu
		Lower		Vbl	Andesite lava and tuff
		Pliocene	Senca Volcanic Rocks	Vse	Hornblende-biotite welded tuff and tuffaceous sandstone
			Huayllillas Formation	Hy	Dacitic tuff (partly welded)
			Alpabamba Formation	Al	Dacitic tuff, lapilli and welded tuff (partly with dacite)
Tacaza Formation	Tc		Andesitic tuff breccia and dacitic tuff breccia		
Mesozoic	Cretaceous	Huano Formation	Vhc	Andesitic volcanic and tuffaceous sandstone	
		Arcurquina Formation	Arc	Limestone and marl and chert nodule	
		Murco Formation	Mu	Red shale and sandstone bearing conglomerate	
	Jurassic	Yura Group	Yu	Quartzite, siliceous and alternation of sandstone	
		Socosani Formation	So	Black shale, limestone and chert	
		Chocolate volcanic rocks	Cho	Andesitic tuff breccia and tuffaceous sandstone	
Precambrian		Gn	Gneiss, gneissose gneiss		
Intrusive Rocks					
(Stock and Dyke)		Vd	Hornblende andesite		

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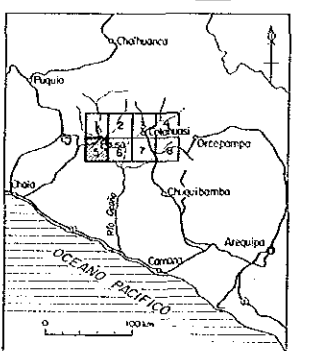
PL. 3-(5)

MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

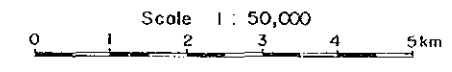
GEOLOGICAL MAP OF THE REGIONAL SURVEY AREA (5)

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LOCATION INDEX

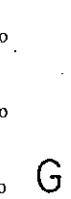
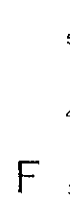
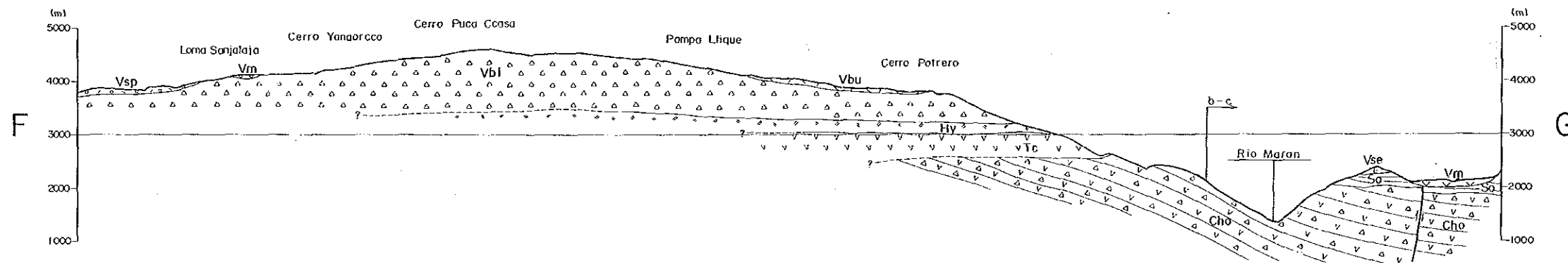
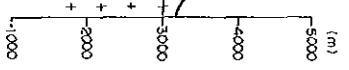
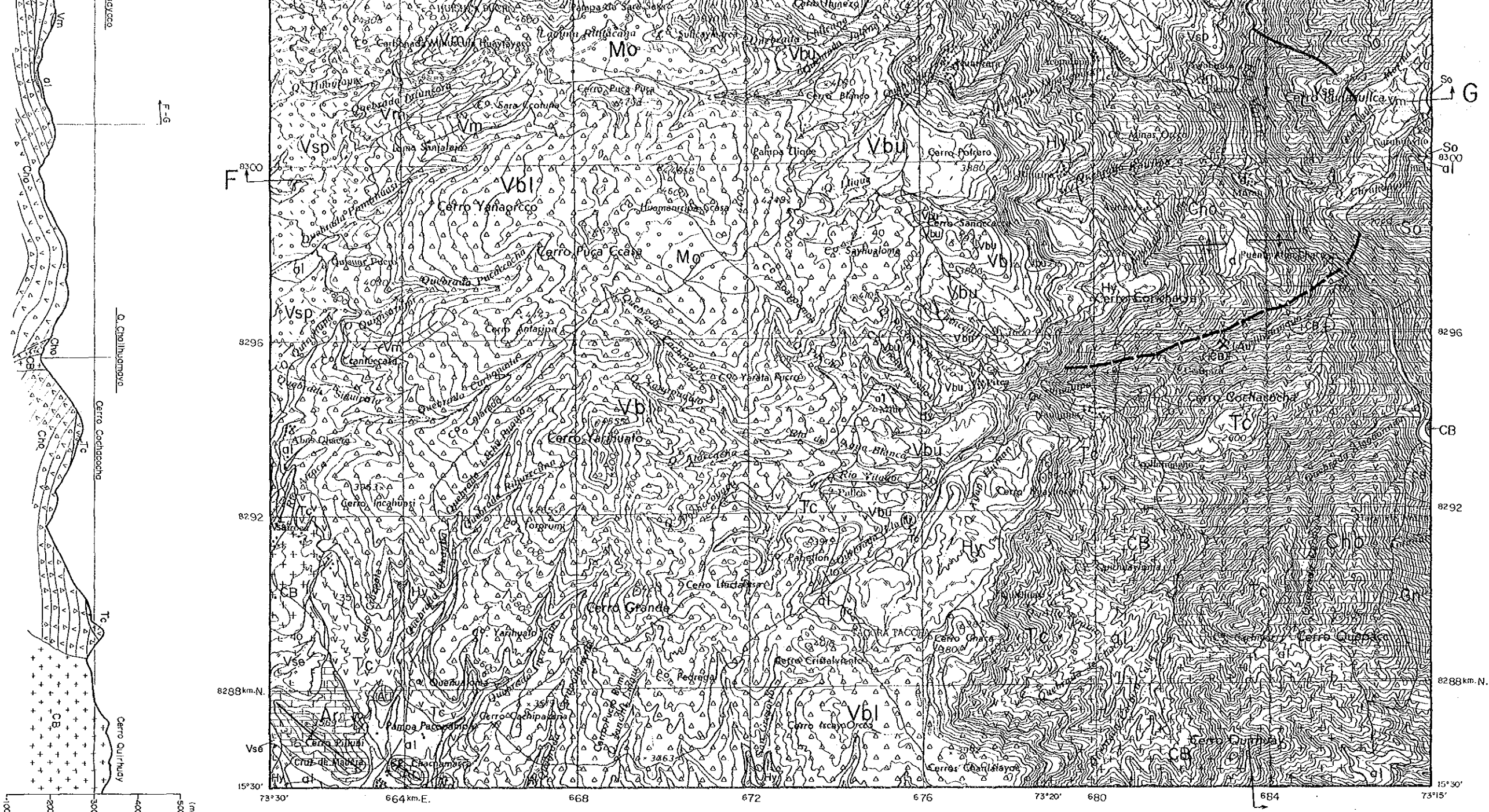



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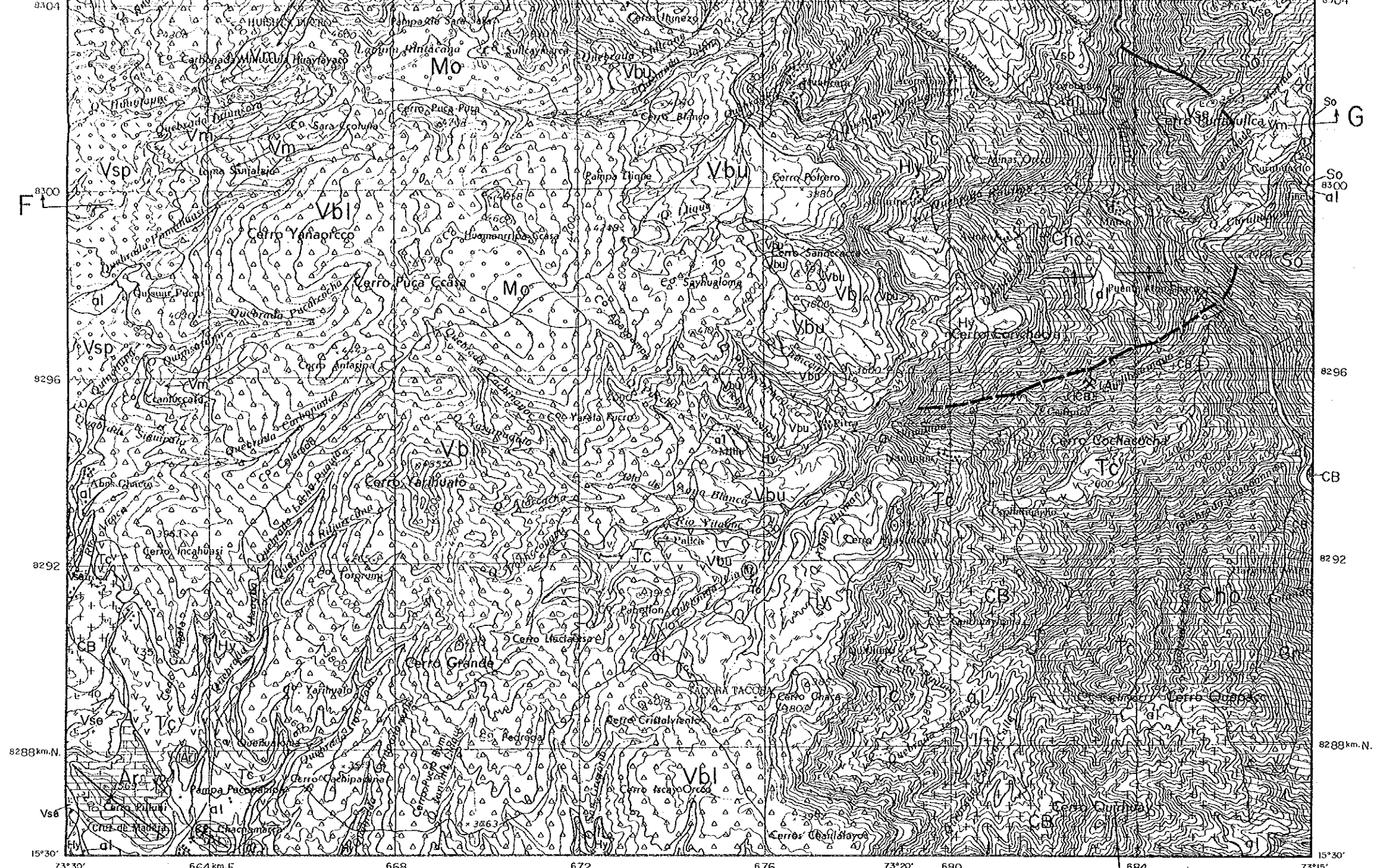
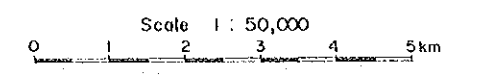
LEGEND

Cenozoic	Quaternary	Alluvium	al	Sand, mud and gravel	
		Holocene	Mollebamba Volcanic Rocks	Vm	Andesite lava and volcanic ash
			Volcanic Sediment of Pausa	Vsp	Volcanic ash, sand and gravel
		Lampa Volcanic Rocks	Vla	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
		Pliocene	Senca Volcanic Rocks	Vse	Hornblende-biotite dacite lava, welded tuff and tuff
	Huayllillas Formation		Vhy	Dacitic tuff (partly pumice bearing)	
	Alpabamba Formation		VAl	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff (partly with dacite lava or andesite lava)	
Tacaza Formation	VTe		Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)		
Mesozoic	Cretaceous	Huanca Formation	VHc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)	
		Arcuquina Formation	VAr	Limestone and marl with sandstone and chert nodule	
		Murco Formation	VMu	Red shale and sandstone with gypsum bearing conglomerate	
		Yura Group	VYu	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale	
	Jurassic	Sococani Formation	VSo	Black shale, limestone with sandstone and tuff	
		Chocolate volcanic rocks	VCho	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone	
	Precambrian		VGn	Gneiss, gneissose granite and diorite	
		Intrusive Rocks	VIV		



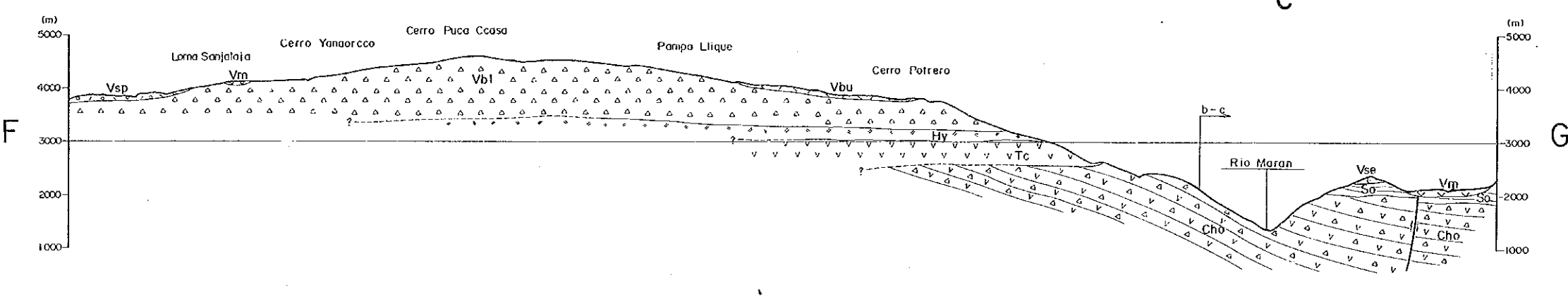
LEGEND

- | | | | | | |
|--------------------|--------------------------|----------------------------|---|------------------------------------|--|
| Cenozoic | Quaternary | Alluvium | al | Sand, mud and silt | |
| | | Mollebamba Volcanic Rocks | Vm | Andesite lava and welded tuff | |
| | | Volcanic Sediment of Pausa | o o o Vsp | Volcanic ash, sand and tuff | |
| | | Lampa Volcanic Rocks | A A A Vlg | Andesite (basaltic) | |
| | Pleistocene | Morote Sediment | o o o Mo | Gravel, sand and silt | |
| | | Borroso Group | Upper | Vbu | Acidic tuff |
| | | | Lower | Vbi | Andesite lava |
| | | Pliocene | Sencca Volcanic Rocks | L L L Vse | Hornblende-biotite welded tuff and tuffaceous sand |
| | | | Huayllitas Formation | H H H | Dacitic tuff (partly with welded tuff) |
| | | Tertiary | Miocene | Alpabamba Formation | L L L LAI |
| Tacaza Formation | V V V VTC | | | Andesite tuff and dacitic tuff | |
| Pliocene | Huanca Formation | | V V V VHC | Andesitic volcanic tuffaceous sand | |
| | Cretaceous | | Acurquina Formation | L L L AIC | Limestone and chert nodules |
| Murco Formation | | Mu | Red shale and bearing conglomerate | | |
| Yura Group | | Yu | Quartzite, siliceous and alternation of sandstone and shale | | |
| Socosani Formation | | So | Block shale, limestone | | |
| Jurassic | Chocolate volcanic rocks | Ch | Andesitic tuff breccia and tuffaceous sands | | |
| | Precambrian | | Gn | Gneiss, gneissose schist | |
| Tertiary | | Intrusive Rocks | Stock and Dyke | V V V V An | Hornblende andesite |
| | Acha Stock | | X X X DI | Diorite and quartz diorite | |
| | Cretaceous | La Costa Batholith | + + + CB | Quartz diorite and granite | |
-
- | | |
|--------|-----------------------------|
| — | Fault |
| - - - | Inferred fault |
| + | Anticline |
| + | Syncline |
| ○ | Geological boundary |
| AL — B | Geological profile |
| 30° | Strike and dip of fault |
| 30° | Strike and dip of strata |
| X | Mine (working or abandoned) |
| ⊙ | Hot spring |



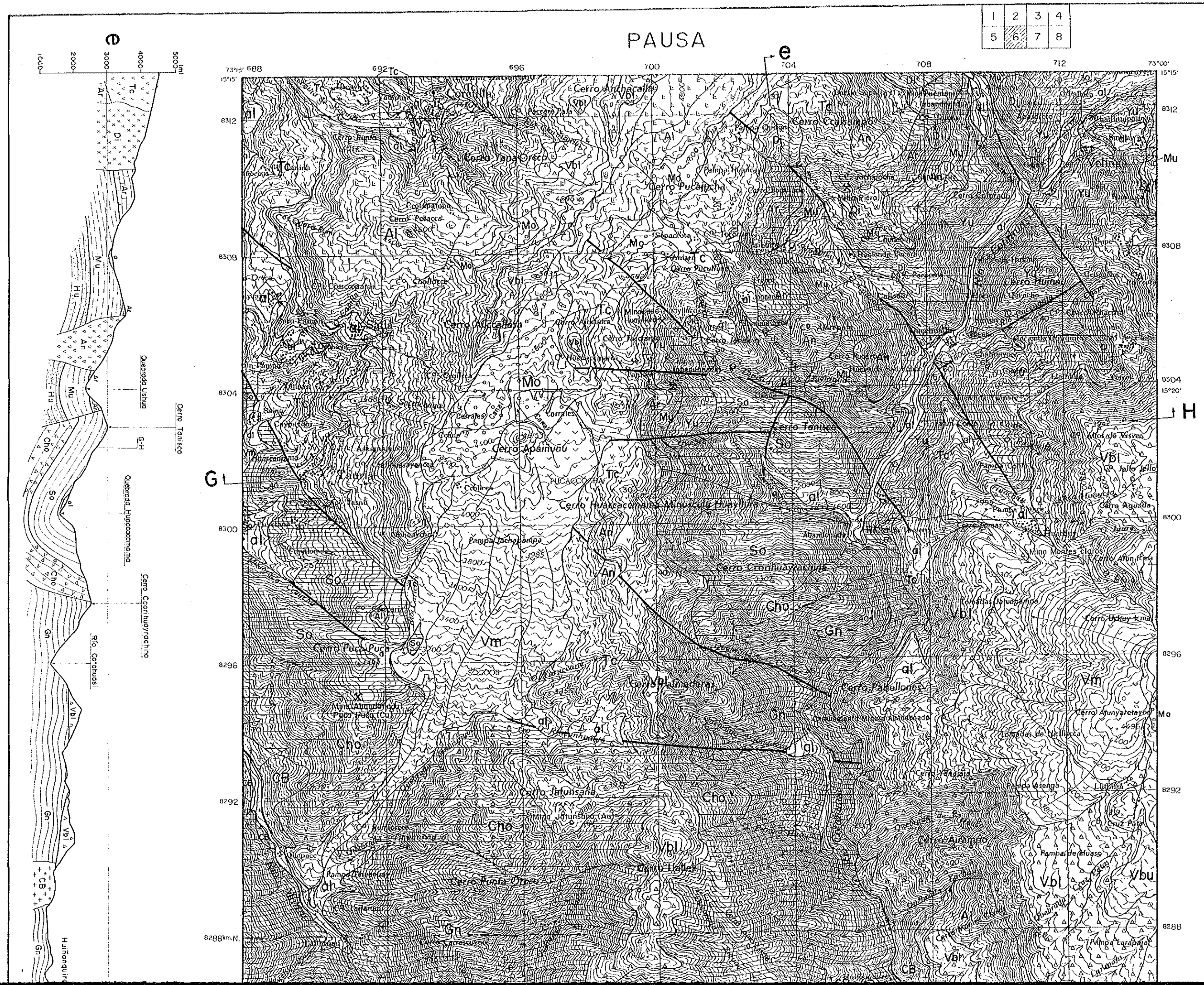
LEGEND

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	Vla	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	Vsc	Hornblende-biotite dacite lava, welded tuff and tuff
			Huaylillas 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)	
Oligocene		Huanca Formation	Vhc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)	
		Cretaceous	Arcurquina Formation	Ar	Limestone and marl with sandstone and chert nodule
Marco Formation	Mu		Red shale and sandstone with gypsum bearing conglomerate		
Yura Group	Yu		Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale		
Socosani Formation	So		Black shale, limestone with sandstone and tuff		
Precambrian	Chocolate volcanic rocks	Cho	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone		
		Gn	Gneiss, gneissose granite and diorite		
Intrusive Rocks	Tertiary	Stock and Dyke	An	Hornblende andesite, andesite	
		Accho Stock	Di	Diorite and quartz diorite	
	Cretaceous	La Costa Batholith	CB	Quartz diorite and granodiorite	
<p>— Fault</p> <p>- - - Inferred fault</p> <p>∧ Anticline</p> <p>∩ Syncline</p> <p>○ Geological boundary</p> <p>— Geological profile line</p> <p>30° Strike and dip of bedding</p> <p>50° Strike and dip of foliation</p> <p>— Strike and dip of flow structure</p> <p>X Mine (working or closed)</p> <p>⊙ Hot spring</p>					



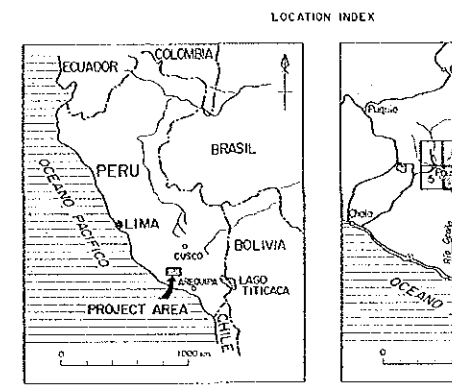
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MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE 1)

GEOLOGICAL MAP THE REGIONAL SURVEY (6)

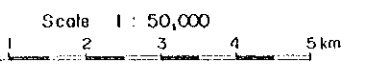


JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986

Scale 1 : 50,000

LEGEND

Cenozoic	Quaternary	Alluvium	al	Sand, mud and gravel	
		Mollebamba Volcanic Rocks	Vm	Andesite lava and tuff	
		Volcanic Sediment of Pausa	o-vsp	Volcanic ash, sand and tuff	
		Lampa Volcanic Rocks	A-Vlo	Andesite (basaltic) tuff	
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and tuff	
		Barroso Group	Upper	Vbu	Acidic tuff
	Lower		Vbl	Andesite lava and tuff	
	Tertiary	Pliocene	Sencca Volcanic Rocks	L-Vse	Hornblende-biotite welded tuff and tuffaceous sandstone
			Huayllillas Formation	H	Dacitic tuff (partly welded)
		Miocene	Alpabamba Formation	L-A1	Dacitic tuff, lapilli and welded tuff (partly with dacite)
Tacaza Formation			V-VTc	Andesitic tuff breccia and dacitic tuff breccia	
Huanco Formation			V-VHc	Andesitic volcanic and tuffaceous sandstone	
Mesozoic	Cretaceous	Arcuquina Formation	L-Ar	Limestone and marl and chert nodules	
		Murco Formation	Mu	Red shale and sandstone bearing conglomerate	
		Yura Group	Yu	Quartzite, siliceous and alternation of sandstone and shale	
	Jurassic	Socosani Formation	So	Black shale, limestone and tuffaceous sandstone	
		Chocolate volcanic rocks	Cho	Andesitic tuff breccia and tuffaceous sandstone	
Precambrian		Gn	Gneiss, gneissose gneiss		
Intrusive Rocks	Tertiary	Stock and Dyke	V-VAn	Hornblende andesite	
			X-X		



LEGEND

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	Vlo	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	Seneca Volcanic Rocks	Vse	Hornblende-biotite dacite lava, welded tuff and tuff
			Huayllillas 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)
Tocaza Formation			Tc	Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)	
Paleocene		Huancá Formation	Hc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)	
		Arcurquina Formation	Ar	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		
Intrusive Rocks	Tertiary	Stock and Dyke	An	Hornblende andesite, andesite	
		Accha Stock	Di	Diorite and quartz diorite	
	Cretaceous	La Costa Batholith	CB	Quartz diorite and granodiorite	
<ul style="list-style-type: none"> Fault Inferred fault Anticline Syncline Geological boundary Geological profile line Strike and dip of bedding Strike and dip of foliation Strike and dip of flow structure Mine (working or closed) Hot spring 					

