




 Semi_detailed_survey_area
 Geological Section Lines
 Zn (geochem. + ore assay)

 224 - 2005 (ppm)








 143 - 223

 74 - 142

 29 - 73

 1 - 28

Geomap_Putre_S

-  Qal (Recent sediments)
-  Qv (Quaternary-Tertiary volcanics)
-  Qvr (Quaternary-Tertiary ignimbrite)
-  Kv(s) (Cretaceous volcanics)
- Intrusive rocks
-  Qp (Quartz porphyry)
-  Di, Dip (Diorite, Diorite porphyry)
-  Tgd (Tertiary granodiorite)

0 1 2 km



Fig. 2-2-87 (1) Geochemical Anomaly Map in the Area to the South of Putre (Zn)

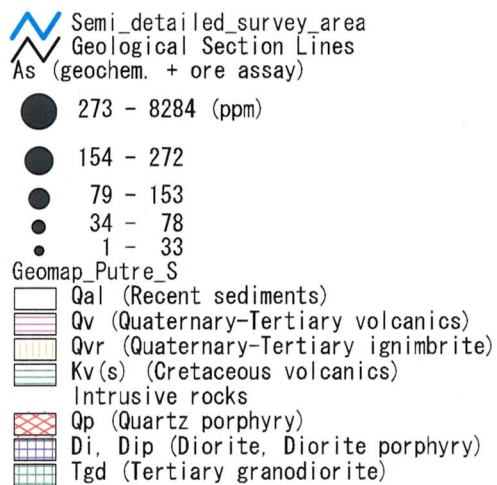
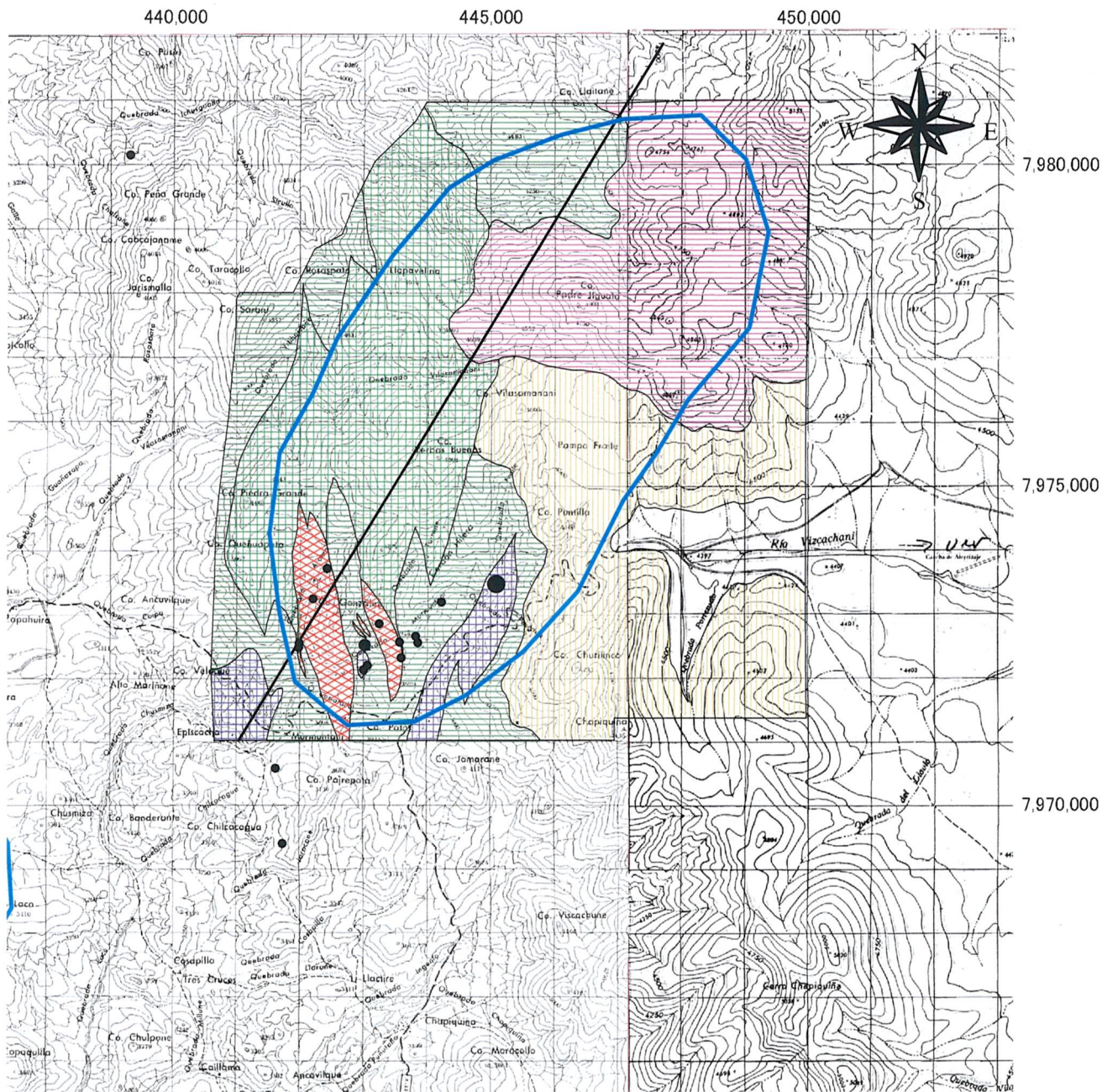


Fig. 2-2-87 (2) Geochemical Anomaly Map in the Area to the South of Putre (As)

In this area, sericitized-silicified zones are widely developed in the above intrusive bodies and the Upper Cretaceous units nearby. Also kaolinized and silicified zones are developed in the Upper Tertiary-Quaternary formations. Pyrite dissemination is developed in the former alteration zones and limonite dissemination in the latter.

Zn-As anomalies were detected by rock geochemical survey.

The above alteration-mineralization zones are located within intermediate airborne magnetic intensity zones, overlapping zones of medium wavelength low magnetic anomaly and short wavelength high magnetic anomaly zones and the vicinity.

2 - 20 District to the southwest of Putre

A geological map of this area is shown in Figure 2-2-88 and schematic geological columns in Figure 2-2-89.

The geology of this area is composed of Upper Cretaceous-Lower Tertiary intrusive bodies, Neogene System, Upper Neogene-Quaternary System, and Quaternary System.

The Upper Cretaceous-Lower Tertiary intrusive bodies consist of granodiorite and granite. The K-Ar age determined during the present survey for the two rocks resulted in 65 ± 2 Ma (biotite) for both rocks.

Neogene System consists of Miocene-Pliocene ignimbrite (rhyolitic welded tuff).

The Upper Neogene-Quaternary System consists of, from bottom upward, conglomerate, ignimbrite (pumiceous tuff), and basalt lava, and these units have unconformable relation with each other.

The Quaternary System consists of alluvium.

Weak propylitization occurs in the above intrusive rocks in this area, but mineralization is not observed.

Rock geochemical anomalies are not detected in this area.

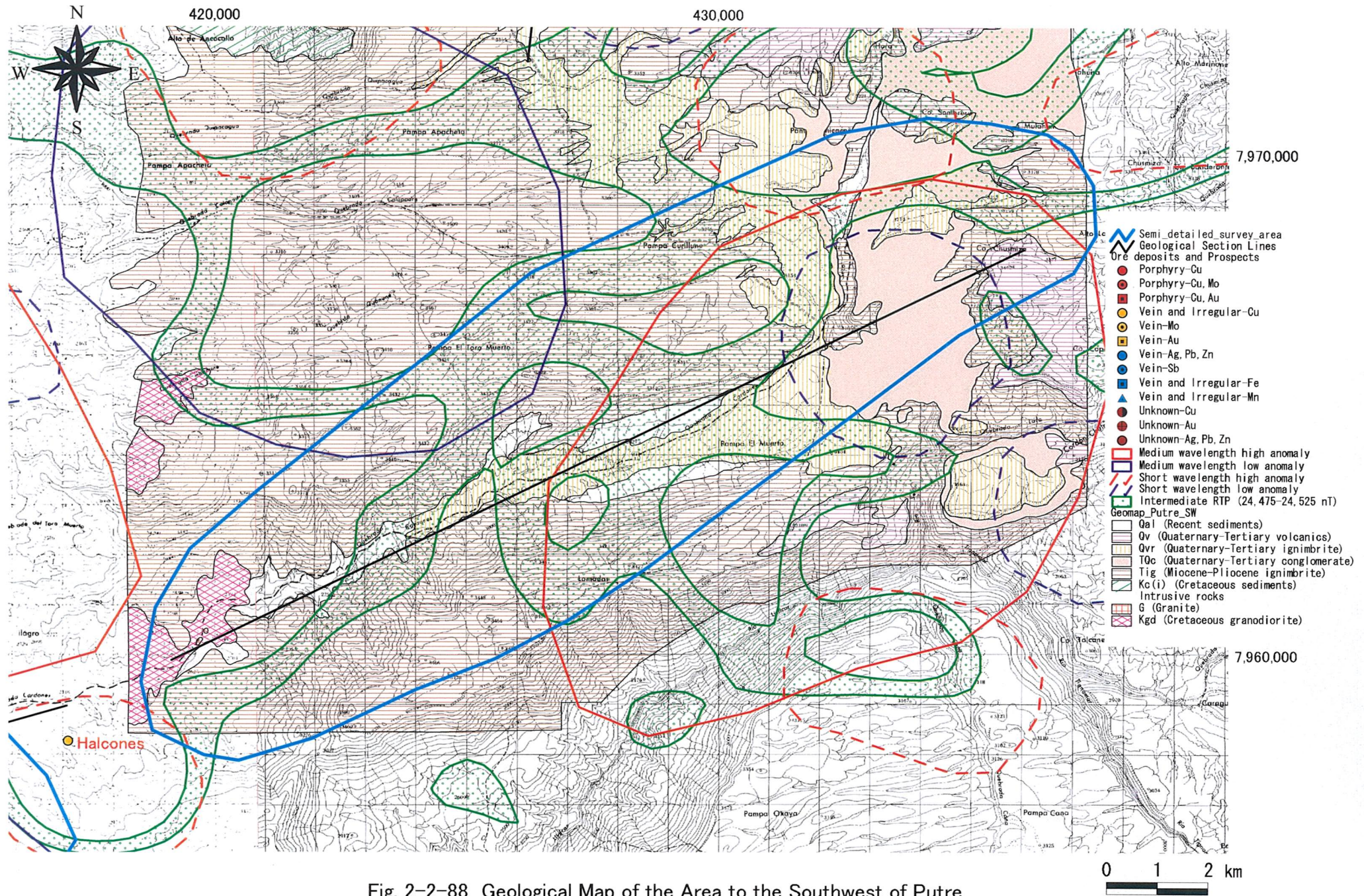
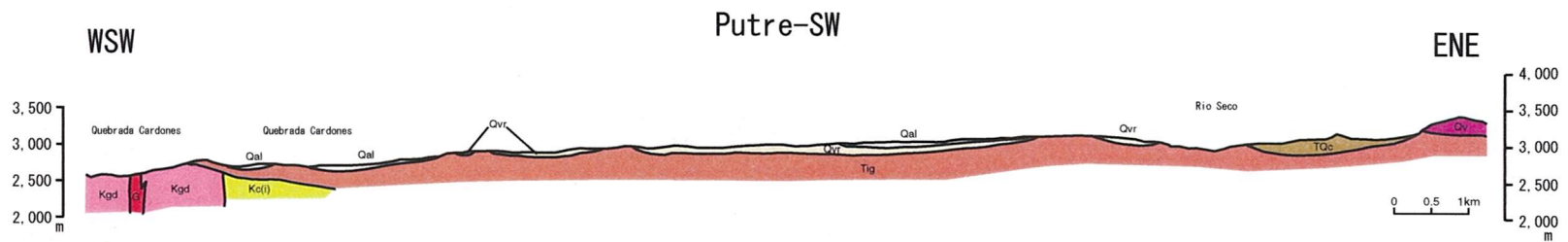


Fig. 2-2-88 Geological Map of the Area to the Southwest of Putre



Geologic Time		Columnar Section	Lithology	Intrusives	Mineralization
CENOZOIC	QUATERNARY HOLOCENE	Qal	Alluvium	Granodiorite (Kgd) Granite (G)	
	QUATERNARY ~ TERTIARY	Qv	Basalt lava		
		Qvr	Pumice tuff		
		TQc	Conglomerate		
	TERTIARY PLIOCENE ~ MIOCENE	Tig	Welded tuff		
MESOZOIC	CRETACEOUS EARLY	Kc(i)	Sandstone		

Fig.2-2-89 Schematic Stratigraphic Columns and Profiles of the Area to the Southwest of Putre

Geologic features characteristic in other survey areas, in intermediate airborne magnetic intensity zones, and in the overlapping parts of the peripheral zones of medium wavelength high magnetic anomaly and medium wavelength low magnetic anomaly do not occur in this area.

2 - 21 District to the east of Arica

A geological map of this area is shown in Figure 2-2-90, schematic geologic columns in Figure 2-2-91, mineral showings in Figure 2-2-93, and rock geochemical anomaly distribution in Figure 2-2-94.

The geology of this area is composed of Upper Jurassic System, Lower Cretaceous System, Tertiary System, Quaternary System, and intrusive bodies.

The Upper Jurassic System consists of shale and marble, and skarnization with amphiboles is observed near granodiorite intrusion.

The Lower Cretaceous System consists of sandstone.

The Upper Jurassic and Lower Cretaceous System are intruded by granodiorite bodies. The primary K-Ar ages of intrusion are; 66 ± 2 Ma (biotite) and 68 ± 2 Ma (biotite) and those for alteration are, 57.4 ± 2.1 Ma (whole rock) for kaolinized rocks and 66 ± 2 Ma (whole rock) for sericitized rocks.

The Upper Jurassic and Lower Cretaceous Systems and the above intrusive bodies are overlain unconformably by Tertiary units.

The Tertiary System is composed of Oligocene-Miocene conglomerate and unconformably overlying Miocene-Pliocene ignimbrite (rhyolitic welded tuff • pumiceous tuff).

The Quaternary System is alluvium.

In this area, a vein-type copper deposit (abandoned Halcones mine) occurs in granodiorite and the vicinity of the vein has been sericitized. One vein is exposed on the surface, and its attitude is N-S, 50E, and its width 0.8m, length more than 250m. The ore minerals are chrysocolla, malachite, antlerite, anglesite, plumbojarosite cerussite, chlorargyrite, chalcocite,

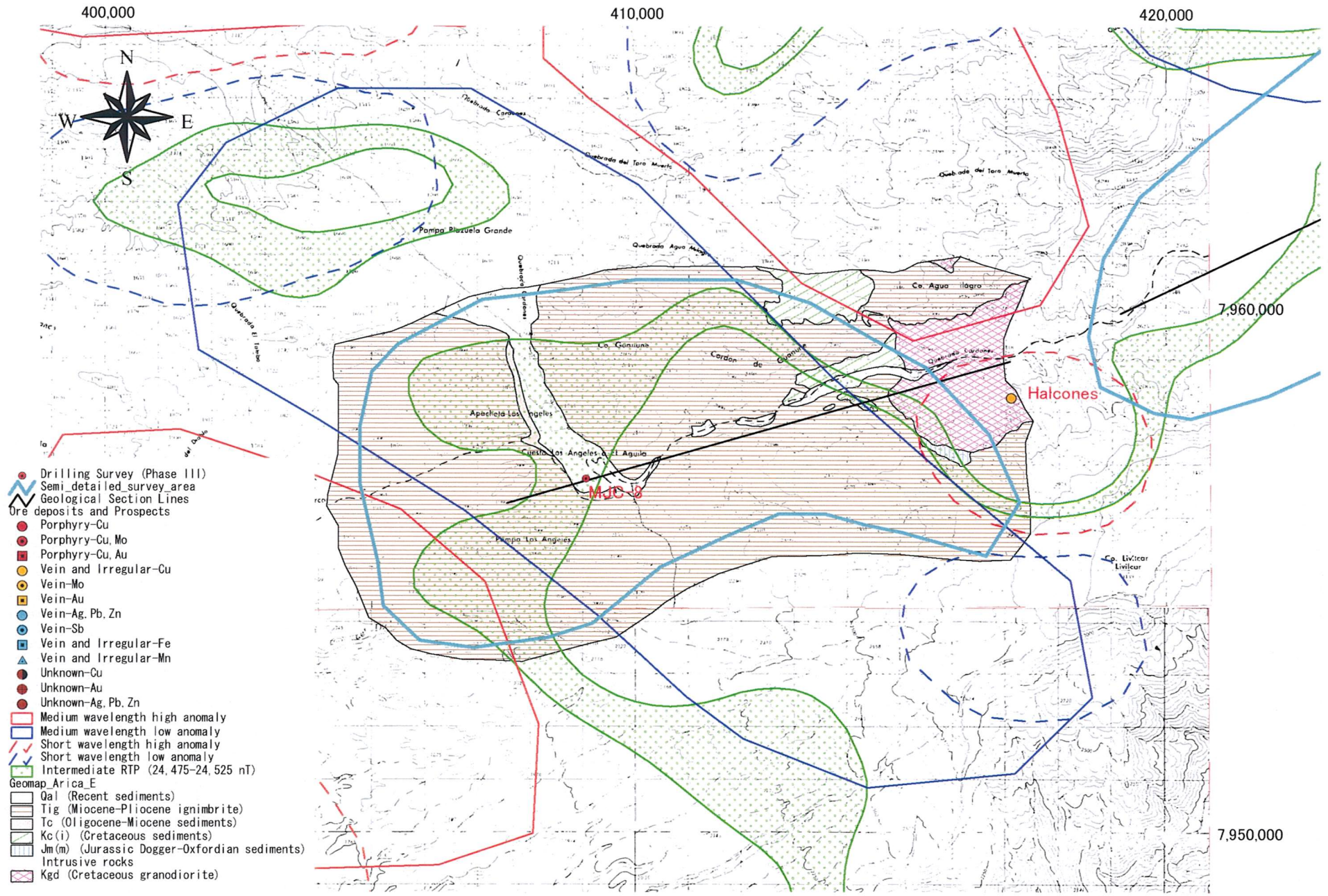
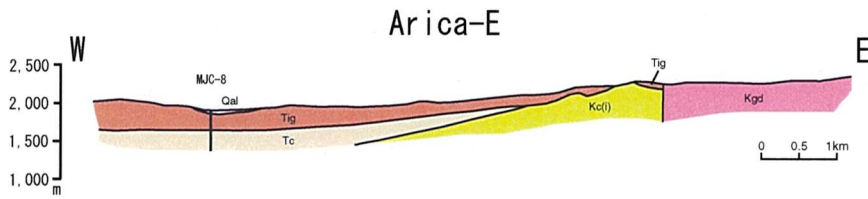


Fig. 2-2-90 Geological Map of the Area to the East of Arica





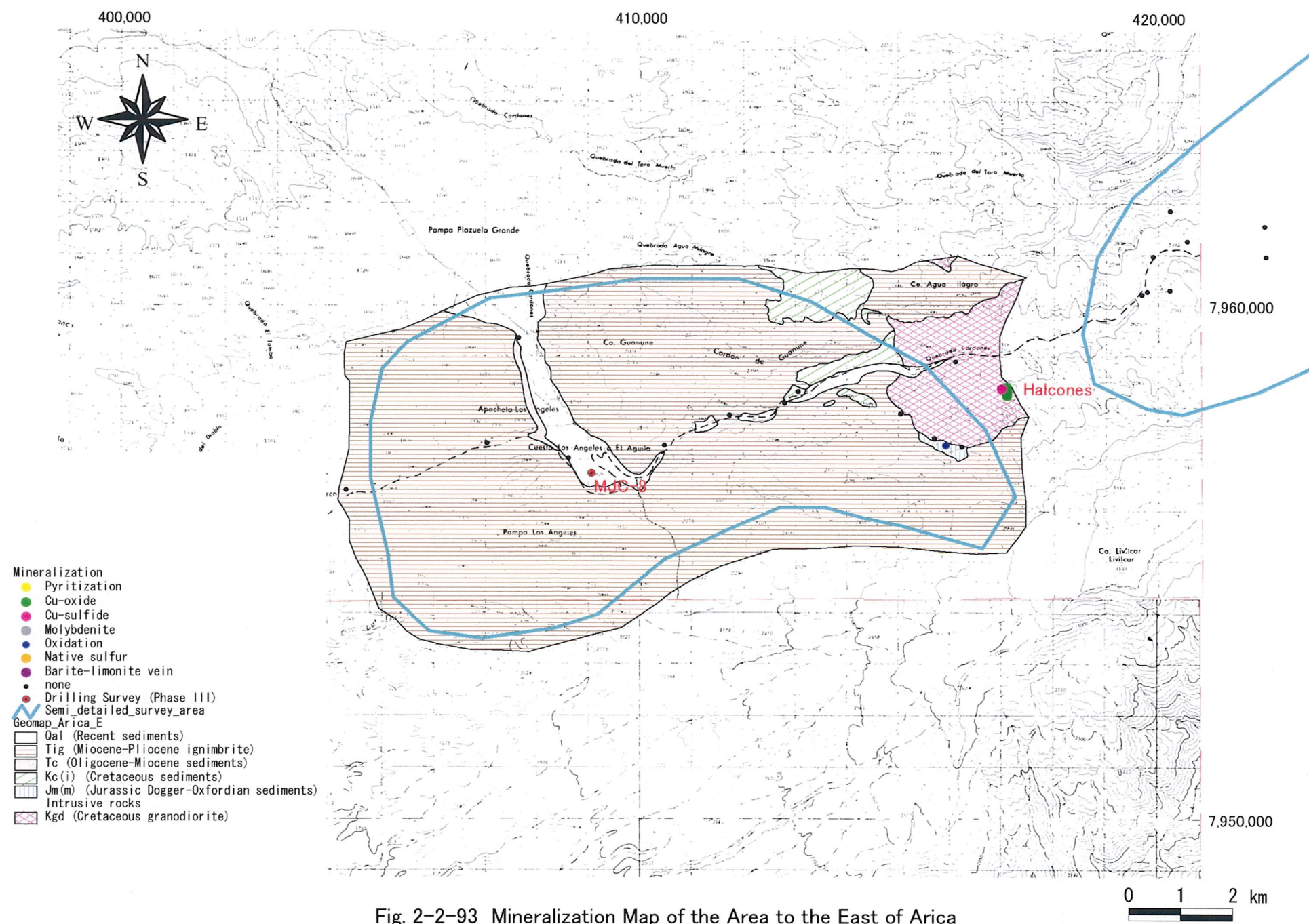
Geologic Time		Columnar Section	Lithology	Intrusives	Mineralization
CENOZOIC	QUATERNARY	HOLOCENE	Qal	Alluvium	Vein type (Cu, Pb), Skarn (contact metamorphism) ↑
	TERTIARY	PLIOCENE ~ MIOCENE	Tig	Welded tuff Pumice tuff	
		MIOCENE ~ OLIGOCENE	Tc	Conglomerate	
		EARLY			
MESOZOIC	CRETACEOUS	LATE		Granodiorite (Kgd) ↑ Granite (G) ↑	
		EARLY	Kc(i)		Sandstone
	JURASSIC	LATE	Jm(m)		Alternation of marble and shale

Fig.2-2-91 Schematic Stratigraphic Columns and Profiles of the Area to the East of Arica

437

437

— 437 —



- Mineralization**
- Pyritization
 - Cu-oxide
 - Cu-sulfide
 - Molybdenite
 - Oxidation
 - Native sulfur
 - Barite-limonite vein
 - none
 - Drilling Survey (Phase III)
 - Semi_detailed_survey_area
- Geomap Arica_E**
- Qal (Recent sediments)
 - Tig (Miocene-Pliocene ignimbrite)
 - Tc (Oligocene-Miocene sediments)
 - Kc(i) (Cretaceous sediments)
 - Jm(m) (Jurassic Dogger-Oxfordian sediments)
 - Intrusive rocks
 - Kgd (Cretaceous granodiorite)

Fig. 2-2-93 Mineralization Map of the Area to the East of Arica

0 1 2 km

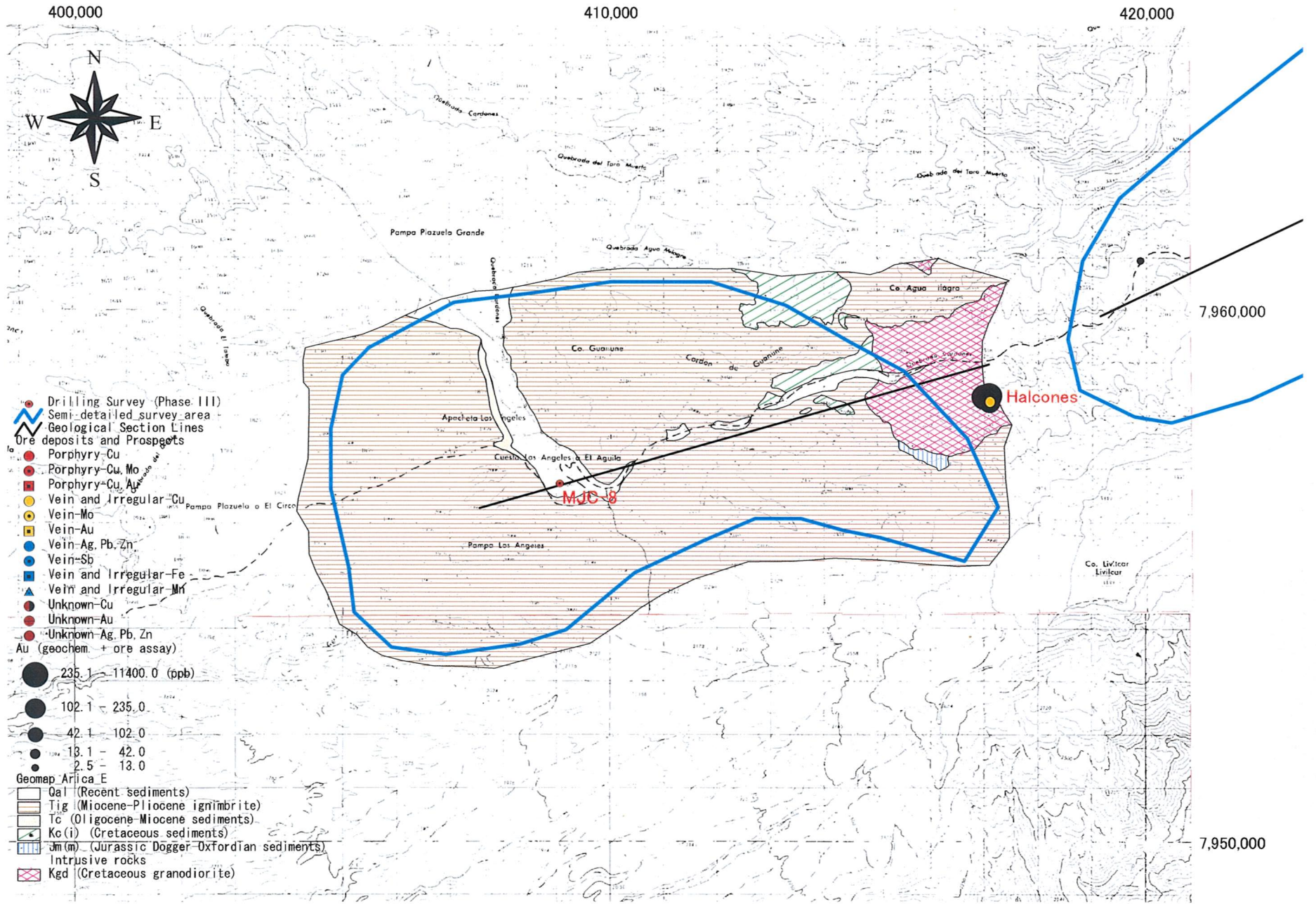
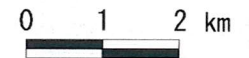


Fig. 2-2-94 (1) Geochemical Anomaly Map in the Area to the East of Arica (Au)



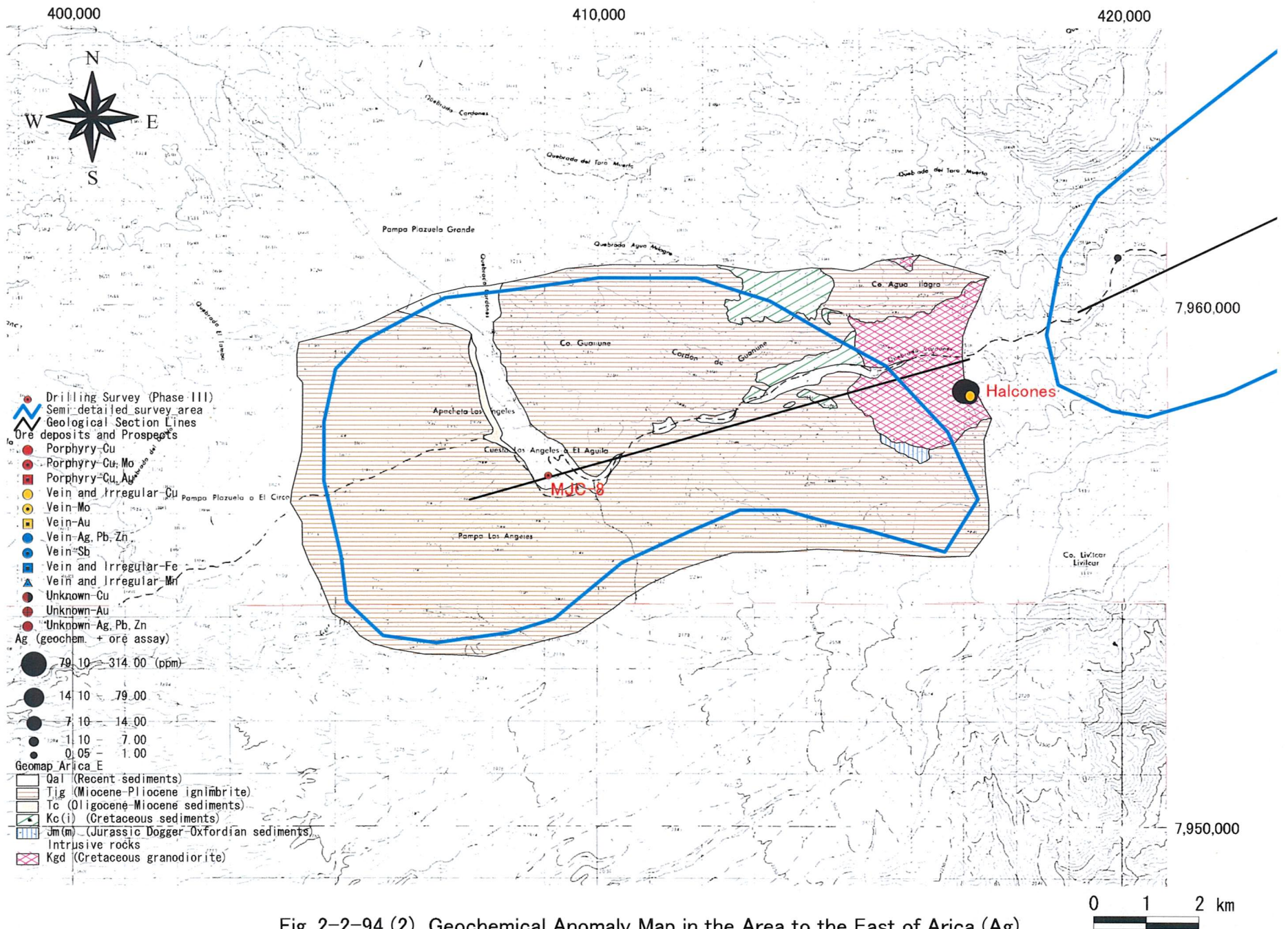


Fig. 2-2-94 (2) Geochemical Anomaly Map in the Area to the East of Arica (Ag)

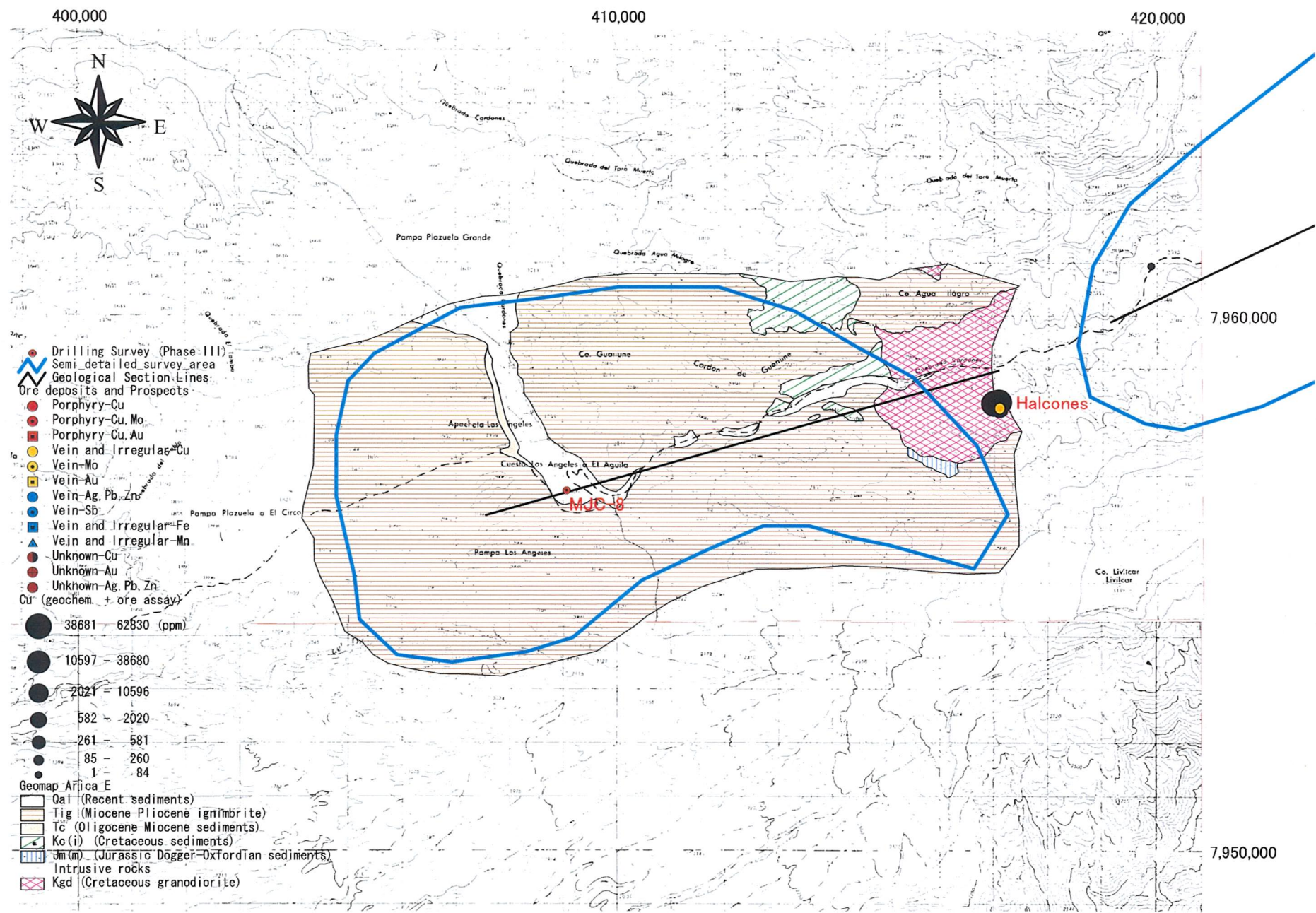


Fig. 2-2-94 (3) Geochemical Anomaly Map in the Area to the East of Arica (Cu)