Chapter 3 Ground truth

3-1 Survey districts and reasons to be selected

1) Phase-1 survey

In the Phase-1, 31 districts were selected for ground truth survey based on the result of the existing data analysis and the satellite image analysis. The location map of the survey districts is shown in Fig. II-3-1-1. There were two reasons for the selection of these districts; the existence of known mineral deposit and the hydrothermal alteration zones extracted by the satellite image analysis. The field survey was intended to comprehend the geology and mineralization in the known deposit areas and in the hydrothermal alteration zones. Especially, in the model mineral deposits area, samples were taken for various laboratory works aiming at clarifying the nature of mineralization and construction of the exploration strategy.

The results of the survey in each district are shown in Table II-3-1-1. Districts that were judged to require follow-up survey in the Phase-2 are the following eleven: Varvarco, Campana Mahuida, Palau Mahuida, Nireco, La Voluntad, El Bolson, Condorcanqui, Epuyen, Lago Colila, Cerro Gonzalo and Arroyo Cascada. Five districts, Andacollo, Huemules, Joya del Sol, Cerro Colorado and Cerro Blanco, were judged that the potential already had been proven by mining production or exploration of ore deposits, and therefore were not included in the Phase-2 survey.

2) Phase-2 survey

In the Phase-2, follow-up survey was conducted for nine of the eleven districts selected in the Phase-1. In addition, seven new districts were added to the subject of the survey based on the results of the existing data analysis and the satellite images analysis that were made in the Phase-2. Location map of these 16 districts in total are shown in Fig. II-3-1-2, and the summaries of these districts are shown in Table II-3-1-2. Fig. II-3-1-3 to II-3-1-9 show the distribution of alteration zones extracted in each district from satellite image analysis in the Phase-2.

The field survey was intended to comprehend the geology and mineralization in the known deposit areas and in the hydrothermal alteration zones. Especially, efforts were made to comprehend the conditions of the follow-up districts more precisely than in the Phase-1. Samples were taken for various laboratory works that were considered necessary.

Among eleven districts selected in the Phase-1, El Bolson and Lago Cholila districts were not included in the follow-up survey because access to the former was difficult and the landowner's agreement on entrance could not be obtained for the latter.

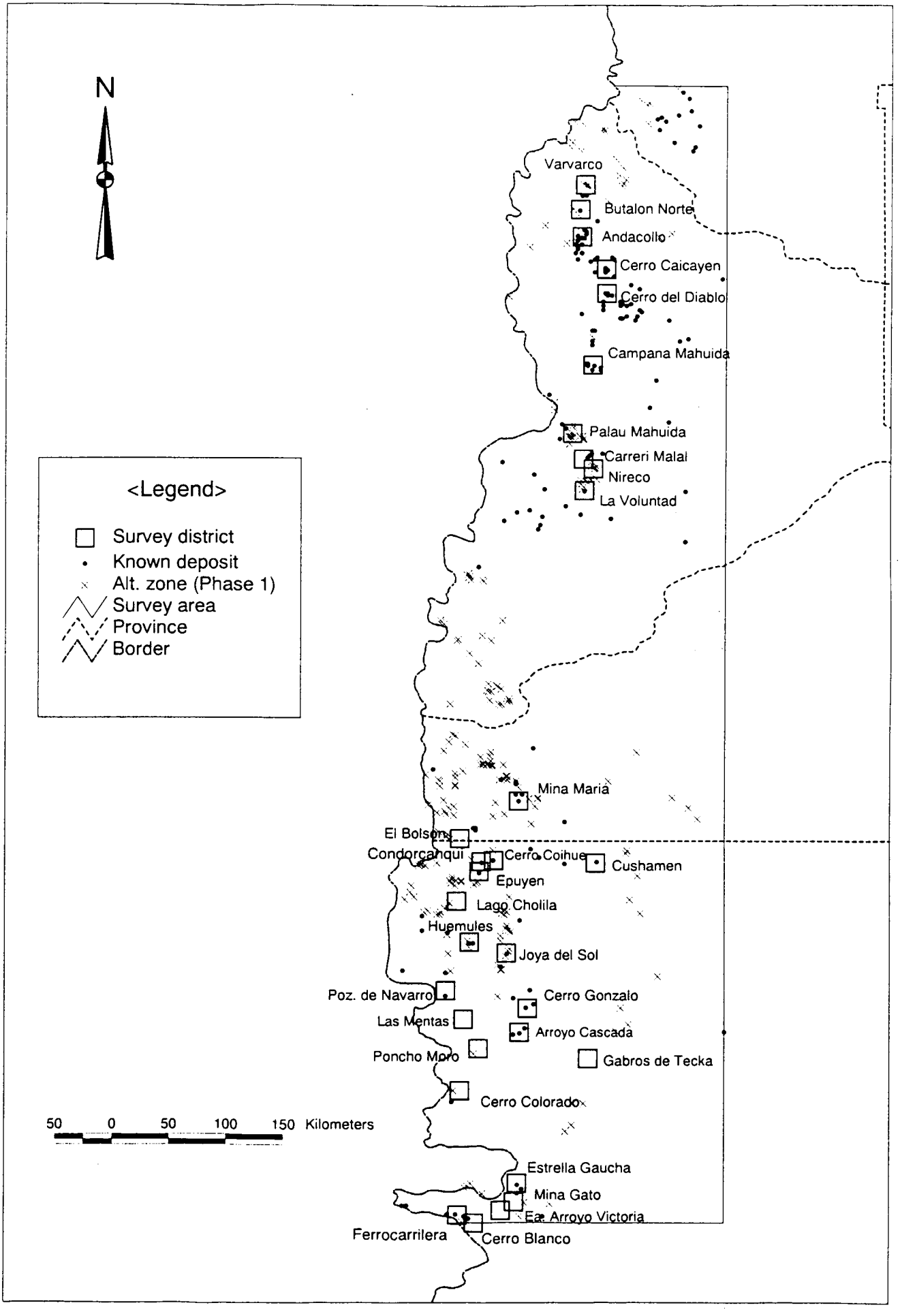


Fig. II-3-1-1 Location map of the Phase 1 ground truth survey districts.

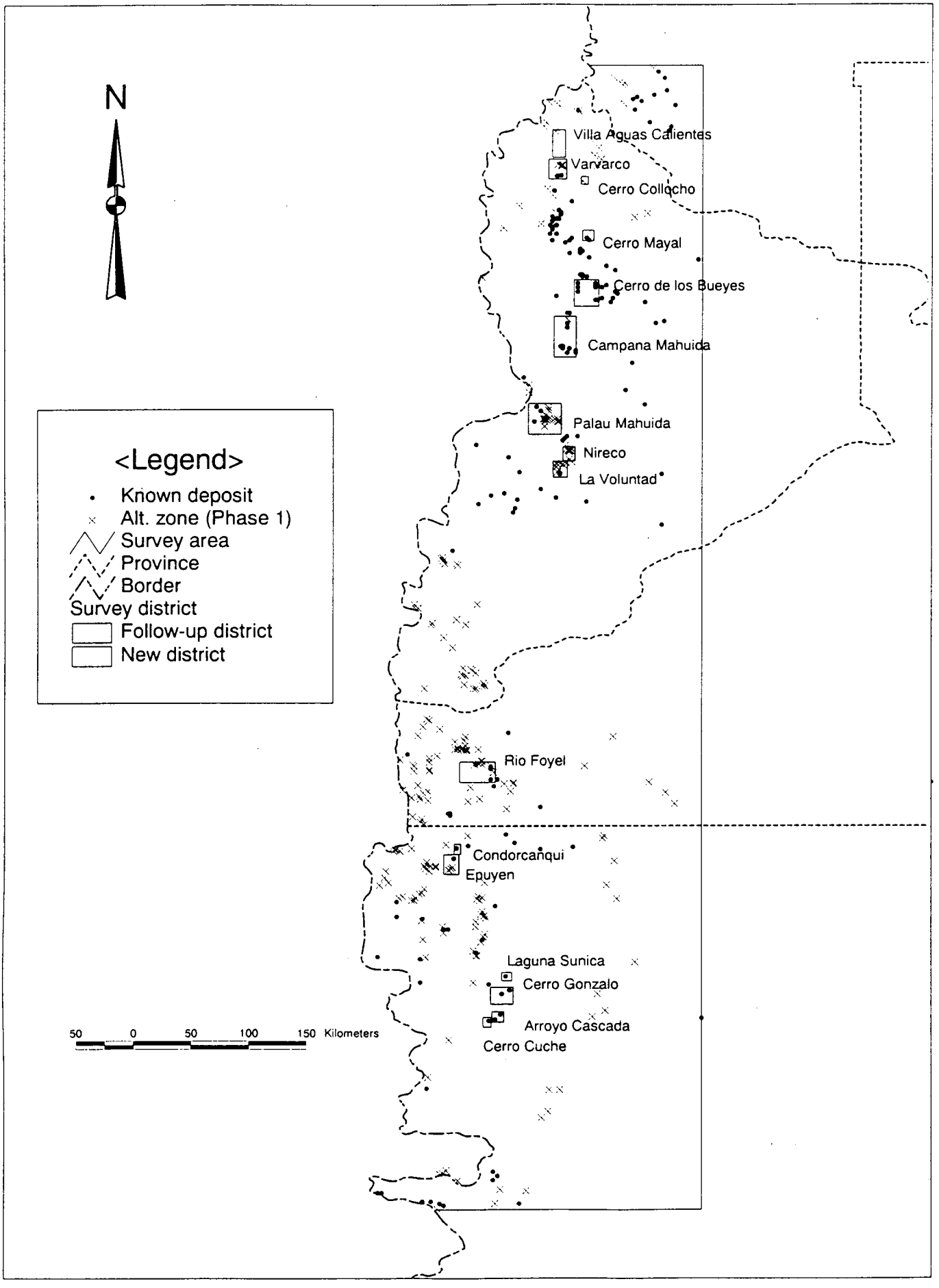


Fig. II-3-1-2 Location map of the Phase 2 ground truth survey districts.

Table II-3-1-1 Phase 1 ground truth survey conclusions (2).

No.	Disrict	Locality	Reason	Access	Topography	Vegitation	Unit	Formation	Rock	Intrusive	Fault	Lineament (TM)	Alt. zone (TM)	Alteration	Known deposit	Result	Conclusion	Phase-2 survey
18	Huemules	Huemules Sur	Known mineral occurrence	Car	Mountains	None	JBa	Cañadón Huemules Fm.	Andesite	Basalt, Andesite	NW	NNW~NNE	LM014-015	Silicification	Huemules (Au-Ag-Basemetals vein)	0.12 to 4.11 g/t Au for vein ore of the Huemules deposots.	Ore reserves had been calculated. Potentiality had been already proved.	×
19	Joya del Sol	Joya del Sol	Alteration zone from TM image, Known mineral ocurrence	Car	Mountains	Thin, Rare	JBa	Lago la Plata Fm.	Andesite			NE, NW, N-S	LM022-024	Silicification	Joya del Sol (Auriferous quartz vein)	0.12 to 42.72 g/t Au for vein ore of the Joya del Sol deposots.	Drilling survey by private company is on-going. Potentiality had been already proved.	×
20	Cerro Gonzalo	Cerro Gonzalo-Arroyo Luque	Known mineral occurrence	Car	Hills	Thin	Kg	Cretacous granitoids	Granodiorite porphyry	Granodiorite porphyry		NE		Phyllic, Silicification	Cerro Gonzalo (Breccia pipe), Arroyo Luque (Porphyry Cu)	Maximum 2.57% Cu for oxide ore but 1,655ppm Cu for hypogene mineralization.	More wide area including known mineralized sites should be surveyed in phase-2 to evaluate the potentiality.	○
21	Arroyo Cascada	Arroyo Cascada	Known mineral occurrence	Car	Moderate mountains	Forrest	JBa	Lago la Plata Fm.	Andesite			NW		Silicification	Arroyo Cascada (Epithermal Au?)	4.07 and 13.87 g/t Au for quartz vein and silicified rock of the Arroyo Cascada deposit.	Further survey in phase-2 is necessary to unveil the Au mineralization potentiarity of this district.	○
22	Gabros de Tecka	Gabros de Tecka	Known mineral occurrence	Car	Hills	Thin	Mz	Tecka Fm.	Gabblo	Gabbro		NE, NW, E-W, N-S		None	None	Expected PGM mineralization in gabbro was not confirmed.	Further survey in phase-2 is not necessary to concentrate to other Cu-Au mineralized districts.	×
23	Pozones de Navarro	Pozones de Navarro, Estancia el Triunfo	Known mineral occurrence	Car	Mountains	Forrest	JBa	Lago la Plata Fm.	Andesite	Qz porphyry		NW, N-S		Silicification	Los Pozones (Cu veinlet)	Hydrothermal alteration is not developed. Low grade in Au mineralization.	Observed mineralization lacks promising feature.	×
24	Las Mentas	Las Mentas	Known mineral occurrence	Car, Walk	Moderate mountains	Forrest	JBa	Lago la Plata Fm.	Andesite			NE		Silicification	Las Mentas (Pb vein)	Hydrothermal alteration is not developed. Low grade in Au mineralization.	Observed mineralization lacks promising feature.	×
25	Poncho Moro	Arroyo Pedregoso, Arroyo Poncho Moro	Alteration zone from TM image	Car	Mountains	Forrest	JBa	Lago la Plata Fm.	Andesite			NE, NW	LM032	Floats of silicified rocks and quartz veins	None	Float of quartz vein revealed slight arsenic anomaly.	Unchecked alteration zones in mountains is preferable for phase-2 survey, but it has low priority.	×
26	Cerro Colorado	Co. Colorado, Co. Rinon	Alteration zone from TM image, Known mineral ocurrence	Car, Walk	Mountains	Forest	JBa	Lago la Plata Fm.	Andesite	Porphyrite			N.I.	Silicification	Cerro Colorado (High-sulfidation Au)	Floats of pyrophyllite alteration rocks	Au mineralization was reported and mining concession was claimed by major company. Potentiality had been alrady proved.	×
27	Estrella Gaucha	Estrella Gaucha	Alteration zone from TM image, Known mineral ocurrence	Car, Walk	Hills	Thin	Km, Ka	Apeleg Fm., Devisadero Fm.	Sandstone, Conglomerate, etc.	Basalt		NE, NW	N.I.	Silicification, Argillization	Estrella Gaucha (Kaolinite)	Kaolinite and sericite alterations were confiemed in deifferent places, but anomalous Au-Cu values were not obtained.	Observed mineralization lacks promising feature.	×
28	Mina Gato	Mina Gato	Alteration zone from TM image, Known mineral ocurrence	Car	Hills	Thin	Ka	Divisadero Fm.	Rhyolite etc			NW		Silicification	Mina Gato (Kaolinite)	Kaolinite and sericite alterations were confiemed in deifferent places, but anomalous Au-Cu values were not obtained.	Observed mineralization lacks promising feature.	×
29	Ea. Arroyo Victoria	A. Huemul	Alteration zone from TM image	Car	Mountains	Thin	Km	Apeleg Fm.	Mudstone etc	Granodiorite		NE, NW	N.I.	Silicification	None	Floats of silicified rocks	Observed mineralization lacks promising feature.	×
30	Ferrocarrilera	Ferrocarrilera	Known mineral occurrence	Car	Mountains	Forrest	JBa	Lago la Plata Fm.	Andesite		NW	E-W~WNW		Propylite	Ferrocarrilera (Basemetals vein)	Hydrothermal alteration is not developed. Low grade in Au mineralization.	Observed mineralization lacks promising feature.	×
31	Cerro Blanco	Cerro Blanco	Alteration zone from TM image, Known mineral ocurrence	Car, Walk	Mountains	Thin, Rare	Kim, Ka	Apeleg Fm., Divisadero Fm.	Sandstone, Mudstone, Volcanics	Qz porphyry, Andesite		NW, Circular	N.I.	Silicification, Argillization	Cerro Blanco (Au-Basemetals vein)	Hydrothermal alteration is developed and 1.575 g/t Au was obtained for qz vein.	Au mineralization was confirmed and mining concession was claimed by major company. Potentiality had been alrady proved.	×

N.I. : Not interpreted although color anomaly of hydrothermal alteration is generated on TM ratio image.

Table II-3-1-1 Phase 1 ground truth survey conclusions (1).

No.	Disrict	Locality	Reason	Access	Topography	Vegitation	Unit	Formation	Rock	Intrusive	Fault	Lineament (TM)	Alt. zone (TM)	Alteration	Known deposit	Result	Conclusion	Phase-2 survey
1	Varvarco	Alt. zones, Granite area	Alteration zone from TM image, Known mineral ocurrence	Car, Walk	Hills	Thin	PTR	Choiyoi Fm.	Rhyolite etc	Granodiorite, Tonalite		NE, NW, N-S	CM004-007	Silicification, Pyrophyllite	Varvarco (Au-Ag-Basemetals vein)	64.7±3.2Ma for Tonalite, Pyrophyllite alteration.	Possibility of advanced argillic alteration and/or high sulfidation type mineralization. And Known Au mineralization should be surveyed.	○
2	Butalon Norte	Alt. zones	Alteration zone from TM image, Known mineral ocurrence	Car	Hills	Thin	PTR	Choiyoi Fm.	Andesite	Granodiorite, Tonalite		NE	CM009-010	Silicification	Butalon Norte (Low grade Au)	Sericite-kaolinite alteration in CM010.	No anomalous Au contents of chemical analysis results.	×
3	Andacollo	Mina Sofia, Sur los Maitenes, Arroyo Huaraco, Cero Colo, Alt. zones	Alteration zone from TM image, Known mineral ocurrence	Car	Mountains	Thin	C	Andacollo Group	Mudstone etc	Granite, Dacite porphyry etc	E-W to NE	NE	CM011-013	Sericite, Silicification	Sofia (Au-Ag-Basematals vein) etc	1.71 to 152.85 g/t Au for vein ore of the Sofia mine.	Mining activity is on-going. Potentiality had been already proved.	×
4	Cerro Caicayen	Quebrada del Bronce, Mina Hierro	Known mineral occurrence	Car	Hill	Thin	J	Cuyo Group	Mudstone etc	Granite		NE, NW, N-S		Montmorillonite, Kaolinite	Cerro Caicayen (Porphyry Cu, Replacement)	Hydrothermal alteration in el Bronce stream. Massive Fe in limestone.	No anomalous Cu contents of chemical analysis results.	×
5	Cerro del Diablo	Cerro del Diablo (Cu), Cerro del Diablo (Barite)	Known mineral occurrence	Car, Walk	Mountains	Thin	J	Cuyo Group	Shale, Sandstone, Tuff	Granodiorite		NE, NW		Silicification, Argillization	Cerro del Diblo (Cu dissemination, Barite vein)	Maximum width of sericite-kaolinite alteration is about 20m at Cu mineralized occurrence.	Scale of hydrothermal alteration was no so large. Drilling and geophysics are necessary for further exploration, but these are not available in phase-2.	×
6	Campana Mahuida	Campana Mahuida, Barite veins	Alteration zone from TM image, Known mineral ocurrence	Car	Hills	Thin	J	Cuyo Group	Sandstone etc	Granodiorite, Andesite porphyry		NE	N.I.	Phyllic	Campana Mahuida (Porphyry Cu) etc	Chalcocite enrichment is observed for drilling core.	Porphyry Cu productive area. Existence of undiscoverd deposits are expected.	○
7	Palau Mahuida	Palau Mahuida	Alteration zone from TM image	Horse is necessary	Mountains	Thin	Tα2	Cajon Negro Fm.	Andesite etc			Circular, NE, NW	ZA004-019	Not checked	Arroyo Manzano (Cu, Zn, Fe stockwork)	Only accessibility was checked. Horse is necessary for field survey.	Hydrothermal alteration zones inferred from TM ratio image should be surveyed in phase-2.	○
8	Carreri Malal	Carreri Malal	Known mineral occurrence	Car, Walk 1h	Mountain	Thin	CPg	Permian Granitoids	Granite	Granite		NE, NW	ZA020	Chlorite-Sericite	Carreri Malal (Ag-Basemetals vein)	Hydrothermal alteration is not developed. Low grade in Au mineralization.	Observed mineralization lacks promising feature.	×
9	Nireco	Alt. zones	Alteration zone from TM image	Car, Walk 2h	Hills	Thin	TQB	Campos basalticos de Zapala	Basalt etc			NE, NW, N-S	ZA021-030	Sericite, Kaolinite	None	Distributions of hydrothermal alteration were confirmed, but it is barren for mineralization.	All of alteration zones were not surveyed. Remain shoud be surveyed in phase-2.	○
10	La Voluntad	La Voluntad	Known mineral occurrence	Car, Walk 0.5h	Mountains	Thin	CPg	Permian Granitoids	Granite	Granite		NE, NW	ZA001,035-037	Potasic, Phyllic	La Voluntad (Porphyry Cu)	Previous exploration works proved low grade hypogene mineralization and lack of secondary enrichment.	Unchecked 4 alteration zones in NW part should be surveyed in phase-2.	○
11	Mina Maria	Mina Maria	Known mineral occurrence	Car	Mountains	Thin	Ta1	Ventana Fm.	Andesite		NE		SB073	Propylite	Mina Maria (Ag-Basemetas vein)	Hydrothermal alteration is not developed. Low grade in Au mineralization.	Observed mineralization lacks promising feature.	×
12	El Bolson	Rio Azul, Rio Lindo	Alteration zone from TM image	Car, Walk	Mountains	Forest	Kg	Cretacous granitoids	Granite, Granodiorite	Granite, Granodiorite		NNW, NE, N-S	SB022-024	Floats of silicified rocks	None	Float of granite with pyrite revealed 355ppm Cu.	Unchecked 3 alteration zones in Western part are preferable for phase-2 survey.	○
13	Cerro Coihue	Qda. Baya, Qda. Ferreyro	Known mineral occurrence	Car, Walk	Mountains	Rare	Kg	Cretacous granitoids	Tonalite, Granodiorite, Andesite	Tonalite, Granodiorite, Andesite		NW		Tourmaline, Chlorite, Sericite	Cerro Coihue (Porphyry Cu?)	Weak hydrothermal alteration and maximum 235ppm Cu content were proved.	Observed mineralization lacks promising feature.	×
14	Condorcanqui	Condorcanqui	Known mineral occurrence	Car, Walk 0.3h	Mountains	Forrest	Ta1	Ventana Fm.	Andesite		N-S, E-W	NE, NW		Propylite	Condorcanqui (Chalcopyrite veinlets)	Besides the chalcopyrite mineralization, high-sulfidation system might be expected based on the isotopic data.	Silicified zones repoted in previous works should be surveyed in phase-2.	○
15	Cushamen	Cushamen	Known mineral occurrence	Car, Walk	Moderate hills	Thin	Pc2	Chshamen Fm.	Metamorphic rocks, Granitoids	Tertiary rhyolite				Silicification, Argillization	Cushamen (Molybdenite vein)	Sericite-Kaolinite alteration and maximum 709ppm Mo; 364ppm Cu contents were proved.	Observed mineralization lacks promising feature.	×
16	Epuyen	A. Pedregoso de Epuyen	Alteration zone from TM image	Car	Mountains	Forrest	Ta1	Ventana Fm.	Andesite			NE, NW, N-S	SB081-083	Floats of silicified rocks	Arroyo Pedrgoso (Placer Au)	Float of silicified andesite revealed slight arsenic anomaly.	Unchecked 3 alteration zones in Cordon de Cholila should be surveyed in phase-2 to find the source of placer Au deposit.	○
17	Lago Cholila	A. Pedregoso de Lago Cholila	Alteration zone from TM image	Car	Mountains	Forrest	Kg	Cretacous granitoids	Granite, Granodiorite	Granite, Granodiorite		NE	SB050-057	Floats of brecciated and silicified rock	None	Float of brecciated and silicified rock revealed 2,490ppm Cu.	Unchecked alteration zones in northern mauntains should be surveyed in phase-2 to find the outcrops of Cu mineralization.	○

N.I. : Not interpreted although color anomaly of hydrothermal alteration is generated on TM ratio image.

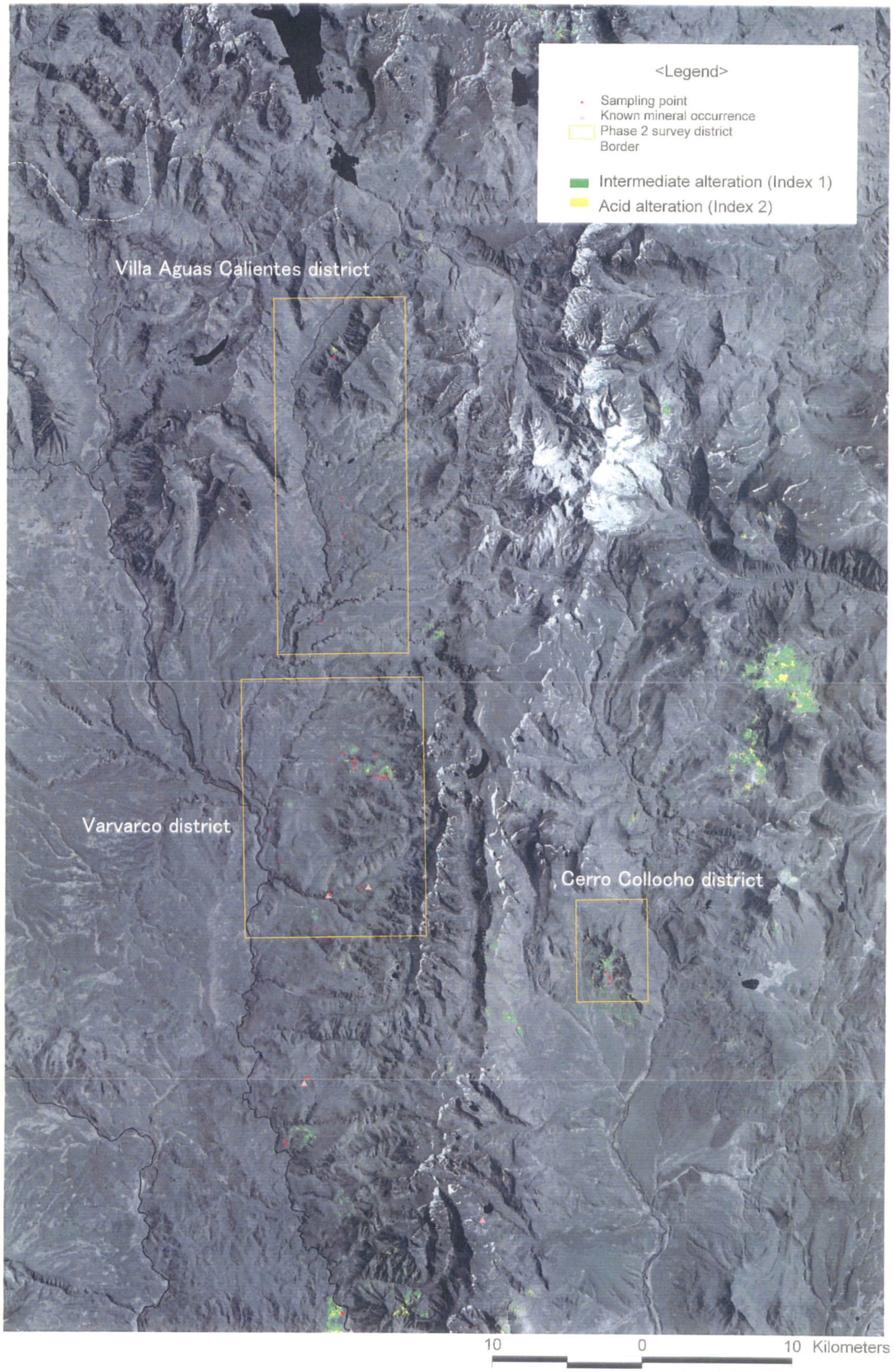


Fig. II-3-1-3 Distribution of alteration zones for the area including the Villa Aguas Calientes, Varvarco and Cerro Collocho districts.

Fig. II-3-1-4 Disrtibution of alteration zones for the area including the Cerro Mayal district.

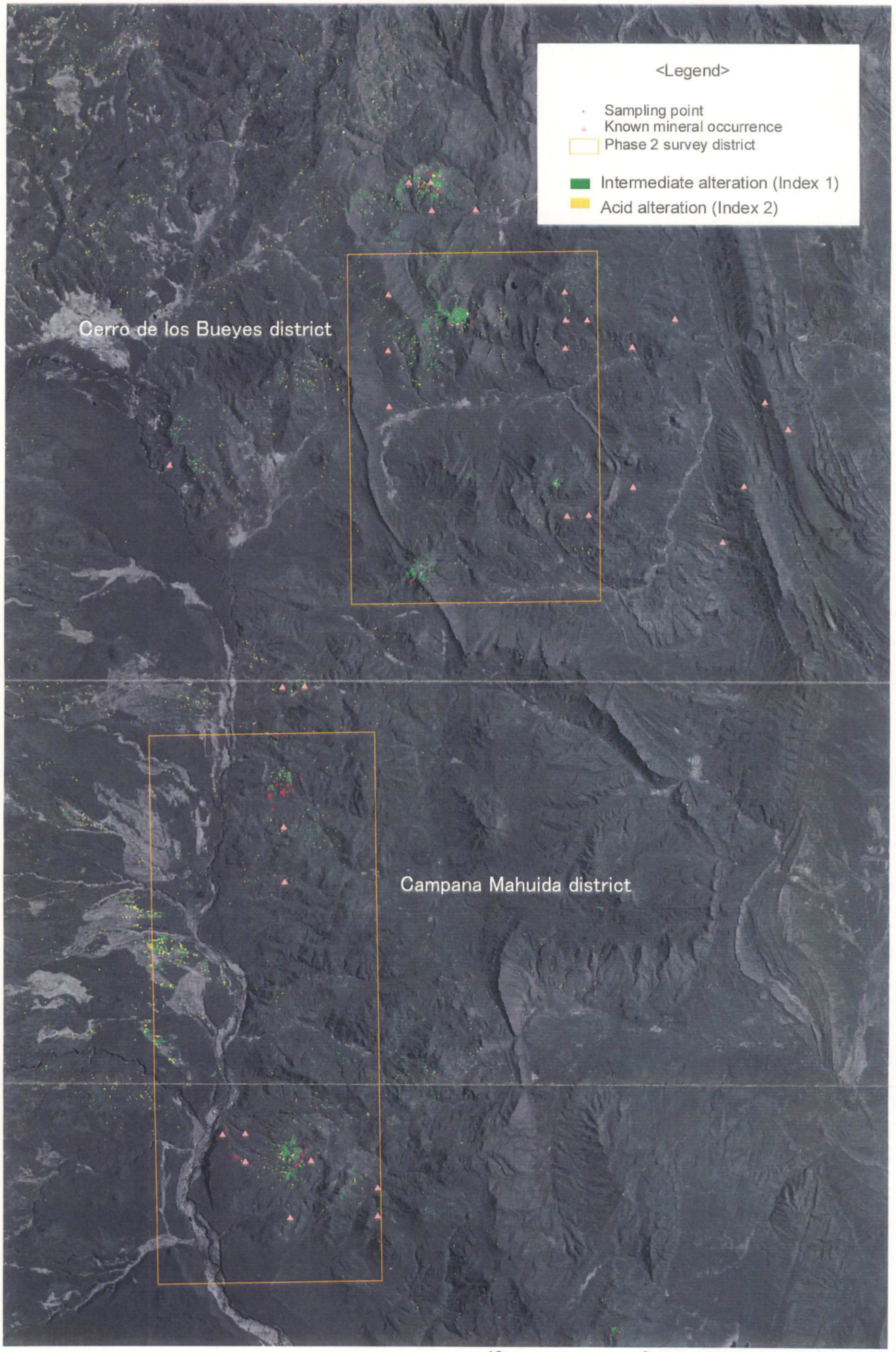


Fig. II-3-1-5 Distribution of alteration zones for the area including the Cerro de los Bueyes district and the Campana Mahuida district.

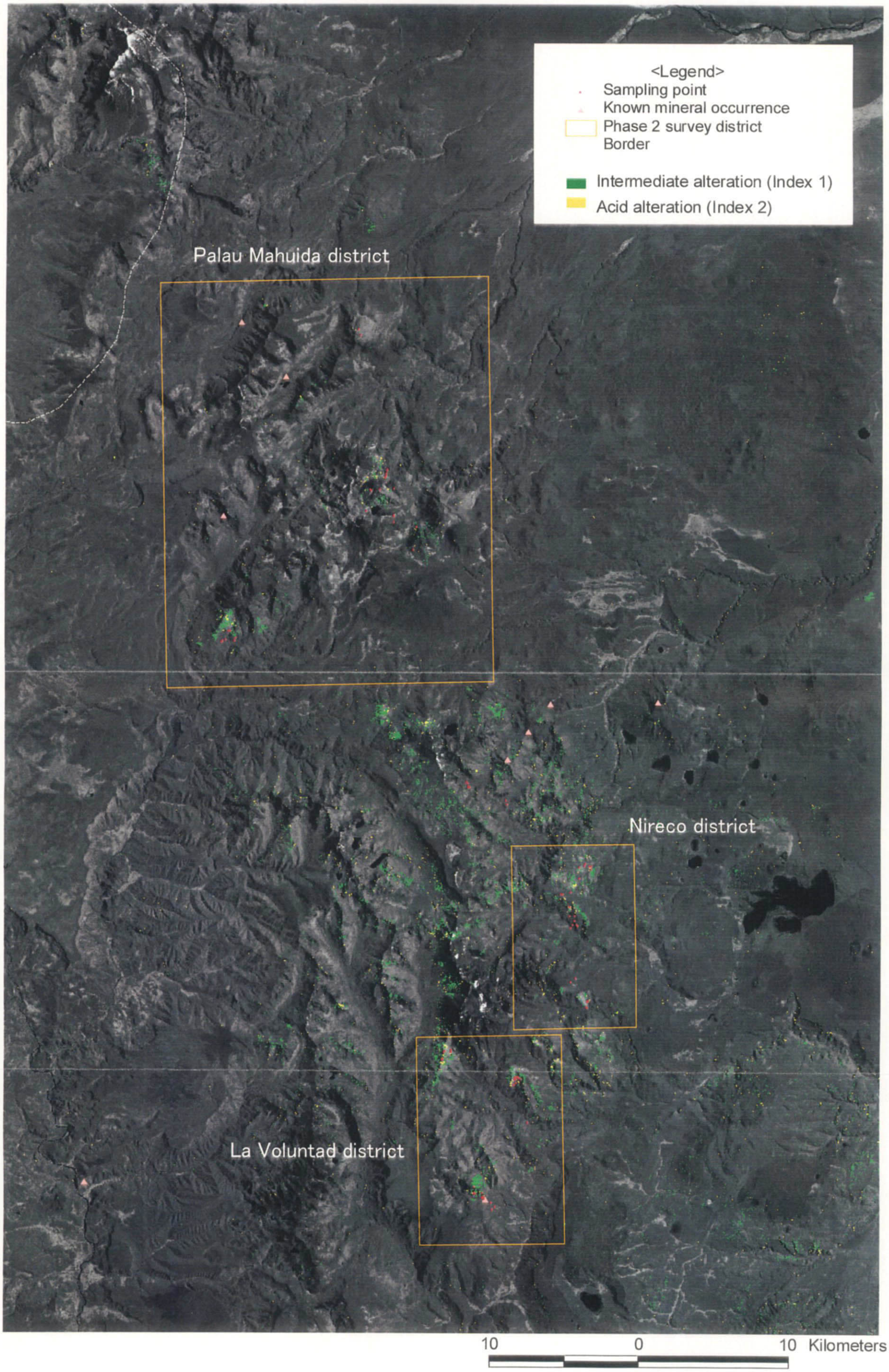


Fig. II-3-1-6 Distribution of alteration zones for the area including the Palau Mahuida, Nireco and La Voluntad districts.

Fig. II-3-1-7 Disrtibution of alteration zones for the area including the Rio Foyel district.

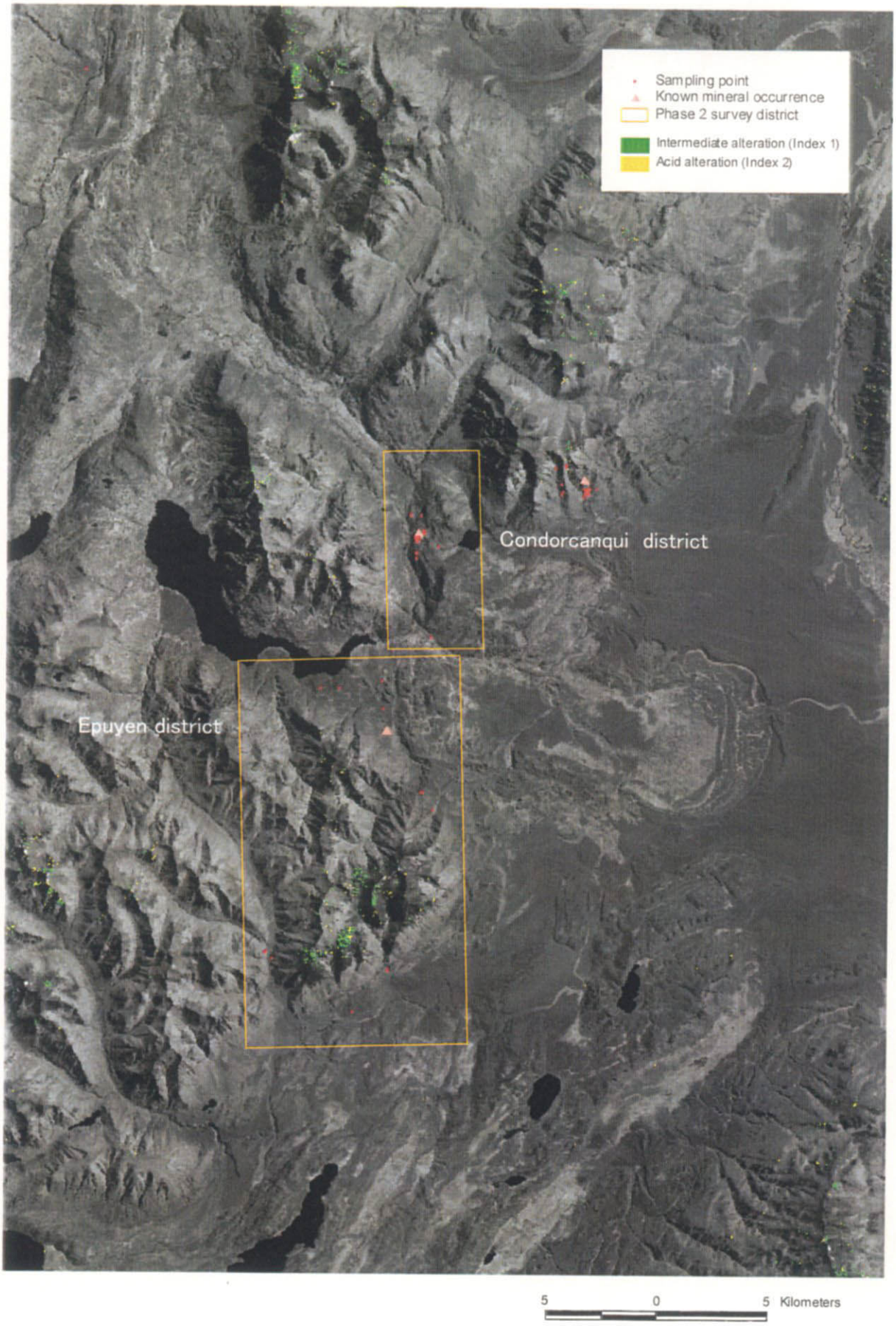


Fig. II-3-1-8 Disrtibution of alteration zones for the area including the Condorcanqui district and the Epuyen district.

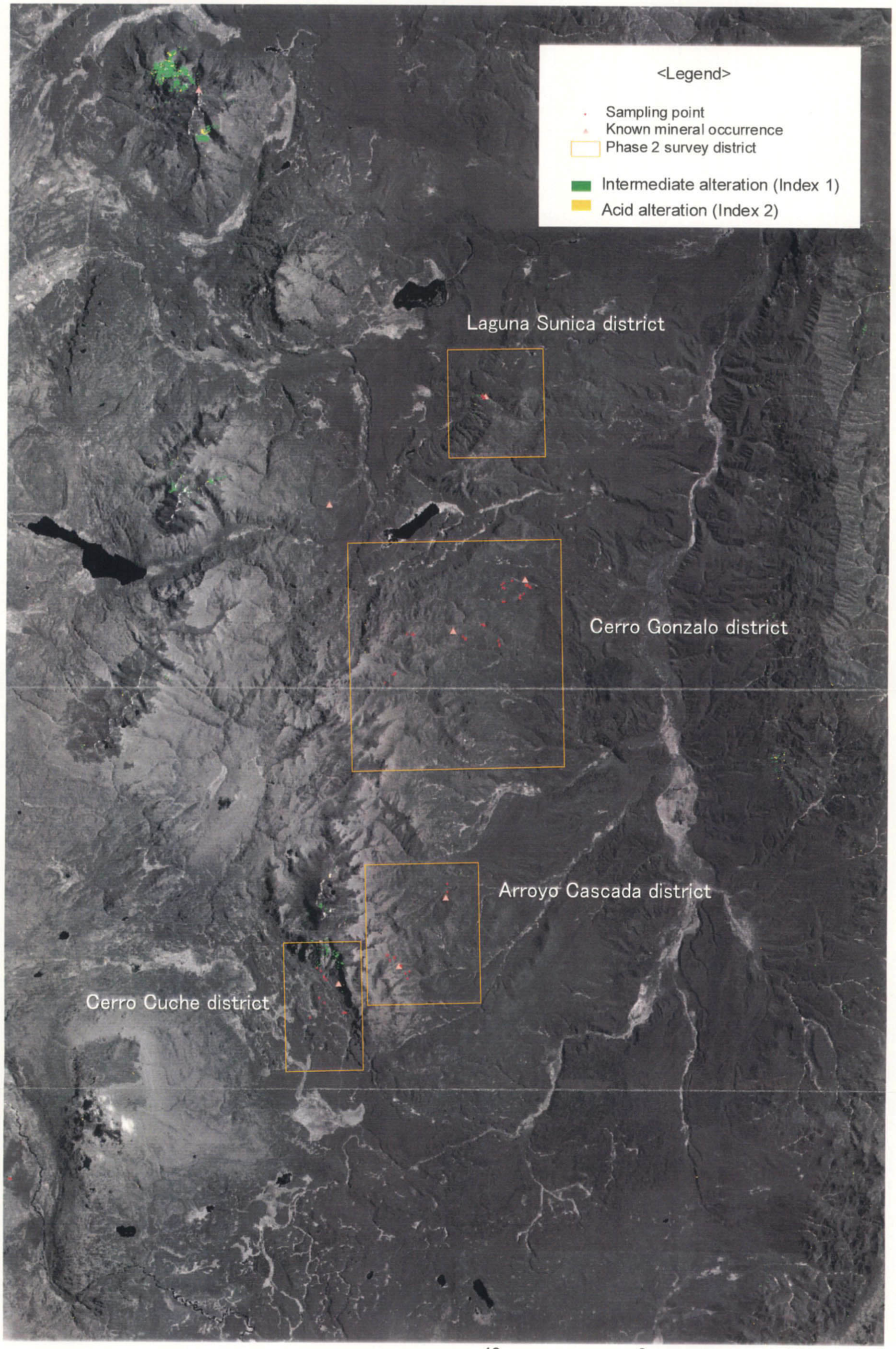


Fig. II-3-1-9 Distribution of alteration zones for the area including the Laguna Sunica, Cerro Gonzalo, Arroyo Cascada and Cerro Cuche districts.

Table II-3-1-2 Phase 2 ground truth survey districts and reasons to be selected.

No.	Survey district	Survey site	Unit	Category	Reason to be selected	Mineralization type	Lineament	Alteration (Phase 1)	Alteration (phase 2)	NE corner	SW corner
1	Villa Aguas Calientes	Alteration zones near ML013, Arroyo Ailinco-Arroyo Atreuco	Tα2	New district	Geothermal alteration zones, Au anomalies of stream sediments, alteration zones from satellite image			ML013	Neutral, acid	S36°30'36", W70°34'12"	S36°43'12", W70°40'12"
2	Varvarco	Alteration zones along Arroyo Auquen, Varvarco (Mina Santos, Mina Santos West)	PTR	Follow-up district	Known Au mineralization, alteration zones	Vervarco (Au-Cu vein)	NE, NW, N-S	CM004-007	Neutral, acid	S36°44'24", W70°33'36"	S36°53'24", W70°41'24"
3	Cerro Collocho	Cerro Collocho	JK	New district	Alteration zones from satellite image		NE	CM008	Neutral, acid	S36°52'48", W70°23'24"	S36°56'24", W70°27'00"
4	Cerro Mayal	Cerro Mayal	JK	New district	Known Au mineralization	Cerro Mayal (Au vein)			Acid	S37°17'24", W70°21'00"	S37°22'12", W70°25'48"
5	Cerro de los Bueyes	Cerro de los Bueyes, El Espinal, Cerro los Potreritos	JK	New district	Alteration zones from satellite image	Cerro de los Bueyes (Cu-Barite vein)	NE		Neutral, acid	S37°40'48", W70°18'36"	S37°52'48", W70°30'00"
6	Campana Mahuida	Campana Mahuida, Pino Andino, alteration zones near Loncopue	JK	Follow-up district	Porphyry Cu productive area, alteration zones from satellite image	Campana Mahuida, Pino Andino (Porphyry Cu)	NE, NW, NWW	CM015	Neutral, acid	S37°57'36", W70°28'48"	S38°17'24", W70°39'00"
7	Palau Mahuida	Cerro Cochico, ZA004, ZA007, ZA008	Tα2	Follow-up district	Alteration zones from satellite image		NE, NW, Circular	ZA004, 007-008	Nuetral, acid	S38°39'36", W70°35'24"	S38°54'00", W70°51'00"
8	Nireco	ZA021, ZA022, ZA023	PTR	Follow-up district	Alteration zones from satellite image		NE, NW	ZA021-023	Neutral, acid	S39°00'00", W70°29'24"	S39°06'36", W70°34'48"
9	La Voluntad	ZA001, ZA032, ZA034	PTR	Follow-up district	Alteration zones from satellite image	La Voluntad (Porphyry Cu)	NE, NW	ZA001, 032, 034	Neutral, acid	S39°07'12", W70°32'24"	S39°14'24", W70°39'36"
10	Rio Foyel	Quilin Mahuida, Cerro Carrera (SB068), Cerro Carrera east, Rio Foyel west	Tα1	New district	Placer Au area, alteration zones from satellite image	Rio Foyel (Placer Au)	N-S, NE	SB068	Nuetral, acid	S41°28'48", W71°06'00"	S41°38'24", W71°22'48"
11	Condorcanqui	Condorcanqui	Jm	Follow-up district	Known Cu mineralization, noticeable S isotope data	Condorcanqui (Manto type Cu)	NE, NW			S42°07'48", W71°22'12"	S42°12'36", W71°25'12"
12	Epuyen	Cordon de Cholila	Jm	Follow-up district	Placer Au area, alteration zones from satellite image	Arroyo Pedregoso (Placer Au)	NE, N-S	SB081-083	Neutral	S42°12'54", W71°22'48"	S42°22'12", W71°30'00"
13	Laguna Sunica	Laguna Sunica	Tα1	New district	Alteration zones from satellite image	Laguna Sunica (Cu-Au Vein)	NE		Neutral	S43°08'24", W70°58'12"	S43°12'36", W71°03'00"
14	Cerro Gonzalo	Sector 1 (Arroyo Luque), Sector 2-6	Kg	Follow-up district	Porphyry Cu productive area	Cerro Gonzalo (Porphyry Cu)				S43°15'36", W70°57'36"	S43°23'24", W71°08'24"
15	Arroyo Cascada	Arroyo Cascada, Princess	Jβa	Follow-up district	Known Au mineralization	Arroyo Cascada (Au vein)	N-S			S43°27'00", W71°0148"	S43°31'48", W71°07'48"
16	Cerro Cuche	Cerro Cuche	Jβa	New district	Alteration zones from satellite image	Cerro Cuche (Porphyry Cu)	NW		Neutral	S43°30'00", W71°07'48"	S43°34'12", W71°11'24"

3-2 Survey results for each district

3-2-1 Villa Aguas Calientes district

1) Location

This district is located about 100 km north of Andacollo town in the northwest of Neuquen province (Fig. II-3-1-2). The area is lat. 36° 30' 36" S to 36° 43' 12" S and long. 70° 34' 12" to 70° 40' 12" W, and 255 km^2. The Representative coordinate is lat.36° 37' 00" S and long. 70° 37' 00" W (Fig. II-3-2-1).

In this district, an alteration zone in the northwestern side of Sierra de la Puntilla was extracted by the Phase-2 satellite image analysis (Fig. II-3-2-2). Besides, a small alteration zone was confirmed at downstream of Arroyo Ailinco which is a upstream branch of Rio Varvarco, and outcrops of quartz veins were observed at downstream of Arroyo Manchana Covunco and Arroyo Atreuco.

2) Topography and vegetation

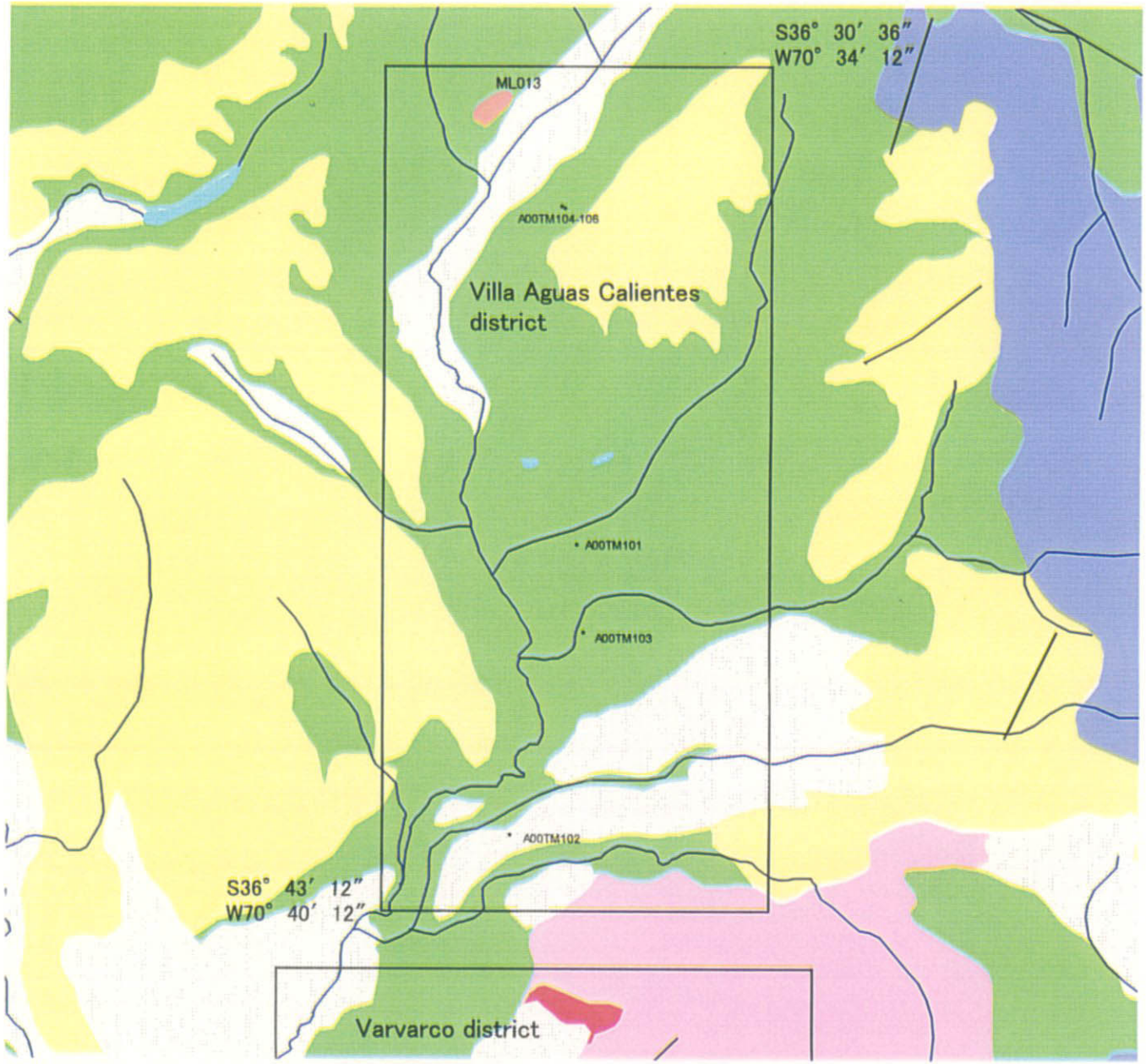
This area is located mainly on the left bank of Rio Varvarco, an upstream branch of Rio Neuquen. Volcano Domuyo (4,702 m above sea level), the highest mountain in Neuquen province is located in northeastern outside of this district. The northern part of this district is rather steep where the Sierra de la Puntilla with Cerro La Puntilla (2,940 m above sea level) is located. From the central to southern parts, moderate hills continue, but the rivers are intensely eroded to form steep cliffs.

In the flooded fields along the banks, bushes are seen partially, but vegetation is not thick on the whole. On the moderately sloped hillsides, thorny shrubs less than one meter high make "earth hummocks" (about 2 meters in diameter) indigenous to cold districts.

3) Access

Traveling northward about 70 km from the Andacollo town on No. 43 provincial road will reach the Varvarco village via the Las Ovejas village (about 1.5 hours by car). This road, although unpaved, is well maintained up to the Las Ovejas village and allows cars to drive at high speeds. Access from the Varvarco village to the Arroyo Atreuco at the southern limit of this district is possible within 0.5 hours.

Access to the small alteration zone at downstream Arroyo Ailinco and to the outcrops of quartz veins at downstream of Arroyo Manchana Covunco and downstream of Arroyo Atreuco is quite easy because they are located along No. 48 provincial road. The alteration zone in the northwest of Sierra de la Puntilla is on the left bank of Rio Varvarco, and No. 48 provincial



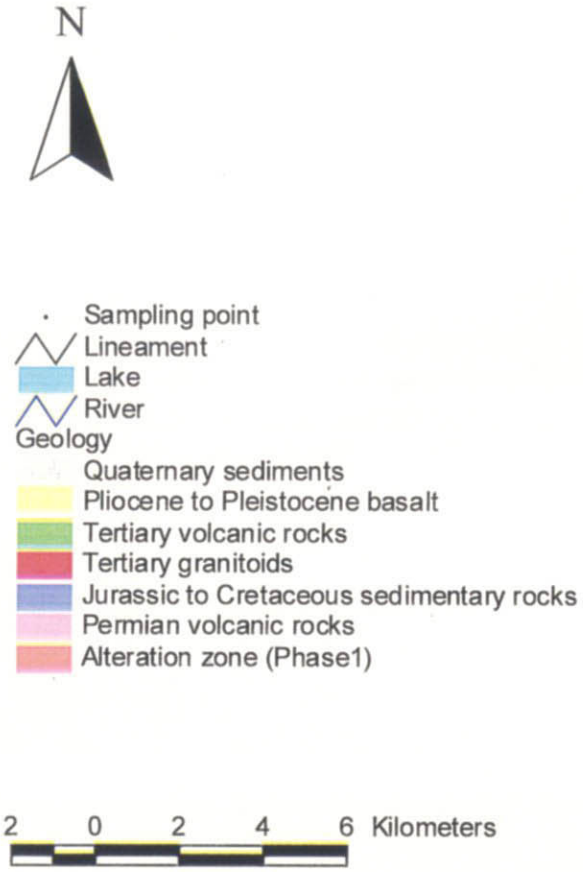


Fig. II-3-2-1 Geological map with sampling points of the Villa Aguas Calientes district.

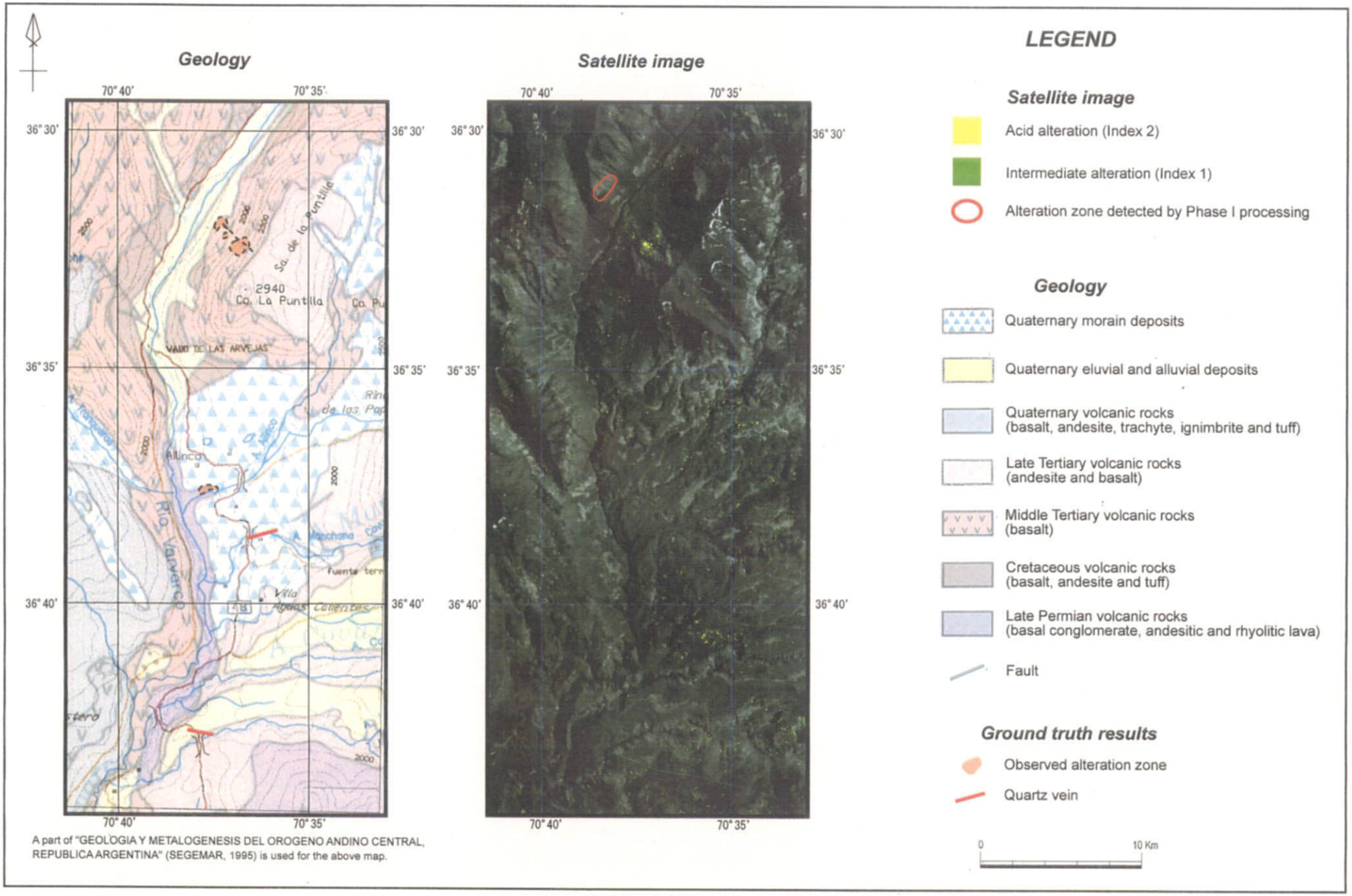


Fig. II-3-2-2 Satellite image and ground truth results in the Villa Aguas Calientes district

road in this neighborhood runs on the right bank of Rio Varvarco, so access requires crossing the river.

On November 23 when the field survey was conducted, the survey was made on foot from a point about 5 km ahead of the Ailinco village to the alteration zone because No. 48 provincial road was partially damaged by heavy snowfall and melting snow.

4) Previous surveys

Although the central to southern part of this district was included in the geothermal resource exploration (JICA, 1984), mineral resource exploration has not been known.

5) Mining properties

No mining property has been established.

6) Geology and geological structure

According to "Geologia y Metalogenesis del Orogeno Andino Central" (Mendez et al., 1995), the geology of this district, in ascending order, consists of Choiyoi volcanic rocks that are volcanic complex of the Permian to Triassicin Gondwana period, Abanico volcanic rocks belonging to volcanic complex of the Cretaceous Euandinico period, Palaoco volcanic rocks that are volcanic complex of the Tertiary Pehuenchico period, volcanic complex of the Quechuico period, and glacial sediments, alluvium and diluvium of the Quaternary.

Choiyoi volcanic rocks are made up of basal conglomerate, andesitic rocks, rhyolitic rocks and tuff, and are distributed along Rio Varvarco, which is topographically the lowest in the southern part of this district. Abanico volcanic rocks of the Cretaceous are composed of basaltic rocks, andesitic rocks and tuff, and are distributed along Rio Varvarco in the northern part of this district. Palaoco volcanic rocks of the Tertiary Pehuenchico period are made up of basaltic rocks and form a mountain mass in the northern part of this district. Volcanic complex of the Quechuico period are composed of basaltic rocks and andesitic rocks, and are widely distributed mainly around Arroyo Covunco and in the upper part of the northern mountain mass. The Quaternary glacial sediments fill up low ground spreading from the downstream of Arroyo Manchana Covunco to Arroyo Ailinco. The Quaternary alluvium and diluvium mainly cover the hill spreading from Arroyo Atreuco to Arroyo Manchana Covunco.

On the other hand, according to the geological map by JICA (1984) that includes the central southern part of this district, granodiorite porphyry, which is the basement, is distributed as window along the downstream of Rio Varvarco and Arroyo Manchana Covunco. Hornfels schist is observed as the basement in the midstream of Arroyo Manchana Covunco, while sedimentary rocks of Chacay, Auquilco and Tordillo formations of the Jurassic are

widely distributed upstream. Granodiorite porphyry, which is intrusive rock, is distributed in the upstream of Arroyo Atreuco (outside the area) in a small scope. In Cerro Las Papas on the right bank up Arroyo Manchana Covunco, andesite dykes of the new period intruding into andesitic rocks of the Pliocene to the Pleistocene are observed.

Andesite lava (volcanic complex of the Tertiary Pehuenchico period) is distributed on the northwestern side of Sierra de la Puntilla where presumed alteration zones from Phase-2 satellite image analysis are concentrated. In the higher part than this place, volcanic clastic rocks (volcanic complex of the Quenchuico period) such as white tuff are distributed, while basalt lava (volcanic complex of the Quechuico period) is distributed around the mountaintop in the higher part. Diorite porphyry was observed near the entrance of the valley.

7) Mineralization and alteration

In places of presumed alteration zone on the left bank up Rio Varvarco about 1.5 km north-northwest from Cerro La Puntilla and on the slope in the northwestern part of Sierra de la Puntilla, weak limonitization and dissemination of fine-grained pyrite are observed in andesite lava (volcanic complex of the Tertiary Pehuenchico period) and diorite porphyry intruding into andesite. However, Cu mineralization, etc. are not observed. It was confirmed that the area, where alteration was presumed, is zone with neutral argillization and weak limonitization. This alteration also affects volcanic clastic rocks (volcanic complex of the Quechuico period) such as white tuff.

A small mountain of several ten meters is seen down Arroyo Ailinco and shows a distinctly white color even from a distant view. As a result of the survey, the small mountain is found to be composed of neutral clay deposit containing andesitic fragments. It is supposed that the clay was moved from alteration zones in the upstream area and accumulated again.

In granite exposed along Arroyo Manchana Covunco, a network zone of quartz veinlets is observed. This zone extends along the valley, and similar outcrops are also observed about 50 m upstream. Quartz veins forming the network are less than 10 cm in width and are made up of drusic quartz. The width of the network zone is 3.0 m. Granite that is the host rock contains potassium feldspar and is middle-grained granodiorite slightly chloritized. According to the geological map of JICA (1984), this granodiorite is included in basement.

In Arroyo Atreuco, a quartz veinlet (width: 1 to 5 cm) is observed in granite which intrudes into an andesite dyke of about 3.0 m in width. This quartz veinlet is further cut by a sheet-shaped young andesite dyke (maximum width 1.0 m).

8) Characteristics of the satellite image

As alteration zones presumed from ratio composite images in the Phase-1, ML013 was extracted on the right bank of Rio Varvarco in the northern part of this district. The

alteration zone was not confirmed in a distant view.

Presumed alteration zones from spectral pattern analysis in the Phase-2 are distributed on the slope of the northwestern part and the southwestern mountain foot in Sierra de la Puntilla, around the area from the midstream of Arroyo Ailinco to the midstream of Arroyo Manchana, and on the hill on the right bank side of Arroyo Covunco. Among these areas, alteration zones concentrate on a small scale but most densely (the largest size of about 0.02 km^2) in the left bank up Rio Varvarco about 1.5 km north-northwest from Cerro La Puntilla on the northwestern side of Sierra de la Puntilla. As mentioned above, alteration zones were confirmed almost in this area from the results of the field survey. Other areas where alteration is presumed are sporadically located, and it is considered that the possibility of alteration zones is low.

On the other hand, areas where alteration is presumed from spectrum pattern analysis are not observed near small-scale alteration zones, which have been confirmed, in the field survey down Arroyo Ailinco.

9) Laboratory work results

The powdery X-ray diffraction was applied for gray andesite with argillization (A00TM104) and white andesite with argillization (A00TM105). Both were collected in a small-scale alteration zone on the northwestern side of Sierra de la Puntilla. As a result, albite, pyrite, sericite and a small amount of chlorite were identified in A00TM104, while albite, sericite, montmorillonite and jarosite were identified in A00TM105. As a result of chemical analysis of these samples, no particular values were obtained for any elements. As a result of the microscopic observation, porphyritic andesite without alteration (A00TM106) was identified as hypersthene bearing hornblende andesite affected by alteration of chlorite and calcite.

Concerning white argillized sediments (A00TM101) in the downstream of Arroyo Ailinco, montmorillonite and a small amount of sericite were identified as a result of the X-ray diffraction.

As a result of chemical analysis for channel samples (A00TM102, width: 2.0 m) taken in the network quartz veins zone along Arroyo Manchana Covunco and the quartz veinlet (A00TM103, width: 2 cm) in Arroyo Atreuco, these were proven to be barren quartz veins with low values of Au and Ag. Fluid inclusion study for quartz of the latter (A00TM103) indicated a homogenization temperature of 239℃ and salinity of 14 wt %.

10) Assessment

It is judged for the following reasons that the alteration zone on the northwest side of Sierra de la Puntilla have a low possibility that exploitable metal resources exist: the scale of

alteration zone is extremely small; alteration minerals related to porphyry deposits are poor; the metal content is low; these alteration zone is located in the marginal part of Villa Aguas Calientes geothermal zone; and, alteration is considered to have accompanied the young geothermal system because alteration extends to the Tertiary volcaniclastic rocks.

Both the network quartz veins zone along Arroyo Manchana Covunco and the quartz veinlet in Arroyo Atreuco are barren in content of metals such as gold. Therefore, these are judged to have a low possibility that exploitable metal resources exist.

3-2-2 Varvarco district

1) Location

This district is located about 40 km north of Andacollo town in the northwest of Neuquen province (Fig. II-3-1-2). The Varvarco village is situated in the southwest of this district. The area is lat. 36° 44' 24" to 36° 53' 24" S and long.70° 33' 36" to 70° 41' 24" W, and about 260 km^2. The representative coordinate is lat. 36° 49' 00" S and long. 70° 39' 00" W (Fig. II-3-2-3).

In this district, a relatively large presumed alteration zone extracted by satellite image analysis is distributed on both banks at midstream Arroyo Auquen. The Arroyo Auquen mineral occurrence is located at downstream of Arroyo Auquen. The Mina Santos and unnamed mineral occurrence are located on the right bank of Arroyo Gruaraco Norte, which is a branch of Rio Neuquen, in the east to the southeast of the Varvarco village. Unnamed mineral occurrence is named Mina Santos West in this survey.

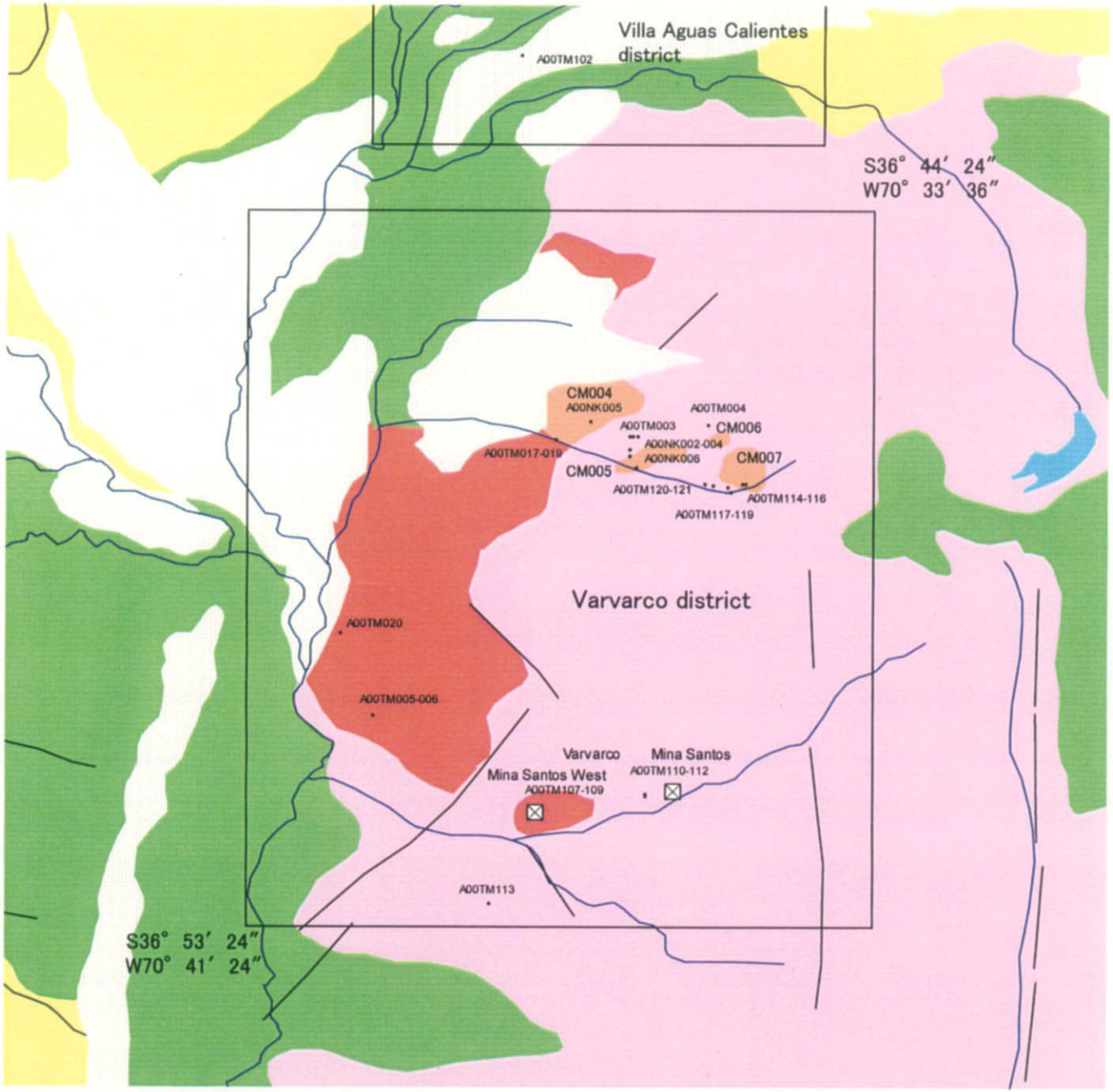
2) Topography and vegetation

Since this district is situated on the western side of Cordillera del Viento, the eastern half of this district is relatively steep rocky mountains, while the western side is made up of fairly moderately sloped hills. Erosion has progressed in the streams of Arroyo Auquen etc. to form steep cliffs. In the western moderately sloped hillsides, short shrubs form numerous earth hummocks.

3) Access

Traveling northward about 70 km from the Andacollo town on No. 43 provincial road will reach the Varvarco village via the Las Ovejas village (about 1.5 hours by car). This road, although unpaved, is well maintained up to the Las Ovejas village and allows cars to travel at high speeds.

Because No. 48 provincial road to the north from the Varvarco village is only road accessible by car, access to the above-mentioned mineral occurrences is by riding on



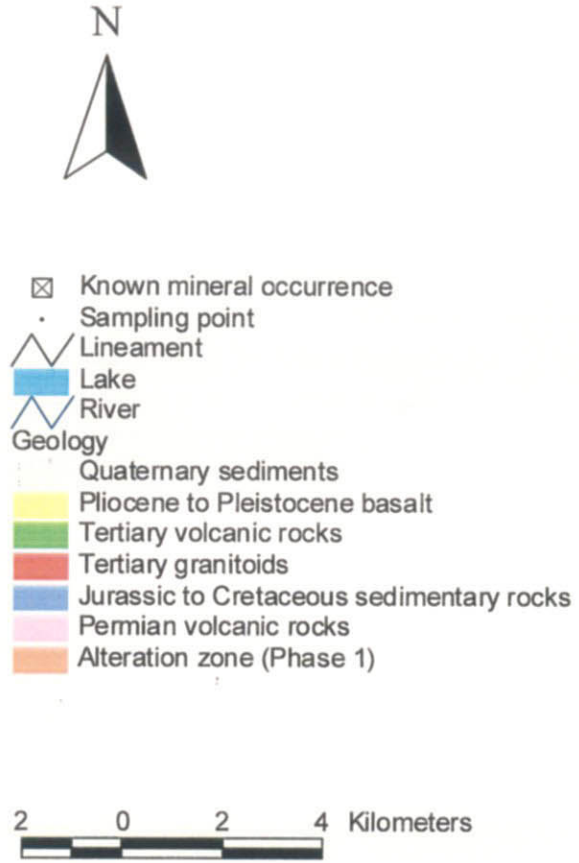
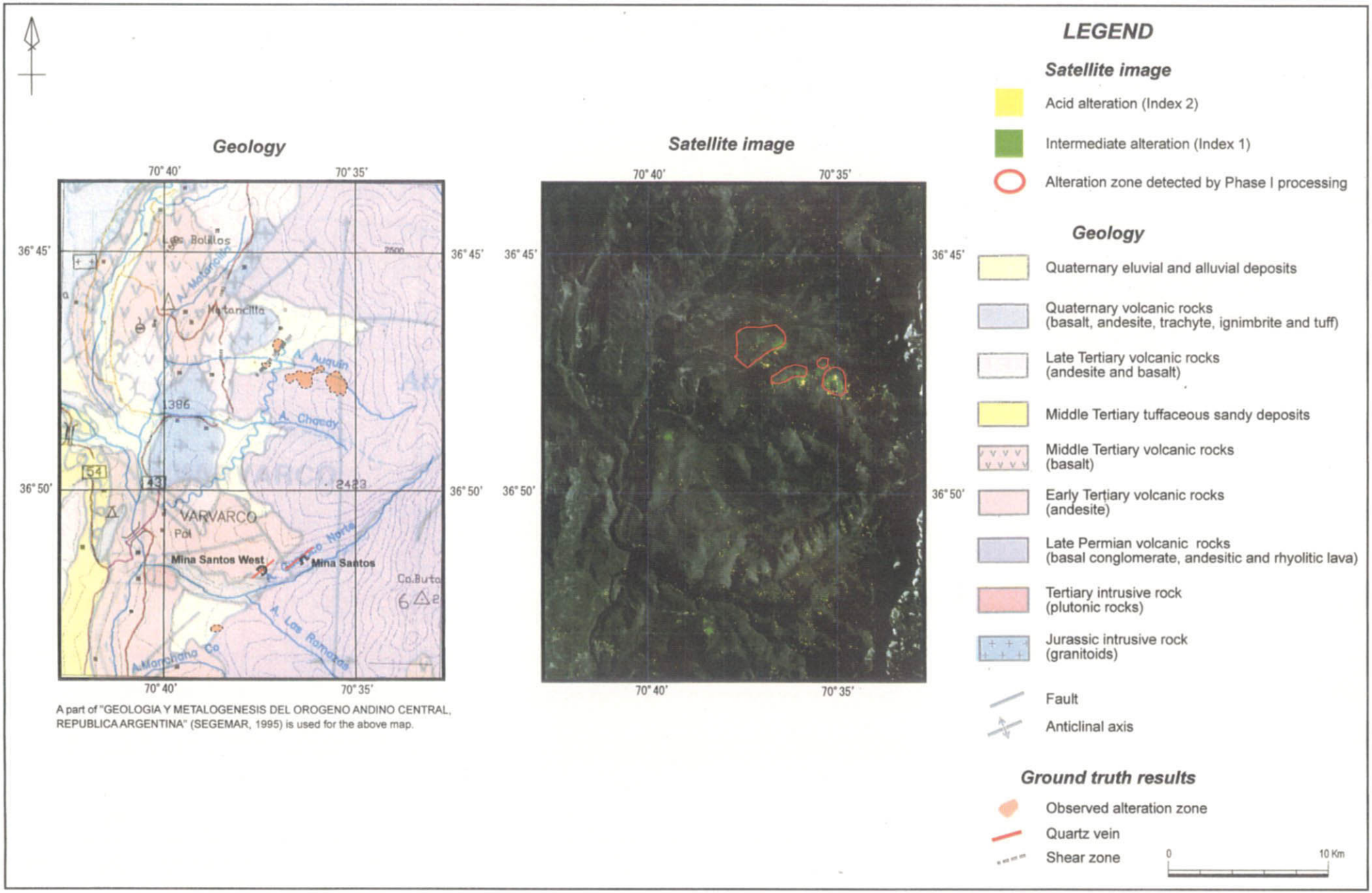


Fig. II-3-2-3 Geological map with sampling points of the Varvarco district.



A part of "GEOLOGIA Y METALOGENESIS DEL OROGENO ANDINO CENTRAL, REPUBLICA ARGENTINA" (SEGEMAR, 1995) is used for the above map.

Fig. II-3-2-4 Satellite image and ground truth results in the Varvarco district

horseback or walking on foot.

4) Previous surveys

The district was surveyed by SEGEMAR and CORMINE in the past. According to information obtained after the Phase-2 field survey, Rome Resources Ltd. showed interest in this area as "Varvarco Gold Area" in 1998, and they are examining the possibility of exploration, their Canadian consulting company made a preliminary survey in October 2000.

5) Mining properties

A mining property is established by CORMINE S.E.P., the public mining corporation of the Neuquen province.

6) Geology and geological structure

According to "Geologia y Metalogenesis del Orogeno Andino Central" (Mendez et al., 1995), the geology of this district, in ascending order, consists of Neofamatinicas plutonic rocks of basement, Choiyoi volcanic rocks that are volcanic complex of the Permian to Triassic Gondwana period, Molle volcanic rocks that are volcanic complex of the early Tertiary Incaico period, Palaoco volcanic rocks that are volcanic complex of the Tertiary Pehuenchico period, effusive rocks that are volcanic complex of the Quechuico period, the Quaternary diluvium and alluvium, and Sanjorgicas plutonic rocks (Varvarco granitic rocks) that indruded into the Choiyoi volcanic rocks.

Neofamatinicas plutonic rocks of basement is distributed on a small scale in the downstream of Arroyo Guaraco Norte in the southern part of this district. Choiyoi volcanic rocks unconformably overlying the plutonic rocks are made up of basal conglomerate, andesitic rocks, rhyolitic rocks and tuff. These rocks are widely distributed forming a mountain mass on the east side of this district. Molle andesitic volcanic rocks of the Tertiary are distributed in the southwestern part of this district, while effusive rocks of basalt and andesite of the Quechuico period are distributed on hills in the northwestern part. Sanjorgicas plutonic rocks (Varvarco granitic rocks) are distributed in north of Varvarco village and hills area on the left bank of Arroyo Matancilla.

7) Mineralization and alteration

The Varvarco deposit in the valley about 7 km east from Varvarco village is a polymetallic vein and a dissemination ore deposit whose host rock is volcanic rocks of the Choiyoi group and Varvarco granite. The vein is composed of pyrite, chalcopyrite, chalcocite, copper oxide, magnetite, goethite, tetrahedrite, tennantite, galena, sphalerite, native gold, silver mineral, bornite and hematite. As the average values of six ore samples, 16.97 g/t Au,

302.25 g/t Ag, 20,389 ppm Cu, 1,148 ppm Pb and 2,142 ppm Zn was reported. The strike and dip of the vein is N30E and 30 NW. Alterations of propylite, phyllic, potassic, argillization were reported.

Varvarco deposit is actually composed of Mina Santos and Mina Santos West. In Mina Santos deposit on the right bank up Arroyo Guaraco Norte, a branch of Rio Neuquen, gold contained in the limonite had been mined in the past. There are a small-scale trench (NE - SW, about 50 m extension) and an old adit (about 10 m extension) crossing it at almost right angles in granodiorite on the steep slope. The trench is almost buried, and the limonitic zone is not observed possibly because it was worked out. However, at the adit entrance, network quartz veins zone (N40°E, 30°NW) with pyrite dissemination of about 50 cm in the maximum width is observed. In the whole surrounding place, pyrite and quartz vein masses with copper oxides (malachite and azurite) and a small amount of chalcopyrite exist in a pile of exploited material. Granodiorite 2 to 3 m above the old adit has suffered weak propylitic alteration, and granodiorite inside the trench in the upper part of the old adit has suffered gray colored argillization. Downstream, there are places where ore dressing and processing were carried out to obtain gold. (without formal records).

Mina Santos West, is located in the downstream side of Mina Santos. A trench with extension of about 15 m exists in whitened and altered porphyritic granodiorite. As it is buried, the details were not surveyed. In the vicinity, quartz veins with pyrite (maximum diameter of 2 cm) exist sporadically, and silicified rocks are distributed around this old mining area.

Along the Arroyo Auquen, alteration zones of CM004 to 007 are distributed from downstream to upstream. The alteration zone CM004 forms a hill with a comparative differential height of 10 m and tending to the E-W direction. It is made up of schist of the Huaraco formation of the Andacollo group (N20°W, 50°E) with white argillization and Varvarco granitic rocks intruding into schist. Varvarco granitic rocks are distributed at the west end of the hill. Silicified rocks form a lens-shaped ledge of 5 m to 50 m wide tending to the N40°W at an angle somewhat inclined to the schistocity of the Huaraco formation. Around the silicified rocks, limonite concentration is observed. As a result of POSAM measurement, pyrophyllite was identified for the silicified rocks. Monmorillonite was identified for the white argillized rock at the center of the hill. Kaolinite was identified in the agrillized zones around the hill. No sulfide minerals were discovered in this alteration zone. Although veinlets of tourmaline and epidote develop in the Varvarco granitic rocks in contact with the west end of CM004, their relations with the surrounding argillization are not apparent.

The alteration zone CM005 on the downstream of Arroyo Auquen shows strong white silicification and argillization and forms a steep valley. In this alteration zone, a shear zone

whose width is about 200 m is observed in NE-SW direction. Continuation of white silicification, argillization and limonitization is observed along the valley. As a result of POSAM measurement for the white alteration zones, pyrophyllite was identified. According to CORMINE (1996), phyllic alteration zone of silicification and sericitic alteration exists in an area of 2 km^2 along sheared fault zone (NNW-SSE strike, NE dip, 2km extension) in rhyolitic pyroclastics of the Cyoiyoi group in Arroyo Auquen, about 7 km northeast from Varvarco village. As a result of chemical analysis for samples taken from this fault zone, the value of 0.36 g/t Au was reported.

The alteration zone CM007 is an argillized and silicified alteration zone where rhyolite or dacite was altered. It is widely distributed particularly on the left bank on a scale almost the same as or larger than the satellite image.

8) Characteristics of the satellite images

The CM004 to CM007 alteration zones of this district show reddish purple color in the ratio composite image. These are part of the alteration zones scattered to the north of the Andacollo area and exist in the Choiyoi group and the Varvarco granitic rocks. Lineaments trending to the N-S, NE-SW and NW-SE are extracted, but their relations with mineralization and alteration are not clearly defined.

In Phase-2 satellite image analysis by spectral patterns analysis, relatively large-scale alteration zones were extracted on both banks of the midstream of Arroyo Auquen. These are mainly in three sites, and maximum size is 0.8 km^2. These, particularly CM007, are almost consistent with the result of ratio composite image analysis, and are harmonious with the distribution of white argillization and silicification confirmed in the field survey. On the other hand, there are no such presumed alteration zone near two mineral occurrences on the right bank of Arroyo Guaraco Norte.

Rome Resources Ltd., which has expressed interest in the Varvarco area, gives attention to deep dome structure expected from ring structure of Arroyo Auquen on the north side and Arroyo Guaraco Norte on the south side.

9) Laboratory work results

It was confirmed by powdery X-ray diffraction that the samples A00NK006 and A00TM003 are composed of quartz and pyrophyllite. The microscopic observation of the sample A00TM020 from the Varvarco granitic rocks clarified that the sample is tonalite, and that the alteration is weak and biotite is slightly chloritized. 64.7 ± 3.2 Ma of K-Ar radiometric dating data was obtained for plagioclase separated from Varvarco granite. Chemical analysis results for samples (A00TM108 and A00TM020) from Varvarco granite clarified that the samples are calc-alkaline and island arc type granodiorite (Phas-1 report).

As a result of the X-ray diffraction for seven samples (A00TM114 to 117, 120 and 121) with different degrees of silicification in the upstream side of Arroyo Auquen, sericite was identified in addition to quartz in A00TM114 to 116, while chlorite was identified in addition to quartz, albite, potassium feldspar in A00TM117. In the white alterantion part in the shear zone in the downstream side of Arroyo Auquen (A00TM120), quartz and pyrophyllite were identified, and potassium feldspar, sericite and a small amount of jarosite were identified as well as a large amount of quartz in the strong silicified part (A00TM121). As a result of the chemical analysis for six samples (A00TM114 to 118 and 121) including those mentioned above, a very lowl content, but more than the detection limit (0.005 g/t), of gold was detected in A00TM114 to 116. Quartz vein sample (A00TM119) in silicified tuff breccia had a very low content (0.001 g/t) of gold. The result of the fluid inclusion study indicated homogenization temperature of 267℃ and salinity of 6 wt %.

Propylitic granodiorite, which is host rock of the quartz vein in Mina Santos, was microscopically identified as biotite hornblende granophyre with abundant alteration minerals of epidote, quartz, chlorite, iron oxide ore leucoxene. Concerning granodiorite with gray colored argillization (A00TM111), a large amount of sericite and a small amount of chlorite were identified by powdery X-ray diffraction, and 0.17 g/t Au and 1.8 g/t Ag were obtained by chemical analysis. As a result of the chemical analysis for composite sample (A00TM112) from the quartz vein mass with chalcopyrite and malachite existing sporadically in front of the adit entrance, high grades of 14 g/t Au, 524 g/t Ag, 2.8% Cu and 2.7% Pb were obtained. In addition, a homogenization temperature of 184°C and salinity of 8.5 wt % were obtained from the result of the fluid inclusion study for the quartz vein.

On the other hand, the powdery X-ray diffraction was done for the white alteration part of porphyritic granodiorite (A00TM107) and silicified granodiorite (A00TM108) that are the host rocks of quartz-pyrite vein of Mina Santos West in the downstream side. As a result, sericite and chlorite were detected in addition to quartz for A00TM107, while a very small amount of sericite and chlorite were detected in addition to quartz and potassium feldspar for A00TM108. In the results of the chemical analysis of these two samples, 0.06 g/t Au and 0.2 g/t Ag were obtained for A00TM107, although these contents are very low. No noticeable values were obtained for A00TM108. As a result of the chemical analysis of one sample (A00TM1109) from quartz-pyrite vein mass existing sporadically in front of the pit, 15 g/t Au and 37 g/t Ag were obtained. A homogenization temperature of 231°C and salinity of 7 wt% were obtained from the fluid inclusion study for the quartz vein.

10) Assessment

Concerning the alteration zones along Arroyo Auquen, it is considered that neutral alteration characterized by sericite is dominant, and acid and high temperature alteration

with pyrophyllite is overlapping along the shear zone. The results of the chemical analysis revealed very low contents of gold, and no remarkable values were obtained.

As to the mineral occurrences along Arroyo Guaraco Norte, concentration of gold more than 10g/t Au was confirmed for the quartz veins of Mina Santos and Mina Santos West. It is considered that gold may be included in sulfide minerals, probably pyrite, disseminated in quartz veins. Gold was also detected in granodiorite that is the host rock of these quartz veins, although the contents are low. Therefore, the area including the upstream of Arroyo Guanaco Notre is thought to be potential area of gold because low contents of gold were detected for silicified rocks, same as the host rocks of quartz veins.

3-2-3 Cerro Collocho district

1) Location

This area is located about 50 km north of Chos Malal town in the north part of Neuquen province (Fig. II-3-1-2) and covers an area of about 40 km^2 with Cerro Collocho (2,537m above sea level). This area is lat. 36° 52' 48" to 36° 56' 24" S and long. 70° 23' 24" to 70° 27' 00" W. Representative coordinate is lat.36° 54' 00" S and long. 70° 25' 00" W (Fig. II-3-2-5). A presumed alteration zone is extracted by a satellite image analysis in southwestern side near the top of Cerro Collocho.

2) Topography and vegetation

This district is in a mountainous area surrounding Cerro Collocho (2,537 m above sea level) with continued mountains of Codillera del Vient to the west. In the east, Rio Curi Leuvu runs originating from Volcan Domuyo, while the south forms a flat basin dotted with a number of villages. The southwestern foot of Cerro Collocho in the southwestern part of this district forms hills of relatively moderate slope, though the landform near the top becomes fairly steep with partially continuous outcrops of sheet dykes. The slope of mountain is covered with taluses composed of a quantity of debris with only short bushes growing at lower altitude.

3) Access

Traveling about 20 km from the Chos Malal town on No. 43 provincial road toward Andacollo town and then northward about 40 km along the unpaved No. 43 and 42 provincial roads will reach the Villa Curi Leuvu village (the terminus of No. 42 provincial road). From there, access is possible by four-wheeled vehicle on the bad road up to an altitude of about 1,700 m.

4) Previous surveys

There are no records indicating that metallic resource exploration was carried out.

5) Mining properties

No mining properties are established.

6) Geology and geological structure

According to "Geologia y Metalogenesis del Orogeno Andino Central" (Mendez et al., 1995), the geology of this district is composed of Mendoza group made up of littoral to semi-littoral sediments of the Jurassic to the Cretaceous, with Campana Mahuida plutonic rocks of the Cretaceous intruding into the Mendoza group.

As a result of the field survey, it was proven that Mendoza layer group in this district is composed of bedded alternation of sandstone, shale and limestone with badly preserved ammonite fossils. It was also proven that plutonic rock of the Cretaceous is biotite bearing hypersthene augite dacite.

7) Mineralization and alteration

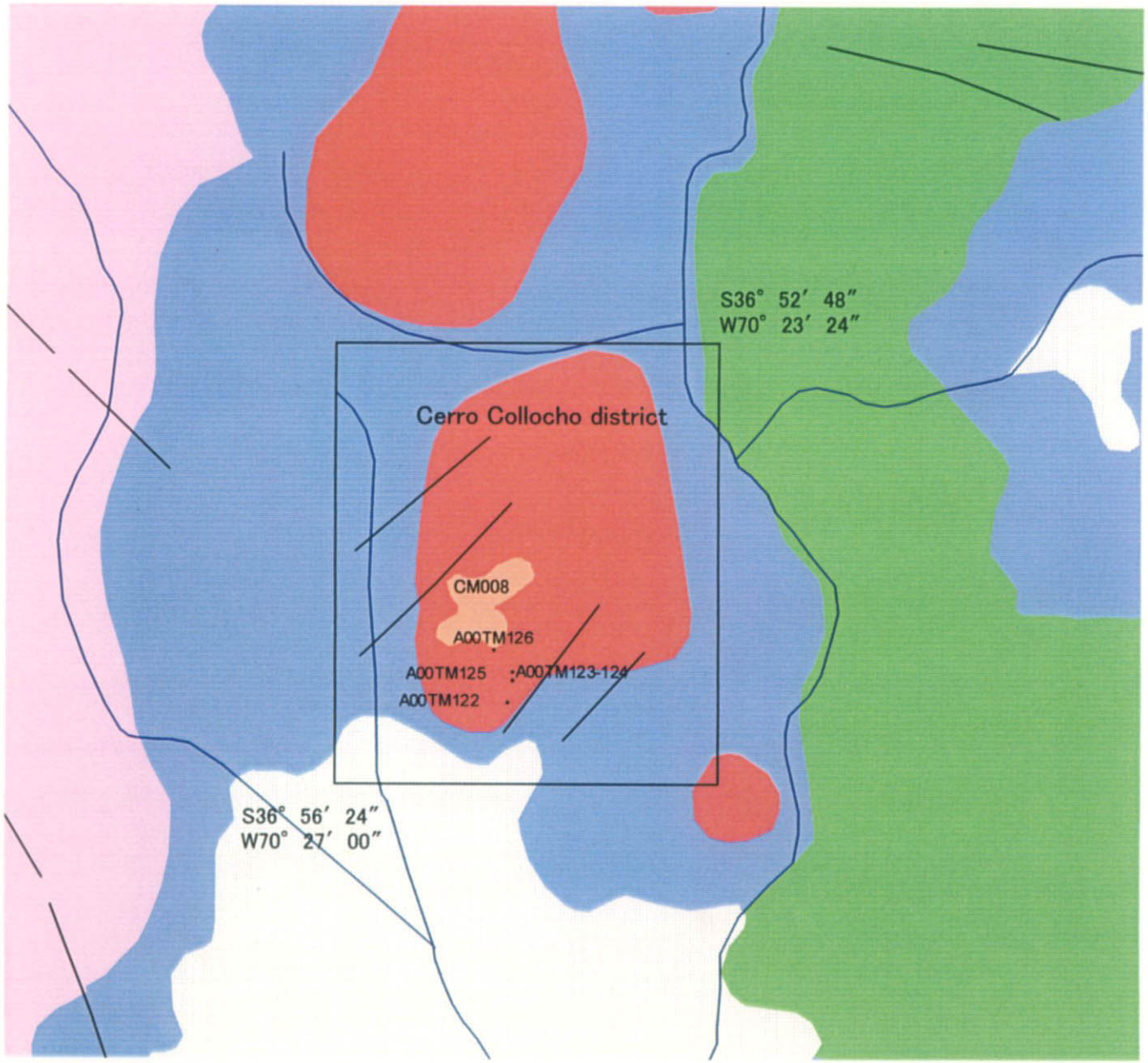
There is distribution of sandstone, shale and limestone of the Lower Cretaceous with porphyritic dacitic andesite (biotite bearing hypersthene augite dacite in the microscopical observation) intruding into them. Alteration such as silicification is observed mainly in andesite. In this alteration, quartz-pyrite veinlets zone with limonite (N50°E, 80°S, width 5 m+) is observed. Silicification and pyrite dissemination are observed in sandstone and shale at an altitude of around 2,260 m within the area of 2 to 3 m from the contact with andesite. In the area where sedimentary rocks are distributed, hydrothermal breccia with fragments of shale and sandstone is observed, and matrix part of hydrothermal breccia is only silicified. Mainly on the left bank of the valley, the skarn of quartz, epidote and garnet, etc., is also observed.

8) Characteristics of the satellite image

In the satellite image of spectral patterns analysis, relatively concentrated distribution of the presumed alteration zones are extracted mainly on the southwest side of the mountaintop of Cerro Collocho. These presumed alteration zones include the alteration zone of CM008 (about 1 km^2) extracted by the ratio composite image analysis, and are generally consistent with the alteration zones in andesite that was confirmed by the field survey.

9) Laboratory work results

As a result of the powdery X-ray diffraction for the matrix of hydrothermal breccia with



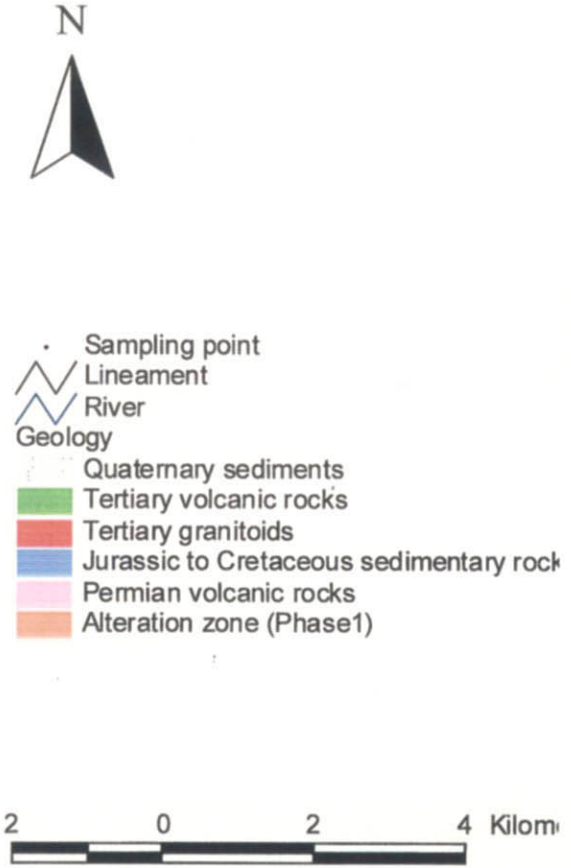
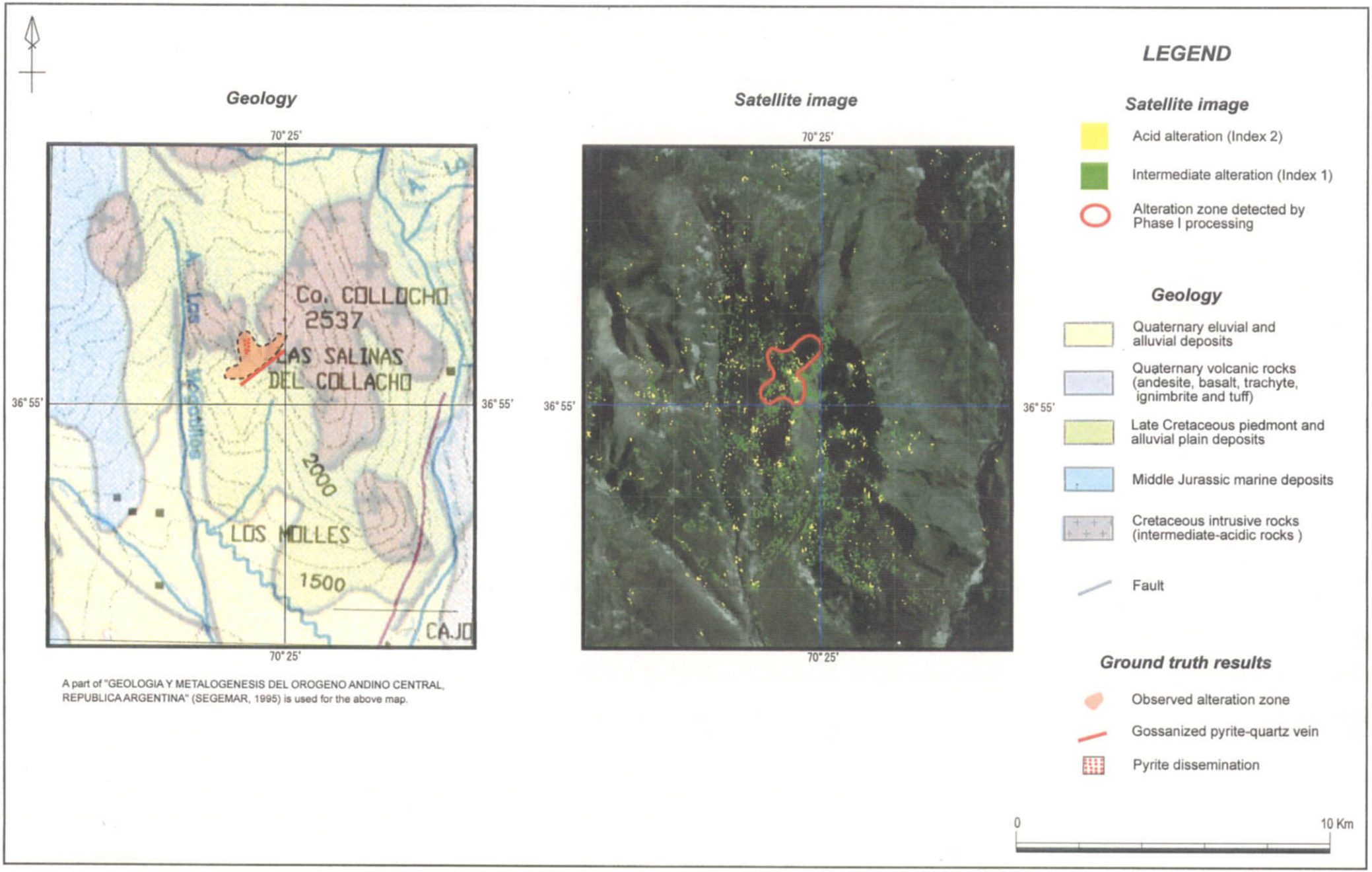


Fig. II-3-2-5 Geological map with sampling points of the Cerro Collocho district.



A part of "GEOLOGIA Y METALOGENESIS DEL OROGENO ANDINO CENTRAL, REPUBLICA ARGENTINA" (SEGEMAR, 1995) is used for the above map.

Fig. II-3-2-6 Satellite image and ground truth results in the Cerro Collocho district

silicification and argillization (A00TM122), albite and jarosite were identified in addition to quartz. As a result of the chemical analysis, the relatively high content of 911 ppm As was obtained, but no other particular geochemical anomaly was obtained.

Concerning the channel sample (A00TM123) from the quartz-pyrite veinlets zone with limonite (width: 5 m), chemical analysis was done to detect the gold content in particular, but gold content was under the detection limit (0.005 ppm). The powdery X-ray diffraction was done for the white argillized part (A00TM124) and white argillic altered part (A00TM126), both of which are located at the side of quartz veinlets. As a result, sericite was identified besides quartz for A00TM124, while sericite, albite and kaolin were identified besides quartz for A00TM126.

In the microscopical observation, poryphyritic dacitic andesite that has not altered (A00TM125) was identified as biotite bearing hypersthene augite dacite with highly porphyritic texture. As a result of K-Ar radiometric dating for abundant hornblende of the dacite, 13.2±0.7 Ma was obtained as the age of the rock (the Neogene Miocene).

10) Assessment

It is considered that the possibility of promising ore deposits, such as porphyry Cu deposits, is low for following reasons: metallic minerals other than pyrite (limonite) are not observed: no anomaly is detected in the result of the chemical analysis; the distribution of alteration zones is narrower than in known deposits, such as Campana Mahuida and Pino Andino, and is limited to topographical high places; and alteration degree is weak.

3-2-4 Butalón Norte district

This district was only surveyed in Phase 1. Therefore, outline of Phase 1 survey results are described here. Phase 1 report is the reference for details of the survey results.

1) Location

The Butalón Norte district is located about 20 km to the north of Andacollo town in the northwest of Neuquen province (Fig. II-3-1-1). The hydrothermal alteration zones of CM009 and CM0010 extracted from the satellite image analysis are distributed here. The area is lat. 36° 55' 48" to 37° 03' 36" S, and long.70° 36' 36" to 70° 43' 12" W, and about 170 km^2.

2) Previous surveys

In 1988, the CORMINE S.E.P. and the Dirección General de Minería of Neuquen province executed the geochemical survey and hydrothermal alteration zones were described. 176 rock chip sampls were taken and values of 0.1 to 0.3 ppm Au were obtained. The fluid

inclusion study showed relatively high salinity contents.

3) Outline of the surevy results

The geology of the district, in ascending order, consists of upper Permian to Triassic volcanics of Choiyoi group, Tertiary Molle volcanic rocks and Quaternary basaltic rocks, piedmont sediments and alluvium. And intrusive rocks of unknown ages are distributed.

Volcanic rocks of the Choiyoi group are made up of rhyolitic ignimbrite and andesitic rocks with interbeds of tuff. The Molle volcanic rocks are composed of andesitic rocks. The intrusive rocks comprise granodiorite, tonalite and quartz andesitic porphyry.

No significant alteration zones were found in the area surveyed by previous exploration, although hydrothermal breccia or pebble dyke into the Choiyoi group were observed. In the southern alteration zone of CM010, silicified dacite porphyry with limonite is distributed. In the powdery X-ray diffraction, sericite and kaolin were identified. In the chemical analysis, no noticeable results were obtained.

4) Assessment

Neither noticeable hydrothermal alterations nor geochemical anomalies were observed in the Butalón Norte where exploration was conducted in the past. Further, although the alteration zone of CM010 in the south is affected by sericite and kaolin alteration, no geochemical anomalies were obtained there. These resluts lead to consideration that the possibility of mineralization in this district is low.

3-2-5 Andacollo district

This district was only surveyed in Phase 1. Therefore, outline of Phase 1 survey results are described here. Phase 1 report is the reference for details of the survey results.

1) Location

This district is located in the northwestern part of Neuquen province (Fig. II-3-1-1). The representative town is Andacollo. Sofia and Erica deposits of the Andacollo mine are located. The area is lat. 37° 06' 00" to 37° 16' 12" S, and long. 70° 34' 48" to 70° 42' 36" W, and about 270 km^2. The representative coordinate is lat. 37° 11' 30.1" S and long. 70° 37' 58.5" W at the adit entrance of Level-1 in Sofia deposits.

2) Previous surveys

In 1890, alluvial gold was discovered at Rio Milla Michico and, in 1894, gold veins were discovered in Cerro Minas. DGFM, CORMINE S.E.P. and others conducted the exploration.

CORMINE S.E.P., the property owner, signed in 1998 a development contract with Minera Andacollo Gold S.A. of Chilean and Canadian joint venture for the Andacollo project. The company started operation at a minimum processing capacity of 200 t/d from January 1999.

In southwestern part of the district, Los Maitenes of porphyry Au mineral occurrence is distributed. Placer Dome and Cameco Argentina S.A. had conducted the exploration and already withdrawn.

3) Outline of the surevy results

The Geology of this district consists of, in ascending order, Carboniferous sedimentary rocks, Permian granitic rocks, Permian to Triassic volcanic rocks, Jurassic sedimentary rocks, Paleogene volcanic rocks and Quaternary glacial sediments, colluvium and alluvium.

The Andacollo group of Carboniferous comprises tuff, sandstone and mudstone. Permian batholith comprises granodiorite, granite and tonalite intruded in the Andacollo group. Choiyoi group of the Permian to the Triassic is distributed overlying them unconformably. Choiyoi group with basal conglomerate at the bottom comprises of basaltic, andesitic and rhyolitic volcanic rocks. The Cuyo group of Jurassic is black mudstone etc., and unconformably overlies Choiyoi group in the southwest part of this district. The Serie Andesita of Paleogene comprises terrestrial andesitic rocks. Dykes and small-sized stocks of dacite, dacite porphyry and andesite porphyry etc. intruded into the older than Jurassic.

Andacollo mine consists of about 50 veins system hosted in black mudstone of Andacollo group. The main veins are the Sofia and Erica deposits. The ore deposits are quartz veins with a small amount of sulfides consisting of pyrite, sphalerite, galena, etc. Dacite dyke exists along the vein at Sofia deposit.

The gold grades of 1.71 g/t, 5.49 g/t and 152.85 g/t Au were confirmed by ore grade assay. These revealed 0.7% to 2.18% Pb (Appendix-10). The average of homogenization temperatures are 214℃ to 309 ℃, and the salinities are 3.6 to 4.7 wt%. (Appendix-11). The oxygen isotopic composition of the quartz is +11.2‰ and calculated oxygen isotopic composition of the hydrothermal water is +0.4‰ (Appendix-13). Sulfur isotopic composition of +3.5‰ was obtained for pyrite in quartz vein (Appendix-12). Contribution of magmatic components is indicated by oxygen isotopic composition of hydrothermal water and sulfur isotopic composition of pyrite (Appendix-15). Granitic rocks are classified to island arc type calc-alkaline granite based on the chemical analysis results.

4) Assessment

It is understood that there were igneous activities of calc-alkaline granite of the island arc type and epithermal mineralization occurred in connection with the igneous activities. In Sofia deposits representing the mineralization of Au, it was confirmed that high grade Au ore

exists in quartz and calcite veins accompanied by sulfides. In this district, mining activities by a private company is on-going, and high potential has been already proven. With consideration given to the purpose of this survey that new promising areas should be extracted, it is judged that this district is not necessary to be included in the Phase-2 survey.

3-2-6 Cerro Mayal district

1) Location

This district is located about 10 km west of Chos Malal town in the north part of Neuquen province (Fig. II-3-1-2). The area is about 55 km^2 including the Cerro Mayal Mahuida (about 1,900 m above sea level) with a telecommunications antenna tower at the top. This area is lat. 37° 17' 24" to 37° 22' 12" S and long. 70° 21' 00" to 70° 25' 48" W. The representative coordinate is lat. 37° 20' 00" S and long. 70° 23' 30" W (Fig. II-3-2-7).

2) Topography and vegetation

Cerro Mayal Mahuida is a solitary mountain peak in the north of Rio Neuquen. Its northern mountainside is rather gently sloped while the southern side is relatively steep. The southern side is seriously eroded, and bushes grow thick along the steep mountain streams. In the gently sloped mountain foot, short shrubs and bushes grow thick.

3) Access

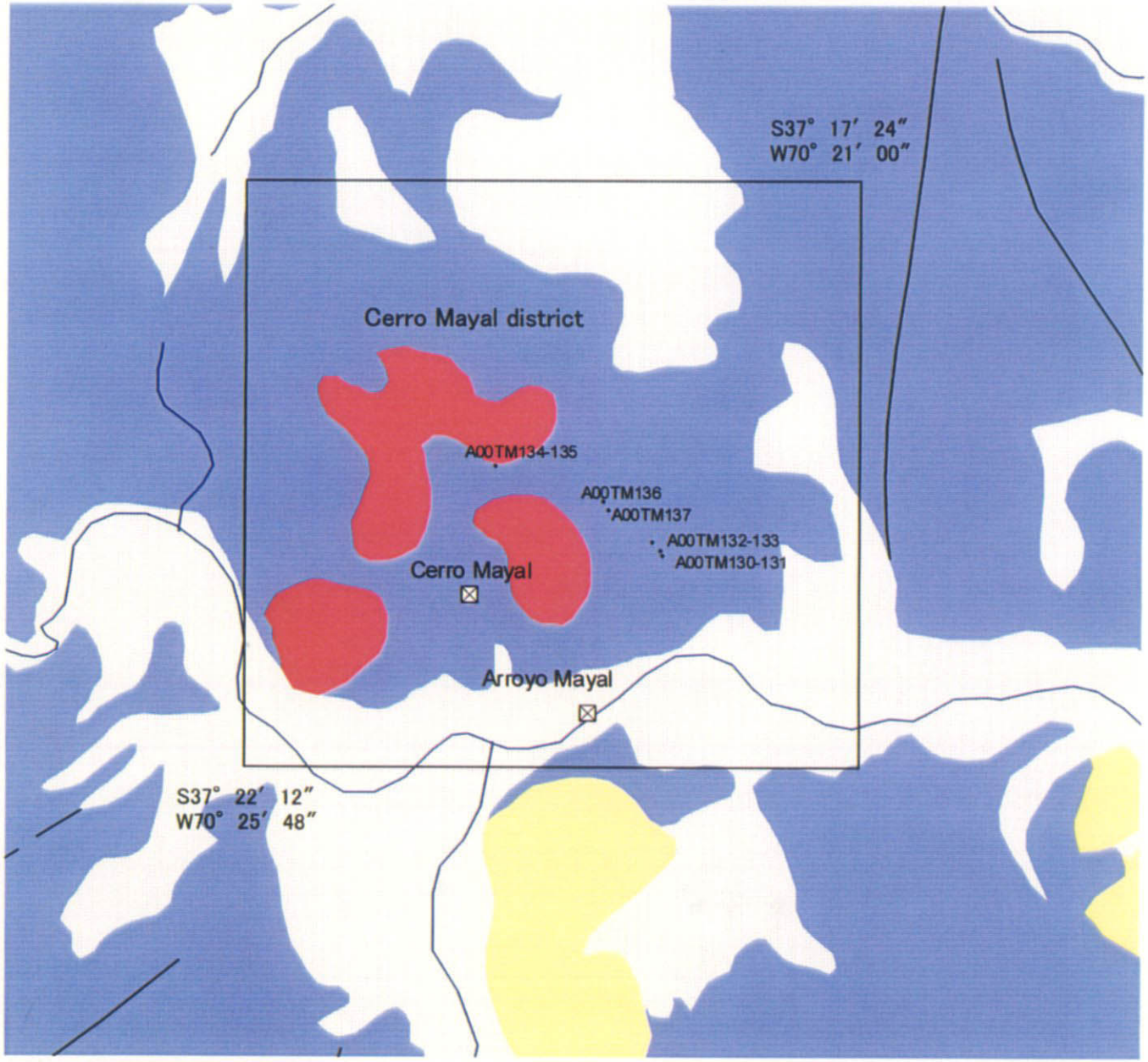
Good access is available because about 15 km of No. 43 provincial road is paved toward the Andacollo town, and from there southward a mountain road is provided up to the telecommunications antenna tower at the top of Cerro Mayal Mahuida. It is to be noted, however, that two gates are installed, at the mountain road inlet and on the mountain side, respectively, and there are usually locked by the town authority controlling the telecommunications antenna tower.

4) Previous surveys

According to CORMINE (1996), Cormine S.E.P. and D.G.F.M. conducted geological and geochemical surveys, and geological map in scale of 1:12,500 and alteration/geochemical map (Au, Ag, As, Cu, Pb, Zn) in scale of 1:2,500 were made.

5) Mining properties

Although mining properties are established in a very limited part on low land and the slope of south side to Rio Neuquen and on the slope of the west side of Cerro Mayal Mahuida, no mining properties have been established on the northwestern side of the mountaintop and



Known mineral occurrence
Sampling point
Lineament
River
Geology
Quaternary sediments
Pliocene to Pleistocene basalt
Tertiary granitoids
Jurassic to Cretaceous sedimentary rocks

Fig. II-3-2-7 Geological map with sampling points of the Cerro Mayal district.

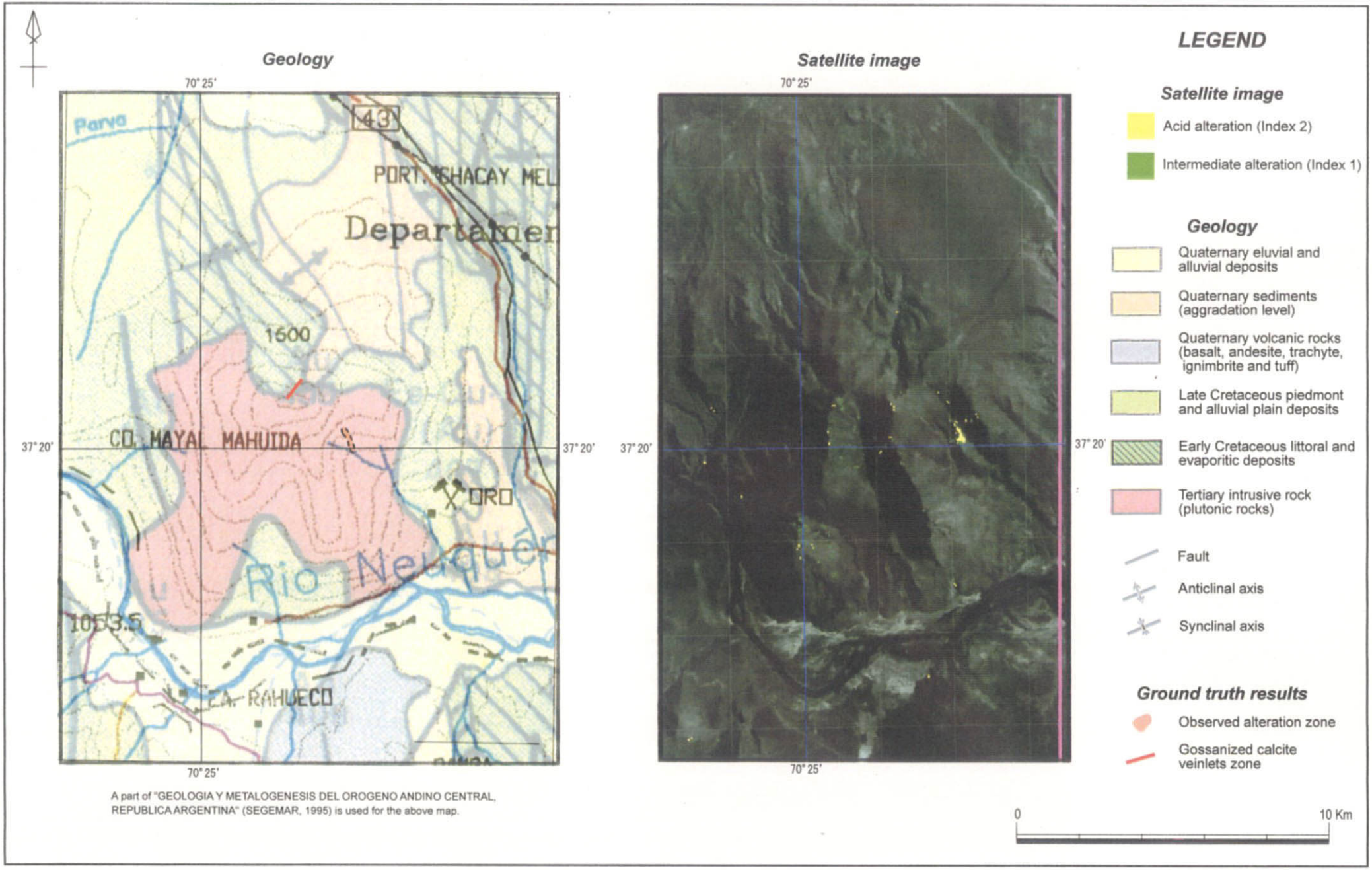


Fig. II-3-2-8 Satellite image and ground truth results in the Cerro Mayal district

around a southeastern small ridge where the field survey was conducted.

6) Geology and geological structure

According to "Geologia y Metalogenesis del Orogeno Andino Central" (Mendez et al., 1995), the main geology of this district is composed of Mendoza group of littoral to semi-littoral sediments of the Jurassic to the Cretaceous, Huitrin or Amarga formation of littoral sediments and evaporite of the lower Cretaceous overlying the Mendoza group, and Tertiary Andean plutonic rocks intrude into them.

According to "Prospectos y Areas de Alteracion Hidrotermal, Provincia del Neuquen" (CORMINE, 1996), there is the distribution of the Cretaceous Agrio formation made up of shale and limestone with intercalation of sandstone. Besides, dacitic volcanic complex and intrusions of andesite and micro diorite are distributed.

7) Mineralization and alteration

On the northwestern side of the communication antenna at the mountaintop of Cerro Mayal Mahuida, there is a small-scale trench where high grade gold contents (average 75.84 g/t Au) were reported (CORMINE, 1996). This trench has been excavated about 20 m in extension of N40°E direction. Around the trench, sandstone, shale and limestone of lower Cretaceous, and white altered andesite porphyry intruding into them, are distributed. It is presumed from conditions of the vicinity of the trench that limonitized calcite veinlets zone (strike of N40° E, width of about 1.5 m) developed in the trench along the fracture zone in andesite porphyry.

Andesite porphyry with white argillization is widely exposed from the place near this trench to the southeastern small ridge, and tuff breccia with propylitic alteration exists sporadically on this small ridge. This prophylitic alteration is located on the upper part of white argillization. Malachite was observed among gossan boulders in a small valley of the northern side of this ridge.

8) Characteristics of the satellite images

No alteration zones were extracted from the ratio composite image of the Phase-1. In the Phase-2 satellite image of spectral patterns analysis, yellow pixels indicating acid alteration concentrate on the southeast small ridge of Cerro Mayal Mahuida although the scale is extremely small.

9) Laboratory work results

As a result of the chemical analysis for the channel sample (A00TM134) from limonitized calcite veins in the mountaintop trench, values of 59.4 g/t Au, 3.4 g/t Ag and

>25% Fe were obtained. In the powdery X-ray diffraction of the white argillized part near the trench (A00TM135), only albite and quartz were identified and no alteration minerals were identified.

Concerning silicified and argillized tuff breccia in the prophylitic alteration zone on the small ridge (A00TM136), jarosite and a very small amount of sericite in addition to albite and a small amount of quartz were identified by the X-ray diffraction. No geochemical anomaly was obtained in the chemical analysis for same sample.

Concerning white argillized andesite in the white argillized zone on the small ridge (A00TM137), sericite and quartz were identified by the powdery X-ray diffraction. No geochemical anomaly was obtained by the chemical analysis for shale with slight silicification and pyrrhotite dissemination from a small valley in the northern side of the small ridge (A00TM130). No particular chemical analysis results were not obtained except 0.5% Cu content for andesite (A00TM132) with pyrite and malachite along the cracks. As a result of the powdery X-ray diffraction for this sample, calcite, chlorite and a very small amount of sericite were identified as well as quartz and albite. Concerning partially brecciated and weakly altered andesite (A00TM133) was identified as hornblende andesite with secondary minerals of a large amount of quartz, sericite, chlorite, calcite and a very small amount of pyrite by microscopic observation of polished thin section.

Moreover, as a result of the powdery X-ray diffraction for calcite vein with white clay from the hillside in the northern side of Cerro Mayal Mahuida (A00TM131), although a very small amount of quartz and plagioclase were identified besides calcite, no alteration minerals were identified.

10) Assessment

Regarding the limonitized calcite veinlets zone that develops in the fracture zone in andesite porphyry confirmed on the northwestern side of the communication antenna at the mountaintop of Cerro Mayal Mahuida, high grade gold contents (average 75.84 g/t Au) was reported by CORMINE (1996). A gold content of 59.4 g/t Au was also obtained in the Phase-2 field survey, although these are veinlets divided from the main body. Therefore, gold mineralization with limonite (originally presumed to be pyrite) is worth notice. According to the existing rock geochemical map (Au) in scale of 1:2,500 for the area of about 300 m x 600 m around this trench (sampling interval of about 30 m), the largest value is about 0.08 g/t Au, which is not high content. It is considered that this kind of vein type mineralization is not detectable by the 30m intervals sampling. Therefore, it is necessary to carefully trace the limonitized calcite veinlets zone in the future exploration.

The possibility of porphyry Cu mineralization in the alteration zone on the small ridge southeast of Cerro Mayal Mahuida is judged to be low because the alteration zone is in

extremely small scale and alteration degree is weak.

3-2-7 Cerro Caicayén area

This district was only surveyed in Phase 1. Therefore, outline of Phase 1 survey results are described here. Phase 1 report is the reference for details of the survey results.

1) Location

This district is located about 20 km to the southwest of Chos Malal town in the northwest of Neuquen province (Fig. II-3-1-1). The area is lat. 37° 23' 24" to 37° 30' 36" S, and long. 70° 22' 48" to 70° 29' 24" W, and about 170 km^2. The reprsentative cordinate is lat. 37° 26' 41.3" S and long. 70° 26' 45.1" W in Quebrada del Bronce.

2) Previous surveys

Dirección General de Minería of Neuqun province conducted the geochemical survey of 98 rock samples in alteration zones along Quebrada del Bronce in 1988. Average values of 0.06 ppm Au, 6,406 ppm Cu were obtained. Placer Dome Exploration Inc. (1994) reported the anomalous area of more than 100 ppm Cu in the main part of phyllic and potassic zones, and suggested the presence of porphyry copper deposits.

3) Outline of the surevy results

The main part of Cerro Caicayen is Paleogene intrusive and effusive rocks. The largest rock body including the mountain top is laccolith of micro quartz diorite of 7 km in diameter. Around Quebrada del Bronce where alteration zone is distributed, quartz diorite porphyry, dacite porphyry, etc. intruded.

In Quebrada del Bronce, hydrothermal alteration zone of about 1 km^2 is distributed, and it is considered to be porphyry Cu type with veinlets and dissemination of pyrite and limonite. Meanwhile, skarn deposits exists in the southern part, massive and network of pyrite and limonite were observed in the contact zone of 2 to 3 m width between limestone and dacite porphyry. However, no noticeable copper values were obtained by chemical analysis.

4) Assessment

Porphyry copper deposits and skarn deposits were expected in the alteration zone based on the previous exploration results. However, remarkable mineralization of copper could not be observed while hydrothermal alteration was observed. Besides, no noticeable chemical analysis results were obtained for rock and ore samples. Therefore, Phase-2 survey for this

district is not necessary.

3-2-8 Cerro del Diablo district

This district was only surveyed in Phase 1. Therefore, outline of Phase 1 survey results are described here. Phase 1 report is the reference for details of the survey results.

1) Location

This district is located about 30 km to the southwest of Chos Malal town in the northwest of Neuquen province (Fig. II-3-1-1). The area is lat. 37° 34' 48" to 37° 42' 36" S and long. 70° 22' 12" to 70° 30' 00" W, and about 200 km^2. In the area, copper deposits and barite deposits are located The coordinate of the copper deposits is lat. 37° 38' 21.5" S and long 70° 25' 48.5" W. And the coordinate of the barite deposits, which is located about 2 km to the west of the copper deposits, is lat. 37° 37' 43.4" S and long 70° 25' 58.8" W.

2) Previous surveys

In the copper deposits, CORMINE S.E.P. conducted exploration. The copper deposits have an area of 4 km x 4 km. It is considered that hydrothermal alteration and mineralization of the dissemination type, which were controlled by the fissure system, generated by the igneous activity of Cretaceous to Tertiary. Mineralization was reported as the occurrences of chalcopyrite, tetrahedrite, pyrrhotite, pyrite, galena, sphalerite and barite. In the barite deposits, mineralization was reported as the occurrence of chalcopyrite, sphalerite and galena in addition to barite. Old trenches exist in these mineralized zones.

3) Outline of the survey results

The geology of this district comprise, in ascending order, Jurassic calcareous mudstone and shale of Vaca Muerta formation, Cretaceous sandstone of Mulichinco formation and Paleogene andesitic rocks. Granitic rocks and andesite such as Paleogene quartz diorite (48.4 Ma) intruded into Jurassic to Cretaceous sedimentary rocks.

In the copper deposits around the summit of Cerro de Diablo, gossan zone is developed with extension of about 400m and maximum width of 40m. Copper mineralization continues intermittently about 200 m along the trenches. Well mineralizaed part has a size of about 30 m extension and 3 m width. Copper mineralization of disseminated azurite, chrysocolla and malachite were observed, and alteration minerals of kaolin and sericite were identified. Barite veins show the structure of N 10° W and 85° E and have the width of 10 m to 15 m.

Mineralized sample taken in the copper deposits revealed 0.11 g/t Au, 3.8 g/t Ag, 3.2% Cu, 40 ppm Pb and 150 ppm Zn. Granodiorite porphyry was taken for K-Ar radiometric

dating in the barite deposits. Measurement was done for the separated plagioclase and 53.8 ±3.0 Ma was obtained. The chemical analysis results for same granodiorite sample shows that it is calc-alkaline and island arc type granite.

4) Assessment

Copper mineralization in gossan zone controlled by the linear fractures of E-W direction was observed. However, the width of hydrothermal alteration zones is not wide, and shale and granitic rocks are not altered in the area of 20 to 30 m away from the trenches. Therefore, it is assumed that the size of hydrothermal activity is small and large scale mineralization cannot be expected. Therefore, this district has a low priority to be selected for Phase-2 survey.

3-2-9 Cerro de los Bueyes district

1) Location

This district is located about 50 km south of Chos Malal town in the northwest part of Neuquen province (Fig. II-3-1-2). The area is lat. 37° 40' 48" to 37° 52' 48" S and long. 70° 18' 36" to 70° 30' 00" W, and covers an area of about 300 km^2. The representative coordinate is lat. 37° 47' 00" S and long. 70° 24' 00" W (Fig. II-3-2-9).

Cerro de los Bueyes mineral occurrence and presumed alteration zones extracted from the satellite image of spectral patterns analysis are located in this district. Cerro de los Bueyes mineral occurrence has been described by "Prospectos y Areas de Alteracion Hidrotermal, Provincia del Neuquen" (CORMINE, 1996).

2) Topography and vegetation

Cerro Molina, Cerro de los Bueyes (2,229 m above sea level) and Cerro Pichi Trolon are located in northern part, and Cerro Negro, Cerro Colipilli and Cerro los Potreritos (2,107 m above sea level) are located in southern part. All of these mountains are steep with rocks near the top and lift high from undulating hills.

The undulating hills are rather thickly covered with short bushes and dotted with shrubs. The coverage is about 50% on average. The mountain side is also covered with short bushes, but its coverage is 0 to 30%.

3) Access

Access is by traveling southbound about 30 km on No. 40 national road from Chos Malal town and then by taking the unpaved No. 4 provincial road from the Naurauco village. Traveling further about 10 km from Naurauco village, the vehicle will reach a bad road that

runs about 15 km to its terminus about 5 km before the top of Cerro de los Bueyes. Beyond the terminus, there is no other way of access to the mineral occurrence but by going on foot or horseback.

No. 4 provincial road detours the south of the Cerro Molina, Cerro de los Bueyes and Cerro Pichi Trolon mountain block. Driving down this provincial road about 40 km and getting on the southbound No. 31 provincial road and traveling down the road about 25 km via Ranquilon village reach the southern mountain foot of Cerro Nonial. Beyond this point, no other means of access to the presumed alteration zone of Cerro los Potreritos is available than by going on foot or on horseback.

4) Previous surveys

According to "Prospectos y Areas de Alteracion Hidrotermal, Provincia del Neuquen" (CORMINE, 1996), a geological survey in scale of 1:200,000 was done in the area including Cerro de los Bueyes mineral occurrence. It seems that there were no particular exploration activities for metallic mineral resources.

5) Mining properties

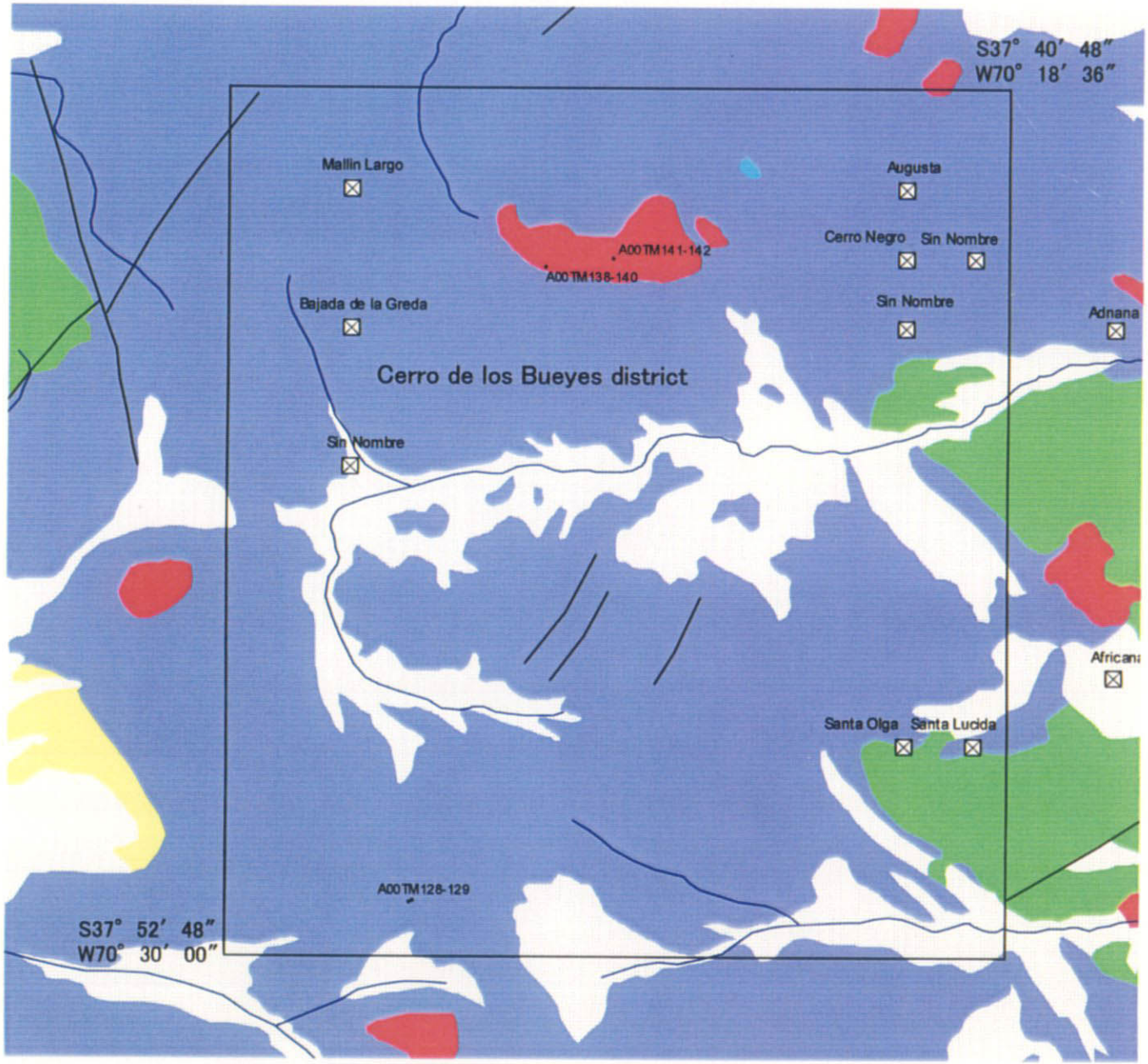
A mining property (SUSANA 1269/67) is established in Cerro de los Bueyes mineral occurrence, but no mining properties are established in Cerro los Potreritos presumed alteration zone.

6) Geology and geological structure

According to "Geologia y Metalogenesis del Orogeno Andino Central" (Mendez et al., 1995),Mendoza group made up of littoral to semi-littoral sediments of the Jurassic to lower Cretaceous is distributed in a wide range including in Cerro de los Buyeyes, and the Tertiary Andean plutonic rocks are locally distributed, including volcanic complex (Palaoco volcanic rocks) of the Tertiary Pehuenchico period that intrude into the Mendoza group. According to the same map, Cerro de los Bueyes and its periphery are areas where Mendoza group is distributed. On the other hand, according to "Prospectos y Areas de Alteracion Hidrotermal, Provincia del Neuquen" (CORMINE, 1996), these areas are regarded as Mulichinco formation composed of feldspathic sandstone of the Lower Cretaceous.

7) Mineralization and alteration

According to CORMINE (1996), it is reported that alteration zones were distributed and mineral occurrence of copper oxides exist in Cerro de los Bueyes about 17 km southeast of El Huecú village. In the field survey, sandstone, shale and limestone of the Lower Cretaceous are widely distributed in a mountain mass, and andesite porphyry intruding into them is



Known mineral occurrence
Sampling point
Lineament
Lake
River

Geology
Quaternary sediments
Pliocene to Pleistocene basalt
Tertiary volcanic rocks
Tertiary granitoids
Jurassic to Cretaceous sedimentary rocks

Fig. II-3-2-9 Geological map with sampling points of the Cerro de los Bueyes district.

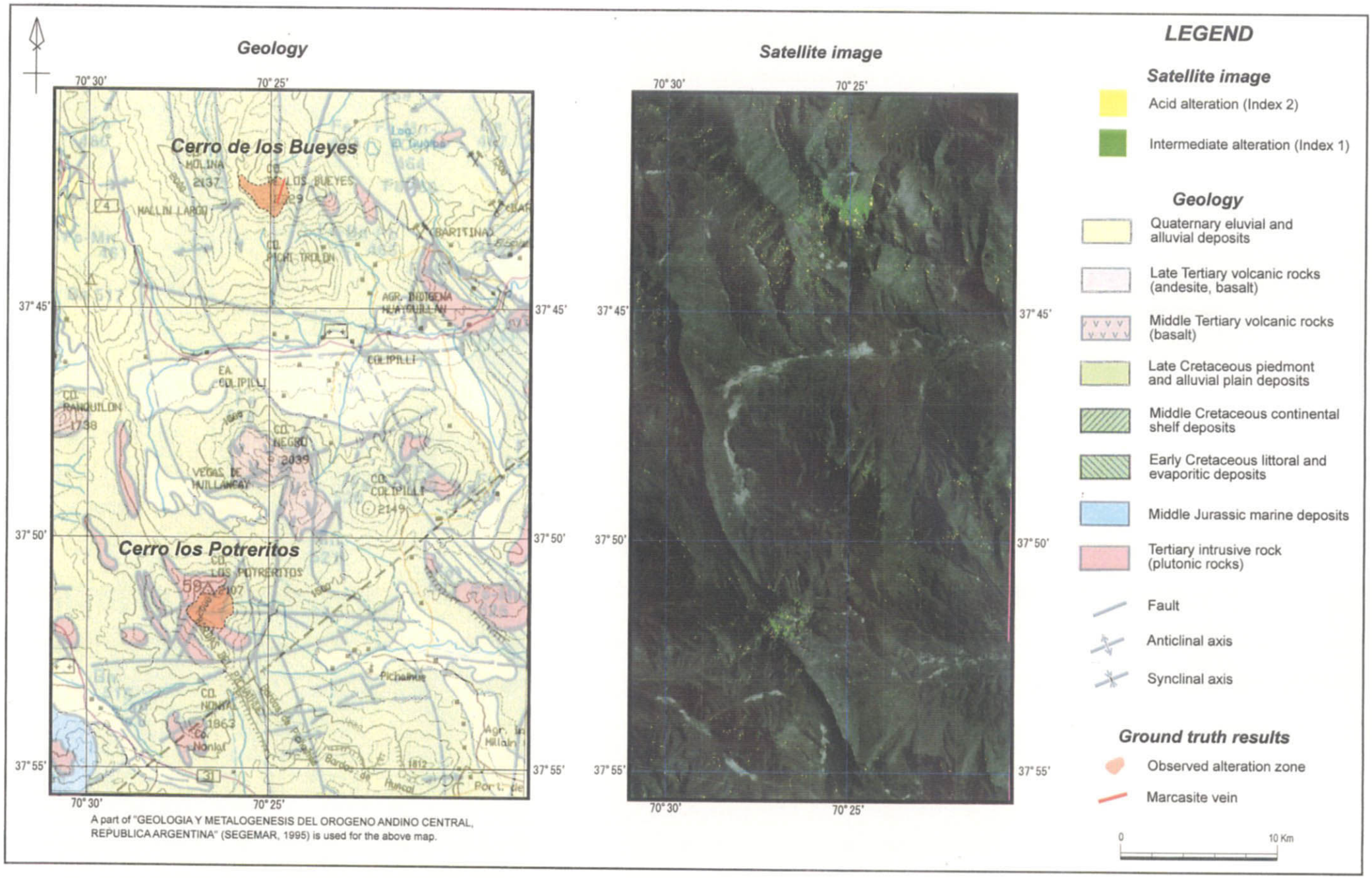


Fig. II-3-2-10 Satellite image and ground truth results in the Cerro de los Bueyes district

exposed in the northeast mountain foot. The zone near the mountaintop is covered by talus sediments made up of debris with silicification and argillization. About 500 m northwest of the mountaintop, there are small-scale quarry (Mina Don Jose de Arcilla) where kaolin was exploited in past. An extremely small amount of chrysocolla was observed in the small rock pieces of sedimentary rock with whitened alteration. Several marcasite-chlorite veins (the maximum width of 2 m, N20°E, 40°SE) selectively replacing the sandstone part of the bedded alternation of sandstone and shale are observed on the mountainside about 1 km northeast of the mountaintop. Extensions of these veins were traced over 100 m including limonitic zone of oxidation.

In the eastern part of Cerro los Potreritos, sandstone and shale, and porphyritic andesite intruding into them are distributed in presumed alteration zone extracted by satellite image of spectral patterns analysis. The presumed alteration zone is in the range of about 2.5 km^2 including a hollow place in the south side of the mountaintop. The hollow place is occupied by talus sediments composed of debris of silicification and argillization. Silicification and fine-grained pyrite dissemination were observed in the sedimentary rock near andesite dyke on the slope in the southwest side of the alteration zone.

8) Characteristics of the satellite images

Alteration zones were not extracted in the Phase-1 ratio composite image analysis. As a result of the satellite image analysis by spectral patterns in the Phase-2, presumed alteration zones were extracted in the vicinity of the mountaintop and the northeast side of Cerro de los Bueyes, and the east side of Cerro los Potreritos. The presumed alteration zone in the Cerro de los Bueyes has an area of about 2 km^2, and pixels indicating neutral alteration are relatively concentrated. The presumed alteration zone in Cerro los Poteritos, pixels indication neutral alteration are relatively concentrated in the range of about 2.5 km^2.

9) Laboratory work results

The powdery X-ray diffraction was done for sandstone (A00TM138) with white argillization, weak silicification and a small amount of fine-grained marcasite dissemination from the old kaolin quarry, and sericite in addition to quartz and albite were identified. In the chemical analysis, no particular geochemical anomaly was obtained. According to the observation result of polished thin section, this rock was identified as altered tuffaceous sandstone accompanied by a large amount of clay minerals besides quartz and sericite as secondary minerals, and a very small amount of magnetite was observed as an opaque mineral. As a result of the chemical analysis for gossan-like weakly silicified rock (A00TM139) with chrysocolla along cracks, 0.6% Cu, 382 ppm As and >25% Fe were obtained. The powdery X-ray diffraction for sandstone (A00TM140) with silicification and white

argillization resulted in only identification of quartz, albite and potassium feldspar. Concerning the marcasite-chlorite veins on the northeastern mountainside of Cerro de los Bueyes, the powdery X-ray diffraction was done for altered host rock (A00TM141) and the marcasite vein (A00TM142). As a result, calcite and chlorite in addition to quartz and albite were identified for A00TM141, while a large amount of pyrite in addition to quartz and albite were identified for A00TM142. Noticeable chemical analysis results, except 281ppm Cu for A00TM142, were not obtained for both samples. According to the microscopic observation for polished thin section of A00TM142, the rock was identified as fine-grained sandstone composed of a large amount of quartz and a small amount of plagioclase with abundant clay minerals, and a moderate quantity of pyrite (marcasite) and a very small amount of chalcopyrite were also identified as ore minerals.

The powdery X-ray diffraction was done for gray to mud yellow shale (A00TM128) with silicification and pyrite dissemination and sandstone (A00TM129) with white silicification and argillization accompanied by pyrite dissemination, both of which were taken from the east side of Cerro los Potreritos. As a result, although quartz, albite and potassium feldspar were identified for A00TM128 and quartz, plagioclase and potassium feldspar were identified for A00TM129, no alteration minerals were identified. In the chemical analysis, 0.06ppm Au, 143ppm Cu and 10.8% Fe were obtained for A00TM128, while 2860 ppm Ba was obtained for A00TM129.

10) Assessment

The marcasite-chlorite vein (maximum width of about 2 m, extension of 100 m or more) on the mountainside northeast of Cerrro de los Bueyes is of a relatively large scale but poor in commodity metals such as Cu. Therefore, the possibility of development of these veins itself is low.

Concerning the presumed alteration zones in Cerro de los Bueyes Cerro los Potreritos, the possibility of the existence of promising ore deposits such as porphyry Cu is judged low for the following reasons: alteration in both places is weak; particular anomaly was not obtained in the result of the chemical analysis; and the distribution of alteration zones is limited to topographically high places, furthermore, scale of alteration is smaller than that of alteration zones in known deposits such as Campana Mahuida and Pino Andino.

3-2-10 Campana Mahuida district

1) Location

This district is located about 50 km west of Zapala city in the west part of Neuquen province (Fig. II-3-1-2). The area is lat. 37° 57' 36" to 38° 17' 24" S and long. 70° 28' 48" to 70°

39' 00" W, and about 675 km^2. The representative coordinate is lat. 38° 07' 30" S and long. 70° 34' 00" W (Fig. II-3-2-11).

This district includes the Campana Mahuida prospect surveyed in the Phase-1 and the Pino Andino prospect located 30 km to north of the Campana Mahuida, and a large-scale presumed alteration zone in the west of Loncopue town extracted by the satellite image of spectral patterns analysis.

2) Topography and vegetation

Short shrubs grow on undulating hills. The distribution area of granodiorite forms a steep rocky mountain.

3) Access

First traveling northward about 100 km on the No. 22 and No. 231 national road from Zapla city to Loncopue town, and then taking an eastbound route to cross Rio Agrio. Beyond that point, traveling southward about 7 km on unpaved roads reaches the Campana mahuida prospect or northward about 10 km on unpaved roads reaches the Pino Andio prospect.

4) Previous surveys

Concerning the previous surveys on Campana Mahuida prospect, see the Phase-1 report. Previous surveys regarding Pino Andino prospect where the Phase-2 field survey was conducted are described in detail in the Pino Andino final report (Cominco, 1996). The following description is an extracted translation of the report.

In Pino Andino area, quartz-barite veins had been exploited by A. Gonzales, a mine claim owner, on a small scale for about 70 years. In the Arroyo Mulichinco area located 2 km southeast, quartz-limonite veins with a small amount of galena and some gold were exploited on a small scale, although the time is unknown.

In 1995, Minera Andes Co., Ltd. expressed interest in gold and copper geochemical anomaly in this area and carried out systematic rock and soil geochemical survey, geological survey, magnetic geophysical survey and RC drilling (10 holes: 1,003 m in total).

In 1996, Cominco Co., Ltd. concluded an option contract with Minera Andes Co., Ltd. Based on the result of IP and resistivity survey (37.5 line km) and ground magnetic survey (55.3 line km), which were carried out immediately, RC drilling (10 holes: 2,000 m in total) was conducted. Five of the holes were drilled aiming at IP and resistivity anomaly coincident with low magnetic anomaly; four holes were for the geological target, and the remaining one hole was for the geological and geochemical target.

As a result of these surveys, it is clarified that a small-scale potassic porphyry body is

surrounded by sericitic alteration, and a hydrothermal alteration system of the porphyry Au-Cu type with mineralization of gold and copper exists, although it in low grades. However, it was concluded that it would be difficult to obtain the exploitable ore for open pit mining of 200 m depth in the drilled area because secondary enrichment is not developed. At the same time, because the scale of known potassic alteration is too small to explain the presence of surrounding sericitic alteration, it was suggested that there is the possibility that the central part of porphyry exists in the places such as the western side where the Quarternary sediments cover the bedrocks. Accordingly, as a scope of future prospecting, there were listed the area with magnetic anomaly accompanied by IP anomaly in south of Arroyo Mulichinco in the southern part, the area in northwest from the drilling sites, and also the area with geochemical anomaly in the eastern part.

5) Mining properties

In the Campana Mahuida prospect, the mining property is held by CORMINE S.E.P., a mining public corporation of Neuquen province.

In the Pino Andino prospect, a mining property is in litigation between CORMINE S.E.P. and A. Gonzales, owner of a mine claim for barite exploitation, and has not been clarified.

6) Geology and geological structure

This district is located in the Neuquen Basin formed in the Jurassic where the sedimentary rocks are distributed. The geology conists of the Cuyo group, and the Tortillo and Vaca Muerto formations of the Mendoza group, composed of siltstone, sandstone, conglomerate and limestone of shallow marine sediments. These are intruded by diorite, granodiorite, tonalite and andesite porphyry. As to andesite porphyry related to mineralization of Campana Mahuida deposits in the southern part of this area, the age of 74.2 ± 1.4 Ma was obtained by K-Ar radiometric dating for the secondary biotite (Sillitoe, 1977). On the other hand, regarding the quartz diorite porphyry located about 8 km northeast of Campana Mahuida deposits, the age of 21.3 ± 1.1 Ma was obtained by K-Ar radiometric dating for whole rock sample (JICA/MMAJ, 1984).

The geology of the periphery of Pino Andino prospect is summarized in the Pino Andino final report (mentioned above). The following description is an epitomized translation of it.

Pino Andino area is mainly underlain by Tordillo formation of Jurassic sedimentary rocks. In the central part of this area, there are outcrops of shale and tuffaceous sandstone, both of which have been bedded and contain nodules and fossils of invertebrate animals. In the eastern part, there are the distributions of tuff, lapilli tuff, tuffaceous sandstone, strongly re-crystallized shale, limestone and conglomerate. At the southeastern margin of the area where these Jurassic sedimentary rocks are distributed, granodiorite intrusion of the upper

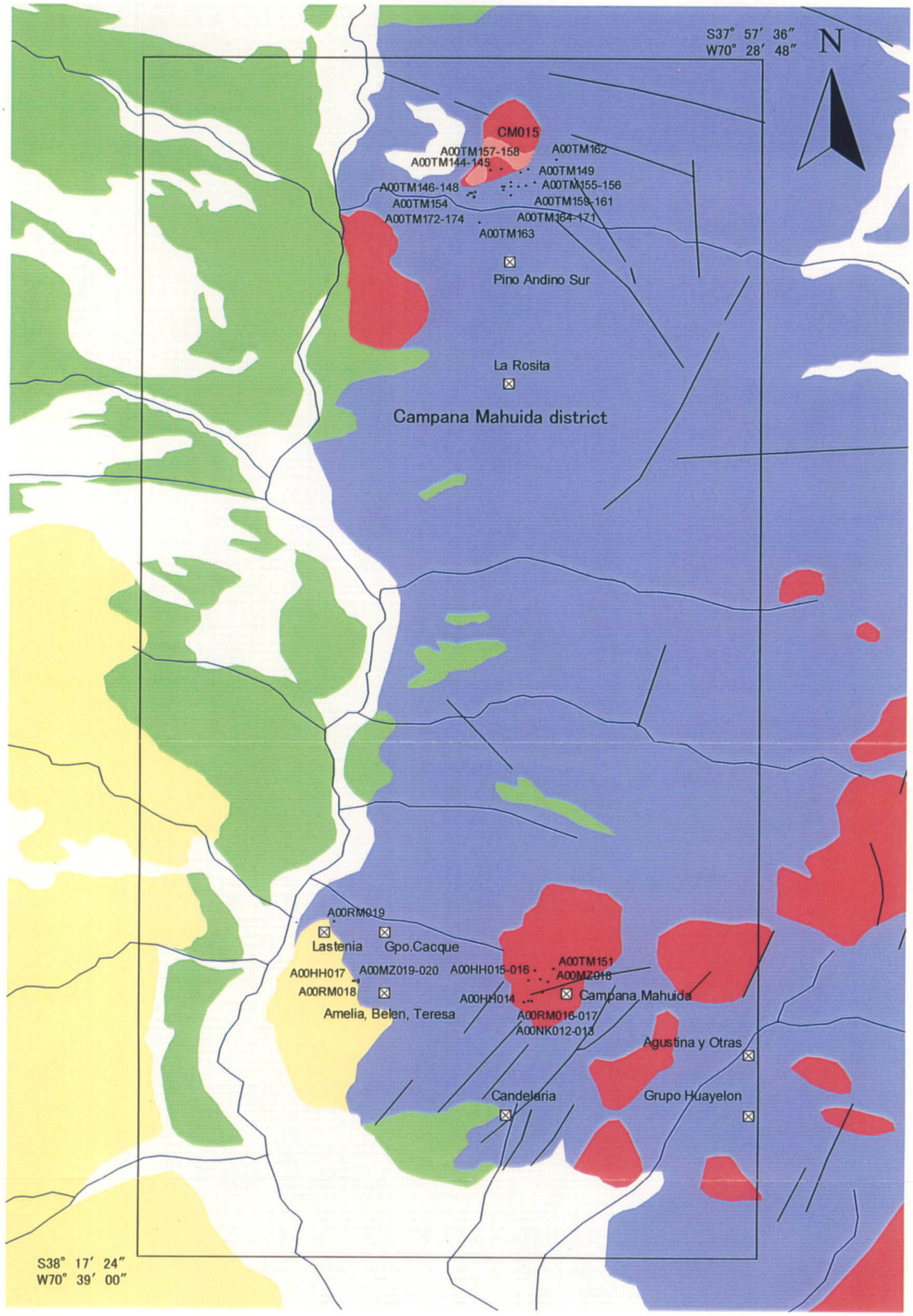


Fig. II-3-2-11 Geological map with sampling points of the Campana Mahuida district.

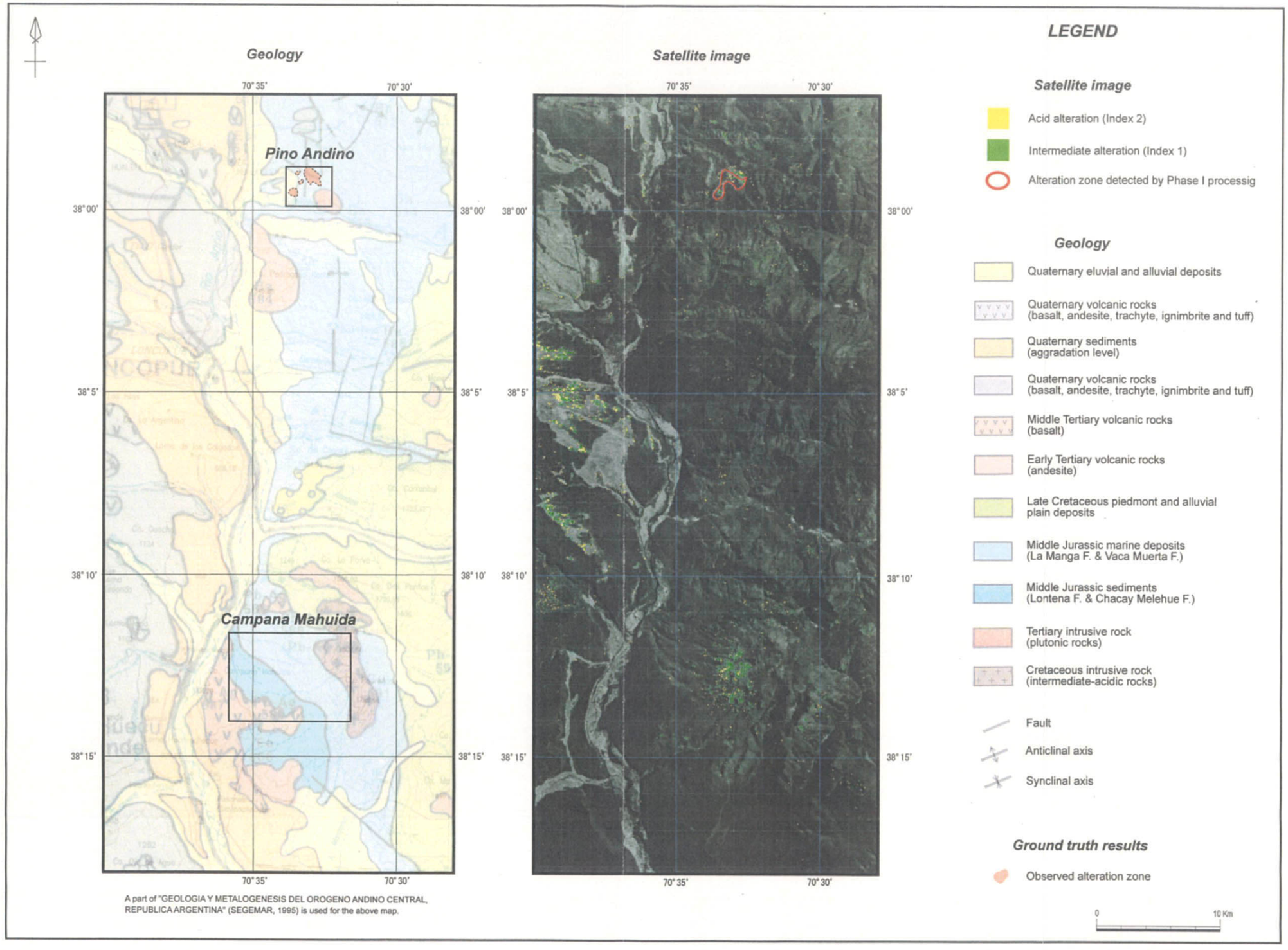
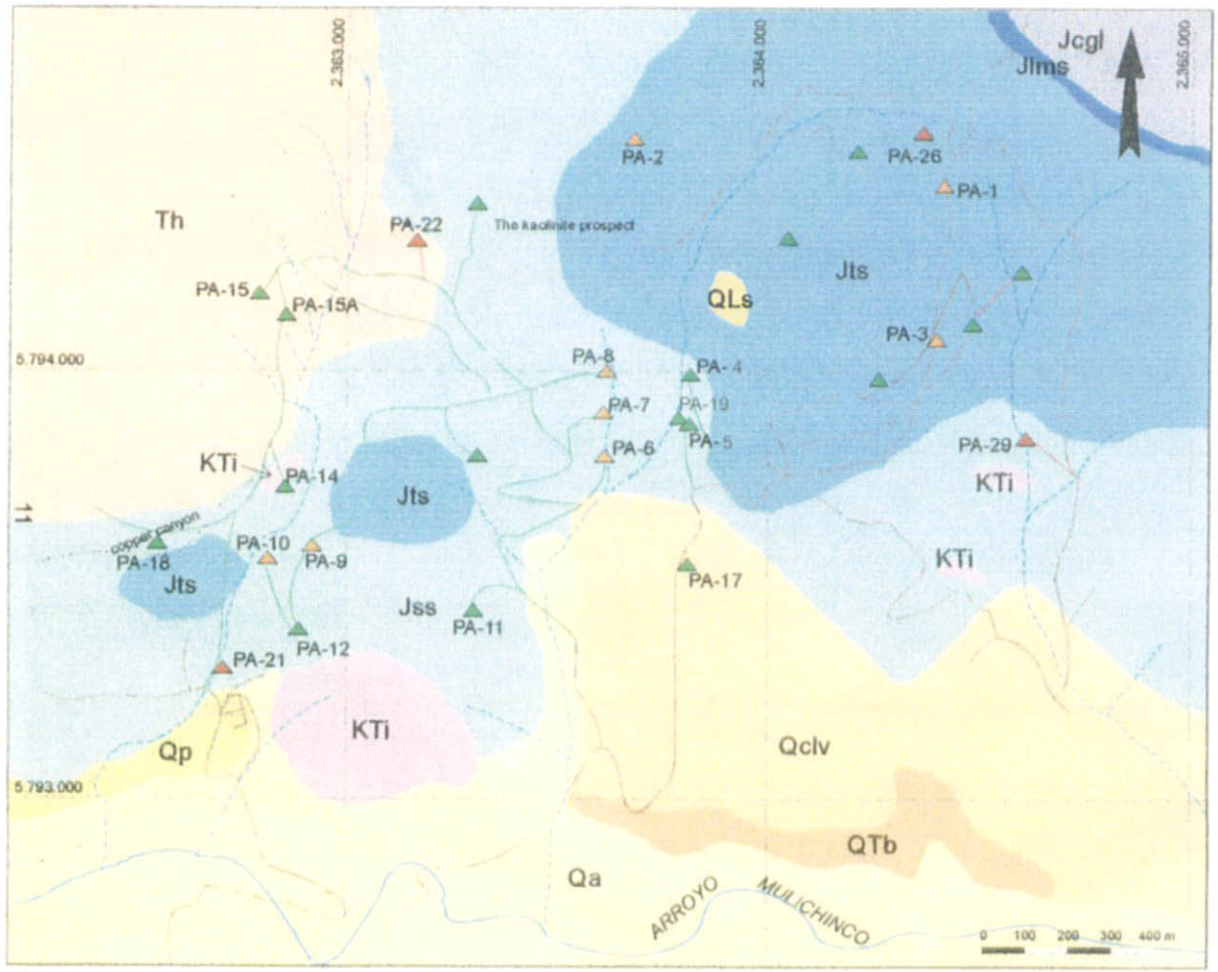


Fig. II-3-2-12 Satellite image and ground truth results in the Campana Mahuida district



REFERENCIAS / REFERENCES

TIPOS DE ROCAS / ROCK TYPES

Cuaternario / Quaternary

- Qa — Aluvión / Alluvium
- QLs — Depósito de deslizamiento / Landslide deposit
- Qclv — Coluvio / Colluvium
- Qp — Depósito de pumita / Pumice deposit
- QTb — Basalto Cuaternario-Terciario / Quaternary-Tertiary basalt

Terciario / Tertiary

- Th — Formación Huarenchenque: tobas, conglomerado polimíctico, depósitos fluviales. Huarenchenque Formation: unlithfied tuffs, polymictic conglomerate, fluvial deposits

Cretásico-Terciario / Cretaceous-Tertiary

- KTi — Cuerpos intrusivos. Generalmente de composición granodiorítica. / Intrusive bodies. General composition is granodiorite.

Jurásico / Jurassic

- Jcgl — Conglomerado / Conglomerate
- Jlms — Calizas / Limestone
- Jts — Tuff, lapilli-tuff, tuffaceous sandstone, and minor shale. Predominantly massive thick-bedded unit. Generally highly recrystallized. Toba, toba lapilli, arenisca tobácea y lutitas. Unidad predominantemente masiva en mantos gruesos. Generalmente recristalizada.
- Jss — Lutitas interestratificadas y areniscas tobáceas. Mantos medios a delgados. Interbedded shales and tuffaceous sandstone. Medium to thin bedded.

PERFORACIONES - DRILLINGS

- De 1997 - Of 1997
- 1996
- 1995-1996

CAMINOS - ACCESS

- Construídos en 1997 / Built in 1997
- Construídos en 1995-1996 / Built in 1995-1996
- Anteriormente existente / Previously existent

CORMINE (1998)

Fig. II-3-2-13 Geology and RC-drill hole locations in the Pino Andino project area

Cretaceous is distributed. Near the drilling sites of PA-7, PA-11 and PA-14, diorite or feldspathic porphyry of diorite to andesite composition intrudes into sedimentary rocks. Towards the west of the mining claim, unconsolidated volcanic ash, multiple conglomerate and alluvium of Huarenchenque formation (the last glacial epoch) are distributed. A series of sediments, basaltic lava, pumice, coluvium and alluvium of the Quaternary are distributed until Arroyo Mulichinco in the southern part of the mining claim as the southern limit.

7) Mineralization and alteration

Concerning the mineralization and alteration of the Campana Mahuida porphyry Cu deposit located in the southern part of this district, see the Phase-1 report.

The following description is regarding Pino Andino prospect in the northern part of this district where the field survey was conducted preponderantly in the Phase-2.

As to granodiorite (KTi) shown in Fig. II-3-2-13, relatively fresh body is exposed along Arroyo Mulichinco. In the small valley of the western margin of the prospect, near the drilling hole PA14 (1,100 m above sea level) located on the eastern foot of a plateau (about 1,250 m above sea level) composed of the Quaternary Huarenchenque formation, weakly altered granodiorite with malachite along the cracks is observed. In the vicinity, white argillization with pyrite dissemination is also observed. Weak argillization with limonite and malachite is observed along the valley on the downstream side of this drilling hole. Moreover, argillized porphritic granodiorite is also distributed near the drilling hole PA7 (1,140 m above sea level) in the central part of the prospect. Barite-quartz veins (N50°E, 70°N, width 1.0 m) with limonite and malachite are hosted in the granodiorite.

Near the drilling hole PA9 (1,130 m above sea level) about 200 m southeast of the drilling hole PA-14, tuffaceous sandstone with white argillization is distributed. On the hill (1,150 m above sea level) southeast of the drilling hole PA9, large blocks of hydrothermal breccia containing clear quartz exist sporadically.

In the vicinity of the drilling hole PA16 (1,200 m above sea level) in the northwestern part of the prospect, there is the sporadic existence of debris of white argillized tuffaceous sandstone or shale accompanied by black patches like copper oxide on the surface. Near the drilling hole PA2 (1,320 m above sea level) in the top part of the small ridge about 400 m to the northeast of drilling hole PA16, tuffaceous sandstone with silicification and white argillization is widely distributed. Among these, those with strong silicification and white argillization are also observed.

Near the top part (1350 m above sea level) of the mountain mass on the opposite side of PA2 and about 400 m to the southeast of the drilling hole PA2, tuffaceous sandstone with white argillization is distributed. In this tuffaceous sandstone with white argillization, there is also quartz-limonite veinlets of several centimeters in width locally and partial

silicification of somewhat porous texture with limonitization.

A small volume of a barite mass with malachite remains near the old pit around the drilling hole PA6 (1,100 m above sea level) in central part of the prospect. There is the distribution of tuffaceous sandstone with white argillization and vein-formed silicification with intensive limonitization. Around the drilling hole PA8 (1,160 m above sea level), weak silicification and vein-formed limonitization (width: 20 cm) develop in tuffaceous sandstone with white argillization. This aleration presents remarkable gossan-likeness. Tuffaceous sandstone near the drilling hole PA17 (1,140 m above sea level) with strong silicification is accompanied by quartz-limonite veinlets. Strongly silicified rocks with limonite are also observed near the place.

Tuffaceous sandstone in the vicinity of the old pit (N70°E) around the drilling hole PA3 (1,260 m above sea level) in the eastern part of the prospect with white argillization is accompanied by partial strong limonitization and barite. Similar rock is also distributed in the old barite trench about 100 m south of this drilling hole and the old barite mining pit (20 m in diameter) about 200 m west of the drilling hole.

An old barite mining trench also exists at the northeast margin of the prospect, and tuffaceous sandstone with weak silicification and argillization accompanied by barite is observed in it.

8) Characteristics of the satellite images

Although no alteration zones were extracted in the ratio composite image analysis around Campana Mahuida ore deposit, a color tone anomaly of light reddish purple is recognized on the image. The alteration zone CM015 was extracted around Pino Andino prospect, In the false color image, concentration of NE-SW oriented lineaments of 2 to 5 km in length are extracted from Campana Mahuida ore deposit to the southern part.

In the satellite image of spectral patterns analysis, yellow and green pixels indicating acid and neutral alteration are relatively extracted in both Campana Mahuida and Pino Andino. Besides these, however, it was confirmed that yellow and green pixels existing sporadically in places where the alluvium seems to be distributed in the west of Loncopue town corresponds to the reflection of dead plants and does not correspond to alteration at all.

9) Laboratory work results

Microscopic observation was done for granodiorite porphyry (A00TM151) forming a mountain mass on the eastern side of Campana Mahuida ore deposit, and K-Ar radiometric dating was done for biotite contained in it. As a result, this rock was identified as augite biotite hornblende quartz diorite, and 65.0±3.3 Ma (late Cretaceous) was obtained as an age of the biotite. This age is younger than the K-Ar age (74.2±1.4 Ma) of secondary biotite in

andesite porphyry related to mineralization reported by Sillitoe (1976). It was proven from this that rock forming the mountain mass on the eastern part of Camapana Mahuida ore deposits is quartz diorite that intruded after mineralization of Campana Mahuida. Concerning the results of laboratory works obtained in the Phase-1 survey for Campana Mahuida ore deposits and the vicinity, see the Phase-1 report.

In the Pino Andino prospect, a total of 27 samples were taken and chemical analysis and the powdery X-ray diffraction were done.

Granodiorite (A00TM163) along Arroyo Mulinchinco was identified by microscopic observation as hornblende dacite with alteration minerals of quartz, calcite, chlorite, sericite, etc.

The chemical analysis was done for slightly altered granodiorite (A00TM154) with malachite along cracks from near the drilling hole PA14 on the western margin of the prospect. As a result, >1% Cu, 7% Fe, 0.315 g/t Au, 2.4 g/t Ag, 0.6% Mn, 0.1% Zn and 354 ppm As were obtained. Sericite and a small amount of kaolin in addition to quartz were identified by the poedery X-ray diffraction. Porphyritic granodiorite (A00TM173) slightly weathered was identified by the microscopic observation as hornblende dacite that had suffered stronger alteration than A00TM163 and in which a large amount of calcite, sericite, quartz, chlorite, etc. were generated. In porphyritic granodiorite (A00TM172) with white argillization and pyrite dissemination, a large amount of sericite in addition to quartz were identified by the powdery X-ray diffraction, but no anomalous values were obtained by the chemical analysis. As to weakly argillized porphyritic granodiorite (A00TM174) with limonite and malachite, sericite and chlorite in addition to quartz and plagioclase were identified by the powdery X-ray diffraction, and 0.1 g/t Au, 2 g/t Ag and 0.4% Cu were obtained as a result of the chemical analysis. As a result of the chemical analysis for hydrothermal breccia (A00TM148) on the hill southeast of the drilling hole PA9, 2.33 g/t Au was obtained but no other geochemical anomaly of Ag, As, Hg, Cu, etc. was obtained. Sericite and chlorite were identified in addition to quartz as a result of the powdery X-ray diffraction for white argillized tuffaceous sandstone (A00TM146) that was taken from near the drilling hole PA9. No geochemical anomaly was obtained in the result of the chemical analysis for a similar sample (A00TM147).

Chemical analysis was also done for the barite-quartz veins (A00TM156, width: 1.0 m) with malachite and limonite, which are hosted in granodiorite near the drilling hole PA7 in the central part of the prospect. As a result, geochemical anomalous values of 0.5g/t Au, 64g/t Ag, 0.25% Cu, 11% Fe, 0.1% Zn, 2310ppm As, 3480ppb Hg and 810ppm Sb were obtained. In some cases, black round patches stick to the surface of this granodiorite debris existing sporadically in the vicinity. Only sericite in addition to quartz were identified as a result of the powdery X-ray diffraction for the sample (A00TM155).

The powdery X-ray diffraction for tuffaceous sandstone (A00TM159) with white argillization around the top part of the mountain mass on the opposite side of the drilling hole PA2 resulted in identification of sericite in addition to quartz and a small amount of potassium feldspar. In the results of the chemical analysis for quartz-limonite veinlets (A00TM160) in the tuffaceous sandstone, 0.5g/t Au, 19g/t Ag, 0.4% Pb, 397ppm As and 520ppb Hg were obtained as well as 12.6% Fe. As a result of the chemical analysis for slightly porous tuffaceous sandstone (A00TM161) with white argillization, partial silicification and intensive limonitization, 1.8g/t Au, 20g/t Ag and 18,610ppb Hg were obtained.

Concerning the barite vein mass (A00TM149) accompanied by malachite that is near the drilling hole PA6, <0.3g/t Au, 45g/t Ag, 1.1% Ba, 1.7% Cu, 0.6% Pb and 0.2% Zn were obtained from the result of the chemical analysis. The chemical analysis was also done for sandstone (A00TM165) with white argillization, vein-like silicification and intensive limonitization near the drilling hole PA5. As a result, the following geochemically anomaly were obtained: 0.9g/t Au, >100g/t Ag, 0.18% Cu, >1% Pb, 12% Fe, 1720ppm As, 12,590ppb Hg and >1000ppm Sb. As a result of the chemical analysis for the gossan-like part with weak silicification and intensive limonitization in the vein form (width: 20 cm) that is near PA3, geochemical anomaly of 0.2g/t Au, 1.4g/t Ag, 0.4% Cu, 18% Fe, 1500ppm As, 80ppb Hg and 33ppm Sb were obtained. In the results of the chemical analysis for sandstone (A00TM164) accompanied by quartz-limonite veinlets and strongly silicified sandstone (A00TM171) with intensive limonitization, both of which are located near the drilling hole PA17, no noticeable geochemical anomaly was obtained except 840ppb Hg and 3850ppm Ba for A00TM164.

The chemical analysis was done for a sample (A00TM169) with intensive limonitization around the old adit (in the direction of N70° E) near the drilling hole PA3 (PA3 on the eastern side). The following anomalous values were obtained: 0.5g/t Au, 4.2g/t Ag, >25% Fe, 0.3% Pb and 943ppm As. Anomalous values of 1g/t Au, 29g/t Ag, 0.2% Pb, 22% Fe, 1335ppm As and 490ppb Hg were also obtained for a similar sample (A00TM170) from the old barite trench, while 0.6g/t Au, 8.4g/t Ag, 1220ppb Hg, 850ppm Ba and 7.6% Fe were obtained for a similar sample (A00TM168) in the old barite mining pit.

As a result of the chemical analysis for a sample (A00TM167) taken in the place slightly to the west of the old trench, which is accompanied by barite, white argillization and limonite along the crack in silicified sandstone, the content of Au and Ag is very small although 1290ppm Ba and 7.9% Fe were obtained.

Anomalous values of 16.5% Fe, 782ppm As, 260ppb Hg and 480ppm Ba were also obtained as a result of the chemical analysis for a sample (A00TM162) with intensive limonitization inside the barite trench on the northeastern margin of the prospect. The values of Au and Ag were, however, 0.065g/t and 4.8g/t, respectively, which is very low.

The powdery X-ray diffraction for debris (A00TM144) of white argillized tuffaceous sandstone and shale with black small copper-oxide-like patches near the drilling hole PA16 in the northwestern part of the prospect resulted in identification of sericite, montmorillonite and kaolin in addition to quartz. As a result of the chemical analysis for a similar sample (A00TM145), 0.035g/t Au and 11% Fe were obtained but the Cu content was 391 ppm, which is unexpectedly low. As a result of the powdery X-ray diffraction for tuffaceous sandstone (A00TM157) with silicification and white argillization that is widely distributed in the vicinity of the drilling hole PA2, sericite and kaolin in addition to quartz were identified. In the results of the chemical analysis of both this sample A00TM157 and tuffaceous sandstone (A00TM158) with intensive silicification and argillization, no geochemical anomaly was obtained.

From these results of laboratory works, alteration in this prospect can be characterized mainly by silicification and sericitization. Although calcite and chlorite were confirmed for small rock body of granodiorite (identified as hornblende dacite by microscopic observation) and the vicinity, potassic alteration reported by "Pino Andino final report" (Cominco, 1996) has not been confirmed. It was clarified that geochemical anomalies of copper (>0.1%) was mainly caused by dissemination of copper oxide such as malachite in a small body of granodiorite and the vicinity, and that it was located from the middle to southwestern part of this prospect. Geochemical anomalies of gold (>0.5 g/t) is accompanied by anomalies of Ag, Hg, As, Sb and Pb on the whole except hydrothermal breccia where 2.33 g/t Au, the high grade, was obtained. Anomalies are relatively concentrated on high places in the northeastern mountain mass and the southeastern mountainside in the area where tuffaceous sandstone with limonitization, silicification and sericitization is distributed. There are old barite mining sites in this range, but no correlation between Au and Ba was recognized. Contents of Ag, Hg, As, Sb and Pb in hydrothermal breccia (A00TM148) were low in spite of the highest Au content (2.33 g/t Au). Therefore, it has been clarified that this Au mineralization behavior is different from that of Au mineralization in alteration rocks.

10) Assessment

It is judged that Campana Mahuida deposits themselves don't require future exploration since sufficient drilling surveys already have been carried out, as mentioned in the Phase-1 report.

Regarding the Pino Andino prospect, the possibility can be considered that the central part of porphyry probably exists beneath the plateau covered by the Quaternary sediment in the northwestern part, as mentioned in the "Pino Andino final report" (Cominco, 1996). As a practical matter, however, exploration and development are considered to be difficult because the presence of the Quarternary sediment plateau about 150 m relative height will be a

negative subject.

Geochemical anomalies of gold (>0.5 g/t) was relatively concentrated on the northeastern mountain mass and the southeastern mountainside in the area where tuffaceous sandstone with limonitization, silicification and sericitization is distributed. The area seems to have been already surveyed with seven (PA-23 to PA-29) of nine drilling holes after the final report mentioned above. The results of such surveys, however, have not been confirmed.

3-2-11 Palau Mahuida district

1) Location

This district is located about 50 km west of Zapala City in the west part of Neuquen province (Fig. II-3-1-2). The area is lat. 38° 39' 36" to 38° 54' 00" S and long. 70° 35' 24" to 70° 51' 00" W, and about 1,000 km^2 (Fig. II-3-2-14). In the center of this district, presumed alteration zones ZA004 to ZA019 extracted by ratio composite image are extracted. In addition, some alteration zones extracted by the satellite image of spectral patterns analysis were extracted between Arroyo Cochico Grande and Arroyo Cochico Chico in the southwestern end of this district (hereafter, called the Cochico Grande alteration zone). In the northwestern part of this district, Arroyo Manzano, Litran, and Mallin Chileno mineral occurrences are located.

2) Topography and vegetation

Cerro Las Lajas (2,650 m above sea level) and its vicinity in the central-eastern part of this district is the area of volcanic mountains of the Tertiary to Quarternary rising higher than 2,000 m above sea level. This topography is the highest in altitude and the steepest in the field survey area. Radial water systems develop in all the directions from the top of Cerro Palau Mahuida and Cerro Las Lajas to form undulating mountain-foot landforms. Among those, big valleys with steep cliffs develop in the NE-SW direction. The mountain tops are bare with exposed rocks while the foot of the mountains is sparsely covered by tall pino trees and short shrubs such as neneo, coiron and nire.

The Cochino Grande alteration zone and its vicinity are relatively gently sloping. Though the mountain tops are exposed with rocks, shrubs such as neneo, coiron and nire sparsely grow in low lands.

The vicinity of the alteration zone ZA004 in the northern part of this district is a rocky zone full of stones.

3) Access

National and provincial road develop around Cerro Palau Mahuida and Cerro Las Lajas.