Chapter 4 Ground truth

4-1 Selection of survey zones

For the selection of survey zones in Phase I, among 44 zones those are dense with mineral deposits as shown in Table I-5-1-1, the following 20 zones that had little relationship with porphyry copper or copper/gold deposits, epithermal gold deposits, polymetallic vein deposits or SEDEX lead/zinc deposits, all of which had been selected as the targets for the reasons mentioned above, were excluded from the survey.

① Zones dense with the Ordovician sedimentary phosphate deposits: Zones 06 and 25
② Zone dense with REE (rare earth element) deposits in carbonatite dikes: Zone 20
③ Zones dense with borate / salts in evaporite : Zones 21, 29 and 30
④ Zones dense with uranium / vanadium deposits existing in the Cretaceous Yacoraite Formation : Zones 35, 36 and 37
⑤ Zones dense with deposits of rare metals such as Nb, Ta and Be in pegmatite: Zones 32, 33 and 40
⑥ Zones dense with placer deposits: Zones 04 and 19
⑦ Zones dense with Sn or W deposits that were generated at relatively high temperature and are expected to have little relationship with porphyry copper deposits: Zones 13, 14 and 44.
⑧ Zones dense with Pb/Zn/Ag vein deposits with Precambrian/Cambrian wall rock before the forming of SEDEX lead/zinc deposits: Zones 16, 23 and 41

From the remaining 24 zones, 21 zones, or a total of 36 places (of mineral showings), were selected as zones to be covered by the field survey of Phase I.

In Phase II, the following 8 areas were selected. Because these area are thought to have high potential for the existence of deposits but have been surveyed insufficiently, and future survey are expected to lead to the discovery of new deposits, among potential zones extracted in the evaluation of Phase I.

(1) SEDEX type lead/zinc deposits and volcanogenic massive sulfide deposits

1) El Aguilar area

It is necessary to clarify ore horizons by using lithogeochemistry in El Aguilar mine area including Rio Grande (Zone 13), and stratigraphical division with microfossils such as conodont.

2) Pumahuasi and 3)Santa Victoria area

It is also necessary to identify, by the similar method, ore horizons in the east-to-west route (Zones 2, 3 and 5) connecting from Pumahuasi to Santa Rosa and La Cienaga mineral showings.

4) La Colorada area

In La Colorada mineral showing, volcanongenic massive sulfide deposits were discovered by drilling of Pacific Rim Co., Ltd. It is desirable to identifier the feature of this deposit by analyzing drill hole core sample. Similarly to El Aguilar, lithogeochemical exploration is also required for extraction of ore horizons (Zone 18). Furthermore, Limeca mineral showing are considered as SEDEX type deposit and it also needs to clear the detail.

(2) Porphyry copper and epithermal type deposits

1) **Pancho Arias area**

It is hard to say that porphyry type copper and copper/gold deposits have been fully investigated in small-scale stock of the Neogene in the basement rocks located in the extension of volcanic rock arms away from the main body of volcanic rock. Concretely, areas to be investigated are Zone-28.

2) **El Pago area**

El Pago have been extracted as alteration zones by analysis of the satellite images. It is desirable to acquire the detailed characteristics and distribution of the alteration zone (Zone 47).

3) **Rachaite area**

It is known that large-scale argillitic alteration zones with base metal, such as Rachaite, Incachule and Pan de Azucar, exist on the wall of annular structure or resurgent calderas. Rachaite in Cornazuli caldera is one of the largest alteration zones in such area, therefore it necessary to identify the detail.

4) **Galan area**

From the analysis of satellite images, alterations were identified in the candela wall and on its southeast side around Zone-39 and Galan candela. However, this zone has not been sufficiently surveyed yet, so it is desirable to investigate the characteristics and the distribution of alteration and mineralization.

4-2 Survey result

4-2-1 SEDEX/VMS deposits

(1) Aguilar Mountains zone

1) Location and access

The Agular mountains (highest altitude: 5127m) is located from north to south between smooth plateaus, called Puna and east part mountain range (Cordillera Oriental). The El Aguilar mine is located almost at the center of this Aguilar Mountains, and about 60km south of Abra Pampa town, at 23° 12′ 46.3" S. Lat., and 65° 40′ 42.4" W. Long. By driving 47km southward on the paved National Road 9 from Abra Pampa, Tres Cruces where there is the gate of the El Aguilar mine is reached in about 20 minutes. Going southward from this gate on a private road constructed over 50km at the east foot of the Aguilar Mountains leads to the mine office.

2) Content of survey

In the Aguilar mine area, mineralization outcrops of El Aguilar, Oriental, Pirita, Esperanza, and Rio Grande were surveyed, and in Aguilar mine area periphery, the lower part outcrop of Santa Victoria Group was mainly surveyed and samples were collected (see Fig.II-4-2-1-1). In order to clarify petrological, paleontological, geochemical characteristics of SEDEX horizon hosted deposits and their stratum of hanging/foot walls, and to discover horizon similar to already-known SEDEX horizon hosted deposits , these samples were subjected to the following various laboratory examinations.

Observation of thin section of rock:	4
X rays diffraction analysis:	2
Observation of polished section of ore:	1
Ore assay:	1
Fossil identification:	18
Geochemical analysis:	46

To trace horizon hosted deposits, the characteristics of the stratum accompanying SEDEX horizon hosted deposits were clarified by ASTER images.

3) Mining concessions

Mining concessions are hold in the El Aguilar mine and surrounded area.

4) Past exploration and mining activities

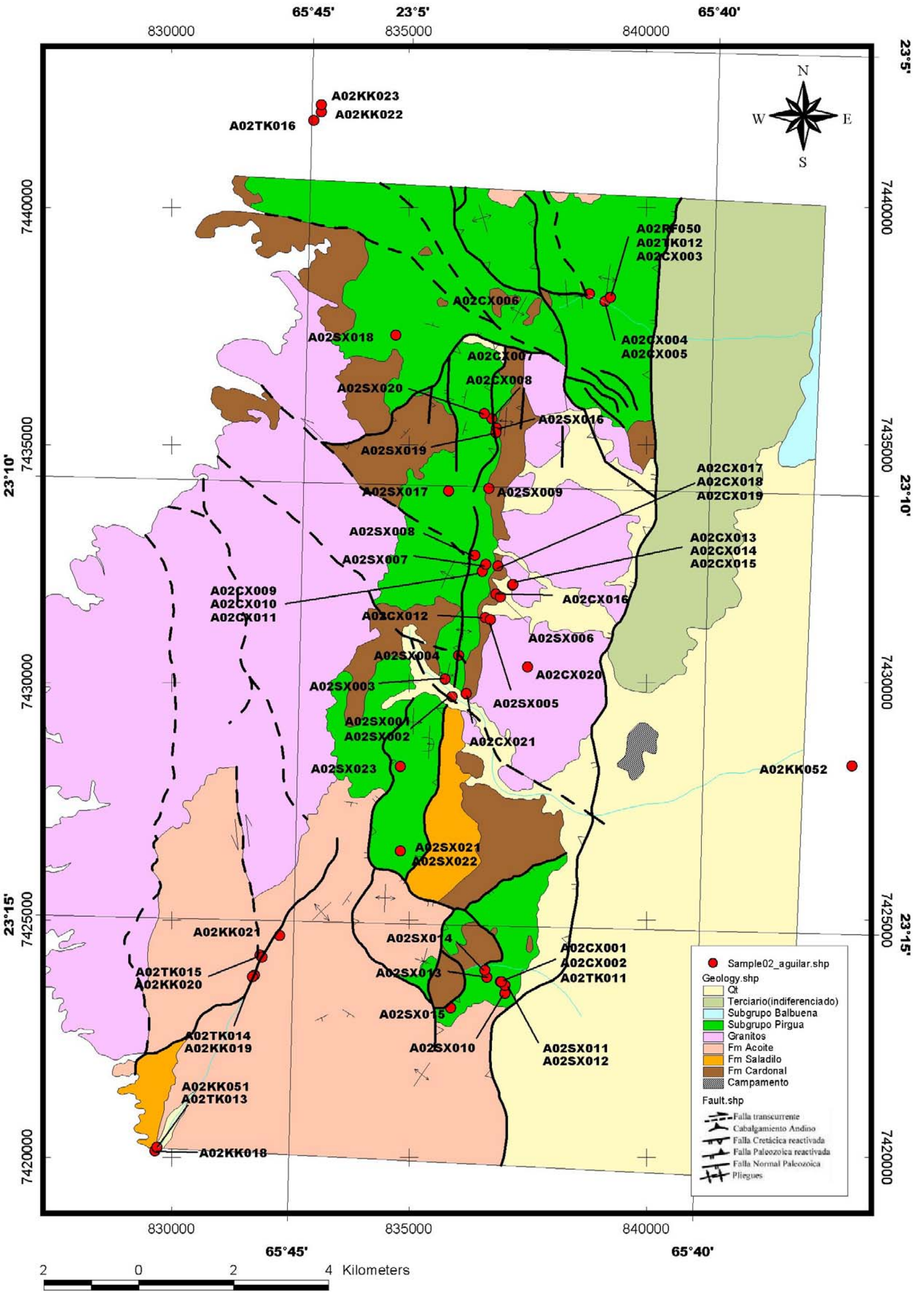


Fig.II-4-2-1-1 Location map of samples collected in the Aguilar range area

In the Spanish colony age, a missionary who settled down in Yavi tried to recover the silver of this ore deposits, and constructed a charcoal-fired blast furnace in the Fundicion valley of 7km south from the Aguilar mine. The same as this registration of the Tapada mine, as the oldest report concerning ore deposits of Aguilar mountain range; it is filed in the mining ledger of the Argentine Republic that the mining right was granted to Mr. Manuel P. Pinto in June 1891.

Ore mining was carried out intermittently and on a small scale especially during World War I. The mine property existed in the names of two men, Mr. Stone and Mr. Bongiovanni of San Salvador of Jujuy in around 1918. This mine property was transferred to geologists of Saint Joseph Lead for the name of the company by the end of 1923. Then, this mining right was deposed by the recommendation of Compania Minera Aguilar S.A. (CMASA) and the Examination No. 23B in 1925. The measurement records of the mine property and the approval are dated on November 6, 1928. The investment to the ore deposits exploration including the adit development of 6,798m in length was made in around 1932. Significant tonnage ore worthwhile to develop a large-scale ore deposits was exposed. The economic crisis in 1930 delayed the initiation of development in Aguilar mine and operation of the dressing plant for six years. From the beginning of 1936 up to the present time, the production of ore mining and lead and zinc concentrate has been continued. In 1980's, the government-run lead company transferred CMASA to a holding company FLUOR. Actually, this company is in possession of a joint adventure of COMSUR (66.6%) and Rio Tinto Zinc Company (33.3%).

5) Geology and tectonics

In geology of Aguilar Mountains, the northern part of mountain range bordered by Portillo Grande valley is shown in a geological map "La Quiaca" with a scale of 1 to 250,000, and the middle southern part of the mountain range including Aguilar deposits is shown in a geological map “Ciudad de Libertador General San Martin" with the same scale.

According to these geological maps, Acoite Formation in the upper part of Ordovician system Santa Victoria Group is distributed in the northern part of the mountain range. The middle southern part of the mountain range is mainly occupied by Santa Victoria Group (no division). Intrusive rock bodies called Aguilar and Abra Laite granite that is estimated to have been formed during Cretaceous and Jurassic Periods are distributed on both sides of east and west of Aguilar deposits. Santa Victoria Group in the vicinity of Aguilar granite on east side is especially discriminated to Guayoc Chico Formation (corresponding to the lower part of Santa Victoria Group). All lowlands are covered with alluvial deposits.

Regarding the central part of Aguilar Mountains, a geological map (Scale: about 1 to 125,000 and made in Aguilar mine) which was inserted in Sureda J.R. (1999) is available.

According to Sureda R.J. (1999), Ordovician system geological stratigraphy consists of Despensa layer, Padrioc formation, Lampazar formation and Cardonal formation corresponding to the lower part of the Tremadocian, and Acoite Formation and Sepulturas layer corresponding to the Arenig, from below. Aguilar quartzite layer or Aguilar Quartzite (Spencer 1950) is a metamorphic unit in the Cretaceous, and it is assumed that the sedimentary rock of the relevant source rock is Padrioc formation.

Based on some facts obtained from explorations conducted as part of the geological map-drawing project of SEGEMAR, Seggiaro R. (in preparation) proposes re-composition of geological stratigraphy in this zone and is making a new geological map.

Stratum that hosts SEDEX deposits has so far been assumed in between Cambrian uppermost part and Lampazar formation of the lowest part of Tremadocian formation. However, in the sedimentary rocks of the Rio Grande valley assumed to be this Lampazar formation, the existence of the fossil from the lower part of Tremadocian series to their central part was identified. (Martin, 1989 and Rao and Flores, 1998) And the stratum from the lower part to the central part of Tremadocian series in the east part mountain range is called Saladillo formation (Moya et al, 2000 and Malanca, 2002). For the above reasons, it has been so decided in this area that conventional Lampazar formation is now called Saladillo formation based on this fossil stratigraphy. Furthermore, it is proposed to include quartzite (Acenolasa 1968) that was so far included in Padrioc formation in the lower part of Lampazar formation into Cardonal formation that is further upper position. In this connection, it is proposed that the conventional Aguilar quartzite in the open-cut mining area in the Aguilar mine be included in the Cardonal formation because it is positioned in the lower part of the Saladillo conglomerate.

In addition, because olistostrome is recognized in the Saladillo formation, Seggiaro R. (in preparation) points out that a tensile fault that acts key role as a pipe of ore-forming fluid of SEDEX ore deposits exists in the Rio Grande valley and the Despensa valley, and describes as follows. In other words, “Saladillo formation in the vicinity of boundary with Cardonal formation contains rounded quartzite and is multi-source conglomerate layer consisting of the fragment etc. of squarish, black shale. Meanwhile, in the Rio Grande valley and the Despensa valley, rubble of quartzite, olistostrome, landslides and slumping structure are observed. Olistolith is massive rocks that slipped from the lower plate side block of the normal fault in the Saladillo formation sedimentary basin. It was caused as an immediate result of the tensile fault. Economical importance of the discovery tensile fault formed at the same time as this Saladillo formation's development should be noteworthy. These faults became a pipe for discharging the ore-forming fluid that turned out to be the SEDEX source of Aguilar deposits (Pb, Ag, Zn).”

Thus, in spite of this complex geological structure, because a reasonable interpretation of the field observation result is possible, it was decided in this report, to use this geological map under preparation (see Fig.II-4-2-1-2) with the consent of Mr. Seggiaro R.

6) Mineralization and alteration

In Aguilar Mountains area, mineral showings such as Candelaria, Pozo Bravo, Rio Grande, Zarzo, Hueco, Pirita, Oriental, Tapada, and Despensa exist from the north besides El Aguilar and Esperanza deposits in operation now. Candelaria is a small-scale abandoned mining site and is composed of galena and zincblende quartz vein with a maximum width of about 10cm hosted in Acoite formation (confirmed in the first phase survey). Mineral showings other than this Candelaria are located around the vicinity of both El Aguilar and Esperanza ore deposits (see Fig.II-4-2-1-3).

The El Aguilar deposits are hosted in the meta-quartzite and holnfels in the Cardonal formation (so far called Aguilar quartzite) with a layer thickness of 200m and are composed of ten stratiforms of Pb - Zn ore bodies with a scale of an average length of 150 to 1000m, 50 to 300m in width, and 5 to 80m in thickness. The Aguilar quartzite (according to the result of microscopic examination of sample A02CX021, metamorphic chart or quartzite which consists of a large amount of quartz and an small amount of muscovite and a negligible amount of opaque minerals) is formed from the Cardonal formation that was metamorphosed by the intrusion of Abra Laite granite and Aguilar granite (according to the microscopic examination of the sample A02CX020, this is amphibole-granodiorite or Complejo Eruptive Oire with sericite of negligible amount as altered minerals).

Esperanza deposits in the Saladillo formation (conventional Lampazar formation) consists of the main manto-type ore body of 350m in total length, 130m in width in the E-W direction, 27°W in dip and 18m in the maximum, and two ore bodies accompanying the lower part of this stratigraphy.

In the first phase survey, the main ore bodies were observed at the adit 4,577m above sea level and samples were collected. Microscopic examination of the ore (A01RT059) shows the state of production of bedded sulfide ore, indicating that the ore consists mainly of zincblende and galena containing a small amount of chalcopyrite and a very small amount of pyrite. It further presents a clear lamination structure that almost harmonized with sedimentary structure as long- flaky sericite did.

At about 200m north extension part from the open-cut mining site of this main ore bodies, SEDEX-type galena and zincblende stratiform ore bodies (about 1.0m thick layer), shale immediately above that and phyllite quality Slate at the lower part were collected and analyzed (see Fig.II-4-2-1-4). The geochemical analysis values of three samples are compared, and the elements with the maximum values were enumerated respectively. The elements with values more than ten times of the minimum value were shown in bold type.

Upper part shale (A02CX008) :**As, Be, Ca, Cr, Cu, P, Sr, V**

Stratiform ore bodies (A02CX007) :**Au, Hg, Ag, Cd,** Fe, Mn**, Pb, S, Sb, W, Zn**

Slate (A02SX016) :**Al, Ba,** Co, **K, Mg, Na, Ni, Ti**

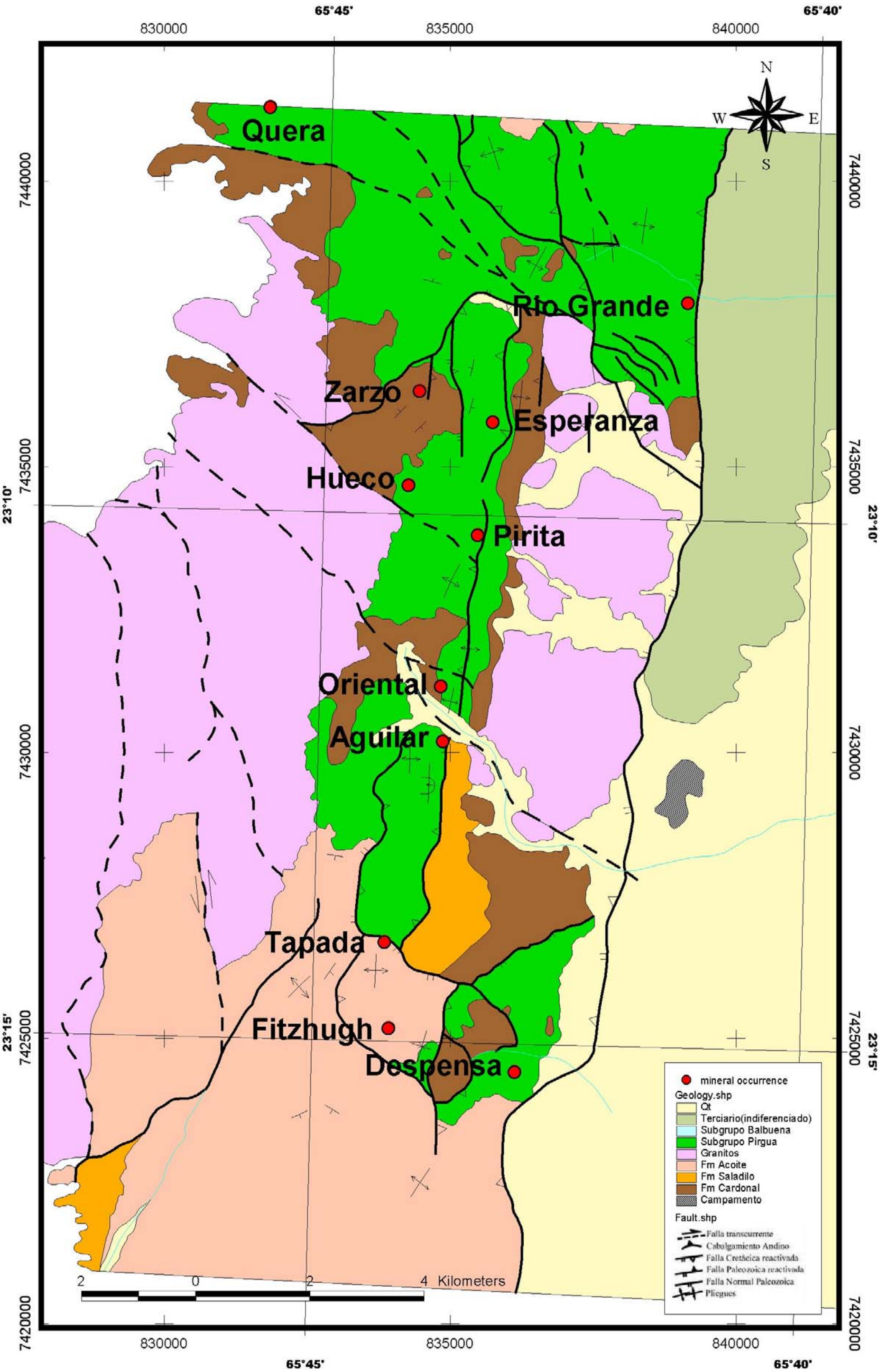


Fig.II-4-2-1-3 Location map of the mineral occurrences in the Aguilar range area

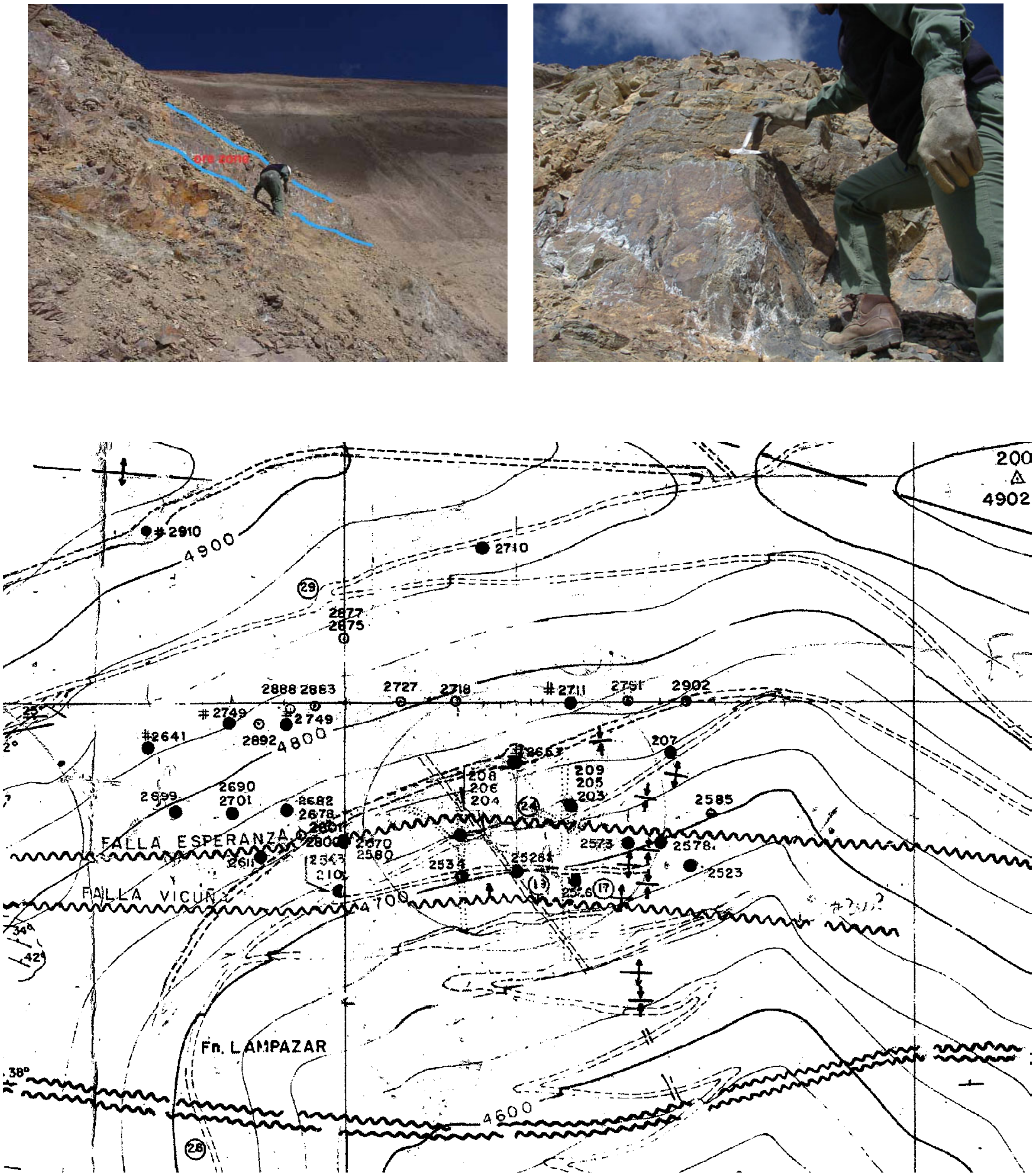


Fig.II-4-2-1-4 Location and photos of the Esperanza outcrop in the Aguilar range area

Pozo Bravo is located about 7km north-northwest of Esperanza deposits, most upper-stream of Quera river on the west side of Aguilar Mountains, and is vein-type lead and zinc deposits hosted in Acoite Formation. (Sureda,1999)。

Rio Grande, located about 3km northeast of Esperanza deposits and midstream of Rio Grande valley, is massive pyrrhotite layers with a maximum width of about 20cm, confirmed in the Saladillo formation (previously Lampazar formation). It is immediately above the stromatolite layer in a bedded black shale, and with a strike of N30°W and a dip of 15°SW. In the first phase survey, these mineralized horizons are confirmed at least 150m in length in the inclined direction. Although the mineralization is similar to that of Mina Esperanza deposits and drilling was carried out, a final conclusion was obtained that it is not profitable.

Zarzo is located in the most upper-stream of the north side branch of the Rio Grande on the west side of Aguilar Mountains, about 1km west of Esperanza deposits, and is bedded deposits hosted in the Saladillo formation. In general, it is considered to correspond to the extension of the west side of Esperanza deposits with the synclinal structure of N - S direction in between.

Hueco is located about 2km south-southwest of Esperanza deposits and at the most upper-stream of Rio Grande south branch of Westside of Aguilar Mountains. It is vein-type lead/zinc deposits hosted in the Cardonal formation. (Sureda 1999)

Pirita, located about 2.5km south of Esperanza deposits, is a mineral showing zone (area of about 1km2) that is hosted in the Saladillo formation. According to Figure 3 of Sureda (1999), El Aguilar-Oriental-Pirita is assumed to be a series of bedded deposits. Rincon is one stratiform ore bodies in this mineral showing zone, and is located about 4km south of Esperanza deposits. Strike and dip of the ore bodies apparently shows the form of harmonized bedded deposits with the bedding plane (N10E/50W). The hanging-wall side ore bodies (about 1.0m in layer thickness) are massive quartz's (Zn grade of about 7%) accompanied by pyrrhotite and zincblende, and ore bodies (layer thickness of about 1.5m) on the foot side is massive quartzes (Zn grade of about 7%) accompanied by pyrite impregnation (see Fig.II-4-2-1-5).

As is the case with Esperanza deposits outcrop, geochemical analysis values were compared with those of the shale of the upper part ore bodies, hanging wall side ore bodies and the lower part shale, and each element with the highest value was enumerated. The elements with values of ten times larger than the minimum value were shown in bold type.

Upper part shale (A02CX009)	:**Al, Ba,** Be, **K, Mg,** Mn, **Na, P, Sr, Ti, V**
Hanging wall side ore bodies (A02CX011)	:**Au,** Hg, **Ag, As, Bi, Cd,** Co, **Cu,** Fe, **Mo,** Ni, Pb, **S,** Sb, W, **Zn**
Lower part shale (A02CX010)	:Ca, Cr

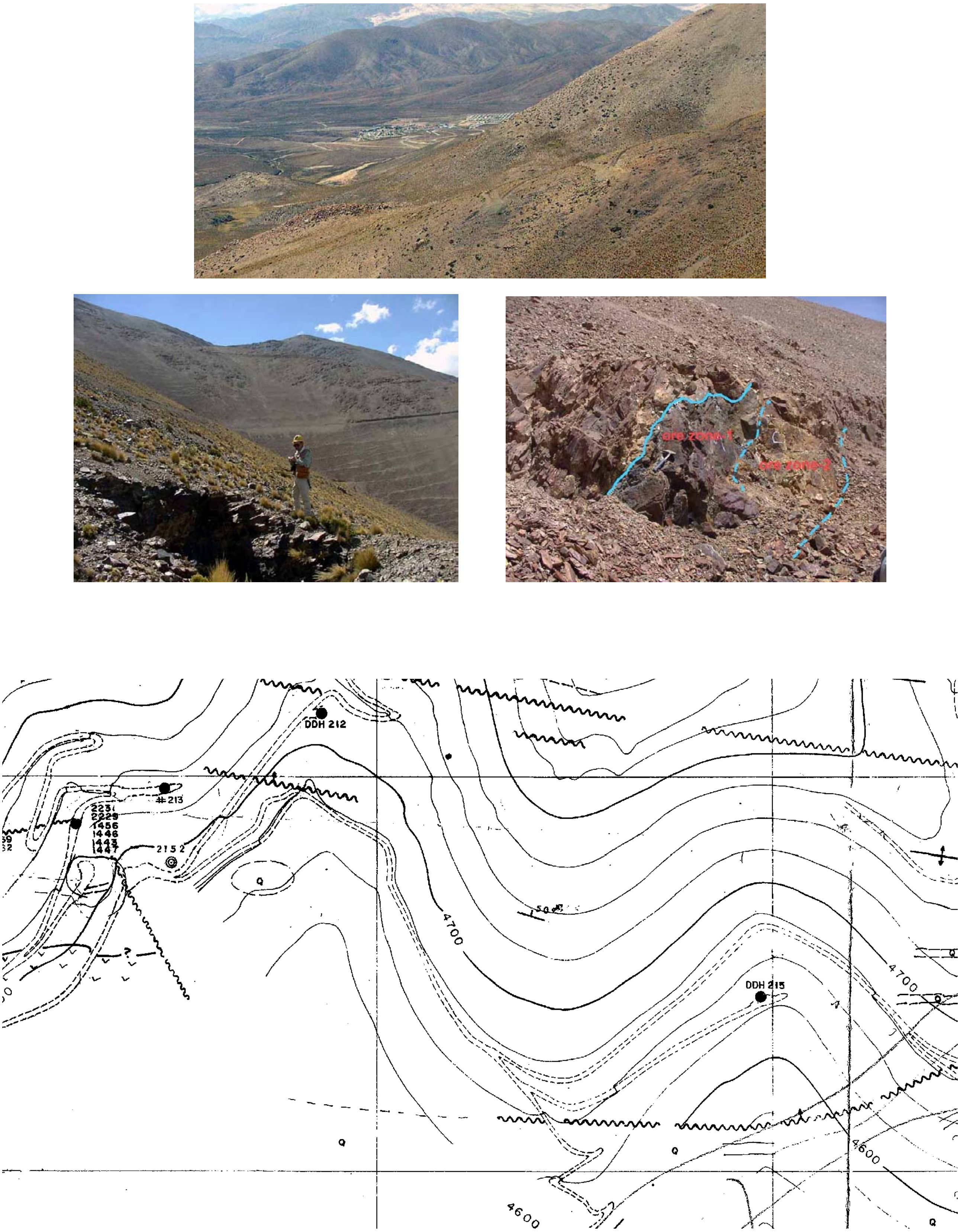


Fig.II-4-2-1-5 Location and photos of the Rincon mineral showing in the Aguilar range area

Oriental is located about 1km south of Rincon and about 1.5km north- northeast of El Aguilar open-cut mining pit, and is stratiform ore bodies (layer thickness of about 2m, with average Pb: 7%, and Zn: 6%) in the Cardonal formation sandstone which received metamorphism, and is brecciated ore bodies of average grade of Pb:7% and Zn:6% accompanied by macro crystals of galena and zincblende (see Fig.II-4-2-1-6).

As is the case with Rincon, the geochemical analysis values are compared with those of sandstone (according to microscopic examination, altered fine-grain sandstone～siltstone that consists mainly of quartz, biotite, and feldspar grain) of the upper part of the ore bodies, metamorphic sandstone of brecciated ore bodies and lower part. Thus, the elements each having a highest value was enumerated. Further, the elements with values ten times or larger than the minimum value were shown in bold type.

Upper part sandstone(A02SX006)	:Al, Ba, Be, Cr, **K**, **Na**, Ni, Sr, **Ti**
Brecciated ore bodies(A02CX012)	:**Au**, Hg, **Ag**, As, **Bi**, Ca, **Cd**, Co, **Cu**, Fe, **Mg, Mn, Mo**, **P, Pb, S,Sb**, V, W, **Zn**
Lower part metamorphic sandstone (A02SX005)	:None

Tapada is a small-scale abandoned mining site, located about 3km south of the El Aguilar open-cut mining site. This is silver-galena brecciated ore bodies harmoniously hosted in the bedding of the Saladillo formation sandstone of wall rock. There are hanging wall ore bodies with a layer of 0.3m+ thick (altitude 4,719m; see Fig.II-4-2-1-7.) and foot wall ore bodies (altitude of 4,646m) prospected by drift at the interior of a cross cut of about 20m from the entrances of adits.

Despensa accompanies hammock-like stromatolite with a short diameter of about 20cm in bedded black shale that admixes limonite breccia thin layer (about 5cm thick) (see Fig.II-4-2-1-8). Automorphic pyrite(maximum diameter of 2cm)is accompanied scattered in this stromatolite. This Despensa mineral showings, even of a small-scale, is similar to Rio Grande mineral showings in the existence of bedded black shale, stromatolite, and iron sulphide etc.

7) Geochemical characteristics

Using samples in Saladillo formation (conventional Lampazar formation) that is horizon hosted deposits, Discriminant analysis (DA) was carried out as a supervised classification method out of the multivariate analysis technique, and principal component analysis (PCA) was carried out as an unsupervised classification method.

The analytical data used are those of 72 samples in total of the cores taken from drilling #3070 hole that captured the SEDEX ore bodies (Refer to Table II-4-2-1-1).

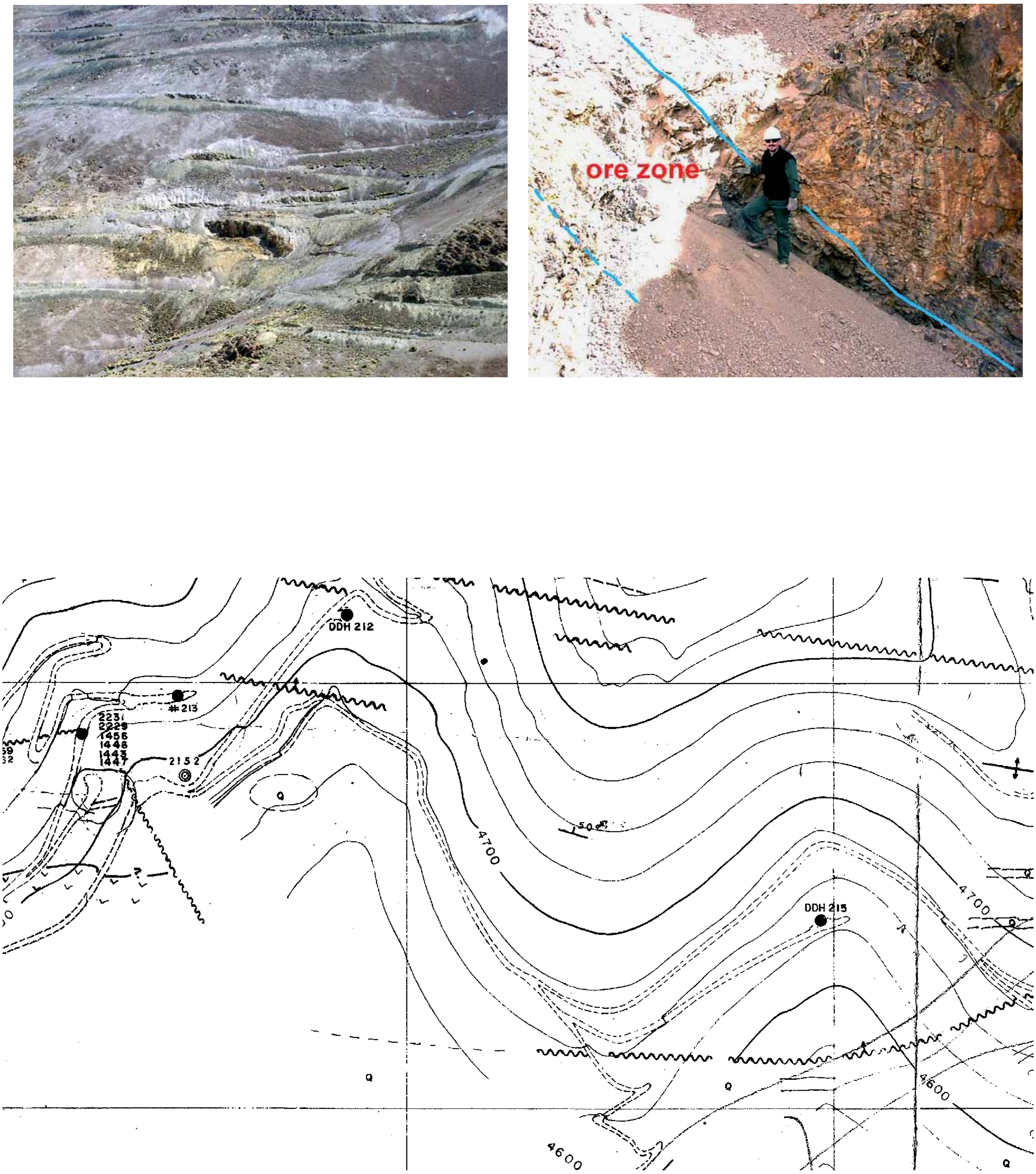


Fig.II-4-2-1-6 Location and photos of the Oriental mineral showing in the Aguilar range area

Fig.II-4-2-1-7 Photos of the Tapada mineral showing in the Aguilar range area

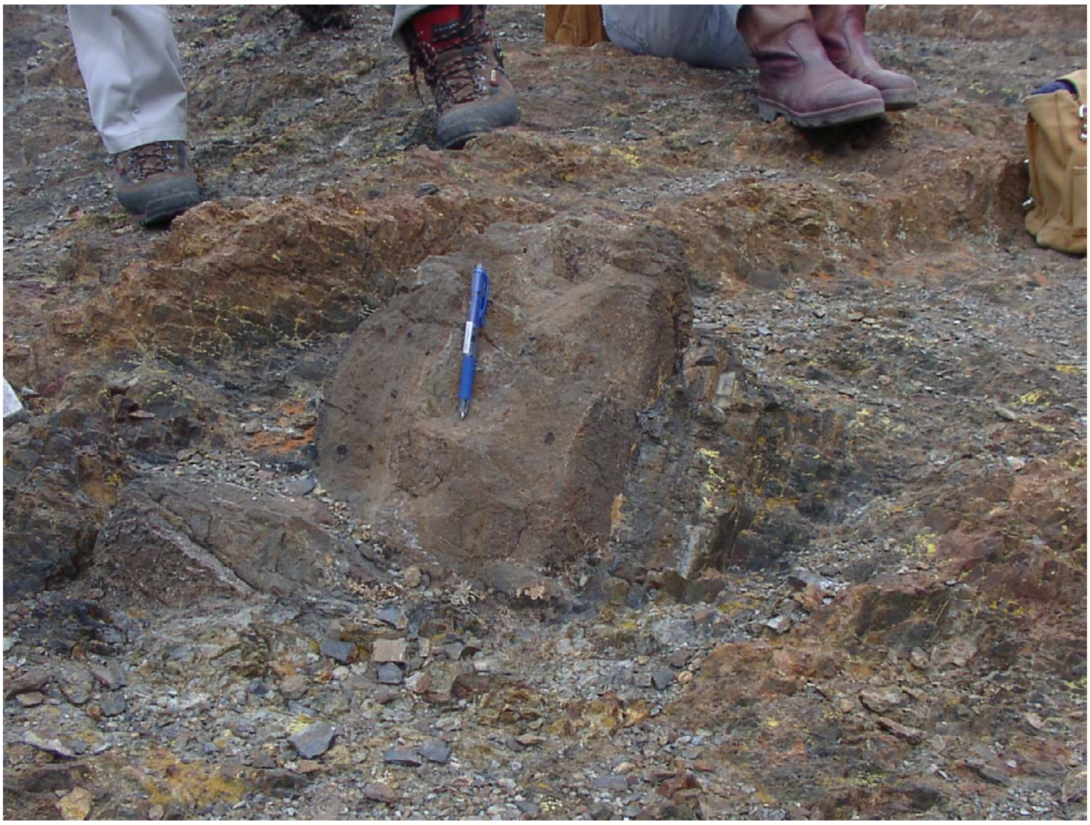


Fig.II-4-2-1-8 Photos of the Despensa mineral showing in the Aguilar range area

Elements for analysis are Au, Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sr, Ti, V, W, Zn and Hg, 29 elements in total.

Data pre-processing etc, prior to the statistical analysis are omitted because it will be fully explained later in paragraph 4-3-1(1) "Integrated geochemical analysis".

Discriminant analysis (DA)

The results of grouping by the Discriminant analysis are shown in Table II-4-2-1-2, including location of each samples collected, characteristics of the appearance and pre-determined grouping based on the layer level relation with the ore horizon. At the same time, ten variables (logMn, V, logCa, Cr, Ti, logSb, Na, Mg, logW, and logSr) that are carefully selected as useful for discrimination, and the coefficient of each variable to three discriminant functions (Y_{1-2}, Y_{1-3}, and Y_{2-3}) which discriminate between ore horizon (G2) and hanging wall (G1), between hanging wall (G1) and foot wall (G3), and between ore horizon (G2) and foot wall (G3), are shown. Therefore, the three discriminant functions are expressed as follows.

Y_{1-2}=-27.90398XlogMn-0.00244XV+16.82988XlogCa-0.23149XCr-55.95001XTi -13.69739XlogSb-6.84131XNa+19.45493XMg+27.31680XlogW+10.55409XlogSr+ 64.16628

Y_{1-3}=2.47213XlogMn-0.09387XV-8.14173XlogCa-0.18578XCr+49.30599XTi +10.82742XlogSb-3.95804XNa-3.33270XMg-28.70279XlogW+8.98198XlogSr+ 0.58989

Y_{2-3}=30.37611XlogMn-0.09144XV-24.97161XlogCa-0.41727XCr+105.25600XTi +24.52481XlogSb+2.88327XNa-22.78763XMg-56.01958XlogW-1.57211XlogSr- 63.57639

Theoretical error rate is the highest in between hanging wall (G1) and foot wall (G3), while the rate between deposits horizon (G2) and foot wall (G3) is lower than between ore horizon (G2) and hanging wall (G1). That is, though the ore horizon and the footwall can be easily discriminated comparatively, the hanging wall and the hanging wall are difficult to be discriminated.

Although the discriminant rate shows high value (95.83%), in Table II-4-2-1-3 (referred to earlier), one shale sample (A01AG49) accompanying quartz minute pulse of ore horizon hanging wall (G1) is misdiscriminated to be foot wall of ore horizon(G3), while two samples (A01AG66 and A01AG72) of phyllitic shale in foot wall (G3) of ore horizon are both misdiscriminated to be ore horizon hanging wall (G1).

Discriminant functions were applied to 46 samples collected on the ground surface, and grouping to presume a layer level relation with the ore horizon was made. The results are shown in Table II-4-2-1-3 and Fig.II-4-2-1-9.

Table II-4-2-1-1 Chemical analysis & DA results of drill core 72 samples

Serial No.	Sample No.	Drill hole # or Locality	Depth	Rock	g/t	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	ppm	ppb
					Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sr	Ti	V	W	Zn	Hg
1	A01AG01	#3070	57.20m	f.s.s.	0.0025	0.5	5.34	20	290	2.0	1	0.60	0.25	11	32	29	2.57	1.35	0.58	420	0.5	2.1	23	720	34	0.40	2.5	231	0.30	38	5	58	5
2	A01AG02	#3070	65.00m	f.s.s.	0.0025	0.25	4.73	35	180	1.5	1	0.57	0.25	9	27	21	2.42	0.65	0.67	515	0.5	2.05	25	670	20	0.27	2.5	180	0.30	33	5	74	5
3	A01AG03	#3070	70.10m	shale	0.0025	0.25	8.27	1440	1030	2.5	1	0.40	0.25	107	75	35	4.08	3.94	1.23	565	0.5	1.15	144	920	18	0.25	5	86	0.58	121	5	148	5
4	A01AG04	#3070	75.00m	f.s.s.	0.0025	0.25	8.94	70	1210	2.5	1	0.58	0.25	9	73	8	2.77	4.35	0.88	600	1	1.35	27	680	18	0.01	2.5	136	0.61	129	5	78	5
5	A01AG05	#3070	81.70m	f.s.s.	0.0025	0.25	7.98	35	1080	2.5	1	0.43	0.25	10	75	19	3.87	3.76	1.06	800	0.5	0.87	33	700	24	0.10	2.5	151	0.56	118	5	104	5
6	A01AG06	#3070	87.30m	f.s.s.	0.0025	0.25	6.64	15	340	2.0	1	0.64	0.25	5	42	12	2.58	1.45	0.91	690	0.5	2.51	15	670	28	0.005	2.5	180	0.38	61	5	150	5
7	A01AG07	#3070	93.90m	f.s.s.	0.065	0.25	9.59	80	1200	3.5	1	0.18	0.25	25	103	39	4.54	4.77	1.16	500	0.5	0.38	42	500	18	0.005	2.5	61	0.59	138	5	124	5
8	A01AG08	#3070	97.20m	f.s.s.	0.005	0.25	5.76	55	210	2.0	1	0.35	0.25	13	40	79	4.58	1.55	0.90	305	1	1.27	47	780	28	1.34	2.5	101	0.33	62	5	96	2230
9	A01AG09	#3070	103.40m	f.s.s.	0.010	0.25	8.82	35	1150	3.0	1	0.43	0.25	18	86	35	4.70	4.13	1.19	480	0.5	1.04	53	520	24	0.42	2.5	112	0.59	135	5	112	410
10	A01AG10	#3070	109.20m	f.s.s.	0.010	0.25	8.26	15	1010	2.5	1	0.32	0.5	17	71	36	4.11	3.82	1.10	460	0.5	1.08	44	470	16	0.39	2.5	112	0.55	109	5	294	200
11	A01AG11	#3070	115.00m	f.s.s.	0.0025	0.25	5.18	15	240	1.5	1	0.95	0.25	7	30	17	2.18	0.79	0.53	465	0.5	2.24	14	710	42	0.13	2.5	239	0.34	42	5	126	320
12	A01AG12	#3070	118.50m	f.s.s. with py. diss.	0.0025	0.25	4.84	10	180	1.5	1	0.58	0.25	8	28	37	2.64	0.58	0.59	310	0.5	2.23	20	680	34	0.53	2.5	201	0.25	36	5	86	300
13	A01AG13	#3070	124.60m	f.s.s.	0.0025	0.25	7.82	40	1110	3.0	1	0.37	0.25	16	75	26	4.24	4.04	0.99	405	0.5	1.18	40	480	22	0.26	2.5	144	0.58	112	5	100	160
14	A01AG14	#3070	130.45m	f.s.s.	0.0025	0.25	7.14	15	620	2.0	1	0.36	2	25	54	77	5.06	2.20	1.13	635	0.5	1.69	55	900	68	0.43	2.5	116	0.44	70	5	360	90
15	A01AG15	#3070	133.70m	f.s.s.	0.0025	0.5	4.14	2.5	400	0.5	2	0.50	0.25	6	24	8	2.15	1.30	0.64	545	0.5	1.05	13	580	46	0.005	2.5	149	0.23	29	5	82	170
16	A01AG16	#3070	140.60m	f.s.s.	0.0025	0.25	4.39	2.5	230	1.0	2	0.92	1.5	7	24	22	2.16	0.79	0.61	350	0.5	1.48	14	830	36	0.15	2.5	221	0.22	32	5	198	230
17	A01AG17	#3070	146.70m	f.s.s. with py. diss.	0.0025	0.25	7.39	10	500	3.0	6	0.91	0.25	19	55	31	4.07	2.13	1.03	530	0.5	2.31	35	930	40	0.59	2.5	263	0.43	76	5	102	250
18	A01AG18	#3070	152.70m	f.s.s.	0.0025	0.25	9.04	10	800	2.5	1	0.50	0.25	22	76	42	5.12	3.60	1.32	500	0.5	1.27	44	830	24	0.92	2.5	125	0.54	103	5	108	390
19	A01AG19	#3070	155.70m	shale with py. diss.	0.0025	0.25	8.02	25	1230	2.5	1	0.17	0.25	15	75	32	3.76	3.73	1.06	440	0.5	0.86	40	430	22	0.56	2.5	98	0.50	171	5	106	30
20	A01AG20	#3070	163.65m	shale with py. diss.	0.0025	1.0	8.52	25	600	2.0	1	3.20	0.25	14	45	24	5.13	2.10	1.59	1140	4	2.05	22	810	36	0.40	2.5	500	0.68	128	5	202	80
21	A01AG21	#3070	169.75m	shale with py. diss.	0.0025	0.5	9.87	15	1330	3.5	1	0.18	0.25	18	81	36	4.56	4.65	1.32	355	0.5	1.03	46	500	14	0.70	2.5	93	0.60	154	5	124	60
22	A01AG22	#3070	175.00m	shale with po. diss.	0.0025	0.25	10.35	20	1530	3.0	1	0.22	0.25	18	90	35	4.65	4.61	1.35	540	0.5	1.05	47	440	32	0.57	2.5	99	0.54	146	5	132	20
23	A01AG23	#3070	178.90m	shale with py. diss.	0.0025	0.25	9.27	5	1010	3.0	1	0.16	0.25	14	87	16	4.33	4.37	1.06	260	0.5	0.35	42	430	8	0.74	2.5	44	0.51	152	5	28	50
24	A01AG24	#3070	188.00m	shale with py. diss.	0.0025	0.25	8.03	15	860	3.0	1	0.76	0.25	14	65	26	3.37	3.00	0.91	325	1	1.62	33	640	24	0.50	2.5	122	0.52	119	5	84	30
25	A01AG25	#3070	191.05m	f.s.s. with py. diss.	0.0025	0.25	7.91	15	750	2.5	1	0.65	0.25	13	56	20	3.36	2.50	0.93	435	0.5	2.15	26	770	28	0.31	2.5	181	0.54	87	5	96	100
26	A01AG26	#3070	196.25m	shale with py. diss.	0.0025	2.5	9.84	5	1340	2.5	1	0.24	0.25	17	91	31	4.98	4.66	1.21	575	0.5	0.89	43	530	16	0.59	2.5	109	0.63	129	5	126	40
27	A01AG27	#3070	199.30m	shale with py. diss.	0.0025	0.25	8.11	5	810	2.5	1	0.52	0.25	15	63	27	3.70	2.84	1.00	390	0.5	1.61	32	620	26	0.35	2.5	180	0.51	89	5	92	30
28	A01AG28	#3070	205.40m	f.s.s. with py. diss.	0.0025	2.0	7.08	2.5	710	2.0	4	0.52	0.25	13	55	15	3.23	2.40	0.91	335	0.5	1.19	35	590	16	0.32	5	100	0.44	72	5	68	40
29	A01AG29	#3070	211.50m	f.s.s. with py. diss.	0.0025	0.25	7.34	5	760	2.5	1	0.50	0.5	16	63	33	3.59	2.41	0.97	440	4	1.18	33	580	38	0.35	2.5	136	0.45	74	5	76	30
30	A01AG30	#3070	217.60m	f.s.s.	0.0025	0.25	7.70	2.5	980	2.0	1	0.27	0.25	14	76	28	3.92	3.70	0.98	335	1	0.64	33	360	46	0.27	5	83	0.51	98	5	90	10
31	A01AG31	#3070	220.70m	shale with py. diss.	0.0025	0.25	9.74	15	1180	3.5	1	0.52	0.25	17	96	31	4.06	3.81	1.19	415	1	0.89	44	340	30	0.34	5	238	0.50	109	5	100	10
32	A01AG32	#3070	224.50m	shale with py. diss.	0.0025	0.25	8.55	50	970	2.5	1	0.38	0.5	22	86	35	4.20	3.51	1.12	375	1	0.79	44	480	20	0.65	2.5	97	0.52	101	5	100	30
33	A01AG33	#3070	233.00m	shale with py. diss.	0.0025	1.0	7.95	2.5	900	2.0	1	0.36	0.5	12	71	19	3.42	3.28	1.00	425	4	1.11	31	580	34	0.33	2.5	136	0.54	109	5	80	5
34	A01AG34	#3070	239.00m	shale with py. diss.	0.0025	0.5	6.27	2.5	520	2.0	1	1.15	0.5	10	40	20	2.70	1.96	0.77	280	3	1.1	22	430	22	0.40	2.5	79	0.32	62	5	56	50
35	A01AG35	#3070	242.60m	shale with veinlets	0.0025	1.5	6.87	15	1180	2.5	1	0.45	0.25	8	54	4	3.35	4.28	1.08	410	0.5	1.05	18	490	18	0.07	2.5	70	0.42	71	5	30	10
36	A01AG36	#3070	248.40m	shale with veinlets/py.	0.0025	0.5	6.58	30	770	2.0	1	0.32	0.25	8	50	22	2.53	2.26	0.73	460	1	1.09	26	740	32	0.25	2.5	71	0.39	73	5	68	5
37	A01AG37	#3070	253.40m	f.s.s.	0.0025	0.25	4.62	40	470	2.0	1	2.30	0.5	9	33	30	2.82	1.66	0.72	945	4	0.61	18	860	90	0.34	2.5	147	0.26	45	5	76	20
38	A01AG38	#3070	260.50m	phyllitic shale	0.0025	2.5	8.08	25	980	3.5	1	1.30	2.5	10	66	12	4.14	2.45	1.08	2020	3	1.37	24	430	144	0.11	2.5	245	0.47	90	5	966	10
39	A01AG39	#3070	265.10m	shale	0.0025	0.5	6.16	5	950	2.5	1	0.75	0.25	14	60	27	4.63	2.90	1.12	1775	1	0.6	34	540	32	0.23	2.5	136	0.41	74	5	138	30
40	A01AG40	#3070	273.45m	phyllitic shale	0.0025	0.25	7.84	15	540	2.0	2	0.73	0.25	15	81	36	3.36	3.88	0.90	875	5	0.19	43	700	14	0.72	2.5	100	0.47	138	5	96	10
41	A01AG41	#3070	276.50m	phyllitic shale with a few py. diss.	0.0025	0.25	7.95	75	290	2.0	1	0.47	0.25	12	90	34	4.82	4.38	0.97	1295	11	0.35	39	460	22	1.06	2.5	92	0.54	110	5	98	20
42	A01AG42	#3070	282.10m	phyllitic shale with a few py. diss.	0.0025	3.0	5.03	115	400	2.0	1	1.25	0.25	16	53	40	4.85	2.20	1.03	1730	2	0.28	24	770	76	1.33	2.5	53	0.31	65	5	158	10
43	A01AG43	#3070	288.70m	shale with veinlets/py.	0.0025	1.5	5.70	20	370	2.0	1	1.15	3	10	83	151	8.46	1.91	1.87	5130	0.5	1.18	20	430	1366	1.89	15	132	0.40	96	5	336	10
44	A01AG44	#3070	291.50m	f.s.s.	0.005	1.5	4.42	35	800	1.5	2	0.83	0.5	16	39	102	4.14	1.75	0.81	1360	4	0.32	31	780	446	0.65	5	84	0.23	48	5	106	5
45	A01AG45	#3070	297.30m	shale	0.0025	0.5	8.16	5	1050	4.5	1	2.30	0.25	3	60	18	2.66	2.06	0.83	1895	2	1.47	20	730	120	0.13	2.5	382	0.44	78	5	118	60
46	A01AG46	#3070	303.00m	phyllitic shale with py.	0.0025	0.25	9.40	85	2190	3.0	1	0.39	0.5	20	105	26	3.90	4.79	1.17	1005	1	0.39	46	400	34	0.43	10	80	0.54	137	5	90	10
47	A01AG47	#3070	305.80m	f.s.s.	0.0025	0.25	6.31	20	1020	2.0	1	0.68	0.25	11	52	30	3.34	2.72	0.77	810	3	0.3	29	680	40	0.44	5	48	0.35	82	5	156	10
48	A01AG48	#3070	312.15m	shale	0.0025	0.25	11.45	40	1460	3.5	2	0.43	0.5	16	79	35	4.91	4.68	1.51	870	1	0.37	57	680	40	0.55	2.5	53	0.64	202	5	196	5
49	A01AG49	#3070	318.00m	shale with veinlets	0.0025	0.25	9.83	55	960	5.5	2	2.00	0.5	11	49	15	3.84	2.09	1.45	1605	1	3.87	25	540	116	0.12	2.5	666	0.41	89	5	520	5
50	A01AG50	#3070	321.00m	shale with veinlets	0.0025	0.25	10.83	20	940	3.0	2	0.56	0.25	18	76	39	4.99	5.06	1.46	1225	0.5	0.74	55	760	46	0.53	2.5	81	0.65	209	5	150	5
51	A01AG51	#3070	327.20m	shale with py. diss.	0.0025	0.5	6.65	160	320	2.5	2	0.66	2.5	18	36	35	3.76	2.49	0.98	535	4	0.85	36	880	148	0.67	2.5	104	0.36	82	5	358	5
52	A01AG52	#3070	331.95m	shale with py. diss.	0.0025	0.5	8.64	70	670	3.5	1	0.45	0.5	20	71	48	4.47	4.14	1.26	770	1	0.83	53	630	122	0.58	2.5	101	0.52	157	5	286	5
53	A01AG53	#3070	337.45m	phyllitic shale	0.0025	0.25	9.74	60	730	4.0	8	0.50	0.25	21	73	54	5.07	4.55	1.40	825	2	0.93	57	710	154	0.65	2.5	104	0.58	169	5	246	5
54	A01AG54	#3070	343.55m	f.s.s.	0.0025	0.25	7.51	25	1630	3.0	1	1.05	0.25	11	53	21	3.78	2.32	1.12	755	0.5	2.05	29	690	76	0.25	2.5	263	0.50	104	5	158	5
55	A01AG55	#3070	346.60m	phyllitic shale	0.0025	0.5	8.64	20	580	2.5	1	0.74	0.5	19	66	49	5.19	4.04	1.39	640	0.5	0.68	49	590	64	0.61	2.5	82	0.54	117	5	452	5
56	A01AG56	#3070	354.25m	phyllitic shale	0.005	0.25	8.00	35	2640	2.5	1	0.81	0.25	13	52	13	3.39	2.64	1.07	690	0.5	1.17	29	760	138	0.23	2.5	82	0.47	159	5	110	5
57	A01AG57	#3070	358.80m	shale	0.0025	0.25	7.83	20	1470	2.0	1	1.15	0.25	12	44	16	3.02	1.75	0.94	1610	0.5	2.61	30	710	60	0.18	2.5	209	0.54	85	5	62	5
58	A01AG58	#3070	361.85m	shale	0.0025	0.25	6.97	10	1370	1.5	1	0.80	0.25	9	42	17	3.01	1.63	0.88	1565	0.5	2.59	22	710	42	0.20	2.5	177	0.48	82	5	92	5
59	A01AG59	#3070	366.90m	phyllitic shale with py. diss.	0.0025	0.25	8.64	40	770	3.0	1	0.28	1.5	9	59	23	3.37	3.80	1.03	2670	0.5	1.09	41	640	100	0.36	2.5	86	0.59	155	5	1265	5
60	A01AG60	#3070	372.65m	Pb-Zn ore zone with py.	0.0025	1.5	7.08	40	870	1.5	1	0.56	1.5	10	42	38	4.52	2.45	1.18	20000	1	1.16	28	750	386	0.11	2.5	195	0.41	98	5	758	5
61	A01AG61	#3070	378.40m	Pb-Zn ore with shale	0.340	26.0	5.82	330	310	2.0	1	0.47	369	22	22	80	6.99	2.80	0.82	20000	3	0.25	18	410	19600	5.95	35	56	0.32	68	20	140500	1330
62	A01AG62	#3070	384.80m	Pb-Zn ore zone with py.	0.055	53.0	5.11	210	320	3.0	1	3.20	220	8	23	141	5.95	0.70	0.72	20000	12	0.04	36	430	39000	2.94	95	141	0.28	286	5	69800	3290
63	A01AG63	#3070	390.00m	Pb-Zn ore zone with py.	0.030	38.0	6.99	495	40	3.0	1	0.58	150	18	38	138	5.49	2.92	1.01	3260	3	1.06	35	600	14600	5.07	70	107	0.27	162	5	59300	3100
64	A01AG64	#3070	393.05m	shale with veinlets/py.	0.0025	0.25	9.24	100	140	4.5	1	2.10	1.5	14	60	43	4.16	2.61	1.28	5390	0.5	1.23	36	680	306	1.06	2.5	310	0.34	234	5	648	20
65	A01AG65	#3070	394.05m	phyllitic shale	0.010	0.25	9.06	55	490	2.5	1	0.63	1.0	15	59	25	4.50	4.08	1.23	1270	0.5	0.29	41	550	56	0.64	2.5	55	0.48	232	5	408	5
66	A01AG66	#3070	399.40m	phyllitic shale	0.005	0.25	8.71	30	1370	2.0	1	0.53	0.25	14	60	32	4.98	3.88	1.22	1140	0.5	0.61	37	520	82	0.52	2.5	48	0.46	137	5	252	5
67	A01AG67	#3070	403.30m	phyllitic shale	0.0025	0.25	8.59	35	600	5.0	1	2.80	0.5	16	64	44	4.83	1.71	1.24	855	5	3.53	43	2840	92	0.70	2.5	269	0.46	162	5	234	10
68	A01AG68	#3070	408.80m	phyllitic shale	0.0025	0.5	9.62	25	1180	2.5	2	0.38	2.0	15	79	37	4.45	4.12	1.33	540	0.5	0.71	45	530	28	0.49	2.5	63	0.53	295	5	188	5
69	A01AG69	#3070	415.60m	phyllitic shale	0.0025	1.0	8.13	20	880	3.0	1	0.40	6.5	17	77	60	4.52	3.53	1.20	470	2	0.67	51	500	66	0.58	2.5	52	0.45	297	5	712	5
70	A01AG70	#3070	421.55m	phyllitic shale	0.0025	0.5	9.22	5	790	3.5	1	0.78	0.25	16	89	44	4.58	3.47	1.40	515	1	1.26	43	950	42	0.43	2.5	167	0.48	156	5	172	5
71	A01AG71	#3070	428.10m	phyllitic shale	0.0025	0.25	9.24	20	630	4.0	1	1.25	0.25	15	90	37	4.88	3.03	1.28	600	2	2.46	41	810	46	0.35	2.5	186	0.57	143	5	132	5
72	A01AG72	#3070	434.20m	phyllitic shale	0.0025	0.5	8.73	15	660	2.0	1	0.38	0.25	20	78	33	4.71	3.44	1.23	500	0.5	1.05	47	600	18	0.30	2.5	90	0.50	118	5	70	5

Table II-4-2-1-2 Result of DA (discriminant analysis) for the drill core 72 samples, Aguilar range area

Serial No.	Sample No.	Drill hole # and depth	Altitude (m)	District	Locality	Rock	Actual group	Discriminant function values Y_{1-2}	Y_{1-3}	Y_{2-3}	Predicted group
1	A01AG01	Drill hole #3070, 57.2m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	13.27	9.39	-3.88	G1
2	A01AG02	Drill hole #3070, 65.0m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	10.23	10.12	-0.11	G1
3	A01AG03	Drill hole #3070, 70.1m	4,860	Aguilar	Mina Esperanza	shale	G1	11.29	10.17	-1.12	G1
4	A01AG04	Drill hole #3070, 75.0m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	9.16	8.92	-0.24	G1
5	A01AG05	Drill hole #3070, 81.7m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	14.04	10.19	-3.85	G1
6	A01AG06	Drill hole #3070, 87.3m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	7.98	5.93	-2.05	G1
7	A01AG07	Drill hole #3070, 93.9m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	19.27	5.24	-14.03	G1
8	A01AG08	Drill hole #3070, 97.2m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	21.43	7.69	-13.75	G1
9	A01AG09	Drill hole #3070, 103.4m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	21.06	5.21	-15.84	G1
10	A01AG10	Drill hole #3070, 109.2m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	16.22	9.61	-6.61	G1
11	A01AG11	Drill hole #3070, 115.0m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	10.91	9.59	-1.32	G1
12	A01AG12	Drill hole #3070, 118.5m	4,860	Aguilar	Mina Esperanza	f.s.s. with py. diss.	G1	17.25	6.56	-10.68	G1
13	A01AG13	Drill hole #3070, 124.6m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	16.39	10.36	-6.02	G1
14	A01AG14	Drill hole #3070, 130.45m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	12.06	8.56	-3.50	G1
15	A01AG15	Drill hole #3070, 133.7m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	17.21	11.44	-5.77	G1
16	A01AG16	Drill hole #3070, 140.6m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	25.86	7.97	-17.89	G1
17	A01AG17	Drill hole #3070, 146.7m	4,860	Aguilar	Mina Esperanza	f.s.s. with py. diss.	G1	19.37	4.91	-14.45	G1
18	A01AG18	Drill hole #3070, 152.7m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	23.68	6.21	-17.48	G1
19	A01AG19	Drill hole #3070, 155.7m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	15.82	3.25	-12.57	G1
20	A01AG20	Drill hole #3070, 163.65m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	18.46	12.26	-6.20	G1
21	A01AG21	Drill hole #3070, 169.75m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	18.33	6.49	-11.84	G1
22	A01AG22	Drill hole #3070, 175.0m	4,860	Aguilar	Mina Esperanza	shale with po. diss.	G1	20.91	2.41	-18.49	G1
23	A01AG23	Drill hole #3070, 178.9m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	23.83	1.84	-21.99	G1
24	A01AG24	Drill hole #3070, 188.0m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	20.01	3.70	-16.31	G1
25	A01AG25	Drill hole #3070, 191.05m	4,860	Aguilar	Mina Esperanza	f.s.s. with py. diss.	G1	10.79	9.61	-1.18	G1
26	A01AG26	Drill hole #3070, 196.25m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	14.83	9.50	-5.33	G1
27	A01AG27	Drill hole #3070, 199.3m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	18.80	9.19	-9.61	G1
28	A01AG28	Drill hole #3070, 205.4m	4,860	Aguilar	Mina Esperanza	f.s.s. with py. diss.	G1	17.06	11.59	-5.47	G1
29	A01AG29	Drill hole #3070, 211.5m	4,860	Aguilar	Mina Esperanza	f.s.s. with py. diss.	G1	21.52	8.62	-12.90	G1
30	A01AG30	Drill hole #3070, 217.6m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	17.42	12.23	-5.19	G1
31	A01AG31	Drill hole #3070, 220.7m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	31.98	7.32	-24.66	G1
32	A01AG32	Drill hole #3070, 224.5m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	26.83	5.79	-21.05	G1
33	A01AG33	Drill hole #3070, 233.0m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	17.33	9.59	-7.75	G1
34	A01AG34	Drill hole #3070, 239.0m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	29.23	3.04	-26.19	G1
35	A01AG35	Drill hole #3070, 242.6m	4,860	Aguilar	Mina Esperanza	shale with veinlets	G1	21.20	6.95	-14.25	G1
36	A01AG36	Drill hole #3070, 248.4m	4,860	Aguilar	Mina Esperanza	shale with veinlets/py.	G1	11.04	8.42	-2.62	G1
37	A01AG37	Drill hole #3070, 253.4m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	26.56	6.36	-20.20	G1
38	A01AG38	Drill hole #3070, 260.5m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G1	13.11	6.98	-6.13	G1
39	A01AG39	Drill hole #3070, 265.1m	4,860	Aguilar	Mina Esperanza	shale	G1	16.01	9.06	-6.95	G1
40	A01AG40	Drill hole #3070, 273.45m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G1	22.85	2.61	-20.25	G1
41	A01AG41	Drill hole #3070, 276.5m	4,860	Aguilar	Mina Esperanza	phyllitic shale with a few py. diss.	G1	13.00	7.80	-5.20	G1
42	A01AG42	Drill hole #3070, 282.1m	4,860	Aguilar	Mina Esperanza	phyllitic shale with a few py. diss.	G1	20.17	2.34	-17.84	G1
43	A01AG43	Drill hole #3070, 288.7m	4,860	Aguilar	Mina Esperanza	shale with veinlets/py.	G1	11.93	5.37	-6.56	G1
44	A01AG44	Drill hole #3070, 291.5m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	14.81	9.41	-5.40	G1
45	A01AG45	Drill hole #3070, 297.3m	4,860	Aguilar	Mina Esperanza	shale	G1	14.86	7.83	-7.04	G1
46	A01AG46	Drill hole #3070, 303.0m	4,860	Aguilar	Mina Esperanza	phyllitic shale with py.	G1	12.85	8.01	-4.83	G1
47	A01AG47	Drill hole #3070, 305.8m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	12.64	7.90	-4.74	G1
48	A01AG48	Drill hole #3070, 312.15m	4,860	Aguilar	Mina Esperanza	shale	G1	16.65	2.00	-14.65	G1
49	A01AG49	Drill hole #3070, 318.0m	4,860	Aguilar	Mina Esperanza	shale with veinlets	G1	13.15	-1.72	-14.87	G3
50	A01AG50	Drill hole #3070, 321.0m	4,860	Aguilar	Mina Esperanza	shale with veinlets	G1	11.60	2.18	-9.42	G1
51	A01AG51	Drill hole #3070, 327.2m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	21.17	7.90	-13.27	G1
52	A01AG52	Drill hole #3070, 331.95m	4,860	Aguilar	Mina Esperanza	shale with py. diss.	G1	18.38	3.02	-15.35	G1
53	A01AG53	Drill hole #3070, 337.45m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G1	17.56	3.44	-14.12	G1
54	A01AG54	Drill hole #3070, 343.55m	4,860	Aguilar	Mina Esperanza	f.s.s.	G1	15.21	6.71	-8.49	G1
55	A01AG55	Drill hole #3070, 346.6m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G1	24.67	6.08	-18.59	G1
56	A01AG56	Drill hole #3070, 354.25m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G1	15.42	0.18	-15.24	G1
57	A01AG57	Drill hole #3070, 358.8m	4,860	Aguilar	Mina Esperanza	shale	G2	-5.97	10.12	16.09	G2
58	A01AG58	Drill hole #3070, 361.85m	4,860	Aguilar	Mina Esperanza	shale	G2	-7.17	8.70	15.86	G2
59	A01AG59	Drill hole #3070, 366.9m	4,860	Aguilar	Mina Esperanza	phyllitic shale with py. diss.	G2	-13.84	11.02	24.86	G2
60	A01AG60	Drill hole #3070, 372.65m	4,860	Aguilar	Mina Esperanza	Pb-Zn ore zone with py.	G2	-20.71	12.78	33.49	G2
61	A01AG61	Drill hole #3070, 378.4m	4,860	Aguilar	Mina Esperanza	Pb-Zn ore with shale	G2	-27.26	10.55	37.82	G2
62	A01AG62	Drill hole #3070, 384.8m	4,860	Aguilar	Mina Esperanza	Pb-Zn ore zone with py.	G2	-29.97	7.89	37.86	G2
63	A01AG63	Drill hole #3070, 390.0m	4,860	Aguilar	Mina Esperanza	Pb-Zn ore zone with py.	G2	-16.92	12.83	29.74	G2
64	A01AG64	Drill hole #3070, 393.05m	4,860	Aguilar	Mina Esperanza	shale with veinlets/py.	G3	16.18	-11.67	-27.85	G3
65	A01AG65	Drill hole #3070, 394.05m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	14.37	-4.54	-18.92	G3
66	A01AG66	Drill hole #3070, 399.4m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	12.99	1.93	-11.06	G1
67	A01AG67	Drill hole #3070, 403.3m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	17.82	-12.25	-30.08	G3
68	A01AG68	Drill hole #3070, 408.8m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	22.41	-12.30	-34.72	G3
69	A01AG69	Drill hole #3070, 415.6m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	25.35	-16.55	-41.90	G3
70	A01AG70	Drill hole #3070, 421.55m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	35.76	-4.78	-40.55	G3
71	A01AG71	Drill hole #3070, 428.1m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	22.54	-4.74	-27.28	G3
72	A01AG72	Drill hole #3070, 434.2m	4,860	Aguilar	Mina Esperanza	phyllitic shale	G3	22.59	3.31	-19.28	G1

G1: hanging wall of SEDEX ore zone, **G2** : SEDEX ore zone, **G3** : foot wall of SEDEX ore zone

Correct classification rate : 95.83%

Discriminant functions as results of DA (discriminant analysis)

Varibles	Discriminant function coefficients Y_{1-2}	Y_{1-3}	Y_{2-3}
logMn	-27.90398	2.47213	30.37611
V	-0.00244	-0.09387	-0.09144
logCa	16.82988	-8.14173	-24.97161
Cr	0.23149	-0.18578	-0.41727
Ti	-55.95001	49.30599	105.25600
logSb	-13.69739	10.82742	24.52481
Na	-6.84131	-3.95804	2.88327
Mg	19.45493	-3.33270	-22.78763
logW	27.31680	-28.70279	-56.01958
logSr	10.55409	8.98198	-1.57211
Constant	64.16628	0.58989	-63.57639
Mahalanobis' generalized distance	5.89991	3.70004	7.47785
Theoretical error rate	0.00159	0.03216	0.00009

Table II-4-2-1-3 Horizons predicted by using the discriminant functions, Aguilar range area

Serial No.	Sample No.	District	Locality	Rock	Discriminant function values			Predicted group
					Y_{1-2}	Y_{1-3}	Y_{2-3}	
1	A02KK023	Aguilar	Qda. Quera	shale	30.211	-2.492	-32.704	G3
2	A02CX006	Aguilar	Qda. Rio Grande	siliceous s.s.	32.294	-4.012	-36.307	G3
3	A02CX003	Aguilar	Qda. Rio Grande	pyritized zone	46.626	-7.167	-53.794	G3
4	A02CX004	Aguilar	Qda. Rio Grande	lim. pyrite-rich	93.722	-40.704	-134.427	G3
5	A02CX005	Aguilar	Qda. Rio Grande	black shale	51.880	-7.232	-59.114	G3
6	A02SX018	Aguilar	Mina Esperanza	shale	7.493	12.635	5.140	G1
7	A02SX020	Aguilar	Mina Esperanza	phillitic state	30.861	1.751	-29.111	G1
8	A02CX007	Aguilar	Mina Esperanza	ga-zb ore	-42.126	17.963	60.089	G2
9	A02CX008	Aguilar	Mina Esperanza	shale	4.635	7.550	2.913	G1
10	A02SX016	Aguilar	Mina Esperanza	phillitic slate	6.862	-10.014	-16.879	G3
11	A02SX019	Aguilar	Mina Esperanza	shale	34.936	-3.152	-38.089	G3
12	A02SX009	Aguilar	Qda. Vacas	shale	14.192	11.434	-2.759	G1
13	A02SX017	Aguilar	Mina Esperanza	shale	14.961	11.516	-3.446	G1
14	A02SX008	Aguilar	Mina Pirita	shale	8.696	10.497	1.801	G1
15	A02CX009	Aguilar	Mina Rincon	shale?	5.252	11.268	6.015	G1
16	A02CX010	Aguilar	Mina Rincon	po+zb quartz ore	38.188	-3.775	-41.963	G3
17	A02CX011	Aguilar	Mina Rincon	shale?	9.554	-9.609	-19.162	G3
18	A02SX007	Aguilar	Mina Pirita	shale	19.885	0.861	-19.025	G1
19	A02CX017	Aguilar	Mina Pirita	shale	-15.470	5.945	21.414	G2
20	A02CX018	Aguilar	Mina Pirita	altered zone	9.650	-1.439	-11.090	G3
21	A02CX019	Aguilar	Mina Pirita	pyrite-quartz	13.116	5.179	-7.937	G1
22	A02CX014	Aguilar	Mina Pirita	py-mv-qtz-vein	8.255	-33.296	-41.552	G3
23	A02CX015	Aguilar	Mina Pirita	quartzite breccia	65.441	-59.686	-125.128	G3
24	A02CX013	Aguilar	Mina Pirita	massive quartzite	-2.443	-2.960	-0.517	G3
25	A02CX016	Aguilar	Mina Pirita	bedded quartzite	18.344	0.611	-17.734	G1
26	A02SX006	Aguilar	Mina Oriental	sandstone	11.116	9.305	-1.812	G1
27	A02CX012	Aguilar	Mina Oriental	breccia ore	-8.015	-21.446	-13.432	G3
28	A02SX005	Aguilar	Mina Oriental	metamorphic sediments	10.552	6.828	-3.725	G1
29	A02SX004	Aguilar	Mina Aguilar	quartzite	15.950	9.486	-6.465	G1
30	A02CX020	Aguilar	Mina Aguilar	Aguilar Granite	-13.623	13.772	27.395	G2
31	A02SX003	Aguilar	Mina Aguilar	sandstone	7.652	8.024	0.372	G1
32	A02CX021	Aguilar	Mina Aguilar	quartzite	21.868	-9.185	-31.052	G3
33	A02SX001	Aguilar	Mina Aguilar	silicified shale with po	23.708	-16.178	-39.888	G3
34	A02SX002	Aguilar	Mina Aguilar	galena ore	-0.121	-3.703	-3.583	G3
35	A02SX023	Aguilar	Qda. Polvorines	shale and s.s.	23.531	6.169	-17.363	G1
36	A02SX021	Aguilar	Mina Tapada	sandstones	21.418	5.326	-16.092	G1
37	A02SX022	Aguilar	Mina Tapada	conglomerate	47.031	-4.377	-51.409	G3
38	A02SX014	Aguilar	Qda. Despensa	phillitic slate	33.554	-6.631	-40.186	G3
39	A02SX013	Aguilar	Qda. Despensa	phillitic shale	42.646	-9.932	-52.579	G3
40	A02CX001	Aguilar	Qda. Despensa	lim.conglomerate	19.638	4.177	-15.461	G1
41	A02CX002	Aguilar	Qda. Despensa	pyritized zone	47.700	-7.365	-55.065	G3
42	A02SX011	Aguilar	Qda. Despensa	stromatolite	36.870	1.583	-35.288	G1
43	A02SX012	Aguilar	Qda. Despensa	phillitic slate	26.122	-4.410	-30.533	G3
44	A02SX010	Aguilar	Qda. Despensa	sandstones	36.502	-7.020	-43.523	G3
45	A02SX015	Aguilar	Qda. Despensa	quarzite	-12.796	15.490	28.285	G2
46	A02KK018	Aguilar	Qda. Quebralena	shale	23.102	-2.248	-25.351	G3

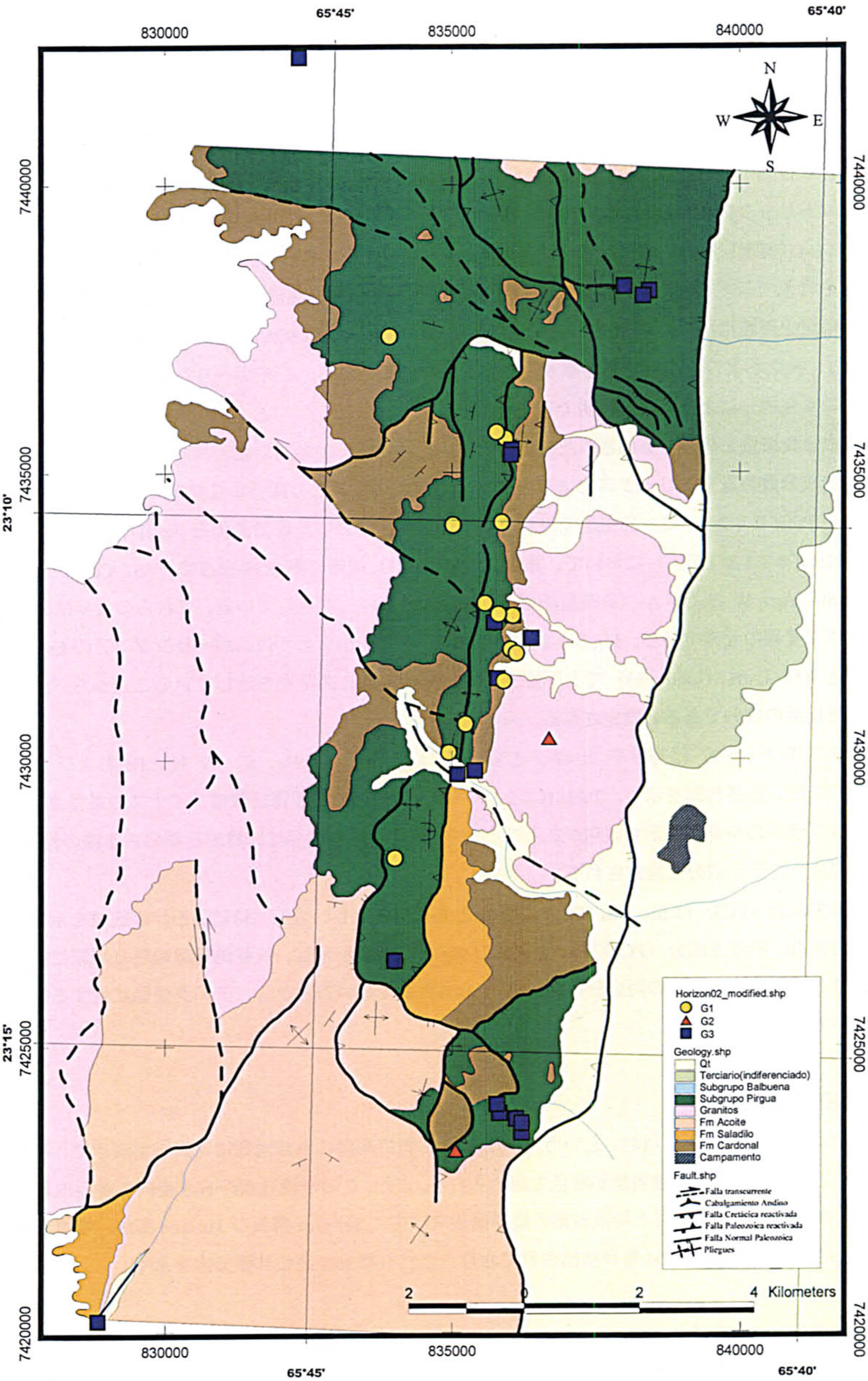


Fig.II-4-2-1-9 Predicted horizons by geochemical discriminant analysis, Aguilar range area

According to the table and figure, the following four samples are discriminated to ore horizon (G2) in this zone.

A02CX007: Collected from galena and marmatite stratiform ore bodies of the north extension outcrop of Esperanza ore bodies. Upper part shale (A02CX008) has been discriminated to ore horizon hanging wall (G1), and lower Slate (A02SX016) to footwall of ore horizon (G3). An excellent result has been obtained as shown in the observation results described in the paragraph of mineralization and alteration.

A02CX017: Collected as a set with A02CX018 and A02CX019 from mineralization outcrop (Refer to Fig.II-4-2-1-10) along the mining road about 1km northeast of Oriental. The sample of A02CX017 is shale (apparently un-mineralized) immediately above the mineralization part. Chlorite and Sericite alteration part (A02CX018) adjoining this shale are discriminated to footwall of ore horizon(G3). Silicified rocks (A02CX019) accompanying pyrite dissemination of the lower part are discriminated to footwall of ore horizon (G1). These are remarkably different from the observation results.

A02CX020: Aguilar granite collected about 1.5km northeast of the Aguilar open-cut mining site. Since this discriminant function should be basically applied to Santa Victoria Group Saladillo formation in horizon hosted deposits, it is not appropriate to evaluate granite.

A02SX015: Quartzite of the Cardonal formation collected in the Despensa valley in the southern part. The function is not appropriate to evaluate for the same A02CX020.

When taking a general view of the discrimination results in the distribution zone of the Saladillo formation shown in Fig.II-4-2-1-9 (Referred to earlier), footwall of ore horizon (G3) exists over the area, from north to south, of Rio Grande, Esperanza, Pirita, Oriental, El Aguilar, Tapada and Despensa. On the other hand, ore horizon hanging wall (G1) is widely distributed on the west side of the above listed areas that are Esperanza, Pirita, Oriental, El Aguilar and Tapada. It is, however, not found in the vicinity of Rio Grande in the north and Despensa in the south.

Principal component analysis (PCA)

The principal component analysis starts with the calculation of statistic and correlation coefficient matrix. The calculated results and output of statistic and correlation coefficient matrix are shown in Tables 4-2-1-4 and 5 respectively. The principal component load matrix obtained from this correlation coefficient matrix is shown in Table II-4-2-1-6, the relation between each principal component and the element in Fig.II-4-2-1-10. In this Table 4-2-1-4, absolute value of load larger than

Table II-4-2-1-4 Statistics of the drill core
72 samples,Aguilar range area

	Mean	Unbiased estimate of population	Standard deviation
logAu	-2.477	0.139	0.372
logAg	-0.333	0.249	0.499
Al	7.725	2.800	1.673
logAs	1.364	0.296	0.544
logBa	2.838	0.093	0.306
logBe	0.387	0.025	0.158
logBi	0.069	0.032	0.178
logCa	-0.219	0.085	0.292
logCd	-0.285	0.422	0.650
logCo	1.132	0.040	0.200
Cr	61.625	437.759	20.923
logCu	1.478	0.075	0.274
logFe	0.594	0.014	0.118
K	2.971	1.419	1.191
Mg	1.064	0.066	0.257
logMn	2.908	0.168	0.410
logMo	-0.006	0.147	0.383
Na	1.209	0.582	0.763
logNi	1.524	0.031	0.177
logP	2.796	0.018	0.133
logPb	1.754	0.450	0.670
logS	-0.463	0.307	0.554
logSb	0.500	0.094	0.306
logSr	2.089	0.060	0.245
Ti	0.461	0.013	0.114
V	115.958	3486.435	59.046
logW	0.707	0.005	0.071
logZn	2.269	0.416	0.645
logHg	1.336	0.599	0.774

Table II-4-2-1-5 Correlation coefficient matrix of 29 elements for the drill core 72 samples, Aguilar range area

logAu	1.000																											
logAg	**0.576**	1.000																										
Al	-0.116	-0.299	1.000																									
logAs	0.446	0.277	0.066	1.000																								
logBa	-0.235	-0.354	**0.541**	-0.210																								
logBe	0.050	-0.052	**0.694**	0.285	1.000																							
logBi	-0.113	-0.046	0.050	-0.094	-0.008	1.000																						
logCa	-0.036	0.189	-0.286	0.083	0.101	0.047	1.000																					
logCd	**0.669**	**0.770**	-0.211	0.439	0.052	-0.061	0.175	1.000																				
logCo	0.157	-0.039	0.420	0.420	0.289	0.079	-0.350	0.040	1.000																			
Cr	-0.183	-0.311	**0.776**	-0.036	**0.524**	-0.073	-0.442	-0.323	0.458	1.000																		
logCu	0.402	0.372	-0.042	0.388	0.164	0.011	0.026	**0.524**	0.424	0.065	1.000																	
logFe	0.371	0.380	0.400	0.382	0.431	-0.029	-0.060	0.401	**0.556**	0.428	**0.677**	1.000																
K	0.011	-0.171	**0.794**	0.140	0.448	0.017	**-0.591**	-0.165	**0.517**	**0.818**	0.001	0.438	1.000															
Mg	-0.115	-0.066	**0.711**	0.151	**0.529**	0.067	-0.047	-0.039	0.466	**0.623**	0.269	**0.731**	**0.563**	1.000														
logMn	0.462	**0.589**	-0.127	0.467	0.071	-0.077	0.422	**0.655**	-0.121	-0.268	0.367	0.417	-0.165	0.132	1.000													
logMo	0.204	0.414	-0.194	0.217	0.105	0.020	0.428	0.385	-0.061	-0.133	0.299	0.170	-0.155	-0.146	0.327	1.000												
Na	-0.304	-0.277	-0.043	-0.170	0.097	0.021	0.389	-0.236	-0.239	-0.281	-0.291	-0.326	-0.499	-0.044	-0.138	-0.212	1.000											
logNi	-0.019	-0.179	**0.642**	0.331	**0.500**	0.076	-0.400	-0.067	**0.798**	**0.639**	0.402	**0.523**	**0.657**	**0.522**	-0.146	-0.061	-0.291	1.000										
logP	-0.244	-0.213	-0.116	0.074	0.023	0.167	0.414	-0.185	0.024	-0.273	0.038	-0.154	-0.349	-0.046	-0.044	0.090	0.479	0.016	1.000									
logPb	0.615	0.749	-0.282	0.473	0.073	-0.001	0.405	**0.857**	-0.071	-0.415	**0.555**	0.413	-0.299	-0.001	**0.809**	0.415	-0.126	-0.172	-0.041	1.000								
logS	0.208	0.367	0.025	0.268	0.236	0.006	0.077	0.442	0.357	0.014	**0.693**	**0.569**	0.056	0.201	0.263	0.315	-0.258	0.335	-0.034	0.424	1.000							
logSb	**0.654**	**0.762**	-0.242	0.422	0.020	-0.062	0.150	**0.784**	0.081	-0.200	**0.521**	0.394	-0.133	-0.064	**0.568**	0.347	-0.272	-0.029	-0.277	**0.797**	0.435	1.000						
logSr	-0.253	-0.109	-0.106	-0.165	0.105	0.037	**0.597**	-0.114	-0.356	-0.272	-0.192	-0.272	**-0.522**	-0.057	0.110	0.015	**0.752**	-0.369	0.311	0.052	-0.219	-0.127	1.000					
Ti	-0.177	-0.338	**0.844**	-0.001	0.478	-0.036	-0.345	-0.354	0.409	**0.753**	-0.140	0.338	**0.756**	**0.616**	-0.210	-0.219	-0.036	**0.584**	-0.101	-0.425	-0.080	-0.312	-0.105	1.000				
V	0.171	0.126	**0.604**	0.299	**0.524**	0.019	-0.067	0.314	0.285	0.440	0.311	0.489	**0.511**	**0.511**	0.210	0.070	-0.311	**0.558**	-0.126	0.192	0.288	0.177	-0.288	0.422	1.000			
logW	**0.645**	0.418	-0.136	0.253	-0.065	-0.047	-0.045	0.525	0.126	-0.226	0.186	0.254	-0.017	-0.113	0.407	0.151	-0.150	-0.181	-0.164	0.452	0.267	0.407	-0.166	-0.148	-0.097	1.000		
logZn	**0.707**	**0.734**	-0.088	**0.530**	0.162	-0.051	0.217	**0.923**	0.087	-0.294	**0.538**	0.476	-0.101	0.061	**0.739**	0.344	-0.171	0.008	-0.121	**0.878**	0.421	**0.754**	-0.033	-0.236	0.339	**0.534**	1.000	
logHg	0.447	0.379	-0.329	0.004	-0.161	-0.027	0.047	0.401	-0.063	-0.329	0.287	0.096	-0.286	-0.311	0.086	0.095	-0.025	-0.166	-0.109	0.309	0.322	0.448	0.117	-0.311	-0.137	0.276	0.385	1.000
	logAu	**logAg**	**Al**	**logAs**	**logBe**	**logBi**	**logCa**	**logCd**	**logCo**	**Cr**	**logCu**	**logFe**	**K**	**Mg**	**logMn**	**logMo**	**Na**	**logNi**	**logP**	**logPb**	**logS**	**logSb**	**logSr**	**Ti**	**V**	**logW**	**logZn**	**logHg**

Table 4-2-1-6 PC (principal component) loading matrix after varimax rotation for the drill core 72 samples , Aguilar range area

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	Contribution ratio
logAu	**-0.813**	-0.056	-0.192	-0.096	-0.236	-0.083	-0.097	0.783
logAg	**-0.772**	-0.138	-0.101	-0.211	0.209	0.183	0.016	0.748
Al	0.131	**0.928**	-0.028	0.103	-0.134	-0.011	0.036	0.908
logAs	**-0.510**	0.162	-0.079	-0.080	0.090	**-0.671**	-0.160	0.783
logBa	0.279	**0.543**	-0.205	0.471	-0.089	0.079	-0.023	0.651
logBe	-0.091	**0.765**	0.244	-0.089	0.106	-0.096	-0.084	0.688
logBi	0.050	0.012	0.020	-0.024	0.004	-0.010	**0.973**	0.950
logCa	-0.195	-0.168	**0.668**	0.005	**0.555**	-0.042	0.047	0.824
logCd	**-0.874**	-0.076	-0.050	-0.264	0.142	0.014	-0.011	0.862
logCo	-0.006	0.469	-0.297	-0.386	-0.293	**-0.528**	0.077	0.828
Cr	0.302	**0.804**	-0.303	-0.040	-0.068	0.088	-0.119	0.858
logCu	-0.375	0.139	-0.115	**-0.758**	0.156	-0.218	0.020	0.820
logFe	-0.429	**0.621**	-0.139	-0.454	0.051	-0.085	0.018	0.805
K	0.087	**0.761**	**-0.532**	0.089	-0.165	-0.016	0.009	0.905
Mg	-0.012	**0.845**	0.073	-0.122	0.047	-0.050	0.112	0.751
logMn	**-0.787**	0.052	0.146	0.062	0.356	-0.078	-0.023	0.780
logMo	-0.286	-0.101	-0.042	-0.199	**0.655**	-0.046	-0.004	0.565
Na	0.200	-0.092	**0.874**	0.116	-0.204	-0.087	-0.003	0.875
logNi	0.156	**0.674**	-0.312	-0.366	-0.083	-0.395	0.037	0.874
logP	0.245	-0.154	0.493	-0.077	0.157	**-0.592**	0.203	0.749
logPb	**-0.871**	-0.103	0.127	-0.208	0.296	-0.046	0.043	0.921
logS	-0.283	0.150	-0.104	**-0.758**	0.162	-0.058	0.024	0.718
logSb	**-0.783**	-0.082	-0.110	-0.331	0.108	0.094	-0.063	0.766
logSr	0.061	-0.084	**0.903**	0.060	0.030	0.142	-0.012	0.850
Ti	0.234	**0.828**	-0.076	0.166	-0.218	-0.012	-0.049	0.823
V	-0.226	**0.677**	-0.182	-0.115	0.261	-0.033	0.029	0.626
logW	**-0.697**	-0.120	-0.111	0.056	-0.352	-0.094	0.040	0.651
logZn	**-0.914**	0.043	0.056	-0.225	0.094	-0.072	-0.006	0.905
logHg	-0.348	-0.316	0.123	**-0.551**	-0.349	0.312	-0.050	0.762
Sum of loading square	6.680	6.193	3.156	2.650	1.746	1.522	1.084	
Contributionrat 0io	23.035	21.354	10.883	9.138	6.021	5.249	3.736	
Cumulative contribution ratio	23.035	44.389	55.272	64.410	70.432	75.681	79.417	

Integration criterion =0.00001

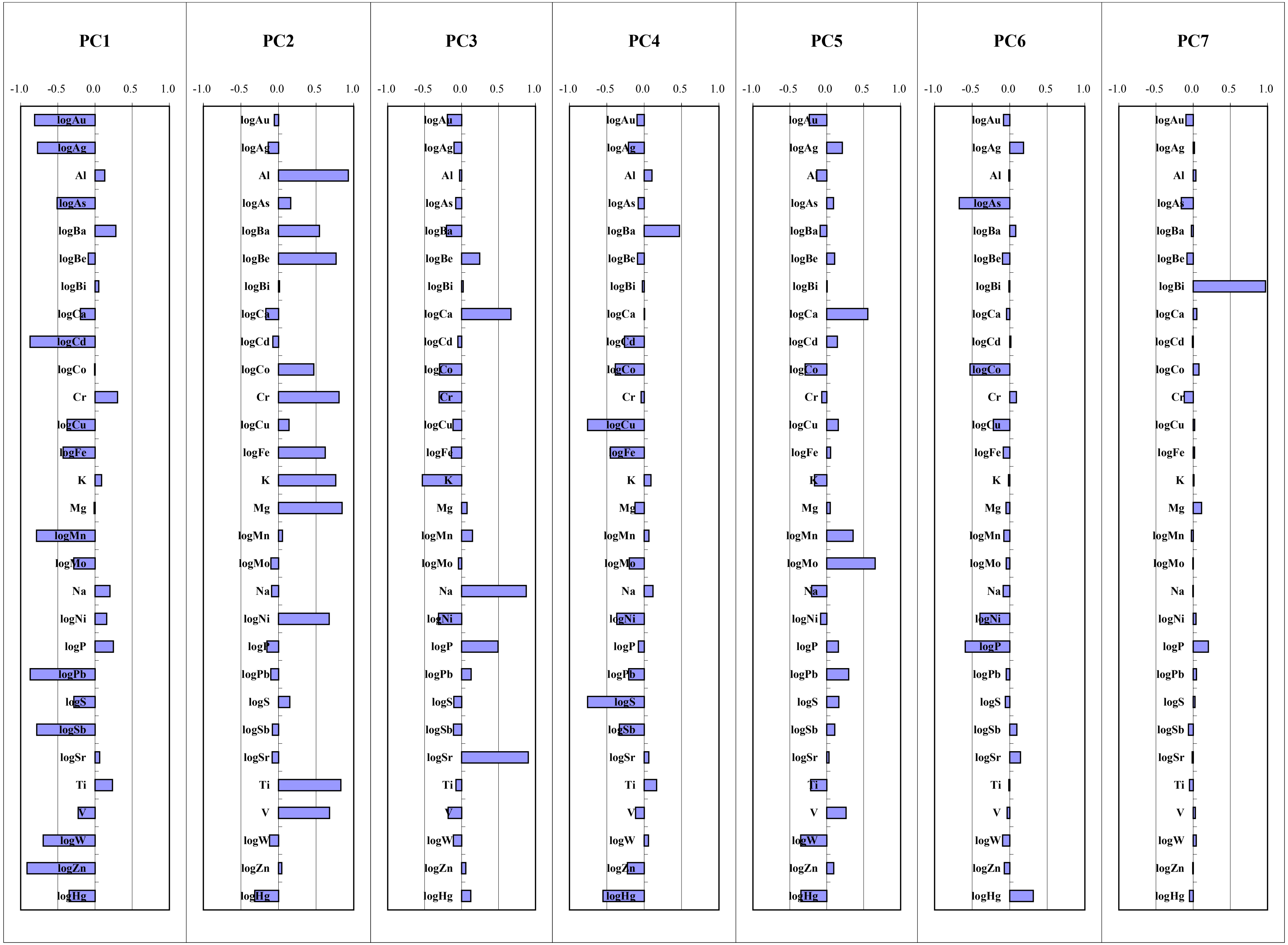


Fig.II-4-2-1-10 Principal component loadings for the drill core 72 samples, Aguilar range area

0.5 is shown in bold type. Further the values with plus sign are indicated in red, and those with minus sign in blue. (Note that the signs are relative to each other. No contradiction will incur in the interpretation even if all signs are reversed for each principal component.) The discriminated cumulative contribution rates of the seven principal components show such a high rate as about 80%. Since the first four principal components (PC1, PC2, and PC3) make up 60% or higher of the contribution rate, these four principal components can almost explain the characteristics of these samples of 72 drilling cores.

Principal component scores of each sample calculated by using the principal component loads are shown in Table II-4-2-1-7, together with their geological descriptions. The characteristics of the principal components presumed from principal component load matrix and the relations between each principal component scores and rock type are shown in Table II-4-2-1-8, and the change of each principal component scores with depth for each drilling hole is shown in Fig.II-4-2-1-11.

In Table II-4-2-1-8, primary principal components (PC1) accounts for the contribution rate of 23%, and show high correlation with Zn, Cd, Pb, Au, Mn, Sb, Ag, W, and As (in descending order of absolute load value). The majority of these are ordinary elements of the SEDEX-type ore bodies. As obvious from Fig.II-4-2-1-11, a higher score at the encounter part with Esperanza ore bodies of drilling cores (A01AG060～63) is obtained in comparison with hanging/foot walls. Therefore these elements are considered to be for SEDEX mineralization.

Secondary principal components (PC2) accounts for the contribution rate of 21.4%, and show a high correlation with Al, Mg, Ti, Cr, Be, K, V, Ni, Fe, and Ba (in descending order of load). This principal components are presumed to be elements that show a certain kind of characteristics (for instance, grain size) of clastic rocks because, as is clear in Table II-4-2-1-7, there is a tendency that arenite indicates a high plus score and muddy rock a high minus score.

Tertiary principal components (PC3) show high correlations with Sr, Na, Ca and K and are presumed to be elements that show a composition of rocks (especially, feldspar). Fourth principal components (PC4) show high correlation with Cu, S, and Hg, and are presumed to be elements associated with the hydrothermal deposit at a comparatively low temperature. Because the contribution rates of these elements are low at about 10%, it is considered that the influence to the data variation is low.

8) Characteristics of the satellite image

In ASTER image analysis, false color BGR=147 (hereinafter 147) image identified granite in Aguilar range as weak red in color, and Ordovician sediments in dark color. The image also identified sedimentary structure with N-S direction. For alteration mineral identification, ASTER detected Ser-Geo zone in the boundary area of granite and sedimentary rocks, and Ser-Chl and Chl zone in sedimentary rocks with N-S in direction.

Table II-4-2-1-7 PC scores and descriptions for the drill core 72 samples, Aguilar range area

Sample No.	Drill hole # and depth	District	Locality	Rock	PC1	PC2	PC3	PC4	PC5	PC6	PC7
A01AG01	Drill hole #3070, 57.2m	Aguilar	Mina Esperanza	f.s.s.	1.588	-4.095	1.102	-0.133	-0.438	-0.848	-0.559
A01AG02	Drill hole #3070, 65.0m	Aguilar	Mina Esperanza	f.s.s.	1.651	-4.989	0.731	0.253	-0.441	-1.212	-0.619
A01AG03	Drill hole #3070, 70.1m	Aguilar	Mina Esperanza	shale	1.090	1.392	-1.227	-0.552	-1.573	-5.433	-0.630
A01AG04	Drill hole #3070, 75.0m	Aguilar	Mina Esperanza	f.s.s.	0.004	0.754	-0.147	4.333	-0.046	-0.592	-0.617
A01AG05	Drill hole #3070, 81.7m	Aguilar	Mina Esperanza	f.s.s.	0.532	0.877	-0.232	1.835	-0.140	-0.298	-0.466
A01AG06	Drill hole #3070, 87.3m	Aguilar	Mina Esperanza	f.s.s.	-0.098	-2.579	1.883	3.533	-0.495	0.171	-0.437
A01AG07	Drill hole #3070, 93.9m	Aguilar	Mina Esperanza	f.s.s.	-1.517	2.367	-2.443	2.741	-2.205	-1.422	-0.790
A01AG08	Drill hole #3070, 97.2m	Aguilar	Mina Esperanza	f.s.s.	1.989	-3.270	0.046	-4.272	-1.490	-0.841	-0.696
A01AG09	Drill hole #3070, 103.4m	Aguilar	Mina Esperanza	f.s.s.	0.265	2.140	-0.141	-1.144	-1.999	0.376	-0.712
A01AG10	Drill hole #3070, 109.2m	Aguilar	Mina Esperanza	f.s.s.	0.057	0.933	-0.469	-0.898	-2.147	0.692	-0.565
A01AG11	Drill hole #3070, 115.0m	Aguilar	Mina Esperanza	f.s.s.	0.939	-4.918	2.143	0.172	-1.166	0.506	-0.618
A01AG12	Drill hole #3070, 118.5m	Aguilar	Mina Esperanza	f.s.s. with py. diss.	2.008	-5.301	1.550	-2.068	-1.296	0.424	-0.576
A01AG13	Drill hole #3070, 124.6m	Aguilar	Mina Esperanza	f.s.s.	0.878	1.151	-0.066	-0.434	-1.565	0.476	-0.774
A01AG14	Drill hole #3070, 130.45m	Aguilar	Mina Esperanza	f.s.s.	0.836	-0.656	0.639	-2.494	-1.535	-1.278	-0.104
A01AG15	Drill hole #3070, 133.7m	Aguilar	Mina Esperanza	f.s.s.	0.363	-6.807	-0.999	2.749	-0.995	1.660	1.769
A01AG16	Drill hole #3070, 140.6m	Aguilar	Mina Esperanza	f.s.s.	1.078	-6.130	1.049	-0.409	-0.798	1.134	1.567
A01AG17	Drill hole #3070, 146.7m	Aguilar	Mina Esperanza	f.s.s. with py. diss.	0.971	-0.215	2.753	-1.743	-1.740	0.076	3.856
A01AG18	Drill hole #3070, 152.7m	Aguilar	Mina Esperanza	f.s.s.	1.653	1.517	0.824	-2.483	-1.581	0.218	-0.174
A01AG19	Drill hole #3070, 155.7m	Aguilar	Mina Esperanza	shale with py. diss.	1.145	0.845	-1.566	-0.373	-0.954	0.614	-0.577
A01AG20	Drill hole #3070, 163.65m	Aguilar	Mina Esperanza	shale with py. diss.	-0.241	2.012	3.983	-0.382	0.894	0.627	-0.152
A01AG21	Drill hole #3070, 169.75m	Aguilar	Mina Esperanza	shale with py. diss.	1.092	2.930	-0.790	-1.056	-1.482	0.972	-0.390
A01AG22	Drill hole #3070, 175.0m	Aguilar	Mina Esperanza	shale with po. diss.	0.802	3.095	-0.886	-0.395	-1.073	0.752	-0.418
A01AG23	Drill hole #3070, 178.9m	Aguilar	Mina Esperanza	shale with py. diss.	2.213	1.282	-2.724	-0.685	-1.011	1.683	-0.389
A01AG24	Drill hole #3070, 188.0m	Aguilar	Mina Esperanza	shale with py. diss.	1.571	0.165	0.506	-0.359	-0.248	0.132	-0.555
A01AG25	Drill hole #3070, 191.05m	Aguilar	Mina Esperanza	f.s.s. with py. diss.	1.070	-0.341	1.872	-0.130	-1.435	0.145	-0.466
A01AG26	Drill hole #3070, 196.25m	Aguilar	Mina Esperanza	shale with py. diss.	0.698	2.751	-0.893	-0.758	-1.117	1.739	-0.144
A01AG27	Drill hole #3070, 199.3m	Aguilar	Mina Esperanza	shale with py. diss.	1.478	0.160	0.934	-0.546	-1.134	0.736	-0.318
A01AG28	Drill hole #3070, 205.4m	Aguilar	Mina Esperanza	f.s.s. with py. diss.	0.824	-1.387	-0.674	-0.137	-0.923	1.675	3.153
A01AG29	Drill hole #3070, 211.5m	Aguilar	Mina Esperanza	f.s.s. with py. diss.	1.748	-0.777	-0.268	-0.946	0.506	0.614	-0.403
A01AG30	Drill hole #3070, 217.6m	Aguilar	Mina Esperanza	f.s.s.	1.270	0.054	-2.121	-0.177	-0.262	1.933	-0.328
A01AG31	Drill hole #3070, 220.7m	Aguilar	Mina Esperanza	shale with py. diss.	0.813	2.651	0.010	-0.330	-0.252	1.498	-0.776
A01AG32	Drill hole #3070, 224.5m	Aguilar	Mina Esperanza	shale with py. diss.	1.364	0.926	-1.204	-0.967	-0.577	-0.201	-0.683
A01AG33	Drill hole #3070, 233.0m	Aguilar	Mina Esperanza	shale with py. diss.	1.284	0.045	-0.945	0.432	0.944	1.379	-0.133
A01AG34	Drill hole #3070, 239.0m	Aguilar	Mina Esperanza	shale with py. diss.	1.835	-3.193	-0.941	-0.478	1.023	1.751	-0.337
A01AG35	Drill hole #3070, 242.6m	Aguilar	Mina Esperanza	shale with veinlets	0.092	-0.813	-1.325	3.326	-0.238	1.298	-0.243
A01AG36	Drill hole #3070, 248.4m	Aguilar	Mina Esperanza	shale with veinlets/py.	1.344	-2.900	-1.485	1.294	0.472	-0.719	-0.467
A01AG37	Drill hole #3070, 253.4m	Aguilar	Mina Esperanza	f.s.s.	1.057	-4.257	0.004	0.325	2.460	-0.982	-0.498
A01AG38	Drill hole #3070, 260.5m	Aguilar	Mina Esperanza	phyllitic shale	-2.367	1.280	1.382	2.188	1.481	1.398	-0.520
A01AG39	Drill hole #3070, 265.1m	Aguilar	Mina Esperanza	shale	0.574	-0.292	-0.323	-0.111	0.489	0.926	-0.221
A01AG40	Drill hole #3070, 273.45m	Aguilar	Mina Esperanza	phyllitic shale	1.935	-0.344	-1.976	-0.515	1.827	-0.235	1.197
A01AG41	Drill hole #3070, 276.5m	Aguilar	Mina Esperanza	phyllitic shale with a few py. diss.	1.370	0.239	-2.215	-0.991	1.930	0.075	-0.896
A01AG42	Drill hole #3070, 282.1m	Aguilar	Mina Esperanza	phyllitic shale with a few py. diss.	0.259	-2.632	-1.722	-0.749	2.259	-1.457	-0.341
A01AG43	Drill hole #3070, 288.7m	Aguilar	Mina Esperanza	shale with veinlets/py.	-2.490	1.475	1.002	-2.462	1.526	1.982	-0.197
A01AG44	Drill hole #3070, 291.5m	Aguilar	Mina Esperanza	f.s.s.	-0.153	-3.880	-2.181	-0.889	2.286	-1.401	1.408
A01AG45	Drill hole #3070, 297.3m	Aguilar	Mina Esperanza	shale	-0.245	0.200	3.141	1.793	1.774	2.288	-0.614
A01AG46	Drill hole #3070, 303.0m	Aguilar	Mina Esperanza	phyllitic shale with py.	-0.134	2.631	-2.150	0.735	0.228	0.214	-0.828
A01AG47	Drill hole #3070, 305.8m	Aguilar	Mina Esperanza	f.s.s.	1.100	-2.521	-2.466	0.382	1.817	-0.531	-0.394
A01AG48	Drill hole #3070, 312.15m	Aguilar	Mina Esperanza	shale	0.127	4.105	-1.462	0.613	0.644	-0.439	1.511
A01AG49	Drill hole #3070, 318.0m	Aguilar	Mina Esperanza	shale with veinlets	-1.880	2.996	5.798	2.129	-0.330	0.189	0.965
A01AG50	Drill hole #3070, 321.0m	Aguilar	Mina Esperanza	shale with veinlets	0.312	3.924	-0.537	0.273	0.150	-0.424	1.656
A01AG51	Drill hole #3070, 327.2m	Aguilar	Mina Esperanza	shale with py. diss.	-0.006	-2.033	-0.745	-0.366	1.447	-2.340	1.258
A01AG52	Drill hole #3070, 331.95m	Aguilar	Mina Esperanza	shale with py. diss.	0.133	1.940	-0.662	-0.421	0.504	-1.123	-0.384
A01AG53	Drill hole #3070, 337.45m	Aguilar	Mina Esperanza	phyllitic shale	-0.106	3.282	-0.480	-0.277	0.622	-0.880	4.573
A01AG54	Drill hole #3070, 343.55m	Aguilar	Mina Esperanza	f.s.s.	0.117	0.817	2.237	1.371	-0.104	-0.236	-0.426
A01AG55	Drill hole #3070, 346.6m	Aguilar	Mina Esperanza	phyllitic shale	0.337	1.682	-0.659	-0.772	0.117	-0.378	-0.063
A01AG56	Drill hole #3070, 354.25m	Aguilar	Mina Esperanza	phyllitic shale	-0.312	0.267	-0.238	2.503	0.237	-0.931	-0.189
A01AG57	Drill hole #3070, 358.8m	Aguilar	Mina Esperanza	shale	0.192	-0.291	2.217	2.095	-0.359	-0.670	-0.363
A01AG58	Drill hole #3070, 361.85m	Aguilar	Mina Esperanza	shale	0.329	-1.442	1.624	2.056	-0.299	-0.086	-0.248
A01AG59	Drill hole #3070, 366.9m	Aguilar	Mina Esperanza	phyllitic shale with py. diss.	-1.310	1.269	-0.467	1.785	0.075	-0.487	-0.351
A01AG60	Drill hole #3070, 372.65m	Aguilar	Mina Esperanza	Pb-Zn ore zone with py.	-2.753	-0.413	0.554	2.121	1.337	-0.664	0.054
A01AG61	Drill hole #3070, 378.4m	Aguilar	Mina Esperanza	Pb-Zn ore with shale	-15.189	-2.509	-1.663	0.765	-3.921	-0.976	0.353
A01AG62	Drill hole #3070, 384.8m	Aguilar	Mina Esperanza	Pb-Zn ore zone with py.	-9.670	-0.901	0.143	-2.558	3.613	1.691	-0.687
A01AG63	Drill hole #3070, 390.0m	Aguilar	Mina Esperanza	Pb-Zn ore zone with py.	-7.689	-1.230	0.366	-4.601	0.178	0.001	-0.576
A01AG64	Drill hole #3070, 393.05m	Aguilar	Mina Esperanza	shale with veinlets/py.	-1.501	1.939	2.888	-0.892	1.320	-0.678	-0.467
A01AG65	Drill hole #3070, 394.05m	Aguilar	Mina Esperanza	phyllitic shale	-1.172	1.369	-1.720	0.814	0.412	-0.765	-0.215
A01AG66	Drill hole #3070, 399.4m	Aguilar	Mina Esperanza	phyllitic shale	-0.303	0.830	-1.881	0.876	0.207	-0.389	-0.145
A01AG67	Drill hole #3070, 403.3m	Aguilar	Mina Esperanza	phyllitic shale	1.185	1.785	5.201	-1.322	1.595	-3.083	-0.188
A01AG68	Drill hole #3070, 408.8m	Aguilar	Mina Esperanza	phyllitic shale	-0.119	2.873	-1.760	0.360	0.474	0.437	1.524
A01AG69	Drill hole #3070, 415.6m	Aguilar	Mina Esperanza	phyllitic shale	-0.285	1.925	-2.204	-0.770	1.731	0.213	-0.175
A01AG70	Drill hole #3070, 421.55m	Aguilar	Mina Esperanza	phyllitic shale	1.399	2.515	1.072	-0.892	0.652	0.091	-0.019
A01AG71	Drill hole #3070, 428.1m	Aguilar	Mina Esperanza	phyllitic shale	1.108	2.860	2.396	-0.487	0.655	-0.462	-0.533
A01AG72	Drill hole #3070, 434.2m	Aguilar	Mina Esperanza	phyllitic shale	1.467	0.871	-0.999	-0.428	-0.519	-0.321	-0.193

Table 4-2-1-8 The main principal components with related elements and their characteristics

Principal component	Related elements	PC loadings	Characteristics
PC1 Contribution: 23.0%	logAu	(0.813)	Because these elements are common in the SEDEX ore body and the samples near the Esperanza ore body show high scores of the PC, the PC is probably a component of the SEDEX mineralization.
	logAg	(0.772)	
	logAs	(0.510)	
	logCd	(0.874)	
	logMn	(0.787)	
	logPb	(0.871)	
	logSb	(0.783)	
	logW	(0.697)	
	logZn	(0.914)	
PC2 Contribution: 21.4%	Al	0.928	The principal component is probably showing specified characteristics of rock. Comparing to the geological description of the samples, arenaceous rocks generally show plus values of PC loadings, and pelitic rocks , on the other hand, show minus values of PC loadings.
	logBa	0.543	
	logBe	0.765	
	Cr	0.804	
	logFe	0.621	
	K	0.761	
	Mg	0.845	
	logNi	0.674	
	Ti	0.828	
	V	0.677	
PC3 Contribution: 10.9%	logCa	0.668	The principal component is probably showing specified characteristics of rock related to feldspar type.
	K	(0.532)	
	Na	0.874	
	logSr	0.903	
PC4 Contribution: 9.1%	logCu	(0.758)	Cu, S and Hg are elements showing the possibility of hydrothermal mineralization of relatively low temperature.
	logS	(0.758)	
	logHg	(0.551)	

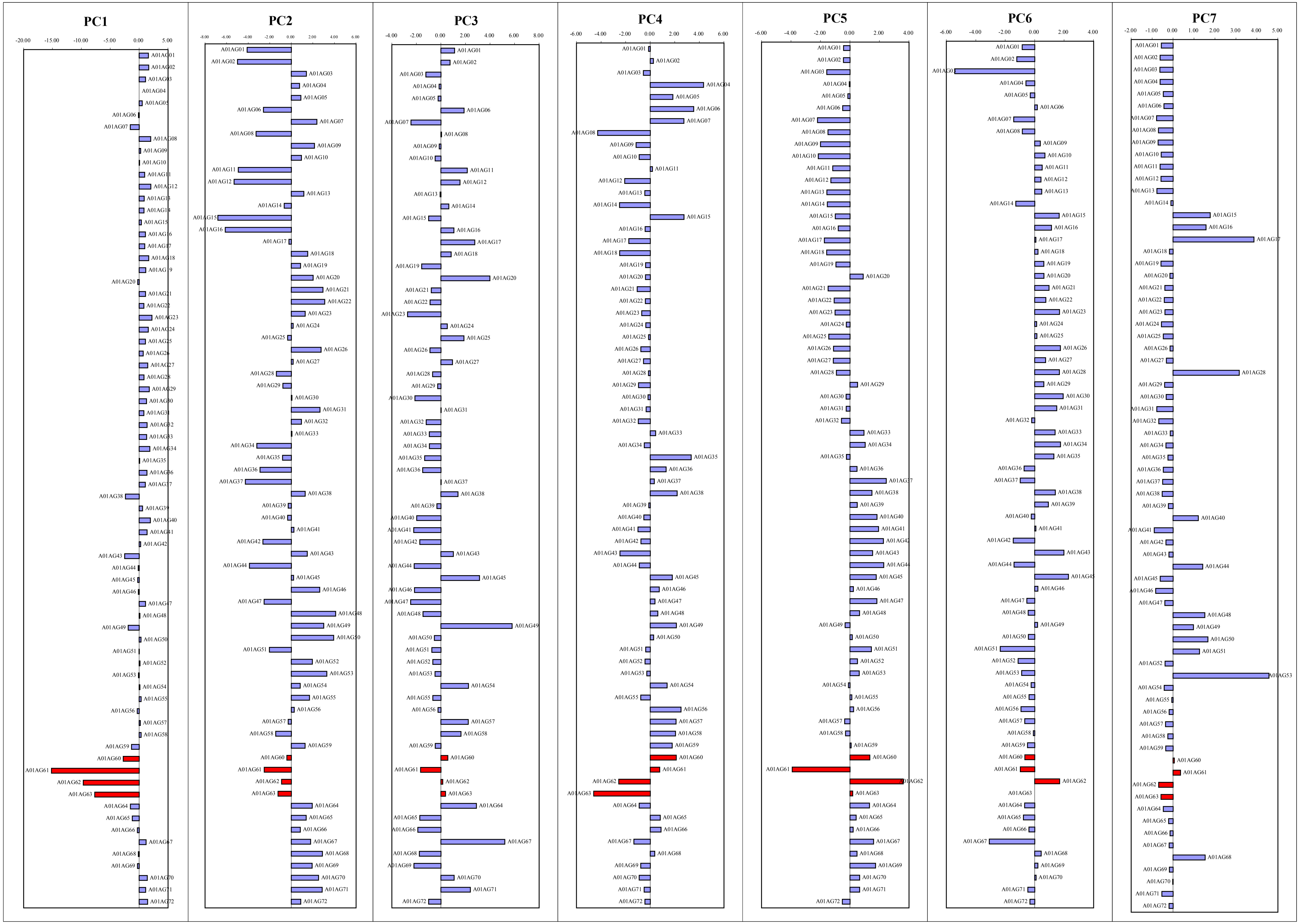


Fig.II-4-2-1-11 Variation diagrams of PC scores for the drill core 72 samples,Aguilar range area

9) Survey results and comments

(Characteristics of mineralization in Aguilar mine zone)

In Table II-4-2-1-8, primary principal components (PC1) account for the contribution rate of 23%, and they are highly correlated with Zn, Cd, Pb, Au, Mn, Sb, Ag, W, and As (in descending order of load absolute value). The greater part of these elements is ordinary ones in the SEDEX-type ore bodies. As obvious from Fig.II-4-2-1-11, it is presumed that these are elements of SEDEX mineralization, because the high score is clearly shown at an encounter parts (A01AG060-63) of drilling cores of Esperanza ore bodies when compared with those of hanging/foot walls

In Aguilar Mountain range area, not only in Esperanza deposits which is assumed to be a typical model of SEDEX deposits, but also in Aguilar deposits, Oriental mineral showings, and Pirita mineral showings, a high score distribution of these secondary principal components show geochemically the existence of this SEDEX-type mineralization. However, in Rio Grande mineral showings located about 3km northeast of Esperanza deposits that are thought to be a similar SEDEX mineralization, no high score of these secondary principal components has been obtained contrary to our expectations.

In Aguilar deposits and mineral showings in the periphery, mineralization represented by La Colorada deposits exists while overlapping with that of SEDEX. However, from the result of this principal component analysis of 197 samples, no such mineralization is observed in Esperanza ore bodies. No high score of secondary principal components that indicate SEDEX mineralization are not identified neither in Rio Grande mineral showings at northeast of Esperanza deposits which were thought to be SEDEX mineralization in the past, nor in Despensa mineral showings which are similar to Rio Grande, though of very small-scale, located about 4km southeast of Tapada. Nonetheless, a high score of this principal component exist in these mineral showings.

・In Aguilar Mountain range zone, it was clarified that SEDEX mineralization contributed not only to Esperanza deposits which is assumed to be a typical model of SEDEX deposits, but also to Aguilar deposits, Oriental mineral showings, and Pirita mineral showings.

・In Aguilar deposits and mineral showings in the periphery other than Esperanza deposits, it turned out that mineralization represented by La Colorada deposits exist while overlapping with SEDEX mineralization.

・On the other hand, it was found that Rio Grande mineral showings in the neighborhood of northwest of Esperanza deposits, previously thought to be similar to SEDEX mineralization, had relationship with mineralization represented by La Colorada deposits rather than with SEDEX mineralization, contrary to our expectations.

(2) Pumahuasi district

1) Location and access

This district, called PMD (Pumahuasi Mining District), is near the Bolivian border, ranging from La Quiaca town to Cangrejillo village, which is about 40km south of that town. In this district, there are many adits of small-scale abandoned mines such as Pumahuasi, La Belgica, Sol de Mayo, etc., where they once mined the vein deposits of lead, zinc, and barite. These mines are not far from highways and access is easy.

2) Contents of Survey

According to the existing data, this district is located in the Acoite Formation, the upper layer of Santa Victoria Group, and therefore, it is highly unlikely that the SEDEX deposit horizon is exposed. Seven samples were extracted just for reference use (see Fig.II-4-2-1-12).

3) Mining concessions

Mining concessions are widely covered in this area.

4) Past exploration and mining activities

At the beginning of the 20th century: Mining activities were started at Pumahuasi.

1920: Mining was started at Sol de Mayo.

Around 1937: Production at Pumahuasi.

1940 - 1941: Production of 6,000 t lead concentrates At Sol de Mayo.

1978 - 1979: The DGFM (Direccion General de Fabricaciones Militares) carried out the geological survey, geophysical exploration (electromagnetics, IP, and specific resistivity) and drilling in PMD. Based on the geophysical exploration, four holes were drilled in Belgica. At three of them, zincblende impregnation was captured (DGFM, 1980b).

1993 - 1994: Based on a hypothesis that Pb-Zn-Ag mineralization in the PMD could represent the northern extension of SEDEX-type zinc and lead deposits in El Aguilar, Argentina Mineral Development S.A carried out detailed geological, geochemical and IP electrical exploration. The drilling was proposed as the only method to confirm the presence of massive sulfide deposits (Argentina Mineral Development S.A., 1994).

5) Geology and tectonics

According to the geological map " La Quiaca " with a scale of 1 to 250,000, the greater part of this district is covered with the alluvial and lake-bottom sediments of Tertiary Pliocene - Quaternary Alluvial epoch. The Paleozoic Ordovician system, which is exposed mainly at the southeast part, consists of the Acoite formation of upper layer of Santa Victoria Group. Ordovician system is exposed

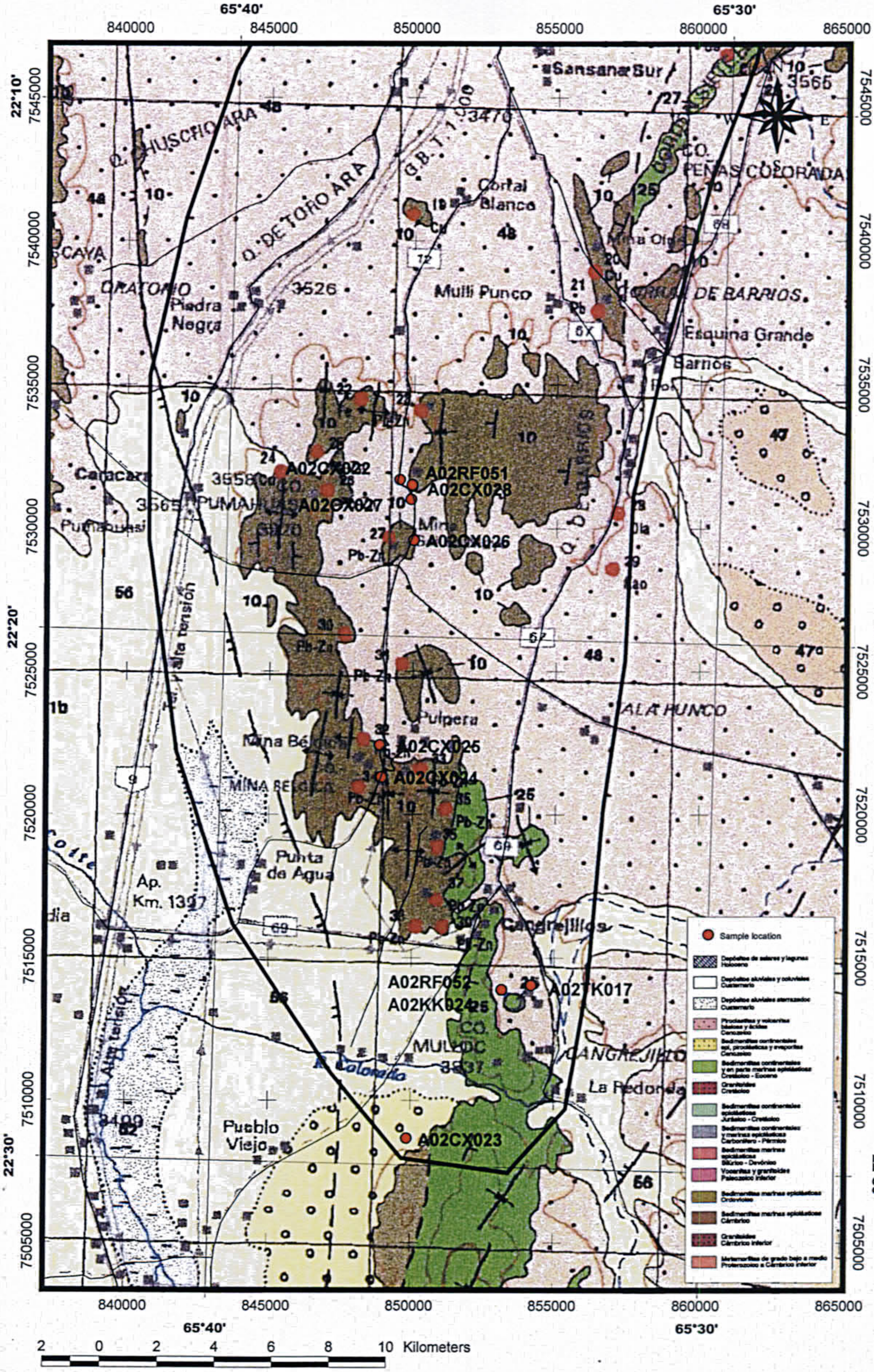


Fig.II-4-2-1-12 Sample location and geological map of Pumahuasi area scatteredly, and its weathered alteration is remarkable, and therefore, the detailed structure is not clear (see Fig.II-4-2-1-12 referred to earlier).

6) Mineralization and alteration

In the Pumahuasi district, they once mined the deposits on a small scale, such as Pumahuasi, Sol de Mayo, La Belgica-Alejandro etc. These deposits were surveyed in the 1st year of the project. The Pumahuasi deposit consists of two main veins that are called Pumahuasi Viejo and Pumahuasi Nueva. The ores collected from the place near the ground surface are cerussite, anglesite and limonite. In the lower part, galena is dominant (Pb:14%, Zn:1%). Pb starts to decrease at a depth of about 250m, and accompanies Zn of 35% at maximum at a depth of around 350m. The deposit is located along the river flowing in flat Pampas, and its only remaining structures are a vein trench, two vertical shafts, a building foundation, and a large-scale debris-piling site.

At the Sol de Mayo deposit, two almost parallel veins about 250m apart are observed; "Matadero" in the northern part and "Sol de Mayo" in the southern part. As underground mining was carried out at these veins and they are submerged in water now, it is impossible to investigate. Matadero vein has a total length of 120m, and the main vertical shaft reaches the depth of 150m. The most dominant mineralization is shown in zincblende and galena followed by chalcopyrite.

La Belgica deposit and Alejandro deposit adjoin mutually, and both veins run almost in the E-W direction, which is perpendicular to stratum strike (the N-S direction). Main minerals are galena, zincblende, iron pyrite, chalcopyrite, limonite, cerussite and anglesite. Barite, ankerite, quartz, and limonite exist as gangue mineral.

7) Geochemical characteristics

The discriminant functions were built on the basis of the analytical data of 72 drilling core samples of the Aguilar district, and they were applied to seven samples collected and analyzed in this district. The discrimination result is shown in Table II-4-2-1-9 and Fig.II-4-2-1-13. According to the table and figure, all the seven samples come from the bedded shale belonging to the Acoite Formation of upper layer of Santa Victoria Group, or bedded shale accompanied by a thin layer of sandstone. In the discriminant analysis result, they are classified into the category of the hanging-wall layer of mineralized horizons.

Two samples from the bedded shale in the waste of Pumahuasi mining site and the bedded shale/sandstone from the northwest of southern part of Morado Mountain are discriminated to the deposit horizon foot wall (G3). Five other samples are discriminated to the semi-foot wall (G1).

8) Characteristics of the satellite image

ASTER 147 outlined upper Ordovician sediments with N-S direction and Quaternary, which

Table II-4-2-1-9 Horizons predicted by using the discriminant functions, Pumahuasi area

Serial No.	Sample No.	District	Locality	Rock	Discriminant function values			Predicted group
					Y_{1-2}	Y_{1-3}	Y_{2-3}	
1	A02CX028	Pumahuasi	Chaussette north	bedded f.s.s.&shale	**23.270**	**2.080**	**-21.190**	**G1**
2	A02CX022	Pumahuasi	Mina Pumahuasi	bedded shale	**29.789**	**-4.385**	**-34.175**	**G3**
3	A02CX027	Pumahuasi	Mina Chaussette	hard shale	**7.824**	**17.134**	**9.310**	**G1**
4	A02CX026	Pumahuasi	Mina Sol de Mayo	bedded shale	**17.143**	**5.260**	**-11.884**	**G1**
5	A02CX025	Pumahuasi	Mina Belgica	bedded shale	**27.093**	**4.253**	**-22.841**	**G1**
6	A02CX024	Pumahuasi	Mina Alejandro	bedded shale	**15.371**	**12.440**	**-2.932**	**G1**
7	A02CX023	Pumahuasi	NW Cerro Morado	bedded shale&s.s	**39.890**	**-6.548**	**-46.439**	**G3**

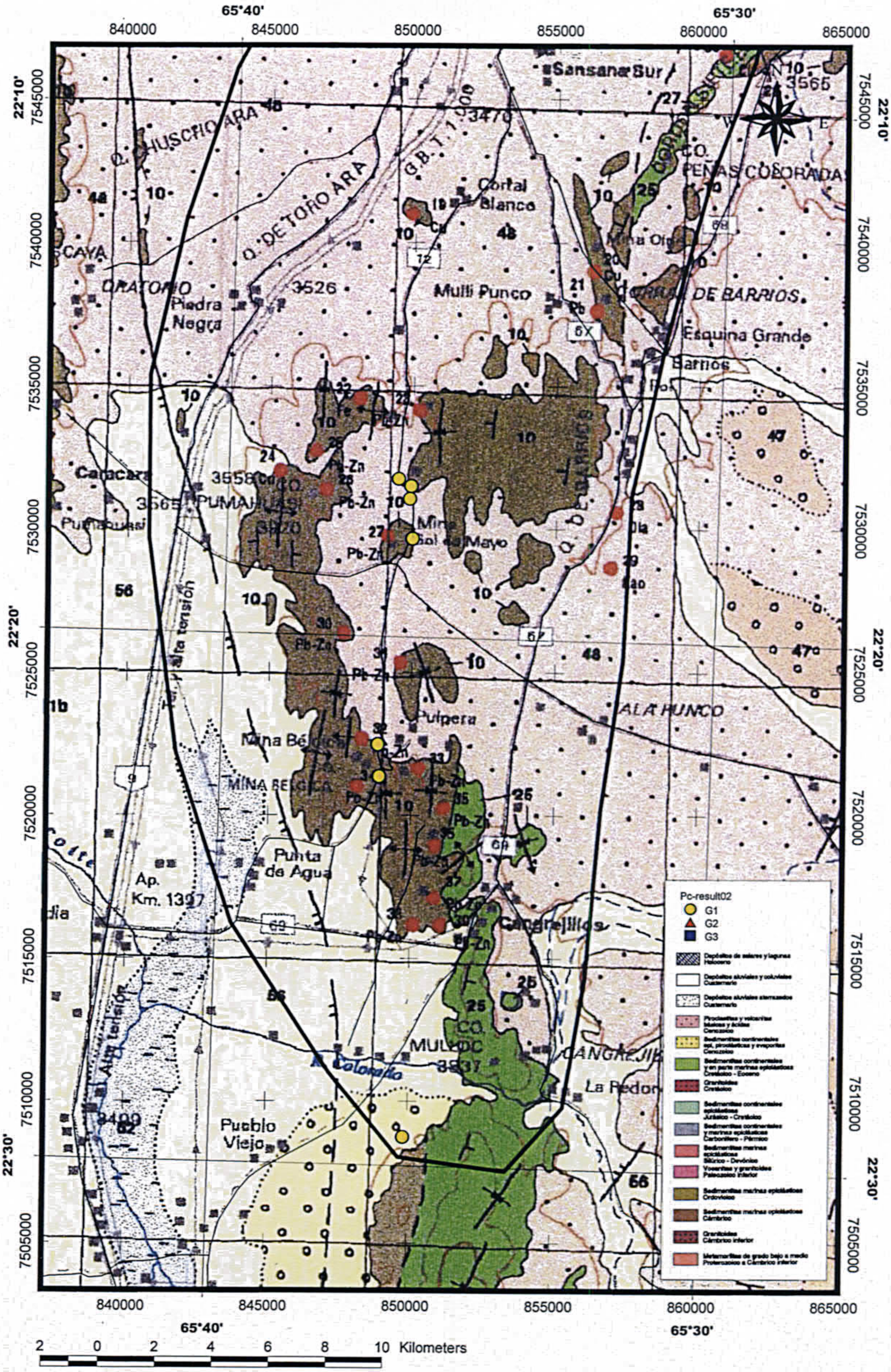


Fig.II-4-2-1-13 Predicted horizons by geochemical discriminant analysis, Pumahuasi area covers Ordovician. Mineral identification detected Chl zone of elongated shape in the southern part of survey area.

(3) Santa Victoria Mountain area

1) Location and access

This area is located in the Agua Chilca village at the western foot of the Santa Victoria Mountains. The route starts from La Quiaca town and goes on State Road No. 5, on unpaved road along the Casti valley, and on State Road No.69. It takes about one hour by car to reach there.

The Santa Rosa abandoned mine is located at S. Lat. 22°37' 54 " and W. Long. 66°2' 55". It is located about 50km southeast of La Quiaca and about 40km east of the Pumahuasi mineral showings. The route starts from La Quiaca town and goes on State Road No. 5 , the unpaved road along the Quobrada de Casti, then to Agua Chilca, a colony at the western foot of Santa Victoria Mountains. The place of mineral showings is then reached by going on State Road No. 69 by way of Abra del Condor. It is about one hour and 45 minutes' drive.

La Cienaga abandoned mine is located about 20km south-southwest of Santa Victoria town, about 25km east of the Santa Rosa mineral showings and about 70km southeast of La Quiaca. It takes about 2 hours to reach the Cienaga from the Santa Rosa by going on a bad mountain path over the altitude of 4,000m. The access is very bad.

2) Contents of survey

The area that crosses the Santa Victoria Mountains with remarkable structure of N-S direction was surveyed. This area stretches along State Roads Nos. 5-7, and No. 69. Samples were collected mainly from Santa Rosita layer, i.e., the outcrop of the lower part of Santa Victoria Group. (see Fig.II-4-2-1-14.). In order to discover some deposit horizons similar to the SEDEX horizon hosting deposit whose characteristics on petrology, paleontology and geochemistry are already known, these samples were subjected to laboratory examinations as follows.

Observation of thin section of rock:	5
Diffraction X ray analysis:	3
Observation of polished section of ore:	2
Ore assay:	3
Fossil identification:	7
Geochemical analysis	104

Moreover, in order to track the horizon hosted deposits, the characteristics of strata with SEDEX horizon hosted deposits were clarified by ASTER images.

3) Mining concessions

Mining concessions are covered in old abandon mine area only.

4) Past exploration and mining activities

None

5) Geology and tectonics

According to the geological map " La Quiaca " with a scale of 1/250,000, the geological stratigraphy of this district is as follows in the ascending order of depth. The Proterozoic Puncoviscana formation, the Lizoite formation (which is the lower layer of Meson Group of the Middle and Upper Cambrian), the Campanario formation (which is the middle layer of this Group), the Chalhualmayoc formation (which is the upper layer of Lizoite), the Santa Rosita formation (which is the lower layer of the Santa Victoria Group of the late Cambrian to the Middle Ordovician), the Acoite Formation (which is the upper layer of this Group), the Mecoyita of the late Ordovician, the Lipeon formation of late Ordovician to the Lower Devonian, Pirgua sublayer group from the Lower Cretaceous to the Upper, the Santa Balbuena sublayer of the Palaeogene, furthermore, the conglomerate layer of the Pliocene to the Pleistocene. As intrusive rocks, the granites of the Lower and the Middle Cambrian and the syenite of the Paleocene etc. are observed.

Among these rocks, the rocks before the Palaeogene are controlled by the fault and fold configuration in the direction of NNE-SSW～NE-SW. Especially the Santa Rosita layer of Santa Victoria Group, which is considered to be important as the SEDEX horizon hosting deposit, is developed and distributed in the extension of this direction, and it is often repeatedly exposed by the thrust fault (see Fig.II-4-2-1-14 referred to earlier).

In this survey, Rossodus tenuis (Miller and 1980) and Drepanoistodus sp. were identified. They were found to be mixed with gastropods and brachiopods in the Santa Rosita layer limestone of the lower layer of Santa Victoria Group near Santa Victoria town. It proved to be Tremadocian Deposit (absolute age, about 487 - 489 m.y.) of the lower layer of widespread Ordovician system (see Fig.II-4-2-1-15).

6) Mineralization and alteration

In the Santa Victoria Mountains, there are Pb-Zn-Cu ore deposits such as Santa Rosa, La Cienaga etc. that were explored on a small scale. These deposits were surveyed in the first year of the project. The survey results in the first year are extracted as follows.

Santa Rosa

The abandoned mining site shows an inverted-L shape where a 60-m trench in the N50°E

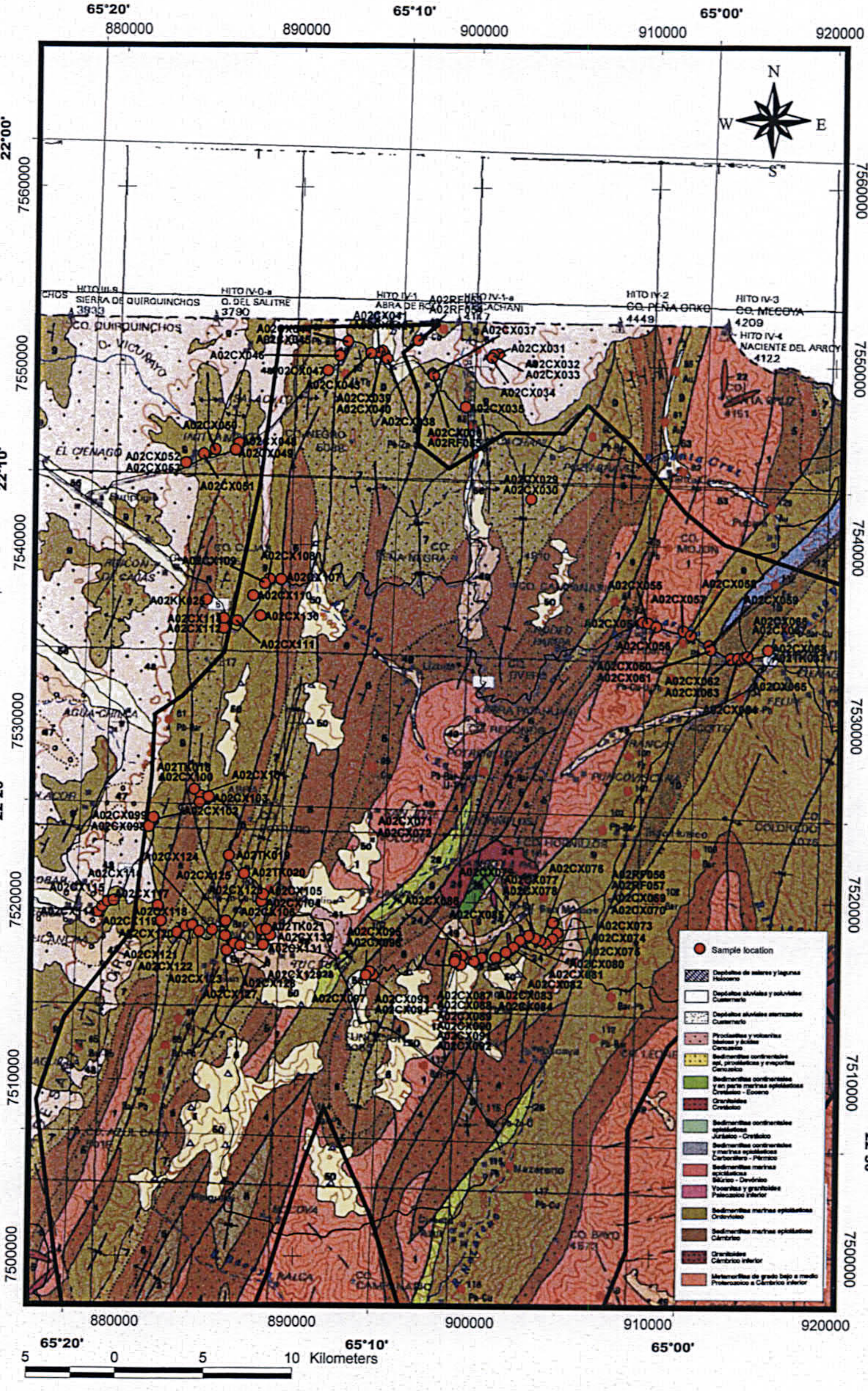


Fig.II-4-2-1-14 Sample location and geological map of Santa Victoria mountains area direction crosses a 50-m trench in the N30°W direction. As weathered erosion is significant, the conditions of the existence of veins in the abandoned mining site are unknown. According to SEGEMAR (1999), results of mineralization are galena, a small amount of zincblende, chalcopyrite, and their oxidation mineral. Gangue minerals are only barite and quartz. Silicification and kaolinization are observed at the edge of wall. The reserve is calculated to be 27,000t (Pb:4%, Zn:3.5%).

La Cienaga

Three entrances of adits were confirmed at two on the south side and one on the north side of the valley. With consideration given to the fact that all adits show similar direction of almost N-S and all veins show similar inclination of westward, it is assumed that these adits were used for mining one plate of the vein. In an adit on the south side along the valley, stringers (about 20 cm wide) of barite accompanied by a small amount of malachite are exposed in a small range.

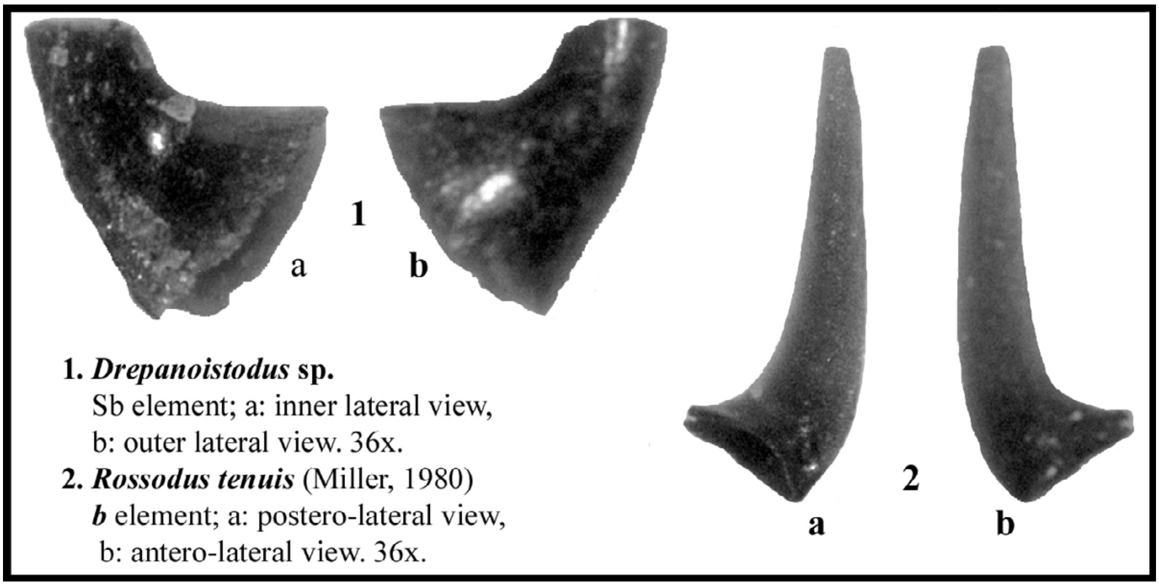
7) Geochemical characteristics

The discriminant functions were built on the basis of the analytical data of drilling core samples of the Aguilar district, and they were applied to 104 samples that were collected and analyzed in this district. The discrimination results are shown in Tables 4-2-1-10 and Fig.II-4-2-1-16. According to the table and figure, the following four samples are discriminated to the deposit horizon (G2) in this district.

A02CX070: Bedded black shale found in alternation of mica-sandstone and black shale at the west foot of anticlinal structure at the western part of La Cienaga deposit (see Fig.II-4-2-1-17). Incidentally the sandstone of mica (A02CX069) is discriminated to the deposit horizon foot wall (G3).

A02CX086: Bedded black shale found along the road about 5km west southeast of La Cienaga deposit (see Fig.II-4-2-1-17 referred to earlier). The black shale (A02CX085) of the eastern outcrop is discriminated to the deposit horizon-hanging wall (G1). The fine-grain sandstone of mica of the western outcrop (A02CX087) is discriminated to the deposit horizon foot wall (G3).

A02CX092: Bedded shale found in alternation of mica-sandstone and bedded black shale, which are exposed about 2km further west of the above-mentioned A02CX086 (see Fig.II-4-2-1-17 referred to earlier). Incidentally the sandstone of mica (A02CX091) is discriminated to the deposit horizon foot wall (G3). The bedded shale (A02CX090) found further eastward of the alternation outcrop is discriminated to the deposit horizon-hanging wall (G1).



1. *Drepanoistodus* sp.
Sb element; a: inner lateral view,
b: outer lateral view. 36x.
2. *Rossodus tenuis* (Miller, 1980)
b element; a: postero-lateral view,
b: antero-lateral view. 36x.

Fig.II-4-2-1-15 Conodont fossil collected in the Santa Victoria mountains area.(see Appendix DocA1)

Table II-4-2-1-10 Horizons predicted by using the discriminant functions, Santa Victoria mountains area

Serial No.	Sample No.	District	Locality	Rock	Discriminant function values			Predicted group
					Y_{1-2}	Y_{1-3}	Y_{2-3}	
1	A02CX044	Santa Victoria	North route	f.s.s.	42.704	-14.784	-57.488	G3
2	A02CX045	Santa Victoria	North route	siltstone	18.839	7.148	-11.691	G1
3	A02CX031	Santa Victoria	North route	hard quartzite	69.627	-9.577	-79.204	G3
4	A02CX039	Santa Victoria	North route	f.s.s.	43.010	-16.846	-59.857	G3
5	A02CX040	Santa Victoria	North route	siltstone	42.979	-3.748	-46.728	G3
6	A02CX032	Santa Victoria	North route	fine s.s.	22.113	-1.347	-23.459	G3
7	A02CX033	Santa Victoria	North route	shale	37.855	7.345	-30.511	G1
8	A02CX041	Santa Victoria	North route	f.s.s.	67.662	-35.604	-103.266	G3
9	A02CX042	Santa Victoria	North route	siltstone	67.340	-31.699	-99.039	G3
10	A02CX043	Santa Victoria	North route	silicified f.s.s.	29.447	-15.140	-44.587	G3
11	A02CX034	Santa Victoria	North route	s.s.	45.281	-2.411	-47.691	G3
12	A02CX046	Santa Victoria	North route	shale	23.607	3.123	-20.484	G1
13	A02CX038	Santa Victoria	North route	siltstone	19.691	6.330	-13.363	G1
14	A02CX047	Santa Victoria	North route	bedded shale	28.990	-4.600	-33.591	G3
15	A02CX037	Santa Victoria	North route	massive siltstone	31.884	0.902	-30.983	G1
16	A02CX036	Santa Victoria	North route	bedded s.s.	9.510	1.144	-8.366	G1
17	A02CX035	Santa Victoria	North route	quartzite	29.818	0.360	-29.458	G1
18	A02CX048	Santa Victoria	North route	phillitic shale	37.006	8.745	-28.262	G1
19	A02CX049	Santa Victoria	North route	bedded shale	33.871	-0.472	-34.344	G3
20	A02CX050	Santa Victoria	North route	mv.-bearing f.s.s.	8.283	10.652	2.368	G1
21	A02CX051	Santa Victoria	North route	mv.-bearing m.s.s.	27.449	-6.283	-33.732	G3
22	A02CX052	Santa Victoria	North route	s.s.	11.015	-4.564	-15.580	G3
23	A02CX053	Santa Victoria	North route	shale	37.320	-6.081	-43.402	G3
24	A02CX029	Santa Victoria	Vizcachani	bedded quartzite	4.136	6.590	2.454	G1
25	A02CX030	Santa Victoria	Vizcachani	lutite with quartzite	29.356	5.642	-23.714	G1
26	A02CX108	Santa Victoria	North route	quartzose s.s.	28.370	-1.520	-29.890	G3
27	A02CX107	Santa Victoria	North route	quartzose s.s.	32.161	5.455	-26.706	G1
28	A02CX109	Santa Victoria	North route	bedded shale	15.517	3.337	-12.181	G1
29	A02CX110	Santa Victoria	North route	silicificated shale & s.s.	22.584	-5.601	-28.186	G3
30	A02CX054	Santa Victoria	Santa Victoria	shale	7.618	-6.147	-13.764	G3
31	A02CX055	Santa Victoria	Santa Victoria	shale	11.272	-18.410	-29.683	G3
32	A02CX056	Santa Victoria	Santa Victoria	shale	21.307	-2.650	-23.958	G3
33	A02CX130	Santa Victoria	South route	shale	15.555	7.622	-7.934	G1
34	A02CX057	Santa Victoria	Santa Victoria	shale	32.181	-8.658	-40.840	G3
35	A02CX113	Santa Victoria	North route	bedded mica. siltstone	21.934	2.667	-19.268	G1
36	A02CX111	Santa Victoria	North route	thin bedded black shale	9.905	13.773	3.867	G1
37	A02CX058	Santa Victoria	Santa Victoria	shale	18.724	8.774	-9.951	G1
38	A02CX112	Santa Victoria	North route	thin bedded shale	21.700	2.482	-19.219	G1
39	A02CX059	Santa Victoria	Santa Victoria	shale	15.807	13.700	-2.108	G1
40	A02CX068	Santa Victoria	Santa Victoria	limestone	29.051	-2.663	-31.714	G1
41	A02CX060	Santa Victoria	Santa Victoria	sand stone	41.595	-13.295	-54.890	G3
42	A02CX061	Santa Victoria	Santa Victoria	shale	32.232	-2.780	-35.013	G3
43	A02CX066	Santa Victoria	Santa Victoria	sand stone	35.742	-15.829	-51.571	G3
44	A02CX067	Santa Victoria	Santa Victoria	shale	20.305	6.540	-13.765	G1
45	A02CX065	Santa Victoria	Santa Victoria	sandy shale	61.102	-37.634	-98.736	G3
46	A02CX064	Santa Victoria	Santa Victoria	sandy shale	35.306	-9.234	-44.541	G3
47	A02CX062	Santa Victoria	Santa Victoria	shale	45.141	-15.523	-60.665	G3
48	A02CX063	Santa Victoria	Santa Victoria	sand stone	34.741	-9.058	-43.800	G3
49	A02CX101	Santa Victoria	North route	shale	11.016	13.122	2.104	G1
50	A02CX103	Santa Victoria	North route	shale	19.627	-0.948	-20.576	G3
51	A02CX102	Santa Victoria	North route	sandy shale	26.312	-0.293	-26.606	G3
52	A02CX100	Santa Victoria	North route	shale	22.488	0.678	-21.811	G1
53	A02CX098	Santa Victoria	North route	shale	18.427	4.553	-13.875	G1
54	A02CX099	Santa Victoria	North route	sand stone	5.034	8.509	3.475	G1
55	A02CX105	Santa Victoria	North route	shale	17.701	6.048	-11.655	G1
56	A02CX104	Santa Victoria	North route	shale	18.216	5.397	-12.820	G1
57	A02CX117	Santa Victoria	South route	shale	18.243	4.075	-14.169	G1
58	A02CX116	Santa Victoria	South route	shale	26.117	-0.484	-26.602	G3
59	A02CX118	Santa Victoria	South route	shale	6.863	4.829	-2.034	G1
60	A02CX115	Santa Victoria	South route	sandstone	28.556	1.591	-26.966	G1
61	A02CX071	Santa Victoria	South route	dacite dyke in shale	12.913	-2.775	-15.688	G3
62	A02CX072	Santa Victoria	South route	black shale with black dots	50.640	-9.283	-59.924	G3
63	A02CX069	Santa Victoria	South route	micaceous s.s.	11.725	-2.412	-14.137	G3
64	A02CX070	Santa Victoria	South route	black shale	-0.067	9.768	9.835	G2

Serial No.	Sample No.	District	Locality	Rock	Discriminant function values			Predicted group
					Y_{1-2}	Y_{1-3}	Y_{2-3}	
65	A02CX114	Santa Victoria	South route	shale	25.396	3.036	-22.361	G1
66	A02CX125	Santa Victoria	South route	shale	20.632	0.083	-20.550	G1
67	A02CX119	Santa Victoria	South route	shale	-6.954	8.075	15.028	G2
68	A02CX073	Santa Victoria	South route	bedded shale	39.404	1.687	-37.717	G1
69	A02CX122	Santa Victoria	South route	shale	16.730	5.767	-10.965	G1
70	A02CX079	Santa Victoria	South route	black shale	19.852	9.676	-10.178	G1
71	A02CX121	Santa Victoria	South route	shale	10.269	4.758	-5.512	G1
72	A02CX074	Santa Victoria	South route	bedded shale	13.592	10.335	-3.258	G1
73	A02CX077	Santa Victoria	South route	bedded shale	5.774	7.643	1.868	G1
74	A02CX078	Santa Victoria	South route	micaceous fine s.s.	15.803	-0.708	-16.511	G3
75	A02CX106	Santa Victoria	North route	shale	23.568	0.984	-22.585	G1
76	A02CX124	Santa Victoria	South route	shale	32.671	-3.765	-36.437	G3
77	A02CX076	Santa Victoria	South route	bedded siltstone	28.442	2.248	-26.195	G1
78	A02CX080	Santa Victoria	South route	bedded shale	12.003	11.390	-0.613	G1
79	A02CX123	Santa Victoria	South route	shale	2.129	13.576	11.446	G1
80	A02CX075	Santa Victoria	South route	bedded fine s.s.	13.873	10.411	-3.463	G1
81	A02CX120	Santa Victoria	South route	shale	14.645	4.736	-9.909	G1
82	A02CX132	Santa Victoria	South route	shale	35.726	2.506	-33.221	G1
83	A02CX126	Santa Victoria	South route	shale	31.624	-4.529	-36.154	G3
84	A02CX081	Santa Victoria	South route	bedded shale	10.391	8.568	-1.824	G1
85	A02CX128	Santa Victoria	South route	shale	17.442	5.583	-11.861	G1
86	A02CX082	Santa Victoria	South route	bedded siltstone	18.253	7.636	-10.618	G1
87	A02CX131	Santa Victoria	South route	shale	2.648	4.761	2.112	G1
88	A02CX129	Santa Victoria	South route	shale	12.524	8.288	-4.237	G1
89	A02CX087	Santa Victoria	South route	massive, mica. fine s.s.	11.927	-2.054	-13.981	G3
90	A02CX083	Santa Victoria	South route	bedded mica. siltstone	16.283	13.477	-2.807	G1
91	A02CX084	Santa Victoria	South route	sandstone lens	13.261	5.495	-7.767	G1
92	A02CX088	Santa Victoria	South route	bedded micaceous siltstone	21.046	-3.801	-24.847	G3
93	A02CX085	Santa Victoria	South route	bedded black shale	15.986	5.037	-10.950	G1
94	A02CX127	Santa Victoria	South route	shale	15.511	4.723	-10.789	G1
95	A02CX089	Santa Victoria	South route	massive micaceous s.s.	33.957	0.844	-33.113	G1
96	A02CX086	Santa Victoria	South route	bedded black shale	-1.042	10.376	11.417	G2
97	A02CX091	Santa Victoria	South route	micaceous s.s.	35.731	-7.078	-42.810	G3
98	A02CX092	Santa Victoria	South route	bedded shale	-2.450	11.579	14.028	G2
99	A02CX090	Santa Victoria	South route	bedded shale	20.680	9.061	-11.620	G1
100	A02CX095	Santa Victoria	South route	thin bedded micaceous s.s.	11.391	-2.796	-14.188	G3
101	A02CX096	Santa Victoria	South route	bedded shale	20.448	10.872	-9.577	G1
102	A02CX093	Santa Victoria	South route	sandstone	12.451	0.436	-12.016	G1
103	A02CX094	Santa Victoria	South route	thin bedded shale	-6.834	16.507	23.341	G1
104	A02CX097	Santa Victoria	South route	black shale with thin siltstone	30.853	2.445	-28.409	G1

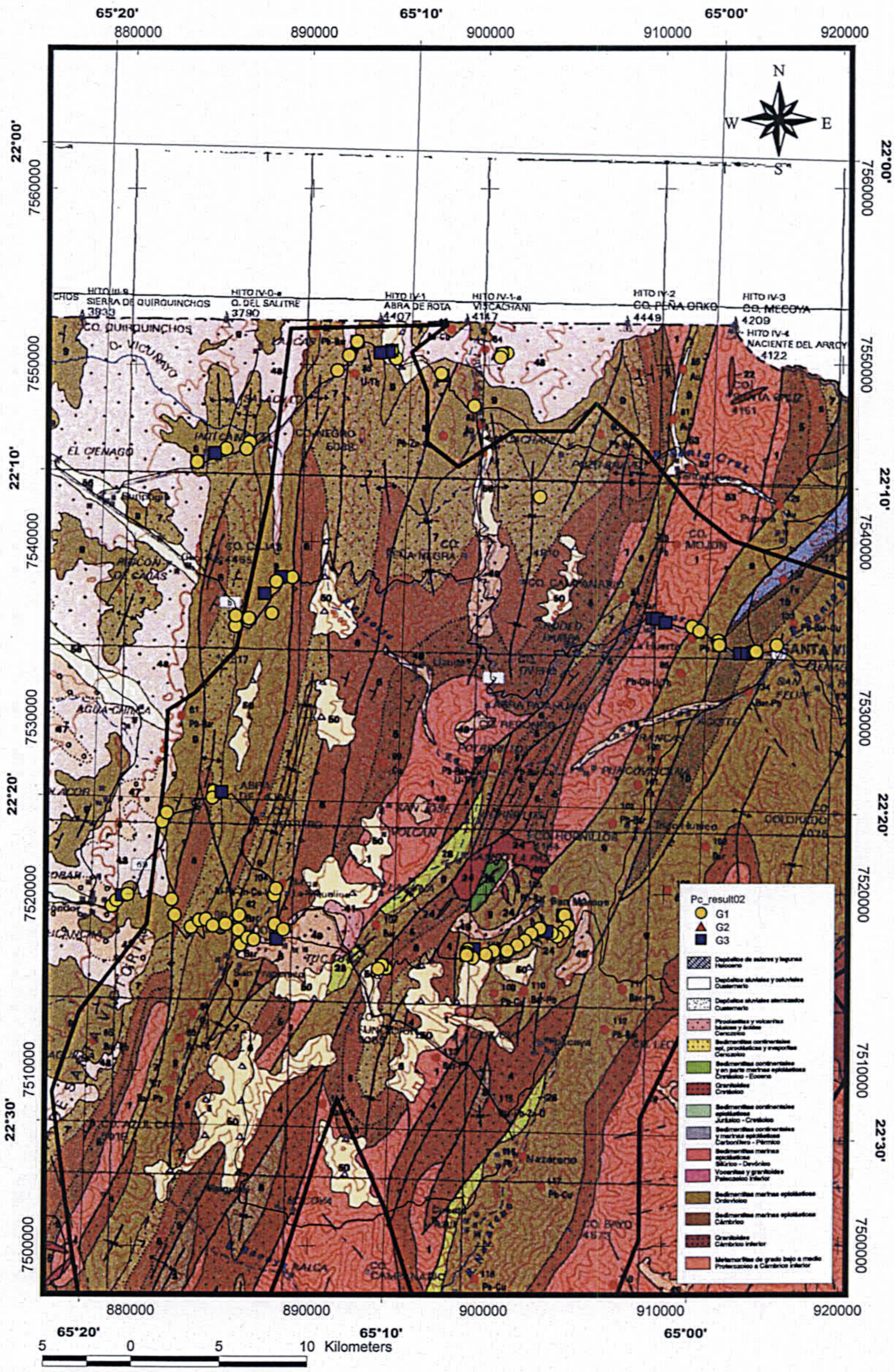


Fig.II-4-2-1-16 Predicted horizons by geochemical discriminant analysis, Santa Victoria mountains area

A02CX070 (La Cienaga)
Micaceous s.s. and black shale

A02CX069 (La Cienaga)
Micaceous s.s.

A02CX086 (WSW of La Cienaga)
Black shale

A02CX087 (WSW of La Cienaga)
Micaceous fine s.s.

A02CX092 (2km West of A02CX086)
Alternation of micaceous s.s. and shale

A02CX091 (2km West of A02CX086)
Micaceous s.s.

A02CX090 (Eest of A02CX092)
Bedded shale

A02CX090 (Eest of A02CX092)
Bedded shale

Fig.II-4-2-1-17 Photos of bedded sandstone and shale outcrops, Santa Victoria mountains area

8) Characteristics of the satellite image

ASTER 147 indicates the distribution of sedimentary rocks with N-S direction of brown to light brown in color. Mineral identification detected many of Ser-Goe zone and Kao-Ser zone in western part of survey area, these alterations are distributed concordance with sedimentary structures.

(4) La Colorada mine area

1) Location and access

La Colorada abandoned mine is located at S. Lat. 23°38' 52.6" and W. Long. 66°17' 26.9", at an altitude of 3,577m (abandoned site for open-cut mining at the east side). It is about 65km north of the San Antonio de los Cobres town. It takes about 1.5 hours by car from the town to the site. The routes from the town are National Road No. 40 and State Road No. 38. The distance is 68km to be covered in about 1.5 hours. The roads allow high-speed driving, though not yet paved.

According to Mendez y Mendez (2001), the Limeca mining site is located at S. Lat. 23°41' 09" and W. Long. 66°20' 35", and at an altitude of 3,711m. It is located 6km from Cobres colony, and is reached by driving south for several kilometers on State Road No. 38, branching westward, then on foot.

2) Contents of Survey

The deposit horizon and hanging/foot walls of La Colorada deposit are considered to volcanic massive sulfide deposit (VMS). In order to clarify petrological, mineralogical and geochemical characteristics of the deposit, drilling cores kept at Mines Bureau of Salt State were examined in detail and some samples were collected (see Fig.II-4-2-1-18). The collected samples were subjected to laboratory examinations as follows.

Observation of thin section of rock:	22
X rays diffraction analysis:	20
Observation of polished section of ore:	15
Ore assay:	15
Geochemical analysis	35

Further, in order to track a north-south extension of La Colorada deposit, La Colorada abandoned its neighborhood and mine were surveyed and samples were collected. Mendez y Mendez (2001) indicated presence of SEDEX-type mineralization in the Limeca mining site, where detailed examination of the outcrop along the river was made and samples were collected (Fig.II-4-2-1-19). The collected samples were subjected to laboratory examinations as follows.

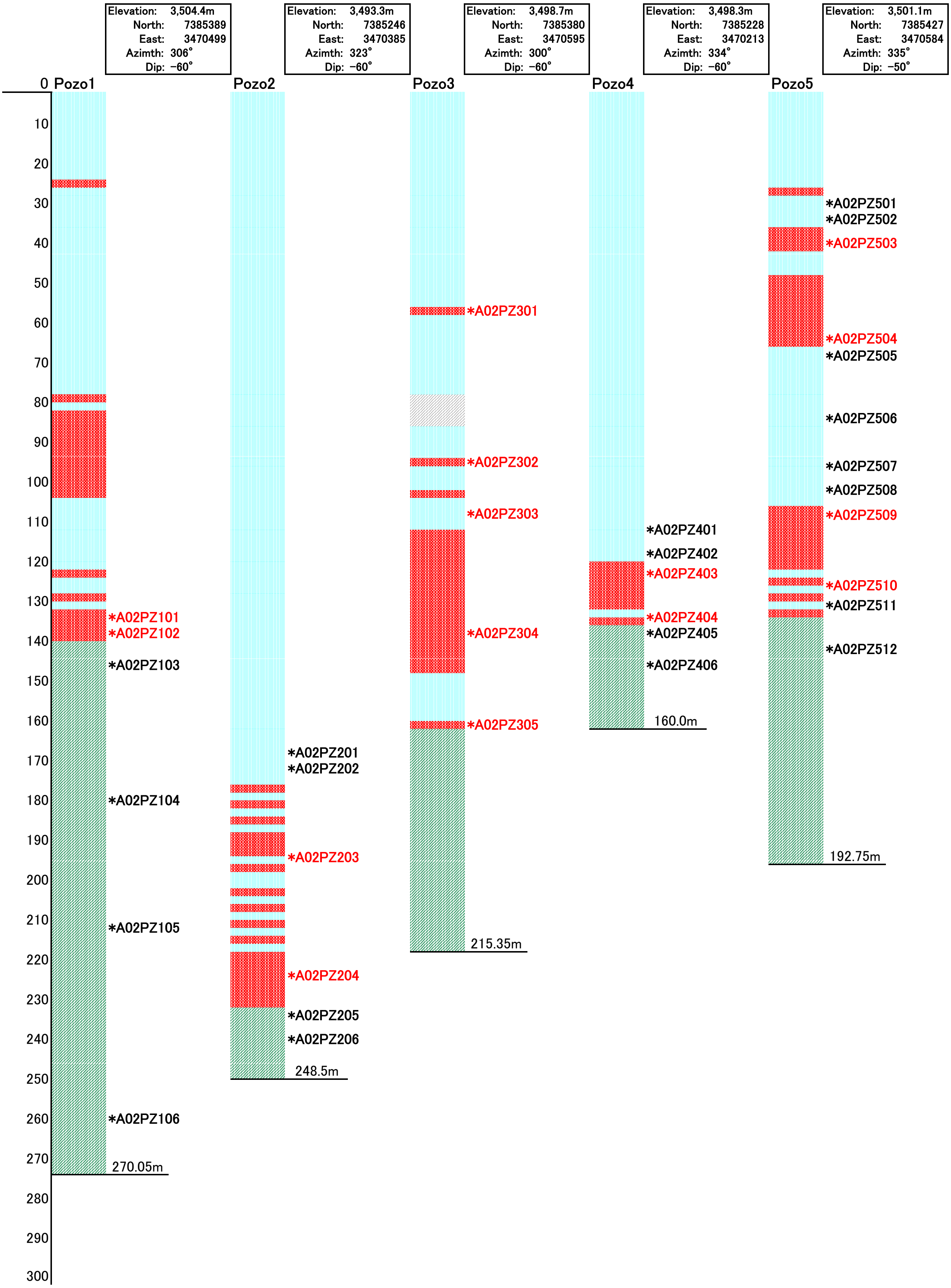


Fig.II-4-2-1-18 Sample locations on the columns of the five holes, La Colorada area

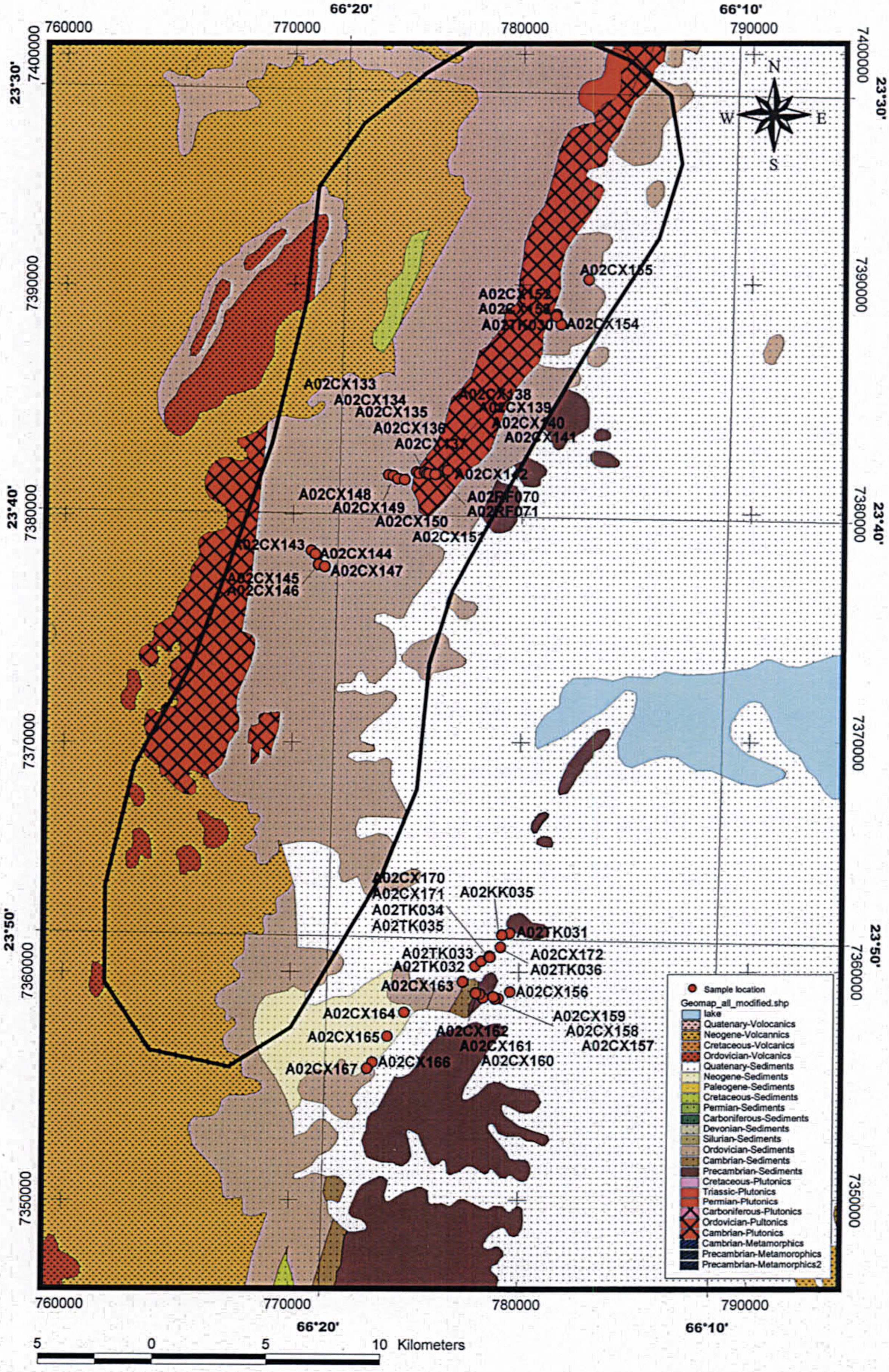


Fig.II-4-2-1-19 Sample location and geological map of La Colorada area

Observation of thin section of rock:	3
X rays diffraction analysis:	4
Observation of polished section of ore:	1
Ore assay:	1
Fossil identification:	3
Geochemical analysis	46

3) Mining concessions

See 4) past survey

4) Past exploration and mining activities

1955-56: In La Colorada deposit district, Compana Minera Aguilar carried out the geological surveys, physical exploration and drilling (nine holes, a total of 800m)

1988-1990: The Army Arsenal (FM) carried out the geological surveys, geochemical exploration and drilling (two holes, a total of 300m).

1992: Pacific Rim Co., Ltd. obtained a mining right.

1993-1999: Pacific Rim Co., Ltd. carried out the satellite image analysis, airborne magnetic surveys, EM, CSAMT, TEM, TFM, and drilling (five holes, a total of 1,086m)

As a result, massive sulfide deposits of three horizons were captured. It was estimated that reserves (demonstrated + inferred) were 12.5 million t. They judged that there was not sufficient economic feasibility, and withdrew.

Mendez y Mendez (2001) introduced the Limeca exploration site and indicated the possibility of a SEDEX deposit.

5) Geology and tectonics

According to the Salta geological map with a scale of 1/500,000, the geological stratigraphy of this district is in the ascending order of depth as follows: the Puncoviscana formation of the Precambrian, the Meson Group of the Cambrian, Las Vicunas layer and Falda Cienaga formation of the Lower and Middle Ordovician, the Payogastilla Group of the Neogene, and talus cone sediment of the Recent. As intrusive rocks, Oire eruption compound rocks of the Middle Ordovician or the Hornillos syenite or Rangel granite of the Lower Cretaceous are distributed (see Fig.II-4-2-1-19 referred to earlier).

La Colorada deposit, which is called volcanic massive sulfide deposit (VMS), is located in the Ordovician system. Generally the Ordovician system of this neighborhood constitutes the fold of various order, and its schistosity is remarkable. Moreover, thermal metamorphism causes hornfels under the effect of the Cobres granodiorite belonging to the Oire eruption compound rocks of the Middle Ordovician which adjoins the west side.

On the other hand, the Limeca exploration site by Mendez y Mendez (2001) is located in the above-mentioned Ordovician system range. The findings are described by Mendez y Mendez (2001) as follows.

" In the Limeca exploration site, Sierra de Cobre mountain area is formed by Santa Victoria Group of the Ordovician period. The Group consists of slate, uartzite, quartz-biotite schist, etc. Except stocks or vein of Neogene quartz porphyry andesite, there are no volcanic rocks in Ordovician sediment known. "

6) Mineralization and alterations

According to the results of exploration made by Pacific Rim Co., Ltd, it seems that three sulfide deposit horizons were captured from detailed geological surveys of the ground surface and drillings. The ground surface consists of gossans. It shows a vein-like shape at a glance. Sulfide minerals appear 3m under the ground surface and downward. Observations of drilling cores taken by Pacific Rim Co., Ltd., show massive sulfides of pyrrhotite slightly accompanied by iron pyrite and chalcopyrite, part of which fills the brecciated parts of the wall rock. According to Mayon et al. (1999), primary sulfides confirmed with samples at drilling are pyrrhotite, zincblende, chalcopyrite, galena, magnetite, loellingite, natural bismuth, cassiterite, tetrahedrite and electrum.

According to the 1st year survey, microscopic examination of two samples of volcanic rocks revealed the following. One sample was metamorphic rocks originating in muddy rock and is composed of biotite, muscovite, and anthophyllite. It is assumed that another sample is holocrystalline equigranular texture, consisting of alteration minerals such as clinopyroxenes, brown amphibole, sericite, smectite, and chlorite.

In the 2nd year survey, 15 samples of drilling cores were collected, and microscopic observations of ore grinding slices were made. According the results, the ore body mainly consists of pyrrhotite, and accompanies chalcopyrite, zincblende, arsenopyrite, galena, and ilmenite. It also accompanies a trace of bismuthinite, natural bismuth, and electrum. The presence of these minerals was confirmed by the results of chemical analysis of these samples, showing that the values were all high for S, Fe, Cu, Zn, As, Pb, Ti, Bi, Au and Ag.

Rocks of the hanging wall (including the gangue rock in an ore horizon) and the footwall of deposit horizon are mostly biotite-muscovite schist. The footwall is partially spotty biotite granodiorite (spotty lay rock or spotty, fine lay rock under microscopic examination). The diffraction X-ray analysis (see Table II-4-2-1-11) of these rock samples revealed commonly quartz, chlorite, and sericite. There is no significant difference between the hanging wall (including the middle stones in an deposit zone) and the footwall of deposit horizon. Using samples of hornfelsized shale, sandstone, and hornfelsized phyllite sandstone at the Rio de Cobres valley in the southern edge of in La Colorada deposit, the diffraction X-ray-analysis revealed commonly quartz, chlorite, and sericitein the same manner as the drilling cores.

On the other hand, Mendez y Mendez (2001) described the mineralization of the Limeca exploration site as follows.

"Mineralization occurred in the sedimentary rock of the Ordovician and the deposit is composed of pyrite, pyrrhotite, zincblende, leaf-like graphite, chalcopyrite, zircon, apatite, titanite, rutile, and tourmaline. Moreover, the substrate is recrystalized, consisting of the quartz, sericite, calcite, epidote, and barite. "

7) Geochemical characteristics

Drilling cores of five holes that captured VMS deposit (see Fig.II-4-2-1-18 referred to earlier) were used in order to examine geochemical characteristics of deposit horizon and the hanging/foot walls. Principal component analysis and discriminant analysis were conducted in the same manner for samples from Aguilar Mountain area.

Analytical data obtained from 35 samples of drilling cores of five holes were used. The geological description etc. of 35 samples is shown in Table II-4-2-1-12, and the analysis results are shown in Table II-4-2-1-13. Analyzed elements are Au, Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sr, Ti, V, W, Zn and Hg, 29 in total. The pre-processing of the data before the statistical analysis will be described in detail in 4-3-1 (1) " General geochemical analysis" and is omitted here.

Discriminant analysis (DA)

Results of grouping obtained by the discriminant analysis are shown in Table II-4-2-1-14, together with the pre-determined grouping base on drilling hole number, sample collection depth, and layer level relationship with horizon. The following variables and coefficients were carefully selected as useful for discrimination and are shown in the table. They are four variables (logFe, logNi, logCu, and logCo), and the coefficient of each variable for three discriminant functions ($Y_{1\text{-}2}$, $Y_{1\text{-}3}$, and $Y_{2\text{-}3}$). These functions discriminate between deposit horizon (G2) and hanging wall (G1), between hanging wall (G1) and foot wall (G3), as well as between deposit horizon (G2) and foot wall (G3). Therefore, three discriminant functions are expressed as follows.

$$Y_{1\text{-}2}=-53.33277X\log Fe+25.16985X\log Ni+3.29869X\log Cu-10.03044X\log Co-64.16628$$

$$Y_{1\text{-}3}=15.89377X\log Fe-4.14167X\log Ni+4.97457X\log Cu-4.80755X\log Co-12.50252$$

Table 4-2-1-11 X-ray diffractive analysis result of the drill core samples, La Colorada area

Sample No.	Hole No.	Depth	Geology*1	Rock name named by microscopic observation	Relation to ore zone	Qz	pl	chl	se	cal	ank	par	Hb	Po	Cpy	daw
A02PZ101	Pozo1	134.50m - 134.60m	Massive sulphide body (po>>>asp>sp>cpy>ga)		**Ore zone**											
A02PZ102	Pozo1	139.00m - 139.10m	Massive sulphide body (po>>>sp>cpy>asp)		**Ore zone**											
A02PZ103	Pozo1	145.00m - 145.15m	Phlogopite-chlorite-muscovite schist	Altered tuff	Foot wall	◎		△	·	○	○					
A02PZ104	Pozo1	180.00m - 180.15m	Biotite-muscovite schist	Biotite-muscovite schist?	Foot wall	?		◎	◎							
A02PZ105	Pozo1	221.00m - 221.10m	Biotite-muscovite schist	Biotite-muscovite-quartz-plagioclase schist?	Foot wall	◎	?	○	◎							
A02PZ106	Pozo1	260.00m - 260.15m	Garnet-biotite-muscovite-chlorite schist	Garnet-biotite-muscovite hornfelsic quartzite	Foot wall	○		○	·							
A02PZ201	Pozo2	167.85m - 168.00m	Biotite-feldspar-muscovite schist	Mineralized biotite-muscovite schist	Hanging wall*2	◎		○	◎				?	?		
A02PZ202	Pozo2	171.15m - 171.30m	Biotite-feldspar-muscovite schist	Biotite-muscovite siliceous hornfels	Hanging wall*2	◎		△	○							
A02PZ203	Pozo2	192.50m - 192.65m	Zone of semi-massive sulfide (po>>>asp>sp>cpy) w/in metarhyolite		**Ore zone**											
A02PZ204	Pozo2	222.65m - 222.80m	Massive sulfide body (po>>sp>asp>cpy)		**Ore zone**											
A02PZ205	Pozo2	232.30m - 232.45m	Chlorite-biotite-muscovite schist	Metamorphosed basic tuff?	Foot wall	◎		○	◎							
A02PZ206	Pozo2	237.80m - 237.95m	Chlorite-biotite-muscovite schist	Biotite-muscovite-chlorite schist	Foot wall	◎		·	◎							
A02PZ301	Pozo3	56.00m - 56.15m	Thin massive sulfide zone (po>>>asp>sp>cpy) in garnet-biotite-muscovite schist		**Ore zone**											
A02PZ302	Pozo3	93.00m - 93.15m	Zone of semi-massive sulfide with massive agregates of poand trace amount of cpy and sp in garnet-biotite-chlorite schist		**Ore zone**											
A02PZ303	Pozo3	106.00m - 106.10m	Garnet-biotite-chlorite schist with qtz veinlets		**Ore zone**											
A02PZ304	Pozo3	137.00m - 137.20m	Massive sulfide horizon (po>>>>sp>cpy=asp)		**Ore zone**											
A02PZ305	Pozo3	158.00m - 158.15m	Massive sulfide zone (po>>>>sp>asp) in andalusite-muscovite schist		**Ore zone**											
A02PZ401	Pozo4	109.55m - 109.70m	Biotite-muscovite schist	Metamorphosed diorite? -siliceous hornfels contact	Hanging wall*2	◎		○	○							
A02PZ402	Pozo4	115.65m - 115.80m	Chlorite-phlogopite-muscovite schist	Mineralized metamorphosed basic tuff and mudstone	Hanging wall*2	◎		·	◎							
A02PZ403	Pozo4	119.90m - 120.05m	Massive sulfide horizon (po>>>sp>asp>cpy)		**Ore zone**											
A02PZ404	Pozo4	133.20m - 133.35m	Massive sulfide horizon (po>>>sp>asp>cpy)		**Ore zone**											
A02PZ405	Pozo4	136.85m - 137.00m	Porphyritic biotite granodiorite with calcite veinlets	Altered gabbro	Foot wall		?	○	△	△		○				
A02PZ406	Pozo4	144.75m - 144.90m	Porphyritic biotite granodiorite with calcite veinlets	Meta micro-gabbro	Foot wall	◎		○	○							
A02PZ501	Pozo5	30.00m - 30.15m	Sulfide veined meta-rhyolite (qtz-sericite schist)	Mineralized meta basite? (basic tuff origin?)	Hanging wall*2	◎		◎		·						
A02PZ502	Pozo5	33.00m - 33.10m	Chlorite-altered, garnet-muscovite schist		Hanging wall*2	○		◎	·	·					?	
A02PZ503	Pozo5	36.50m - 36.65m	Massive sulphide horizon consisting of massive, very fine-grained po replacements, plus cpy fracture fillings, ga-aspy disseminations and sp fracture-fillings/disseminations		**Ore zone**											
A02PZ504	Pozo5	65.00m - 65.20m	Massive sulphide horizon (po>>>ga>sp>asp>cpy)		**Ore zone**											
A02PZ505	Pozo5	66.00m - 66.15m	Phlogopite-muscovite-chlorite schist		Hanging wall*2	◎		◎	○							
A02PZ506	Pozo5	83.00m - 83.20m	Biotite-muscovite schist		Hanging wall*2	◎		·	◎							?
A02PZ507	Pozo5	94.00m - 94.15m	Biotite-muscovite schist, fine-grained, well developed schistosity		Hanging wall*2	◎		○	◎							
A02PZ508	Pozo5	101.00m - 101.15m	Biotite-muscovite schist		Hanging wall*2	◎		○	○	·						
A02PZ509	Pozo5	107.00m - 107.10m	Massive sulfide horizon (po>>>sp>asp)		**Ore zone**											
A02PZ510	Pozo5	125.00m - 125.15m	Massive sulfide horizon (po>>>sp>asp)		**Ore zone**											
A02PZ511	Pozo5	129.00m - 129.10m	Biotite-muscovite schist		Hanging wall*2	◎		○	◎							
A02PZ512	Pozo5	141.00m - 141.15m	Biotite-muscovite schist with abundant metamorphic qtz vns		Foot wall	◎		○	○							

*1:The geology is based on the data of International Pacific Rim

*2:Hanging wall including rocks within ore zones

$Y_{2\text{-}3}$=73.22653XlogFe-29.31151XlogNi+1.67588XlogCu+5.22289XlogCo-59.80429

The theoretical error rate is highest among the hanging wall (G1) and the foot wall (G3), while the rate between the deposit horizon (G2) and the footwall (G3) is lower than the rate between the deposit horizon (G2) and the hanging wall (G1). The results are similar to that of the discriminant analysis of 72 drilling core samples collected from Aguilar Mountains zone. In other words, discrimination between the deposit horizon and the foot wall is relatively easy, while discrimination between the hanging wall and the foot wall is difficult.

Although the discriminant rate is high (94.29%), errors occur sometimes as shown in Table II-4-2-1-14 (above). One sample (A02PZ205) of chlorite - biotite - muscovite schist of deposit horizon foot wall (G3) is misjudged as the deposit horizon hanging wall (G1). Another sample (A02PZ507) of biotite - muscovite schist of the deposit horizon hanging wall (G1) is misjudged as the deposit horizon hanging wall (G3).

Principal component analysis (PCA)

The principal component loading matrix obtained from principal component analysis is shown in Table II-4-2-1-15. In this table, the load of absolute value larger than 0.5 is bold-faced. The positive and negative values are shown in red and blue, respectively. The cumulative contribution rate of four principal components extracted is as high as about 84%. It seems, therefore, the 35 samples that captured La Colorada deposit can be characterized by these four principal components.

Table II-4-2-1-16 shows the principal component score of each sample calculated using the principal component load, as well as the layer level relationship with the deposit horizon. Table II-4-2-1-17 shows the characteristics of principal components that are estimated as to how the rock qualities etc. are related to the principal component loading matrix and score of each principal component.

The discriminant functions based on analytical data of drilling cores taken from Aguilar area were applied to 46 samples collected in this district and analyzed. The discrimination results are shown in Table II-4-2-1-18 and Fig.II-4-2-1-20.

8) Characteristics of the satellite image

Because of widely covered clouds, ASTER image quality is not enough for interpretation, but BGR 147 identified N-S direction sedimentary rocks. Mineral identification image detected Kao-Ser zone and Jar-Goe zone in the middle to southern part of survey area.

Table II-4-2-1-12 Geology of the drill core samples, La Colorada

Ser. No.	Sample No.	Depth	Relative situation	Geology
1	A02PZ101	134.50m - 134.60m	ore zone	Massive sulphide body (po>>>asp>sp>cpy>ga)
2	A02PZ102	139.00m - 139.10m	ore zone	Massive sulphide body (po>>>sp>cpy>asp)
3	A02PZ103	145.00m - 145.15m	foot wall	Phlogopite-chlorite-muscovite schist
4	A02PZ104	180.00m - 180.15m	foot wall	Biotite-muscovite schist
5	A02PZ105	221.00m - 221.10m	foot wall	Biotite-muscovite schist
6	A02PZ106	260.00m - 260.15m	foot wall	Garnet-biotite-muscovite-chlorite schist
7	A02PZ201	167.85m - 168.00m	hanging wall	Biotite-feldspar-muscovite schist
8	A02PZ202	171.15m - 171.30m	hanging wall	Biotite-feldspar-muscovite schist
9	A02PZ203	192.50m - 192.65m	ore zone	Zone of semi-massive sulfide (po>>>asp>sp>cpy) w/in metarhyolite
10	A02PZ204	222.65m - 222.80m	ore zone	Massive sulfide body (po>>sp>asp>cpy)
11	A02PZ205	232.30m - 232.45m	foot wall	Chlorite-biotite-muscovite schist
12	A02PZ206	237.80m - 237.95m	foot wall	Chlorite-biotite-muscovite schist
13	A02PZ301	56.00m - 56.15m	ore zone	Thin massive sulfide zone (po>>>asp>sp>cpy) in garnet-biotite-muscovite schist
14	A02PZ302	93.00m - 93.15m	ore zone	Zone of semi-massive sulfide with massive agregates of poand trace amount of cpy and sp in garnet-biotite-chlorite schist
15	A02PZ303	106.00m - 106.10m	ore zone	Garnet-biotite-chlorite schist with qtz veinlets
16	A02PZ304	137.00m - 137.20m	ore zone	Massive sulfide horizon (po>>>>sp>cpy=asp)
17	A02PZ305	158.00m - 158.15m	ore zone	Massive sulfide zone (po>>>>sp>asp) in andalusite-muscovite schist
18	A02PZ401	109.55m - 109.70m	hanging wall	Biotite-muscovite schist
19	A02PZ402	115.65m - 115.80m	hanging wall	Chlorite-phlogopite-muscovite schist
20	A02PZ403	119.90m - 120.05m	ore	Massive sulfide horizon (po>>>sp>asp>cpy)
21	A02PZ404	133.20m - 133.35m	ore	Massive sulfide horizon (po>>>sp>asp>cpy)
22	A02PZ405	136.85m - 137.00m	foot wall	Porphyritic biotite granodiorite with calcite veinlets
23	A02PZ406	144.75m - 144.90m	foot wall	Porphyritic biotite granodiorite with calcite veinlets
24	A02PZ501	30.00m - 30.15m	hanging wall	Sulfide veined meta-rhyolite (qtz-sericite schist)
25	A02PZ502	33.00m - 33.10m	hanging wall	Chlorite-altered, garnet-muscovite schist
26	A02PZ503	36.50m - 36.65m	ore zone	Massive sulphide horizon consisting of massive, very fine-grained po replacements, plus cpy fracture fillings, ga-aspy disseminations and sp fracture-fillings/disseminations
27	A02PZ504	65.00m - 65.20m	ore zone	Massive sulphide horizon (po>>>ga>sp>asp>cpy)
28	A02PZ505	66.00m - 66.15m	ore zone	Phlogopite-muscovite-chlorite schist
29	A02PZ506	83.00m - 83.20m	ore zone	Biotite-muscovite schist
30	A02PZ507	94.00m - 94.15m	ore zone	Biotite-muscovite schist, fine-grained, well developed schistosity
31	A02PZ508	101.00m - 101.15m	ore zone	Biotite-muscovite schist
32	A02PZ509	107.00m - 107.10m	ore zone	Massive sulfide horizon (po>>>sp>asp)
33	A02PZ510	125.00m - 125.15m	ore zone	Massive sulfide horizon (po>>>sp>asp)
34	A02PZ511	129.00m - 129.10m	ore zone	Biotite-muscovite schist
35	A02PZ512	141.00m - 141.15m	foot wall	Biotite-muscovite schist with abundant metamorphic ptz vns

Table 4-2-1-13 Analytical results of the drill core samples, La Colorada area

Ser.No.	Sample No.	Depth	Au	Hg	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sr	Ti	V	W	Zn
1	A02PZ101	134.50m - 134.60m	0.021	0.25	37.4	1.31	3953	5	0.25	196	0.05	162.5	30	13	4749	50	0.11	1.23	450	2	0.01	10	5	23800	20	28	0.5	0.07	18	210	78900
2	A02PZ102	139.00m - 139.10m	0.02	0.16	13.4	0.57	4283	5	0.25	146	0.1	75.1	26	6	3956	50	0.03	0.43	263	0.5	0.01	15	5	12600	20	21	0.5	0.03	11	310	38100
3	A02PZ103	145.00m - 145.15m	0.008	0.005	0.25	1.14	25	70	0.25	1	2.63	0.5	10	134	22	2.96	0.23	0.46	2330	0.5	0.02	10	60	84	0.8	2.5	49	0.02	13	5	226
4	A02PZ104	180.00m - 180.15m	0.024	0.005	0.25	8.93	11	660	3.9	1	0.26	0.25	23	93	83	6.53	2.66	1.65	597	0.5	0.43	48	500	35	0.06	2.5	54	0.35	96	10	101
5	A02PZ105	221.00m - 221.10m	0.003	0.005	0.25	9.8	6	760	4	1	0.41	0.25	18	64	57	5.03	3.19	1.57	609	3	1.02	53	660	21	0.21	2.5	73	0.35	109	10	94
6	A02PZ106	260.00m - 260.15m	0.009	0.005	0.25	2.59	8	180	0.9	1	0.12	0.25	9	74	23	3.48	0.61	0.63	300	3	0.05	13	430	10	0.04	2.5	6	0.13	22	10	45
7	A02PZ201	167.85m - 168.00m	0.033	0.01	0.25	7.12	26	360	2	6	0.32	0.25	21	80	722	10.64	2.26	2.1	1160	0.5	0.2	23	420	89	1.92	2.5	20	0.39	75	10	419
8	A02PZ202	171.15m - 171.30m	0.874	0.005	0.25	7.26	238	380	2.4	1	0.16	0.25	19	64	773	6.36	2.68	1	498	0.5	0.21	27	610	141	1.71	2.5	14	0.42	72	10	814
9	A02PZ203	192.50m - 192.65m	0.067	0.005	2	0.23	862	5	0.25	66	0.1	10.8	75	11	897	50	0.03	0.76	624	12	0.005	15	30	3720	20	2.5	0.5	0.01	13	60	58
10	A02PZ204	222.65m - 222.80m	0.107	0.27	56.9	0.19	20000	5	0.25	154	1.08	73.9	135	9	36100	50	0.01	3.14	392	0.5	0.005	9	30	59700	20	135	0.5	0.01	8	10	67600
11	A02PZ205	232.30m - 232.45m	0.034	0.005	0.25	9.95	137	460	3.5	1	0.27	0.25	25	87	315	7.44	2.68	1.44	892	0.5	0.57	32	560	303	1.45	2.5	79	0.47	112	20	406
12	A02PZ206	237.80m - 237.95m	0.003	0.01	0.25	6.02	43	610	2.1	1	0.29	0.25	16	89	42	5.42	1.93	1.05	518	0.5	0.52	30	470	139	0.09	2.5	67	0.37	69	10	199
13	A02PZ301	56.00m - 56.15m	0.128	0.02	3.5	2.02	6510	90	0.25	35	0.06	3.8	185	40	9910	50	0.58	0.81	316	6	0.02	26	160	221	20	2.5	0.5	0.13	23	30	2818
14	A02PZ302	93.00m - 93.15m	0.612	0.005	0.25	1.94	682	10	0.25	115	0.07	7.5	265	31	2450	50	0.06	0.92	464	3	0.005	30	180	32	20	2.5	0.5	0.1	22	40	157
15	A02PZ303	106.00m - 106.10m	0.021	0.01	0.25	5.99	24	190	1.7	1	0.16	0.25	24	70	2510	17.84	1.44	1.31	668	0.5	0.07	7	360	152	5.26	2.5	0.5	0.28	78	30	238
16	A02PZ304	137.00m - 137.20m	0.061	0.01	0.25	0.24	73	5	0.25	29	0.02	12.2	56	12	10700	50	0.01	0.24	271	20	0.005	13	5	59	20	2.5	0.5	0.01	20	50	1156
17	A02PZ305	158.00m - 158.15m	0.058	0.14	18.4	0.42	6600	30	0.25	110	0.1	59.1	111	13	5350	50	0.02	0.53	231	3	0.01	14	30	13600	20	36	0.5	0.02	9	5	37800
18	A02PZ401	109.55m - 109.70m	0.009	0.005	0.7	7.97	242	620	4	1	0.17	0.25	14	70	827	7	2.68	1.57	868	0.5	0.13	34	590	176	0.27	2.5	8	0.46	101	10	551
19	A02PZ402	115.65m - 115.80m	0.003	0.005	3.4	6.8	2740	110	2	18	0.12	2.2	15	65	945	13.19	2.45	1.08	668	0.5	0.15	19	450	1295	4.21	2.5	0.5	0.41	95	20	2508
20	A02PZ403	119.90m - 120.05m	1.01	0.01	2.9	1.3	9840	5	0.25	155	0.13	9.1	135	17	19000	50	0.04	0.64	527	2	0.005	26	60	179	20	2.5	0.5	0.06	15	60	327
21	A02PZ404	133.20m - 133.35m	0.034	0.005	2	0.39	333	5	0.25	37	0.03	8.7	27	11	2740	50	0.02	0.26	171	6	0.005	18	20	73	20	2.5	0.5	0.02	9	40	470
22	A02PZ405	136.85m - 137.00m	0.003	0.005	0.25	6.13	11	470	1.7	1	7.1	0.6	48	262	151	8.21	0.93	6.33	1340	2	1.91	193	2000	29	0.34	8	414	1.35	218	20	99
23	A02PZ406	144.75m - 144.90m	0.003	0.005	0.25	7.23	2.5	490	2.1	6	6.5	0.25	41	199	65	8.14	1.26	5.45	1565	0.5	2.37	153	2390	25	0.15	5	552	1.46	227	20	128
24	A02PZ501	30.00m - 30.15m	0.003	0.01	0.9	6.76	107	140	1.5	1	0.11	0.25	53	79	5170	12.08	0.56	2.33	1285	0.5	0.04	28	80	27	1.64	2.5	0.5	0.26	65	20	666
25	A02PZ502	33.00m - 33.10m	0.003	0.01	0.25	8.14	48	80	1.5	1	0.22	1.7	18	70	381	15.74	0.48	4.15	2030	0.5	0.05	30	410	115	0.49	2.5	5	0.3	92	20	1434
26	A02PZ503	36.50m - 36.65m	0.134	0.01	0.6	1.53	684	10	0.25	34	0.07	12.3	96	28	3620	50	0.05	1.02	404	3	0.005	12	100	1030	20	2.5	0.5	0.06	23	30	4837
27	A02PZ504	66.00m - 66.20m	0.094	0.01	4.9	0.66	2630	20	0.25	74	0.05	31.6	134	16	2480	50	0.1	0.56	245	5	0.005	19	50	3710	20	2.5	0.5	0.03	13	20	9863
28	A02PZ505	67.00m - 67.15m	0.02	0.01	0.25	6.29	47	290	1.9	1	0.14	0.25	14	78	4870	9.35	2.1	1.17	1805	0.5	0.04	14	330	106	1.42	2.5	0.5	0.29	74	30	406
29	A02PZ506	83.00m - 83.20m	0.012	0.005	0.25	8.52	5	650	1.4	1	0.19	0.25	19	90	304	10.24	3.57	1.88	986	0.5	0.09	47	620	41	0.6	2.5	2	0.52	120	20	116
30	A02PZ507	94.00m - 94.15m	0.01	0.005	0.25	9.81	58	870	3.5	1	0.22	0.25	22	75	92	7.5	3.7	1.54	991	0.5	0.17	39	530	61	0.39	6	33	0.47	113	20	92
31	A02PZ508	101.00m - 101.15m	0.003	0.005	0.25	4.95	158	290	1.9	1	0.26	0.25	10	103	178	6.8	1.19	1.02	776	0.5	0.06	19	320	65	1.07	2.5	14	0.23	53	10	268
32	A02PZ509	107.00m - 107.10m	0.337	0.005	0.25	0.44	924	5	0.25	43	0.03	12.3	60	12	1615	50	0.02	0.48	137	6	0.005	16	10	229	20	2.5	0.5	0.02	12	50	803
33	A02PZ510	125.00m - 125.15m	0.329	0.005	0.25	0.4	777	5	0.25	62	0.03	10.4	53	15	3620	50	0.01	0.45	167	6	0.005	17	20	1065	20	2.5	0.5	0.02	12	50	336
34	A02PZ511	129.00m - 129.10m	0.003	0.005	0.25	10.59	94	860	4.1	1	0.34	0.25	20	65	908	6.42	3.59	1.66	711	0.5	0.75	48	630	113	0.57	2.5	92	0.44	117	20	215
35	A02PZ512	141.00m - 141.15m	0.003	0.005	0.25	5.97	2.5	340	2.4	1	0.54	0.25	9	84	27	3.88	1.6	1.12	473	0.5	0.9	22	850	17	0.19	2.5	76	0.33	69	10	47

Table II-4-2-1-14 Result of DA for the drill core 35 samples, La Colorada area

G1 : hanging wall including gangue rock
G2 : massive sulfide ore
G3 : foot wall

Sample No.	Hole No.	Depth	Actual group	Discriminant function values			Predicted group
				G1-G2	G1-G3	G2-G3	
A02PZ101	Pozo1	134.50m - 134.60m	G2	-27.623	21.547	49.170	G2
A02PZ102	Pozo1	139.00m - 139.10m	G2	-22.829	20.722	43.551	G2
A02PZ103	Pozo1	145.00m - 145.15m	G3	39.849	-7.283	-47.132	G3
A02PZ104	Pozo1	180.00m - 180.15m	G3	35.569	-3.514	-39.082	G3
A02PZ105	Pozo1	221.00m - 221.10m	G3	43.680	-5.793	-49.473	G3
A02PZ106	Pozo1	260.00m - 260.15m	G3	39.210	-6.322	-45.532	G3
A02PZ201	Pozo2	167.85m - 168.00m	G1	18.866	6.043	-12.823	G1
A02PZ202	Pozo2	171.15m - 171.30m	G1	33.965	2.559	-31.406	G1
A02PZ203	Pozo2	192.50m - 192.65m	G2	-29.570	15.304	44.874	G2
A02PZ204	Pozo2	222.65m - 222.80m	G2	-32.421	22.978	55.399	G2
A02PZ205	Pozo2	232.30m - 232.45m	G3	29.436	0.824	-28.612	G1*
A02PZ206	Pozo2	237.80m - 237.95m	G3	35.675	-4.668	-40.343	G3
A02PZ301	Pozo3	56.00m - 56.15m	G2	-24.049	17.619	41.669	G2
A02PZ302	Pozo3	93.00m - 93.15m	G2	-26.052	13.593	39.645	G2
A02PZ303	Pozo3	106.00m - 106.10m	G2	-5.803	14.163	19.966	G2
A02PZ304	Pozo3	137.00m - 137.20m	G2	-26.311	21.527	47.837	G2
A02PZ305	Pozo3	158.00m - 158.15m	G2	-29.474	18.468	47.941	G2
A02PZ401	Pozo4	109.55m - 109.70m	G1	35.525	3.590	-31.935	G1
A02PZ402	Pozo4	115.65m - 115.80m	G1	13.279	9.154	-4.126	G1
A02PZ403	Pozo4	119.90m - 120.05m	G2	-21.744	19.683	41.428	G2
A02PZ404	Pozo4	133.20m - 133.35m	G2	-21.527	19.522	41.049	G2
A02PZ405	Pozo4	136.85m - 137.00m	G3	42.731	-4.679	-47.411	G3
A02PZ406	Pozo4	144.75m - 144.90m	G3	39.885	-5.813	-45.697	G3
A02PZ501	Pozo5	30.00m - 30.15m	G1	16.643	8.885	-7.758	G1
A02PZ502	Pozo5	33.00m - 33.10m	G1	11.776	7.209	-4.567	G1
A02PZ503	Pozo5	36.50m - 36.65m	G2	-31.086	18.204	49.290	G2
A02PZ504	Pozo5	66.00m - 66.20m	G2	-28.057	15.864	43.922	G2
A02PZ505	Pozo5	67.00m - 67.15m	G1	21.158	11.014	-10.144	G1
A02PZ506	Pozo5	83.00m - 83.20m	G1	26.829	2.833	-23.995	G1
A02PZ507	Pozo5	94.00m - 94.15m	G1	30.192	-1.869	-32.061	G3*
A02PZ508	Pozo5	101.00m - 101.15m	G1	29.151	1.820	-27.330	G1
A02PZ509	Pozo5	107.00m - 107.10m	G2	-27.050	16.924	43.974	G2
A02PZ510	Pozo5	125.00m - 125.15m	G2	-24.691	18.818	43.509	G2
A02PZ511	Pozo5	129.00m - 129.10m	G1	40.028	1.830	-38.198	G1
A02PZ512	Pozo5	141.00m - 141.15m	G3	42.481	-6.171	-48.652	G3

***: discrimination error** **Correct classification rate : 94.29%**

Discriminant function

Varibles	Discriminant function coefficients		
	G1-G2	G1-G3	G2-G3
Mahalanobis' generalized distance	7.10200	3.10624	9.33256
Theoretical error rate	0.00019	0.06020	0.00000
logFe	-57.33277	15.89377	73.22653
logNi	25.16985	-4.14167	-29.31151
logCu	3.29869	4.97457	1.67588
logCo	-10.03044	-4.80755	5.22289
Constant	47.30177	-12.50252	-59.80429

Table II-4-2-1-15 PC loading matrix after varimax rotation for the drill core 35 samples, La Colorada area

	PC1	PC2	PC3	PC4	Contribution ratio
logAu	0.353	**-0.643**	-0.002	0.294	0.625
logHg	0.126	-0.103	**-0.919**	0.148	0.894
logAg	0.164	-0.270	**-0.847**	0.207	0.860
Al	-0.341	0.258	0.281	**-0.836**	0.961
logAs	0.366	**-0.570**	**-0.579**	0.198	0.833
logBa	-0.352	0.476	0.314	**-0.693**	0.929
logBe	-0.310	0.383	0.292	**-0.784**	0.943
logBi	0.192	**-0.613**	-0.449	**0.546**	0.913
logCa	**-0.751**	**0.535**	-0.096	-0.102	0.871
logCd	0.236	-0.492	**-0.576**	**0.565**	0.949
logCo	-0.098	**-0.754**	-0.205	0.396	0.777
Cr	**-0.773**	0.454	0.247	-0.158	0.890
logCu	0.288	**-0.749**	-0.435	0.091	0.842
logFe	0.231	**-0.766**	-0.348	0.447	0.962
K	-0.141	0.221	0.265	**-0.852**	0.864
Mg	**-0.899**	0.095	-0.115	-0.138	0.850
logMn	-0.433	0.401	0.077	-0.444	0.552
logMo	0.177	-0.482	0.221	**0.685**	0.781
Na	**-0.901**	0.184	0.158	-0.039	0.872
logNi	**-0.824**	-0.051	0.322	-0.268	0.857
logP	**-0.511**	0.329	0.389	**-0.568**	0.844
logPb	0.249	-0.292	**-0.817**	0.160	0.840
logS	0.361	**-0.690**	-0.353	0.393	0.886
logSb	-0.167	0.007	**-0.897**	0.158	0.858
logSr	**-0.610**	**0.559**	0.280	-0.249	0.824
Ti	**-0.892**	0.136	0.172	-0.314	0.943
V	**-0.809**	0.161	0.217	-0.484	0.962
logW	0.106	**-0.590**	-0.157	0.228	0.436
logZn	0.223	-0.289	**-0.849**	0.106	0.865
Sum of loading square	6.942	6.035	6.033	5.473	
Contribution ratio	23.936	20.809	20.802	18.872	
Cumulative contribution ratio	23.936	44.745	65.548	84.419	

Integration criterion =0.00001

Table 4-2-1-16 Relative situations and PC scores of tha drill core 35 samples, La Colorada area

Sample No.	Drill hole	Relative situation	PC1	PC2	PC3	PC4
A02PZ101	Pozo1	ore zone	0.73345	-6.25014	-1.40836	1.28579
A02PZ102	Pozo1	ore zone	-0.88979	-5.40066	-0.41203	1.69434
A02PZ103	Pozo1	foot wall	-4.46608	0.04459	7.44861	0.89679
A02PZ104	Pozo1	foot wall	1.41149	1.53912	1.64716	-0.76613
A02PZ105	Pozo1	foot wall	0.41036	1.85406	2.31493	-1.29044
A02PZ106	Pozo1	foot wall	-2.67446	2.53526	4.84810	1.67735
A02PZ201	Pozo2	hanging wall	2.53998	0.31040	0.17062	-0.15568
A02PZ202	Pozo2	hanging wall	2.79963	1.17859	-0.61151	0.81979
A02PZ203	Pozo2	ore body	-5.06295	0.99219	-1.05990	-0.39581
A02PZ204	Pozo2	ore body	-2.39847	-8.82246	0.91936	-1.67034
A02PZ205	Pozo2	foot wall	3.15529	0.66560	-0.14532	-0.21876
A02PZ206	Pozo2	foot wall	0.93830	0.37918	3.32446	0.20271
A02PZ301	Pozo3	ore body	0.27171	0.19296	-4.40092	-0.55596
A02PZ302	Pozo3	ore body	-2.23650	2.71340	-4.59758	-1.71488
A02PZ303	Pozo3	ore body	3.57570	0.65009	-0.97047	2.28103
A02PZ304	Pozo3	ore body	-5.26243	2.29505	-1.19036	1.38635
A02PZ305	Pozo3	ore body	-3.22010	-5.28915	0.86838	-0.16321
A02PZ401	Pozo4	hanging wall	3.70516	0.16468	0.34261	0.78715
A02PZ402	Pozo4	hanging wall	4.31675	-1.29561	-1.13421	1.74164
A02PZ403	Pozo4	ore body	-1.75953	0.65749	-4.37602	-0.81612
A02PZ404	Pozo4	ore body	-4.74362	1.66971	-0.43645	1.56294
A02PZ405	Pozo4	foot wall	0.32504	0.39439	0.70316	-6.28385
A02PZ406	Pozo4	foot wall	0.96991	0.31081	1.20855	-5.59548
A02PZ501	Pozo5	hanging wall	3.41693	0.11021	-1.52856	0.55437
A02PZ502	Pozo5	hanging wall	2.83319	-0.46974	0.11124	-0.26329
A02PZ503	Pozo5	ore body	-1.21085	0.25000	-2.69549	0.31118
A02PZ504	Pozo5	ore body	-2.50122	-0.67473	-2.14522	0.22016
A02PZ505	Pozo5	ore zone	4.26332	0.47302	-0.84083	2.25026
A02PZ506	Pozo5	ore zone	2.88066	1.59691	-0.31882	-0.09202
A02PZ507	Pozo5	ore zone	2.49716	0.73735	0.89735	-0.41112
A02PZ508	Pozo5	ore zone	1.32876	0.58670	2.49184	1.36950
A02PZ509	Pozo5	ore body	-4.57004	2.05517	-1.81560	0.89943
A02PZ510	Pozo5	ore body	-4.49371	1.97144	-1.94693	0.75911
A02PZ511	Pozo5	ore zone	3.21798	0.63906	0.33546	-0.49794
A02PZ512	Pozo5	foot wall	-0.10103	1.38206	4.40276	0.19113

Table 4-2-1-17 The main principal components with related elements and their characteristics, La colorada drill core samples

Principal component	Related elements	PC loadings	Characteristics
PC1 Contribution : 24%	Na	-0.901	The principal component is probably showing specified characteristics of rock. Comparing to the geological description of the samples, arenaceous rocks generally show plus values of PC loadings, and pelitic rocks , on the other hand, show minus values of PC loadings.
	Mg	-0.899	
	Ti	-0.892	
	logNi	-0.824	
	V	-0.809	
	Cr	-0.773	
	logCa	-0.751	
	logSr	-0.610	
	logP	-0.511	
PC2 Contribution : 21%	logFe	-0.766	Because Fe, Cu, S, As, Bi and Au in the 8 elements are accompanied by the Colorada ore body , the PC is supposed to be a component of the Colorada mineralization.
	logCo	-0.754	
	logCu	-0.749	
	logS	-0.690	
	logAu	-0.643	
	logBi	-0.613	
	logW	-0.590	
	logAs	-0.570	
	logCa	0.535	
	logSr	0.559	
PC3 Contribution : 21%	logHg	-0.919	Because all of these elements are common in the SEDEX ore body, the PC is probably a component of the SEDEX mineralization.
	logSb	-0.897	
	logZn	-0.849	
	logAg	-0.847	
	logPb	-0.817	
	logAs	-0.579	
	logCd	-0.576	
PC4 Contribution : 19%	K	-0.852	
	Al	-0.836	
	logBe	-0.784	
	logBa	-0.693	
	logP	-0.568	
	logBi	0.546	
	logCd	0.565	
	logMo	0.685	

Table II-4-2-1-18 Horizons predicted by using the discriminant functions, La Colorada area

Serial No.	Sample No.	District	Locality	Rock	Discriminant function values			Predicted group
					Y_{1-2}	Y_{1-3}	Y_{2-3}	
1	A02CX155	La Colorada	Cerro Cobres	schist	11.832	9.961	-1.872	G1
2	A02CX152	La Colorada	Cerro Cobres	shale	23.637	1.264	-22.375	G1
3	A02CX153	La Colorada	Cerro Cobres	sand stone	19.603	9.856	-9.748	G1
4	A02CX154	La Colorada	Cerro Cobres	schist	21.039	2.351	-18.689	G1
5	A02CX142	La Colorada	Rio de Cobres	hornfelsic phillitic s.s.	24.509	-3.452	-27.963	G3
6	A02CX133	La Colorada	Rio de Cobres	quartzite (hornfels)	39.409	-4.158	-43.569	G3
7	A02CX135	La Colorada	Rio de Cobres	hard hornfels	20.227	9.309	-10.919	G1
8	A02CX134	La Colorada	Rio de Cobres	silicified shale (hornfels)	16.242	8.714	-7.529	G1
9	A02CX137	La Colorada	Rio de Cobres	phillitic s.s.	23.657	2.896	-20.762	G1
10	A02CX136	La Colorada	Rio de Cobres	hornfelsic mica. s.s.	31.880	-2.913	-34.793	G3
11	A02CX138	La Colorada	Rio de Cobres	limonitized zone	42.131	-9.768	-51.900	G3
12	A02CX139	La Colorada	Rio de Cobres	chloritized zone	26.538	-29.442	-55.980	G3
13	A02CX141	La Colorada	Rio de Cobres	metamorphosed s.s.	37.077	-9.710	-46.788	G3
14	A02CX140	La Colorada	Rio de Cobres	hornfelsic phillitic s.s.	40.909	-9.772	-50.682	G3
15	A02CX148	La Colorada	Rio de Cobres		11.353	3.972	-7.382	G1
16	A02CX149	La Colorada	Rio de Cobres		17.836	-7.804	-25.640	G3
17	A02CX150	La Colorada	Rio de Cobres		30.283	-8.272	-38.556	G3
18	A02CX151	La Colorada	Rio de Cobres		33.651	-12.751	-46.404	G3
19	A02CX143	La Colorada	Limeca	bedded siltstone	36.882	-14.319	-51.203	G3
20	A02CX144	La Colorada	Limeca	bedded siltstone-shale	14.245	0.279	-13.967	G1
21	A02CX146	La Colorada	Limeca	py.diss. siltstone-shale	14.332	9.269	-5.064	G1
22	A02CX145	La Colorada	Limeca	bedded f.s.s.-shale	7.648	8.283	0.633	G1
23	A02CX147	La Colorada	Limeca	bedded fine s.s.-shale	12.206	4.219	-7.988	G1
24	A02CX172	La Colorada	Limeca	shale	6.185	11.979	5.793	G1
25	A02CX170	La Colorada	Limeca	sandstone	14.399	7.064	-7.336	G1
26	A02CX171	La Colorada	Limeca	sandy shale	18.013	14.217	-3.796	G1
27	A02CX169	La Colorada	Limeca	shale	23.600	8.948	-14.653	G1
28	A02CX168	La Colorada	Limeca	shale	21.082	7.918	-13.165	G1
29	A02CX163	La Colorada	Cerro Chuschuyo	phillitic shale in s.s.	35.910	3.469	-32.442	G1
30	A02CX156	La Colorada	Cerro Chuschuyo	foliated phillite	14.306	3.284	-11.023	G1
31	A02CX162	La Colorada	Cerro Chuschuyo	medium s.s.	37.171	3.615	-33.556	G1
32	A02CX161	La Colorada	Cerro Chuschuyo	siliceous bedded s.s.	42.469	4.082	-38.387	G1
33	A02CX159	La Colorada	Cerro Chuschuyo	bedded quartzose s.s.	38.509	-0.906	-39.415	G3
34	A02CX160	La Colorada	Cerro Chuschuyo	siliceous bedded s.s.	32.161	1.253	-30.908	G1
35	A02CX157	La Colorada	Cerro Chuschuyo	conglomerate	8.922	7.888	-1.035	G1
36	A02CX158	La Colorada	Cerro Chuschuyo	s.s. beds in c.g.l.	19.736	8.144	-11.592	G1
37	A02CX164	La Colorada	Cerro Chuschuyo	foliated,dacitic lava	15.030	0.330	-14.701	G1
38	A02CX165	La Colorada	Cerro Chuschuyo	thin bedded slate	10.925	5.877	-5.048	G1
39	A02CX166	La Colorada	Cerro Chuschuyo	thin bedded slate	21.113	5.045	-16.070	G1
40	A02CX167	La Colorada	Cerro Chuschuyo	thin bedded slate	28.073	1.122	-26.952	G1

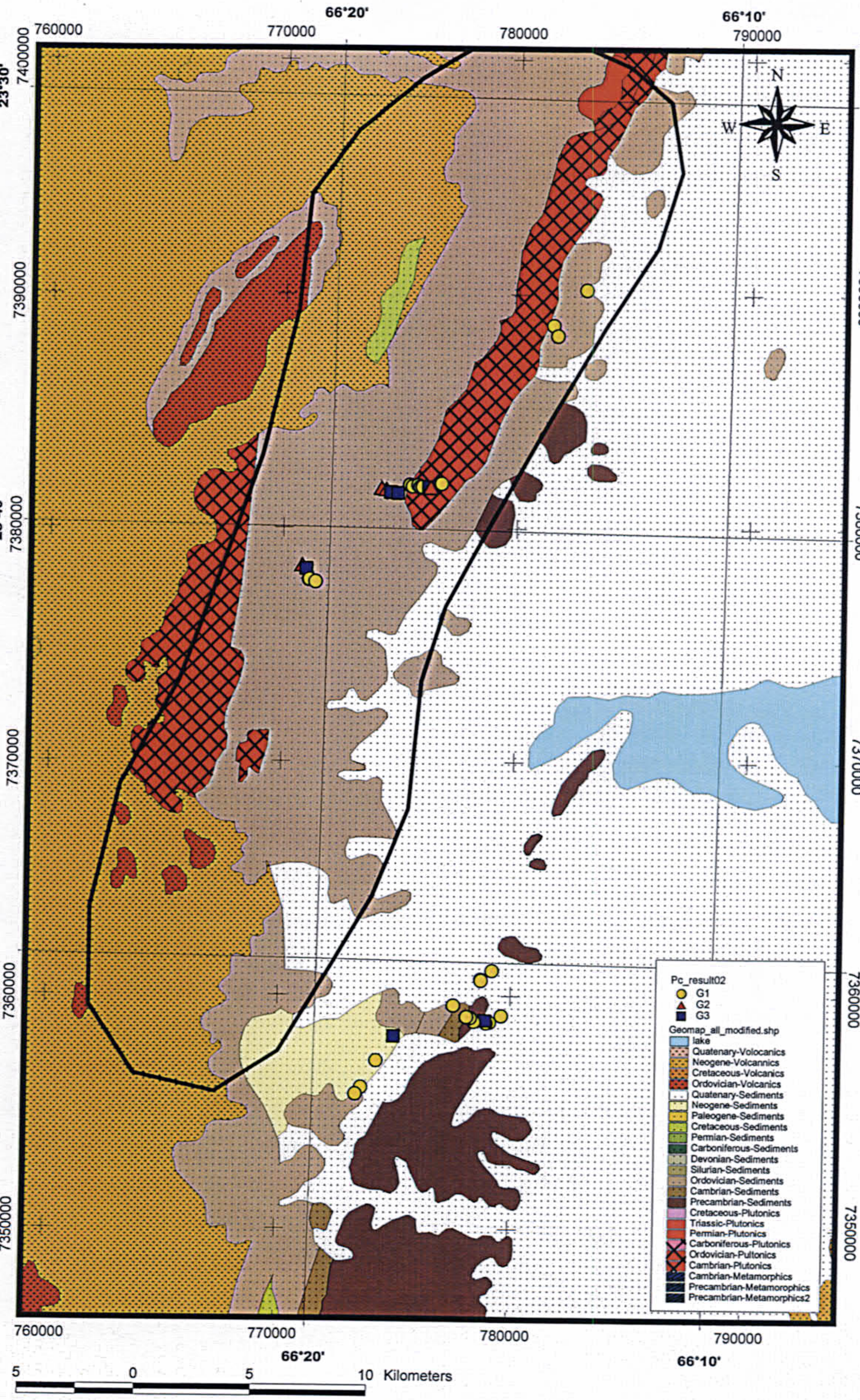


Fig.II-4-2-1-20 Predicted horizons by geocheminal discriminant analysis, La Colorada area

4-2-2 Porphyry copper and epithermal type deposits

(1) Pancho Arias area

1) Location and access

The Mina Pancho Arias is located at lat. 24º16' S, long. 65º51' W, about 3,500 m above sea level. It lies 75 km direct northwest of Salta. This area is administratively under Departamento de Rosario de Lerma in Salta Province. The area is reached by going up to north on a rough road along Río Rosario diverging from Puerta Tastil where is located 35 km from Salta, via National Road 51, which runs from Salta to San Antonio de los Cobres. It is possible to travel all the way by a 4-wheel-drive vehicle. (Fig. II-4-2-2-1-1 Location map of the Pancho Arias area)

2) Mining concessions

The following concessions are established in and around the Mina Pancho Arias:

- Mining license No. 4799 (holder: Lapacha Minera SRL)
- Exploration licenses Nos. 15602-1996, 15603-1996 and 15757-1996 (held by Minera Argentina Gold SA)

The mining license is located around the old workings in the Mina Pancho Arias (also called the Mina Vizcacheral). In a place west of this area, three exploration licenses are located in a line from south to north. No other concessions are established in this area (in the Las Burras and the Incahuasi prospects, there is no concession at present). Fig. II-4-2-2-1-2 shows the situation of concessions in the Pancho Arias area.

3) Past exploration and mining activities

- Around 1700, some prospectors who visited with the Jesuit missionary discovered the mineral showings. (There are some old workings, which seem to date from that time.)
- In 1950's and 1960's, a series of exploration was carried out by the Delegacio'n General de Fabricaciones Militares (DGFM).
- From 1972 to 1975, the exploration was carried out according to the United Nations NOA I program (DGFM set up a Reserva and called it as the Vizcacheral). The works included topographic survey (Scale: 1 to 2,500), geochemical survey (stream sediments), geophysical survey using the IP method (total line length: 19.2 km), electromagnetic survey (line length: 5 km) and drilling (10 holes totaling 1,716 m). As the result, porphyry copper-molybdenum deposits with ore reserves of 230 million tons at 0.035 % Mo were caught (regarding Cu mineralization, a copper dissemination body was caught in a drill hole at a depth from 50 m. The average copper grade at 32 m length was 0.30 % Cu. The highest copper grade reached to 1.45 % Cu). Based on the results of the IP and electromagnetic survey, the anomaly probably due to a sulfide body was detected at a depth of about 300 m.
- From 1995 to 1997, an exploration program (mainly comprising geological survey, geochemical survey, geophysical survey using the IP method) was made by Aranlee Resources. Aranlee Resources said that the mineralization seemed to be of the typical porphyry Cu and Mo type. According to a report

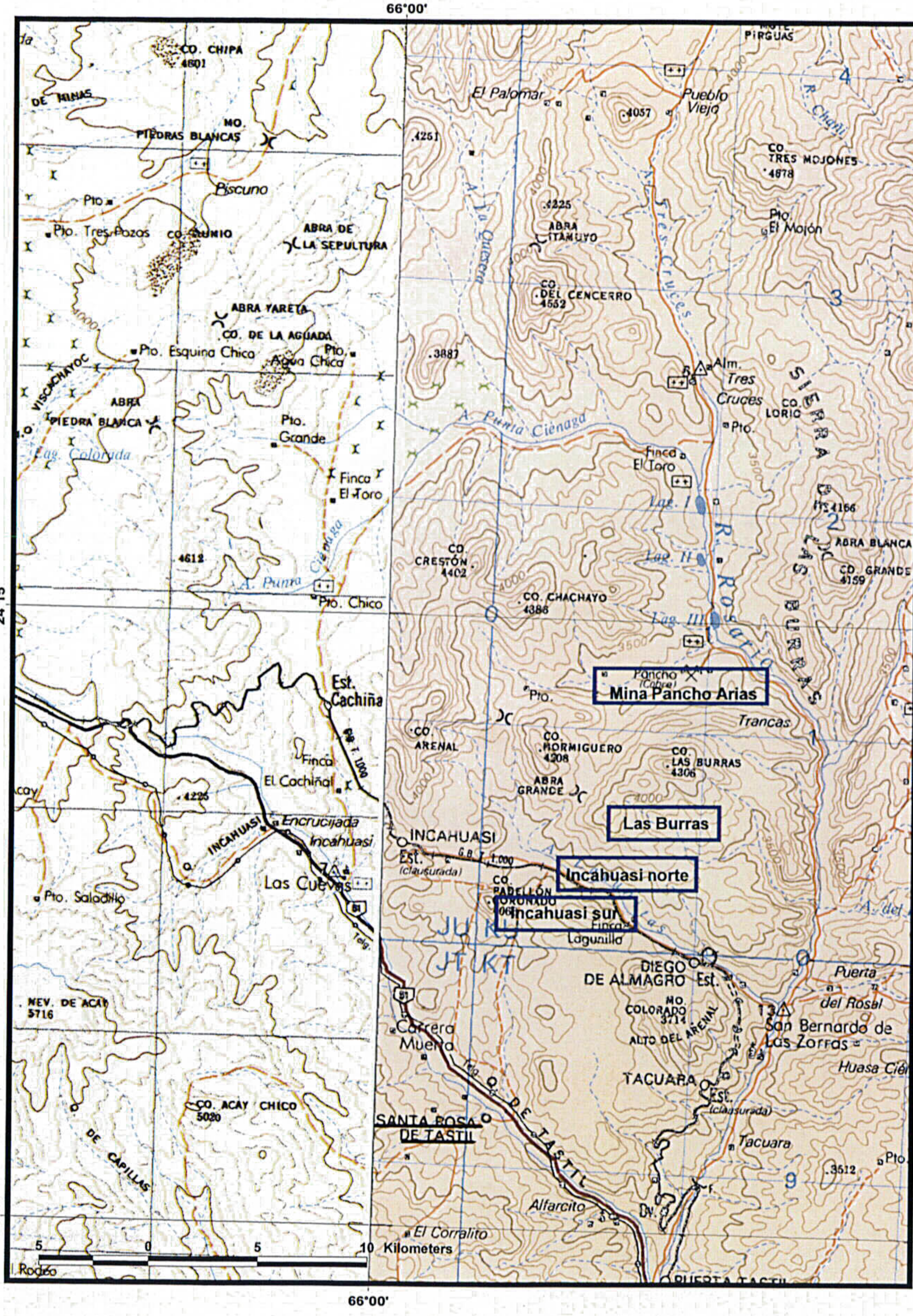


Fig. II-4-2-2-1-1 Location map of the Pancho Arias area

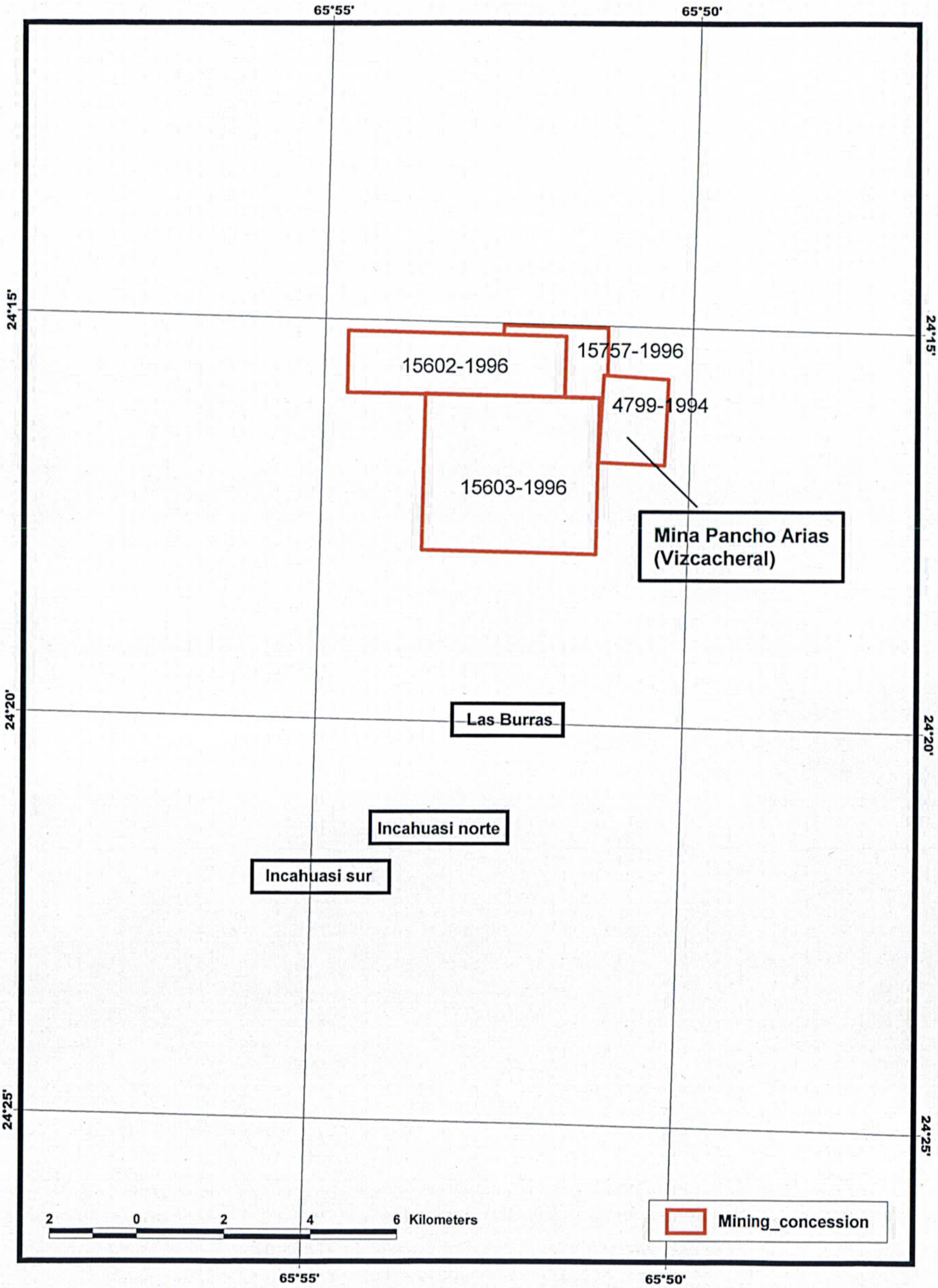


Fig. II-4-2-2-1-2 Status of mining concessions in the Pancho Arias area of Aranlee Resources, mineralization occurs in the quartz stockwork zone hosted by dacite porphyry. The central part of the deposits lies in the potassic alteration zone, and it is surrounded by phyllic/argillic alteration zone (consisting of quartz-sericite-clay minerals, and sulfide minerals). The propylite zone occurs at the outermost of them.

- In 1998, Mansfield Minerals carried out an exploration program (geological survey, geochemical survey, geophysical survey using the IP method, six trenches of 870 m in length and four drill holes) in the Las Burras prospect (8 km south of the Mina Pancho Arias).
- From 1997 to 1999, Mansfield Minerals carried out an exploration program (geological survey, geochemical survey, geophysical survey using the IP method and 6 trenches of 860 m in length) in the Incahuasi prospect (13 km south of the Mina Pancho Arias).

4) Geology and geologic structure

Based on the Mapa Geológico de la Provincia del Salta at a scale of 1 to 500,000, the geology around the mineral showings, is composed of the upper Precambrian Puncoviscana group sedimentary rocks (greywacke, shale and sandstone; partly presenting the green schist facies due to the weak metamorphism), the lower Cambrian, Meson group (shale, sandstone and conglomerate), the Santa Victria group (sandstone), and the Cambrian granitic rocks (Tastil granite). The Tertiary acidic intrusives occur in these sedimentary rocks and granites. The acidic intrusives are generally small (about 5 km in length along the major axis), made up of dacitic, audesitic, monzonitic, and dioritic composition. About ten acidic bodies are exposed on the surface in this area, occurring for 50 km from south to north. The acidic intrusives are of Miocene age (15 to 13 Ma). (Fig. II-4-2-2-1-3 Geologic map of the Pancho Arias area)

5) Mineralization and alteration

The Mineralization and alteration of the Mina Pancho Arias occur in monzonite or dacite porphyry of the upper Miocene (age determination was made by the survey last year; a result of 15.4 ± 0.3 Ma was obtained), and in the Precambrian sedimentary rocks near the porphyry. The known ore deposits have of porphyry copper-molybdenum type mineralization. Sulfide minerals such as chalcopyrite, chalcocite, covellite, galena and molybdenite were reported. The ore deposits accompany several hydrothermal alteration zones. The most important of them is the potassic alteration zone (biotite-potash feldspar) within the area whose major axis from the central part is several hundred meters, which is in turn surrounded by a propylite alteration zone (accompanied by chlorite - epidote - calcite and pyrite). Inside and around the propylite zone, a phyllic - argillic alteration zone (quartz - sericite - clay mineral) is distributed. There is mineralization of mainly molybdenite and a small amount of chalcopyrite and pyrite partly in the potash alteration zone, while mainly pyrite is mineralized in the phyllic - argillic alteration zone. Mineralization of these sulfide minerals present dissemination and form stringers.

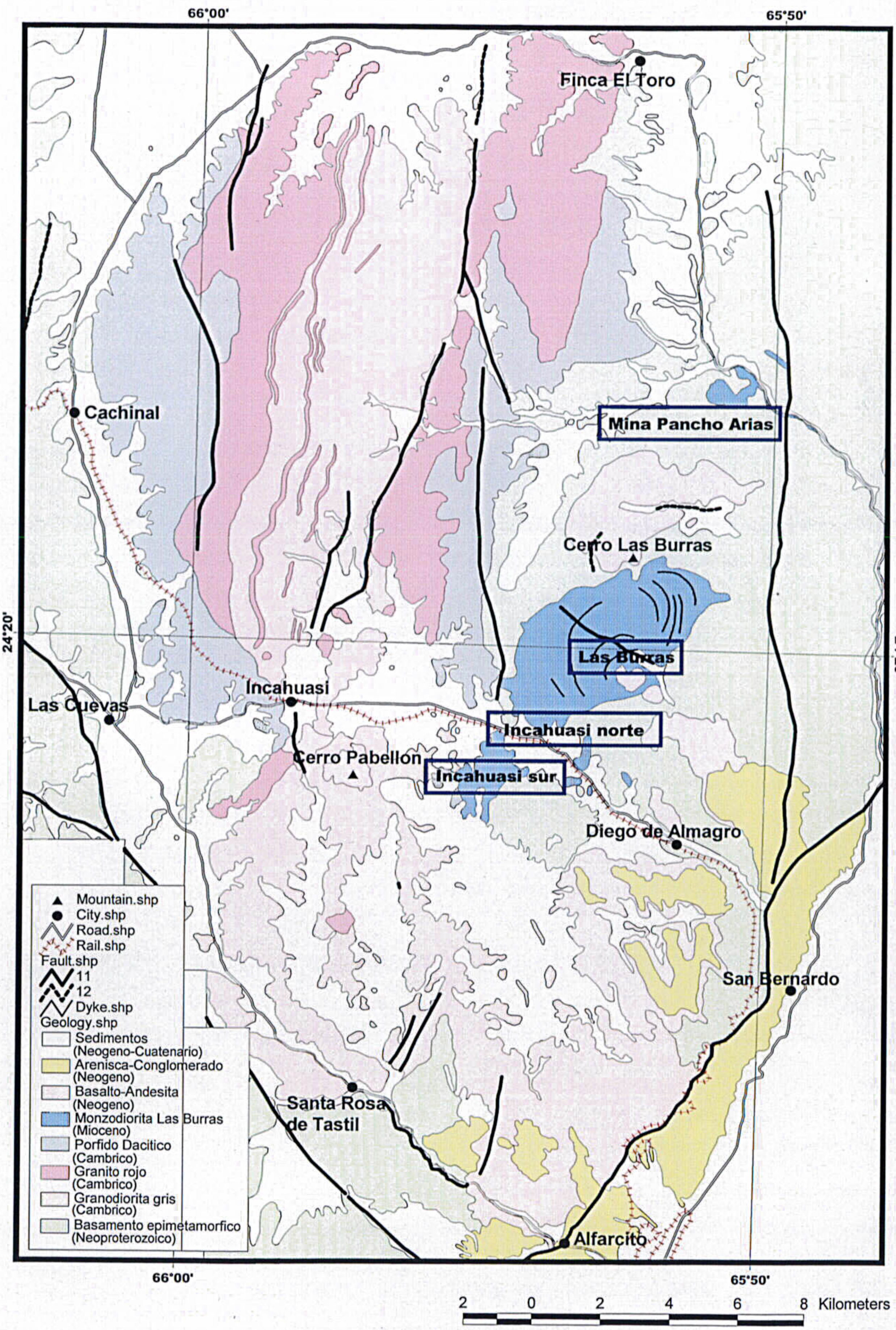


Fig. II-4-2-2-1-3 Geological map of the Pancho Arias area
(Horgn, et al., 2002)

In the south of the Mina Pancho Arias, porphyry copper/gold mineralization is observed in Mozonitic porphyry in Las Burras. Dissemination - stockwork of quartz - tourmaline - magnetite containing Cu and Au (±Mo) is distributed with silicification and sericitizatio. As sulfide mineral, pyrite, chalcopyrite and chalcocite are observed. ineralized alteration is not found remarkably on the ground surface, and only weak propylitization is observed generally.

In two places, which are about 3 km away from each other (Incahuasi Norte and Incahuasi Sur) in Incahuasi, porphyry copper/gold mineralization is observed in monzonitic porphyry of Tertiary Miocene. Mineralization of quartz - tourmaline - magnetite of the stockwork type is accompanied by silicification, sericitization and chloritization here. In stockwork, sulfide minerals, such as pyrite, chalcopyrite and chalcocite, and rarely native gold are observed. According to the results of the investigation of Mansfield Minerals Co., Ltd., quartz and tourmaline stringers located in the peripheral zone accompany places with the largest amount of gold.

6) Characteristics of the satellite image

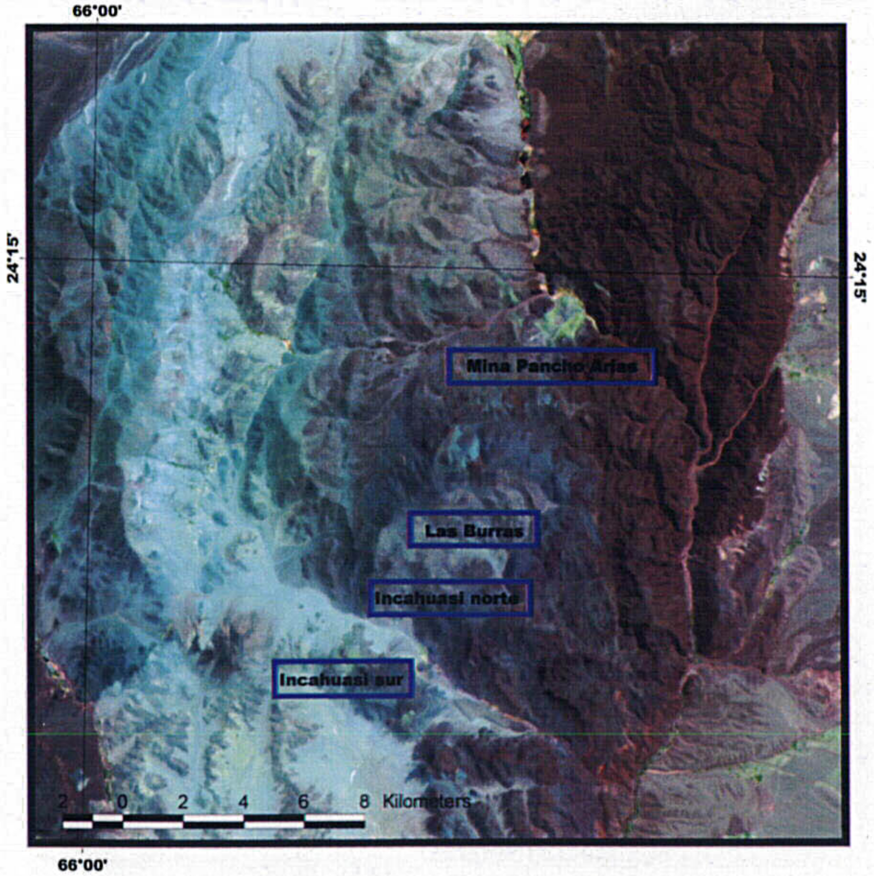
In the Mina Pancho Arias, three main alteration zones can be identified from ASTER image analysis. As a result of identification of altered mineral with the Isograin Model used, it was found that an alteration zone composed of chlorite - epidote spreads in the area of 2.0 km x 1.5 km near an old mine (Socabón). Inside it, an alteration zone mainly made up of sericite and kaolin and accompanied by a small to trace quantity of goethite and jarosite is observed, and forms alteration zoning. Northwest of this old mine, there is distribution of an alteration zone mainly consisting of a combination of chlorite and epidote. Inside or around these alteration zones, it is observed that alteration zones mainly composed of small-sized sericite are output sporadically.

South of Mina Panch Arias, alteration zones have been mapped out in several places from ASTER image analysis. Although no large alteration zone is found in Las Burras, in and around Incahuasi, located south of it, alteration zones with the long axis of 1 to 3 km and made up of sericite and chlorite are distributed in several places. (Fig.II-4-2-2-1-4 ASTER image analysis of hydrothermal alteration zones in the Pancho Arias area)

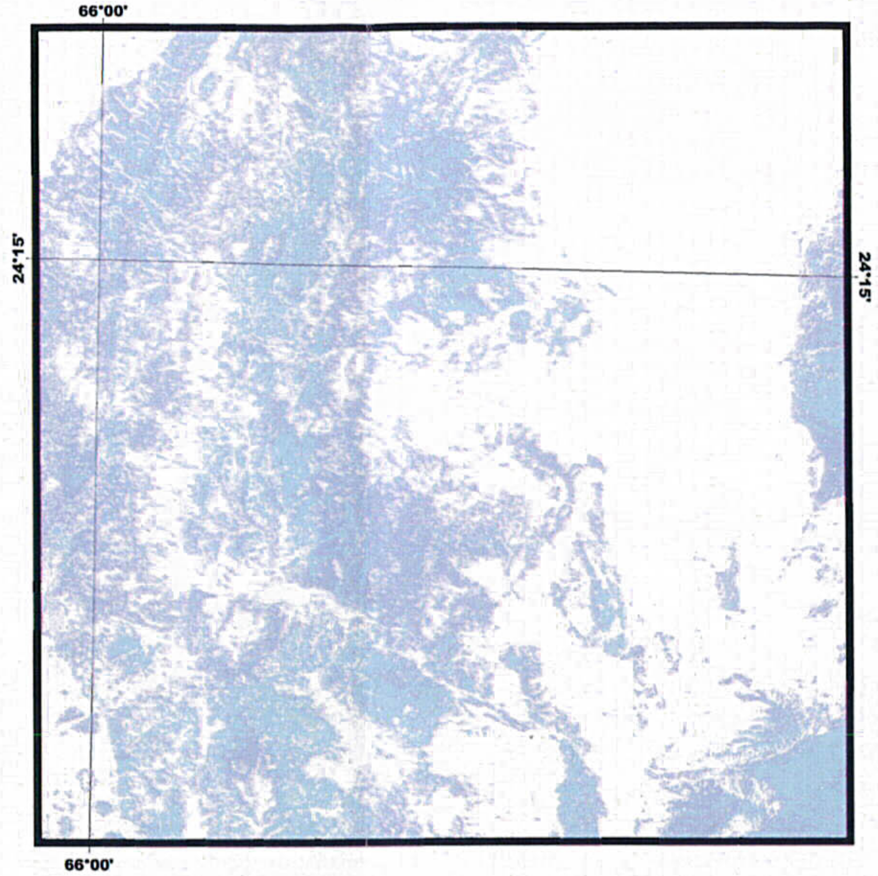
7) Survey results

Following the investigation of Phase I (number of collected samples: 12), geological surveys were carried out in three zones: (i) Mina Pancho Arias, (ii) Las Burras and (iii) Incahuasi zones. In addition, a drilling core, which was made by DGFM and is kept by the Mine Department of Salta State, was surveyed. The number of collected samples is 89 in total. (The breakdown of analyses and tests is as follows: 40 geochemical analyses, 6 ore analyses, 2 whole rock analyses, 50 X-ray analyses, 18 rock thin-section assessments and 4 ore polished thin-section assessments.)

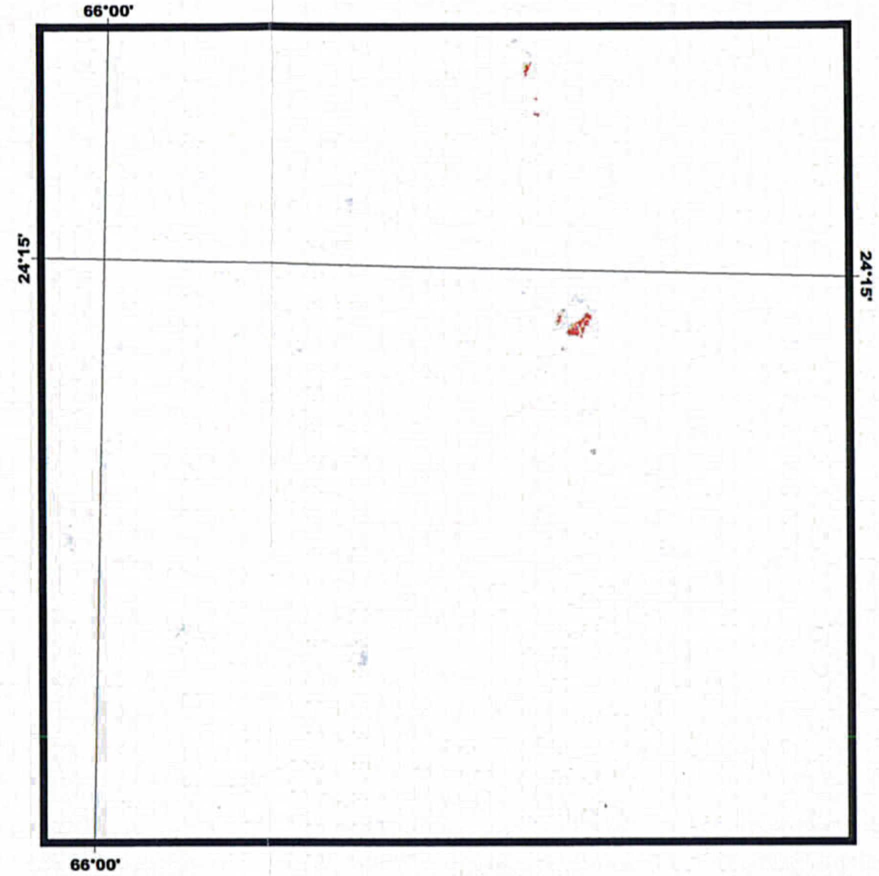
In the Mina Pancho Arias, with an old mine and pits in three places aligned in the N-S direction as the primary object, outcrops of a potash alteration zone in monzonitic porphyry, drilling holes and trenches were also investigated. Objects of the exploration of the old mine and pits were monzonitic



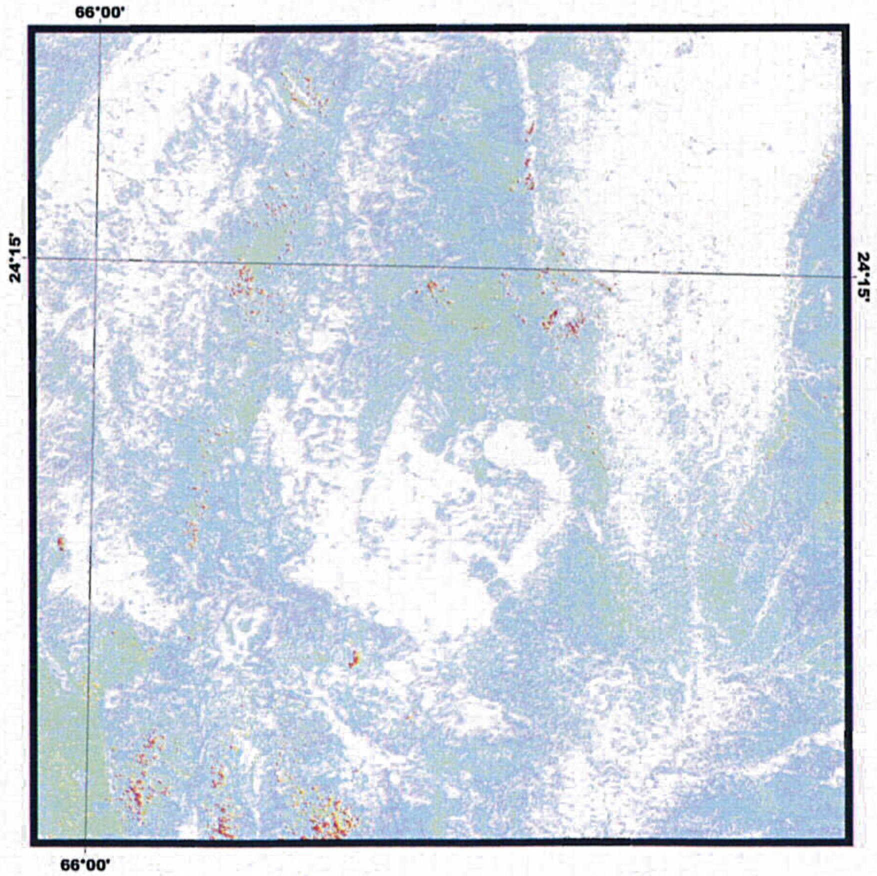
(a) False color image (BGR=147)



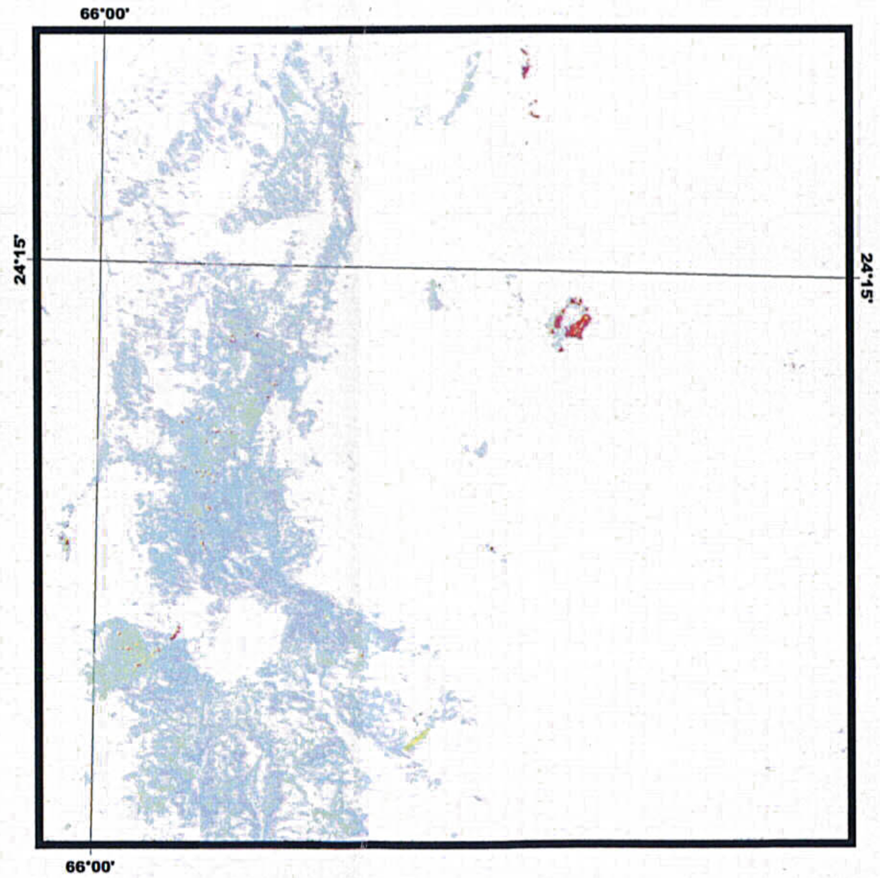
(c) Iso grain model mineral identification (Chl)



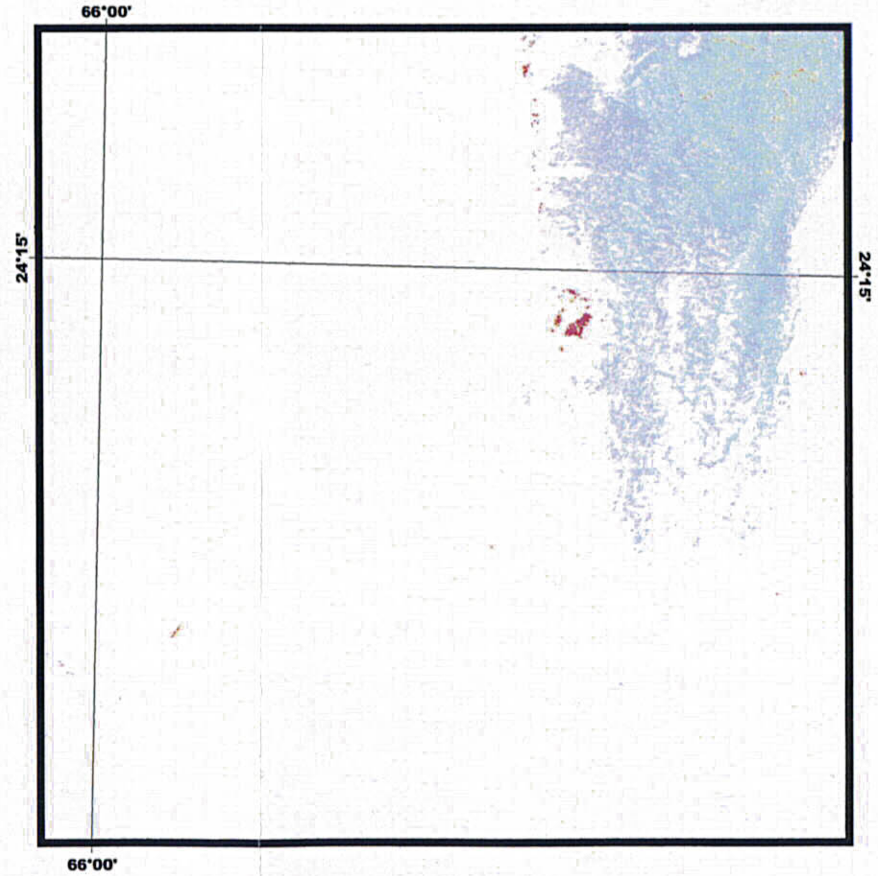
(e) Iso-grain model mineral identification (Goe)



(b) Iso-grain model mineral identification (Ser)

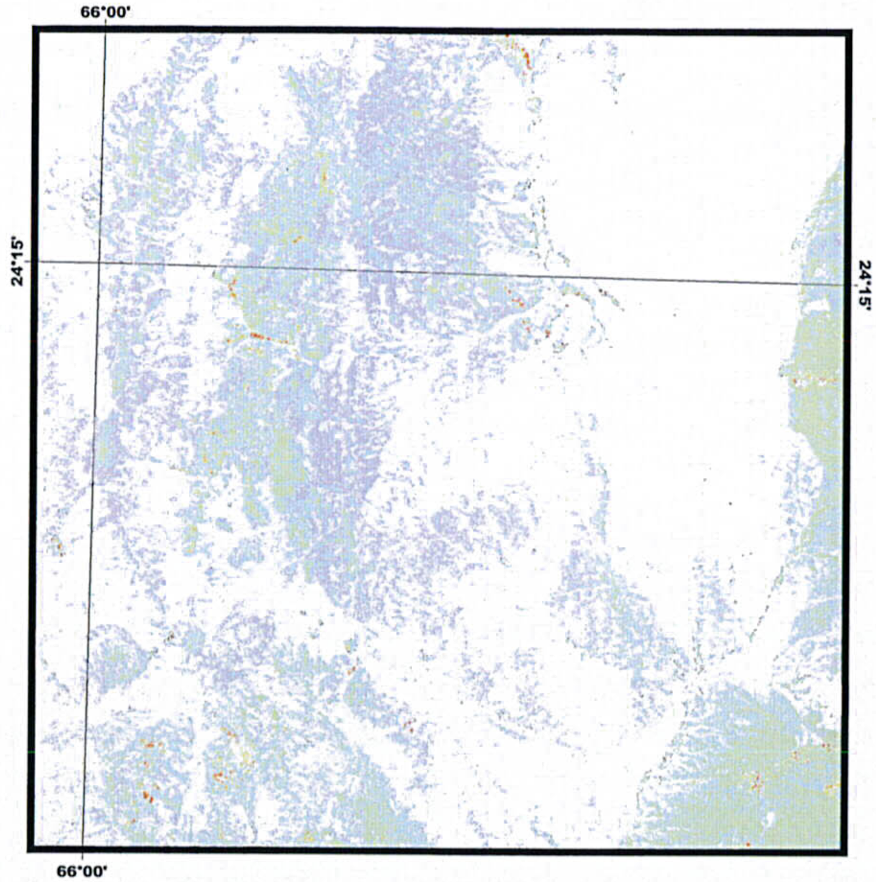


(d) Iso-grain model mineral identification (Kao)

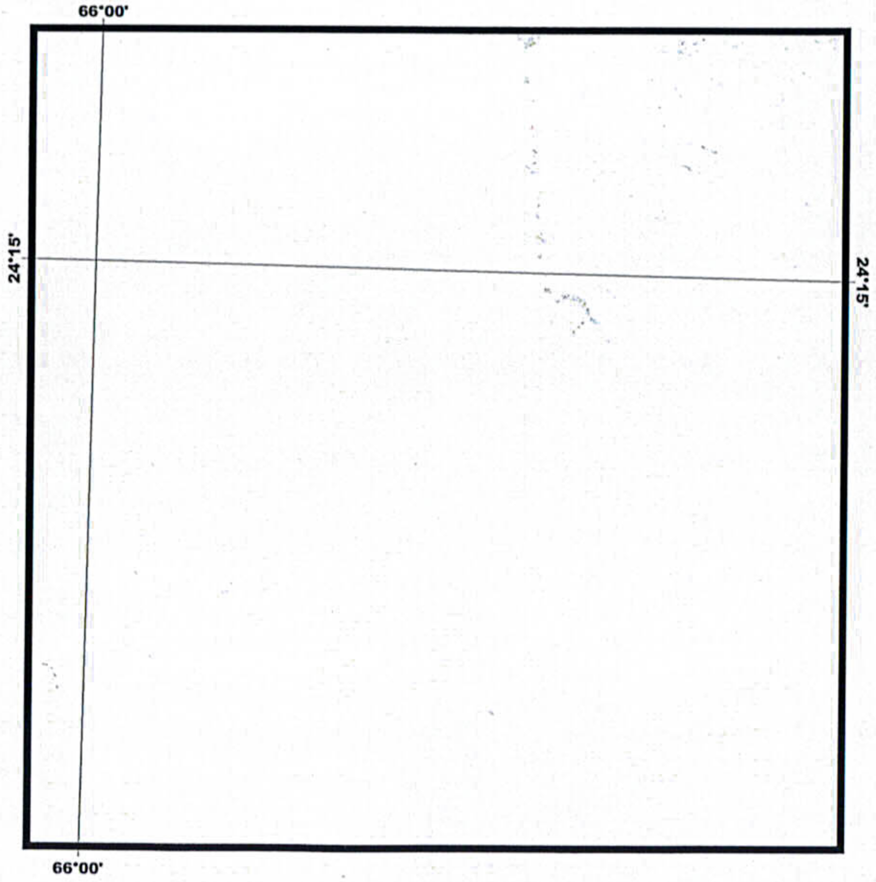


(f) Iso-grain model mineral identification (Jar)

Fig. II-4-2-2-1-4 ASTER image analysis of alteration zones in the Pancho Arias area (a)



(g) Iso-grain model mineral identification (Epi)



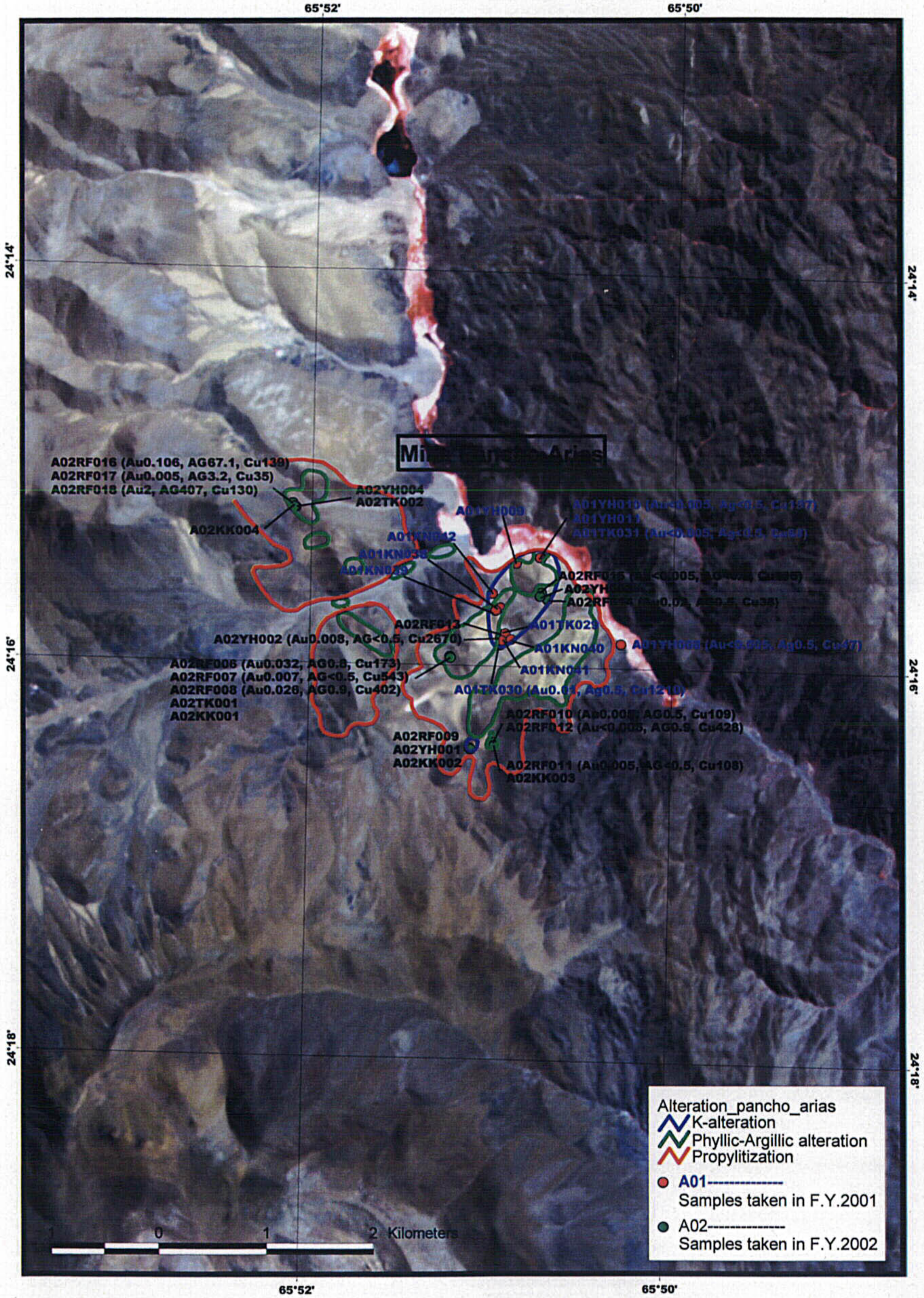
(h) Iso-grain model mineral identification (Aln)

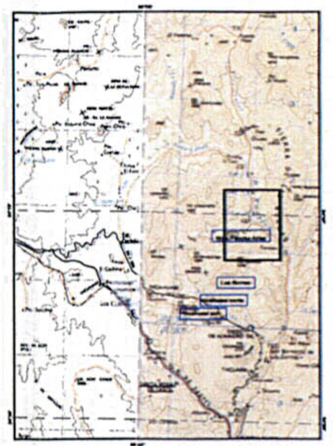
Fig. II-4-2-2-1-4 ASTER image analysis of alteration zones in the Pancho Arias area (b) porphyry which was subjected to silicification, argilliization, or potash alteration with biotite as the main body; and quartz stringers and network vein zones around it which exist in sandstone/shale belonging to Puncoviscana complex. In and around the quartz veins, silicified sulfide minerals (partly changed to limonite due to weathering) with pyrite as the main are observed. It is seen that strongly silicified parts contain tourmaline. Parts with dissemination of copper mineral were found, although partially. The following results of analysis were obtained from samples collected in a trench northwest of the old pit: Au 2.00 g/t, Ag 407 g/t, Cu 0.01%, Pb 1.91%, As 0.83% (A02RF018).

According to results of X-ray analysis of samples collected in this zone, a potash alteration zone mainly made up of quartz, biotite and potassium feldspar is observed within the area with the long axis of about 1 km (short axis of several hundreds meters) whose center is the place located about 800 m northeast of the old pit where monzonitic porphyry is exposed. Other potash alteration zones are partly observed on a small scale. In this zone, there is output of phyllic - argillic alteration zones characterized by a combination of quartz - sericite - kaolin and containing a small to trace quantity of goethite and jarosite. Two phyllic - argillic alteration zones presenting a long and narrow form principally extending in the NE-SW direction are output in parallel near the old mine. In several places, there is distribution of small phyllic - argillic alteration zones with the long axis of several hundred meters northwest of the old pit in the Mina Pancho Arias. Surrounding these alteration zones, propylite alteration zones made up of chlorite and epidote are distributed.

Based on results of ASTER image analysis and site surveys, characteristics of hydrothermal alteration zones can be summarized as follows: (1) Alteration zones can be divided into three kinds according to the combination of minerals: potash alteration zones, phyllic - argillic alteration zones and propylite alteration zones. (2) Potash alteration zones occupy a small part of the inside of propylite zones. Phyllic - argillic alteration zones are spreading mainly in the NE - SW direction, and appear to be controlled by cracks. (3) Porphyry copper/molybdenum (gold) mineralization is output in the area where potash alteration zones and phyllic - argillic alteration zones are distributed. (4) These alteration zones are located in Precambrian sedimentary rocks around monzonitic porphyry of Miocene as the center.

For the drilling core made by DGFM, parts where copper mineral and molybdenum mineral were observed were mainly investigated, and a small quantity of samples was collected. Mineralization is found in monzonitic porphyry, and sandstone and shale in Puncoviscana complex. In Drilling Hole P4, stringers of quartz and carbonate mineral develop in parts with strong silicification, and sulfide minerals with pyrite and a trace of chalcopyrite as the main were observed in those stringers. Results of analysis of this part were Au 0.02 g/t, Ag<1 g/t and Cu 0.42% (Sample A02RF002). In Drilling Hole P7, parts containing stringers of pyrite and molybdenite in monzonitic porphyry were observed. Results of analysis of this part were Au and Ag below the limit of detection, Cu 0.01% and Mo 0.22% (Sample A02RF005). As a result of X-ray analysis of these drilling samples, small to trace quantities of sericite and potassium feldspar were detected with quartz and biotite as the main. (Fig. II-4-2-2-1-5 Survey results in the Mina Pancho Arias)



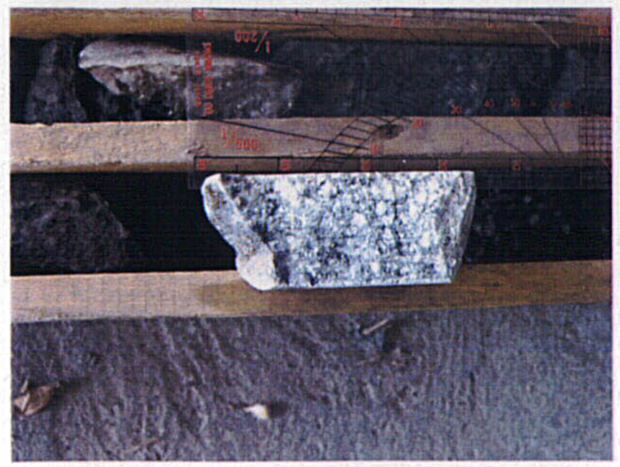


Mina Pancho Arias

Mina Pancho Arias Socabo'n

Quartz fills in the country rock (sediments) with pyrite and green copper mineral.

Occurrence of silicification and K-alteration (biotitization) in porphyry (dacitic).



Morybdenite veinlets/dissemination in porphyry (Drill P7, 416.10'- 416.65', Wd 0.55', Mo 0.22%)

Fig. II-2-2-2-1-5 Results of the survey in the Mina Pancho Arias

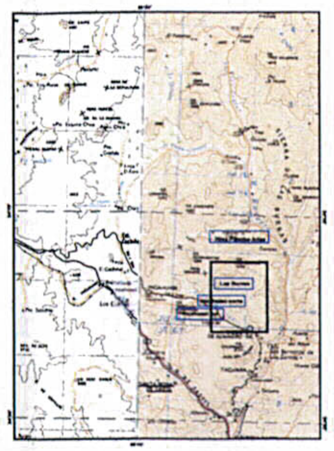
In Las Burras zone, trenches excavated in N-S and E-W directions in four places and alteration zone outcrops are distributed in valleys between mountains rising about 3,700 m above sea level. Parts where quartz stringers or network veins accompanying copper mineral in monzonitic porphyry developed were observed here. As a result of analysis of this part, Au 0.03 g/t, Ag <0.5 g/t and Cu 0.38% (Sample A02RF040) were obtained. The scale of zones with copper mineralization is as small as about 10 m in the long axis on the ground surface. (Fig. II-4-2-2-1-6 Survey results in the Prospecto Lass Burras)

In Incahuasi zone, trenches have been cut in two areas about 3 km apart, southwest (Incahuasi Sur) and northeast (Incahuasi Norte). Both of them were used for geochemical exploration of silicified/argillized alteration zones of monzonitic porphyry. From observation with the trenches used, weak silicified/argillized alteration is found but mineralization of sulfide mineral is slight. As a result of analysis of rock samples in trenches, values such as Au 0.10 g/t, Ag<0.5 g/t and Cu 0.01% (A02RF022) were derived. (Fig. II-4-2-2-1-7 Survey results in the Prospecto Incahuasi)

In addition to the above-mentioned areas, site verification was carried out for those, which were considered from ASTER image analysis to be probable alteration zones.

8) Comments

- Mina Pancho Arias, Las Burras, Incahuasi (Norte, Sur) and main porphyry copper/molybdenum (gold) mineralized zones are located almost in the NNE-SSW direction because of restriction due to intrusion of monzonitic porphyry of Neogene Miocene.
- Hydrothermal alteration zones are distributed in monzonitic porphyry, and Precambrian sedimentary rocks are located around the former in several places. Among alteration zones, those in the Mina Pancho Arias show zonal structure of potash alteration zones, phyllic - argillic alteration zones and propylite alteration zones. Porphyry mineralization is recognized in potash alteration zones and phyllic - argillic alteration zones.
- These mineralized zones are small-scale, and it is judged that the ore grades of copper, molybdenum and gold are also low.



Prospecto Las Burras

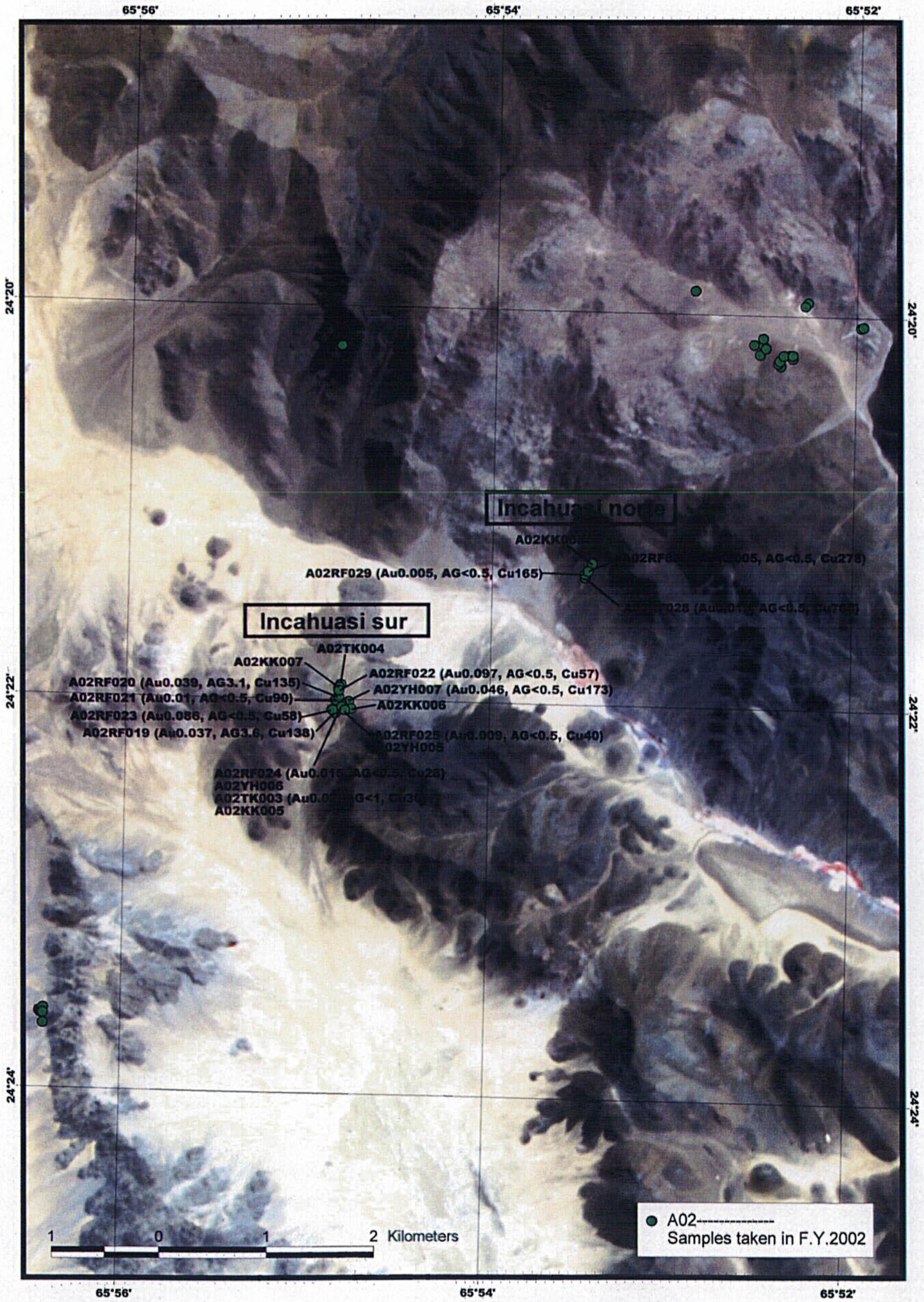
Trenching survey was carried out in 1998 by Mansfield Minerals in the Prospecto Las Burras.

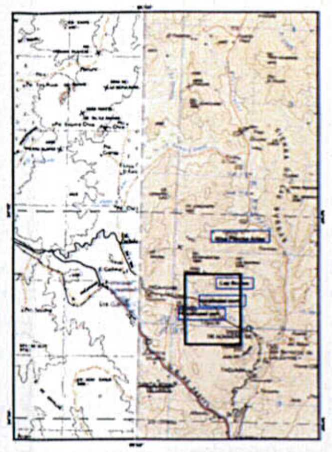
Two cross-lines and other two lines of trenches were dug within the outcrop of porphyry (monzonitic) intrusion.

Quartz veinlet/network with limonite and some green copper minerals. Pyrite, chalcopyrite and sphalerite were also observed under the microscope.

An assay of Au 0.03 g/t, Ag < 0.5 g/t Cu 0.38 % was returned from this part (A02RF040).

Fig. II-2-2-2-1-6 Results of the survey in the Prospecto Lass Burras





Prospecto Incahuasi

Trenching survey was carried out in 1997-99 by Mansfield Minerals in two prospects (Incahuasi Norte and Incahuasi Sur).

Incahuasi Sur

Silicified porphyry (monzonitic) with pyrite dissemination was observed in the trenches. Anomalous Cu values (up to 173 ppm) were obtained from those samples.

Incahuasi Norte

Quartz veinlet/network was developed in weakly altered porphyry (monzonitic) in the trench.

Fig. II-2-2-2-1-7 Results of the survey in the Prospecto Incahuasi

(2) El Pago area

1) Location and access

These mineral showings are located at lat. 27º05' S, long. 65º55' W, 3,000 m - 4,300 m above sea level. This place is administratively under Departamento de Monteros in Tucumán State. They are located in the mountains of Sierra del Aconquija on the upstream of Río de la Horqueta, and there is no road in the vicinity. Entering from Andalhuala by riding on a horse (two-day trip each way) or using a helicopter is the only way to reach there. (Fig. II-4-2-2-2-1 Location map of the El Pago area)

2) Mining concessions

There is an old mine (Mina Rica) in this place of mineral showings. It is said that mining area are established in the periphery. (Details unknown)

3) Past exploration and mining activities

The outline of past investigations is as follows (mainly according to Carlos H. Morello, a geological engineer).

- Geological survey was carried out by the U.N. and Servicio Nacional de Geología y Mineria (SM) several times during the 1970s. (Several-hundred rock samples were collected, and geochemical analysis, analysis of altered mineral, etc. were carried out.)
- Utah Co., Ltd., an American company, carried out investigation in 1987 (Eighteen rock geochemical samples were collected.)
- Paramount Ventures & Finance Co., Ltd., carried out investigation in 1996. (Twenty-nine rock geochemical samples were collected.)
- Pegasus Gold International Co., Ltd., carried out investigation in 1997. (Sixteen rock geochemical samples were collected.)
- Rio Tinto Co., Ltd., may have carried out investigation thereafter. (Details unknown.)

4) Geology and geologic structure

According to the geological map of Tucumán State on a scale of 1 to 500,000, the place of mineral showings, El Pago, is within the area where Upper Precambrian bedrock (Piscoyacú gneiss) is distributed. Ordovician granite rocks are distributed in the northeast, and Portezuelo las Ánimas volcanic composite rocks of Tertiary Miocene (mainly andesitic volcanic rocks) are distributed in the north and northeast.

According to geological data obtained from SEGEMAR Tucumán branch office, there are three kinds of rock distributed in this place of mineral showings: Precambrian bedrocks (granulite, metasedimentary rock, gneiss etc.), dacitic - andesitic porphyry, and lamprophyre. (Fig. II-4-2-2-2-2 Geologic map of the El Pago area)

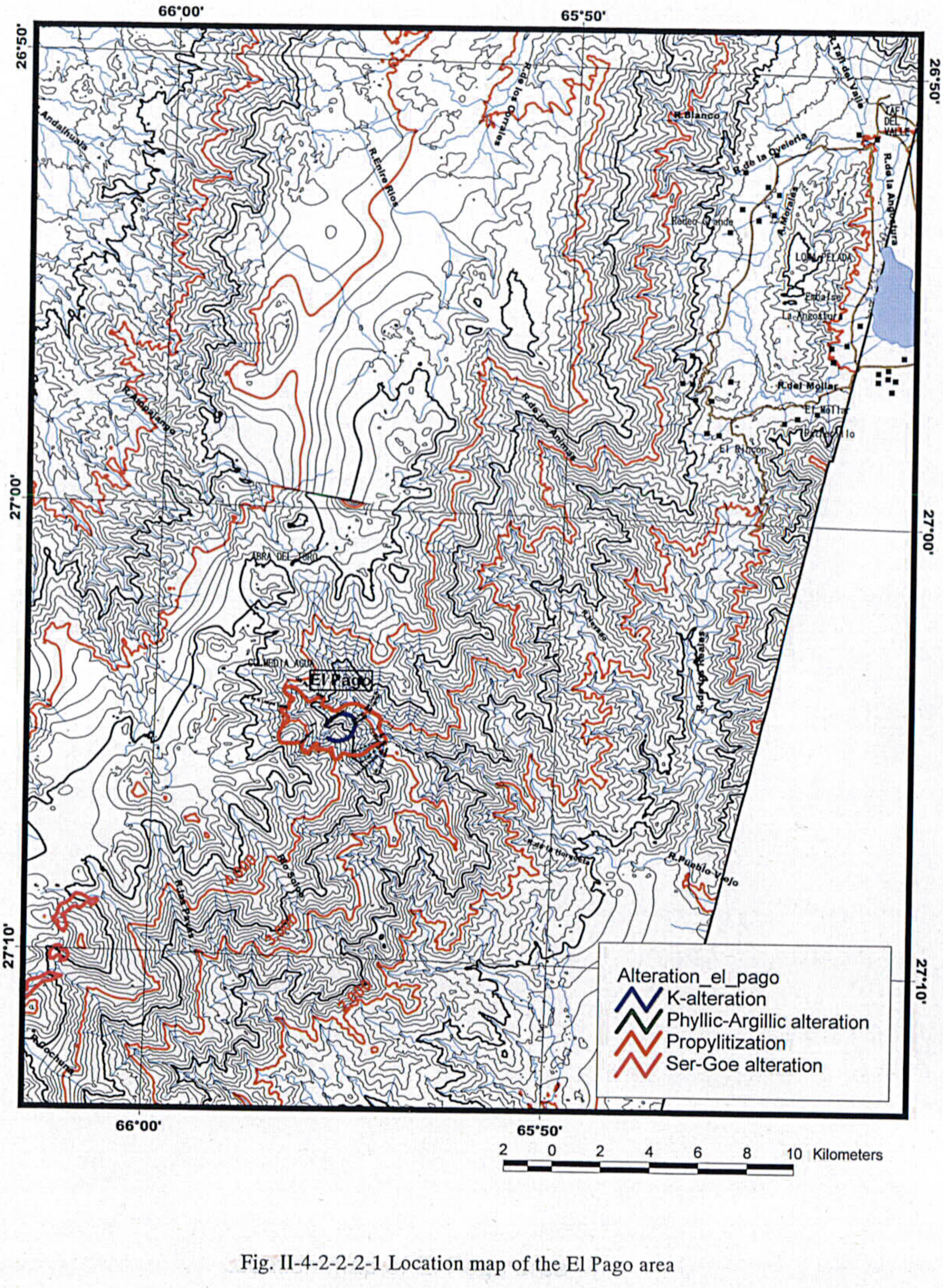


Fig. II-4-2-2-2-1 Location map of the El Pago area

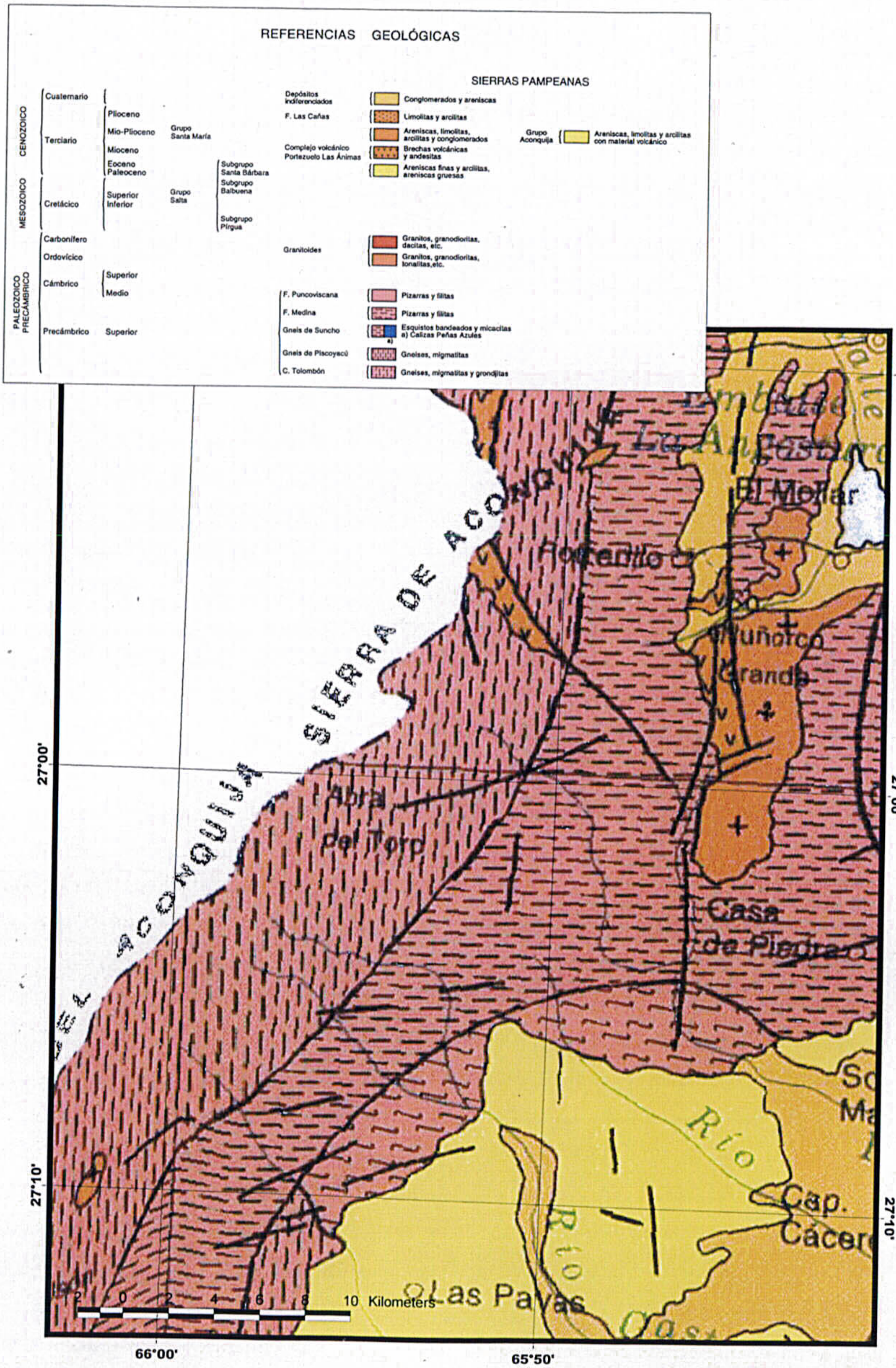


Fig. II-4-2-2-2-2 Geological map of the El Pago area
(Mapa geologico de la provincia de Tucuman 1:500,000)

5) Mineralization and alteration

In this place of mineral showings, an old mine called Mina Rica is known. It is said that this mine was used for quartz prospecting by drift carried out in 1988 by the then mining-right holder. It is also said that quartz veins contained pyrite, and results of analysis such as Au grade 1.4 g/t, 6.8 g/t, and 12.6 g/t were obtained (according to Carlos H. Morello).

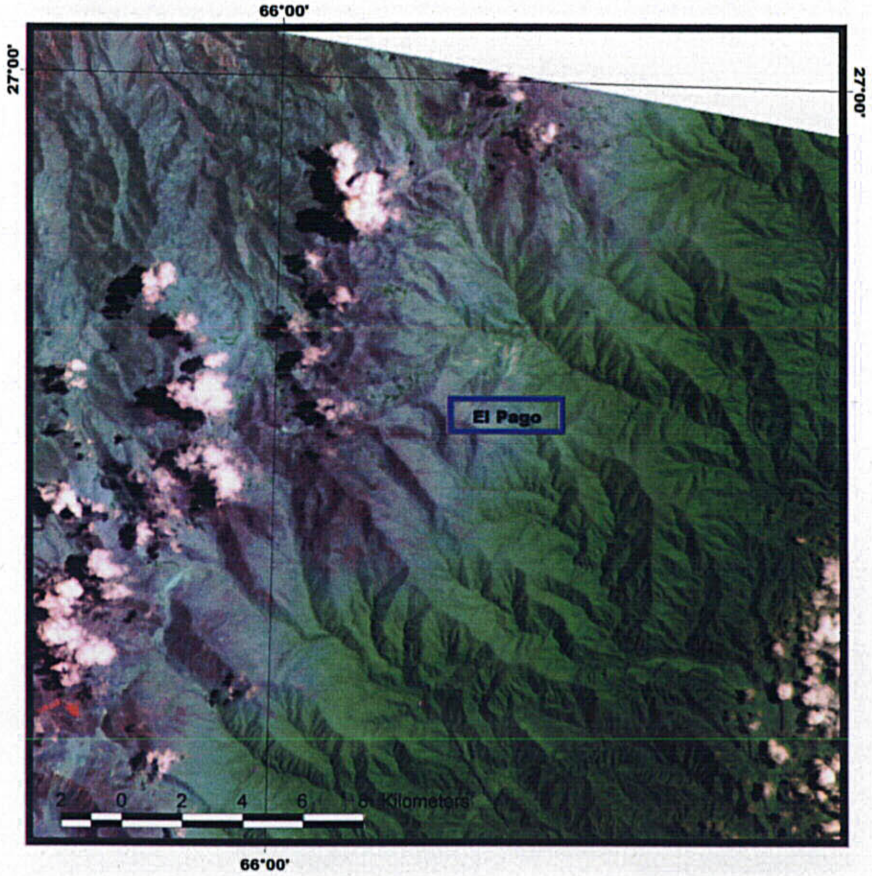
In this place of mineral showings, silicified - argillized alteration zones are distributed on the ground surface in the area of about 4 km x 2 km (generally extending from east to west). According to investigations carried out by SM and others, alterations here include potash alteration, sericitization, argillization, propylitization and silicification. In the investigation by the U.N. and SM in 1976, geochemical analysis was made for several-hundred rock samples. The results are as follows: Au～2.4 ppm (Highest value - same hereinafter: Sample 26426), Ag～8 ppm (Sample 67594), Cu～125 ppm (Sample 67501)*, Pb～400 ppm (Sample 25190), Zn～275 ppm (Samples 25151 and 26418) and Mo ～80 ppm (Sample 25183). As known from these values, higher grades are found locally but, generally, only low values have been obtained. (* This year, part of samples stored by SEGEMAR was analyzed again, as mentioned later; Cu 1,675 ppm was the highest value was obtained; Sample 23264.)

Last year, X-ray analysis was carried out for ten rock samples supplied by SEGEMAR Tucumán branch office (3 porphyry samples, 4 metamorphic bedrocks samples, 3 lamprophyre samples). From the result of X-ray analysis, the presence of the above-mentioned alteration has been confirmed. It was found that chalcopyrite and pyrite were contained in some samples.

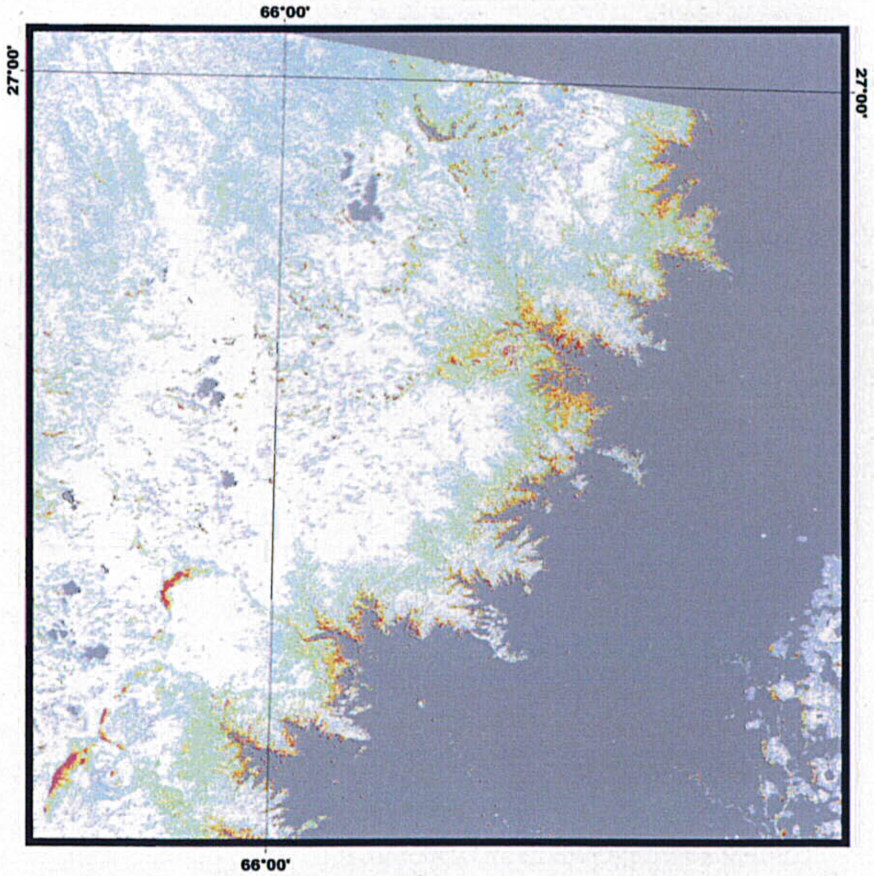
6) Characteristics of the satellite image

This place of mineral showings is located in the peripheral part of a vegetation zone, and is an area where image analysis is difficult due to the influence of vegetation. In the ASTER false color (VNIR) image, the area of 4 km x 2 km presents a color tone which is remarkably different from the circumference and can be recognized as a large-scale alteration zone. When this part is seen in a 3D image, the situation like depressed topography (Bajo) surrounded by branch streams is recognized. According to the result of altered mineral identification with the Isograin Model used, sericite, chlorite, goethite, and a small quantity of epidote are distributed over the area of alteration zones. Outcrop of kaolin and jarosite is partly observed in alteration zone.

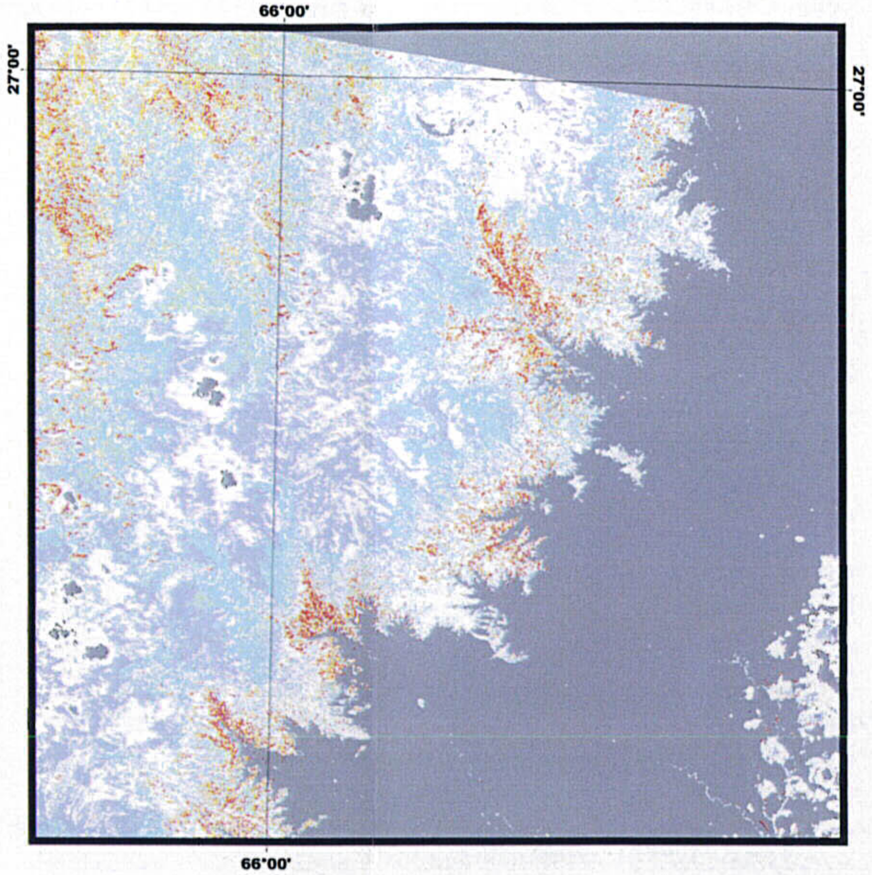
This place of mineral showings is located 30 to 40 km northwest of Agua Rica, Filo Colorado, and a prospecting area of porphyry copper deposits. In satellite image analysis, it is recognized that there is distribution of a group of alteration zones which extend in the NE-SW direction sporadically between Filo Colorado and El Pago and which mainly consist of sericite and goethite. Furthermore, although probable indication of alteration zones is recognized in the place 4 to 6 km northeast of El Pago, it is difficult to identify alteration zones with the satellite image used because this is a vegetation zone. (Fig. II-4-2-2-2-3 ASTER image analysis of hydrothermal alteration zones in the El Pago area)



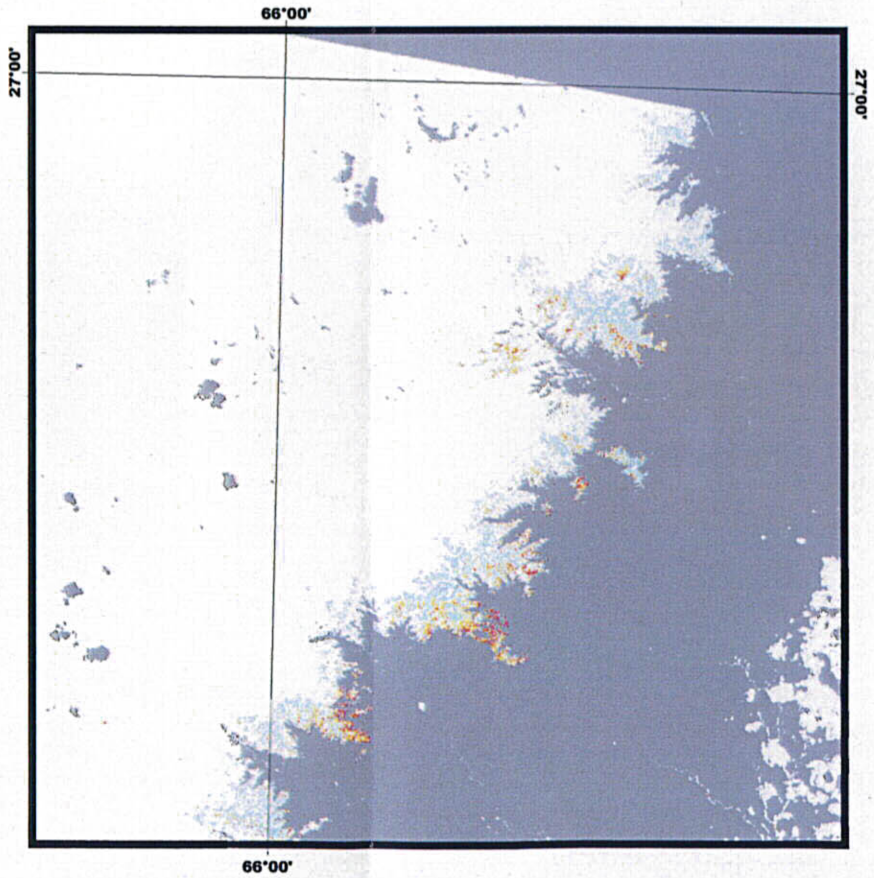
(a) False color image (BGR=147)



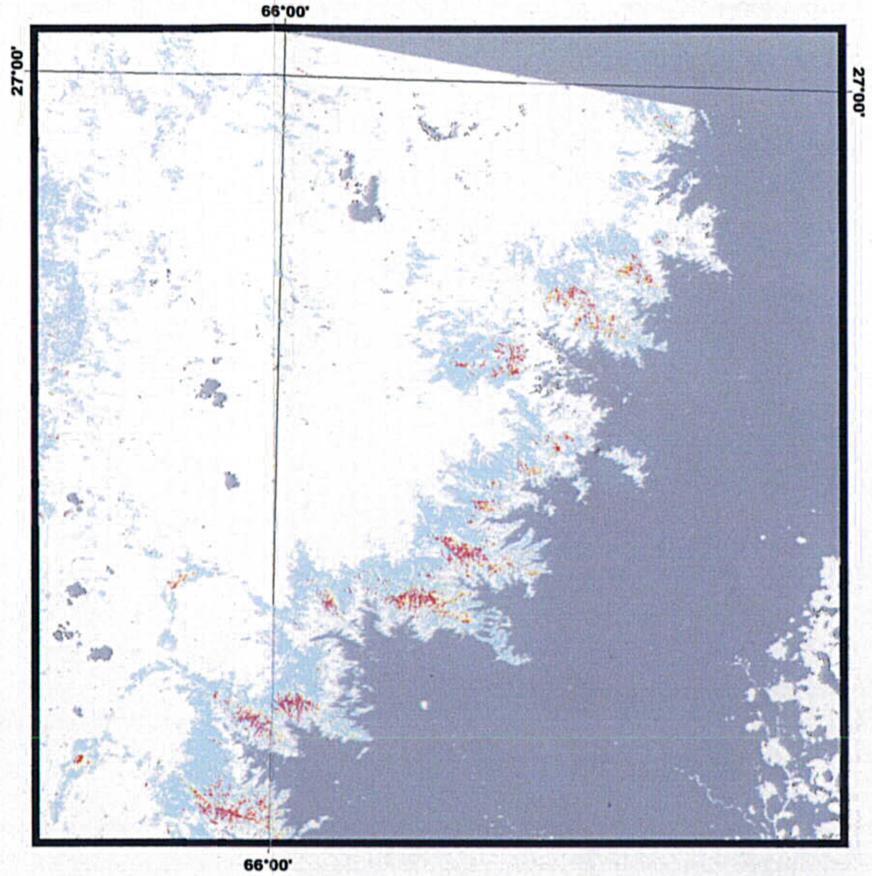
(b) Iso-grain model mineral identification (Ser)



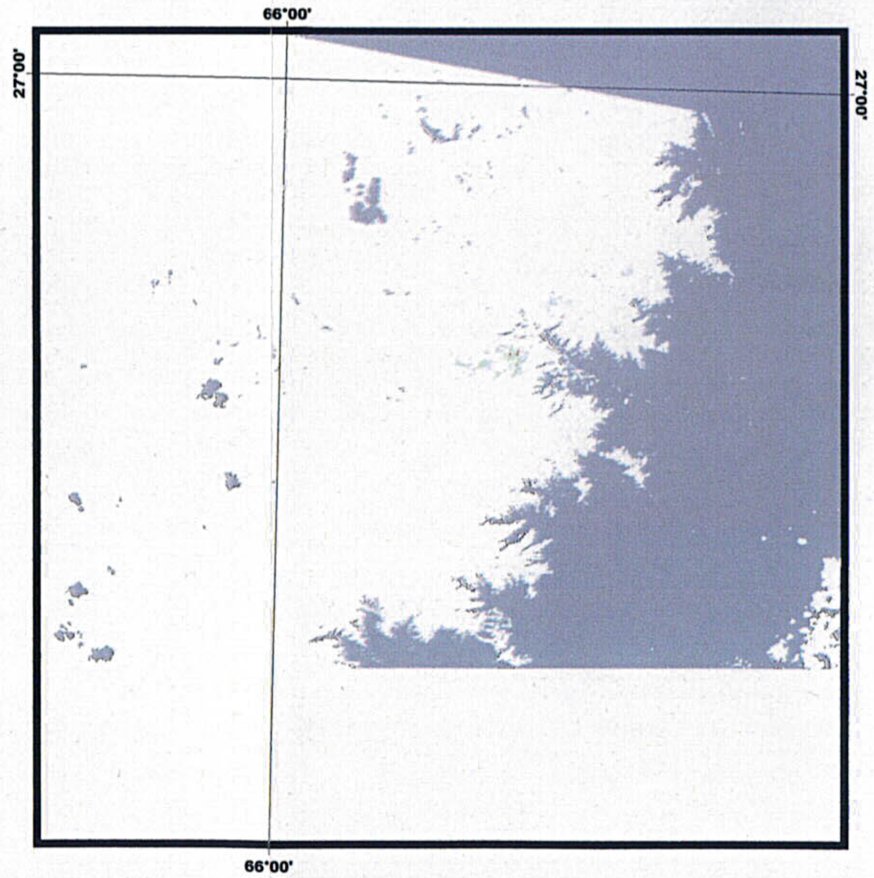
(c) Iso grain model mineral identification (Chl)



(d) Iso-grain model mineral identification (Kao)

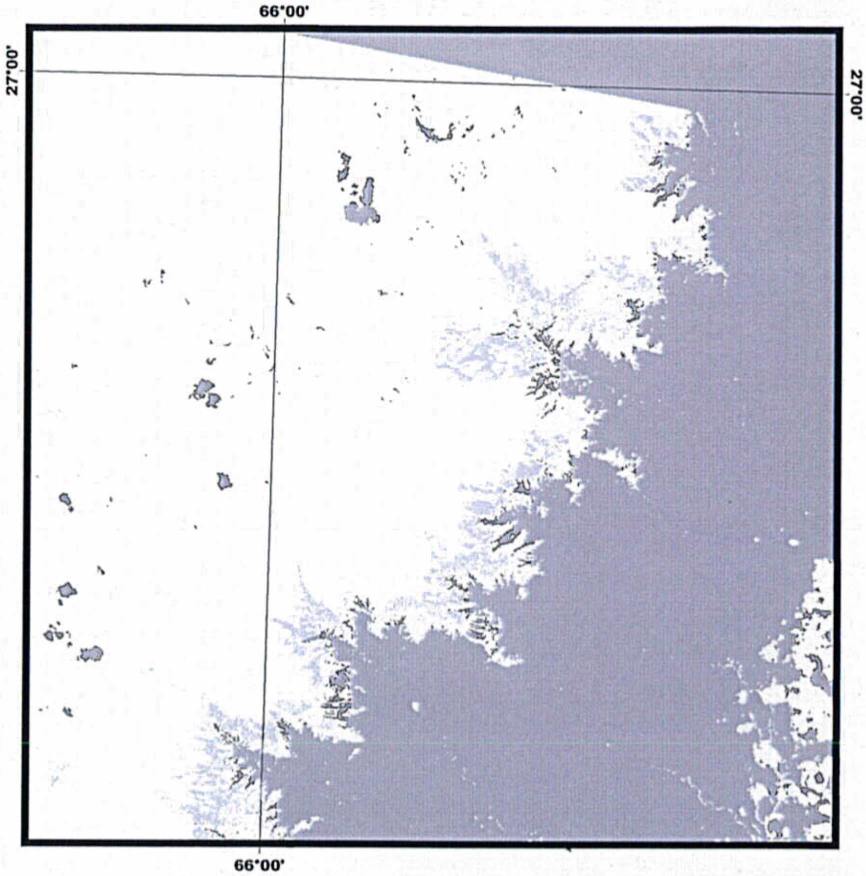


(e) Iso-grain model mineral identification (Goe)

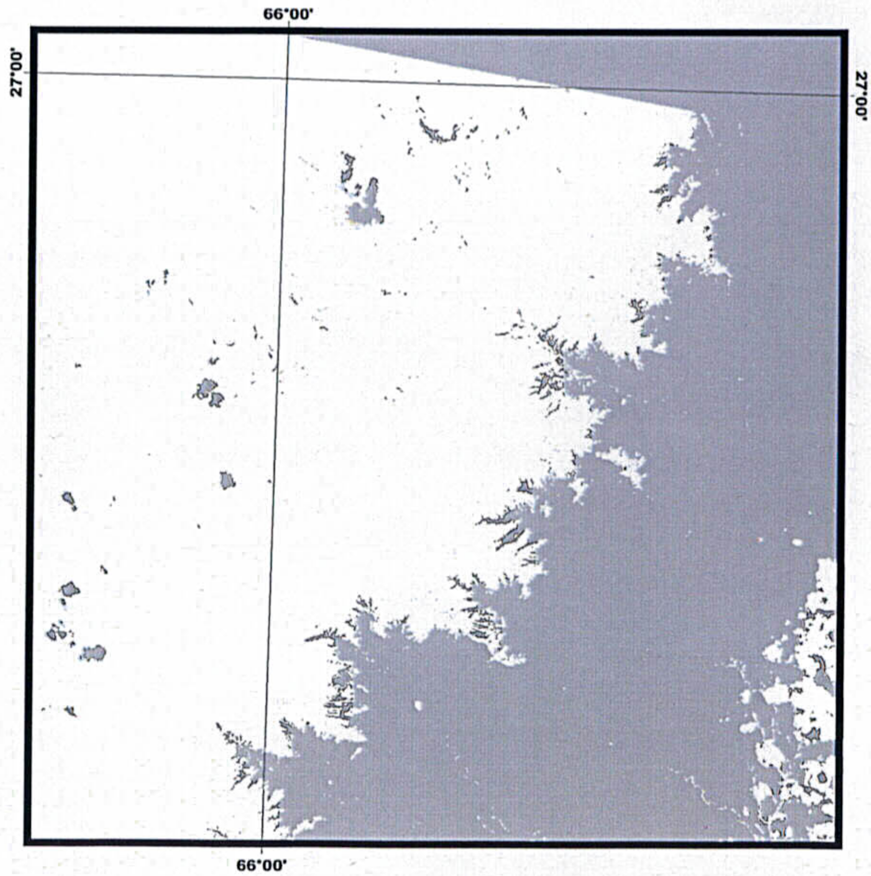


(f) Iso-grain model mineral identification (Jar)

Fig. II-4-2-2-2-3 ASTER image analysis of alteration zones in the El Pago area (a)



(g) Iso-grain model mineral identification (Epi)



(h) Iso-grain model mineral identification (Aln)

Fig. II-4-2-2-2-3 ASTER image analysis of alteration zones in the El Pago area (b)

7) Survey results

X-ray analysis was made for 10 rock samples provided by SEGEMAR Tucumán branch office, our counterpart in the last year. This year, site survey was carried out mainly for an old mine (Mina Rica) situated in the northern part of this zone and alteration zones in the northwestern part, and samples were collected. The number of collected samples is 17 in total. (The breakdown of analyses and tests is as follows: 15 geochemical analyses, one ore analysis, 13 X-ray analyses, 18 rock thin-section assessments and 4 ore polished thin-section assessments). In addition to geochemical analysis of 15 rock samples provided by SEGEMAR Tucumán branch office last year, data on analysis of rock geochemical samples and on alteration of rock samples, obtained by SM during the 1970s, was input in GIS and analyzed together with results of geochemical analysis and X-ray analysis in this investigation.

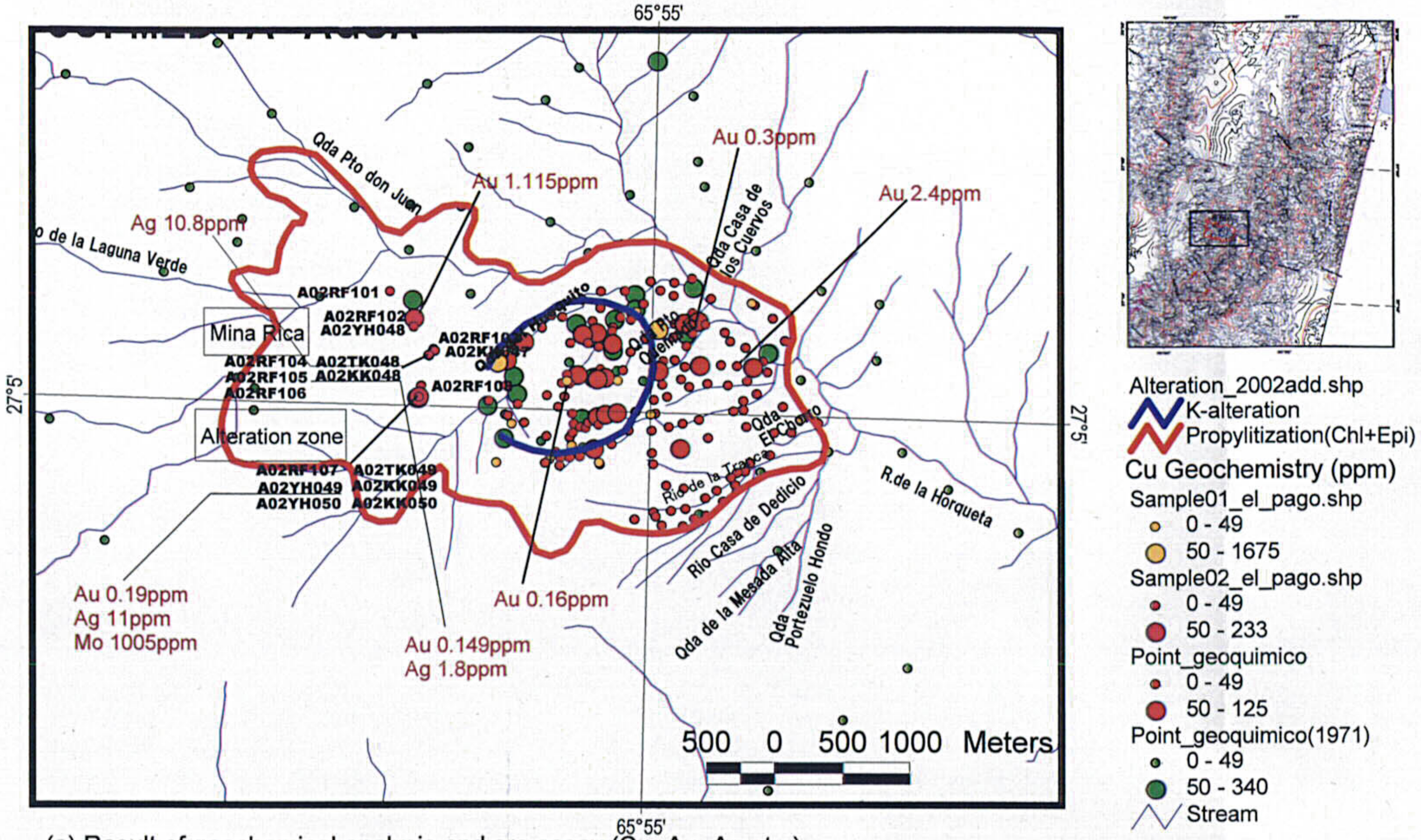
The old mine in Mina Rica was cut on the steep slope of the mountain (at about 3,770 m above sea level) and used for prospecting by drift of quartz stringers/networks in gneiss belonging to the Precambrian Piscoyacú complex The drift was excavated about 10 m along veins. Veins have strike and dip of N72°W, 78°S, and width of 50 to 70 cm. Sulfide mineral (mainly pyrite) is observed in quartz veins. As a result of analysis of vein samples, Au 0.01 g/t, Ag<1 g/t and Cu 0.01% were obtained (width of collection: 65 cm; Sample: A02RF104). In the results of analysis of ore samples, which had fallen near the pit mouth, Au 0.149 g/t, Ag 1.8 g/t (Sample A02KK048), Au 0.065 g/t, Ag 10.8 g/t (Sample A02TK048) etc. were obtained. As a result of microscopic observation of ore polished thin-sections, pyrite, goethite and small quantities of pyrrhotite and sphalerite were recognized in quartz veins (Samples A02RF104, A02RF105 and A02RF106). Wall rock around veins suffers strong silicification and argillization. In the results of X-ray analysis of alteration zones on upper bedrock of a vein, quartz, sericite, and trace quantity of chlorite and jarosite were detected (Samples A02RF105 and A02RF106). In the results of geochemical analysis of altered rock samples at the point about 300 m north of this old mine, values of Au 1.115 g/t, Ag<0.5 g/t and Cu 79 ppm were derived (Sample A02RF102). From the X-ray analysis test of altered rock (gneiss) around the said point, quartz sericite and small to trace quantities of chlorite, limonite and others were detected.

In this zone, alteration zones have been widely extracted in ASTER image analysis, as mentioned above. These alteration zones are distributed on the steep slopes of mountains, and, as far as we observed in the actual place, there were many parts that were difficult to access. Site investigation of the north end part of the western alteration zone is carried out. This alteration zone is mainly located in gneiss. The following results of geochemical analysis were obtained from a collected rock sample (Sample A02YH049): Au 0.191 g/t, Ag 11 g/t, Cu 104 ppm and Mo 1,005 ppm as the highest values. In the results of X-ray analysis of this part, quartz and sericite were the main compornents while small to trace quantities of chlorite and goethite were recognized, and alteration corresponded to phyllic-argillic alteration.

From the combination of results of X-ray analysis this year and the results of alteration analysis carried out by SM during the 1970s, the following state of output of alteration zones was recognized: (1) Alteration zone (phyllic - argillic type alteration and propylite type alteration) mainly consisting of quartz, sericite, chlorite and clay mineral on the ground surface in the area of 4 km x 2 km. Distribution of both types of alterations overlaps. (2)Around the center of these, potassic alteration zones are distributed where potassium feldspar (±biotite) is recognized (according to materials of the 1970s). (3) In alteration zones in this zone, there are places where quartz stringers/networks are contained, and silicified zones are distributed around them. Quartz veins are considered to be mainly E - W oriented. Gold is partly contained in quartz veins. (Fig. II-4-2-2-2-4 Survey results in the El Pago area)

8) Comments

- In The El Pago area, propylite alteration zones and phyllic - argillic alteration zones overlapping them are distributed in a wide area, and potassic alteration zones are distributed in the central part of hydrothermal alteration zones. Quartz stringers/networks exist partly in them, and it is considered that gold is contained there.
- Around this zone, porphyry deposits such as Agua Rica and Filo Colorado are known. It is assumed that these were formed in relation to dacite/andesite intrusive rock of the Neogene. These deposits or mineralized zones run linearly in the NE -SW direction, and in the middle part of and on the extension line of them, alteration zones have been detected from ASTER image analysis, which is considered to indicate the existence of a tectonic line that controlled mineralization and alteration.
- The El Pago area is located in the Sierra del Aconquija Mountains and has been scarcely investigated systematically so far due to limited accessibility. Therefore, this zone is still left as a virgin area, and according to the results of investigations and analysis of this year, it seems to have the possibility of being a predominant prospecting area of porphyry deposits depending on the procedure of future systematic investigation.



(a) Result of geochemical analysis and ore assay (Cu, Au, Ag etc.)

Mina Rica

A prospecting tunnel (about 10 m) dug in 1988 was investigated in the field. It follows a zone of quartz veinlet/network of N72°W, 78°S in the strongly alterated gneiss (Precambrian).

Socabo'n

Hanging wall alteration (silicification-sericitization -argillization)

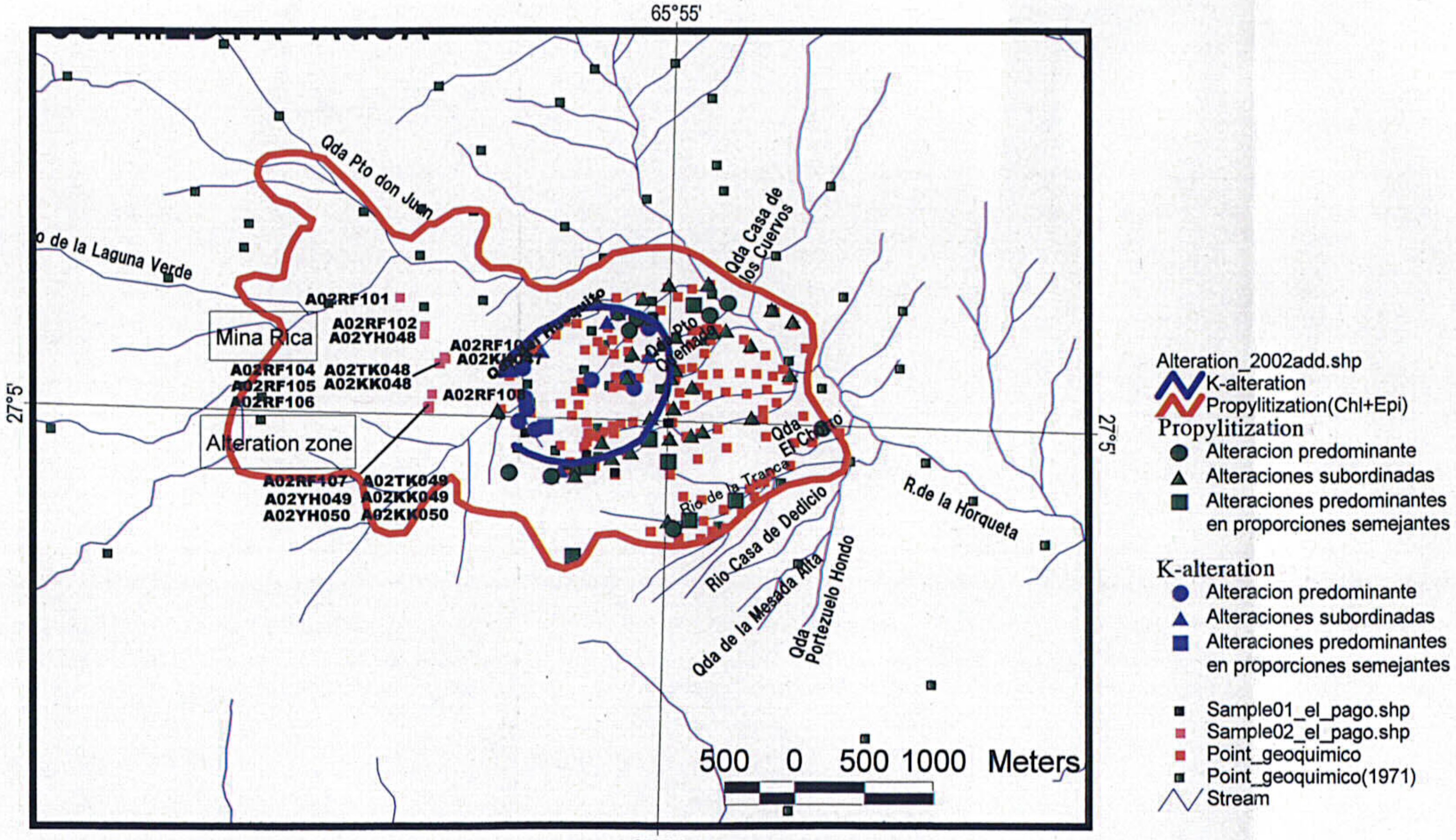
Quartz with some sulfide minerals (pyrite, pyrrhotite, sphalerite) and goethite.

Quartz veinlet/network zone (wd= 65 cm)

Alteration Zone

Broad alteration zones were detected by the ASTER image analysis. A couple of the alteration zones were surveyed in the field.

Some samples were collected from the alteration zones. The alteration minerals detected by the X-ray analysis are: quartz, sericite, chlorite, goethite. It corresponds to the phyllic-argillic alteration.



(b) Result of alteration mapping (K-alteration, propylitization)

Fig.II-4-2-2-2-4 Results of the survey in the El Pago area

(3) Rachaite area

1) Location and access

The Rachaite area is located at lat. 22º52' S, long. 66º08' W, 3,600 m - 4,000 m above sea level. This place is located about 60 km directly west from Abra Pampa, and about 45 km south of Rinconada. Administratively, it is under Departamento de Rinconada in Jujuy State. The Rachaite area is reached by going from Abra Pampa on unpaved State Road 74 by a 4-wheel-drive car, and going south 4 km along Quebrada Liviala, on the east side of Rachaite village. The mileage is 58 km, and it takes about one- and -a-half hours to get there. (Fig. II-4-2-2-3-1 Location map of the Rachaite area)

2) Mining concessions

The following mining areas are established in and around the place of the Rachaite area:

- Mining Area No. 546-S-1979 (Chocaya, Mining-right holder: Carlos Silva)
- Mining Area Nos. 109 - O - 1997 and 110 - O - 1997 (Opawica Min. Ar. SA), 276 - W - 1997 and 277 - W - 1997 (Mario C. Rojo)
- Prospecting Area Nos. 096 - O - 1997 (Opawica Min. Ar. SA), 113 - R - 1997 (RTZ Min. Exp. Ltd.)

(Fig. II-4-2-2-3-2 Situation of concessions in the Rachaite area)

3) Past exploration and mining activities

There is a record that lead and zinc were produced during the 1950s, but details are unknown.

4) Geology and geologic structure

According to "Mina Pirquitas," a geological map on a scale of 1 to 250,000, the geology of this zone consists of Coranzuli volcanic complex of the Tertiary Miocene. A place of mineral showings is located about 25 km northeast of Coranzuli caldera. Coranzuli volcano is a caldera of about 5 km in diameter, which is characterized by eruption of dacitic ignimbrite; it was formed by the eruption of ignimbrite, which occurred three times (5 Ma). On the other hand, Cerro Rachaite was formed in the early stage of a series of volcanic activities. The Rachaite place of mineral showings is located in the southern part of Cerro Rachaite and is made up of dacite lava formed in the early stage of volcanic activities (8 - 9 Ma). The whole southwestern part from the Rachaite place of mineral showings to Cerro Coranzuli is widely covered by ignimbrite. (Fig. II-4-2-2-3-3 Geologic map of the Rachaite area)

5) Mineralization and alteration

In this region, alteration zones extending from south to north parallel to Quebrada Liviala exist in two places, east and west. The eastern alteration zone has a length of about 3 km from south to north and the greatest width of 700 m from east to west. It forms a small, steep mountain with relative height of about 200 m, sandwiched by southern and northern streams. This zone is subjected to white argillized alternation and limonitic alteration. White argillized rock can be relatively clearly

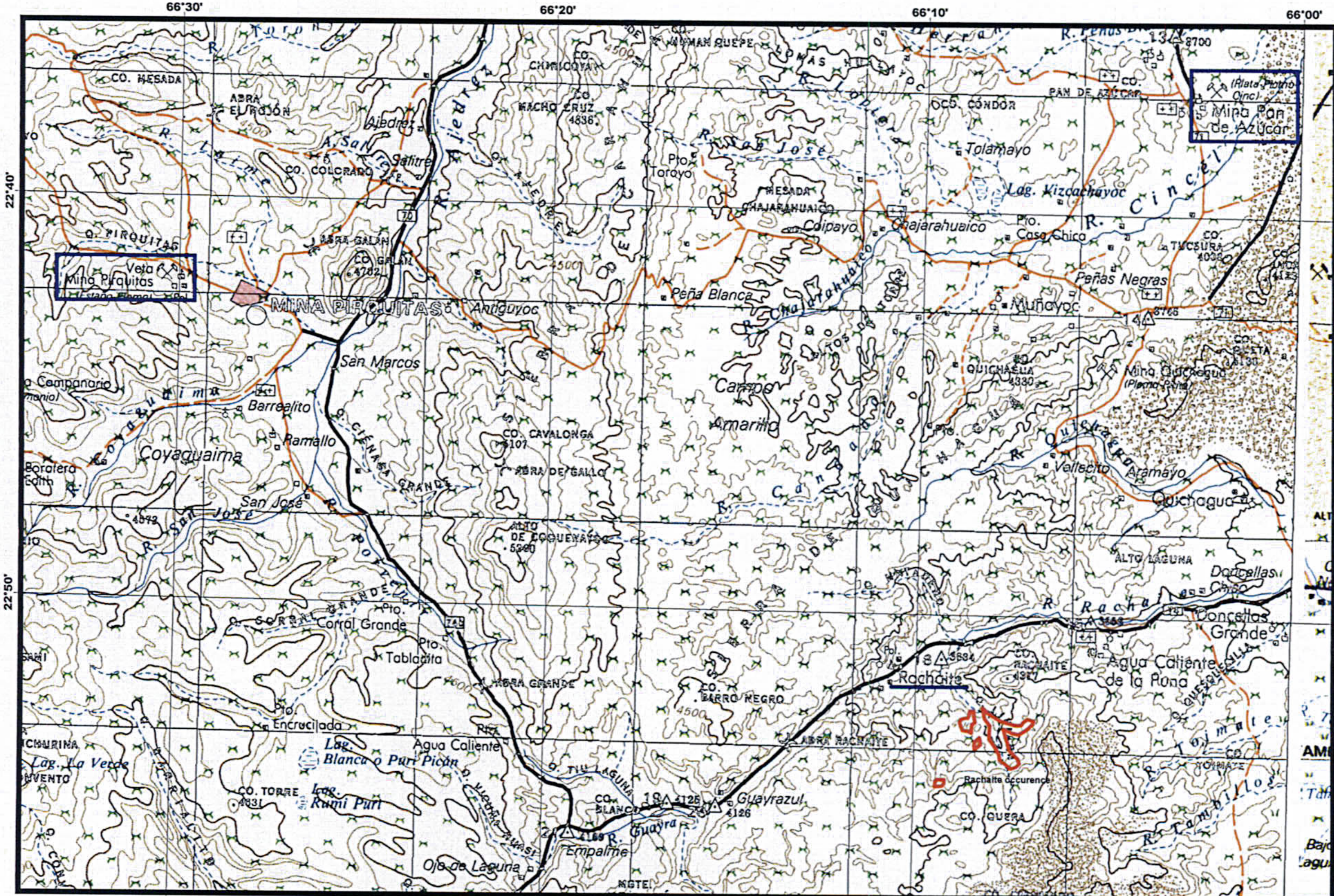


Fig. II-4-2-2-3-1 Location map of the Rachaite area

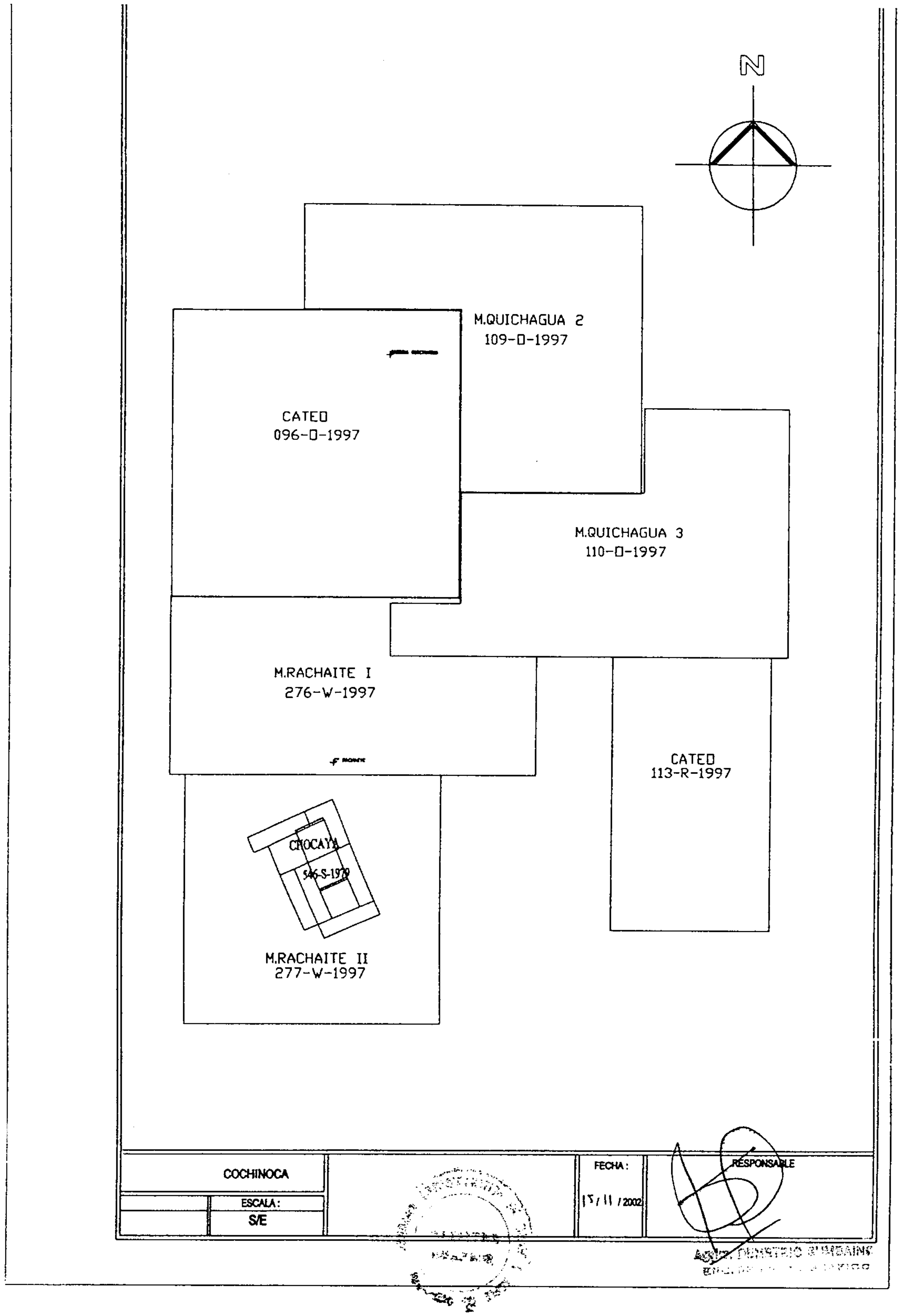
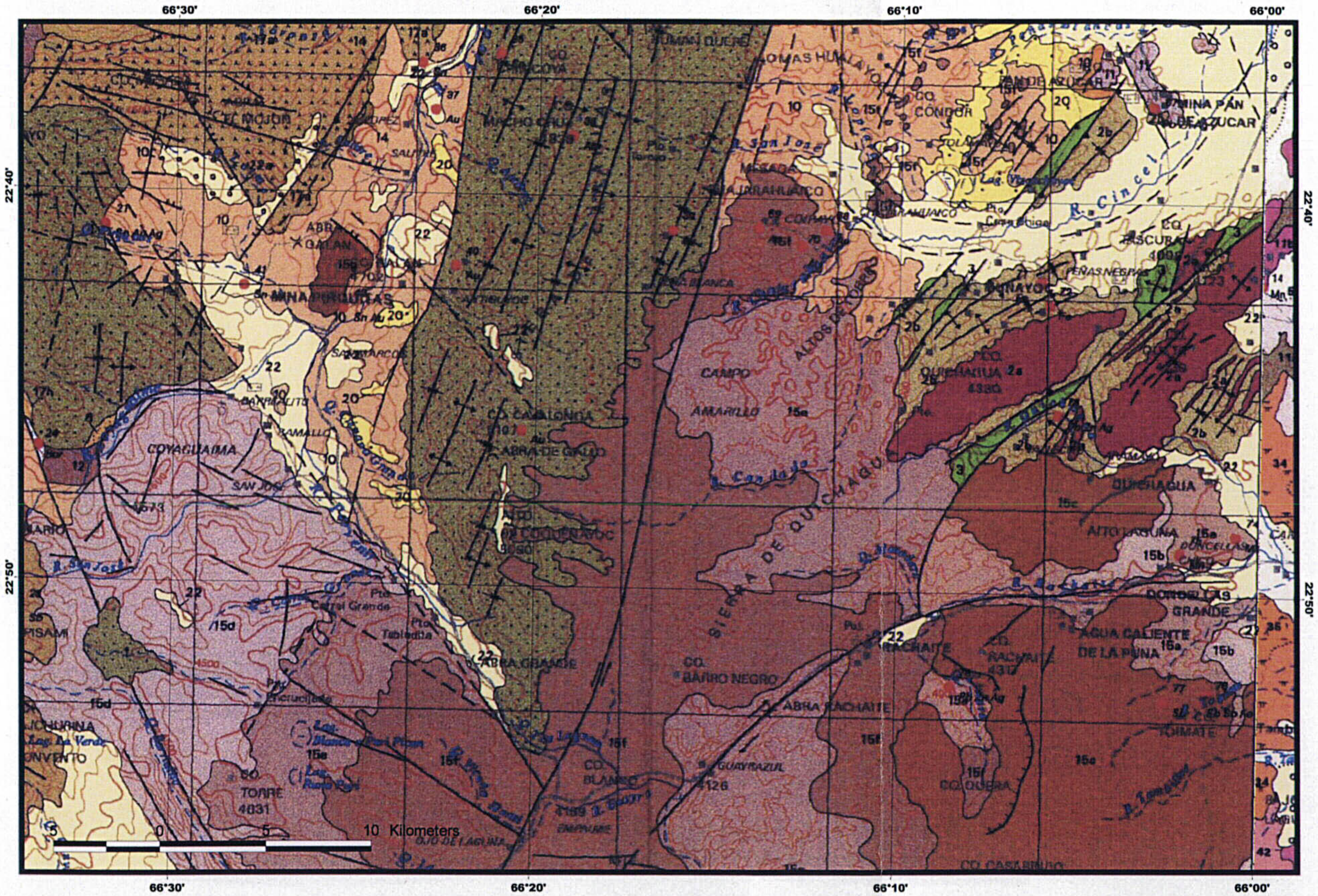
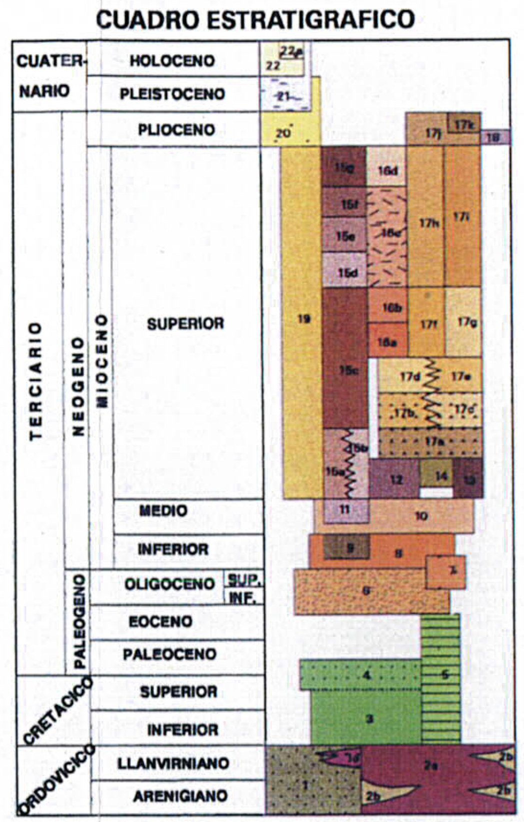


Fig. II-4-2-2-3-2 Status of mining concessions in the Rachaite area





10 FORMACIÓN TIOMAYO. Areniscas, limolitas, arcilitas, niveles conglomerádicos, rocas volcaniclásticas y piroclásticas.

9 COMPLEJO VOLCANICO DOMICO CASA COLORADA - MINUYOC. Complejos volcánicos piroclásticos lávicos dacíticos.

8 FORMACION CABRERIA. Conglomerados, areniscas conglomerádicas con ignimbritas y depósitos volcaniclásticos intercalando hacia el techo.

7 FORMACION MORETA. Areniscas medianas, lutitas, conglomerados.

6 FORMACION PEÑA COLORADA. Areniscas, calizas y arcilitas.

5 GRUPO SALTA indiferenciado. Areniscas, calizas y arcilitas.

4 SUBGRUPO BALBUENA (Formación Yacoraite). Arenicas calcáreas, calizas, margas y lutitas.

3 SUBGRUPO PIRGUA. Areniscas, limoarcilitas y escasos conglomerados.

2 COMPLEJO MAGMATICO - SEDIMENTARIO COCHINOCA - ESCAYA. a) Facies magmáticas (volcánicas y subvolcánicas): lavas espilíticas, brechas autoclásticas, domos y rocas volcaniclásticas dacíticas riolíticas. b) Facies sedimentarias: areniscas, limolitas y lutitas.

1 FORMACION ACOITE. Facies sedimentarias: areniscas, limolitas y lutitas.
a) volcanitas y volcaniclásticas del borde occidental.

16 COMPLEJO VOLCANICO PANIZOS:
d) Dacita Panizos. Lavas dacíticas.
c) Ignimbrita Panizos. Ignimbritas de enfriamiento simple y compuesta dacíticas.
b) Ignimbrita Ciénaga. Flujos piroclásticos pumíceos y depósitos de caída dacíticos.
a) Dacita Limitayoc. Lavas dacíticas.

15 COMPLEJO VOLCANICO CORANZULI:
g) Dacita Coranzuli. Lavas dacíticas.
f) Ignimbrita Las Termas. Flujos piroclásticos pumíceos dacíticos.
e) Ignimbrita Potreros. Flujos piroclásticos pumíceos dacíticos.
d) Ignimbrita Abra Grande. Flujos piroclásticos pumíceos dacíticos.
c) Formación Vicuñahuasi. Lavas y brechas autoclásticas de composición esencialmente andesítica y representantes subvolcánicos.
b) Formación Alto Laguna. Ignimbrita dacítica-riodacítica.
a) Formación Doncellas. Tobas brechosas, brechas y aglomerados volcánicos andesíticos.

14 IGNIMBRITA OROSMAYO. Flujos piroclásticos pumíceosdacíticos con menores depósitos de oleadas piroclásticos.

13 COMPLEJO VOLCANICO PAIRIQUE. Lavas, ignimbritas y brechas dacíticas y andesíticas.

12 COMPLEJOS VOLCANICOS ANTIGUOS TOLOMA - PAMPA BARRENO. Lavas e ignimbritas dacíticas.

11 COMPLEJO VOLCANICO DOMICO LAGUNA DE POZUELOS. Complejos piroclásticos lávicos dacíticos.

22 DEPOSITOS ALUVIALES-COLUVIALES RECIENTES: a) Materiales de derrumbes y deslizamientos. Gravas, arenas, limos y arcillas.

21 DEPOSITOS LAGUNARES Y EVAPORITAS: Limolitas, arcilitas, menores areniscas.

20 DEPOSITOS ALUVIALES-COLUVIALES MODERNOS: Conglomerados, areniscas y menores limoarcilitas.

19 FORMACION PUERTAS DE SAN PEDRO. Conglomerados, areniscas y aglomerados volcánicos.

18 COMPLEJO VOLCANICO LA PACANA. Ignimbrita Atana, ignimbrita dacítica.

17 COMPLEJO VOLCANICO VILAMA:
k) Ignimbrita Pululus, ignimbrita en escudo de composición dacítica.
j) Conjunto lávico de los Cerros Tinte, Campanario, Granada, Caucani, San Pedro y Zapaleri. Lavas dacíticas a andesíticas.
i) Ignimbrita Bonanza. Flujos piroclásticos pumíceos dacíticos.
h) Lavas del Cerro Morado. Flujos lávicos y conos de ceniza andesíticos.
g) Ignimbrita Zapaleri. Ignimbrita dacítica.
f) Conjunto lávico temprano de los Cerros Bayo, Brajma, Salle y Orosmayo. Lavas de composición dacítica y andesítica.
e) Ignimbrita Coja Grande. Ignimbrita andesítica.
d) Ignimbrita Salle. Flujos ignimbríticos andesíticos.
c) Ignimbrita Capaderos. Ignimbrita dacítica.
b) Ignimbrita Vilama. Ignimbrita dacítica.
a) Ignimbrita Granada. Flujos piroclásticos pumíceos de composición dacítica con menores depósitos de oleadas piroclásticas asociadas y reducidas unidades piroclásticas de caída.

Fig. II-4-2-2-3-3 Geological map of the Rachaite area
(Carta geologica de la Republica Argentina 1:250,000, Mina Pirquitas)

distinguished from surrounding dacite and andesite. Andesite with no or weak alteration is dark black in color and has clear phenocryst (plagioclase, quartz and amphibole). White dacite is brecciated, and the matrix is filled up with limonite. By the naked eye, dark mineral does not remain, and argillized plagioclase phenocryst is observed. According to results of X-ray analysis, both dacite with plagioclase completely replaced by clay mineral (sericite, sericite/montmorillonite mixed-layer mineral, chlorite, kaolin, etc.) and dacite with part of plagioclase still remaining are recognized. Altered andesite is intruded by andesite veins presenting dark color to green. In dacite, N-S oriented fine fractures develop, which are filled up by limonite stringers. Near the mountaintop, a limonite layer considered to be recent is formed and iron is leached by acidic epithermal water sediments. There is an old mine (formerly a prospecting one) at the north end of the alteration zone in the east side. The direction of the gallery is N10°W, and it appears that lead/zinc stringers were prospected by drift. In waste, there is mixture of quartz veins containing galena/sphalerite. In the results of microscopy in the first year, disseminated - networked pyrite, coarse-grained sphalerite, small quantity of galena, arsenopyrite, and, as gangue, calcite and quartz were observed. In the results of ore analysis, the following values were obtained: Au 0.04 g/t, Ag 142 g/t, Pb 1.71%, Zn 2.5% （A01KN088), Au 0.025 g/t, Ag 2.5 g/t, Pb 0.18% and Zn 1.22% (A01YH050).

On the other hand, the western alteration zone is exposed on the cliff part along small streams. It has a length of about 1.3 km from south to north and a width of 400 to 500 m, and is subjected to strong white argillized alteration. In the results of analysis of this opaline quartz vein sample in the first year, both Au and Ag values were below the detection limit.

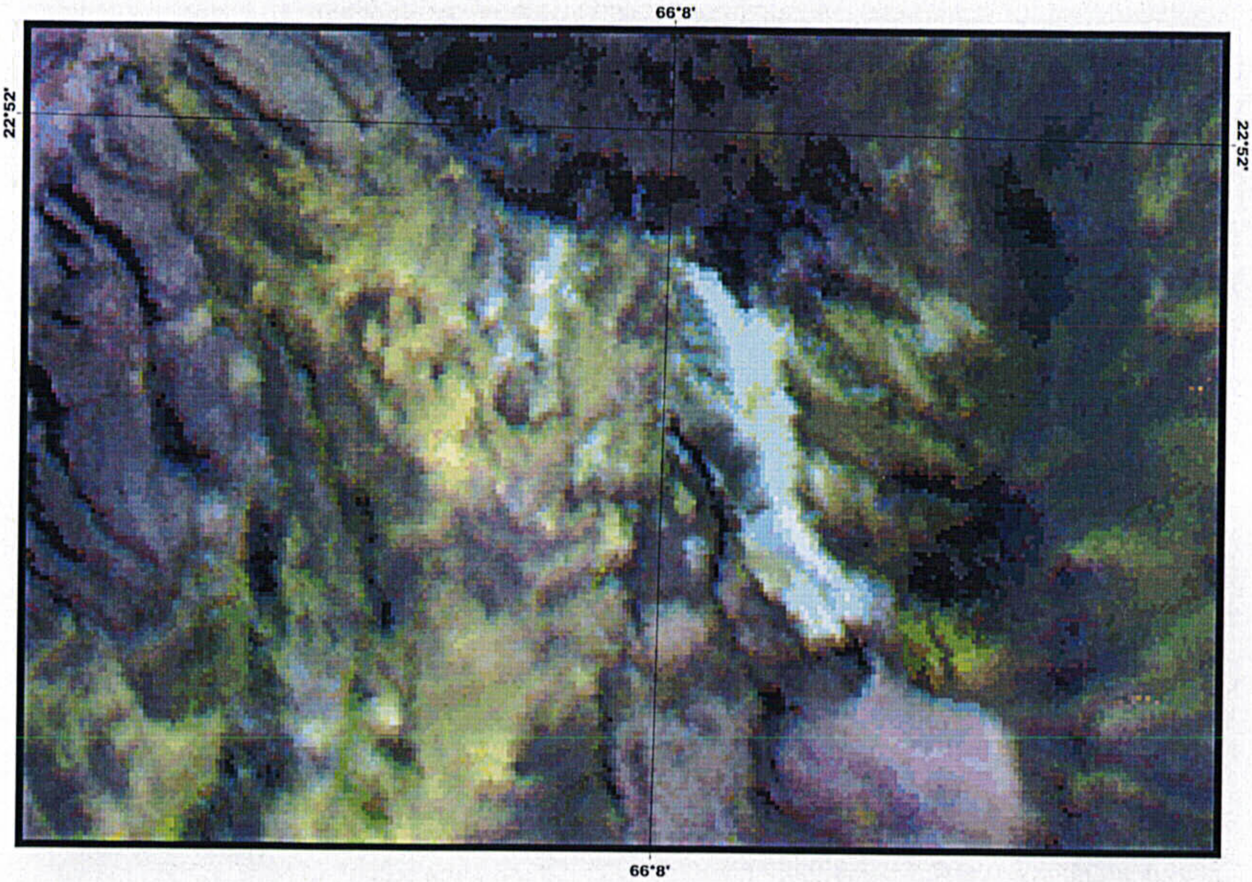
6) Characteristics of the satellite image

Alteration zones detected in this place of mineral showings present white color and can be identified very clearly in the false color image. In the color-ratio composite, strongly abnormal areas consistent with the white part in the false color image were detected. In the results of altered mineral identification with the Iso-grain Model used, the color tone indicating alunite - kaolin acid alteration zones and sericite alteration zones were detected in the same places. The color tone representing goethite and quartz is observed there. (Fig. II-4-2-2-3-4 ASTER image analysis of hydrothermal alteration zones in the Rachaite area)

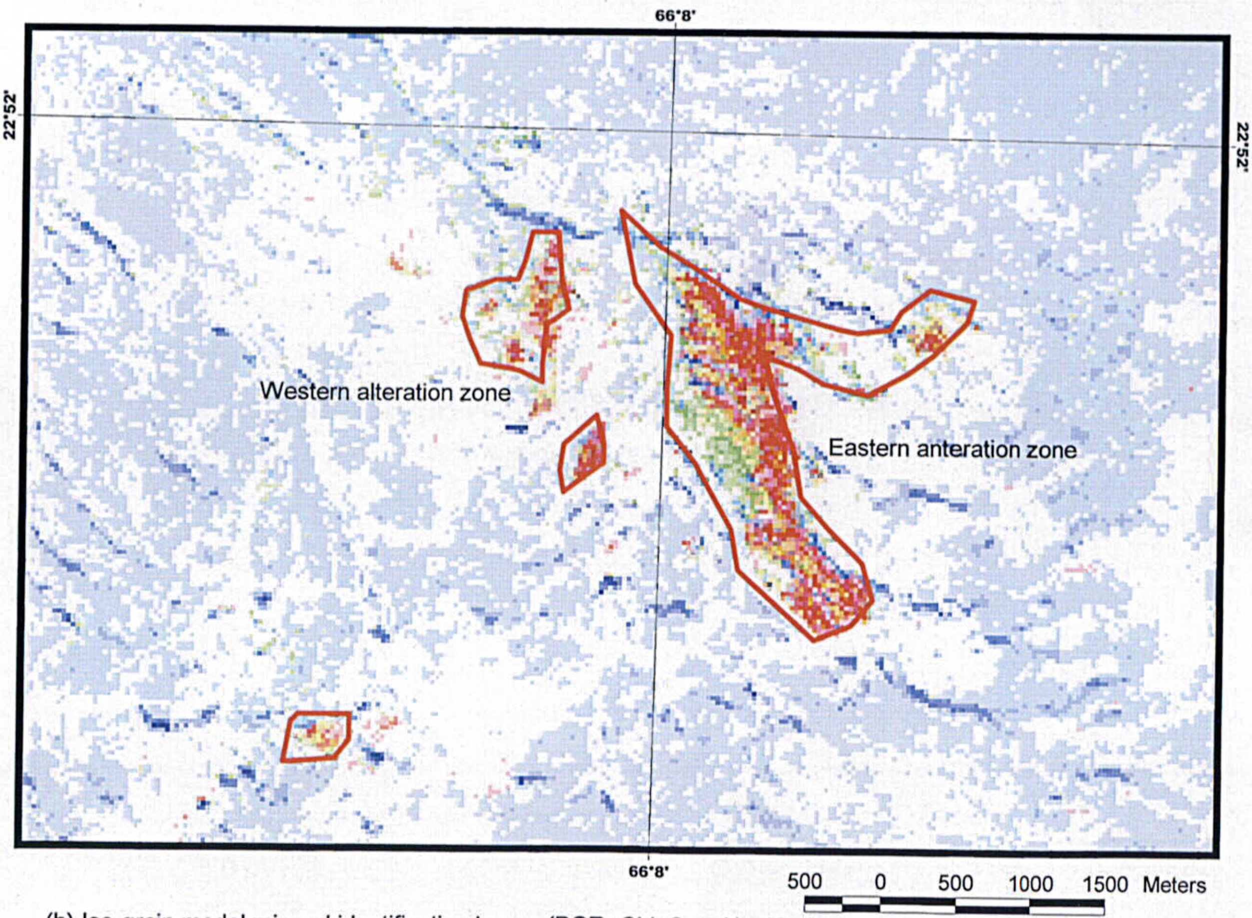
7) Survey results

The phase I survey was carried out mainly regarding the north part of alteration zones (Number of collected samples: 25). This year, site investigation was conducted mainly regarding the south part of east and west alteration zones. The number of collected samples is 30 in total: (10 geochemical analyses, 26 X-ray analyses and 3 rock thin-section identifications).

In the east alteration zone, which is of the largest scale, old mines were cut in several places in the north part, as described in last year’s report, and were used for prospecting by drift of quartz - calcite stringer zones with an almost N - S strike, which contain sulfide mineral. Veins have dacite as



(a) False color image (BGR=147)



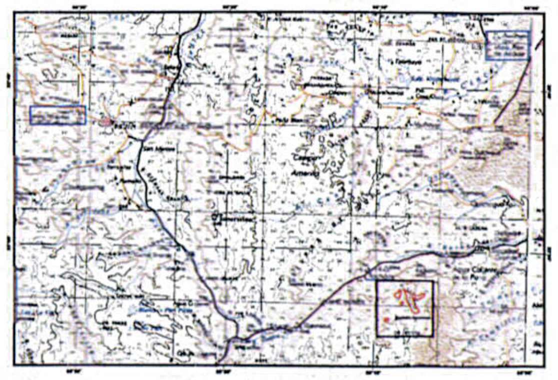
(b) Iso-grain model mineral identification image (BGR=Chl, Ser, Aln+Kao)

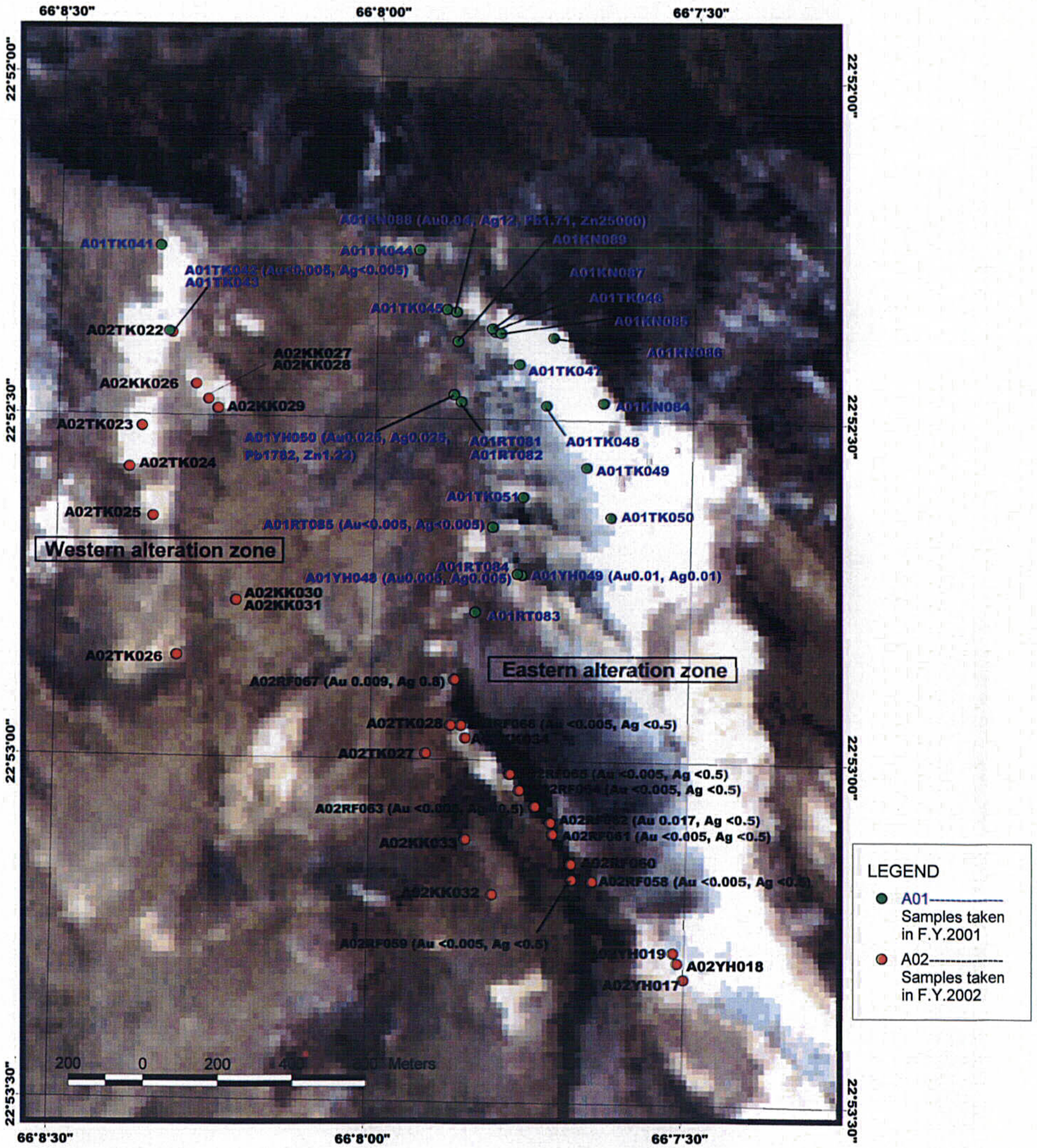
Fig. II-4-2-2-3-4 ASTER image analysis of alteration zones in the Rachaite area host rock and contain mainly pyrite, galena and sphalerite. Silver is contained in sulfide mineral, although quantity is small. The edge of veins is subjected to weak silicification and alteration with sericite as the main. In this year's survey, many places receiving strong silicification - pyritic alteration were found in clay alteration zones of dacite along streams and on ridges. In these places, strong alteration zones made up of quartz, pyrite, gypsum and clay mineral are distributed in the form of an irregular vein with a width of several meters. Parts where quartz veins containing pyrite exist were recognized, although only partly. In the results of analysis of these alteration samples or quartz veins, the values of Au, Ag, Pb and Zn were low; the highest Au value was 0.02 g/t (Sample A02RF062) and the highest Ag value was 0.8 g/t (Sample A02RF067). Namely, though alteration zones in this zone are disseminated by sulfide mineral with pyrite as the main, mineralization of Au, Ag or base metal is weak. According to the results of X-ray analysis of samples collected in this zone, altered mineral has mineral combination of quartz - opaline quartz, sericite, and sericite/montmorillonite mixed-layer mineral, and is accompanied by small to trace quantities of kaolin, jarosite, chlorite, calcite, alunite, pyrophyllite, gypsum and pyrite.

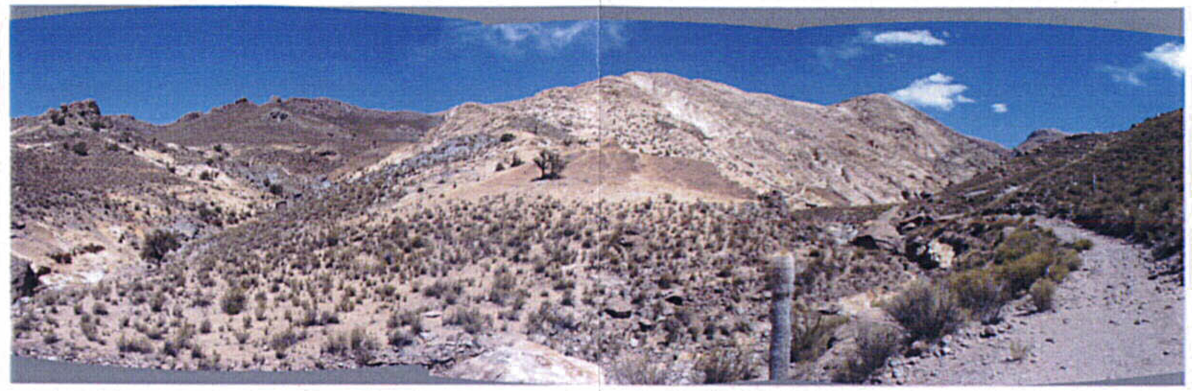
The alteration zone in the west part is basically similar to the alteration zone in the east part, mainly a mineral combination of quartz-opalic quartz, sericite, and sericite/montmorillonite mixed-layer mineral. It is accompanied by small to trace quantities of kaolin, jarosite, chlorite, alunite, pyrophyllite, gypsum and pyrite. (Fig. II-4-2-2-3-5 Survey results in the Rachaite area)

8) Comments

- Ag-Pb-Zn mineralization in the Rachaite area is reserved in Miocene dacite lava, and is considered to be related to a hydrothermal system formed in the relatively early stage of dacitic Coranzuli caldera complex activities, which occurred in the middle to later Miocene.
- In the survey carried out successively from last year's investigation, silicified zones and mineralization/alteration zones where quartz veins were accompanied by mineralization of sulfide mineral with pyrite as the main were newly found in several places in the southern part of the zone. However, no noteworthy grades were derived from the results of analysis of collected samples.
- Considering the results of both last year's and this year's investigations in a comprehensive manner, although strongly acid alteration zones are distributed in this zone, as main sulfide mineral is pyrite, it is judged that mineralization of Ag, Pb and Zn is limited to a very small part of veins only.

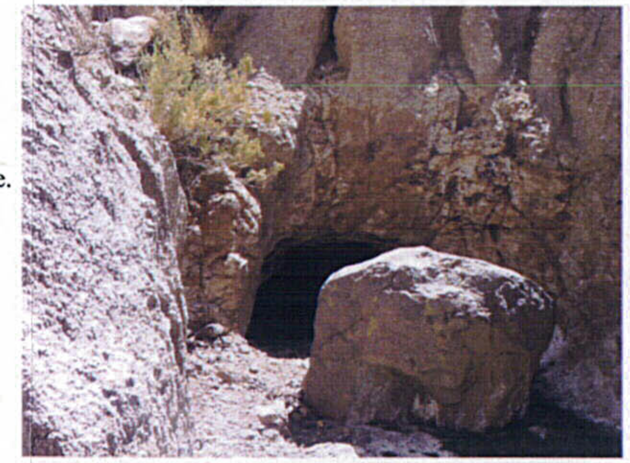






Lachaite alteration zone - Mainly composed of quartz/opal-sericite-sericite/montmorillonite

Several old workings exist within the alteration zone. Those were dug mainly for quartz-spalerite-galena veins containing some Ag.



Strongly altered part (pyrite-clay-gypsum) - Southern part of the Eastern Alteration Zone

Quartz vein found at the southern hill of the Eastern Alteration Zone. Sulfide minerals (mainly pyrite) are observed.

Fig. II-4-2-2-3-5 Results of the survey in the Rachaite area

(4) Cerro Galán area

1) Location and access

This alteration zone is located at lat. 25º52’ S, long. 67º02’ W, about 5,000 m above sea level. This place is administratively under Departamento de San Carlos in Salta State and is located about 40 km directly northeast from Antofagasta de la Sierra, and about 18 km north of Laguna Diamante. The distance is 80 km from El Penón along State Road 43 by driving a 4-wheel-drive car, but depending on the season, travel by car can be difficult. (Fig. II-4-2-2-4-1 Location map of the Cerro Galán area)

2) Mining concessions

Around the Cerro Galán caldera outer-wall, companies such as BHP and RTZ established mining areas during the 1980s and the 1990s. These mining areas are now under the jurisdiction of the state. In the central part of the caldera, Reserva D-216-1996 is established, and no mining area can be made. (Fig. II-4-2-2-4-2 Situation of concessions in the Cerro Galán area)

3) Past exploration and mining activities

In this zone, volcanololgic studies mainly covering ignimbrite were conducted by American and English geologists during the 1980s. Although geological survey and geochemical exploration were carried out by BHP at the end of the 1980s, it is recognized that the results were negative (information of SEGEMAR Tucumán branch office). After that, although it seems that several prospecting companies conducted small-scale investigations, no official records are kept.

4) Geology and geologic structure

Mineral showings is located on the northwestern wall of the Cerro Galán caldera. This caldera is a volcanic caldera complex of about 40 km from south to north and about 25 km from east to west, and develops on Precambrian to Paleozoic basements, which has changed to horst/graven. This horst/graven is controlled by faults, running in the direction of south to north, which are about 20 km distant from each other.

According to "Cachi," a geological map on a scale of 1 to 250,000, and other existing geological materials, the geology around these alteration zones consists of upper Proterozoic schist, phyllite, hybrid rocks (called Pachamama layer and Río Blanco metamorphic rocks), granite - diorite rocks (Silurian, called Ore composite rocks), sandstone/conglomerate rocks (Lower Silurian to Devonian system, referred to as Falda Ciénaga layer), monzonite granodiorite (Devonian?), and dacitic to andesitic lava rocks and ignimbrite of the Neogene Miocene to Pleistocene, which cover them. Basements border Neogene volcanic rocks on a fault with inclination to the east, "Falla del Medio." For Neogene volcanic rocks, age determination and classification are made as follows: dacitic porphyry (Inca Viejo layer, 15 Ma), dacitic - andesitic stratovolcano (Beltrán layer or Tebenquicho layer, 14.5 Ma), Toconquis stratovolcano, Colorado stratovolcano, Pabellon stratovolcano (age of all

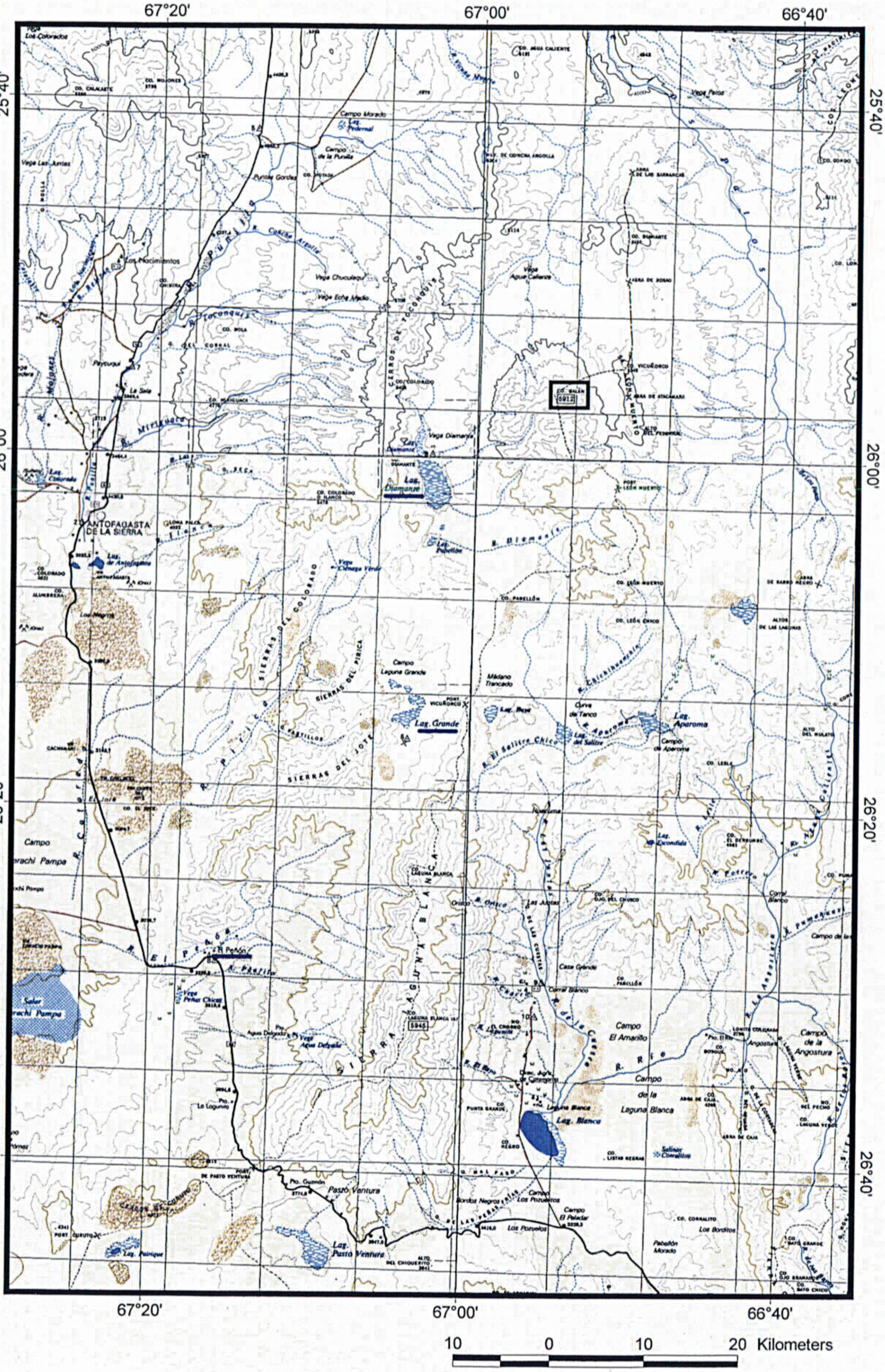


Fig. II-4-2-2-4-1 Location map of the Cerro Galán area

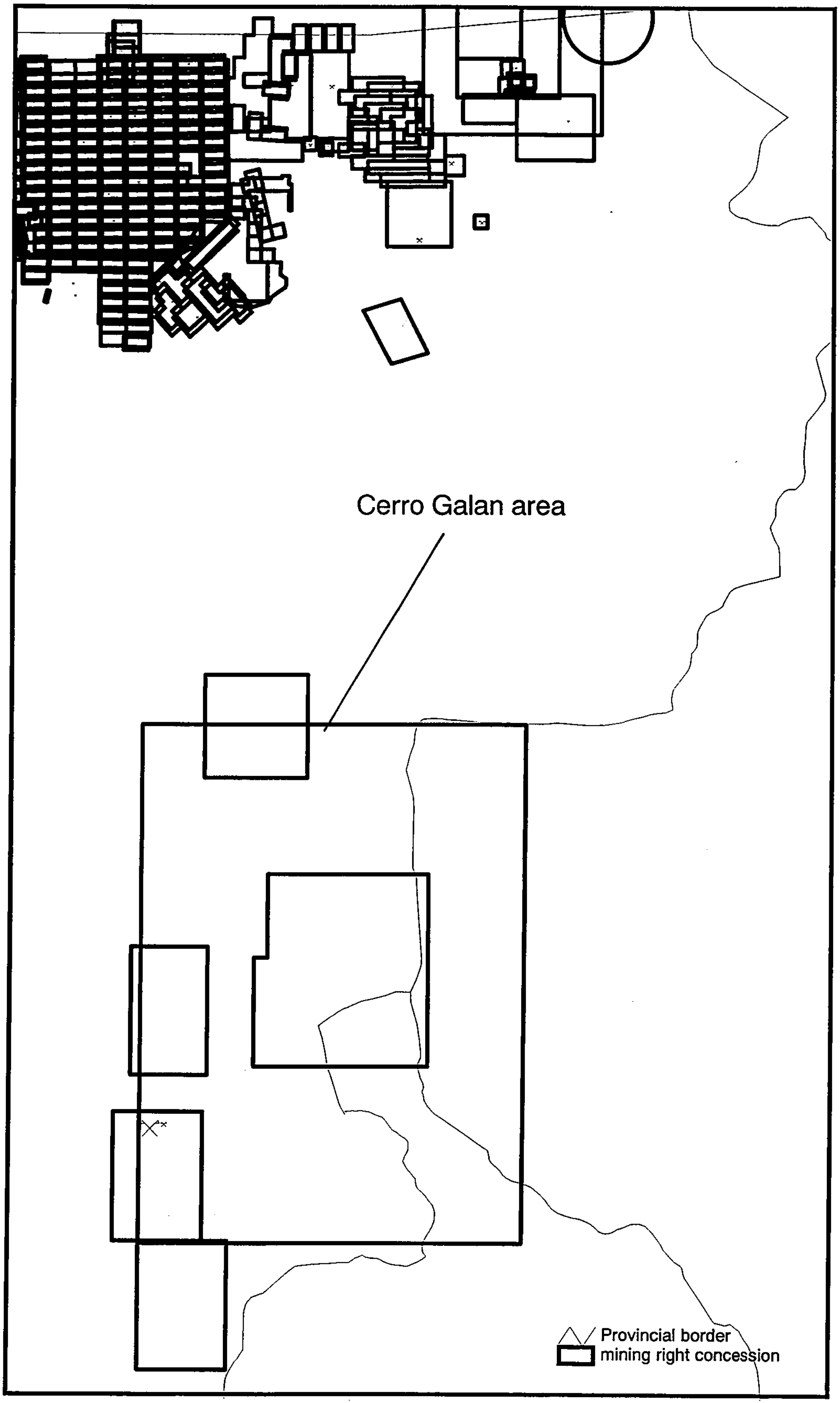


Fig. II-4-2-2-4-2 Status of mining concessions in the Cerro Galán area of which is 7 to 4 Ma), old ignimbrite (such as Real Grande ignimbrite, 6 to 4.2 Ma), and new ignimbrite (Cerro Galán ignimbrite, 2.2 Ma).

Alteration zones in this zone are located on the wall part of the Cerro Galán caldera, as mentioned above. In the central part of the alteration zones, crossing of E-W oriented and NE-SW oriented lineaments is recognized (Is it a fault?). (Fig. II-4-2-2-4-3 Geologic map of the Cerro Galán area)

5) Mineralization and alteration

This alteration zone was found as a result of analysis of alteration zones by the use of ASTER data, but details are unknown because past investigation materials have not been obtained. As mentioned in the section on tectonic structure, however, it is considered, from the fact that a caldera fault and a lineament estimated to be a radial fault crossing it are distributed, that there is the possibility of a hydrothermal alteration zone formed by rise, along the part crossing the fault, of epithermal water accompanying volcanic activity when the caldera structure was formed. Therefore, it was expected that this alteration zone has reserve of epithermal deposits formed by such hydrothermal activity.

6) Characteristics of the satellite image

Several alteration zones have been detected from the Cerro Galán caldera by LANDSAT TM and ASTER image analyses. Most of these alteration zones run along the caldera wall. The largest of them is in the northwest part of the caldera. This alteration zone is about 4 km in diameter and presents the color tone mainly representing the presence of kaolin in the results of altered mineral identification. (Other than this, alteration representing small amounts of alunite, sericite and goethite is recognized.) About 500 m south of this large-scale alteration, a small-scale alteration zone group that shows the color tone representing distribution of alunite and kaolin has been detected. In the western part of Laguna Diamante, indications of alunite, kaolin and sericite are recognized. (Fig. II-4-2-2-4-4 ASTER image analysis of hydrothermal alteration zones in the Cerro Galán area)

7) Survey results

The number of samples collected in the field survey is 37 in total (21 geochemical analyses, 33 X-ray analyses and 4 rock thin-section identifications).

In the result of geochemical analysis of altered rock, almost all of samples had Au<0.005 ppm, Ag<0.5 ppm and Cu 2 - 18 ppm.

In the X-ray analysis test of altered rock, altered mineral made up of a combination of sericite, chlorite and calcite was recognized in many samples. A large quantity of kaolin was recognized in some samples (Samples A02KK041, A02KK045). Only in a very limited number of samples, trace quantities of jarosite (A02KK036, A02KK040) and pyrite (A02YH036) were detected. (Fig. II-4-2-2-4-5 Survey results in the Cerro Galán area)

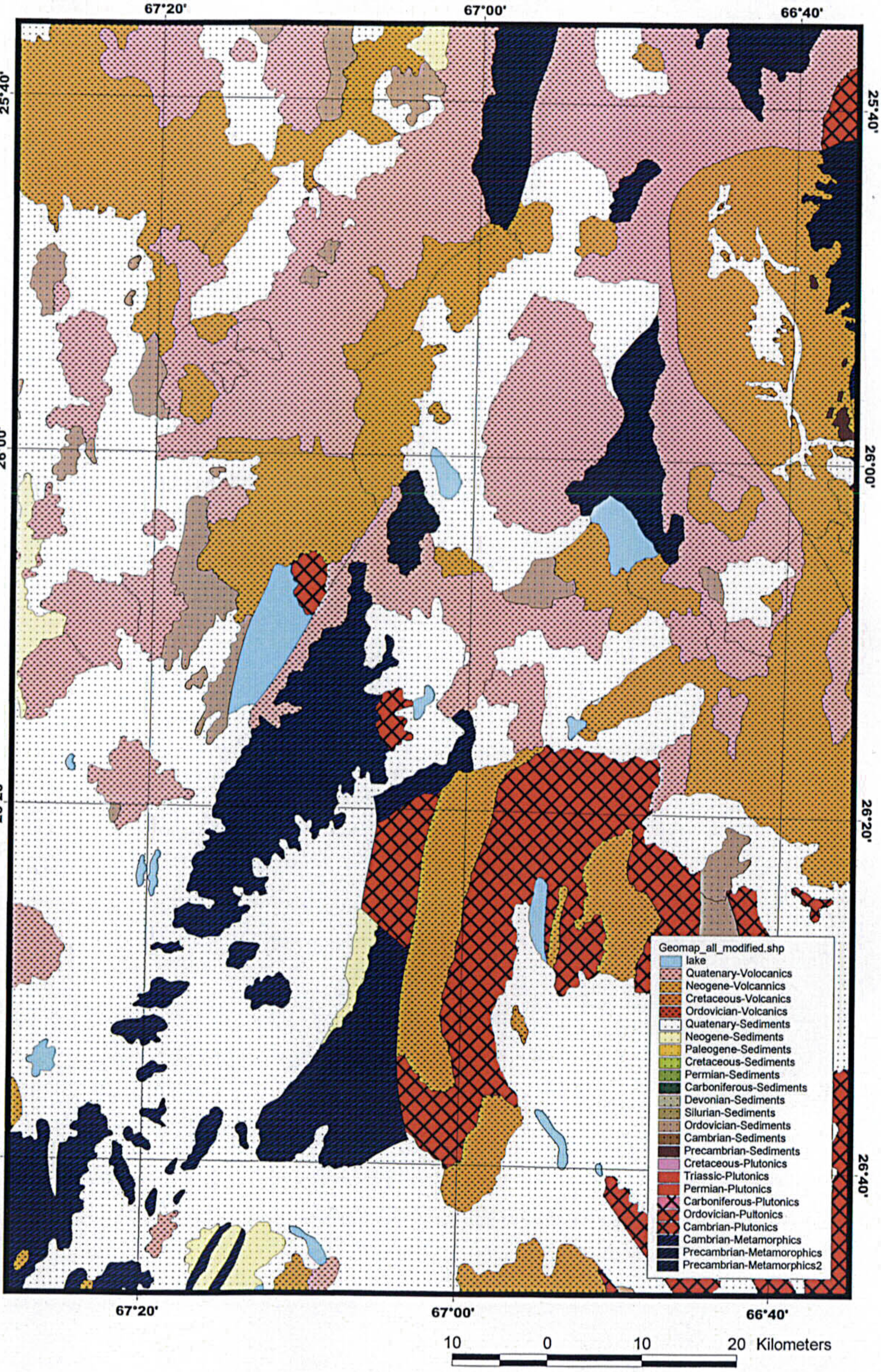
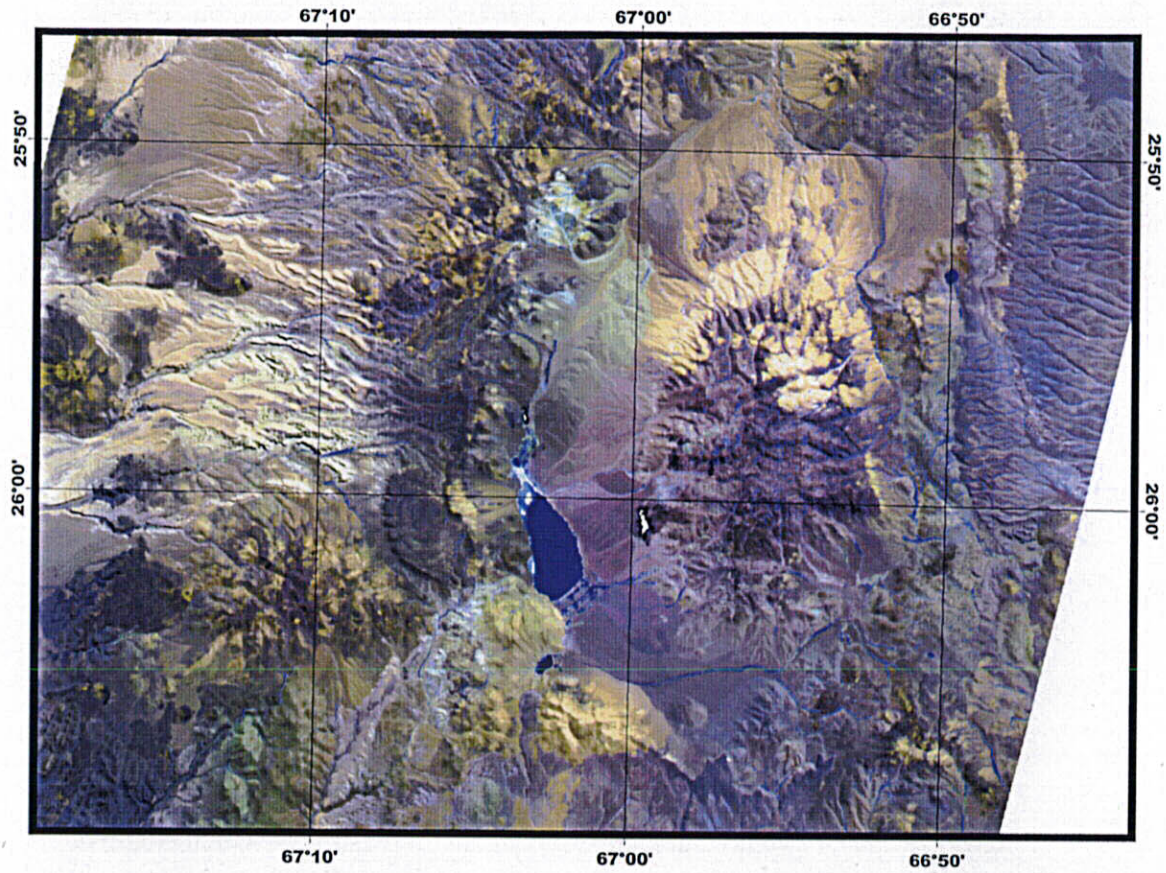
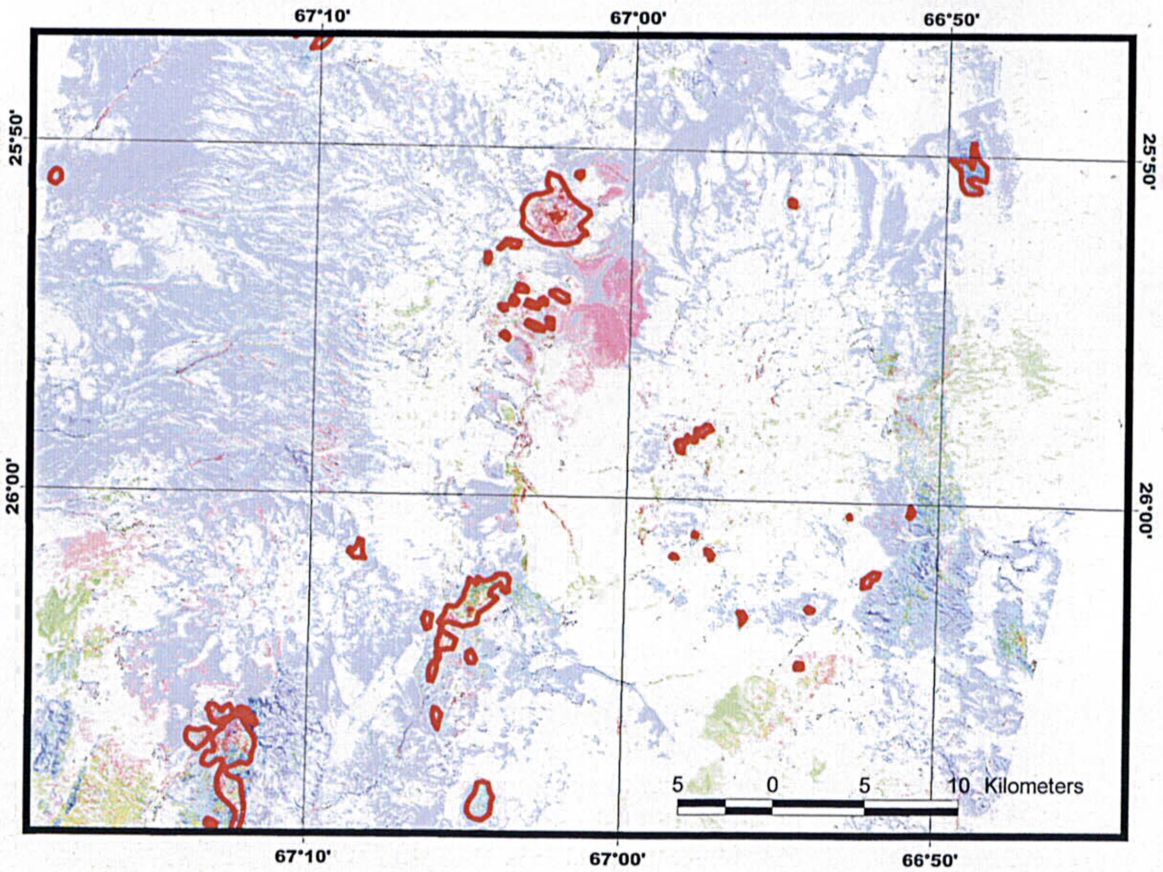


Fig. II-4-2-2-4-3 Geological map of the Cerro Galán area
(Mapa geologico de la provincia de Catamarca 1:500,000)

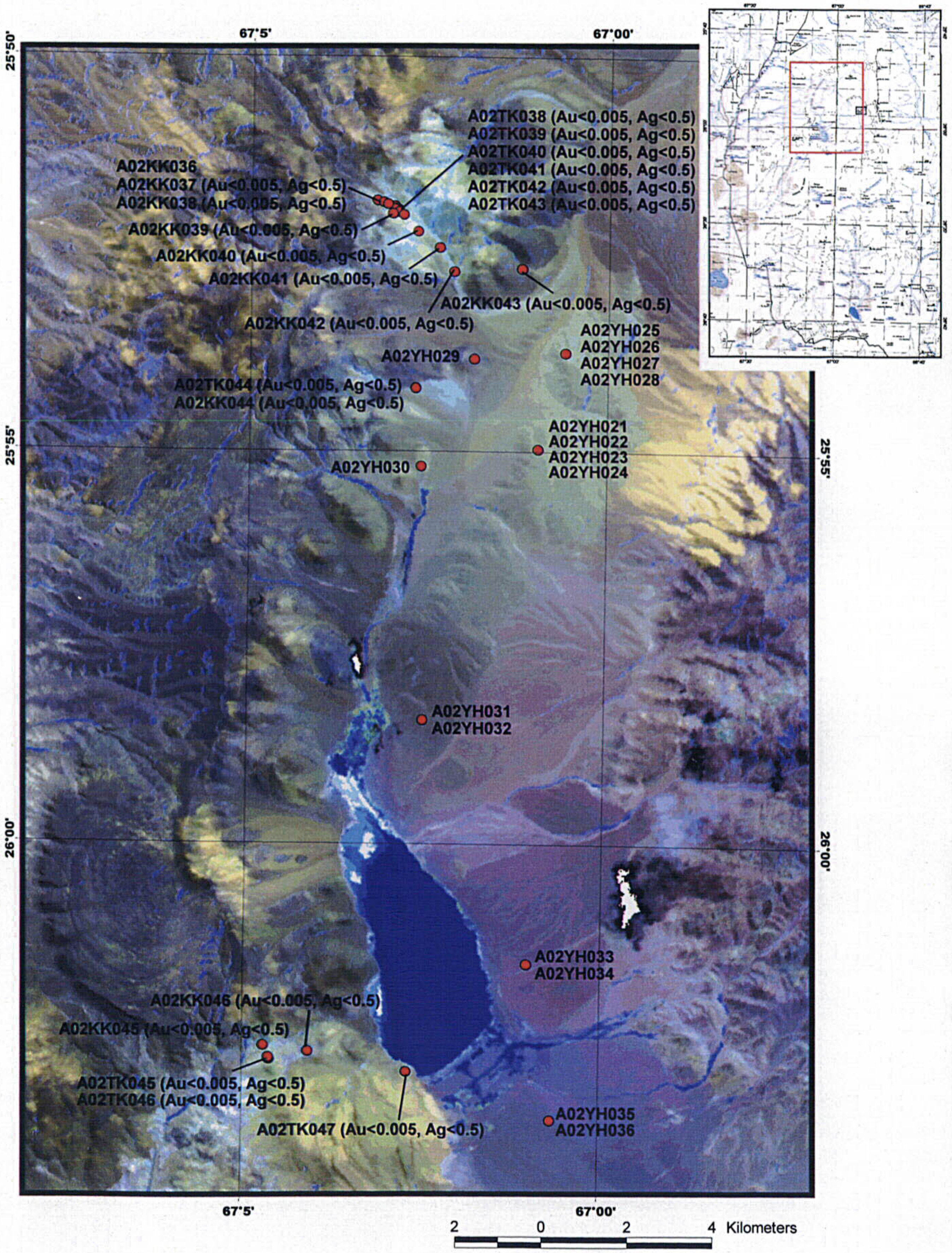


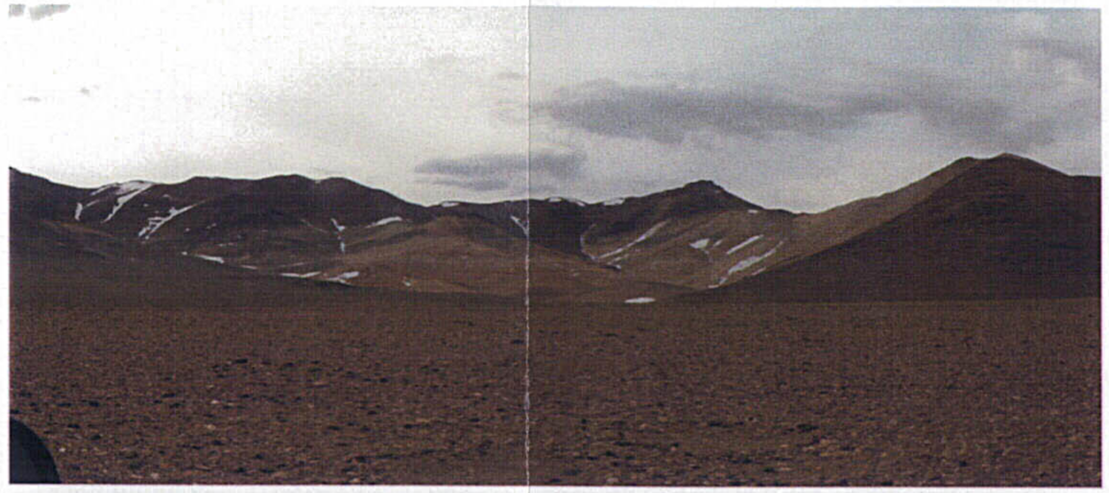
(a) False color image (BGR=147)



(b) Iso-grain model mineral identification image (BGR=Chl, Ser, Aln+Kao)

Fig. II-4-2-2-4-4 ASTER image analysis of alteration zones in the Cerro Galán area





Main alteration zone - mainly composed of sericite-chlorite-calcite and partly abandunt in kaolinite (A02KK041). No significant mineralization was recognized.

Southern alteration zone (west of Laguna Diamante) - alteration is similar to the main alteration zone.

Kaolinite abandunt area in southern alteration zone (A02KK045)

Fig. II-4-2-2-4-5 Results of the survey in the Cerro Galán area

8) Comments

- In this area, several lineaments were recognized on the ASTER images. They were interpreted as faults. Some of them show a characteristic feature of normal faults formed by caldron subsidence, and others exhibit a nature of radial faults, which crosscut the former. On the basis of such evidence, the alteration zones in this area are assumed to be formed by the hydrothermal solution, which ascended along the intersections of faults during the volcanic activity.
- The hydrothermal alteration zones, which were detected by the ASTER image analysis, were surveyed in the field. The geochemical analysis on the samples obtained during the survey this phase, however, showed no significant value.
- Such results present no positive indication for the economical point of view, at least on the surface. We cannot see the potential of the depth because there is no information at the moment. In addition to it, there is another difficult condition for the survey of this area; the altitude is very high, more than 5,000 m. The necessity for the further work on this area is thought to be very little.

4-3 Discussion of survey results

4-3-1 SEDEX/VMS deposits

(1) General geochemical analysis

1) Introduction

By using the results of the geo-chemical analysis of 197 samples in total collected from four areas of Aguilar range area, Pumahuasi area, Santa Victoria Mountains area, and La Colorada area that are selected to explore SEDEX/VMS deposits, a principal component analysis that is one of the unsupervised classification methods among multivariate analyses was carried out.

Principal component analysis attempts to explain variations included in one set of multivariate data by a set of a smaller number of variations (principal components) that are not correlated to each other. New variables (principal components) are called 1st principal component, 2nd principal component, ・・・・・ and Nth principal component. It is said that the majority of the variations of the data can be explained by the first several principal components. Here, this principal component analysis was carried out for the purpose of discriminating expected mineralization such as SEDEX or VMS, etc. as principal components from the variations of the analytical values of 29 elements out of 197 samples in total. The analysis was also carried out for the purpose of discriminating potential zones of this mineralization from the geographic distribution of the principal component score.

2) Used data

The data used are chemical analytical data (Table II-4-3-1-1) of rock (and, ore) samples collected from four areas of Aguilar range area, Pumahuasi area, Santa Victoria Mountains area, and La Colorada area. The total number of the samples is 197, and the breakdown is shown as follows.

Aguilar Range area:	46
Pumahuasi area:	7
Santa Victoria Mountains area:	104
La Colorada area:	40

The 29 elements analyzed are Au, Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sr, Ti, V, W, Zn, and Hg.

3) Pre-processing of data

Prior to the processing of statistical analysis, the 1/2 times value of the detection limit value was conveniently adopted for the value below the minor detection limit. The two times value of the detection limit value was adopted for the values higher than the upper detection limit. In

Table II-4-3-1-1 Analytical results of the 197 samples for the SEDEX/VMS exploration

Ser.No.	Samplw No.	Au	Hg	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sr	Ti	V	W	Zn
1	A02CX001	0.0025	0.005	0.25	6.4	12	460	1.3	1	0.06	0.9	3	38	46	5.59	1.43	0.88	242	0.5	1.35	4	680	18	0.08	2.5	82	0.14	56	5	69
2	A02CX002	0.016	0.01	0.25	3.13	51	260	0.7	1	17.65	1.6	5	18	87	3.45	0.9	0.55	2690	1	0.45	15	690	13	0.32	2.5	660	0.09	50	10	50
3	A02CX003	0.0025	0.005	0.25	10.04	12	430	2.3	1	0.76	1.2	23	62	111	5.97	4.1	1.39	380	3	0.68	76	750	10	2.17	2.5	112	0.42	117	10	75
4	A02CX004	0.559	0.005	0.9	3.48	5	100	0.9	341	1.13	5.7	85	36	2420	50	0.79	1.68	348	7	0.13	57	500	12	20	2.5	60	0.17	47	110	67
5	A02CX005	0.0025	0.005	0.25	9.89	6	640	3.5	1	3.32	0.25	5	49	39	3.1	2.5	1.32	316	13	1.32	31	1420	19	0.54	2.5	249	0.32	134	5	57
6	A02CX006	0.0025	0.005	0.25	9.9	26	810	1.8	1	0.18	0.25	4	46	6	3.53	3.18	1.18	234	0.5	1.04	19	580	8	0.02	2.5	78	0.38	120	10	90
7	A02CX007	0.042	78	419	0.41	2.5	130	0.25	1	0.05	1860	6	8	37	4.65	0.09	0.03	3980	0.5	0.01	6	30	249000	20	250	16	0.03	15	20	600000
8	A02CX008	0.022	8.3	146	7.03	68	460	3.2	1	0.6	128.8	6	86	919	2.83	2	0.2	1540	0.5	0.14	21	2030	24900	0.28	88	347	0.3	165	10	35000
9	A02CX009	0.0025	0.07	0.9	8.63	52	2080	2.2	1	0.05	2.4	1	51	34	4.63	3.28	0.85	500	0.5	0.43	5	670	479	0.22	2.5	50	0.33	89	5	421
10	A02CX010	0.0025	0.02	0.7	0.85	92	340	0.25	1	0.08	0.9	1	95	8	1.53	0.24	0.04	63	3	0.19	3	380	147	0.38	5	21	0.04	6	5	169
11	A02CX011	0.114	0.08	9.4	0.29	3050	60	0.25	5	0.02	26.1	9	48	451	15.8	0.07	0.02	261	85	0.01	9	50	2920	20	8	5	0.01	2	20	27700
12	A02CX012	0.153	0.03	222	3.39	155	200	2.1	89	2.17	162	34	48	1475	10.4	0.3	1.51	97800	78	0.005	19	1620	151000	8.25	101	27	0.18	161	40	53200
13	A02KK018	0.0025	0.005	0.25	9.99	16	940	4.4	6	0.18	0.25	9	52	35	4.94	3.29	1.38	677	0.5	0.98	31	590	18	0.01	2.5	82	0.42	120	10	99
14	A02KK023	0.0025	0.005	0.25	10.64	2.5	660	4.4	1	0.17	0.25	10	52	32	5.11	3.37	1.33	373	0.5	0.91	27	600	22	0.005	2.5	76	0.4	109	10	116
15	A02CX013	0.0025	0.005	0.25	1.94	7	650	2.1	1	0.03	2.2	1	74	33	0.45	0.98	0.17	761	2	0.05	8	60	406	0.05	2.5	5	0.03	6	5	372
16	A02CX014	0.0025	0.03	1	2.02	25	3310	6.2	1	0.07	40	82	94	1310	1.22	1.07	0.12	20000	21	0.04	109	310	645	0.04	2.5	33	0.05	18	80	1600
17	A02CX015	0.02	0.005	0.25	0.56	9	110	0.5	10	0.04	0.6	5	121	173	2.59	0.39	0.42	403	4	0.01	5	300	54	0.04	2.5	5	0.16	8	320	174
18	A02CX016	0.0025	0.005	0.25	10.06	44	1920	2.6	1	0.22	0.6	14	55	34	4.23	4.13	1.04	782	0.5	0.53	44	490	81	0.12	2.5	83	0.45	125	10	149
19	A02CX017	0.0025	0.005	0.25	9.19	63	1390	3.7	1	0.16	2.5	3	51	165	5.16	4.16	0.79	8170	0.5	0.14	16	510	317	0.02	2.5	51	0.41	99	10	935
20	A02CX018	0.0025	0.005	0.7	8.87	303	1360	2.4	1	0.17	3	0.5	59	385	5.74	4.16	0.57	1155	0.5	0.13	9	570	2470	0.09	8	55	0.38	99	20	641
21	A02CX019	0.034	0.02	12.5	1.31	342	210	1.9	50	0.05	1.9	4	64	519	11.3	0.35	0.09	131	14	0.02	7	640	2070	0.11	51	15	0.05	19	10	648
22	A02CX020	0.0025	0.005	0.25	9.26	11	680	3.8	1	1.95	1.3	7	22	40	4.67	3.46	0.68	950	0.5	3.98	5	1460	73	0.01	2.5	254	0.53	18	5	128
23	A02CX021	0.0025	0.005	0.25	1.66	25	380	3.3	1	0.04	0.25	2	104	40	1.14	0.97	0.2	196	32	0.1	5	160	95	0.02	2.5	6	0.07	12	5	325
24	A02CX022	0.0025	0.005	0.25	9.95	20	1300	2.5	1	0.14	3.6	11	52	45	4.27	3.23	1.17	496	0.5	0.85	35	480	181	0.36	2.5	94	0.29	99	10	592
25	A02CX023	0.0025	0.005	0.25	6.2	31	700	1.3	3	0.15	0.5	4	49	30	5.52	1.3	0.53	127	0.5	0.98	29	520	52	0.02	2.5	101	0.17	67	10	104
26	A02CX024	0.0025	0.005	0.25	10.39	13	790	2.5	1	0.17	1	4	34	25	1.94	3.49	0.35	100	0.5	0.85	20	470	21	0.01	2.5	80	0.4	102	5	65
27	A02CX025	0.0025	0.01	0.25	8.81	24	1150	1.8	1	0.19	0.25	8	42	28	4.47	2.38	0.78	165	0.5	0.93	33	340	15	0.02	2.5	80	0.27	88	5	79
28	A02CX026	0.0025	0.005	0.25	10.07	66	630	3.5	1	0.14	1.9	11	45	15	4.54	3.57	0.4	117	0.5	1.04	31	480	45	0.01	2.5	64	0.33	110	5	482
29	A02CX027	0.0025	0.01	0.25	8.56	7	730	2	1	0.21	3.9	3	29	6	3.1	3.03	0.38	681	0.5	0.18	11	820	141	0.15	2.5	189	0.29	81	5	2620
30	A02CX028	0.0025	0.005	0.25	4.32	38	190	0.25	1	0.31	0.5	5	46	10	2.48	0.66	0.61	279	2	1.47	22	610	22	0.005	2.5	88	0.19	36	5	95
31	A02CX029	0.0025	0.005	0.25	2.66	10	840	0.25	1	0.2	0.25	2	52	3	0.8	2.01	0.04	1070	3	0.62	5	600	23	0.05	2.5	73	0.1	9	5	49
32	A02CX030	0.0025	0.005	0.25	6.45	25	900	1.7	1	0.15	0.25	3	29	4	2.43	3.25	0.56	115	0.5	0.94	22	680	16	0.005	2.5	73	0.14	39	5	54
33	A02CX031	0.0025	0.005	0.25	2.11	2.5	490	0.25	1	0.73	0.25	1	106	3	0.34	1.6	0.06	46	2	0.29	5	3370	15	0.005	2.5	104	0.08	7	5	11
34	A02CX032	0.0025	0.01	0.25	1.67	5	390	0.25	1	0.09	0.25	6	86	5	0.32	1.1	0.05	360	4	0.22	9	400	53	0.005	2.5	38	0.05	7	5	14
35	A02CX033	0.0025	0.005	0.25	4.67	10	670	1.9	1	0.1	0.25	6	63	17	1.92	2.5	0.32	126	1	0.36	9	480	61	0.02	2.5	185	0.12	31	5	20
36	A02CX034	0.0025	0.005	0.25	2.46	2.5	520	0.25	1	0.27	0.25	1	73	9	0.68	1.58	0.1	92	2	0.5	6	1280	17	0.005	2.5	75	0.06	7	5	22
37	A02CX035	0.0025	0.005	0.25	3	13	520	0.25	1	0.13	0.25	1	87	5	1.09	1.69	0.13	138	0.5	0.81	5	540	19	0.01	2.5	64	0.17	19	5	47
38	A02CX036	0.0025	0.01	0.25	3.63	10	430	0.6	1	0.22	0.25	4	68	8	0.92	1.46	0.16	878	2	1.02	14	870	18	0.005	2.5	75	0.12	20	5	20
39	A02CX037	0.0025	0.02	0.25	9.81	29	880	2.9	1	0.25	0.25	14	88	35	5.01	3.75	1.2	374	0.5	0.25	35	230	15	0.03	2.5	48	0.42	103	5	119
40	A02CX038	0.0025	0.02	0.25	9	15	1590	2.1	1	0.17	0.25	1	68	32	2.63	3.31	0.8	369	0.5	0.31	17	240	16	0.1	2.5	114	0.43	152	5	52
41	A02CX039	0.0025	0.005	0.25	2.49	2.5	420	0.25	1	0.04	0.25	2	169	5	0.82	1.75	0.07	201	3	0.47	10	90	7	0.01	2.5	45	0.03	17	5	8
42	A02CX040	0.0025	0.005	0.25	9.58	11	880	2.8	1	0.3	0.7	10	76	4	3.13	5.31	0.69	78	0.5	0.74	23	1160	8	0.01	5	77	0.41	106	10	63
43	A02CX041	0.0025	0.005	0.25	0.91	2.5	150	0.25	1	0.03	0.25	2	266	5	0.73	0.6	0.08	107	4	0.09	9	60	1	0.005	2.5	15	0.05	9	5	12
44	A02CX042	0.0025	0.005	0.25	2.8	2.5	260	0.7	1	0.05	0.25	4	255	6	1.56	1.49	0.31	116	3	0.17	14	90	12	0.005	2.5	22	0.16	33	5	37
45	A02CX043	0.0025	0.005	0.25	2.45	2.5	460	0.25	1	0.03	0.25	1	182	3	0.89	1.53	0.05	453	3	0.62	9	60	4	0.005	2.5	41	0.08	10	5	7
46	A02CX044	0.0025	0.005	0.25	6.81	6	860	1.6	1	0.17	0.25	6	157	12	2.85	2.52	0.78	272	0.5	1.65	21	660	11	0.01	2.5	93	0.27	49	5	44
47	A02CX045	0.0025	0.01	0.25	8.55	14	970	3	1	0.12	0.25	8	79	11	3.4	3.37	1.08	264	0.5	0.9	23	630	21	0.01	6	53	0.39	87	5	108
48	A02CX046	0.0025	0.01	0.25	8.89	18	1000	3.1	1	0.12	0.25	8	82	12	3.54	3.5	1.11	273	0.5	0.94	26	630	17	0.005	2.5	54	0.41	89	5	111
49	A02CX047	0.0025	0.005	0.25	9.19	11	920	2.4	1	0.14	0.8	8	67	10	3.53	3.44	1.23	342	0.5	0.95	24	570	12	0.005	2.5	54	0.41	101	10	195
50	A02CX048	0.0025	0.05	0.25	10.94	20	2370	2.7	1	0.25	1.1	10	67	34	2.68	4.18	0.91	110	0.5	0.65	31	270	17	0.02	2.5	170	0.46	114	5	112
51	A02CX049	0.0025	0.01	0.25	10.35	14	1460	2.9	1	0.19	1.1	8	50	48	4.81	4.04	1.21	268	0.5	0.27	34	440	12	0.005	2.5	47	0.41	100	10	135
52	A02CX050	0.0025	0.005	0.25	7.14	31	960	1.3	1	0.23	0.25	10	73	17	3.5	2.78	0.78	531	0.5	1.12	22	750	10	0.01	6	79	0.39	63	5	88
53	A02CX051	0.0025	0.01	0.25	5	21	750	0.25	1	0.26	0.25	5	139	11	1.96	2.55	0.3	489	2	1.17	23	920	9	0.005	2.5	94	0.29	33	5	55
54	A02CX052	0.0025	0.01	0.25	4.07	22	390	0.5	1	0.2	0.25	6	98	25	1.77	1.08	0.24	990	1	1.64	26	600	49	0.01	2.5	95	0.15	23	5	120
55	A02CX053	0.0025	0.02	0.25	10.03	36	1220	2.9	1	0.35	0.7	13	82	27	4.27	4.12	1.05	443	0.5	0.53	35	630	16	0.01	2.5	82	0.41	97	10	163
56	A02CX054	0.0025	0.005	0.25	5.01	2.5	240	0.9	1	0.18	0.25	4	95	51	2.26	1.13	0.41	782	0.5	1.95	19	650	6	0.005	2.5	54	0.21	36	5	50
57	A02CX055	0.0025	0.005	0.25	5.43	5	300	1	1	0.16	0.7	12	119	63	2.48	1.54	0.29	1290	0.5	1.94	19	720	3	0.005	2.5	50	0.22	44	10	31
58	A02CX056	0.0025	0.005	0.25	7.64	9	510	2	1	0.24	0.7	8	87	55	4.47	3.04	1.13	931	0.5	0.7	33	580	1	0.005	2.5	46	0.32	84	5	104
59	A02CX057	0.0025	0.01	0.25	7.93	10	430	1.7	1	1.53	1.6	13	85	35	4.82	2.03	1.32	1860	0.5	0.94	35	450	63	0.14	5	96	0.38	78	10	201
60	A02CX058	0.0025	0.01	0.25	8.82	6	570	2.2	1	0.22	0.25	16	56	32	5.02	2.39	0.97	387	0.5	0.83	45	510	33	0.005	2.5	90	0.4	87	5	120
61	A02CX059	0.0025	0.01	0.25	8.87	25	500	1.3	1	0.17	0.9	16	67	23	4.38	2.15	0.66	242	0.5	0.37	38	530	17	0.2	2.5	76	0.5	93	5	106
62	A02CX060	0.0025	0.005	0.25	4.76	6	1040	0.7	1	0.4	0.25	6	116	16	2.33	1.82	0.51	427	0.5	0.98	20	700	32	0.02	2.5	93	0.27	33	10	63
63	A02CX061	0.0025	0.005	0.25	7.12	6	640	1.4	1	0.29	1	12	64	26	3.75	2.48	0.97	321	0.5	1.14	35	620	13	0.01	2.5	92	0.38	67	10	91
64	A02CX062	0.0025	0.005	0.25	6.69	2.5	290	0.9	1	0.23	0.25	12	123	26	4.48	1.43	0.85	236	0.5	1.4	46	530	16	0.005	2.5	75	0.34	55	10	99
65	A02CX063	0.0025	0.005	0.25	7.11	8	370	1.1	1	0.23	0.25	12	95	23	4.01	1.79	0.92	313	0.5	1.4	39	620	23	0.005	2.5	82	0.38	67	10	94
66	A02CX064	0.0025	0.005	0.25	6.83	6	350	1	1	0.22	0.25	12	94	22	3.75	1.68	0.87	295	1	1.33	38	580	19	0.005	2.5	78	0.36	64	10	89

Table II-4-3-1-1 Analytical results of the 197 samples for the SEDEX/VMS exploration

Ser.No.	Samplw No.	Au	Hg	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sr	Ti	V	W	Zn
67	A02CX065	0.0025	0.01	0.25	5.23	9	230	0.5	1	0.17	0.25	7	237	17	2.77	1.07	0.57	286	1	1.73	24	550	7	0.005	2.5	60	0.29	39	10	44
68	A02CX066	0.0025	0.005	0.25	5.85	6	260	0.7	1	0.19	0.25	7	163	18	2.8	1.23	0.62	303	2	1.86	23	590	6	0.01	2.5	65	0.3	43	5	50
69	A02CX067	0.0025	0.005	0.25	8.71	13	540	2	1	0.89	1	11	47	26	3.75	2.77	1.05	528	0.5	1.28	36	890	11	0.01	2.5	98	0.43	77	5	75
70	A02CX068	0.0025	0.005	0.25	8.43	11	510	1.8	1	0.86	0.25	11	47	26	3.62	2.67	1	505	0.5	1.24	34	870	9	0.01	2.5	94	0.41	75	10	73
71	A02CX069	0.0025	0.01	0.25	4.15	12	560	0.9	1	0.27	4.3	8	105	91	3.24	1.97	0.18	1175	4	0.82	19	1130	92	0.01	2.5	60	0.21	26	5	249
72	A02CX070	0.0025	0.01	0.25	9.39	32	1010	3.6	1	0.54	2.2	6	37	23	2.37	3.67	0.46	477	4	1.71	15	560	77	0.08	5	69	0.35	61	5	162
73	A02CX071	0.0025	0.01	0.25	9.48	34	1010	3.7	1	0.54	2.2	6	40	22	2.37	3.71	0.46	474	5	1.73	14	560	72	0.08	2.5	69	0.35	61	10	164
74	A02CX072	0.0025	0.02	0.25	6.95	23	640	2.4	1	2.07	0.25	8	66	34	3.56	2.71	1.06	580	0.5	0.75	25	4060	38	0.44	2.5	228	0.34	95	10	53
75	A02CX073	0.0025	0.02	0.25	6.75	24	630	2.4	1	2.02	0.9	8	55	33	3.47	2.63	1.03	565	3	0.73	25	4000	39	0.43	2.5	220	0.34	93	5	52
76	A02CX074	0.0025	0.03	0.25	8.97	8	650	2.4	1	0.09	1.2	6	49	28	3.81	2.94	0.78	172	0.5	0.52	23	1090	14	0.01	2.5	37	0.42	102	5	72
77	A02CX075	0.0025	0.03	0.25	8.98	15	670	2.5	1	0.09	0.6	6	49	29	3.82	2.95	0.8	177	0.5	0.52	22	1080	12	0.01	2.5	39	0.42	103	5	72
78	A02CX076	0.006	0.02	0.25	10.36	12	870	3.3	1	0.27	1.5	18	79	42	5.35	3.3	1.2	349	0.5	0.53	48	710	6	0.03	2.5	51	0.44	104	5	134
79	A02CX077	0.0025	0.02	0.25	10.84	18	920	2.4	1	0.06	0.25	9	56	32	3.46	3.87	0.73	274	0.5	0.47	34	460	8	0.01	2.5	53	0.45	172	5	99
80	A02CX078	0.0025	0.01	0.25	4.49	7	180	0.7	1	0.35	0.8	8	48	11	2.94	0.55	0.55	546	1	1.62	64	1480	9	0.01	2.5	75	0.15	33	5	124
81	A02CX079	0.0025	0.01	0.25	10.27	7	810	3.3	1	0.12	0.8	13	55	37	4.79	3.26	1.2	291	0.5	0.62	44	490	13	0.005	2.5	68	0.44	109	5	149
82	A02CX080	0.0025	0.02	0.25	10	11	1030	2.8	1	0.22	0.9	19	54	33	4.86	3.31	0.91	550	0.5	0.44	41	820	23	0.005	2.5	78	0.45	106	5	130
83	A02CX081	0.0025	0.02	0.25	9.28	17	1050	2.7	1	0.26	1.1	17	51	35	4.62	2.92	0.89	577	0.5	0.7	66	830	26	0.005	2.5	70	0.43	111	5	168
84	A02CX082	0.0025	0.03	0.25	10.28	35	1270	2.9	1	0.13	0.25	7	57	48	4.76	3.31	0.75	173	0.5	0.44	29	560	25	0.01	2.5	65	0.46	150	5	122
85	A02CX083	0.0025	0.01	0.25	8.28	12	550	1.6	1	0.05	0.25	3	54	21	2.95	2.87	0.3	73	0.5	0.53	11	530	18	0.005	2.5	65	0.38	90	5	42
86	A02CX084	0.0025	0.005	0.25	3.73	2.5	110	0.25	1	0.03	0.25	5	67	19	1.72	0.45	0.07	84	1	1.51	19	240	9	0.005	2.5	55	0.18	25	5	60
87	A02CX085	0.0025	0.02	0.25	9.67	15	980	2.8	1	0.11	0.25	14	48	31	4.88	2.94	1.07	541	2	0.6	47	970	16	0.01	2.5	78	0.45	107	10	150
88	A02CX086	0.0025	0.04	0.25	10.16	24	1260	2.4	1	0.03	0.8	13	41	24	4.99	3.12	1.03	368	4	0.85	31	510	27	0.18	2.5	74	0.44	184	5	116
89	A02CX087	0.0025	0.01	0.25	3.67	8	190	0.5	1	0.63	0.25	5	52	7	1.56	0.92	0.17	931	2	1.21	13	260	27	0.01	2.5	62	0.1	20	5	46
90	A02CX088	0.0025	0.01	0.25	7.02	13	420	1.7	1	0.21	0.25	14	45	31	3.62	2.11	0.79	487	0.5	1.29	31	690	12	0.01	2.5	65	0.26	55	10	108
91	A02CX089	0.0025	0.005	0.25	2.55	11	370	0.9	1	1.38	0.25	4	58	5	1.4	1.38	0.06	632	2	0.5	13	6490	13	0.005	2.5	220	0.07	14	5	33
92	A02CX090	0.0025	0.01	0.25	9.98	15	850	3.7	1	0.25	1	13	40	31	4.32	3.48	1.07	265	0.5	0.63	37	730	12	0.005	2.5	51	0.41	93	5	87
93	A02CX091	0.0025	0.02	0.25	1.73	9	200	1.3	1	2.02	1.1	6	104	15	1.26	0.65	0.09	2050	3	0.16	11	9670	39	0.01	2.5	206	0.07	17	5	132
94	A02CX092	0.0025	0.01	0.25	9.26	16	620	3	1	0.18	0.25	15	41	38	4.52	3.48	0.85	1270	0.5	0.47	39	760	23	0.005	2.5	46	0.38	89	5	99
95	A02CX093	0.0025	0.01	0.25	2.78	2.5	340	0.9	1	0.07	0.8	3	85	18	1.69	0.97	0.1	544	4	0.02	13	400	85	0.01	2.5	24	0.1	18	5	157
96	A02CX094	0.0025	0.02	0.25	10.3	22	810	3.4	1	0.04	0.25	12	56	30	4.68	4.41	0.48	713	0.5	0.05	23	670	16	0.02	2.5	51	0.38	92	5	149
97	A02CX095	0.0025	0.01	0.25	4.05	2.5	160	0.9	1	0.81	0.5	6	62	9	2.02	0.75	0.26	1440	2	1.26	15	460	25	0.01	2.5	75	0.13	22	5	82
98	A02CX096	0.0025	0.01	0.25	10.14	11	560	2.9	1	0.14	0.7	11	50	23	4.25	3.3	1.09	277	0.5	0.62	37	620	10	0.005	2.5	75	0.41	92	5	103
99	A02CX097	0.0025	0.01	0.25	10.48	12	800	3.3	1	0.2	0.5	14	40	36	4.55	3.98	1.05	224	0.5	0.05	39	550	9	0.01	2.5	37	0.42	95	10	155
100	A02CX098	0.0025	0.005	0.25	5.77	15	560	1.1	1	0.29	0.25	6	47	19	3.02	2.06	0.63	325	0.5	1.37	22	990	11	0.005	2.5	80	0.25	43	5	74
101	A02CX099	0.0025	0.01	0.25	4.92	15	580	0.5	1	0.28	0.25	5	49	20	2.21	1.92	0.44	601	2	1.43	15	1150	14	0.005	2.5	83	0.29	32	5	60
102	A02CX100	0.0025	0.01	0.25	9.15	13	720	2.4	1	0.13	0.25	7	48	21	4.36	3.14	1.11	391	0.5	0.86	26	650	18	0.005	2.5	62	0.39	90	10	96
103	A02CX101	0.0025	0.01	0.25	10.83	37	660	2.8	1	0.23	0.25	10	40	37	5.54	4.55	1.08	477	0.5	0.35	39	720	6	0.01	2.5	50	0.48	107	5	146
104	A02CX102	0.0025	0.005	0.25	6.28	11	630	1.4	1	0.11	0.25	2	42	11	2.27	2.35	0.54	129	0.5	1.35	9	500	10	0.005	2.5	71	0.27	48	10	41
105	A02CX103	0.0025	0.01	0.25	11.08	10	640	4.1	1	0.03	0.25	9	57	33	5.13	3.64	1.26	312	0.5	0.74	19	430	1	0.005	2.5	48	0.38	126	10	80
106	A02CX104	0.0025	0.005	0.25	8.79	23	670	2.8	1	0.17	0.25	6	48	3	2.87	3.08	0.74	183	0.5	1.4	12	720	82	0.005	2.5	75	0.34	85	5	49
107	A02CX105	0.0025	0.01	0.25	13.48	28	1090	5	1	0.14	1.3	24	67	23	4.49	5.1	1.03	236	0.5	0.4	50	610	1	0.005	2.5	42	0.52	153	5	322
108	A02CX106	0.0025	0.005	0.25	9.47	7	690	3.2	1	0.21	0.25	12	58	19	3.9	2.9	0.92	202	0.5	1.46	42	690	4	0.005	2.5	69	0.34	93	5	175
109	A02CX107	0.0025	0.005	0.25	7.19	15	970	3.2	1	0.05	0.25	6	78	0.5	1.42	4.48	0.36	96	0.5	0.41	10	280	5	0.005	2.5	90	0.2	53	5	20
110	A02CX108	0.0025	0.005	0.25	2.5	6	380	0.7	1	0.03	0.25	3	107	0.5	0.61	2.01	0.08	188	0.5	0.22	5	100	1	0.005	2.5	47	0.05	9	5	5
111	A02CX109	0.0025	0.01	0.25	11.33	23	1050	5.4	1	0.28	0.25	18	56	6	4.28	4.76	0.97	541	0.5	0.64	36	830	1	0.005	2.5	50	0.39	118	5	70
112	A02CX110	0.0025	0.02	0.25	8.57	24	650	2.6	1	0.16	0.25	17	50	46	5.01	1.94	1.21	681	0.5	1.33	36	750	7	0.005	2.5	69	0.29	80	10	94
113	A02CX111	0.0025	0.01	0.25	9.58	16	570	3	1	0.04	0.25	10	47	15	4.43	2.46	1.12	372	0.5	0.76	27	330	1	0.005	2.5	94	0.37	99	5	65
114	A02CX112	0.0025	0.005	0.25	8.7	11	630	3.3	2	0.17	0.25	12	48	19	4.39	2.71	1.03	339	0.5	0.94	31	670	1	0.02	2.5	58	0.28	90	5	101
115	A02CX113	0.0025	0.01	0.25	8.33	17	680	3.1	1	0.18	0.25	11	40	20	4.11	2.7	0.96	297	0.5	1.04	26	630	1	0.005	2.5	56	0.24	76	5	74
116	A02CX114	0.0025	0.005	0.25	6.87	10	620	2	1	0.21	0.25	12	43	21	3.27	1.61	0.7	165	0.5	1.53	29	360	1	0.005	2.5	93	0.23	58	5	68
117	A02CX115	0.0025	0.005	0.25	8.62	34	680	2.8	1	0.31	0.25	10	49	29	4.69	2.39	0.98	208	0.5	1.37	50	860	1	0.005	6	91	0.22	84	5	94
118	A02CX116	0.0025	0.005	0.25	8.69	19	620	2.5	4	0.27	0.25	17	52	26	4.45	2.17	1.03	299	0.5	1.44	39	800	1	0.08	2.5	90	0.28	92	5	86
119	A02CX117	0.0025	0.02	0.25	7.62	23	410	2.3	1	0.06	0.25	8	50	21	3.84	2.01	0.82	193	0.5	1.12	28	520	1	0.02	2.5	57	0.24	80	5	67
120	A02CX118	0.0025	0.01	0.25	5.15	8	310	2	1	0.14	0.25	10	63	4	1.67	1.71	0.46	576	0.5	1.11	19	300	1	0.005	2.5	58	0.25	46	5	54
121	A02CX119	0.0025	0.005	0.25	5.05	7	780	2.3	1	0.21	0.25	9	60	7	2.77	1.92	0.49	2141	0.5	0.71	20	860	1	0.005	2.5	50	0.3	53	5	55
122	A02CX120	0.0025	0.005	0.25	8.82	8	620	3.4	4	0.19	0.25	19	46	0.5	4.17	3.46	1.17	384	0.5	1.25	36	670	3	0.005	2.5	42	0.37	83	5	97
123	A02CX121	0.0025	0.005	0.25	8.9	6	510	3.5	1	0.15	0.25	20	48	0.5	4.43	3.45	1.07	414	0.5	1.3	36	660	1	0.005	2.5	43	0.37	91	5	88
124	A02CX122	0.0025	0.01	0.25	10.38	11	510	3.3	1	0.15	0.25	13	45	32	4.26	3	1.2	360	0.5	1.43	34	640	24	0.005	2.5	88	0.36	99	5	61
125	A02CX123	0.0025	0.01	0.25	9.45	19	800	4	1	0.03	0.25	11	40	9	3.41	3.64	0.77	207	0.5	0.96	23	610	18	0.005	2.5	49	0.37	96	5	174
126	A02CX124	0.0025	0.005	0.25	11.51	9	460	4	1	0.19	0.25	12	46	19	4.9	3.42	1.45	365	0.5	0.83	43	520	2	0.005	2.5	66	0.39	118	10	129
127	A02CX125	0.0025	0.01	0.25	11.36	22	690	3.5	1	0.05	0.25	10	50	32	5.04	3.28	1.3	366	0.5	0.98	35	380	19	0.02	2.5	69	0.38	115	10	85
128	A02CX126	0.0025	0.02	0.25	11.62	18	760	4.1	1	0.33	0.25	18	47	18	4.71	3.53	1.17	363	0.5	0.99	47	830	1	0.005	2.5	85	0.39	117	10	76
129	A02CX127	0.0025	0.01	0.25	10	20	1430	3.4	1	0.05	0.25	13	35	14	4.89	2.86	1.23	345	0.5	0.71	40	260	3	0.01	2.5	47	0.4	103	10	111
130	A02CX128	0.0025	0.005	0.25	11.62	13	860	3.9	1	0.15	0.25	16	48	26	4.77	3.36	1.2	303	0.5	1.23	45	530	28	0.005	2.5	88	0.42	133	5	135
131	A02CX129	0.0025	0.02	0.25	9.33	19	1130	2.8	8	0.05	0.25	7	43	7	4.38	2.6	1.14	295	0.5	1.1	36	460	24	0.005	2.5	64	0.32	97	5	71
132	A02CX130	0.006	0.01	0.25	11.72	18	600	3.9	7	0.14	0.25	13	50	39	4.74	3.66	1.28	370	0.5	1.09	42	430	38	0.005	2.5	73	0.44	118	5	134

Table II-4-3-1-1 Analytical results of the 197 samples for the SEDEX/VMS exploration

Ser.No.	Samplw No.	Au	Hg	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sr	Ti	V	W	Zn
133	A02CX131	0.0025	0.01	0.25	8.06	6	490	3.1	1	0.22	0.25	17	45	6	3.75	2.92	1.09	1028	2	1.15	41	590	1	0.005	2.5	37	0.36	87	5	118
134	A02CX132	0.0025	0.02	0.25	10.14	15	560	4	1	0.25	0.25	9	41	11	2.67	4.3	0.53	79	0.5	0.05	23	1180	1	0.005	2.5	40	0.27	107	5	97
135	A02CX133	0.0025	0.01	0.25	13.8	10	930	4.8	6	0.4	0.25	25	80	7	6.62	4.35	1.79	419	0.5	1.02	54	760	1	0.005	2.5	120	0.62	154	10	52
136	A02CX134	0.0025	0.005	0.25	9.66	5	580	3.1	1	0.77	0.25	20	54	40	4.77	2.64	1.2	575	0.5	1.55	36	590	1	0.005	2.5	121	0.53	91	5	86
137	A02CX135	0.007	0.02	0.25	4.83	12	150	2.1	1	0.66	0.25	9	54	4	2.14	0.98	0.5	267	0.5	1.6	15	740	12	0.02	2.5	159	0.38	37	5	42
138	A02CX136	0.0025	0.01	0.25	11.12	10	580	5.2	1	0.3	0.25	20	63	21	5.53	3.55	1.32	498	0.5	0.83	40	680	15	0.005	2.5	93	0.45	112	10	160
139	A02CX137	0.0025	0.005	0.25	12.44	19	680	4.8	1	0.25	0.25	17	59	46	5.64	4.01	1.4	660	0.5	0.92	37	500	139	0.005	2.5	131	0.54	123	10	279
140	A02CX138	0.008	0.01	0.25	8.6	59	300	2.2	1	0.1	3	9	59	775	10.94	1.68	1.25	388	0.5	0.08	33	410	187	0.01	2.5	63	0.43	93	30	696
141	A02CX139	0.098	0.005	0.25	4.13	93	5	0.25	1	0.03	0.7	7	79	490	8.05	0.25	1.65	566	3	0.01	10	120	42	0.005	2.5	0.5	0.22	44	20	274
142	A02CX140	0.005	0.005	0.25	11.26	25	490	5.4	1	0.51	2.3	16	69	129	5.89	3.16	1.4	560	0.5	1.53	43	450	4	0.005	2.5	227	0.52	104	20	434
143	A02CX141	0.0025	0.01	0.25	11.1	17	610	4	1	0.41	0.6	17	62	4	5.59	3.05	1.33	636	0.5	1.19	43	530	1	0.005	2.5	138	0.48	102	20	115
144	A02CX142	0.0025	0.005	0.25	11.68	50	700	4	1	0.14	0.7	16	62	4	5.31	3.63	1.34	543	0.5	0.83	47	430	1	0.005	2.5	60	0.43	120	10	90
145	A02CX143	0.0025	0.005	0.25	12.06	15	500	4.1	9	0.16	0.25	25	60	46	5.98	3.65	1.51	497	0.5	1.15	51	540	12	0.26	2.5	73	0.42	125	20	144
146	A02CX144	0.0025	0.005	0.25	9.5	18	390	3.2	1	0.09	0.25	6	40	20	3.82	3.21	1.3	349	0.5	1.15	10	530	15	0.04	2.5	42	0.33	148	5	50
147	A02CX145	0.005	0.005	0.25	9.57	18	330	3	1	0.12	0.25	5	40	16	3.95	3.28	1.14	337	0.5	1.32	12	540	23	0.01	2.5	55	0.44	119	5	60
148	A02CX146	0.0025	0.005	0.25	5.41	29	130	1.9	5	0.05	0.25	4	38	7	2.06	1.93	0.47	104	1	1.26	10	240	27	0.14	2.5	55	0.23	48	5	46
149	A02CX147	0.0025	0.01	0.25	6.59	9	140	2	1	0.12	0.25	8	40	13	2.8	2.01	0.86	269	0.5	1.65	15	460	17	0.15	2.5	61	0.28	76	5	71
150	A02CX148	0.014	0.02	0.25	11.14	24	990	5.4	1	0.08	0.25	9	60	41	5.19	4.43	1.38	878	0.5	0.39	19	470	47	0.04	2.5	43	0.52	122	10	123
151	A02CX149	0.0025	0.01	0.25	8.45	8	130	3.5	1	0.46	1.4	17	48	6	4.38	1.18	1.34	634	0.5	3.34	35	660	2	0.005	2.5	184	0.4	76	10	89
152	A02CX150	0.0025	0.01	0.25	12	17	630	4	4	0.2	1.6	21	59	24	5.55	4.03	1.64	741	0.5	1.33	45	570	22	0.005	2.5	90	0.37	121	10	69
153	A02CX151	0.0025	0.01	0.25	10.42	16	500	4.4	1	0.19	0.9	22	44	0.5	3.62	3.42	1.28	256	0.5	2.34	43	620	1	0.005	2.5	125	0.25	109	10	65
154	A02CX152	0.0025	0.01	0.25	11.68	54	720	4.4	1	0.24	1.2	22	55	0.5	5.1	4.06	1.11	599	0.5	0.78	49	390	1	0.005	2.5	107	0.44	104	10	46
155	A02CX153	0.0025	0.005	0.25	5.04	12	90	1.1	2	0.33	0.9	12	33	0.5	3.12	1.18	0.72	267	0.5	1.09	21	490	1	0.005	2.5	84	0.3	44	5	34
156	A02CX154	0.0025	0.02	0.25	11.52	11	690	4	1	0.43	1.7	22	57	31	4.87	3.79	1.19	800	0.5	1.01	47	770	3	0.005	2.5	141	0.53	116	10	124
157	A02CX155	0.0025	0.01	0.25	7.21	69	180	2.6	1	0.4	0.7	10	45	4	3.24	1.68	0.86	437	0.5	1.69	28	500	14	0.005	2.5	135	0.42	70	5	76
158	A02CX156	0.0025	0.005	0.25	8.88	23	250	3.4	1	0.19	0.9	16	38	15	3.94	3.54	1.29	441	0.5	1.47	36	650	8	0.005	2.5	49	0.34	93	5	105
159	A02CX157	0.0025	0.005	0.25	7.16	19	120	2.5	1	0.17	1	15	49	6	3.45	2.23	1.1	499	0.5	1.56	29	1000	6	0.005	2.5	67	0.39	70	5	175
160	A02CX158	0.0025	0.01	0.25	3.7	17	1410	1.1	1	0.15	0.25	8	50	27	2.21	1.39	0.68	420	0.5	0.89	16	430	59	0.07	2.5	110	0.2	32	5	58
161	A02CX159	0.0025	0.005	0.25	0.91	11	40	0.25	1	0.01	0.25	0.5	85	0.5	0.31	0.68	0.04	19	0.5	0.07	4	40	350	0.005	2.5	13	0.03	5	5	1
162	A02CX160	0.016	0.09	0.25	2.67	28	290	0.9	1	0.4	0.25	4	48	7	0.9	1.75	0.29	267	0.5	0.35	8	1510	18	0.09	2.5	62	0.08	17	5	83
163	A02CX161	0.0025	0.005	0.25	3.86	30	750	0.9	1	0.27	0.25	3	38	0.5	0.84	2.9	0.3	80	0.5	0.52	7	1240	11	0.03	2.5	93	0.08	17	5	17
164	A02CX162	0.0025	0.005	0.25	4.49	39	480	1.5	1	0.39	0.25	5	34	0.5	1.3	2.21	0.59	124	0.5	1.16	13	1870	12	0.04	2.5	114	0.15	29	5	37
165	A02CX163	0.0025	0.01	0.25	6.37	45	530	2.5	1	0.36	0.25	8	38	20	1.79	3.36	0.83	174	3	0.81	19	1630	6	0.02	2.5	89	0.21	57	5	52
166	A02CX164	0.0025	0.005	0.25	9.22	25	740	2.9	7	0.49	1.2	14	41	20	3.83	3	1.25	538	0.5	2.3	31	910	10	0.005	2.5	96	0.36	90	5	47
167	A02CX165	0.0025	0.005	0.25	7.64	19	230	2.5	1	0.18	0.7	14	44	1	3.64	2.1	0.87	293	0.5	1.69	30	560	4	0.005	2.5	67	0.36	80	5	77
168	A02CX166	0.0025	0.005	0.25	6.3	25	120	2.4	1	0.24	0.5	10	46	12	3.2	1.52	0.82	222	0.5	1.58	22	630	3	0.005	2.5	96	0.31	66	5	38
169	A02CX167	0.0025	0.005	0.25	10.76	34	450	3.9	7	0.18	1.2	13	44	27	4.51	3.75	1.26	260	0.5	0.77	31	610	3	0.005	2.5	57	0.46	108	10	119
170	A02CX168	0.0025	0.005	0.25	4.75	8	300	2.1	1	0.08	0.6	6	42	1	2.39	2.43	0.48	160	0.5	0.29	12	380	10	0.005	2.5	40	0.19	48	5	36
171	A02CX169	0.0025	0.005	0.25	3.47	2.5	290	1.2	1	0.07	0.25	5	26	0.5	1.33	1.35	0.32	87	0.5	0.75	9	240	1	0.005	2.5	56	0.11	25	5	23
172	A02CX170	0.0025	0.005	0.25	6.91	18	640	2.7	1	0.17	0.8	11	38	0.5	3.14	2.79	0.84	434	0.5	0.95	22	850	13	0.005	2.5	66	0.26	65	5	69
173	A02CX171	0.0025	0.005	0.25	3.09	6	180	1.1	1	0.02	0.25	3	28	0.5	1.34	1.59	0.24	72	0.5	0.06	4	230	2	0.02	2.5	38	0.12	31	5	11
174	A02CX172	0.0025	0.005	0.25	6.27	17	160	2.3	1	0.08	0.25	9	53	7	2.81	3.03	0.77	366	0.5	0.1	21	430	11	0.005	6	21	0.3	65	5	59
175	A02SX001	0.0025	0.005	1.9	8.65	28	230	4.6	1	0.51	0.25	21	82	508	4.55	4.89	0.65	1100	4	1.29	69	990	412	2.1	2.5	99	0.14	141	5	151
176	A02SX002	0.288	0.79	560	4.54	2.5	330	6.2	178	1.4	234	37	49	5110	4.66	1.78	0.4	3740	1	1.18	23	400	178000	9.82	115	113	0.21	59	30	58500
177	A02SX003	0.0025	0.005	1.2	6.01	2.5	440	2	5	0.33	0.25	9	38	27	2.31	1.7	0.68	468	0.5	2.04	23	840	327	0.03	2.5	133	0.32	51	5	186
178	A02SX004	0.0025	0.005	0.5	9.77	24	1060	4.9	1	0.44	0.25	15	54	33	4.3	3.84	1.06	488	0.5	1.2	43	640	295	0.01	2.5	119	0.49	100	5	1039
179	A02SX005	0.0025	0.005	0.25	6.96	22	550	4.9	1	0.22	0.25	11	43	36	3.58	2.13	0.89	549	0.5	1.18	25	730	48	0.04	2.5	65	0.32	70	5	103
180	A02SX006	0.0025	0.005	0.25	10.82	28	1560	7.2	1	0.45	0.25	15	52	12	3.59	4.08	0.85	560	0.5	1.32	41	610	74	0.01	2.5	146	0.47	107	5	88
181	A02SX007	0.0025	0.005	0.25	9.22	37	950	4.2	3	0.36	0.25	15	49	30	4.11	3.3	1.02	467	0.5	1.5	26	620	29	0.005	2.5	121	0.48	101	10	99
182	A02SX008	0.0025	0.005	0.25	10.5	20	1170	4.5	1	0.26	0.25	11	47	20	4.16	4.12	1.1	640	0.5	0.92	34	530	20	0.01	2.5	72	0.47	105	5	104
183	A02SX009	0.0025	0.005	0.25	10.62	2.5	1570	4.7	1	0.81	0.25	12	50	1	3.76	4.15	1.09	871	0.5	0.74	34	690	38	0.005	2.5	111	0.52	102	5	86
184	A02SX010	0.0025	0.005	0.25	9.74	12	780	4.1	3	0.15	0.25	4	49	33	4.04	3.01	1.31	325	0.5	1.03	12	880	29	0.01	2.5	101	0.29	116	10	56
185	A02SX011	0.0025	0.005	0.25	4.85	10	360	1.9	1	21.6	0.8	5	23	24	2.72	1.45	0.63	3380	0.5	0.6	16	350	27	0.12	2.5	630	0.14	47	5	58
186	A02SX012	0.005	0.01	0.8	10.13	6	1020	4.1	1	0.11	0.25	4	48	48	4.36	3.38	1.25	280	1	1.09	13	630	72	0.06	2.5	95	0.28	184	5	98
187	A02SX013	0.0025	0.005	0.25	10.69	38	750	4	1	0.24	0.25	7	54	27	5	3.47	1.45	436	0.5	0.79	28	550	137	0.005	2.5	93	0.27	114	10	118
188	A02SX014	0.0025	0.005	0.25	8.99	13	600	4.2	1	0.17	0.25	10	44	38	4.13	3.2	1.06	282	0.5	0.96	24	800	27	0.01	2.5	78	0.27	106	10	110
189	A02SX015	0.0025	0.005	0.25	9.96	27	1970	9	1	0.05	0.25	6	45	16	4.12	4.73	0.55	1395	0.5	0.08	13	810	16	0.01	2.5	56	0.5	95	10	138
190	A02SX016	0.005	0.15	2.5	10.47	95	540	5.2	1	0.33	13.1	10	43	16	2.62	4.48	1.1	1200	4	0.96	27	770	1410	1.38	2.5	73	0.37	276	5	8445
191	A02SX017	0.0025	0.005	0.25	10.39	11	860	4.3	3	0.29	0.25	11	50	20	4.51	3.71	1.24	480	0.5	1.14	37	580	22	0.01	2.5	105	0.5	98	5	233
192	A02SX018	0.0025	0.005	0.25	9.55	10	820	1.7	1	0.09	0.25	2	46	13	3.81	3.2	1.11	368	0.5	0.81	7	760	18	0.03	2.5	68	0.48	125	5	138
193	A02SX019	0.0025	0.005	0.25	9.13	27	790	2	1	0.3	0.9	15	56	43	3.95	3.57	1.24	350	0.5	0.68	40	540	25	1.01	2.5	79	0.42	111	10	167
194	A02SX020	0.0025	0.005	0.25	13.36	16	1590	3.3	1	0.36	0.9	15	61	23	4.52	5.73	1.19	490	0.5	0.53	36	610	15	0.01	2.5	103	0.34	115	5	132
195	A02SX021	0.0025	0.01	0.25	4.79	2.5	210	0.25	1	0.5	0.7	6	52	7	2.03	0.74	0.62	349	0.5	1.9	16	670	32	0.01	2.5	200	0.28	37	5	68
196	A02SX022	0.008	0.005	0.25	4.97	7	330	1.6	1	4.06	5.2	18	50	44	2.27	0.91	0.19	240	3	1.92	21	20000	49	0.7	2.5	549	0.1	23	5	933
197	A02SX023	0.0025	0.005	0.25	12.64	12	1480	3.7	1	0.14	0.7	13	53	9	3.97	5.64	1.13	488	0.5	0.54	29	390	18	0.01	2.5	86	0.28	82	5	109

addition, as a result of normality test by histogram, the analysis values were logarithmically conversed for 22 elements (Au, Ag, As, Ba, Be, Bi, Ca, Cd, Co, Cu, Fe, Mn, Mo, Ni, P, Pb, S, Sb, Sr, W, Zn, and, Hg) that showed the tendency of logarithmic normal distribution (positive asymmetric distribution).

4) Calculation processing

Following WWW data analysis “Black Box", one of the web software for principal component analysis, was employed for the calculation.

http://aoki2.si.gunma-u.ac.jp/BlackBox/BlackBox.html (in Japanese)

According to the arrangement for using this “Black Box", all data was converted into text files (ASCII files). The principal component analysis starts with the calculation of a correlation coefficient matrix. The statistic output obtained by WWW data analysis and the correlation coefficient matrix are shown in Table II-4-3-1-2 and 3, respectively. In this table, correlation coefficients 0.5 or larger that are assumed high in correlation are shown in a bold-faced type. For instance, it is seen that the elements showing high correlation with the main, metallic element Zn of SEDEX deposits are Cd, Ag, Pb, Sb, Hg, Cu, S and Au.

5) Calculation result

The matrix of the principal component loadings obtained is shown in Table II-4-3-1-4. The relation of each principal component to the elements is shown in Fig.II-4-3-1-1. The principal component scores of the 197 samples calculated based on the principal component loadings are shown in Table II-4-3-1-5 together with the geological description etc. In Table II-4-3-1-4 (afore mentioned), figures whose absolute values of loadings are 0.5 or larger are shown in a bold-faced type. (The plus and minus signs are relative to each other, and there is no problem in the interpretation even if all signs are reversed per principal components.) The cumulative contribution rates of the six principal components extracted are 74%. Since the contribution rates of the first three principal components (PC1, PC2 and PC3) accounts for more than 50%, a geochemical feature of 197 samples in these four areas can be almost explained by these three principal components. The features of the three main principal components presumed from these diagrams are shown as follows.

1st principal component (PC1)

Al, Ti, V, Be, Mg, K, Ni, Fe, Co, and Ba show highly negative correlation (principal component loadings below-0.5) with the 1st principal component. They are presumed to be principal components that represent a composition of a certain kind of rock. Because pelitic rocks (shale and

Table II-4-3-1-2 Statistics of the 197 samples for the SEDEX/VMS exploration

	Mean	Unbiased estimate of population	Standard deviation
logAu	-2.503	0.123	0.350
logHg	-2.043	0.225	0.475
logAg	-0.493	0.229	0.479
Al	7.582	9.952	3.155
logAs	1.164	0.178	0.422
logBa	2.719	0.117	0.342
logBe	0.289	0.137	0.370
logBi	0.111	0.130	0.361
logCa	-0.707	0.232	0.481
logCd	-0.262	0.329	0.573
logCo	0.903	0.125	0.354
Cr	62.203	1231.867	35.098
logCu	1.253	0.465	0.682
logFe	0.508	0.079	0.280
K	2.637	1.474	1.214
Mg	0.812	0.183	0.428
logMn	2.593	0.175	0.419
logMo	-0.096	0.171	0.413
Na	0.911	0.352	0.593
logNi	1.343	0.087	0.294
logP	2.761	0.114	0.338
logPb	1.254	0.807	0.898
logS	-1.777	0.601	0.775
logSb	0.458	0.072	0.269
logSr	1.838	0.113	0.336
Ti	0.309	0.019	0.137
V	78.091	1886.073	43.429
logW	0.837	0.062	0.249
logZn	2.032	0.398	0.631

Table II-4-3-1-3 Correlation coefficient matrix of 29 elements for the 197 geochemical samples

logAu	1.000																												
logHg	0.453	1.000																											
logAg	**0.697**	**0.728**	1.000																										
Al	-0.299	-0.089	-0.244	1.000																									
logAs	0.225	0.143	0.186	0.170	1.000																								
logBa	-0.429	-0.019	-0.180	**0.563**	0.070	1.000																							
logBe	-0.145	-0.007	-0.031	**0.787**	0.227	**0.524**	1.000																						
logBi	**0.656**	0.117	0.496	-0.110	0.109	-0.185	0.061	1.000																					
logCa	0.098	-0.007	0.069	0.089	-0.030	0.060	0.143	0.095	1.000																				
logCd	**0.595**	**0.648**	**0.756**	-0.148	0.238	-0.116	0.016	0.332	0.171	1.000																			
logCo	0.171	0.075	0.092	0.486	0.065	0.104	**0.546**	0.263	0.298	0.182	1.000																		
Cr	-0.072	-0.103	-0.070	-0.342	-0.277	-0.140	-0.426	-0.088	-0.200	-0.133	-0.232	1.000																	
logCu	**0.523**	0.304	0.451	0.072	0.279	0.015	0.155	0.384	0.165	0.467	0.248	-0.014	1.000																
logFe	0.344	0.110	0.187	**0.583**	0.370	0.106	**0.517**	0.361	0.143	0.239	**0.612**	-0.341	**0.507**	1.000															
K	-0.333	-0.107	-0.226	**0.858**	0.188	**0.671**	**0.717**	-0.167	0.021	-0.168	0.301	-0.259	-0.053	0.337	1.000														
Mg	0.005	-0.143	-0.150	**0.772**	0.152	0.224	**0.626**	0.157	0.170	-0.086	**0.585**	-0.303	0.188	**0.713**	**0.531**	1.000													
logMn	0.282	0.288	0.406	0.026	0.108	0.091	0.206	0.184	0.396	0.488	0.346	-0.094	0.445	0.267	-0.022	0.161	1.000												
logMo	0.411	0.100	0.331	**-0.519**	0.168	-0.290	-0.343	0.292	0.024	0.314	-0.097	0.273	0.311	-0.144	-0.432	-0.338	0.214	1.000											
Na	-0.245	-0.239	-0.185	0.189	-0.179	-0.065	0.121	-0.050	0.315	-0.170	0.239	-0.115	-0.140	0.091	-0.037	0.194	0.001	-0.233	1.000										
logNi	-0.123	-0.038	-0.117	**0.643**	0.050	0.303	**0.551**	0.048	0.282	-0.002	**0.813**	-0.135	0.229	**0.566**	0.428	**0.636**	0.241	-0.237	0.219	1.000									
logP	-0.116	-0.075	-0.101	0.193	0.052	0.218	0.243	-0.020	**0.613**	-0.058	0.214	-0.250	0.063	0.106	0.167	0.136	0.133	-0.064	0.263	0.209	1.000								
logPb	**0.508**	**0.522**	**0.731**	-0.257	0.266	-0.052	-0.077	0.310	0.064	**0.647**	-0.147	-0.072	**0.521**	0.058	-0.189	-0.222	0.393	0.369	-0.231	-0.244	-0.063	1.000							
logS	**0.588**	0.450	**0.610**	-0.215	0.272	-0.114	-0.062	0.401	0.225	**0.595**	0.038	-0.158	0.474	0.215	-0.170	-0.067	0.296	0.437	-0.208	-0.130	-0.004	**0.612**	1.000						
logSb	**0.615**	**0.683**	**0.915**	-0.234	0.182	-0.164	-0.053	0.428	0.061	**0.692**	0.031	-0.058	0.372	0.168	-0.222	-0.161	0.343	0.235	-0.195	-0.154	-0.094	**0.652**	0.495	1.000					
logSr	-0.272	-0.038	-0.113	0.300	-0.133	0.366	0.259	-0.114	**0.681**	-0.053	0.198	-0.235	-0.082	0.056	0.217	0.137	0.109	-0.329	0.434	0.288	**0.569**	-0.106	0.020	-0.126	1.000				
Ti	-0.231	-0.062	-0.225	**0.867**	0.129	0.449	**0.664**	-0.082	0.127	-0.125	0.474	-0.245	0.101	**0.580**	**0.695**	**0.718**	0.092	**-0.504**	0.220	**0.592**	0.185	-0.211	-0.233	-0.192	0.258	1.000			
V	-0.071	0.140	0.054	**0.837**	0.274	0.437	**0.709**	0.020	0.073	0.047	0.417	-0.302	0.220	**0.567**	**0.705**	**0.718**	0.151	-0.283	0.001	**0.551**	0.172	-0.013	0.070	-0.008	0.211	**0.726**	1.000		
logW	**0.565**	0.169	0.353	-0.054	0.172	-0.135	0.043	0.485	0.029	0.442	0.288	0.035	**0.515**	0.389	-0.130	0.220	0.350	0.247	-0.190	0.127	-0.123	0.301	0.334	0.301	-0.207	0.012	0.035	1.000	
logZn	**0.548**	**0.649**	**0.761**	0.068	0.346	0.024	0.222	0.295	0.113	**0.794**	0.277	-0.221	**0.586**	0.440	-0.004	0.085	0.536	0.235	-0.143	0.140	0.007	**0.694**	**0.555**	**0.687**	-0.102	0.089	0.261	0.399	1.000
	logAu	**logHg**	**logAg**	**Al**	**logAs**	**logBa**	**logBe**	**logBi**	**logCa**	**logCd**	**logCo**	**Cr**	**logCu**	**logFe**	**K**	**Mg**	**logMn**	**logMo**	**Na**	**logNi**	**logP**	**logPb**	**logS**	**logSb**	**logSr**	**Ti**	**V**	**logW**	**logZn**

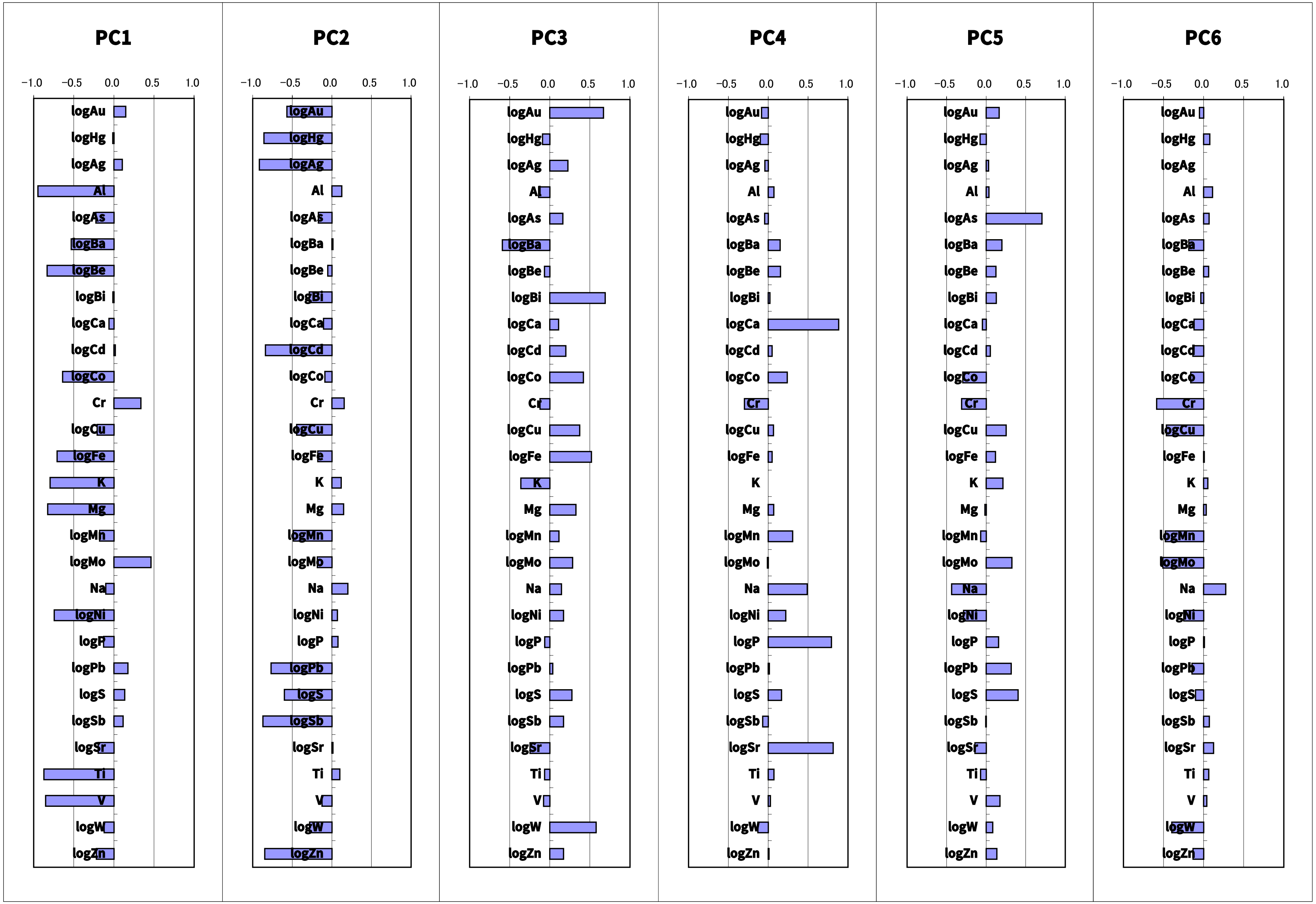
Table II-4-3-1-4 Principal component loading matrix after varimax rotation for the 197 geocheminal samples

	PC1	PC2	PC3	PC4	PC5	PC6	Contribution ratio
logAu	0.147	**-0.567**	**0.669**	-0.084	0.163	-0.052	0.827
logHg	-0.014	**-0.857**	-0.090	-0.099	-0.076	0.076	0.764
logAg	0.104	**-0.916**	0.225	-0.042	0.031	0.000	0.903
Al	**-0.946**	0.125	-0.139	0.071	0.034	0.110	0.949
logAs	-0.225	-0.170	0.161	-0.044	**0.706**	0.067	0.610
logBa	**-0.532**	0.013	**-0.591**	0.149	0.198	-0.185	0.728
logBe	**-0.833**	-0.051	-0.066	0.153	0.122	0.061	0.742
logBi	-0.012	-0.285	**0.691**	0.021	0.127	-0.035	0.576
logCa	-0.060	-0.106	0.109	**0.884**	-0.047	-0.119	0.824
logCd	0.017	**-0.839**	0.199	0.048	0.052	-0.133	0.767
logCo	**-0.640**	-0.088	0.418	0.237	-0.296	-0.161	0.762
Cr	0.336	0.154	-0.122	-0.298	-0.310	**-0.586**	0.679
logCu	-0.208	-0.445	0.373	0.065	0.252	-0.465	0.664
logFe	**-0.707**	-0.178	**0.518**	0.047	0.117	0.007	0.817
K	**-0.795**	0.117	-0.361	0.000	0.212	0.051	0.823
Mg	**-0.826**	0.147	0.326	0.067	-0.015	0.032	0.815
logMn	-0.179	-0.486	0.113	0.305	-0.069	-0.477	0.606
logMo	0.462	-0.183	0.284	-0.010	0.325	**-0.509**	0.693
Na	-0.101	0.200	0.144	0.488	-0.437	0.275	0.577
logNi	**-0.744**	0.069	0.170	0.219	-0.286	-0.247	0.778
logP	-0.128	0.076	-0.064	**0.792**	0.156	0.008	0.678
logPb	0.174	**-0.768**	0.036	0.013	0.316	-0.145	0.742
logS	0.134	**-0.599**	0.276	0.166	0.403	-0.100	0.653
logSb	0.114	**-0.871**	0.170	-0.069	-0.005	0.070	0.811
logSr	-0.195	0.013	-0.247	**0.814**	-0.141	0.123	0.796
Ti	**-0.873**	0.099	-0.064	0.071	-0.071	0.063	0.789
V	**-0.851**	-0.124	-0.078	0.026	0.173	0.039	0.777
logW	-0.121	-0.281	**0.577**	-0.130	0.082	-0.398	0.608
logZn	-0.219	**-0.847**	0.170	0.009	0.134	-0.131	0.830
Sum of loading square	6.810	5.887	2.954	2.734	1.663	1.540	
Contribution ratio	23.483	20.298	10.186	9.428	5.733	5.310	
Cumulative contribution ratio	23.483	43.781	53.967	63.395	69.129	74.439	

Table II-4-3-1-5 Principal component scores and sample descriptions for the 197 geochemical samples

Serial No.	Sample No.	District	Locality	Rock	PC1	PC2	PC3	PC4	PC5	PC6
1	A02CX020	Aguilar	Mina Aguilar	Aguilar Granite	0.434	-0.496	0.066	4.417	-0.725	1.865
2	A02CX021	Aguilar	Mina Aguilar	quartzite	4.352	1.154	-0.602	-2.980	2.546	-2.018
3	A02SX001	Aguilar	Mina Aguilar	silicified shale with po	-0.911	-0.727	0.238	2.003	1.496	-2.053
4	A02SX002	Aguilar	Mina Aguilar	galena ore	0.499	-14.517	3.901	1.342	-2.680	0.449
5	A02SX003	Aguilar	Mina Aguilar	sandstone	1.240	-0.912	0.744	1.955	-1.433	0.921
6	A02SX004	Aguilar	Mina Aguilar	quartzite	-2.599	-0.809	-0.908	0.903	0.185	-0.248
7	A02CX007	Aguilar	Mina Esperanza	ga-zb ore	3.459	-19.688	-1.260	-4.324	-4.424	2.917
8	A02CX008	Aguilar	Mina Esperanza	shale	-0.332	-14.407	-3.332	1.181	-0.891	0.630
9	A02SX016	Aguilar	Mina Esperanza	phillitic slate	-2.992	-5.554	-1.965	0.534	2.136	-0.040
10	A02SX017	Aguilar	Mina Esperanza	shale	-2.513	0.403	0.135	0.469	-0.188	0.186
11	A02SX018	Aguilar	Mina Esperanza	shale	-0.702	0.376	-1.175	-0.473	1.295	1.004
12	A02SX019	Aguilar	Mina Esperanza	shale	-1.929	0.088	0.248	0.358	1.060	-0.587
13	A02SX020	Aguilar	Mina Esperanza	phillitic state	-3.276	0.078	-1.522	0.188	0.546	-0.687
14	A02CX012	Aguilar	Mina Oriental	breccia ore	0.559	-10.148	6.038	2.144	2.456	-2.958
15	A02SX005	Aguilar	Mina Oriental	sed. and metamorphic	-0.331	0.466	0.196	0.747	0.484	0.259
16	A02SX006	Aguilar	Mina Oriental	sandstone	-2.579	0.171	-1.267	1.167	0.338	-0.121
17	A02CX013	Aguilar	Mina Pirita	massive quartzite	4.121	-1.209	-2.183	-3.640	0.870	-1.484
18	A02CX014	Aguilar	Mina Pirita	py-mv-qtz-vein	0.161	-3.647	-0.874	-0.403	-0.474	-7.543
19	A02CX015	Aguilar	Mina Pirita	quartzite breccia	3.916	1.776	5.491	-3.595	0.977	-3.089
20	A02CX016	Aguilar	Mina Pirita	bedded quartzite	-2.815	-0.137	-0.919	0.052	1.368	-1.193
21	A02CX017	Aguilar	Mina Pirita	shale	-1.995	-1.553	-1.888	-0.318	2.244	-2.002
22	A02CX018	Aguilar	Mina Pirita	altered zone	-0.611	-2.546	-1.974	-0.647	4.385	-0.837
23	A02CX019	Aguilar	Mina Pirita	pyrite-quartz	3.902	-4.043	4.587	-1.754	3.784	1.123
24	A02SX007	Aguilar	Mina Pirita	shale	-2.033	0.863	0.694	0.878	0.378	0.105
25	A02SX008	Aguilar	Mina Pirita	shale	-2.624	0.475	-0.832	0.080	0.396	-0.160
26	A02CX009	Aguilar	Mina Rincon	shale?	-0.110	-3.161	-2.943	-1.051	2.776	0.855
27	A02CX010	Aguilar	Mina Rincon	po+zb quartz ore	6.300	-1.053	-0.894	-1.494	2.804	0.874
28	A02CX011	Aguilar	Mina Rincon	shale?	4.426	-5.023	6.040	-4.037	4.812	0.003
29	A02SX021	Aguilar	Mina Tapada	sandstones	3.181	-0.224	0.296	1.946	-2.359	1.137
30	A02SX022	Aguilar	Mina Tapada	conglomerate	4.066	-0.792	0.859	6.906	0.570	-0.202
31	A02CX001	Aguilar	Qda.Despensa	lim.conglomerate	2.032	0.413	0.402	0.180	1.130	1.639
32	A02CX002	Aguilar	Qda.Despensa	pyritized zone	3.671	-0.371	1.538	4.884	1.670	-0.407
33	A02SX010	Aguilar	Qda. Despensa	sandstones	-0.996	1.037	0.382	0.254	1.053	0.507
34	A02SX011	Aguilar	Qda. Despensa	stromatolite	2.622	-0.510	-0.439	4.551	0.122	-0.318
35	A02SX012	Aguilar	Qda. Despensa	phillitic slate	-1.509	-0.745	-0.847	-0.139	0.991	0.563
36	A02SX013	Aguilar	Qda. Despensa	phillitic shale	-2.060	0.708	-0.040	-0.041	1.108	-0.160
37	A02SX014	Aguilar	Qda. Despensa	phillitic slate	-1.295	0.775	0.207	0.129	0.451	0.110
38	A02SX015	Aguilar	Qda. Despensa	quarzite	-2.492	0.184	-2.024	-1.003	1.844	-0.739
39	A02SX023	Aguilar	Qda. Polvorines	shale and s.s.	-2.657	0.084	-1.552	-0.604	0.317	-0.233
40	A02KK018	Aguilar	Qda. Quebralena	shale	-2.527	0.937	1.024	-0.008	0.410	-0.228
41	A02KK023	Aguilar	Qda. Quera	shale	-2.343	0.543	0.038	-0.374	-0.934	-0.289
42	A02CX003	Aguilar	Qda. Rio Grande	pyritized zone	-2.182	0.754	1.191	1.434	0.847	-1.779
43	A02CX004	Aguilar	Qda. Rio Grande	lim. pyrite-rich	0.364	1.125	12.424	1.087	1.169	-1.497
44	A02CX005	Aguilar	Qda. Rio Grande	black shale	0.212	1.194	0.076	3.704	1.477	-1.136
45	A02CX006	Aguilar	Qda. Rio Grande	siliceous s.s.	-1.143	1.054	-0.153	-0.209	0.976	0.788
46	A02SX009	Aguilar	Qda. Vacas	shale	-2.403	-0.020	-1.722	0.940	-1.149	-0.216
47	A02CX028	Pumahuasi	Chaussette north	bedded f.s.s.&shale	3.340	1.231	1.171	1.134	0.121	0.657
48	A02CX024	Pumahuasi	Mina Alejandro	bedded shale	-0.411	0.131	-1.469	-0.278	0.769	0.975
49	A02CX025	Pumahuasi	Mina Belgica	bedded shale	-0.658	0.414	-0.379	-0.224	0.454	0.568
50	A02CX027	Pumahuasi	Mina Chaussette	hard shale	0.624	-2.572	-2.394	0.992	0.967	0.558
51	A02CX022	Pumahuasi	Mina Pumahuasi	bedded shale	-1.757	-1.173	-0.502	0.181	0.853	-0.722
52	A02CX026	Pumahuasi	Mina Sol de Mayo	bedded shale	-1.443	-0.324	-0.540	-0.448	1.079	0.972
53	A02CX023	Pumahuasi	NW Cerro Morado	bedded shale&s.s	1.059	0.788	1.030	0.222	1.002	0.591

Fig. II-4-3-1-1 Diagrams of principal component loadings for the 197 geocheminal samples



slate, etc.) generally show a negative high score, and sandstones (sandstone and quartzite, etc.) a positive high score, these are presumed to be a principal component, which is related to the amount of the muddy material. The 1st principal component is similar to the 1st principal component for the 35 drill core samples from La Colorada area, and the 2nd principal component for the 72 drill core samples from the Aguilar range area.

2nd principal component (PC2)

Ag, Sb, Hg, Zn, Cd, Pb, S, and Au show highly negative correlation (principal component loadings below-0.5) with the 2nd principal component. Because these elements are common in the Esperanza ore body being thought to be a typical model of SEDEX deposits, the 2nd principal component is presumed to be the principal components showing the SEDEX mineralization. The 2nd principal component is discriminated as the 1st principal component for the 72 drill core samples from the Aguilar range area, and the 3rd principal component for the 35 drill core samples from La Colorada area.

3rd principal component (PC3)

Bi, Au, W, Fe, and Ba show highly positive correlation (principal component loadings :0.5 or larger) with the 3rd principal component. For the 35 drill core samples of La Colorada area, these elements plus Co and Cu are extracted as the 2nd principal component with high correlation. Because these are common in La Colorada ore bodies consisting mainly of pyrrotite, accompanied by chalcopyrite, marmatite, arsenopyrite, galena and ilmenite, and also a small amount of bismuthinite, natural bismuth, and electrum, they are presumed to be the principal components showing the mineralization (VMS?) represented by La Colorada deposits.

6) Score distribution of principal components

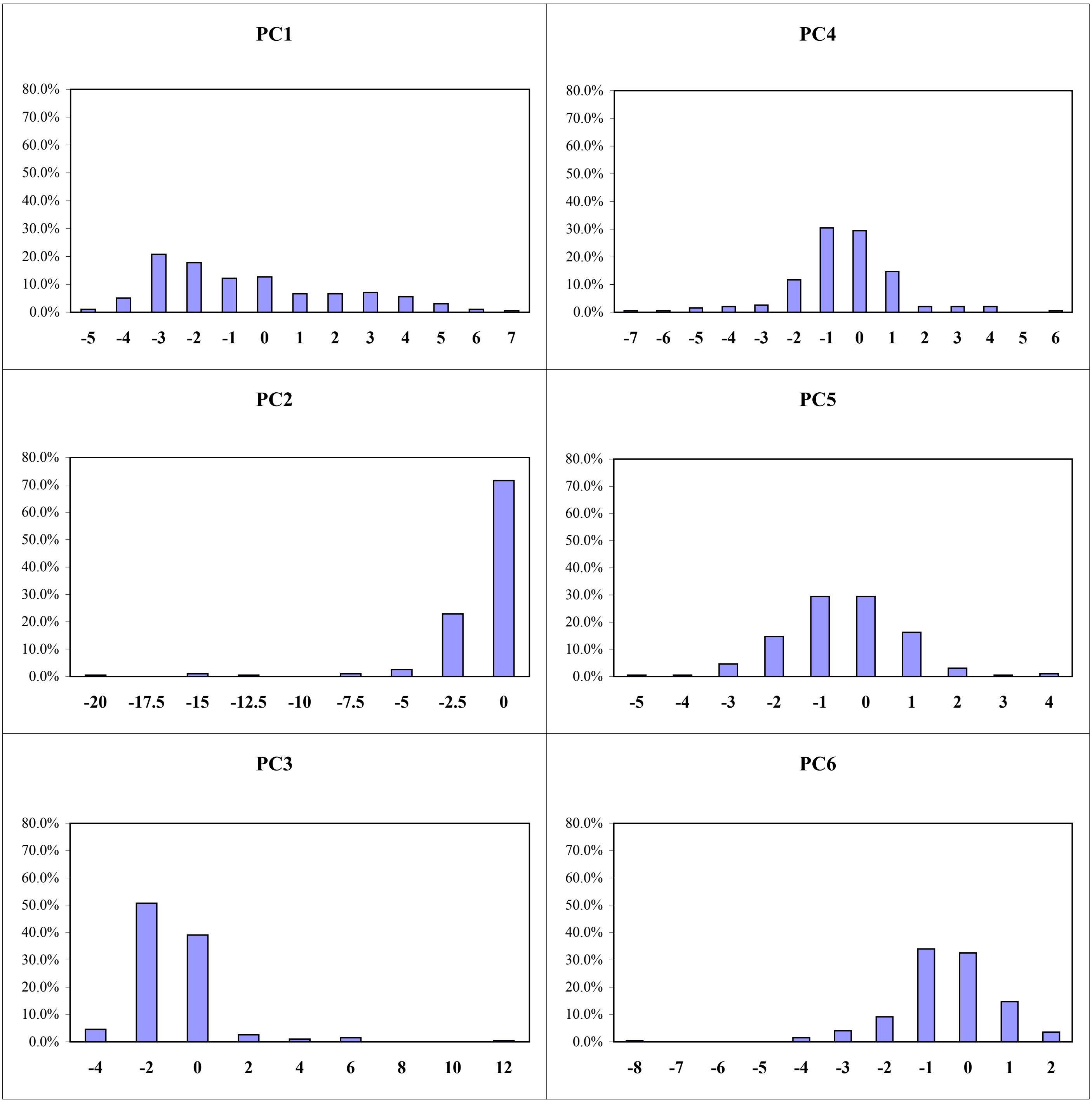
Classification of each principal component scores is made based on frequency distribution (Fig.II-4-3-1-2) of each principal component score.

1st principal component (PC1)

Scores of the 1st principal component are distributed within the range of -4.895 to +7.012. These are presumed to be principal components that relate to a kind of composition (perhaps grain size) of the rock, and have significant meanings both on the positive side and negative side. So, the symmetrical classification centering on the zero value was adopted.

Score distributions in the Aguilar Range, Pumahuasi, Santa Victoria Mountains and La Colorada areas are shown in Fig.II-4-3-1-3 (1) - (4). The blue circles and yellow circles nearly correspond to shale and sandstone (including phyllite) of the sample descriptions, respectively.

Fig.II-4-3-1-2 Histograms of PC scores for 197 geochemical samples



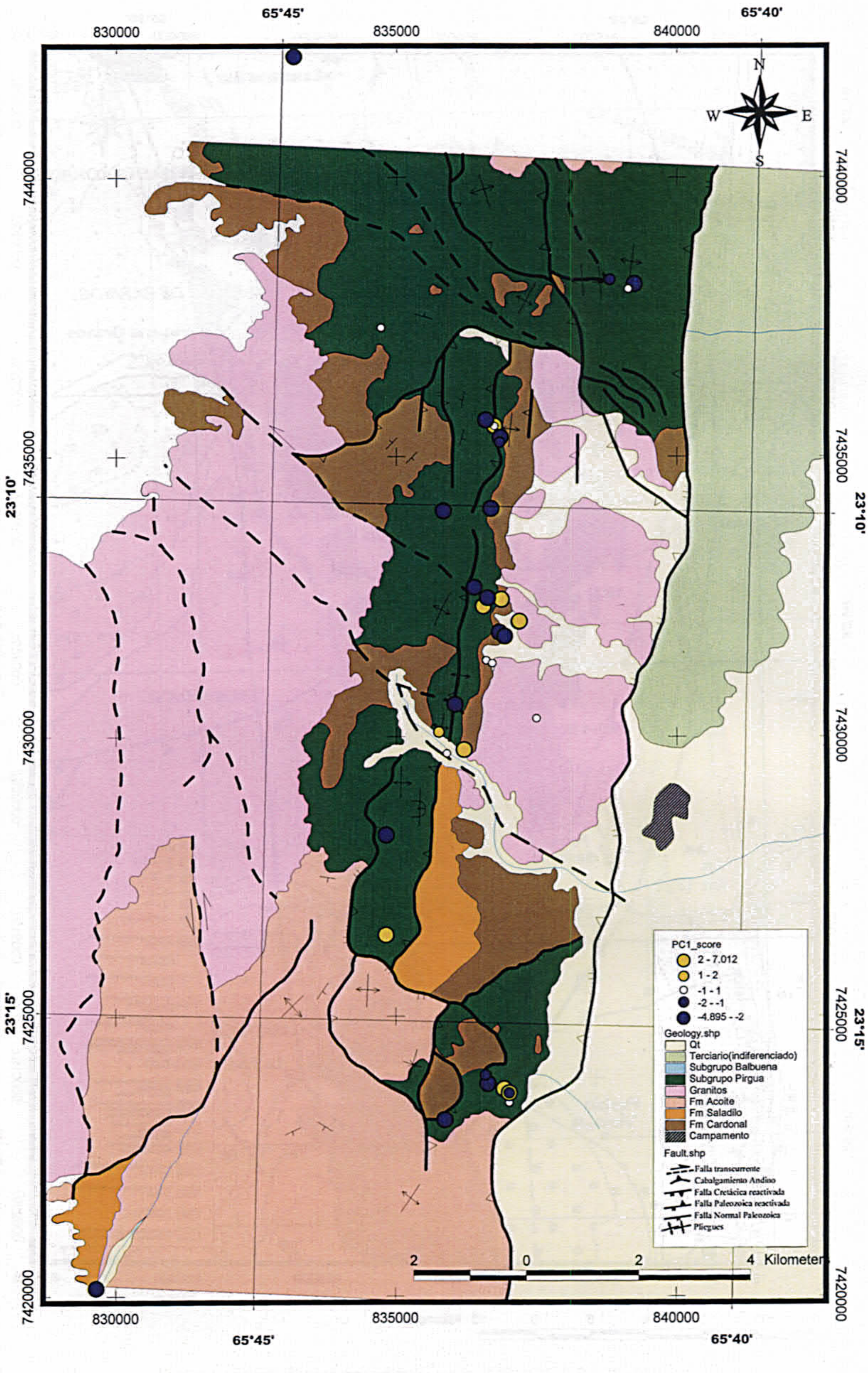


Fig.II-4-3-1-3(1) PC1 score distribution map, Aguilar range area

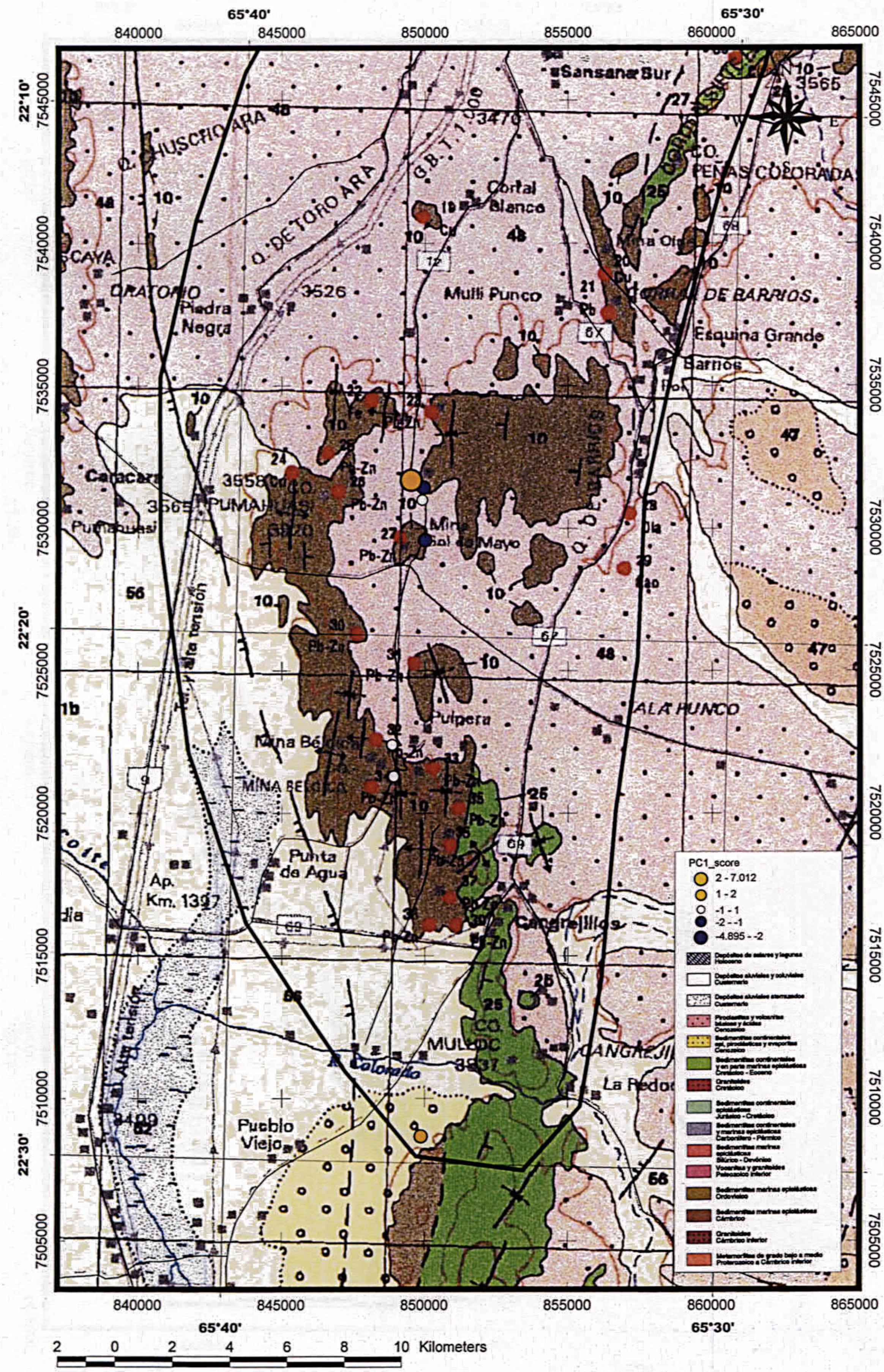


Fig.II-4-3-1-3(2) PC1 score distribution map, Pumahuasi area

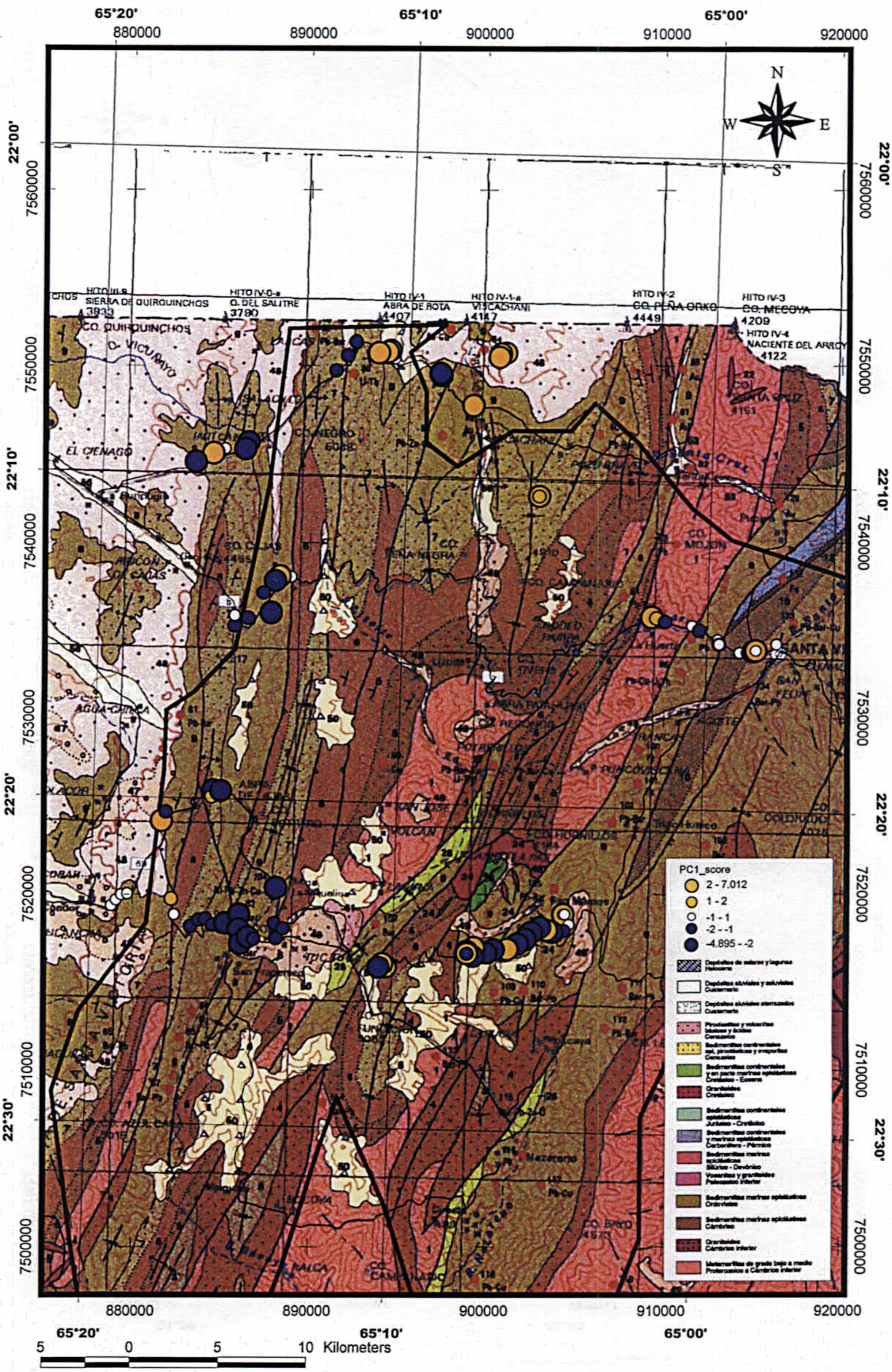


Fig.II-4-3-1-3(3) PC1 score distribution map, Santa Victoria mountains area

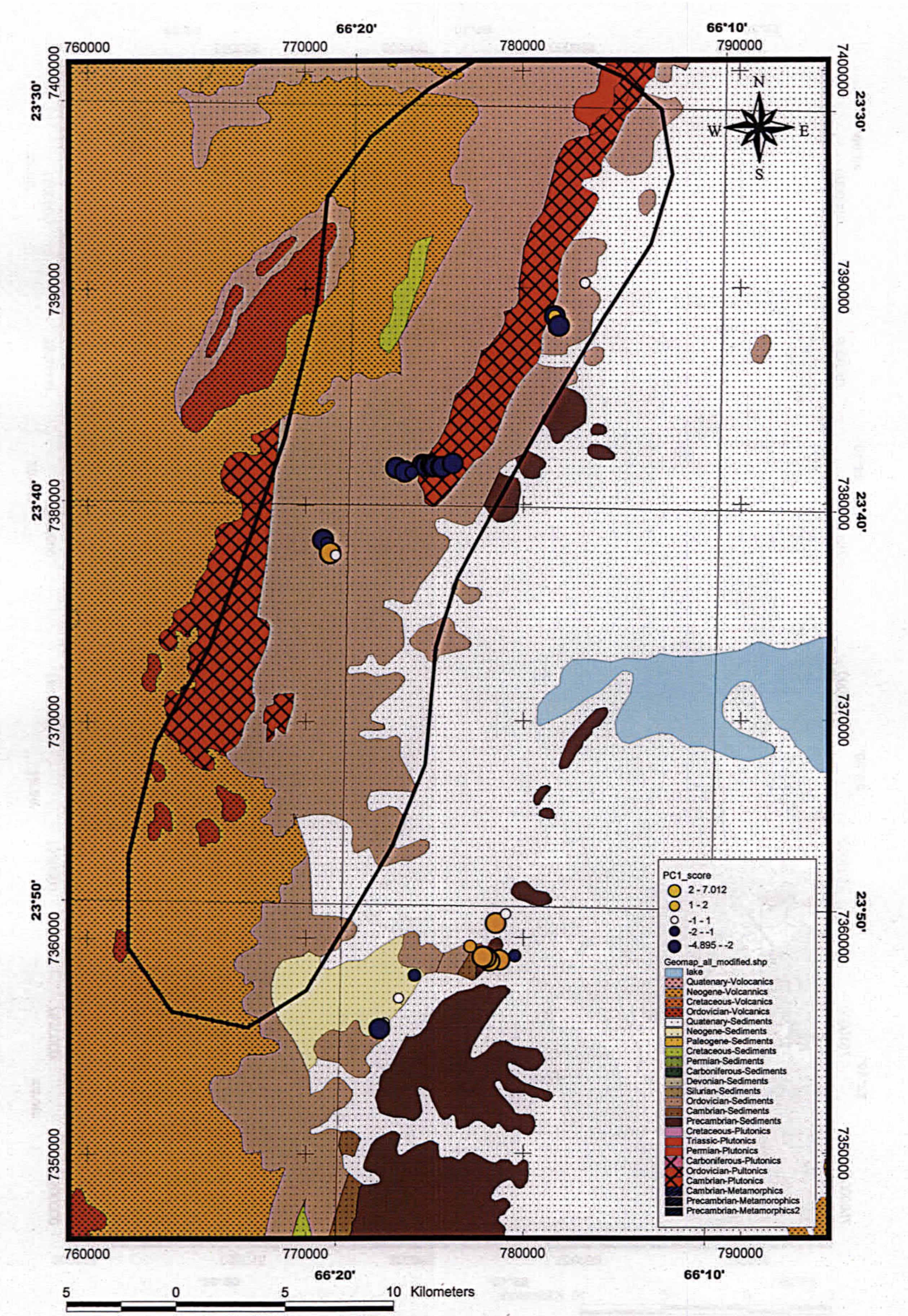


Fig.II-4-3-1-3(4) PC1 score distribution map, La Colorada area

2nd principal component (PC2)

Scores of the 2nd principal component, ranging from -19.688 to +2.295, show a distribution extremely biased to the minus side. Because the loadings of the elements highly correlated with the 2nd principal component shows minus (Table II-4-3-1-4 referred to earlier), it indicates that the higher scoring is on the minus side, the stronger the elements of these principal components are. Because the 2nd principal component predict the possibility of being SEDEX deposits, the higher the scoring on the minus side, means the stronger the possibility of SEDEX deposits. In Fig.II-4-3-1-4 (1) - (4), the values of -1.000 or less of 18 samples corresponding to about 9% of the whole are displayed in red circles, furthermore, the values of -5.000 or less of six samples corresponding to about 3% of the whole displayed in a large red circle. 13 samples out of 18 samples with values of -1.000 or less and six samples with values of-5.000 or less as well are collected from ore bodies and their surroundings of Esperanza, Aguilar, Oriental and Pirita (Rincon) in the Aguilar Ranges area. Two samples of the other five samples with values of -1.000 or less are all shale in the vicinity of Chaussette ore deposits of the Pumahuasi area and in the vicinity of Pumahuasi ore deposits. The other three samples are all shale samples collected respectively in the upstream of Vicunayo valley of North route, in the west of Santa Victoria town and in La Cienaga ore deposits of South route in Santa Victoria Mountains area. No high score sample has been recognized in La Colorada area.

In Aguilar Range area, the existence of the SEDEX mineralization was geochemically presented because of a high score distribution of the 2nd principal component not only in Esperanza deposits, which is assumed to be a typical model of SEDEX deposits, but also in Aguilar deposits, Oriental and Pirita mineral showings. However, in Rio Grande mineral showings thought to be similar SEDEX mineralization located about 3km northeast of Esperanza deposits, high score of the 2nd principal component has not been obtained against our forecast.

It has been thought that the Pumahuasi area is covered by the sediments of Acoite Formation which is the upper part of the Santa Victoria Group, and the existence of SEDEX mineralization hosted in the lower part has been regarded as negative. However, Because of a high score of the 2nd principal component obtained, further examination is required on the shale in the vicinity of Chaussette deposits and Pumahuasi deposits of this area.

In Santa Victoria Mountains area, a lot of samples (104 samples) were examined; nevertheless, only three samples show high scores of the 2nd principal component. Furthermore, the score values are not remarkably high, ranging from +1.2 to +1.4, even though they are classified in high score group. Among these samples, however, two samples from upstream of Vicunayo valley and from the west of Santa Victoria town indicated the possibility of the existence of the SEDEX mineralization, according to the discriminant analysis that both exist in the vicinity of the ore zone of

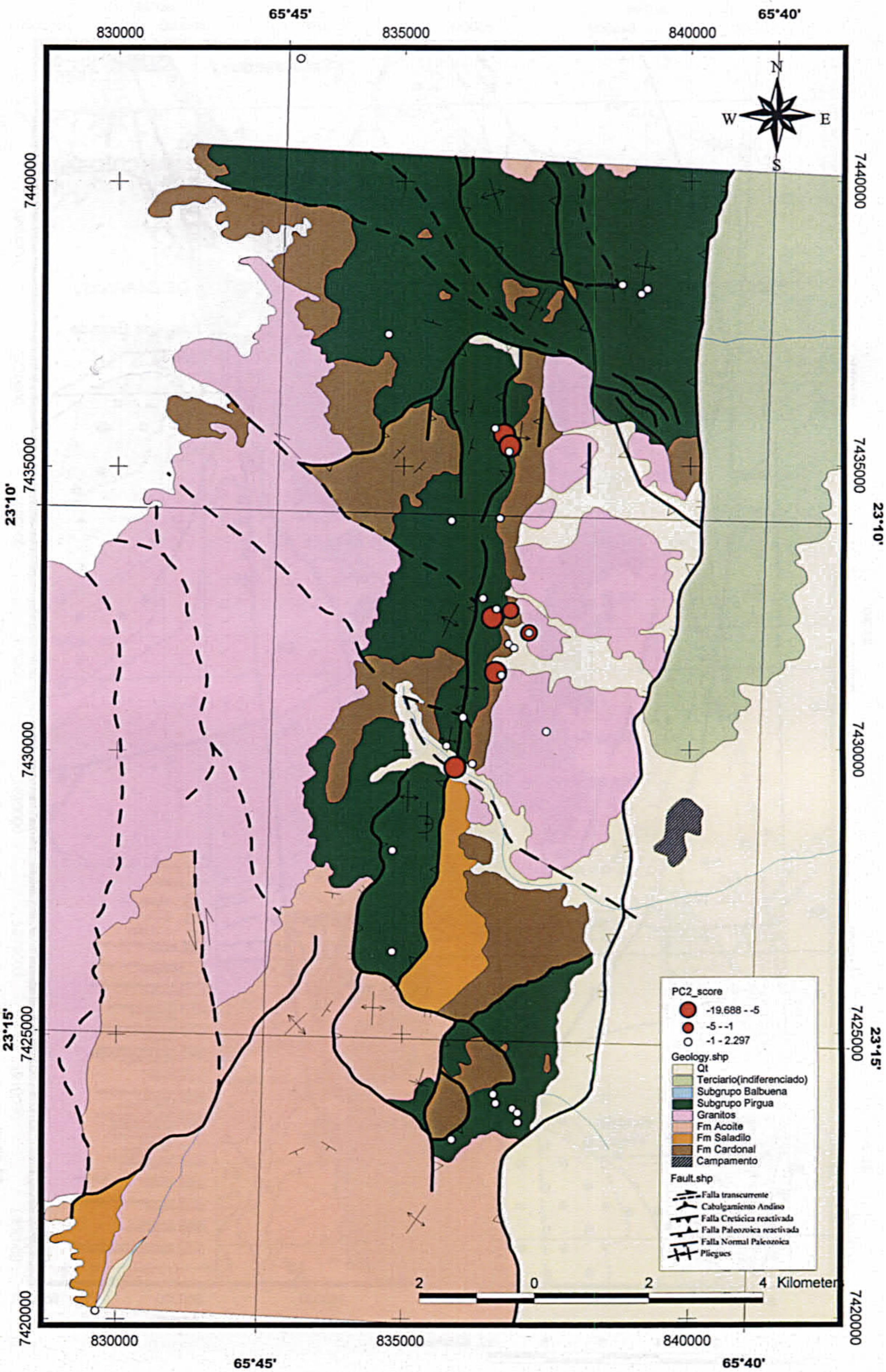


Fig.II-4-3-1-4(1) PC2 score distribution map, Aguilar range area

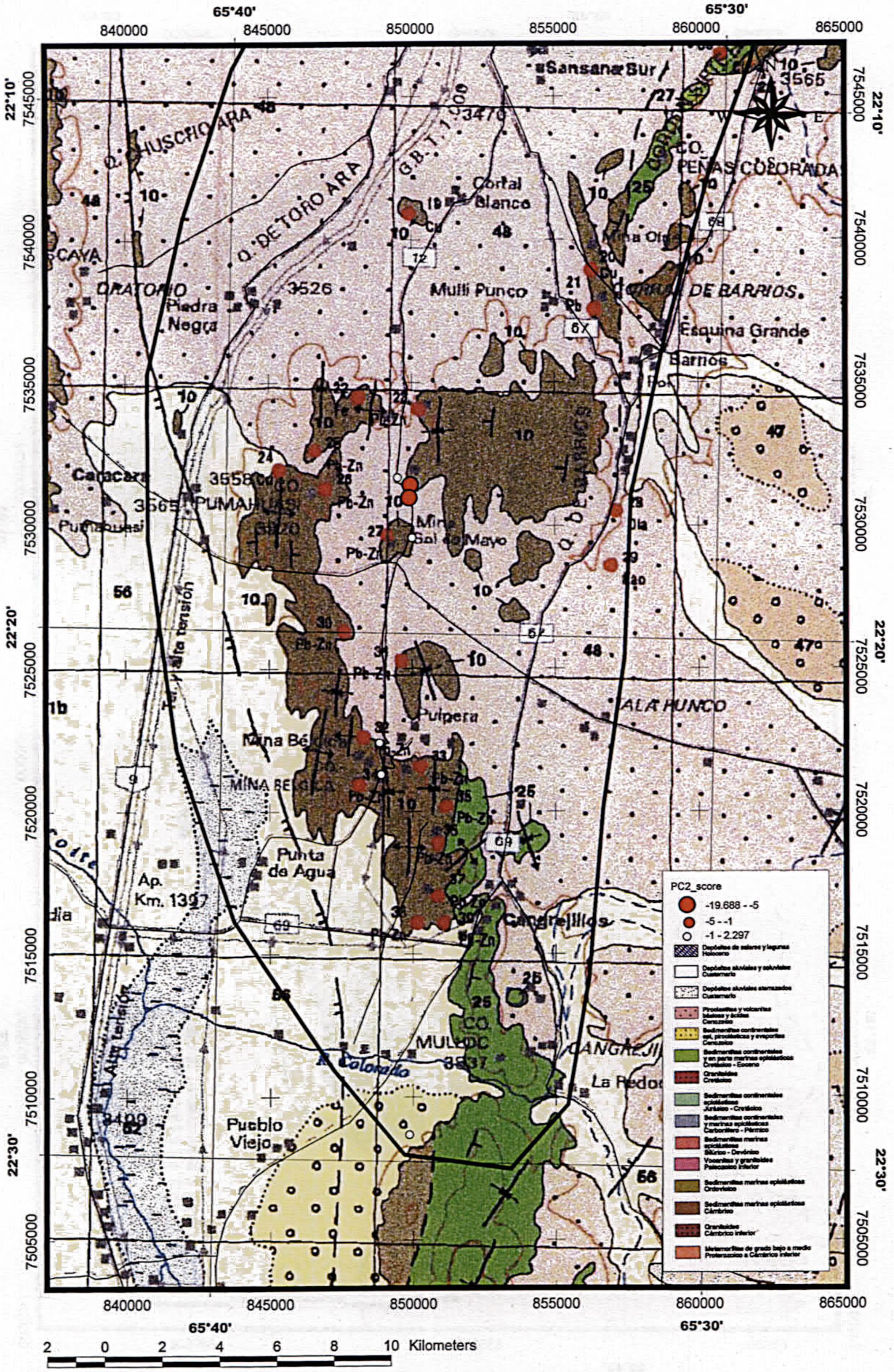


Fig.II-4-3-1-4(2) PC2 score distribution map, Pumahuasi area

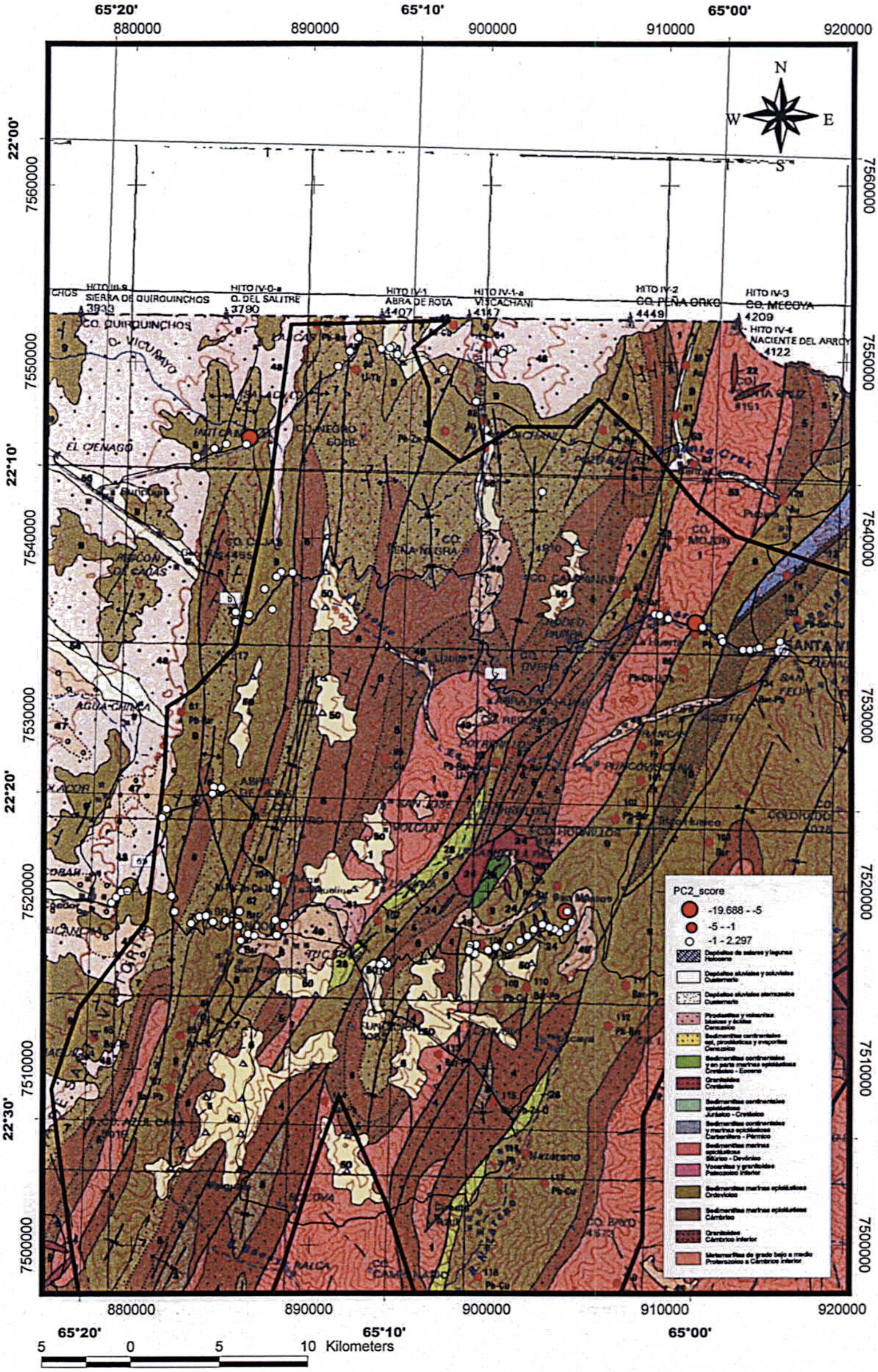


Fig.II-4-3-1-4(3) PC2 score distribution map, Santa Victoria mountains area

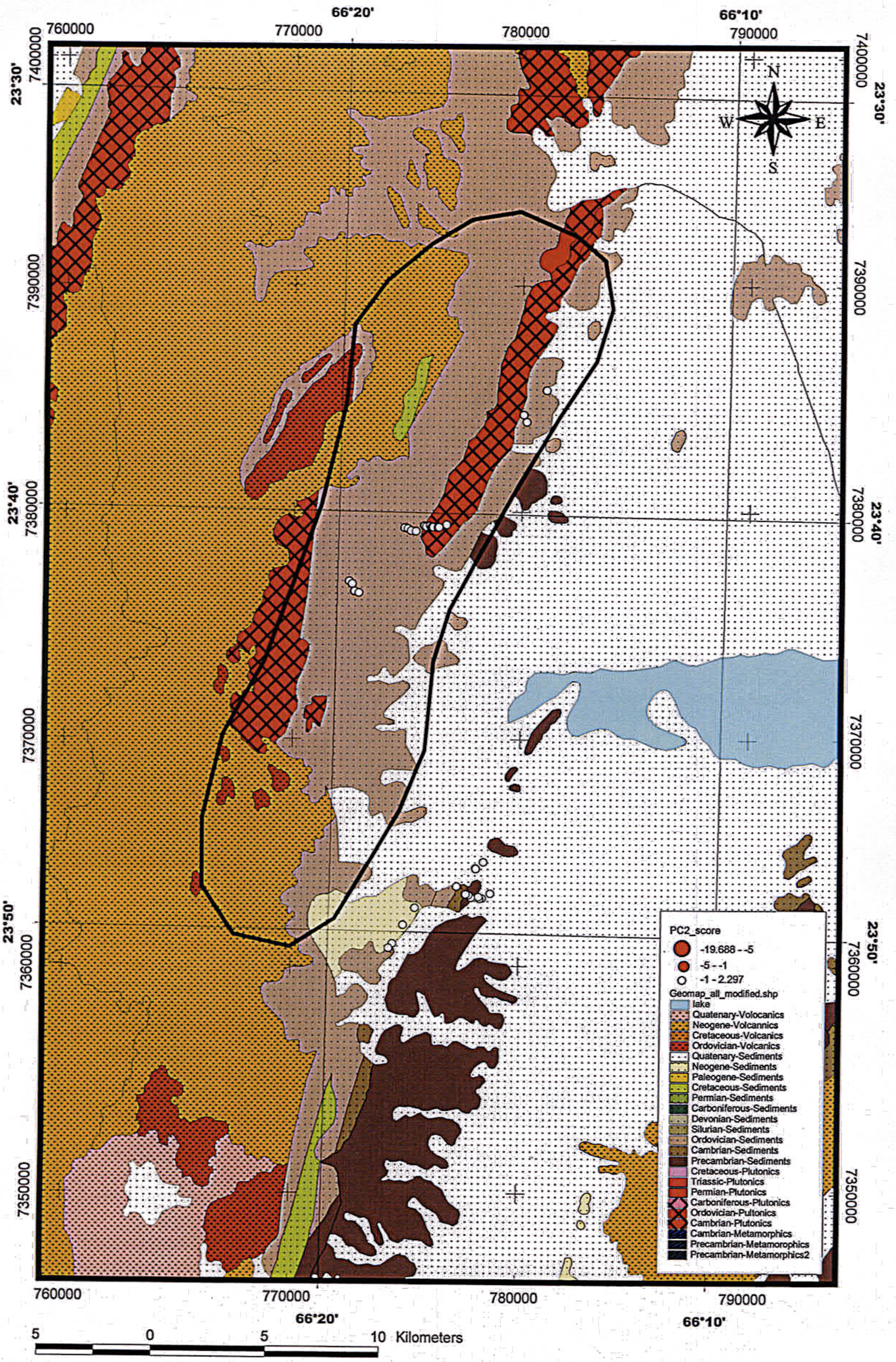


Fig.II-4-3-1-4(4) PC2 score distribution map, La Colorada area

the hanging and foot walls boundary. Other high score sample of A02CX070 is collected in La Cienaga mineral showings, and, it is suggested that they are ore zone itself in the foot walls of ore zone according to the discriminant analysis.

In La Colorada area, high score of the 2nd principal component is not recognized according to the result of the principal component analysis of these 197 samples. However, as the result of the principal component analysis, intended only for 35 core samples of the La Colorada area, the possibility of the existence of SEDEX mineralization in this area still exists, because principal components showing SEDEX mineralization corresponding to the 2nd principal components is discriminated as the 3rd principal component.

3rd principal component (PC3)

Scores of the 3rd principal component are distributed within the range from -3.332 to +12.424. Because the loadings of the elements highly correlated with the 3rd principal component indicate plus (Table II-4-3-1-4, referred to earlier), it is shown that the elements of the principal component are stronger as score becomes higher. The possibility of the principal component that shows mineralization represented by La Colorada deposits can be forecast from the 3rd principal component, it is indicated that the possibility of this mineralization becomes stronger as the score becomes higher. In Fig.II-4-3-1-5 (1) - (4), 27 samples with scores of +1.000 or larger that account for about 14% of the whole are displayed in red circle, 11 samples with scores of +2.000 or larger that account for about 6% of the whole in medium red circles, furthermore, five samples with scores of +5.000 or larger that account for about 2.5% of the whole in a large red circle.

Out of 27 samples with the scores of +1.000 or larger, 13 samples are collected in La Colorada area, nine samples in the Aguilar Range area, three samples in the Santa Victoria Mountains area, and two samples in the Pumahuasi area. Further, out of 11 samples with the scores of +2.000 or larger, six samples are collected from ore bodies of Rio Grande, Pirita (Rincon), Oriental, and Aguilar and the surrounding of their ore bodies excluding Esperanza deposit in the Aguilar Range area, and five samples are collected around the surrounding of La Colorada deposits in La Colorada area, in its northern part, and in Limeca in its southern part. Out of five samples with the scores of +5.000 or larger, four samples are collected in Rio Grande, Pirita (Rincon), and Oriental excluding Esperanza deposits in the Aguilar Range area and one sample is collected from chlorite alteration zones around La Colorada deposits in La Colorada area.

In Aguilar deposits and its peripheral mineral showings, mineralization of La Colorada deposits type overlaps on SEDEX mineralization area. As the result of the principal component analysis on 197 samples, however, the above-mentioned phenomenon cannot be recognized with regard to Esperanza deposits. Rio Grande mineral showings so far thought to be SEDEX mineralization located in the northeast of Esperanza deposits, and Despensa mineral showings

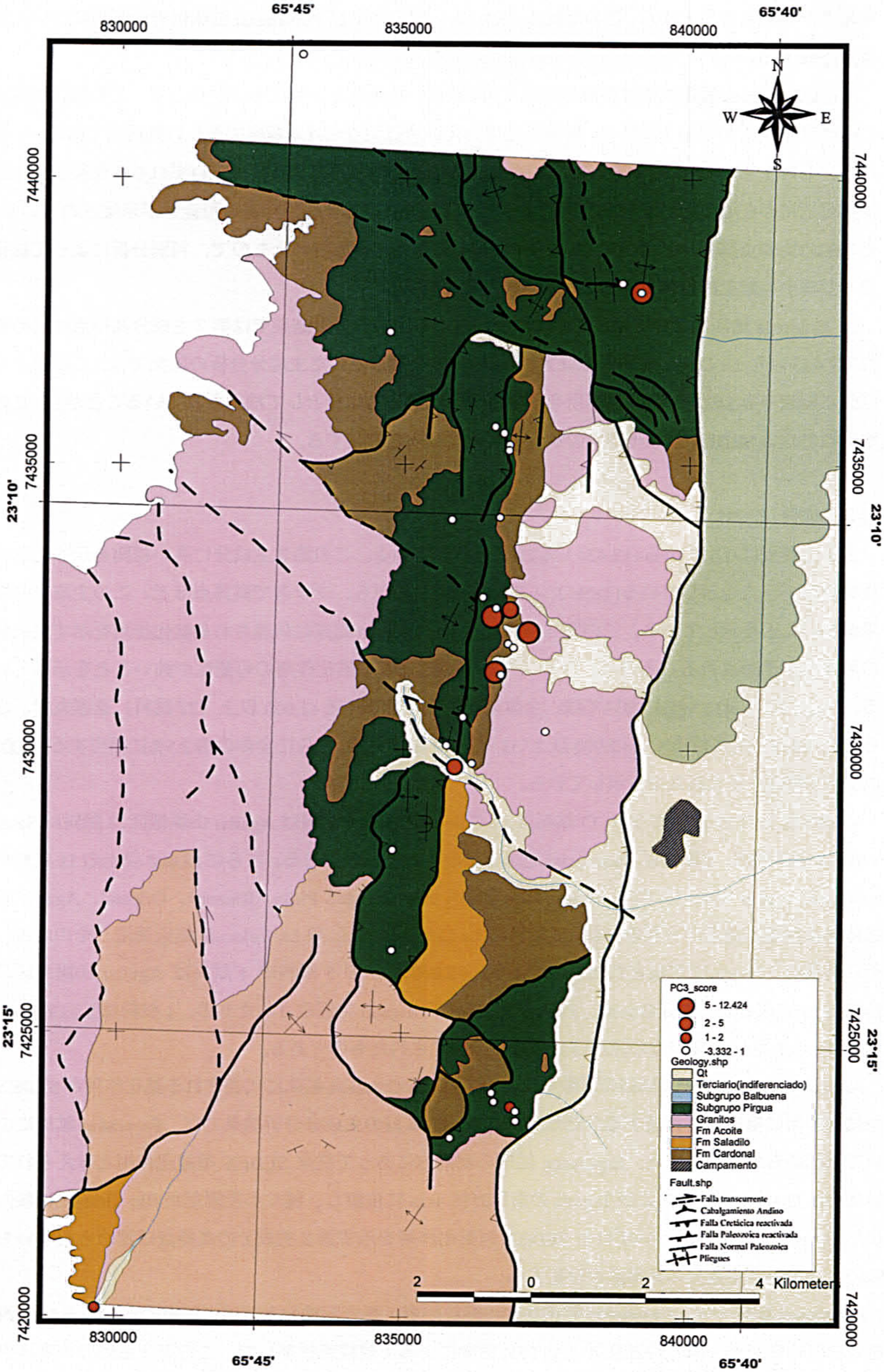


Fig.II-4-3-1-5(1) PC3 score distribution map, Aguilar range area

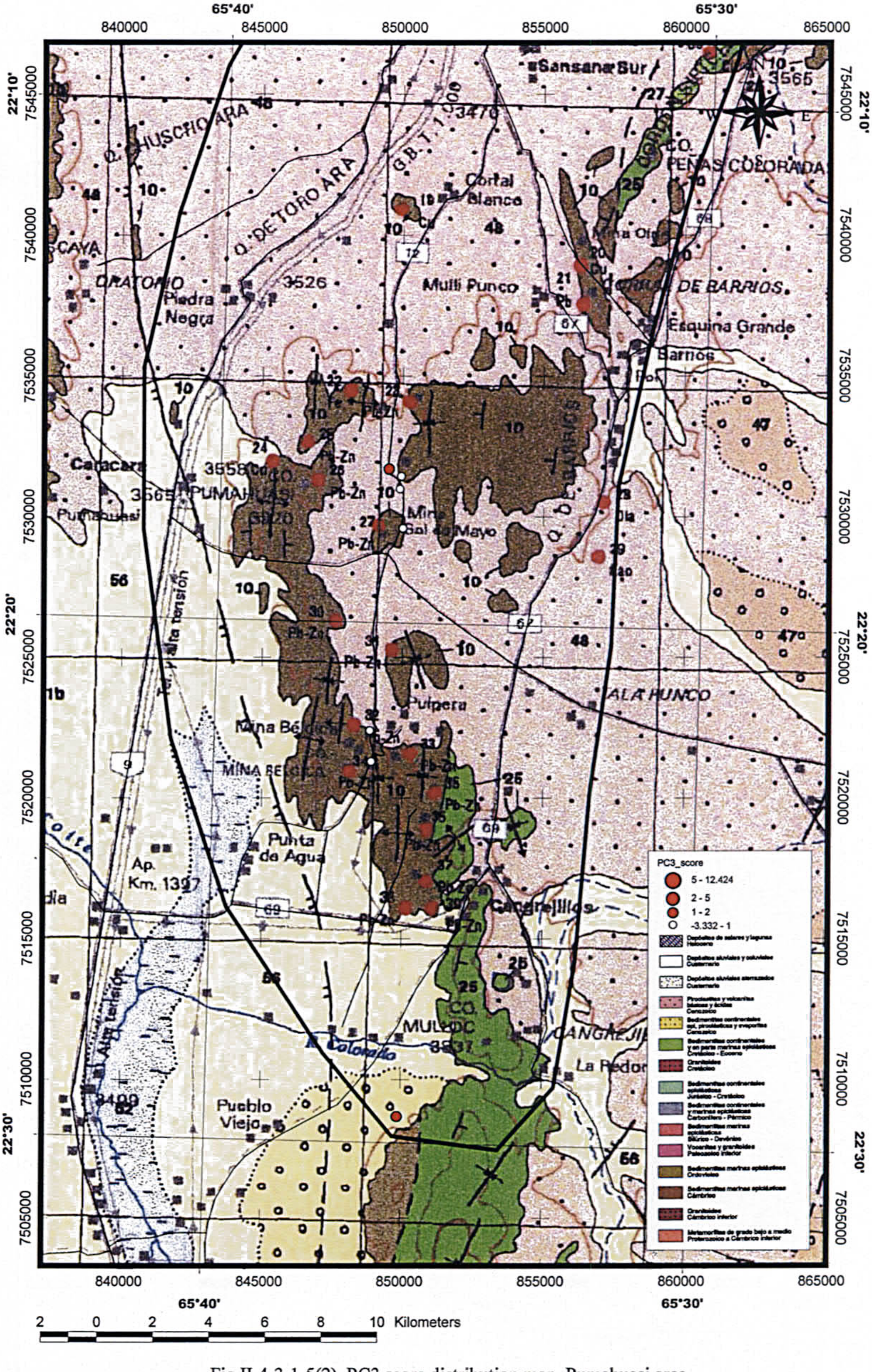


Fig.II-4-3-1-5(2) PC3 score distribution map, Pumahuasi area

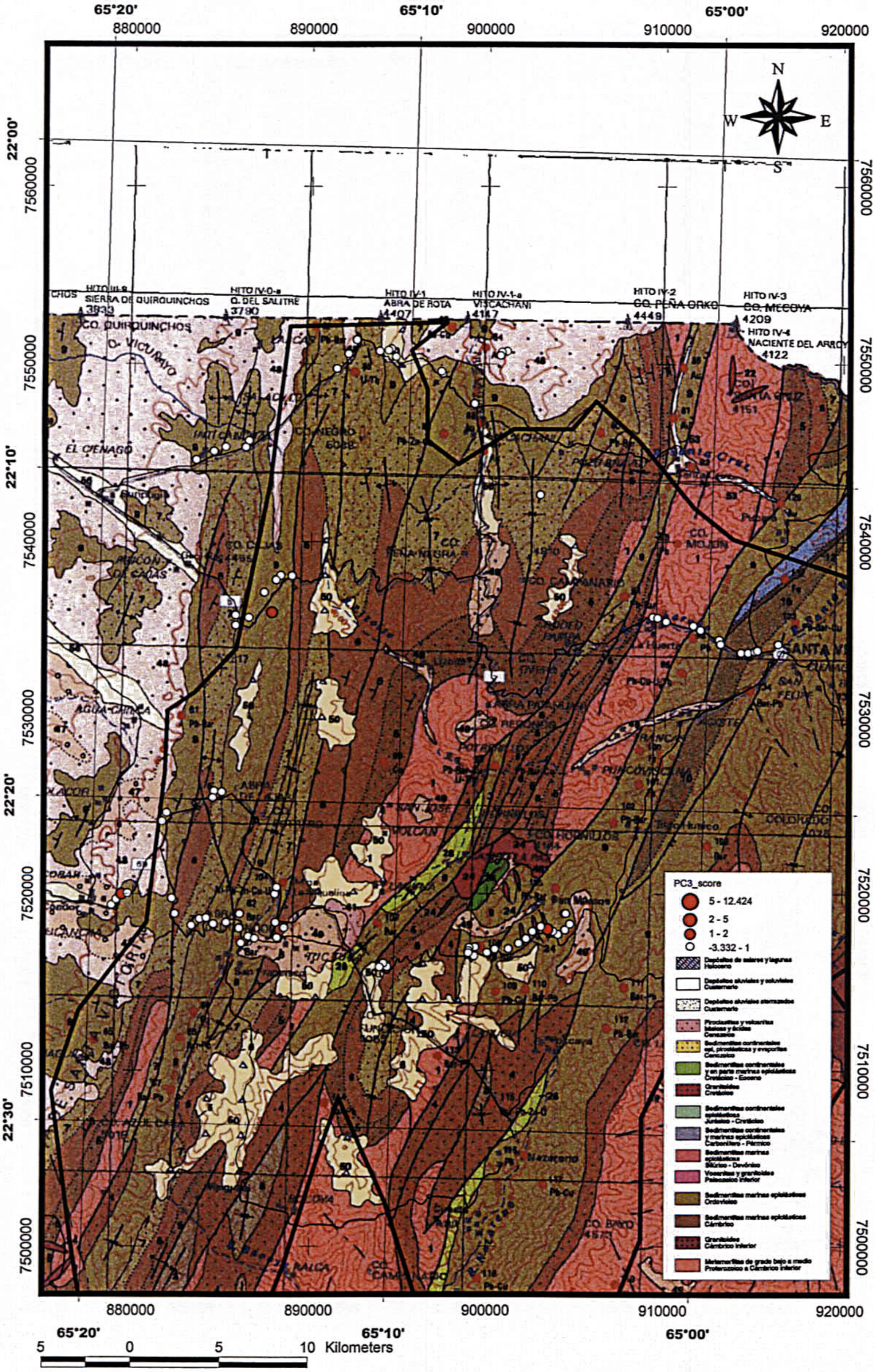


Fig.II-4-3-1-5(3) PC3 score distribution map, Santa Victoria mountains area

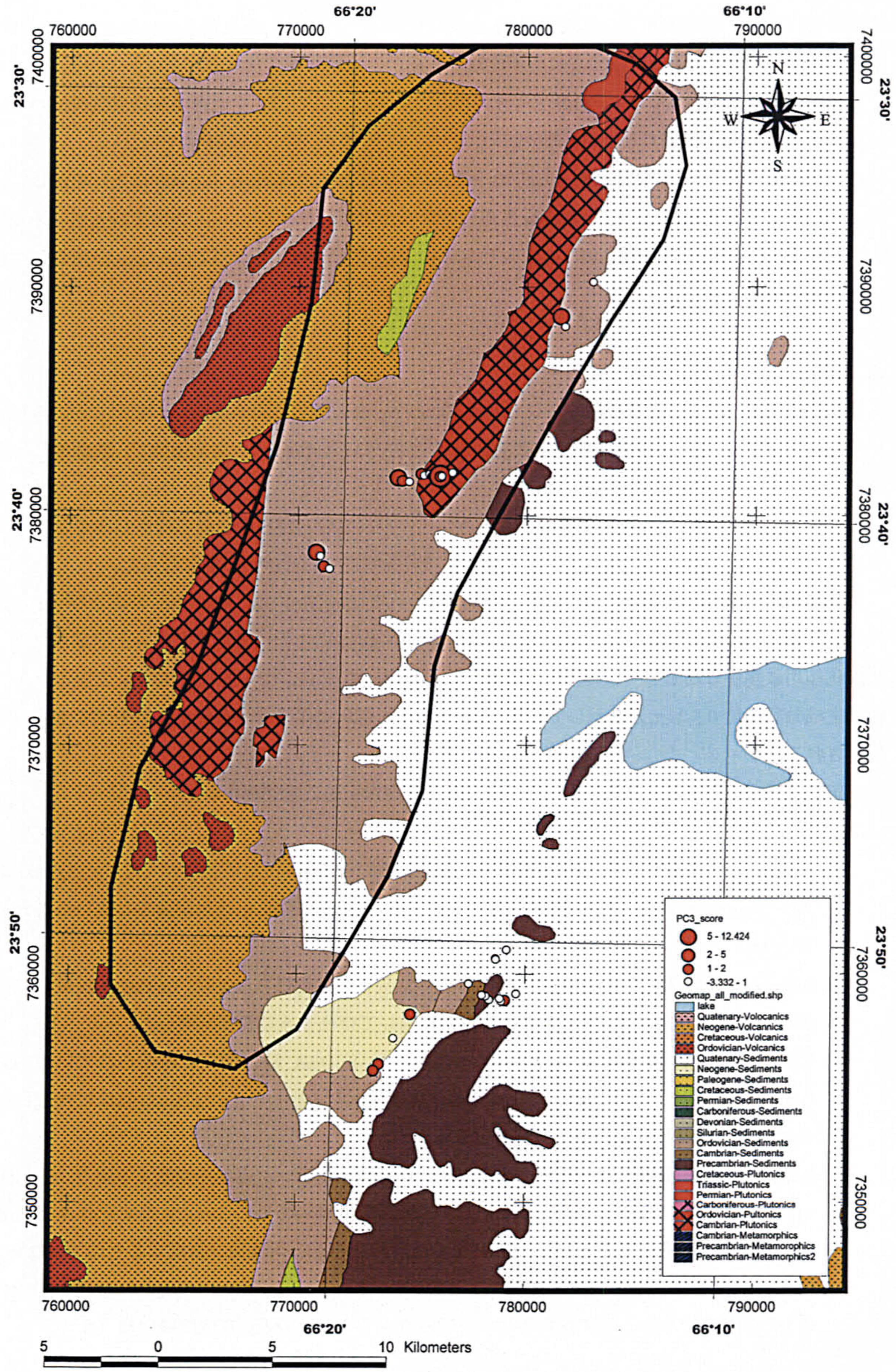


Fig.II-4-3-1-5(4) PC3 score distribution map, La Colorada area

located in about 4km in the southeast direction of Tapada and resembled Despensa mineral showings to Rio Grande though it is very small-scale. A high score of the 3rd principal component exists while a high score of 2nd principal component, which shows SEDEX mineralization is not recognized.

In the Pumahuasi area, in the alternation of fine-grain sandstone and shale beds in the northern part of Chaussette deposits and in the alternation of micaceous shale and fine-grain sandstone beds in the northwest foot of Cerro Morado on the area south edge (small-scale alteration zone by ASTER image), a high score of the 3rd principal component has been obtained. It is forecast that the former has some relation to Chaussette deposits of Pb-Zn vein deposits type located in the south, while the latter, a relation with the small-scale alteration zone discriminated by ASTER image is expected.

In Santa Victoria Mountains area, in the same manner as the case of the 2nd principal component, the number of the samples with the high score of the 3rd principal component is only three; moreover, the scores only range from +1.10 to +1.65, not being remarkably high in score even though they are supposed to be of a high score.

In La Colorada area, out of 40 samples provided for the study, 13 samples show high score (+1.000 or larger). Nine samples are distributed to the south up to Limeca along the NE-SW extension trend of Cobres Eruptive Oire (Middle Ordovician) distributed to the north around La Colorada deposits and the four samples are distributed along the valley in the south of Chuschuyo mountain.

7) Conclusion

In four areas of Aguilar Ranges area, Pumahuasi area, Santa Victoria Mountain area and La Colorada area selected to explore SEDEX/VMS deposits, principal component analysis, one of the unsupervised classification methods was carried out by using the collected analytical data of 197 samples. As a result, it was clarified that the wide viewed geochemical variation in this region can be explained by three principal components (One primary principal components which relate to composition of rock and the secondary and ternary principal components that relate to mineralization). One of the principal components that relate to mineralization is the secondary principal components, which shows highly negative correlation with Ag, Sb, Hg, Zn, Cd, Pb, S, and Au (principal components loading of below -0.5), is presumed to be principal components that show SEDEX mineralization. Another principal components, which relate to mineralization, are the ternary principal components, showing highly positive correlation with Bi, Au, W, Fe, and Ba, (principal component loading: 0.5 or larger). These are presumed to be principal components, which show mineralization represented by La Colorada deposits. The following is clarified from the score distribution of the secondary and the ternary principal components that relate to ore deposits.

In Aguilar Range area, it was clarified that SEDEX mineralization related, not only with Esperanza deposits which is assumed to be a typical model of SEDEX deposits, but also with Aguilar deposits, Oriental mineral showings, and Pirita mineral showings.

In Aguilar deposits and mineral showings around its periphery except Esperanza deposits, it turned out that the existence of mineralization represented by La Colorada deposits overlapped with that of SEDEX mineralization.

On the other hand, with regard to Rio Grande mineral showings that existed in the neighborhood of the northeast of Esperanza deposits and were thought to show similar SEDEX mineralization, in contradiction to the forecast, it turned out that mineralization represented by La Colorada deposits was related rather than SEDEX mineralization.

No one can say otherwise that Santa Victoria Mountain area is a region where mineralization is scarce so long as judging it only from the designated ground chemical data of 104 samples. However, because a geochemical symptom of SEDEX mineralization is observed, though it is weak, the possibility of the SEDEX mineralization existence is not denied.

In La Colorada area, naturally, mineralization represented by La Colorada deposits remarkably develops. This mineralization is distributed indistinctly harmonizing with (NE-SW) the extension of LaCobres Complejo Eruptive Oire (Middle Ordovician). In the La Colorada area including Limeca in question, the result suggesting the association of SEDEX mineralization has not been obtained. However, from the result of a partial principal component analysis, intended for only 35 samples of the cores of the La Colorada area, the possibility of the SEDEX mineralization in this region including Limeca still exists, because principal components suggesting this SEDEX mineralization have been discriminated

(2) SEDEX/VMS deposits

Targeting the exploration of SEDEX/VMS deposits in 4 areas, field surveys and sample collections were made and various laboratory examinations including fossil identification and chemical analysis were carried out in order to clarify petrological, paleontological and geochemical features of the SEDEX/VMS ore horizon and their hanging and foot walls and to discover horizon similar to those of known SEDEX ore deposits. To understand paleontological stratigraphy, which is the essential factor for SEDEX deposits, five samples in total for Conodont identification and 19 samples in total for the pollen identification were collected. Only among the limestone of the Santa Rosita Formation of the lower part of the Santa Victoria Group in the vicinity of Santa Victoria town, Rossodus tenuis (Miller, 1980), and Drepanoistodus sp. were identified, mixed with gastropod and brachiopod, and it was clarified that this was Tremadocian Deposits (absolute age of almost 487-489m.y) of the lower part of the regional Ordovician.

The principal component analysis was made by using the analytical data of 197 rock samples in total collected from the four areas. In addition, the discriminant analysis and the principal component analysis were made by using the obtained analytical data of drilling cores in Aguilar Range area and the La Colorada area, where respectively Esperanza ore bodies of SEDEX-type and La Colorada ore bodies assumed to be VMS-type were intersected by drillings. As a result of the principal component analysis, the following facts relating to mineralization were clarified.

In Aguilar Range area, SEDEX mineralization highly correlated with Ag, Sb, Hg, Zn, Cd, Pb, S and Au contributes not only to Esperanza deposits, which is assumed to be typical model of SEDEX deposits, but also to Aguilar deposits, Oriental and Pirita mineral showings. In Aguilar deposits and its peripheral mineral showings except for Esperanza deposits, mineralization represented by the La Colorada deposit and highly correlated with Bi, Au, W, Fe and Ba exists while overlapping with SEDEX mineralization. To the Rio Grande mineral showings located in about 3km northeast of Esperanza deposits, mineralization represented by La Colorada deposits contributes rather than to the SEDEX mineralization.

In Santa Victoria Mountains area, since a geochemical indication of SEDEX mineralization is recognized, though not remarkable, the possibility of the existence of the SEDEX mineralization is not to be denied.

In the La Colorada area, the mineralization represented by La Colorada deposits remarkably develops naturally. This mineralization is distributed indistinctly harmonizing with in the NE-SW extension trend of the La Cobres Faja Eruptive del Puna (Middle Ordovician). As a result of local principal component analysis for only drilling cores of La Colorada deposits, the principal component, which suggests SEDEX mineralization, is extracted. For this reason, the possibility of the existence of SEDEX mineralization in this area including Limeca area still exists.

4-3-2 Porphyry copper and epithermal type deposits

(1) Hydrothermal alteration

[Porphyry copper deposits]

Before examination of hydrothermal alteration accompanying porphyry deposits in NOA region, let's consider Bajo de la Alumbrera deposits and Agua Rica deposits in Catamarca State, representatives whose data has been made public so far.

Baja de la Alumbrera deposits are porphyry copper/gold deposits whose host rock are Farallón Negro volcanic complex of the Miocene and dacitic porphyry (about 7 Ma), which intrudes into them. A primary alteration zone in Bajo de la Alumbrera is composed of the following four facies running from the center towards the fringe as a concentric circle: (1) Quartz-magnetite ±k feldspar alteration, (2) Potassic alteration, (3) Chlorite - epidote (propylitic) alteration and (4) Feldspar destructive alteration. Mineralization of gold/copper mainly appears in (2) potassic alteration zones. (Pyrite is also seen in (3) propylitic zones, which is accompanied by small quantity of molybdenite, sphalerite and galena.) (Ulrich and Heinrich, 2001)

Agua Rica deposits are porphyry copper/gold deposits whose main host rock is feldspathic porphyry and breccia veins (8 - 5 Ma) intruding into basements and granite rocks of the Precambrian to Paleozoic, and are accompanied by small quantity of molibdenum. Hydrothermal alteration zones in Agua Rica deposits are a little more complicated than those in Bajo de la Alumbrera deposits. It is known from the period of generation that there are the following three facies: (1) Potassic alteration (accompanied by weak Cu - Mo mineralization), (2) Potassic alteration in the central part and prophylitic alteration around it (accompanying the main stage of Cu - Au - Mo mineralization with primary chalcopyrite as the main body) and (3) Phyllic - advanced argillic alteration (which is epithermal alteration, overprints (1) and (2), and accompanies mineralization of Cu - Au - Ag - As - Pb - Zn with covellite as the main). (Landtwing, et al., 2002)

In the Pancho Arias area where field survey was carried out this year, several hydrothermal alteration zones are observed. Among them, there is output of potassium alteration zones with quartz - biotite - potassium feldspar as the main body within the area of 1 km x several-hundred meters centering on monzonitic porphyry. In this zone, there is also outcrop of phyllic - argillic alteration zones characterized by mineral combination of quartz, sericite and kaolin and containing small to trace quantities of geothite and jarosite. As for the phyllic - argillic alteration zones, there is distribution of two long and narrow zones extending in parallel in the NE - SW direction around the old mine, and of small-scale zones in several places northwest of them. Propylite alteration zones made up of chlorite and epidote are distributed surrounding these alteration zones. Mainly molybdenite and small quantities of chalcopyrite and pyrite are mineralized in part of the potassium alteration zones, and mainly pyrite is mineralized in the phyllic - argillic alteration zones. Mineralization of these sulfide minerals forms dissemination and stringers. In addition, mainly silicification, sericitization, and partly chloritization, all of which accompany dissemination of sulfide mineral, are found in Las Burras and Incahuasi in the south part.

In The El Pago area, alteration zones (phyllic - argillic alteration zones and propylite alteration zones) mainly made up of quartz, sericite, chlorite and clay mineral are distributed on the ground surface in the area of 4 km x 2 km extending from east to west. Around the center of them, potassium alteration zones where potassium feldspar (±biotite) is recognized are output. Distribution of quartz, sericite, chlorite and clay mineral spreads over the alteration zones, and ranges of propylite zones and phyllic-argillic alteration zones overlap each other. There are places where quartz stringers/networks exist in these alteration zones, and silicified zones are distributed around them. Gold is contained in some quartz veins.

In the case of El Alisar ore deposits, which were investigated last year (porphyry copper/gold deposits located about 40 km northeast of the El Pago area), alteration zones are distributed asymmetrically in a semi-circle/concentric-circle form. From its center to the outside, there is distribution of potassium alteration zones (characterized by biotite, quartz and potassium feldspar (microcline)), sericite - clay alteration zones and propylite alteration zones (Phase I's report).

Characteristics of hydrothermal alteration zones accompanying porphyry mineralization in this zone are summarized from the above, as follows: alteration zones can be roughly divided into potassium alteration zones in the central part and propylite alteration zones in the periphery; porphpyric copper/gold ore deposits accompany potassium alteration zones, mainly. There is output of phyllic - argillic alteration zones made up of quartz, sericite and clay mineral, and two cases are recognized: where a phyllic - argillic alteration zone forms zonal structure with propylite zone or overlaps a propylite zone (El Pago, El Alisar), and where the state of output in such a form to cut a propylite zone is shown (Pancho Arias). In Agua Rica ore deposits, phyllic - highly argillic alteration is deemed to be of the epithermal period after the period of potassium alteration/propylite alteration, and the possibility that the stage of alteration is also different in the case of the Pancho Arias area can be considered.

[Epithermal gold deposits]

Hydrothermal alteration in the Rachaite and Cerro Galán areas, field survey of both of which was carried out this year, is accompanied by acid alteration of the high sulfur type.

In the Rachaite area, there is distribution of two white alteration zones extending from south to north in Miocene dacite lava. Both the eastern alteration zone (3 km x 0.7 km) and the western alteration zone (1.3 km x 0.4 - 0.5 km) are subjected to strong white argillization (composed of quartz/opal, sericite, sericite/montmorillionite mixed-layer mineral, chlorite, kaolin, alunite, jarosite, etc.) and limonitic alteration. In some alteration zones, quartz veins containing pyrite and Ag, Pb, Zn etc. exist, and the vein fringe is accompanied by a silicified/ seriticized alteration zone.

In the Cerro Galán area, several alteration zones have been detected from dacite in Galán caldera of the Miocene to Pleistocene. Almost all of these alteration zones are aligned along the caldera wall. The largest one of them is located in the northwest wall part of the caldera. This alteration zone is about 4 km in diameter and is an acid alteration zone mainly composed of kaolin.

Besides it, small quantities of jarosite, sericite, chlorite and pyrite are recognized. About 500 m south of this place, there is output of a small-scale alteration zone group made up of alunite and kaolin. Indication of alteration of alunite, kaolin, sericite, etc. is recognized in the western part of Laguna Diamante.

Characteristics of hydrothermal alteration zones accompanying epithermal mineralization in this zone are summarized as follows: Alteration zones have properties of acid alteration with kaolin, sericite, montmorilonite, alunite, quartz, chlorite and jarosite as the main, and accompany dacitic caldera volcanic activities of the Miocene. Activities of hot water are controlled by tectonic movement in formation of a caldera, and are generated on the caldera wall or along faults, which occurred there. The main body of mineralization is pyrite, and, in the Rachaite area, mineralization of Pb/Zn, which is accompanied by Ag partly in veins, is recognized but is of very small scale. No noteworthy mineralization was recognized in the Cerro Galán area.

(2) Comparison of the results of the alteration analysis using the ASTER images with the results of the survey

[Porphyry copper deposits]

In the Pancho Arias area, main alteration zones in three places were detected from alteration analysis with ASTER images used. As a result of alteration mineral identification by the use of the Iso-grain Model, those near the old mine in the Mina Pancho Arias show zonal structure of alteration zones (two zones were identified) presenting characteristics of sericite - kaolin - geothite (- jarosite) and alteration zones made up of chlorite and epidote around them. In the northwestern side of the old mine, several small-scale alteration zones mainly composed of sericite and kaolin were found inside and around alteration zones made up mainly of chlorite and epidote. Alteration zones were also detected in several places south of the Mina Pancho Arias. In Las Burras, although a large group of alteration zones is not recognized, in Incahuasi (south of Las Burras) and around it, alteration zones with long axis of 1 - 3 km which are composed of sericite and chlorite were grasped in several places.

Alteration zones detected near the Mina Pancho Arias almost agree with the following distribution areas of hydrothermal alteration zones presenting zonal structure mentioned in the previous section. (They consist of Potassic alteration zones (biotite - potassium feldspar) in the central part, phyllic - argillic alteration zones (quartz - sericite - clay mineral) surrounding them, and propylite alteration zones (accompanied by chlorite - epidote - calcite and pyrite) in the outside periphery.) Areas where sericite, kaolin and goethite (and jarosite) were detected in the satellite image correspond to phyllic - argillic alteration zones, and parts mainly made up of chlorite and epidote around them corresponds to propylite alteration zones. Though image analysis data has not been examined closely yet, calcite in addition to chlorite and epidote has been detected in the area corresponding to propylite zones. Detection of potassium alteration zones in the central part by means of satellite image analysis could not be tested because calculation of corresponding constituents has not been performed.

A sericite - kaolin alteration zone in an alteration zone made up of chlorite and epidote, which was detected in satellite image analysis of the northwest part of the old mine in the Mina Pancho Arias this year, corresponds to a phyllic - argillic alteration zone in a propylite zone, and a part of it corresponds to the place where mineralization containing Au was recognized in this year's field survey.

Regarding mineralization/alteration zones in the southern part of the Pancho Arias area, alteration zones composed of sericite and chlorite were detected in Incahuasi zone, and they almost correspond to mineralization/alteration zones (where silicification and sericitization - chloritization are recognized).

It was judged that an alteration zone made up of kaolin - sericite (and jarosite), detected from the satellite image around Abra Chaní in the northeastern part of the Mina Pancho Arias, might be that of Precambrian quartz sandstone (quartzite). As a result of the field survey, an alteration zone made up of chlorite or of chlorite - sericite, detected in the southwestern part of Incahuasi, proved to correspond to granite outcrops.

In The El Pago area, the area of 4 km x 2 km (extending from east to west) in the ASTER false color (VNIR) image presents a color tone which is remarkably different from the circumference and can be recognized as a large-scale alteration zone. In the results of alteration mineral identification, sericite, chlorite, geothite and a small quantity of epidote are found in the whole area of alteration zones. Kaolin and jarosite are detected partly in the alteration zones.

In El Pago place of mineral showings, alteration zones (phyllic - argillic alteration zones and propylite zones) mainly made up of quartz - sericite - chlorite and clay mineral are distributed as mentioned in the previous section. Around the center, potassium alteration zones where potassium feldspar (±biotite) is recognized are output, and silicified zones are distributed locally. When this alteration is interpreted as overlapping of potassium alteration zones in the central part, phyllic - argillic alteration zones and propylite alteration zones in the peripheral part, among these alteration zones, phyllic - argillic alteration zones and propylite zones almost correspond to the area where sericite, chlorite, geothite, epidote, kaolin and jarosite were detected in the image.

This place of mineral showings is located about 40 km northwest of Filo Colorado, a prospecting area of porphyry copper deposits. According to satellite image analysis, it is recognized that there is distribution of a group of alteration zones, which are located sporadically in the NE - SW, direction between Filo Colorado and El Pago, and which are composed of sericite/geothite (±kaolin). Furthermore, indication of a probable alteration zone is found 4 - 6 km northeast of El Pago. However, it is difficult to identify an alteration zone by the use of the satellite image because this area is a vegetation zone. Nevertheless, that the state of outcrop where indications of hydrothermal alteration such as the above are distributed sporadically in the NNE - SSW direction could be identified will be an important guide when mineralization in this zone is considered.

[Epithermal gold deposits]

In the Rachaite area, alteration zones in two places, east and west, presenting a remarkable white color tone are clearly observed in the false color image. In the color-ratio composite, strongly anomaly areas, which agree with the white parts in the false color image, are detected. In the result of alteration mineral identification by the use of the Iso-grain Model, the color tone indicating an acid alteration zone of alunite - kaolin and a sericite alteration zone is detected from the same place. The color tone representing goethite and quartz is recognized there.

Both of these two white alteration zones extending from south to north agree with areas subjected to strong white argillization (mainly composed of quartz/opal - sericite - sericite/montmorilonite mixed-layer mineral and accompanied by kaolin, jarosite, chlorite, alunite, etc.) and limonitic alteration in dacite.

In the Cerro Galán area, several alteration zones have been detected from Galán caldera by LANDSAT TM and ASTER image analyses; the main alterations run along the caldera wall. From the result of alteration mineral identification, an alteration zone of 4 km in diameter on the northwest wall part of the caldera is judged to be an alteration zone composed of alunite, sericite and goethite with kaolin as the main. Five-hundred meters south of this alteration zone, a small-scale alteration zone group representing distribution of alunite and kaolin is detected, and indication of alteration of alunite - kaolin - sericite is recognized in the western part of Laguna Diamante.

In the results of X-ray analysis of alteration samples collected in the field survey of the Cerro Galán area, alteration mineral made up of a combination of sericite, chlorite and calcite was identified in many samples. A large quantity of kaolin was detected in some of them. In addition, trace quantities of jarosite and pyrite were recognized.

Following last year, detection of alteration zones by the use of false color images, color-ratio composites and the Iso-grain Model was carried out this year. Particularly, in alteration mineral identification by the use of the Iso-grain Model, analysis of alteration mineral was made for some scenes with 12 constituents (quartz, calcite, sericite, chlorite, epidote, kaolin, goethite, jarosite, alunite, gypsum, hematite and pyrophyllite) used as a reference. As a result, we could obtain data, which will be a good guide in the detection of alteration zones in the Pancho Arias and El Pago areas, as mentioned above. The effectiveness of and future tasks regarding alteration zone detection by this technique are organized as follows:

(i) Alteration related to porphyry primary mineralization in NOA region is potassic alteration, phyllic alteration, advanced argillic alteration and propylite alteration. Of these, finding of propylite zones by the use of satellite images is a very important guide in the stage of selecting zones to be covered by the method. From this point of view, it can be considered as an advance in development of technique that the scope of propylite (chlorite - epidote distribution) could be detected from the Pancho Arias and El Pago areas by ASTER image analysis in this survey.

(ii) Argillic alteration zones such as NOA region can be easily recognized in false color images in dry areas with a little vegetation. It is, however, effective for analysis of alteration zones that constituents of those alteration zones can be identified by mineral identification technique. It is considered as a noteworthy result that, particularly, chlorite, sericite, kaolin and alunite could be detected as clay mineral.

(iii) Regarding iron gossan in the superficial part of weathered zones, it is also worthy of notice that the degree of limonitic alteration could be detected sensitively. Hematite and jarosite could be also identified to some extent.

(iv) As a future task, it is desired to develop a method of identifying potassium feldspar and biotite. If it becomes possible, the way for detection of potassic alteration zones, which are often outcrop in the central part of porphyry mineralization, will be opened.

(v) In addition, it is one of the noteworthy results of this investigation and analyses that, with the merits of multi-band and highly-precise ASTER image data utilized, useful data for estimation of the tectonic line which had controlled mineralization/alteration could be obtained by extracting small-scale but important alteration zones.

(3) Structural control of the mineralization and hydrothermal alteration

[Structural control of porphyry copper and epithermal gold deposits]

As is pointed out in last year's report, it is recognized that distribution of porphyry and epithermal deposits in NOA region has a relationship from viewpoints of time and space with areas where Neogene volcanic rocks are intensively distributed. (See Chapter 6. Consideration - 6.1. Characteristics of tectonic structure and mineralization, and control of mineralization in last year's report.)

- A magmatic arc of the Miocene to Pliocene accompanied by porphyry copper deposits such as Los Pelambres and el Teniente in Chile is widely distributed over the whole Andes mountains around the Chile - Argentina boundary (called CVZ (Central Volcanic Zone): Ramos, 2000 etc.). NOA region is located in the east side of this magmatic arc, and four distribution areas of volcanic rocks are observed extending in the SE direction in an arm-like shape branching away from the magmatic arc itself spreading from south to north. Such arm-shaped distribution areas of Neogene volcanic rocks are called Arm Nos. 1 to 4 (volcanic rock arms), in order from the north. These arms agree with known wide-area NW-SE oriented lineaments or their extension part, respectively. According to the results of air-borne magnetic survey, the distribution of these arms shows good agreement with the short-wave magnetic anomalyl area. This is considered to indicate that it corresponds not only to effusive facies of volcanic rock but also to intrusion facies. In NOA region, several calderas of the Neogene are distributed, including Galán caldera whose scale is exceptional in the world. Volcanic activities of each arm are accompanied by such strong eruption activity that is characterized by formation of large-scale resurgent calderas and/or wide-area distribution of ignimbrite.
- Regarding distribution of porphyry deposits in NOA region, Cerro Redondo (porphyry gold deposits) is located in Arm No. 1, Pancho Arias (porphyry copper/molybudenum deposits) and

Organullo (porphypric gold deposits) are in Arm No. 2, Taca Taca (porphyry copper deposits) and Inca Viejo (porphypric copper/gold deposits) lie between Arm Nos. 2 and 3, El Arisar (porphpyric copper deposits) is in Arm No. 3, and Bajo de la Alumbrera (porphpyric copper/gold deposits), Agua Rica (porphypric copper deposits) and Filo Colorado (porphyry copper/gold deposits) are located in Arm No. 4.

- Regarding epithermal deposits, Chocaya exists in Arm No. 1, Esperanza, Concordia, Bajos de Incachule and Organullo are located in Arm No. 2, Centenario lies between Arm Nos. 2 and 3, and Farallon Negro, Alto de la Blenda and Carmen deposits exist in Arm No. 4.

Distribution of Neogene Tertiary volcanic rocks from the northwestern part of Argentina to the northern part of Chile and locations of the four arms are shown in Fig. II-4-3-2-3-1.

Four arms representing Neogene volcanic activity in NOA region are distributed along NW-SE oriented lineaments crossing the range of the Andes Mountains, as mentioned above. The main ones of these lineaments have been already named, such as Calama-Olacapato-El Toro lineament and Archibarca lineament (Salfity, 1985, Hongn et al., 2002 etc.). These lineaments are interpreted as strike-slip faults (shifted to left) representing the shear belt accompanying subduction of Nazca plate, and are estimated to represent deep fracture, which controlled the rise of magma. Along these lineaments, volcanic activities were actively generated during the Miocene to Pliocene period. Fig. II-4-3-2-3-2 shows the regional geologic structure of NOA region and the north region of Chile adjoining the region.

As mentioned above, in NOA region, mainly magmatic activity of Miocene to Pliocene calc-alkaline volcanic rock is actively generated along the NW-SE oriented tectonic line in particular. The magmatic activity is accompanied by porphyry and epithermal mineralization/alteration.

As structural factors, which control calc-alkaline magmatic activity of the Neogene and mineralization/alteration accompanying them, the presence of these NW-SE oriented shear belts can be mentioned. Together with these, in Chile, the presence of the line structure crossing them, in other words, the importance of the crossing part of two tectonic lines, is pointed out. (It is pointed out by Richards (2000) and others that porphyry deposits in Chile, such as Quebrada Blanca, El Abra, Chuquicamata, Zaldivar, Chimborazo, Spence, La Escondida, El Sadovador and Potrerillos, are distributed along the Domeiko fault parallel to the subduction zone of Nazcaplate, and there is the tendency that deposits concentrate in the part of crossing an NW-SE oriented fault). Then, the possibility that such a structural factor exists is examined regarding NOA region below.

[Characteristics of the structural control of porphyry copper deposits]

In the Pancho Arias area in NOA region, where field survey was carried out this year, mineralization zones and hydrothermal alteration zones, such as the Mina Pancho Arias (Mina Vizcacheral), Las Burras, Incahuasi Norte and Incahuasi Sur, are distributed in the NNE-SSW direction over ten or several kilometers. As mentioned above, The Pancho Arias area is located in the

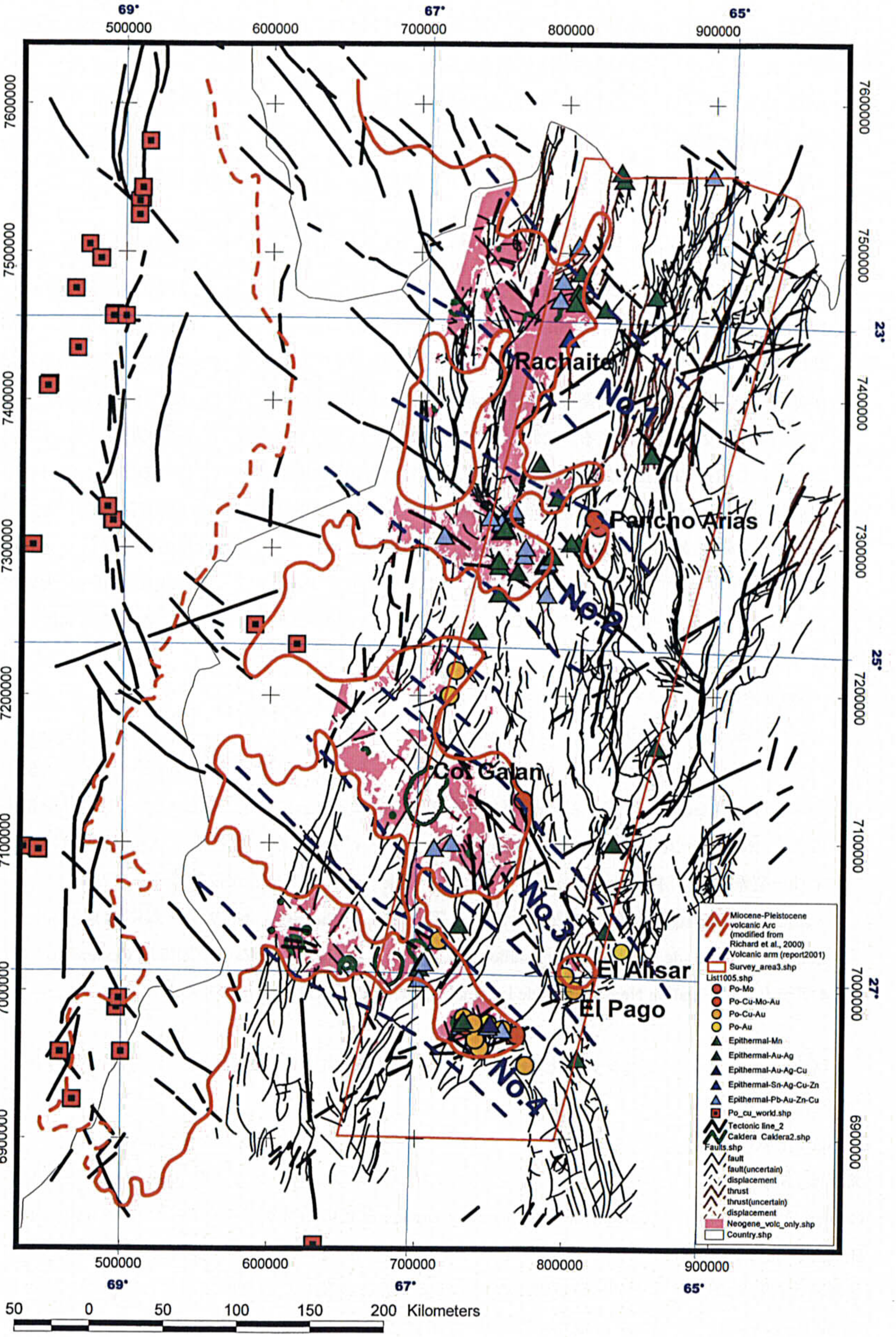


Fig. II-4-3-2-3-1 Distribution of Neogene Tertiary volcanic rocks in the NOA region

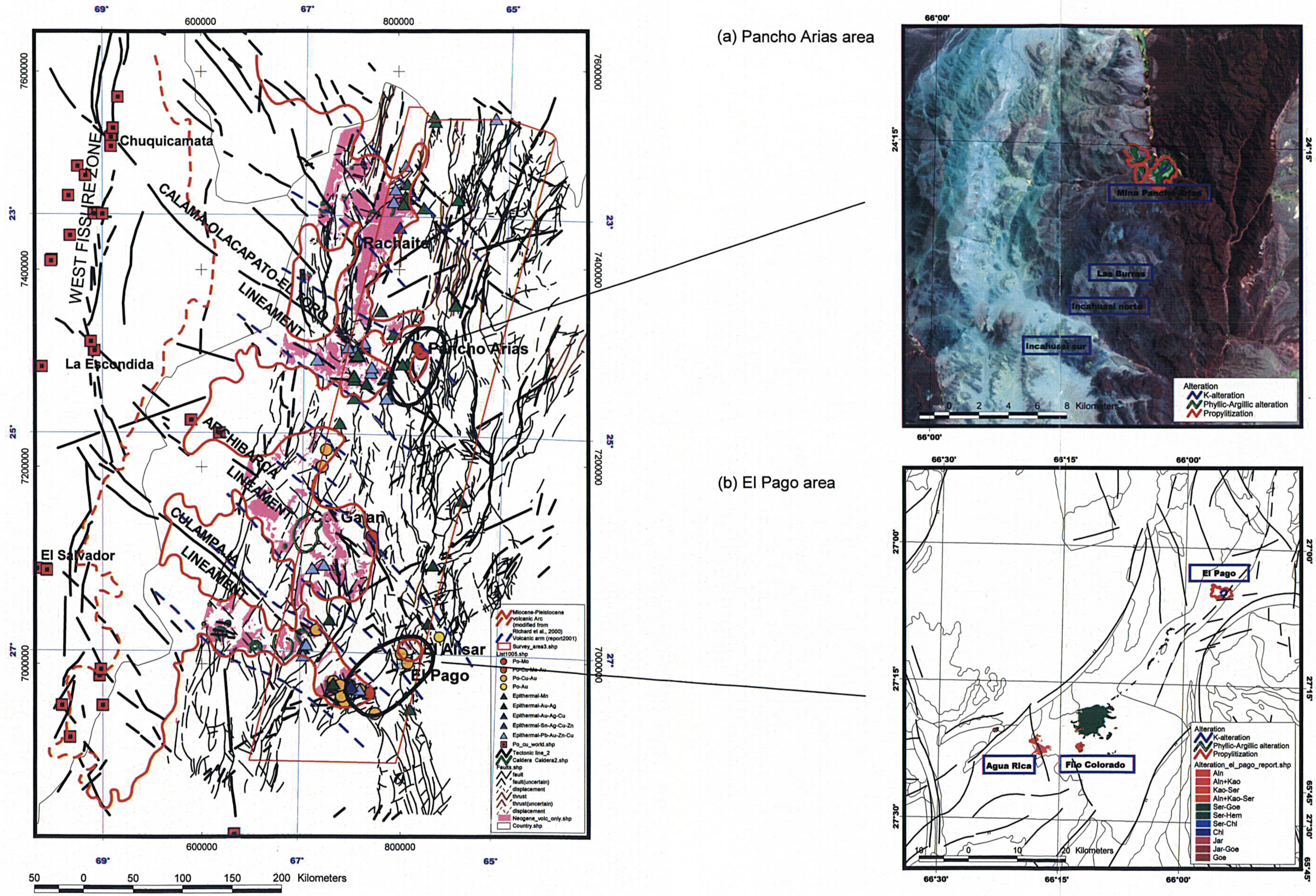


Fig. II-4-3-2-3-2 Regional Geological structure of the NOA region volcanic rock distribution area of Arm No. 2, and it corresponds to the extension part of El Toro lineament as a shear belt of the Miocene to Pliocene. Porphyry mineralization/alteration in Pancho Arias zone is closely related to intrusion of monzonitic or dacitic porphyry of the Miocene. (See the section stating results of the field survey.) Ten rock bodies of acidic intrusive rock of the Miocene are exposed in this zone, and run in the NNE-SSW direction generally. These intrusive rocks correspond to acidic igneous activity of the Neogene in the east end part in the scope of El Toro lineament. That is, it can be interpreted that, in this zone, porphyry mineralization/alteration is/are controlled by activity of Miocene acid intrusive rock governed by a line structure in the NNE-SSW direction, which crosses it within the scope of Arm No. 2.

As for the El Pago area, because detailed geological investigation of the zone has not been carried out, its tectonic structure is not clear, unlike the Pancho Arias area. Characteristics of mineralization/alteration in the El Pago area based on the existing geological materials are as follows: (1) the El Pago area is in Arm No. 3 together with El Alisar, and it is located in the extension part of Archibarca lineament. Although details of mineralization have not been clarified, it is considered to be related to andesite or dacitic intrusive rock of the Neogene (or Miocene?). (2) About 40 km south of the El Pago area, porphyry deposits exist, such as Agua Rica and Filo Colorado (belonging to Arm No. 4). These are assumed to be formed in relation to activity of Farallón Negro composite volcanic rocks of the Miocene. (3) Deposits/mineralization zones such as the El Pago, Filo Colorado and Agua Rica run in a linear form along the direction of Sierra del Aconquija extending in the NE-SW direction. In the middle part and the extension part of them, alteration zones have been detected by ASTER image analysis.

According to the results of last year's investigation of El Alisar zone, porphyry copper mineralization accompanies activity of El Alisar volcanic rocks/hypabyssal composite rocks (the result of age determination of rhyolite which composes a part of them = 8.0±0.2 Ma) similar to Farallón Negro composite volcanic rocks. Geological data with which porphpyric mineralization in the El Pago area and mineralization in the El Alisar area is considered to belong to a sequence of the same phenomenon has not been obtained. However, the presence of mineralization/alteration zones which continue sporadically from the El Pago area in the SSW direction is considered to indicate that the El Pago deposit are closely related to Filo Colorado and Agua Rica deposits. Thus, it is considered that porphyry mineralization/alteration in the El Pago, Filo Colorado and Agua Rica areas was controlled by the NE-SW oriented tectonic line crossing in the direction of distribution of Arm Nos. 3 and 4.

In this way, it seems possible that structural elements similar to those recognized in Chile also exist in the field of porphyry mineralization in NOA region. It is the presence of "line structure in the NNE-SSW direction which crosses it within the scope of belonging to Arm No. 2" seen in the Pancho Arias area, and interpretation that Miocene acid intrusive rock which is governed by this presence and porphyry mineralization/alteration accompanying its intrusive igneous activity. "Arrangement of deposits and mineralization/alteration along the NE-SW oriented tectonic line crossing in the direction of distribution of Arm Nos. 3 and 4" in and around the El Pago area (Sierra del Aconquija region) is also interpreted to imply the importance of a tectonic line crossing the shear belt accompanying plate activity indicated by the distribution direction of the arms. It is considered that, from these points of view, it is helpful for selection of potential prospecting areas of porphyry deposits to carry out work to find shear belts and tectonic lines crossing them and, in addition, to extract alteration zones by the use of the new technique mentioned above.

[Characteristics of the structural control of epithermal gold deposits]

The Rachaite area is in the distribution of Neogene volcanic rock belonging to Arm No. 1, and mineralization/alteration zones are considered to be made by the hydrothermal system formed in the relatively early stage (8 - 9 Ma) of dacitic Coranzuri composite caldera activity that occurred in the middle to upper Miocene. Mineralization/alteration zones in the Rachaite area are located inside the ring structure interpreted as the caldera wall, and they are composed of two parallel alteration zones extending in the N-S direction generally. Main lead/zinc veins in the Rachaite area are those with an almost N-S strike. From such a state of outcrop of deposits and alteration zones, it is considered that epithermal mineralization/alteration accompanies dacitic caldera volcanic activity of the Miocene and is controlled by N-S oriented cracks near the caldera wall.

Epithermal alteration zones in the Cerro Galán area are distributed mainly on the inside wall of dacitic Galán caldera formed in the Neogene. Galán caldera is a composite caldera whose scale is exceptional in the world, covering an area of 40 km from south to north x 25 km from east to west. It is located on Archibarca lineament representing a NW-SE oriented shear belt. As a Neogene volcanic rock distribution area, it belongs to the scope of Arm No. 3. From the fact that, in the distribution area of epithermal alteration zones, there are caldera faults and lineaments estimated to be radial faults crossing them, it is considered that there is the possibility that alteration zones in this zone were formed by the rise, along the fault crossing part, of hot water accompanying volcanic activity when the caldera structure was formed.

As the structure that controlled the field of generation of epithermal mineralization, both in the Rachaite and Cerro Galán areas, the fault structure on or around the caldera wall accompanying formation of the caldera serves as a passage for hot water in the hydrothermal activity stage after the formation of the caldera.

Chapter 5 Discussion

5-1 Mineralization and potentiality of existing mineral deposits

Tectonics in the northwestern part of Argentina was, as mentioned in Chapter 3, Part I, formed by collision and accretion of micro continents on the southwest margin of Gondowana continent of the upper Precambrian to the lower Paleozoic, and by cordillera type orogeny due to subduction of the ocean plate from the west side, which has continued since the upper Paleozoic.

In the geological body of the Precambrian to the Quaternary developing in this area, there are deposits each of which are closely related to the history of tectonics development and have characteristics of its own age. Deposits of the Ordovician system, whose potential is considered to be high are SEDEX-type lead and zinc deposits and volcanogenic massive sulfide deposits, while those of the Neogene system are porphyry type copper and copper/gold deposits and epithermal gold deposits.

The El Aguilar deposit classified as SEDEX type lead and zinc deposits exists in the lower Ordovician Lampasar formation which is passive margin deposits to the eastern side of the north of the survey area. The La Colorada deposit classified as volcanogenic massive sulfide deposit exists in the Ordovician magmatic arc to the west of the north of the survey area.

The porphyry type copper and copper/gold deposits and the epithermal gold and silver deposit are limited to the areas of four Neogene volcanic rock zone extending like armed shape in a SE direction from the Chilean border, near intrusive rocks between the volcanic rock zone, and on its extensions. The porphyry type copper and copper/gold deposits develop around Farallon Negro, which is located in one of the volcanic rock zone of relatively advanced erosion, in the neighborhood of Inca Viejo, which is on the periphery of intrusive rock area between the volcanic rock zones, and to the west of Tucuman, which is the zone's extension. On the other hand, the alteration zones related to the epithermal gold and silver deposit tend to exist at a less eroded area, such as those near the Agua Caliente caldera.

5-2 SEDEX/VMS type deposits

For exploration of SEDEX type lead/zinc deposits, there are only a few clues because deposits of this type generally have a weak alteration halo differently from other epithermal deposits. In order to explore a similar type that provides few clues to the exploration, it is desirable that the characteristics and formation restricting conditions of El Aguilar deposit (including Esperanza deposit) be correctly determined and that exploration factors drawn from those characteristics and formation restricting conditions and general exploration factors of world’s major SEDEX-type lead/zinc deposits be deductively applied to a similar neighboring geological environment. There is a similarity that the typical SEDEX type lead/zinc deposits in the world are formed in small-scale sedimentary basins with anoxic environments in large-scale sedimentary basins such as passive margin (for example, Sangster and Macintyre, 1983; Lydon, 1995). Sureda (1999) inferred that El Aguilar deposits were formed in Padrioc Basin of the third order spreading north and south from El Aguilar to Pumahuasi. From the viewpoint of the regional scale, it is desirable to re-analyze (re-examine) sedimentary basins in terms of positioning of El Aguilar deposits in the Ordovician system, based on the existing sedimentological data.

In the analysis carried out during the Phase I, drilling core of El Aguilar deposit was provided by Compania Minera Aguilar S.A. and an attempt was made to identify the ore horizon as well as hanging wall and foot wall through the statistical analysis of the chemical composition of the drilling core's mudstone. It was found as a result that litho geochemical analysis can discriminate the differences in the chemical composition between hanging wall and footwall. The similar ore horizon found through the aforementioned study to identify the hanging wall and foot wall of the SEDEX type Pb/Zn deposit, stretches in the N-S direction in the environs of El Aguilar deposits including Rio Grande one, is the most promising area.

Meanwhile La Colorada deposits distributed on the west side of the area in the Ordovician system were regarded as volcanogenic massive sulfide deposits because the deposits were accompanied by volcanic rocks in the vicinity, because filling texture with sulfide minerals in the space of brecciated volcanic rock is observed and because the content of copper is higher than those of lead and zinc compared with typical SEDEX deposits. Although the control factor of this deposit are not clear, if it was formed accompanying volcanic activity, it is expected that similar deposits exist in the whole magmatic arc of the Ordovician on the west side in the north part of the survey area.

The study of the Phase II, as one of the methodology to understand sedimentary basin of SEDEX, has increased a possibility that a horizon similar to a known SEDEX deposit horizon can be traced mainly from geochemical characteristics. Based on this study, it was shown that Discriminant Analysis and principal component analysis can identified litho geochemical feature of SEDEX and VMS. On the basis of this, it seems possible to identify the distribution of SEDEX or VMS deposits occurrence or regional sedimentary basin structure, by analyzing geochemical characteristics of the lower Ordovician System that has not been fully surveyed. Those findings will be valuable basic information in order to carry forward the SEDEX deposit exploration in the future.

In terms of the ore forming age, the ore horizon of El Aguilar is considered to lower Ordovician of Lampasar formation with the evidence of mega fossils. However, recent discovery of conodont and olistostrom made reconsider traditional theory of ore forming age. Therefore stratigraphic classification using high-resolution microfossils (such as conodonts and radiolarian) of the Early Paleozoic Era is desired. It will be necessary to collect conodonts directly from mudstone as well as from calcareous rock because calcareous rock that preserves conodonts in good condition is outcropped only in small quantities. Furthermore in the area, which has olistostrom, it is also necessary for accurate geochemical and paleontrogical study about olistolith and matrix rocks respectively.

On the other hand, the microfossil study, which is an important factor for identifying the stratigraphy related to the SEDEX type deposits, was carried out. As a result, Rossodus tenuis (Miller, 1980) and Drepanoistrodus sp. was identified accompanied with gastropods and brachiopods in the Santa Rosita limestone, lower of the Santa Victoria group located at the vicinity of the Santa Victoria town. These fossils indicate the age of the area is Tremadocian in lower Ordovician system (absolute age approximately 487-489 m.y.).

For recommendation in future exploration, in concrete, it is necessary to apply the litho geochemical method, in a wider range, to a northern extent including Rio Grande where El Aguilar deposit is included, sulfide layers were discovered in the ground truth checking of the previous year, in order to clarify the ore horizon. It is also necessary to identify ore horizon in a similar way from a north-south extent including Santa Rosa and La Cienaga prospects.

A massive sulfide deposit was discovered in La Colorada deposit through drilling carried out by Pacific Rim. It is essential to determine the characteristics of this deposit, using the core samples. As in the case of El Aguilar deposit, a lithological and geochemical study using ore host rock to extract ore horizon is required. Existence of hydrothermal alteration zone is expected on the hanging wall and footwall of a volcanic massive sulfide deposit; therefore, its confirmation is needed. The tectonic setting of La Colorada deposit differs from that of El Aguilar deposit in that the occurrence of calc-alkali volcanic rock is seen. Little is known about its genesis. In the light of the characteristics of La Colorada deposit determined up to now, it is desired that the genesis environment be studied with the help of existing data, from the viewpoint of a volcanic activity setting and formation of a massive sulfide deposit.

5-3 Porphyry copper and epithermal type deposits

Miocene to Pliocene magmatic arcs developed near the border between Chile and Argentina. In this area, four volcanic rocks zone extend like an arm shape in the NE-SE direction from this north south trending main magmatic arc. This report tentatively called them No.1 to No.4 arms for convenience. Distribution of porphyry type copper and copper/gold deposits and epithermal gold deposits are restricted in these four arms. Therefore, these four zones can be fundamentally mentioned as highly potential zones. Particularly, Arm No. 4 has some porphyry type deposits and alteration zones such as Bajo de la Alumbrera, Bajo de la Agua Tapada, and Filo Colorado. Although distribution of volcanic rocks is very small near Inca Viejo halfway between Arms No. 2 and No. 3, it is assumed from the results of airborne magnetics that the potentiality of intrusive rocks exists in the shallow part of the vicinity. In addition, mineralized zones including Inca Viejo, Diablillos, Condor Yacu and Centenario are known. Therefore, even though the distribution of volcanic rocks is very small, these zones can be regarded as those with high potential for the presence of porphyry type copper and copper/gold deposits and epithermal gold deposits.

In the SE tending extension of each arm, small-scale intrusive rocks are scattered, which are not expressed on a small-scale geological map. Porphyry type copper and copper/gold mineralization are observed inside and outside those rocks. This mineralization corresponds to Agua Rica deposits of Arm No. 4, El Alisal and El Pago of Arm No.3 and Panco Arias alteration zone of Arm No. 2. These have been also extracted as alteration zones in the satellite image analysis.

Regarding porphyry type copper and copper/gold deposits, the potential for the existence of deposits is thought to be high, as mentioned above. Substantially minute investigations have been already carried out, and room for exploration is considered to exist in the SE tending extension of each arm.

In three north arms of the four, there are resurgent calderas accompanied by ignimbrite, and erosion of volcanic body has not advanced so much yet. Therefore, if porphyry type copper and copper/gold deposits are formed in these volcanic arms, those deposits exist in the deeper level and cannot be the object of exploration.

It is considered that epithermal gold deposits are at the favorable level of erosion. In particular, Rachaite and Incachule alteration zones are obviously inside the caldera wall and can be regarded as products of the volcano-hydrothermal system. A similar presumption can be applied to alteration zone on the east side of Galan caldera extracted from the satellite image analysis.

In order to clarify the alteration zone, the geochemical and other features of each survey areas that located in the four zones (arms) which are object of the prospecting of porphyry copper and epithermal deposits, the Phase II study has carried out field survey and collection of samples, followed by laboratory work consisting of geochemical analysis, X-ray diffraction, thin section identification. At this stage, the geochemical analysis has not revealed any significant ore showing that suggests economic value in four places selected as a survey target area of this fiscal year. The feature of a typical porphyry copper type alteration zone, however, was clarified in El Pago, and similar cluster of alteration with NNE-SSE trend near to El Pago, which may be a promising candidate for exploration, depending on a future survey.

With respect to porphyry copper type deposits and copper/gold deposits, it can be hardly said that a sufficient survey has been made on the mineral showing in a small-scale Neogene Period stock in the bed rock located in the volcanic rock arm extension because the mineral showing is far away from the major volcanic rock distribution. The alteration zone group extending in the NE-SW direction from the Agua Rica and Filo Colorado prospects 40 km south-southwest of El Pago to El Pago shows characteristics similar to those of an alteration zone. Further study will be required for some alteration zones. Also, at an extension to the alteration zone group is situated El Arisar prospect where a mineral showing dominated by structural factors is very likely to occur. For this reason, it is desired that the characteristics, extent, geophysical feature, etc. of the neighboring alteration zones be determined through a more detailed satellite image analysis, regional geophysical exploration.

With respect to epithermal gold/silver deposits, a lot of ore showings are known in the volcanic rock extension zone. The image analysis of Phase I and the ground truth checking revealed that an argillic alteration zone occurs with base metal on the wall of a resurgent caldera such as Rachite, Incachule, and Pan de Azucar or on the wall of a ring structure. Large-scale alteration zones in the Rachite and Cerro Galan areas situated on the margin of the caldera were surveyed in this fiscal year, however no significant mineral showing was found near the ground surface. These large-scale alteration zones, however, are likely to represent a shallow part of the hydrothermal system; therefore, the occurrence of an epithermal gold deposit in the depths cannot be ruled out. A technique for estimating the deeper level of hydrothermal system such as isotope geochemical study is needed for future exploration.

PART III: CONCLUSION AND RECOMMENDATION

PART III: CONCLUSION AND RECOMMENDATION

Chapter 1 Conclusion

Analysis of the existing data including preparation of the mineral deposits database, satellite image analysis of two ASTER data, geochemical analysis of the stream sediments, and field survey work have been carried out during the current fiscal year, that is the final year of the two-year survey program under way. SEDEX type Pb/Zn deposits, porphyry copper type Cu and Cu/Au deposits and epithermal Au deposits have been targeted in the work step referring to the existing data analysis, because they are deposit types with economic merits.

The number of areas object of field survey totaled eight, with four areas (Aguilar mountain range, Pumahuasi, Santa Victoria mountain range and La Colorada) surveyed with the object of prospecting SEDEX/VMS type deposits and other four areas (Pancho Arias, Rachaite, Cerro Galan and El Pago) with the object of prospecting porphyry Cu and epithermal deposits.

(1) SEDEX type lead/zinc deposits and volcanogenic massive sulfide deposits

In the analysis carried out during the Phase I, drilling core of El Aguilar deposit was provided by Compania Minera Aguilar S.A. and an attempt was made to identify the ore horizon as well as hanging wall and foot wall through the statistical analysis of the chemical composition of the drilling core’s mudstone. Based on this study, it was shown that Discriminant Analysis and principal component analysis can identified litho geochemical feature of SEDEX and VMS

The following facts related to the mineralization have been found as a result of the geochemical analysis.

・In Aguilar mountain range area the occurrence of the SEDEX type mineralization (high degree of correlation with Ag, Sb, Hg, Zn, Cd, Pb, S and Au) has relation not only with Esperanza deposit, which is a typical of SEDEX type mineralization, but also with other places such as Aguilar deposit, Oriental prospecting area, Pirita prospecting area, etc.

・Furthermore, in other prospecting area besides Esperanza deposit, such as Aguilar deposit and the prospecting area surrounding it, other mineralization represented by Colorada deposit (high degree of correlation with Bi, Au, W, Fe and Ba) overlaps.

・On the other hand, the intervention of a mineralization rather related to La Colorada deposit than the SEDEX type mineralization is found in Rio Grande prospecting area which is located approximately 3 km to NE of the Esperanza deposit.

・Since geochemical factors of the SEDEX type mineralization are found, although not conspicuously, in Santa Victoria mountain range area, the possibility of occurrence of the SEDEX type mineralization can not be rejected.

・As a matter of course, the mineralization represented by La Colorada deposit is markedly developed in La Colorada area (second principal component). Since a third principal component suggesting the occurrence of the SEDEX type mineralization was found as a result of a local principal component analysis covering exclusively La Colorada deposit drilling core, it may safely be said that the possibility of existence of the SEDEX type mineralization in this area, including Limeca, still persists.

In the meanwhile, the sulfur isotopic ratio of lead in vein-type lead, zinc and barite deposits in the area with distribution of the Ordovician system differ from those of El Aguilar deposits. Therefore, the origin of sulfur of these deposits is considered to be different.

2) Porphyry type copper and copper/gold deposits

Miocene to Pliocene magmatic arcs developed near the border between Chile and Argentina. In this area, four volcanic rocks zone extend like an arm shape in the NE-SE direction from this north-south trending main magmatic arc. Distribution of porphyry type copper and copper/gold deposits and epithermal gold deposits are basically restricted in these four zone. Therefore, these four zones can be fundamentally mentioned as highly potential zones.

ASTER image analysis had revealed detailed classification of alteration zone, which is impossible with conservative satellite sensors in this survey. As results, it is found that the outlined alteration zones are distributed more in four zones where Tertiary volcanic rocks extend NE and SE and in the extension of these zones. The major tectonic line is also along these NE-SW trending zones of Tertiary volcanic rocks and in their extension (Fig.II-3-3-2).

In order to clarify the alteration zone, the geochemical and other features of each survey areas that located in the four volcanic rock zones which are object of the prospecting of porphyry copper and epithermal deposits, the Phase II study has carried out field survey and laboratory work. At this stage, the geochemical analysis has not revealed any significant ore showing that suggests economic value in four areas selected as a survey target area of Phase II. The feature of a typical porphyry copper type alteration zone, however, was clarified in El Pago, and similar cluster of alteration with NNE-SSE trend near to El Pago, which may be a promising candidate for exploration, depending on a future survey.

Furthermore, the most south part of volcanic rock zone (No.4 arm) has some porphyry type deposits and alteration zones such as Bajo de la Alumbrera, Bajo de la Agua Tapada, and Filo Colorado which were the target area of Phase I survey, and although distribution of volcanic rocks is very small near Inca Viejo, it is assumed from the results of airborne magnetics that the potentiality of intrusive rocks exists in the shallow part of the vicinity. In addition, mineralized zones including Inca Viejo, Diablillos, Condor Yacu and Centenario are known. Therefore, even though the distribution of volcanic rocks is very small, these zones can be regarded as those with high potential for the presence of porphyry type copper and copper/gold deposits and epithermal gold deposits.

Chapter 2 Recommendation for future survey

1) SEDEX type lead/zinc deposits and volcanogenic massive sulfide deposits

In order to explore a similar type of El Aguilar deposit, it is desirable that general exploration factors of SEDEX-type lead/zinc deposits be deductively applied to NOA area. Specifically, from the viewpoint of the regional scale, it is desirable 1) to re-analyze sedimentary basins in terms of positioning of El Aguilar deposits in the Ordovician system, based on the existing sedimentological data, 2) to apply the litho geochemical method to lower Ordovician system for tracing SEDEX/VMS horizon, 3) to classify detailed stratigraphy using high-resolution microfossils (such as conodonts and radiolarian) of the Early Paleozoic Era, to collect conodonts directly from mudstone, and 4)to carry out accurate geochemical and paleontrogical study about olistolith and matrix rocks respectively. Furthermore it is also necessary to confirm presence of a hydrothermal alteration in La Colorada area, which is expected on the hanging wall and footwall of a volcanic massive sulfide deposit

2) Porphyry type copper and copper/gold deposits

With respect to porphyry copper type deposits and copper/gold deposits, it can be hardly said that a sufficient survey has been made on the mineral showing in this survey area. For future exploration, it is desirable to carry out more detailed satellite image analysis, regional geophysical survey in order to clarify the distribution and geophysical feature of alteration zones that are known in volcanic rock zone and on its extension or are discovered by satellite analysis of this survey

With respect to epithermal gold/silver deposits, especially large-scale argillic alteration zone located on the wall of a resurgent annular structure which are considered as corridor of hydrothermal water, a technique for estimating the deeper level of hydrothermal system such as isotope geochemical study is needed for future exploration.

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APPENDIX

Table A-1 List of samples and laboratory test

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02RF001	Drill P4 (209.25'-209.75')							Pancho Arias		sediment ?	1		1						
A02RF002	Drill P4 (214.75'-215.30')							Pancho Arias		porphyry	1				1				
A02RF003	Drill P4 (215.85'-216.15')							Pancho Arias		sediment ?	1		1						
A02RF004	Drill P7 (370.00'-370.45')							Pancho Arias		porphyry		1			1				
A02RF005	Drill P7 (416.10'-416.65')							Pancho Arias		porphyry	1		1		1				
A02RF006	24	16	0.6	65	51	9.6	3,544	Pancho Arias	Pancho Arias	shale			1	1					
A02RF007	24	16	0.6	65	51	9.6	3,544	Pancho Arias	Pancho Arias	volcanoclastic ?				1					
A02RF008	24	16	0.6	65	51	9.6	3,544	Pancho Arias	Pancho Arias	sediment			1	1					
A02RF009	24	16	28.5	65	51	2.4	3,551	Pancho Arias	Pancho Arias	sediment ?	1		1						
A02RF010	24	16	27.5	65	50	55.1	3,580	Pancho Arias	Pancho Arias	porphyry ?				1					
A02RF011	24	16	27.3	65	50	54.7	3,560	Pancho Arias	Pancho Arias	sediment			1	1					
A02RF012	24	16	27.3	65	50	54.7	3,580	Pancho Arias	Pancho Arias	sediment			1	1					
A02RF013	24	15	54.2	65	50	53.1	3,506	Pancho Arias	Pancho Arias	porphyry	1		1			1			
A02RF014	24	15	43.3	65	50	37.7	3,506	Pancho Arias	Pancho Arias	dacite ?			1	1					
A02RF015	24	15	41.4	65	50	40.2	3,512	Pancho Arias	Pancho Arias	dacite	1		1	1					
A02RF016	24	15	15.3	65	52	2.6	3,466	Pancho Arias	Pancho Arias	dacite			1	1					
A02RF017	24	15	15.3	65	52	2.6	3,466	Pancho Arias	Pancho Arias	dacite ?			1	1					
A02RF018	24	15	15.3	65	52	2.6	3,466	Pancho Arias	Pancho Arias	dacite ?			1	1					
A02RF019	24	22	4.5	65	54	48.1	3,704	Pancho Arias	Incahuasi Sur	porphyry	1		1	1					
A02RF020	24	22	3.1	65	54	47.6	3,706	Pancho Arias	Incahuasi Sur	porphyry				1					
A02RF021	24	22	1.6	65	54	47.1	3,703	Pancho Arias	Incahuasi Sur	porphyry				1					
A02RF022	24	21	59.7	65	54	46.4	3,698	Pancho Arias	Incahuasi Sur	porphyry				1					
A02RF023	24	22	5.8	65	54	48.9	3,699	Pancho Arias	Incahuasi Sur	porphyry			1	1					
A02RF024	24	22	5.0	65	54	46.1	3,706	Pancho Arias	Incahuasi Sur	porphyry				1					
A02RF025	24	22	5.4	65	54	44.5	3,709	Pancho Arias	Incahuasi Sur	porphyry			1	1					
A02RF026								Pancho Arias	Incahuasi Sur	porphyry ?				1					
A02RF027								Pancho Arias	Incahuasi Sur	porphyry ?			1	1					
A02RF028	24	21	23.8	65	53	25.8	3,484	Pancho Arias	Incahuasi Sur	monzonite ?	1		1	1					
A02RF029	24	21	22.8	65	53	25.5	3,494	Pancho Arias	Incahuasi Sur	monzonite ?			1	1					
A02RF030	24	21	21.5	65	53	25.1		Pancho Arias	Incahuasi Sur	monzonite ?				1					
A02RF031	24	20	12.3	65	52	28.2	3,712	Pancho Arias	Las Burras	porphyry	1	1	1	1					
A02RF032	24	20	14.7	65	52	29.0	3,716	Pancho Arias	Las Burras	porphyry				1					
A02RF033	24	20	11.5	65	52	31.1	3,702	Pancho Arias	Las Burras	weathered Rock				1					
A02RF034	24	20	12.7	65	52	26.7	3,707	Pancho Arias	Las Burras	weathered Porphyry				1					
A02RF035	24	20	9.9	65	52	27.5		Pancho Arias	Las Burras	porphyry			1	1					
A02RF036	24	20	9.9	65	52	27.5		Pancho Arias	Las Burras	porphyry			1	1					
A02RF037	24	20	9.9	65	52	27.5		Pancho Arias	Las Burras	porphyry			1	1					
A02RF038	24	20	14.8	65	52	18.0	3,713	Pancho Arias	Las Burras	porphyry				1		1			
A02RF039	24	20	15.5	65	52	18.2	3,716	Pancho Arias	Las Burras	porphyry			1	1					

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02RF040	24	20	14.7	65	52	18.5	3,719	Pancho Arias	Las Burras	porphyry		1	1	1					
A02RF041	24	19	58.6	65	52	13.3	3,713	Pancho Arias	Las Burras	monzonite				1					
A02RF042	24	20	0.2	65	52	13.9	3,717	Pancho Arias	Las Burras	monzonite	1			1					
A02RF043	24	19	56.3	65	52	51.0	3,754	Pancho Arias	Las Burras	weathered porphyry ?			1	1					
A02RF044	24	28	0.4	65	59	28.0	3,374	Pancho Arias	Mina Maria Ines	conglomerate/breccia					1				
A02RF045	24	28	0.4	65	59	28.0	3,374	Pancho Arias	Mina Maria Ines	conglomerate/breccia					1				
A02RF046	24	28	0.4	65	59	28.0	3,374	Pancho Arias	Mina Maria Ines	shale		1			1				
A02RF050	23	7	51.3	65	41	16.6	3,938	Aguilar	Rio Grande	grey sil shale									
A02RF051	22	17	11.3	65	36	16.4	3,663	Pumahuasi		ore		1							
A02RF052	22	26	40.8	65	34	9.4	3,627	Pumahuasi			1		1						
A02RF053	22	5	48.2	65	9	30.4	4,219	Santa Victoria	Mina Rosario	ore		1							
A02RF054	22	5	48.2	65	9	30.4	4,219	Santa Victoria	Mina Rosario	ore					1				
A02RF055	22	6	51.3	65	8	57.5	4,136	Santa Victoria	Viscachani	sandstone									
A02RF056	22	23	17.7	65	4	25.5	3,900	Santa Victoria	Mina Cienaga	ore					1				
A02RF057	22	23	17.7	65	4	25.5	3,900	Santa Victoria	Mina Cienaga	ore		1							
A02RF058	22	53	11.8	66	7	39.0	4,000	Rachaite		aletred dacite			1	1					
A02RF059	22	53	11.7	66	7	40.9	4,027	Rachaite		aletred dacite			1	1					
A02RF060	22	53	10.3	66	7	41.0	4,018	Rachaite		dacite lava	1								
A02RF061	22	53	7.7	66	7	42.8	4,010	Rachaite		aletred dacite			1	1					
A02RF062	22	53	6.7	66	7	43.0	4,022	Rachaite		aletred dacite			1	1					
A02RF063	22	53	5.3	66	7	44.5	4,025	Rachaite		aletred dacite			1	1					
A02RF064	22	53	3.9	66	7	46.0	4,002	Rachaite		aletred dacite			1	1					
A02RF065	22	53	2.5	66	7	46.9	3,997	Rachaite		aletred dacite			1	1					
A02RF066	22	52	58.3	66	7	51.6	3,971	Rachaite		aletred dacite			1	1					
A02RF067	22	52	54.3	66	7	52.3	3,970	Rachaite		aletred dacite			1	1					
A02RF068	23	5	45.0	66	2	17.4	3,577		Mina Peladar	ore		1			1				
A02RF069	23	23	22.2	66	2	0.8	3,902		Mina Sta. Julia	ore		1			1				
A02RF070	23	39	4.8	66	17	33.4	3,605	La Colorada	Mina La Colorada	ore	1								
A02RF071	23	39	4.8	66	17	33.4	3,605	La Colorada	Mina La Colorada	sandstone		1							
A02RF101	27	4	33.8	65	56	10.4	3,691	El Pago		gneiss	1			1					
A02RF102	27	4	40.2	65	56	3.7	3,745	El Pago		gneiss	1			1					
A02RF103	27	4	47.3	65	55	58.5	3,788	El Pago		gneiss/schist			1	1					
A02RF104	27	4	48.8	65	55	59.8	3,773	El Pago		ore		1			1				
A02RF105	27	4	48.8	65	55	59.8	3,773	El Pago		ore (grab)		1	1	1					
A02RF106	27	4	48.8	65	55	59.8	3,773	El Pago		HW rock		1	1	1					
A02RF107	27	4	59.3	65	56	2.2	3,811	El Pago		gneiss			1	1					
A02RF108	27	4	56.0	65	56	1.5	3,808	El Pago		gneiss			1	1					
A02YH001	24	16	40.0	65	51	5.5		Pancho Arias	Pancho Arias	monzonite porphyry	1								
A02YH002	24	16	5.8	65	50	56.0		Pancho Arias	Pancho Arias	monzonite porphyry	1			1					
A02YH003	24	15	52.9	65	50	43.2		Pancho Arias	Pancho Arias	monzonite porphyry and sediments	1								

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02YH004	24	15	27.0	65	52	4.7		Pancho Arias	Pancho Arias	malachite filling fissures									
A02YH005	24	22	17.2	65	54	46.7		Pancho Arias	Incahuasi	monzonite porphyry	1								
A02YH006	24	22	16.5	65	54	48.8		Pancho Arias	Incahuasi	monzonite porphyry			1						
A02YH007	24	22	14.5	65	54	45.9		Pancho Arias	Incahuasi	monzonite porphyry			1	1					
A02YH008	24	20	26.0	65	54	50.5		Pancho Arias	Las Burras	andesite (boulder)	1								
A02YH009	24	20	26.2	65	52	21.4		Pancho Arias	Las Burras	monzonite porphyry?	1								
A02YH010	24	20	26.2	65	52	21.4		Pancho Arias	Las Burras	monzonite porphyry?			1						
A02YH011	24	20	26.2	65	52	21.4		Pancho Arias	Las Burras	monzonite porphyry?			1						
A02YH012	24	20	26.3	65	52	21.2		Pancho Arias	Las Burras	turquoise filling fissures				1					
A02YH013	24	20	26.4	65	52	20.8		Pancho Arias	Las Burras	monzonite porphyry?			1	1					
A02YH014	24	20	17.5	65	51	57.7		Pancho Arias	Las Burras	jarosite? vein			1						
A02YH015	24	20	17.5	65	51	57.7		Pancho Arias	Las Burras	monzonite porphyry?			1						
A02YH016	24	20	17.2	65	51	56.9		Pancho Arias	Las Burras	Tour-Qz vein	1								
A02YH017	22	53	20.2	66	7	30.2		Rachaite		white altered rock			1						
A02YH018	22	53	18.8	66	7	30.8		Rachaite		white altered (kaolinite?) rock			1						
A02YH019	22	53	17.9	66	7	31.2		Rachaite		white altrered rock with Py			1	1					
A02YH020								Rachaite			1		1						
A02YH021	25	54	58.4	67	0	58.1		Cerro Galan		white altered dacitic rock			1						
A02YH022	25	54	58.4	67	0	58.1		Cerro Galan		dacitic rock	1								
A02YH023	25	54	58.4	67	0	58.1		Cerro Galan		surface sand and clay			1						
A02YH024	25	54	58.4	67	0	58.1		Cerro Galan		deep sand and clay			1						
A02YH025	25	53	44.7	67	0	36.0		Cerro Galan		white altered dacitic rock			1						
A02YH026	25	53	44.7	67	0	36.0		Cerro Galan		dacitic rock	1								
A02YH027	25	53	44.7	67	0	36.0		Cerro Galan		surface sand and clay			1						
A02YH028	25	53	44.7	67	0	36.0		Cerro Galan		deep sand and clay			1						
A02YH029	25	53	49.8	67	1	52.2		Cerro Galan		Hb-dacite lava	1								
A02YH030	25	55	12.1	67	2	35.9		Cerro Galan		dacitic pyroclastics?	1								
A02YH031	25	58	26.1	67	2	32.0		Cerro Galan		surface sand and clay			1						
A02YH032	25	58	26.1	67	2	32.0		Cerro Galan		deep sand and clay			1						
A02YH033	26	1	31.4	67	1	1.8		Cerro Galan		surface sand and clay			1						
A02YH034	26	1	31.4	67	1	1.8		Cerro Galan		deep sand and clay			1						
A02YH035	26	3	29.6	67	0	40.5		Cerro Galan		surface sand and clay			1						
A02YH036	26	3	29.6	67	0	40.5		Cerro Galan		deep sand and clay			1						
A02YH048	27	4	42.1	65	56	3.8		El Pago		granodiorite?	1		1	1					
A02YH049	27	4	59.1	65	56	2.2		El Pago		limonitized and silicified rock				1					
A02YH050	27	4	59.1	65	56	2.2		El Pago		limonitized, sericitized and silicified rock			1						
A02TK001	24	16	12.1	65	51	12.5		Pancho Arias	Pancho Arias	white clay			1						
A02TK002	24	15	26.8	65	52	5.0		Pancho Arias	Pancho Arias	white clay			1						
A02TK003	24	22	16.5	65	54	48.1	3,703	Pancho Arias	Incahuasi	volcanic rock					1				
A02TK004	24	22	9.3	65	54	48.7	3,687	Pancho Arias	Incahuasi	volcanic rock			1						

Sample No.	Lat(D)	Lat(M)	Lat（S)	Lon(D)	Lon(M	Lon（S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02TK005	24	23	50.4	65	56	26.1		Pancho Arias	Incahuasi	granite			1						
A02TK006	24	23	50.5	65	56	26.1		Pancho Arias	Incahuasi	granite			1						
A02TK007	24	23	50.5	65	56	26.1		Pancho Arias	Incahuasi	jarosite?			1						
A02TK008	24	23	50.9	65	56	25.7		Pancho Arias	Incahuasi	volocanic breccia			1						
A02TK009	24	23	51.1	65	56	25.3		Pancho Arias	Incahuasi	limonite			1						
A02TK010	24	23	54.2	65	56	24.8		Pancho Arias	Incahuasi	granite			1						
A02TK011	23	15	40.6	65	42	25.8		Aguilar		shale/limestone				1					
A02TK012	23	7	51.2	65	41	16.6		Aguilar		shale with Py				1					
A02TK013	23	17	39.1	65	46	37.8		Aguilar		shale with fossils									1
A02TK014	23	15	40.9	65	45	29.7		Aguilar		shale				1					
A02TK015	23	15	27.3	65	45	23.2		Aguilar		shale with Py				1					
A02TK016	23	5	54.9	65	44	58.5		Aguilar		shale				1					
A02TK017	22	26	35.0	65	33	33.5		Pumahuasi		white clay			1						
A02TK018	22	19	34.7	65	16	18.4		Santa Victoria		quarzite			1						
A02TK019	22	21	34.1	65	15	5.8		Santa Victoria		quarzite			1						
A02TK020	22	22	6.5	65	14	34.6		Santa Victoria		quarzite(Ni)					1				
A02TK021	22	23	46.8	65	13	47.1		Santa Victoria		conglomerate	1								
A02TK022	22	52	24.1	66	8	19.6		Rachaite		gypsum			1						
A02TK023	22	52	32.4	66	8	22.3		Rachaite		andesite?			1						
A02TK024	22	52	36.0	66	8	23.4		Rachaite		andesite?			1						
A02TK025	22	52	40.3	66	8	21.1		Rachaite		andesite?			1						
A02TK026	22	52	52.5	66	8	18.7		Rachaite		breccia			1						
A02TK027	22	53	0.8	66	7	54.9		Rachaite		andesite?			1						
A02TK028	22	52	58.3	66	7	52.6		Rachaite		andesite?			1						
A02TK029	23	13	54.3	65	58	36.3		Abra Pampa		andesite?			1						
A02TK030	23	35	18.1	66	14	32.7		La Colorada	La Colorada	aplite					1				
A02TK031	23	49	53.8	66	15	19.9		La Colorada	La Colorada	shale				1					
A02TK032	23	50	40.7	66	16	11.9		La Colorada	Limeca	shale									
A02TK033	23	50	33.3	66	16	2.4		La Colorada	Limeca	shale									
A02TK034	23	50	26.8	66	15	50.8		La Colorada	Limeca	shale									
A02TK035	23	50	27.6	66	15	49.2		La Colorada	Limeca	shale									
A02TK036	23	50	13.5	66	15	33.8		La Colorada	Limeca	shale									
A02TK037	22	14	51.1	64	57	43.5	2,302	Santa Victoria		limestone							1		
A02TK038	25	51	56.5	67	2	57.6		Cerro Galan		andesite?			1	1					
A02TK039	25	51	53.9	67	3	0.8		Cerro Galan		andesite?			1	1					
A02TK040	25	51	55.4	67	3	1.2		Cerro Galan		andesite?			1	1					
A02TK041	25	51	56.2	67	3	0.9		Cerro Galan		andesite?			1	1					
A02TK042	25	51	58.3	67	2	57.5		Cerro Galan		andesite?			1	1					
A02TK043	25	52	0.3	67	2	53.4		Cerro Galan		andesite?			1	1					
A02TK044	25	54	12.4	67	2	41.3		Cerro Galan		andesite?			1	1					
A02TK045	26	2	54.1	67	2	41.8		Cerro Galan		Mica schist			1	1					

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02TK046	26	2	45.5	67	4	37.4		Cerro Galan		andesite?			1	1					
A02TK047	26	2	44.2	67	4	37.9		Cerro Galan		mironite			1	1					
A02TK048	27	4	48.9	65	55	59.6		El Pago		andesite?			1	1					
A02TK049	27	4	59.0	65	56	2.5		El Pago		andesite?			1	1					
A02KK001	24	16	12.2	65	51	12.6		Pancpo Arias	Pancho Arias	sediment			1						
A02KK002	24	16	40.1	65	51	5.4		Pancpo Arias	Pancho Arias	sediment			1						
A02KK003	24	16	38.9	65	50	57.6		Pancpo Arias	Pancho Arias	sediment			1						
A02KK004	24	15	26.9	65	52	5.3		Pancpo Arias	Pancho Arias	dacite?			1						
A02KK005	24	22	15.5	65	54	48.3		Pancpo Arias	Incahuasi	porphyry			1						
A02KK006	24	22	16.7	65	54	45.1		Pancpo Arias	Incahuasi	porphyry			1						
A02KK007	24	22	10.2	65	54	49.3		Pancpo Arias	Incahuasi	porphyry			1						
A02KK008	24	21	30.8	65	53	26.0		Pancpo Arias	Incahuasi	porphyry			1						
A02KK009	24	23	49.5	65	56	24.8		Pancpo Arias	Incahuasi	porphyry			1						
A02KK010	24	23	50.9	65	56	24.8		Pancpo Arias	Incahuasi	porphyry			1						
A02KK011	24	23	51.1	65	56	24.8		Pancpo Arias	Incahuasi	volcanic rock			1						
A02KK012	24	23	51.1	65	56	24.8		Pancpo Arias	Incahuasi	volcanic breccia			1						
A02KK013	24	23	51.1	65	56	24.8		Pancpo Arias	Incahuasi	granite(float)				1					
A02KK014	24	20	29.5	65	52	24.3	3,765	Pancpo Arias	Las Burras	porphyry ?			1						
A02KK015	24	20	28.8	65	52	25.0	3,750	Pancpo Arias	Las Burras	porphyry ?			1						
A02KK016	24	20	28.0	65	52	24.6	3,742	Pancpo Arias	Las Burras	porphyry ?			1						
A02KK017	24	20	26.3	65	52	23.3	3,726	Pancpo Arias	Las Burras	porphyry ?			1						
A02KK018	23	17	41.4	65	46	39.3	3,570	Aguilar		shale				1					
A02KK019	23	15	40.0	65	45	28.4	3,812	Aguilar		shale			1						
A02KK020	23	15	26.1	65	45	24.7	3,848	Aguilar		shale				1					
A02KK021	23	15	12.3	65	45	10.3	3,942	Aguilar		shale			1						
A02KK022	23	5	48.9	65	44	53.2	3,836	Aguilar		tuff				1					
A02KK023	23	5	44.1	65	44	53.2	3,837	Aguilar		shale				1					
A02KK024	22	26	41.1	65	34	9.5	3,630	Pumahuasi		sandstone			1						
A02KK025	22	13	50.0	65	16	6.4	4,066	Santa Victoria		quartzite			1						
A02KK026	22	52	28.6	66	8	17.3	3,891	Rachaite			1								
A02KK027	22	52	29.9	66	8	16.1	3,937	Rachaite											
A02KK028	22	52	29.9	66	8	16.1	3,937	Rachaite		white clay			1						
A02KK029	22	52	30.7	66	8	15.2	3,946	Rachaite		white clay			1						
A02KK030	22	52	47.6	66	8	13.2	4,070	Rachaite		breccia									
A02KK031	22	52	47.6	66	8	13.2	4,070	Rachaite		breccia			1						
A02KK032	22	53	13.1	66	7	48.4	4,081	Rachaite		porphyry?			1						
A02KK033	22	53	8.3	66	7	51.0	4,026	Rachaite		porphyry?			1						
A02KK034	22	52	59.4	66	7	51.2	3,985	Rachaite		white clay			1						
A02KK035	23	49	56.3	66	15	32.0	3,656	La Colorada	Limeca	quartzite			1						
A02KK036	25	51	49.7	67	3	15.8	5,156	Cerro Galan		white clay			1						
A02KK037	25	51	51.0	67	3	10.3	5,134	Cerro Galan		white clay			1	1					

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02KK038	25	51	52.3	67	3	6.8	5,112	Cerro Galan		ignimbrite			1	1					
A02KK039	25	51	59.6	67	3	2.7	5,088	Cerro Galan		ignimbrite?			1	1					
A02KK040	25	52	13.0	67	2	41.0	4,956	Cerro Galan		white clay			1	1					
A02KK041	25	52	25.2	67	2	22.3	4,896	Cerro Galan		white clay			1	1					
A02KK042	25	52	43.5	67	2	10.0	4,842	Cerro Galan		white clay			1	1					
A02KK043	25	52	40.8	67	1	13.2	4,769	Cerro Galan		white clay			1	1					
A02KK044	25	54	12.7	67	2	41.5	4,832	Cerro Galan		ignimbrite			1	1					
A02KK045	26	2	35.1	67	4	42.2	4,870	Cerro Galan		white clay			1	1					
A02KK046	26	2	39.2	67	4	5.1	4,879	Cerro Galan		ignimbrite			1	1					
A02KK047	27	4	47.7	65	55	58.1	3,800	El Pago		porphyry?			1	1					
A02KK048	27	4	48.7	65	55	59.7	3,765	El Pago		white clay			1	1					
A02KK049	27	4	58.7	65	56	2.1	3,816	El Pago		porphyry?			1	1					
A02KK050	27	4	58.7	65	56	2.1	3,816	El Pago		white clay			1	1					
A02KK051	23	17	39.3	65	46	37.8	3,605	Aguilar		shale with fossil									1
A02KK052	23	13	7.6	65	38	10.0	3,847	Aguilar		shale with fossil									1
A02BC001								Cerro Galan		ignimbrite			1						
A02BC002								Cerro Galan		ignimbrite			1						
A02SX001	23	12	26.6	65	43	7.0	4,568	Aguilar	Mina Aguilar	shale silicified with Po				1					
A02SX002	23	12	26.6	65	43	7.0	4,568	Aguilar	Mina Aguilar	galena ore				1					
A02SX003	23	12	14.5	65	43	12.4	4,567	Aguilar	Mina Aguilar	sandstone				1					
A02SX004	23	11	58.1	65	43	2.7	4,837	Aguilar	Mina Aguilar	cuarcitas				1					
A02SX005	23	11	33.4	65	42	40.0	4,795	Aguilar	Mina Oriental					1					
A02SX006	23	11	17.7	65	42	32.7	4,717	Aguilar	Mina Oriental	black dotty	1			1					
A02SX007	23	10	55.7	65	42	44.1	4,736	Aguilar	Mina Pirita					1					
A02SX008	23	10	49.7	65	42	52.5	4,772	Aguilar	Mina Pirita	thin bedded slate				1					
A02SX009	23	10	3.7	65	42	43.4	4,919	Aguilar	Quebrada Vacas	thin bedded black slate				1				1	
A02SX010	23	15	48.4	65	42	22.9	4,074	Aguilar	Quebrada Despensa	shale				1				1	
A02SX011	23	15	42.9	65	42	23.2	4,092	Aguilar	Quebrada Despensa	limestone	1			1			1		
A02SX012	23	15	42.9	65	42	23.2	4,092	Aguilar	Quebrada Despensa	phillitic slate				1					
A02SX013	23	15	37.8	65	42	36.7	4,090	Aguilar	Quebrada Despensa	phillitic shale				1				1	
A02SX014	23	15	32.8	65	42	38.3	4,106	Aguilar	Quebrada Despensa	phillitic slate				1					
A02SX015	23	15	59.3	65	43	2.9	4,094	Aguilar	Quebrada Despensa	limonitized sandstone?				1					
A02SX016	23	9	22.4	65	42	38.5	4,684	Aguilar	Mina Esperanza	phillitic state				1					
A02SX017	23	10	5.8	65	43	13.0	5,029	Aguilar	Mina Esperanza	shale				1				1	
A02SX018	23	8	20.2	65	43	54.5	4,759	Aguilar	Mina Esperanza	shale				1				1	
A02SX019	23	9	25.4	65	42	38.9	4,717	Aguilar	Mina Esperanza	shale				1					
A02SX020	23	9	12.6	65	42	47.9	4,862	Aguilar	Mina Esperanza	phillitic state				1					
A02SX021	23	14	12.9	65	43	42.6	4,857	Aguilar	Mina Tapada	silicified fine ssandstone with Py				1				1	
A02SX022	23	14	12.9	65	43	42.6	4,857	Aguilar	Mina Tapada	conglomerate (sub-angular)				1					
A02SX023	23	13	14.9	65	43	44.0	4,729	Aguilar	Quebrada Polvorines	black slate				1				1	
A02CX001	23	15	40.7	65	42	26.4		Aguilar	Quebrada Despenza	limonitized, conglomeratic rock				1					

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02CX002	23	15	40.7	65	42	26.4		Aguilar	Quebrada Despenza	hammocky limestone with Py				1				1	
A02CX003	23	7	51.3	65	41	16.7		Aguilar	Rio Grande	limonitized ore zone with hammocky limestone				1				1	
A02CX004	23	7	54.1	65	41	20.5		Aguilar	Rio Grande	limonitized Py rich zone				1					
A02CX005	23	7	54.1	65	41	20.5		Aguilar	Rio Grande	black shale				1					
A02CX006	23	7	49.0	65	41	32.1		Aguilar	Rio Grande	siliceous sandstone				1					
A02CX007	23	9	15.9	65	42	42.3		Aguilar						1					
A02CX008	23	9	15.9	65	42	42.3		Aguilar						1					
A02CX009	23	11	0.6	65	42	46.6		Aguilar	Rincon	shale? (hanging wall of mineralized zone)				1					
A02CX010	23	11	0.6	65	42	46.6		Aguilar	Rincon	Po+Zb quartz ore				1					
A02CX011	23	11	0.6	65	42	46.6		Aguilar	Rincon	shale? (foot wall of mineralized zone)				1					
A02CX012	23	11	31.9	65	42	43.8		Aguilar	El Oriental	breccia ore				1	1				
A02CX013	23	11	9.1	65	42	24.0		Aguilar	Mina Pirita	massive quartzite with Mv.				1					
A02CX014	23	11	8.8	65	42	23.8		Aguilar	Mina Pirita	Py-Mv-Qz vein				1					
A02CX015	23	11	8.8	65	42	23.8		Aguilar	Mina Pirita	quartzite breccia with Mn				1					
A02CX016	23	11	15.5	65	42	36.2		Aguilar	Mina Pirita	bedded quartzite				1					
A02CX017	23	10	56.4	65	42	35.3		Aguilar	Mina Pirita	shale				1					
A02CX018	23	10	56.4	65	42	35.3		Aguilar	Mina Pirita	altered zone				1					
A02CX019	23	10	56.4	65	42	35.3		Aguilar	Mina Pirita	Py-Qz				1					
A02CX020	23	12	5.0	65	42	11.6		Aguilar	Mina Aguilar	granite	1			1					
A02CX021	23	12	24.3	65	42	56.4		Aguilar	Mina Aguilar	quartzite	1			1					
A02CX022	22	17	13.5	65	36	16.2		Pumahuasi	Pumahuasi	bedded shale				1					
A02CX023	22	29	32.2	65	36	0.7		Pumahuasi		bedded shale and sandstone				1					
A02CX024	22	22	43.5	65	36	44.2		Pumahuasi	Alejandro	bedded shale				1					
A02CX025	22	22	7.3	65	36	47.1		Pumahuasi	Belgica	bedded shale				1					
A02CX026	22	18	13.1	65	36	12.4		Pumahuasi	Sol de Mayo	foliated, bedded shale				1					
A02CX027	22	17	27.9	65	36	17.3		Pumahuasi	Chaussette	hard shale				1					
A02CX028	22	17	5.6	65	36	31.5		Pumahuasi		well-bedded sine sandstone and shale				1					
A02CX029	22	10	28.3	65	5	38.6		Santa Victoria	Vizcachani	bedded quartzite	1			1					
A02CX030	22	10	28.3	65	5	38.6		Santa Victoria	Vizcachani	bedded lutite intercalating with quartzite				1					
A02CX031	22	6	7.3	65	6	51.8		Santa Victoria		light grey hard quartzite				1					
A02CX032	22	6	9.0	65	7	1.9		Santa Victoria		fine sandstone				1					
A02CX033	22	6	9.0	65	7	1.9		Santa Victoria		shale				1					
A02CX034	22	6	15.3	65	7	4.6		Santa Victoria		sandstone				1					
A02CX035	22	7	45.4	65	7	53.2		Santa Victoria		quartzite				1					
A02CX036	22	6	51.5	65	8	57.3		Santa Victoria		bedded sandstone with mega-fossils				1				1	
A02CX037	22	6	47.8	65	9	0.1		Santa Victoria		weathered, massive siltstone				1					

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02CX038	22	6	22.9	65	10	30.0		Santa Victoria		weathered siltstone				1					
A02CX039	22	6	8.3	65	10	39.6		Santa Victoria		fine sandstone				1					
A02CX040	22	6	8.3	65	10	39.6		Santa Victoria		siltstone				1					
A02CX041	22	6	11.3	65	10	45.3		Santa Victoria		fine sandstone				1					
A02CX042	22	6	11.3	65	10	45.3		Santa Victoria		siltstone				1					
A02CX043	22	6	13.1	65	11	2.2		Santa Victoria		silicified fine sandstone				1					
A02CX044	22	5	53.6	65	11	48.1		Santa Victoria		fine sandstone	1			1					
A02CX045	22	5	53.6	65	11	48.1		Santa Victoria		siltstone				1					
A02CX046	22	6	19.6	65	12	3.7		Santa Victoria		shale				1					
A02CX047	22	6	47.4	65	12	25.6		Santa Victoria		bedded shale				1					
A02CX048	22	9	3.4	65	15	14.8		Santa Victoria		phillitic, bedded shale				1					
A02CX049	22	9	15.4	65	15	20.9		Santa Victoria		bedded shale				1				1	
A02CX050	22	9	16.0	65	16	0.6		Santa Victoria		fine sandstone with Mv.				1				1	
A02CX051	22	9	24.7	65	16	23.3		Santa Victoria		fine sandstone with Mv.				1					
A02CX052	22	9	41.0	65	16	57.5		Santa Victoria		sandstone				1					
A02CX053	22	9	41.0	65	16	57.5		Santa Victoria		shale				1					
A02CX054	22	14	6.8	65	1	50.5	2,910	Santa Victoria		shale				1					
A02CX055	22	14	8.4	65	1	41.1	2,874	Santa Victoria		shale				1					
A02CX056	22	14	14.5	65	1	24.3	2,834	Santa Victoria		shale				1					
A02CX057	22	14	20.9	65	0	31.0	2,687	Santa Victoria		shale				1					
A02CX058	22	14	28.6	65	0	16.7	2,673	Santa Victoria		shale				1					
A02CX059	22	14	45.8	64	59	39.5	2,556	Santa Victoria		shale				1					
A02CX060	22	14	53.7	64	59	36.6	2,578	Santa Victoria		sandstone				1					
A02CX061	22	14	53.7	64	59	36.6	2,578	Santa Victoria		shale				1					
A02CX062	22	15	8.1	64	58	56.0	2,503	Santa Victoria		shale				1					
A02CX063	22	15	8.1	64	58	56.0	2,503	Santa Victoria		sandstone				1					
A02CX064	22	15	7.7	64	58	42.4	2,485	Santa Victoria		sandy shale				1					
A02CX065	22	15	5.2	64	58	29.3	2,456	Santa Victoria		sandy shale				1					
A02CX066	22	15	3.7	64	58	23.9	2,443	Santa Victoria		sandstone				1					
A02CX067	22	15	3.7	64	58	23.9	2,443	Santa Victoria		shale				1					
A02CX068	22	14	51.1	64	57	43.5	2,302	Santa Victoria		limestone				1					
A02CX069	22	23	18.0	65	4	27.2		Santa Victoria		micaceous sandstone	1			1					
A02CX070	22	23	18.0	65	4	27.2		Santa Victoria		black shale				1					
A02CX071	22	23	17.5	65	4	24.4		Santa Victoria		dacite dyke in shale				1					
A02CX072	22	23	17.5	65	4	24.0		Santa Victoria		black shale with black dots				1				1	
A02CX073	22	23	36.7	65	4	15.8		Santa Victoria		bedded shale				1					
A02CX074	22	23	47.7	65	4	25.1		Santa Victoria		weathered bedded shale				1					
A02CX075	22	23	56.2	65	4	38.3		Santa Victoria		bedded fine sandstone (fossils?)				1					
A02CX076	22	23	51.1	65	4	48.3		Santa Victoria		bedded siltstone (fossils?)				1					
A02CX077	22	23	47.9	65	4	58.9		Santa Victoria		bedded shale				1					
A02CX078	22	23	47.9	65	4	58.9		Santa Victoria		micaceous fine sandstone	1			1					

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A02CX079	22	23	43.1	65	5	12.3		Santa Victoria		black shale				1					
A02CX080	22	23	52.3	65	5	28.7		Santa Victoria		weathered bedded shale				1					
A02CX081	22	24	5.5	65	5	40.9		Santa Victoria		weathered bedded shale				1					
A02CX082	22	24	14.6	65	5	55.5		Santa Victoria		weathered bedded siltstone				1					
A02CX083	22	24	25.0	65	6	15.2		Santa Victoria		bedded micaceous siltstone				1					
A02CX084	22	24	25.0	65	6	15.2		Santa Victoria		sandstone lens				1					
A02CX085	22	24	26.4	65	6	42.1		Santa Victoria		bedded black shale				1					
A02CX086	22	24	33.2	65	6	57.0		Santa Victoria		bedded black shale				1					
A02CX087	22	24	23.8	65	7	20.7		Santa Victoria		hard, massive, micaceous fine sandstone	1			1					
A02CX088	22	24	25.1	65	7	32.6		Santa Victoria		bedded micaceous siltstone				1					
A02CX089	22	24	30.7	65	7	34.0		Santa Victoria		massive micaceous sandstone				1					
A02CX090	22	24	40.2	65	7	22.4		Santa Victoria		bedded shale				1					
A02CX091	22	24	34.9	65	7	34.4		Santa Victoria		micaceous sandstone				1				1	
A02CX092	22	24	34.9	65	7	34.4		Santa Victoria		bedded shale				1				1	
A02CX093	22	25	3.5	65	10	13.7		Santa Victoria		sandstone				1					
A02CX094	22	25	3.5	65	10	13.7		Santa Victoria		thin bedded shale				1					
A02CX095	22	24	57.7	65	10	21.1		Santa Victoria		thin bedded micaceous sandstone				1					
A02CX096	22	24	57.7	65	10	21.1		Santa Victoria		bedded shale				1					
A02CX097	22	25	4.7	65	10	28.2		Santa Victoria		bedded black shale with thin bedded siltstone				1					
A02CX098	22	20	44.9	65	17	44.8	4,263	Santa Victoria		shale				1					
A02CX099	22	20	44.9	65	17	44.8	4,263	Santa Victoria		sand stone				1					
A02CX100	22	20	28.6	65	17	36.5	4,303	Santa Victoria		shale				1					
A02CX101	22	19	46.4	65	16	4.9	4,583	Santa Victoria		shale				1					
A02CX102	22	19	58.8	65	16	6.8	4,618	Santa Victoria		sandy shale				1					
A02CX103	22	19	47.6	65	15	49.5	4,657	Santa Victoria		shale				1					
A02CX104	22	22	55.6	65	13	58.7	4,248	Santa Victoria		shale				1					
A02CX105	22	22	43.1	65	13	55.7	4,328	Santa Victoria		shale				1					
A02CX106	22	23	48.2	65	13	56.4	4,383	Santa Victoria		shale				1					
A02CX107	22	13	9.2	65	13	42.5		Santa Victoria		quartzose sandstone				1					
A02CX108	22	13	8.9	65	14	5.1		Santa Victoria		quartzose sandstone				1					
A02CX109	22	13	17.2	65	14	14.1		Santa Victoria		weathered bedded shale				1					
A02CX110	22	13	40.3	65	14	36.6		Santa Victoria		folded, silicificated bedded shale and sandstone				1					
A02CX111	22	14	26.9	65	15	5.7		Santa Victoria		thin bedded black shale				1					
A02CX112	22	14	41.6	65	15	31.9		Santa Victoria		thin bedded shale				1					
A02CX113	22	14	23.2	65	15	32.3		Santa Victoria		bedded micaceous siltstone				1					
A02CX114	22	23	22.6	65	19	19.5	3,994	Santa Victoria		shale				1					
A02CX115	22	23	12.5	65	19	10.8	4,025	Santa Victoria		sand stone				1					
A02CX116	22	23	2.8	65	19	0.4	4,041	Santa Victoria		shale				1					
A02CX117	22	23	0.7	65	18	48.8	4,052	Santa Victoria		shale				1					

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A02CX118	22	23	8.0	65	17	21.7	4,421	Santa Victoria		shale				1					
A02CX119	22	23	36.1	65	17	14.8	4,492	Santa Victoria		shale				1					
A02CX120	22	23	56.9	65	16	41.9	4,431	Santa Victoria		shale				1					
A02CX121	22	23	44.8	65	16	25.9	4,331	Santa Victoria		shale				1					
A02CX122	22	23	42.7	65	16	13.0	4,316	Santa Victoria		shale				1					
A02CX123	22	23	53.6	65	15	58.7	4,312	Santa Victoria		shale				1					
A02CX124	22	23	49.9	65	15	33.5	4,258	Santa Victoria		shale				1					
A02CX125	22	23	33.3	65	15	7.1	4,222	Santa Victoria		shale				1					
A02CX126	22	24	0.0	65	15	7.5	4,270	Santa Victoria		shale				1					
A02CX127	22	24	27.0	65	15	3.4	4,234	Santa Victoria		shale				1					
A02CX128	22	24	14.4	65	14	49.0	4,174	Santa Victoria		shale				1					
A02CX129	22	24	17.7	65	14	36.5	4,144	Santa Victoria		shale				1					
A02CX130	22	14	16.8	65	14	20.6	4,130	Santa Victoria		shale				1					
A02CX131	22	24	15.3	65	13	52.2	4,182	Santa Victoria		shale				1					
A02CX132	22	23	57.4	65	13	38.7	4,213	Santa Victoria		shale				1					
A02CX133	23	39	1.9	66	18	2.0		La Colorada		dark gray bedded quartzite (hornfels)				1					
A02CX134	23	39	3.8	66	17	57.6		La Colorada		hard, bedded, graded silicified shale (hornfels)			1	1					
A02CX135	23	39	2.0	66	17	49.7		La Colorada		greenish grey, hard hornfels				1					
A02CX136	23	39	4.4	66	17	46.4		La Colorada		weak hornfelsic micaceous sandstone				1					
A02CX137	23	39	4.1	66	17	42.7		La Colorada		weathered, greenish grey phillitic sandstone				1					
A02CX138	23	39	4.4	66	17	33.3		La Colorada		sheared limonitized zone				1					
A02CX139	23	39	4.4	66	17	33.3		La Colorada		greenish grey, chloritized zone				1					
A02CX140	23	39	5.1	66	17	32.8		La Colorada		hornfelsic phillitic sandstone with aggregates of secondary biotite				1					
A02CX141	23	39	4.4	66	17	30.2		La Colorada		metamorphosed sandstone			1	1					
A02CX142	23	38	58.9	66	17	13.8		La Colorada		hornfelsic phillitic sandstone			1	1					
A02CX143	23	40	56.1	66	20	41.6		La Colorada	Limeca	dark grey bedded siltstone				1					
A02CX144	23	41	1.1	66	20	35.2		La Colorada	Limeca	dark grey bedded siltstone to shale				1					
A02CX145	23	41	16.2	66	20	30.1		La Colorada	Limeca	foliated bedded fine sandstone to shale				1					
A02CX146	23	41	16.0	66	20	29.7		La Colorada	Limeca	cubic pyrite disseminated layers in bedded siltstone to shale				1					
A02CX147	23	41	18.9	66	20	20.4		La Colorada	Limeca	bedded fine sandstone to shale				1					
A02CX148	23	39	7.0	66	18	44.8								1				1	
A02CX149	23	39	8.3	66	18	37.8								1					
A02CX150	23	39	12.4	66	18	30.8								1				1	
A02CX151	23	39	13.4	66	18	20.2								1				1	
A02CX152	23	35	15.4	66	14	32.4	3,537	La Colorada	La Colorada	shale				1					

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A02CX153	23	35	15.4	66	14	32.4	3,537	La Colorada	La Colorada	sand stone				1					
A02CX154	23	35	29.6	66	14	25.5	3,580	La Colorada	La Colorada	shist				1					
A02CX155	23	34	24.9	66	13	44.0	3,489	La Colorada	La Colorada	shist				1					
A02CX156	23	51	16.0	66	15	17.5		La Colorada	Limeca	foliated phillite				1					
A02CX157	23	51	25.7	66	15	34.9		La Colorada	Limeca	conglomerate				1					
A02CX158	23	51	26.7	66	15	40.2		La Colorada	Limeca	sandstone beds in conglomerate				1					
A02CX159	23	51	23.2	66	15	42.4		La Colorada	Limeca	hard, bedded quartzose sandstone				1					
A02CX160	23	51	25.1	66	15	58.5		La Colorada	Limeca	hard, siliceous bedded sandstone				1					
A02CX161	23	51	20.0	66	16	4.2		La Colorada	Limeca	hard, siliceous bedded sandstone				1					
A02CX162	23	51	18.6	66	16	9.9		La Colorada	Limeca	dark grey, massive sandstone				1					
A02CX163	23	51	3.0	66	16	30.6		La Colorada	Limeca	phillitic shale in sandstone				1					
A02CX164	23	51	48.2	66	17	59.7		La Colorada	Limeca	foliated, dacitic lava	1			1					
A02CX165	23	52	22.7	66	18	24.9		La Colorada	Limeca	thin bedded slate with quartz veinlets				1					
A02CX166	23	53	0.1	66	18	46.9		La Colorada	Limeca	dark grey, thin bedded slate	1			1					
A02CX167	23	53	9.3	66	18	54.9		La Colorada	Limeca	overturned thin bedded slate				1					
A02CX168								La Colorada	Limeca					1					
A02CX169								La Colorada	Limeca					1					
A02CX170	23	50	26.0	66	15	50.5	3,559	La Colorada	Limeca	sandstone				1					
A02CX171	23	50	27.6	66	15	49.7	3,553	La Colorada	Limeca	sandyshale				1					
A02CX172	23	50	13.6	66	15	33.7	3,548	La Colorada	Limeca	shale				1					
A02PZ101	Pozo-1 (134.50m-134.60m)							La Colorada				1		1	1				
A02PZ102	Pozo-1 (139.00m-139.10m)							La Colorada				1		1	1				
A02PZ103	Pozo-1 (145.00m-145.15m)							La Colorada			1		1	1					
A02PZ104	Pozo-1 (180.00m-180.15m)							La Colorada			1		1	1					
A02PZ105	Pozo-1 (221.00m-221.10m)							La Colorada			1		1	1					
A02PZ106	Pozo-1 (260.00m-260.15m)							La Colorada			1		1	1					
A02PZ201	Pozo-2 (167.85m-168.00m)							La Colorada			1		1	1					
A02PZ202	Pozo-2 (171.15m-171.30m)							La Colorada			1		1	1					
A02PZ203	Pozo-2 (192.50m-192.65m)							La Colorada				1		1	1				
A02PZ204	Pozo-2 (222.65m-222.80m)							La Colorada				1		1	1				
A02PZ205	Pozo-2 (232.30m-232.45m)							La Colorada			1		1	1					
A02PZ206	Pozo-2 (237.80m-237.95m)							La Colorada			1		1	1					
A02PZ301	Pozo-3 (56.00m- 56.15m)							La Colorada				1		1	1				
A02PZ302	Pozo-3 (93.00m- 93.15m)							La Colorada				1		1	1				
A02PZ303	Pozo-3 (106.00m-106.10m)							La Colorada				1		1	1				
A02PZ304	Pozo-3 (137.00m-137.20m)							La Colorada				1		1	1				
A02PZ305	Pozo-3 (158.00m-158.15m)							La Colorada				1		1	1				
A02PZ401	Pozo-4 (109.55m-109.70m)							La Colorada			1		1	1					
A02PZ402	Pozo-4 (115.65m-115.80m)							La Colorada			1		1	1					
A02PZ403	Pozo-4 (119.90m-120.05m)							La Colorada				1		1	1				

Sample No.	Lat(D)	Lat(M)	Lat(S)	Lon(D)	Lon(M	Lon(S)	Altitude	District	Locality	Rock	TS	PT	XR	GC	OA	WR	FC	FP	FM
A02PZ404	Pozo-4 (133.20m-133.35m)							La Colorada				1		1	1				
A02PZ405	Pozo-4 (136.85m-137.00m)							La Colorada			1		1	1					
A02PZ406	Pozo-4 (144.75m-144.90m)							La Colorada			1		1	1					
A02PZ501	Pozo-5 (30.00m- 30.15m)							La Colorada			1		1	1					
A02PZ502	Pozo-5 (33.00m- 33.10m)							La Colorada			1		1	1					
A02PZ503	Pozo-5 (36.50m- 36.65m)							La Colorada				1		1	1				
A02PZ504	Pozo-5 (66.00m- 66.20m)							La Colorada				1		1	1				
A02PZ505	Pozo-5 (67.00m- 67.15m)							La Colorada			1		1	1					
A02PZ506	Pozo-5 (83.00m- 83.20m)							La Colorada			1		1	1					
A02PZ507	Pozo-5 (94.00m- 94.15m)							La Colorada			1		1	1					
A02PZ508	Pozo-5 (101.00m-101.15m)							La Colorada			1		1	1					
A02PZ509	Pozo-5 (107.00m-107.10m)							La Colorada				1		1	1				
A02PZ510	Pozo-5 (125.00m-125.15m)							La Colorada				1		1	1				
A02PZ511	Pozo-5 (129.00m-129.10m)							La Colorada			1		1	1					
A02PZ512	Pozo-5 (141.00m-141.15m)							La Colorada			1		1	1					
5618	27	5	1.5	65	55	0.0		El Pago						1					
23264	27	4	41.3	65	54	58.5		El Pago						1					
23277	27	4	37.2	65	55	4.3		El Pago						1					
23281	27	5	1.8	65	54	20.3		El Pago						1					
25167	27	5	13.8	65	55	40.9		El Pago						1					
25169	27	5	12.4	65	55	23.6		El Pago						1					
25173								El Pago						1					
25175	27	5	9.3	65	55	21.0		El Pago						1					
25208	27	4	54.0	65	55	22.5		El Pago						1					
25214	27	4	53.6	65	55	9.0		El Pago						1					
26405	27	5	4.5	65	55	37.0		El Pago						1					
26415								El Pago					1	1					
26434	27	4	50.2	65	55	41.1		El Pago						1					
67580	27	5	11.8	65	55	26.3		El Pago					1	1					
67581	27	5	13.2	65	55	13.5		El Pago					1	1					
67588	27	4	34.5	65	54	33.8		El Pago						1					

Qz:quartz, Tour:tourmaline, Py:pyrite, Gn:galena, Po: , Mv: , Zb: , Hb: , Hw:
TS:thin section
PS:polish thin section
XR:X-ray diffraction
GC:geochemical analysis (Au, Hg, Ag, Al, As, ba, Be, Bi, Ca, Cr, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sr, Ti, V, W, Zn)

WR:whole rock analysis (SiO_2, Al_2O_3, FeO_3, CaO, MgO, Na_2O_3, K_2O, Cr_2O_3, TiO_2, Mn
V, W, Y, Yb, Zn, Zr)
FC:fossil (conodont)
FP:fossil (polinomorfo)
FM:fossil (megafossil)

Table A-2 Result of the laboratory test (microscopic observation of rock and ore samples)

(1) Rock samples

Sampe No.	Rock name		Primary minerals																				matrix, alteration, vein minerals																						
	Field observation	Microscopic observation	qz	pl	kf	bt	mu	ill	ho	opx	cpx	ol	ga	spi	zi	ap	opq	act	ant	Cc	ba	br	qz	chl	seri	ep	smec	kao	lim	alu	to	gl	preh	act	cc	k-f	pl	opq	bt	cpx	sph	gla	phl	chal	x
A02RF001	sediment ?	biotite hornfels	◎	・		◎								×			・						◎v													○v	○v	・v							
A02RF002	porphyry	biotite chlorite-epidote hornfels? (dacitic tuff origin)	○	○	○	△											○						◎v,m	・a?		○v											・m	△v	△m						
A02RF003	sediment ?	altered biotite hornfels	◎			○											△						◎v		○v													△v							
A02RF005	porphyry	altered andesite	△	◎		○			△								△						◎m	・a	・a												△m		・a						
A02RF009	sediment ?	altered sandstone	◎	△													・						○a		○a						△a														・a
A02RF013	porphyry	altered dacitic tuff?	◎	○		△											△						◎a?		◎a?			○	・									△							
A02RF015	dacite	weakly altered biotite granite porphyly	○	◎	△	△									・	・	・								・a																				
A02RF019	porphyry	altered dacitic tuff	◎	○	○	○											△							・a	・a		・a	・a																	
A02RF028	monzonite ?	altered cataclasite	◎			○											○								・a		・a		・a													◎a?	・a		
A02RF031	porphyry	altered granite?	○	○	△	○											△									×a																			
A02RF042	monzonite	altered silicified rock	◎			△?											・								◎a		・a		・a																
A02RF052		quartzite	◎		・			・									×																												
A02RF060	dacite lava	weakly altered olivine-augite basalt		◎							△	○					・										・a										○m	・a,m				○m			
A02RF070	ore	biotite-muscovite schist	○	△	△	◎	◎										・							△?																					
A02RF101	gneiss	biotite-garnet-quartz schist	◎	△		○							・			・	・																												
A02RF102	gneiss	metamorphosed trackitic ～ dacitic tuff?	○				○										・												・a																
A02YH001	monzonite porphyry	altered sandstone	◎																				○v,a		○v,a						・a							・a							
A02YH002	monzonite porphyry	altered dacite	△	◎	○																		◎a,m	・a	・a	・a,m	・a										・a	△m	○m						
A02YH003-1 (gr)	monzonite porphyry and sediments	altered porphyritic biotite granite - biotite muscovite hornfels	△	◎	△	○																	◎m	・a	・a	・		・a									・m	・m			・				
A02YH003-1 (hf)			◎			◎	△																																						
A02YH005	monzonite porphyry	dacitic tuff	△	◎		○					△?				・		・						◎m	・a										・a			△m	・a	・a,m						
A02YH008	andesite (boulder)	hornblende-augite andesite		◎					△		・						△										・a										◎m	・a,△m		・m		○m			
A02YH009	monzonite porphyry?	cataclasitic altered granite	○	◎	△	△																			・a		△a											・a	◎a						
A02YH016	Tour-Qz vein	tourmaline-quartz rock																					◎a								○a							△a							
A02YH020		altered dacitic tuff	△	○		△?			△?						・								○a		○a					?			?											◎m	
A02YH022	dacitic rock	dacite	○	◎		△											△																				◎m	・a							
A02YH026	dacitic rock	dacitic welded tuff?	○	◎		△?			△?								△						◎m														○v	△m				◎m			
A02YH029	Hb-dacite lava	dacitic tuff?	○	◎	△	○											・						△m	△m	・a												△a					○v			
A02YH030	dacitic pyroclastics?	altered dacitic tuff ～ tuff breccia	◎	○		△										・	・						◎m	○a	○a										◎a		△m,a								
A02YH048	granodiorite?	altered meta chert or quartzite	◎																						◎a				・a									△a							
A02TK021	conglomerate	altered breccia?	◎			・																○			・		・																		
A02KK026		sandy mudstone	◎														・			・				・			△																		
A02SX006	black dotty	metamorphosed fine sandstone-siltstone	◎	○		◎	・										△						◎v																△v						
A02SX011	limestone	siliceous limestone	△	・												・?				◎																									
A02CX020	granite	hornblende-biotite granite - granodiorite	△	◎	△	△			○						×	×	・								・a																				
A02CX021	quartzite	quartzite or metamorphosed chert	◎				△?										・																												
A02CX029	bedded quartzite	weakly recrystallized chert or quartz arenite	◎	△			・								×																	×													
A02CX044	fine sandstone	arenaceous fine sandstone	◎	○			・										・							・v,m								×													
A02CX069	micaceous sandstone	weakly metamorphosed arenaceous fine sandstone	◎	△	△		△										△										・																		
A02CX078	micaceous fine sandstone	weakly metamorphosed fine sandstone	◎	△		△?	△										・										・																		

Sampe No.	Rock name		Primary minerals																			
	Field observation	Microscopic observation	qz	pl	kf	bt	mu	ill	ho	opx	cpx	ol	ga	spi	zi	ap	opq	act	ant	Cc	ba	br
A02CX087	massive, micaceous fine sandstone	weakly metamorphosed fine quartz sandstone or quatzite?	◎	△	•		•										○					
A02CX164	foliated, dacitic lava	metamorphosed dacitoc tuff	○	◎	△	○	◎									•	•					
A02CX166 (sand stone)	dark grey, thin bedded slate	medium sandstone - siltstone boundary	◎	△			△										•					
A02CX166 (silt stone)			○	△			△										△					
A02PZ103		altered green tuff	○			•?			•?								•	○?				
A02PZ104		biotite-muscovite schist?	△	△		◎	◎		•?								△				•?	
A02PZ105		biotite-muscovite-quartz-plagioclase schist	○	○		◎	◎		•								△		•?			
A02PZ106		garnet-biotite-muscovite hornfelsic quartzite	◎	•		△	△						•				•					
A02PZ201		mineralized biotite muscovite schist	○	•		◎	△										•					
A02PZ202		biotite muscovite siliceous hornfls	◎	•		○	△										•					
A02PZ205		metanorphosed basic tuff?	△			◎	○										•					
A02PZ206		biotite-muscoite-chlorite schist	○			◎	△								•	•?	•					
A02PZ401 (hornfers)		metamorphosed diorite? - siliceous hornfels contact	◎	△		○											•					
A02PZ401 (diorite)			△	○		◎			△?		△?						△					
A02PZ402 (tuff)		mineralized metamorphosed basic tuff? and mudstone		○		○	△						•				•					
A02PZ402 (mudstone)			◎			◎	•						•				△					
A02PZ405		altered gabbro		○					○		○						△					
A02PZ406		meta micro gabbro?		○					◎		△						△					
A02PZ501		mineralized meta basite?(bacitic tuff origin?)	○			•	△						△				△			•		
A02PZ502		meta basite	◎				△						△				△					
A02PZ505		metamorphosed tuffaceous sandstone	◎	△		△	○													△		
A02PZ506		Biotite-quartz-X schist	◎	○?		◎										•	△					
A02PZ507		Biotite-muscovite-chlorite schist	○	△?		◎	○										•					
A02PZ508		metamorphosed quartzite with basic tuff?	◎			△	△						•				•	△				
A02PZ511		biotite-muscovite-quartz schist	◎			○	△										•					
A02PZ512		biotite-muscovite schist	◎			△	◎										△					

Sampe No.	matrix, alteration, vein minerals																						
	qz	chl	seri	ep	smec	kao	lim	alu	to	gl	preh	act	cc	k-f	pl	opq	bt	cpx	sph	gla	phl	chal	x
A02CX087					•a					×													
A02CX164													×a?				×a?						
A02CX166 (sand stone)																							
A02CX166 (silt stone)																							
A02PZ103	•v	•v,a	○v,•a																				
A02PZ104	•a?		•a?												•a?								
A02PZ105																			•				
A02PZ106		•																					
A02PZ201	◎v	○v	•v											△v		○v	△v						
A02PZ202	◎v																						
A02PZ205	○v	△	•v													•v							
A02PZ206	◎v	•v	•v											△v		•v	•v						
A02PZ401 (hornfers)		•	•v																				
A02PZ401 (diorite)																							
A02PZ402 (tuff)	◎v	•														○v							
A02PZ402 (mudstone)																							
A02PZ405		•a										•a	•a										
A02PZ406		•a	•a		•a							•a	•a										
A02PZ501	◎v	◎														△v							
A02PZ502		◎	△v,m																				
A02PZ505	•v,◎m	•v,m											△v,m			△v,m							
A02PZ506	◎v																						
A02PZ507		△																					
A02PZ508		○	•a										△v		•a								
A02PZ511	•v	•	•a													•							
A02PZ512																•v							

Legend; ◎ abundant; ○ common; △ minor; • rare, × very rare

Primary mineral

qz:quartz, pl:plagioclase, kf:k-feldspar, bt:biotite, mu:muscovite, ill :illite, ho:hornblende, opx:ortho pyroxene, cpx:clino pyroxene, ol:olivine, ga:garnet, spi:spinel, zi:zircon, ap:apatite, opq:opaque minerals (mainly iron oxide), act:actinolite, ant:anthophyllite, cc:calcite, ba:barite, br: breccia

Secondary mineral

chl:chlorite, seri:sericite, ep:epidote, smec:smectite, kao:kaolinite, lim:limonite, alu:alunite, to:tourmaline, gl:glauconite, preh:prehnite,sph:sphene, gla:glass, phl:phlogopite, chal:chalsedonic quartz, x:unknown

a:alteration, v:vein, m:matrix

(2) Ore samples

Sampe No.	Rock name		Ore minerals																			Note
	Field observation	Microscopic observation	py	pyr	asp	mac	spl	cp	ga	bis	co	tet	po	na-bi	el	mt	ru	il	go	lp	ag	(others)
A02RF004	porphyry	Pyrire disseminated ore	○	•			△	△								△	△	△	△			
A02RF031	porphyry	Limonite ore	△					•									△		○	○		
A02RF040	porphyry	Brecciated limonite ore	•					•									△		◎	△		
A02RF046	shale	Banded ore	•														△					
A02RF051	ore	Clastic coarse-grained galena ore	△				◎	•	◎		•	△	△						•			
A02RF053	ore	Clastic ore	•					•	○		△						△		○	△	○	
A02RF057	ore	Quartz-Galena-Chalcopyrite banded ore	○				○	◎	◎		△	•							△			
A02RF068	ore	Limonite network in quartz																	○	○		
A02RF069	ore	Quartz	△					•									△		△			
A02RF071	sandstone	Flexural rock															△	△				
A02RF104	ore	Limonite ore	△														△		◎			
A02RF105	ore (grab)	Pyrire disseminated ore	◎														△		△			
A02RF106	HW rock	Pyrire disseminated ore	○	•			•										△					
A02PZ101		Banded pyrrhotite-spalerite ore		◎	△		◎	△	○						•	•		△				
A02PZ102		Massive pyrrhotite-rich ore		◎	△	•?	○	△	△	•?					•	△		△				
A02PZ203		Massive pyrrhotite ore		◎	△		△	△	△	△				△		△		△				
A02PZ204		Pyrrhotite-rich ore		◎	○		○	○	○													
A02PZ301		Network pyrrhotite-chalcopyrite ore		◎	○		△	○	•									△				
A02PZ302		Massive Pyrrhotite -rich ore		◎	△		•	△						•				△				
A02PZ303		Network pyrrhotite ore		◎	△		•	△									△	△				
A02PZ304		Massive pyrrhotite-rich ore		◎	•		△	○				•		•				△				
A02PZ305		Pyrrhotite-rich ore		◎	○		○	△	△					•				△				
A02PZ403		Massive pyrrhotite-rich ore		◎	△		△	○	•					•			•	△				
A02PZ404		Massive pyrrhotite ore		◎	△		△	△								△		△				
A02PZ503		Pyrrhotite-rich ore		◎	△		○	△	•			•				△	△	△				
A02PZ504		Pyrrhotite-rich ore	•	◎	○		○	△	△			•		•	•		•	△				
A02PZ509		Pyrrhotite-rich ore		◎		•?	△	○	△	•?					•	•	△	△	△			
A02PZ510		Pyrrhotite ore		◎	△		△	△	△	•?						△		△				

Legend; ◎ abundant; ○ common; △ minor; • rare

Ore mineral

py:pyrite, pyr:pyrrhotite, asp:arsenopyrite, mac:mackinawaite, spl:spaleraite, cp:chalcopyrite, ga:galena, bis:bismuthinite, co:covellite, tet:tetrahedrite, po:polybasite, na-bi:native bithmuth, el:electrum, mt:magnetite, ru:rutile, il:ilmenite, go:goethite, lp:lepidocrocite, ag:anglesite

Table A-3 Result of the laboratory test (X-ray diffraction)

Sample No.	qz	opl	Kf	pl	sm	chl	chl/sm	se	se/sm	ep	kao	pyr	ja	al	cal	ank	gyp	py	hm	amp	tour	and	Comment	Ethylene glycol treatment
A02RF001	◎		○	○		・		◎										・						
A02RF003	◎		○	・		・		◎																
A02RF005	◎		○	○	・	・		◎																
A02RF006	◎			・		・		◎																
A02RF008	◎			・				○																
A02RF009	◎		△					△																
A02RF011	◎			・		・		◎																
A02RF012	◎					・		△						・										
A02RF013	◎		○	△		・		・																
A02RF014	◎		・		・																			
A02RF015	◎			○		・		○																
A02RF016	◎							○						・										
A02RF017	◎		・					○																
A02RF018	◎																							
A02RF019	◎		△	○	・	・		・																
A02RF023	◎		△	○		・		△																
A02RF025	◎		・	○				△						・										
A02RF027	◎		△	△		・		・																
A02RF028						・		・												○			amp:magnesiohornblende	
A02RF029				○	○	・		・							・					○			amp:hornblende	
A02RF031	◎			◎		・		△																
A02RF035	◎			△	△	・		○						・										
A02RF036	◎			○	△	・		○																
A02RF037	◎			△	・	・		○																
A02RF039	◎		・		・	・		◎					・											
A02RF040	◎					・		○																
A02RF043	◎			◎	・	・		・												△			amp:hornblende	
A02RF052	◎							・			△													
A02RF058	○	△			・	・		△										△						
A02RF059	・	△			・			△									○							
A02RF061	○	○										・						・						
A02RF062		○	△									△					・			・			amp?:hornblende	
A02RF063		○	・									○			・			・						
A02RF064	○	○		○				○					・											
A02RF065		△		○	・	・		・																sm, se, chl
A02RF066	◎			・	○	△		○					・											sm, se, chl
A02RF067	◎							△			・		・											
A02RF103	◎			○		・		◎																
A02RF105	◎							◎					・					・						
A02RF106	◎			○		・		△	△															
A02RF107	◎			○				◎																
A02RF108	◎			○		△		◎															ser:biotite?	
A02YH006	◎			○		・		△																

Sample No.	qz	opl	Kf	pl	sm	chl	chl/sm	se	se/sm	ep	kao	pyr	ja	al	cal	ank	gyp	py	hm	amp	tour	and	Comment	Ethylene glycol treatment
A02YH007	◎		○	△				○																
A02YH010	·				·										◎									
A02YH011	◎				○	△		◎																
A02YH013	◎		△		·			○																
A02YH014	·												○											
A02YH015	◎							·																
A02YH017	◎		·		○			·															sm:ser/sm?	sm, se
A02YH018	◎				△			○															sm:ser/sm?	sm, se
A02YH019	◎				·	·															△		sm:ser/sm?	sm, se, chl
A02YH020	◎				·	·		△													·		sm:ser/sm?	sm, se, chl
A02YH021	◎			△				·																
A02YH023	◎			△		·		·																
A02YH024	◎		·	○		·		·																
A02YH025	◎		·	△		·		·	·															
A02YH027	◎			○		·		·																
A02YH028	◎			○		·		·																
A02YH031	○	○		○		·		·																
A02YH032	○			◎		·		·																
A02YH033	○			○	·	·		△																
A02YH034	○			○	·	·		△																
A02YH035	◎			○	·	·		△																
A02YH036	◎			△	·	·		·										·						
A02YH048	◎					·		◎																
A02YH050	◎							○					·											
A02TK001	◎							◎					·											
A02TK002	◎							○					·											
A02TK004	◎							◎																
A02TK005	◎			○	·	·		◎																
A02TK006	◎			◎		△			○															
A02TK007	○														△	◎								
A02TK008	◎														△	◎								
A02TK009	○							·							○	○								
A02TK010	◎			◎		·		△																
A02TK017	○				·	·		△							○								?d=3.22, 3.94, 4.05	
A02TK018	◎		△					·															Kf?	
A02TK019	◎		△		·			·															Kf?	
A02TK022	·								·								◎							sm, chl
A02TK023	◎		·			·			·															se/sm, chl
A02TK024	◎		·		·								△											
A02TK025		△									○			△										
A02TK026		◎									·			○										
A02TK027		○									○			·										
A02TK028	◎							△			·													
A02TK029	◎			○		·		△																

Sample No.	qz	opl	Kf	pl	sm	chl	chl/sm	se	se/sm	ep	kao	pyr	ja	al	cal	ank	gyp	py	hm	amp	tour	and	Comment	Ethylene glycol treatment
A02TK038	◎		·	○					·				·											
A02TK039	◎		·	○		·		·																
A02TK040	◎			△				·																
A02TK041	◎		△	○				·																
A02TK042	◎		△	△		·		·																
A02TK043	◎		·	○				·																
A02TK044		○		○				△															opal:crist, pl:anorthoclase	
A02TK045	◎			◎		·		○																
A02TK046	◎			○				·																
A02TK047	◎			◎		·		○															ser: ser/sm?	
A02TK048	◎		·			·		○																
A02TK049	◎			○				○										·						
A02KK001	◎							◎																
A02KK002	◎		○					△																
A02KK003	◎							○					·											
A02KK004	◎							○																
A02KK005	◎			○		·		△																
A02KK006	◎			○				○																
A02KK007	◎							○																
A02KK008	◎		○	○		·		·																
A02KK009	◎							·			△												ser:ser/sm?	
A02KK010	◎		○					·			△												ser:ser/sm?	
A02KK011	◎							·			△							·					ser:ser/sm?	
A02KK012	◎							·			△				·			·					ser:ser/sm?	
A02KK014	◎		·					◎																
A02KK015	◎		△			·		◎					·											
A02KK016	◎		○			·		△					·											
A02KK017	◎		·					○	·				·											
A02KK019	◎			·		·		○	·															
A02KK021	◎					·		○																
A02KK024	◎							·			·												ser:ser/sm?	
A02KK025	◎		△					·															ser:ser/sm?	
A02KK028	◎		·			·		·					·										ser:ser/sm?	chl, se/sm, sm?
A02KK029	◎							△					·										ser:ser/sm?	se, se/sm
A02KK031	·	○									·			◎										
A02KK032	◎		○			·		·		·													ser:ser/sm?	sm, chl, se?
A02KK033	◎					△		△							△									
A02KK034	○	△									·			○										
A02KK035	◎		·					·																
A02KK036	◎			△				·					·										ser:ser/sm?	
A02KK037	◎			△		·		·															cpx?	
A02KK038	◎			○		·		·															cpx?	
A02KK039	◎			○		·		·																
A02KK040	◎		·	○				·	·				·											

Sample No.	qz	opl	Kf	pl	sm	chl	chl/sm	se	se/sm	ep	kao	pyr	ja	al	cal	ank	gyp	py	hm	amp	tour	and	Comment	Ethylene glycol treatment
A02KK041	◎										◎													
A02KK042	◎		△	○				・																
A02KK043	◎		・	○				△																
A02KK044	◎		・	△		・		△																
A02KK045	◎								・		◎													
A02KK046	◎			○				○			・												ser:ser/sm?	
A02KK047	◎			○				○															pl:anorthoclase	
A02KK048	◎					・		○																
A02KK049	◎			○		・		○																
A02KK050	◎					・		○																
A02BC001	◎			○				○																
A02BC002	◎		・	△		・		△																
A02CX134	◎		△			△		◎																
A02CX141	◎		△			○		◎																
A02CX142	◎		△			○		◎																
A02PZ103	◎					△		・							○	△								
A02PZ104	○					◎		◎																
A02PZ105	◎					○		◎																
A02PZ106	◎					○		・																
A02PZ201	◎					○		◎												・			amp:hornblende	
A02PZ202	◎					・		○																
A02PZ205	◎					○		◎																
A02PZ206	◎					・		◎																
A02PZ401	◎					○		○																
A02PZ402	◎					・		◎																
A02PZ405				○		△		△							・					○			amp:ferropargasite	
A02PZ406	◎					○		○							・									
A02PZ501	◎					◎									・									
A02PZ502	◎					◎		・							・									
A02PZ505	◎					◎		○							・									
A02PZ506	◎					・		◎														○	ser:biotite?	
A02PZ507	◎					○		◎														・		
A02PZ508	◎					○		○							・									
A02PZ511	◎					○		◎																
A02PZ512	◎			△		○		○																
26415	◎			◎		○		・																
67580	◎			○				△																
67581	◎			○		・		・																

Legend : ◎ abundant, ○ comon, △ minor, ・rare

qz:quartz, opl:opal, Kf:k-feldspar, pl:plagioclase, sm:smectite, chl:chlorite, chl/sm:chlorite/smectite mixed layer mineral, se:sericite, se/sm:sericite/smectite mixed layer mineral, ep:epidote, kao:kaolinite, pyr:p

ja:jarosite, al:alunite, cal:calcite, ank:ankerite, gyp:gypsum, py:pyrite, hm:hematite, amp:amphiboles, tour:troumaline, and:andalusite

Table A-4 Result of the laboratory test (geochemical analysis)

(1) Geochemistry for rock chip samples

Sample No.	Au g/t	Hg ppm	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm
A02RF006	0.032	0.08	0.8	7.88	9	400	2.2	<2	0.2	<0.5	2	68	173	2.83	3.32	1.18	386	<1	0.63	12	530	7	0.08	<5	32	0.42	86	10	92
A02RF007	0.007	0.03	<0.5	6.51	<5	360	1.7	3	0.06	<0.5	5	151	543	5.48	3.22	0.31	78	4	0.19	14	780	<2	0.85	<5	39	0.26	76	20	112
A02RF008	0.026	<0.01	0.9	7.04	20	330	1.9	10	0.15	<0.5	3	190	402	5.11	3.37	0.49	62	2	0.14	12	1170	<2	0.32	<5	29	0.29	80	30	104
A02RF010	0.005	0.03	0.5	4.59	51	210	1.2	4	0.05	<0.5	1	116	109	1.27	1.89	0.16	32	3	0.21	5	310	4	0.45	<5	35	0.19	53	20	10
A02RF011	0.005	0.02	<0.5	4.59	49	210	1.2	<2	0.05	<0.5	4	126	108	1.3	1.9	0.16	52	3	0.21	147	300	2	0.44	<5	36	0.2	52	20	11
A02RF012	<0.005	<0.01	0.9	2.96	10	120	0.9	<2	0.04	<0.5	1	292	428	1.7	1.3	0.12	33	4	0.16	7	920	<2	0.35	<5	34	0.11	34	20	4
A02RF014	0.02	0.08	0.5	3.8	<5	470	0.7	<2	0.03	<0.5	2	231	38	1.17	3.96	0.39	85	323	0.38	10	170	8	0.14	<5	117	0.15	42	10	33
A02RF015	<0.005	0.02	<0.5	7.85	<5	610	2.3	<2	1.45	<0.5	7	76	115	1.7	3.52	0.52	138	91	1.72	13	590	7	0.04	<5	649	0.19	59	<10	86
A02RF016	0.106	0.05	67.1	6.71	1535	180	2.3	<2	0.18	8.1	4	86	139	2.96	2.86	0.24	5220	1	0.04	7	390	1445	0.05	27	52	0.38	190	<10	845
A02RF017	0.005	0.02	3.2	7.82	125	230	3.3	<2	0.29	<0.5	14	291	35	3.24	4.19	0.33	1195	3	0.14	22	920	142	0.01	<5	39	0.46	89	10	476
A02RF018	2	0.36	407	2.36	8340	100	1	3	0.12	3.1	5	194	130	7.48	1.08	0.08	1625	4	0.06	8	430	19100	0.73	103	129	0.18	134	10	487
A02RF019	0.037	0.01	3.6	7.8	75	460	2.6	8	0.26	<0.5	1	78	138	2.55	3.97	0.37	173	14	1.92	5	520	207	0.04	<5	138	0.23	62	10	60
A02RF020	0.039	<0.01	3.1	7.66	68	460	2.6	2	0.26	<0.5	2	92	135	2.5	3.99	0.37	165	15	1.93	5	510	191	0.04	<5	137	0.22	61	10	59
A02RF021	0.01	<0.01	<0.5	7.41	<5	320	2.7	<2	0.42	<0.5	3	96	90	1.98	2.86	0.37	122	3	2.3	8	420	72	0.05	<5	212	0.25	61	<10	68
A02RF022	0.097	<0.01	<0.5	7.16	<5	340	2.4	6	0.24	<0.5	1	60	57	2.67	2.72	0.41	104	1	1.83	5	430	26	0.22	<5	86	0.23	64	<10	44
A02RF023	0.086	<0.01	<0.5	7.37	<5	350	2.3	<2	0.25	<0.5	1	64	58	2.76	2.81	0.42	104	1	1.88	6	450	26	0.23	<5	87	0.23	65	<10	44
A02RF024	0.015	<0.01	<0.5	6.23	6	330	1.9	<2	0.22	<0.5	2	126	28	3.81	3.34	0.38	72	4	0.77	4	480	16	0.81	<5	80	0.17	73	10	19
A02RF025	0.009	<0.01	<0.5	7.23	<5	380	2.6	<2	0.29	<0.5	1	98	40	3.01	3.03	0.41	61	1	1.74	5	470	16	0.47	<5	93	0.21	73	<10	31
A02RF026	0.018	0.01	<0.5	6.33	<5	490	2.4	<2	0.33	<0.5	1	122	68	2.16	3.04	0.29	90	13	1.8	7	400	30	0.26	<5	127	0.18	52	<10	37
A02RF027	0.017	0.01	<0.5	6.75	<5	530	2.5	4	0.35	<0.5	1	128	72	2.28	3.2	0.31	95	14	1.9	7	410	33	0.26	<5	136	0.19	54	<10	38
A02RF028	0.019	<0.01	<0.5	9.7	10	70	1.4	6	4	1.1	32	20	768	9.07	0.38	3.26	920	<1	0.26	36	280	15	0.03	<5	191	0.6	355	10	64
A02RF029	0.005	0.01	<0.5	9.36	<5	100	1.9	2	8.9	1.4	43	59	165	8.61	0.31	4.24	1535	<1	0.94	25	2710	3	0.09	<5	826	0.83	382	10	85
A02RF030	<0.005	<0.01	<0.5	9.89	<5	260	2.3	3	7.28	1.1	30	51	278	7.43	0.42	3.19	1520	<1	2.13	15	2440	8	<0.01	<5	848	0.85	324	10	89
A02RF031	0.018	0.01	<0.5	8.25	10	510	2.2	4	0.74	<0.5	6	82	527	2.33	3.51	0.54	121	60	1.01	10	320	26	0.07	<5	243	0.16	70	10	23
A02RF032	0.017	0.01	0.6	8.21	10	510	2.2	<2	0.74	<0.5	6	60	518	2.3	3.48	0.54	120	59	1	5	320	22	0.07	<5	238	0.16	68	10	22
A02RF033	0.044	0.1	<0.5	6.66	61	1040	1.7	3	11.36	<0.5	4	19	516	1.99	1.83	1.19	130	8	0.42	11	1560	12	0.12	<5	328	0.13	58	<10	61
A02RF034	<0.005	<0.01	<0.5	6.13	<5	310	2.4	<2	2.46	<0.5	6	182	27	2.72	2.35	0.76	482	1	1.96	10	810	11	0.01	<5	317	0.26	64	<10	43
A02RF035	0.045	<0.01	1.2	7.59	14	380	3.8	<2	0.7	<0.5	10	64	1155	4.4	3.2	0.99	753	17	0.7	13	1590	510	0.53	<5	361	0.32	97	50	277
A02RF036	0.024	<0.01	<0.5	8.59	32	480	2.9	3	1.03	<0.5	6	56	1495	4.4	3.38	1.01	237	18	1.48	9	890	21	0.26	<5	462	0.29	108	20	90
A02RF037	0.025	<0.01	<0.5	8.12	32	460	2.7	3	0.97	<0.5	5	49	1425	4.17	3.19	0.96	222	16	1.4	9	850	17	0.25	<5	439	0.27	103	10	86
A02RF038	0.055	<0.01	1	6.42	7	470	1.5	<2	0.23	<0.5	1	136	1340	3.7	4.85	0.2	49	9	0.53	5	1630	19	0.32	<5	279	0.2	60	10	26
A02RF039	0.057	0.01	0.7	6.71	11	380	1.6	7	0.41	<0.5	1	139	645	3.58	4.24	0.4	74	6	0.47	6	690	19	0.15	<5	179	0.12	63	10	41
A02RF040	0.032	<0.01	<0.5	6.88	15	290	2.1	<2	0.38	<0.5	1	159	3780	4.03	2.79	0.42	83	15	0.1	5	3430	57	0.03	8	91	0.07	52	10	32
A02RF041	0.014	<0.01	0.5	8.31	5	320	2.2	5	0.45	<0.5	1	44	178	2.59	3.7	0.45	53	17	0.59	2	550	29	0.52	<5	222	0.14	78	20	28
A02RF042	0.015	<0.01	0.7	8.13	5	310	2.2	<2	0.44	<0.5	1	32	170	2.53	3.62	0.44	52	18	0.57	2	530	31	0.51	<5	216	0.15	76	20	27
A02RF043	<0.005	<0.01	<0.5	7.82	<5	350	3.3	4	2.08	<0.5	6	89	27	1.89	2.18	0.52	383	1	2.2	10	290	23	0.02	<5	364	0.33	69	10	58
A02RF058	<0.005	0.09	<0.5	6.99	57	270	2.9	<2	0.51	<0.5	33	57	20	7.44	1.91	0.61	142	1	0.34	13	1290	22	3.9	<5	283	0.48	286	20	79
A02RF059	<0.005	0.59	<0.5	3.51	6	190	2.7	<2	0.2	<0.5	9	215	7	3.04	0.97	0.47	135	1	0.22	10	940	11	2.21	<5	138	0.23	60	<10	49
A02RF061	<0.005	0.29	<0.5	2.47	33	190	2.7	<2	0.21	<0.5	8	112	18	3.61	0.87	0.11	101	3	0.25	10	970	33	4.49	<5	165	0.88	148	10	76
A02RF062	0.017	0.2	<0.5	3.76	15	190	2	<2	0.15	<0.5	59	84	13	4.42	2.24	0.05	35	4	0.54	26	750	26	5.13	<5	476	0.51	186	10	84
A02RF063	<0.005	0.07	<0.5	1.39	45	140	1.6	<2	0.59	<0.5	36	90	8	8.37	0.27	0.1	121	3	0.15	31	410	28	8.81	<5	96	0.51	74	10	98
A02RF064	<0.005	0.29	<0.5	7.14	10	220	5	<2	1.88	<0.5	8	66	7	4.91	2.73	0.64	177	<1	1.78	8	570	36	3.03	<5	388	0.57	78	10	84
A02RF065	<0.005	1.49	<0.5	8.16	12	830	3.7	2	0.98	<0.5	5	42	10	5.21	2.23	0.43	142	<1	1.15	4	1310	28	0.75	<5	741	0.58	136	10	66
A02RF066	<0.005	0.08	<0.5	8.12	6	560	2.6	4	0.42	<0.5	4	21	5	5.99	2.94	0.73	85	<1	0.43	3	1890	25	1.16	<5	316	0.53	120	10	49
A02RF067	0.009	0.01	0.8	8.57	39	520	3.4	14	0.11	<0.5	1	19	7	1.45	3.36	0.71	126	8	0.08	<1	890	147	0.52	14	73	0.61	134	<10	20

Sample No.	Au g/t	Hg ppm	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm
A02RF101	<0.005	<0.01	<0.5	7.06	<5	520	2.6	<2	1.34	0.6	15	86	17	4.11	2.18	1.48	833	4	1.83	35	680	17	0.01	<5	176	0.59	96	10	94
A02RF102	1.115	<0.01	<0.5	6.47	11	350	1.7	<2	0.03	<0.5	1	61	79	2.11	3.15	0.36	47	4	0.06	6	320	6	0.02	<5	11	0.42	93	10	14
A02RF103	0.008	<0.01	<0.5	6.9	<5	490	2	<2	1	<0.5	10	79	33	3.5	2.09	1.31	431	4	1.7	30	550	16	0.01	<5	172	0.43	81	10	34
A02RF105	0.008	6.71	<0.5	6.84	<5	590	1.9	<2	0.34	<0.5	6	77	28	2.68	2.63	1.04	87	3	1.29	20	190	6	0.88	<5	121	0.25	81	10	18
A02RF106	0.008	0.13	<0.5	6.52	<5	480	1.6	<2	0.55	<0.5	5	69	13	3.16	2.25	1.11	225	3	1.42	21	230	8	0.95	<5	122	0.27	75	10	16
A02RF107	0.008	0.04	<0.5	7.06	<5	450	2.4	<2	1.09	<0.5	5	80	24	3.46	2.36	1.44	423	6	1.86	36	700	6	0.22	<5	169	0.43	91	10	65
A02RF108	0.01	0.04	<0.5	6.51	<5	310	1.1	<2	1.4	<0.5	9	67	18	3.12	1.84	1.11	413	3	1.98	24	1020	12	0.01	<5	178	0.44	69	10	44
A02YH002	0.008	<0.01	<0.5	7.57	<5	640	1.5	<2	0.87	<0.5	18	49	2670	2.17	5.6	0.57	139	369	1.65	3	690	12	1.2	<5	330	0.17	57	10	19
A02YH007	0.046	0.01	<0.5	7.99	<5	320	2.5	<2	0.19	<0.5	1	42	173	4.48	2.99	0.39	96	12	2.27	3	740	29	0.12	<5	173	0.14	80	10	36
A02YH012	0.041	<0.01	0.9	7.94	17	350	2.2	4	0.48	<0.5	1	36	3520	3.28	3.57	0.45	99	10	0.16	3	1930	33	0.02	<5	131	0.09	58	10	39
A02YH013	0.049	<0.01	0.5	6.14	10	430	1.3	<2	0.21	<0.5	1	56	1620	4.24	3.08	0.31	56	116	0.18	4	930	12	0.04	<5	94	0.14	78	10	22
A02YH019	<0.005	<0.01	<0.5	6.2	96	70	3.5	<2	0.24	<0.5	2	55	20	1.95	0.71	1.18	70	8	0.31	4	620	13	0.04	9	116	0.38	69	<10	21
A02YH048	0.069	0.01	1.7	6.85	<5	840	2	<2	0.06	<0.5	3	90	46	3.04	3.04	0.88	196	3	0.08	14	560	16	0.03	<5	21	0.28	79	10	22
A02YH049	0.191	<0.01	11	1.6	23	80	0.9	2	0.02	<0.5	<1	168	104	6.76	0.72	0.07	24	1005	0.04	2	1180	8	0.34	<5	7	0.04	27	10	21
A02TK011	<0.005	<0.01	<0.5	4.02	6	370	1.9	<2	>25.0	<0.5	7	21	27	2.86	1.32	0.63	3770	<1	0.45	22	290	24	0.1	7	639	0.2	59	<10	65
A02TK012	0.033	<0.01	<0.5	7.88	17	200	3.9	12	3.71	0.6	23	95	146	7.86	1.5	1.54	395	1	1.34	44	1670	13	3.09	<5	219	0.35	99	10	69
A02TK014	<0.005	<0.01	<0.5	10.38	7	1170	5.1	<2	0.41	<0.5	20	52	47	5.93	3.49	1.53	626	<1	1.05	51	530	21	0.21	<5	100	0.49	102	10	135
A02TK015	<0.005	<0.01	<0.5	5.57	322	40	7.7	<2	0.41	6.6	3	65	56	4.64	0.31	1.01	341	<1	1.95	6	280	65	0.62	<5	240	0.25	57	10	486
A02TK016	<0.005	<0.01	<0.5	10	5	600	3.9	3	0.21	<0.5	8	53	19	5.05	2.9	1.36	442	<1	1.11	17	820	38	0.03	<5	100	0.46	100	10	89
A02TK031	<0.005	<0.01	<0.5	9.23	6	460	4.6	<2	0.2	<0.5	17	44	14	4.66	3.6	1.63	685	<1	1.38	40	840	18	0.01	<5	67	0.51	105	10	129
A02TK038	<0.005	0.02	<0.5	7.76	<5	650	3.3	2	0.33	<0.5	2	31	4	1.54	3.48	0.33	34	5	2.53	4	300	28	0.54	<5	219	0.33	54	10	29
A02TK039	<0.005	0.02	<0.5	9.07	8	670	6.2	2	0.48	<0.5	4	37	18	2.36	4.1	0.22	121	8	2.72	6	620	13	0.05	<5	270	0.43	56	10	71
A02TK040	<0.005	0.01	<0.5	8.01	<5	570	4.8	<2	0.77	<0.5	7	25	10	1.82	3.89	0.51	149	2	2.36	7	660	24	0.02	<5	227	0.27	49	10	39
A02TK041	<0.005	0.01	<0.5	8.3	19	640	6.2	<2	0.34	<0.5	2	26	15	1.54	4.26	0.21	66	2	2.43	5	410	15	0.01	<5	211	0.28	41	10	49
A02TK042	<0.005	0.01	<0.5	8.68	<5	660	4	<2	0.53	<0.5	1	19	10	0.98	3.74	0.18	27	2	2.65	3	290	17	0.02	<5	240	0.34	41	10	29
A02TK043	<0.005	0.01	<0.5	7.82	5	630	3.2	<2	0.22	<0.5	1	22	8	1.49	2.67	0.39	75	2	2.49	6	660	14	0.03	<5	221	0.31	59	10	42
A02TK044	<0.005	0.01	<0.5	8.2	8	620	3.7	2	1.13	<0.5	4	20	9	1.38	3.99	0.49	118	3	2.02	6	410	21	0.29	<5	240	0.3	44	10	43
A02TK045	<0.005	<0.01	<0.5	6.3	<5	80	3.8	2	0.21	<0.5	1	49	5	1.09	4.36	0.12	124	8	1.73	2	600	16	0.01	<5	21	0.07	2	10	25
A02TK046	<0.005	0.01	<0.5	8.96	<5	190	4.7	<2	0.34	<0.5	<1	9	3	1.3	3.04	0.41	409	1	2.02	2	330	11	0.02	<5	104	0.33	27	<10	17
A02TK047	<0.005	0.04	<0.5	5.89	<5	200	2.6	<2	0.07	<0.5	1	37	2	0.63	4.26	0.1	37	2	1.47	2	250	13	0.03	<5	39	0.11	9	10	8
A02TK048	0.065	5.94	10.8	5.71	<5	210	1.4	5	0.02	<0.5	5	143	16	4.17	2.73	0.28	48	3	0.07	8	210	211	3.23	<5	19	0.16	48	30	13
A02TK049	0.008	0.03	<0.5	6.21	<5	110	1.2	2	0.13	<0.5	9	62	233	2.11	3.28	0.88	77	6	1.69	18	380	11	1.48	<5	128	0.19	68	10	30
A02KK013	<0.005	<0.01	0.6	6.83	<5	260	2.6	4	0.3	<0.5	1	35	4	0.6	4.05	0.11	187	<1	2.61	3	690	30	0.01	<5	35	0.05	7	<10	14
A02KK018	<0.005	<0.01	<0.5	9.99	16	940	4.4	6	0.18	<0.5	9	52	35	4.94	3.29	1.38	677	<1	0.98	31	590	18	0.01	<5	82	0.42	120	10	99
A02KK020	<0.005	<0.01	<0.5	11.68	12	1060	4.2	3	0.06	<0.5	4	57	43	4.27	3.81	1.17	259	<1	1	11	270	13	0.02	<5	89	0.4	170	10	95
A02KK022	<0.005	<0.01	<0.5	10.22	<5	630	5	2	0.39	<0.5	13	56	33	5.11	2.89	1.4	553	3	1.3	37	420	26	0.01	<5	155	0.43	103	10	128
A02KK023	<0.005	<0.01	<0.5	10.64	<5	660	4.4	<2	0.17	<0.5	10	52	32	5.11	3.37	1.33	373	<1	0.91	27	600	22	<0.01	<5	76	0.4	109	10	116
A02KK037	<0.005	0.07	<0.5	7.7	<5	650	4.1	<2	0.55	<0.5	1	29	5	0.95	3.96	0.21	26	1	2.13	3	420	17	0.06	<5	184	0.25	28	10	9
A02KK038	<0.005	0.01	<0.5	8.33	5	530	5.1	<2	1.52	<0.5	3	26	8	2.36	3.54	0.74	360	2	2.75	8	510	18	0.03	<5	267	0.35	39	<10	50
A02KK039	<0.005	0.03	<0.5	6.64	11	210	4	<2	0.98	<0.5	4	54	10	1.61	2.22	0.49	146	2	1.62	6	470	20	0.02	<5	126	0.2	42	10	43
A02KK040	<0.005	0.01	<0.5	7.31	6	510	3.6	<2	0.34	<0.5	1	24	10	1.38	3.53	0.31	155	2	2.2	4	320	20	0.48	<5	226	0.21	36	10	88
A02KK041	<0.005	<0.01	<0.5	6.65	36	110	0.8	<2	0.06	<0.5	<1	18	2	0.16	0.09	0.02	12	1	0.05	2	570	10	0.07	5	264	0.26	22	10	3
A02KK042	<0.005	<0.01	<0.5	7.68	<5	630	3.4	<2	0.15	<0.5	1	30	5	1.09	3.36	0.16	24	2	2.66	1	360	5	0.03	<5	211	0.27	42	10	10
A02KK043	<0.005	<0.01	<0.5	7.8	6	590	5	<2	1.52	<0.5	6	29	8	1.89	3.5	0.48	195	3	2.51	6	660	23	0.04	<5	241	0.25	48	10	60
A02KK044	<0.005	0.03	<0.5	7.01	31	470	3.7	<2	0.75	<0.5	2	22	7	1.01	3.39	0.28	50	3	1.76	2	130	27	0.32	<5	161	0.2	29	10	23
A02KK045	<0.005	0.02	<0.5	8.96	<5	70	4.7	<2	0.05	<0.5	2	20	5	1.02	0.37	0.05	33	2	0.05	4	250	13	0.01	<5	22	0.37	65	10	32
A02KK046	<0.005	<0.01	<0.5	8.21	<5	460	6.2	<2	1.15	<0.5	6	26	7	2.18	3.14	0.65	238	3	1.93	6	800	20	0.01	<5	202	0.33	60	10	61
A02KK047	0.005	<0.01	<0.5	7.5	<5	520	2	<2	0.31	<0.5	6	66	7	2.35	4.12	1.34	69	5	1.25	21	400	6	1.21	<5	134	0.27	102	20	24

Sample No.	Au g/t	Hg ppm	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm
A02KK048	0.149	<0.01	1.8	7.04	5	300	1.8	<2	0.01	<0.5	1	101	27	3.24	2.93	0.36	39	2	0.08	2	130	18	0.17	<5	9	0.22	79	20	7
A02KK049	0.008	<0.01	<0.5	6.18	<5	150	1.3	<2	0.1	<0.5	10	95	67	2.29	3.31	0.84	74	7	1.4	17	390	12	1.64	<5	107	0.2	69	10	28
A02KK050	0.006	<0.01	<0.5	6.8	<5	660	2	<2	0.02	<0.5	2	98	35	3.59	3.47	0.68	63	7	0.36	11	1400	76	0.18	<5	56	0.19	80	10	39
A02SX001	<0.005	<0.01	1.9	8.65	28	230	4.6	<2	0.51	<0.5	21	82	508	4.55	4.89	0.65	1100	4	1.29	69	990	412	2.1	<5	99	0.14	141	<10	151
A02SX002	0.288	0.79	560	4.54	<5	330	6.2	178	1.4	234	37	49	5110	4.66	1.78	0.4	3740	1	1.18	23	400	178000	9.82	115	113	0.21	59	30	58500
A02SX003	<0.005	<0.01	1.2	6.01	<5	440	2	5	0.33	<0.5	9	38	27	2.31	1.7	0.68	468	<1	2.04	23	840	327	0.03	<5	133	0.32	51	<10	186
A02SX004	<0.005	<0.01	0.5	9.77	24	1060	4.9	<2	0.44	<0.5	15	54	33	4.3	3.84	1.06	488	<1	1.2	43	640	295	0.01	<5	119	0.49	100	<10	1039
A02SX005	<0.005	<0.01	<0.5	6.96	22	550	4.9	<2	0.22	<0.5	11	43	36	3.58	2.13	0.89	549	<1	1.18	25	730	48	0.04	<5	65	0.32	70	<10	103
A02SX006	<0.005	<0.01	<0.5	10.82	28	1560	7.2	<2	0.45	<0.5	15	52	12	3.59	4.08	0.85	560	<1	1.32	41	610	74	0.01	<5	146	0.47	107	<10	88
A02SX007	<0.005	<0.01	<0.5	9.22	37	950	4.2	3	0.36	<0.5	15	49	30	4.11	3.3	1.02	467	<1	1.5	26	620	29	<0.01	<5	121	0.48	101	10	99
A02SX008	<0.005	<0.01	<0.5	10.5	20	1170	4.5	<2	0.26	<0.5	11	47	20	4.16	4.12	1.1	640	<1	0.92	34	530	20	0.01	<5	72	0.47	105	<10	104
A02SX009	<0.005	<0.01	<0.5	10.62	<5	1570	4.7	<2	0.81	<0.5	12	50	1	3.76	4.15	1.09	871	<1	0.74	34	690	38	<0.01	<5	111	0.52	102	<10	86
A02SX010	<0.005	<0.01	<0.5	9.74	12	780	4.1	3	0.15	<0.5	4	49	33	4.04	3.01	1.31	325	<1	1.03	12	880	29	0.01	<5	101	0.29	116	10	56
A02SX011	<0.005	<0.01	<0.5	4.85	10	360	1.9	<2	21.6	0.8	5	23	24	2.72	1.45	0.63	3380	<1	0.6	16	350	27	0.12	<5	630	0.14	47	<10	58
A02SX012	0.005	0.01	0.8	10.13	6	1020	4.1	<2	0.11	<0.5	4	48	48	4.36	3.38	1.25	280	1	1.09	13	630	72	0.06	<5	95	0.28	184	<10	98
A02SX013	<0.005	<0.01	<0.5	10.69	38	750	4	<2	0.24	<0.5	7	54	27	5	3.47	1.45	436	<1	0.79	28	550	137	<0.01	<5	93	0.27	114	10	118
A02SX014	<0.005	<0.01	<0.5	8.99	13	600	4.2	<2	0.17	<0.5	10	44	38	4.13	3.2	1.06	282	<1	0.96	24	800	27	0.01	<5	78	0.27	106	10	110
A02SX015	<0.005	<0.01	<0.5	9.96	27	1970	9	<2	0.05	<0.5	6	45	16	4.12	4.73	0.55	1395	<1	0.08	13	810	16	0.01	<5	56	0.5	95	10	138
A02SX016	0.005	0.15	2.5	10.47	95	540	5.2	<2	0.33	13.1	10	43	16	2.62	4.48	1.1	1200	4	0.96	27	770	1410	1.38	<5	73	0.37	276	<10	8445
A02SX017	<0.005	<0.01	<0.5	10.39	11	860	4.3	3	0.29	<0.5	11	50	20	4.51	3.71	1.24	480	<1	1.14	37	580	22	0.01	<5	105	0.5	98	<10	233
A02SX018	<0.005	<0.01	<0.5	9.55	10	820	1.7	<2	0.09	<0.5	2	46	13	3.81	3.2	1.11	368	<1	0.81	7	760	18	0.03	<5	68	0.48	125	<10	138
A02SX019	<0.005	<0.01	<0.5	9.13	27	790	2	<2	0.3	0.9	15	56	43	3.95	3.57	1.24	350	<1	0.68	40	540	25	1.01	<5	79	0.42	111	10	167
A02SX020	<0.005	<0.01	<0.5	13.36	16	1590	3.3	<2	0.36	0.9	15	61	23	4.52	5.73	1.19	490	<1	0.53	36	610	15	0.01	<5	103	0.34	115	<10	132
A02SX021	<0.005	0.01	<0.5	4.79	<5	210	<0.5	<2	0.5	0.7	6	52	7	2.03	0.74	0.62	349	<1	1.9	16	670	32	0.01	<5	200	0.28	37	<10	68
A02SX022	0.008	<0.01	<0.5	4.97	7	330	1.6	<2	4.06	5.2	18	50	44	2.27	0.91	0.19	240	3	1.92	21	>10000	49	0.7	<5	549	0.1	23	<10	933
A02SX023	<0.005	<0.01	<0.5	12.64	12	1480	3.7	<2	0.14	0.7	13	53	9	3.97	5.64	1.13	488	<1	0.54	29	390	18	0.01	<5	86	0.28	82	<10	109
A02CX001	<0.005	<0.01	<0.5	6.4	12	460	1.3	<2	0.06	0.9	3	38	46	5.59	1.43	0.88	242	<1	1.35	4	680	18	0.08	<5	82	0.14	56	<10	69
A02CX002	0.016	0.01	<0.5	3.13	51	260	0.7	<2	17.65	1.6	5	18	87	3.45	0.9	0.55	2690	1	0.45	15	690	13	0.32	<5	660	0.09	50	10	50
A02CX003	<0.005	<0.01	<0.5	10.04	12	430	2.3	<2	0.76	1.2	23	62	111	5.97	4.1	1.39	380	3	0.68	76	750	10	2.17	<5	112	0.42	117	10	75
A02CX004	0.559	<0.01	0.9	3.48	5	100	0.9	341	1.13	5.7	85	36	2420	>25.0	0.79	1.68	348	7	0.13	57	500	12	>10.0	<5	60	0.17	47	110	67
A02CX005	<0.005	<0.01	<0.5	9.89	6	640	3.5	<2	3.32	<0.5	5	49	39	3.1	2.5	1.32	316	13	1.32	31	1420	19	0.54	<5	249	0.32	134	<10	57
A02CX006	<0.005	<0.01	<0.5	9.9	26	810	1.8	<2	0.18	<0.5	4	46	6	3.53	3.18	1.18	234	<1	1.04	19	580	8	0.02	<5	78	0.38	120	10	90
A02CX007	0.042	78	419	0.41	<5	130	<0.5	<2	0.05	>500	6	8	37	4.65	0.09	0.03	3980	<1	0.01	6	30	249000	>10.0	250	16	0.03	15	20	>300000
A02CX008	0.022	8.3	146	7.03	68	460	3.2	<2	0.6	128.8	6	86	919	2.83	2	0.2	1540	<1	0.14	21	2030	24900	0.28	88	347	0.3	165	10	35000
A02CX009	<0.005	0.07	0.9	8.63	52	2080	2.2	<2	0.05	2.4	1	51	34	4.63	3.28	0.85	500	<1	0.43	5	670	479	0.22	<5	50	0.33	89	<10	421
A02CX010	<0.005	0.02	0.7	0.85	92	340	<0.5	<2	0.08	0.9	1	95	8	1.53	0.24	0.04	63	3	0.19	3	380	147	0.38	5	21	0.04	6	<10	169
A02CX011	0.114	0.08	9.4	0.29	3050	60	<0.5	5	0.02	26.1	9	48	451	15.8	0.07	0.02	261	85	0.01	9	50	2920	>10.0	8	5	0.01	2	20	27700
A02CX012	0.153	0.03	222	3.39	155	200	2.1	89	2.17	162	34	48	1475	10.4	0.3	1.51	>10000	78	<0.01	19	1620	151000	8.25	101	27	0.18	161	40	53200
A02CX013	<0.005	<0.01	<0.5	1.94	7	650	2.1	<2	0.03	2.2	1	74	33	0.45	0.98	0.17	761	2	0.05	8	60	406	0.05	<5	5	0.03	6	<10	372
A02CX014	<0.005	0.03	1	2.02	25	3310	6.2	<2	0.07	40	82	94	1310	1.22	1.07	0.12	>10000	21	0.04	109	310	645	0.04	<5	33	0.05	18	80	1600
A02CX015	0.02	<0.01	<0.5	0.56	9	110	0.5	10	0.04	0.6	5	121	173	2.59	0.39	0.42	403	4	0.01	5	300	54	0.04	<5	5	0.16	8	320	174
A02CX016	<0.005	<0.01	<0.5	10.06	44	1920	2.6	<2	0.22	0.6	14	55	34	4.23	4.13	1.04	782	<1	0.53	44	490	81	0.12	<5	83	0.45	125	10	149
A02CX017	<0.005	<0.01	<0.5	9.19	63	1390	3.7	<2	0.16	2.5	3	51	165	5.16	4.16	0.79	8170	<1	0.14	16	510	317	0.02	<5	51	0.41	99	10	935
A02CX018	<0.005	<0.01	0.7	8.87	303	1360	2.4	<2	0.17	3	<1	59	385	5.74	4.16	0.57	1155	<1	0.13	9	570	2470	0.09	8	55	0.38	99	20	641
A02CX019	0.034	0.02	12.5	1.31	342	210	1.9	50	0.05	1.9	4	64	519	11.3	0.35	0.09	131	14	0.02	7	640	2070	0.11	51	15	0.05	19	10	648
A02CX020	<0.005	<0.01	<0.5	9.26	11	680	3.8	<2	1.95	1.3	7	22	40	4.67	3.46	0.68	950	<1	3.98	5	1460	73	0.01	<5	254	0.53	18	<10	128
A02CX021	<0.005	<0.01	<0.5	1.66	25	380	3.3	<2	0.04	<0.5	2	104	40	1.14	0.97	0.2	196	32	0.1	5	160	95	0.02	<5	6	0.07	12	<10	325
A02CX022	<0.005	<0.01	<0.5	9.95	20	1300	2.5	<2	0.14	3.6	11	52	45	4.27	3.23	1.17	496	<1	0.85	35	480	181	0.36	<5	94	0.29	99	10	592

Sample No.	Au	Hg	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sr	Ti	V	W	Zn
	g/t	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	ppm
A02CX023	<0.005	<0.01	<0.5	6.2	31	700	1.3	3	0.15	0.5	4	49	30	5.52	1.3	0.53	127	<1	0.98	29	520	52	0.02	<5	101	0.17	67	10	104
A02CX024	<0.005	<0.01	<0.5	10.39	13	790	2.5	<2	0.17	1	4	34	25	1.94	3.49	0.35	100	<1	0.85	20	470	21	0.01	<5	80	0.4	102	<10	65
A02CX025	<0.005	0.01	<0.5	8.81	24	1150	1.8	<2	0.19	<0.5	8	42	28	4.47	2.38	0.78	165	<1	0.93	33	340	15	0.02	<5	80	0.27	88	<10	79
A02CX026	<0.005	<0.01	<0.5	10.07	66	630	3.5	<2	0.14	1.9	11	45	15	4.54	3.57	0.4	117	<1	1.04	31	480	45	0.01	<5	64	0.33	110	<10	482
A02CX027	<0.005	0.01	<0.5	8.56	7	730	2	<2	0.21	3.9	3	29	6	3.1	3.03	0.38	681	<1	0.18	11	820	141	0.15	<5	189	0.29	81	<10	2620
A02CX028	<0.005	<0.01	<0.5	4.32	38	190	<0.5	<2	0.31	0.5	5	46	10	2.48	0.66	0.61	279	2	1.47	22	610	22	<0.01	<5	88	0.19	36	<10	95
A02CX029	<0.005	<0.01	<0.5	2.66	10	840	<0.5	<2	0.2	<0.5	2	52	3	0.8	2.01	0.04	1070	3	0.62	5	600	23	0.05	<5	73	0.1	9	<10	49
A02CX030	<0.005	<0.01	<0.5	6.45	25	900	1.7	<2	0.15	<0.5	3	29	4	2.43	3.25	0.56	115	<1	0.94	22	680	16	<0.01	<5	73	0.14	39	<10	54
A02CX031	<0.005	<0.01	<0.5	2.11	<5	490	<0.5	<2	0.73	<0.5	1	106	3	0.34	1.6	0.06	46	2	0.29	5	3370	15	<0.01	<5	104	0.08	7	<10	11
A02CX032	<0.005	0.01	<0.5	1.67	5	390	<0.5	<2	0.09	<0.5	6	86	5	0.32	1.1	0.05	360	4	0.22	9	400	53	<0.01	<5	38	0.05	7	<10	14
A02CX033	<0.005	<0.01	<0.5	4.67	10	670	1.9	<2	0.1	<0.5	6	63	17	1.92	2.5	0.32	126	1	0.36	9	480	61	0.02	<5	185	0.12	31	<10	20
A02CX034	<0.005	<0.01	<0.5	2.46	<5	520	<0.5	<2	0.27	<0.5	1	73	9	0.68	1.58	0.1	92	2	0.5	6	1280	17	<0.01	<5	75	0.06	7	<10	22
A02CX035	<0.005	<0.01	<0.5	3	13	520	<0.5	<2	0.13	<0.5	1	87	5	1.09	1.69	0.13	138	<1	0.81	5	540	19	0.01	<5	64	0.17	19	<10	47
A02CX036	<0.005	0.01	<0.5	3.63	10	430	0.6	<2	0.22	<0.5	4	68	8	0.92	1.46	0.16	878	2	1.02	14	870	18	<0.01	<5	75	0.12	20	<10	20
A02CX037	<0.005	0.02	<0.5	9.81	29	880	2.9	<2	0.25	<0.5	14	88	35	5.01	3.75	1.2	374	<1	0.25	35	230	15	0.03	<5	48	0.42	103	<10	119
A02CX038	<0.005	0.02	<0.5	9	15	1590	2.1	<2	0.17	<0.5	1	68	32	2.63	3.31	0.8	369	<1	0.31	17	240	16	0.1	<5	114	0.43	152	<10	52
A02CX039	<0.005	<0.01	<0.5	2.49	<5	420	<0.5	<2	0.04	<0.5	2	169	5	0.82	1.75	0.07	201	3	0.47	10	90	7	0.01	<5	45	0.03	17	<10	8
A02CX040	<0.005	<0.01	<0.5	9.58	11	880	2.8	<2	0.3	0.7	10	76	4	3.13	5.31	0.69	78	<1	0.74	23	1160	8	0.01	5	77	0.41	106	10	63
A02CX041	<0.005	<0.01	<0.5	0.91	<5	150	<0.5	<2	0.03	<0.5	2	266	5	0.73	0.6	0.08	107	4	0.09	9	60	<2	<0.01	<5	15	0.05	9	<10	12
A02CX042	<0.005	<0.01	<0.5	2.8	<5	260	0.7	<2	0.05	<0.5	4	255	6	1.56	1.49	0.31	116	3	0.17	14	90	12	<0.01	<5	22	0.16	33	<10	37
A02CX043	<0.005	<0.01	<0.5	2.45	<5	460	<0.5	<2	0.03	<0.5	1	182	3	0.89	1.53	0.05	453	3	0.62	9	60	4	<0.01	<5	41	0.08	10	<10	7
A02CX044	<0.005	<0.01	<0.5	6.81	6	860	1.6	<2	0.17	<0.5	6	157	12	2.85	2.52	0.78	272	<1	1.65	21	660	11	0.01	<5	93	0.27	49	<10	44
A02CX045	<0.005	0.01	<0.5	8.55	14	970	3	<2	0.12	<0.5	8	79	11	3.4	3.37	1.08	264	<1	0.9	23	630	21	0.01	6	53	0.39	87	<10	108
A02CX046	<0.005	0.01	<0.5	8.89	18	1000	3.1	<2	0.12	<0.5	8	82	12	3.54	3.5	1.11	273	<1	0.94	26	630	17	<0.01	<5	54	0.41	89	<10	111
A02CX047	<0.005	<0.01	<0.5	9.19	11	920	2.4	<2	0.14	0.8	8	67	10	3.53	3.44	1.23	342	<1	0.95	24	570	12	<0.01	<5	54	0.41	101	10	195
A02CX048	<0.005	0.05	<0.5	10.94	20	2370	2.7	<2	0.25	1.1	10	67	34	2.68	4.18	0.91	110	<1	0.65	31	270	17	0.02	<5	170	0.46	114	<10	112
A02CX049	<0.005	0.01	<0.5	10.35	14	1460	2.9	<2	0.19	1.1	8	50	48	4.81	4.04	1.21	268	<1	0.27	34	440	12	<0.01	<5	47	0.41	100	10	135
A02CX050	<0.005	<0.01	<0.5	7.14	31	960	1.3	<2	0.23	<0.5	10	73	17	3.5	2.78	0.78	531	<1	1.12	22	750	10	0.01	6	79	0.39	63	<10	88
A02CX051	<0.005	0.01	<0.5	5	21	750	<0.5	<2	0.26	<0.5	5	139	11	1.96	2.55	0.3	489	2	1.17	23	920	9	<0.01	<5	94	0.29	33	<10	55
A02CX052	<0.005	0.01	<0.5	4.07	22	390	0.5	<2	0.2	<0.5	6	98	25	1.77	1.08	0.24	990	1	1.64	26	600	49	0.01	<5	95	0.15	23	<10	120
A02CX053	<0.005	0.02	<0.5	10.03	36	1220	2.9	<2	0.35	0.7	13	82	27	4.27	4.12	1.05	443	<1	0.53	35	630	16	0.01	<5	82	0.41	97	10	163
A02CX054	<0.005	<0.01	<0.5	5.01	<5	240	0.9	<2	0.18	<0.5	4	95	51	2.26	1.13	0.41	782	<1	1.95	19	650	6	<0.01	<5	54	0.21	36	<10	50
A02CX055	<0.005	<0.01	<0.5	5.43	5	300	1	<2	0.16	0.7	12	119	63	2.48	1.54	0.29	1290	<1	1.94	19	720	3	<0.01	<5	50	0.22	44	10	31
A02CX056	<0.005	<0.01	<0.5	7.64	9	510	2	<2	0.24	0.7	8	87	55	4.47	3.04	1.13	931	<1	0.7	33	580	<2	<0.01	<5	46	0.32	84	<10	104
A02CX057	<0.005	0.01	<0.5	7.93	10	430	1.7	<2	1.53	1.6	13	85	35	4.82	2.03	1.32	1860	<1	0.94	35	450	63	0.14	5	96	0.38	78	10	201
A02CX058	<0.005	0.01	<0.5	8.82	6	570	2.2	<2	0.22	<0.5	16	56	32	5.02	2.39	0.97	387	<1	0.83	45	510	33	<0.01	<5	90	0.4	87	<10	120
A02CX059	<0.005	0.01	<0.5	8.87	25	500	1.3	<2	0.17	0.9	16	67	23	4.38	2.15	0.66	242	<1	0.37	38	530	17	0.2	<5	76	0.5	93	<10	106
A02CX060	<0.005	<0.01	<0.5	4.76	6	1040	0.7	<2	0.4	<0.5	6	116	16	2.33	1.82	0.51	427	<1	0.98	20	700	32	0.02	<5	93	0.27	33	10	63
A02CX061	<0.005	<0.01	<0.5	7.12	6	640	1.4	<2	0.29	1	12	64	26	3.75	2.48	0.97	321	<1	1.14	35	620	13	0.01	<5	92	0.38	67	10	91
A02CX062	<0.005	<0.01	<0.5	6.69	<5	290	0.9	<2	0.23	<0.5	12	123	26	4.48	1.43	0.85	236	<1	1.4	46	530	16	<0.01	<5	75	0.34	55	10	99
A02CX063	<0.005	<0.01	<0.5	7.11	8	370	1.1	<2	0.23	<0.5	12	95	23	4.01	1.79	0.92	313	<1	1.4	39	620	23	<0.01	<5	82	0.38	67	10	94
A02CX064	<0.005	<0.01	<0.5	6.83	6	350	1	<2	0.22	<0.5	12	94	22	3.75	1.68	0.87	295	1	1.33	38	580	19	<0.01	<5	78	0.36	64	10	89
A02CX065	<0.005	0.01	<0.5	5.23	9	230	0.5	<2	0.17	<0.5	7	237	17	2.77	1.07	0.57	286	1	1.73	24	550	7	<0.01	<5	60	0.29	39	10	44
A02CX066	<0.005	<0.01	<0.5	5.85	6	260	0.7	<2	0.19	<0.5	7	163	18	2.8	1.23	0.62	303	2	1.86	23	590	6	0.01	<5	65	0.3	43	<10	50
A02CX067	<0.005	<0.01	<0.5	8.71	13	540	2	<2	0.89	1	11	47	26	3.75	2.77	1.05	528	<1	1.28	36	890	11	0.01	<5	98	0.43	77	<10	75
A02CX068	<0.005	<0.01	<0.5	8.43	11	510	1.8	<2	0.86	<0.5	11	47	26	3.62	2.67	1	505	<1	1.24	34	870	9	0.01	<5	94	0.41	75	10	73
A02CX069	<0.005	0.01	<0.5	4.15	12	560	0.9	<2	0.27	4.3	8	105	91	3.24	1.97	0.18	1175	4	0.82	19	1130	92	0.01	<5	60	0.21	26	<10	249
A02CX070	<0.005	0.01	<0.5	9.39	32	1010	3.6	<2	0.54	2.2	6	37	23	2.37	3.67	0.46	477	4	1.71	15	560	77	0.08	5	69	0.35	61	<10	162

Sample No.	Au g/t	Hg ppm	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm
A02CX071	<0.005	0.01	<0.5	9.48	34	1010	3.7	<2	0.54	2.2	6	40	22	2.37	3.71	0.46	474	5	1.73	14	560	72	0.08	<5	69	0.35	61	10	164
A02CX072	<0.005	0.02	<0.5	6.95	23	640	2.4	<2	2.07	<0.5	8	66	34	3.56	2.71	1.06	580	<1	0.75	25	4060	38	0.44	<5	228	0.34	95	10	53
A02CX073	<0.005	0.02	<0.5	6.75	24	630	2.4	<2	2.02	0.9	8	55	33	3.47	2.63	1.03	565	3	0.73	25	4000	39	0.43	<5	220	0.34	93	<10	52
A02CX074	<0.005	0.03	<0.5	8.97	8	650	2.4	<2	0.09	1.2	6	49	28	3.81	2.94	0.78	172	<1	0.52	23	1090	14	0.01	<5	37	0.42	102	<10	72
A02CX075	<0.005	0.03	<0.5	8.98	15	670	2.5	<2	0.09	0.6	6	49	29	3.82	2.95	0.8	177	<1	0.52	22	1080	12	0.01	<5	39	0.42	103	<10	72
A02CX076	0.006	0.02	<0.5	10.36	12	870	3.3	<2	0.27	1.5	18	79	42	5.35	3.3	1.2	349	<1	0.53	48	710	6	0.03	<5	51	0.44	104	<10	134
A02CX077	<0.005	0.02	<0.5	10.84	18	920	2.4	<2	0.06	<0.5	9	56	32	3.46	3.87	0.73	274	<1	0.47	34	460	8	0.01	<5	53	0.45	172	<10	99
A02CX078	<0.005	0.01	<0.5	4.49	7	180	0.7	<2	0.35	0.8	8	48	11	2.94	0.55	0.55	546	1	1.62	64	1480	9	0.01	<5	75	0.15	33	<10	124
A02CX079	<0.005	0.01	<0.5	10.27	7	810	3.3	<2	0.12	0.8	13	55	37	4.79	3.26	1.2	291	<1	0.62	44	490	13	<0.01	<5	68	0.44	109	<10	149
A02CX080	<0.005	0.02	<0.5	10	11	1030	2.8	<2	0.22	0.9	19	54	33	4.86	3.31	0.91	550	<1	0.44	41	820	23	<0.01	<5	78	0.45	106	<10	130
A02CX081	<0.005	0.02	<0.5	9.28	17	1050	2.7	<2	0.26	1.1	17	51	35	4.62	2.92	0.89	577	<1	0.7	66	830	26	<0.01	<5	70	0.43	111	<10	168
A02CX082	<0.005	0.03	<0.5	10.28	35	1270	2.9	<2	0.13	<0.5	7	57	48	4.76	3.31	0.75	173	<1	0.44	29	560	25	0.01	<5	65	0.46	150	<10	122
A02CX083	<0.005	0.01	<0.5	8.28	12	550	1.6	<2	0.05	<0.5	3	54	21	2.95	2.87	0.3	73	<1	0.53	11	530	18	<0.01	<5	65	0.38	90	<10	42
A02CX084	<0.005	<0.01	<0.5	3.73	<5	110	<0.5	<2	0.03	<0.5	5	67	19	1.72	0.45	0.07	84	1	1.51	19	240	9	<0.01	<5	55	0.18	25	<10	60
A02CX085	<0.005	0.02	<0.5	9.67	15	980	2.8	<2	0.11	<0.5	14	48	31	4.88	2.94	1.07	541	2	0.6	47	970	16	0.01	<5	78	0.45	107	10	150
A02CX086	<0.005	0.04	<0.5	10.16	24	1260	2.4	<2	0.03	0.8	13	41	24	4.99	3.12	1.03	368	4	0.85	31	510	27	0.18	<5	74	0.44	184	<10	116
A02CX087	<0.005	0.01	<0.5	3.67	8	190	0.5	<2	0.63	<0.5	5	52	7	1.56	0.92	0.17	931	2	1.21	13	260	27	0.01	<5	62	0.1	20	<10	46
A02CX088	<0.005	0.01	<0.5	7.02	13	420	1.7	<2	0.21	<0.5	14	45	31	3.62	2.11	0.79	487	<1	1.29	31	690	12	0.01	<5	65	0.26	55	10	108
A02CX089	<0.005	<0.01	<0.5	2.55	11	370	0.9	<2	1.38	<0.5	4	58	5	1.4	1.38	0.06	632	2	0.5	13	6490	13	<0.01	<5	220	0.07	14	<10	33
A02CX090	<0.005	0.01	<0.5	9.98	15	850	3.7	<2	0.25	1	13	40	31	4.32	3.48	1.07	265	<1	0.63	37	730	12	<0.01	<5	51	0.41	93	<10	87
A02CX091	<0.005	0.02	<0.5	1.73	9	200	1.3	<2	2.02	1.1	6	104	15	1.26	0.65	0.09	2050	3	0.16	11	9670	39	0.01	<5	206	0.07	17	<10	132
A02CX092	<0.005	0.01	<0.5	9.26	16	620	3	<2	0.18	<0.5	15	41	38	4.52	3.48	0.85	1270	<1	0.47	39	760	23	<0.01	<5	46	0.38	89	<10	99
A02CX093	<0.005	0.01	<0.5	2.78	<5	340	0.9	<2	0.07	0.8	3	85	18	1.69	0.97	0.1	544	4	0.02	13	400	85	0.01	<5	24	0.1	18	<10	157
A02CX094	<0.005	0.02	<0.5	10.3	22	810	3.4	<2	0.04	<0.5	12	56	30	4.68	4.41	0.48	713	<1	0.05	23	670	16	0.02	<5	51	0.38	92	<10	149
A02CX095	<0.005	0.01	<0.5	4.05	<5	160	0.9	<2	0.81	0.5	6	62	9	2.02	0.75	0.26	1440	2	1.26	15	460	25	0.01	<5	75	0.13	22	<10	82
A02CX096	<0.005	0.01	<0.5	10.14	11	560	2.9	<2	0.14	0.7	11	50	23	4.25	3.3	1.09	277	<1	0.62	37	620	10	<0.01	<5	75	0.41	92	<10	103
A02CX097	<0.005	0.01	<0.5	10.48	12	800	3.3	<2	0.2	0.5	14	40	36	4.55	3.98	1.05	224	<1	0.05	39	550	9	0.01	<5	37	0.42	95	10	155
A02CX098	<0.005	<0.01	<0.5	5.77	15	560	1.1	<2	0.29	<0.5	6	47	19	3.02	2.06	0.63	325	<1	1.37	22	990	11	<0.01	<5	80	0.25	43	<10	74
A02CX099	<0.005	0.01	<0.5	4.92	15	580	0.5	<2	0.28	<0.5	5	49	20	2.21	1.92	0.44	601	2	1.43	15	1150	14	<0.01	<5	83	0.29	32	<10	60
A02CX100	<0.005	0.01	<0.5	9.15	13	720	2.4	<2	0.13	<0.5	7	48	21	4.36	3.14	1.11	391	<1	0.86	26	650	18	<0.01	<5	62	0.39	90	10	96
A02CX101	<0.005	0.01	<0.5	10.83	37	660	2.8	<2	0.23	<0.5	10	40	37	5.54	4.55	1.08	477	<1	0.35	39	720	6	0.01	<5	50	0.48	107	<10	146
A02CX102	<0.005	<0.01	<0.5	6.28	11	630	1.4	<2	0.11	<0.5	2	42	11	2.27	2.35	0.54	129	<1	1.35	9	500	10	<0.01	<5	71	0.27	48	10	41
A02CX103	<0.005	0.01	<0.5	11.08	10	640	4.1	<2	0.03	<0.5	9	57	33	5.13	3.64	1.26	312	<1	0.74	19	430	<2	<0.01	<5	48	0.38	126	10	80
A02CX104	<0.005	<0.01	<0.5	8.79	23	670	2.8	<2	0.17	<0.5	6	48	3	2.87	3.08	0.74	183	<1	1.4	12	720	82	<0.01	<5	75	0.34	85	<10	49
A02CX105	<0.005	0.01	<0.5	13.48	28	1090	5	<2	0.14	1.3	24	67	23	4.49	5.1	1.03	236	<1	0.4	50	610	<2	<0.01	<5	42	0.52	153	<10	322
A02CX106	<0.005	<0.01	<0.5	9.47	7	690	3.2	<2	0.21	<0.5	12	58	19	3.9	2.9	0.92	202	<1	1.46	42	690	4	<0.01	<5	69	0.34	93	<10	175
A02CX107	<0.005	<0.01	<0.5	7.19	15	970	3.2	<2	0.05	<0.5	6	78	<1	1.42	4.48	0.36	96	<1	0.41	10	280	5	<0.01	<5	90	0.2	53	<10	20
A02CX108	<0.005	<0.01	<0.5	2.5	6	380	0.7	<2	0.03	<0.5	3	107	<1	0.61	2.01	0.08	188	<1	0.22	5	100	<2	<0.01	<5	47	0.05	9	<10	5
A02CX109	<0.005	0.01	<0.5	11.33	23	1050	5.4	<2	0.28	<0.5	18	56	6	4.28	4.76	0.97	541	<1	0.64	36	830	<2	<0.01	<5	50	0.39	118	<10	70
A02CX110	<0.005	0.02	<0.5	8.57	24	650	2.6	<2	0.16	<0.5	17	50	46	5.01	1.94	1.21	681	<1	1.33	36	750	7	<0.01	<5	69	0.29	80	10	94
A02CX111	<0.005	0.01	<0.5	9.58	16	570	3	<2	0.04	<0.5	10	47	15	4.43	2.46	1.12	372	<1	0.76	27	330	<2	<0.01	<5	94	0.37	99	<10	65
A02CX112	<0.005	<0.01	<0.5	8.7	11	630	3.3	2	0.17	<0.5	12	48	19	4.39	2.71	1.03	339	<1	0.94	31	670	<2	0.02	<5	58	0.28	90	<10	101
A02CX113	<0.005	0.01	<0.5	8.33	17	680	3.1	<2	0.18	<0.5	11	40	20	4.11	2.7	0.96	297	<1	1.04	26	630	<2	<0.01	<5	56	0.24	76	<10	74
A02CX114	<0.005	<0.01	<0.5	6.87	10	620	2	<2	0.21	<0.5	12	43	21	3.27	1.61	0.7	165	<1	1.53	29	360	<2	<0.01	<5	93	0.23	58	<10	68
A02CX115	<0.005	<0.01	<0.5	8.62	34	680	2.8	<2	0.31	<0.5	10	49	29	4.69	2.39	0.98	208	<1	1.37	50	860	<2	<0.01	6	91	0.22	84	<10	94
A02CX116	<0.005	<0.01	<0.5	8.69	19	620	2.5	4	0.27	<0.5	17	52	26	4.45	2.17	1.03	299	<1	1.44	39	800	<2	0.08	<5	90	0.28	92	<10	86
A02CX117	<0.005	0.02	<0.5	7.62	23	410	2.3	<2	0.06	<0.5	8	50	21	3.84	2.01	0.82	193	<1	1.12	28	520	<2	0.02	<5	57	0.24	80	<10	67
A02CX118	<0.005	0.01	<0.5	5.15	8	310	2	<2	0.14	<0.5	10	63	4	1.67	1.71	0.46	576	<1	1.11	19	300	<2	<0.01	<5	58	0.25	46	<10	54

Sample No.	Au g/t	Hg ppm	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm
A02CX119	<0.005	<0.01	<0.5	5.05	7	780	2.3	<2	0.21	<0.5	9	60	7	2.77	1.92	0.49	2141	<1	0.71	20	860	<2	<0.01	<5	50	0.3	53	<10	55
A02CX120	<0.005	<0.01	<0.5	8.82	8	620	3.4	4	0.19	<0.5	19	46	<1	4.17	3.46	1.17	384	<1	1.25	36	670	3	<0.01	<5	42	0.37	83	<10	97
A02CX121	<0.005	<0.01	<0.5	8.9	6	510	3.5	<2	0.15	<0.5	20	48	<1	4.43	3.45	1.07	414	<1	1.3	36	660	<2	<0.01	<5	43	0.37	91	<10	88
A02CX122	<0.005	0.01	<0.5	10.38	11	510	3.3	<2	0.15	<0.5	13	45	32	4.26	3	1.2	360	<1	1.43	34	640	24	<0.01	<5	88	0.36	99	<10	61
A02CX123	<0.005	0.01	<0.5	9.45	19	800	4	<2	0.03	<0.5	11	40	9	3.41	3.64	0.77	207	<1	0.96	23	610	18	<0.01	<5	49	0.37	96	<10	174
A02CX124	<0.005	<0.01	<0.5	11.51	9	460	4	<2	0.19	<0.5	12	46	19	4.9	3.42	1.45	365	<1	0.83	43	520	2	<0.01	<5	66	0.39	118	10	129
A02CX125	<0.005	0.01	<0.5	11.36	22	690	3.5	<2	0.05	<0.5	10	50	32	5.04	3.28	1.3	366	<1	0.98	35	380	19	0.02	<5	69	0.38	115	10	85
A02CX126	<0.005	0.02	<0.5	11.62	18	760	4.1	<2	0.33	<0.5	18	47	18	4.71	3.53	1.17	363	<1	0.99	47	830	<2	<0.01	<5	85	0.39	117	10	76
A02CX127	<0.005	0.01	<0.5	10	20	1430	3.4	<2	0.05	<0.5	13	35	14	4.89	2.86	1.23	345	<1	0.71	40	260	3	0.01	<5	47	0.4	103	10	111
A02CX128	<0.005	<0.01	<0.5	11.62	13	860	3.9	<2	0.15	<0.5	16	48	26	4.77	3.36	1.2	303	<1	1.23	45	530	28	<0.01	<5	88	0.42	133	<10	135
A02CX129	<0.005	0.02	<0.5	9.33	19	1130	2.8	8	0.05	<0.5	7	43	7	4.38	2.6	1.14	295	<1	1.1	36	460	24	<0.01	<5	64	0.32	97	<10	71
A02CX130	0.006	0.01	<0.5	11.72	18	600	3.9	7	0.14	<0.5	13	50	39	4.74	3.66	1.28	370	<1	1.09	42	430	38	<0.01	<5	73	0.44	118	<10	134
A02CX131	<0.005	0.01	<0.5	8.06	6	490	3.1	<2	0.22	<0.5	17	45	6	3.75	2.92	1.09	1028	2	1.15	41	590	<2	<0.01	<5	37	0.36	87	<10	118
A02CX132	<0.005	0.02	<0.5	10.14	15	560	4	<2	0.25	<0.5	9	41	11	2.67	4.3	0.53	79	<1	0.05	23	1180	<2	<0.01	<5	40	0.27	107	<10	97
A02CX133	<0.005	0.01	<0.5	13.8	10	930	4.8	6	0.4	<0.5	25	80	7	6.62	4.35	1.79	419	<1	1.02	54	760	<2	<0.01	<5	120	0.62	154	10	52
A02CX134	<0.005	<0.01	<0.5	9.66	5	580	3.1	<2	0.77	<0.5	20	54	40	4.77	2.64	1.2	575	<1	1.55	36	590	<2	<0.01	<5	121	0.53	91	<10	86
A02CX135	0.007	0.02	<0.5	4.83	12	150	2.1	<2	0.66	<0.5	9	54	4	2.14	0.98	0.5	267	<1	1.6	15	740	12	0.02	<5	159	0.38	37	<10	42
A02CX136	<0.005	0.01	<0.5	11.12	10	580	5.2	<2	0.3	<0.5	20	63	21	5.53	3.55	1.32	498	<1	0.83	40	680	15	<0.01	<5	93	0.45	112	10	160
A02CX137	<0.005	<0.01	<0.5	12.44	19	680	4.8	<2	0.25	<0.5	17	59	46	5.64	4.01	1.4	660	<1	0.92	37	500	139	<0.01	<5	131	0.54	123	10	279
A02CX138	0.008	0.01	<0.5	8.6	59	300	2.2	<2	0.1	3	9	59	775	10.94	1.68	1.25	388	<1	0.08	33	410	187	0.01	<5	63	0.43	93	30	696
A02CX139	0.098	<0.01	<0.5	4.13	93	<10	<0.5	<2	0.03	0.7	7	79	490	8.05	0.25	1.65	566	3	0.01	10	120	42	<0.01	<5	<1	0.22	44	20	274
A02CX140	0.005	<0.01	<0.5	11.26	25	490	5.4	<2	0.51	2.3	16	69	129	5.89	3.16	1.4	560	<1	1.53	43	450	4	<0.01	<5	227	0.52	104	20	434
A02CX141	<0.005	0.01	<0.5	11.1	17	610	4	<2	0.41	0.6	17	62	4	5.59	3.05	1.33	636	<1	1.19	43	530	<2	<0.01	<5	138	0.48	102	20	115
A02CX142	<0.005	<0.01	<0.5	11.68	50	700	4	<2	0.14	0.7	16	62	4	5.31	3.63	1.34	543	<1	0.83	47	430	<2	<0.01	<5	60	0.43	120	10	90
A02CX143	<0.005	<0.01	<0.5	12.06	15	500	4.1	9	0.16	<0.5	25	60	46	5.98	3.65	1.51	497	<1	1.15	51	540	12	0.26	<5	73	0.42	125	20	144
A02CX144	<0.005	<0.01	<0.5	9.5	18	390	3.2	<2	0.09	<0.5	6	40	20	3.82	3.21	1.3	349	<1	1.15	10	530	15	0.04	<5	42	0.33	148	<10	50
A02CX145	0.005	<0.01	<0.5	9.57	18	330	3	<2	0.12	<0.5	5	40	16	3.95	3.28	1.14	337	<1	1.32	12	540	23	0.01	<5	55	0.44	119	<10	60
A02CX146	<0.005	<0.01	<0.5	5.41	29	130	1.9	5	0.05	<0.5	4	38	7	2.06	1.93	0.47	104	1	1.26	10	240	27	0.14	<5	55	0.23	48	<10	46
A02CX147	<0.005	0.01	<0.5	6.59	9	140	2	<2	0.12	<0.5	8	40	13	2.8	2.01	0.86	269	<1	1.65	15	460	17	0.15	<5	61	0.28	76	<10	71
A02CX148	0.014	0.02	<0.5	11.14	24	990	5.4	<2	0.08	<0.5	9	60	41	5.19	4.43	1.38	878	<1	0.39	19	470	47	0.04	<5	43	0.52	122	10	123
A02CX149	<0.005	0.01	<0.5	8.45	8	130	3.5	<2	0.46	1.4	17	48	6	4.38	1.18	1.34	634	<1	3.34	35	660	2	<0.01	<5	184	0.4	76	10	89
A02CX150	<0.005	0.01	<0.5	12	17	630	4	4	0.2	1.6	21	59	24	5.55	4.03	1.64	741	<1	1.33	45	570	22	<0.01	<5	90	0.37	121	10	69
A02CX151	<0.005	0.01	<0.5	10.42	16	500	4.4	<2	0.19	0.9	22	44	<1	3.62	3.42	1.28	256	<1	2.34	43	620	<2	<0.01	<5	125	0.25	109	10	65
A02CX152	<0.005	0.01	<0.5	11.68	54	720	4.4	<2	0.24	1.2	22	55	<1	5.1	4.06	1.11	599	<1	0.78	49	390	<2	<0.01	<5	107	0.44	104	10	46
A02CX153	<0.005	<0.01	<0.5	5.04	12	90	1.1	2	0.33	0.9	12	33	<1	3.12	1.18	0.72	267	<1	1.09	21	490	<2	<0.01	<5	84	0.3	44	<10	34
A02CX154	<0.005	0.02	<0.5	11.52	11	690	4	<2	0.43	1.7	22	57	31	4.87	3.79	1.19	800	<1	1.01	47	770	3	<0.01	<5	141	0.53	116	10	124
A02CX155	<0.005	0.01	<0.5	7.21	69	180	2.6	<2	0.4	0.7	10	45	4	3.24	1.68	0.86	437	<1	1.69	28	500	14	<0.01	<5	135	0.42	70	<10	76
A02CX156	<0.005	<0.01	<0.5	8.88	23	250	3.4	<2	0.19	0.9	16	38	15	3.94	3.54	1.29	441	<1	1.47	36	650	8	<0.01	<5	49	0.34	93	<10	105
A02CX157	<0.005	<0.01	<0.5	7.16	19	120	2.5	<2	0.17	1	15	49	6	3.45	2.23	1.1	499	<1	1.56	29	1000	6	<0.01	<5	67	0.39	70	<10	175
A02CX158	<0.005	0.01	<0.5	3.7	17	1410	1.1	<2	0.15	<0.5	8	50	27	2.21	1.39	0.68	420	<1	0.89	16	430	59	0.07	<5	110	0.2	32	<10	58
A02CX159	<0.005	<0.01	<0.5	0.91	11	40	<0.5	<2	0.01	<0.5	<1	85	<1	0.31	0.68	0.04	19	<1	0.07	4	40	350	<0.01	<5	13	0.03	5	<10	<2
A02CX160	0.016	0.09	<0.5	2.67	28	290	0.9	<2	0.4	<0.5	4	48	7	0.9	1.75	0.29	267	<1	0.35	8	1510	18	0.09	<5	62	0.08	17	<10	83
A02CX161	<0.005	<0.01	<0.5	3.86	30	750	0.9	<2	0.27	<0.5	3	38	<1	0.84	2.9	0.3	80	<1	0.52	7	1240	11	0.03	<5	93	0.08	17	<10	17
A02CX162	<0.005	<0.01	<0.5	4.49	39	480	1.5	<2	0.39	<0.5	5	34	<1	1.3	2.21	0.59	124	<1	1.16	13	1870	12	0.04	<5	114	0.15	29	<10	37
A02CX163	<0.005	0.01	<0.5	6.37	45	530	2.5	<2	0.36	<0.5	8	38	20	1.79	3.36	0.83	174	3	0.81	19	1630	6	0.02	<5	89	0.21	57	<10	52
A02CX164	<0.005	<0.01	<0.5	9.22	25	740	2.9	7	0.49	1.2	14	41	20	3.83	3	1.25	538	<1	2.3	31	910	10	<0.01	<5	96	0.36	90	<10	47
A02CX165	<0.005	<0.01	<0.5	7.64	19	230	2.5	<2	0.18	0.7	14	44	1	3.64	2.1	0.87	293	<1	1.69	30	560	4	<0.01	<5	67	0.36	80	<10	77
A02CX166	<0.005	<0.01	<0.5	6.3	25	120	2.4	<2	0.24	0.5	10	46	12	3.2	1.52	0.82	222	<1	1.58	22	630	3	<0.01	<5	96	0.31	66	<10	38

Sample No.	Au g/t	Hg ppm	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm
A02CX167	<0.005	<0.01	<0.5	10.76	34	450	3.9	7	0.18	1.2	13	44	27	4.51	3.75	1.26	260	<1	0.77	31	610	3	<0.01	<5	57	0.46	108	10	119
A02CX168	<0.005	<0.01	<0.5	4.75	8	300	2.1	<2	0.08	0.6	6	42	1	2.39	2.43	0.48	160	<1	0.29	12	380	10	<0.01	<5	40	0.19	48	<10	36
A02CX169	<0.005	<0.01	<0.5	3.47	<5	290	1.2	<2	0.07	<0.5	5	26	<1	1.33	1.35	0.32	87	<1	0.75	9	240	<2	<0.01	<5	56	0.11	25	<10	23
A02CX170	<0.005	<0.01	<0.5	6.91	18	640	2.7	<2	0.17	0.8	11	38	<1	3.14	2.79	0.84	434	<1	0.95	22	850	13	<0.01	<5	66	0.26	65	<10	69
A02CX171	<0.005	<0.01	<0.5	3.09	6	180	1.1	<2	0.02	<0.5	3	28	<1	1.34	1.59	0.24	72	<1	0.06	4	230	2	0.02	<5	38	0.12	31	<10	11
A02CX172	<0.005	<0.01	<0.5	6.27	17	160	2.3	<2	0.08	<0.5	9	53	7	2.81	3.03	0.77	366	<1	0.1	21	430	11	<0.01	6	21	0.3	65	<10	59
A02PZ101	0.021	0.25	37.4	1.31	3953	<10	<0.5	196	0.05	162.5	30	13	4749	>25.0	0.11	1.23	450	2	0.01	10	<10	23800	>10.00	28	<1	0.07	18	210	78900
A02PZ102	0.02	0.16	13.4	0.57	4283	<10	<0.5	146	0.1	75.1	26	6	3956	>25.0	0.03	0.43	263	<1	0.01	15	<10	12600	>10.00	21	<1	0.03	11	310	38100
A02PZ103	0.008	<0.01	<0.5	1.14	25	70	<0.5	<2	2.63	0.5	10	134	22	2.96	0.23	0.46	2330	<1	0.02	10	60	84	0.8	<5	49	0.02	13	<10	226
A02PZ104	0.024	<0.01	<0.5	8.93	11	660	3.9	<2	0.26	<0.5	23	93	83	6.53	2.66	1.65	597	<1	0.43	48	500	35	0.06	<5	54	0.35	96	10	101
A02PZ105	<0.005	<0.01	<0.5	9.8	6	760	4	<2	0.41	<0.5	18	64	57	5.03	3.19	1.57	609	3	1.02	53	660	21	0.21	<5	73	0.35	109	10	94
A02PZ106	0.009	<0.01	<0.5	2.59	8	180	0.9	<2	0.12	<0.5	9	74	23	3.48	0.61	0.63	300	3	0.05	13	430	10	0.04	<5	6	0.13	22	10	45
A02PZ201	0.033	0.01	<0.5	7.12	26	360	2	6	0.32	<0.5	21	80	722	10.64	2.26	2.1	1160	<1	0.2	23	420	89	1.92	<5	20	0.39	75	10	419
A02PZ202	0.874	<0.01	<0.5	7.26	238	380	2.4	<2	0.16	<0.5	19	64	773	6.36	2.68	1	498	<1	0.21	27	610	141	1.71	<5	14	0.42	72	10	814
A02PZ203	0.067	<0.01	2	0.23	862	<10	<0.5	66	0.1	10.8	75	11	897	>25.0	0.03	0.76	624	12	<0.01	15	30	2050	>10.0	<5	<1	0.01	13	60	58
A02PZ204	0.107	0.27	56.9	0.19	>10000	<10	<0.5	154	1.08	73.9	135	9	36100	>25.0	0.01	3.14	392	<1	<0.01	9	30	59700	>10.0	135	<1	0.01	8	10	67600
A02PZ205	0.034	<0.01	<0.5	9.95	137	460	3.5	<2	0.27	<0.5	25	87	315	7.44	2.68	1.44	892	<1	0.57	32	560	303	1.45	<5	79	0.47	112	20	406
A02PZ206	<0.005	0.01	<0.5	6.02	43	610	2.1	<2	0.29	<0.5	16	89	42	5.42	1.93	1.05	518	<1	0.52	30	470	139	0.09	<5	67	0.37	69	10	199
A02PZ301	0.128	0.02	3.5	2.02	6510	90	<0.5	35	0.06	3.8	185	40	9910	>25.0	0.58	0.81	316	6	0.02	26	160	221	>10.0	<5	<1	0.13	23	30	2818
A02PZ302	0.612	<0.01	<0.5	1.94	682	10	<0.5	115	0.07	7.5	265	31	2450	>25.0	0.06	0.92	464	3	<0.01	30	180	32	>10.0	<5	<1	0.1	22	40	157
A02PZ303	0.021	0.01	<0.5	5.99	24	190	1.7	<2	0.16	<0.5	24	70	2510	17.84	1.44	1.31	668	<1	0.07	7	360	152	5.26	<5	<1	0.28	78	30	238
A02PZ304	0.061	0.01	<0.5	0.24	73	<10	<0.5	29	0.02	12.2	56	12	10700	>25.0	0.01	0.24	271	20	<0.01	13	<10	59	>10.0	<5	<1	0.01	20	50	1156
A02PZ305	0.058	0.14	18.4	0.42	6600	30	<0.5	110	0.1	59.1	111	13	5350	>25.0	0.02	0.53	231	3	0.01	14	30	13600	>10.0	36	<1	0.02	9	<10	37800
A02PZ401	0.009	<0.01	0.7	7.97	242	620	4	<2	0.17	<0.5	14	70	827	7	2.68	1.57	868	<1	0.13	34	590	176	0.27	<5	8	0.46	101	10	551
A02PZ402	<0.005	<0.01	3.4	6.8	2740	110	2	18	0.12	2.2	15	65	945	13.19	2.45	1.08	668	<1	0.15	19	450	1295	4.21	<5	<1	0.41	95	20	2508
A02PZ403	1.01	0.01	2.9	1.05	9840	<10	<0.5	155	0.13	9.1	135	17	19000	>25.0	0.04	0.64	527	2	<0.01	26	60	179	>10.0	<5	<1	0.06	15	60	327
A02PZ404	0.034	<0.01	2	0.39	333	<10	<0.5	37	0.03	8.7	27	11	2740	>25.0	0.02	0.26	171	6	<0.01	18	20	73	>10.0	<5	<1	0.02	9	40	470
A02PZ405	<0.005	<0.01	<0.5	6.13	11	470	1.7	<2	7.1	0.6	48	262	151	8.21	0.93	6.33	1340	2	1.91	193	2000	29	0.34	8	414	1.35	218	20	99
A02PZ406	<0.005	<0.01	<0.5	7.23	<5	490	2.1	6	6.5	<0.5	41	199	65	8.14	1.26	5.45	1565	<1	2.37	153	2390	25	0.15	5	552	1.46	227	20	128
A02PZ501	<0.005	0.01	0.9	6.76	107	140	1.5	<2	0.11	<0.5	53	79	5170	12.08	0.56	2.33	1285	<1	0.04	28	80	27	1.64	<5	<1	0.26	65	20	666
A02PZ502	<0.005	0.01	<0.5	8.14	48	80	1.5	<2	0.22	1.7	18	70	381	15.74	0.48	4.15	2030	<1	0.05	30	410	115	0.49	<5	5	0.3	92	20	1434
A02PZ503	0.134	0.01	0.6	1.53	684	10	<0.5	34	0.07	12.3	96	28	3620	>25.0	0.05	1.02	404	3	<0.01	12	100	1030	>10.0	<5	<1	0.06	23	30	4837
A02PZ504	0.094	0.01	4.9	0.66	2630	20	<0.5	74	0.05	31.6	134	16	2480	>25.0	0.1	0.56	245	5	<0.01	19	50	3710	>10.0	<5	<1	0.03	13	20	9863
A02PZ505	0.02	0.01	<0.5	6.29	47	290	1.9	<2	0.14	<0.5	14	78	4870	9.35	2.1	1.17	1805	<1	0.04	14	330	106	1.42	<5	<1	0.29	74	30	406
A02PZ506	0.012	<0.01	<0.5	8.52	5	650	1.4	<2	0.19	<0.5	19	90	304	10.24	3.57	1.88	986	<1	0.09	47	620	41	0.6	<5	2	0.52	120	20	116
A02PZ507	0.01	<0.01	<0.5	9.81	58	870	3.5	<2	0.22	<0.5	22	75	92	7.5	3.7	1.54	991	<1	0.17	39	530	61	0.39	6	33	0.47	113	20	92
A02PZ508	<0.005	<0.01	<0.5	4.95	158	290	1.9	<2	0.26	<0.5	10	103	178	6.8	1.19	1.02	776	<1	0.06	19	320	65	1.07	<5	14	0.23	53	10	268
A02PZ509	0.337	<0.01	<0.5	0.44	924	<10	<0.5	43	0.03	12.3	60	12	1615	>25.0	0.02	0.48	137	6	<0.01	16	10	229	>10.0	<5	<1	0.02	12	50	803
A02PZ510	0.329	<0.01	<0.5	0.4	777	<10	<0.5	62	0.03	10.4	53	15	3620	>25.0	0.01	0.45	167	6	<0.01	17	20	1065	>10.0	<5	<1	0.02	12	50	336
A02PZ511	<0.005	<0.01	<0.5	10.59	94	860	4.1	<2	0.34	<0.5	20	65	908	6.42	3.59	1.66	711	<1	0.75	48	630	113	0.57	<5	92	0.44	117	20	215
A02PZ512	<0.005	<0.01	<0.5	5.97	<5	340	2.4	<2	0.54	<0.5	9	84	27	3.88	1.6	1.12	473	<1	0.9	22	850	17	0.19	<5	76	0.33	69	10	47
5618	0.007	0.01	<0.5	5.78	<5	640	1	<2	0.04	<0.5	<1	94	26	1.78	2.92	0.68	44	1	0.12	5	450	2	0.35	<5	23	0.22	80	10	13
26264	0.033	0.02	4.5	6.44	<5	90	3.6	<2	3.43	1.8	15	205	1675	7.15	2.46	4.65	808	10	0.1	124	3150	30	3.65	<5	206	1.83	223	20	216
26277	0.009	0.03	<0.5	7.29	<5	600	3.7	<2	4.07	0.6	20	80	38	7.52	1.7	2.84	1065	9	3.05	74	3580	6	0.08	<5	570	1.18	128	20	93
23281	0.005	0.01	<0.5	6.59	<5	630	1.2	<2	5.23	<0.5	39	239	42	7.54	1.83	4.42	1160	4	2.31	140	2220	4	0.01	<5	614	1.52	149	20	105
25167	0.006	0.02	<0.5	6.86	6	940	1.7	5	7.65	0.7	34	151	48	8.15	3.83	5.53	2030	9	0.9	125	3050	9	0.79	<5	996	1.87	248	10	144
25173	0.017	0.02	<0.5	6.71	<5	180	2	<2	7.3	<0.5	50	219	99	8.24	3.03	6.21	1575	11	1.36	129	4060	13	2.97	<5	686	2.28	281	10	114
25175	0.005	0.01	<0.5	7.76	7	70	3.2	<2	1.99	0.6	10	54	10	3.78	2.6	1.02	118	1	2.08	13	1240	13	3.83	<5	488	0.18	67	10	41

Sample No.	Au g/t	Hg ppm	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm
25208	0.16	0.01	<0.5	5.04	<5	160	0.9	<2	0.08	<0.5	7	85	<1	1.93	2.61	0.43	29	<1	0.08	14	160	<2	1.66	<5	11	0.21	50	10	5
25214	<0.005	0.01	<0.5	8.3	6	690	3.2	<2	1.78	<0.5	8	74	2	3.64	3.53	1.5	632	3	1.33	40	570	9	0.11	<5	133	0.53	116	<10	48
26405	0.005	0.02	<0.5	6.43	<5	240	2.6	<2	0.05	<0.5	<1	11	15	0.59	5.05	0.13	26	3	0.15	5	90	80	0.04	<5	117	0.04	6	<10	28
26415	0.005	0.01	<0.5	9.89	5	240	1.5	<2	4.25	<0.5	9	22	46	4.43	1.57	1.23	741	3	2.47	3	470	12	0.63	<5	500	0.5	95	<10	43
26434	0.005	0.02	<0.5	6.78	<5	450	3.9	<2	1.39	<0.5	14	74	87	3.68	3.38	1.83	301	3	0.37	37	550	2	0.76	<5	89	0.36	110	<10	24
67580	<0.005	0.02	<0.5	6.29	5	140	0.7	<2	0.09	<0.5	6	56	7	2.11	3.45	0.17	23	<1	2.54	9	200	8	1.72	<5	95	0.14	30	<10	7
67581	0.007	<0.01	<0.5	3.58	<5	700	<0.5	<2	0.13	<0.5	<1	36	8	0.52	2.08	0.08	62	<1	0.9	3	210	14	0.01	<5	108	0.2	23	<10	7
67588	<0.005	0.01	<0.5	8.25	11	620	1.8	8	5.21	<0.5	22	7	<1	6.19	1.29	2.02	1090	4	2.99	4	9510	12	0.01	<5	637	0.6	50	<10	175

(2) Ore assay

Sample No.	Au	Hg	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sr	Ti	V	W	Zn
	g/t		ppm	%		ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	%	ppm	ppm	%	ppm		ppm			ppm	%	ppm		ppm
A02RF002	0.02		<1	4.27		500	<10	<20	0.51	<10	20	460	4160	2.84	3.2	0.36	170	60	0.85	20		<10			140	0.16	60		60
A02RF004	<0.01		<1	5.41		400	<10	<20	1.23	<10	80	460	110	13.95	3	0.54	320	640	1.29	20		<10			310	0.17	60		30
A02RF005	<0.01		<1	7.85		600	<10	<20	2.42	<10	20	390	120	3.17	2.7	0.91	410	2160	2.19	20		<10			520	0.27	80		50
A02RF044	<0.01		14	6.4		2400	<10	<20	2.45	<10	10	120	18450	1.53	2.5	0.3	620	10	1.98	10		20			180	0.16	80		90
A02RF045	<0.01		1	2.66		700	<10	<20	16.6	<10	80	50	65900	0.79	0.8	0.23	1890	10	0.82	10		690			570	0.07	40		600
A02RF046	0.03		10	8.8		600	<10	<20	0.27	<10	20	110	7750	4.57	2.9	1.66	710	10	1.47	50		370			60	0.49	110		140
A02RF054	0.01		3	2.56		400	<10	<20	0.31	<10	10	370	300	3.74	1.1	0.31	3160	<10	0.2	70		4860			230	0.39	70		240
A02RF056	0.01		5	2.74		600	<10	<20	0.13	30	20	220	4490	2.24	1.3	0.08	1890	10	0.36	10		15050			30	0.16	10		4960
A02RF068	<0.01		1	3.59		300	<10	<20	0.11	<10	10	130	40	13.05	1.9	0.17	60	<10	0.15	30		2660			90	0.19	90		650
A02RF069	0.02		20	1.21		300	<10	<20	0.09	<10	<10	210	80	0.93	0.4	0.07	150	<10	<0.05	10		83600			60	0.13	30		3710
A02TK003	0.02		<1	3.37		100	<10	<20	0.07	<10	<10	160	30	25.9	1.7	0.21	100	<10	0.07	<10		180			20	0.22	110		40
A02TK020	<0.01		<1	1.02		300	<10	<20	<0.05	<10	<10	330	10	0.97	0.6	<0.05	470	<10	<0.05	10		100			<10	<0.05	10		20
A02TK030	0.01		<1	5.62		100	20	<20	0.09	<10	<10	200	20	2.86	2.9	<0.05	70	<10	2.85	<10		60			10	0.08	<10		30
A02CX007	0.04		391	0.43		200	<10	<20	0.06	1860	<10	70	40	4.84	0.1	<0.05	5260	<10	<0.05	10		235000			20	<0.05	20		>300000
A02CX012	0.18		246	2.31		900	<10	90	1.72	260	50	70	2170	14.55	0.5	2.09	97800	60	<0.05	30		169500			30	0.12	120		78000
A02PZ101	0.09		42	0.9		<100	<10	120	0.08	150	70	60	4030	>30.0	0.1	1.1	600	<10	0.06	20		24400			<10	<0.05	10		71200
A02PZ102	0.02		16	0.59		<100	<10	40	0.18	60	40	20	3360	>30.0	<0.1	0.52	370	<10	<0.05	30		12250			10	<0.05	10		36000
A02PZ203	0.12		6	0.16		<100	<10	40	0.09	<10	80	20	1270	>30.0	<0.1	0.48	540	10	<0.05	20		3720			<10	<0.05	10		290
A02PZ204	0.14		68	0.1		<100	<10	150	1	90	280	10	26000	>30.0	<0.1	3.19	270	10	<0.05	20		64300			<10	<0.05	<10		74800
A02PZ301	0.06		2	4.8		300	<10	<20	0.11	<10	160	60	3240	>30.0	2.1	2.28	750	550	0.12	30		400			<10	0.3	60		2650
A02PZ302	0.81		<1	1.81		<100	<10	90	0.07	<10	300	120	2860	>30.0	0.1	0.93	430	10	0.08	40		120			<10	0.09	20		230
A02PZ303	0.02		<1	7.02		600	<10	<20	0.15	<10	20	170	1060	15.85	1.9	1.42	770	<10	0.2	10		150			30	0.31	90		290
A02PZ304	0.05		23	0.38		100	<10	80	0.1	60	110	30	5160	>30.0	<0.1	0.48	270	<10	<0.05	20		13250			<10	<0.05	10		36600
A02PZ305	0.03		1	0.33		<100	<10	<20	<0.05	<10	60	20	5640	>30.0	<0.1	0.28	310	20	<0.05	10		80			<10	<0.05	20		1630
A02PZ403	0.98		3	1.25		<100	<10	120	0.16	<10	120	110	10350	>30.0	<0.1	0.69	1180	<10	<0.05	30		250			<10	0.08	20		350
A02PZ404	0.04		4	0.36		<100	<10	<20	<0.05	<10	30	20	2120	>30.0	<0.1	0.21	130	<10	<0.05	20		80			<10	<0.05	10		450
A02PZ503	0.13		3	1.19		<100	<10	20	0.1	10	130	60	1300	>30.0	<0.1	0.89	360	<10	<0.05	20		1560			<10	0.06	20		5230
A02PZ504	0.06		7	0.82		<100	<10	30	0.07	20	110	40	2150	>30.0	0.1	0.62	250	<10	<0.05	20		4130			<10	<0.05	10		10900
A02PZ509	0.15		1	0.43		<100	<10	20	0.05	<10	60	20	3920	>30.0	<0.1	0.42	170	<10	<0.05	20		180			<10	<0.05	10		1300
A02PZ510	0.22		3	0.37		<100	<10	30	0.06	10	60	10	3850	>30.0	<0.1	0.41	180	<10	<0.05	20		1200			<10	<0.05	10		3550

(3) Whole rock analysis

Sample No.	SiO2 %	Al2O3 %	Fe2O3 %	CaO %	MgO %	Na2O %	K2O %	Cr2O3 %	TiO2 %	MnO %	P2O5 %	SrO %	BaO %	LOI %	Total %	Ag ppm	Ba ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Dy ppm	Er ppm	Eu ppm	Ga ppm	Gd ppm
A02RF013	69.23	14.33	3.23	0.47	0.2	1.63	6.78	0.01	0.49	<0.01	0.04	0.03	0.06	3.06	99.56	1	596	23.5	1.9	<10	1.8	379	1.2	0.7	0.7	20	1.5
A02RF038	66.86	14.42	4.72	0.78	0.48	1.06	5.07	0.01	0.51	<0.01	0.42	0.05	0.06	5.38	99.81	<1	526	16.5	0.8	30	6.5	835	0.8	0.5	0.4	19	0.9

Sample No.	Hf ppm	Ho ppm	La ppm	Lu ppm	Mo ppm	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Pr ppm	Rb ppm	Sm ppm	Sn ppm	Sr ppm	Ta ppm	Tb ppm	Th ppm	Tl ppm	Tm ppm	U ppm	V ppm	W ppm	Y ppm	Yb ppm	Zn ppm	Zr ppm
A02RF013	4	0.2	14.3	0.2	384	27	8.1	7	21	2.3	176	1.3	2	199.1	1.7	0.2	8	<1	<0.5	2.2	52	13	6.3	0.8	32	134.2
A02RF038	5	0.2	10.8	0.1	6	28	5.8	8	29	1.7	218	1	7	262.5	2.3	0.1	18	1	<0.5	2.8	66	12	4.5	0.7	40	180.6

Table A-5 List of mineral occurrences in the survey area

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
1	JUJUY	Z-01	Abra Colorada	Chocoite	22°15'	65°47'	Cu-Fe-Mn	Vein-form		Fe:31-49%		Ordovician	Dacitic porphyries, sandstones and shales	Cochinoca-Escaya Complex
2	JUJUY	Z-01	Chocoite	Chocoite	22°20'30"	65°46'43"	Cu	Vein				Ordovician	Dacitic porphyries, sandstones and shales	Cochinoca-Escaya Complex
3	JUJUY	Z-01	Hornillos (Cerro Escaya)	Cerro Escaya	22°15'06"	65°46'21"	Cu	Vein				Ordovician	Dacitic porphyries, sandstones and shales	Cochinoca-Escaya Complex
4	JUJUY	Z-01	La Gateada	Cerrillos	22°22'23.5"	65°49'44.7"	Pb	Vein	quartz, pyrite, chalcopyrite, sphalerite, galena, chalcosite, covelline, hematite, limonite, psilome			Ordovician	Sandstones, shales	Cochinoca-Escaya Complex
5	JUJUY	Z-01	Yangaso	Cieneguillas	22°08'54"	65°49'06"	Cu	Vein				Ordovician	Quartzitic sandstones and shales	Cochinoca-Escaya Complex
6	JUJUY	Z-02	6 de Noviembre	Pumahuasi	22°15'33"	65°37'22"	Fe	Vein-form	hematite, limonite			Ordovician	Sandstone,siltstone and shale	Acoite Formation
7	JUJUY	Z-02	9 de Julio	Pumahuasi	22°18'	65°34'	Pb-Zn-Ag							
8	JUJUY	Z-02	Barrios	Pumahuasi	22°15'	65°31'	Pb	Simple veins				Ordovician	Sandstones, shales	Acoite Formation
9	JUJUY	Z-02	Caricasini	Pumahuasi	22°20'33"	65°36'23"	Barite-Pb	Simple veins	barite, galena			Ordovician	Sandstones and shales	Acoite Formation
10	JUJUY	Z-02	Cerro Colorado	Pumahuasi	22°20'01"	65°37'33"	Pb-Zn	Simple veins	limonite, galena, barite			Ordovician	Sandstones and shales	Acoite Formation
11	JUJUY	Z-02	Chaussette	Pumahuasi	22°17'18"	65°38'00"	Pb-Zn	Simple veins	galena, ankerite, barite, hematite, cerussite, anglesite, sphalerite, pyrite			Ordovician	Sandstones and shales	Acoite Formation
12	JUJUY	Z-02	Constancia-La Casualidad	Pumahuasi	22°15'	65°40'	Fe	Simple veins						
13	JUJUY	Z-02	Corralito Blanco	La Quiaca	22°12'01"	65°36'25"	Cu	Simple veins				Ordovician	Sandstones and shales	Acoite Formation
14	JUJUY	Z-02	General Leman	Pumahuasi	22°22'01"	65°37'07"	Pb-Zn	Simple veins in faults	galena, sphalerite, cerussite, anglesite, barite, limonite			Ordovician	Sandstones and shales	Acoite Formation
15	JUJUY	Z-02	Isabel	Pumahuasi	22°15'	65°36'	Pb-Zn	Simple veins in faults	limonite, barite, galena, quartz			Ordovician	Sandstones, shales	Acoite Formation
16	JUJUY	Z-02	La Bélgica (Sur Bélgica, Aramayo), Alejandro	Pumahuasi	22°23'55"	65°37'11"	Pb-Zn	Simple veins in faults	galena, sphalerite, pyrite, chalcopyrite, limonite, cerussite, anglesite, barite, ankerite, quartz, limonite			Ordovician	Sandstones and shales	Acoite Formation
17	JUJUY	Z-02	La Blanquita, La Sanguinaria	Pumahuasi	22°13'46"	65°32'37"	Pb	Simple veins in faults				Ordovician	Sandstones, shales	Acoite Formation
18	JUJUY	Z-02	La Perla	Pumahuasi	22°25'01"	65°35'32"	Pb-Zn	Simple veins in faults				Ordovician	Sandstones and shales	Acoite Formation
19	JUJUY	Z-02	La Pulpera	Pumahuasi	22°22'32"	65°35'56"	Pb-Zn	Simple veins in faults	galena, sphalerite, pyrite, chalcopyrite, limonite, cerussite, anglesite, barite, ankerite, quartz, limonite			Ordovician	Sandstones and shales	Acoite Formation
20	JUJUY	Z-02	La Quiaqueña	La Quiaca	22°06'33"	65°35'08"	Pb	Simple veins				Ordovician	Sandstones and shales	Acoite Formation
21	JUJUY	Z-02	Leman	Pumahuasi	22°21'	65°36'	Pb	Simple veins in faults						
22	JUJUY	Z-02	Luisito	Pumahuasi	22°23'17"	65°35'24"	Pb-Zn	Simple veins in faults	galena, limonite, ankerite, quartz, Cu-oxide, barite			Ordovician	Sandstones and shales	Acoite Formation
23	JUJUY	Z-02	Olga	Pumahuasi	22°13'01"	65°32'41"	Cu-Ag	Epithermal polymetallic veins	bornite, galena, barite, ankerite	Cu:12.5%, Ag:275g/t		Ordovician	Sandstones, shales	Acoite Formation
24	JUJUY	Z-02	Pumahuasi	Pumahuasi	22°16'34"	65°38'13"	Pb-Zn	Simple veins in faults	barite, galena, chalcopyrite, malachite, sphalerite			Ordovician	Sandstones and shales	Acoite Formation
25	JUJUY	Z-02	Rosa de Oro (Cangrejillos)	Pumahuasi	22°25'32"	65°35'57"	Pb-Zn	Simple veins in faults	barite, galena			Ordovician	Sandstones and shales	Acoite Formation
26	JUJUY	Z-02	San Marcial	Pumahuasi	22°24'00"	65°35'33"	Pb-Zn	Simple veins in faults				Ordovician	Sandstones and shales	Acoite Formation
27	JUJUY	Z-02	Sol de Mayo	Pumahuasi	22°18'09"	65°36'43"	Pb-Zn	Simple veins in faults	barite, galena, sphalerite, pyrite, chalcopyrite, cerussite, ankerite,			Ordovician	Sandstones and shales	Acoite Formation
28	JUJUY	Z-02	Victoria	Pumahuasi	22°16'57"	65°38'57"	Cu	Epithermal polymetallic				Ordovician	Sandstones and shales	Acoite Formation
29	JUJUY	Z-02	Washington	Pumahuasi	22°25'31"	65°35'24"	Pb-Zn	Simple veins	barite, galena, Fe-oxides			Ordovician	Sandstones and shales	Acoite Formation
30	JUJUY	Z-03	Rincón de Cajas	Rincón de Cajas	22°17'26"	65°17'18"	Pb-Barite	Veins in faults	galena, barite, quartz			Ordovician	Sandstones and shales	Santa Rosita Formation
31	JUJUY	Z-03	Romina Elisa	Cóndor	22°27'31"	65°19'49"	Pb-Barite	Veins in faults	barite, galena			Ordovician	Sandstones, shales	Santa Rosita Formation
32	JUJUY	Z-03	San Antonio	Abra de Cóndor	22°26'35"	65°16'36"	Cu	Veins in faults	Cu-oxide, quartz			Ordovician	Sandstones and shales	Santa Rosita Formation
33	SALTA	Z-03	Arias	Tres Lagunas	22°05'18"	65°08'45"	Au-Cu	Mesothermal Au veins	gold, arsenopyrite, pyrite, hematite, Cu-oxide, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation
34	SALTA	Z-03	Atahualpa	Lizoite	22°18'42"	65°10'32"	Cu	Vein	pyrite, chalcopyrite, malachite, lmonite			Cambrian	Quartzite and quartzose	Mesón Group
35	SALTA	Z-03	Huasi, Viejito	Cerro Toroyoc	22°36'18"	65°16'15"	Pb-Cu	Veins in faults	galena, chalcopyrite, pyrite, limonite, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation
36	SALTA	Z-03	Jaime Alberto	Tuc Tuca, Abra de Có ndor	22°23'30"	65°15'09"	Barite	Veins in faults	barite, galena			Ordovician	Shales and sandstones	Santa Rosita Formation
37	SALTA	Z-03	La Codiciada	Santa Cruz, Sierras de Santa Victoria	22°08'25"	65°03'48"	Pb-Barite	Veins in faults	galena, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
38	SALTA	Z-03	La Niquelina	Abra de Cóndor, Tuc Tuca	22°22'36"	65°13'42"	Ni-Pb-Zn-(Co-As-Cu-U)	Mesothermal, Veins in faults	chalcocite, chalcopyrite, bornite, tetrahedrite, pyrite, niccolite, galena, sphalerite, pitchblende	Ni:0.45-1.65%, Pb:2.5-30%, Zn:1.5-21%, Co:0.47-1.76% (selected samples), As:26.6-31.46% (selected samples)		Cambrian, Ordovician	Quartzite, shale and sandstone	Chahualmayoc Formation, Santa Rosita Formation
39	SALTA	Z-03	Laguna Blanca	Cóndor	22°29'01"	65°17'16"	Barite-Pb	Veins in faults	barite, galena			Ordovician	Shales and sandstones	Santa Rosita Formation
40	SALTA	Z-03	Romina Elisa	Sierras de Santa Victoria	22°27'	65°20'	Barite-Pb	Veins in faults				Ordovician	Shales and sandstones	Santa Rosita Formation
41	SALTA	Z-03	Rosario	Tres Lagunas	22°05'23"	65°13'13"	Pb-Barite	Veins in faults	galena, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
42	SALTA	Z-03	San Felipe	Cóndor	22°27'24"	65°17'02"	Barite-Pb	Veins in faults	barite, galena			Ordovician	Shales and sandstones	Santa Rosita Formation
43	SALTA	Z-03	Santa Rosa	Tuc Tuca, Abra de Có	22°24'22"	65°15'09"	Barite	Veins in faults	barite, galena	$BaSO_4$:82.11-84.48%		Ordovician	Shales and sandstones	Santa Rosita Formation
44	SALTA	Z-03	Toroyoc, Huaira	Cerro Toroyoc	22°37'27"	65°16'55"	Pb-Cu	Veins in faults	galena, chalcopyrite, pyrite, limonite, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation
45	SALTA	Z-03	Vizcachani Norte	Tres Lagunas, Sierras de Santa Victoria	22°08'35"	65°08'54"	Pb-Zn-Cu	Veins in faults	galena, sphalerite, pyrite, chalcopyrite, cerussite, chrysocolla, malachite, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
46	SALTA	Z-03	Volcán Blanco	Abra de Fundiciones	22°23'44"	65°10'36"	Barite-Pb	Veins in faults	barite, galena, Cu-oxide, limonite,			Ordovician	Shales and sandstones	Santa Rosita Formation
47	SALTA	Z-04	Antigal	Antigal, Sierras de Santa Victoria	22°10'20"	64°54'53"	Fe	Stratiform, oolitic, turbiditic	hematite, thuringite, biotite, silice hidratada, muscovite, limomite			Silurian	Siltstone, Greywacke	Lipeón Formation
48	SALTA	Z-04	Cerros Bravos	Pucará, Sierras de Santa Victoria	22°12'25"	64°48'14"	Au	Alluvial gold	gold			Pleistocene - Holocene	Alluvial plain deposits	
49	SALTA	Z-04	Mecoyita	Mecoyita, Sierras de Santa Victoria	22°07'58"	64°53'10"	Fe	Stratiform, oolitic	hematite, thuringite, biotite, silice hidratada, muscovite, limomite			Silurian	Siltstone, Greywacke	Lipeón Formation
50	SALTA	Z-04	Pozo Bravo	Tres Lagunas, Sierras de Santa Victoria	22°09'04"	65°07'36"	Au	Alluvial gold	gold					
51	SALTA	Z-04	Pucará	Pucará, Sierras de Santa Victoria	22°10'25"	64°57'52"	Au	Alluvial gold	gold			Pleistocene - Holocene	Alluvial plain deposits	
52	SALTA	Z-04	Pueblo de Minas	Tres Lagunas, Sierras de Santa Victoria	22°05'53"	65°07'39"	Au	Alluvial gold	gold	Au:<2.4g/m^3 (mine sector)		Pleistocene - Holocene	Alluvial-colluvial deposits	
53	SALTA	Z-04	Santa Cruz	Santa Cruz, Santa Victoria	22°09'22"	65°00'48"	Au	Alluvial gold	gold				Alluvial plain deposits	
54	SALTA	Z-04	Santa Rosita	Pucará, Sierras de Santa Victoria	22°11'51"	64°52'01"	Au	Alluvial gold	gold	Au:1g/m^3 (average in Pucará)		Pleistocene - Holocene	Alluvial plain deposits	
55	SALTA	Z-04	Santa Victoria	Río Santa Cruz	22°08'	65°00'	Au	Alluvial gold	gold					
56	SALTA	Z-04	Vizcachani Norte	Tres Lagunas, Sierras de Santa Victoria	22°08'12"	65°07'42"	Au	Alluvial gold	gold					
57	SALTA	Z-04	Yavihuaico	Santa Cruz, Sierras de Santa Victoria	22°07'53"	65°01'26"	Au	Alluvial gold	gold			Pleistocene - Holocene	Alluvial plain deposits	
58	SALTA	Z-05	Abra Colorada	Cerro Fundiciones	22°27'46"	65°08'31"	Pb-Barite	Veins in faults	barite, galena, quartz			Precambrian	Schists and slates	Puncoviscana Formation
59	SALTA	Z-05	Acoite, Hornillos	Lizoite	22°18'20"	65°06'28"	Pb-Cu- Barite	Veins in faults	galena, barite, quartz			Cambrian	Quartzite	Campanario Formation
60	SALTA	Z-05	Alejandra	Pascaya, Cerro Blanco	22°24'32"	64°57'49"	Pb-Barite	Veins in faults	galena, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
61	SALTA	Z-05	Beatriz, Socorro	Molino, Río Nazareno	22°34'35"	65°07'01"	Pb-Cu-Barite	Veins in faults	galena, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
62	SALTA	Z-05	Campamento	Puncoviscana, Sierras de Santa Victoria	22°19'11"	65°02'12"	Fe	Vein-form	specularite, hematite, magnetite			Ordovician		Santa Rosita Formation
63	SALTA	Z-05	Churquipampa	Lizoite	22°18'44"	65°06'55"	Pb-Cu-U-Th-Barite	Mesothermal, Th-REE veins	galena, malachite, thorite, thuringite, barite, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation
64	SALTA	Z-05	Dana	Trigohuaico, Sierras de Santa Victoria	22°21'03"	64°59'55"	Barite		barite			Ordovician	Shales and sandstones	Santa Rosita Formation
65	SALTA	Z-05	Don Alberto, Puca Aypa, San Cayetano, María Marquesa	Sierras de Santa Victoria	22°16'13"	64°58'41"	Barite-Pb		barite, galena, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation
66	SALTA	Z-05	Don José, Julia	Poscaya, Nazareno	22°25'30"	65°02'30"	Barite-Pb		barite, galena, Fe-oxides, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation
67	SALTA	Z-05	El Nazareno	Nazareno	22°30'45"	65°05'35"	Pb-Barite		galena, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
68	SALTA	Z-05	El Quirusillal	Nazareno	22°29'10"	65°06'39"	Pb-Zn-U-Cu-Ni-Barite		barite, galena, sphalerite, uraninite, pitchblende			Cambrian	Quartzites, quartzose sandstones	Mesón Group
69	SALTA	Z-05	Elizabeth	Sierras de Santa Victoria	22°14'05"	64°57'16"	Pb-Cu- Barite		galena, barite, malachite, azurite, quartz, limonite			Ordovician	Shales and sandstones	Santa Rosita Formation
70	SALTA	Z-05	Encrucijada	Sierras de Santa Victoria	22°14'39"	65°00'35"	Pb	Veins in faults	galena, quartz, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
71	SALTA	Z-05	Hermán	Trigohuaico, Sierras de Santa Victoria	22°20'25"	65°02'59"	Barite-Pb	Veins in faults	galena, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
72	SALTA	Z-05	La Ciénaga	Paltorco, Sierras de Santa Victoria	22°22'30"	65°04'49"	Pb-Cu- Barite	Veins in faults	galena, barite, quartz, chalcopyrite, hematite			Ordovician	Shales and sandstones	Santa Rosita Formation
73	SALTA	Z-05	Lopiara	Poscaya, Nazareno	22°25'38"	65°05'43"	Barite-Pb	Veins in faults	barite, galena, Fe-oxides, quartz	$BaSO_4$:59.92-95.36%, Pb:32.49%		Ordovician	Shales and sandstones	Santa Rosita Formation
74	SALTA	Z-05	María Cristína	Nazareno	22°31'39"	65°04'56"	Pb-Cu	Veins in faults	galena, Cu-oxide, barite, quartz			Ordovician	Shales and sandstones	Santa Rosita Formation
75	SALTA	Z-05	María Gabriela	Acoite, Sierras de Santa Victoria	22°18'08"	65°02'13"	Fe	Vein-form	specularite, hemattite, magnetite			Ordovician	Lutite, Sandstone	Santa Rosita Formation
76	SALTA	Z-05	María Julia	Sierras de Santa Victoria	22°13'25"	65°02'52"	Pb-Barite	Veins in faults	galena, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
77	SALTA	Z-05	Misquero	Poscaya, Nazareno	22°25'43"	65°06'42"	Pb-Cu-Barite	Veins in faults	barite, galena, Cu-oxide, radioactive anomalies, limonite			Ordovician	Shales and sandstones	Santa Rosita Formation
78	SALTA	Z-05	Mono Abra	Trigohuaico, Sierras de Santa Victoria	22°22'26"	65°01'07"	Barite	Veins in faults	barite, galena, quartz, oxides of Cu-Fe	$BaSO_4$:86.10%	118,000 t	Ordovician	Shales and sandstones	Santa Rosita Formation
79	SALTA	Z-05	Ouebrada Colorada	Cerro Fundiciones	22°29'18"	65°12'11"	Barite-Pb	Veins in faults	barite, galena, quartz			Precambrian	Schists and slates	Puncoviscana Formation
80	SALTA	Z-05	Papachacra	Sierras de Santa Victoria	22°16'07"	64°55'10"	Pb	Veins in faults	galena			Ordovician	Shales and sandstones	Santa Rosita Formation
81	SALTA	Z-05	Parmense, Vizcachani	Abra de Fundiciones	22°24'24"	65°07'14"	Pb-Barite	Veins in faults	barite, quartz	Pb:17%, Cu:1.8-4.9%, Ag:115-360g/t		Ordovician	Shales and sandstones	Santa Rosita Formation
82	SALTA	Z-05	Poscaya	Poscaya, Nazareno	22°26'46"	65°03'01"	Pb-Barite	Veins in faults	barite, galena, quartz, Fe-Mn-oxides		barite:53,000t	Ordovician	Shales and sandstones	Santa Rosita Formation
83	SALTA	Z-05	Río Blanco	Acoite, Sierras de Santa Victoria	22°15'43"	65°00'55"	Pb-Cu-U-Th	Veins in faults	galena, malachite, azurite, barite			Ordovician	Shales and sandstones	Santa Rosita Formation
84	SALTA	Z-05	San José	San Pedro, Río Nazareno	22°34'38"	65°02'29"	Pb-Ag	Veins in faults	galena			Precambrian	Schists, slates, greywackes	Puncoviscana Formation
85	SALTA	Z-05	San Santiago, Agua Blanquita	Pucará, Sierras de Santa Victoria	22°11'44"	65°01'12"	Pb	Veins in faults	galena			Precambrian	Schists, slates	Puncoviscana Formation
86	SALTA	Z-05	Sepultura	Sierras de Santa Victoria	22°12'45"	64°57'40"	Fe	Stratiform, oolitic	hematite, thuringite, biotite, silice hidratada, muscovite, limonite			Silurian	Siltstone, Greywacke	Lipeón Formation
87	SALTA	Z-05	Virgen del Valle	San Pedro, Rio Nazareno	22°38'28"	65°06'51"	Fe	Vein-form	specularite, hematite, limonite			Precambrian	Schist, Slate, Phyllite	Puncoviscana Formation
88	SALTA	Z-06	Baritú	Baritú	22°32'25"	64°45'02"	Fe	Stratiform, oolitic, turbidite	hematite, thuringite, biotite, silice hidratada, muscovite, limonite			Silurian	Siltstone, Greywacke (grey and greenish)	Lipeón Formation
89	SALTA	Z-06	Candelaria	Baritú	22°40'44"	64°46'38"	Fe	Stratiform, oolitic, turbidite	hematite, thuringite, biotite, silice hidratada, muscovite, limonite			Silurian	Siltstone, Greywacke (grey and greenish)	Lipeón Formation
90	SALTA	Z-06	Cuesta de Minas	Los Toldos	22°27'58"	64°44'50"	Fe	Stratiform, oolitic, turbidite	hematite, thuringite, biotite, silice hidratada, muscovite, limonite			Silurian	Siltstone, Greywacke (grey and greenish)	Lipeón Formation
91	SALTA	Z-06	Porongal	Baritú	22°37'04"	64°45'30"	Fe	Stratiform, oolitic, turbidite	hematite, thuringite, biotite, silice hidratada, muscovite, limonite			Silurian	Siltstone, Greywacke (grey and greenish)	Lipeón Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
92	SALTA	Z-06	Quebrada La Misión	Los Toldos	22˚13'47"	64˚42'17"	Phosphates	Stratiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:7%		Ordovician	Quartzite, Sandstone, Lutite	Labrado Formation, Centinela Formation
93	SALTA	Z-06	Río Alisal	Isla de Cañas	22˚42'44"	64˚48'51"	Phosphates	Stratiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:6-7%		Ordovician	Quartzite, Sandstone, Lutite	Labrado Formation, Centinela Formation
94	SALTA	Z-06	Río Astillero	Isla de Cañas	22˚54'47"	64˚50'02"	Phosphates	Stratiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:2.8-7%		Ordovician	Quartzite, Sandstone, Lutite	Labrado Formation, Centinela Formation
95	SALTA	Z-06	Río Lipeo	Río Lipeo, Lipeo	22˚24'36"	64˚45'03"	Phosphates	Stratiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:1%		Ordovician	Quartzite, Sandstone, Lutite	Labrado Formation, Centinela Formation
96	SALTA	Z-06	Rio Porongal	Baritú	22˚34'50"	64˚45'48"	Phosphates	Stratiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:<8.7%		Ordovician	Quartzite, Sandstone, Lutite	Labrado Formation, Centinela Formation
97	SALTA	Z-06	Río San José	Los Toldos	22˚22'57"	64˚44'47"	Phosphates	Stratiform, biocoenose	Shells of Lingula Blachiopodo concentrations			Ordovician	Quartzite, Sandstone, Lutite	Labrado Formation, Centinela Formation
98	JUJUY	Z-07	España, Potosí, Veta Jesuita	Cochinoca	22º 37'	66º 03'	Pb-Ag-Zn	Epithermal, polymetallic, subvolcanic	sphalerite, marcasite, fluorite, pyrite, sederite, galena, alunite, quartz, calcite	Pb:6.4%, Ag:490g/t	87,000t	Middle Miocene	Dacites and andesites	Laguna de Pozuelos Volcanic Complex
99	JUJUY	Z-07	Pan de Azúcar-Potosí-España	Cochinoca	22˚37'54"	66˚02'55"	Pb-Ag-Zn-Sb	Epithermal, polymetallic, subvolcanic	sphalerite, marcasite, fluorite, pyrite, sederite, galena, alunite, quartz, calcite	Pb:4.62%, Zn:6.58%, Ag:0.224kg/t, Sb:0.88%	59,000t	Middle Miocene	Dacites and andesites	Laguna de Pozuelos Volcanic Complex
100	JUJUY	Z-08	Graciela	Sierra de Quichagua	22˚47'	66˚05'	Pb-Zn-(Cu-Ag)	Veins				Ordovician	Lutite, Sandstone	Acoite Formation
101	JUJUY	Z-08	La Esperanza	Sierra de Quichagua	22˚45'	66˚07'	Sb-Zn-Au	Vein		Sb:20%	240,000t (inferred)	Ordovician	Lutite, Sandstone	Acoite Formation
102	JUJUY	Z-08	Tupiza	Escaya, Sierra de Cochinoca	22˚45'01"	66˚05'42"	Pb-Ag-Zn-Cu	Epithermal polymetallic				Ordovician	Sandstones, shales, rhyodacitic porphyries	Cochinoca-Escaya Complex
103	JUJUY	Z-09	Doncellas, San José	Doncellas	22˚53'	66˚01'	Sb-Au-Fe	Epithermal	stibnite, quartz			Neogene tertiary	Dacites and biotitic andesites	Doncellas Formation
104	JUJUY	Z-09	Rachaite (incluya la mina Chocaya)	Rachaite	22º 52'30"	66˚07'52.6"	Pb-Zn-Ag-Mn	Epithermal to mesothermal disseminated polymetallic. Pb, Zn and Ag Veins.	pyrrhotite, pyrite,chalcopyrite, galena, argentite, sphalerite, Ag-minerals	Pb:0.7%, Zn:1.5%, Ag:200ppm	5Mt (total)	Upper Miocene	Dacites, andesites, tuffs, breccias	Doncellas Formation, Alto Laguna Formation
105	JUJUY	Z-09	Yancanacota	Doncellas	22˚51'	66˚02'	Sb-Fe-Mn	Vein				Miocene	Lava, Andesite, Breccia	
106	JUJUY	Z-10	Barcosconte	Cochinoca	22˚41'15"	65˚53'11"	Cu	Vein				Ordovician	Dacitic porphyries, sandstones and shales	Cochinoca-Escaya Complex
107	JUJUY	Z-10	Cerro Chutanay	Sierra de Cochinoca	22˚46'	65˚54'	Pb-Barite	Veins	barite, galena			Ordovician	Sandstones, shales, rhyodacitic porphyries	Cochinoca-Escaya Complex
108	JUJUY	Z-10	Montecristo	Cordón Escaya Cochinoca	22˚38'47"	65˚51'14"	Pb	Veins	barite, galena			Ordovician	Sandstones, shales, rhyodacitic porphyries	Cochinoca-Escaya Complex
109	JUJUY	Z-10	Punta del Quivil	Cochinoca	22˚47'24"	65˚54'48"	Barite	Veins	barite			Ordovician	Rhyodacitic porphyries, sandstones and shales	Cochinoca-Escaya Complex
110	JUJUY	Z-10	Santa Teresita de Jesús	Cochinoca	22˚42'33"	65˚53'36"	Barite	Veins	barite, galena			Ordovician	Rhyodacitic porphyries, sandstones and shales	Cochinoca-Escaya Complex
111	JUJUY	Z-11	Alba	Rumicruz	22˚50'08	65˚34'04"	Cu	Veins	barite, chalcopyrite, malachite			Ordovician	Sandstones and shales	Santa Victoria Group
112	JUJUY	Z-11	Charito, Arbolito	Abra Pampa	22˚43'43"	65˚33'12"	Pb-Barite	Simple veins	barite, galena			Ordovician	Sandstones, siltstones, shales	Santa Victoria Group
113	JUJUY	Z-11	La Purísima, El Brechón, Santo Domingo, Altos Rumicruz	Rumicruz	22˚49'	65˚31'	Cu-Pb-Zn-Ag-Barite	Epithermal polymetallic	chalcocite, chalcopyrite, barite, tetrahedrite, galena, sphalerite, pyrite, niccolite	Cu:6%, Pb:4%, Zn:1.1%, Ag:50g/t		Ordovician	Sandstones and shales	Santa Victoria Group
114	JUJUY	Z-11	El Cóndor, Angelita, Punta de Agua	Abra Pampa	22˚50'	65˚30'	Mn	Fissure and joint filling, Impregnation	psilomelane, pyrolusite			Cretaceous	Sandstone	Pirgua Subgroup
115	JUJUY	Z-11	La Purísima, Trebol, Silvia	Rumicruz	22˚49'33.8"	65˚32'09.8"	Cu-Pb-Barite	Epithermal, polymetallic	chalcocite, chalcopyrite, barite, tetrahedrite, galena, sphalerite, pyrite, niccolite		7,300t (inferred), 31,200t (indicated)	Ordovician	Sandstones, shales and siltstones	Santa Victoria Group
116	JUJUY	Z-11	Mabel, Melliza, Cóndor Huasi	Abra Pampa	22˚42'58"	65˚33'41"	Pb-Barite	Simple veins	barite, galena			Ordovician	Sandstones, siltstones, shales	Santa Victoria Group
117	JUJUY	Z-11	Norma Patricia	Abra Pampa	22˚37'40"	65˚36'45"	Cu	Vein				Ordovician	Sandstones and shales	Acoite Formation
118	JUJUY	Z-11	Rumicruz, Doña Emma, Argentina ll, Don Santiago, Doña Emma, El Rosario, Nona Constanza, Nona María and others	Rumicruz	22˚49'32.3"	65˚32'08.6"	Cu-Pb-Ba-Ni-Co-Zn-Ag-Au	Epithermal, polymetallic	chalcocite, chalcopyrite, barite, tetrahedrite, galena, sphalerite, pyrite, niccolite	Cu:5.5%	234,700t (total)	Ordovician	Sandstones, shales and siltstones	Santa Victoria Group
119	JUJUY	Z-12	7 de Febrero, 5 de Marzo, 2 de Noviembre	Ocloyas	22˚53'	65˚12'	Pb-Zn	Veins in faults	galena, sphalerite, quartz			Ordovician	Shales, Quartzitic sandstones	Santa Victoria Group
120	JUJUY	Z-12	Casillas, Brujo	Casillas	22˚45'15"	65˚21'48"	Barite	Veins				Ordovician	Shales and sandstones	Santa Victoria Group
121	JUJUY	Z-12	Colpayoc	Tres Cruces	22˚49'50"	65˚21'44"	Pb	Veins				Ordovician	Shales and sandstones	Santa Victoria Group
122	JUJUY	Z-12	El Morro, La Descubridora	Ocloyas	22˚53'	65˚16'	Pb-Cu-Zn	Veins		Pb:10%, Ag:174g/t		Ordovician	Sandstones, calcareous siltstones, oolitic limestones	Balbuena Subgroup
123	JUJUY	Z-12	Inti Cancha	Casillas	22˚43'49"	65˚22'02"	Barite	Simple veins				Ordovician	Shales and sandstones	Santa Victoria Group
124	JUJUY	Z-12	Peña Blanca	Casillas	22˚46'57"	65˚24'53"	Cu	Vein				Ordovician	Sandstones and shales	Santa Victoria Group
125	JUJUY	Z-12	Virgen de Luján	Ocloyas	22˚53'	65˚15'	Pb-Cu-Zn-Ag	Veins	galena, quartz	Pb:10%	1,000 t	Cretaceous	Sandstones, calcareous siltstones, limestones	Balbuena Subgroup
126	SALTA	Z-12	Esperanza, Esther (ex. Chacabuco)	Iruya	22˚43'30"	65˚13'03"	Cu-Pb-Zn- Ag-U-Co	Epithermal, polymetallic	chalcopyrite, pyrite, bornite, tetrahedrite, sphalerite, galena, pitchblende	Cu:19-23%, Pb:10-21%, Zn:9.75-10.3%, U_2O_3:0.14-0.37%		Precambrian, Cambrian	Schists, slates. Quartzites	Puncoviscana Formation, Mesón Group
127	SALTA	Z-12	Juanita	Iruya	22˚43'26"	65˚14'11"	Cu	Veins				Precambrian	Schists, quartzites	Puncoviscana Formation
128	SALTA	Z-12	La Soledad	Iruya	22˚41'55"	65˚14'32"	Fe-Cu	Vein				Cambrian	Quartzite	Mesón Group
129	SALTA	Z-12	Las Tolderías	Coranzuli, Iruya	22˚52'18"	65˚11'44"	Barite-Pb	Veins in faults	barite, galena, Fe-oxide, quartz	$BaSO_4$:41.28-98.66%, Pb:27.96%		Precambrian	Schists, slates	Puncoviscana Formation
130	SALTA	Z-12	San Isidro	Iruya	22˚44'15"	65˚13'45"	Pb-Cu	Veins	chalcopyrite, pyrite			Precambrian	Schists, slates, quartzites	Puncoviscana Formation
131	SALTA	Z-12	Viejito, Toroyoc	Iruya	22˚52'	65˚11'	Barite-Pb	Vein				Precambrian	Schist, Slate	Puncoviscana Formation
132	JUJUY	Z-13	Abdon Castro Tolay	Cerros de Pelomoy	23˚15'	66˚09'	Cu	Veins	malachite			Ordovician	Sandstone, Lutite	Chiqueros Formation
133	JUJUY	Z-13	Alto de Minas	Castro Tolay、Río de Barrancas	23˚13'	66˚07'	Cu	Veins	malachite			Ordovician	Quartzite	Chiqueros Formation
134	JUJUY	Z-13	El Peladar	Cerros de Pelomoy	23˚06'	66˚04'	Sn-Pb	Veins				Ordovician	Rhyolitic dike	Acoite Formation
135	JUJUY	Z-14	9 de Julio	Sierra de Tusaquillas	23˚22'	66˚01'	W	Greisen	wolframite, specularite, muscovite, quartz	WO3:2.5% (grade of the whole district)	15,000t (inferred)	Jurassic - Cretaceous	Granodiorite	Tusaquillas Batholith

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
136	JUJUY	Z-14	Abra de Tusaquillas	Sierra de Tusaquillas	23˚12'	66˚02'	W	Greisen	wolframite, specularite, muscovite,			Jurassic - Cretaceous	Granodiorite	Tusaquillas Batholith
137	JUJUY	Z-14	Esperanza, Entre Ríos, Cumbre Blanca	Sierra de Tusaquillas	23˚15'	66˚00'	W	Greisen	wolframite, specularite, muscovite, quartz			Jurassic - Cretaceous	Granodiorite	Tusaquillas Batholith
138	JUJUY	Z-14	Liquinaste	Sierra de Tusaquillas	23˚22'	65˚59'	W	Greisen	wolframite, specularite, muscovite,			Jurassic - Cretaceous	Granodiorite	Tusaquillas Batholith
139	JUJUY	Z-14	Tusaquillas I y II	Sierra de Tusaquillas	23˚11'	65˚59'	W	Greisen	wolframite, specularite, muscovite,			Jurassic - Cretaceous	Granodiorite	Tusaquillas Batholith
140	JUJUY	Z-15	Blanca Flor	Sierra de Aguilar	23˚20'	65˚43'	Barite					Ordovician	Sandstones and shales	Acoite Formation
141	JUJUY	Z-15	Carahuasi, Piscuno, Curzniyoc	Agua Chica (Cerro Colorado)	22˚53'55"	65˚43'00"	Pb	Simple veins	galena, quartz			Ordovician	Sandstones, siltstones, shales	Acoite Formation
142	JUJUY	Z-15	El Aguilar	Sierra de Aguilar	23˚12'21.6"	65˚43'1.4"	Pb-Ag-Zn	SEDEX		Zn:8.4%, Pb:5.5%, Ag:90-120g/t	5Mt (measured), 3.3Mt (minable)	Ordovician - Cretaceous	Quartzites, Granites	Lampazar Formation, Aguilar Formation, Padrioc Formation, Aguilar Granite
143	JUJUY	Z-15	Esperanza	Sierra de Aguilar	23˚09'27.1"	65˚42'25.3"	Pb-Ag-Zn	SEDEX		Zn:12.7%, Pb:4.9%, Ag:100g/t	75,000t			
144	JUJUY	Z-15	La Candelaria	Agua Chica (Cerro Colorado)	22˚52'35.5"	65˚43'42.6"	Pb	Simple veins	galena, quartz			Ordovician	Sandstones, siltstones, shales	Acoite Formation
145	JUJUY	Z-15	Oriental	Sierra de Aguilar	23˚09'	65˚43'	Pb-Ag-Zn	SEDEX						
146	JUJUY	Z-15	Tapada - Fitz Hugh	Sierra de Aguilar	23˚15'	65˚44'	Pb-Ag-Zn	SEDEX						
147	JUJUY	Z-16	Exodo I y II, Cristina, Santa Ana	Cianzo	23° 09'	65° 09'	Pb-Ag-Zn	Polymetallic veins	chalcopyrite, pyrite, bornite, galena			Precambrian	Schists, slates	Puncoviscana Formation
148	JUJUY	Z-16	Mudana (Casa Mocha, Encrucijada, Abra de Minas)	Sierra del Horconal	23˚21'	65˚13'	Pb-Barite	Veins	barite, galena		90,000t	Precambrian	Slates, greywackes, schists	Puncoviscana Formation
149	JUJUY	Z-16	San Marcos	Moya (Uquía)	23˚20'	65˚16'	Barite	Veins	barite			Cambrian	Quartzites	Mesón Group
150	JUJUY	Z-16	Zaira Cristina, Sixilera, Yacoraite, José Eduardo	Uquía	23˚21'	65˚18'	Barite	Veins	barite		60,000 t	Cambrian	Quartzites and shales	Mesón Group
151	JUJUY	Z-17	Noemí Antonina, La Argentina, Santa Bárbara	Cerro El Gigante (Aparzo)	23˚02'	65˚05'	Barite	Veins in faults		Pb:4-11%, Ag:<200g/t		Ordovician	Sandstones, quartzites and shales	Acoite Formation
152	JUJUY	Z-17	Santa Ana, San Rafael	Abra de Zenta	23˚18'	65˚01'	Pb-Cu	Veins	galena, chalcocite, quartz, barite		36,000t - 60,000t (inferred), 7,200t (total)	Ordovician	Sandstones, shales	Centinela Formation
153	SALTA	Z-17	Aidee	Sierra de Zenta	23˚09'	64˚54'	Pb-Barite	Veins in faults				Ordovician	Shales and sandstones	Santa Rosita Formation
154	SALTA	Z-17	Andrés, Agarayo, Molino, Zenta	Sierra de Zenta	23˚06'	65˚00'	Barite-Pb	Veins in faults				Ordovician	Shales and sandstones	Santa Rosita Formation
155	SALTA	Z-17	Constanza, Narcisa	Sierra de Zenta	23˚07'	64˚53'	Pb	Veins in faults				Ordovician	Greywackes, pelites and quartzitic sandstones	Santa Victoria Group
156	SALTA	Z-17	Cristian	Sierra de Zenta	23˚06'	65˚03'	Barite-Pb	Veins in faults				Ordovician	Shales and sandstones	Santa Rosita Formation
157	SALTA	Z-17	Lagunita	Sierra de Zenta	23˚10'	65˚01'	Fe	Veins in faults				Ordovician	Quartzose sandstones, pelitic rocks	Santa Victoria Group
158	SALTA	Z-17	Rosa, Agustín	Sierra de Zenta	23˚13'	64˚58'	Pb	Veins in faults				Ordovician	Greywackes, pelites and quartzitic sandstones	Santa Victoria Group
159	SALTA	Z-17	San Juan, San José	Sierra de Zenta	23˚04'	65˚03'	Barite-Pb	Veins in faults				Ordovician	Shales and sandstones	Santa Rosita Formation
160	SALTA	Z-17	San Martín	Sierra de Zenta	23˚01'	65˚03'	Barite-Pb	Veins in faults				Ordovician	Shales and sandstones	Santa Rosita Formation
161	SALTA	Z-17	Sirio Argentina	Sierra de Zenta	23˚02'	65˚03'	Barite-Pb	Veins in faults				Ordovician	Shales and sandstones	Santa Rosita Formation
162	SALTA	Z-18	El Cardonal, Las Vertientes	Sierra de Rangel	23˚27'	66˚16'	Pb	Veins				Ordovician Tertiary	Greywackes, pelites and quartzitic sandstones. Ignimbrites	Falda Ciénaga Formation
163	SALTA	Z-18	La Colorada	Sierra de Rangel	23˚38'55.7"	66˚17'14.3"	Cu-Pb-Zn- Fe	SEDEX, massive sulphide		Fe: 33-50%, S:20-30%, Cu:0.5%, Zn:0.9-1%, Pb:0.1-1%, Ag:7-10g/t, Au:0.7g/t	12Mt (indicated)	Ordovician	Quartzitic sandstones, greywackes and shales. Granites	Chiqueros Formation, Cobres Granodiorite
164	SALTA	Z-18	La Norteña	Sierra de Rangel	23˚29'	66˚16'	Cu	Veins				Ordovician	Shales, greywackes and quartzitic sandstones	Falda Ciénaga Formation
165	SALTA	Z-19	Pueblo Viejo, Gabriela, Lagunita	San Antonio de los	23˚52'	66˚14'	Au	Alluvial gold	gold			Pleistocene - Holocene	Detrital accumulation	Puncoviscana Formation
166	JUJUY	Z-20	Ra, Isis, Osiris	Cerro Cobres	23˚25'	66˚11'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite	ThO_2:0.02%, ETR:0.08%	1Mt	Ordovician	Lutite	Chiqueros Formation
167	SALTA	Z-20	Curaca-Estrella de Oriente	Cerro Cobres	23˚27'	66˚11'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite	ThO_2:0.45%, ETR+Y:0.6%	6Mt (geological, for all bodies)	Ordovician	Lutite	Chiqueros Formation
168	SALTA	Z-20	El Ucu	Cerro Cobres	23˚32'	66˚15'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite	ThO_2:0.095%, ETR+Y:0.25%		Ordovician, Cretaceous	Greywacke, Quartzite, Pelitic rock, Granite, Alkali-syenite	Acoite Formation, Rangel Formation
169	SALTA	Z-20	La Aurelia	Cerro Cobres	23˚27'	66˚12'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite	ThO_2:0.52%, ETR+Y:0.65%		Ordovician	Granodiorite	Cobres Granodiorite
170	SALTA	Z-20	La Barba	Cerro Cobres	23˚26'	66˚11'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite	ThO_2:0.42%, ETR+Y:0.6%		Ordovician	Granodiorite	Cobres Granodiorite
171	SALTA	Z-20	Plateria	Cerro Cobres	23˚32'	66˚14'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite	ThO_2:0.005-0.2%, ETR+Y:0.03-0.09%		Ordovician	Granodiorite	Cobres Granodiorite
172	SALTA	Z-20	Rangel, Aurelia y otras	Cerro Cobres	23˚34'	66˚15'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite	ThO_2:0.25%, ETR+Y:0.45%		Ordovician	Granodiorite	Cobres Granodiorite
173	SALTA	Z-20	Tierias Raras	Cerro Cobres	23˚29'	66˚13'	REE-Th	Carbonatite dike	thorite, thorianite, galena, chalcopyrite, pyrite, quartz, barite, calcite, hematite			Ordovician	Granodiorite	Cobres Granodiorite
174	JUJUY	Z-21	Aconcagua, Salinas Grandes	Salinas Grandes	23˚36'	65˚52'	Salt	Evaporite				Pleistocene - Holocene	Fine sedimentary beds, Surface saline crust	
175	JUJUY	Z-21	Adrián, Angélica, Cirus,Conrado, Chañi, Silvia	Salinas Grandes	23˚34'	65˚52'	Salt	Evaporite				Pleistocene - Holocene	Fine sedimentary beds, Surface saline crust	
176	JUJUY	Z-21	Borataypc, Ludovica, Eduardo, Federico and others	Salinas Grandes	23˚20'	65˚53'	Borates	Evaporite	ulexite, tincal	B_2O_3:30-35%	622,000t (dry ulexite)	Pleistocene - Holocene	Intercalation of salt beds and fine-detritic sediments	Evaporitic Deposits
177	JUJUY	Z-21	Borateras Jujeñas	Salinas Grandes	23˚45'	65˚58'	Borates	Evaporite	ulexite, tincal			Pleistocene - Holocene	Intercalation of salt beds and fine-detritic sediments	Evaporitic Deposits
178	JUJUY	Z-21	Grupo Buenos Aires, Grupo Cordoba, Grupo Jujuy, Grupo Salta and others	Salinas Grandes	23˚21'	65˚53'	Borates	Evaporite	ulexite, tincal			Pleistocene - Holocene	Intercalation of salt beds and fine-detritic sediments	Evaporitic Deposits
179	JUJUY	Z-21	Grupo Pozo Cavado and others	Salinas Grandes	23˚43'	65˚57'	Borates	Evaporite and nodule	ulexite, tincal	boron anhydride : 30.90%	500,000t (raw borate)	Pleistocene - Holocene	Intercalation of salt beds and fine-detritic sediments	Evaporitic Deposits
180	JUJUY	Z-21	Grupo Tucumán, Grupo Rosario and others	Salinas Grandes	23˚21'	65˚54'	Borates	Evaporite	ulexite, tincal			Pleistocene - Holocene	Intercalation of salt beds and fine-detritic sediments	Evaporitic Deposits
181	JUJUY	Z-21	Ingoen, Molina, Aquadita, Juan Manuel and others	Salinas Grandes	23˚44'	65˚57'	Borates	Evaporite	ulexite, tincal		840,000t (dry borate)	Pleistocene - Holocene	Intercalation of salt beds and fine-detritic sediments	Evaporitic Deposits
182	JUJUY	Z-21	Sócrates, Saturno	Salinas Grandes	23˚36'	65˚53'	Salt	Evaporite				Pleistocene - Holocene	Fine sedimentary beds, Surface saline crust	
183	SALTA	Z-21	Júpiter, Prode, Yoruga, La	Salinas Grandes	23˚44'	66˚02'	Salt	Evaporite	ulexite, tincal			Pleistocene - Holocene	Relleno superior delsalar/	Evaporitic Deposits
184	SALTA	Z-21	Los Andes, Neuquén, Chubut	Salinas Grandes	23˚44'	66˚07'	Borates	Evaporite	ulexite, tincal			Pleistocene - Holocene	Relleno superior del salar/Intercalaci?n de niveles salinos y detr?ticos finos	Evaporitic Deposits
185	SALTA	Z-21	Morro Colorado	Salinas Grandes	23˚40'	66˚10'	Borates	Evaporite	ulexite, tincal			Pleistocene - Holocene	Relleno superior del salar/Intercalaci?n de niveles salinos y detr?ticos finos	Evaporitic Deposits
186	SALTA	Z-21	Niño Muerto, Walterio, San Francisco	Salinas Grandes	23˚43'	66˚12'	Borates	Evaporite	ulexite, tincal			Pleistocene - Holocene	Relleno superior del salar/Intercalaci?n de niveles salinos y detr?ticos finos	Evaporitic Deposits
187	JUJUY	Z-22	Achacanal	San José de Chañi	23° 54'	65˚48'	Barite	Simple veins	barite, calcite			Ordovician	Sandstones and shales	Acoite Formation
188	JUJUY	Z-22	Jarunco, Colorado	Puerta de Colorados	23˚35'	65˚38'	Barite	Simple veins	barite, calcite			Precambrian	Slates, phyllites, schists	Puncoviscana Formation
189	JUJUY	Z-22	La Morenita	Sierra de Chañi	23˚55'	65˚48'	Barite	Simple veins	barite, calcite			Ordovician	Sandstones and shales	Acoite Formation
190	JUJUY	Z-22	La Vasca, Santa María	Lipan	23˚39'	65˚42'	Barite	Simple veins	barite, calcite			Ordovician	Sandstones and shales	Acoite Formation
191	JUJUY	Z-22	Natasia	Lipan	23˚43'	65˚43'	Barite	Simple veins	barite, calcite		44,000t (inferred)	Ordovician	Sandstones and shales	Acoite Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
192	JUJUY	Z-22	Ruth	Sierra de Chañi	23˚52'	65˚43'	Barite	Simple veins	barite, calcite		7,800t (inferred)	Ordovician	Sandstones and shales	Acoite Formation
193	JUJUY	Z-22	Santa Bárbara (Irigoyen)	Sierra Alta	23° 39'	65° 37'	Barite	Simple veins	barite, calcite			Precambrian	Slates, phyllites, schists	Puncoviscana Formation
194	JUJUY	Z-22	Sixto	Lipan	23˚40'	65˚42'	Barite	Simple veins	barite, calcite			Ordovician	Sandstones and shales	Acoite Formation
195	JUJUY	Z-22	Tusca, Saladillo, Pives,	Lipan	23˚40'00"	65˚42'03.2"	Barite	Simple veins	barite, calcite			Ordovician	Sandstones and shales	Acoite Formation
196	JUJUY	Z-23	9 de julio, Venus, Triques, Phobos, Gracia, Europa, Deynos, Compañ era I, II y III, Asia, Arenal, Amé rica I y II, Almona I y II	Sierra Alta	23˚25'	65˚29'	Pb-Ag-Zn	Veins	galena, quartz, barite			Precambrian	Schists, slates, greywackes, phyllites	Puncoviscana Formation
197	JUJUY	Z-23	Arroyo Despensa	Huacalera	23˚27'	65˚29'	Pb	Veins	galena, quartz			Precambrian	Schists, slates	Puncoviscana Formation
198	JUJUY	Z-23	Cieneguillas	Purmamarca	23˚40'	65˚31'	Cu	Vein				Precambrian	Schists, slates and greywackes	Puncoviscana Formation
199	JUJUY	Z-23	Cobre Loma	Purmamarca	23° 41'	65° 31'	Cu	Vein				Precambrian	Schists, slates and greywackes	Puncoviscana Formation
200	JUJUY	Z-23	El Halcón	Yacoraite (Quebrada de Iriquez)	23˚20'	65˚28'	Barite	Vein				Cambrian	Quartzites and shales, basic dikes	Mesón Group
201	JUJUY	Z-23	Hornos	Purmamarca	23˚38'	65º 28'	Cu	Vein				Precambrian	Schists, slates and greywackes	Puncoviscana Formation
202	JUJUY	Z-23	Huichaira	Humahuaca	23˚33'	65˚28'	Cu	Vein	chalcopyrite, pyrite, malachite, quartz			Precambrian	Sand clay schists	Puncoviscana Formation
203	JUJUY	Z-23	María Cristina	Iriquez (Quebrada de Yacoraite)	23˚22'	65˚28'	Barite		barite, galena			Cambrian, Ordovician	Quartzites, quartzitic sandstones, sandstones and shales	Mesón Group, Acoite Formation
204	JUJUY	Z-23	Potrerillos	Quebrada de Yacoraite	23˚18'	65˚26'	Cu	Vein and lenses	chalcosite, malachite			Cambrian	Quartzites, slates and ultrabasic dikes	Mesón Group
205	JUJUY	Z-23	Quebrada de los Toldos	Humahuaca	23˚13'	65˚29'	Cu	Vein				Cambrian	Quartzites y shales	Mesón Group
206	JUJUY	Z-23	Queta Cara, Lidia, Jorge Arturo, Fernando Daniel, Claudia, César Augusto	Humahuaca	23˚23'	65˚25'	Cu	Vein				Precambrian - Cambrian	Schists, slates and quartzites	Puncoviscana Formation, Mesón Group
207	JUJUY	Z-23	San José	Humahuaca	23˚26'	65° 28'	Pb-Zn	Veins				Precambrian	Schists, slates	Puncoviscana Formation
208	JUJUY	Z-23	San José, San Juan	Humahuaca	23˚13'	65˚23'	Pb-Zn	Veins				Cambrian	Quartzites, shales	Mesón Group
209	JUJUY	Z-24	Abra de las Cañas, Yolanda l, ll y	Tumbaya	23˚51'	65˚22'	Pb	Veins	galena, quartz			Precambrian	Schists, slates	Puncoviscana Formation
210	JUJUY	Z-24	Chorrillos	León-Volcán	24˚00'	65˚26'	Cu-Ag-Sb-Pb	Vein and brecciated vein	chalcopyrite, pyrite, bornite, malachite, azurite	Cu:2.9%	74,700t (indicated)	Precambrian	Schists, slates, limestones, phyllites	Puncoviscana Formation
211	JUJUY	Z-24	Coiruro, María Remedios, Nuevo Coiruro, Chiquita	Tumbaya	23˚44'48.2"	65˚29'57.8"	Sb-Au	Epithermal	stibnite, gold, quartz			Precambrian	Schists, slates and greywackes, rhyolitic dikes	Puncoviscana Formation
212	JUJUY	Z-24	Edith Luisa	Purmamarca	23˚45'	65˚35'	Cu	Vein	malachite, chalcopyrite			Precambrian	Phyllitic schists and slates	Puncoviscana Formation
213	JUJUY	Z-24	General Güemes	Tumbaya	23˚48'	65˚28'	Barite	Veins	barite			Precambrian	Schists and slates	Puncoviscana Formation
214	JUJUY	Z-24	La Italiana	León	24˚02'	65˚28'	Pb	Veins	galena, sphalerite, chalcopyrite, pyrite			Precambrian	Schists, slates	Puncoviscana Formation
215	JUJUY	Z-24	Volcán	Volcán	23˚53'	65˚31'	Cu	Vein, lenses and irregular vein		Cu:13.66%		Precambrian	Schists, slates and greywackes	Puncoviscana Formation
216	JUJUY	Z-25	11 de Octubre, Honduras, Pantanillo	Calilegua	24˚12'	65˚04'	Fe	Mantiform, stratiform, oolitic, turbiditic	specularite, thuringite, biotite, hydrated silica, limonite	Typical ore; Fe_2O_3:65%, CaO:0.66%, MgO:0.40%, TiO_2:0.79%, MnO:0.03%, P_2O_5:1.17%, S:0.22%,		Silurian		Lipeón Formation
217	JUJUY	Z-25	Area Mina de hierro 9 de Octubre	Calilegua	24˚14'	65˚05'	Phosphates	Mantiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:2.8-5.9%		Ordovician	Quartzose sandstones, Lutites	Centinela Formation, Labrado Formation
218	JUJUY	Z-25	Cargadero Chauque (Río Capillas)	Calilegua	24˚02'	65˚07'	Phosphates	Mantiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:4.6%	315,000t	Ordovician	Quartzose sandstones, Lutites	Centinela Formation, Labrado Formation
219	JUJUY	Z-25	Cerro Labrado	Calilegua	24˚02'	65˚10'	Fe	Mantiform, stratiform, oolitic, turbiditic	specularite, thuringite, biotite, hydrated silica, limonite	Chemistry of the reserve; Fe:35%, SiO2:37%, S:0.09%,		Silurian	Ferruginous micaceous sandstone, Iron bed	Lipeón Formation
220	JUJUY	Z-25	Mina 9 de Octubre	Calilegua	24˚13'	65˚07'	Fe	Mantiform, stratiform, oolitic, turbiditic	specularite, thuringite, biotite, hydrated silica, limonite	Fe:65.28%, SiO_2:20.27%, S:0.22%, P:1.17%, TiO_2:0.8%		Silurian	Ferruginous micaceous sandstone, Iron bed	Lipeón Formation
221	JUJUY	Z-25	Río Negro	Calilegua	23˚43'	65˚10'	Phosphates	Mantiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:4.11-5.39%		Ordovician	Quartzose sandstones, Lutites	Centinela Formation, Labrado Formation
222	JUJUY	Z-25	Río Ocloyas (Río Catre)	Calilegua	23˚55'	65˚12'	Phosphates	Mantiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:6.3%	41,800t	Ordovician	Quartzose sandstones, Lutites	Centinela Formation, Labrado Formation
223	JUJUY	Z-25	Río Rangel	Calilegua	23˚58'	65˚10'	Phosphates	Mantiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:7.36%		Ordovician	Quartzose sandstones, Lutites	Centinela Formation, Labrado Formation
224	JUJUY	Z-25	Río San Lucas	Calilegua	23˚34'	65˚05'	Phosphates	Mantiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:<14.4%		Ordovician	Quartzose sandstones, Lutites	Centinela Formation, Labrado Formation
225	JUJUY	Z-25	Río Trementinal	Calilegua	23˚51'	65˚12'	Phosphates	Mantiform, biocoenose	Shells of Lingula Blachiopodo concentrations	P_2O_5:3.5%		Ordovician	Quartzose sandstones, Lutites	Centinela Formation, Labrado Formation
226	JUJUY	Z-25	Zapla-9 de Octubre	Calilegua	24˚12'	65˚04'	Fe	Mantiform, stratiform, oolitic, turbiditic	specularite, thuringite, biotite, hydrated silica, limonite			Silurian	Ferruginous micaceous sandstone, Iron bed	Lipeon Formation
227	SALTA	Z-26	Abra del Gallo	Agua de Castilla	24˚19'22"	66˚28'16"	Au	Alluvial gold	gold			Quaternary	Sands	Modern deposits
228	SALTA	Z-26	Acazoque	Agua de Castilla	24˚17'17"	66˚22'42"	Pb	Vein, epithermal	galena, chalcopyrite, tetrahedrite, pyrite, stibnite, barite, quartz, fluorite, cerussite, azurite, malachite, limonite			Ordovician	Granodiorite	Oire Formation
229	SALTA	Z-26	California	La Poma	24˚17'14"	66˚29'02"	Pb-Ag	polymetallic, leptothermal vein	galena, sphalerite, pyrite, chalcopyrite, quartz	Pb:11.02%, Ag:190.8g/t (average of the district)	260,000t (total for Pb+Ag of the district)	Tertiary	Dacites	Agua Caliente Formation
230	SALTA	Z-26	Concordia	Concordia	24˚12'27"	66˚24'19"	Pb-Ag-Zn	polymetallic, meso-epithermal veins	galena, argentite, tetrahedrite, sphalerite, chalcopyrite, pyrite, bornite, acanthite, anglesite, cerussite, limonite,	Pb:5.59%, Zn:1.26%, Cu:0.6%, Ag:490g/t.	270,000t, 40,000t (measured)	Cretaceous	Conglomerates, dacites and dacitic breccias	Pirgua Subgroup, Punta del Viento Formation
231	SALTA	Z-26	El Abra	La Poma	24˚16'50"	66˚28'01"	Sb	Vein, epithermal	stibnite, gold, quartz			Tertiary (Miocene)	Dacite	Agua Caliente Formation
232	SALTA	Z-26	Emilia	Concordia	24˚11'	66˚24'	Pb	polymetallic, meso-epithermal veins	galena, argentite, tetrahedrite, sphalerite, chalcopyrite, pyrite, bornite, acanthite, anglesite, cerussite, limonite,			Cretaceous	Conglomerates	Pirgua Subgroup
233	SALTA	Z-26	Esther	La Poma	24˚15'47"	66˚27'46"	Sb	Vein, epithermal	stibnite, gold, quartz	Sb:2-3%	100,000t	Tertiary (Miocene)	Dacite	Agua Caliente Formation
234	SALTA	Z-26	Farallones	La Poma	24˚16'53"	66˚26'52"	Sb	Vein, epithermal	stibnite, gold, quartz			Tertiary (Miocene)	Dacite	Agua Caliente Formation
235	SALTA	Z-26	Flamarión	Concordia	24˚10'06"	66˚24'19"	Pb	polymetallic, leptothermal vein				Cretaceous	Conglomerates	Pirgua Subgroup
236	SALTA	Z-26	Victoria	Incachule	24˚16'06"	66˚26'55"	Sb	Veins, epithermal	stibnite, quartz, gold, pyrite	Sb:<30%		Tertiary (Miocene)	Dacite	Agua Caliente Formation
237	SALTA	Z-26	La Esperanza, Rosa, La Poma	La Poma	24˚14'33"	66˚28'51"	Pb-Ag-Zn	polymetallic, leptothermal vein	galena, sphalerite, pyrite, chalcopyrite, quartz	Pb:11%, Ag:190g/t	260,000t	Tertiary	Dacites and dacitic tuffs	Agua Caliente Formation
238	SALTA	Z-26	La Olvidada	Aguas Calientes	24˚12'10"	66˚33'38"	Pb	Vein	galena, barite, quartz, limonite, hematite, cerussite			Tertiary (Pliocene)	Andesite	Rumibola Formation
239	SALTA	Z-26	La Paz	Concordia	24˚11'51"	66˚24'21"	Pb-Ag-Zn	polymetallic, meso-epithermal veins	galena, argentite, tetrahedrite, sphalerite, chalcopyrite, pyrite, bornite, acanthite, anglesite, cerussite, limonite,	Pb:14.25%, Zn:2.4%, Cu:0.15%, Ag:337g/t		Cretaceous	Conglomerates, dacites and dacitic breccias	Pirgua Subgroup, Punta del Viento Formation
240	SALTA	Z-26	Matilde	Concordia	24˚11'54"	66˚25'06"	Pb-Ag-Zn	polymetallic, meso-epithermal veins	galena, argentite, tetrahedrite, sphalerite, chalcopyrite, pyrite, bornite, acanthite, anglesite, cerussite, limonite,			Ordovician	Granodiorite, dacites and dacitic breccias	Oire Formation, Punta del Viento Formation
241	SALTA	Z-26	Organullo (placeres)	Organullo	24˚15'11"	66˚20'51"	Au	Alluvial gold	gold			Quaternary	Sands, gravels	Terrace sediments
242	SALTA	Z-26	Polvorilla	Concordia	24˚11'22"	66˚25'29"	Pb-Ag-Zn	polymetallic, meso-epithermal veins	galena, argentite, tetrahedrite, sphalerite, chalcopyrite, pyrite, bornite, acanthite, anglesite, cerussite, limonite,			Tertiary	Dacites and dacitic breccias	Punta del Viento Formation
243	SALTA	Z-26	Recuerdo	Concordia	24˚10'31"	66˚24'06"	Pb-Ag-Zn-Au	polymetallic, meso-epithermal veins	galena, argentite, tetrahedrite, sphalerite, chalcopyrite, pyrite, bornite, acanthite, anglesite, cerussite, limonite,	Pb:1.82%, Zn:9.55%, Cu:1.82%, Ag:130g/t		Cretaceous	Conglomerates	Pirgua Subgroup
244	SALTA	Z-26	Sebastián	Agua de Castilla	24˚17'53"	66˚23'25"	Barite	Vein-form	galena, fluorite, chalcopyrite, quartz			Ordovician	Granodiorite	Oire Eruptive Complex
245	SALTA	Z-26	Sin Nombre	Agua de Castilla	24˚15'	66˚20'	Au	Alluvial gold	gold			Quaternary	Sands, gravels	Terrace sediments

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
246	SALTA	Z-26	Vicuña	Concordia	24°09'20"	66°23'59"	Pb	polymetallic, meso-epithermal veins	galena, argentite, tetrahedrite, sphalerite, chalcopyrite, pyrite, bornite, acanthite, anglesite, cerussite, limonite,			Cretaceous	Conglomerates	Pirgua Subgroup
247	SALTA	Z-27	Cerro Gordo (A. de R. n° 20 - Pastos Grandes)	Pastos Grandes(Nevados de Palermo)	24°32'	66°22'	Au	Disseminated in fracture zone, tectonic breccia	pyrite, chalcopyrite, gold, silica			Precambrian	Slate, Schist, Breccia	Puncoviscana Formation
248	SALTA	Z-27	Diana	Organullo	24°26'	66°15'	Pb-Ag-Zn-Cu	Veins in faults, epithermal	galena, sphalerite, pyrite, chalcopyrite, tetrahedrite, quartz	Ag:302.78g/t, Pb:10.44%, Zn:3.40%	20,000t (total)	Precambrian, Tertiary	Greywackes and phyllites. Dacites and tuffs	Puncoviscana Formation
249	SALTA	Z-27	Don Ignacio	La Poma	24°40'	66°10'	Pb	Veins	galena			Miocene - Pliocene	Continental conglomerates, sandstones and pelites	Payogastilla Group
250	SALTA	Z-27	El Acay	Nevada de Acay	24°29'16.8"	66°11'01.7"	Fe-Cu-Pb-Zn	Skarn, metasomatic	magnetite, pyrite, chalcopyrite, calcite, enstatite, quartz, chlorite, epidote	Fe:<62%		Cretaceous, Oligocene	Garnetiferous skarn, Limestone, Calcareous sandstone, Marl, Granite	Yacoraite Formation, Acay Formation
251	SALTA	Z-27	Encrucijada	Acay	24°29'33"	66°11'10"	Cu-Pb	Epithermal, polymetallic, veins	chalcopyrite, sphalerite, galena, pyrite			Cretaceous	Calcareous sandstones and shales	Yacoraite Formation
252	SALTA	Z-27	Estela, María Inés, María	Capillas	24°30'39"	66°01'05"	Cu	Veins	chalcopyrite, pyrite, malachite	María Inés; Cu:4.7%, Au:0.6g/t, Ag:62g/t		Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
253	SALTA	Z-27	Francisco, Cornejo, San Roque	Las Cuevas	24°21'57"	66°03'04"	Cu	Simple veins associated with plutons	chalcopyrite, bornite, chalcocite, limonite, malachite, barite, quartz, azurite, chrysocolla			Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
254	SALTA	Z-27	Huaico Hondo	Acay	24°28'49"	66°11'26"	Cu-Pb-Zn	Epithermal polymetallic	chalcopyrite, sphalerite, galena, pyrite			Tertiary (Oligocene - Miocene)	Sandstones	Rio Grande Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
255	SALTA	Z-27	Isa I y II, San Santiago	Las Cuevas	24˚22'30"	66˚01'20"	Cu	Simple veins associated with plutons	chalcopyrite, bornite, chalcocite, limonite, malachite, barite, quartz, azurite, chrysocolla			Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
256	SALTA	Z-27	Leonor, Marta, Mercedes	Capillas	24˚29'59"	66˚01'35"	Cu	Simple veins		Martha; Cu:2%, Ag:5g/t		Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
257	SALTA	Z-27	Lucrecita	Las Cuevas	24˚16'31"	66˚04'04"	Cu	Simple veins associated with plutons	chalcopyrite, bornite, chalcocite, limonite, malachite, barite, quartz, azurite, chrysocolla			Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
258	SALTA	Z-27	Milagro	Acay	24˚27'38"	66˚12'01"	Fe(-Cu-Pb-Zn)	Skarn, veinlets, banded, metasomatic	magnetite, pyrite, chalcopyrite, calcite, enstatite, quartz			Cretaceous, Oligocene	Garnetiferous skarn, Limestone, Calcareous sandstone, Marl, Granite	Yacoraite Formation Acay Formation
259	SALTA	Z-27	Nevado de Acay (Area de Reserva No.18)	Acay	24˚28'	66˚10'	Cu-Pb-Zn	Disseminated	pyrite			Precambrian, Cretaceous, Tertiary	Metasediments, Conglomerates and sandstones. Dacitic and rhyodacitic intrusives.	Puncoviscana Formation, Pirgua Subgroup
260	SALTA	Z-27	Organullo	Organullo	24˚16'	66˚21'	Au	Porphyry Au, epithermal	gold			Tertiary	Dacitic and andesitic flows. Dioritic stock	
261	SALTA	Z-27	Organullo (Julio Verne)	Organullo	24˚23'41.9"	66˚19'04"	Au-Bi-Cu-Pb-Zn	Polymetallic veins	pyrite, tetrahedrite, gold, bismuthinite, chalcopyrite, sphalerite, galena, quartz			Precambrian, Tertiary	Slates and schists. Dacitic and andesitic flows. Dioritic stock	Puncoviscana Formation
262	SALTA	Z-27	Pueblo Viejo	Palermo Oeste(La Poma)	24˚42'23"	66˚11'45"	Au	Alluvial gold	gold			Quaternary	Sand	Terrace sediments
263	SALTA	Z-27	Rosario	Acay	24˚30'14"	66˚12'11"	Cu	Epithermal polymetallic	sphalerite, galena, pyrite, chalcopyrite, tetrahedrite			Precambrian	Metasediments	Puncoviscana Formation
264	SALTA	Z-27	Saturno	Acay	24˚28'41"	66˚10'14"	Cu-Ag-Au	Epithermal polymetallic	chalcopyrite, pyrite, gold, galena, sphalerite	Cu:0.9-18%, Ag:300-1,572g/t		Precambrian	Metasediments	Puncoviscana Formation
265	SALTA	Z-27	Señor del Milagro	Las Cuevas	24˚23'18"	66˚01'18"	Cu	Simple veins associated with plutons	chalcopyrite, bornite, chalcocite, limonite, malachite, barite, quartz, azurite, chrysocolla			Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
266	SALTA	Z-27	Sor Rafaela	Las Cuevas	24˚20'07"	66˚04'12"	Cu	Simple veins associated with plutons	chalcopyrite, bornite, chalcocite, limonite, malachite, barite, quartz, azurite, chrysocolla			Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
267	SALTA	Z-27	Torca	Organullo	24˚25'53"	66˚19'33"	Pb-Ag-Cu	Epithermal polymetallic, veins in faults	galena, chalcopyrite, malachite			Tertiary (Pliocene)	Andesites	Rumibola Formation
268	SALTA	Z-27	Virgen del Carmen	Las Cuevas	24˚20'59"	66˚01'29"	Cu	Simple veins associated with plutons	chalcopyrite, bornite, chalcocite, limonite, malachite, barite, quartz, azurite, chrysocolla			Precambrian	Shales, slates, phyllites and quartzites	Puncoviscana Formation
269	SALTA	Z-28	Pancho Arias, Vizcacheral	Finca El Toro (San Bernardo de las Zorras)	24˚15'29.1"	65˚50'40.8"	Mo-Cu-Au	Porphyry Cu-Mo, hydrothermal breccia	pyrite, chalcopyrite, molybdenite, quartz, tourmaline	In surface; Cu:<3,300ppm, Mo:<750ppm, Au:<0.2g/t		Precambrian, Miocene	Leptometamorphic rocks, Dacitic porphyry dikes swarm and intrusive and hydrothermal breccias	Puncoviscana Formation
270	SALTA	Z-29	Carahuasi	Sijes	24˚47'44"	66˚39'03"	Borates	Evaporite	ulexite	B_2O_3:13.08%		Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
271	SALTA	Z-29	Chinchillas	Sijes	24˚56'06"	66˚45'18"	Borates	Evaporite	ulexite			Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
272	SALTA	Z-29	Esparanza	Sijes	24˚40'25"	66˚39'18"	Borates	Fossil evaporite	colemanite, hydrobaracite, inyoite	B_2O_3:28%	100,000t	Miocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Sijes Formation
273	SALTA	Z-29	Monte Azul	Sijes	24˚41'42"	66˚40'31"	Borates	Fossil evaporite	colemanite, hydrobaracite, inyoite			Miocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Sijes Formation
274	SALTA	Z-29	Monte Gris	Sijes	24˚45'16"	66˚40'42"	Borates	Fossil evaporite	colemanite, hydrobaracite, inyoite			Miocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Sijes Formation
275	SALTA	Z-29	Monte Marrón	Sijes	24˚46'23"	66˚41'44"	Borates	Fossil evaporite	colemanite, hydrobaracite, inyoite			Miocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Sijes Formation
276	SALTA	Z-29	Monte Verde	Sijes	24˚43'24"	66˚40'33"	Borates	Fossil evaporite	colemanite, hydrobaracite, inyoite			Miocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Sijes Formation
277	SALTA	Z-29	Pampa Ciénaga, Purmamarca	Sijes	24˚57'01"	66˚44'14"	Borates	Evaporite	ulexite	B_2O_3:<32% (Purmamarca)	324,000t	Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
278	SALTA	Z-29	San Gabriel	Sijes	24˚49'13"	66˚40'17"	Borates	Evaporite	ulexite			Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
279	SALTA	Z-30	Aegyr, La Pichunga, Odin, Thor	Salar de Diablillos	25˚14'40"	66˚45'20"	Borates	Evaporite	ulexite			Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
280	SALTA	Z-30	Coral, Entrerriana, Escorpio, Sur	Salar de Diablillos	25˚15'35"	66˚43'20"	Borates	Evaporite	ulexite	B_2O_3:34.47% (for the salar)	2.25Mt (inferred, for all the salar)	Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
281	SALTA	Z-30	Hipólito, Maria Luisa	Salar de Ratones	25˚08'00"	66˚47'10"	Borates	Evaporite	ulexite		ulexite:1.2 Mt (estimated reserves for whole basin)	Pleistocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
282	SALTA	Z-30	Julián, Marita	Salar de Ratones	25˚09'00"	66˚47'30"	Borates	Evaporite	ulexite			Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
283	SALTA	Z-30	La Despreciada, La Perdida, Santiago	Salar de Diablillos	25°15'50"	66°45'35"	Borates	Evaporite	ulexite			Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
284	SALTA	Z-30	Pascual, Victor Felipe	Salar de Diablillos	25°15'25"	66°44'30"	Borates	Evaporite	ulexite			Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
285	SALTA	Z-30	San Felipe, San Marcelo, Tosca	Salar de Diablillos	25°14'20"	66°44'10"	Borates	Evaporite	ulexite			Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
286	SALTA	Z-30	San Juan, San Pablo, San Pedro, Santo Domingo	Salar de Diablillos	25°15'35"	66°44'25"	Borates	Evaporite	ulexite			Pleistocene - Holocene	Upper filling of salt deposit. Intercalation of saline and fine detrital beds.	Evaporitic Deposits
287	SALTA	Z-31	Diablillos	Salar de Diablillos	25°18'24"	66°48'29"	Au-Cu	High sulfidation, epithermal gold, Porphyry				Miocene	Granitic intrusives, intrusive breccias	Inca Viejo Formation
288	SALTA	Z-31	Inca Viejo (incluye 42 pertenencias)	Abra de Minas	25°07'01.5"	66°46'33.1"	Au-(Cu-Mo)	Porphyry Au-Cu	limonite, pyrite, chalcopyrite, molybdenite, malachite, azurite, chrysocolla, turquoise	In surface; Cu:180ppm, Mo:25ppm		Tertiary (Miocene)	Monzonitic and dacitic porphyries. Intrusive and collapse tourmaline-bearing breccias	Inca Viejo Formation
289	SALTA	Z-31	Soroche, Vulcano	Abra de Minas (Inca	25°07'15"	66°44'55"	Pb-Ag-Zn					Ordovician	Gneisses, schists, granodiorites	Oire Eruptive Complex
290	SALTA	Z-32	Abra de Cuernos	Tacuil	25°32'40"	66°42'45"	Sillimanite	Nodules, venas, metamorphic	aluminosilicate minerals, quartz			Precambrian	Schist, Biotite-gneiss, Quartzose mica schist	Pachamama Igneo-Metamorphic Complex
291	SALTA	Z-32	Berilo I, II, III y IV	Cerro Incahuasi	25°18'45"	66°33'15"	Be-mica	Pegmatite	quartz, microcline, biotite, muscovite, beryl, garnet, tourmaline			Precambrian	Biotite schist, Biotite gneiss	Río Blanco Metamorphic Complex
292	SALTA	Z-32	Casa Grande, Las Juntas	Tacuil	25°30'03"	66°38'05"	Sillimanite	Nodules, venas, metamorphic	aluminosilicate minerals, quartz			Precambrian	Schist, Biotite-gneiss, Quartzose mica schist	Pachamama Igneo-Metamorphic Complex
293	SALTA	Z-32	Cerro Blanco	Tacuil	25°33'25"	66°42'12"	Be Sillimanite	Nodules, venas, metamorphic	aluminosilicate minerals, quartz	Al_2O_3:58-60%	600t (indicated)	Precambrian	Schist, Biotite-gneiss, Quartzose mica schist	Pachamama Igneo-Metamorphic Complex
294	SALTA	Z-32	Cerro Blanco, Olga	Tacuil	25°34'50"	66°42'50"	Be-mica	Pegmatite				Precambrian	Biotite schist, Biotite gneiss	Río Blanco Metamorphic Complex
295	SALTA	Z-32	Cerro Guayitas, Cueva de Funes	Tacuil	25°30'05"	66°41'56"	Sillimanite	Nodules, venas, metamorphic	aluminosilicate minerals, quartz			Precambrian	Schist, Biotite-gneiss, Quartzose mica schist	Pachamama Igneo-Metamorphic Complex
296	SALTA	Z-32	Chaco Huasi	Tacuil	25°30'50"	66°39'22"	Sillimanite	Nodules, venas, metamorphic	aluminosilicate minerals, quartz			Precambrian	Schist, Biotite-gneiss, Quartzose mica schist	Pachamama Igneo-Metamorphic Complex
297	SALTA	Z-32	El Toldo	Tacuil	25°29'45"	66°42'15"	Be-mica	Pegmatite	quartz, microcline, biotite, muscovite, beryl, garnet, tourmaline			Precambrian	Biotite schist, Biotite gneiss	Río Blanco Metamorphic Complex
298	SALTA	Z-32	Patricia	Cerro Incahuasi	25°17'15"	66°33'18"	Be-mica	Pegmatite	quartz, microcline, biotite, muscovite, beryl, garnet, tourmaline			Precambrian	Biotite schist, Biotite gneiss	Río Blanco Metamorphic Complex
299	SALTA	Z-32	Puesto Excursionera	Tacuil	25°28'00"	66°42'40"	Sillimanite	Nodules y venas y tambien como rodados enterrazas y faldeos	aluminosilicate minerals, quartz			Precambrian	Schist, Biotite-gneiss, Quartzose mica schist	Pachamama Igneo-Metamorphic Complex
300	SALTA	Z-33	Aguas Calientes	Sierra de Cachi	24°44'41"	66°20'31"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
301	SALTA	Z-33	Anzotana	Sierra de Cachi	24°49'	66°18'	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
302	SALTA	Z-33	El Peñón	El Quemado	24°50'23"	66°19'29"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
303	SALTA	Z-33	El Quemado	El Quemado	24°50'42"	66°21'11"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
304	SALTA	Z-33	Elvirita	El Quemado	24°45'27"	66°20'32"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
305	SALTA	Z-33	María Eugenia, María Isabel	Cachi	25°04'05"	66°17'00"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian	Slate, Schist, Phyllite, Greywacke	La Paya Formation
306	SALTA	Z-33	Peñas Blancas	El Quemado	24°57'38"	66°18'29"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
307	SALTA	Z-33	Santa Elena	El Quemado	24°49'30"	66°20'31"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene	Ta_3O_5+Nb_2O_5:0.01-0.035%	5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
308	SALTA	Z-33	Tres Tetas	El Quemado	24°53'06"	66°18'03"	Nb-Ta-Li-Bi-Be	Pegmatitic	niobite, tantalite, microlite, bismuth, bismuthinite, lepidolite, spodumene		5Mt (for the district)	Precambrian - Lower Cambrian	Slate, Schist, Phyllite, Trondhjemite Pluton, Pegmatite	Puncoviscana Formation, Cachi Formation
309	SALTA	Z-34	Brealito (A. de R. n° 24)	Brealito	25°18'02"	66°20'35"	Cu					Precambrian, Cretaceous	Metasediments, Porphyritic body	Puncoviscana Formation
310	SALTA	Z-34	El Monte	Brealito	25°21'55"	66°23'10"	Cu	Stratabound Cu	malachite, azurite			Cretaceous	Sandstones and pelites	Pirgua Subgroup
311	SALTA	Z-34	Emma Olga	Cachi	25°08'	66°24'	Pb	simple veins				Precambrian	Slates, schists, phyllites. Granites	La Paya Formation, Cachi Formation
312	SALTA	Z-34	Incauca	Cerro Incauca (Cachi)	25°09'58"	66°24'00"	Pb-Ag	simple veins				Cretaceous	Conglomerates and sanstones	Pirgua Subgroup
313	SALTA	Z-34	Magdalena Amencay, Santiaguito	La Paya	25°11'08"	66°14'40"	Pb	Veins				Precambrian	Slates, schists, phyllites	La Paya Formation
314	SALTA	Z-34	San Antonio	Luracatao	25°15'03"	66°24'00"	Pb-Ag	Veins				Precambrian	Slates, schists, phyllites	La Paya Formation
315	SALTA	Z-34	Santa Julia	Cachi	25°13'25"	66°16'15"	Pb-Ag	Veins				Precambrian	Slates, schists, phyllites	La Paya Formation
316	SALTA	Z-34	Titi Orco	Seclantás	25°14'25"	66°14'00"	Pb	Veins				Precambrian	Slates, schists, phyllites	La Paya Formation
317	SALTA	Z-35	Don Bosco	Cachi	25°06'12"	66°00'50"	U-V	Stratabound, Tabular				Cretaceous	Micaceous calcareous sandstone, Oolitic limestone, Sandy	Yacoraite Formation
318	SALTA	Z-36	Don Otto	Quebrada de Ovejería	25°38'	65°54'	U-V	Stratabound, Tabular	autunita, metaautunita, carnotita, tyoyamonita	U:1.05‰ (average of the district) V_2O_5:0.02-0.24%	584,709t (total of the district)	Cretaceous	Micaceous calcareous sandstone, Oolitic limestone, Sandy limestone	Yacoraite Formation
319	SALTA	Z-36	Los Berthos	Quebrada de Ovejería	25°24'	65°57'	U-V	Stratabound, Tabular	fojfouraniuta, uranofano, pitchblende	U:1.44‰ (average), V_2O_5:0.40-0.64%		Cretaceous	Micaceous calcareous sandstone, Oolitic limestone, Sandy	Yacoraite Formation
320	SALTA	Z-36	M.M. De Guemes	Quebrada de Ovejería	25°22'	65°58'	U-V	Stratabound, Tabular		V_2O_5:0.20%		Cretaceous	Micaceous calcareous sandstone, Oolitic limestone, Sandy	Yacoraite Formation
321	SALTA	Z-36	Pedro Nicolás	Quebrada de Ovejería	25°30'	65°57'	U-V	Stratabound, Tabular		V_2O_5:0.01%		Cretaceous	Micaceous calcareous sandstone, Oolitic limestone, Sandy	Yacoraite Formation
322	SALTA	Z-37	Emmy, El Leñadero, El Desecho	Sierra Alisar	25°41'	65°30'	U-V	Stratabound, Tabular		U:0.08-1.36‰ (El Leñ adero) , U:0.03‰ (El Desecho)		Cretaceous	Micaceous calcareous sandstone, Oolitic limestone, Sandy limestone	Yacoraite Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
323	SALTA	Z-37	La Despedida	Sierra Alisar	25°54'	65°30'	U	Stratabound, Tabular			4.86Mt with 1,700t of U_3O_8	Cretaceous	Micaceous calcareous sandstone, Oolitic limestone, Sandy	Yacoraite Formation
324	SALTA	Z-38	Casualidad lll	Cafayate	26°01'	66°11'	Cu	Veins				Precambrian	Metamorphic rocks	Tolombón Metamorphic Complex
325	SALTA	Z-38	Los Cardones	Vallecito (Finca Pucara)	25°56'10"	66°10'40"	Cu	Veins				Precambrian	Schists, slates and greywackes	Puncoviscana Formation
326	SALTA	Z-38	Vallecito (A. de R. nº 25) (mina San Francisco I y II)	Vallecito (Finca Pucara)	25°55'50"	66°17'05"	Cu	Stratabound Cu		Cu:0.05-1%		Ordovician, Cretaceous	Migmatites, granites. Conglomerates, sandstones	Oire Eruptive Complex, Pirgua Subgroup
327	CATAMARCA	Z-39	Languna del Salitre	Laguna Aparoma	26°14'	66°53'	Pb-Zn	Vein				Miocene	Monzodiorite	Salitre Formation
328	SALTA	Z-39	Margarita, Zorriquín	La Yesera	25°58'	66°41'	Cu	Stratabound Cu	malachite, azurite			Cretaceous	Sandstones and conglomerates	Pirgua Subgroup
329	SALTA	Z-39	Tres Morritos	Cafayate	26°12'	66°46'	Cu	Stratabound	malachite, azurite			Miocene - Pliocene	Continental pelitic, sandy and conglomerate levels	Payogastilla Group
330	CATAMARCA	Z-40	El Yocavil	Sierra de Los Patos Grandes	26°37'	66°05'	Muscovite	Pegmatitic and lenticular				Upper Precambrian	Gneiss, Schist	Tolombón Formation (Piscoyacu Gneiss)
331	CATAMARCA	Z-40	María Arsenita, San Alfredo	Sierra de Los Patos Grandes	26°27'	66°08'	Kaoline	Pegmatitic, Tabular				Upper Precambrian - Lower Carboniferous	Schist, Granite	La Cébila Formation, El Manchao Pluton
332	SALTA	Z-40	17 de Octubre	Sierra de Los Patos Grandes	26°08'	66°07'	Mica	Pegmatite	quartz, microcline, biotite, muscovite, beryl, tourmaline			Precambrian	Schist, Gneiss, Quartzite	Tolombón Metamorphic Complex
333	SALTA	Z-40	La Vieja	Sierra de Los Patos Grandes	26°13'	66°06'	Mica	Pegmatite	quartz, microcline, biotite, muscovite, beryl, tourmaline			Precambrian	Schist, Gneiss, Quartzite	Tolombón Metamorphic Complex
334	TUCUMAN	Z-40	Don Sixto, Tintillo y otras	Sierra de Los Patos Grandes	26°29'	66°06'	Mica	Pegmatitic and lenticular			2t	Upper Precambrian	Gneiss, Migmatite	Piscoyacu Formation
335	TUCUMAN	Z-40	Graciela (ex Milagro), Alejandra, Victor Hugo, Facundo, Cueva de Bazán, Alto Cazadero I, II, III, IV	Sierra de Los Patos Grandes	26°22'	66°05'	Mica	Pegmatitic, Lenticular			790t	Upper Precambrian	Gneiss, Migmatite	Piscoyacu Formation
336	TUCUMAN	Z-40	Talapazo I,II,III,IV, La Plegada, Las Cañas and others	Sierra de Los Patos Grandes	26°27'	66°04'	Mica	Pegmatitic and lenticular			850t	Upper Precambrian	Gneiss, Migmatite	Piscoyacu Formation
337	TUCUMAN	Z-40	Juliana	Sierra de Los Patos Grandes	26°23'	66°03'	Be	Pegmatitic, Lenticular				Upper Precambrian	Gneiss, Migmatite	Piscoyacu Gneiss
338	TUCUMAN	Z-40	Las Cañas	Sierra de Los Patos Grandes	26°21'	66°07'	Be	Pegmatite				Upper Precambrian	Gneiss, Migmatite	Piscoyacu Gneiss
339	TUCUMAN	Z-41	Las Canas(ex La Rosa)	Sierra de Los Patos Grandes	26°21'	66°07'	Cu-Pb-Zn-Au	Disseminated		Cu:1%, Au:1.5-2.6g/t		Upper Precambrian	Gneiss, Migmatite	Piscoyacu Gneiss
340	TUCUMAN	Z-41	Pañas Coloradas (ex. San Carlitos)	Sierra de Los Patos Grandes	26°26'	66°01'	Cu-Au-Pb-Zn	Disseminated		Cu:0.8%, Au:1.5-2.5g/t		Upper Precambrian	Gneiss, Migmatite	Piscoyacu Gneiss
341	CATAMARCA	Z-42	Andrés	Cerro Medano Blanco	26°56'	66°56'	Pb	Vein				Upper Miocene	Breccia	La Hoyada Formation
342	CATAMARCA	Z-42	Cuevas Negras	Cerro Medano Blanco	26°56'	66°56'	Pb-Ag-Cu	Vein		Cu:0.07%, Pb:1.75%, Ag:291g/t (rock chips)		Upper Miocene	Breccia	La Hoyada Formation
343	CATAMARCA	Z-42	Culanpaja	Cerro Medano Blanco	27°02'	66°58'	Au-(W)							
344	CATAMARCA	Z-42	Don Cirilo	Cerro Medano Blanco	26°55'	66°51'	Pb-Ag	Vein		Ag:65g/t		Upper Cambrian - Lower Ordovician	Schist, Phyllite, Slate, Limestone, Granite	Grupo
345	CATAMARCA	Z-42	Dona Martina, La Marcos, La Pilar, La Tomasita, La Zaragozana, La Rosalía, Cóndor	Cerro Medano Blanco	26°55'	66°51'	Pb-Ag	Vein				Upper Cambrian - Lower Ordovician	Schist, Phyllite, Slate, Limestone, Granite	Cachiñán Group (parcial)
346	CATAMARCA	Z-42	El Aragonés, Don Enrique, Piedra Calzada	Cerro Medano Blanco	26°58'	66°52'	W-Sn	Vein				Upper Cambrian - Lower Ordovician	Schist, Phyllite, Slate	Cachiñán Group (parcial)
347	CATAMARCA	Z-42	El Moradito, Gutiérrez, Tajo Largo, El Ingenio, El Rosario	Culampajá	26°56'00"	66°56'30"	Au	Vein	gold, pyrite, chalcopyrite, sphalerite, arsenopyrite, malachite, azurite, Fe-oxide, quartz	Au:10.2g/t, Ag:2g/t		Upper Ordovician - Silurian	Granite	Chango Real Formation
348	CATAMARCA	Z-42	Eusebio	Cerro Medano Blanco	26°56'	66°56'	Pb	Vein				Upper Miocene	Andesite	La Hoyada Formation
349	CATAMARCA	Z-42	Granatita, La Cuesta	Cerro Medano Blanco	26°57'	66°50'	Garnet	Lentiform				Ordovician	Crystalline limestone, Meta-sediments	Cachiñán Group (parcial)
350	CATAMARCA	Z-42	Gutiérrez, Tajo Largo, El Ingenio, El Rosario	Cerro Medano Blanco	26°58'	66°58'	Au	Vein				Upper Ordovician - Silurian	Granitic orthogneiss	Chango Real Formation
351	CATAMARCA	Z-42	La Argentina	Cerro Medano Blanco	26°55'	66°51'	Pb-Ag	Vein		Ag:129g/t		Upper Cambrian - Lower Ordovician	Schist, Phyllite, Slate, Limestone, Granite	Cachiñán Group (parcial)
352	CATAMARCA	Z-42	La Cobriza, Ojo de Agua	Cerro Medano Blanco	26°54'30"	66°51'00"	Cu	Skarn	chalcopyrite, pyrite, Cu-oxide	Cu:12-13%		Upper Cambrian - Lower Ordovician	Schists and Limestones	Cachiñán Group (parcial)
353	CATAMARCA	Z-42	La Preciosa Argentina	Cerro Medano Blanco	26°57'	66°50'	Topaz	Tabular				Ordovician	Metasediments	Cachiñán Group (parcial)
354	CATAMARCA	Z-42	María Magdalena	Cerro Medano Blanco	26°56'	66°56'	Pb-Cu	Vein				Upper Miocene	Andesite	La Hoyada Formation
355	CATAMARCA	Z-42	Negra Dorada	Cerro Medano Blanco	26°55'	66°51'	Pb-Ag	Vein		Pb:6%, Zn:2%, Ag:70-377g/t		Upper Cambrian - Lower Ordovician	Schist, Phyllite, Slate, Limestone, Granite	Cachiñán Group (parcial)
356	CATAMARCA	Z-42	Piedra Calzada	Cerro Medano Blanco	26°48'	66°51'	Cu-Bi-Pb-Zn-W	Pegmatitic, Tabular				Upper Cambrian - Lower Ordovician	Schist, Slate, Phyllite	Cachiñán Group (parcial)
357	CATAMARCA	Z-42	San Isidro, La Banda (Grupo La Mesada)	Cerro Medano Blanco	26°58'	66°56'	W	Vein				Upper Cambrian - Lower Ordovician	Slate, Phyllite	Cachiñán Group (parcial)
358	CATAMARCA	Z-42	Tiburcio, El Enrejado	Cerro Medano Blanco	26°57'	66°50'	Fluorite	Tabular body				Ordovician		Chango Real Formation, Cachiñán Group (parcial)
359	CATAMARCA	Z-42	Vaca Vizcana	Cerro Medano Blanco	26°47'30"	66°49'30"	Cu - Au	Porphyry Cu	pyrite, chalcopyrite, bornite, gold, native copper, bornite, pyrrhotite, rutile, magnetite, malachite, azurite, covellite, limonite			Miocene, Upper Ordovician - Silurian	Intrusives, Andesitic porphyry dikes and Granite	El Aspero Formation, Chango Real Formation
360	CATAMARCA	Z-43	Agua Rica (ex Mi Vida)	Farallón Negro	27°22'00"	66°17'30"	Cu-Mo-Pb-Zn-Ag-Au	Porphyry Cu, High sulfidation epithermal	pyrite, covellite. bornite, enargite, molybdenite, galena, sphalerite, marcasite, rhodochrosite, sulfur	Cu:0.61%, Au:0.24g/t, Ag:3.17g/t, Mo:0.035%	802Mt (geological)	Upper Miocene	Igneous breccia, hydrothermal breccias	Canudo Breccia
361	CATAMARCA	Z-43	Agua Tapada	Agua de Dionisio	27°15'30"	66°41'15"	Au	Epithermal, low sulfidation	gold bearing pyrite, chalcopyrite, galena, sphalerite, quartz, calcite, barite	Au:2.2g/t, Ag:174g/t		Upper Miocene	Andesitic breccias and Quartz andesites	Farallón Negro Volcanic Complex
362	CATAMARCA	Z-43	Alto de la Blenda	Agua de Dionisio	27°18'30"	66°39'30"	Au-Ag-Mn	Epithermal, low sulfidation	native gold, argentite, polybasite, tetrahedrite, galena, sphalerite, chalcopyrite, pyrite, bornite, Mn-carbonate, quartz, calcite, pyrolusite, psilomelane	Au:4g/t, Ag:70g/t	745,000t, 1,834t (average)	Upper Miocene	Monzonite and Andesite	Farallón Negro Volcanic Complex
363	CATAMARCA	Z-43	Bajo de Agua Tapada	Farallón Negro	27°16'	66°39'	Cu-Au							
364	CATAMARCA	Z-43	Bajo de la Alumbrera	Agua de Dionisio	27°19'00"	66°37'30"	Cu-Au	Porphyry Cu	pyrite, chalcopyrite, magnetite, hematite, specular iron, molybdenite, bornite, sphalerite, covellite, marcasite	Cu:0.52%, Au:0.67g/t(Probable); Cu:0.52%, Au:0.58g/t (Possible)	550,680,000t (Probable); 114,410,000t (Possible)	Upper Miocene	Andesitic breccia, Andesitic tuff, Andesitic dikes and sills, Quartz andesitic stock and dikes	Farallón Negro Volcanic Complex
365	CATAMARCA	Z-43	Bajo de San Lucas	Farallón Negro	27°24'	66°33'	Cu-(Au-Mo)							
366	CATAMARCA	Z-43	Bajo El Durazno	Agua de Dionisio	27°17'13"	66°34'25"	Cu-Au	Porphyry Cu	pyrite, chalcopyrite, gold, molybdenite, magnetite, galena, bornite, azurite	Cu:0.12%, Au:0.32g/t	2,000,000t (Estimated)	Upper Miocene	Rhyodacitic stock	Farallón Negro Volcanic Complex
367	CATAMARCA	Z-43	Bajo Las Juntas	Farallón Negro	27°26'30"	66°32'00"	Cu-Au	Porphyry Cu	pyrite, chalcopyrite, gold, malachite, magnetite, covellite			Upper Miocene	Andesite	Farallón Negro Volcanic Complex
368	CATAMARCA	Z-43	Bajo Las Pamplitas	Agua de Dionisio	27°19'00"	66°39'00"	Au-Ag	Porphyry Cu	pyrite, galena, magnetite, bornite, Mn-oxides	Cu:1,100ppm Cu:2,150ppm		Upper Miocene	Rhyodacite, breccia pipe	Farallón Negro Volcanic Complex
369	CATAMARCA	Z-43	Bajo San Lucas	Agua de Dionisio	27°24'00"	66°33'00"	Cu-Au	Porphyry Cu	pyrite, chalcopyrite, molybdenite, magnetite	Cu:0.26-0.06%, Au:0.35-0.14g/t		Upper Miocene	Dacitic and dioritic porphyries	Farallón Negro Volcanic Complex
370	CATAMARCA	Z-43	Carmen	Farallón Negro	27°19'	66°29'	Au-Ag-(W)							
371	CATAMARCA	Z-43	Carmelitas, Ortiz	Farallón Negro	27°20'	66°23'	Rhodochrosite-capillitite	Vein			5,393t	Upper Miocene	Rhyolite, Tuff, Volcanic breccia	Pachamama Igneo-Metamorphic Complex
372	CATAMARCA	Z-43	Cerro Atajo	Farallón Negro	27°18'	66°29'	Au-(Bi-Cu)							

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
373	CATAMARCA	Z-43	Farallón Negro	Agua de Dionisio	27º18'00"	66º39'30"	Au-Ag-Mn	Epithermal, low sulfidation	pyrite, sphalerite, chalcopyrite, galena, quartz, native gold, argentite, polibasite, tenorite, pyrolusite, psilomelane, calcite, Mn- carbonate			Upper Miocene	Andesitic breccias and Monzonite	
374	CATAMARCA	Z-43	Filo Colorado	Farallón Negro	27°33'	66°13'	Cu-Au-Mo	Porphyry Cu	gold bearing pyrite, chalcopyrite, molybdenite, chalcocite, bornite,	Cu:0.3-0.5%, Au:0.3g/t, Mo:200ppm	9,000,000t (Possible)	Ordovician, Upper Miocene	Granite, Dolerite and Dacites	Canudo Breccia
375	CATAMARCA	Z-43	Grupo Capillitas (Rosario, Capillitas, Restauradora, Veta 9, La Grande, Ortiz, Luisita and	Farallón Negro	27°20'	66°23'	Cu-Au-Pb-Zn-Ag	Disseminated, veinlets, filling, massive, chimney and vein		Cu:2.32%, Pb:1.62%, Au:2.66g/t, Ag:108g/t (grades of 3 veins)	387,000t (measured), 675,000t (inferred)	Upper Miocene	Volcanic breccia, Rhyolite, Tuff	Farallón Negro Volcanic Complex
376	CATAMARCA	Z-43	La Grande, Ortiz, Luisita and others	Capillitas	27º20'00"	66º22'30"	Cu-Pb-Au-Ag-Rhodochrosite	Polymetallic	pyrite, enargite, tennantite, chalcopyrite, chalcocite, sphalerite, galena, marcasite, gold, arsenopyrite, galena, bismutite, digenite, idaite, quartz, rhodochrosite, calcite, barite	Cu:2.32%, Au:2.6g/t, Ag:108g/t (grades of 3 veins)	387,000t (indicated), 675,000t (inferred) rhodochrosite is not considered.	Upper Miocene	Volcanic breccia	
377	CATAMARCA	Z-43	La Josefa	Agua de Dionisio	27°19'	66°38'	Cu	Epithermal, low sulfidation	chalcopyrite, pyrite, Fe-oxides, bornite, galena, sphalerite, carbonates, gypsum, quartz	Au:4-5g/t, Ag:7-11g/t		Upper Miocene	Andesitic breccias and Andesites	Farallón Negro Volcanic Complex
378	CATAMARCA	Z-43	Las Juntas	Cerro Atajo	27º18'30"	66º28'30"	Cu	Polymetallic	pyrite, chalcopyrite, sphalerite, enargite, chalcocite,quartz, galena	Cu:0.2%	14Mt	Upper Miocene	Andesite, Breccia, Tuffs	
379	CATAMARCA	Z-43	Los Viscos	Agua de Dionisio	27°18'	66°40'	Au-Ag-Mn	Epithermal, low sulfidation	carbonate, quartz	Au:13.75g/t, Ag:114g/t		Upper Miocene	Andesite and Andesitic breccias	Farallón Negro Volcanic Group
380	CATAMARCA	Z-43	Macho Muerto	Agua de Dionisio	27°18'	66°40'	Au-Ag-Mn	Epithermal, low sulfidation	pyrite, sphalerite, chalcopyrite, galena, quartz, gold, argentite, polybasite, tenorite, pyrolusite, psilomelane	Au:<1g/t		Upper Miocene	Andesitic and rhyodacitic breccias	Farallón Negro Volcanic Group
381	CATAMARCA	Z-43	Morro Bola	Agua de Dionisio			Au-Ag	Epithermal	Mn-oxides, quartz, carbonate			Upper Miocene	Andesite	
382	CATAMARCA	Z-43	Santo Domingo	Agua de Dionisio	27°18'	66°40'	Au	Epithermal, low sulfidation	gold bearing pyrite, Fe-oxides, Mn-oxides, pyrite, quartz, gypsum			Upper Miocene	Andesitic breccias	Farallón Negro Volcanic Group
383	CATAMARCA	Z-43	Secto Atajo	Cerro Atajo	27º18'30"	66º28'30"	Cu-Au	Porphyry Cu-Au	pyrite, hematite, chalcocite, chalcopyrite, gold	Cu:0.15%	70Mt	Upper Miocene	Dacitic porphyry	
384	CATAMARCA	Z-43	Sector Carmen	Cerro Atajo	27º18'30"	66º28'30"	Au-Ag-W	Epithermal	wolframite, native gold, gold bearing pyrite, Ag-sulfides, sphalerite, chalcopyrite, pyrite, Mn-oxides, quartz, rhodochrosite	Au:25g/t, Ag:42.7g/t, W:1.8kg/t	25,700t (Probable)	Upper Miocene	Andesitic tuffs, dacitic porphyry	Farallón Negro Volcanic Group
385	CATAMARCA	Z-43	Sector Maria Eugenia	Cerro Atajo	27º18'30"	66º28'30"	Cu-Pb-Zn-Au-Ag	Polymetallic	native gold, pyrite, chalcopyrite, tetrahedrite, tennantite, chalcocite, sphalerite, enargite	Cu:9%, Au:1.8g/t, Ag:90g/t	150,000t (Probable)	Upper Miocene	Andesitic breccias and Dacitic tuffs	Farallón Negro Volcanic Group
386	CATAMARCA	Z-43	Sector Salto Morado - San Antonio	Cerro Atajo	27º18'30"	66º28'30"	Cu-Au-Ag	Epithermal	pyrite, chalcopyrite, gold, quartz	Cu:0.4-0.5%	Salto Morado:<20,000 t	Upper Miocene	Andesite, Breccia, Tuffs	Farallón Negro Volcanic Group
387	CATAMARCA	Z-43	Sector Triunfo	Cerro Atajo	27º18'30"	66º28'30"	Cu-Ag-Au	Polymetallic	pyrite, chalcopyrite, enargite, sphalerite, chalcocite, quartz, rhodochrosite	Cu:5%, Au:1.4g/t, Ag:75g/t	18,748t (Probable)	Upper Miocene	Pyroclastic andesite	Farallón Negro Volcanic Group
388	CATAMARCA	Z-44	Andacolla	Belén	27°50'	67°27'	W-(Sb-Mo)							
389	CATAMARCA	Z-44	Del Valle	Belén	27°37'	67°04'	W-(Bi)							
390	CATAMARCA	Z-44	Del Valle, Gloria, La Cuestionada (Grupo Del Valle)	Belén	27°38'	67°05'	W	Vein/pasaje apegmatoide		WO_3:4%	1.12Mt (inferred)	Precambrian - Lower Cambrian	Slate, Phyllite	Capillitas Granite
391	CATAMARCA	Z-44	El Progreso Argentino and others	Belén	27°37'	67°19'	Sn							
392	CATAMARCA	Z-44	Las Champas (Grupo El Fraile)	Belén	27°38'	67°20'	Sn	Vein				Upper Precambrian - Upper Ordovician - Silurian	Schist, Granite	Famabalasto Formation, Chango Real Formation
393	CATAMARCA	Z-44	Las Pircas	Belén	27°53'	67°28'	Sn	Vein				Upper Precambrian - Carboniferous	Granite, Granite porphyry, Schist	Famabalasto Formation, Los Ratones Pluton
394	CATAMARCA	Z-44	Porvenir Argentino, San Nicolás, Santa Marta, Camela, La Nieve and others (Grupo El Fraile)	Belén	27°40'	67°20'	Sn	Vein				Upper Precambrian - Upper Ordovician - Silurian	Granite, Schist	Famabalasto Formation, Chango Real Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
395	CATAMARCA	Z-44	Progreso Argentino (Grupo El Fraile)	Belén	27˚38'	67°19'	Sn	Vein				Upper Precambrian - Upper Ordovician - Silurian	Schist, Granite	Famabalasto Formation, Chango Real Formation
396	CATAMARCA	Z-44	San Antonio, Santa Delia, Trece (Grupo San Antonio)	Belén	27˚49'	67°13'	W	Vein		WO3:4%	4,050t (indicated); 966t (inferred)	Upper Devonian	Granite	San Antonio Pluton
397	CATAMARCA	Z-44	San Cristóbal	Belén	27˚46'	67°19'	Sn	Vein				Upper Ordovician - Silurian	Granite	Chango Real Formation
398	CATAMARCA	Z-44	San Pedro, San Felipe, Hernán Cortéz	Belén	27˚53'	67°28'	Sn	Guias				Upper Precambrian	Schist, Gneiss	Famabalasto Formation, Chango Real Formation
399	CATAMARCA	Z-44	San Ramon and others	Belén	27˚42'	67°15'	Sn	Vein/Ore pockets				Upper Ordovician - Silurian	Granite, Adamellite	Chango Real Formation
400	CATAMARCA	Z-44	Vil Achay	Belén	27˚53'	67°28'	Sn	Filling		Sn:0.9-1.38%	25,730t (inferred); 115,930t (indicated)	Upper Cambrian - Lower Ordovician, Carboniferas	Granite, Gabbro-norite	Granito VII Achay Complejo Noritic o Fiambalá
401	TUCUMAN	Z-46	El Alisal	El Alisar	26˚50'18"	65˚34'40"	Cu- Au	Porphyry Cu	chalcopyrite, pyrite, sphalerite, magnetite, pyrrhotite, hematite, molybdenite, tenorite, Cu-oxides	Cu: 49-820ppm, Pb: 44ppm, Au:75-185ppb		Ordovician / Miocene	Andesitic porphyry, andesites, breccias	Mala Mala Granodiorite
402	TUCUMAN	Z-47	El Pago		27˚05'	65°54'	Cu-Au-Pb-Zn	Disseminated	pyrite, chalcopyrite, sphalerite,galena			Upper Precambrian	Gneiss, Migmatite	Piscoyacu Gneiss
403	CATAMARCA	Out of zones	Morro Blanco		26˚56'	66°49'	Crystalline limestone	Tabular				Ordovician	Metasediments	Cachiñán Group (parcial)
404	CATAMARCA	Out of zones	Visvil		27˚28'	66°30'	Fe	Vein-form		Fe:59.20 %	800,000t (indicated)	Precambrian - Cambrian	Greywacke, Pelitic rock	Suncho Formation
405	CATAMARCA	Out of zones	El Vasquito and others		27˚30'	65°52'	Mn							
406	CATAMARCA	Out of zones	Agua de Las Palomas, La Chilca, San Esquiú		27˚37'	66°30'	Muscovite	Pegmatitic				Precambrian	Gneiss, Migmatite, Injected schist	Gneiss del Suncho Formation
407	CATAMARCA	Out of zones	Suda Mineral		27˚42'	66°03'	Muscovite	Pegmatitic, Lenticular				Upper Precambrian	Gneiss, Migmatite, Injected schist	Gneiss del Suncho Formation
408	JUJUY	Out of zones	Tafna and others		22˚05'	65˚45'	Mn	Veinlets, Impregnation, Lenticular	pyrolusite, psilomelane			Quaternary	Sandstone, Conglomerate, Tuff	Tafna Formation
409	JUJUY	Out of zones	Yuraj, La Merced, Firj, La Lucha	Tafna	22˚06'42"	65˚44'57"	Kaoline	Mantiform, Lenticular		Al_2O_3:22%, Fe_2O_3:4.6%	1.23Mt (measured); 467,567t (indicated); 355,182t (inferred)	Pleistocene	Tuff, Conglomerate, Sandy conglomerate	Tafna Formation
410	JUJUY	Out of zones	Casablanca I, II y III, Marita	Tafna	22˚07'41"	65˚44'05"	Mn	Veinlets, Impregnation, Lenticular	pyrolusite, psilomelane			Quaternary	Sandstone, Conglomerate, Tuff	Tafna Formation
411	JUJUY	Out of zones	Silvana Luisa	Tafna	22˚07'41"	65˚44'05"	Mn	Veinlets, Impregnation, Lenticular	pyrolusite, psilomelane	Mn:10-15%	350,000t (measured+inferred)	Quaternary	Sandstone, Conglomerate, Tuff	Tafna Formation
412	JUJUY	Out of zones	Caballito Blanco	Tafna	22˚07'48"	65˚44'45"	Kaoline	Mantiform, Lenticular				Pleistocene	Tuff, Conglomerate, Sandy conglomerate	Tafna Formation
413	JUJUY	Out of zones	Cantera Lecho, Cantera 7 de Mayo, Cantera Exodo	Yavi	22˚08'	65˚29'	Limestone-travertine-onix	Stratiform				Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation
414	JUJUY	Out of zones	Cantera San Francisco	Yavi	22˚08'	65˚29'	Limestone-travertine-onix	Stratiform	limestone, oolite, onix			Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation
415	JUJUY	Out of zones	Cantera Gabriel, Cantera Elbar	Yavi	22˚09'	65˚30'	Limestone-travertine-onix	Stratiform	limestone, oolite, onix			Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation
416	JUJUY	Out of zones	La Casualidad, La Constanza	Escaya	22˚12'06"	65˚44'18"	Fe	Vein-form				Ordovician	Dacitic and rhyodacitic porphyry	Cochinoca-Escaya Complex
417	JUJUY	Out of zones	Esquina Blanca		22˚17'35"	65˚32'06"	Diatomite	Lentiform, lagunar		50% defr?stulos de diatomeas		Pleistocene	Sandstone, Micaceous sandstone, Pelitic rocks	
418	JUJUY	Out of zones	Bellavista, La Gitana, Pachamama		22˚18'38"	65˚32'10"	Kaoline	Mantiform, Lenticular				Pleistocene	Tuff, Conglomerate, Sandy conglomerate	Tafna Formation
419	JUJUY	Out of zones	Chocoite I, II y III	Chocoite	22˚22'06"	65˚46'25"	Kaoline	Stratiform				Pleistocene	Tuff, Conglomerate, Sandy conglomerate	Tafna Formation
420	JUJUY	Out of zones	Tacanaite		22˚25'03"	65˚46'52"	Kaoline	Mantiform, Lenticular				Pleistocene	Tuff, Conglomerate, Sandy conglomerate	Tafna Formation
421	JUJUY	Out of zones	Alumbre		22˚30'	65˚33'	Sb	Vein				Ordovician	Grey slate, Quartzitic sandstone	Acoite Formation
422	JUJUY	Out of zones	Cantera Beatriz, Cantera Piedra Blanca		22˚39'	65˚36'	Limestone	Stratiform				Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation
423	JUJUY	Out of zones	El Sombrero	Cochinoca	22˚42'	66˚05'	Fe	Hydrothermal	hematite, limonite			Ordovician, Tertiary, Quaternary	Lutite, Sandstone, Volcanite	Acoite Formation
424	JUJUY	Out of zones	Peñas Negras		22˚42'	66˚06'	Fe	Vein-form				Ordovician	Lutite, Sandstone, Volcanite	Acoite Formation
425	JUJUY	Out of zones	Positiva		22˚42'04"	65˚59'57"	Mn	Veinlets, Impregnation, volcannogenic sediments	psilomelane, limonite			Ordovician	Sandstone, Lutite, Rhyodasitic porphyry	Cochinoca-Escaya Complex
426	JUJUY	Out of zones	Iral, Pabelloncito		22˚49'	66˚01'	Mn	Veinlets, Impregnation, Lenticular, volcannogenic sediments	psilomelane, limonite			Upper Miocene	Tuff breccia, Andesite	Doncellas Formation
427	JUJUY	Out of zones	Queta		22˚50'	66˚00'	Mn	Lense, veinlets, cemented, volcannogenic sediments	psilomelane, limonite			Pleistocene	Conglomerate, Sandstone	
428	JUJUY	Out of zones	San José, Doncellas	Doncellas	22˚53'	66˚02'	Mn	Veinlets, Impregnation, Lenticular, volcannogenic sediments	psilomelane, limonite			Upper Miocene	Lava, Andesitic breccia	Vicuñahuasi Formation
429	JUJUY	Out of zones	Cantera Las Alamos	Tres Cruces	22˚55'	65˚35'	Limestone	Stratiform	limestone, oolite			Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation
430	JUJUY	Out of zones	Toimate		22˚55'	65˚50'	Mn	Vein/Impregnation				Tertiary	Sandstone, Tuff, Dacitic tuff	Doncellas Formation
431	JUJUY	Out of zones	Corral Blanco	Tres Cruces	22˚55'43"	65˚25'06"	Barite	Veins	barite, galena			Ordovician	Shales and sandstones	Santa Rosita Formation
432	JUJUY	Out of zones	Cantera Cerro Tres Tomos	Tres Cruces	22˚56'	65˚31'	Limestone	Stratiform	limestone, oolite			Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
433	JUJUY	Out of zones	Cantera La Cueva	Tres Cruces	22°56'	65°23'	Limestone	Stratiform	limestone, oolite			Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation
434	JUJUY	Out of zones	Casayoc		22°56'49"	65°23'52"	Fe	Veinlets/Impregnation	hematite			Cambrian	Quartzite	Chalhualmayoc Formation
435	JUJUY	Out of zones	Cantera La Cumbre, Cantera Elbar		22°59'	65°28'	Limestone	Stratiform				Cretaceous	Oolitic limestone, Marl, Calcareous sandstone	Yacoraite Formation
436	JUJUY	Out of zones	Cerrillos, Luisa Stael		22°59'27"	65°19'19"	Fe	Veinlets/Impregnation	hematite			Cambrian	Quartzite	Mesón Group
437	JUJUY	Out of zones	Valle Grande		23° 34'	64° 53'	Pb-Ag-Zn	Veins				Cretaceous - Tertiary	Calcareous sandstones, limestones, marls	Balbuena Subgroup
438	JUJUY	Out of zones	Yacoraite	Río Yacoraite	23°21'	65°24'	Fe	Lentiform, Massive	hematite			Cambrian, Cretaceous	Quartzite, Sandstone	Mesón Group, Yacoraite Formation
439	JUJUY	Out of zones	Santa Julia	A. Castro Tolay	23°23'	66°02'	Pb-Barite	Veins	galena, quartz, barite		97,480t (total)	Jurassic - Cretaceous	Granodiorites	Castro Tolay Stock
440	JUJUY	Out of zones	Cantera Cueva del León, Cantera Cueva del Tigre, Cantera Susques	Susques	23°27'	66°18'	Travertine-onix	Mantiform	travertine		5,200t	Ordovician, Tertiary	Sandstone, Lutite, Andesite	Acoite Formation
441	JUJUY	Out of zones	Cantera Juella, Cantera Amarilla	Tilcara	23°31'	65°28'	Limestone	Stratiform	limestone, oolite			Cretaceous	Oolitic and stromatolitic limestone, Calcareous limestone	Yacoraite Formation
442	JUJUY	Out of zones	Cantera María Amanda, Cantera María	Tilcara	23°35'	65°26'	Gypsum (Alabaster)	Evaporite	alabaster		3,778t (inferred-indicated)	Upper Cretaceous	Sandstone, Siltstone, Silty shale	Mealla Formation
443	JUJUY	Out of zones	Cantera Maimará, Cantera Adriana, Cantera Silvia, Cantera	Maimará	23°37'	65°24'	Limestone	Stratiform	limestone, oolite		35.000 t	Cretaceous	Oolitic and stromatolitic limestone, Calcareous limestone	Yacoraite Formation
444	JUJUY	Out of zones	Cantera Agua Chica	Tumbaya	23°47'	65°30'	Dolomite	Lentiform			600.000 t	Precambrian	Dolomite, Slate, Schist, Volcanic rocks	Tumbaya Member of Volcan Formation (Puncoviscana Formation)
445	JUJUY	Out of zones	Santa Teresita, Santa María	Tumbaya	23°47'	65°30'	Mn	Lenticular, Impregnaction, volcannogenic sediments	pyrolusite, psilomelane		1,500t (indicated)	Cambrian, Cretaceous	Lutite, Slate, Quartzite, Limestone, Calcareous	Mesón Group, Yacoraite Formation
446	JUJUY	Out of zones	Tumbaya Grande	Tumbaya	23°48'	65°30'	Mn	Ore pocket, Impregnation		Mn:18%		Cambrian, Cretaceous	Lutite, Slate, Quartzite, Limestone, Calcareous	Mesón Group, Yacoraite Formation
447	JUJUY	Out of zones	Zona del Ramal		23°50'	66°20'	Au	Alluvial gold	gold				Fluvial sediments	Acoite Formation
448	JUJUY	Out of zones	Cantera Volcán (Bárcena)	Volcán	23°57'	65°26'	Crystalline limestone	Stratiform	limestone			Precambrian	Metamorphosed limestone (micrite and microsparite)	Volcán Formation (Puncoviscana Formation)
449	JUJUY	Out of zones	Victoria (Yungara)	Yungara	23° 33'	66° 30'	Pb-Ag-Zn	Veins	galena			Upper Cretaceous - Lower Tertiary	Sandstones, conglomerates, dacites	Pirgua Subgroup
450	JUJUY	Out of zones	La Betty, Sol de Mañana, María Teresa, La Eva		24°02'55"	66°29'00"	Sulfur-gypsum	Solfatara, Impregnation, Vein, Cavity filling		S:22.6%	551.000 t	Pliocene - Pleistocene	Tuff	Tuzgle Efusive Suite
451	JUJUY	Out of zones	Tuzgle		24°03'	66°29'	Sulfur-gypsum	Solfatara, Impregnation, Vein, Cavity filling				Pliocene - Pleistocene	Tuff	Tuzgle Efusive Suite
452	JUJUY	Out of zones	León		24°03'	65°26'	Kaoline	Mantiform, Lenticular						
453	JUJUY	Out of zones	La Regalona		24°07'	65°12'	Kaoline	Mantiform, Lenticular						
454	JUJUY	Out of zones	Tocomar		24°11'	65°32'	Kaoline	Mantiform, Lenticular						
455	JUJUY	Out of zones	Electra, Mafalda, Marleta, Pompeya, Rosana, San Antonio, Valeria, Viviana	Sierra de Chañi	24°20'	65°30'	Cu	Vein				Precambrian - Cambrian	Schists, slates and quartzites	Santa Rosita Formation
456	JUJUY	Out of zones	El Porvenir	Cerro Purma	24°20'	65°35'	Pb-Cu-Zn	Epithermal polymetallic		Pb: 7.5% , Ag: 125g/t	12,000 t	Cambrian, Ordovician	Quartzites, sandstones, shales	Mesón Group, Acoite Formation
457	JUJUY	Out of zones	Claudia		24°22'	65°24'	Kaoline	Mantiform, Lenticular						
458	JUJUY	Out of zones	Videncia	San Antonio (Cerro Negro)	24°25'	65°27'	Barite					Precambrian	Slates, schists and phyllites	Puncoviscana Formation
459	JUJUY / SALTA	Out of zones	La Novedad, Volcán (Tocante)	Río Yacoraite	23°17'	65°29'	Th-Mn-REE-Pb	Vein, Ore pockets, Brecciated vein	galena, pyrolusite	ThO_2:0.51% (La Novedad); U_3O_8:0.01%, REE:0.64%	Th:15t (geological) REE:20t (geological)	Ordovician	Lutite, Quartzitic sandstone, Basic dikes	Acoite Formation
460	SALTA	Out of zones	Río Lipeo	Lipeo	22°28'34"	64°39'50"	Au	Acumulaciones de conchillas de Lingulas	gold					
461	SALTA	Out of zones	La Sureña		23°31'	66°16'	Fe	Vein-form				Ordovician	Greywacke, Lutite	Falda Ciénaga Formation
462	SALTA	Out of zones	Nueva Esperanza		23°44'	66°19'	Fe	Vein-form				Ordovician	Greywacke, Lutite	Falda Ciénaga Formation
463	SALTA	Out of zones	El Milagro, La Caldera I, II y III	La Caldera	24° 36'	65° 29'	Pb	Veins	galena, quartz			Precambrian	Slates, phyllites, greywackes	Puncoviscana Formation
464	SALTA	Out of zones	Ana María, Esteban		24°04'29"	66°06'40"	Mn	Impregnation, Vein, Manto	pyrolusite, psilomelane	Mn:30-44%	3,400t	Cretaceous, Quaternary	Limestone, Sandstone, Conglomerate	Yacoraite Formation, Modern deposit
465	SALTA	Out of zones	Orión		24°06'	66°13'	Kaoline							
466	SALTA	Out of zones	El Pato, La Pava, Anta, Ciervo, Guanaco, El Suri		24°08'	66°20'	Perlite (Volcanic glass)	Irregulary stratiformed body				Tertiary (Pliocene)	Rhyolitic pyroclastic deposits, ameboidales lava flow	
467	SALTA	Out of zones	El Sol I y II		24°08'	66°20'	Perlite (Volcanic glass)	Irregulary stratiformed body				Tertiary (Pliocene)	Rhyolitic pyroclastic deposits, ameboidales lava flow	
468	SALTA	Out of zones	Maurice, Ivani, Peca, María and others	Cerro Purma	24°12'	65°53'	Barite	Veins				Precambrian	Schists, slates and greywackes. Granites	Puncoviscana Formation, Tastil Formation
469	SALTA	Out of zones	Amanta, Trinidad		24°13'	66°15'	Kaoline							
470	SALTA	Out of zones	Los Patos		24°14'26"	66°10'57"	Pozzolana				7Mt	Tertiary (Pliocene)	Ignimbrite, Tuff	Abra del Gallo Formation
471	SALTA	Out of zones	Incachule (Julio Cesar, Victoria)		24°16'15"	66°27'34"	Mn	Fissure filling	pyrolusite, psilomelane			Tertiary (Miocene)	Andesite	Rumibola Formation
472	SALTA	Out of zones	La Escondida	El Queva	24°19'15"	66°51'48"	Pb	Vein	galena			Tertiary	Dacitic porphyry, Tuff, Ignimbrite	Agua Caliente Formation

Ser.No.	Province	Zone	Name of mine	District	Latitude	Longitude	Elements	Type	Minerals	Grade	Resources	Age	Lithology	Unit
473	SALTA	Out of zones	San Pedro, Cardonal	Cerro Purma	24°20'	65°42'	Pb	Veins	galena, quartz			Ordovician	Shales and sandstones	Acoite Formation
474	SALTA	Out of zones	Inca, Virgen del Rosario		24°21'	65°54'	Fe	Vein-form			124.000t (inferred)	Precambrian	Slate, Schist, Quartzite, Granodiorite	Puncoviscana Formation, Quesera Formation
475	SALTA	Out of zones	Aries		24°21'	65°58'	Mn	volcannogenic sediments	pyrolusite, psilomelane			Quaternary	Conglomerate, Sandstone with travertine beds	Modern deposits
476	SALTA	Out of zones	Virgen del Valle, Jesús, San José	Las Cuevas	24°21'	66°01'	Mn	volcannogenic sediments	pyrolusite, psilomelane			Quaternary	Conglomerate, Sandstone with travertine beds	Modern deposits
477	SALTA	Out of zones	Cleopatra		24°22'	66°18'	Kaoline							
478	SALTA	Out of zones	Trinl		24°25'	66°23'	Perlite (Volcanic glass)	Irregulary stratiformed body				Tertiary (Pliocene)	Andesite	Rumibola Formation
479	SALTA	Out of zones	Cueva Real	San Antonio de los Cobres	24°26'	66°19'	Kaoline							
480	SALTA	Out of zones	Bordo de la Cueva		24°26'	66°08'	Mn	Mantiform, impregnation,volcannogenic sediments				Quaternary	Conglomerate, Sandstone with travertine beds	Modern deposits
481	SALTA	Out of zones	Elsa		24°27'	66°16'	Borates	Fossil evaporite				Pleistocene	Pelite, Evaporite, Travertine, Borates	Blanca Lila Formation
482	SALTA	Out of zones	Coquemayo, Emma		24°27'	66°16'	Perlite (Volcanic glass)	Irregulary stratiformed body				Tertiary (Pliocene)	Andesite, Dacite, Pyroclastics	
483	SALTA	Out of zones	Tina, Justa		24°27'53"	66°25'25"	Perlite (Volcanic glass)	Irregulary stratiformed body				Tertiary (Pliocene)	Andesite, Dacite, Pyroclastics	
484	SALTA	Out of zones	El Cedro		24°28'	66°30'	Mn	Vein/Impregnation				Ordovician, Quaternary	Ryodacitic porphyry, Grandiorite, Conglomerate,	Oire Eruptive Complex
485	SALTA	Out of zones	San Fernando, Reconquista	La Caldera	24°28'	65°28'	Pb-Ag	Veins	galena, quartz			Precambrian, Cambrian	Slates, phyllites, greywackes. Quartzites	Puncoviscana Formation, Mesón Group
486	SALTA	Out of zones	San Justo, Laguna Seca, Olga, Stella and others	Las Cuevas	24°28'02"	66°29'30"	Mn	Lense, veinlets	pyrolusite, psilomelane	Mn:20%	80,000t	Quaternary	Conglomerate, Sandstone	Terrace sediments
487	SALTA	Out of zones	San Carlos	Las Cuevas	24°30'02"	66°29'30"	Mn	Lense, veinlets	pyrolusite, psilomelane			Quaternary	Conglomerate, Sandstone	Modern deposits
488	SALTA	Out of zones	El Sauce	La Merced	24°35'	65°09'	Limestone	Stratiform	limestone, oolite			Cretaceous, Quaternary	Oolitic limestone, Travertine	Yacoraite Formation, El Sauce Formation
489	SALTA	Out of zones	Plateada	Quebrada del Rio Toro (El Gólgota)	24°39'	65°47'	Pb-Ag	Veins	galena, quartz			Precambrian	Greywackes, pelites, schists	Puncoviscana Formation
490	SALTA	Out of zones	Ochaqui (19 Pertenencias)		24°40'07"	66°29'26"	Mn-Fe	Sub-concordant manto, Irregulares, Vein/veinlets, Impregnation	pyrolusite, psilomelane	Mn:9.7%, Fe_2O_3:6.3%	201,289t	Tertiary (Pliocene)	Tuff, Conglomerate, Breccia, Sandstone	Abra del Gallo Formation
491	SALTA	Out of zones	Pozo Bravo		24°43'26"	66°12'28"	Travertine-onix				1,800t	Pleistocene - Holocene	Hydatogenic limestone	
492	SALTA	Out of zones	Cerro Negro		24°51'42"	66°39'50"	Cu	Vein				Ordovician	Granite	Oire Eruptive Complex
493	SALTA	Out of zones	Ciénaga Grande		24°54'02"	66°37'38"	Mn	Impregnation, Vein				Quaternary	Sands, Tuff	Talus deposits
494	SALTA	Out of zones	El Carmen, Los Pinos, El Tarco, Mojón Paco, San Cayetano, San	La Merced	24°55'	65°24'	Limestone	Stratiform	limestone, oolite			Cretaceous	Calcareous sandstone, Oolitic limestone, Sandy marl	Yacoraite Formation, Lecho Formation
495	SALTA	Out of zones	La Cañadita		24°56'	65°27'	Limestone	Stratiform				Cretaceous	Calcareous sandstone, Oolitic limestone, Sandy marl	Yacoraite Formation, Lecho Formation
496	SALTA	Out of zones	Citrus		24°57'	65°28'	Limestone	Stratiform				Cretaceous	Calcareous sandstone, Oolitic limestone, Sandy marl	Yacoraite Formation, Lecho Formation
497	SALTA	Out of zones	Mi Esperanza		24°58'	65°28'	Limestone	Stratiform				Cretaceous	Calcareous sandstone, Oolitic limestone, Sandy marl	Yacoraite Formation, Lecho Formation
498	SALTA	Out of zones	Santa Elena		24°58'	65°28'	Limestone	Stratiform				Cretaceous	Calcareous sandstone, Oolitic limestone, Sandy marl	Yacoraite Formation, Lecho Formation
499	Salta	Out of zones	El Tarador	Guachipas	25° 38'	65° 23'	Au	Mesothermal Au veins	gold, quartz			Precambrian	Slates, phyllites, greywackes	Puncoviscana Formation
500	SALTA	Out of zones	Los Manantiales	Cafayate	25°03'	66°30'	Mica	Pegmatite	tourmaline, quartz, microcline, biotite, muscovite, beryl			Ordovician	Granodiorite, Rhyodacitic porphyry	Oire Eruptive Complex
501	SALTA	Out of zones	Quebrada de Escoipe		25°10'	65°50'	Cu		malachite, azuritre, chalcocite					
502	SALTA	Out of zones	Custodio, San Martín, Salamanca	Quebrada de Escoipe	25°10'	65°49'	Cu	Stratabound Cu	malachite, azuritre, chalcocite	Cu: 0.7 %	152,000 t	Cretaceous	Conglomerates and arcosic sandstones	Santa Bárbara Subgroup
503	SALTA	Out of zones	La Pachamamita	Guachipas	25°35'	65°24'	Au	Mesothermal Au veins				Precambrian	Slates, phyllites, greywackes	Puncoviscana Formation
504	SALTA	Out of zones	Doña Inés	Alemanía	25°38'	65°37'	Cu-Fe	Stratabound Cu				Cretaceous	Conglomerates and sandstones	Pirgua Subgroup
505	SALTA	Out of zones	Maria Elena, Azul, Las Coyas	Alemanía	25°56'	65°42'	Cu	strata-bound				Precambrian, Cretaceous	Schists, shales and sandstones. Conglomerates	Puncoviscana Formation, Pirgua Subgroup
506	SALTA	Out of zones	Eudosia, La Gauchita	Cafayate	26°06'	66°28'	Mica	Pegmatite	tourmaline, quartz, microcline, biotite, muscovite, beryl			Ordovician	Granite, Granodiorite	Oire Eruptive Complex
507	TUCUMAN	Out of zones	Sector Volcán Azul		26°11'	65°40'	Au-Ag	Vein				Upper Precambrian - Lower Cambrian	Slate, Phyllite, Sandstone	Puncoviscana Formation
508	TUCUMAN	Out of zones	Salinas de Amaicha		26°35'	65°57'	Salt	Impregnation				Tertiary	Sandstone	
509	TUCUMAN	Out of zones	Peñas Azules		26°39'	65°40'	Limestone	Stratiform		$CaCO_3$:87-92 %	15.6 Mt (measured)	Precambrian - Lower Paleozoic	Gneiss, Limestone	Peñas Azules Formation
510	TUCUMAN	Out of zones	Cerros El Negrito y Bayos		26°43'	65°42'	Au-Ag	Vein/Disseminated					Granodiorite, Biotite-quartz-schist	
511	TUCUMAN	Out of zones	Abra del Toro		27°00'	65°58'	Cu-Au	Disseminated				Upper Precambrian	Gneiss, Migmatite	Piscoyacu Gneiss
512	TUCUMAN	Out of zones	Las Mercedes (Chavarría)		27°35'	65°54'	W-(Cu-Pb-Zn)	Disseminated				Upper Precambrian	Gneiss, Migmatite	Piscoyacu Gneiss

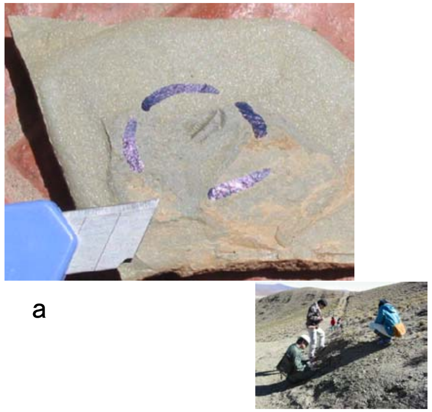
Table A-6a List of mega fossil

No.	Date	Sample No.	Lat (D)	Lat (M)	Lat (S)	Lon (D)	Lon (M)	Lon (S)	Alt. (m)	District	Locality	Unit	Formation	Identification	Age
1	30-Oct-01	A01TKF01	23	13	12.9	65	38	10.6	3845	Aguilar			Lampasar fm.	*Parabolina(Neoparabolina) frequens argentina* (Asaphida) [ex Parabolina argentina(kaysus)] Photo-1a	Uppermost Canbrian-Lowermost Ordovician
2	01-Nov-01	A02TKF02	22	23	20.5	65	64	23.8	3950	La Cienaga				*Asaphid* (Asaphida) Photo-2	Ordovician
3	07-Nov-01	A01TK057	23	39	57.8	65	42	1.4	4094	Tusca			Meson G. or St.Victoria G.	Articuleta, Inarticuleta Photo-3 (outcrop)	Lower Tremadocian or Uppermost Canbrian-Lowermost Ordovician
4	31-Oct-02	A02RF055	22	6	51.3	65	8	57.5	-	Santa Victoria	Viscachani			*Parabolina (Neoparabolina) frequens argentina* (kayser) *Angelina hyeronini* (Trilobite) Pygidium(tail part) of asafidos Phoot-4	Upper Cambrian - Lower Tremadocian
5	28-Oct-02	A02TK013	23	17	39.1	65	46	37.8	-	Aguilar			Lampasar fm.	Identical to A02KK051 Adelograptus(Graphtolite) -Possible Photo-5a,b	Tremadocian
6	28-Oct-02	A02KK051	23	17	39.3	65	46	37.8	-	Aguilar	NW part of Aguilar mountain		Lampasar fm.	Mollusca; Gastropoda Peelerophon oehlerti(Bergeron) Photo-6	Lower Ordovician
7	28-Oct-02	A02KK052	23	13	7.6	65	38	10	-	Aguilar	Quebrada. Amarillo/hi ll		Lampasar fm.	*Angelina hyeronini* *Parabolina(Neoparabolina) freguens argentina* *Micragnostus hoeki* KOBAYASHI Rusophycus (traces fossils) Traces of trilobites Same locality of A01TKF01 Photo-7	Upper Cambrian - Lower Tremadocian
8	29-Oct-02	Graptolites1							-	Aguilar	Quebrada. Amarillo/hi ll		Acoite fm.	Baltograptus sp. and Didymograptus sp (fragments) (Identified by Dr. Guillermo L. Albanesi) Photo-8	late Lower Ordovician (early Arenig age)

Identifier; (Triobite etc.) Prof.Susana Malanca, Catedra de Paleontologia General, Escuela de Geologia, Universidad Nacional de Salta
(Graptlite) Dr. Guillermo L. Albanesi, CONICET - Museo de Paleontología, Universidad Nacional de Córdoba

We are grateful to Professor Susana Malanca and Doctor Guillermo L. Albanesi for their cooperation.

Table A-6b Photo of mega fossil



a

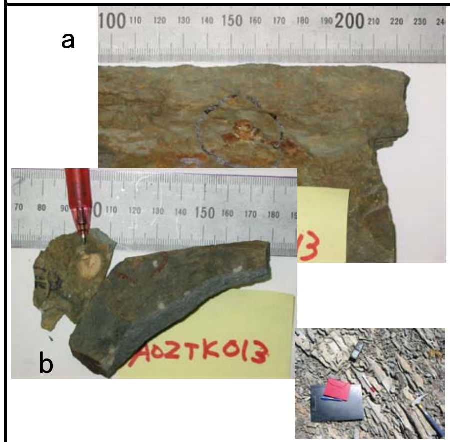
b

Photo−1: A01TKF01

Photo−2: A02TKF02

Photo−3: A01TK057

Photo−4: A02RF055



a

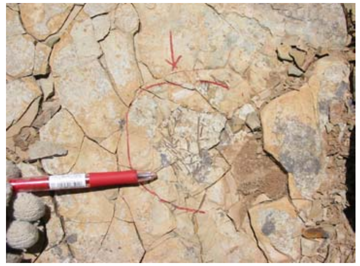
b

c

Photo−5: A02TK013

Photo−6: A02KK051

Photo−7: A02KK052



Photo−8: graptolites1

Table A-7 List of collected data

No.	Title	Language	Author	Year	Organization	Category	Comments	Source
1 DGFM(1975)	INFORME FINAL, AREA DE RESERVA No.25 "VALLECITO"	Spanish	J. Darocca	1975/12	Direccion General de Fabricaciones Militares, Subdireccion de Desarrollo Minero, Departamento Geologia y Mineria	VALLECITO	Geology and mineraliztion of Vallecito area including geochemistry and geophysics.	Guillou
2 Ministerio de Industria y Mineria, Subsecretaria de Mineria.	PEDIDO DE ZONA DE RESERVA No.34, ZONA: "LAGUNA DEL SALITRE", MOSAICO: 19-A1 y 19-B1, Provincia: CATAMARCA	Spanish	O. Gonzales	????	Ministerio de Industria y Mineria, Subsecretaria de Mineria, NOA 1 GEOLOGICO MINERO	LAGUNA DEL SALITRE	Geology and mineraliztion of Salitre area including geochemistry.	Gonzalez
3 Ministerio de Industria y Mineria, Subsecretaria de Mineria.	AREA DE RESERVA "LAGUNA DEL SALITRE" No.34, Mosaicos 19-A1-B1	Spanish	Luis F. y Navarro Garcia	1975	Ministerio de Industria y Mineria, Subsecretaria de Mineria, NOA 1 GEOLOGICO MINERO	LAGUNA DEL SALITRE	Geology of Salitre area.	Gonzalez
4 Ministerio de Industria y Mineria, Subsecretaria de Mineria.	GEOGRAFIA : HOJA LAGUNA BLANCA	Spanish	Juan Carlos Turner		Ministerio de Industria y Mineria, Subsecretaria de Mineria,	LAGUNA BLANCA	Geography of Laguna Branca area	Gonzalez
5 Servicio Minero Nacional(1981)	ESTUDIO GEOLOGICO ECONOMICO, AREA DE INVESTIGACION GEOLOGICO MINERA No.34, "LAGUNA DEL SALITRE", DEPARTAMENTO BELEN, PROVINCIA DE CATAMARCA	Spanish	Osvaldo Edgar Gonzalez	1981	Servicio Minero Nacional, Exploracion Minera de la Region Noroeste, Noa Geologico Minero	LAGUNA DEL SALITRE	Geology and mineraliztion of Salitre area including geochemistry.	Gonzalez
6 Servicio Minero Nacional(1984)	AREA DE INVESTIGACION GEOLOGICO MINERAL No.41, "VACA VIZCANA-PAPACHACRA", SECTOR "VACA VIZCANA", INFORME FINAL	Spanish	Gonzalo Cruz Zuloeta	1984/04/12	Servicio Minero Nacional, Exploracion Minera de la Region Noroeste, Noa Geologico Minero	VACA VIZCANA	Geology and mineraliztion of VACA VIZCANA area including geochemistry, geophysics, drilling.	Gonzalez
7 DGFM(1975)	AREA DE RESERVA No.24, "BREALITO", INFORME FINAL	Spanish		1975/12	Direccion General de Fabricaciones Militares, Subdireccion de Desarrollo Minero, Departamento	BREALITO	Geology and mineraliztion of BREALITO area including geochemistry.	SEGEMAR - Salta
8 DGFM(1975)	AREA DE RESERVA No.18, "NEVADO DE ACAY", INFORME FINAL	Spanish		1975/12	Direccion General de Fabricaciones Militares, Subdireccion de Desarrollo Minero, Departamento Geologia y Mineria	EL ACAY Mina Huaico Honda Mina Encrucijada Grupo Minas Saturno	Geology and mineraliztion of NEVADO DE ACAY area including geochemistry.	SEGEMAR - Salta
9 DGFM(1980a)	AREA DE RESERVA No.23, "INCA VIEJO" (Departamento Los Andes-Prov. de Salta)	Spanish	Humberto Cecere	1980/03	Direccion General de Fabricaciones Militares, Centro de Exploracion Geologico Minera II	INCA VIEJO	Geology and economic geology of INCA VIEJO area.	SEGEMAR - Salta
10 DGFM(1975)	AREA DE RESERVA No.26, "ORGANULLO" - Provincia Salta -, INFORME FINAL	Spanish	O. Viera	1975/12	Direccion General de Fabricaciones Militares, Centro de Exploracion Geologico Minera II	ORGANULLO	Geology and ore deposit of ORGANULLO area.	SEGEMAR - Salta
11 DGFM(1975)	AREA DE RESERVA No.31, "ESPERANZA-INCACHULE", INFORME FINAL	Spanish	Carlos Lurgo, C. Morello,	1975/12	Direccion General de Fabricaciones Militares, Subdireccion de Desarrollo Minero, Departamento Geologia y Mineria	ESPERANZA - INCACHULE Mina Esperanza Mina Victoria	Geology and economic geology of ESPERANZA-INCACHULE area, including geochemistry, geophysics and drillings.	SEGEMAR - Salta
12 DGFM(1975)	AREA DE RESERVA No.22, "CENTENARIO",PROVINCIA DE SALTA, INFORME FINAL	Spanish	Carlos Lurgo, C. Morello, Mario Crespo Kennedy, Norberto Pancetti and Juan Carlos Zanettini	1975/12	Direccion General de Fabricaciones Militares, Centro de Exploracion Geologico Minera II	CENTENARIO	Geology and economic geology of CENTENARIO area, including geochemistry, geophysics and drillings.	SEGEMAR - Salta
13 Secretaria de Mineria(1985)	ESTUDIO DEL AREA DE INVESTIGACION GEOLOGICO MINERA No.1, "DIABLILLOS", DEPARTAMENTO ANTOFAGASTA DE LA SIERRA, PROVINCIA DE CATAMARCA	Spanish	Osvaldo Edgar Gonzalez	1985/3	Secretaria de Mineria, Direction Nacional de Mineria y Geologia, Centro de Exploracion, NOA	DIABLILLOS	Geology and economic geology of DIABLILLOS area.	O. Gonzalez
14 Argentina Mineral Development S.A.(1994)	STRATOBOUND Pb-Zn-Ag DEPOSITS JUJUY PROVINCE ARGENTINA THE DISCOVERRY POTENTIAL WITHIN THE PUMAHUASI MINING DISTRICT	English	D.H.TRABERT, J.GIUDICI, B.HUGHES and I.GEMUTS	1994/11/25	Argentina Mineral Development S.A.	PUMAHUASI MINING DISTRICT Mina Belgica Mina Sol de Mayo Mina	Geology and mineralization of Pumahuasi Mining District, including geochemistry, geophysics and drillings.	
15 Direccion Nacional Del Servicio Geologico(1996)	COMPLEJO VOLCANICO "EL ALISAL", TUCUMAN : UN NUEVO PROSPECTO DE MINERALIZACION DISEMINADA	Spanish	L.DEL V.MARTINEZ y M.A.CHIPULINA	1996	Direccion Nacional Del Servicio Geologico	EL ALISAL	Geology and mineralization of "El Alisal" prospect.	Liliana del Valle Martinez
16 YMAD(2000)	DESCRIPCION OPERACION ALUMBRERA	Spanish	Yacimiento Mineros Aguas del Dionisio	2000/03	Yacimientos Mineros de Agua de Dionisio	ALUMBRERA	General information on Alumbrera project.	Minera Alumbrera
17 YMAD(????)	RESENA DE LA GEOLOGIA - MINERIA Y OPERACIONES, SECTOR MINERALIZADO, FARALLON NEGRO - LAS BLENDA	Spanish	MARIO CESAR ALDERETE	????	Yacimientos Mineros de Agua de Dionisio	FARALLON NEGRO	Geology, ore deposits and operations of Alto de la Blenda, Farallon Negro.	M. Alderete

No.	Title	Language	Author	Year	Organization	Category	Comments	Source
18 Hongn,F.D.; Tubia,J.M.; Aranguren,A.; Mon,R. y Battaglia,R.(2001)	INTRUSION DEL GRANITO ROJO DEL BATOLITO DE TASTIL EN ARENISCAS EOPALEOZOICAS EN EL ANGOSTO DE LA QUESERA, CORDILLERA ORIENTAL , SALTA.	Spanish	FERNANDO D.HONGN, JOSE M.TUBIA, AITOR ARANGUREN, RICARDO MON, RICARDO BATTAGLIA	2001	Asociacion Geologica Argentina	BATOLITO DE TASTIL	Red granite intrusion in Tastil batholith within narrow eopaleozoic sandstone of the Quesera, Cordillera Oriental, Salta.	SEGEMAR - Salta
19 Chernicoff,C.J. y Zappettini,E.O.(2000)	INTERPRETAQCION GEOLOGICO-METALOGENICA DEL LEVANTAMIENTO AEROMAGNETICO DE LA PUNA, ARGENTINA	Spanish	CHERNICOFF, C.J. Y ZAPPETTINI, E.O.	2000/07	IX CONGRESO GEOLOGICO CHILENO	AEROMAGNETICO DE LA PUNA	Geologic-metalogenic interpretation of aeromagnetic survey in the Puna, Argentina	SEGEMAR - Salta
20 Becchio,R.; Lucassen,F.; Kasemann,S.; Franz,G. y Viramonte,J.(1999)	GEOQUIMICA Y SISTEMATICA ISOTOPICA DE ROCAS METAMORFICAS DEL PALEOZOICO INFERIOR. NOROESTE DE ARGENTINA Y NORTE DE CHILE (21-27S)	Spanish	R.BECCHIO, F.LUCASSEN, S.KASEMANN, G.FRANZ, Y J.VIRAMONTE	1999	ACTA GEOLOGICA HISPANICA	ROCAS METAMORFICAS DEL PALEOZOICO INFERIOR	Geochemistry and isotope systematics of Early Paleozoic metamorphic rocks. Northwest Argentina and North Chile (21-27S)	SEGEMAR - Salta
21 Gorustovic,S.; Maquillas,R.; Matthews,S.; Sabino,I. y Salfity,J.(1999)	DEPOSITOS ESTRATOLIGADOS DE Cu-U(Ag, Pb, Zn) EN EL SUR DE LA CUENCA DEL GRUPO SALTA (CRETACICO-PALEOGENO), NORTE ARGENTINO	Spanish	SERGIO GORUSTOVICH, ROSA MARQUILLAS, STEPHEN MATTHEWS, IGNACIO SABINO, Y	1999	XIV CONGRESO GEOLOGICO ARGENTINO, ACTA II, SALTA	DEPOSITOS ESTRATOLIGADOS DE Cu-U(Ag, Pb, Zn)	Strata-bound deposits of Cu-U(Ag, Pb, Zn) in the south of the basin of Salta group (Cretacious-Paleozoic), North Argentina.	SEGEMAR - Salta
22 Hongn,F. y Becchio,R.(1999)	Guia de Campo, Basamento Igneo - Metamorfico, Fajas de Deformacion Ductil Asociadas a Granitoides y Rocas Metamorficas de Bajo a Alta Grado, Valles Calchaquies, Salta	Spanish	FERNANDO HONGN Y RAUL BECCHIO	1999/09	XIV CONGRESO GEOLOGICO ARGENTINO Y UNIVERSIDAD NACIONAL DE SALTA		Igneous-metamorphic basement, ductile deformation faults associated with granitoids and metamorphic rocks of low to high grade, Calchaquies valley, Salta	SEGEMAR - Salta
23 Becchio,R.; Lucassen,F.; Franz,G.; Viramonte,J. y Wemmer,K.(1999)	EL BASAMENTO PALEOZOICO INFERIOR DEL NORESTE DE ARGENTINA (23-27) - METAMORFISMO Y GEOCRONOLOGIA.	Spanish	RAUL BECCHIO, FRIENDRIC LUCASSEN, GERHARD FRA NZ, JOSE VIRAMONTE Y KLAUS	1999	XIV CONGRESO GEOLOGICO ARGENTINO		Early Paleozoic basement of northeast of Argentina (23-27) - Metamorphism and geochronology	SEGEMAR - Salta
24 Petrinovic,I.A.; Mitjavila,J; Virmonte,J.G.; Marti,E.J.; Becchio,R.; Arnosio,M. y Colombo,F.(1999)	DESCRIPCION GEOQUIMICA Y GEODRONOLOGICA DE SECUENCIAS VOLCANICAS NEOGENAS DE TRASARCO, EN EL EXTREMO ORIENTAL DE LA CADENA VPLCANICA TRANSVERSAL DEL QUEVAR (NOROESTE DE ARGENTINA)	Spanish	I.A.PETRINOVIC, J.MITJAVILA, J.G.VIRAMONTE, J.MARTI, R.BECCHIO, M.ARNOSIO Y F. COLOMBO	1999	ACTA GEOLOGICA HISPANICA		Geochemistry and Geochronology descriptions of the Backarc Neogene vplcanic sequences in the eastern border of the Quevar Transversal Volcanic Range (NW Argentina)	SEGEMAR - Salta
25 Viramonte,J.G.; Kay,S.M.; Becchio,R.; Escayola,M. and Novitski,I.(1999)	CRETADEOUS RIFT RELATED MAGMATISM IN CENTRAL-WESTERN SOUTH AMERICA	English	J.G.VIRAMONTE, S.M.KAY, R.BECCHIO, M.ESCAYOLA, I.NOVITSKI	1999	Journal of South American Earth Sciences		CRETADEOUS RIFT RELATED MAGMATISM IN CENTRAL-WESTERN SOUTH AMERICA	SEGEMAR - Salta
26 Lucassen,F.; Becchio,R.; Wilke,H.G.; Franz,G.; Thirlwall,M.F.; Virmonte,J. and Wemmer,K.(2000)	PROTEROZOIC-PALEOZOIC DEVELOPMENT OF THE BASEMENT OF THE CENTRAL ANDES (18-26S) - A MOBILE BELT OF THE SOUTH AMERICAN CRATON	English	F.LUCASSEN, R.BECCHIO, H.G.WILKE, G.FRANZ, M.F.THIRLWALL, J.VIRAMONTE, K.WEMMER	2000	Journal of South American Earth Sciences		PROTEROZOIC-PALEOZOIC DEVELOPMENT OF THE BASEMENT OF THE CENTRAL ANDES (18-26S) - A MOBILE BELT OF THE SOUTH AMERICAN CRATON	SEGEMAR - Salta
27 Secretaria de Mineria de la Nacion - Delegacion Salta(????)	LA CALDERA DEL PAIRIQUE (PUNA JUJENA), VINCULACION CON ZONAS DE ALTERACION HIDROTERMAL Y MANIFESTACIONES METALIFERAS DE POSIBLE INTERES ECONOMICO	Spanish	SEGGIARO,R; R.BECCHIO, B.COIRA, F.HONGN	????	Secretaria de Mineria de la Nacion - Delegacion Salta		The caldera of Pairique (Puna Jujena) associated with hydrotherma alteration zones and metaliferous manifestation with possibility of economic interests	SEGEMAR - Salta
28 Becchio,R.; Lucassen,F.; Franz,G. y Viramonte,J. (1997)	CONDICIONES DE P-T DEL BASAMENTO METAMORFICO DE ALTO GRADO, BORDE ORIENTAL DE LA PUNA AUSTRAL ARGENTINA	Spanish	RAUL BECCHIO, FRIEDRICH LUCASSEN, GERHARD FRANZ Y JOSE VIRAMONTE	1997	VIII CONGRESO GEOLOGICO CHILE		P-T conditions of high grade metamorphic basement, eastern border of the southern Puna, Argentina	SEGEMAR - Salta
29 Hongn,F. y Becchio,R.(????)	SISTEMA DE FAJAS MILONITICAS DE BREALITO Y MINERALIZACIONES ASOCIADAS, PALEOZOICO INFERIOR	Spanish	FERNANDO HONGN Y RAUL BECCHIO	1998	X Congreso Geològico Latinoamericano		Milonitic fault system of Brealito and associated mineralization, Early Paleozoic	SEGEMAR - Salta
30 Becchio,R.; Viramonte,J. y Castillo,A.(1999)	LA FAJA ALUMINICA TACUIL - CERRO BLANCO, LEUCOSOMAS ? DE CUARZO-SILIMANITA EN ESQUISTOS DE ALTO GRADO	Spanish	RAUL BECCHIO, JOSE VIRAMONTE, ALFREDO CASTILLO	1999	IX CONGRESO GEOLOGICO ARGENTINO			SEGEMAR - Salta
31 Lucassen,F.; Becchio,R.; Harmon,R. and Franz,G.(1999)	A Chaos of Lead in the Basement of the Central Andes (18-27)?	English	FRIEDRICH LUCASSEN, RAUL BECCHIO, RUSSELL HARMON AND GERHARD FRANZ	1999	FOURTH ISAG GOETTINGEN (GERMANY)		A CHAOS OF LEAD IN THE BASEMENT OF THE CENTRAL ANDES (18-27)?	SEGEMAR - Salta

No.	Title	Language	Author	Year	Organization	Category	Comments	Source
32 This lieteratur ist from south Argentina ?????								
33 Jorge Darocca, Consultoria	PROSPECTO MINERO "NEGRA MUERTA" ZONA "EL ACAY" SALTA	Spanish	Jorge Darocca	1994?	Informe Interno	NEGRA MUERTA EL ACAY		SEGEMAR - Salta
34 Sureda,R.J. and Martin,J.L.(1990)	EL AGUILAR MINE: AN ORDOVICIAN SEDIMENT-HOSTED STRATIFORM LEAD-ZINC DEPOSIT IN THE CENTRAL ANDES	English	R.J.SUREDA AND J.L.MARTIN	1990		EL AGUILAR		SEGEMAR - Salta
35 Sangster,A.L.(2001)	MINERAL OCCURRENCES IN THE PUNA REGION SALTA AND JUJUY PROVINCES, ARGENTINA	English	ALAN L.SANGSTER	2001	SEGEMAR, PASMA PROJECT 15 FINAL REPORT	La Cienaga, La Belgica, Sol de Mayo, La Pumahuasi, Olga, Tusca, El Aguilar, Esperanza, La Colorada, La Gateada, La Candelaria, Rachaite, Concordia, Organullo		SEGEMAR - Salta
36 Sangster,A.L.. and Sangster,D.F.(2000)	EVALUATION OF THE CONCEPT THAT PUMAHUASI VEINS INDICATE A POTENTIAL FOR THE EXISTENCE OF UNDERLYING UNDISCOVERED SEDEX DEPOSITS, NORTHERN ARGENTINA	English	ALAN L.SANGSTER AND DONALD F.SANGSTER	2000/12	SEGEMAR	PUMAHUASI VEINS	EVALUATION OF THE CONCEPT THAT PUMAHUASI VEINS INDICATE A POTENTIAL FOR THE EXISTENCE OF UNDERLYING UNDISCOVERED SEDEX DEPOSITS, NORTHERN ARGENTINA	SEGEMAR - Salta
37 BHP Billiton & Northern Orion(2001)	Agua Rica	English	BHP Billiton & Northern Orion	2001/10	BHP Billiton,	AGUA RICA		AGUA RICA GEOLOGIST
38 Morello,C.H.(2001)	MINA RICA, PROSPECTO PORFIDICO DE COBRE Y ORO, DEPARTAMENTO MONTEROS, PROVINCIA DE TUCUMAN	Spanish	CARLOS H.MORELLO	2001	Informe Interno, Paramount	EL PAGO		Morello, C.
39 Universidad Nacional de Salta(1999)	Guia de Campo, Curso Internacional de Volcanologia de Campo de los Andes Centrales VIII Edicion Octubre 2001, Auspiciado por la UNESCO	Spanish / English	UNIVERSIDAD NACIONAL DE SALTA, INSTITUDO GEONORTE, ESCUELA DEL DOCTORADO	2001/10	Instituto Geonorte, Universidad Nacional de Salta			SEGEMAR - Salta
40 MINISTERIO DE LA PRODUCCION Y EL EMPLEO, SECRETARIA DE MINERIA, INDUSTRIA Y RECURSOS ENERGETICOS, PROVINCIA DE SALTA, ARGENTI NA	RECURSOS MINEROS	Spanish	Secretaría de Minería	1998	MINISTERIO DE LA PRODUCCION Y EL EMPLEO, SECRETARIA DE MINERIA, INDUSTRIA Y RECURSOS ENERGETICOS, PROVINCIA DE SALTA,			S. Gorustovich
41 MINISTERIO DE LA PRODUCCION Y EL EMPLEO, SECRETARIA DE MINERIA, INDUSTRIA Y RECURSOS ENERGETICOS, PROVINCIA DE SALTA, ARGENTI NA	OPORTUNIDADES PARA INVERTIR EN MINERIA E HIDROCARBUROS	Spanish / English	Secretaría de Minería	1998	MINISTERIO DE LA PRODUCCION Y EL EMPLEO, SECRETARIA DE MINERIA, INDUSTRIA Y RECURSOS ENERGETICOS, PROVINCIA DE SALTA,			S. Gorustovich
42 Sureda,R.J.; Perez,H.D.; Martin,J.L. y Flores,F.J. (????)	EXPLORACION Y DESARROLLO EN UN DEPOSITO SEDEX (Zn, Pb, Ba) DE LA SIERRA DE AGUILAR: MINA ESPERANZA, JUJUY, ARGENTINA	Spanish / English	R.J.SUREDA, H.D.PEREZ, J.L.MARTIN, F.J.FLORES	????		ESPERANZA		SEGEMAR - Salta
43 DGFM(1979)	AREA DE RESERVA NO.10 - EL PELADAR, PROVINCIA DE JUJUY, INFORME FINAL	Spanish		1979/11	Direccion General de Fabricaciones Militares, Centro de Exploracion Geologico Minera II	EL PELADAR		RAMALLO (2001/10/27)
44 Direccion Provincial de Mineria, Jujuy (1976)	INFORME PRELIMINAR MINA "NATACIA", DISTRITO "EL COLORADO"	Spanish	RICARDO JOSE GOMEZ OMIL??	1976/08	Direccion Provincial de Mineria, Jujuy	Mina Natacia		RAMALLO (2001/10/27)
45 DGFM(1980b)	INFORME, AREA DE RESERVA NO.30 - PUMAHUASI, PROVINCIA DE JUJUY	Spanish	NORBORTO PARCETTI	1980/08	Direccion General de Fabricaciones Militares, Subdireccion de Desarrollo Minero, Departamento Geologia y Mineria	PUMAHUASI Pumahuasi Sol de Mayo Belgica		RAMALLO (2001/10/27)
46 Loma Sur S. A	CAPITULO II, CONSIDERACIONES GEOLOGICAS, RACHAITE	Spanish	Guillermo Gimeno	????	Loma Sur S.A.	RACHAITE		RAMALLO (2001/10/27)
47 Coira,B.; Chayle,W.; Barber,E.; Solos,N.; Brodtkorb,M.; Camacho,M. y Diaz,A.(1990)	PALEOSISTEMA GEOTERMAL DEL TERCIARIO SUPERIOR Y SU MINERALIZACION DE METALES BASICOS (Pb, Zn, Ag), RACHAITE, JUJUY, ARGENTINA	Spanish	COIRA, B; CHAYLE, W; BARBER, E; SOLOS,N; BRODTKORB,M; CAMACHO,M; DIAZ,A	1990	DECIMO PRIMER GEOLOGICO ARGENTINO, SAN JUAN	RACHAITE		RAMALLO (2001/10/27)
48 Direccion Provincial de Mineria, Jujuy (1970)	RECONOCIMIENTO GEOLOGICO MINERO EXPEDITIVO EN MINA DE PLOMP "LA GATEADA" DPTO. DE YAVI - PROV. DE JUJUY	Spanish	Fernando Tuttolomondo	1970	DIRECCION PROVINCIAL DE MINERIA, JUJUY	LA GATEADA		RAMALLO (2001/10/27)

No.	Title	Language	Author	Year	Organization	Category	Comments	Source
49	MUESTREO PETROGRAFICO Y BOSQUEJO DE ALTERACION, AREA DE RESERVA No.30 "ACONQUIJA", SECTOR EL PAGO					EL PAGO		Liliana del Valle Martinez
50 J. Darocca, Consultoria	PROYECTO "CENTENARIO"	Spanish	J. Darocca	1975/12	Informe Inerno	CENTENARIO		SEGEMAR - Salta
51 J. Darocca	PROSPECTO PANCHO ARIAS O VIZCACHERAL		J. Darocca	1994	Informe Inerno	PANCHO ARIAS		SEGEMAR - Salta
52 J. Darocca	Anomalia Vicuña Muerta		J. Darocca	1994	J. Darocca	VICUNA MUERTA	Ubicacion Acceso Antecedentes Geologia Geoquimica Razones para su estudio Recomendaciones	SEGEMAR - Salta
53 Sureda,R.J.(1999)	LOS YACIMIENTOS SEDEX DE PLOMO Y ZINC EN LA SIERRA DE AGUILAR, JUJUY	Spanish	Ricardo J. Sureda	1999	RECURSOS MINERALES DE LA REPUBLICA ARGENTINA, Volumen 1	EL AGUILAR ESPERANZA RIO GRANDE		SEGEMAR - Salta
54 抜粋	LA MINA DE PLOMO "LA CANDELARIA"	Spanish		1962	DIRECCION GENERAL DE MINAS, PROVINCIA DE JUJUY	LA CANDELARIA		SEGEMAR - Salta
55 Loma Sur S. A	INFORME PRELIMINAR AREA MINERALIZADA DE RACHAITE, "MINA CHOCAYA"		Guillermo Gimeno	????	Loma Sur S.A.	MINA CHOCAYA RACHAITE		SEGEMAR - Salta
56 Segal,S.J. y Caffe,P.J.(1999)	EL GRUPO MINERO PAN DE AZUCAR, JUJUY	Spanish	Susana J.Segal y Pablo J.Caffe	1999	RECURSOS MINERALES DE LA REPUBLICA ARGENTINA, Volumen 1	PAN DE AZUCAR		SEGEMAR - Salta
57 Segal,S.J.; Godeas,M.C.; Pezzutti,N. y Zappettini,E.O.(1999)	DISTRITO POLIMETALICO PUMAHUASI, JUJUY	Spanish	Susana J.Segal, Marta C.Godeas, Norma Pezzutti y Eduardo O.Zappettini	1999	RECURSOS MINERALES DE LA REPUBLICA ARGENTINA, Volumen 1	MINA PUMAHUASI MINA CHAUSSETTE MINA SOL DE MAYO MINA CERRO COLORADO MINA CARICASINI MINA GENERAL LEMAN MATADERO PULPERA BELGICA ALEJANDRO		SEGEMAR - Salta
58 Castillo,A.L.; Battaglia,R.R. and Moya,M.C.(????)	DEPOSITOS MINERALES EN LOS DISTRITOS SANTA VICTORIA, ZENTA E IRUYA (PRECAMBRICO - PALEOZOICO INFERIOR), SALTA, ARGENTINA	Spanish	A.L.CASTILLO. R.R.BATTAGLIA & M.C.MOYA	????		LA CIENAGA SANTA ROSA 10		
59 C. Lurgo, S. Segal y E. Zappettini. (1999)	EL YACIMIENTO DE SULFUROS MASIVOS LA COLORADA, SALTA	Spanish	C. Lurgo, S. Segal y E. Zappettini.	1999	RECURSOS MINERALES DE LA REPUBLICA ARGENTINA, Volumen 1	LA COLORADA		SEGEMAR - Salta
60 不鮮明	INFORME GEOLOGICO MINERO DEL AREA DE YANGASO, DEPARTAMENTO DE SANTA CATALINA	Spanish	Bernardo G.Matthews	1972	Direccion provincial de mineria, jujuy	YANGASO		SEGEMAR - Salta
61 DGFM(1979)	INFORME FINAL AREA DE RESERVA No.10 "EL PELADAR", PROVINCIA DE JUJUY	Spanish	Morello y Ramallo E.	1979/11	Direccion General de Fabricaciones Militares, Centro de Exploracion Geologico Minera II			SEGEMAR - Salta
62 Mendez,V. y Mendez,C.(2001)	Limeca: Prospecto Sedex en la puna saltena?	Spanish	V.Mendez y C.Mendez	2001	VII Congreso de Geologia Económica. Salta	LIMECA		SEGEMAR - Salta
63 Quantec Geofisica Argentina S.A.(1998)	GEOPHYSICAL REPORT ON THE TRANSIENT ELECTROMAGNETIC TOTAL FIELD GROUND MAGNETIC AND CONTROLLED SOURCE AUDIO-FREQUENCY MAGNETOTELLURIC SURVEYS CONDUCTED AT LA COLORADA PROJECT, SALTA PROVINCE, ARGENTINA ON BEHALF OF INTERNATIONAL PACIFIC RIM S.A.	English	Miles Rideout, Brian Benget	1998	Quantec Geofisica Argentina S.A.	LA COLORADA		SEGEMAR - Salta
64 Direccion Nacional Del Servicio Geologico(1996)	Programa Nacional de Cartas Geologicas de la Republica Argentina, 1:250,000 Hoja Geologica 2566-I, San Antonio de los Cobres, Provincias de Jujuy y Salta	Spanish	E. Zappettini, G. Blasco de Nullo y F. Hongn	1996	Direccion Nacional Del Servicio Geologico			SEGEMAR - Salta
65 Ferpozzi,L.. y Turel,A.(1999)	- Serie Contribuciones Tecnicas Geoquimica 7 - Datos geoquimicos de Cu, Pb y Zn y ubicacion de sitios de muestreo de sedimentos de corriente del Plan NOA Geologico Minero. Hoja 2366-I Mina Pirquitas, Jujuy. Republica Argentina.	Spanish	Ferpozzi L. y A. Turel	1999	Subsecretaria de Mineria de la Nacion Instituto de Geologia y Recursos Minerales Servicio Geologico Minero Argentino	Jujuy	Geochemical data of Cu, Pb and Zn and locations of stream sediment samples of mining geological NOA plan. Sheet 2366-I Pirquitas Mine, Jujuy, Republic of Argentine.	SEGMAR- Bs. As.

No.	Title	Language	Author	Year	Organization	Category	Comments	Source
66 Ferpozzi,L.. y Turel,A.(1999)	- Serie Contribuciones Tecnicas Geoquimica 8 - Datos geoquimicos multielemento y ubicacion de sitios de muestreo de sedimentos de corriente del Plan NOA Geologico Minero - MAP. Hoja 2366-I Mina Pirquitas, Jujuy. Republica Argentina.	Spanish	Ferpozzi L. y A. Turel	1999	Subsecretaria de Mineria de la Nacion Instituto de Geologia y Recursos Minerales Servicio Geologico Minero Argentino	Jujuy	Geochemical data of multielement and locations of stream sediment samples of mining geological NOA plan. Sheet 2366-I Pirquitas Mine, Jujuy, Republic of Argentine.	SEGMAR- Bs. As.
67 Ferpozzi,L.. y Turel,A.(2000)	- Serie Contribuciones Tecnicas Geoquimica 29 - Datos geoquimicos de Cu, Pb y Zn y ubicacion de sitios de muestreo de sedimentos de corriente del Plan NOA Geologico Minero. Hoja 2366-III Mina Pirquitas, Jujuy y Salta. Republica Argentina.	Spanish	Ferpozzi L. y A. Turel	2000	Subsecretaria de Mineria de la Nacion Instituto de Geologia y Recursos Minerales Servicio Geologico Minero Argentino	Jujuy y Salta	Geochemical data of Cu, Pb and Zn and locations of stream sediment samples of mining geological NOA plan. Sheet 2366-III Pirquitas Mine, Jujuy y Salta, Republic of Argentine.	SEGMAR- Bs. As.
68 Ferpozzi,L.. y Turel,A.(2000)	- Serie Contribuciones Tecnicas Geoquimica 30 - Datos geoquimicos multielemento y ubicacion de sitios de muestreo de sedimentos de corriente del Plan NOA Geologico Minero - MAP. Hoja 2366-III Mina Pirquitas, Jujuy y Salta. Republica Argentina.	Spanish	Ferpozzi L. y A. Turel	2000	Subsecretaria de Mineria de la Nacion Instituto de Geologia y Recursos Minerales Servicio Geologico Minero Argentino	Jujuy y Salta	Geochemical data of multielement and locations of stream sediment samples of mining geological NOA plan. Sheet 2366-III Pirquitas Mine, Jujuy y Salta, Republic of Argentine.	SEGMAR- Bs. As.
69 Moya,M.C.(????)	EL ORDOVICICO EN LOS ANDES DEL NORTE ARGENTINO	Spanish	Maria Cristina Moya	????	Universidad Nacional de Salta, Facultad de Ciencias Naturales			
70 Fernandez,L.R.R.; Heredia,N.; Seggiaro,R.E. y Gonzalez,M.A.(?)	ESTRUCTURA ANDINA DE LA CORDILLERA ORIENTAL EN EL AREA DE LA QUEBRADA DE HUMAHUACA, PROVINCIA DE JUJUY, NO DE ARGENTINA	Spanish	Fernandez,L.R.R.; Heredia,N.; Seggiaro,R.E. y Gonzalez,M.A.	????				
71 Moya,M.C.(????)	Sedimentacion, SEDIMENTOLOGIA Y PALEOGEOGRAFIA DEL GRUPO MESON (CAMBRICO)	Spanish	Marìa Cristina Sanchez	1999	Relatorio XIV Congreso Geológico Argentino			SEGEMAR-Salta
72 Boll,A. y Hernandez,R.M.(????)	INTERPRETACION ESTRUCTURAL DEL AREA "TRES CRUCES" - PROVINCIA DE JUJUY - ARGENTINA	Spanish	Boll,A. y Hernandez,R.M.	1986	BIP 3ra època V:II.7			SEGEMAR-Salta
72 Seggiaro,R.E. y Hongn,F.D.(1994)	TECTINICA TRANSCURRENTE ASOCIADA AL VOLCAN CORANZULI, JUJUY, ARGENTINA	Spanish	Seggiaro,R.E. y Hongn,F.D.	1994	VIII CONGRESO GEOLOGICO CHILE			SEGEMAR-Salta
73 Coira,B.(1982)	MAGMATISMO Y MINERALIZACIONES ASOCIADAS EN PUNA JUJENA, ARGENTINA	Spanish	Coira,B.	1982	II Congreso de Geología Económica			SEGEMAR-Salta
74 Seggiaro,R.E. y Hongn,F.D.(1999)	Influencia tectonica en el volcanismo Cenozoico del Noroeste argentino	Spanish/English	Seggiaro,R.E. y Hongn,F.D.	1999	Relatorio XIV Congreso Geológico Argentino		Tectonic influence in Cenozoic volcanism in Noryth-Western Argentina	SEGEMAR-Salta
75 Bahlburg,H.(1990)	The Ordovician basin in the Puna of NW Argentina and N Chile: geodynamic evolution from back-arc to foreland basin	English	Bahlburg,H.	1990	PHD, Tesis.			SEGEMAR-Salta
76 SEGEMAR(1999)	Programa Nacional de Cartas Geologicas de la Republica Argentina, 1:250,000 Hoja Geologica 2366-II y 2166-IV, La Quiaca, Provincias de Salta y Jujuy	Spanish	D. Rubiolo	1999	SEGEMAR	Cienaga		SEGEMAR-Salta
77	VII Congreso Argentino de Geologia Economica, Actas 1	Spanish		2001	Asociacion Argentina de Geologos Economitas, y Secretaria de Mineria, Industria y Recursos Energeticos de la Provincia de Salta			
78	VII Congreso Argentino de Geologia Economica, Actas 2	Spanish		2001	Asociacion Argentina de Geologos Economitas, y Secretaria de Mineria, Industria y Recursos Energeticos de la Provincia de Salta			
79	INVENTARIO DE YACIMIENTOS Y MANIFESTACIONES DE MINERALES METALIFEROS E INDUSTRIALES DE LA REPUBLICA	Spanish						

STUDY OF 5 CONODONT SAMPLES

Direction of study: Dr. Mario A. Hünicken.
Present report: Dr. Guillermo L. Albanesi.
Córdoba, Argentina

Introduction

Five carbonate samples were processed in search of conodonts. These samples (28506 g in total) were completely digested by conventional acid etching techniques, using either 10 % acetic or formic acid. The heavy fraction of insoluble residue was separated by means of heavy liquid (bromoform). This fraction was examined through stereoscopic binocular, and microfossils were recovered by picking techniques (see Stone, 1987, for reviews on conodont laboratory methodologies). Conodonts and associated microfossils were mounted on slides for study and final storage.

Record of conodont samples and results

1
Date: October 27, 2002.
District: El Aguilar.
Locality: Despensa Creek.
Sample: L1 (overlying interval with olistoliths).
Formation: Lampazar?, Saladillo?
Mass: 8418 g.
Lithology: Calcarenite, interbedded with shales and fine green sandstones).
Sample: L2 = 7 m above L1.
Mass: 4800 g.
S 23º 15´40,7´´.
W 65º 42´26.3´´.
Micropaleontological result: both samples barren of fossils.

2
Date: October 27, 2002.
District: El Aguilar.
Locality: Río Grande Creek – Section with SEDEX .
Sample: L3 .

Mass: 7573 g.
Formation: Lampazar?, Saladillo?
S 23º 07´49´´.
W 65º 41´16´´.
Micropaleontological result: barren of fossils.
Comment: It is significant to note that a correlative level, in same study area, studied by Rao and Flores (1998) yielded a conodont assemblage with the key species *Paltodus deltifer* (Lindstöm, 1955) of the eponymous biozone, which allowed for dating the mineralized interval as Upper Tremadoc (Lower Ordovician) in age.

3
Date: October 28, 2002.
District: El Aguilar.
Locality: Quebralaite Creek.
Sample: A1.
Mass: 3615 g.
Sample A2 = 5 m above A1.
Mass: 3373 g.
Formation: Saladillo?
Lithology: Calcarenite nodules, 5-10 cm thick, in shales and bluish fine sandstones.
Latitude: S 23º 17´39.9´´.
Longitude: W 651 46´38.6´´.
Altitude: 3600 m.
Micropaleontological result: barren of fossils .

4
Date: October 8, 2002.
District: El Aguilar .
Locality: Despensa Creek.
Sample: AO2SX011.
Mass: 3200 g.
Formation: Lampazar?
Lithology: Limestone.
Latitude: S 23º 15´37.8´´.
Longitude: W 65º 42´36.7´´.
Micropaleontological result: barren of fossils.

5

Date: October 31, 2002.

District: Santa Victoria.

Sample: AO2TK037.

Mass: 5700 g.

Formation: Santa Rosita?

Lithology: Limestone.

Latitude: 22º 14´51.1´´ .

Longitude: 64º 57´43.5´´.

Altitude: 2,302 m.

Micropaleontological result: After complete digestion and recovering of fossil remains by picking from undisolved residue, three elements pertaining to two conodont species were collected (Figs. 1, 2). Associated fossils include undetermined gasteropods and inarticulate brachiopods (Fig. 3).

Following conodont species are determined, and consequent biochronology is established.

Conodont taxonomy

Genus *Rossodus* Repetski and Ethington, 1983

Type species: *Rossodus manitouensis* Repetski and Ethington, 1983

Rossodus tenuis (Miller, 1980)
Fig. 2a-b

Synonymy

1980 – *Utahconus tenuis* Miller, 1980, p. 36-37, pl. 2, figs. 5-7, text-fig. 4T.

1994 – *Rossodus tenuis* Ji and Barnes, 1994, p. 56-57, pl. 17, figs. 10-19.

2002 – *Rossodus tenuis* Pyle and Barnes, 2002, p. 102-103, pl. 13, fig. 21-26 (*cum syn*.).

Material: 1 *a* element, 1 *b* element.

Remarks: Diagnosis of the species was emended by Ji and Barnes (1994) from original designation given by Miller (1980), and the apparatus reconstruction was recently reconsidered by Pyle and Barnes (1994). These authors provide a detailed description of every morphotype (*a*, *b*, and *c*) that compose the species apparatus. Current collection includes a and b elements. Figure 2a-b illustrates the *b* element, which is asymmetrical, bilaterally compressed, and presents sharp anterior and posterior margins of the cusp. Both faces of cusp show a faint carina. The base is slightly extended to posterior, with a flared postero-basal margin. Basal cavity is triangular in lateral view, with an apex directed to the anterior margin.

Occurrence and age: *Rossodus tenuis* and *Rossodus manitouensis* zones *sensu* Pyle and Barnes 2002, or *Cordylodus angulatus* Zone, the second conodont biozone of the Ordovician System from other schemes of North America (*e.g.,* Ross *et al.,* 1997). Lower (but not lowermost). Tremadoc Stage of the global Lower Ordovician Series. About 487-489 million years (Cooper, 1999).

Genus *Drepanoistodus* Lindström, 1971

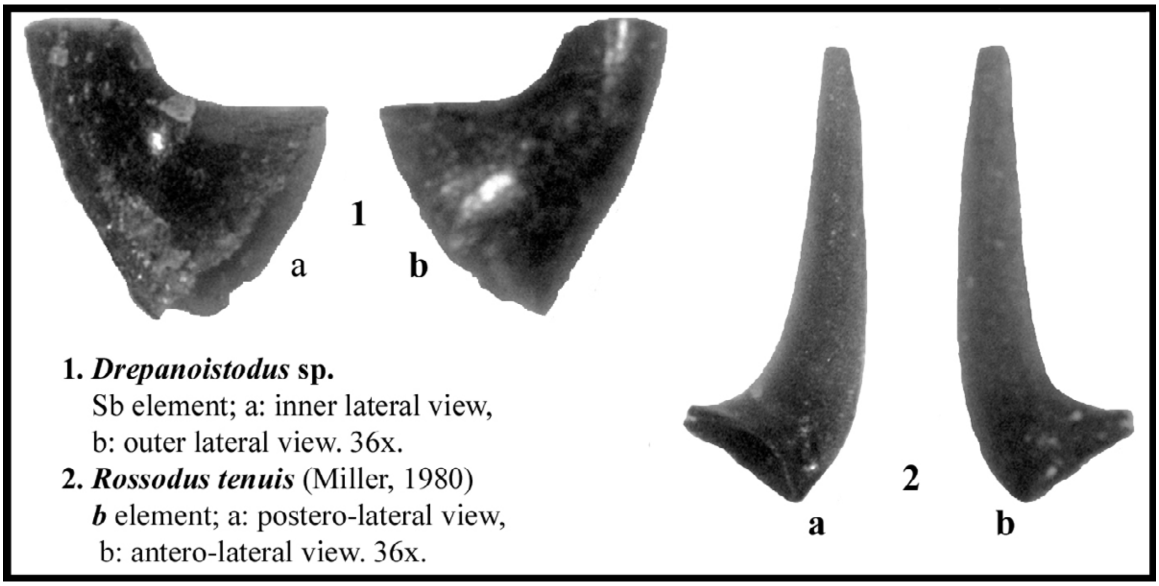
Type species: *Oistodus forceps* Lindström, 1955

Drepanoistodus sp.
Fig. 1a-b

Material: 1 Sb element.

Remarks: One element characteristic of the genus *Drepanoistodus* was recovered. Apparently, the morphotype corresponds to the Sb position in the apparatus of a new species. The illustrated specimen is distinguished by a narrow groove on the inner flank that runs along the anterior margin, as well as a proclined cusp, and oval basal margin. The absence of diagnostic morphotypes, such as the M element, precludes specific designation.

Nota Bene: The Color Alteration Index of registered conodonts is ca. 3, which indicates up to 200ºC of overburden paleotemperatures for the bearer strata (Epstein et al., 1977).



Figures 1, 2. Conodont species from sample AO2TK037 (optical photomicrographs).

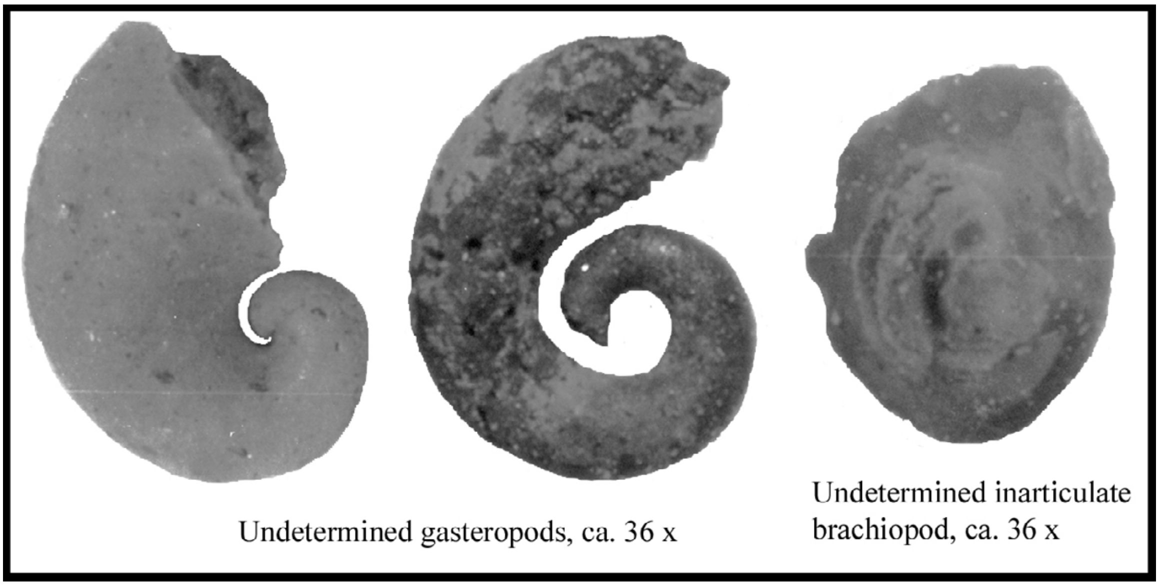


Figure 3. Associated fossils from sample AO2TK037 (optical photomicrographs).

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Document A2

PALYNOLOGICAL STUDY OF 19 SAMPLES

Present report: Dr. Eduardo G. Ottone

INTRODUCTION

The aim of this study is to provide a biostratigraphic basis for facies and pale environmental interpretations.

Laboratory procedures followed conventional practices. Between 20 and 25 grams of each sample were processed. Following crushing, carbonates and silicates were removed by treatment with hydrochloric and hydrofluoric (70%) acids. Residues were sieved on 200 µm and 25 um meshes and mounted in unstained glycerine jelly. Slides were examined under a Leitz Orthoplan binocular microscope.

CONCLUSIONS

All samples are palynologically barren. There is almost no kerogen in the studied samples. The list of analyzed samples is the following one:

1) Rock type: shale/SEDEX
Location: Río Grande, Sierra El Aguilar, Cordillera Oriental, Jujuy Province.

2) Rock type: shale.
ID: A02SX010
Date: 08.10.2002
Location: Aguilar mountain, Quebrada de Despensa.
Level: Cardonal?
Coordinate: lat 23º 15' 48.4'' – lon 65º 42' 22.9''
Altitude: 4.074 m

3) Rock type: shale.
ID: A02SX013
Date: 08.10.2002
Location: Aguilar mountain, Quebrada Despensa.
Level: Lampazar
Coordinate: lat 23º 15' 37.8'' – lon 65º 42' 36.7''
Altitude: 4.090 m

4) Rock type: shale.
ID: A02SX018
Date: 08.10.2002
Location: Aguilar, Mina Esperanza.
Level: Lampazar?
Coordinate: lat 23º 08' 20.2'' – lon 65º 43' 54.5''

Altitude: 4.759 m

5) Rock type: shale.
ID: A02SX017
Date: 2002
Location: Aguilar, Mina Esperanza.
Level: Cardonal?
Coordinate: lat 23º 10’ 5.8’’ – lon 65º 43’ 13.0’’
Altitude: 5.029 m

6) Rock type: shale.
ID: A02CX002
Date: 27.10.2002
Location: Aguilar, Quebrada Despenza.
Level: ?
Coordinate: lat 23º 15’ 32.8’’ – lon 65º 42’ 13.1’’
Altitude: 5.029 m

7) Rock type: shale.
ID: A02CX003
Date: 27.10.2002
Location: Aguilar, Río Grande.
Level: ?
Coordinate: lat 23º 15’ 31.0’’ – lon 65º 42’ 44.7’’
Altitude: ?

8) Rock type: shale.
ID: A02SX023
Date: 08.10.2002
Location: Aguilar, Quebrada Polvorines.
Level: Lampazar.
Coordinate: lat 23º 13’ 14.9’’ – lon 65º 43’ 44.0’’
Altitude: 4.729 m

9) Rock type: shale.
ID: A02SX021
Date: 08.10.2002
Location: Aguilar, Mina Tapada.
Level: Lampazar.
Coordinate: lat 23º 14’ 12.9’’ – lon 65º 43’ 42.6’’
Altitude: 4.857 m

10) Rock type: shale.

ID: A02SX009
Date: 08.10.2002
Location: Aguilar mountain, Quebrada Vacas.
Level: Lampazar.
Coordinate: lat 23º 10’ 3.7’’ – lon 65º 42’ 43.4’’
Altitude: 4.919 m

11) Rock type: shale.
ID: A02CX050
Date: 31.10.2002
Location: Santa Victoria.
Level: ?
Coordinate: lat 22º 09’ 41.0’’ – lon 65º 16’ 57.5’’
Altitude: ?

12) Rock type: shale.
ID: A02CX049
Date: 31.10.2002
Location: Santa Victoria.
Level: ?
Coordinate: lat 22º 09’ 24.7’’ – lon 65º 16’ 23.3’’
Altitude: ?

13) Rock type: shale.
ID: A02CX036
Date: 31.10.2002
Location: Santa Victoria.
Level: ?
Coordinate: lat 22º 06’ 22.9’’ – lon 65º 10’ 30.0’’
Altitude: ?

14) Rock type: shale.
ID: A02CX072
Date: 01.11.2002
Location: Santa Victoria.
Level: ?
Coordinate: lat 22º 23’ 17.5’’ – lon 65º 04’ 24.0’’
Altitude: ?

15) Rock type: shale.
ID: A02CX092
Date: 01.11.2002
Location: Santa Victoria.

Level: ?
Coordinate: lat 22º 24’ 34.9’’ – lon 65º 07’ 34.4’’
Altitude: ?
16) Rock type: shale.
ID: A02CX091
Date: 01.11.2002
Location: Santa Victoria.
Level: ?
Coordinate: lat 22º 24’ 34.9’’ – lon 65º 07’ 34.4’’
Altitude: ?

17) Rock type: shale.
ID: A02CX151
Date: 05.11.2002
Location: ?
Level: ?
Coordinate: lat 23º 39’ 13.4’’ – lon 66º 18’ 20.2’’
Altitude: ?

18) Rock type: shale.
ID: A02CX150
Date: 05.11.2002
Location: ?
Level: ?
Coordinate: lat 23º 39’ 12.4’’ – lon 66º 18’ 30.8’’
Altitude: ?

19) Rock type: shale.
ID: A02CX148
Date: 05.11.2002
Location: ?
Level: ?
Coordinate: lat 23º 39’ 07.0’’ – lon 66º 18’ 44.8’’
Altitude: ?