PART Ⅰ GENERALITIES

CHAPTER 1　INTRODUCTION

1-1　Purpose of the survey

Oriental Republic of Uruguay (hereafter "Uruguay") main industries are agriculture and cattle breeding. After inauguration of Mercosur, the country has made efforts to orient its economy toward developing mining and manufacturing industries. During the 1980s, mining junior companies, most from Canada and U.S.A. has entered Uruguay to prospect its greenstone belt areas and have discovered some gold mines as Mahoma and San Carlos in the south, and San Gregorio at the north of the country. A request for mineral exploration survey was made to the Japanese government on 10 February 2000.

The Metal Mining Agency of Japan had recognized the potentiality of the proposed areas and signed the scope of work with Dirección Nacional de Minería y Geología (DINAMIGE) of Uruguay on 24 November 2000.

The purpose of this survey is to clarify the potentiality of San Jose area and Arroyo Grande areas (Fig.1) by using various surveys methods aiming to discover a new mineral deposit.

1-2　Contents and coverage area

The project areas of San Jose area and Arroyo Grande area are located in the southern part of Uruguay, covering an extension of about 12,000km^2 as indicated in Figure 2.

During the PhaseⅠ, it was carried out an analysis of existing data and a geological interpretation of satellite image. Based on these results, a survey area of 2,500km^2 was extracted in order to carry out a regional geological survey and regional geochemical survey by soil and rock sampling.

During the Phase II a regional airborne geophysical survey was performed together with geological survey and geochemical survey within the blocks areas named A, B, C, D and E.

During Phase III, detailed geological and geochemical surveys were carried out in Mahoma Este area, Mundo Azul area and Andresito area. Later, VLF and Magnetic geophysical survey followed by a trench survey were carried out in Mahoma East area and Andresito area FigI-1-1.

The contents of the surveys are shown in Table1-1-1.

1-3　Survey Team

The following members participated in the survey planning and negotiation.

Phase	Survey items	Survey contents	Survey areas: San Jose area	Survey areas: Arroyo Grande area
Phase I	Existing data analysis Satellite image interpretation	Geology and mineralization Area:12,000km^2 Lineaments Extraction of Greenstone belt	San Jose area	Arroyo Grande areas
	Geological mapping Soil geochemical prospecting Rock geochemical prospecting	Area:2,500km^2 at 1/100,000 scale Area:2,500km^2 2,021 Samples Area:2,500km^2 607 Samples	San Jose area Greenstone belt	Arroyo Grande area Greenstone belt
	Overall analysis	Selection of Survey areas	11 areas	2 areas
Phase II	Data interpretation	Extraction of 5 Survey zones	Zone A, Zone B, Zone C, Zone D	Zone E
	Aero-geophysical prospecting Magnetic/Radiometric survey	Area:12,000km^2 Geological structure detection	San Jose area	Arroyo Grande area
	Geological mapping Soil geochemical prospecting	Area:400km^2 1/20,000 scale Area:400km^2 1,926 Samples	Zone A, Zone B, Zone C, Zone D	Zone E
	Overall analysis	Extraction of promising Areas	Zone A Anomaly, Zone C Anomaly	
Phase III	Soil geochemical prospecting Geological mapping Geophysical prospecting Electro-Magnetic(VLF-EM) Magnetic survey Trench Survey	Along 162km 1,689 Samples Area:40km 1/20,000 scale Survey points: 2,662 Survey station interval:10m Line spacing:100m Length : 4,520m 4,520 Samples	Mahoma Este area, Mundo Azul area	Andresito area
	Overall analysis	Mineralization model Selection of driling sites	Mahoma Este area, Mundo Azul area	Andresito area

Fig. I-1-1 Survey contents and its flow from Phase I to Phase III

Tab. I-1-1 Contents and amount of works of the project

	Phase I	Phase II	Phase III
Existing Data Analysis	Survey area 12,000 km^2		
Geological Interpretation of Satellite Image Data	Survey area 12,000 km^2		
Geological Survey	Reconnaissance survey Survey area 2,580 km^2 Survey route 649 km	Semi-detailed survey Survey area 400 km^2 Survey route 400 km	Detailed survey Survey area 45 km^2 Survey route 40 km
Geochemical Survey	Soil sampling Line length 649 km Soil samples 2,021 samples	Soil sampling Line length 400 km Soil samples 1,926 samples	Soil sampling Line length 40 km Soil samples 1,689 samples
Airborne Survey		Aeromagnetic and radiometric survey Survey area 12,000 km^2 Line length 27,000 km	
Trench Survey			Trench survey Total length 4,520 m Amount of excavating soil 8,130 m^3 Mahoma Este(8trenches) 2,245 m Andresito(5trenches) 2,275 m
Laboratorial Studies	Geological and geochemical survey Thin section 67 samples Polished section 38 samples X-ray diffraction analysis 31 samples Whole rock analysis 61 samples Rock chemical analysis 607 samples Soil chemical analysis 2,021 samples Fluid inclusion 14 samples Dating 6 samples	Geological and geochemical survey Thin section 20 samples Polished section 20 samples X-ray diffraction analysis 20 samples Rock chemical analysis 630 samples Soil chemical analysis 1,926 samples Fluid inclusion 30 samples Dating 5 samples Geophysical survey Remanent magnetization 8 samples	Geological and geochemical survey Thin section 20 samples Polished section 30 samples X-ray diffraction analysis 30 samples Rock chemical analysis 4,520 samples (Trench samples) Soil chemical analysis 1,689 samples Fluid inclusion 30 samples Geophysical survey Remanent magnetization 10 samples

1-3-1 Planning and negotiation

Japanese side	Uruguayan side
Keisuke Mihira (JICA)	Dr. Carlos Soares de Lima (DINAMIGE)
Akira Chiba (MMAJ)	Ing. Jorge Spoturno (DINAMIGE)
Tetsuo Suzuki (MMAJ)	Ing. Humberto Pirelli (DINAMIGE)
Tetsuya Honjo (MMAJ)	Ing. Richard Arrighetti (DINAMIGE)
Yoshiaki Igarashi (MMAJ)	Ing. Javier Techera (DINAMIGE)

DINAMIGE : Dirección Nacional de Minería Geología

1-3-2 Field Inspection

(1) Phase I: Tadashi Itoh (MMAJ)

(2) Phase II: Noboru Fujii (MMAJ)

(3) Phase III: Takeshi Harada (MMAJ)

1-3-3 Survey team

(1) Phase I:

Japanese side	Uruguayan side
Norio Ikeda (Team Leader)	Dr. Carlos Soares de Lima (DINAMIGE)
Yoshio Takeda (Geological and geochemical survey)	Ing. Jorge Spoturno (DINAMIGE)
Nobuhiro Goto(Geological and geochemical survey)	Ing. Humberto Pirelli (DINAMIGE)
Susumu Takeda(Geological and geochemical survey)	Ing. Richard Arrighetti (DINAMIGE)
Masami Otake(Geological and geochemical survey)	Ing. Eduardo Medina (DINAMIGE)
	Ing. Javier Techera (DINAMIGE)

(2) Phase II:

Japanese side	Uruguayan side
Takeshi Katano (Team Leader)	Dr. Carlos Soares de Lima (DINAMIGE)
Koseki Takehiro (Geological and geochemical survey)	Ing. Jorge Spoturno (DINAMIGE)
Masami Otake (Geological and geochemical survey)	Ing. Humberto Pirelli (DINAMIGE)
Kazuyasu Tsuda (Geological and geochemical survey)	Ing. Richard Arrighetti (DINAMIGE)
David Escobar (Airborne survey)	Ing. Javier Techera (DINAMIGE)

(3) Phase III

Japanese side	Uruguayan side
Takeshi Katano (Team Leader) Junichi Yamagata (Geological and geochemical survey) Kazuyasu Tsuda (Geological and geochemical survey) David Escobar (Geophysical survey)	Dr. Carlos Soares de Lima (DINAMIGE) Ing. Jorge Spoturno (DINAMIGE) Ing. Humberto Pirelli (DINAMIGE) Ing. Richard Arrighetti (DINAMIGE) Ing. Javier Techera (DINAMIGE) Ing. Hugo Cicalese (DINAMIGE) Ing. Antonio Pacheco (DINAMIGE)

1-4 Survey Period

(1) Phase I:

Analysis of existing data: From 18 December 2000 to 20 January 2001

Geological interpretation of satellite image: From 20 December 2000 to 20 January 2001

Geological and geochemical survey: From 24 January 2001 to 5 March 2001

(2) Phase II:

Airborne Survey: 12 November 2001 to 16 January 2002

Geological and geochemical survey: From 24 October 2001 to 16 December 2001

(3) Phase III:

Geological and Geochemical survey: From 2 September 2002 to 16 December 2002

Geophysical survey: From 5 October 2002 to 20 November 2002

CHAPTER 2　GENERALITIES

2-1　Location and Access

Uruguay is located on the eastern seashore of the South American Continent facing the Atlantic Ocean. The country borders are Brazil in the north and the La Plata River and Uruguay River bordering Argentine at the south and the west. Uruguay has a surface of 176,000Km^2 and a population of about 3,160,000 (year 1996) with almost half living in the capital, Montevideo.

The survey areas consisted of two areas of San Jose and Arroyo Grande located in the northern part of Montevideo lying at the south of the country.

The San Jose area is located at approximately 90km northwest of the capital Montevideo and has a rectangular shape with 220km along east-west direction and about 50km along south-north direction. National Roads No. 5, 3, 23 and 54 connects the access for this area.　The area is located within San Jose de Mayo district and it has Trinidad district and Cardona district respectively at the eastern part and at western part.　The base camp for the survey is located near the San Jose de Mayo city.

The Arroyo Grande area is located about 140km northwest of the capital Montevideo and it has a rectangular shape with 50km along east-west direction and about 20km along north-south direction. National Road No. 3 connects the area with the city of San Jose de Mayo and it takes around two and a half hours by car from Montevideo City.

2-2　Topography and Drainage system

The highest altitude in Uruguay is 514m above sea level.　Almost the whole country shows a flat to gently topography, particularly the southern part of the country including the project area.　In the eastern part of San Jose area, the Santa Lucia River flows southward, the San Jose River flows in the central part and Rosario and San Juan Rivers flow in the western part of the area.　The Neguro River flows westward in the Arroyo Grande Area.

2-3　Climate and Vegetation

According to the world climate division, Uruguay belongs to temperate rainy climate with mild annual average temperature of about 16℃. In winter season, from June to September, the average temperature frequently reaches temperature below 10℃.　During the summer season from December to March the average temperature is 23℃.　The average annual precipitation in Montevideo is around 1000mm, which is considered low for the temperate rainy climate.　The best period for field survey is between September and December due to the low rainfall rate and mild temperature.

The vegetation in the survey area consists of natural and artificial pasture, with low trees spots along the riverside.

CHAPTER 3 GEOLOGICAL BACKGROUND OF THE SURVEY AREA

3-1 Geological Outline

Basement rocks of pre-Cambrian age and sedimentary rocks and basalt lava of post-Mesozoic age underlie the geology of Uruguay. The pre-Cambrian basement rocks is widely predominant in the south of the country and accounts for 40% of the Uruguay land. The Permian sedimentary rocks and the Cretaceous basalt lava plateau that cover the Rio de la Plata Craton, outcrop from central part to northern part of Uruguay. Cenozoic rocks are distributed from east of the country to the Atlantic Coast and in the western and southern part of the country (Fig. I-3-1).

Rio de la Plata Craton is represented by mylonitized and diversified effusive rocks, intrusive rocks and sedimentary rocks that were intensely deformed by metamorphism. Rio de la Plata Craton shows an E-W trend, with Archaean and Lower to Middle Proterozoic age rock at western part. Upper Proterozoic to Cambrian age rocks crop out at the eastern extension. The Craton show igneous rock as basalts, basic intrusive rocks and siliceous volcanic rock and sedimentary rock, as chert, shale, greywacke and quartzite, these characteristics are very similar to the geology of Western Australia, Canada and Ontario.

Pre-Cambrian unit is broadly classified into three Terrains, Piedra Alta Terrain in the south, Nico Perez Terrain at east and Cuchilla Dionisio Terrain at southeast of the country. Between these terrains there are mylonitic and migmatitic rocks (Fig.I-3-2).

An E-W trending sequence of Archaean to Lower Proterozoic age, basalt rocks, volcaniclastic rocks and sedimentary rocks that are intruded by granitic plutons are present at northern and southern boundaries of Piedra Alta Terrain. The northern sequence is called Arroyo Grande Belt and the southern sequence is called San Jose Belt. A stratigraphic column is shown on Fig. I-3-3.

3-2 Gold mineralization and mining history

3-2-1 Gold Mineralization

Gold ore deposits named Mahoma and San Carlos mines are present in the volcano-sedimentary sequence of San Jose belt. The Mahoma ore deposit is located within San Jose Province, about 130 km to northwest of Montevideo. Mahoma mine is located approximately in the center of the San Jose belt, and its mining right holder is Rea Gold Co. Ltd. of Canada. It was discovered through investigation carried out by Lac Mineral Co., Ltd from 1986 to 1990 and American Resources Corp. (ARC), a subsidiary company of Rea Gold, mined it in 1992. The ore deposits are auriferous quartz veins and it consists of three gold quartz veins that extend along E-W trending faults system. The veins are hosted in granodiorite and its strike is N70E with dip to 75N. The estimated ore volume ranges from 169,000 to 330,000 tons with Au grade from 8.9 to 11.8 g/t. Films and dissemination of pyrite, chalcopyrite, galena and blenda are related to gold mineralization, as well as secondary minerals as covelline and chalcocite.

The San Carlos mine is located at western extremity of the San Jose belt. It was also discovered through

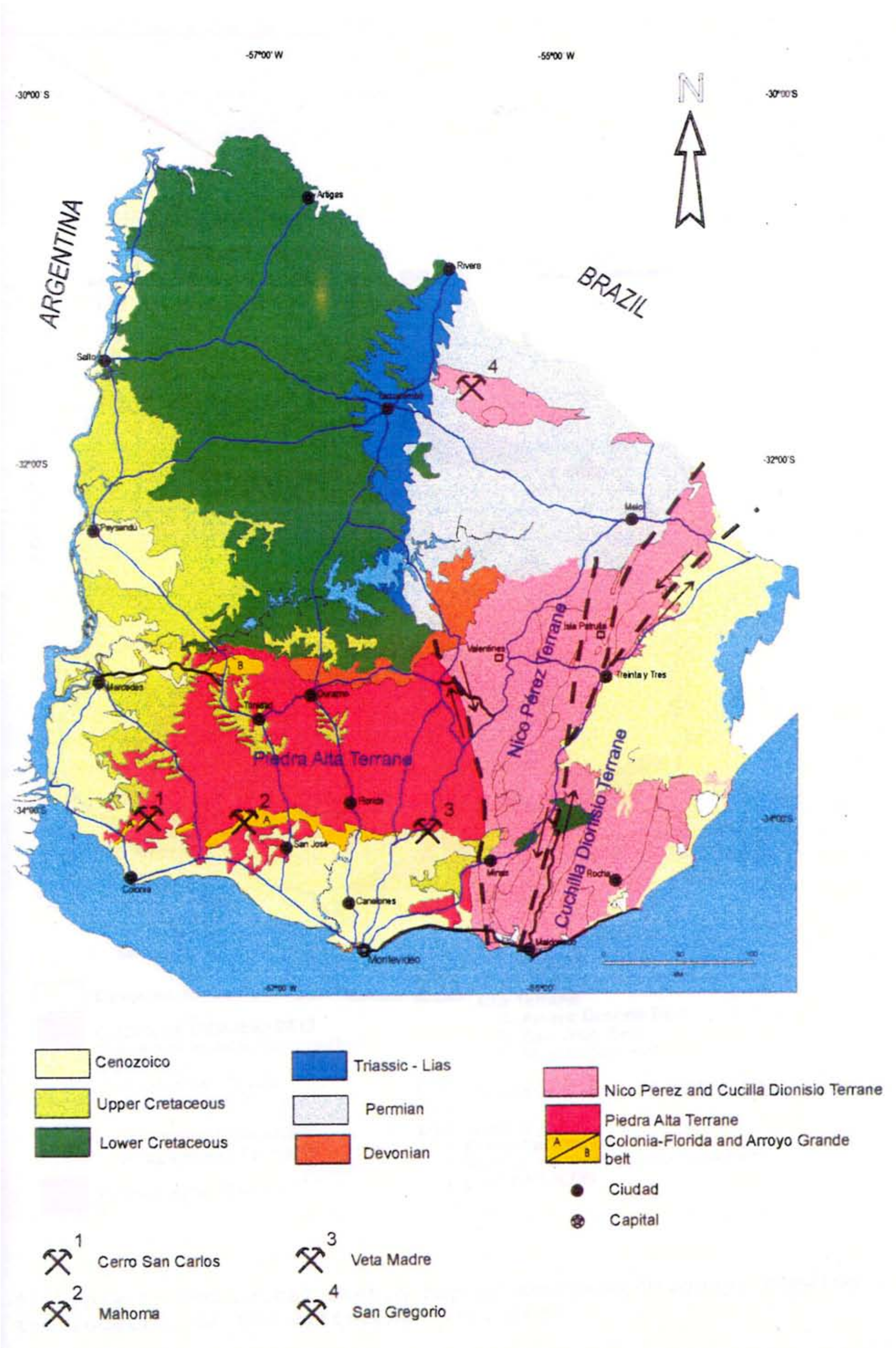


Fig. I-3-1 Geological map of Uruguay

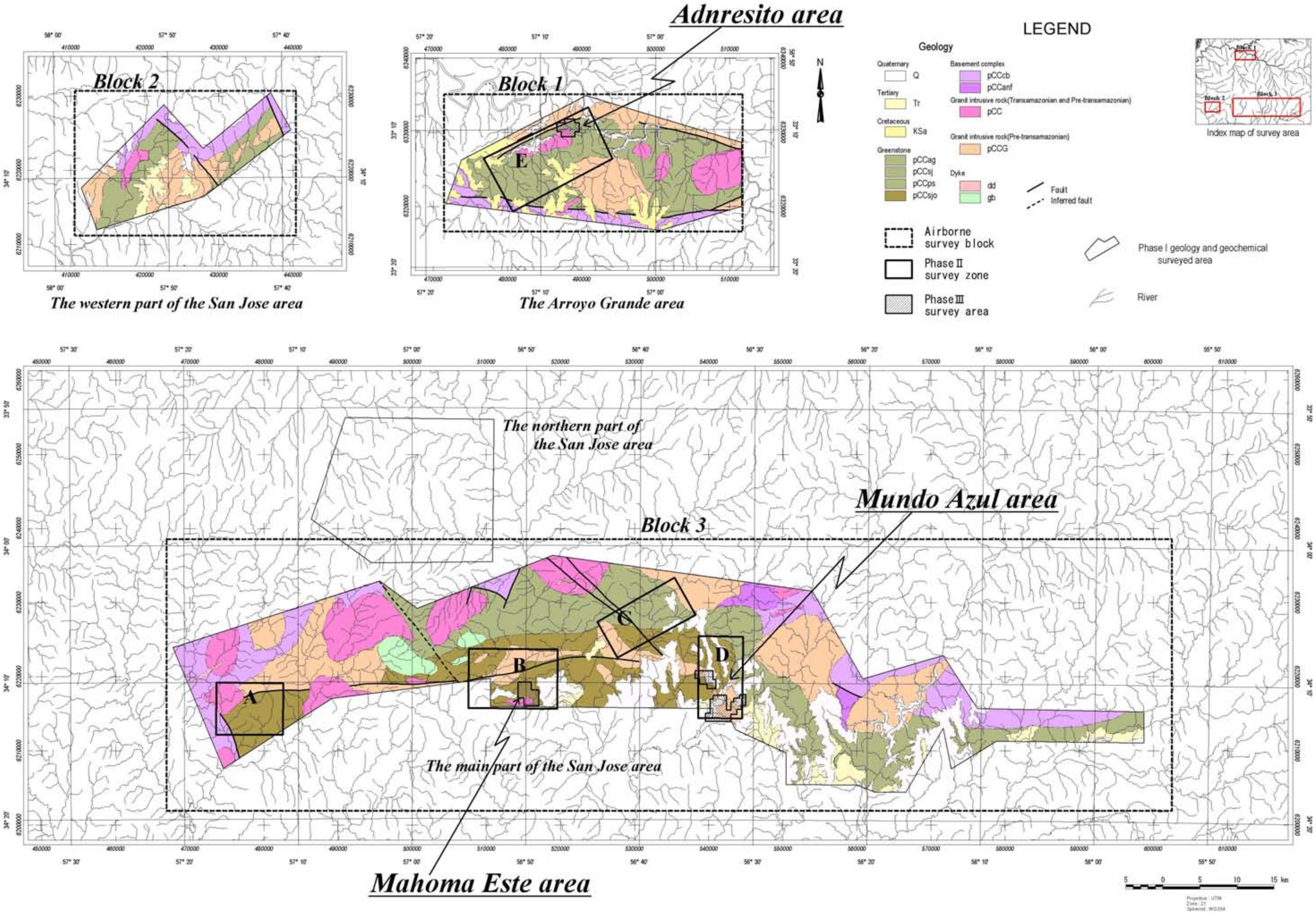


Fig. I-3-2 Geological map of the San Jose and Arroyo Grande area

Age (Ma)	Units	Events	Domain
1,400–1,800	Doleritic dykes	Distensive enviroments	
1,845 1,900	Pintos granite	*CRATONIZATION*	
1,900–1,970	Aplites and granitic dykes Leucogranite dykes		TRANSAMAZONIAN OROGENESIS
2,000–2,070	Granite-gneissic complex Granitic dyke Isla Mala Gabbroic Complex Mahoma-Guaycuru		
2,070–2,100		Metamorphism, migmatization, granitization and folding	
2,100	Leucogranite	3^{rd} deformation phase	
2,180 2,225	Southern granite A. Virgen leucogranite	Syncolisional Paso Lugo fault Late orogenic	PRE TRANSAMAZONIAN
2,270–2,290	A. Grande granodiorite Hornblendites Isla Mala leucogranite San Jose Granodiorite	Distensive, 2^{nd} deformation phase *MYLONITIZATION*	
2,291–2,386	Marincho main granodiorite		
2,450	Isla Mala granodiorite		
2,500–2,544	*San Jose metamorphic belt* Alkaline granite	Metamorphism+1^{st} deformation phase	
	Arrojo Grande metamorphic belt Complejo Basal	Metamorphism+1^{st} deformation phase	ARCHEAN

Stratigraphy in accordance with PRECIOZZI et al.(1999). Modified.

Fig. I-3-3 Schematic stratigraphic column of survey area investigation carried out by Lac Mineral Co., Ltd. and it is a small-scale ore deposit disseminated in quartz vein.

3-2-2 Mining history

Gold ore deposits such as Mahoma and San Carlos gold mines are distributed in the greenstone rocks of the San Jose formation. The Mahoma ore deposit located approximately in the center of San Jose belt was discovered during investigation carried out by Lac Mineral Co., Ltd during 1986 to 1990. Survey method was mainly by alluvial geochemical and later soil geochemical prospecting. Mahoma mining right holder is Rea Gold Co., Ltd. of Canada. American Resources Corp. (ARC), a subsidiary company of Rea Gold, carried out mining operation The quartz veins are hosted in granodiorite and it strikes N70E and dip 75 degrees to N. It is estimated the following figure for Mahoma mine, ore amount from 169,000 to 330,000 tons and gold grade between 8.9 and 11.8 g/t. Sulphide such as pyrite, chalcopyrite, galena and blende are present as well as the secondary minerals of covelline and chalcocite. The San Carlos mine is located near the western extremity of San Jose belt. It was also surveyed and discovered by Lac Mineral Co. This was a small scale gold deposit that accompanied quartz vein or sulphide dissemination.

CHAPTER 4 SURVEY RESULTS

4-1 Phase I

Analysis of existing data and Satellite image interpretation were performed within an area of 12,000 km^2 that include the areas of San Jose(Western portion and Main portion) and Arroyo Grande. Geological survey and soil and rock geochemical surveys were carried out within the above three areas, aiming to understand the relationship between gold mineralization and geological structure.

Existing data analysis, of geology, geological features, geological structure, mineral deposit and results of geochemical prospecting were made. From these data compilation it was possible to understand the outline of geological features, geological structure and the potentiality of the gold mineralization.

Analysis results confirmed that gold ore deposits were associated with volcano-sedimentary sequence and it was closely associated with granodioritic intrusions. Based on this information and from an original project area of 12,000 km^2, it was extracted a survey area of about 2,500km^2, where the presence of volcano sedimentary sequence and granodiorite intrusions was confirmed. For this selection, it was used the compilation result of the existing data analysis and interpretation of satellite image data

Faults with two predominant trends, ENE-WSW and NW-SE were detected in the south of the survey area. ENE-WSW trending faults are old, with the fault with NW-SE trend crossing the first and forming a structure in block with NW-SW direction. Some of the granitic rocks (pCCG and pCC) are distributed in association with the ENE-WSW trending faults. It is expected that the emplacement took place at approximately the same period of the faults activity. Interpreted lineament shows an intermediate density with predominant trends along NW-SE and NE-SW.

The area mainly consists of basement complex (pCCcb, pCCanf), volcano-sedimentary sequence (pCCsjo, pCCsj, pCCps and pCCag), ancient granite intrusive rocks (pCCG) and younger granite intrusive rocks (pCC). Cretaceous, Neogene and Quaternary age sequence overlay discordantly.

The basement complex is distributed in the western extremity and eastern extremity of the main part of the San Jose area. The basement is also distributed at north of the western part of the San Jose area and along the southern edge of the Arroyo Grande area. The basement complex is mainly composed by gneiss, schists, quartzite, amphibolite and granites, and accompanied by migmatite and hornfels. Granites show weak foliation that is attributed to metamorphism. Quartz schist, metasandstone and silicified rocks are predominant in the western part of San Jose area.

The volcano-sedimentary sequences of San Jose formation (pCCsjo) was subjected to a relatively high grade metamorphism, while Paso Severino (pCCps), the Cerros de San Juan (pCCsj) and the Arroyo Grande (pCCag) formations were subjected to a weak metamorphism. The Arroyo Grande formation was subjected to weak to moderate metamorphism and the common lithofacies of these formations are schist (greenschist, mica schist and quartz schist), meta-volcanic rocks and meta-sedimentary rocks. The San Jose formation mainly consists of greenschist, mica schist, quartz schist, gneiss, meta-rhyolite, meta-basalt, green rock, quartzite, meta-sandstone, slate, phyllite and amphibolites.

A total of 2,021 soil samples were collected by using a semi-grid distribution at the depth of B-horizon. Chemical analysis was carried out for the 34 following elements: Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Co, Cu, Ga, Fe, La, Pb, Mg, Mn, Hg, Mo, Ni, P, K, Sc, Ag, Na, Sr, S, Tl, Ti, W, U, V, Zn and Au. The maximum analytical values for gold in each survey zone, was as follows: Zone A (Au146ppb), Zone B (Au138ppb), Zone C (Au88ppb), Zone D (Au138ppb), Zone E (Au79ppb).

The rock geochemical samples were taken from quartz veins and its host rocks. The total of collected rock samples were 607, analyzed for 8 elements: Au, Ag, Cu, Pb, Zn, As, Sb and Hg. The gold assay value for quartz veins hosted in green rocks was between 19,890ppb and 5ppb, and for granites between 5,370ppb and 37ppm, while for other rocks, between 562ppb and 14ppb. Gold assay results of host rock were between 37ppb and 5ppb for green-rocks and between 291ppb and 9ppb for granites, while for other rocks was between 354ppb and 9 ppb.

Based in the above results, it was recommended the zones, A, E, G, H, K and L for further survey during Phase II.

4-2 Phase II

Airborne geophysical survey, soil geochemical prospecting and geological mapping were carried out during the Phase II survey in San Jose and Arroyo Grande areas in the locations shown in Fig.II-1-1.

An airborne survey was flown over 3 blocks located in San Jose and Arroyo Grande areas. Total coverage of the survey amounted to 12,000Km^2 consisting of 27,497m-lines at about 120m above sea level. Aeromagnetic maps provided good complementary information for use in geological interpretations. This information permitted the interpretation of contact/faults and underlying lithologies that provided new insights on the geological framework to decide future exploration works in the area. The application of enhancement techniques, such as the vertical gradient probed to be useful in the determination of magnetic lineaments related to fault and contacts. On this regards, the aeromagnetic survey was able to detect several trends and features characteristic of the structural setting of the area such as three main trends associated with faults and/or contacts observed in the survey area.

The approximate N60E trend is by far the most recognizable trending system. One of these trends crosses the zone B where Mahoma mine is located. The intersection of these systems by structures and faults along the second EW trend are thought of particular interest for the existence of gold mineralizations. Using the radiometric data, it was possible to observe that some anomalous potassium revealed lineaments that coincide with magnetic lineaments. This may indicate that the lineaments found in the potassium maps and associated to magnetic lineaments may indicate shear zones related to the possibility of hydrothermal minerals.

The geology of the 5 surveyed zones consists of the following units: Complejo Basal (pCCcb), San Jose belt (pCCsjo), Arroyo Grande belt (pCCag), ancient granite (pCCG), younger granite (pCC), dolerite dike (dd) and gabbro (gb) and Triassic sediments. The regional geology presents an E-W trend that is the same direction of the greenstone units in the surveyed area. The surveyed areas are controlled by faults and linear structures as indicated by the airborne geophysical lineaments along ENE-WSW direction. Shear zones along WNW-ESE direction cross the ENE-WSW structures.

A total of 17 zones with concentration of quartz veins were surveyed and its results showed that the quartz veins are mainly transparent to semi-transparent, milky and few of them are blackish. Analytical results confirmed gold mineralization in quartz veins, but its grade is very heterogeneous.

A total of 1,926 soil samples were taken using a semi-grid distribution at the depth of B-horizon. The spacing of the samples was designed so that 4 to 5 soil samples can be taken every square kilometer. From analytical results, 6 soil gold anomalies zones were confirmed and in 5 of them, the soil anomaly overlapped with gold anomaly in quartz samples.

4-3 Phase III

Geological survey, geophysical survey, soil geochemical survey and trench survey were carried out in Mahoma East area, Andresito area and Arroyo Grande area, as recommended during Phase II. The survey main target

In the survey area were observed greenstone rocks named, San Jose(pCCsjo) and Arroyo Grande(pCCag) and these rocks were intruded by ancient granite (pCCG) and by younger granite and granodiorite (pCC) and also by several dykes as, aplitic dykes, granitic dykes and dolerite dykes.

San Jose unit is composed essentially by biotite schist and greenschist, locally filled by lenses of quartz veins and silicified rocks. General trend is N70W plunging 30 degrees to south; only at the proximity of the granitic intrusion the schistosity has the direction of the intrusive body.

A total of 1,689 soil samples were collected and analyzed. Soil geochemical prospecting confirmed wide gold anomalies within granite rocks (pCC) that outcrop at the southern part of the Mahoma East area. Soil gold anomalies also were detected at western part and central part of the Andresito area.

The disposition of the gold anomalies in Mahoma East area approximately overlaps the linear magnetic anomaly detected during airborne survey of Phase II. VLF-EM and magnetic geophysical survey carried out within soil geochemical anomalies of the same area confirmed linear magnetic and linear VLF anomalies overlapping the magnetic anomaly detected during airborne survey. Magnetic survey conducted in Andresito area showed a fault system distributed in the northern part of the area. A relatively strong magnetic trend seen along NE direction, may be probably due to high magnetic volcano-sedimentary rocks.

Trench survey, with a total length of 4,520m and a volume of 8,130m^3 were excavated in places overlapped by soil gold anomalies and VLF anomalies. 1m-width channel samples were taken from trenches bottom, resulting in the following results: Mahoma East area trenches, 515600: 0.13ppm～0.75ppm, trench 515700: 0.13ppm～0.27ppm, trench 515800: 0.25ppm～0.54ppm, trench 515900: 0.14ppm～0.31ppmin quartz veins; Andresito area trenches, 486900: Au0.95ppm～1.09ppm, Trench 487000: 0.22ppm～2.06ppm, Trench 487100: 0.08ppm～0.57ppm, Trench 487200: 0.09ppm～0.35ppm, Trench 488500: 0.39ppm in quartz veins.

CHAPTER 5　CONCLUSIONS AND RECOMMENDATIONS

5-1 Conclusiosn

Analysis of existing data, satellite image interpretation, airborne survey, geological mapping, ground geophysical survey, soil geochemical prospecting and trench survey were carried out during three years in San Jose and Arroyo Grande areas. Extracted conclusions are as follows:

(1) Mahoma East area

A total length of 2,245m and volume of 3,220m^3 of trenches were excavated and a study of gold mineralization was performed. Shear zones were confirmed and dolerite dykes with maximum width of 26m intruded them. Within these shear zones, quartz veins lenses were found that confirmed a maximum gold values of 745ppb in 1m-width channel sample.　Others channel samples confirmed the following results in quartz veins and veinlets filling dolerite and granite; trench 515600 with gold between 0.13ppm and 0.75ppm, trench 515700 with gold between0.13ppm and 0.27ppm, trench 515800 with gold between0.25ppm and 0.54ppm, trench 515900 with gold between0.14ppm and 0.31ppm. Gold mineralization detected in the trenches is of low grade and it lacks in homogeneity of gold content, and also in veins thickness and extension.

(2) Andresito area

In Andresito area 2,275m of trenches were excavated with a total volume of 4,910m^3. 1m-wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows: Trench 486900: Au0.95ppm～1.09ppm, Trench 487000: 0.22ppm～2.06ppm, Trench 487100: 0.08ppm～0.57ppm, Trench 487200: 0.09ppm～0.35ppm, Trench 488500: 0.39ppm. Gold mineralization are probably related to the last stage of granodioritic intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets. Gold mineralization detected in quartz veins of southern trenches is of higher gold grade, but it lacks in homogeneity of gold content, and also in veins thickness and extension. The above characteristics indicate the low potentiality to find an economic gold deposit within surveyed area.

(3)Mundo Azul area

A total of 980 soil samples were taken from Mundo Azul areas and the correlation coefficients calculated clearly indicates that the relation among elements showed no correlation with gold. No concentration of soil anomalies was detected in Mundo Azul north area, while in the Mundo Azul south area, the gold anomaly detected was very restricted and its maximum gold value was 20ppb. Overall results indicated that the potentiality of this area is low.

5-2 Recommendations

Recommendations for further surveys in Mahoma East area, Andresito area and Mundo Azul area are as follows:

(1)Mahoma East area

Trench survey detected gold anomalies between 0.13ppm and 0.75ppm in 1m-wide channel sample in granite and diabase. Since these anomalies lack in width and length, its gold potentiality is considered very low and further survey cannot be recommended in the area.

(2)Andresito area

1m-wide channel samples taken from southern trenches of Andresito area showed gold values between 0.1 and 2.06 ppm in quartz veins. Since these anomalies lack in width and length, its potentiality to find an economic gold deposit is considered low and further survey cannot be recommended in the area.

(3)Mundo Azul area

Soil geochemical prospecting results indicated very poor results, therefore, further survey is not recommended in the area.

PART II　SURVEY RESULTS

CHAPTER 1　PHASE I

The Phase I survey area is shown in the Fig.2.

1-1 Existing Geological data

After the year 1980, many mining companies from Canada and USA came to Uruguay and start a prospection boom and targeting promising area for gold. In the San Jose area were discovered the Mahoma and the San Carlos gold mines. The San Gregorio gold mine was discovered in the north of Uruguay, and it is being worked nowadays. As recommended by Mason et al, 1990, the denomination greenstone was adopted in this report to the rocks composing the San Jose belt and Arroyo Grande belt.

From analysis of existing data and by using interpretation of satellite data, the survey area was reduced from an initial area of 12,000km^2 to an area of 2,500km^2.

1-2 Interpretation of satellite image data

The targeted survey area for geologic interpretation of the satellite image data covers both the San Jose and the Arroyo Grande areas and the gross area amounts to 12,000km^2 (Fig.1 and Fig.II-1-1).

1-2-1 Lineament analysis

Generally, the lineament is developed without discriminating predominant trends, while the N-S trending lineaments are developed in the east part of the Arroyo Grande area as well as the San Jose area. No lineament with a predominant E-W trend is developed in any part of the area. The lineaments are densely found in the northern part of the Mahoma mine and form a high-density zone of ring arrangement. Lineament density is higher in the eastern part of the Arroyo Grande area, when compared with the other areas.

1-2-2 Result of image analysis

Considering the expected ore deposit type, the potential of the ore bearing area analyzed at this stage, requires at least the following necessary conditions.

(1) Existence of faults developed in predominant trends ENE-WSW and NW-SE.

(2) In or near the area which Unit gs and Unit G are distributed.

(3) Lineament, which is considered to reflect the geological structure, is concentrated, although the scale range is different from the faults.

As for (1), it is considered that the faults as well as (3) provide space for ore deposits to lie. However, it is necessary to figure out the timing of activity in relation to Unit G. As for (2) it is pointed that Unit gs is important as a supply source of hydrothermal solution, and Unit G as a heat source. Based on these aspects, the interpretation map of satellite imagery resuming the result of geological interpretation is shown in Fig. II-1-1. As a result, the following two areas can be appointed as the locations that fill all these requirements.

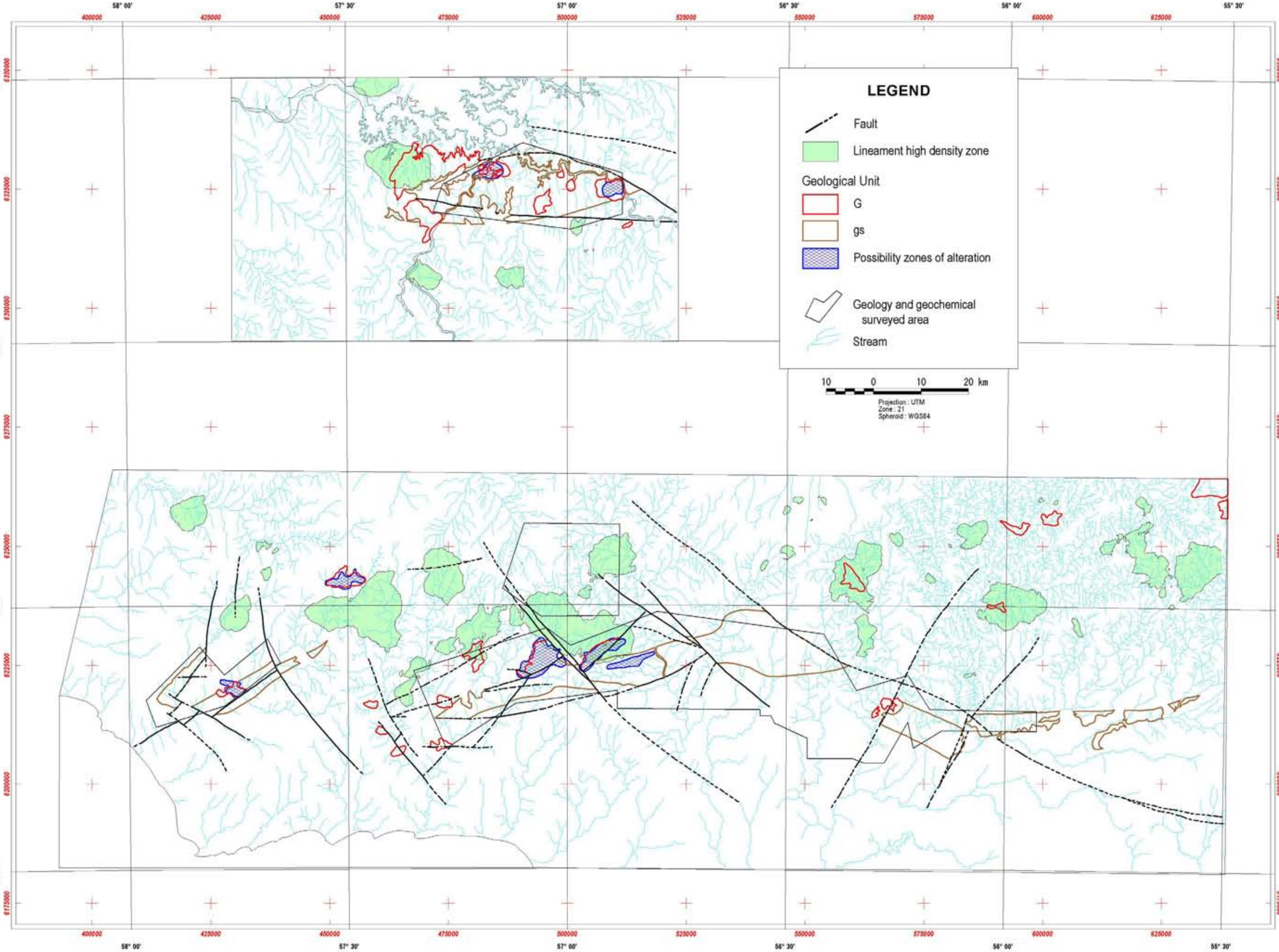


Fig. Ⅱ-1-1 Interpretation map of satellite imagery

San Jose area

(1) Around the Mahoma mine

(2) The area about 20km west from the Mahoma mine

Arroyo Grande area

(1) Further west than the northwest part of the area

1-3 Geological mapping

During Phase I, geological mapping was carried out within three areas of 2,500km^2 named, San Jose main area, western part of San Jose and the Arroyo Grande areas in order to understand the geological features and structure of the survey area (Fig. I-3-2).

1-3-1 Result of the geological mapping

The basement rocks, greenstone rocks, intrusive rocks of Pre-Transamazonian age and younger granitic rocks mainly compose the geological formation of this area. Cretaceous, Neogene and Quaternary sediments overlay the above geological units (Fig.I-3-2).

The greenstone rocks is composed of San Jose formation that was subjected to a relatively high grade metamorphism and Paso Severino, Cerros de San Juan and the Arroyo Grande formations that were subjected to a weak metamorphism.

The common lithofacies of these four formations, which are constituent of greenstone, are schists as (green schist, mica schist and quartz schist) and metamorphic volcanic rocks.

The representatives intrusive are ancient granites rocks and younger granites rocks.

1-3-2 Geological structure

The geological structure of the survey area is characterized by faults with general trends along E-W and NW-SE directions.

The E-W fault forms the boundary between the San Jose formation at south side and the Paso Severino formation at north. In the Arroyo Grande area, the E-W fault forms the boundary between the complex rocks of the basement at south and the Arroyo Grande formation in the north.

At western part of the San Jose main area, the schistosity at the proximity of the fault is controlled by NW-SE direction and mylonitization are observed within younger granites rocks.

1-3-3 Gold Mineralization

Quartz veins are located within ancient granites rocks and within greenstone rocks. The survey showed the following 13 quartz vein zones (Fig.II-1-2) and Tab. II-1-1.

(1) Main part of the San Jose area (10 zones)

(2) Western part of the San Jose area (1 zone)

(3) Arroyo Grande area (2 zones)

Host rock alteration near the quartz vein show silicification at the proximity of quartz veins at the Mahoma mine. The quartz veins were classified into three types: milky sacharoidal quartz, semi-transparent quartz and transparent quartz.

1-4 Soil geochemical prospecting

Soil geochemical prospecting was carried out in the same area of the geological survey. Samples of soil sediment were taken in places that form the ancient riverbeds. Sampling points were selected using aerial photographs and topographical maps with locations confirmed by GPS. The sampling density was of 1 sample/km^2 and the number of soil samples was 2,021.

Chemical analysis was carried out for 34 elements that included the elements Au, Ag, Cu, Fe, Pb, Zn, As and Hg.

1-5 Rock geochemical prospecting

Rock geochemical prospecting with total of 607 samples was carried out on the same survey area of geological mapping. Result of Au assay showed 23 quartz vein samples with intermediate gold grade, maximum of 19,890ppb. The quartz veins hosted by green rocks showed values between 19,890ppb and 5ppb, and that hosted by granites showed between 5,370ppb and 37ppm. Other host rocks showed values between 562ppb and 14ppb.

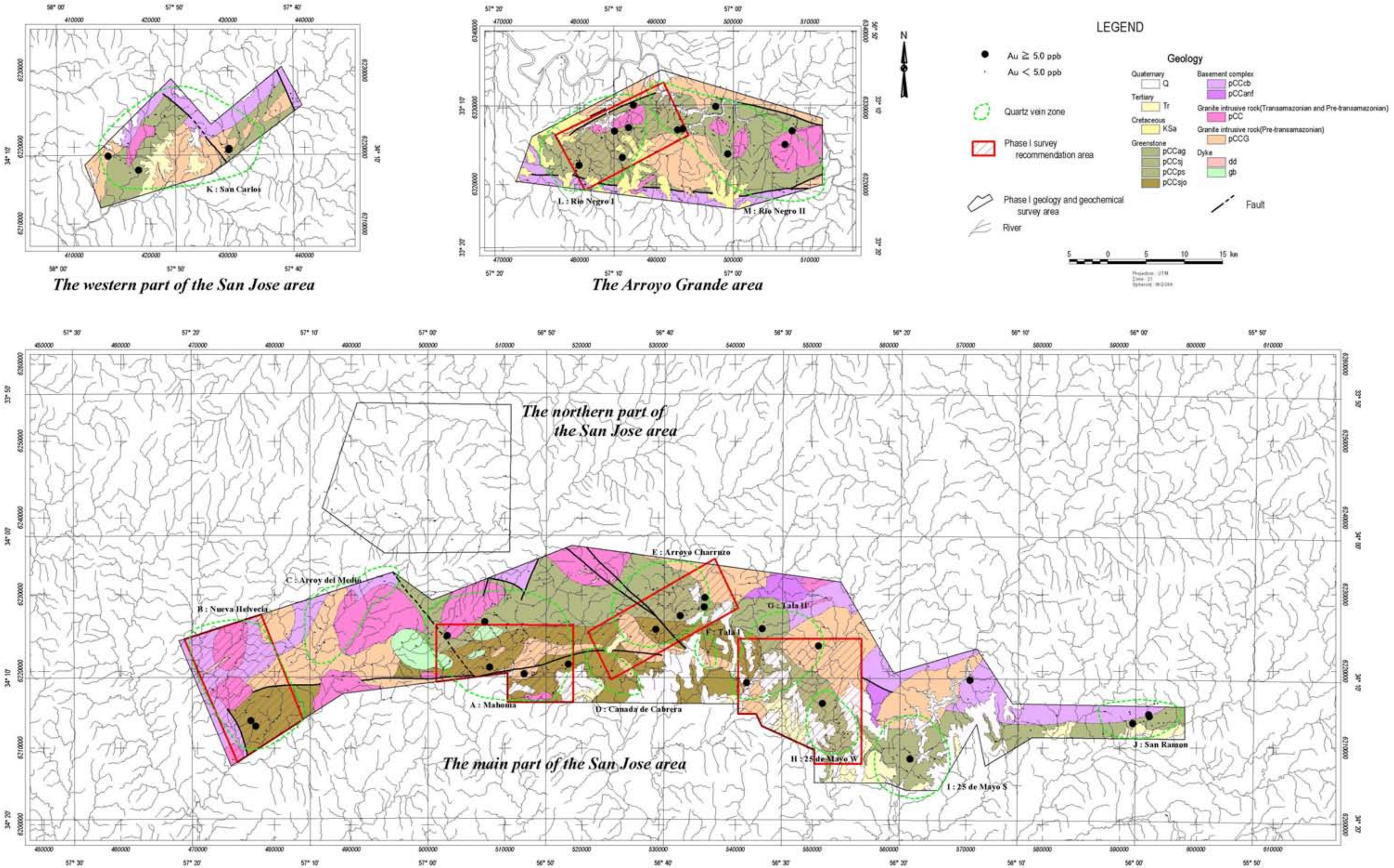


Fig. II-1-2 Composite map of results of the Phase I survey

Tab. II-1-1 Composite table of results of the Phase I survey

	Mineral showings	Location	Occurrence	Length, width	Host rock	Alteration minerals	Ore minerals	Gangue minerals	Results of soil analysis	Results of analysis	Evaluation
A	Mahoma	Paso del Rey	quartz vein (NW,E-W,NE) >> floats of quartz	20km × 15km	green schist, metabasalt, quartz schist, granodiorite (pCCG)	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	pyrite, limonite	quartz,clay	Au:23-79ppb, Cu,Pb,Zn, Factor2,Factor3, Factor4	quartz:1520-19890ppb, rock:5-354ppb	A (rock and soil geochem.)
B	Nueva Helvecia	Colla-Nueva Helvecia	floats of quartz	10km × 18km	green schist> quartz schist,	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite, (pyrite)	quartz	Au:14-23ppb, As,Cu,Pb,Zn, Factor1,Factor4	rock:32-37ppb	B (soil geochem.)
C	Arroy del Medio	Mal Abrigo	quartz vein (NE,E-W) = floats of quartz	6km × 15km	granodiorite (pCCG)	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	Cu,Pb,Zn, Factor2,Factor3	-	D
D	Canada de Cabrera	Paso del Rey	floats of quartz	8km × 4km	green schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	Au:6ppb,Pb,Zn, Factor2	-	C
E	Arroyo Charruzo	Paso del Rey	quartz vein (E-W,N-S) = floats of quartz	10km × 12km	green schist> metabasalt, quartz schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz,clay	Au:14-51ppb, As,Cu,Pb, Factor4	quartz:37-1680ppb, rock:5-23ppb	B (soil geochem.)
F	Tala I	Paso del Rey	quartz vein (NE,NW)	3km × 4km	green schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	Au:32ppb	-	D
G	Tala II	Florida	quartz vein (NE) = floats of quartz	9km × 14km	green schist, granodiorite (pCC-V)	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite, (pyrite)	quartz	As,Factor2, Factor3,Factor4	quartz:18-125ppb	B (soil geochem.)
H	West of 25 de Mayo	Florida-Cardal	floats of quartz	6km × 8km	green schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	Au:9-111ppb, As,Cu, Factor4	quartz:32ppb	A (rock and soil geochem.)
I	South of 25 de Mayo	Cardal	floats of quartz >> quartz vein (NW)	10km × 10km	green schist> quartz schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	As, Factor4	quartz:23ppb	C
J	San Ramon	San Ramon	floats of quartz	10km × 5km	green schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	Cu,Pb,Factor3	quartz:5ppb, rock:9-41ppb	C
K	San Carlos	Miguelete	quartz vein (NE) > floats of quartz	21km × 13km	green schist> quartz schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	Au:9-37ppb, Cu,Pb,Zn	quartz:37-1548ppb, rock:115ppb	C
L	Rio Negro I	Paso del Puerto	quartz vein (NW,E-W)	10km × 15km	green schist, quartz schist	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite, (pyrite)	quartz,sericite	Au:14-97ppb, As,Cu,Pb,Zn, Factor3,Factor4	quartz:245-5370ppb, rock:19ppb	A (rock and soil geochem.)
M	Rio Negro II	Paso del Puerto	quartz vein (NW) = floats of quartz	25km × 10km	green schist, metabasalt, granodiorite (pCCG)	quartz-(sericite)-(pyrite), chlorite-(epidote)-(albite)	limonite	quartz	Au:9-97ppb, As,Cu,Pb,Zn, Factor1, Factor2,Factor3	quartz:32-826ppb, rock:9-562ppb	C

Evaluation: A > B > C > D

CHAPTER 2　PHASE II

Airborne geophysical survey, soil geochemical survey and geological survey were carried out during the Phase II survey in San Jose and Arroyo Grande areas (Fig.I-3-2). The area covered by the airborne geophysical survey was 12,000Km^2 and the area for geological and geochemical survey area was 400 Km^2 that comprised the San Jose and Arroyo Grande areas. More than 400 linear Km of geological mapping and a grid sampling geochemical prospecting were carried out.

2-1 Airborne survey

2-1-1 Purpose of the survey

The purpose of this survey was to assist in the clarification of the overall structural and lithological mapping of the San Jose and Arroyo Grande areas by using aeromagnetic and radiometric data (Fig.II-2-1). The Project area covered by this survey consists of 3 blocks: Block1, Block 2 and Block 3. The Blocks 2 and 3 are located within the San Jose area, while the Block 1 is located within Arroyo Grande area. The survey area covers about 2,980km^2. Traverse and tie lines were spaced 250m and 5,000m, respectively. The traverse lines were flown NS and the control lines in an E-W direction every 5,000 meters resulting in an estimated total line km. count as follows:

Total coverage within the survey boundary was according to the table shown below.

Tab. II-2-1 Total line coverage

Block	Survey Lines		Control Lines		Total Distance (km)
	No. Lines	Distance (km)	No. Lines	Distance (km)	
1	164	3,114.8	5	332.2	3,447.0
2	121	2,576.3	5	152.9	2,729.2
3	547	20,229	8	1,090.3	21,319.5
Total		25,920.3		1,575.4	27,495.7

2-1-2 Survey results

The surveyed areas are shown in the Fig.II-2-2 and Fig. II-2-3.

2-1-2-1 Magnetic survey

(1) Block 1

Dominant high magnetic N60E-trendings are seen distributed in the area as illustrated by lineaments with localized zones of higher magnetic response in the vertical gradient map.　In the central part of this block, especially within the zone E, several high magnetic lineaments running along approximate EW trending are

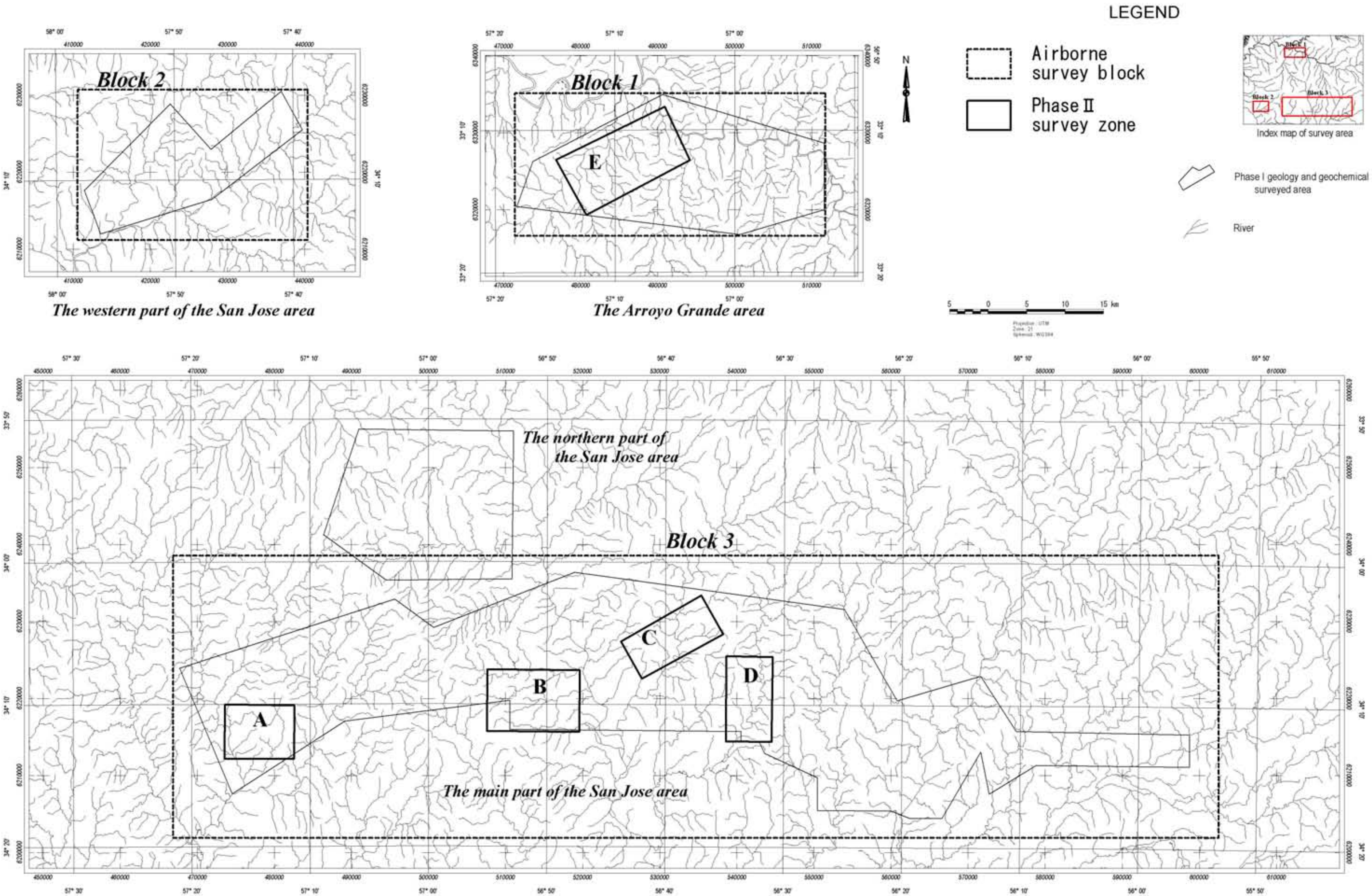


Fig. Ⅱ-2-1　Location map of the airborne survey area

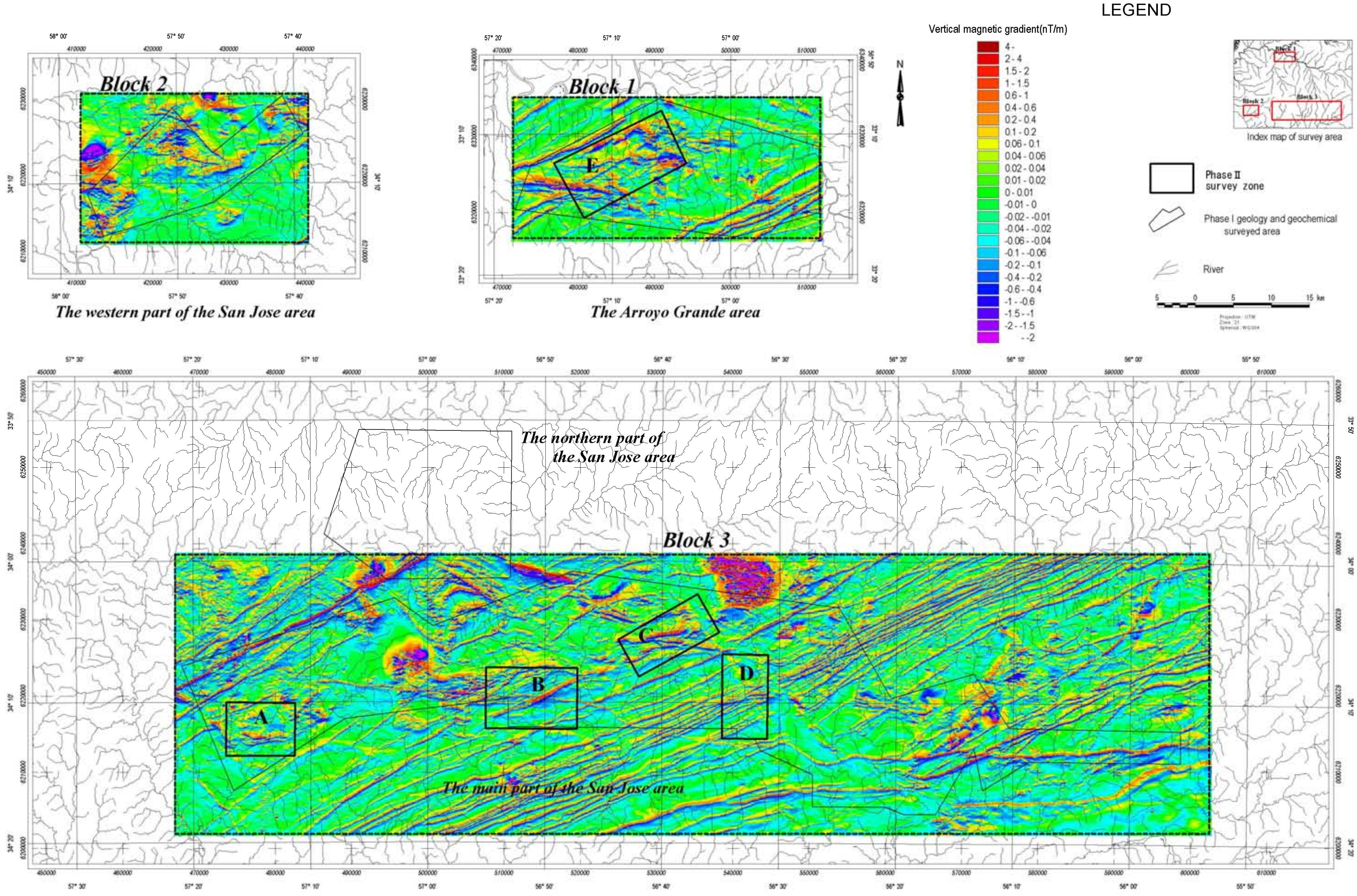


Fig. II-2-2 Magnetic vertical gradient of the survey area seen crossing diagonally the zone and appearing to interrupt the more prominent N60E trending.

Several high magnetic distributions running along N60E are distributed in the SE edge of the block as well as in the NW edge. These high magnetic anomalies are considered to be due to basaltic intrusive.

In the SW of zone E, the high magnetic anomaly corresponds probably to meta-basaltic lava, while the NE of this zone corresponds to metagabro.

Low magnetic values are widely seen in this block suggesting the influence of basement rocks, granitic rocks or meta-sedimentary rocks. Trans-Amazonian granite is inferred in the north part of zone E

(2) Block 2

This block is located in what was called the western part of the San Jose area in Phase I of this project. This block does not present clear linear magnetic trends, excepting one N60E distributed from the central part to about the northeast part of the block.

Most of the high magnetic relief is observed in the southwest part of the area, with conspicuous non-magnetic structures. Low magnetic distributions are detected in the north part of zone E due probably to the Trans-Amazonian granite.

(3) Block 3

Total magnetic intensity values (Fig. II-2-2) within this block vary from about 23000nT to over 23350nT. Intensities of less than 23230nT are typical in most of this area. Three main magnetic lineament trends associated with faults and/or contacts are observed in the block:

a) Approximately N60E trending systems are detected in the entire block. The analysis of the high magnetic N60E structures suggests that they are probably tied to a geological event at regional level with high magnetic values due to magnetized formation such as ultra-mafic intrusives along the structural trend. Especially the conspicuous high magnetic trendings seen in zone B are due to limonitized meta-sediments with sulphide minerals. However, in zone D the high magnetic values are probably due to basaltic intrusives.

b) A second group of lineaments includes trends oriented approximately EW in the middle part of the block and appears to interrupt and possibly offset the more prominent N60E trends in the southeast part of the block. This trend cannot be clearly defined due to a change either in the geological structure or weathering effects of the rocks. These trends of high magnetic values may also be due to ultramafic intrusives along the structural zone. In the eastern part of zone B, granodiorite veins are seen along the fault.

c) Other high magnetic trends are seen along NW-SE. This trend is seen in the northeast part of zone A, in both zone C and D, but it cannot be clearly clarified because they are widely covered by sediments.

2-1-2-2 Radiometric survey

(1) Block 1

The bright red area distributed in the north west of the image shows the so-called granitized belt of Florida. Several distributions with high K values are also detected from the center to the west edge of this block.

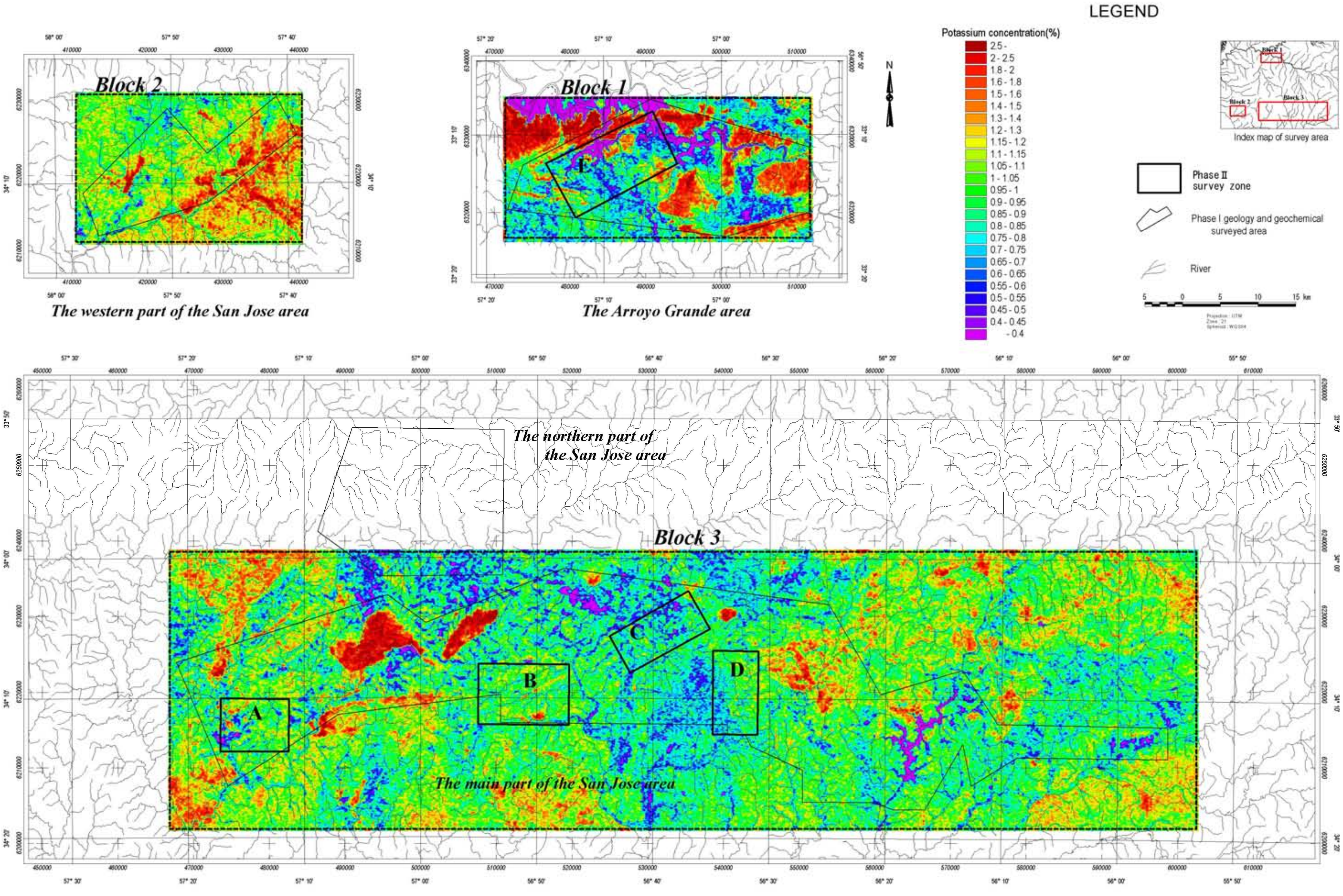


Fig. II-2-3 Airborne radiometric map of potassium of the survey area

These distributions show all low to medium magnetic values. They are inferred to be intrusive plutonics. These distributions are only weakly detected by the uranium and thorium concentration.

(2) Block 2

Granite plutonic of relatively high K values with no magnetic signature is detected in the east part of the block. However in the same area, low to intermediate concentrations of Uranium and Thorium are detected. The other half, shows opposite behavior. More investigation is needed to understand this behavior.

(3) Block 3

A large distribution of high to medium values is detected around the northwest and southwest edges of the block. They also show some coincidence with relatively high values as indicated by the reduction to the pole (RTP) distribution map.

In the southwest part of the zone A, metabasalt formation is assumed due to the high magnetic signatures presented and by the low potassium values. In the Zone B, the potassium map detected only 2 prominent portions; the most important is the strong N60E trending detected also in the RTP map.

2-1-3 Considerations

An airborne survey was flown over 3 blocks located in San Jose and Arroyo Grande areas;

1) Aeromagnetic maps have provided good complementary information for use in geological interpretations. This information permitted interpretation of contact/faults and underlying lithologies that will provide new insights on the geological framework to decide future exploration works in the area.

2) The approximate N60E trend is by far the most recognizable trending system. One of these trends crosses the zone B where Mahoma mine is located. The intersection of these systems by structures and faults along the second EW trend are thought of particular interest for the existence of gold mineralizations.

3) Low magnetic values widely seen in the survey area suggest the influence of basement rocks, granitic rocks or meta-sedimentary rocks.

4) Using the radiometric data, it was possible to observe that some anomalous potassium revealed lineaments that coincide with magnetic lineaments.

2-2 Geological mapping

2-2-1 Generalities

The geological survey was carried out within San Jose area and Arroyo Grande area in order to understand the geological features and structure of the project area as well as to interpret the soil geochemical and rock geochemical anomalies. During Phase II, the geological survey surveyed 5 zones from Zone A to Zone E, with a total coverage area of 400 Km^2, as shown in the Fig.I-3-2.

2-2-2 Survey results

2-2-2-1 Zone A

The Zone A is located at the western edge of the San Jose area, at 50Km west from San Jose de Mayo city and to the North of Nueva Helvecia city, as shown in Fig. II-2-4. The surveyed area has a rectangular shape elongated to E-W and measuring 9Km by 7 Km, with a total area of 63 Km^2.

The geology of the zone A is composed of San Jose belt (pCCsjo), ancient granites unit (pCCG) and younger granite intrusions (pCC). The older unit named San Jose greenstone is composed of meta-volcanic and meta-sedimentary sequence and it is widely distributed in the zone A (Fig.II-2-4).

The distribution of the geological units is strongly controlled by the E-W direction tectonic structures as faults. At the northern part of the zone A, a fault along E-W direction controls the boundaries between ancient granite and greenstone unit. This same fault extends toward east, crosses the northern portion of the Mahoma gold mine in zone B and goes through the southern part of the zone C.

Two large zones with outcrop of quartz veins were confirmed in the zone A, named A-a and A-b. Quartz vein thickness is in the order of centimeters to decimeters with a maximum thickness of about 2.5 meter. The quartz vein is commonly milky and semi-transparent and locally blackish and opaque.

(a) Quartz vein zone A-a

The quartz veins zone is located at northern part of the survey area and the meta-volcanic (meta-basalt) San Jose unit hosts it. Pelitic schist is observed locally as host rock. The general direction of the quartz veins is N-S or NNW-SSE. The host rock shows silicic alteration.

(b) Quartz vein zone A-b

This quartz veins zone is located at southern part of the survey area and the meta-sediment (meta-pelitic and meta-psammitic) San Jose unit hosts it. The general direction of the quartz veins is E-W and it is commonly white or blackish color with low pyrite content.

2-2-2-2 Zone B

The Zone B is located at the central part of the San Jose area, at 30Km north from San Jose de Mayo city and 80Km to northwest of Montevideo capital. The zone area has a rectangular shape elongated to E-W and measuring 12Km by 8 Km, with a total area of 96 Km^2. The closed Mahoma gold mine is located at the central part of the zone B.

The geology of the Zone B is composed by Complex basement (pCCcb), San Jose belt (pCCsjo), ancient granitic unit (pCCG) and younger granite (pCC) rocks (Fig.II-2-4).

The distribution of the ancient granodiorite is strongly controlled by E-W or NE-SW directions tectonic structures. At the central part of the zone B, shear zones with E-W and NE-SW directions are present. Shear zones trending ENE-WSW were detected in two locations at the central part with parallel disposition.

Four large quartz veins outcrop zones were confirmed in the Zone B, named from B-a to B-d and most part of them were related to shear zone. The quartz vein is in general milky and semi-transparent but locally blackish. Opaque vein is also observed.

(a) Quartz vein zone B-a

This quartz veins zone is located at the eastern part of the Zone B and the gold content of the veins was from Au0.4ppm until Au0.83ppm.

(b) Quartz vein zone B-b

It is located in the western edge of the Zone B and the analytical results showed Au0.03ppm.

(c) Quartz vein zone B-c

It is located in the north part of the Zone B and it is in general transparent with very low gold contents.

(d) Quartz vein zone B-d

This zone is located in the central part of Zone B and the gold content of these veins are also very low.

2-2-2-3 Zone C

The Zone C is located about 30Km to the northeastern of the San Jose city with a total area of 60 Km^2.

The geology of the Zone C is composed of San Jose belt (pCCsjo), Paso Severino belt, ancient granites unit (pCCG) and basic intrusions. Meta-sedimentary origin green schist mostly composes the San Jose and Paso Severino units (Fig.II-2-4). The San Jose unit outcrops at the southern part and the Paso Severino unit at the northern part of the Zone C. The ancient granite intrusion outcrops at western and eastern part and the dolerite (dd) is observed at the eastern part of the Zone C.

Five shear zones/faults are present in the central part along a NW-SE disposition and they were also interpreted by remote sensing showing a regional continuity within San Jose greenstone belt.

Three large quartz veins outcrop-zones were confirmed in the Zone C, named C-a, C-b and C-c. In general the quartz vein is transparent, but locally it is milky and semi-transparent or blackish and opaque.

(a) Quartz vein zone C-a

This quartz veins zone is located at the eastern part of the survey area, within Paso Severino belts. Values between Au0.03ppm and Au5.51ppm were detected in this zone.

(b) Quartz vein zone C-b

This quartz vein zone is located within Paso Severino unit with confirmed gold values of Au1.19ppm, Au0.39ppm and Au0.42ppm.

(c) Quartz vein zone C-c

The zone C-c is located at west of the Zone C and presented a gold content of Au0.22ppm.

2-2-3-4 Zone D

The Zone D is located about 30Km east from San Jose city, with a total area of 66 Km^2.

The geology of the Zone D consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granitic unit (pCCG). The older units named San Jose and Paso Severino greenstone unit are composed of meta-volcanic and meta-sedimentary sequence that are widely distributed in the Zone D. Meta-volcanic rocks is present at the central part and meta-sedimentary rocks are present at the northern part and at the eastern edge of the zone D (Fig. II-2-4).

Two large fault zones, one at the central part with E-W trending and other at central southern part with NE-SW trend is present in Zone D.

Two large quartz veins outcrop zones were confirmed in the Zone D, named D-a and D-b. The quartz vein is in general milky and semi-transparent and locally it is blackish and opaque.

(a) Quartz vein zone D-a

This quartz vein zone presents a N-S elongated form and covering the central northern part of the Zone D and presenting a gold content of Au171ppb.

(b) Quartz vein zone D-b

This quartz vein zone is located at the western part of the survey area.

2-2-2-5 Zone E

The Zone E is located in the Arroyo Grande belt area about 150Km north of San Jose city and with a total area of 120 Km^2.

The geology of the Zone E is composed of the following units: Complejo Basal (pCCcb), Arroyo Grande belt (pCCag), ancient granites unit (pCCG), younger granite intrusions (pCC), dolerite dike (dd) and gabbro (gb). Triassic sediments cover the above units (Fig. II-2-4). At the northern part of the Zone E, a fault with E-W direction controls the boundaries between ancient granite and the Arroyo Grande greenstone unit.

Six large quartz veins outcrop zones were confirmed in the Zone E, named E-a, E-b, E-c, E-d, E-e and E-f and most of them was gold barren.

(a) Quartz vein zone E-b

E-b quartz veins zone showed a milky semi-transparent quartz vein with local black spots. Analytical results showed no gold content for the milky semi-transparent section, but the blackish section of the quartz veins presented gold values of 2ppm.

At the southern part of the zone E-b, a milky semi-transparent quartz vein with blackish section showed gold content of Au0.50ppm and Au3.21ppm.

(b) Quartz vein zone E-d

It shows a N80W direction filling younger granite (pCC). Analytical results showed Au9.32ppm and Au2.74ppm.

(c) Others quartz vein zones

Others quartz veins from this area was barren gold.

2-2-3 Compilation

The geology of the 5 surveyed zones consists of the following units: Complejo Basal (pCCcb), San Jose belt (pCCsjo), Arroyo Grande belt (pCCag), ancient granite (pCCG), younger granite (pCC), dolerite dike (dd) and gabbro (gb) and Triassic sediments. The regional geology presents an E-W trend that is the same direction of the greenstone units in the surveyed area. The surveyed areas are controlled by faults and linear structures as indicated by the airborne geophysical lineaments along ENE-WSW direction. Shear zones along WNW-ESE direction cross the ENE-WSW structures.

A total of 17 zones with concentration of quartz veins were surveyed and its results showed that the quartz veins are mainly transparent to semi-transparent, milky and few of them are blackish. Analytical results showed that gold mineralization exists in the quartz veins, but it is heterogeneous. Gold mineralizations are present either in small veins or only within the blackish spots within quartz veins.

2-3 Soil geochemical prospecting

Geochemical survey including soil geochemical and rock geochemical were carried out concomitant with geological survey and it aimed to detect zones with gold anomaly within the surveyed area. A total of 1,926 soil samples were taken using a semi-grid distribution at the depth of B-horizon. The spacing of the samples was designed so that 4 to 5 soil samples can be taken every square kilometer. The results from geochemical samples were statistically analyzed. Factor analysis was examined by multi element analysis. Relationships between elements and factors were extracted by the factor analysis and as a result very weak correlations between Au and (As, S and P) were observed.

As results of soil geochemical survey 6 soil anomalies were found. In 5 of them the soil anomalies overlapped with gold anomalies in quartz veins.

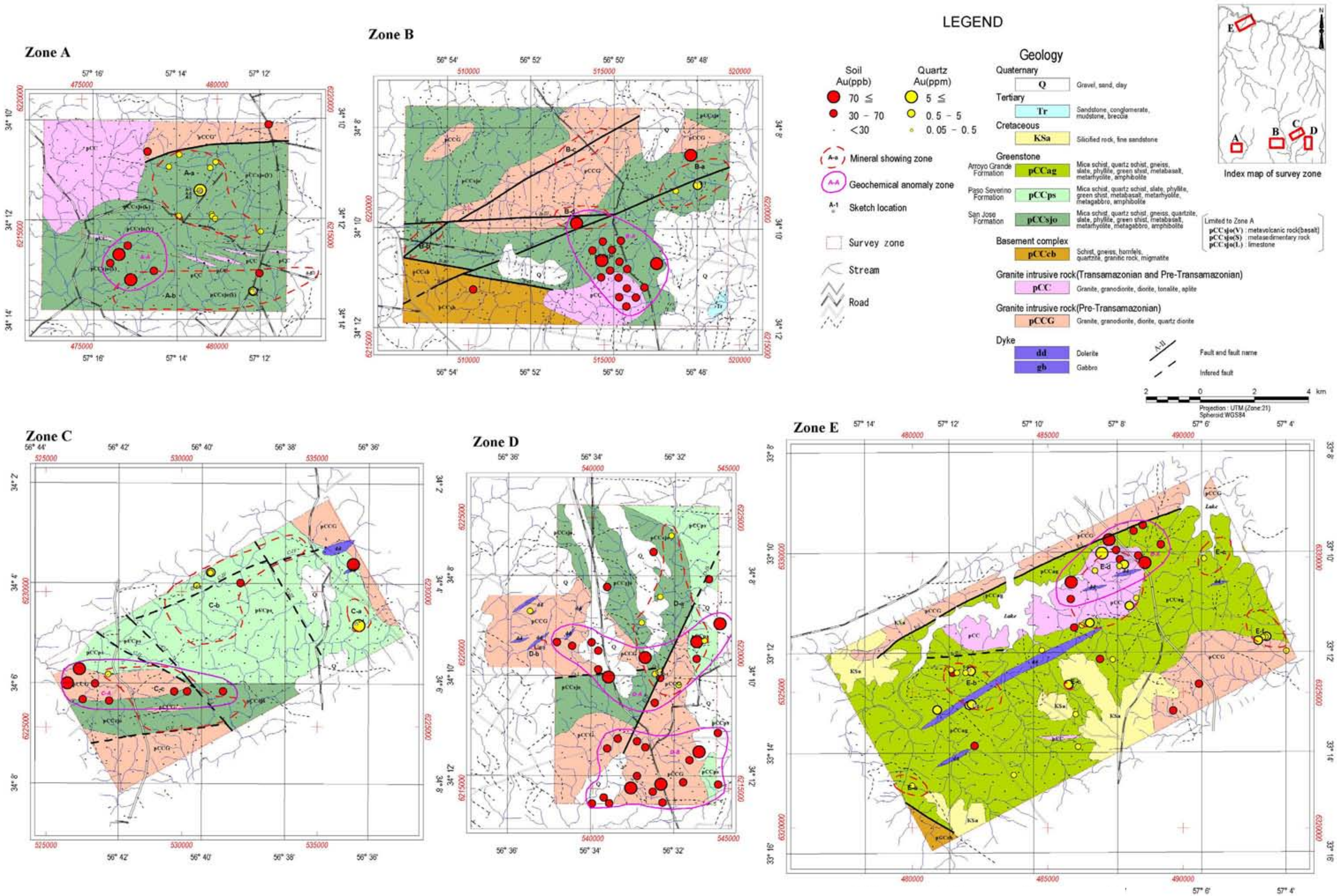


Fig. Ⅱ-2-4 Composite map of results of the PhaseⅡ survey

Tab. II-2-2 Evaluation of the results by geological and geochemical survey (1)

Zone	Geological Survey							Geochemical Survey						Total Evaluation*2
	Mineral Showings	Location	Width	Geological Situation	Main Quartz Veins (Mineralization)	Assay of Veins*1 (One Part)	Evaluation*2 (Comments)	Anomalies Areas	Location	Width	Geological Situation	Results of Soil Au Assay	Evaluation*2 (Comments)	
Zone A	A−a	North	4km× 2.5km	Among fracture zone (pCCsjo)	wide1-2m, 3-4veins, strike:N-S	176, 129, 52.5	◎ (High assay)	No						
	A−b		7km× 1.5km	Among fracturezone? (pCCsjo)	wide20cm strike:N80W	1.23	○	A−A	South	2km×2km	E*3	2*4 :>70ppb) 3 (>30ppb)	○	○
Zone B	B−a	East	1.5km× 3km =4.5km²	Along Fault B−II (pCCsjo)	①80m×80m> ②20m×100m> ③15m×80m > ④ 7m×20m>	× × 0.4 0.83, 0.77	◎ (Big many quarts veins)	No	-					
	B−b	West	0.5km× 2km =1km²	Along Fault B−II (pCCsjo)	① 4m×12m> ② 5m×10m> ③ 4m×15m >	0.03 × ×	△	No						
	B−c	North	0.5km× 2km = 1 km²	Along Fault B−I (pCCG)	①15m×40m> ② 4m×20m>	× ×	△	No						
	B−d	Center	0.5km× 2km = 1 km²	Along Fault B−III (pCCG)	①20m×50m> ② 5m×25m>	× ×	△	B−A	South east	2km×4km	Near pCC, B−II, B−III, main part in pCCsjo	3 (:>70ppb) 14 (>30ppb)	◎ Strong clear anomaly area	◎
Zone C	C−a	East	0.5km × 1km = 0.5km²	Along the Foult C−I, pCCps	① 5m×600m ② 5m×30m>	0.03 5.51	○	No						
	C−b	North	3km×4km =6km²	Along the Foult C−IV, pCCp	①20m×30m ②0.5m×4m ③30m×50m	× 1.19 0.025	○	No				1 (>30ppb)		
	C−c	South East	2km×5km =8km²	Along the Foult C − V, pCCG PCCsjo, pCCG	①0.1m×10m ②10m×20m ③10m×50m ④0.5m×10m	0.22 × × ×	△	C−A	South east	2km×4km	Along and boundary pCCG, Fault C−I	2 (:>70ppb) 6 (>30ppb	◎	○

*1 Au results of rock assay : ppm
*2 Evaluation : Very Good : ◎, ○ : Good, △ : Not so Good
*3 Equal geological situation to [Geological Survey] column
*4 Nunber of Au soil anomaly

Tab. II-2-3 Evaluation of the results by geological and geochemical survey (2)

Zone	Geological Survey							Geochemical Survey						Total Evaluation*2
	Mineral Showings	Location	Width	Geological Situation	Main Quartz Veins (Mineralization)	Assay of Veins*1 (One Part)	Evaluation*2 (Comments)	Anomalies Areas	Location	Width	Geological Situation	Results of Au Soil Assay	Evaluation*2 (Comments)	
Zone D	D−a	Center-North	3km × 5km =7km²	Along the Arroyo uemada pCCsjo Green schist	①4m×65m>	0.17、0.07	△	D−A	Center (East to West)	3km×6km	E*3	4*4 (:>70ppb) 8 (>30ppb)	◎ Strong large anomaly area	◎
					②3m×20m>	0.04								
					③3m×10m>	0.04								
	D−b	West	0.2km × 0.5km = 0.1km²	Along the dd. pCCG Granodiorite	① 2m×20m>	×	△	No						
					② 2m×20m>	×								
					③ 3m×60m>	×								
					④ 12m×20m>	×								
								D−B	South	4km×5km	On pCCG	3 (:>70ppb) 14 (>30ppb	◎ Strong large anomaly area	◎
ZoneE	E−a	South-west	0.6km × 1.5km	pCCag	①2m×20m	×	△	No						
					②2m×10m	0.10								
					③2m×40m	0.03								
	E−b	Central West	2.5km × 1.5km	pCCag	①2m×10m	2.18、1.98	◎	No						
					②2m×10m	2.13								
					③3m×20m	3.21								
					④2m×30〜50m×8	0.34								
	E-c	Center	0.5km× 0.2km	pCCag	wide:1m wide:a few 10cm?	4.29	△	No						
	E-d	Center〜North	3km× 2.5km	PCCag	wide:1m	9.32	◎	E−A	Center〜North	2km×4km	Boundary of pCCQ. Along Fault B−I	4 (:>70ppb) 7 (>30ppb	◎ Strong large anomaly area	◎
					wide:a few 10cm?	2.74								
	E−e	North-east	1.5km × 1km	PCCag	①3m×7m	0.03	○	No						
					②3m×5m	0.43								
					③2m×7m	0.05								
					④1m×3m	0.03								
	E−f	South-east	1km×2km	pCCag	①1.5m×7m	4.42	○	No						
					②1.5m×30m	0.10								
					③1.5m×20m	0.09								
					④3m×40m	0.75								

*1 Au results of rock assay : ppm
*2 Evaluation : Very Good : ◎, ○ : Good, △ : Not so Good
*3 Equal geological situation to [Geological Survey] column
*4 Nunber of Au soil anomaly

CHAPTER 3　PHASE III

Geological survey, geophysical survey, soil geochemical survey and trench survey were carried out during the Phase III survey in Mahoma East area, Andresito area and Arroyo Grande area, as shown in Fig.I-3-2. More than 40 linear Km of geological mapping and 1,689 soil geochemical prospecting, 4,520m of trenches with an excavated volume of 8,130m^3 and 2,662 points measured by ground geophysical survey.

3-1 Mahoma East area

Geological mapping, soil geochemical prospecting, ground VLF-EM and magnetic geophysical survey and trench survey were carried out during Phase III, in Mahoma East area (Fig.II-3-1).

3-1-1 Geological mapping

San Jose greenstone rock (pCCsjo) were observed at northeastern part and at southern part of the survey area while granite (pCC) was observed at southwestern part and southern part. Aplitic dykes, granitic dykes and dolerite dykes were observed within granite (Fig.II-3-1). San Jose unit is composed essentially by biotite schist and greenschist, locally filled by lenses of quartz veins and silicified rocks. Granitic rock was strongly altered forming muscovite rich rocks and presenting alteration minerals as chlorite and epidote. Strong magnetic diabase dyke showing ENE-WSW direction is intruded within granite. Trench survey showed many diabase dykes along this direction as well as many pegmatite veins and aplite dykes with the same direction.

3-1-2 Soil geochemical prospecting

A total of 399 soil samples were taken from Mahoma East area. Results of statistical data treatment confirmed large gold anomalies in soil with E-W trend. The anomaly has an amoeboid form with 800m extensions along E-W and 500m extensions along N-S directions. Gold anomalies were confirmed at the southeastern part of the granite, at the proximity of the border with San Jose units and in other places, small anomalies were identified as spots inside San Jose unit (Fig.II-3-2). The disposition of the gold anomalies approximately overlapped the linear magnetic anomaly detected during airborne survey of Phase II.

3-1-3 Geophysical survey

3-1-3-1 VLF-EM survey

Clear and remarkable anomaly was detected with NNE trend through the central part of the survey area Fig.II-3-3 and Fig.II-3-4). All the magnetic profiles show the same kind of pattern indicating that the most important source of magnetic intensity is due to the existence of the dolerite dyke with maximum amplitude of about 1200nTesla (peak to peak). Both RTP and Fraser map indicate the possibility of fractures in places with low-high conductivity and low-high magnetic intensity that may be associated to the emplacement of a

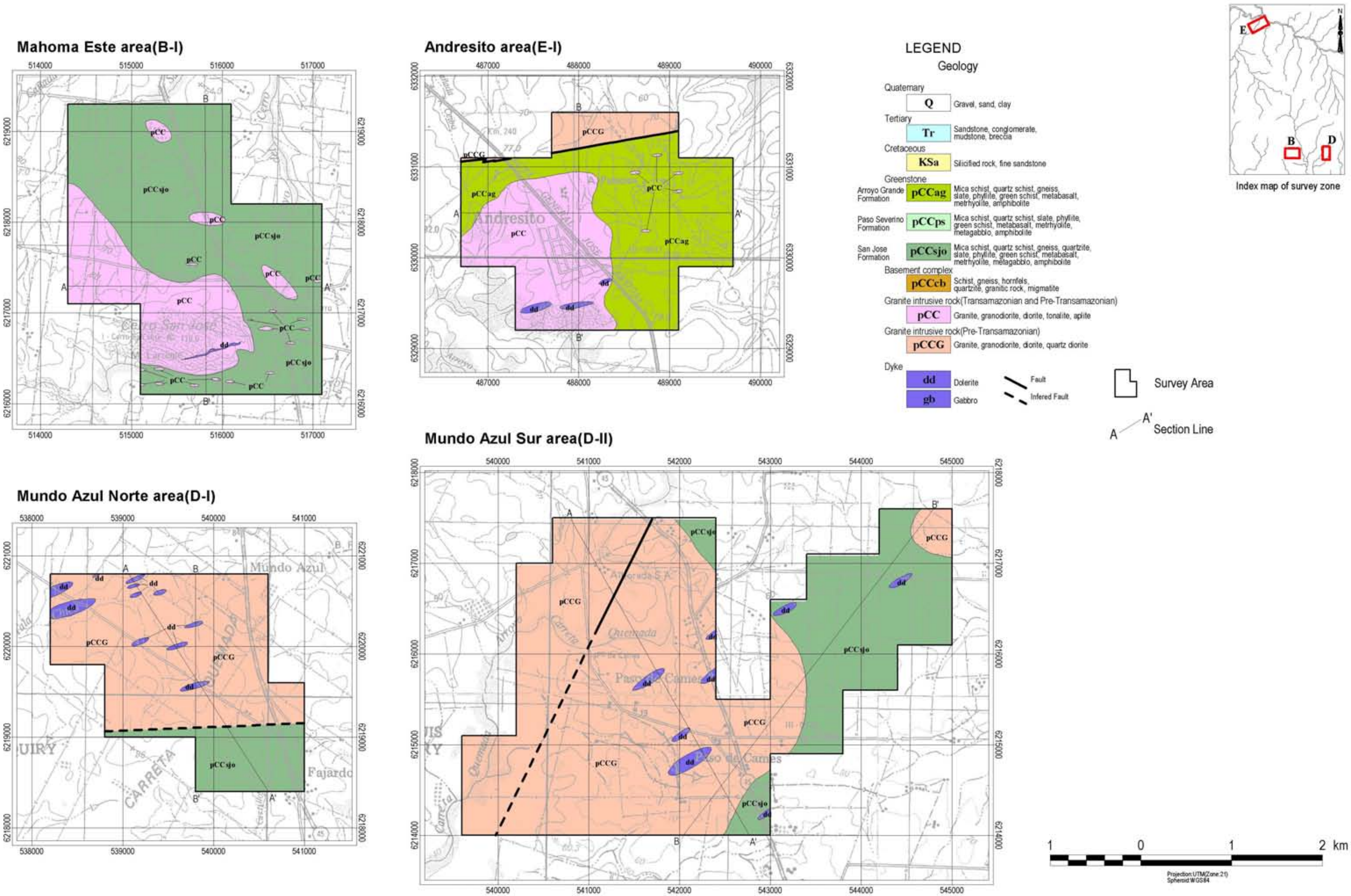


Fig. II-3-1　Geological map of the PhaseIII survey area

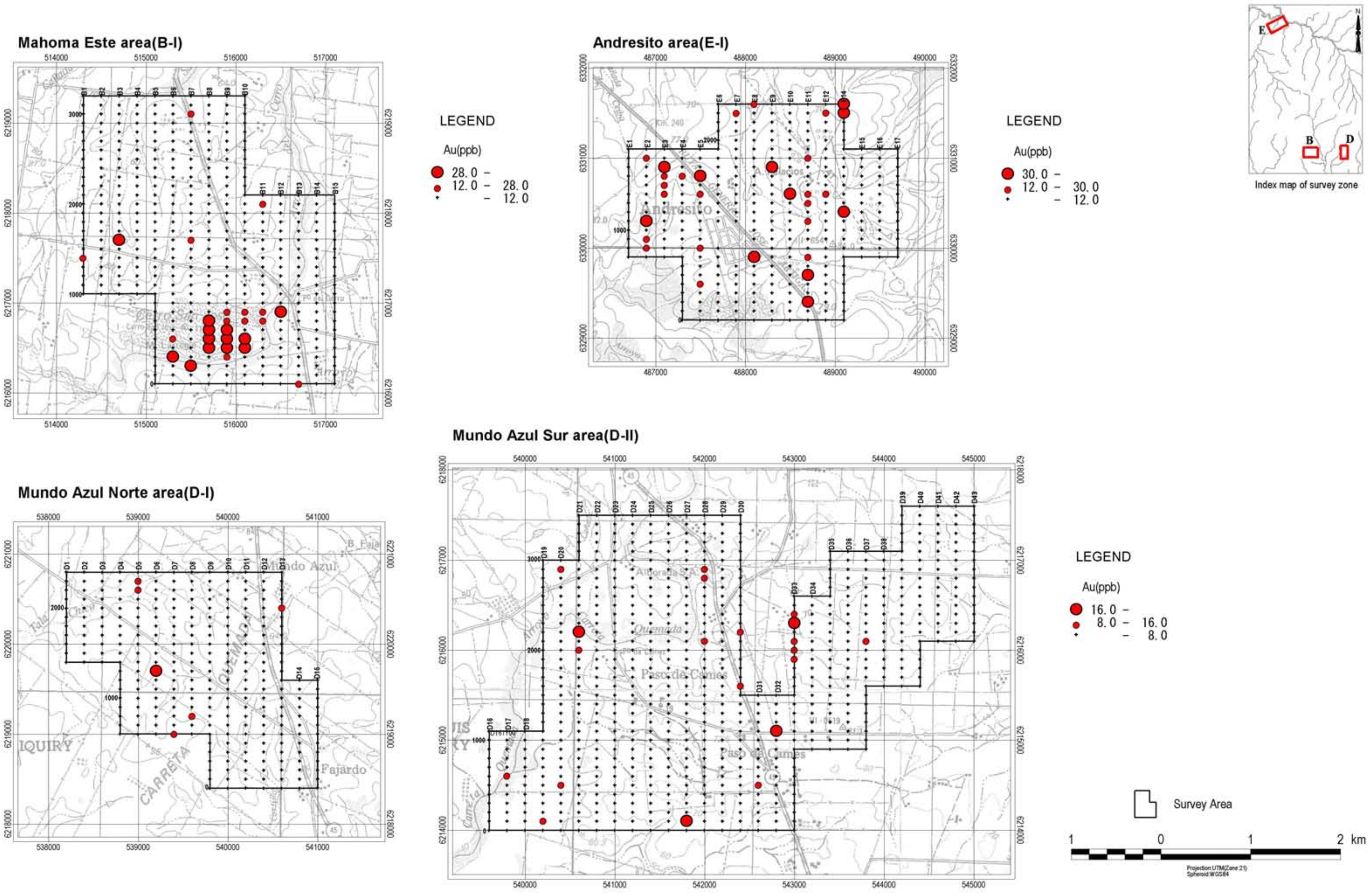


Fig. Ⅱ-3-2 Distribution map of Au anomalies of soil samples

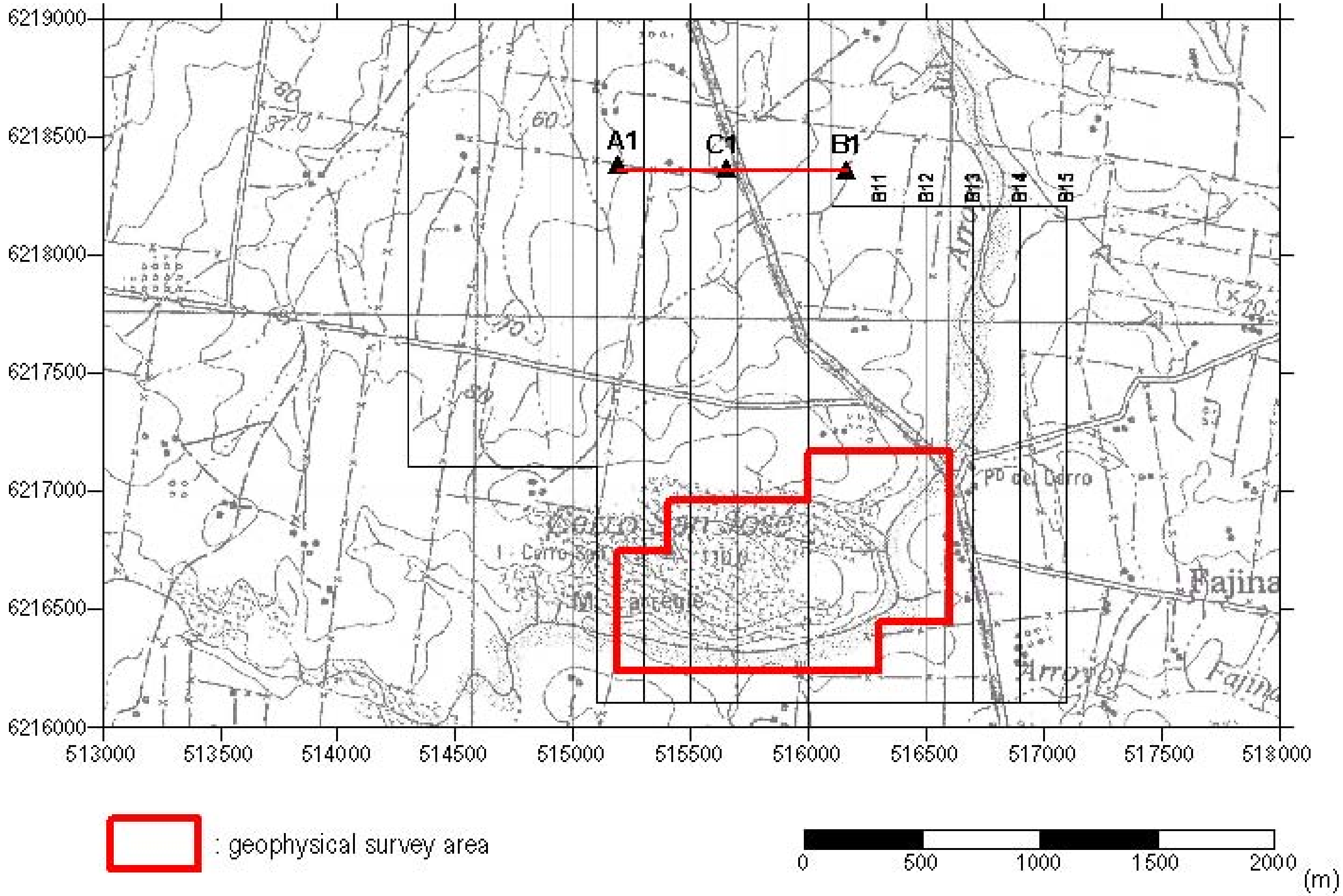
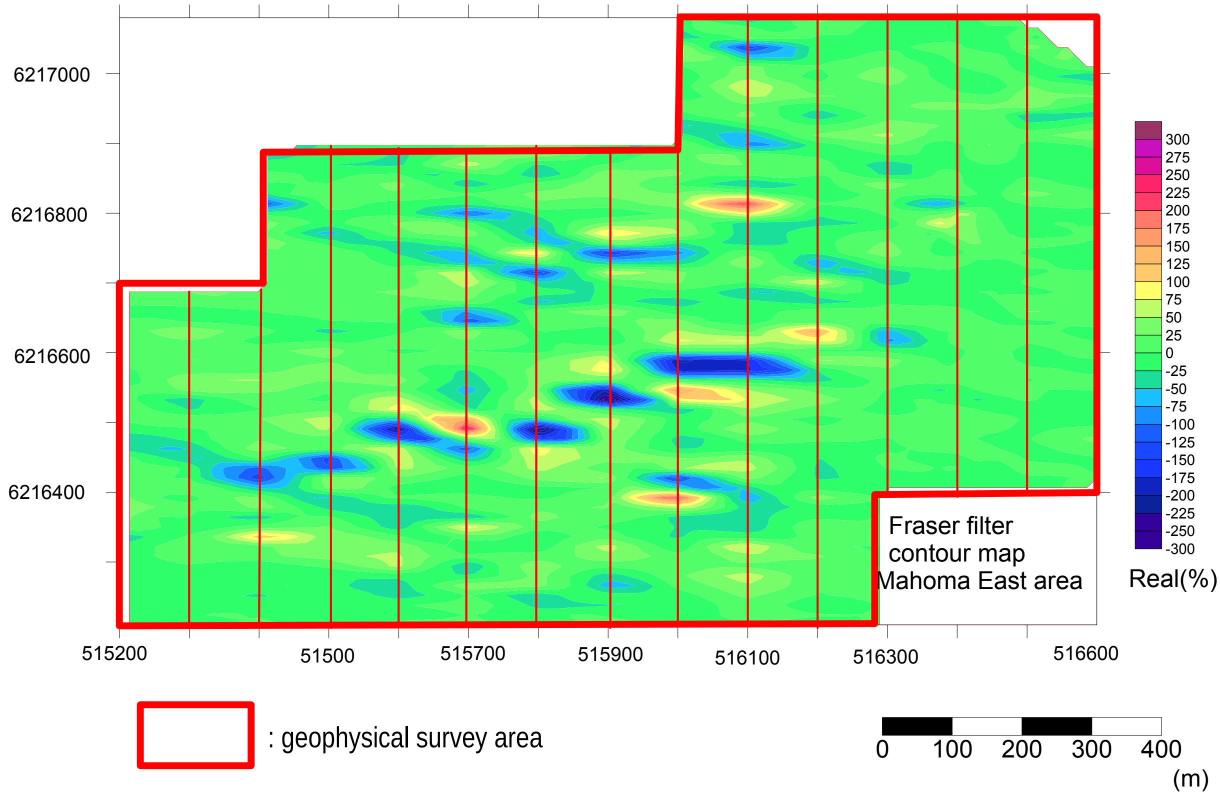


Fig. Ⅱ-3-3　Geophysical survey area and transmitter dipole in Mahoma Este area

Fraser filtered map



Equivalent current density pseudo-section along profile 516000

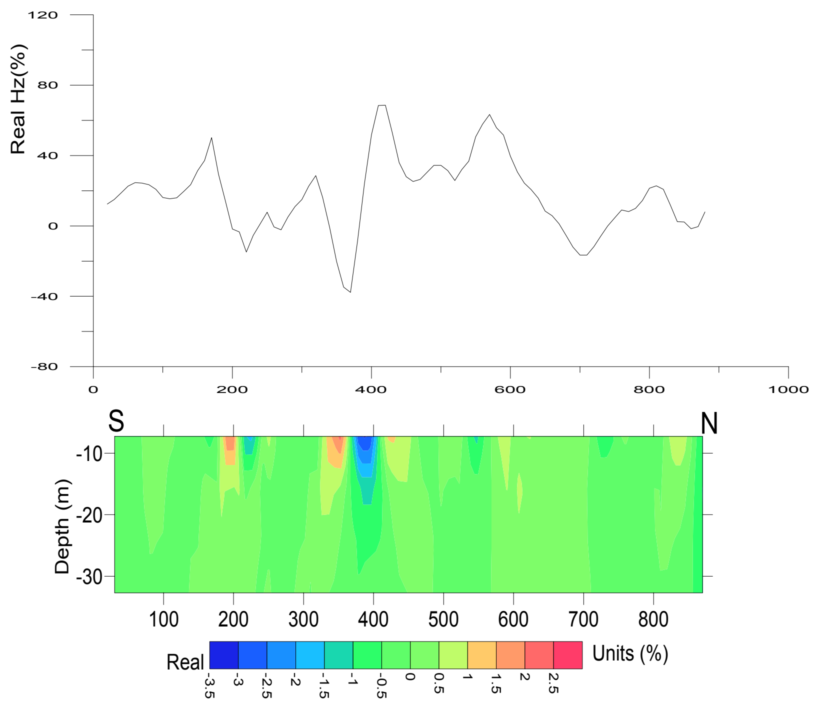


Fig. II-3-4 VLF filtered results in Mahoma Este area dyke structure and lateral fracturing probably associated to gold mineralization.

3-1-3-2 Magnetic survey

Chiefly a dolerite dyke underlies the trend of magnetic high, while the zones of magnetic lows are inferred to be associated with green-schist zone (Fig.II-3-5). Areas of intermediate magnetic intensity are extensions of the high magnetic and interpreted to be caused by granite. In the north part of the survey area, the magnetic anomaly trend changes from NNE-SSW to NE-SW with an unclear continuity but suggesting that the dolerite dyke may extend further towards NE.

3-1-4 Trench survey

Trench survey were carried out within area where was confirmed an overlapping of soil geochemical prospecting anomaly with VLF-EM anomalies (Fig.II-3-6). 1m wide channel samples were taken from 2,245m of trench, and its results are as follows (Fig.II-3-7).

Trench 515600: Au0.43ppm(w:1m), 0.18ppm(w:1m), 0.29ppm(w:1m), 0.75ppm(w:1m) ; Trench 515700: Au0.15ppm (w:2m), 0.2ppm (w:1m), 0.21ppm (w:1m), 0.20ppm(w:1m), 0.23ppm (w:1m) 0.21ppm (w:1m), 0.13ppm (w:3m), 0.16ppm (w:1m), 0.27ppm (w:1m) ; Trench 515800: Au0.48ppm (w:1m), 0.31ppm (w:1m), 0.54ppm (w:1m), 0.25ppm (w:2m), 0.31ppm(w:1m) ; Trench 515900: Au0.18ppm (w:1m), 0.17ppm (w:1m), 0.31ppm(w:5m), 0.14ppm (w:1m), 0.24ppm (w:3m), 0.14ppm (w:1m), 0.14ppm (w:1m), 0.14ppm (w:2m); Trench 516000: Au0.19ppm (w:1m), 0.18ppm (w:1m) ; Trench 516100: Au0.34ppm (w:1m), 0.26ppm (w:2m) were intercepted in intervals of granite with quartz veins lenses or in diabase dyke with quartz veins fragments agglomerated.

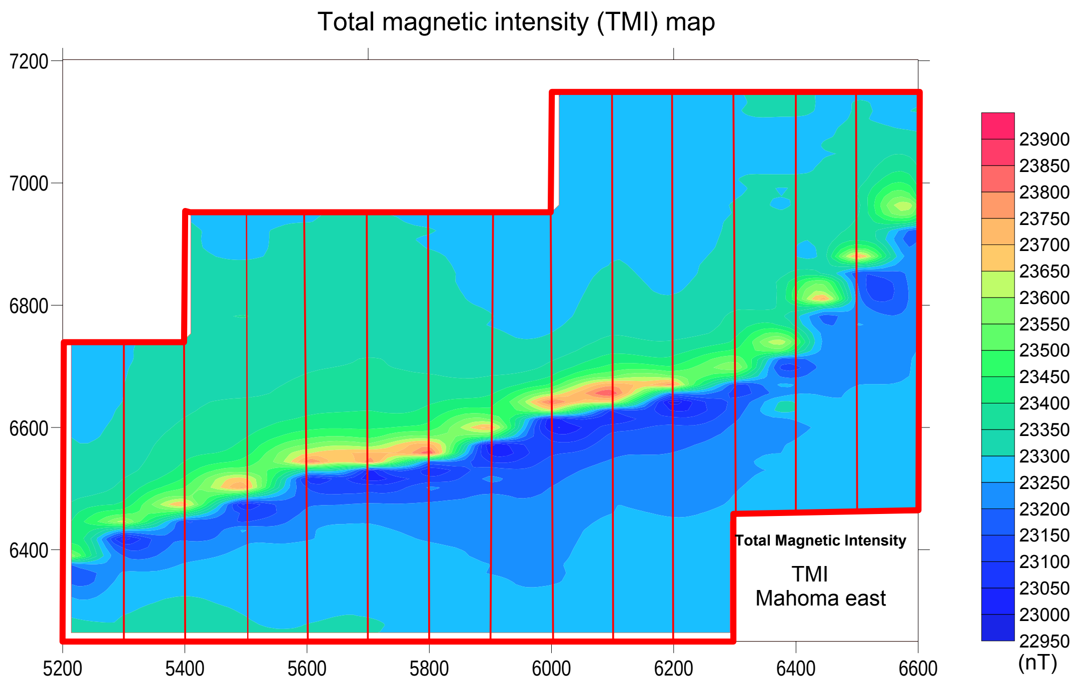
3-1-5 Considerations

San Jose greenstone rock (pCCsjo) is composed essentially by biotite schist and greenschist (Fig. II-3-8), and locally presenting lenses of quartz veins and silicified rocks. San Jose unit is distributed at northeastern part and at southern part of the survey area while granite (pCC) was observed at southwestern part and southern part of the same area. Aplitic dykes, pegmatite veins and dolerite dykes were observed within granite.

Soil geochemical prospecting confirmed amoeboid gold anomalies in soil with an area of 800m by 500m at the southeastern part of the granite (pCC).

Shear zones along ENE-WSW direction were identified by trench survey. In these shear zones, diabase dykes with maximum width of 26m and quartz veins lenses were found intruded.

1m-width channel samples taken from the trench bottom, confirmed a maximum gold values of 0.75ppm and others channel samples confirmed the following results: gold values between 0.13ppm and 0.75ppm in trench 515600, gold between0.13ppm and 0.27ppm in trench 515700, gold between0.25ppm and 0.54ppm in trench 515800, gold between0.14ppm and 0.31ppm in trench 515900 (Fig. II-3-9).



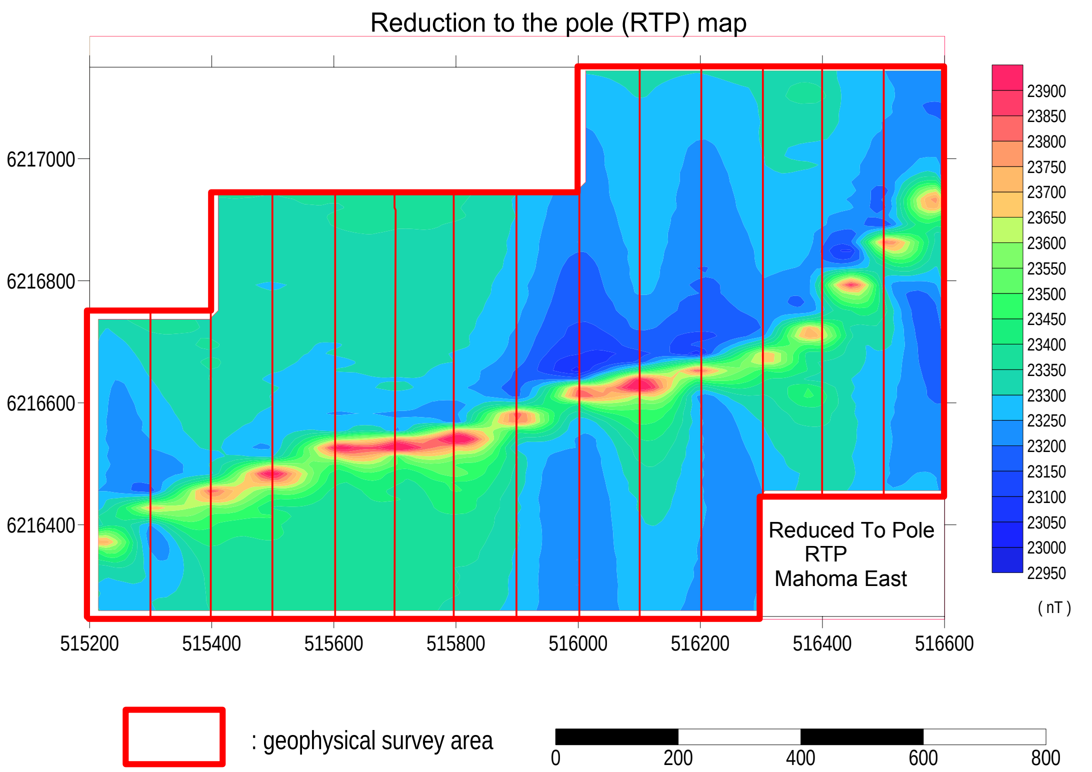


Fig. Ⅱ-3-5 Total magnetic intensity and Reduction to the pole in Mahoma Este area

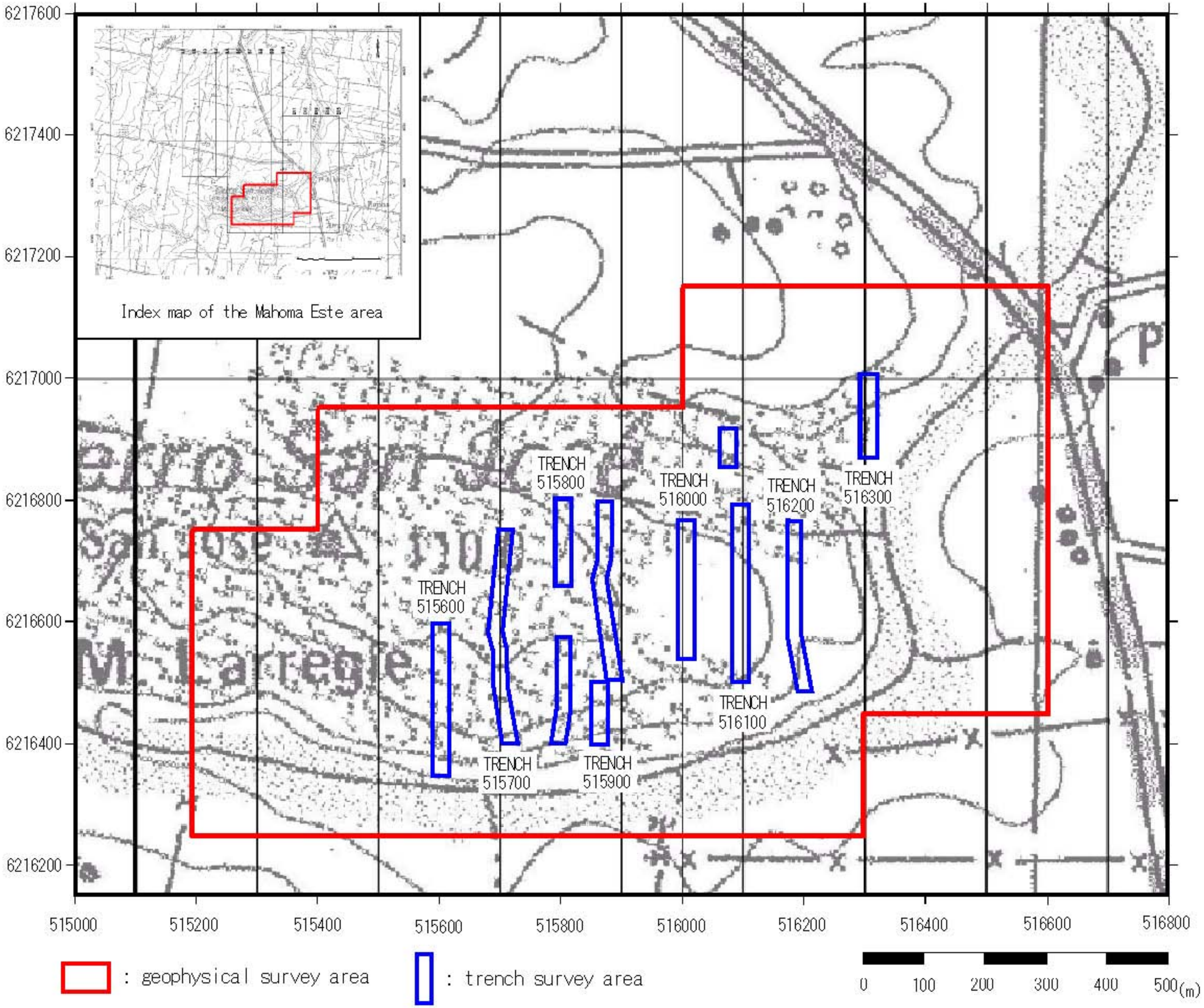


Fig. II-3-6 Location map of trenches in Mahoma Este area

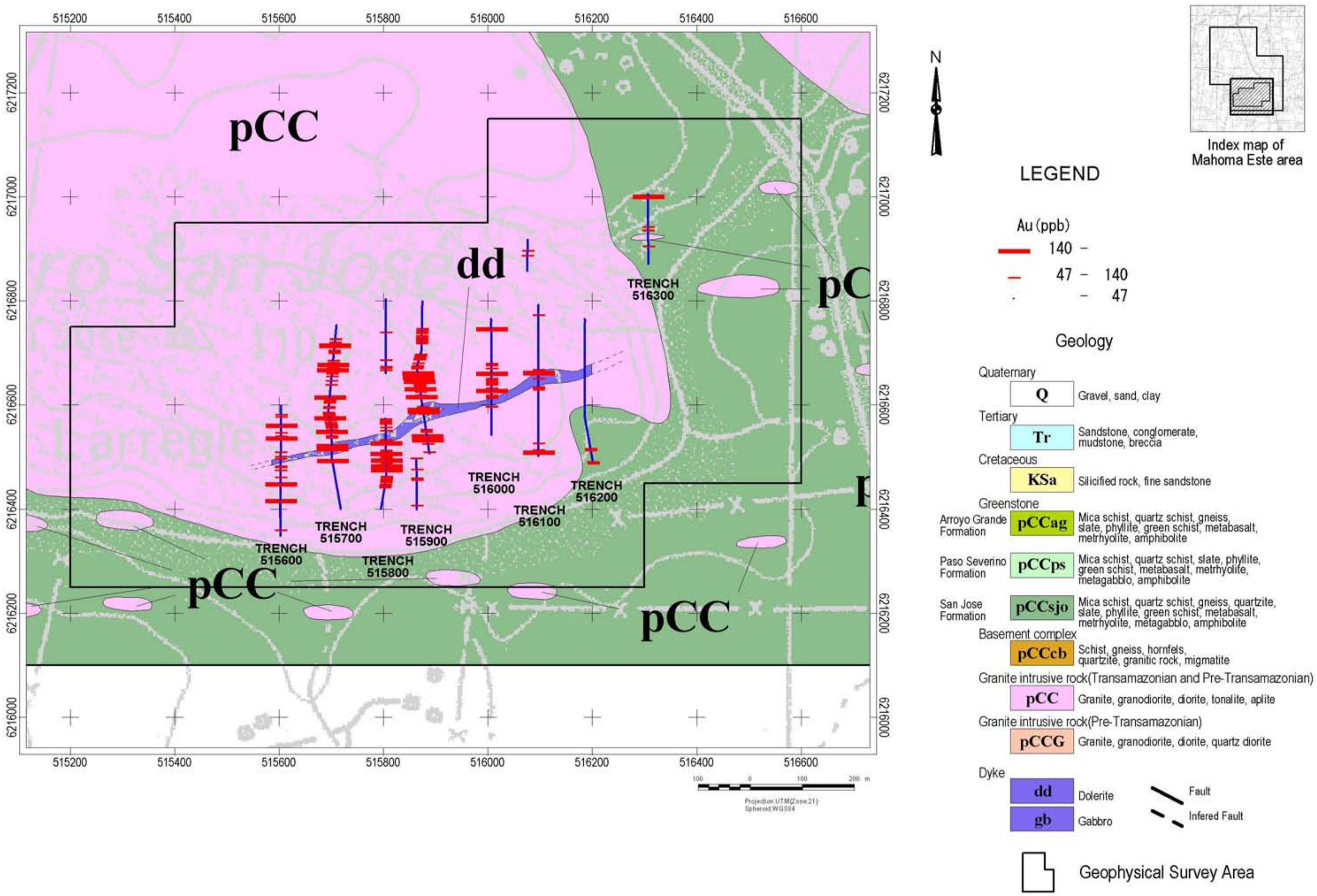


Fig. Ⅱ-3-7　Distribution map of Au anomalies from trench survey in Mahoma Este area

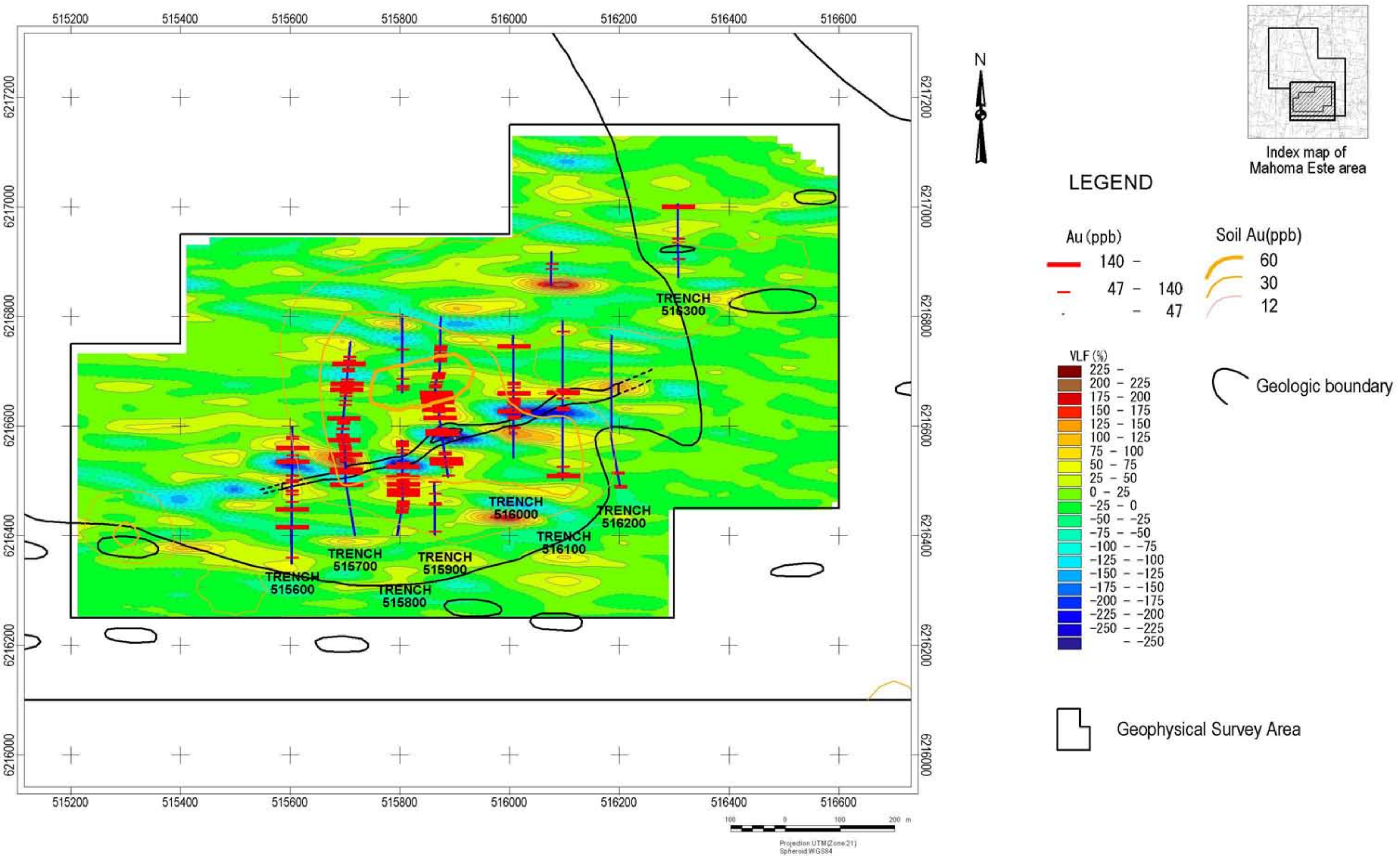
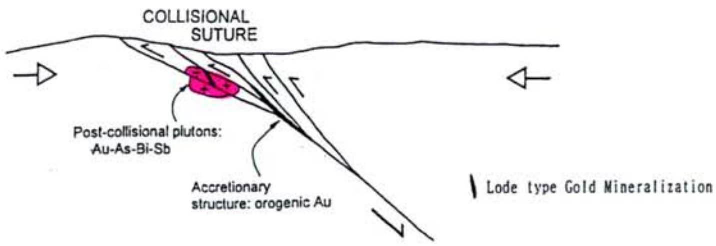
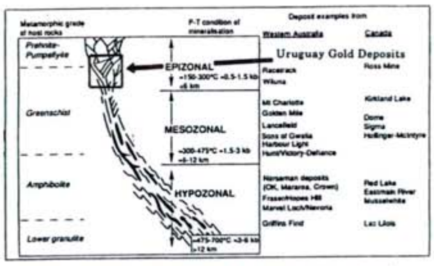


Fig. Ⅱ-3-8 Composite map of survey results in Mahoma Este area



Schematic tectonic setting of intrusion related and position of orogenic lode gold deposits.
Source: Sillitoe and Thompson, 1998.



Schematic section showing the crustal continuum of lode gold deposits and examples from Western Australia and Canada.
Source: Groves and Colvine (1993)

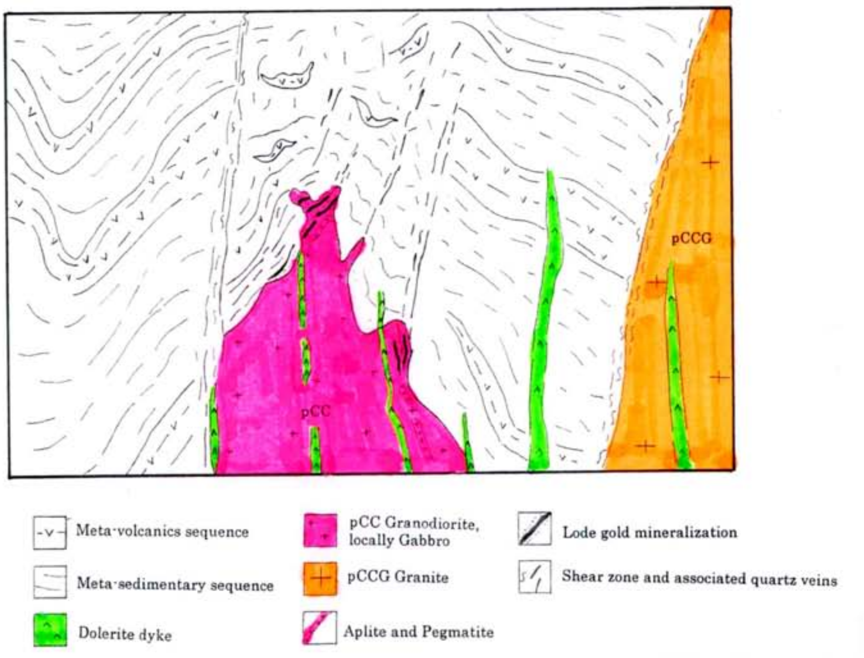


Fig. II-3-9 Schematic model of gold mineralization in San Jose and Arroyo Grande area

3-2 Andresito area

Geological mapping, soil geochemical prospecting, ground VLF-EM and magnetic geophysical survey and trench survey were carried out during Phase III, in Andresito area (Fig.I-3-2).

3-2-1 Geological mapping

Arroyo Grande greenstone rock (pCCag) was widely distributed in the survey area while granite (pCC) was observed at southern part and ancient granites rock(pCCG) at northwestern part. Migmatite and strong metamorphism was observed within ancient granite while dolerite dyke was observed within granodiorite intrusion (Fig.II-3-1). Dolerite dykes were widely observed in the survey area. Trench survey indicated that metabasalt, metasediment and schist were widely distributed in the northwestern portion of the survey area.

Granodiorite intrusion shows lower silica content at its northern border and at these places it presents a gabbro texture. Low dip quartz veins fill granodiorite along an approximate E-W strike and showing a parallel distribution. Visible gold is frequently seen in the veins fractures.

3-2-2 Soil geochemical prospecting

A total of 310 soil samples were collected from Andresito area. Gold soil anomalies were detected at western part and central part of the survey area, as shown in the Fig.II-3-2. Gold anomaly of western part is divided in two, one at north and other at south. The south anomaly was confirmed within granodiorite and the north anomaly was located at the boundary between gabbro and Arroyo Grande formation. The maximum gold value in soil at the north anomaly was 60ppb and at south anomaly was 33ppb.

3-2-3 Geophysical survey

VLF-EM and magnetic geophysical survey were carried out in Andresito East area and Andresito West area (Fig.II-3-10).

A total of 8.35 km of lines were surveyed by each survey method.

In Andresito West area, VLF survey (Fig.II-3-11) and magnetic survey showed that a relatively strong magnetic trending is seen along NE direction, and it may be probably due to high magnetic volcano-sedimentary rocks (Fig.II-3-12). To the north of this trending, it was detected a magnetic contrast from intermediate to low and inferred to be caused by shear fault zones. The low magnetic zone detected to the south of the above mentioned trending might be due to the response of gabbro/granodiorite structure.

In Andresito East area, a system of trends of weak positive-negative VLF anomalies was detected along SE direction from the NW part of the area (Fig.II-3-13). A high voltage transmission line affected the VLF data collected in the eastern part of the survey area. According to the magnetic results, a fault system is seen distributed from the north east part of the area. They are also weakly detected by the VLF survey. According to the results of the RTP map, a high-low magnetic contrast SE trending was detected around the NW corner of the survey area (Fig.II-3-14). This trend runs all the way to the SE. Though there is no clear indication on the surface, this magnetic trend seems to be related to a fault system along SE direction. From the central

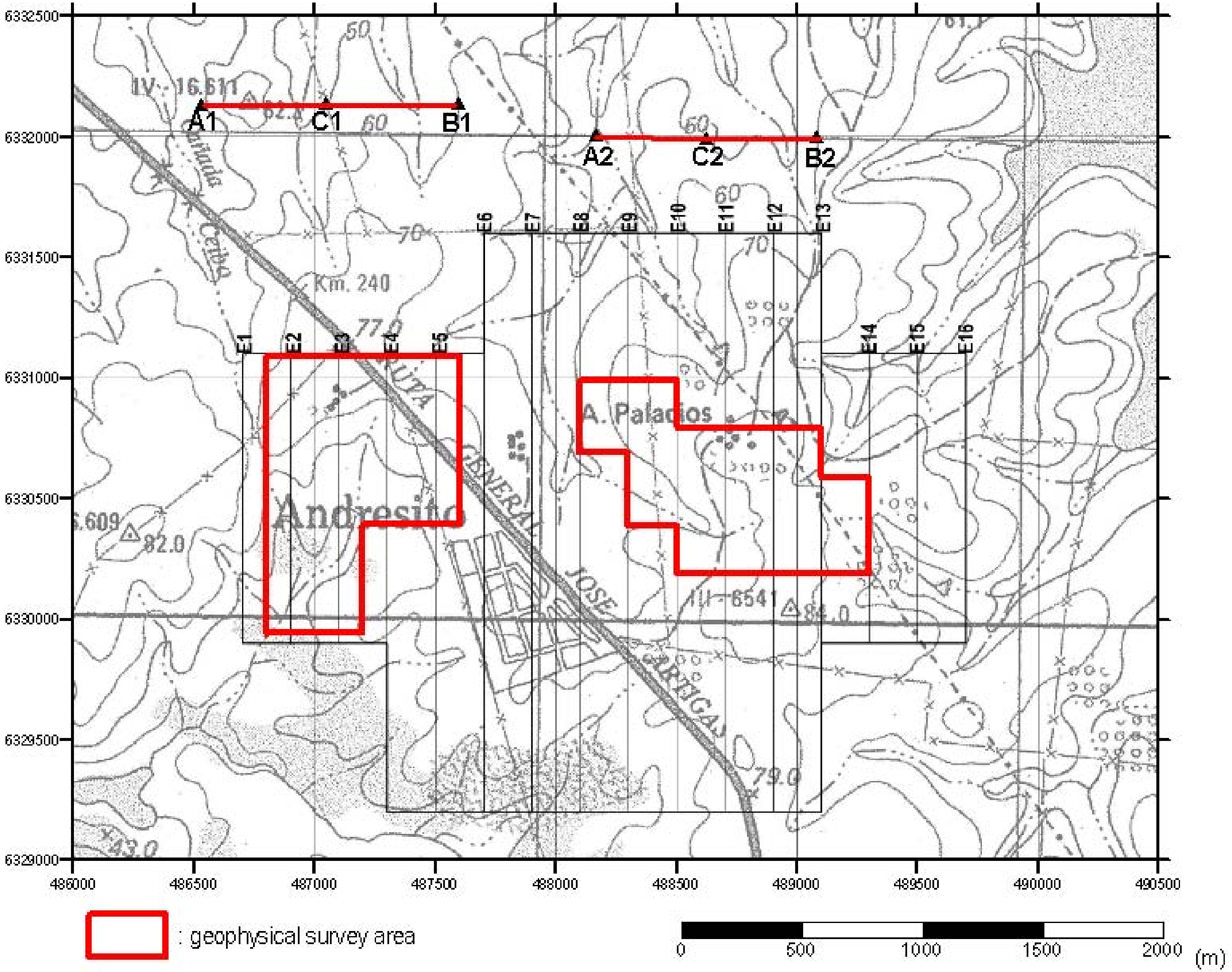


Fig. Ⅱ-3-10　Geophysical survey areas and transmitter dipoles in Andresito area

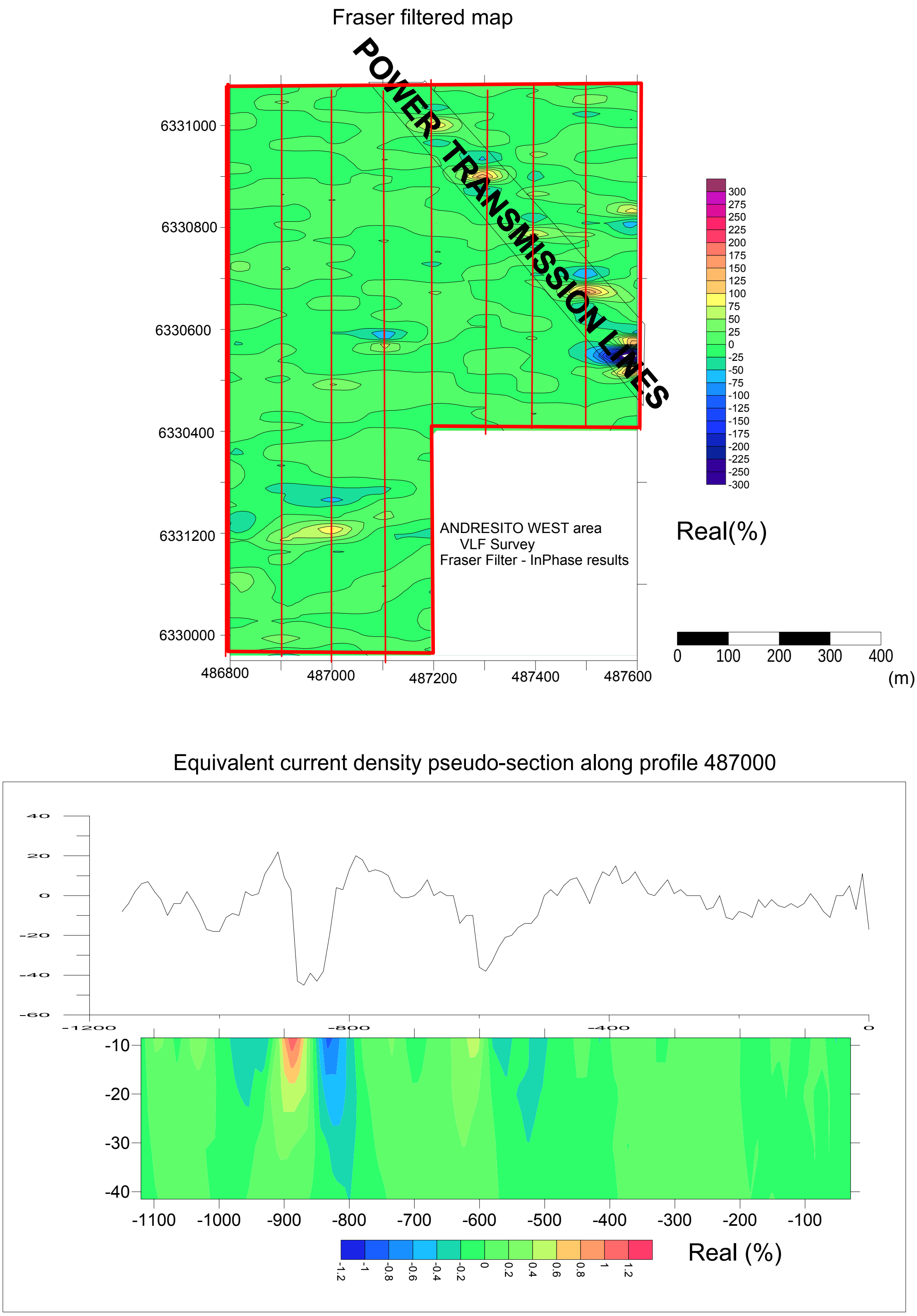


Fig. Ⅱ-3-11　VLF filtered results in Andresito West area

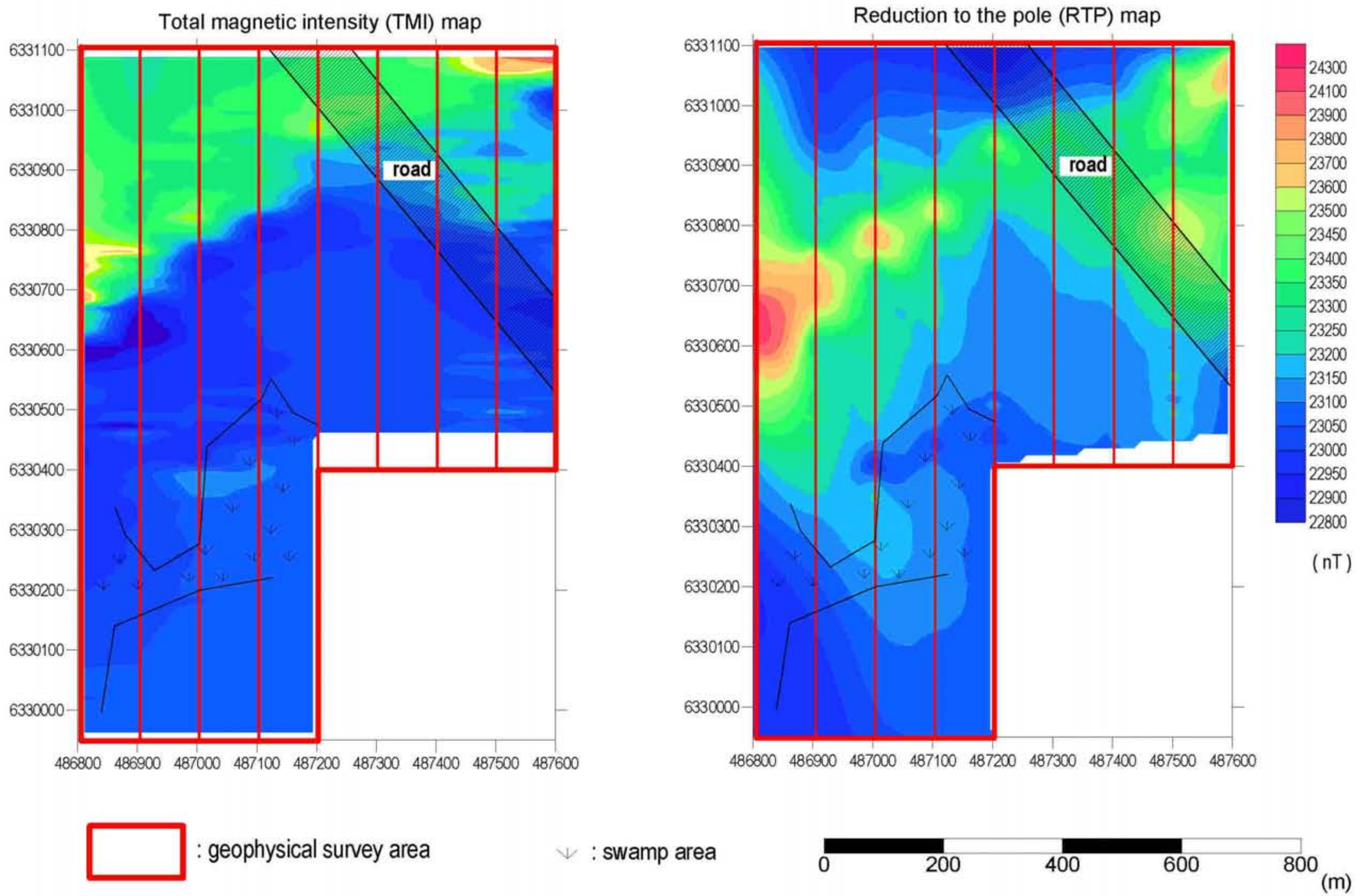
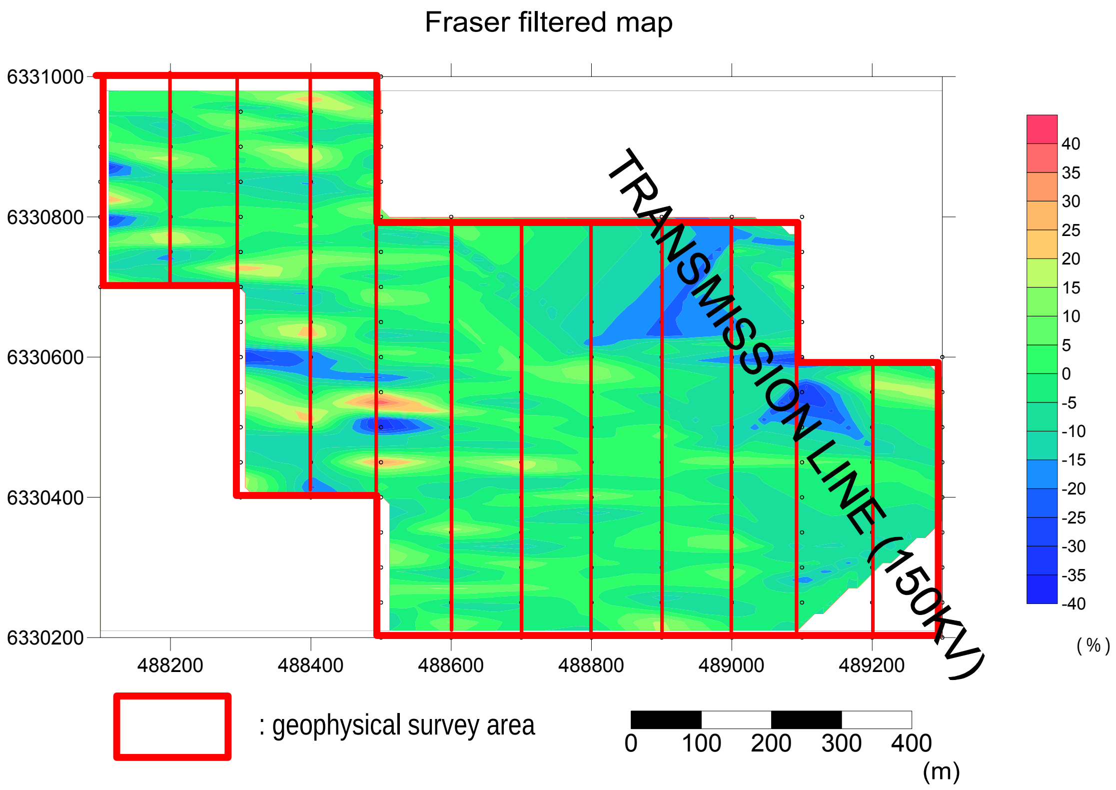


Fig. Ⅱ-3-12　Total magnetic intensity and Reduction to the pole in Andresito West area



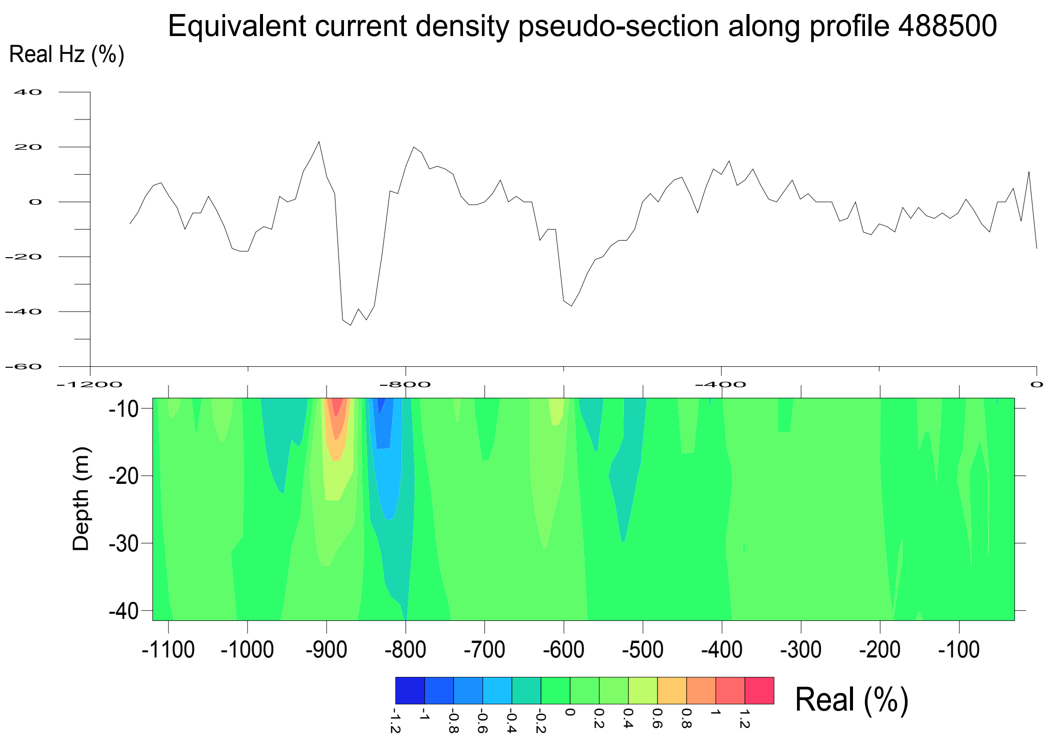
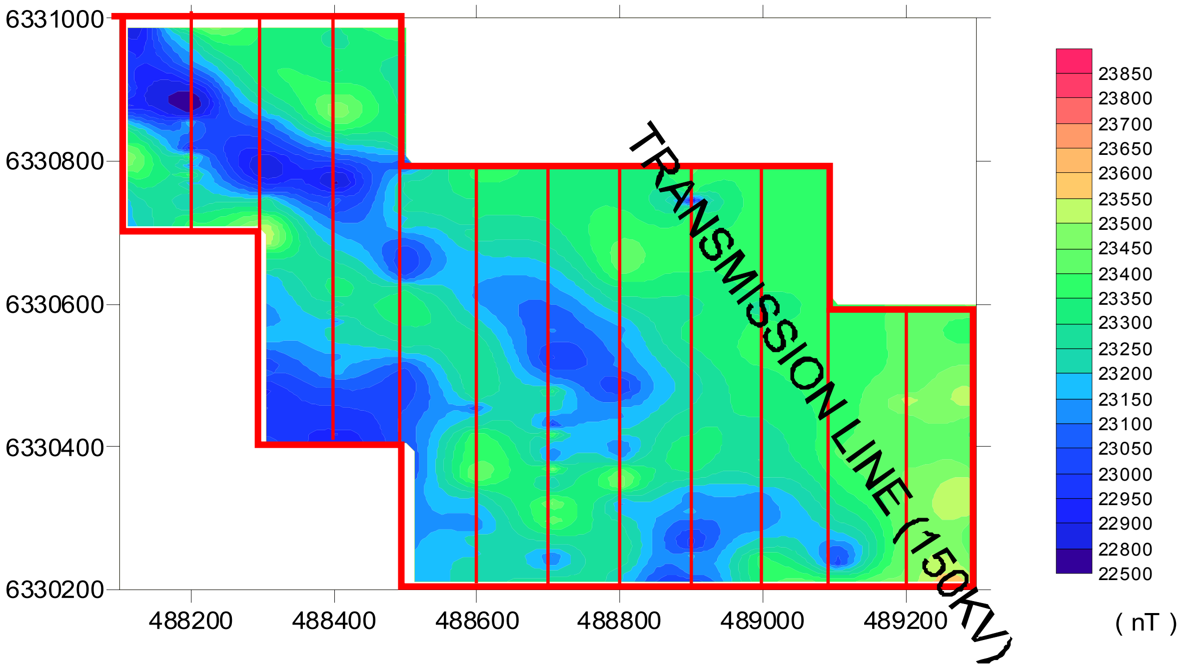


Fig. Ⅱ-3-13　VLF filtered results in Andresito East area

Total magnetic intensity (TMI) map



Reduction to the pole (RTP) map

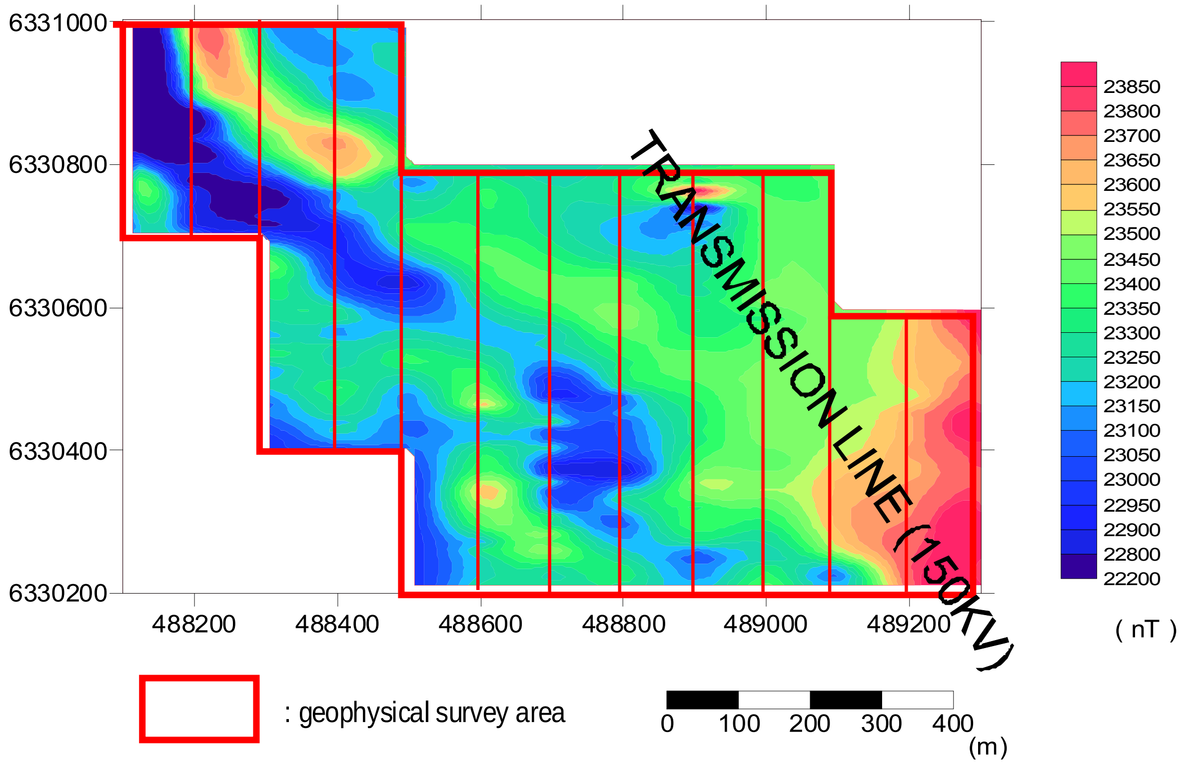


Fig. Ⅱ-3-14 Total magnetic intensity and Reduction to the pole in Andresito East area profile along SE direction towards the remaining NE side of the area, no conclusion could be drawn because of a high voltage transmission line running along this direction that greatly affected the results.

3-2-4 Trench survey

Trench survey with a total length of 2,275m and volume of 4,910m^3 was carried out in two areas, namely, Andresito West area and Andresito East area (Fig.II-3-5 and Fig.II-3-16). 1m-wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows: Trench 486900: Au0.95ppm～1.09ppm, Trench 487000: 0.22ppm～2.06ppm, Trench 487100: 0.08ppm～0.57ppm, Trench 487200: 0.09ppm～0.35ppm, Trench 488500: 0.39ppm in quartz veins. Gold mineralization detected in quartz veins of southern trenches is from low to intermediate gold grade, but it lacks in homogeneity of gold content, veins thickness and extension. The gold mineralization is probably related to the last stage of granodioritic intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets.

3-2-5 Considerations

Arroyo Grande greenstone rock (pCCag) was widely distributed in the survey area (Fig.II-3-17) while granodiorite (pCC) was observed at southern part and ancient granites rock (pCCG) at northwestern part. Granodiorite intrusion shows lower silica content at its northern border and at these places it presents a gabbro texture. Low dip quartz veins fill granodiorite with approximate E-W strike and show a parallel distribution. Visible gold is frequently seen in the veins fractures.

Gold soil anomalies were detected at western part and central part of the survey area. Gold anomalies in the western part are divided in two, one at north and other at south. The south anomaly was confirmed within granodiorite while the north anomaly was located at the boundary between gabbro and Arroyo Grande formation. The maximum gold value in soil at north anomaly was 60ppb and at south anomaly was 33ppb.

Observation of Polished section in 16 samples of quartz veins detected gold in 10 samples. Milky quartz vein of the trench 487000 (142m) and trench 486900 (93m) presented pyrite and goethite as accessory minerals. Fluid inclusion samples from these quartz veins showed a homogenization temperature of 257.1 degrees and salinity of 10.1%. X-ray samples indicated alteration minerals as silicification, kaolin and muscovite.

Simultaneous to the ground magnetic survey, VLF-EM survey was conducted on Andresito West and East areas. According to the magnetic results, a fault system is seen distributed at northeast part of the area. They are also weakly detected by VLF survey. A relatively strong magnetic trend is seen along NE direction, and it may be probably due to high magnetic volcano-sedimentary rocks. To the north of this trending, it was detected a magnetic contrast from intermediate to low magnetic contrast and inferred to be caused by shear fault zones. The low magnetic zone detected to the south of the above mentioned trending might be due to the response of gabbro/granodiorite structure.

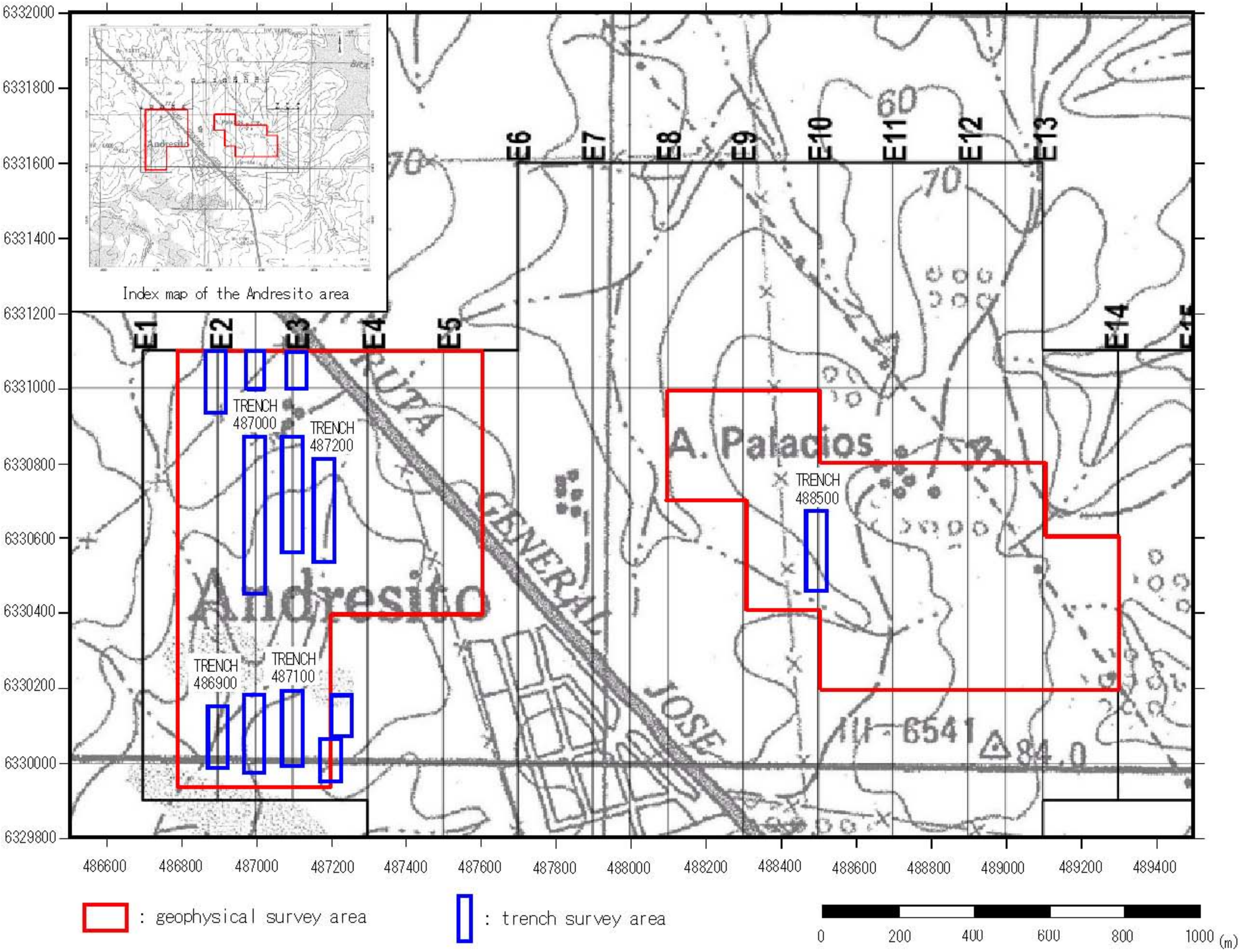


Fig. II-3-15 Location map of trenches in Andresito area

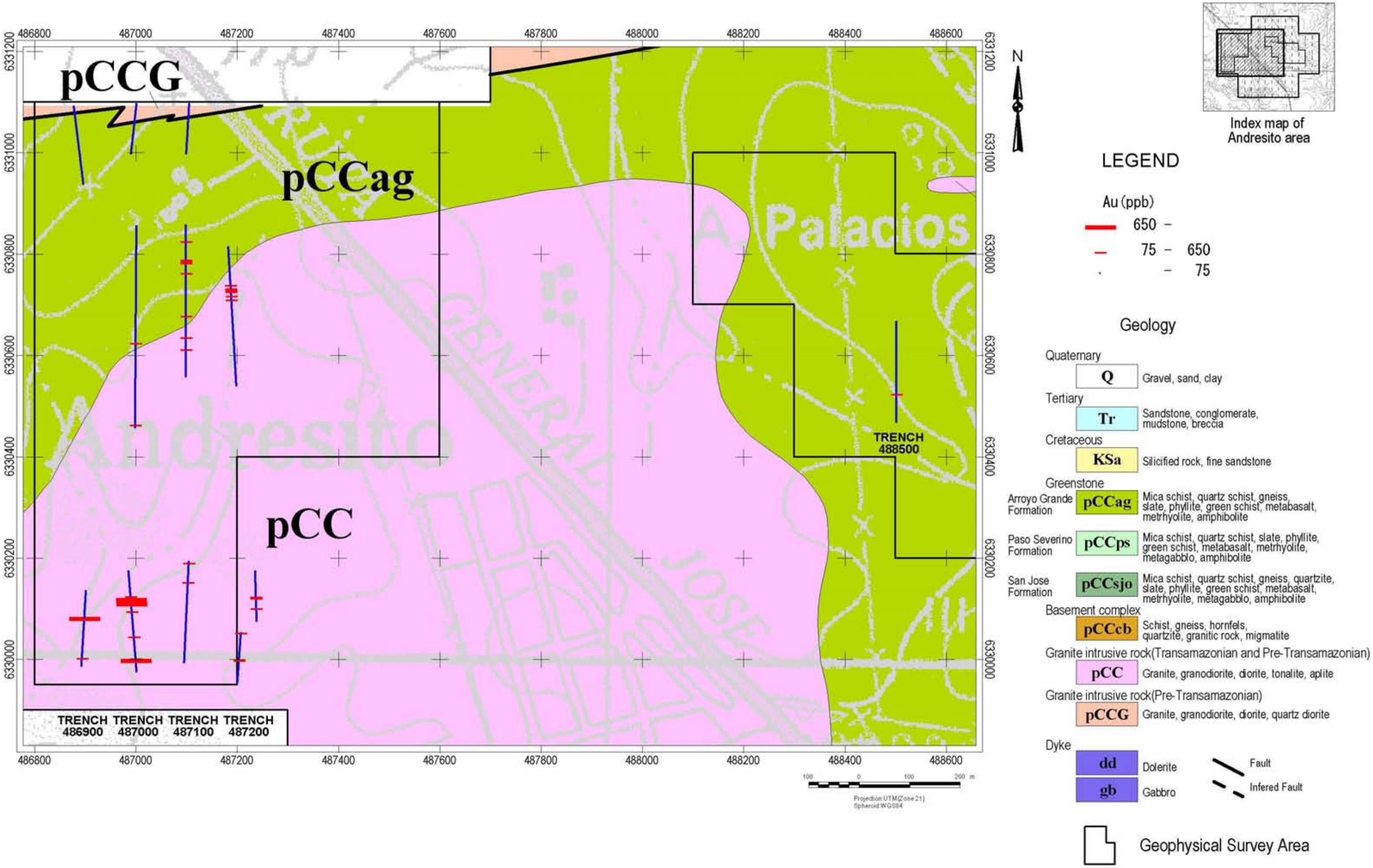


Fig. Ⅱ-3-16　Distribution map of Au anomalies from trench survey in Andresito area

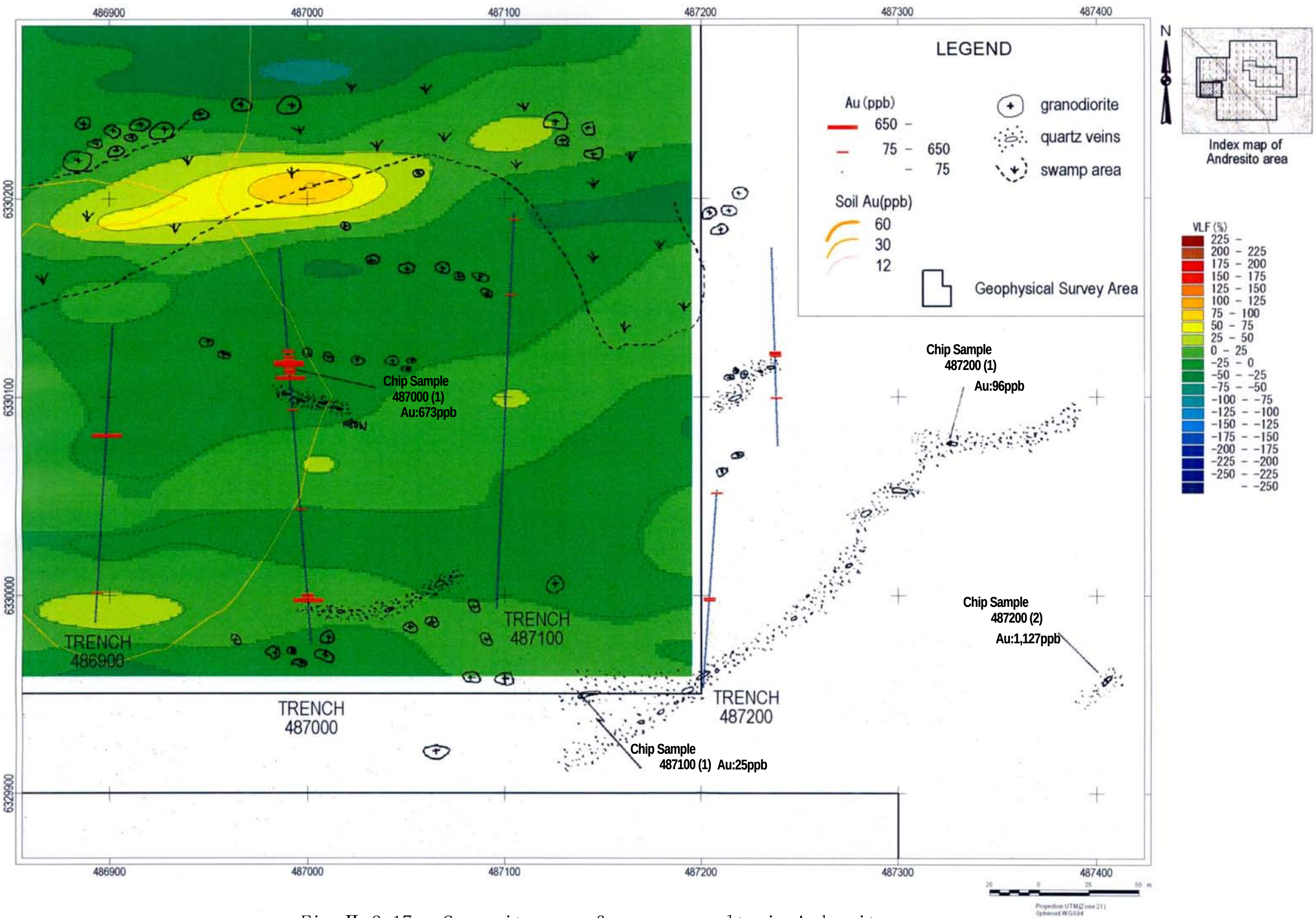


Fig. II-3-17 Composite map of survey results in Andresito area

1m-wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows: Trench 486900: Au0.95ppm～1.09ppm, Trench 487000: 0.22ppm～2.06ppm, Trench 487100: 0.08ppm～0.57ppm, Trench 487200: 0.09ppm～0.35ppm, Trench 488500: 0.39ppm in quartz veins (Fig.II-3-9). Gold mineralization detected in quartz veins of southern trenches show low to intermediate gold grade, but it lacks in homogeneity of gold content, veins thickness and extension and for these reasons, there is a low potentiality to find an economic gold deposit within surveyed area.

3-3 Mundo Azul area

Mundo Azul area, as shown in the Fig.II-3-2, was divided in North area and South area and in these two areas were performed geological mapping and soil geochemical prospecting during Phase III.

3-3-1 Geological mapping

The geology of the Mundo Azul area consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granites unit (pCCG) (Fig.II-3-1). The older units named San Jose and Paso Severino greenstone unit are composed by meta-volcanic and meta-sedimentary sequence that are widely distributed in the Mundo Azul area. At the proximity of the ancient granite it is strongly silicified and show alteration minerals such as K-feldspar, epidote and chlorite. Several faults and shear zones control the boundary between San Jose greenstone unit and ancient granite.

Both, Mundo Azul north and south areas present intrusion of ancient granite (pCCG), which is also intruded by dolerite dykes (dd). Dolerite dykes outcrop along ENE-WSW direction, which is concordant with high magnetic anomalies detected during airborne survey.

3-3-2 Soil geochemical prospecting

A total of 980 soil samples, 279 from north area and 701 from south area, were taken from Mundo Azul areas, as shown in the Fig.II-3-2. Statistical data treatment performed for 980 soil samples taken from Mundo Azul areas showed that there are no elements among the analyzed elements that correlate with gold. A threshold value of Au 8ppb was calculated, so values above 8ppb were considered gold anomalies. There are no concentrations of soil anomalies in Mundo Azul north area, while the gold anomaly detected in the south area was very restrict with maximum gold values around 20ppb.

3-3-3 Considerations

Mundo Azul area consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granites unit (pCCG). The older units named San Jose and Paso Severino greenstone unit are composed by meta-volcanic and meta-sedimentary sequence that are widely distributed in the Mundo Azul area. Several faults and shear zones control the boundary between San Jose greenstone unit and ancient granite, which is intruded by dolerite dykes (dd). Geochemical prospecting showed very low threshold values for Au of 8ppb. Soil anomalies was absent in Mundo Azul north area, while in the south area, the anomaly was very limited with maximum gold value of 20ppb.

PART III

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 1 CONCLUSIONS

Analysis of existing data, satellite image interpretation, airborne survey, geological mapping, ground geophysical survey, soil geochemical prospecting and trench survey were carried out during three years in San Jose and Arroyo Grande areas. The conclusions derived are as follows:

(1) Mahoma East area

A total length of 2,245m and volume of 3,220m^3 of trenches were excavated. From the analysis of this information, dolerite dykes were confirmed within shear zones and in these shear zones, quartz veins lenses were found confirming maximum gold values of 745ppb in 1m-width channel sample. Others channel samples confirmed anomalous results within dolerite and granite, which presented quartz veins and veinlets, as follows: trench 515600 Au (0.13ppm and 0.75ppm), trench 515700 Au (0.13ppm and 0.27ppm), trench 515800 Au (0.25ppm and 0.54ppm), trench 515900 Au (0.14ppm and 0.31ppm). Gold mineralization in trenches presented low grade and it lacked not only in the homogeneity of gold content, but also in veins thickness and extension.

(2) Andresito area

Conclusive trench survey was performed in Andresito area with 2,275m length and a total volume of 4,910m^3. 1m-wide channel samples showed gold anomalies within quartz veins zones and at the borders of diabase dyke, as follows: Trench 486900: Au (0.95ppm and 1.09ppm), Trench 487000: Au (0.22ppm and 2.06ppm), Trench 487100: Au (0.08ppm and 0.57ppm), Trench 487200: Au (0.09ppm and 0.35ppm), Trench 488500: Au 0.39ppm. Gold mineralization in Andresito is probably related to the last stage of granodioritic intrusion (pCC), with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets.

(3)Mundo Azul area

Results of a total of 980 soil samples taken from Mundo Azul area showed no correlation between gold and the 31 analyzed elements. Soil gold anomalies were absent in Mundo Azul north area, while in the south area, the anomaly was very restricted and with maximum gold value of 20ppb. Overall results indicated that the potentiality of this area is very low.

CHAPTER 2 RECOMMENDATIONS

Recommendations from 3 years surveys are described below for Mahoma East area, Andresito area and Mundo Azul area.

(1)Mahoma East area

Trench survey detected gold anomalies between 0.13ppm and 0.75ppm in 1m-wide channel sample in granite and diabase. Since these anomalies lack in width and length, its gold potentiality is considered very low and further survey cannot be recommended in the area.

(2)Andresito area

1m-wide channel samples taken from southern trenches of Andresito area showed gold values between 0.1 and 2.06 ppm in quartz veins. Since these anomalies lack in width and length, its potentiality to find an economic gold deposit is considered low and further survey cannot be recommended in the area.

(3)Mundo Azul area

Soil geochemical prospecting results indicated very poor results, so further survey cannot recommend in the area.