REPORT
ON
THE MINERAL EXPLORATION
IN
THE TALAS AREA
THE KYRGYZ REPUBLIC
(PHASE II)

MARCH, 1996

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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PREFACE

In response to the request the Government of the Kyrgyz Republic, the Japanese Government decided to conduct a Mineral Exploration in Talas Area Project and entrusted the survey to the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ).

The JICA and MMAJ sent to the Kyrgyz Republic a survey team headed by Mr. Masaharu Marutani from July 16, 1995 to December 9, 1995.

The team exchanged views with the officials concerned of the Government of the Kyrgyz Republic and conducted a survey in the Talas area. After the team returned to Japan, further studies were made and the present report has been prepared.

We hope that this report will serve for the development of the Project and contribute to the promotion of friendly relation between our two countries.

We wish to express our deep appreciation to the officials concerned of the Government of the Kyrgyz Republic for their close cooperation extended to the team.

February, 1996

Kimio Fujita
President
Japan International Cooperation Agency

Shozaburo Kiyotaki
President
Metal Mining Agency of Japan

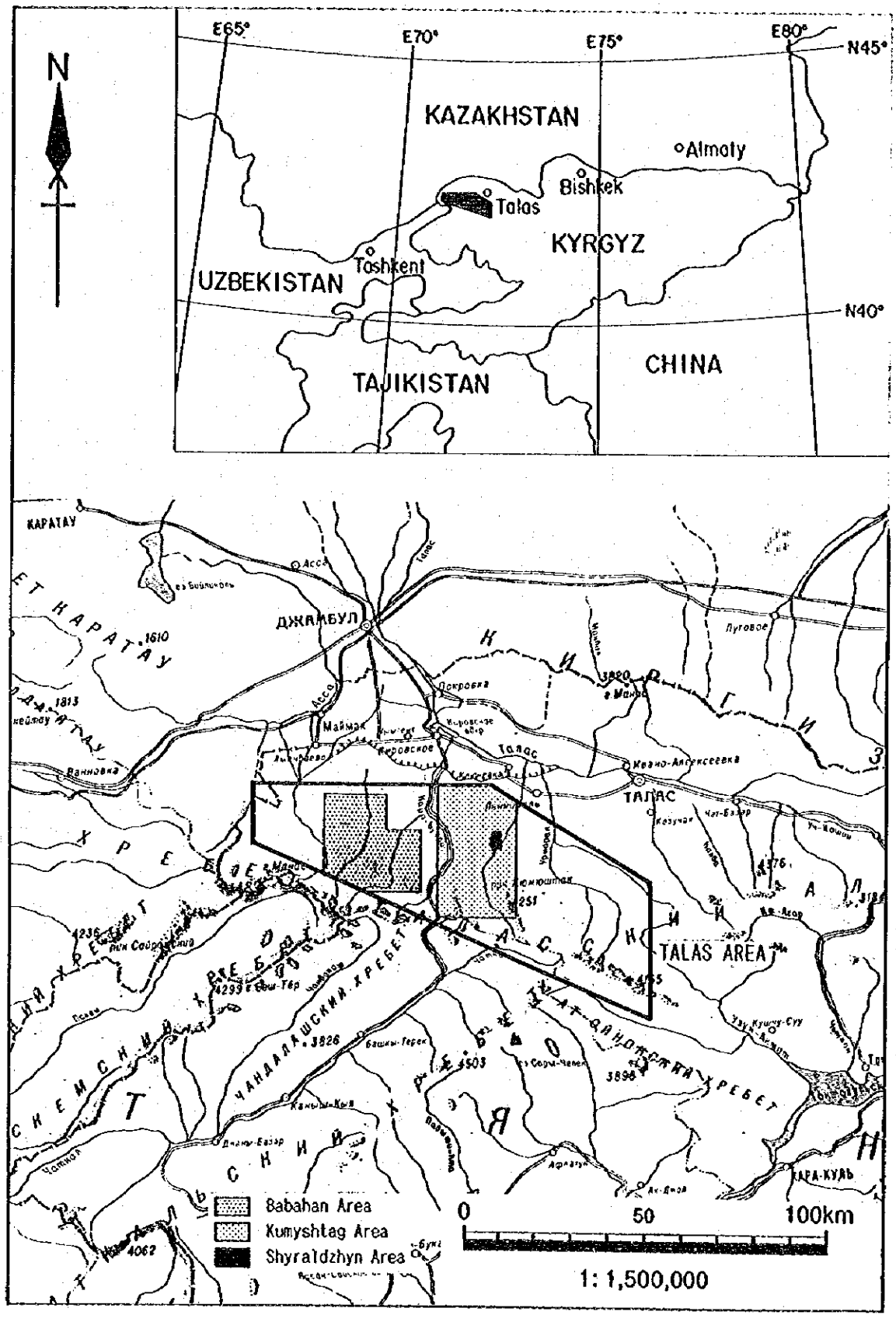

Fig. I -1 Location Map of the Survey Area

РЕЗЮМЕ

В настоящем отчете представлено короткое изложение результатов II этапа исследований по программе технического сотрудничества в освоении новых недровых ресурсов в Талаской области Республики Киргизстан. Полевые исследования, производящиеся с июля по декабрь 1995 г. заключились в выяснении геологических характеристик и ресурсов полезных ископаемых и в данном регионе.

Второй этап исследований, был проведен на 2 будущих перспективных месторождениях золота, которые определялись результатами сбора и анализа данных I этапа.

Детальная геологическая разведка была проведена на участке площадью 12 км² в районе Ширальджин. Кумыштагская гранитная порода включает в себе 4 жилы кварца и золотосодержащую мангано-сидеритовую жилу, которые расположены параллельно друг другу по направлению ССВ-ЮЮЗ, под углом 70° ~ 80°. Ширина каждого рудного тела от 0,6 м до 3,7 м. Длина достигает 1500 м вдоль протежения жила. Содержание золота колеблется в пределах - 1,0 г/т ~ 19,6 г/т. Среднее содержание золота составляет 8,6 г/т. Средняя температура гомогенизации жидких включений в кварце составляет 180°С ~ 150°С. Эта температурная зона является наиболее благоприятной для образования минерализации золота по направлению вытягивания жилы. Измененная зона калиевого полевого шпата и серицита вдоль обнаженной жилы указывает на то, что это рудное месторождение имеет благоприятные условия для минерализации золота. Поэтому этот факт показывает на высокое содержание золота в руде в направлении вниз вытягивания жилы.

Результат измерения (по методу K-Ar) абсолютного возраста мусковита по грейзенизации, который образовался раньше, чем минерализация золота, составляет 405±21 Ма. Это соответствует периоду от позднего Силурийского до

раннего Девонского. Кумыштагский гранит показывает одинаковый возраст (406±14 Ма по методу U-Pb). Этот факт свидетельствует, что минерализация золота связана с последней стадией активизации магматизма, которая происходила в поздний Силурийский и ранний Девонский периоды.

Геолого-разведочные исследования были проведены в зоне свыше 1.220 км² в районе Кумыштаг и Бабахан. Одновременно для геохимических поисков было отобрано 768 поверхностных проб. Результаты геохимических исследований показывают, что в районе Кумыштаг аномалии серебра, медь, мышьяк частично содержатся над большим районом, включая Кумыштагское месторождение серебра и Учимчекское месторождение мышьяка. Несмотря на то, что Кумыштагское месторождение содержит крупномасштабную серебросодержащую мангано-сидеритовую жилу, минерализация золота здесь низка, что соответствует результатам геохимического исследования. В районе Бабахана геохимические аномалии серебра были найдены на разломе Джолсай поблизости от месторождения серебра Куру-Бакаир. Исходя из мало-геохимических аномалиев и маломасштабного месторождения серебра, около поверхности не предполагается крупномасштабного месторождения.

На почве проверяли зоны аномалиев, которые определялись путем спектрального анализа спутниковых снимков. Эта зона аномалиев совпадает с зоной распространения лимонита Рифейской серии. К тому же можно вынести диагноз, что эта зона аномалия последствия гидротермального процесса.

По результатам исследований II этапа можно предполагать, что Ширальджинское месторождение имеет минерализацию золота с большим его содержанием, внизу рудного тела. С учетом предположения наличия высокой минерализации золота на месторождении Ширальджин целесообразно произвести бурение для непосредственного подтверждения состояния и непрерывности рудного тела.

SUMMARY

This report summarized results of the phase II survey of a technical cooperation for mineral exploration conducted in Talas area, Kyrgyz Republic. The survey focuses to clarify the geology and mineral potential of the area and to explore new ore deposits. The field survey has been conducted from July to December, 1995.

In the phase II survey, detailed geological survey was performed in a promising gold deposit, and geological reconnaissance survey as well as geochemical survey were performed in two promising areas, which had been assessed to be prospective through compilation and analysis of the previous data on geology and mineral deposits of the phase I survey.

Detailed geological survey was conducted over an area of 12 square kilometers in Shyraldzhyn. The deposit in Kumyshtag granite is composed of gold-bearing manganous siderite veins and quartz veins, and consists of four veins paralleled to each other, striking NNE-SSW with westward dipping of ranging from 70° to 80°. The width of the main orebody ranges from 0.6 to 3.7 m, and the length reaches 1,500 m along the strike of vein. The gold grade ranges from 1.0 to 19.6 g/t and average gold grade is 8.6 g/t. Average homogenization temperature of fluid inclusions in quartz ranging from 180°C to 150°C suggests that the most favorable temperature zone for gold mineralization exists in the downward extension of the vein. Altered zone of potassium feldspar and sericite partly detected along the outcrop of veins proves that ore deposit has the worthy condition for gold deposition. Consequently, these facts show that high grade gold ore could exist in the downward extension of the vein.

The results of absolute age measurement (K-Ar method) of muscovite produced by greisenization before gold mineralization shows 405±21 Ma, which corresponds to late Silurian to early Devonian. Kumyshtag granite also shows the same age (406±14 Ma, U-Pb method). It is assumed that gold mineralization had been taken place at the latest stage of igneous activity occurred in the late Silurian to early Devonian.

Geological reconnaissance survey was conducted over an area of 1,220 square kilometers in Kumyshtag and Babahan areas and geochemical survey was simultaneously implemented with 768 soil samples. In Kumyshtag area, geochemical overlapped anomalies of silver, copper, arsenic and antimony were extracted over a wide area including Kumyshtag silver deposit and Uchimcheck arsenic deposit. Although Kumyshtag deposit is composed of large-scale silver-

bearing manganous siderite veins, gold mineralization is poor and it corresponds to the result of geochemical survey. In Babahan area, geochemical silver anomaly was extracted on the Dzholsay fault near Kuru-Bakair silver deposit. Geochemical small anomaly and small-scale silver deposits presumes that a large-scale ore deposit would not be expected near the surface.

Ground truth was carried out to check the anomalous zones delineated from the satellite image spectral analysis. The anomalous zones corresponded to limonite disseminated schist of Riphean series. Ground truth revealed diagenesis alteration instead of hydrothermal alteration have produced these anomalous zones.

The phase II survey has suggested that Shyraldzhyn gold deposit could have high grade gold mineralization in downward extension of known orebody. For the further survey, drilling survey will clarify directly these suggestion about the occurrence and circumstances of whole Shyraldzhyn deposit.

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PART I

GENERAL REMARKS

CHAPTER 1 INTRODUCTION

1-1 Background

The Kyrgyz Republic is mainly composed of metamorphic and sedimentary rocks from Precambrian to Paleozoic era which are widely intruded by granite. Potential of existence of metal deposits is high, and gold, silver, copper, lead, zinc, mercury, antimony, tin, tungsten and rare earth are occurred.

Although the Kyrgyz Republic has many kinds of mineral resources, a lot of deposits have been undeveloped and also mining has been not promoted during defunct USSR.

Under these circumstances, the State Committee on Geology, Usage and Protection of Natural Resources (GOSCOMGEOLOGY), requested, through the State Commission on Foreign Investments and Economic Assistance of the Kyrgyz Republic, a technical cooperation from the Japanese Government for the survey in April 1994. In August 1994, a delegation for the preliminary survey and agreement negotiations for this purpose was organized among the Ministry of International Trade and Industry (MITI), Japan International Cooperation Agency (JICA) and Metal Mining Agency of Japan (MMAJ), and was dispatched to the Kyrgyz Republic. On August 11, 1994, the scope of work to the Talas area project was signed between the parties.

According to the scope of work concluded among GOSCOMGEOLOGY, JICA and MMAJ, the region to be surveyed covers an area of approximately 3,300 square kilometers. The phase I survey was carried out by previous data compilation combined with the satellite image analysis of entire survey area.

1-2 Conclusion and recommendation of the phase I survey

1-2-1 Conclusion of the phase I survey

Conclusions of the phase I survey are summarized as follows:

(1) The survey area is composed of the various geological units from Proterozoic to Cenozoic Era which are intruded by the granite of Kumyshtag and Babahan.

(2) Various type of ore deposits of gold, silver, lead, zinc, arsenic, beryllium, copper and tungsten are located in the area. The mineralization has taken place in the limestone and sandstone of Upper Riphean series - Vendian series of Proterozoic and the Kumyshtag granite of late Silurian to early Devonian.

(3) From the geological structure and characteristics of ore deposits of this area, the mineralization is classified into ① vein type and massive mineralization related

to Uzunahmat-Kumyshtagsky thrust fault and its subordinate faults or fractures, and ② vein type, greisen and skarn type mineralization related to Kumyshtag granite of late Silurian to early Devonian.

(4) Although Shyraldzhyn deposit is only one gold deposit in Kumyshtag granite in the survey area, it has been investigated by trenching and has not yet explored the downward extension. The prognostic reserves (Category P_1 + Category P_2) are estimated to be 16 tones of gold, with average gold grade of 5 g/t.

(5) As geochemical anomaly of gold around Shyraldzhyn deposit was detected, the mineralized area could be expanded around this deposit.

(6) A lineament analysis of the satellite images has revealed that a group of silver deposits including Dzholsay deposits in the western part of the survey area are lined along the east - west fault, and the lineaments of trending north-northwest to northwest predominate in the area covering the west of Kumyshtag deposits in the eastern part of the area and Sarymsak deposit in the north central part of the area.

(7) A spectral analysis of the satellite images to extract alteration zones has disclosed the existence of anomalous zones in three areas. It is suggested that these anomalous zones may represent the alteration zones produced by the hydrothermal activity along the west-northwest trending fault or the skarn deposits formed in the carbonate rock of Riphean series.

(8) The results of geochemical survey show that an anomalous gold concentration is located near the Uzunahmat-Kumyshtagsky thrust fault which is considered worthy to conduct further exploration.

1-2-2 Recommendation of the phase I survey

Based upon the results of the phase I survey, the following exploration is recommended to be carried out.

(1) Detailed geological survey and diamond drilling survey are to be carried out in Shyraldzhyn gold deposit which are found out by GOSCOMGEOLOGY.

(2) Geological reconnaissance and semi-detailed geochemical survey are to be conducted in the following six area; Kumyshtag, Kara-Buura, Babahan, Shalbaly-Say, Chymtash and Tabylgaty where geochemical gold anomalies were extracted by analysis of the previous data.

(3) Geological reconnaissance check survey is to be conducted for the anomalies extracted by the spectral analysis of satellite image in the areas of upstream of Babahan, upstream of Kumyshtag and upstream of Chymtash.

(4) Detail geological investigation for the known forty ore deposits or mineral manifestations is to be conducted.

1-3 Outline of the phase II survey

1-3-1 Scope and purpose of the survey

The phase II survey was conducted as follows according to priority of recommendation of the phase I survey.

(1) Shyraldzhyn area

A detailed geological survey was conducted over an area of 12 square kilometers in Shyraldzhyn gold deposit including manganous siderite veins and quartz veins, which is extracted from previous data compilation of the phase I survey. The purpose of the survey is confirm the dimension of surface exposure of veins (width and elongation), the grade of ore and the dimension of alteration of country rocks.

Moreover, new dirt road was constructed on 10.11 km and clearing of previous road was performed along 14.22 km, to transport heavy machines and equipment for drilling survey to verify the mineralized conditions in downward extension of vein.

(2) Kumyshtag and Babahan areas

Geological reconnaissance survey was conducted over an area of 1,220 square kilometers in Kumyshtag and Babahan areas and geochemical survey was simultaneously implemented. The purpose of the survey is to assess the relation between the mineralization and geology or geological structure, to check the mineralization of geochemical anomalies extracted by analysis of previous data compilation, to check the anomalous zones extracted by the spectral analysis of satellite image, and assess the mineralization of the known ore deposits and manifestations in the areas. Besides, Kumyshtag area of this survey includes Kara-Buura area where mineral deposit has been suggested to exist after the phase I survey, and Babahan area of this survey also includes Shalbaly-Say area.

1-3-2 Method and amount of the survey

The procedure of each survey will be outline as follows. The survey of phase II is summarized in Table I-1.

Table I-1 Amount of the Survey

(Field survey)

Item		Kumyshtag	Babahan	Shyraldzhyn
Geological survey				
	Regional geological survey			
	Survey area	700 km²	520 km²	
	Length of route	175 km	60 km	
	Geochemical soil	564 pcs	204 pcs	
	Detailed geological survey			
	Surveyed area			12 km²
	Length of route			26 km
Drilling survey				
	Road construction			
	Dirt road construction			10.11 km
	Previous road clearing			14.22 km

(Laboratory studies)

Item	Whole area
Observation of thin section	11 pcs
Observation of polished section	20 pcs
Chemical analyses	
Soil (Au,Ag,Cu,As,Sb: 5 elements)	768 pcs
Ore assay (Au,Ag,Cu,As: 4 elements)	60 pcs
X-ray diffraction analysis	20 pcs
Fluid inclusion	11 pcs
Isotopic dating (K-Ar)	2 pcs

(1) Detailed geological survey

A detailed geological survey was conducted in Shyraldzhyn area. A topographic map on a scale of 1/10,000 belonged to Goscomgeology is enlarged to a scale of 1/5,000 and is used as a base map for the survey. The survey was carried out using a surveying transit compass and/or clinocompasses, GPS (Global positioning system) and measuring tapes with a scale of 1/5,000. Correction of measurement errors was made at such topographical characteristic points as a peak. A closed measuring line was drawn around the main orebody vein, combined with making the relative position of each outcrop accurate.

(2) Geological reconnaissance survey

Geological reconnaissance survey was conducted in the Kumyshtag and Babahan areas. Topographic maps on a scale of 1/100,000 published by Kyrghyzgeodesy (State Agency of Geodesy and Cartography of Kyrgyz Republic) are enlarged to a scale of 1/50,000 and are used as base maps for the survey. Base camp for the survey was set up at Talas and advanced camps were set up at the middle reaches of Kumyshtag river, the upper reaches of Kara-Buura river and the middle reaches of Suluu-Bakair. Three field survey teams were organized. Each team was composed of a Japanese geologist, a counterpart geologist of Kyrgyz and one or two assistants. Moreover, soil samples for geochemical survey were simultaneously collected.

(3) Drilling survey

As no road was passable for automobiles, transporting road was constructed for the drilling survey in the Shyraldzhyn area. Clearing previous road and new road construction were completed by bulldozers from the northwestern side through Beisheke village and along Manka-Blak river. Cutting works were drilled by compressed air drifters and exploded by ANFO (ammonium nitrate with fuel oil solid explosives). Base camp was set up at the uppermost reaches of Manka-Blak river.

1-3-3 Organization of the survey team and period of the survey

The representative from Japanese government for negotiation and the phase II survey was dispatched to Kyrgyz during the period from September 28, 1995 to October 5, 1995. The delegation member and their counterparts from Kyrgyz are sown as below:

From Japan:

Mr. Junichi TOMINAGA	Metal Mining Agency of Japan

From Kyrgyz:

Mr. Bayseit T. TURSUNGAZIEV	GOSCOMGEOLOGY*
Mr. Sheyshenaly M. MURZAGAZIEV	GOSCOMGEOLOGY
Mr. Vitaly A. STAVINSKY	GOSCOMGEOLOGY
Mr. Alexandar G. KONYUKHOV	GOSCOMGEOLOGY
Mr. Victor P. ROGALSKY	GOSCOMGEOLOGY
Mr. Lev F. CLEMENTEV	NKGE
Mr. Vladimir P. ZUBKOV	NKGE
Mr. Vichaclav P. JAKOVENKO	NKGE

* GOSCOMGEOLOGY : State Committee on Geology, Usage and Protection of Mineral Resources

* NKGE : North Kyrgyz Geological Expedition

Leader of the field survey team was dispatched from July 16, 1995 to December 9, 1995, and two geologists were dispatched from July 16, 1995 to September 16, 1995. The team members from Japan and their counterpart from Kyrgyz are shown as below:

From Japan:

Mr. Masaharu MARUTANI	MINDECO* ; Leader. geological and drilling survey
Mr. Tsuyoshi YAMADA	MINDECO ; geological survey
Mr. Shoji KUMITA	MINDECO ; geological survey

* MINDECO : Mitsui Mineral Development Engineering Co., LTD

From Kyrgyz:

Mr. Vladimir M. SHUBIN	NKGE* ; Leader of geological survey
Mr. Farid K. APAYAROV	NKGE ; geological survey
Mr. Vladimir M. ANTSYFROV	NKGE ; geological survey
Mr. Alexander F. LOPIN	NKGE ; geological survey
Mr. Yury I. KOSTENKO	NKGE ; geological survey
Mr. Sergy I. KORSHUNOV	NKGE ; geological survey
Mr. Ermek A. INABEKOV	NKGE ; geological survey
Mr. Tokonazar K. ISMAILOV	NKGE ; drilling survey
Ms. Valentina N. STESHENKO	NKGE ; drilling survey

* NKGE : North Kyrgyz Geological Expedition

CHAPTER 2 GEOGRAPHY OF THE SURVEY AREA

2-1 Location and access

The Kyrgyz Republic is known for the Tien-Shan mountains, marking 7,000 m altitude class, which is one of the highest mountain ranges in the world. The country stretches the east-west direction along the extension of the Tien-Shan mountains for hundreds of kilometers in southern Central Asia. The longest distance between the east-west point is 925 km and north-south, 454 km. Total area is 198.5 thousand square kilometers which is approximately half area of Japan. The survey area is located in the northwestern part of the Kyrgyz Republic. Location map of the survey area is shown in Fig. I -1.

Talas town, where the field survey is based, is located at about 200 km to the west-southwestern of the capital Bishkek. Absolute elevation of Talas marks about 1,250 m. The town is the central of the Talas oblast, with about 30,000 population.

The following two routes are available to move from Bishkek to Talas. Main route is taken westward to Dzhambul in Kazakhstan, and turned southeastward into Talas. The other route is taken through Kara-Bulta, Tyuz-Ashuu pass and Otmek pass. It is available to go to Talas through all year on the former route, 410 km of distance, taking 7 hours by automobile. On the other hand, it is available to pass except snowy season on the latter route, because of bad road condition by snow, avalanches and fallen rocks. Although the distance of the latter is 80 km shorter than the former, it takes almost same hours to be necessary.

A lot of dirt roads are constructed for nomads along the main rivers in the survey area. It is available to go upstream using the four-wheel cars along dirt roads. Furthermore, in the steep highland geological survey is carried out by riding

2-2 Topography and drainage

The Tien-Shan mountain ranges are divided into three parts, that is the Northern Tien-Shan, the Middle Tien-Shan and the Southern Tien-Shan. The survey area is located in the southern part of the Northern Tien-Shan. Talas Ala-Too mountain ranges, marking 4,000 m altitude class, locate in the southern part of the survey area. The mountain ranges trend from northwest to southeast. The highest peak is Kumyshtag peak, with 4,251 m of elevation, and is located in the central part of the area.

Most high mountains are widely covered with glacier. The rivers, pouring

out from glacial troughs, form deep gorges. Most rivers flow to the north and flow into the Talas river, running to the west. The Talas river turns the direction from west to northwest, and separates to the branches and disappears into the Kazakhstan steppe.

In Kumyshtag area, Kumyshtag river runs northeastward at the eastern part of the area, and Kara-Buura river flows northward at the western part. In Babahan area, Shalbaly-Say river, a big branch of Kara-Buura river, runs northward at eastern part of the area, Suluu-Bakayir river runs at central part, and Babahan river runs at western part, respectively.

Both of Kumyshtag and Babahan area are topographically extremely steep, it is very difficult to obtain the survey routes. In Kumyshtag area, relative elevation is 2,850 m between Kumyshtag river with absolute elevation of 1,440 m and the highest peak with 4,250 m. In Babahan area, relative elevation is 2,570 m between Suluu-Bakair river with absolute elevation of 1,400 m and the highest peak with 3,970 m.

2-3 Climate and vegetation

The climate and vegetation in the survey area are characterized by changing of elevation because of 3,000 m in relative elevation. The climate in highland above 3,000 m belongs to cold zone, and grass grows partly. The climate ranging from 2,000 to 3,000 m belongs to the highland zone, and bushes partly grows besides pines, cedars and birches grow along rivers below 2,000 m. In summer season, the slope of mountain is covered with grass, and sheep, cattle and houses are put to pasture.

The monthly average temperature in Talas ranges from -5°C to -9°C in January, from +15°C to +20°C in July. The annual rain fall shows 290 mm. The most monthly rain fall shows 48 mm in April and March, and the fewest shows 9 mm in September. The annual sun shining is 2,772 hours in Talas.

The highest temperature in the survey area is recorded +38°C in July, and the lowest is recorded -39°C in January. The annual rain fall ranges from 230 to 320 mm in the area. The thickness of snow show 4 cm in the western part of the Talas basin, and 16 cm in the eastern part.

CHAPTER 3 GENERAL GEOLOGY

The survey area is included in Talas marginal massif in geological structure zones of Kyrgyz. This massif is a small one between the Nikolaevsky tectonic line (Talas-Fergansky fault - Nikolaevsky fault) and the Eachkeletau-Susamyrsky fault in the western edge of the Northern Tien-Shan massif. The Talas block is divided into Uzunahmatsky block and Karagainsky block by Uzunahmat-Kumyshtagsky thrust. The Talas block is characterized by prominent sedimentary rock with carbonate rock and acid igneous rock intruding it, and shows complex structures where many thrust faults and folds are developed. A lot of igneous activities from Proterozoic era to Silurian period are recognized. Many granitic batholith intruded in the Talas block. Many ore deposits of gold, silver, copper and lead are recognized to be related with leucocratic granite of Silurian.

Basement rock of this survey area is Riphean system of Proterozoic era which was folded in Baikalian stage, is covered with Vendian system, Paleozoic group and Cenozoic group unconformably. The area is bordered on the Middle Tien-Shan massif by the Talas-Fergansky fault in the southern edge of the area.

The prominent direction of fold axis and strike is west-northwest, that is, the parallel direction to the main faults mentioned above.

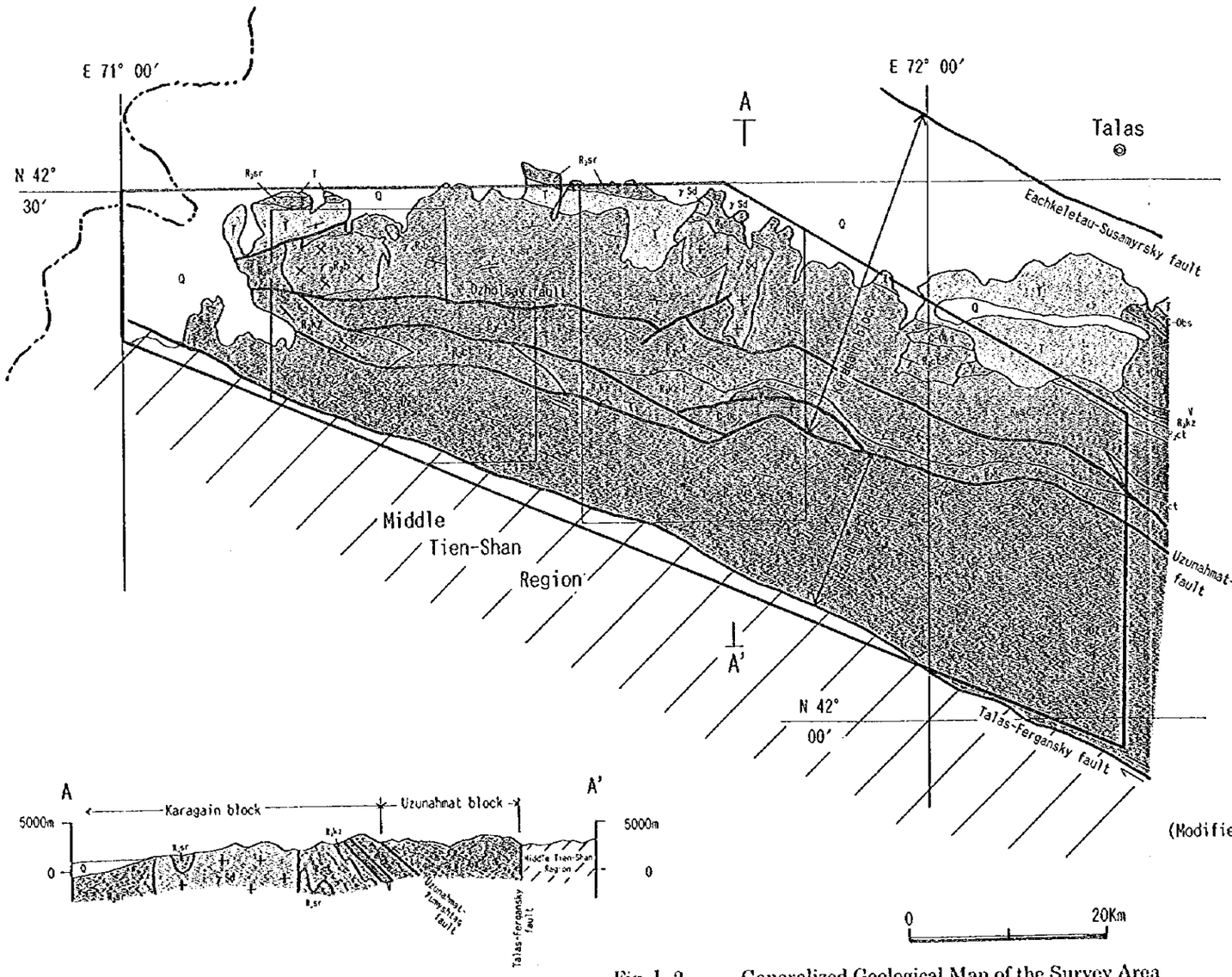
The geological map of the survey area is shown in Fig. I -2, and generalized stratigraphic column in Fig. I -3. The summary of stratigraphic relationship and lithofacies are as follows:

(Age)			(Main lithofacies)
Cenozoic	Tertiary - Recent		: gravel, sand, silt, clay
Paleozoic	Cambrian - Ordovician		: limestone, dolomite
Proterozoic	Vendian		: conglomerate, sandstone
	Riphean	Kyzylbelskaya F.	: siltstone
		Chatkaragaiskaya G.	: limestone, sandstone, shale
		Sarydzhonskaya G.	: sandstone, shale, siltstone
		Uzunahmatskaya G.	: limestone, phyllite, sandstone

This area is intruded by Kumyshtag intrusive in Kumyshtag area, and by Babahan intrusive in Babahan area. Kumyshtag intrusive is exposed in the west of the midstream of the Kumyshtag river, where the width is about 10 km in north and south and about 9 km in east and west. It mainly consists of leucocratic to pink

granite. The result of recent absolute age measurement (U-Pb method) shows 406± 14 Ma, which corresponds to late Silurian (S_2) to early Devonian (D_1) (after Geological Institute of the Academy Science, unpublished).

Babahan intrusive is exposed in the area between Babahan river and Suluu-Bakayir river, whose the width is about 6 km in north and south and about 10 km in east and west. It mainly consists of tonalite. Intrusion of an aplite dike can be seen at the end of the activity. The result of recent absolute age measurement (U-Pb method) shows 1,050±50 Ma, which corresponds to middle to late Riphean (R_2-R_3) (after Geological Institute of the Academy Science, unpublished).



LEGEND

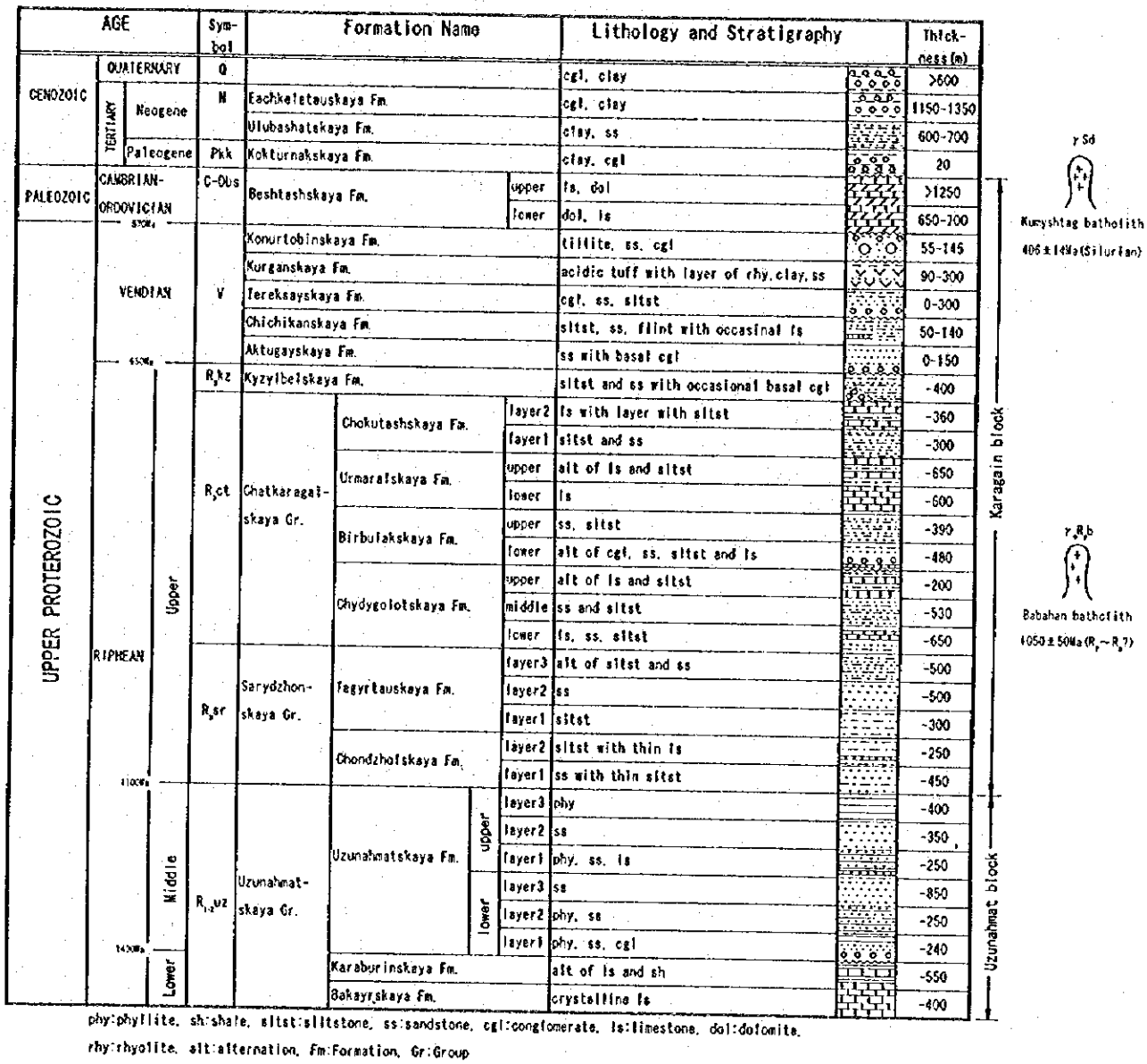
Cenozoic	Quaternary		Q	γ Sd: Kumyshtag batholith 408±14Ma (Silurian)
	Tertiary		T	
Paleozoic	Cambrian-Ordovician	Beshtashskaya Fm.	C-Obs	
Proterozoic	Vendian		V	γ1Rjb: Babahan batholith 1050±50Ma (R3-R1?)
	Riphean	Kyaylbelskaya Fm.	Rjkz	
		Chatkaragaiskaya Gr.	Rjct	
		Sarydzhonskaya Gr.	Rjsr	
		Uzunahmatskaya Gr.	Rjuz	

Dip and strike
Bedding plane
Major fault
Thrust fault

Talas Area
Babahan Area
Kumyshtag Area

(Modified Geological Map of Kyrghystan (1:500,000), 1980)

Fig. 1-2 Generalized Geological Map of the Survey Area



phy:phyllite, sh:shale, siltst:siltstone, ss:sandstone, cgl:congfomerate, ls:limestone, dol:dolomite,
rhy:rhyolite, alt:alternation, Fm:Formation, Gr:Group

Fig. I-3 Generalized Stratigraphic Column of the Survey Area

CHAPTER 4 COMPREHENSIVE ANALYSIS

4-1 Geological structure, and characteristics and controlling factors of mineralization

The survey area is located in the western edge of the Northern Tien-Shan massif between the Talas-Fergansky fault and the Eachkeletau-Susamyrsky fault, which direct the west-northwest. The area is characterized by prominent sedimentary rock with carbonate rock. The prominent direction of fold axis and strike is west-northwest, that is, the parallel direction to the main faults mentioned above.

The results of satellite image lineament analysis clearly showed the principal faults such as Talas-Fergansky fault, Uzunahmat-Kumyshtagsky thrust fault and Dzholsay fault. The indicated faults revealed to be related to the known mineral deposits as described below. Kumyshtag silver vein-type deposit and Uchimchek massive arsenic deposit are located near the Uzunahmat-Kumyshtagsky thrust fault in Kumyshtag area. Silver, lead and zinc deposits such as Babahan and Kuru-Bakair deposits are located near the east-west trending Dzholsaysky fault in Babahan area.

The results of this field survey also interpreted that Kumyshtag silver deposit, Uchimchek arsenic deposit and Dzholsay silver deposit are occurred confining along the west-northwest directing faults, the east - west faults and their subordinate faults, or geological discontinuity. The above mentioned facts presumes that the mineralization has taken place along the fractures related to the north-south stress which formed the west-northwest trending faults.

The north - south and north-northeast directing fractures and textures are predominant in the southeastern part of Kumyshtag granite. Gold bearing veins are filled with these fractures. The result of absolute age measurement of muscovite along Shyraldzhyn gold veins shows 405±21 Ma, which correspond to late Silurian to early Devonian. The result of absolute age measurement of Kumyshtag granite shows almost same age of 406±14 Ma. The above mentioned results of absolute age and the occurrence of veins have suggested that the mineralization in Shyraldzhyn deposit including greisenization and hydrothermal alteration has taken place gold bearing veins filled with shear fractures, which had been developed in the latest stage of igneous activity formed the Kumyshtag intrusive. Uzuntashy and Tuktuarcha beryllium deposits are located near the

northern margin of Kumyshtag intrusive. The occurrence of skarn minerals has presumed that a formation of the deposits had been related to intrusion of the granite.

The above mentioned interpretation suggests that Kumyshtag granite formed during late Silurian to early Devonian had controlled the mineralization in this area. This is conformable to the suggestion that gold, silver and copper mineralization around the survey area is genetically related to Silurian granites in Talas massif.

4-2 Potential of an existence of ore deposits

The various types of ore deposits of gold, silver, lead, zinc, arsenic, beryllium, copper and tungsten are known to occur in the survey area. They are classified into the following six types through compilation and analysis of the previous data on geology and mineral deposits of the phase I survey.

① Gold veins in Kumyshtag granite
② Silver, lead veins in limestone or sandstone of upper Riphean series to Vendian series
③ Massive and disseminated arsenic deposits in limestone or sandstone of upper Riphean series
④ Greisen and stockwork beryllium deposits in Kumyshtag intrusive
⑤ Copper veins around Kumyshtag intrusive
⑥ Vein and skarn type tungsten deposits around Kumyshtag intrusive

The result of the phase II survey suggests that most economical deposit could be Shyraldzhyn gold deposit according to scale and grade of deposits in this area. Goscomgeology has calculated ore reserves of Shyraldzhyn deposit on trench survey. The prognostic P1 category reserves are 1,740 thousand tones of crude ore, 5 g/t of average gold grade, 8.1 tones of gold. P2 category reserves are 8 tones of gold. Totally 16 tones of gold with 5 g/t of average gold grade are estimated. The result of this field survey reveals that Shyraldzhyn deposit is composed of manganous siderite veins and quartz veins in Kumyshtag granite of late Silurian to early Devonian. The deposit consists of four veins paralleled to each other, striking N10° E with dipping 70° to 80° W. The width of main orebody ranges from 0.6 to 3.7 m with extension of 1,500 m along strike. Gold grade ranges from 1.0 to 19.6 g/t and average gold grade is 8.6 g/t. As ratio of gold to silver is (2~5) to 1, the deposit has undergone prominent gold mineralization. Homogenization temperature of fluid inclusions in quartz collected from trenches was measured. Average homogenization

temperatures in quartz range from 180℃ to 150℃. This temperature is lower than temperature ranging from 300℃ to 200℃, that is most favorable temperature for gold mineralization of vein-type deposit. The above mentioned interpretation suggests that gold concentration could exist in the downward extension of the vein. Potassium feldspar and sericite produced by hydrothermal alteration are partly detected along vein and around country rock in this deposit. These altered zone proves that ore deposit has the worthy condition for gold deposition. Outcrops of veins belong to oxidation zone and primary reduction zone could exist in the downward extension. High grade of gold ore is produced by changes of oxidation-reduction condition near ground water level beneath deposit. Ground water level around the deposit presumes to be situated in the elevation ranging from 2,700 to 2,600 m (150 to 200 m beneath the surface), according to the location and elevation of the nearest headstream. Consequently, drilling survey will be expected to catch a favorable gold mineralization in the downward of vein in Shyraldzhyn deposit.

Ground truth was performed to check the anomalous zones delineated from the satellite image spectral analysis in upper reaches of Taldyblak river, a branch of Kumyshtag river. The anomalous zones corresponded to limonite disseminated schist in Uzunahmat group of Riphean series. Ground truth revealed that diagenesis alteration instead of hydrothermal alteration had produced those anomalous zones.

4-3 Relation between geochemical anomaly and mineralization

Geochemical anomalies extracted from this survey overlie on or near altered zones, mineralized zones and discontinuity.

Geochemical gold anomaly of soil in the eastern slope of Shyraldzhyn overlaps with geochemical gold anomaly of stream sediment performed by Goscomgeology. An area of the gold anomaly of soil is smaller than that of vein of Shyraldzhyn deposit. The small-scale dispersion halo of gold reflected in soil suggests that gold occurs in veins filled fractures in granite and does not occur in disseminated and stockwork ore widely.

Overlapped geochemical anomalies of silver, copper, arsenic and antimony were extracted over a wide area including Kumyshtag silver deposit and Uchimcheck arsenic deposit. These anomalies are exposed to reflect dispersion halos from both deposits. These four elements could disperse expansively. Northwestward extension of anomalies reveals that a prospecting site could exist beyond Kumyshtag river.

In Babahan area, geochemical silver anomaly extracted on the Dzholsaysky fault near Kuru-Bakair silver deposit presumes that silver mineralization is developed centering the fault. A small-scale geochemical silver anomaly suggests that the mineralization in Babahan area would be smaller or weaker than that of Kumyshtag silver deposit.

Recently, a lot of gold deposits called Carlin type where fine-grained gold is disseminated in sedimentary rocks, have been discovered in the western America, centering Nevada. Crude ore reserves of the deposits range from 1.1 to 24 million tones with average 5.1 million tones. Gold grade ranges from 0.69 to 7.6 g/t with average 2.5 g/t. Geological characteristics of this type deposit are as follows (Togashi, 1988) :

(1) Ore deposit is embedded in silty dolomite, limestone, calcareous siltstone and mudstone.
(2) Gold mineralization is disseminated in sedimentary rock.
(3) Grain size is extremely fine and is less than 1 mm in non-oxidation zone.
(4) Primary alteration is silicification, ex-calcium alteration, argillization and carbonatization.
(5) Prominent supergene alteration is oxidation.
(6) Accompanied element is gold, arsenic, mercury, antimony and thallium.

The survey area is underlain by prominent sedimentary rock composed of carbonate rock and siltstone of Riphean series. A broad anomalies of gold, arsenic and antimony would expect to be extracted by geochemical soil survey, when mineralization of Carlin type had been occurred in the shallow underground. No geochemical anomaly showing above mentioned mineralization indicates that Carlin type gold deposit would not be expected near the surface in the area.

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5-1 Conclusion

The survey area is composed of the basement of Riphean system of Proterozoic, is unconformably overlain by Vendian system and Paleozoic group. They are intruded by the batholith of Kumyshtag and Babahan. The area is bordered on the Middle Tien-Shan massif by the Talas-Fergansky fault in the southern edge of the area.

The result of this field survey interpreted that Kumyshtag silver deposit, Uchimchek arsenic deposit and Dzholsay silver deposit were embedded in Riphean system. The above mentioned fact presumes that the mineralization has taken place along the fractures related to the west-northwest trending fault, the east-west faults such as the Uzunahmat-Kumyshtagsky thrust fault and the Dzholsaysky fault, or geological discontinuity.

Ground truth was conducted to check the anomalous zones delineated from the satellite image spectral analysis. The anomalous zones corresponded to limonite disseminated schist of Riphean series. Ground truth revealed diagenesis alteration instead of hydrothermal alteration had produced these anomalous zones.

Shyraldzhyn gold deposit is the most economical deposit in this area from the viewpoint of the scale and grade of deposits. Shyraldzhyn deposit is composed of manganous siderite veins and quartz veins in Kumyshtag granite of late Silurian to early Devonian. The deposit consists of four veins paralleled to each other, striking N 10° E with dipping 70° to 80° W. The width of main orebody ranges from 0.6 to 3.7 m with extension of 1,500 m along strike of vein. Gold grade ranges from 1.0 to 19.6 g/t and average gold grade is 8.6 g/t. The above mentioned facts indicate that the deposit has undergone prominent gold mineralization. Average homogenization temperatures of fluid inclusion in quartz range from 180°C to 150°C. These temperature are lower than temperature ranging from 300°C to 200°C, that is the most favorable temperature for gold mineralization of vein-type deposit. The above mentioned interpretation suggests that gold concentration could exist in the downward extension of the vein. Potassium feldspar and sericite produced by hydrothermal alteration are partly detected along vein in this deposit. This altered zone proves that ore deposit has the worthy condition for gold deposition. Consequently, these facts suggest that drilling survey could catch favorable gold mineralized zones in downward extension of Shyraldzhyn deposit.

5-2 Recommendation for the phase III survey

Based upon the results of the phase II survey, the following positive exploration is recommended to be carried out in the phase III survey.

Drilling survey will be conducted to clarify directly the downward extension of vein and the gold mineralization in Shyraldzhyn deposit.

PART II

PARTICULARS

CHAPTER 1 KUMYSHTAG AREA

1-1 Purpose and methods of survey

1-1-1 Purpose of survey

Kumyshtag area contains geochemical high gold concentrated anomalous sites extracted by the compilation and analysis of the previous data on geology of the phase I survey, and contains high concentrated anomalous sites of gold in stream sediments which had been conducted by Goscomgeology. The area also contains the anomalous zones delineated from the satellite image spectral analysis.

The purpose of the survey is to assess the relation between the mineralization and geology or geological structure, to check the mineralization of geochemical anomalies extracted by the above mentioned study, to check the anomalous zones extracted by the satellite image spectral analysis, and to assess the mineralization of the known ore deposits and manifestations in the area. Geological reconnaissance survey as well as geochemical survey were conducted over an area of 700 square kilometers.

1-1-2 Methods of survey

Topographic maps on a scale of 1/100,000 published by Kyrghyzgeodesy are enlarged to a scale of 1/50,000 and are used as base maps for the survey. The survey was carried out using clinocompasses or clinometers and altitude barometers and/or GPS to confirm the localities. Geological observations are reported on the field maps.

Survey routes in the area were set up on dirt roads along streams and set up on pathway in the mountainside for riding. Soil samples were simultaneously collected for geochemical survey. Although sampling points of soil were set up over the whole survey area, dense sampling was collected around Shyraldzhyn deposit, Kumyshtag deposit and the upper reaches of Kara-Buura river where geochemical gold anomalous zones of stream sediments were extracted. Therefore, an interval of sampling was set up about 500 m in the above described sector, and it was about 1,000 m in other sector.

Base camp for the survey was set up at Talas situated about 50 km to the east of the area. Advanced camps were set up at the middle reaches of Kumyshtag river in the eastern part of the area, and at the upper reaches of Kara-Buura river in the western part. Three field survey teams were organized. Each team was composed of a Japanese geologist, a counterpart geologist of Kyrgyz and one or two assistants.

1-2 Geology

Basement rock of this survey area is the Uzunahmatskaya group of Riphean system, is covered with the Sarydzhonskaya group, the Chatkaragaiskaya group, the Kyzylbelskaya formation unconformably, and moreover is overlain by Vendian and Cambrian-Ordovician system. They are intruded by Kumyshtag batholith in the northern part, and is covered with Tertiary system in the west of the batholith. The prominent direction of folding axis and strike of bedding is west-northwest with complex folding structure. The geological map and profile of this area are shown in Fig. II-1-1.

In the report of the phase I survey was described a detailed new stratigraphy established as the result of the investigation and lithofacies comparison of Riphean and Vendian conducted in 1980's. But in the phase II survey, the new stratigraphy has not be completed. After discussing with Kyrgyz counterparts, the geological map in this report follows to modify the 1:5000,000 geological map of the old classification published in 1980.

1-3 Result of survey

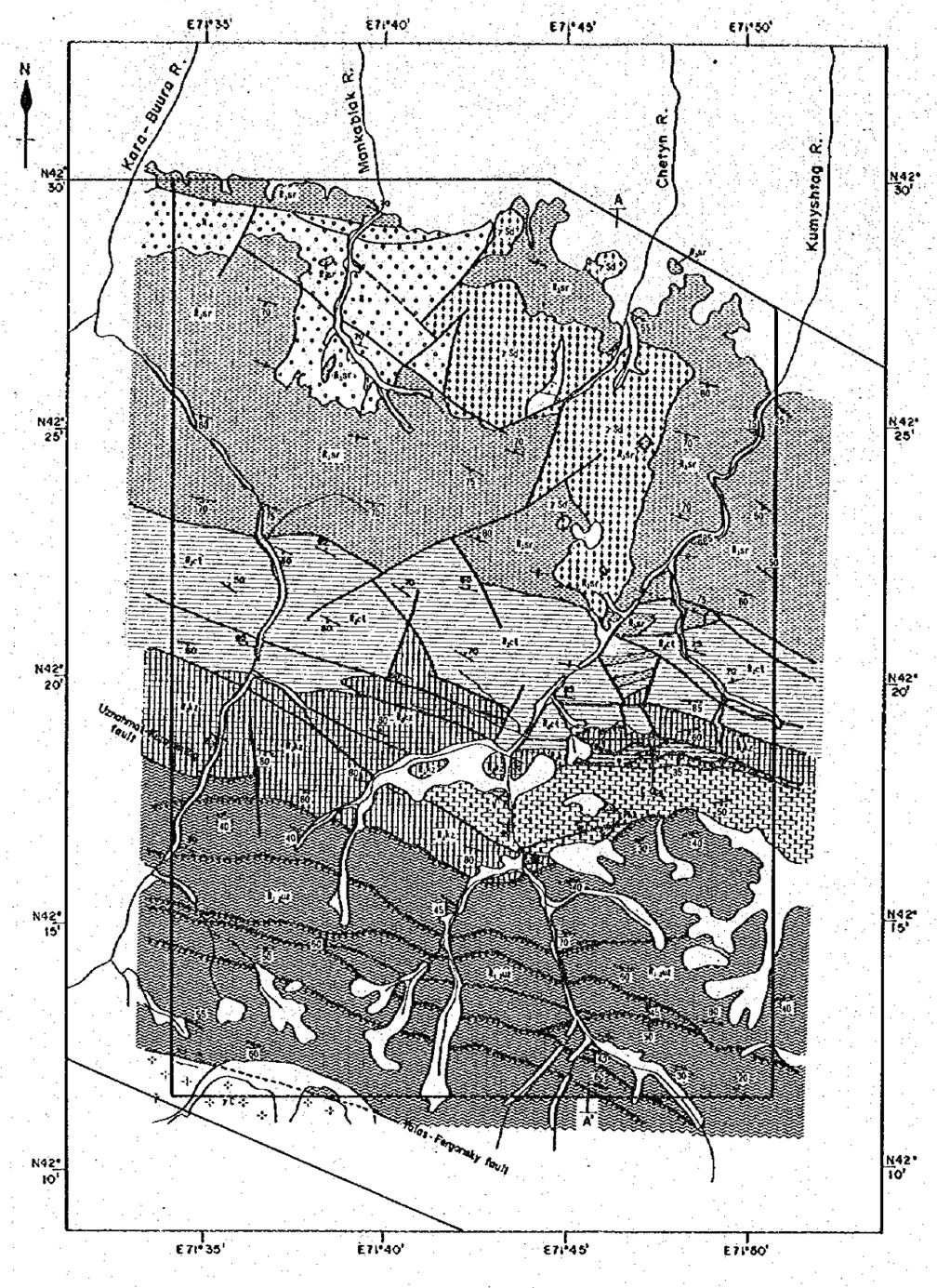
As Kumyshtag area contains Shyraldzhyn area, the results of survey on geology and ore deposit are described in Shyraldzhyn area of Chapter 3

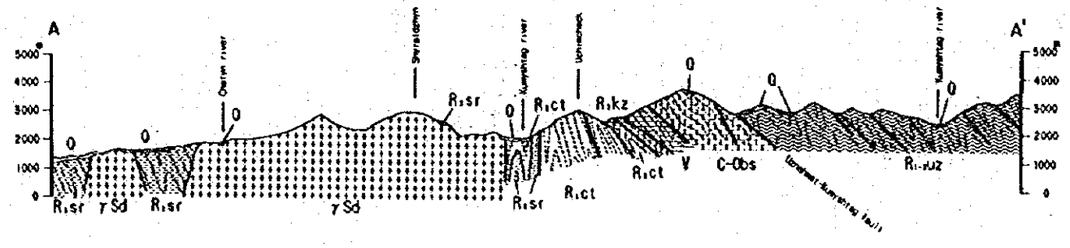
1-3-1 Geological survey

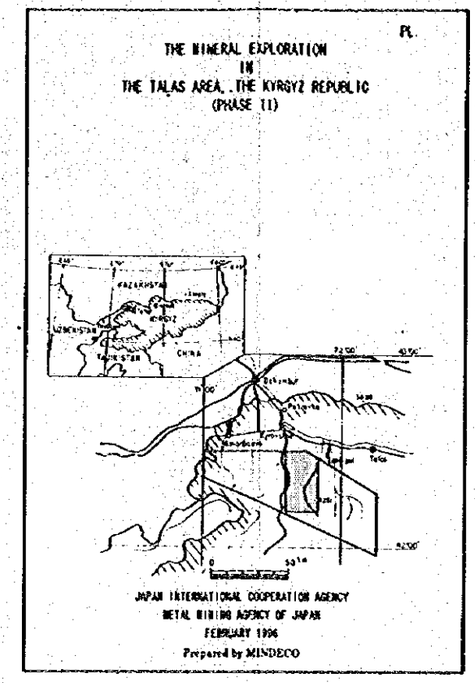
The Uzunahmatskaya group in this report is sedimentary rocks of Uzunahmatsky block of lower and middle Riphean system, and is composed of carbonate and clastic rocks. This group corresponds to the Bakayrskaya formation and the Karaburinskaya formation and the Uzunahmatskaya formation in the phase I report.

The Uzunahmatskaya group widely covers around the upper reaches of Kumyshtag river and the ridge of Talas Ala-Too mountain ranges. The southern edge of this group borders on granite which belongs to the Middle Tien-Shan massif, by the Talas-Fergansky fault. The northern edge of this group borders on the Kyzylbelskaya formation of Riphean system and the rock of Cambrian-Ordovician system, by the Uzunahmat-Kumyshtagsky thrust fault. This group mainly consists of carbonate rock of crystalline limestone, limestone and dolomite, and clastic rock of phyllite, sandstone and shale. The formation mainly trends west-northwest with steep dipping south or north. It shows complex folding structure.

The Karagainsky block which covers the north area over the Uzunahmat-







LEGEND

Cenozoic	Quaternary (recent)			Q	Conglomerate, clay
	Neogene			N	Conglomerate, sandstone, clay
	Paleogene	Koktumalskaya		Pk	Clay, conglomerate
Paleozoic	Cadorian-Ordovician	Beshtashskaya Fo.		C-Obs	Limestone, dolomite
Proterozoic	Vendian			V	Conglomerate, sandstone, siltstone, shale
	Riphean	Kyrpilskaya Fo.		R3kz	Siltstone, sandstone
		Chatkargaiskaya Gr.		R2ct	Limestone, siltstone, shale, sandstone
		Sarydzhazskaya Gr.		R1sr	Siltstone, shale, sandstone, limestone
		Ozernaiskaya Gr.		R1-2uz	Sandstone, phyllite, shale, limestone
Igneous rock	Carboni-ferous	Middle Tien-shan granites		γC	Granite
	Silurian-Devonian	Kumyshtag batholith		γSd	Granite
			a b c		Fault a)actual b)inferred c)concealed
					Thrust fault
			75		Strike and dip(Bedding)
					Bedding plane

Fig. II-1-1 Geological Map and Profile of the Kumyshtag Area

Kumyshtagsky thrust fault, is overlain by the rocks Riphean system (mainly carbonate and clastic rock), Vendian system (mainly tillite and tuff) and Cambrian-Ordovician system (mainly carbonate rock). Riphean system of Karagainsky block is composed of the Sarydzhonskaya group, the Chatkaragaiskaya group and the Kyzylbelskaya formation.

The Sarydzhonskaya group corresponds to the Chondzholskaya and the Tagyrtauskaya formation in the phase I report. This group widely covers over the lower reaches of both Kumyshtag river and Kara-Buura in the northern part of this area. It mainly consists of clastic rock of sandstone, shale and siltstone. The prominent direction of formation is west-northwest with steep dipping south or north.

The Chatkaragaiskaya group corresponds to the Chydygolotskaya, the Birblakskaya, the Urmaralskaya and the Chokutashskaya formation in the phase I report. This group crops out the middle reaches of both Kumyshtag river and Kara-Buura. It consists of predominantly carbonate rock of limestone and silty limestone, and clastic rock of sandstone, shale and siltstone. The prominent direction of formation is west-northwest with steep dipping south or north. This group is fault contact with the underlain Sarydzhonskaya group.

The Kyzylbelskaya formation crops out distributing between the Uzunahmatskaya and the Chatkaragaiskaya group, in the upper reaches of both Kumyshtag river and Kara-Buura. This formation mainly consists of red, purple and green siltstone which form alternating beds ranging from 5 to 20 m in interval, and is separated from the other formations characteristically. This formation is fault contact with the Chatkaragaiskaya group and partly covers it unconformably.

Vendian system corresponds to the Aktugayskaya, the Chichkanskaya, the Tereksayskaya, the Kurganskaya and the Konurtobinskaya formation. The formation of this system overlies only on the northern slope of the Kumyshtag peak. The system consists of sandstone, siltstone and conglomerate containing tillite in the upper formation.

The Beshtashskaya formation of Cambrian-Ordovician system is distributed with Vendian system between the Uzunahmatskaya group and the Kyzylbelskaya formation in the upper reaches of Kumyshtag river. Limestone and dolomite are predominant in this formation. It is fault contact with the Uzunahmatskaya group and the Kyzylbelskaya formation.

The Kokturnakskaya formation of Paleogene crops out within the Beshtashskaya formation, and consists of pleochroic clay and granule conglomerate.

The Tertiary system is composed of the Ulubashatskaya and the Eachkeletauskaya formation. It overlies around Sarymsak stream and consists of sandstone, conglomerate and clay.

This area is intruded by Kumyshtag batholith. This granite intrudes in the Sarydzhonskaya group. It is exposed in the area among the upper reaches of Sarymsak river, the Chetyn stream and the middle reaches of Kumyshtag river, where a width is about 9 km in east and west and about 10 km in north and south. The prominent facies is potassium feldspar-rich medium-grained pink granite. Under the microscope (Apx-2; 5KK29), it shows hypidiomorphic-grained and poikilitic texture, and is composed mainly of microcline, quartz, plagioclase and biotite, with subordinate amounts of apatite, zircon and fluorite. Recently isotopic dating of Kumyshtag granite had been conducted by Geological Institute of the Academy Science of Kyrgyz. The result of absolute age measurement analyzed by U-Pb method (Apx-11) ranges from 424 to 389 Ma, average of 406±14 Ma, which corresponds to late Silurian (S_2) to early Devonian (D_1). This batholith is intruded in the Sarydzhonskaya group or fault contact with the group.

The prominent fractures in this area shows direction of west-northwest which is parallel to the Talas-Fergansky fault and the Uzunahmat-Kumyshtagsky thrust fault. The fractures crossing with above described fractures shows the direction of north-northeast and north-northwest. The beds in the area trends west-northwest and dips west or north steeply with complex folding.

The Talas-Fergansky fault is assumed to cross around the Kara-Buura pass, 3,302 m of elevation, situated in the southwestern edges of this area. Direct evidence showing a presence of the fault, such a fracture, is not recognized, because the pass is covered with soil and talus. After looking over the south to the direction presumed the Talas-Fergansky fault, the valley is formed in a straight line along the direction S75°E, and a linear structure is formed to continue topographically at opposite side. The Uzunahmat group composed of sandstone, schist and phyllite crops out on the northeastern side of the pass. On the other hand, granite which belongs to the Middle Tien-Shan massif intrudes in 10 m southwest of the pass. The above fact proves that the Talas-Fergansky fault could exist to cross the Kara-Buura pass. The Talas-Fergansky fault is clearly recognized on the satellite image as shown in the phase I report.

The Uzunahmat-Kumyshtagsky thrust fault is exposed crossing around the elevation of 1,900 m along the Kara-Buura river, situated about 11 km north of the Kara-Buura pass. A clayey fracture zone dips 40° to 35°S with a large-scale of about

100 m in width. The thrust fault contacts red and green shale of the Kyzylbelskaya formation exposed in the foot wall side (northern side), with sandstone schist and phyllite of the Uzunahmatskaya group exposed in the hanging wall side (southern side). The difference of rock facies between hanging wall and foot wall of the fault, suggests that the Uzunahmat-Kumyshtagsky thrust fault could exist in the upper reaches and branches of the Kumyshtag river.

Ground truth was performed to check the anomalous zones delineated from the satellite image spectral analysis in upper reaches of Taldyblak river, a branch of Kumyshtag river. The anomalous zones corresponded to limonite disseminated sandstone schist in Uzunahmat group. Ground truth revealed that the anomalous zones delineated from the satellite image analysis had reflected the limonite disseminated alteration zones accompanied with diagenesis instead of hydrothermal alteration.

1-3-2 Mineralization

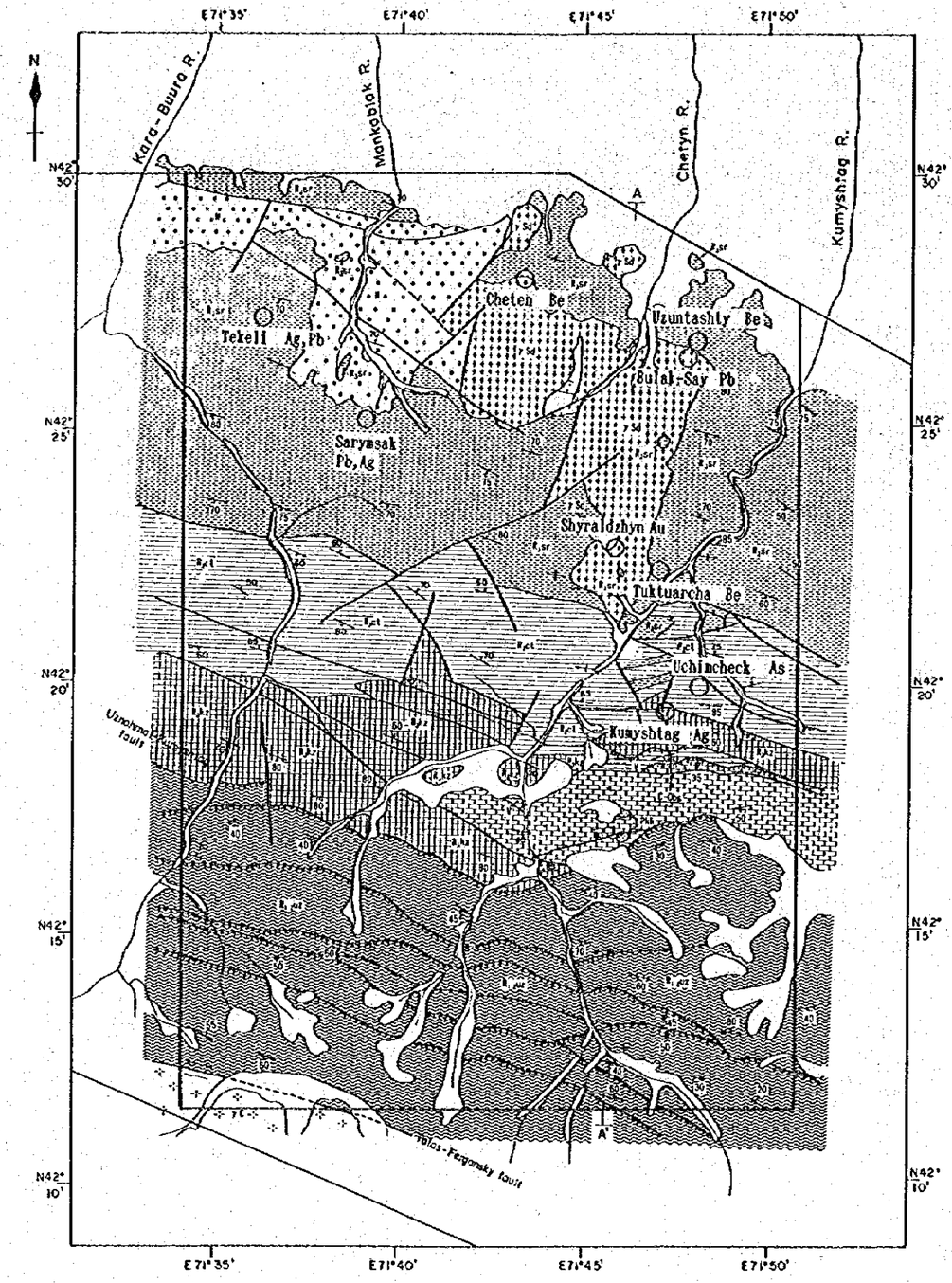
Ore deposits in the Kumyshtag area are listed in Table II-1, and are shown in Fig. II-1-2. Main deposits are described below.

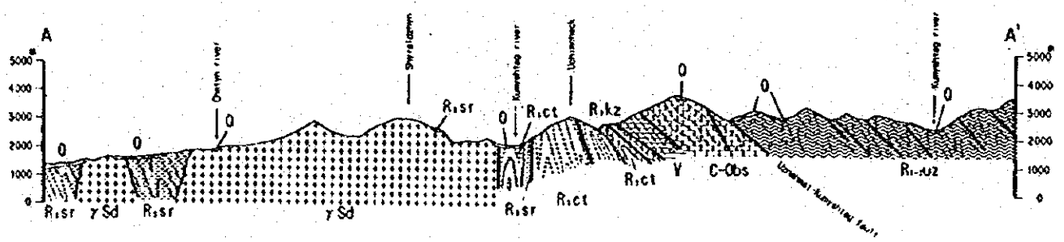
Kumyshtag deposit is composed of silver-bearing manganous siderite veins embedded along structural discontinuity between the Chatkaragaiskaya group and the Kyzylbelskaya formation. The structural discontinuity is presumed to be subordinate fault of the Uzunahmat-Kumyshtagsky thrust fault, and is very important for genesis of this ore deposit. An adit is located at 2,630 m of elevation on the southwestern slope of Uchimcheck mountain. Completed closing of the entrance results in refusing an underground investigation. According to geological data under Goscomgeology, this deposit consists of five quartz-manganous siderite veins. It trends northeast and dips 30° to 50° SE. The length ranges from 350 to 600 m along the strike. The width ranges from 2-3m to 1-10 cm. Waste deposited place whose area is about 80 m in east and west, about 12 m in south and north, and about 15 m in height, is located near the closed entrance of adit. A lot of ores are observed among waste. Country rock is silicified sandstone and silicified shale. Ore consists of dark brown to yellow ochre manganous siderite vein and milky to translucent quartz vein with banded sulfide minerals. The difference of grain sizes of manganous siderite suggests that manganous siderite has been produced by two stages. One is coarse-grained manganous siderite of about 1 cm in grain size, and the other is fine-grained one of about 1 mm. Boundary between these two kinds of vein is sharp. As ore minerals, arsenopyrite, chalcopyrite, pyrite, sphalerite and

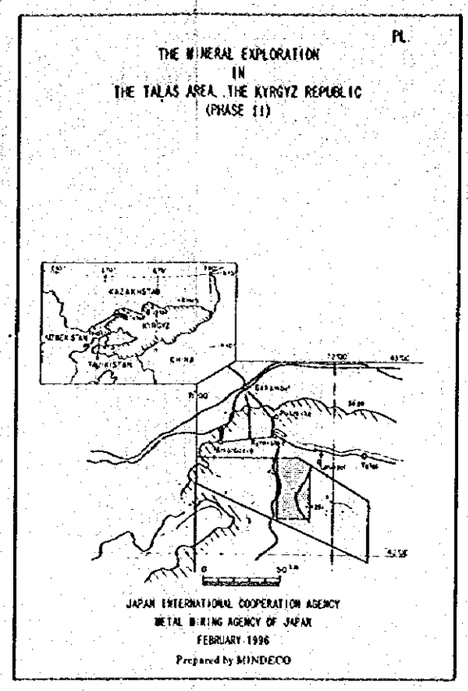
No.	Deposit Name	Geology	Formation	Kind of element	Description of occurrences	Present condition	Note
1	Shyraloznyn	Granite	Kumyshtag batholith	Au	Vein type deposit in Kumyshtag batholith. Manganosiderite,quartz vein. Strike and dip of vein: N5°~20°E, 35°~82°W Width of vein:0.3~3.7m Length of vein:200~1,400m Gold grade:0.6~28.4 g/t	About 90 trenches and 5 adits are present. 1 adit is possible to enter. Most trenches are burried by soil and pebbles.	P1 reserve:8.1t of gold P2 reserve:8t of gold with totally average gold grade of 5g/t
2	Kumyshtag	Sandstone/shale	Kyzylbelskaya Fm, Chatkaragaiskaya Gr	Ag	Vein type deposit in sandstone/shale near boundary of Kyzylbelskaya Fm and Chatkaragaiskaya Gr. Manganosiderite vein. Paralleled 5 main veins at main deposit. Strike and dip of vein: NE-SW, 30°~50°SE Width of vein:1cm~3m Length of vein:350~600m Silver grade:1,928g/t (ore from waste)	1 adit with waste and about 10 trenches are present. Adit is closed and trenches are burried by soil.	C2+C1 reserves:1,523t of silver with average silver grade of 256 g/t Chalcocite,bornite,tetrahedrite, tennantite,jamesonite and bismuthinite are observed in the ore from the waste.
3	Tekeli	Sandstone/shale	Sarydzhonskaya Gr	Ag,Pb	Silver bearing manganosiderite veins.	1 adit with waste,some trenches and ruin of building are present. Adit is possible to enter up to about 100m from enterance.No vein at inside. Trenches are burried by soil and pebbles.	No ore is observed in trench and waste.
4	Sarymsak	Sandstone/shale	Sarydzhonskaya Gr	Pb,Ag	Silber bearing manganosiderite veins. Width of vein:0.71m Silver grade:1.6~202.4 g/t Average lead grade:2.38% Average zinc grade:1.36%	1 trench with waste is present. Trenche is burried by soil and pebbles.	No ore is observed in trench and waste.
5	Bulak-Say	Granite	Kumyshtag batholith	Pb	Quartz-carbonate veins with galena and chalcopyrite.	2 trenches are present. Trenches are burried by soil and pebbles.	Strong siliceous alteration is observed around the trenches. No ore is observed from trenchs.
6	Uchimcheck	Sandstone, limestone, shale	Chatkaragaiskaya Gr	As	Massive and disseminated arsenopyrite ore. Length on the strike:60~180m Width:0.5~15m Length on the dip:40~350m	1 adit,two open pit ,mark of winch and ruin of many buildings is present.	Host rocks around the deposit have undergone limonitization. 2 white argillization zones are present in the open pit. Arsenopyrite,pyrite and native silver are observed in ore from the open pit.
7	Cheten	Granite, limestone/ sandstone(shale)	Kumyshtag batholith, Sarydzhonskaya Gr	Be	Pegmatite and granite porphyry veins. Strike and dip of vein: N15°E, vertical Width of vein:0.3~1m	1 adit with waste and over 10 trenches are present. Trenches are burried by soil and pebbles.	No ore is observed in trenches and waste.
8	Uzuntashty	Limestone/shale	Sarydzhonskaya Gr	Be	Skarn type deposit. Diopside,epidote,amphibole,vesuvianite, fluorite and calcite bearing garnet skarn with magnetite ore in limestone/shale.	1 small pit and over 50 trenches are present. Trenches are burried by soil and pebbles.	Especially strong of metasomatic garnet alteration is adjacent granite.
9	Tuktuarcha	Hornfels	Sarydzhonskaya Gr	Be	Vein and veinlet type deposit in hornfels. Quartz veins are present along host rock lamination. Strike and dip of vein: N80°W, 78°~80°W Width of vein:20cm	3 adits with wastes and over 50 trenches are present. 1 adit is possible to enter up to 100m from enterance. Trenches are burried by soil and pebbles.	Veins of epidote and garnet skarn are observed in the ore from the waste.

Table II-1 List of Ore Deposits (2)

No.	Deposit Name	Geology	Formation	Kind of element	Description of occurrences	Present condition	Note
10	Babahan	Limestone/shale	Chatkaragaiskaya Gr	Ag,Pb,Zn	Vein type deposit in limestone/shale. Quartz vein between shale and limestone. Strike and dip of vein: N60°~70°W, vertical Width of vein:5~15cm	1 adit with waste,about 100 trenches and ruin of lodge and office are present. Adit is possible to enter up to about 100m from enterance. Trenches are burried by soil.	Sphalerite,chalcopyrite,pyrite and tetrahedrite are observed in the ore from the waste.
11	Kuru-Bakair	Sandstone/shale	Sarydzhonskaya Gr	Ag	Vein and lens type deposit in limestone/shale. Quartz vein and manganosiderite vein. Silver grade:14.6 g/t	About 20 trenches,4 drilling hole and ruin of office are present. Trenches are burried by soil and pebbles.	Continuous manganese gossans are present around the deposit. Goethite,pyrolusite,chalcopyrite and pyrite are observed in manganese gossan
12	Stock	Sandstone/shale	Sarydzhonskaya Gr	Ag		1 adit with waste is present.	No ore is observed from waste.
13	Suluu-Bakair	Shale/sandstone	Sarydzhonskaya Gr	Ag		1 vertical shaft,some trenches and ruin of lodge are present.	No ore is observed from trenches.
14	Dzholsay	Shale/sandstone	Sarydzhonskaya Gr	Ag	Vein type deposit in shale/sandstone. Manganosiderite and quartz-manganosiderite veins Strike and dip:E-W, steeply Width of vein:about 1.5m Silver grade:4.5~16.5 g/t	2 adits and over 100 trenches are present. Both adits are closed. Almost trenches are burride by soil.	Goethite and manganoxide are observed in the ore from the vein.







0 10 km

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Cenozoic	Quaternary (alluvial)			Q	Conglomerate, clay
	Neogene			N	Conglomerate, sandstone, clay
	Paleogene	Kalkamakskaya		Pal	Clay, conglomerate
Paleozoic	Cambrian-Ordovician	Archaskskaya Fm		C-Obs	Limestone, dolomite
Proterozoic	Vendian			V	Conglomerate, sandstone, siltstone, shale
	Riphean	Kyrgyzbaskaya Fm.		R3kz	Siltstone, sandstone
		Chatkalsky-Kalkan Gr.		R1ct	Limestone, siltstone, shale, sandstone
		Sarydzhazskaya Gr.		R1sr	Siltstone, shale, sandstone, limestone
		Kassabulakskaya Gr.		R1-2u2	Sandstone, phyllite, shale, limestone
Igneous rock	Paleozoic Formation	Middle Devonian Granites		γD	Granite
	Silurian-Devonian	Kuzyshty batholith		γSd	Granite

Fault, structural boundary inferred, concealed
Thrust fault
Strike and dip (bedding)
Bedding plane

Deposit name	Kind of element
○ Shyraldzhyn	Au

Fig. II-1-2 Distribution of Ore Deposits in the Kumyshtag Area

galena are observed by naked eyes. Under the microscope (Apx-4; 5KK56, 5KK57), chalcocite, bornite, tetrahedrite, tennantite, jamesonite, bismuthinite and unidentified silver mineral are observed. Manganous siderite collected from waste deposited place is analyzed to show the grade of Au 0.3 g/t, Ag 1,927.8 g/t, As 1.85 %. This ore deposit is predominant in silver mineralization.

Uchimcheck deposit is located in the opposite side of Kumyshtag deposit beyond the summit of Uchimcheck mountain, and is exposed in the elevation ranging from 2,600 m to 2,800 m on the northeastern slope of Uchimcheck mountain. A path crosses horizontally around the deposit at the elevation of 2,660 m. It is massive arsenopyrite-rich deposit whose country rock is sandstone, limestone and shale of the Chatkaragaiskaya group. The country rock around the deposit is subjected to strong limonite alteration. Two open pits mined before are situated in upper and lower slope of the path, respectively. Each open pit is about 60 m in width and about 80 m in height. Ore collected from the lower open pit is pyrrhotite predominant. Under the microscope (Apx-4; 5KK55), pyrite and native silver besides pyrrhotite are observed.

Tuktuarcha deposit is located in the left bank of middle reaches of Kumyshtag river and to the east of Shyraldzhyn deposit. Country rock around the deposit is composed of sandstone of the Sarydzhonskaya group, and strikes N 85°W and dips 80°N. Many trenches and three adits are recognized around the deposit. The deposit consists of quartz vein of 20 cm in width, striking N 80°W, dipping 78° to 80°N in hornfels. The vein is formed along the bedding plane. Massive and veinlet epidote and garnet skarn is recognized in waste near an entrance of the adit. Beryllium mineralization has been observed in this survey. Homogenization temperature of fluid inclusion in quartz from this deposit is divided into two zones (Apx-8; 5YK02). A higher temperature zone ranges from 330°C to 270°C in fine-grained quartz, a lower temperature zone ranges from 150°C to 120°C in drusy quartz. This fact assumes that polyasendant mineralization had taken place in the deposit.

Uzuntashty deposit is located to the east of Chetyn river, with ranging in elevation from 1,400 m to 2,000 m. It is composed of limestone and shale of the Sarydzhonskaya group. Kumyshtag batholith intrudes around the deposit. Many trenches are recognized near the deposit. Epidote garnet skarn occurs in the deposit. Country rock grades into irregular and massive garnet skarn near the granite. Beryllium mineralization has been observed in this survey. Under the microscope (Apx-2; 5KK62), skarn is composed of garnet, diopside, epidote, amphibole, vesuvianite, fluorite and calcite. Homogenization temperature of fluid inclusion in

fluorite from fluorite vein, 50 cm in width, contacted with garnet skarn, ranges from 180℃ to 100℃ (Apx-8; 5KK65).

1-3-3 Geochemical survey

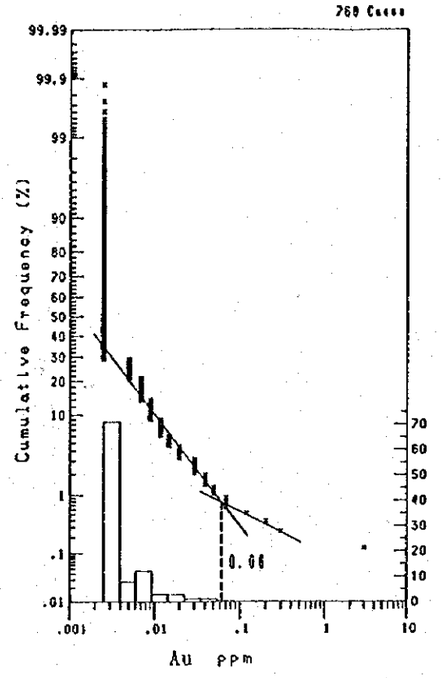
Sampling of 564 soils for geochemical survey was performed simultaneous with the geological survey. After drying naturally and sieving in the field, all the soil samples were sent to the laboratory of the Central Research Laboratory which belongs to Goscomgeology. Gold, silver, copper, arsenic and antimony were analyzed there.

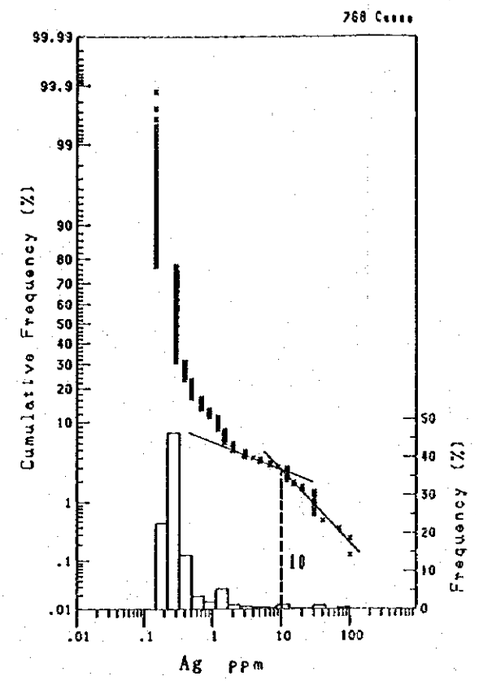
The analyzed value of soil samples are listed in Apx.-7. As the background of rock facies is almost same between Kumyshtag and Babahan area, statistical processing was conducted together with both areas. A cumulative frequency distribution was plotted on normal probability graphs, and the relevant threshold value was extracted as the bending point of the cumulative frequency distribution curve, which would discriminate between the background and anomaly values (Fig. II-1-3). Geochemical anomaly map in Kumyshtag area is drawn in Fig. II-1-4 on the basis of the threshold values. When an analyzed value is equal to an upper limited value, the upper limited value is used for the statistical processing. When an analyzed value is equal to an lower limited value, a half value of the lower limited value is used. The threshold values and the statistical values of mean and standard deviation are shown in Table II-2.

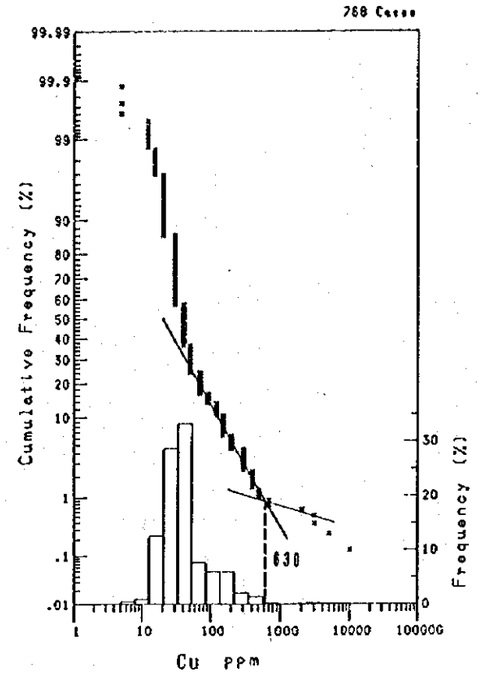
In a general view of geochemical anomaly map (Fig. II-1-4), geochemical anomalous zones of gold appear in a scattered pattern at the eastern slope of Shyraldzhyn deposit, around the Kumyshtag deposit, near the upper reaches of Kumyshtag river and near the middle reaches of Kara-Buura. On other hand, geochemical anomalous zone of silver is found in a wide field centering the Kumyshtag and Uchimcheck deposit, where a width is about 5 km in east and west and about 5 km in south and north. The geochemical anomalous zone of silver overlies the Sarydzhonskaya and Chatkaragaiskaya group. Although geochemical anomalous zone of copper is detected around the Kumyshtag and Uchimcheck deposit, the anomalous zone of copper is smaller than those of silver. Moreover, geochemical anomalous zones of arsenic and antimony overlap with those of copper. The above interpretation suggests that behavior of trace elements is divided into two groups that consist of only gold and a group of silver, copper, arsenic and antimony.

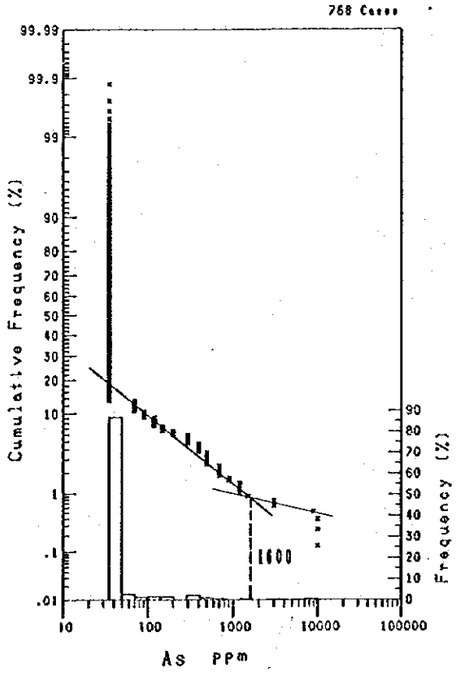
Table II-2 Geochemical Threshold of Soil Samples

Area	Statistical element	Au (ppm)	Ag (ppm)	Cu (ppm)	As (ppm)	Sb (ppm)
Total area	Number of Sample	768	768	768	768	768
	Maximum	3.000	>100	10,000	>10,000	5,000
	Minimum	<0.005	<0.3	5	<70	<10
	Mean	0.010	1.4	91	126	24
	Standard Deviation	0.109	6.7	439	727	240
	Threshold	0.060	10	630	1,600	170
Kumyshtag	Number of Sample	564	564	564	564	564
	Maximum	3.000	>100	10,000	>10,000	5,000
	Minimum	<0.005	<0.3	5	<70	<10
	Mean	0.012	1.7	112	159	30
	Standard Deviation	0.127	7.7	510	845	280
	Threshold	0.060	10	630	1600	170
Babahan	Number of Sample	204	204	204	204	204
	Maximum	0.030	30	90	70	50
	Minimum	<0.005	<0.3	15	<70	<10
	Mean	0.004	0.5	34	36	5.2
	Standard Deviation	0.001	2.1	14	4.8	3.1
	Threshold	0.060	10	630	1600	170









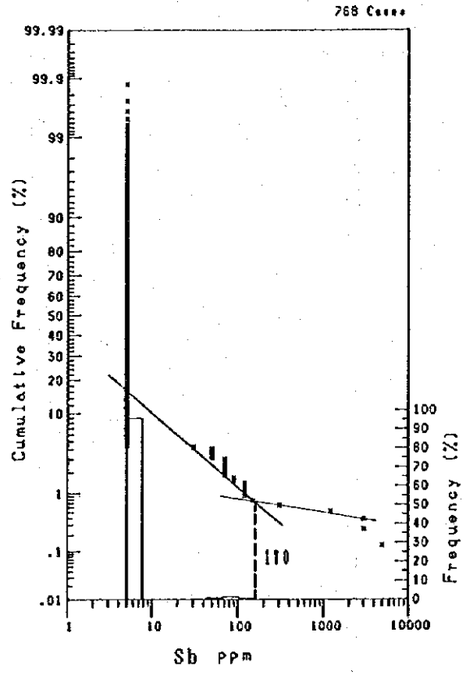


Fig. II-1-3 Histogram and Cumulative Frequency Diagram of Analyzed Elements in Soil Samples

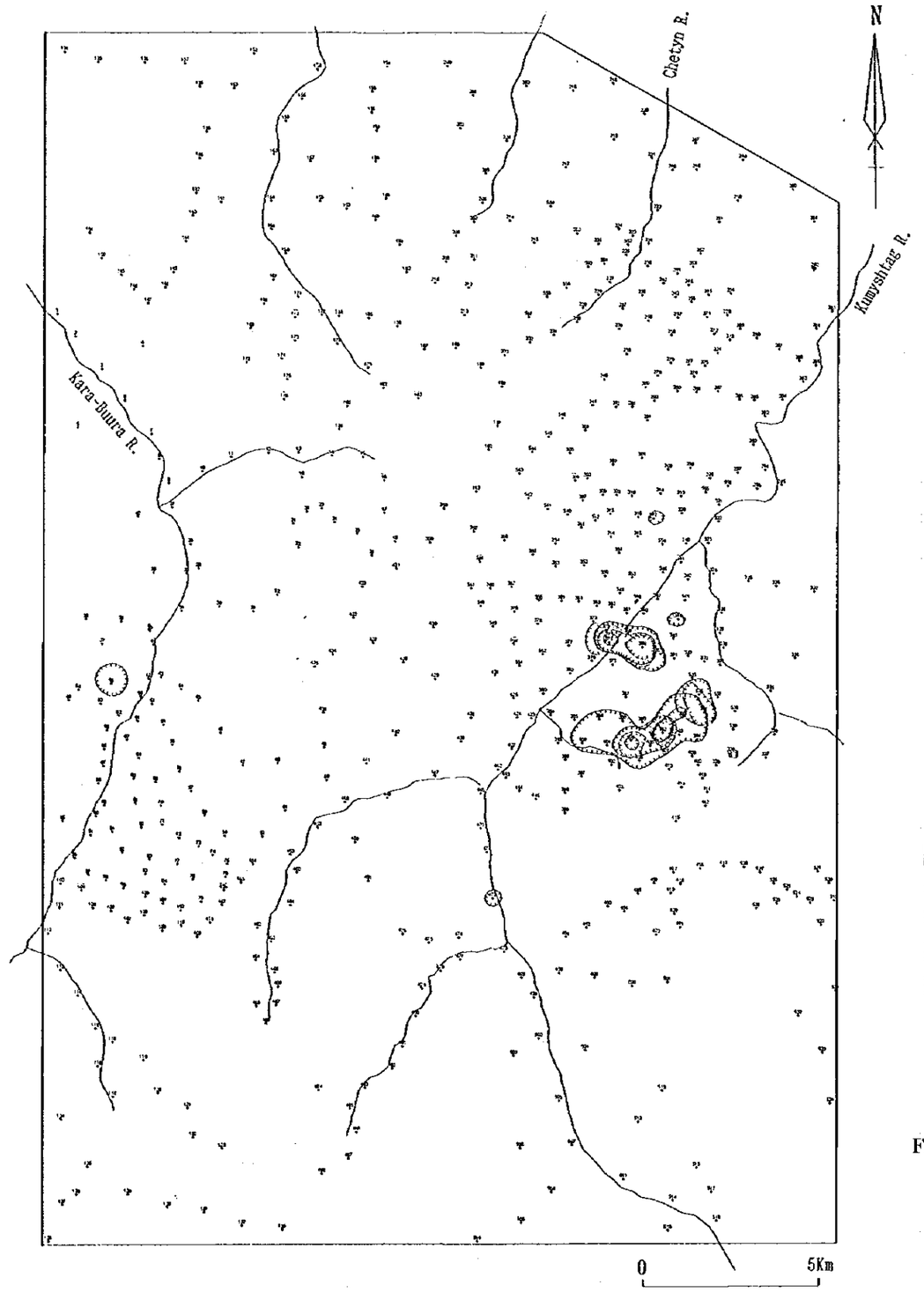


Fig. II-1-4 Geochemical Anomaly Map in the Kumyshtag Area

1-4 Consideration

This area is widely underlain by the basement of Riphean system composed of carbonate and clastic rock. It is overlain by tillite and tuff of Vendian system and carbonate rock of Cambrian-Ordovician system. They are intruded by the Kumyshtag batholith of late Silurian to early Devonian

Geological structure in this area is characterized by the prominent direction showing west-northwest. The tectonic lines represented by Talas-Fergansky fault and Uzunahmat-Kumyshtagsky thrust fault, the other faults and fractures and the strike of bedding are parallel to the above mentioned direction.

Apart from Shyraldzhyn deposit, the Kumyshtag silver deposit the Uchimcheck arsenic deposit which are embedded in Riphean system, represent ore deposit in this area. These deposits are genetically related to the Uzunahmat-Kumyshtagsky thrust fault and other tectonic discontinuity. Beryllium deposits of Uzuntashty and Tuktuarcha distribute around Kumyshtag batholith. The fact indicates that their mineralization are related to Kumyshtag granite.

Kumyshtag deposit consists of large-scale five manganous siderite veins with ranging in length from 300 to 600 m along the strike of vein. Ore collected from waste is analyzed to show the grade of Ag 2 kg/t and Au 0.3 g/t. The fact reveals the deposit is predominant in silver mineralization. Taking into account silver cut-off grade of 40 g/t, minable reserves C_2 plus prognostic reserves P_1 are calculated of conditional silver metal of 1,523 tones with the average silver grade of 256 g/t. Evaluation concerning gold in this deposit is not performed in the report of Kyrgyz side. The above described interpretation infers that gold mineralization is barren in the shallow underground of this deposit, though adequate exploration had not been conducted in downward extension of vein.

Alteration extraction method by the satellite image spectral analysis in the phase I survey has delineated anomalous zones which indicated the existence of oxides, iron hydroxides and clay minerals. Ground truth in this survey was conducted to check the anomalous zones delineated from the spectral analysis. The anomalous zones corresponded to limonite disseminated schist of Uzunahmatskaya group of Riphean series. Ground truth revealed diagenesis alteration instead of hydrothermal alteration had produced these anomalous zones. Therefore, alteration extraction method by the spectral analysis is recommended to be effective method, because this method has extracted the alteration zone of iron oxides in Talas area.

All anomalous zones in a geochemical anomaly map would not indicate an existence of ore deposit embedded under the anomalous zone. This false anomalous

zone is caused by following.

(1) An existence of rock containing high background.

(2) Human pollution

(3) Secondary dispersion of water-soluble element

Seepage anomaly in secondary dispersion by water-soluble element forms strong anomaly on a bending point of hillside or on a bank of river by surface and ground water. In a general way, the origin of seepage anomaly is poor in economic evaluation (Levingson, 1973). Gold is chemically stable and physically ductile and malleable. This property had been inferred that gold could not be granulated by weathering and would not form secondary dispersion around deposit. Recently, an theory has proposed that gold also disperse widely in a colloidal state by chemical process (Rossiter, 1980).

Any ore deposits or manifestations and any anomalous zones of stream sediments of the phase I survey does not overlie around gold anomalous zone (SKA472) in the upper reaches of Kumyshtag river. This gold anomalous zone could be inferred to correspond to false anomaly above described.

Gold anomalous zone (SKA317) on the eastern slope of Shyraldzhyn deposit overlays the anomalous zone of stream sediment extracted by Goscomgeology. A width covered with this gold anomalous zone of soil, is smaller than a field underlain Shyraldzhyn gold deposit (see Chapter 3). The small-scale secondary dispersion of gold in soil presumes that gold occurs within veins filled with fractures in granite, instead of dissemination or stockwork in granite.

Geochemical anomalous zones widely overlapped with silver, copper, arsenic and antimony, distribute a width ranging from Kumyshtag silver deposit to Uchimcheck arsenic deposit. The fact presumes that these anomalous zones have distinctly reflected secondary dispersion of host constituent elements from both deposits and those four elements are dispersive broadly. Tendency showing extension of anomalous zone to the northwest, will suggest the existence of new manifestation.

The gold anomalous zone (SAK066) representing highest value, 3 ppm, in this survey is situated in the middle reaches of Kara-Buura. This anomalous zone of gold overlaps with the high gold concentrated anomalous sites of stream sediment extracted by the compilation and analysis of the previous data on geology of the phase I survey. Darbazakol lead manifestation is situated about 1 km to the north of this anomaly. Although detail of the manifestation is not investigated, the relation between the lead manifestation and the gold anomaly could not negate.

Geochemical survey of soil in Kumyshtag area concludes that gold is effective pathfinder element of gold vein, and on the other hand silver, copper, arsenic and antimony are effective pathfinder elements of silver, arsenic (lead, copper) sulfide deposit.

CHAPTER 2 BABAHAN AREA

2-1 Purpose and methods of survey

Babahan area contains geochemical high gold concentrated anomalous sites extracted by the compilation and analysis of the previous data on geology of the phase I survey. The purpose of the survey is to assess the relation between the mineralization and geology or geological structure, to check the mineralization of geochemical anomalies extracted by the above mentioned study, and to assess the mineralization of the known ore deposits and manifestations in the area. Geological reconnaissance survey as well as geochemical survey were conducted over an area of 520 square kilometers

As same as Kumyshtag area, topographic maps on a scale of 1/100,000 published by Kyrghyzgeodesy are enlarged to a scale of 1/50,000 and are used as base maps for the survey. The survey was carried out using clinocompasses or clinometers and altitude barometers and/or GPS to confirm the localities. Survey routes in the area were set up on dirt roads and pathway in the mountainside for riding. Soil samples were simultaneously collected for geochemical survey. An interval of sampling was set up about 1,000 m. Base camp for the survey was set up at Talas, and advanced camp was set up at the middle reaches of Suluu-Bakair river in the central part of the area.

2-2 Geology

Basement rock of this survey area is the Uzunahmatskaya group, is covered with the Sarydzhonskaya group, the Chatkaragaiskaya group, the Kyzylbelskaya formation unconformably. They are intruded by Babahan batholith in the northwestern part, and is covered with Tertiary system in the northwest of the batholith. Although the prominent direction of folding axis and strike of bedding is west-northwest, the direction is circularly parallel to the margin of Babahan batholith near by the batholith. The geological map and profile of this area are shown in Fig.II-1-1.

2-3 Result of survey

2-3-1 Geological survey

The Uzunahmatskaya group covers a widespread area ranging from the upper reaches of Shalbaly-Say river, those of Suluu-Bakayir river to those of Babahan river. The southern edge of this group is bordered on granite which belongs to the

Middle Tien-Shan massif, by the Talas-Fergansky fault. The northern edge of this group is bordered on the Chatkaragaiskaya group and the Kyzylbelskaya formation, by the Uzunahmat-Kumyshtagsky thrust fault. This group mainly consists of carbonate rock of limestone and dolomite, and clastic rock of phyllite, sandstone and shale. The formations mainly trend west-northwest and steeply dip south or north. It shows complex folding structure.

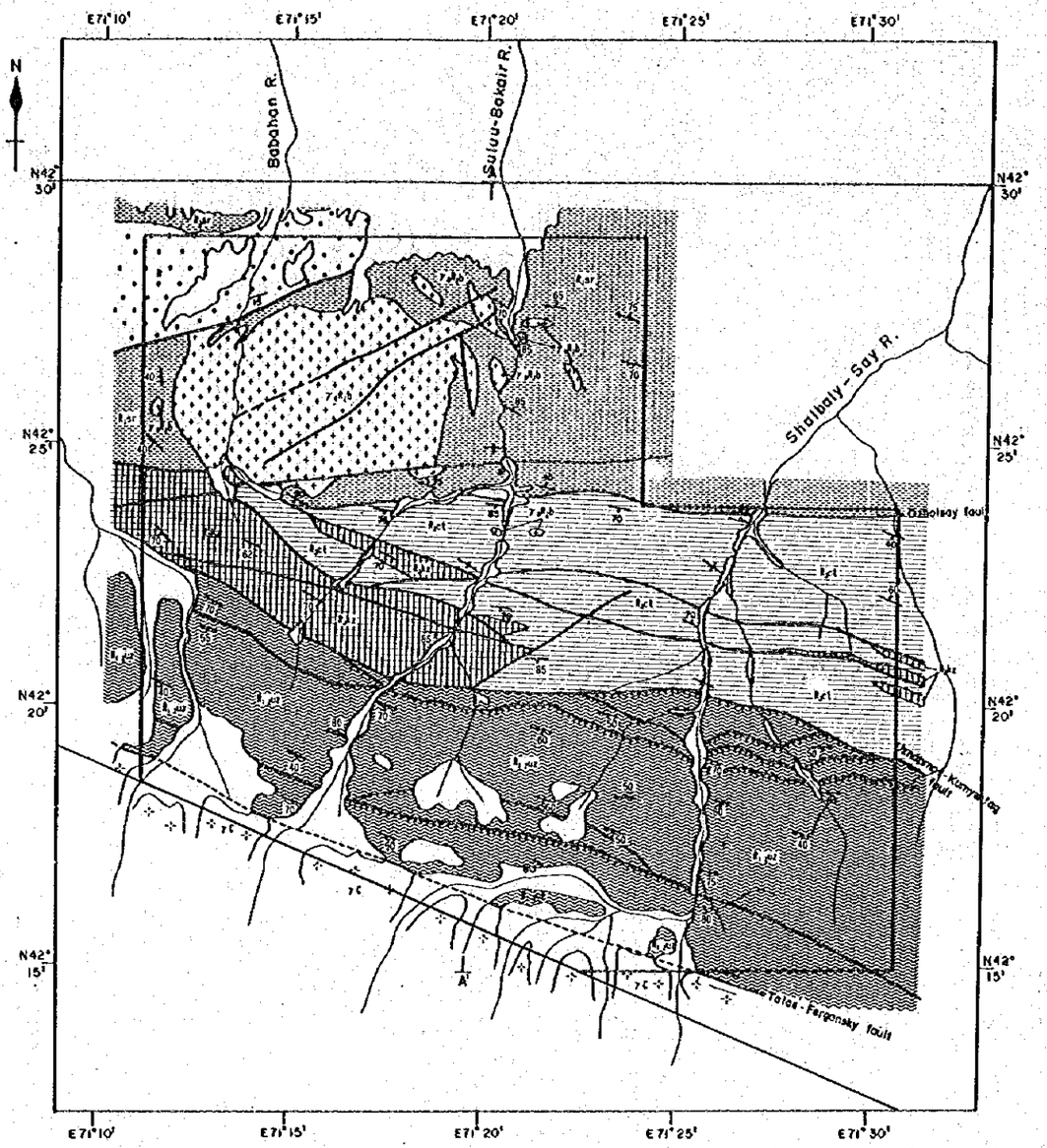
The Sarydzhonskaya group covers over the middle reaches of both Suluu-Bakayir river and Babahan in the northern part of this area. It mainly consists of clastic rock of sandstone, shale and siltstone. The formations mainly trend west-northwest and steeply dip south or north, though the formation trends northwest to north-northwest and dips west steeply in the west of Babahan river.

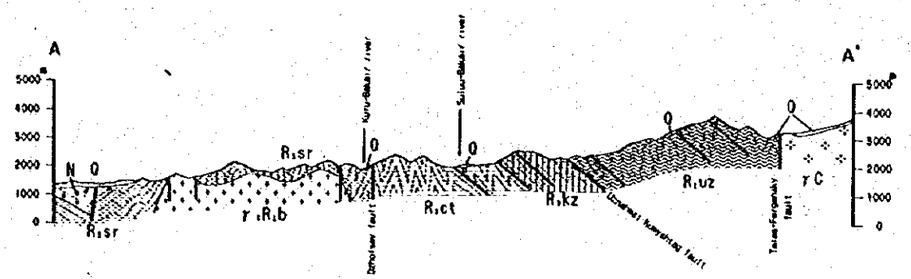
The Chatkaragaiskaya group crops out the middle reaches of both Shalbaly-Say river and Suluu-Bakayir. It consists of predominantly carbonate rock of limestone and clastic rock of sandstone, shale and siltstone. The formations trend west-northwest and dip south or north steeply. This group is contact with the underlain Sarydzhonskaya group by Dzholsay fault.

The Kyzylbelskaya formation crops out distributing between the Uzunahmatskaya and Chatkaragaiskaya group, in the middle reaches of both Kumyshtag river and Kara-Buura. This formation is characterized by red and purple siltstone.

This area is intruded by Babahan batholith. This granite intrudes in the Sarydzhonskaya group and is exposed in the area between the middle reaches of Suluu-Bakayir river and the middle reaches of Babahan river, where a width is about 10 km in east and west and about 6 km in north and south. The prominent facies is medium-grained light gray to pale orange tonalite. Under the microscope (Apx-2; 5KB05), it shows hypidiomorphic-grained and glomeroblastic texture and is composed mainly of plagioclase, with subordinate amounts of quartz, potassium feldspar and biotite, as accessories amphibole, apatite, zircon and sphene. Recently isotopic dating of Babahan granite had been conducted by Geological Institute of the Academy Science of Kyrgyz. The result of absolute age measurement analyzed by U-Pb method indicates 1,050±50 Ma, which corresponds to middle to late Riphean (R_2-R_3).

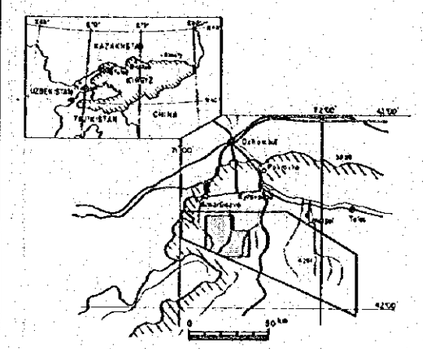
The prominent fractures in this area show the trend of west-northwest which is parallel to Talas-Fergansky fault and Uzunahmat-Kumyshtagsky thrust fault, and the trend of east and west of Dzholsay fault. The faults crossing with above described faults are recognized in the direction of northeast. The formations in this





PL.

THE MINERAL EXPLORATION
IN
THE TALAS AREA, THE KYRGYZ REPUBLIC
(PHASE I)



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FEBRUARY 1996
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0 10 km

LEGEND

Cenozoic	Quaternary -recent			N	Conglomerate, clay
	Neogene			N	Conglomerate, sandstone,clay
Proterozoic	Riphean	Kyrylbelskaya Fm.		R1kz	Siltstone, sandstone
		Chatkaragaiskaya Gr.		R1ct	Limestone, siltstone, shale, sandstone
		Sarydzhazskaya Gr.		R1sr	Siltstone, Shale, sandstone, limestone
		Uzunakasatskaya Gr.		R1uz	sandstone, phyllite, shale, limestone
Igneous rock	Carboni-ferous	Middle Tien-shan granites		γC	Granite
	Riphean	Babahan batholith		γR1b	Granite

Fault a)actual b)inferred c)concealed
Thrust fault
Strike and dip(bedding)
Bedding plane

Fig. II-2-1 Geological Map and Profile of the Babahan Area

area trend west-northwest and dip west or north steeply with complex folding.

2-3-2 Mineralization

Ore deposits in the Babahan area are listed in Table II-1, and are shown in Fig. II-2-2. The ore deposits in this area are controlled by tonalite of Babahan batholith and Dzholsay fault of the east-west direction. All the deposits are situated along the arc zone about 10 km in length and about 2 km in width. Dzholsay fault separates the Sarydzhonskaya group from the Chatkaragaiskaya group. Main deposits composed of silver, zinc and lead deposit are described below.

Babahan deposit is located on 2,100 m of elevation near a branch of Babahan river. The deposit is exposed along southern margin of Babahan batholith. An adit places to be excavated in limestone bordering shale, and its length is about 100 m to the northeast. Calcite, quartz vein runs in the adit. It strikes N60°W to N70°W and dips vertically with ranging in width from 5 to 15 cm (Fig. II-2-3). Zinc ore is found in waste. Under the microscope (Apx-4; 5KB24), it consists mainly of sphalerite and chalcopyrite, with subordinate amounts of pyrite, tetrahedrite. Homogenization temperature of fluid inclusion in quartz collected from calcite, quartz vein with 10 cm in width, ranges from 300°C to 170°C (Apx-8; 5KB20).

Kuru-Bakair deposit is situated on the north of Kuru-Bakair stream, a branch of Suluu-Bakayir river. The deposit is composed of manganous siderite occurred in lens-shape in sandstone and shale. Under the microscope (Apx-4; 5KB16), it consists mainly of goethite and pyrolusite, as accessories chalcopyrite and pyrite. Manganous siderite is analyzed to show the grade of Au 0.1 g/t, Ag 14.6 g/t. (Apx-6; 5KB16)

Mineralization of Dzholsay deposit is detected along the Dzholsay fault. The Dzholsay fault trending east-west shows grayish white clayey shear zone dipping vertically with ranging in width from 3 to 5 cm. The shear zone continues intermittently over 2 km along the strike. The deposit consists of manganous siderite vein and quartz, manganous siderite vein which trends east-west and dips almost vertically with 1.5 m in width in shale and sandstone. Under the microscope (Apx-4; 5KB25, KB28), it consists mainly of goethite, pyrolusite, braunite, psilomelane and chalcophanite. Manganous siderite is analyzed to show the grade of Au 0.1 g/t, Ag 4.5 to 16.5 g/t (Apx-6). Homogenization temperature of fluid inclusion in quartz collected from quartz, manganous siderite vein, ranges from 230°C to 105°C (Apx-8; 5KB28).

Stock deposit situated on the left bank of Suluu-Bakair, is located in the

eastern edge of Babahan intrusive. Although no ore is detected in the waste, homogenization temperature of fluid inclusion in quartz collected from waste, ranges from 320℃ to 260℃ (Apx-8; 5YB04).

2-3-3 Geochemical survey

After drying naturally and sieving in the field, collected 204 soil samples as well as all the soil samples in Kumyshtag area were analyzed gold, silver, copper, arsenic and antimony.

One geochemical anomaly of silver is extracted after statistical analysis (Table II-2, Fig. II-2-4). This anomaly is situated along Kuru-Bakair river and is located on the Dzholsay fault. The fault would be related to the formation of Suluu-Bakair and Kuru-Bakair silver deposit.

According to the result of geochemical survey, Babahan area is low in concentrations of pathfinder elements as compared with Kumyshtag area. This interpretation suggest that Babahan area would be barren from geochemical point of view.

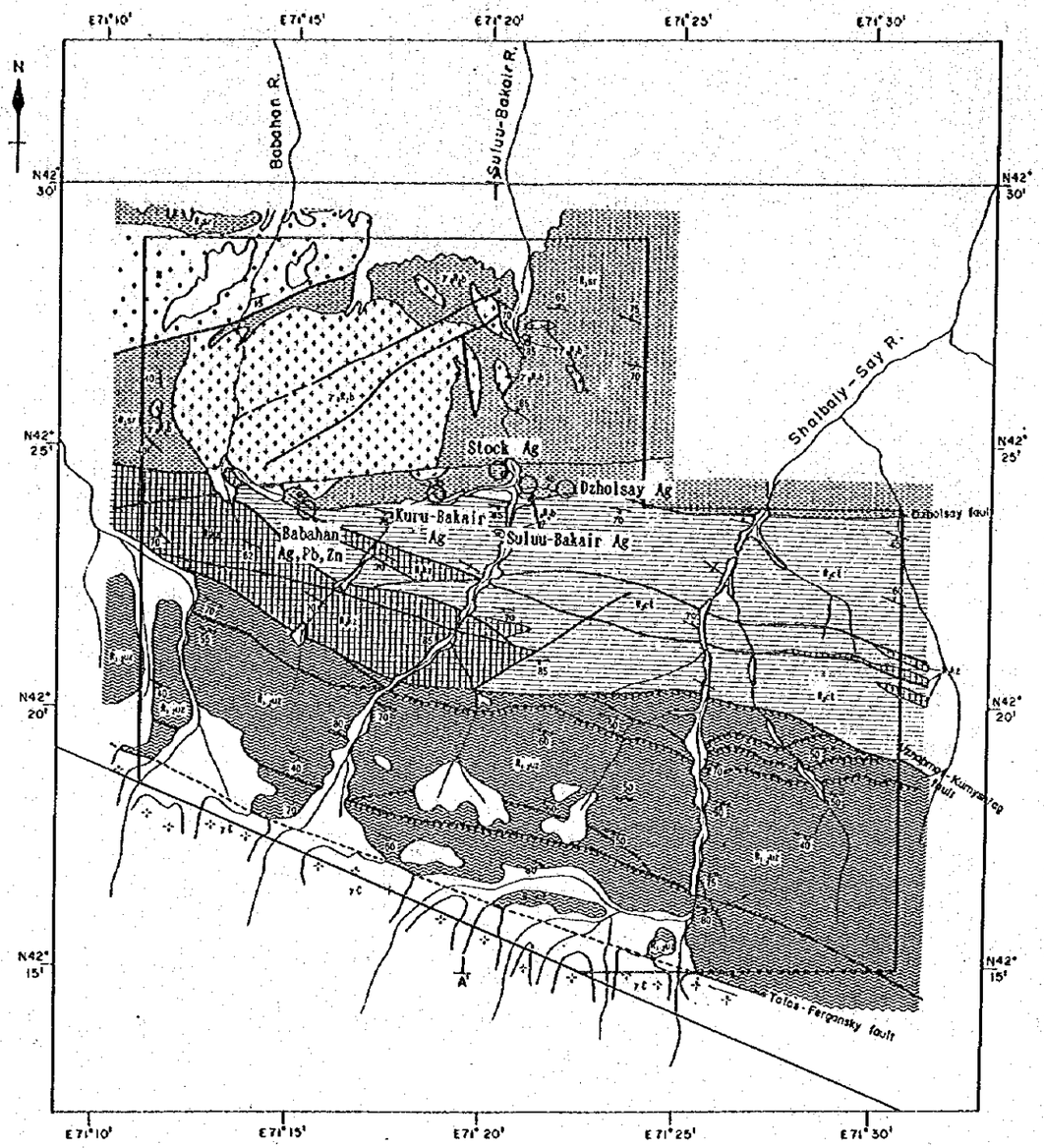
2-4 Consideration

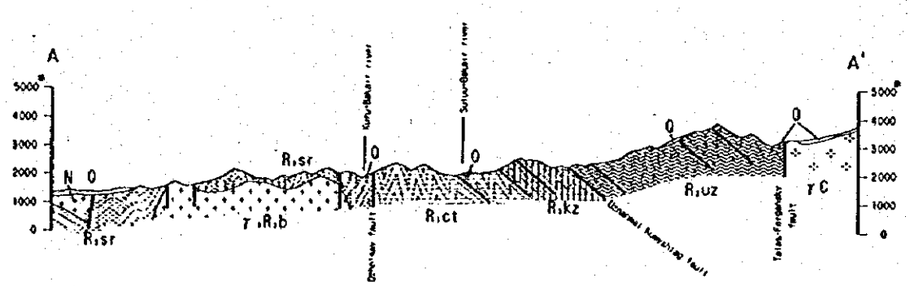
This area is overlain by carbonate and clastic rocks of Riphean system and is intruded by Babahan granite of middle to late Riphean. The prominent faults trend west-northwest to east-west. Formations of Riphean system also trend west-northwest.

Silver, lead and zinc deposits are principal deposits in this area. Those location and occurrence suggest that the formation of those deposits had been controlled by the intrusion of tonalite of Babahan batholith and the Dzholsay fault trending east-west. All the deposits are small in scale and poor in grade as compared with Kumyshtag deposit.

Geochemical anomaly is extracted in silver. This silver anomaly is situated on the Dzholsay fault near Kuru-Bakair silver deposit. The small-scale geochemical anomaly proves that silver mineralization have taken place focusing Dzholsay fault.

The above mentioned interpretation presumes that large-scale deposit would not be embedded in the shallow underground in Babahan area.





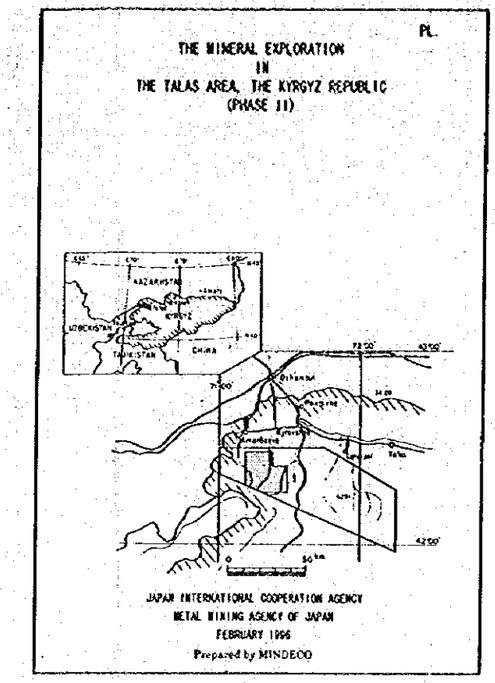


Fig. II-2-2 Distribution of Ore deposits in the Babahan Area

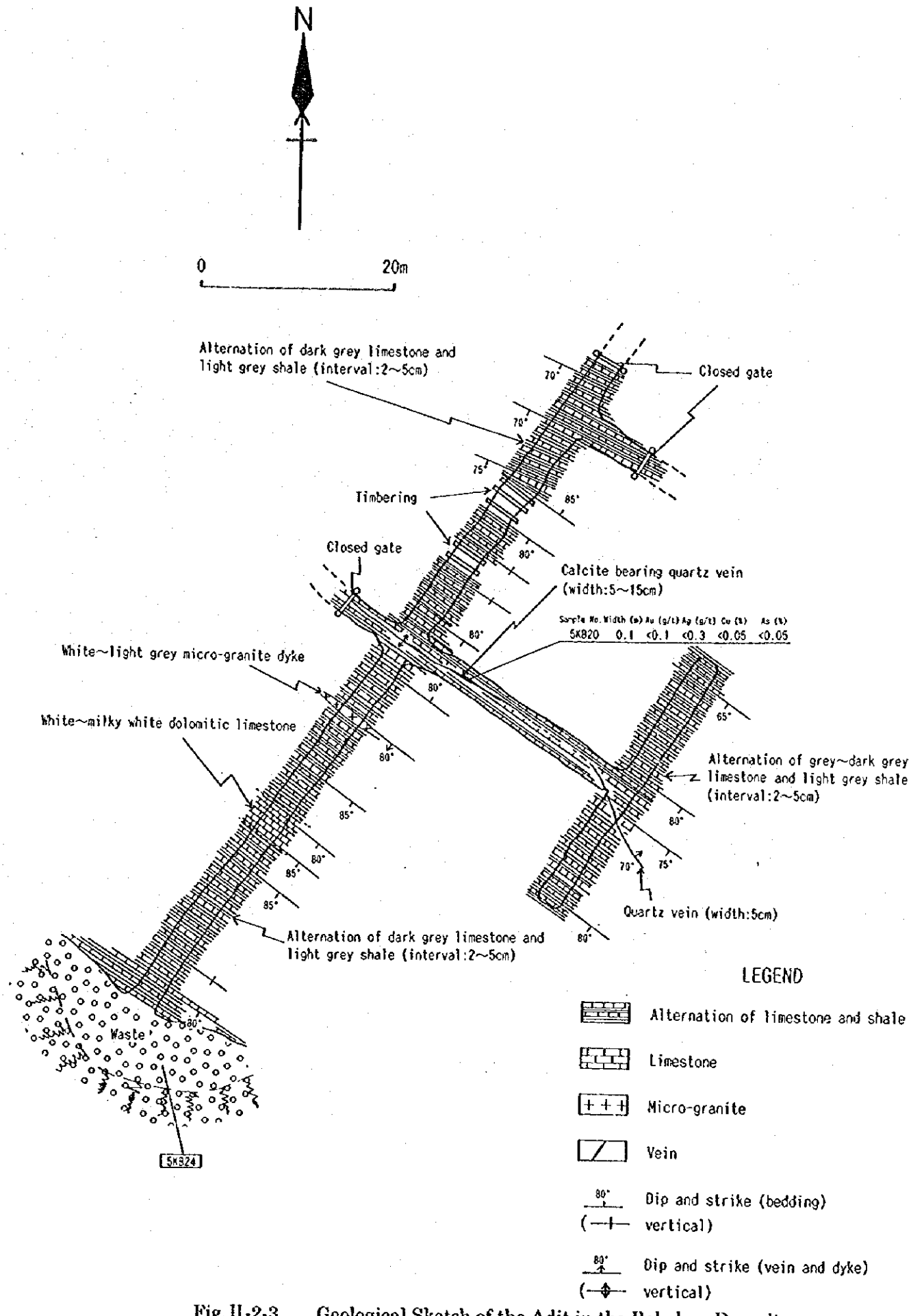


Fig. II-2-3 Geological Sketch of the Adit in the Babahan Deposit

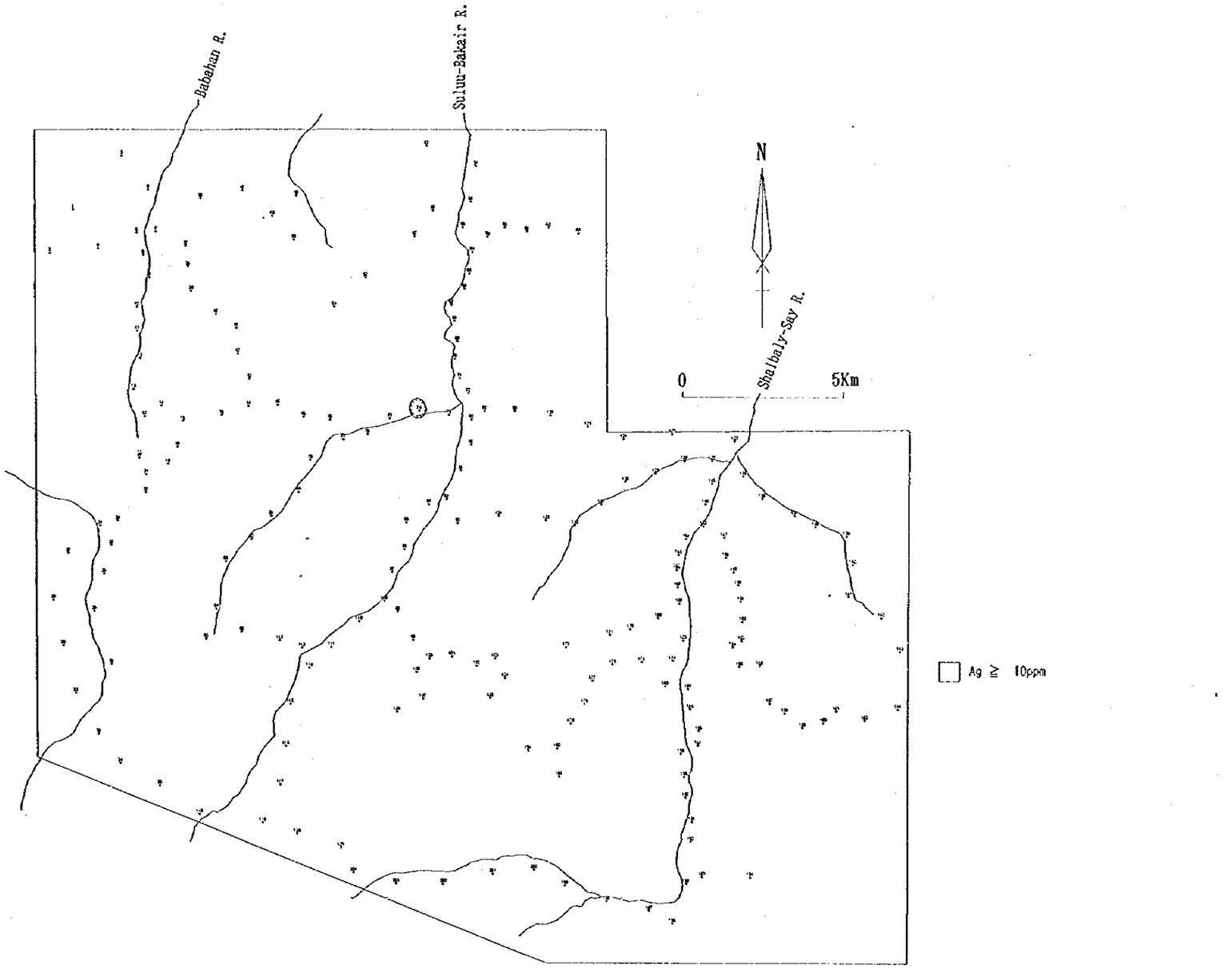


Fig. II-2-4 Geochemical Anomaly Map in the Babahan Area