

**REPORT  
ON  
THE MINERAL EXPLORATION  
IN  
THE KICHI-SANDYK AREA  
THE KYRGHYZ REPUBLIC**

**(CONSOLIDATED REPORT)**

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**JAPAN INTERNATIONAL COOPERATION AGENCY  
METAL MINING AGENCY OF JAPAN**

## PREFACE

In response to the request of the Government of the Kyrgyz Republic, the Japanese Government decided to conduct a Mineral Exploration in the Kichi-Sandyk area of western Kyrgyz and entrusted to the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ).

The JICA and the MMAJ sent a survey team to the Kyrgyz Republic from 1997 to 1999.

The team exchanged views with the State Concern "KYRGHYZALTYN" of the Government of the Kyrgyz Republic and conducted a field survey in the Kichi-Sandyk 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 relations 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.

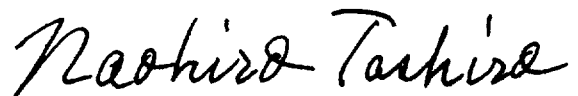
February, 2000



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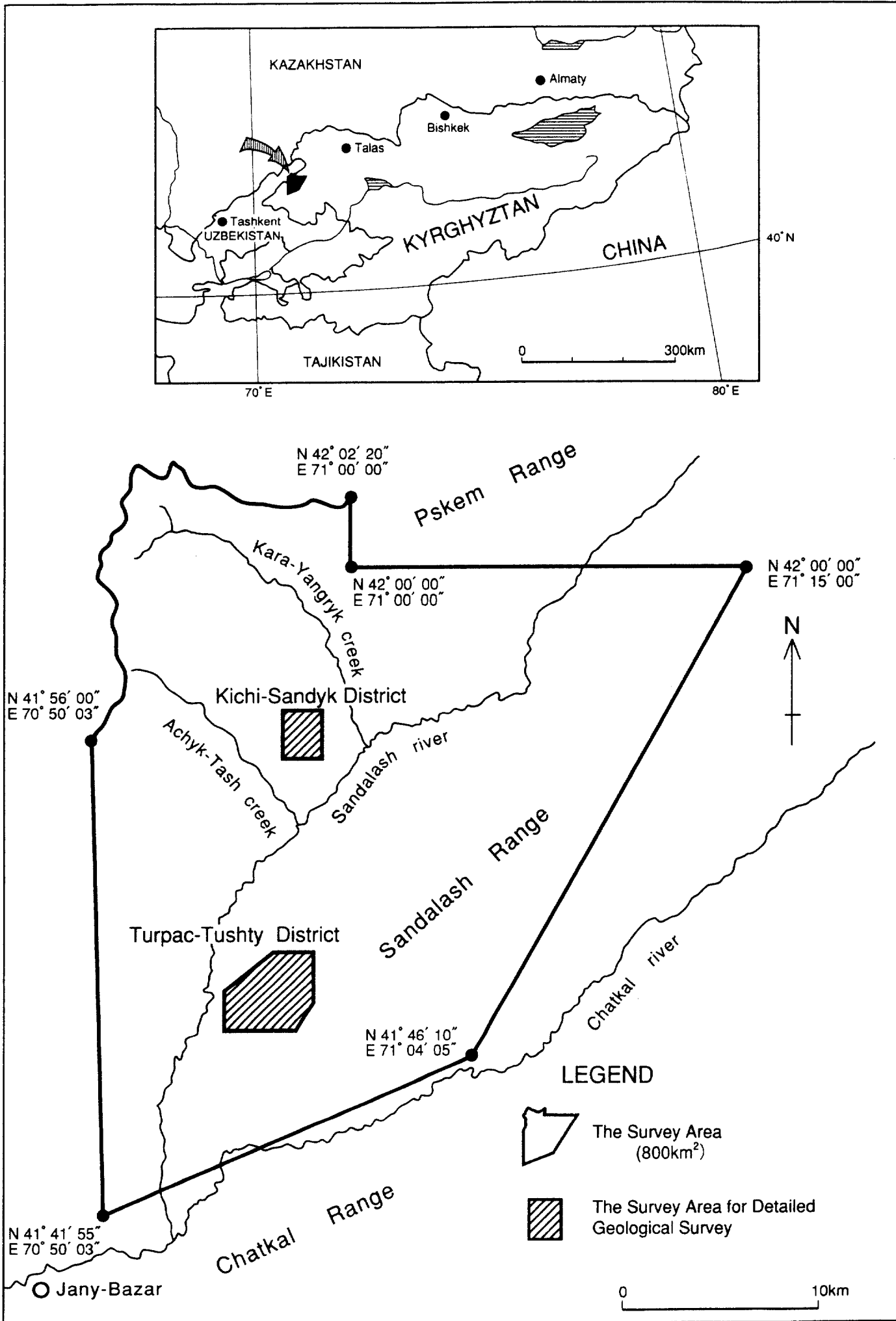


Fig. I -1-1 Location Map of the Survey Area

## Резюме

Данный отчет резюмирует результаты геологического изучения, проводимого на площади Кичи-Сандык в Кыргызской Республике с 1997 по 1999 год. Целью данного исследования являлось изучение геологии площади и залегания рудных месторождений, а затем выявление новых месторождений.

Поисковые работы выполнялись в каждом году следующим образом:

- 1 этап: Анализ существующих данных, анализ данных с использованием спутникового изображения (800 км<sup>2</sup>)

Район Кичи-Сандык : Геологические поиски (4,0 км<sup>2</sup>)

Месторождение Кичи-Сандык: Геологические поиски (0,9 км<sup>2</sup>)

- 2 этап:

Район Кичи-Сандык: Бороздовое опробование (500 м), керновое бурение (7 скважин, 819 м)

Район Турпак-Тушты: геологические поиски (20 км<sup>2</sup>)

- 3 этап:

Район Кичи-Сандык: Керновое бурение (3 скважины , 450 м)

В результате сделаны следующие заключения.

### 1) Район Кичи-Сандык

- В районе залегают кристаллические известняки от Позднекембрийского до Раннего Каменноугольного возраста и гранодиоритовые порфиры Пермского возраста, прорывающие

известняки. Минерализация имеет место вблизи контакта известняков и интрузивных пород.

- Этот район характеризуется медно-золотой минерализацией, сопровождающейся слоистым скарном в известняках и жильобразным скарном в гранодиоритах.
- По результатам геологических исследований, проводимых в 1976 году кыргызскими геологами, предполагаемые запасы руды (категории С2+Р1) оценивались в 33 тонны золота со средним содержанием 3,8 г/т. Таким образом, предполагалось существование перспективного месторождения.
- Однако, было выявлено, что минерализация широко распространена в этом районе, но содержания золота в руде, в основном, низкие. Существование участков минерализации с высокими содержаниями ограничено в зоне окисления на поверхности или вблизи поверхности и содержание золота в руде внезапно уменьшается с глубиной.
- Поэтому протяженность рудного тела очень ограничена как вертикально, так и горизонтально, в связи с чем, едва ли можно предполагать существование перспективных рудных месторождений.
- В центральной зоне минерализации возможные запасы руды были оценены в 0,7 тонн золота со средним содержанием золота 1,9 г/т.
- В северной зоне минерализации запасы руды не были оценены, так как содержания золота в руде чрезвычайно низкие.

## 2) Район Турпак-Тушты

- В районе в основном залегают кристаллические известняки Каменноугольного возраста и интрузивные породы, составляющие гранодиориты и диориты Каменноугольного и Пермского возрастов. Третичные отложения покрывают все вышеуказанные породы.
- Этот район характеризуется медно-золотой минерализацией, сопровождающейся гидротермальными пирит-серицит-кварцевыми жилами в интрузивных породах и слоистым скарном в известняках. Также она сопровождается россыпными золоторудными месторождениями в песчано-галечных залежах.
- Мелкие, но с высокими содержаниями рудные месторождения предположительно существуют в рудопроявлениях Турпак-Тушты и Ак-Камоу.
- Предполагаемые запасы оцениваются в 7.0 тонн золота со средним содержанием золота 5.0 г/т.

Подводя итоги прошедших трех лет геологических исследований в этом районе, мы рекомендуем следующее:

### 1) Район Кичи-Сандык

- Рудное тело (жилообразный скарн) с низким содержанием (около 1г/т золота) мелкого масштаба в центральной зоне минерализации района Кичи-Сандык. Таким образом, присутствие рудного месторождения для разработки не предполагается. Минерализация широко распространена в районе, но существование участков с высокими содержаниями весьма

ограничено. Соответственно, нет необходимости в дальнейшем детальном изучении этой зоны.

- В северной зоне минерализации района Кичи-Сандык содержание золота в слоистом скарне очень низкое, менее 1 г/т золота. Хотя, предыдущие геологоразведочные работы на этой огромной территории были очень ограничены, существование промышленных рудных месторождений с высокими содержаниями золота не предполагается. В случае разработки требуется, чтобы содержание золота в руде составляло не менее 6-8 г/т. Следовательно, дальнейшее изучение этой зоны не требуется.

## 2) Район Турпак-Тушты

- Возможно существование мелкомасштабных рудных тел с высокими содержаниями золота на рудопроявлениях Турпак-Тушты и Ак-Камоу вдоль северо-восточных и юго-западных сбросов.
- Рекомендуются дальнейшие геологоразведочные работы в этом районе и на прилегающих участках, направленные на поиски рудных тел с высокими содержаниями золота.
- Также необходимо выяснение условий существования рудных тел с высокими содержаниями золота. Однако, так как инфраструктура этой зоны минерализации очень бедна, как и в районе Кичи-Сандык, для промышленной разработки требуется рудное месторождение с высоким содержанием золота.

## SUMMARY

This report summarizes the results of mineral exploration survey conducted in the Kichi-Sandyk area, Kyrghyz Republic during 1997-1999. The purpose of the survey was to clarify the geological setting of the area and occurrence of ore deposits, then discover new ore deposits.

The survey carried out the following each year:

- Phase I : Analysis of existing data, Satellite image analysis (800 km<sup>2</sup>)
  - Kichi-Sandyk district : Geological survey (4.0 km<sup>2</sup>)
  - Kichi-Sandyk deposit : Geological survey (0.9 km<sup>2</sup>)
- Phase II : Kichi-Sandyk district : Trenching (500 m), Core drilling ( 7 holes, 819 m)
  - Turpac-Tushty district : Geological survey (20 km<sup>2</sup>)
- Phase III : Kichi-Sandyk district : Core drilling (3 holes, 450 m)

As a result, the following conclusions were obtained.

### 1) Kichi-Sandyk district

- The district is underlain by crystalline limestone of Late Cambrian to Early Carboniferous age and Permian granodiorite porphyry, intruding into the limestone. Mineralization took place near the contact of limestone and intrusive.
- This district is characterized by copper-gold mineralization accompanied with layered skarn in limestone and vein-like skarn in granodiorite
- The 1976 Kyrghyz survey estimated potential ore reserves (C2+P1 ore reserves) of 33 tons Au with an average grade of 3.8 g/t Au. Thus the existence of a promising ore deposit was expected.
- However, it was revealed that the mineralization is recognized widely in the district, but ore grade is generally low. Existence of high-grade parts of mineralization are limited in oxidized zone on the surface or near the surface, and ore gold grade suddenly decreases underground.
- Therefore extension of the ore body is very limited both laterally and vertically, and the existence of promising ore deposits is hardly expected.
- In the central mineralization zone, the probable ore reserves containing 0.7 tons Au with an average grade of 1.9 g/t Au were estimated.
- In the northern mineralization zone, ore reserves were not estimated as the ore grade was too low.

### 2) Turpac-Tushty district



- The district is underlain mainly by crystalline limestone of Carboniferous age and intrusives comprising granodiorite and diorite of Carboniferous and Permian ages. Tertiary sediment covers all of the above rocks.
- This district is characterized by copper-gold mineralization, accompanied with hydrothermal pyrite-sericite-quartz vein in intrusive rock, and layered skarn in limestone. Also it is accompanied with placer gold deposit in sand-gravel bed.
- The existence of a small but high-grade ore deposit can be expected in the ore manifestations of Turpac-Tushty and Ak-Kamou.
- Expected ore reserves containing 0.7 tons of Au with an average grade of 5.0 g/t Au was estimated.

As a result of the past three years' survey regarding mineral exploration of this district, we recommend the following:

1) The Kichi-Sandyk district

- The ore body (vein-like skarn) is low grade (about 1 g/t Au) and small in the central mineralization zone of the Kichi-Sandyk district. So that the presence of a minable ore deposit is not expected. The mineralization is recognized widely in the district, but existence of high-grade parts is very limited. Accordingly, a further detailed survey in this zone is not necessary.
- In the northern mineralization zone of the Kichi-Sandyk district, the gold grade of the layered skarn deposits was low, less than 1 g/t Au. Although the previous exploration for this vast area is very limited, the existence of an economical high-grade ore deposit is not expected. The ore grade is required to be at least 6-8 g/t Au in the case of mining in this district. Therefore, a further survey in this zone is not required.

2) The Turpac-Tushty district

- The existence of high-grade but small-scale ore bodies are possible in Turpac-Tushty and Ak-Kamou ore manifestations along NE-SW faults.
- Further exploration aiming at high-grade ore bodies is recommended in this district and its surrounding area.
- Also clarifying of conditions on the existence of high-grade ore bodies is necessary. However, since the infrastructure of this mineralization zone is poor as that of Kichi-Sandyk district, considerably higher ore grade is demanded for an economically minable ore deposit.

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## **PART I GENERAL REMARKS**

## **CHAPTER 1 INTRODUCTION**

### **1-1 Background and Purpose of Survey**

The area surveyed, which is about 800km<sup>2</sup>, is located in the middle of the Central Tien-Shan Mountains by the boarder with the Republic of Uzbekistan. Administratively it belongs to Chatkal district in Alabuka region in the state of Dzhahalal-Abad. It extends about 27km in the East-West direction, 30km in the North -South direction, and has a total area of 800 square kilometers, and is surrounded by the following points:

42° 02' 20" north latitude,	71° 00' 00" east longitude
42° 00' 00" north latitude,	71° 00' 00" east longitude
42° 00' 00" north latitude,	71° 15' 00" east longitude
41° 46' 10" north latitude,	71° 04' 05" east longitude
41° 41' 55" north latitude,	70° 50' 03" east longitude
41° 56' 00" north latitude,	70° 50' 03" east longitude

The purpose of the survey was to clarify the geological condition and occurrence of ore deposits in the area and discover new ore deposits.

### **1-2 Methods and Contents of Survey**

The survey was performed over three years from 1997 to 1999. Survey method of each year is summarized in Fig. I-1-2. Contents by respective survey are given Table. I-1-1. Selection of prospective area is conducted by flow chart presented in Fig. I-1-3.

Phase I of the survey was carried out by existing data compilation combined with satellite image analysis and geological survey in the Kichi-Sandyk district (4 km<sup>2</sup> in area, with 909 m trenches). Phase II of the survey was performed by core drilling (7 holes, 819 m) and geological survey with 500m trenches in the Kichi-Sandyk district, and geological survey in the Turpac-Tushty district (20 km<sup>2</sup>). Phase III of the survey was conducted by core drilling in the Kichi-Sandyk district (3 holes, 450 m).

### **1-3 Period and Members of Survey**

Periods of the field survey and analysis during three years are given in Table. I-1-2. Members of the survey are presented in Table I-1-3.



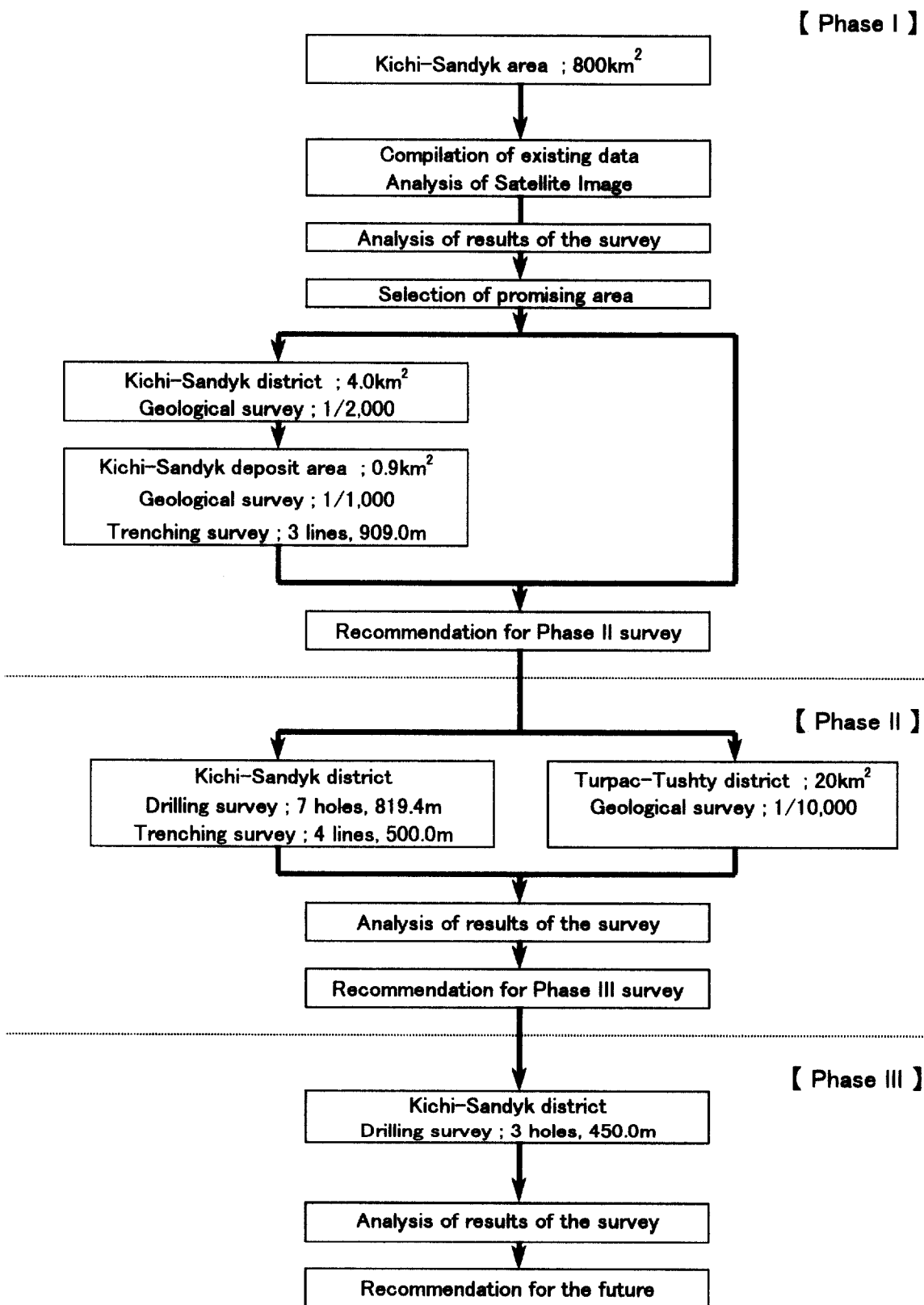


Fig. I -1-2 Flow Sheet of the Survey

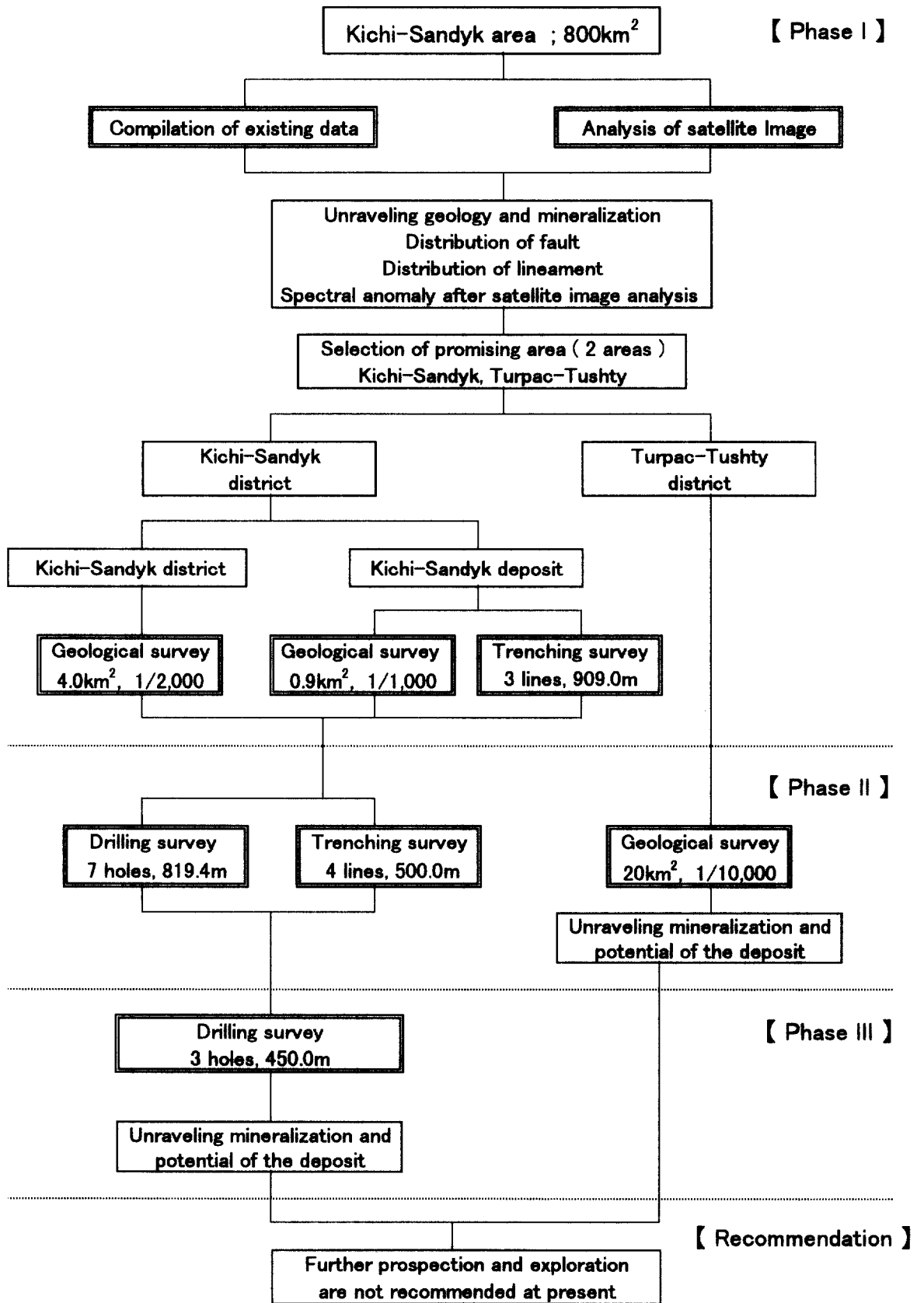


Fig. I -1-3 Flow Chart of Selection of the Promising Area

Table I -1-1 Methods and Contents of the Survey

	Phase I (1997)		Phase II (1998)		Phase III (1999)	Total (1997-1999)
	Whole area	Kichi-Sandyk district	Kichi-Sandyk deposit	Kichi-Sandyk district		
Satellite image analysys (km <sup>2</sup> )	800					800
Geological survey (km <sup>2</sup> )						
Length of route (km)		4.0	0.9		20.0	24.9
Trenching (m)		15.0	15.0		80.0	110.0
Drilling survey			909.0	500.0		1,409.0
Number of drill holes (hole)						
Length of drilling (m)						
		7			3	10
		819.4			450.0	1,269.4
Laboratory studies						
Thin section (pcs)		20	10	6	14	70
Polished thin section (pcs)		10	10	5	15	60
Ore assay (pcs)		100	1,000	130	70	1,638
Fluid inclusion (pcs)		5	5		5	25
X-ray diffraction analysis (pcs)		10	5	10		50
EPMA analysis (pcs)			5			5
Isotopic dating (K-Ar) (pcs)		2	2			4

**Table I -1-2 Period of the Survey**

<b>Phase</b>	<b>Period of Field Survey</b>	<b>Period of Analysis</b>
<b>Phase I</b>	<b>Sep 7, 1997 ~ Oct 18, 1997</b>	<b>Aug 14, 1997 ~ Feb 27, 1998</b>
<b>Phase II</b>	<b>July 7, 1998 ~ Oct 16, 1998</b>	<b>Aug 27, 1998 ~ Feb 26, 1999</b>
<b>Phase III</b>	<b>July 13, 1999 ~ Aug 21, 1999</b>	<b>Aug 23, 1999 ~ Feb 29, 2000</b>

Table I -1-3 Members of the Survey Team

JAPAN		KIRGHYZ	
(Planning and Negotiation)		(Planning and Negotiation)	
SATO Akira	MMAJ*1	CHUKIN Almas T.	SPFKR*3
NAWATA Tooru	JICA*2	MURZAGAZIEV Sheyshenaly M.	SAGMR*4
YAMAGUCHI Satoshi	MMAJ	JAKYPOV Almazbek S.	Kyrghyzaltyn*5
		YARKOV Alexander V.	Kyrghyzaltyn
(Phase I)		(Phase I)	
TAKAHASHI Mikio	MINDECO*6	YARKOV Alexander V.	Kyrghyzaltyn
AIZAWA Naoto	MINDECO	SAVCHENKO Gennady A.	Kyrghyzaltyn
YAMASAKI Tatsuo	MINDECO	DZHUMAGULOV Ryskul	Kyrghyzaltyn
		APOG Igor A.	Kyrghyzaltyn
ADACHI Kazuhiro	MINDECO	NIKITIN Andrey	Kyrghyzaltyn
WATANABE Hidehisa	MINDECO	BOBOSHCO Asunov	Kyrghyzaltyn
(Phase II)		(Phase II)	
NAKAMURA Kiyoshi	MINDECO	YARKOV Alexander V.	Kyrghyzaltyn
YAMASAKI Tatsuo	MINDECO	SAVCHENKO Gennady A.	Kyrghyzaltyn
YAMAMOTO Nobuhiko	MINDECO	DZHUMAGULOV Ryskul	Kyrghyzaltyn
		APOG Igor A.	Kyrghyzaltyn
		NIKITIN Andrey	Kyrghyzaltyn
		REZNICHENKO Gennady	Kyrghyzaltyn
(Phase III)		(Phase III)	
NAKAMURA Kiyoshi	MINDECO	YARKOV Alexander V.	Kyrghyzaltyn
		SAVCHENKO Gennady A.	Kyrghyzaltyn
		APOG Igor A.	Kyrghyzaltyn
		NIKITIN Andrey	Kyrghyzaltyn
		REZNICHENKO Gennady	Kyrghyzaltyn

\*1 : The Metal Mining Agency of Japan

\*2 : The Japan International Cooperation Agency

\*3 : The State Property Fund of the Kyrgyz Republic

\*4 : The State Agency on Geology and Mineral Resources of the Government of the Kyrgyz Republic

\*5 : Kyrgyz State Concern "Kyrghyzaltyn"

\*6 : Mitsui Mineral Development Engineering Co., Ltd.

## **CHAPTER 2 PREVIOUS SURVEY**

Geological surveys into the valleys of Chatkal and Sandalash rivers began in the late 19th century, and a deposit of placer gold along the Sandalash was investigated in 1898. The 1:500,000 geological surveys from 1931 to 1936 revealed a series of mineralization sites including pyrite along upper streams of the Achyktash river, including a gold deposit along the Sandalash river. This gold deposit, as well as tungsten/molybdenum deposit of Toyalmysk in the upper valley of the Sandalash was mined during the Second World War (1941-1945).

Systematic investigations of the area were begun in 1948, and the 1:200,000 survey was conducted between 1952 and 1954.

The 1:50,000 geological survey was conducted in the main part of this area from 1965 to 1968, and Kichi-Sandyk deposit was discovered. That called for more detailed surveys.

From 1973 to 1976 geological surveys, sampling of heavy minerals and geochemical survey, electric prospecting (IP), magnetic prospecting, gravitational prospecting were carried out in the mineralization areas of Sandalash-Chatkal. A series of geological maps including an integrated geological map, a 1:10,000 geological map, and location map of samples were produced. Trenches, bulldozer opening (27,000m<sup>3</sup>), drilling of pits (612m), and digging of a short tunnel (22m) were applied to the Kichi-Sandyk deposit. Major mineralization zones were investigated down to 10 to 15m from the surface by means of pits with drift and short tunnels. Many samples were collected by channel sampling method, and as many as 3,296 pieces were analyzed.

The results suggested high probabilities of gold deposit in the Kichi-Sandyk area, but no further survey or searching was conducted after 1976.

## **CHAPTER 3 GENERAL GEOLOGY**

### **3-1 General Geology of the Survey Area**

The survey area is situated in western Kyrghyz, or west of the dividing Talas-Fergana fault, within the Middle Tien-Shan folding zone of the Hercynian folding system which extends from the central Kyrghyz to western Kyrghyz. It lies on the southern slopes of the Pskem Mountains (Fig. I-1-1).

The Middle Tien-Shan folding zone lies between the Northern Tien-Shan folding zone of the Caledonian folding system and Southern Tien-Shan folding zone of the Hercynian folding zone. By the middle Proterozoic (Ripheian) it is believed that the geosyncline had been formed to produce land at least partially. In this area, the Middle Proterozoic groups consisting mainly of glacial sediments, volcanic rocks and carbonaceous sediments, Paleozoic groups consisting of flysch, terrigenous and volcanic sediments are underlain as the basement rocks, and the Cenozoic of lake sediments and molasse lies on top of them.

Various types of igneous activities in Kyrghyz, such as the ones caused by the subduction of the plate and alkaline magma of the inner continent, are known to have existed from Proterozoic era to the late Paleozoic era. In the survey area, granite of late Paleozoic (Carboniferous and Permian) is distributed among the basement rocks. Major geological stratigraphy in the Kichi-Sandyk area is shown below. A geological map of the Sandalash-Chatkal region is shown in Fig. I -3-1 and a schematic geological column is shown in Fig. I-3-2, respectively.

### **3-2 Characteristics of Gold Mineralization in the Survey Area**

In the survey area including Kichi-Sandyk deposit, skarn has been often formed at the contact between the Lower Carboniferous limestone and the Carboniferous and Permian intrusive rocks such as diorite, granodiorite, monzonite and granodiorite porphyry. Mineralization of copper-gold, antimony, tungsten and molybdenum are observed in the skarn. It is suggested that the skarn related with early Permian granodiorite porphyry (Chalmersay complex) contains gold with higher quality than that with the Sandalash-Chatkal complex.

Two ore showing areas of Kichi-Sandyk and Turpac-Tushty are identified as promising for copper-gold deposits in this area. Furthermore, several ore showings have been also entrapped. According to the results of the previous explorations by the Kyrghyz, 200 tons of gold (140 t in Kichi-Sandyk district and its surrounding areas) and 350 thousand tons of copper have been assessed as the potentials for this area.

But the results of the survey obtained only about two tones of gold ore reserves.

## **CHAPTER 4 GEOGRAPHY OF THE SURVEY AREA**

### **4-1 Location and Access**

The survey area is located in the western end of the Kyrgyz Republic near the border of Uzbekistan, and topographically situated in the middle Tien-Shan Range. In the administration division, the area belongs to the Chatkal district, Alabuka region, Dzhahalal-Abad State. The area extends for about 27 km east-west and 30 km north-south covering about 800 km<sup>2</sup> (Fig. I-1-1).

The nearest village, Jany-Bazar, is located about 200 km northwest of Dzhahalal-Abad. There was an old exploration road from Jany-Bazar to the survey area. The road was improved and maintained for this survey.

There are two routes from Bishkek, the capital city, to Jany-Bazar. One route passes through Toktogul, Tash-Kumyr, Alabuka and Chapchama Pass (2,814 m in altitude), and the other route goes through Talas, Kirovskoye, and Kara-Buura Pass (3,305 m). Distance from Bishkek to Jany-Bazar using the former route is 800 km, while it is 520 km using the latter route. Although the former route is longer, the road is usable throughout the year. On the other hand, the latter road passes through mountains over 3,000 m high e.g. Kara-Buura pass is closed during the winter due to poor conditions.

### **4-2 Topography and Drainage System**

The Tien-Shan Mountains are divided into three parts : Northern, Central and Southern. Our survey area is located in the southern part of the Central Tien-Shan Mountains. North of our survey area is the Pskem Mountains, which are on the border with Uzbekistan and the watershed of the area, running from southwest to northeast.

The surveyed area is on the southern side of the Pskem Mountains with altitudes between 2,600 m and 3,000 m. Mineral showings are distributed at an altitude between 2,800 m and 2,950 m. General topography of the area is a near flat plateau with slight ups and downs, and sharply eroded valleys. The largest river in the area is the Chatkal River, which originates in the Sandalash and Chatkal Mountains and runs from east-northeast to west-southwest.

### **4-3 Climate and Vegetation**

Most part of the survey area lies between 2,000 m and 3,000 m in altitude, and its climate is of high mountain. The coldest month of the year is January with the temperature as low as -40° C, and the warmest month is August with the temperature



higher than 28° C. Daily fluctuation of the temperature is great, which is typical for the inland area. The winter is cold with heavy snowfalls. The first snow of the season falls in the beginning to the middle of October, and the annual precipitation amounts to 740 mm-1200 mm. The average monthly temperature of the survey area (3,000 m in altitude) is shown in Table I -4-1. The areas with mineral showing, which are about 2,800 m in altitude, have poor development of soils with little vegetation - just some grass and Alpine plants. Development of foliage, mainly bushes with some broadleaf trees such as white birch, poplars and conifers similar to pines, is seen only along the rivers at an altitude lower than 2,000 m.

Table I -4-1 Temperature & Humidity in the Kichi-Sandyk Area

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ave. Temp (°C)	-19.5	-15.7	-8.0	-0.8	3.8	6.6	9.1	8.4	4.1	-2.1	-11.0	-17.8
Humidity*	60%	-	-	-	-	-	22%	-	-	-	-	-

\* : relative humidity (%)

## **CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS**

### **5-1 Conclusions**

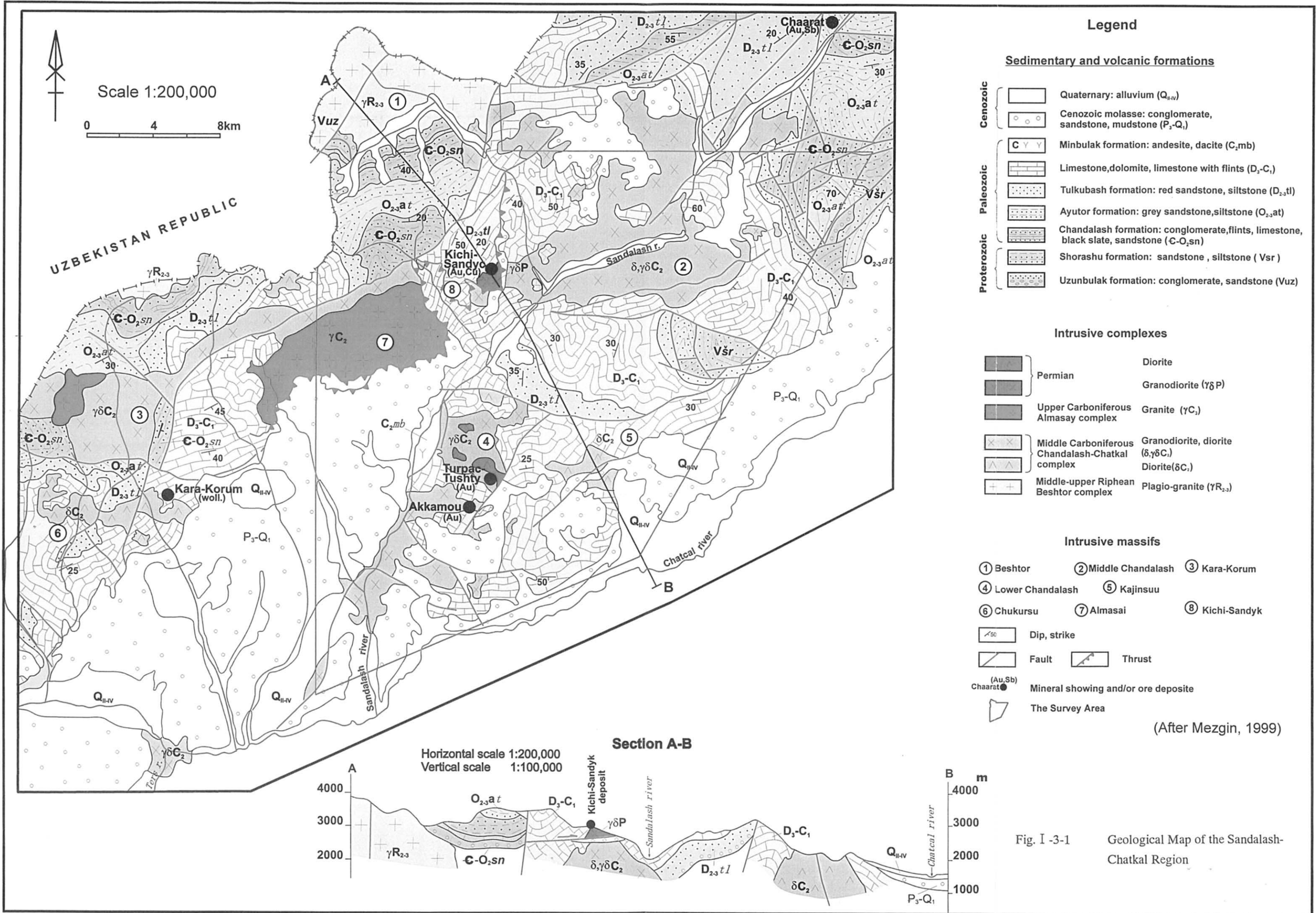
Initially, the existence of a promising ore deposit was expected due to the 1976 Kyrghyz survey estimated potential ore reserves (C2+P1 ore reserves) of 33 tons Au with an average grade of 3.85 g/t Au in the central and the northern mineralization zones in the Kichi-Sandyk district. However, it was revealed that the extension of the ore body is very limited both laterally and vertically, and the ore gold grade suddenly decreases underground. Therefore the existence of a promising ore deposit is hardly expected in both mineralization zones.

In the Turpac-Tushty district, the result of the survey confirms an existence of high-grade ores at the Turpac-Tushty and the Ak-Kamou ore manifestations and suggests a possibility that the high-grade ore bodies, even though of a small scale, exist in both the manifestations. The other hand, possible ore reserve (P1) of 695 thousand tons and gold quantity of 2.9 tons (average Au-grade: 4.22g/t) were estimated by the Kyrghyz side.

### **5-2 Recommendations for the future**

Concerning the results of these three years' survey, we recommend the following for the future:

- (1) The ore body (vein-like skarn) is low grade (about 1 g/t Au) and small in the central mineralization zone of the Kichi-Sandyk district, so that the presence of a minable ore deposit is not expected. Accordingly, a further detailed survey in this zone is not necessary.
- (2) In the northern mineralization zone of the Kichi-Sandyk district, the gold grade of the layered skarn deposits was low, less than 1 g/t Au. Although the previous exploration for this vast area is very limited, the existence of an economical high-grade ore deposit is not expected. The ore grade is required to be at least 6-8 g/t Au in the case of mining in this district. Therefore, a further survey in this zone is not required.
- (3) In the Turpac-Tushty district, the existence of high-grade but small-scale ore bodies are possible in Turpac-Tushty and Ak-Kamou ore manifestations along the NE-SW faults. Further exploration aiming at high-grade ore bodies is recommended in this district and surrounding area of this district. Also clarifying of conditions on the existence of high-grade ore bodies is necessary. However, since the infrastructure of this mineralization zone is poor same as that of Kichi-Sandyk district, considerably higher ore grade is demanded for economically minable ore deposit.



Age (Thickness)			BRIEF DESCRIPTION OF ROCKS
Cenozoic	P <sub>1</sub> -Q (>500 m)		Interbedded gray conglomerates, loam & clay. Basement of the section consists of red conglomerate and clay.
	Paleozoic	C <sub>2</sub> mb (250 m)	
D <sub>2</sub> -C <sub>1</sub> (2900 m)			Grey, dark-grey, light grey limestone, dolomite limestone and dolomite. In upper portion of this section, limestone consists of nodular and banded inclusions of chert.
D <sub>2-3</sub> tl (600 m)			Tulkubash formation Sandstone consists of pinky-grey and grey quartz. Basement consists of conglomerate.
O <sub>2-3</sub> at (950 m)			Ayutor formation. Flysch, interbedded greenish-grey sandstone, siltstone, rare interlayers of gritstone and conglomerate.
C-O <sub>2</sub> (1850 m)			Chandalash formation. Grey & dark-grey conglomerate sandstone, dark-grey siltstone. Lower portion of this section consists of dark chert and massive limestone horizons.
Proterozoic	V (2200 m)		Shoroshuy formation. Tillite-like conglomerate. Upper portion expresses rhythmic interbedding of sandstone with silt-argillaceous shales of dark-grey colour.
			Uzunbulak formation. Conglomerate, gritstone with sandstone, siltstone and schist.
	R <sub>2-3</sub> (930 ± 15 m.y.)		Beshtor intrusive complex. Plagiogranite.

(after Mezgin, 1999)

Fig. I -3-2 Schematic Geologic Column of the Survey Area