REPORT
ON
THE MINERAL EXPLORATION
IN
THE EASTERN BUKANTAU AREA
THE REPUBLIC OF UZBEKISTAN

(PHASE II)

MARCH 1996

JAPAN INTERNATIONAL COOPERATION AGENCY

METAL MINING AGENCY OF JAPAN

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PREFACE

In response to the request of the Government of the Republic of Uzbekistan, the Japanese Government determined to conduct a series of survey involving geological survey, geochemical survey and other studies related to exploration of ore deposits, for the purpose of examining the potentials of mineral resources in the Eastern Bukantau Area, situated some 500km northwest of Tashkent, the Uzbek capital city, and entrusted the survey to the Japan International Cooperation Agency (JICA).

In view of the geological and mineralogical nature of the intended survey, the JICA commissioned the Metal Mining Agency of Japan (MMAJ) to execute the survey.

During the second fiscal year of the survey which was commenced in the fiscal 1994, the MMAJ organized and sent to the Republic of Uzbekistan a six-man survey team for the period from July 9 to December 23, 1995. The field survey was completed as schduled, in close collaboration with the Uzbek government agencies concerned and the State Committee of Geology and Mineral Reserves.

This Report compiles the results of the fiscal 1995 survey and will form an integral part of the final survey report to be elaborated.

We should like to take this opportunity to express our sincere gratefulness to the Uzbek government agencies and persons concerned for their valuable cooperation. We are also thankful to the Japanese Ministry of Foreign Affairs, the Ministry of International Trade and Industry, the Japanese Embassy in Tashkent and persons concerned who have rendered assistance and support for the survey.

March, 1996

Kimio Fujita
President
Japan International Cooperation Agency

Shozaburo Kiyotaki
President
Metal Mining Agency of Japan

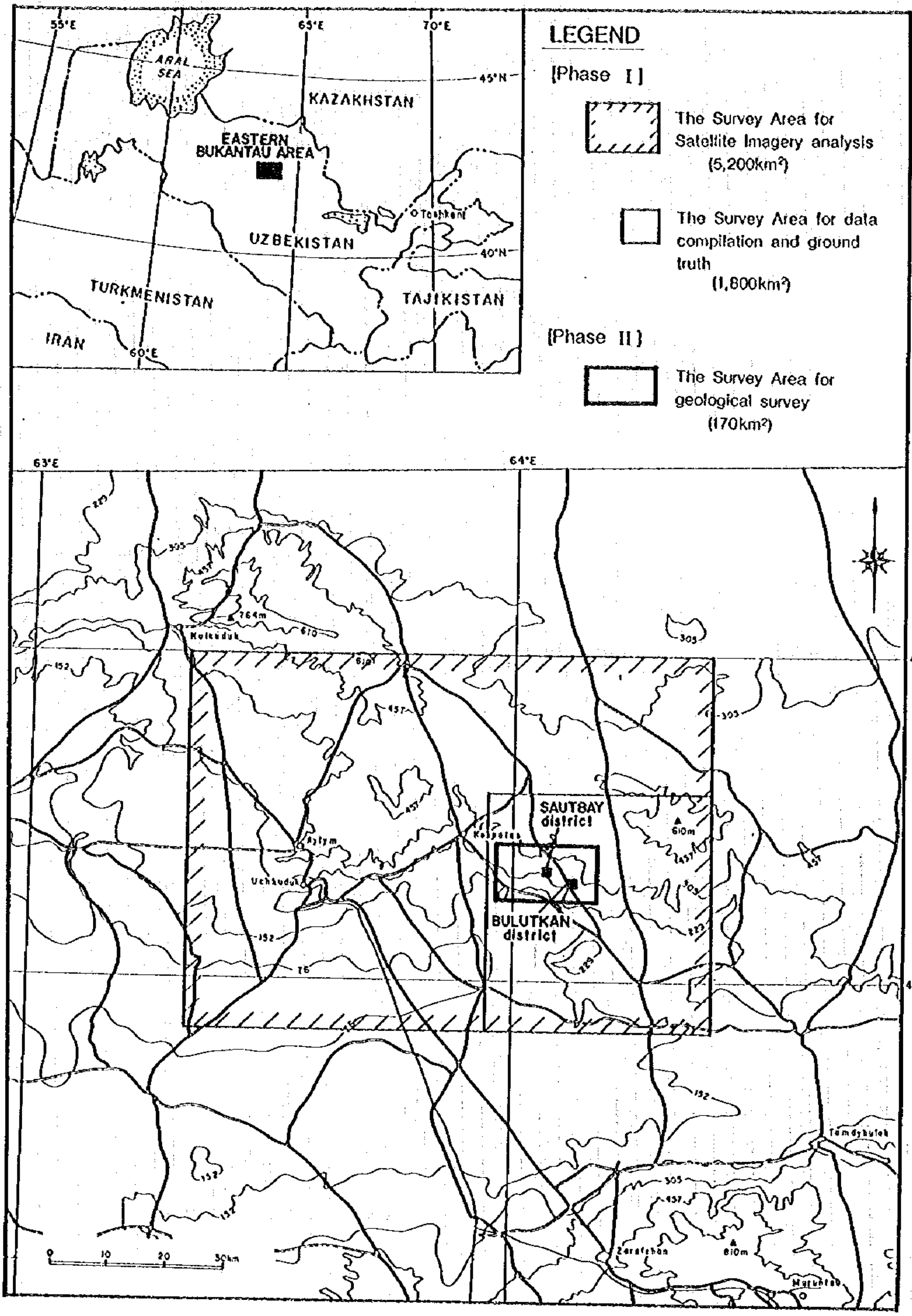

Fig. I −1 Location Map of the Survey Area

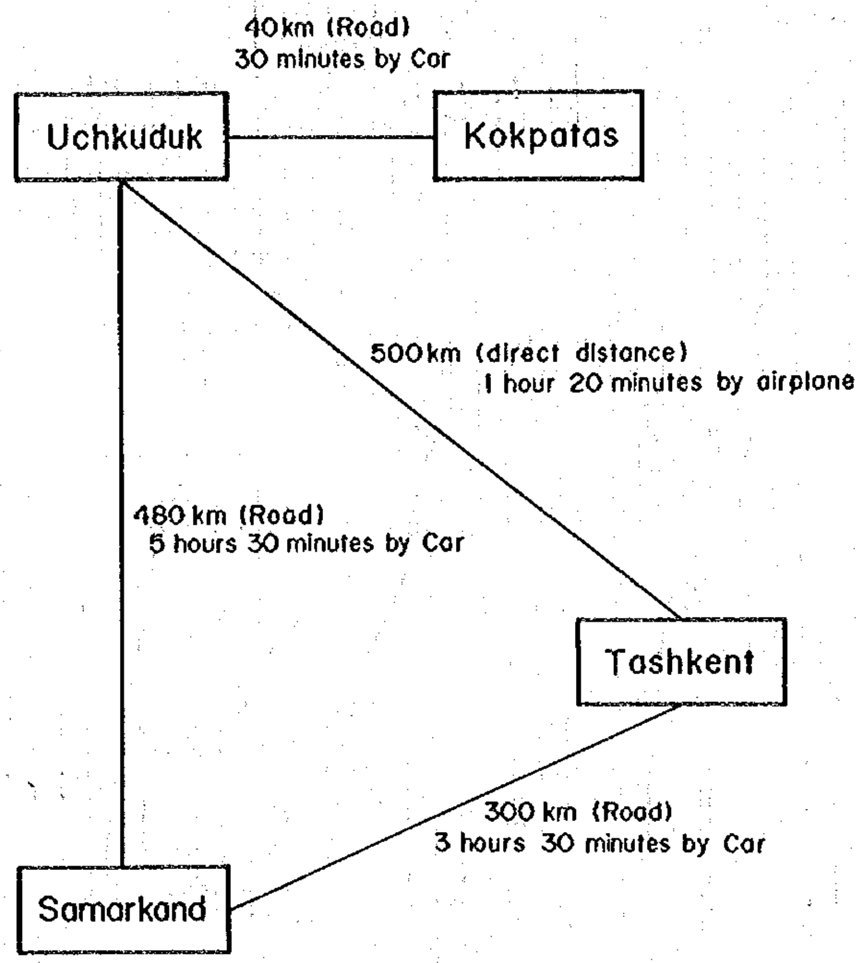

Fig. I –2　Accessibility of the Survey Area

СВОДКА

Настоящий отчет представляет собой сводку результатов геологоразведочных работ, проведенных в районе Восточного Букантау республики Узбекистана в втором году выполнения Соглашения о сотрудничестве по основным исследованиям для оказания помощи в разработки рессурсов. Целью этих работ было выяснить геологическое строение и рудоносноть данного района, разработать направление дальнейших геологоразведочных работ и повторно оценить существующие месторождения.

Полевые работы проводились С июля по декабрю 1995 года .

В этих работах второго года проведена гаологическое исследование в объеме 170км² для Саутбайского - Булутканского районов, выбранных в результате анализа данных исследования, проведенного в прошлом году, и вместе с тем, для Саутбайского рудного месторождения - разведка бурением 4 скважина в объеме 1 509,9 м. А также, для Булутканского района проведена разведка канавами в 10 местах в объем 6 300 м, геофизическая разведка в 1,8 км², разведка бурением 7 скважинах в объеме 1 011,0 м.

Более того, для Сагхинканского рудного месторождения, северо-западнее Саутбайского рудного месторождения, был проведен подсчет запасов для повторной оценки рудного месторождения.

Ниже дано описание результатов работ и предложения для геологоразведки, осуществляемой в третьем году, по районам.

1) Саутбайский - Булутканский районы (районы геологического исследования)

(1) В этих районах, как известно, размещаются Саутбайское (W) , Бургутское(W) , Сагхинканское (W) и Булутканское (Au) рудные месторождения, геологическим исследованием в данном году не было выявлено нового рудного месторождения и рудопроявления.

(2) Поскольку аномальные значения анализа пород относятся к зоне, где плотнее развиваются стоволы и дайки, можно считать, что оруденение широко распространяется в основном в Бултканском и Саутканском районах в месте с интрузивными породами.

2) Саутбайский район

(1) Для Сагхиканского рудного месторождения (W) так же, как в прошлом году, был проведена подсчет запасов руды с применением программного обеспечения для оценки запасов (MicroLYNK Plus) и компьютера, в результате чего, выяснено, что при бортовом содержании 0,05 %(WO_3), запас руды составляет 16 320 тыс.тонн, среднее содержание WO_3 - 0,24%, а Au - 0,02 г/т. Сагхинканское рудное месторождение можно считать среднемасштабным, но у него довольно низкое содержание

маталлов.

(2) В результате проведенной для Саутбайского рудного месторождения разведки бурением 4 скважин, в скважинах MJUS -3, -4 были обнаружены скарновые рудные тела со содержанием WO_3 не менее 0,30% и истинной шириной не менее 2 м. Из этих скарновых рудных тел, в том числе и главного рудного тела, было подтверждено, что оруденение непрерывно развивается до глубины около в 400 м под земной поверхности и есть большая возможность его непрерывного развития в нижнем и южно-южно-восточном направлениях.

3) Булутканский район

(1) Из результатов геофизической разводки было подтверждено, что в Кокпатасской свите, расположенной в северной стороне сиенитодиорита , 5 зон, показывающих такую структуру с высоким удельным сопротивлением и значение IP. как у Булутканского рудного месторождения.

(2) В скважинах MJUB-1 и MJUB-7, пробуренных при разведке нижней протяженности Булутканского рудного месторождения, было подтверждено золотое оруденение, которое развито непрерывно до глубины около 100 м под земной поверхностью.

Верхняя часть рудного тела представляет собой окремненную породу в сопровождении железной шляпы, мелкозернистой кварцевой дайковой породы и халцедона, в нижняя часть - скарновое рудное тело с сопровождением золотого оруденения.

(3) При разведеке бурением нижней части Булутканского рудного месторождения были подтверждены интервалы содержания золота следующим образом: у скважины MJUB-1, в глубине 86,0 - 88,0 м (истинная ширина 1,1 м) - содержание Au 2,8 г/т; у скважины MJUB-7, в глубине 0-10,4 м (истинная ширина 5,5 м) содержание Au 4,3 г/т и в глубине 36,1 - 51,0 м (истинная ширина 7,9 м) содержание Au 21,2 г/т. В других рудных месторождениях кроме Булутканского, содержание Au у скважины MJUB-3 составляет 2,3 г/т в интервале 82,0 - 84,0 м (истинная ширина 1,6 м) а содержание Ag - 36,1 г/т.

(4) При разводке канавами верхней части Булутканского рудногос месторождения обнаружены участки содержания золота у канавы Т-2: участок (228,4 - 248,6 (Истинная ширина 20,2 м) содержание Au составляет 11,7 г/т, участок 252,1 - 253,4 м (истинная ширина 1,3м)- 7,0 г/т а участок 260,2 - 264,3 м (истинная ширина 4,1 м) - 2,4 г/т.

(5) Что касается температуры гомогенизации включения жидкости халцедона и кварцевой дайковой породы то у образцов, взятых из канавы рудном месторождением и близости золотого рудопроявления, в Булутканском составляет 150°C - 250°C, а у образцов,

взятых из скарнововой породы или сиенитодиорита, - 250°С - 350°С. А, у образца, взятого в месте, где совпадают золотое оруденение и скарнизация между собой, эта температурв составляет 150°С - 330°С.

Из вышеуказанного предполагается, что образование кварцевой гайковой породы происходит на нескольких стадиях и золотое оруденение связано с низкотемпературным кварцем последней стадии.

(6) Была отмечена географическая аномаля образов Булутканского района, взятых при разведке канавами в близости основных золотых оруденений, зон разломов или дайковых пород, а также в породе сиенитодиорита в близости границы Кокпатасской свиты.

(7) В результате исследований второго года было выяснено, что в зоне, прилегающей к северной стороне стовола сиенитодиорита, развитого в направление ЗСЗ-ВЮВ, непрерывно развиваются рудопроявления и высока возможность наличия рудного месторождения такого, как Булутканного.

В трерьем году желательно произвести следующие работы.

(1) Произвести разведку канавами и разведу бурением в восточном продолжении Булутканного рудного месторождения.

(2) Произвести геофизическую разветку методом ТЕМ, разведку канавами и разведку бурением с целью разведки участка развития Кокпатасской свиты, где можно ожидать залегание месторождения, аналогичного Булутканскому, в зоне прилегающей к северной стороне ствола сиенитодиорита с направлением ЗСЗ-ВЮВ.

С целью разведки зоны размещения Кокпатасского слоя.

(3) Произвести разведку бурением в юго-восточном продолжении первого рудного тела Саутобайского рудного месторождения, с целью изучения интервала - 300-400 м произвести разведку.

(4) Составить предварительный проект разработки месторождений Саутбайского - Бургутского и Сагхинканского месторождений

SUMMARY

This Report summarizes the results of the Phase II survey implemented in the Eastern Bukantau Area of the Republic of Uzbekstan, under the Technical Cooperation for the Mineral Exploration. The survey was intended to clarify geological conditions and occurrence of ore deposits in the area, to provide an orientation for future exploration and also to make reevaluation of the known ore deposits. The field survey was executed from July to December, 1995.

Performed during the second year were geological survey covering an area of $170km^2$ at the Sautbay-Bulutkan district, extracted by the preceding year's analysis of the existing data; drilling survey at four drillholes totaling 1,509.9m at the Sautbay deposit; and, trenching survey at 10 trenches totaling 6,300m, geophysical prospecting over an area of $1.8km^2$ and drilling survey at seven drillholes totaling 1,011.0m at the Bulutkan district.

With regard to the Saghinkan deposit adjacent to the northwest of the Sautbay deposit, ore reserve estimation was made for reevaluation of the deposit.

The survey results, as well as recommendations for the Phase III survey, are summarized in the following paragraphs.

1) Sautbay-Bulutkan district (geological survey area)

(1) The known ore deposits and showings at this district are the Sautbay deposit (W), Burgut deposit (W), Saghinkan deposit (W) and Bulutkan deposit (Au), while this year's survey resulted in confirming no new deposits nor showings.

(2) Since most of the anomalies in the rock analysis are located at or near zones with high concentration of stocks and dikes, mineralization presumably extends, accompanying intrusive rocks, over a wide area centering around the Sautbay and Bulutkan districts.

2) Sautbay district

(1) Ore reserves of the Saghinkan deposit was estimated with the computer software (microLYNX Plus) designed for ore reserve calculation, which was used in the Phase I, as well. The ore reserves turned out to be 16,320,000t averaging 0.24% WO_3 and 0.02g/t Au, in case of a cutoff grade at 0.05% WO_3.

The Saghinkan deposit is a medium-size ore deposit, but ore grade is rather low.

(2) The drilling survey at four drillholes aimed at the Sautbay deposit resulted in capturing a skarn ore body of more than 2m in true width, grading 0.30% WO_3 or more, at the drillholes Nos. 3 and 4. Consequently, it was ascertained that mineralization of the skarn ore bodies including the main ore body No.1 is continued up to about 400m below the surface, thereby strengthening the possibility of the mineralization continuing further downward and south-southeastward.

3) Bulutkan district

(1) The geophysical prospecting confirmed five zones showing high resistivity structure and high IP values, similar to the Bulutkan deposit, in the Kokpatas Formation to the north of the syenodiorite stock.

(2) Drilling aimed at the lower extension of the Bulutkan deposit captured gold mineralization, at the drillholes Nos. MJUB-1 and -7, confirming that the mineralization is continued up to about 100m under the surface.

The ore body with gold mineralization is formed with silicified rocks accompanied by gossan, fine-grained quartz veins and chalcedony in the upper portion, whilst the lower portion comprises skarn ore bodies accompanied by sulfide veins.

(3) The drilling, aimed at the lower part of the Bulutkan deposit, seized relatively high-grade and continuous gold mineralization: Au grade of 2.8g/t at the drillhole MJUB-1 between the depths of 86.0-88.0m (true width 1.1m) ; Au 4.3g/t at MJUB-7 between 0.0-10.4m (true width 5.5m) ; and, Au 21.2g/t at the same drillhole between 36.1-51.0m (true width 7.9m). Outside of the Bulutkan deposit, Au 2.3g/t and Ag 36.1g/t were confirmed at MJUB-3 between 82.0-84.0m (true width 1.6m).

(4) At the trench T-2, for exploring the upper part of the Bulutkan deposit, relatively high-grade and continuous gold mineralization was confirmed : Au 11.7g/t between 228.4-248.6m (true width 19.0m), Au 7.0g/t between 252.1-253.4m (true width 1.2m) and Au 2.4g/t between 260.2-264.3m (true width 3.9m).

(5) Measurement of the homogenization temperature of fluid inclusions of quartz veins and chalcedony revealed that the samples collected from trenches at the Bulutkan deposit and near the gold showing zones show a range of 150°C-250°C whilst samples taken from skarn or syenodiorite range from 250°C-350°C. Drilling core samples taken from the zones where gold mineralization is overlapped with skarnization range

from about 150°C to 330°C. From these results, it is therefore presumed that the quartz veins were formed through more than one stage and the gold mineralization was accompanied by the late-stage, low temperature quartz.

(6) Geochemical anomalies at this district were recognized near the main mineralization zone confirmed by the trenching survey, the fracture zones and the dikes, and also in the syenodiorite body near the border with the Kokpatas Formation.

(7) The second year's survey revealed that indications of mineralization continuously appear in zones near the north side of the syenodiorite stock extending in the WNW-ESE direction, which suggests high potentials of occurrence of ore deposits similar to the Bulutkan deposit.

For the Phase III, the following survey is recommended.

(1) Trenching and drilling survey aimed at the east-west extension of the Bulutkan deposit.

(2) Geophysical prospecting by the TEM method, plus trenching and drilling survey, aimed at the area where the Kokpatas Formation occurs and occurrence of ore deposits similar to the Bulutkan deposit may be expected, within the zones alongside of the northern side of syenodiorite body extending in the WNW-ESE direction.

(3) Drilling survey aimed at the southeast extension, at the depths of 300-400m under the surface, of the No.1 ore body of the Sautbay deposit.

(4) Working out of conceptual mine development plan for the Sautbay-Burgut deposit and the Saghinkan deposit.

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PART I : GENERALITIES

Chapter 1 Introduction

1-1 Antecedents of the Survey

The subject survey of mineral resources in the Eastern Bukantau Area of the Republic of Uzbekstan is conducted by the Japanese Government at the request of the Uzbek Government, in conformity to the Scope of Work agreed to between the two governments on August 10, 1994.

The survey is intended to clarify the geological conditions and mineral resources in the mentioned area, to formulate exploration principles and to reassess the known ore deposits, thereby helping development of the mineral industry of the host country. It is also aimed to promote technological transfer to the host nation's organizations through the collaborative survey.

The first year's survey comprised the satellite imagery analysis covering an area of 5,200km^2, collection and analysis of mineral resources-related data and the ground truth over 1,800km^2 in the selected districts within the designated area of survey.

The second year's survey consisted of geological survey over an area of 170km^2 at the Sautbay-Bulutkan district and drilling survey at the Sautbay district (4 boreholes totaling 1,509.9m), as well as trenching survey (10 trenches totaling 6,300m), geophysical survey over 1.8km^2 and drilling survey (7 boreholes totaling 1,011.0m) at the Bulutkan district.

As regards the Saghinkan deposit adjacent to the northwestern part of the Sautbay deposit in the survey area, ore reserve estimation was made for the purpose of reevaluation of the ore deposit.

1-2 Conclusions and Recommendations of the Phase I Survey

1-2-1 Conclusions

Conclusions of the Phase I survey may be summarized as follows:

(1) From within the survey area, 24 districts were picked out as the districts of ore deposits or showings of tungsten, gold, silver and copper. The Karashakh and Kokpatas Formations -- both Proterozoic -- as well as the Devonian ~ Carboniferous Systems constitute the host rock of the mineralization in the area. The mineralization is presumably related to activities of granitic rocks intruding in the Late Carboniferous ~

Early Permian and to the faults and fractures with the NW-SE, NE-SW and NNW-SSE trends.

(2) Of the selected 24 districts of ore deposits and showings, worthy of further investigation are the Sautbay deposit (W) and the Bulutkan showings (Au).

(3) Ore reserve estimation of the Sautbay-Burgut deposits (W) indicated that, in case the cut-off grade is 0.05% WO_3, the total ore reserves of the both deposits come to 25,885,000t, averaging 0.27% WO_3 and 0.24g/t Au, of which a planned open-pit area (up to 150m below the surface) has ore reserves of about 2,600,000t averaging 0.35% WO_3 and 0.13g/t Au. The WO_3 grades of both deposits are considerably lower than those of the operating skarn-type tungsten mines in the western countries.

(4) From the interpretation of the satellite imagery, the area was divided into 18 geological units. The ground truth ascertained that the rock divisions in the geological interpretation map reflects the lithologic characters; the survey method proved to be effective in grasping regional geology and geological structure.

(5) The spectrum analysis resulted in extraction of 17 areas as alteration zones. The ground truth indicated the possibility that the alteration zones extracted by the imagery analysis are those related to high sulfide-type gold mineralization.

1-2-2 Recommendations

Based upon the conclusions of the first year's survey, the following recommendations were made in relation to the second year's survey:

(1) As regards the Sautbay-Burgut deposits, drilling survey aimed at the No.1 orebody, an immediate exploration target, about 300m under the surface would be carried out.

As for the Saghinkan deposit(W) adjacent to the northwestern part of the Sautbay deposit, reference data would be collected and analysed for the purpose of ore reserve estimation.

In the final fiscal year, ore reserve calculation would be effected, as well as preliminary feasibility study for overall development of the Sautbay-Burgut-Saghinkan deposits.

(2) . As to the Bulutkan mineral showing district, drilling survey would be carried out to examine the shape, structure and mineral composition of an ore deposit, in which some gold concentration has been ascertained, as well as its continuity to the depth of more than 70m, in preparation for future exploration.

Besides, trenching survey and geophysical survey would be carried out to ascertain horizontal and vertical extension of the mineralization.

(3) Of the 17 alteration zones extracted by the satellite imagery analysis, four zones are located in the Sautbay-Bulutkan area while Okjetpes area includes five zones. To examine mineralization potentials in these districts, verification survey would be conducted.

1-3 Outline of the Phase II Survey

1-3-1 Survey area

The Eastern Bukantau Area is situated southeast of the Bukantau range in the central Kizil-kum desert. Based on the first year's survey recommendations, the second year's survey was implemented within the area of 170km² which includes Sautbay and Bulutkan districts (Fig. I-1). The survey area is located some 500 straight-line kilometers WNW of Tashkent. The area is gently inclined hilly country protruding in a flat desert, having the altitude of 300-600m above sea level.

1-3-2 Purpose of survey

In the Sautbay district, it was planned to carry out : ① drilling survey to examine mineralization in the portion below the planned open-pit site of the skarn-type tungsten deposit, thereby clarifying continuity of the mineralization into deeper part, as regards the Sautbay-Burgut deposits, and ② sorting out and analysis of collected data for ore reserve estimation and reassessment of the ore deposit, as regards the Saghinkan deposit.

In the Bulutkan district, it was planned to carry out : ① drilling survey to examine mineralization in the deeper part of the gold deposit accompanying the silicified veins of the Bulutkan deposit, ② trenching survey to study metallogenic character of the gold mineralization and also to ascertain its horizontal extension; and ③ geophysical survey (TEM method and TDIP method) to check resistivity structure and chargeability in a deeper portion, thereby examining vertical distribution of the gold mineralization zone.

In both districts, geological survey is to be carried out to clarify the geology and the relationship between geological structure and mineralization so that promising mineral occurrence areas may be extracted.

Results of all these surveys are to be subjected to overall study for formulating recommendations for the third fiscal year.

1-3-3 Methods of survey

(1) Analysis of reference data

As regards the Saghinkan deposit adjacent to the northwestern part of the Sautbay deposit in the survey area, ore reserve estimation was made for the purpose of reassessment of the ore deposit, using the Western method. For this estimation, a computer software (microLYNX Plus), which is fit to ore reserve calculation of skarn-type and vein-type deposits, was utilized in continuation from the preceding year.

Collection of data was undertaken at the State Committee of Geology & Mineral Reserves and the Kokpatas Expedition, whilst their analysis was done in Japan.

(2) Geological survey

In the survey area(170km^2) including the Sautbay and Bulutkan districts, geological survey was conducted. Table I-1-3-1 indicates the survey quantity. A base camp for the survey was set up at the Kokpatas Expedition base.

For the survey, a route map was prepared, utilizing a topographic map enlarged from a scale of 1/50,000 to 1/25,000. Especially important outcrops were sketched with 1/100 - 1/200 scales and photographed in color. The survey results were recorded on a 1/50,000 geological map.

In the Bulutkan district, trenching survey was carried out along 10 survey lines to verify the geology and mineralization. Table I-1-3-1 indicates the quantity of survey. After observation of the geology and mineralization, trenching sketches, with a scale of 1/1,000 for the entire work area and 1/100 for the ore showings were prepared. In parallel with the geological survey, various types of sampling in the quantity indicated in Appendix 2-1 was conducted, as well as laboratory tests.

(3) Geophysical survey

In the Bulutkan district, geophysical survey in the quantities indicated in Table I-1-3-1 was carried out in order to examine distribution of blind gold mineralization zones. The survey equipments were transported from Japan except some consumables. A base camp for the survey was placed at the Kokpatas Expedition base.

For the survey, the TEM method was employed with a view to verifying the resistivity structure up to the depth of 150-200m and to extract resistivity distribution related to the mineralization. For examination of high chargeability distribution, which is considered to reflect mineralized zones accompanied by sulfides, the TDIP method was applied.

With the TEM method, measurement was done on the 10 survey lines at 250-m intervals and some supplementary lines totaling not less than 10km, of which six survey lines totaling not less than 6km were measured with the TDIP method.

From the drill cores of the Bulutkan district, rocks and ores of the quantities shown in Appendix 2-1 were collected for the measurement of resistivity and chargeability.

(4) Drilling survey

In the Sautbay and Bulutkan districts, drilling survey in the quantity shown in Table I-1-3-1 was performed. The drilling work was undertaken by a local drilling contractor under the supervision of a drilling engineer sent from Japan.

After core observation and photographing of drill cores obtained, various sampling in the quantities indicated in Appendix 2-1 was conducted, as well as the laboratory tests. Core observation results were recorded in geologic core logs with a 1/200 scale.

1-3-4 Organization of survey team

(1) Survey team

Japan		Uzbekistan	
Name	Entity	Name	Entity
Katsuji Fukumoto (Leader)	MINDECO	Remir V. Tsoi (Coordinator)	SCG
Haruo Harada (Geologist)	MINDECO	J. R. Karimov (Coordinator)	SCG
Nobuhiko Yamamoto (Drilling engineer)	MINDECO	S. Musaev (Coordinator)	SCG
Kazuhiko kinoshita (Geophysist)	MINDECO	N. A. Akhmedov (Coordinator)	SKG
Mitsuyoshi Saito (Geophysist)	MINDECO	A. L. Ogarkov (Geologist)	SCG
Masaki Kinemuchi (Geophysist)	MINDECO	N. E. Kozarez (Geologist)	SCG
		A. T. Zakirov (Geologist)	SCG
		V. F. Gbizdon (Geologist)	KE
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		I. Shaimardanov (Technical engineer)	SCG
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MMAJ: Metal Mining Agency of Japan

SCG: State Committee of Geology and Mineral Reserves

SKG: Samarkandgeology

KE: Kokpatas Expedition

MINDECO: Mitsui Mineral Development Engineering Co., Ltd.

(2) Field inspection

Junichi Tominaga MMAJ

Hirofumi Ono MMAJ Almaty Office

1-3-5 Period of survey

	1995							1996	
	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Planning, Preparation		8							
Field survey		9					23		
Tests and analysis				1					15
Compilation of Report							24		29

Table I-1-3-1 Outline of the Survey

Items	Quantity
Analysis of existing data (Saghinkan deposits)	Ore reserves estimation in Japan; 1 geologist 45 days
Geological survey (Sautbay-Bulutkan district)	Survey Area ; 170 km² Length of route ; 94.8km
(Bulutkan district)	Trench works ; T- 1 600 m T- 2 800 m T- 3 650 m T- 4 650 m T- 5 550 m T- 6 500 m T- 7 550 m T- 8 550 m T- 9 650 m T-10 800 m Total length 6,300 m
Geophysical survey (Bulutkan district)	TEM method ; Total length of lines 10 km Total number of lines 10 lines Total number of stations 605 stations TDIP method ; Total length of lines 6 km Total number of lines 6 lines Total number of stations 312 stations
Drilling survey (Sautbay district)	Hole No. Length Dip Direction MJUS-1 352.0m -75° S 60° W MJUS-2 426.5m -75° S 60° W MJUS-3 381.4m -75° S 60° W MJUS-4 350.0m -75° S 60° W Total 4 holes, Total length 1,509.9m
(Bulutkan district)	MJUB-1 150.0m -75° S 16° W MJUB-2 200.0m -75° S 16° W MJUB-3 143.5m -75° S 35° W MJUB-4 130.0m -75° S 30° W MJUB-5 134.0m -76° S 5° W MJUB-6 153.0m -80° S 20° W MJUB-7 100.5m -80° S 16° W Total 7 holes, Total length 1,011.0m

Chapter 2 Geography of the Survey Area

2-1 Location and Accessiibility

The Eastern Bukantau Area is located southeast of the Bukantau range of hills in the central Kizil-kum desert. In administrative division terms, the area constitutes a part of Uchkuduk District of Navoi Region.

The area is situated some 500km in straight-line distance northwest of Tashkent, the national capital. The Kokpatas Expedition is placed in the central part of the area, which has the total population of approximately 1,200. The largest population center of the area is Uchkuduk located 30km west of the Kokpatas Expedition, between which there is an unasphalted road, an about 30-minute car ride.

Some 80km southeast of the area, Zarafshan is located; 28km east of Zarafshan, there is the Muruntau gold mine and gold extraction complex.

Tashkent and Uchkduk are connected by three air-flights a week, which takes about 80 minutes. A road from Tashkent to Kokpatas via Samarkand, the ancient capital, has a distance of about 820km and takes some 10 hours by car (Fig. I-2).

2-2 Topography and Drainage Syetems

The Bukantau range lies in a low range of hills, 230km long and 30-50km wide, protruding through the Kizil-Kum desert in the WNW-ESE direction. The highest point, alt. 750m above sea level, is located near Kulkuduk in the western side of the range. The altitude of the range diminishes eastward. The Sautbay deposit area, alt. 200-300m, is located in the east side of the range, having gently undulating topography.

The area has no water system with constant flow of water but there are a number of dried stream beds where water flow is occasionaly seen when it rains in spring or fall. The water systems represent dendritic or parallel patterns stretching in the NNE direction.

2-3 Climate and Vegetation

The area has the typically continental climate, characterized with dry, hot summer and windy, cold winter. The annual average temperature is 14.7°C. The monthly average temperature comes to the lowest, -1.2°C, in January when the minimum temperature of -30°C has been recorded. July is the hottest month when the temperature is 31.2°C in average and 45°C at the maximum (Table I-2-2-1).

The annual average precipitation is 118mm whereas the humidity varies widely between 18% and 74%.

March - April	40-48%
May - August	18-24%
September - November	27-38%
December - February	61-74%

Northeasterly winds are dominant, with occasional northwesterly and southerly. The annual average wind speed is 6m per second while the maximum is 35m. Sand storms are frequent.

Owing to the desert climate, the area has unique vegetation which is closely related to types of soil. In a hilly area covered by earth and sand, a variety of annual and perennial grasses are flourishing, as well as mushrooms in springtime, whilst various deep-rooted shrubs are observed in a flatland covered by aeolian sand.

Table I-2-2-1 Mean Monthly and Annual Temperature (℃) in the Eastern Bukantau Area

Year	Mean Monthly											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1969	-13.4	12.9	3.4	14.6	14.6	28.6	29.5	27.0	21.5	13.2	6.0	4.6
1970	-5.6	3.4	7.0	17.4	24.2	27.7	—	—	21.7	—	5.7	-2.9
1971	-3.8	-0.7	8.6	13.5	22.4	27.7	30.6	27.2	22.9	15.2	10.0	4.4
1972	9.3	8.8	3.1	15.2	20.3	27.9	28.7	25.9	21.2	14.3	8.4	-2.4
1973	-5.5	2.7	6.4	16.3	22.1	29.8	31.3	28.8	18.8	13.2	7.8	0.4
1974	6.0	-6.2	6.4	14.0	24.4	28.7	31.2	26.2	21.2	15.2	7.1	-3.4
1975	0.1	-1.1	8.2	17.9	22.9	29.2	32.7	29.1	22.9	12.2	2.4	1.3
1976	3.2	-4.9	3.6	16.2	23.5	28.4	31.4	30.8	21.2	9.6	1.4	-4.1
1977	1.1	1.2	9.9	19.1	24.7	38.2	30.7	27.9	22.8	11.2	7.2	0.5
1978	-1.8	-5.1	5.0	16.0	20.3	26.9	30.9	26.4	24.3	13.1	4.2	—
1983	0.9	5.3	6.4	18.1	23.0	29.0	33.7	29.7	27.3	12.9	8.0	—
1984	—	—	5.8	—	20.9	28.7	33.7	—	24.0	13.7	5.7	—
1985	-3.6	3.9	4.6	17.5	23.0	29.9	31.3	26.0	22.0	11.0	3.7	—
1986	-2.3	1.8	3.0	15.1	23.3	27.3	30.7	27.6	27.6	24.1	12.8	4.5
Average	-1.2	1.7	5.8	16.2	22.1	29.1	31.3	27.7	22.8	13.8	6.5	0.3

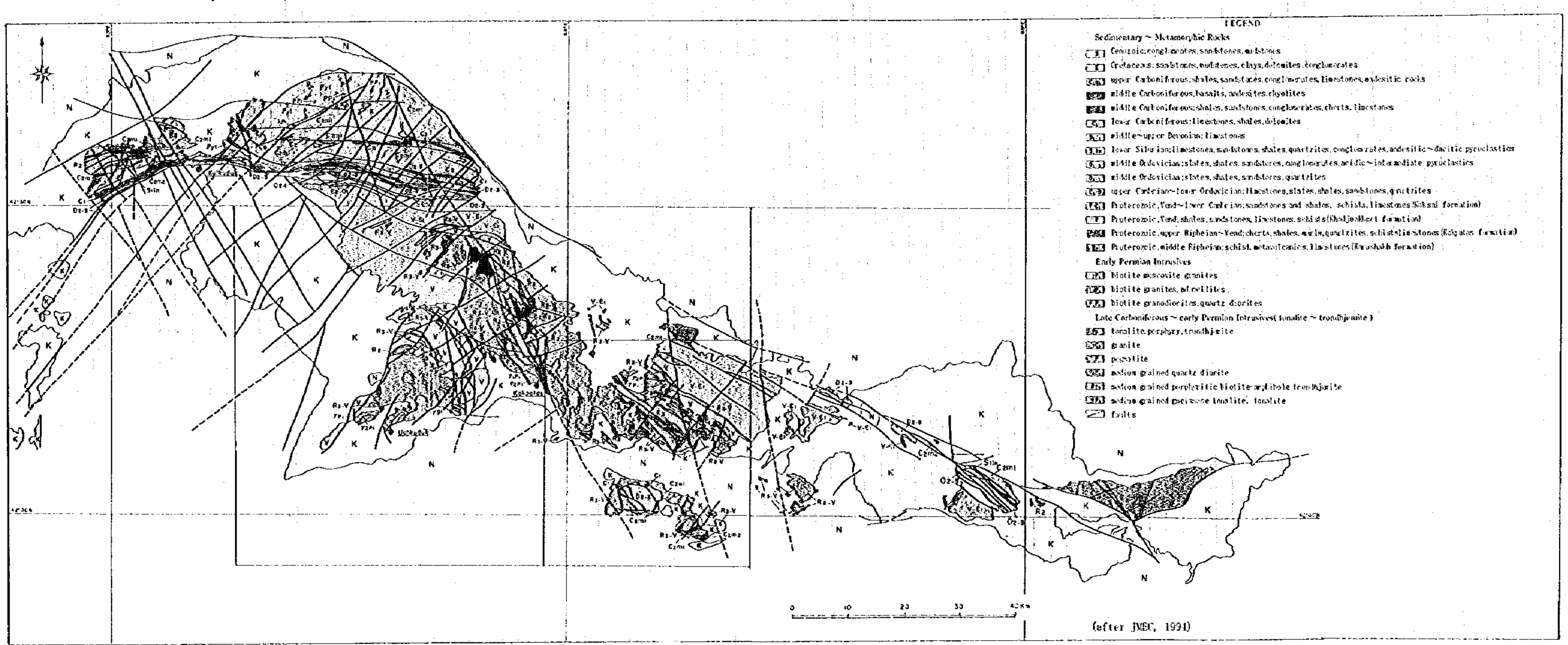


Fig. I-3-1-1 Geological Map of the Bukantau Region

Age			Formation	Thickness (m)	Geologic Column	Lithology
Cenozoic	Quaternary			<160		calcareous conglomerate
Cenozoic	Tertiary	Neogene Paleogene		<800		mudstones red sandstones conglomerates
Mesozoic	Cretaceous			<600		mudstones sandstones conglomerates
Paleozoic	Carboniferous	late	Saradar	50~100		sandstones,conglomerates
Paleozoic	Carboniferous	middle	Bostau	>200		basalts, andesites, rhyolite shales·sandstones
Paleozoic	Carboniferous	early	Okjetpes	>1,200		limestones sandstones shales dolomites cherts
Paleozoic	Devonian		Okjetpes			limestones
Paleozoic	Ordovician		Lupek			shales,sandstones acidic ~ intermediate pyroclastics
Paleozoic	Cambrian		Koksai	>500		alternations of shales and sandstones schists limestones
Proterozoic	Vendian		Khodjaakhmet	>500		shales,sandstones limestones,schists
Proterozoic	Riphean	end ~ late	Kokpatas.	>1,500		cherts, shales, dolomites marls,quartzites, schists sandstones limestones schists,limestones metavolcanics
Proterozoic	Riphean	middle	Karashakh (Cholcharatau)	600		

Fig. I −3−1−2 Schematic Geologic Column of the Eastern Bukantau Area

Chapter 3 General Geology

The Bukantau mountains are divided by North Bukantau Deep Fractures Zone into two zones : Northern Bukantau zone and Southern Bukantau zone.

The Eastern Bukantau Area is located in the Southern Bukantau zone.

Geology of Eastern Bukantau Area including the survey area is composed of the basement formation of Proterozoic Ripheian to Vendian Systems, strata of Paleozoic and Mesozoic and Cenozoic which unconformablly overlay on the basement formations.

Granitic rocks and dikes of Late Carboniferous to Early Permian intruded into the strata of Proterozoic and Paleozoic (Fig. I-3-1-1,2).

Geological structure of the Eastern Bukantau Area is characterized by an overthrust by which the strata of Paleozoic is overlain by the Proterozoic, Kokpatas Antiform and overfolding of Proterozoic Systems. The axis of Kokpatas Antiform is extending in NNW-SSE direction from Kokpatas to Okjetpes. A series of Lower Devonian to Carboniferous are exposed in the axis as a window.

Schist, chert, slate, dolomite, limestone and quartzite of Proterozoic age are distributed in the area of more than 50km in axial direction and 20km in transversal direction, surrounding the Paleozoic rocks.

The Proterozoic are divided into four formations: Karashakh, Kokpatas, Khodjaakhmet, and Koksai Formations in ascending order. Karashakh and Kokpatas Formations crop out in the survey area of this fiscal year.

Karashakh Formation consists mainly of schists and meta-volcanics with intercalation of quartzite, dolomite amd limestone. The total thickness is more than 500m.

The Kokpatas Formation is composed of sandstone, slate and quartzite intercalated by dolomite and limestone at the base which is overlain by thick sandstone accompanied by slate, quartzite, schist, limestone and dolomite. Its thickness reaches 1,000m or more.

Paleozoic rocks are correlated to the Silurian to Carboniferous in the Eastern Bukantau Area. However, they do not crop out in the survey area of this fiscal year.

Silurian rocks crop out in the narrow area southeast of Okjetpes, and consist of alternation of shale and sandstone. Middle Devonian to Lower Carboniferous rocks expose mainly in the north of the Kokpatas, and Okjetpes areas, and consist mainly of limestone and dolomite. Continental sedimentary rocks of Middle Carboniferous age crop out on the flanks of the Kokpatas Antiform, consisting of shale, sandstone, schist and phyllite.

Total thickness of the Paleozoic rocks are estimated to be more than 1,200m.

Cretaceous to Quaternary sediments crop out widely in the survey area, overlying discordantly Proterozoic to Paleozoic formations. Cretaceous sediments are the marine sediments consisting of mudstone, and sandstone, and Quaternary sediments are the continental sediments consisting of silt, sand, gravel and gypsum.

In the survey area, stocks and dikes of granodiorite, syenodiorite, aplite, diorite, lamprophyre snd porphyrite of the Late Carboniferous ~ Early Permian intrude into the Proterozoic snd Paleozoic.

The prominent directions of faults in the survey area are NW-SE, NE-SW and NNW-SSE, represented by the North Sautbay Fault (NW-SE), South Sautbay Fault (NW-SE), Okjetpes Fault (NW-SE) and the West Sautbay Fault (NE-SW).

Proterozoic rocks in the survey aera underwent regional metamorphism of Baikal orogenic movement at the end of Proterozoic age. Pre-Permian rocks underwent more or less contact metamorphism by Carboniferous to Permian intrusive rocks.

The regional metamorphism shows green schist facies dominantly. Metamorphic rocks are characterized by development of schistosity and quartz veins, recrystallization and occurrence of porphyroblasts. They consist mainly of chlorite, epidote, sericite, amphibole, carbonate minerals, albite and quartz.

The contact metamorphism shows amphibolite facies and the pelitic hornfels occurs in the area up to 2,000m from the contact.

Skarnization often occurs at the contact zone of intrusive rocks and surrounding sedimentary rocks. The skarns are mainly composed of hedenbergite, diopside, tremolite-actinolite, wollastonite with small amount of grossular.

Eastern Bukantau metallogenic zones are characteristic of tungsten and gold-silver mineralization together with copper and molybdenum. Wide spread tungsten occurrence is quite characteristic. At the early and latest stages of Hercynian orogeny in parallel with thermal metamorphism and batholithic granitic magmatism in the Eastern Bukantau Area, stockwork gold-silver quartz vein, tungsten quartz vein and tungsten skarn deposits were formed.

The Sautbay deposit (W) is situated in the survey area. And Burgut and Saghinkan ore deposits (W) which are adjacent to the Sautbay deposit, snd Bulutkan deposit (Au) are also known in the survey area.

Chapter 4 Overall Analysis of the Survey Results

4-1 Relationship of Geology and Geological Structure to Mineralization

1) Sautbay district

The skarn-type tungsten deposit at the Sautbay district occurs at the contact zone of the intrusive granodiorite body with the carbonate rocks in the Proterozoic. The Sautbay stock of granodiorite intrudes along the core of the Sautbay Anticline, whilst, on the surface, several granodiorite bodies are distributed in the NW-SE direction. The Sautbay intrusive rock body has been considered as one of the cupolas of the deep concealed South Bukantau batholith, being characteristic of numerous comb-like protrusions from the stock itself. The comb-like protrusions, together with the stock, played an important role in the formation of skarn.

The carbonate rocks which control the mineralization appear at various horizons at the Proterozoic and the mineralization extends over about 500m in the section, whilst the horizons, at which ore bodies are mainly controlled, are in the upper portion of the Karashakh Formation and in the lower portion of the Kokpatas Formation. The Sautbay-Burgut deposits are controlled mainly by the lower portion of the Kokpatas Formation, where some 20 skarn ore bodies are formed. The Saghinkan deposit is controlled by the upper portion of the Karashakh Formation where 14 skarn ore bodies have been confirmed.

The skarn ore bodies are stratiform, almost conformable with the bedding plane of the host rock.

The ore shoots are generally formed between 50 and 100m -- rarely 200m -- from the contact zones with the granodiorite body.

In addition to these stratiform ore bodies, stockwork-type tungsten mineralization consisting of veins-veinlets controlled by fractures develop mainly within granodiorite bodies, which has no economic value because of the low grades.

2) Bulutkan district

The Bulutkan deposit in the district is situated near the intersection of the North Sautbay Fault with the NW-SE trend and the faults with the NNW-SSE trend.

A Syenodiorite stock, 9km long and 3km wide, which controls the gold mineralization of Bulutkan deposit, intrudes along the southern side of the North Sautbay Fault. This suggest that the North Sautbay Fault controlled the syenodiorite intrusion. The Kokpatas Formation around the ore body is composed of sandstone, slate, quartzite, limestone and dolomite, as well as those metamorphosed from these rocks, such as hornfels, silicified rocks, silicified-skarnized metasomatite and skarn.

The upper portion of the ore body consists of silicified rocks accompanied by gossan, fine-grained quartz and chalcedony while the lower portion is a skarn ore body with gold mineralization accompanied by sulfide minerals. It has been clarified by the drilling and trenching surveys that the ore body strikes WNW-ESE and dips 70°N. The ore shoots are in the WNW-ESE direction, distributed in close relations with lamprophyre and syenodiorite dikes intruding in the same direction. These intrusive rocks and the ore body are considered to be controlled by a group of fractures which strike WNW-ESE and dip 65-70°N. The skarn ore body in the lower portion occurs at the intersection of the group of fractures with the horizon including carbonate rocks. Since the trenching survey results indicate that the carbonate rocks strike E-W ~ NE-SW and dip south, the bonanza presumably plunges in the ESE direction.

In other areas than the Bulutkan deposit, as well, most of the silicified rocks in the gold mineralization areas, as confirmed by this year's trenching survey, strike WNW-ESE, accompanied by dikes of lamprophyre, syenodiorite, etc. in the same direction. From this, it is presumed that the fractures with the WNW-ESE trend paralleling the North Sautbay Fault have certain relationship to the mineralization.

4-2 Characteristics of Mineralization

(1) Sautbay district

The main type of mineralization at this district is that of tungsten, as represented by the Sautbay-Burgut deposit and the Saghinkan deposit.

The deposits have two types of tungsten mineralization, one of which is a stratiform skarn ore body along carbonate rocks while the other is a stockwork ore body occurring in granodiorite stock, skarn, quartzite and hornfels.

Ores of the Sautbay deposit's skarn ore bodies are hornblende-clinopyroxene skarn accompanied by scheelite and hornblende-clinopyroxene-pyrrhotite skarn, containing pyrite, pyrrhotite, chalcopyrite and marcassite, rarely accompanied by bismuthinite, native bismuth, arsenopyrite, sphalerite, galena, chalcocite and covelline.

The stockwork ore bodies are composed of veins/veinlets of quartz and a small quantity of feldspar, accompanied by scheelite. They develop mainly in granodiorite and has little economic value as the tungsten mineralization is so weak.

Although the skarn ore bodies are accompanied by some gold, no auriferous minerals have been confirmed by the microscopic observation of the polished sections.

The fluid inclusions of two samples of quartz veins are those with vapor-liquid phases, and their homogenization temperatures are 110°C-346°C, distributed similarly to those of the Bulutkan district.

(2) Bulutkan district

The Bulutkan ore body with gold mineralization is composed of silicified rocks accompanied by gossan, fine-grained quartz veins and chalcedony in the upper portion while the lower portion comprises skarn ore body accompanied by sulfide ores. The mineral components of the silicified rocks in the upper portion are mainly quartz, chalcedony, natrojarosite, goethite, limonite and lepidochrocite, accompanied by pyrrhotite and gypsum. The skarn in the lower portion is hornblende-clinopyroxene skarn composed mainly of quartz, chlorite, pyrite, marcasite, pyrrhotite, arsenopyrite and chalcopyrite, containing small quantities of scheelite, epidote and garnet. The mineral composition resembles that of the skarn of the Sautbay deposit.

The auriferous mineral occurs in the form of native gold in quartz and chalcedony. The microscopic observation of the polished sections, however, confirmed no auriferous minerals in sulfide minerals such as pyrite in skarn with gold mineralization. In this case, the auriferous mineral might be extra fine-grained or might have substituted the internal texture of pyrite, etc.

Alteration of the host rock incudes silicification, pyritization and skarnization. Alteration zones are mainly quartz-sericite zones or sericite-chlorite zones, accompanied by small quantities of kaolinite and smectite.

During this fiscal year's survey, the homogenization temperature of fluid inclusions was measured of 36 trenching samples and 16 drilling core samples of the Bulutkan district. The samples are quartz in networks, quartz in veins/veinlets and chalcedony.

All the fluid inclusions exist in quartz crystals, mostly with vapor-liquid phases, while also existing are those with solid phase, presumably halite, and polyphasic fluid inclusions containing liquid-phase carbon dioxide. The homogenization temperatures of fluid inclusions range from 100°C to 378°C.

In case of trenching samples collected in the vicinity of the Bulutkan deposit and the gold showings near the syenodiorite body, the homogenization temperatures range from 150°C to 250°C, whereas those of samples taken from skarn or syenodiorite range from 250°C to 350°C. Drilling samples of the Bulutkan deposit taken from a zone where gold mineralization and skarnization are overlapped are in a range of 150°C-330°C. Samples taken from sedimentary rocks of the Kokpatas Formation away from the syenodiorite body tend to show a wide range from around 100°C to 300°C or higher. In general, fluid inclusions with solid phase occur in the vicinity of the syenodiorite body, whose homogenization temperatures often exceed 300°C. However, some occur in the Kokpatas Formation away from the syenodiorite body. Samples in which fluid inclusions containing liquid-phase carbon dioxide are observed also occur in or near the syenodiorite body.

Thus, the fluid inclusions may be classified into those of the homogenization temperatures ranging from 150°C to 250°C, those ranging from 250°C to 350°C, those in a wide range from 100°C to 300°C, and those with solid phase. From their distribution, it is presumable that those in a 150°C-250°C range are related with gold mineralization, while those with a 250°C-350°C range are with skarnization. However, the temperature ranges are not distinctively divided; in the case of the drilling core samples in a 150°C-330°C range, for example, gold mineralization and skarnization are presumably overlapped. The homogenization temperatures of the fluid inclusions related to the gold mineralization and skarnization at the Bulutkan district are similar to the temperature range of the other similar mineralization (Roedder, 1984). At a late stage of magma solidification, fluid with high concentration of salt is exuded, and fluid inclusions with solid phase are often observed around magma intrusion(Kilinc and Burnham, 1972; Holland, 1974); it may be considered, therefore, that the fluid inclusions produced from around the syenodiorite at the Bulutkan district might have been affected by such fluids. As regards those with solid phase in the Kokpatas Formation, the fossil marine water conceivably altered into fluid of high salt concentration, in view of the facts that their distribution is relatively far off from the syenodiorite and that they exist in sedimentary rocks. Since it is not necessarily deniable that the syenodiorite distribution was relatively shallow, however, there remains a possibility that they are ore-forming fluids similar to skarn. It is also possible that the fluid inclusions containing liquid-phase carbon dioxide were those exuded at the time of magma solidification.

In the light of these considerations, it is presumed that the quartz veins were formed through a number of stages and that the gold mineralization was accompanied by low-temperature quartz of a late stage.

In case of the Bulutkan deposit's ore body, it is highly likely that gold mineralization accompanied by low-temperature quartz was added subsequent to skarnization.

4-3 Relation between Geochemical Anomaly and Mineralization

(1) Sautbay-Bulutkan district (geological survey area)

It was clarified that the geochemical anomalies are concentrated in the two zones: ① the surroundings of the Sautbay intrusive rock bodies and of the accompanying dikes, and ② the surroundings of the Bulutkan syenodiorite body, the granitic rock body in the northeast of the survey area and of the dikes accompanying these rock bodies.

On the other hand, the mineralization of the deposits at Sautbay district and of the Bulutkan deposit is considered to be controled by the activities of intrusive rocks in the respective zones; therefore, the geochemical anomaly in the area is interpreted to correspond to an area of extension of the mineralization that formed these ore deposits. Since no correlations are recognizable between the elements of the geochemical anomalies and anomalous values of various elements are seen in narrow areas, a plural number of polymetallic mineralization of distinctive characters might have overlapped at the district.

(2) Bulutkan district

Geochemical anomalies at this district were recognized near the main mineralization zone confirmed by the trenching survey, the fracture zones and the dikes, and also in the syenodiorite body near the border with the Kokpatas Formation. The extracted anomalies are interpreted to indicate the main mineralization zones including the Bulutkan deposit, the mineralization zones accompanying the fracture zones and faults which develop in the area in the NW-SE ~ E-W directions, and the stockwork or disseminated mineralization zones in the periphery of syenodiorite body.

Apart from the main gold mineralization zones confirmed by the ore analysis, geochemical anomalies of gold are concentrated along the syenodiorite body; therefore, predominant gold mineralization is considered to have occurred alongside of the syenodiorite body.

4-4 Relation between Geophysical Anomalies and Mineralization

The TEM and TDIP surveys determined the resistivity structure to a depth of about 200m and the near surface IP character of the survey area.

The survey area can be divided into three distinct zones by its resistivity structure (Fig. I-4).

① The southern structural zone is composed mainly of medium to resistive layers from the surface to depth. This zone corresponds with the location of a syenodiorite body.

② The resistivity section in the central structural zone is conductive throughout. In some places there is overburden of medium to high resistivity at the surface. The lateral extent of this resistive overburden is limited and it ranges in thickness from 10 to more than 100 m. This structural zone is composed mainly of sandstone of the Kokpatas Formation.

③ In the northern structural zone the resistivity section consists of three resistivity layers. They are, from surface to depth, a conductive layer about 100 m thick, a very conductive layer and conductive layer at depth. The rocks in this area are mainly slate and limestone of the Kokpatas Formation.

In the southern structural zone, IP values are low (under 30 mV/V), but in the central structural zone there is an anomalous IP high (over 60 mV/V) which lies in a belt extending in the WNW-ESE direction. IP values change sharply at a the boundary of this anomaly.

In the southern structural zone, low IP values reflect the presence of syenodiorite bearing slight sulfide mineralization. The high IP values seen in the central structural zone are caused by sandstone with extensive silicification and pyritization. IP values are high at and around the intersection of the North Sautbay Fault which strike NW-SE and NNW-SSE fault. The sharp boundary between the IP low and high in central structural zone may indicate the north end of the syenodiorite body.

The geophysical survey revealed that the Bulutkan deposit is in the central structural zone near the southern structural zone and indicates high resistivity and high IP chargeability. The electrical section is resistive from the surface to depth with IP values of 40 to 50 mV/V.

Zones of prospective ore deposition, similar to the Bulutkan ore deposit, must fulfill the following conditions. In the central structural zone, prospective areas must be resistive or very resistive and IP chargeability values must be high (over 40 mV/V).

Therefore five resistive zones in the central zone have potential of bearing ore deposits like Bulutkan.

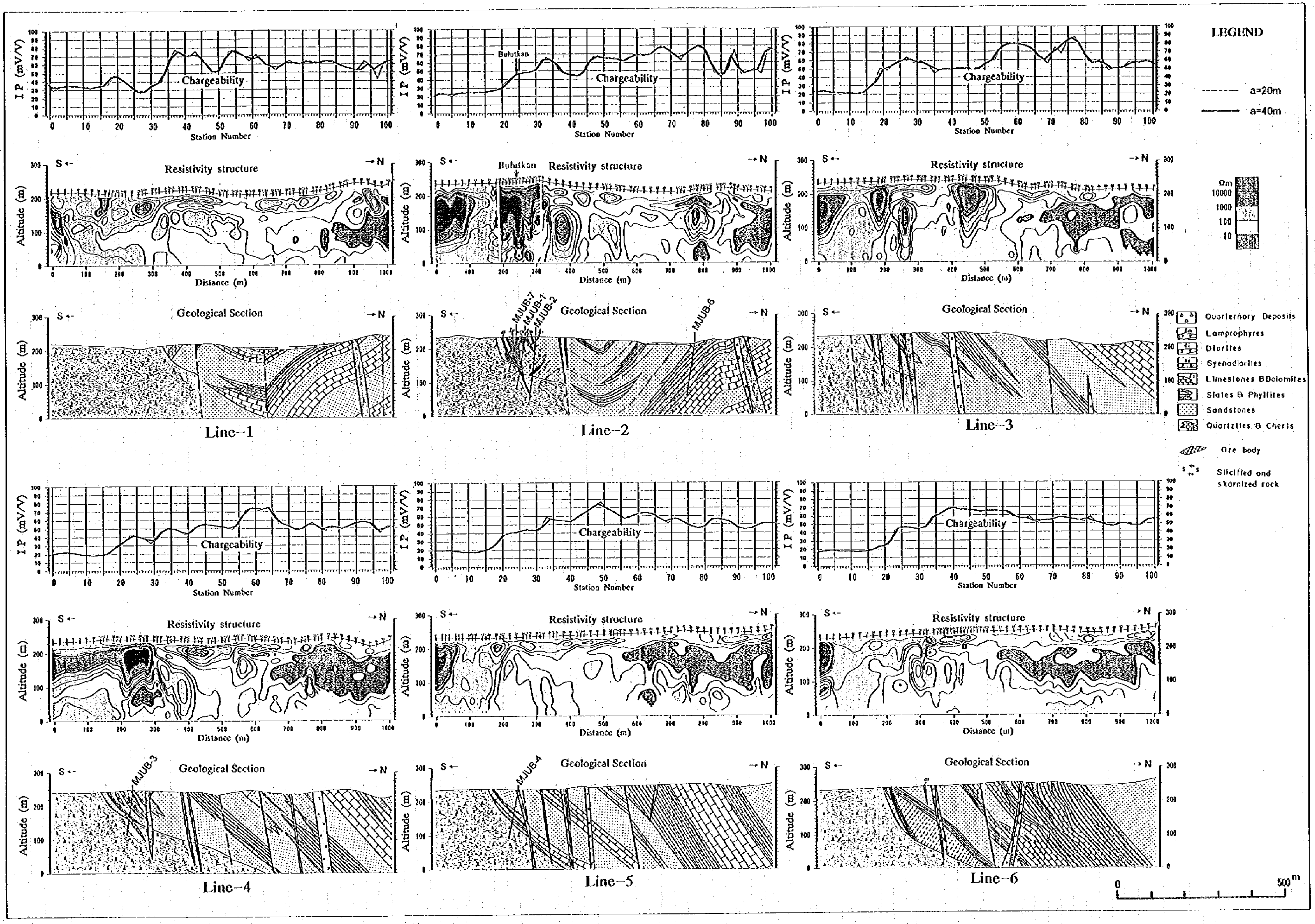


Fig. I-4 Relation between Geophysical Results and Geological Structure

4-5 Potentialities of Existence of Ore Deposits

The Eastern Bukantau Area is characterized by the tungsten and gold-silver mineralization accompanied by copper and molybdenum. Above all, the wide distribution of tungsten deposits and showings is distinctive. In the early and late Hercynian orogeny, magma activity of granitic rocks in batholith took place in the Eastern Bukantau Area, by which the stockwork gold-silver quartz veins, tungsten-quartz veins and tungsten-skarn deposits were formed with the hydrothermal activity.

As the result of analysis of the existing data during the Phase I survey, these ore deposits were classified into seven types: ①gold-bearing quartz veins, ②gold-silver-bearing quartz veins, ③gold-silver-copper-bearing quartz veins, ④silver-bearing quartz veins, ⑤tungsten-skarn deposits, ⑥tungsten-quartz stockwork deposits, and ⑦tungsten-gold-skarn deposits.

Economically viable ore deposits located in this year's survey area are the Bulutkan deposit with the gold-bearing quartz veins①, the Sautbay deposit and the adjacent Burgut and Saghinkan deposits, which are the tungsten-skarn deposits⑤.

1) Sautbay-Bulutkan district (geological survey area)

This fiscal year's geological survey ended without confirming no new ore deposits or showings to be added to the known deposits of Sautbay, Burgut, Saghinkan and Bulutkan.

Anomalous values in the rock analysis are mostly located in or near zones with high concentration of stocks and dikes. Mineralization is considered to spread over a wide zone, accompanying intrusive rocks, in the area centering around the Sautbay and Bulutkan districts. However, many of the ore samples were under the detection limits, and no ores of a significant grade were found.

It has to be concluded that, at this district, possibility is scanty for new discovery of an ore deposit or showing which may develop into a large-scale ore deposit.

2) Sautbay district

The drilling survey in this fiscal year ascertained that the mineralization of skarn ore bodies including the No.1 ore body is continued up to about 400m under the surface, at the zone southeast of the drillhole MJUS-2, which enhanced the possibility of the mineralization continuing further downward and south-southeastward. The past exploration seems insufficient especially in the area between the Sautbay and Burgut deposits and at the southeastern extension of the Burgut deposit. It appears highly likely that further drilling survey will result in seizing predominant ore bodies.

As to the low-grade, medium-size Saghinkan deposit, a substantial increase in ore reserves and grade is hardly expected even though drilling survey is conducted further.

3) Bulutkan district

It was ascertained by this year's drilling survey that the mineralization of the Bulutkan deposit is continued at least up to about 100m under the surface.

The bonanzas strike WNW-ESE and, the non-core drilling executed at their east-west extension have also confirmed gold indications; further drilling is likely to encounter predominant ore body in the east-west extension.

Apart from the mentioned Bulutkan deposit, a gold showing zone has been found at this district by trenching in the Kokpatas Formation near the north side of the syenodiorite stock. This year's geophysical survey also confirmed five zones which indicate high resistivity and IP values, similar to those of the Bulutkan deposit, to the north of the syenodiorite stock. It seems highly likely that future trenching and drilling survey will capture ore bodies similar to the Bulutkan deposit.

Chapter 5 Conclusions and Recommendations

5-1 Conclusions

Following are the conclusions by district based on this fiscal year's survey.

1) Sautbay-Bulutkan District (Geological Survey Area)

(1) The survey area is dominated by the Karashakh Formation and the Kokpatas Formation both pertaining to the Ripheian ~ Vendian Systems of the Proterozoic. From the Late Carboniferous to the Early Permian, granodiorite, syenodiorite and granitic rocks intruded into the Proterozoic in the form of stocks. These rock bodies are accompanied by numerous dikes of dioritic rocks, lamprophyre and syenitic rocks. In these strata and intrusive rocks, faults develop in the NW-SE, NE-SW and NNW-SSE directions.

(2) As regards the alteration zones around and to the west of Sautbay district, among those extracted by the spectral analysis of the satellite imagery in the first year, it was ascertained by the geological survey that they are formed with the Proterozoic, which are not those deriving from thermal process but reflecting the pyrite alteration zone accompanying diagenesis.

(3) This year's survey did not result in confirming occurrence of a new ore deposit or showings in the survey area, in addition to the known ore deposits at Sautbay (W), Burgut (W), Saghinkan (W) and Bulutkan (Au).

(4) Since the anomalies in the rock analysis are mostly located at or near the areas where stocks and dikes are concentrated, the mineralization is considered to extend over a wide area including the Bulutkan and Sautbay districts, accompanying intrusive rocks.

2) Sautbay District

(1) Ore reserves of the Saghinkan deposit (W) was estimated, for which a computer software (MicroLYNX Plus) for ore reserve calculation was used in continuation from the first fiscal year. As the result, the ore reserve turned out to be 16,320,000t averaging 0.24% WO_3 and 0.02g/t Au, in case of a cutoff grade at 0.05% WO_3.

In case of a cutoff grade at 0.1% WO_3, ore reserves come to 13,944,000t averaging 0.27% WO_3, which is larger in ore reserves but lower in average grade when compared to the Uzbek-side estimation of 12,710,000t averaging 0.32% WO_3.

The Saghinkan deposit is a medium-size ore deposit, whose ore grade is lower than that of the skarn-type tungsten mines operated since 1980 in the Western countries.

(2) The drilling survey at four drillholes aimed at the Sautbay deposit resulted in capturing a skarn ore body of more than 2m in true width, grading 0.30% WO_3 or more, at the drillholes Nos. 3 and 4. Consequently, it was ascertained that mineralization of the skarn ore bodies including the main ore body No.1 is continued up to about 400m below the surface, thereby strengthening the possibility of the mineralization continuing further downward and south-southeastward.

(3) Ores of the Sautbay deposit are hornblende-clinopyroxene skarn accompanied by scheelite and hornblende-clinopyroxene-pyrrhotite skarn, containing pyrite, pyrrhotite, chalcopyrite and marcassite, and rarely bismuthinite, native bismuth, arsenopyrite, sphalerite, galena, chalcocite and covelline.

3) Bulutkan District

(1) The TEM and TDIP surveys determined the resistivity structure to a depth of about 200m and the near surface IP character of the survey area.

The survey area can be divided into three distinct zones by its resistivity structure: Southern, central and northern structural zones.

IP values are low (under 30 mV/V) in the southern structural zone, while in the central zone there is an anomalous IP high (over 60 mV/V) which lies in a belt. IP values change sharply at the boundary of this anomaly. The sharp boundary between the IP low and high in central structural zone may indicate the north end of the syenodiorite body.

(2) The geophysical prospecting confirmed five zones showing high resistivity structure and high IP values, similar to the Bulutkan deposit, in the Kokpatas Formation to the north of the syenodiorite stock extending in the WNW-ESE direction.

(3) The drilling aimed at the lower extension of the Bulutkan deposit captured gold mineralization at the drillholes Nos. MJUB-1 and -7, confirming the continuous mineralization up to about 100m below the surface. It was also clarified that the ore

body strikes WNW-ESE and dips about 70°N.

The ore body with gold mineralization is composed of silicified rocks accompanied by fine-grained quartz veins and chalcedony at the upper portion, while the lower portion comprises skarn ore body accompanied by sulfide veins. The ore bodies assume the WNW-ESE strike and are distributed in close relations with dikes of lamprophyre and diorite intruding in the same direction.

(4) The mineral components of the Bulutkan deposit in its upper portion, are the silicified rocks composed mainly of quartz, chalcedony, natrojarosite, goethite, limonite and lepidochrocite, accompanied by pyrrhotite and gypsum, whilst the skarn in the lower portion is the hornblende-pyroxene skarn composed mainly of quartz, chlorite, pyrite, marcasite, pyrrhotite, arsenopyrite, chalcopyrite, containing small quantities of scheelite, epidote and garnet, the mineral composition being similar to that of the skarn in the Sautbay deposit.

The auriferous mineral occurs in the form of native gold in quartz and chalcedony.

(5) The homogenization temperature of the fluid inclusions of quartz veins and chalcedony ranges from 100°C to 378°C. Samples of the silicified rocks with gold mineralization collected at trenches show a homogenization temperature range of approximately 150°C-250°C, whereas samples taken from the skarn or syenodiorite have a higher range of 250°C-350°C. Portions where gold mineralization and skarnization are overlapped are in a range of about 150°C-330°C.

It is therefore presumable that the quartz veins were formed through more than a single stage and the gold mineralization was accompanied by a late-stage, low-temperature quartz. In case of the ore body of the Bulutkan deposit, it is highly likely that the gold mineralization accompanied by low-temperature quartz was added, subsequent to the skarnization.

(6) Relatively high-grade and continuous gold mineralization was confirmed by drilling aimed at the lower portion of the Bulutkan deposit: Au 2.8g/t at the drillhole MJUB-1 between the depths of 86.0-88.0m(true width 1.1m); Au 4.3g/t at MJUB-7 between 0.0-10.4m(true width 5.5m), and, Au 21.2g/t at the same drillhole between 36.1-51.0m(true width 7.9m). Outside of the Bulutkan deposit, Au 2.3g/t and Ag 36.1g/t were confirmed at MJUB-3 between 82.0-84.0m(true width 1.6m).

(7) Relatively high-grade and continuous gold occurence was confirmed at the trench T-2 aimed at exploring the upper part of the Bulutkan deposit: Au 11.7g/t between

228.4-248.6m(true width 19.0m); Au 7.0g/t between 252.1-253.4m(true width 1.2m); and, Au 2.4g/t between 260.2-264.3m(true width 3.9m). At the other trenches than T-2, no gold indication exceeding Au1.0g/t was confirmed. At T-3, T-6 and T-10, however, low-grade but relatively continuous gold mineralization was confirmed in the Proterozoic in the vicinity of the syenodiorite stock.

(8) Geochemical anomalies at this district were recognized near the main mineralization zone confirmed by the trenching survey, the fracture zones and the dikes, and also in the syenodiorite body near the border with the Kokpatas Formation.

(9) The second fiscal year's survey ascertained indications of continuous mineralization in the zone near the north side of the syenodiorite stock extending in the WNW-ESE direction, which suggests high potentials of occurrence of ore deposits similar to the Bulutkan deposit.

5-2 Recommendations for the Phase III Survey

For the Phase III, the following survey is recommended.

(1) Trenching and drilling survey aimed at the east-west extension of the Bulutkan deposit.

(2) Geophysical prospecting by the TEM method, plus trenching and drilling survey, aimed at the area where the Kokpatas Formation occurs and occurrence of ore deposits similar to the Bulutkan deposit may be expected, within the zones alongside of the northern side of syenodiorite body extending in the WNW-ESE direction.

(3) Drilling survey aimed at the southeast extension, at the depths of 300-400m under the surface, of the No.1 ore body of the Sautbay deposit.

(4) Working out of conceptual mine development plan for the Sautbay-Burgut deposit and the Saghinkan deposit.

PART II PARTICULARS

Chapter 1 Sautbay-Bulutkan District

1-1 Geological Survey

1-1-1 Purpose of survey

Within the area of 170km² indicated in Fig. I-1, geological survey was conducted for the purpose of ascertaining relationship between the geology/geological structure and the mineralization thereby extracting high potential areas of occurrence of ore deposits.

1-1-2 Methods of survey

Geological survey and lobroratory tests of collected samples were conducted. Quantities of the survey are recorded in Table I-1-3-1 while Appendix 2-1 shows the quantities of samples collected. The base camp for the survey was placed at the Kokpatas Expedition base, from where the survey team commuted to the survey site by car and conducted geological survey on foot.

For the geological survey, a route map was prepared based on a topographic map with a scale of 1 to 25,000, enlarged from three 1/50,000 topographic maps. The survey route were so determined that all the known lithofacies might be observed in the direction traversing the general strike of the geological structure (NW-SE). Along the routes, sketching, sample collection, photographing in color and ground truth of the first year's satallite imagery analysis were performed. A 1/50,000 geological map (Fig. II-1-1-1) was drawn on a basis of the geological survey findings. Anomalies in the rock chemical analysis are indicated in Fig. II-1-1-5. The locations of sample are shown in Fig. II-1-1-4, while the microscopic observation and photomicrographs of the thin sections are exhibited in Appendices 2-2 and 2-3, respectively.

1-1-3 Results of survey

1) Results of geological survey

The geological map and a geological cross section are respectively exhibited in Figs. II-1-1-1 and II-1-1-2, while a schematic geologic column appears in Fig. II-1-1-3.

Table II-1-1-1 shows ore deposits and showings in the survey area.

(1) Geology and geological structure

In the survey area, there occur the Karashakh and Kokpatas Formations of the Proterozoic Ripheian System ~ Vendian System, the Late Carboniferous ~ Early

Permian intrusive rocks which cut the formations, and the Cretaceous and Quaternary Systems unconformably overlying these.

In the Proterozoic and intrusive rocks in the area, faults in the NW-SE direction are conspicuously distributed, followed by those in the NE-SW and NNW-SSE directions. The West Sautbay Fault (NE-SW) in the west of the Sautbay district, the Okjetpes Fault (NW-SE) to the south, the South Sautbay Fault (NW-SE) in the south of the Sautbay district, and the North Sautbay Fault (NW-SE) extending from near the Bulutkan deposit to the north of Sautbay deposit are known as the main faults.

In the Karashakh and Kokpatas Formations, many small folds are visible at outcrops while large size folding structures are seen in the Sautbay Anticline (NW-SE or NNW-SSE) west of the Sautbay deposit, and also in a presumed anticline (NW-SE) in the northwest of the Bulutkan deposit. In the vicinity of the both anticlines, the lowermost part of the Karashakh Formation occurs. Generally, the Proterozoic strikes NW-SE, in the northeast side of the North Sautbay Fault which passes through the Bulutkan deposit, whereas, in the southwest side where the Sautbay deposit is situated, the strike varies from E-W to NW-SE and N-S depending on location.

The Karashakh Formation, more than 500m thick, is composed of green rocks of volcanic origin and schists accompanied by quartzite, dolomite and limestone. The formation extends from the northeastern part of the survey area to the Sautbay anticline near the Sautbay deposit and also along the NW-SE anticline axis and faults northeast of Bulutkan. The formation is considered to be conformably overlain by the Kokpatas Formation with partial interfingering. The Karashakh Formation is also considered to be distributed in the flatland to the south of the Sautbay deposit, overlain by the Cretaceous. On the surface, the two formations contact at faults in most cases.

The Kokpatas Formation is composed of sandstone, slate and quartzite intercalated by dolomite and limestone at the base, which is overlain by thick sandstone accompanied by slate, quartzite, schist, limestone and dolomite. Some of these rocks contain carbonaceous substances, turning black. This formation is widely spreading over the survey area and its thickness reaches 1,000m or more.

The Cretaceous is composed of semi-consolidated and marine mudstone, sandstone, dolomite and conglomerate. This formation unconformably overlies the Proterozoic. Those which have escaped erosion widely spread over the gently inclined lands. The thickness of the formation is estimated to be 80m or less.

The Quaternary comprises silt, sand, gravel and gypsum. This formation is distributed in most of valleys, stream beds and faltlands in thicknesses of 1 to 10m. Gypsum beds mingled with mud, about 1m thick, are frequently visible on flatlands.

In the survey area, syenodiorite, quartzdiorite, diorite, granite, granodiorite, lamprophyre and aplite are distributed, which are considered to have intruded into the Late Carboniferous ~ Early Permian. Among these rocks, those in stocks are represented by the granodiorite aligned in the NW-SE direction near the Sautbay deposit, syenodiorite, granodiorite and quartzdiorite near the Bulutkan deposit, and granite or granodiorite in the northeast part of the survey area.

To the north of the Sautbay-Saghinkan deposits and to the west and the south-southest of the Saghinkan deposit, numerous dikes of granodiorite, diorite and lamprophyre and a few syenodiorite dikes are distributed accompanying the granodiorite stocks near the Sautbay deposit. In the area between the syenodiorite body in Bulutkan and granite/granodiorite body in the northeast of the survey area, many dikes of lamprophyre, diorite and syenodiorite and rare rhyolite dikes accompanying these rock bodies, are observable.

(2) Ground truth of the satellite imagery analysis

Of the alteration zones extracted by the satellite imagery analysis in the first year, the geological survey revealed that zones around and to the west of the Sautbay deposit, composed of sandstone and slate disseminated with limonite of the Kokpatas and Karashakh Formations, are alteration zones not deriving from hydrothermal process but reflecting the pyrite alteration accompanying diagenesis.

2) Results of chemical analysis

The chemical analysis of ores and rocks are shown in Appendices 2-6(1) and 2-7(1), respectively.

(1) Analysis of ores

The ores are generally in low grades, many of which did not reach the detection limits. None of the ores showed significant grades.

(2) Analysis of rocks

Fig. II-1-1-5 demonstrates locations of anomalies by element of rock samples, as well as the distribution areas of intrusive rocks.

The anomalous values of analysis were determined in the following manner:

Of 91 samples, only 13 exceeded the detection limit of Au, all of which showed 10ppb. The value was used as the anomalous value of Au.

As for Ag, Cu, Pb, Zn, As and Mo, probability graphs of analysis values were made to obtain the thresholds, which were Ag 2ppm, Cu 150ppm, Pb 30ppm, Zn 100ppm, As 50ppm and Mo 10ppm. These values were used as the anomalous values of respective elements. As for Bi and W, all the samples were under the detection limits.

33 anomalous points were extracted, many of which are distributed in the vicinity of the Bulutkan deposit and the Sautbay-Saghinkan deposits. The areas where anomalous points are distributed coincided with the areas where stocks and dikes have developed. Besides the mentioned areas, the anomalies are distributed to the northeast of the Saghinkan deposit, to the north of the Bulutkan deposit, and also on the hill at the southernmost part of the survey area to the southwest of the Bulutkan deposit. Anomalous elements in the surrounding areas of the Bulutkan deposit were Au, Ag, Cu, Pb, Zn, As and Mo whilst those in the vicinity of the Sautbay-Saghinkan deposits were Au, Ag, Cu, Pb, As and Mo. Correlations between the elements are unclear.

1-1-4 Conclusive summary and consideration

The Proterozoic Karashakh and Kokpatas Formations are distributed in the survey area. From the Late Carboniferous to the Early Permian, intruded into the Proterozoic were granodiorite in the Sautbay deposit area, syenodiorite in the Bulutkan deposit area and granitic rocks in the northeast of the survey area. These rock bodies are accompanied by numerous dikes of dioritic rocks, lamprophyre and syenitic rocks. The dikes are continuously distributed in abundance, especially from the syenodiorite body of the Bulutkan deposit to the granodiorite body in the northeast part of the survey area. The fact is interpreted to indicate that a batholith-like rock body exists underground below the dike distribution area and that the both rock bodies are either very close to each other or continuous. In these strata and intrusive rocks, many faults develop in the NW-SE, NE-SW and NNW-SSE directions.

Ore samples are low in grades, no new ore deposits nor showings were confirmed.

In view of the fact that most anomalies in the analysis of rock samples are located at or near areas where stocks and dikes are concentrated, it is presumed that mineralization extends over a broad area surrounding the Bulutkan and Sautbay deposits, accompanying the intrusive rocks. Since no correlations between the elements are recognizable and anomalies of various elements are seen within a small area, a plural number of polymetallic mineralization of different characters have possibly overlapped in the area.

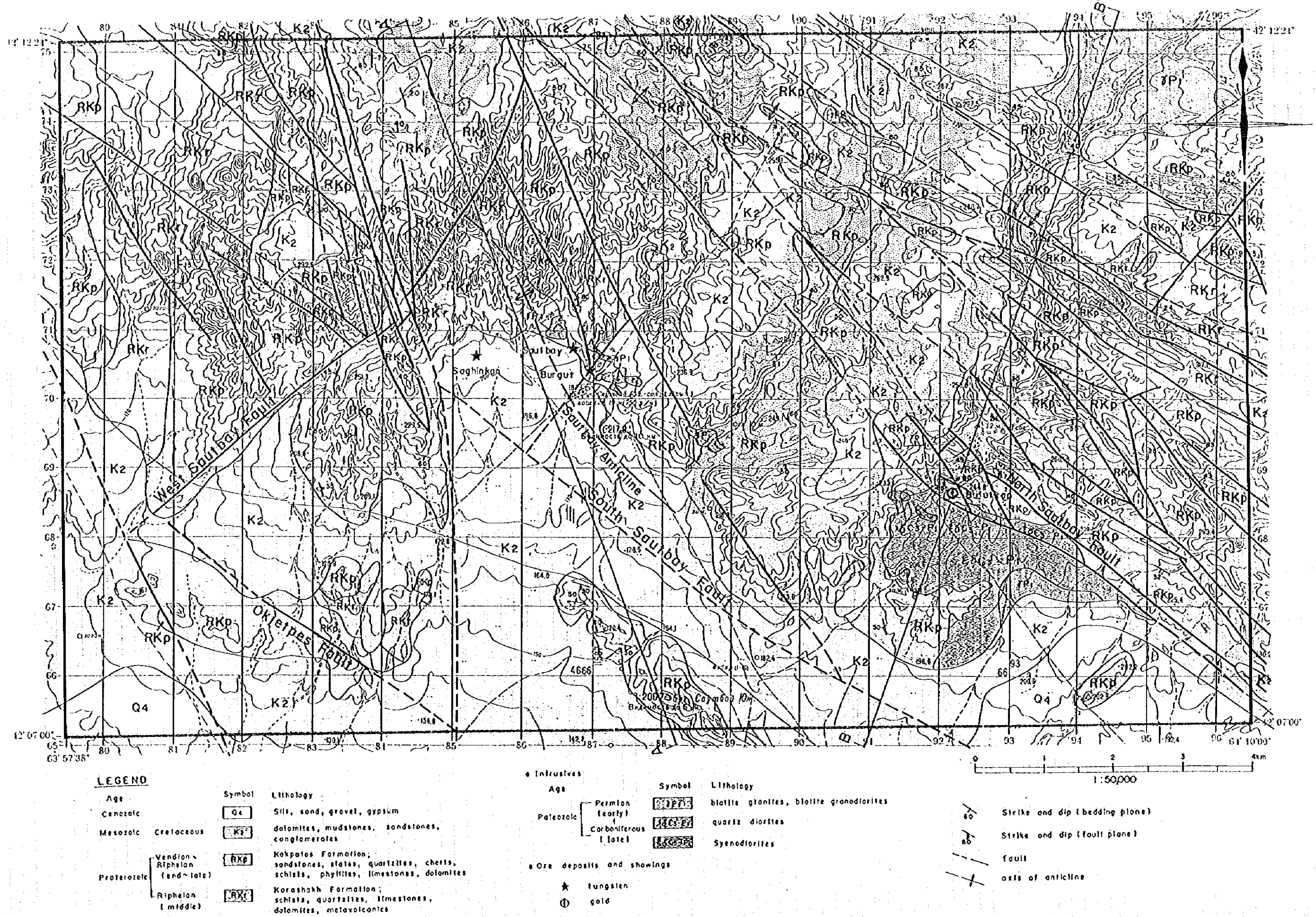
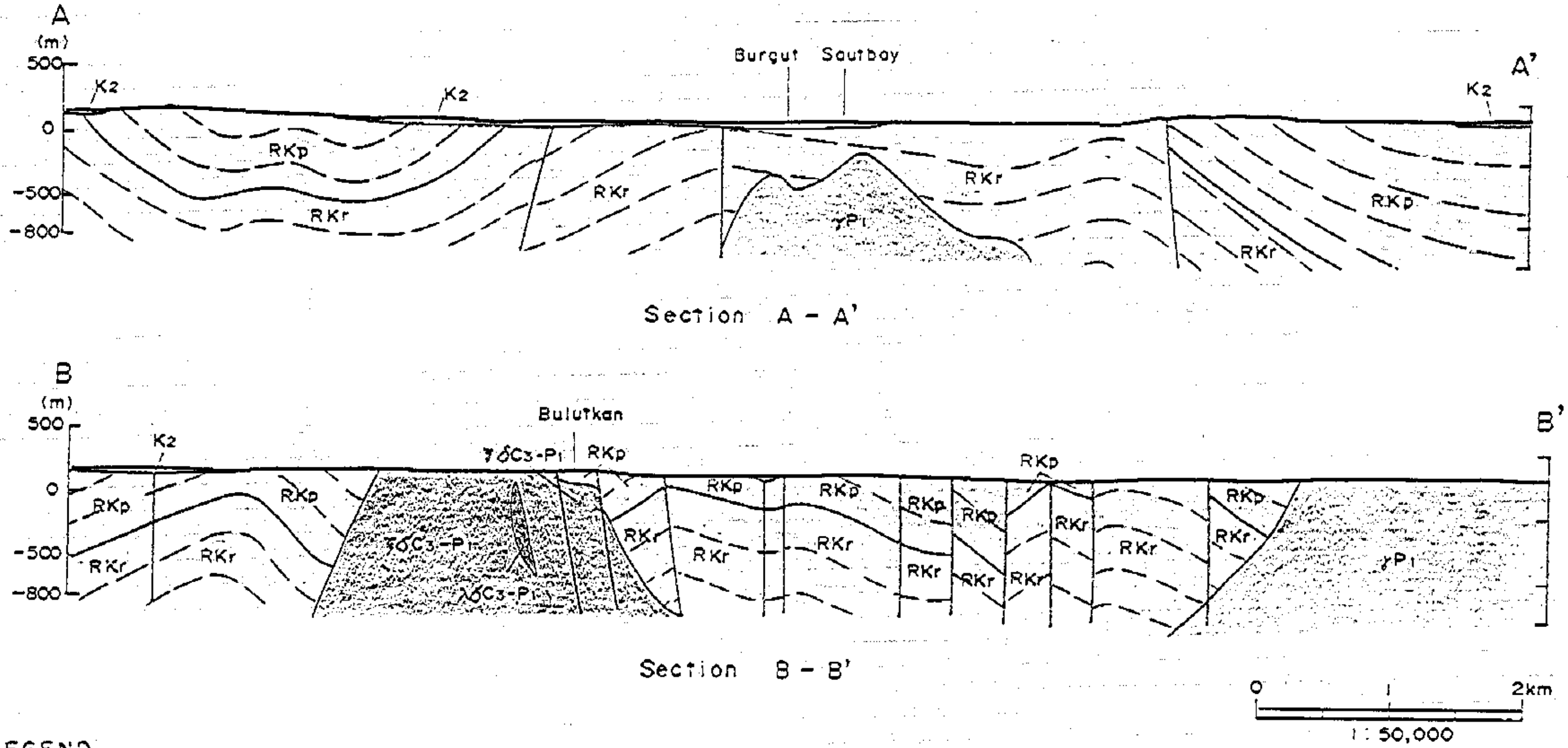


Fig. II-1-1-1, Geological Map of the Survey Area



LEGEND

Age		Symbol	Lithology
Mesozoic	Cretaceous	Kz	dolomites, mudstones, sandstones, conglomerates
Proterozoic	Vendian ~ Riphean (end ~ late)	RKp	Kokpatas Formation; sandstones, slates, quartzites, cherts, schists, phyllites, limestones, dolomites
	Riphean (middle)	RKr	Karashokh Formation; schists, quartzites, limestones, dolomites, metavolcanics

• Intrusives

Age		Symbol	Lithology
Paleozoic	Permian (early) ~ Carboniferous (late)	γP1	biotite granites, biotite granodiorites
		γδC3-P1	quartz diorites
		λδC3-P1	Syenodiorites

Fig. II−1−1−2 Geological Cross Sections of the Survey Area

Age			Formation	Thickness (m)	Geologic Column	Lithology
Cenozoic	Quaternary			< 10		silt, sand, gravel, gypsum
Mesozoic	Cretaceous			< 80		dolomites mudstones sandstones conglomerates
Proterozoic	Vendian		Kokpatas	>1,000		sandstones, slates quartzites, cherts schists, phyllites limestones, dolomites
	Ripheian	end ∫ late				schists, quartzites limestone, dolomites metavolcanics
		middle	Karashakh	> 500		

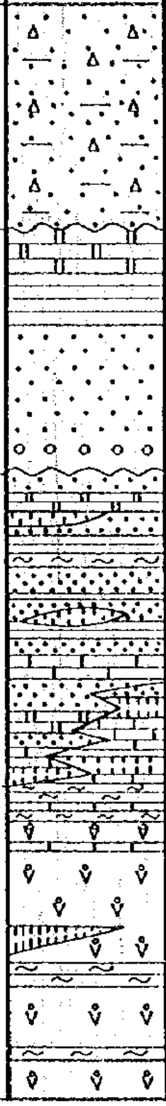
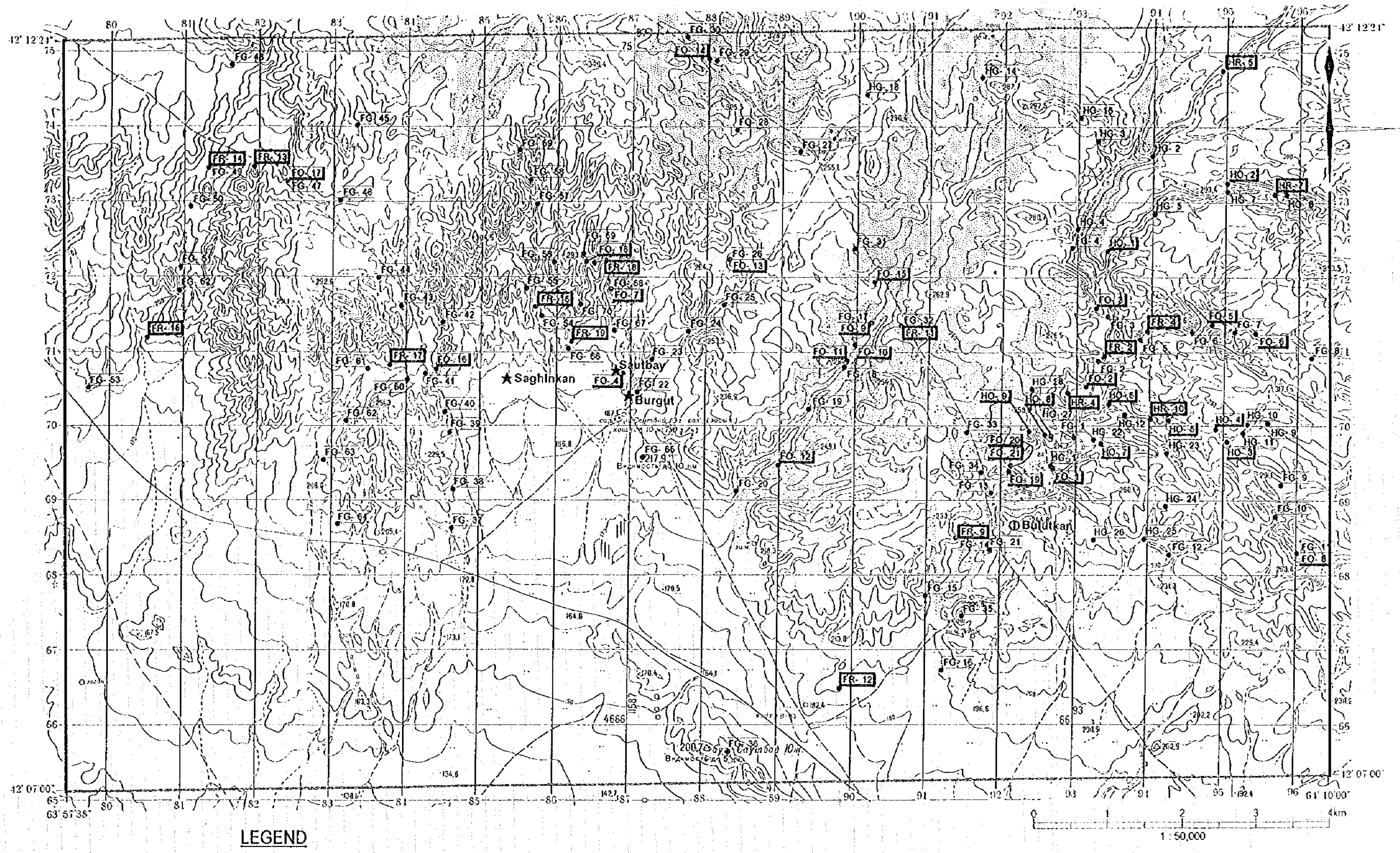


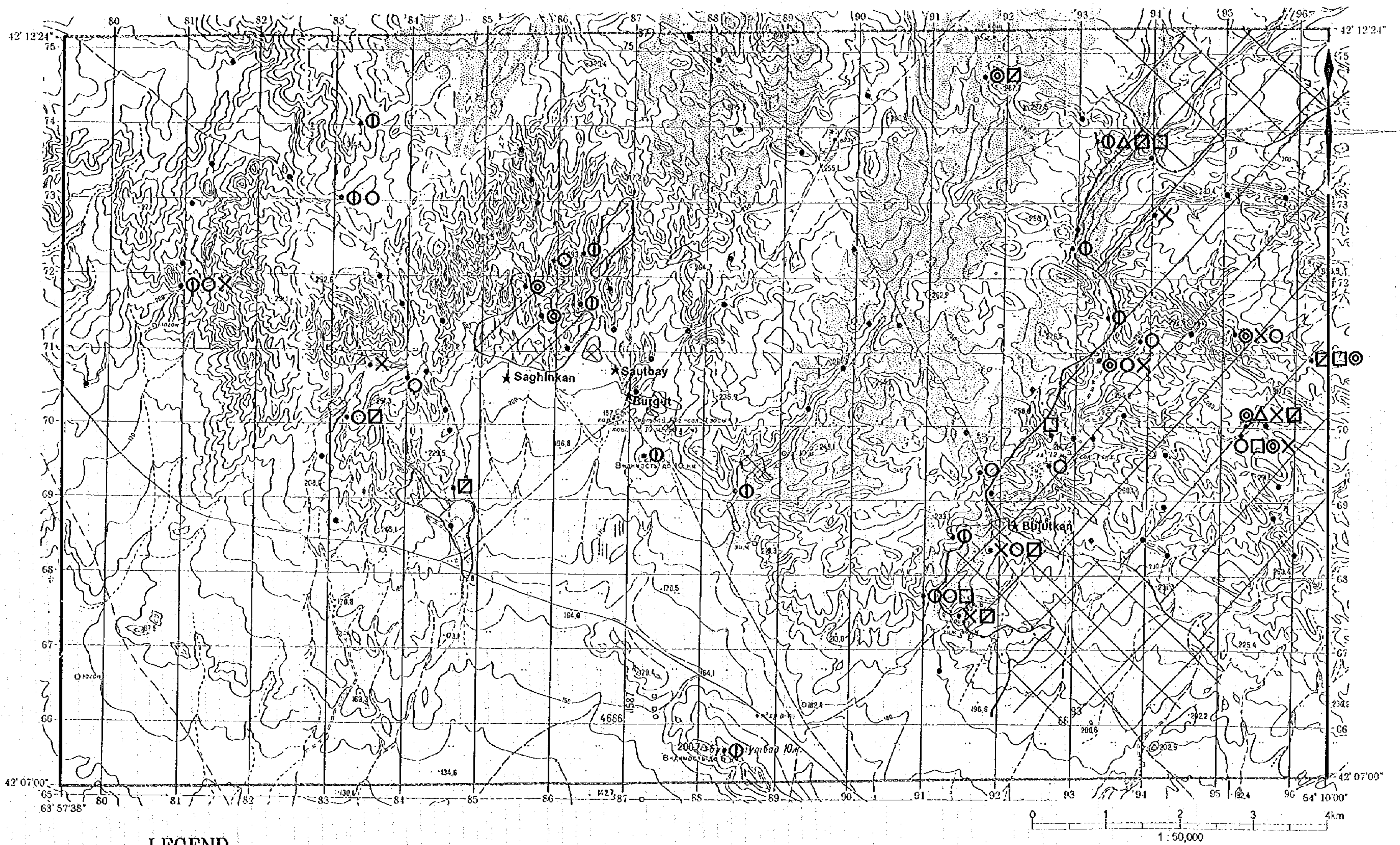
Fig. II−1−1−3 Schematic Geologic Column of the Survey Area



LEGEND

- • Location of the Sample
- Rock Samples for Assay
- Ore Samples for Assay
- Rock Samples for Thin Sections and Hand Specimens
- ★ Ore deposit(W)
- Φ Ore deposit(Au)

Fig.II−1−1−4 Location Map of the Samples



LEGEND

- • Location of the Rock Sample
- Φ Au anormaly(≧10ppb)
- O Ag anormaly(≧ 2ppm)
- △ Cu anormaly(≧200ppm)
- ⊠ Pb anormaly(≧20ppm)
- □ Zn anormaly(≧100ppm)
- ◎ As anormaly(≧50ppm)
- × Mo anormaly(≧10ppm)
- Intrusive bodies
- Area of dense distribution of dykes
- ★ Ore deposit

Fig. II−1−1−5 Anomaly Points of the Rock Samples(Surface Survey)

Table II-1-1-1 List of Ore Deposits and Ore Showings in the Survey Area

Name	Host Rock	Minerali-zation	Type of Ore bodies	Size	Grade	Ore Reserves	Exploration
Sautbay·Burgut Ore deposits	Kokpatas Formation Karashakh Formation Granodiorite (stock)	W (Au)	Skarn (Stockwork)	21 skarn ore bodies l=1,600m(total) w=0.5-50m d=0-600m	(1993) WO_3=0.20-0.87% (Grade of ore bodies) (MMAJ,1995) WO_3=0.09-0.52% (Grade of ore bodies)	(1993) cut off WO_3=0.05, 0.08% C_1+C_2+P_1: 39,539,352t WO_3=0.43%, Au=0.34g/t (MMAJ,1995) cut off WO_3=0.05% Reserves: 25,885,000t WO_3=0.27%, Au=0.24g/t	Underway Prospecting activities(1985-1993); magnetic survey 70km² and 10km², trenching-9,044m³, non-coring drilling-4,440m, coring drilling 300m deep on average-42,030m, exploration shaft with drifts and cross-cuts-3,294m. (MMAJ,1996) Coring drilling-4 drillholes-1,509.9m.
Saghinkan Ore deposit	Karashakh Formation	W	Skarn	14 skarn ore bodies l=460-960m w=1-40m d=110-400m	(1994) WO_3=0.12-0.64% (Grade of ore bodies) (MMAJ,1996) WO_3=0.11-0.52% (Grade of ore bodies)	(1994) cut off WO_3=0.10% C_2+P_1: 12,710,000t WO_3=0.32% (MMAJ,1996) cut off WO_3=0.10% Reserves: 13,944,000t WO_3=0.27%	Completed Prospecting activities: trenching-1,152m³, mapping drilling-3,456m, coring drilling by 160m×80m and 80m×80m grid-19,051m.
Bulutkan Ore deposit	Kokpatas Formation Lamprophyres (dikes)	Au	Silicified rocks Skarn	1 ore bodies l=more than 100m w=32m (max.) d=more than 100m	Au=1-420g/t	(MMAJ,1995) Reserves: (rough estimate) 342,000t Au=6.98g/t	Underway Prospecting activities(1993-1994); trenching, 70 non-coring drillings(depth up to 70m). Further prospecting works such as trenches, drill holes, geophysical survey, shaft and cross cuts are scheduled until 1998.
Another showings in Bulutkan district	Kokpatas Formation	Au	Silicified rocks Skarn	w= 6.0m, Au= 0.2g/t(T-3) w= 7.0m, Au= 0.6g/t(T-6) w=17.2m, Au= 0.3g/t(T-6) w= 2.6m, Au= 0.2g/t(T-10) w= 2.0m, Au= 0.3g/t(T-10) w= 7.5m, Au= 0.2g/t(T-10) w= 2.0m, Au=74.7g/t(P-819) w= 8.0m, Au=31.0g/t(P-822)		—	(MMAJ,1996) Coring drilling-7 drillholes-1,011.0m Trenching-6,300m.