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People's Republic of Bangladesh  
**JAMUNA RIVER BRIDGE CONSTRUCTION PROJECT**

**TOPOGRAPHIC SURVEY REPORT**

August, 1975

**Japan International Cooperation Agency**  
**(J.I.C.A)**

**International Engineering Consultants Association**  
**(I.E.C.A)**



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## SUMMARY

This report shows achievement of the survey which was entrusted between International Engineering consultants Association (IECA) and Japan International Cooperation Agency (JICA).

### I. Topographic Maps for River Planning

We made a 1:20,000 topographic map which is necessary for accurate and detailed surveys of the first priority areas in the proposed bridge construction site in accordance with the recommendations in preparatory feasibility survey in 1972 fiscal. The survey was for the area of approximately 344 km<sup>2</sup>, that is, about 26 km from north to south and about 12 km from west to east along the main stream of the Sirajganji river.

The making of topographic maps was based on the aerial photos taken from the airplane which was brought from Japan, and plotting work was carried out according to photogrammetry. Field surveys were made to collect the necessary data for the plotting of topographic maps. The achievements we made are shown in the three (3) sheets of the original topographic maps and one (1) sheet of 1:50,000 mosaic photo.

### II. Cross Section for River Planning

Following the cross sectional survey of the Jamuna river as a part of the first feasibility survey during the rainy season, cross sectional surveys were conducted at the interval of one (1) km along the Jamuna river's main stream and at eight (8) places of small and medium rivers in the dry season by utilizing the established control points for the making of topographic maps of river planning, and during this survey period, water stages were observed at three (3) places of up, middle and down streams in the survey area. The achievements are shown in twenty-six (26) sheets of original cross section of the main stream and eight (8) sheets of original cross section of small and medium

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rivers and water stage observation field notebook. The topo-graphic maps and cross sectional maps contrast each other.

### III. Cross Sections of Bridge Construction Sites within Access Roads and Designed Railway Routes

Following the first feasibility survey conducted in 1973 fiscal, cross sectional surveys of river were conducted in the field at the bridge construction sites within roads and railway planning routes in the second survey. It covers about 130 km from Dacca through Tangail to Sirajganj. Final results are shown in nine (9) sheets of original cross section of railway, and one (1) sheet of original cross section of roads

Attached map \_\_\_\_\_ general view of survey area

Attached table \_\_\_\_\_ survey result list

1. Original topographic map for river planning and positive
2. Original cross section for river planning and positive
3. Access roads, railway bridge construction site, original cross section and positive
4. Mosaic
5. Negative for reprint and original map
6. Negative for reduced reprint
7. Aerial triangulation final result book
8. Positive film
9. Control point survey book and detailed control point list
10. Leveling data book and calculation book
11. Bench mark pricking photo
12. Water depth measurement record book
13. Navigation control point survey calculation book
14. Water stage observation field book
15. Approach leveling book
16. Small river's longitudinal survey book.

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## Chapter I. Introduction

### 1-1. Formation of Survey Team

#### 1. Survey Team

Leader (General)	Masao Kikuchi	Asia Air Survey Co., Ltd.
Member (Coordinator)	Takashi Kawamura	"
Member ( " )	Toshimine Miyashita	Toyo Aero Survey Co., Ltd.
Member (Ground control point)	Kazuyoshi Fukushima	Asia Air Survey Co., Ltd.
Member ( " )	Kiminori Muraishi	"
Member ( " )	Moriyasu Ohe	"
Member ( " )	Kunio Inoue	Toyo Aero Survey Co., Ltd.
Member ( " )	Takushi Asono	"
Member ( " )	Hideomi Okamura	"
Member ( " )	Takeshi Ohsawa	Hasyu Surveying Co., Ltd.
Member ( " )	Masao Yoshikawa	"
Member ( " )	Mitsuya Konno	"
Member ( Levelling )	Yoshiaki Ohtoku	Asia Air Survey Co., Ltd.
Member ( " )	Yukio Tozaki	Toyo Aero Survey Co., Ltd.
Member ( Sounding )	Tadahiro Yoshida	Sanyo Hydrographic Survey Co., Ltd.
Member ( " )	Kingo Ando	"
Member ( " )	Katsuhiko Nagao	"
Member ( " )	Shigeru Kotao	"
Member ( " )	Tetsuo Fujita	"
Member ( " )	Mitsuhide Wakamatsu	"
Member (Photo Taking)	Yoshio Yasumitsu	Asia Air Survey Co., Ltd.
Member ( " )	Nobumitsu Takegawa	"
Member ( " )	Seiji Kawakami	Nihon Air Transport Co., Ltd.
Member ( " )	Tsukasa Takase	"

2. Supervisory Committee

Keiji Nishimura	G. S. I.
Toshitomo Kanakubo	"
Yukio Kitani	"

3. JICA office

Osamu Wakatsuki	JICA office (Dacca)
Junji Ebihara	" (Serajganj)
Masayuki Ijichi	" ( " )

1-2. Government officer of Bangladesh

1-2-1 General

S.S.M. Luteul Huq	Ministry of Communications
M.D. Touhid Khan	"
A.U. Md, Choudhury	"
Mr. Hafizuddin	Survey of Bangladesh

1-2-2 Counter-part

Mr. Nural Amin Kham	Railway Engineer
Mr. Rahman	Road and Highway Engineer
Mr. T. Ali	Survey of Bangladesh
Mr. Sharafat Hossain Bhuiyan	"
Mr. Abdul Mannan	"
Mr. Delway Hossain	"
Mr. Rafique Ahmod	Water Development Board
Mr. Rafiqul Islam	"
Mr. Fariduddin Ahmed	"
Mr. Abul Kashom	"
Mr. Giasuddin	"



1-2-3 Advisor

Mr. Zainul Abedin	Governor of Tangail province
Mr. Siffidin Ahmed	Governor of Pabna province
Mr. Naoshi Yamamoto	Jamuna Office Staff
Mr. Shahed Akhtar	Jamuna Office Staff
Mr. Harunor Rashid	"
Mr. Wusuf Al Aswad	Operater of helicopter
Mr. Balayat Hassain	Operater of jeep
Mr. Abdul Hakim	"

1-3. Embassy of Japan

Takashi Oyamada	Ambassdor
Shojiro Imanishi	First Secretary
Norihiro Someya	"
Koichi Iizuka	"
Yoshikazu Kaneko	Second Secretary

1-4. Work Schedule

1. Preparation

Oct. \_\_\_\_\_ Nov. 1974

2. Aerial Photography

Nov. 1974

3. Ground Control & Sounding

Dec. 1974 \_\_\_\_\_ Mar. 1975

4. Aerial Triangulation Method

Apr. 1975

5. Constructional Mapping

May 1975 \_\_\_\_\_ Aug.

## 1-5 Daily Programme of Field Investigation and Outline of Action

The survey team in seven different groups left Japan respectively in accordance with the schedule of each survey party. During the survey period, staffs of management and coordination were changed and each survey party returned respectively soon after its field survey was finished.

### 1-5-1 Departure and Returns

**Headquarters;** One member started in advance on 21st of October, returned on 26th of February.

The leader started on 7th November and returned on 9th February.

One member followed them and returned on 19th February.

**Control Point Survey Party;** One member started on 7th November and returned on 31st January.

The main party of eight members started on 28th January and returned on the same date as the above.

**Leveling Checking Party;** One member started on 7th November and returned on 31st January.

Another member followed on 28th November and returned on the same date as the above.

**Sounding Party;** One member started on 21st November and returned on 21st March.

The main party of five members started on 2nd December and returned 14th March.

**Phototaking and Processing Party;** Two members started on 11th November and returned on 13th December.

A two-crewed aeroplane started on 16th November and returned 10th December.

## 1-5-2 Outline of Action of Control Point Party

### 1. Field Preparation from November 8th to November 29th

The first member who arrived in Bangladesh on 8th November had good cooperation with the member of the headquarters who reached and started to take action for the receipt of the cargo of instrument and materials, and they received all the cargos at Dacca station before 12th November. These cargos were kept at three depots seperately. And they paid a courteous call on the government offices of Bangladesh, and confirmed the facilities which Bangladesh planned to afford to the Japanese survey team. And at the same time they coordinated a planned transportation of equipment and materilas, and the chartering of sea-trucks from Dacca to the survey base of the team, after making field reconnaissance for the planning of survey plan, reached Sirajgang as the first base on 29th November aboard a large scale sea truck fully loaded with the materials, going up the streams of Padoma river and Jamuna river.

### 2. Field Reconnaissance for 18th November and 22nd November

Investigations of the situations on the spots were made for five days on the round trips in order to obtain necessary information for the survey planning and transportation plan of the materials and equipment. This reconnaissance was made with the participation of one member of the leveling checking part and one official of the Bangladesh government.

The subjects of the investigation were as follows;

- (1) to find out whether or not there are control points to show clearly the position of the earth for the bridge construction site,
- (2) whether or not it is possible to use the vehicles such as jeeps,
- (3) whether or not the jeep can reach the opposite shore directly,
- (4) whether or not it is necessary to build a tower for the survey of the land form in the survey area, and

(5) to investigate the conditions of bars in the main stream.

The conclusion was made from the results of the above investigation;

(1) It is convenient to give coordinate value to the bridge construction site, as the triangulation point which the British Survey Department set up within 15 km in the north from the construction site.

(2) There are not roads good for the operation of vehicles along the river shore except some part, because arable lands and villages scatter there.

(3) At the moment of investigation, it is easy to land the shore by sea truck, but water receding in future may limit landing points.

(4) The land form is a flood plain of the Jamuna river, and the most part of it is cultivated and it is a flat land which has no hills.

(5) The river bed of the Jamuna is complicated and has depths, there are unvisible bars here and there.

(6) Direct collimation toward the opposite shore is comparatively easy because of the land form and the conditions of other factors, and it is unnecessary to build a tower.

And a final field survey plan was made on the basis of the results of the investigation.

### 3. Arrival of the Main Survey Party and Its Preparations from 29th November to 5th December

The main survey party arrived in Dacca on 29th November, and they were given a welcome party of the Japanese residents at the official residence of the Japanese ambassadore on the evening of the following day. On the 1st December, they left for Serajganj as the first base by railway.

4. Control Point Survey and River Crossing Leveling from 7th December to 10th January

Surveying work was started at the Sirajganj office (JICA office) as the base on 7th December. On 16th December, they moved to the JICA base camp (Singuli village) as planned beforehand. After the starting of survey work, the water level went down as time passed so that bars came to appear in the river.

This made moving around by boat impossible, and it was anticipated that the seasonal wind would blow and sand storms would take place from the latter part of February. Therefore, it was hoped that surveying would be finished earlier than planned in order to have good contact with the sounding party and leveling party which were to come in succession. For this purpose, we had to carry out the working methods which were made in the field survey planing, and besides, attitude, power and team work fitted for the field work were needed a great deal.

(1) Formation of Team

One team consists of three survey engineers, one counterpart and two or three laborers. Three teams participated in the work.

(2) Survey Instrument

Geodimeter

AGA geodimeter 8-typed	1 piece
Geodimeter 6 BL typed	1 "
Wild T2 type	4 pieces
Heliotrope	6 "
Other auxiliary instrument	some

(3) Transportation Means

Sea trucks : water transportation  
for personnel & equip-  
ment 2 vessels

speed boat : 1 vessel

Truck : land transportation for

personnel & equipment 1 set

Jeep : same as above 2 sets

(4) Working Schedule

Main stream triangulation chain point selection & observation:

9th December to 31st December

Working for Triangulation point:

7th December to 10th December

Polaris azimuth observation:

12th, 21st and 24th December

River crossing leveling:

12th and 30th December

Inland traverse point selection and observation;

3rd January to 10th January 1975

Photo pricking:

7th December to 18th January

We could utilize a helicopter because of the continuation of good weather and of no strong winds, and besides, working was carried smoothly because of the good camping facilities, and this made us able to finish the selectional observation as planned. Although we had been worrying, we could finish the work easily because pricking points were available at each place in the photos which were necessary for aerial triangulation. However, it was difficult to make vertical angle observation because the collimation line goes over the global surface with little margin.

5. Field calculation and Arrangements from 11th January to 15th January

Of the calculation and arrangements on the field, the subjects to check or the calculation to conduct during the process of con-

struction were finished during the above period, and our work entered into the stage of integrating all the results.

(1) Calculating and Checking

Our observation books were studied carefully, because it would have been too late if some mistakes had been found out after reaching Japan. And we coordinate the results by evaluating the survey good or bad. Particularly, we did our best for perfection of pricking results.

(2) Taking-over of Results

Of the above-mentioned survey results, those of rivercross leveling were taken over by the leveling checking party, and control point results by the sounding party. The result of position measurement at the boring point which was conducted by a working squad was also handed over to the boring squad. As the result of checking on the field, its survey results were all satisfactory in the topographic mapping and surveying. And it was confirmed that the mission of the control point investigation squad was completely terminated.

6. Withdrawing of Personnel and Equipment 16th January to 28th January

The control point survey party left necessary equipment and materials for the sounding party still conducting the work after they had completed surveying, and were engaged in inspecting and packing equipment and materials in Dacca in order to transfer the above-mentioned cargos to Japan.

Sea trucks were used to transport to the base camp the equipment and materials at the time of starting the survey. This water transport required a few days in arriving the terminal. However, the same transport methods might be accompanied with danger because the general situations had changed. Therefore, the helicopter was utilized for the purpose of sending valuable cargos so that they would arrive in Dacca in a short time.

All the work of the control point investigation party in Bangladesh was finished when the departure procedures of the personnel concerned and farewell greetings to government offices concerned of Bangladesh were made.

7. Conclusion of Control Point Investigation Party's Survey Work  
Bottlenecks which always occur in working abroad are not working itself of the selection of point or observation but unpleasant conditions of transport, storage of the cargos and also poor living conditions for team member.

We were favored by the good will of Bangladesh government offices. From the stand-point of the Japanese people, the Bangladesh appear not to be punctual, and they seem not always keep their promises. Despit these factors, the transport and storage were conducted as planned. The weather was very pleasant not different from that of Japan. And the camping facilities were well furnished because much attention was paid to lodging, meals, rest, etc. and all the surveying were carried out without troubles.

### 1-5-3. Leveling Checking Party and Its Outline of Action

#### 1. General

This investigation was a survey of leveling route with 260 km in length which was set up in the adjacent of the Jamuna river for the purpose of making a height control point for the cross sectional river survey and topographic mapping. In the area covered by topographic mapping.

P.W.D. datum height was adopted for a height datum, and also for both land area and river area.

Part of the leveling was entrusted to a private survey enterpriser in Bangladesh in order to foster its survey enterprisers, and the investigation party was to check their results.



2. Preparation on the Field 8th November to 6th December

(1) Receipt and storage of Instrument and Materials. The member who had reached on 8th November left the headquarters to conduct the receipt and storage of the instrument and materials in cooperation with the control point survey party.

(2) We requested two local contractor (Survey Corporation and Survey Organization) to submit us an estimate by showing them our specification.

We decided unofficially to entrust it to Survey Corporation around 20th November after making a study of its amount, their techniques, etc.

The team discussed the details of working specification with Survey Corporation for the period of 23th November to 26th November, and we made preparations of making a contract.

On 27th, we made an investigation of the existing bench mark on the field by helicopter, and made a selection of B. M No. 9 (L--7B. 2B), deciding this bench mark as datum point of leveling this time. This mark was established at Survey of Bangladesh mosque, and it is located on the floor of a mosque of Pacca in Randhunibatri village.

In the general conference of the team on 4th December, (refer to 2--1), as the result of decision for survey area, the private survey enterpriser was entrusted to take care of southern side from B. M No. 9 and the downstream part from the bridge axis, and the upperstream part would be taken care of by the Japanese team. And an official contract was made with Survey Corporation.

3. Field Reconnaissance 18th November to 22nd November We made a field reconnaissance with the control point survey party which had started in advance. (refer to 1-5-2,)

4. Arrival of party Started Later and Its Survey Preparations 29th November to 6th December

One member of the leveling checking party has started later arrived in Dacca on 29th November , and left with the control point survey party for the Serajganj base for making survey preparations. (refer to 1-5-2 & 3)

On 6th December, we showed the leveling routes fixed point on the photo mosaic to the representative on the field of Survey Corporation, and at the same time visited their camp to inspect their instrument.

Their instrument were a Wild and Hilger Watts company of England tilting level produced by and we ordered them to adjust their unaccurate line of collimation.

5. Leveling 9th December to 16th January 1975

On 9th December, the Japanese team left the point of B.M. 9 for Serajganj in the upstream area, and the local contractor for the downstream direction in order to conduct leveling.

During the working period, they moved to the base camp in Singuli and continued to take leveling.

(1) Formation of Team

The Japanese team consisted of two survey engineers, one native counterpart and two laborers. The handling of staff was taken care of by two laborers under the guidance of the counterpart. The selection of point, observation and recording were done by the survey engineers. The local contractor consisted of four to six members.

(2) Survey instrument

Sokkisha B--2 auto level	1 unit
Staff and footplate	2 units

(3) Transport instrument

Jeep for personnel, equipment and materials, land use	1
Sea truck (for water use)	1
speed boat (for water use)	1

(4) Working Schedule

Japanese team

- a. right bank of the main stream  
and upperstream bars; 11th December to 20th  
December
- b. left bank of the main  
stream; 21st December to 5th  
January

Local contractor

- a. right bank of the  
main stream; 9th December to 18th  
December
- b. left bank; 20th December to 5th  
January

And checking of survey result of the right bank of the main stream was conducted on 6th and 7th January, and checking of survey result of the left bank was conducted on 9th January.

Checking of pricking photo and geographic names was conducted on 10th to 16th January.

There are a lot of sandy soil in comparison, and although a footplate was use, a re-survey of 30 % was needed because the plate could not be fixed firmly. (Any that has a large error was re-checked.) The daily mean leveling was a progress of 6 km per day, because it took much time to reach the survey point from the base camp. For the reason of requiring the height of the

leveling route which passes through the periodical crossing stake of B.W.D.B., the route was revised by confirming the position directly with the guidance of the counterpart of WAPDA Serajganj office.

6. Withdrawing of Personnel and Equipment (refer to 1-5-2 & 6)

7. Conclusion of Leveling Checking Survey Party

The overseas operation of this time was entrusted to the native survey enterpriser to undertake a part of leveling work so that we were given technical cooperation of the Bangladesh survey enterpriser. As a result, although there were differences among the survey methods of two teams, and insufficiency was noticed which was caused by the shortage of experience, full cooperation of Bangladesh and Japanese engineers in operations gave good effects to the general parts of this project with great significance.

1-5-4. Outline of Action of Sounding Party

1. Preparations on the Field 22nd November to 6th December

The member who had started in advance on 22nd November arrived in Bangladesh, and took the receipt of all equipment and materials which had been sent beforehand. And he started to conduct the unpacking, inspection and improvement of the cargos.

He started to conduct the field reconnaissance by helicopter and jeep on the route of railway plan and access road from Dacca to the bridge construction site of the Jamuna river. In cooperation with the JICA Dacca office, he tested the speed boat for delivery, and also he built a wireless and antenna for wireless communication between Dacca and the base camp through Sirajganji.

2. Arrival and Preparations on Field of Survey Main Party 3rd to 6th December

The main party arrived in Dacca on 3rd December and stayed at

two different places in groups for one month's working as planned. They made preparations for survey and coordination of the equipment.

3. Cross Sectional Survey of Construction Point along Access Roads and route of Railway Plan

The party started to conduct surveying work in Dacca as the base on 7th December. Through Dacca to Tangail road (all weather road), they proceeded respectively to the survey point. For this purpose, laborers were hired to carry the equipment and materials. This movement was completed one by one beginning with closest places to Dacca.

On 26th, the investigation of access roads from Tangail to the base camp was completed, and the connection with B M (bench mark) established by Survey of Bangladesh was finished except for a part of it.

The working schedule was as follows;

Routes of Railway Plan:

Tungi (F) coordination and arrangements	--- 7th & 8th Nov.
Turag (E-2), Bailmail (E-1) investigation and arrangements	--- 9th & 10th Nov.
Shimultali (D-1), Bangshi (D-2) ---	11th Nov.
Latifpur (D-3) investigation	--- 12th Nov.
Lahajong (C) investigation	--- 14th Nov.
Putiajani (A), Futzani (B) investigation	--- 17th Nov.
Small rivers S--107 investigation	-- 19 th & 20th Nov.
Arrangements of investigations on small rivers and railway routes	--- 21st to 24th Nov.
Investigation of access roads from Tangail to base camp--	26th Nov.

4. **Moving to Base-Camp (Singuli) and Cross Sectional Survey of the Jamuna River and Its Branches**, 2nd January 25th February We transported the equipment and materials to Nara-Yanganji port and loaded them on sea trucks in order to move to the base-camp on 2nd January, and on 3rd these sea trucks left the base camp. We transported the main equipment and materials by railway and by helicopter on 5th January. All the personnel of the survey investigation party got together at the base camp. And the party made a field reconnaissance on the control point and bench mark which is necessary to determine the establishment of three gauges at suitable places, and navigation control points. And at the same time we equipped the survey ship, and started to make the cross sectional survey from the southern part of the main stream, establishing a navigation control point on 11th January.

(1) **Formation of Team**

It consists of 6 survey engineers, 6 counterparts and 5 to 6 laborers. Of these members, we had three counterparts make fixed time water stage observations, and we divided the team into a navigation party, survey ship party and according to the situation, a leveling party.

(2) **Surveying Instrument**

**Electric distance measuring instrument**

Hydrodist MRBz, mk-II 1 unit  
 Tellurometer CA-1,000 1 "

**Echo sounder**

PS--103 1 "  
 RS--61 1 "

**Transit**

TM-10B 1 "

**Level**

B--2 1 "

Establishment of navigation control point and sounding  
 S--Nos. 1 to 3; 6th to 7th February  
 S--Nos. 7 to 10; 8th February  
 Traverse J--No. 7, J No.6--1 & Nov. 5;  
 7th to 12th February  
 Middle and small river investigation  
 S--Nos. 105 & 107; 10th & 13th February  
 Traverse and level (inland area);  
 15th to 22nd February  
 Photographing of river (by helcoper);  
 24th February

We had to suspend to carry on the working because of strong wind blowing which had been occurring as time passed and especially of sand storm on the 23rd, although the weather had been fine during the whole working period. However, we succeeded in finishing the survey because our surveying had been proceeding comparatively well.

Nevertheless, our surveying period was in the dry season, and the main stream was in the lowest water season. Therefore, bars and shallows appeared here and there in the main stream, and it became difficult for us to operate the survey ship. We had to shift the sounding equipment to a rubber boat or had to make water stage measurement from the land or to apply various methods for the completion of the survey.

Unluckily, there occurred an attacking accident at the our base camp, and we had to shorten the our period of stay by continuing our efforts day and night without taking a holiday.

5. **Withdrawing of Personnel and Equipment and Materials and  
 Supplementaty Survey, 25th February to 11th March**

After the completion of the survey we left some parts of the equipment and materials in the base camp for the purpose of promoting

withdrawing, and the large parts the cargos were air-lifted to Dacca. And we conducted the approach leveling from the B.M. in connection with the three points of Tungi, Futzain and Patiajani, in Dacca from 27th February to 1st March.

The whole operation of the sounding party in Bangladesh was completed along with the finish of necessary procedures such their departure, farewell greetings to the government offices concerned of Bangladesh.

#### 6. Conclusion of Survey Work of Sounding Party

In comparison with the cross sectional survey during the rainy season in 1973, higher accuracy in survey result was achieved during the whole operation this time for the following reasons;

- (1) The control points which had been established by the control survey point survey party and leveling checking party were fully utilized.
- (2) Up-to-date aerial photo mosaics and aerial photos were available.
- (3) In addition to the completely furnished facilities for camping, much attention was paid to lodging, meals, resting, etc.
- (4) The survey operation was not under the season of sand storm.

#### 1-5-5. Outline of Action of Photo-Taking and Processing Party

##### 1. Preparations in Field, 12th to 21st November

Two members who had arrived in Bangladesh in advance on 12th November started to conduct the following before the arrival of the photo-taking aeroplanes;

- (1) Taking-in procedures of the aeroplanes, planning of photography flight plans and other necessary procedures.
- (2) Negotiation and procedures for the use of photo processing facilities and equipment and assistance of native employees of the survey of Bangladesh.



(3) Bringing-in of equipment and materials for photo processing, inspection and necessary preparations for the survey at the Survey of Bangladesh.

(4) Investigation of Meteorological Conditions

The equipment and materials which had been air-lifted to Dacca airport on 14th November were got through with the customs office on 18th of the same month, and were inspected carefully in the processing laboratory of the Survey of Bangladesh.

The problems which appeared during the negotiation with the Survey of Bangladesh were the durations of use of the dark room and of their equipment. The Japanese side wanted to use them until 10th December, but they wanted us to finish it on before the end of November. However this disagreement was solved with good hospitality of the Ministry of Communications of Bangladesh so that at last we were permitted to use them as we had wished in the first place. We really appreciated the good will of Bangladesh very much.

As regards the meteorological conditions along with the check-ups of statistical data, weather charts, information materials of upper air wind, we observed carefully daily weather conditions, and came to conclusion that time of little cloudiness is two hours of eight o'clock am to 10 o'clock am. Therefore, we fixed up time for the flight for photo-taking.

## 2. Arrival of Photo-Taking Aeroplanes and Photo-Taking

The photo-taking aeroplane leaving Nagoya, Japan on 16th November arrived in Dacca airport on 20th of the same month via Okinawa, Ishigakijima, Manila, Dana, Bangkok and Rangoon. The aerial cameras were packed properly, and carried by the plane.

Photo-taking was the starting of this survey, and good results of this survey was dependent upon the quality of this photo-taking.

The first time limit was to finish photo mosaics which necessary for the chekcup of bridge construction axis for the benefit of the survey parties of rivers, briges and roads, and of the whole survey team including the supervisory committee members, which were expected to arrive there at the end of November. The second time limit was to finish the photo-taking before the period of the agreement to use the facilities of Survey of Baugladesh would expire, deducted with the number of days necessary for photo processing. The photo-taking sphere and its scale were two requirements such at the Serajganj area of 30 km x 30 km nearly 900 km<sup>2</sup> and a scale of 1:30,000, and an area of 12 km x 25 km nearly 300 km for surveying.

(1) Formation of Party

One pilot, mechanic and cameraman were in charge of photo-taking, and one photo processing member was in charge of carrying of films, liaison work to the offices concerned and also of driving the vehicle. According to the request of Baugladesh, the photo-taking was confirmed by a pilot of its air forces aboard the plane.

(2) Data of Aeroplane and Aerial Camera

Photo-taking aeroplane:

Aerocommander	680FL
Number of plane	JA5197

Aerial camera:

Wild RC-10	No. 1239
Focal length	1.51.50mm
Angle of coverage:	Wide angle 92°
Size	23cm x 23cm
Film	Koda plus X

(3) Surveying Schedule

Reconnaissance of photo-taking area and test of photo-taking;

21st & 22nd November

Computer		
Y H P MODEL--10		1 unit
Other auxiliary instrument		some
(3) Transportation Equipment		
Sea truck (equipped as survey ship)		1 unit
Sea truck (transportation for personnel & equipment & materials)		1 "
Speed boat (same as the above)		2 units
Rubber boat (for surveying a shallow)		1 unit
Jeep (transportation for personnel, land use)		1 "
(4) Working Flow Table, 7th January to 24th February		
Water guage establishment; 7th to 10th January		
Navigation control point, sounding		
S--Nos. 15, 16 & 17;	11th & 12th January	
Water stage observatory data collection;		
	16th January	
Navigation control establishment, sounding		
S--Nos. 21, 22 & 23;	17th to 20th January	
Sounding, S--Nos. 24, level No. 23 & 24;		
	21st 22st January	
Middle & small river survey S--Nos. 102 & 107;		
	21st January	
Inspection of water guage establishment;		
	29th January and determination	
Establishment of navigation control point and sounding;		
S--Nos. 5 & 6;	30th January to 1st February	
S--Nos. 1 to 4;	3rd February to 5th February	
Water stage observatory data collection;		
	5th February	

## Chapter 5. Photo Mosaic Making

### 5-1. Work Plan

Photo mosaic is classified into the photo mosaic made immediately after photo taking on the field and into those made after returning to Japan.

#### 5-1-1. Photo mosaic made in Bangladesh

In Bangladesh, for the purposes mentioned under 2-1, photo mosaic was made by temporary mosaicking work plan for using those in joint conference. Such photo mosaic was made by applying features composing method for 1:33,000 scale contact photo. Further, survey area, bridge axis line and Jamuna river main stream crossing survey line were drawn on the original of the photo mosaic and necessary reprinted map was made by photo reproduction and it was used for survey work in Bangladesh.

#### 5-1-2. Mosaic Photo Made in Japan

First, original photo mosaic was made by features composing in the scale of 1:33,000 from 1:33,000 scaled contact phot that had been brought to Japan as a survey result. Then, the scale was reduced to 1:50,000 and negative was made.

### 5-2. Completed photo mosaic

Completed original photo mosaic was stuck up on panel and its negative was also made, project area is mostly flat land except rivers and photo mosaic is possibly used as plan. As the value of photo map does not vary by the reduction on enlargement of photo map, photo mosaic is effectively used as data for various plannings.

Plotting area of this survey covers 334 km<sup>2</sup> around Jamuna river main stream while photo mosaic covers 900 km<sup>2</sup>, so it is adequate that photo mosaic and contact photo are used for survey of the area other than plotting area.

1:33,000 crossing six strip;

23rd November (flight duration: 5 hours  
and 55 minutes)

1:10,000 six strip;

24th November Impossible to take photos  
due to Cyclone;

26th - 29th November

Reconnaissance flight of supervising committee members of  
river and bridge parties;

1st December

Test flight for departure;

3rd December

Departure from Dacca airport;

5th December

Whether photo-taking is successful or not depends entirely  
on weather conditions, and working will be always accompanied  
by more hardship when it is conducted in a foreign country  
the information of which is not sufficient.

But five days and non cloudiness for two days in spite of  
worries made our work a success. And this contributed a  
great deal to future activities of the survey team, and con-  
vinced us to gain a fruitful completion of our operation.

### 3. Photo-Processing and Mosaicing

We examined and improved the dark room and equipment of the  
Survey of Bangladesh for photo processing, and also purchased  
some materials for repairs so that they could be used enough  
for our purpose.

## Chapter 6. Transportation and Camping

### 6-1. Transportation Plan

In this survey, how to transport personnel and instrument effectively had great effect on the result of survey, according to the survey conducted before departure from Japan, the flood in 1974 was considered the worst ever happened in the history of Bangladesh and shortage of material was anticipated and need for transporting almost all kinds of instruments and food from Japan was felt.

According to the experience of rainy season survey in 1973, the following points were specially considered for sea and air transportation of cargo necessary for the present survey.

1. In consideration of number of days required for business affairs such as customs clearance in Bangladesh, ship cargo is dispatched at least three months before starting the work.
2. Before main survey team enter Bangladesh, a few advance party members are sent to Bangladesh and they receive cargo, then main team depart.
3. First, all instruments and material are gathered at Dacca and then the instruments and material are transported to survey base by the safest and fastest means.  
Those points were drawn up in the plan and one advance party member of headquarters in charge of those mission was sent to Dacca middle October.

### 6-2. Camping Plan

For this survey, establishing new base camp was necessary. Because, the width of Jamuna river is more than 4 km even in dry season and survey area is expected to cover the area stretching about 25 km along main stream and about 12 to 18 km in cross sectional direction and it is necessary to carry personnel and instrument to required survey point mainly by transportation by water.

So, it was concluded that survey work is conducted most efficiently from new base-camp established about the middle of river bank of the survey area in consideration of the speed of boat used.

Construction of base camp was planned as the work executed directly by JICA and survey team also participated in the planning and cooperated. All of construction materials needed for the construction is transported by ship from Japan.

As bottleneck of camp construction two points such as whether, fuel and so on can be sufficiently supplied or not and how to secure emergency medical care were considered.

### 6-3. Condition of transportation and camping

#### 6-3-1. Transportation

One advance party member whose main duty is to receive and transport ship cargo and air cargo arrived at Dacca on October 22nd, 1974.

By that time, 99 bales of ship cargo that had been sent from Japan on August 26th reached Chittagong and those were passing through the customs. On October 30th, custom clearance was finished.

Then those were sent from Chittagong by railway reaching Dacca station on November 9th.

In initial plan, 56 bales of air cargo were supposed to be received at Dacca early November. But, the pipe of air cargo transportation between Bangkok and Dacca was narrow. So, after various negotiations with air line company, they barely arrived at Dacca air port on November 14th and customs clearance was finished on the 18th.

The instruments and materials necessary for photographic processing work were carried directly to survey of Bangladesh from the airport.

Both ship's cargo and air cargo were separately kept in custody at three places prepared in advance in Dacca city. The Cargo to be transported from Dacca to first survey base Sirajignji consisting of 100 bales of daily necessities and instruments for control point

survey and leveling and 30 drum can of fuel was loaded on three sea-trucks and the sea-trucks left Varayonganj port on November 25th and went up Meguna river, Padoma river and Jamuna river reaching Sirajganj port on November 29th.

One sea-truck of 57 feet class and two of 25 feet class sea-trucks were used continuously for the survey. Two members of the survey team and about 20 hired men including seven police officers got on board and engaged in looking to safety of transportation and preparation of base construction. Besides one truck and jeep that made a detour on land and reached JICA office in Sirajganj beforehand, two trucks were chartered and used for transportation from Sirajganj port to Sirajganj JICA office and transportation was completed. All of transportation from Japan to survey base was finished and all instruments and material reached without any damage. Unpacking all instruments and material and checking and adjusting them were all completed before expected starting day of work thanks to appropriate measure taken against the bottleneck of transportation that was the biggest cause for delay in the start of work of rainy season survey in 1973 such as delayed dispatch from Japan, delayed business affairs concerning customs clearance and arrangement for transportation. Because such bottleneck was known to us beforehand.

In addition, as transportation, there are movement from Sirajganj to base camp, movement of sounding party from Dacca to Base-camp, transportation for with drawing from Base-camp to Dacca, and transportation from Bangladesh to Japan.

However, they are mentioned under related chapter respectively.

#### 6-3-2. Camp Making

In initial plan, it was expected that construction of base-camp would be finished by end of November and survey work would be started at early December with base-camp as its base. Despite extraordinary effort by JICA office in the district, proposed site for Base-camp was



determined on November 18th and first arrival of construction material was on November 26th. So, it was estimated that construction would be finished after middle December. On account of work process of survey team, sand storm season that would come in March had to be avoided, so, it became necessary to almost finish sounding by the end of February and by counting backward it was necessary condition to start control point survey and leveling early December, for such compelling reason, it was decided that Sirajganj JICA-Office on the opposite bank about 10 km upstream of Base-camp would be used and on the completion of camp construction movement to Base-camp would be made, Sirajganj JICA-Office was used as quarters when survey was conducted in 1973 and it had been provisionally closed since May 1974. so, it was not in the condition suitable for living. Those people for camp making who transported instruments and materials repaired facilities of water works, electricity and so on of the office and made shelves, lumber closet and so on necessary for the living of team members in the office and received 9 members of main survey team on December 2nd. On December 16th, with the almost finished consolidation of Singuli base camp. Survey base was moved to that place and it was used as base until the end of February of following year when sounding party completed survey. Base-camp was prepared and continuously administered directly by JICA. It was used as field quarters for various investigation teams survey team and especially as the base for boring work of geological survey party. Outline of Base-camp is as Fig. -23. Thoughtful consideration was given for providing facilities of lodging, supplying food, recreation and so on, and specially water works and bathing and lighting by independent power generation, distribution of electricity and so on made both work condition for field work and living condition ideal, what was considered bottleneck accompanying base-camp making was procurement of large quantity of fuel needed for vehicles, sea-truck, generator, cooking and water supplying facilities. At that time, in Bangladesh,

fuel like high octane gasoline was in short and although official permission was obtained troubles were unavoidable for supplying large quantity of fuel over a long period of time. At the moment, the land route from Dacca to Base-camp was closed because of a kindrance with rivers and during the former half of survey transportation depended on sea trucks. But, in the course of survey transportation became easy through the use of helicopter.

One helicopter (Bell-47) was chartered from Singapore for emergency transportation of injured or sick team member and for supply to the team. In the latter half of the period, it was also used for survey investigation and proved very effective.

#### 6-4. Base-Camp Attack Incident

In the former half of the survey work, environmental condition such weather, topography, quarters and so on was fine and the work was smoothly carried out. However, in the latter half, the Base-camp attack incident led to pressure to psychology and operation of survey investigation.

##### 6-4-1. Situation Before the Attack Incident

It was on December 16th, 1974 that survey team moved to Base-camp from Sirajganj. JICA office on the spot held opening ceremony of the Camp on December 28th. The administrative assistant vice-ministry of transport, prefectural governor and many other people concerned attended the ceremony and observed survey work and camp facilities and it was closed in an amiable and placid mood. From about that time, it was heard of that at major cities Tangail and Sirajganj near the camp, police boxes were attacked by armed group. The police troop staying at the camp consisted of about 12 people and besides their main duty of guarding the camp, they controlled boats navigating the Jamuna river and villages around the camp. It seemed that they had been specially watchful against native people's entering the camp

without premission. After January had come, once at night, putting out light was ordered for the reason that gun shooting was heard. However, Japanese people of the camp did not realize that the situation became serious. For, it had been judged that attacking the camp could not happen because Jamuna river bridge constuction survey was received with good intentions even by inhabitants in the vicinity to say nothing of the Bangladesh government officials concerned and cooperative attitude for the project spread out.

**Attachment**

**Map and Data of Field Survey**

Fig 1. Location of Jamuna Survey Area

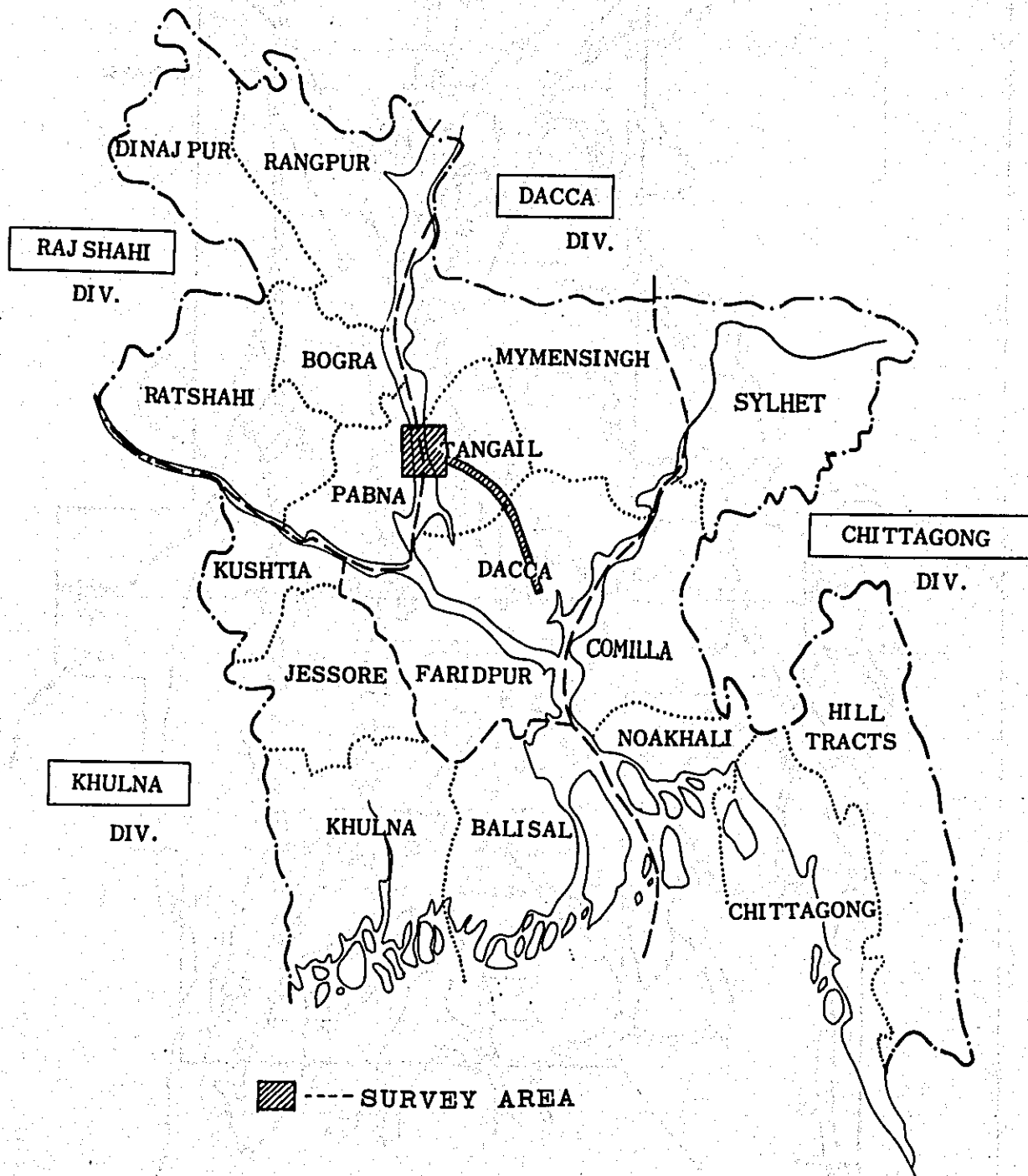


Fig. 2 LOCATION OF SERAJGANJ AREA

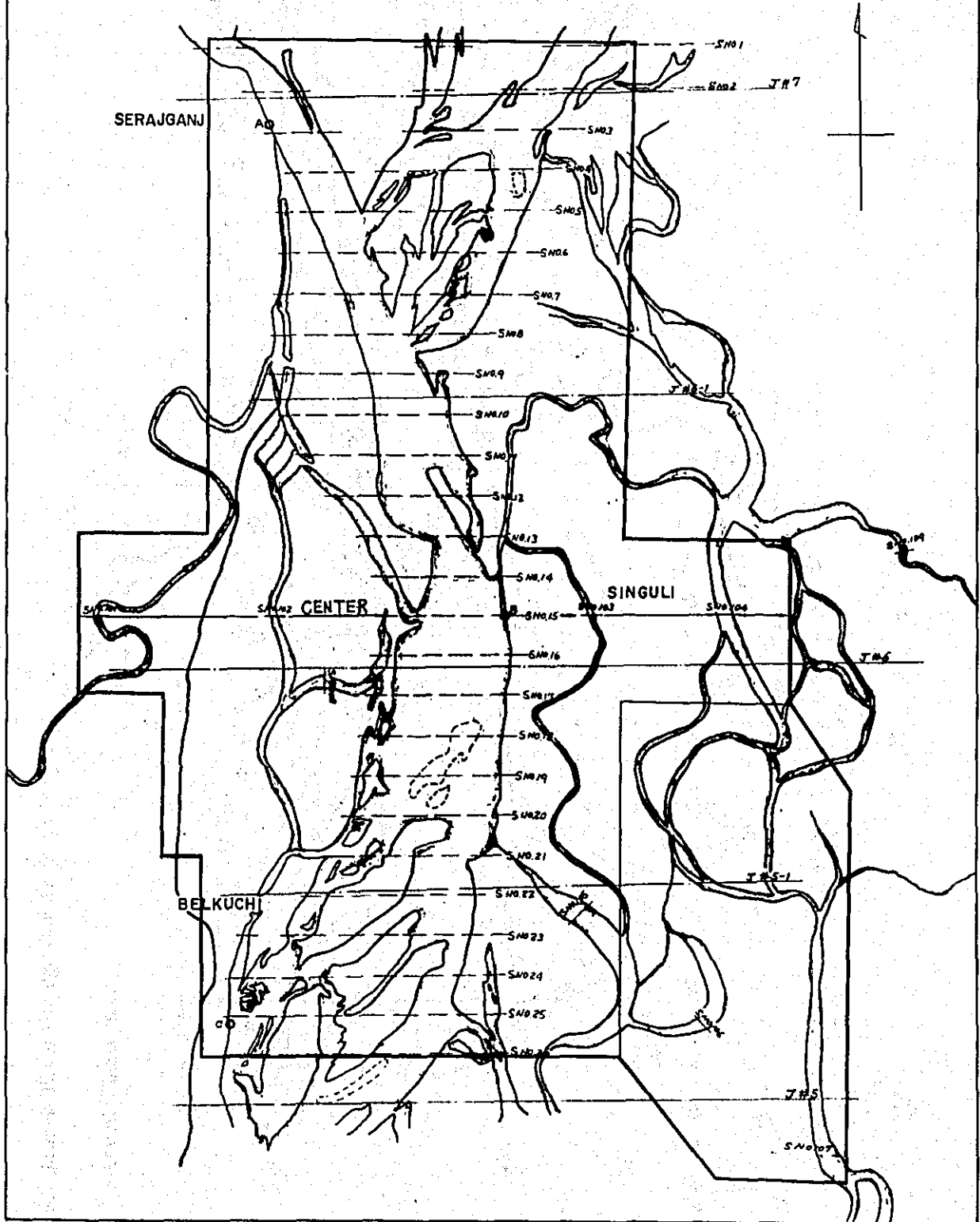
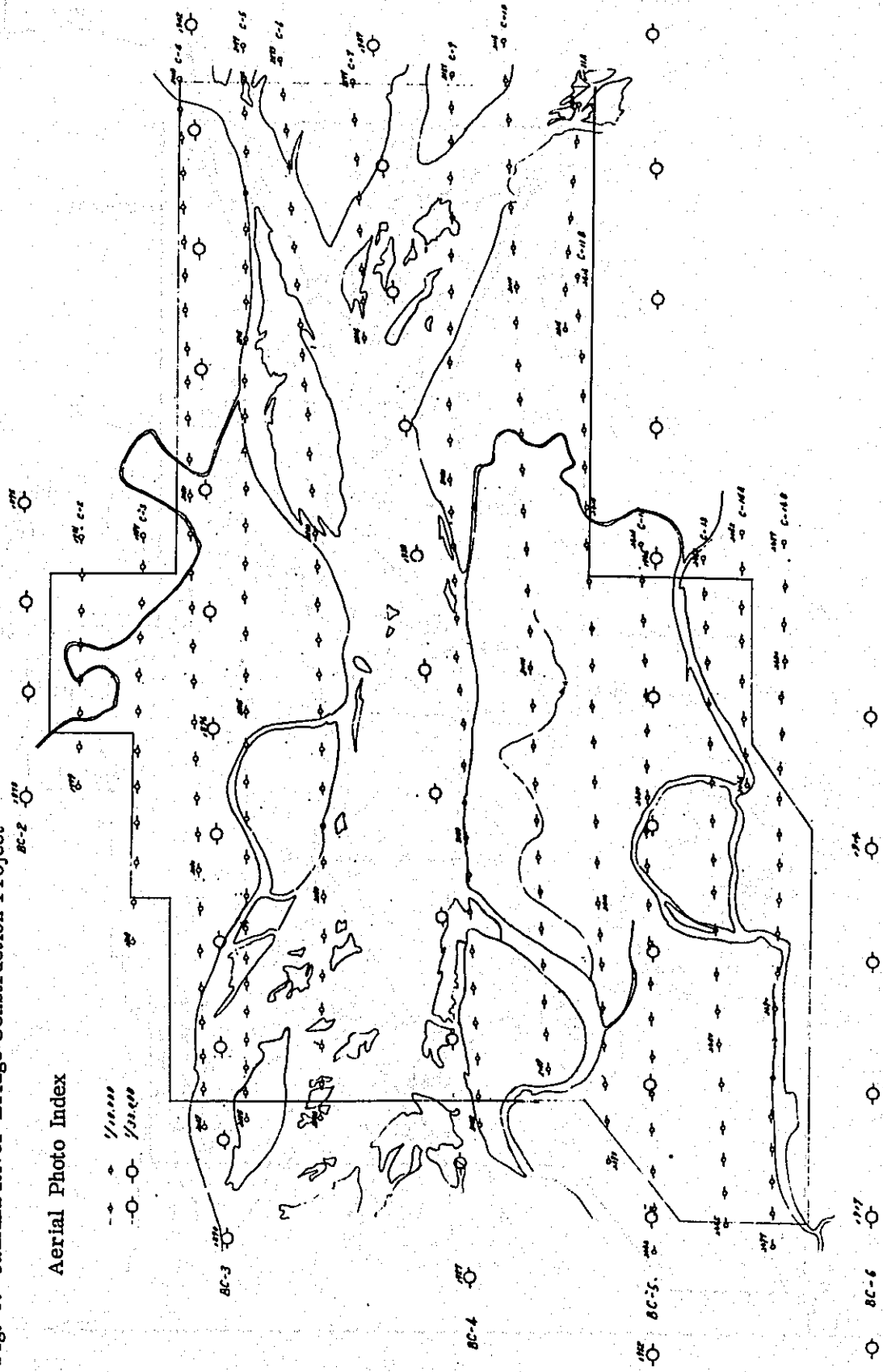
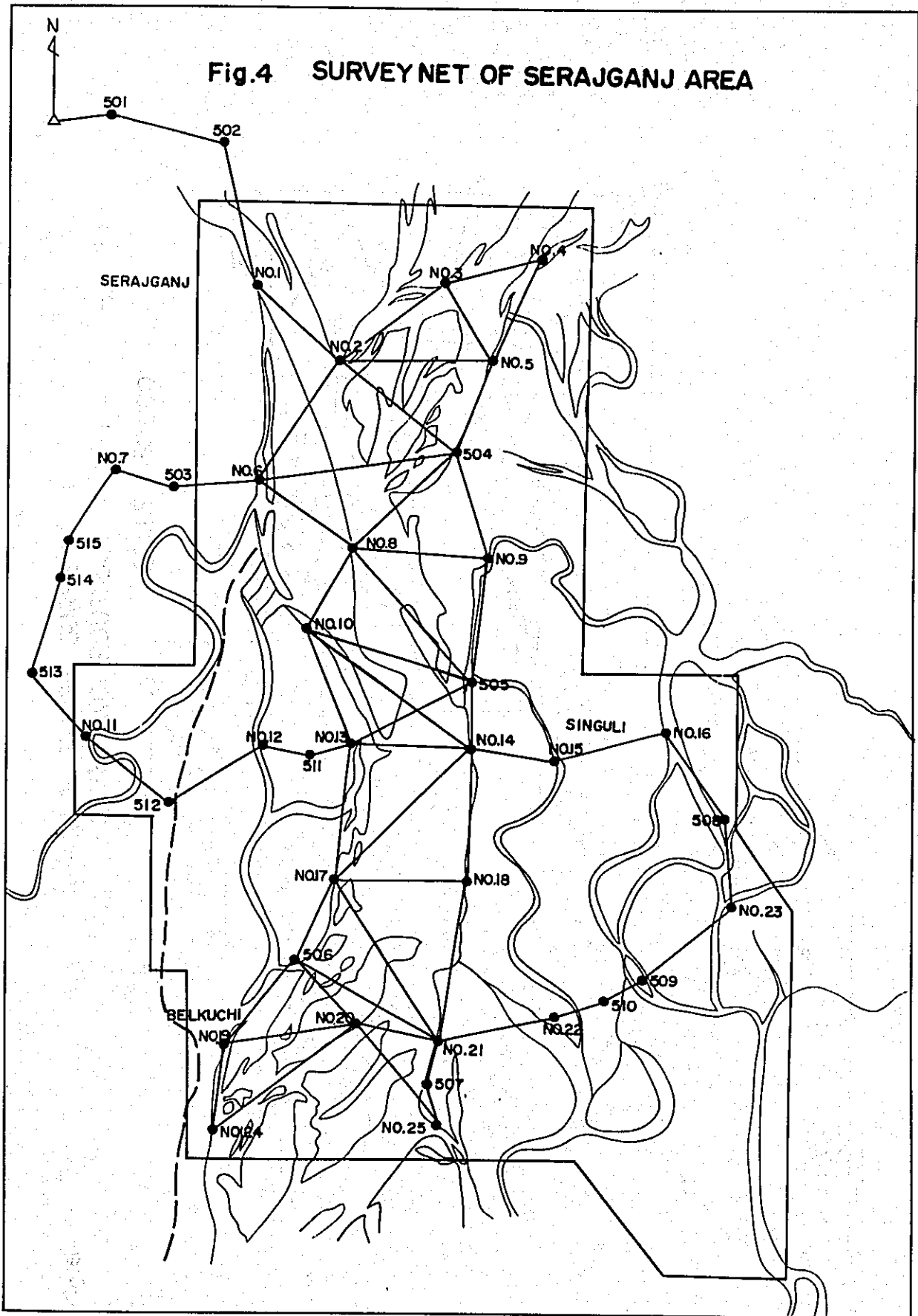


Fig. 3. Jamuna River-Bridge Construction Project







JAMUNA BRIDGE SURVEY  
LEVELLING ROUTMAP

SCALE 1:30,000

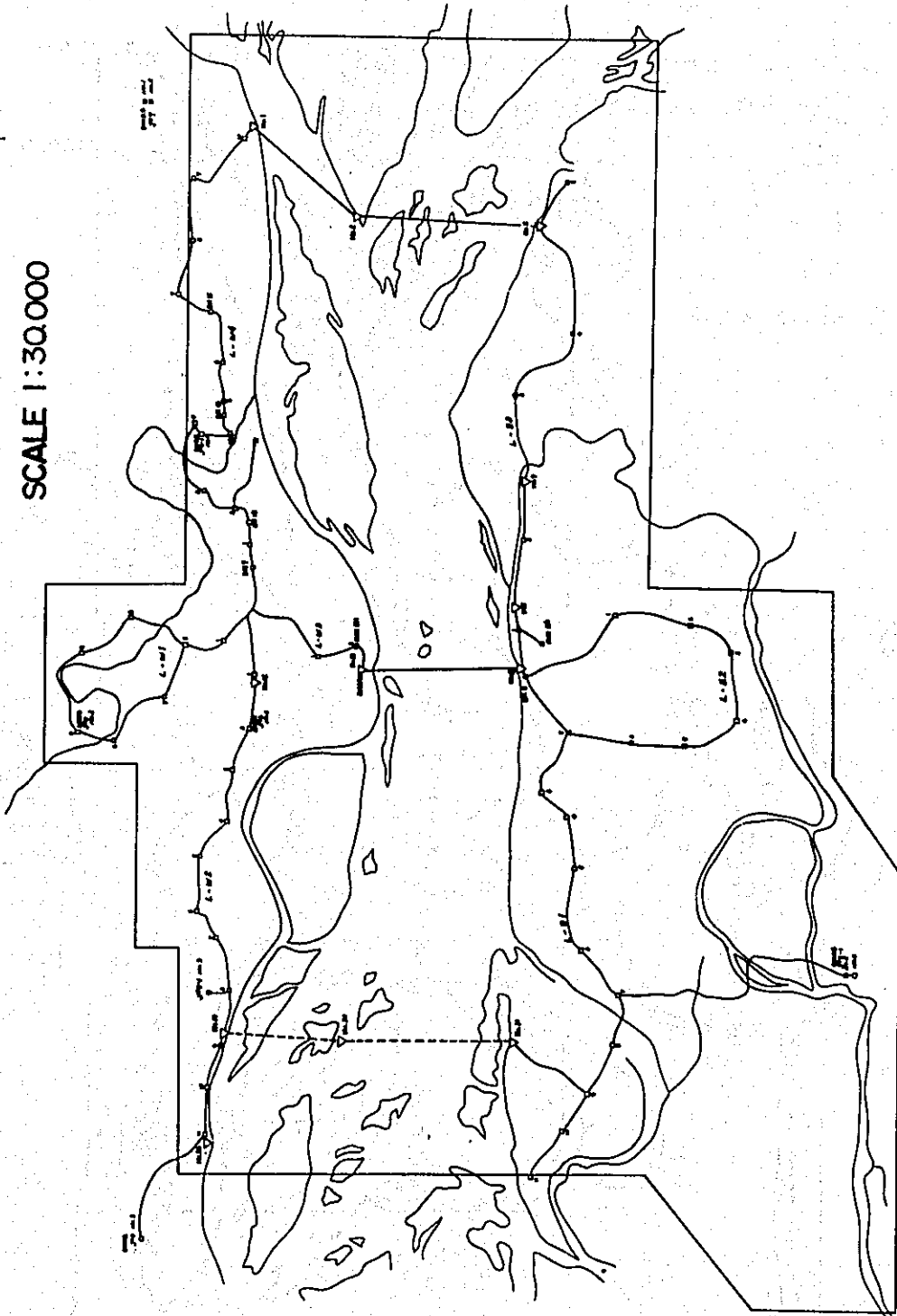


Fig.6

Fig. 8 LOCATION OF SERAJGANJ AREA

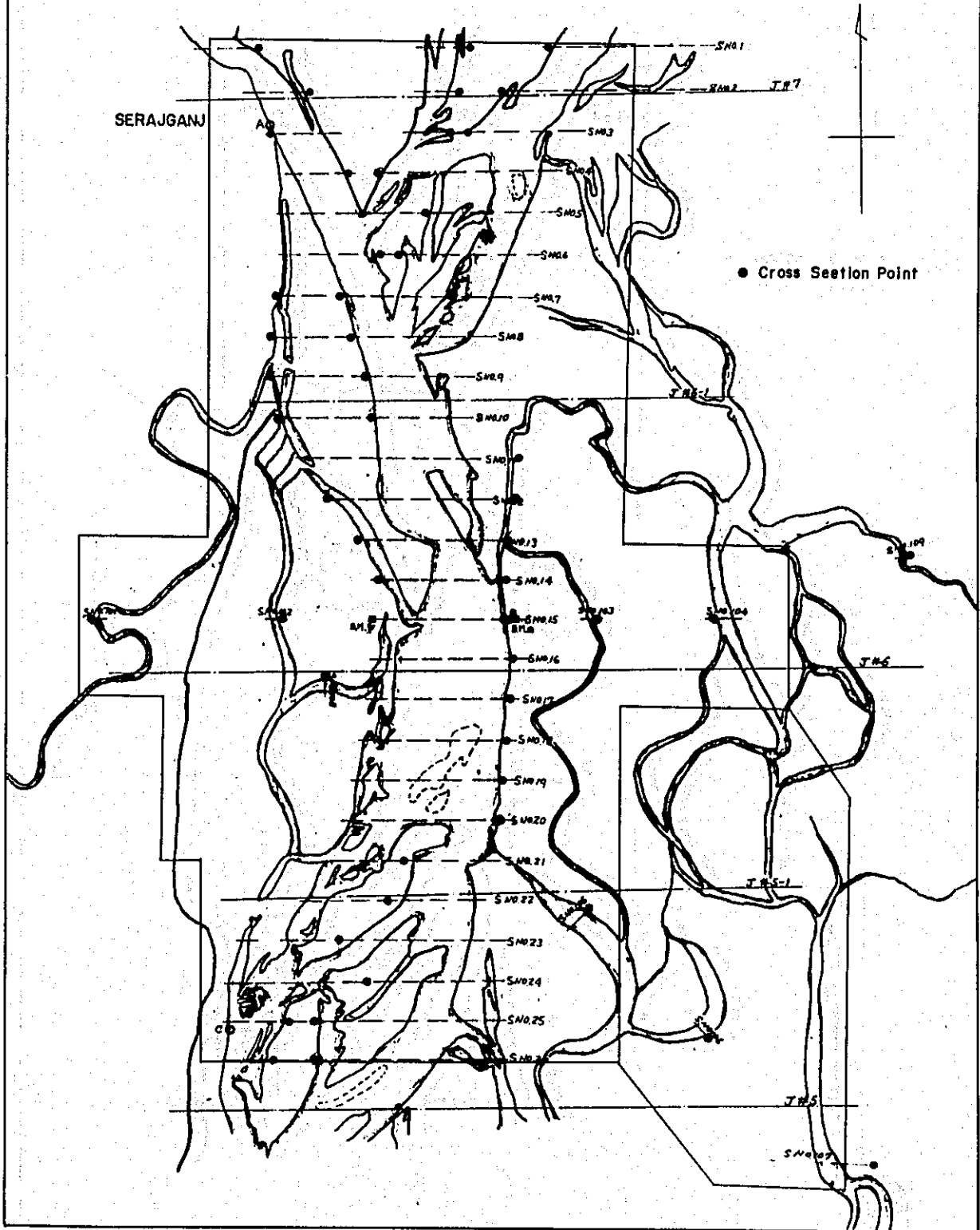


Fig. 9 LOCATION OF SERAJGANJ AREA  
GAUGING STATION

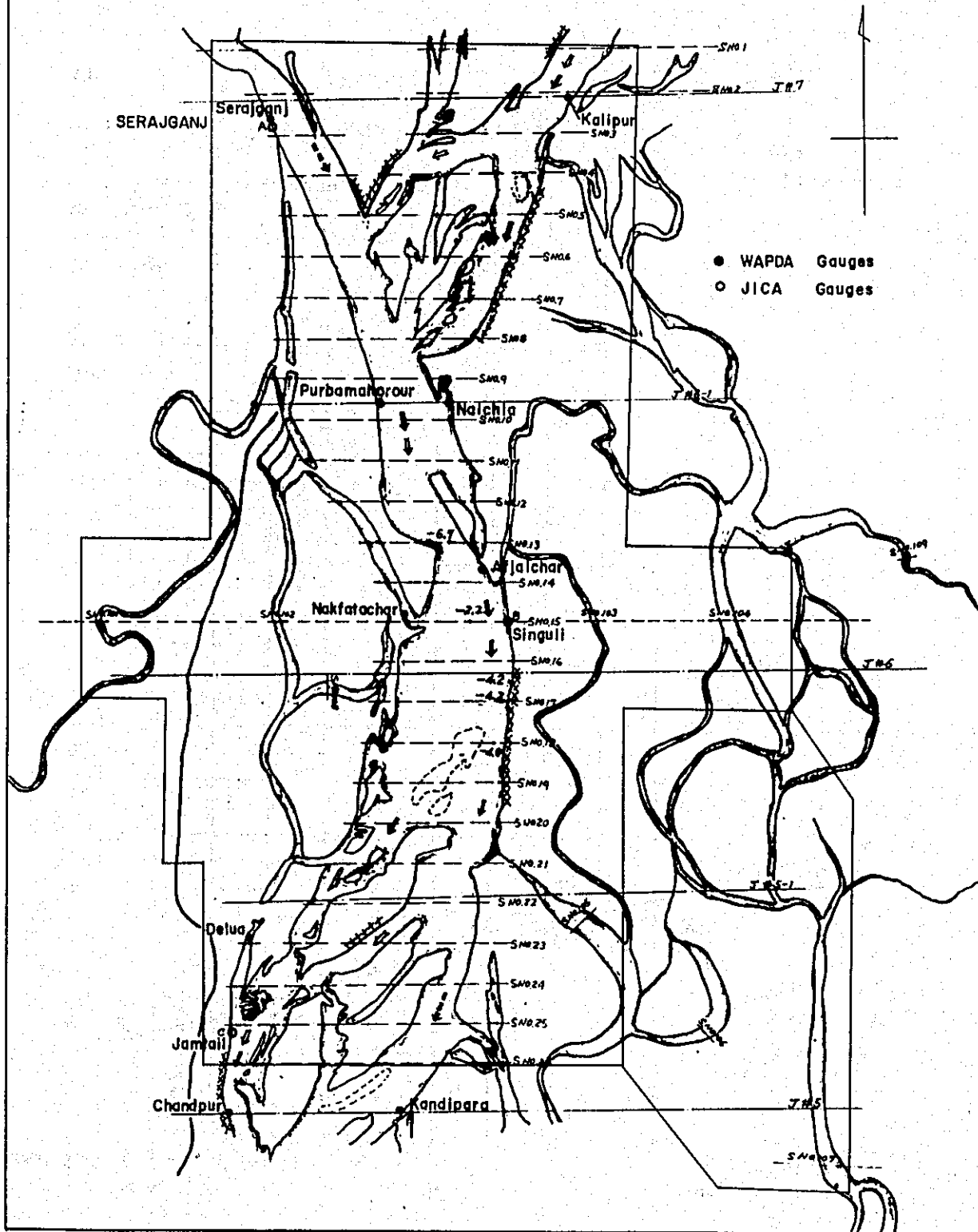


Fig. 10

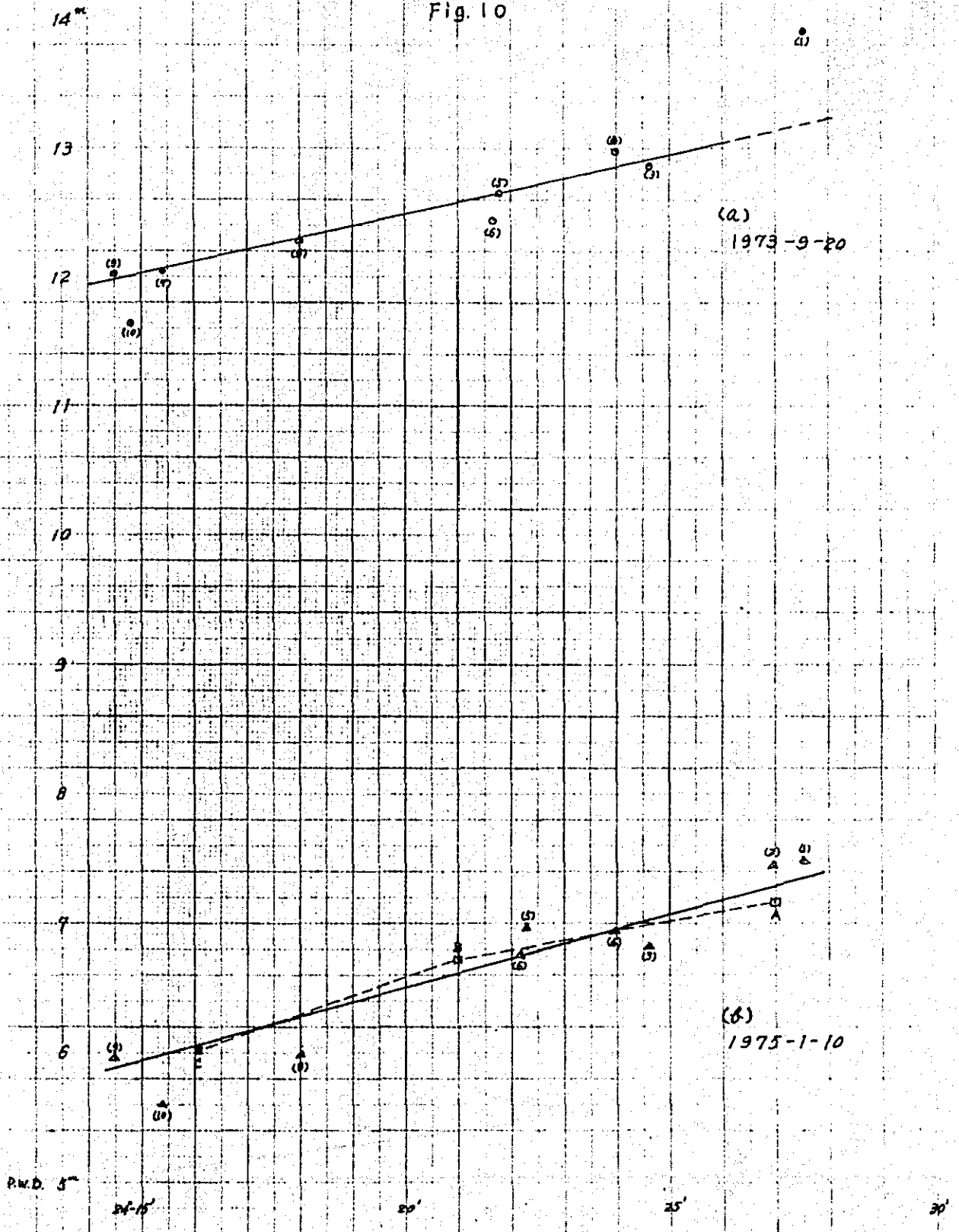
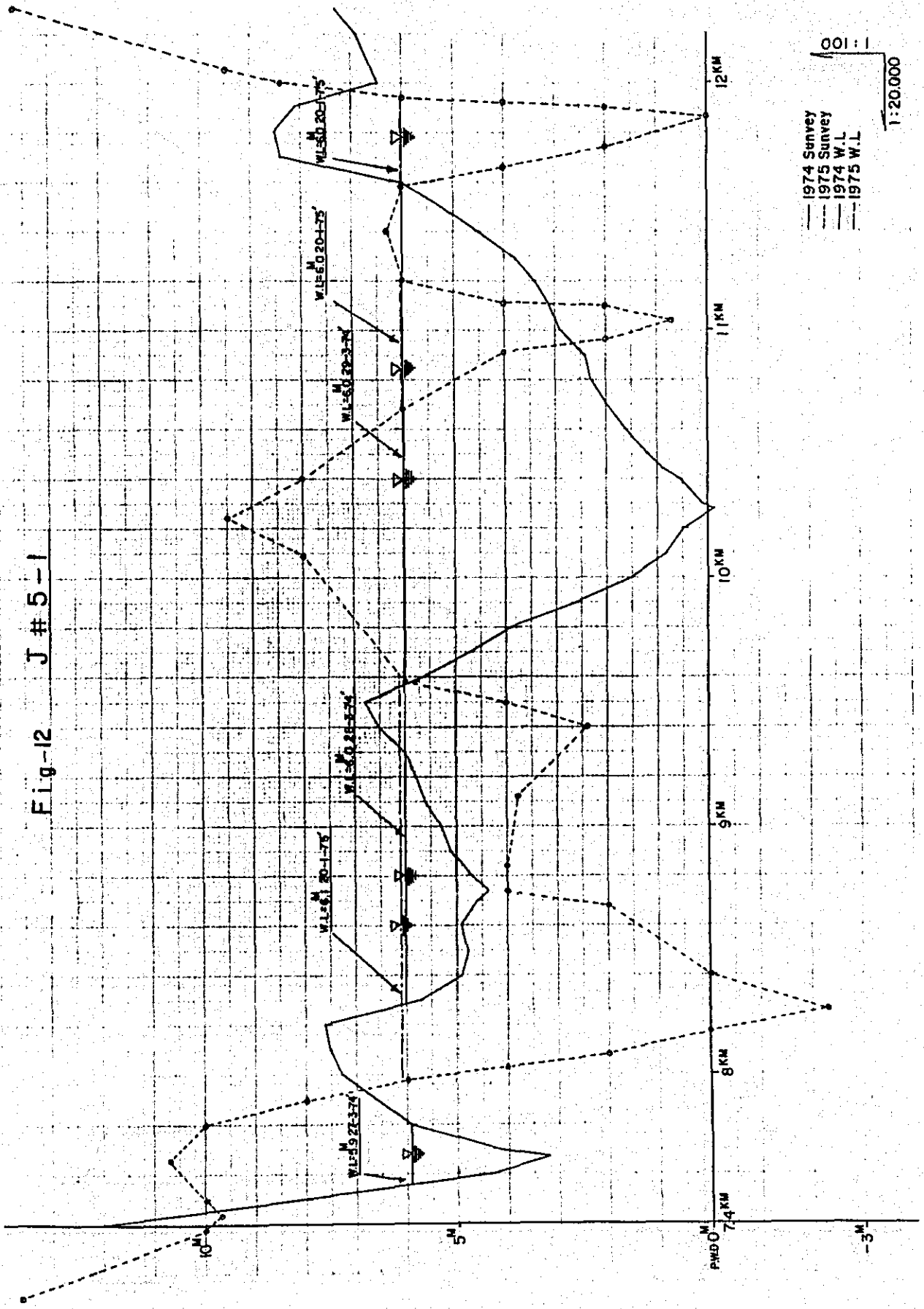


Fig-12 J # 5-1



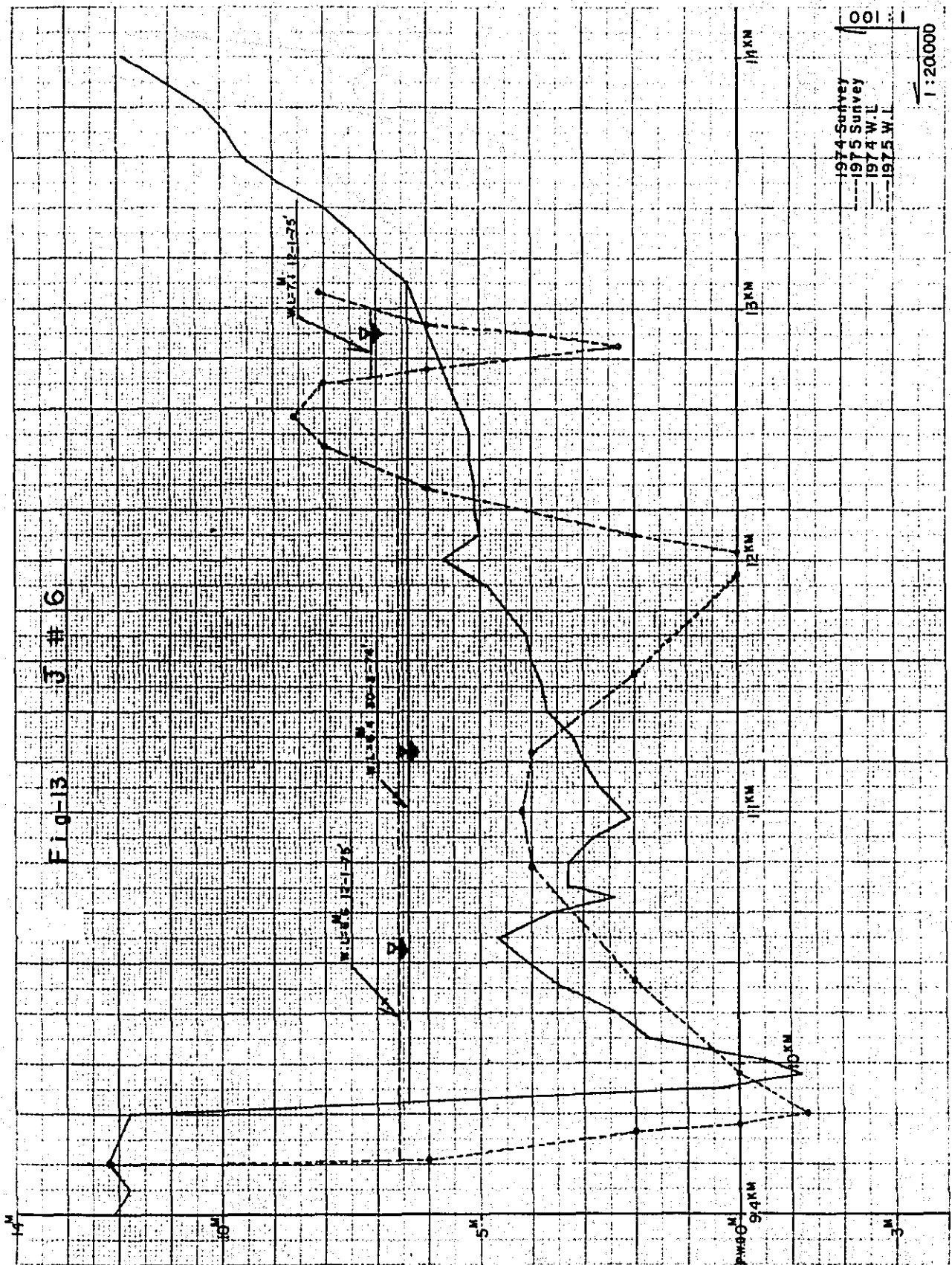


Fig-14 J#6-1

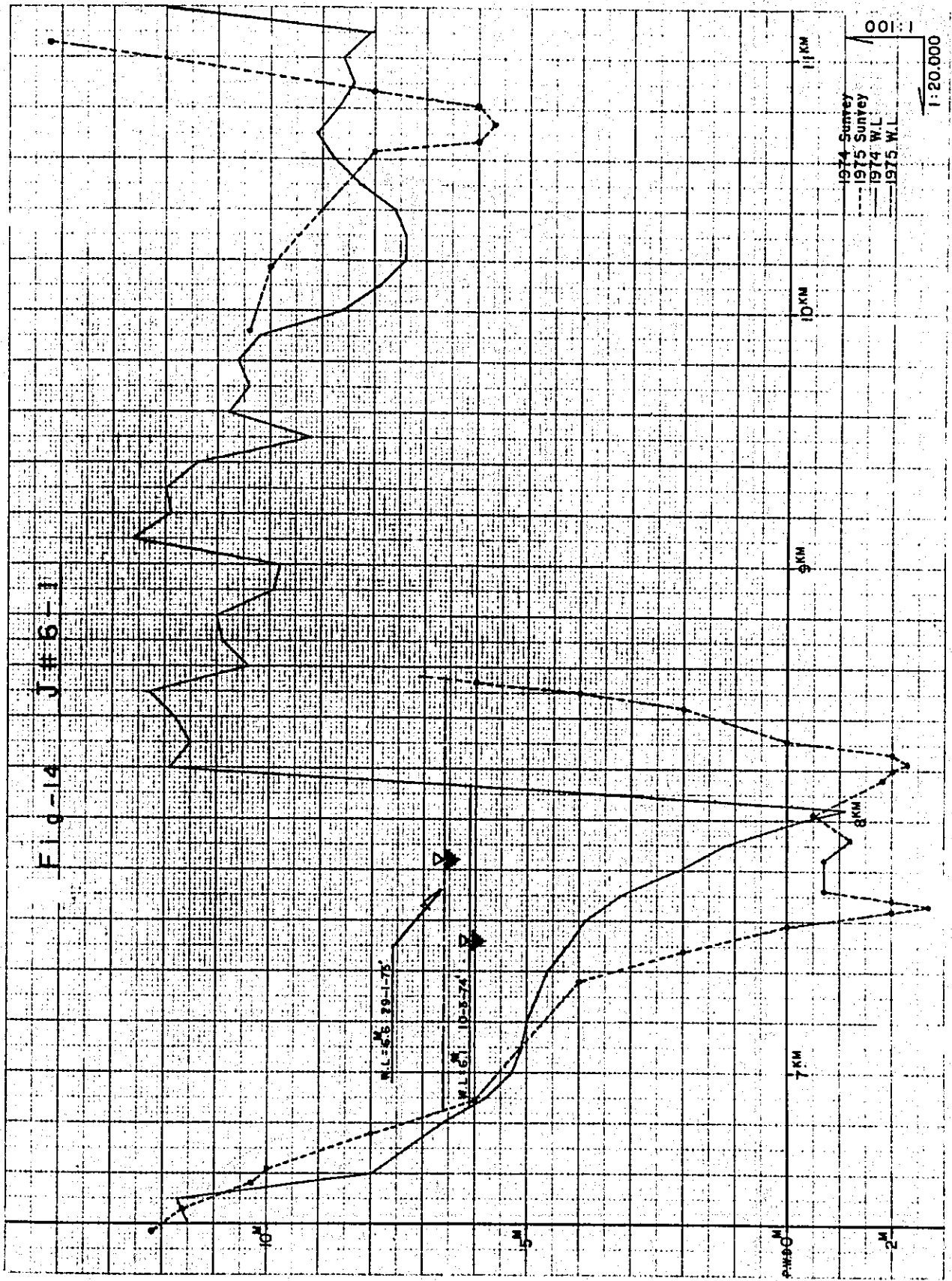
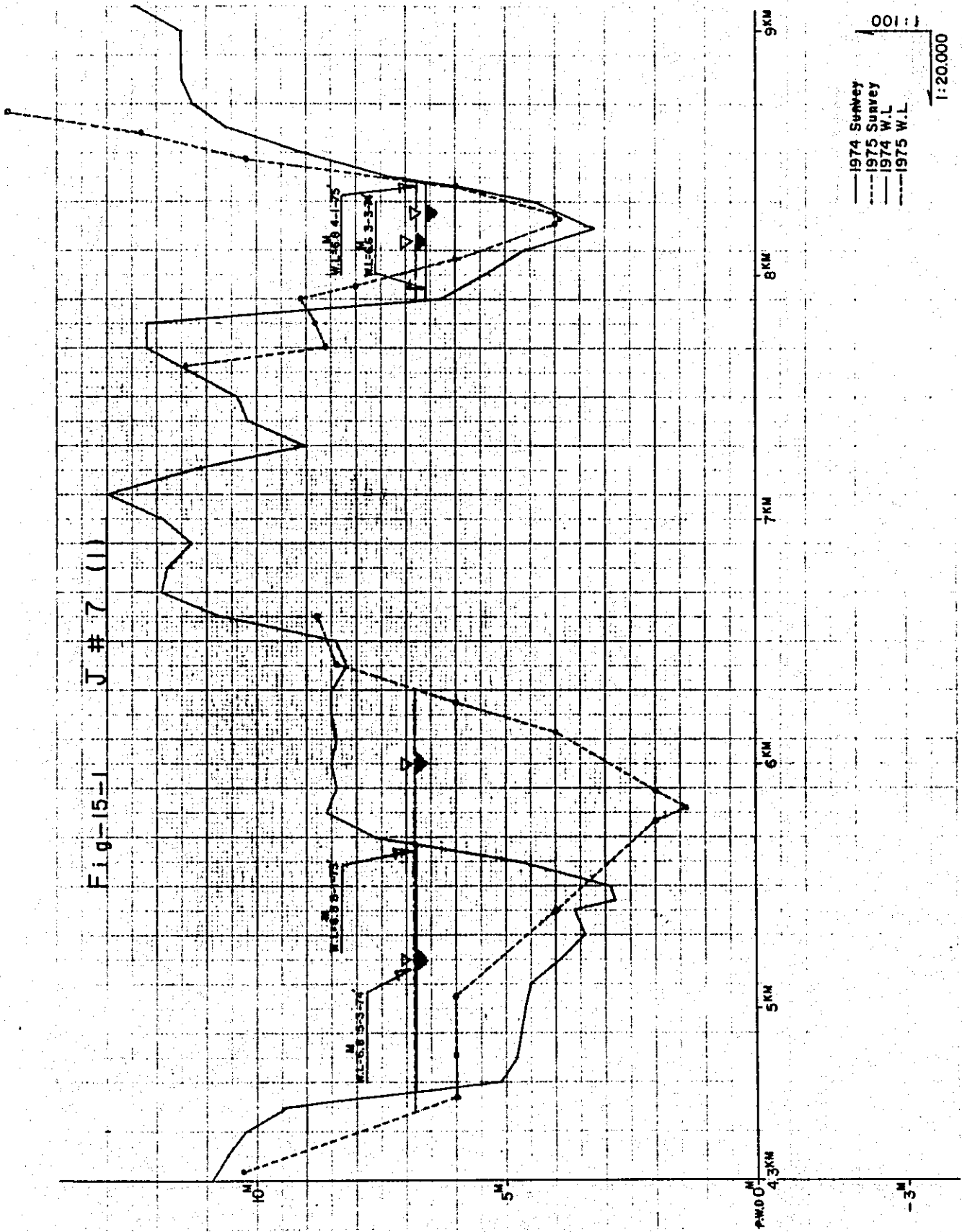


Fig-15-1

J # 7 (11)

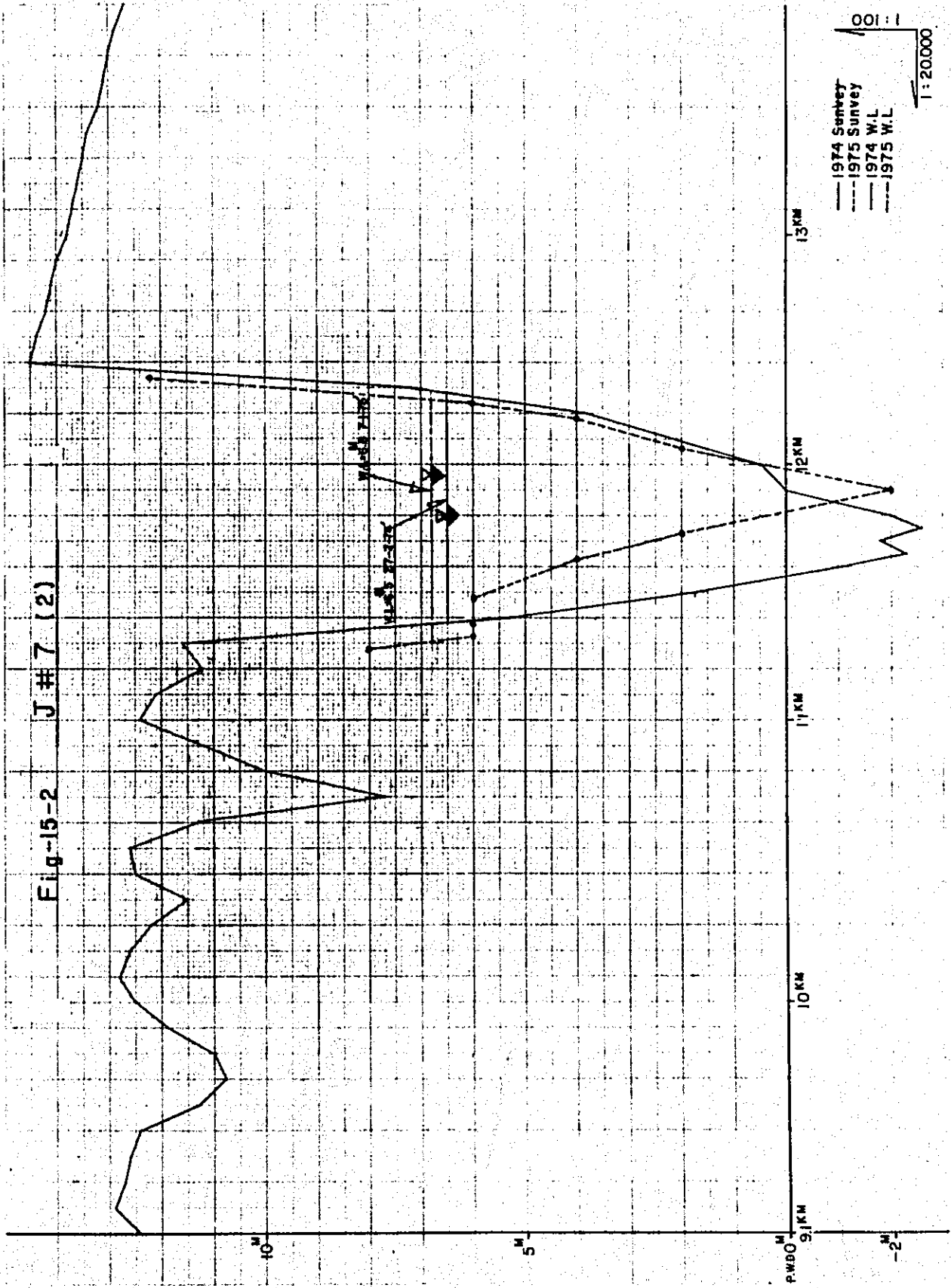


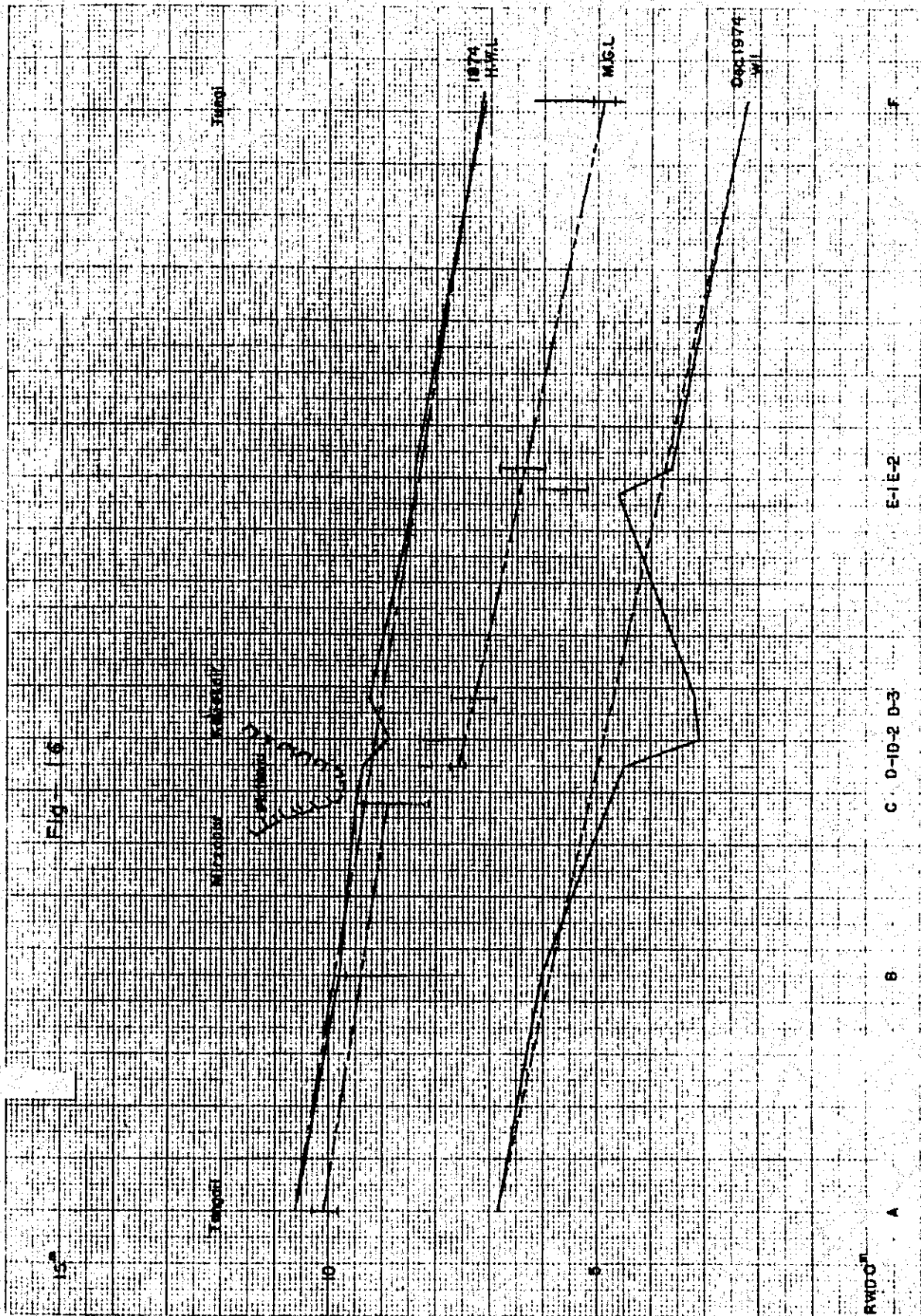
— 1974 Survey  
- - - 1975 Survey  
- · - 1975 W.L.  
1:20,000



Fig-15-2

J # 7 (2)





115 A4 180 - 250%

SCHEM (NO 40)

AWD<sup>TM</sup> A B C D-10-2 D-3 E-1E-2 F



Fig. 18 FUTJANI (B)

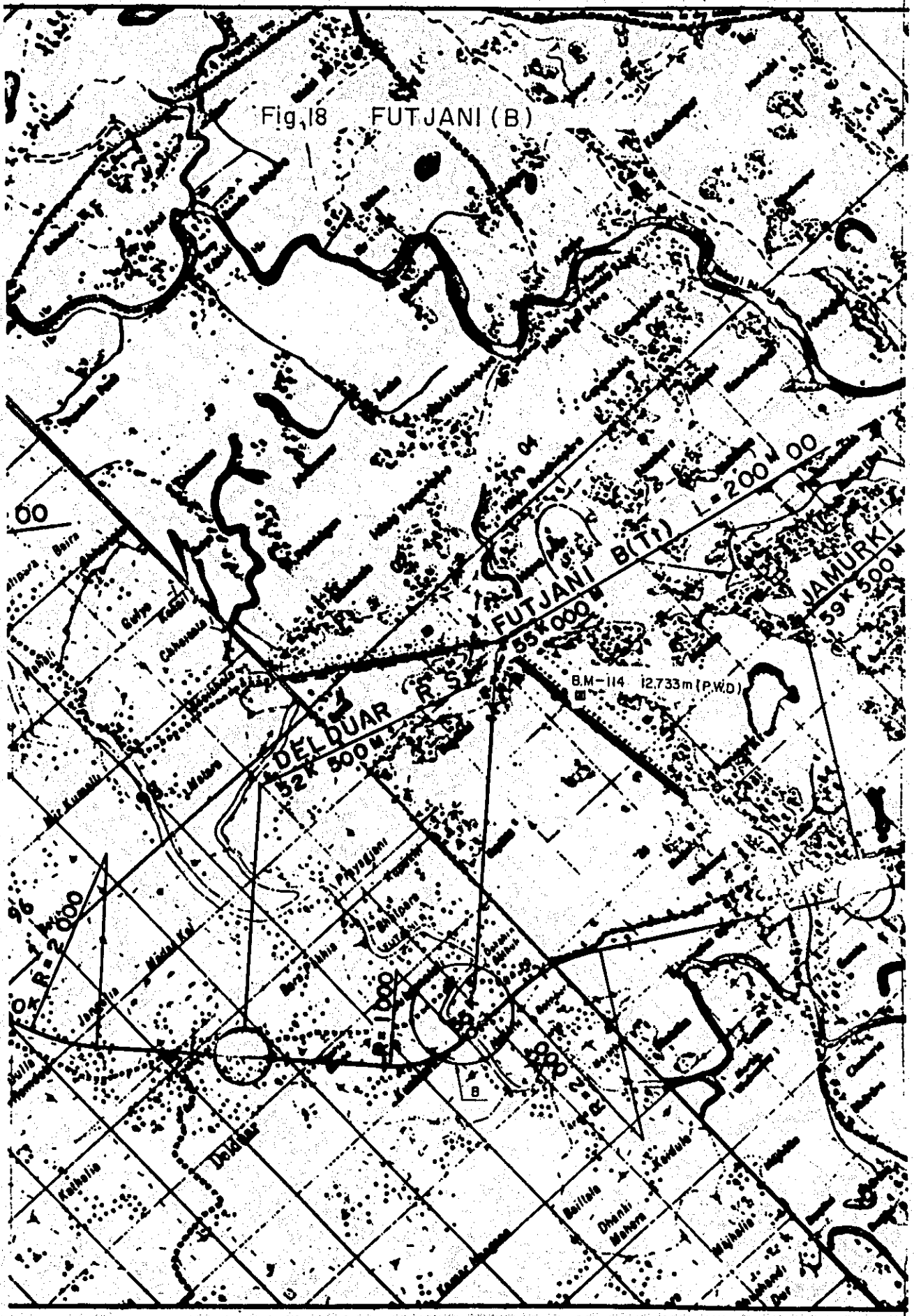


Fig. 19 LOHAJANG (C)

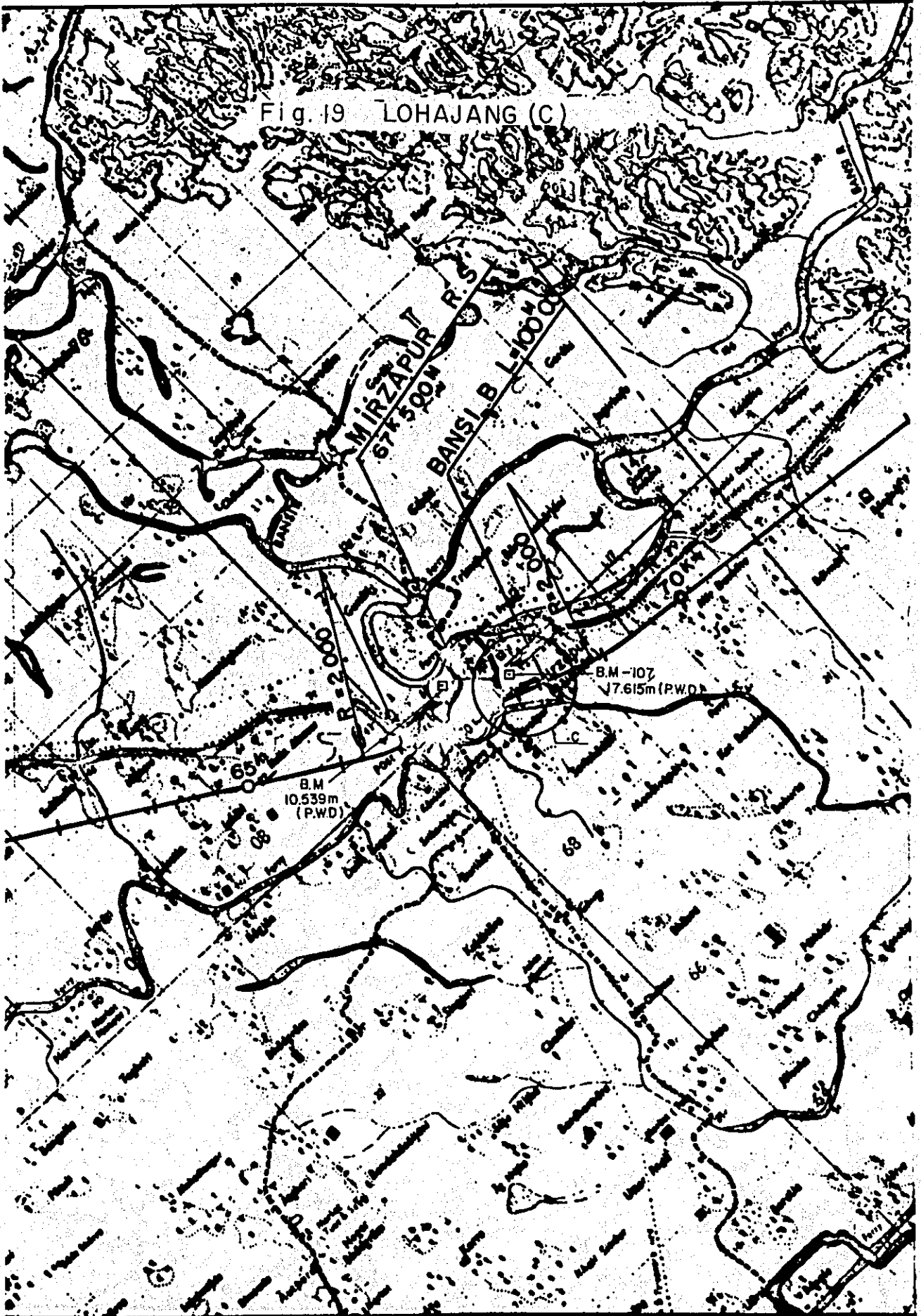


Fig. 20 SHIMULTALI (D-1)  
BANGSHI (D-2)  
LATIFPUR (D-3)





Fig. 22 TUNGI (F)

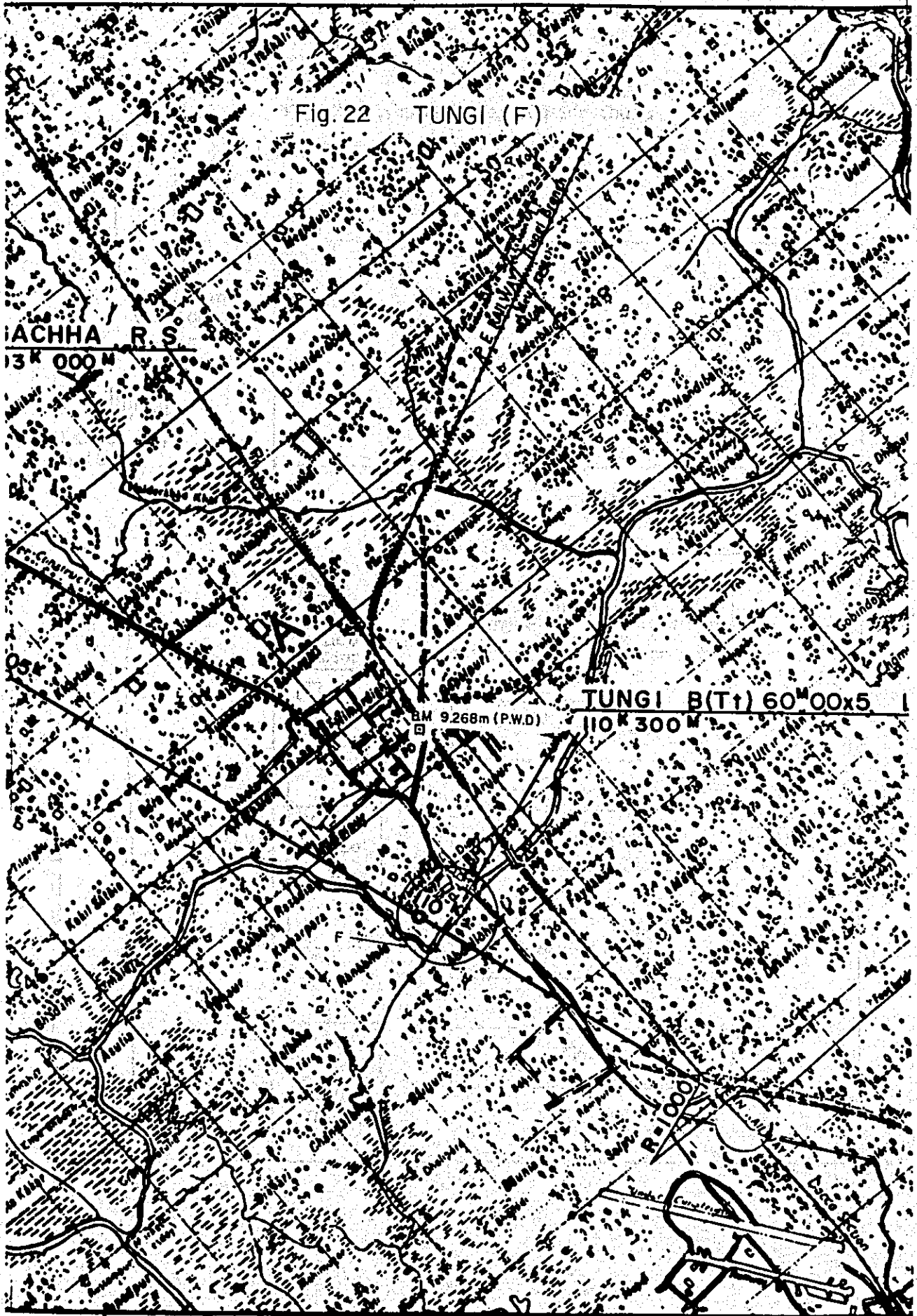




Fig. 23. Abstract Map of Base-Camp

