

REPORT ON TOPOGRAPHIC MAPPING PROJECT
FOR
CAGAYAN VALLEY,
THE REPUBLIC OF THE PHILIPPINES
(THIRD YEAR)
PHOTO PROCESSING
LEVELLING
FIELD IDENTIFICATION

JUNE, 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

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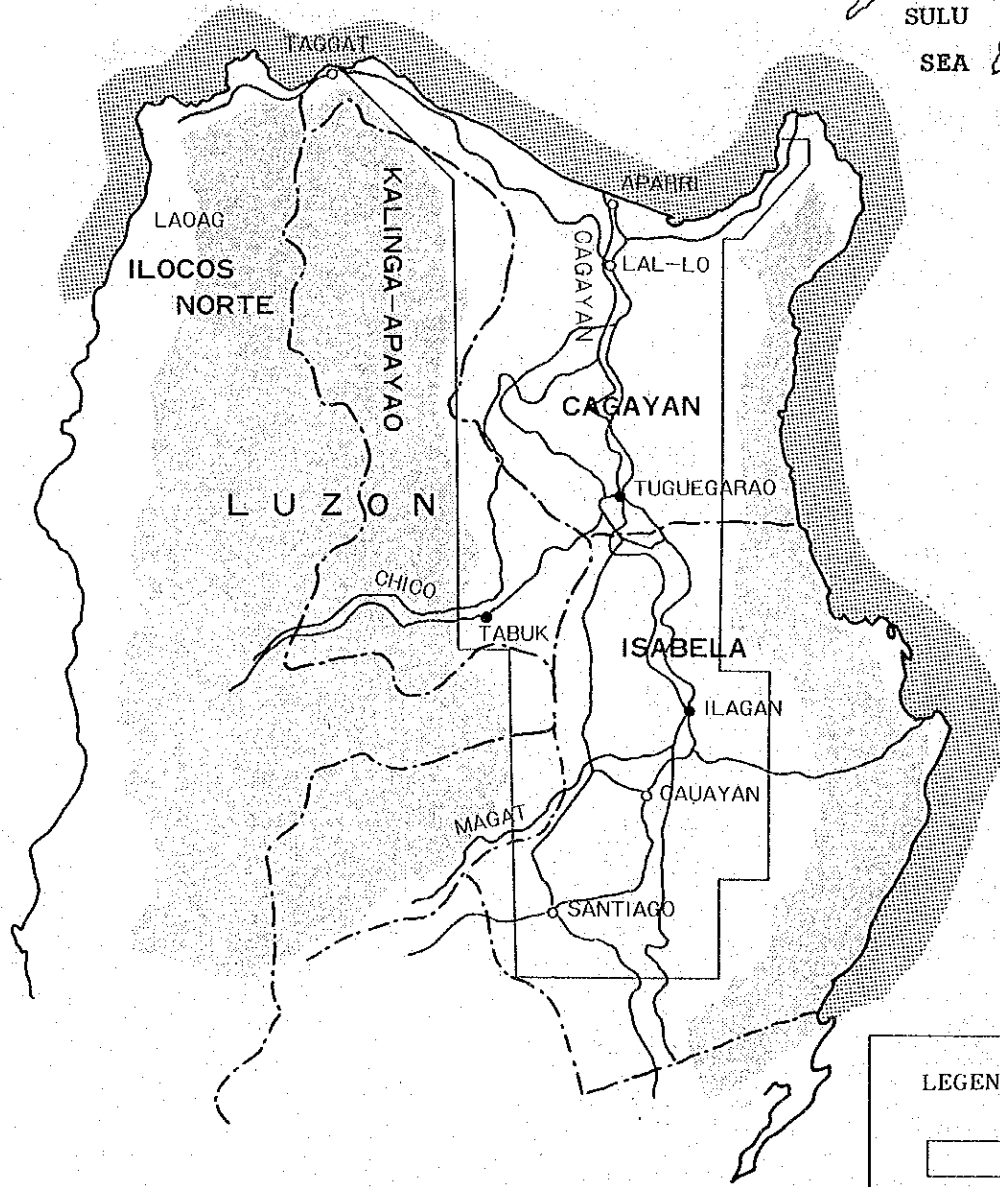
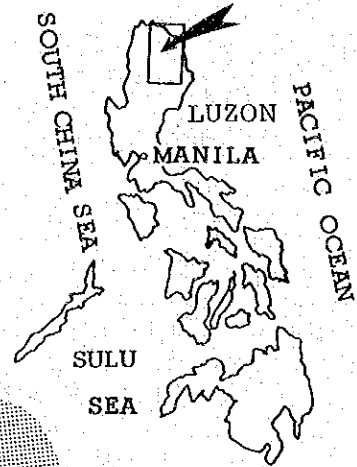
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**CAGAYAN VALLEY
MAPPING PROJECT
LOCATION MAP**



LEGEND :

- : Project Area
- : Road
- : River
- : Mountainous Area
- : Provincial Boundary

LETTER OF TRANSMITTAL

Mr. Keisuke Arita, President
Japan International Cooperation Agency

The Report on the Third Year Survey Work (photographic processing, levelling and field identification) of the Topographic Mapping Project of Cagayan Valley, the Republic of the Philippines, conducted from November 1980 through April 1981 in compliance with your request, is herewith submitted to you.

This Report describes the details of the above-mentioned third year work. We feel confident that the third year survey work, through our activities, has greatly contributed to the advancement of the surveying standard of the Republic of the Philippines as well as consolidated the foundation for the subsequent year's work.

On behalf of the survey team, I would like to express my deep appreciation to the project inspectors, the officials of the Bureau of Coast and Geodetic Survey of the Philippines, the Japanese Embassy in the Philippines, Manila Office of Japan International Cooperation Agency and the Japanese Government for their guidance and cooperation. At the same time, it is hoped that the work for subsequent years will be conducted without delay.

June 1981

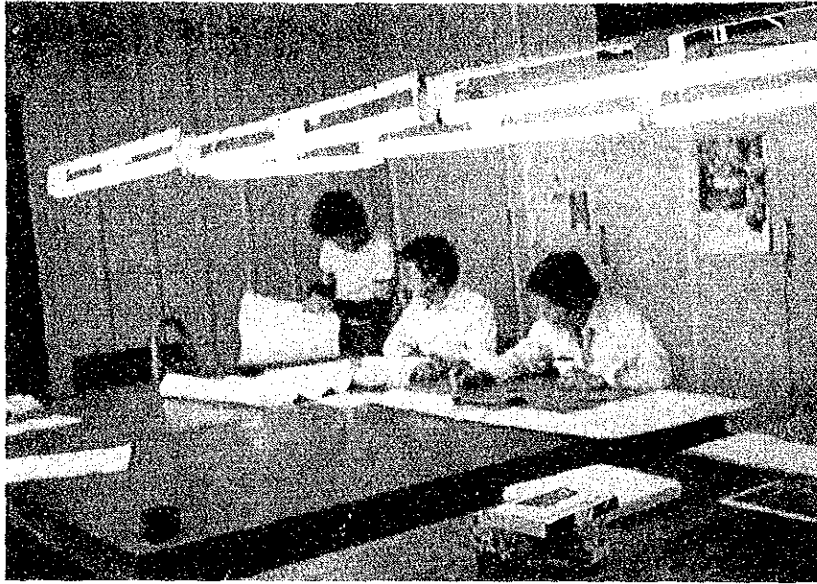
Shigehiro Shino
Leader, Topographic Mapping Project
of the Cagayan Valley, the Republic
of the Philippines,
International Engineering Consultants
Association



Cagayan River



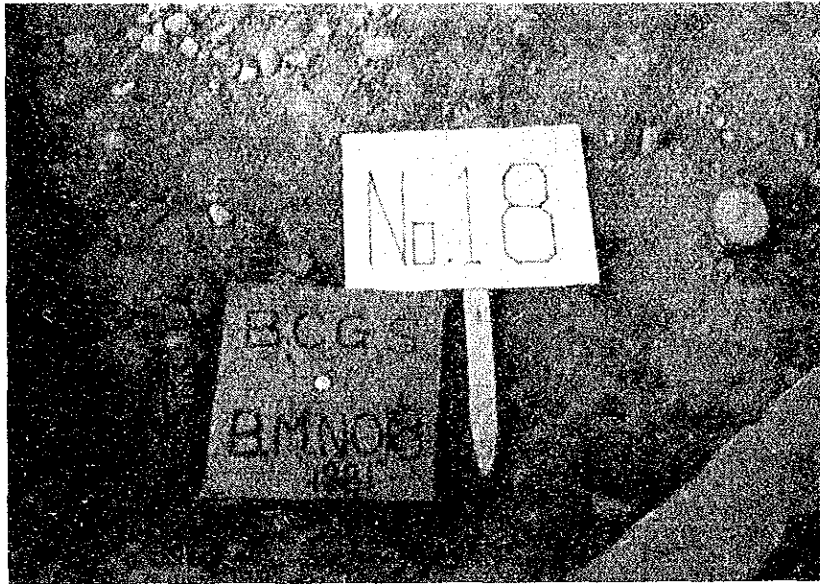
Meeting for Survey Work with BCGS



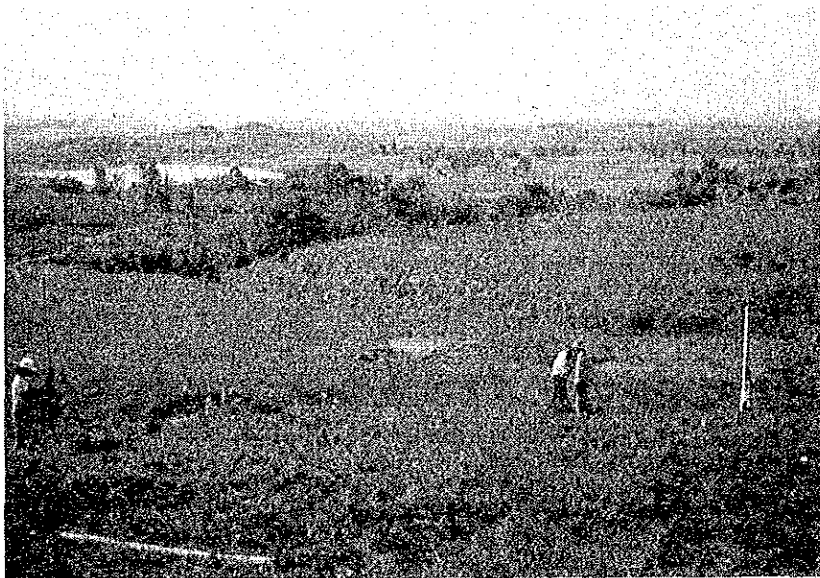
Field Identification (Work in Office)



Monumenting



Monumented Marker



Levelling



River-crossing Levelling



Indirect Levelling



Field Identification



Pricking

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APPENDIX: Minutes of the Meeting on Cagayan Valley
Topographic Mapping Project

Part I Work in Japan

A. Outline of the Work in Japan

1. Objective

Photographic processing required for the third year onward was performed, using the films of the photographs taken during the first year of this project which is being undertaken as a part of the technical cooperation with the Republic of the Philippines.

2. Work Types and Volumes

1) Un-controlled mosaic photographs	192 sheets
2) Contact prints	2,701 "
3) Positive films	1,240 "
4) Positive films for ortho-photos	66 "
5) 2-time enlargement photographs	82 "

3. Work Period

From October 11, 1980

To December 13, 1980

B. Work Conducted

1. Preparatory Work

Photographic processing was planned so as to minimize its work volume which involves various photographs to be used in the third year work onward.

2. Photographic Processing

2.1 Preparation of Un-controlled Mosaic Photographs

In order to preclude missing parts in the un-controlled mosaic photographs, contact prints were compiled for each course. Further, in the interest of work accuracy and efficiency, two final maps were incorporated into each sheet and the unified scale of 1/25,000 was used.

2.2 Production of Contact Prints

Contact prints were produced for the subsequent aerial triangulation and stereo plotting, photo-interpretation of the third year work, levelling route studies and pricking of newly established bench marks.

2.3 Production of Positive Films

Only those which will be used for aerial triangulation and stereo plotting were produced.

2.4 Production of Positive Films for Ortho-photos

Only those of the areas requiring ortho-photos were produced.

2.5 Production of 2-time Enlargement Photographs

For pricking of the existing 1st order bench marks in the survey site, 2-time enlargement photographs of such levelling routes were produced.

3. Conclusion

All products obtained from the photographic processing

were classified into the group of photographs for the third year field work and that of photographs for subsequent work and were placed in safe and careful custody in accordance with the method of safekeeping agreed upon through consultation with the Philippines Government.

It is believed that sufficient accomplishments were attained as the photographic processing required not only for the third year work but also for the fourth year work was completed before the start of the third year field work, enabling the fourth year work to begin without loss of time.

Part II Work in the Philippines

A. Outline of the Work in the Philippines

1. Objective

The third year work consisting of levelling and field identification for stereo plotting of the survey site was performed for the 1/25,000 topographic mapping project for Cagayan Valley in northern Luzon, which has been under way since 1979 as a part of the technical cooperation with the Republic of the Philippines.

2. Project Area

A total of approximately 11,200 km², subject to stereo plotting, in the Cagayan Valley region of northern Luzon (See attached Figure 1)

3. Work Period

From December 1, 1980

To April 21, 1981

4. Work Types and Volumes

(1) Levelling

Direct levelling	460 km (duplicate)
	340 km (single)
Indirect levelling	80 km
Levelling across river	6 locations
Monumenting	20 points

- (2) Field Identification 11,200 km²
- (3) Pricking of Bench Marks 457 km (existing 1st order
levelling routes)
100 points (newly established
control points)
- (See attached Figure 2)

5. Organization of the Survey Team

Leader (General control) : Shigehiro Shino
Dec. 8, 1980 - Dec. 28, 1980
Apr. 5, 1981 - Apr. 21, 1981

Deputy Leader (General survey): Toshimasa Nagashima
Dec. 8, 1980 - Apr. 21, 1981

Coodinator : Takashi Harada
Dec. 1, 1980 - Apr. 21, 1981

Mechanic : Isamu Saito
Dec. 1, 1980 - Apr. 21, 1981

Chief Surveyor : Chuji Misawa
Dec. 8, 1980 - Apr. 21, 1981

Surveyor (Field Identification): Shigeo Ono
Dec. 15, 1980 - Apr. 13, 1981

Surveyor (") : Eiichi Taguchi
Dec. 15, 1980 - Apr. 13, 1981

Surveyor (") : Naoyuki Sato
Dec. 15, 1980 - Apr. 13, 1981

Surveyor (") : Kazuyoshi Iba
Dec. 15, 1980 - Apr. 13, 1981

Surveyor (Field Identification) : Susumu Semba
 Dec. 15, 1980 - Apr. 13, 1981

Surveyor (") : Atsushi Okuizumi
 Dec. 15, 1980 - Apr. 13, 1981

Surveyor (Levelling) : Masaji Koyama
 Dec. 15, 1980 - Apr. 7, 1981

Surveyor (Levelling) : Seihiro Tominaga
 Dec. 15, 1980 - Apr. 7, 1981

Surveyor (") : Keiji Hirasawa
 Dec. 15, 1980 - Apr. 7, 1981

Surveyor (") : Makoto Masuda
 Dec. 15, 1980 - Apr. 7, 1981

Surveyor (") : Tomokazu Saito
 Dec. 15, 1980 - Apr. 7, 1981

Surveyor (") : Hiroshi Fukazawa
 Dec. 15, 1980 - Apr. 7, 1981

Surveyor (") : Jun-ichiro Okamoto
 Dec. 15, 1980 - Apr. 7, 1981

Surveyor (") : Yuichi Kato
 Dec. 15, 1980 - Apr. 7, 1981

6. Weather Conditions during Work Period

Weather	Dec.	Jan.	Feb.	Mar.	Apr.	Total	%
Clear	2.5	10.0	18.5	28.0	19.0	84.0	60.0
Cloudy	18.0	20.0	8.5	3.0	1.0	50.5	36.1
Rainy	3.5	1.0	1.0	0.0	0.0	5.5	3.9
Total	30.0	31.0	28.0	31.0	20.0	140.0	100.0

Note: The days of departure from and arrival in Japan are excluded and local and transient rainfalls are not counted in.

7. Existing Conditions of the Project Area

In mid-November, a severe typhoon inflicted heavy damage to northern Luzon. The inhabitants of this area suffered a great deal and especially Dalton Pass, the gateway to Cagayan Valley, situated 200 km to the north of Manila was closed to the traffic for about two weeks. This typhoon caused the rivers in the project area to flood and destroyed ferry ports and washed bridges away and thus greatly impeded the field reconnaissance activities.

The entry into the project area of the survey team in mid-December fell on the transitional period from wet to dry season and the commencement of observation work did not meet any serious obstruction except that in the northern Aparri district penetration by way of roads other than main roads was difficult until the early part of February due to intermittent rainfalls. In the mountainous area to the east of southern Cauayan where there are local squalls frequently, maneuvering of land cruisers was obstructed by the large ditches formed by slipping of the large vehicles used as a means of public transportation, and therefore the work in this area was planned to start in mid-February, when the wet season would be over.

At the present time in the Cagayan River basin a land improvement project is under way, using its abundant water resources, and especially agricultural irrigation water channels and auxiliary roads are under construction. Also,

along the route 150 km long between Santiago and Tuguegarao, the construction of pylons is under way by National Power Corporation.

Gasoline, which was indispensable to the field investigation, could be supplied sufficiently at Tuguegarao, Aparri, Cagayan and other towns; daily commodities were in abundant supply but their prices were much higher than they were in the previous year.

8. Summary Progress Record of Work

December 1, 1980 : Coordinator Harada and Mechanic Saito left Japan.

December 2, 1980 : Investigation preparatory work commenced.

December 8, 1980 : Mr. Hosono of Geographical Survey Institute, Mr. Kimura of J.I.C.A., leader Shino, deputy leader Nagashima and team member Misawa left Japan.

December 9-15, 1980 : A conference held with BCGS.

December 10-13, 1980: Team member Harada conducted preparatory work at Tuguegarao.

December 15, 1980 : Team members Taguchi, Koyama, Ono, Tominaga, Sato, Iba, Hirasawa, Masuda, T. Saito, Fukazawa, Senba, Okuizumi, Okamoto and Kato left Japan.

December 16-24, 1980: Leader Shino and deputy leader Nagashima inspected the project site.

- December 18-22, 1980: Mr. Hosono and Mr. Kimura inspected the project site.
- December 20, 1980 : 17 team members entered the survey site by land.
- December 21, 1980 : Survey office opened at Tuguegarao.
- December 22, 1980 : Reconnaissance and field identification started.
- December 26-27, 1980: Deputy leader Nagashima left Manila, arrived at Tsuguegarao, conferred with BCGS and signed the minutes of the conference.
- December 28, 1980 : Mr. Hosono, Mr. Kimura and leader Shino left Manila for Japan.
- December 31, 1980 -
- January 7, 1981 : Off duty.
- January 2, 1981 : Monumenting and direct levelling observation started.
- January 14-17, 1981 : Team member Harada reported the progress of work and conferred with BCGS in Manila.
- January 16-19, 1981 : Team members Harada and Saito conferred in Manila for investigation of vehicle maintenance status.
- February 2-5, 1981 : Team members Harada and Saito received the vehicles and on Feb. 5 arrived at Tsuguegarao by land.
- February 2-7, 1981 : River-crossing levelling observation conducted.

- February 9-13, 1981 : Indirect levelling in the Gattaran district conducted.
- February 16-22, 1981: Members of the field identification team put up at separate locations in the Cauayan district and conducted field identification.
- February 23-March 8, 1981 : Members of the levelling team put up at separate locations in the Cauayan district and conducted direct levelling of the Cauayan district and indirect levelling of Jones, Angadanan and Ilagan districts.
- February 24-27, 1981: Team member Harada conferred with BCGS.
- March 4-6, 1981 : Deputy leader Nagashima and team member Harada reported the progress of work and conferred with BCGS.
- March 13-15, 1981 : Team member Harada reported the progress of work and conferred with BCGS.
- March 18-19, 1981 : Indirect levelling in Roxas district conducted.
- March 23-26, 1981 : Team member Harada reported the progress of work and conferred with BCGS.
- March 27, 1981 : The levelling team completed the field work.

- March 28-29, 1981 : Team member Harada conferred in Manila.
- April 1, 1981 : The levelling team arrived in Manila by land.
- April 1-4, 1981 : Team member Harada conferred in Manila.
- April 4, 1981 : The field identification team completed its work.
- April 5, 1981 : Leader Shino left Japan.
- April 6, 1981 : Mr. Aiba of J.I.C.A. left Japan and team member Harada left for Manila for coordination work.
- April 7, 1981 : The field identification team arrived in Manila by land. Team members Koyama, Tominaga, Hirasawa, Masuda, Saito, Fukazawa, Okamoto and Kato left Manila for Japan.
- April 8-10, 1981 : Mr. Aiba of J.I.C.A., leader Shino and deputy leader Nagashima inspected the survey site and paid courtesy visits to the agencies concerned.
- April 13, 1981 : Mr. Yaguchi, staff of Topographic Section, Geographical Survey Institute, Ministry of Construction left Japan. Team members Ono, Taguchi, Sato, Iba, Senba and Okuizumi left Manila for Japan.

April 14-19, 1981 : A conference was held with BCGS on the results of the Third Year Work and the schedule for the Fourth Year Work.

April 20, 1981 : The minutes was signed by both parties.

April 21, 1981 : Mr. Yaguchi of Geographical Survey Institute, Mr. Aiba of J.I.C.A., leader Shino, deputy leader Nagashima, team members Misawa, Harada and Saito left Manila for Japan.

9. Work Supervision and Inspection

During the work period, the following Japanese officials visited the Philippines for work supervision, guidance, consultation with the Philippines Government and receipt and storage of the vehicles for the work:

Mr. Taketsune Hosono

Research Staff, Geodetic Department, Geographical Survey Institute, Ministry of Construction

(December 8-28, 1980)

Mr. Akira Yaguchi

Staff, Topographic Section, Topographic Division, Geographical Survey Institute, Ministry of Construction

(April 13-21, 1981)

Mr. Hiroshi Kimura

First Development Survey Division,
Social Development Cooperation Department,
Japan International Cooperation Agency

(December 8-28, 1980)

Mr. Manabu Aiba

Second Training Division, Training Affairs Department,
Japan International Cooperation Agency

(April 6-21, 1981)

10. Work Conducted by BCGS

During the work period, BCGS, in accordance with the Implementing Arrangements, conducted the following investigations:

- 1) Administrative boundaries
- 2) Geographical names
- 3) Roads

B. Progress Record of Work

1. Preparatory Work

The team members Harada and Saito left Japan on December 1, 1980 to undertake the preparatory work and make the vehicles ready for the work. Immediately upon arrival in Manila, they inspected the vehicles, concentrated all of them at BCGS and at the same time made arrangements for receipt of materials and equipment shipped from Japan, employment of drivers, procurement of local materials and equipment, bank

transactions and transportation of materials and equipment.

Leader Shino, deputy leader Nagashima and team member Misawa left Japan on December 8, 1980 together with Mr. Hosono of Ministry of Construction and Mr. Kimura of J.I.C.A. and, beginning on the following day, explained and discussed this years work at BCGS.

The team member Harada moved to Tuguegarao on December 10 to negotiate renting of an office, open a bank account and arrange for lodging houses, and then returned to Manila on December 12.

On December 15, leader Shino and deputy leader Nagashima moved to Tuguegarao by land and they paid courtesy visits to the authorities and agencies concerned located within the survey site, solicited their cooperation and inspected the work field.

The 17 team members moved to Tuguegarao on December 20 by land, started setting up the office on December 21 and completed it on December 23.

1.1 Setting-up (Head Office and Base Camp)

1.1.1 Head Office

The head office was set up at the under-mentioned address in the city of Tuguegarao. Tuguegarao is the capital of Cagayan Province and is situated in the center of the survey site, therefore this town was most convenient to

the execution of the work.

The head office activities such as management and control, storage and supply of materials, vehicle maintenance checking, communication and coordination between Manila and Japan, accounting, etc. were executed in Tuguegarao.

Address: PEREZ COMPOUND, BALZAIN,
TUGUEGARAO, CAGAYAN, 1101

Telephone: TUGUEGARAO, 446-1768

1.1.2 Base Camp

The base camp was located at a pension within a walking distance of 7 to 8 minutes from the head office.

1.2 Communication

Prior to the commencement of the work, an official permission to use the radio equipment shipped from Japan was obtained based on the Implementing Arrangements from the Bureau of Telecommunications through BCGS.

An antenna was installed at the head office in Tuguegarao, and communication with the teams was made by radio.

1.3 Issuance of ID Cards

The Philippines Government issued ID cards to all team members, who then carried those ID cards on their persons at all times.

2. Levelling

2.1 Objective

The objective of the work was to determine the elevations for aerial triangulation and supplement the levelling nets in connection with the production of 1/25,000 topographic maps of the Cagayan Valley region comprising approximately 11,200 km².

2.2 Selection of Levelling Routes

The levelling routes were selected by dividing the work as follows in accordance with the plans prepared on the basis of the aerial photographs and the distribution densities of the control points established in the previous year:

2.2.1 Direct Levelling

a) Duplicate Observation Routes

Main routes connecting the existing 1st order bench marks, and those routes which, for topographical reasons, cannot form closed traverse circles.

b) Single Observation Routes

Routes connecting the existing 1st order bench marks, and those routes which can form closed traverse circles, using as given points the bench marks established as in a) above.

2.2.2 Indirect Levelling

Indirect levelling was performed in the routes where direct levelling was not possible for topographical restrictions

and therefore triangulation levelling had to be employed.

2.2.3 River-crossing Levelling

River-crossing levelling was performed at the locations in direct levelling routes where observation was not possible within the standard staff distance for topographical restrictions.

2.3 Observation

2.3.1 Direct Levelling Routes

a) Duplicate Observation Routes

Third order levelling was carried out, using an automatic level and single graduation staffs, the staff distances being not more than 70 m, and temporary bench marks (fixed points) were established with interval distances of 2 km as the standard distance, and the duplicate observation discrepancies were checked as to the route lengths and the temporary bench mark distances. (Tolerance $10 \text{ mm } \sqrt{S \text{ km}}$)

An effort was made to carry out check observation of the starting points and the fixed points beforehand and the observation of a new route was started after the results of the previous observation were confirmed.

b) Single Observation Routes

An automatic level and double graduation staffs were used. Four readings in four sights were made. Since it was a single line observation, the difference between right reading and left reading per observation point was

limited to 3 mm and the error of closure was limited to $10 \text{ mm } \sqrt{S \text{ km}}$.

In the above levelling observation, twenty-six control points in flat areas which had been established in the Second Year Work were covered to confirm and improve the accuracy of their elevations. Together with the four directly levelled bench marks of the Second Year Work, they make a total of 30 points, which is sufficient to maintain reference to the levelling net.

2.3.2 Indirect Levelling

Indirect levelling was conducted in areas where direct levelling was difficult because of topographical restrictions. In indirect levelling, the elevation is determined by observing the vertical angle and the distance. If at the same time its horizontal angle is observed, its coordinate values can be obtained and it can be used as a control point. Therefore, in consideration of the subsequent aerial triangulation, horizontal angles were observed in all the routes. All observation points were pricked upon the contact print photographs.

i) Horizontal Angle Observation

A WILD T2 was used. Two pairs of observation at 0° and 90° were made. The maximum allowable double angle difference was 12" and the maximum allowable observed difference 7". For any observation exceeding these limits, reobservation was conducted. Signal lamps were used for observing signal targets.

ii) Vertical Angle Observation

A WILD T2 was used. Four pairs of simultaneous observation in each direction were conducted. Considering the weather variations, the intervals of over 5 minutes were provided for each pair of observation. The allowable variation in instrumental constants was limited to 10".

iii) Distance Observation

An HP 3808A was used for distance observation. One set of observation (four readings) was made. In temperature measurement, a thermometer was placed at a height of 2 m to 3 m above the ground level to prevent heat radiation from the ground, and in atmospheric pressure measurement, an aneroid barometer was used. The compensation table was used for meteorological correction of the measured distances.

2.3.3 River-crossing Levelling

River-crossing levelling was conducted at the six locations along the levelling routes where non-existence of a bridge made normal observation within the maximum staff distance of 70 m impossible. At each location of river-crossing, a signal was installed and a signal lamp was installed at a height of approximately 2 m above the ground on the signal target. The longest distance of measurement was 1,000 m.

i) Vertical Angle Observation

A WILD T2 was used. Two sets of simultaneous observations (five pairs make up 1/2 set) were conducted.

Each set of observation was divided into two 1/2 sets, which were performed at times symmetrically centering around 13:00 PM. The allowable discrepancies in instrumental constants were limited to 10".

ii) Distance Measurement

An HP3808 was used. Two sets of measurements (four readings make up one set) were made. Intervals of over 30 minutes were provided between sets, and the allowable discrepancy between sets was limited to 35 mm. Meteorological survey was made as in the case of indirect levelling.

2.4 Monumenting

Monumenting of new bench marks was made at crossing points between principal bench mark nets and along long distance open lines. The bench marks of 30 cm x 30 cm x 50 cm made of concrete were used with iron bolt metal tablets. (See attached Figure 3)

Monumenting was made at twenty points, of which one point was in privately owned land and all others in public land (under administration of municipal mayors, Barangai captains, school masters and principals, etc.). The observation work proceeded smoothly, thanks to the cooperation of those administrators and to the understanding of the local people. For each monument, a notation was made.

2.5 Computation

i) Approximate Computation at Site

Traverse closures were checked by using observation data obtained from direct levelling (duplicate lines and single lines) and computed values obtained from river-crossing levelling. The results of this trial computation were acceptable, proving that all traverse closures were within the maximum allowable error.

(See attached Table 1)

The elevations of the existing 1st order bench marks used in this computation were the results of the work by BCGS received in January 1980.

As to indirect levelling, computations were made of direct telescope position observation values and reversed telescope position observation values separately, using the vertical angles and compensated distances, and the error of closure was sought for direct observation and reversed observation separately. The maximum discrepancy between these was limited to 0.13.

Computations for river-crossing levelling were made as in the case of indirect levelling. However, only altitude differences between the two points were computed.

ii) Final Computation

An electronic computer was used for computation of the adjustment of the net and the coordinate of direct levelling. The computation was made separately for three blocks, namely Aparri, Tuguegarao and Cauayan, and the final results were obtained by means of homoge-

neous net adjustment of coordinates. The average square errors for those blocks obtained from the net adjustment computation were as follows:

Aparri district	±5.65 mm	(Links Nos. 3,4)
Tuguegarao district	±4.88 mm	(Links Nos. 5,6,7,8,9, 10)
Cauayan	±5.03 mm	(Links Nos. 11,12,13, 14,15)

Table 2 shows a comparison between the results of the Second Year Work control points and those obtained from the direct levelling. At two points (control points No. 8 and No. 27) there are differences over 1 m, and their values were computed on the basis of the average side length of 16K (maximum 20K, minimum 11K).

The accuracy of the elevation of the control points established during the Second Year Work was improved by corrective computation, using the elevations of the control points obtained from the direct levelling as given data.

3. Pricking of Bench Marks

3.1 Existing Routes

A national highway runs north to south approximately through the center of the survey site, and the 1st order bench marks established by the Philippines Government are located with intervals of 1.0 km to 1.5 km.

This time, in order to improve the accuracy of the subse-

quent aerial triangulation and stereo plotting, pricking was performed on the 2-time elongation photographs. Also, eccentric observations were made depending on the field conditions. Pricking work performed on the existing routes is as shown below. The loss of some bench marks as shown will not affect the subsequent aerial triangulation and stereo plotting.

Total Length	Total Points	Pricked Points	Lost Points	Loss Percentage.
457 km	340	308	32	9.4%

3.2 New Routes

In the observation of new routes, elevation points were established every 10 km of distance at longest and were pricked on the contact print photographs in consideration of the subsequent aerial triangulation and stereo plotting.

4. Field Identification

4.1 Objective

The objective was to perform identification of roads, buildings, vegetations, rivers and so forth which is necessary for production of the 1/25,000 maps, using the symbols adopted by BCGS for mapping, and to show the results thereof in different colors on the mosaic photographs to serve as data for stereo plotting.

4.2 Examination of Symbols before Field Identification

In connection with the 1/25,000 mapping symbols of BCGS of the Philippines which were received on the occasion of

the second year work consultation, the survey team had prepared beforehand a proposed "Manual of Guideline for Field Identification" in English and had it checked and revised by Mapping Advisory Committee of J.I.C.A. and by experts of Geographic Survey Institute. They brought it to the Philippines and discussed it with BCGS.

Based on this proposed English manual, sufficient discussions were made concerning the definition, unified interpretation and extent and method of usage, etc. of each symbol to be used, and this manual was then formalized as "Manual of Guideline for Field Identification" and was made a formal attachment to the Minutes of the Conference. At the same time, it was agreed that this manual should be the guideline to be used in the field identification work.

This conference was held at BCGS in Manila, and it was agreed that any question which may arise on the field be solved on the field through consultation with the BCGS counterpart.

4.3 Preparatory Work

Immediately upon penetration into the site, the preparatory work started and "Manual of Guideline for Field Identification" as revised through the preliminary consultation with BCGS was confirmed. The work site concerned was, considering their characteristics, divided into three blocks, and supplementary reconnaissance, preparation of photo-interpretation keys, establishment of countermeasures against

changing site conditions, consultations with the BCGS survey team, etc. were performed for each of these blocks.

4.4 Field Work

The work site was divided into Aparri, Tuguegarao and Cauayan district. Concerning the preparation of photo-interpretation keys, the field survey team and the BCGS counterpart spent approximately ten days, reconnoitering the site, recognizing the photographic characteristics of topographical features, miscellaneous objects and land categories and unanimously confirming and agreeing to the unified methods of symbolization.

Topographical features, miscellaneous objects and land categories were interpreted in accordance with the photo-interpretation keys. However, field identification was performed, using 1/50,000 topographical maps as to those buildings and objects which require notations or symbolization as well as uninterpretable land categories.

Field identification was conducted, always accompanied by the counterpart. In this site, there were a large number of schools and churches of which only large ones were given notations.

Flat areas were mostly covered by rice field and farmland, and special attention was given to the photographic color tone differences of differing rice field conditions generated by rice plants of different crops in multi-cropping, of differing conditions between grassy land and vacant rice

field or farm land and of differing seasonal conditions of double-cropping farms.

The Aparri district is marked with marshland and crowding nipa and coconuts. Tuguegarao is rich in sugar cane farms and the hilly land of the Cauayan district in farms and grassy land. The mountainous areas were generally covered with broadleaf trees and grass.

4.5 Data Collection

While the field identification was in progress, data were collected at the authorities concerned. Concerning the places of interest and historical points, information was collected by hearings to facilitate the field identification operations.

4.6 Adjustment of Photographs

The contact prints were stereoscopically observed in accordance with the photo-interpretation keys and 3-color identification was given to the 1/25,000 mosaic photographs as the primary adjustment and as the secondary adjustment, revisions were given on the basis of 1/50,000 topographic maps, field identification photographs and other data. Care was taken of conditions changing with time and of jointing, etc.

4.7 Work Conducted by BCGS

In all areas of this project, BCGS conducted the following field work in accordance with the Manual of Guideline for

Field Identification:

i) Administrative Boundaries

Administrative boundaries were shown with different colors directly on the mosaic photographs and also on the overlays.

ii) Geographical Names

Geographical names were shown with different colors directly on the mosaic photographs and also on the overlays.

iii) Notations

The names of rivers and bridges were entered directly on the mosaic photographs.

iv) Road Classifications

The road classifications and names of roads were entered directly on the mosaic photographs, using different colors, and their destinations were shown in the same way.

Concerning these results of the field investigation, the following discussions were made with BCGS in the interest of maintaining compatibility with the subsequent work:

a) Geographical Names and Notations

In principle, the same geographical names and notations as used by BCGS will be used at the time of editing, except possible slight variations in their positions on the maps.

b) Administrative Boundaries

Due to a lack of data, the administrative boundaries could not be shown correctly for the 1/25,000 maps. However, they will be outlined on the topographical maps and be re-checked at the time of supplementary investigation.

5. Withdrawal Operations

The survey instruments and materials were checked repaired if necessary and crated. The office was removed. The vehicles were inspected, repaired if necessary and stored. Materials were inspected and assorted.

The materials and equipments that are expected to be used in the Fourth Year Work were properly sorted and brought into the office of BCGS, which was requested to keep them in custody.

6. Vehicle Maintenance

Those parts for vehicle maintenance work which could not be procured in the Philippines during the Second Year Work were shipped from Japan.

Those vehicles which were newly leased in the Philippines were also inspected and maintained.

Safety was emphasized to all members. The conditions of the vehicles were always informed to the mechanics, and the mechanics maintained the vehicles in coordination with such information.

C. Consultation with BCGS

The Japanese side consulted with the Philippines side (BCGS) on the following matters at the commencement and completion of the Third Year Work:

1. Reports and Consultations at Commencement of Third Year Work

i) Matters concerning Second Year Work

- a) Submission of reports in English
- b) Submission of the copies of the table of geodetic controls established, the notations for control points and the details of pricked points
- c) Explanation of control point computation results and the comparison with JMR points

ii) The following matters of the Third Year Work were discussed:

- a) Submission of the results of the photographic processing work
- b) Submission and discussion of "Manual of Guideline for Field Identification" prepared and translated into English by the Japanese side to facilitate the field identification work
- c) Acquisition of 1/25,000 topographical map sheet titles and numbers
- d) BCGS to provide five counterparts to expedite the work

e) Confirmation of the work carried out by BCGS.

2. Consultations at Completion of Third Year Work

The Japanese side and the Philippines side explained and confirmed their activities and the results thereof.

1. Results of Levelling

Concerning the control point elevations obtained by the net adjustment computation of the Second Year Work, it was agreed that the values of the points established this time by direct levelling will be adopted and that the elevations of the remaining points will be improved by re-computation.

2. Work Conducted by BCGS

2.1) Investigation of Administrative Boundaries

Where the boundary is not clear, the word "approximate" will be entered in English.

2.2) Investigation of Geographical Names, etc.

In principle, the same geographical names as used by the Philippines side will be used, except possible slight variations in their positions on the maps.

2.3) Investigation of Roads

In principle, the results of the work conducted by the Philippines side will be used.

Further, the Philippines side including the United Nations experts expressed their high evaluation of "Manual of Guideline for Field Identification", specifications for symbolization, used in the field identification of the year and expressed their appreciation for the effort of

the Japanese side to produce such manual.

3. Discussions concerning Fourth Year Work

The contents of the work will be as follows:

Aerial triangulation	1,151 models
Stereo plotting and editing	11,200 km ² 72 sheets
Ortho-photo	12 sheets
Supplementary survey	

i) Aerial Triangulation and Stereo Plotting

The work will be conducted in accordance with the Overseas Survey Regulations of J.I.C.A. The method and the accuracy criteria were recorded in the minutes of conference.

ii) Symbols

The specifications for 1/25,000 topographic map symbols of the Philippines had previously been received as Annex "C" to the minutes of the meeting dated May 27, 1980. The survey team, in accordance with the results of their consultation with the experts of Geographic Survey Institute, proposed certain improvements from a cartological viewpoint and presented as reference data the specifications of 1/25,000, 1/50,000 and 1/250,000 scale topographic map symbols, in English, of Geographic Survey Institute.

BCGS is now revising Annex "C" to produce revised symbol specifications taking into consideration some cartological viewpoints and their cartographical and printing capabilities. The revised specifications will

be sent to Japan upon finalization.

iii) In the supplementary survey, emphasis will be placed upon plotting of the agricultural irrigation channels now being constructed by NIA and the high tension electric power transmission lines being built by National Power Corporation, whose features may change with elapse of time.

iv) Ortho-photos

The production of ortho-photos in accordance with the document titled "Scope of Work" and appended to the Implementing Arrangements of this project will be as follows:

- | | |
|----------------------|--|
| 1. District | Cagayan Valley District 4 locations |
| 2. Sheets | 12 sheets |
| 3. Area | 25 km ² each, totalling 300 km ² |
| 4. Coordinate System | Philippines Plane Right Angle Coordinate System |

BCGS has recently chosen the Universal Transverse Mercator (UTM) coordinate system projection method to be used for all maps to 1/10,000 or smaller scales of the entire land of the Philippines, over which BCGS has jurisdiction and has changed the 1/50,000 topographical map size from the present 15' x 10' to 15' x 15'.

BCGS requested the survey team to make the following changes also on 1/10,000 photographic maps:

- a. Change the projection method from the Philippines Transverse Mercator (PTM) coordinate system to the UTM coordinate system.
- b. Change the map size from PTM 5 km x 5 km to UTM 3' x 3' (approx. 5.3 km x 5.4 km)

The survey team decided to convey these requests of BCGS to the Mapping Advisory Committee of JICA but told BCGS that it cannot recommend these changes for this project as it is difficult to adopt these changes for the following reasons:

- a) Compared with maps to scales smaller than 1/25,000, 1/10,000 ortho-photos and topographic maps are more often used on stages closer to making of working plans such as planning and on-the-map design stages in various development projects, and at the present time, all working plans are made on the basis of the geodetic standards of the PTM coordinate system, which is higher, in projection level, than UTM.
- b) The photographing courses in this project were planned to traverse the centers of sheets exactly 5 km apart to best facilitate the production of 1/10,000 square photographic maps by the PTM coordinate system. Also, both countries had agreed to use the photographing scale of 1/30,000, which is larger than the scale normally used in photographing for stereo plotting of 1/25,000 topographic maps. Therefore, if it is changed to 3' x 3' sheets by UTM, there will be some sheets for which two

photographs of different photographing courses should be used. Further, a larger number of models will be required and the quality of the ortho-photos will be greatly degraded.

- c) In order to conform to the 1/25,000 topographic map size (7'1/2 x 7'1/2), the size of the 1/10,000 map should be 3'3/4 x 3'3/4 or 2'1/2 x 2'1/2, other than 3' x 3', the former being too large as a sheet and the latter too small.

v) Trainees

The Philippines counterparts in Japan will be trained in three 3-month shifts, each shift composed of two trainees as follows:

- a) Aerial photographic survey May-July, 1981
- b) Mapping (stereo plotting) Aug.-Oct., 1981
- c) Mapping (editing) Nov., 1981 to Jan., 1982

The two trainees will be dispatched as follows:

- a) J2 Armed Force of Philippines
- b) BCGS

vi) Data, etc.

The following data necessary for the Four Year Work will be prepared by BCGS and sent to Japan by July:

- a) 1/25,000 revised symbols
- b) 1/25,000 sample maps
- c) Marginal data
- d) BCGS insignia

- e) Stick-up samples
 - f) Photocomposition types
 - g) Contour line maps
 - h) Ortho-photo marginal data
- vii) Photographic Sheet Positives

BCGS requested that twenty positives of each photographic sheet be added to the items to be submitted as presentations to the authorities and agencies concerned of the Philippines in order to widen areas where the photographic sheets of the Fourth Year Work may be made use of. The survey team agreed to this proposal and told BCGS that this matter would be discussed with JICA after return to Japan.

D. Comments for the Fourth Year Work

The Fourth Year Work will consist of aerial triangulation, detailed stereo plotting, editing, ortho-photographing and supplementary survey. All work except supplementary survey is to be carried out in Japan and each item of work should be carefully scheduled and be completed as scheduled.

Supplementary survey should be carried out to solve questions which may arise at the time of stereo plotting and to confirm current changes being made by the land development work in progress. Special attention should be given to irrigation channels, roads and power transmission lines.

The Third Year Work was accomplished in close coordination

with, and with aggressive cooperation of, BCGS. It is desired that the Fourth Year Work be carried out in the same way upon the foundation of closer cooperation and stronger confidence in each other.

E. Conclusion

The work consisted of surveying of the control points established in the Second Year Work. Therefore, general topographic characteristics were sufficiently confirmed. Further, the survey team brought uncontrolled mosaic photographs, therefore the field identification could be performed smoothly. In mid-November, however, a large typhoon washed many bridges away, and the latter part of December, when the survey team entered the survey site, was still in the rainy season, therefore there were certain areas where the vehicles could not enter. It was, however, fortunate that as soon as the rainy season was over, the ferries and bridges were completely repaired and restored so that the work could be carried out without obstructions.

Through working together without trouble with the local people and others and the purpose of our activities more widely understood, the team contributed to the enhancement of the friendly relationship with the people of the Philippines.

We would like to express our deep appreciation to the governors and municipal mayors of the provinces of Cagayan,

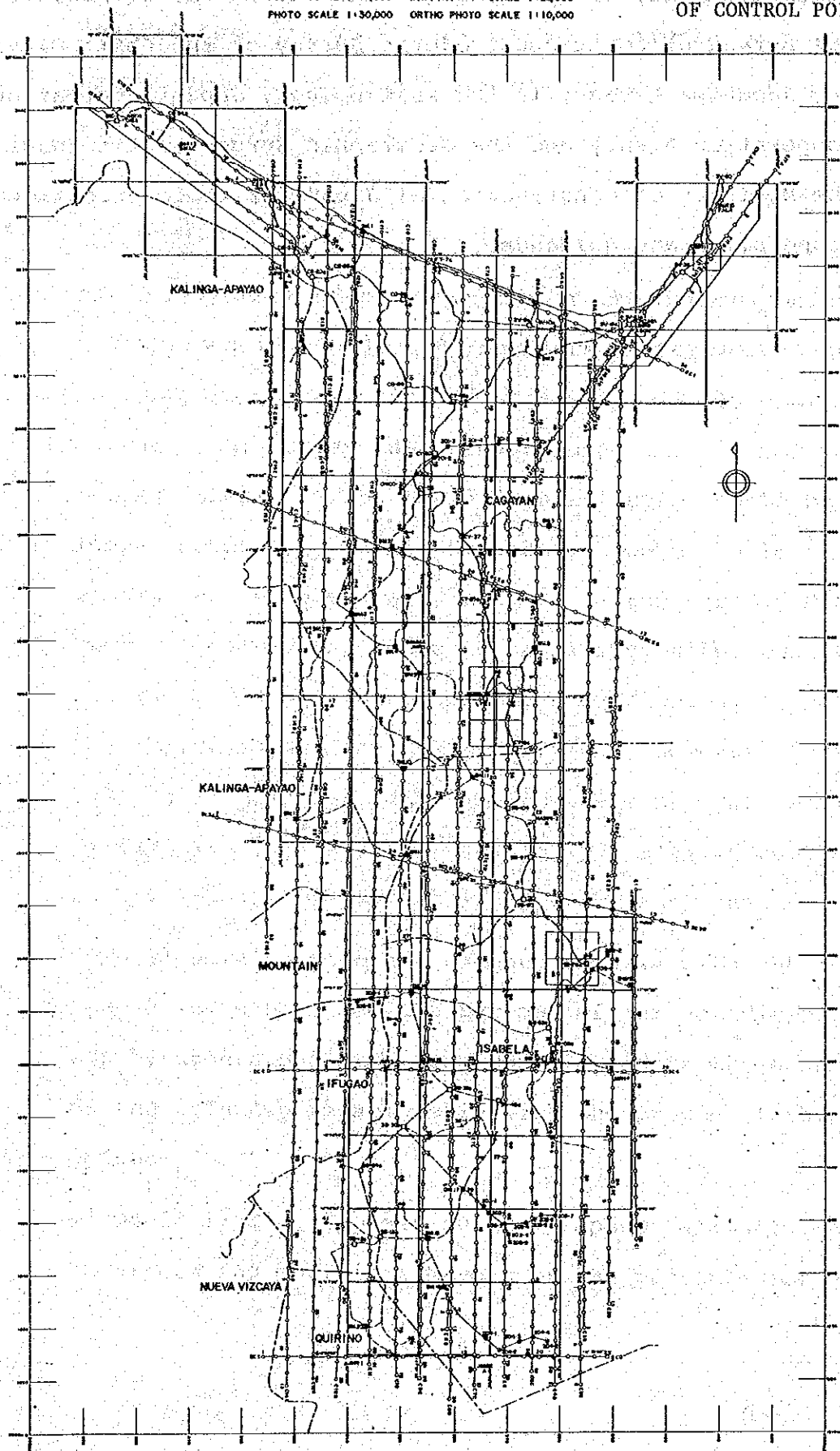
Kalinga-Apayao, Isabela and Quilino and to the officers of the Bureau of Coast and Geodetic Survey of the Philippines, the Japanese Embassy in the Philippines, Japan International Cooperation Agency and the Geographic Survey Institute of the Ministry of Construction of Japan for their exceptional cooperation and guidance.

CAGAYAN VALLEY TOPOGRAPHIC MAPPING

[Figure 1]

PLANNING ORGANIZATION - JAPAN INTERNATIONAL COOPERATION AGENCY, 1978-1982
EXECUTIVE ORGANIZATION - INTERNATIONAL ENGINEERING CONSULTANTS ASSOCIATION
MAP SCALE 1:100,000 MAPPING SCALE 1:25,000
PHOTO SCALE 1:30,000 ORTHO PHOTO SCALE 1:10,000

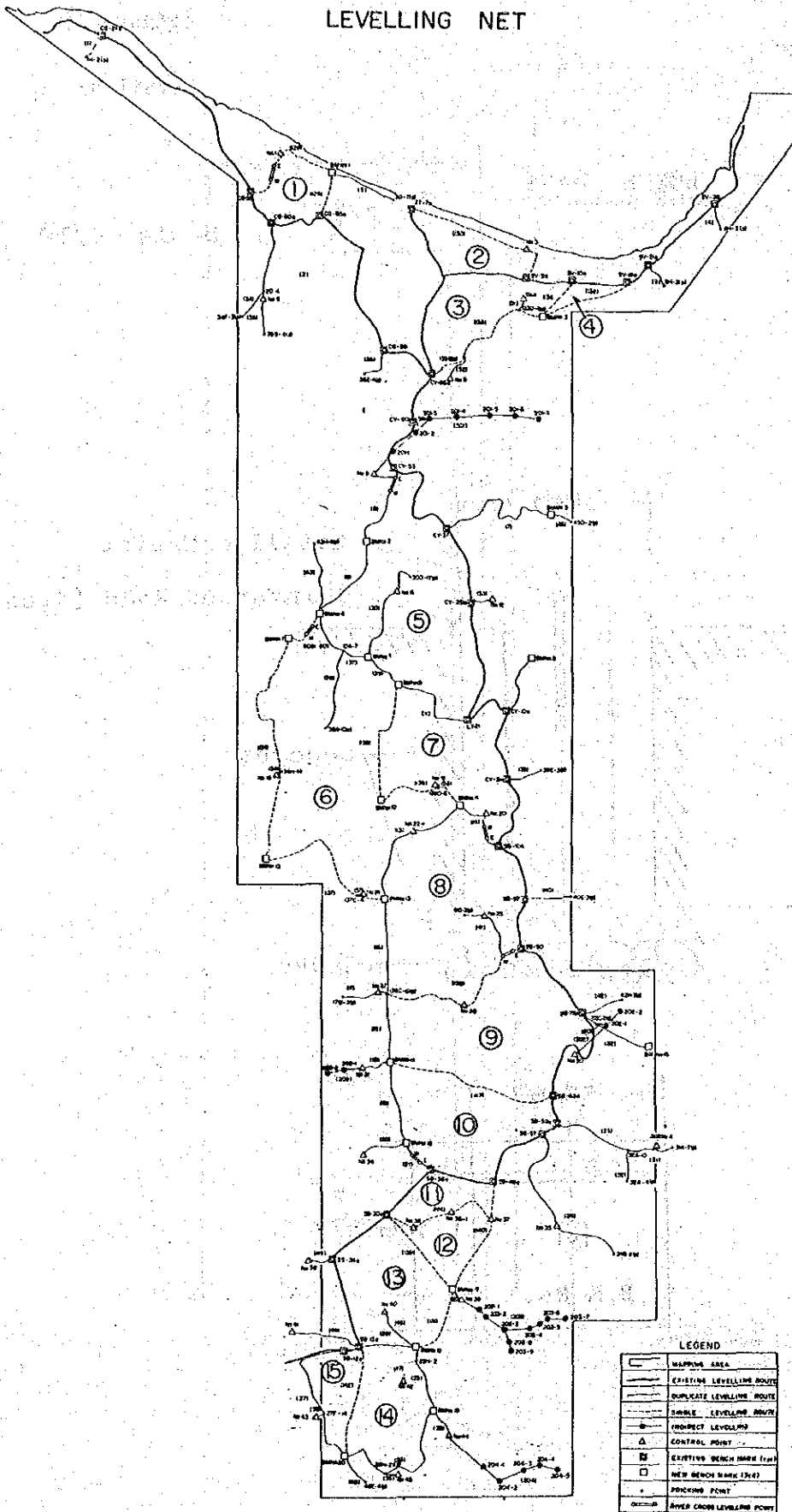
SHEET COVERAGE DIVISIONS OF CONTROL POINT MAPS



CAGAYAN VALLEY TOPOGRAPHIC MAPPING

[Figure 2]

LEVELLING NET



LEGEND

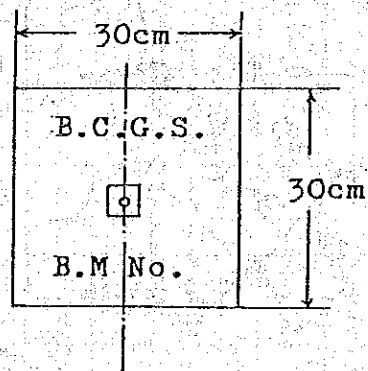
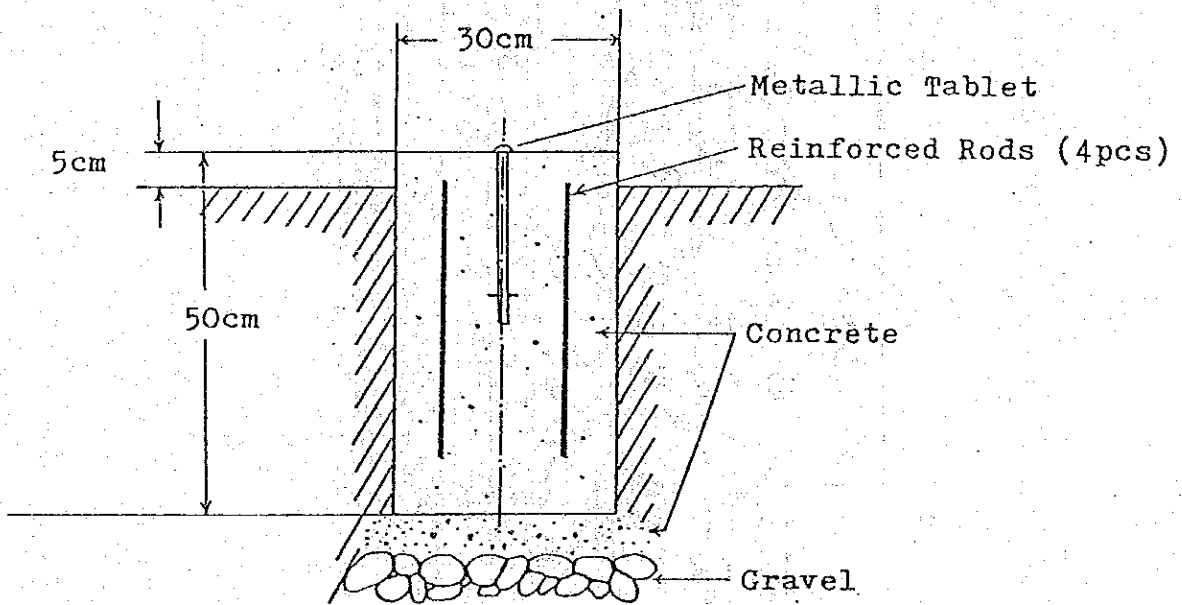
[Solid line]	MAPPING AREA
[Dashed line]	EXISTING LEVELLING ROUTE
[Dotted line]	DUPLICATE LEVELLING ROUTE
[Dash-dot line]	SINGLE LEVELLING ROUTE
[Dotted line with arrow]	INDIRECT LEVELLING
[Square]	CONTROL POINT
[Triangle]	EXISTING BENCH MARK (2m)
[Square]	NEW BENCH MARK (2m)
[Star]	PACKING POINT
[Circle]	RIVER CROSS LEVELLING POINT

[Figure 3]

Detail No. 1

BENCH MARK

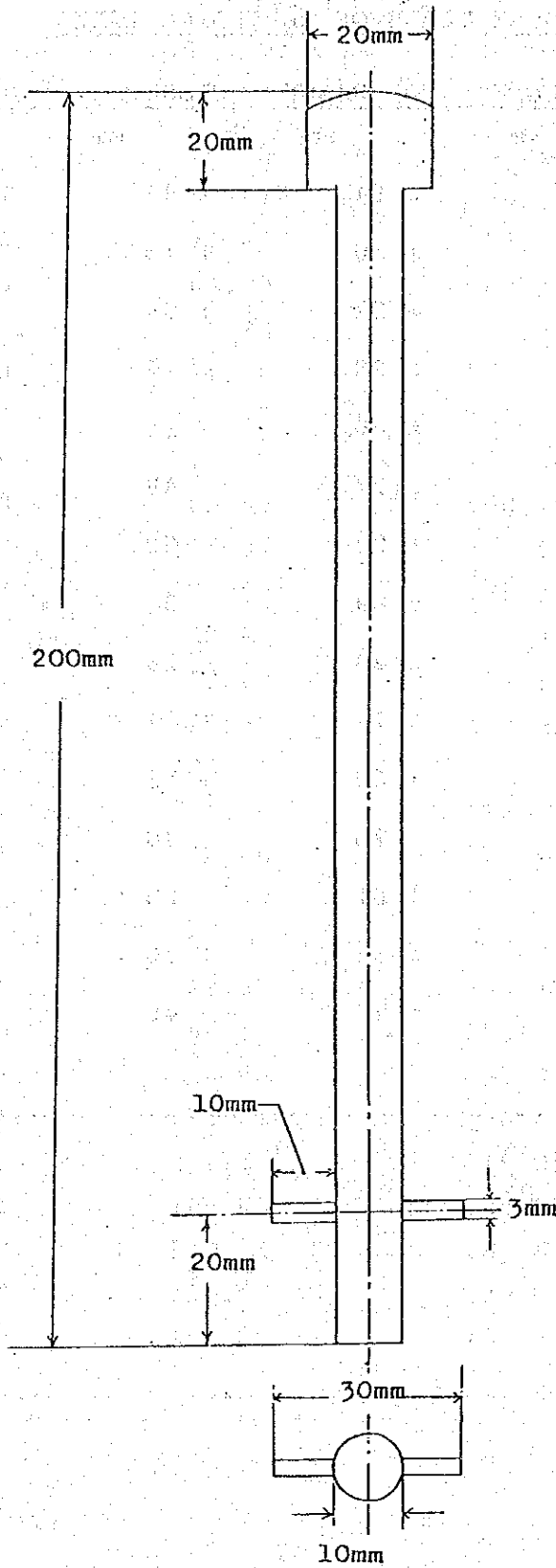
Scale 1/10



[Figure 3]

Detail No. 2

METALLIC TABLET



Scale 1/1

[Table 1]

CLOSURE TABLE OF LEVELLING LINKS

<u>LINK No.</u>	<u>ROUTE LENGTH</u>	<u>TOLERANCE</u>	<u>CLOSURE</u>	<u>REMARKS</u>
	km	mm	mm	
1.	29.8	± 54	+ 44	
2.	25.7	± 50	+ 15	
3.	28.0	± 52	+ 34	
4.	15.0	± 38	+ 12	
5.	65.6	± 80	+ 14	
6.	163.4	± 127	- 48	
7.	68.7	± 82	- 50	
8.	79.3	± 89	- 35	
9.	69.0	± 83	+ 13	
10.	52.1	± 72	+ 14	
11.	39.4	± 62	+ 13	
12.	58.4	± 76	- 40	
13.	38.1	± 61	- 25	
14.	71.7	± 84	+ 30	
15.	53.8	± 73	- 46	

[Table 2]

COMPARISON TABLE OF ELEVATION

No.	CONTROL- POINT No.	ELEVATION OF		(A) - (B)	REMARKS
		(A) C.P.	(B) D. LEVELLING		
		m	m	m	
1.	1.	34.15	34.46	- 0.31	
2.	4.	59.42	59.14	+ 0.28	
3.	6.	77.63	77.86	- 0.23	
4.	8.	104.82	103.42	+ 1.40	
5.	11.	21.92	22.20	- 0.28	
6.	12.	74.18	74.27	- 0.09	
7.	18.	135.45	135.37	+ 0.08	
8.	19.	181.37	181.46	- 0.09	
9.	20.	60.42	60.48	- 0.06	
10.	22-1	128.94	128.67	+ 0.27	
11.	24.	222.69	222.39	+ 0.30	
12.	25.	30.96	30.85	+ 0.11	
13.	27.	58.49	57.37	+ 1.12	
14.	28.	122.55	122.03	+ 0.52	
15.	31.	100.96	100.45	+ 0.51	
16.	34.	157.49	156.97	+ 0.52	
17.	35.	97.66	97.51	+ 0.15	JMR No. 3
18.	36.	73.42	72.78	+ 0.64	
19.	36-1	65.05	64.39	+ 0.66	
20.	37.	63.57	63.19	+ 0.38	
21.	38.	156.33	156.51	- 0.18	
22.	39.	66.38	65.92	+ 0.46	
23.	40.	75.02	75.48	- 0.46	
24.	41.	115.65	115.09	+ 0.56	
25.	42.	106.81	106.98	- 0.17	
26.	43.	180.34	180.60	- 0.26	
27.	44.	130.67	130.75	- 0.08	
28.	45.	153.88	153.89	- 0.01	

Republic of the Philippines
MINISTRY OF NATIONAL DEFENSE
BUREAU OF COAST AND GEODETIC SURVEY
421 Barraca St., San Nicolas, Manila

MINUTES OF THE MEETINGS, CAGAYAN VALLEY
TOPOGRAPHIC MAPPING PROJECT

Date : 9, 10, 11, 15, 23 & 26 December 1980

Place : Bureau of Coast and Geodetic Survey, Ministry of
National Defense, Manila

Attended By :

Commodore Antonio P. Venture	Mr. Taketsune Hosono, GSI
Commander Mamerto S. Gler	Mr. Hiroshi Kimura, JICA
Commander Ceferino R. Pascual	Mr. Shigehiko Shino, Survey Team Leader
Mr. Mario C. Manansala	
Mr. Conrado Santos	Mr. Toshimasa Nagashima, Deputy Survey Team Leader
Mr. Ponciano Ciceron	
Lieut. Pascua	Mr. Chuji Misawa, Chief Surveyor
Lieut. De Luna	Mr. Takashi Hamada, Survey Coordinator
Ens. Claudio Ramos	

BACKGROUND :

I. The 2nd Year Work :

1. JICA submitted to BCGS copies of the Report on the activities during the 2nd year of the project.
2. Presentation of the result of precise horizontal control net adjustment were made by JICA Survey Team (hereinafter called the Team) and comparison between values obtained from JMR observations using precise ephemeris data and these from JICA data are also shown. Both parties have agreed in adopting the alternative under item "b" of the report in the adjustment on the result to be used as the basic horizontal control for this project.

3. The copy of the final result, description of geodetic control point; and description of photo pricking have been submitted by the Team.

II. The 3rd Year Work :

1. The detailed work scheme has been explained by the Team as per Appendix I.
2. Photographic materials, prepared for the purpose of field identification of topographic features and for use in aerial triangulation have been delivered to BCGS, but the latter (diapositives) has been delivered to the Embassy of the Philippines in Japan for safe-keeping, as per attached Appendix II.

III. Particular items on the 3rd Year Work :

1. Manual of guideline for Field Identification indicating the criteria and work standard based on the map symbols adopted by BCGS has been discussed and final manual of guidelines was prepared as per attached Appendix III.
2. Some recommendations regarding some refinements on cartographic expression will be made by the Team and BCGS will appreciate to receive such recommendation at the next occasion.
3. Sheet Title and Numbering of 1:25,000 Scale Topographic Maps: Sheet Index of topographic maps of the project area showing title and number, have been handed to the Team as per attached Appendix IV.
4. Some very small excess area will be expected in the north west end of the project area somewhere between Centinela Point and Data Point. If the area extends over the outer neat line of the regular map sheet, one irregular map sheet will be produced.
5. Proceeding into critical area :
The decision to enter some critical areas will be according to the judgement of each field survey party.
6. Inaccessibility of some areas for field identification

and levelling may result in less completeness of final map compilation. As agreed under paragraph II-7 on the Minutes dated May 27, 1980, such areas will be indicated on the reliability diagram of the finished map.

7. Counterparts for the field surveying: BCGS has agreed to assign to the Team five (5) counterparts, one of which will be designated as chief liaison officer for the group.

8. Field Identification by BCGS :

BCGS will deploy one survey field edit party headed by one commissioned officer to gather the following field data :

- a. Geographic Names
- b. Administrative boundaries
- c. Road Classification

9. For proper coordination periodic meetings will be held in the field between the Team, BCGS counterparts and BCGS field edit survey team. In case there should arise any problem regarding the field work implementation including application of the Manual of Guidelines. The Team and BCGS counterparts shall exercise their best efforts to obtain a joint solution on the spot in order to facilitate progress of the field work.

10. Letter of Introduction :

For smooth implementation of the fieldwork and also to ensure the safety of the Team, the Director of BCGS furnished the Team Letters of Introduction to the following :

- a. The Commanding General Northeast Command
- b. Regional Director, Region II Local Government and Community Development
- c. The Provincial Governors of the different provinces comprising the project area

IV. The 4th Year Work :

1. Tentative work scheme during the 4th year of the proj-

ect will be discussed when the work of this phase (3rd year work) will be terminated (1981 April).

2. Availability of Diapositives in Japan :

BCGS has agreed that for preparatory work in aerial triangulation which will be undertaken even before starting the next phase of the work, the diapositives at present deposited in the Philippine Embassy in Japan are available for use whenever there are security officers stationed in Japan even for other projects.

3. Training Program :

The following Training Program will be expected and final confirmation will be transmitted through JICA Manila Office after approval of its Headquarters :

Aerial Triangulation May-July 1981 (3 months)

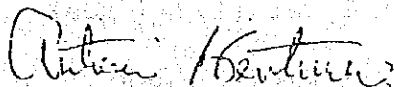
Stereoplotting and Map Compilation,

Aug.-Oct. 1981 (3 months)

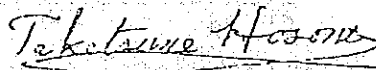
Nov. 1981-Jan. 1982 (3 months)

Two trainees including one security officer will be accommodated for each of the above-mentioned training program.

APPROVED :



ANTONIO P. VENTURA, Commodore, BCGS
Director



TAKETSUNE HOSONO
Technical Adviser JICA

Date : 26 Dec. 1980