2-3 Plan and Result

The plan and results of the above topographic mapping project are as follows:

Work item	Plan	Results	Remarks
Air photo signal	0 point	11 points	
Aerial photography	10,000 km^2	10,000 km^2	
Doppler satellite observation	10 points	11 points	1 point is an auxiliary point for aerial triangulation
Second order levelling	70 km	70 km	
Third order levelling	80 km	113 km	Plan changed
Indirect levelling	70 km	21 km	"
Pricking	100 points	193 points	
Field survey	6,500 km^2	6,570 km^2	
Aerial triangulation	400 models	426 models	
Detail plotting	6,500 km^2 (Net 8.3 sheets)	6,570 km^2 (Net 8.39 sheets)	
Compilation	"	"	
Drawing	"	"	
Printing	9 sheets 1,000 copies each	9 sheets 1,000 copies each	4-color printing

While part of levelling work had to be changed due to the field condition, it disrupted no ensuing work.

2-4 Field Work Supervisors

During the field work period, the following officials visited Indonesia for technical talks, work supervision, and guidance.

1st year

Mr. Kazuo Komaki
Deputy Director, 2nd Geodetic Division, Geodetic Department, Geographical Survey Institute, Ministry of Construction

Mr. Akira Ukiya
Senior Staff
Social Development Cooperation Bureau, JICA

Mr. Yoshiharu Mawatari
First Training Division, Training Affairs Department, JICA

2nd year

Mr. Yoshiya Egawa
Director, Topographic Division, Topographic Department, Geographical Survey Institute, Ministry of Construction

Mr. Minoru Akiyama
Overseas Cooperation Officer, International Affairs Division, Economic Affairs Bureau, Ministry of Construction

Mr. Hiroshi Murakami
Staff, First Development Survey Division, Social Development Cooperation Department, JICA

2-5 Outline of the Each Year Work

2-5-1 First year (F.Y. 1983)

(1) Organization of the survey team

	Number of staff	Remarks
Leader	1	
Deputy leader	1	
Member	1	Photography supervisor
"	1	Chief surveyor
"	6	Doppler satellite observation & levelling
"	2	Levelling

(2) Field work period

From July 19, 1983 to October 29, 1983

(3) Content of the work

	Plan	Results
Aerial photography	10,000 km^2	8,500 km^2
Doppler satellite observation	10 points	11 points
Second order levelling	70 km	70 km
Third order levelling	80 km	113 km
Indirect levelling	70 km	21 km

2-5-2 Second year (F.Y. 1984)

(1) Organization of the survey team

	Number of staff	Remarks
Leader	1	
Deputy leader	1	
Member	1	Chief surveyor
"	1	Photography supervision and photography check
"	5	Pricking and field survey
"	5	Field completion

(2) Field work period

From June 18 to September 7, 1984 (photographing and field identification)

From February 1 to February 15, 1985 (field completion)

(3) Content of the work

	Plan	Results
Aerial photography	1,500 km^2	1,500 km^2
Pricking	approx. 100 points	193 points
Field identification	6,500 km^2	6,570 km^2
Aerial triangulation	400 models	426 models
Detail plotting	6,500 km^2 (Net 8.3 sheets)	6,570 km^2 (Net 8.39 sheets)
Compilation	6,500 km^2 (Net 8.3 sheets)	6,570 km^2 (Net 8.39 sheets)
Field completion	6,500 km^2	6,570 km^2

2-5-3 Third year (F.Y. 1985)

(1) In-door work period

From June 10, 1985 to January 31, 1986

(2) Content of the work

	Plan	Results
Scribing	6,500 km^2	6,570 km^2
Printing	9 sheets × 1,000 copies	9 sheets × 1,000 copies

Table-2 Implementation of topographic mapping project for upper stream area of Negara River basin

Item of Work \ year / month	1st year F.Y. 1983 4	7	10	1	2nd year F.Y. 1984 4	7	10	1	3rd year F.Y. 1985 4	7	10	1	Remark
Aerial Photography	━	━	━		━	━							
Photo Processing		━	━		━	━							
Control Point Survey		━											
Levelling		━	━										
Pricking					━								
Field Identification					━								
Aerial Triangulation					═	═							
Stereo Plotting						═	═						
Compilation							═	═					
Field Completion								━					
Drawing										═	═		
Printing											═		
Delivery												△	

━ : Field Work

═ : In-door Work

3. Survey Plan

3-1 Outline

The project area has its northern half in the source basin of the Negara River and the terrain is rugged covered with inaccessible primeval forest lacking any roads at all.

The southern part, meanwhile, consists of hilly terrain and plateau where rubber plantation and agricultural cultivation are observed as major land use, and various roads are developed. Further, in the central part, felling of trees is actively carried out and company roads for timber transportation run through the mountainous area to the national highway in the south.

Considering such field conditions, it was planned to minimize the field work and to set class B of the JICA Specifications for Overseas Surveying for the mapping accuracy. Survey methods of each work were defined as follows.

(1) Aerial photography

The aerial photography shall be carried out at the scale of 1:60,000 with superwide angle camera in consideration of the photographing and the successive work. Ceiling ability of the aircraft shall be of more than 5,300 m and the flight course shall be East - West direction.

(2) Control point (horizontal)

Sufficient number of the control points shall be newly established for mapping within/around the project area. The survey method shall be the Doppler satellite observation for which point selection and observation can be carried out by point positioning method.

(3) Levelling

For aerial triangulation as well as the arrangement of levelling routes, direct and indirect levelling shall be conducted from the existing point in Tanjung area as a given point. Levelling shall be made along the existing roads or forest roads and connected to the Doppler satellite observation points in the southern part of the project area. Elevation of the Doppler satellite observation points in the northern part, shall be adjusted with the differences of the elevations between the results of computation of the Doppler satellite observation data for the south and the levelling data.

(4) Aerial triangulation

The aerial triangulation shall be made by the analythical block adjustment method.

(5) Plotting

Plotting shall be made at the scale of 1:50,000 based on the Specifications for the National Base Map of Indonesia.

3-2 General Plan

3-2-1 Survey area

The area shall be 10,000 km^2 covered by latitude 1°15' & 2°15' South and longitude 115°15' & 115°50' East. (See Fig.-3)

3-2-2 Aerial photography

(1) Area to be covered: 10,000 km^2
(2) Camera: Superwide angle camera
(3) Film: Pancromatic
(4) Scale: 1:60,000

3-2-3 Ground control point survey (horizontal)

(1) Observation mode: Doppler satellite observation
(2) Observation method: Point positioning by broadcast ephemeris
(3) Number of observation points: 11 points (including one observed at the existing astronomical point)

3-2-4 Levelling

(1) 2nd order levelling

Levelling along the national highway extending from Tanjung to north-eastern direction for 70 km shall be made.

(2) 3rd order levelling

Levelling along the national highway extending from the southern end of the project area to northern direction for 80 km shall be made.

(3) Indirect levelling

Levelling along the company road running through the central part of the project area to north for 70 km shall be made.

3-2-5 Pricking

Pricking of ground control points and levelling points shall be made. In case difficult to prick, neighbouring place shall be selected where topography or features are clearly identified on the aerial photo.

3-2-6 Field identification

Administrative boundaries, geographical names, etc. shall be surveyed in cooperation with the Indonesian Government. Classification of land use, vegetation, etc. shall be made mainly by photo interpretation. Further, results of photo interpretation shall be identified in the field.

3-2-7 Monument

Monumentation shall be made by the Indonesian side in accordance with the Indonesian specifications.

3-2-8 Aerial triangulation

Aerial triangulation shall be made by the analytical block adjustment method.

3-2-9 Plotting

Plotting shall be made as follows using stereo precision plotting instrument:

(1) Area for plotting: 6,500 km^2
(2) Scale for plotting: 1:50,000
(3) Contour interval: 25 m
(4) Sheet line: 15' × 15'

3-2-10 Field completion

After confirmation of the geographical names, check & approval by the Indonesian side shall be conducted. If necessary, field survey shall be made.

3-2-11 Drawing

Plotted sheet shall be printed on stable polyester base and color separation drafting shall be made by scribing.

3-2-12 Printing

Photo-mechanical process shall be made by using the scribed sheet, and printing shall be four-color offset printing. Proof shall be conducted on the printed polyester film.

3-3 Annual Plan

This plan shall be the following three year programme from 1983 to 1985.

3-3-1 First year

(1) Photographing: approximately 10,000 km
(2) Ground control point survey: 10 points
(3) Direct levelling (second and third order): 70 km & 80 km respectively
(4) Indirect levelling: 70 km

3-3-2 Second year

(1) Pricking: 100 points
(2) Field identification: 6,500 km^2
(3) Aerial triangulation: 400 models
(4) Plotting: 6,500 km^2
(5) Compilation: 6,500 km^2
(6) Field completion: 6,500 km^2

3-3-3 Thrid year

(1) Drawing: 6,500 km^2
(2) Printing: 9 sheets

4. Technical Report

In this Chapter, outline of the work of the first and second year of the project and detailed contents of the third year's work are described. The details of the first and second year work are to be referred to the progress report for each year.

4-1 Aerial Photography

4-1-1 Outline

Aerial photography was contracted out to a local aerial photography firm according to the regulations of the Indonesian Government concerning the security of the country. In selecting a contractor for the aerial photography, type of instruments and equipment, capability, and experience of companies were used as criteria. As the results of the preliminary selection, P.T.EXSA INTERNATIONAL, P.T.AEROKARTO INDONESIA, and PENAS were short-listed. P.T. EXSA INTERNATIONAL was finally chosen because of its rich experiences in photography and large staff as well as better facilities, and agreed to accept a lump-sum contract considering unfavourable weather conditions in the project area.

In the original plan, the scale of aerial photography was 1:60,000. But, since it was found that EXSA's aircraft did not have enough ceiling ability to carry out small scale (high-altitude) photography in the project area where the datum is relatively high, the scale was changed to 1:50,000.

The aerial photography work and photo processing work were supervised by Japanese experts and the final results were checked also by the Japanese experts for accuracy control purposes.

4-1-2 Aerial signalization

Considering the conditions of the project area it was judged that the pricking method could not satisfy accuracy requirements for the project. Therefore, aerial signalization method was chosen. Specifications of the aerial signals used are as follows:

(1) Shape: Y shape (3 wings)

(2) Dimension of one wing: 90 cm 250 cm

(3) Material: 5 mm thick plywood painted in white

4-1-3 Specifications for aerial photography

(1) Size of subject area: Approximately 10,000 km
(2) Scale of photography: 1:50,000
(3) Number of flight courses: 17
(4) Flight altitude: 4,600 m ± 5%
(5) Lens: Super wide angle lens
(6) Lap: Overlap: More than 60% (standard)
Sidelap: 30% ± 5%
(7) Tip and tilt: Within 5 Degree (Crab: within 10 Degree)
(8) Allowable cloud coverage: Within 3% in 5 successive photos
(9) Direction of flight course: East - West

4-1-4 Instruments used for aerial photography

(1) Aerial photography
1) Aircraft: Beechcraft S.18
2) Camera: Zeiss Jena MRB 9/2323. Focal Length 88 mm
3) Film: Kodak TRI-X
(2) Photo processing
1) Developing
Developer: Mose Rewind Type Processing Kit
Dryer: Natural drying. No instrument was used.
2) Printing
Printer: Log Electronic Co. Electronic Printer
Printing paper: For proof print, single weight paper of Kodak. For final product, double weight paper of Kodak.

4-1-5 Aerial photography

Plan for the aerial photography was made using 1:250,000 scale topographic maps compiled by the British government in 1972. These maps were only topographic maps available covering the project area. But because only rough contour lines were shown in the northern mountainous area and also considerable changes have occurred in flat areas in the project area, it was very difficult to identify natural and artificial features on the maps. Overlap and sidelap were set at 10% larger than the original figures considering that the type of photography was changed to super wide angle

photography. The aerial photography work encountered some difficulties. The aerial photography was carried out only by the visual flight over the planned flight courses, which were difficult to be identified from the air.

On the other hand, radio communication between the project area and Banjarmasin, the base for aircraft used in the work, was impossible. Flight crew could not check the weather conditions in the subject area in advance and for this reason the study team ordered them to make flight every day. If it was judged that photography was impossible after the aircraft reached the project area because of cloud, the crew tried to make flight over the project area in order to check and to practice to approach the planned flight courses as much as possible before return flight.

Although datum was determined for each course at the flight planning, since flat areas and mountainous areas mix in one course of approximately 85 km, scale of some part of the project areas did not reach 1:50,000. Further, because of the world wide abnormal weather conditions of the first year (1983), the aerial photography could not be completed within the work period of the first year despite of the effort of the team to make flight every day. The photography of approximately 15% of the subject area, mainly northern mountainous area, was completed in the second year (1984).

(1) Summary of Aerial Photography of the 1st Year

1) Total number of days: 49 days
2) Days of photographic flight: 47 days
3) Total photographic flight hour: 126 hr 05 min.
   - Flight hours for exposure: 31 hr. 50 min.
   - Flight hours without exposure: 94 hr. 15 min.
4) Results: 17 courses 461 photos

(2) Summary of Aerial Photography of the 2nd Year

1) Total number of days: 47 days
2) Days of photographic flight: 46 days
3) Total photographic flight hour: 114 hr. 35 min.
   - Flight hours for exposure: 24 hr. 30 min.
   - Flight hours without exposure: 90 hr. 05 min.
4) Results: 16 courses 160 photos

4-1-6 Photo processing

Rewind type development was done for film development. Therefore, sufficient length of film (leader) was used for test exposure. Test exposure parts were cut off from rolls for test development before the development of the remaining part of the rolls. Developed film was dried naturally. After this film development process contact prints which were used for photo orientation and primary inspection of photos were made.

(1) Photo orientation

Contact prints for photo orientation were mosaiced without any control for each course and mosaiced photos were pasted together with adhesive tape. Degree of overlap and sidelap, cloud coverage and cloud shadow coverage were checked as well as the coverage of project area by each photo. Also, it was checked whether the photos contain any problem for subsequent work. If any photo which does not satisfy the specifications, re-flight were ordered.

As for photo orientation for the northern mountainous areas, accurate plotting of principal point of photos on 1:250,000 scale topographic maps was generally difficult because the mountainous area was evenly covered by thick primeval forest and, further, shown only with rough contour lines on the map.

(2) Film annotation and preparation of photo index sheet

Film annotation was made as follows:

Film roll #	Project Name	Implementation Agency	Date
ROLL 1	NEGARA RIVER UPSTREAM	P3SA	(SEPT 1983)

Scale	Course #	Photo #
(1:50,000)	R14	(1 - 25)

On the first and last photos of each course all of the above information was printed while only course and photo numbers were shown on other photos.

4-1-7 Results of aerial photography

Approved photos which are the results of the two year aerial photography work are summarized in Table-3 and Fig.-3.

Table-3 Number of aerial photographs by course

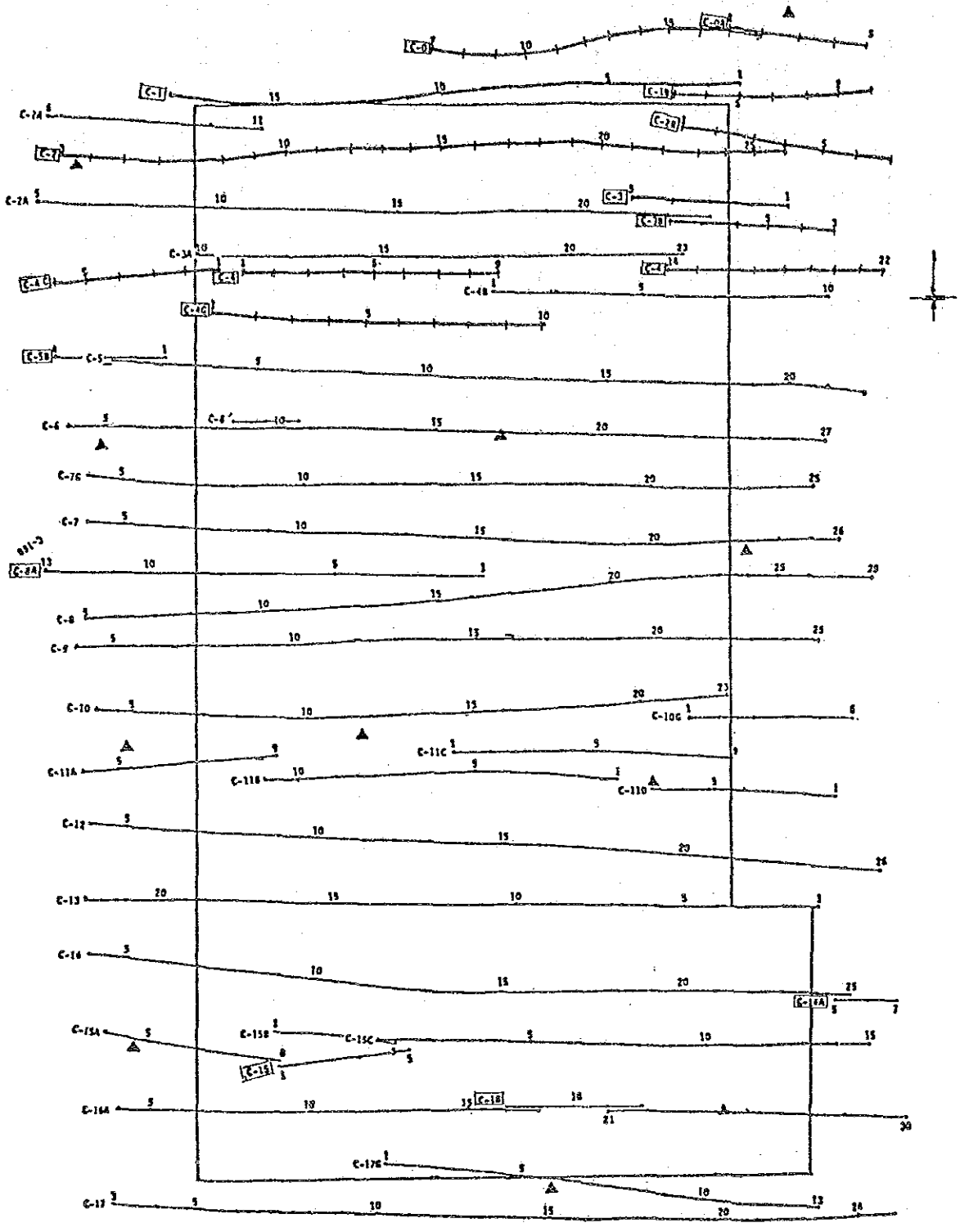
First year (1983)

Course No.	Counter No.	Compiled No.	Amount
1A	~	1 ~ 11	11
2A	267 ~ 243	1 ~ 21	21
3A	222 ~ 244	1 ~ 23	23
4A	~	1 ~ 7	7
4B	107 ~ 098	1 ~ 10	10
5	073 ~ 096	1 ~ 24	24
6	071 ~ 045	1 ~ 27	27
7G	414 ~ 390	1 ~ 25	25
7	019 ~ 044	1 ~ 26	26
8	035 ~ 063	1 ~ 29	29
9	034 ~ 011	1 ~ 25	25
10	~	1 ~ 23	23
10G	446 ~ 441	1 ~ 6	6
11A	221 ~ 213	1 ~ 9	9
11B	~	1 ~ 11	11
11C	212 ~ 200	1 ~ 9	9
11D	079 ~ 073	1 ~ 7	7
12	~	1 ~ 26	26
13	~	1 ~ 24	24
14	~	1 ~ 25	25
15A	~	1 ~ 8	8
15B	165 ~ 169	1 ~ 5	5
15C	~	1 ~ 15	15
16A	121 ~ 137	1 ~ 17	17
16B	139 ~ 148	1 ~ 10	10
17G	161 ~ 149	1 ~ 13	13
17	178 ~ 202	1 ~ 25	25
		Total	461

Second year (1984)

Course No.	Counter No.	Compiled No.	Amount
C-0	179 ~ 192	5 ~ 18	14
C-0A	410 ~ 414	1 ~ 5	5
C-1	105 ~ 124	1 ~ 20	20
C-1B	415 ~ 421	1 ~ 7	7
C-2	125 ~ 150	1 ~ 26	26
C-2B	422 ~ 428	1 ~ 7	7
C-3	151 ~ 155	1 ~ 5	5
C-3B	25 ~ 32	1 ~ 8	8
C-4	3~11,16~24	1~9,14~22	18
C-4C	167 ~ 174	1 ~ 8	8
C-4G	397 ~ 406	1 ~ 10	10
C-5B	201 ~ 205	1 ~ 5	5
C-8A	175 ~ 187	1 ~ 13	13
C-14A	8 ~ 10	5 ~ 7	3
C-15	300 ~ 305	1 ~ 6	6
C-16	571 ~ 575	5 ~ 9	5
		Total	160

Fig.-3 Index map of aerial photography



Phot scale about 1: 50,000

2nd year flight course

1st year flight course

4-2 Control Point Survey

4-2-1 Outline

Control point survey was done by point positioning method of Doppler observation of artificial satellites for 11 points shown on Figure-4. Doppler observation at the existing astronomical point of Muaranalong could not be done despite of the original plan because the point could not be found in Muaranalong. Therefore, as for the comparison of satellite geodecy data and astronomical observation data of a point, the team decided to refer to the results of control point survey (Doppler observation) of "Mosaic Photo Map Project of the Down Stream Area of the Negara River Basin in South Kalimantan, the Republic of Indonesia."

4-2-2 Specifications

(1) Method of observation: Point positioning

(2) Number of observation: More than 45 passes (angle of elevation 15 degree - 17 degree)

(3) Computation: by Broadcast ephemeris

(4) Accuracy: Within standard deviation $\pm$ 6 m

4-2-3 Doppler observation

(1) Plan for the distribution of control points

Main role of the Doppler stations is the control point for the subsequent aerial triangulation. Their distribution and allocation were planned so that the mapping work can be done with sufficient accuracy. As for newly established control points, permanent monuments were constructed.

(2) Selection of point

In selecting the locations of Doppler stations following matters were considered in addition to the conditions mentioned above:

1) There should be no objects around the points which may reflect or weaken electric waves.
2) Permanent monuments to be established should be easily found in the future. Also, easy maintenance of such monuments should be possible.

3) Considering the easiness of transportation of instruments and equipment, camping, and supply of foods and materials for observation work, vehicles should be able to reach the location of the points.

Selected locations of the points are as shown in Fig.-4.

(3) Monument

Monumentation of Doppler points was carried out by the Ministry of Public Works of the Indonesian Government according to the agreement with the Indonesian side. Specifications of the monument are shown in Fig.-5.

Fig.-4 Distribution of control points of Negara upper stream mapping project

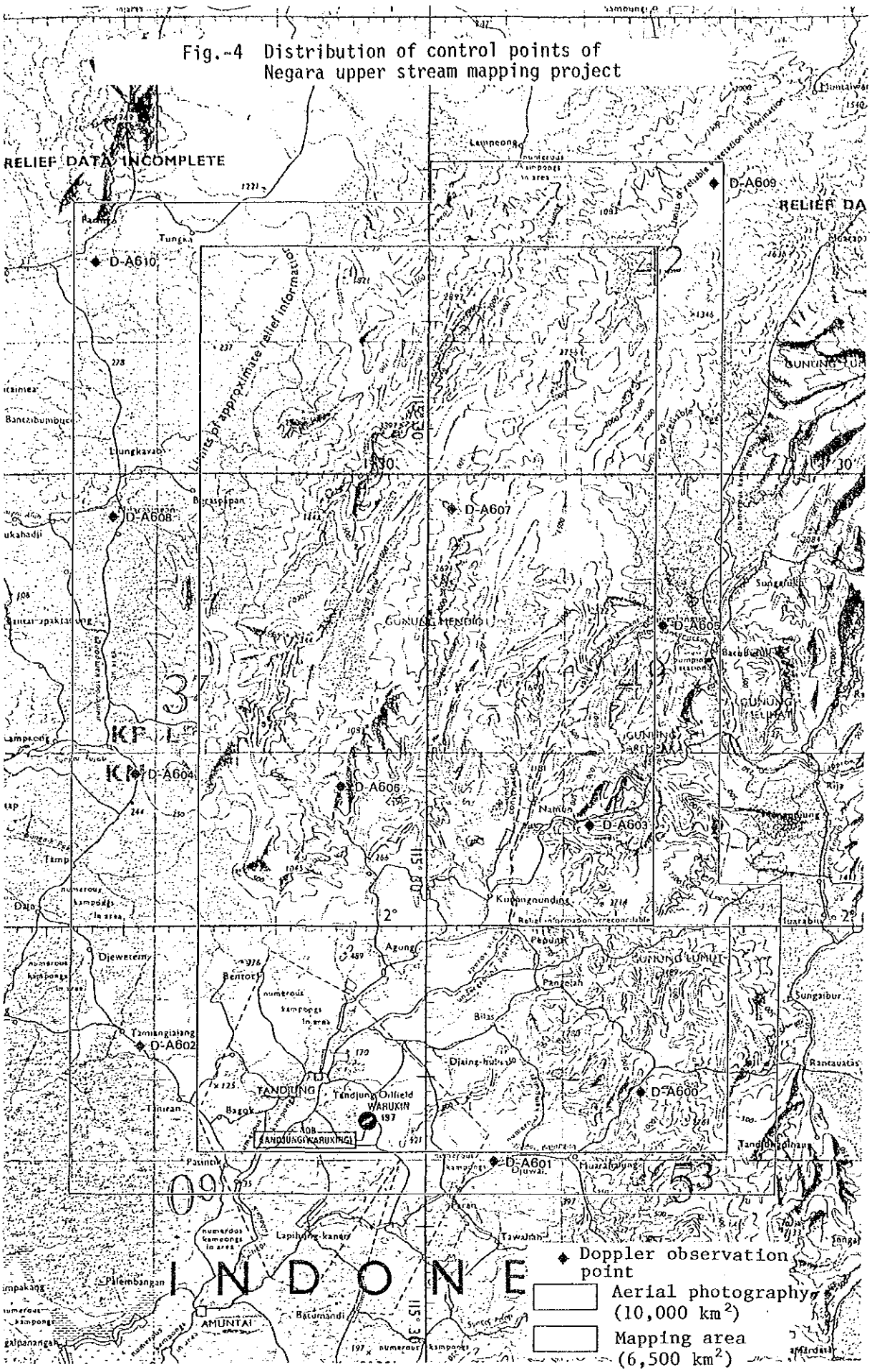
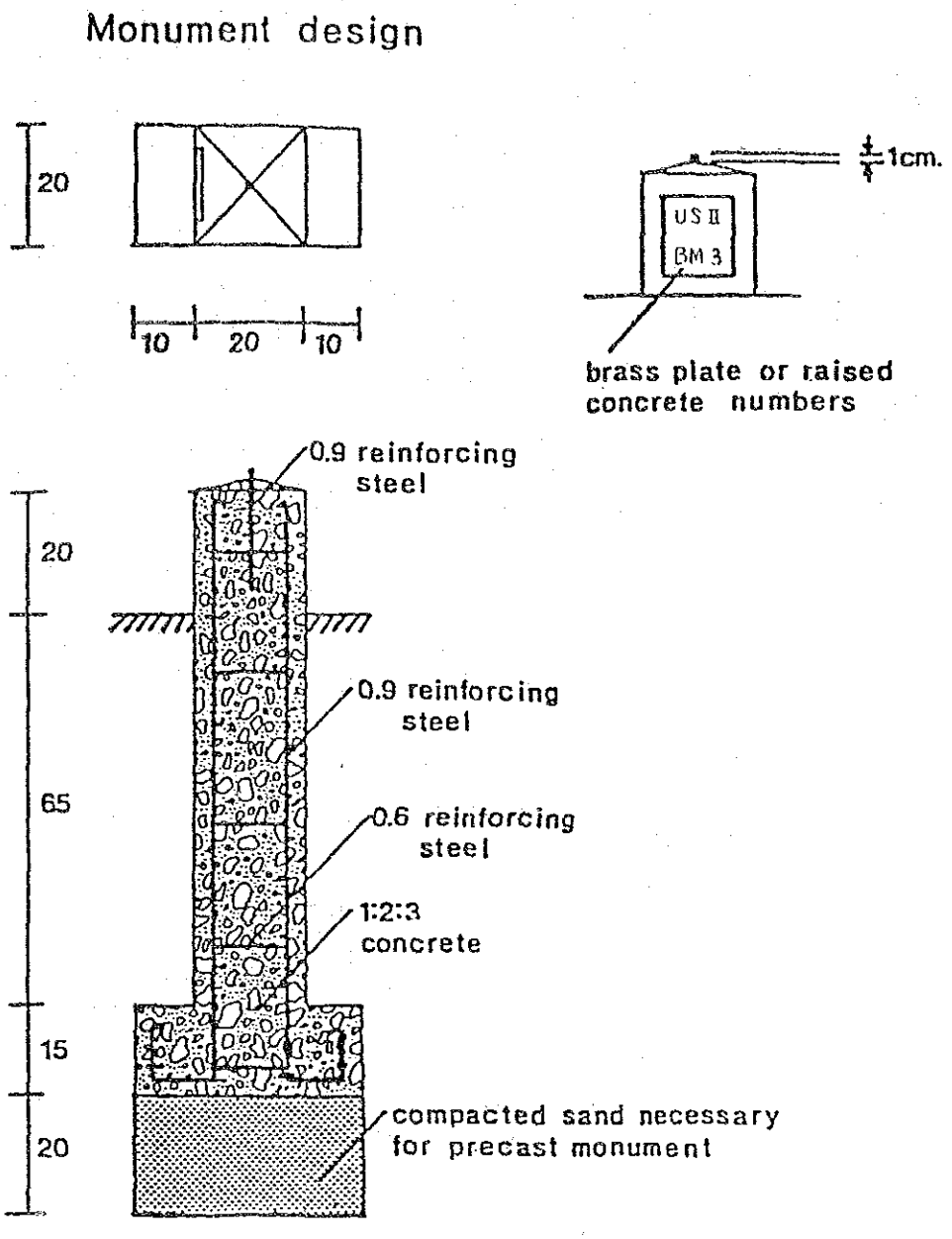


Fig.-5 Specifications of monument



Scale 1:14
Volume 0.046m³

(4) Observation

The Doppler observation using satellite was done by auto-alert method by using 4 receivers in total - one JMR-4 and three JMR-3. In carrying out the observation special attention was paid to the temperature and humidity of the atmosphere around the receivers. The receivers were watched throughout the observation period to ensure normal function. Further, during the observation period, temperature, moisture, and atmospheric pressure were simultaneously measured and recorded by automatic instruments in order to use the collected data to obtain correction parameters required in coordinate computation.

Length of observation period, and number of pass for each Doppler station are shown in Table-4.

Table-4 Doppler satellite observation

Doppler station	Length of observation period	Total number of pass
D-A600 (NS-1)	1983.8.24 ∿ 8.29 (6 days)	50
D-A601 (NS-2)	1983.9. 9 ∿ 9.15 (7 days)	57
D-A602 (NS-3)	1983.8.13 ∿ 8.20 (8 days)	49
D-A603 (NS-4)	1983.9. 2 ∿ 9. 7 (6 days)	49
D-A604 (NS-5)	1983.8.31 ∿ 9. 5 (6 days)	60
D-A605 (NS-6)	1983.8.26 ∿ 8.31 (6 days)	52
D-A606 (NS-7)	1983.9. 2 ∿ 9. 7 (6 days)	57
D-A607 (NS-7')	1983.9.10 ∿ 9.15 (6 days)	49
D-A608 (NS-8)	1983.9.10, 8.19 ∿ 8.24 (7 days)	46
D-A609 (NS-9)	1983.8.23 ∿ 8.28 (6 days)	53
D-A610 (NS-10)	1983.8.13 ∿ 8.20 (8 days)	48

(5) Computation

1) *Computation program:* SP-2P of JMR

2) Reference ephemeris: Broadcast ephemeris

3) Ellipsoid (Geodetic coordinate system): ID-1974

Details of ID-1974:

a = 6,378,160 f = 1/298.25

Datum in Padang

S 0°56'38"414

E 100°22'08"808

EL 3.19 m (from ellipsoid)

H 14.0 m (above mean sea level)

4) Conversion parameters

Parameters for converting from NWL-9D to ID-1974:

ΔX = - 2,691 m

ΔY = +14,757 m

ΔZ = - 0,224 m

According to the agreement with the Indonesian side, conversion to ID-1974 of Indonesia was done by using the following formula - discrepancy between broadcast ephemeris and precise ephemeris was ignored.

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix}_{\text{Datum in Padang}} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}_{\text{Broadcast Ephemeris}} + \begin{pmatrix} -2{,}691\ \text{m} \\ +14{,}754\ \text{m} \\ -0{,}224\ \text{m} \end{pmatrix}$$

Computation of coordinate of each point was done based on broadcast ephemeris and using SP-2P program of JMR. Standard deviation of coordinate of each point is shown in Table-5. Further, coordinates of each point - which were converted to the coordinate based on reference ellipsoid being used for the present Indonesian coordinate system - are as shown in Table-7. At point D-A608, observation was done on the point located some distance from the monument and later the coordinate of the monument was calculated from the coordinate of the observation point by eccentric reduction method. Numbers such as NS-1 shown in Table-5 next to the point numbers are temporary numbers of the observation points.

Table-5 Standard deviation of Doppler satellite observation results

Station	Latitude	Longitude	Height	Remarks	
	m	m	m	(総観測パス数)	(計算パス数)
D-A600(NS-1)	1.18	2.10	1.26	50	35
D-A601(NS-2)	1.66	2.55	1.76	57	27
D-A602(NS-3)	1.12	1.77	1.20	49	40
D-A603(NS-4)	1.38	2.33	1.41	49	37
D-A604(NS-5)	0.57	0.89	0.60	60	43
D-A605(NS-6)	1.71	2.79	1.80	52	32
D-A606(NS-7)	1.37	2.23	1.48	57	32
※D-A607(NS-7')	2.24	3.75	2.42	49	17
D-A608(NS-8)	1.33	2.00	1.44	46	36
D-A609(NS-9)	0.77	1.14	0.80	53	32
D-A610(NS-10)	1.10	1.77	1.22	48	39

* Supplementary point for aerial triangulation.

Table-6 Doppler satellite observation values and geodetic coordinates

STATION NAME	NGS-72			ID-1974(GRS-67)		
	LATITUDE	LONGITUDE	HEIGHT ABOVE ELLIPSOID	LATITUDE	LONGITUDE	HEIGHT ABOVE ELLIPSOID
D-A600(NS.01)	2-11-57.800 S	115-44-33.618 E	260.209 m	2-11-57.791 S	115-44-33.489 E	249.668 m
D-A601(NS.02)	2-16-04.746	115-34-36.212	87.849	2-16-04.737	115-34-36.084	77.320
D-A602(NS.03)	2-07-47.834	115-11-10.541	69.239	2-07-47.826	115-11-10.417	58.738
D-A603(NS.04)	1-53-22.700	115-40-25.549	223.069	1-53-22.694	115-40-25.421	212.535
D-A604(NS.05)	1-50-59.476	115-10-50.826	102.149	1-50-59.470	115-10-50.702	91.649
D-A605(NS.06)	1-40-01.113	115-46-06.406	137.829	1-40-01.108	115-46-06.277	127.290
D-A606(NS.07)	1-50-19.353	115-24-07.291	243.229	1-50-19.347	115-24-07.165	232.714
D-A607(NS.07')	1-33-24.618	115-32-05.402	788.189	1-33-24.614	115-32-05.275	777.666
※D-A608(NS.08)	1-33-48.272	115-09-34.581	100.129	1-33-48.268	115-09-34.457	89.631
D-A609(NS.09)	1-09-41.793	115-48-46.655	225.130	1-09-41.792	115-48-46.526	214.587
D-A610(NS.10)	1-18-05.839	115-08-08.561	139.670	1-18-05.837	115-08-08.437	129.173

* Eccentric Point (observation point)

Table-7 Transformed coordinates values to UTM

STATION NAME	GEODETIC COORDINATES		U.T.M.(ZONE No.50) COORDINATES		HEIGHT (TAKISONG DATUM)	REMARKS
	LATITUDE	LONGITUDE	N	E		
D-A600(NS.01)	2-11-57.791 S	115-44-33.489 E	9 756 840.81 m	360 177.46 m	202.01 m	Height is based on Table-9.
D-A601(NS.02)	2-16-04.737	115-34-36.084	9 749 239.83	341 727.57	29.69	
D-A602(NS.03)	2-07-47.826	115-11-10.417	9 764 455.77	298 276.41	11.246	
D-A603(NS.04)	1-53-22.694	115-40-25.421	9 791 080.56	352 485.08	163.775	
D-A604(NS.05)	1-50-59.470	115-10-50.702	9 795 430.56	297 632.97	43.279	
D-A605(NS.06)	1-40-01.108	115-46-06.277	9 815 705.25	363 001.41	78.837	
D-A606(NS.07)	1-50-19.347	115-24-07.165	9 796 686.64	322 248.67	185.880	
D-A607(NS.07')	1-33-24.614	115-32-05.275	9 827 865.07	337 001.10	729.99	
※D-A608	1-33-52.174	115-09-35.774	9 826 985.74	295 286.80	47.12	
D-A609(NS.09)	1-09-41.792	115-48-46.526	9 871 578.97	367 925.12	165.86	
D-A610(NS.10)	1-18-05.837	115-08-08.437	9 856 054.32	292 563.13	80.52	

* Monumented point by eccentric reduction

4-3 Levelling

4-3-1 Outline

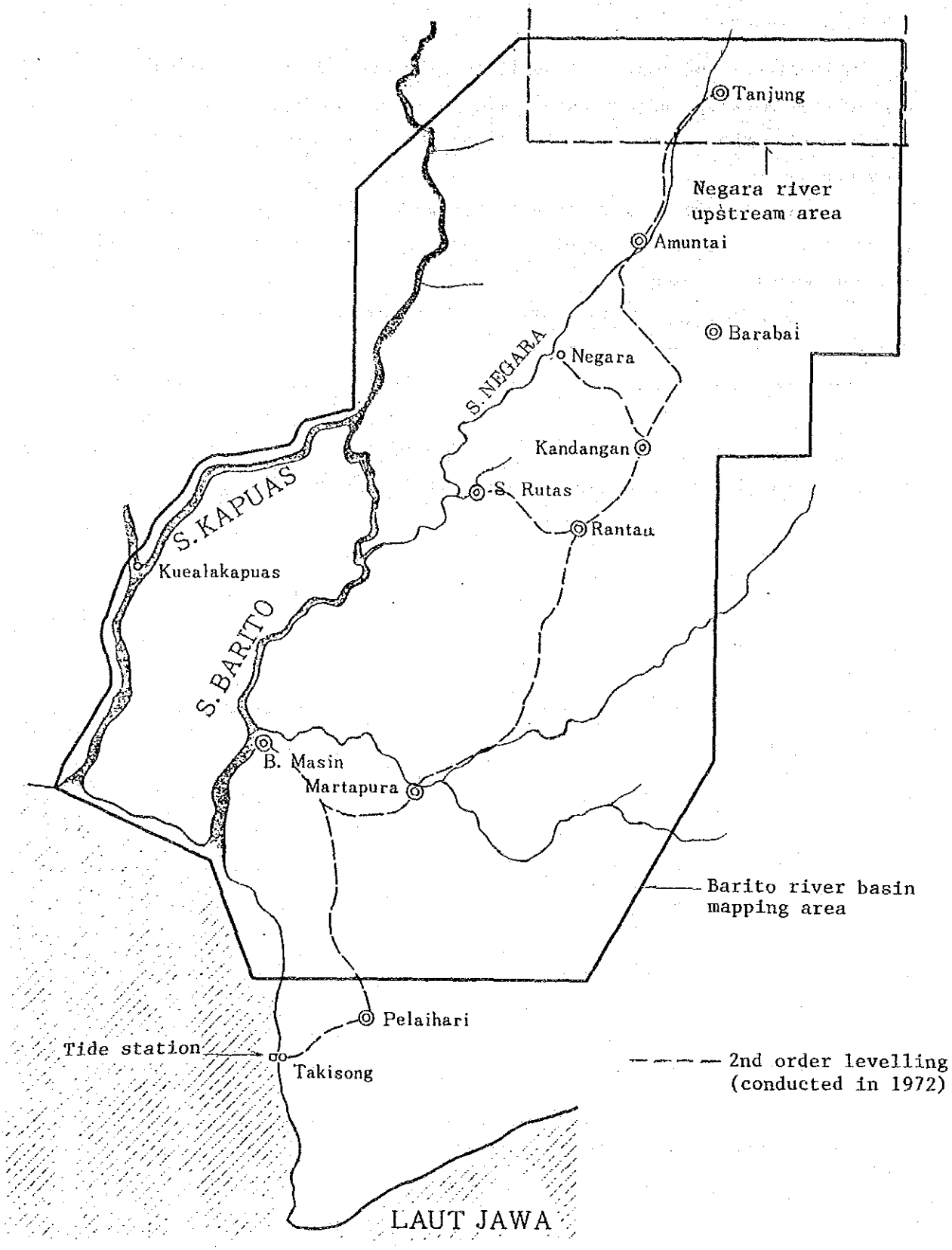
Both direct and indirect levelling were carried out for elevation control for mapping, adjustment of elevation of the doppler points, and supplementing the second order levelling routes of the South Kalimantan province.

Existing 2nd order levelling routes were made in 1972 during the period of the Barito River Basin mapping project under the technical cooperation of the Japanese Government.

As shown in Fig.-6, the routes connect Takisong, south coast of Kalimantan, and Tanjung. The datum of elevation is the mean sea level obtained from the records of sea level at the tide observation station of Takisong.

Elevation of points measured by the levelling for the present project is based on the elevation of the existing bench mark in Tanjung.

Fig.-6 Levelling route of Barito River basin mapping project



4-3-2 Direct levelling

(1) Bench mark allocation plan

1) 2nd order levelling

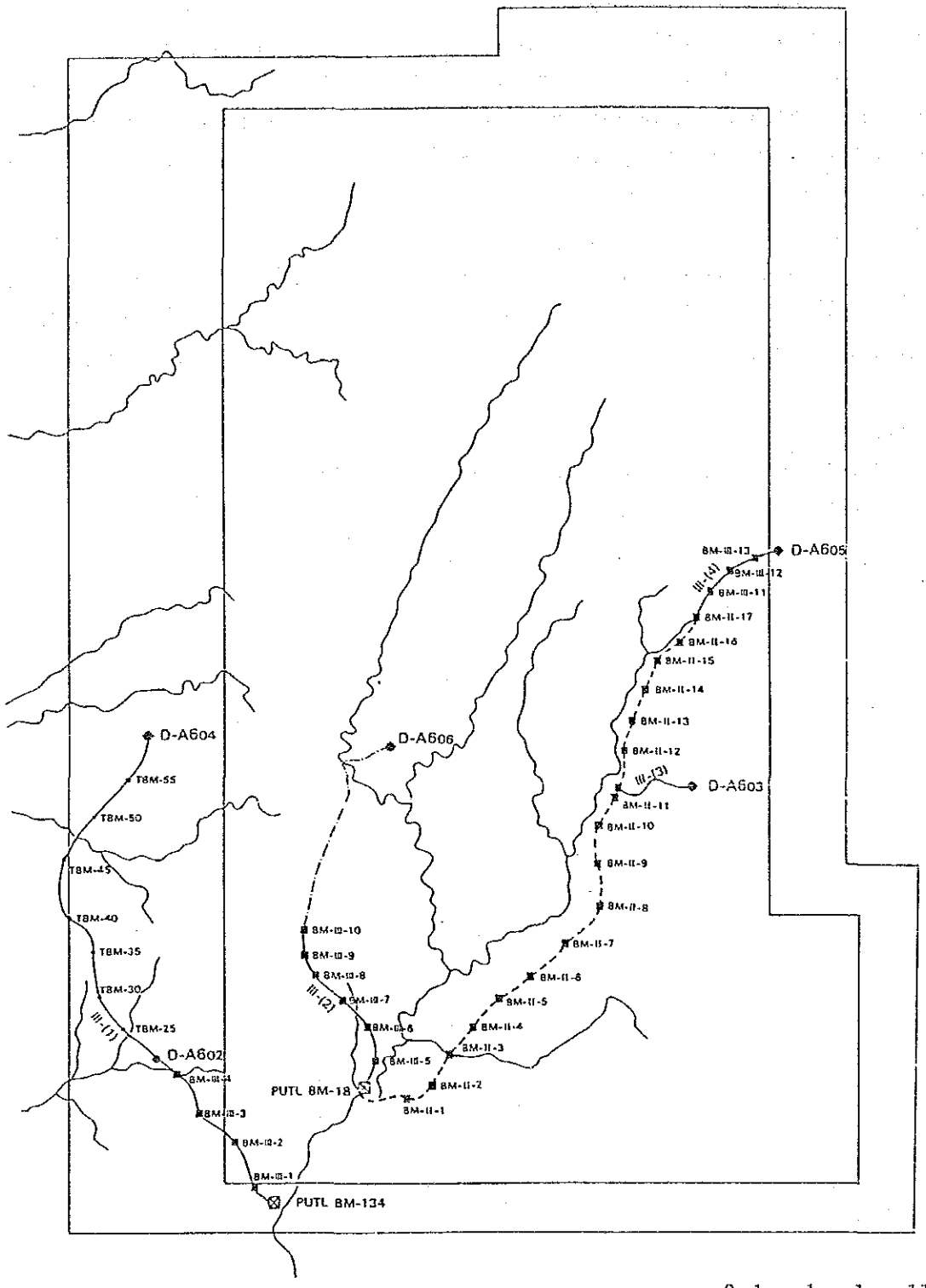
2nd order bench marks were distributed on the national highway which connects Tanjung and Balikpapan, a town on the east coast of Kalimantan. Length of the levelling route is approximately 70 km and the starting point of the route is the existing bench mark in Tanjung.

2) 3rd order levelling

3rd order bench marks were distributed on the routes which start from existing bench mark in Tanjung, and from existing bench mark in Kurua, a town approximately 20 km south-west of Tanjung, and also on the routes which start from the 2nd order levelling routes established by the present project.

Total 30 permanent monuments were established for 2nd and 3rd order bench marks of direct levelling. (see Fig.-7)

Fig.-7 Levelling routes of Negara upper stream mapping project



⊠ Existing levelling point

▪ Newly established levelling point

◆ Doppler observation point

------ 2nd order levelling route

——— 3rd order levelling route

-·-·-·- Indirect levelling route

(2) Selection of the location of bench marks

The following factors were considered in selecting the locations of bench marks.

1) Locations should be along existing roads and where reservation of monuments is easy.
2) Locations which are easy to find and also easy to prick on aerial photos.

(3) Monumentation

Establishment of monuments for bench marks was carried out by the Indonesian Government. The specifications of the monuments are the same with the specifications of the monuments for Doppler stations. Distance between permanent monuments is 4 - 5 km and between these permanent monuments wooden bench marks were established approximately every 1 km. As for the route between D-A602 and D-A604 metal stakes were attached to existing structures, such as building, along the route, because the route was not the planned one. And approximately every 1 km wooden bench marks were established just like on other routes.

(4) Observation

Two way observation was carried out starting from the known points. Limit of standard deviation of two values obtained from two way observation and 5 $mm\sqrt{S}$ for 2nd order levelling and 10 $mm\sqrt{S}$ for 3rd order levelling while 'S' is the distance between two points in kilometers.

4-3-3 Indirect levelling

(1) Outline

Indirect levelling was done for approximately 22 km between point BM-III-10 of the 3rd order levelling route to Doppler point D-A606.

(2) Selection of the location of points

As the indirect levelling route runs along the timber transportation road of private company, the following factors were considered in selecting the locations of points:

1) Visibility for the vertical angle measurement by theodolite should be good.
2) Points should not be bothered by timber transportation vehicles.
3) Points should be easily pricked on aerial photos.

(3) Monumentation

As monuments, wooden stakes were set up at 41 observation points.

(4) Indirect levelling

Vertical angle measurement was done by 1" reading theodolite and distance measurement was done by electro-optical distance meter. Allowance of constant of vertical angle was 10". As for distance measurement average of three times of measurement was used for the elevation calculation. In carrying out the distance measurement, special attention was paid not to make mistake in writing higher digit figures of the measured value.

4-3-4 Computation

(1) Direct levelling

Discrepancy of two way observation done for a day calculated and checked within the same day and if the discrepancy exceeded the specified limit, re-measurement was done. For the 2nd order levelling, the following correction was done.

1) Rod correction

Rod correction to compensate graduation error of the staff and the expansion of rod, caused by the change of temperature, was made.

2) Normal orthometric correction

Correction was made by the following formulas:

$$k = 5.29 \times \sin 2B \frac{B_1 - B_2}{\rho'} H$$

k = Normal orthometric correction value

B_1 and B_2: Latitude of starting and ending point respectively in the unit of minute

B: $(B_1 + B_2)/2$

H: Average elevation of the levelling route concerned

(2) Indirect levelling

Maximum discrepancy of forward and backward observation of the indirect levelling was 0.12 m.

(3) Results of computation

The results of the final computation of direct and indirect levelling are shown in Table-8.

Table-8 Results of levelling

Points	Height (m)	Points	Height (m)
U-BM-Ⅱ-1	17.899	U-BM-Ⅲ-1	12.945
U-BM-Ⅱ-2	31.238	U-BM-Ⅲ-2	24.671
U-BM-Ⅱ-3	32.166	U-BM-Ⅲ-3	18.450
U-BM-Ⅱ-4	52.800	U-BM-Ⅲ-4	26.709
U-BM-Ⅱ-5	56.829	D-A602	11.246
U-BM-Ⅱ-6	70.485	D-A604	43.279
U-BM-Ⅱ-7	52.489	U-BM-Ⅲ-5	19.989
U-BM-Ⅱ-8	35.675	U-BM-Ⅲ-6	29.472
U-BM-Ⅱ-9	55.701	U-BM-Ⅲ-7	53.955
U-BM-Ⅱ-10	48.515	U-BM-Ⅲ-8	67.102
U-BM-Ⅱ-11	55.933	U-BM-Ⅲ-9	56.494
U-BM-Ⅱ-12	50.933	U-BM-Ⅲ-10	76.222
U-BM-Ⅱ-13	73.881	D-A603	163.775
U-BM-Ⅱ-14	118.377	U-BM-Ⅲ-11	151.977
U-BM-Ⅱ-15	92.441	U-BM-Ⅲ-12	105.825
U-BM-Ⅱ-16	123.029	U-BM-Ⅲ-13	74.093
U-BM-Ⅱ-17	266.480	D-A605	78.837
		D-A606	185.88

(4) Elevation of Doppler stations

Elevation of five Doppler stations - D-A602, D-A603, D-A604, D-A605, D-A606 - were obtained by both computation using Doppler survey results and by the direct levelling based on the mean sea level of Takisong. Although elevation was corrected to elevation based on geoid by GEODOP-V program, which was used in the final computation of the coordinate of satellite observations points elevation of a Doppler point obtained by computation could not be the same with the elevation obtained by direct levelling. Therefore, to obtain the elevation of Doppler stations other than the five points mentioned earlier, the average of the discrepancies of elevation values obtained by the two methods of the five points was added to the elevation value of other points obtained by the computation. (see Table-9)

Table-9 Adjusted elevation values of Doppler satellite observation points

Station	Height of ID-1974	Levelling results	Difference	Correction Value	Height
	m	m	m	m	m
D-A600 (NS-1)	249.188	—	—	-47.180	202.01
D-A601 (NS-2)	76.870	—	—	-47.180	29.69
D-A602 (NS-3)	57.758	11.246	-46.512	—	11.246
D-A603 (NS-4)	212.035	163.775	-48.260	—	163.775
D-A604 (NS-5)	90.409	43.279	-47.130	—	43.279
D-A605 (NS-6)	126.500	78.837	-47.663	—	78.837
D-A606 (NS-7)	232.214	185.88	-46.334	—	185.88
D-A607 (NS-7')	777.166	—	—	-47.180	729.99
D-A608 (NS-8)	88.251	—	—	-47.180	41.07
D-A609 (NS-9)	213.037	—	—	-47.180	165.86
D-A610 (NS-10)	127.703	—	—	-47.180	80.52

4-3-5 Pricking

For the purpose of aerial triangulation and for the height control for compilation, direct levelling points were pricked on aerial photos enlarged twice approximately every 2 km on each levelling route.

4-4 Field Identification

4-4-1 Outline

Field identification was carried out for 1:50,000 scale topographic mapping area (6,500 km^2). In this work, features which will be shown on the topographic maps by map symbols should be checked in the field without fail. After this survey was completed, the confirmation of the results of the preliminary survey by photo interpretation, the determination of interpretation keys for the jungle areas where no access was available, the survey and data collection of place names and boundaries, etc. were done.

4-4-2 Criteria for field identification

Map symbols used in this 1:50,000 scale mapping was the one for the base maps of Indonesia (SPECIFIKASI PETA RUPABUMI INDONESIA SKALA 1:50,000, BAKOSURTANAL) provided by the Indonesian Government in the first year.

As the results of the detailed examination of this Indonesian map format in Japan, it was found that the detailed application of symbols need to be clarified concerning buildings and other features, because although there were some descriptions on the application of the symbols, their expression were too simple (see Appendix attached to the end of this report). As for the unclear matters concerning the regulation on the application of map symbols, they were clarified by the discussion with the BAKOSURTANAL of Indonesia before the start of the field identification work of the second year.

Followings are the contents of the agreement on the map symbols.

(1) 1.1. Bangunan

1) The application standard of temporary house shall be for a house in which somebody live at the time of field survey. Minimum size shall be 3 m × 3 m.

2) When neighbouring houses are close to less than 0.2 mm on map, the two houses shall be generalized.

(2) 1.3. Kantor pemerintahan

Symbol "G" (Gubernuran) stands for administrative office of Province.

(3) 1.4. Tempat beribadat

Islamic temple exists even in small village.

The most important temple in one area shall be selected for expression in consultation with the Indonesian counterparts.

Description of some symbol marks shall be corrected as follows:

Hindu ---- Kong Fu Tse

Budha ---- Hindu, Budha

(4) 1.5. Makam

Application standard of cemetry shall basically be minimum of 100 m × 100 m (2 mm × 2 mm on map) or its equivalent.

(5) 1.6. Tempat bangunan bersejarah

Data related to historical monuments or buildings shall be provided by DPU.

(6) 1.7. Menara

Data related oil towers shall be provided by DPU.

(7) 1.10. Pusat listrik

Data related to power stations shall be provided by DPU.

(8) 1.12. Kawat listrik tegangan tinggi

Data related to high tension power transmission lines shall be provided by DPU.

However, the transmission line in the densely populated area shall not be expressed.

(9) 1.13. Kawat telepon, telegram

1) Data related to telephone and telegram lines shall be provided by DPU.
2) The application standard shall be only for the lines between town and town and exclude those lying underground or in the densely populated area.

(10) 1.14. Pipa bahan bakar

1) Data related to pipe lines shall be provided by DPU.
2) The expression of pipe lines shall be made only for main routes. Small branch routes as well as the lines in the densely populated area, shall be excluded.

(11) 2.1. - 2.6. Jalan

1) Roads shall be expressed according to the road classification to be provided by DPU.
2) Any other road which can not be classified in the Items 2.1. - 2.4. or 2.6., shall be classified in 2.5. Jalan lainnya.

(12) 2.8. Tonggak kilometer

Both distances from Banjarmasin and Tanjung are marked on the kilometer post. Selection of its origin shall be made by DPU.

(13) 3.6. Titik tinggi

Density of spot heights shall be basically one point per 5 cm x 5 cm on map, except jungle area where stereo-plotting will be difficult.

(14) 3.7. Tebing

Minimum application standard of cliff shall be more than 3 m in height and 100 m in length.

(15) 3.9. Timbunan & 3.10. Galian

Minimum application standard of embankment or canal shall be more than 100 m in length.

(16) 4.3. Perkebunan

Minimum application standard of plantation shall be more than 250 m × 250 m (5 mm × 5 mm on map) with annotation of vegetation classified.

(17) 4.6. Tegalan/ladang

Minimum application standard of field shall be more than 150 m × 150 m (3 mm × 3 mm on map).

(18) 5. BATAS ADMINISTRASI

Administrative boundaries shall be expressed according to data to be provided by DPU.

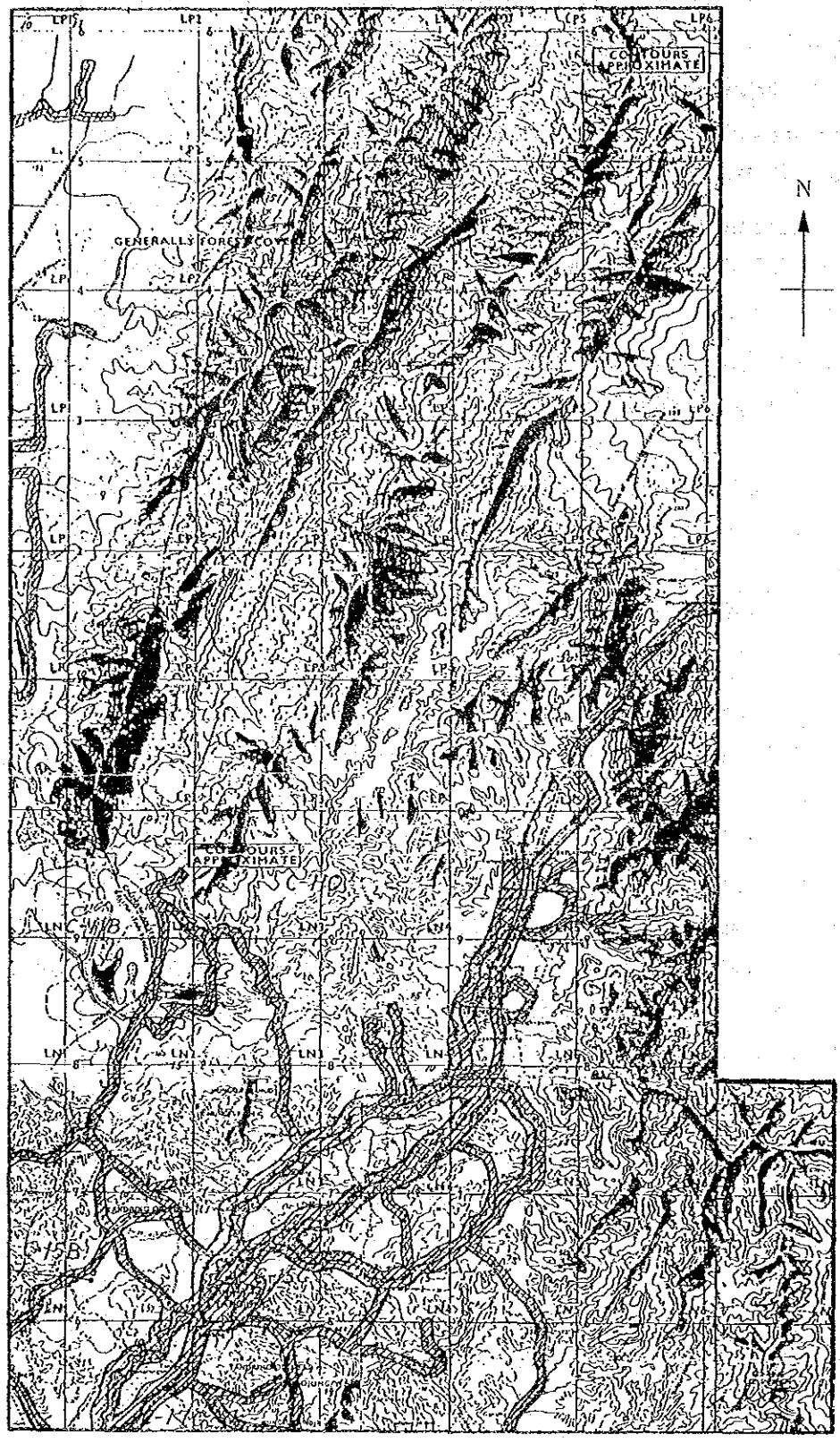
1) Administrative boundary on single line shall not be expressed.
2) Administrative boundary on double lines shall be expressed in the center.
3) Where boundary crosses linear feature (road, pipe line, etc.), the boundary shall be cut off at the crossing.

(19) Pipe line installed on overbridge shall be expressed as it is, with linear feature being cut off at the crossing.

4-4-3 Field identification

Field identification was done for approximately 578 km along the main roads and roads reaching to villages which were previously selected in Japan by the survey team (see Fig.-8). As for the areas where actual field check is difficult, photo interpretation method was used. Interpretation were made by referring to the conditions of the areas actually field checked. As for interviews to check place names, administrative boundary, and other matters, it was done mainly by the Indonesian counterparts.

Fig.-8 Plan of field identification



4-4-4 Data collection

To get information on administrative boundaries, place names, classification of roads, etc. data such as existing maps, drawings, administrative maps, road maps, etc. were collected by the branch offices of the Indonesian Government and Provincial Government office of South Kalimantan and other offices or agencies concerned.

4-4-5 Compilation

The results of field identification and photo interpretation were superimposed on the aerial photos by colour ink in a specified manner.

Except for vegetation, the map symbols were used. Following symbols were used for vegetation.

- Irrigated paddy field
- Rain-fed paddy field
- Plantation
- Forest
- Bush
- Cultivated area, slash and burn area, bare land, grass field, wasteland

4-5 Aerial Triangulation

4-5-1 Outline

426 models of aerial triangulation was carried out by using coordinates of Doppler points and the results of levelling (pricked photos, etc.) (see Fig.-9).

4-5-2 Specifications

Specifications for the aerial triangulation are as follows:

(1) Measurement of image coordinates

Measured twice. Discrepancy between the two measurement should be within 0.02 m.

(2) Relative orientation

Residual parallax was specified as within 0.03 mm contact printed posifilm.

(3) Successive orientation

Discrepancy of coordinate value of a passpoint on two successive photos should be within 0.5‰ of the flight altitude for both planimetric and vertical values.

(4) Computation of geodetic coordinates

Allowance of the residual error at the ground control points was 2.7‰ of the flight altitude for both planimetric and vertical values.

4-5-3 Adjustment computation

426 models was divided into two blocks - 279 models for south and 147 models for north - at the border of course C-5 and C-6. Adjustment computation was done separately for each block using PAT-M program. The results of the computation for each block are as shown in Table-10.

Standard deviation of the residual error at the ground control points were 0.6‰ and 0.4‰ of the flight altitude for planimetric and vertical values respectively.

4-5-4 Instruments

Major instruments used for the aerial triangulation are as follows:

(1) Pricking Device: PMG-2 of Kern

(2) Coordinate measurement device: STECOMETER of Zeiss Jena

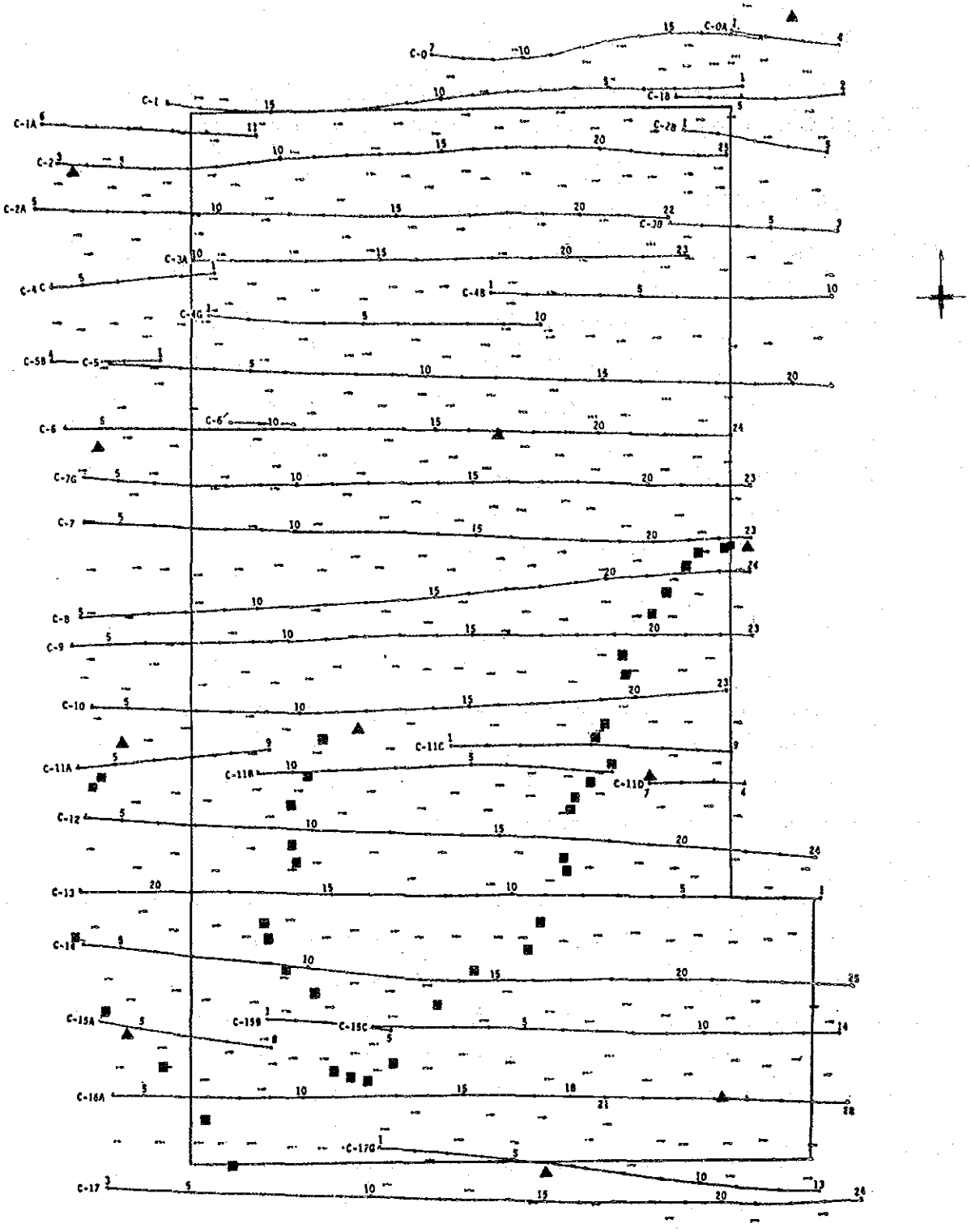
(3) Computer: Vangurd 1100 (UNIVAC)

Table-10 Standard deviation of control points in aerial triangulation

Block	No. of Course	No. of Model	No. of Control Point		Residual of Control Point				Tie Point			
					(Horizontal)		(Vertical)		(Horizontal)		(Vertical)	
			Horizontal	Vertical	Mean Square Error	Maximum Value	Mean Square Error	Maximum Value	Mean Square Error	Maximum Value	Mean Square Error	Maximum Value
I	19	279	9	51	2.01 m	3.59 m	0.85 m	-1.99 m	1.19 m	3.14 m	0.93 m	2.67 m
II	15	147	* (19)	* (19)	3.0 m	8.48 m	2.85 m	7.87 m	1.40 m	3.00 m	0.90 m	-3.07 m

* Includes 17 tie points of Block I.

Fig.-9 Aerial triangulation index map



Phot scale about 1: 50,000

▲ Doppler Satellite Observation Point
■ B.M. Point
— Tie Point

4-6 Machine Plotting

4-6-1 Outline

Machine plotting was done using the results of aerial triangulation, and field identification, and data of control points and bench marks.

4-6-2 Specifications

(1) Mapping scale: 1:50,000

(2) Mapping area: 6,500 km^2

(3) Contour interval: Intermediate contour line: 25 meter
Index contour line: 100 meter

(4) Plotting machine: Autograph A10, Stereometrograph G, and Planimat D2

(5) Projection: UTM (ID-1974)

(6) Sheet size: 15' × 15'

(7) Plotting sheet: Polyester base #500

(8) Plotting: Automatic plotting machine D-SCAN

4-6-3 Detail compilation

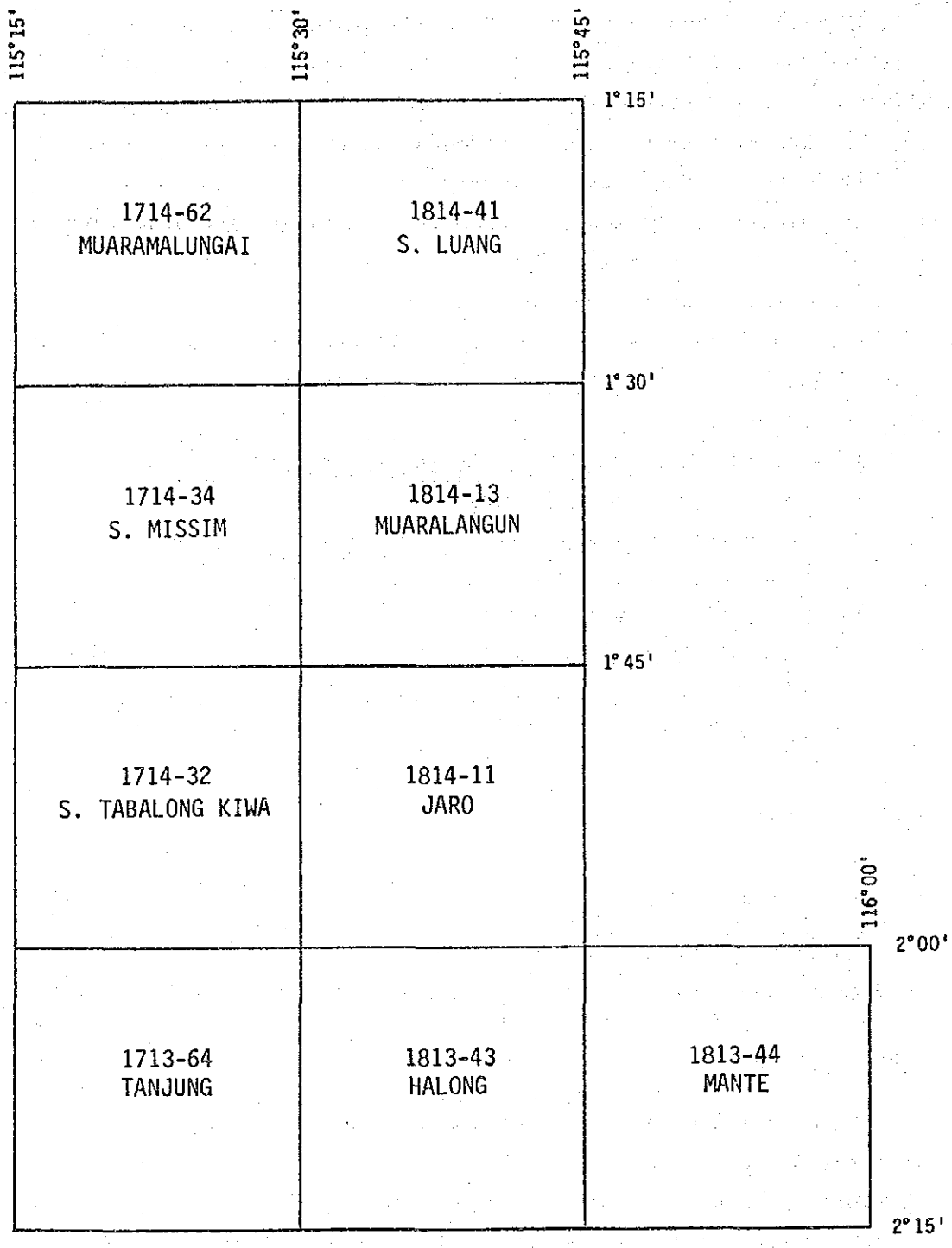
(1) Orientation

The results of sheet orientation was good. In detail, for both control points and pass points, discrepancy of orientation was within average 0.1 mm on the map, and discrepancy of elevation at control points and bench marks was within average 1 m at the orientation stage.

(2) Compilation

Detail compilation was done following the map format for 1:50,000 scale base map of Indonesia. Sheet numbers and names are shown in Fig.-10. For detail compilation, several colours of ball point pens were used. Linear features such as roads and rivers were plotted first, followed by plotting of other planimetric features, and contour lines. Measurement of spot height was done at the end of detail compilation.

Fig.-10 Number and name of map sheet



Assignment of clours was as follows:

1) Blue: Water body, water tank
2) Red: Red dots: symbols for houses.
   Line: roads
   Broken line: foot paths
3) Brown: Line: Two lane roads
4) Green: Vegetation boundary
5) Black: Intermediate contours, buildings, and other artificial and natural objects.
6) Orange: Index contour line

For spot height measurement, separate overlay was used. Location of spot height was shown on the overlay sheet together with their elevation. Measurement was done twice for each spot and their average value (rounded value) was used. Spot height of the following places was measured.

1) Top of the major mountains
2) Intersection of major roads; on the ridges where road exists
3) Mouth of valley and intersection of rivers
4) Major turning point of slopes
5) Points representing the elevation of their surrounding areas
6) The deepest point of concaved area as far as the deepest point can be measured.

4-7 Editing

4-7-1 Outline

Editing was done according to the agreement with the Indonesian Government concerning the map format and regulations on its application.

4-7-2 Editing

Materials and size of compilation manuscript were the same with that of restitution manuscript. Sheet for compilation manuscript were also prepared by plotting machines. In editing, colour pencils were used according to the classification of colours specified for detail restitution and the specified map symbols. As for annotation on compilation maps, they were compiled on separate polyester base sheet as annotation sheet according to the

information collected in the field identification, and letter size, etc. were specified.

Further, road data sheet, vegetation data sheet, control point data sheet (control points were marked on the spot height overlaied sheet) were also prepared for convenient and easy inspection of compiled maps. Measured spot height points were selected on compilation manuscript and only appropriate ones were saved.

4-8 Field Completion

4-8-1 Outline

After the completion of edited maps, mainly confirmation of annotation and administrative boundaries as well as the confirmation of matters found unclear during the compilation and editing stages were done.

4-8-2 Confirmation of annotation and boundaries

Annotations on the compiled maps such as place names, were checked by the Indonesian Government. Errors were corrected and official annotation lists were prepared for each map sheet by the Indonesian Government.

Boundaries such as provincial boundary were drawn according to the boundary information sheets prepared by the Indonesian side on compiled maps. (see Fig.-11).

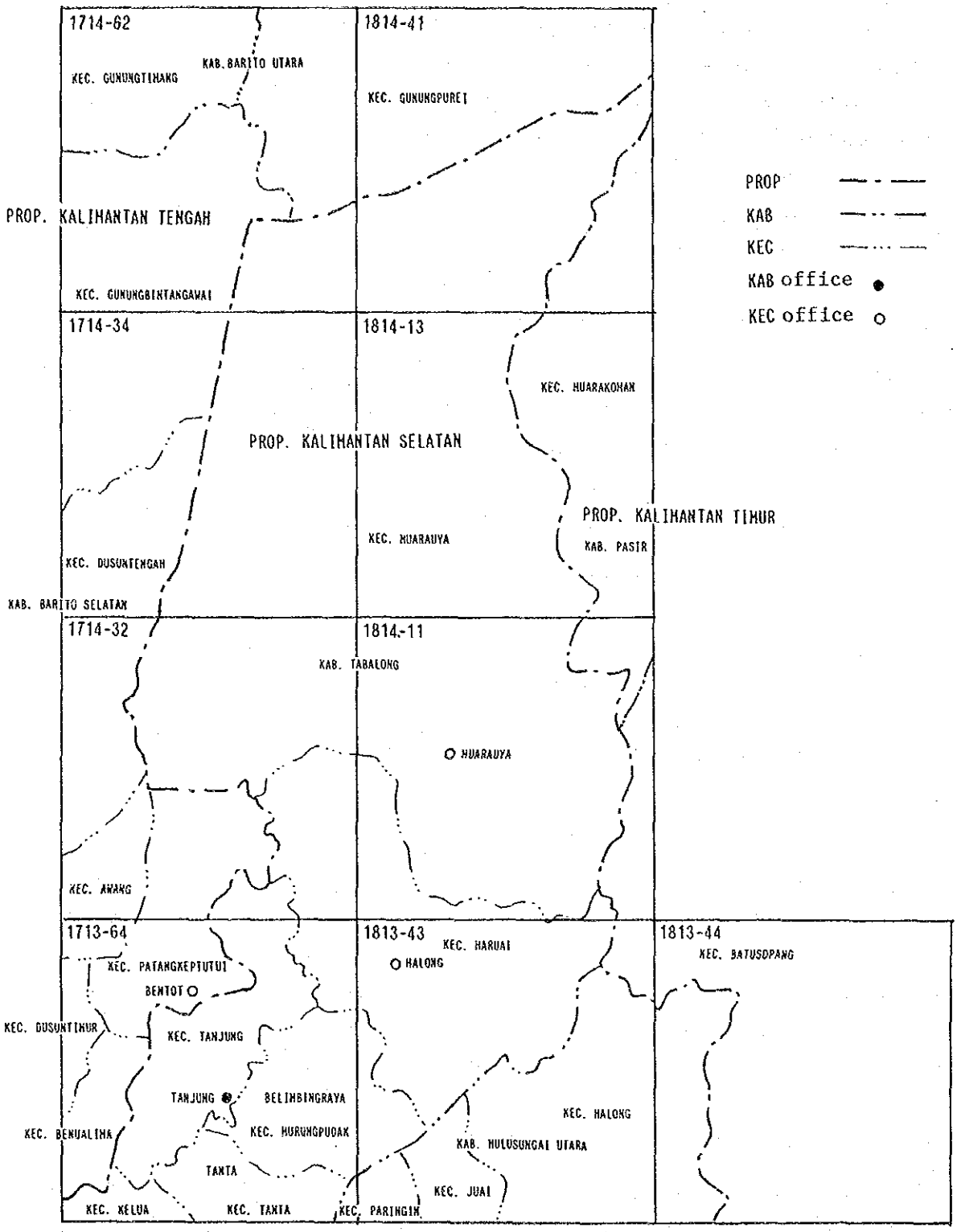
4-8-3 Inspection of compilation manuscript

Supplemental survey was done in the field concerning unclear matters such as types of buildings and connection of foot paths. As for the road constructed after the aerial photography, they were measured by plane table method and drawn on compiled map. The Indonesian Government inspected the contents of compilation manuscript and marginal information. Data on magnetic north was provided by the Indonesian Government.

4-8-4 Completion of compilation manuscript

Compilation manuscript was completed after its contents were checked and corrected, if necessary, according to the results of the field completion.

Fig.-11 Administrative names of the project area



4-9 Drawing and Printing

Drawing and printing were carried out according to the results of discussion with the Indonesian Government.

4-9-1 Drawing

(1) Outline

Scribing was done for each colour of four colour printing using completed compilation manuscript and other source maps.

(2) Materials

The following materials were used in the scribing work:

1)	Scribe base (0.12 mm thick):	Yellow base of K & E
2)	Mask base (0.12 mm thick):	Daylight peel coat of K & E
3)	Mask base (0.12 mm thick):	Peel coat of Kimoto
4)	Zip-a-tone (0.10 mm thick):	V0100 of Fuji Film
5)	Negative film (0.10 mm thick):	V0100 of Fuji Film
6)	Annotation sheet base (0.08 mm thick):	Diamat of Kimoto

(3) Method of preparation of scribed sheet

1) Method of printing images of original manuscript on scribing base

Reversed image of the original manuscript was printed on scribing base by diazo method. Holes were punched on scribe base and relevant sheets for registration purposes. Imaging was done by referring to these punched holes.

2) Method of preparing scribed sheets

In preparing scribed sheets, roads, buildings, rivers, latitude and longitude lines, contour lines, etc. were scribed on each specific colour separation sheet according to the Indonesian map format. For registration purpose, cross mark was printed at the center of each side of four sides of margin and "L" shape registration mark was printed on each corner of the scribe sheets.

To make the connection of features drawn by different colour smooth, scribing was done in the following manner:

- Scribing was done in the order of black, blue, orange, and grid sheets.
- Contents of already scribed sheet were printed in different colour on the colour separation sheet to be scribed in the next.

- Then, scribing of the next colour separation sheet was done.

Details of the work flow and the plate separation for each sheet are shown in work flow chart (Fig.-12) and in Table-11.

Fig.-12 Flow chart for scribing and printing

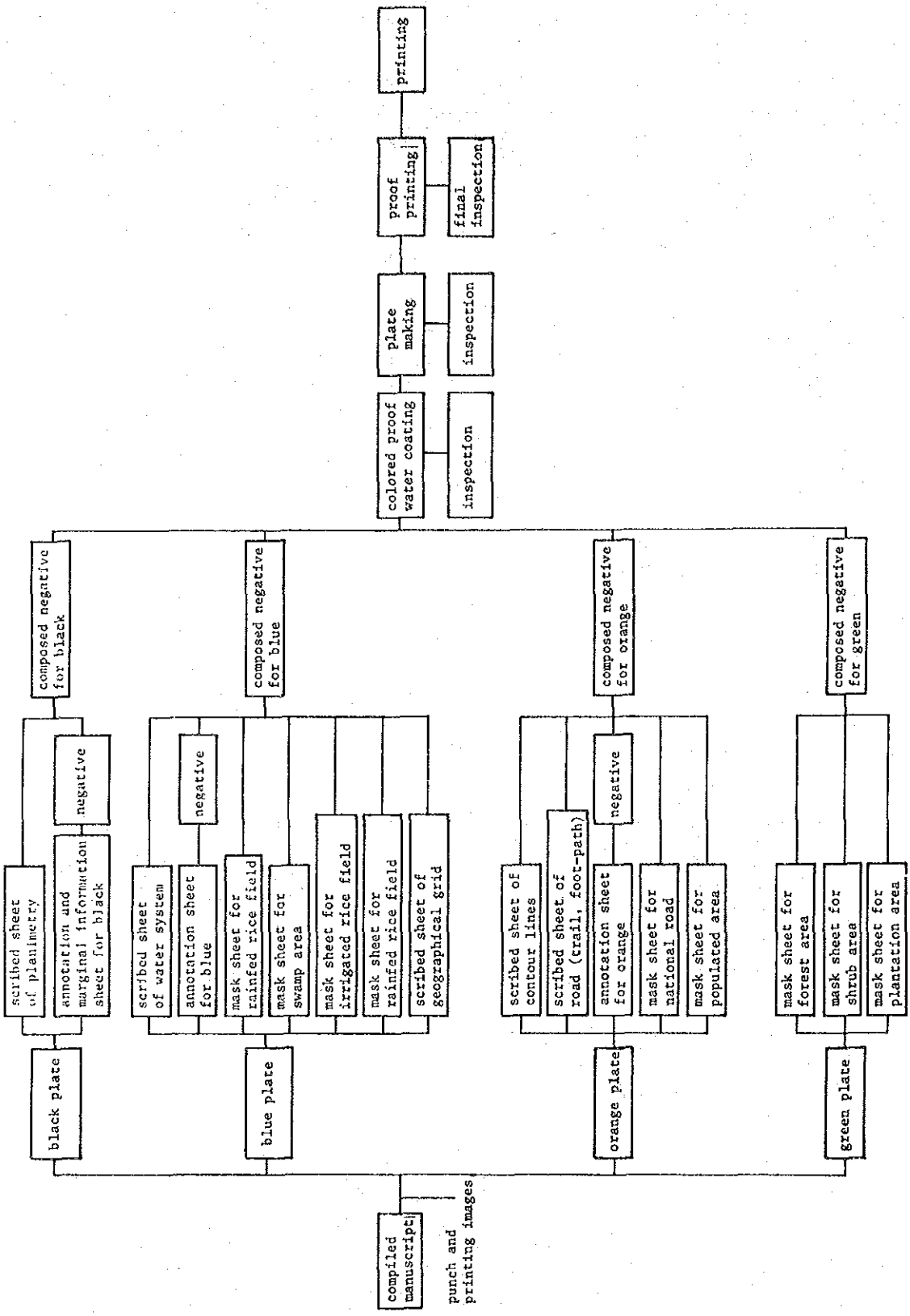


Table-11 Plate separetion of each sheet

	plate \ sheet No.	1714-62	1714-34	1714-32	1713-64	1814-41	1814-13	1814-11	1813-43	1813-44
scribing	black	○	○	○	○	○	○	○	○	○
	blue	○	○	○	○	○	○	○	○	○
	orange	○	○	○	○	○	○	○	○	○
	orange(trail, foot-path)	○	○	○	○		○	○	○	○
	grid	○	○	○	○	○	○	○	○	○
masking	water surface	△	△	△	△	△	△	△	△	△
	marsh				●					
	irrigated rice field							△		
	rainfed rice field				●			△	●	
	national road				●		△	●	●	
	popurated area			△	△			●	●	
	forest area	●	△	●	△	●	●	●	●	△
	scrub area	△	△	●	●	△	●	●	●	
	plantation area			●	●		△	●	●	

○ scribe base
● K & E peel coat (photo etching)
△ Kimoto peel coat (mechanical)

Plate Description

1. scribe plate
   1) black plate : road, building, structure, administrative boundary, UTM grid
   2) blue plate : water system, water-tank
   3) orange plate : contour lines, releaf expression
   4) orange plate : trail, foot-path
   5) grid plate : geographical grid

2. mask plate
   1) water surface : water surface
   2) swamp : swamp
   3) irrigated rice field : irrigated rice field
   4) *rainfed rice field :rainfed rice field*
   5) national road : national road
   6) populated area : populated area
   7) forest : forest area
   8) shrub : shrub area
   9) plantation : plantation area

3. annotation sheet
   1) black : marginal information(black), black annotation structural symbols, spot height & point, UTM coordinates
   2) blue : marginal information(blue), water sphere annotation, annotation blue symbols, geographical coordinates
   3) orange : marginal information(orange), contour values

3) Preparation of mask base

As mask base, two types of peel coat were used. One of them is the day light peel coat on which image of compilation manuscript can be printed. The other one is the peel coat on which image of compilation manuscript cannot be printed. For special roads, and complex border lines such as vegetation boundaries, daylight peel coat was used while for simple shape features the peel coat was used. Registration marks were printed at eight locations just like on scribing bases.

4) Preparation of zip-a-tone sheet

For zip-a-tone for paddy fields, forests, etc. which should be the same with the Indonesian map format, zip-a-tone provided by the Indonesian Government was reproduced in Japan and used.

5) Preparation of marginal information sheet and annotation sheet

Marginal information was prepared according to the style sheet which was attached to the Indonesian map format. For making marginal information sheet, myler base was used. Only common marginal information was prepared by photo-lettering and printed on myler base (positive print). These positive print sheets were used as bases for annotation sheet for each colour. On annotation sheets which were made based on source maps, specific marginal information for each sheet was supplemented.

6) Matching of adjacent sheets (Tying)

Each sheet overlaps with the adjacent sheets for about 1 cm. Concerning lines and patterns on this 1 cm of overlapping areas, lines and patterns of right hand sheet and lower sheet were scribed first.

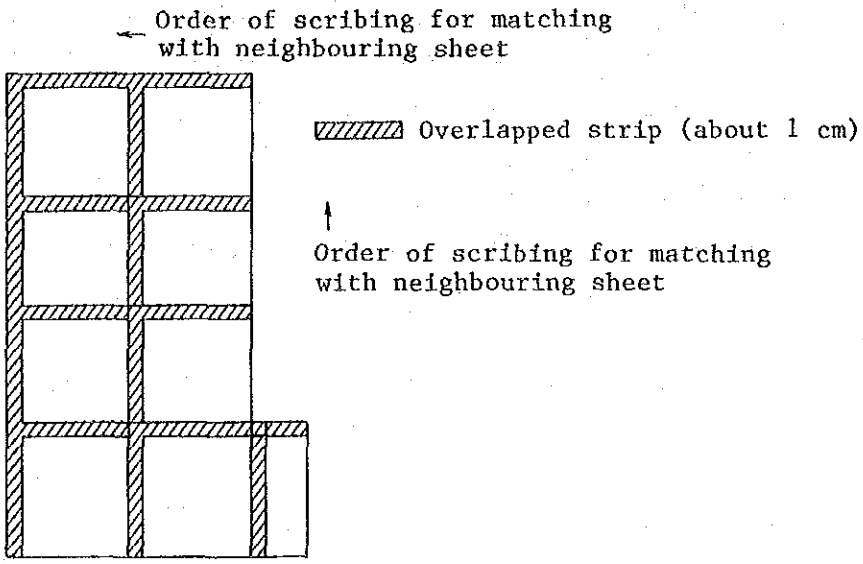
These scribed lines and patterns were then printed on the overlapping areas of upper and left hand sheet separately for each colour sheet by magic printing. Then these printed lines and patterns were scribed on the lower and left hand sheet with care. By this way, smooth connection of neighbouring sheets was secured. (see Fig.-13)

7) Inspection and proof-correction

Colour composite of whole colour separation was prepared by a photographic method for proof correction. Proof-correction was done in cooperation with the Indonesian counterparts from BAKOSURTANAL and DGWRD who visited Japan as regards to mistakes in writing, drawing, omissions, deviation from the map format, etc. in the reference to the compilation manuscript, annotation sheets and other source maps. These were further

inspected by the Surveying Technical Center (Authorized public inspection organization).

Fig.-13 Overlapped strips of each sheet



4-9-2 Printing

From the scribed original, composite negative film was made for each colour separation sheet, and then from these composite negative sheet, printing plate of aluminum PS sheet was made. Before printing, proof prints were made and inspected. After this proof-correction process, approval of the Indonesian Government on printing was obtained. 1,000 sets of four colour maps were printed for each of 9 sheets. Printed maps were trimed to the specified size of map sheet. These completed maps were again submitted to the Surveying Technical Center for approval.

Types of printing ink used for the printing were as follows:

1) Black: Tokyo Ink No.88
2) Red: Tokyo Ink No.37 (Vermillion red)
3) Blue: Tokyo Ink No.42 (Yellowish blue)
4) Green: Toyo Ink medium/No.51 (Grass)/No.47 (Medium yellow)

Data of printing papers are as shown in Table-12. Character of this printing paper are almost same with the paper used in Japan for printing base maps.

Table-12 Physical and chemical characteristics of printing paper

Item			Average	Maximum	Minimum
Folding endurance (time)	Machine direction		2,400	3,200	1,900
Tension/1 kg (MIT type tester)	Cross direction		3,100	4,000	2,600
Bursting strength (kgf/cm^2)	Dry		5.53	5.85	5.10
	Wet		2.81	3.50	2.45
Tensile breaking strengh (kgf)	Dry	Machine direction	11.6	12.1	11.1
		Cross direction	8.93	9.30	8.45
	Wet	Machine direction	3.59	3.80	3.30
		Cross direction	3.31	3.50	3.15
Tearing strength (gf)	Machine direction		92.0	94.0	90.0
	Cross direction		87.7	90.0	86.0
Smoothness (sec)	Surface		120	140	100
	Back		100	120	90
Expansion (%) (RH 60∿80)	Machine direction		0.05	-	-
	Cross direction		0.10	-	-
Opacity (%)			90.7	91.0	90.4
Brightness (%)			89.2	89.3	891
Size condition (sec)			71	77	60
Thickness (mm)			0.101	0.104	0.099
Surface strength (A)	Surface		26	26	26
Weight (g/m^2)			90.9		
Water content (%)			7.9		
PH			6.3		

Paper material	Unbreached pulp
Flow of fibres	Good
Curling and other defects	None
Texture	Good
Difference in quality between surface and back	Little

NOTE: Wet means the condition in which the specimen has been immersed in water of 20°C and is soaked with superflous water.

5. Review

5-1 Aerial Photography

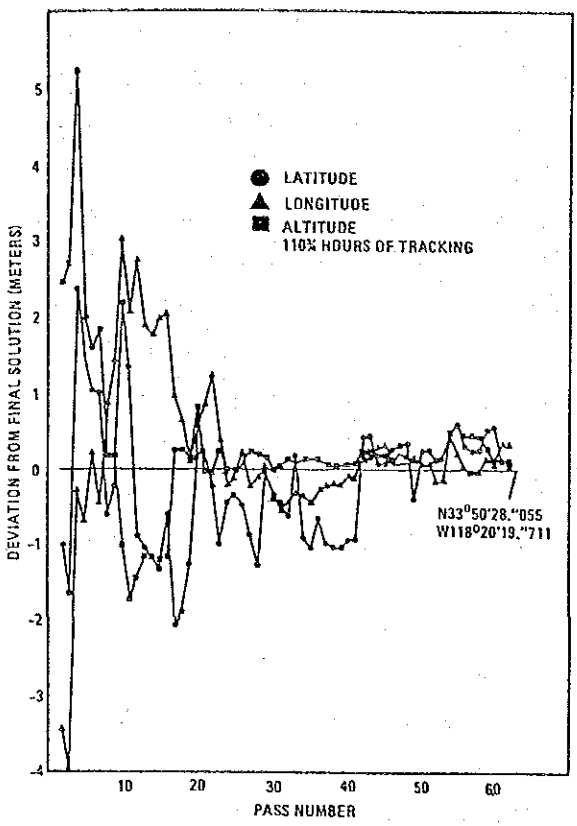
While the scale for aerial photography was set at 1:60,000 at the stage of survey planning, limitations in the ceiling ability of the aircraft and the fact that project area involved the mountainous region in the northern part, the actual scale was finalized between 1:45,000 and 1:51,000. This meant an increase in the number of models in aerial triangulation and reduced the density of control points in aerial triangulation for the northern mountainous region. Therefore, block for the southern region having many control points, including those vertical control points for aerial triangulation, were first computed and the coordinates of tie points for the northern region based on this computation were used as the control points for the computation of the northern region.

While the larger photo scale resulted in increasing number of models for plotting, enabling photo-interpretation in detail.

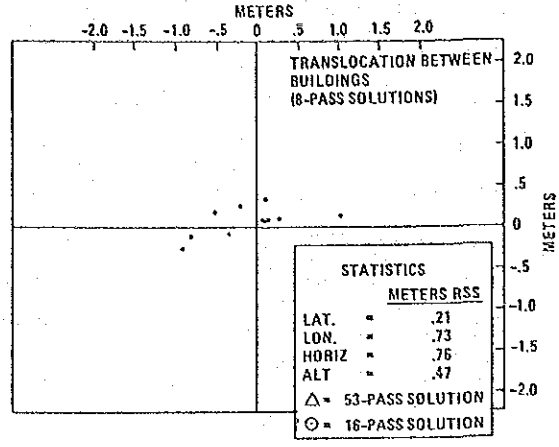
5-2 Doppler Satellite Observation

For establishing control points to be necessary for topographic mapping, Doppler satellite observation by the point positioning system was conducted. With regard to this, when explaining the work plan to the Indonesian side prior to the commencement of the work for the 1st year, there was a difference of opinion in that the Indonesian side insisted on the translocation system as the observation mode, while the Japanese side was in favor of the point positioning system using the broadcast ephemeris. While there are some differences in accuracy between both systems, the Japanese side explained about observation by the point positioning system, and stated that with computation based on the broadcast ephemeris, the accuracy of point positioning would be well within the order of several meters so that the observation points may be able to serve satisfactorily as control points for 1:50,000 topographic mapping (See Fig.-14)

Fig.-14 Point positioning convergence and translocation results



3-D Point Positioning Convergence (62 MX 1502 Satellite Passes)



8-Pass 3-D Translocation Results

It is understood that the Indonesian side desired the translocation system because it intended to use these Doppler satellite observation points not only for preparation of 1:50,000 topographic maps, but also for arranging them as the national geodetic control points.

With respect to this observation system, the implementation of the point positioning system was finally agreed by the Indonesian side. For the computation, it was decided that the Indonesian side would obtain a precise ephemeris from the United States, and use the Japanese observation data to conduct positioning computation.

Table-13 shows the positioning results based on the broadcast ephemeris and the precise ephemeris. This positioning computation in accordance with the precise ephemeris was conducted in Japan for reference purposes.

It was found that among the passes used for computation based on the broadcast ephemeris, the number of passes which were effective for computation based on the precise ephemeris was about one third or less, and some of them indicated poor convergence of the computed value.

At present, there is only one artificial satellite to be utilized for the computation based on the precise ephemeris. It needs longer observation time for effective observation comparing to the case of using the broadcast ephemeris. For establishment of the control points for topographic mapping, generally, it is considered to be good enough to use the broadcast ephemeris from the standpoint of accuracy and efficiency.

Number of the control points (horizontal) had seemed to be not enough in consideration of the total number of the models of aerial photos, but fortunately it became possible to distribute the control points around the project area including its four corners. These Doppler satellite observation points were used as control point for the aerial triangulation for 1:50,000 topographic mapping keeping necessary planimetric accuracy.

Regarding elevation of the Doppler satellite observation points, the newly established points in the southern half of the project area were able to connect to the direct or indirect levelling. Differences between the elevations of the Doppler satellite observation points converted from the reference ellipsoid (WGS-72) to the Indonesian reference ellipsoid (GRS-67), and the elevations obtained by levelling based on Takisong datum (Tidal gauge station was established in September 1972 for the mapping project of Barito river basin - see Fig.-6) are 46 - 48 m showing good convergence.

These values are closely approximate to these of elevations of geoid of the reference ellipsoid (WGS-72) of this region, and it is considered to be proper to have used these values for adjustment of the elevation of the Doppler satellite observation points in the northern half of the project area.

Table-13 Coordinate values of Doppler satellite observation points based on broadcast ephemeris and precise ephemeris

	U.T.M. COORDINATES (Broadcost Ephemeris)		U.T.M. COORDINATES (Precise Ephemeris)		Discrepancy	
	N	E	N	E	N	E
	m	m	m	m	m	m
D-A600(NS.01)	9,756,840.81	360,177.46	9,756,843.79	360,172.45	2.98	-5.01
D-A601(NS.02)	9,749,239.83	341,725.57	9,749,249.88	341,726.48	10.05	-1.09
D-A602(NS.03)	9,764,455.77	298,276.41	9,764,456.39	298,272.52	0.62	-3.89
D-A603(NS.04)	9,791,080.56	352,485.08	9,791,072.24	352,484.31	-8.32	-0.77
D-A604(NS.05)	9,795,430.56	297,632.97	9,795,427.67	297,629.82	-2.89	-3.15
D-A605(NS.06)	9,815,705.25	363,001.41	9,815,705.74	363,000.29	0.49	-1.12
D-A606(NS.07)	9,796,686.64	322,248.67	9,796,686.03	322,250.12	-0.61	1.45
D-A607(NS.07)	9,827,865.07	337,001.10	9,827,874.31	336,988.76	9.24	-12.34
D-A608(NS.08)	9,827,105.71	295,245.96	9,827,106.67	295,249.14	0.96	3.18
D-A609(NS.09)	9,871,578.97	367,925.12	9,871,581.82	367,921.41	2.85	-3.71
D-A610(NS.10)	9,856,054.32	292,563.12	9,856,049.89	292,563.87	-4.43	0.74

5-3 Characteristics of Map Symbols

The map symbols of the 1:50,000 Indonesian base map (SPESIFIKASI PATA RUPABUMI INDONESIA SKALA 1:50,000) was compiled in 1983 as shown in the attached appendixes, and consisted of the following items.

(1) Multi-storied and other buildings
(2) Transportation route (road and railway)
(3) Topography and control points
(4) Vegetation
(5) Administrative boundaries
(6) Water sphere
(7) Annotation

5-3-1 Multi-storied and other buildings

Multi-storied and other structures include buildings, cemeteries, historical monuments, historical buildings, civil engineering work, etc. Buildings consist of "buildings" (indicating individual buildings) and "residential areas" (indicating densely built-up areas). As building symbols, administrative buildings (3 kinds), places of worship (4 kinds),

high towers, power plants and tanks were applicable. For other works, high tension transmission lines, telegraph and telephone lines, and oil pipelines are indicated, and mining site and oil well are also shown.

The expression of buildings provides only the identifications for individual building and for densely built-up residential areas, and there is no distinction between the size of buildings, high-rise buildings or otherwise. Buildings are shown in black, while residential areas use dotted orange. For settlements in a village, symbol for residential areas is used same as densely built-up areas in cities or towns.

Symbols indicating the use of buildings include places of worship, historical monuments, historical buildings, administrative buildings and power-related buildings. The number of symbols for buildings is limited, and symbols for schools, post offices, hospitals and factories are not provided. However, reflecting the diversity of religions, places of worship are separately indicated for Islam, Christianity, Confucianism, and Buddhism. For cemeteries, similarly classified symbols for the various religions are provided.

The color of dotted orange for residential areas looks similar to the color of the roof tiles as seen from the air, and in it, building symbols and other symbols in black stand out in clear contrast for easy identification.

As for the expression of high tension transmission lines, telegraphs and telephone lines and oil pipelines, only those major ones connecting cities and towns are indicated. These are affected by thick vegetation that makes field surveys and photo-interpretation extremely difficult. Therefore their expression is dependent upon the collected data.

5-3-2 Transportation routes (roads · railways)

Transportation routes include stations, airports and other associated facilities other than roads and railways.

Roads are classified into the following categories: special roads; semi-special roads; local roads; other roads; and footpaths.

Special roads are national highways connecting cities and large local towns, while semi-special roads are main national roads linking cities and towns, and local roads are roads connecting local towns. These roads are all constructed in accordance with the regulations of the Road Bureau.

Local roads are indicated in only black single lines, while both special road and semi-special road are in black lines filled in orange so that they stand out.

Other roads together with trails and footpaths are shown in a line of concentrated dots. It is in the same color as the contour line, and their distinction is not in thickness of color but in the size of line.

Bridges are shown by classifying them as motorable or nonmotorable. When facility exists on the bed of river or lake for crossing instead of bridge, such facility is expressed as a ford. Special roads and semi-special road are expressed with mileposts.

Railways are indicated with a distinction between ordinary railways and small-scale railways. Ordinary railways are classified into double track and single track, and as associated facilities, railway stations, and train stops other than stations, tunnels, and grade separation are also shown.

Airports are indicated by classifying them as an "airport" which is fully equipped with airport facilities, and as a "local airport" lacking such facilities. All features except stations are shown in black.

5-3-3 Topography and ground control points

Symbols for topography and control points show the topography of land area, consisting of contour lines, other topography, and control points.

Contour lines are intermediate contour line in every 25 m, and index contour lines in every 100 m, and supplement contour lines also drawn whenever necessary. Other symbols showing the topography include depression, salient, cliff, outcropped rock, banking, canal, sand and gravel land, sand dune, and known spot heights. Natural gas points, and hot spring points are also indicated separately.

Order (from 1st to 4th order) and control point No. are added to the triangulation symbols. Other symbols indicated are for astronomical stations, Doppler satellite observation points and cadastral points used for cadastral survey, and all bench marks.

As the mountainous areas are mostly covered by jungles of high trees, it is considered proper to set the contour interval 25 m to show such topography.

This contour interval might be considered insufficient for the expression of slightly undulating terrain comparing to the 20 m contour

interval, but this can be dealt with by using the supplementary contour line.

5-3-4 Vegetation

Agricultural land use and forest are indicated for vegetation. Irrigated paddy field, rainfed paddy field, and plantation are expressed for agricultural land use. For plantations, the kinds of cultivated products are shown with letter symbol.

Forest are indicated by separately classifying shrubs and other forest. Others are shown as wasteland and fields grouped together with barren land, grass land. In the tropical rain forest zone, growth of vegetation is tremendous due to the high temperature and humidity, and it is difficult to differentiate farm and wasteland or abandoned farm, so that classified indication of farm land is in most cases not made.

5-3-5 Administrative boundaries

Administrative boundaries indicate international boundaries, provincial boundaries, and city or other (Kabupaten, Kecamatan) administrative boundaries. The symbol of black broken line with dots enables easy identification.

5-3-6 Water sphere

For the water sphere, in addition to symbols indicating topography of various water areas, symbols representing works on river, stream and coast, and the land use of water area also available.

As symbols expressing sea area, coast line, coral reef, exposed and hidden rock, or permanently exposed coral reef are provided. Symbols for inland water area, lake, marsh, river, stream, dried up river, waterfall, rapids, spring, water channel, and direction of water flow are available. As land use of water area, fish-breeding pond and saltbed are indicated. Symbols for works in river, streams and coasts include dams, quays, breakwaters, wharfs and lighthouses. The majority of rivers and streams are natural, and the coasts are also mostly natural, requiring only a few symbols. Symbols of the water sphere consist of a combination of blue and black.

5-3-7 Annotation

Annotations are classified into five categories: names of water system such as bay, river and stream; geographical names of mountains and capes; names of residential areas, cities and towns; names of administrative areas; and others. Their letter style and height are specified respectively and expressed accordingly.

As various dialects are used in Indonesia, and their kinds are numerous, abbreviation for lettering in each dialect is provided and is used accordingly. Abbreviation for lettering in dialects includes settlements, mountains, rivers, marshes, ponds, bays, capes, islands, estuaries, plantations, government offices, and others.

5-4 Plotting and Compilation

5-4-1 Building

In detail plotting the large scale of aerial photographs permitted photo interpretation in detail, as house to be expressed on the map in accordance with the map symbol specification of Indonesia is "any and all buildings associated with residence and human activity," and watch huts in paddy fields and farms, and any other temporary buildings whatever recognized in the photographs were plotted. These houses were so numerous that they were drawn by building symbols on the compiled sheets in accordance with the map symbols. As the symbol is large (one side 0.5 mm) comparing to that of Japan, settlements appear as if to have been scattered in the farm, and it was decided to erase the majority of watch huts in the farm at the stage of the field completion with due consideration for the balance with the surrounding villages.

The area subject to generalization as a residential area was confined within the scope directed by the Indonesian side. The concept of area for generalization is unlike Japan. Even such areas where small houses assemble and their occupying ratio is small comparing to the surrounding vacant area, as settlers' village MALONG I and II observed on the map "HALONG," are expressed as residential area.

This expression is the same system for urban built-up areas. Settlers' village with scattered buildings or small groups of houses along the road

in a village give more realistic impression on the map by generalizing several houses as a single house with independent building symbol.

5-4-2 Foot path and stream

Photo-interpretation of narrow streams and footpaths was difficult when they were covered with thick forest. While they were supplemented as much as possible at the stage of the field completion, surveys on foot were limited. For example, there were cases where paths connecting settlements was partly discovered, but the connection was not identified and these therefore had to be deleted with agreement of the Indonesian side.

5-4-3 Vegetation

Classification of forests is simple, ordinary forest and shrubs. Some rubber plantations without proper care were sometimes difficult to be identified from miscellaneous forest.

5-4-4 Field completion

The confirmation of administrative boundaries implemented by the field completion required presence of responsible officials of the administration concerned. In order to complete the work within a limited period, the detailed work plan and copies of the compiled manuscript prepared by the Japanese survey team was submitted to the Indonesian side in advance with a request for preliminary preparation by the Indonesian counterparts, so that the work could be executed almost according to the schedule. However, with regard to part of the provincial boundaries it became necessary to take some more time for their confirmation on the manuscript, and, therefore, both side agreed the Indonesian side would prepare data on the administrative boundaries in time.

With regard to geographical names consisting of several words, as the official geographical name list was not available, detailed instructions were given by the Indonesian side to clarify the relationship between words with spaces in-between and combined words, and a list of annotation was prepared.

Several roads constructed after taking aerial photographs were surveyed by plane table surveying and incorporated in the compiled sheets.

5-5 Drawing and Printing

5-5-1 Drawing

(1) Line symbol

Line symbols for vegetation boundaries, rivers and streams, and grid line specified in the map symbol specification and the attached sample map are different. In this work, the specified line symbols were used for vegetation boundaries and grid line. While in view of the judgement that a slightly thinner line would be more adequate for rivers and streams, a slightly thinner line (0.15 mm) than the specified line was used.

(2) Letters for annotation

The letter height of annotation for marginal information is expressed in point in the marginal information and the map symbols specifications. The letter height specified in point is different from the one used in Japan. The Indonesian letter height size (0.25 mm per point) was taken as a standard, and the letter height of the sample of marginal information attached to the specifications was also followed. The letter height and style of marginal information were different from those of the map "CIANJUR" published in September 1984 and provided at the second year meeting. Except the expression within the administrative boundary diagram instructed by the Indonesian side, however, all of them followed the marginal information attached to the map symbols specifications published in 1983.

(3) Change in indication method for annotation and elevation

Annotation of mountain was specified to be placed below the top of the mountain according to the sample map attached to the specifications. After consultation with the Indonesian side it was agreed to indicate it above the top of the mountain. The elevation value was also decided to be indicated in the lower right of the indicated point. This is unlike the map symbol specifications in 1983, but it is the same style as the above mentioned map "CIANJUR." However, control points are expressed at two stages this time, that is, the name of point and elevation. This is a system different from the sample map of the specifications.

(4) Houses

Houses shown in the map "CLANJUR" are expressed in the size of 0.3 mm, considerably smaller in comparison with the map symbol specifications. On

the other hand, in the sample map of the specifications, it is shown twice as large as this one. The impression from the map is that the smaller symbol is more realistic and more refined.

5-5-2 Printing

Printing ink is available in both transparent and opaque. In printing a topographical map, if orange for contour line is first printed, then opaque green for vegetation is superimposed, since the color of forest is dark, the orange contour line and its figure are likely to be difficult for identification. For this reason, as the order of printing, it is necessary to print the dark color green first and then superimpose the orange, although selection of color is important.

It is desirable for the finish of maps to be able to identify general topography and landscape at first glance as well as of easy readability in detail. Such effects of the map expression are dependant basically on design of map symbols, although being adjustable to some extent by color coordination. Therefore, it become necessary to re-examine map symbols if the effects of map expression are to be considerably improved.

5-6 Matching with Existing Maps

The existing 1:50,000 topographic maps prepared in 1974 and the new topographic maps overlap in the maps 1713-64 "TANJUNG" and 1813-43 "HALONG" printed as the second edition this time. However, this overlapping does not extend entirely, but is limited only to about 60 percent of the southern part. The existing topographical map was prepared on the basis of the control points established based on the existing triangulation points and astronomical points, Bessel's ellipsoid was used as the reference ellipsoid, and transverse Mercator's projection (UTM) was used as the projection system. This time Doppler observation points were used as the control points based on reference ellipsoid ID-1974, which is the new Indonesian coordinate system, and, even if the projection system remains the same UTM, it is obvious that there is discrepancy between both maps.

At the time of survey planning, this discrepancy was to be computed by conducting Doppler observation at the existing astronomical point in the southern part of the project area, but at the time of implementation this

existing astronomical point could not be discovered, and it was decided to refer to the data obtained by the photo mapping project for the neighbouring down stream area of Negara River basin.

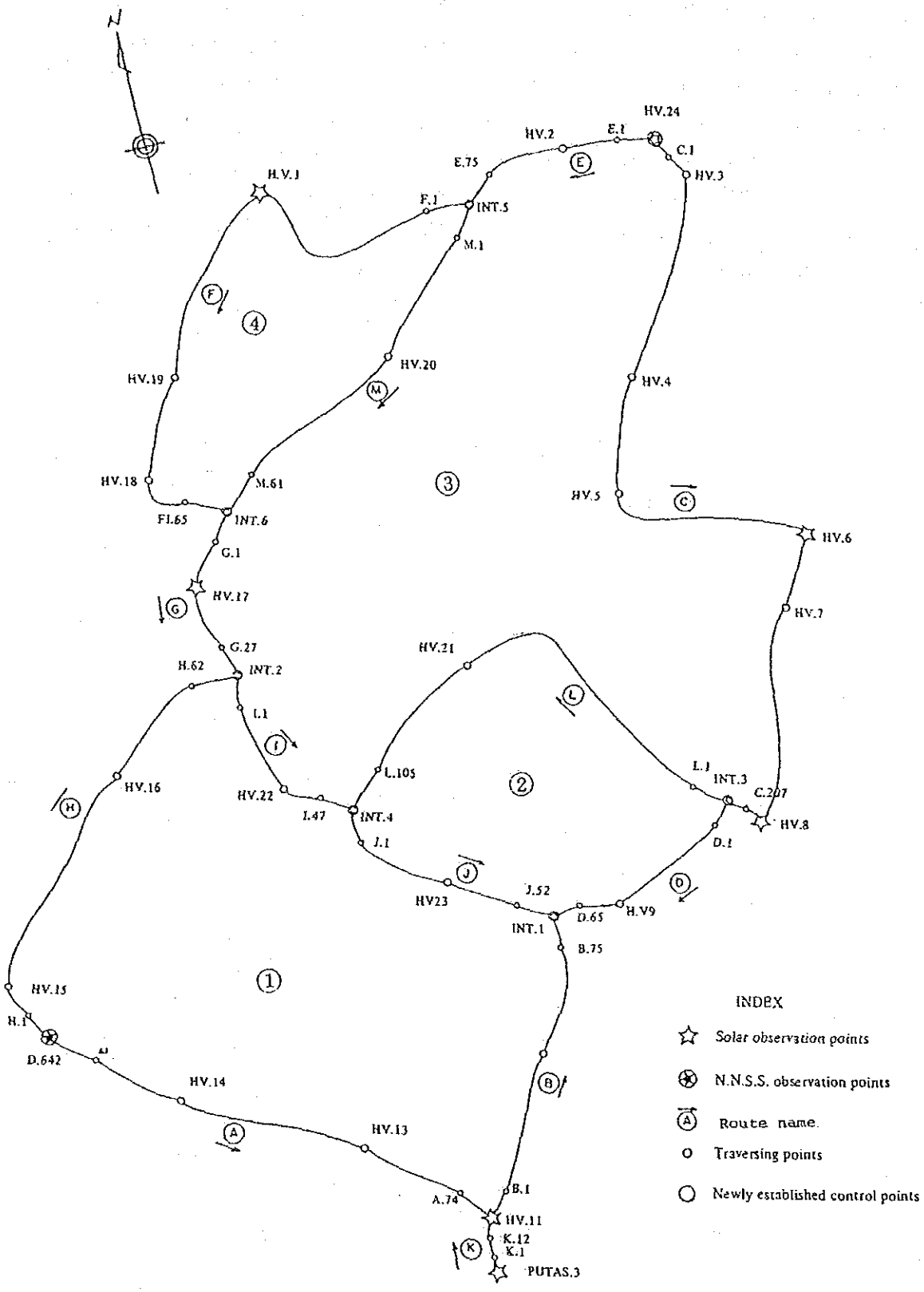
Fig.-15 illustrates a traverse route map of the project for the downstream area of the Negara River basin. The astronomical point at Kandangan seen in the map, PUTAS-3 is the point used for preparation of the existing topographical map. D-642 is the Doppler observation point established by BAKOSURTANAL and the newly computed coordinate value at PUTAS-3 obtained by traverse based upon the coordinate value of D-642 is shown in the following Table-14:
However, the observation value in 1984 was in accordance with the new Indonesian coordinate system, while the one in 1972 was based upon Bessel's ellipsoid.

Table-14 Differences in coordinates of PUTAS-3

Item	Latitude	Longitude	X	Y
Observation value in 1972	S2°47'19."32	E115°15'16."14	9,691,650. m	305,990. m
Observation value in 1984	S2°47'22."804	E115°15'48."384	9,691,511.997m	306,961.495m
Difference	- 3."484	- 32."244	138.003m	- 971.495m

From the above results, it is considered that the new 1:50,000 topographical map shifts about 138 m to the south, and about 971 m to the east compared with the existing 1:50,000 topographical map prepared in 1974.

Fig.-15 Traverse route map of Negara River down stream area



6. Utilization of Survey Results

6-1 Results of Control Points

As the project area did not have existing control points (horizontal), four control points (one of them was an auxiliary point for aerial triangulation) in the mapping area, and seven control points in surrounding area were newly established. These new points were established as Doppler satellite observation points enabling the independent observation as the northern half is in the jungle area.

As the main object of these observation points was for use as control points for aerial triangulation. Their positioning computation was based on the broadcast ephemeris. However, as these Doppler satellite observation points were likely to be used as control points for various surveys and plans in future, permanent monuments were installed, and a new positioning computation was made in Japan based on the precise ephemeris to improve the results.

6-2 Results of Levelling

Due to limitations of topography, road and others, the installation of level points is restricted within the southern half of the project area. The second order levelling covered the section of about 70 km from the existing point at Tanjung along the national highway leading to Balikpapan, while the third order levelling covered one northward route from the existing point at Tanjung, and one northwestward route from the existing point at Kelua. As permanent monument, 17 points of second order and 13 points of third order were newly installed. The results of these level points have satisfied the respective accuracies, and they will be satisfactorily used as elevation data.

6-3 Aerial Photography

Aerial photography was executed over two years in 1983 and 1984 because of weather restrictions. The time of aerial photography was September in 1983 and July to August in 1984. As the service ceiling limit of the

aircraft for photography was about 4,700 meters, and a super-wide angle camera was used, the photo scale was about 1:50,000 around Tanjung where the altitude is low, while in the northern mountainous area about 1:45,000.

All of these aerial photographs can be used for stereoscopic photo-interpretation for basic survey of vegetation, land use, topography, surface geology, etc., and development surveys for forest resources, water resources, road planning, etc.

Table-15 shows the difficulty of identification by photo interpretation with regard to major items of surface landscapes.

Generally speaking the interpretation of building is easy, and unless it is surrounded by trees, even small huts can be interpreted. particularly, buildings of concrete or zinc roofing reflecting light quite well can be easily identified.

Oil wells and tanks can be easily identified by photo-interpretation. However, from photographs of this scale it is difficult to directly identify line structures such as telegraph and telephone lines or oil pipelines. Only when the land is cleared it is possible to recognize the position of these facilities.

Paved road, or even unpaved road where traffic is heavy have light reflection ratio relatively higher than the surrounding, and they are therefore easy to interpret. Even if they are covered by coconut or other trees, interpretation is possible where motor traffic is heavy, while interpretation of footpaths is absolutely impossible.

With regard to motorable bridges, the wider the river width the easier to interpret. It appears almost impossible to interpret small bridges across narrow streams. However, small bridges (suspension bridge) across a wide river can sometimes be interpreted.

Airport and its facilities are easily identifiable from their characteristic features.

Vegetations to be expressed on the map are mostly photo-identifiable. Irrespective of irrigated paddy field or rain fed paddy field, paddy fields can be easily interpreted from their shape and tone. Plantations can be either easy or difficult to identify. Rubber plantations with fresh seedlings and abandoned rubber plantations mixed with miscellaneous trees are difficult to interpret.

Forests and shrubs are easy to identify. A large tree in the jungle, provided with key for photo-interpretation, will even enable interpretation of the kind of tree from the shape of crown and the tone. A wasteland such as grass land where Alang Alang is grown is easy to interpret from its particular grain and tone. Farms are often difficult to identify due to the rapid growth of weeds whether it is a grass land or otherwise. However, if no distinction is necessary between waste land and farm, their identification is easy.

Generally speaking, it is easy to interpret water surface. The absence of water due to the dry season, river course and swamp can be interpreted.

However, it is difficult to interpret river system covered with thick jungle, therefore the river system will only be traced from the interpretation of topography. But the river system in the slightly undulated jungle area is difficult to identify. Marshes and old river channels are easy to interpret.

Table-15 Difficulties in photo interpretation

Classification	Item	Easy interpretation	Interpretable	Interpretable/non-interpretable	Non-interpretable
Buildings, etc.	Concrete building	○			
	House (zinc roofing)	○			
	House (grass thatched/ wooden roofing)			○	
	Oil well	○			
	Tank	○			
	Telegraph and telephone line				○
	Oil pipeline				○
Transportation route	Paved road	○			
	Unpaved road		○		
	Footpath			○	
	Bridge	○			
	Small bridge				○
	Local airport	○			
Vegetation	Paddy field	○			
	Plantation			○	
	Forest	○			
	Shrub	○			
	Wasteland	○			
	Farm			○	
Water sphere	River channel	○			
	Dry riverbed	○			
	Lake	○			
	Swamp	○			

6-4 1:50,000 Topographic Map

While this topographic map is primarily prepared as basic material for preparation of development plan for Negara River basin, it is available for multipurpose use as it is prepared in accordance with the map symbol of the 1:50,000 basic map of Indonesia.

The basic map shows nature developed in the area and topography of the earth which is a vessel of cultural landscape by contour line, and further, natural landscape such as river system and vegetation, buildings, transportation route and other land use are expressed after selection in accordance with united standards. It is, therefore, possible to read the topography and geographical landscape from the topographic map at a fixed accuracy.

Altitude and topography of land will be available from intermediate contour lines every 25 m, supplementary contour lines every 12.5 m, and elevation points indicated every 2 to 2.5 km. Furthermore, the use of these contour lines and elevation points will also be possible to obtain gradient of the land surface and topographical profiles.

As for natural landscape, recognition of the river system distribution, basin area, distribution of natural vegetation, etc. is available, while with regard to the cultural landscape, the correct understanding of distribution of settlements, and the present state of land use including distribution of road, paddy field, plantation and oil well is possible.

Topographic maps are also essential as basic maps for various surveys and plans. For topographical analysis and preparation of various thematic maps, in combined use of aerial photo-interpretation, improved accuracy and effect of survey can be expected. The scope of the topographic maps prepared by this project covers the entire basin of Negara River extended north of Tanjung, reaching even outside the watershed. Therefore it is most suitable for various surveys and plannings of the upstream area of Negara River.

APPENDICES

1. Specification of 1:50,000 Topographic Map Symbols, Indonesia
2. Record of Levelling & Control Points
3. Scope of Work
4. Minutes of Meetings
   (1) Minutes of the First Year
   (2) Minutes of the Second Year

1. Specifications of 1 : 50,000 Topoqraphic Map Symbols, Indonesia

SPESIFIKASI
PETA RUPABUMI INDONESIA
SKALA 1 : 50.000

EDISI : 1

LAMPIRAN A

SIMBOL PETA, DEFINISI DAN KEGUNAANNYA.

(図式及規程)

BADAN KOORDINASI SURVEY DAN PEMETAAN NASIONAL

1983

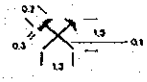
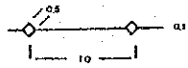
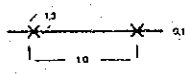
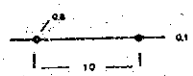
DAFTAR ISI
内容

/

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
1. GEDUNG DAN BANGUNAN LAINNYA　高層建物及びその他の建造物		
1.1.	Bangunan 建物	Segala bentuk dan struktur bangunan yang berhubungan dengan tempat tinggal dan kegiatan manusia. 住居及び人間活動に関連する全ての形状と建造物
1.2.	*Daerah pemukiman* 居住地区	*Bagian daerah yang berpenduduk berupa kelompok bangunan dan jalan* yang cukup luas sehingga dengan skala sulit untuk digambarkan secara sendiri-sendiri. Termasuk daerah perkampungan yang mempunyai batas tegas. 個々に表現出来ない幅道路をともなった密集地区、 或は明瞭に居住区分出来る村落
1.3.	Kantor Pemerintahan 行政建物	Bangunan yang menjadi tempat pejabat pemerintah berkantor, melakukan kegiatan untuk mengelola masalah administrasi wilayahnya. 地方行政を司どる役所建物
1.4.	*Tempat beribadat*　礼拝場 – Mesjid　ムスジッド – Gereja　グルジャ – Pura　プラ – Kelenteng　クルントウシ	*Bangunan untuk melakukan ibadah bagi penganut agama:* 宗教上の礼拝を行う場所 – Islam　イスラム教 – Kristen　キリスト教 – Cina　儒教 – Budha　ヒンズー教、仏教
1.5.	Makam　墓地 – Islam　イスラム教 – Kristen　キリスト教 – Cina　儒教 – *Hindu, Budha dan lain-lain.*	Daerah/tempat pemakaman bagi penganut agama/masyarakat: 宗教的な埋葬場 – Islam – Kristen – Cina – *Hindu, Budha dan lain-lain.*　ヒンズー教、仏教、その他の宗教
1.6.	Tempat/bangunan bersejarah. 史跡／歴史建物	Tempat atau bangunan yang mempunyai nilai sejarah. 歴史的に重要な場所・建物
1.7.	*Menara* 高塔	*Semua menara selain menara suar dan mempunyai arti tanda medan antara* lain menara stasiun radio/TV, manara pengeboran minyak. 燈台又はこれに準ずるもの及びラジオ、 TV塔、油井塔を除く全ての高塔

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter
Untuk menyajikan bangunan tunggal dan atau terpencar sejauh masih dimungkinkan menurut skala peta. Bangunan yang mempunyai ukuran kurang dari 25 m × 25 m di medan, digambar dengan simbol. 25㎜×25㎜未満は図式、その他は実形表示	黒 Hitam	
Untuk menunjukkan daerah tempat tinggal yang berupa kelompok bangunan dan disajikan bersamaan dengan pola jalannya. Daerah terbuka yang lebih besar dari pada 2,5 mm × 2,5 mm akan digambarkan sesuai dengan simbolnya. Jalan-jalan yang disajikan disesuaikan dengan klasifikasinya. 居住密集地の表示、ただし、図上 2.5㎜× 2.5㎜角以上の空地はこれを表示する 密集地の通過道路は道路区分する	橙 Hitam	
Untuk menunjukkan lokasi bangunan pemerintahan: 行政建物、位置の表示 – Gubernuran : G 政府建物 – Kabupaten : B 郡都行政建物 – Kecamatan : C 区域郡行政建物	黒 Hitam	
Untuk menunjukkan secara umum tempat ibadah suatu agama di daerah tersebut. 一般的な宗教上の礼拝場所・施設の表示	黒 Hitam	イスラム教 キリスト教 儒教 仏教 ヒンズー教
Untuk menunjukkan lokasi daerah pemakaman. Simbol dicantumkan di dalam batas daerah pemakaman. Taman Makam Pahlawan, cukup dengan tulisan "Makam Pahlawan." 埋葬場の表示、区域界の中に記号を入れる 勇士の墓地等充分に広い場所には 'Makam Pahlawan' を注記する	黒 Hitam	
Untuk menunjukkan lokasi tempat/bangunan bersejarah. Simbol diletakkan di pusat tempat bangunan bersejarah. 歴史的な建物の位置の表示。記号はその中心におくものとする	黒 Hitam	
Untuk menunjukkan letak menara. Letak simbol sesuai dengan letak menara. 高塔位置の表示、記号は高塔の真位置におく	黒 Hitam	

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
1.8.	Tambang 採鉱場	Instalasi untuk mendapatkan bahan tambang beserta bangunan lain yang berkaitan dengan tambang tersebut. 採鉱のための設備と関連施設
1.9.	Sumur bahan bakar 油井	Sumur untuk mendapatkan bahan bakar. 採油のための井戸
1.10.	Pusat listrik 電力所	Bangunan pembangkit tenaga listrik termasuk yang menggunakan tenaga: air, disel, uap dan lain-lain. 水力、ジーゼル・　発電にかかわる施設
1.11.	Tangki: タンク Air　水 Bahan Bakar　オイル	Tempat untuk menampung: タンクの場所を指示する Air Bahan Bakar
1.12.	Kawat listrik tegangan tinggi 高圧送電線	Kawat penghantar arus listrik tegangan tinggi dari sumber pembangkit ke stasiun berikutnya. 電力所から次のステーションに到る高圧の送電線
1.13.	Kawat telepon, telegram 電信、電話線	Jalur hubungan dengan suara ataupun dengan sandi. 電信、電話の連絡線
1.14.	Pipa bahan bakar 油送管	Pipa yang digunakan untuk memindahkan bahan bakar baik gas ataupun cair dari satu tempat ke tempat lain yang berada di atas permukaan tanah. 地上に敷設されたオイル、ガス等の液体の輸送パイプ

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter
Untuk menunjukkan lokasi tanpa menyebutkan jenisnya. 採鉱場に類似したものを除く、採鉱場を指示	黒 Hitam	
Untuk menunjukkan lokasi yang masih menghasilkan/diusahakan tanpa menyebutkan jenisnya. 類似のたぐいを除く、採油中の井戸を表示する	黒 Hitam	
Untuk menunjukkan lokasi pembangkit tenaga listrik tanpa menyebutkan jenisnya. 類似のたぐいを除く、電力関連施設を表示	黒 Hitam	
Untuk menunjukkan letak tangki. Letak simbol sesuai dengan letak tangki. タンクの位置を表示する	青 Biru 黒 Hitam	
Untuk menunjukkan jalur hantaran listrik tegangan tinggi. Di wilayah kota tidak disajikan. 高圧電線を表示する。都市内は通過しない	黒 Hitam	
Untuk menunjukkan jalur telepon dan telegram. Di wilayah kota, sepanjang jalan raya dan jalan kereta api tidak disajikan. 電信・電話線を表示するが、市内、道路及び鉄道上は表示しない	黒 Hitam	
Untuk menunjukkan semua jalur pipa, kecuali yang berada di wilayah kota. 都市部を除いた全てのパイプラインを表示する	黒 Hitam	

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
2．PERHUBUNGAN　輸送路（道路・鉄道）		
2.1.	Jalan arteri 特殊道路 – Satu jalur　無区分帯道路 – Dua jalur　区分帯道路	Jalan yang melayani angkutan utama dengan ciri-ciri perjalanan jarak jauh, kecepatan rata-rata tinggi dan jumlah jalan masuk dibatasi secara efisien. 到達表示、走行速度表示、距離表示のある、入場制限される特殊道路 Yang tidak mempunyai jalur pemisah. 区分帯のない道路 Yang mempunyai jalur pemisah. 区分帯のある道路
2.2.	Jalan kolektor 準特殊道路	Jalan yang melayani angkutan pengumpulan/pembagian dengan ciri-ciri perjalanan jarak sedang, kecepatan rata-rata sedang dan jumlah jalan masuk dibatasi. 速度・距離等の表示があり、入場制限される準特殊道路
2.3.	Jalan lokal 地方道路	Jalan yang melayani angkutan setempat dengan ciri-ciri perjalanan jarak dekat, kecepatan rata-rata rendah dan jumlah jalan masuk tidak dibatasi. 入場制限のない、地方都市、町、部落等を結ぶ一般道路
2.4.	Jalan yang sedang dibangun 建設中道路	Jalan yang sedang dalam pembuatan.
2.5.	Jalan lainnya その他の道路	Jalan yang tidak termasuk dalam 2.1, 2.2, 2.3 dan 2.4 ２１／２２／２３／２４／に規定されないその他の道路
2.6.	Jalan setapak 徒歩道	Jalan dipakai khusus untuk pejalan kaki. Biasanya menghubungkan kampung satu dengan lainnya atau di daerah pegunungan. 郊外に於ける部落間を結ぶ徒歩道
2.7	Tambangan 河・湖沼等渡道	Sarana perhubungan yang melintasi sungai, danau atau selat. 河・湖沼を渡るための施設

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter
Untuk menunjukkan jalan, utama yang menghubungkan kota-kota propinsi atau kota besar dan mengikuti ketentuan dari Direktorat Jenderal Bina Marga Departemen Pekerjaan Umum. Untuk jalan tol digunakan label. 道路局の法規に基いた都市・地方大きな町を結ぶ高速道路に準ずる特殊道路を表示する	橙 Oranye	0.25-0.50 0.35-0.41-0.10
Untuk menunjukkan jalan yang menghubungkan kota-kota yang cukup penting dan mengikuti ketentuan dari Direktorat Jenderal Bina Marga Departemen Pekerjaan Umum. 道路局の法規に基づく都市間を結ぶ主要な道路を表示する	橙 Oranye	0.10-0.40
Untuk menunjukkan jalan-jalan yang menghubungkan kota-kota lainnya dan mengikuti ketentuan dari Direktorat Jenderal Bina Marga Departemen Pekerjaan Umum. 道路局の法規に基く地方都市を結ぶ道路	黒 Hitam	0.35-0.40
Untuk menunjukkan semua jenis jalan yang sedang dibangun. Simbol disesuaikan dengan jenis jalan. 全ての建設中の道路を表示する 図式は道路の一種として扱う	黒 Hitam	0.30-0.40 1.0
Untuk menunjukkan jalan gerobak, jalan kuda dan jalan lainnya. 牛馬の通行可能な道路を表示する	橙 Oranye	0.5-0.40 – 50% (30° – 60°)
Untuk menunjukkan jalan setapak. Jalan setapak dalam daerah pemukiman tidak digambarkan. 徒歩道を表示する。ただし、屋敷内ものは表示しない。	橙 Oranye	0.3-0.40 – 50% (30° – 60°)
Untuk menunjukkan semua penyeberangan atau tambangan yang dapat dipakai untuk menyeberangkan kendaraan bermotor roda empat. 渡河道を表示する。フェリー等の車両の通行道にも表示	黒 Hitam	1.0 0.5

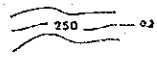
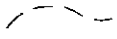
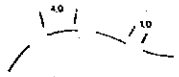
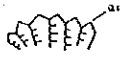
No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
2.8.	Tonggak kilometer 道路杆杭	Tonggak yang dipergunakan sebagai tanda jarak dalam kilometer dari suatu tempat ke tempat lainnya dan terletak di tepi jalan. 或る場所から次の場所への道路わきに置かれたkm距離標、コンクリート杭
2.9.	Jembatan 橋	Sambungan jalan yang dapat dilalui oleh kendaraan bermotor roda empat atau lebih. 自動車以上の車両の通行可能な道路に続く橋
2.10.	Titian 小橋	Jembatan yang tidak dapat dilalui oleh kendaraan beroda empat. 車両の通行が不可能な橋
2.11.	Jalan kereta api rangkap 複線鉄道	Jalan kereta api dua jalur atau lebih. 2線以上の複線鉄道
2.12.	Jalan kereta api tunggal 単線鉄道	Jalan kereta api satu jalur. 1線の鉄道
2.13.	Stasiun 駅	Stasiun kereta api yang dilengkapi dengan fasilitas untuk kegiatan peng angkutan penumpang/barang. 人間／物貨の輸送施設の完備した駅
2.14.	Perhentian 停車場	Tempat perhentian kereta api yang bukan merupakan stasiun. 駅以外の列車の停車場

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter
Untuk menunjukkan jarak dalam kilometer dengan angkanya. 杆杭No. とともに距離をKmで表示する	橙 Oranye	
Untuk menunjukkan letak jembatan. Jembatan yang panjangnya lebih dari 100 m digambarkan menurut skala. 100m以上のものは実距離で表示	黒 Hitam	
	黒 Hitam	
Untuk menunjukkan semua jalan kereta api yang terdiri dari dua jalur atau lebih. 複線以上の鉄道を表示する	黒 Hitam	
Untuk menunjukkan semua jalur kereta api yang mempunyai satu jalur. Jalan kereta api yang dapat dilalui oleh kereta listrik ditambah dengan tulisan "listrik" sejajar dengan jalan kereta api. 単線鉄道全てを表示。電車の場合は平行して"電鉄" " Listrik " を記入する	黒 Hitam listrik	
Untuk menunjukkan letak semua stasiun kereta api. 駅の位置を表示する	橙 Oranye	
Untuk menunjukkan letak semua perhentian kereta api. 停車場の位置を表示する	黒 Hitam	

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
2.15.	Jalan lori 小規模鉄道	Jalan kereta api di luar 2.10 dan 2.11 2.10 / 2.11に規定する以外の鉄道
2.16.	Jalan layang, talang 交差、側溝	Jalan atau saluran yang melintas di atas jalan lainnya. 道路上、下を交差する鉄道
2.17.	Terowongan トンネル	Bagian permukaan bumi yang ditembus untuk keperluan transportasi. トンネルの表面表示
2.18.	Lapangan terbang 空港	Lapangan terbang yang mempunyai fasilitas lengkap untuk penerbangan dalam dan luar negeri. 国内・国際の航空施設の完備したもの
2.19.	Lapangan terbang perintis ローカル空港	Lapangan terbang yang fasilitasnya tidak lengkap. 空港施設の不備なもの
3. RELIEF DAN TITIK KONTROL　等高線・地形／基準点		
3.1.	Garis kontur 主曲線	Garis yang menghubungkan tempat-tempat yang ketinggiannya sama. 標高の同じ所を表示する連続曲線

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter.
Untuk menunjukkan semua jalan lori. 全ての簡易鉄道を表示	黒 Hitam	
Untuk menunjukkan lintasan jalan atau saluran di atas jalan lainnya. Jalan yang di bawahnya digambar terputus.		
Untuk menunjukkan terowongan-terowongan jalan kereta api, jalan raya dan saluran air. Terowongan yang panjangnya lebih dari 100 m digambar menurut skala. 100m以上のものを表示	黒 Hitam	
Untuk menunjukkan semua lapangan terbang internasional dan domestik. Lapangan terbang internasional diberi tulisan "Internasional" dan nama lapangan terbangnya. Lapangan terbang domestik hanya diberi tulisan nama lapangan terbangnya. 国際空港は "Internasional " の文字とともにその空港名を、 国内空港は空港名のみを記入する	黒 Hitam Lapangan terbang Internasional Halim Perdanakusuma	
Untuk menunjukkan semua lapangan terbang yang tidak lengkap fasilitasnya ditambah tulisan nama lapangan terbangnya. 不備な施設の空港をその名前とともに表示する	Lapangan terbang Panasan	
Untuk menunjukkan garis kontur yang mempunyai kelipatan 25 meter. 25m毎の等高線を表示する	橙 Oranye	

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
3.2.	Garis kontur indeks 計曲線	Garis kontur yang digambar lebih tebal untuk mempermudah membaca ketinggian.
3.3.	Garis kontur bantuan 間曲線	Garis kontur yang ditambahkan untuk memperoleh gambaran relief yang *lebih baik.*
3.4.	Cekungan 凹地	Sebagian permukaan tanah yang menurun, antara lain disebabkan karena pernah terjadi depresi pada tempat tersebut. 地表面がへこんだ所
3.5.	*Bukit* 丘（突出地）	*Bukit*
3.6.	Titik tinggi 標高	Suatu titik di permukaan tanah yang ketinggiannya telah diketahui di atas permukaan air laut rata-rata. 平均海面からの標高既知点
3.7.	Tebing 崖	Suatu lereng yang sangat terjal, biasanya terjadi karena proses alamiah. 自然現象による急峻な所
3.8.	Batu 頁岩	Batuan keras dari kerak bumi yang menonjol.

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter
Untuk menunjukkan garis kontur yang mempunyai kelipatan sepuluh dari garis kontur 25 meter.	橙 Oranye 	
Untuk menunjukkan garis kontur yang mempunyai kelipatan 12,5 m (setengah selang garis kontur).	橙 Oranye 	
Untuk menunjukkan cekungan dengan menggambarkan semua garis kontur termasuk garis kontur bantuan.	橙 Oranye 	
Untuk menunjukkan suatu permukaan tanah yang lebih tinggi dan daerah sekitarnya yang belum mencapai ketinggian 25 meter. 25m以上のものを表示	橙 Oranye 	
Untuk menunjukkan titik-titik tinggi yang ditentukan di puncak-puncak gunung, persimpangan jalan dan di tempat-tempat yang dianggap perlu ditambah dengan angka ketinggian yang sesuai. 山頂、道路交差部等必要に応じて	黒 Hitam	
Untuk menunjukkan adanya lereng yang tidak mungkin digambarkan dengan garis kontur. 等高線表現出来ない急峻な所	橙 Oranye	
Untuk menunjukkan adanya deposit batuan yang cukup luas. Jika mungkin jenis batuannya ditunjukkan dengan tulisan. 図面に表現出来るにたる大きさのもの	橙 Oranye 	

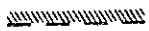
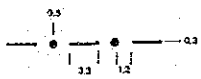
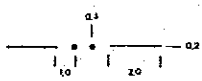
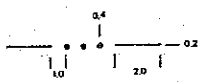
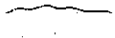
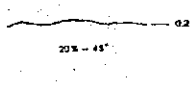
No.. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
3.9.	Timbunan 盛土	Gundukan tanah yang dibuat untuk sarana jalan, saluran dan sebagainya. 道路、側溝等にともなう盛土
3.10.	Galian 堀	
3.11.	Pasir/Kerakal 砂地、礫地	Daerah yang tertutup pasir/kerakal dan tidak terdapat tumbuh-tumbuhan. 耕作物のない砂地
3.12.	Bukit pasir 砂丘	Bukit yang terbentuk dari pasir yang umumnya berbentuk sabit dan menghadap arah angin. 砂で作られた丘、風向面に対して記入
3.13.	Sumber gas alam 天然ガス資源	Sumber gas yang belum diusahakan dan muncul di permukaan bumi *secara alamiah*. 未開発のガス資源で、地上に噴出している所
3.14.	Sumber air panas 温泉源	Tempat air panas keluar dari dalam tanah. 温泉の湧出している所
3.15.	Titik-titik Triangulasi: 三角点 – Primer – Sekunder – Tersier – Kuarter	Titik di atas tanah yang posisi geografinya ditentukan secara survey geodetis. 実測によって測定された基準点 – Titik triangulasi tingkat I 1st order – Titik triangulasi tingkat II 2nd order – Titik triangulasi tingkat III 3rd order – Titik triangulasi tingkat IV 4th order

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan millimeter
Untuk menunjukkan timbunan yang tingginya lebih dari 2 meter. 高さ2m以上のものを表示 – Diperkeras 舗装. – Tanah. 土	黒 Hitam 橙 Oranye	
Untuk menunjukkan galian yang dalamnya lebih dari 2 meter. 2m以下の深さのものを表示 – Diperkeras – Tanah.	黒 Hitam 橙 Oranye	
Untuk menunjukkan daerah pasir/kerakal yang cukup luas. 大きなものを表示	橙 Oranye	
Untuk menunjukkan bukit-bukit pasir pada padang pasir, tanpa menggambarkan garis kontur. コンターなしで表示	橙 Oranye	
	黒 Hitam	
	黒 Hitam	
Untuk menunjukkan triangulasi primer disertai huruf P, nomor dan angka ketinggian. Untuk menunjukkan triangulasi sekunder disertai huruf S, nomor dan angka ketinggian. Untuk menunjukkan triangulasi tersier disertai huruf T, nomor dan angka ketinggian. Untuk menunjukkan triangulasi kuarter disertai huruf Q, nomor dan angka ketinggian.	黒 Hitam $\Delta \frac{P.140}{78}$ $\Delta \frac{S.142}{79}$ $\Delta \frac{T.143}{80}$ $\Delta \frac{Q.144}{89}$	

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
3.16.	Titik astronomi 天測点	Titik di atas tanah yang posisi geografinya ditentukan secara pengamatan astronomi. 天測により観測された基準点
3.17.	*Titik sipatdatar* 水準点	*Titik di atas tanah yang tingginya di atas permukaan laut rata-rata diten-* tukan secara sipatdatar. 水準測量により決定された標高点
3.18.	Titik Doppler 衛星観測点 – D.O. – D.	Titik di atas tanah yang posisinya terhadap pusat massa bumi ditentukan dengan metoda pengamatan satelit Doppler. Titik Doppler untuk kontrol geodesi 測地基準点 Titik Doppler untuk kontrol pemetaan. 測図基準点
3.19	Titik-titik Kadaster : 地籍点 – Primer – Sekunder – Tersier – Kuarter	Titik di atas tanah yang dibuat dan digunakan oleh Direktorat Pendaftaran Tanah (Kadaster). 地籍測量に使用される地上の点
4. TUMBUH-TUMBUHAN 植生		
4.1.	Sawah 灌漑水田	Tanaman padi dengan sistim irigasi. 灌漑による水田
4.2.	Sawah tadah hujan 天水田（陸とう）	Tanaman padi dengan sistim tadah hujan. 降雨に依存する水田
4.3.	Perkebunan プランテーション	Tanah yang diusahakan dengan tanaman perkebunan. 人工の組織的なプランテーション

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter
Untuk menunjukkan titik astronomi disertai huruf A, nomor kadang-kadang dengan angka ketinggian. 天測点を表示する。A とともに番号を記入 場合により標高値も記入する	黒 Hitam 	
Untuk menunjukkan titik sipat datar disertai huruf T.T.G. dan nomor (T.T.G. = Titik Tinggi Geodesi) 水準点を表示。T.T.G と番号を入れる	黒 Hitam 	
Untuk menunjukkan titik Doppler disertai huruf D.O. dan nomor. Titik Doppler disertai huruf D dan nomor. ドップラー観測点を表示。D.O.又はD とその番号	黒 Hitam 	
Untuk menunjukkan lokasi -- relatip titik KP (Primer), KS (Sekunder), KT (Tersier) dan KQ (Kuarter) 標高地点の位置を表示する。KP, KS, KT, 及 KQ	黒 Hitam 	
	青 Biru 	Am 406, reduksi 50%, screen D 60 -- 50% (30° -- 60°) 50 % 縮小スクリーン
	青 Biru 	Am 902, reduksi 50%, screen D 60 -- 50% (30° -- 60°) 50 % 縮小スクリーン
Untuk menunjukkan daerah perkebunan. Jenis tanaman ditunjukkan dengan tulisan disertai dengan batas yang jelas. プランテーションの地域を表示。明取境界があって 耕作されている土地。	緑 Biru 	30% -- 45°

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
4.4.	Hutan 森林	Tanah yang tertutup tanaman hutan dengan tinggi tanaman lebih dari 10 meter. 樹高10m以上が繁茂する森林
4.5.	Belukar 灌木	Tanah yang tertutup tanaman hutan dengan tinggi tanaman kurang dari 10 meter. 樹高10m以内のもの
4.6.	Tegal/ladang 荒地、畑地	Tanah kosong atau yang ditanami tetapi tidak tetap/tidak teratur. 裸地又は不規則な植生地
5. BATAS ADMINISTRASI 行政界		
5.1	Batas Negara 国境界	Batas negara.
5.2.	Batas Propinsi 州境界	Batas propinsi
5.3.	Batas Kabupaten/Kotamadya 郡境界	Batas kabupaten/kotamadya.
5.4.	Batas Kota Administrasi/Kecamatan 市、行政区界	Batas kota administrasi/kecamatan
6. PERAIRAN		
6.1.	Garis pantai 海岸線	Garis yang memperlihatkan pantai pada air pasang rata-rata. 平均潮位を示す海岸線

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て縮尺 Semua ukuran dalam satuan milimeter
Untuk menunjukkan hutan homogen digunakan tulisan jenis hutan 森林地帯を表示	緑 Hijau 	Reduksi 50% – 45% Negatip 447 50～45% 縮小
	緑 Hijau 	Reduksi 50% – 45% 447
Untuk menunjukkan tegal/ladang, padang rumput dan alang-alang dengan tulisan. 裸地、草地、荒地の表示		
Jika dua batas administrasi berimpitan, maka batas administrasi yang tingkatannya lebih rendah tidak perlu digambar. 行政界が隣接して重なる場合、低位の境界は記入しない	黒 Hitam 	
	黒 Hitam 	
	黒 Hitam 	
	黒 Hitam 	
Untuk menunjukkan semua garis pantai. すべての汀線を表示	青 Biru 	

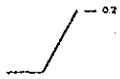
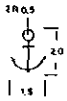
No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
6.2.	Batu karang 隆起珊瑚礁	Batu yang selalu tampak di atas permukaan air laut. 常に海上に現われている石
6.3.	Terumbu 珊瑚礁	Batu karang yang tampak pada waktu air surut. 干潮のときだけ海面上に現われる珊瑚
6.4.	Beting karang 珊瑚岩	Batu karang dekat pantai. 海岸の周辺に見られる珊瑚
6.5.	Danau 湖沼	Danau
6.6.	Sungai 河川	Sungai yang mengalir sepanjang tahun. 年間を通じて流水のある河川
6.7.	Sungai musiman かれ川	Sungai yang mengalir pada musim tertentu. 降雨のときだけ水流がある川
6.8.	Air terjun 滝	Perubahan kecepatan aliran yang tiba-tiba, karena adanya perbedaan tinggi dasar aliran, sehingga air jatuh. 流水器に比高差があって、流れの速度が急に変化する場所
6.9.	Jeram 急流	Perubahan kecepatan aliran yang tiba-tiba tetapi belum mencapai taraf air terjun. 流れが急に変化するが、滝には至らないもの

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全てmm Semua ukuran dalam satuan milimeter
	黒 Hitam	
	黒 Hitam	
Untuk menggambarkan beting karang sejauh masih dimungkinkan menurut skala-peta. 地図に表現出来る限り、表示される	黒 Hitam	
	青 Biru	
Untuk menggambarkan sungai. Sungai dengan lebar lebih dari 25 m digambar menurut skala. Sungai dengan lebar kurang dari 25 m digambar dengan garis tunggal. 巾25m以上は実巾、25m未満は1条線	青 Biru	
	青 Biru	
Untuk menggambarkan air terjun yang tinggi jatuhnya melebihi 10 m. 比高差の10m以上のものを滝として表示する	青 Biru	
Untuk menggambarkan jeram hanya pada sungai yang mempunyai lebar lebih dari 25 meter. 巾25m以上の2条河川の場合のみ表示する	青 Biru	

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
6.10	Rawa 沼地	Genangan air sepanjang tahun dan biasanya ditumbuhi tumbuhan rawa. 通年水があり、通常水草がある
6.11.	Empang/tambak 養魚池	Tempat untuk peternakan ikan. 魚を養育している池
6.12.	Penggaraman 塩田	Area tempat pembuatan garam dari air laut. 海水を利用する塩田
6.13.	Arah aliran 流水方向	Tanda yang menunjukkan arah aliran. 流れの方向を指示するもの
6.14.	Sumber air 水源（湧水）	Tempat air keluar dari tanah secara alami. 地下より自然に湧水する場所
6.15.	Terusan; Saluran air 水路	Saluran air buatan. 人工的に作られた水路
6.16.	Bendung; Bendungan ダム、堰	Konstruksi yang dibuat untuk membendung aliran air. 貯水目的につくられたダム
6.17.	Dermaga 岸壁	Konstruksi yang dibuat untuk kapal bersandar. 船が停泊するための構造物

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL 図式	SPESIFIKASI 仕様
		寸法は全て㎜ Semua ukuran dalam satuan milimeter
Untuk menunjukkan daerah yang berrawa; nama dan tumbuhan yang dominan dapat digunakan tulisan. 沼地を表現する。名前と植生を記入する	青 Biru	
Untuk menunjukkan lokasi empang/tambak dan disajikan sejauh masih dimungkinkan menurut skala peta. Empang/tambak yang mempunyai ukuran kurang dari 100 m × 100 m di medan digambar dengan simbol. 図面に表現出来るものを表示 100m× 100m未満のものは図式記号として表示する	青 Biru	
Untuk menunjukkan lokasi daerah penggaraman dan disajikan sejauh masih dimungkinkan menurut skala peta. Daerah penggaraman yang mempunyai ukuran kurang dari 100 m × 100 m di medan digambar dengan simbol. 図面に表現出来るものを表示 100m× 100m未満のものは図式記号表示	青 Biru	
Digambar pada sungai di tempat yang dipandang perlu. 必要に応じて表示する	青 Biru	
	青 Biru	
Untuk menunjukkan letak terusan/saluran sampai dengan saluran sekunder. Terusan yang mempunyai nama ditunjukkan dengan tulisan yang sejajar dengan saluran. 名前のあるものは２条線で表示する	青 Biru	
Untuk menunjukkan letak bendung/bendungan. Penggambaran simbol sesuai dengan lebar sungai/saluran dan hanya untuk sungai yang digambarkan dengan dua garis. Gerigi simbol menuju arah aliran. 記号は広い川又は２条線の河川のみに適用する 記号は流水の方向に対して記入（方向がある）	黒 Hitam	
Untuk menunjukkan letak dermaga. Panjang dan bentuk digambar sesuai skala. 図面に表現出来る長さ規模のものを表示する	黒 Hitam	

No. SIMBOL	NAMA SIMBOL 図式名	KETERANGAN 説明
6.18.	Penahan ombak/gelombang 防波堤	Konstruksi yang dibuat untuk menahan gelombang/ombak. 波を防ぐための構造物
6.19.	Tempat berlabuh 停船場	Tempat kapal berlabuh.
6.20.	Menara suar 燈台	Bangunan yang dilengkapi dengan lampu untuk kepentingan navigasi. 船の航行に重要役割をはたす燈台施設

PENGGUNAAN SIMBOL 図式適用規程	SIMBOL	SPESIFIKASI 仕様
		寸法は全てmm *Semua ukuran dalam satuan milimeter*
Untuk menunjukkan letak penahan ombak/gelombang. Panjang dan bentuk digambar sesuai skala. 図面に表現出来る長さのものを表示	黒 Hitam 	
Untuk menunjukkan lokasi tempat kapal berlabuh. Letak simbol di tengah tempat berlabuh. 停船場を表示する。記号はその中央部におくものとする	黒 Hitam 	
Untuk menunjukkan letak menara. *Letak simbol di tengah tempat berlabuh.*	黒 Hitam 	

No.	UNSUR 適用	JENIS HURUF 字体
7. NAMA-NAMA		
7.1.	Nama unsur perairan: samudera, laut, sungai, teluk, selat, danau dan sejenisnya. 海洋、海、湾、海峡、河川、湖名等々の水系の名前	Italic dengan serif warna biru. Ukuran huruf dari nama unsur perairan sesuai dengan luas unsur tersebut. ライトブルーのイタリック、字大は適宜
7.2.	Nama unsur rupabumi: pegunungan, gunung, bukit, tanjung, pulau, kepulauan, lembah dan sejenisnya. 地形名、山脈、山、丘、岬、島、群島、谷等々に適用	Italic dengan serif warna hitam. Ukuran huruf dari nama unsur rupabumi *sesuai dengan luas unsur tersebut.* 黒のイタリック、字大は適宜
7.3.	Nama-nama tempat pemukiman: 居住地名 Ibukota Negara 首都名 Ibukota Propinsi 州都名 Ibukota Kabupaten/Kotamadya. 郡都名 Ibukota Kecamatan 区域都名 Kota/Kampung lainnya. その他の市・町名	 Huruf besar tegak dengan serif warna hitam. 黒の直立文字、大文字のみ Huruf besar tegak dengan serif warna hitam. 〃 Huruf besar tegak dengan serif warna hitam. 〃 Huruf besar dan kecil tegak dengan serif warna hitam. 黒直立大文字と小文字 Huruf besar dan kecil tegak dengan serif warna hitam. 〃
7.4.	Nama daerah administrasi yaitu: 行政地域名 – Kabupaten 郡名 – Kecamatan 地区名	Huruf besar tegak San serif medium warna hitam. 黒直立等線体大文字
7.5.	Nama unsur di luar tersebut 7.1, 7.2, 7.3, dan 7.4. その他の注記名	Huruf besar dan kecil tegak San serif medium warna hitam. 黒の直立等線大文字と小文字

UKURAN TINGGI HURUF 字高	CONTOH サンプル
	寸法は全てmm Semua ukuran dalam satuan milimeter
Ukuran maximum 5,0 mm dan minimum 1,5 mm tergantung dari tingkat unsur tersebut. 字高最大 5.0mm、最小 1.5mm適宜	青 Biru *SAMUDERA* *LAUT* *DANAU* *SUNGAI* *Danau* *Sungai*
Ukuran maximum 5,0 mm dan minimum 1,5 mm tergantung dari tingkat unsur tersebut. 字高最大 5.0mm、最小 1.5mm適宜	黒 Hitam *PEGUNUNGAN* *GUNUNG* *Gunung* *Bukit* *Lain-Lain*
Ukuran 5,0 mm 字高サイズ 5.0mm Ukuran 4,0 mm Ukuran 3,5 mm Ukuran 3,0 mm Ukuran 1,5 mm – 2,0 mm 字高サイズ 1.5mm~ 2.0mm	黒 Hitam JAKARTA BANDUNG BOGOR Jombang Kemijen Babadan
Ukuran 2,5 mm Ukuran 2,0 mm	黒 Hitam ACEH BESAR BAITURRAHMAN
Ukuran maximum 2,0 mm dan minimum 1,5 mm tergantung dari tingkat unsur tersebut. 字高最大 2.0mm最小 1.5mm	黒 Hitam Lapangan terbang Blang Bintang

SPESIFIKASI
PETA RUPABUMI INDONESIA
SKALA 1 : 50.000

EDISI : 1

LAMPIRAN C

SINGKATAN
(方言注記略語リスト)

BADAN KOORDINASI SURVEY DAN PEMETAAN NASIONAL

1983

SINGKATAN DAN ISTILAH SETEMPAT
方言及びその略語

KAMPUNG KAMPUNG 部落

Bab	:	Babakan (Jawa - Barat)
Bc	:	Bancah (Sumatera - Barat)
Be	:	Bone (Sulawesi)
Bg	:	Bagan (Sumatera - Selatan)
Bh	:	Bah
Dn	:	Dusun (Sumatera - Selatan)
Gp	:	Gampong (Aceh)
Ha	:	Huta (Tapanuli)
Han	:	Handulan (Bengkulu)
J	:	Jambo (Aceh)
Jb	:	Jambur (Aceh)
K	:	Kota (Jambi)
Kj	:	Keujruen (Aceh)
Kla	:	Kelekak (Bangka)
Kt	:	Kuta (Aceh)
Ku	:	Kubu (Bali)
L	:	Lam (Aceh)
Lad	:	Ladang (Aceh)
Le	:	Lewo (Lomblem, Adonara)
Lg	:	Long (Aceh, Kalimantan)
Lm	:	Lumban (Sumatera - Barat)
Lr	:	Laras
M	:	Meunasah (Aceh)
Mk	:	Mukim (Aceh)
Mst	:	Meuseugit (Aceh)
Nat	:	Natai (Kalimantan)
Ne	:	Negeri, Negara
Nga	:	Nanga (Flores, Kalimantan)
Ni	:	Nuai (Timor)
Pang	:	Pangkalan (Riau)
Pdk	:	Pondok
Pem	:	Pemaren (Aceh)
Pn	:	Peukan (Aceh)
Pri	:	Peraing (Sumba, Sumbawa)
R	:	Rantau (Jambi)
Rng	:	Riang (Flores)
Seun	:	Seuneubo (Aceh)
Sg	:	Simpang
T	:	Talang (Riau)
Tal	:	Talang (Sumatera - Selatan)
Tm	:	Tumbang (Kalimantan)
Tor	:	Toro (Flores)
Trt	:	Terutong (Aceh)

GUNUNG – GUNUNG 山

Ad	:	*Adian (Tapanuli)*
Bl	:	*Bulu (Sulawesi)*
Bn	:	*Buntu (Sulawesi)*
Br	:	*Bur (Gayo)*
Bt	:	*Bukit*
Bu	:	*Buku (Halmahera)*
C	:	*Cot (Aceh)*
D	:	*Doro (Sumbawa, Flores)*
De	:	*Dede (Timor)*
Dg	:	*Deleng (Tapanuli, Aceh)*
Dk	:	*Dolok (Tapanuli, Aceh)*
Dl	:	*Delong (Tapanuli, Aceh)*
Dt	:	*Doto (Sumbawa)*
F	:	*Fude (Buru)*
Fa	:	*Fatu (Timor, Flores)*
Fh	:	*Foho (Timor, Flores)*
G	:	*Gunung*
Gg	:	*Gunong (Aceh)*
Gk	:	*Guguk (Jambi)*
Gl	:	*Gle (Aceh)*
Gm	:	*Gumuk (Jawa - Tengah)*
Go	:	*Golo (Flores)*
Gr	:	*Geger (Jawa - Tengah)*
Gs	:	*Gosong (Sulawesi)*
H	:	*Hol (Timor)*
Hh	:	*Huhun (Wetar)*
Hl	:	*Hili (Nias)*
Ht	:	*Hatu (Seram)*
I	:	*Ili (Flores)*
Ir	:	*Igir (Jawa)*
Ke	:	*Keli (Flores)*
Kg	:	*Kong (Kalimantan)*
Kk	:	*Kaku (Buru)*
L	:	*Lolo (Timor)*
M	:	*Munduk (Bali, Lombok)*
Mb	:	*Mbotu (Flores)*
Mg	:	*Moncong (Sulawesi)*
N	:	*Ngga (Irian)*
Nf	:	*Nuaf (Timor)*
Ng	:	*Ngalau*
Ot	:	*Olet (Sumbawa)*
Pc	:	*Poco (Flores)*
Pd	:	*Padang (Sumbawa)*

Peg	:	*Pegunungan*
Pg	:	*Pematang (Sumatera)*
Pk	:	*Puntuk (Jawa - Timur)*
Pld	:	*Palindi (Sumba)*
Pr	:	*Pasir (Jawa - Barat)*
Sm	:	*Sampar (Sumba)*
Ta	:	*Tangkit*
Tb	:	*Tubu (Timor, Flores)*
Td	:	*Tandulu (Timor, Sumba)*
Ti	:	*Tinetan, Tintane (Seram)*
Tn	:	*Tintin (Kalimantan)*
Tr	:	*Tor (Tapanuli)*
Tt	:	*Tuiu (Sulawesi)*
U	:	*Uker (Seram)*
Uk	:	*Uruk (Sumatera - Barat)*
Ul	:	*Ulate (Seram)*
Ur	:	*Unter (Sumbawa)*
W	:	*Wagir (Jawa - Tengah)*
Wl	:	*Wolo (Flores)*

KALI – KALI 河川

A	:	*Air*
Ak	:	*Air, Aek (Sumatera - Barat)*
		Ake (Halmahera)
Al	:	*Alue, Alur (Aceh)*
Ar	:	*Arul, Arosan (Aceh)*
B	:	*Bah (Sumatera - Selatan)*
Bg	:	*Balang (Sulawesi)*
Bng	:	*Brang (Sumbawa)*
Bi	:	*Binanga (Sulawesi)*
Bt	:	*Batang (Sumatera)*
Cr	:	*Curah (Jawa - Timur)*
Ge	:	*Ger (Irian)*
H	:	*Handil (Kalimantan - Selatan)*
I	:	*Ie (Aceh)*
Id	:	*Idano (Nias)*
J	:	*Jol (Irian)*
Je	:	*Jene (Sulawesi)*
Jr	:	*Jar (Pantar)*
K	:	*Kali*
Ka	:	*Kuala (Aceh, Halmahera)*
Kd	:	*Kedang (Kalimantan)*
Ko	:	*Kokar (Sumba)*
Kok	:	*Kokok (Lombok)*
Kr	:	*Krueng (Aceh)*
L	:	*La, Le (Aceh)*
La	:	*Lawe (Aceh)*
Lb	:	*Lubuk (Kalimantan)*
Leb	:	*Lebak (Sumatera)*
Lh	:	*Lahar (Sulawesi)*
Li	:	*Liu (Kalimantan)*
Lk	:	*Loku (Sumba)*
Ln	:	*Luan (Aceh)*
Lo	:	*Lao (Tapanilu)*
Lu	:	*Luku (Sumba)*
Lw	:	*Lowo (Flores)*
Mo	:	*Mota (Timor)*
Mt	:	*Meta (Wetar)*
N	:	*Noe (Timor)*
Na	:	*Nanga (Sumbawa, Flores)*
Ngi	:	*Nguai (Halamahera)*
Nl	:	*Noil (Timor, Flores)*
Ol	:	*Oil (Flores)*
Pkg	:	*Pangkung (Bali)*
Png	:	*Pangung (Kalimantan)*
Ps	:	*Paisu (Halmahera)*
Pt	:	*Parit (Kalimantan)*
S	:	*Sungue (Aceh)*
S	:	*Sei (Kalimantan - Selatan)*
Se	:	*Sunge (Sumbawa)*
Si	:	*Sungai*
Sl	:	*Selat (Kalimantan)*
So	:	*Salo (Sulawesi)*
Su	:	*Suak (Aceh)*
Sv	:	*Sava (Irian, P.Selaru)*
Ter	:	*Terusan (Sumatera - Selatan)*
Th	:	*Tatah (Kalimantan - Selatan)*
Tk	:	*Tukad (Bali)*
Tu	:	*Tulung (Palembang)*
Tul	:	*Tulung (Sumatera - Selatan)*
U	:	*U (Timor)*
W	:	*Way (Sumatera - Selatan, Sulawesi)*
Wa	:	*Wa (Buru)*
We	:	*Wae (Seram)*
Wh	:	*Weuih (Aceh)*
Wi	:	*Wai (Lampung, Sumba)*
Wn	:	*Waiyan (Seram)*
Wo	:	*Wayo (Sulawesi, Sula)*
Wr	:	*Weri (Irian, P. Selaru)*
Wy	:	*Weye (Irian, P. Selaru)*
Y	:	*Yeh (Bali)*
Yr	:	*Yer (Irian, P. Babar)*

RAWA – RAWA 沼湿地

Ba	:	*Balong*
Br	:	*Baruh (Kalimantan - Selatan)*
Db	:	*Debu (Timor)*
Kl	:	*Kolam (Timor)*

Lb	:	*Lebak*
Lr	:	*Lura (Sulawesi)*
P	:	*Paya*
R	:	*Rawah*
Rw	:	*Rawang (Palembang, Riau)*
Tlr	:	*Telar (Jawa - Barat)*

TELAGA TELAGA 湖、池

Bg	:	*Balang (Sulawesi)*
Bw	:	*Bawang (Lampung)*
D	:	*Danau*
Kb	:	*Kobak*
Kn	:	*Kenohan (Kalimantan)*
L	:	*Lebak (Sumatera - Selatan)*
Lp	:	*Lopa (Halmahera)*
Lt	:	*Laut (Aceh)*
R	:	*Ranau*
St	:	*Setu, Situ (Jawa - Barat)*
T	:	*Telaga*
Ts	:	*Tasik (Sumatera - Barat)*
Wk	:	*Waduk*

TELUK – TELUK 湾

Ao	:	*Ayiko (Halmahera)*
Jk	:	*Jiko (P. Sula)*
Lab	:	*Labuhan*
Lg	:	*Lego (Jawa)*
Lhk	:	*Lhok (Aceh)*
Lng	:	*Lempong*
Loh	:	*Loho (Flores)*
Sk	:	*Solok*
Tl	:	*Teluk*

TANJUNG – TANJUNG 岬

Ba	:	*Batu*
Bk	:	*Buku (Timor)*
Nn	:	*Nunu (Wetar)*
Nu	:	*Ngalu (Flores)*
Td	:	*Tando (Sulawesi)*
Te	:	*Tongge (Sulawesi)*
Tg	:	*Tanjung, Tanjong*
Tn	:	*Tubun (P. Tanimbar)*
Tno	:	*Tano (Sumbawa)*
Tre	:	*Ture (Nias)*
Tt	:	*Tuktuk (Sumatera - Utara)*
Tu	:	*Tutun (Irian, P. Wetar)*
Ug	:	*Ujung*
Wt	:	*Wutun (Timor, Flores)*

PULAU – PULAU 島

B	:	*Busung*
Gi	:	*Gili (Lombok, Flores)*
Gn	:	*Gosong (Kalimantan)*
Kep	:	*Kepulauan*
Mi	:	*Mios*
Nh	:	*Nuha (Sulawesi, Sumbawa)*
Ns	:	*Nusa, Nus*
P	:	*Pulau*
Tog	:	*Tokong (Riau)*
Y	:	*Yef, Yus (Irian)*

KUALA – KUALA 河口

Ka	:	Kuala
M	:	Muara

TANAMAN – TANAMAN プランテーション

Ch	:	Cengkeh
Ct	:	Coklat
Gbr	:	Gambir
Ka	:	Kapas
Km	:	Kayumanis
Ko	:	Koka
Kpo	:	Ketela Pohon
Ld	:	Lada
Pi	:	Pinang
Pl	:	Pala
Po	:	Pohon Buah-buahan
Pra	:	Pohon Randu
Ps	:	Pisang
Sa	:	Serai
Se	:	Serabut
Si	:	Sirih
Te	:	Tebu
Tem	:	Tembakau

KANTOR – KANTOR PEMERINTAHAN　役所

G	:	Gubernur
W	:	Walikota
B	:	Kabupaten
C	:	Kecamatan

LAIN – LAIN　その他

At	:	Air Terjun
Bp	:	Balai Pengobatan
Btm	:	Bangsal Tembakau
Ga	:	Gua
Kw	:	Kawah
Pal	:	Pusat Aliran Listrik
Pgk	:	Penggergajian Kayu
Pka	:	Pangkalan Kayu
Png	:	Penginapan
Rt	:	Rumah Tinggal/Hampir Runtuh

2. Record of Levelling & Control Points

St. No.	N (X) m	E (Y) m	H m	Signal H. m
D-A600(NS-01)	9756,840.81	360,177.46	202.01	202.81
D-A601(NS-02)	9749,239.83	341,727.57	29.69	30.14
D-A602(NS-03)	9764,455.77	298,276.41	11.25	11.80
D-A603(NS-04)	9791,080.56	352,485.08	163.78	164.52
D-A604(NS-05)	9795,430.56	297,632.97	43.28	43.96
D-A605(NS-06)	9815,705.25	363,001.41	78.84	79.29
D-A606(NS-07)	9796,686.64	322,248.67	185.88	186.18
D-A607(NS-07')	9827,865.07	337,001.10	729.99	730.49
D-A608(NS-08)	9826,985.74	295,286.80	47.12	47.63
D-A609(NS-09)	9871,578.97	367,925.12	165.86	166.53
D-A610(NS-10)	9856,054.32	292,563.13	80.52	81.11
U-BM-II-1			17.8987	
U-BM-II-2			31.2380	
U-BM-II-3			32.1661	
U-BM-II-4			52.8004	
U-BM-II-5			56.8289	
U-BM-II-6			70.4847	
U-BM-II-7			52.4891	
U-BM-II-8			35.6752	
U-BM-II-9			55.7009	
U-BM-II-10			48.5152	
U-BM-II-11			55.9325	
U-BM-II-12			50.9326	
U-BM-II-13			73.8814	
U-BM-II-14			118.3771	
U-BM-II-15			92.4409	
U-BM-II-16			123.0285	
U-BM-II-17			266.4797	
U-BM-III-1			12.945	
U-BM-III-2			24.671	
U-BM-III-3			18.450	
U-BM-III-4			26.709	
U-BM-III-5			19.989	

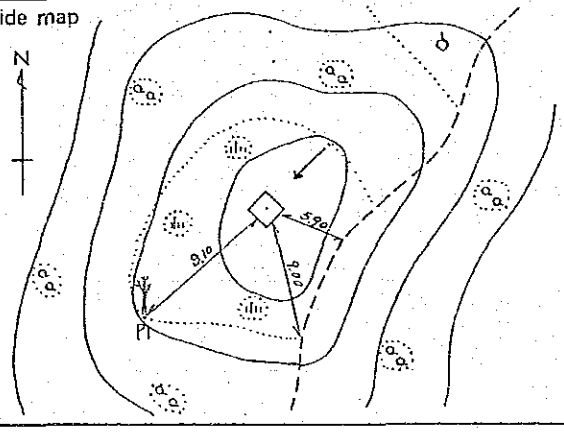
St. No.	N (X)	E (Y)	H	Signal H.
U-BM-III-6			29.472	
U-BM-III-7			53.955	
U-BM-III-8			67.102	
U-BM-III-9			56.494	
U-BM-III-10			76.222	
U-BM-III-11			151.977	
U-BM-III-12			105.825	
U-BM-III-13			74.093	
PUTL BM. 18			15.465	
PUTL BM. 134			8.847	

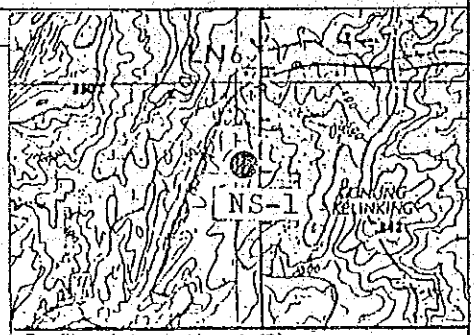
DESCRIPTION

Sheet No.		Station No.	D-A600(NS-01)	
Location	Gunung Hairun			
Coordinate (Controlpoint) or (Bench mark)		N (X)	E (Y)	H
	Essential point	9756,840.81	360,177.46	202.01
	Auxiliary point	9756,836.50	360,170.60	200.61
Measurement	Type	NNSS Obsevation		
Measurement	Date	Aug.29,1983		
	Organization	J.I.C.A.		
Remark	KAB. Hulu Sungai Utara			
	KEC. Juwai			

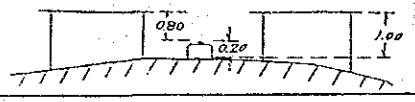
Location

Guide map



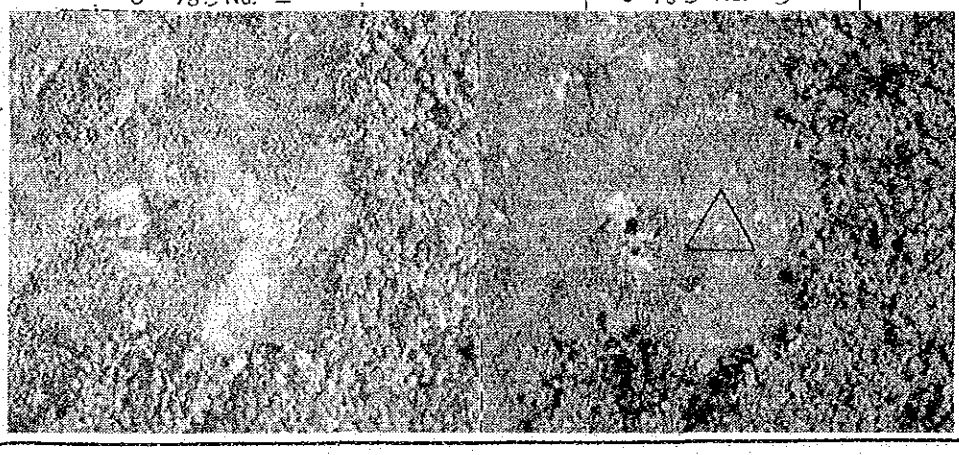


Profile (ANT H = 0.48)



Aerial photograph

C- 16B No. 4 N ⇧ E C-16B No. 5

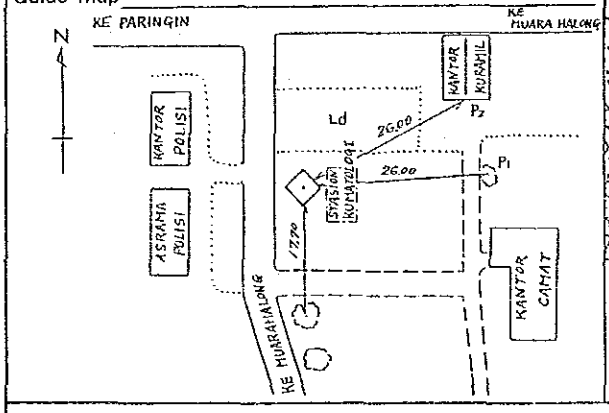


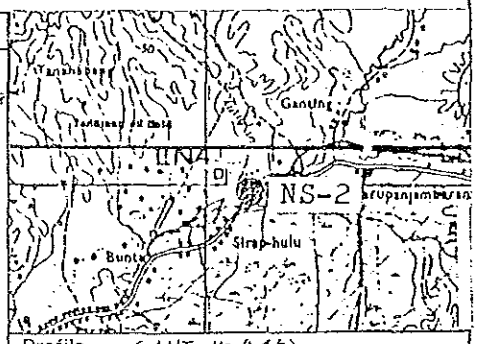
DESCRIPTION

Sheet No.		Station No.	D-A601(NS-02)	
Location	Hurung Uyam			
Coordinate (Controlpoint) or (Bench mark)		N (X)	E (Y)	H
	Essential point	9749.239.83	341.727.57	29.69
	Auxiliary point	. .	. .	30.14
		. .	. .	.
Measurement	Type	NNSS Observation		
Measurement	Date	Sep.13,1983		
	Organization	J.I.C.A.		
Remark	KAB. H.S.U.			
	KEC. Juwai			

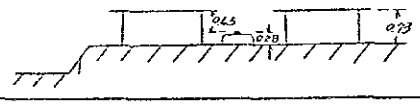
Location

Guide map

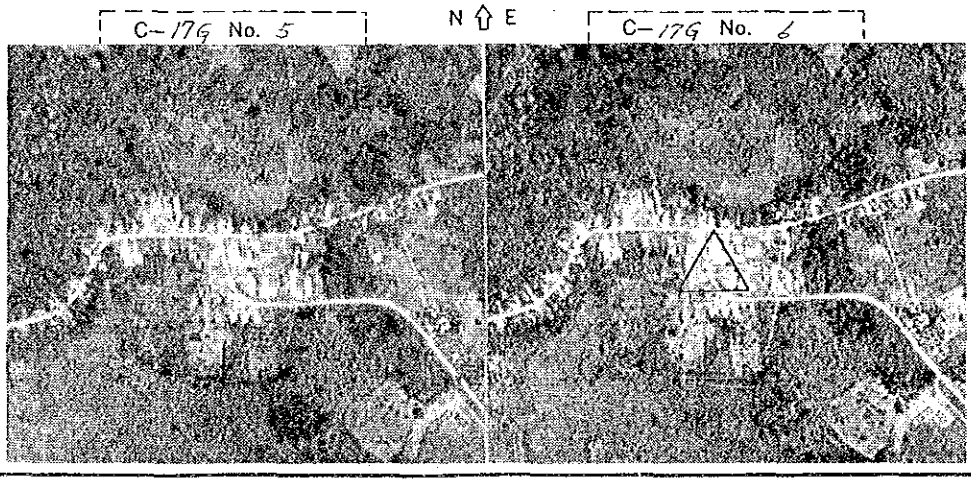




Profile (ANT H= 0.45)



Aerial photograph

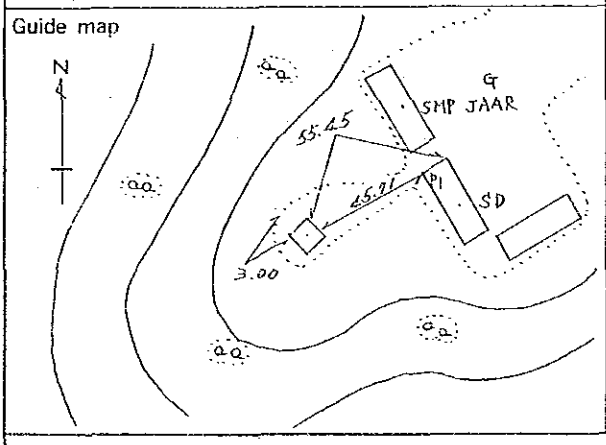


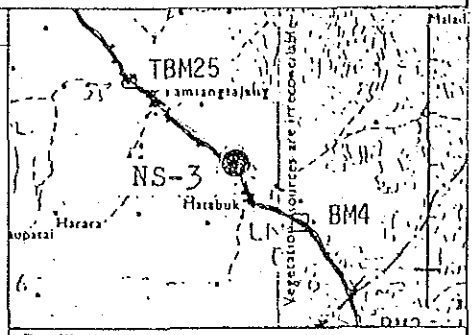
DESCRIPTION

Sheet No.		Station No.	D-A602(NS-03)
Location	Matabu		
Coordinate (Controlpoint) or (Bench mark)		N (X)	E (Y)	H
	Essential point	9764,455. 77	298,276. 41	11 . 25
	Auxiliary point	, .	, .	11 . 80
		, .	, .	.
Measurement	Type	NNSS Observation		
Measurement	Date	Aug. 14, 1983		
	Organization	J.I.C.A.		
Remark	KAB. Barito Timur KEC. Tamiang Layang			

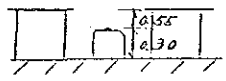
Location

Guide map



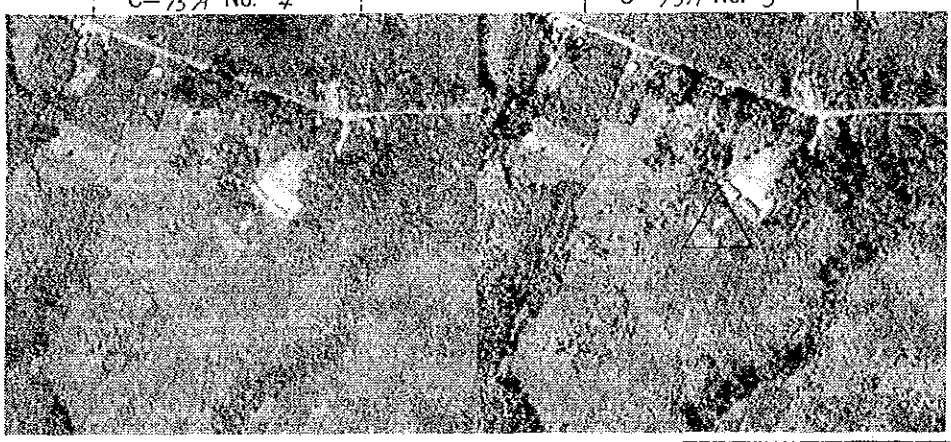


Profile (ANT H= 0.98)



Aerial photograph

C-15A No. 4 N ⇧ E C-15A No. 5

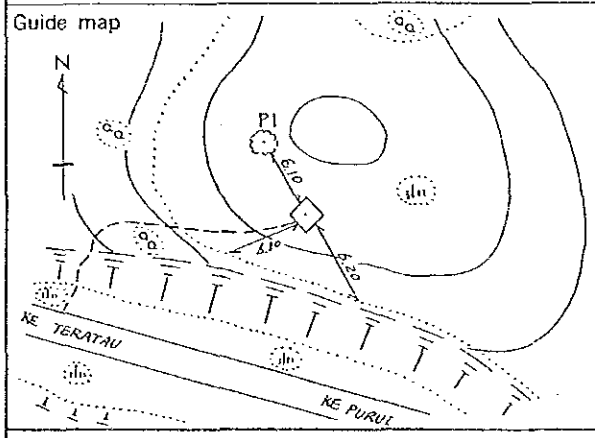


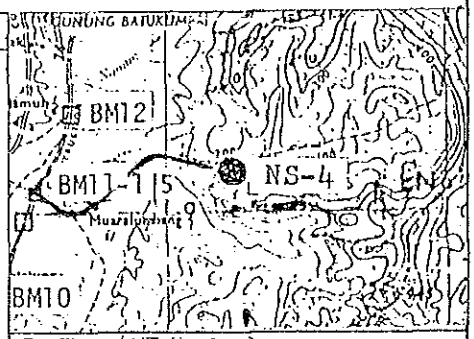
DESCRIPTION

Sheet No.		Station No.	D-A603(NS-04)	
Location	Purui			
Coordinate (Controlpoint) or (Bench mark)		N (X)	E (Y)	H
	Essential point	9791,080.56	352,485.08	163.78
	Auxiliary point	, ,	, ,	164.52
		, ,	, ,	,
Measurement	Type	NNSS Observation		
Measurement	Date	Sep. 7, 1983		
	Organization	J.I.C.A.		
Remark	KAB. Tabalong			
	KEC. Muara Uya			

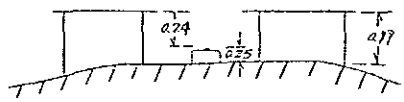
Location

Guide map





Profile (ANT H= 0.50)



Aerial photograph

C-11C No. 6

N ⇧ E

C-11C No. 7