

SURVEY REPORT
FOR
ORTHOPHOTO MAP MAKING FOR THE
SANREGO IRRIGATION PROJECT
SOUTH SULAWESI, REPUBLIC OF INDONESIA

DECEMBER 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

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国際協力事業団

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ORTHOPHOTO MAP MAKING FOR THE SANREGO IRRIGATION
PROJECT, SOUTH SULAWESI, REPUBLIC OF INDONESIA

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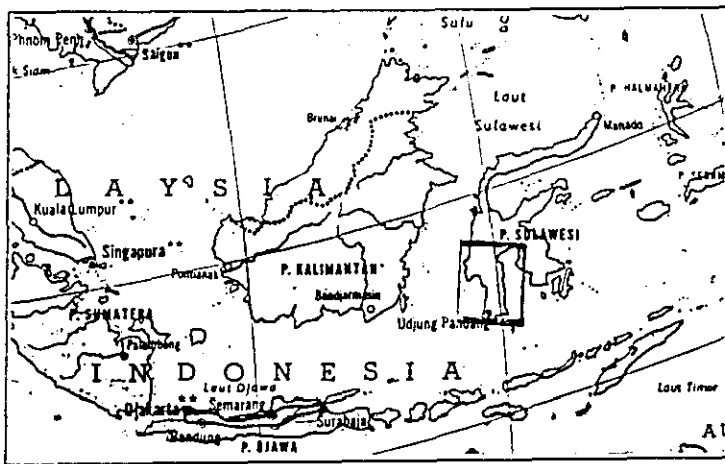
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I. INTRODUCTION

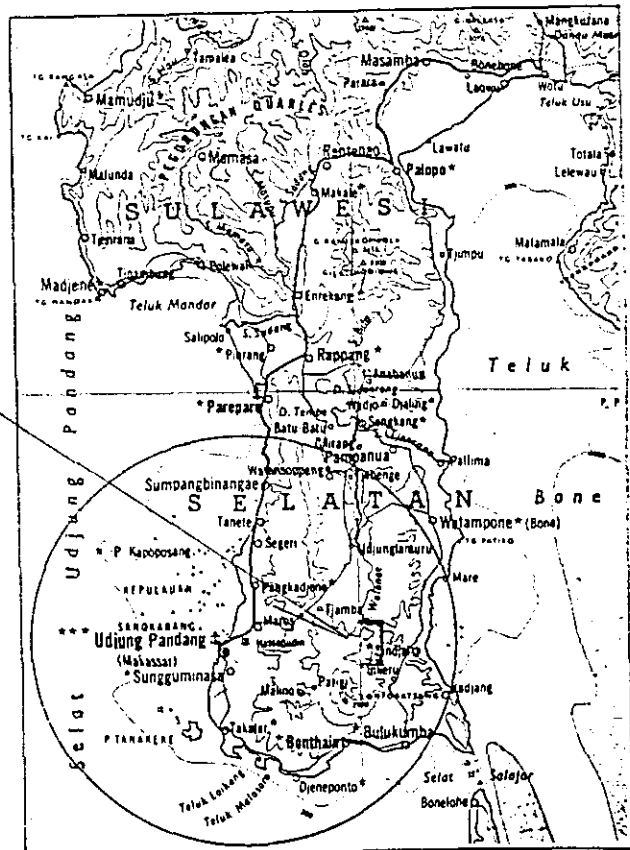
This report concerns "Orthophoto Map Making for the Sanrego Irrigation Project, South Sulawesi, Republic of Indonesia" which was executed by the Japan International Cooperation Agency.

The Project area is located in the south-eastern part of South Sulawesi province and the size of the project area is approximately 170 km².

Location Map



Project Area



II. COMPOSITION OF FIELD SURVEY TEAM AND THE WORK SCHEDULE

2.1. Composition of Field Survey Team

The undermentioned 6 Japanese topographic surveyors were dispatched to Indonesia for 51 days to execute field survey in the project area.

Mr. Masao Sato	Leader of Field Survey Team
Mr. Kazuo Kawahara	Member of Field Survey Team
Mr. Tooru Watanabe	"
Mr. Koojiroo Tsuda	"
Mr. Yoshio Iizuka	"
Mr. Nobuyuki Kanno	"

2.2. Work Schedule

Field survey work and indoor work schedule were as follows.

a. Field Survey Work Schedule

15th June	Arrived in Jakarta
16th June - 24th June	Meeting with P.U. in Jakarta and Bandung
25th June	Moved to Ujung Pandang
26th June	Meeting with P.U. in Ujung Pandang and preparation for field survey
28th June	Moved to Sinjai
29th June	Courtesy call on local government officials and reconnaissance survey
30th June	Field work
7th July - 8th July	Indoor work at Sinjai
9th July - 20th July	Field work; moved to Ujung Pandang
21th July - 25th July	Indoor work in Ujung Pandang
26th July	Moved to Sinjai
27th July - 28th July	Field work; moved to Ujung Pandang
29th July	Indoor work in Ujung Pandang
30th July	Meeting with P.U. in Ujung Pandang

31th July	Moved to Jakarta
1st August	Preparation for leaving for Japan
2nd August - 3rd August	Meeting with P.U. in Jakarta
4th August	Departed for Japan

WORKING SCHEDULE

1982

June , July , August , September , October , November , December ,

Field Survey

Aerial Photography

Preparation for Indoor Work

Aerial Triangulation

Orthophoto Map Production

Outline Map Production

Checking

III. ITEMS DISCUSSED BY ORTHOPHOTO MAP MAKING TEAM AND THE MINISTRY OF PUBLIC WORKS IN JAKARTA AND IN BANDUNG

The most important items which were agreed upon by the Orthophoto Map Making Team and the Ministry of Public Works in Jakarta and in Bandung were as follows.

- a. The Government of Indonesia suggested that the coordinates of existing control points which were established by the Government of Indonesia be checked.
- b. Method for checking the coordinates of existing control points would be done by aerial triangulation.
- c. Minimum traversing would be done for aerial triangulation and would be based on an existing triangulation point (one point).
- d. Government of Indonesia requested that spot leveling (one point per one ha) be executed for contour drawing. But, considering the work schedule (Feasibility Study Team and Orthophoto Map Making Team) and budget, Government of Indonesia and Orthophoto Map Making Team agreed as follows.
 - i. Orthophoto Map Making Team would make orthophoto map without contour lines for the Government of Indonesia.
 - ii. Orthophoto Map Making Team would make outline map for Feasibility Study Team. Contour lines would be drawn by plotting instrument.
 - iii. Spot leveling would be done by the Government of Indonesia in the future.

Other items that were discussed are shown in attached " Minutes of Meeting ".

IV. FIELD SURVEY IN INDONESIA

4.1. Survey party and equipment used

Field survey was executed by undermentioned topographic surveyors and equipment.

a. Traversing

Topographic surveyor :

Mr. Kazuo Kawahara	Orthophoto Map Making Team
Mr. Yoshio Iizuka	"
Mr. Abd Rasyid	Counterpart from P.U. Ujung Pandang
Mr. Abd Rauf	"

Survey equipment :

Electro-optical distance meter		
Hewlett Packard 3808 A		1 set
Theodolite	Wild T-2	1 set
Vehicle :	Jeep	2 units

b. Leveling

Topographic surveyor :

Mr. Masao Sato	Orthophoto Map Making Team
Mr. Koojiroo Tsuda	"
Mr. Nobuyuki Kanno	"
Mr. Haeri Nawi	Counterpart from P.U. Ujung Pandang
Mr. Arifin	"
Mr. Abu Rauf	"

Survey equipment :

Level	B-2	3 sets
Vehicle :	Jeep	2 units

c. Aerial photography and field identification

Topographic surveyor :

Mr. Tooru Watanabe	Orthophoto Map Making Team	
Mr. Wahab	Counterpart from P.U. Ujung Pandang	
Vehicle :	Jeep	1 unit

4.2. Aerial Photography

Aerial photography was executed by P.T. Exsa International Co., Ltd. (an Indonesian Company).

Data on aerial photography is as follows.

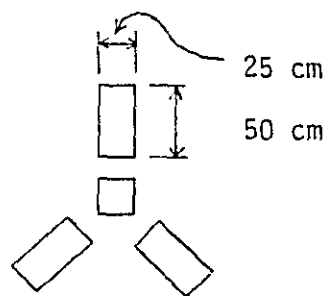
- | | |
|------------------------------------|-----------------------------------|
| a. date of aerial photography : | August 1982 |
| b. Scale of aerial photos : | 1:10,000 |
| c. Aerial camera : | MRB |
| d. Focal length of aerial camera : | 152.22 mm |
| e. Number of courses : | 14 courses |
| f. Number of aerial photos : | 461 pieces |
| g. Overlap : | approximately 85 % |
| h. Sidelap : | approximately 30 % |
| i. Area covered by aerial photos : | approximately 170 km ² |

Note : Refer to the attached " Photo Index Map ".

4.3. Establishment of Aerial Photo Signals

Before starting the execution of aerial photography, aerial photo signals were established on the existing control points, newly established control points and existing triangulation point. Data on establishment of aerial photo signals is as follows.

- | | |
|---|-----------|
| a. Number of aerial photo signals established on existing control points : | 11 points |
| b. Number of aerial photo signals established on newly established control points : | 10 points |
| c. Number of aerial photo signals established on existing triangulation point : | 1 point |
| d. Style and size of aerial photo signals are shown below. | |



The location of aerial photo signal points are shown in attached "Control Point Distribution Map".

4.4. Traversing

Traversing was executed based on the existing triangulation point (T.T. 137) located in the center of the project area.

Data on traversing is as follows.

a. Original point for traversing :

T.T. 137	N (Y)	176,920 ^m .38
	E (x)	9,457,568.22
	B	-4° 54' 05" 571
	L	120 05 12. 793

b. Total length of traversing : approximately 70 km

c. Number of newly established control points : 10 points

d. Ratio of closing error : approximately less than 1:50,000

e. True north was decided by solar observation.

Traversing network is shown in attached "Traversing Network Map".

4.5. Leveling

Leveling was executed based on the existing bench marks (S.D.S. points) which were established in 1977 for 1:25,000 scale topographic map making.

Temporary bench marks were established along the leveling route for feasibility study and for future use.

Data on leveling is as follows.

a. Given points for leveling

S.D.S. 57	109 ^m .303
S.D.S. 58	118.755
S.D.S. 60	147.745
S.D.S. 61	134.102
S.D.S. 62	151.917

b. Total length of leveling route : approximately 200 km

c. Number of established temporary bench marks : 130 points

d. Accuracy of leveling : closure error : less than $10 \text{ mm} / \sqrt{S}$

Temporary elevation of established temporary bench marks was calculated on the project site and final elevation was calculated in Japan by adjusting the computation program of leveling network. Leveling network is shown in attached "Leveling Network Map".

4.6. Field Identification

Necessary data for orthophoto map and outline map was collected from the villagers with the cooperation of Indonesian counterpart.

4.7. Check Leveling

According to the request from the advisory group of this project, the Orthophoto Map Making Team decided to dispatch two topographic surveyors to Indonesia to check the elevation of bench marks around the dam site.

The result of this check is shown in attached "Survey Report for Orthophoto Map Making for the Sanrego Irrigation Project, South Sulawesi, Republic of Indonesia in November 1982".

V. INDOOR WORK IN JAPAN

5.1. Work Schedule

Work schedule is shown in attached "Work Schedule".

5.2. Aerial Triangulation

Aerial triangulation was executed by independent model adjustment method.

Data on aerial triangulation is as follows.

- | | |
|--------------------------|--------------------------|
| a. Number of models : | approximately 175 models |
| b. Instruments used : | |
| Pricking device : | Wild PUG-4 |
| Comparator | Wild STK-1 |
| Computer | UNIVAC Vanguard 1100 |
| c. Computation program : | PAT-M |

To check the coordinates of existing control points, X and Y coordinates of existing control points were calculated by aerial triangulation.

5.3. Orthophoto Map Making (without contour lines)

Based on the field survey data and aerial triangulation data, orthophoto map making was executed as follows:

Flow Chart of Orthophoto Map Making

Positive film with
aerial triangulation data

Marginal information sheet

Orthophoto scanning

Scale adjustment

Mosaic (Positive print)

Orthophoto negative film

Orthophoto paper print

Data on orthophoto map making is as follows.

- | | |
|---|---------------------------|
| a. Scale of orthophoto map : | 1:50,000 |
| b. Number of sheets : | 43 sheets |
| c. Area of orthophoto map making | 170 km ² |
| d. Sheet size | 50 cm x 50 cm |
| e. Grid and Grid tick : | U.T.M. (Zoon No. 51) |
| f. Annotation on orthophoto map : | |
| Names of villages, rivers and districts | |
| Bench marks and etc. | |
| g. Equipment used : | Gestalt Orthophoto Mapper |

Sheet size, style and marginal information were same as Indonesian standard.

5.4. Outline Map Making

Based on the field survey data and aerial triangulation data, outline map was made for feasibility study team.

Data on outline map is as follows.

- | | |
|---------------------------------|----------------------|
| a. Scale of outline map : | 1:50,000 |
| b. Area of outline map making : | 170 km ² |
| c. Sheet size : | 50 cm x 50 cm |
| d. Contour interval : | |
| Intermediate contour line | 1 m |
| Half interval contour line | 0.5 m |
| e. Grid and Grid tick : | U.T.M. (Zoon No. 51) |
| f. Annotation on outline map : | |
| Contour lines | |
| Rivers and roads | |
| Boundaries | |
| Bench marks and etc | |
| g. Number of sheets : | 43 sheets |
| h. Equipment used : | Wild A-7 |

5.5. Final Products

Final products of this project were as follows.

- | | |
|---|---------|
| a. Positive film : | one set |
| b. Contact prints : | one set |
| c. Original negative film of orthophoto map : | one set |
| d. Prints of orthophoto maps : | two set |
| e. Aerial triangulation data : | one set |
| f. Ground survey data | one set |
| g. Survey report | 30 sets |

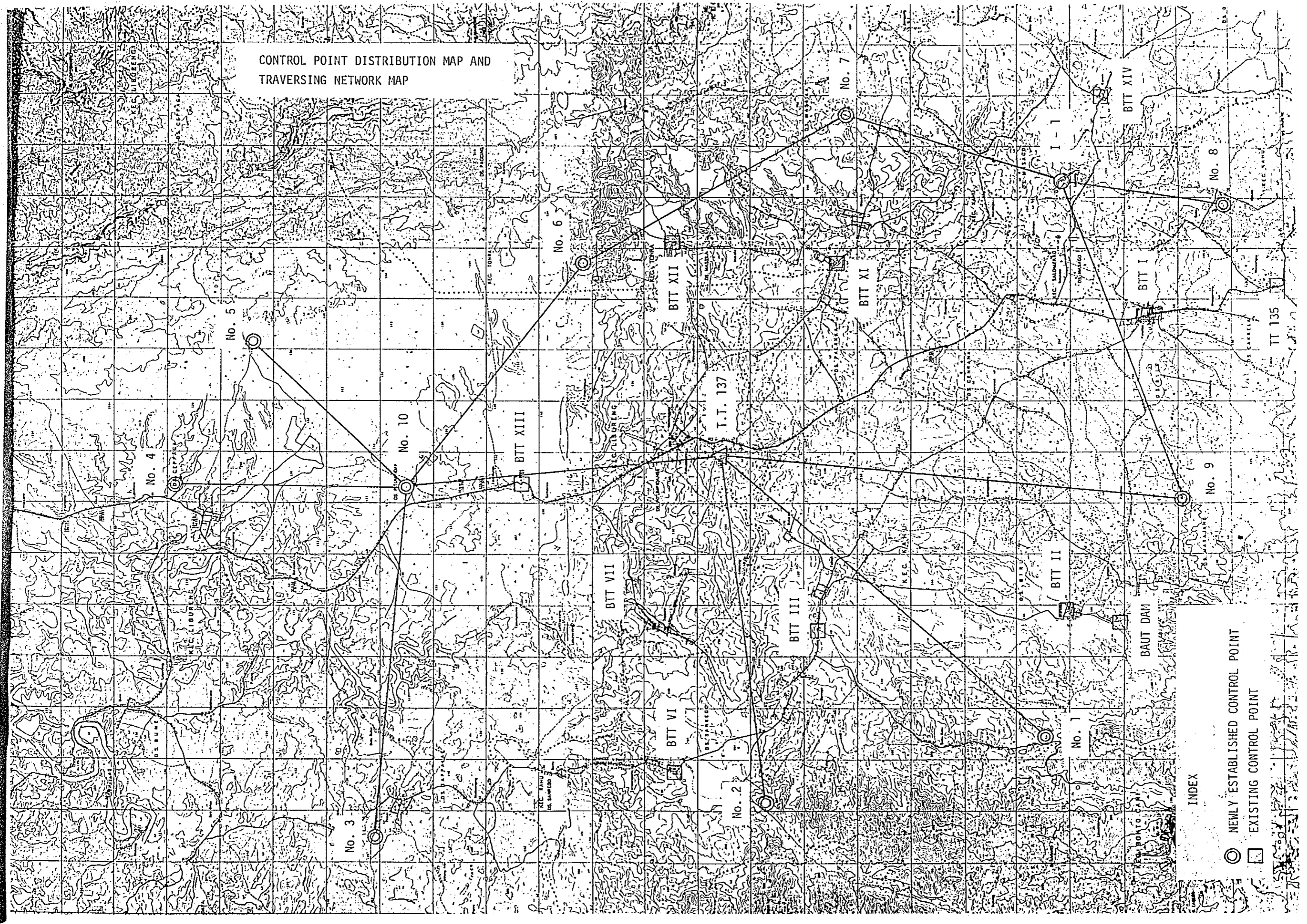
APPENDIX

- 6.1. Photo Index Map
- 6.2. Control Point Distribution Map and Traversing Network Map
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6.1. Photo Index Map

6.2. Control Point Distribution Map and
Traversing Network Map

CONTROL POINT DISTRIBUTION MAP AND
TRAVERSING NETWORK MAP



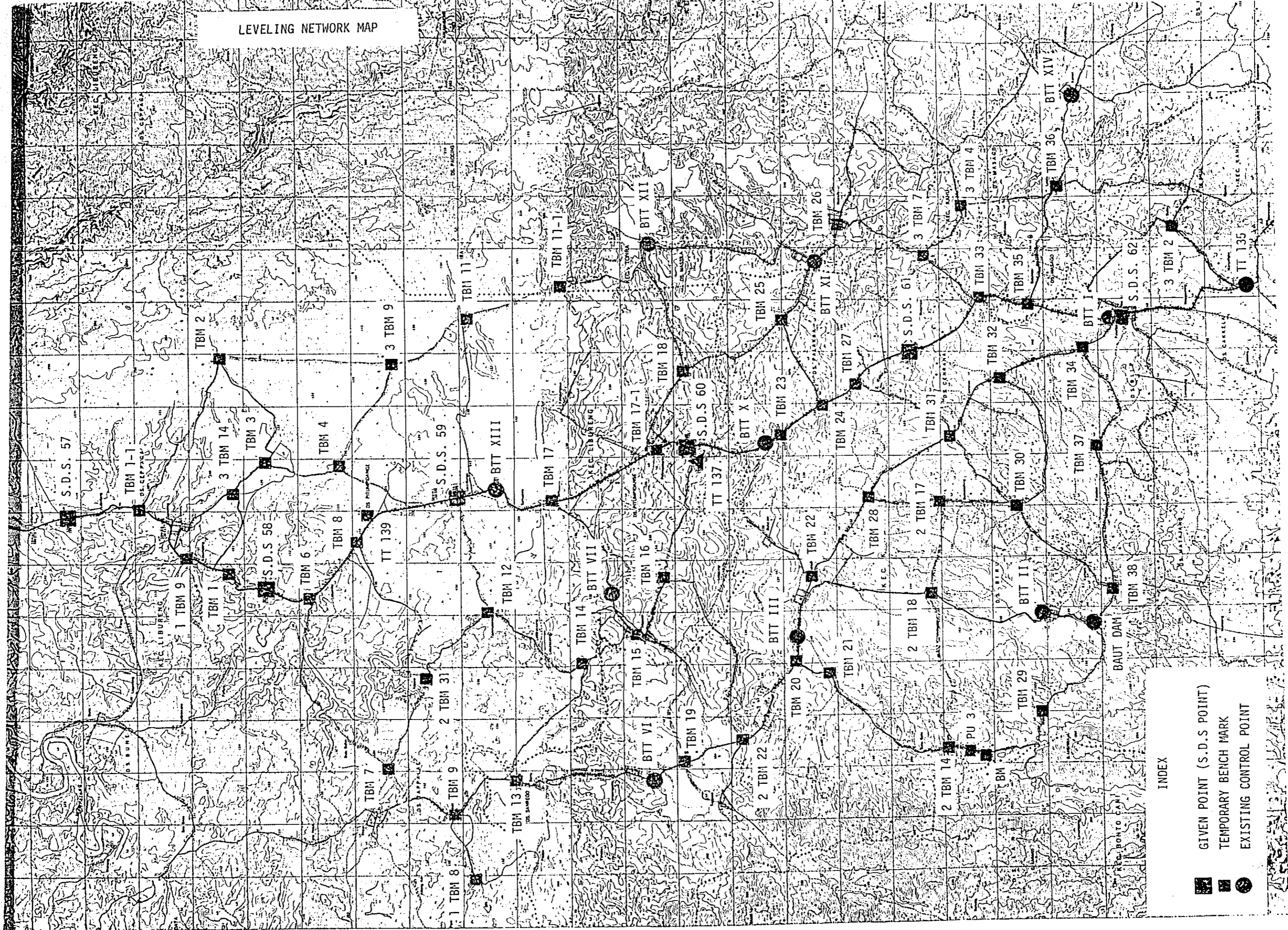
INDEX

- NEWLY ESTABLISHED CONTROL POINT
- ◐ EXISTING CONTROL POINT




TT 135

6.3. Leveling Network Map

LEVELING NETWORK MAP

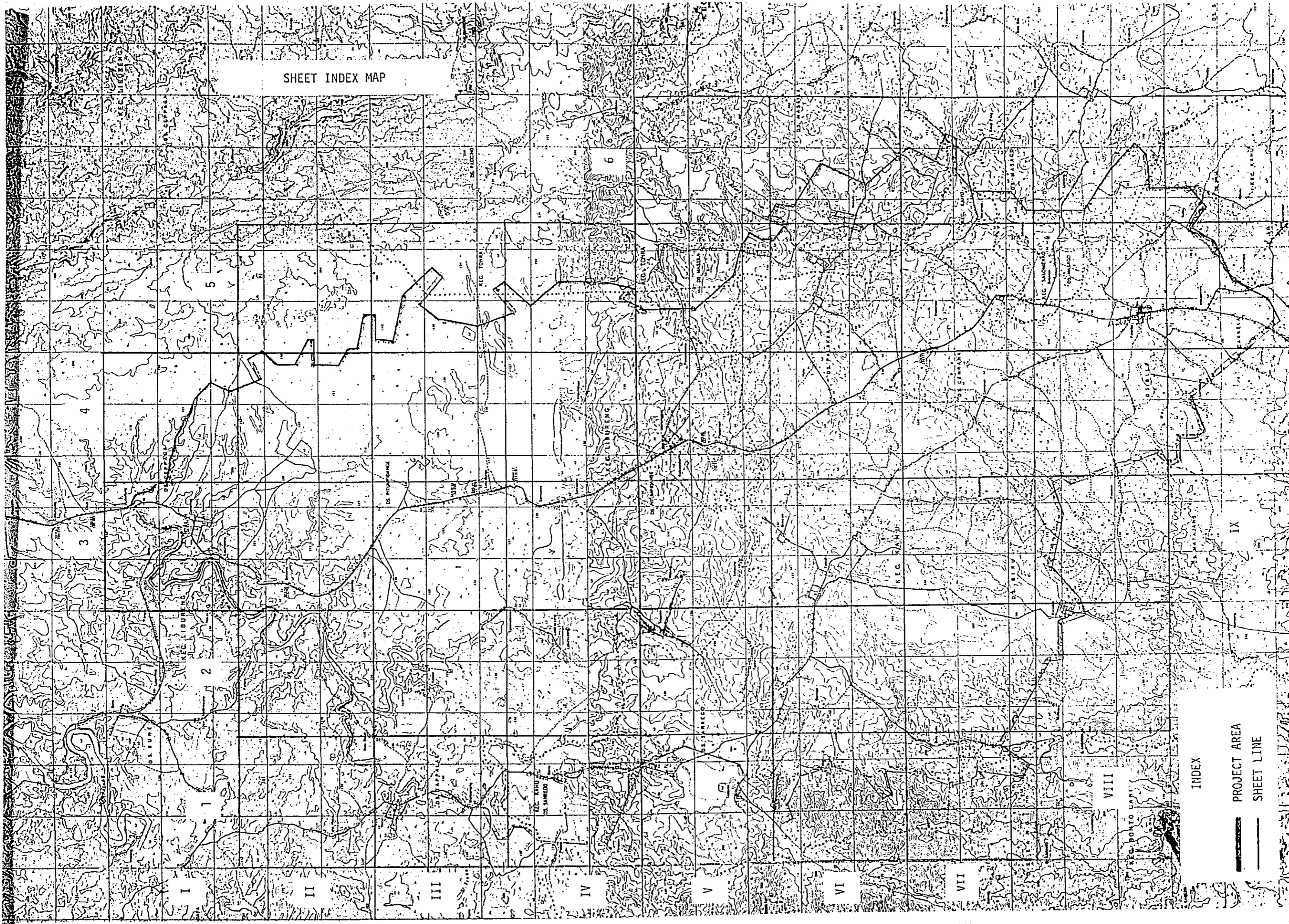


INDEX

-  GIVEN POINT (S.D.S. POINT)
-  TEMPORARY BENCH MARK
-  EXISTING CONTROL POINT

6.4. Sheet Index Map

SHEET INDEX MAP



INDEX

PROJECT AREA

SHEET LINE

6.5. Results of Checking of Existing Control Points
by Aerial Triangulation

RESULTS TABLE (Photogrammetric Points)

Zone No. 51

Point Name	N.(Y)	E.(X)	Latitude (B)	Longitude (L)	Height (H)
Baut Damu (300100)	k m 9449.634.81'	k m 179.600.45'	.	.	m
BTT. I (301500)	9450.034.744'	173.700.552'	.	.	
" II (300200)	9451.090.96'	173.888.29'	.	.	
" III (300300)	9455.747.488'	173.349.000'	.	.	
" VI (300500)	9458.393.532'	170.782.116'	.	.	
" VII (300400)	9459.288.195'	174.570.598'	.	.	
" X (301000)	9456.400.63'	177.170.96'	.	.	
" XI (301100)	9455.363.114'	180.703.648'	.	.	
" XII (301200)	9458.458.281'	181.139.945'	.	.	
" XIII (301300)	9461.399.659'	176.447.247'	.	.	
TT. 134, (313500)	9447.181.112'	180.175.742'	.	.	

6.6. Control Points Results

RESULTS TABLE

Point Name	E.(X) k m	N.(Y) k m	Latitude (B)	Longitude (L)	Height (H) m
T.T 137	176.920.38	9457.568.22	- 4 54 05.571	120 05 22.793	152.56
110.1	171.362.46	9451.542.06	- 4 57 20.792	120 02 11.675	213.42
2	170.220.46	9456.846.49	- 4 54 28.089	120 01 35.405	195.39
3	169.585.72	9463.999.32	- 4 50 35.339	120 01 15.846	159.77
4	176.290.20	9467.876.86	- 4 48 30.173	120 04 53.797	110.82
5	179.200.01	9466.482.25	- 4 49 15.925	120 06 27.964	153.85
6	180.754.85	9460.166.36	- 4 52 41.593	120 07 17.515	200.06
7	183.463.59	9455.121.66	- 4 55 26.103	120 08 51.154	189.99
8	181.932.29	9448.241.60	- 4 59 09.669	120 07 54.035	153.52
9	176.028.95	9448.931.43	- 4 58 46.386	120 04 42.651	221.83
10	176.389.59	9463.406.85	- 4 50 55.574	120 04 56.399	146.68

6.7. Temporary Bench Marks Results

Results of Existing Bench Mark

SDS. 57	m 109.303
SDS. 58	118.755
SDS. 59	121.489
SDS. 60	147.745
SDS. 61	134.102
SDS. 62	151.917

Result of Established Bench Mark

	m
TBM. 1	112.518
TBM. 1 - 1	104.015
TBM. 2	141.607
TBM. 3	113.494
TBM. 4	116.664
TBM. 6	125.328
TBM. 7	121.711
TBM. 8	139.724
TBM. 9	149.661
TBM. 10	147.192
TBM. 11	138.185
TBM. 11 - 1	139.852
TBM. 12	139.537
TBM. 13	136.968
TBM. 14	141.355
TBM. 15	141.287
TBM. 16	137.832
TBM. 17	136.531
TBM. 17 - 1	143.615
TBM. 18	148.852
TBM. 19	167.712
TBM. 20	147.279
TBM. 21	154.828
TBM. 22	138.962
TBM. 23	133.515
TBM. 24	138.540
TBM. 25	149.781
TBM. 26	142.104
TBM. 27	140.767
TBM. 28	145.945
TBM. 29	187.292
TBM. 30	157.310
TBM. 31	146.961
TBM. 32	148.248

Result of Established Bench Mark

TBM. 33	^m 147.977
TBM. 34	147.904
TBM. 35	145.166
TBM. 36	155.550
TBM. 37	166.457
TBM. 38	193.976

Result of Established Bench Mark

	m
1 - TBM. 1	143.534
1 - TBM. 2	139.848
1 - TBM. 3	118.054
1 - TBM. 6	116.102
1 - TBM. 7	141.127
1 - TBM. 8	96.201
1 - TBM. 8 - 1	119.840
1 - TBM. 9	98.094
1 - TBM. 10	131.328
1 - TBM. 11	132.660
1 - TBM. 12	105.451
1 - TBM. 13	104.114
1 - TBM. 14	123.710
1 - TBM. 14 - 1	163.276
1 - TBM. 15	149.047
1 - TBM. 15 - 1	138.242
1 - TBM. 17	167.058
1 - TBM. 18	177.494
1 - TBM. 70	121.267
1 - TBM. 71	120.019
1 - TBM. 72	154.467
2 - TBM. 1	162.929
2 - TBM. 2	159.426
2 - TBM. 3	143.099
2 - TBM. 4	179.458
2 - TBM. 5	189.140
2 - TBM. 6	165.636
2 - TBM. 7	158.132
2 - TBM. 8	154.369
2 - TBM. 9	155.452
2 - TBM. 10	142.969
2 - TBM. 11	143.992
2 - TBM. 12	133.994
2 - TBM. 13	167.169

Result of Established Bench Mark

2 - TBM. 14	^m 168.031
2 - TBM. 15	194.560
2 - TBM. 16	180.421
2 - TBM. 17	148.633
2 - TBM. 18	148.850
2 - TBM. 19	139.022
2 - TBM. 20	134.919
2 - TBM. 21	138.881
2 - TBM. 22	155.077
2 - TBM. 23	186.081
2 - TBM. 24	161.375
2 - TBM. 25	150.286
2 - TBM. 26	153.230
2 - TBM. 27	153.710
2 - TBM. 28	147.775
2 - TBM. 29	124.000
2 - TBM. 30	121.953
2 - TBM. 31	120.682
3 - TBM. 1	156.234
3 - TBM. 2	154.629
3 - TBM. 3	155.429
3 - TBM. 3 - 1	153.166
3 - TBM. 4	150.163
3 - TBM. 4 - 1	153.399
3 - TBM. 5	155.472
3 - TBM. 6	155.279
3 - TBM. 7	151.102
3 - TBM. 8	126.676
3 - TBM. 9	131.976
3 - TBM. 12	119.747
3 - TBM. 13	147.827
3 - TBM. 14	116.583
3 - TBM. 15	134.511
3 - TBM. 16	142.620

Result of Established Bench Mark

3 - TBM. 17	^m 134.563
3 - TBM. 18	140.052
3 - TBM. 18 - 1	152.284
Baut Dam (300100)	^m 174.143
BTT. I (301500)	150.414
BTT. II (300200)	169.977
BTT. III (300300)	148.590
BTT. VI (300500)	171.874
BTT. VII (300400)	119.930
BTT. X (301000)	130.007
BTT. XI (3011000)	144.963
BTT. XII (301200)	156.806
BTT. XIII (301300)	116.815
TT. 134 (313500)	158.276
BM	181.844
PU-3	170-028

6.8. Minutes of Meeting and Plan of Operation

MINUTES OF MEETING
THE PLAN OF OPERATION
FOR
FEASIBILITY STUDY AND ORTHOPHOTO MAPPING
ON
THE SANREGO IRRIGATION PROJECT

1. DATE AND TIME : 17 June 1982; 10:30 - 12:30
18 June 1982; 12:30 - 14:00

2. PLACE : Meeting Room, DGWRD, Jakarta

3. ATTENDANTS : Attachment - 1

4. CONFIRMATION

4-1 Plan of Operation for Feasibility Study

The Leader of the Feasibility Study Team, Mr. T. SAKAMOTO, briefed the Draft Plan of Operation for the Feasibility Study (refer to Attachment-2).

Through the discussion, the followings were confirmed.

- (1) The Government of Indonesia strongly requested the Team to carry out the Feasibility Study with understanding of the existing design conducted by the Directorate of Irrigation as mentioned in the Minutes of Meeting of the Scope of Works for the Feasibility Study on the Sanrego Irrigation Project agreed between JICA and the Government of Indonesia dated on March 16, 1982.
- (2) Necessary data mentioned in the Draft Plan of Operation (Page-22) will be provided by the Government of Indonesia.
- (3) The Government of Indonesia suggested that the project assessment will be studied from the view point of not only the socio-economic impacts but also the environmental impacts.

- (4) Five (5) vehicles with drivers will be provided for the Team during the study period by the Government of Indonesia.
- (5) The Government of Indonesia will provide the counterpart personnel.
- (6) The Team was requested to prepare some documents necessary for the early project implementation during the study period.

4-2 Plan of Operation for Orthophoto Map Making

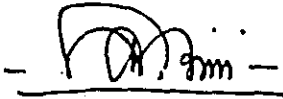
The Leader of the Survey Team for making orthophoto maps, Mr. Masao Sato, briefed the draft plan of operation for orthophoto map making (refer to Attachment-3), provided by JICA.

The following discussion was held:

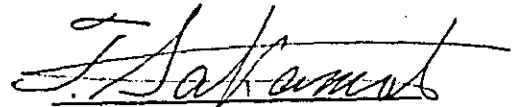
- (1) The Government of Indonesia agreed the area covered by 1:5,000 scale orthophoto maps.
- (2) The Government of Indonesia suggested to take the aerial photos on north-south direction from the viewpoint of economical conditions.
- (3) The overlap of the aerial photo will be 70%.
- (4) Density of the photo image on the positive film will be between 0.3 to 1.2.
- (5) The Government of Indonesia suggested to check the coordinates of existing control points which were established by the Government of Indonesia.
- (6) Method for checking the established control points will be done by aerial triangulation results.
- (7) Planning for leveling network is enough to keep the vertical accuracy.
- (8) Minimum traversing will be done for aerial triangulation based on existing triangulation point (one point).

- (9) For the very flat area, spot height from plotting machine will be plotted at 100 m interval..
- (10) Further technical matter for orthophoto map making will be discussed with Sub Directorate of Planning and Designing, D.O.I., Bandung.

Jakarta, 19th June, 1982



Ir. Sarbini Ronodibroto
Director
Directorate of Planning
and Programming



Mr. Tadashi Sakamoto
Leader of
Feasibility Study Team on
Sanrego Irrigation Project



Mr. Masao Sato
Leader of
Orthophoto Mapping Team on
Sanrego Irrigation Project

Attendants of Meeting

(17th June 1982)

1. The Indonesian Government

Ir. Mashudi	Dit. of Planning and Programming
Mr. Aziz Bockings	ABLN, Air
Ir. Sudiyanto	Dit. of Planning and Programming
Ir. Yantahin	P3SA Sul. Sel.
Ir. Syamsul Arida	P3SA Sul. Sel.
Drs. Syafiuddin	P3SA Sul. Sel.
Mr. E. Wahyono	Dit. of Planning and Programming
Mr. Wiharjono	Dit. of Irrigation
Mr. M. Yuasa	Colombo Plan Expert, Dit. of Irrigation

2. The Japanese Government

2.1 Advisory Committee

Mr. K. Takeuchi	Irrigation
Mr. K. Sakai	Agronomy
Mr. K. Inoue	Coordination

2.2 JICA Jakarta Office

Mr. R. Goto	Assistant Resident Representative
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2.3 Feasibility Study Team

Mr. T. Sakamoto	Team Leader
Mr. T. Kawaguchi	Irrigation and Drainage Planner
Mr. F. Nagao	Agronomist/Agro-Economist
Mr. K. Mizushima	Irrigation and Drainage Design Engineer

2.4 Orthophoto Mapping Team

Mr. M. Sato	Chief Surveyor
Mr. T. Watanabe	Surveyor
Mr. K. Kawahara	Surveyor
Mr. K. Tsuda	Surveyor
Mr. Y. Iizuka	Surveyor
Mr. N. Kanno	Surveyor

Attendants of Meeting

(18th June 1982)

1. The Indonesian Government

Ir. Mashudi	Dit. of Planning and Programming
Ir. Sudiyanto	Dit. of Planning and Programming
Mr. Wiharjono	Dit. of Irrigation
Mr. Suharto	Dit. of Planning and Programming
Mr. Beddi	Dit. of Planning and Programming
Mr. M. Yuasa	Colombo Plan Expert
Mr. T. Iwai	Colombo Plan Expert
Mr. J. Donaldson	Lavalin
Mr. R.G. Reid	Lavalin
Ir. Leo Nardy	P.T. EXSA
Mr. Ariffin	P.T. EXSA

2. The Japanese Government

2.1 Advisory Committee

Mr. K. Takeuchi	Irrigation
Mr. K. Sakai	Agronomy
Mr. K. Inoue	Coordination

2.2 Orthophoto Mapping Team

Mr. M. Sato	Team Leader
Mr. T. Watanabe	Surveyor

REPUBLIC OF INDONESIA
THE MINISTRY OF PUBLIC WORKS

PLAN OF OPERATION
FOR MAKING ORTHOPHOTO MAPS
FOR THE SANREGO IRRIGATION PROJECT
SOUTH SULAWESI, REPUBLIC OF INDONESIA

JUNE, 1982

THE JAPAN INTERNATIONAL COOPERATION AGENCY

PLAN OF OPERATION

I. INTRODUCTION.

The Government of Japan, in response to the request of the Government of Indonesia, has decided to produce orthophoto maps for the feasibility study for the Sanrego Irrigation Project in South Sulawesi, Indonesia.

The Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will carry out the study in close cooperation with the Indonesian authorities concerned.

II. OBJECTIVE OF THE STUDY.

The objective of the study is to produce 1:5,000 scale orthophoto maps for the feasibility study for the Sanrego Irrigation Project in South Sulawesi, Indonesia.

III. OUTLINE OF THE PLAN.

Orthophoto Map Production

- Scale: 1:5,000
- Area to be covered: 170 Km²
- Contour Interval:
 - Flat areas..... 1 m
 - Hilly areas..... 2 m
 - Mountainous areas..... 4 m
- Field survey will be conducted by Japanese and Indonesian surveyors.
- Indoor work (e.g. aerial triangulation, orthophoto map production, etc.) will be done in Japan.

IV. DETAILED PLAN.

1. Aerial Photography.

1:10,000 scale aerial photographs will be taken for orthophoto map production.

- Scale of aerial photos: 1:10,000
- Area to be covered: 170 Km²
- Focal length of aerial camera: 150 mm
- Number of aerial photos: approximately 150 photos
- Number of photo courses: approximately 13 courses

2. Leveling.

Leveling will be done along the main road so as to keep the accuracy of elevation on the orthophoto maps at a certain level.

- Original point of elevation will be selected from among existing bench marks and will be used as the point of elevation for survey work.
- Length of leveling route: approximately 200 Km
- Accuracy of leveling: The closure error will be less than $10 \text{ mm} / \sqrt{S}$
S = length of leveling route
- Length of leveling route will be measured on the existing 1:25,000 scale topographic maps.
- Number of work parties: 3 parties
(Each party will consist of one Japanese surveyor, one Indonesian counterpart from the Ministry of Public Works and several local laborers.)

3. Traversing.

Traversing will be conducted along the main road so as to keep the accuracy of the horizontal position on the orthophoto maps at a certain level.

- Original point of traversing will be selected from among the existing triangulation points or control points which have already been established by the Government of Indonesia and shall be used as the original point of horizontal coordination for the survey works.
- Number of new control points to be established: 5 points
- Accuracy of traversing: closure error will be less than 1:10,000
- Number of work parties: one party
(The work party will consist of two Japanese surveyors and two Indonesian counterparts from the Ministry of Public Works and several local laborers.)

4. Pricking.

Pricking of existing triangulation points and existing control points which have already been established by the Government of Indonesia will be done for aerial triangulation.

- Number of points to be pricked: 13 points

5. Field Identification.

Field identification will be done to collect the names of villages, the names of rivers and the locations of major facilities (mosques, official government buildings, etc.) in the project area.

- Area to be identified: the area along the main road
- Number of work parties: one party
(The work party will consist of one Japanese surveyor, one Indonesian counterpart from the Ministry of Public Works and several local laborers.)

6. Establishment of Temporary Bench Marks.

Temporary bench marks will be established along the leveling route at about two kilometer intervals for future use.

7. Aerial Triangulation.

Aerial triangulation will be done using the PAT-M Program.

- Number of models: approximately 150 models

8. Orthophoto Map Production.

1:5,000 scale orthophoto maps will be produced using the G.P.M. (Gestalt Photo Mapper) System.

- Contour Interval:
 - Flat areas..... 1 m
 - Hilly Areas..... 2 m
 - Mountainous Areas..... 4 m
- The contour line will be drawn on a first-class plotting machine (A-7 or equivalent).

- The style of the marginal information will be discussed with the Ministry of Public Works.
- Sheet size: 60 cm x 80 cm
- Grid and Grid Tick will be U.T.M.

V. TRANSFER OF KNOWLEDGE.

Indonesian surveyors of the Ministry of Public Works will be given on-the-job training.

VI. WORK SCHEDULE.

Please refer to the attached Figure.

VII. FINAL PRODUCTS TO BE DELIVERED.

1. Positive film.....one set
2. Contact prints.....one set
3. Original negative film of orthophoto maps.....one set
4. Prints of orthophoto maps.....two sets
5. Aerial triangulation results.....one set
6. Ground survey results.....one set
7. Survey report..... 30 sets

VIII. UNDERTAKINGS OF THE GOVERNMENT OF INDONESIA.

For this survey, it is requested that the Government of Indonesia agree to the following:

1. to provide the teams with the following data and information:
 - a) list of geographical names and administrative borders in the project area;
 - b) list of coordinates of existing control points which have been established by the Government of Indonesia;
2. to allow all data and materials involved in the project to be taken out of The Republic of Indonesia and brought to Japan by the survey team, subject to security regulations;

3. to relieve the members of the survey team from income tax and from import/export duties necessary for the survey activities;
4. to arrange working permits for the survey team;
5. to assign counterparts (surveyors) to the survey team during the survey period;
6. to provide the survey team with suitable office space and office equipment necessary for the project;
7. to make arrangements for accommodations for the survey team;
8. to make arrangements for drivers, local laborers, jeeps and fuel for the survey team;
9. to provide medical service for the survey team when necessary;
10. to insure the security of the survey team and its equipment to the greatest extent possible.

THE SURVEY TEAM
FOR
MAKING ORTHOPHOTO MAPS
FOR
THE SANREGO IRRIGATION PROJECT
(SOUTH SULAWESI PROVINCE)

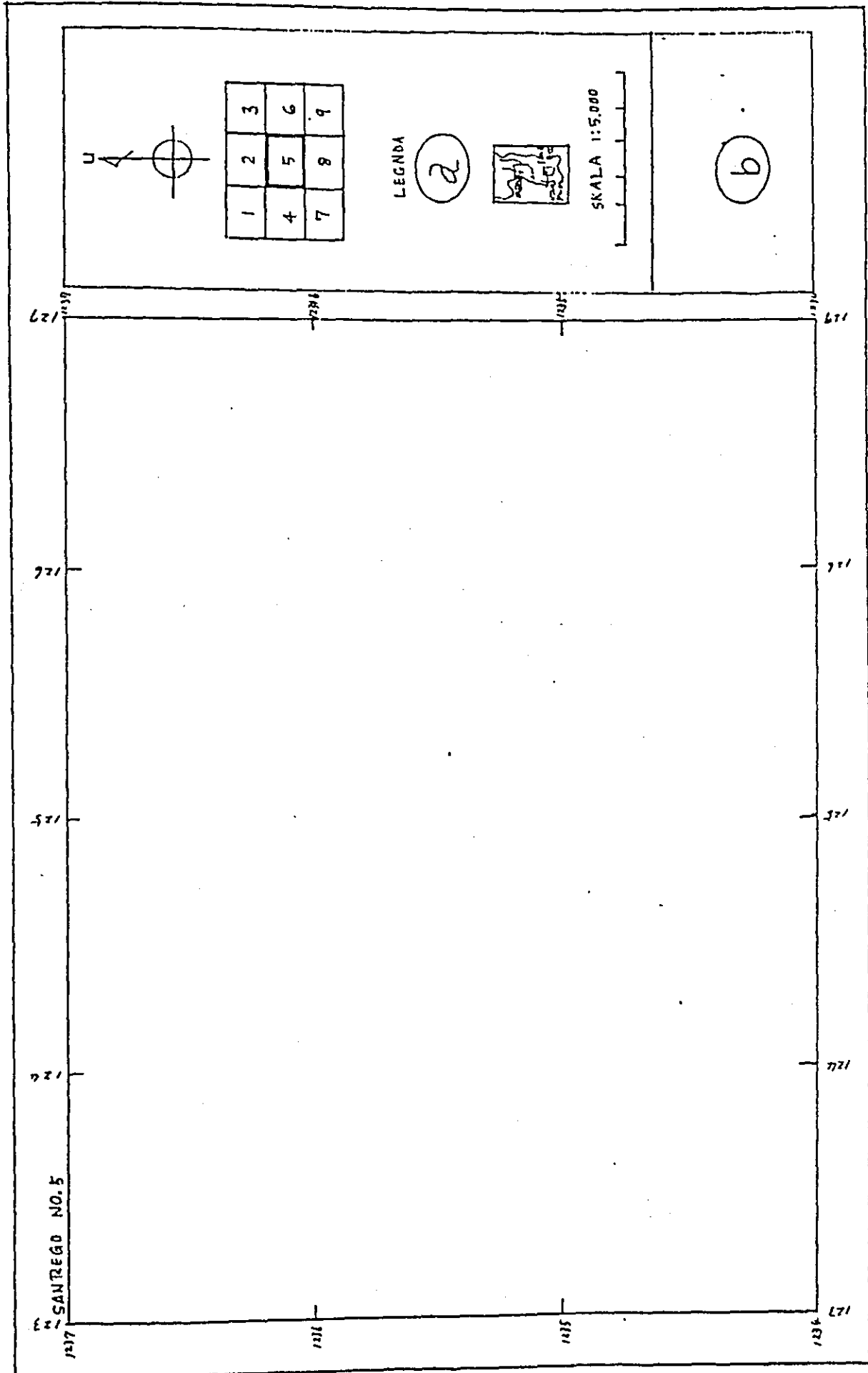
<u>No.</u>	<u>NAME</u>	<u>ASSIGNMENT</u>
1.	Masao SATO	Chief Surveyor
2.	Kazuo KAWAHARA	Surveyor
3.	Koojiroo TSUDA	Surveyor
4.	Yoshio IIZUKA	Surveyor
5.	Nobuyuki KANNO	Surveyor
6.	Toru WATANABE	Surveyor

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

P.O. Box 216, Mitsui Bldg.
1, 2-chome, Nishishinjuku
Shinjuku-ku, Tokyo
Japan

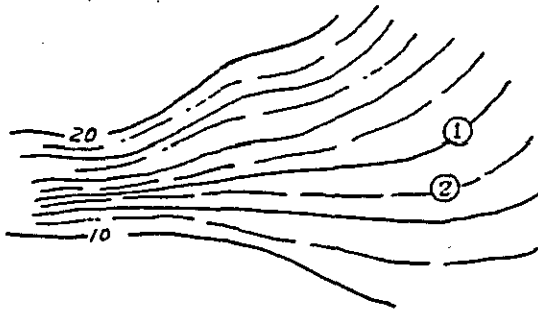
WORK SCHEDULE

<u>MONTH:</u>	1982	JUNE	JULY	AUG	SEPT	OCT	NOV
<u>ITEM</u>							
FIELD WORK IN INDONESIA			15	27			
AERIAL TRIANGULATION				28	20		
ORTHO PHOTO MAP PRODUCTION					21		15



2

- $\Delta \frac{P5}{181.1}$ TITIK TRIANGULASI KE-I (PRIMAIR)
DENGAN NOMOR DAN TINGGINYA
- $\Delta \frac{S.30}{15.1}$ IDEM KE-II (SEKUNDAIR)
- $\Delta \frac{T.25}{10.3}$ IDEM KE-III (TERTIAIR)
- I $\frac{SDS.3}{150.121}$ TIANG PENYIPAT DATAR TETAP (S. D. S.)
- ⊙ $\frac{SBM-11-5}{125.123}$ TIANG PENYIPAT DATAR (S. B. M.)
- ⊙ $\frac{TBM.1}{138.160}$ TIANG PENYIPAT DATAR (T. B. M.)
- 12.14 TITIK TINGGI TAMBAHAN
- 12.1 TITIK TINGGI DARI PLOTTING



- ① GARIS TINGGI 2M DAN 4M
- ② GARIS TINGGI 1M



DIREKTORAT JENDERAL PENGAIRAN
PROYEK PERANCANG PENGEMBANGAN SUMBER-SUMBER
AIR SULAWESI SELATAN BAGIAN TENGA

PROYEK IRIGASI	PEMOTRETAN UDARA DILAKSANAKAN OLEH	
	SKALA PHOTO	
	BULAN	
	DIPETAKAN	
	BULAN	
	SKALA PETA	
	DIPERIKSA	
DIPETAKAN SECARA PHOTOGRAMMETRIS DENGAN SELISIH GARIS SAMA TINGGITIAP M	DI SERAHKAN	

6

EQUIPMENT LIST
FOR
ORTHOPHOTO MAP MAKING
FOR
SANREGO IRRIGATION PROJECT

<u>ITEM NO.</u>	<u>DESCRIPTION OF GOODS</u>	<u>SERIAL NO.</u>	<u>QTY</u>	<u>UNIT PRICE</u> (₱)	<u>AMOUNT</u> (₱)
1.	LEVEL (SOKKISHA B-2)	80297 80373 84320 83946	4 pcs	60,000.	240,000.
2.	TRIPOD FOR LEVEL	602 604 605 608	4 PCS	10,000.	40,000
3.	STAFF FOR LEVEL	1 2 4 5 6 7 8 10	8 pcs	8,000.	64,000
4.	STAFF BASE	7 32 34 36 38 41 128 129	8 pcs	1,000.	8,000
5.	THEODOLITE (T-2)	154641	1 pc	800,000.	800,000.
6.	TRIPOD FOR THEODOLITE	2 3 122 170	4 pcs	25,000.	100,000.
7.	ELECTRO OPTICAL DISTANCE METER	1226A00737	1 pcs	4,000,000.	4,000,000.
8.	REFLEX MIRROR SET	20 26	2 sets	200,000.	400,000
9.	ATTACHMENT FOR REFLEX MIRROR	01 04 14 16	4 pcs	60,000.	240,000.
10.	TARGET SET	1	1 set	60,000.	60,000
11.	BATTERY FOR ELECTRO DISTANCE METER	1304A0447	1 pc	200,000.	200,000
12.	BATTERY CHARGER	1	1 pc	100,000.	100,000

<u>ITEM NO.</u>	<u>DESCRIPTION OF GOODS</u>	<u>SERIAL NO.</u>	<u>QTY</u>	<u>UNIT PRICE</u> (₹)	<u>AMOUNT</u> (₹)
13.	PLANE TABLE	3 6	2 pcs	15,000.	30,000.
14.	TRIPOD FOR PLANE TABLE	24 93	2 pcs	30,000.	60,000.
15.	ALIDADE	55-4 55-6	2 pcs	11,000.	22,000.
16.	BOX COMPASS	2 55-3	2 pcs	1,000.	2,000.
17.	PLASTIC TAPE	21 155	2 pcs	4,000.	8,000.
18.	BINOCULAR	41 132	2 pcs	8,000.	16,000.
19.	TRANSFORMER	1	1 pc	10,000.	10,000.
20.	KNAPSACK		6 pcs	1,000.	6,000.
TOTAL			55 pcs 3 sets		6,406,000.

6.9. Field Survey Report dated September 1982

FIELD SURVEY REPORT
FOR
ORTHOPHOTO MAP MAKING FOR THE
SANREGO IRRIGATION PROJECT
SOUTH SULAWESI, REPUBLIC OF INDONESIA

AUGUST 1982

TOPOGRAPHIC SURVEY TEAM FOR ORTHOPHOTO MAP MAKING
SANREGO IRRIGATION PROJECT

This report concerns the field survey of " Orthophoto Map making for the Sanrego Irrigation Project ", which was executed according to the Plan of Operation which was submitted to and approved by the Government of Indonesia.

I. FORMATION OF SURVEY TEAM

1. Traversing.....one party
 Traversing party consisted of as follows.
 Japanese surveyor two persons
 Indonesian counterpart two persons
 Local labourer eight persons

 Electro optical distance meter (type 3808A) one pc.
 Theodolite one pc.
 Reflex mirror set four sets
 Tripod for theodolite seven pcs.
2. Leveling.....three parties
 Leveling party consisted of as follows.
 Japanese surveyor one person
 Indonesian counterpart one person
 Local labourer five persons

 Level (type B-2) one pc.
 Tripod for level one pc.
 Staff for level two pcs.
3. Field Identification.....one party
 Field identification party consisted of as follows.
 Japanese surveyor one person
 Indonesian counterpart one person
 Local labourer one person

II. FIELD SURVEY

1. Establishment of aerial photo signals
 Eleven (11) aerial photo signal were established in the project area for ground control point survey.

Also, twelve (12) aerial photo signals were established on the existing control points for checking of coordination.

Coordination of existing control points will be calculated by the aerial triangulation result in Japan.

2. Traversing

Length of traversing route: approximately 70 km

Original point of traversing was used the existing triangulation point in the project area (TT-137).

Traversing networks are shown on attached map.

3. Leveling

Length of leveling route: approximately 200 km

Temporary results of newly established bench marks are shown on attached sheet and location of newly established bench marks are shown on attached map.

Final results will be calculated by computer in Japan.

4. Field Identification

Name of village and name of river was collected from the villagers with the cooperation of Indonesian counterpart.

III. WORKING SCHEDULE

Working schedule of the field work is as follows.

15th June	Arrived at Jakarta
16th June - 24th June	Meeting in Jakarta and Bandung
25th June	Move to Ujung Pandang
26th June	Meeting in Ujung Pandang and preparation for field work
28th June	Move to Sinjai
29th June	Courtesy call for local government and reconnaissance survey
30th June - 6th July	Field work
7th July - 8th July	Indoor work in Sinjai
9th July - 20th July	Field work and move to Ujung Pandang
21th July - 25th July	Indoor work in Ujung Pandang
26th July	Move to Sinjai
27th July - 28th July	Field work and move to Ujung Pandang
29th July	Indoor work in Ujung Pandang
30th July	Meeting in Ujung Pandang

31th July

Move to Jakarta .

1st August

Preparation for leaving for Japan

2nd August - 3rd August

Metting in Jakarta

4th August

Leave for Japan

Caluculation Result of Control Point

Point Name	N (Y) k m	E (X) k m	Latitude (B)			Longitude (L)			
			°	'	"	°	'	"	
T.T. 137	176.920.38	9457.568.22	-	4	54	05	120	05	12.793
No. 1	171.362.46	9451.542.06	-	4	57	20	120	02	11.675
No. 2	170.220.46	9456.846.49	-	4	54	28	120	01	35.405
No. 3	169.585.72	9463.999.32	-	4	50	35	120	01	15.846
No. 4	176.290.20	9467.876.36	-	4	48	30	120	04	53.797
No. 5	179.200.01	9466.482.25	-	4	49	15	120	06	27.964
No. 6	180.754.85	9460.166.36	-	4	52	41	120	07	17.515
No. 7	183.663.59	9455.121.66	-	4	55	26	120	08	51.154
No. 8	181.932.29	9448.241.60	-	4	59	09	120	07	54.035
No. 9	176.028.95	9448.931.43	-	4	58	46	120	04	42.651
No. 10	176.389.59	9463.406.85	-	4	50	55	120	04	56.399

Result of Existing Bench Mark

	m
SDS. 57	109.303
SDS. 58	118.755
SDS. 59	121.486
SDS. 60	147.745
SDS. 61	134.102
SDS. 62	151.917

Temporary Result of Established Bench Mark

	m
TBM. 1	112.518
TBM. 1 - 1	104.012
TBM. 2	141.620
TBM. 3	113.500
TBM. 4	116.665
TBM. 6	125.329
TBM. 7	121.724
TBM. 8	139.725
TBM. 9	149.672
TBM. 11	138.186
TBM. 11 - 1	139.847
TBM. 12	139.545
TBM. 13	136.980
TBM. 14	141.365
TBM. 15	141.292
TBM. 16	137.833
TBM. 17	136.530
TBM. 17 - 1	143.616
TBM. 18	148.852
TBM. 19	167.721
TBM. 20	147.287
TBM. 21	154.834
TBM. 22	138.964
TBM. 23	133.514
TBM. 24	138.540
TBM. 25	149.785
TBM. 26	142.112
TBM. 27	140.767
TBM. 28	145.944
TBM. 29	187.299
TBM. 30	157.309
TBM. 31	146.956
TBM. 32	148.255

Temporary Result of Established Bench Mark

TBM. 33	^m 147.974
TBM. 34	147.908
TBM. 35	145.163
TBM. 36	155.564
TBM. 37	166.468
TBM. 38	193.986

Temporary Result of Established Bench Mark

1 - TBM. 1	^m 143.535
1 - TBM. 2	139.848
1 - TBM. 3	118.056
1 - TBM. 7	141.137
1 - TBM. 8	96.199
1 - TBM. 8 - 1	119.842
1 - TBM. 9	98.092
1 - TBM. 10	131.335
1 - TBM. 11	132.661
1 - TBM. 12	105.453
1 - TBM. 13	114.117
1 - TBM. 14	123.721
1 - TBM. 14 - 1	163.284
1 - TBM. 15	149.058
1 - TBM. 15 - 1	138.242
1 - TBM. 17	167.069
1 - TBM. 18	177.505
1 - TBM. 70	121.274
1 - TBM. 71	120.028
1 - TBM. 72	154.478
2 - TBM. 1	162.936
2 - TBM. 2	159.427
2 - TBM. 3	143.095
2 - TBM. 4	180.985
2 - TBM. 5	189.146
2 - TBM. 6	165.639
2 - TBM. 7	158.133
2 - TBM. 8	154.372
2 - TBM. 9	155.458
2 - TBM. 10	142.971
2 - TBM. 11	143.992
2 - TBM. 12	133.995
2 - TBM. 13	167.175

Temporary Result of established Bench Mark

2 - TBM. 14	168.037 ^m
2 - TBM. 15	194.566
2 - TBM. 16	180.431
2 - TBM. 17	148.632
2 - TBM. 18	148.859
2 - TBM. 19	139.028
2 - TBM. 20	134.918
2 - TBM. 21	138.888
2 - TBM. 22	155.083
2 - TBM. 23	186.089
2 - TBM. 24	161.383
2 - TBM. 25	150.292
2 - TBM. 26	153.235
2 - TBM. 27	153.714
2 - TBM. 28	147.778
2 - TBM. 29	124.001
2 - TBM. 30	121.960
2 - TBM. 31	120.683
3 - TBM. 1	156.238
3 - TBM. 2	154.636
3 - TBM. 3	155.439
3 - TBM. 3 - 1	153.177
3 - TBM. 4	150.179
3 - TBM. 4 - 1	153.404
3 - TBM. 5	155.506
3 - TBM. 6	155.290
3 - TBM. 7	151.109
3 - TBM. 8	126.683
3 - TBM. 9	131.980
3 - TBM. 12	119.757
3 - TBM. 13	147.826
3 - TBM. 14	116.587
3 - TBM. 15	134.513
3 - TBM. 16	142.617

Temporary Result of Established Bench Mark

3 - TBM. 17	^m 134.565
3 - TBM. 18	140.049
3 - TBM. 18 - 1	152.282

T.T. - 135	158.280
T.T. - 137	152.560
PU - 3	170.034
BM	181.849

6.10. Survey Report dated November 1982

SURVEY REPORT
FOR
ORTHOPHOTO MAP MAKING FOR THE
SANREGO IRRIGATION PROJECT
SOUTH SULAWESI, REPUBLIC OF INDONESIA

NOVEMBER 1982

TOPOGRAPHIC SURVEY TEAM FOR ORTHOPHOTO MAP MAKING
SANREGO IRRIGATION PROJECT

This report concerns the elevation of bench marks which were established at near the weir site of Sanrego Irrigation Project.

I. LEVELING WORKS FOR THE SANREGO IRRIGATION PROJECT

We understand that undermentioned leveling works were executed for the Sanrego Irrigation Project.

1. Wecon's (Tri Tunggal's) old leveling work.
2. Wecon's (Tri Tunggal's) new leveling work.
3. JICA survey team's leveling work.

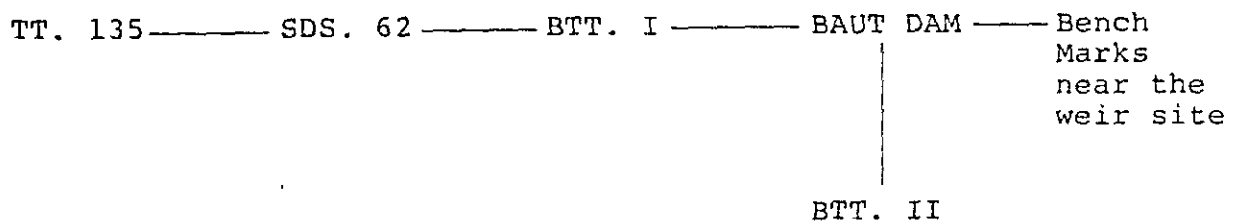
Concerning the elevation of bench marks, above three leveling works have different results.

II. CHECK LEVELING

To check the elevation of bench marks near the weir site and to determine the reason of difference of elevation, survey team decided to dispatch two surveyors to Indonesia for execution of check leveling.

Check leveling was executed along undermentioned leveling route.

Check Leveling Route



III. WORKING SCHEDULE

Working schedule of check leveling was as follows:

31 Oct	Arrived at Jakarta
1 Nov	Meeting in Jakarta
2 Nov	Moved to Ujung Pandang
3 Nov	Meeting in Ujung Pandang
4 Nov	Moved to Sinjai
5 Nov	Check leveling
6 Nov	Check leveling
7 Nov	Moved to Ujung Pandang
8 Nov	Meeting in Ujung Pandang
9 Nov	Moved to Jakarta
10 Nov	Meeting in Jakarta
11 Nov	Moved to Bandung and meeting in Bandung
12 Nov	Moved to Jakarta
13 Nov	Departure for Tokyo

Check leveling was executed by undermentioned surveyors.

Mr. Toru Watanabe	Japanese Surveyor
Mr. Kiminori Muraishi	Japanese Surveyor
• Mr. Wahab	Counterpart of Sanrego Irrigation Project, P.U. Ujung Pandang

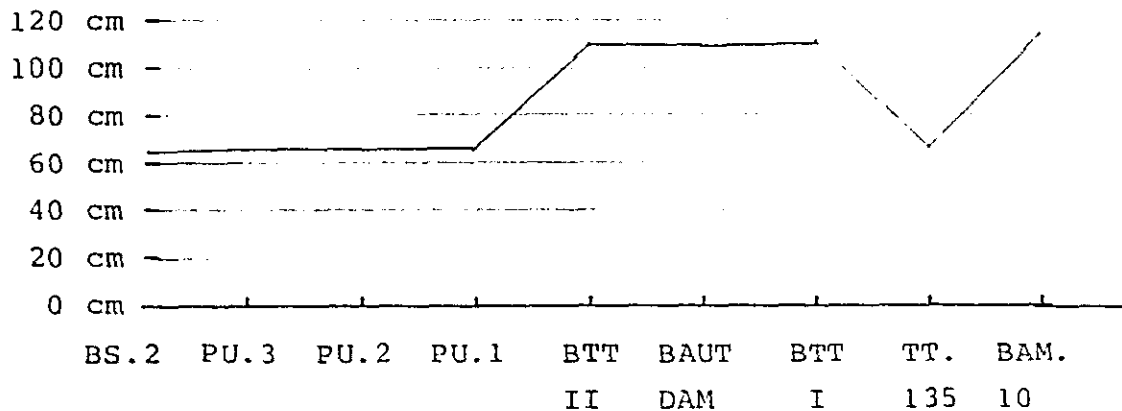
IV. CHECK LEVELING RESULT

Check leveling result is shown on attached table page 6.
Elevation of Bench Marks is shown on attached table page 7.

1. The elevations of Bench Marks which were observed by JICA Survey Team on July 1982 and Nove. 1982 are almost same.
We believe that our survey result is correct. JICA Survey Team used SDS. 57 - SDS. 62 for original point (datum point) for leveling work.

2. We understand that Indonesian (Wecon and Tri Tunggal) original point for leveling work is TT. 135.
Concerning the elevation of TT. 135, There is about 70 cm difference between Indonesian elevation and JICA survey team's elevation.
Indonesian elevation is about 70 cm higher than JICA survey team's elevation.
3. Concerning the elevation of bench marks (P.U. 1, P.U. 2 and BS. 2) near the weir site, Indonesian elevation are about 70 cm higher than JICA survey team's elevation.
4. Concerning the elevation of bench marks (BTT. I, BTT. II and BAUT DAM) near marada dam and Palattae, Indonesian elevations are about 1 m 10 cm higher than JICA survey team's elevation.
5. The relation above Item 1 - 4 is as follows:

Difference of Elevation



Difference of Elevation No. of Bench Mark

$$\text{Difference of elevation} = \text{Indonesian elevation} - \text{JICA survey team's elevation}$$

Indonesian elevation is as follows:

- BAM. 10 data from description of bench mark of Tri Tunggal
 TT. 135 data from P.U. 1:25,000 map

BTT. I	data from Wecon's old leveling work
BTT. II	data from Wecon's new leveling work
PU. 1	"
P.U. 2	"

V. INDONESIAN ORIGINAL POINT (DATUM POINT) FOR LEVELING WORK

According to the information from Indonesian side, there seems to be two original points for leveling work (TT. 134 and TT. 135). But, according to the following reasons, TT. 134 and TT. 135 seems to be the same triangulation point. Also, elevation and X,Y coordinate of TT. 134 of description of bench mark which was made by Tri Tunggal seems to be wrong.

1. According to the guide map of description of bench mark which was made by Tri Tunggal, the location of TT. 134 is same as the location of TT. 135 on P.U. 1:25,000 Map.
2. The photo (TT. 134) of description of bench mark which was made by Tri Tunggal is the same as TT. 135 on P.U. 1:25,000 map.
3. X, Y coordinate of TT. 135 from last page of description of bench mark which was made by Tri Tunggal and X. Y coordinate of TT. 134 of the list on P.U. 1:25,000 map are same. The location of this point is same as TT. 135 on P.U. 1:25,000 map.
4. We looked for the TT. 134 on the area which is shown by X, Y coordinate of TT. 134 of description of bench mark which was made by Tri Tunggal. But, we can not find the triangulation point at the site.
5. The relative hight between BAM. 10 and TT. 134 (TT. 135) is as follows.

Relative Hight between BAM. 10 and TT. 134 (TT. 135)

	Description of bench mark (Tri Tunggal)	JICA survey team 2nd
	m	m
(1) BAM. 10	158.541	157.433
(2) TT. 134 TT. 135	153.286	158.279
(1) - (2)	5.255	- 0.846

VI. CONCLUSION

Our conclusion is as follows.

1. Concerning the elevation of original point (datum point) for leveling work, there is about 70 cm difference of elevatic between Indonesian original point (TT. 135) and JICA survey team's original point (SDS. 57 - SDS. 62, same as bench mark system of JICA 1:25.000 map).
2. Concerning the relative hight between bench marks near the weir site and BTT.II, there is about 40 cm difference between Indonesian relative hight of Wecon's new leveling work (between bench marks near the weir site and BTT.II) and JICA survey team's relative hight (between bench marks near the weir site and BTT.II),

CHECK LEVELING RESULT

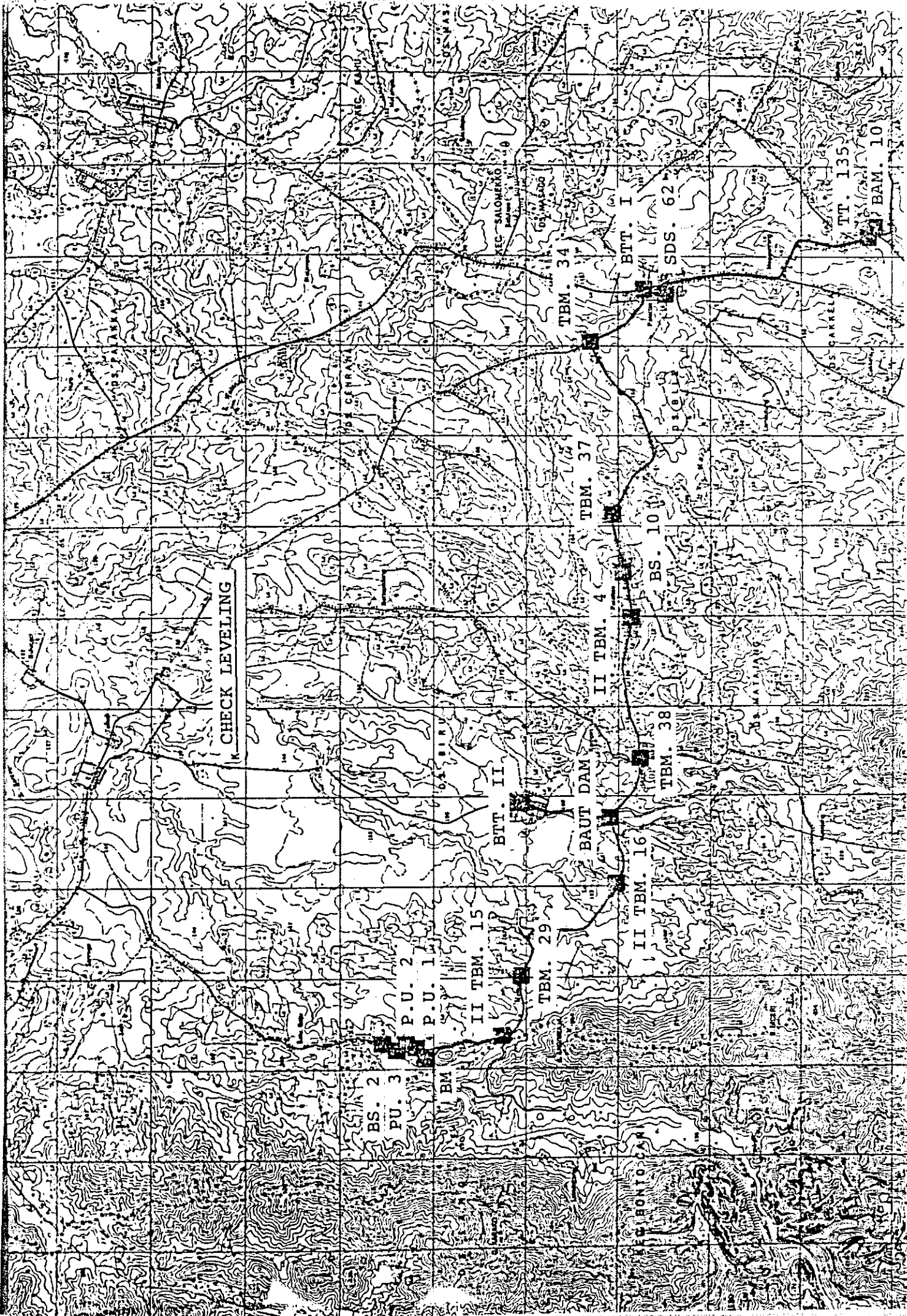
	(1) SURVEY TEAM 1st	(2) SURVEY TEAM 2nd	(1) - (2)
	m	m	
SDS. 62	151.917	151.917	DATUM POINT
BTT. I	150.414	150.415	- 0.001
TBM. 34	147.908	147.914	- 0.006
TBM. 37	166.468	166.450	+ 0.018
BS. 10	-----	166.213	-----
II TBM. 4	179.458	179.468	- 0.010
TBM. 38	193.986	193.987	- 0.001
BAUT DAM	174.143	174.156	- 0.013
BTT. II	169.977	169.954	+ 0.023
II TBM. 16	180.431	180.444	- 0.013
TBM. 29	187.299	187.325	- 0.026
II TBM. 15	194.566	194.601	- 0.035
P.U. 1	-----	184.373	-----
BM	181.849	181.897	- 0.048
P.U. 2	-----	175.925	-----
PU. 3	170.034	170.075	- 0.041
BS. 2	-----	171.205	-----
SDS. 62	151.917	151.917	DATUM POINT
TT. 135	158.280	158.279	+ 0.001
BAM. 10	-----	157.433	-----

ELEVATION OF BENCH MARKS

	(1) WECON OLD m	(2) WECON NEW m	(3) F/S TEAM m	(4) SURVEY TEAM 1st m	(5) SURVEY TEAM 2nd m	(1) - (5) (2) - (5)
SDS. 62	-----	-----	-----	151.917	151.917	-----
BTT. I	151.524	-----	-----	150.414	150.415	1.109
BS. 10	-----	-----	166.230	-----	166.213	-----
BAUT DAM	175.212	175.212	-----	174.143	174.156	1.069
BTT. II	171.025	171.025	169.982	169.977	169.954	1.071
P.U. 1	-----	185.036	-----	-----	184.373	0.663
BM	-----	-----	-----	181.849	181.897	-----
P.U. 2	-----	176.581	175.877	-----	175.925	0.656
P.U. 3	-----	-----	-----	170.034	170.075	-----
BS. 2	171.209	171.862	171.154	-----	171.205	0.657
DISCRPTION OF BENCH MARK (TRI TUNGGAL)		LAST PAGE OF DESCRIPTION OF BENCH MARK (TRI TUNGGAL)	LIST ON P.U. 1:25,000 MAP	P.U. 1:25,000 MAP	SURVEY TEAM 1st	SURVEY TEAM 2nd
TT. 135	-----	158.844	-----	158.984	158.280	158.279
TT. 134	153.286	-----	158.984	-----	158.280	158.279
BAM. 10	158.541	-----	-----	-----	-----	157.433

ELEVATION AND X, Y COORDINATION OF TT. 134 AND TT. 135

POINT NO	T. 134	TT. 135	TT. 134	TT. 135	P. U. 1:25,000 MAP
	DESCRIPTION OF BENCH MARK (TRI TUNGGAL)	LAST PAGE OF DESCRIPTION OF BENCH MARK (TRI TUNGGAL)	LIST ON P. U. 1:25,000 MAP		
H:	+ 153.286	158.844	158.984	158.984	
X:	+ 15,501.883	+ 15,728.10	15,728.10	-----	
Y:	- 18,169.167	- 17,921.60	17,921.60	-----	



CHECK LEVELING

BS. 2
P.U. 3

P.U. 2
P.U. 1

II TBM. 15
BTT. II

TBM. 29

BAUT DAM

II TBM. 16

TBM. 38

BS. 10

II TBM. 4

TBM. 37

TBM. 34

BTT. I

SDS. 62

TT. 135

BAM. 10

KEC-SALONENKO

CIRONTO

