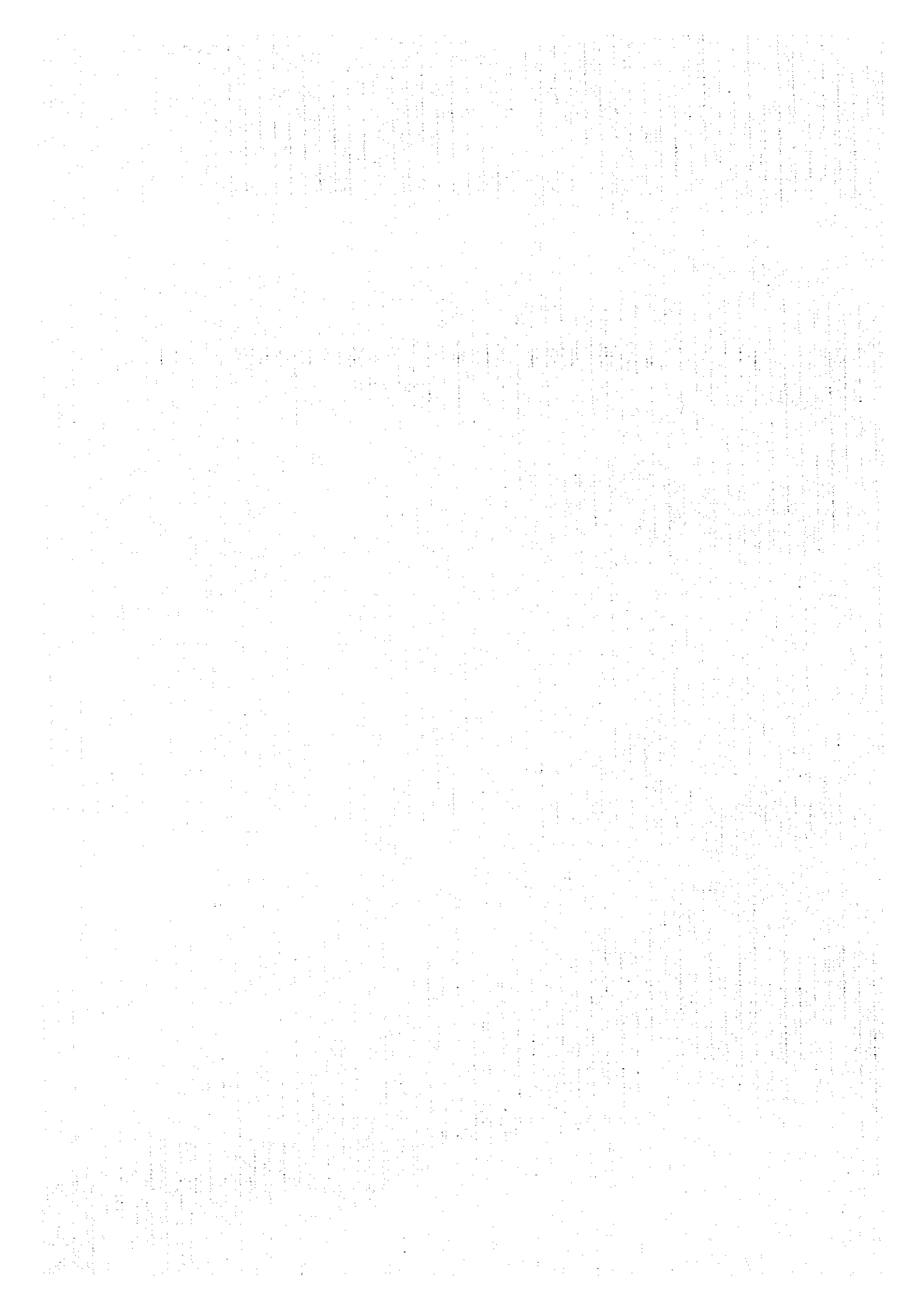


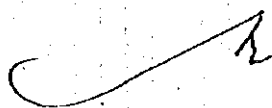
第二次事前調査団派遣時作成S/W及びM/Mレポート
(1996年5月)



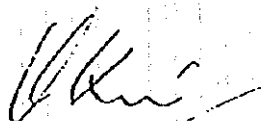
SCOPE OF WORK
FOR
THE FOUR NATION JOINT RE-SURVEY OF CRITICAL AREAS
AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED
SHOALS AND WRECKS
IN
THE STRAITS OF MALACCA AND SINGAPORE
AGREED UPON BETWEEN
THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
THE GOVERNMENT OF MALAYSIA
THE GOVERNMENT OF THE REPUBLIC OF SINGAPORE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY
THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN

SCOPE OF WORK
FOR
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INVESTIGATION OF DANGEROUS/UNCONFIRMED
SIGNALS AND WRECKS
IN
THE STRAITS OF MALACCA AND SINGAPORE
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THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
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THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN

Signed on 28 MAY 1996 at Seremban, MALAYSIA.



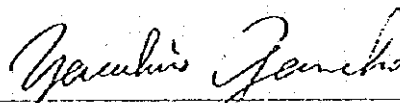
CAPTAIN SYAHWIN HAMID
for Directorate General of Sea Communication
Ministry of Communications
Republic of Indonesia



O.C. PHANG
for Ministry of Transport
Malaysia



CAPTAIN WILSON CHUA
for Maritime and Port Authority of Singapore
Republic of Singapore



DR. YASUHIRO GANEKO
Leader
Preparatory Study Team
Japan International Cooperation Agency

1. INTRODUCTION

1.1 In response to the request of the Government of the Republic of Indonesia (hereinafter referred to as "the Government of Indonesia"), the Government of Malaysia and the Government of the Republic of Singapore (hereinafter referred to as "the Government of Singapore"), the Government of Japan has decided to conduct jointly with the Littoral States the Re-Survey of Critical Areas and Investigation of Dangerous/Unconfirmed shoals and Wrecks in the Straits of Malacca and Singapore (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

1.2 Accordingly, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study in close relation with the authorities concerned of the Governments of Indonesia, Malaysia and Singapore.

1.3 This document sets forth the scope of work with regard to the Study.

2. OBJECTIVE OF THE STUDY

2.1 The objective of the Study is to conduct hydrographic survey of critical areas including the investigation of dangerous/unconfirmed shoals and wrecks for the promotion of maritime safety in the Straits of Malacca and Singapore.

3. STUDY AREA

3.1 The Study shall cover 25 survey areas and points in the Straits of Malacca and Singapore, details of which are attached as Appendix I and the map attached as Appendix II. The total area to be surveyed is approximately 780 square kilometers.

3.2 The Study Areas are divided into 6 Group Areas shown in Appendix III. Each Littoral Government shall be assigned Group Areas and undertake to take necessary measures to facilitate smooth conduct of the Study in connection with their designated Group Areas. The Group Areas assigned to each Littoral Government and the order of implementation priority are as follows:

- i) Group Area 2 to the Government of Malaysia;
- ii) Group Area 4 to the Government of Malaysia;
- iii) Group Area 1 to the Government of Indonesia;
- iv) Group Area 3 to the Government of Indonesia;
- v) Sub-Areas E and F and point (h) in Group Area 5 to the Government of Indonesia;
- vi) Remaining Sub-Areas and points in Group Area 5 to the Government of Singapore;
- vii) Group Area 6 to the Government of Singapore;

4. GOVERNMENT REPRESENTATIVE

- 4.1 In any Group Area assigned to a Littoral Government, a representative from each of the other two Littoral Governments shall also be present throughout the Study. The representative will be rotated on a monthly basis.
- 4.2 During final data processing conducted at a Littoral State, three representatives from each of the other two Littoral Governments shall also be present.

5. SCOPE OF THE STUDY

- 5.1 In order to meet the objective, the Study shall cover the following items;

i) Horizontal Control Survey

Based on the existing control points available for the Study, new points necessary for sounding operation shall be determined by Global Positioning System (GPS) observation.

ii) Tidal Observation

In order to determine the chart datum level for tidal reduction of soundings, tide stations and temporary tide poles shall be established in appropriate locations.

iii) Sounding (Search)

Sounding (Search) operation shall be carried out by using precise four-beam echo sounders with side scan sonars. The standard interval between lines of sounding is 200 meters. However, for the investigation of shoals and wrecks the sounding interval shall be closer.

iv) Position Fixing

Positioning of sounding shall be determined by Differential Global Positioning System (DGPS).

v) Data Processing

Preliminary data processing shall be carried out in the field. Any dangerous shoals or wrecks detected shall be promulgated to all vessels by radio broadcast as soon as possible and subsequently by Notices to Mariners. Final data processing shall be carried out in each of the Littoral Government following completion of the Study in their designated Group Areas.

vi) Preparation of Smooth Sheets

Based on the result of surveys, smooth sheets shall be prepared on plastic films. The scale of the smooth sheets shall be 1:20,000.

vii) Preparation of Electronic Navigational Charts (ENC) Database

The Electronic Navigational Charts (ENC) database covering the six sheets of common datum charts of the Straits of Malacca and Singapore shall be prepared. The approval of each of the Littoral States must be obtained for the release of any ENC for commercial use.

viii) Specifications of the Study

The specifications of the Study are listed in Appendix IV.

6. STUDY SCHEDULE

6.1 The Study shall be conducted in accordance with the Tentative Schedule attached as Appendix V.

7. REPORTS AND FINAL RESULTS

7.1 JICA shall prepare and submit the following reports in English to the Governments of Indonesia, Malaysia and Singapore. The date of submission of each report is dependent on the Study Schedule.

i. Reports

(a) Plan of Operation

Eighty (80) copies shall be prepared at the commencement of the Study. Twenty (20) copies are to be submitted to each Government.

(b) Progress Report

Eighty (80) copies shall be prepared after every survey of each Government. Twenty (20) copies are to be submitted to each Government.

(c) Final Report

Eighty (80) copies shall be prepared upon the completion of the Study. Twenty (20) copies are to be submitted to each Government.

ii. Smooth Sheets

Four (4) sets of each area shall be prepared. One set is to be submitted to each Government.

iii. Digital data and ENC Database

Four (4) sets of each area shall be prepared. One set is to be submitted to each Government. Digital data will include ENC database covering six sheets of common datum charts of the Straits of Malacca and Singapore.

iv. Raw Data

The raw data including echograms, side scan sonar records and tidal observations shall be kept by the respective Littoral States after the completion of final data processing. However, any Littoral State may request raw data of any area relevant to each state.

v. Other Data

Other survey and observation data results shall be prepared throughout the Study.

8. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

8.1 To facilitate smooth conduct of the Study, the Government of Malaysia shall take necessary measures;

- i. to inform the members of the Study Team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study Team,
- ii. to ensure the necessary entry permits for the Study Team to conduct field surveys in Malaysia and exempt them from consular fees,
- iii. to exempt the members of the Study Team from taxes and duties, as normally accorded under the provision of the relevant Malaysian rules and regulations, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study,
- iv. to exempt the members of the Study Team from income tax on their official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study, but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources,
- v. to provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into Malaysia from Japan in connection with the implementation of the Study,
- vi. to secure permission for entry into private properties or restricted area for the implementation of the Study,

- vii. to make arrangements for the Study Team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia, in order to prepare the reports,
 - viii. to provide the Study Team with medical services when needed but the expenses will be chargeable to the members of the Study Team,
 - ix. to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.
- 8.2 The Government of Malaysia shall indemnify any member of the Study Team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- 8.3 The Government of Malaysia shall coordinate the three Littoral countries in respect of the Study.
- 8.4 Ministry of Transport (hereinafter referred to as "MOT") shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.
- 8.5 MOT shall, at its own expense, provide the Japanese Study Team with the following, in cooperation with other organizations concerned;
- i. available data and information related to the Study,
 - ii. counterpart personnel,
 - iii. mother vessel for survey with crew including fuel expense,
 - iv. supervisor to the survey,
 - v. suitable office space with office equipment in Kuala Lumpur or at the base of the mother vessel,
 - vi. credentials or identification cards, and
 - vii. appropriate number of vehicles with drivers.

9. UNDERTAKINGS OF THE GOVERNMENT OF INDONESIA

- 9.1 To facilitate smooth conduct of the Study, the Government of Indonesia shall take necessary measures;
- i. to inform the members of the Study Team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study Team,
 - ii. to permit the members of the Japanese Study Team to enter, leave and sojourn in Indonesia for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,

- iii. to exempt the members of the Japanese Study Team from taxes, duties and other charges on equipment, machinery, vehicles and other materials brought into Indonesia for the conduct of the Study,
 - iv. to exempt the members of the Japanese Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese Study Team for their services in connection with the implementation of the Study,
 - v. to provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into Indonesia from Japan in connection with the implementation of the Study,
 - vi. to secure permission for entry into private properties or restricted area for the implementation of the study,
 - vii. to make arrangements for the Japanese Study Team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Indonesia, in order to prepare the reports,
 - viii. to provide medical services as needed. Its expenses will be chargeable to members of the Japanese Study Team,
 - ix. to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.
- 9.2 The Government of Indonesia shall indemnify any member of the Study Team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- 9.3 Directorate General of Sea Communication (hereinafter referred to as "DGSC") shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.
- 9.4 DGSC shall, at its own expense, provide the Japanese Study Team with the following, in cooperation with other organizations concerned:
- i. available data and information related to the Study,
 - ii. counterpart personnel,
 - iii. mother vessel for survey with crew including fuel expense,
 - iv. supervisor to the survey,
 - v. suitable office space with office equipment in Jakarta or at the base of the mother vessel,
 - vi. credentials or identification cards, and
 - vii. appropriate number of vehicles with drivers.

10. UNDERTAKINGS OF THE GOVERNMENT OF SINGAPORE

10.1 To facilitate smooth conduct of the Study, the Government of Singapore shall take necessary measures;

- i. to inform the members of the Study Team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study Team,
- ii. to permit the members of the Japanese Study Team to enter, leave and sojourn in Singapore for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,
- iii. to exempt the members of the Japanese Study Team from taxes, duties and other charges on equipment, machinery, vehicles and other materials brought into Singapore for the conduct of the Study,
- iv. to exempt the members of the Japanese Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese Study Team for their services in connection with the implementation of the Study,
- v. to provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into Singapore from Japan in connection with the implementation of the Study,
- vi. to secure permission for entry into private properties or restricted area for the implementation of the Study,
- vii. to secure permission for the Japanese Study Team to take all data and documents (including maps, photographs) related to the Study out of Singapore to Japan,
- viii. to provide medical services as needed. Its expenses will be chargeable to members of the Japanese Study Team,
- ix. to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.

10.2 The Government of Singapore shall bear claims, if any arises, against the members of the Japanese Study Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or wilful misconduct on the part of the members of the Japanese Study Team.

10.3 Maritime and Port Authority of Singapore (hereinafter referred to as "MPA") shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.

10.4 MPA shall, at its own expense, provide the Japanese Study Team with the following, in cooperation with other organizations concerned:

- i. available data and information related to the study,
- ii. counterpart personnel,
- iii. mother vessel for survey with crew including fuel expense,
- iv. supervisor to the survey,
- v. suitable office space with office equipment in Singapore,
- vi. credentials or identification cards, and
- vii. appropriate number of vehicles with drivers.

11. UNDERTAKINGS OF JICA

11.1 For the implementation of the Study, JICA shall take the following measures:

- i. to despatch, at its own expense, Study Team to Indonesia, Malaysia and Singapore.
- ii. to pursue technology transfer to the counterpart personnel in the course of the Study.
- iii. to hire survey boat and vehicles for positioning at the expense of JICA.

12. AUTHORIZATION

12.1 Each of the Government shall update its official nautical charts based on the final results and data obtained under the Study.

12.2 Considering that the final results and data obtained under the Study will be adopted for production of and/or updating official nautical charts published by the hydrographic offices concerned and in order to ensure the safety of navigation using these nautical charts in the Straits, the result and data of hydrographic surveys carried out under the Study shall be verified and authorized by the relevant Japanese authority.

13. CONSULTATION

13.1 JICA and MOT of Malaysia (Coordinator of the three Littoral Governments) shall consult with each other in respect of any matter that may arise or in connection with the Study.

APPENDIX I
LIST OF STUDY AREAS / POINTS

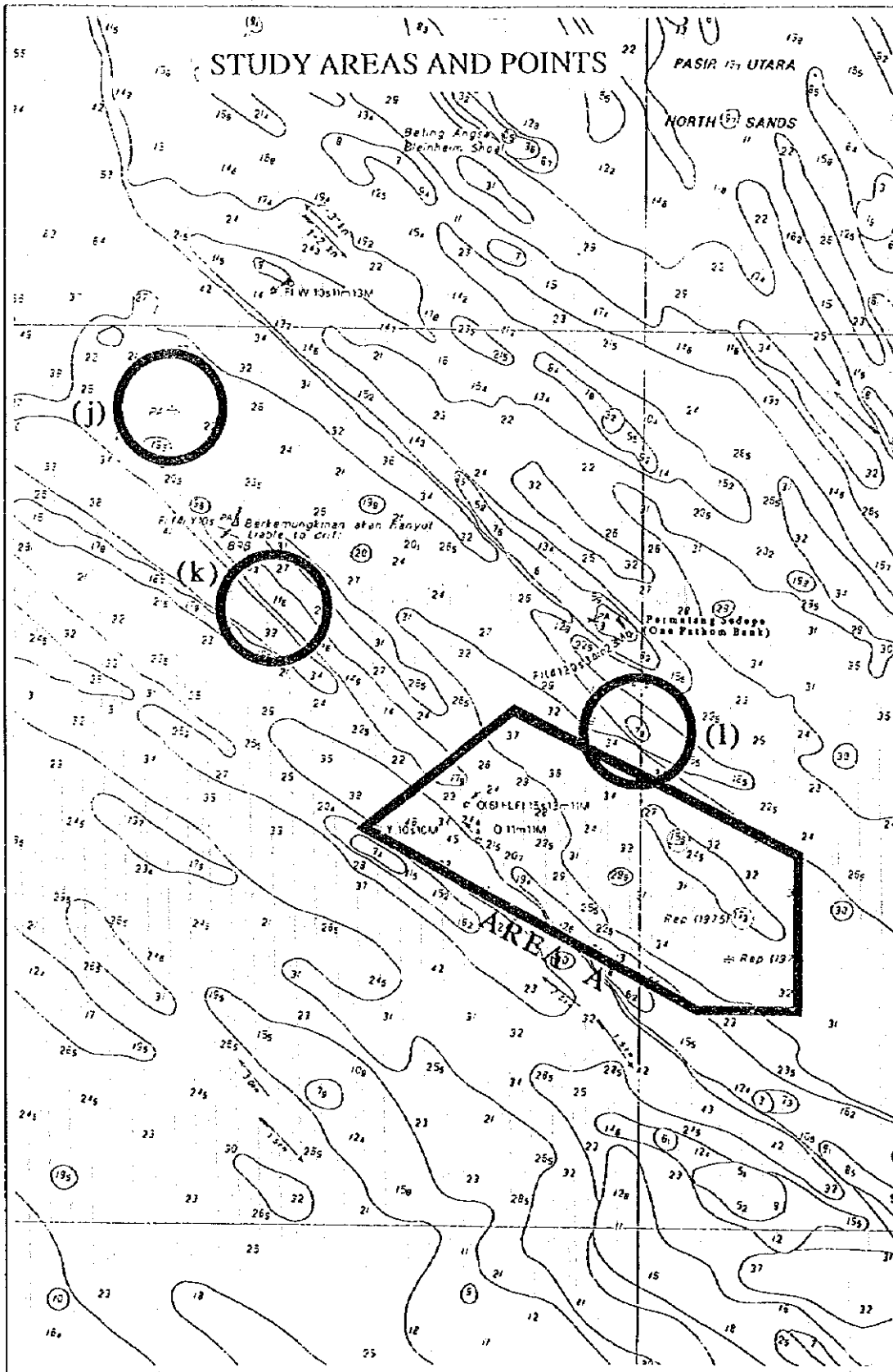
LIST OF STUDY AREAS/POINTS

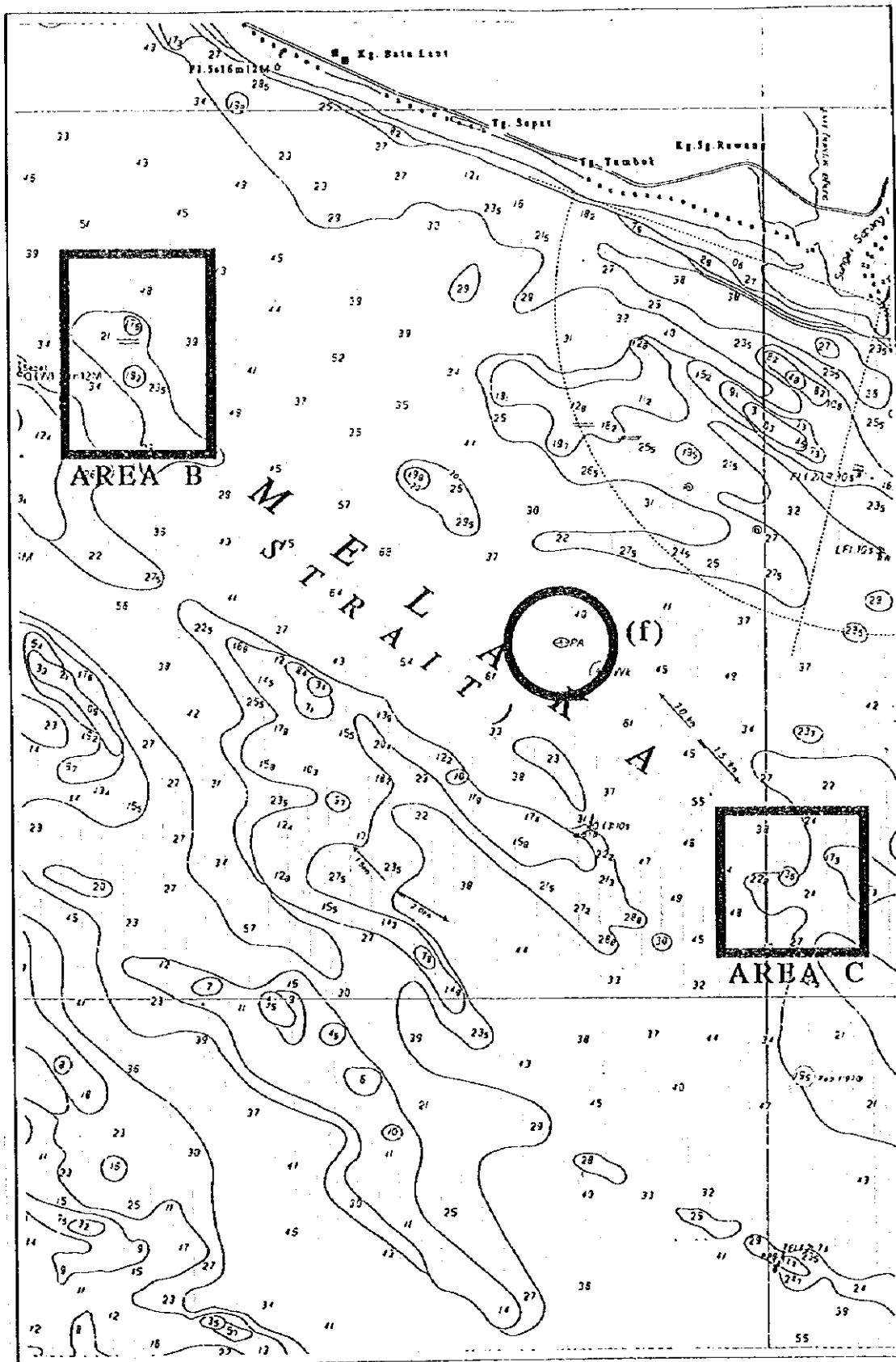
Areas/Point	Position	Subject	Remarks
A	(a) 02° 51'.4 N 100° 57'.2 E	Wreck/shoal and sand wave areas	(1) 02° 48'.7 N 101° 00'.8 E
	(b) 02° 48'.3 N 101° 03'.4 E		(2) 02° 47'.0 N 101° 02'.1 E
	(c) 02° 45'.0 N 101° 03'.4 E		(3) 02° 46'.0 N 101° 02'.1 E
	(d) 02° 45'.0 N 101° 01'.3 E		
	(e) 02° 48'.9 N 100° 54'.1 E		
B	(a) 02° 36'.7 N 101° 24'.4 E	Shoal	(4) 02° 35'.2 N 101° 25'.9 E
	(b) 02° 36'.7 N 101° 27'.5 E		(5) 02° 33'.9 N 101° 26'.0 E
	(c) 02° 32'.4 N 101° 27'.5 E		
	(d) 02° 32'.4 N 101° 24'.4 E		
C	(a) 02° 24'.1 N 101° 39'.1 E	Shoal	(6) 02° 22'.6 N 101° 40'.6 E
	(b) 02° 24'.1 N 101° 42'.1 E		
	(c) 02° 21'.1 N 101° 42'.1 E		
	(d) 02° 21'.1 N 101° 39'.1 E		
D	(a) 01° 57'.6 N 102° 12'.6 E	Wreck	(7) 01° 56'.1 N 102° 14'.1 E
	(b) 01° 57'.6 N 102° 16'.9 E		(8) 01° 55'.5 N 102° 15'.4 E
	(c) 01° 54'.0 N 102° 16'.9 E		
	(d) 01° 54'.0 N 102° 12'.6 E		
E	(a) 01° 13'.3 N 103° 24'.3 E	Wreck	(9) 01° 11'.8 N 103° 25'.9 E
	(b) 01° 13'.3 N 103° 27'.4 E		(10) 01° 10'.8 N 103° 25'.8 E
	(c) 01° 09'.3 N 103° 27'.4 E		
	(d) 01° 09'.3 N 103° 24'.3 E		

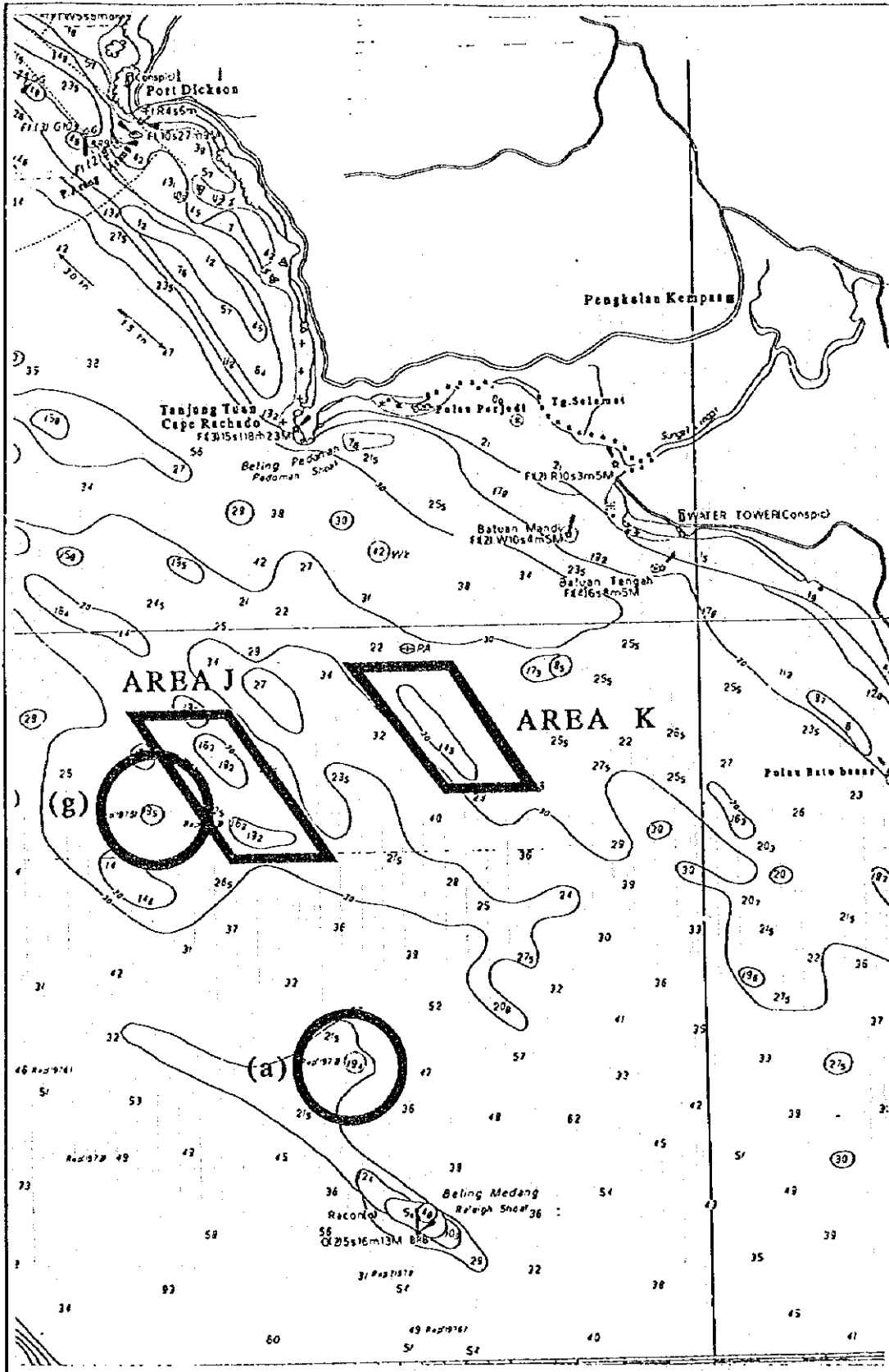
Areas/Point	Position	Subject	Remarks
F	(a) 01° 06'.7 N 103° 40'.6 E (b) 01° 06'.7 N 103° 43'.6 E (c) 01° 03'.7 N 103° 43'.6 E (d) 01° 03'.7 N 103° 40'.6 E	Wreck	(11) 01° 05'.2 N 103° 42'.1 E
G	(a) 01° 09'.1 N 103° 43'.9 E (b) 01° 09'.1 N 103° 46'.9 E (c) 01° 06'.1 N 103° 46'.9 E (d) 01° 06'.1 N 103° 43'.9 E	Wreck	(12) 01° 07'.6 N 103° 45'.4 E
H	(a) 01° 12'.0 N 103° 47'.4 E (b) 01° 12'.0 N 103° 50'.4 E (c) 01° 09'.0 N 103° 50'.4 E (d) 01° 09'.0 N 103° 47'.4 E	Danger	(13) 01° 10'.5 N 103° 48'.9 E
I	(a) 01° 17'.5 N 104° 13'.5 E (b) 01° 17'.5 N 104° 16'.5 E (c) 01° 14'.5 N 104° 16'.5 E (d) 01° 14'.5 N 104° 13'.5 E	Wreck	(14) 01° 16'.0 N 104° 15'.0 E
J	(1) 02° 17'.4 N 101° 49'.0 E (2) 02° 15'.6 N 101° 49'.6 E	Shoals	
K	02° 17'.2 N 101° 54'.2 E	Shoal	

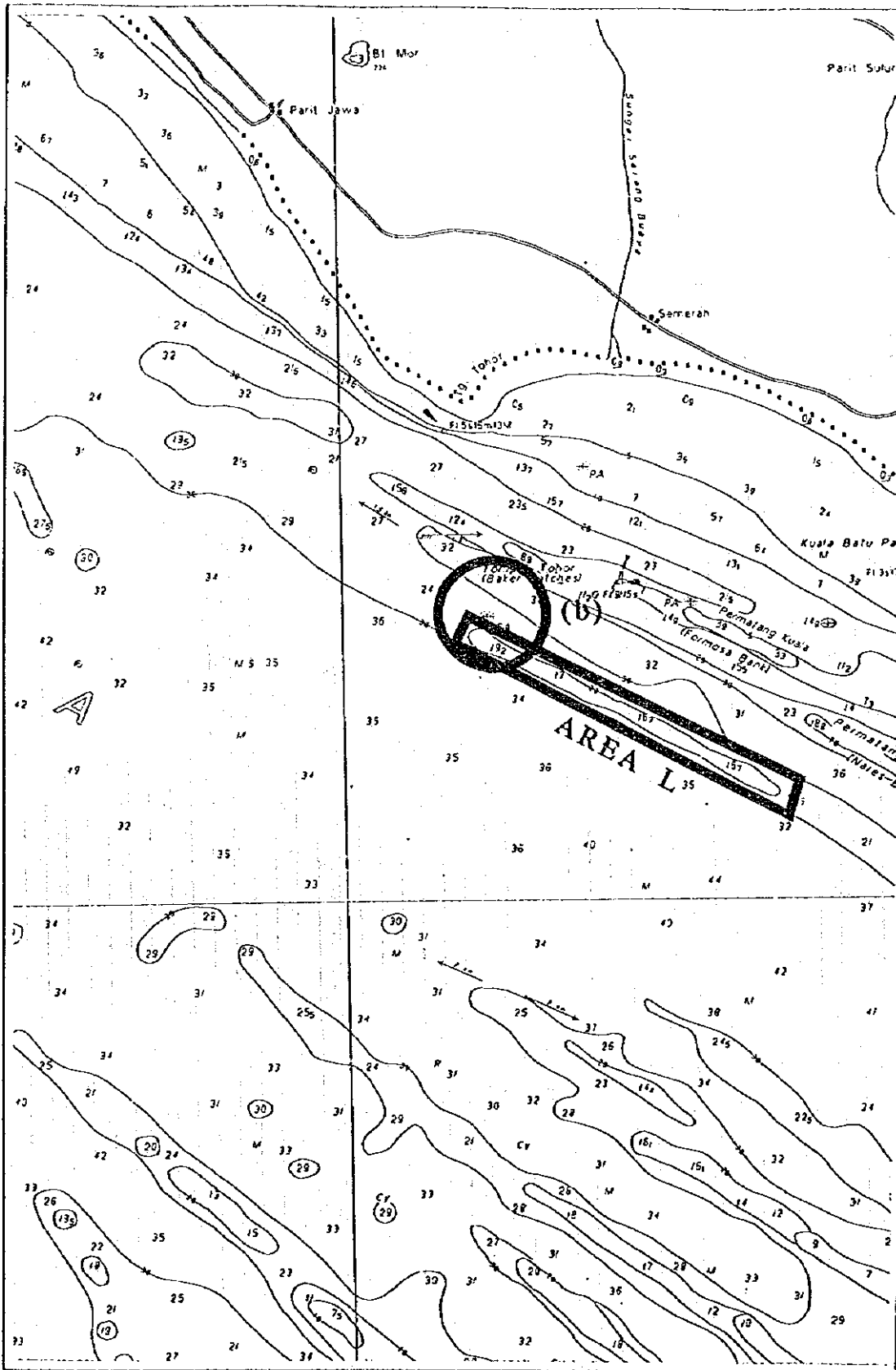
Areas/Point	Position	Subject	Remarks
L	(a) 01° 46'.2 N 102° 42'.8 E	Shoal	
	(b) 01° 42'.6 N 102° 50'.0 E		
	(c) 01° 42'.0 N 102° 49'.8 E		
	(d) 01° 45'.8 N 102° 42'.6 E		
a	02° 10'.2 N 101° 52'.0 E	Shoal	
b	01° 46'.4 N 102° 43'.3 E	Wreck	
c	01° 34'.0 N 103° 05'.0 E	Wreck	
d	01° 12'.2 N 103° 34'.3 E	Wreck	
e	01° 07'.4 N 103° 44'.2 E	Wreck	
f	02° 28'.0 N 101° 35'.4 E	Wreck	
g	02° 16'.0 N 101° 47'.7 E	Shoal	
h	01° 15'.8 N 103° 19'.8 E	Wreck	
i	01° 11'.1 N 103° 33'.0 E	Wreck	
j	02° 58'.2 N 100° 49'.5 E	Wreck	
k	02° 53'.9 N 100° 52'.0 E	Shoal	
l	02° 51'.1 N 101° 00'.0 E	Shoal	
m	01° 59'.3 N 102° 12'.4 E	Wreck	

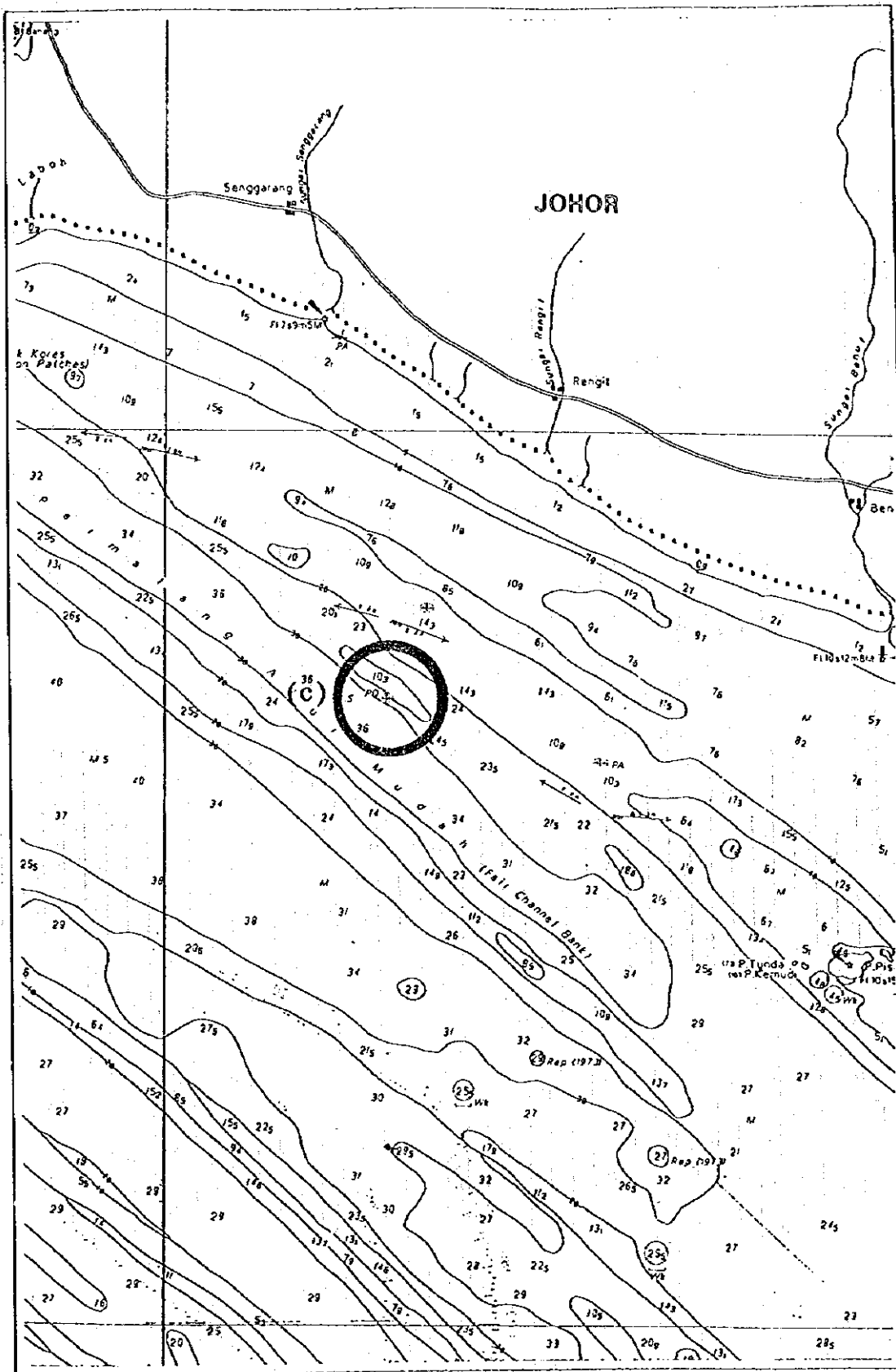
APPENDIX II
MAP OF STUDY AREAS / POINTS



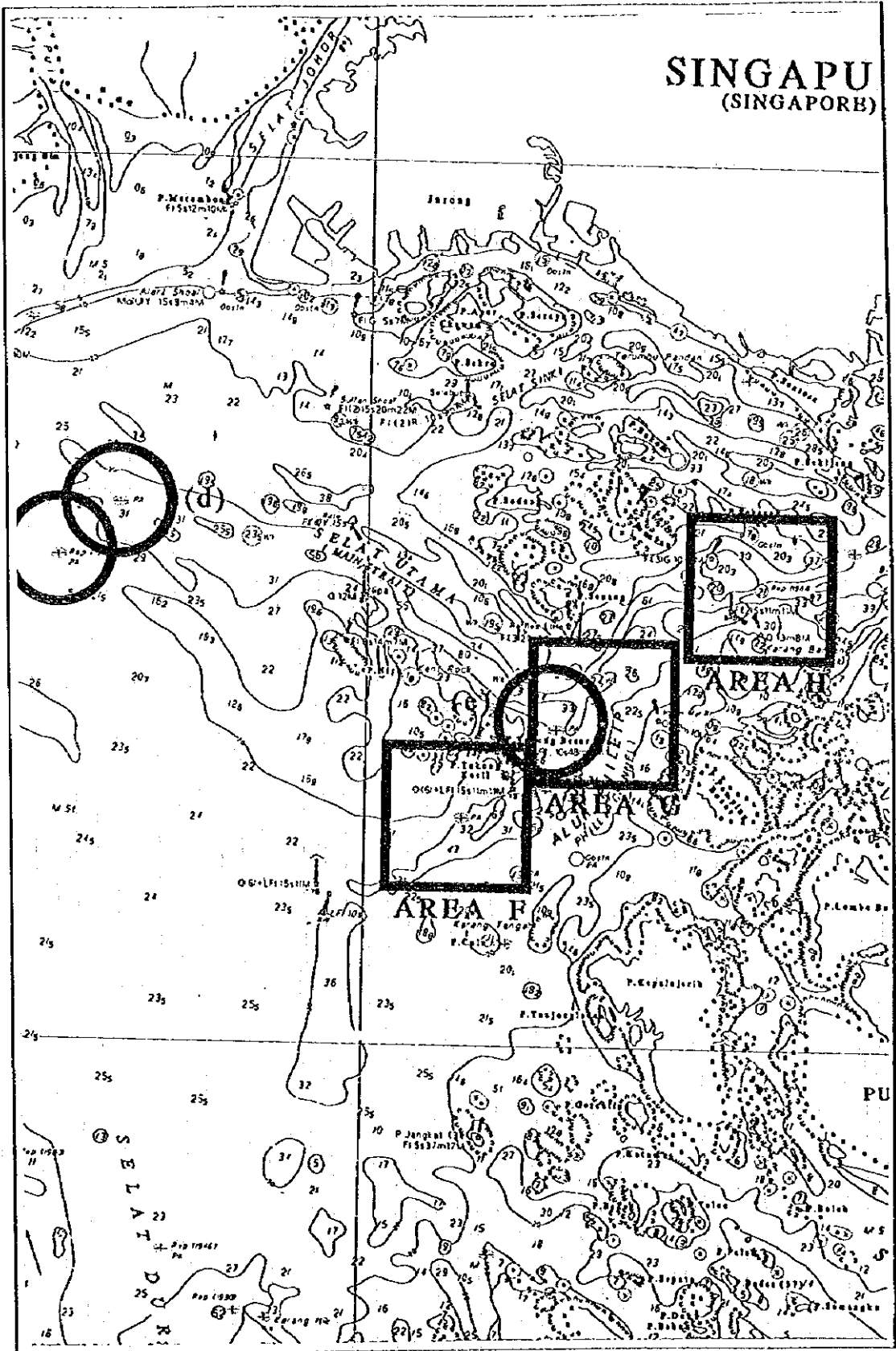


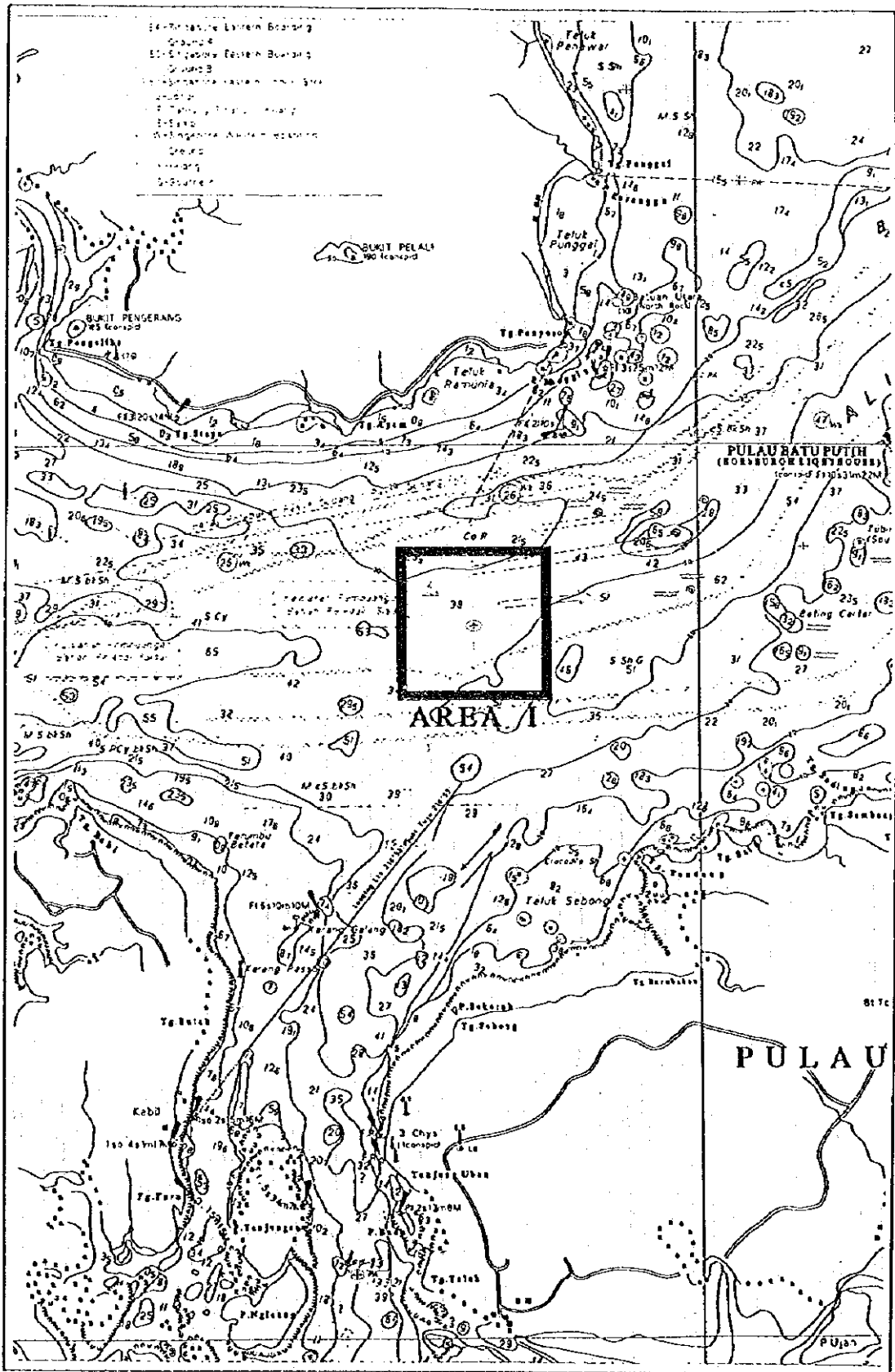






SINGAPU (SINGAPORE)



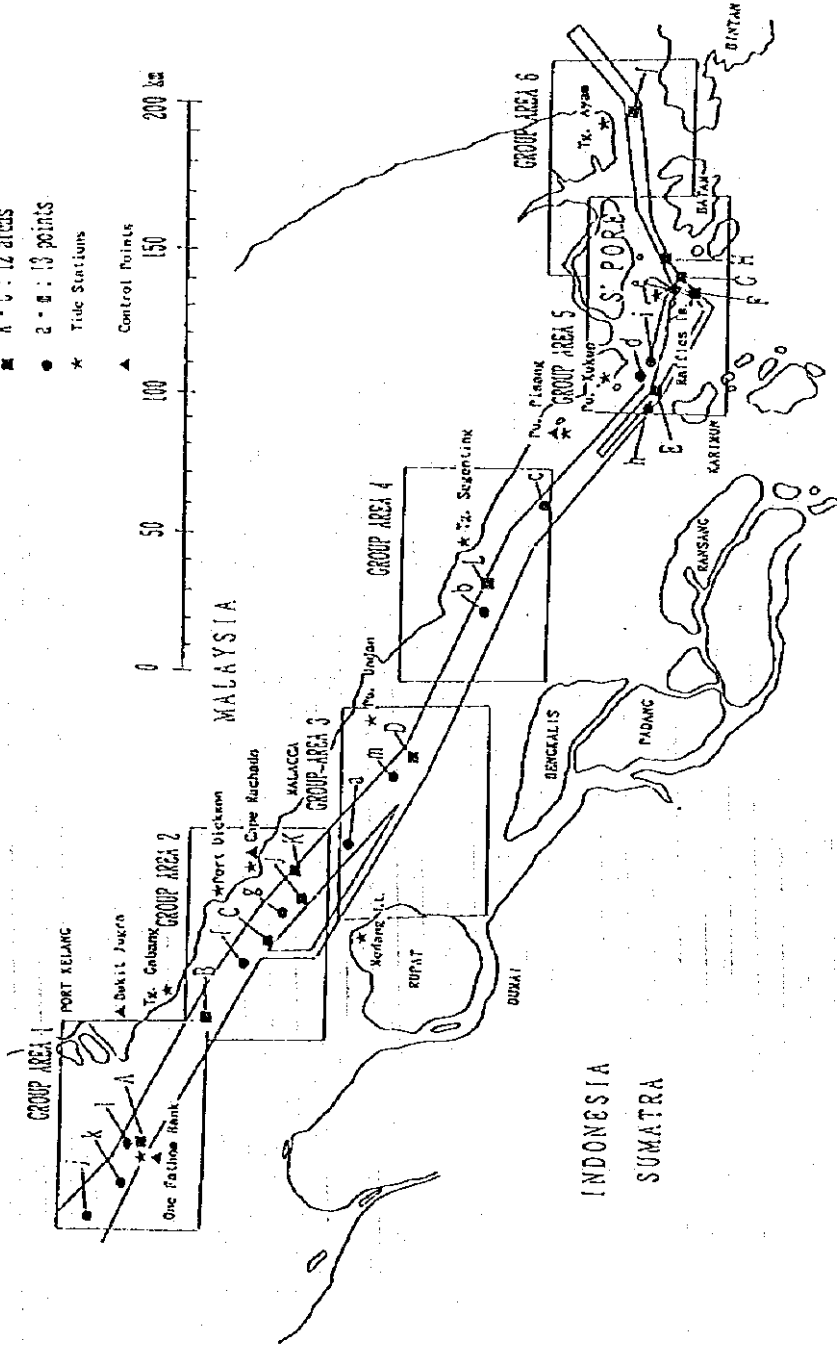
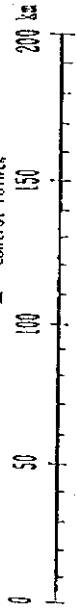


APPENDIX III
GROUP AREAS OF STUDY

GROUP AREAS OF STUDY

INDEX

- A - U : 12 AREAS
- 2 - G : 13 POINTS
- * TIDE STATIONS
- ▲ CONTROL POINTS



APPENDIX IV
SPECIFICATIONS OF SURVEY

SPECIFICATIONS OF SURVEY

1. HYDROGRAPHIC SURVEY STANDARDS

- 1.1 The International Hydrographic Organization (IHO) Standards for Hydrographic Survey : the Fourth Edition of SP-44 shall be applied to the hydrographic surveying to be carried out under the Study. The minimum standard for the Study shall be of Second Order to the IHO Specification SP-44.

2. COORDINATES AND DATUM LEVEL

- 2.1 The reference coordinates and ellipsoid, projection and chart datum level to be used for the Study will be as follows:
- i. Reference coordinates and ellipsoid : WGS-84 DATUM
 - ii. Projection : Transverse Mercator (TM) Projection
 - iii. Origin of coordinates : Center of each survey area
 - iv. Chart Datum Level : Lowest Astronomical Tide (LAT)

3. CONTROL POINT SURVEY

3.1 Survey Method

Based on the existing horizontal control points available for the Study, new horizontal points necessary for sounding operations shall be determined by a static method using Differential Global Positioning System (DGPS).

3.2 Control Points

New horizontal control points to be established for reference stations of DGPS at Bukit Jugra Lighthouse, Cape Rachado Lighthouse, One Fathom Bank Lighthouse and at other locations as necessary.

4. SOUNDING AND SEARCH

- 4.1 The sounding and search operations will be carried out by using precise four-beam echo sounders and a side scan sonar. The standard interval between sounding lines is 200 meters. For detailed identification of shoals and wrecks, sounding lines will be intensified to ensure full ensonification of the features. Digital data of the hydrographic survey will also be acquired.

4.2 Correction of Sounding Data

The correction of sounding data will be made for the sound velocity in sea water by a bar-check method or sound speed correction table and for the tidal reduction by tidal heights observed.

4.3 Positioning System

The position of survey launch will be determined by a Real-Time Differential Global Positioning System.

5. TIDAL OBSERVATION

5.1 In order to determine the chart datum level and make the tidal reduction to sounding data, temporary tide stations using digital type tide gauges and/or tide poles will be set at the following locations:

i.	One Fathom Bank	-	Area A, Points (j), (k) and (l)
ii.	Tanjung Gabang	-	Area B
iii.	Port Dickson	-	Area C and Point (f)
iv.	Cape Rachado	-	Areas J, K and Point (g)
v.	Beting Medang Lt.Bn	-	Point (a)
vi.	Pulau Undan	-	Area D and Point (m)
vii.	Tanjung Segenting	-	Area L, Points (b) and (c)
viii.	Pulau Kukup	-	Area E, Points (d), (h) and (i)
ix.	Raffles Island	-	Areas F, G, H and Point (e)
x.	Tanjung Ayam	-	Area I

5.2 The relation between a temporary tide station and/or a tide station and/or a tide pole and new bench marks will be determined by direct levelling using the nearest existing bench marks.

5.3 For determination of Chart Datum (DL) in each survey area, tidal harmonic constants and other results obtained during the tidal study carried out by Japan and three littoral countries in the Straits of Malacca and Singapore from 1977 to 1979 will be used. The sum of four main tidal components in tidal harmonic constants is ZO. Therefore, D.L - Mean Sea Level - ZO. The time difference for tide and height ratio in each survey area will also be calculated from the above results.

5.4 The long-term mean sea level of a temporary tide station will be obtained by comparing its short-term mean sea level with the mean sea level of the same period at the standard tidal station.

6. BOTTOM SAMPLING

6.1 The bottom sampling using a hand-lead and/or a tube dredge will be carried out at about 300 meters interval only near the shoals and patches in each sounding area for discrimination of its bottom characteristics.

7. DATA PROCESSING

7.1 Preliminary Data Processing

Initial data processing shall be carried out in the field by the following procedures:

- i. To store the positioning and sounding data with time/date in floppy disks on the survey launch.
- ii. To develop preliminary track charts to confirm the coverage of the survey areas by a computer and a plotter on the survey vessel (mother vessel).
- iii. To interpret side scan sonar records to search and confirm shoals and wrecks.
- iv. To develop preliminary sounding charts to confirm the shapes and positions of shoals and wrecks by a computer and a plotter on the survey vessel.
- v. To choose detailed survey area to confirm the precise position and the shallowest depth on the survey vessel.

7.2 Final Data Processing

- i. The final data processing such as the sound velocity correction and tidal reduction for sounding data will be carried out in each of the littoral countries following the completion of survey works in their designated Group Areas.
- ii. After that, final track charts and sounding charts will be developed by a computer and a flat-bed plotter.
- iii. Finally, smooth sheet for each survey area will be prepared on plastic film. Digital data equivalent to smooth sheets and ENC database covering six sheets of common datum charts in the Straits of Malacca and Singapore will also be prepared. The production of ENC database will be carried out in accordance with the International Standards and Specifications for ENC "IHO S57 Version 3".

8. FINAL RESULTS

8.1 Main final survey results of the Study as a part of the Final Report will be as follows:

- i. Control Point Survey
 - a. List of Control Points
 - b. Description of Control Points
 - c. Location Map of Control Points

- ii. Sounding and Search
 - a. Echograms
 - b. Records of Side Scan Sonar
 - c. Positioning Data of Survey Launches
 - d. Track Charts (Scale 1:20,000)
 - e. Sounding Charts (Scale 1:20,000)

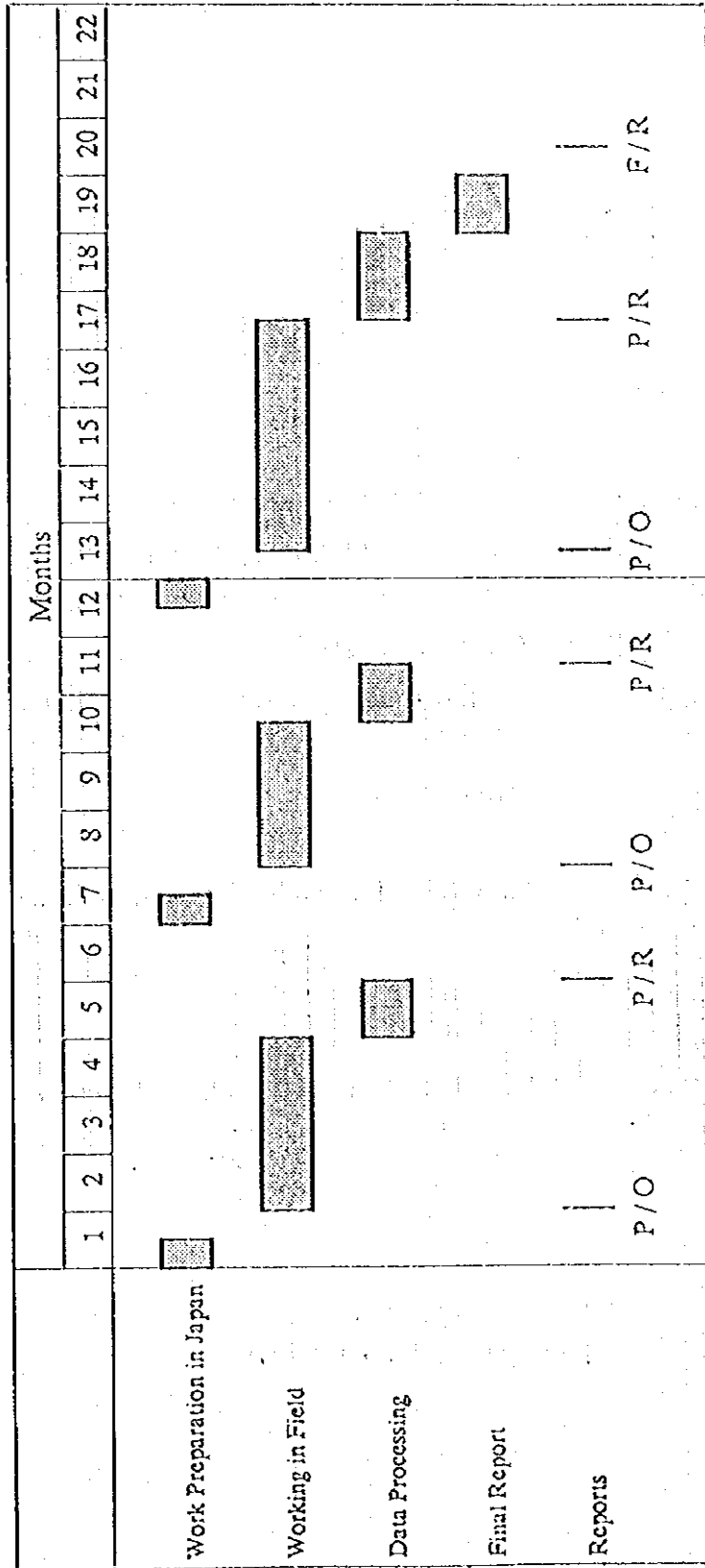
- iii. Tidal Observation
 - a. Records of Tidal Observation
 - b. Tidal Diagrams

- iv. Smooth Sheets
 - a. Smooth Sheets (Scale 1:20,000)

- v. Digital Data and ENC database
 - a. Floppy Disk of Digital Data
 - b. ENC database on six common charts

APPENDIX V
STUDY SCHEDULE

STUDY SCHEDULE



P/O : Plan of Operation
 P/R : Progress Report
 F/R : Final Report

COPY

M/M

**REPORT OF THE
MEETING OF THE FOUR NATION
JOINT RE-SURVEY OF CRITICAL AREAS AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED
SHOALS AND WRECKS
IN THE STRAITS OF MALACCA AND SINGAPORE**

BETWEEN

THE GOVERNMENTS OF INDONESIA, MALAYSIA, SINGAPORE

AND

JAPAN INTERNATIONAL COOPERATION AGENCY
THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN

**27 - 28 MAY 1996
SEREMBAN, MALAYSIA**

LETTER OF TRANSMITTAL

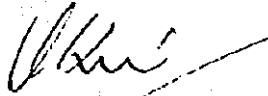
LETTER OF TRANSMITTAL

**MEETING OF THE FOUR NATION JOINT
RE-SURVEY OF CRITICAL AREAS AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED SHOALS AND WRECKS
IN THE STRAITS OF MALACCA AND SINGAPORE
BETWEEN
THE GOVERNMENTS OF INDONESIA, MALAYSIA, SINGAPORE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY
THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN**

27 - 28 MAY 1996

The Meeting of The Four Nation Joint Re-Survey of Critical Areas and Investigation of Dangerous/Unconfirmed Shoals and Wrecks in The Straits of Malacca and Singapore Between the Governments of Indonesia, Malaysia, Singapore and Japan International Cooperation Agency the Technical Cooperation Implementation Arm of the Government of Japan hereby submits its Reports as attached.

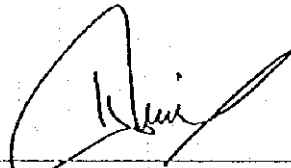
Dated this 28th day of May, 1996.



O.C. PHANG
Head of the Malaysian Delegation



CAPTAIN SYAHWIN HAMID
Head of the Indonesian Delegation



CAPTAIN WILSON CHUA
Head of the Singaporean Delegation



DR. YASUHIRO GANEKO
Head of the Japanese Delegation

**MEETING OF THE FOUR NATION
JOINT RE-SURVEY OF CRITICAL AREAS AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED
SHOALS AND WRECKS IN THE STRAITS OF MALACCA AND SINGAPORE
BETWEEN
THE GOVERNMENTS OF INDONESIA, MALAYSIA, SINGAPORE
AND
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THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN**

CONTENTS

1. Report of the Meeting of the Four Nations Joint Re-survey of Critical Areas and Investigation of Dangerous/Unconfirmed Shoals and Wrecks in the Straits of Malacca and Singapore Between the Governments of Indonesia, Malaysia, Singapore and Japan International Cooperation Agency the Technical Cooperation Implementation Arm of the Government of Japan, 27 - 28 May 1996, Seremban, Malaysia.
2. Annexes
 - A : List of Delegates
 - B : Agenda
 - C : Draft Scope of Work Submitted By The Government of Japan
 - D : Revised and Final Draft Scope of Work

**REPORT OF THE
MEETING OF THE FOUR NATION
JOINT RE-SURVEY OF CRITICAL AREAS AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED
SHOALS AND WRECKS
IN THE STRAITS OF MALACCA AND SINGAPORE**

BETWEEN

THE GOVERNMENTS OF INDONESIA, MALAYSIA, SINGAPORE

AND

JAPAN INTERNATIONAL COOPERATION AGENCY
THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN

**27 - 28 MAY 1996
SEREMBAN, MALAYSIA**

**REPORT OF THE MEETING OF
THE FOUR NATION JOINT RE-SURVEY OF CRITICAL AREAS AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED SHOALS AND WRECKS
IN THE STRAITS OF MALACCA AND SINGAPORE BETWEEN
THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
THE GOVERNMENT OF MALAYSIA
THE GOVERNMENT OF THE REPUBLIC OF SINGAPORE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY
THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN**

27 - 28 MAY 1996

INTRODUCTION

1. A meeting of the Four Nation Joint Re-Survey of Critical Areas and Investigation of Dangerous/Unconfirmed Shoals and Wrecks in the Straits of Malacca and Singapore between the Governments of Indonesia, Malaysia, Singapore and Japan International Cooperation Agency, the official agency responsible for the implementation of technical cooperation programmes of the Government of Japan, was held in Seremban, Malaysia on 27 - 28 May 1996.
2. The Meeting was attended by delegates from Indonesia, Malaysia, Singapore and Japan. The list of delegates appears as Annex A.

WELCOME REMARKS

3. The Head of the Malaysian delegation welcomed the delegates from Indonesia, Singapore and Japan to Seremban.

ELECTION OF CHAIRMAN AND VICE-CHAIRMAN

4. Mdm. O.C Phang, Head of the Malaysian delegation was unanimously elected Chairman of the Meeting.
5. Captain Wilson Chua, Head of the Singapore delegation was unanimously elected Vice-Chairman of the Meeting.

ADOPTION OF AGENDA

6. The Meeting adopted the Agenda which appears as Annex B.

BUSINESS ARRANGEMENTS

7. The Meeting discussed all agenda items in Plenary.

SCOPE OF WORK

8. The Meeting discussed the draft Scope of Work submitted by the Preparatory Study Team (1st) which appears as Annex C. The revised Scope of Work incorporating the decisions of the Meeting appears as Annex D.

8.1 Title of Project

- i. The Meeting agreed to revise the title of the Project to "The Four Nation Joint Re-Survey of Critical Areas and Investigation of Dangerous/Unconfirmed Shoals and Wrecks in the Straits of Malacca and Singapore".

8.2 Allotment of Survey Groups

- i. The Meeting agreed on the allotment of Group Areas to the respective Littoral States for Study as follows:-
 - a) Group Areas 2 and 4 to Malaysia;
 - b) Group Areas 1 and 3 to Indonesia;
 - c) Sub-Areas E and F and point (h) in Group Area 5 to Indonesia;
 - d) Remaining Sub-Areas and points in Group Area 5 to Singapore;and

- e) Group Area 6 to Singapore.

8.3 Government Representative

- i. The three Littoral States took note that there may be some cost involved in the participation of representatives from the Littoral States in the respective joint re-survey operations and final data processing.

8.4 Scope of the Study

- i. The Meeting agreed to amend paragraph (f) of the Scope of the Study to read as follows:-

"Based on the result of surveys smooth sheet shall be prepared on plastic films. The scale of the smooth sheets shall be 1 : 20,000"

- ii. The Meeting agreed to add a new item to the Scope of the Study regarding preparation of electronic navigational chart database as follows:-

"g) Preparation of Electronic Navigational Chart (ENC) Database.

The Electronic Navigational Chart (ENC) Database covering the six sheets of common datum chart of the Straits of Malacca and Singapore shall be prepared. The approval of each of the three littoral states must be obtained for the release of any ENC for commercial use"

8.5 Reports and Final Results

- i. The Meeting agreed to amend the paragraphs on reports and final result to read as follows:-

"VII. Reports and Final Results

JICA shall prepare and submit the following reports in English to the Governments of Indonesia, Malaysia and Singapore. The date of submission of each report is dependent on the Study Schedule.

a. Reports

(1) Plan of Operation

Eighty (80) copies shall be prepared at the commencement of the Study. Twenty (20) copies are to be submitted to each Government.

(2) Progress Report

Eighty (80) copies shall be prepared after every survey. Twenty (20) copies are to be submitted to each Government.

(3) Final Report

Eighty (80) copies shall be prepared upon the completion of the Study. Twenty (20) copies are to be submitted to each Government.

b. Smooth Sheets

Four (4) sets of each area shall be prepared. One set is to be submitted to each Government.

c. Digital data and ENC Database

Four (4) sets of each area shall be prepared. One set is to be submitted to each Government. Digital data will include ENC database covering six sheets of common datum charts of the Straits of Malacca and Singapore.

d. Raw Data

The raw data including echograms, side scan sonar records and tidal observations shall be kept by the respective Littoral States after the completion of final data processing. However, any Littoral State may request raw data of any area relevant to each state.

e. Other Data

Other survey and observation data results shall be prepared throughout the Study."

8.6 Undertakings of the Government of the Littoral States

- i. The Malaysian delegation explained that with regard to paragraph VIII 4, the counterpart agency for Malaysia is the Marine Department Peninsular Malaysia.
- ii. The Meeting agreed that the provision for the supply of appropriate number of vehicles with drivers is on the need basis.

8.7 Specification of Survey

- i. The Meeting agreed that the production of ENC database will be carried out in accordance with the International Standards and Specifications for ENC " IHO S57 Version 3".

COUNTERPART TRAINING

9. The three Littoral States requested counterpart training in the relevant fields such as ENC and DGPS technology. The Japanese delegation responded that this request would be conveyed to the JICA Headquarters for consideration.

SURVEY EQUIPMENT

10. The delegations of the three Littoral States requested that survey equipment used for the Study be donated to the respective counterpart agency for future use in ensuring the safety of navigation in the Straits of Malacca and Singapore. The Japanese delegation responded that this request would be conveyed to the JICA Headquarters for consideration.

SURVEY PROGRAMME

11. The Meeting was informed by the Japanese delegation that the Study will probably commence in October 1996 and will take 21 months to complete.
12. The three Littoral States strongly requested that the Study be conducted as soon as possible to meet the schedule of the proposed review of the traffic separation scheme in the Straits of Malacca and Singapore which had been submitted to the International Maritime Organization.

OTHER MATTERS

13. There were no items discussed under this agenda item.

ADOPTION OF REPORT

14. The Meeting considered and adopted the Report.

ACKNOWLEDGEMENT

15. The delegations from Indonesia, Singapore and Japan expressed their sincere appreciation to the host country for the hospitality extended to them and the excellent arrangements made for the Meeting.
16. The Meeting was held in the traditional spirit of goodwill and mutual understanding.

ANNEX A
LIST OF DELEGATES

INDONESIA

1. CAPT. SYAHWIN HAMID
Director of Navigation
Directorate General of Sea Communication
Ministry of Communications

2. CAPT. ASNAR SITOMPUL
Head
District of Navigation
Sibolga Office
DGSC, MINCOM

3. IR. A. TONY BUDIONO
Chief
Navigational Survey Section
Directorate of Navigation
DGSC, MINCOM

MALAYSIA

1. MDM. O.C. PHANG
Undersecretary
Maritime Division
Ministry of Transport
2. MR. ABDULLAH YUSUFF BASIRON
Principal Assistant Secretary
Maritime Division
Ministry of Transport
3. CAPT. AHMAD OTHMAN
Acting Director
Safety of Navigation Division
Marine Department Peninsular Malaysia
4. MR. ZULKURNAIN AYUB
Director of Marine Southern Region
Marine Department Peninsular Malaysia

SINGAPORE

1. CAPT. WILSON CHUA
Hydrographer
Maritime and Port Authority of Singapore
2. CAPT. CHNG LOY TEOH
Dy Controller
Port Operations Control
Maritime and Port Authority of Singapore
3. MR. CHEW CHEE MUN
Dy Hydrographer
Maritime and Port Authority of Singapore
4. MRS. PEGGY KOH
Cartographer
Maritime and Port Authority of Singapore

JAPAN

1. DR. YASUHIRO GANEKO
Director
Planning Division
Hydrographic Department
Maritime Safety Agency
2. MR. HIROYUKI KAWANO
Official
Development Cooperation Division
Economy Cooperation Bureau
Ministry of Foreign Affairs
3. MR. SHOICHI KOKUTA
Senior Coastal Survey Officer
Coastal Survey and Cartographic Division
Hydrographic Department
Maritime Safety Agency
4. MR. MASAHIRO ONO
Staff
First Development Division
Social Development Study Department
Japan International Cooperation Agency
5. MR. MASAYOSHI HIRAO
Deputy Director
Research and Development Division
Japan Hydrographic Association
6. MR. MAMORU UEDA
2nd Secretary
Embassy of Japan
Kuala Lumpur
7. MR. YOSHIKAZU YAMADA
Deputy Resident Representative
Japan International Cooperation Agency
Malaysia Office

SECRETARIAT

1. MR. ROSLEE MAT YUSOF
2. CAPT. HOO KWONG FOOK
3. MS. ZALEHA MOHAMED
4. MR. MOHD. SOM MOHD. AMIL
5. MR. MOHD ZAKIA @ YAHYA MAHMUD
6. MS. NORSAPAHATI EMBONG
7. MR. NOORASIKIN ABDUL SHUKOR
8. MR. SHAIFUL AMRAN AMIR
9. MR. PANEERSELVAM GOVINDAN

ANNEX B

AGENDA

**MEETING OF THE FOUR NATIONS JOINT
RE-SURVEY OF CRITICAL AREAS AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED SHOALS AND WRECKS
IN THE STRAITS OF MALACCA AND SINGAPORE
BETWEEN
THE GOVERNMENTS OF INDONESIA, MALAYSIA, SINGAPORE
AND
THE GOVERNMENT OF JAPAN**

**27 - 28 MAY 1996
SEREMBAN, MALAYSIA**

1. Introduction
2. Election of Chairman and Vice Chairman
3. Adoption of Agenda
4. Business Arrangements
5. Scope of Work
6. Counterpart Trainings
7. Survey Equipment
8. Survey Programme
9. Other Matters
10. Consideration and Adoption of Report

ANNEX C
DRAFT SCOPE OF WORK SUBMITTED BY
THE GOVERNMENT OF JAPAN

DRAFT
SCOPE OF WORK
FOR
THE RE-SURVEY OF CRITICAL AREAS
AND
INVESTIGATION OF DANGEROUS / UNCONFIRMED
SHOALS AND WRECKS
IN
THE STRAITS OF MALACCA AND SINGAPORE
AGREED UPON BETWEEN
THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
THE GOVERNMENT OF MALAYSIA
THE GOVERNMENT OF THE REPUBLIC OF SINGAPORE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

, 1996

Directorate General of Sea Communication
Ministry of Communication
Government of Indonesia

Maritime Division
Ministry of Transport
Government of Malaysia

Hydrographic Department
Maritime and Port Authority of Singapore
Ministry of Communication
Government of Singapore

Leader
Preparatory Study Team
Japan International
Cooperation Agency

I. Introduction

In response to the request of the Government of the Republic of Indonesia (hereinafter referred to as "the Government of Indonesia"), the Government of Malaysia and the Government of the Republic of Singapore (hereinafter referred to as "the Government of Singapore"), the Government of Japan has decided to conduct the Re-Survey of Critical Areas and Investigation of Dangerous / Unconfirmed Shoals and Wrecks in the Straits of Malacca and Singapore (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study in close relation with the authorities concerned of the Governments of Indonesia, Malaysia and Singapore.

The present document sets forth the scope of work with regard to the Study.

II. Objective of the Study

The objectives of the Study is to conduct hydrographic survey of critical areas including the investigation of dangerous/unconfirmed shoals and wrecks for the promotion of maritime safety in the Straits of Malacca and Singapore.

III. Study Area

Study shall cover 25 areas in the Straits of Malacca and Singapore, details of which are attached as Appendix I and the map attached as Appendix II. The total areas to be surveyed will be approximately 780 square kilometers.

The Study Areas are divided into 6 Group Areas shown in Appendix III. Each littoral Governments shall be designated Group Areas and undertake to take necessary measures to facilitate smooth conduct of the Study in connection with their designated Group Areas. The Group Areas designated to each littoral Governments and their order of implementation priority are as follows:

- a) Group Area 2 to the Government of Malaysia;
- b) Group Area 4 to the Government of Malaysia;
- c) Group Area 1 to the Government of Indonesia;

- d) Group Area 3 to the Government of Indonesia;
- e) Sub-Areas E and F and point (h) in Group Area 5 to the Government of Indonesia;
- f) Remaining Sub-Areas E and F and point (h) in Group Area 5 to the Government of Singapore;
- g) Group Area 6 to the Government of Singapore

IV. Government Representative

In Group Area designated to a littoral Government, a representative from each of the other two littoral Governments shall also be present throughout the Study.

During final data processing conducted at a littoral state, three representatives from each of the other two littoral Governments shall also be present.

V. Scope of the Study

In order to achieve the objective mentioned above, the Study shall cover the following items;

a) Horizontal Control Survey

Based on the existing control points available for the Study, new points necessary for sounding operation shall be determined by Global Positioning System (GPS) observation.

b) Tidal observation

In order to determine the chart datum level for tidal reduction of soundings, tide stations and temporary tide poles shall be established in appropriate locations.

c) Sounding (Search)

Sounding (Search) operation shall be carried out by using precise four-beam echo sounders with side scan sonars. The standard interval between lines of sounding is 200m. However for the investigation of shoals and wrecks the sounding interval shall be closer.

d) Positioning fixing

Positioning of sounding shall be determined by Differential Global Positioning System (DGPS).

e) Data Processing

Preliminary data processing of survey data shall be carried out in the field. Any dangerous shoals or wrecks detected shall be promulgated to all vessels by radio

broadcast as soon as possible and subsequently by Notices to Mariners. Final data processing of survey data shall be carried out in each of the littoral Government following completion of the Study in their designated Group Areas.

f) Preparation of smooth sheets

Based on the result of surveys, smooth sheets shall be prepared on plastic films. The scale of the smooth sheets shall be 1:20,000. Digital data equivalent to smooth sheets and Electronic Navigational Chart (ENC) Database covering six sheets of common charts in the Straits shall distributed to each of the four countries.

g) Specifications of the Study

The specifications of the Study are listed in Appendix IV.

VI. Study Schedule

The Study shall be conducted in accordance with the Tentative Schedule attached as Appendix V.

VII. Reports and final results

JICA shall prepare and submit the following reports containing the final results in English to the Governments of Indonesia, Malaysia and Singapore. The date of submission of each report may change according to the Study Schedule.

The raw data including echograms, side scan sonar records and tidal observations shall be kept by the respective Littoral States after the completion of final data processing. However any Littoral States may request for the raw data of any area relevant to each State.

1. Reports

(1) Plan of Operation

Eighty (80) copies in English to be prepared at the commencement of the Study. Twenty (20) copies are to be submitted to each government.

(2) Progress Report

Eighty (80) copies to be prepared after every surveys of each government. Twenty (20) copies are to be submitted to each government.

(3) Final Report

Eighty (80) copies to be prepared upon the completion of the Study. Twenty (20) copies are to be submitted to

each government.

2. Smooth Sheets

Four (4) sets of each area to be prepared. One set is to be submitted to each government.

3. Digital data and ENC database

Four (4) sets of each area to be prepared. One set is to be submitted to each government. Digital data will include ENC database covering six sheets of common charts in the Straits.

4. Other survey and observation data results prepared throughout the Study.

VIII. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

1. To facilitate smooth conduct of the Study, the government of Malaysia shall take necessary measures;

(1) to inform the members of the Study team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study team,

(2) to ensure the necessary entry permits for the Study team to conduct field surveys in Malaysia and exempt them from consular fees,

(3) to exempt the members of the Study team from taxes and duties, as normally accorded under the provision of Malaysian General Circular No. 1 of 1979, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study,

(4) to exempt the members of the Study team from income tax on their official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study, but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources,

(5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into Malaysia from Japan in connection with the implementation of the Study,

(6) to secure permission for entry into private properties or restricted area for the implementation of the Study,

(7) to make arrangements for the Study team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia, in order to prepare the reports,

(8) to provide the Study team with medical services when needed but the expenses will be chargeable to the members of the Study Team,

(9) to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.

2. The government of Malaysia shall indemnify any member of the Study team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or willful misconduct.

3. The government of Malaysia shall coordinate the three littoral countries in respect of the Study.

4. Ministry of Transport (hereinafter referred to as "MOT") shall act as counterpart agency to the Japanese study team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.

5. MOT shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned:

- (1) available data and information related to the Study,
- (2) counterpart personnel,
- (3) mother vessel for survey with crew including fuel expense.
- (4) supervisor to the survey
- (5) suitable office space with office equipment in Kuala Lumpur and the base of the mother vessel,
- (6) credentials or identification cards, and
- (7) appropriate number of vehicles with drivers

IX. UNDERTAKINGS OF THE GOVERNMENT OF INDONESIA

1. To facilitate smooth conduct of the Study, the Government of Indonesia shall take necessary measures;

- (1) to inform the members of the Study team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study team,
- (2) to permit the members of the Japanese study team to enter, leave and sojourn in Indonesia for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,
- (3) to exempt the members of the Japanese study team from

taxes, duties and other charges on equipment, machinery, vehicles and other materials brought into Indonesia for the conduct of the Study,

(4) to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study,

(5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into Indonesia from Japan in connection with the implementation of the Study,

(6) to secure permission for entry into private properties or restricted area for the implementation of the Study,

(7) to make arrangements for the Study team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Indonesia, in order to prepare the reports,

(8) to provide medical services as needed. Its expenses will be chargeable on members of the Japanese study team,

(9) to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.

2. The government of Indonesia shall indemnify any member of the Study team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or willful misconduct.

3. Directorate General of Sea Communication (hereinafter referred to as "DGSC") shall act as counterpart agency to the Japanese study team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.

4. DGSC shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned:

(1) available data and information related to the Study,

(2) counterpart personnel,

(3) mother vessel for survey with crew including fuel expense

(4) supervisor to the survey

(5) suitable office space with office equipment in Jakarta or at the base of mother vessel,

(6) credentials or identification cards, and

(7) appropriate number of vehicles with drivers

X. UNDERTAKINGS OF THE GOVERNMENT OF SINGAPORE

1. To facilitate smooth conduct of the Study, the Government of Singapore shall take necessary measures;

(1) to inform the members of the Study team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study team,

(2) to permit the members of the Japanese study team to enter, leave and sojourn in Singapore for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,

(3) to exempt the members of the Japanese study team from taxes, duties and other charges on equipment, machinery, vehicles and other materials brought into Singapore for the conduct of the Study,

(4) to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study,

(5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into Singapore from Japan in connection with the implementation of the Study,

(6) to secure permission for entry into private properties or restricted area for the implementation of the Study,

(7) to secure permission for the Japanese study team to take all data and documents (including maps, photographs) related to the Study out of Singapore to Japan,

(8) to provide medical services as needed. Its expenses will be chargeable on members of the Japanese study team,

(9) to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.

2. The government of Singapore shall bear claims, if any arises, against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.

3. Maritime and Port Authority of Singapore (hereinafter referred to as "MPA") shall act as counterpart agency to the Japanese study team and also as coordinating body in

relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.

4. MPA shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned:

- (1) available data and information related to the Study,
- (2) counterpart personnel,
- (3) mother vessel for survey with crew including fuel expense.
- (4) Supervisor to the survey
- (5) suitable office space with office equipment in Singapore,
- (6) credentials or identification cards, and
- (7) appropriate number of vehicles with drivers

XI. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures;

- (1) to dispatch, at its own expense, study team to Indonesia, Malaysia and Singapore,
- (2) to pursue technology transfer to the counterpart personnel in the course of study.
- (3) to hire survey boat and vehicles for positioning at the expense of JICA

XII. AUTHORIZATION

Each of the Government shall update official nautical charts published as the final results and data obtained under the Study.

And consideration that the final results and data obtained under the Study will be adopted for production of and/or updating official nautical charts published by the hydrographic offices concerned and from the viewpoints of ensuring the safety of navigation using these nautical charts in the Straits, the result and data of hydrographic surveys carried out under the Study shall be verified and authorized by the relevant Japanese authority.

XIII. CONSULTATION

JICA and MOT of Malaysia (Coordinator of the three littoral Governments) shall consult with each other in respect of any matter that may arise from or in connection with the Study.

SPECIFICATIONS OF SURVEY

1. HYDROGRAPHIC SURVEY STANDARDS

The International Hydrographic Organization (IHO) Standards for Hydrographic Surveys ; the Forth Edition of SP-44 shall be applied to the hydrographic surveying to be carried out under the Study. The minimum standard for the Study shall be of second Order to the IHO Specification SP-44.

2. COORDINATES AND DATUM LEVEL

The reference coordinates and ellipsoid, projection and chart datum level to be used for the study will be as follows;

- 1) Reference coordinates and ellipsoid : WGS-84 DATUM
- 2) Projection : Transverse Mercator (TM) Projection
- 3) Origin of coordinates : Center of each survey area
- 4) Chart Datum Level : Lowest Astronomical Tide (LAT)

3. HORIZONTAL CONTROL POINT SURVEY

3-1 Survey Method

Based on the existing horizontal control points available for the Study, new horizontal points necessary for sounding operations shall be determined by a static method using Differential Global Positioning System (DGPS).

3-2 Control Points

New horizontal control points to be established for reference stations of DGPS at Rukit Jugra Lighthouse, Cape Rachado Lighthouse, One Fathom Bank Lighthouse and at other locations as necessary.

4. SOUNDING AND SEARCH

4-1 Survey Method

The sounding and search operations will be carried out by using precise four-beam echo sounders and a side scan sonar. The standard interval between sounding lines is 200 meters. For detailed identification of shoals and wrecks, sounding lines will be intensified to ensure full ensonification of the features. Digital data of the hydrographic survey will also be acquired.

4-2 Correction of Sounding Data

The correction of sounding data will be made for the sound velocity in sea water by a bar-check method or sound speed correction table and for the tidal reduction by tidal heights observed.

4-3 Positioning System

The position of survey launch will be determined by a Real-Time Differential Global Positioning System.

5. TIDAL OBSERVATION

In order to determine the chart datum level and make the tidal reduction to sounding data, temporary tide stations using digital type tide gauges and/or tide poles will be set at the following locations:

5-1	One Fathom Bank	-	Area A, Points (j), (k) and (l)
5-2	Tanjung Gabang	-	Area B
5-3	Port Dickson	-	Area C and Point (f)
5-4	Cape Rachado	-	Areas J, K and Point (g)
5-5	Beting Medang Lt. Bn	-	Point (a)
5-6	Pulau Undan	-	Area D and Point (m)
5-7	Tanjung Segenting	-	Area L, Points (b) and (c)
5-8	Pulau Kukup	-	Area E, Points (d), (h) and (i)
5-9	Raffles Island	-	Areas F, G, H and Point (e)
5-10	Tanjung Ayam	-	Area I

The relation between a temporary tide station and/or a tide pole and new bench marks will be determined by a direct leveling using the nearest existing bench marks.

For determination of Chart Datum (D.L) in each survey area, tidal harmonic constants and other results obtained during the tidal study carried out by Japan and three littoral countries in the Straits of Malacca and Singapore from 1977 to 1979 will be used. The sum of four main tidal components in tidal harmonic constants is Z0. Therefore, $D.L = \text{Mean Sea Level} - Z0$. The time difference for tide and height ratio in each survey area will also be calculated from the above results.

The long-term mean sea level of a temporary tide station will be obtained by comparing its short-term mean sea level with the mean sea level of the same period at the standard tidal station.

6. BOTTOM SAMPLING

The bottom sampling using a hand-lead and/or a tube dredge will be carried out at about 300 meters interval only near the shoals and patches in each sounding area for discrimination of its bottom characteristics.

7. DATA PROCESSING

7-1 Preliminary Data Processing

Initial data processing shall be carried out in the field by the following procedures;

- 1) To store the positioning and sounding data with time/date in floppy disks on the survey launch.
- 2) To develop preliminary track charts to confirm the coverage

of the survey areas by a computer and a plotter on the survey vessel (mother vessel).

- 3) To interpret side scan sonar records to search and confirm shoals and wrecks.
- 4) To develop preliminary sounding charts to confirm the shapes and positions of shoals and wrecks by a computer and a plotter on the survey vessel.
- 5) To choose detailed survey area to confirm the precise position and the shallowest depth on the survey vessel.

7-2 Final Data Processing

The final data processing such as the sound velocity correction and tidal reduction for sounding data will be carried out in each of the littoral countries following the completion of survey works in their designated Group Areas.

After that, final track charts and sounding charts will be developed by a computer and a flat-bed plotter.

Finally, smooth sheet for each survey area will be prepared on plastic film. Digital data equivalent to smooth sheets and ENC database covering six sheets of common charts in the Straits will also be prepared. The production of ENC database will be carried out with the international standards and specifications for ENC (IMO S-57).

8. FINAL RESULTS

Main final survey results of the Study as a part of the Final Report will be as follows:

- 1) Control Point Survey
 - a) List of Control Points
 - b) Description of Control Points
 - c) Location Map of Control Points
- 2) Sounding and Search
 - a) Echograms
 - b) Records of Side Scan Sonar
 - c) Positioning Data of Survey Launches
 - d) Track Charts (Scale 1:20,000)
 - e) Sounding Charts (Scale 1:20,000)
- 3) Tidal Observation
 - a) Records of Tidal Observation
 - b) Tidal Diagrams
- 4) Smooth Sheets
 - a) Smooth Sheets (Scale 1:20,000)
- 5) Digital Data and ENC database
 - a) Floppy Disk of Digital Data
 - b) ENC Database on six common charts

ANNEX D
REVISED AND FINAL DRAFT OF
SCOPE OF WORK

DRAFT
SCOPE OF WORK
FOR
THE FOUR NATION JOINT RE-SURVEY OF CRITICAL AREAS
AND
INVESTIGATION OF DANGEROUS/UNCONFIRMED
SHOALS AND WRECKS
IN
THE STRAITS OF MALACCA AND SINGAPORE
AGREED UPON BETWEEN
THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
THE GOVERNMENT OF MALAYSIA
THE GOVERNMENT OF THE REPUBLIC OF SINGAPORE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY
THE TECHNICAL COOPERATION IMPLEMENTATION ARM OF THE
GOVERNMENT OF JAPAN

Signed on 28 MAY 1996 at Seremban, MALAYSIA.

for Directorate General of Sea Communication
Ministry of Communications
Republic of Indonesia

for Ministry of Transport
Malaysia

for Maritime and Port Authority of Singapore
Republic of Singapore

Leader
Preparatory Study Team
Japan International Cooperation Agency

1. INTRODUCTION

- 1.1 In response to the request of the Government of the Republic of Indonesia (hereinafter referred to as "the Government of Indonesia"), the Government of Malaysia and the Government of the Republic of Singapore (hereinafter referred to as "the Government of Singapore"), the Government of Japan has decided to conduct jointly with the Littoral States the Re-Survey of Critical Areas and Investigation of Dangerous/Unconfirmed shoals and Wrecks in the Straits of Malacca and Singapore (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.
- 1.2 Accordingly, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study in close relation with the authorities concerned of the Governments of Indonesia, Malaysia and Singapore.
- 1.3 This document sets forth the scope of work with regard to the Study.

2. OBJECTIVE OF THE STUDY

- 2.1 The objective of the Study is to conduct hydrographic survey of critical areas including the investigation of dangerous/unconfirmed shoals and wrecks for the promotion of maritime safety in the Straits of Malacca and Singapore.

3. STUDY AREA

- 3.1 The Study shall cover 25 survey areas and points in the Straits of Malacca and Singapore, details of which are attached as Appendix I and the map attached as Appendix II. The total area to be surveyed is approximately 780 square kilometers.
- 3.2 The Study Areas are divided into 6 Group Areas shown in Appendix III. Each Littoral Government shall be assigned Group Areas and undertake to take necessary measures to facilitate smooth conduct of the Study in connection with their designated Group Areas. The Group Areas assigned to each Littoral Government and the order of implementation priority are as follows:
 - i) Group Area 2 to the Government of Malaysia;
 - ii) Group Area 4 to the Government of Malaysia;
 - iii) Group Area 1 to the Government of Indonesia;
 - iv) Group Area 3 to the Government of Indonesia;
 - v) Sub-Areas E and F and point (h) in Group Area 5 to the Government of Indonesia;
 - vi) Remaining Sub-Areas and points in Group Area 5 to the Government of Singapore;
 - vii) Group Area 6 to the Government of Singapore;

4. GOVERNMENT REPRESENTATIVE

- 4.1 In any Group Area assigned to a Littoral Government, a representative from each of the other two Littoral Governments shall also be present throughout the Study. The representative will be rotated on a monthly basis.
- 4.2 During final data processing conducted at a Littoral State, three representatives from each of the other two Littoral Governments shall also be present.

5. SCOPE OF THE STUDY

- 5.1 In order to meet the objective, the Study shall cover the following items;

i) Horizontal Control Survey

Based on the existing control points available for the Study, new points necessary for sounding operation shall be determined by Global Positioning System (GPS) observation.

ii) Tidal Observation

In order to determine the chart datum level for tidal reduction of soundings, tide stations and temporary tide poles shall be established in appropriate locations.

iii) Sounding (Search)

Sounding (Search) operation shall be carried out by using precise four-beam echo sounders with side scan sonars. The standard interval between lines of sounding is 200 meters. However, for the investigation of shoals and wrecks the sounding interval shall be closer.

iv) Position Fixing

Positioning of sounding shall be determined by Differential Global Positioning System (DGPS).

v) Data Processing

Preliminary data processing shall be carried out in the field. Any dangerous shoals or wrecks detected shall be promulgated to all vessels by radio broadcast as soon as possible and subsequently by Notices to Mariners. Final data processing shall be carried out in each of the Littoral Government following completion of the Study in their designated Group Areas.

vi) Preparation of Smooth Sheets

Based on the result of surveys, smooth sheets shall be prepared on plastic films. The scale of the smooth sheets shall be 1:20,000.

vii) Preparation of Electronic Navigational Charts (ENC) Database

The Electronic Navigational Charts (ENC) database covering the six sheets of common datum charts of the Straits of Malacca and Singapore shall be prepared. The approval of each of the Littoral States must be obtained for the release of any ENC for commercial use.

viii) Specifications of the Study

The specifications of the Study are listed in Appendix IV.

6. STUDY SCHEDULE

6.1 The Study shall be conducted in accordance with the Tentative Schedule attached as Appendix V.

7. REPORTS AND FINAL RESULTS

7.1 JICA shall prepare and submit the following reports in English to the Governments of Indonesia, Malaysia and Singapore. The date of submission of each report is dependent on the Study Schedule.

i. Reports

(a) Plan of Operation

Eighty (80) copies shall be prepared at the commencement of the Study. Twenty (20) copies are to be submitted to each Government.

(b) Progress Report

Eighty (80) copies shall be prepared after every survey of each Government. Twenty (20) copies are to be submitted to each Government.

(c) Final Report

Eighty (80) copies shall be prepared upon the completion of the Study. Twenty (20) copies are to be submitted to each Government.

ii. Smooth Sheets

Four (4) sets of each area shall be prepared. One set is to be submitted to each Government.

iii. Digital data and ENC Database

Four (4) sets of each area shall be prepared. One set is to be submitted to each Government. Digital data will include ENC database covering six sheets of common datum charts of the Straits of Malacca and Singapore.

iv. Raw Data

The raw data including echograms, side scan sonar records and tidal observations shall be kept by the respective Littoral States after the completion of final data processing. However, any Littoral State may request raw data of any area relevant to each state.

v. Other Data

Other survey and observation data results shall be prepared throughout the Study.

8. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

8.1 To facilitate smooth conduct of the Study, the Government of Malaysia shall take necessary measures;

- i. to inform the members of the Study Team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study Team,
- ii. to ensure the necessary entry permits for the Study Team to conduct field surveys in Malaysia and exempt them from consular fees,
- iii. to exempt the members of the Study Team from taxes and duties, as normally accorded under the provision of the relevant Malaysian rules and regulations, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study,
- iv. to exempt the members of the Study Team from income tax on their official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study, but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources,
- v. to provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into Malaysia from Japan in connection with the implementation of the Study,
- vi. to secure permission for entry into private properties or restricted area for the implementation of the Study,

- vii. to make arrangements for the Study Team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia, in order to prepare the reports,
 - viii. to provide the Study Team with medical services when needed but the expenses will be chargeable to the members of the Study Team,
 - ix. to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.
- 8.2 The Government of Malaysia shall indemnify any member of the Study Team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- 8.3 The Government of Malaysia shall coordinate the three Littoral countries in respect of the Study.
- 8.4 Ministry of Transport (hereinafter referred to as "MOT") shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.
- 8.5 MOT shall, at its own expense, provide the Japanese Study Team with the following, in cooperation with other organizations concerned;
- i. available data and information related to the Study,
 - ii. counterpart personnel,
 - iii. mother vessel for survey with crew including fuel expense,
 - iv. supervisor to the survey,
 - v. suitable office space with office equipment in Kuala Lumpur or at the base of the mother vessel,
 - vi. credentials or identification cards, and
 - vii. appropriate number of vehicles with drivers.

9. UNDERTAKINGS OF THE GOVERNMENT OF INDONESIA

- 9.1 To facilitate smooth conduct of the Study, the Government of Indonesia shall take necessary measures;
- i. to inform the members of the Study Team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study Team,
 - ii. to permit the members of the Japanese Study Team to enter, leave and sojourn in Indonesia for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,

- iii. to exempt the members of the Japanese Study Team from taxes, duties and other charges on equipment, machinery, vehicles and other materials brought into Indonesia for the conduct of the Study,
 - iv. to exempt the members of the Japanese Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese Study Team for their services in connection with the implementation of the Study,
 - v. to provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into Indonesia from Japan in connection with the implementation of the Study,
 - vi. to secure permission for entry into private properties or restricted area for the implementation of the study,
 - vii. to make arrangements for the Japanese Study Team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Indonesia, in order to prepare the reports,
 - viii. to provide medical services as needed. Its expenses will be chargeable to members of the Japanese Study Team,
 - ix. to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.
- 9.2 The Government of Indonesia shall indemnify any member of the Study Team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- 9.3 Directorate General of Sea Communication (hereinafter referred to as "DGSC") shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.
- 9.4 DGSC shall, at its own expense, provide the Japanese Study Team with the following, in cooperation with other organizations concerned:
- i. available data and information related to the Study,
 - ii. counterpart personnel,
 - iii. mother vessel for survey with crew including fuel expense,
 - iv. supervisor to the survey,
 - v. suitable office space with office equipment in Jakarta or at the base of the mother vessel,
 - vi. credentials or identification cards, and
 - vii. appropriate number of vehicles with drivers.

10. UNDERTAKINGS OF THE GOVERNMENT OF SINGAPORE

10.1 To facilitate smooth conduct of the Study, the Government of Singapore shall take necessary measures;

- i. to inform the members of the Study Team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study Team,
- ii. to permit the members of the Japanese Study Team to enter, leave and sojourn in Singapore for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,
- iii. to exempt the members of the Japanese Study Team from taxes, duties and other charges on equipment, machinery, vehicles and other materials brought into Singapore for the conduct of the Study,
- iv. to exempt the members of the Japanese Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese Study Team for their services in connection with the implementation of the Study,
- v. to provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into Singapore from Japan in connection with the implementation of the Study,
- vi. to secure permission for entry into private properties or restricted area for the implementation of the Study,
- vii. to secure permission for the Japanese Study Team to take all data and documents (including maps, photographs) related to the Study out of Singapore to Japan,
- viii. to provide medical services as needed. Its expenses will be chargeable to members of the Japanese Study Team,
- ix. to secure permission to use telecommunication facilities introduced from Japan for the execution of the field survey.

10.2 The Government of Singapore shall bear claims, if any arises, against the members of the Japanese Study Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or wilful misconduct on the part of the members of the Japanese Study Team.

10.3 Maritime and Port Authority of Singapore (hereinafter referred to as "MPA") shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organization concerned for the smooth implementation of the Study.

10.4 MPA shall, at its own expense, provide the Japanese Study Team with the following, in cooperation with other organizations concerned:

- i. available data and information related to the study,
- ii. counterpart personnel,
- iii. mother vessel for survey with crew including fuel expense,
- iv. supervisor to the survey,
- v. suitable office space with office equipment in Singapore,
- vi. credentials or identification cards, and
- vii. appropriate number of vehicles with drivers.

11. UNDERTAKINGS OF JICA

11.1 For the implementation of the Study, JICA shall take the following measures:

- i. to despatch, at its own expense, Study Team to Indonesia, Malaysia and Singapore.
- ii. to pursue technology transfer to the counterpart personnel in the course of the Study.
- iii. to hire survey boat and vehicles for positioning at the expense of JICA.

12. AUTHORIZATION

12.1 Each of the Government shall update its official nautical charts based on the final results and data obtained under the Study.

12.2 Considering that the final results and data obtained under the Study will be adopted for production of and/or updating official nautical charts published by the hydrographic offices concerned and in order to ensure the safety of navigation using these nautical charts in the Straits, the result and data of hydrographic surveys carried out under the Study shall be verified and authorized by the relevant Japanese authority.

13. CONSULTATION

13.1 JICA and MOT of Malaysia (Coordinator of the three Littoral Governments) shall consult with each other in respect of any matter that may arise or in connection with the Study.

APPENDIX I

LIST OF STUDY AREAS / POINTS

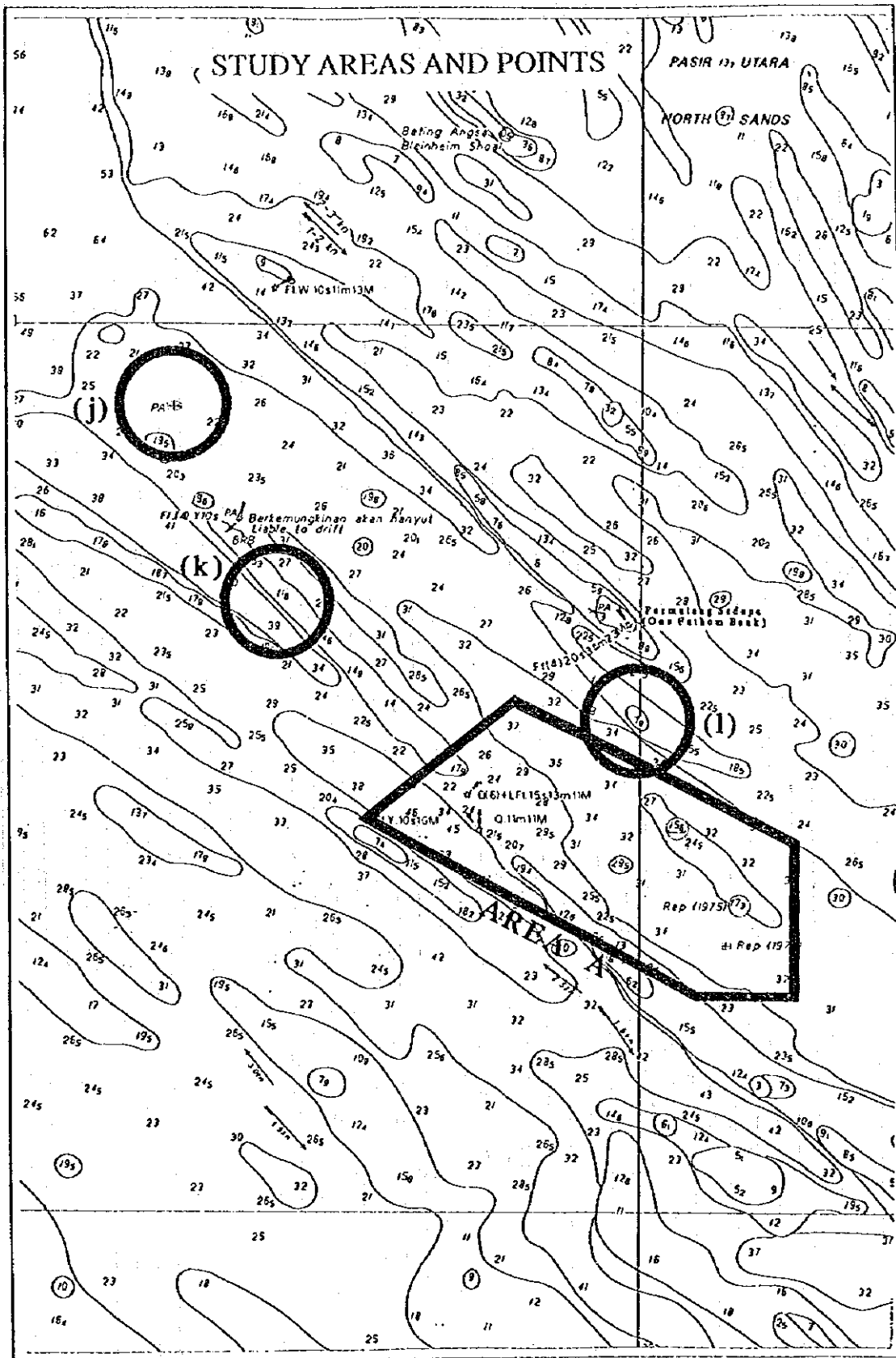
LIST OF STUDY AREAS/POINTS

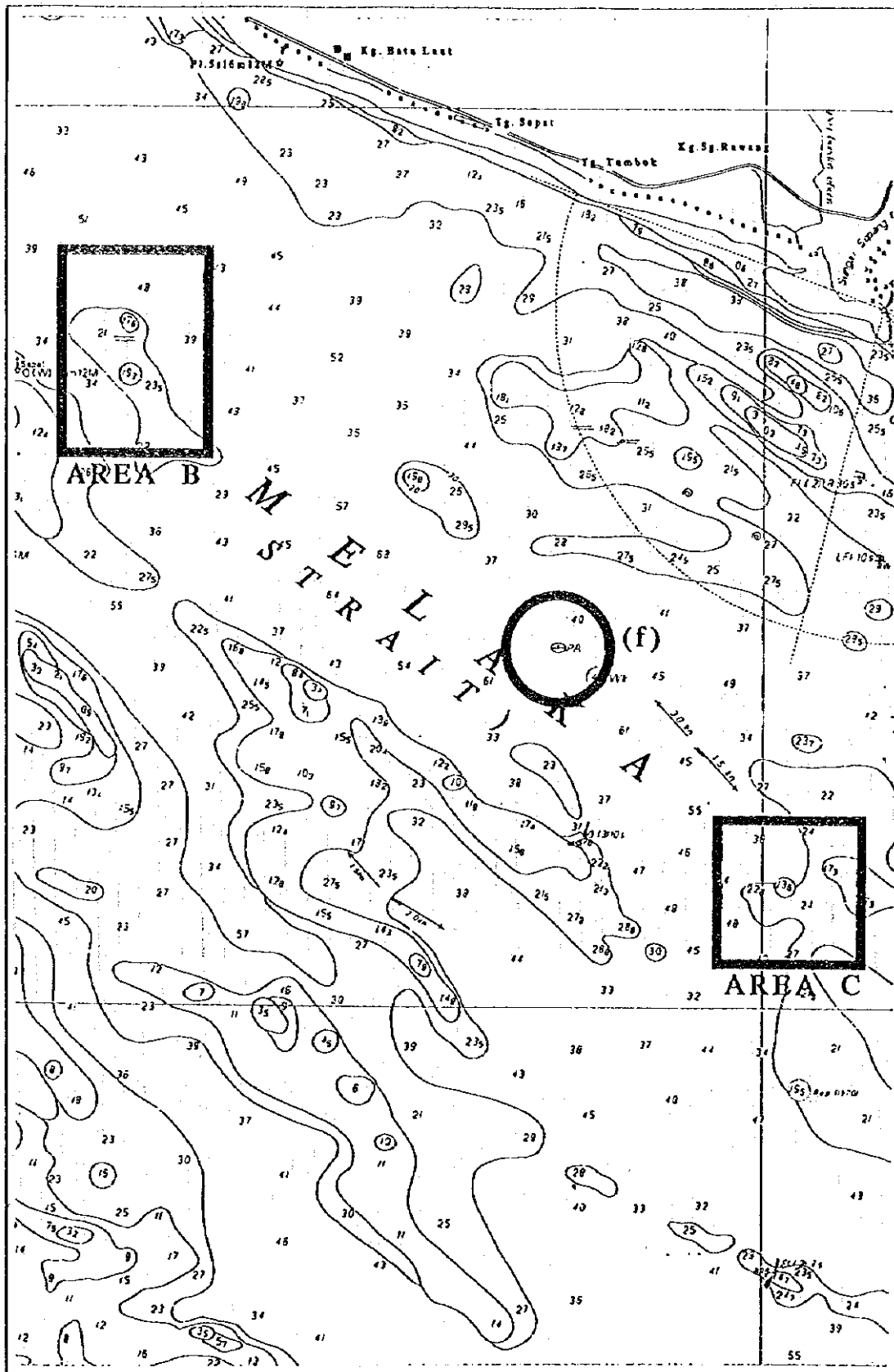
Areas/Point	Position	Subject	Remarks
A	(a) 02° 51'.4 N 100° 57'.2 E	Wreck/shoal and sand wave areas	(1) 02° 48'.7 N 101° 00'.8 E
	(b) 02° 48'.3 N 101° 03'.4 E		(2) 02° 47'.0 N 101° 02'.1 E
	(c) 02° 45'.0 N 101° 03'.4 E		(3) 02° 46'.0 N 101° 02'.1 E
	(d) 02° 45'.0 N 101° 01'.3 E		
	(e) 02° 48'.9 N 100° 54'.1 E		
B	(a) 02° 36'.7 N 101° 24'.4 E	Shoal	(4) 02° 35'.2 N 101° 25'.9 E
	(b) 02° 36'.7 N 101° 27'.5 E		(5) 02° 33'.9 N 101° 26'.0 E
	(c) 02° 32'.4 N 101° 27'.5 E		
	(d) 02° 32'.4 N 101° 24'.4 E		
C	(a) 02° 24'.1 N 101° 39'.1 E	Shoal	(6) 02° 22'.6 N 101° 40'.6 E
	(b) 02° 24'.1 N 101° 42'.1 E		
	(c) 02° 21'.1 N 101° 42'.1 E		
	(d) 02° 21'.1 N 101° 39'.1 E		
D	(a) 01° 57'.6 N 102° 12'.6 E	Wreck	(7) 01° 56'.1 N 102° 14'.1 E
	(b) 01° 57'.6 N 102° 16'.9 E		(8) 01° 55'.5 N 102° 15'.4 E
	(c) 01° 54'.0 N 102° 16'.9 E		
	(d) 01° 54'.0 N 102° 12'.6 E		
E	(a) 01° 13'.3 N 103° 24'.3 E	Wreck	(9) 01° 11'.8 N 103° 25'.9 E
	(b) 01° 13'.3 N 103° 27'.4 E		(10) 01° 10'.8 N 103° 25'.8 E
	(c) 01° 09'.3 N 103° 27'.4 E		
	(d) 01° 09'.3 N 103° 24'.3 E		

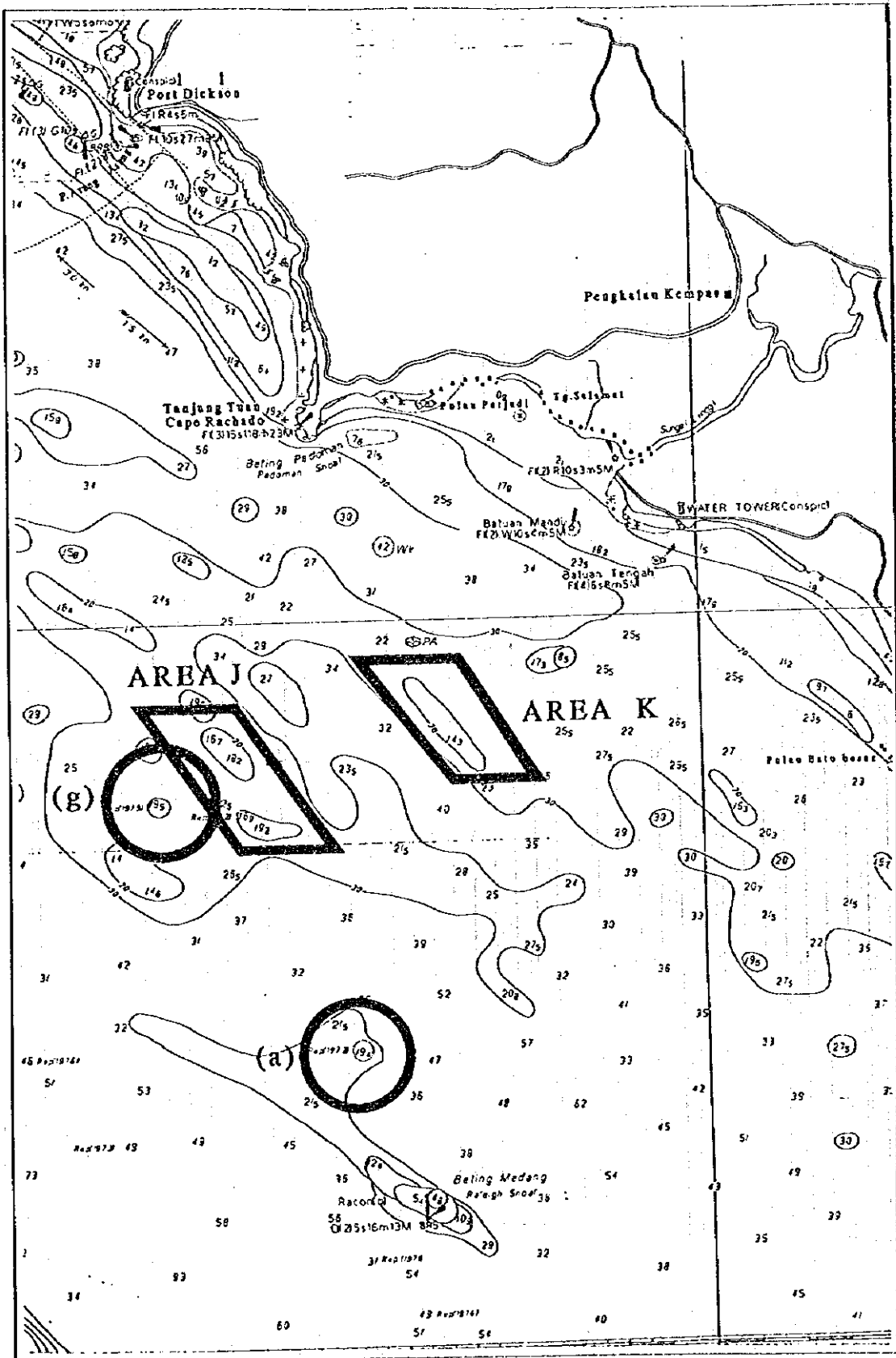
Areas/Point	Position	Subject	Remarks
F	(a) 01° 06'.7 N 103° 40'.6 E (b) 01° 06'.7 N 103° 43'.6 E (c) 01° 03'.7 N 103° 43'.6 E (d) 01° 03'.7 N 103° 40'.6 E	Wreck	(11) 01° 05'.2 N 103° 42'.1 E
G	(a) 01° 09'.1 N 103° 43'.9 E (b) 01° 09'.1 N 103° 46'.9 E (c) 01° 06'.1 N 103° 46'.9 E (d) 01° 06'.1 N 103° 43'.9 E	Wreck	(12) 01° 07'.6 N 103° 45'.4 E
H	(a) 01° 12'.0 N 103° 47'.4 E (b) 01° 12'.0 N 103° 50'.4 E (c) 01° 09'.0 N 103° 50'.4 E (d) 01° 09'.0 N 103° 47'.4 E	Danger	(13) 01° 10'.5 N 103° 48'.9 E
I	(a) 01° 17'.5 N 104° 13'.5 E (b) 01° 17'.5 N 104° 16'.5 E (c) 01° 14'.5 N 104° 16'.5 E (d) 01° 14'.5 N 104° 13'.5 E	Wreck	(14) 01° 16'.0 N 104° 15'.0 E
J	(1) 02° 17'.4 N 101° 49'.0 E (2) 02° 15'.6 N 101° 49'.6 E	Shoals	
K	02° 17'.2 N 101° 54'.2 E	Shoal	

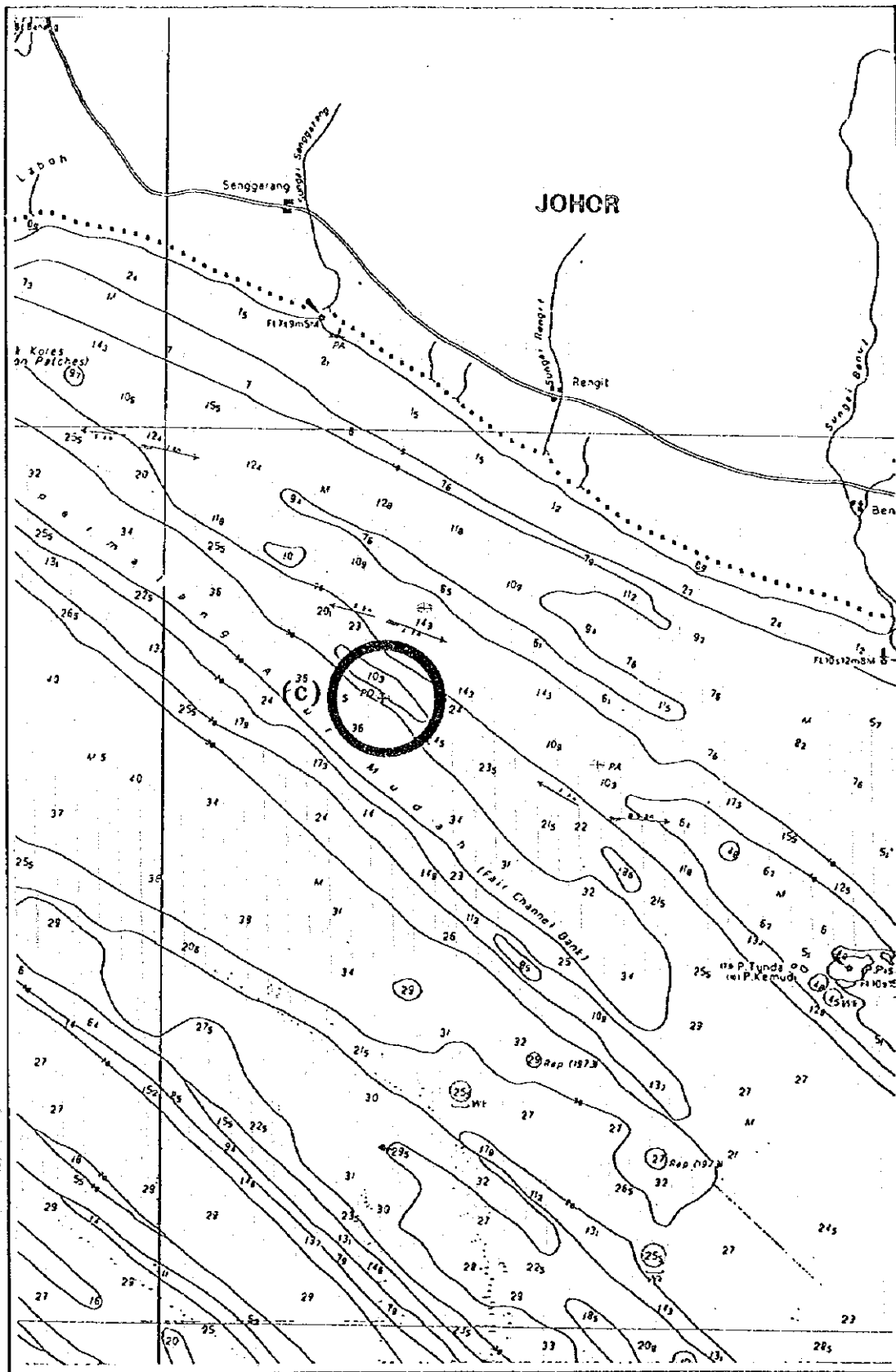
Areas/Point	Position	Subject	Remarks
L	(a) 01° 46'.2 N 102° 42'.8 E (b) 01° 42'.6 N 102° 50'.0 E (c) 01° 42'.0 N 102° 49'.8 E (d) 01° 45'.8 N 102° 42'.6 E	Shoal	
a	02° 10'.2 N 101° 52'.0 E	Shoal	
b	01° 46'.4 N 102° 43'.3 E	Wreck	
c	01° 34'.0 N 103° 05'.0 E	Wreck	
d	01° 12'.2 N 103° 34'.3 E	Wreck	
e	01° 07'.4 N 103° 44'.2 E	Wreck	
f	02° 28'.0 N 101° 35'.4 E	Wreck	
g	02° 16'.0 N 101° 47'.7 E	Shoal	
h	01° 15'.8 N 103° 19'.8 E	Wreck	
i	01° 11'.1 N 103° 33'.0 E	Wreck	
j	02° 58'.2 N 100° 49'.5 E	Wreck	
k	02° 53'.9 N 100° 52'.0 E	Shoal	
l	02° 51'.1 N 101° 00'.0 E	Shoal	
m	01° 59'.3 N 102° 12'.4 E	Wreck	

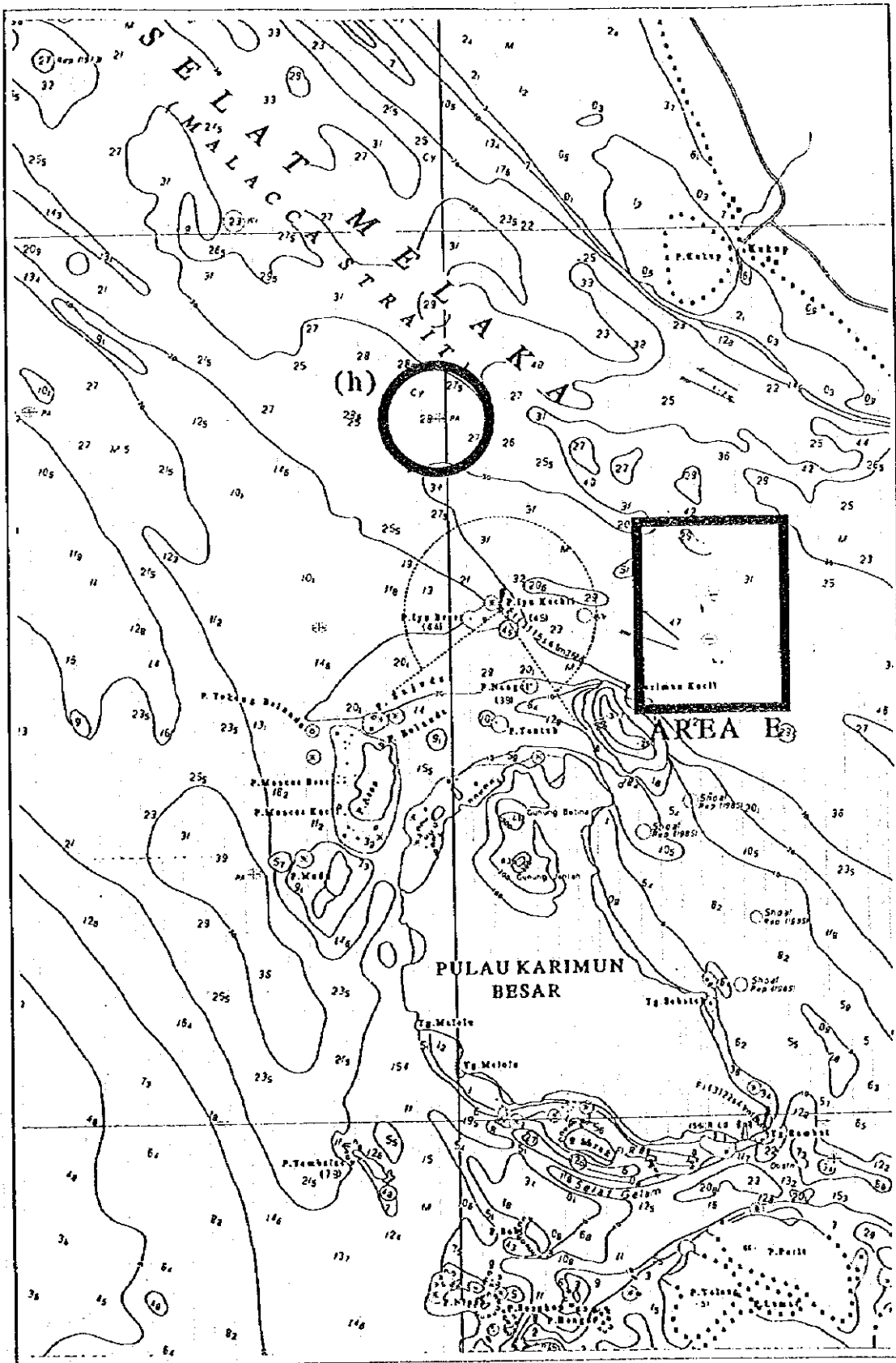
APPENDIX II
MAP OF STUDY AREAS / POINTS









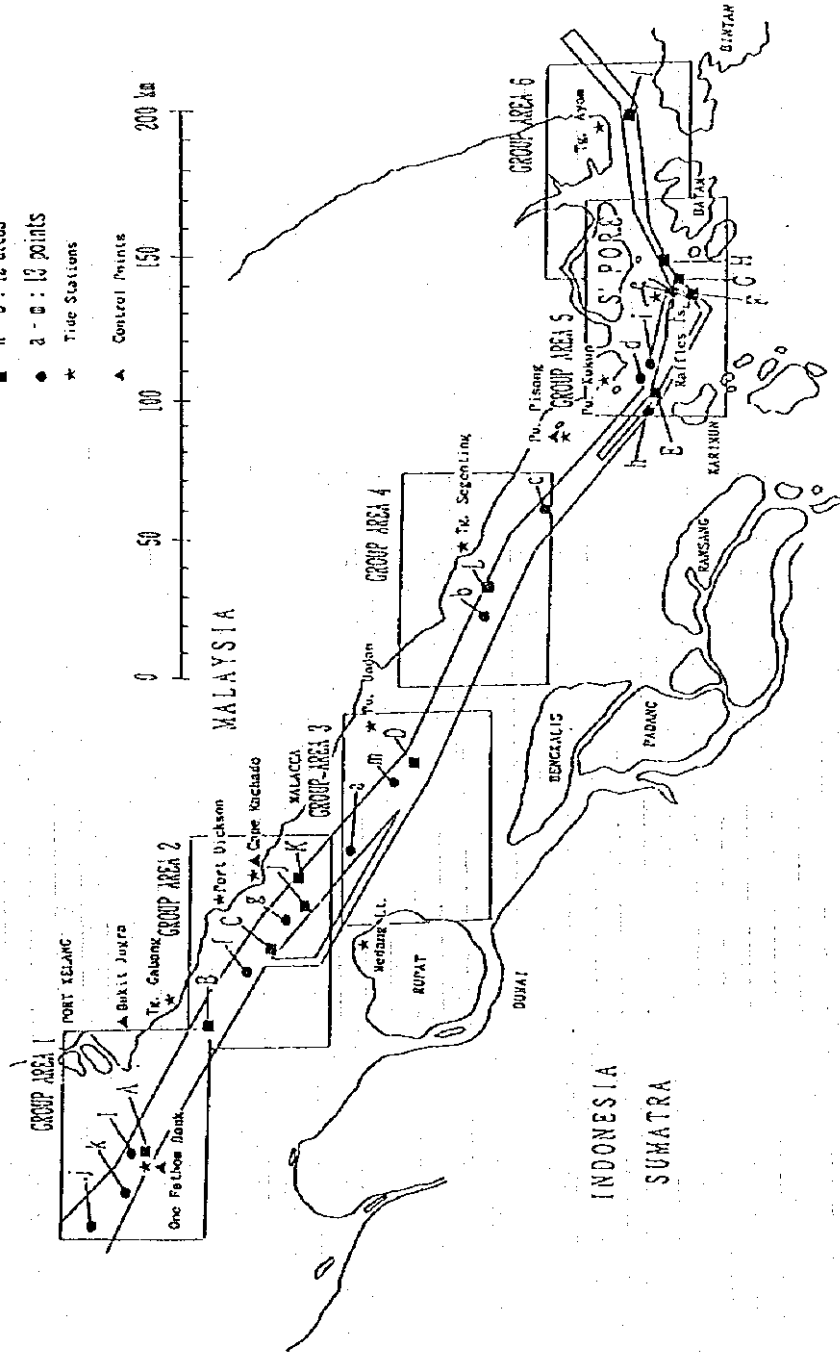


APPENDIX III
GROUP AREAS OF STUDY

GROUP AREAS OF STUDY

INDEX

- 1 - 6 : 12 areas
- 7 - 12 : 12 points
- ★ Tide Stations
- ▲ Control Points



APPENDIX IV
SPECIFICATIONS OF SURVEY

SPECIFICATIONS OF SURVEY

1. HYDROGRAPHIC SURVEY STANDARDS

- 1.1 The International Hydrographic Organization (IHO) Standards for Hydrographic Survey : the Fourth Edition of SP-44 shall be applied to the hydrographic surveying to be carried out under the Study. The minimum standard for the Study shall be of Second Order to the IHO Specification SP-44.

2. COORDINATES AND DATUM LEVEL

- 2.1 The reference coordinates and ellipsoid, projection and chart datum level to be used for the Study will be as follows:

- i. Reference coordinates and ellipsoid : WGS-84 DATUM
- ii. Projection : Transverse Mercator (TM) Projection
- iii. Origin of coordinates : Center of each survey area
- iv. Chart Datum Level : Lowest Astronomical Tide (LAT)

3. CONTROL POINT SURVEY

3.1 Survey Method

Based on the existing horizontal control points available for the Study, new horizontal points necessary for sounding operations shall be determined by a static method using Differential Global Positioning System (DGPS).

3.2 Control Points

New horizontal control points to be established for reference stations of DGPS at Bukit Jugra Lighthouse, Cape Rachado Lighthouse, One Fathom Bank Lighthouse and at other locations as necessary.

4. SOUNDING AND SEARCH

- 4.1 The sounding and search operations will be carried out by using precise four-beam echo sounders and a side scan sonar. The standard interval between sounding lines is 200 meters. For detailed identification of shoals and wrecks, sounding lines will be intensified to ensure full ensonification of the features. Digital data of the hydrographic survey will also be acquired.

4.2 Correction of Sounding Data

The correction of sounding data will be made for the sound velocity in sea water by a bar-check method or sound speed correction table and for the tidal reduction by tidal heights observed.

4.3 Positioning System

The position of survey launch will be determined by a Real-Time Differential Global Positioning System.

5. TIDAL OBSERVATION

5.1 In order to determine the chart datum level and make the tidal reduction to sounding data, temporary tide stations using digital type tide gauges and/or tide poles will be set at the following locations:

i.	One Fathom Bank	-	Area A, Points (j), (k) and (l)
ii.	Tanjung Gabang	-	Area B
iii.	Port Dickson	-	Area C and Point (f)
iv.	Cape Rachado	-	Areas J, K and Point (g)
v.	Beting Medang Lt. Bn	-	Point (a)
vi.	Pulau Undan	-	Area D and Point (m)
vii.	Tanjung Segenting	-	Area L, Points (b) and (c)
viii.	Pulau Kukup	-	Area E, Points (d), (h) and (i)
ix.	Raffles Island	-	Areas F, G, H and Point (e)
x.	Tanjung Ayam	-	Area I

5.2 The relation between a temporary tide station and/or a tide station and/or a tide pole and new bench marks will be determined by direct levelling using the nearest existing bench marks.

5.3 For determination of Chart Datum (DL) in each survey area, tidal harmonic constants and other results obtained during the tidal study carried out by Japan and three littoral countries in the Straits of Malacca and Singapore from 1977 to 1979 will be used. The sum of four main tidal components in tidal harmonic constants is ZO. Therefore, D.L - Mean Sea Level - ZO. The time difference for tide and height ratio in each survey area will also be calculated from the above results.

5.4 The long-term mean sea level of a temporary tide station will be obtained by comparing its short-term mean sea level with the mean sea level of the same period at the standard tidal station.

6. BOTTOM SAMPLING

6.1 The bottom sampling using a hand-lead and/or a tube dredge will be carried out at about 300 meters interval only near the shoals and patches in each sounding area for discrimination of its bottom characteristics.

7. DATA PROCESSING

7.1 Preliminary Data Processing

Initial data processing shall be carried out in the field by the following procedures:

- i. To store the positioning and sounding data with time/date in floppy disks on the survey launch.
- ii. To develop preliminary track charts to confirm the coverage of the survey areas by a computer and a plotter on the survey vessel (mother vessel).
- iii. To interpret side scan sonar records to search and confirm shoals and wrecks.
- iv. To develop preliminary sounding charts to confirm the shapes and positions of shoals and wrecks by a computer and a plotter on the survey vessel.
- v. To choose detailed survey area to confirm the precise position and the shallowest depth on the survey vessel.

7.2 Final Data Processing

- i. The final data processing such as the sound velocity correction and tidal reduction for sounding data will be carried out in each of the littoral countries following the completion of survey works in their designated Group Areas.
- ii. After that, final track charts and sounding charts will be developed by a computer and a flat-bed plotter.
- iii. Finally, smooth sheet for each survey area will be prepared on plastic film. Digital data equivalent to smooth sheets and ENC database covering six sheets of common datum charts in the Straits of Malacca and Singapore will also be prepared. The production of ENC database will be carried out in accordance with the International Standards and Specifications for ENC "IHO S57 Version 3".

8. FINAL RESULTS

8.1 Main final survey results of the Study as a part of the Final Report will be as follows:

- i. Control Point Survey
 - a. List of Control Points
 - b. Description of Control Points
 - c. Location Map of Control Points

- ii. Sounding and Search
 - a. Echograms
 - b. Records of Side Scan Sonar
 - c. Positioning Data of Survey Launches
 - d. Track Charts (Scale 1:20,000)
 - e. Sounding Charts (Scale 1:20,000)

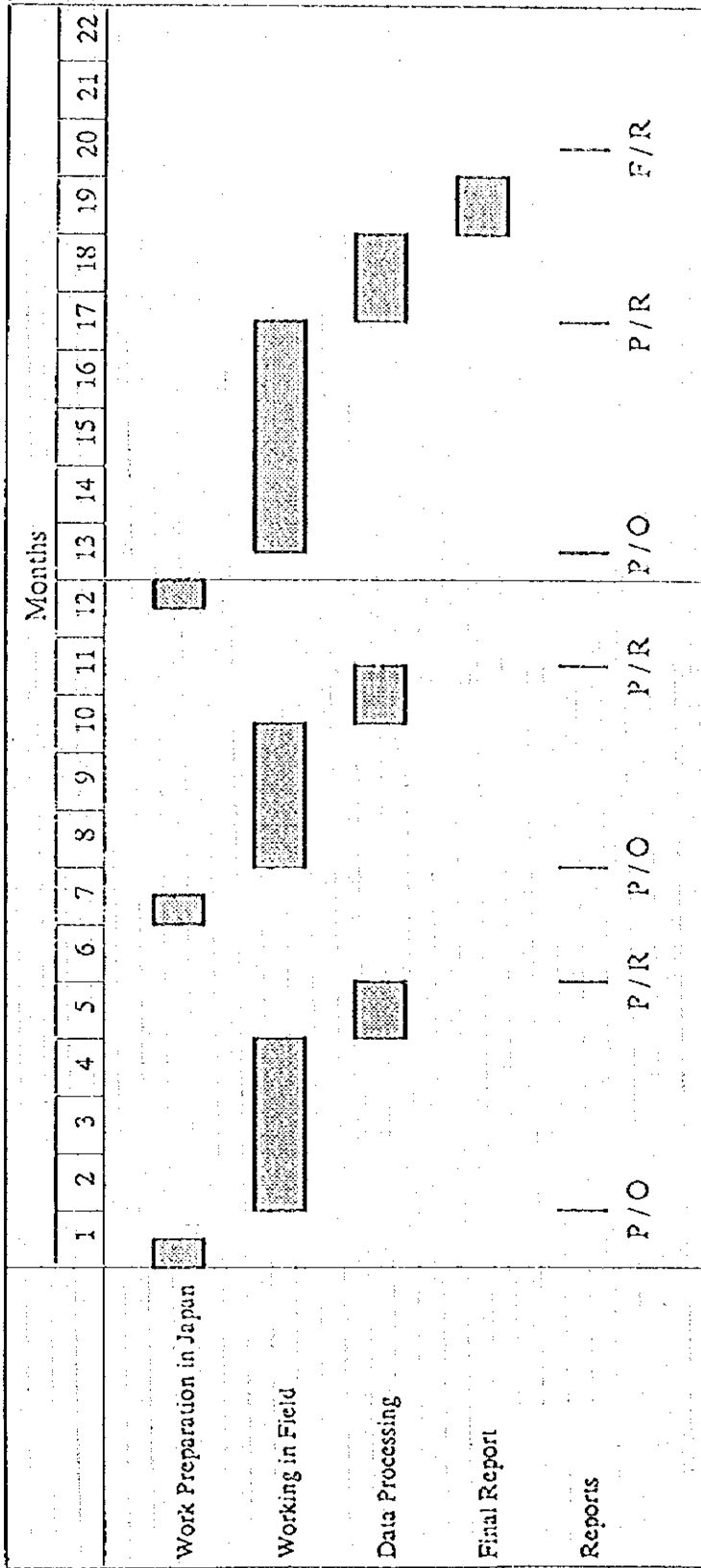
- iii. Tidal Observation
 - a. Records of Tidal Observation
 - b. Tidal Diagrams

- iv. Smooth Sheets
 - a. Smooth Sheets (Scale 1:20,000)

- v. Digital Data and ENC database
 - a. Floppy Disk of Digital Data
 - b. ENC database on six common charts

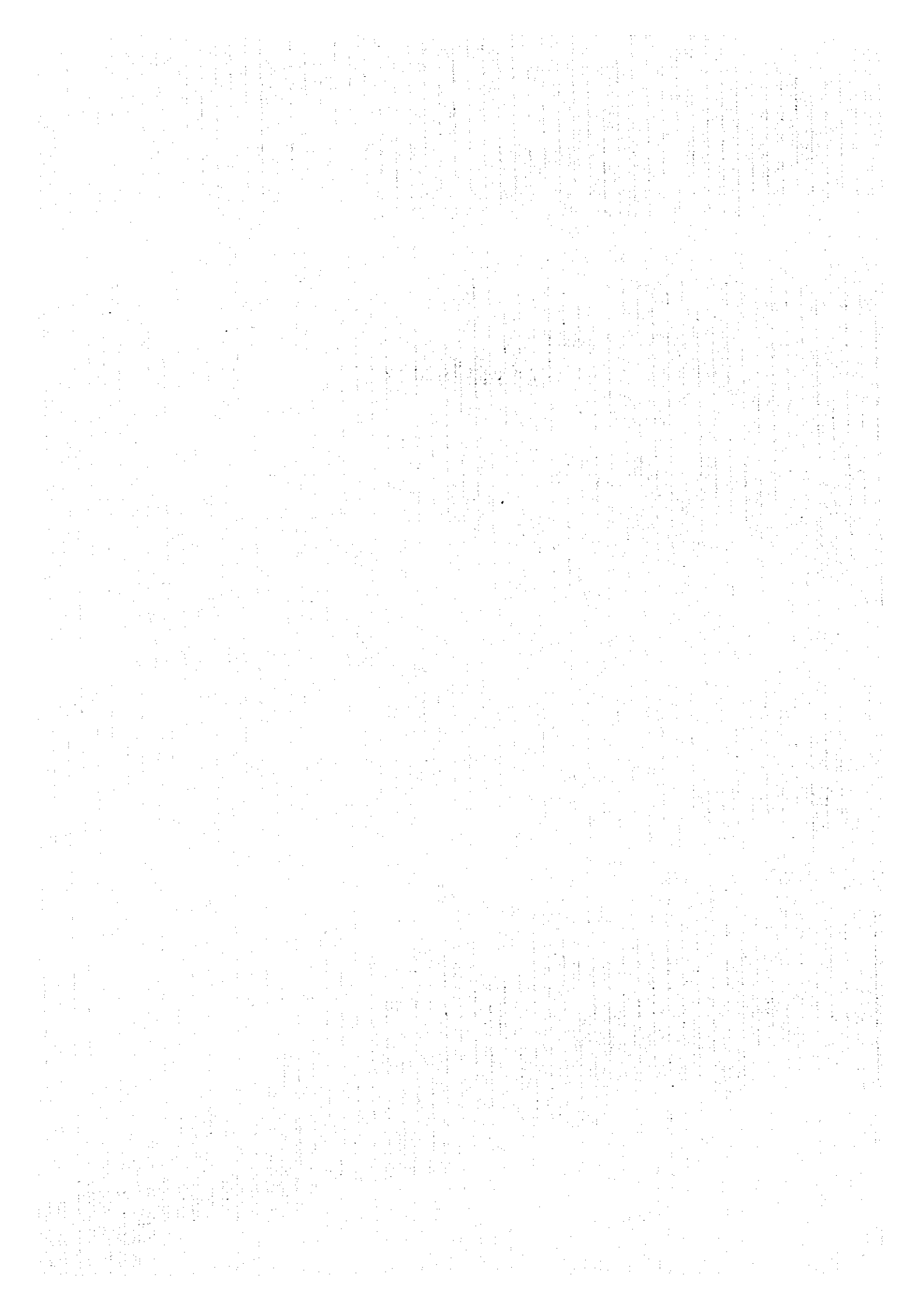
APPENDIX V
STUDY SCHEDULE

STUDY SCHEDULE



P/O : Plan of Operation
 P/R : Progress Report
 F/R : Final Report

収集資料リスト



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