4-3-2 Short Term Plan

(1) Development Plan

1) Visual Aids to Navigation

(A) Number of Visual Aids to be Developed

According to the development schedule of the Long Term Plan formulated in Section 4-3-1, (1), 1), (E) of this study, the Short Term Plan for development of lighted aids to navigation is as given below:

The plan also includes the number of lights to be implemented in the on-going projects.

Type of Navaids	No. of Units
Lighthouse on land	69 (35)
Lighthouse off shore	2 (-)
Light beacon (incl. harbour lights)	131 (81)
RLB	8*
Lighted buoys	249 (222)
Total	459 (338)

Note: 1) * does not include 4 RLB's for Malacca/Singapore Straits.
2) ( ) shows the number of units included in on-going projects.

a) Coastal Aids and Navigational Dangers

The site selection for lighthouses (on land), lighthouses (off shore), light beacons for off shore and navigation dangers is made according to their higher priority evaluated based on the selection criteria given in Section 4-3-1, (1), 1), (B).

b) Harbour Light and Lighted Buoy

As regards harbour lights, priority is given to the port development plan in the Gateway system, and some other ports are also included in the plan.

The short term development plans both for light beacons for harbour lights and for lighted buoys are made as shown in **Table 4-3-2-(1)/1** and **Table 4-3-2-(1)/2.**

Table 4-3-2-(1)/1 Short Term Development Plan for Light Beacons for Harbour Lights

Category of Port	No. of Lights	Remarks
Gateway	12	60% of Total plan (20)
Collector	16	40% of Total plan (42)
Trunk	7	30% of Total plan (25)
Others	11	15% of Total plan (71)
Total	46	(158)

Notes: ( ) shows the number of units planned in the Long Term Plan.

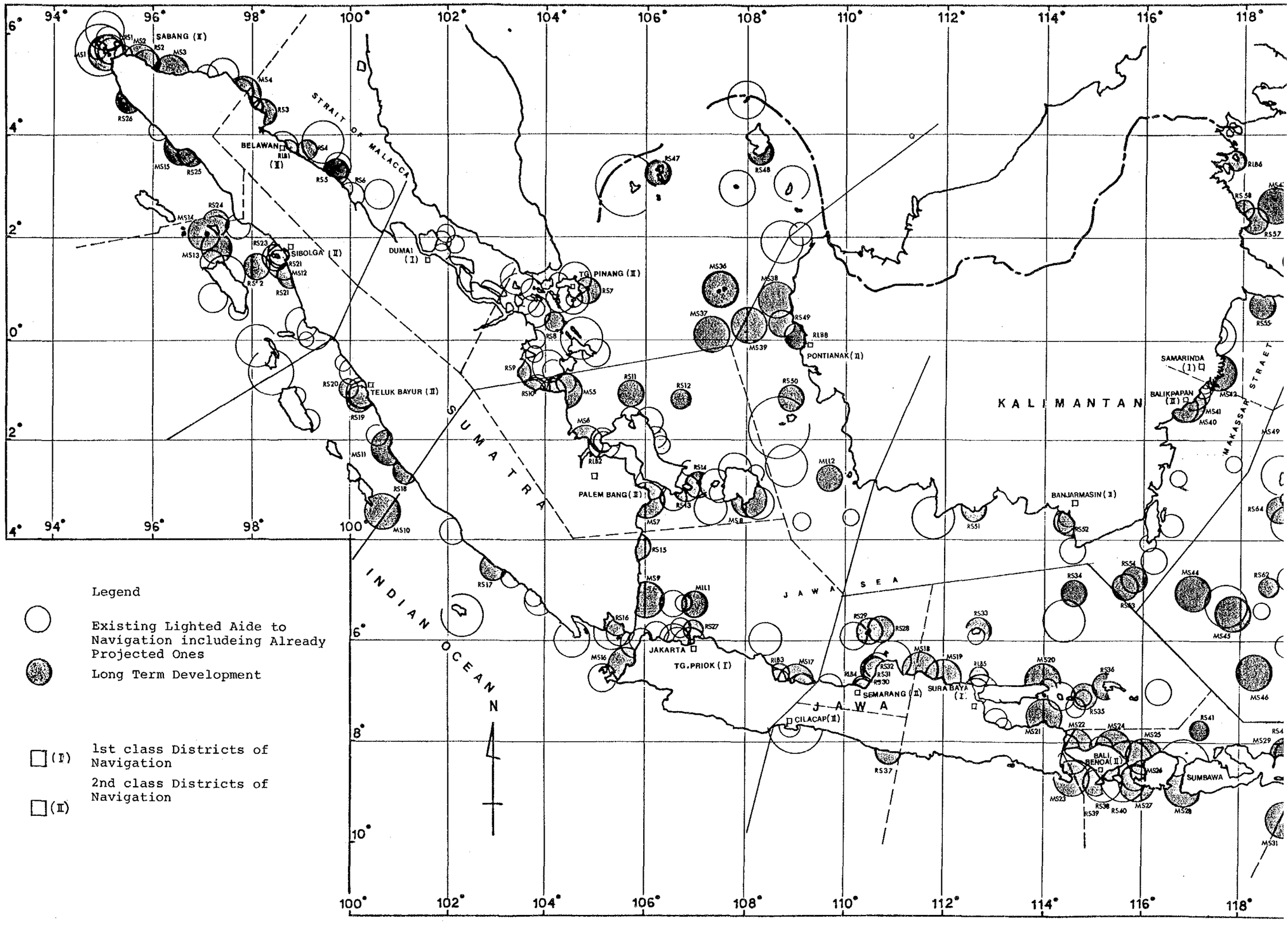
Table 4-3-2-(1)/2 Short Term Development Plan for Lighted Buoys

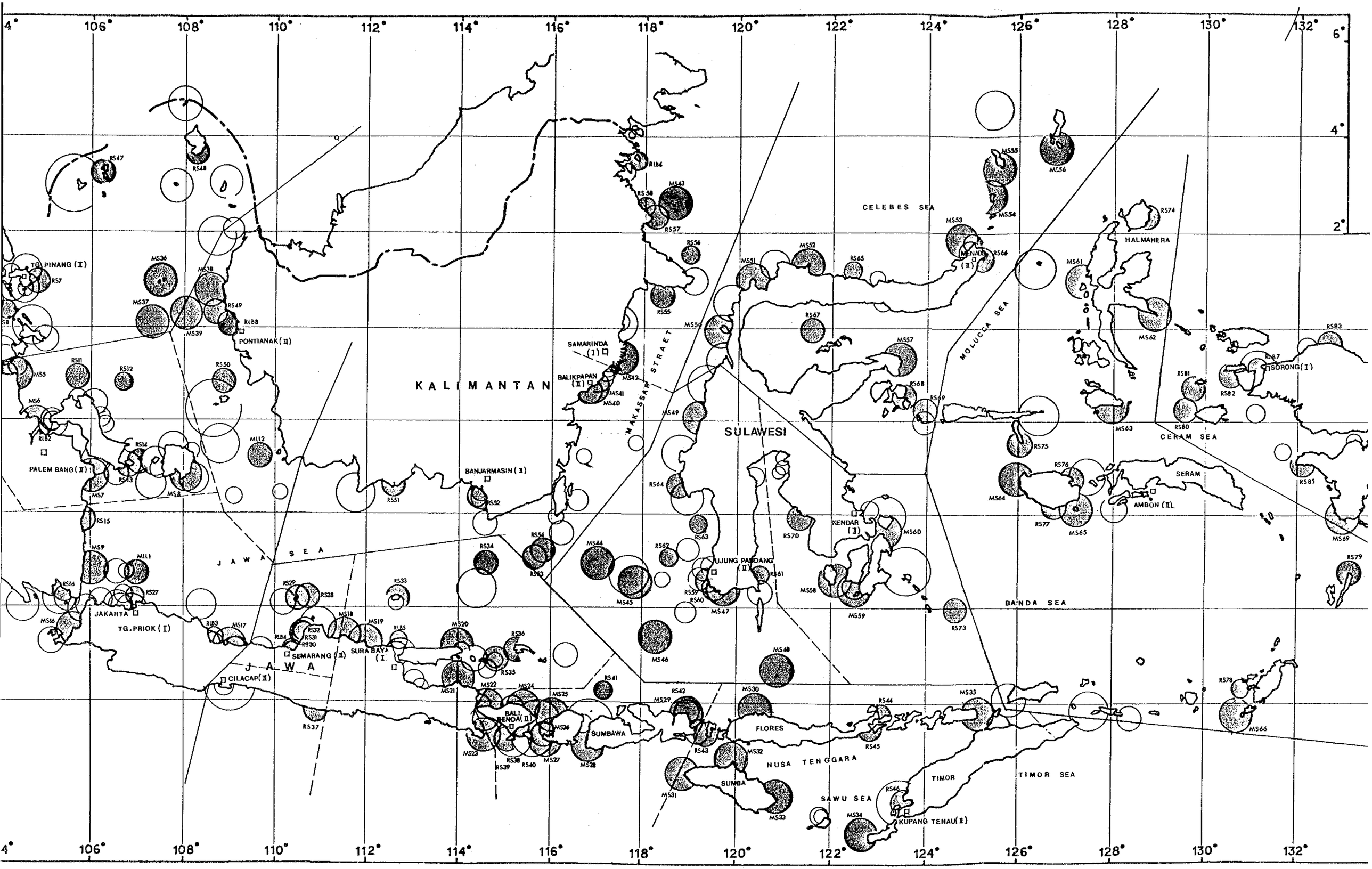
Category of Port	No. of Lights	Remarks
Gateway	60	100% of Total plan (60)
Collector	90	80% of Total plan (112)
Trunk	45	60% of Total plan (75)
Others	54	Approx. 50% of Total plan (103)
Total	249	(350)

Notes: ( ) shows the number of units planned in the Long Term Plan.

(B) Site Arrangement Plan for Visual Aids to Navigation

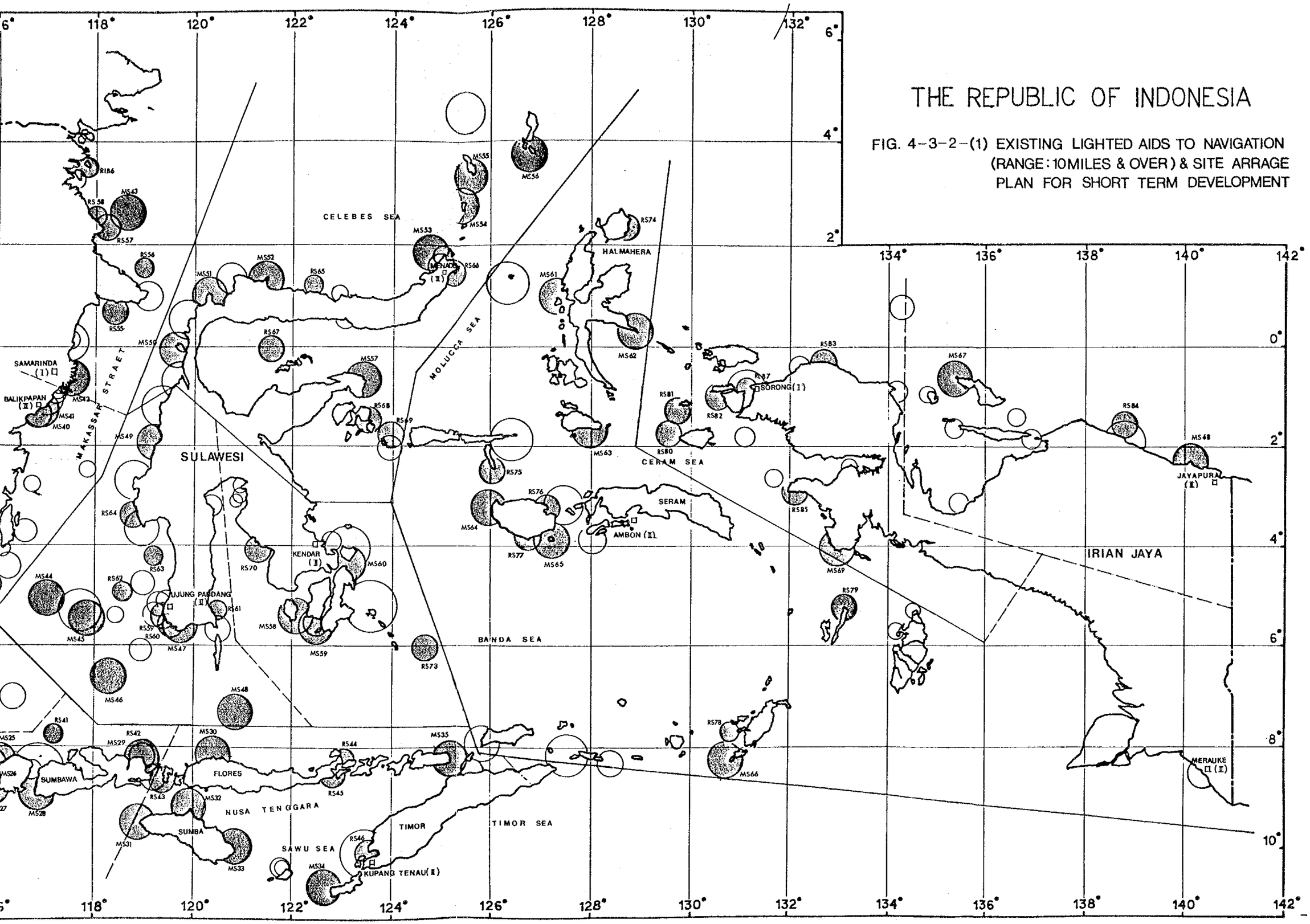
The site arrangement for lighthouses, light beacons and resilient light beacons are given in Fig. 4-3-2-(1), and the detailed lists of their respective aids are given in Table 4-3-2-(1)/3, /4, /5 and /6 respectively.


SABANG (I)
BELAWAN (II)
SIBOLGA (II)
TELUK BAYUR (II)
DUMAI (I)
TG. PINANG (II)
PALEM BANG (II)
PONTIANAK (II)
JAKARTA
TG. PRIOK (I)
SEMARANG (II)
CILACAP (II)
SURABAYA (I)
BANJARMASIN (II)
SAMARINDA (I)
BALIKPAPAN (II)
BALI, BENOA (II)
SUMBAWA
KALIMANTAN
SUMATRA
JAWA
STRAIT OF MALACCA
INDIAN OCEAN
JAWA SEA
MAKASSAR STRAET
Legend
Existing Lighted Aide to Navigation includeing Already Projected Ones
Long Term Development
(I) 1st class Districts of Navigation
(II) 2nd class Districts of Navigation
N


4°
106°
108°
110°
112°
114°
116°
118°
120°
122°
124°
126°
128°
130°
132°
6°
4°
2°
KALIMANTAN
SULAWESI
CELEBES SEA
MOLUCCA SEA
MAKASSAR STRAET
JAWA SEA
BANDA SEA
CERAM SEA
TIMOR SEA
SAWU SEA
HALMAHERA
SERAM
FLORES
SUMBAWA
SUMBA
TIMOR
NUSA TENGGARA
JAWA
TG PINANG (II)
PONTIANAK (II)
PALEM BANG (II)
BANJARMASIN (I)
SAMARINDA (I)
BALIKPAPAN (II)
JAKARTA
TG.PRIOK (I)
SEMARANG (II)
SURABAYA (I)
CILACAP (II)
BALI (I)
BENOA (II)
MENADO (II)
KENDARI (II)
UJUNG PANDANG (II)
AMBON (II)
SORONG (I)
KUPANG TENAU (I)

THE REPUBLIC OF INDONESIA

FIG. 4-3-2-(1) EXISTING LIGHTED AIDS TO NAVIGATION
(RANGE: 10 MILES & OVER) & SITE ARRAGE
PLAN FOR SHORT TERM DEVELOPMENT



Short Term Development Plan for Visual Aids

Table 4-3-2-(1)/3 Development of Lighthouses (on land)

Table 4-3-2-(1)/4 Development of Lighthouses (off shore)

Table 4-3-2-(1)/5 Development of Light Beacons

Table 4-3-2-(1)/6 Development of Resilient Light Beacons

Remarks:

MS	Lighthouses (on land)
MLL	Lighthouses (off shore)
RS	Light Beacon
RLB	Resilient Light Beacon
(P)	: for Port
(S)	: from Seawards
(T)	: for Traffic Route

Table 4-3-2-(1)/3 Development of Lighthouses (on land)

No.	NAME	RANGE	LOCATION	REMARKS	DIS NAV
MS1	Pu. BUNTA	20	N- 5-33 95-09	Landfall (T)	SABANG
MS2	Uj. PIDIE	20	N- 5-30 95-53	Landfall (S)	SABANG
MS3	Tg. RAJA	20	N- 5-13 96-28	Landfall (S)	SABANG
MS4	Tg. PEUREULA	20	N- 4-53 97-53	Landfall (S)	BELAWAN
MS5	Tg. DYABUNG	20	S- 1-01 104-21	Landfall (T)	PALEMBANG
MS6	BATAKARANG	20	S- 2-01 104-51	Landfall (T)	PALEMBANG
MS7	LUCIPARAT	20	S- 3-13 106-04	Landfall (T)	PALEMBANG
MS8	AYAR HASIN	20	S- 3-14 108-23	Landfall (S)	PALEMBANG
MS9	Pu. SEGAHA	20	S- 5-10 106-06	Landfall (S)	Tg. PRIOK
MS10	SANDING	20	S- 3-28 100-39	Landfall (S)	Teluk BAYUR
MS11	Uj. TANJUNG	20	S- 2-09 100-50	Landfall (S)	Teluk BAYUR
MS12	TUNGKUS NASI	20	N- 1-35 98-41	Landfall (P)	SIBOLGA
MS13	SERANGBAUNG	20	S- 1-44 97-26	Landfall (T)	SIBOLGA
MS14	Pu. BENGKARU	20	N- 2-02 97-07	Landfall (P)	SIBOLGA
MS15	Uj. RAJA	20	N- 3-44 96-32	Landfall (S)	SABANG
MS16	Tg. LESUNG	20	S- 6-28 105-40	Landfall (P)	Tg. PRIOK

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
MS17	Tg. LOSARI	20	S- 6-45 108-49	Landfall (S)	Tg. PRIOK
MS18	Tg. BENDOH	20	S- 6-37 111-29	Landfall (S)	SURABAYA
MS19	Tg. AWER AWER	20	S- 6-46 111-57	Landfall (S)	SURABAYA
MS20	MADARA	20	S- 6-52 113-56	Landfall (S)	SURABAYA
MS21	Tg. PATJINAN (PACINAAN)	20	S- 7-37 114-02	Landfall (P)	SURABAYA
MS22	Pu. MENDIANGA	20	S- 8-05 114-31	Landfall (T)	BENOA
MS23	Tg. BANTENAN	20	S- 8-46 114-31	Landfall (S)	SURABAYA
MS24	Tg. TEKURENAN	20	S- 8-11 115-29	Landfall (S)	BENOA
MS25	Pu. TREWANGAN	20	S- 8-21 116-02	Landfall (T)	BENOA
MS26	Pu. PO	20	S- 8-42 115-58	Landfall (P)	BENOA
MS27	Tg. BATU GENDANG	20	S- 8-49 115-50	Landfall (T)	BENOA
MS28	Tg. AMAT	20	S- 8-58 116-43	Landfall (T)	BENOA
MS29	Tg. NAROE	20	S- 8-19 119-00	Landfall (T)	BENOA
MS30	Tg. TORO BESI	20	S- 8-14 120-26	Landfall (S)	KUPANG
MS31	Tg, KAROSSO	20	S- 9-30 118-58	Landfall (S)	KUPANG
MS32	Tg. SASAR	20	S- 9-16 119-56	Landfall (S)	KUPANG
MS33	Tg. UNDU	20	S- 10-05 120-50	Landfall (S)	KUPANG

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
MS34	Pu. DAO B.	20	S- 10-48 122-38	Landfall (S)	KUPANG
MS35	Tg. LAISUMBU	20	S- 8-19 125-07	Landfall (S)	KUPANG
MS36	Pu. TAMBELAN	20	N- 1-00 107-36	Landfall (S)	Tg. PINANG
MS37	PEDYANTANG	20	N- 0-07 107-13	Landfall (S)	Tg. PINANG
MS38	Pu. LEMUKUTAN	20	N- 0-48 108-42	Landfall (S)	PONTIANAK
MS39	Pu. PENGIKI	20	N- 0-15 108-02	Landfall (S)	PONTIANAK
MS40	Tg. JUMALAI	20	S- 1-22 116-44	Landfall (P)	BALIKPAPAN
MS41	Tg. MANGGAR	20	S- 1-11 116-59	Landfall (P)	BALIKPAPAN
MS42	Tg. MABAYOR	20	S- 0-45 117-35	Landfall (P)	SAMARINDA
MS43	Tg. BALI TUMATAN	20	N- 2-33 118-33	Landfall (T)	SAMARINDA
MS44	Pu. SAHARU	20	S- 5-05 117-03	Landfall (T)	Uj. PANDANG
MS45	DOANG DOANGAN	20	S- 5-25 117-56	Landfall (T)	Uj. PANDANG
MS46	LONG KOITONG	20	S- 6-41 118-16	Landfall (T)	Uj. PANDANG
MS47	Tg. BULO BULO	20	S- 5-42 119-43	Landfall (S)	Uj. PANDANG
MS48	BONE RATE	20	S- 7-23 121-05	Landfall (T)	Uj. PANDANG
MS49	Tg. LALERAH	20	S- 1-59 119-12	Landfall (S)	Uj. PANDANG
MS50	MANIMBAYA	20	N- 0-06 119-37	Landfall (S)	BITUNG

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
MS51	SEMATAN	20	N- 1-05 120-24	Landfall (P)	BITUNG
MS52	Tg. KANDI	20	N- 1-18 121-27	Landfall (S)	BITUNG
MS53	MANTAR AWE	20	N- 1-45 124-44	Landfall (S)	BITUNG
MS54	ULU SIAU	20	N- 2-44 125-24	Landfall (P)	BITUNG
MS55	Pu. BENGLAUT	20	N- 3-29 125-43	Landfall (S)	BITUNG
MS56	KABURUANG	20	N- 3-58 126-49	Landfall (S)	BITUNG
MS57	Tg. TALABU	20	S- 0-46 123-27	Landfall (S)	BITUNG
MS58	TELAGA BESAR	20	S- 5-30 122-03	Landfall (T)	KENDARI
MS59	Tg. MASSIGA	20	S- 5-41 122-28	Landfall (T)	KENDARI
MS60	Tg. BUTON	20	S- 4-23 123-04	Landfall (T)	KENDARI
MS61	HIRI (HALMAHERA)	20	N- 0-55 127-19	Landfall (P)	AMBON
MS62	Tg. NGOTOPORO	20	N- 0-13 128-53	Landfall (S)	AMBON
MS63	Tg. WOOI	20	S- 1-43 128-01	Landfall (S)	AMBON
MS64	Pu. TENGAH	20	S- 3-14 125-59	Landfall (S)	AMBON
MS65	AMBELAU	20	S- 3-53 127-13	Landfall (T)	AMBON
MS66	Tg. ARO USU	20	S- 8-20 130-45	Landfall (S)	AMBON
MS67	Tg. MANDUNDI	20	S- 0-39 135-17	Landfall (S)	JAYAPURA

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
MS68	HATTERER	20	S- 2-19 140-09	Landfall (S)	JAYAPURA
MS69	Tg. PAPISOI	20	S- 4-05 133-00	Landfall (S)	SORONG

Following gives the on-going projects:

MS2, MS4, MS13, MS14, MS15, MS17, MS21, MS26
MS32, MS33, MS35, MS38, MS41, MS42, MS43, MS44
MS45, MS46, MS47, MS48, MS49, MS50, MS52, MS54
MS55, MS56, MS58, MS59, MS60, MS64, MS65

Table 4-3-2-(1)/4 Development of Lighthouses (offshore)

No.	NAME	RANGE	LOCATION	REMARKS	DIS NAV
MLL1	GOSONG ETNA	15	S- 5-18 106-54	Landfall	Tg. PRIOK
MLL2	CORY FORT REEF	15	S- 2-42 109-40	Landfall	PONTIANAK

Table 4-3-2-(1)/5 Development of Light Beacons

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
RS1	Uj. EUMPEE	15	N- 5-36 95-11	Channel	SABANG
RS2	SIGLI	15	N- 5-23 95-57	Entrance (P)	SABANG
RS3	Uj. TAMIANG	15	N- 4-26 98-17	Landfall (P)	BELAWAN
RS4	GOSONG BUNGA	10	N- 3-45 99-05	Danger	BELAWAN
RS5	Pu. SALAHANAMA	15	N- 3-21 99-43	Danger	BELAWAN
RS6	Tg. SIAPIAPI	15	N- 2-55 99-59	Landfall (P)	BELAWAN
RS7	Pu. MARAPAS	15	N- 0-56 104-55	Channel	Tg. PINANG
RS8	BATU BELAYAR	10	N- 0-24 104-15	Danger	Tg. PINANG
RS9	Tg. LABU	15	S- 0-46 103-28	Entrance (P)	Tg. PINANG
RS10	Tg. SOLOK	15	S- 1-00 103-48	Entrance (P)	PALEMBANG
RS11	DOKAN	15	S- 1-00 105-39	Danger	PALEMBANG
RS12	HAWKINS	10	S- 1-09 106-39	Danger	PALEMBANG
RS13	Tg. MURUNG	15	S- 3-02 106-53	Channel	PALEMBANG
RS14	Pu. CELAKA	15	S- 2-52 107-00	Channel	PALEMBANG
RS15	Tg. PASIR	15	S- 4-08 105-49	Entrance (P)	Tg. PRIOK
RS16	CUKU BLANTUNG	15	S- 5-41 105-31	Entrance (P)	Tg. PRIOK

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
RS17	MANA	15	S- 4-29 102-53	Landfall (S)	Tg. PRIOK
RS18	MUKO MUKO	15	S- 2-34 101-06	Landfall (S)	Teluk BAYUR
RS19	SIKOWAI	15	S- 1-09 100-19	Entrance (P)	Teluk BAYUR
RS20	Pu. ILIR	15	N- 1-16 98-43	Landfall (S)	SIBOLGA
RS21	LABU LABU	15	N- 1-35 98-35	Entrance (P)	SIBOLGA
RS22	Pu. BINTANAH	15	N- 1-28 98-10	Danger	SIBOLGA
RS23	MANSALAR	15	N- 1-40 98-33	Landfall(S)	SIBOLGA
RS24	Pu. BAGU	15	N- 2-17 97-24	Channel	SIBOLGA
RS25	SUSOH	15	N- 3-43 96-47	Entrance (P)	SABANG
RS26	Uj. BARO	15	N- 4-39 95-32	Entrance (P)	SABANG
RS27	NASSAU REEF	10	S- 5-49 106-50	Danger	Tg. PRIOK
RS28	GENTING	15	S- 5-51 110-36	Danger	SEMARANG
RS29	KARIUM JAWA	15	S- 5-50 110-28	Danger	SEMARANG
RS30	Pu. PANJANG	15	S- 6-35 110-37	Landfall (P)	SEMARANG
RS31	JEPARA	15	S- 6-35 110-39	Entrance (P)	SEMARANG
RS32	Tg. KUNIRAN	15	S- 6-34 110-39	Entrance (P)	SEMARANG
RS33	Tg. MANTIGI	15	S- 5-43 112-41	Landfall (S)	SURABAYA

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
RS34	Pu. KERAMIAN	15	S- 5-06 114-36	Landfall (S)	SURABAYA
RS35	Pu. KAMUDI	15	S- 7-06 114-47	Channel	SURABAYA
RS36	KANGEAN	15	S- 7-00 115-17	Entrance (P)	SURABAYA
RS37	Tg. NGAMBER	15	S- 8-14 111-05	Entrance (P)	CILACAP
RS38	Tg. MEBULU	15	S- 8-40 115-05	Landfall (S)	BENOA
RS39	Tg. SERANGAN	10	S- 8-43 115-15	Entrance (P)	BENOA
RS40	Tg. PANDANAN	15	S- 8-44 115-51	Channel	BENOA
RS41	Gs. SEKUMOI	10	S- 7-51 117-12	Danger	BENOA
RS42	SANGEANG	15	S- 8-14 119-01	Channel	BENOA
RS43	LANG KOI	15	S- 8-44 119-22	Channel	KUPANG
RS44	Kr. SERBETE	10	S- 8-09 122-50	Channel	KUPANG
RS45	Pu. LANOTOBI	15	S- 8-36 122-50	Channel	KUPANG
RS46	KERA	15	S- 10-05 123-33	Entrance (P)	KUPANG
RS47	Tg. PEDAS	15	N- 3-14 106-12	Entrance (P)	Tg. PINANG
RS48	Tg. PIAN PADANG	15	N- 3-39 108-18	Landfall (S)	Tg. PINANG
RS49	Pu. SITINJAN	15	N- 0-21 108-44	Landfall (S)	PONTIANAK
RS50	Pu. LEMAN	15	S- 1-17 108-53	Channel	PONTIANAK

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
RS51	Tg. SIAHOK	15	S- 3-23 112-33	Entrance (P)	BANJARMASIN
RS52	Tg. BURUNG	15	S- 3-33 114-31	Entrance (P)	BANJARMASIN
RS53	KALAHBAU	15	S- 4-55 115-39	Landfall (S)	BANJARMASIN
RS54	HATASIRI	15	S- 4-49 115-48	Landfall (S)	BANJARMASIN
RS55	Pu. BIRAH BIRAHAN	15	N- 0-41 118-27	Danger	SAMARINDA
RS56	Kr. BILANG BILANGAN	10	N- 1-34 118-57	Danger	SAMARINDA
RS57	PANDYANG	15	N- 2-23 118-12	Danger	SAMARINDA
RS58	Kr. BALIK TABA	10	N- 2-30 118-00	Danger	SAMARINDA
RS59	Tg. JEMBATAN	15	S- 5-34 119-15	Channel	Uj. PANDANG
RS60	Tg. LAIKANG	15	S- 5-36 119-27	Landfall (S)	Uj. PANDANG
RS61	KARANG MALABIRI	10	S- 5-15 120-26	Danger	Uj. PANDANG
RS62	TAKA BAKANG	10	S- 4-58 118-33	Danger	Uj. PANDANG
RS63	Kr. PANKAHANDRA	10	S- 4-16 119-17	Danger	Uj. PANDANG
RS64	Tg. CINRANA	15	S- 3-19 118-50	Entrance (P)	Uj. PANDANG
RS65	Kr. BULIOGUT	10	N- 1-08 122-25	Danger	BITUNG
RS66	BATU KAPAL	15	N- 1-32 125-17	Channel	BITUNG
RS67	UNA UNA	15	S- 0-10 121-36	Landfall (S)	BITUNG

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
RS68	Pu. BAKAKANG	15	S- 1-35 123-27	Channel	BITUNG
RS69	TEMPAU	15	S- 1-51 124-01	Channel	BITUNG
RS70	Pu. LAMBASINA	15	S- 4-04 121-19	Entrance (P)	KENDARI
RS71	Pu. KADATUA	15	S- 5-31 122-30	Channel	KENDARI
RS72	Pu. BATU SURI	15	S- 5-21 122-39	Channel	KENDARI
RS73	Pu. MORO-MORO	15	S- 6-07 124-37	Landfall (S)	KENDARI
RS74	Pu. TABAILENGI	15	N- 2-22 128-40	Entrance (P)	AMBON
RS75	Tg. WAKA	15	S- 2-28 126-02	Landfall (S)	AMBON
RS76	Tg. KARBAU	15	S- 3-16 127-07	Entrance (P)	AMBON
RS77	Tg. WATINA	15	S- 3-47 126-43	Landfall (S)	AMBON
RS78	BARA SADI	10	S- 7-48 130-48	Landfall (S)	AMBON
RS79	Tg. BORONG	15	S- 5-17 133-08	Landfall (S)	AMBON
RS80	NAMPALE	15	S- 1-47 129-37	Channel	SORONG
RS81	Tg. TABEK	15	S- 1-17 129-43	Channel	SORONG
RS82	SAGEWIN	15	S- 0-57 130-39	Channel	SORONG
RS83	Tg. WIEIOS(VALSCHE CAPE)	15	S- 0-22 132-43	Landfall (S)	SORONG
RS84	KUMAMBA	15	S- 1-36 138-44	Landfall (S)	JAYAPURA

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
RS85	P. EKKA	15	S- 2-58 132-07	Landfall (S)	SORONG

Following gives the on-going projects:

RS1, RS2, RS3, RS4, RS6, RS7, RS8, RS9, RS10
RS15, RS18, RS20, RS25, RS29, RS30, RS31, RS34
RS35, RS41, RS42, RS48, RS51, RS57, RS58, RS59
RS60, RS61, RS62, RS63, RS64, RS70, RS71, RS73
RS80, RS81

Table 4-3-2-(1)/6 Development of Resilient Light Beacons

No.	N A M E	RANGE	LOCATION	R E M A R K S	D I S N A V
RLB1	BELANWAN	10	N- 4-01 98-50	Entrance of Port	BELAWAN
RLB2	PALEMBANG	10	S- 2-09 104-58	Entrance of Port	PALEMBANG
RLB3	CIREBON	10	S- 6-32 108-51	Entrance of Port	Tg. PRIOK
RLB4	SEMARANG	10	S- 6-54 110-24	Entrance of Port	SEMARANG
RLB5	Tg. PEARK	10	S- 6-37 112-44	Entrance of Port	SURABAYA
RLB6	TARAKAN	10	S- 3-14 117-53	Entrance of Port	SAMARINDA
RLB7	SORONG	10	S- 0-52 131-12	Entrance of Port	SORONG
RLB8	PONTIANAK	10	N- 0-17 110-50	Entrance of Port	PONTIANAK

(C) Engineering Surveys

In order to effectively carry out the implementation of the development of visual aids to navigation, engineering surveys should be carried out at the sites for the meteorological and oceanographic environment required for the designing of navaids and for the execution of projects, in addition to extensive studies on the site positions, performances and other related matters.

Expecially, topographical surveys for sea bottom and the soil analysis, etc. need to be carried out by expert engineers who have sufficient expertise and experience, prior to the construction of such off shore structures as lighthouses, light beacons and RLS's.

(D) System Configuration

a) Outline of Equipments Configuration

i) Lighthouse (on land)

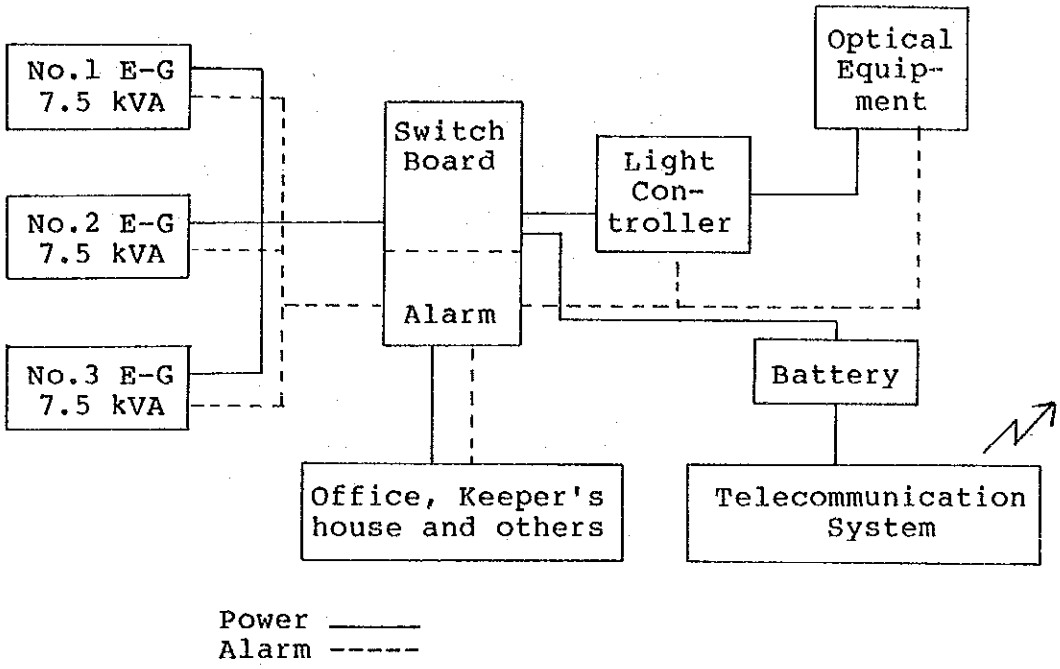


Fig. 4-3-2-(1)/1 Schematic Diagram of 3E-G System

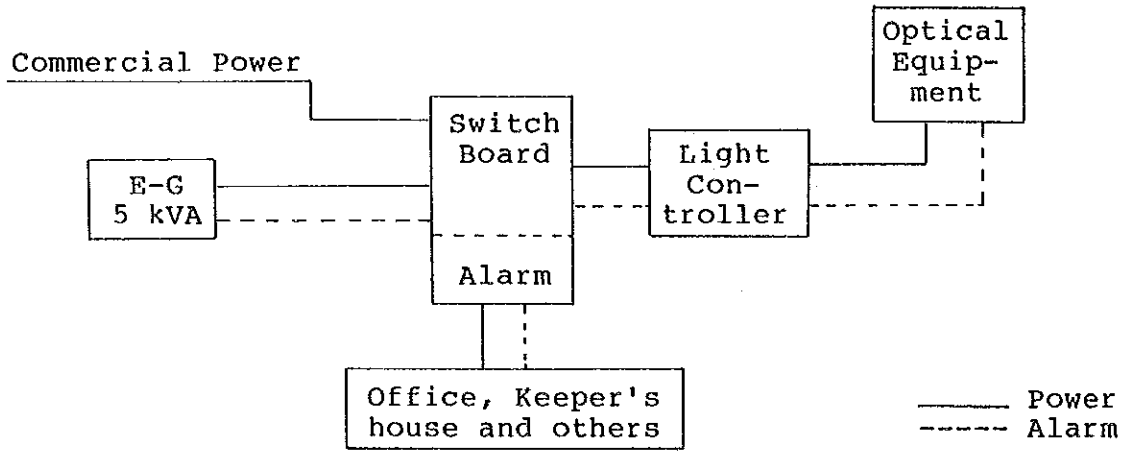


Fig. 4-3-2-(1)/2 Schematic Diagram of Commercial Power and E-G stand-by system

ii) Lighthouse (off shore)

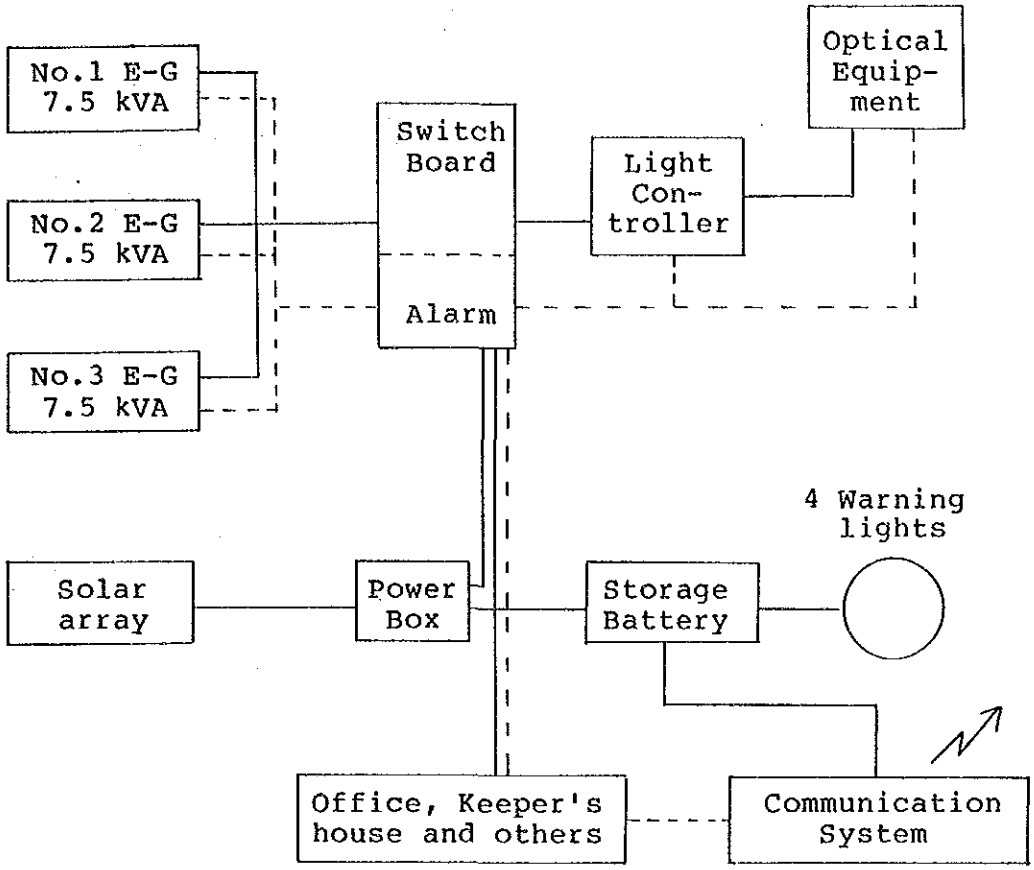


Fig. 4-3-2-(1)/3 Schematic Diagram of 3E-G and Solar Power System

Optical equipment for lighthouse:

Light intensity	1,200,000 Candelas or over
Power source	110/220V/50Hz single phase commercial power or diesel engine generator.

iii) Light beacon (on land)

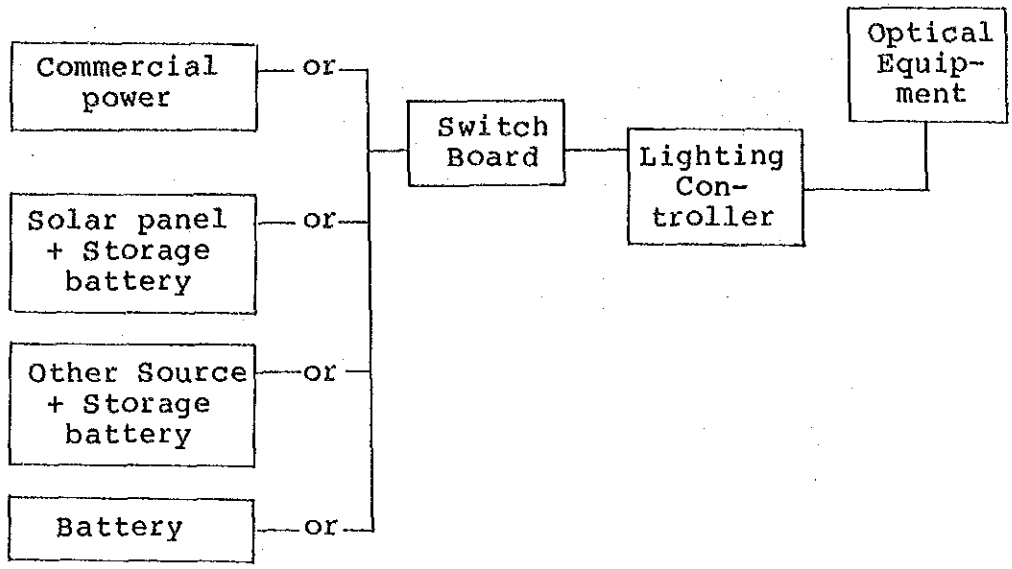


Fig. 4-3-2-(1)/4 Schematic Diagram of Electrical Power System

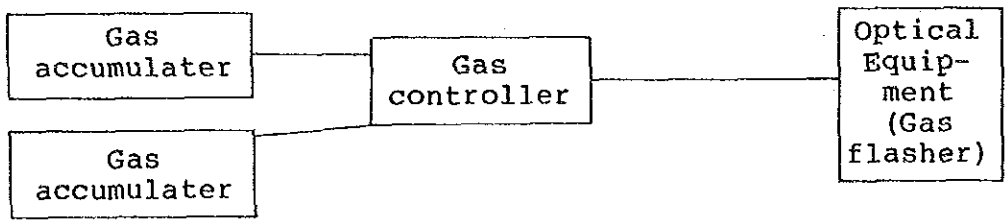


Fig. 4-3-2-(1)/5 Schematic Diagram of Gas Power System

Optical equipment for light beacon

Light intensity	Major type	7,000 candelas or over
	Others	800 candelas or over

Power source	Commercial power, solar panel, other source and battery or gas
Lens	250 mm or over

iv) Light beacon (off shore)
Same as ii), Light beacon (on land) above.

v) Resilient light beacon
As same as light beacon.

vi) Light buoy

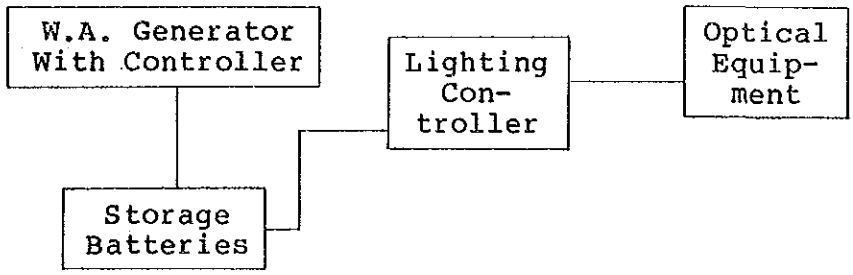


Fig. 4-3-2-(1)/6 Schematic Diagram of Wave-Activated Generator System

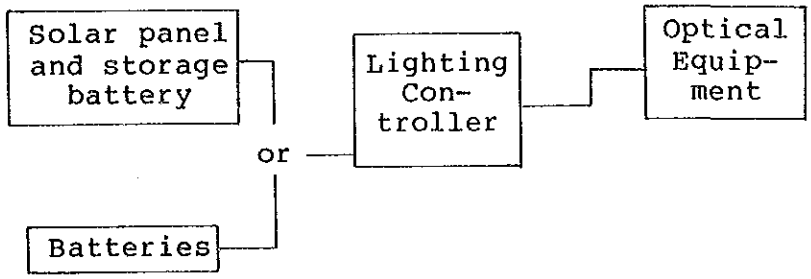


Fig. 4-3-2-(1)/7 Schematic Diagram of Solar and Battery System

Gas power system is as same that of light beacon **Fig. 4-3-2-(1)/4.**

Optical equipment

Light intensity	70 candelas and over
Power source	W.A. Generator, solar panel, batteries or gas

b) Outline of Facility

Following are for reference only

i) Lighthouse

Site plan:	**APPENDIX-18**	(No.1)
Light tower:	**APPENDIX-18**	(No.2)
Office and quarters:	**APPENDIX-18**	(No.3)
Engine generator and store room:	**APPENDIX-18**	(No.4)

ii) Lighthouse (offshore)

Tower	**APPENDIX-18**	(No.5)
Plan	**APPENDIX-18**	(No.6)

iii) Light beacon (on land)

Facility	**APPENDIX-18**	(No.7)

iv) Light beacon (offshore)

Facility	**APPENDIX-18**	(No.8)

v) Resilient light beacon (RLB)

Facility	**APPENDIX-18**	(No.9)

2) Electronic Aids to Navigation

The electronic maritime aids to navigation in Indonesia is now in developing stage, and the present situation is that only eighteen medium-wave radiobeacon stations are being implemented, in addition to three radar beacon stations which are now in operation.

On the other hand, the development plans for maritime spheres within REPELITA I, II and III have been materialized with the development of shipping, ports and traffic routes as the main pillars. The maritime development in REPELITA IV is directing towards stepping up of integrity of all the maritime fields concerned.

In planning the Short Term Development Plan, the medium-wave radiobeacons are to provide service coverages over the water areas which include all the ports to be developed within REPELITA IV, and to be harmonically sited with the eighteen stations complementarily filling the gaps of service coverage.

The radar beacons are planned to cover the Most Important Waters linking between the Gateway ports.

The traffic routes to be covered by the radiobeacons are those lying between Gateway and Collector ports, and extremely important areas as well.

The Very Important and Important Waters are also rich areas as fishing grounds, where a great number of small fishing vessels operate and high density of marine casualties occurs.

In the light of the above, top priority to establish the electronic aids to navigation should be given to these water areas, where a great number of small to large vessels actively engage in shipping and fishing operations.

The eighteen MF radiobeacon stations now under implementation are as follows:

1. SABANG	10. BENOA
2. SIMEDANG ISLAND	11. BALIKPAPAN
3. TG PRIOK	12. TG MANGKALIHAT
4. PONTIANAK	13. TG MANDAR
5. PESEMUT ISLAND	14. U. PANDANG
6. MANDALIKA ISLAND	15. AMBON
7. CILACAP	16. BITUNG
8. JAMUANG ISLAND	17. RAM SORONG
9. TG SELATAN	18. MERAUKE

(A) Site Arrangement

a) Medium-wave radiobeacon station

Out of the four most important ports, Belawan, Tg. Priok, Surabaya and Ujung Pandang, three except Belawan are situated in Jawa Sea.
There are in Jawa Sea important traffic routes linking between these ports and those for RLS, Local shipping, Pioneer shipping and so on, which have made the areas very busy.
Following ports are to be developed within REPELITA IV.

1.	Lhok Seumawe	8.	Balikpapan
2.	Dumai	9.	Lembar
3.	Teluk Bayur	10.	Kendari
4.	Batam	11	Bitung
5.	Panjang	12.	Ambon
6.	Cirebon	13.	Sorong
7.	Semarang	14.	Pontianak

Accordingly, the stations planned are to function covering the Most Important Waters: cross bearings of two or more stations will be obtained in Jawa Sea and single bearings in other Important Waters along the main traffic routes.
The total number of seventeen (17) medium-wave radiobeacon stations is planned in the Short Term Plan.

All the sites selected are listed in **Table 4-3-2-(1)/7** and the site arrangement is given in **Fig. 4-3-2-(1)/8.**

b) Radar beacon station

The radar beacon stations are to be installed mainly at landfalls or port entrances for their distinctive indication when ships with radar on board approach. They are also to be installed on lighted aids showing hazadous areas.
Vital requirement to use racons is obviously that ships must have radar equipment on board, and there are a number of radar fitted ships are in operation in Indonesia, and they are mostly concentrated on the main traffic routes connecting the four major ports as described in Section 4-3-1, (1), 2), *"Medium-wave radiobeacon station."*

The occurrence of marine accidents by area has shown that Jawa Sea has overwhelming majority followed by Maccassar Straits and then Flores Sea.

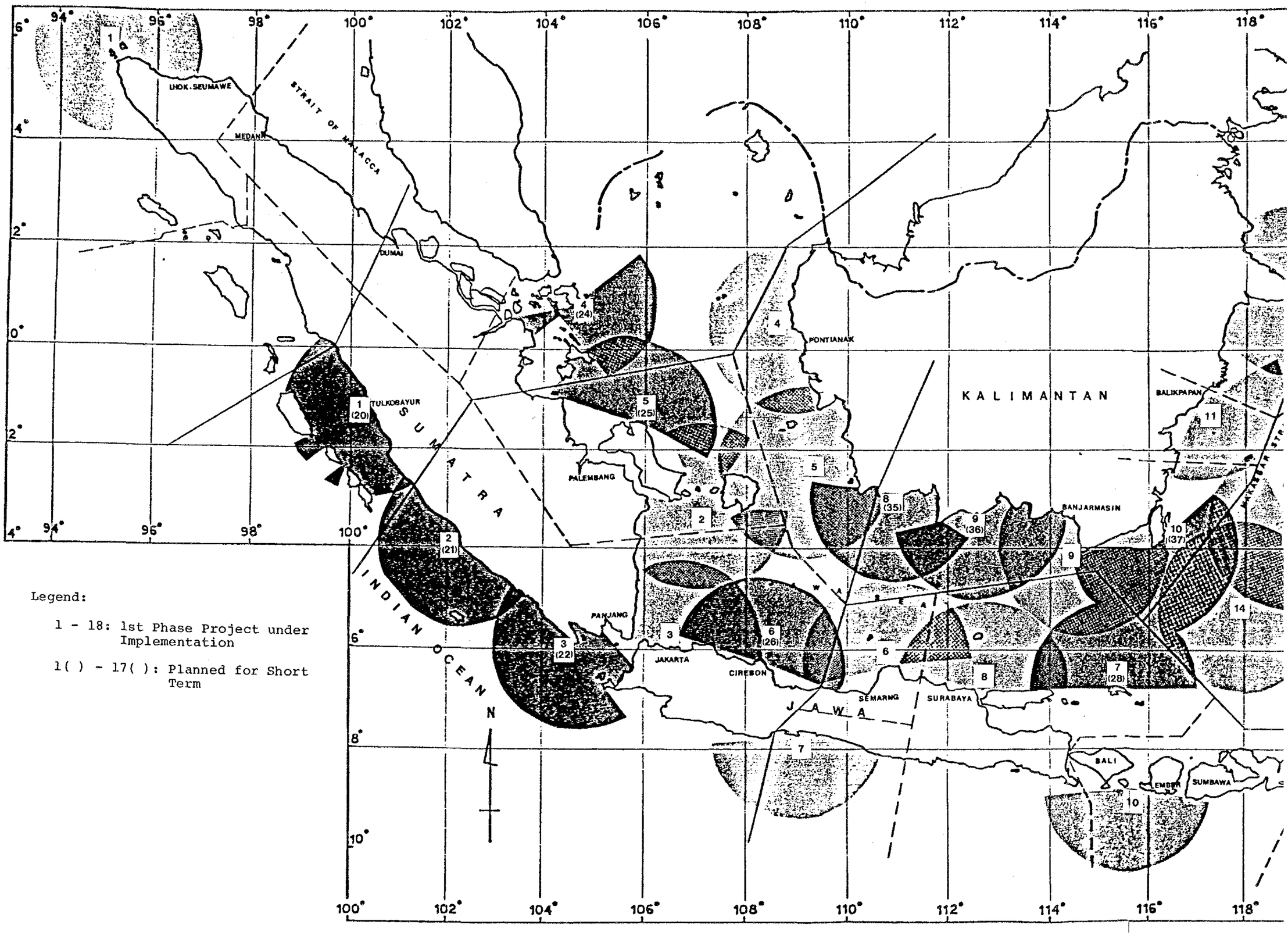
The racon stations currently in operation are at:

- One Fathom Bank
- Nanka Is.
- Kalan Jamuang

Under these circumstances, a plan is made in this Short Term Development to urgently establish racon stations in and around Jawa Sea, where three of the four major ports are situated and a large number of marine accidents occur.

The total number of twenty-eight (28) radar beacon stations is planned in the Short Term Plan.

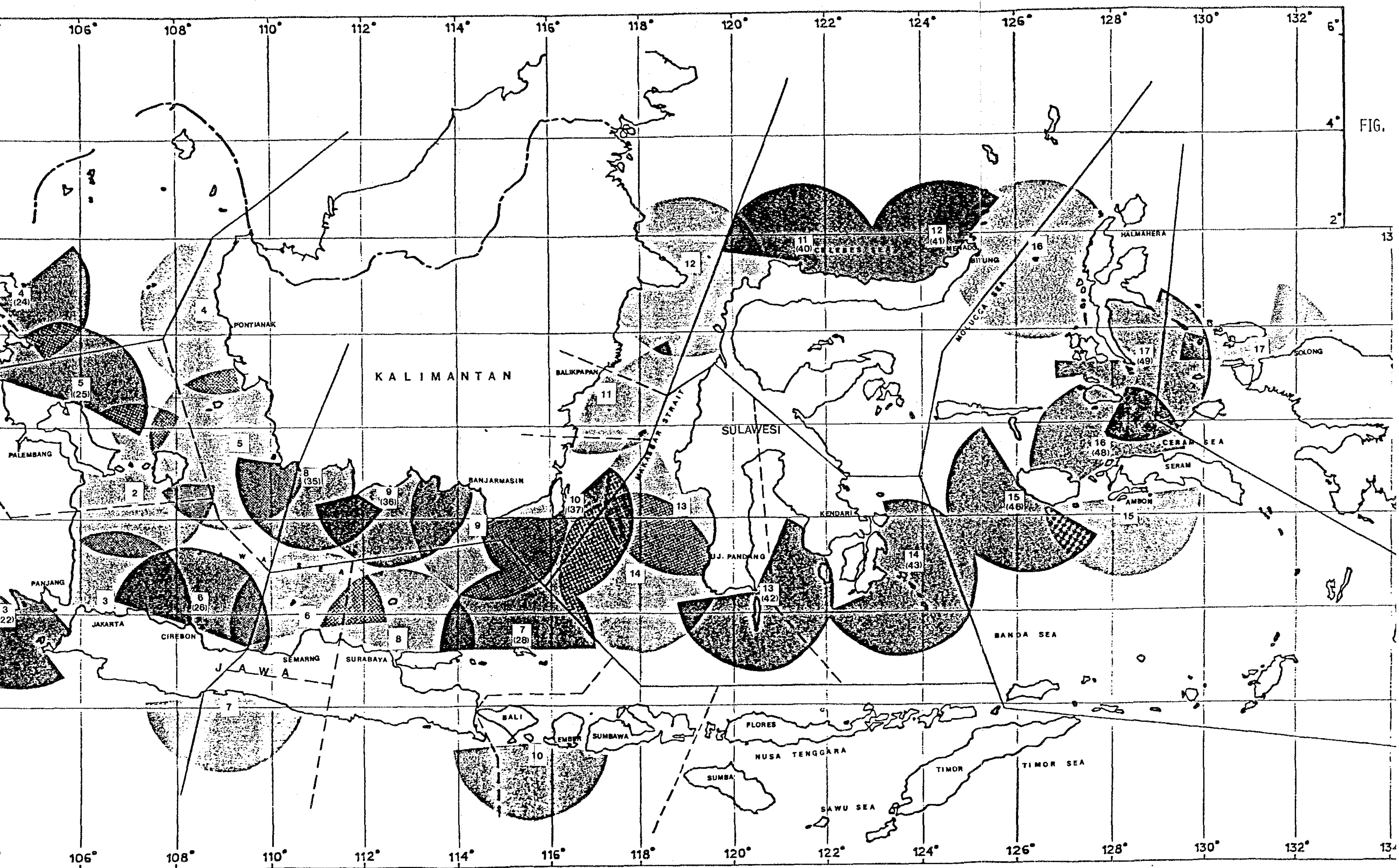
The site plan for radar beacon stations selected is given in **Fig. 4-3-2-(1)/9**, and these stations are listed in **Table 4-3-2-(1)/8.**



Legend:

1 - 18: 1st Phase Project under Implementation

1( ) - 17( ): Planned for Short Term



KALIMANTAN
SULAWESI
JAWA
PONTIANAK
PALEMBANG
PANJANG
JAKARTA
CIREBON
SEMARNG
SURABAYA
BANJARMASIN
BALIKPAPAN
MAKASSAR STRAIT
U.J. PANDANG
KENDARI
CELEBES SEA
MENADO
BITUNG
MOLUCCA SEA
HALMAHERA
SOLONG
CERAM SEA
SERAM
AMBON
BANDA SEA
BALI
LEMBER
SUMBAWA
FLORES
NUSA TENGGARA
SUMBA
SAWU SEA
TIMOR
TIMOR SEA

FIG.

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FIG. 4-3-2-(1)/8 MF RADIOBEACON STATIONS UNDER IMPLEMENTATIO N & SITE ARRANGEMENT PLAN(DIRECTIONAL) FOR SHORT TERM DEVELOPMENT

(REF)

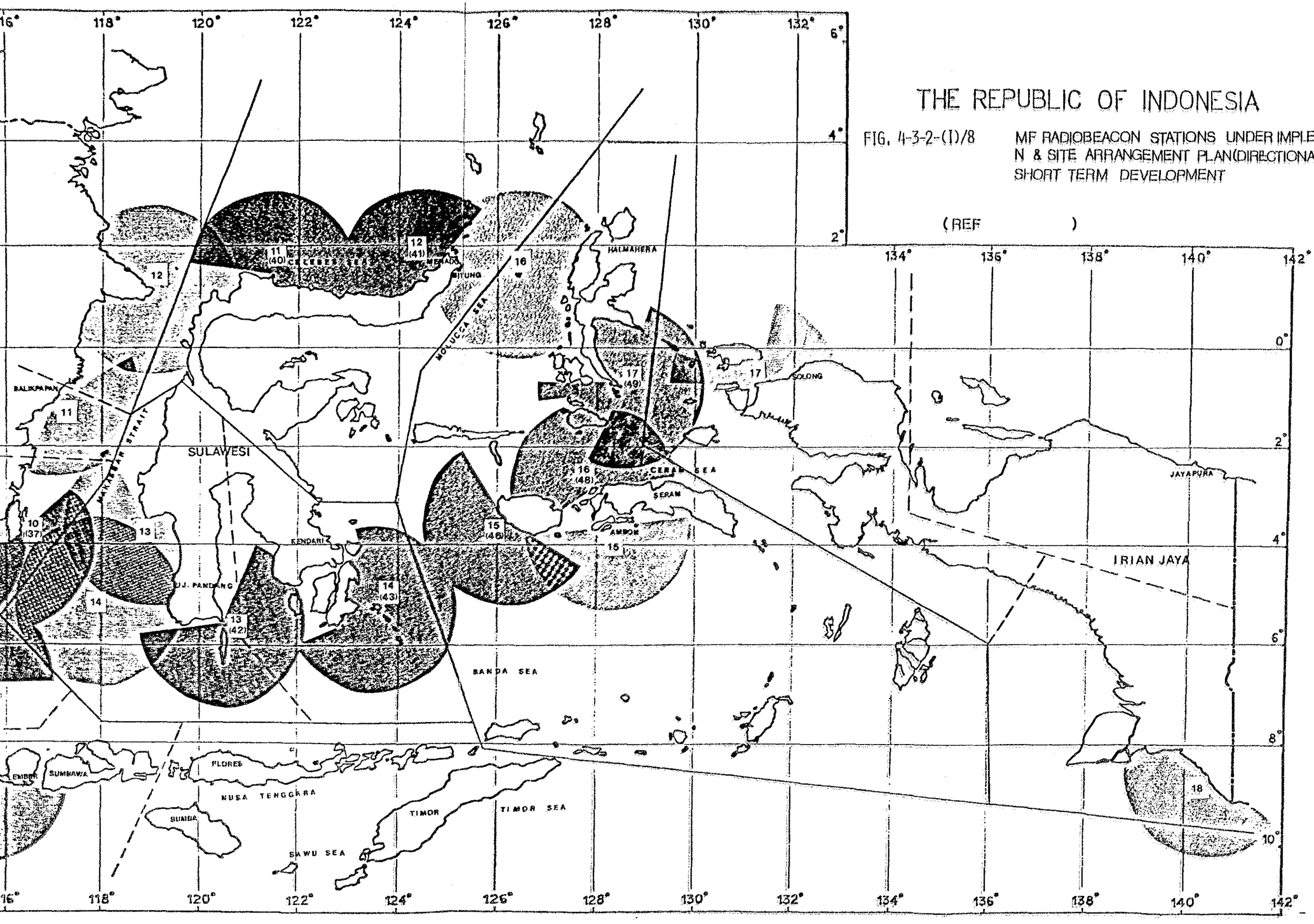


Table 4-3-2-(1)/7 List of MF Radiobeacon Station - Short Term Plan -

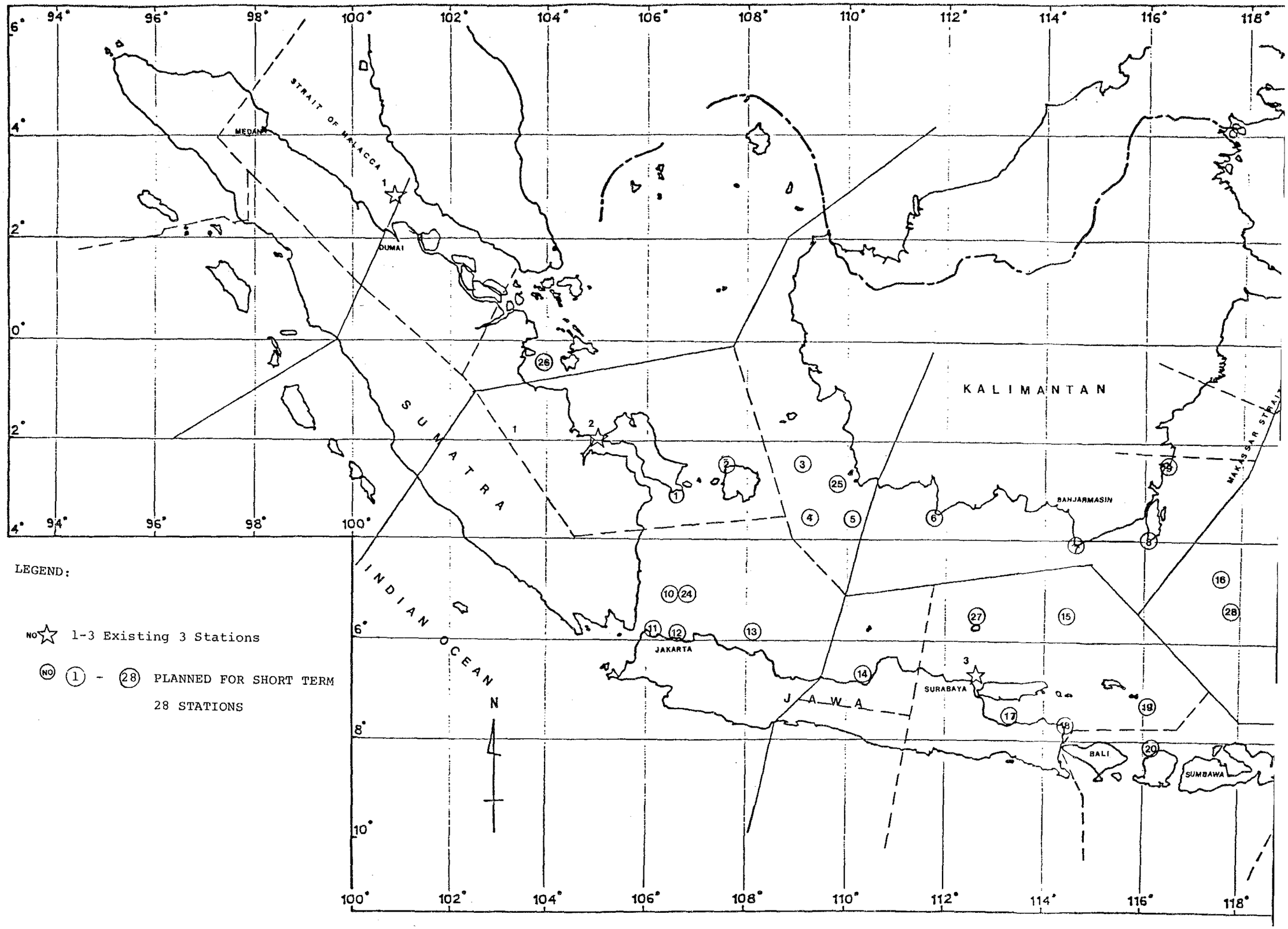
Notes: G-G: Gateway port to Gateway port T-C: Trunk port to Collector port
C-G: Collector port to Gateway port

No.	LTP# No.	Name of Station	LAT/LOG	Covering area	KANWIL	District NAVIGASI	Monitor Station	Remarks
1	2 (20)	TELUK BAYAR	S 01° 05' E100° 20'	South-west coast of SUMATERA	II	TELUK BAYAR	TELUK BAYAR	C to G route (TG PRIOK-PADANG)
2	3 (21)	TG. KERBAN	S 03° 53' E102° 18'	South-west coast of SUMATERA	II	TELUK BAYAR	TELUK BAYAR	C to G route (TG PRIOK-PADANG)
3	4 (22)	BELIMBING	S 05° 56' E104° 34'	SUNDA STRAIT	III	TG. PRIOK	TG. PRIOK	C to G route (TG PRIOK-PADANG)
4	6 (24)	TG. PINANG	N 00° 55' E104° 35'	East Coast of SUMATERA	II	TG. PINANG	DUMAI	G to G route (BELAWAN-TG. PEPAK)
5	7 (25)	BANGKA (TG. SAMAK)	S 01° 28' E105° 55'	East of SUMATERA	III	PALEMBANG	PALEMBANG	G to G route (BELAWAN-TG. PERAK)
6	8 (26)	INDRAMAYU	S 06° 15' E108° 16'	JAVA SEA	III	TG. PRIOK	CIREBON RADIO	G to G route (TG PRIOK-UJUNG PANDANG)
7	10 (28)	ARIASA	S 06° 47' E115° 20'	JAVA SEA	IV	BENOA	SURABAYA	G to G route (TG PRIOK-UJUNG PANDANG)
8	17 (35)	TG. SELAKA	S 03° 04' E111° 00'	JAVA SEA	V	BANJARMASIN	BANJARMASIN	G to G route (BANJARMASIN PERAK)
9	18 (36)	KUALAPEMBUANG	S 03° 28' E112° 33'	JAVA SEA	V	BANJARMASIN	BANJARMASIN	G to G route (BELAWAN-UJUNG PANDANG)
10	19 (37)	LAUT (TG. SELOKA)	S 3° 54' E116° 18'	MAKASSAR STRAIT	V	BANJARMASIN	BANJARMASIN	G to G route (BELAWAN-UJUNG PANDANG) & C to G route (TG. PERAK-BAUKPAPAN)
11	22 (40)	TG. KANDI	N 01° 20' E121° 28'	CELEBES SEA	VII	MENADO/BITUNG	BITUNG	C to G route (UJUNG PANDANG-BITUNG)
12	23 (41)	SIDATE	N 01° 15' E124° 20'	CELEBES SEA	VII	MENADO/BITUNG	BITUNG	C to G route (UJUNG PANDANG-BITUNG)

No.	LTP# No.	Name of Station	LAT/LOG	Covering area	KANWIL	District NAVIGASI	Monitor Station	Remarks
13	24 (42)	PASITANETE	S 05° 45' E120° 30'	South of TELUK BONE	VI	UJUNG PANDANG	UJUNG PANDANG	C to G route (UJUNG PANDANG-KENDARL)
14	25 (43)	WANGI-WANGI	S 05° 16' E123° 32'	BANDA SEA	VI	KENDARI	KENDARI	C to G route (UJUNG PANDANG-KENDARI)
15	28 (46)	BOBO	S 03° 40' E126° 15'	BANDA SEA	VIII	AMBON	AMBON	C to G route (UJUNG PANDANG-SORONG)
16	30 (48)	BOAND	S 02° 50' E127° 50'	CERAM SEA	VIII	AMBON	AMBON	C to G route (UJUNG PANDANG-SORONG)
17	31 (49)	TG. LIBOBO	S 00° 50' E128° 29'	HALMAHERA SEA	VIII	AMBON	AMBON	C to G route (UJUNG PANDANG-SORONG)

Notes: - Nos. in ( ) give the serial number of stations shown in Fig. 4-3-2-(1)/8 inclusive of the 1st phase 18 stations

- # ... LTP = Long Term Plan.

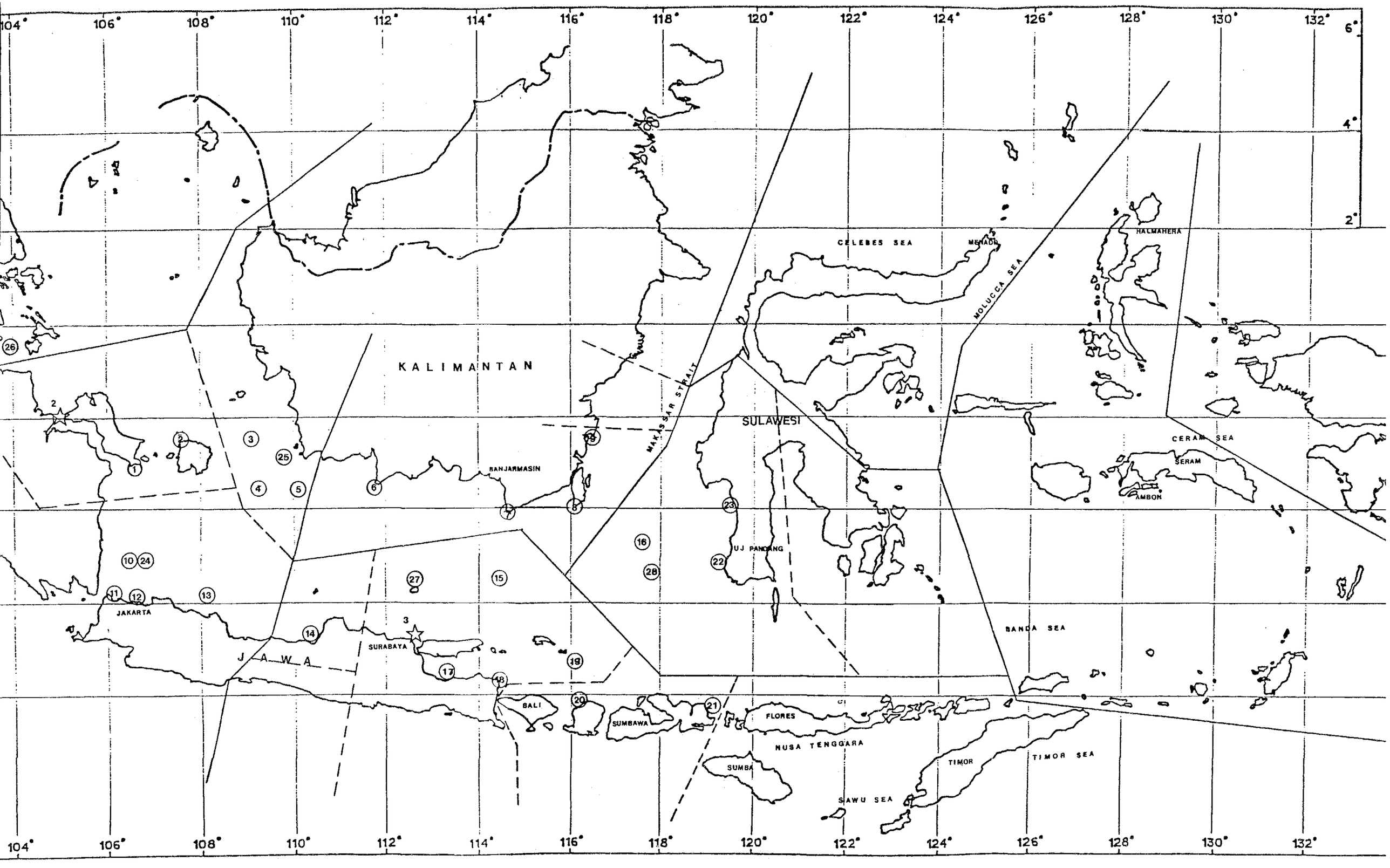


LEGEND:

NO☆ 1-3 Existing 3 Stations

(NO) (1) - (28) PLANNED FOR SHORT TERM

28 STATIONS


104°
106°
108°
110°
112°
114°
116°
118°
120°
122°
124°
126°
128°
130°
132°
6°
4°
2°
KALIMANTAN
CELEBES SEA
MENADO
MOLUCCA SEA
HALMAHERA
MAKASSAR STRAIT
SULAWESI
CERAM SEA
SERAM
AMBON
BANJARMASIN
UJ PANDANG
JAKARTA
SURABAYA
J A W A
BALI
BANDA SEA
SUMBAWA
FLORES
NUSA TENGGARA
SUMBA
TIMOR
TIMOR SEA
SAWU SEA
1
2
3
4
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6
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10
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28

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FIG. 4-3-2-(1)/9 EXISTING RADAR BEACON (RACON) STATIONS AND SITE ARRANGEMENT PLAN FOR SHORT TERM DEVELOPMENT

(REF.)

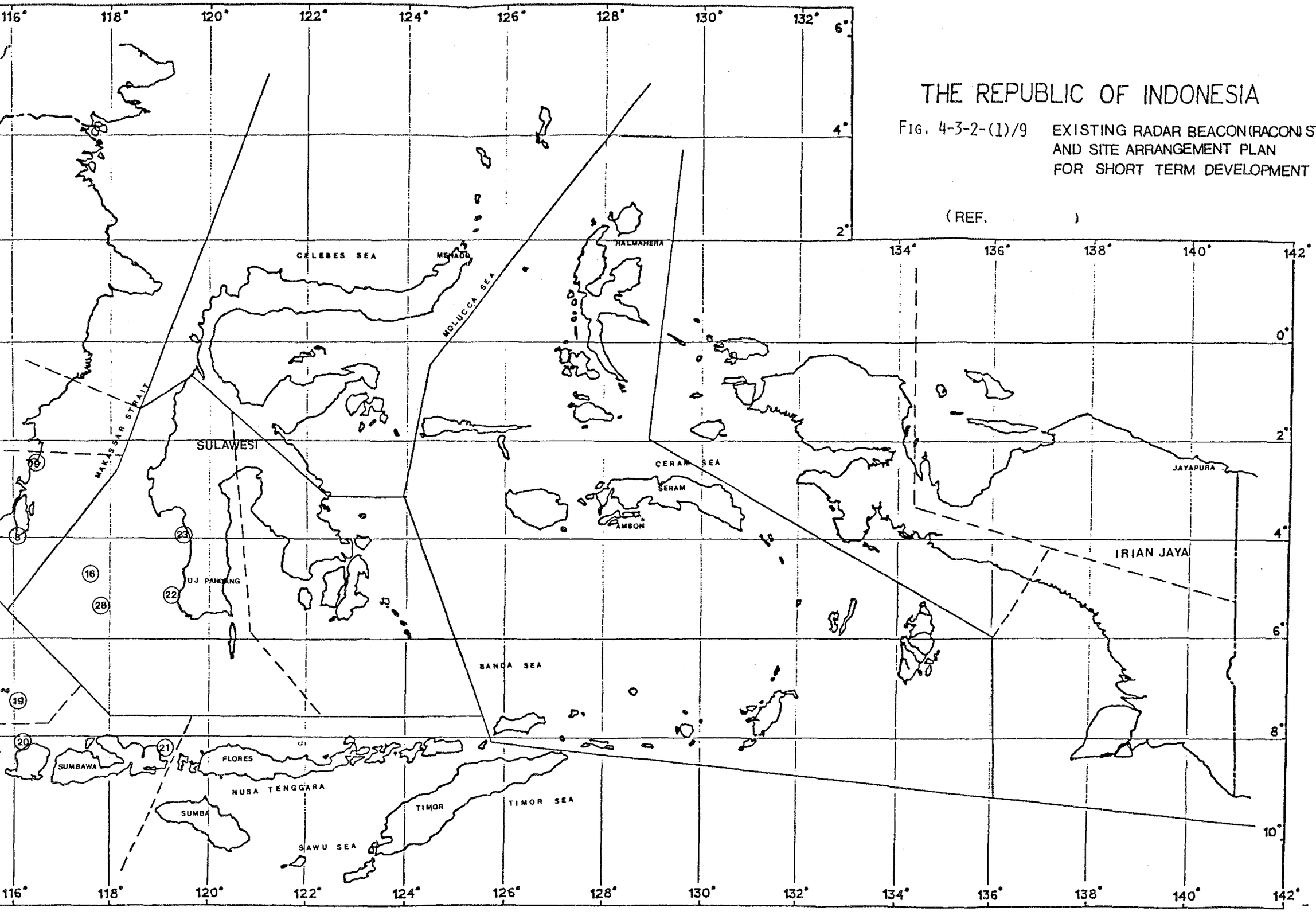


Table 4-3-2-(1)/8 List of Radar Beacon Stations - Short Term Plan

No.	LTP# No.	Name of Location	No. of Existing Lighthouse	Position (LAT/LON)	Area	KANWIL	DISTRICT NAVIGASI	Coast Station Nearby	Remarks
1	11 (14)	DAPUR	1660	S 03° 08' E 106° 31'	South point of BANGKA Is.	III	PLEMBANG	PALEMBANG	
2	12 (15)	LANGKUAS	1880	S 02° 32' E 107° 38'	NW point of BELITUNG Is. (SELAT KARIMATA)	III	PALEMBANG	PALEMBANG	
3	13 (16)	PESEMUT	Under Construction at FOREIGN FINANCE	S 02° 30' E 108° 50'	Approx. 150 NM South of PONTIANAK (SELAT KARIMATA)	III	PONTIANAK	PONTIANAK	
4	14 (17)	DISCOVERY EASTBANK	1960	S 03° 35' E 109° 10'	Approx. 210 NM South of PONTIANAK (JAVA SEA)	III	PONTIANAK	PONTIANAK	ON BANK
5	15 (18)	FOX BANK	1970	S 03° 31' E 110° 11'	Approx. 220 NM SSE of PONTIANAK (JAVA SEA)	III	PONTIANAK	PONTIANAK	ON BANK
6	16 (19)	TG. PUTING	Under Construction at FOREIGN FINANCE	S 03° 32' E 111° 48'	SW point of KALIMANTAN (JAVA SEA)	V	BANJARMASIN	SAMPIT	
7	17 (20)	SELATAN	4350	S 04° 11' E 114° 39'	South point of KALIMANTAN (JAVA SEA)	V	BANJARMASIN	BANJARMASIN	
8	18 (21)	PU^{2} SAMBARGULANG	4440	S 04° 24' E 116° 10'	MAKASSAR Strait	V	BANJARMASIN	BANJARMASIN	
9	19 (22)	KARANG SULING	4630	S 02° 23' E 116° 44'	Approx. 70 NM South of BALIKPAPAN	V	BALIKPAPAN	BALIKPAPAN	ON REEF
10	20 (23)	JAGA UTARA	1690	S 05° 12' E 106° 28'	Approx. 50 NM NW of TG. PRIOK (JAVA SEA)	III	TG. PRIOK	TG. PRIOK	

No.	LTP# No.	Name of Location	No. of Existing Lighthouse	Position (LAT/LON)	Area	KANWIL	DISTRICT NAVIGASI	Coast Station Nearby	Remarks
11	21 (24)	TEMPURUNG	2280	S 05° 54' E 105° 56'	Approx. 50 NM West of TG. PRIOK (SELAT SUNDA)	III	TG. PRIOK	PANJANG	
12	22 (25)	DAMAR-BESAR	1720	S 05° 58' E 106° 51'	Approx. 12 NM North of TG. PRIOK (JAVA SEA)	III	TG. PRIOK	JAKARTA	
13	23 (26)	PU. RAKIT	2990	S 05° 57' E 108° 28'	Approx. 50 NM NNW of CIREBON (JAVA SEA)	III	TG. PRIOK	JAKARTA	
14	25 (28)	KOROWELANG	3190	S 06° 49' E 110° 11'	Entrance to SEMARANG Port	IV	SEMARANG	SEMARANG	ON REEF
15	26 (29)	MASALEMBO	Under Construc-tion at FOREIGN FINANCE	S 05° 35' E 114° 27'	Approx. 150 NM NE of TG. PERAK (JAVA SEA)	IV	SURABAYA	SURABAYA	
16	27 (30)	KALUKALUKANG	Under Construc-tion at FOREIGN FINANCE	S 05° 12' E 117° 40'	Approx. 100 NM West of UJUNT PANDANG (JAVA SEA)	VI	UJUNG PANDANG	UJUNG PANDANG	
17	28 (31)	KARANG KOKO	3840	S 07° 28' E 113° 07'	SELAT MADURA	IV	SURABAYA	SURABAYA	ON REEF
18	29 (32)	KARANG MAS	3940	S 07° 41' E 114° 26'	SELAT MADURA	IV	SURABAYA	PANARUKAN	ON REEF
19	30 (33)	PU. SEKALA	4326	S 06° 56' E 116° 15'	Approx. 80 NM North of LOMBOK	IV	KALIANGAT (SURABAYA)	LEMBER	
20	31 (34)	PU. TREWANGAN	Included in MASTER PLAN	S 08° 20' E 116° 00'	NW LOMBOK (LOMBOK STRAIT)	IV	BENOA	LEMBER	
21	34 (37)	TG. NAROE	Included in MASTER PLAN	S 08° 19' E 119° 00'	NE SUMBAWA (FLORES SEA)	IV	BENOA	LEMBER	

No.	LTP# No.	Name of Location	No. of Existing Lighthouse	Position (LAT/LON)	Area	KANWIL	DISTRICT NAVIGASI	Coast Station Nearby	Remarks
22	38 (41)	KUDINGARENG LOMPO	4930	S 05° 09' E 119° 16'	Entrance to UNUNG PANDANG Port	VI	UJUNG PANDANG	UJUNG PANDANG	
23	39 (42)	TG. LERO	5040	S 04° 03' E 119° 36'	Approx. 70 NM North of UJUNG PANDANG (Entrance to PAREPARE Port)	IV	UJUNG PANDANG	UJUNG PANDANG	ON REEF
24	54 (57)	GOSONG ETNA	1710	S 05° 18' E 106° 54'	Approx. 50 NM from Tg. Priok (JAWA SEA)	III	Tg PRIOK	Tg. PRIOK	Short Term Plan (Offshore LH)
25	55 (58)	CORYFORT	-		Approx. 180 NM SSE of PONTIANAK (SELAT KARIMATA)	III	PONTIANAK	PONTIANAK	Short Term Plan (Offshore LH)
26	6 (9)	Tg. MANTIGI		S 05° 43' E 112° 41'					On Visual Aids for Short Term Plan
27	67 (70)	DOANG DOANGAN		S 05° 25' E 117° 56					On Visual Aids for Short Term Plan
28	66 (69)	MUCI		S 00° 33' E 104° 02'	SELAT BERNALA	II			On Visual Aids for Short Term Plan

Notes: - Nos. in ( ) give the serial number of stations shown in Fig. 4-3-2-(1)/9 inclusive of the existing 3 stations.

- # .. LTP = Long Term Plan.

(B) System Plan and Designing

(a) System Plan

a) Medium-wave radiobeacon

i) A medium-wave radiobeacon consists of both directional and omni-directional beacons.

ii) Direct air monitoring system is to be adopted through reception of radiobeacon signals at nearby coastal radio stations and Districts of Navigation.

iii) Improvement and rehabilitation of the existing power supply facilities at lighthouses are to be carried out in principle for the automated operation. However, if the distance between the existing lighthouse and radiobeacon station would be fairly long, then independent power plant will be installed and in such case maintenance personnel will be stationed.

b) Radar beacon

i) X band radar beacon is to be installed.

ii) Direct monitoring is to be carried out at the nearest locations of manned lighthouse, coastal radio station or District of Navigation. Either air or line monitoring is to be adopted.

iii) Power is to be supplied from nearby lighthouse and such through battery and battery charger. In case of independent installations, battery is to be used and the total battery unit is to be replaced for maintenance.

iv) Total equipment replacement system is to be adopted for maintenance.

(b) Facility plan and Designing

a) Medium-wave radiobeacon

i) Station site

The land space required is approximately 70 x 70 m ≒ 5,000 m^2 in general with some allowances.

ii) Station facilities

. Station building
Shelters are to be used to house the main equipment of transmitter, goniometer and control units in one and power supply installations of batteries and battery charger in another.

. Power supply building
Concrete block-make house is to be built for engine generators with the control and distribution panel housed.

. Oil storage
Oil tanks are to be installed.

. Living quarters
In case of independent power supply, living quarters are to be built for the maintenance technicians.

. Antenna-grounding system
45-meter high truss structure tower is to be erected with radial grounding mats.

The facility plans are shown in **APPENDIX-19**, No.1 - No.4 for reference.

b) Radar beacon

i) Station Site

The land space required is approximately 7 x 7 meters ≒ 50 m^2, where a tower is to be built.

However, the radio beacons are to be installed at the sites of existing lighthouses.

ii) Station facilities

. Station hut, power supply and living quarters
The facilities of existing lighthouse are in principle to be in co-use.

. Antenna tower
The equipment are to be fitted in princi-

ple on the existing lighthouse towers. However, if the existing towers would be old, then new iron framed towers are to be built. The height is either 10 m or 30 m high.

The facility plans are shown in **APPENDIX-19**, No.5 and No.6 for reference.

(c) Equipment plan and Designing

a) Medium-wave radiobeacon

i) Radiobeacon control unit

Two complete sets of the radiobeacon control unit are to be installed for the full automated change-over from in-operation to standby equipment and vice-versa. Manual change-over is also to be done.

ii) Radiobeacon transmitter

. Three complete sets of both power amplifier and modulation units are to be installed respectively for directional and omni-directional radiobeacons for their full automated change-over. Manual change-over is also to be done.

. Power supply unit 1 set

. Transmission of monitor signal
The monitor signal is to be transmitted

simultaneously with the radiobeacon signals through modulation frequency switching so that automatic reception and recording may be carried out at the monitoring site.

. Transmission output
1 kWPP

. Other ratings
In accordance with the Radio Regulations

iii) Power supply equipment

. 3 x Engine generators with automatic starting and stopping
output ... 7.5 kVA AC 110/220V
AVR, control and switching panels with necessary spares.

. Batteries
Alkaline batteries with the operational capacities of continuous six hours at the normal load.

. Battery charger
The capacity is to meet the battery requirement.

. Others
Measuring instruments and tools required for the maintenance are to be provided.

The schematic diagram is shown in **Fig. 4-3-2-(1)/10.**

b) Radar beacon

i) Transmitter-receiver

. X band radar beacon
. Antenna power
  0.5/1W to be switchable
. Total equipment replacement system is to be adopted for maintenance.

ii) Spare equipment and measuring instruments

One complete set of equipment is provided for the spare. The number of spare equipment equivalent to 20% of the total number of equipment installed within the service area of the relevant Districts of Navigation is to be provided at the Districts of Navigation together with one complete set of necessary instrumentation.

The standard configuration of a radar beacon station is shown in **Fig. 4-3-2-(1)/11.**

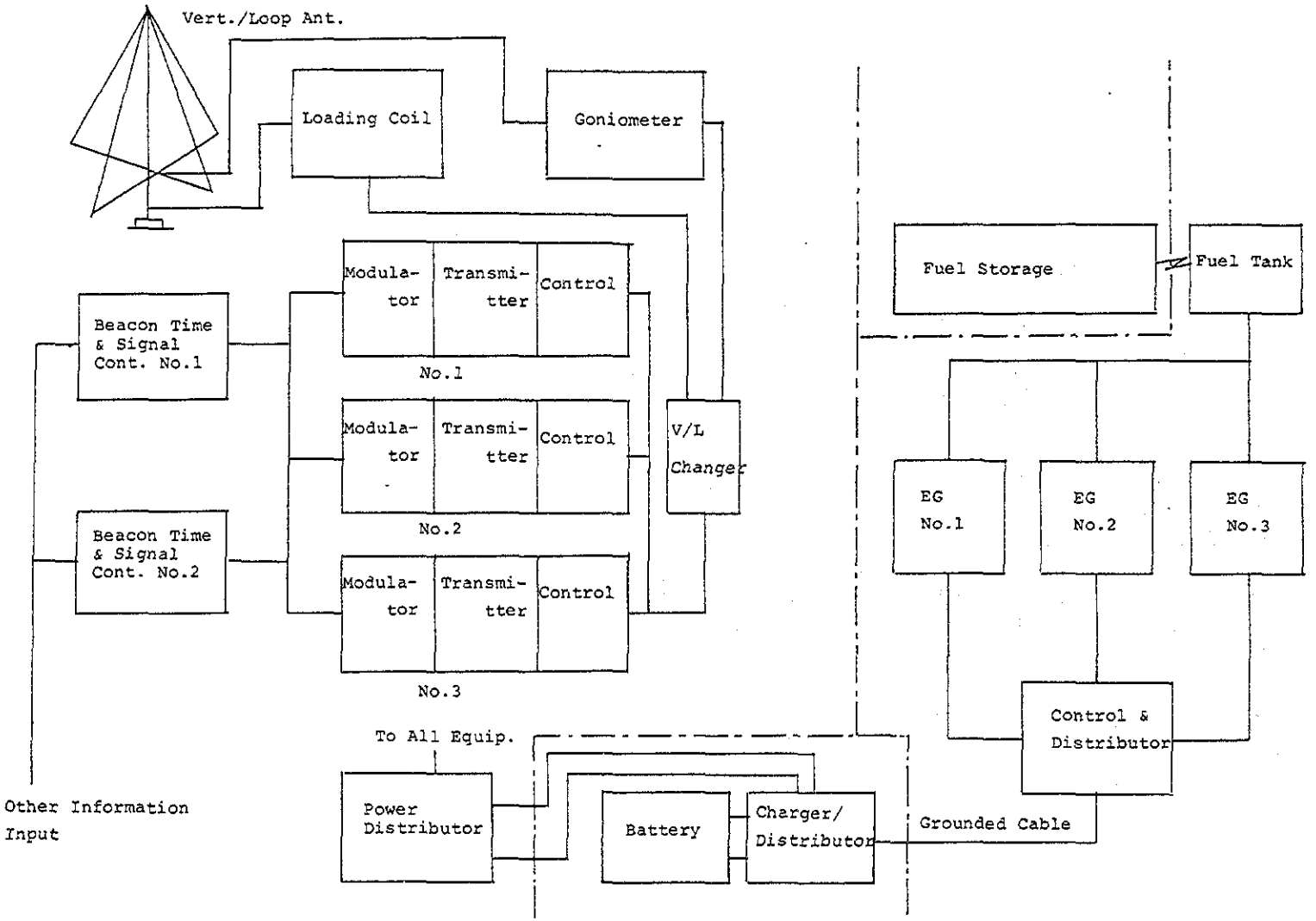


Fig. 4-3-2-(1)/10 Block Diagram of Medium Wave Radiobeacon Station

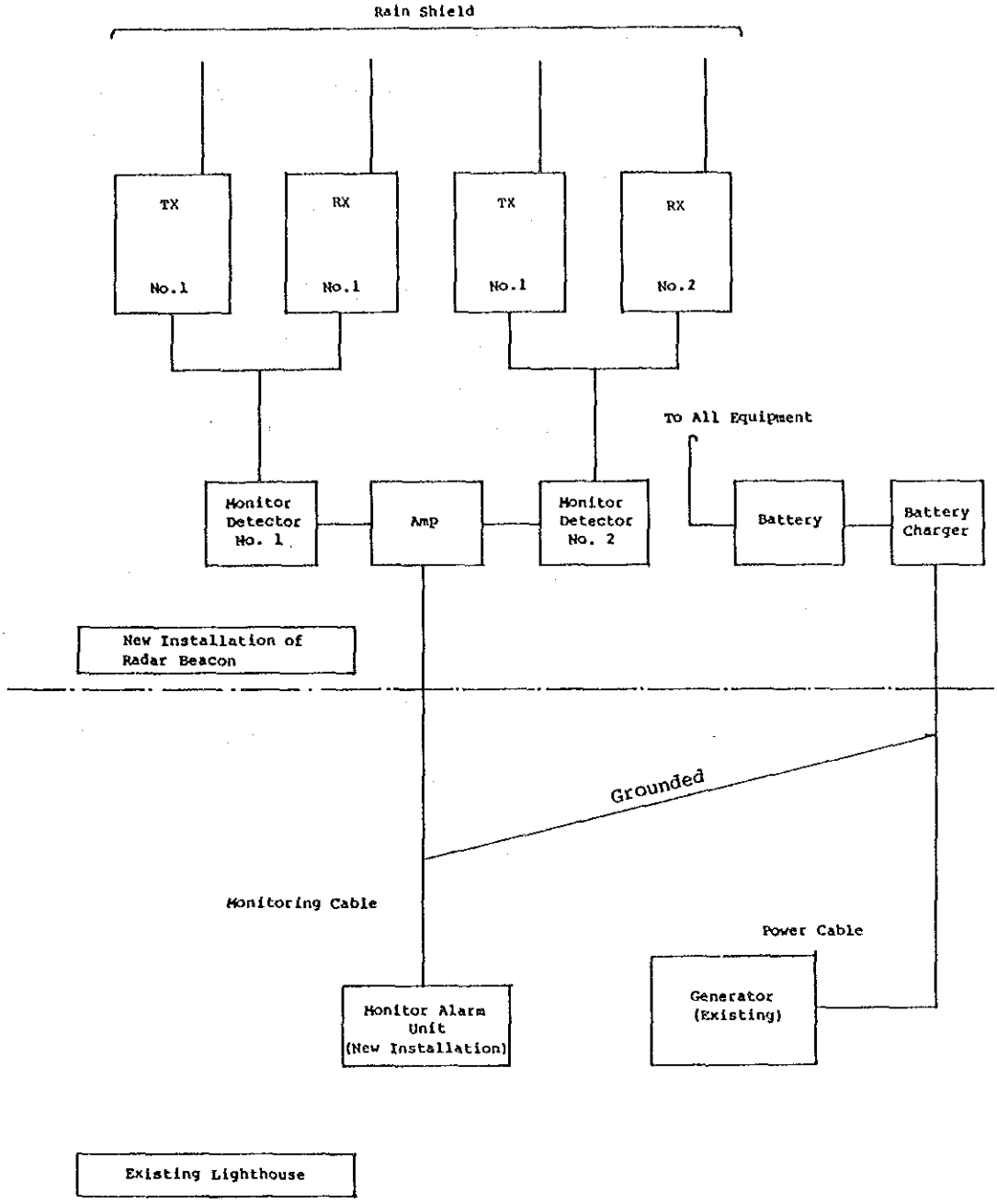


Fig. 4-3-2-(1)/11 Block Diagram of Radar Beacon Station

(2) Improvement Plan

1) Visual Aids to navigation

Due to the urgency in implementing the improvement and rehabilitation of existing lighted aids, all the facilities included in the Long Term Plan are to be improved and rehabilitated in the Short Term.

a) Improvement in Luminous Range

The following lights are planned in the Short Term improvement plan, and those are exactly same as given in the Long Term improvement plan.

Lighthouse	14 units
Light beacon	30 units
Total	44 units

The details of these lights are as given in **Tables 4-3-1-(2)/1**, Plan for Improvement and Improvement of Lighted Aids.

b) Group Remote Monitoring of Lighted Buoys

Remote monitoring will be carried out for the buoys installed in Dumai, Belawan and Surabaya areas:

Dumai area	31 buoys
Belawan	7 buoys
Surabaya	17 buoys
Total	55 buoys

The locations of those buoys range from short to long distance from the respective Districts of Navigation, at which the monitoring stations will be installed.

The buoys are to be remote-monitored generally

in groups depending on the size of service areas to be covered, and radio relay stations are to be installed, when required.

Fig. 4-3-2-(2)/1 shows the system configuration of buoy remote monitoring system: the buoys in short range group are monitored directly through VHF, those in medium range and long range groups are monitored via a radio relay station through VHF/UHF radio links. Each buoy within the service coverages is equipped with transmitter/receiver on board, and receiver unit of each installation will be operational so as to respond to the selective calls to be made from a monitoring station onshore, according to pre-established schedule, for monitoring of the operational functions of each buoy.

The grouping arrangement for the three areas are illustrated:

Dumai area ..... **Fig. 4-3-2-(2)/2**
Belawan area ... **Fig. 4-3-2-(2)/3**
Surabaya area .. **Fig. 4-3-2-(2)/4**

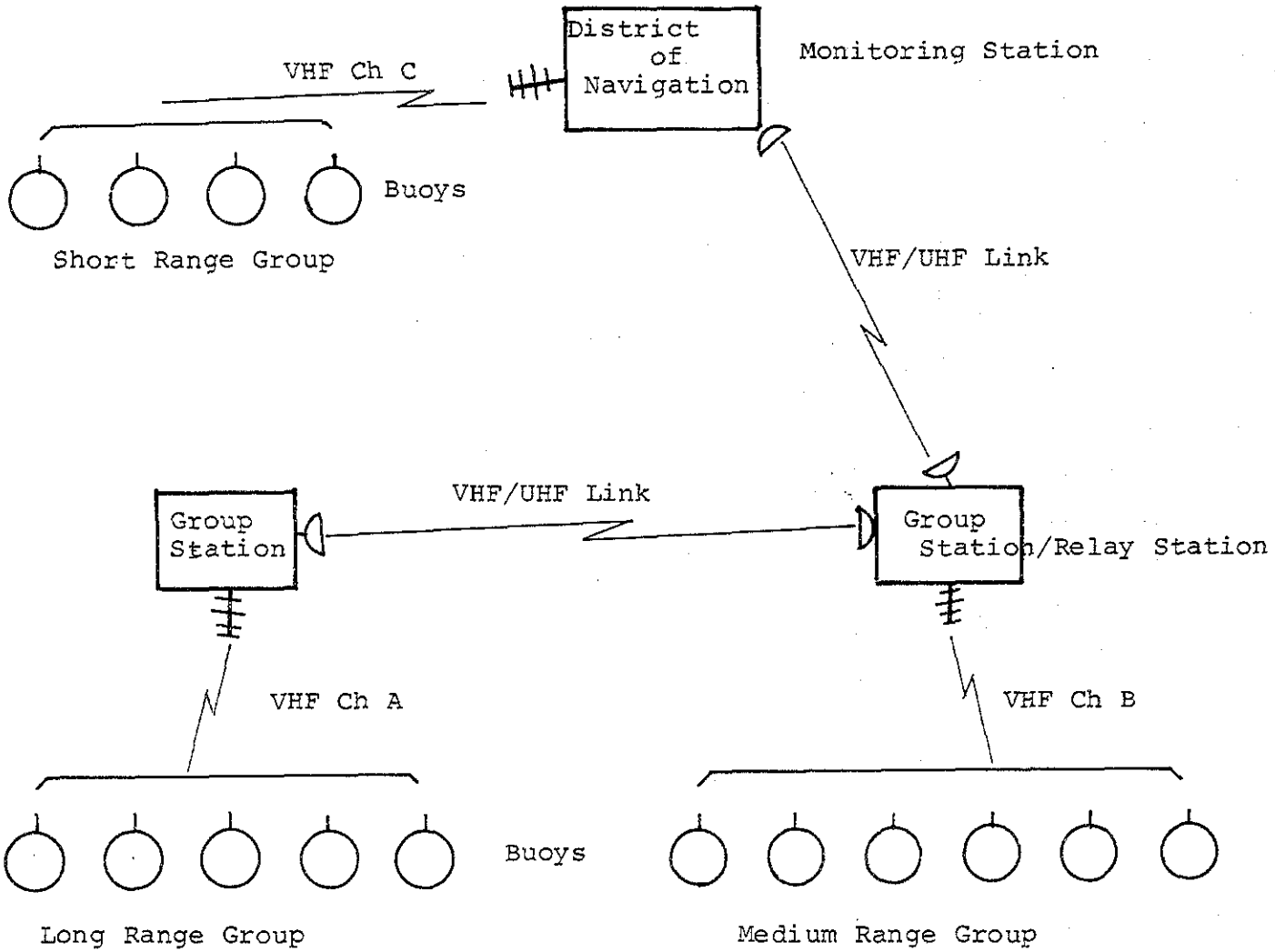
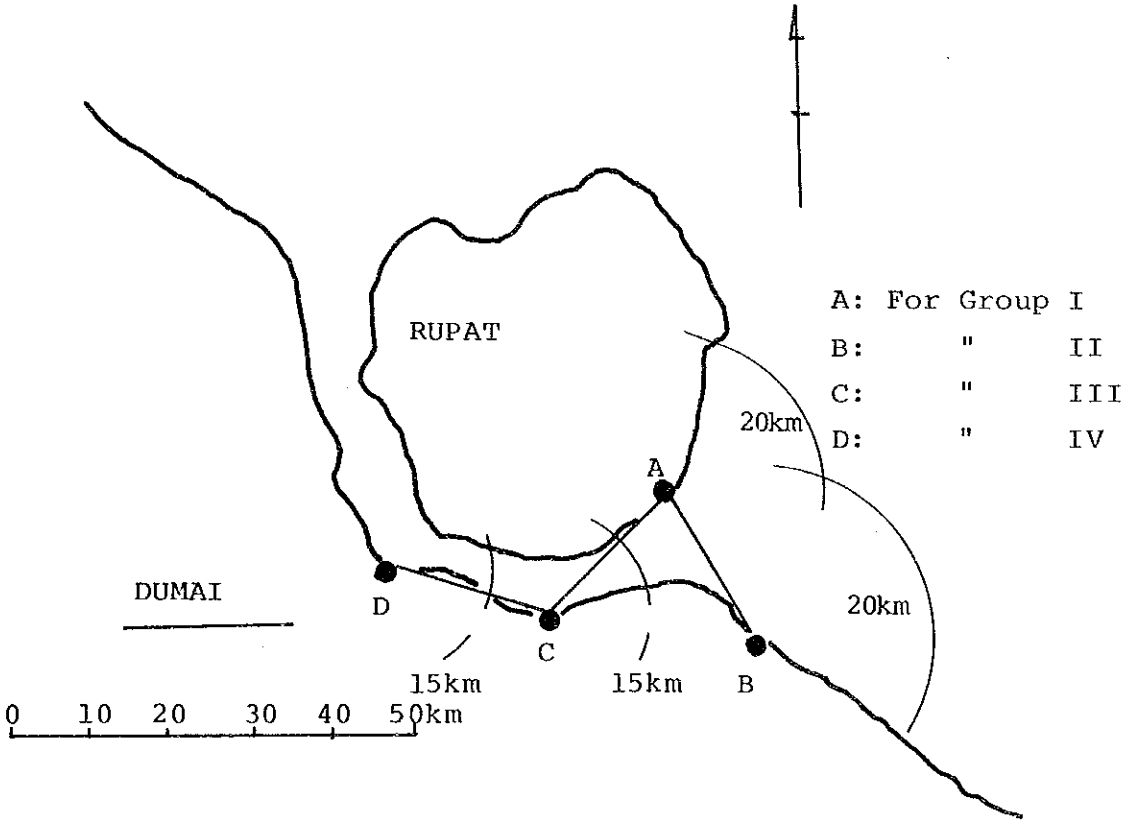
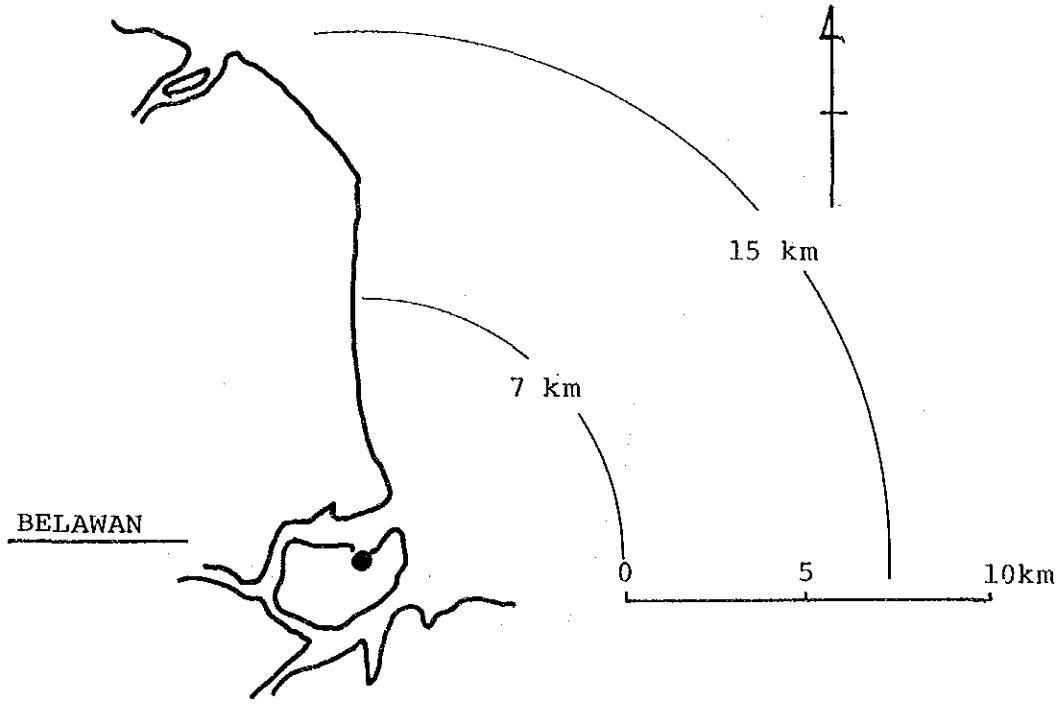


Fig. 4-3-2-(2)/1 System configuration of Buoy Group Remote Monitoring System



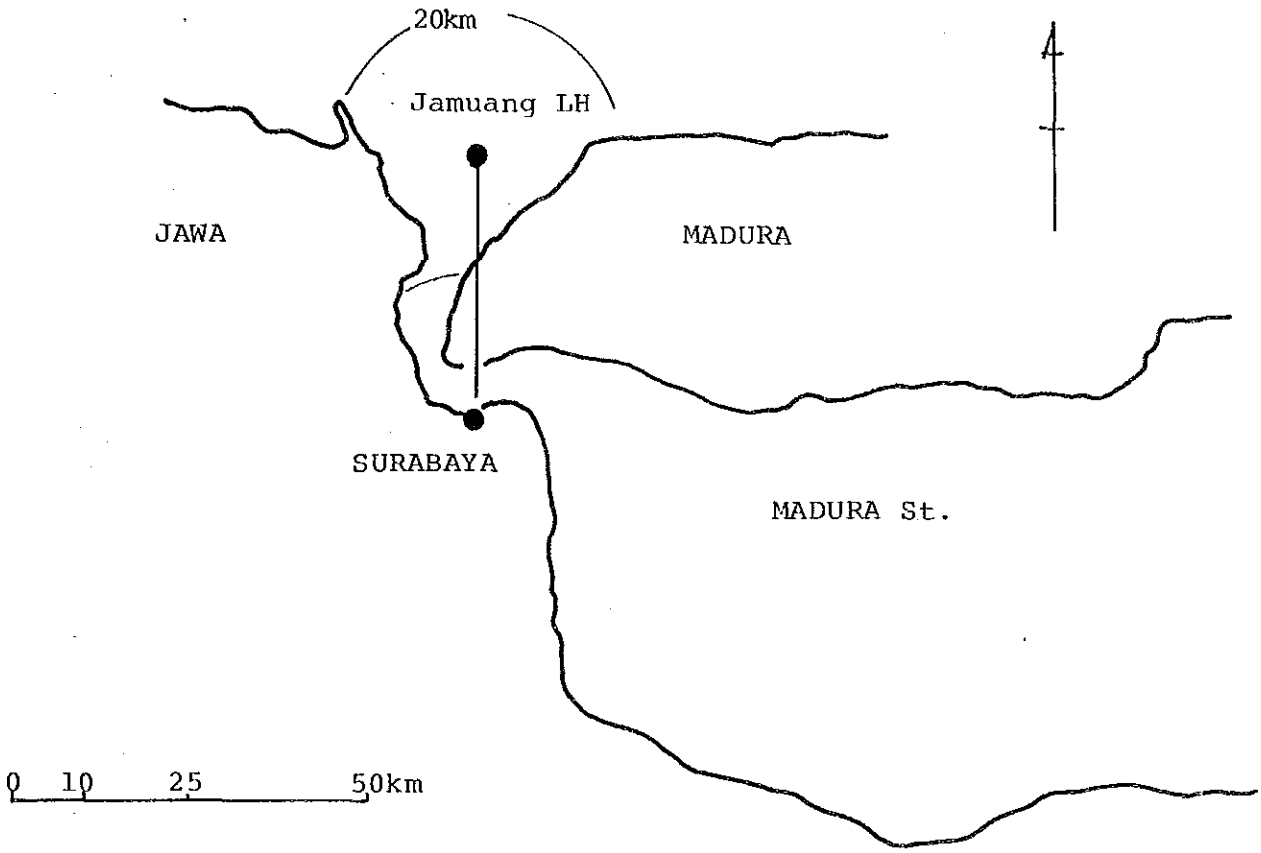
No. of Buoy St.	No. of Monitoring St.	No. of Relay St.	Remarks
4	1	1	Group I, VHF Beam Ant.
17		1	" II
6		1	" III
4			" IV (Direct Reception)

Fig. 4-3-2-(2)/2 Buoy Group Remote Monitoring System, Dumai



No. of Buoy St.	No. of Monitoring St.	No. of Relay St.	Remarks
7	1	0	VHF beam ant.

Fig. 4-3-2-(2)/3 Buoy Group Remote Monitoring System, Belawan



No. of Buoy St.	No. of Monitoring St.	No. of Relay St.	Remarks
17	1	1	Relay station is to be co-sited at MF radiobeacon station using its power supply

Fig. 4-3-2-(2)/4 Buoy Group Remote Monitoring System, Surabaya

c) Electrification from Propane Gas

In view of increasing difficulties in obtaining propane gas, the electrification is to be carried out for the following lighted aids as given in the Long Term Plan:

Light beacon	33 units
Lighted buoys	21 units
Total	54 units

d) Automatization of Lighthouse

Automatizing system for lighthouses is described on the two different cases of engine-generator power supplied installations and commercial power-engine generator installations for their power supplies.

(i) Outline of system

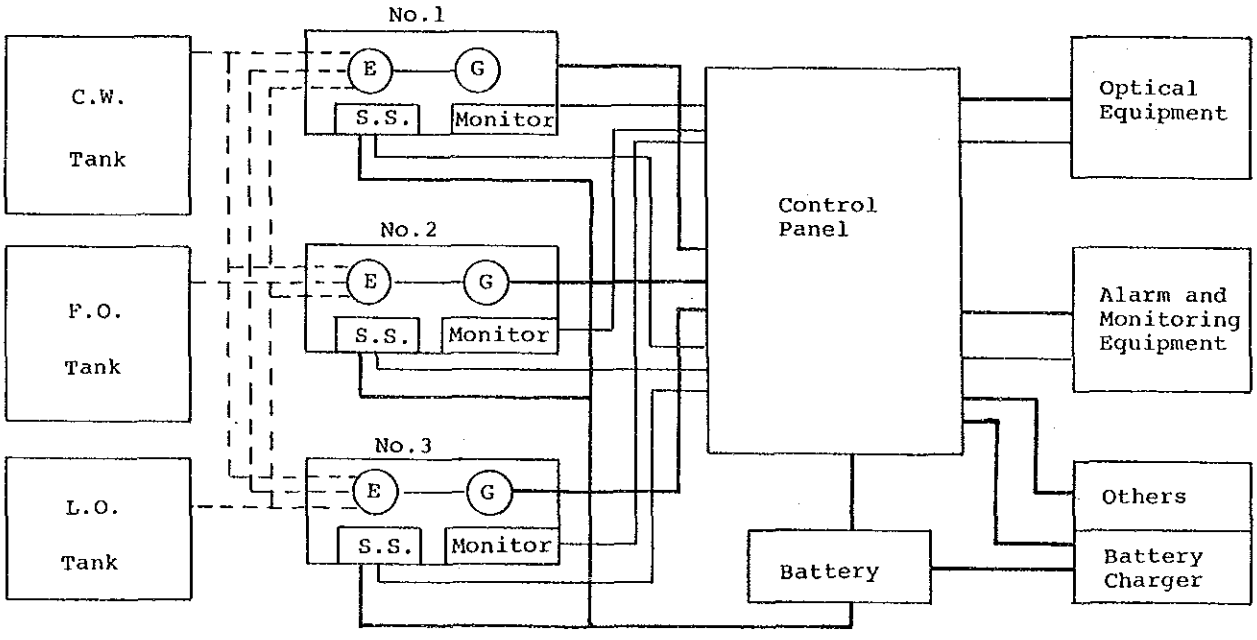


Fig. 4-3-2-(2)/5 Schematic Diagram of 3 Engine Generator System

(no commercial power available)

C.W Cooling water
F O Fuel oil
L O Lubricant oil
E Engine
G Generator
S.S Starting motor

--- Piping
—— Control wiring
—— Power wiring

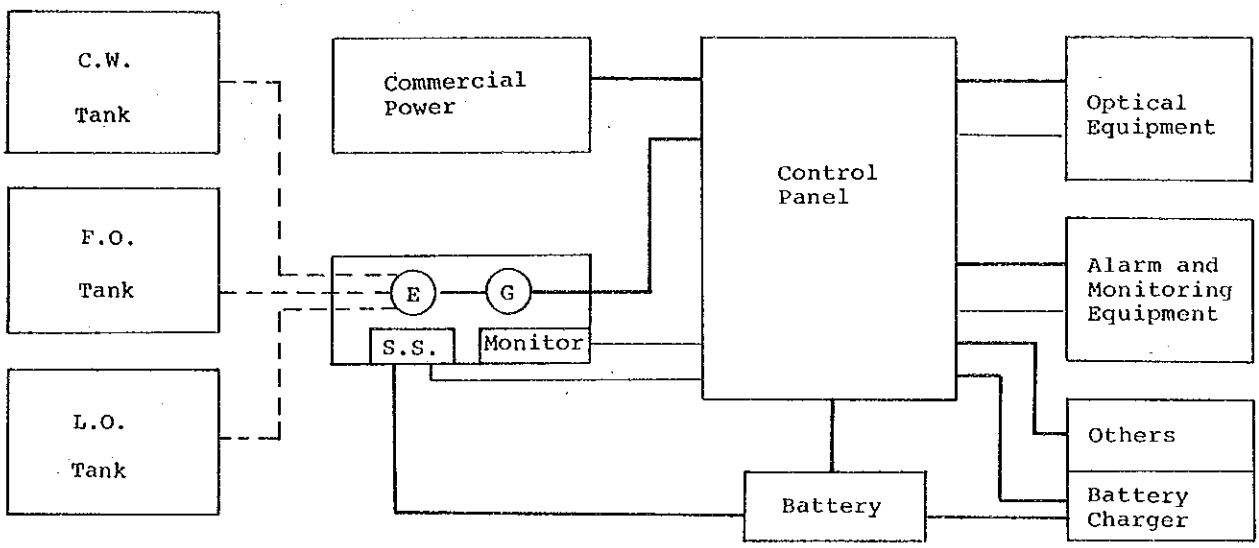


Fig. 4-3-2-(2)/6 Schematic Diagram of Commercial Power + Standby Engine Generator System

Engine-generator: 3 - 5 kVA 110/220V 50 Hz single phase

Control panel:

C W Tank: 500-1,000 lit.

F O Tank: 200-500 lit.

L O Tank: 50-100 lit.

Main functions:

- Automatic starting and stopping of engine-generators
- On-off switching of optical equipment
- Automatic switchover from inoperation engine to standby in case of failure
- Changing of batteries for both control and starter motors

Alarm and monitoring:

EG ... Excess rotation, oil pressure, high/low voltage, over heating, oil gauge

Optical equipment ...
Abnormality of light characteristics

Lamp changer ...
Working conditions

(ii) Remote monitoring and control

Remote monitoring and control for visual aids to navigation may be briefly categorized as follows:

i) Reporting of on-off of lights to the monitoring sites

ii) Reporting of lights conditions to the monitoring sites at regular intervals.

iii) Issuing of instructions to change over to standby power source via remote control in

case of primary power failure, and the response capability is incorporated.

The information to be sent for monitoring is to cover a simple piece of on-off report and various operational functions as well as security and fire alarming.
Single as well as multimonitoring may be carried out, and typical example of the former is illustrated in **Fig. 4-3-2-(2)/7.**

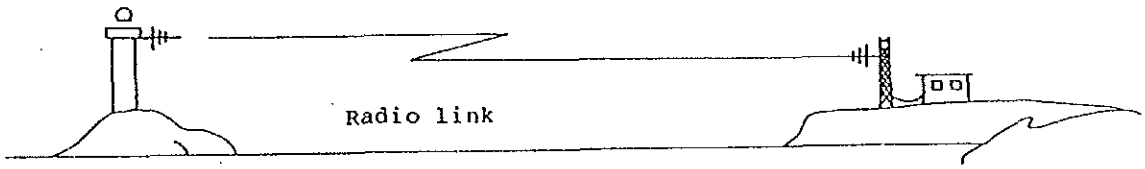


Fig. 4-3-2-(2)/7 Simple Type of Monitoring

Remote control and monitoring may also be carried out for multi-items, and examples are illustrated in **Fig. 4-3-2-(2)/8** and **Fig. 4-3-2-(2)/9** together with the information to be sent as tabled in **Table 4-3-2-(2)/1.**

	Functions	Partner
A	To be monitored and controlled	C
B	Relay and to be monitored	C
C	Monitor and control	A,B

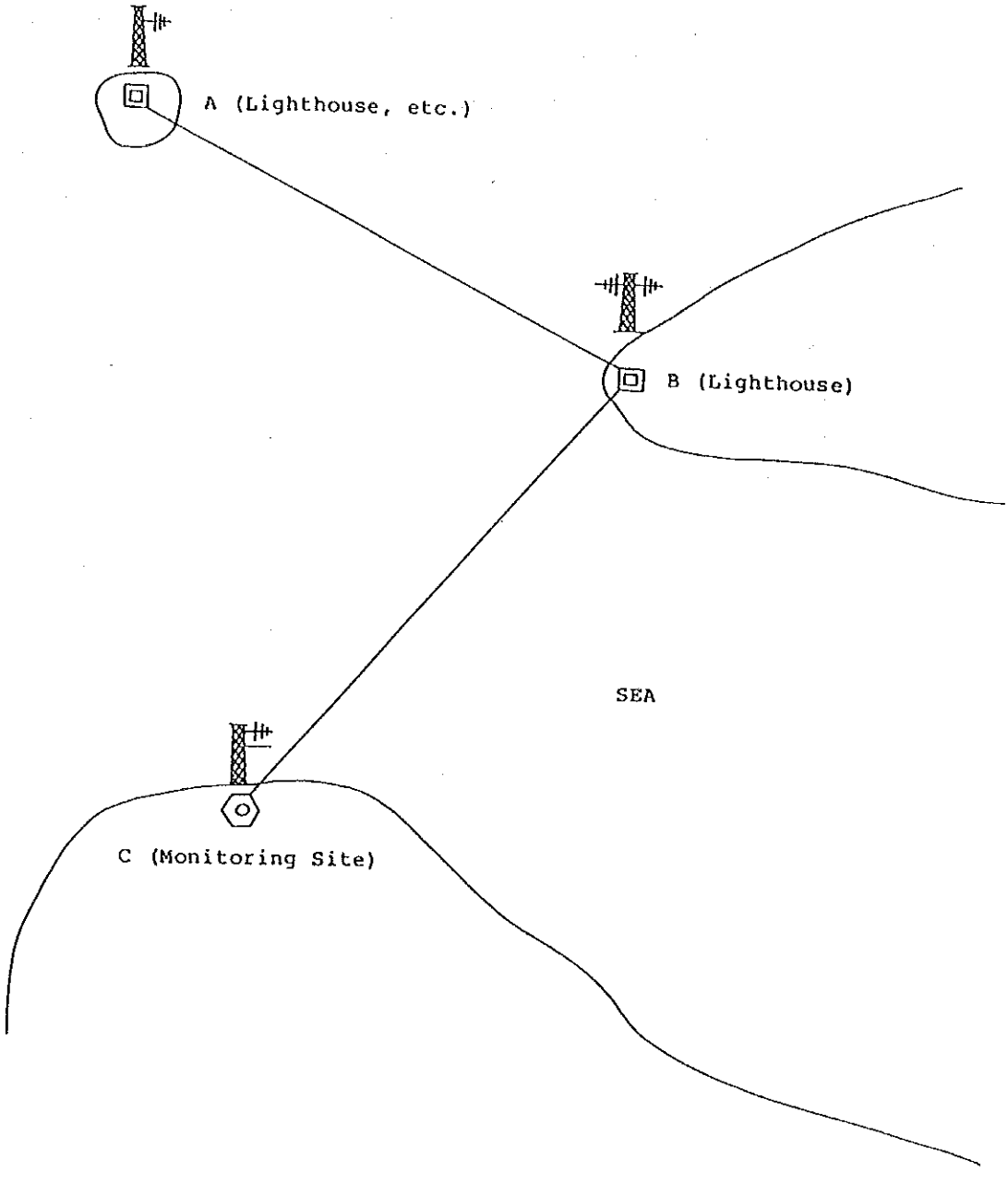


Fig. 4-3-2-(2)/8 Remote Control and Monitoring

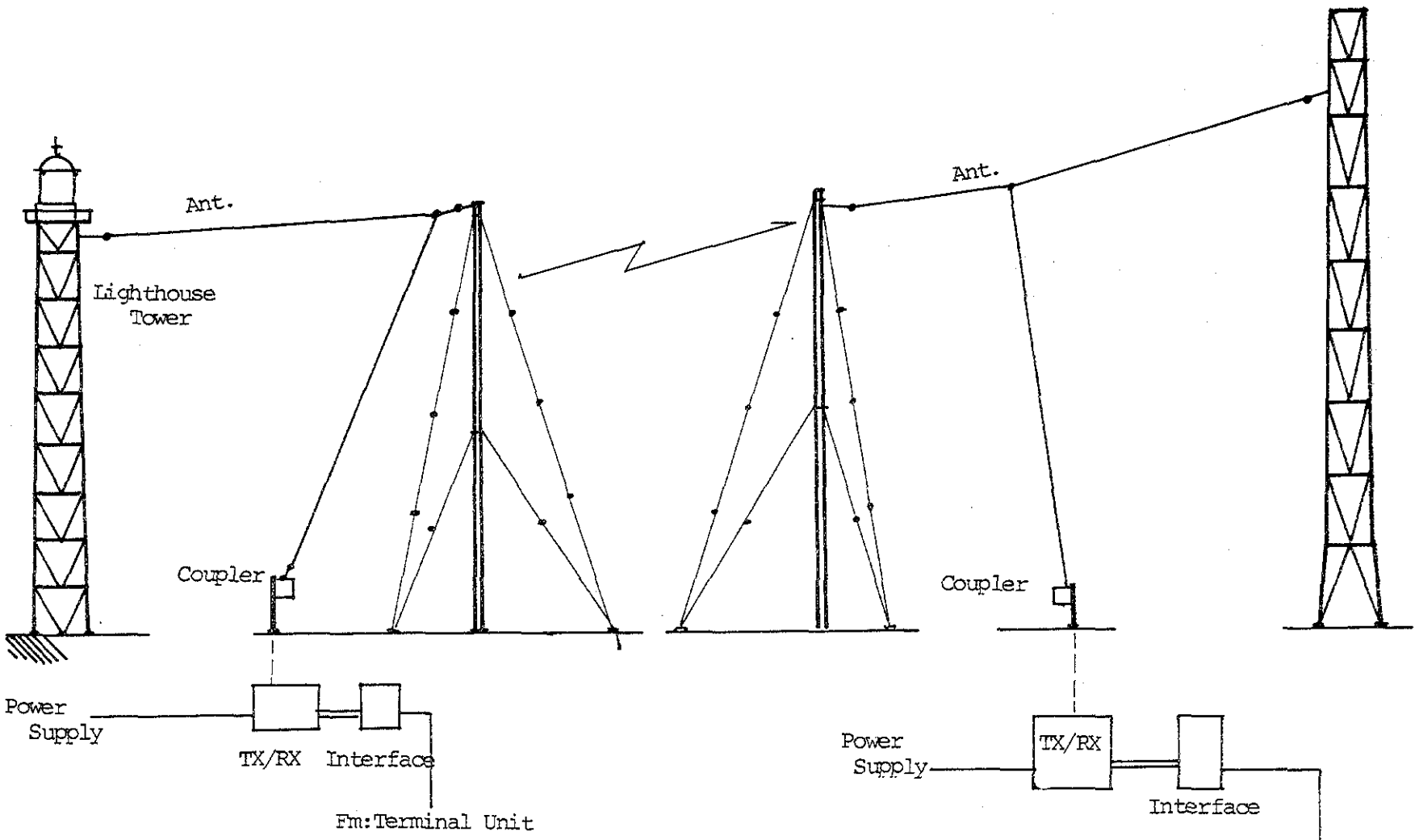


Fig. 4-3-2-(2)/9 Remote Control and Monitoring Configuration

Table 4-3-2-(2)/1 Monitoring Information (Example)

	Monitoring			Remarks
Own station	Lights normal	o		
	EG No.1	o		
	EG No.2		x	
	Lights abnormal			
	Commercial line off		x	
	Control			
	EG start	on	off	
	EG change-over	on	off	
	Lamp changer	on	off	
	Telecommunication line			
Other station	Relay line			

2) Supporting/Logistic Facilities

a) Supporting/Logistic Facilities and Equipment

Priority is given in the Short Term Plan for improvement of supporting facilities and equipment to the 1st and 2nd Class Districts of Navigation having larger scale facilities.

The plan is as given in **Table 4-3-2-(2)/2.**

Table 4-3-2-(2)/2 Short Term Plan for Supporting Facilities and Equipment

Facilities / Districts / Navigation	Work shop m^2	Equipment	Open storage m^2	Store house m^2	Jetty	Dry dock unit
DUMAI						○ 1
TG. PINANG	○ 170	○ Equipment list B	◎ 700	◎ 70	◎ Type A	-
BELAWAN	○ 260	○ do B	-	○ 70	-	-
SABANG	○ 160	○ do B	◎ 400	-	◎ Type B	-
PALEMBANG	-	○ do A	-	-	-	○ 1
PONTIANAK	-	○ do A	◎ 700	○ 160	◎ Type A	○ 1
TLK BAYUR	○ 260	○ do B	◎ 700	◎ 100	◎ do	-
SEMARANG	○ 340	○ do B	◎ 700	◎ 160	◎ do	-
KUPANG	○ 320	-	◎ 700	◎ 240	-	-
UG. PANDANG	◎ 160	○ do B	◎ 700	◎ 140	◎ Type A	-
SAMARINDA	-	○ do A	-	-	-	○ 1
BANJARMASIN	○ 340	-	◎ 700	◎ 240	-	-
BITUNG	◎ 400	○ do B	◎ 700	◎ 160	-	-
SORONG	-	○ do A	○ 1,300	◎ 280	-	-
JAYAPURA	○ 300	○ do A	◎ 700	○ 190	◎ Type A	○ 1
AMBON	○ 320	○ do B	-	◎ 160	-	-
MERAUKE	○ 300	○ do A	-	-	-	○ 1
Total	(12) 3,330 m^2	list A (6) list B (8)	(11) 8,000 m^2	(12) 1,970 m^2	Type A (6) Type B (1)	(6)

Notes: ( ) shows the number of facilities
◎ ; New Establishment, ○ ; Improvement

Remarks: 1) Equipment Lists A & B are given in **APPENDIX-25**

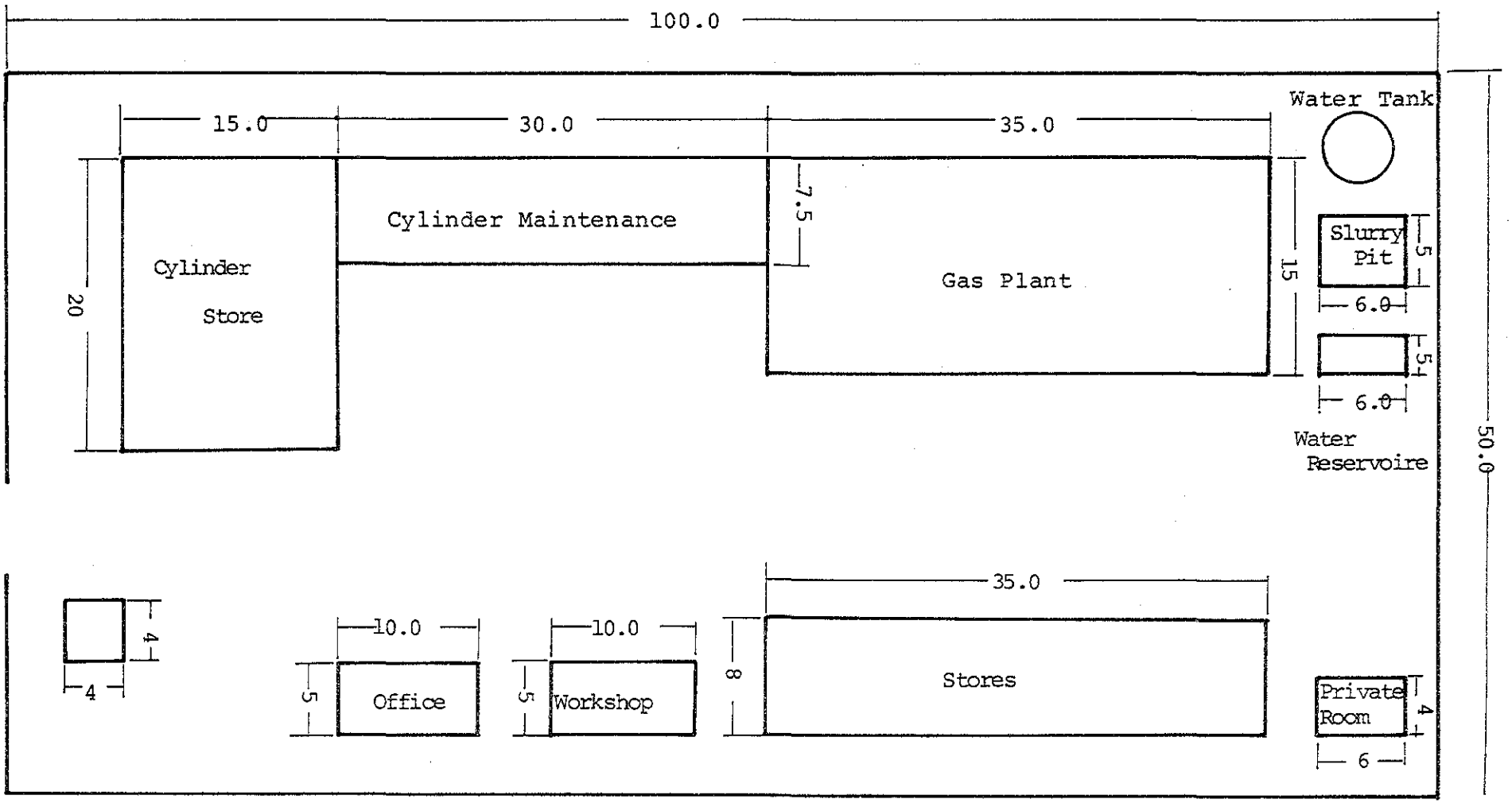
2) Jetty Type A: Length 40 m/Width 8 m/Draught 5.5 m
Jetty Type B: Length 25 m/Draught 3 m
(Section 4-3-1, (2), 2), Facility Criteria)

b) Gas Plant

As stated in the Long Term Plan, a new gas plant planned in Tg. Priok is to have following capabilities:

Site area:	5,000 m^2
Gas filling capability:	20 m^3/H
Gas filling pressure:	25 ATM
Gas holder capacity:	10 m^3
Compressor: Motor compressor, high pressure	

The layout for gas factory is given in **Fig. 4-3-2-(2)/10** together with that for gas plant as shown in **Fig. 4-3-2-(2)/11.**



Unit:Meter

Fig. 4-3-2-(2)/10 Layout Area of Gas Factory

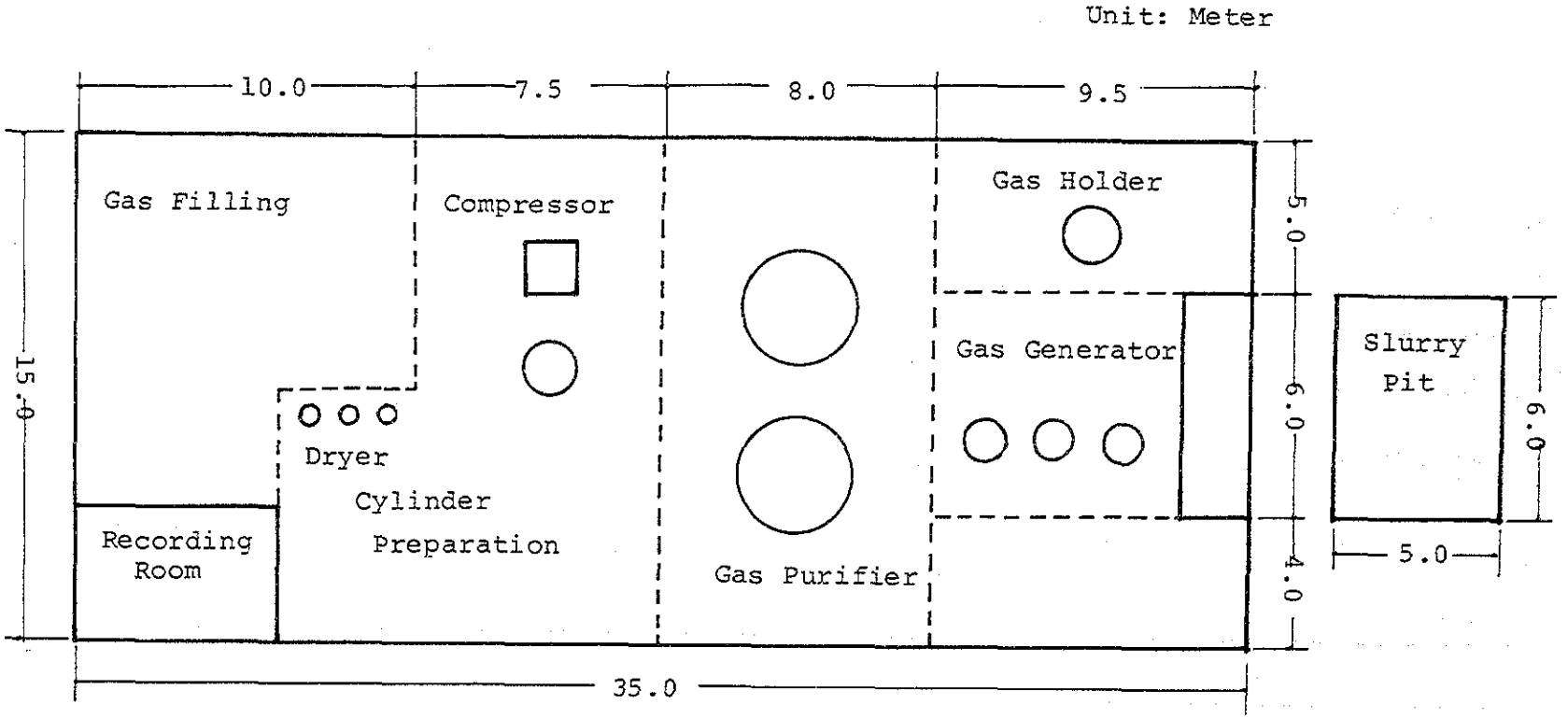


Fig. 4-3-2-(2)/11 Layout of 20 M^3/H Acetylene Gas Plant

c) Buoy Maintenance Facility

The five year port development plan has currently been in its implementation for Dumai port, and there is also a re-locating plan of Dumai District of Navigation. Therefore, the facility improvement plan is established in the Short Term Development Plan for the 1st Class District of Navigation, Dumai including the buoy base due to its urgent need.

(a) Facility of Buoy Base

Dumai is a base for buoy tenders and has a buoy base, and maintenance services are carried out by the buoy tenders for the buoys under the control of Dumai and other three 2nd Class Districts of Navigation respectively located at Tg. Pinang, Belawan and Sabang.
Calculation is made hereunder on the work loads required for the biannual maintenance currently in service (non property buoys are excluded in the calculation).

The performance of buoy tender is as follows:

Lighted buoy: 2 times/year x 1 day/unit
x (*) units
Small buoy: 2 " x 1 "
x (*) units
x 0.35

*: No. of units
(Source: Short Term Development Plan for Aids to Navigation and Maritime Telecommunication System, DGSC, Aug. 83)

The current work loads are as given below:

District of Navigation	Lighted Buoy (L.B.)	Small Buoy (U.L.B.)	No. of Mobili-zation/ year
Tg. Pinang	12	53	62
Belawan	7	29	35
Sabang	8	23	33
Dumai	28	7	61
	55	112	191

Following gives the calculation of work loads for the biannual complete replacement system for the same number of buoys as currently installed. In this case, gas cylinders are to be replaced for lighted buoys once every six months.

Work Loads for Complete Replacement System
(Number of buoys is esteemed as same as that currently in operation)

District of Navigation	Distance (N.M.)	Lighted Buoy (L.B.)*	Small Buoy (U.L.B.)*	No. of Days/ year
Tg. Pinang	225	12	53	52
Belawan	241	7	29	30
Sabang	495	8	23	28
Dumai	-	28	7	33
Total		55	112	143

Note: * Number of existing units

The total number of 36 lighted buoys is planned in the Short Term Development Plan for these areas. When this number is taken into consideration without change in the number of U.L.B., the following computation may be made:

Work Loads for Complete Replacement System after Implementation of Short Term Development Plan

District of Navigation	Distance (N.M.)	Lighted Buoy (L.B.)	Small buoy (U.L.B.)	No. of Mobilization/ year	No. of Days/ year
Tg. Pinang	225	19	53	6	59
Belawan	241	22	29	5	46
Sabang	459	15	23	4	36
Dumai	-	35	7	4	39
Total		91	112	19	180

The resultant number of days given above includes that required for preparation of mobilization, cruising days, working days at sea, as well as that to be needed for at-sea maintenance of non-replaced buoys and their checking days of 4 units /day. The improvement plan will be implemented in the Short Term Plan for Dumai in order to substantially cover the maintenance of buoys, and the plan for individual facilities is as given in Section 7-3, Maintenance of Buoys.

(b) Facility of Buoy Open Storage

The buoy tenders belonging to Dumai District of Navigation have to cover a number of buoys under the control of each District of Navigation concerned, and accordingly the number of days for mobilization will increase if a tender carries on board six buoys for their replacements, as described before.

In this case, mobilization of a buoy tender will be required six times every year to Tg. Pinang, for example, and the total number of days will be 180.

In order to improve the operational efficiency of buoy tenders, the buoy open storages are to be established for each District of Navigation within the Dumai territory. At the buoy open storages, the whole services of repair and checking will be carried out for buoy body, mooring equipment, sinker, lighting device, power source and so on.

Since the buoys removed from sea will be repaired and services at the open storages, restriction on necessity of ships mobilization merely for the purpose of buoy transportation will disappear, and appropriate planning for mobilization of buoy tenders will become feasible.
Estimation is made in this plan that the buoy tenders are to be sent to each District of Navigation concerned twice a year, taken into account the biannual replacement cycle of gas cylinders for lighted aids.

Work Loads After Completion of
Buoy Base and Open Storages

District of Navigation	No. of Mobilization/ Year	No. of Days/ Year	
Tg. Pinang	2	51	(Open Storage)
Belawan	2	39	(")
Sabang	2	28	(")
Dumai	4	39	(Buoy Base)
Total	10	157	

At the buoy open storages, repair and maintenance services are also carried out as described before, and accordingly adequate open spaces will be required both for buoy bodies, chains, sinkers and such, and for warehouse and repairing spaces.
The minimum of approximately 1,200 m^2 space will be desirable for this purpose, where the service capability of about ten lighted buoys and ten to twenty small buoys will be retained on continuous basis.
The open storage should preferably be near the jetty to a possible extent from the viewpoint of improving the works efficiency. All the buoy bodies and other materials will be stored in this area to implement the complete buoy replacement system. **Fig. 4-3-2-(2)/12** shows an example of site plan for buoy open storage:

(i) Open storage for buoys
including (ii) - (iv) and (vi):
approx. 500 - 3,000 m^2
Buoys serviced or to be serviced are to be stored.

(ii) Open storage for chains: Approx. 135 m^2
Individual chains are to be stretched and stored.

(iii) Open storage for sinkers: Approx. 40 m^2
Sinkers are to be placed

(iv) Open workshop: Approx. 110 m^2
Buoys unloaded from buoy tenders and those serviced and ready for re-installation are to be placed. The workshop is also used for repair, painting and re-assembling.

(v) Workshop storage: Approx. 400 - 1,000 m^2
The equipment and materials are to be housed, and indoor repair and maintenance are to be carried out. Painting works are also to be done during rainy weather.

(vi) Passage road
5-meter wide passage roads are to be available for maneuvering of vehicles, forklift, mobile crane, etc. within the facility area.

(c) Workshop

The workshop is one of the important establishments as a supporting facilities for repair and maintenance of all kinds of equipment used for aids to navigation facilities.
Heavy duty machines and equipment are inevitably required for the maintenance of buoys, and are to be installed at the workshops of buoy base and buoy open storages.

The workshops in Dumai, Tg. Pinang, Belawan and Sabang will have exclusive space sections as given below, in which work benches are to be fitted:

i)	Storage room;	20 - 40 m^2
ii)	Work room;	6 - 8 m^2
iii)	Lighting device test and adjustment room;	9 - 16 m^2
iv)	Battery charge room;	15 - 25 m^2

(d) Spares

Spares of buoy body and other materials are to be kept at the buoy base and each open storage in order to carry out smooth replacement works. These spares will facilitate immediate recovery of buoy troubles and accidents like collisions, drifting away, light failures and so forth.
The necessary spares are listed in **Table 4-3-2-(2)/3.**

Fig. 4-3-2-(2)/12 Example of Buoy Open Storage
- Site plan -

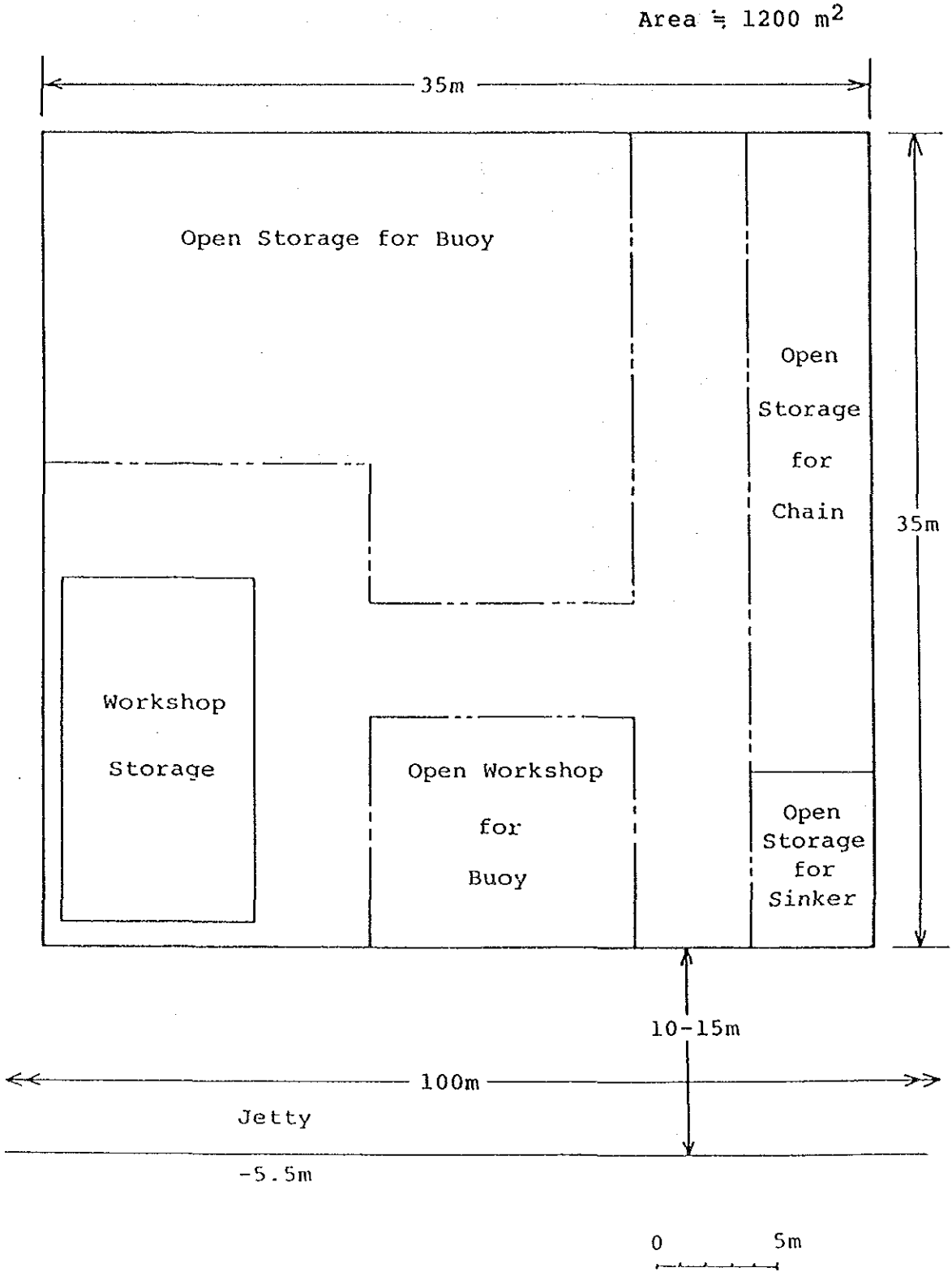


Table 4-3-2-(2)/3 List of Spares for Buoy Base and Buoy Open Storages

	Buoy Base	Buoy Open Storage				
	DUMAI	TG. PINANG	BELAWAN	SABANG	TOTAL	Remarks
Light Buoy	8	7	8	6	29	Complete sets with mooring equipment
Small Buoy	2	18	11	8	39	"
Lantern	3	2	2	2	9	Complete sets with flasher
Flasher	3	2	2	2	9	
Batteries	1	1	1	1	4	6 pcs. 1 unit
Gas Cylinder	1	1	1	1	4	4 pcs. 1 unit
Chain for L.B.	4	2	3	2	11	With shackle 3 eyes piece and swivel
Chain for U.L.B.	1	6	3	3	13	"
Sinker	4	5	4	3	16	1 ton cast iron sinker

(e) Jetty

Jetty is a vital facility to be needed both at a buoy base and at open buoy storage, and should preferably be closely located to buoy base or open buoy storage.

Among the Districts of Navigation within Dumai territory, priority should be given to Tg. Pinang and Sabang to respectively construct a jetty since there are no jetties there.

If and when road access will be required between a buoy base or open buoy storage, then due consideration should be given to have the road width and ground solidity adequate for works and carriage by mobile cranes and forklifts.

The scale of jetty is as follows:

Tg. Pinang

Length	:	40 m
Width	:	8 m
Draught	:	-5.5 m

Sabang

Length	:	25 m
Width	:	6 m
Draught	:	-3 m

5. COST ESTIMATION

5. Cost Estimation

The cost estimation for this Master Plan is summarized in **Table 5.**

The cost estimation is made both for the Long Term Plan and for the Short Term Plan, which are based on the current price quotation, and no reference has been made to future cost escalation.

Table 5 Summary of Cost Estimation for Master Plan for Development of Aids to Navigation System

1. Long Term Plan

(Unit: US$ x 1,000)

Item / Currency	Foreign Currency	Local Currency	Total Amount
(1) Development Plan			
1) Visual Aids to Navigation			
	(17,535)	(6,020)	(23,555)
Lighthouse (on land)	95,190	32,680	127,870
Lighthouse (off shore)	18,282	27,577	45,859
	(13,608)	(2,187)	(15,795)
Light beacon (on land)	50,400	8,100	58,500
Light beacon (off shore)	7,210	3,255	10,465
Resilient Light Beacon	3,510	1,098	4,608
	(3,600)		(3,600)
Lighted buoy (WAG)	5,400	-	5,400
	(3,640)		(3,640)
Lighted buoy (Gas)	4,940	-	4,940
	(6,324)		(6,324)
Lighted buoy (Solar)	11,160	-	11,160
	(44,707)	(8,207)	(52,914)
Sub-total	196,092	72,710	268,802
2) Electronic Aids to Navigation			
MF Radiobeacon	50,698	7,797	58,495
	(1,755)	(201)	(1,956)
Radar beacon	14,609	1,669	16,278
	(1,755)	(201)	(1,956)
Sub-total	65,307	9,466	74,773
(2) Improvement Plan			
1) Visual Aids to Navigation			
a) Range Improvement	12,521	1,408	13,929
b) Buoy Group Monitoring	5,455	375	5,830

Item \ Currency	Foreign Currency	Local Currency	Total Amount
c) Electrification from Gas	6,417	330	6,747
d) L.H. Automatization	829	114	943
Sub-total	25,222	2,227	27,449
2) Supporting/Logistic			
a) Workshop	-	1,170	1,170
Equipment	13,453	458	13,911
Open storage	-	378	378
Store house	-	734	734
Jetty	705	4,095	4,800
b) Gas plant	212	386	598
c) Spare buoys and parts	2,428	-	2,428
Sub-total	16,798	7,221	24,019
Total of (1) & (2)	(46,462) 303,419	(8,408) 91,624	(54,870) 395,043
(3) Training 1) Factory Training	2,846	-	2,846
(4) Basic Design (for Lighthouse offshore)	2,750	-	2,750
Total of (1),(2),(3) & (4)	(46,462) 309,015	(8,408) 91,624	(54,870) 400,639
(5) Consultancy (6%)	(2,788) 18,541	(504) 5,497	(3,292) 24,038
(6) Contingency (10%)	(4,646) 30,902	(841) 9,162	(5,487) 40,064
Total	(53,896) 358,458	(9,753) 106,283	(63,649) 464,741

Notes: 1. Exchange rate applied ... US$1 = ¥230.-
2. ( ) shows the costs for one-going projects which are included in the relevant total costs.

2. Short Term Plan

(Unit: US$ x 1,000)

Item \ Currency	Foreign Currency	Local Currency	Total Amount
(1) Development Plan			
1) Visual Aids to Navigation			
	(17,535)	(6,020)	(23,555)
Lighthouse (on land)	34,569	11,868	46,437
Lighthouse (off shore)	3,324	5,014	8,338
	(13,608)	(2,187)	(15,795)
Light beacon (on land)	20,328	3,267	23,595
Light beacon (off shore)	2,060	930	2,990
Resilient Light Beacon	1,560	488	2,048
	(3,600)		(3,600)
Lighted buoy (WAG)	3,600	-	3,600
	(3,640)		(3,640)
Lighted buoy (Gas)	3,640	-	3,640
	(6,324)		(6,324)
Lighted buoy (Solar)	7,998	-	7,998
	(44,707)	(8,207)	(52,914)
Sub-total	77,079	21,567	98,646
2) Electronic Aids to Navigation			
MF Radiobeacon	22,049	3,151	25,200
	(1,755)	(201)	(1,956)
Radar beacon	5,879	661	6,540
	(1,755)	(201)	(1,956)
Sub-total	27,928	3,812	31,740
(2) Improvement Plan			
1) Visual Aids to Navigation			
a) Range Improvement	12,521	1,408	13,929
b) Buoy Group Monitoring	5,455	375	5,830
c) Electrification from Gas	6,417	330	6,747

Item \ Currency	Foreign Currency	Local Currency	Total Amount
d) L.H. Automatization	829	114	943
Sub-total	25,222	2,227	27,449
2) Supporting/Logistic			
a) Workshop	-	892	892
Equipment	9,290	312	9,602
Open storage	-	274	274
Store house	-	528	528
Jetty	331	2,035	2,366
b) Gas plant	212	386	598
c) Buoy spare parts	2,428	-	2,428
Sub-total	12,261	4,427	16,688
Total of (1) & (2)	(46,462) 142,490	(8,408) 32,033	(54,870) 174,523
(3) Training			
1) Factory Training	1,032	-	1,032
(4) Basic Design (for Lighthouse offshore)	500	-	500
Total of (1),(2),(3) & (4)	(46,462) 144,022	(8,408) 32,033	(54,870) 176,055
(5) Consultancy (6%)	(2,788) 8,641	(504) 1,922	(3,292) 10,563
(6) Contingency (10%)	(4,646) 14,402	(841) 3,203	(5,487) 17,605
Total	(53,896) 167,065	(9,753) 37,158	(63,649) 204,223

Notes: 1. Exchange rate applied ... US$1 = ¥230.-
2. ( ) shows the costs for on-going projects which are included in the relevant total costs.

5-1 Scope of Estimation in Foreign Currency

(1) Equipment and installation

a. Costs (C.I.F. Jakarta) of equipment includes spares, measuring instruments & tools and installation materials and cost of installation. However, only costs of the equipment for visual aids to navigation and associated devices are estimated both for harbour lights and buoys and for the Improvement Plan respectively without estimate of their installation costs.

b. Costs for domestic transportation of the equipment and materials are not included.

c. Costs for factory test are estimated (cost for witness to Factory Test is included in Consultancy fee).

d. Costs for any kind of tests required for completion of the project are estimated including the test to evaluate the DF performances. However, the cost for chartering an appropriate vessel necessary for the DF test is not included.

(2) Training

Cost for training includes;

a. Return air flight fare (Jakarta and Tokyo)

b. Personnel expenses for manufacturer's instructors

c. Living cost for trainees in Japan for two (2) months.

d. Cost for text books and training materials

e. Travelling cost in Japan

(3) Consultancy services

Cost for consultant includes;

a. Payroll

b. Overhead charges

c. Engineering fee

d. Direct expenses such as flight fare, printing fee, local employee's salary, etc.

5-2 Scope of Estimation in Local Currency

(1) Equipment and installation

a. Cost for locally procured installation materials

b. Local staff and laborer's salary

c. Domestic flight fare

d. Office expenses

e. Living allowances

f. Communication fee

g. Vehicle maintenance fee and fuel

(2) Housing

Prefabrication structures are to be used for housing of offices and living quarters for lighthouses so that at the time of future implimentation of lighthouse automatization their removal to other places may be facilitated.

(3) Station Building

Shelter type housing is to be provided for medium-wave radiobeacon stations.

For details, refer to Section 4-3-2, (1), 2).

(4) Consultancy fee

a. Living allowance
b. Domestic flight fare
c. Local transportation
d. Office rent share
e. Communication fee
f. Office supply and printing fee
g. Electricity and city water charges
h. Bilingual secretary
i. Laborer fee
j. Tax

5-3 Details of Cost Estimation

The details of cost estimation are given hereunder both for the Long Term Plan and the Short Term Plan.

5-3-1 Long Term Plan

The details of cost estimation for Long Term Plan are given in **Table 5-3-1/1** to **Table 5-3-1/6**.

(1) Development Plan

1) Visual Aids to Navigation

Table 5-3-1/1 Cost Estimation for Long Term Development Plan
= Visual Aids to Navigation =

(Unit: US$x 1,000)

Item \ Currency	No. of Unit	Foreign currency		Local currency		Total cost
		Unit cost	Total cost	Unit cost	Total cost	
1) Costs of Equipment and Installation						
Lighthouse (on land)	(35) 190	501	(17,535) 95,190	172	(6,020) 32,680	(23,555) 127,870
Lighthouse (offshore)	11	1,662	18,282	2,507	27,577	45,859
Light beacon (on land)	(81) 300	168	(13,608) 50,400	27	(2,187) 8,100	(15,795) 58,500
Light beacon (offshore)	35	206	7,210	93	3,255	10,465
Resilient Light Beacon	18	195	3,510	61	1,098	4,608
Light buoy (WAG)	(50) 75	72	(3,600) 5,400		-	(3,600) 5,400
Light buoy (Gass)	(70) 95	52	(3,640) 4,940		-	(3,640) 4,940
Light buoy (Solar)	(102) 180	62	(6,324) 11,160		-	(6,324) 11,160
Total	(338) 904		(44,707) 196,092		(8,207) 72,710	(52,914) 268,802

2) Electronic Aids to Navigation

Table 5-3-1/2 Cost Estimation for Long Term Development Plan
= MF Radiobeacon Stations =

(Unit: US$ x 1,000)

No.	Item / Station	Foreign Currency	Local Currency	Total	Remarks	
					Short Term No.	(Ser. No.)
1	MEULABOH	1,303	215	1,518		(19)
2	TELUK BAYAR	1,286	131	1,417	1	(20)
3	Tg. KERBAN	1,286	131	1,417	2	(21)
4	BELIMBING	1,286	131	1,417	3	(22)
5	TG. JAMBO AYE	1,303	215	1,518		(23)
6	TG. PINANG	1,286	131	1,417	4	(24)
7	BANGKA (TG. SAMAK)	1,303	215	1,518	5	(25)
8	INDRAMAYU	1,303	215	1,518	6	(26)
9	TG. JANGKAR	1,303	215	1,518		(27)
10	ARIASA	1,303	215	1,518	7	(28)
11	P. MEDANG	1,303	215	1,518		(29)
12	REO	1,303	215	1,518		(30)
13	TG. KOPONDEI	1,303	215	1,518		(31)
14	PU. SEMPU	1,303	215	1,518		(32)
15	TG. SASAR	1,303	215	1,518		(33)
16	TG. KURONG	1,303	215	1,518		(34)
17	TG. SELAKA	1,303	215	1,518	8	(35)

No.	Item / Station	Foreign Currency	Local Currency	Total	Remarks	
					Short Term No.	(Ser. No.)
18	KUALAPEMBUANG	1,303	215	1,518	9	(36)
19	LAUT (TG. SELOKA)	1,303	215	1,518	10	(37)
20	PASANGKAYU	1,303	215	1,518		(38)
21	TARAKAN	1,303	215	1,518		(39)
22	TG. KANDI	1,303	215	1,518	11	(40)
23	SIDATE	1,303	215	1,518	12	(41)
24	PASITANETE	1,286	131	1,417	13	(42)
25	WANGI-WANGI	1,286	131	1,417	14	(43)
26	PADABALE	1,303	215	1,518		(44)
27	MALIK (TG. PANGKALSIONG)	1,303	215	1,518		(45)
28	BOBO	1,303	215	1,518	15	(46)
29	MANGOLE (TG. LAMPAU)	1,303	215	1,518		(47)
30	BOAND	1,303	215	1,518	16	(48)
31	TG. LIBOBO	1,303	215	1,518	17	(49)
32	SEGET	1,303	215	1,518		(50)
33	KWAOS	1,303	215	1,518		(51)
34	TG. PAPISO	1,303	215	1,518		(52)
35	WANAPIRI	1,303	215	1,518		(53)
36	MANOKUWARI (TG. MEMORI)	1,286	131	1,417		(54)
37	TG. WOKA	1,303	215	1,518		(55)

No.	Item / Station	Foreign Currency	Local Currency	Total	Remarks	
					Short Term No.	(Ser. No.)
38	TEBA (CD URVILLE)	1,303	215	1,518		(56)
39	DEMTA (MATTERER B)	1,303	215	1,518		(57)
	Total	50,698	7,797	58,495		

Table 5-3-1/3 Cost Estimation for Long Term Development Plan
= Radar Beacon Stations =

(Unit: US$ x 1,000)

No.	Item / Station	For-eign Cur-rency	Local Cur-rency	Total	Remarks	
					Short Term No.	(Ser. No.)
1	IE MEULE	231	27	258		(4)
2	TG. JAMBO AYE	231	27	258		(5)
3	NIPAH LARANGAN	231	27	258		(6)
4	BERHALA	231	27	258		(7)
5	GOSONG PYRAMID	231	27	258		(8)
6	MUCI	231	27	258	26	(9)
7	UG. SUNGAI BRAMEI	231	27	258		(10)
8	TIKUS	231	27	258		(11)
9	BELIMBING	231	27	258		(12)
10	MA. KAPUAS KECIL	231	27	258		(13)
11	DAPUR	200	22	222	1	(14)
12	LANGKUAS	200	22	222	2	(15)
13	PESEMUT	200	22	222	3	(16)
14	DISCOVERY EASTBANK	231	27	258	4	(17)
15	FOX BANK	231	27	258	5	(18)
16	TG. PUTING	200	22	222	6	(19)
17	SELATAN	200	22	222	7	(20)
18	PU^2 SAMBRGULANG	200	22	222	8	(21)
19	KARANG SULING	200	22	222	9	(22)

No.	Item / Station	For-eign Cur-rency	Local Cur-rency	Total	Remarks	
					Short Term No.	(Ser. No.)
20	JAGA UTARA	200	22	222	10	(23)
21	TEMPURUNG	200	22	222	11	(24)
22	DAMAR-BESAR	200	22	222	12	(25)
23	PU. PAKIT	200	22	222	13	(26)
24	KARANGJERUK	231	27	258		(27)
25	KOROWELANG	231	27	258	14	(28)
26	MASALEMBO	200	22	222	15	(29)
27	KALUKALUKANG	200	22	222	16	(30)
28	KARANG KOKO	231	27	258	17	(31)
29	KARANG MAS	231	27	258	18	(32)
30	PU. SEKALA	200	22	222	19	(33)
31	PU. TREWANGAN	200	22	222	20	(34)
32	TG. SEDIHING	231	27	258		(35)
33	PU. MEDANG	231	27	258		(36)
34	TG. NAROE	200	22	222	21	(37)
35	TG. SASAR	231	27	258		(38)
36	TG. KURONG	231	27	258		(39)
37	PASITANETE	231	27	258		(40)
38	KUDINGARENG LOMPO	200	22	222	22	(41)
39	TG. LERO	231	27	258	23	(42)
40	BALIKPAPAN	231	27	258		(43)
41	PASANGKAYU	231	27	258		(44)
42	MANGKALIHAT	231	27	258		(45)

No.	Item / Station	For-eign Cur-rency	Local Cur-rency	Total	Remarks	
					Short Term No.	(Ser. No.)
43	KARANG MALALUNGUN	231	27	258		(46)
44	TG. ARANG	231	27	258		(47)
45	SALANDO	231	27	258		(48)
46	TALISEI	231	27	258		(49)
47	MAYU	231	27	258		(50)
48	GORONTALO	231	27	258		(51)
49	WALEA	231	27	258		(52)
50	WANGI-WANGI	231	27	258		(53)
51	PU. BUAYA	231	27	258		(54)
52	TG. NUSANIVE	231	27	258		(55)
53	CILACAP	231	27	258		(56)
54	GOSONGETNA	200	22	222	24	(57)
55	CORY FORT	200	22	222	25	(58)
56	GOSONG PYRAMID	200	22	222		(59)
57	GOSONG MALATAYUR	200	22	222		(60)
58	SELATAN PU ABO	200	22	222		(61)
59	SIBALD BANK	200	22	222		(62)
60	Tg. SOLAU	200	22	222		(63)
61	CITY OF CARLISLE BK	200	22	222		(64)
62	GRIEG REEF	200	22	222		(65)
63	KR BESAR	200	22	222		(66)
64	Near BURU IS	200	22	222		(67)
65	KARIUM JAWA	231	27	258		(68)

No.	Item / Station	Foreign Currency	Local Currency	Total	Remarks	
					Short Term No.	(Ser. No.)
66	DOANG DOANGAN	231	27	258	28	(69)
67	Tg MANTIGI	231	27	258	27	(70)
	Total	(1,755) 14,609	(201) 1,669	(1,956) 16,278		

Notes: ( ) shows the costs for the on-going projects, *nos. of which are as follows;*
Nos. 6, 14, 15, 21, 22, 23, 28 and 29 (total 8).

(2) Improvement Plan

1) Visual Aids to Navigation

Table 5-3-1/4 Cost Estimation for Long Term Improvement Plan
= Visual Aids to Navigation =

(Unit: US$x 1,000)

Item \ Currency	No. of Unit	Foreign currency		Local currency		Total cost
		Unit cost	Total cost	Unit cost	Total cost	
Costs of Equipment						
a) Luminous Range Improvement			12,521		1,408	13,929
Lighthouse	14	374	5,236	67	938	6,174
Light Beacon	47	155	7,285	10	470	7,755
b) Group Monitoring for Buoys			5,455		375	5,830
Electrification of Buoy	55	62	3,410		-	3,410
Monitoring Equipment	3		2,045		375	2,420
c) Electrification from Gas			6,417		330	6,747
Light Beacon	33	155	5,115	10	330	5,445
Buoy (Solar)	21	62	1,302			1,302
d) Lighthouse Automatization			829		114	943
Engine-Generator	3	235	705	13	39	744
Monitoring Equipment	3		124		75	199
Total			25,222		2,227	27,449

2) Supporting/Logistic Facilities

Table 5-3-1/5 Cost Estimation for Long Term Improvement Plan

= Supporting/Logistic Facilities =

(Unit: US$ x 1,000)

Item \ Currency	No. of Unit	Foreign Currency	Local Currency	Total Cost
Costs of Equipment and Facilities				
a) Work shop	17	-	1,170	1,170
Equipment	21	13,453	458	13,911
Open storage	17	-	378	378
Store house	19	-	734	734
Jetty	16	705	4,095	4,800
b) Gas plant	1	212	386	598
c) Spare buoys and parts		2,428	-	2,428
Total		16,798	7,221	24,019

The above costs are detailed in **Table 5-3-1/5-1** and **Table 5-3-1/5-2.**

Table 5-3-1/5-1 Details of Cost Estimation for Supporting Facilities

Item / Facility	No. of Districts of Navigation	Required Facilities Equipment	Foreign Currency	Local Currency	Total Amount
Workshop	17	4,370 m^2	-	1,170	1,170
Equipment	21 (8)	See Table 5-3-1/5.1A	(939*x 8) 7,512	(28* x 8) 224	7,736
	21 (13)	See Table 5-3-1/5.1B	(457*x 13) 5,941	(18*x 13) 234	6,175
Open storage	17	11,000 m^2	-	378	378
Store house	19	2,740 m^2	-	734	734
Jetty	16	16 (places)	705	4,095	4,800
Total	90	-	14,158	6,835	20,993

Remarks: * Details are given in **Tables 5-3-1/5.1A and /5.1B**

Table 5-3-1/5-2 Details of Cost Estimation for Gas Plant

(Unit: US$ x 1,000)

Works & Equipment	Foreign currency portion	Local currency portion	Total
1. Gas plant housing 1,430m^2	-	377	377
2. Gas plant equipment 20m^3/H	212	9	221
Total	212	386	598

Table 5-3-1/5.1A Details of Cost Estimation for Workshop Installation/1st Class District of Navigation

(Unit: US$ x 1,000)

Item \ Currency	Qty	Foreign Currency	Local Currency	Total Amount	Remarks
Machine Tools	1 set	261	14	275	**APPENDIX-25,** A-1
Wood work Machine	1 set	35	2	37	**APPENDIX-25,** A-2
Cutting & Welding Machine	1 set	8		8	**APPENDIX-25,** A-3
Compressor & Pump	1 set	70		70	**APPENDIX-25,** A-4
Hand Tools	1 set	12		12	**APPENDIX-25,** A-5
Bench Tools	1 set	33		33	**APPENDIX-25,** A-6
Testing & Measuring Equipment	1 set	18		18	**APPENDIX-25,** A-7
Electric Maintenance Equipment	1 set	49		49	**APPENDIX-25,** A-8
Handling Equipment	1 set	386	4	390	**APPENDIX-25,** A-9
Generating Set	1 set	67	8	75	**APPENDIX-25,** A-10
Total		939	28	967	

Table 5-3-1/5.1B Details of Cost Estimation for Workshop Installation/2nd Class District of Navigation

(Unit: US$ x 1,000)

Item \ Currency	Qty	Foreign Currency	Local Currency	Total Amount	Remarks
Machine Tools	1 set	108	6	114	**APPENDIX-25,** B-1
Wood work Machine	1 set	34	2	36	**APPENDIX-25,** B-2
Cutting & Welding Machine	1 set	8		8	**APPENDIX-25,** B-3
Compressor & Pump	1 set	29		29	**APPENDIX-25,** B-4
Hand Tools	1 set	6		6	**APPENDIX-25,** B-5
Bench Tools	1 set	19		19	**APPENDIX-25,** B-6
Testing & Measuring Equipment	1 set	12		12	**APPENDIX-25,** B-7
Electric Maintenance Equipment	1 set	48		48	**APPENDIX-25,** B-8
Handling Equipment	1 set	126	2	128	**APPENDIX-25,** B-9
Generating Set	1 set	67	8	75	**APPENDIX-25,** B-10
Total		457	18	475	

(3) Training

1) Factory Training

	No. of Places	No. of Persons	No. of Days	No. of Times
i) Visual Aids	24*	3	30	5
ii) Electronic Aids				
MF Beacon	39**	2	30	2
Racon	24*	1	30	2

Notes: * ..... Districts of Navigation
** ..... Stations

Table 5-3-1/6 Cost Estimation for Long Term Plan

= Factory Training for Visual and Electronic Aids to Navigation =

(Unit: US$)

	Unit Cost	Visual Aids		Electronic Aids		Total
		Qty	Cost	Qty	Cost	
Return Air Fare	(¥353,300)	24x 3Px5T		(39x 2Px2T) +(24x 1Px2T)		
(JKT - TKY)	$1,536	= 360	552,960	= 204	313,344	866,304
Daily Allowance & Accommodation	(¥20,000) $ 87	360P x30D =10,800	939,600	204 x30D =6,120	532,440	1,472,040
Domestic Travelling Fee	(¥50,000) $217	360P	78,120	204	44,268	122,388
Training Texts & Materials	(¥100,000) $435	360P	156,600	204	88,740	245,340
Instructors' Fee	(¥60,000) $260	2Px 30Dx5T =300	78,000	4Px 30Dx2T =240	62,400	140,400
Total			1,805,280		1,041,192	2,846,472

5-3-2 Short Term Plan

The details of cost estimation for Short Term Plan are given in **Table 5-3-2/1** to **Table 5-3-2/6.**

(1) Development Plan

1) Visual Aids to Navigation

Table 5-3-2/1 Cost Estimation for Short Term Development Plan
= Visual Aids to Navigation =

(Unit: US$ x 1,000)

Item \ Currency	No. of Unit	Foreign currency		Local currency		Total cost
		Unit cost	Total cost	Unit cost	Total cost	
1) Costs of Equipment and Installation						
Lighthouse	(35)		(17,535)		(6,020)	(23,555)
(on land)	69	501	34,569	172	11,868	46,437
Lighthouse (offshore)	2	1,662	3,324	2,507	5,014	8,338
Light beacon	(81)		(13,608)		(2,187)	(15,795)
(on land)	121	168	20,328	27	3,267	23,595
Light beacon (offshore)	10	206	2,060	93	930	2,990
Resilient Light Beacon	8	195	1,560	61	488	2,048
Light buoy	(50)		(3,600)			(3,600)
(WAG)	50	72	3,600		-	3,600
Light buoy	(70)		(3,640)			(3,640)
(Gas)	70	52	3,640		-	3,640
Light buoy	(102)		(6,324)			(6,324)
(Solar)	129	62	7,998		-	7,998
Total	(338)		(44,707)		(8,207)	(52,914)
	459		77,079		21,567	98,646

Notes: ( ) shows the costs for the on-going projects, which are included in the relevant total costs.

Table 5-3-2/2 Cost Estimation for Short Term Development Plan
= Medium Wave Radiobeacon Stations =

(Unit: US$ x 1,000)

No.	Item / Station	For-eign Cur-rency	Local Cur-rency	Total	Remarks	
					Long Term No.	(Ser. No.)
1	TELUK BAYAR	1,286	131	1,417	2	(20)
2	Tg. KERBAN	1,286	131	1,417	3	(21)
3	BELIMBING	1,286	131	1,417	4	(22)
4	TG. PINANG	1,286	131	1,417	6	(24)
5	BANGKA (TG. SAMAK)	1,303	215	1,518	7	(25)
6	INDRAMAYU	1,303	215	1,518	8	(26)
7	ARIASA	1,303	215	1,518	10	(28)
8	TG. SELAKA	1,303	215	1,518	17	(35)
9	KUALAPEMBUANG	1,303	215	1,518	18	(36)
10	LAUT (TG. SELOKA)	1,303	215	1,518	19	(37)
11	TG. KANDI	1,303	215	1,518	22	(40)
12	SIDATE	1,303	215	1,518	23	(41)
13	PASITANETE	1,286	131	1,417	24	(42)
14	WANGI-WANGI	1,286	131	1,417	25	(43)
15	BOBO	1,303	215	1,518	28	(46)
16	BOAND	1,303	215	1,518	30	(48)
17	TG. LIBOBO	1,303	215	1,518	31	(49)
	Total	22,049	3,151	25,200		

Table 5-3-2/3 Cost Estimation for Short Term Development Plan
= Radar Beacon Stations =

(Unit: US$ x 1,000)

No.	Item / Station	For-eign Cur-rency	Local Cur-rency	Total	Remarks	
					Long Term No.	(Ser. No.)
1	DAPUR	200	22	222	11	(14)
2	LANGKUAS	200	22	222	12	(15)
3	RESEMUT	200	22	222	13	(16)
4	DISCOVERY EASTBANK	231	27	258	14	(17)
5	FOX BANK	231	27	258	15	(18)
6	TG. PUTING	200	22	222	16	(19)
7	SELATAN	200	22	222	17	(20)
8	PU^2 SAMBARGULANG	200	22	222	18	(21)
9	KARANG SULING	200	22	222	19	(22)
10	JAGA UTARA	200	22	222	20	(23)
11	TEMPURUNG	200	22	222	21	(24)
12	DAMAR-BESAR	200	22	222	22	(25)
13	PU. PAKIT	200	22	222	23	(26)
14	KOROWELANG	231	27	258	25	(28)
15	MASALEMBO	200	22	222	26	(29)
16	KALUKALUKANG	200	22	222	27	(30)
17	KARANG KOKO	231	27	258	28	(31)
18	KARANG MAS	231	27	258	29	(32)

No.	Item / Station	Foreign Currency	Local Currency	Total	Remarks	
					Long Term No.	(Ser. No.)
19	PU. SEKALA	200	22	222	30	(33)
20	PU. TREWANGAN	200	22	222	31	(34)
21	TG. NAROE	200	22	222	34	(37)
22	KUDINGARENG LOMPO	200	22	222	38	(41)
23	TG. LERO	231	27	258	39	(42)
24	GOSONG ETNA	200	22	222	54	(57)
25	CORY FORT	200	22	222	55	(58)
26	MUCI	231	27	258	6	(9)
27	DOANG DOANGAN	231	27	258	67	(70)
28	Tg MANTIGI	231	27	258	66	(69)
	Total	(1,755) 5,879	(201) 661	(1,956) 6,540		

Notes: ( ) shows the costs for the on-going projects, nos. of which are as follows;
Nos. 4, 5, 11, 12, 13, 17, 18 and 26.

(2) Improvement Plan

1) Visual Aids to Navigation

Table 5-3-2/4 Cost Estimation for Short Term Improvement Plan
= Visual Aids to Navigation =

(Unit: US$x 1,000)

Item \ Currency	No. of Unit	Foreign currency		Local currency		Total cost
		Unit cost	Total cost	Unit cost	Total cost	
Costs of Equipment						
a) Luminous Range Improvement			12,521		1,408	13,929
Lighthouse	14	374	5,236	67	938	6,174
Light Beacon	47	155	7,285	10	470	7,755
b) Group Monitoring for Buoys			5,455		375	5,830
Electrification of Buoy	55	62	3,410		-	3,410
Monitoring Equipment	3		2,045		375	2,420
c) Electrification from Gas			6,417		330	6,747
Light Beacon	33	155	5,115	10	330	5,445
Buoy (Solar)	21	62	1,302			1,302
d) Lighthouse Automatization			829		114	943
Engine-Generator	3	235	705	13	39	744
Monitoring Equipment	3		124		75	199
Total			25,222		2,227	27,449

The details of costs for the monitoring equipment both for "Group Monitoring for Buoys" and for "Lighthouse Automatization" are given in Tables 5-3-2/4A and 5-3-2/4B.

Table 5-3-2/4A Cost Estimation for Monitoring Equipment for Buoy Group Monitoring

(Foreign Currency)

(Unit: US$ x 1,000)

Item / Place·Equip.	Costs	Remarks
Dumai		
Buoy Group Monitoring Equipment and Relay St. Equipment	1,289	
Belawan		
Buoy Group Monitoring Equipment	221	
Surabaya		
Buoy Group Monitoring Equipment and Relay St. Equipment	535	
Total	2,045	

(Local Currency)

Item / Place·Equip.	Costs	Remarks
Dumai		
Ant Tower etc.	220	
Belawan		
Ant Tower etc.	50	
Surabaya		
Ant Tower etc.	105	
Total	375	

Table 5-3-2/4B Cost Estimation for Monitoring Equipment for Lighthouse Automatization

(Foreign Currency)

(Unit: US$ x 1,000)

Item \ Place・Cost	Unit Cost	TIKUS		DE BRIL		BUANG 2		Total Cost
		Qty	Cost	Qty	Cost	Qty	Cost	
Lighthouse Automatization Equipment and Associated Devices	-	1	56	1	34	1	34	124

(Local Currency)

Item \ Place・Cost	Unit Cost	TIKUS		DE BRIL		BUANG		Total Cost
		Qty	Cost	Qty	Cost	Qty	Cost	
Ant. Foundation etc.	-	-	35	-	20	-	20	75

2) Supporting/Logistic Facilities

Table 5-3-2/5 Cost Estimation for Short Term Improvement Plan
= Supporting/Logistic Facilities =

(Unit: US$ x 1,000)

Item \ Currency	No. of Unit	Foreign Currency	Local Currency	Total Cost
Costs of Equipment and Facilities				
a) Work shop	12	-	892	892
Equipment	14	9,290	312	9,602
Open storage	11	-	274	274
Store house	12	-	528	528
Jetty	7	331	2,035	2,366
b) Gas plant	1	212	386	598
c) Spare Buoys and parts		2,428	-	2,428
Total		12,261	4,427	16,688

The above costs are detailed in **Table 5-3-2/5-1**, and **Table 5-3-2/5-2**

Table 5-3-2/5-1 Details of Cost Estimation for Supporting/Logistic Facilities

(Unit: US$ x 1,000)

DISTRICTS NAVIGATION	Workshop	Equipment*		Open storage	Store house	Jetty						Total		Total
						Coast protection		Dredging	Pavement	Sub total				
	Local	Foreign	Local	Local	Local	Foreign	Local	Local	Local	Foreign	Local	Foreign	Local	
TG. PINANG	45	457	18	24	19	50	150	159	11	50	320	507	426	933
BELAWAN	70	457	18	-	19	-	-	-	-	-	-	457	107	564
SABANG	43	457	18	14	-	31	94	16	5	31	115	488	190	678
PALEMBANG	-	939	28	-	-	-	-	-	-	-	-	939	28	967
PONTIANAK	-	939	28	24	43	50	150	159	11	50	320	989	415	1,404
TLK BAYUR	70	457	18	24	27	50	150	159	11	50	320	507	459	966
SEMARANG	91	457	18	24	43	50	150	159	11	50	320	507	496	1,003
KUPANG	86	-	-	24	64	-	-	-	-	-	-	-	174	174
UG PANDANG	43	457	18	24	37	50	150	159	11	50	320	507	442	949
SAMARINDA	-	939	28	-	-	-	-	-	-	-	-	939	28	967
BANJARMASIN	91	-	-	24	64	-	-	-	-	-	-	-	179	179
BITUNG	107	457	18	24	43	-	-	-	-	-	-	457	192	649
AMBON	86	457	18	-	43	-	-	-	-	-	-	457	147	604
SORONG	-	939	28	44	75	-	-	-	-	-	-	939	147	1,086
JAYAPURA	80	939	28	24	51	50	150	159	11	50	320	989	503	1,492
MERAUKE	80	939	28	-	-	-	-	-	-	-	-	939	108	1,047
Total	(12)	(14)	(14)	(11)	(12)					(7)	(7)			
	892	9,290	312	274	528	331	994	970	71	331	2,035	9,621	4,041	13,662

Notes.

1) Workshop ≒ 267/m^2
2) Open storage ≒ 34/m^2
3) Store house ≒ 267/m^2
4) ( ) shows the number of Districts of Navigation
5) * ... Breakdown is given in Tables 5-3-1/5.1A and /5.1B
6) Jetty coast protection Foreign Currency ≒ 1,250/m
7) Jetty coast protection Local Currency ≒ 3,750/m
8) Jetty Dredging Local Currency ≒ 5.3/m^3
9) Jetty Pavement Local Currency ≒ 33/m^2

Table 5-3-2/5-2 Details of Cost Estimation for Spare Buoys and Parts

(Unit: US$ x 1,000)

Equipment	Qty	Foreign Currency portion		Local Currency portion	Total
		Unit cost	Total cost		
1. Light buoy	29	50	1,450	-	1,450
2. Small buoy	39	15	585	-	585
3. Lantern	9	15	135	-	135
4. Flasher	9	9	81	-	81
5. Battery 500AH 6pcs 1 set	4	3	12	-	12
6. Gas cylinder 7000L 4pcs 1 set	4	1	4	-	4
7. Chain set for light buoy	11	7	77	-	77
8. Chain set for small buoy	13	4	52	-	52
9. Sinker 1 ton steel	16	2	32	-	32
Total			2,428		2,428

Table 5-3-2/5.1A Details of Cost Estimation for Jetty Type A

(Unit: US$ x 1,000)

Works	Foreign currency portion	Local currency portion	Total
1. Coast protection works 40 m	50	150	200
2. Dredging works 30,000 m^3		159	159
3. Pavement 250 m^2		11	11
Total	50	320	370

Table 5-3-2/5.1B Details of Cost Estimation for Jetty Type B

(Unit: US$ x 1,000)

Works	Foreign currency portion	Local currency portion	Total
1. Coast protection works 25 m	31	94	125
2. Dredging works 3,000 m^3		16	16
3. Pavement 150 m^2		5	5
Total	31	115	146

(3) Training

1) Factory Training

	No. of Places	No. of Persons	No. of Days	No. of Times
i) Visual Aids	24*	3	30	2
ii) Electronic Aids				
MF Beacon	17**	2	30	1
Racon	24*	1	30	1

Notes: * ..... Districts of Navigation
** ..... Stations

Table 5-3-2/6 Cost Estimation for Short Term Plan

= Factory Training for Visual and Electronic Aids to Navigation =

(Unit: US$)

	Unit Cost	Visual Aids		Electronic Aids		Total
		Qty	Cost	Qty	Cost	
Return Air Fare	(¥353,300)	24x 3Px2T		(17x 2Px1) +(24x 1Px1T) = 58		
(JKT - TKY)	$1,536	= 144	221,184		89,088	310,272
Daily Allowance & Accommodation	(¥20,000)	144 x30D		58 x30D		
	$ 87	=4,320	375,840	=1,740	151,380	527,220
Domestic Travelling Fee	(¥50,000)					
	$217	144	31,248	58	12,586	43,834
Training Texts & Materials	(¥100,000)					
	$435	144	62,640	58	25,230	87,870
Instructors' Fee	(¥60,000)	2Px 30Dx2T		4Px 30Dx1T		
	$260	=120	31,200	=120	31,200	62,400
Total			722,112		309,484	1,031,596

6. PROJECT EVALUATION

6. Project Evaluation

There may be no exaggeration to say that the future development basis for Indonesia as a great maritime nation rests in maritime activities of shipping, fishery and so forth.

In other words, securing of intensive inter-insular sea transportation through the development especially of domestic sea transportation service networks has an extremely significant meaning for the furtherence of development in Indonesian economy and society as the country geographically comprises a large number of islands scattered around in vast areas. The development of sea transporation may be said to be equivalent to that of the road networks on land as a social infrastructure.

At the same time, future growth in international trade will be clearly seen keeping in step with the growth of Indonesian economy, and it is, therefore, expected that international shipping will also be further activated.

The development of aids to navigation will provide vessels, engaging in such future expanding maritime activities as shipping and fishery, with navigational guide and orderly improvement in sea transportation, and thereby contribute greatly to the prevention of marine accidents of collisions, strandings, etc. and to securing the safety of invaluable life and property at sea.
The effects to derive from the navaids development may be considerable in such way that easy positioning can be conducted, at-night navigation becomes feasible and less dangerous, and unrest of mind may be relieved during at sea. At the same time, possibility will increase for ships to navigate the shortest possible routes, which results in economical voyage and energy saving.

Accordingly, each nation has been enthusiastically pro-

ceeding with the development of aids to navigation. With regard to visual aids, for instance, Holland has 112 units per 100 miles, France 70, FRG 62, USA 46 and Japan 27. On the contrary Indonesia has slightly more than 3 units per 100 miles, and continues to endeavour to expand the navaids establishments.

This study on the development of aids to navigation in Indonesia is aimed at establishing a Master Plan for the Long Term development with the target year of 2,000 and the Short Term development plan based thereupon both for visual aids to navigation, and for electronic aids to navigation specifically for medium-wave radiobeacons and radar beacons. The implementation of this total project in future together with the on-going implementation of the maritime telecommunications project and maritime SAR telecommunications project may mean the opening of an epoch-making age, bringing the downing for the vessels which, in the past, were forced to be rather at blind sea. The overall implementation of relevant maritime projects will provide ships at sea with substantial and full support for safe navigation.

Since this study includes the development of the supporting and logistic system for efficient management and maintenance of all navaids located throughout the country, the maintenance system for navaids and the development and improvement of ATN vessels and buoy bases are studied. Studies are also made on the personnel plan including training and on distribution plan for MF radiobeacon receivers.

These efforts may be considered to be most appropriate in the light of future acceleration of maritime shipping and fishery activities.

Medium-wave radiobeacon stations, generally co-sited at

the lighthouses, are in the implementation stage for the first eighteen stations and further coverage development is in an urgent need as one of the basic electronic aids to navigation. The radiobeacons are to provide users with all weather services of either cross bearing for positioning or single bearing for homing over longer ranges, while visual aids are to cover short ranges.

The radiobeacons are to be remotely monitored. Radar beacons are remarkable navaids for radar-equipped vessels for identification of land marks and dangers to navigation, and are to be sited at major points in important water areas. Introduction of modern electronics technology into the navaids field may bring about eventual improvement in electronics industry in Indonesia.

Analytic evaluation is made hereunder on the effects which may be expected to derive from the development of aids to navigation in Indonesia.

As stated above, the effects generally deriving from the development of aids to navigation are not only on such maritime activities as shipping and fishery, which are directly affected, but also on the socio economy as a whole, when a spreading effect will be taken into account. The following major effects will be considered to be involved in Indonesia.

6-1 Effect on Maritime Activities by Ships

They are the effects, needless to say, that the development of aids to navigation will directly affect the vessels engaging in maritime activities of sea transportation and fishery, and among the main effects are improvement in the productivity of shipping and fishery and possible decrease in marine casualties.

(1) Increase in transportation capabilities due to improvement in navigation efficiency

The domestic sea transportation activities in Indonesia are largely dependent on a great number of motorized sailing and sailing ships and old small cargo vessels, which often rely on very basic navigation instruments and primitive installations. The actual situations, therefore, are such that there exist operational restrictions inevitably put on those ships in narrow channels, traffic-congested areas and during at-night navigation as well as at the time of ships being in and out of ports. The development of aids to navigation will enable them to have accurate positioning, by means of which correct heading may be maintained, and will facilitate their easy navigation in the waters, where navigational difficulties previously existed, and at night voyage.

It is expected that this will bring about an increase in ships' transportation capabilities and cost saving in fuel and other operation costs because of saving in cruising time due to shortening of mileage and time adjustment for ships when they are in and out of ports.

(2) Improvement of productivity in maritime fishery

As in the case of general shipping, the development of aids to navigation will make it possible to increase in time the cruising opportunities to the possible extent, to facilitate locating fishing grounds and thus to make available more time for fishing operation through mileage saving to the grounds. It will also create increases in catches, fuel saving and such benefit, and is considered to

consequently lead to an improvement, to a certain extent, in productivity of maritime fishery as a whole.

(3) Decrease in marine casualties

Decrease in number of maritime casualties themselves may no doubt be anticipated through the development of aids to navigation. There are a number of areas in Indonesian waters where many marine accidents have occurred although the occurrence might have some relations more or less with ships' performances.

It may be seen that there have been considerable number of marine accidents of small vessels which are not shown in the existing statistical data, to which reference is made later, and that not a few of them have been caused by inadequacy of establishment of aids to navigation. It may evidently be said that the development of aids to navigation will have a remarkable effect on preventing strandings especially among other marine accidents since ships at sea are able to check their own positions in traffic congested areas and during at-night navigation. Namely, effects stemming from decrease in marine casualties together with "Effect on Maritime Activities by Ships" referred to in the preceding subsection, are most substantial ones, which are described below, to be conceivable from the aids to navigation development.

1) Decrease in human casualties

Marine casualties inevitably involve human casualties. It is extremely difficult to evaluate

and analyse how and to what extent human casualties would be affected by the development of aids to navigation. However, decrease in marine casualties will evidently bring about that in human casualties.

2) Decrease in casualties of ships and cargoes

This will be the outcome to be most directly affected by decrease in marine casualties, and cost-wise assessment may be made for the loss and casualties if the costs of ships and cargoes could be estimated.

3) Decrease in environmental pollution

Marine accidents involve environmental pollution due to oil spills and cargo damages and drifting. Their possible decrease may lead to preservation of natural environment as well as prevention of danger of the secondary casualties. The importance of this effect will be increasingly emphasized both socially and economically.

4) Mitigation in work load of ship's crew

The development of aids to navigation will give ship's crew peace of mind while they are at sea, and this will enable them to have safe and efficient navigation. In other words, securing the safety of navigation by the establishment of aids to navigation will mitigate their work loads through the alleviation of excessive strain, by which safe and effective navigation at moderate speed will possibly be effected.

5) Easy traffic control of ships

Maritime traffic control may be necessary for securing the safety of ships on traffic routes and their efficient operation in ports and harbours, narrow waters and traffic congested areas, and the development of aids to navigation will facilitate future implementation of such traffic controls as allocation of traffic routes, designation of heading directions, speed limit, signal controls in meeting the traffic situations in respective areas.

6-2 Socio-economical Effect

This is so-called rather extensive and indirect effects, and covers the wide aspects, as described below, of socio-economy as a whole to be involved in terms both of expansion in transportation capabilities and smoothness in distribution of goods through efficient sea transportation.

It is, therefore, very difficult to make economical analysis on the resultant effects.

(1) Development of national economy and industry through efficient sea transportation and expansion of transportation capabilities, and increase in opportunities for employment deriving therefrom.

(2) Balancing of local social and economical gaps, improvement of distribution mechanism, improvement of national life due to cost stabilization deriving from furtherence of the local development through smoothing distribution of goods.

6-3 Other Effects

There are other effects considered to stem from the development of aids to navigation.

(1) Modernization of electronic industry
Introduction of electronic technic and engineering into aids to navigation will eventually necessitate development of domestic electronic industry.

(2) Furtherence of exploration of maritime resources
Some effects will be brought about on such maritime activities as finding positions of exploration areas, offshore transportation for necessary materials and equipment, etc. for oil rigs in the development of oil resources.

Major effects deriving from the development of aids to navigation are reviewed as above.

It is, however, considered to be appropriate to make analysis in the project evaluation for this study on the effects on decrease in the number of marine casualties.

As described in the preceding subsection, there are economically significant effects of "Improvement in navigation efficiency of ships," "Improvement in fishery production" and so on other than "Effects on decrease in the number of marine casualties." Analysis on such factors is, however, extremely difficult to make in terms of cost- and volume-wise approach, i.e. quantitative analysis, due to the limited data available.

As regards "Socio-economical effects," mathematical approach of evaluation is nearly impossible to practice as stated above.

Approach of evaluation for "Effects on decrease in the number of marine casualties" concerns also with unavailability of sufficient data required, and general approach is only possible to carry out by means mainly of logical description. However, mathematical approach is partially possible based on the existing data in a way of supplementing the logical evaluation as given hereunder.

6-4 Decrease in Number of Marine Casualties and Effects Deriving Therefrom

The objectives of development of aids to navigation are to improve the safety of navigation and navigational efficiency in the Indonesian waters, and it can be said that one of the most important effects deriving therefrom is the prevention of marine casualties.

The marine accidents occurred in the Indonesian waters are mostly within 20 miles off shore, and the areas where casualties frequently occurred are near congested ports, especially the four Gateway ports, in narrow channels and in the vicinity of reef and sunken reef, etc. located thereby.

Analysis is tried only on the marine casualties which are assumed to have concerned more or less with aids to navigation and occurred recently shown on the data provided by DGSC. However, the data made available did not produce a statistical basis for detailed analysis, and accordingly some estimation is made for the analysis through the adaption of analized data currently issued by the Marine Accidents Inquiry Agencies, Ministry of Transport, Government of Japan.

The marine casualties by kinds of accidents of Indonesian flag vessels (motorized only) occurred during the four years period of 1980 to 1983 are as given in **Table 6-4/1.**

Table 6-4/1 Marine Casualties by Kinds

Unit: Number

Kinds \ Year	1980	1981	1982	1983	Total	Annual Average	Ratio (%)
Collision	24	40	45	28	137	34	8.9
Stranding	39	48	57	46	190	48	12.3
Sunk	70	13	197	127	407	102	26.4
Fire	14	138	19	-	171	43	11.1
Others	195	207	120	114	636	159	41.3
Total	342	446	438	315	1,541	385	100

During the four years period, the total number of 1,541 accidents occurred as shown above, giving the annual average of 385.

Out of the total number of 1,541, collision numbers 137 accounting for 8.9%, giving annual average of 34. Stranding numbers 190 accounting for 12.3% with the annual average of 48. Sunken gives the total number/ annual average/percentage respectively of 407/102/26.4% while fire shows 636/159/41.3%.

The marine casualties by type of causes are shown in **Table 6-4/2.**

Table 6-4/2 Marine Casualties by Causes

Unit: Number

Causes \ Year	1980	1981	1982	1983	Total	Annual Average	Ratio (%)
Mis-navigation	172	239	186	112	709	177	46.0
Engine Trouble	130	153	107	104	494	124	32.1
Bad Weather	40	54	145	99	338	85	21.9
Total	342	446	438	315	1,541	385	100

The marine casualties by type of causes indicate that mistaken navigation accounts for 46%, highest, of the total accidents giving the total number of 709 with the annual average of 177. Those caused by engine troubles and adverse weather are respectively 32.1%/494/124 and 21.9%/338/85.

Analysis should better be directed to focus on estimation of casualties deriving from aids to navigation, but has not been possible to do so due to unavailability of the detailed data in Indonesia.

It is considered not always right to apply one country's situations to another's since maritime activities differ in various aspects and factors involved according to individual nations.

However, a trial effort is made in this study to make assessment through application of the analyzed data currently issued by the Marine Accidents Inquiry Agencies, Japan.

Out of the causes of marine accidents occurred in Japan, those concerned with aids to navigation are mostly strandings accounting for 26.3% of the total number of strandings (4.8% due to mis-identification of navigational aids, etc., and 21.5% due to unavailability of ships positioning).
When this occurrence rate is applied to the Indonesian data, following is given:

$$\frac{\text{(Total No. of strandings)}}{\text{4 years}} \times \text{(Occurrence rate)} =$$

$$\frac{190}{4} \times 0.263 = 12.49 = 12.5/\text{year}$$

i.e. the number of strandings (number of ships) shows 12.5, and a ratio in relation to the total number of

accidents is given below:

$$\frac{\text{(No. of strandings)}}{\text{(Total No. of Casualties)}} \times \text{(Occurrence rate)} =$$

$$\frac{190}{1,541} \times 0.263 = 0.0324$$

i.e. the estimated annual occurrence ratio of strandings to the total shows 3.24%.

There are two different approaches to the analysis of maritime traffic accidents, collisions and strandings taken out of all casualties: either annual occurrence rate or occurrence rate per passage in narrow channel may be applied.

According to the Japanese statistical data published, collisions against piers or ships occur in ports at the rate of one to 1,000 times the number of entries of ships into ports, and that in narrow channels gives the rate of one to 10,000 times the number of passages. Collisions near capes generally occur at the rate of one to 100,000 times in average.

While on the other hand, the annual occurrence rate is given as a ratio of the number of ships involved in accidents to the total number of ships registered. Accordingly, if an assumption is made that various factors constituting the movement of marine casualties would be basically the same, occurrence of maritime traffic accidents would be proportional to the number of ships.

Thus, an estimation is made in **Table 6-4/3** on the number of marine accidents (strandings) which may possibly be related to aids to navigation for the coming five years based on the assumption of the four different cases applied to the annual growth rate of the number of ships.

Table 6-4/3 Estimate for Marine Accidents (Strandings) to be possibly related to Aids to navigation

Unit: number of ships

Estimated Annual Occurrence	Annual* Growth Rate	1984	1985	1986	1987	1988	Total
12.5	5%	13.1	13.8	14.5	15.2	16.0	72.5
	6%	13.3	14.0	14.9	15.8	16.7	74.7
	8.9%	13.6	14.8	16.1	17.6	19.1	81.3
	12.2%	14.0	15.7	17.7	19.8	22.2	89.5

Remarks: * Annual Growth Rate

5%: Estimated growth rate of GDP during REPELITA IV

6%: Estimated growth rate of No. of ocean-going ships during REPELITA IV

8.9%: Estimated growth rate of No. of both ocean-going and domestic ships during REPELITA IV

12.2%: Estimated growth rate of No. of domestic ships during REPELITA IV

As seen above, the estimated number of marine accidents (strandings) to be possibly related to aids to navigation during the coming five years is:

72.5 ships at growth rate of GDP estimated at 5% per year during REPELITA IV.

74.7 ships at growth rate of No. of ocean-going ships estimated at 6% per year during REPELITA IV.

81.3 ships at growth rate of No. of both ocean-going and domestic ships estimated at 8.9% per year during REPELITA IV.

89.5 ships at growth rate of No. of domestic ships estimated at 12.2% per year during REPELITA IV.

Approach has not been made in this study for the estimation of casualties other than strandings. However, collisions are possibly related to some extent to aids to navigation, and a number of marine casualties not shown in the statistics may involve those connected with navigational aids, especially those of the traditional ships, small type of fishing vessels and such which actively engage in maritime activities in Indonesia. Some of the accidents occurred on them may have not been reported to the authorities concerned due to their minor damages.

Marine casualties may occur when such factors as follows interact or are combined directly or indirectly: meteorological and sea conditions, geographical conditions in navigable waters, establishment status of aids to navigation, congestion of navigating ships, operational status of on-board equipment and their performances, expertise knowledge of ships' crew and their skills.

Prevention of marine casualties will, therefore, requires that the individual factors be overcome and also all the factors be carefully examined as a whole.

The development of aids to navigation is one of the factors to be improved. The evaluation of how the improvement of navigational aids affects a decrease in the number of marine casualties is an extremely difficult subject to examine, and may not be analysed in a simple way.

However, past experiences have shown that establishment of aids to navigation facilities resulted in considerable decrease in the number of strandings and played an important role in preventing especially strandings among other marine traffic accidents.

It may be, therefore, expected that further implementa-