ROUTEING MEASURES AND MANDATORY SHIP REPORTING SYSTEMS

Establishment of a new traffic separation scheme and associated routeing measures in the Sunda Strait, Indonesia

Submitted by Indonesia

SUMMARY

Executive summary: This document contains a proposal to establish a traffic separation scheme (TSS) in the Sunda Strait for enabling separation of the two streams of routes by using a separation zone. A precautionary area with recommended directions of traffic flow and inshore traffic zones is also provided for managing the intersection of shipping lanes in the Sunda Strait. All of these proposed routeing measures are aimed to minimize the risk of collision between ships as well as grounding on the existing Koliot Reefs located in the Sunda Strait.

Strategic direction, if applicable: Other work

Output: OW 4

Action to be taken: Paragraph 54

Related documents: SOLAS regulation V/10, resolutions A.572(14), as amended; MSC.71(69); MSC 72(69); SN/Circ.206; MSC.1/Circ.1060, as amended; and UNCLOS 1982, part IV and NCSR 6/INF.19

Introduction

1 This document contains a proposal by Indonesia to establish an IMO-adopted traffic separation scheme (TSS) that includes one precautionary area and two inshore traffic zones in the Sunda Strait located between Sumatera Island and Java Island in Indonesia.
Details of the proposed TSS, precautionary area and inshore traffic zones are provided as follows:

1. description of the TSS and inshore traffic zones, including the name, number, edition and geodetic datum of the reference chart as well as the geographical coordinates that define them, are provided in annex 1;
2. chartlet showing proposed routeing measures is provided in annex 2;
3. description of the proposed precautionary area with recommended directions of traffic flow, including the name, number, edition and geodetic datum of the reference chart as well as the geographical coordinates that define them are provided in annex 3;
4. detailed chartlet of the proposed routeing measures is provided in annex 4; and
5. the existing visual aids to navigation in the area are provided in annex 5.

Summary

The proposal aims to establish a new TSS, a precautionary area and inshore traffic zones in the Sunda Strait which are located within Sumatera Island and Java Island as shown in figures 1 to 3.

The objectives of establishing the proposed TSS with one precautionary area and inshore traffic zones are to:

1. reduce the number of head-on situations to increase the safety of navigation by separating opposing traffic streams in the area;
2. reduce, if not eliminate, the risk of accidental ship grounding by keeping ships well away from the coral reef atolls of Terumbu Koliot;
3. reduce, if not eliminate, the risk of collision between ships by recommending one precautionary area; and
4. ensure that ships follow the routes that are absolutely free from the known dangers posed by the coral reef atolls of Terumbu Koliot by AToN.

The proposed ship's routeing measures can be seen in figure 4 followed by details of each routeing measure:

1. 2.67 NM wide TSS separated by 0.3 NM wide separation zone, which lies between northern entrance of TSS and proposed precautionary area. The total length of the TSS is approximately 2.6 NM that lies between the southern bound and proposed precaution area (see Figure 4);
2. a precautionary area with recommended directions of traffic flow located within the proposed TSS, approximately 2.67 NM from the northern entrance of TSS to about 1.2 NM to the south (see Figure 4);
1.2 NM wide TSS in the Sunda Strait that lies between the proposed precautionary areas and the southern entrance and acts as a main shipping lane at the southern entrance of the Sunda Strait. The total length of the proposed southern TSS is approximately 4 NM (see figures 3 and 4); and

inshore traffic zones that lie from TSS to the east coast of Sumatera Island and west coast of Java Island (see Figure 4).

The demonstrated need to establish the TSS with a precautionary area is to ensure that all ships are well informed of the existing potential of collision due to crossing traffic from Merak Port in Java Island to Bakauheni Port in Sumatera Island. Hence, the established TSS would likely reduce ship collisions on the route by providing a separation zone and a precautionary area for the intersection routes.
Figure 3: Map of southern side of the Sunda Strait
Figure 4: Chartlet of the proposed TSS and associated routing measures in the Sunda Strait
Figure 5: Copy of chart showing the proposed TSS and associated routeing measures in the Sunda Strait
7 The reason of the TSS being preferred is because this system provides an area for separation of the two opposing streams of the shipping lane. The separation zone is aimed at increasing the safety of ship navigation in the route and reducing the probability of head-on ships' collisions. The TSS which is effective for giving adequate sea separation area is controlling the two-way traffic route and keeping the ships in the right track.

8 The TSS is proposed to establish clear ship navigation courses. This is used as guidance to assist ships to navigate safely so they can avoid approaching the shallow water and the Koliot Reef. The reef exists near the traffic lane and can potentially cause groundings.

9 The TSS has one precautionary area to prevent collisions in the intersection area of the route. The precautionary area enables the ship's master to have more awareness so the risk of collision is minimized. In addition, the risk of ship grounding could be reduced since the proposed TSS will provide more time for the responsible ship to give aid to the drifting ship. This is to prevent additional damage to the reef as well as to the ship itself since the ship could be assisted before the impact occurs.

10 As mentioned previously, the new routeing measures are proposed in order to increase the safety of ship navigation in the route, to prevent the collision in the intersection area of the route, as well as to prevent the occurrence of ship grounding by avoiding ships approaching the shallow water, particularly the Koliot Reef. Based on history, there have been several incidents involving collisions between ships and groundings in the Sunda Strait.

11 On 26 September 2012, a collision occurred involving Singapore registered gas tanker **MT Norgas Cathinka** that was passing the Sunda Strait and Indonesia-registered ro-ro passenger ferry **MV Bahuga Jaya** that was crossing the Sunda Strait on the way from Java island to Sumatera island. Figure 6 shows the passage way of **MT Norgas Cathinka**, the position before collision and the structure condition of **MT Norgas Cathinka** after collision.

Figure 6: Collision between MT Norgas Cathinka and MV Bahuga Jaya in 2012
12 In 2014, a collision occurred involving a passenger ship and a general cargo ship. The passenger ship was sailing across the Sunda Strait while the general cargo ship passed the Sunda Strait. The damage caused by the collision is shown figure 7. The density of passenger ships crossing the Sunda Strait is very high (covering 77.4% of the total traffic density in the Sunda Strait). This means there is the potential for a collision with ships passing the Sunda Strait.

Figure 7: Impact of collision on the hull of passenger ship after collided with general cargo ship in 2014

13 In 2015, a containership **MV Hanjin Aqua** (IMO No. 9632480) was grounded to Koilot Reef (Terumbu Kailot). Figure 8 shows the passage way of the **MV Hanjin Aqua**, the grounded position and the container transfer activity before she was pulled out from the reef.

Figure 8: Grounding of a containership MV Hanjin Aqua to Koliot Reefs in 2015

14 The proposed system is recommended for use by all ships, whether national or foreign flagged, navigating to and from the Sunda Strait.
15 It is expected that ships using the TSS and associated routeing measures will comply with rule 10 of the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREG) that stipulates the rules of ships navigating in or near a TSS.

16 After the adoption of Archipelagic Sea Lanes in 1998 (resolution MSC.72(69)), ships exercising the right of archipelagic sea lane passage in Archipelagic Sea Lane I have been using the lane as a primary route between coordinate I-12 to I-14. Referring to Indonesian Nautical Chart No. 170 second edition of June 2018, based on WGS 84 datum, the coordinates are (see figure 9):

.1 Coordinate I-12: 05° 15'.00 S, 106° 12'.50 E;
.2 Coordinate I-13: 05° 57'.25 S, 105° 46'.33 E; and
.3 Coordinate I-14: 06° 18'.50 S, 105° 33'.25 E.

![Figure 9: Point I-12 to I-14 of the Indonesia Archipelagic Sea Lane I](image)

17 The proposed TSS will still be using the axis line of the Archipelagic Sea Lane (ASL) I as the separation line or the centre of the separation zone. The proposed scheme will not materially alter the way ships navigate in the area. There will be no increase in typical voyage distances for ships on voyages from Indonesia to ports in other countries.

18 A risk analysis of ship collision has been conducted for the proposed ship routeing measures. The analysis was done by using the methodology mentioned in figure 10.
The model of the proposed routeing measures was simulated by using IWRAP (IALA Waterways Risk Assessment Program) which is shown in figure 11. The inputted data is the data of the traffic density, metocean data, bathymetry data, conservation area and ports data. The ship traffic density used in the model is the data for the next 20 years until 2037. The traffic density is assumed to increase by 2% annually during this period. The model of IWRAP comprises LEG and WAY POINT in order to input the data and simulate the collision frequency based on the type, number, size and speed of ship. The model of IWRAP shows the annual frequency of ship collisions. There are five types of collision to be analysed in this model, namely head-on, crossing, overtaking, bend and merging collisions. The result of IWRAP simulation can be seen in table 1. The result shows that the total frequency of ship collision in the proposed routeing measures for the next 20 years is 0.159704 (less than one event of ship collision). In comparison, if the simulation is conducted for existing shipping lane (without TSS and other routeing measures), the total annual frequency of ship collision by implementing proposed TSS and other routeing measures can be reduced about 27%.

Figure 10: Methodology of risk analysis of ship collision
Figure 11: Model of the ship traffic using IWRAP
<table>
<thead>
<tr>
<th>Collision Type</th>
<th>Annual Frequency Collision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>w/o Proposed Routeing Measures</td>
</tr>
<tr>
<td>Head-on collision</td>
<td>0.121355</td>
</tr>
<tr>
<td>Crossing collision</td>
<td>0.065852</td>
</tr>
<tr>
<td>Overtaking collision</td>
<td>0.025585</td>
</tr>
<tr>
<td>Bend collision</td>
<td>0.018878</td>
</tr>
<tr>
<td>Merging collision</td>
<td>0.030643</td>
</tr>
<tr>
<td><strong>Total annual frequency</strong></td>
<td><strong>0.262136</strong></td>
</tr>
</tbody>
</table>

Table 1: Annual frequency of collision without and with proposed routeing measures

20 Indonesia seeks IMO's approval and adoption for the TSS, one precautionary area with recommended directions of traffic flow and inshore traffic zones in the area of the Sunda Strait.

Description of the area

21 The Sunda Strait lies between Java Island and Sumatera Island (see figure 1). This Strait connects the Indian Ocean and the Java Sea. The Sunda Strait is one of the most important straits in Indonesia. This strait has been used as a primary route since it was adopted as the Archipelagic Sea Lane (ASL) I in 1998 (resolution MSC.72(69)) where ships exercise the right of ASL passage on their voyages through the Sunda Strait from southbound to northbound and vice versa. Along with the existence of ASL I in the Sunda Strait, there is also a high density crossing traffic line oscillate Java Island and Sumatera Island that cuts ASL I. This crossing traffic is mainly occupied by passenger ferry ro-ro as well as other merchant ships. Figures 9 and 11 in addition to figures 1 to 3 show the location map of the Sunda Strait and adopted ASL I, while figures 12 and 13 show the chartlet of the Sunda Strait.
Figure 12: Reference chart of the Sunda Strait (Southern Part)
22 The bathymetry of the Sunda Strait has a variation of depth. It includes angular sub-basin and steep slopes that the formation is controlled by faulting which makes the contour of bathymetry much more complex. The western part bathymetry of the Sunda Strait is constructed of an array of four main ridges. The ridges are the Semangko Horst, the Tabuan, Panaitan and Krakatau Ridges; and also two pronounced grabens: the Semangko Graben and the Krakatau Graben. The depth of Semangko Graben varies from less than 800 to 1,500 m, while the bathymetry of Krakatau Graben is relatively flat caused by abundance of volcanic deposition since the Krakatau Volcano is located in this area. There is also the Koliot Reef which is located approximately 1 NM northeast of the centreline of IASL I. The Koliot Reef is a coral reef which is located in the northwest of Sangiang Island in the Sunda Strait. Koliot Reefs will potentially increase the event of groundings for the ships that pass through the IASL I and go to the Indian Ocean from the Java Sea and vice versa.

23 Based on the Indonesian Hydro-Oceanography chart number 170, July 2018 edition, the Sunda Strait also contains flora and fauna nature reserve areas such as Sangiang Island, Panaitan Island and Ujung Kulon (Java Island). The waters around Krakatau Island, Krakatau Kecil Island, and Sertung Island are declared as dangerous areas because there could be a hazardous eruption at any time since these are active volcanic areas which had the biggest eruption in history.
24 There is one inshore lane that has been proposed for the reason that there is a lot of coastal traffic in the eastern bound and western bound of the Sunda Strait.

Cooperation between States

25 This proposal has been developed solely by Indonesia. The TSS, precautionary area and inshore traffic zones are proposed to be adopted in the Sunda Strait between Sumatera and Java Islands, and between the Java Sea and the Indian Ocean.

26 The Indonesian Government had conducted communication and consultation with the stakeholders which concerned with the existence of the route namely government agencies, shipping companies, shipowners, port managements and ship operator associations.

Traffic considerations

27 According to the Indonesian Law Number 6 Year 1996 on Indonesian Waters and Government Regulation Number 37 Year 2002 on Rights and Obligations of Foreign Ship and Aircraft Exercising Archipelagic Sea Lanes Passage in Designated Archipelagic Sea Lanes, the Sunda Strait is designated as Indonesian Archipelagic Sea Lane (IASL) I. This Strait serves as a domestic and international sea lane and is also crossed by ferries between Java and Sumatera Islands. The IASL was also adopted by IMO through resolution MSC.72(69) in 1998.

28 Indonesia as the Archipelagic State has the right to prescribe the TSS to enhance the safety of navigation, based on Article 53(6) of the United Nations Convention on the Law of the Sea (UNCLOS) 1982 and also based on the General Provisions for the Adoption, Designation and Substitution of Archipelagic Sea Lanes. The designation of the TSS will not affect the rights of Archipelagic Sea Lane Passage in the Sunda Strait.

29 According to AIS data provided by https://www.marinetraffic.com/, the traffic patterns in the Sunda Strait are given in figures 14 and 15. The traffic pattern shows that ASL I has been used as reference of voyage in the Sunda Strait by international shipping. The traffic pattern also shows the existence of crossing traffic from Java Island in the east to Sumatera Island on the west side and vice versa. The existence of an industrial area in Cilegon (Java Island) also affects the density of ship traffic to this area which is shown with the traffic pattern towards the east side water area of Sangiang Island.

Figure 14: Traffic pattern in the Sunda Strait (1)
30 There are also existing visual aids to navigation in the area of the proposed TSS. The detail of the name as well as the location of the visual aids is shown in annex 5.

31 There were 53,068 ship voyages made through the area of the Sunda Strait in 2016. This translates to about 145 ships per day. Of these, 77.4% were passenger ships, 8.7% were cargo ships, 7.6% were tankers, 2.6% were tugboats, offshore supply vessels and AHTS, 1.7% were barge and landing crafts and 1.9% others (chips, bitumen, woods, cements, vehicles, livestock, urea, carriers, researches, fishing, sailing ships, etc.).

32 There is fluctuation in the shipping activity near the Sunda Strait. The fluctuation is caused by two main shipping routes which intersect in the middle of the Sunda Strait. An international shipping route which lies on the north-south bound intersects with a national shipping route which lies on the east-west bound of the Sunda Strait. The international shipping route is fluctuated by the transportation of commodities between southeast, east Asia and middle Asia countries to Australia. While the national shipping route is fluctuated by the crossing of shipping routes between Port of Merak, Port of Tanjung Priok, Port of Bakauheni and other ports in the district of Banten. Ship traffic density between these routes is likely to grow since the Indonesian Government is speeding up Indonesia maritime development by proposing a sea highway.
Figure 16: Number of ships passing through the Sunda Strait in 2016

The Indonesian Naval Hydrographic and Oceanographic Centre conducted hydrographic surveys in the Sunda Strait in 2004, 2007, 2008, 2011 and 2016:

.1 The last hydrographic survey conducted in 2017 was based on WGS84 datum. The survey was conducted using GPS Trimble Net R5, Trimble Net R9, and Trimble SPS 855 equipped with Zephyr Geodetic 2 antennas for positioning. The area was 100% covered by multi-beam echo-sounder in 2012; maximum error is less than 10 cm with a confidence level of 95%. The depths in the area vary from 30 m to 100 m.

.2 The proposed TSS area is clear from navigational hazard. Uncharted features hazardous to surface navigation are not expected but may exist, so the area is designated as Zone of Confidence (ZOC) B.

.3 The area is covered by Electronic Navigational Chart (ENC) in scale of 1:200,000 and nautical chart in scale up to 1:25,000 that was updated in 2017. All charts are in metric units and based on WGS84 datum.
34 The proposed scheme has been designed to follow the IASL I (existing traffic pattern) as closely as possible, as well as to consider the record of ship navigation pattern obtained from AIS data in the Sunda Strait. Course alterations, convergence areas and route junctions have been kept to a minimum.

35 There are no offshore structures such as drilling rigs or exploration platforms located in or near the proposed TSS.

36 There is no existing hydrocarbon exploration or exploitation activities planned in the vicinity of the proposed TSS.

**Marine environmental considerations**

37 The eastern tropical Indian Ocean including the Sunda Strait is greatly influenced by the Australian-Indonesian monsoon system. These two monsoon systems are seasonally reversing monsoon winds which dynamically impact the ocean currents along the southern part of Java and Sumatera sea water. The northwest monsoon season occurs between December and February. Wind flows from the Eurasian continent, past the South China Sea and the Bay of Bengal. During this season, the wind carries warm and moist air to Indonesia. The southeast monsoon season happens between June and September. During this time south-easterly winds blow from Australia and carry warm and dry air to Indonesia.
38 Inside the Sunda Strait, there is an exchange of water mass between the Java Sea and the Indian Ocean. In general, the mass of water moves towards the Indian Ocean because the water level in the Java Sea is higher than that in the Indian Ocean. The Java Sea and the South China Sea are the source of low-salinity water masses. Runoff from major rivers of Sumatera, Kalimantan and Java affects more salinity than rainfall, while the mass of the Indian Ocean water is characterized by high salinity due to the mass of water from the Red Sea and Persian Gulf.

39 The presence of the Koliot Reef located close to the shipping lane poses a potential hazard to the safety of navigation of ships passing through ASL I, especially the occurrence of ship grounding to the Koliot Reef. The Koliot Reef is located at coordinates of 5° 55’.00 S and 105° 49’.17 E. The Indonesian Government has established Aids to Navigation as a presence of the reef, with details as follows:

1. AtoN name: West Cardinal Light Beacon
2. Coordinate: 05° 55’.29 S, 105° 48’.84 E

**Status of routeing systems**

40 As an IMO adopted TSS, all vessels will be subject to the provision of rule 10 of COLREG 1972.

41 If a vessel fails to comply with the measures on a designated ship routeing system, appropriate actions will be taken, including interaction with the flag State, in accordance with relevant IMO regulations.

42 The proposed TSS can be reasonably expected to reduce the risk of collision, reduce and delay the risk of pollution or other harm to the marine environment.
Figure 18: Location of the Koliot Reef
Position-fixing in relation to the routeing system

43 There are existing visual aids to navigation in the area of the proposed TSS and other ships’ routeing measures. The detail of the name as well as the location of the visual aids is shown in annex 5.

44 The installation of virtual AtoN will be determined in accordance with IMO and IALA guidelines regarding virtual AtoN. The installation of the said virtual AToN will be conducted prior to the implementation of the measures in the Sunda Strait upon adoption.

45 The proposed TSS, precautionary area and inshore traffic zones are within coverage of the fully operational AIS base stations.

46 There are AIS base stations operated by the Indonesian Government which are able to reach the AIS signal from ships located in the area, namely VTS Merak, VTS Jakarta and VTS Center Panjang. These AIS base stations recognize all the ships located in the TSS as well as the ships which are out of TSS. By using VTS, the Indonesian Government will give services to all ships in order to ensure the safe passage of ships. Every effort will be made to ensure ships out of TSS maintain their voyage in the right track.

47 There are VTS services available within the proposed TSS, precautionary area and inshore traffic zones and ships are expected to participate using the said services.

Miscellaneous information

48 There are no fishing grounds in the area of the proposed TSS.

49 According to Ministerial Decree of the Ministry of Forestry of Indonesia No. 55/Kpts-II/1993, Sangiang Island which is located in vicinity of ASL I has been designated as a Marine Nature Park.

50 There are no foreseeable changes in the traffic patterns stemming from ports or any other related developments.

51 Extensive consultation has taken place with user States and stakeholders including other local interested parties.

52 The Indonesian Government conducted the international Workshop on the proposal of the Designation traffic separation scheme (TSS) in Lombok and the Sunda Strait that took place in Bali on 9 April 2018 and was attended by the representatives of user States, the shipping industry and other stakeholders. The objectives were to update the information on the proposal of the designation of TSS in Lombok and the Sunda Strait as well as to enhance the awareness of the user States and stakeholders on the said proposals.

Proposed date of implementation

53 It is proposed that the TSS and associated routeing measures will enter into force six months after adoption by the Maritime Safety Committee.

Action requested of the Sub-Committee

54 The Sub-Committee is invited to consider the proposal and recommend it to the Maritime Safety Committee for adoption.
ANNEX 1

DESCRIPTION OF THE PROPOSED TRAFFIC SEPARATION SCHEME
AND INSHORE TRAFFIC ZONES

Note: This chart is based on World Geodetic System 1984 datum (WGS84)).

Description of the traffic separation scheme

(a) A separation zone, 0.3 mile wide, is centred upon the following geographical positions:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>05° 49'.06 S</td>
<td>105° 51'.58 E</td>
</tr>
<tr>
<td>(2)</td>
<td>05° 48'.89 S</td>
<td>105° 51'.31 E</td>
</tr>
<tr>
<td>(3)</td>
<td>05° 51'.17 S</td>
<td>105° 49'.89 E</td>
</tr>
<tr>
<td>(4)</td>
<td>05° 51'.34 S</td>
<td>105° 50'.16 E</td>
</tr>
</tbody>
</table>

(b) A traffic lane for northeast bound traffic is established between the separation zone in (a) and a line connecting the following geographical positions:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(5)</td>
<td>05° 49'.66 S</td>
<td>105° 52'.54 E</td>
</tr>
<tr>
<td>(6)</td>
<td>05° 51'.94 S</td>
<td>105° 51'.13 E</td>
</tr>
</tbody>
</table>

(c) A traffic lane for southwest bound traffic is established between the separation zone in (a) and a line connecting the following geographical positions:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(7)</td>
<td>05° 50'.57 S</td>
<td>105° 48'.92 E</td>
</tr>
<tr>
<td>(8)</td>
<td>05° 48'.30 S</td>
<td>105° 50'.35 E</td>
</tr>
</tbody>
</table>

(d) A separation line connects the following geographic positions:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(9)</td>
<td>05° 53'.65 S</td>
<td>105° 48'.56 E</td>
</tr>
<tr>
<td>(10)</td>
<td>05° 57'.04 S</td>
<td>105° 46'.46 E</td>
</tr>
</tbody>
</table>

(e) A traffic lane for northeast bound traffic is established between the separation line in (d) and a line connecting the following geographical positions:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(11)</td>
<td>05° 53'.97 S</td>
<td>105° 49'.09 E</td>
</tr>
<tr>
<td>(12)</td>
<td>05° 57'.36 S</td>
<td>105° 46'.98 E</td>
</tr>
</tbody>
</table>

(f) A traffic lane for southwest bound traffic is established between the separation line in (d) and a line connecting the following geographical positions:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(13)</td>
<td>05° 56'.72 S</td>
<td>105° 45'.95 E</td>
</tr>
<tr>
<td>(14)</td>
<td>05° 53'.34 S</td>
<td>105° 48'.06 E</td>
</tr>
</tbody>
</table>
Inshore traffic zones

(g) Eastern inshore traffic zone
The area between the traffic separation scheme from position (5) to Pujut Point (05° 52'.56 S, 106° 02'.47 E) with direction 106°, and a line drawn from position (12) to Cikoneng Point (06° 04'.35 S, 105° 52'.97 E) with direction 139° is designated as an inshore traffic zone.

(h) Western inshore traffic zone
The area between the traffic separation scheme from position (8) to Kanggalan Point (05° 47'.73 S, 105° 47'.84 E) with direction 288°, and a line drawn from position (13) to Tua Point (05° 54'.49 S, 105° 43'.05 E) with direction 307° is designated as an inshore traffic zone.
ANNEX 2

CHARTLET OF THE TRAFFIC SEPARATION SCHEME
AND INSHORE TRAFFIC ZONE IN THE SUNDA STRAIT

SUMATERA ISLAND

JAVA ISLAND
ANNEX 3

DESCRIPTION OF THE PROPOSED PRECAUTIONARY AREA
WITH RECOMMENDED DIRECTIONS OF TRAFFIC FLOW IN THE SUNDA STRAIT

(Reference chart: Indonesian Nautical Chart No. 170 second edition of June 2018. Note: This chart is based on World Geodetic System 1984 datum (WGS84).)

Precautionary area with recommended directions of traffic flow

A precautionary area with recommended directions of traffic flow, as described in the chartlet below, is established bounded by a line joining the following geographical positions:

<table>
<thead>
<tr>
<th></th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>05° 51'.94 S</td>
<td>105° 51'.13 E</td>
</tr>
<tr>
<td>16</td>
<td>05° 50'.57 S</td>
<td>105° 48'.92 E</td>
</tr>
<tr>
<td>17</td>
<td>05° 53'.34 S</td>
<td>105° 48'.06 E</td>
</tr>
<tr>
<td>18</td>
<td>05° 53'.97 S</td>
<td>105° 49'.09 E</td>
</tr>
</tbody>
</table>

Chartlet: Precautionary area with recommended directions of traffic flow

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ANNEX 4

DETAILED CHARTLET OF PROPOSED TSS AND ASSOCIATED ROUTEING MEASURES IN THE SUNDA STRAIT
ANNEX 5

EXISTING NAVIGATION AIDS (LIGHTS)

The name as well as the location of the existing visual aids to navigation in the area of the proposed TSS are listed in detail, as follows:

I. Main AtoN (shown in the chartlet)

<table>
<thead>
<tr>
<th>No</th>
<th>AtoN</th>
<th>Position</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Latitude</td>
<td>Longitude</td>
</tr>
<tr>
<td>1</td>
<td>Cikoneng Lighthouse</td>
<td>06° 04'.00 S</td>
<td>105° 53'.00 E</td>
</tr>
<tr>
<td>2</td>
<td>Tanjung Tua Light Beacon</td>
<td>05° 54'.37 S</td>
<td>105° 43'.00 E</td>
</tr>
<tr>
<td>3</td>
<td>Sangiang Light Beacon</td>
<td>05° 58'.33 S</td>
<td>105° 51'.13 E</td>
</tr>
<tr>
<td>4</td>
<td>Pulau Ular Light Beacon</td>
<td>06° 00'.55 S</td>
<td>105° 55'.57 E</td>
</tr>
<tr>
<td>5</td>
<td>Koliot Reef Light Beacon</td>
<td>05° 55'.29 S</td>
<td>105° 48'.84 E</td>
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<td>6</td>
<td>Pulau Panjurit Light Beacon</td>
<td>05° 53'.12 S</td>
<td>105° 47'.12 E</td>
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<td>7</td>
<td>Serdang Light Beacon</td>
<td>05° 57'.01 S</td>
<td>105° 58'.83 E</td>
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<td>8</td>
<td>Merak Besar Light Beacon</td>
<td>05° 56'.08 S</td>
<td>105° 59'.53 E</td>
</tr>
<tr>
<td>9</td>
<td>Tempurung Lighthouse</td>
<td>05° 54'.01 S</td>
<td>105° 55'.88 E</td>
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II. Secondary AtoN

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<th>No</th>
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<th>Range</th>
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<td>Longitude</td>
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<td>1</td>
<td>Sebeku beacon light</td>
<td>05° 51'.00 S</td>
<td>105° 32'.00 E</td>
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<td>Pulau Rakata beacon light</td>
<td>06° 09'.74 S</td>
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<td>Pulau Tiga beacon light</td>
<td>05° 49'.17 S</td>
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<td>Pasir Brower buoy light</td>
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<td>Karang Ayer Serdang beacon light</td>
<td>05° 59'.23 S</td>
<td>106° 46'.50 E</td>
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[Chartlet of the main Navigation Aids in the Sunda Strait]