SYAMA PRASAD MOOKERJEE PORT, KOLKATA (KDS &HDC)

OIL SPILL CONTINGENCY PLAN (OSCP)

(THIS PLAN IS A PART OF DMP)

By

IRCLASS
Indian Register of Shipping

July - 2024

This is to state that at the request of Syama Prasad Mookerjee Port (SMPK), the undersigned surveyors have prepared Oil Spill Contingency Plan (OSCP).

This work has been carried out for SMPK as per their work order dated 04th January, 2024 and is confidential. No part of this report may be released to any outside organization unless explicitly advised by the owners in writing.

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REPORT REVISION RECORD

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1	Final report issued to SMPK.	05.07.2024

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IMPORTANT NOTE

The Oil Spill Contingency Plan outlines the steps required for the management of responses to marine oil spills that are the responsibility of the Syama Prasad Mookerjee Port.

This document should be read/ referred to in conjunction with the National Oil Spill Disaster Contingency Plan (NOS-DCP).

This document is prepared in three sections. **Section-I** including Strategy, **Section –II** including Action and Operations and **Section-III** includes Data directory.

ABBREVIATIONS

CCA	Central Coordinating Authority
CEC	Chief Emergency Controller
CGHQ	Coastguard Headquarters
CMO	Chief Medical Officer
COMCG	Commander Coast Guard
CIC	Chief Incident Controller
CISF	Central Industry Security Force
CMG	Crisis Management Group
CMT	Crisis Management Team
COMDIS - 8	Commander, Coast Guard District – 8 (WP - Haldia)
DHQ	Coast Guard District Headquarters
DOSC	Deputy On Scene Commander
DOS-CMG	District Oil Spill Crisis Management Group
DMP	Disaster Management Plan
EAP	Emergency Action Plan
EARL	East Asia Response Limited
ECC	Emergency Control Centre
EG	Environment Group
HDC	Haldia Dock Complex
HFO	Heavy Fuel Oil
GNOME	General NOAA Operational Modeling Environment
IAP	Incident Action Plan
IDRN	Indian Disaster Resource Network
INCOIS	Indian National Centre for Ocean Information Services
IMD	India Meteorological Department
IMO	International Maritime Organization
IMT	Incident Management Team
INCOIS	Indian National Centre for Ocean Information Services
ITOPF	International Tanker Owners Pollution Federation
KDS	Kolkata Dock System
KPD	Kidderpore Dock
LAG	Local Action Group
LCA	Lead Combat Agency
LO	Logistics Officer
LOS-CMG	Local Oil Spill Crisis Management Group
LST	Local Action Group Support Team
M&OH	Medical and Occupational Health
MLO	Media Liaison Officer
MMD	Mercantile Marine Department
MoEF	Ministry of Environment & Forest
MoU	Memorandum of Understanding
MPC	Marine Pollution Coordinator
MRCC	Maritime Rescue Coordination Centre

MRU	Marine Response Unit
MSDS	Materials Safety Data Sheet
M&OHC	Medical & Occupational Health Coordinator
NOSC	National On-scene Commander
NOS-CMG	National Oil Spill Crisis Management Group
NOS-DCP	National Oil Spill Disaster Contingency Plan
NRT	National Response Team
NSD	Netaji Subhash Dock
OISD	Oil Industry Safety Directorate
OO	Operations Officer
OOSA	Online Oil Spill Advisory
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-operation
OSC	On-Scene Commander
OSCP	Oil Spill Contingency Plan
OSD	Oil Spill Dispersant
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organization
OSTM	Oil Spill Trajectory Model
OH&S	Occupational Health and Safety
PAS	Public Address System
POLFAC	Pollution Facilities
POLINF	Pollution Information
POLREP	Pollution Reports
POLWARN	Pollution Warning
PPM	parts per million
PTFE	Polytetrafluoro Ethylene
P&IR	Personnel and Industrial Relations
RMC	Regional Meteorological Centre
SA	Statutory Agency
SAR	Search and Rescue
SC	Shoreline Coordinator
SCBA	Self-contained Breathing Apparatus
SIC	Site Incident Controller
SITREP	Situation Report
SMCU	Salvage Monitoring and Control Unit
SMPK	Syama Prasad Mookerjee Port
SOSC	State On-scene Commander
SOS-CMG	State Oil Spill Crisis Management Group
SOS DCP	State Oil Spill Disaster Contingency Plan
STN-CDR	Station Commander
TOVALOP	Tanker Owner Voluntary Agreement Concerning Liability for Oil Pollution

WBCZMA	West Bengal Coastal Zone Management Authority
WBPCB	West Bengal Pollution Control Board
VHF	Very High Frequency

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SECTION I
STRATEGY

1.0 INTRODUCTION

1.1 AIM AND OBJECTIVES

1.1.1 Aim

The aim of this plan is to enable the Syama Prasad Mookerjee Port (SMPK) which includes KDS (KPD, NSD and Budge-Budge) and HDC, to minimize the effect of any Marine Oil and/or HNS pollution incident in the Port and associated Port limits, through the implementation of rapid, effective and appropriate response procedures.

1.1.2 Objectives

1. To ensure that procedures are consistent with NOS-DCP.
2. To identify sensitive areas, cleanup actions and strategies.
3. To protect the life and economic interests of SMPK and immediate surrounding due to oil pollution resulting from port activities.
4. To ensure that complete and accurate records are maintained of all incidents to facilitate evaluation of the efficacy of the plan, prosecution of the offender and recovery of cost.

1.2 PRIORITIES

The priorities of Marine Oil/HNS Pollution Response are to protect

1. Human health and safety.
2. Rare and/or endangered flora and fauna.
3. Habitat and cultural resources.
4. Commercial resources.
5. Recreational and amenity areas.

1.3 AUTHORITY

This OSCP has been prepared and issued in accordance with

- The provisions of Merchant Shipping Act, 1958 as amended and Major Ports Authorities Act, 2021.

Stakeholders identified as a part of this plan are SMPK, Terminal Operators within its port limit and other members as per the Mutual Aid Plan. The institutional mechanism has been proposed for ensuring the effective participation of identified stakeholders for oil spill preparedness and response for achieving the objectives of Facility Level Oil Spill Contingency Plan for SMPK.

1.4 RESPONSIBILITIES

1.4.1 Syama Prasad Mookerjee Port

The SMPK Authority will

- Maintain an adequate response preparedness (Tier-1 level) in Port by:
  - Providing and maintaining OSR equipment,
  - Providing training and PPE to the personnel,
  - Actively participate in the local, district, state and national level committees/forums for oil spill response contingency.
- Make all reasonable efforts to act as early as possible on occurrence of oil spill and becomes the “First Response Agency”.

FIGURE 1.1: RESPONSIBILITY FLOWCHART

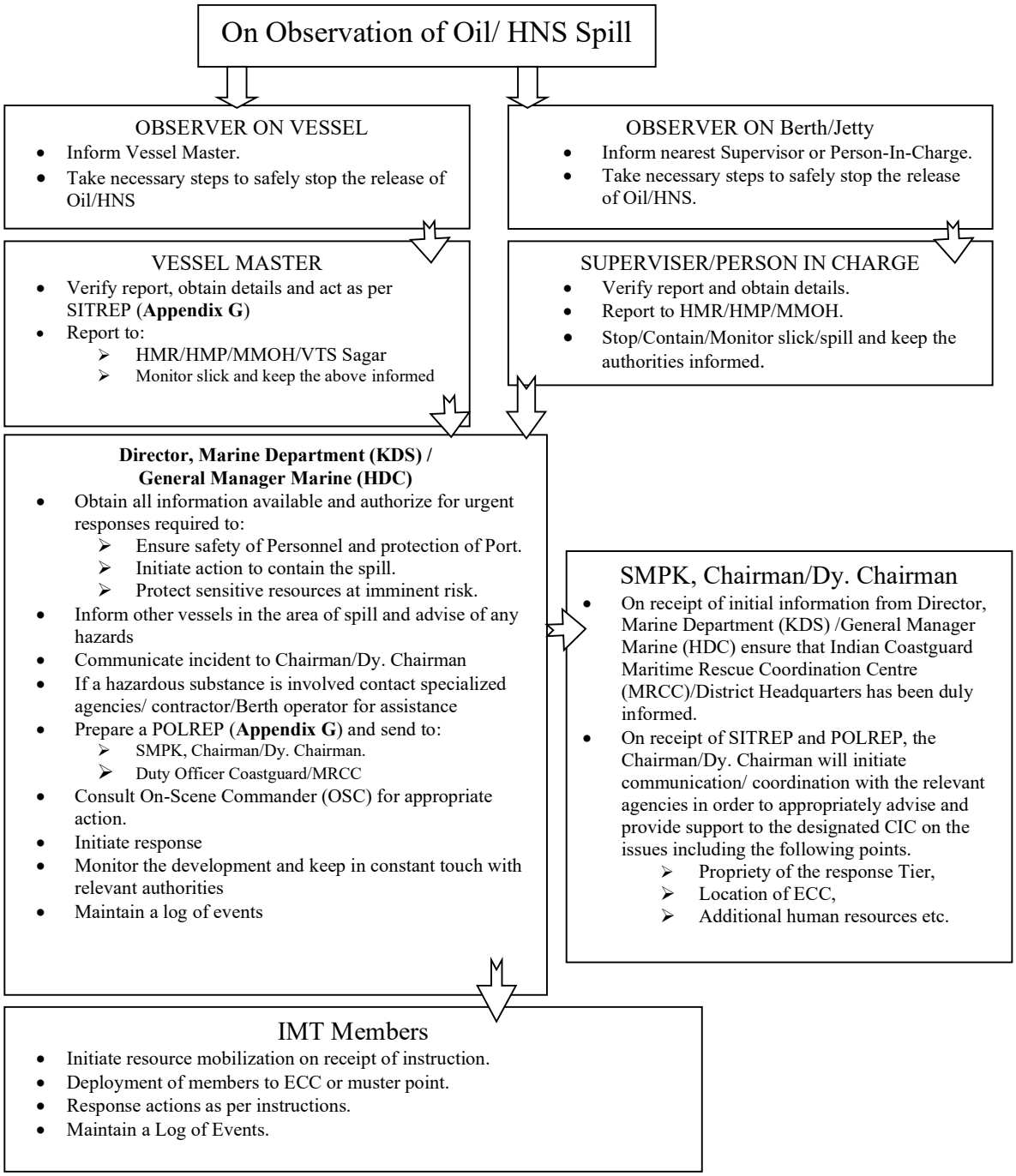


Table 1.1: Lead Combat Agency for KDS

Area	Source of spill	Lead Combat Agency for KDS (1)
		Tier*-1
Dock area	Any (Inside port limit)	SMPK, District Authority
Inland Navigational channel		
Shoreline in port limit		

Table 1.2: Lead Combat Agency for HDC

Area	Source of spill	Lead Combat Agency for HDC (1)		
		Tier*-1	Tier-2	Tier-3
Dock area	Any (Inside port limit)	SMPK, District Authority	Coast Guard, District Authority, SMPK	Coast Guard, District Authority
Inland Navigational channel and Delta region				
Shoreline in port limit				

(1) Response Tiers, or levels of response, are defined in para 7.3.
(2) * Refer para 7.3

1.4.2 Berth operators, associated staff, stevedores and ship's crew

It is the responsibility of berth operators, associated staff, stevedores and ship's crew to:

- Report all identified Oil /HNS spills.
- If trained, take all necessary steps to effectively prevent spills or limit the spread of spills that have occurred.

1.4.3 Other Government Agencies and Crisis Management Group (CMG)

The roles and responsibilities of other relevant Government agencies and CMG group are detailed in NOS- DCP 2015 (Refer Para 8.6.2.5).

1.5 COORDINATING COMMITTEE

CMG will be the coordinating committee for the oil spill response operations under Facility Level Oil Spill Contingency Plan for SMPK.

1.6 STATUTORY REQUIREMENTS

As per NOS-DCP, SMPK is to maintain Oil Spill Response Equipment as per Risk Category-A. The equipment details are given in **Appendix F**.

1.6.1 International Regulations

- International Convention on Oil Pollution Preparedness Response and Cooperation (OPRC 90);
- MARPOL 73/78;

- Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGs);
- The 1992 Civil Liability Convention (CLC);
- International Convention on Salvage, 1989;
- The International Maritime Dangerous Goods Code (IMDG Code);
- The International Maritime Solid Bulk Cargoes Code (IMSBC Code);
- The International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code) applies to ships built after June 1986;
- The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (International Gas Carrier Code) applies to ships built after June 1986.

1.6.2 National Regulations includes

- Indian Ports Act, 2021;
- Coastguard Act, 1978;
- Merchant Shipping Act, 1958;
- Major Ports Authorities Act, 2021;
- Manufacture, Storage and Import of Hazardous Chemical (MSIHC) rules, 1989;
- The Wild Life (Protection) Act, 2022;
- Water (Prevention & Control of Pollution) Act, 1974, Amended in 1988;
- Environmental Protection Act, 2022 (Environment (Protection) Amendment Bill, 2022);
- Coastal Regulation Zones Notification –1991 and amendments.

1.7MUTUAL AID AGREEMENTS

Mutual aid agreements are under process with the stakeholders.

1.8 GEOGRAPHICAL LIMITS OF PLAN

This OSCP applies to all Oil/HNS spills that occur within Port limit.

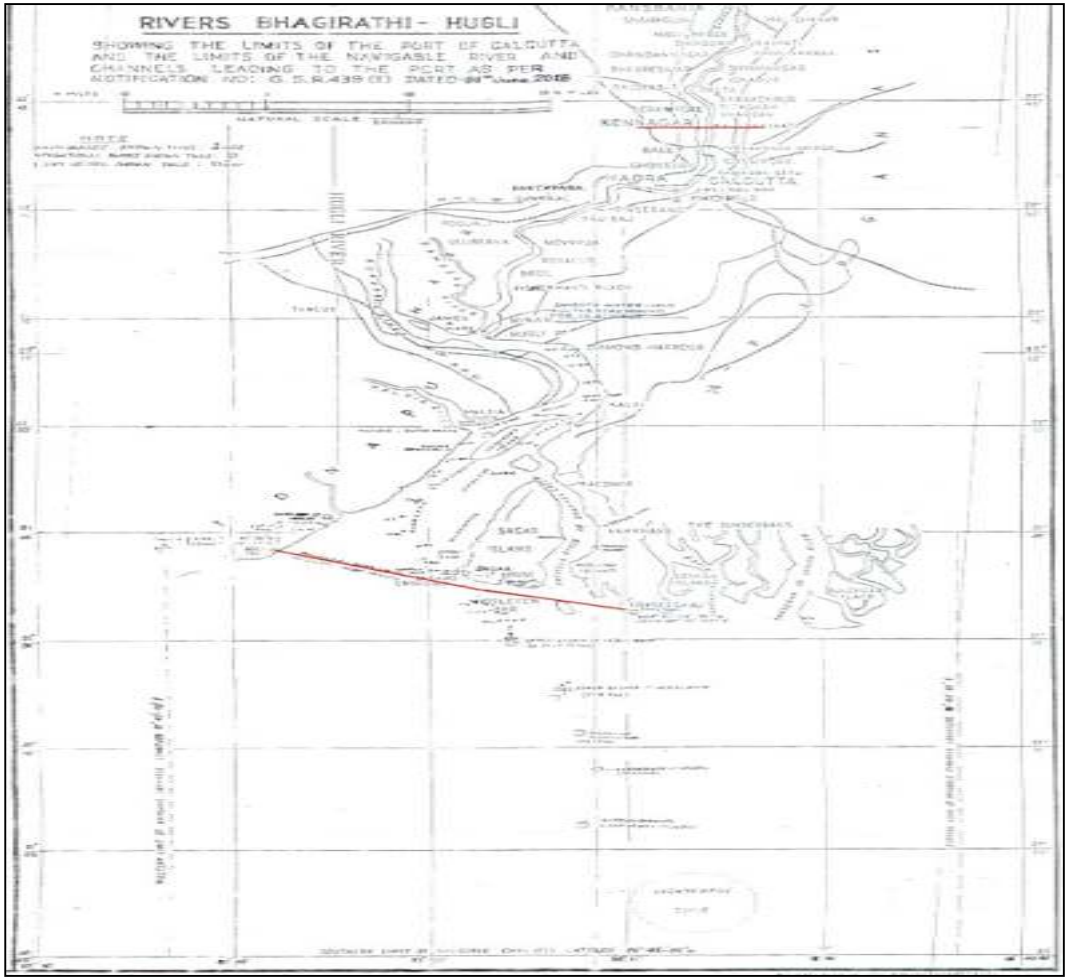


Figure 1.2: Port Limit Chart

1.9 INTERFACES WITH OTHER PLANS/GUIDELINES

1.9.1 Interface with SMPK's Disaster Management Plan (DMP)

OSCP should be read in conjunction with the SMPK - Disaster Management Plan (DMP).

1.9.2 Interface with National Plan and Guidelines

OSCP has been developed in alignment with the following

- National Oil Spill Disaster Contingency Plan (NOS-DCP), 2015 and amendments thereafter;
- Eastern Region Oil Spill Disaster Contingency Plan (EROS-DCP);
- District Oil Spill Disaster Contingency Plan – (West Bengal);
- Guidelines for Preparation of Oil Spill Contingency Plan (OISD Guidelines), 2002;
- Policy and Guidelines for use of Oil Spill Dispersants (OSD) in Indian waters, 2009;
- CGBR 774: Guidelines & Inspection Handbook for Pollution Response Facilities of Ports & Oil Handling Agencies;
- West Bengal State Disaster Management Plan

Note: *SMPK should review and revise this OSCP in the event of any updates with the above Plan/guidelines listed under para 1.8.1 and 1.8.2.*
Consequent to any change/modification, the Director, Marine Department (KDS) and General Manager Marine (HDC) are responsible for revising the OSCP and for issuing updates to holders of controlled copies.

2.0 RISK ASSESSMENT

One of the most important initial steps in the contingency planning process is the operational risk assessment. This section of the OSCP identifies the oils that will be handled by SMPK as a part of this project scope, identification of activities and associated oil spill risks, oil spill modeling results and environmental sensitivities in the region.

2.1 IDENTIFICATION OF ACTIVITIES & RISKS

2.1.1 Facility Description

Syama Prasad Mookerjee Port (SMPK) established in 1870, the oldest Major Port in India, is located on the eastern coast of West Bengal. Kolkata Dock System (KDS) is located on the East Bank of Hugli River & Haldia Dock Complex (HDC) is on the West Bank. SMPK comprises of two dock systems one at Kolkata and other at Haldia. KDS consists of three sub-components i.e., Kidderpore Dock (KPD), Netaji Subhash Dock (NSD) and Budge-Budge Oil jetties.

2.1.2 Location

Table 2.1: Location of KDS and HDC

KDS		**HDC**	
Latitude	Longitude	Latitude	Longitude
22° 32’ N	88° 18’ E	22°02’ N	88°06’E

2.1.3 Kolkata Dock System (KDS)

2.1.3.1 Kidderpore Dock (KPD)

The KPD comprises of two Dock basins – separated by a bascule bridge. KPD – I has 12 berths, KPD – II has 8 berths (**Figure 2.1)** and KPD has 3 Dry Docks. The entrance to the Dock Systems is through Lock Gates, having outer & inner lock Gates. The size of berths and the back-up storage facilities in KPD – I and KPD – II is listed in **Table 2.2**.

Port is well connected to nearby places by road, rail and air routes. National Highway (NH) 117 is about 1.5 km from KDS and connects to NH 6 (Delhi – Kolkata Road).

Port is also well connected to South Eastern &Eastern railway network. Nearest railway station to KDS is Majherhat.

2.1.3.1.1 Kidder Dock Port Layout

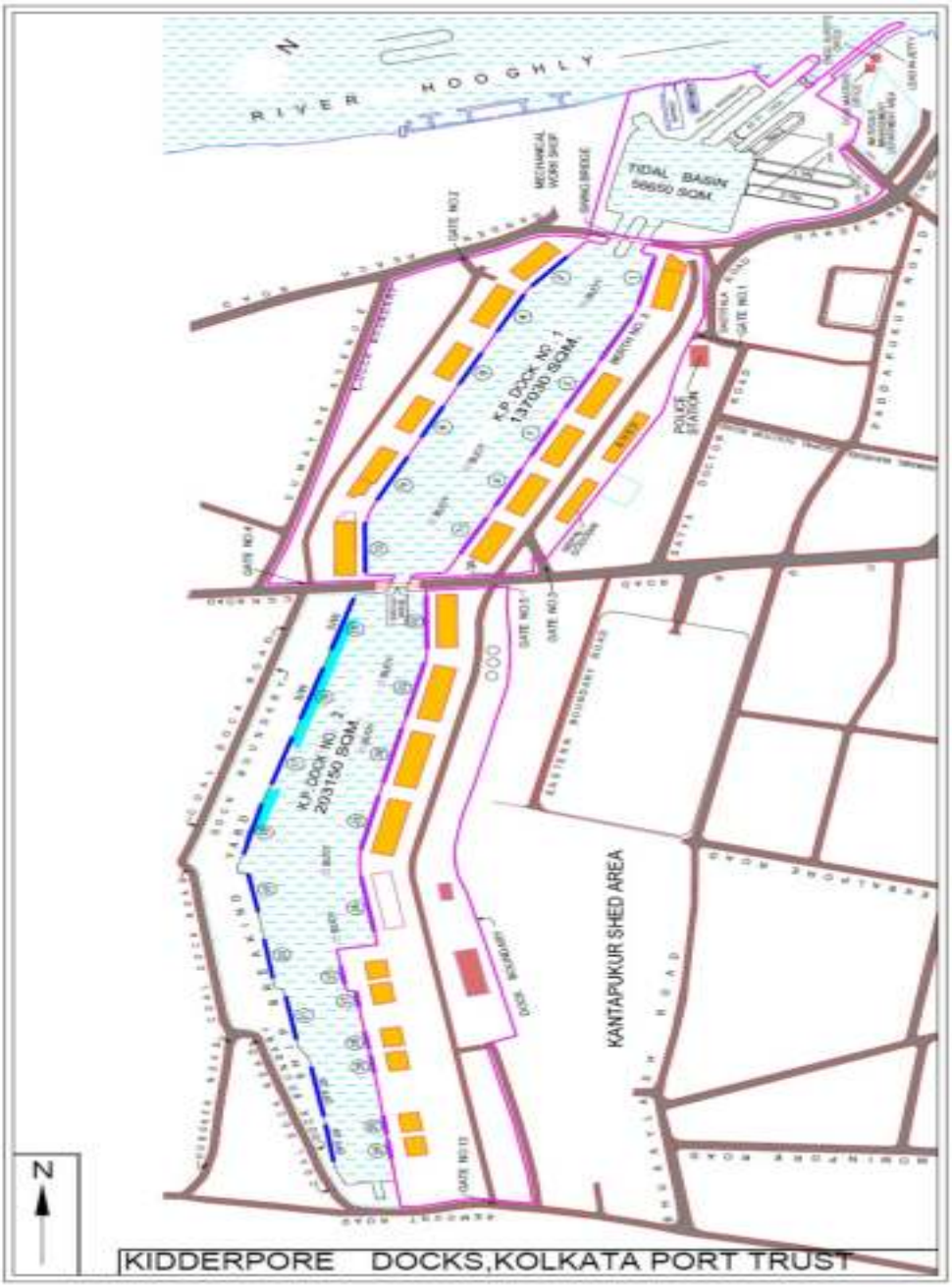


Figure 2.1: KPD Layout

2.1.3.1.2 Berth wise details

Table 2.2: Berth wise specification - KPD

Sr. No.	Name of Berth	Type of Berth	Designed depth (m)	Quay length (m)
1	1	General Cargo	8	133
2	3	General Cargo	8.7	128
3	5/7	General Cargo	8.7	229
4	9	General Cargo	8.7	108
5	11	General/Coastal cargo/Passenger	8.5	151
6	4	General Cargo	8.5	136
7	6	General Cargo	8.2	118
8	8	General Cargo	8.5	128
9	10	General Cargo	8.5	161
10	12	General/Coastal cargo/Passenger	8.5	143
11	22	General Cargo	8.7	151
12	23	General Cargo	8.7	147
13	24	General Cargo	8.7	152
14	25	General Cargo	8.5	169
15	26	General Cargo	8.4	185
16	27	General Cargo	8.2	195
17	28	General Cargo	8.4	195
18	29	General Cargo	8.4	185

2.1.3.2 Netaji Subhash Dock (NSD)

The NSD comprises of dock basin with a single lock entrance and has 10 berths and 2 dry docks (**Figure 2.2**). Sizes of berths and the storage space around these is given in **Table 2.3**.

2.1.3.2.1 Netaji Subhash Dock Port Layout

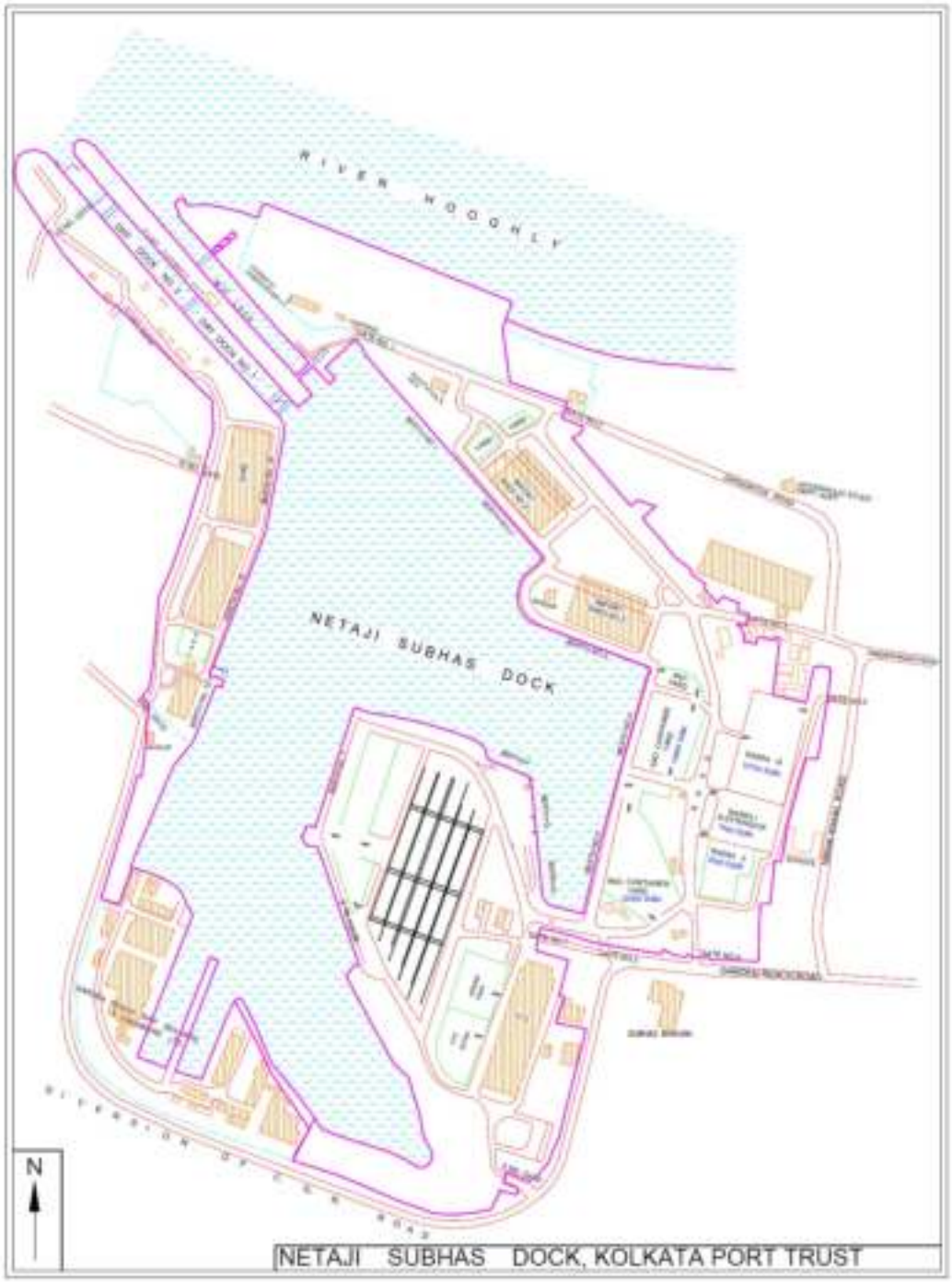


Figure 2.2: NSD Layout

2.1.3.2.2 Berth wise details

Table 2.3: Berth wise specification - NSD

Sr. No.	Name of Berth	Type of Berth	Designed depth (m)	Quay length (m)
1	1	General Cargo (Heavy Lift)	8.2	200
2	2	General Cargo	8.5	187
3	3	General Cargo	8.7	183
4	4	Container	8.5	181
5	5	Container	8.6	182
6	7	Container	8.7	192
7	8	Container	8	225
8	12	Liquid bulk	8	152
9	13	General Cargo	8.4	174
10	14	General Cargo	8.2	174

2.1.3.3 Budge-Budge Oil Jetties

Budge-Budge is located about 25 km downstream of Kolkata. There are 6 jetties of different sizes with associated storage facilities as shown in **Figure 2.3**. Details of these jetties and the associated storage facilities are given in **Table 2.4**.

2.1.3.3.1 Budge-Budge Oil Jetties Layout

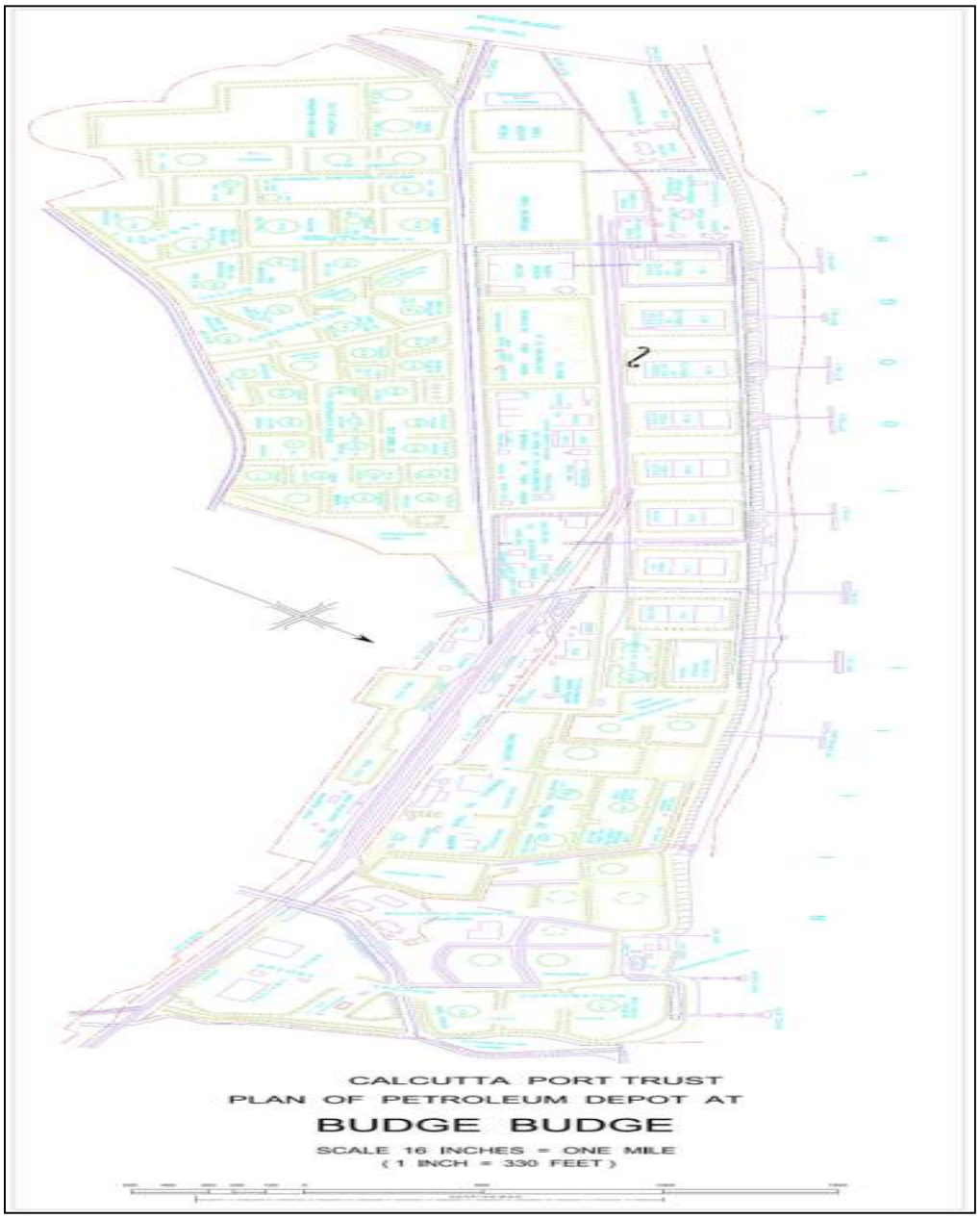


Figure 2.3: Layout of Budge-Budge Oil Jetties

2.1.3.4 Jetty Facilities

Table 2.4: Jetty Facilities – Budge budge

Jetty No.	Designed depth (m)	Length (m)*	Commodity handled
1	11.5	190	POL, Vegetable Oil & other liquid
2	11.5	105	
3	11.5	140	
5	10.5	190	
7	8.5	140	
8	8.5	177	

** Length mentioned in this Table refers to the maximum length of the vessel that can be berthed at the jetties*

2.1.4 HALDIA DOCK COMPLEX (HDC)

2.1.4.1 Berths / Jetties mentioned as below:

- 14 +1 layup Berths inside (1 - 14),
- 3 Oil Jetties & OT-II on the river,
- 2 Barge Jetties for POL products,
- 4 Barge Jetties for Fly Ash,
  - HDC-1
  - IWAI-3
- 2 Floating crane facilities for anchorage operation,
- 1 Floating cargo handling terminal,
- Outer Mooring Buoy.

The HDC Railway system is connected with the South Eastern Railway at Gaurichak near Durgachak station in Panskura-Haldia broad gauge railway section through a fully electric single line corridor connecting general marshalling yard and further extended up to the Bulk handling yard which is 7 km from the take off-point.
The 4 lane National Highway 116 (*erstwhile NH41*) (Port Connectivity) connects the Port city with National Highway 16 (part of Golden Quadrilateral) at Kolaghat.
A State Highway also connects Haldia with Kolaghat via Tamluk town which is the District Headquarters as an alternate connectivity.

Figure 2.4: Port Layout - HDC

2.1.4.2 Berth Particulars

Table 2.5: Berth Particulars - HDC

Sr. No.	Berth Details	Cargoes handled	Quay Length (m)	LOA (m)	Designed Draft (m)	DWT
1.	HOJ-I	POL Products, Liq. Ammonia, LPG, Paraxylene, Bengine, Butadine, MTBE and Methyl Alcohol.	290	236	12.2	90000
2.	HOJ-II	POL Product and LPG	330	277	12.2	150000
3.	HOJ-III	Crude, POL Product, LPG, Palm Oil, Soya Oil and MTBE.	345	275	12.5	150000
4.	Berth no. 2	Para-xylene, POL Product, Palm Oil, Soya Oil, LSHS, N.C. Coal, Coke Breeze, R. Phosphate, Sand and Manganese Ore.	260	238	10.0	75000
5.	Berth no. 3	Palm Oil, Soya Oil and Veg Oil.	337	239	12.2	75000
6.	Berth no. 4	Coking Coal and Non-Coking Coal.	284	239	12.2	75000
7.	Berth no. 4A	Coking Coal and Non-Coking Coal.	245	230	12.2	75000
8.	Berth no. 4B	Dry bulk and break-bulk cargo	181	180	12.2	75000
9.	Berth no. 5	Coking Coal, Manganese Ore, Coke Breeze, Cement Clinkers, Non-Coking Coal, Met Coke, R.P. Coke, Gypsum, Limestone, Iron Ore, Rock Phosphate, Iron & Steel.	195	183	12.2	75000
10.	Berth no. 6	Coking Coal, Non-Coking Coal, Met Coke, R.P. Coke, Manganese Ore, Limestone, Pyroxinite, Iron Ore, Bitumen, Palm Oil, Soya Oil, Phosphoric Acid, P. Cargo, Gypsum, Sulphur, Rock Phosphate and Wood Pulp.	234	212	12.2	75000
11.	Berth no. 7	Phosphoric Acid, Bitumen, CBFS, Benzene, Low Sulphur Heavy Stock, Palm Oil, Soya Oil, Veg Oil, MEG and Acetic Acid.	234	212	12.2	75000
12.	Berth no. 8	Phosphoric Acid, Bitumen, CBFS, Benzene, Palm Oil, Palm Fatty Acid, Soya Oil, Veg Oil, MEG, Acetic Acid, Nitric Acid, DEG, N.C. Coal,	218	220	12.2	75000

		Manganese Ore, Pig Iron and Wood Pulp.				
13.	Berth no. 9	Coking Coal, Limestone, Manganese Ore, Non-Coking Coal, Met Coke, Pyroxinite, Dolomite, R.P. Coke, Gypsum and Iron & Steel.	218	210	12.2	75000
14.	Berth no. 10	Coking Coal, Non-Coking Coal, Coke Breeze, Cement, Met Coke R.P. Coke, Limestone, Rock Phosphate, Sulphur, Manganese Ore, Pyroxinite, Soda Ash, Iron Ore, Iron & Steel Scrap, Zeolite in Bags, Rice, Iron Steel, Wood Pulp, P. Cargo and PTA.	220	210	12.2	75000
15.	Berth no. 11	PTA, Wood Pulp and Container	220	210	12.2	
16.	Berth no. 12	Wood Pulp and Container	220	210	12.2	75000
17.	Berth no. 13	Limestone, Sulphur, Pyroxinite, Fertilizer, Dolomite, Gypsum, Iron Ore, P. Cargo and Iron & Steel.	220	210	10.0	75000
18.	POL Barge Jetties	POL Product, Palm Oil, Soya Oil.				
19.	Fly Ash Jetties	Fly ash				

2.1.5 Navigational Channel

SMPK maintains two approach channels from sea one via Eastern channel for vessels visiting to KDS (KPD, NSD and Budge-Budge) and the other via Western channel / EDEN for vessels visiting to HDC as shown in **Figure 2.5**.

The pilotage distance to KDS is 223 km comprising 148 km of river and 75 km of sea pilotage. The Pilotage distance to Haldia is 115 kms comprising 30 kms of river and 85 kms of sea pilotage/VTMS. Remote pilotage assistance is provided through VTMS during the sea passage of the vessels in both the channels.

The channels are well marked with nearly 125 light vessels / lighted buoys and 500 shore marks. The Centre Pilot Control Station is located on Sagar Island. In addition to the pilot station, SMPK maintains a pilot vessel at around Sagar in foul weather. The pilot transfer is undertaken for the pilot station / pilot vessel through dedicated pilot launches. The pilots for KDS vessels board at middle point south of Sagar. At Haldia, the pilot bringing the vessel from Upper Auckland hands over the vessel inside the lock to the Dock Pilot. For the outward passage the same process is used in a reverse order.

Being a riverine port with numerous sand bars (shoals), the advantage of rise of tide is utilized to obtain the maximum draft for shipping. The length of vessel is restricted to 172m at Kolkata due to lock gate dimensions. Due to the nature of river and the shifting of sand taking place regularly inside the channels regular hydrographic surveys are done to confirm the depth and width of the channel.

2.1.5.1 Navigational Channel map

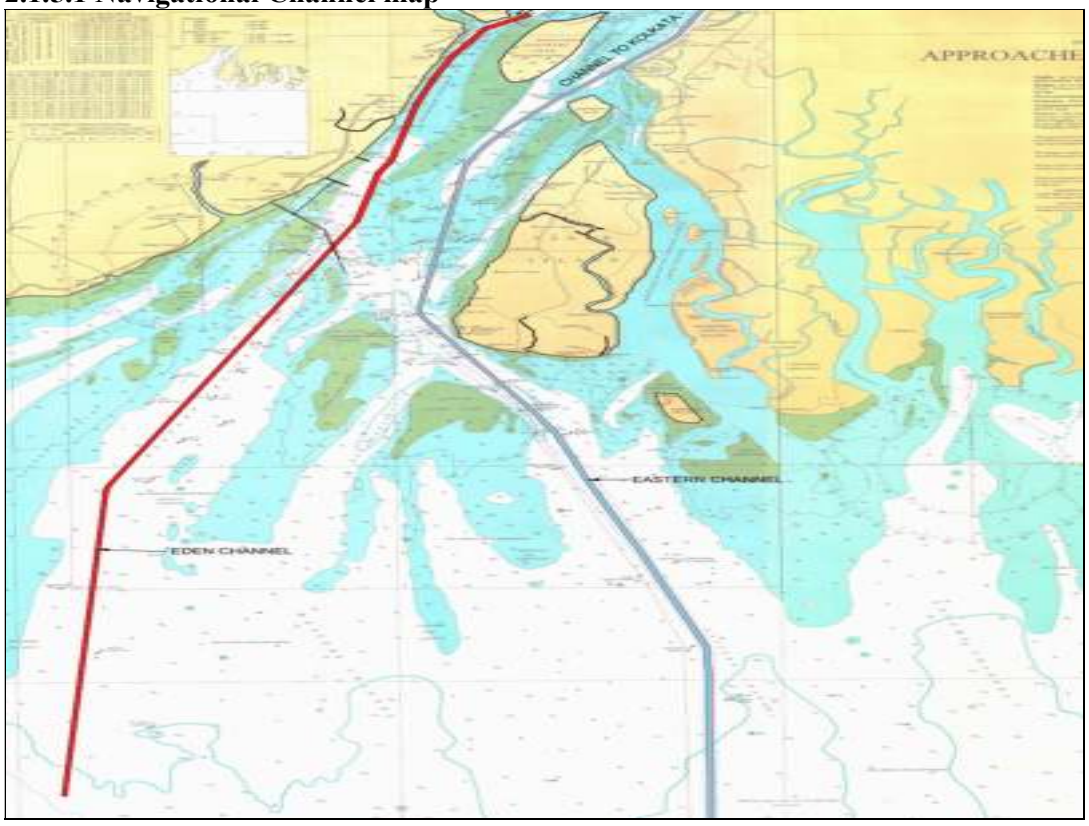


Figure 2.5: Navigational Channel

2.1.6 Anchorages

In order to handle large vessels with no requirement of pilotage, there are three anchorage points (Inner sandheads anchorages – NX1, NX2 and NX3) which are 24 nautical miles north of sandheads.

NX1, NX2 and NX3 have drafts of 9.5m, 10m and 10.5 respectively and no dimensional (Length or Beam restrictions) constraints of vessels. These anchorages are used for midstream lighterage/ topping up of only cape, baby cape, panamax etc. and not for waiting vessels.

NX1, NX2 and NX3 lies in the eastern channel and are sufficiently clear of the entrance channel, leaving clear passage for the inbound and outbound vessels.

The geographical coordinates are as follows

Table 2.6: Anchorage points

Anchorage	Position
NX1	Latitude: 21°18'15" N Longitude: 88°13'45" E
NX2	Latitude: 21°16'45" N Longitude: 88°14'00" E
NX3	Latitude: 21°15'30" N Longitude: 88°14'00" E

2.1.7 Traffic Handled at SMPK

Table 2.7: Vessels handled at KDS and HDC

KPD										
Year	Tanker	Bulk Carrier	General Cargo	Passenger	Barges					TOTAL
2023-2024										
2022-2023										
2021-2022										
Total										

NSD										
Year	Tanker	Bulk Carrier	General Cargo	Passenger	Barges					TOTAL
2023-2024										
2022-2023										
2021-2022										
Total										

Budge- Budge										
Year	Tanker	Bulk Carrier	General Cargo	Passenger	Barges					TOTAL
2023-2024										
2022-2023										
2021-2022										
Total										

HDC						
Year	**Tanker**	**Dry Bulk**	**Container**	**Passenger**	**Barges**	**TOTAL**
2023-2024	947	606	189	0	1011	**2753**
2022-2023	916	603	202	0	Data Not Available	**1721**
2021-2022	965	472	265	0	Data Not Available	**1702**
Total	**2828**	**1681**	**656**	**0**	**1011**	**6176**

2.1.8 RISK ASSESSMENT

Considering the facilities given above the potential for oil spills are discussed in the following sections.

The events and scenarios presented here are indicative. The credible release quantities given are only an indication and an actual oil spill may vary significantly.

Risk Assessment exercise is primarily for the concern of environmental pollution caused by accidental spillage of oil. The factors which may influence the risk will include the followings:

- Frequency of ship movement;
- Exposure time of the port due to transit of ship;
- Physical and mechanical condition of the ship and its equipment;
- Performance of ship's crew, including pilot;
- Traffic density;
- Hydrographic and meteorological conditions;
- Type and quantity of oil carried by the ships.

The present Risk Assessment exercise has been carried out in stages as follows:

- Gathering of relevant information and Data;
- Hazard Identification;
- Frequency Estimation;
- Consequence Estimation;
- Risk Estimation.

Note: *The Risk Assessment need to be reviewed as and when there is facility expansion / upgradation.*

2.1.8.1 Hazard Identification

In view of the nature of the navigational operations connected with pilotage of vessel and weather variations including tidal windows, berthing complexity, turning circle maneuvers and usage of tugs, etc. the following potential scenarios have been analyzed using Hazard assessment (Table 2.11 and 2.12).

For KDS:
Scenario 1: Collision with small craft-Tanker /Container/Bulk Carrier/Barge (Area B)
Scenario 2: Collision between two vessels (Area A)
Scenario 3: Collision between two vessels (Area B)
Scenario 4: Tanker /Container/ Bulk Carrier berthing - Contact with jetty/berth/wharf (Area C and Budge-Budge Wharf)
Scenario 5: Grounding- Tanker/Container/ Bulk Carrier –Pilot On-board (Area B)
Scenario 6: Grounding- Tanker/Container/ Bulk Carrier–Pilot not on-board (Area A)
Scenario 7: Collision of vessel with dredger (Area A, B)
Scenario 8: Dragging anchor (River and sea anchorage) (Area A, B)
Scenario 9: Contact with channel and river marking buoys/light vessels (Area A, B)
Scenario 10: Contact/Allision with Lock Gate (KPD & NSD) (Area C)
Scenario 11: Contact/Allision with bridge (Hooghly Bridge (Vidyasagar Setu); Howrah Bridge (Rabindra Setu))
Scenario 12: Capsize of vessel at/near berth
Scenario 13: Pipeline hose/Valve malfunction during operation
Note:
Area A: *Approaches to Kolkata port (East anchorage to Middleton pilot boarding point);*
Area B: *River passage area (from Middleton to Garden reach anchorage or Budge-Budge wharf, anchorage to lock gate);*
Area C: *Lock gate to berth.*

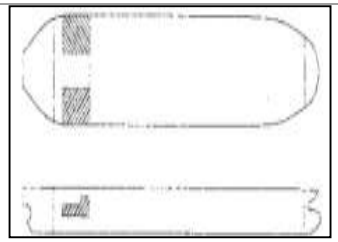
For HDC:
Scenario 1: Collision with small craft - Tanker / Container/ Bulk Carrier/Heavy Lift vessel (Area E);
Scenario 2: Collision between two vessels (Area D, E);
Scenario 3: Collision of Vessel with dredger (Area D, E);
Scenario 4: Dragging anchor (Area D);
Scenario 5: Grounding- Tanker/Container/ Bulk Carrier/Heavy Lift vessel – Pilot On-board (Area E);
Scenario 6: Grounding- Tanker/Container/ Bulk Carrier/Heavy Lift vessel – Pilot not on-board (Area D);
Scenario 7: Tanker /Container/ Bulk Carrier/Heavy Lift vessel tug assisted berthing - Contact with Berth/Jetty/Shore installation (Area E, F);
Scenario 8: Contact/Collision with the lock gate (Area F);
Scenario 9: Contact with channel marking buoys (Area D, E);
Scenario 10: Capsize of vessel at/near berth
Scenario 11: Pipeline hose/Marine Loading arm rupture/Valve malfunction during operation
Note:
Area D: *Approaches to Haldia Dock Complex (West anchorage point to Pilot boarding point),*
Area E: *River passage area (from Pilot boarding point to lock gate),*
Area F: *Lock gate to Berth/Jetty impounding dock basin.*

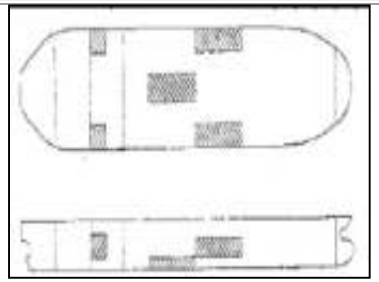
In general, two categories of accidents have been identified as a cause of major oil spill incident – as follows:

- Collisions
- Groundings

Based on above scenarios, potential spill volumes for KDS and HDC are shown as given in below table.

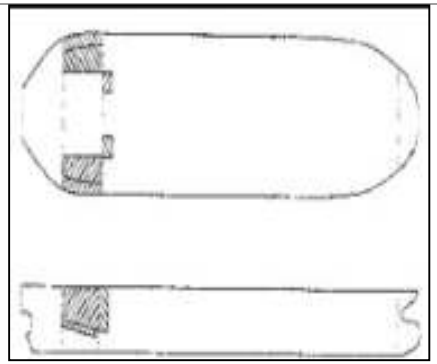
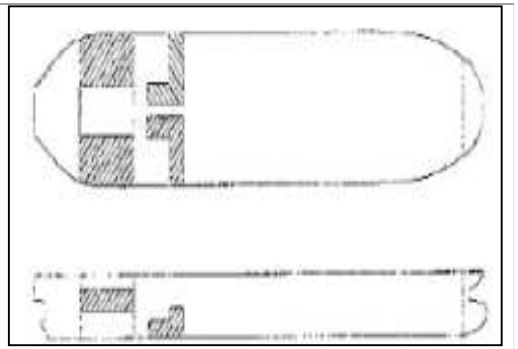
Table 2.8: Potential Oil Spill Volumes for KDS (Assuming 1 tank rupture/leakage for worst credible scenario)

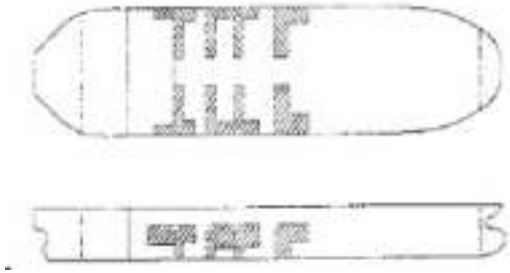
KDS				
Vessel type	**Bunker tank arrangement**	**Incident**	**Oil Type**	**Approx. Potential Spill Volume [(1)] (considered leak of 10% of 1 tank volume)**
Tanker- Liquid Bulk Handling Facility (upto 38000 DWT) POL products and others	 Handymax vessel	Grounding (1 tank)	Fuel oil	Up to 100 t
		Collision (1 tank)	Fuel oil	Up to 100 t
Bulk Carrier	 Panamax	Grounding (1 tank)	Fuel oil	Up to 100 t
		Collision with wharf or other vessel (1 wing type)	Fuel oil	Up to 100 t

Containership (upto 21000 DWT)	 Panamax vessel	Grounding (1 tank)	Fuel oil	50 t
		Collision (1 tank)	Fuel oil	50 t
Fishing Vessel		Grounding (Total Loss)	Diesel oil	50 t
		Collision (Total Loss)	Diesel oil	50 t
Tug/Pilot vessel		Grounding (Total loss)	Diesel oil	25 t (Est. total fuel held)
		Collision with wharf or other vessel (Total loss)	Diesel oil	25 t (Est. total fuel held)

(1) Indicative worst credible scenario based on Risk Assessment of SMPK. Actual volumes will vary according to vessel configuration and spill scenario.

Table 2.9: Potential Oil Spill Volumes for HDC (Assuming 1 tank rupture/leakage for worst credible scenario)

HDC				
Vessel type	**Bunker tank arrangement**	**Incident**	**Oil Type**	**Approx. Potential Spill Volume [1] (considered leak of 10% of 1 tank volume)**
Tanker- Liquid Bulk Handling Facility (upto 89000 -150000 DWT) Crude and POL products	 Suezmax	Grounding (1 tank)	Fuel oil	Up to 100 t
			Crude oil	Up to 1400 t
		Collision (1 tank)	Fuel oil	Up to 100 t
			Crude oil	Up to 1400 t
Bulk Carrier (upto 75000 DWT)	 Panamax	Grounding (1 tank)	Fuel oil	Up to 100 t
		Collision with wharf or other vessel (1 wing type)	Fuel oil	Up to 100 t

Containership (upto 40000 DWT)	 Post Panamax (for 55000 DWT)	Grounding (1 tank)	Fuel oil	Upto 150 t
		Collision (1 tank)	Fuel oil	Upto 150 t
Fishing Vessel		Grounding (Total Loss)	Diesel oil	50 t
		Collision (Total Loss)	Diesel oil	50 t
Tug/Pilot vessel		Grounding (Total loss)	Diesel oil	25 t (Est. total fuel held)
		Collision with wharf or other vessel (Total loss)	Diesel oil	25 t (Est. total fuel held)

2.1.8.2 Consequence (Impact) Assessment

Assessment of consequence has been done considering the effect of potential accidents on -

- Life (e.g. personal injury, fatality, etc.),
- Property damage (e.g. damage to ship),
- Environment (Oil pollution, Air pollution, soil contamination etc),
- Port Business (reputation, financial loss, etc.).

Table 2.10: Impact Categorization

Scale	People	Property	Environment	Port Business /Port stakeholders
I0	No injury	No damage	Negligible environmental impact (<1T)	Negligible
I1	Minor (Single slight injury)	Minor damage	Minor (<100 T) Tier 1 oil spill, Minimal environmental harm	Minor
I2	Slight (multiple minor or single major injury)	Local damage	Moderate (100T – 700T) Tier 1 (limited outside assistance) oil spill or environmental amenity impaired, Moderate environmental impact	Moderate Bad local publicity or short-term loss of dues, revenue, etc.
I3	Serious (multiple major injuries or single fatality)	Major damage	Serious (>700T) Tier 2 (regional assistance) oil spill, localized flooding or multiple amenities impaired, Long term or serious environmental damage	Serious Bad widespread publicity, temporary port closure or prolonged restriction of navigation
I4	Major (More than one fatality)	Total loss	Major Tier 3 (national assistance) oil spill, widespread flooding or extensive damage to amenities, Major environmental harm. e.g., major pollution incident causing significant damage or potential to health or the environment	Major Port closes, navigation seriously disrupted for more than 1-2 days. Long term loss of trade

2.1.8.3 Frequency Assessment

The probability of incident (above identified potential scenarios) depends on the factors such as follows:

- maritime traffic situation (channel layout, traffic intensity, level of VTS management);
- weather conditions (wind, currents, visibility);
- vessel characteristics (vessel type, vessel age, maneuverability, available bridge equipment);
- human factors (experience and capability of the captain and his crew, working conditions).

Frequencies are derived for 'most credible' and 'worst credible' hazard events, using the following frequency criteria:

Table 2.11: Frequency Matrix

Category	Descriptive term	Definition
F1	Frequent	An event occurring once in an operating year
F2	Likely	An event occurring once a year to once every 10 operating years
F3	Remote	An event occurring once every 10 operating years to once in 50 operating years
F4	Unlikely	An event occurring once every 50 operating years to once in 100 operating years
F5	Rare	An event occurring once in more than 100 operating years

Table 2.12: HAZARD ASSESSMENT WORKSHEET - KDS

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible					Worst Credible					
								Impact					Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
NAVIGATIONAL DISASTERS																		
1	B	**Collision**	Collision of Small Craft with Tanker / Container/ BC/Barge (Area B)	Vessel equipment failure/ malfunction (navigational, propulsion, steering, auxiliary, tugs), Human error (pilot, tug master), Language communication issues, Failure to follow Collision Regulations, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, channel size/depth, rough weather, high wind speed)	PMS, Exchange of information between Pilot & Master (Pilot exchange card), Training of personnel and experienced pilots, River marks and buoy, weather monitoring, suspension of vessel movement on increase of wind speed beyond permissible limits.	Avoiding action fails resulting in glancing blow with moderate damage to one or both vessel, Injury to Person	Oil pollution (damage to Flora and Fauna & loss of fishing activity), Fly ash, coal & other hazardous cargo spillage sinking of small craft, Injuries / loss of life, blockage of navigational and river channel	**1**	**1**	**0**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
2	A	**Collision**	Collision between two vessels (Area A)	Non-compliance with collision regulation, Human error (fatigue, lack of situational awareness, knowledge etc.), Ship's equipment breakdown, Local congestion and sandbars, difficulty in communication, maneuvering to (dis)embark pilot, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed).	VTMS, VHF, Pilot information exchange card, Designated anchorage area & designated VHF frequency, Navigational channel is buoyed & well marked, weather monitoring, suspension of vessel movement on increase of wind speed beyond permissible.	Moderate damage to one or both vessel, Delay in berthing, Injuries to personnel, Temporary passage block	Serious damage to vessels and Oil / HNS pollution, Fire and Explosion, Blockage of the navigational Channel, Injuries / Loss of life.	**1**	**2**	**0**	**1**	**3**	**3**	**3**	**2**	**4**	**4**	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible					Worst Credible					
								Impact					Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
3	B	Collision	Collision between two vessels (Area B)	Non-compliance with collision regulation, Human error (fatigue, lack of situational awareness, knowledge etc.), Ship's equipment breakdown, Local congestion (fishing activity, vessel traffic) and sandbars, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed) Sharp bends/turns in the river impeding navigation	River marks and buoys, light vessels, Experienced pilots, Training of personnel, PMS, Pilotage information exchange card, Designated anchorage areas, boarding area, designated VHF frequency, Weather monitoring, Suspension of operation on increase of wind speed beyond 25 knots, No night navigation, Proper communication	Moderate damage to one or both vessel, Delay in berthing, injuries to personnel, Temporary channel block	Serious damage to vessels and Oil / HNS pollution (damage to Flora and Fauna & loss of fishing activity), Fire and Explosion, Blockage of the navigational/river Channel, Injuries / Loss of life.	1	2	0	2	2	3	3	2	4	4	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
4	C	Contact	Tanker /Container/ BC berthing - Contact with Jetty/berth/ wharf (Area C and Budge-Budge Wharf)	Vessel equipment failure / malfunction (navigational propulsion, steering or main engine), misjudgment by pilot/Master/tug master, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed), breakdown of tugs, parting of tow line, Inadequate illumination at Berth / Jetty, Damaged or missing fenders.	PMS, Assistance of tugs and use of anchor, Use of electronic aids and proper bridge team management, Weather monitoring, Suspension of operation on increase of wind speed beyond permissible limits, Use of anchor and call for standby tugs, Use of engines, Ships portable fenders, Use of ship's and tugs illumination, preventive maintenance of fenders.	Minor damage to side shell plating of vessel, Minor damage to quay moorings or fendering system.	Serious damage to side shell plating of vessel, Serious damage to quay/ Fender/ moorings, Loss of cargo / containers, Oil / HNS pollution (damage to Flora and Fauna & loss of fishing activity), fire/ explosion, personnel injuries or loss of life.	0	1	0	1	2	3	2	1	3	4	Report incident to Port and relevant authority, Shipboard EAP, Remove vessel from damage areas and re-berth, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
5	B	Grounding	Grounding-Tanker/ Container/ BC - Pilot onboard (Area B)	Misjudgment by pilot / master / tug master, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed), Fishing vessel/small craft impedes passage, vessel equipment failure / malfunction (navigational, propulsion, steering, auxiliary), outdated electronic chart, wrong position fixing, failure of navigational aids, shifting of sand bars in the approach channel.	Electronic aids and proper bridge team management, Leading Lights, River marks and buoys, light vessels, Continuous monitoring of the drift by pilot and "Course made Good", Weather monitoring, suspension of vessel movement on increase of wind speed beyond permissible limits, Use of Anchor, Proper ship signal, security boat signals, PMS, Assistance of tugs, updated navigational chart, preventive maintenance of navigational aids, Experience pilots, Periodical maintenance dredging, vessel length and draft restriction.	Minor damage to shell plating – possible water ingress, Temporary passage block	Major hull damage leading to stranding of vessel, Oil / HNS pollution (damage to Flora and Fauna & loss of fishing activity), Possible loss of cargo or containers, Blockage of Navigational/River channel, Fire / explosion, Injuries / loss of life	0	1	0	1	2	3	3	2	3	3	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
6	A	Grounding	Grounding-Tanker/Container/BC - Pilot not onboard (Area A)	Vessel equipment failure / malfunction (navigational propulsion, steering, auxiliary), vessel transiting too fast, outdated electronic chart, wrong position fixing, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed), improper maintenance of navigational aids, Human error (fatigue, lack of situational awareness, knowledge etc.), small craft impedes passage	PMS, Use of anchor, vessel to transit in safe maneuvering, VTMS, updated navigational chart to be used at all times, suspension of vessel movement on increase of wind speed beyond permissible limit, preventive maintenance of navigational aids, Bridge team management, training of personnel, proper ship signal, use of boat signals	Minor Damage to shell plating, possible water ingress, Temporary passage block, Injury to personnel	Major hull damage leading to vessel stranding, Possible loss of cargo or containers, Oil / HNS pollution (damage to Flora and Fauna & loss of fishing activity), Blockage of Navigational Channel, Fire / explosion, Injuries / loss of life.	1	1	0	1	2	3	3	2	3	4	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
7	A, B	**Collision**	Collision of vessel with Dredger (Area A, B)	Vessel equipment failure / malfunction (navigational propulsion, steering, auxiliary), Human error (improper communication, fatigue), Environmental conditions (poor visibility, high current flows, unpredicted current eddies), results of avoiding action (e. g. Small craft), navigational failure (markers, lights)	PMS, VTMS, Exchange of information between Pilot & Master (Pilot Exchange Card) training, adequate work/rest hour, situational awareness, weather monitoring, communication with dredger, suspension of vessel movement on increase of wind speed beyond permissible limit, proper ship signal, use of security boat	Temporary Grounding of either of the vessel, Temporary passage block.	Grounding or sinking of either of the vessel, Possible loss of cargo or containers, Oil / HNS pollution (damage to Flora and Fauna & loss of fishing activity), Fire / Explosion, Blockage of Navigational channel, Injuries / Loss of life.	**0**	**1**	**0**	**1**	**2**	**3**	**3**	**1**	**3**	**4**	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
8	A, B	Collision	Dragging anchor (River and sea anchorage) (Area A, B)	Bad weather, Poor monitoring, Poor holding ground, Insufficient scope of anchor chain, vessel equipment failure, heavy underwater current, loss of anchor	MET warning through VTMS, Bridge team management, Vessel to drop anchor in designated anchorage area, Vessel to ensure that sufficient chain is paid out, training of personnel, PMS, main engine standby vessel, Tug assistance, use of navigational aids	Minor Damage to vessel and/or other vessels, Injury to personnel	Grounding, Oil / HNS pollution (damage to Flora and Fauna & loss of fishing activity), Grounding and capsizing, Possible loss of cargo or containers, Blockage of Navigational channel, Injuries / Loss of life.	1	1	0	1	2	3	3	1	3	3	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	A, B	**Contact/Riding over the buoy**	Contact with channel and river marking buoys/ light vessels/ Fishing Nets (Area A, B)	Vessel equipment failure/ malfunction (navigational propulsion, steering, auxiliary), Human error (improper communication, Fatigue), Environmental conditions (poor visibility, high current flows, unpredicted current eddies, channel size/ depth), results of avoiding action (e. g. small craft), navigational failure (markers, lights), Drifting of Channel Marking Buoy	PMS, VTMS, Exchange of information between Pilot & Master (Pilot Exchange Card) adequate work/rest hour, situational awareness, weather monitoring, experienced pilot, proper ship signal, security boat, Information about the location of missing buoys	Minor Damage to vessel (including propeller fouling) &/or buoy/light vessel	Grounding or sinking of light vessel or buoy, Oil/HNS pollution (damage to Flora and Fauna & loss of fishing activity), Blockage of navigational channel, Injury to personnel	**0**	**1**	**0**	**1**	**2**	**2**	**4**	**1**	**2**	**4**	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
10	C	Contact / Allision	Contact/ Allision with Lock gate (KPD & NSD) (Area C)	Environmental conditions (poor visibility, high current flows, unpredicted current eddies, channel size/ depth), unexpected Wind effect, Parting of tow line, High rate of turn, Misjudgment, Human error (fatigue, lack of knowledge, etc.), Breakdown of tugs, vessel equipment failure/malfunction (navigational propulsion, steering, auxiliary)	Use of anchor and use of standby tugs, assistance of tugs, capstan rope adjustment, Suspension of movement of vessel on increase of wind speed beyond permissible limits, Use of additional tugs, Use of electronic aid, proper bridge team management, use of all navigational aids, PMS.	Minor Damage to vessel &/or Tug / Lock gate	Major damage to Tug / Lock gate, Temporary port closure, Injury to Personnel, Grounding of vessels due to failure to maintain impounding basin water level.	0	1	0	0	2	2	2	0	3	3	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
11	B	Collision/Allision	Collision/ allision with the bridge (Hooghly Bridge (Vidyasagar Setu); Howrah Bridge (Rabindra Setu))	Vessel equipment failure / malfunction (navigational propulsion, steering, auxiliary), Human error (improper communication, fatigue), Environmental conditions (poor visibility, high current flows, unpredicted current eddies), results of avoiding action (e.g. small craft), navigational failure	PMS, VTMS, training, adequate work/rest hour, situational awareness, weather monitoring, communication with dredger, suspension of vessel movement on increase of wind speed beyond permissible limit, proper ship signal	Temporary Grounding of the vessel, Temporary passage block, Minor damage to the bridge and vessel, Injury to people	Grounding or capsizing of the vessel, Major damage to the bridge/ collapse, Possible loss of cargo or containers, Oil / HNS pollution (damage to Flora and Fauna & loss of fishing activity), Fire / Explosion, Blockage of Navigational channel, Injuries / Loss of life.	1	1	0	1	2	3	3	2	3	4	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
12	C	Capsize	Capsize of vessel at/near berth	Flooding in vessel, vessel collision, Human error- low initial stability, inappropriate ballasting, shifting of cargo due to poor cargo planning, vessel equipment failure/ malfunction (navigational propulsion, steering, auxiliary), Environmental conditions (poor visibility, high current flows, unpredicted current eddies), unexpected wind effects.	Vessel watertight integrity system, safe distance, tug assistance, use of all navigational aids, proper bridge team management, vessel loading software, PMS, mooring adjustment, suspension of movement of vessel on increase of wind speed beyond permissible limits.	Minor Damage to vessel and/or other vessels, Injury to personnel	Major damage to vessel, major damage to quay/ Fender/ moorings, Loss of cargo / containers, Oil / HNS pollution, fire/ explosion, personnel injuries or loss of life.	2	1	1	2	2	3	2	2	3	3	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
13	C		Pipeline Hose/ Valve malfunction during operation	Human/operator error, Faulty equipment /Failure of Equipment, Inadequate precautions during maintenance work, Failure to take the appropriate precaution when handling specific cargoes.	Standard Operating Procedure, Training, adequate work rest hour, Situational awareness, PMS, Shipboard emergency procedure.	Minor Oil/HNS spill, Minor Damage to port property	Oil/ HNS Spill, Major Damage due to Fire and Explosion to Port property, Closure of Jetty	1	1	1	2	3	3	3	2	3	4	Incident report, Activate port DMP, SOPEP, POLREP, Activate port OSCP

#Area code	Area
A	Approaches to Kolkata port (East anchorage to middleton pilot boarding point).
B	River passage area (from middleton to Garden Reach anchorage or budge-budge wharf, Anchorage to lock gate, lock gate to bridge).
C	Lock gate to berth/Jetties

Table 2.13: HAZARD ASSESSMENT WORKSHEET - HDC

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible					Worst Credible					
								Impact					Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
NAVIGATIONAL DISASTERS																		
1	E	**Collision**	Collision with small craft – Tanker / Container / BC/Heavy lift vessel in (Area E)	Vessel equipment failure/ malfunction (navigational, propulsion, steering, auxiliary, tugs), Human error (pilot, tug master), Language communication issues, Failure to follow Collision Regulations, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, channel size/depth, rough weather, high wind speed)	PMS, VTMS, Exchange of information between Pilot & Master (Pilot exchange card), Training of personnel, Security boat, Navigational channel is buoyed & well marked, weather monitoring, suspension of vessel movement on increase of wind speed beyond permissible limit.	Avoiding action fails resulting in glancing blow with moderate damage to one or both vessel, Delay in berthing	Oil pollution (damage to flora & fauna, loss of fishing activity), serious damage to small craft, possible total loss of the craft (sinking), loss of cargo / containers, Injuries / loss of life	**1**	**1**	**0**	**0**	**2**	**3**	**4**	**1**	**2**	**3**	Report incident to Port & relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible					Worst Credible					
								Impact					Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
2	D &E	Collision	Collision between two vessels (Area D, E)	Non-compliance with collision regulation, Human error (fatigue, lack of situational awareness, knowledge etc.), Ship's equipment breakdown, Local congestion, difficulty in communication, maneuvering to (dis)embark pilot, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed).	VTMS, VHF, Security boat, Pilot information exchange card, Designated anchorage area & designated boarding area & designated channel for port operation &pilot (designated VHF frequency), Navigational channel is buoyed & well marked, weather monitoring, suspension of vessel movement on increase of wind speed beyond permissible limit.	Moderate damage to one or both vessel, Delay in berthing, injuries to personnel, Temporary passage block	Serious damage to vessels and Oil / HNS pollution (damage to flora & fauna, loss of fishing activity), Fire and Explosion, Blockage of the navigational Channel, loss of cargo / containers, Injuries / Loss of life.	1	2	0	1	3	3	3	2	4	4	Report incident to Port & relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible					Worst Credible					
								Impact					Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
3	D &E	Collision	Collision of vessel with dredger (Area D,E)	Vessel equipment failure / malfunction (navigational propulsion, steering, auxiliary), Human error (Misjudgment, improper communication, fatigue), Environmental conditions (poor visibility, high current flows, unpredicted current eddies, channel size/ depth), results of avoiding action (e. g. Small craft), Shifting of sand bars in the channel.	PMS, VTMS, training, adequate work/rest hour, situational awareness, weather monitoring, standard operating procedure, suspension of vessel movement on increase of wind speed beyond permissible limit, Periodical survey of channel and regular survey of governing sand bars.	Temporary Grounding of either of the vessel, Temporary passage block.	Grounding or sinking of either of the vessel, Possible loss of cargo or containers, Oil/HNS pollution(damage to flora & fauna, loss of fishing activity), Fire/Explosion, Blockage of Navigational channel, Injuries / Loss of life.	0	1	0	1	3	3	3	2	3	4	Report incident to Port & relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
4	D	Collision	Dragging Anchor (Area D)	Bad weather e.g. Norwester season, Poor monitoring, Poor holding ground, Insufficient scope of anchor chain, Human error, vessel equipment failure, heavy underwater current, loss of anchor	MET warning through VTMS, Bridge team management, Vessel to drop anchor in designated anchorage area, Vessel to ensure that sufficient chain is paid out, training of personnel, PMS, main engine standby vessel, Tug assistance, VTMS.	Minor Damage to vessels and/or other vessels, Injury to personnel	Grounding, Oil / HNS pollution (damage to flora & fauna, loss of fishing activity), Grounding and capsizing, Possible loss of cargo or containers, Blockage of Navigational channel, Injuries / Loss of life.	1	1	0	0	2	3	3	2	2	3	Report incident to Port & relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
5	E	Grounding	Grounding – Tanker/ Container/ BC/ Heavy lift vessel – Pilot onboard (Area E)	Misjudgment by pilot / master / tug master, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed), small craft impedes passage, vessel equipment failure / malfunction (navigational, propulsion, steering, auxiliary), outdated electronic chart, wrong position fixing, improper maintenance of navigational aids, shifting of sand bars in the approach channel.	VTMS, Use of electronic aids and proper bridge team management, leading lights, Weather monitoring, suspension of vessel movement on increase of wind speed beyond permissible limit, Use of Anchor, continuous monitoring of the drift by pilot and "Course made Good", Proper ship signal, Use of security boat signals, Assistance of tugs, updated navigational chart to be used at all times, preventive maintenance of navigational aids, Experience pilots, Periodical maintenance dredging.	Minor damage to shell plating – possible water ingress, Temporary passage block	Major hull damage leading to stranding of vessel, Oil / HNS pollution (damage to flora & fauna, loss of fishing activity), Possible loss of cargo or containers, Blockage of Navigational channel, Fire / explosion, injuries / loss of life	0	1	0	1	2	3	3	2	3	3	Report incident to Port & relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
6	D	Grounding	Grounding – Tanker/ Container/ BC/ Heavy lift vessel – Pilot not onboard (Area D)	Vessel equipment failure / malfunction (navigational propulsion, steering, auxiliary), vessel transiting too fast, outdated electronic chart, wrong position fixing, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed), improper maintenance of navigational aids, Human error (fatigue, lack of situational awareness, knowledge etc.)	PMS, Use of anchor, vessel to transit in safe maneuring, VTMS monitoring, updated navigational chart to be used at all times, suspension of vessel movement on increase of wind speed beyond permissible limit, preventive maintenance of navigational aids, Bridge team management.	Damage to shell plating, possible water ingress, Temporary passage block	Major hull damage leading to vessel stranding, Possible loss of cargo or containers, Oil / HNS pollution (damage to flora & fauna, loss of fishing activity), Blockage of Navigational Channel, Fire / explosion, Injuries / loss of life.	1	2	0	1	2	3	3	2	3	3	Report incident to Port & relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
7	E& F	Contact	Tanker/ Container/ BC/Heavy lift vessel tug assisted berthing – Contact with Berth / Jetty / Shore installation (Area E,F)	Vessel equipment failure / malfunction (navigational propulsion, steering or main engine), Misjudgment by pilot/master/tug master, Environmental conditions (poor visibility, high current flow, unpredicted current eddies, rough weather, high wind speed), Breakdown of tugs, Parting of tow line, Inadequate illumination at Berth / Jetty, Damaged or missing fenders.	PMS, Assistance of tugs and use of anchor, Use of electronic aids and proper bridge team management, Weather monitoring, VTMS, Pilot information card, Use of ship's and tugs illumination for night berthing, DGPS, Harbor / Dock pilot system, Ship ECDIS, preventive maintenance of fenders.	Minor damage to side shell plating of vessel, Minor damage to quay or fendering system.	Serious damage to side shell plating of vessel, Serious damage to quay/ Fender/shore installation, Loss of cargo / containers, Oil / HNS pollution (damage to flora & fauna, loss of fishing activity), fire/ explosion, personnel injuries or loss of life	0	1	0	1	2	3	3	1	3	4	Report incident to Port & relevant authority, Shipboard EAP, Remove vessel from damage areas and re-berth, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible					Worst Credible					
								Impact					Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
8	F	Contact / Collision	Contact / Collision – with the lock gate (Area F)	Environmental conditions (poor visibility, high current flows, unpredicted current eddies, channel size/ depth), unexpected Wind effect, Parting of tow line, High rate of turn, Misjudgment, Human error (fatigue, lack of knowledge, etc.), Breakdown of tugs, vessel equipment failure, maneuvering constraint of vessel.	Weather monitoring, suspension of vessel movement on increase of wind speed beyond permissible limit, Use of additional tugs, Use of electronic aid, proper bridge team management, use of all navigational aids, PMS.	Minor Damage to vessel &/or Tug / Lock gate	Major damage to Tug / Lock gate, Temporary port closure, Injury to Personnel.	0	1	0	0	2	1	2	0	3	3	Report incident to Port & relevant authority, Shipboard EAP, Port DMP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	D &E	Contact/Riding over the buoy	Contact with channel marking buoys (Area D,E)	Vessel equipment failure/ malfunction (navigational propulsion, steering, auxiliary), Human error (improper communication, Fatigue), Environmental conditions (poor visibility, high current flows, unpredicted current eddies, channel size/ depth), results of avoiding action (e. g. small craft), navigational failure (markers, lights), Drifting of channel marking buoy.	PMS, VTMS, Training, adequate work/rest hour, situational awareness, weather monitoring, Standard operating procedure, suspension of vessel movement on increase of wind speed beyond permissible limit, information about the location of missing buoys.	Minor Damage to vessel &/or buoy	Major damage to the buoy, Grounding, Oil pollution (damage to flora & fauna, loss of fishing activity), Blockage of navigational channel	**0**	**1**	**0**	**0**	**2**	**0**	**2**	**1**	**2**	**4**	Report incident to Port & relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP.

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible					Worst Credible					
								Impact					Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
10	F	Capsize	Capsize of vessel at/near berth	Flooding in vessel, vessel collision, Human error- low initial stability, inappropriate ballasting, shifting of cargo due to poor cargo planning, vessel equipment failure/ malfunction (navigational propulsion, steering, auxiliary), Environmental conditions (poor visibility, high current flows, unpredicted current eddies), unexpected wind effects.	Vessel watertight integrity system, safe distance, tug assistance, use of all navigational aids, proper bridge team management, vessel loading software, PMS, mooring adjustment, suspension of movement of vessel on increase of wind speed beyond permissible limits.	Minor Damage to vessel and/or other vessels, Injury to personnel	Major damage to vessel, major damage to quay/ Fender/ moorings, Loss of cargo / containers, Oil / HNS pollution, fire/ explosion, personnel injuries or loss of life.	2	1	2	3	3	3	2	3	4	4	Report incident to Port and relevant authority, Shipboard EAP, Port DMP, POLREP, Port OSCP

Scenario No. *	Area #	Category	Hazard /Disaster Detail	Possible Causes	Hazard Reduction Barriers	MCS	WCS	Hazard/Disaster Assessed										Mitigation
								Most Credible Impact					Worst Credible Impact					
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
11	F		Pipeline Hose/ Marine Loading Arm rupture / Valve malfunction during operation	Human/operator error, Faulty equipment /Failure of Equipment, Inadequate precautions during maintenance work, Failure to take the appropriate precaution when handling specific cargoes.	Standard Operating Procedure, Training, adequate work rest hour, Situational awareness, PMS, Shipboard emergency procedure.	Minor Oil/HNS spill, Minor Damage to port property	Oil/ HNS Spill, Major Damage due to Fire and Explosion to Port property, Closure of Jetty	1	1	0	2	3	3	3	1	3	4	Incident report, Activate port DMP, SOPEP, POLREP, Activate port OSCP

#Area code	Area
D	Approach to Haldia Dock Complex (West Anchorage Point to Pilot Boarding point)
E	Riverine passage area (from Pilot Boarding point to lock gate)
F	Lock gate to Berth / Jetty impounding dock basin

2.1.8.4 Risk Assessment Matrix

For each identified hazard, risk quantification is done based on a scale of 1 (low risk) to 10 (high risk) as described in the Table 2.14 as below:

Table 2.14: Risk Assessment Matrix

Impact						
	I4	5	6	7	8	10
	I3	4	5	6	7	9
	I2	3	3	4	6	8
	I1	1	2	2	3	6
	I0	0	0	0	0	0
Frequency		**F5**	**F4**	**F3**	**F2**	**F1**

Where: -

0 & 1 - Negligible Risk
2 & 3 - Low Risk
4, & 5 – Assessed to be in ALARP region
6 – Heightened Risk
7, 8 & 9 - Significant Risk
10- High Risk

Based on the values of frequency and consequence as assessed, Risk Ranking have been done in Table 2.15 & 2.16 for each of the four consequence entities as described in Table 2.10 both for the 'most likely' and the 'worst credible' scenarios as mentioned in Hazard Assessment Worksheet.

2.1.8.5 Risk Ranking

The risk score of each of the four categories (People, Property, Environment and Business) is analyzed to obtain four indices for each hazardous scenario as follows:

a) The average risk value of the four categories in the 'most likely' set.
b) The average risk value of the four categories in the 'worst credible' set.
c) The maximum risk value of the four categories in the 'most likely' set.
d) The maximum risk value of the four categories in the 'worst credible' set.

The hazardous scenarios list is then sorted in order of the aggregate of the four indices to produce an Assessed Risk Ranking List, in descending order, with the highest risk scenario prioritized at the top.

2.1.8.6 Risk Summary

The risk assessment matrix for the environment demonstrates that oil spill risks based on identified scenarios are of low status. The matrix identifies areas that require continuous improvement to reduce their occurrence and areas where risk reduction measures are required.

Table 2.15: Risk ranking for KDS for Grounding, Collision & Oil pollution

Rank No.	Scenario No.	Category	Scenario	Assessed Risk							
				Most Credible				Worst Credible			
				People	Property	Environment	Business	People	Property	Environment	Business
1	11	**Capsize**	Capsize of vessel at/near berth	6	3	3	6	6	4	4	6
2	3	**Collision**	Collision between two vessels (Area B)	3	6	0	6	5	5	3	6
3	1	**Collision**	Collision of Small Craft with Tanker / Container/BC/Barge (Area B)	3	3	2	3	6	7	2	4
4	2	**Collision**	Collision between two vessels (Area A)	2	4	0	2	5	5	3	6
5	8	**Collision**	Dragging anchor (River and sea anchorage) (Area A, B)	3	3	0	3	6	6	2	6
6	5	**Grounding**	Grounding- Tanker/Container/BC - Pilot onboard (Area B)	0	3	0	3	6	6	4	6
7	12	**Pipeline rupture**	Pipeline Hose/ Valve malfunction during operation	2	2	2	4	5	5	3	5
8	11	**Collision/ Allision**	Collision/ allision with the bridge (Hooghly Bridge (Vidyasagar Setu); Howrah Bridge (Rabindra Setu))	3	3	0	3	5	5	3	5
9	6	**Grounding**	Grounding- Tanker/Container/BC - Pilot not onboard (Area A)	3	3	0	3	5	5	3	5
10	9	**Contact**	Contact with channel and river marking buoys/ light vessels/ Fishing Nets (Area A, B)	0	3	0	3	3	6	2	3
11	7	**Collision**	Collision of Tanker/BC/Container vessel with Dredger (Area A, B)	0	3	0	3	5	5	2	5
12	10	**Contact/ Allision**	Contact/ Allision with Lock gate (KPD & NSD) (Area C)	0	3	0	0	4	4	0	6
13	4	**Contact**	Tanker /Container/BC berthing - Contact with Jetty (Area C and Budge-Budge Wharf)	0	3	0	3	5	3	2	5

Table 2.16: Risk ranking for HDC for Grounding, Collision & Oil pollution

Rank No.	Scenario No.	Category	Scenario	Assessed Risk							
				Most Credible				Worst Credible			
				People	Property	Environment	Business	People	Property	Environment	Business
1	10	**Capsize**	Capsize of vessel at/near berth	**4**	**2**	**4**	**6**	**5**	**3**	**5**	**6**
2	6	**Grounding**	Grounding – Tanker/Container/BC/Heavy lift vessel – Pilot not onboard (Area D)	**3**	**6**	**0**	**3**	**6**	**6**	**4**	**6**
3	2	**Collision**	Collision between two vessels (Area D, E)	**2**	**4**	**0**	**2**	**5**	**5**	**3**	**6**
4	1	**Collision**	Collision of small craft with Tanker / Container / BC/Heavy lift vessel (Area E)	**3**	**3**	**0**	**0**	**6**	**7**	**2**	**4**
5	5	**Grounding**	Grounding – Tanker/Container/BC/Heavy lift vessel – Pilot onboard (Area E)	**0**	**3**	**0**	**3**	**6**	**6**	**4**	**6**
6	4	**Collision**	Dragging Anchor (Area D)	**3**	**3**	**0**	**0**	**6**	**6**	**4**	**4**
7	11	**Pipeline rupture**	Pipeline Hose/Marine Loading Arm rupture / Valve malfunction during operation	**2**	**2**	**0**	**4**	**5**	**5**	**2**	**5**
8	7	**Contact**	Tanker/Container/BC/Heavy lift vessel tug assisted berthing – Contact with Berth/Jetty/shore installations (Area E, F)	**0**	**3**	**0**	**3**	**5**	**5**	**2**	**5**
9	8	**Contact**	Contact / Collision – with the lock gate (Area F)	**0**	**3**	**0**	**0**	**2**	**4**	**0**	**6**
10	3	**Collision**	Collision of vessel with dredger (Area D, E)	**0**	**2**	**0**	**2**	**5**	**5**	**3**	**5**
11	9	**Contact**	Contact with channel marking buoys (Area D, E)	**0**	**3**	**0**	**0**	**0**	**3**	**2**	**3**

2.2 TYPES OF OIL LIKELY TO BE SPILLED

Table 2.17: Properties of Oil handled at SMPK

Sr. No.	Type	Specific gravity	Viscosity (cSt)	Pour Point (^{0}C)	Flash point (^{0}C)
1.	Crude Oil	0.8	4 at 40^{o}C	-15	-5
2.	Diesel Oil	0.85	2 at 38^{o}C	-32	55
3.	Bunker Oil	0.99	211 at 50 ^{o}C	15	98

2.3 PROBABLE FATE OF SPILLED OIL

Oil spilled on the water undergoes a series of processes collectively known as "weathering" which will change its characteristics and behaviour. Although, the individual processes, which bring about these changes act simultaneously, their relative importance during the lifetime of an oil slick varies. The following diagram represents the different process involved.

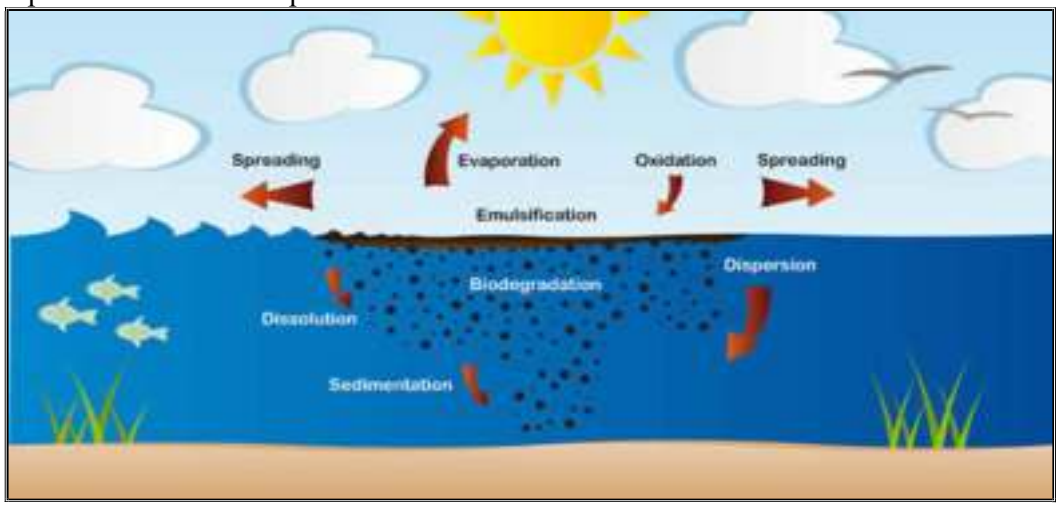


Figure 2.6: Processes taking place after an oil spill

The main processes of "Weathering" are as follows:

- Spreading
- Evaporation
- Dispersion
- Emulsification
- Dissolution
- Oxidation
- Sedimentation
- Biodegradation

The main factors affecting the behavior of oil spill are:

- physical characteristics of the oil, in particular, specific gravity, viscosity and boiling range;
- composition and chemical characteristics of the oil;
- meteorological conditions (sea and river state, sunlight and air temperatures); and
- Characteristics of the water (specific gravity, currents, temperature, presence of bacteria, nutrients and dissolved oxygen and suspended solids).

2.3.1 Types of Oils

Oil Types, as grouped by the International Tanker Owners Pollution Federation (ITOPF) consist of:

- **Group I**: Rapidly evaporating and fast spreading oils with low persistence (one day) in the water. **High toxicity levels**.
  This group includes products such as motor gasolines and aviation fuels all of which have high evaporation rates. Primary concerns surrounding a release of these products are the potential for fire and explosion; and the pollution risk, although significant due to the toxicity of components, is secondary in terms of the threat to human safety. Most of these products have high aquatic toxicity and a release can have a serious impact on marine life in the intertidal zone and birds in offshore waters.

- **Group II:** Rapidly spreading oil with moderate evaporation and emulsification and relatively low persistence (2-3 days) in the water. **Generally, highly toxic.**
  Fuels such as automotive distillate and marine diesel oils, which are moderate evaporation rates, a release of these products creates a risk of fire and explosion; the pollution risk, although very significant due to toxicity of components, is secondary in terms of the threat to human safety. A release can have a serious impact on marine life in the intertidal zone as well as birds in offshore waters.

- **Group III:** Light fuels oils, waste oils and lubricating oils. **Medium to low toxicity.**
  These have slower spread rates and form thick emulsions that may persist in the water for about a week.

- **Group IV**: Some crude oils and heavy fuel oils. Viscous, residual oils that spread slowly and form persistent emulsions in water. **Low toxicity but significant smothering action.**
  Heavy fuel oils (HFO) are supplied as bunker fuels at the ports. Most vessels calling the port carry HFO as bunker fuel. Crude oils when shipped contain all four groups initially. When spilled, the lighter ends evaporate and the residue consists of groups III & IV.

2.4 DEVELOPMENT OF OIL SPILL SCENARIOS INCLUDING WORST CASE DISCHARGE

2.4.1 Oil Spill Modelling

The attached modeling results are to be used for indicative purposes only. As there exist many uncertainties in the prediction model so is the result. As such it is recommended that the incident response action should take account of the actual observation.

2.4.1.1 Oil Spill Trajectory & Weathering Modeling

Analysis has been done using trajectory modeling software 'General NOAA Operational Modeling Environment (GNOME)' developed by National Oceanic and Atmospheric Administration (NOAA). The results are shown in Appendix C. Most credible scenarios for IFO, HSD and Crude Oil spills have been simulated for 10T

and 100T. Results are shown over a period of 2, 4, 6, 8 and 12 hours after leakage from a ruptured tank.

2.5 SHORELINE SENSITIVITIES MAPPING

This section gives an overview of the socioeconomic sensitivities to oil spills with an emphasis on marine ecosystems and communities as these are regarded as the most probable sites affected by oil pollution. Subsequently, this information can be useful for the team for developing shoreline protection and response strategies.
Appendix B shows the shoreline sensitivity mapping and sensitive areas around port.

All coastal habitats are vulnerable to oil spill impact. The vulnerability analysis provides information about resources and communities that could be harmed in the event of an oil spill. **Table 2.18** shows the vulnerability level of port surrounding coast in the case of an accidental oil spillage.
All coastal flora and fauna are vulnerable to Oil disaster. Vulnerable areas and entities in and around port have been identified using reliable information sources.

Table 2.18: Assessing vulnerability data for SMPK coastal area

		Very low (0)	Low (1)	Moderate (5)	High (20)	Very high (50)
Environment	Shoreline character					X
	Plants and animals				X	
	Protected sites				X	
Human	Economic			X		
	Cultural			X		
	Social, amenity and recreation			X		

Overall vulnerability ratings of SMPK coastal area = 105 (Very High) (Using Table 2.19 & 2.20)

Table 2.19: Conversion of consequence score into qualitative vulnerability rating

Sum of combined scores	Vulnerability rating
0	Very low
1-3	Low
4-18	Moderate
19-79	High
80+	Very High

Table 2.20: Categories to determine vulnerability level

Resource category		Consequence level description				
		Very low (0)	**Low (1)**	**Moderate (5)**	**High (20)**	**Very high (50)**
Environment	**Shoreline character**	Negligible sensitivity	Low sensitivity (e.g. exposed rocky headlands, eroding wave cut platforms)	Moderate sensitivity (e.g. fine-grained sand beaches, exposed compacted tidal flats, mudstone, coarse grained beaches)	High sensitivity (e.g. mixed sand and gravel beaches, gravel beaches, shelter rocky coasts)	Extremely high sensitivity (e.g. sheltered tidal flats, salt marshes, mangroves)
	Plants and animals	None or very few vulnerable species	Minor short-term impacts	Vulnerable species are generally of local value only	Limited but medium-term effects	Vulnerable species are of local and regional importance
	Protected sites	No protected sites present	Scenic or wildlife management reserve	Scenic/nature reserve, wildlife refuge	Marine Park, marine reserve, wildlife/marine mammal sanctuary	International protected sites
Human	**Economic**	No resources or activities of economic significance	Low economic significance for the region and nation	Some economic significance of the region, none nationally	High regional economic significance, some national significance	High national economic significance
	Cultural	No cultural importance	Some importance for local community, low regional significance	Importance to local and regional community but low national significance	Importance to local and regional community, some national significance	High national cultural significance
	Social, amenity and recreation	No community significance	Low community significance for the region and nation	Some community significance for the region, none nationally	High regional community significance, some national significance	High national community significance

2.6 SHORELINE RESOURCES, PRIORITIES FOR PROTECTION

2.6.1 Shoreline Resources

The port limit includes sensitive areas such as sandy beaches, salt marshes, sand dunes, salt pans, mudflats, mangroves, industrial water intake, considerable number of marine species comprising of coastal vegetation, river dolphin, terrapin, organisms, fisheries and birds. Refer **Appendix B** for more details.

2.6.2 Prioritizing Shorelines for Clean Up

Priorities for protection may depend on several factors such as:

- Location of spill
- Oil type
- Fate of oil and weathering state
- Geographical area of impact viz. type of ecosystem and recovery rates
- Climate, weather and season
- Biological factors - Susceptibility of the impacted ecosystem/ species to oil
- Economy of the local people
- Clean up and rehabilitation efforts

The resources available with the port have been listed in **Appendix F**.

During an oil spill many resources may be at risk and at times decisions have to be made with respect to prioritizing the resources for protection.

The following table provided by OISD can be used for ranking the sensitivities identified in the region. Resources with a high environmental sensitivity index value should be protected first.

Table 2.21: Types of Shorelines

Index	Type of Shoreline	Comments
10	Salt Marshes / Mangroves	Rich aquatic environment. High sedimentation rates. Oil may persist for very long period. Areas to receive top priority.
9	Sheltered Tidal Flats	Priority protection from impact of oil.
8	Sheltered Rocky Coast	Heavy accumulations in cracks and pools.
7	Vegetated Tidal Flats	Sediments less mobile but difficult to clean up
6	Gravel Beaches	Deep penetration. Difficult to clean up.
5	Exposed Tidal Flats	Oil penetrates. Difficult to clean.
4	Coarse Sand Beaches	Oil mobile with tide but little penetration.
3	Medium Sand Beaches	Oil does not penetrate. Mechanical clean up
2	Wave Cut Platform	Most oil is removed by natural process
1	Exposed Rocky Head Land	Wave reflections keep most of oil offshore

2.7 SPECIAL LOCAL CONSIDERATION

Primarily agricultural and seasonal cropping is being undertaken by the nearby village population which is supplementary to the occupation of fishing.

3 RESPONSE STRATEGY

The oil spill response strategy was finalized based on vulnerability of the coastline which can be described based on different factors namely source of spill, location of oil slick containment, type and quantity of oil spilled, marine meteorological condition, shoreline characteristics and sensitivity to oil spill in the area. The following sections deal with development of oil spill response strategy.

3.1 PHILOSOPHY AND OBJECTIVES

Every oil spill incident is different in terms of the type of oil spilled, volume, location, time, as well as weather and sea/river conditions. However, there are some general principles which apply when selecting response strategies:

- If possible, prevent, control or stop outflow of oil from the source;
- If coastal or marine resources are not immediately threatened, monitor the movement and behavior of the oil spill;
- If coastal and marine resources are threatened, activate response operations to protect sensitive resources.
- If possible, contain the spread of oil; and
- If, due to climate conditions response at sea/river is not feasible or protection of sensitive areas is not feasible, or these have already been affected, determine appropriate clean-up priorities and other response measures.

Note: *For detailed strategy the information as given in* ***Appendix D*** *may be followed. This may be noted that the information given is only indicative, the actual response action needs to take account of the realistic situation/circumstances. The Net Environmental Benefit Analysis (NEBA) has been carried out and is given in* ***Appendix B****.*

3.2 LIMITING & ADVERSE CONDITIONS FOR KDS

3.2.1 Climate

The climate of West Bengal is tropical, having four well-marked seasons, i.e., summer (March – May); monsoon (June – September); post monsoon (October – November); winter (December – February).

3.2.2 Visibility

Due to heavy rainfall poor visibility is reported during the southwest monsoon. On an average, fog is reported on 5-7 days in each month from November to February during morning hours.

3.2.3 Temperature

The month of April is the hottest, whereas December and January are colder months for Kolkata. According to the IMD data, the highest temperature recorded is 43.9°C at Kolkata. The lowest temperatures were observed to be 6.7°C for Kolkata.

Table 3.1: Month wise - Maximum and Minimum Temperature for Kolkata (Alipore)
(**Source:** Climate of West Bengal,2008 by IMD – data 1971-2000)

Month	Mean of Maximum Temperature (^{0} C)	Mean of Minimum Temperature (^{0} C)
January	26.1	13.9
February	29.1	17.2
March	33.5	21.9
April	35.4	25.1
May	35.3	26.1
June	34	26.6
July	32.4	26.2
August	32	26.2
September	32.3	25.9
October	32.3	24
November	30.2	19.6
December	26.9	14.7

3.2.4 Rainfall Data

The region is mainly exposed to Southwest monsoon from June to September and an annual rainfall of more than 1700 mm were reported. The IMD data suggests that the months of July and August are the wettest months having monthly rainfall of more than 350 mm. During northwest monsoon from November to March, monthly average rainfall of less than 50 mm is experienced.

3.2.5 Tides

Manual tidal gauges are maintained at Akra, Mayapur, Hooghly point, Balari, Gangra and Sagar for displaying rises of tide for the convenience of various vessels navigating, dredging and surveying in river Hooghly.

The tides details at Kolkata are as follows:

- Highest High-Water Level (HHWL): +7.70 m CD
- Mean High Water Springs (MHWS): +5.62 m CD
- Mean High Water (MHW): +5.01 m CD
- Mean Low Water Springs (MLWS): +0.71 m CD
- Local Mean Water level (LMWL): +3.19 m CD
- Mean Low Water Neaps (MLWN): +2.00 m CD
- Mean Low Water (MLW): 1.68 m CD
- Mean Low Water Springs (MLWS): +1.41 m CD
- Lower Low Water (LLW): +0.14 m CD

The above water levels are with respect to chart datum.

3.2.6 Wind

The predominant wind direction reported at Alipore is from south and southeast. About 25 % of the time wind was reported to be calm and blowing from north. The highest wind speed of approx.5 knots was reported in the month of May. During the months of April to August wind speed was found to be higher than 3 knots.

Table 3.2: Wind Speed – Alipore (**Source:** Climate of West Bengal,2008 by IMD – data 1971-2000)

Month	Mean Wind Speed (kmph)	Wind Direction from (Morning)	Wind Direction from (Evening)
January	3.3	C/NW/N	C/NW/N
February	4.4	C/N	C/NW
March	6	SW/C	S/C
April	8.7	S/SW	S
May	9.7	S	S
June	7.8	S	S
July	6.8	S	S
August	6	SE	S/SE
September	5.4	C/S	C/S
October	4	C/NE	C/NW
November	3.6	C/N	C/NW
December	3	C/NW/N	C/NW

C: Calm, N: North, NW: North West, NE: North East, S: South, SW: South West, SE: South East

3.2.7 Currents

The coastal currents that are prevalent along the West Bengal coast are of two types. The northerly drift – during the months of May to October and the southerly drift- during November to March.

3.2.8 Waves

Wave heights are in the range of 1.5m to 3.5m (INCOIS – 2017-2018 data).

3.3 LIMITING & ADVERSE CONDITIONS for HDC

3.3.1 Temperature and Rainfall

January to February is the winter period and March to May is usually the hot weather period.

The highest maximum and minimum temperature were observed 40.9^0 C (May) and 9.30^0 C (January) respectively. The annual mean maximum temperature at Haldia is 30.8^0 C, while annual mean minimum temperature is 23.0^0 C. Month wise maximum and minimum temperature at the Haldia is presented in table below.

Table 3.3: Month wise - Maximum and Minimum Temperature for Haldia (**Source:** Climate of West Bengal,2008 by IMD – data 1971-2000)

Month	Mean of Maximum Temperature (^{0} C)	Mean of Minimum Temperature (^{0} C)
January	25.6	14.7
February	28.4	18.4
March	31.8	22.8
April	33.1	25.7

May	33.4	26.6
June	33.0	27.2
July	31.8	26.8
August	31.6	26.8
September	31.8	26.4
October	31.8	24.6
November	29.8	20.1
December	27.0	15.7

The south-west monsoon occurs from June to September. The later period is often indicated as the post monsoon period. About 74% of annual rainfall is received during the southwest monsoon season, i.e. between June to September. October contributes to about 8% of the annual rainfall as given in table below. The heaviest rainfall in 24 hours recorded at Haldia was 294.6 mm on 05th June 1984.

Table 3.4: Month wise – Average rainfall for Haldia (**Source:** Climate of West Bengal,2008 by IMD – data 1971-2000)

Month	**Average Rainfall (mm)**
January	12.1
February	35.6
March	37.4
April	66.7
May	106.7
June	298.5
July	376.7
August	371.8
September	358.1
October	131.8
November	62.8
December	1.8

Table 3.4: Average monthly distribution of Rainfall

3.3.2 Relative Humidity

The average humidity ranges from nearly 57% in January to about 86% in August.

3.3.3 Wind

The predominant wind direction reported at Sagar Island, is from south and southwest. About 25 % of the time wind was reported to be blowing from north and northeast. The highest wind speed of 16 knots was reported in the month of May. During the months of April to August wind speed was found to be higher than 10 knots.

Table 3.5: Wind Speed – Haldia (**Source:** Climate of West Bengal,2008 by IMD – data 1971-2000)

Month	Mean Wind Speed (kmph)	Wind Direction from (Morning)	Wind Direction from (Evening)
January	3.7	C/NW	C/N/NW
February	5.4	C/NW	C/S/NW
March	9.8	C/SW	S/SW
April	13.7	SW	S
May	12.4	S	SW
June	11.9	SW/S	S/SW
July	11.2	SW	S/SW
August	9.4	S/SW/C	SE/SW
September	7.6	C/SE	S/SE
October	4.6	C/NW	C/SE/S
November	3.9	N	C/NW
December	3.7	C/N	C/NW

C: Calm, N: North, NW: North West, NE: North East, S: South, SW: South West, SE: South East

Table 3.6: Wind Speed – Sagar Island (**Source:** Climate of West Bengal,2008 by IMD – data 1971-2000)

Month	Mean Wind Speed (kmph)	Wind Direction from (Morning)	Wind Direction from (Evening)
January	10.5	N	N
February	12.6	N/NE	S
March	18.4	SW	S
April	25.6	SW	S
May	28.4	SW/S	S
June	24.8	SW	S/SW
July	24.2	SW	SW/S
August	20.7	SW/S	S/SW
September	16.9	SW/S	S/SW
October	11.5	NE/N	SW
November	10.5	N/NE	N/NE
December	10.5	NE/N	N/NE

C: Calm, N: North, NW: North West, NE: North East, S: South, SW: South West, SE: South East

3.3.4 Visibility

Visibility is found to be lower at times due to heavy rainfall during the southwest monsoon. On an average, fog is reported on 5-7 days in each month from November to February during morning hours.

3.3.5 Tides

The tidal details at HDC are as follows:

- Highest High-Water Level (HHWL): +7.26 m
- Mean High Water Springs (MHWS): +5.70 m
- Mean High Water (MHW): +5.01 m
- Mean High Water Neaps (MHWN): +4.26 m
- Local Mean Water Level (LMWL): +3.23 m
- Mean Low Water Neaps (MLWN): +2.10 m
- Mean Low Water (MLW): +1.34 m
- Mean Low Water Springs (MLWS): +0.80 m
- Lowest Low Water (LLW): -0.07 m

The above water levels are with respect to chart datum.

3.3.6 Currents

The coastal currents that are prevalent along the West Bengal coast are of two types. The northerly drift – during the months of May to October and the southerly drift- during November to March.

3.3.7 Waves

Wave heights are in the range of 1.5m to 3.5m (INCOIS – 2017-2018 data).

3.4 MARINE OIL SPILL RESPONSE

3.4.1 Response Methods

A number of marine response methods are available:

- Containment and recovery (para 3.4.4).
- Use of dispersants (para 3.4.5).
- Physical breakup of the slick (para 3.4.6).
- Monitoring only, i.e. relying on natural weathering processes (para 9.3).

The effectiveness of these methods can be limited by oil type and weathering, weather and sea/river state, or logistics. The response actions need to be taken as fast as possible to prevent escalation.

Note: *The table provided in this Section are guidance only. The final selection of methods will depend on specific cases.*

3.4.2 Priorities

Response actions to be prioritized based on the type of the oil as defined in **Table 3.8**.

3.4.3 Health and Safety Issues

3.4.3.1 Volatile Oils

Spills of volatile (Group I) oils must be handled with care. OSC should check for safety of the site before allowing personnel to handle this type of oil.

Before deploying personnel or equipment close to these spills, qualified person should test the weather and sea/river conditions.

Table 3.7: Response Priorities for Various Oil Types

Product	Priority	Method	Rationale
Group I **Very Light Oils** Motor spirit, Aviation gasoline	**1**	Monitor/natural weathering.	Oil dissipates rapidly.
	2	Protection of sensitive shorelines/resources at risk	Oil can cause environmental damage
	Do Not	Use dispersants.	Potential environmental effects
		Contain and recover.	Not safe
		Physically break up.	Not safe
Group II **Light Oils &** **Group III** **Medium Oils** Lubricating oils, diesel & kerosene.	**1**	Contain and recover.	Has little potential to cause harm.
	2	Use of dispersants	Rapid response and high encounter rate. Can prevent emulsification.
	3	Monitor/natural weathering.	Suitable for small or remote spills.
	4	Shoreline Protection.	Oïl can cause environmental damage.
	5	Physically break up: Diesel only.	For small spills close to shore only. Monitor closely. (See below).
	Do Not	Physically break up non-Diesel oils	Oil tend to emulsify if mixing energy is applied.
Group IV **Heavy Oil** Heavy fuel oils.	**1**	Contain and recover.	Has little potential to cause harm.
	2	Shoreline protection	Oïl can cause environmental damage.
	3	Use of dispersants.	May be applicable. Monitor closely.
	4	Monitor/natural weathering.	Small isolated spills only.
	Do Not	Physically break up with vessel props.	May emulsify with high energy agitation

Table 3.8: Beaufort scale of weather and sea conditions

Beaufort Wind Force	Mean wind speed in knots	Limits of wind speed in knots	Descriptive term	Sea Criterion	Probable height of waves in meters (m)	Probable maximum height of waves in meters (m)
	Measured at a height of 10 m above sea level		Wind	Sea	Mean	Max.
0	0	<1	Calm	Flat/Sea like a mirror.	-	-
1	2	1-3	Light air	Ripples.	0.1	0.1
2	5	4-6	Light breeze	Small wavelets. No breakers.	0.2	0.3
3	9	7-10	Gentle breeze	Large wavelets. Some breaking crests & scattered white horses.	0.6	1.0
4	13	11-16	Moderate breeze	Small waves. Fairly frequent white horses.	1.0	1.5
5	19	17-21	Fresh breeze	Moderate waves. Many white horses. Occasional spray.	2.0	2.5
6	24	22-27	Strong breeze	Large waves. Extensive white foam crests. Some spray.	3.0	4.0
7	30	28-33	Near gale	Sea rises. White foam from breaking waves in streaks.	4.0	5.5
8	37	34-40	Gale	Moderate, long waves. White foam blown in long streaks.	5.5	7.5
9	44	41-47	Strong gale	High waves. Dense streaks of foam. Crests begin to topple.	7.0	10.0
10	52	48-55	Storm	Very high waves. Long hanging crests. Foam in large patches. Sea surface largely white.	9.0	12.5
11	60	56-63	Violent storm	Extreme waves (small-medium ships lost to view). Foam covered sea surface. Reduced visibility.	-	-
12	-	>64	Hurricane/ Cyclone	Air filled with foam and driving spray. Very reduced visibility.	>14	-

3.4.4 Containment and Recovery

3.4.4.1 Containment Methods

The following methods to be used for the Containment and Recovery:

- Location of the oil slick (aerial support).
- Containment (boom deployment).
- Recovery (skimmers).
- Temporary waste storage (on-deck storage, barges, drums etc.).
- Waste transport and onshore waste receiving capacity.

Procedures for deciding on suitable method are illustrated in Figure 3.1.

3.4.4.2 Constraints

Indicative operational constraints are shown in **Table 3.9 and 3.10**.

Table 3.9: Operational Constraints for Recovery

Response Component		Constraint				
		Current (Knots)	Beaufort Scale (1)	Performance on oil		
				Light	Medium	Heavy
Recovery (Skimmers)	Weir	<1.0	0	Good	Good	Moderate
	Disc	<1.0	<2	Good	Good	Moderate
	Mop/Belt	5-6	<3	Moderate	Good	Moderate
	Vacuum	<1.0	0	Good	Good	Moderate
Temporary Storage (2)		-	-	-	-	-

(1) Refer to Table 3.8. (2) Held by SMPK. See Appendix F.

Table 3.10: Boom selections for different operating conditions (Operational Constraints for Containment)

	Calm water	Calm water Current	Protected water	Open water	Open rough water
Wave height (m)	<0.3	<0.3	0-1.0	0-2.0	>2
Conditions	Small short non- breaking waves	Currents of 0.4 m/s or greater	Small waves and some white caps	Moderate waves and frequent white caps	Large waves, foam crests and some spray
Suitable boom type or group	Curtain Fence	Curtain with freeboard of 50% of boom height Fence	Curtain Fence	Curtain Fence with external tension support	Curtain
Boom height (mm)	150-600	200-600	450-1100	900-2300	1500+

3.4.4.3 Temporary Waste Storage

Temporary waste storage areas are listed in **Appendix F**. It is important that the time taken to fill, transport, empty and re-deploy the waste is calculated throughout the response.

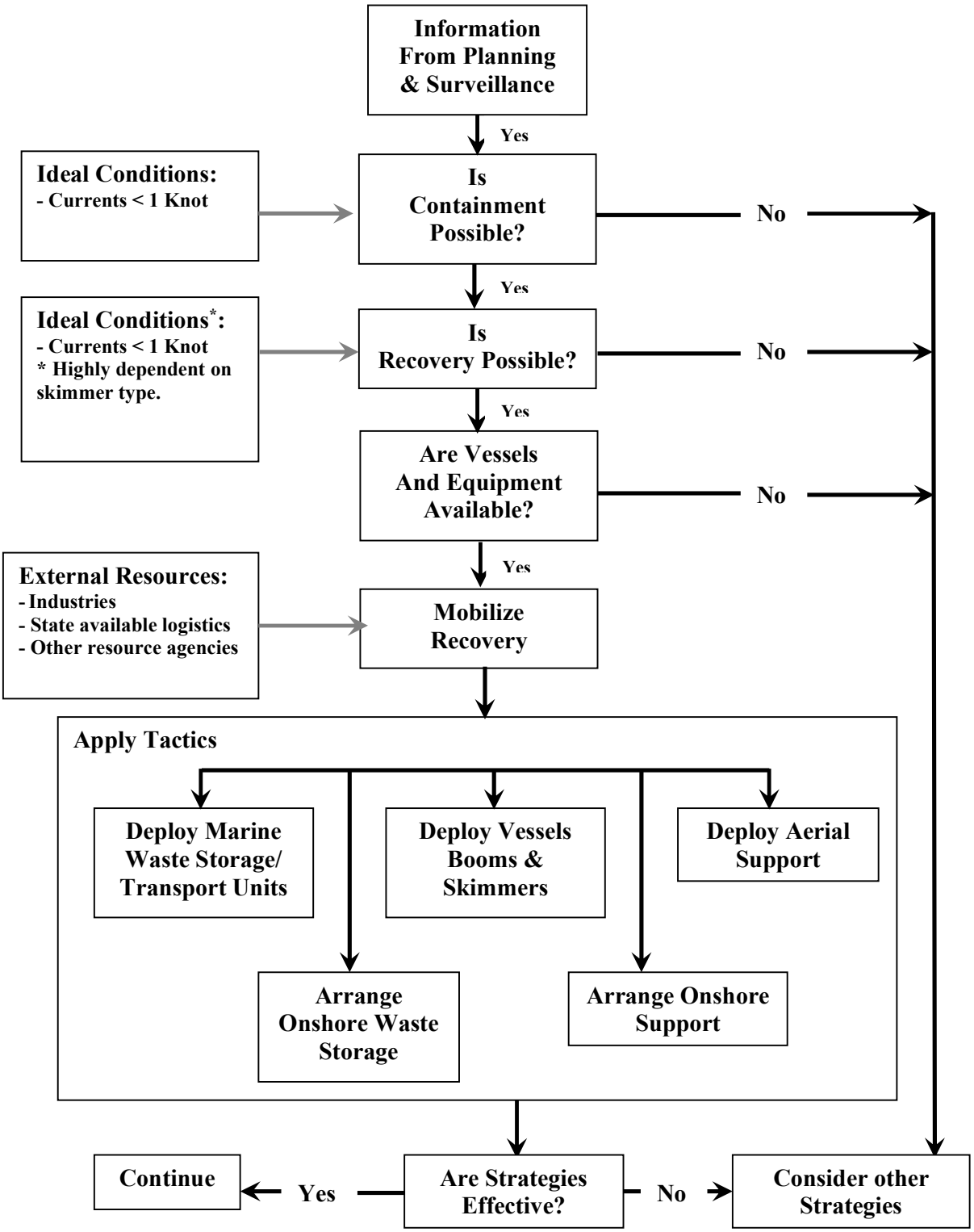


Figure 3.1: Marine Containment and Recovery Strategy Guide

3.4.5 Use of Dispersants

3.4.5.1 Approval for Use

Spill response personnel are to seek Indian Coast Guard approval for use of dispersant prior use. Refer NOS-DCP for the approved type of dispersants and Coast guard – Policy and Guideline for use of Oil Spill dispersants (OSD) in Indian Waters.

Note: *Dispersants should be used as early as possible to reduce a fire/explosion risk posed by spilt oil.*

Table 3.11: Oil Spill Dispersants approved for use in Indian Waters

Product name	Product nature and type	Approved use in Type II form	Approved use in Type III form	Contact Points
Nova 4G	Chemical Dispersant - 2/3	12 nm and beyond	24 nm and beyond	Nova Chemicals Office No. 6, 4th Floor, Hatim Manzil, (Old Sai Bhuvan), 141, Shamal Das Gandhi Marg, Princess Street, Lohar Chawal, Mumbai 400 002 Email: solutions@novachemicals.in
Spilcare - ADT	Chemical Dispersant - 2/3	Coastline and beyond	Coastline and beyond	Spilcare-O Metaclen Pvt Ltd 128/12, Emerald Apartments Anna Nagar West Extension Thirumangalam, Chennai 600 040 Email: sales@si:iilcare.com
FINASOL OSR 52	Chemical Dispersant - 2/3	24 nm and beyond	24 nm and beyond	Total Oil India Pvt Ltd 3rd Floor, The Leela Galleria Andherl- Kurla Road Andheri(East}, Mumbai 400 059 Email: MS-IN.totalindia@total.com
Swach Plus	Bioremediation Agent (Biosimulation) - 2	Shoreline, Rocky area and Sea	--	Bint Biotech Pvt. Ltd., New Delhi Email: kbinu@bintbiotech.com
Slickgone NS	Chemical Dispersant - 2/3	24 nm and beyond	24 nm and beyond	Dasie International Ltd Winchester Hill, Ramsey Hampshire, S0SI 7YD United Kingdom Email: info@dasicinter.com
Rochem	Chemical Dispersant - 2/3	24 nm and beyond	24 nm and beyond	Rochem India Pvt Ltd 101, HDIL Tower Anant Kanekar Marg Bandra (East), Mumbai 400 051 Email: ro chem@rQchemindia.com
Sunchem	Chemical Dispersant - 2/3	12 nm and beyond	24 nm and beyond	M/s Sunchem Industries 302, Katchhi Memon Bldg. 272, Narshi Natha Street Masjid Bunder, Mumbai 400 009 Email: sunchem ind@mtnl.net.in
Kemex Nex-Gen	Chemical Dispersant - 2/3	12 nm and beyond	12 nm and beyond	B - 6, Bonanza Indl. Est., Ashok Chakrawarti Road, Kandivali (E), Mumbai - 400 101 Email: info@kemexinternational.com
FOAMER BRAND Oil Spill Dispersant (OSD)	Chemical Dispersant - 2/3	24 nm and beyond	24 nm and beyond	Foamtech Antifire Company Plot No 153, KL, Sector - 53 EPIP Kundli, Sonipat Haryana - 131 028 Email: foamtechantifire@yahoo.com sales@foamtechantifire.com
Sunchem Eco Treat	Bioremediation Agent			M/s Sunchem Industries Plot No. PAP-A-333 TTC Industrial Area, MIDC, Koparkhairane, Navi Mumbai 400710 Email: sunchem1988@gmail.com

3.4.5.2 Requirements: Vessels

- Vessels equipped with appropriate spray booms with the port.
- Fixed wing aircraft or helicopter, to direct the vessel towards the most concentrated oil and to report on effectiveness.
- Effective communications between vessels and aircraft.
- Helicopter spray bucket from Indian Navy and Coastguard

Note: *The Indian Navy and the Coast Guard will provide fixed wing aircrafts or helicopters to conduct aerial surveillance or provide logistic support in movement of personnel and materials to the incident site. They will also provide ground to air communication link at the site for use by the On Scene Commander. The Ministry of Shipping and Ministry of Petroleum and Natural Gas would provide tankers or tank barges for storage of recovered oil.*

3.4.5.3 Constraints

Operation for spraying dispersants from vessels is generally restricted to:

- Environmental conditions.
- Non-viscous oils (<2,000 cSt.).
- Persistent (non-Group I) oils.

3.4.5.4 Health and Safety Issues

Due consideration should be given to safety when handling dispersants. Personnel must be familiar with instructions on the safe use of dispersants and be given the relevant MSDS.

Caution: *Vessel Masters must ensure that crew is not exposed to dispersants sprayed from the vessel or from aircraft.*

Table 3.12: Types of oil and the probable effectiveness of various types of dispersants

Oil type	Dispersant Type		
	Conventional	Concentrate	
		Water-diluted application	Neat application
Light distillate fuels	(1)	(1)	(1)
High spreading rate (low-viscosity) products and crudes	√	√	√
Low spreading rate (high-viscosity) asphaltic crudes, residuals and weathered oil	(2)	×	(2)
Waxy crudes	(2)	×	(2)
Water-in-oil emulsions	(2)	×	(2)
Non-spreading oils	×	×	×

Notes:

(1) Application of dispersants in this case should be solely for the purpose of controlling a fire hazard. Dispersants are not normally used on such fuels because of their high rate of evaporation and because of their high toxicity.

(2) Effectiveness will be severely limited or not effective.

× Dispersant will not be effective.

√ Dispersant should be effective on fresh oil.

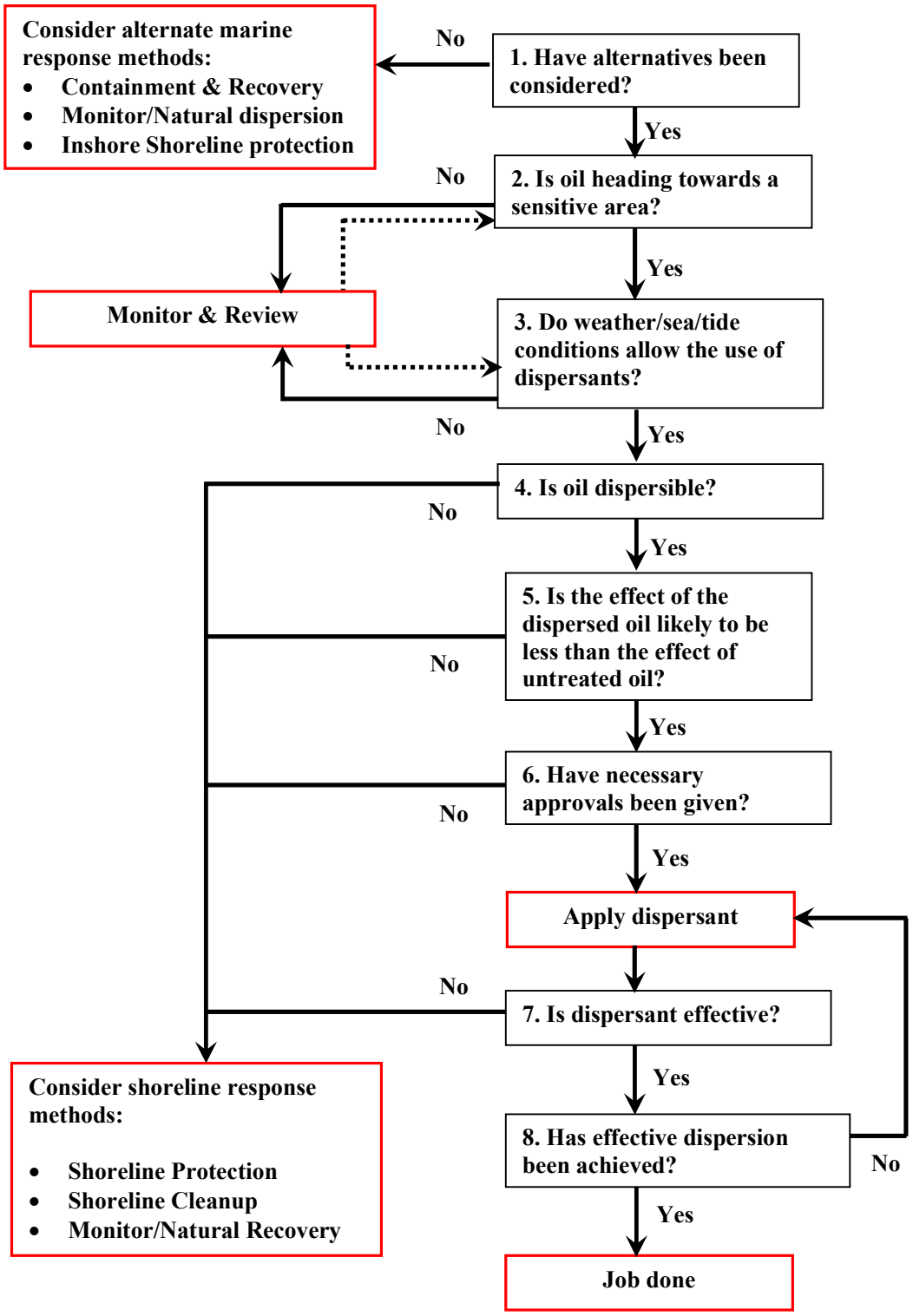


Figure 3.2: Guidelines for the Use of Dispersants

3.4.6 Physical Breakup of Slicks

Thin films of oil can be physically dispersed by agitating the sea/river surface using support vessels' propeller wash.

The use of this method is constrained by:

- The size of the slick. It is not effective for large spills.
- Oil volatility (flash point) and consequent personnel and vessel safety.
- Light, volatile (Group-I) oils will dissipate quickly on its own.
- The potential for some oils to emulsify. Heavy fuel oils and lubricating oils may emulsify, if subject to prop-wash.

3.4.7 Other Methods

3.4.7.1 In Situ Burning

In situ burning is the process of controlled burning contained oil. This may be considered when oil can be contained but recovery, transport or disposal is not possible. Constraints to this method are:

- Oil needs to be contained (e.g. by booms).
- The oil slick must be thick (i.e. at least 2-3mm thick).
- Oil should be un-weathered. Weathered, emulsified or heavy oils need to be ignited at higher temperatures and will need accelerants.
- Burnt residues must be recovered and disposed of.
- Smoke produced is undesirable in populated areas.

3.5 MARINE HNS SPILL RESPONSE

HNS constitutes gas, liquids and solids phase which when spilled in water will purely Float (F), Evaporate (E), Sink(S) or Dissolve (D) or in certain combinations of this physical characteristics as shown in **Table 3.13** below.

3.5.1 Definitions

3.5.1.1 Evaporators

Comprises of volatile liquids which are less dense than water;

E- A substance with a high vapour pressure (>3k Pa) and low solubility (<1%). The vapour cloud formed behaves the same way as that of a gas (G). Such a liquid substance is also termed a “fast evaporator”;

ED- A liquid which rapidly forms a vapour substance (>3 kPa) and dissolves in water (>1%). Although dissolving, such substances may form flammable vapors over the water surface.

3.5.1.2 Floaters

Comprises of non-volatile liquids which are less dense than water;

F- A floating substance which does not significantly evaporate (<0.3 kPa) and dissolves (<0.1%);

FD- A floating substance which does not significantly evaporate (<0.3 kPa) but slowly dissolves in water (0.1-5%);

FE- A floating substance which slowly evaporates (0.3-3 kPa) without dissolving (<0.1 kPa);

FED- A floating substance which slowly evaporates (0.3-3 kPa) and dissolves (0.1-5%). The extent of solubility will determine whether toxic concentrations might occur in water. This type of product will completely disappear in time.

3.5.1.3 Dissolvers

Comprises of products which are soluble in water;

D- A substance which dissolves in water (>5%) and does not rapidly evaporate. The degree of solubility of the substance and the turbulence in the water column will determine whether toxic concentrations in the water column will occur;

DE- A substance which dissolves in water (>5%) and rapidly evaporates (>10 kPA).

3.5.1.4 Sinkers

Comprises of products which are denser than water, and; when the density of a liquid is higher than that of water, then the solubility is considered to differentiate between sinkers (S) and a sinker/ dissolver (SD):

S- A sinking substance which is not soluble has a solubility of <0.1%

SD- A substance which sinks and then dissolves has a solubility >0.1%

When the density is lower than that of water, both the vapour pressure and solubility are considered to differentiate between different behavior sub-groups of evaporators, floaters and dissolvers.

This table provides response techniques against spilled substances in water. Each method has a specific designation. X-marks indicate groups of substances for which the methods are applicable.

Table 3.13: Application of various response techniques to different behavior groups

	Gas Phase		Liquid (all groups) and Solid Phase (F, FD, D, SD, S groups only)									
Group / Method	G	G D	E	E D	F E	FE D	F	F D	D E	D	S D	S
F1 Forecasting the spread in air	X	X	X	X	X	X			X			
F2 Forecasting the spread on water surface					X	X	X	X				
F3 Forecasting the spread in water body		X		X		X		X	X	X	X	
M1 Monitoring the spread in air	X	X	X	X	X	X			X			
M2 Monitoring the spread in water body		X		X		X		X	X	X	X	(1)
C1 Combating water soluble gas clouds		X										
C2 Combating spills that float on water							X					
C3 Combating spills that dissolve in water		X		X		X		X	X	X	X	
C4 Combating spills that sink to the bottom											X	X

(1) It may also be appropriate to monitor sinkers that move over the bottom in the water body

Table 3.14: Group designations

G	Gas	**F**	Floater
GD	Gas/Dissolver	**FD**	Floater/dissolver
E	Evaporator	**DE**	Dissolver/Evaporator
ED	Evaporator/dissolver	**D**	Dissolver
FE	Floater/Evaporator	**SD**	Sinker/Dissolver
FED	Floater/Evaporator/ Dissolver	**S**	Sinker

3.5.2 Response Techniques

Several response options for HNS spills in water are available (Detailed of response options are given in Appendix I):

3.5.2.1 Responding to releases of gases or volatile liquids
3.5.2.2 Responding to releases of floaters
3.5.2.3 Responding to releases of dissolvers
3.5.2.4 Responding to releases of sinkers
3.5.2.5 Responding to HNS spillage in package form

The effectiveness of these methods can be limited by chemical type and weathering, weather and sea/river state, or logistics. Response actions need to be taken as fast as possible to prevent escalation.

Table 3.15: An overview of the 12 behavior groups of the behavior classification system

	Group designation **Meaning of designation**	**Properties**	**Chemicals handled at SMPK**	**Spread A=Air WS=water surface WB=water body B=Bottom**
Evaporate immediately (gases)	G gas	Evaporate immediately	Propane, Butane, LPG	A
	GD gas/dissolver	Evaporate immediately	Ammonia	A WB
Evaporate rapidly	E evaporator	Float, evaporate rapidly	Chlorobenzene, Cyclohexane, Pentane, Toluene, N-Hexane	A
	ED evaporator/dissolver	Evaporate rapidly, dissolve	Methyl-t-butyl ether, vinyl acetate	A WB
Float	FE floater /evaporator	Float, evaporate	Xylene, Toluene	A WS
	FED floater/evaporator /Dissolver	Float, evaporate, dissolve	Butyl acetate	A WS WB
	F Floater	Float	Palm Oil, Diesel Oil,	WS

	FD floater/dissolver	Float, dissolve	Butyl acrylate, Butanol	WS WB
Dissolve	DE dissolver/evaporator	Dissolve rapidly, evaporate	Ethyl methyl ketone, Acetone, Acetonitrile, phenol,	A WB
	D dissolver	Dissolve rapidly	Phosphoric acid, Butanol, Ethanol, Acrylic acid, Ethyl alcohol, Acetic acid, Potassium hydroxide, Potassium hydroxide, Ester	WB
Sink	SD sinker/dissolver	Sink, dissolve	Dichloromethane, Chloroform	WB B
	S sinker	Sink	Sulphur, Trichloroethylene	B

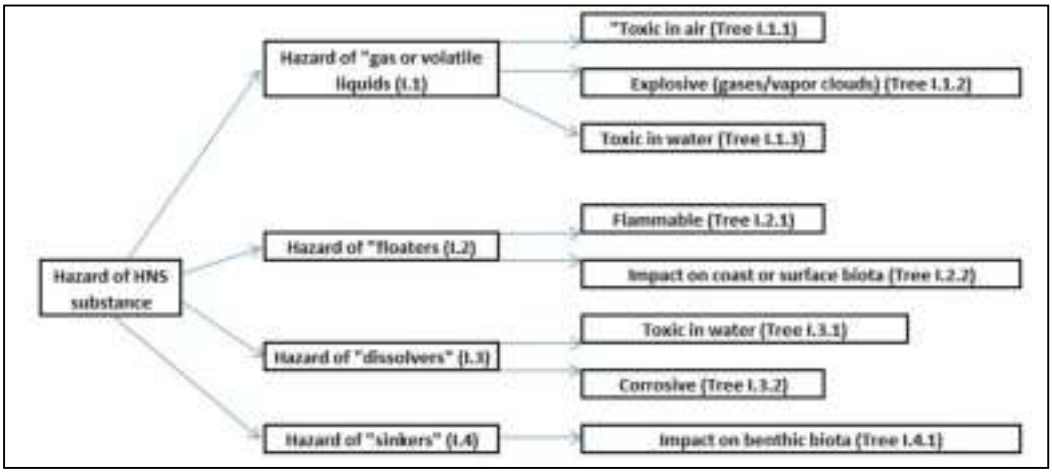


Figure 3.3: Chemical's behavior/ hazard combination

Note: *See* ***Appendix I*** *for (Tree I.1) to (Tree I.4)*

3.6 SHORELINE OIL SPILL RESPONSE

3.6.1 Shoreline Response Authority

The Shoreline Unit undertakes shoreline assessment, cleanup strategies/operations under the direction of a nominated coordinator by District Authority.

3.6.2 Responsibilities

The District Authority responsible for the shoreline must be advised of the shoreline impact. This authority must be consulted, and preferably be involved in, the planning of shoreline cleanup.

The CIC will take account of feedback/advices received from OSC/Shoreline authorities, Government Agencies and other relevant bodies.

3.6.3 Shoreline Response Strategies

Shoreline Response Strategies consists of two stages as follows

3.6.3.1 Shoreline Protection (Refer Appendix D response strategy – D.4)

Inshore or Onshore protection methods should be initiated if:

- Persistent oil is moving towards the shore or sensitive areas; and
- Marine strategies cannot prevent impact on shorelines; and
- The shoreline, or associated fauna, flora or heritage resources, will be harmed by the oil;
- Cleanup is not possible; or
- Cleanup will not prevent or reduce damage to an acceptable level.

3.6.3.2 Shoreline Cleanup (Refer Appendix E)

A number of shoreline response strategies are available (**Table 3.12**), but shorelines should be assessed to see whether these are suitable. This will depend on:

- Rate and likelihood of natural cleaning.
- Access for personnel and machinery.
- Nature and distribution of the Oil/HNS.
- Shoreline character.
- Availability of personnel and machinery.
- Safety issues.
- Environmental sensitivity to Oil/HNS and cleanup methods.

	PRIMARY CLEANUP					FINAL CLEANUP						
	Pumping/ skimming	**Mechanical removal**	**Manual Removal**	**Natural recovery**	**Comments**	**Low-pressure flushing**	**High-pressure washing/ Sand blasting**	**Disper sants**	**Natural organic sorbents**	**Batch recovery**	**Natural recovery**	**Comments**
Rocks, Boulders and artificial structures	V	N/A	V	+	Poor access may prevent pumping/ skimming. Exposed/remote shorelines best left to natural recovery.	N/A	V	+	+	N/A	V	Avoid excessive abrasion of rocks/artificial structures. Cleanup of boulders difficult and often gives poor results.
Cobbles, Pebbles and shingle	V	X	V	+	Exposed/remote shorelines best left to natural recovery.	V	X	+	+	+	+	If load-bearing character good, consider pushing oiled material to surf zone to enhance natural recovery.
Sand	V	+	V	+	Heavy equipment only applicable on firm beaches.	V	X	+	N/A	+	+	Solid oil can be recovered using beach-cleaning machines. Enhance natural recovery by ploughing/harrowing.
Mud flats, marshes and mangroves	+	X	+	V	Operations preferably carried out on the water from small, shallow-drought vessels.	+	X	X	+	N/A	V	Operations should preferably be carried out on the water from small, shallow-draught vessels.

Table 3.16 – Application of techniques to different shoreline types

Note: Some of these techniques, such as the use of dispersants, may require pre-approval before use.
V = viable + = possibly useful X = not recommended N/A = not applicable

3.7 STORAGE AND DISPOSAL OF OIL AND OILY WASTE

3.7.1 Responsibility

The temporary storage, transport, treatment and disposal of waste material must be managed so as not to inhibit cleanup activities or pose any threat to the environment.

For small-scale responses, the OSC/IC will deal with waste management.

For larger-scale responses, the CIC may deploy a Waste Management Coordinator (WMC) to undertake the task and continued agreement should also be in place. A Waste Management Recycling Unit will be required.

Note: *The volumes of oily waste recovered may be significantly greater than the volume of oil spilled.*

It is the responsibility of the relevant IMT officers/coordinators to request assistance from the Waste Management Contractor to advice on the location and capacity of waste storage required.

3.7.2 On-Site (Field) Temporary Storage

Temporary storage containers and facilities may be required at:

- Jetties, ramps or other locations where marine response teams bring wastes ashore.
- Shoreline segments within the vicinity of SMPK being cleaned.
- Decontamination centers and equipment cleaning sites.

Guidelines for the use of storage containers are provided in Table 3.17.

3.7.3 Waste Management Sites

The waste management area in the Port is the reserved waste management site for oily wastes. This site will be used to:

- Store collected waste (Table 3.17).
- Undertake the final segregation of waste (Table 3.18).

Table 3.17: Guidelines for the Use of Temporary Storage Containers

Container Type	Suitability		Volume (m^3)	Comment	
	Solid	Liquid			
Plastic bags	R	C	Up to 0.04/ bag	Onshore	• Half fill only. • Should be moved using Bobcat or front-end loader. • Not suitable for light oils, sharps or long-term storage.
200 litre drums	R	C	0.2	Onshore	• Half fill only. Difficult to handle. • Cover required.
Flexible bags/ containers (1)		R	1-10	Onshore	• On deck or off deck.
		C	1-10	Onshore	• Load onto trucks prior to filling.
Barges (1)		R		Onshore	• Covered.
Rigid tanks (1)		R	Variable	Onshore	• Security required (public areas).
Plastic-lined pits		C	Variable	Onshore	• Needs to be well lined. • Cover needed. • Security required (public areas).

(1) See Appendix F for availability of barges.
R = Recommended/ preferred.
C = Conditional. May be used or adapted, if preferred options are not available.
Not recommended under most circumstances or not applicable.

3.7.4 Segregation of Waste

Wherever possible, wastes should be segregated in accordance with the preferred segregation in Table 3.18.

For large spills, or those where it is not possible to effectively segregate wastes in the field, the 'field' segregations can be used.

Table 3.18: Segregation of Waste

Field Segregation		Preferred Segregation
Liquid	Oils	Non-emulsified oils.
		Emulsified oils.
	Wastewater	Water from temporary storage.
		Water from heat or gravity separation of emulsions.
		Water from chemically demulsified oil.
Solid	Oils	High pour point oils.
		High viscosity emulsions.
		Tar balls.
	Oily debris	Oil mixed with cobble or sand.
		Oil mixed with wood, vegetation, plastics or sorbents.

3.7.5 Transport

Care should be taken that all vessels, vehicles, or containers used for the transport of oily wastes are sealed and leak-proof.

3.7.6 Disposal of Oil

Waste must be disposed-off in accordance with requirements of relevant authority.

Below indicates the disposal methods and location of disposal for recovered wastes from SMPK oil spill response operations.

Table 3.19: Disposal Methods

Type of Material	Disposal Method
Liquid oil waste (Predominantly oil with some water)	Recycle
	Incineration
Oily Water (mainly water some oil)	Oily water separation unit.
	Bioremediation
Solid oil inorganic waste (sediment)	Bioremediation
	Landfill. Only after oil content reduced to <30 ppm.
Solid oil organic waste (non-synthetic)	Bioremediation
	Landfill.
Other Solid Waste Materials (oily synthetic materials)	Landfill
Hazardous materials	Offsite disposal

3.7.7 Disposal Methods for HNS

3.7.7.1 General

Disposal processes include methods by which chemicals and chemical-contaminated wastes are disposed-off or finally eliminated. Such methods are normally applied after the response phase. A few techniques are utilized at the site of accident, but most of them are practiced at special facilities after transportation of the hazardous materials.

Main groups of disposal methods are briefly discussed below.

3.7.7.2 In situ burning (controlled burning)

Many substances emit highly toxic vapors when burning. This method is therefore used in exceptional cases only, and approval is generally required from appropriate authorities. Floating spills on the water surface are normally difficult to ignite and usually require special ignition techniques like incendiary bombs containing thermite, flame throwers or air curtains.

3.7.7.3 Incineration

High-temperature burning in a special combustion chamber gives complete oxidation if the burning is performed under carefully controlled conditions. There are various types of incinerator systems based on either fixed or moving bed designs. Generally speaking, incineration is a very efficient technique to dispose of a wide range of substances where the process gives minimum pollution.

3.7.7.4 Wet air oxidation

Wet air oxidation of chemicals under moderate temperatures and elevated pressure with proper combinations of temperature, pressure and reaction time can give complete oxidation of substances in specially designed equipment. The process is energy conserving with a proper chemical feed and the oxidation reaction is thermally self-sustaining once started.

3.7.7.5 Pyrolysis

Pyrolysis is a combustion process based on insufficient oxygen supply. It is aimed for complex waste mixtures that are converted by heat to solid easy-to-handle char in a pyrolyzing chamber with no oxygen. The volatile fractions are given off to a fume incinerator.

3.7.7.6 Landfill

HNS waste can be buried in ground cavities or excavated trenches. The material should be pre-treated according to applicable regulations in order to reduce contents of certain components. Many states prohibit landfill of certain chemicals.

3.7.7.7 Deep-well storage

Underground storage requires selection of a geologic formation and drilling a well to an appropriate depth. The method is often strictly regulated and surround by requirements regarding low seismic activity, low site value as a resource, careful geologic investigation and perfect encapsulation technique.

4. RESPONSE EQUIPMENT

4.1 MARINE OIL SPILL RESPONSE EQUIPMENT

As per risk classification of ports (refer **Table 4.1**) based on type of cargo handled SMPK belongs to ***Risk Category A***.

Table 4.1: Risk Categorization of Ports

RISK CATEGORY	DESCRIPTION
A	Ports handling crude oil cargo Tankers(alongside/SBM/STS)
B	Ports handling Ships with other Cargos, than crude oil cargo
	Ports handling Tankers with products only
C	Other than Cat 'A' and Cat 'B'
D	Ports handling ships using HSD only as bunker fuel and nil HFO onboard

The details of minimum inventory requirement for port facilities as per NOSDCP Circular no. 03/2018 are given in below table.

Table 4.2: Oil Spill Response equipment for each risk category of ports

	DESCRIPTION	RISK CATEGORY			
		A	B	C	D
Pollution Response Equipment	Inflatable Booms with accessories (Material: Neoprene /rubber /Neoprene rubber)	2000 with 04 power Pack	1000 with 03 power pack	600 with 02 power pack	-
	Fence boom (Material: Neoprene/ rubber/Neoprene rubber/ PU/ PV)	1000 metres	600 metres	200 metres	200 metres
	Skimmer (20TPH 50% weir type, 50% Brush type)	6	4	2	-
	OSD Applicator with Spray arms type along with 02 Nozzles system and 02 hand lancers (no.)	4	3	1	-
	Oil Spill Dispersant (Chemical Dispersant) (litres)	3000	2000	1000	-
	Bioremediation (litres)	2000	1000	1000	1000
	Flex Barge 10 Tons (no.)	4	3	2	-
	Weir Boom 100 metres with minimum 02 weirs with power pack and accessories	4 or 2	3 or 1	2 or 1	-

	(no.) Or integrated containment cum recovery system with power pack and accessories (no.)					
	Sorbent boom size min. 5-inch Dia, min. length 5 feet (no.)		500	200	100	500
	Sorbent Pads min. 20-inch x 20 inch (no.)		2000	1000	500	2000
	Shoreline cleanup Equipment	Mini Vacuum pumps capacity 25 m^3	5	2	1	-
		Portable Oil temporary storage facility capacity 10 m^3	5	3	2	-
	200 metres Shoreline sealing boom with power pack and accessories (material: Neoprene/ rubber/Neoprene rubber) (nos.)		3	2	1	-
	VOC Portable Monitor		4	3	2	2
Personal Protective Gear	Level A protection: - Positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA; - Totally encapsulated chemical and vapor protective suit; - Inner and outer chemical resistant gloves; and - Disposable protective suit gloves, and boots		5	3	1	-
	Level B protection: - Positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape		10	6	3	-

	SCBA; - Inner and outer chemical-resistant gloves; - Face shield; - Hooded chemical resistant clothing; - Coveralls; and - Outer chemical-resistant boots.				
	Level C protection: - Full-face air purifying respirators; - inner and outer chemical-resistant gloves; - Hard hat; - Escape mask; and - Disposable chemical resistant outer boots	20	10	5	20
	Level D protection: - Gloves; - Coveralls; - Safety glasses; - Face shield; and - Chemica resistant, steel-toe boots or shoes.	30	20	10	30
Vessels	Work boats	4	3	1	-
	Tugs	4	3	1	-
Manpower	IMO Level 1	20	15	10	5
	IMO Level 2	10	7	5	1
	IMO Level 3	4	3	2	-
	Equipment handlers	15	10	6	2

4.1.2 List of OSR equipment available at SMPK are as follows:

The available list of equipment with SMPK is given in **Appendix F**.

4.2 INSPECTION, MAINTENANCE AND TESTING

All the equipment mentioned above are to be maintained as per the preventive planned maintenance schedule given by the OEMs during the supply and commissioning. It is important that these equipments be run at least once every quarter and a log book be maintained for the same, for inspection during drills and exercise. (***Refer CGBR 776*** – Maintenance Schedule for Pollution Response Equipment including containment, recovery, dispersant and storage & auxiliary equipment).

Equipment should be stored under cover in a dry, well-ventilated store. In order to prolong equipment life, humidity, temperature and exposure to ultraviolet radiation should be controlled. In addition, equipment should be protected from potential damage from pests. Booms, which may be folded or reeled in storage, should be regularly unfolded or unreeled to prevent the material sticking together or creases,

forming, will lead to points of weakness.

The store should provide a clear working area where equipment can be cleaned to remove oil and salt-water and to carry out maintenance activity. Good access to the equipment is essential, both to facilitate inspection and maintenance and also to give access by road vehicles so that equipment can be deployed quickly in an emergency.

4.3 SHORELINE EQUIPMENT

The following are the minimum required shoreline clean-up equipment:

- Protective clothing (e.g. coveralls, boots and gloves) for everyone
- Cleaning material, rags, soap, detergents, brushes
- Equipment to clean clothes, machinery, etc., with jets of hot water
- Plastic bags (heavy duty) for collecting oily debris
- Heavy duty plastic sheets for storage areas especially for the lining of temporary storage pits
- Spades, shovels, scrapers, buckets, rakes
- Lamps and portable generators
- First Aid material
- Non sparking shovels
- Vinyl/PVC pull-on over boots
- Combustible Gas Indicator with H_2S, HC, VOC's etc. detection capabilities
- "Oil-dry" Loose absorbent material
- Absorbent pads
- Full face or eye protection (e.g. face shields, safety glasses or goggles)
- When there is potential exposure to oil mist, particulate respiratory protection of at least the level of a disposable filtering face piece respirator is recommended in addition to skin, eye, face protection and protection footwear.

5 OIL SPILL MANAGEMENT

5.1 ADMINISTRATIVE ARRANGEMENTS

Figure 5.1 illustrates the organization of response preparedness.

5.1.1 Disposal Methods for HNS

Administrative arrangements under the National Plan are documented in the National Oil Spill Disaster Contingency Plan (NOS-DCP). Details can also be obtained from the Coast Guard website (www.indiancoastguard.gov.in).

5.1.2 Crisis Management Group (CMG)

Members of the CMG may be called upon to complement IMT functions or roles during a response. Membership comprises:

- Chairman/Dy. Chairman -SMPK;
- Director- Marine Department, KDS- SMPK;
- General Manager (Marine), HDC- SMPK;
- District Commander - Indian Coast Guard;
- WBPCB;
- Indian Navy;
- IWAI local representative;
- Representative of Oil Terminals;
- District Disaster Management Authority;
- District Superintendent Police;
- District Administrator (Deputy Commissioner);
- District Fire Officer (West Bengal Fire & Rescue Services);
- District Medical Officer;
- Department of Fisheries, West Bengal;
- Department of Forest, West Bengal;
- West Bengal State Transport Corporation (WBSTC);
- Inspector of Factories;
- Representative of Local MMD.

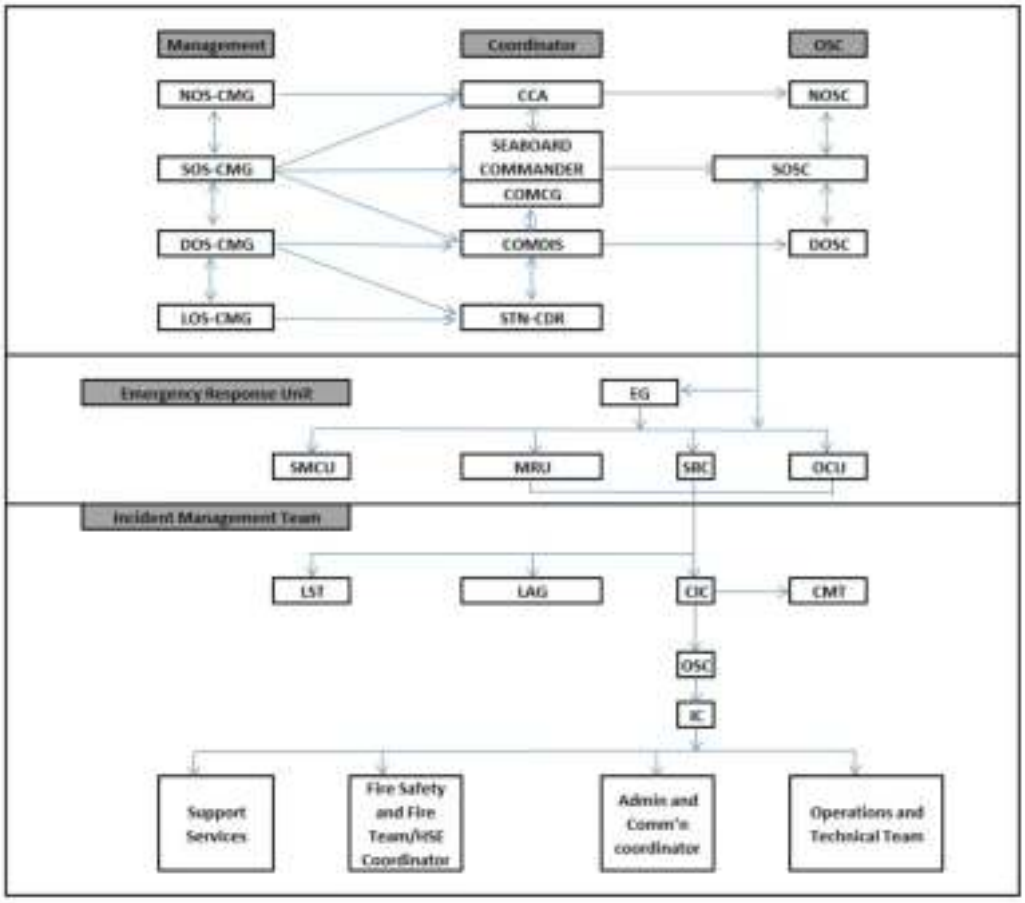


Figure 5.1: Organogram of national structure for coordination of oil spill emergencies in Indian waters

5.2 THE INCIDENT MANAGEMENT TEAM (IMT)

Operational control of all oil spill responses rests with the Incident Management Team (IMT) under the control of a Chief Incident Controller (CIC).

5.2.1 IMT Functions and Roles

IMT functions and roles are outlined in Table 5.2. These functions are informed to the IMT members as required.

5.2.2 Size and Structure

Responsibility for determining the size and structure of a Tier-1 IMT rests with the nominated SMPK Incident Controller (IC) in consultation with On-Scene Commander/ Chief Incident Controller.

The Team will consist of following members for **KDS**,

- Chief Emergency Controller: Chairman/Dy. Chairman
- Chief Incident Controller: Director Marine
- On-Scene Commander: Dy. Director – I (Marine)
- Incident Controller: Harbour Master (Port)/ Harbour Master (River)
- Dock Master/ Dy. Dock Master
- Commander Sagar Pilot Station
- Port Fire Officer (Alternate: Assistant Fire Officer)
- Sr. Comdt. CISF & PSO -Security (Alternate: Commandant /PSO)

- Chief Medical Officer (Alternate: Sr. Dy. Chief Medical Officer)
- Media and Public Relation Officer: Secretary
- Engineers: Chief Engineer (Mechanical, Electrical & Civil) (Alternate: Dy. Chief Engineer)
- Material Manager
- Financial Advisor & Chief Accounts officer
- Traffic Manager (Alternate: Dy. Traffic Manager)
- Environmental and Scientific Coordinator: OSD (Environment)
- Berth Managers and Respective Terminal Manager – All terminals

The Team will consist of following members for **HDC**,

- Chief Emergency Controller: Chairman/Dy. Chairman
- Chief Incident Controller: General Manager (Marine operations)
- On-Scene Commander: MMOH/ Dy. MMOH,
- Incident Controller: Dy. Dock Master,
- General Manager (Engineering),
- General Manager (Management & Services),
- Administration & Communication Officer: Sr. Dy. Manager,
- General Manager -Traffic (Alternate: Sr. Dy. Manager)
- General Manager (Finance),
- Fire & Security Officer / Dy. Fire & Security Officer (Fire unit),
- Safety and Anti-Pollution Officer
- Security Officer: Sr. Commandant CISF (Alternate: Dy. Commandant)
- Media and Public Relation Officer: Secretary
- Sr. Dy. Manager (Material Management),
- Medical Officer: Medical Superintendent-I (Alternate: On duty Medical Officer)
- Berth Managers and Respective Terminal Manager – All terminals

Below table denotes the responsible officer for reporting the incidence and the nodal officers responsible for initiating the oil spill action and informing all concerned.

Table 5.1: Reporting Officers /Nodal Officers

Zone	Geographical boundaries	Principal officer responsible for reporting incidents	Other officers responsible for reporting incidents	Nodal Officer responsible for initiating the oil spill combating action	Contacts for reporting
I	Konnagar to Baj Baj	Commander E & PS Station	Mooring Master/Assistant Morring Master	Dy.HM(P) (in his absence HM(P)	Port Wireless Station: Ph:2439-3888/2553/ VHF Ch:16 Commander, E&PS Mob: 9836298674 Dy.HM(P):24391730, Mob:967415563
II	At Baj Baj	Assisting Mooring Master / Mooring Master	Commander URSS Baj Baj	Dy.HM(P) (in his absence HM(P)	Port Wireless Station Ph:2439-3888/2553/ VHF Ch: 16 AHM Baj-Baj: 24701872 URSS Baj-Baj: 24701491 Cdr. Baj-Baj: 9433432821 Dy.HM(P):24391730 Mob: 9674155637
III	Baj-Baj to Northern tip Of Nayachara Island	Commanders Baj-Baj/ URRS Phalta/ Hugli Point station	All pilots / Commanders on Port & DCI Dredgers / Commanders Survey vessels/ Commander Dispatch vessels	Dy. HM(R) (in his absence HM(R)	Port Wireless Station Ph:2439-3888/2553/ VHF Ch:16 URSS Baj-Baj: 24701491 URRS Phalta: 03174-201202, Mob:9836298675 Hugli Point:03174-211978, Cdr.Hu.Pt.:9684155639 Dy.HM(R): 24391853/ Mob:9674155638
IV	Nayachara Island to Sagar	All pilots / Commanders on Port & DC! Dredgers (Survey vessels/ Dispatch vessels	Commander Haldia Port Survey Unit/ MOH	Dy. MMOH (MMOH in his absence)	Port Wireless Station: Ph:03224-252594 VHF Ch: 16 MMOH (I/C): 03224252340 Mob: 94340-63161 Cdr HPSU: 9432673349

V	South of Sagar	Commander Pilot Station	All pilots/ Commanders on Port & DC! Dredgers/ Survey vessels/ Dispatch vessels	Dy. HM(R) (in his absence HM(R)	Port Wireless Station Ph:2439-3888/2553/ VHF Ch: 16 Sagar Pilot Station: 9674733341 /9674733311 Dy.HM(R):24391853 Mob: 9674155636
VI	Within KPD/NSD	DDM/ ADM on duty	Dock Pilots	Dy.HM(P) (in his absence HM(P)	Port Wireless Station Ph:2439-3888/8553/ VHF Ch: 16 KPD: 24597911 /9674449215 NSD: 24698926/ 9674449216 Dy.HM(P):24391730 Mob: 9674155637
VII	Within Haldia dock	DOM/ ADM on duty	Dock Pilots	Dy. MMOH (MMOH in his absence)	MMOH (l/C): 03224252340 Mob: 94340-63161
VIII	At Haldia oil jetties	Chief Terminal Manger/ MOH	PILOTS/ Commander HPSU	Dy. MMOH (MMOH in his absence)	Port Wireless Station: Ph:03224-252594 VHF Ch: 16 Dy. MMOH: 03224252340 Mob: 94340-63161 Cdr. HPSU: 9432673349

5.2.3 Designated Tier-1 IMT Positions

A number of functions are pre-assigned to personnel who will be activated for all spills in SMPK. Personnel nominated against these key IMT roles are listed in the Contact Directory (**Appendix H**).

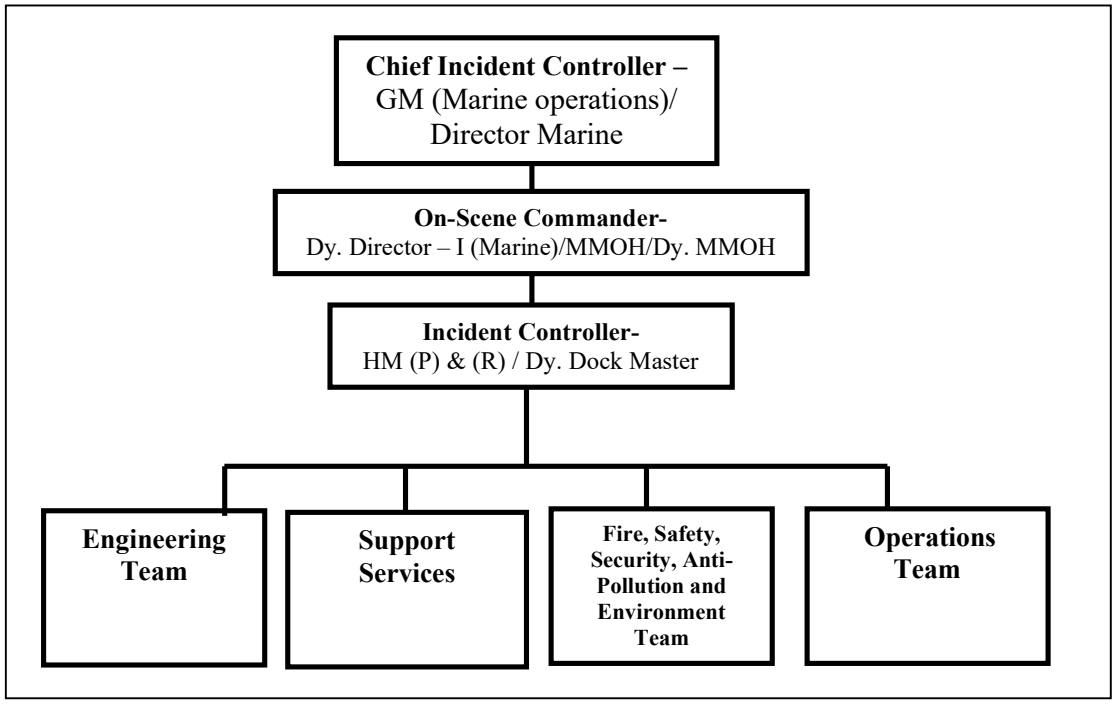
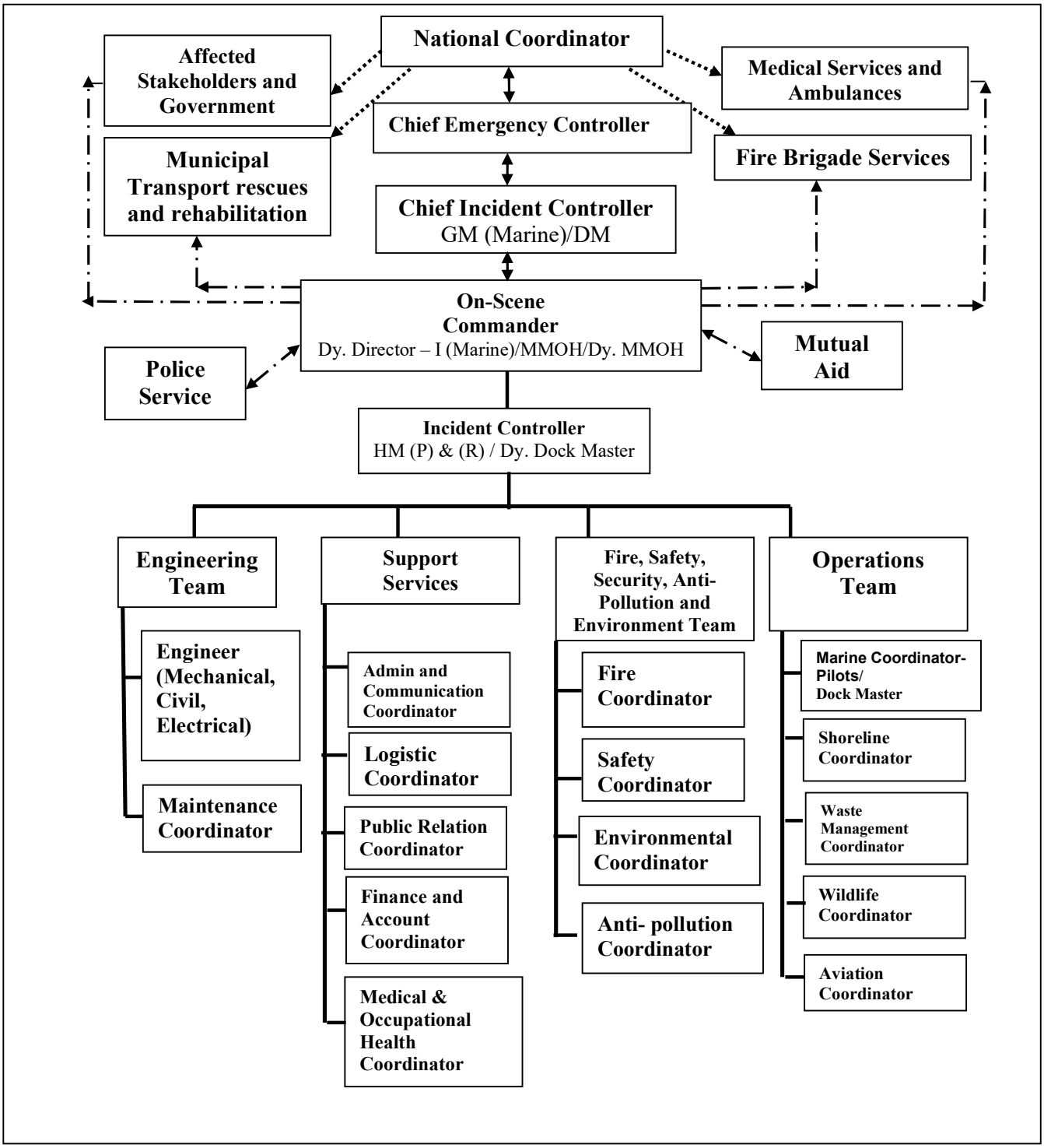


Figure 5.2: Indicative Tier-1 (Small Spill[1]) Incident Management Team

(1) Small spill may be defined as the type of spill, which can be controlled by SMPK -IMT team and does not have potential for shoreline effect.



- Level 1
- Level 2
- Level 3

Figure 5.3: Incident Management Team Structure for a Major Response

Table 5.2: Incident Management function and roles (Ref. Figure 5.3)

Function	Functionary	Role	Comment
SMPK Port limit			
Chief Incident Controller	GM-HDC/ DM -KDS/ (Marine)	The overall planning and control of the spill response.	
On-Scene Commander	Dy. Director – I (Marine)/ MMOH/ Dy. MMOH	Responsible for monitoring and directing responses to all oil spills and hazardous substance releases. Also, responsible for the assessing the incident in consultation with IC and CIC.	
Incident Controller	HM (P) & (R) / Dy. Dock	Overall, in-charge of the incident. Monitoring and assessing the spill and reporting to OSC.	A nominated IC is appointed for all spills.
Operations &Technical Team	Directs all "field" operations in the response, which may include:		
	Marine	Coordination & direction of all activities undertaken by waterborne craft such as tugs & oil pollution equipment.	In coordination with Coastguard.
	Aviation	Coordination & direction of all activities undertaken utilizing aircraft, e.g. aerial dispersant spraying, aerial surveillance & transport.	In coordination with Coastguard.
	Shoreline	Planning & coordination of shoreline assessment and cleanup activities.	In coordination with resource agencies.
	Wildlife	Implement measures in consultation with local environment and forest department.	
	Waste Management	Coordination of the containment, storage, transport & disposal of recovered oil & oily waste. Also, instruction in on-site handling, storage &/or separation & treatment.	In coordination with the WBPCB and WBPCB approved agencies.
Fire, Safety, Security, Anti-Pollution and Environment Coordinator	Responsible for providing health, safety, environmental and security support and response. Functions include:		
	Fire & Safety Coordinator	Responsible to the HSE coordinator for providing Fire & Safety assistance.	
	Anti-Pollution Coordinator	Responsible for monitoring the cargo inside the port and providing the response actions with respect to the MSDS and anti-pollution activity.	

	Environmental & Scientific Coordinator	Responsible for the collection & collation of environment data from INCOIS, IMD and local sources.	The SMPK Environment Adviser to liaise with the relevant authority.
	Security Coordinator	Responsible for providing security and assisting fire, safety and anti-pollution officer.	
Engineering Team	Responsible for the provision of engineering and maintenance services to the IC/OSC.		
Support Services	Responsible for the provision of administrative services to the IC/OSC, Sections and Units of the IMT. Functions include:		
	Administration	Provision of administrative and logistics assistance to various teams, Management of ECC.	
	Records	Collation & filing of records & forms including time sheets, equipment usage records and personnel records.	
	Communications	Provision of communications services and support. Coordination with mutual aid members and other external agencies and directing them on arrival of external agencies to respective coordinators at desired locations.	
	Finance Coordinator	Providing accounting and contracting services.	
	Logistics	Responsible for ensuring that the IMT is provided with adequate resources to enable an effective response. These include providing transport and logistics support as required.	
	Media & public relation officer	Manages media relations. Prepares press statements, organizes press briefings and supports in dealing with media.	A Media Liaison Officer should be appointed.
	Operations & Technical Coordinator	The Operations and Technical Coordinator is responsible for the provision of scientific and environmental information, maintenance of incident information services, and the development of Strategic and Incident Action Plans.	
	Medical and Occupational Health	Provision of medical services where needed.	Coordinates with Chief Medical Officer.

It may be noted that the below given checklists are meant for the purpose of guidance only. The actual actions should be appropriate to the reality of the situation. It is expected that all concerned personnel of the above listed IMT members remain aware of their actions to be taken.

CHECKLIST SMPK-1		**CHIEF EMERGENCY CONTROLLER (CEC)**		
Phase		**Action**		**Time**
Mobilization /Activation	1	Obtain details of spill and any actions taken by the polluter or person on scene from CIC.		
	2	Communicate with		
		a	Ministry of Home affairs	
		b	Ministry of Ports, Shipping and Waterways	
		c	Director General of Shipping	
		d	Crisis Management Group (CMG)	
		e	Chief Incident Controller (CIC)	
		f	Media Liaison officer	
		g	Ship's Authority	
Establishing Control	3	Nominate alternate person if any functionary is not available.		
	4	Establish radio or telephone contact with CIC and CMG.		
Planning	5	Provide support/advice to CIC.		
		a	Propriety of response Tier	
		b	Location of ECC	
		c	Additional Human Resource	
	6	Advise CIC on activation of OSCP.		
Ongoing Response	7	Activate Off Site Plan, if necessary		
Response Termination	8	Provide advice to CIC for termination of response action when all conditions are met.		
Post Spill	9	Receive reports (POLREP & SITREP) from CIC and decide necessary future course of action.		

END CEC CHECKLIST

CHECKLIST SMPK-2		CHIEF INCIDENT CONTROLLER (CIC)	
Phase		**Action**	**Time**
Mobilization / Activation	1	Obtain details of spill and any actions taken by the Polluter or person on scene.	
	2	Start recording of events in the Personal Log.	
	3	Apprise (via POLREP):	
		a Chairman/Dy. Chairman	
		b Coastguard (COMDIS-8).	
		c District Authorities	
Establishing Control	4	Authorize any immediate action by on site staff as required.	
	5	Proceed to the ECC and verify that it has been set-up.	
	6	Mobilize IMT (as required) to the ECC and assign IMT roles.	
	7	Establish radio or telephone contact with COMDIS-8, District headquarters.	
Evaluation	8	Determine trajectory.	
	9	Determine resources at risk. Consult ICG and District Authorities.	
	10	Reassess the Response Tier, in consultation with the CEC and CMG Coordinator.	
	11	For Tier-2 or Tier-3 level of response, coordinate with COMDIS-8. For Tier-1, proceed to 12 below.	
Planning	12	Arrange surveillance of oil slick.	
	13	Convene planning meeting.	
	14	Instruct Logistics Officer to make a list of required needs: Personnel, equipment, transport etc. Authorize acquisition.	
Ongoing Response	15	Implement spill response actions as per OSCP and IAP.	
	16	Continue to monitor slick.	
	17	Monitor the response by scheduling and undertaking regular briefings/debriefings of IMT.	
	18	Amend the IAP as required. Inform COMDIS-8 of any changes via SITREP (Appendix C).	
	19	If necessary, call for additional resources from COMDIS-8 & DHQ.	
	20	Ensure that IMT is supplied with necessary personal needs such as PPE, food etc.	
	21	Arrange for shift/rotation of IMT members.	
	22	Monitor waste volumes.	

	23	Communicate media statements from the PRO. These should be authorized and released through the SMPK Chairman.	
	24	If necessary, authorize use of dispersants in consultation with COMDIS-8 and record the event.	
Response Termination	25	Terminate response if conditions are met.	
	26	Advise the CMG Coordinator.	
	27	Ensure that all IMT members, combat and support agencies are informed of termination of response (issue final SITREP).	
	28	Monitor to ensure safe and complete demobilization.	
	29	Debrief IMT.	
Post Spill	30	Attend debrief with Chairman (or COMDIS-8).	
	31	Ensure that all records are collated and stored.	

END CIC CHECKLIST

CHECKLIST SMPK-3	**ON-SCENE COMMANDER (OSC)**		
Phase		**Action**	**Time**
Mobilization /Activation	1	Obtain details of spill and if any mitigative actions taken by the polluter or any other person.	
	2	Start recording of events in the Personal Log.	
	3	Activation of	
		a Rescue Operations	
		b Pollution response operations	
		c Fire Fighting Operations	
	4	Communicate with	
		a Chief Incident Controller (CIC)	
		b Crisis Management Group (CMG)	
		c Incident Controller	
Establishing Control	5	Lead or instruct IC to lead the Pollution response team- Operational Team.	
	6	Authorize any immediate action required by on site staff and contract agencies.	
	7	Establish radio or telephone contact with CIC, IC and CMG.	
	8	Assess the severity of the Risk.	
Planning	9	Arrange for	
		a Deployment of Pollution response equipment	
		b Response vessels	

		c	Tugs, etc.	
		d	Evacuation of non-essential workers to assembly areas.	
	10	Assist Logistics Officer to compile a list of needs: Personnel, equipment, transport etc.		
Ongoing Response	11	Implement spill response actions as per OSCP and IAP.		
	12	Continue to monitor oil slick.		
	13	Monitor the response as per CIC schedule and undertake regular briefings/debriefings of IMT.		
	14	If necessary, call for additional resources.		
	15	Arrange relief for IMT members & monitor performance.		
	16	Monitor waste volumes.		
Response Termination	17	Terminate response if conditions are met on permission of CIC.		
	18	Ensure that all IMT members, contract agencies and CIC are informed of termination of response.		
	19	Monitor to ensure safe and complete demobilization.		
Post Spill	20	Ensure that all records are collated and stored.		

END OSC CHECKLIST

CHECKLIST SMPK-4		**INCIDENT CONTROLLER (IC)**		
Phase		**Action**		**Time**
Mobilization /Activation	1	Obtain details of spill and if any mitigative actions taken by the polluter or any other person.		
	2	Start recording of events in the Personal Log.		
	3	Activation as per the instruction and guidance of OSC		
		a	Rescue Operations	
		b	Pollution response operations	
		c	Fire Fighting Operations	
	4	Communicate with		
		a	On Scene Commander (OSC)	
		b	IMT	
Establishing Control	5	Lead the Pollution response team- Operational team as per the instruction of OSC.		
	6	Authorize any immediate action required by on site staff and contract agencies. Keep OSC informed of the same.		

	7	Establish radio or telephone contact with OSC and IMT.	
	8	Assess the severity of the Risk.	
Planning	9	Arrange for	
		a Deployment of Pollution response equipment	
		b Response vessels	
		c Tugs, etc.	
		d Evacuation of non-essential workers to assembly areas.	
	10	Assist Logistics Officer to compile a list of needs: Personnel, equipment, transport etc.	
Ongoing Response	11	Implement spill response actions as per OSCP and IAP.	
	12	Continue to monitor oil slick.	
	13	Monitor the response and keep OSC informed.	
	14	If necessary, call for additional resources.	
	15	Arrange relief for IMT members & monitor performance.	
	16	Monitor waste volumes. Keep record of the same.	
Response Termination	17	Terminate response if conditions are met on instruction of OSC.	
	18	Ensure that all IMT members, contract agencies and OSC are informed of termination of response.	
	19	Monitor to ensure safe and complete demobilization.	
Post Spill	20	Ensure that all records are collated and stored.	

CHECKLIST SMPK-5		**PILOT (MARINE ENGINEER) (PO)**	
Phase		**Action**	**Time**
Mobilization / Activation	1	Upon callout, report to CIC/OSC.	
	2	Start recording of events in the Personal Log.	
	3	Attend Initial Briefing.	
Assessment	4	Assist OSC/IC to obtain and collate available data re:	
		a Weather.	
		b Tides, currents.	
		c Latest update on action taken.	
Planning	5	Determine field response equipment/ labor/ transport requirements and provide to CIC/OSC.	

Ongoing Response	6	Direct and coordinate marine response activities.		
	7	Prepare all tugs/crafts for mobilization at the earliest.		
	8	Ensure that field response teams receive required:		
		a	Information i.e. Briefings/Inductions/Weather.	
		b	Personal protective equipment (PPE).	
		c	Essential supplies (e.g. food, first aid etc.).	
		a	Weather conditions.	
		b	Monitoring of response activities.	
	9	Coordinate dispersant operations when permitted.		
	10	Seek for necessary means for aerial observation, containment and recovery actions and vessel dispersant spraying operations.		
Response Termination	11	Advise for termination of response operation.		
	12	Ensure safe return of response personnel.		
	13	Ensure that all equipment is cleaned and returned to stores.		
	14	Attend debriefing.		
	15	Ensure that all records are collated and stored.		

END PO CHECKLIST

CHECKLIST SMPK-6		**PORT FIRE OFFICER (PFO)/ FIRE AND ASSISTANT SAFETY OFFICER (F&ASO)/ FIRE & SECURITY OFFICER (FSO)**		
Phase		**Action**		**Time**
Mobilization / Activation	1	Obtain details of spill/fire and of any mitigative actions taken.		
	2	Start recording of events in the Personal Log.		
	3	Communicate with		
		a	OSC/IC	
		b	CIC	
		c	Port Control room and Fire Station	
	4	Activate Fire Station.		
Establishing Control	5	Lead Fire Fighting Team		
	6	Establish radio or telephone contact with OSC/IC		
Initial Actions	7	Announce Fire Incident Point on PAS.		
	8	Be updated about wind speed and direction.		
	9	Arrange		

		a	- Fire Extinguishers -Maintain sufficient water pressure in fire hydrant system.	
		b	Safety Equipment	
		c	Rescue of injured persons to medical centers	
		d	In consultation with OSC/IC evacuate workers to assembly areas.	
	10		Assist IC to compile a list of needs: personnel, equipment, transport etc.	
Response Actions	11		Implement response actions as per OSCP and DMP as per OSC/CIC instructions.	
	12		If necessary, call for additional resources	
Response Termination	13		Terminate response if conditions are met on consultation with OSC.	
	14		Ensure safe return of response personnel.	
	15		Ensure that all records are collated and stored.	

END PFO/F&SO/FSO CHECKLIST

CHECKLIST SMPK-7	**SAFETY AND ANTI-POLLUTION OFFICER (S&APO)**			
Phase		**Action**		**Time**
Mobilization / Activation	1	Start recording of events in the Personal Log.		
	2	Communicate with		
		a	CIC	
		b	OSC and IC	
		c	Ship owners / Agents / C & F agents / stevedores.	
		d	Terminal Managers	
Establishing Control	3	Furnish necessary statutory information to the Assistant Director, Inspectorate of Dock Safety.		
	4	Establish radio or telephone contact with CIC and OSC.		
Initial Action	5	Prepare consolidated list of dangerous goods including tankers in port.		
	6	To collect necessary evidences required for detailed investigation of any accidents		
	7	Ensure proper accountability of the Cargo Handling Workers and the Private workers engaged by various agencies present at the time of crisis.		
	8	Coordinate with the salvage association and waste/sludge disposal agencies.		
Ongoing Response	9	Assist in the safe evacuation of personnel.		

Response Termination	10	Terminate response if conditions are met on permission of CIC/OSC.	
	11	Submit detailed report regarding the accidents to CIC/OSC.	
	12	Ensure that all records are collated and stored.	

END S&APO CHECKLIST

CHECKLIST SMPK-8		**ENGINEERS (MECHANICAL) (EM)**	
Phase		**Action**	**Time**
Mobilization / Activation	1	Start recording of events in the Personal Log.	
	2	Communicate with	
		a CIC	
		b OSC	
Establishing Control	3	Depute engineers on-site.	
	4	Establish radio or telephone contact with CIC and OSC/IC.	
Initial Action	5	Maintain sufficient stock of required equipment/materials.	
	6	Coordinate with nearby CIC, OSC, IC, S&APO, F&ASO & Logistic officer.	
	7	Ensure water supply to the hydrants.	
Ongoing Response	8	Provide necessary advice and supports.	
	9	Arrange for Bulldozers, mobile cranes, forklifts or any other specialized equipment.	
	10	Mobilize cargo handling equipments.	
	11	Chief Manager (M&EE) to arrange for buses / trucks to enable evacuation.	
Response Termination	12	Terminate response if conditions are met on permission of CIC/OSC.	
	13	Ensure that all records are collated and stored.	

END EM CHECKLIST

CHECKLIST SMPK-9		ENGINEERS (ELECTRICAL) (EE)	
Phase		**Action**	**Time**
Mobilization / Activation	1	Start recording of events in the Personal Log.	
	2	Communicate with	
		a CIC	
		b OSC	
		c State Electricity Board	
Establishing Control	3	Depute engineers on-site.	
	4	Establish radio or telephone contact with CIC and OSC/IC.	
Initial Action	5	Implements elaborate plans for providing continuity of emergency supplies and services such as, electric power, emergency lighting etc.	
	6	Keep alert on duty for any electrical isolation of equipment during an emergency	
	7	Suggests optimal strategies for conducting emergency isolation operations of damaged equipment, the emergency transfer of materials and all other process related emergency operations	
	8	Coordinate with nearby CIC, OSC, IC, S&APO, F&ASO & Logistic officer.	
	9	Arrange Public Address system to caution the public.	
Ongoing Response	10	Provide necessary advice and supports.	
	11	Provide lighting facilities wherever necessary.	
Response Termination	12	Terminate response if conditions are met on permission of CIC/OSC.	
	13	Ensure that all records are collated and stored.	

END EE CHECKLIST

CHECKLIST SMPK-10		ENGINEERS (CIVIL) (EC)	
Phase		**Action**	**Time**
Mobilization / Activation Establishing Control	1	Start recording of events in the Personal Log.	
	2	Communicate with	
		a CIC	
		b OSC	
	3	Depute engineers on-site.	
	4	Establish radio or telephone contact with CIC and OSC/IC.	
	5	Inform WBPCB and other environmental agencies about the incident for getting necessary guidance.	

Initial Action	6	Arrange sand bags, diesel pumps, sufficient quantities of bleaching powder etc., for the event of Cyclone/flood. Plans/strategy, as contemplated, to be forwarded to higher levels.	
	7	Determines the level of contamination of the site as a result of the accident and hire barges or temporary storage facility for collecting the spilled oil or sludge, if any.	
	8	Identify local contractors and keep them as standby to meet emergency requirements such as man power, equipment etc.	
	9	Render and Monitor assistance for extricating trapped personnel by cutting structures etc.	
	10	To ensure that adequate clean water is available in the reservoirs.	
	11	Instruct the contractors to carry out urgency civil works if required.	
	12	Coordinate with CIC, OSC, IC, S&APO, F&ASO & Logistic officer.	
Ongoing Response	13	Provide necessary advice and support.	
	14	In case of fire and especially if the fire involves toxic/flammable materials, contain the run off fire water and other water from the damaged units.	
	15	Cooperate with emergency response squads to conduct the actual cleanup work during and after the emergency.	
Response Termination	16	Terminate response if conditions are met on permission of CIC/OSC.	
	17	Ensure that all records are collated and stored.	

END EC CHECKLIST

CHECKLIST SMPK-11		**MAINTENANCE COORDINATOR (MC)**	
Phase		**Action**	**Time**
Mobilization / Activation	1	Communicate with	
		a CIC	
		b OSC and IC	
		c Engineering	
Initial Action	2	Gather necessary information	
Ongoing Response	3	Instruct maintenance staff	
	4	Recommend the appropriate procedures to isolate damaged units without introducing new hazards and provide resources both in terms of personnel and equipment to accomplish this.	

	5	Provide the necessary utilities during the emergency, isolating or recommending emergency isolation procedures to prevent utility distribution to damaged parts of the facility. If required, activate back up emergency generators, pumps, welding services and underwater diving.	
	6	Render and monitor assistance for extricating trapped personnel by cutting structures, wires etc.	
	7	Remain alert on duty for any electrical isolation of equipment.	
	8	In case of fire and if the fire involves toxic/flammable materials, assist in containing the run off fire water and other water from the damaged units.	
	9	During natural disaster arrange for sand bags.	
Response Termination	10	Assist in accident investigation.	
	11	Terminate response if conditions are met on permission of CIC/OSC.	
	12	Ensure that all records are collated and stored.	

END MC CHECKLIST

CHECKLIST SMPK-12		**TRAFFIC MANAGER (TM) (SH & CH, RAILWAY, CONT.) / GENERAL MANAGER (TRAFFIC) (GM-TM)**	
Phase		**Action**	**Time**
Mobilization / Activation	1	Start recording of events in the Personal Log.	
	2	Communicate with	
		a CIC	
		b OSC and IC	
		c Safety and Anti-pollution Officer	
		d Tank Truck contractors	
		e Terminal Managers	
Establishing Control	3	Prepares vessels to vacate from berth.	
	4	Establish radio or telephone contact with CIC and OSC.	
Initial Action	5	Prepare consolidated list of dangerous goods including tankers in port.	
	6	Arranges to protect cargo in vicinity from damage.	
	7	Arranges to segregate and shift cargo in sheds.	
Ongoing Response	8	Coordinate with the tank truck contractors.	
	9	Provide necessary advice and supports.	
Response Termination	10	Terminate response if conditions are met on permission of CIC/OSC.	

	11	Ensure that all records are collated and stored.	

END TM/GM-TM CHECKLIST

CHECKLIST SMPK-13		**MOORING MASTER**			
Phase		**Action**			**Time**
Mobilization / Activation	1	Upon callout, report to CIC.			
	2	Start recording of events in the Personal Log.			
	3	Attend Initial Briefing.			
Assessment	4	Assist OSC and IC to obtain and collate available data such as:			
		a	Weather.		
		b	Tides, currents.		
		c	Latest update on action taken.		
Planning	5	Determine field response equipment/labor/ transport requirements and provide to OSC/IC.			
Ongoing Response	6	Direct and coordinate mooring response activities.			
	7	Ensure that field response teams receive required:			
		a	Information; i.e. Briefings/Inductions/Weather.		
		b	Personal protective equipment (PPE).		
		c	Essential supplies (e.g. food, first aid etc.).		
	8	Monitoring of current development regarding:			
		a	Location of slick: aerial surveillance reports.		
		b	Condition of the oil (field reports, modeling).		
		c	Weather conditions.		
	9	Coordinate dispersant operations when permitted.			
	10	Seek for necessary means for aerial observation, containment and recovery actions and vessel dispersant spraying operations.			
	11	Inform WBPCB approved parties of anticipated waste quantity and type.			
Response Termination	12	Advise for termination of response operation.			
	13	Ensure safe return of response personnel.			
	14	Ensure that all equipment is cleaned and returned to stores.			
	15	Attend debriefing.			

Post Spill	16	Ensure that all records are collated and stored.	

END MM CHECKLIST

CHECKLIST SMPK-14		**OSD (ENVIRONMENT)/ ENVIRONMENT MANAGER**	
Phase		**Action**	**Time**
Mobilization / Activation	1	Upon callout, report to CIC/ OSC.	
	2	Start recording of pertinent facts and figures in the Personal Log.	
	3	Attend all Briefings in particular initial one.	
Assessment	4	Make preliminary assessment of oil and waste types and quantity.	
	5	Advise the CIC of ecological sensitive areas and biosphere reserve as per the priority.	
Planning	6	Map the ecological sensitive areas and biosphere reserve and update as required.	
	7	Estimate requirements of oil & waste management equipment/personnel/transport and provide to Logistics Officer.	
Ongoing Response	8	Determine and advice on the current location of oil and the policy for the usage of dispersant.	
	9	Coordinate the transport of oil and oiled debris to central storage, or permanent disposal, sites.	
	10	Monitoring of current development regarding:	
		a Location of oil.	
		b Type and quantity of waste being generated.	
Response Termination	12	Ensure safe return of response personnel.	
	13	Ensure that all equipment are cleaned and returned.	
	14	Compile a waste inventory.	
	15	Attend IMT debriefing.	
Post Spill	16	Ensure that all records are collated and stored.	

END OSD(ENV)/EM CHECKLIST

CHECKLIST SMPK-15		CHIEF MEDICAL OFFICER (CMO)/ MEDICAL SUPERITENDANT		
Phase		**Action**		**Time**
Mobilization / Activation	1	Start recording of events in the Personal Log.		
	2	Communicate with		
		a	CIC	
		b	OSC and IC	
		c	ICLO, Nearby Hospitals and Health care professionals.	
		d	Port Control Room and Fire Station.	
Establishing Control	3	Activate Hospital Emergency Action Plan and depute doctors on-site to give first aid to the injured.		
	4	Establish radio or telephone contact with CIC and OSC and understand the emergency situation.		
	5	Advise CIC on industrial hygiene and make sure that the frontline personnel are not exposed to unacceptable levels of toxic substances.		
	6	Inform hospitals of the situation in case of a toxic release and apprise them of the antidotes necessary for the treatment		
	7	Coordinate with ICLO. Along with the District Administration and health care professionals, ICLO will facilitate infection control programme in the event of a natural disaster.		
Initial Action	8	Maintain sufficient stock of medicines, antidotes, oxygen, stretchers etc and arrange for ambulance.		
	9	Suggest and provide an antidote in the event of toxic release.		
	10	Coordinate with nearby hospitals and doctors.		
Ongoing Response	11	Provide necessary advice and supports for appropriate treatment of the injured persons.		
Response Termination	12	Terminate response if conditions are met on permission of CIC/OSC.		
	13	Ensure that all records are collated and stored.		

END CMO/MS CHECKLIST

CHECKLIST SMPK-16		LOGISTICS OFFICER (LO) / MATERIAL MANAGER (MaM)	
Phase		**Action**	**Time**
Mobilization / Activation	1	Upon callout, report to CIC in ECC.	
	2	Start recording of events in the Personal Log.	
	3	Attend all Briefings in particular initial one.	
Assessment	4	Advise the CIC of staffing and other requirements.	
	5	Attend initial planning meeting with CIC and IMT.	
	6	Compile service & support requirements list for IMT.	
	7	Develop a Communication Plan.	
Ongoing Response	8	Coordinate and process requests for resources.	
	9	Prepare and record procurement and service contracts.	
	10	Establish staging areas/ storage facilities as required.	
	11	Liaise with the CIC and other Officers/ Coordinators and assess future service & support requirements, i.e.:	
		a Procure equipment as directed.	
		b Provide adequate storage for equipment.	
		c Delivery of resources.	
		d Accommodation.	
		e Catering services.	
		f Field decontamination facilities.	
		g Security.	
		h Transport.	
		i Fuel.	
		j Maintenance.	
		k Communications.	
		l Technical support.	
	12	Establish check in/out procedures and records for equipment.	
Response Termination	13	Advise for termination of response operation.	
	14	Ensure that all equipment is accounted for/ returned.	
	15	Ensure that all equipment is cleaned and returned.	

	16	Compile list of consumed/lost/damaged equipment.	
	17	Attend debriefing.	
Post Spill	18	Ensure that all records are collated and stored.	

END LO/MaM CHECKLIST

CHECKLIST SMPK-17		**SECRETARY**	
Phase		**Action**	**Time**
Mobilization / Activation	1	Upon callout, report to CIC/ OSC.	
	2	Start recording of pertinent facts and figures in the Personal Log.	
	3	Attend all Briefings in particular initial one.	
Assessment	4	In consultation with the OSC/IC determine administrative and logistic requirements.	
	5	Advise the CIC of administrative and logistics requirements.	
Planning	6	Identify service & support requirements for planned operations.	
Ongoing Response	7	Coordinate with mutual aid members and other external agencies	
	8	On arrival of external agencies provide directions to respective coordinators.	
	9	Mobilize oil spill responders and resources for facilitating the response measures	
	10	Monitor mobilization and demobilization of personnel and resources	
	11	Provide administrative and logistics assistance to various teams	
	12	Recording all financial, legal, procurement, clerical, accounting and recording activities including the contract personnel, equipment and support resources.	
	13	Management of the ECC	
Response Termination	14	Inform all Administrations and Communication Section (including Finance) Unit Coordinators of response termination	
	15	Attend IMT debriefing.	
Post Spill	16	Ensure that all records are collated and stored.	

END AO-S CHECKLIST

CHECKLIST SMPK-18		CISF / PORT SECURITY OFFICER (PSO)	
Phase		**Action**	**Time**
Mobilization / Activation	1	Obtain details of incident and of any mitigative actions taken.	
	2	Start recording of pertinent facts and figures in the Personal Log.	
	3	Communicate with	
		a CIC	
		b OSC and IC	
		c State and District Police	
Establishing Control	4	Authorize any immediate action required by on site staff.	
	5	Establish radio and telephone contact with CIC, OSC and IC.	
Initial Action	6	Obtain necessary instructions from OSC.	
Ongoing Response	7	Control entry of unauthorized persons.	
	8	Facilitate entry of authorized persons, agencies.	
	9	Facilitate entry of emergency vehicles such as ambulance etc.	
	10	Assist in Search and Rescue operation.	
	11	Ensures that residents within port area are notified about disaster and instructions to evacuate if necessary.	
Response Termination	12	Carry out a reconnaissance of the evacuated area before declaring the same as evacuated.	
	13	Terminate response if conditions are met on permission of CIC or OSC.	
	14	Ensure that all records are collated and stored.	

END C/PSO CHECKLIST

CHECKLIST SMPK-19		TERMINAL (TM) / BERTH MANAGERS (BM)	
Phase		**Action**	**Time**
Mobilization / Activation	1	Start recording of events in the Personal Log.	
	2	Communicate with	
		a CIC	
		b OSC	
		c Safety and Anti-Pollution Officer	
		d Ship owners / Agents / C & F agents / stevedores.	
		e Terminal Managers	
Establishing Control	3	Prepares vessels to vacate from berth.	
	4	Establish radio or telephone contact with CIC and OSC.	
Initial Action	5	Prepare consolidated list of dangerous goods including tankers in port.	
	6	Arranges to protect cargo in vicinity from damage.	
	7	Arranges to segregate and shift cargo in sheds.	
Ongoing Response	8	Coordinate with ship owners/agents/C&F agents/stevedores.	
	9	Provide necessary advice and supports.	
Response Termination	10	Terminate response if conditions are met on permission of CIC/OSC.	
	11	Ensure that all records are collated and stored.	

END TM/BM CHECKLIST

CHECKLIST SMPK-20		MEDIA LIAISON OFFICER (MLO)/ PUBLIC RELATION OFFICER (PRO)	
Phase		**Action**	**Time**
Mobilization / Activation	1	Upon callout, report to CIC at ECC.	
	2	Start recording of events in the Personal Log.	
	3	Attend briefing by CIC.	
Planning	4	Review the SMPK Plan.	
	5	Prepare, in consultation with the CIC, a schedule for media releases.	
	6	Prepare, in consultation with the CIC, a schedule for community liaison.	
Ongoing Response	7	Assist the CIC in the preparation of SITREPS (Appendix C).	
	8	Monitor media broadcasts and newspapers and advise the CIC of issues arising.	
	9	Prepare and release (as authorized by the	

		CEC) media bulletins.	
	10	Arrange facilities for media representatives	
	11	Arrange field visit for the media if required.	
	12	Brief CIC or CEC for interviews and attend if requested.	
Post Response	13	Prepare a report on the Media aspects of the response if requested by the CIC or CEC.	
	14	Attend debriefing.	

END MLO/PRO CHECKLIST

CHECKLIST SMPK-21		**Legal (L)**	
Phase		**Action**	**Time**
Mobilization / Activation	1	Communicate with	
		a CEC	
		b CIC	
Initial Action	2	Gather information	
Ongoing Response	3	To issue notice under Major Port Trust Act, Indian Ports Act, Major Port Prevention and Control of Pollution Rules etc. to the defaulters.	
Response Termination	4	Arrange for settlement of related claims	
	5	Liaises with media under guidelines provided by the CEC.	

END L CHECKLIST

5.3 MANPOWER AVAILABILITY (ON SITE/ ON CALL)

Administration & Communication Team will coordinate all activities including movement of manpower and material and their replacements as required, in order to continue the OSR Operations uninterrupted.

5.4 ADDITIONAL MANPOWER

5.4.1 Eastern region Coastguard Resources

The CMG Coordinator will coordinate for provision of Eastern region and National Plan equipment (except that located at SMPK) and human resources for any need to response spill.

5.4.2 National Plan Resources

Resources from the National Response Team (NRT) are available as per the NOS-DCP. This can be accessed through the CMG Coordinator. Additional support services are listed in Appendix H.

5.4.3 Industry Support

Port and industries shall have a MoU to share the resource equipment.

5.5 ADVISORS AND EXPERTS – SPILL RESPONSE, WILDLIFE AND MARINE ENVIRONMENT

The Local Environmental and/or Forest authority will provide advice on local environmental to the Planning officer/Environmental Coordinator.

West Bengal Pollution Control Board- Environmental Officer will be responsible

- To obtain the information regarding offsite emergency
- To communicate with emergency coordinating officer
- To proceed to offsite emergency field station with necessary equipment (e.g. gas concentration monitoring) and staff.
- Assist the Waste Management Coordinator in identifying temporary waste storage sites and on-site waste management.

5.6 TRAINING AND DRILL EXERCISES PROGRAM

5.6.1 Training Imparted to SMPK Personnel

The formal/structured training courses on oil spill response are to be provided by Coastguard in accordance with assigned functional role of the personnel responsible for oil spill response action periodically. These trained personnel will be primarily responsible for handling of oil spillage however other personnel also should be given adequate exposure and awareness so that they will be able to provide support services in case of larger spills.

5.6.2 Training Elements

i. Knowledge of and the extent of area in which the port is located.
ii. Notification procedures for vessel, berth operators, central and state agencies.
iii. Communication systems for notifications
iv. Information on the cargoes carried by the vessel or transferred, stored, or used by the facility including familiarity with material datasheets, special handling procedures, health and safety hazards, spill and fire fighting procedures
v. Vessel's crew responsibilities if any to initiate a response and supervise shore-based resources
vi. Responsibilities and authority of the qualified individual
vii. Organizational structure that will be used for the response actions;
    - Command and control
    - Public information
    - Safety
    - Liaison with Government agencies
    - Spill response operations
    - Planning
    - Logistics support and finance
ix. Role and responsibilities of State and National resource agencies
x. Basic information on oil spill operations and oil spill cleanup technology including
    - Oil containment
    - Oil recovery
    - Equipment limitations and uses
    - Shore line clean up
    - Spill trajectory analysis
    - Use of dispersants, in situ burning, bio remediation, and
    - Waste storage and disposal

xi. Site safety and security procedures
xii. Crisis management
xiii. Ship salvage procedure
xiv. Emergency cargo transfer procedure
xv. Procedure for emergency towing
xvi. Sensitive biological areas
xvii. Procedure for directing the deployment and use of spill response equipment as applicable to designated job responsibilities.

5.6.3 Training Courses

IMO has developed a series of model training courses, designed by an international group of experts from government and industry, and based upon long-term experience in oil spill response. These courses are aimed at providing training to personnel based upon their position and their level of responsibility and role in the response effort.

Presently, IMO Level 1, 2 and 3 Oil/HNS spill responder courses are being considered and as and when these are available personnel must be deputed to undergo the same.

Table 5.3: Various levels of Training Courses

Course	Content and issues
Level 3 Senior managers and administrators	Provides an overview of the roles and responsibilities of senior personnel
Level 2 Supervisors and On-Scene Commanders	Intended for those personnel with significant management responsibility under the contingency plan
Level 1 First responder	Aimed at operator - level personnel, responsible for undertaking on-site clean up

The Indian Coast Guard after promulgation of the NOS-DCP is conducting various training programmes for Oil industry, ports, and other agencies on oil spill response. These training programmes are on the lines of the IMO pollution response training programme level 1 and 2.

5.6.4 Exercises

The level at which an exercise is conducted normally depends on the ***size, severity, likely consequence of a spill.*** These exercises are to be conducted with the involvement of all concerned parties and organizations – main and support.
In general, there are three types of exercises that can be carried out as described below.

Level 1

Spill scenarios are focused on smaller, higher probability operational type spills. The operational exercises are focused on emergency operating procedures, initial response actions, equipment readiness and deployment.

Level 2

Spill scenarios involve the need for assistance and additional resources from outside the individual organization.

Level 3

Spill scenarios reflect an incident of significance to general/wider areas and call for involvement of a large range of organizations.

List of trained/ qualified manpower available in SMPK (Refer **Appendix F**)

5.6.5 Drill Schedule

Port maintains following schedule for the contingency Mock drill

Table 5.4: Drill Schedule

Sr. no.	Drill	Period	Area of consideration
1.	Oil Pollution Emergency drill	Quarterly (Feb, May, Sept. every year)	Response drill is conducted with coastguard

6 COMMUNICATIONS

6.1 EMERGENCY CONTROL CENTRE AND FACILITIES

6.1.1 Location

The ECC will be located in the Jawahar Tower Administrative building, HDC or as directed by the Dy. Chairman. At KDS, ECC will be located at Subhash Bhavan or as directed by the Chairman. For small scale or short duration responses, the local ECC will be used inside the port. For larger scale responses, where external help is needed, the Main Office Area will be utilized along with local ECC.

6.1.2 ECC facilities

The various facilities are required to be present in this room are as follows:

- Copy of Oil Spill Contingency Plan (OSCP);
- Copy of Disaster Management Plan (DMP);
- NOS-DCP issued by Coast guard;
- Map of the entire area, which is likely to be affected by Oil Spill;
- Map showing distances of all the relevant places from Emergency Control Centre;
- Conference table & chairs to accommodate at least 10-12 officers;
- A white board with suitable writing facilities;
- A computer with printer and power point presentation system;
- Photocopy, fax and e-mail facilities;
- A telephone with fax and STD/ISD facilities;
- Communication facilities with ships and other vessel, CIC/OSC and Oil Spill Response Team leader (OSRO team leader);
- Internal & External telephone directories;
- List of Important personnel and their cell phone numbers;
- Log book, Noting sheets and general stationary items;
- Emergency lights so that operations can continue in the event of power failure.

6.2 FIELD COMMUNICATIONS EQUIPMENT

An effective inter-facility communication system associated with oil spill response is in existence, having

Table 6.1: Communication Equipment

Services & Authorities	Communication Equipment
Signal Station	VHF Channel 16/14/10
Fire Service	Special fire alarm and normal communication system- VHF-TELEPHONE-WALKIE TALKIE- MOBILE
Personal and internal Medical services	Normal communication services
Fire-fighting craft and Rescue launches	UHF/VHF Radio telephones, via port authorities as reserve
Ships at Berth	Normal UHF/VHF Radio telephone link used in cargo operations. Terminal/Berth Operator representative at tanker berth to also have own radio-SATCOM

Civil authorities Including fire services, Police and medical services	UHF/VHF radio, telephone or public telephone system. SATCOM Cascade system to be used i.e. through department heads to subordinates
Harbour authorities, Pilots, tugs and other harbour craft	UHF/VHF Radio, telephone or public telephone SATCOM
District Collector or State Secretary	UHF/VHF Radio telephone, public telephone-hot line for emergency level 2 & 3-SATCOM
Jt. Secretary-Ministry of Ports, Shipping and Waterways, New Delhi	Public telephone-hot line for emergency level 2 & 3 SATCOM

List of telephone and mobile numbers are provided in the **Appendix F**.

6.3 REPORT, MANUALS, CHARTS AND INCIDENT LOGS

From Oil Spill Incident report form, it is to be ensured that the basic information required to formulate a response strategy to combat emergency is obtained.
Refer to **Table 7.1** Information Checklists for Spill Reports and **Appendix G**- Oil Spill Report form.

The Personal Log forms should be filled by all personnel involved in emergency response to maintain a personal log of events such as recording contacts and actions carried out during emergency. After completion it should be signed and handed over to the OSC/CIC.

SECTION II
ACTION AND OPERATIONS

7 INITIAL PROCEDURES

7.1 INITIATING THE RESPONSE

Reporting and response activities are to follow the following four stages:

- Establishing the Emergency Control Centre (para 6.1).
- Initial investigation and reporting of the incident (Figure 7.1 and para 7.2).
- Assessment Procedures: Determining the Response Tier (para 7.3).
- Activation of the Incident Management Team (para 7.4).

7.2 INITIAL INVESTIGATION AND REPORTING

Initial investigation and reporting procedures are summarized in Figure 7.1.

7.2.1 Receiving External Reports

Information of the occurrence of oil spills in and around SMPK area may come from a variety of sources (as indicated in Figure 7.1). On receipt of information, Incident Controller must carry out investigation to confirm the incident and gather as many details and as quickly as possible:

- Prepare an incident report using the checklist shown in Table 7.1 or POLREP (**Appendix G**).
- Immediately forward the report to and inform the Director, Marine Department/ General Manager (Marine).

Note: *It is the duty and responsibility of all Staff and Contractors of SMPK to remain vigilant for Oil/HNS spillage and must report all spills, sighted if any or any potential incidents that may lead to oil spill, or observations of oil on the sea/river, through whatsoever possible/available means.*

7.2.2 On Scene Commander

Upon receipt of a spill report or SITREP, OSC will:

- Prepare a POLREP and send to:
  - Director, Marine Department (KDS)/ General Manager Marine (HDC) - CIC.

7.2.3 Director, Marine Department (KDS)/ General Manager Marine (HDC).

Upon receipt of the POLREP, CIC will apprise the Chairman/Dy. Chairman of SMPK.

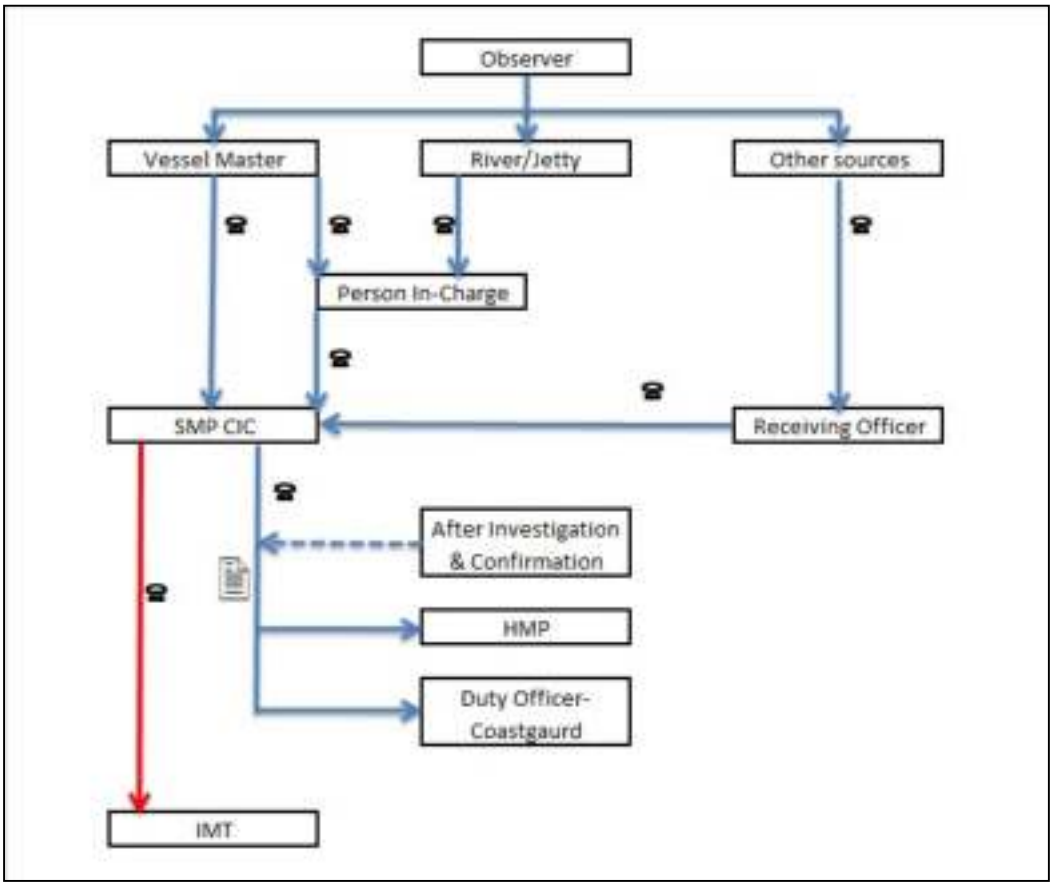


Figure 7.1: Reporting Sequence

POLREP (see Appendix G)

Verbal (radio/telephone)

Table 7.1: Information Checklists for Spill Reports

Question			Prompt/Answer	
1	Full Name of Reporter.			
2a	Contact details:	Telephone No.	Office	
2b			Mobile	
2c		Fax		
2d		E-mail		
3	Position of observer when sighting made		Aircraft___ Vessel___ Ground___ Ground ____ Other (Details): _____	
4	Position of the slick			
5	Source of spill (*If known).*			
6	Type of substance spilled (*If known).*			
7	Amount of substance spilled *(If known).*			
8a	Description of slick	General		
8b		Color	Black_____ Brown_____ Rainbow _____ Silver Other (Specify)_____	
8c		Area	Length ____(m), Width ____(m)	
8d		Other	Broken up? Yes __ No __ Streak? Yes __ No __	
9	Direction of slick movement (If known)			
10	Weather/sea/river conditions.			
11	Action Taken so far, if any			
12	Other information			
13	Name of person receiving Report			
14	Agency/Division/Role			
15	Report to be forwarded to		Name	
			Position	
			Address	

7.3 ASSESSMENT PROCEDURES: DETERMINING THE RESPONSE TIER

Spill response is based on a number of levels, or Tiers (Table 7.2). Each Tier is defined according to the level of resources committed, support agencies and the agency assuming the role of Lead Combat Agency:

Tier-1: is connected with preparedness and response to a small spill within the capabilities of individual facility or harbor authority. 700 tons is often cited as the upper limit of 'Tier-1' however, the circumstances of the spill and the surrounding environment will determine the actual level of response.

Tier-2: is concerned with preparedness and response to a spill that requires the co ordination of more than one source of equipment and personnel. For a Tier-2 response, assistance can come from a number of entities within the port area or from other sources outside the immediate geographic area. Tier-2 describes a wide range of potential spill scenarios and deals with operational spills of upto 10000 tons.

Tier–3: is concerned with a major spill requiring the mobilization of all available national resources and depending upon the circumstances will likely involve mobilization of regional and international systems. It deals with the spills of more than 10,000 tons.

Table 7.2: Lead Combat Agency for KDS

Area	**Source of spill**	**Lead Combat Agency for KDS (1)**
		Tier*-1
Dock area	Any (Inside port limit)	SMPK, District Authority
Inland Navigational channel		
Shoreline in port limit		

Table 7.3: Lead Combat Agency for HDC

Area	Source of spill	Lead Combat Agency for HDC (1)		
		Tier*-1	Tier-2	Tier-3
Dock area	Any (Inside port limit)	SMPK, District Authority	Coast Guard, District Authority, SMPK	Coast Guard, District Authority
Inland Navigational channel and Delta region				
Shoreline in port limit				

(1) Response Tiers, or levels of response, are defined in para 7.3.
(2) * Refer para 7.3

There are no rules for the determination of the response Tier. The fundamental consideration is whether the SMPK can manage the response unaided (Tier-1), or whether additional resources are needed (Tier-2 or Tier-3).

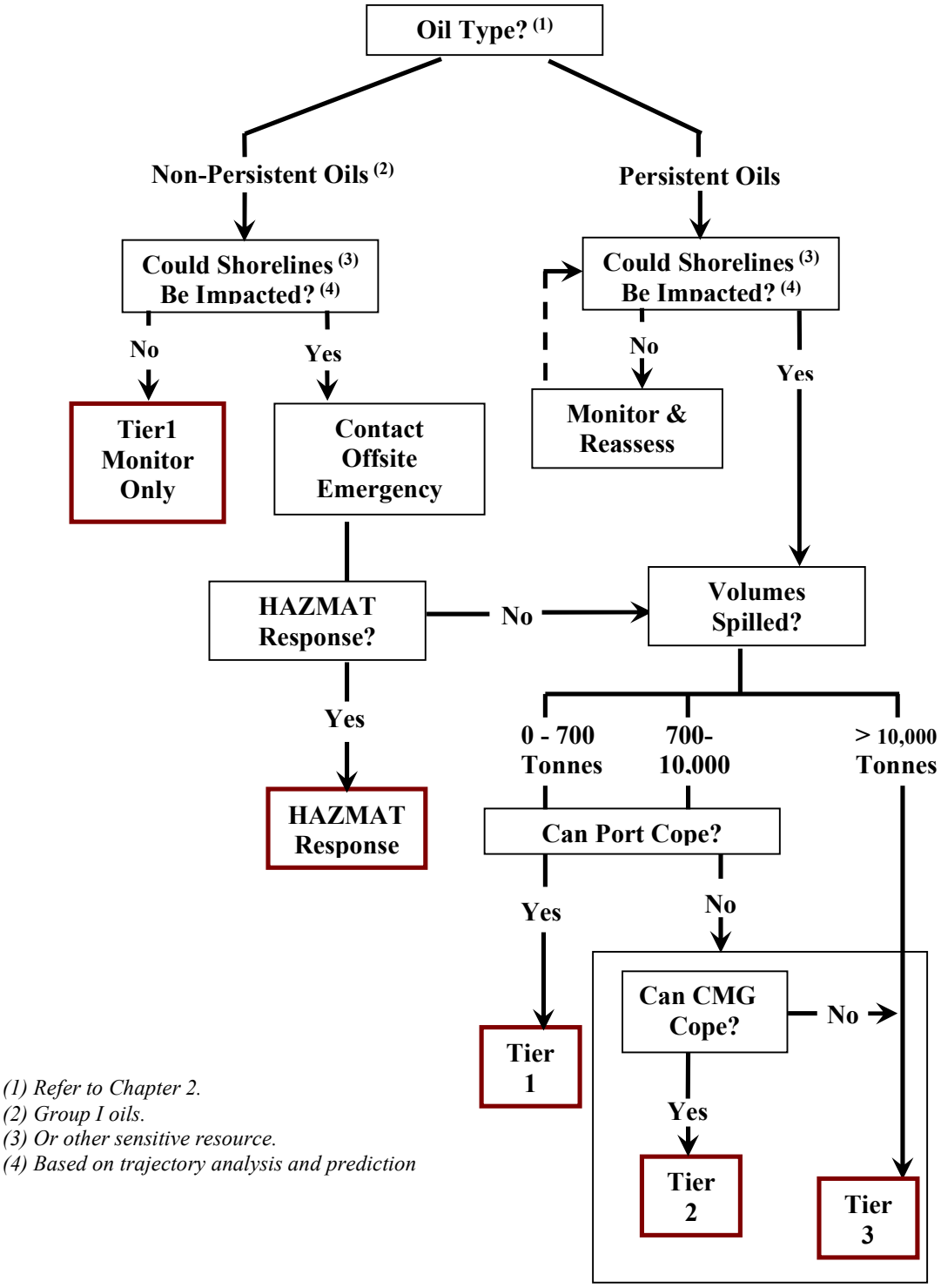
7.3.1 Responsibility

The OSC/CIC, under the advice of the SMPK Chairman, will determine whether port resources can manage the incident (i.e. response is Tier-1).

The port Chairman will notify the CMG Chairman of the assessment in turn the CMG will either confirm the assessment or advise if any additional aid/support is required.

7.3.2 Procedure

Determination of the appropriate Tier may be based on Figure 7.2.



(1) Refer to Chapter 2.
(2) Group I oils.
(3) Or other sensitive resource.
(4) Based on trajectory analysis and prediction

Figure 7.2: Guidelines for determination of the Level (Tier) of Response in SMPK

7.4 ACTIVATION OF THE INCIDENT MANAGEMENT TEAM

7.4.1 Responsibility

The designated OSC for Tier-1 responses or his nominee will mobilize IMT members through available means.

7.4.2 Resource mobilization

The OSC will mobilize sufficient equipment and personnel resources required to manage the response.

7.4.3 Muster Point

IMT personnel will muster at the nominated ECC (see para 6.1) unless otherwise directed by the OSC.

7.5 MANNING EMERGENCY CONTROL CENTRE

The OSC shall be required to coordinate with members of the IMT. Various equipment, documents required for ECC have already been referred in para 6.1, and are to be physically available all the time in ECC.

7.6 COLLECTING INFORMATION (OIL TYPE, SEA/RIVER / WIND FORECAST, AERIAL SURVEILLANCE, REPORTS)

The CIC and OSC/IC are to collect the following information immediately in case of oil spill, if not available already.

a) Time of spill occurred,
b) Position in Latitude/ Longitude and also with reference to prominent landmark, if close to shore,
c) Visual appearance, apparent thickness of oil and extent of area covered,
d) Percentage covers of various thickness of oil,
e) Existing weather condition and weather forecast,
f) Current, tide and wind conditions,
g) Immediate availability of support vessels, equipment and man power specifying time factor, and
h) Estimate oil spill trajectory and likely area and time of its hitting the coast.

7.7 ESTIMATING FATE OF SLICK

Estimating the volume and direction of movement of the spill is an important aspect of handling any oil spill response to determine the level of response plan activation and the type and quantity of resources necessary to recover the spilled oil.

7.7.1 Strategies

7.7.1.1 Use of Vessels

Vessels can be used to monitor an oil slick but determination of slick size is difficult. Vessels should be used to:

- Confirm shoreline oil impact in areas not clearly seen from the air (e.g. mangrove fringes), and to
- Collect samples of the oil.

7.7.1.2 Use of Aircraft

Aerial surveillance should be requested from Coastguard, if the same is felt necessary by the CIC.

A trained observer will normally be present on surveillance aircraft to identify oil on the water or shoreline and to accurately report location to the CIC.

Photographs should be taken to aid detailed analysis and assessments.

7.7.2 Slick Trajectory

7.7.2.1 Computer Models

Movement and behavior of an oil slick may be estimated using the computerized oil spill trajectory model (Online Oil Spill Advisory –OOSA) as may be available with INCOIS, Indian Coast guard and other statutory authorities and combat agencies.

7.7.2.2 Computer Models for HNS spill

Movement and behavior of a chemical slick may be estimated using the computerized chemical spill trajectory model as may be available with INCOIS/COASTGUARD (see Appendix C).
This method is applicable for groups FE, FED, F and FD (all groups with F).

7.7.2.3 Manual Estimates

Spill trajectory can be estimated by adding the vector of current velocity to approximately 3% of the wind velocity. This is illustrated in Figure 7.3.

STEPS: Steps to use SLICK PREDICTION BY VECTOR ANALYSIS.

1. Ascertain the direction and speed of both surface water currents and the wind.
2. Next, draw ocean current and wind component vectors showing their relative directions and lengths. The velocity of the current and wind is represented by the length of the vector.
3. Draw a line parallel to the wind vector starting from the tip of the current vector and measuring the exact length of the wind vector.
4. Draw a line from the point of origin to the tip of the parallel wind vector line. The final line is the resultant vector that gives the direction and speed of the slick movement. The direction can be measured with a protractor. The speed is determined by measuring the length of the resultant vector relative to the scale in use.

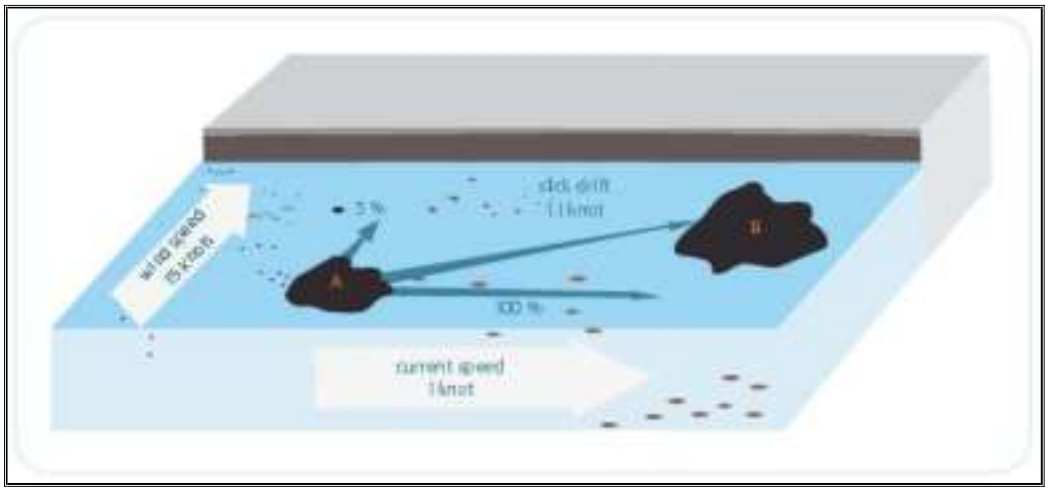


Figure 7.3: Calculation of Oil Trajectory

7.7.3 Estimating Slick Volumes

Estimates of spill volumes can often be made on the basis of the cause and duration of the spill.

7.7.3.1 Calculating Slick volumes of Oil/HNS at Sea

It is also possible to estimate the volume of a slick on the basis of its appearance at sea, and the area covered (see **Figure 7.4** and **Table 7.4**).

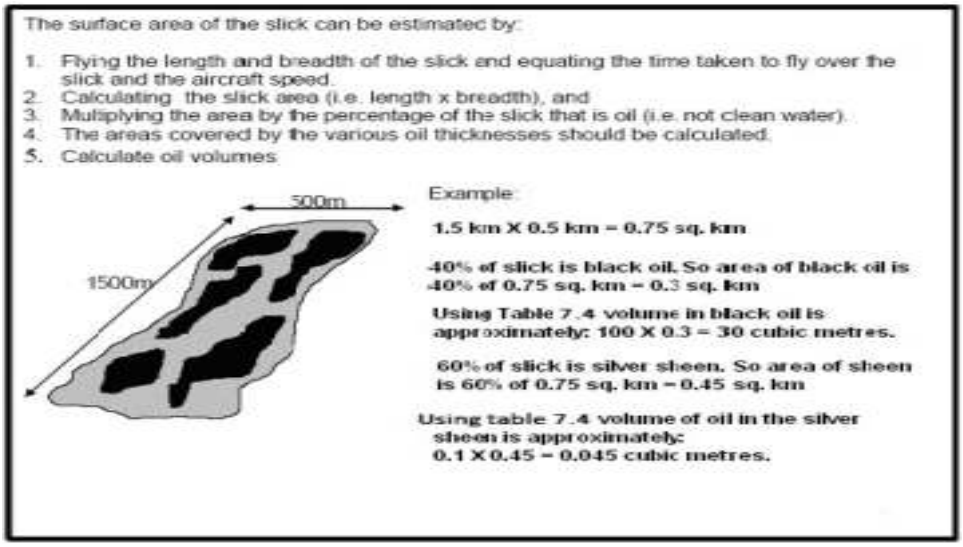


Figure 7.4: Calculating Slick Volumes at Sea

7.7.3.2 Oil on Shorelines: Aerial Survey

Information obtained is generally limited to:

- Location of oily bands.
- Length of beach oiled.
- Width of oily band.
- Presence of oil on reefs or other hazards.

Table 7.4: Guide to the relation between the appearance, thickness and volume of floating oil. (Reference - Chapter 5: Manual on Oil Pollution-Section IV)

Oil Type	Appearance	Approx. Thickness (mm)	Approx. Volume (m^3/sq km)
Oil Sheen	Silver	>0.0001	0.1
Oil Sheen	Iridescent (rainbow)	>0.0003	0.3
Crude and Fuel Oil	Brown to Black	>0.1	100
Water-in-Oil emulsion	Brown/Orange	1	1000

7.7.3.3 Shorelines: Ground Survey

Ground surveys are required to determine the thickness of the oil (i.e. above the beach surface), and the depth of penetration of oil into the beach.

7.8 IDENTIFYING RESOURCES IMMEDIATELY AT RISK, INFORMING PARTIES

Based on the already available data from the resources, map and sensitivity maps, resources immediately at risk and requiring protection based on priority will be identified.

Depending on the area likely to be affected, Coast Guard and other district authorities/ agencies, as applicable, are to be informed. Details of different addresses, telephone nos. are placed as the **Appendix H** for ease of contacting.

8 OPERATIONS PLANNING

8.1 ASSEMBLING FULL RESPONSE TEAM

CIC, in consultation with, OSC and IMT personnel will muster at the nominated ECC (see para 6.1) unless otherwise directed by the OSC and conduct thorough briefing about their role and responsibilities.

8.2 IDENTIFYING IMMEDIATE RESPONSE PRIORITIES

CIC and OSC, with the help of oil slick movement simulation data and prevailing weather condition, would priorities which area to be protected.

8.3 MOBILIZING IMMEDIATE RESPONSE

Effective response to an oil spill requires rapid mobilization of resources depending on a number of factors, one of the most critical of which is the time taken to activate this plan and mobilize equipment and resources to the scene of the spill.

The detail of Oil Spill Response Equipment available with SMPK is given in **Appendix F.**

8.4 PLANNING OPERATIONS

8.4.1 The Role of Chief Incident Controller

The Chief Incident Controller (CIC) is responsible for the overall planning and management of the incident response and control in coordination with On-Scene Commander (OSC) who would lead the Incident Management Team (IMT).

The functions of the CIC and OSC are set out in IMT Checklist SMPK- 1 & 2 in Chapter 5.

8.4.2 Planning Process

Planning of the response involves participation of the CIC, OSC and personnel of IMT and advisors.

8.4.2.1 Information Inputs to the Planning Process

The necessary input information for effective planning is as described in the Figure 8.1 below.

8.4.2.2 The Incident Planning Cycle

The planning process may follow the steps as given below:

- Initial Planning (Briefing) Meeting.
- Development of the Incident Action Plan.
- Execution of the Plan.
- Feedback to Planning Section (collection and analysis of information).
- Ongoing Planning Meetings (to revise/update the Incident Action Plan).

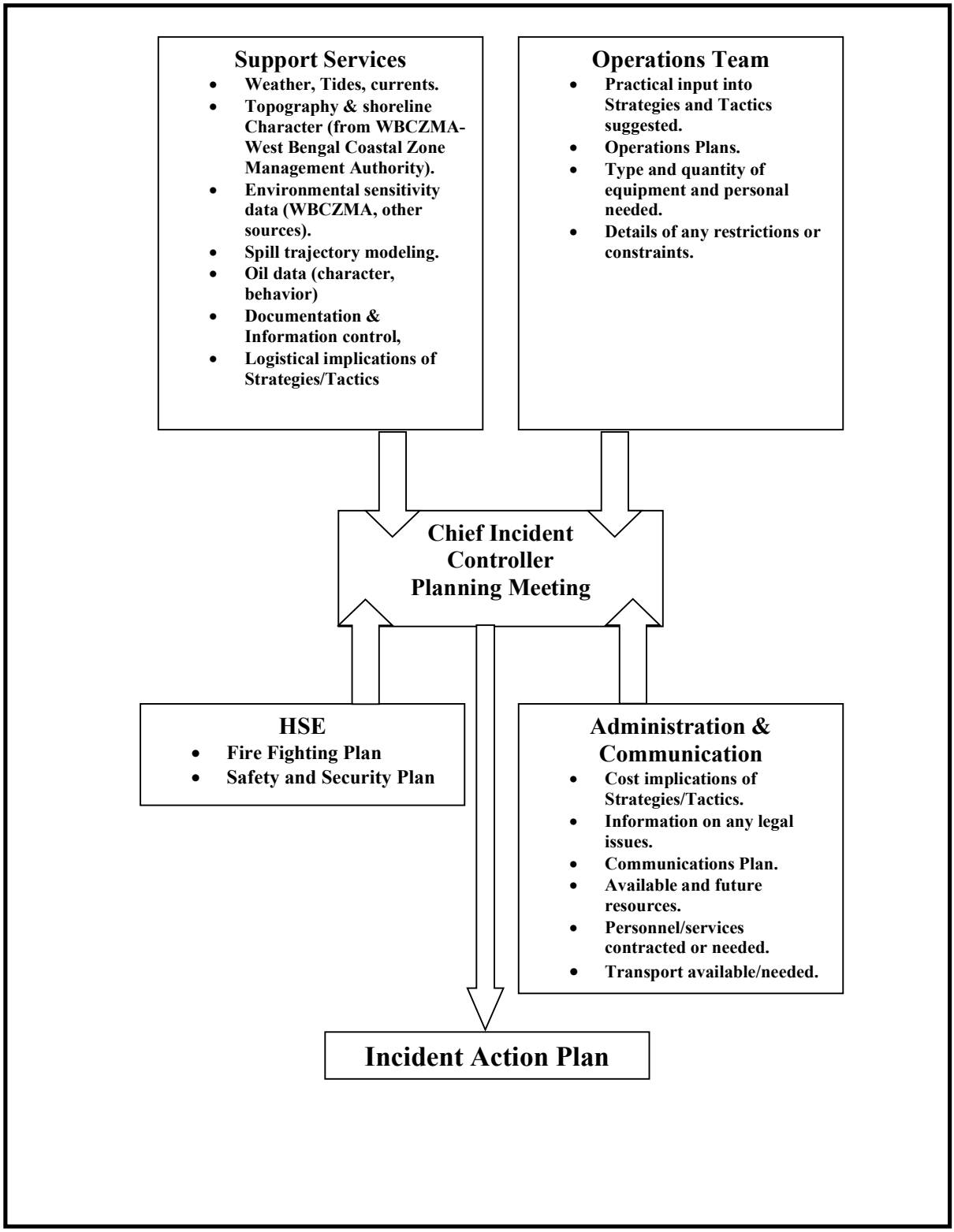


Fig. 8.1: Inputs to the Planning Process

8.4.2.3 Briefing

Planning Meetings should be commenced by a briefing, during which the CIC, personnel of IMT and other relevant personnel should be briefed which includes the following points:

- Current situation: -
  - ✓ Spill location and size,
  - ✓ Combat and Support Agencies,
  - ✓ Response Tier and resources mobilized,
  - ✓ Current shorelines and resources impacted.
- Predicted situation: -
  - ✓ Trajectory
  - ✓ Resources at risk/potential effects.

8.4.2.4 Planning Meeting Phase I

The purpose of this phase is to develop strategies, which should include the following:

- State Aim (or Policy) of the response (Initial Planning Meeting only).
- Define and rank response objectives, based on protection priorities.
- Determination of the ways and means to achieve objectives.
- Identify the necessity for obtaining any statutory permit (e.g. dispersant use).

8.4.2.5 Planning Meeting Phase II

After development of the Strategies the procedural detail for developing action plan may follow the steps as below:

- The CIC will nominate an IMT member to:
  - ➢ To prepare a Draft Incident Action Plan including Aim, Objectives and Strategies.
  - ➢ Distribute Draft Incident Action Plan to key IMT/Section Officers.
- The Communication Officer will develop a communication plan.
- The Public Relation Officer will prepare the Media Plan.

8.4.2.6 Planning Meeting Phase III

After development of action plan -Phase II, the Incident Action Plan (IAP) is developed. The IAP should include the following details.

- The need for Emergency Control Centre(s) (ECC) and/or Advanced Operation Center(s) (AOC).
- The need for, and location of, Staging Areas.
- Compilation of a list of resource needs, e.g. communications, equipment and personnel.
- Prepare a Situation Report (SITREP) for distribution (**Appendix G**).

8.4.3 Documentation & Information Control

It is important that all information is recorded and transmitted quickly and accurately by using:

- Forms
- Wall Maps
- Effective briefings (Refer para 8.4.2.3 and **Appendix A** - Procedure -SMPK-B)
- Issue of bulletins and press releases. These are prepared by the Public Relation Officer (see para 8.5.2).

8.4.3.1 Forms

Essential forms are provided in **Appendix G** of this OSCP.

8.4.3.2 Wall Maps

Wall maps, like Status Boards can display detailed and current information. The contents must be recorded before any updation by appropriate means e.g. Digital cameras etc.

8.5 MEDIA LIAISON

8.5.1 Responsibilities/Authority

For a Tier-1 response, any media management is the responsibility of the SMPK Chairman who will authorize all media releases.

For Tier-2 or Tier-3 responses, the CMG Coordinator/COMDIS-8, will assume this responsibility, and authorize all media releases relating to the incident response.

8.5.2 Public Relation Officer

The CIC will delegate responsibility to the Secretary to prepare an Incident Media Plan.

8.6 DECIDING TO ESCALATE RESPONSE TO HIGHER TIER

Depending upon the feedback given by the OSC about the necessity of re assessing the spill quantity, the OSC and members of IMT will re-inspect the spill site and assess the oil slick thickness, its size, status of spilled oil and decide whether an upgraded response is desired or not. If CEC is convinced that response effort deserves revision upwards, accordingly level of Tier needs to be raised, it will raise the oil spill reporting level accordingly.

Although, the IMT composition for Tier 1 response has been described along with the roles and responsibilities, further in case of heightened response the plan structure as described in the NOS-DCP, a wider role of the described emergency units is added below.

During minor incidents, the CIC shall be responsible for overall response strategy. The CIC shall keep the Statutory Agency informed of progress with the response. The response actions will be supported by the CMG, LAG and LST. However, during major incidents, the overall response strategy shall be formulated by relevant Coast Guard Seaboard Commander and Regional Commanders and implemented by CIC and the IMT.

Separate, but linked emergency response units would direct operations in the event of an incident requiring response beyond the level of IMT.

8.6.1 CRISIS MANAGEMENT GROUP (CMG)

Table 8.1: Functional Responsibilities of CMG

Department/ Agency	Functional Responsibilities
Indian Coast Guard	• To provide assistance to port and pollution control board/line Departments for combating (Tier-1) oil spills. • To advise the clean-up agencies for the type/method of clean-up initiative to be undertaken for the environment protection. • To coordinate with the State Environment Ministry and the concerned District Collector on the shore-line clean-up strategy and shoreline restoration planning. • To seek additional resources from Coast Guard if required.
SMPK	• To be in charge of the overall co-ordination of actions in the area within port limits as regards to anti-oil pollution. • To ensure availability and provide necessary resources such as tugs/boats/barges for clean up. • To ensure that at least minimum equipment for oil spill response is kept available locally at all times. • To assist District Administration in shoreline/coastline/inland surface water clean-up measures by providing necessary resources available. • To assist in towing distressed tanker to "Place/Port of Refuge" for remediation. • To consult the CG, the DG Shipping, or any other authority, when further advice/ assistance is required. • To keep the CG apprised of action being taken. • To ensure that for the purpose of part XIII of the Merchant Shipping Act, 1958, actions are taken by the various authorities under the overall legal responsibility of the receiver of wrecks and dock concerned. • To maintain daily incident log along with records of decisions and actions taken, including expenses incurred during the remediation of the said incident along with a formal detailed report of the entire incident and submit the same to the relevant authority.
Oil companies (IOCL, BPCL, HPCL, SK Oil etc.)	• To assist port with the available resources and manpower for shoreline clean-up equipment and dispersants/chemicals as and when required. • To assist in chartering of tankers to undertake transportation/ transhipment operations. • To arrange for the storage of oil transhipped.
District Administrator	• To take all suitable measures to prevent pollution on shoreline • Nominate Shoreline/Beach Supervisor for shoreline clean-up • Arrange for volunteers from NGOs, civic agencies, colleges and general public for clean-up measures

	and arrange the logistics for clean-up personnel • Keep approved vendors for logistics (transport, food distribution to local teams, PPE, portable toilets, etc) in readiness • To render all possible assistance to the Coast Guard coordinator of the shoreline clean-up • To identify, obtain and maintain in readiness adequate quantity of basic pollution response equipment like deflective booms, fence booms, beach protection booms, spray equipment along with specialized equipment for beach protection and shoreline clean-up • To identify suitable type of tug/boat/fishing vessel in consultation with Coast Guard for mounting the dispersant spraying equipment • Ensure Animals/birds, plant life experts are readily listed and available for carrying out rescue and cleaning of impacted wildlife • To promulgate general precautionary messages for public during shoreline clean-up • To provide administrative infrastructure to the agencies assisting in shoreline clean-up • To identify safe & appropriately designed places for segregated collection & temporary storage of waste oil and oil contaminated debris through suitable collection containers and ensure their safe disposal to a registered approved recycler or to authorized incinerators or any other approved method only, if known, in consultation with State Pollution Control Board
West Bengal Pollution Control Board	• To take all suitable measures to deal with oil pollution on shoreline in accordance with SOS-DCP (State level oil spill contingency plan) and DOS-DCP (District level oil spill contingency plan) as promulgated. This may include beaches, riverine basin and salt pans, grasslands, mangroves, littoral islands with corals reefs, industrial water intake, fishing boats, nets and other fishing community resources, tourism and heritage spots. • To take all suitable measures to prevent pollution on shoreline. • To render all possible assistance to the Shoreline coordinator, Local Action Group and District Administration particularly. • To assess environmental damage and provide guidance on necessary remedial measures.
West Bengal State/Coastal Police Department	• To secure the area from the access of the general public • To provide boats for necessary movement or extension of security perimeter off the shoreline, or operation as would be deemed required (eg. conveying PR personnel or assisting, etc.) • To assist the District Administration for shoreline security

	measures.
District Fire Officer (Fire & Rescue Services)	• To be on emergency standby in case of fire incidence • To be sufficiently prepared and suitably equipped to provide assistance if required • If involved in any manner, to maintain a log and record of all decisions and actions taken by the respective department.
Local MMD	• To assist the coordinator of local contingency plan if requested • To provide a technical advice to local group if requested • To identify surface craft to assist Coast Guard for pollution response if requested • To assist Coast Guard if requested or instructed by DG Shipping to examine ships for efficiency of anti pollution equipments as per the provision of Merchant Shipping Act, 1958.
Local Fisheries Authority	• To assist/advise Local Groups in identifying the rich fishing grounds so as to give priority for protection of such grounds from oil spills as well as use of dispersants. • The local action groups in consultation with Coast Guard regional headquarters to identify the fishing vessels suitable for mounting the oil spill dispersant equipment. • Advise fisherman on the effects of oil pollution on fisheries • Impose ban on fishing in the affected area.
State Forest Department	• Confirm whether any wildlife species are affected on account of oil spill • Remove the affected species from the area to a safe place • Take preventive measures against effects of oil spill by coordinating with the local administration for protection of mangroves and other species • Survey the affected area and serve notice to the polluter for remediation of the coastal area • Put up claim for damages/ compensation against the polluter and for restoration efforts.

8.6.2 LOCAL ACTION GROUP

Role: The Local Action Group (LAG) (Refer **Figure 5.1** of OSCP) provides support in the event of a major oil pollution incident, specifically in the roles of response managers, and response team leaders.

8.6.2.1 LOCAL ACTION GROUP SUPPORT TEAM

Role: The Local Action Group Support Team (LST) is required to support an incident.

The following roles have been identified:

- Environmental Advisers
- Finance & Administration Officer
- Wildlife Officer
- Equipment Operator

- Offshore Containment/Recovery
- Inshore Containment/Recovery
- Engine driver
- Vessel-based dispersant spraying
- Shoreline Assessment
- Shoreline Cleanup

State government would identify above mentioned personnel to fulfill these roles, as these personnel would be required when responding to major incidents within their own jurisdictions, and will become part of the LAG when succession planning.

8.6.2.2 The Environment Group

Role: To provide environmental and public health advice to all these response units

a. perform a purely advisory role;
b. advise on environment aspects and public health impacts of the incident and associated response operations both, real and potential;
c. being a common facility, provide comprehensive advice to all response units and represent all environmental and public health interest considered being at risk

A committee for which core membership of the Group would come from the relevant statutory authorities and include relevant civil administration authorities, forest and wildlife authorities, fisheries authorities, Block Development Officer, local public health officials and relevant non-governmental organizations for appropriate expert advice.

8.6.2.3 COMMUNITY SUPPORT

Role: Participation essential for the success and outcome of an incident.

The Community will include volunteers from the National Cadet Corps, National Disaster Mitigation Resource Centers, National Service Scheme and Non-Governmental Organizations.

8.6.2.4 Emergency Response Unit (ERU)

The ERU as mentioned in the table below would direct operations in the event of incident requiring response under this plan.

Table 8.2: ERU

Salvage Monitoring and Control Unit (SMCU)	**Role:** To monitor and control salvage operations *The ICG will activate the salvage monitoring and control unit. SMCU is located either at the port's own ECC or at the nearest Coast Guard MRCC. The harbour master is a member of the SMCU and it may be beneficial to maintain their presence at the port so that they can keep control of to the activities within the port. The decision whether to use the port or ICG facilities for the SMCU would be predetermined based the requirements of the salvage operations jointly by the port and ICG authorities.*
Marine Response Unit	**Role:** To direct response action at sea

(MRU)	*The ICG shall activate Marine Response Unit. This unit may be co-located with Ports ECC and SMCU or the ICG MRCC. This will primarily be the ICG emergency response center for seaborne pollution prevention and control operation.*
Shoreline Response Centre (SRC)	**Role:** To direct shoreline response *The Shoreline Response Centre (SRC) set up by State government and equipped in accordance with the SOS DCP.*

8.6.2.5 Government/Organizational Responsibilities

Below table 8.3 identifies the government departments and agencies that will act as resource agencies in the event of Tier 2 or Tier 3 oil spill incident. These agencies would also have a role should a 'Tier 1- oil spill' trajectory threaten the Maharashtra state shoreline beyond the limit of the port. In such cases the District Oil Spill Plan and State Oil Spill Disaster Management Plan will also be concurrently activated, e.g. in the event of spill occurring outside the breakwater due to collision, the local CMG will be activated in all such cases. The outline organization for combating a National Oil Spill Contingency and the detailed functions of various concerned departments and agencies are given in NOSDCP (2015).

Table 8.3: Government/Organizational Responsibilities

Department/Agency	Functional Responsibilities
Indian Coast Guard (ICG) – Central Coordinating Authority	• To receive the report of significant spillage of oil in water. • To keep the Ministry of Defence apprised of the development on receipt of information about oil spill. • To decide upon the nature and extent of actions required and to advise the regional headquarters/local action groups/authorities concerned regarding the action to be taken by the latter in consultation with apex committee on control of marine pollution/task force on oil spills. • To arrange for chartering of tankers for oil transhipment operations, if required. • If the resources available with the regional headquarters/port authorities/other agencies/local action groups are inadequate, to mobilise all available and necessary resources and direct the same towards the concerned regional headquarters.
Regional Coast Guard Commanders	• Receiving reports of oil pollution. • Coordinating the activities of RCC when activated. • Keeping the Director General, Coast Guard apprised of developments. • Mobilising Coast Guard resources to support On

	Scene Commander action at spill area.
Indian Navy/Indian Air Force Authorities	• Augment aerial surveillance capability of Coast Guard as necessary in the area when oil spill has occurred. • To make arrangements for oil transhipment operations from any tanker which has caused or causing or is expected to cause oil spillage. • Promulgate general cautionary messages.
Directorate General of Shipping	• To assist Coast Guard on monitoring pollution from ships. • To keep the Ministry of Shipping apprised of the developments on receipt of information from Coast Guard. • Initiation of reports emphasized in Merchant Shipping Act, 1958 on receiving reports from Coast Guard regarding oil pollution. • Collection of evidence relating to oil pollution as envisaged in Merchant Shipping Act, 1958, and collating evidence collected by Coast Guard or other agencies relating to oil pollution with a view to prosecuting a polluter. • To take administrative and legal action for processing claims compiled by Coast Guard and other agencies relating to any other oil pollution incidents. • To serve as a legal advisor to the RCC/OSC in matters related to oil pollution and response. • To arrange for chartering of tankers when oil trans shipment operations are considered necessary by RCC. • To take whatever action is necessary to realize the claims from parties responsible for the oil spillage through the TOVALOP agreement or through any other manner.
Shipping Corporation of India	• To arrange for tankers or ships or tank barges for transport and collection of recovered oil. • To arrange for any personnel required to assist oil transhipment operation or to assist otherwise as may be required.
Ministry of Earth Sciences/Department of Ocean Development / National Institute of Oceanography	• To provide scientific support through Coastal Ocean Monitoring and Prediction System (COMAPS) Centre and Units in investigations of oil pollution monitoring during oil spills and also deployment of its research vessels for this purpose, whenever necessary. • To organize research on impact of pollution on marine life based on actual oil pollution incidents.
Ministry of Environment	• Determining policy for usage of dispersants in the

& Forests	sea areas of the territorial waters over which the state exercises jurisdiction.
Ministry of Agriculture/Department of Animal Husbandry, Dairying and fisheries	• To arrange for suitable fishing vessels on which oil dispersant equipment can be mounted if the local action group concerned is unable to mobilize this requirement locally.
Ministry of Petroleum and Natural Gas and Oil Agencies	• To assist for chartering of tanker/s when required by the regional headquarters in consultation with DG shipping for the oil transhipment operations • To make available to the regional headquarters concerned anti-pollution equipment and chemicals are available with them • To assist in the storage ashore of oil transhipped from wrecked or damaged tanker • To assist in the assessment of the value of the oil transhipped • To provide equipment and personnel resources and device on a range of issues, including oil characteristics and local industry resource availability • To depute an Industry Adviser to the MRC during response to a major oil spill.
Receiver of Wrecks	• To assist Local Action Groups in whatever manner necessary and possible • To take all actions necessary under Part XIII of the Merchant Shipping Act, 1958 (In this connection, the receiver of wreck shall consult the DGS, as and when required) • In situations where he has the local responsibility for certain actions and/or operations, he may authorise other agencies, which are better equipped.
Central Marine Fisheries Research Institute	• Assist in estimating the effect of oil spill to fish and livelihood of fishermen in the area • Assist in restoration of fishing in area after cleanup • Assist in estimating Economic loss due to ban of fishing in the affected area

8.7 MOBILISING OR PLACING ON STANDBY, RESOURCES REQUIRED

With the decision to raise the response level, a review of existing oil spill response capability and additional infrastructure requirement will be done simultaneously. Once it is judged that additional resources are required, the concerned agencies are to be alerted immediately, and mobilization action for those equipment/items will be initiated.

Following is to be planned simultaneously:

- Additional manpower to operate these equipment

- Material handling equipment and manpower to unload/load this equipment at required places
- Accommodation and food arrangements for these personnel.

8.8 ESTABLISHING FIELD COMMAND POST AND COMMUNICATIONS

For response above Tier I, CEC, OSC and IMT team members will be working under the direction of CG who takes over the operations. After this the CEC will take directives from these superior entities, and will also keep ECC informed if ECC and CG/ OSRL /EARL command centers are different.

9 CONTROL OF OPERATIONS

9.1 ESTABLISHING THE INCIDENT MANAGEMENT TEAM

9.1.1 Responsibility

CIC is responsible for activating the IMT and for allocating functions to each IMT members in coordination with OSC.

Each appointed Officer, Manager or Coordinator should identify their respective need of resources including the staff and inform the same to CIC.

On approval by the CIC, each Officer/Coordinator should appoint staff or request allocation of staff through the In-charge of Logistics services.

Staffing requirements may need to be reassessed depending on the development of the situation and accordingly resources may be reallocated.

9.1.2 Registration and Induction

All non-SMPK IMT members should register/record their presence with the Administration Section.

All members of IMT and contractors should be given appropriate training on oil spill response and Health & Safety.

9.2 REVIEWING AND PLANNING OPERATIONS

9.2.1 The Operations Function

The Operations function encompasses all "field" operations in the response (see Figure 5.3 and Table 5.2):

- Marine response (para 3.3 & 3.4- Response for Oil and HNS spill on water).
- Shoreline response (para 3.5).
- Health and Safety (para 9.2.4).
- Wildlife Response (para 9.2.5).
- Waste Management (para 3.6).

9.2.2 Responsibility

A pre-designated Emergency Operations Officer (EOO) should be appointed under OSC.

The role of EOO is as follows:

- Implementation of induction procedures.
- Participation in the planning process (para 8.4).
- Ensuring that adequate communications are provided.
- Arrange for allocation of resources as per planned priorities.
- Ensuring effective field site control (Procedure SMPK-C in **Appendix A**).
- Provision of adequate levels of supervision.
- Documentation & Information management (para 8.4.3).

9.2.3 Priorities

The main response strategies and action priorities are indicated in Figure 9.1.

- Natural dissipation of the slick.
- Marine response-containment and recovery.
- Use of dispersants.
- Shoreline protection.
- Shoreline Cleanup.
- Natural weathering of oil and recovery of impacted shorelines.

9.2.4 Health and Safety

9.2.4.1 Responsibility

The OSC is responsible for ensuring that response activities are carried out safely.

The OSC/CIC may appoint a Medical & Occupational Health Coordinator (M&OHC) to manage Occupational Health and Safety.

9.2.4.2 Health and Safety Briefing

The M&OHC is responsible for providing response-specific health and safety briefing for all IMT personnel.

9.2.4.3 Material Safety Data Sheet (MSDS)

All personnel handling chemical products should be issued with the relevant MSDS. The M&OHC or other delegated person must ensure that this is done and that personnel are aware of the safe materials handling procedures and personnel protective equipment needed.

9.2.5 Wildlife Response

9.2.5.1 Responsibility

Managing the cleanup, care and rehabilitation of oil affected wildlife is the responsibility of NGOs & other wildlife organizations including local forest and environment authority/body.

The CIC should contact the organizations as above in the event that oil affected wildlife is observed or considered likely.

9.2.5.2 Wildlife Response Unit

Wildlife response requires availability of people with specialized training and which should be available with agencies as mentioned above.

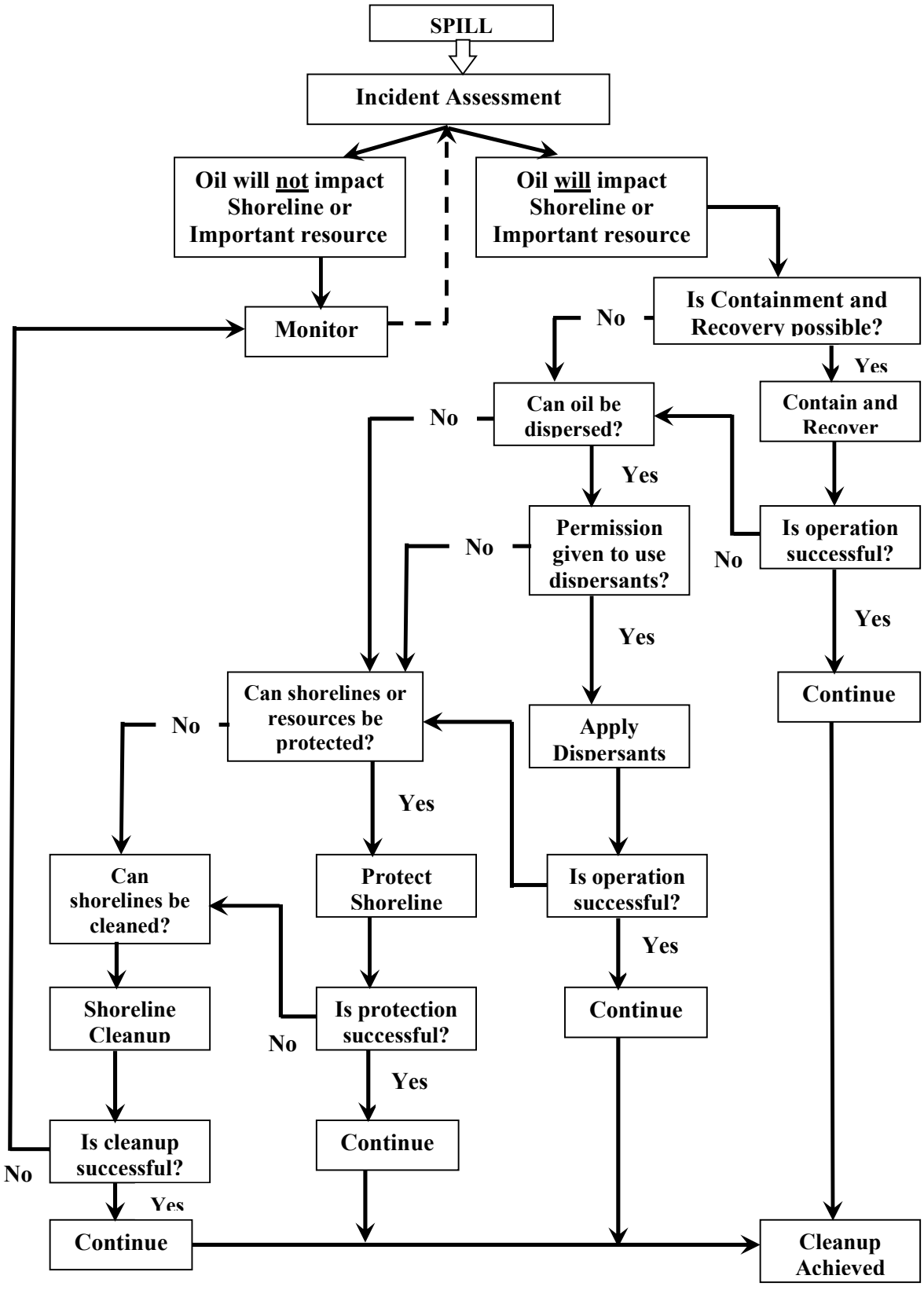


Figure 9.1: Generic Guidelines for Determining Response Strategies

9.3 MONITORING

9.3.1 Responsibility

Monitoring (or surveillance) of slicks or spill on land and water is usually based on:

- Carrying out prediction model analysis, and
- Visual surveillance and Sampling.

9.3.2 Monitoring Objectives

Monitoring may be undertaken to determine the:

- Trajectory,
- Volumes, and
- Weathering state of oil slicks.

This is done to predict potential impact on sensitive resources and to assess the suitability of response strategies.

9.3.3 Strategies

9.3.3.1 Use of Vessels

Vessels can be used to monitor an oil slick but determination of slick size is difficult. Vessels should be used to:

- Confirm shoreline oil impact in areas not clearly seen from the air (e.g. mangrove fringes), and to
- Collect samples of the oil.

9.3.3.2 Use of Aircraft

Aerial surveillance should be requested from Coastguard, if the same is felt necessary by the CIC.

A trained observer will normally be present on surveillance aircraft to identify oil on the water or shoreline and to accurately report location to the CIC.

Photographs should be taken to aid detailed analysis and assessments.

9.3.4 HNS Spills

Many HNS spills will be difficult or impossible to observe with the naked eye and it is essential that an appropriate monitoring strategy is put in place to ensure the safety of responders and to confirm predictions of the spread and dispersion of the slick. The type of monitoring implemented will depend on the specific properties and hazards posed by the substance involved.

9.3.4.1 Monitor the presence of gases in air

In some circumstances, no active response measures would be appropriate because it is too late for active response and the gas has already dispersed into the air. In this case, monitoring the residual gas cloud as it disperses into the air may be the most appropriate response.

The primary objective of trace air monitoring is to identify the areas where unprotected personnel or members of the public should be evacuated.

Three parameters should be monitored when entering a potentially hazardous area

- Oxygen concentration;
- Combustible or explosive gas levels, and
- Toxic substance

Table 9.1: Types of person-portable detectors used for monitoring HNS in air

Parameter	Objective	Type of detector
Oxygen concentration (%) (v/v)	To identify oxygen-deficient (less than 19.5%) or oxygen-rich (more than 23%) areas, 20.9% being the normal value. An oxygen-deficient atmosphere requires the responder to have supplied air (SCBA).	Oxygen cells
Combustible or explosive gas levels (%gas or %LEL)	To identify areas where flammable air/ fuel mixtures may exist. A value below 10% of the LEL is considered safe.	Combustible gas detectors, or explosimeters
Toxic substances	To establish the areas where toxic substances are present and to monitor their levels. The concentration allows the delimitation of the exclusion zone.	Trace-gas analyzer, colorimeter tube.

Response personnel should be trained and familiar with the functioning of the instruments. The measurement should be carried out from outside the gas free area, inwards towards the site of the incident. The boundary line of the exclusion zone should be where a first positive reading is recorded. A map of the exclusion zone area should be defined from further sampling around the site of the accident.

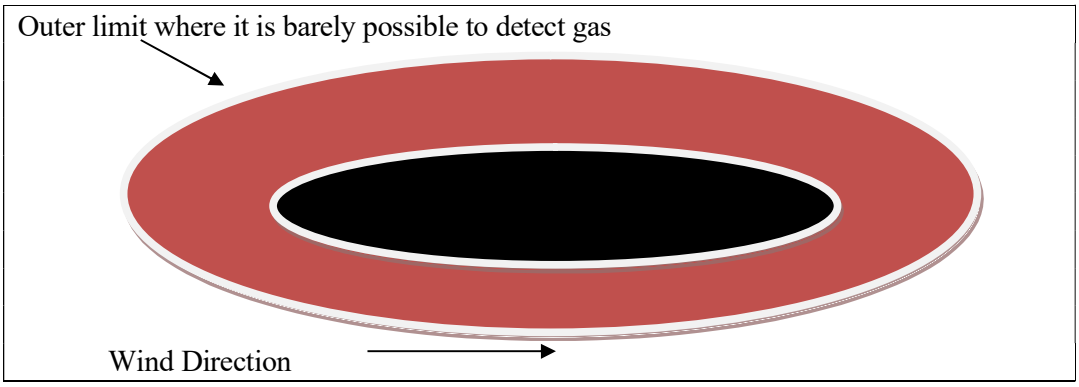


Figure 9.2: The outer limit of measurable concentrations and the area of gas concentrations which are dangerous to health (Source: HELCOM Combating Manual, vol-III)

9.3.4.2 Monitoring the water column

Monitoring the concentration of chemicals in the water column typically involves two main techniques:

• Collecting water samples – these are then transferred for analysis in laboratories;

• Use of towed probes – a number of monitoring devices can be towed through the water column to establish the extent of a slick and to provide real-time data.

Typical measurements include: pH, light absorption, electrical conductivity.

9.3.4.3 Monitoring sunken spills

When a pool of liquid chemical settles on the seabed/riverbed, there will be a phase boundary between the chemical and the water. It may be possible to use echo sounders to locate this phase boundary and hence to identify the area affected by the spill. Monitoring of the concentration of the spilt substance at different depths may also be

useful to delineate the area affected.

9.3.4.4 Monitoring surface slicks

A few techniques have been developed for monitoring purpose:

• Side-Looking Airborne Radar (SLAR) makes use of the reduced intensity of the backscatter and the surface slick appears as a darker area on the SLAR image;

• UV scanners can identify changes in the UV reflectivity of the water surface;

• IR scanners and Forward-Looking Infrared Imagers (FLIR) identify changes in the radiation temperature of the water surface.

The effectiveness of these techniques differs depending on the properties of the chemical involved and the environmental conditions. Understanding the available resources and their applicability is a key part of the contingency planning process.

9.4 OBTAINING ADDITIONAL EQUIPMENTS, SUPPLIES AND MANPOWER

The equipment for combating Tier 1 spill is already available. MoU between SMPK and oil companies should be in place to provide necessary aids including

- Spill response equipment at appropriate locations,
- Trained industry response personnel.

9.5 PREPARING DAILY INCIDENT LOG AND MANAGEMENT REPORT

During daily operations, every person in ECC, OSC and his IMT members are to fill up personal logs e.g., running hrs of the equipment. At the end of the day a daily summary of events shall be prepared and submitted to the ECC, and the consolidated report to be forwarded to the CIC.

This report may cover following aspects:

- Present location,
- Number of manpower deployed,
- Equipment deployed,
- Weather conditions encountered,
- Amount of oil recovered from sea/river,
- Amount of oil transferred for storage /disposal,
- Progress on shore cleaning efforts (as the case may be),
- Difficulties encountered.

9.6 PREPARING OPERATIONS ACCOUNTING AND FINANCIAL REPORT

The financial aspect will be looked after by Finance & Account Department. It is advisable that a representative is always in the ECC to take stock of the situation and prepare the accounts and reports on day-to-day basis.

9.7 PREPARING RELEASES FOR PUBLIC AND PRESS CONFERENCES

As per para 8.5 only authorized person is to issue / release information to public and press.

10TERMINATING THE RESPONSE

10.1 RESPONSIBILITY FOR TERMINATING THE RESPONSE

The decision to terminate a response is taken by the CIC in consultation with the CEC (Tier-1) or CMG and/or Coastguard officers for (Tier-2/3).

10.2 CONDITIONS FOR TERMINATION

10.2.1 Marine Response Operations may be terminated when:

- Oil has been recovered to the extent practicable; or
- The surface oil slick has broken up; or
- The oil slick has gone out to sea and is beyond the range of response options, and is unlikely to return; or
- Oil has impacted shorelines and is no longer on the water.

In the last case **marine response** resources must remain on standby and equipment maintained at the ready until **shoreline response** operations have been completed.

10.2.2 Shoreline Response Operations may be terminated when:

- All accessible shorelines are clean to the extent practicable.
- Cleanup is having no further net beneficial effect or having a deleterious effect on the shoreline or associated plants or animals.

Cleanup operations may be terminated **only** upon the instruction of the **WBPCB.**

10.2.3 Land Spill Response Operations may be terminated when;

- Chemical has been recovered to the extent possible,
- Area has been declared “risk or hazardous” free,
- Source of leakage is stopped and the condition of the area is safe for operation.

10.3 STAND-DOWN PROCEDURES

10.3.1 Return of Equipment

Upon completion of the response, the OSC/IC (or delegate) will:

- Arrange recovery of all equipment and unused materials.
- Ensure that all equipment is cleaned.
- Ensure that all equipment is returned to the owner.

10.3.2 Debrief

The CIC/OSC may hold a post-spill debriefing. Debriefing should address:

- Spill causes (if known) and future prevention methods.
- Speed of response activation.
- Effectiveness or suitability of strategies, tactics and equipment.
- Health and Safety issues (if any).
- Any other issues required to be communicated.

10.3.3 Incident Report

The CEC and COMDIS-8 may request CIC to prepare an Incident Report.

10.4 COST RECOVERY

All records of costs should be collated for submission to the relevant insurer. For expenses incurred assisting third parties, costs record should be kept and submitted to relevant authority.

11RECORDKEEPING AND PREPARATION OF CLAIMS

11.1 RECORDKEEPING

A complete record of the incident and associated response will be logged (including decisions made and the reasons for them). A detailed and comprehensive set of records will be kept.

They will be used to serve as a basis from which reports/press releases are prepared; support claims for the recovery of expenditure; be used as a reference as to what is taking place during Port incident; provide information to reconstruct events; form the backbone of any legal proceedings. A log sheet should be started as soon as port operations receives notification of a spill and from that point on all messages and events with action taken should be noted in chronological order.

When key decisions are made the reason for it should also be noted and when dealing with external organizations if a decision is disagreed with this too should be recorded. This applies to Local Authorities, environmental bodies' vessel owners and especially ITOPF. Applicable details of expenditure should also be noted if this information is known.

Any information recorded on a sheet other than the incident log should be attached to the log sheet. No bits of paper should be thrown away. It is seen as not appropriate to provide different forms for different information as this will become fragmented formats used for record keeping as suggested below. However, the same can be suitably modified by users depending on the requirement of the emergency.

FORMAT

Report on Dispersant Use

Incident No..... Date.....

Volume and Type of Oil.....

Location.....

Remedial Action Taken.....
.....
.....
.....

Dispersant Make.....

Date of Manufacture.....Efficacy last tested on.....
(If applicable)

Amount Used.....

Comments on Effectiveness
.....
.....
.....

Date of Report.....Time of Report.....

Report Made by

..... (Print Name)..... (Sign)

Other Remarks.....
.....
.....
.....

Pollution Site Survey Report Form					
Location:			**Date:**	**Time:**	
Contact Name/Designation:			**Telephone:**		
Visual Appearance of Oil Pollution					
Black ○			**Brown/Reddish Brown** ○		
Physical Appearance of Oil Pollution					
Liquid ○		**Viscous/Semi Solid** ○		**Solid** ○	
Additional Comments					
Polluted Area					
Harbour/Dock ○		**Estuary** ○		**River** ○	
Offshore ○		**Vicinity of Water Intake Pipes** ○			
Additional Comments					
Pollution Coverage					
Extent	**Large continuous slick**		**(90-100%)**		
	Intermittent medium-sized patches		**(50-90%)**		
	Lightly scattered		**(0-50%)**		
Dimensions	**Length (m):**		**Average width (m):**		
	Average thickness (cm):				
Estimated Volume (multiply by percentage cover)					
Length * Width * TH/100 m^3 (tonnes)					
Additional Comments					
Movement of Oil on Next tide will					
Carry pollution out to sea/river ○			**Carry pollution towards shore** ○		
Additional Comments					
Access to polluted area for recovery equipment and/or vehicles					
Is access	**Easy** ○		**Difficult** ○		
If difficult, what improvement could be implemented?					
Comments					
Suitability of location for parking/storing equipment in vicinity					

Equipment	**Available**	○	**Not Available**	○
Security	**Possible**	○	**Unlikely**	○
	Requires Special arrangements			○
Comments				
Facilities in vicinity for temporary storage of recovered oil				
Available	○		**Not Available**	○
Requires Special measures to be taken	○			
Comments				
Estimate of Quantity collected for Final disposal options				
Liquid waste			**Emulsified**	
Liquid waste			**Demulsified**	
Oiled Debris				
Quantity of Dispersant used				

Format – Incident log Sheet

Incident Log Sheet					
Date		**Incident**		**Location**	
Time	**Message or Event**		**Action**		

Format – Sampling Record Sheet

Collection of Oil samples (This form is to be completed by the person taking the sample)		
a.	ID number – yr/month/day	
b.	Sample description	
c.	Location of sample – grid ref. if possible	
d.	Date and time of sampling	
e.	Purpose for which sample was taken	
f.	If known, suspected source	
g.	Were dispersant used?	
h.	Method of sampling (device)?	
i.	Name, address and tel. no of the person taking sample and any witnesses	
If possible the following information would also be helpful		
j.	Wind speed and direction	
k.	Air and water temperature	
l.	Sample description, viscosity, colour, any contaminates	
m.	Description of the oil spill, distribution and consistency	

11.2 CLAIMS (Source: CGBR 774)

1. The Government of India has ratified payment of compensation conventions adopted by IMO that provides relief to the persons affected by oil pollution from ships flying foreign flags within the territorial waters of India. In order to assist the affected persons due to this oil pollution, international established guidelines for presenting claims under various categories are summarized below for your appropriate action.

2. DG shipping will be the coordinating authority in respect of oil pollution claims.

Possible scope of compensation covered under the ratified conventions and Indian Merchant Shipping Act is as described below:

a) **Clean-up operations at sea/river and on shore** - are considered as preventive measures. Compensation may be payable for the cost of measures to combat oil at sea/river, to protect marine resources vulnerable to oil, to clean shore lines and to dispose off collected oil/oily waste.

   Presentation of claims - It is essential for the claimant to submit cost of cleanup and damages with supporting documents showing how the operations are linked with actions taken (spreadsheet example given below). Specific information pertaining to claims is itemized as below:

   i. Delineation of the area affected by using maps or nautical charts, supported by photographs, video tapes or other recording media.
   ii. Analytical evidence such as chemical analysis of oil samples, relevant wind, tide and current data observation and plotting of floating oil movements.
   iii. Summary of events, including a description and justification together with an explanation of why the various working methods were selected.
   iv. Dates on which work was carried out at each site.
   v. Labour costs including overtime.
   vi. Travel, accommodation and living costs for response personnel.
   vii. Equipment costs at each site.
   viii. Cost of replacing equipment damaged beyond reasonable repair.
   ix. Consumable materials (description, by whom supplied, quantity, unit cost and where used).

b) **Property damage -** reasonable cost of cleaning, repairing or replacing property contaminated by oil may be compensated.

   Presentation of claims - It is essential for claimant to submit evidence of the damage to their property with supporting documents confirming that repairs, cleaning or replacement have been undertaken. Specific information pertaining to claims is itemized as below:

   i. Extent of pollution damage to property supported by photographs and other evidences.
   ii. Cost of repair work

iii. Age of damage item replaced.
iv. Cost of restoration such as repairs of roads, piers etc.

c) **Economic loss in the fisheries and fish processing sectors etc. -** Compensation may be payable for loss of earning by the owners of property contaminated by oil.

Presentation of Claims –

i. The geographic proximity of business activity to the contaminated area.
ii. Degree to which business economically depended.
iii. The extent to which claimant had alternative source of supply.
iv. Extent to which the claimant's business forms and integral part of the economical activity.
v. Nature of loss or alleged loss due to contamination.
vi. Monthly break down of income for the period of loss and over the previous three years.
vii. Monthly break down of quantity of each marine product caught, harvested or processed.
viii. Said overheads and methods of calculation of loss.

d) **Economic loss under tourism sector** – Claims for such economic loss may qualify for compensation only if loss was caused by contamination.

i. The geographic proximity of business activity to the contaminated area.
ii. Degree to which business economically depended.
iii. The extent to which claimant had alternative sources of supply.
iv. Extent to which the claimant's business forms and integral part of the economical activity.
v. Nature of loss or alleged loss due to contamination.
vi. Monthly breakdown of income for the period of loss and over the previous three years.
vii. Monthly break down of quantity of each marine product caught, harvested or processed.
viii. Details of changing in capacity of business occurred and during the previous three years.
ix. Said overheads and method of calculation of loss.

e) **Cost of measures to prevent pure economic loss** – Such economic loss may qualify for compensation only if the measures are reasonable.

Presentation of claims –

i. Details of nature, purpose, timings and target group for marketing activities.
ii. Detailed breakdown of the cost of any marketing strategy.
iii. Details and cost of normal marketing strategy and campaigns if any.
iv. Result of the additional marketing activities.

f) **Environmental damage and post spills studies** – Acceptable claims for economical loss due to environmental damage may include reduction in revenue for a marine park or reduction in catches of commercials spices of marine product directly affected by the oil.

Presentation of claims-

i. Delineation of the area affected by using maps or nautical charts, supported by photographs, video tapes or other recording media.
ii. Analytical evidence such as chemical analysis of oil samples, relevant wind, tide and current data, observation and plotting of floating oil movements.
iii. Details and results of any studies undertaken.
iv. Detailed description of any reinstatement measures undertaken.

11.3 THE ROLE OF THE P & I CLUBS WITH REGARD TO MARINE CASUALTIES

Protection and Indemnity Associations or P & I club exist to provide ship owners with insurance for liability they may incur to third parties. Meaning, in this context, anybody other than the insured ship-owner approximately 85% of all ocean-going ships are entered in protection and Indemnity Associations. In the case of tankers, the figure is closer to 95%.

The risk covered by P & I Clubs are numerous and do include oil pollution liabilities. The intergovernmental regimes and voluntary industry agreements which cover compensation and liability for tankers have been covered. However, other ships can cause oil pollution from leakage of bunkers fuel.

In a typical serious casualty., the ship-owner is faced with a number of immediate and urgent problems which include the decision as to whether or not to attempt salvage of the ship and cargo or to dispose of either or both as simply as possible, causing the least possible amount of further damage. If oil has been spilled the owner may be required to take immediate action to deal with the ensuing pollution. A P and I Club, though its local correspondent, will provide advice on the ship owner's rights and duties and negotiate on the ship owner's behalf with the appropriate authorities to take fast and effective action to minimize the damage and subsequent liabilities. At a later stage the Club will assist in determining eventual liability for the damage and the extent of the compensation.

One important principle is that the ship-owner must pay the claim in the first instance and only then claim reimbursement from the P & I Club. As a general rule, the P & I Club will not pay claimants direct. there may be exceptions, for example, in case of oil spills from tankers when the Liability Convention applies, and also when the P & I Club has given a letter of undertaking providing a guarantee of payment of the ship owner's liabilities, but in most cases the P & I Club still insists that the principle should be maintained that the ship-owners pay first.

Note: -
Additional details may also be obtained from IMO Manual on oil pollution-II Contingency plan.

Example spreadsheet: (Source: ITOPF –Preparation and submission of Claims from Oil Pollution)

Grounded Bulker Oil Spill – Cost incurred									
Equipment and Consumable	Use/ Standby	Rate	Day					Total Use/ Standby	Cost
			1	2	3	4	5		
Workboat (Details)	In- uses	500/ day	1	1	1		1	4	2000
	Stand by	250/ day				1		1	250
Inflatable Boom (Details)	In-Use	8/m/ day	200	200	200	200		800	6400
	Standby	3/m/ day					200	200	600
Skimmer (Details)	In-Use	250/ day	1	1	1	1		4	1000
	Stand by	125/ day					1	1	125
Subtotal cost of equipment									**10375**
Sorbent Boom		15 metre		25		25		50	750
1 tonne bag		8 each	5	5	5	5	5	25	200
Subtotal cost of consumables									**950**

Example spreadsheet detailing the use of equipment and consumables during 5 days of response. Each item of equipment is shown when in use and on standby with an appropriate rate differential. Consumable items are shown when used. Consumable items brought to site but not used are not included.

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SECTION III
DATA DIRECTORY

APPENDIX A
OPERATING PROCEDURES

Operating Procedures (OP's) provide guidelines and checklists for actions to be taken during a major oil spill response. Frequently occurring smaller oil spills may be handled based on prudence of the personnel and this procedure may not require to be strictly followed.

Note: *It may be noted that the given procedures are meant for the purpose of guidance only. The actual actions should be appropriate to the reality of the situation. It is expected that all concerned personnel of SMPK remain aware of availability of the procedures.*

Table A.1: List of Operating Procedures

PROCEDURE SMPK-A	ESTABLISHING THE SMPK EMERGENCY CONTROL CENTRE (ECC)	APPENDIX A

The ECC will be located in the Jawahar Tower Administrative building, HDC or as directed by the CEC. At KDS, ECC will be located at Subhash Bhavan or as directed by the CEC. For small scale or short duration responses, the local ECC will be used inside the port. For larger scale responses, where external help is needed the Main Office Area will be utilized along with local ECC.

Task			Action	Status
1.0			Obtain and/or assign ECC equipment.	
1.1			Communications.	
	a		Telephone lines.	
	b		Fax lines.	
	c		Radio frequency (as required).	
1.2			Information Display.	
	a		Set of forms (minimum of 5 sets).	
	b		Regional Maps and Charts:	
		i	Nautical charts.	
		ii	Topographic maps	
	c		Overhead projector (in nominated briefing room).	
	d		Whiteboards.	
1.3			Stationary: Markers, Pens, Pencils and A4 white paper.	
1.4			Computer and Printer.	
1.5			Copy(s) of the SMPK OSCP and DMP	
1.6			Tables and chairs	
1.7			Order and obtain any items needed (1.1-1.6)	
1.8			Advise telephone operator to direct incoming calls to the ECC.	

END OF PROCEDURE A

PROCEDURE SMPK - B		PLANNING MEETING SCHEDULE & PREPARATION OF THE INCIDENT ACTION PLAN (IAP)		APPENDIX A
Phase/ Task		**Action**	**Responsibility**	**Check**
Meeting	1	Briefing on situation.	CIC or others as nominated.	
		a — Current situation:		
		a — i — Spill size & location		
		a — ii — Response Tier &/ resources mobilized		
		b — Predicted situation:		
		b — i — Trajectory		
		b — ii — Resources at potential risk		
	2	State Aim of Response.		
	3	Develop and rank response objectives based on protection priorities.	CIC	
	4	Develop Strategies and Tactics.	CIC and all Coordinators	
	5	Identify necessity for obtaining any permit (e.g. dispersant use).	CIC	
	6	Prepare Draft Incident Action Plan.	CIC	
	7	Determine need and location of Advanced Operations Centers or Staging Areas.	CIC and all Coordinators	
	8	Approve and Document IAP.	CIC	

Process to be repeated in case of any change in scenario, objectives, strategies or tactics.

END OF PROCEDURE B

PROCEDURE SMPK-C	SITE CONTROL PROCEDURE	APPENDIX A

Site Control should be established for every site where access is to be controlled. This includes the ECC, sites of shoreline cleanup, waste storage, response vessel mooring areas or any site containing hazards or hazardous materials

Task		Action	Status
1		Identify perimeter of the "Hot" (secure or prohibited) zone. This may be:	
	i	Oiled shoreline. (***Note:*** *This zone should contain all hazards and sensitive areas where access should be restricted*).	
	ii	Response vessels.	
	iii	Area around the slick.	
	iv	ECC	
2		Identify the "Hot" zone perimeter by sign-posting or establishing a cordon	
3		Identify the "Warm" (exclusion, controlled or support) zone. (***Note:*** *This is a non-contaminated/ non-hazardous zone*). For e.g.:	
	i	Berth/Jetty.	
	ii	Any water area established to exclude non-response vessels.	
	iii	Area behind beach including all areas used for support.	
4		Identify the "Warm" zone perimeter by sign-posting or establishing a cordon	
5		Establish any required "Hot" zone perimeter facilities. For example (i) and (ii) this may include:	
	i	Decontamination facility.	
	ii	Temporary waste storage.	
6		Establish "Warm" zone perimeter facilities. Generally, this is site security.	
7		Establish support facilities within Warm zone as required	

Note 1 Entry to a Hot Zone should be restricted to:

- Personnel involved in the on-site work.
- Personnel equipped with appropriate protective gear.
- Personnel who have undergone appropriate training and induction.

Note 2 The Warm Zone surrounds the Hot Zone and is generally:

- The area from which personnel and equipment are deployed.
- The perimeter where site control is exercised i.e. the entry points to the Hot Zone.
- Restricted to those people who operate in the Hot Zone and those who support them.

Note 3 The Cold Zone is all public or otherwise unrestricted areas, i.e. those areas outside of the controlled site.

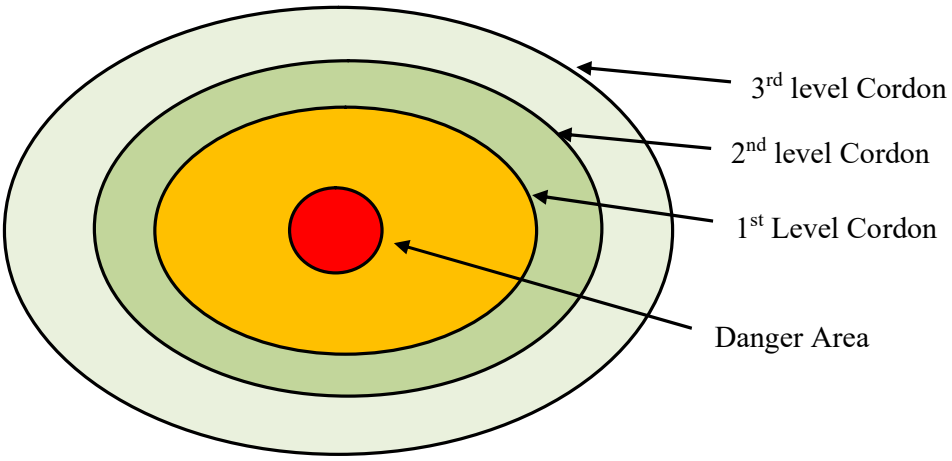


Figure A.1: Isolation of Danger Area

- Danger/Hazardous area
- 1st Level Cordon off
- 2nd Level Cordon off
  - Site Control point
  - Ambulance
  - Casualty Clearing point
- 3rd Level Cordon off
  - Traffic Control

Note: *Positions will depend on the wind directions*

END OF PROCEDURE C

PROCEDURE SMPK-D	SAMPLING AND SAMPLE CONTROL PROCEDURES	APPENDIX A

This procedure is for the purpose of oil spill response only and is not for any legal and/or prosecution purposes.

Task			Action	Status
1	Establish reason for sampling and obtain any specific sampling requirements from the receiving laboratory. In particular:			
	a		Number of replicate samples.	
	b		Type of container.	
	c		Volume of sample needed.	
2	Sampling from the surface of water:			
	a		Thin films:	
		i	Use sorbent discs/pads made from glass wool, teflon (PTFE) wool or stainless-steel gauze.	
		ii	Applied lightly to the water surface and then placed inside an airtight container for transport to the lab.	
	b		Thick slicks:	
		i	In the absence of specialized equipment, collect sample using clean buckets or wide-necked jars.	
3	Sampling from solid surfaces			
	a		Viscous oils and tar-balls can be scraped off surfaces using clean steel or wooden spatulas or spoons, and placed into sample containers.	
	b		Oil adhering to sediment, seaweed, small pieces of wood, plastic materials or other debris may be collected by placing the oil and substrate material, into the sample container	
4	Place each sample into a container			
	a		Clean glass jars or bottles (150-500ml) with caps made of teflon (PTFE).	
5	Label each sample container with:			
	a		Identification number.	
	b		Date and time of sampling.	
	c		Description of sample and location of collection point.	
6	Send copy of the sample record to the laboratory.			
7	Store sample:			
	a		In refrigerators or cold rooms.	
8	Transport samples safely.			

Note: *Oil samples should not be taken by washing oil from surfaces*

END OF PROCEDURE D

APPENDIX B
NET ENVIRONMENTAL BENEFIT ANALYSIS

B.1 Introduction

Net Environmental Benefit Analysis (NEBA) is a structured approach used by the response community and stakeholders during oil spill preparedness planning and response, to compare the environmental benefits of potential response tools and develop a response strategy that will reduce the impact of an oil spill on the environment.

The NEBA process comprises of four stages as follows:

1. **Compile and evaluate data** to identify an exposure scenario and potential response options, and to understand the potential impacts of that spill scenario.
2. **Predict the outcomes** for the identified scenario, to determine which techniques are effective and feasible.
3. **Balance trade-offs** by weighing a range of ecological benefits and drawbacks resulting from each feasible response option. In some cases, this will also include an evaluation of socioeconomic benefits and costs resulting from each feasible response option.
4. **Select the best response options** for the given scenario, based on which combination of tools and techniques will minimize impacts.

B.1.1 Stage 1: Compile and evaluate data

The data are directly linked to the planning scenarios under consideration, and include the following:

B.1.1.1 Types of oil likely to be spilled

Table B.1: Properties of Oil handled at SMPK

Sr. No.	Type	Specific gravity	Viscosity (cSt)	Pour Point (^{0}C)	Flash point (^{0}C)
1.	Crude Oil	0.8	4 at 40^{o}C	-15	-5
2.	Diesel Oil	0.85	2 at 38^{o}C	-32	55
3.	Bunker Oil	0.99	211 at 50 ^{o}C	15	98

B.1.1.2 Previous incidents

In the past few incidents have been reported in and around the vicinity of port limit.

Table B.2: Incident history

Sr. No	Year	Vessel	Location	Incident
1.	February 1992	MV Wash	New Moore Island	
2.	June 1997	MV Green Opal	Hoogly river	
3.	July 2000	MV Prime Value	off Sagar Island	
4.	July 2001	MV Lucnam	Hoogly River	1305/Diesel Oil
5.	May 2003	MV Segitega Biru	Off Haldia (145 T of FFO);	
6.	March 2007	MT Jagpreet	HDC	Grounding
7.	July 2007	MV Vernal Grace	Off Budge Budge	Grounding
8.	July 2007	MV Rajapur -I	Off Budge Budge	Grounding
9.	August 2007	Barge BB-1142	Off Nayachar island	Sinking
10.	March 2008	MV CS Signe	Budge Budge Harbour	Grounding
11.	June 2008	Barge MV Nilan	Hooghly riverbed at Nurpur near Diamond Harbour	Sinking
12.	September 2009	MV City and dredger		Collision while negotiating low draft areas
13.	November 2010	MV Tiger Spring and MV Green Valley	Near Diamond Harbour	Collision, Small spill
14.	2011	MV Ratna Urvi	Contact with jetty	Small spill
15.	October 2013	MV Bing		Wrecked during Cyclone Philine
16.	June 2018	MV SSL Kolkata		Container vessel reported a fire onboard
17.	March 2022	MV Marine Trust 1	NSD berth 05	Capsize

B.1.1.3 Resources at risk

The port limit includes sensitive areas such as sandy beaches, salt marshes, sand dunes, salt pans, mudflats, mangroves, industrial water intake, considerable number of marine species comprising of coastal vegetation, river dolphin, terrapin, organisms, fisheries and birds.

The coast occupies two coastal districts viz, South-24 Parganas, and East Midnapur. The South-24 Parganas has a magnificent mangrove (Sundarbans) on the eastern part and the East Midnapur has an open coast (Digha-Shankarpur) on the western part of West Bengal coast.

The estuary happens to play a major role in fish breeding, which happens to be the nursery ground for the fishes that migrate and lay eggs in this zone.

The marine fishery of West Bengal mainly focused on these two districts. About 380,138 people (as per 2010 census) are directly or indirectly related with the marine fishery. The total number of fishing villages and fisherman families are 188 and 76,981, respectively. The state of West Bengal having a coastline length of 158 km has ecologically sensitive areas, large riverine system and few beaches.

There are five fishing harbours, viz. Sankarpur (Champa River), Petuaghat (Rasulpur river), Sultanpur, Kakdwip (Hooghly River) and Frazergunj (Edward creek) and 78 major and minor fish landing centres in the state.

In South 24-Parganas district of West Bengal, fish landing centres in estuary zones are eight in number and the marine sector fish landing centres are 29 in number. In East Midnapur district of West Bengal, no estuarine fish landing centres are present.
The list of fishing villages and fish landing centres in and nearest port limit are as follows

Table B.3: List of Fish landing sites – District South 24 Parganas

Sr. no.	Fishing Harbour	Location
1.	Nurpur	Diamond harbour
2.	Raichak	Diamond harbour
3.	Hanra	Kulpi
4.	Rangafala	Kulpi
5.	Akshaynagar	Kakdwip
6.	Gangasagar	Sagar
7.	Beguakhali	Sagar
8.	Chemaguri	Sagar

Table B.4: List of Fish landing sites – District Purba Medinipur

Sr. no.	Fishing Harbour	Location
1.	Haripur	Mankaraiput, Contai
2.	Junput	Biramput, Contai
3.	Bhogpur	Bankiput, Contai
4.	Bankiput	Bankiput, Contai
5.	Gorahar	Katkadebichak, Khejuri
6.	Boga Ferryghat	Boga Khejuri
7.	Nijkasba	Nij Kasba, Khejuri

8.	D. Kalagechia 28	D. Kalagechia,Khejuri
9.	Nankar Gobindpur	Washilchak,Khejuri
10.	Thanaberia	Thanaberia,Khejuri
11.	Arakbari	Arakbari,Khejuri
12.	Kadirabadchar ChurSaheb	Kadirabadchar ,Khejuri
13.	Kadirabadchar Ma Ganga	Sahebnagar

Table B.5: List of Fishing villages/hamlets along coast– District South 24 Parganas

Sr. no.	Fishing village/hamlets
1.	Nurpur
2.	Diamond Harbour
3.	Kulpi
4.	Tengrabichi
5.	Kakdwip
6.	Namkhana
7.	Frazerganj
8.	Raichak
9.	Kulpi Nadirghat
10.	Rangafala
11.	Akshaynagar
12.	Gangasagar
13.	Beguakhali
14.	Chemaguri
15.	FaIta

Table B.6: List of Fishing villages/hamlets along coast– District Purba Medinipur

Sr. no.	Fishing village/hamlets
1.	Khadalgobra
2.	Digha Mohana
3.	Mandarmonisilampur
4.	Haripur
5.	Junput
6.	Bankiput
7.	Dahasonamul
8.	Boga Ferryghat
9.	Nijkasba
10.	Thanaberia
11.	Arakbari

12.	Kadirabadchar Chur Saheb
13.	Kadirabadchar Ma Ganga
14.	Gangrachar
15.	Geonkhali
16.	Haldia
17.	Digha Mohana

Sunderbans

The Hooghly-Matlah estuarine complex supports one of the world's most luxuriant mangrove vegetation's viz. the Sunderbans mangrove forests. Mangrove swamps and backwater of the Sunderbans form fertile source of support to much of coastal West Bengal, the most important property of which is that it tends to accrete and extend the coastline. The forest resources of deltaic Sunderbans are used for firewood, timbers, food-resources, recreation and navigation. The benthic planktonic forms of the estuarine system, on which depend many migratory shoals of commercially important fish, shrimps, prawns and other edible sea animals.

Sunderbans houses a national park and tiger reserve. About 258,477 ha of the Indian Sunderban, including almost all of the mangrove forest, were declared a Tiger Reserve in 1974 under Project Tiger. This region adjoins the Sunderban Wildlife Sanctuary of Bangladesh. The park and the tiger reserve are situated among the estuarine mangrove forests which is most suited to the tiger. Conservation of tiger and ridley sea turtles has also been undertaken by a project. The main wildlife include tiger, saltwater crocodile, estuarine and marine turtle, different species of birds and gangetic dolphin.

The Sunderban supports a major inshore and estuarine fishery; the fishing season lasts 4 or 5 months, and more than 10,000 fishermen are engaged in the fishing operations. There are many brackish water aquaculture farms (bheris) particularly in the northern part of the delta.

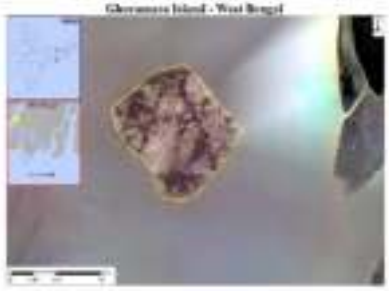
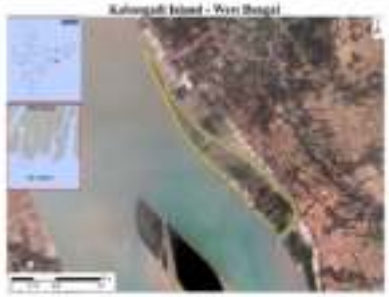
The tidal waters of Hooghly penetrate deeply into Sunderbans. As the Sunderban is in the vicinity of shipping and oil tanker line of Hooghly and the vessels call at Haldia and Kolkata Ports. Any oil spill occurring in the Hooghly estuary will affect the mangrove areas also.

Digha

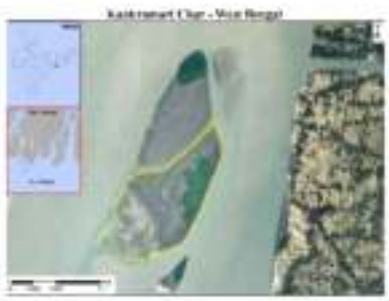
Digha beach along the Bay of Bengal coast is one of the important tourist spots in West Bengal. *Any oil spill occurring in the sea off Digha will affect the tourism beaches.*

Other prominent beaches which might get affected due to oil spill are Mandarmani, Shankarpur, Tajpur, Bakkhali, Junput, Udaipur, Bankiput, Falta, Sagardwip, Talsari, Henry etc.,

Table B.7: Island areas

Sr. no.	Island	Location	Sensitivity (Activity, Biodiversity and conservation)
1.	Ghoramara 21°54'57.60" N 88°07'45.86" E		• Fishing, agriculture, betel farming • Mangrove associated faunas like crustaceans, mollusc, fishes, sea birds and others • Mudflat and sparse mangrove
2.	Kabasgadi 21°52'00.47" N 88°11'05.62" E		• Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Protected (Reserve Forest) • Mangrove with other vegetation

3.	Sikarpur 21°47'26.43" N 88°10'56.00" E		• Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Protected (Reserve Forest) • Mangrove with other vegetation
4.	Dhanir Char 21°45'43.89" N 88°11'55.61" E		• Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Mangrove with other vegetation • Mudflat

5.	Kankramari Char 21°44'25.35" N 88°12'00.82" E		• Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Mangrove with other vegetation • Mudflat
6.	Sagar 21°44'06.00" N 88°06'45.36" E		• Mangrove associated faunas of Zooplankton, Soil Microbe, Ciliates, Hydrozoa, Annelida, crustaceans, Chelicerata, Dipterans, Gastropod, Bivalvia, Spider, fishes, Reptiles, sea birds, Mammals and others • Sand dune, saltmarsh and mangrove
7.	Mahisani 1 21°42'22.46" N 88°11'48.60" E		• Agriculture: Paddy, watermelon and chilly • Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • mudflat and saltpan

8.	Mahisani 2 21°39'21.60" N 88°12'19.45" E		• Agriculture: Paddy, watermelon and chilly • Fishing, agriculture and livestock management. • Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Mudflat
9.	Patibunia 21°39'14.40" N 88°15'12.60" E		• Agriculture: Paddy, watermelon and chilly • Agriculture and fishing • Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Sand dune, saltpan and mudflat

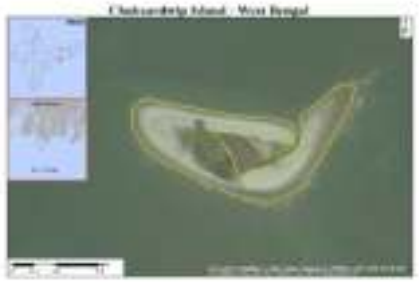
10.	Jambudwip 21°35'10.60" N 88°10'46.96" E		• Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Mudflat
11.	Chuksardwip 21°34'35.49" N 88°01'15.93" E		• Mangrove associated faunas of crustaceans, mollusc, fishes, sea birds and others • Mudflat and sandbar

Figure B.1: Sensitivity Map

LEGENDS			
	Sheltered Solid Man-made structures		Fish
	Beach		Dolphin
	Mangroves		Shorebird

B.1.1.4 Oil spill trajectory modeling

The oil spill trajectory models estimated the spill movement and the potential impact along the coast. The results of the oil spill trajectory simulation are presented in **Appendix C**.

B.1.1.3 Stage 3: Tradeoffs – Advantages and disadvantages

Riverbanks and industrial water intake need to be protected using appropriate measures like using river booms on a priority basis based on the tidal conditions in the prevailing situation. West Bengal Inland Water Transport Department (WBSTC) may also be referred to.

The width of the riverine channel in the delta region is such that, for any oil spillage in the channel it will reach the shoreline. Fixed wing aircraft are the best option for dispersant spraying. This can quickly disperse the oil and reduce the amount of oil reaching the shore. Any spillage in the channel will demand a quick assessment of the scenario.

Spills in rivers can be handled using containment booms and removal by skimmers and sorbent material. Where the oil movement threatens sensitive or economically important areas, deflection booms can be used to divert the oil to collection points suitable for removal.

Spill inside the dock - Locks are permanently installed to allow the passage of vessels. When closed, locks may be considered the ultimate boom because they can effectively block the passage of oil and debris.

Heavy oils, unless dispersed, are acutely toxic for the mangroves, birds, fishes and aquatic mammals; oiling may kill them within hours to several days. Tradeoffs in the case of dispersant use includes potential increased toxicity to adjacent communities, and increased penetration of dispersed oil to mangrove sediments. Oil-impacted mangroves may suffer yellowed leaves, defoliation, and tree death.

Response techniques that reduce oil contact with mangroves, such as chemical dispersants, reduce the resultant toxicity as well. Increased weathering generally lowers oil toxicity. Natural recovery is the most reliable strategy for mangroves.
Refer Appendix D for the response strategy of application of dispersants and below table for Application of techniques to different shoreline types.

	PRIMARY CLEANUP					FINAL CLEANUP						
	Pumping/ skimming	**Mechanical removal**	**Manual Removal**	**Natural recovery**	**Comments**	**Low-pressure flushing**	**High-pressure washing/ Sand blasting**	**Dispersants**	**Natural organic sorbents**	**Batch recovery**	**Natural recovery**	**Comments**
Rocks, Boulders and artificial structures	V	N/A	V	+	Poor access may prevent pumping/ skimming. Exposed/remote shorelines best left to natural recovery.	N/A	V	+	+	N/A	V	Avoid excessive abrasion of rocks/artificial structures. Cleanup of boulders difficult and often gives poor results.
Cobbles, Pebbles and shingle	V	X	V	+	Exposed/remote shorelines best left to natural recovery.	V	X	+	+	+	+	If load-bearing character good, consider pushing oiled material to surf zone to enhance natural recovery.
Sand	V	+	V	+	Heavy equipment only applicable on firm beaches.	V	X	+	N/A	+	+	Solid oil can be recovered using beach-cleaning machines. Enhance natural recovery by ploughing/harrowing.
Mud flats, marshes and mangroves	+	X	+	V	Operations preferably carried out on the water from small, shallow-drought vessels.	+	X	X	+	N/A	V	Operations should preferably be carried out on the water from small, shallow-draught vessels.

Table B.8 – Application of techniques to different shoreline types

Note: Some of these techniques, such as the use of dispersants, may require pre-approval before use.
V = viable + = possibly useful X = not recommended N/A = not applicable

B.1.4 Stage 4: Best option selection

Fixed wing aircraft are the best option for dispersant spraying. This can quickly disperse and breakup the oil slick and reduce the amount of oil reaching the shore. Near shore containment and recovery operations would be mainly targeted around the sensitive areas including populated banks and shorelines. Table below is indicative of the response strategy for various oil types

Table B.9: Oil spill Response strategy

RESPONSE STRATEGY	Crude	Diesel	Bunker Oil
Monitor & Evaluate	√	√	√
Containment & Recovery	√	√	√
Chemical Dispersant	√	×	√
Shoreline Protection/ Clean-up	√	×	√
Waste Disposal	√	×	√

√= Recommended ×= Not Recommended

APPENDIX C
OIL SPILL TRAJECTORY MODELING BY USING GNOME

The National Oceanic and Atmospheric Administrations (NOAA's) GNOME model is used to simulate trajectory of Oil Spill. Input data for GNOME includes:

- Map file generated from GNOME global custom map generator.
- Current file is taken from Geostrophic currents.
- Location of Spill (marked by "+" in figures):
  - Eastern Channel (21°32'09.5"N, 88°06'56.8"E)
  - Eden channel (21°35'18.0"N, 87°52'21.0"E)
- Trajectory Modelling is carried out for spillage of IFO, HSD and Medium crude.

All of these model's oil movements behave differently with the local environmental conditions. The local ocean current and wind plays a significant role in slick oil drive on the water surface. Oil spill movement from two locations is observed in the analysis. Floating, evaporation, and beaching of oil are estimated using the GNOME software. Floating represents the amount of oil which are still in the water, evaporation or dispersion denote the amount of oil which are lost or weathered, and beaching represents the amount of oil which could reach land.
The different scenarios were simulated with varying wind speed and current direction almost for all season data. The spill amount and model run time remained the same for all scenarios (for all the months of a particular oil in the particular location).

Sr. No.	Oil Spill scenarios
1.	**Type of Spill:** Instantaneous **Spill location:** Eastern channel - for Kolkata Port **Pollutant:** IFO **Quantity:** 10 T
2.	**Type of Spill:** Instantaneous **Spill location:** Eden channel-for Haldia Dock **Pollutant:** IFO **Quantity:** 10 T
3.	**Type of Spill:** Instantaneous **Spill location:** Eastern channel - for Kolkata Port **Pollutant:** IFO **Quantity:** 100 T
4.	**Type of Spill:** Instantaneous **Spill location:** Eden channel-for Haldia Dock **Pollutant:** IFO **Quantity:** 100 T
5.	**Type of Spill:** Instantaneous **Spill location:** Eastern channel - for Kolkata Port **Pollutant:** HSD **Quantity:** 10 T
6.	**Type of Spill:** Instantaneous **Spill location:** Eden channel-for Haldia Dock **Pollutant:** HSD **Quantity:** 10 T
7.	**Type of Spill:** Instantaneous **Spill location:** Eden channel-for Haldia Dock **Pollutant:** Medium Crude **Quantity:** 100 T
8.	**Type of Spill:** Continuous **Spill location:** Eden channel-for Haldia Dock **Quantity:** 10 T **Pollutant:** IFO **Duration:** 48 hrs
9.	**Type of Spill:** Continuous **Spill location:** Eastern channel - for Kolkata Port **Quantity:** 10 T **Pollutant:** IFO **Duration:** 48 hrs
10.	**Type of Spill:** Continuous **Spill location:** Eden channel-for Haldia Dock **Quantity:** 100 T **Pollutant:** Medium Crude **Duration:** 48 hrs

Type of Oil: IFO,
Quantity: 10 MT (Instantaneous spill),
Location of Spill: Eastern Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	2hr					4hr					6hr					8hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	10	9.7	0	0.3	0	10	0	9.4	0.6	0	10	0	9	1	0	10	0	8.8	1.2	0
February	6.8	N/NE	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	8.9	0.1	1	0	10	0.8	8	1.2	0
March	10	SW	10	9.7	0	0.3	0	10	0	9.4	0.6	0	10	0	9	1	0	10	0	8.8	1.2	0
April	14	SW	10	9.7	0	0.3	0	10	0	9.4	0.6	0	10	0	9	1	0	10	0	8.8	1.2	0
May	15.5	SW/S	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	7.8	1.2	1	0	10	0	8.8	1.2	0
June	13.5	SW	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0
July	13	SW	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0
August	11	SW/S	10	9.7	0	0.3	0	10	0.4	9	0.6	0	10	0	9	1	0	10	0	8.8	1.2	0
September	9	SW/S	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	8.2	0.8	1	0	10	7.9	0.8	1.2	0
October	6.2	NE/N	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0
November	5.7	N/NE	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	0	9	1	0	10	0	8.8	1.2	0
December	5.7	NE/N	10	9.7	0	0.3	0	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0

Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

Type of Oil: IFO,
Quantity: 10 MT (Instantaneous spill),
Location of Spill: Eden Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	4hr					6hr					8hr					12hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
February	6.8	N/NE	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
March	10	SW	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	6.2	2.2	1.6	0
April	14	SW	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
May	15.5	SW/S	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
June	13.5	SW	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
July	13	SW	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
August	11	SW/S	10	9.4	0	0.6	0	10	9	0	1	0	10	0	8.8	1.2	0	10	0	8.4	1.6	0
September	9	SW/S	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
October	6.2	NE/N	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	0.7	7.7	1.6	0
November	5.7	N/NE	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0
December	5.7	NE/N	10	9.4	0	0.6	0	10	9	0	1	0	10	8.8	0	1.2	0	10	8.4	0	1.6	0

Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

Type of Oil: HSD,
Quantity: 10 MT (Instantaneous spill),
Location of Spill: Eastern Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	2hr					4hr					6hr					8hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	10	9.6	0	0.4	0	10	0	9.3	0.7	0	10	0	8.8	1.2	0	10	0	8.5	1.5	0
February	6.8	N/NE	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	8.7	0.1	1.2	0	10	0.8	7.6	1.5	0
March	10	SW	10	9.6	0	0.4	0	10	0	9.3	0.7	0	10	0	8.8	1.2	0	10	0	8.5	1.5	0
April	14	SW	10	9.6	0	0.4	0	10	0	9.3	0.7	0	10	0	8.8	1.2	0	10	0	8.5	1.5	0
May	15.5	SW/S	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	7.6	1.2	1.2	0	10	0	8.5	1.5	0
June	13.5	SW	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0
July	13	SW	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0
August	11	SW/S	10	9.6	0	0.4	0	10	0.4	8.8	0.7	0	10	0	8.8	1.2	0	10	0	8.5	1.5	0
September	9	SW/S	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	8	0.8	1.2	0	10	7.6	0.8	1.5	0
October	6.2	NE/N	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0
November	5.7	N/NE	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	0	8.8	1.2	0	10	0	8.5	1.5	0
December	5.7	NE/N	10	9.6	0	0.4	0	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0

Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

Type of Oil: HSD,
Quantity: 10 MT (Instantaneous spill),
Location of Spill: Eden Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	4hr					6hr					8hr					12hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
February	6.8	N/NE	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
March	10	SW	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	6	1.9	2.1	0
April	14	SW	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
May	15.5	SW/S	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
June	13.5	SW	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
July	13	SW	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
August	11	SW/S	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	0	8.5	1.5	0	10	0	7.9	2.1	0
September	9	SW/S	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
October	6.2	NE/N	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	0.8	7.1	2.1	0
November	5.7	N/NE	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0
December	5.7	NE/N	10	9.3	0	0.7	0	10	8.8	0	1.2	0	10	8.5	0	1.5	0	10	7.9	0	2.1	0

Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

Type of Oil: Medium Crude,
Quantity: 100 MT (Instantaneous spill),
Location of Spill: Eden Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	4hr					6hr					8hr					12hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
February	6.8	N/NE	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
March	10	SW	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	63	23	14	0
April	14	SW	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
May	15.5	SW/S	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
June	13.5	SW	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
July	13	SW	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
August	11	SW/S	100	94	0	6	0	100	91	0	9	0	100	0	89	11	0	100	0	86	14	0
September	9	SW/S	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
October	6.2	NE/N	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	7	79	14	0
November	5.7	N/NE	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0
December	5.7	NE/N	100	94	0	6	0	100	91	0	9	0	100	89	0	11	0	100	86	0	14	0

Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

Type of Oil: IFO,
Quantity: 10 MT for 48 hrs (Continuous spill),
Location of Spill: Eden Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	4hr					6hr					8hr					12hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
February	6.8	N/NE	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
March	10	SW	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
April	14	SW	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
May	15.5	SW/S	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
June	13.5	SW	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
July	13	SW	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
August	11	SW/S	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	1.1	1.1	0.1	0
September	9	SW/S	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
October	6.2	NE/N	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	1.8	0.4	0.1	0
November	5.7	N/NE	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
December	5.7	NE/N	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0

Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

Type of Oil: IFO,
Quantity: 10 MT for 48 hrs (Continuous spill),
Location of Spill: Eastern Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	4hr					6hr					8hr					12hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	0.6	0.6	0	0	0	1	0.6	0.4	0	0	1.5	0.6	0.8	0.1	0	2.3	0.6	1.5	0.1	0
February	6.8	N/NE	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.2	0.2	0.1	0	2.3	1.3	0.9	0.1	0
March	10	SW	0.6	0.4	0.2	0	0	1	0.4	0.6	0	0	1.5	0.4	1	0.1	0	2.3	0.4	1.7	0.1	0
April	14	SW	0.6	0.6	0	0	0	1	0.6	0.4	0	0	1.5	0.6	0.8	0.1	0	2.3	0.6	1.5	0.1	0
May	15.5	SW/S	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.2	0.2	0.1	0	2.3	1.3	0.9	0.1	0
June	13.5	SW	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
July	13	SW	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
August	11	SW/S	0.6	0.4	0.2	0	0	1	0.6	0.4	0	0	1.5	1	0.4	0.1	0	2.3	1.2	0.9	0.1	0
September	9	SW/S	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	1.7	0.4	0.1	0
October	6.2	NE/N	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0
November	5.7	N/NE	0.6	0.6	0	0	0	1	0.8	0.2	0	0	1.5	0.8	0.6	0.1	0	2.3	0.8	1.3	0.1	0
December	5.7	NE/N	0.6	0.6	0	0	0	1	1	0	0	0	1.5	1.4	0	0.1	0	2.3	2.1	0	0.1	0

Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

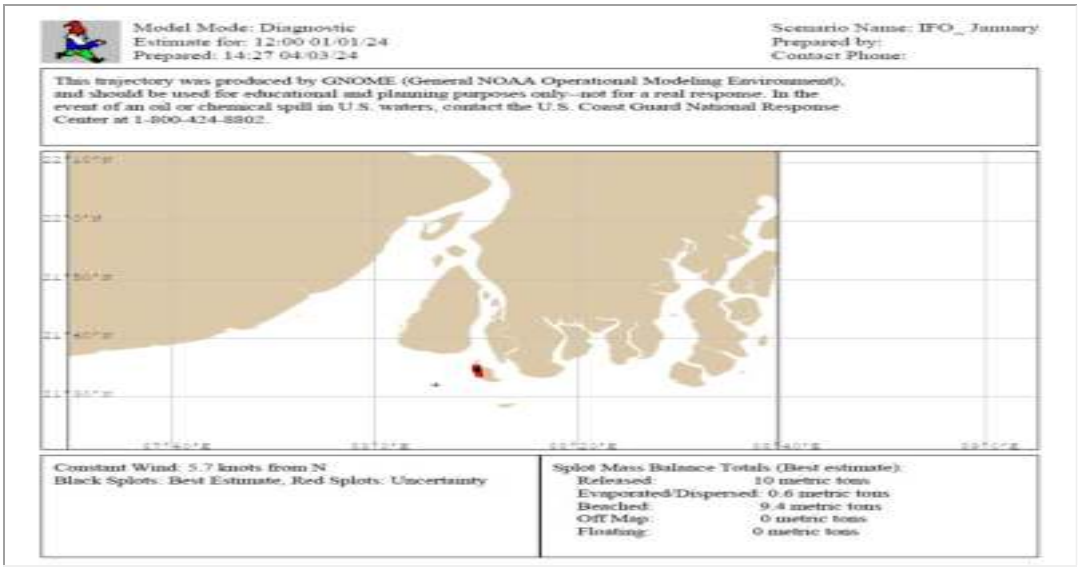
Type of Oil: Medium Crude,
Quantity: 100 MT for 48 hrs (Continuous spill),
Location of Spill: Eden Channel

Month	Mean Wind Speed in knots	Direction of Wind (from)	4hr					6hr					8hr					12hr				
			R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM	R	F	B	ED	OM
January	5.7	N	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
February	6.8	N/NE	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
March	10	SW	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
April	14	SW	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
May	15.5	SW/S	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
June	13.5	SW	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
July	13	SW	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
August	11	SW/S	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	11	11	1	0
September	9	SW/S	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
October	6.2	NE/N	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	28	4	1	0
November	5.7	N/NE	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0
December	5.7	NE/N	6	6	0	0	0	10	10	0	0	0	15	14	0	1	0	23	22	0	1	0

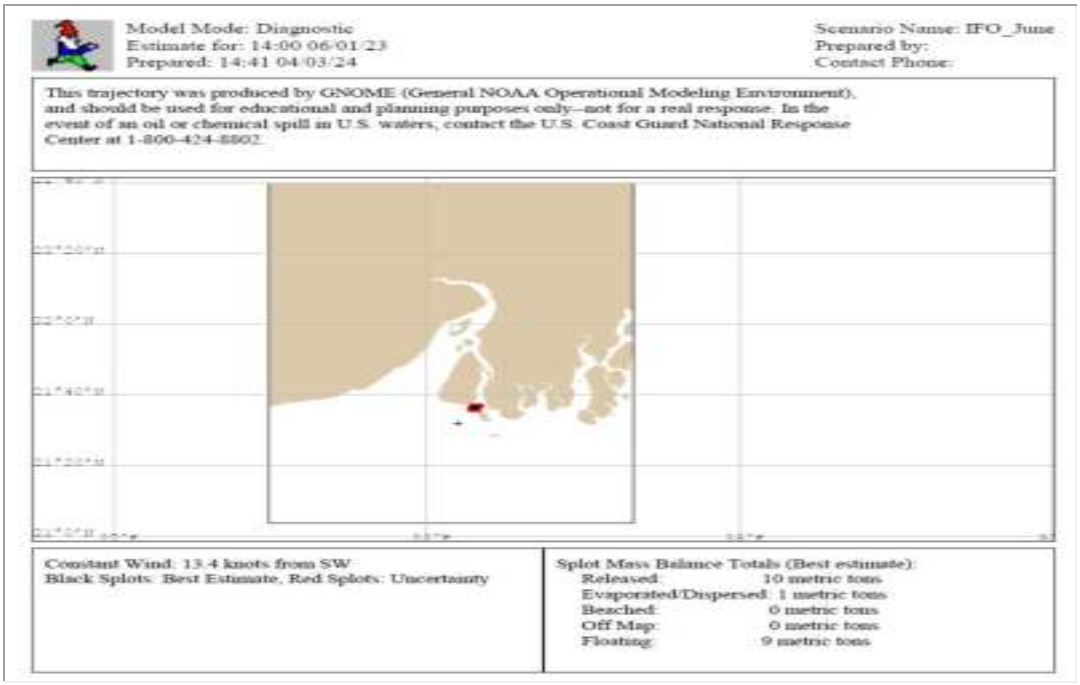
Note:

1. R- Released; F- Floating; B – Beached; ED – Evaporated & Dispersed, OM- Off Map, N – North, NE- North East, W- West, SW- South West
2. The values entered in coloured column are in MT.

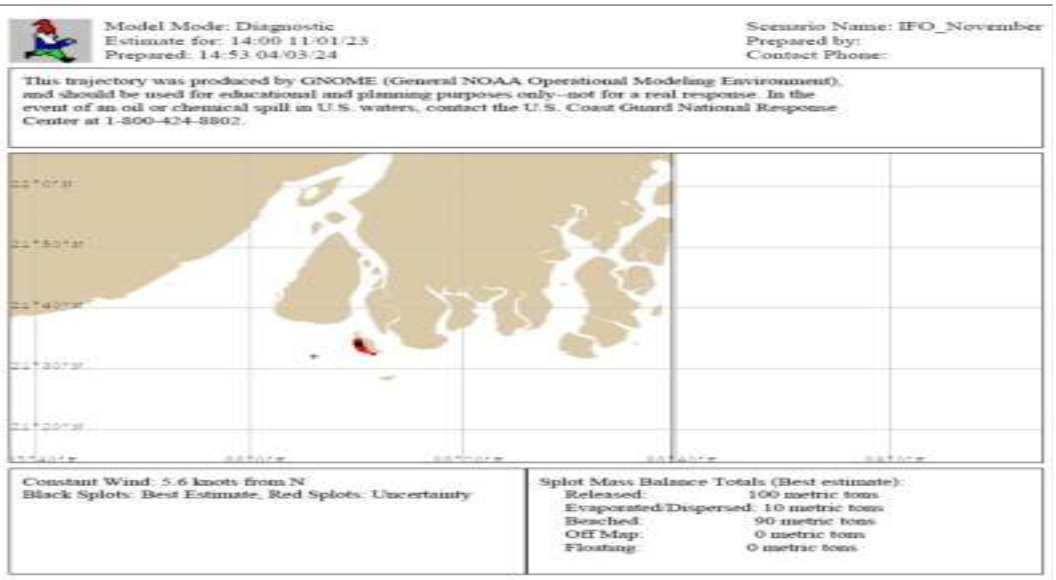
Type of Spill: Instantaneous
Spill location: Eastern channel
Run duration: 4 hrs
Month: January
Pollutant: IFO
Quantity: 10 T



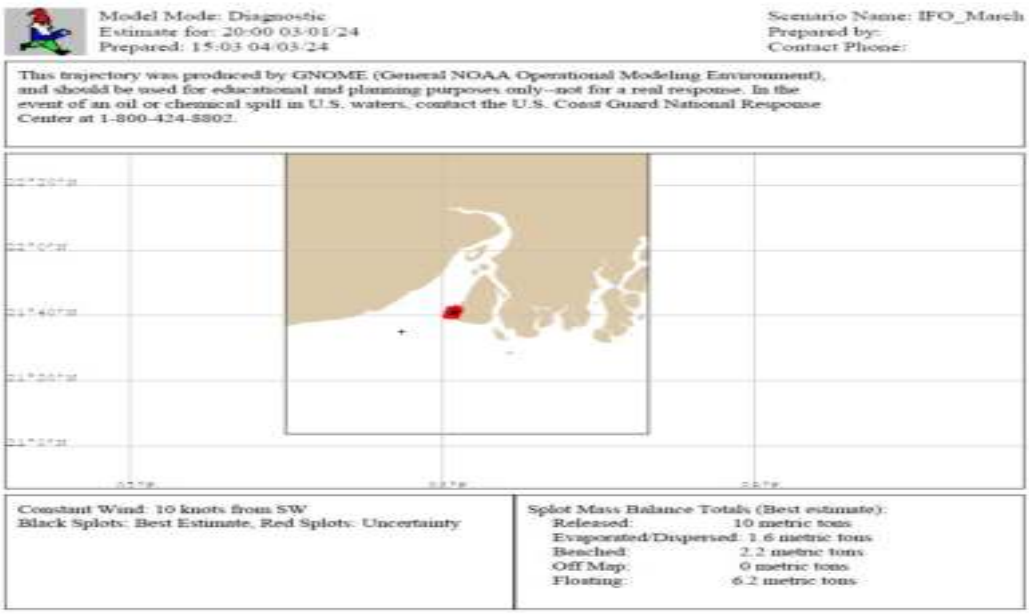
Type of Spill: Instantaneous
Spill location: Eastern channel
Run duration: 6 hrs
Month: June
Pollutant: IFO
Quantity: 10 T



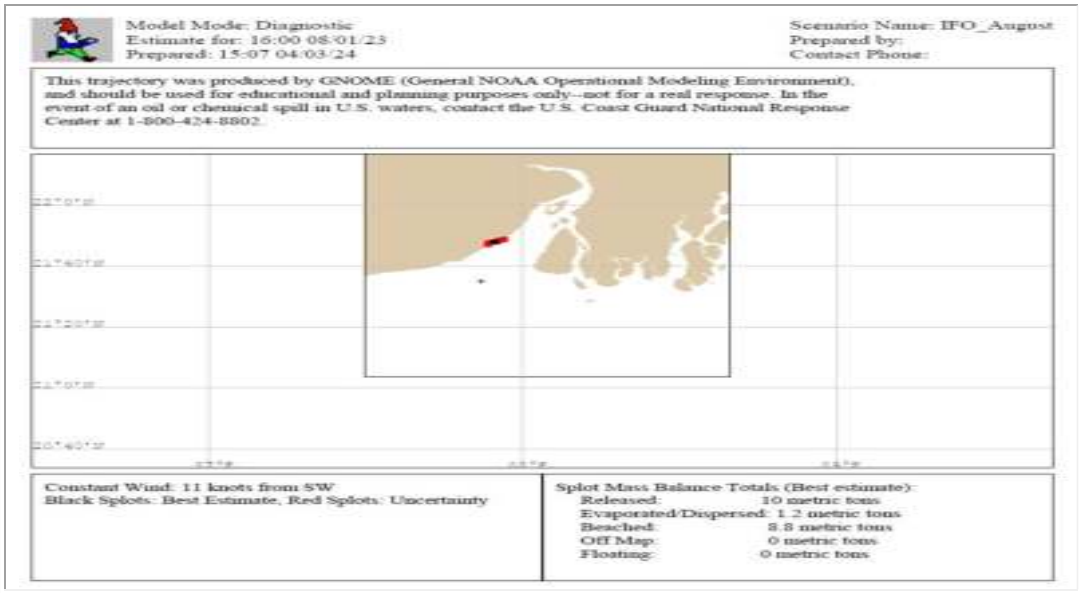
Type of Spill: Instantaneous
Spill location: Eastern channel
Run duration: 6 hrs
Month: November
Pollutant: IFO
Quantity: 10 T



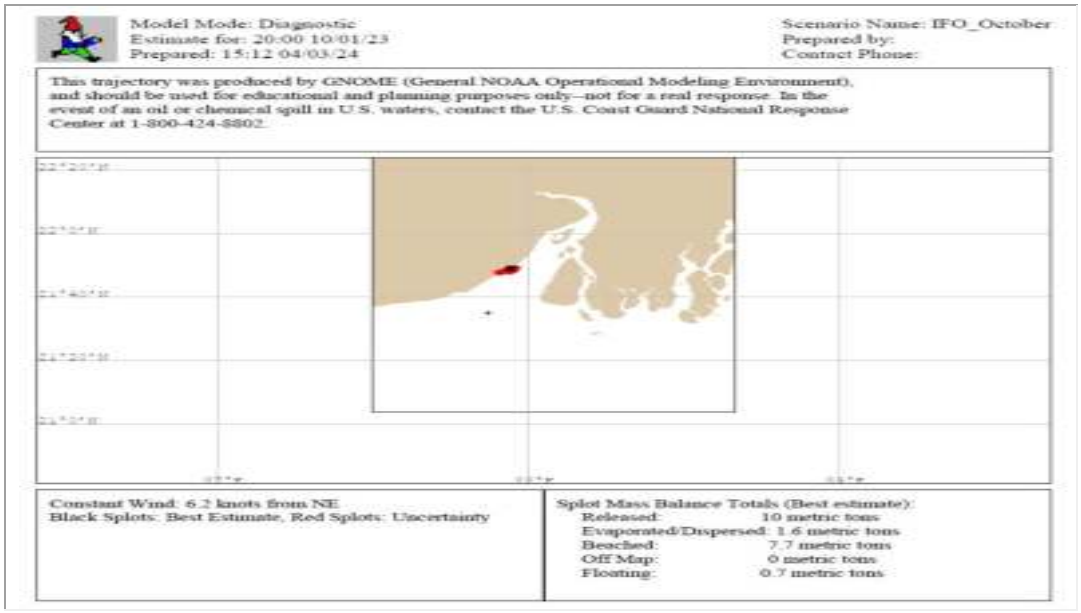
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 12 hrs
Month: March
Pollutant: IFO
Quantity: 10 T



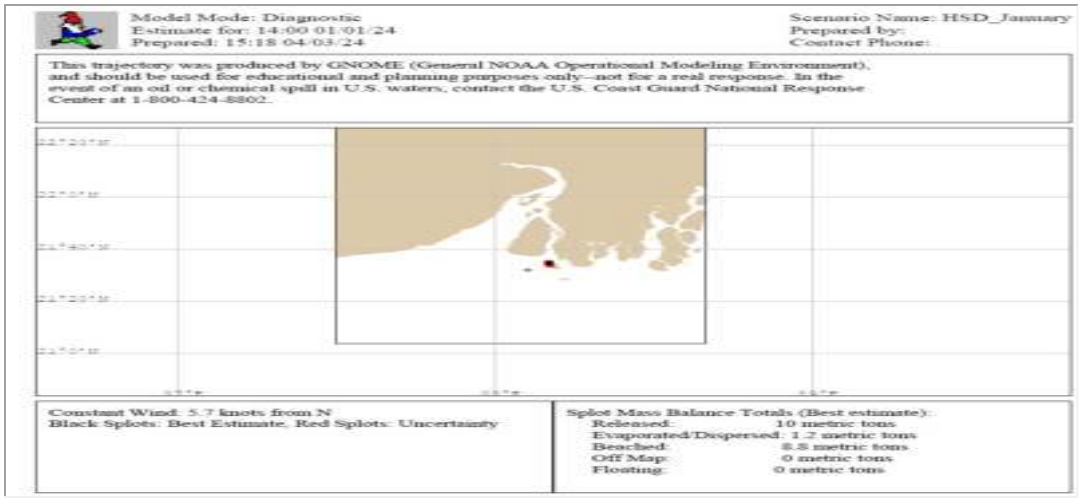
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 8 hrs
Month: August
Pollutant: IFO
Quantity: 10 T



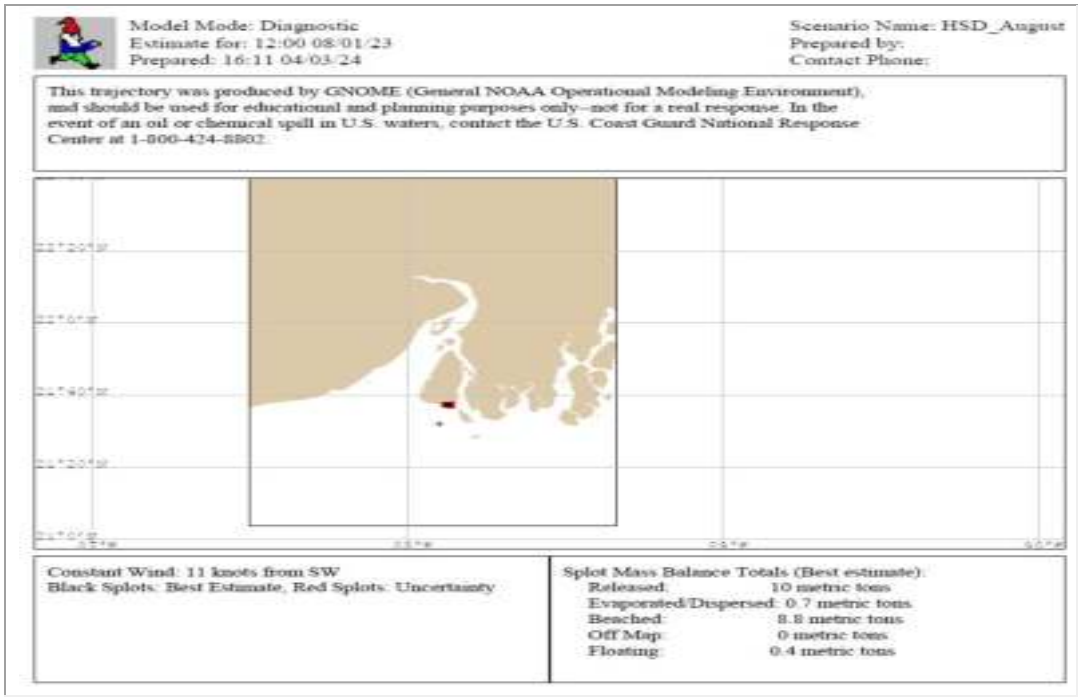
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 12 hrs
Month: October
Pollutant: IFO
Quantity: 10 T



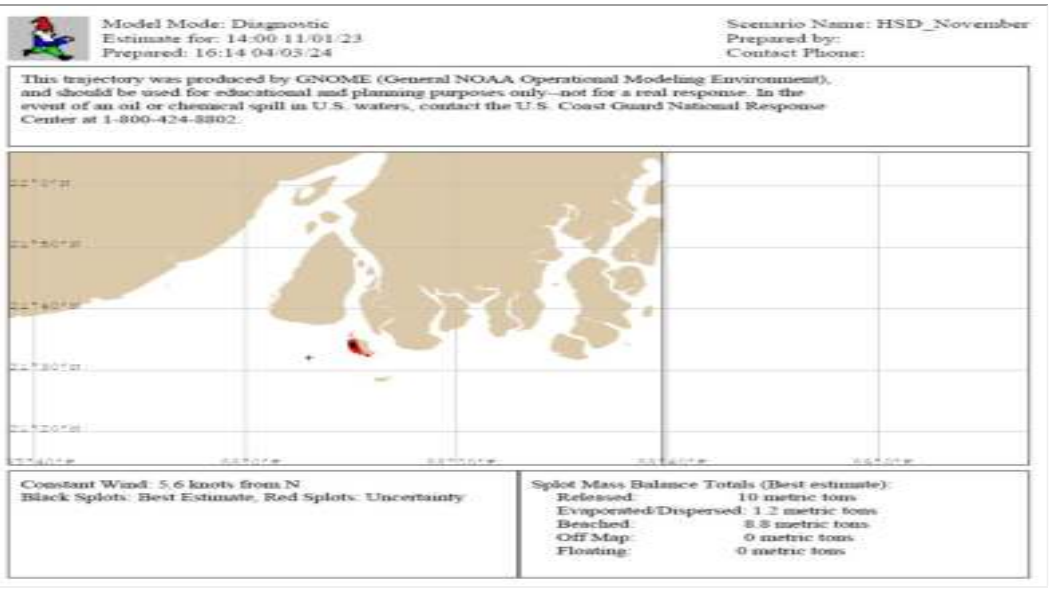
Type of Spill: Instantaneous
Spill location: Eastern channel
Run duration: 6 hrs
Month: January
Pollutant: HSD
Quantity: 10 T



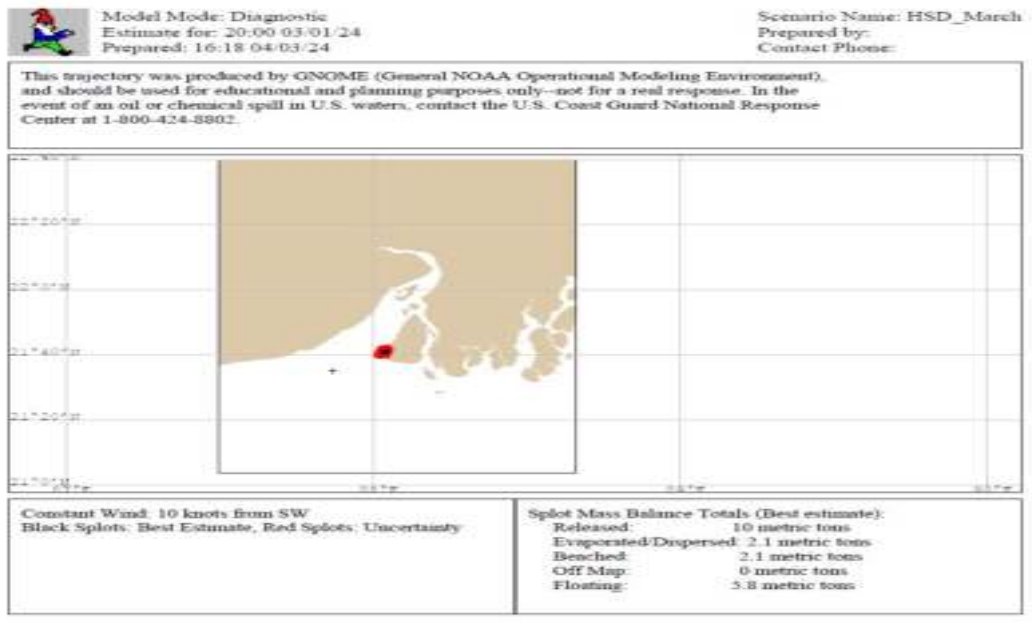
Type of Spill: Instantaneous
Spill location: Eastern channel
Run duration: 4 hrs
Month: August
Pollutant: HSD
Quantity: 10 T



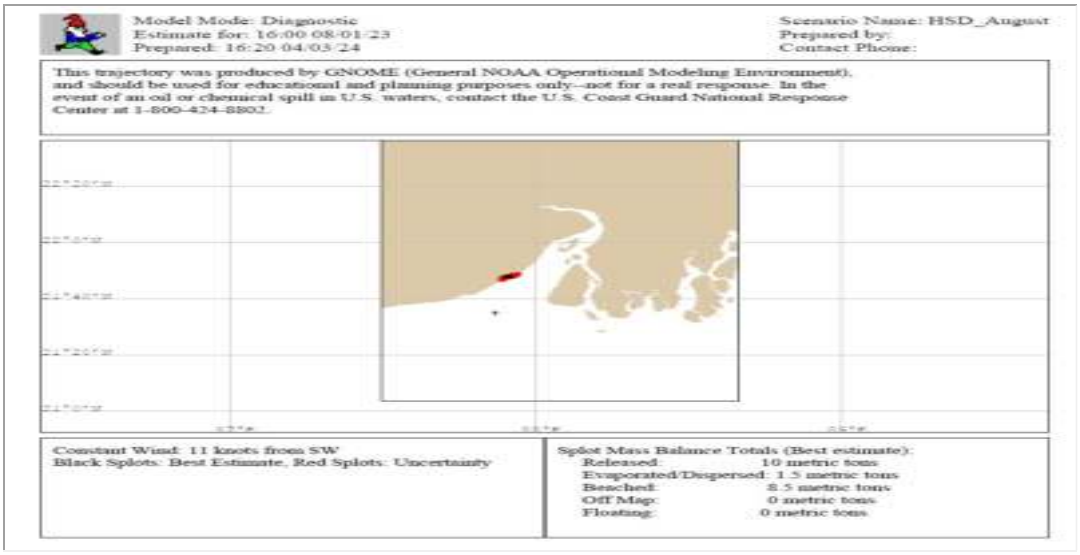
Type of Spill: Instantaneous
Spill location: Eastern channel
Run duration: 6 hrs
Month: November
Pollutant: HSD
Quantity: 10 T



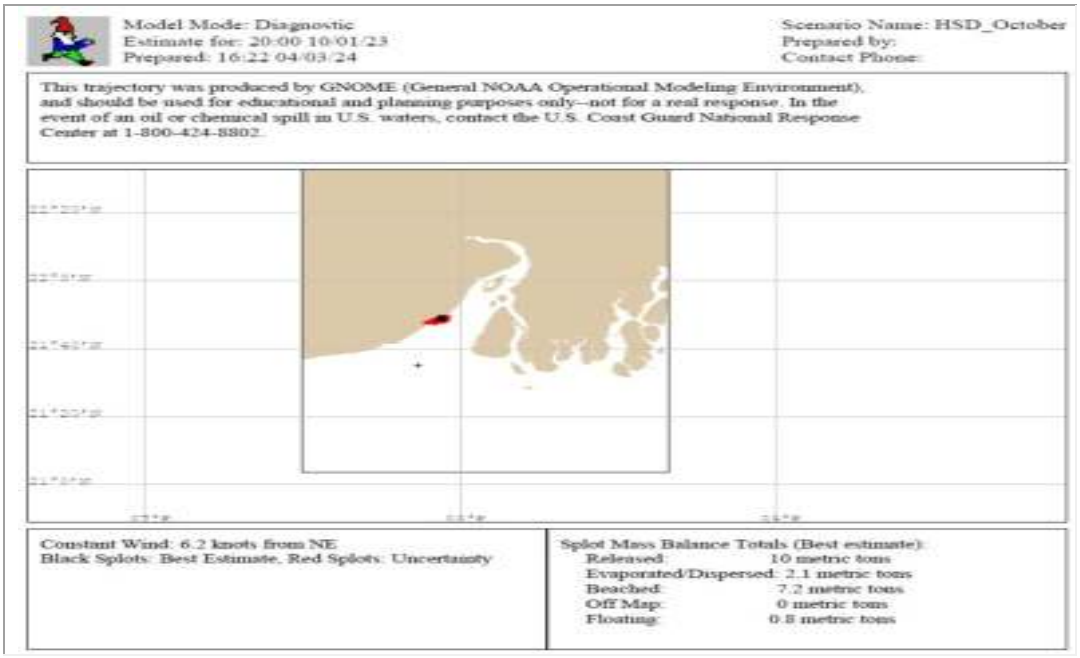
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 12hrs
Month: March
Pollutant: HSD
Quantity: 10 T



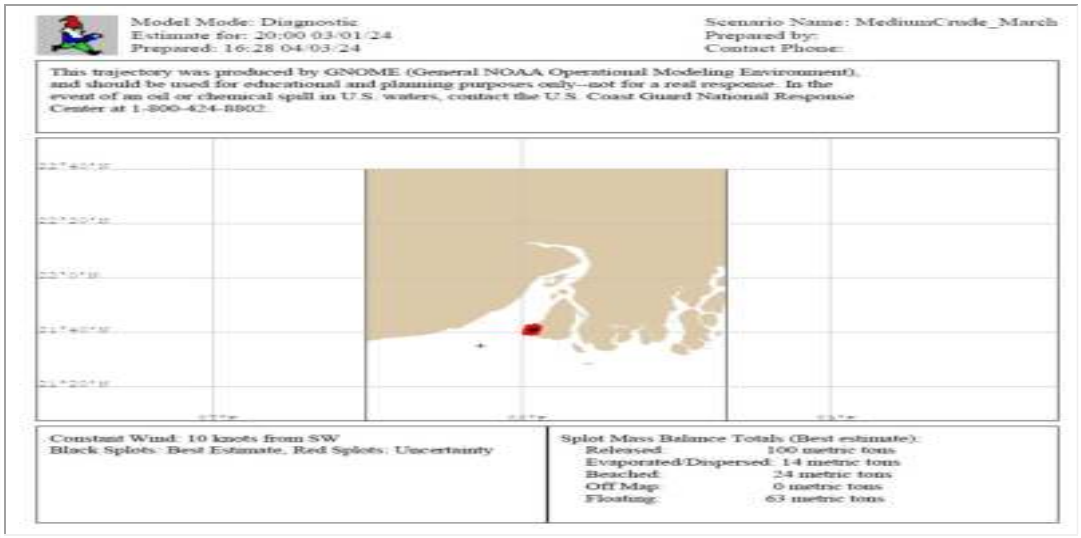
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 8 hrs
Month: August
Pollutant: HSD
Quantity: 10 T



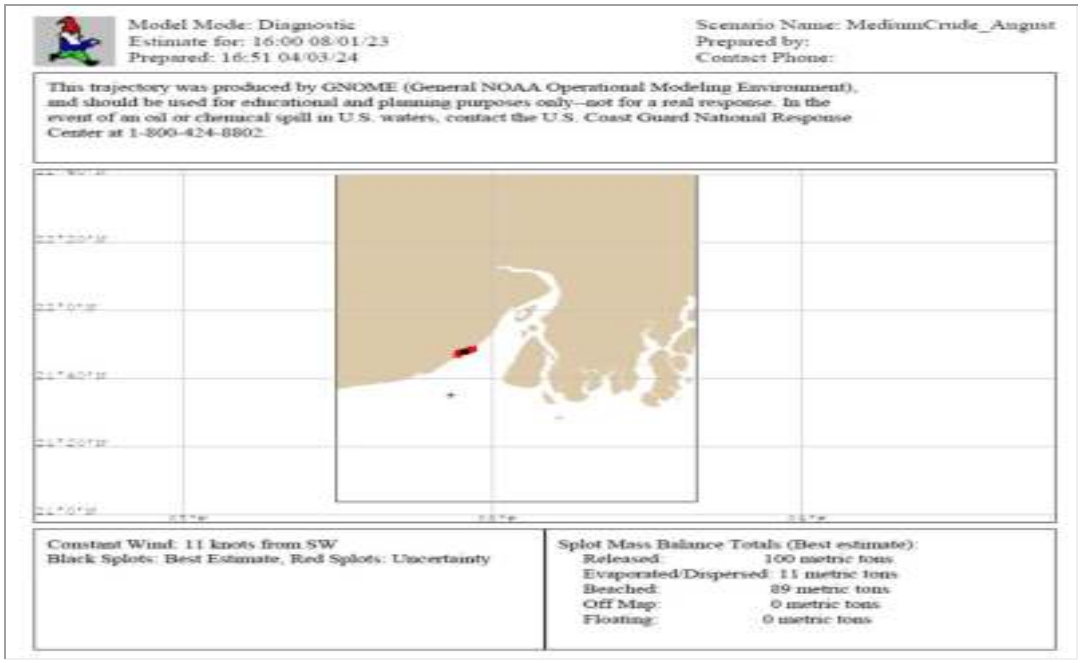
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 12 hrs
Month: October
Pollutant: HSD
Quantity: 10 T



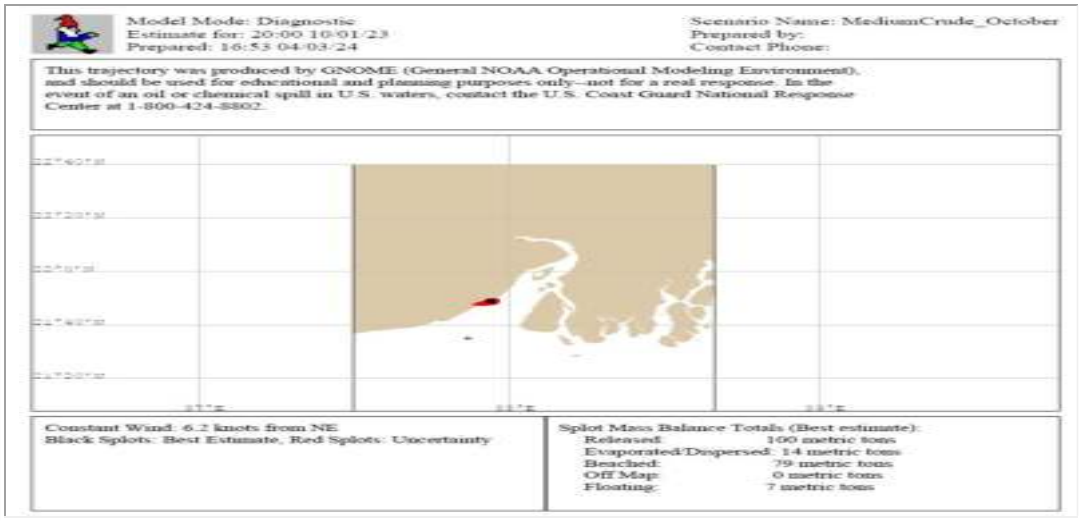
Type of Spill: Instantaneous
Spill location: Eden channel-for Haldia Dock
Run duration: 12 hrs
Month: March
Pollutant: Medium Crude
Quantity: 100 T



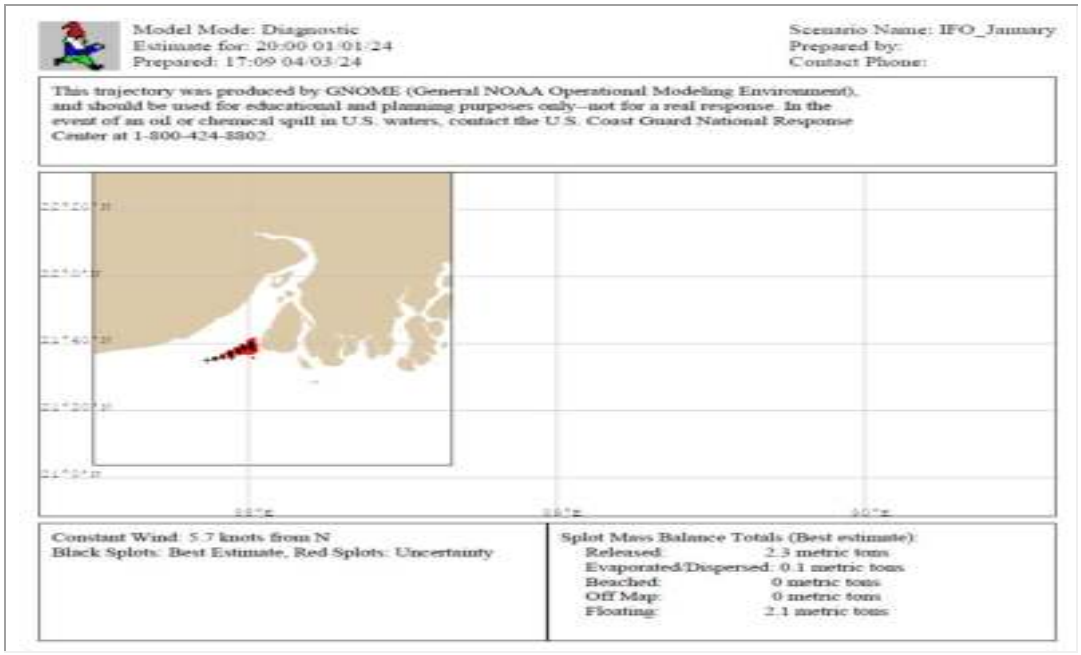
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 8 hrs
Month: August
Pollutant: Medium Crude
Quantity: 100 T



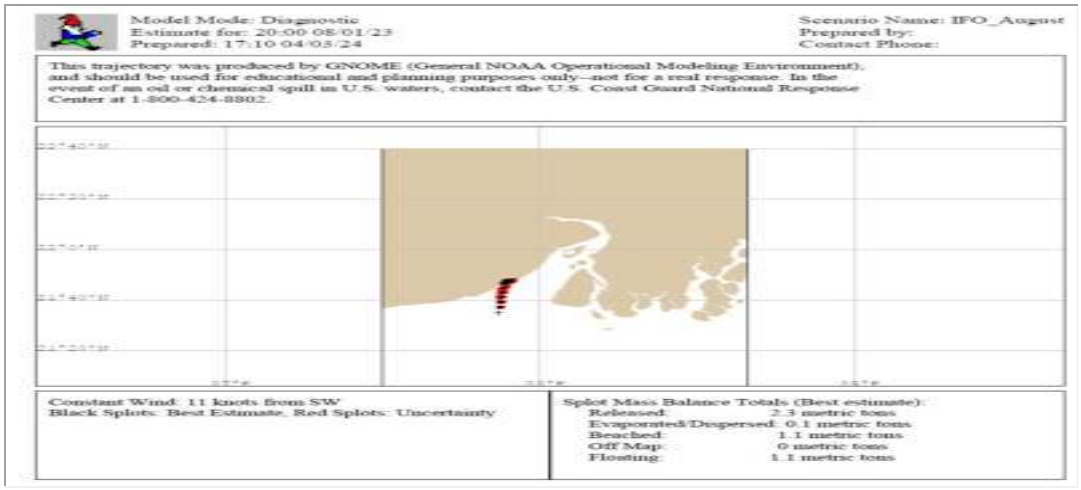
Type of Spill: Instantaneous
Spill location: Eden channel
Run duration: 12 hrs
Month: October
Pollutant: Medium Crude
Quantity: 100 T



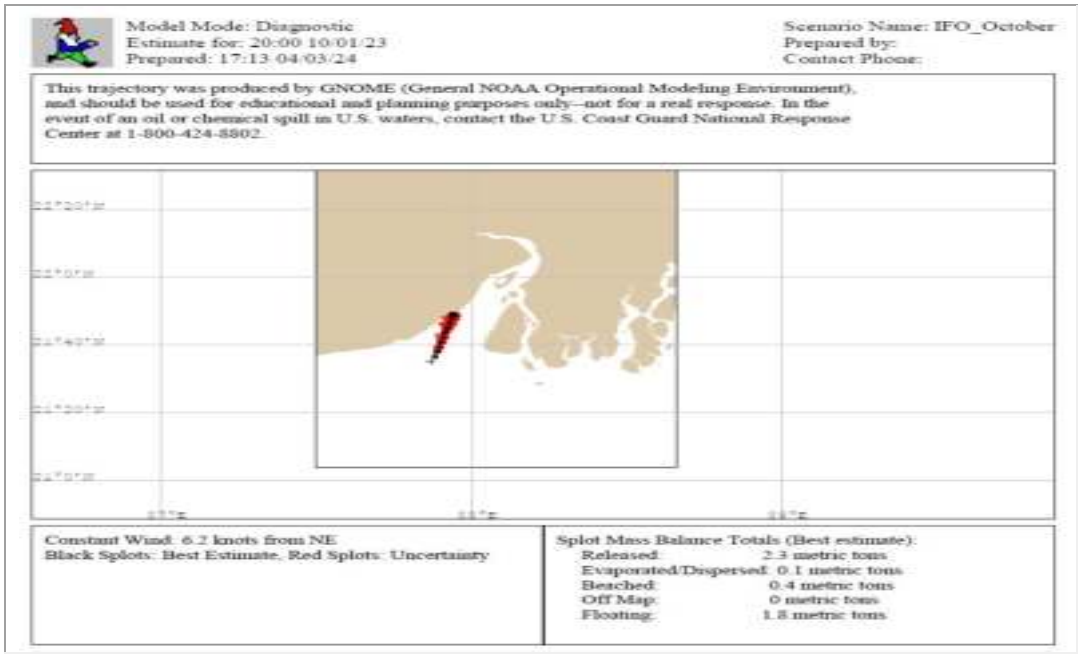
Type of Spill: Continuous
Spill location: Eden channel
Quantity: 10 T
Month: January
Pollutant: IFO
Run duration: 12 hrs
Spill Duration: 48 hrs



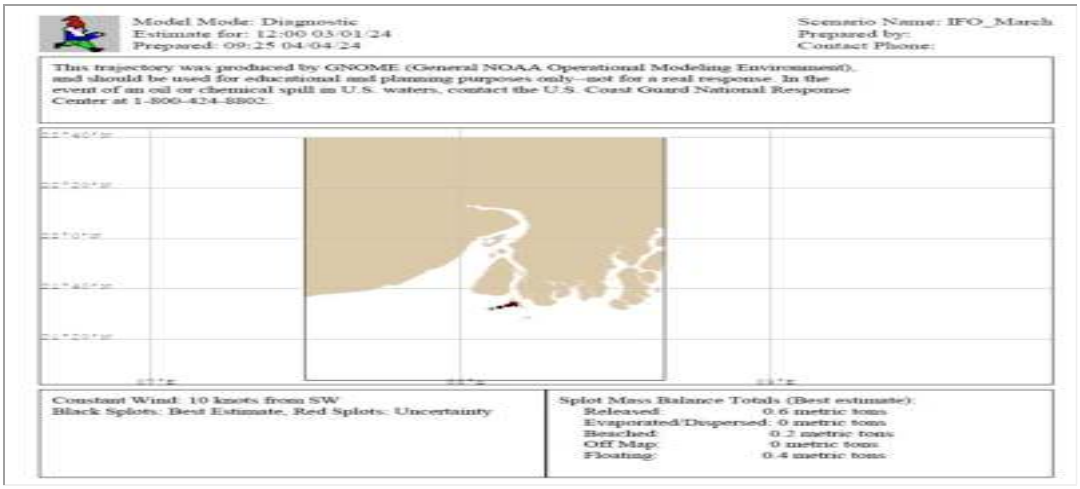
Type of Spill: Continuous
Spill location: Eden channel
Quantity: 10 T
Month: August
Pollutant: IFO
Run duration: 12 hrs
Spill Duration: 48 hrs



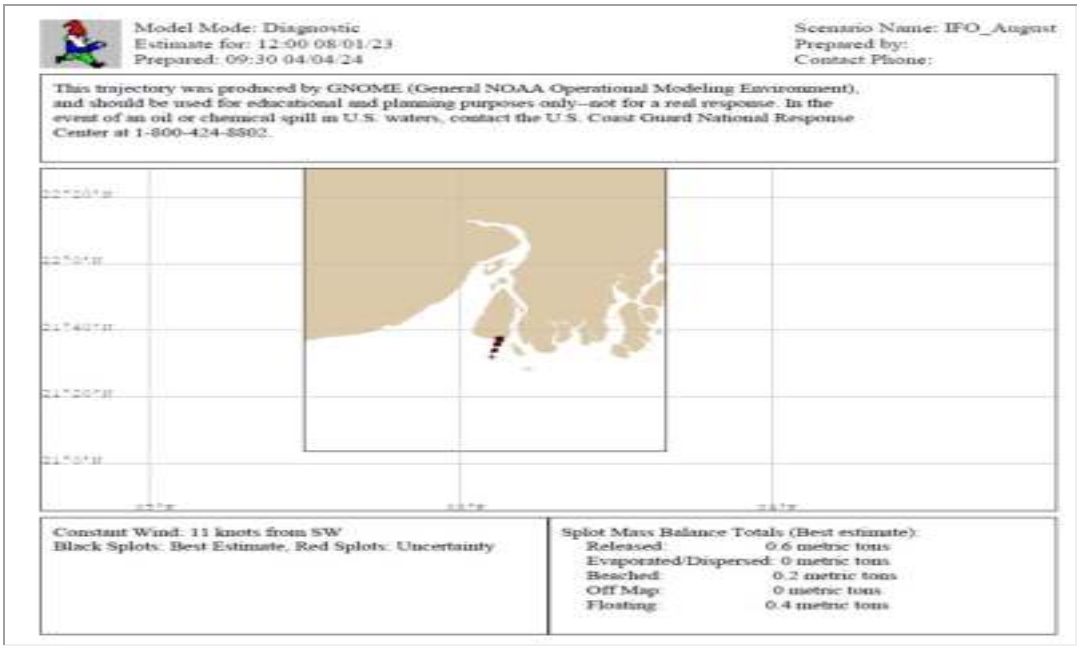
Type of Spill: Continuous
Spill location: Eden channel
Quantity: 10 T
Month: October
Pollutant: IFO
Run duration: 12 hrs
Spill Duration: 48 hrs



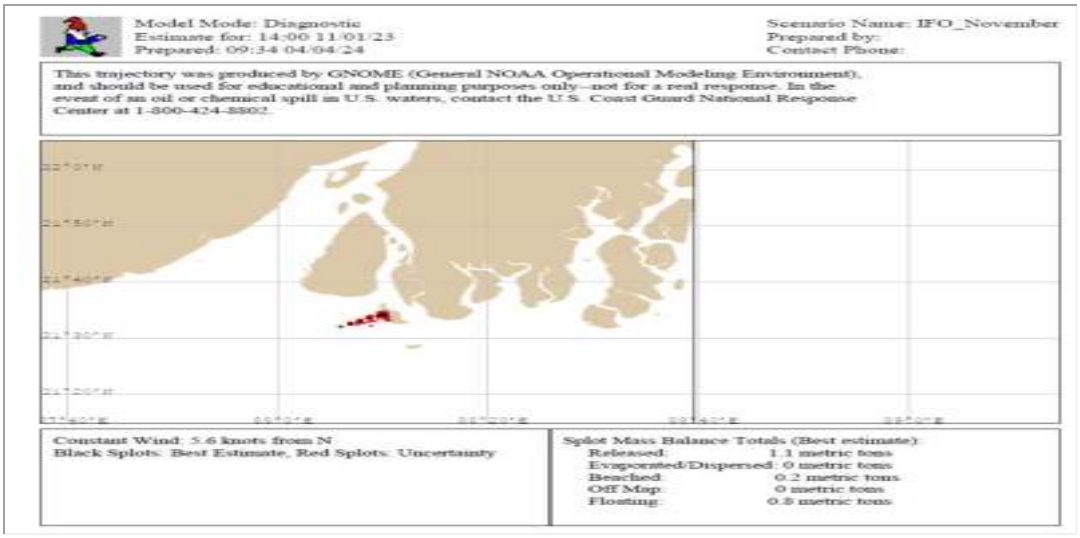
Type of Spill: Continuous
Spill location: Eastern channel
Quantity: 10 T
Month: March
Pollutant: IFO
Run duration: 4 hrs
Spill Duration: 48 hrs



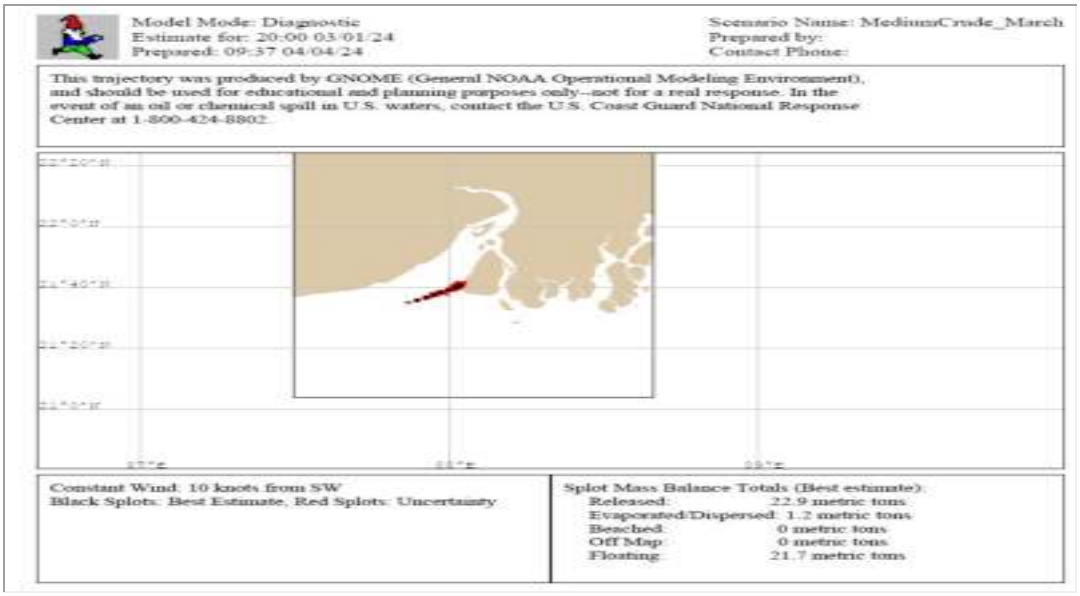
Type of Spill: Continuous
Spill location: Eastern channel
Quantity: 10 T
Month: August
Pollutant: IFO
Run duration: 4 hrs
Spill Duration: 48 hrs



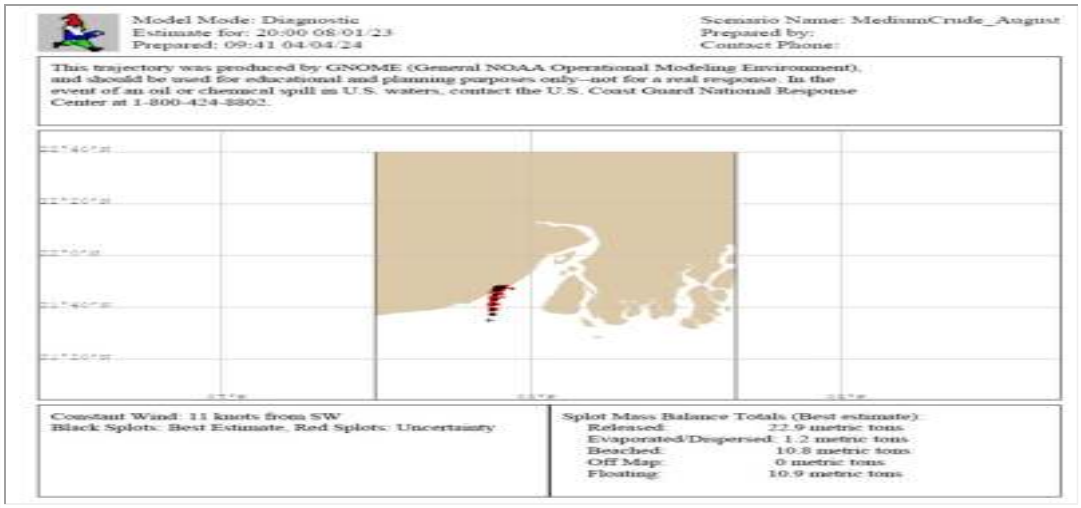
Type of Spill: Continuous
Spill location: Eastern channel
Quantity: 10 T
Month: November
Pollutant: IFO
Run duration: 6 hrs
Spill Duration: 48 hrs



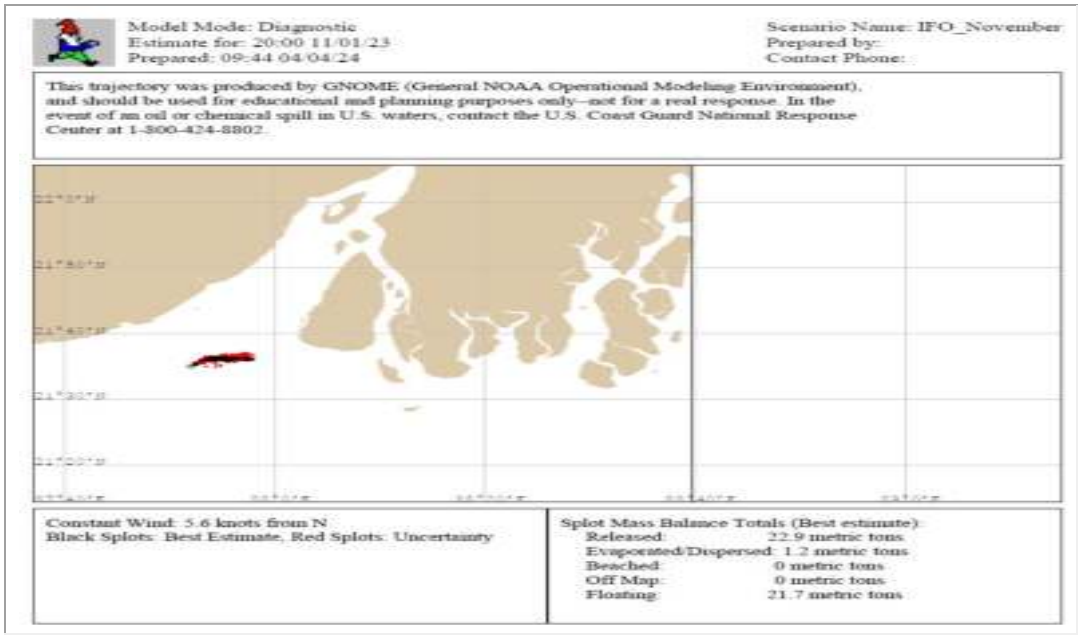
Type of Spill: Continuous
Spill location: Eden channel
Quantity: 100 T
Month: March
Pollutant: Medium Crude
Run duration: 12 hrs
Spill Duration: 48 hrs



Type of Spill: Continuous
Spill location: Eden channel
Quantity: 100 T
Month: August
Pollutant: Medium Crude
Run duration: 12 hrs
Spill Duration: 48 hrs



Type of Spill: Continuous
Spill location: Eden channel
Quantity: 100 T
Month: November
Pollutant: Medium Crude
Run duration: 12 hrs
Spill Duration: 48 hrs



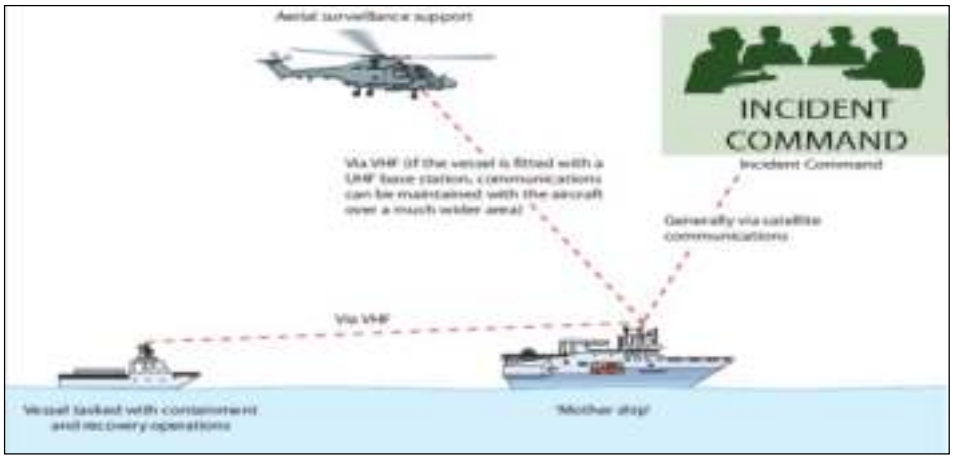
APPENDIX D
RESPONSE STRATEGY

The extent of the response strategy employed will vary depending upon the size and type of the spill and circumstances. The oil spill response strategies are to be integrated with overall response operation.

When a large spill occurs outside the harbor basin and it is not clear where the oil will move, a wide-ranging preliminary assessment should be made considering the most important resources in all the possible directions that the slicks may travel.

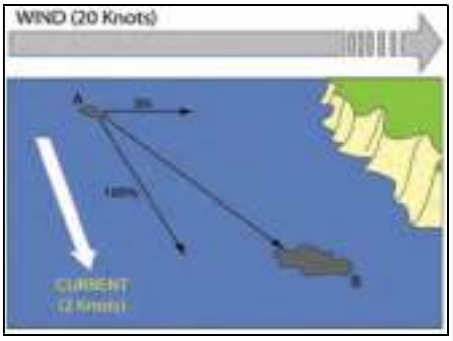
If monitoring of the slick indicates that it is likely to move into a shoreline, it must be decided how it can be treated while it is still well offshore at the same time taking action to protect sensitive shorelines. If sea conditions preclude containment and recovery, dispersant spraying may be the only possible option if there is to be any at-sea response. Modern low toxicity dispersants can help to minimize damage since the area (within Port limit) is highly eco-sensitive.

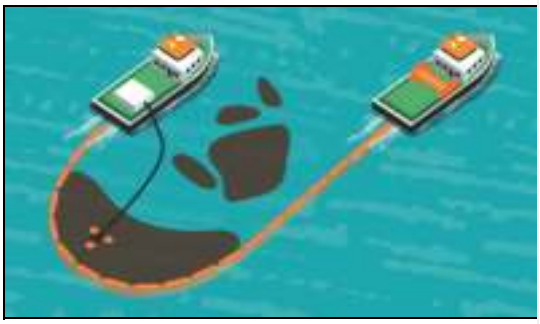
D.1 Surveillance Strategy

Steps	Action
1	**Preparation** Effective communication is essential for the success of response operation. 1. Organize operation for Aerial Surveillance/Use of vessel (as per para 7.7.1) a. Establish communication as per chapter 6.0.  b. Maintain communication with appropriate authority/aircraft/vessel. c. Organize facilities as per para 6.1.2. 2. Follow the Initial procedures as per Chapter 7 Initial Procedures.
2	**Execution of the Plans** 1. Activation of the Incident Management Team (IMT) as per para 7.4 2. Confirmation of the location of the spill a. Prediction of the spill location and fate of spill (Refer Para 7.7). b. Conducting a localized search to determine the exact location of the spill on the basis of the predicted location of the spill. c. Quantification of the amount of spill (Refer para 7.7.3).

	d. Directing the response operations to the thickest part of the spilled area (as per Table 7.3) in the beginning. e. Identification of the resources at immediate risk (refer para 2.5, 7.7.3.2 & 7.8) f. Taking appropriate steps to contain and recover (refer Contain and recovery strategy) g. Directing the use of appropriate Dispersants (Refer para 3.4.5). ***Note:*** *Factors affecting the Visual Observations are as follows:* *1. Weather: There can be difficulties in observations in low contrast light conditions (haze or fog) or extremely bright sunlight due to glare.* *2. Sea/river conditions* 3. *Water clarity: Can affect the visual appearance.*
3	**Record and Report** 1. Ensure that all relevant records (photographs, time log, surveillance log, maps, personal log etc.) are collated and stored.

D.2 Containment & recovery

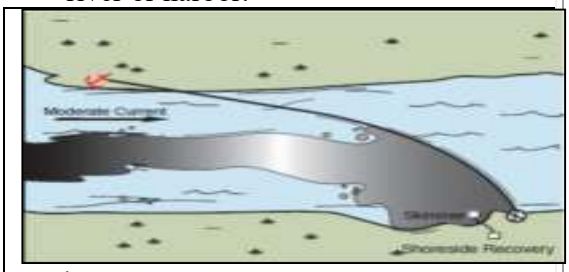
Steps	Action	Remarks
1	**Preparation** 1. Organize operation a. Establish communication as per chapter 6.0 b. Maintain communication with appropriate/relevant authority c. Decide upon the equipment to contain and recover to be used during the execution as per the Tables 3.2, 3.3 and 3.4 and **Appendix F**. d. Decide upon the Boom configuration strategy (See Step 1.b below).	
2	**Execution/Contain** 1. Boom Handling a. Select booms as per Table 3.10 • Booms selected will be as per weather conditions & different operating conditions as per Tables 3.2 & 3.4 b. Boom configuration 1. 'J' Configuration - Conducted by two vessels which tow the containment boom in a 'J' Shape; - Advantage that it is possible to continue skimming while towing is in motion. - Achieved by maintaining the collected oil in the boom close to	 Influence of wind and current on the movement of oil at sea/river. **Appendix F**: SMPK pollution response equipment list.

	the trailing vessel which have the skimming system and temporary storage. - Allows for a narrow or smaller swathe  2. 'U' Configuration - Conducted by two vessel which tow the containment boom in a 'U' Shape; - Allows for a wider swathe; - Once oil has been contained in the apex of the boom, a 'J' configuration can then be adopted to recover the spill using one of the two towing vessels; - Requires third vessel for recovery;  3. 'V' Configuration - Two vessels tow the containment boom in a 'V' configuration and a third vessel dedicated to recovery of the spilled oil is positioned at the apex of the boom. - Allows for a wider swathe; - Allows increase in speed, thereby increases the encounter rate of the configuration	**Safety** • Wear appropriate PPE, Life jacket etc. during the execution.

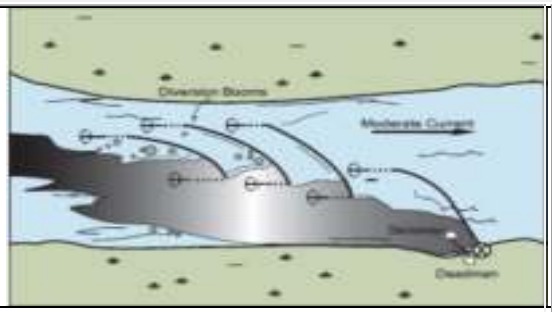
4. Side Sweep using single-vessel
   - Advantageous in situation where resources are limited or where a large swathe width
   - Quick to deploy
   - Easy to maneuver

River Booming strategy:

- Diversion booming moves oil from fast flow areas in the center of the river to calm water to enable collection in slower water or pockets along the bank. This approach allows the use of conventional containment and recovery techniques. The boom can be deployed in a single long section as shown in in the figure below, or as multiple booms staggered across a river or harbor.

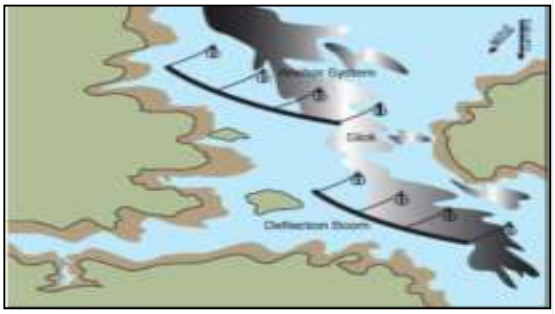


Single Boom Diversion



Cascade Boom diversion

- Deflection booming is used to keep oil away from water intakes and ecologically sensitive areas. It can be used in conjunction with recovery/ collection tactics. Fewer booms may be required than those used for



containment, but the oil may be directed to another sensitive area.

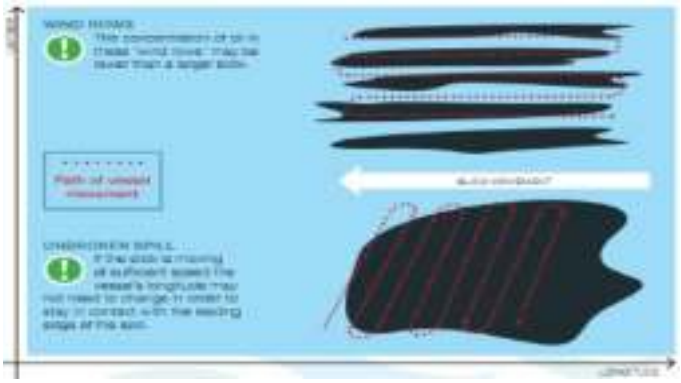
- Exclusion booming is used to completely boom off an area such as a sensitive site, forming a protective barrier. Conventional oil boom, tidal-seal boom, or a combination of each can be used to exclude spilled oil from a sensitive area. This technique is most

effective in no or low current areas.

3	**Recover** 1. Select Skimmers as per Table 3.9. 2. Use the Skimmer as per response technique given **Appendix F**.	• **Appendix F**: SMPK pollution response equipment list
4	Storage of recovered oil 1. As per para 3.4.4.3.	Temporary storage • **Appendix F**: SMPK pollution response equipment list

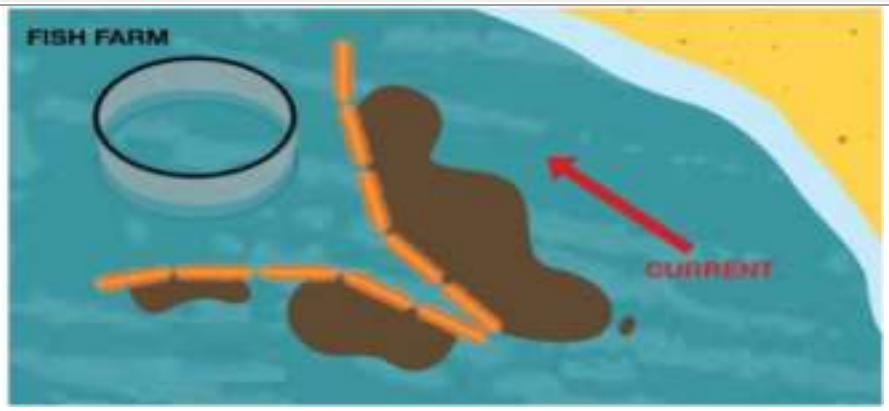
D.3 Dispersant Application Strategy

Steps	Action	Remarks
1	**Determine whether the application of the dispersant is suitable for the spill scenario?** • Identify the sensitive shoreline (para 2.5 and **Appendix B**) and resources immediately at risk to be affected as per Para 7.7 and 7.8. • Is there a suitable window of opportunity to spray dispersant? (refer **Appendix C**-Oil Spill Trajectory Modelling) • Can approval for the use of dispersant be secured by the ICG?	Only dispersant approved by ICG are allowed to be used in the Indian waters (See Table 3.11 for Oil spill dispersants approved for use in Indian waters)
2	**Preparation** 1. Organize operation for Aerial Surveillance (as per para 7.7.1) c. Establish communication as per chapter 6.0. d. Maintain communication with appropriate authority/aircraft/vessel. 2. Select a suitable spray system **Spray Arms**  **Single Nozzle** 	Effective communication is essential for the success of response operation. **Appendix F**: SMPK pollution response equipment list.
3	**Apply Dispersant (Refer para 3.4.5, Refer ICG Policy & Guidelines for use of OSD in Indian Waters)** Apply dispersant in a ladder or zig-zag pattern through the thickest area of the oil, as demonstrated below. Maintain the dispersant to oil ratio as per manufactures' guidance.	**Safety** • Wear appropriate PPE, Life jacket etc. during the execution.

	 **Monitoring Effectiveness of Dispersants** The dispersant spraying operations should be terminated at the point when orange or brown plumes no longer form, and when subsurface sampling suggests that the oil is no longer amenable to dispersants.	
4	**Record and Report** Ensure that all relevant records (photographs, time log, surveillance log, maps, personal log, quantity of dispersant applied etc.) are collated and stored.	

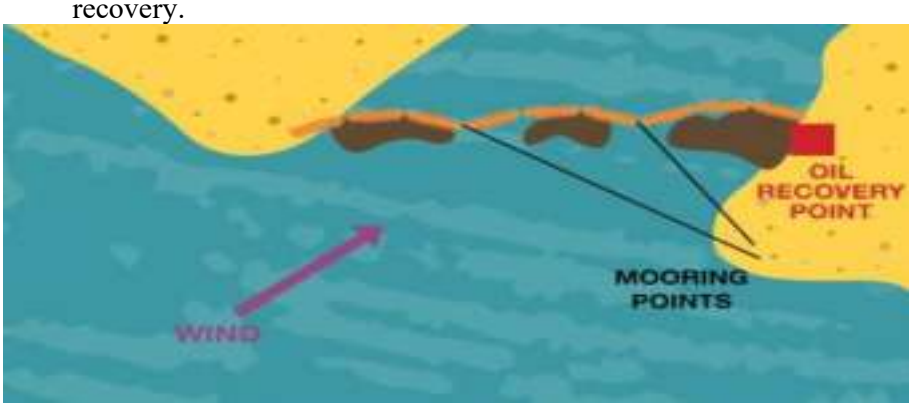
D.4 Shoreline Protection Strategy

Steps	Action
1	Predict spill location **Refer to:** Response Strategy, Surveillance, Para 1 of **Appendix B**.
2	Prioritizing the Shoreline ➢ Assign rank to the shoreline as per para 2.6.
3	Shoreline sensitivity mapping is to be used as a guiding tool and protection of shoreline. Identification of Sensitive Shoreline locations/resources ➢ Identify the sensitive shoreline (para 2.5 and **Appendix B**) and resources immediately at risk to be affected as per Para 7.7 and 7.8.
4	Action to take Identified sensitive locations/resources can be protected by initiating the containment activity including 1. Booming of the area using techniques such as a. Deflection – Deflects oil away from the sensitive locations/resources.



b. Cascading – Deflects oil away from sensitive shorelines to a point of enhanced natural collection for recovery.

c. Exclusion – Protects sensitive locations/ resources. Also, contains oil for recovery.



2. Deploy sand bags and absorbent socks down gradient from the oil, or erect temporary barriers such as trenches or mounts to prevent the oil from flowing towards coastline/banks.
3. Implement land-based response actions (countermeasure) such as digging temporary containment pits, ponds, or curbs to prevent the flow of oil into the river/sea.

5	**Record and Report** Ensure that all record (photographs, time log, surveillance log, maps, personal log etc.) are collated and stored.

D.5 Shoreline Cleanup Strategy

Steps	Action
1	**Preparation** 1. Organize operation for Aerial Surveillance/ground survey (as per para 7.7.3.2 and 7.7.3.3) a. Establish communication as per chapter 6.0. b. Maintain communication with appropriate authority/aircraft/vessel. c. Prioritize shorelines for clean up as per para 2.6. d. Refer guideline for determination of response as per Figure 7.2. e. Decide the shoreline response strategy as per **Appendix D**.  Figure: Recovery of fluid bulk oil from the shoreline using a rope mop skimmer and vacuum pumps 2. Organize equipment. 3. Follow the Initial procedures as per Chapter 7.
2	**Execution of the Plans** 1. Activation of the Incident management Team (IMT) as per para 7.4. 2. Confirmation of the location of the spill/oiled shore a. Prediction of the spill location and fate of spill (Refer Para 7.7). b. Identification of the resources immediately at risk (refer para 2.5, 7.7.3.2 & 7.8) c. Directing Shoreline cleanup method as per para 3.5.3 and **Appendix E**.  Figure: Flushing out oil buried in a sand beach using low pressure water supplied through lances and perforated pipes
3	**Record and Report** Ensure that all record (photographs, time log, surveillance log, maps, personal log etc.) are collated and stored

D.6 Cleanup Guideline for various shoreline types – by ICG

SANDY BEACH	
What to do	**What to avoid**
Consider amenity usage of affected beach, influence of season and is ecological advice to determine degree of optimal clean-up	Do not "over-clean" especially do not remove more sand and substrata than absolutely necessary
Bear in mind that under unfavorable conditions a second clean-up may become necessary	Do not let machinery or people run over contaminated beaches prior to cleaning Avoid workers becoming demoralized by the re-oiling of already-cleaned beaches
If dispersants or other chemicals are allowed and appropriate, apply them with incoming tide. Use manual labour to gather oil and oily sand. There is nothing like manual labour to accurately remove oil and oiled sand.	Do not use undiluted dispersant concentrates. If possible, avoid use of fresh water to hose down dispersants. Avoid using earth moving machinery; where possible do not pile oily debris or plough it into the ground. Avoid driving the oil into inaccessible areas or tidal and sub-tidal zones. Raking of the top layer of sand is however an appropriate way to accelerate biodegradation.
Collect floating oil along beach, when possible (e.g. in calm situations), perhaps using boom and skimmers	Avoid allowing floating oil moving away from the beach and contaminating other areas.
When large amounts of oil are present, consider directing the oil into lined collection troughs from which it can be pumped away by vacuum trucks	Avoid placing troughs in tidal areas unless they can be emptied between tides.
If available, consider using a beach cleaning machine to remove oiled debris, keeping in mind that such machines are not designed for large debris (e.g. drift wood) or small debris (e.g. tar bails). One option may be to use the machine before the oil lands in order to eliminate flotsam and other debris.	Avoid mixing oil into the beach that could easily be removed with manual labour (e.g. thick sheets of oil on the sand surface).
Consider surf washing and/or tilling for contamination by light oils (e.g. diesel or gas oil)	Avoid pushing heavy (black) oils back into the water as these may just contaminate other areas. Do not push any oil back to water, if there is little wave energy to disperse it
Decide whether on-site disposal e.g. by mobile incinerators is possible; if not, arrange transport or temporary storage	Do not destroy vegetation bordering the beach more than absolutely necessary; rather, accept slightly oiled spots. Avoid displacing rocks embedded in beach

SCATTERED ROCKS AND TIDAL POOLS	
What to do	**What to avoid**
Remove bulk oil where possible, perhaps using surface skimmers at high tides or appropriate skimmers at other times (e.g. rope mop across rocky pool areas).	Avoid remobilization of bulk oil. Avoid damaging booms and skimmers in rocky areas
Attempt cleaning by combining hosing with use of diluted dispersants and mechanical removal.	Do not spray freshwater on rocks. Avoid removing bedrock
Sorbents can be used in tidal pools at low tide and retrieved before the-tide returns	
If adjacent areas are ecologically sensitive or are already cleaned, consider the deployment of booms, skimmers, sorbents, etc. to contain leaking oil.	
Pay attention to safety of personnel affected by tides	
Clean to a level that addresses the ecological trade-offs	Do not over-clean. Many inter-tidal organisms might be killed in cleaning that would otherwise survive with residual oil contamination
SALT MARSHES	
What to do	**What to avoid**
Where reasonable, give priority to protection by booming, etc. Use propane gas gun or similar device to scare away birds	Avoid any "cosmetic" clean-up procedures
Consult with experts familiar with the ecology, the wildlife and the seasonal cycle of the area as to what precise clean-up should be attempted	
Water flooding with low pressure water may help to remove oil.	
Consider use of organic sorbents (e.g. peat, straw, etc.) which could be left in place without recovery. This will help minimize bird oiling	
In case of doubt, minimize interference with natural cleansing processes	Do not enter marshes with heavy machinery or large teams of clean-up workers
Remove temporary access roads after use, repair damages to marsh substrate as far as possible	Avoid erosion and other long-term changes to area.

MUDDY COASTS	
What to do	**What to avoid**
Consult local experts familiar with the ecology of the coastline as to which areas should be treated. In many cases a "leave-alone" action will be the ecologically most desirable solution	Do not use heavy machinery or let people trample over the oiled area
If possible, patches of oil may be removed by surface skimmers adjusted these special circumstances.	Avoid forcing oil into the ground; this will retard biodegradation
Under favorable circumstances the use of sorbents may be considered, especially if isolated concentrations of oil is accessible	Avoid applying sorbents that will or cannot be recovered
Where approved, use light mechanical equipment (spades and shovels) for manual cleaning	
Remove matting if used and break open temporary roads after work are complete.	Avoid changing the hydrological profile of the area
ESTUARIES	
What to do	**What to avoid**
Reduce the inflow of oil by whatever practical means available, (booms, closing of tidal locks, etc.) and use the outgoing tide to support cleaning action	Avoid overambitious booming
Collect and/or disperse free floating oil at the earliest possible stage.	
Employ clean-up techniques described on other pages of this section in accordance with specific local conditions (e.g. for fishery harbours, marines, etc.).	Carefully avoid damage to sea walls, dikes, etc., bearing in mind that tidal movements in estuaries can be more pronounced than in open sea.
Employ inland clean-up techniques in small estuaries or upper reaches of the larger river mouths	Do not obstruct local waterborne traffic more than necessary
Check backwaters and side-streams of rivers for re-pollution potential	

APPENDIX E
SHORELINE CLEANUP METHODS

E.1 NATURAL RECOVERY

Oiled shorelines may be left to naturally recover if:

- They cannot be cleaned due to lack of access or other factors.
- Cleaning will not result in any net environmental benefit, i.e.,
  - Cleaning will cause more damage than residual oil.
  - Recovery of affected biological communities will not be speeded up by cleaning communities.
- Weathering or natural removal of the oil is expected to be rapid.

Table E.1: Use of Natural Recovery Method

Shoreline Type	• Can be used on any shoreline subject to the following constraints.
Constraints	• Not suitable for public beaches or shorelines used by sensitive fauna (e.g. birds).
Application	• Monitoring may be required for persistent (non-Group I) oils. • Safety warnings/sign-posts should be used.
Resource Requirements	• Personnel and transport for erection of signposts

E.2 MANUAL REMOVAL OF OIL AND OILY DEBRIS

Removal of oil and oily debris using manual labour is an efficient but slow method, applicable to most shoreline types. This method also tends to result in better selection of oiled substrate and consequently less waste than mechanical methods.

Table E.2: Use of Manual Cleanup Method

Shoreline Type	• Can be used on any shoreline subject to the following constraints.
Constraints	• Shorelines should be assessed for safety before deploying cleanup teams. • This is a slow method and not suitable for use if the extent of oiling is large.
Application	• Close supervision of cleanup teams is essential. • Work-site control should be established
Resource Requirements	• Shoreline Cleanup Team Leaders. • Personal protective equipment such as gloves, hats, boot. • Shovels/wheelbarrows/rakes etc. as required. • Suitable waste storage and transport • Site support equipment.

E.3 USE OF SORBENTS TO COLLECT LIQUID OIL

Sorbents are materials used to recover spilled oil through adsorption or absorption. Loose sorbents or sorbent mats can be used to facilitate the manual or mechanical removal of liquid oil from most shoreline types. They may also be applied to oiled areas to reduce slippery conditions, e.g. on jetties or boat ramps.

Table E.3: Uses of Sorbents on Shorelines

Shoreline Type	• Can be used on any but care is needed for shorelines adjacent to shallow corals (see below)
Constraints	• Oily sorbent materials should not be allowed to wash into coral areas. • See Table E.2 if used with manual cleanup. • See Table E.4 if used with mechanical cleanup.
Application	• Close supervision of cleanup teams is essential in order to prevent over-application.
Resource Requirements	• Sorbent material.

E.4 MECHANICAL REMOVAL OF OIL AND OILY DEBRIS

Mechanical cleanup is the preferred cleanup for extensively oiled sandy shorelines. This method tends to result in the removal of clean substrate also and close supervision is required.

Table E.4: Uses of Mechanical Removal Methods on Shorelines

Shoreline Type	Not suitable for use on: • Bedrock or boulders. • Mud or silts. • Shorelines dominated by sensitive fauna (bird nesting) or flora (sea grass/mangroves/salt marsh).
Constraints	In addition to the above: • Fluid oils may not be amenable to recovery. • Recovery of buried oil may be difficult or result in the removal of extensive sediment.
Application	• Clean parallel to shoreline. • Ensure vehicles do not pass over oily sediments.
Resource Requirements	• Grader, front-end loader and truck (for waste transport). • Fuel. • Manual cleanup support team, Team Leader and personal protective equipment.

E.5 VACUUM RECOVERY

Vacuum recovery is suitable for the recovery of liquid oils and wet debris from most types of shoreline, provided that access is available.

Table E.5: Use of Vacuum Recovery of Liquid oil from Shorelines

Shoreline Type	• Any, except steep inclines and cliffs. • Not recommended for pebble beaches unless oil is associated with loose debris (i.e. pebbles will be removed with the oil unless due care is taken).
Constraints	• Not to be used if the oil is volatile e.g. aviation fuel. Not to be used on Group-I oils (e.g. motor spirit at any time). • On some shorelines this method may result in the removal of large volumes of water along with the oil. This may pose waste problems.
Application	• Liquid oil may be scraped into pits for ease of collection. These must be cleaned before backfilling.
Resource Requirements	• Vacuum truck.

E.6 SEDIMENT REWORKING

Reworking coarse substrates (grit, pebbles or cobbles) will facilitate natural cleaning by wave action. Although slow, this method is very efficient in terms of the commitment of labor and equipment.

Table E.6: Use of Sediment Reworking Method on Shorelines

Shoreline Type	• Lightly contaminated cobble, pebble and gravel beaches only.
Constraints	• Not suitable for fine sediments, such as sand, or where the beach is rapidly accreting.
Application	• Method A: Oil-stained sediment is pushed into the "surf zone for cleaning by wave action (Sediment may be reworked a number of times), or • Method B: Oil is left on the surface so that wave action can clean off surface oil. When clean, the surface can be "tilled" to bring underlying oiled sediments to the surface to be cleaned by wave action. This process should be repeated until the beach is clean.
Resource Requirements	• Method A: One front-end loader or bulldozer or grader. • Method B: Tractor or grader.

E.7 LOW PRESSURE WASHING or SEDIMENT FLUSHING

Washing methods can be used for all oil types and are best suited to shorelines with substrates of pebble size or larger, but may be applied to sand beaches with care. Low-pressure washing can also be applied to mangrove; salt marsh and shallow corals provided that:

- Run-off can be prevented from entering clean areas.
- Cleanup teams do not damage the area.

Table E.7: Use of Low-Pressure Washing Methods on Shorelines

Shoreline Type	• Pebble or rocky shoreline (cobble to bedrock). • Stable sands and mud.
Constraints	• Oily run-off must be collected using inshore booms and skimmers. • Care must be taken not to wash surface oils into lean underlying sediments. • Oily runoff must not pass over clean shoreline unless enough water is applied to prevent adhesion of oil to clean sediments (i.e. deluge/flushing).
Application	• Wash oil from top of beach to lower levels using moderate pressure. If lower intertidal zones are unoiled, this may need to be done on elevated tides only. • Deploy booms and skimmers to collect oily run-off.
Resource Requirements	• Pumps • Hoses • Inshore boom, anchors etc. • Skimmer.

E.8 HIGH PRESSURE WASHING

High pressure washing methods can be used for all oil types but should not be used on small substrates (smaller than pebble). Pebble shorelines should be cleaned with care.

Table E.8: Use of High-Pressure Washing Methods on Shorelines

Shoreline Type	• Pebble, bedrock and cobble beaches.
Constraints	• As per Table E.7.
Application	• Wash oil from top of beach to lower. If lower intertidal zones are unoiled, this may need to be done on elevated tides only. • Deploy booms and skimmers to collect oily run-off.
	Pebble beach's only: • Pebble can be reworked/pushed down the beach into the shallow sub tidal and then washed with the high-pressure water-stream. • Pebble can then be reworked/pushed back up the beach.
Resource Requirements	• Pumps • Hoses • Inshore boom, anchors etc. • Skimmer. • Eye protection for cleanup personnel.

E.9 BIOREMEDATION

Bioremediation is the artificial stimulation of the natural breakdown of oil by bacteria, yeasts and fungi. The most applied method involves the addition of high nitrogen/ phosphate fertilizers to the oiled shoreline. Degradation is a slow process and should not be regarded as a short-term cleanup method.

Light oils are not amenable to this method as light fractions are non-persistent and toxic to the microorganisms. The medium components of heavy fuel oils will degrade but heavy residues will be physically removed by wave action rather than by degradation.

Generally, this method would only be considered for the longer-term rehabilitation of environmentally sensitive areas where conventional cleanup methods cannot be applied.

APPENDIX F
POLLUTION RESPONSE EQUIPMENT LIST

RESOURCES FOR COMBATING OIL SPILL-KDS

F.1 IMO Level Trained Personnel at Kolkata Port

Sl. no.	IMO Level – I/II	IMO Level - III
1.	Director Marine	Commander
2.	Dy. Director II - Marine	Asst. M.M
3.	Chief Officer	Jr. Marine Officer
4.	Dy. Dock Master	

F.2 Floating Crafts-KDS

DETAILS OF FLOATING CRAFTS						
Sl. No.	**Type of Floating Craft**	**Nos.**	**Make**	**Year**	**Capacity (In BP/BHP)**	**Speed (In Knots)**
1.	**Dredger***					
(a)	D.C.I. (Dr. XII)	5	IHC Holland	1990	650-1342 BHP	9.0
(b)	D.C.I. (Dr. XIV)		IHC Holland	1991		9.0
(c)	D.C.I. (Dr. XXI)		IHC Holland	2013		11.0
(d)	River Pearl IV		IHC Holland	1956		8.0
(e)	Marine Hopper (Grab Dredger) (WB-1746)		Goa	2019	325 X 2 =650 BHP	8.85
2.	**Tugs**					
(a)	Golap¥	3	M/s Richard Limited, U.K.	1967	2x475 BHP	7.0
(b)	Kalikata¥		M/s Bharati Shipyard Private Limited, Mumbai	1992	2x474 BHP	
(c)	Gobindapur¥		P. Das & Company	1993	2x470 BHP	
(d)	Gladiator – VI*	3	Reach Asia, Kolkata	2019	2x470 BHP	11.2
(e)	Gladiator – IX* (WB-1864)			2022	2x600 BHP	11.2
(f)	Gladiator – III*			2015	2x600 BHP	12.0
3.	**Pilot Launches**					
(a)	Gopal¥	5	M/s Alcock Ashdown (Gujarat) Limited, Bhavnagar	1994	2x445 BHP	10.0
(b)	Rupsa¥		M/s Corporated	1997	2x940 BHP	12.0

(c)	Hugli¥		Consultancy & Engg Enterprise Pvt. Ltd Kolkata.			
(d)	M. L. Sidho¥		M/s Corporated Consultancy & Engg Enterprise Pvt. Ltd.	1993	2x195 BHP	8.0
(e)	M. L. Mirmadan		M/s Nalanda Engineering Works, Kolkata	1993	195 BHP	5.0
(f)	Deep Blue*	1	B.N. Bose & Co, Ghusuri, Howrah	2015	2x447 KW	15.0
(g)	Aquator 2*	1	Surya Dipta Projects Pvt Ltd. Mumbai	2015	2x441 KW	15.0
4.	**Mooring Launches**	-	-	-	-	-
5.	**Pontoons**	6	Kolkata	-	5 nos.30 mtrs x 9 mtr 1 no.30 mtrs x 6 mtrs	-
6.	**Barges**	-	-	-	-	-
7.	**Survey Vessels/Boats**					
(a)	M V Sarojini (own)	1	M/s. Shalimar Works Ltd. Kolkata	2002	2x700 BHP	12.0
(b)	M.L. Kanho (own)	1	M/s. CC&EE, Kolkata	1994	2x195 BHP	8.0
(c)	River Pearl-1 (hired)	1	Katale Shipyard Private Limited, Ratnagiri	2017	2x447 BHP	12.0
8.	**Special Purpose Launches**					
(a)	WB Sone (GMB/JFD/06, Jaffrabad Port,)	1	Kolkata	2012	2x194	8.0
(b)	D.V. Rabindra Dispatch Vessel (Own)	1	M/s. Bharati Shipyard	2000	2x1320 BHP	10.0
9.	Fire Float	-	-	-	All Tugs are fitted with fire-fighting appliances	
10.	Floating Cranes	-	-	-	-	-
11.	Any Others*	-	-	-	-	-

a	Pilot Vessel "Ma Ganga"	1	M/s. Bharati Shipyard	2006	2 X 600 BHP	10 .0
Mooring Boats (hired)-2 (120 HP each); Also, there are 9 nos. hired wooden body launches.						

Note: *- Hired; ¥ - Owned

F.3 Floating Crafts-HDC

Sr. no.	Type of Floating Craft	Nos.	Make	Year	Capacity (BP/BHP)	Speed (Knots)
1	Dredger (hired) – GD Marine 60	1	M/s Reach Asia of 109/28, Hazra road, Kolkata	2020	540	8.23
2	Tugs					
	Rani Siromani (own)	2	Bharati Shipyard	2000	2 * 2189 (45 T)	More than 9.0
	Tamralipta (own)		Wartsila 9L20	2000	2 * 2160	11
	Ocean Envy^^ (Hired)	6	Hakodate Dock	2005	2 * 2000 (40 T)	
	Ocean Monarch^^ (Hired)		Cosco Shipyard	2007	2 * 2400 (40 T)	
	Ocean Crown^^ (Hired)		Kangawa Dockyard	2004	2 * 1950 (40 T)	
	ALBATROSS 3		2X Yanmar, 8N2V/-EN	2006	3600	12
	IH Blue Whale^^^		Celtug service shipyard	2009	2 * 1400 (30 T)	
	Ocean Symphony^^		Jiangsu Zhenjiang shipyard	2006	2 * 1973 (40 T)	
3	Pilot Launches	-	-	-		
4	Mooring Launches	4	Moonlight Services	2022	165 BHP	8.0
5	Pontoons	-	-	-	-	-
6	Barges	-	-	-	-	-
7	Survey Vessel / Boats	-	-	-	-	-
8	Special Purpose Launches	-	-	-	-	-
9	Fire Float (Hired)	6	-	-	-	-
10	Floating Cranes	-	-	-	-	-
11	Any Others	-	-	-	-	-
	^^ Fire Float Tugs, ^^^Oil Spill Response Vessel					

F.4 Oil Spill Response Facility available at HDC:

Category	Description of Equipment (with Qty)	Available
Pollution Response Equipment	Inflatable Boom with accessories	300 M with 1 power packs
	Fence Boom	1700 M
	Skimmer (50% Weir + 50% Brush)	2 + 2
	OSD Applicator with spray arms	6
	Chemical OSD (lits.)	3000
	Flex Barge 10 tons (nos.)	4
	U-Boom 200 M (nos.)	1
	Sorbent Boom (nos.)	500
	Sorbent Pads (nos.)	2000 (20 units X 100)
Shoreline Cleanup Equipment	Mini vacuum Pumps (25 M^3) (nos.)	5
	Portable oil temporary storage (10 M^3) (nos.)	5
Vessel	Work Boats	4
	Tugs	4

F.5 IMO Level trained personnel at HDC:

Sr. no.	Name	Designation	IMO Level
1.	Capt. Pushpendra Sharma	DMMOH	IMO Level - II
2.	Shri Abhijit Moitra	Dy. Dock Master	IMO Level - II
3.	Shri Jayanta Giri	Asst. Dock Master	IMO Level - II
4.	Shri Sujit Chatterjee	Chief Engineer	IMO Level – I
5.	Shri Indranil Mondal	Asst. Dock Master	IMO Level – I
6.	Zaidul Haque Munshi	Asst. Dock Master	IMO Level – I
7.	Shri Rajesh Rajoo Tirkey	Asst. Dock Master	IMO Level – I
8.	Shri Vijith Valsalan	E.I.C.	IMO Level - I
9.	Shri Ravi Singh	E.I.C.	IMO Level – I
10.	Shri Somnath Giri	Berthing Pilot	IMO Level – I
11.	Shri Jaydeep Dey	Berthing Pilot	IMO Level – I
12.	Shri Anish Mondal	Berthing Pilot	IMO Level - I
13.	Shri Tapan Kumar Maiti	Jr. Marine Officer	IMO Level - III

APPENDIX G
OIL SPILL REPORT FORM

Particulars of Person/Organization Reporting Incident

a. Title :

b. Company :

c. Telephone/Telex Numbers :

d. Date/Time :

e. Spill Location :

f. Type and Quality of Oil Spill :

g. Cause of Spill :

h. Response to Spillage, if any :

j. Any Other Information :

POLREP MESSAGE FORMAT

Reference: IMO - 560 (1995)

Address From..... To.....
Date Time Group
Identification
Serial Number

Part 1 (POLWARN)	1. Date and time 2. Position 3. Incident 4. Outflow 5. Acknowledge
Part II (POLINF)	40. Date and Time 41. Position 42. Characteristics of pollution 43. Source and cause of pollution 44. Wind direction and speed 45. Current or tide 46. Sea/river state and pollution 47. Drift of pollution 48. Forecast 49. Identify of observer and ships on scene 50. Action taken 51. Photographs or samples 52. Names of other agencies informed 53-59. Spare 60. Acknowledge
Part III (POLFAC)	80. Date and time 81. Request for assistance 82. Coast 83. Pre-arrangements for the delivery 84. Assistance to where and how 85. Other agencies requested 86. Change of command 87. Exchange of information 88. Names and number of 89. Description of equipment 90. ETA and arrival information 91. Place of embarkation 92. Place of disembarkation 93-98. Spare

SMPK	**MARINE POLLUTION SITUATION REPORT FORM (SITREP)**			**APPENDIX G**
Precedence	Urgent	Immediate	Standard	Ref. no.
This form is to be faxed /handed over to ICG and Chairman/Dy. Chairman (SMPK)				
Final SITREP	YES: NO:	Next SITREP	____ : ____ on Date:	
Date/Time				
POLREP Reference				
Incident	Name			
	Latitude		Longitude	
SITREP prepared by	Name			
	Agency			
	Position/Role			
	Contact	Telephone		
		Mobile		
		Fax		
Summary of Events since last report (POLREP/SITREP)				
Expected Developments				
Areas Threatened				
Planned Actions				
Details of Assistance Required				
Other Information				
Attachments	Yes		No	

APPENDIX H
EMERGENCY CONTACT NUMBERS

H.1 KDS

Designation	Telephone (033)	Mobile
Chairman	2230-5370	62923-11236
Dy. Chairman (KDS)	2230-9164	81005-24486
Dy. Chairman (HDC)	03224-263209	99482-98304
Secretary	2230-634/3451 7101-2370/2371	98362-98639
Director Marine and General Manager (Marine), HDC	2230-3214/ 03224-263303	98362-98699
Dy. Director - Marine	71012016	98362-98699
Dy. Director II - Marine	22315146	94322-44737
Chief Engineer & In-Charge, Environment Cell	22300413	9836298695
Chief Medical Officer	24014503	98362-98634
Mooring Master (Asst. Mooring Master)	9836298673 033-71003404	9830253963
Traffic Manager	24392926	94340-64873
Financial Adviser & Chief Accounts Officer	2231-2022/ 2230-3451 7101-2014	81276-93333
Chief Hydraulic Engineer (I/C)	24093031	96747-20102
Chief Mechanical Engineer	24093037	94340-52489
LA & IRO/Sr. PO	22306234	98362-98665
Material Manager	2459-4126 7100-3304	96747-20053
Harbour Master (Port)	22391730	96741-55636
Harbour Master (River)	22391730	98744-37766
Dy. Harbour Master (Port) -Vacant	24391730	
Dy. Harbour Master (River) -Vacant	24391853	
Security Adviser	2439-2055/7100-3819	98362-98647
Sr. Commandant - CISF (KDS)	03224-24390566	98362-98616
Sr. Commandant – CISF (HDC)	03224-24397359	95602-97274
Asst. Commandant, HDC	03224-252229	94340-63389
OSD Environment	22300413	9674720054
Manager, Marine operations, HDC (vacant)		
Dy. Manager, Marine Operation, HDC	03224-252401	8989429782
SATM	2470-1871/71002811	89021-75968
Sr. Traffic Manager (Docks)	7100-3367	94340-65098

Sr. Dy. Traffic Manager -II	7100-3372 7100-3235	98362-98689
Sr. Asst. Secretary (Public Relations)	2220-6645/3451 7101-2214	96741-55648
Sr. Dy. Traffic Manager (Docks)	7100-3367	94340-65098
Dy. Traffic Manager (CT)	7100-3270	98362-98689
Port Fire Officer	2439-5881 7100-3475	9674155645
L.A. & I.R.O /Sr. PO	2220-6234/3451 71012355	98362-98665
Safety Officer	7101-2284	96747-93009
Dy. CMO II	2401-4094 7100-3821	90510-77464
Advisor (Environment)	033-24397079	98362-98692
Hospital Enquiry	2401-4577 2401-8735	
Centenary Hospital Front desk-	7100-3637/7100-3678	
Centenary Hospital Casualty	7100-3632	
Dy. CMO	7100-3657	98302-47076
Safety & APO	7101-2396	
Executive Engineer		90388-88036
Dy. CMO	7100-3657	98302-47076
Executive Engineer (Mechanical)		87597-86070
Executive Engineer (Mechanical)		94382-73774
Dy. Commandant CISF (Forward Control)		85477-49936
Asst. Commandant CISF (Base Control)		89897-66885 99788-56611
Insp/Exe Crime & Intelligence		89027-16483
Control room of CISF Unit KoPT Kolkata	24391360/ 24390480	96744-66428
For Kolkata /Howrah & Districts (a)Asst. Supdt PSO (b) Security Officer	7100-3344	96747-20081
Control room (KoPT Security Wing)	2439 5841 7100-3347/ 3346	96741-55660
PSO Control Room	7100-3291	9674155660
Port Fire Control Room	7100-3351	9674155652

Company Name	Designation	Mobile No	Email Id
BPCL	Chief Installation Manager	9982754999	paikarasm@bharatpetroleum.in
HPCL	GM Installation	9840774918	kaushik@hpcl.in
IOC	DGM(I/C) Terminal	9831504668	bc@indianoil.in
IOC (Lub Div)	GM Plant	9830918018	beckrd@indianoil.in
Rajiv Agarwal	GM	9831022279	rajiv_agarwal1963@yahoo.co.in
S K Oil Terminals (P) Ltd	GM	9830021201	Tkmukherjee.skoilterminal2@gmail.com
JRE Tank Terminals Pvt Ltd	GM	9674947990	gururajan@imc.net.in
Hindustan Storage & Distribution Co. Ltd	Operation Manager	7980859815	mihir@hindustanstorage.in
Mundial Export Import Finance Pvt	Operation Manager	07002100690	Tm-mubb@imc.net.in
IFB Agro Industries	Manager	9836479852	Swapanmitra1952@gmail.com
Mother Diary Fruit & Vegetable	SR. Executive	9830211286	Sujit.dey@motherdairy.com
Gem Refineries (1997) Pvt Ltd	Terminal Manager	8961002239	gemrefineries1997_p@yahoo.in

H.2 HDC

Name of Authority	HDC Office (STD code: 03224)	Mobile No.
Chairman	033-22305370	6292311236
Dy. Chairman	033-22305438 / 263209 (H)	9948298304
Director-Marine	033-22303451	9836298639
General Manager (Marine)	263303, 264818	9836298699
Manager (Marine)		8989429782
General Manager (M&S)	263171, 264943	9434054419
General Manager (Engg.)	263255 / 264496	7478005099
General Manager (Finance)	264466, 263170	9434062313
General Manager (Traffic)	263229, 264433	9434063416
Sr. Dy. Manager (Admin)	265490	9434083699
Sr. Dy. Manager (Finance)	263724	9434018021
Sr. Dy. Manager (I & CF)	252844, 252118	9434721138
Sr. Dy. Manager (P & E)	252662	9434735407
Sr. Dy. Manager (P & IR)	263160, 264848	9434031386
Sr. Dy. Manager (Railways)	252209	9434031412
Sr. Dy. Manager (SH & CH)	252208, 252246	9434031407
Sr. Dy. Manager (Material Management)	263358	9434015761
Sr. Fire & Security Officer	265211	9434065452
Dy. Manager (MM)	263358	9434015761
Dy. Manager (M.O.)		8989429782
Dy. Manager (M.E.)		9434031280
Dy. Manager (Traffic)	252067	
Safety & Anti-Pollution Officer		8972989196
Commander (SD&DS)		8170052312
Dy. Manager (Railways)	252209, 252058	9434031412
Dy. Dock Master	252513	
Safety Officer	263993	
Sr. Commandant (CISF)	252229	9434052230
Dy. Commandant (CISF)	252457	9434031098
Asst. Commandant (CISF)	252418	9434063389
Medical Superintendent	263265, 265848	
CISF Control Room, CJP Ops. Building	252222	

1st Oil Jetty Fire Station – Control Room	-	8945523379
2nd Oil Jetty Fire Station – Control Room	-	8945523378 / 8016413657
3rd Oil Jetty Fire Station – Control Room	264874	9434143006
Dock Fire Station – Control Room	-	8945523380 / 9434143025
Central Gate Complex – CISF	252222	
GC Berth Main Gate	252466	
Port Hospital	263388, 266021	
Ambulance Room – Shift Office	263388, 266021	
Marine Office Port Control		8373062386

Port Users – Contact Details	
Indian Oil Corporation Ltd.	08083804927
HPCL	03224 - 274007
BPCL	09051644240
Petronas	0603-20515000 / 20265000
HPL (Plant)	03224 – 274007 / 877 / 876 / 400 / 882 / 384
MCPI	03224 – 275572 / 73
Tata Power	251399
Reliance Petroleum	0288 - 22785214
HBCPL	03224 - 274999

Transport Services	
SBSTC – Durgachak	274439
SP, Purba Medinipur	269580
Other Police officals and Police station	263487
Dy. Controller of Civil Defence	272986

Health & Medical	
CMOH – Purba Medinipur	09233176634
Sub Divisional Hospital, Durgachak	274108
CMO, IOCL, Haldia Refinery	08083804927
CMO, B. C. Ray Hospital, Haldia	269048
District Hospital, Tamluk	03228 - 266059

Emergency Telephone no.	
Fire	252433
Doctor On Duty	263388, 266021
HDC Hospital	265862, 266558
Marine House Control Room	252313

H.3 EXPERTS TEAM

The management group will seek assistance from experts indicated in the following:

Name	Official Address	Contact Number
Department of Home, Govt. of West Bengal		
Secretary (Home)	Writers Buildings Kolkata – 700 001	033-22 535072
Principal Secretary,	Disaster Management and Civil Defence, Nabanna, 2nd Floor, 325 Sarat Chatterjee Road, Mandirtala, Shibpur, Howrah-711102.	033-2214-3674
	Commissioner of Police Kolkata, Lalbazar Kolkata – 700 001.	033-2214-5060/ PBX No.033 2214-5000
District Collector		
South 24 - Parganas		033 24791469, 033 24793713, 9830447711
East Midnapore		03228 262098, 03228 263120, 9434000700
North 24-Parganas		033 25523662, 033 25846202, 033 2584 6204
West Bengal Police		
	Supdt. Of Police South 24 Parganas, Bhabani Bhavan, Alipore Kolkata – 700 027.	033- 479-3333/ PBX No. 033 2479-1311-15
	Add. DG & IG of Police (Admn.) West Bengal Writers Buildings Kolkata – 700 001.	033-2235-7411
Port Police		
	Watgunge Police Control Room	033 2459-3298/2408-2100/ 2459-8819
	Watgunge Women Police Control Room	033 2489-2100
	West Port Police Control Room	033 2439-3617/2409-6100/ 2439-2454
	Garden Reach Police Control Room	033 2469-6569/2408-1100/ 2489-3272
	Hare Street Police Control Room	033 2211-8760/2215-0100/ 2211-8761
	Metiabruz Police Control Room	033 2469-5317 / 2409-9179
	Cyber Police Station	033 2214-3000/2250-5120
	Lalbazar Police Control Room	033 2214-3024 / 2214-3230 / 2214-1310
	Traffic Police Control Room	033 2214-3644 / 2242-7248
	North Divn. Police Control Room	033 2360-6405 /2360-6417

	Port Divn. Police Control Room	033 2409-3109
Kolkata Municipal Corporation		
	5, S.N.Banerjee Road Kolkata – 700 013	033 2286 1212/1313/1414 Whatsapp no: 8335988888 033 2286 1000(28 lines)
SSKM Medical College & Hospital		033 2223 6026/6242/ 1615/9735/ 6180/ 9692/ 9822
Kolkata Medical College & Hospital		033 2212 3853
NRS Medical College & Hospital		033 2286 0140; 988303 1301; 90073 66597; 98320 25916
RG KAR Medical College & Hospital		033 2555-7656/7675/7676 033 2555-7656, Extn: 2516/1021/2515
Calcutta National Medical College & Hospital		033-2289-7122/23 (Extn:104)
Vidyasagar Hospital	Vidyasagar State General Hospital, 4, Brahma Samaj Road, Behala, Kolkata – 700034.	Emergency - (033) 2397-1591, Superintendent-(033) 2397-0581, Facility Manager's office-9007355352 email: sghvidyasagar@gmail.com
Coast Guard		
HQ Coast Guard Region NE, Coast Guard	Newtown Rajarhat, Kolkata 700157	033-2324 8002 email: ops-ne@indiancoastguard.nic.in
Officer-in-Charge MRSC, Haldia	Headquarters Coast Guard District No. 8 (West Bengal) Anchorage Camp Haldia West Bengal – 721605	03224-267755 Email: dhq8@indiancoastguard.nic.in mrsc-haldia@indiancoastguard.nic.in
Navy Office		

	Chief Staff Officer to NOIC Staff Officer (Operation) to NOIC Officer of the day, INS, Netaji Subhas, Hastings, Kolkata – 700 022	033-2242- 0430/ 0432/0503/0441
Inspectorate of Dock Safety		
Dy. Director (Safety) Inspectorate	Dock Safety, Kolkata Nizam Palace, 1st floor, 2nd M.S.O.Bldg. 234/4 A.J.C. Bose Road, Kolkata-700020.	033-2574-5512; 8285412802; 033- 22830719(O)/ Fax: 033 2283-0718 email:idskolkata@dgfasli.nic.in, idskol@rediffmail.com
Specialised Agency		
Bomb Detection & Disposal Squad	Bhabani Bhaban, 31 Belvedere Road, Alipore, Kolkata -700 027	(033) 24506100 / 24506174 email: occomp.cid-wb@gov.in
DG Shipping		
Mercantile Marine Department, Haldia	E&SS-cum-DDG(Tech) Mercantile Marine Department, Chiranjibpur (Opposite BSNL Office Building), East Medinipur, Haldia West Bengal-721604	03224 - 252323 / 252968 email: mmdhaldia@gmail.com
Shipping Corporation of India		
	Regional General Manager Shipping House 13, Strand Road Kolkata – 700 001	033 2254 3415
Directorate of Fire & Emergency Services		
	West Bengal Fire Services 13-D, Mirza Galib Street Kolkata – 700 016	033-2358-1130
Director	West Bengal Fire Services 13-D, Mirza Galib Street Kolkata – 700 016	033-2252 1165
Petroleum & Explosives Safety Organisation, East Circle		
Joint Chief Controller of Explosives	8, Esplanade East, 1st Floor, Kolkata – 700 069.	2213 0895; 033-2248 0427/ 2248 9524/ 2248 6600/ 2242 0686
Disaster Management Department		
	Nodal Officer of Disaster Management Dy. Director Public Health & communicable Disease	2214-5601 2214-3371 (Ext.226)
West Bengal Pollution Control Board		

	Paribesh Bhavan, Block – LA, Bldg.No.10A, Sector-III, Salt Lake, Kolkata – 700 091	033-2335-6731/9088/0261
District Relief Department Office of the District Magistrate		
SDO	South 24Pgs Alipore 2479-1681 South 24Pgs, Diamond Harbour.	0317 4255222
Custom Commissioner	SHRI ASHUTOSH AWASTHI Chief Commissioner of Customs, Kolkata	2242-1173 email: ccu-cuskoa@nic.in
Immigration	Ms. Nidhi Rani, IPS, FRRO Kolkata.	033-22900549, email: frrokol@nic.in
Port Health Organization	Prof. Dr. Ranjan Das, Port Health Officer Port Health Organisation, Kolkata	033- 2223 0904, 033- 2223 0414 email: phokolkata@rediffmail.com
Irrigation Department	Pravat Kumar Mishra, Principal Secretary, Irrigation & waterways Dept, Govt. of West Bengal, Jalsampad Bhavan, 9th Floor, Salt Lake City, Kolkata 700 091	033-23215616, 033-23581315 / 17, email: iwd.prsecy@gmail.com
Bhabha Atomic Research Centre	BARC, Kolkata BARC, Mumbai	033-337 1230 022- 25505050/ 25592000
Government of India Department of Atomic Energy Variable Energy Cyclotron Centre	Sector-I, Block-AF, Bidhan Nagar, Kolkata - 700 064	033-2337- 1230 / 1231 / 1232 / 1233 / 1238 / 4831 / 4832 /4838, 033-2359-4008/2321-4435/ 033-2321-4435
Mercantile Marine Department	Principal Officer Marine House, Hastings, Kolkata – 700 022	033-22230238
MMD Haldia	Mercantile Marine Department, Chiranjibpur (Opp. BSNL Office Building), East Medinipur, Haldia-721604 West Bengal.	03224 - 252323 / 252968 email: mmdhaldia@gmail.com

Name of Agency and Contact Details	
WBWMPL	M/s West Bengal Waste Management Limited, Jindal Towers, Block-A, 4th Floor, 21/1A/3, Darga Road, Kolkata- 700017. (email: *bobbykurien@ramky.com*)
Used + Waste Oil Receiver	a) M/s. Bristol Petroleum Pvt. Ltd., 26/5/D-E, A M Ghosh Road, Budge Budge, 24 Pgs (S), WB, Pin:700137. (Email: bristolpetroleum74@gmail.com). b) M/s Falak Industrials Fuels Pvt. Ltd. 1, Chandni Chowk Street, Block C, 2nd floor, Room -20, Kolkata-700072. (Email : parali1904@gmail.com). c) M/s R.S. Oil Industries, Junglepur, Jalan Industrial Complex, Vill.Baniyara, P.O. Begri, Domjur, Dist. Howrah, Pin.711 411. (Email: rsoilind90@gmail.com) . *d)* M/s. Lubrina Recycling Pvt. Ltd., Vill: Joychandipur , P.O. Bakrahat, P.S. Bishnupur, Dist. 24-Parganas(S), WB., Pin– 743377. (email: disposal@lubrinare.com)

OTHER EXPERTS AND AGENCIES	
Name of body	**Telephone / fax**
Indian Register of Shipping, Mumbai	022-30519400 / 25703611 ho@irclass.org
IIT – Kharagpur	+91-3222-255221
Meteorological Centre, Kolkata	033-2479 3167/24790596 kolkatarmc@gmail.com
The National Environmental Engineering & Research Institute (NEERI), Nagpur	0712-2249999 / 660 / 2244900
Ministry of Petroleum & Natural Gas	011-23382426 / 23383100
National Institute of Ocean Technology (NIOT), Chennai	044-66783300 / 22460275 / 22460645
National Ship Design and Research Centre, Visakhapatnam	0891-2578360 / 2577754 nsdrc@itpvis.ap.nic.in

NDRF – 2nd BATTALION					
Name & Designation	**Address**	**Contact & email id**	**Fax no.**	**Mobile**	**Control room no**
Sh. Nishit Upadhyay (Commandant)	2nd BN NDRF, Near RRI Camp. Haringhata, Mohanpur, Nadia, (West Bengal) Pin - 741246	033-25875032 wb02-ndrf@nic.in	033-25875032	09474061104, 09474116775	033-25875032

SALVAGE ASSOCIATIONS	
Salvage Company	**Contact Number**
M/s. Sealord Diving & Salvage Pvt. Ltd.	02227682825/9769900765/ 9833413650/9819890721
i-Marine Infratech (India) Pvt. Ltd.	02240561222
SMIT Salvage	T: +31 78 6969 000 F: +31 78 6969 555

List of Voluntary Organization and Non – Governmental Organization
https://ngodarpan.gov.in/

List of Approved Waste Handling Agencies for Transportation and Disposal of Recovered Oil	
M/s Inspec Oils Ltd.	Hongkong House, 1st Floor, 31, BBD Bagh (South) Kolkata-700001,West Bengal Mob: 9830428669 e-mail: inspec@poddar.co.in
Bristol Petroleum Pvt. Ltd.	26/5/D-E, A M Ghosh Road, Budge Budge, 24 Pgs (S), WB, Pin:700137. Mob: 8777741235 e-mail: bristolpetroleum2023@gmail.com/ bristolpetroleum74@gmail.com
M/s Kundu Refinery Works	13/8, ARIFF Road, Ward No. 013,Kolkata-700067 Mob: 9851482872 e-mail: kundurefinery@yahoo.co.in
Falak Industries Fuel Pvt. Ltd.	1, Chandni Chowk Street, Block C, 2nd floor, Room -20, Kolkata-700072. Mob: 6393345734 e-mail: fifpl.2015@gmail.com
L. B. S. Industries	Khurai Sajor Leikai, Tinsid Road, P.O./P.S.: Porompat, Imphal East-795005 Mob: 7003848749 e-mail: info@lbsindustries.com
Lubrina Recycling Pvt. Ltd.	Vill: Joychandipur , P.O. Bakrahat, P.S. Bishnupur, Dist. 24-Parganas(S), WB., Pin– 743377. Mob: 9831151692 e-mail: info@lubrinare.com
R. S. Oil Industries	49/5/H/187, Karl Marx Sarani, Kolkata-700023. Mob: 9830204267 e-mail: rsoilind63@gmail.com/ rsoilind90@gmail.com

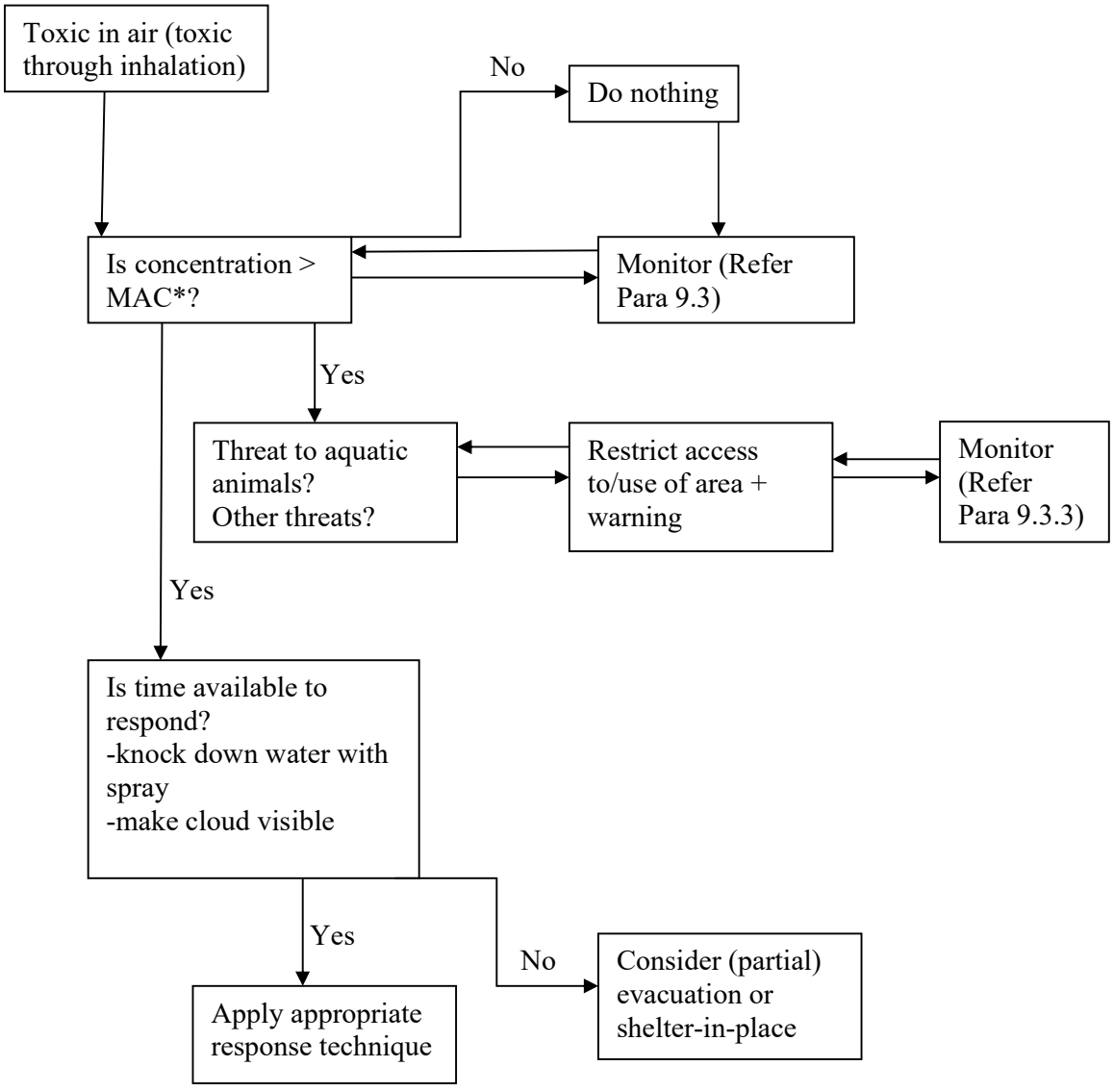
List of Laboratory under agreement with HDC for water testing	
Hubert Enviro Care Systems (P) Ltd., A-21, III Phase, Thiru Vi Ka Industrial Estate, Guindy, Chennai 600032, Tamilnadu, India	# A-21,III Phase, Behind Lions Club School, Thiru Vi Ka Industrial Estate, Guindy, Chennai – 600 032, Tamilnadu , India. Contact No: 044-42985555 Email: lab@hecs.in
R.V. BRIGGS & Co. Pvt. Ltd., 8-9 Bentinck Street, Kolkata 700001, West Bengal, India	8 & 9 Bentinck Street, Taher Mansion, 1st Floor, Kolkata 700001, West Bengal, India Mobile: 98309 88615 E-mail: info@rvbriggs.com

FIRST AID CENTRES			
Sr. no.	**Name of institution**	**Area**	**Telephone**
1.			
2.			
3.			

APPENDIX I
RESPONSE TECHNIQUES FOR HNS SPILL

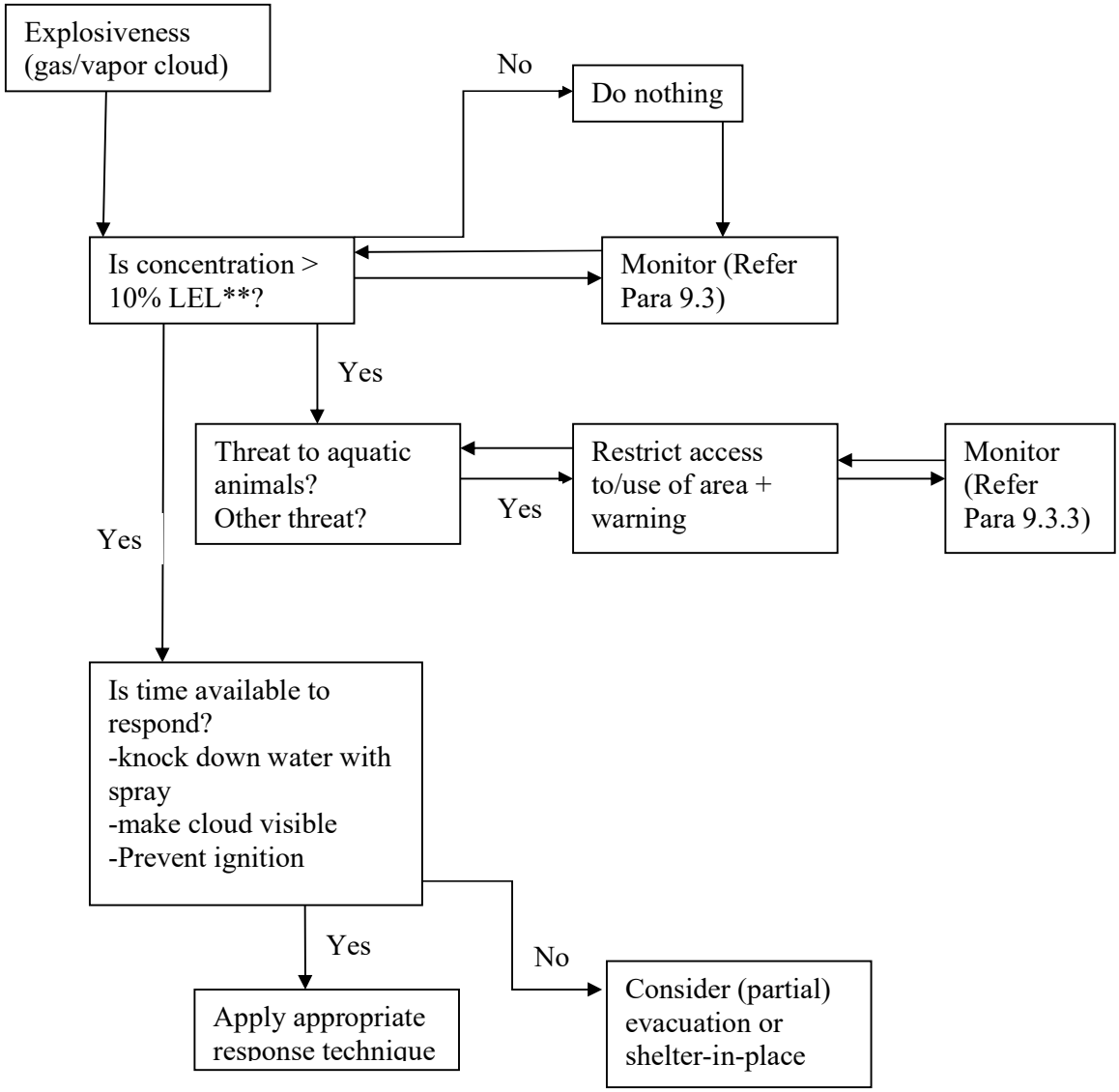
I.1 Response to Gas or Volatile liquids

Tree I.1.1: Decision-tree for responding to substances that is toxic in air (toxic through inhalation)



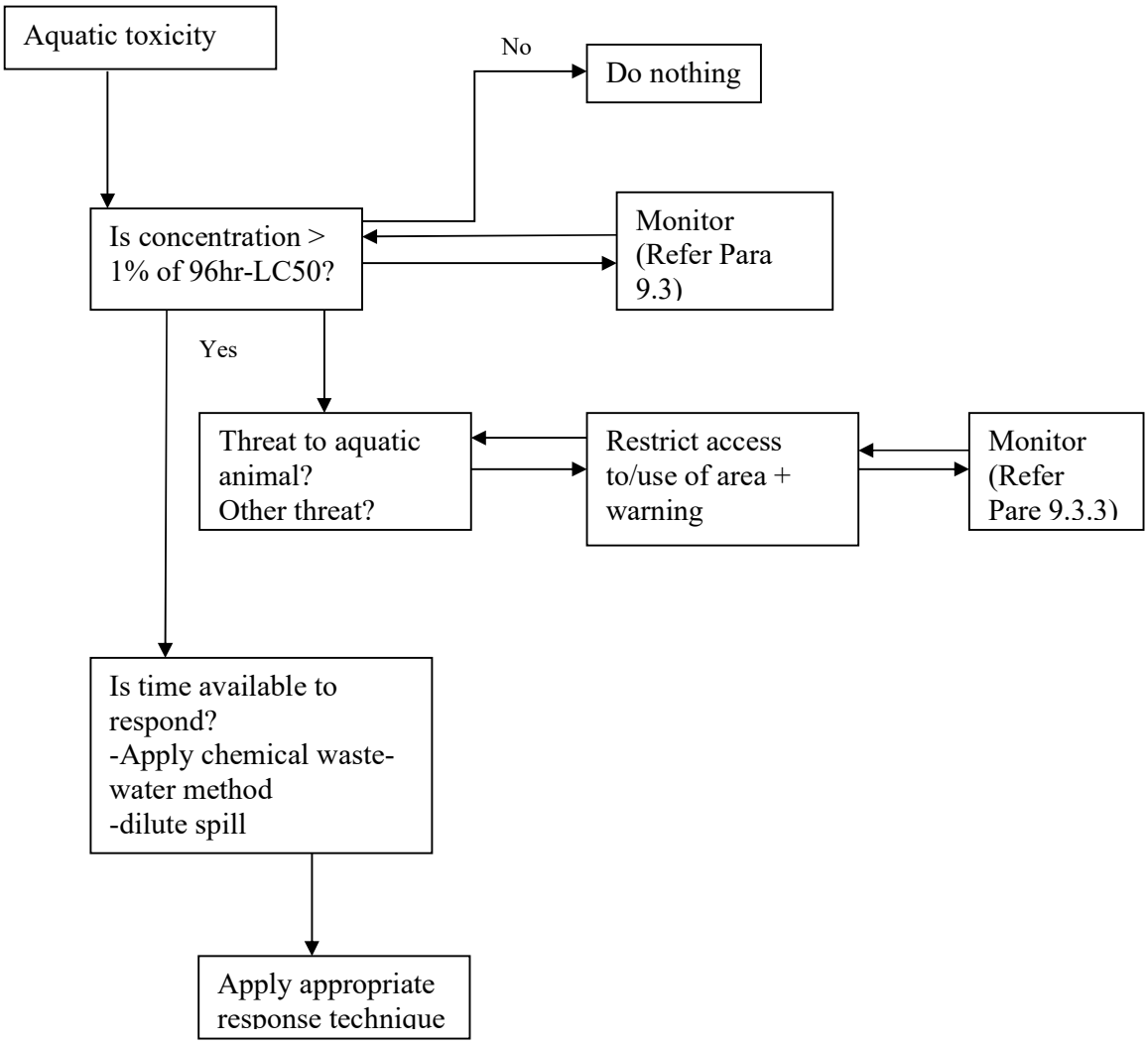
*MAC = Maximum allowable Concentration

Tree I.1.2: Decision-tree for responding to substances that form explosive gaseous/vapour clouds



**LEL – Lower Explosive Limit

Tree I.1.3: Decision-tree for responding to water soluble toxic substances



I.1.1 Response techniques for toxic substances are

I.1.1.1 Controlled burning

If the gas is inflammable, controlled ignition and subsequent burning may be considered.

I.1.1.2'Knock down' with water spray

Fine water spray, or mist, can be used to 'knock down' clouds of water soluble gas (such as ammonia or sulphur dioxide), reduce the fire and explosion risk of inflammable gas clouds (such as butane and ethylene) and help to disperse clouds of water insoluble gases. The water spray technique would only be applicable to relatively small releases of gas and will only be successful in some circumstances; high winds would render the technique impractical. The use of water sprays to 'knock down' vapour clouds would not be feasible if the air temperatures are substantially below zero. The water spray would turn to ice.

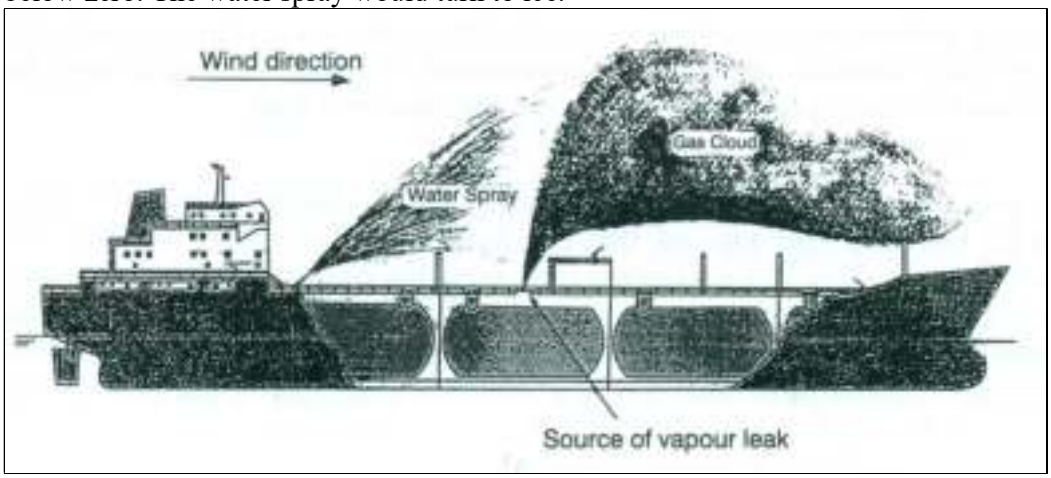
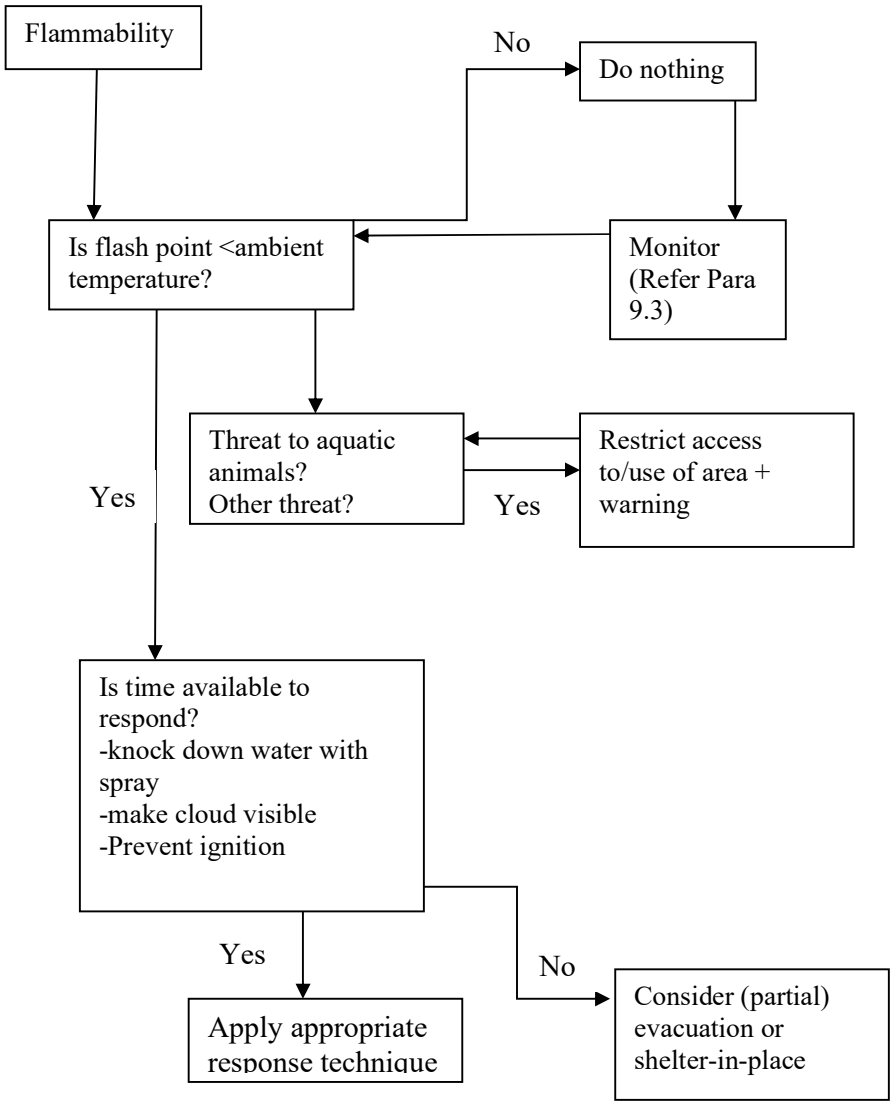


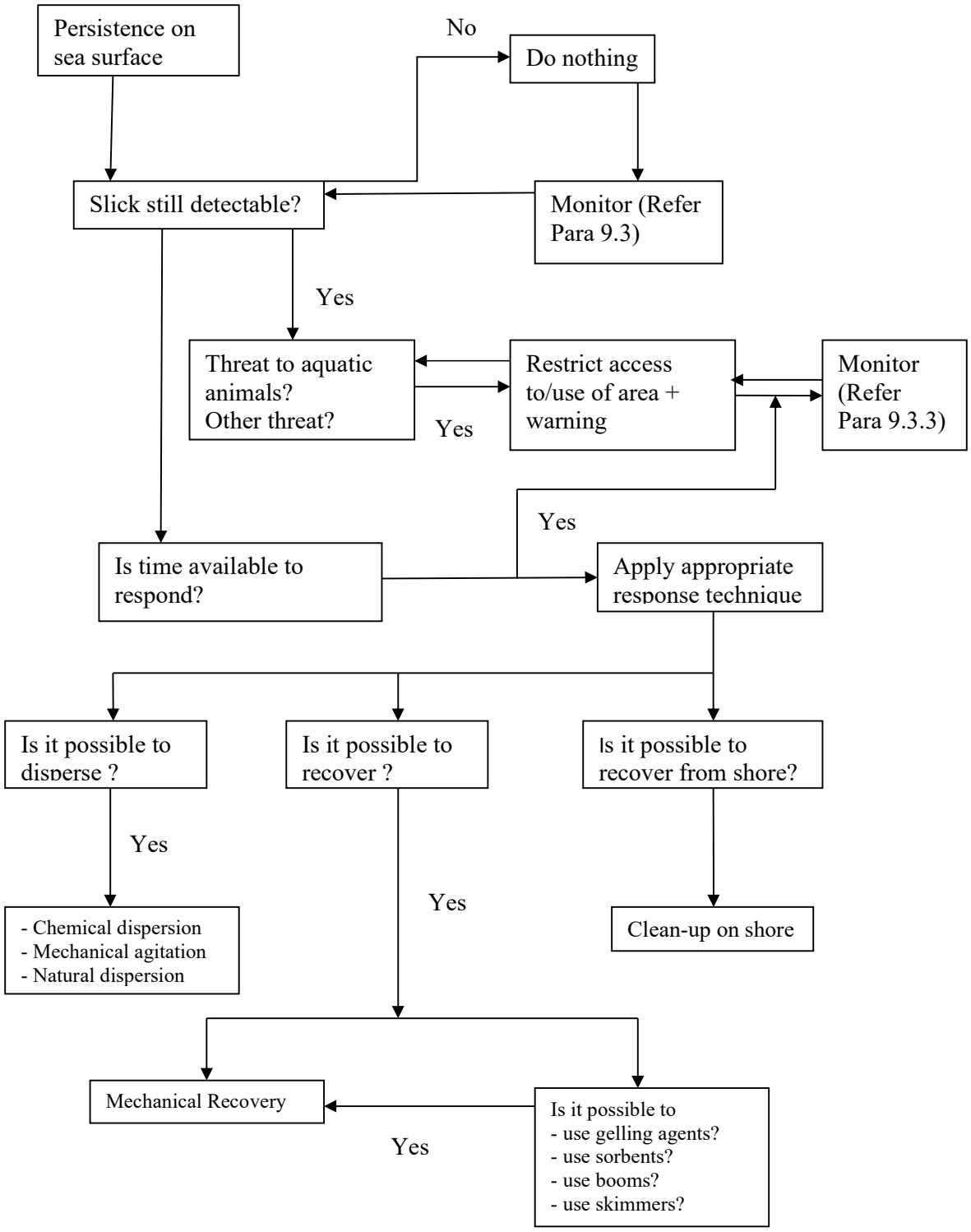
Figure I.1: Small water-soluble gas clouds can be "knocked down", or washed down, by water sprays

I.2 Response to Floaters

Tree I.2.1: Decision-tree for responding to floating flammable substances



Tree I.2.2: Decision-tree for responding to floating substances which persist on the water surface



I.2.1Response Techniques for Floaters

I.2.1.1 Use of fire-fighting foam

Fire-fighting foam can be sprayed onto a Floater to reduce the risk of fire and explosion if it is flammable, or to suppress vapours if it is toxic.

I.2.1.2 Use of sorbents

Sorbents (as sheets, pillows or booms or as powder or granulated material) could be applied to the slick for subsequent collection and recovery of the HNS from the sorbent. Polypropylene sorbents used for the recovery of spilled oil would be suitable for the recovery of hydrocarbons, but other liquid HNS may not be amenable to this technique.

Figure I.2: Treating a HNS spill on the water surface with sorbent plates or pads

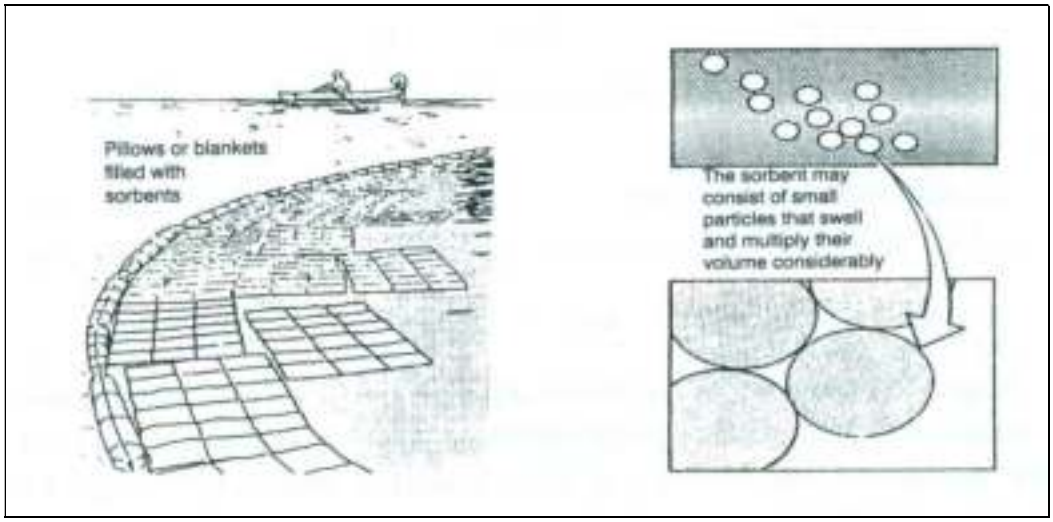


Figure I.3: Treating a HNS spill on the surface with pillows or blankets filled with powdered sorbents

I.2.1.3 Contain and recover

Booms could be used to contain the slick, unless it has already spread too thinly due to low viscosity.

The slick could be recovered by using some types of skimmers. Belt skimmers and sorbent rope skimmers are used for the recovery of some chemicals, e.g. octanol and dioctyl phthalate. Skimmers constructed from stainless steel, aluminium alloy or coated with Teflon (interior) are resistant to aggressive chemicals.

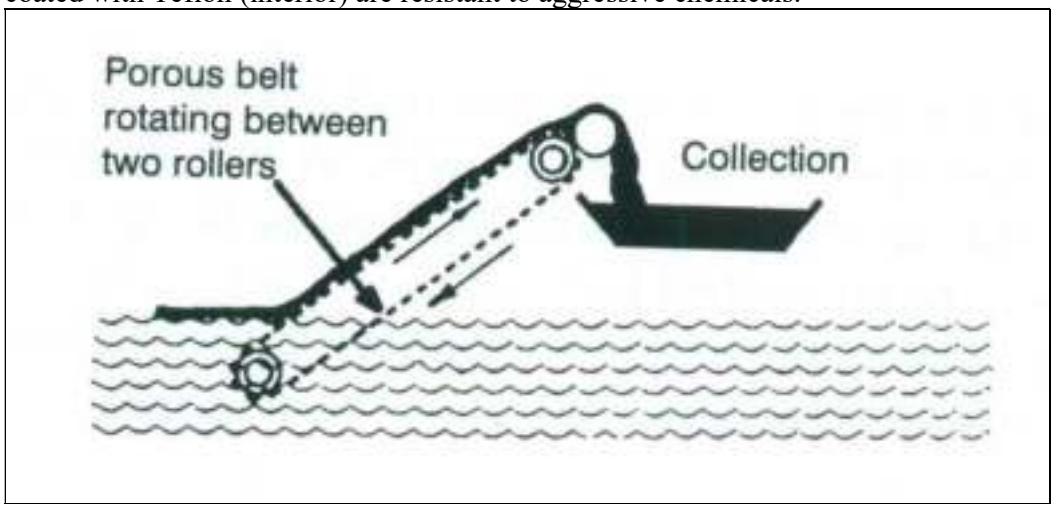


Figure I.4: Recovery of floating HNS on the water surface with a belt skimmer

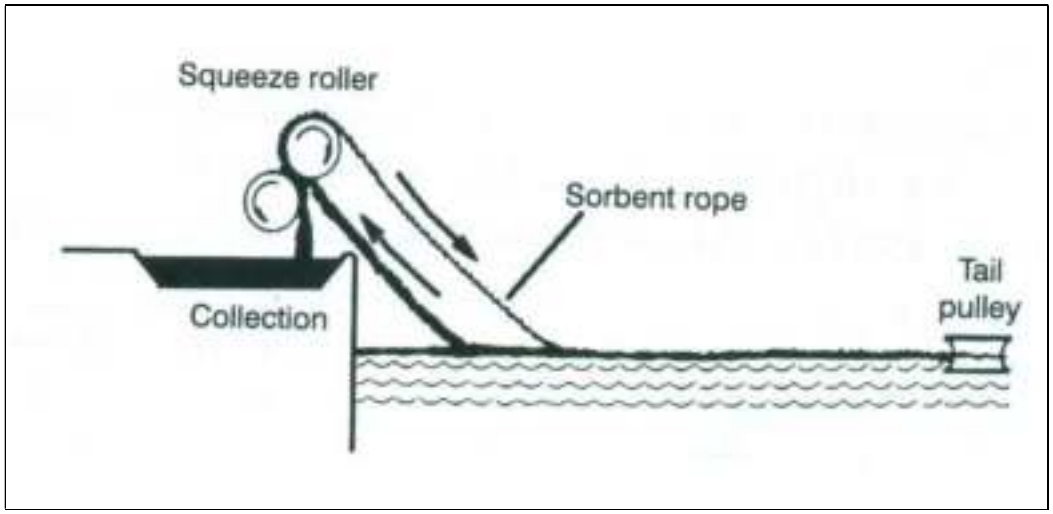
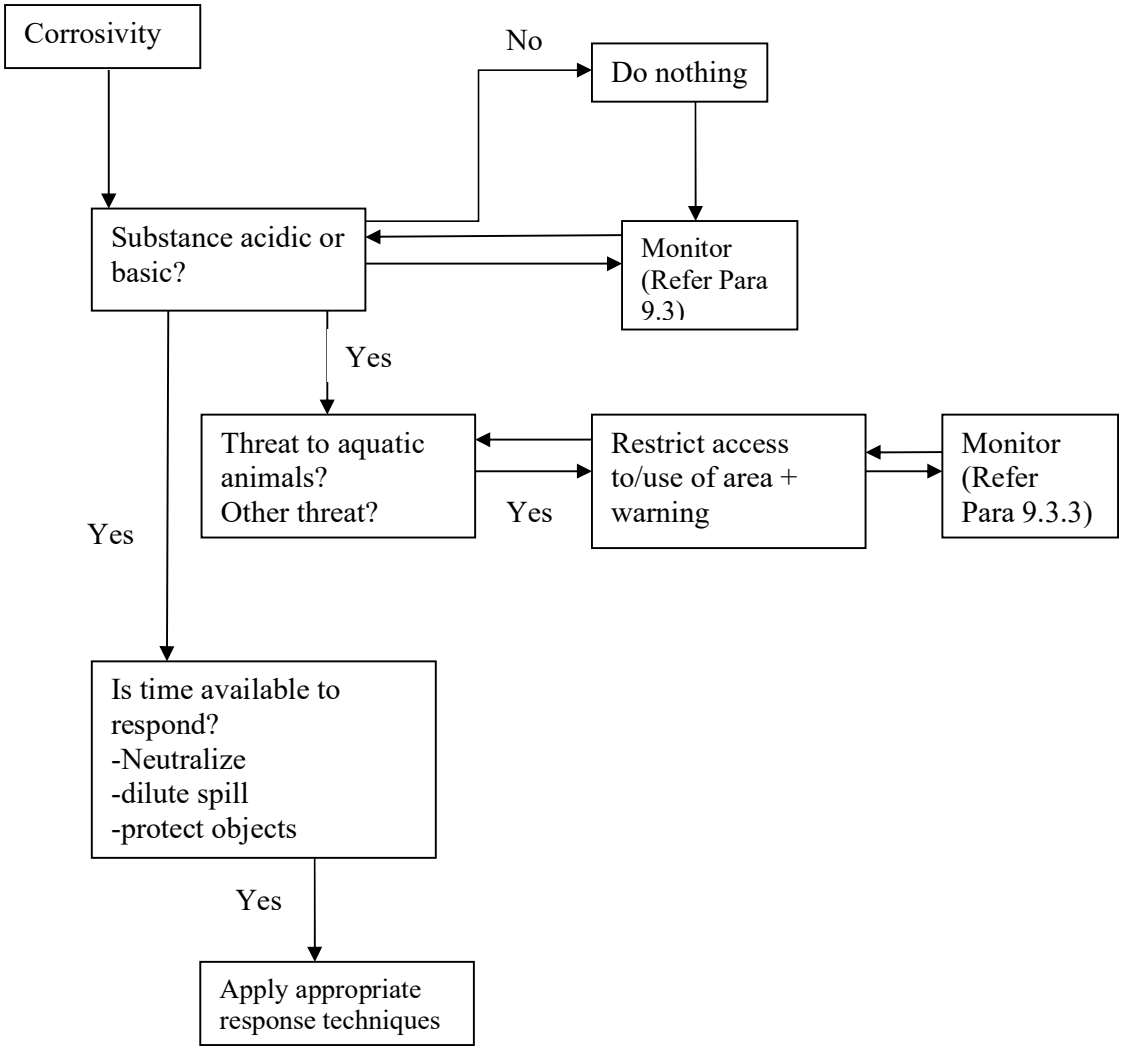


Figure I.5: Recovery of floating HNS with sorbent rope

I.3 Response to Dissolvers

Tree I.3.1: Decision-tree for responding to water soluble toxic substances (refer Tree I.1.3)

Tree I.3.2: Decision-tree for responding to soluble corrosive substances



I.3.1 Response technique for Dissolvers

HNS spills that dissolve in water can be treated with various response agents in order to reduce or "neutralize" their harmful effects. Examples of chemical treating agents are:

- Neutralizing agents;
- Flocculation agents;
- Oxidizing agents;
- Reduction agents;
- Gelling agents;
- Activated carbon;
- Complexing agents; and
- Ion exchangers.

I.3.1.1 Neutralization

Acid Spills can be neutralized with sodium bicarbonate ($NaHCO_3$) and monosodium phosphate (NaH_2PO4) to neutralize spills of alkalis.

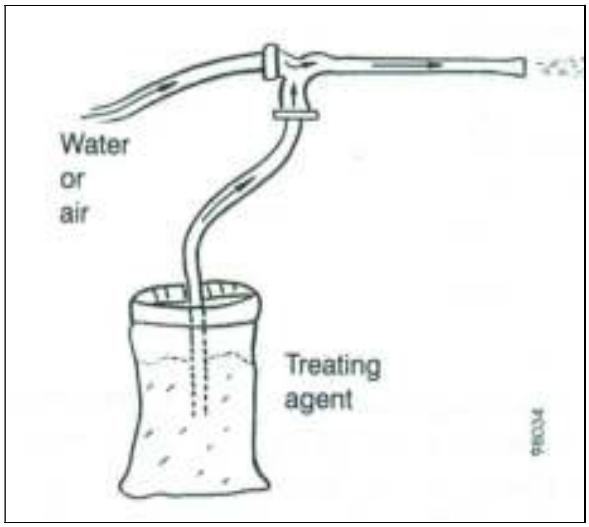
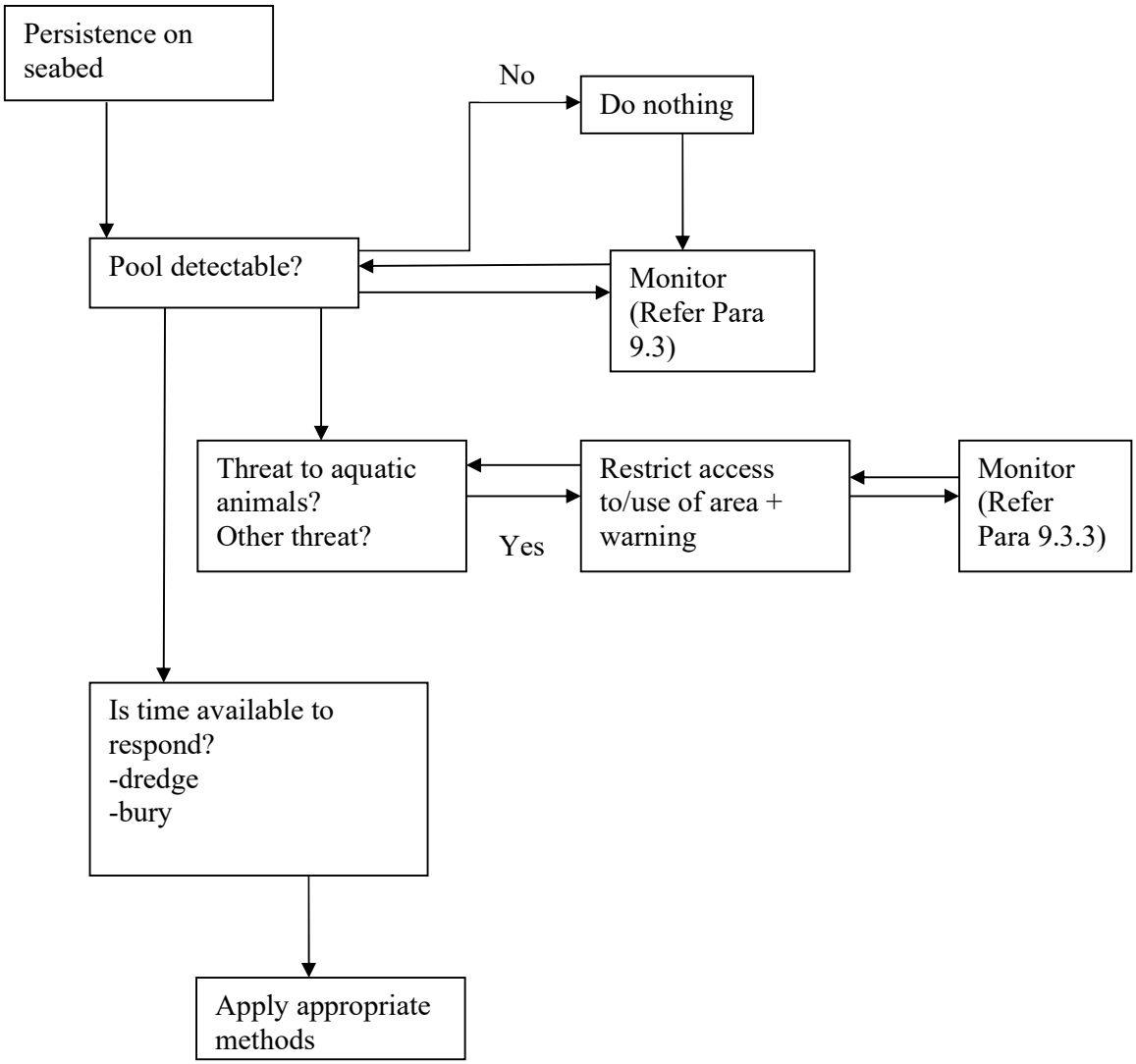


Figure I.6: Use of ejector jet pipe for application of a treating agent

I.4 Response to Sinkers

Tree I.4.1: Decision-tree for responding to substances which have impact on benthic biota (sinkers)



If a Sinker HNS has sunk to the sea/river bed and is considered to present a threat to the marine environment there are two options:

1. Recover it from the sea/river bed
2. Cover it up with some impervious material (bury it)

I.4.1 Recovery of HNS from sea/river bed

Table I.1: Categories and types

Category	Type
1. Mechanical dredges	Mechanical dredges such as grab (clamshell), dipper or bucket ladder type are designed for hard or soft material and normally are not self-propelled. It is not advisable to use such dredges since they tend to scatter the chemicals during operation.
2. Hydraulic dredges	Hydraulic dredges recover materials from the sea/river bed through nozzles connected to suction pumps. Sometimes the nozzles are equipped with cutter heads to facilitate normal dredging work. When these dredges are used for removal of sunken HNS, the cutter heads should be dismounted as, like the buckets on mechanical dredges, they cause strong bottom turbulence that tends to scatter the spill.
3. Pneumatic dredges	Pneumatic dredges have pipe systems extending from the surface to the bottom. Compressed air is injected at the lower part of the pipe which results in a strong rising flow. Airlift dredge systems have been used with some success in chemical accidents.

1. Mechanical dredges

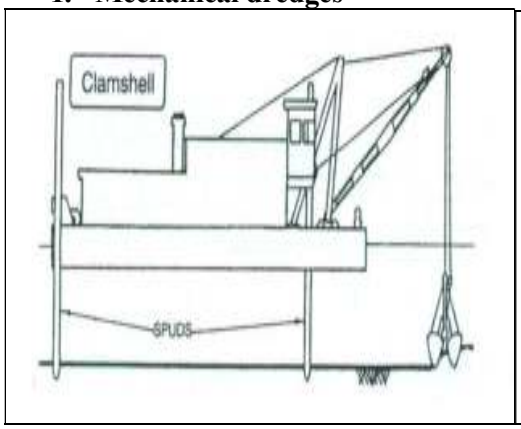


Figure I.7: Clamshell type

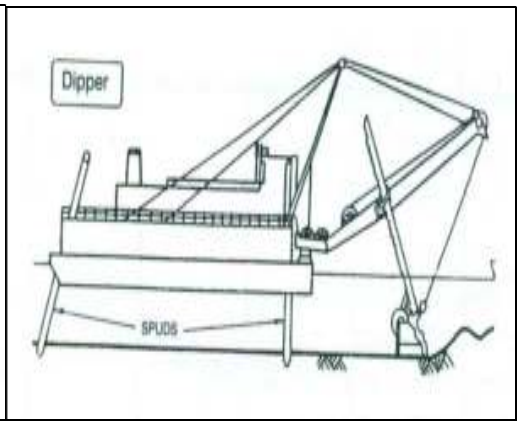


Figure I.8: Dipper type

2. Hydraulic dredges

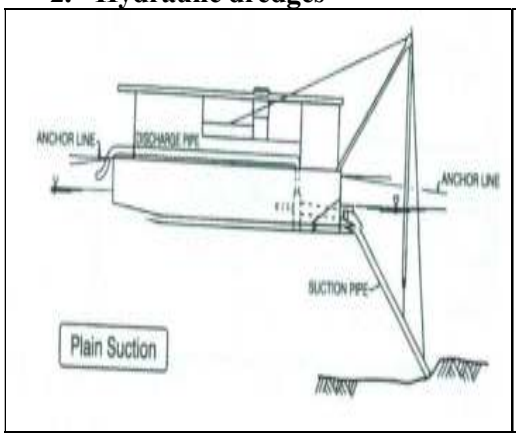


Figure I.9: Plain suction type

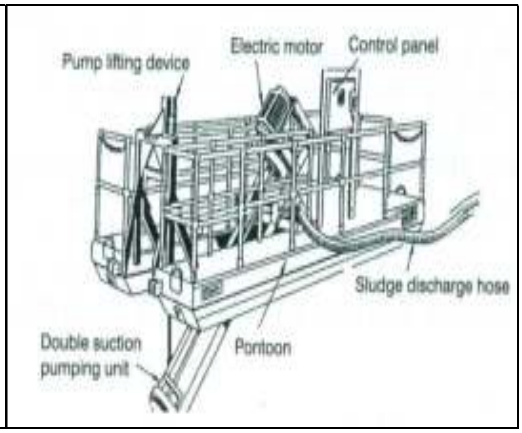


Figure I.10: For operation in shallow water

3. Pneumatic Dredges

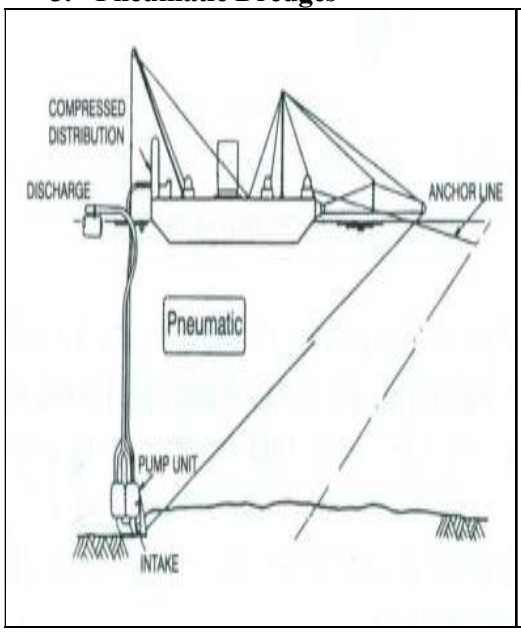


Figure I.11: "Pneuma" type

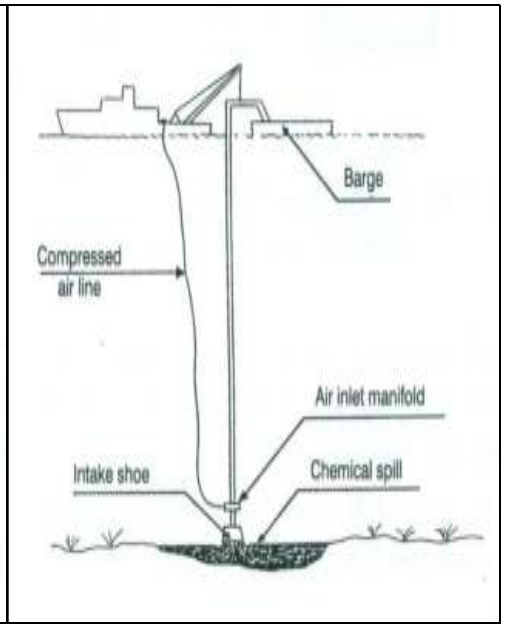


Figure I.12: A pneumatic (airlift) dredge

I.5 Packages fall into 3 groups:

- Package/Floater;
- Package / immersed (intermediate- not floating nor sinking)
- Package / sinker

I.5.1 Response to HNS spilled in packaged form

A situation may arise involving the loss of containers and packages:

- The loss of containers or packages from a vessel during the loading or unloading operation in water. In this circumstance, it may be possible to identify what was in the lost container from the ship manifest and container storage plan.

  - If the container is located, then it may be possible to recover it and its contents before any pollution of HNS has occurred. If the container is floating and undamaged the loss of any HNS contents is unlikely to occur. If the

container is damaged or sinks in water the pressure may rupture drums within a container. With time, it is likely that the container or package may corrode leading to the eventual release of the HNS contents into the water.

However, a container or package may be in a damaged or corroded condition. A careful examination of the recovered container or package may reveal labels that give information about the contents and whether HNS is involved.

APPENDIX J
HAZARDOUS SUBSTANCE INFORMATION SHEET

(Fill in the blanks as completely as possible)

Chemical Name: _____ Common Name: _____
UN Number: _____
Natural physical state: ❑Solid ❑ Liquid ❑Gas
(@ Ambient temperature of 20º to 25ºC)

Tick appropriately:

G	Gas	**F**	Floater
GD	Gas/Dissolver	**FD**	Floater/dissolver
E	Evaporator	**DE**	Dissolver/Evaporator
ED	Evaporator/dissolver	**D**	Dissolver
FE	Floater/Evaporator	**SD**	Sinker/Dissolver
FED	Floater/Evaporator/ Dissolver	**S**	Sinker

Properties	Value	Unit
Molecular weight		g/g-mole
Density		g/ml
Specific gravity		@ ºF/ ºC
Solubility with water		@ ºF/ ºC
Boiling point		ºF/ ºC
Melting Point		ºF/ ºC
Vapour pressure (kPa, mm hg, etc)		@ ºF/ ºC
Vapour density		@ ºF/ ºC
Flash point		(Open cup ,Close cup)
Other		

Hazardous Characteristics
A. Toxic Hazard

Toxicological Hazard (IDLH, TLV, other)	Hazard (Yes/No)	Concentration	Notes
Inhalation			
Ingestion			
Skin/eye absorption			
Carcinogenic			
Teratogenic			
Mutagenic			
Other			

B. Combustible Hazard

Combustibility	Hazard (Yes/No)	Concentration	Notes
Toxic by-product(s)			
Flammability			
LFL/LEL			
UFL/UEL			
Explosivity			

C. Reactivity Hazard

With	Notes

D. Corrosivity Hazard

pH	
Neutralizing agent	

E. Marine Pollution Hazard

Marine Pollution Hazard	Yes/No	Values	Notes
Bioaccumulation			
Biodegradation			
Acute Toxicity			
Tainting			
Chronic Toxicity			
MARPOL Category			
IMDG Code(Marine pollutant)			

Response Action:

_____

Fire Fighting details:

_____

_____

Personnel Protective Equipment:

_____

_____

First Aid:

_____

_____

Monitoring /Sampling Recommended:

_____

_____

Other Information: Contacts with chemical industry, medical personnel_____

APPENDIX K
POLLUTION RESPONSE EQUIPMENT - PHOTOGRAPHS

Inflatable Boom

Air blower for inflatable boom

Permanent type Boom

U Boom

U Boom Air Blower

U Boom Power pack

Brush type skimmer

Drum type skimmer

Disc type skimmer

Weir Skimmer

Skimmer Power pack

OSD Spray pump

Hopper

Oil Transfer pump for shore cleaning equipment

Vacuum pump for Shore cleaning

OSR Equipment

Ocean Envy Tug

Ocean Monarch Tug

Water Pump	
Make	
Model	
Capacity	
Suction head and Total Head	
Photograph	

Flex Floating Storage Tank	
Make	
Model	
Capacity	
Size (when	

unfolded)	
Folded Dimension	
Photograph	

Davit	
Make	
Model	
Operation	
Capacity	
Weight	
Radius	
Rotation	
Photograph	

Oil Spill Dispersant	
Type	
Photograph	

Testing and Maintenance frequency of OSR equipment

Equipment list	Testing frequency	Maintenance frequency
Inflatable Boom	Tested in scheduled mock drill (conducted by ICG)	As per operational maintenance manual
Fence Boom	Tested in scheduled mock drill (conducted by ICG)	As per operational maintenance manual
Multi Skimmer with power pack	Once in a month	As per operational maintenance manual
OSD Spray Pumps	Once in a month	As per operational maintenance manual
Hopper	Once in a month	As per operational maintenance manual
U-Boom	Tested in scheduled mock drill (conducted by ICG)	As per operational maintenance manual
U-Boom power pack and air blower	Once in a month	As per operational maintenance manual
Mini vacuum Pumps (25 M^3) (nos.)	Once in a month	As per operational maintenance manual
Air blower for Inflatable Boom	Once in a month	As per operational maintenance manual
Oil Transfer pumps	Once in a month	As per operational maintenance manual

APPENDIX L
LEVELS OF PROTECTION FOR PRE-DETERMINED LEVELS OF HAZARDS FOR HNS SPILLS

Level of protection	Equipment	Protection provided	Should be used when:	Limiting criteria
A	Recommended: • Pressure-demand, full face-piece SCBA or pressure-demand supplied air respirator with escape SCBA • Fully encapsulating chemical resistant suit • Inner chemical resistant gloves • Chemical resistant safety boots/shoes Optional: • Cooling unit • Coveralls • Long cotton underwear • Hard hat • Disposable gloves and boot covers	The highest available level of respiratory, skin, and eye protection	• The chemical substance has been identified and requires the highest level of protection for the skin, eye and respiratory system based on either: ➢ measured (or potential for) high concentration of atmospheric vapors, gases or particulates; or ➢ Site operations and work functions involving a high potential for splash, immersion or exposure to unexpected vapors, gases or particulates of materials that are harmful to skin or	• Fully encapsulating suit material must be compatible with the substance involved

			capable of being absorbed through the intact skin • Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible • operations must be conducted in confined, poorly ventilated areas, until the absence of conditions requiring level A protection is determined	
B	Recommended: • Pressure-demand, full face-piece SCBA or pressure-demand supplied air respirator with escape SCBA • Chemical resistant clothing (overalls and long-sleeved jacket; hooded one- or two-piece chemical splash suit;	The same level of respiratory, but less skin protection than A It is minimum level recommended for initial site entries, until the hazards have been further identified	• The type and atmospheric concentration of substances have been identified, and require a high level of respiratory protection but less skin protection. This involves atmospheres: ➢ With IDLH concentrations of specific substances	• Use only when the vapours or gases present are not suspected of containing high concentration of chemicals that are harmful to skin or capable of being absorbed through the

	disposable chemical-resistant one-piece suit) • Inner and outer chemical resistant gloves • Chemical resistant safety boots/shoes • Hard hat • Two-way radio communications Optional: • Coveralls • Disposable gloves and boot covers • Face shield • Long cotton underwear		that do not present a severe skin hazard; or ➢ That does not meet air purifying respirators. • Atmospheres containing less than 19.5% oxygen • Presence of incompletely identified vapors or gases is indicated by a direct reading of the organic vapor detection instrument, but are not suspected of containing high levels of chemicals harmful to the skin or capable of being absorbed through the intact skin	intact skin • Use only when it is highly unlikely that the work being done will generate either high concentration of vapours, gases, particulates or splashes of material that will affect exposed skin
C	Recommended: • Full face-piece air purifying canister equipped respirator • Chemical resistant clothing (overalls and long-sleeved jacket; hooded one- or two-piece chemical splash suit; disposable chemical-	The same level of skin protection as level B, but a lower level of respiratory protection	• The atmospheric contaminants, liquid splashes or other direct contact will not adversely affect any exposed skin • The types of air contaminants have been identified and concentrations measured, and a canister is available that	• Atmospheric concentration of chemicals must not exceed IDLH levels • The atmosphere must contain at least 19.5% oxygen

	resistant one-piece suit) • Inner and outer chemical resistant gloves • Chemical resistant safety boots/shoes • Hard hat • Two-way radio communications Optional: • Coveralls • Disposable gloves and boot covers • Face shield • Escape mask • Long cotton underwear		can remove the contaminant • All criteria for the use of air purifying respirators are met	
D	Recommended: • Coveralls • safety boots/shoes • safety glasses or chemical splash goggles • Hard hat Optional: • Gloves • Face shield • Escape mask	No respiratory Protection. Minimal skin protection	• The atmospheric contains no known hazard • work functions preclude splashes, immersion or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals	• this level should not be worn in the exclusion zone • The atmosphere must contain at least 19.5% oxygen