

Marine Infrastructure Developer Private Limited

REGISTERED OFFICE: NO:22, L&T CONSTRUCTION COMPLEX, MOUNT POONAMALLEE ROAD,
MANAPAKKAM, CHENNAI – 600089, TAMIL NADU, INDIA

CIN : U74999TN2016PTC103769

Telephone : 044-2252 6000

MIDPL/TNPCB/GMP/EC-HYC

Date: 14-05-2018

Additional Principal Chief Conservator of Forests (C),
Ministry of Environment, Forest and Climate Change, Regional Office (South Eastern Zone),

1st and 11nd Floor, Handloom Export Promotion Council,
34, Cathedral Garden Road, Nungambakkam,
Chennai – 600 034
roefccc@gmail.com

Dear Sir,

Sub : Half yearly Compliance report of Environment and CRZ Clearance for the development of proposed Port at Katupalli, Tiruvallur District of Tamilnadu by M/s Marine Infrastructure Developer Pvt. Limited for the period of October 2017 – March 2018

Ref : CRZ & Environmental Clearance for the development of proposed Port at Katupalli, Tiruvallur District of Tamilnadu by M/s Marine Infrastructure Developer Pvt. Limited – bifurcation of EC&CRZ Clearance vide F. No 10-130/2007 – IA.III dtd . 9th February 2018

With reference to the above mentioned Environment & CRZ Clearance issued vide dtd 9th February 2018 by Ministry of Environment, Forest & Climate Change (MoEF&CC); please find enclosed herewith the compliance report to the conditions stipulated in the cited reference for the Half Yearly period of **October 2017 to March 2018** in both hard & soft copy for your kind reference.

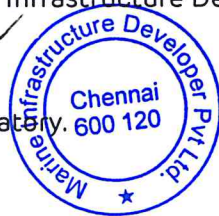
Thank you,

Yours Sincerely,

For, M/s. Marine Infrastructure Developer Ltd



Authorized Signatory.



Encl: As above

Copy to:

- 1) The Director (Monitoring –IA-III Division), Ministry of Environment, Forest & Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi – 110003
- 2) Zonal Office, Central Pollution Control Board, A-Block, Nisarga Bhavan, 1st and 2nd Floors, 7th D Cross, Thimmaiah Road, Shivanagar, Bengaluru, Karnataka 5600879
- 3) The Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai - 600 032

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- 4) The District Environmental Engineer, Tamil Nadu Pollution Control Board, EPIB Building, A.O Block, Gummipoondi Industrial Complex, Gummipoondi – 601201.
- 5) Member Secretary TNCZMA & Director – Dept of Environment, No.1, Jeenis Road, Panagal Building, Ground Floore, Saidapet, Chennai -600 015

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2. Prohibited Items: The currency, bearer cheques, hundi, bearer bill and/or similar other documents, Gold, Silver, Jewellery, Precious stones and liquids, Strictly Liquid perishable/frangible goods narcotics and / or any item which are prohibited and/or restricted by statutory law, laws and Act, are not accepted by us. If any such articles are enclosed without our information, the Company/ Franchisee will not be liable for the same and no claim shall be entertained for such articles.
3. Limitation of Liability: (a) In case of loss, theft, damage and misrouting of booked consignment maximum liability of the Company/ Franchisee shall not be exceeding to the sum equivalent to 10 times of freight charges for documents and 5 times of freight charges for parcels (below Rs. 5000/-) or the value of the consignment mentioned on the docket, whichever is less (b) All the high value shipment (above Rupees Five Thousand) and Fragile Shipment shall be insured by the Consignor while booking, if any such shipment booked uninsured in such cases, in the event of loss/ damages or theft of such shipment the Company/ Franchisee will not be liable at all to reimburse to the customer
4. No Service Area: Where the dock or Non-dock booked unknowingly/ for the area which comes under NSA (No Service Area) i.e beyond the network of SMCSPCL in such event the said shipment shall be returned to the party/consignor, in case of NSA service the Maximum Liability of the Company/s Franchisees shall be limited up to return of freight amount only

CRZ & Environment Clearance for the development of proposed Shipyard-cum-Minor Port Complex at Kattupali, Ponneri Taluka, Tiruvallur district, Tamilnadu by M/s Marine Infrastructure Developer private Limited (MIDPL) – bifurcation of Environment & CRZ clearance – reg
file no: 10-130/2007- A.III dated: 09/02/2018.

SN	EC Condition	Compliance status
01	Kindly refer to online application of M/s L&T Shipbuilding Limited (LTSB) vide proposal No. IA/TN/MIS/20243/1910 dated 27th May, 2017, submitted to this Ministry for bifurcation of Environmental and CRZ Clearance issued vide Letter No. 10-130/2007- IA.III dated July 03, 2009 in favor of M/s L & T Ship Building Limited (Joint venture of L&T and TIDCO) in terms of the provisions of the Environment Impact Assessment (EIA) Notification, 2006 and CRZ Notification, 2011 under the Environment (Protection) Act, 1986.	Noted
02	The proposal was considered by the EAC (Infra-2) in its 21st meeting held during 21-24 August, 2017 and 23rd meeting held on 13th October, 2017. It is inter-alia, noted that the Environmental and CRZ clearance for the development of Shipyard-cum-Minor Port Complex at Kattupalli village, Thiruvallur district, Tamil Nadu was granted to L&T Shipbuilding Limited (LTSB) vide Letter No. 10-130/2007-IA:III dated July 03, 2009. The project consists of shipbuilding, ship repair, modular fabrication facilities, port and associated infrastructure. The Kattupalli Shipyard cum Port Complex has become operational since January, 2013.	Noted
03	In considering the divergent nature of business of LTSB and to harness the potential for growth with clear focus on port business, LTSB had approached the Hon'ble National Company Law Tribunal (NCLT), Chennai with a Scheme of Arrangement for Demerger of Port business of LTSB into a separate company Viz., M/s Marine Infrastructure Developer private Limited (MIDPL). The Hon'ble NCLT after careful examination of the scheme, had accorded its approval on 20.03.2017. In pursuant to the said NCLT Order, the Port business in Kattupalli Shipyard cum Port Complex on a going concern basis together with the identified port assets, powers, sanctions, approvals, and registrations etc., stands transferred and vested with MIDPL. The facilities to be operated by MIDPL are given below:	Noted

Port and Common Facilities:

SN	EC Condition	Compliance
i.	North breakwater, facilities required for Port such as Navigational Channel [Outer (-)16.7 m CD and Inner (-)17.5 m CD depth], Other Navigational Facilities,	Noted
ii.	Five Berths and 2 Port Craft Berths, container Freight Station,	Noted
iii.	Container Stackyard, Cargo Storage areas and Tank farms, other various necessary supporting infrastructures, utilities and services etc., Dredging of Port area and Navigation channel and Offshore dumping	Noted
iv.	Area: 336.75 Acres (321.75 Acres of Revenue Land and 15.0 Acres of Coastal land)	Noted
v.	<p>The Permitted activities to be carried out by MIDPL are as given below:</p> <p>Cargo Handling</p> <p>Containers (Mn TEU's) 1.80</p> <p>Ro-Ro —Automobiles (nos) 1,49,899</p> <p>Project Cargo (MTPA) 0.44</p> <p>Break Bulk/general cargo (Barytes/Gypsum/Limestone/Granite/Steel Cargo) (MTPA) 1.82</p> <p>Edible oil, CBFS, Base Oil, Lube Oil and Non-Hazardous Liquid Cargo (MTPA) 0.57</p> <p>Total Handling Capacity at Port 24.65 MTPA</p>	Noted and will be complied.
04	Based on the information furnished by the Project proponent and the EAC recommendations, the Ministry hereby bifurcates the Environmental & CRZ Clearance in to L&T Shipbuilding Limited (LTSB) and Marine Infrastructure Developer private Limited (MIDPL) for the development of proposed Shipyard-cum-Minor Port Complex at Kattupalli, Ponneri Taluka, Tiruvallur District Tamil Nadu subject to strict compliance of following specific and general conditions:	Noted

Specific Conditions:

SN	EC Condition	LTSB Compliance
(i)	The proponent shall comply all the conditions stipulated in the letter R.C.No. P1/2004/2008, dated 21.10.2008 of the Department of Environment, Chennai.	Complied. Compliance to letter R.C.No. P1/2004/2008, dated 21.10.2008, enclosed as Annexure -I
(ii)	The proponent shall comply all the commitment made vide his letter No. D/Shipyard/00/07 dated 20.03.2009.	Complied This EC is just a bifurcation of original EC of LTSB in name of MIDPL & LTSB. All applicable commitments, wrt letter No. D/Shipyard/00/07 dated 20.03.2009 like provision of fire station, independent port connectivity, no reclamation on areas outside port, non-usage of Tri Butyl Tin [TBT] and treatment of waste water in STP and recycling, disposal of hazardous waste to authorised recyclers are being complied. Dumping of dredging material shall be carried out at identified location, (as per modelling studies carried out by LTSB). In past, LTSB has been continuously monitoring shoreline studies through Institute of Ocean Management, Anna University, Chennai. Further, MIDPL shall further carry out shoreline studies of the concerned area.
(iii)	Provision shall be made for the housing of Construction labour within the site with all necessary infrastructure and facilities such as fuel or cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Complied. Most of the construction labors are from nearby villages. Construction activities are being carried out in daytime and worker leave the site on daily basis.
(vi)	There shall be no withdrawal of groundwater in Coastal Regulation Zone area, for this project. In any case any ground water is proposed to be withdrawn from outside the CRZ area, specific prior permission from the concerned State /Central Groundwater board shall be	Complied. Presently unit is procuring water from M/s. Chennai Metropolitan Water Supply and Sewerage Board, Chennai.

	obtained in this regard.	
(v)	No dumping of dredging materials in the sea shall be undertaken. In case of sea dumping required, an integrated Modelling study to be carried out to locate the dump site so that it does not cause any problem to Ennore port.	Complied. No dumping was carried out during the period October-17 to March-18. Refer Annexure -1
(vi)	Shoreline changes due the project shall be monitored continuously nourishment of northern shoreline shall be carried out using the sediments from beach acceleration on the southern shoreline.	In past, LTSB has been continuously monitoring shoreline studies through Institute of Ocean Management, Anna University, Chennai. Further, MIDPL shall further carry out shoreline studies of the concerned area. Beach Nourishment Report, as carried out by M/s LTSB enclosed as Annexure -2
(vii)	Suitable Screens shall be installed between the construction area and the intakes so that operations of the intakes are not affected by the construction activity.	Complied Presently marine side construction is being carried out within basin area, which is sheltered by northern break water. No impact envisaged.
(viii)	At least a distance of 100 meter shall be provided between intake of Chennai Water Desalination Ltd. (CWDL) and north edge of the northern breakwater as agreed in the meeting between the proponent and CWDL	Complied Distance maintained as agreed.
(ix)	Independent port connectivity shall be developed.	Complied An independent port connectivity was developed
(x)	Rehabilitation if any shall be carried out as per law / State Government.	Complied Rehabilitation carried out completely as per law / State Government at the time of project implementation.
(xi)	Fire station shall be located within the project area	Complied MIDPL is having dedicated fire station with multiple mobile fire tender.
(xii)	The Hazardous waste generated shall be properly collected and handled as per the provisions of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.	Complied. Hazardous waste generated are handled inline to Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. Details of the same are submitted to TNPCCB as a part of Hazardous waste annual return (Form 4) on regular basis

(xiii)	The waste water generated from the activity shall be collected, treated and reused properly.	Complied Domestic waste water generated from the activity is being collected, treated in 45 KLD and reused for green belt.
(xiv)	Sewage Treatment Facility should be provided in accordance with the CRZ Notification.	Complied 45 KLD STP provided in accordance with the CRZ notification.
(xv)	No Solid Waste will be disposed of in the Coastal Regulatory Zone area. The Solid Waste shall be properly collected segregated and disposed as per the provision of Solid Waste Management Rules, 2016.	Complied No solid waste is being disposed of in the CRZ area. APSEZ has developed a vision for making itself – “A Zero Waste Port” by the year 2020. MIDPL vision is based on adoption of 5R principle of waste management i.e Reduce, Reuse, Reprocess, Recycle & Recover. All waste will be handled inline to 5R principle.
(xvi)	Installation and operation of DG set if any shall comply with the guidelines of CPCB.	Complied 02 no of DG set with 2000 kVA capacity has been installed inline to CPCB guideline. Flue gas analysis report, attached as Annexure 3
(xviii)	Air quality including the VOC shall be monitored regularly as per the guidelines of CPCB and reported.	Complied Ambient Air Quality Monitoring is being carried out by MoEF & CC accredited agency, Reports for the period Oct 2017 – Mar 2018 is enclosed as Annexure 3 . All emissions are well with the prescribed standards
(xix)	The project proponent shall undertake green belt development all along the periphery of the project area and also alongside the road.	Complied Presently, 2.94 hectare of the area has been developed under Green belt..Project will be undergoing expansion, and green belt shall be developed inline to the requirement.
(xx)	All necessary clearances from the concerned agencies shall be obtained before initiating the project.	Complied Obtained clearance from Chief Controller of Explosives, Fire Department, Civil Aviation Department
(xxi)	Project proponent shall install necessary oil spill mitigation measures in the shipyard. The details of the facilities	Complied List of oil spill equipment available at site is enclosed as

	provided shall be informed to this Ministry within 3 months from the date of receipt of this letter.	Annexure -4
(xxii)	No hazardous chemicals shall be stored in the Coastal Regulation Zone area.	Noted.
(xxiii)	The project shall not be commissioned till the requisite water supply and electricity to the project are provided by the PWD/ Electricity Department.	Noted.
(xxiv)	Specific arrangements for rainwater harvesting shall be made in the project design and the rain water so harvested shall be optimally utilized.	Due to high water table rainwater harvesting may not be feasible however possibilities will be explored.
(xxv)	The facilities to be constructed in the CRZ area as part of this project shall be strictly in conformity with the provisions of the CRZ Notification, 2011 and its amendment. The facilities such as office building and residential buildings which do not require water front and foreshore facilities shall not be constructed within the Coastal Regulation Zone area.	Complied. All construction has been done inline to CRZ Notification , 2011 & EC&CRZ clearance obtained

General Conditions:

(i)	Construction of the proposed structures shall be undertaken meticulously conforming to the existing Central/local rules and regulations including Coastal Regulation Zone Notification 1991 & its amendments. All the construction designs /drawings relating to the proposed construction activities must have approvals of the concerned State Government Departments /Agencies.	Complied All construction has been done inline to CRZ Notification , 2011 & EC&CRZ clearance obtained
(ii)	Adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc. shall be ensured for construction workers during the construction phase of the project so as to avoid felling of trees/mangroves and pollution of water and the surroundings.	Complied Most of the construction labors are from nearby villages. Construction activities are being carried out in daytime and worker leave the site on daily basis.
(iii)	The project authorities shall make necessary arrangements for disposal of solid wastes and for the treatment of effluents by providing a proper wastewater treatment plant outside the CRZ area. The quality of treated effluents, solid wastes and noise level etc. must conform to the standards laid down by the competent authorities including the Central/State Pollution Control Board and the Union Ministry of Environment and Forests under the Environment (Protection) Act, 1986, whichever are more stringent.	Complied Disposal of solid waste & STP unit is provided in accordance with the CRZ notification. Environment Monitoring is being carried out by MoEF & CC accredited agency, Reports for the period Oct 2017 – Mar 2018 is enclosed as Annexure -3 All the results are found to be well within the prescribed standard.
(iv)	The proponent shall obtain the requisite consents for discharge of effluents and emissions under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (prevention and Control of Pollution) Act, 1981 from the Tamil Nadu State Pollution Control Board before commissioning of the project and a copy of each of these shall be sent to this Ministry.	Complied. Consents for discharge of effluents and emissions under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (prevention and Control of Pollution) Act, 1981 has been obtained from the Tamil Nadu State Pollution Control Board . CTE under Air and Water act, enclosed as Annexure - 6
(v)	In order to carry out the environmental monitoring during the operational phase of the project, the project authorities shall establish an environmental laboratory well equipped with standard equipment and facilities and qualified manpower to carry out the testing of various environmental	Complied MIDPL will set up Environmental Management Cell, staffed with qualified personnel at site supported by team at Head Office in Ahmedabad.

	parameters.	Environment monitoring is being carried out by MoEF & CC accredited agency.
(vi)	The proponents shall provide for a regular monitoring mechanism so as to ensure that the treated effluents conform to the prescribed standards. The records of analysis reports must be properly maintained and made available for inspection to the concerned State/Central officials during their visits.	Complied. Domestic water is being treated in STP and inlet and outlet characteristic of water is regularly analysed by MoEF & CC accredited agency, the monitoring results for the period Oct 2017 – Mar 2018 is enclosed as Annexure - 3 . All the results are found to be well within the prescribed standard. Records shall be made available at site for inspection of State / Central officials during their visit.
(vii)	The sand dunes and mangroves, if any, on the site shall not be disturbed in any way.	Noted
(viii)	A copy of the clearance letter will be marked to the concerned Panchayat / local NGO, if any, from whom any suggestion / representation has been received while processing the proposal.	Complied This EC is just a bifurcation of original EC of LTSB. Copy of original EC was marked by M/s LTSB to all concerned authorities, at that time.
(ix)	The Tamil Nadu Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's Office/Tehsildars Office for 30 days.	The condition does not pertain to project proponent
(x)	The funds earmarked for environment protection measures shall be maintained, in a separate account and there shall be no diversion of these funds for any other purpose. A year-wise expenditure on Environmental safeguards shall be reported to this ministry	Noted and will be complied.
(xi)	Full support shall be extended to the officers (this Ministry's Regional Office at Chennai and the officers of the Central and State Pollution Control Boards by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.	Noted.
(xii)	In case of deviation or alteration in the project including the implementing agency, a fresh reference shall be made to this ministry for modification in the clearance conditions or imposition of new ones for ensuring	Noted.

	environmental protection.	
(xiii)	This Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	Noted.
(xiv)	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.	Noted.
(xv)	The Project proponents shall inform the Regional Office at Chennai as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work.	Noted for compliance

EC & CRZ Amendment letter No. 10-130/2007- A.III dated 12.05.2010:

(2. Specific Conditions :)

(i)	The details of combined effect on both the Ports (i.e. Ennore Port and Kattupalli Port) shall be carried out to monitor the impact of the post-dumping. This model study shall be carried out for a period of one year.	Complied M/s LTSB has already carried out detailed modelling study to understand impact of post dumping and report was submitted to Ministry. No dumping was being carried by MIDPL during the period Oct-17 to March-18.
(ii)	A comparison between model study and actual dumping shall be carried out to examine the impacts both on North-East and South-West of the Ports and shall be submitted to the Ministry,	Complied Comparison between model study and actual dumping was made to examine the impacts and report was submitted to Ministry. No dumping was being carried by MIDPL during the period Oct-17 to March-18
(iii)	No reclamation of the areas outside the Port limit and Buckingham Canal shall be carried out.	Noted.

EC & CRZ Extension of validity letter No. 10-130/2007- XIII dated 17.12.2014:

6. Conditions:

-	The cargo should only include Container (i) 21.60 MTPA, (ii) Ro-Ro - 0.22 MTPA, (iii) Project Cargo 0.44 MTPA, (iv) Break bulk/General Cargo	Noted.
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	<p>(Barites/Gypsum/Limestone/Granite/Steel cargo)-1.82 MTPA and (v) Edible oil, CFBS Base Oil and Lube oil and non-hazardous liquid cargo - 0.57 MTPA.</p> <p>(ii) All the conditions stipulated by the Tamil Nadu Coastal Zone Management Authority (TNCZMA) vide letter no. 6064/EC.3/2014-1 dated 26.06.2014, shall be strictly complied with.</p> <p>(iii) No additional land should be utilized for the proposed development.</p> <p>(iv) As committed, the local traffic should not be disturbed.</p>	<p>Compliance to Tamil Nadu Coastal Zone Management Authority (TNCZMA) vide letter no. 6064/EC.3/2014-1 dated 26.06.2014, enclosed as Annexure -5</p> <p>Noted.</p> <p>Separate road available for local traffic.</p>
5.	These stipulations would be enforced among other under the provisions of water (Prevention and Control of Pollution) Act, 1974 the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991, the Hazardous Chemical (Manufacture, storage and Import) Rules, 1989, Solid Waste Management Rules, 2016 and the Coastal Regulation Zone Notification, 2011 and its subsequent amendments made there under from time to time.	Noted
6.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act 1972, etc shall be Obtained, as applicable by project proponents from the respective competent authorities.	<p>Complied.</p> <p>Obtained clearance from Chief Controller of Explosives, Fire Department, Civil Aviation Department.</p>
7	The project proponent should advertise in at least two local newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Tamil Nadu Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at http://envfonnic.in . The advertisement	<p>Complied</p> <p>Advertisement copies are attached as Annexure 7.</p> <p>The same is being submitted to Regional Office, MoEF&CC, Chennai</p>

	should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Chennai.	
8	Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, within a period of 30 day as prescribed under section 11 of the National Environment Appellate Act, 1997.	Noted.
9	Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website.	Will be complied.
10	This Environmental and CRZ Clearance is valid till 2 nd July, 2019.	Noted.
11	This issue with the approval of the Competent Authority.	Noted.

List of Annexures	
Annexure - 1	Compliance to letter R.C.No. P1/2004/2008, dated 21.10.2008
Annexure -2	Beach Nourishment report carried out by M/s LTSB through Institute of Ocean Management, Anna University, Chennai
Annexure -3	Environment Monitoring Analysis reports
Annexure -4	Oil Spill Contingency Plan and Oil Spill Control Equipment
Annexure -5	Compliance to Tamil Nadu Coastal Zone Management Authority (TNCZMA) vide letter no. 6064/EC.3/2014-1 dated 26.06.2014
Annexure -6	Consent to Establish under Air and Water Act
Annexure -7	Advertisement copies in newspaper (English & local)
Annexure -8	Details of Mock drills

Annexure -1**Compliance to RC No. P1/2004/2008, dated 21.10.2008 of Department of Environment, Chennai**

Sr. No	Conditions	Compliance
i	The unit shall carry out dumping/ land filling at dredged material only on land which is not covered under CRZ	Noted for Compliance
ii	The unit shall not carry out any ship breaking activity	Not applicable
iii	The unit should design that the waste water should be recycled 100% and to be used for developing greenery etc., and there should not be any waste water let out.	Complied Domestic waste water generated is being treated in 45 KLD STP. Treated water is being reused for Horticulture / green belt purpose
iv	The unit should tie - up with institutions like Centre for Environmental Studies or IIT for the periodical monitoring during construction phase so as to ensure the adoption of Safety measures as per the Environmental Management Plan [EMP]	Complied Environment Monitoring is being carried out by MoEF & CC accredited agency, Reports for the period Oct 2017 – Mar 2018 is enclosed as Annexure-3 All the results are found to be well within the prescribed standard
v	Before commencing construction activities, Proper resettlement for the local the unit should ensure the proper resettlement of local inhabitants residing at the project area to the satisfaction of District Collector and submit a report to the Department of Environment.	This EC is just a bifurcation of original EC of LTSCB. Rehabilitation & resettlement was carried out completely as per law / State Government at the time of project implementation.
General Conditions		
a	There should not be any extraction of Ground Water in CRZ.	Noted for compliance. Presently unit is procuring water from M/s. Chennai Metropolitan Water Supply and Sewerage Board, Chennai.
b	The unit should obtain planning permission for their constructions from the CMDA/Department of Environment before commencing the constructions	This EC is bifurcation of original EC of LTSCB. Required permission from concerned authorities were taken before commencing the constructions.

c	The proposed activities should not cause coastal erosion and alter the beach configuration	In past, LTSB has been continuously monitoring shoreline studies through Institute of Ocean Management, Anna University, Chennai. Further, MIDPL shall further carry out shoreline studies of the concerned area.
d	No fencing or barricading along the pipeline alignment and parallel to the coast is permissible in CRZ.	All activities permissible as per CRZ notification 2011 & EC&CRZ clearance will only be carried out.
e	No blasting or drilling activities in CRZ is permissible.	All activities permissible as per CRZ notification 2011 & EC&CRZ clearance will only be carried out.
f	The proponent should not prevent public from easy access to the beach.	MIDPL will not block the access point to beach for the public.
g	Chemical waste generated and the sewage generated, if any should not be discharged in to the sea.	No chemical waste generated. Sewage waste water generated is being treated in STP for further usage in horticulture / greenbelt
h	The proponent should implement the EMP including the Green Belt as envisaged in the EIA report.	Presently, 2.94 hectare of the area has been developed under Green belt.. Project will be undergoing expansion, and green belt shall be developed inline to the requirement.
i	The project activity should not affect the coastal ecosystem including marine flora and fauna.	Complied Marine water quality and productivity is being monitored by MoEF & CC accredited laboratory, there are no adverse impact on water quality and marine productivity in the vicinity. The details of Marine Water quality monitoring report for the period October 2017 – March-2018 is enclosed as Annexure-3 . No impact on water quality and marine productivity has been envisaged during this period.
j	The proponent should not undertake any activity, which is violate of	All activities permissible as per CRZ notification 2011 &

	provisions of CRZ Notification 1991 and the subsequent amendments.	EC&CRZ clearance will only be carried out.
k	The CRZ Clearance will be revoked if any of the conditions stipulated in not complied with.	Noted for compliance

PROJECT REPORT ON

**REPORT ON L&T - KATTUPALLI PORT BEACH
REPLENISHMENT PROJECT**

Prepared for

M/S L&T SHIPBUILDING LIMITED

KATTUPALLI

Prepared By



INSTITUTE FOR OCEAN MANAGEMENT

ANNA UNIVERSITY

CHENNAI- 600025

PROJECT REPORT ON

**REPORT ON L&T - KATTUPALLI PORT BEACH
REPLENISHMENT PROJECT**

Prepared for

***M/S L&T SHIPBUILDING LIMITED
KATTUPALLI***

Prepared By



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CHENNAI- 600025**

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

PREAMBLE:

L&T Shipbuilding Ltd., Kattupalli port situated in the Kattupalli Village of Ponneri Taluk, Thiruvallur District, Chennai, Tamil Nadu, includes a Port, a Shipyard and a Modular Fabrication Facility. The project site is covered under the Survey of India (SOI) Toposheet 66C7 & 66C8. Tamil Nadu Maritime Board has licensed Kattupalli Port to L&T Shipbuilding Ltd. The port basin is protected with a north and south breakwater with eastern entrance channel. The port commenced commercial operations in January 2013.

SCOPE OF STUDY:

In September 2015 L&T Shipbuilding Ltd. issued a work order to the Institute for Ocean Management (IOM), Anna university to study the possibilities of use of dredged sand for Beach Replenishment on the coast to the North of the Port where erosion was present as an alternative to sea dumping in line with the observations of the Expert Appraisal committee, CRZ, Infrastructure and Miscellaneous Projects, given during the meeting held on June 25th 2015.

IOM focused on the possibility of dumping dredged sand from the port onto the coast north of the Port, to replenish sand on the beach to the North of the Port. The dredged sand from the Kattupalli port navigational channel or basin will be available, whenever the port undertakes any capital dredging.

Immediately after receiving the work order, IOM initiated investigation on geomorphological settings, status of the already available structures, marine sand search investigations for nourishment, feasible beach nourishment numerical modelling, hard-bottom habitat investigations, baseline environmental investigations, near shore hydrographic survey, beach profiles and preparation of the Environmental Investigation Strategy (EIS).

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

The Chennai Desalination Plant to the North and Ennore Port to the south are the other important man-made artificial features along the coast in the vicinity of Kattupalli Port. Three coastal villages are besides the Kattupalli Port are Karungali on north, Kalanji south of Karungali village and Kattupalli at south. The land along the coast to the North of the Kattupalli Port is owned by various private parties and the land to the South of Kattupalli Port belongs to Ennore Port.

The Coast under study is located at a high littoral drift prone zone. Shoreline changes are majorly caused by the disturbances of natural processes by disasters events and artificial anthropogenic influences. Climate change influence increased the trend of change of shoreline position farther seaward (recession) and farther landward (advancing). Understanding of the long-term shoreline movement is important for undertaking mitigation measures from the perspective of erosion and stability.

Shoreline analysis carried out from 2009 to 2014 using satellite images of Landsat ETM+ (Figure 1). 2009 image considered as before Kattupalli Port and 2014 image considered as after Kattupalli port construction. Remote sensing and geospatial techniques coupled with Digital Shoreline Analysis System (DSAS) used for long-term shoreline change monitoring and provide a comprehensive view of erosion and accretion patterns of the coastal areas. DSAS analysis of End Point Ratio (EPR) and Linear Regression Rate (LRR) shows changes in the northern and southern side of the project area, where 2 km north of the Kattupalli port is highly eroding and 2 km coast between the Ennore Port and Kattupalli Port is accreting as per the six years satellite images.

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

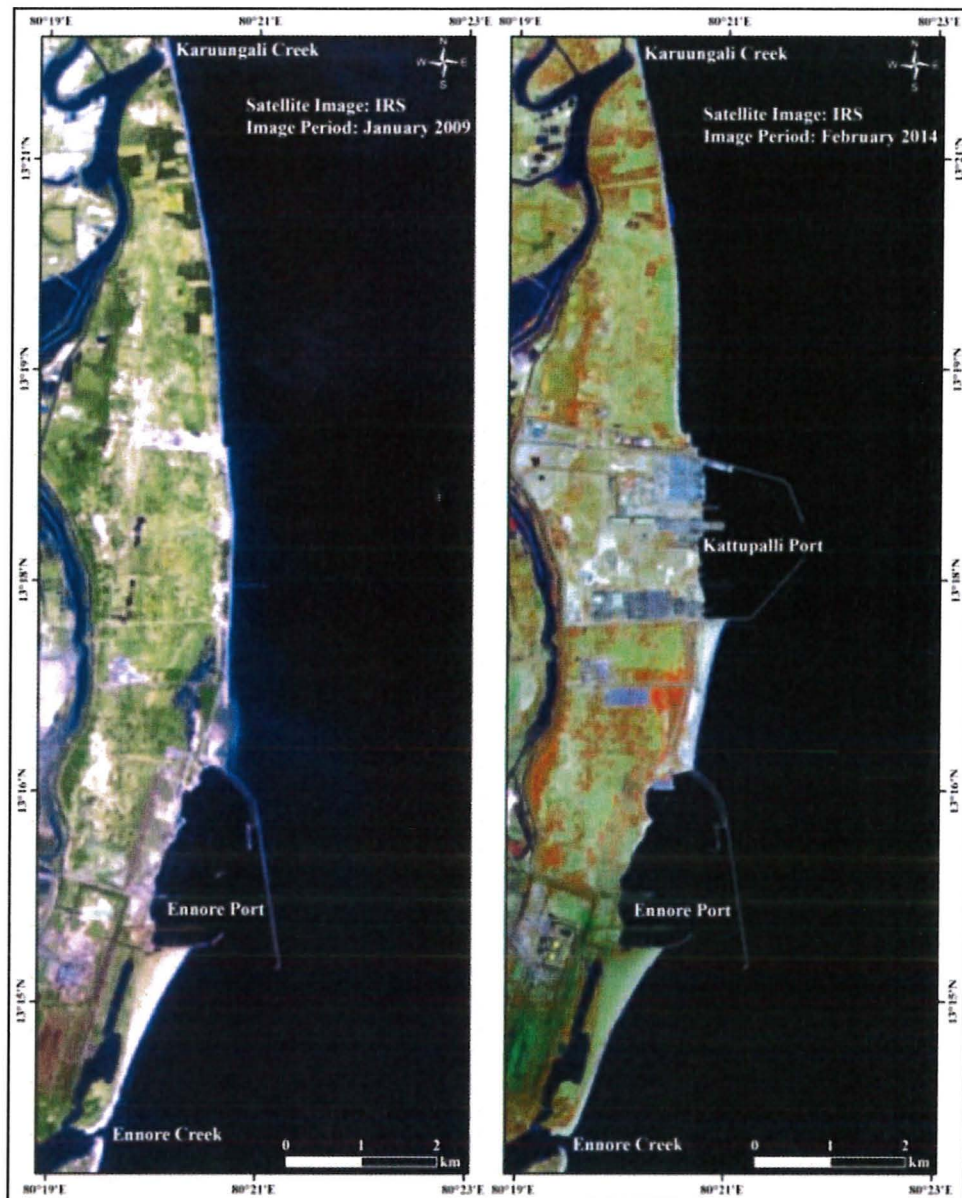


Figure1. a) Satellite image of project area of 2009 (left), 2014 (right)

NUMERICAL APPROACH

Numerical models are effectively used all over the world for modelling different coastal engineering problems. There are number of numerical models available ranging from open source (DELFT 3D, TELEMAC, ROMS, POMS, FVCOM, etc.) to commercial (DHI MIKE, SMS, MOHID, etc.). The numerical modelling simulations of the Kattupalli coast carried out using MIKE 21/3 Coupled Flexible Mesh (FM) module developed by Danish Hydraulic

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

Institute (DHI), Denmark. Flexible Mesh was selected as it uses a finite volume approach which combines the numerical stability of the Finite Difference method (regular rectangular mesh) with the ability of the Finite Element method to create complex geometry (flexible triangular or rectangular grids).

MIKE 21/3 Coupled FM module is integration of various modules. MIKE 21 HD and SW are basic modules. MIKE 21 ST was also included for this study to simulate the morphological evolution of the coast. The MIKE 21 morphological model is combined wave/current/sediment transport numerical models. A local model of the study area was generated for the purpose. 2D model domain was considered to be sufficient to arrive at a reasonably accurate model of the area. Coupled FM simulates all three models in parallel while interchanging various model outputs to required model. Wave radiation stress obtained as the SW model output is fed to the hydrodynamic model. Water level flow and current variation from HD model is provided to the ST model. This section reviews the various modules used for this study.

3.3.1 HYDRODYNAMIC MODULE (HD)

The MIKE21 Flow model FM-HD module simulates water level variations and flows in response to a variety of forcing functions in lakes, estuaries and in coastal regions. It simulates unsteady two dimensional flows in one layer (vertically homogeneous) fluids and has been applied in a large number of studies (DHI 2007b).

Basic formulation

The Hydrodynamic module is based on the numerical solution of two dimensional shallow water equations i.e.; the depth integrated incompressible Reynolds averaged Navier-Stokes equations. Thus the model consists of continuity, momentum, temperature, salinity and density

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

equations. The local continuity equation integrated over a depth (2D) can be written as:

$$\frac{\partial z}{\partial t} + \frac{\partial uh}{\partial x} + \frac{\partial vh}{\partial y} = 0$$

The depth averaged horizontal momentum equations for x and y directions are, respectively:

$$\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} + g \frac{\partial z}{\partial x} - C_{fv} + \tau_{bx} - E_c \nabla^2 u = 0.$$

$$\frac{\partial v}{\partial t} + u \frac{\partial v}{\partial x} + v \frac{\partial v}{\partial y} + g \frac{\partial z}{\partial y} - C_{fu} + \tau_{by} - E_c \nabla^2 v = 0.$$

Where

z - Water surface elevation above the datum

u - X-component of velocity

v - Y-component of velocity

d - Depth of flow below datum

h - Total depth of flow (d+z)

C_f - Coriolis force

T_b - Bed shear stress

E_c - Eddy viscosity coefficient

The spatial discretization of the primitive equations is performed using a cell centered finite volume method. The spatial domain is discretized by subdivision of the continuum into non-overlapping elements or cells. In the horizontal plane an unstructured grid is used comprising of triangles or quadrilateral element. An approximate Riemann solver is used for computation of convective fluxes, which makes it possible to handle discontinuous solutions. For the time integration, an explicit scheme is used.

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

3.3.2 SPECTRAL WAVE MODULE (SW)

MIKE 21 SW is a state-of-the-art numerical tool for prediction and analysis of wave climates in offshore and coastal areas. It includes a new generation spectral wind-wave model based on unstructured meshes. The model simulates the growth, decay and transformation of wind-generated waves and swells in offshore and coastal areas. MIKE 21 SW includes the following physical phenomena:

1. Wave growth by action of wind
2. Non-linear wave-wave interaction
3. Dissipation due to white-capping
4. Dissipation due to bottom friction
5. Dissipation due to depth-induced wave breaking
6. Refraction and shoaling due to depth variations
7. Effect of time varying water depth and flooding and drying

Basic Formulation

Spectral Wave Model in MIKE 21 has two spectral formulations:

1. Directionally decoupled parametric formulation
2. Fully spectral formulation

Directionally decoupled parametric formulation is typically used for the assessment of wave conditions in nearshore and coastal areas which often involves transformation of known offshore wave statistics. Fully spectral formulation is usually used for simultaneous wave prediction and analysis on large and local scale. Although fully spectral formulation is computationally demanding, it is more accurate.

The governing equation is the wave action conservation equation formulated in either Cartesian co-ordinates or Spherical co-ordinates. In

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

horizontal Cartesian co-ordinates, the conservation equation for wave action can be written as

$$\frac{\partial N}{\partial t} + \nabla \cdot (\tilde{v} \cdot N) = \frac{S}{\sigma}$$

where $N(\vec{x}, \sigma, \theta, t)$ is the action density, t is the time, $\vec{x} = (x, y)$ is the Cartesian co-ordinates, $\tilde{v} = (c_x, c_y, c_\sigma, c_\theta)$ is the propagation velocity of a wave group in the four dimensional phase space \vec{x}, σ and θ , and S is the source term for the energy balance equation.

3.3.3 SAND TRANSPORT MODULE (ST)

Sand transport module– ST describes erosion, transport and deposition of sand under the action of currents and wave or under pure current (Geils et al. 2001). It is specifically suited for application to coastal engineering problems for studying sediment transport studies of non-cohesive sediments. The hydrodynamic basis of ST module is calculated using HD module of MIKE 21 Flow model FM. The sand transport calculations are carried out using a mean horizontal velocity component.

The ST model can calculate sediment transport rates using two different model types:

1. Pure current
2. Combined wave and current

The sediment transport rates were calculated in two modes: bed load and suspended load. For pure current model, the bed load and suspended load are calculated separately whereas for combined wave and current actions, the total load is calculated.

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

Basic Formulation

Engelund & Fredsøe Transport Theory

The total-load transport rate q_t is calculated as the sum of the bed load transport q_b and the suspended load transport rate q_s

$$q_t = q_b + q_s$$

It is assumed that bed-load transport takes place in one single layer of thickness equal to one grain diameter d . The bed-load transport q_b is calculated as;

$$q_b = (\sqrt{\theta'} - 0.07\sqrt{\theta_c})[(s-1)gd] \quad \text{if } \theta' > \theta_c$$

where p is the probability that all particles in a single layer will be in motion, θ' is the dimensionless bed shear stress (shields parameter) related to skin friction, θ_c is the critical bed shear stress for initiation of motion and s is the relative density of the bed material.

θ' is defined as

$$\theta' = \frac{U' f^2}{(s-1)gd}$$

p is defined as

$$\left[1 + \left[\frac{\frac{\pi}{6} * \beta}{(\theta' - \theta_c)} \right]^4 \right]^{-1/4}$$

With β = the dynamic friction coefficient.

Following the ideas of Einstein (1950), the suspended load q_s is evaluated as

$$q_s = 11.6 U' f * c_b * a [I_1 * l_n \left(\frac{30h}{k_N} \right) + I_2]$$

With c_b = the bed concentration of suspended sediment, $U' f$ = the shear velocity related to skin friction, $a = 2d$ = the reference level for c_b , l_1 and l_2 =

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

Einstein's integrals, h = the water depth and k_N = Nikuradse's equivalent roughness = $2.5d$.

The integrals I_1 and I_2 are a function of the dimensionless reference level $A = a/h$ and of the Rouse number $z = w_s/\kappa U_f$, where w_s is the settling velocity of the suspended sediment and κ = von Karman's constant (≈ 0.40). I_1 and I_2 are integrated from ($y = a$) to ($y = h$), where y is measured upwards from the fixed bed level.

Engelund and Fredsøe developed a semi-empirical relation for the value of c_b at $a = 2$

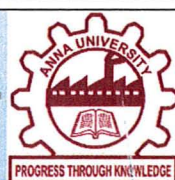
$$c_b = \frac{0.65}{(1 + \frac{\lambda}{3})^3}$$

Where the linear concentration λ is given by

$$\lambda = \sqrt{\frac{\theta' - \theta_c - \frac{\pi p \beta}{6}}{0.027 s \theta'}} \text{ if } \theta' > \theta_c + \pi p \beta / 6$$

3.3.4 MIKE 21/3 COUPLED MODEL FM

MIKE 21/3 Coupled Model FM is a truly dynamic modelling system for applications within coastal, estuarine and river environments. MIKE 21/3 Coupled Model FM is composed of modules namely hydrodynamic module, transport module, eco lab module, mud transport module, particle tracking module, sand transport module, spectral wave module. The hydrodynamic module and the spectral wave module are the basic computational components of the MIKE 21/3 Coupled Model FM. The other modules are optional. The two main features of the MIKE 21/3 Coupled Model FM are dynamic coupling of waves and currents and fully feedback of bed level changes on waves and currents. Using MIKE 21/3 Coupled Model FM it is possible to simulate the mutual interaction between waves and currents using a dynamic coupling between the hydrodynamic module and the



REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

spectral wave module. The following fully dynamic interactions between the hydrodynamic module and the spectral wave module are possible:

- In the hydrodynamic module, it is possible to include the radiation stress field from the spectral wave simulation
- In the spectral wave module, it is possible to include the water level variation from the hydrodynamic simulation
- In the spectral wave module, it is possible to include the current field variation from the hydrodynamic simulation

The MIKE 21/3 Coupled Model FM also includes a dynamic coupling between the Mud Transport Module and the Sand Transport Module and the Hydrodynamic Module and the Spectral Wave Module. Hence, a full feedback of the bed level changes on the waves and flow calculations can be included.

DATA REQUIRED FOR MODELLING:

WIND

The annual wind vectors derived from NCEP (National Centers for Environmental Prediction, NOAA) data for the year 2012 are shown in figure 2. The recorded data (Figure 2) indicate that strong winds usually blow from E-SE direction during NE monsoon period and from S-SSW during SW monsoon. The direction of wind blow is predominantly from NNE-ESE direction during NE monsoon period and from SSW-SSE during SW monsoon period. On the whole, for Ennore coast, wind speed varied from 3.5 to 11 m/s and the directions are mostly between NNE and SSW.

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

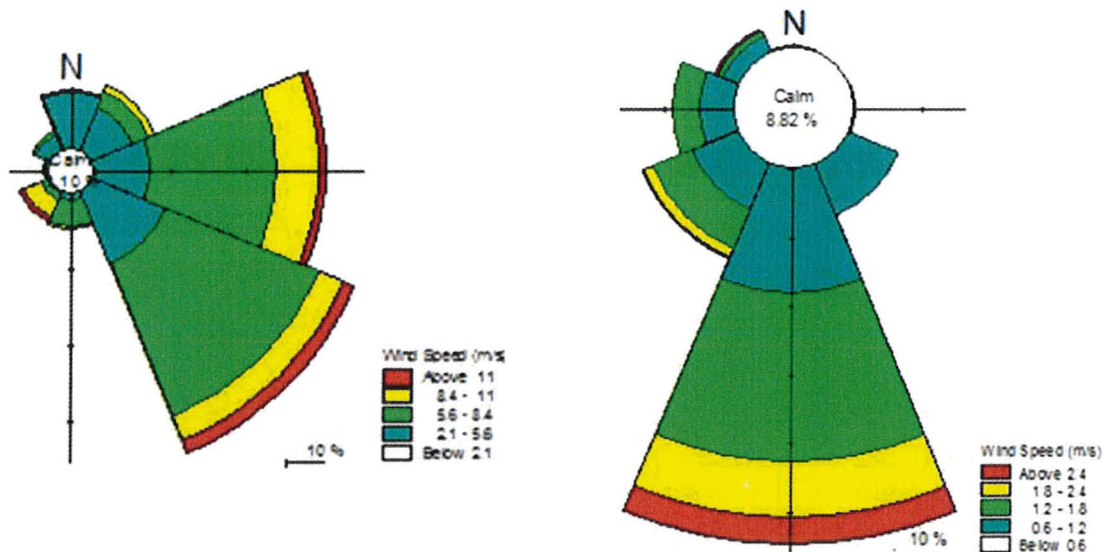


Figure 2 – Wind roses during a) NE monsoon and b) SW monsoon

TIDES

The tides are semi-diurnal type with two high and two low tides occurring on each day with unequal tidal amplitude. The average interval between high and low tides is about 6 hours. The mean tidal range is of the order of 0.9 m to 1.2 m at spring and between 0.8 m to 0.6 at neap tides.

Mean High Water level springs	+ 1.1 m
Mean High Water Neaps	+ 0.8 m
Mean Low water level springs	+ 0.1 m
Mean Low Water Neaps	+ 0.4 m
Mean Sea Level	+ 0.6 m

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

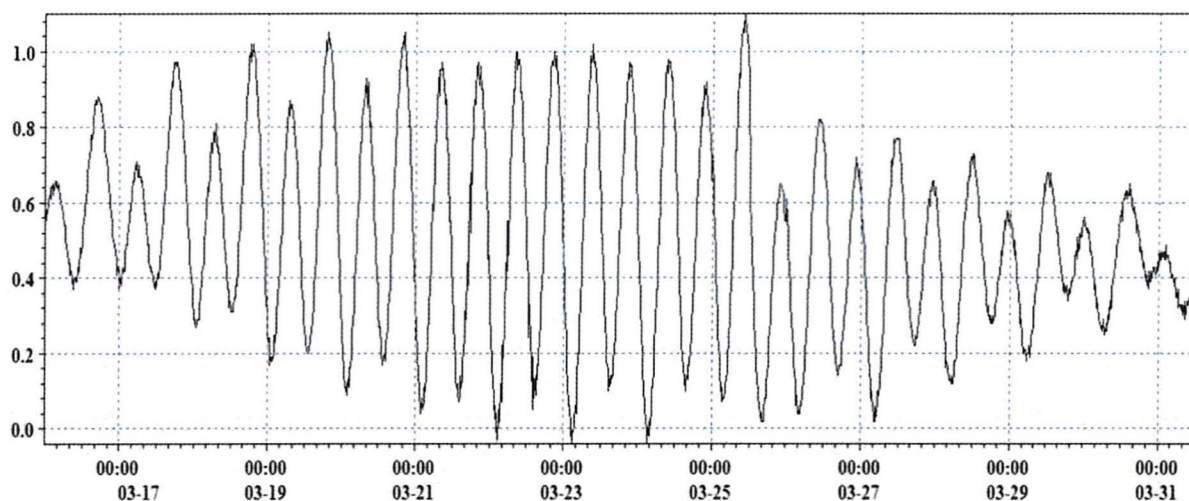


Figure 3 – Water level variations along the Kattupalli coast

Table 1 Frequencies of selected diurnal, semi-diurnal and quarter-diurnal tidal constituents

Type	Tide constitute	Freq (cycle/hour)	Amplitude	Phase
Diurnal	K1	0.04178	0.0585	331.85
	O1	0.03873	0.0343	300.00
	P1	0.04155	0.0337	341.50
Semi diurnal	M2	0.08051	0.2932	241.11
	S2	0.08333	0.2017	270.57
	N2	0.07900	0.0629	224.95
Quarter diurnal	K2	0.08356	0.0382	294.29
	M4	0.16102	0.0029	082.99
	S4	0.16667	0.0005	040.55
	MS4	0.16385	0.0041	124.19

Predominant tidal constituents are M2, S2, N2, K1, O1 and M4 with constituent M2 (0.0805 cph) having the highest amplitude followed by S2 (0.0833 cph), K1 (0.0418 cph) and O1 (0.0387 cph) constituent. The major tidal constituents are tabulated in Table 1. The form number, which is the ratio of the sum of the amplitudes of the diurnal constituents (K1 and O1) to that of the semidiurnal

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

constituents (M2 and S2), is 0.13. The tides are thus classified as semidiurnal in nature.

WAVES:

Regional Wave model was setup primarily to provide wave climate hind cast for the period of one year and calibrated with the measured data. The wave climate extracted nearshore in the area of interest is used as wave forcing in the sediment transport model.

REGIONAL WAVE MODEL: MODEL SETUP AND VALIDATION

A numerical model study using MIKE21 Spectral Wave module was carried out for the Indian Ocean with the aim of hind casting offshore wave characteristics using available wind data. The input boundary condition for Local model is obtained from the Regional model.

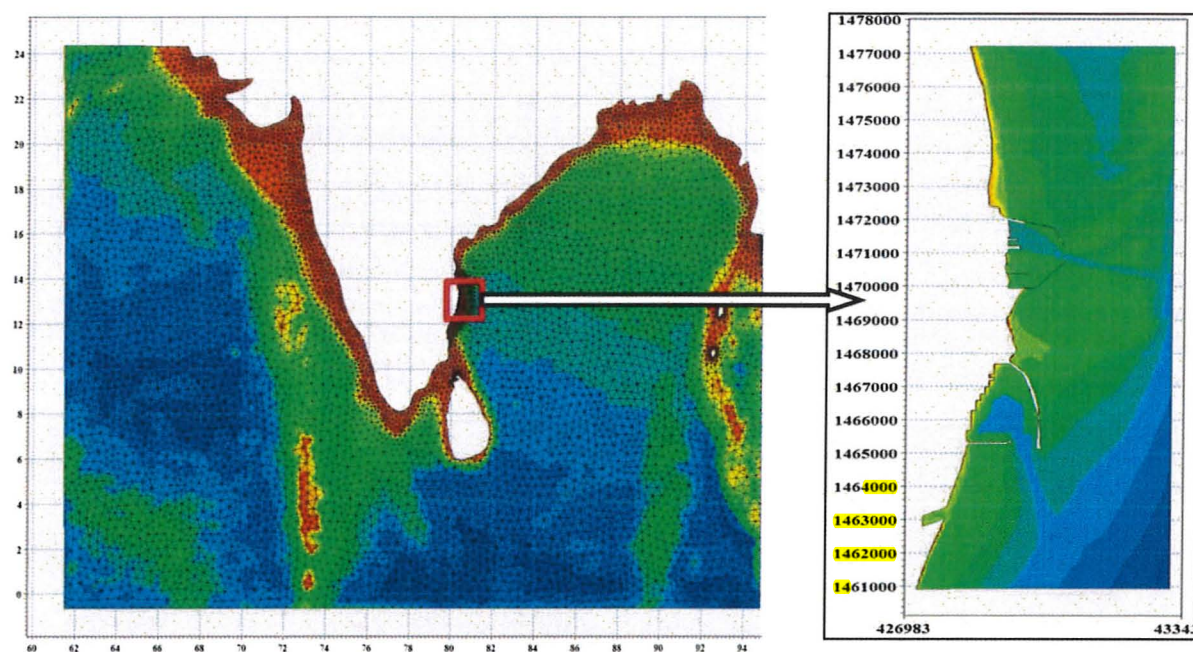


Figure 4 – a) Wind to Wave model b) Sediment Transport model

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

Model Domain and Bathymetry

In order to simulate waves in the Indian Ocean, a large domain, which ranges from 0° to 25° N (latitude) and 60° E to 120° E (longitude) was selected. An unstructured triangulated mesh is generated with varying sizes of triangles (elements); 0.5° (Indian Ocean), 0.125° (Coastal) and 0.02225° (study area). C-MAP data for deep water regions and improved bathymetry data sets of measure data are applied to shallow water regions in the Indian Ocean, by interpolating them to each element in the flexible mesh bathymetry. The horizontal datum is referenced to World Geodetic System 1984 (WGS-84) and the vertical datum is referenced to Chart Datum (CD). Figure 5 shows the model domain and bathymetry used for wave simulations in the Indian Ocean. The model used to simulate waves over flexible mesh bathymetry is MIKE 21 SW. The varying sizes of triangles (elements) with high resolution near Kattupalli are shown in Figure 4.

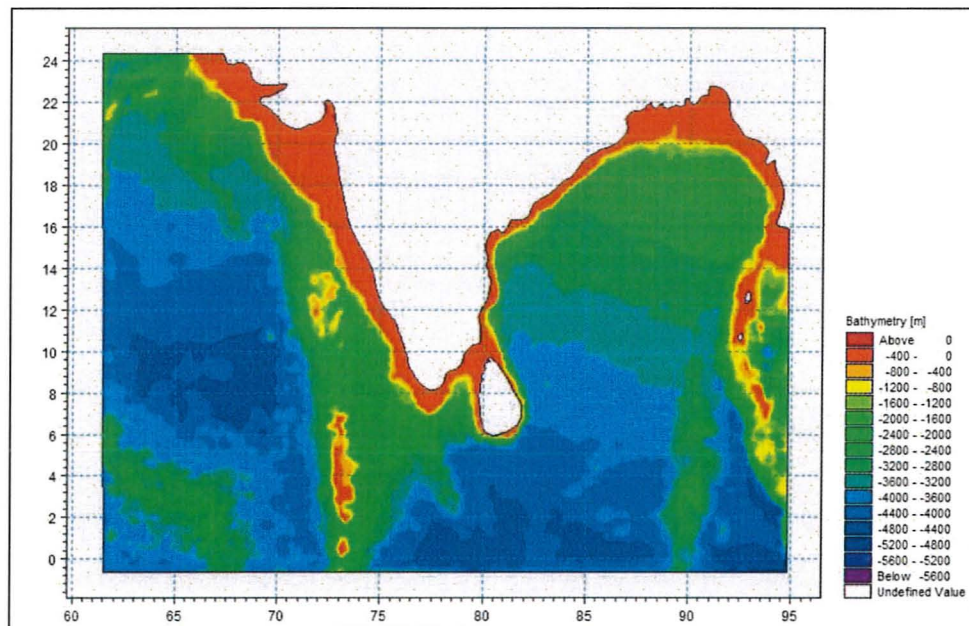


Figure 5 – Model domain and bathymetry of Indian Ocean

Wind is the basic input parameter for wave simulation. Successful wave hind cast and forecast depend on accurate wind fields deduced from meteorological models and analysis.

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

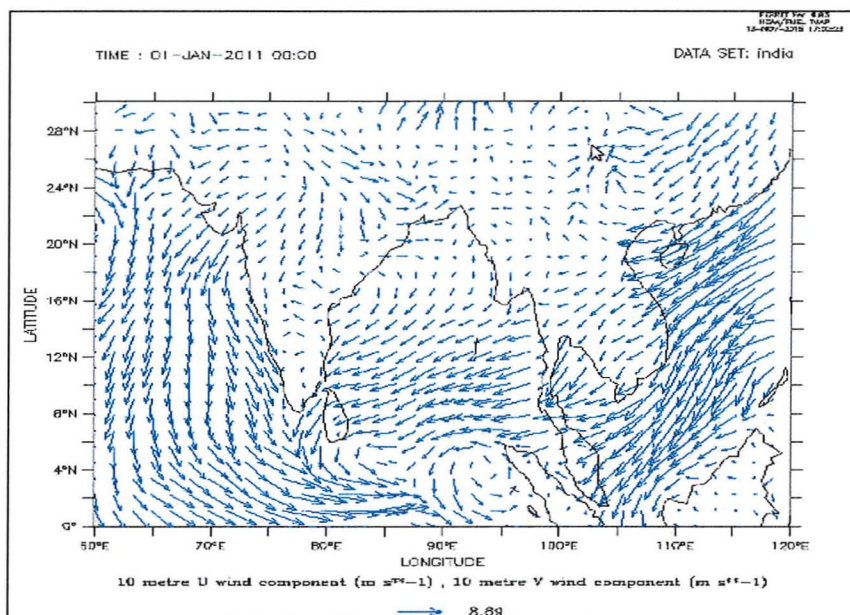


Figure 6 – 10 m U wind component vectors as on 01-Jan-2011(Ferret)

In the present study, wind data was obtained from the database of ECMWF's interim reanalysis (ERA-Interim). Wind data for Indian Ocean region (60°E to 120°E and 0° to 25°N) covering Kattupalli was collected from ECMWF database for regional wave modelling. The wind data was obtained for a period from January 2012 to December 2012 with spatial resolution of 0.25×0.25 degree and temporal resolution of 1 hour. The data for wind was obtained as U & V components of wind velocity (m/s) at 10 m height. U and V components of the wind velocity are calculated from decomposing the wind magnitude and direction along the two horizontal axes: x and y. Typical wind pattern is shown in Figure 6. For regional wave modelling, a directional decoupled formulation with quasi static time approach formulation is used.

REGIONAL MODEL VALIDATION

The regional model results were validated with the wave rider buoy wave data at 30m water depth deployed off Pondicherry coast for the year 2012. The measurement location at off Pondicherry coast is shown in Figure 7. The model result shows modeled wave heights are in good agreement with observed wave heights.

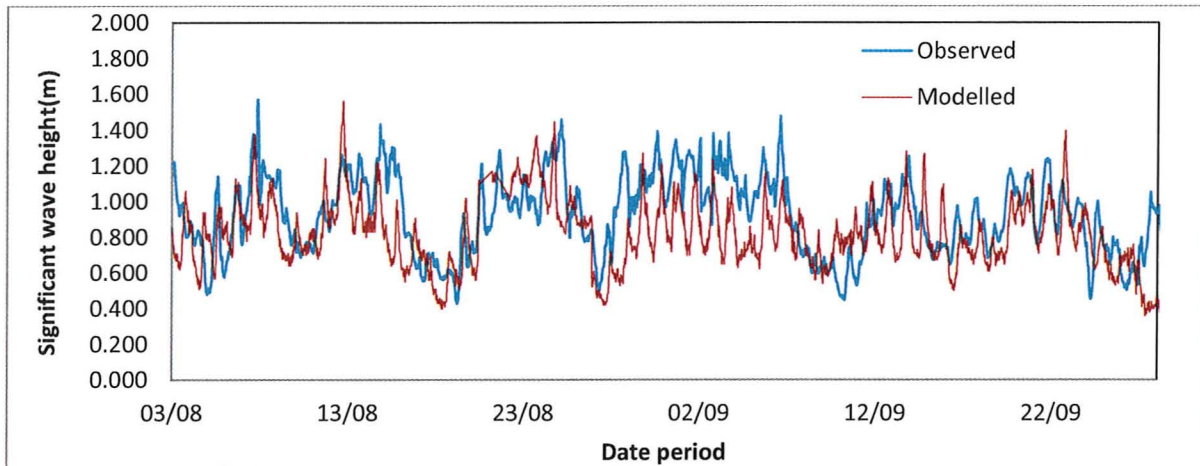
REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

Figure 7 – Comparison between modeled and observed wave heights

From regional model, it is observed, the wave heights in the deep water ranges from 0.4 m to 1.8 m and the predominant waves are of 0.4 m to 1.2 m with wave periods of 4 to 10 seconds.

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

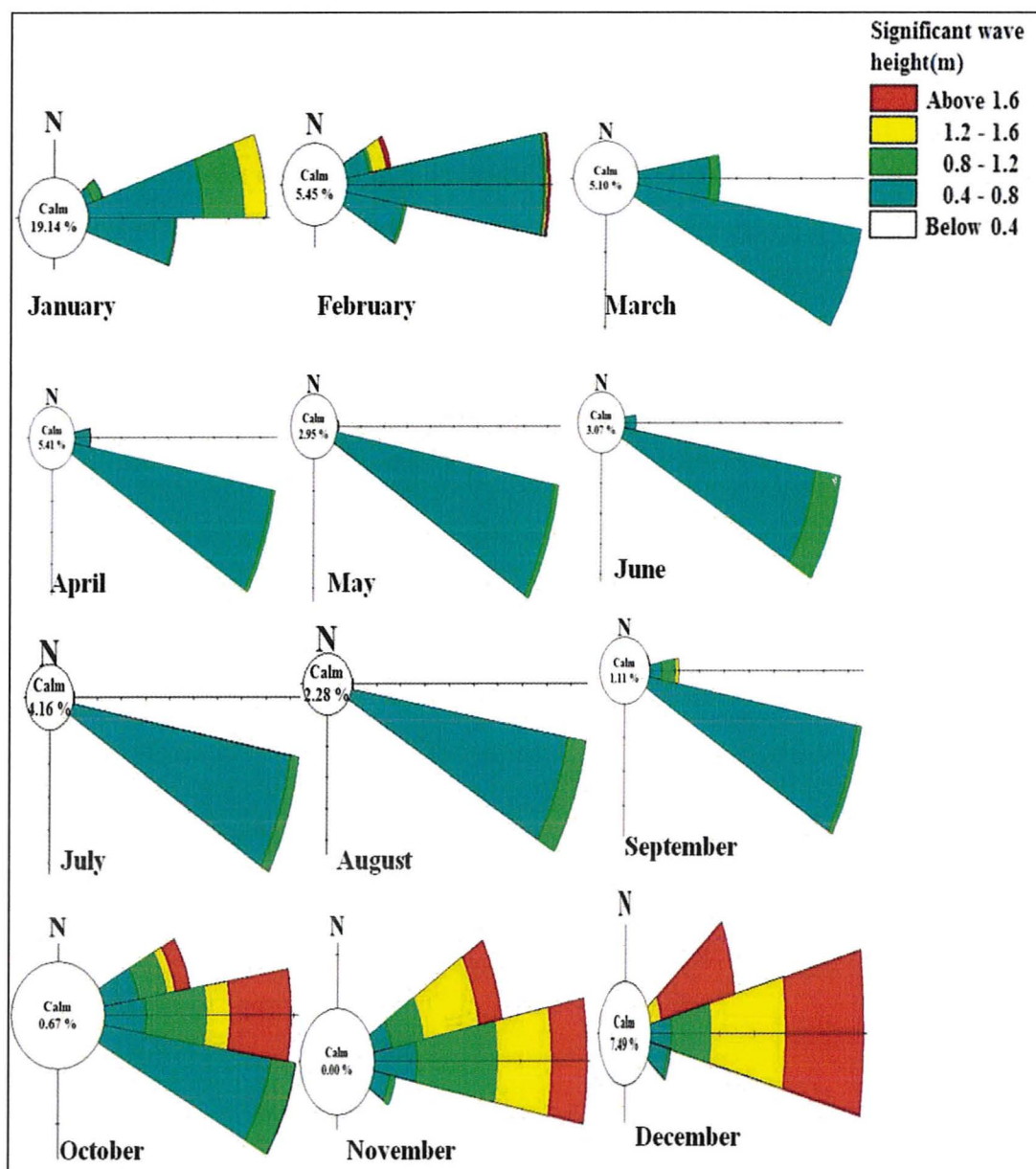


Figure 8 – Annual wave height distribution used for simulation of coastline evolution

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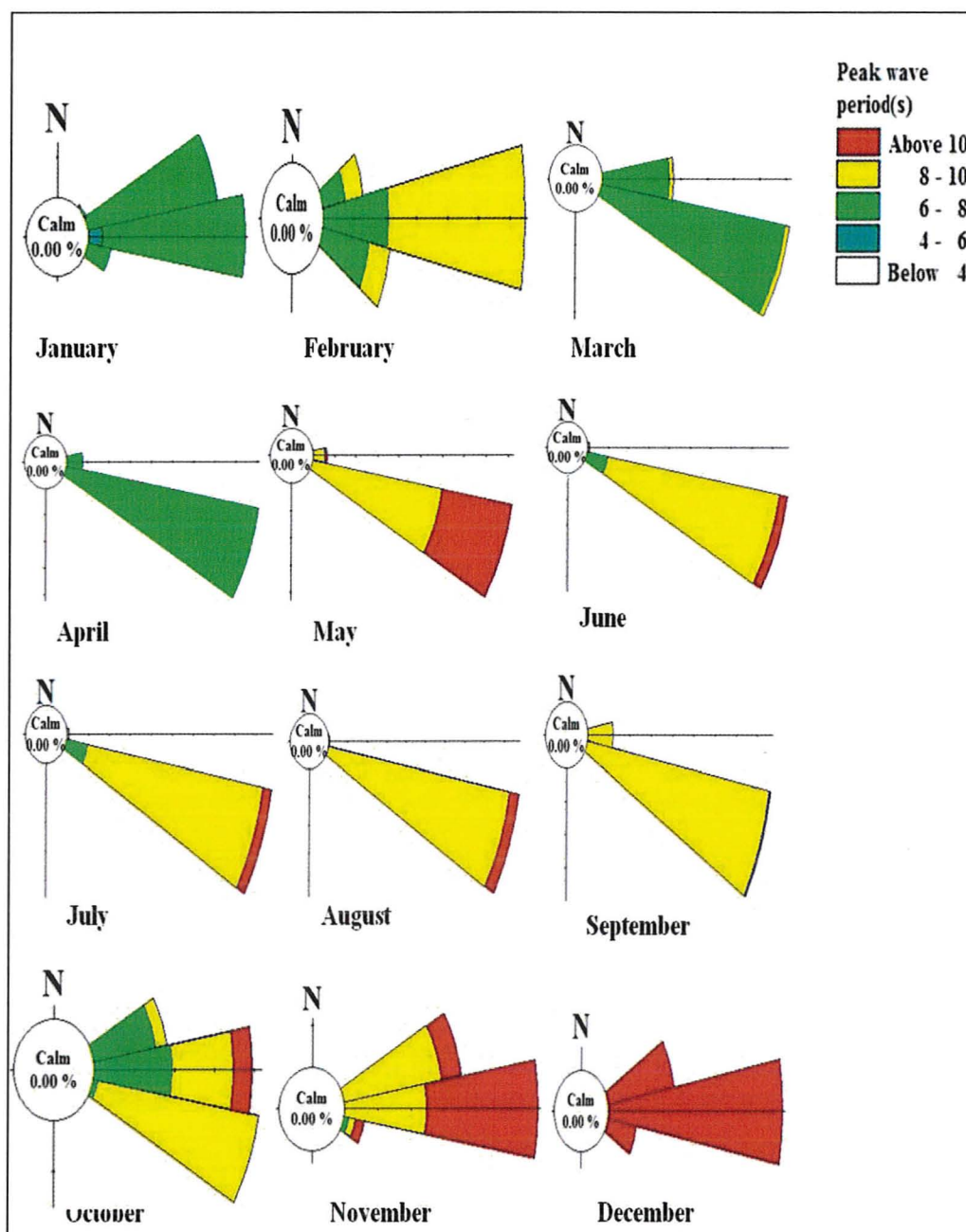


Figure 9 – Annual wave height distribution used for simulation of coastline evolution

From modeling it is observed the predominant wave direction during SW monsoon is 110° - 145° from North and predominant direction during NE monsoon is 65° from North. During North East monsoon the wave heights are in the range of 0.8 to 1.6m and during south west monsoon the heights vary

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

from 0.4 to 0.8m. During cyclone season, waves of height exceeding 2.5 m are recorded. Long period wave upto 20 seconds are experienced rarely. During NE monsoon period the swells in the sea outside the harbour vary from 0.91 to 1.22 m and during SW monsoon 0.61 to 0.91 m during Cyclones.

CURRENTS

The direction of the current during NE Monsoon is directed southwards and in SW Monsoon the currents is directed northwards. The currents in the coastal zone are approximately 0.15 to 0.35 m/s. The current pattern is influenced by the general monsoon climate as the strong currents are of monsoonal origin. Based on the review of annual current speeds and direction from Admiralty charts and Bay of Bengal Pilot Atlas the current flow is parallel to the coast.

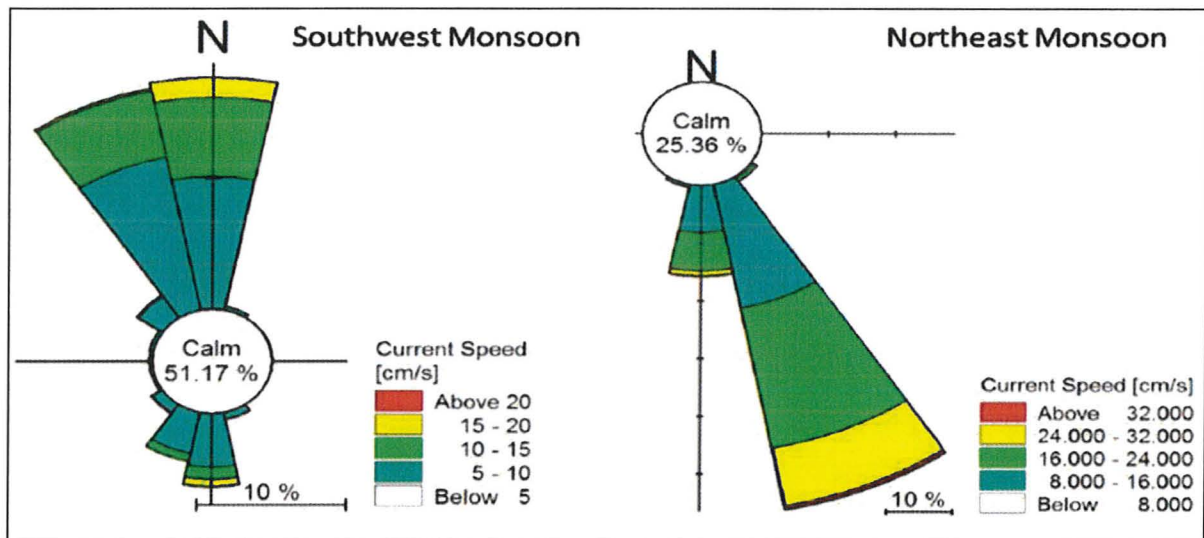


Figure 10 – Coastal currents a) Southwest monsoon b) Northeast monsoon

The general current direction at the site fluctuates between northerly and southerly from February to April, whereas the current direction is northerly from May to September (SW Monsoon) and southerly from October to January (NE Monsoon).

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

IDENTIFICATION OF PREFERRABLE LOCATION FOR DISPOSAL OF DREDGE SPOIL:

The net littoral drift along East coast of India is towards north due to south easterly waves lasting for a period more than 8 months in a year. The net littoral drift along the Ennore coast is $0.3 \times 10^6 \text{ m}^3$. Considering the performance of beach fill at Ennore port it is proposed to place 2.5 Million m^3 of sand north of Kattupalli port with the average dimensions of $1400 \times 280 \times 3\text{m}$.

Numerical modeling was carried out to identify feasible location for the disposal of 2.5 Million m^3 of dredged material along the northern eroding shore. The marine sand dumping location proposed about 2 km away from the port & Chennai Water Desalination Limited (CWDL) which will be adequate and viable for the shore stabilization from erosion.

The model considered that the estimated dredged sand of 2.5 Million m^3 will be placed as profile beach nourishment and their interactions on coastal processes were carried out using numerical modelling. Coastal processes by wind, tide, wave & current with vary intensity used for the determination of sediment movements. The long-term shoreline evolution scenario along the coast was attempted using 2D numerical modelling using MIKE 21. The ability to calculate the stable shoreline, shoreline envelopes and shoreline movements for different scenarios and seasons were attempted.

The model domain (Figure 11) extends from Ennore creek in the south to Kalangi creek in the north and seaward to a depth of 30 m. Flexible mesh of rectilinear grid was generated for the control of node resolution. The smaller elements areas where the bathymetry is more variable and greater detail is required (e.g. the creek mouth) and larger elements where the bathymetry is more uniform, and less detail is required (e.g. the inner shelf zone) and thus optimizes computational time. The domain ranges from $13^\circ 14' \text{ N}$ to $13^\circ 22' \text{ N}$ and from $80^\circ 19' \text{ E}$ to $80^\circ 23' \text{ E}$. The bathymetry and topography collected during field survey were applied near shore coastal areas, whereas MIKE C-MAP data was applied to the deep water regions by interpolating them to

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

each element in the flexible mesh bathymetry. The horizontal datum is referenced to World Geodetic System 1984 UTM Zone 44N and the vertical datum is referenced to Mean Sea Level (MSL).

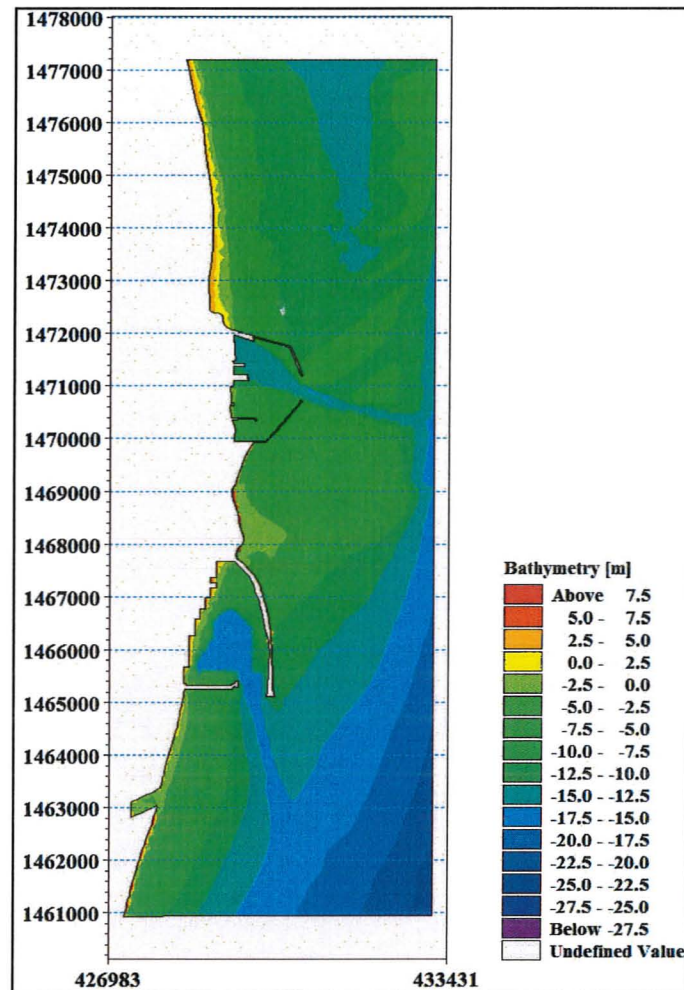


Figure11 – Model domain for sediment transport model.

The bathymetry and topography collected during field survey is applied. A smaller and much refined mesh was used to arrive at an understanding of the hydrodynamics and sediment transport near the site of interest. The mesh resolution increases towards the study area from 250 m to 15 m near the area of interest.

The Hydrodynamic (HD) and Spectral Wave (SW) module were applied together dynamically. A higher order time and space discretization was

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

applied with a CFL number of 0.8 kept at default. Coriolis and tidal components were neglected for these simulation runs. Eddy viscosity was applied using Smagorinsky formulation with the default constant coefficient of 0.28. An initial surface level of 0.41 was applied over the entire domain. Wave radiation was applied as varying in time and across the domain as a dynamic input from SW simulation. Mean water surface level varying in time and along the profile was applied at the northern boundary.

Development of Beach-fill for Coastal Protection

"Soft" engineering measures such as beach nourishment are widely used for shore protection due to their advantage over "hard" measures such as seawalls, groins and breakwaters in terms of performance, aesthetics and restoration of natural beach (Capobianco et al., 2002). As a result, nourishment has become an integral part of coastal zone management strategy. Nourishment approach based on cross-shore dimensions is classified into four types as indicated in Table 2.

Table 2 Types of nourishment approach (based on cross-shore dimensions)

Nourishment approach	Description
Dune nourishment	placing all the sand as a dune behind the active beach
Nourishment of sub aerial beach	using the nourished sand to build a wider and higher berm above the mean water level
Profile nourishment	distributing the added sand over the entire beach profile
Bar or shoreface nourishment	placing the sand offshore to form an artificial bar

The option namely "nourishment of sub aerial beach (to build a wider and higher berm above the mean water level)" was modeled at North of Kattupalli Port. The material dredged from Kattupalli port through capital

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

dredging ($2.5 \times 10^6 \text{ m}^3$) is considered to be transported through pipeline to the project site on the north of the port (Figure 12). Out of the total quantity of dredged material, $0.3 \times 10^6 \text{ m}^3$ was placed over the existing beach to raise the berm height from 2.5 to 5.0 m above mean sea level and the balance of the material ($2.2 \times 10^6 \text{ m}^3$) was dumped in the nearshore region to form the beach-fill.

PERFORMANCE OF BEACH NOURISHMENT

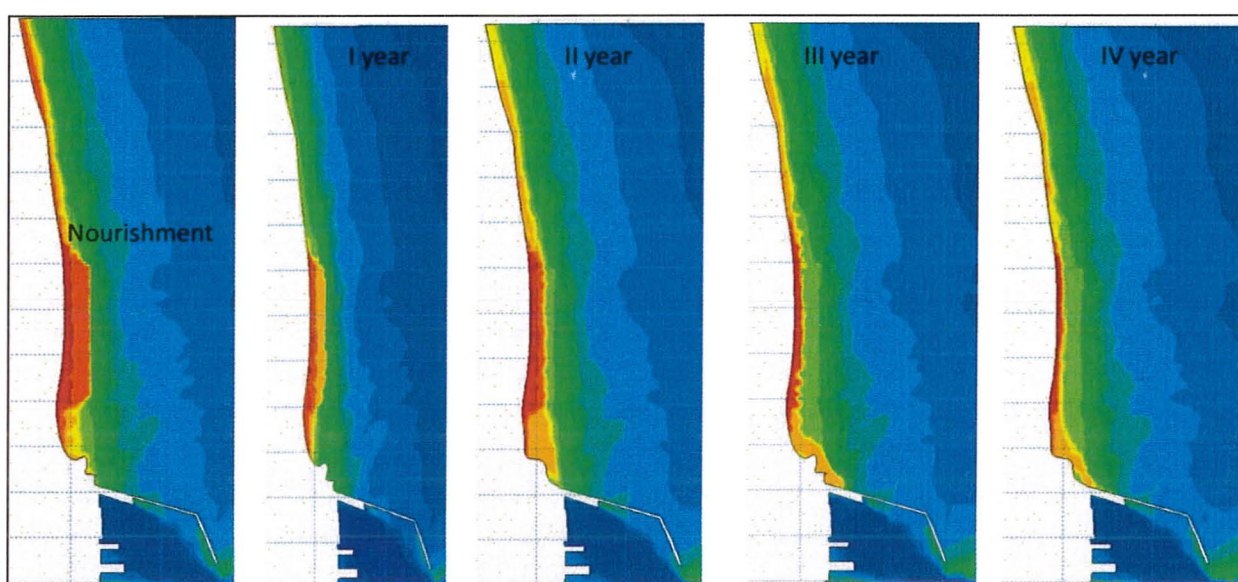


Figure 12 – Performance of beach nourishment for four years

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

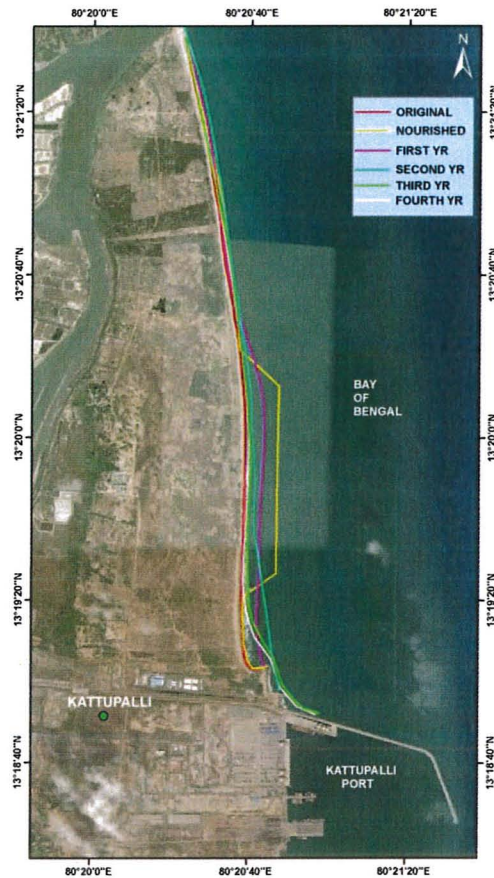


Figure 13 – Yearly shoreline change along North of Kattupalli port

The beach-fill will started supplying material to the down drift coast from forming a steep cut at the beach-fill location. The monsoon shifting leads to the shift in currents direction from South to North and vice-versa. During SW monsoon the current directions are towards North whereas during NE monsoon the predominantly current direction towards south. The beach is expected to supply sediment to north during the SW monsoon and the total fill will erode gradually and completely four years from the date of placement of nourishment (Figure 12). The yearly shoreline changes at the north of Kattupalli port is shown in Figure 13. Similar nourishment carried out for Ennore port (Ramanamurthy et al., 2001) showed the performance of beach fill in supply of sand to north in down drift coast.

REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

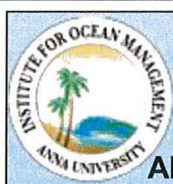
The environmental status of the project site with respect to land, water and socio-economic environment, the beach restoration considered the dredged sand of nourishment along the shores which may be one of the healthy way approaches of beach nourishment. From the preliminary study, it can be concluded that this beach nourishment can be under consideration as it will not have any negative impacts to the natural environment.

FACTORS TO CONSIDER FOR BEACH RECLAMATION:

The below need to be considered prior to under taking beach nourishment:

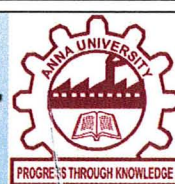
1. Beach reclamation to be carried out only between the months of May and September when the current is in northerly direction.
2. The quality of dredged sand must have a grain size of 0.18 mm to 0.28 mm to ensure that the sand is retained on the beach for a longer period of time.
3. Monitor the turbidity in vicinity of the Chennai Desalination plant and coordinate with them to enable beach replenishment without affecting their operations.

The modeling studies indicate the beach nourishment would be around 4 years. This beach fill will help in controlling the down drift (North of Kattupalli port) and supply the sand to Northern coast.



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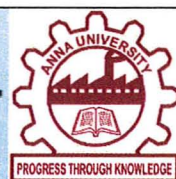
REPORT ON L&T - KATTUPALLI PORT BEACH REPLENISHMENT PROJECT

CONCLUSION:

1. Beach Nourishment is a viable and economic method to mitigate long-term shoreline erosion and provide storm damage reduction but should be carried out at the right season considering the direction of littoral currents
2. Bio-diversity studies to be done prior to commencing beach reclamation to understand the effects of beach replenishment on the beach organisms.
3. For sediment size finer than 0.1mm may recommend for offshore nourishment.
4. A suitable offshore dumping ground should be identified when beach replenishment is not possible due to weather, current direction or other reasons, for alternative way to handle dredge disposal.



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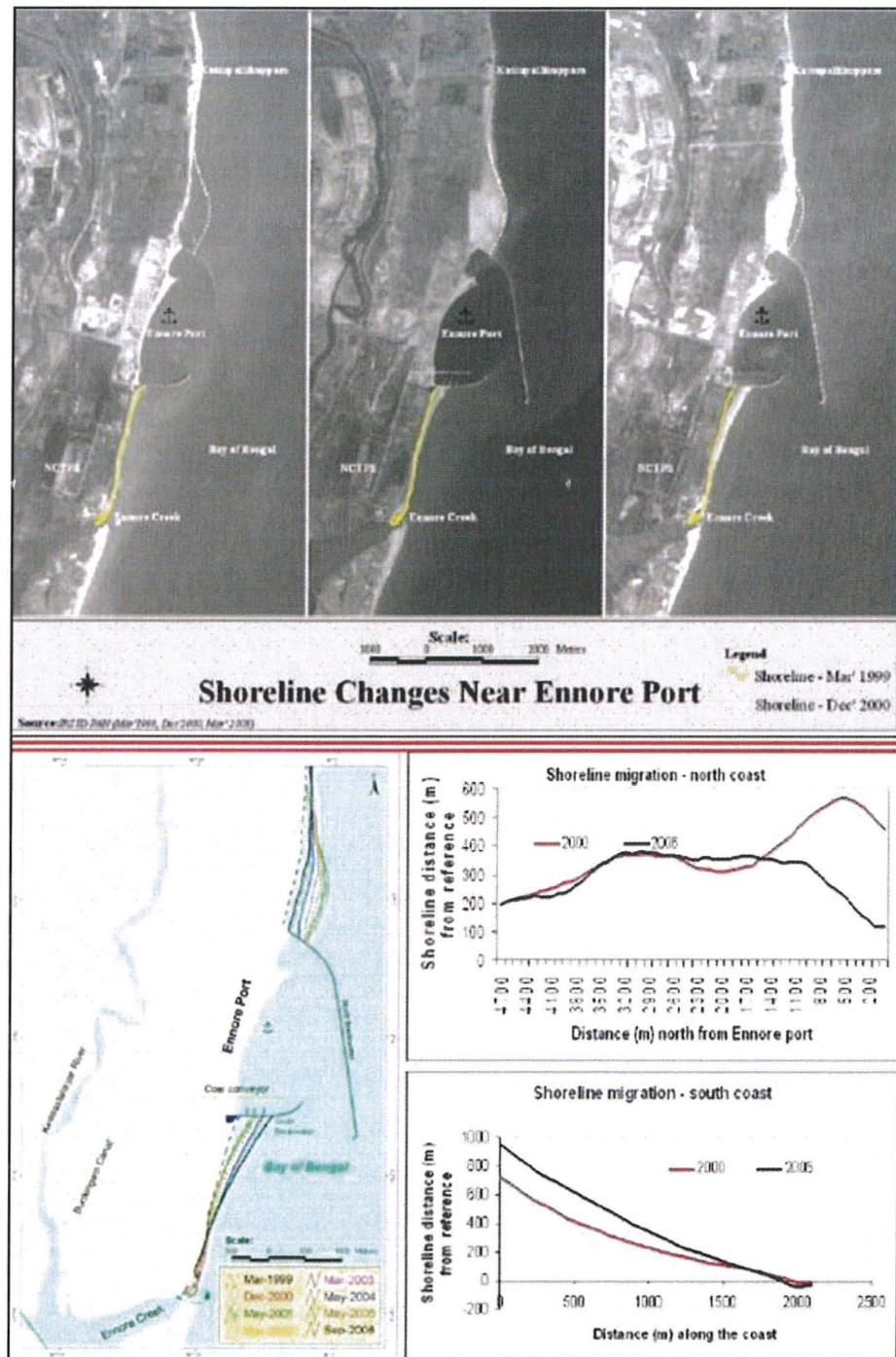
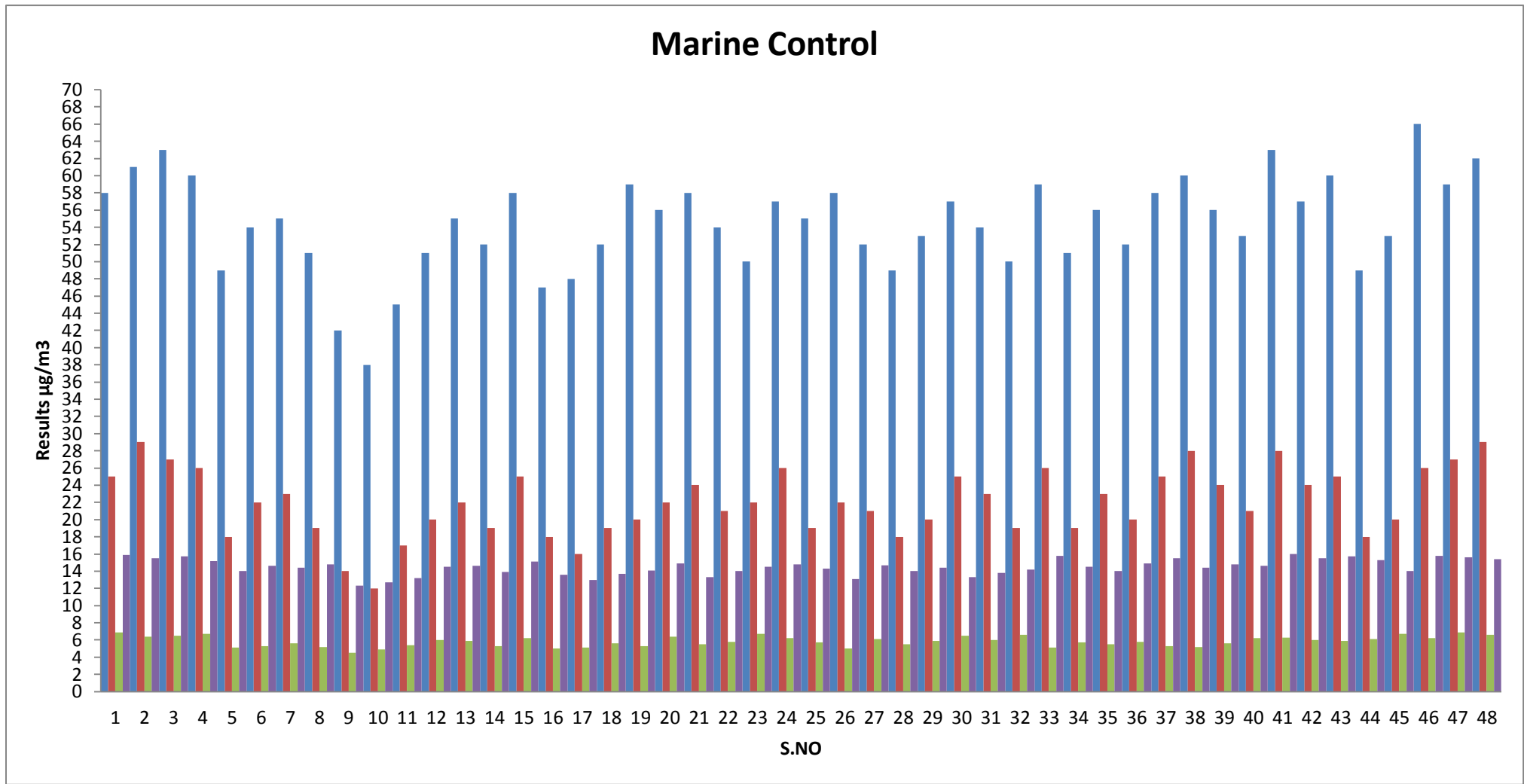


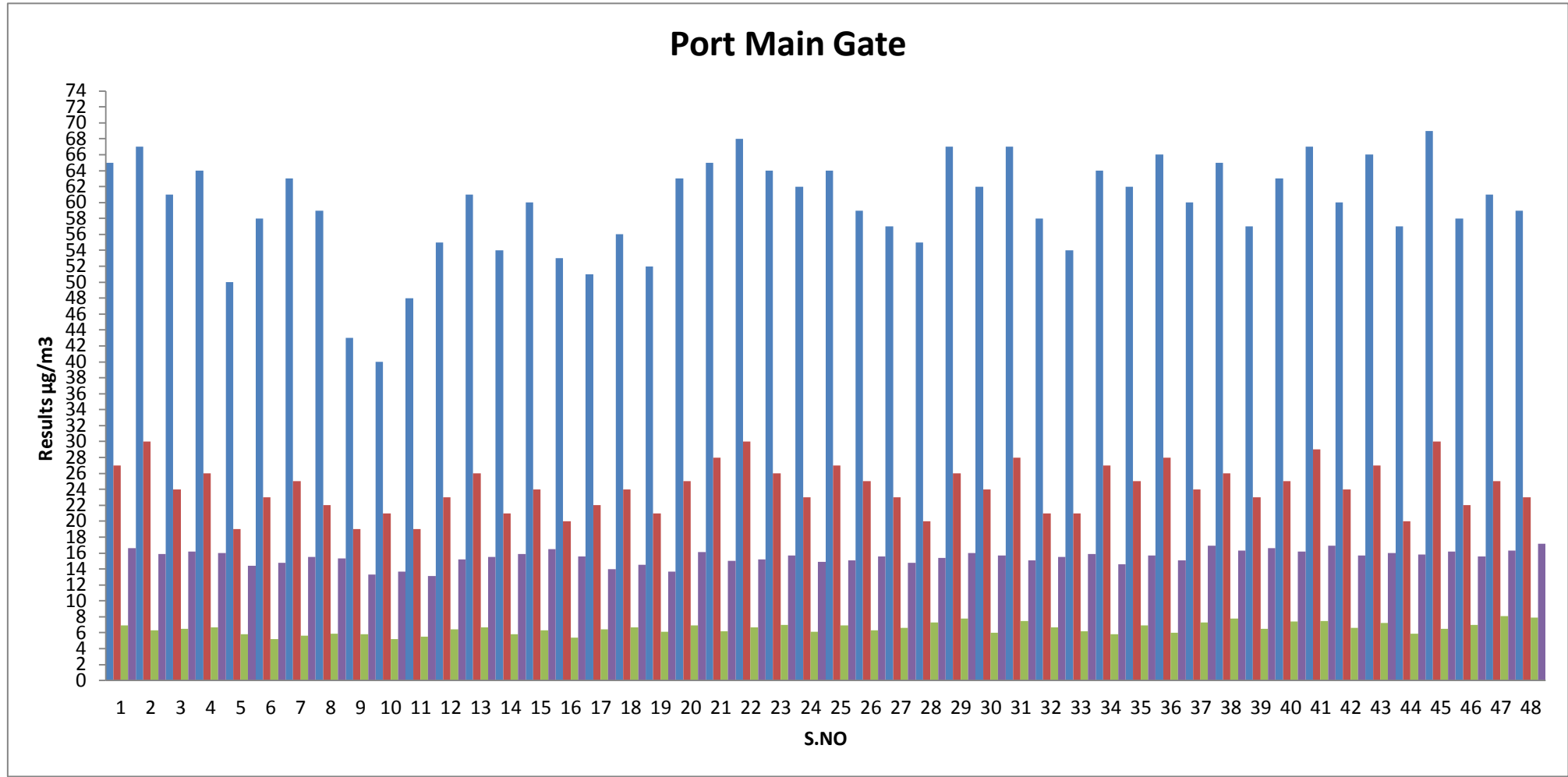
Figure14 – Top picture shows the Satellite image of Ennore port region. Bottom picture (left) shows the shorelines of 1999 – 2006 and (right) Shoreline migrations.

MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED (MIDPL)
October - 17 to March - 18

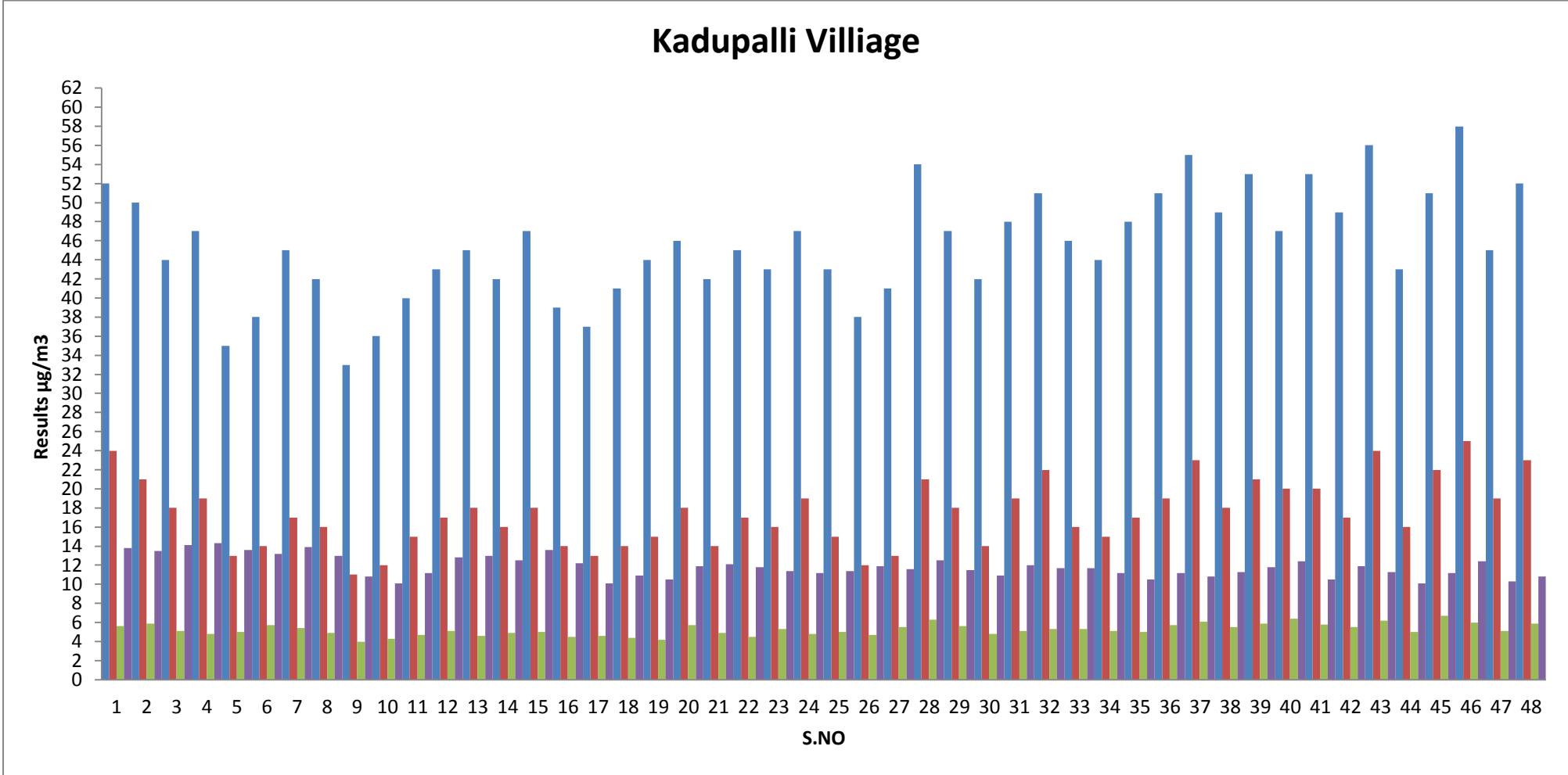
MARINE CONTROL (AAQ1)														
Parameters			Particular matter PM ₁₀	Particular matter PM _{2.5}	Sulphur dioxide as SO ₂	Nitrogen dioxide as NO ₂	Lead as Pb	Carbon monoxide as CO	Ozone as O ₃	Ammonia as NH ₃	Arsenic as As	Nickel as Ni	Benzene as C ₆ H ₆	Benzo (a) pyrene as BaP
Unit			µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³	ng/m ³	ng/m ³	µg/m ³	ng/m ³
National AAQM Standard			100	60	80	80	1	4	180	400	6	20	5	1
S.No.	Sampling Date	Report Number												
1	03.10.2017	GCS/LAB/S/1591/17-18	58	25	6.9	15.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
2	06.10.2017	GCS/LAB/S/1591/17-18	61	29	6.4	15.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
3	09.10.2017	GCS/LAB/S/1591/17-18	63	27	6.5	15.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
4	13.10.2017	GCS/LAB/S/1591/17-18	60	26	6.7	15.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
5	16.10.2017	GCS/LAB/S/1591/17-18	49	18	5.1	14	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
6	20.10.2017	GCS/LAB/S/1591/17-18	54	22	5.3	14.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
7	23.10.2017	GCS/LAB/S/1591/17-18	55	23	5.6	14.4	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
8	27.10.2017	GCS/LAB/S/1591/17-18	51	19	5.2	14.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
9	03.11.2017	GCS/LAB/S/1686/17-18	42	14	4.5	12.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
10	06.11.2017	GCS/LAB/S/1686/17-18	38	12	4.9	12.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
11	11.11.2017	GCS/LAB/S/1686/17-18	45	17	5.4	13.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
12	15.11.2017	GCS/LAB/S/1686/17-18	51	20	6.0	14.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
13	17.11.2017	GCS/LAB/S/1686/17-18	55	22	5.9	14.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
14	20.11.2017	GCS/LAB/S/1686/17-18	52	19	5.3	13.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
15	24.11.2017	GCS/LAB/S/1686/17-18	58	25	6.2	15.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
16	27.11.2017	GCS/LAB/S/1686/17-18	47	18	5	13.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
17	04.12.2017	GCS/LAB/S/1780/17-18	48	16	5.1	13	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
18	08.12.2017	GCS/LAB/S/1780/17-18	52	19	5.6	13.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
19	11.12.2017	GCS/LAB/S/1780/17-18	59	20	5.3	14.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
20	15.12.2017	GCS/LAB/S/1780/17-18	56	22	6.4	14.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
21	18.12.2017	GCS/LAB/S/1780/17-18	58	24	5.5	13.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
22	22.12.2017	GCS/LAB/S/1780/17-18	54	21	5.8	14.0	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
23	26.12.2017	GCS/LAB/S/1780/17-18	50	22	6.7	14.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
24	29.12.2017	GCS/LAB/S/1780/17-18	57	26	6.2	14.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
25	02.01.2018	GCS/LAB/S/1866/17-18	55	19	5.7	14.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
26	05.01.2018	GCS/LAB/S/1866/17-18	58	22	5	13.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
27	08.01.2018	GCS/LAB/S/1866/17-18	52	21	6.1	14.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
28	12.01.2018	GCS/LAB/S/1866/17-18	49	18	5.5	14	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
29	16.01.2018	GCS/LAB/S/1866/17-18	53	20	5.9	14.4	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
30	19.01.2018	GCS/LAB/S/1866/17-18	57	25	6.5	13.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
31	22.01.2018	GCS/LAB/S/1866/17-18	54	23	6	13.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
32	29.01.2018	GCS/LAB/S/1866/17-18	50	19	6.6	14.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
33	02.02.2018	GCS/LAB/S/1958/17-18	59	26	5.1	15.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
34	06.02.2018	GCS/LAB/S/1958/17-18	51	19	5.7	14.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
35	09.02.2018	GCS/LAB/S/1958/17-18	56	23	5.5	14.0	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
36	12.02.2018	GCS/LAB/S/1958/17-18	52	20	5.8	14.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
37	16.02.2018	GCS/LAB/S/1958/17-18	58	25	5.3	15.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
38	19.02.2018	GCS/LAB/S/1958/17-18	60	28	5.2	14.4	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
39	23.02.2018	GCS/LAB/S/1958/17-18	56	24	5.6	14.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
40	26.02.2018	GCS/LAB/S/1958/17-18	53	21	6.2	14.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
41	05.03.2018	GCS/LAB/S/2050/17-18	63	28	6.3	16.0	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
42	09.03.2018	GCS/LAB/S/2050/17-18	57	24	6.0	15.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
43	12.03.2018	GCS/LAB/S/2050/17-18	60	25	5.9	15.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
44	16.03.2018	GCS/LAB/S/2050/17-18	49	18	6.1	15.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
45	19.03.2018	GCS/LAB/S/2050/17-18	53	20	6.7	14.0	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
46	23.03.2018	GCS/LAB/S/2050/17-18	66	26	6.2	15.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
47	26.03.2018	GCS/LAB/S/2050/17-18	59	27	6.9	15.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
48	30.03.2018	GCS/LAB/S/2050/17-18	62	29	6.6	15.4	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1



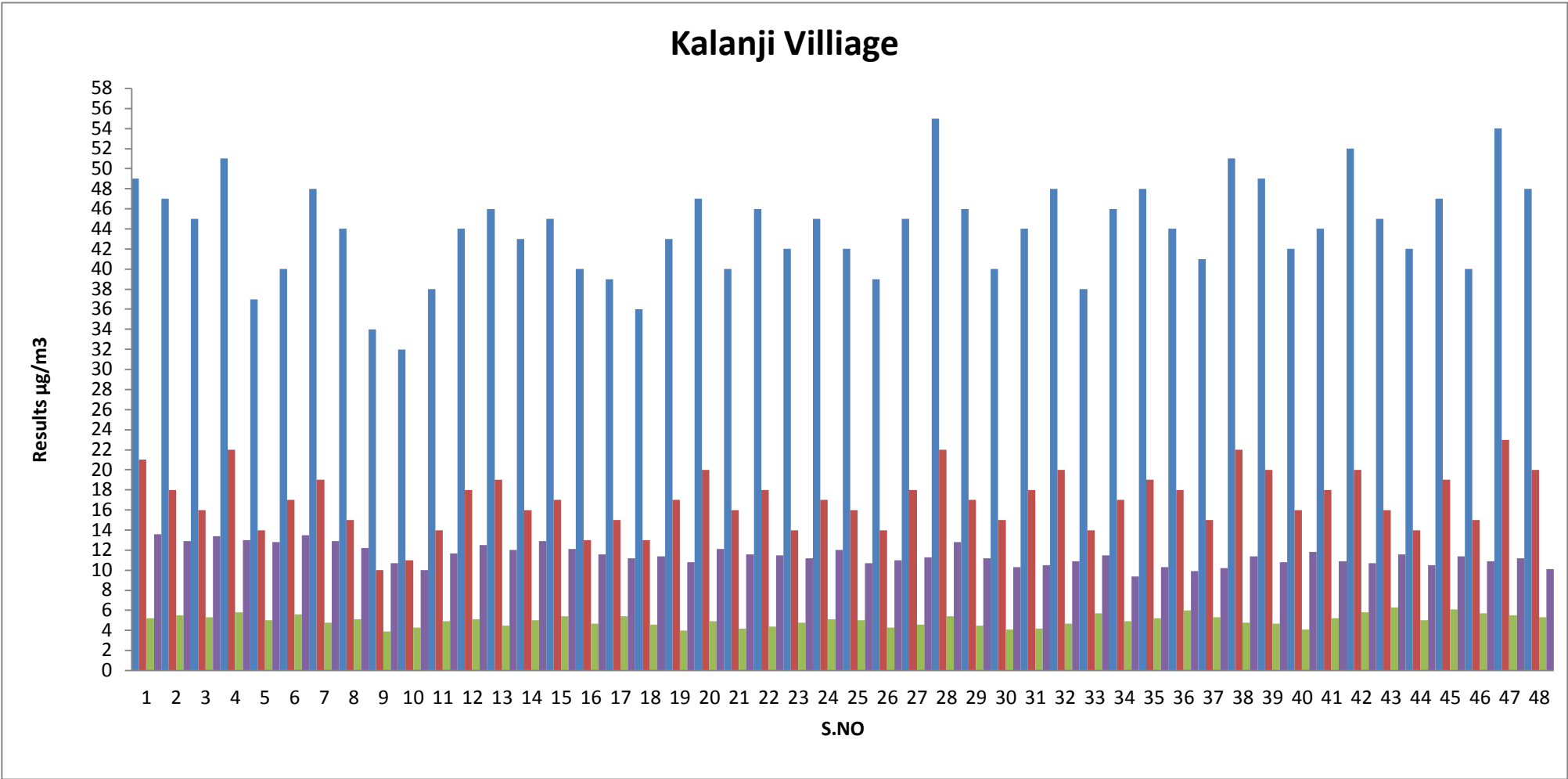
PORT MAIN GATE (AAQ2)														
Parameters			Particular matter PM ₁₀	Particular matter PM _{2.5}	Sulphur dioxide as SO ₂	Nitrogen dioxide as NO ₂	Lead as Pb	Carbon monoxide as CO	Ozone as O ₃	Ammonia as NH ₃	Arsenic as As	Nickel as Ni	Benzene as C ₆ H ₆	Benzo (a) pyrene as BaP
Unit			µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³	ng/m ³	ng/m ³	µg/m ³	ng/m ³
National AAQM Standard			100	60	80	80	1	4	180	400	6	20	5	1
S.No.	Sampling Date	Report Number												
1	03.10.2017	GCS/LAB/S/1591/17-18	65	27	6.9	16.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
2	06.10.2017	GCS/LAB/S/1591/17-18	67	30	6.3	15.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
3	09.10.2017	GCS/LAB/S/1591/17-18	61	24	6.5	16.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
4	13.10.2017	GCS/LAB/S/1591/17-18	64	26	6.7	16	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
5	16.10.2017	GCS/LAB/S/1591/17-18	50	19	5.8	14.4	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
6	20.10.2017	GCS/LAB/S/1591/17-18	58	23	5.2	14.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
7	23.10.2017	GCS/LAB/S/1591/17-18	63	25	5.6	15.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
8	27.10.2017	GCS/LAB/S/1591/17-18	59	22	5.9	15.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
9	03.11.2017	GCS/LAB/S/1686/17-18	43	19	5.8	13.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
10	06.11.2017	GCS/LAB/S/1686/17-18	40	21	5.2	13.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
11	11.11.2017	GCS/LAB/S/1686/17-18	48	19	5.5	13.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
12	15.11.2017	GCS/LAB/S/1686/17-18	55	23	6.4	15.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
13	17.11.2017	GCS/LAB/S/1686/17-18	61	26	6.7	15.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
14	20.11.2017	GCS/LAB/S/1686/17-18	54	21	5.8	15.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
15	24.11.2017	GCS/LAB/S/1686/17-18	60	24	6.3	16.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
16	27.11.2017	GCS/LAB/S/1686/17-18	53	20	5.4	15.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
17	04.12.2017	GCS/LAB/S/1780/17-18	51	22	6.4	14	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
18	08.12.2017	GCS/LAB/S/1780/17-18	56	24	6.7	14.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
19	11.12.2017	GCS/LAB/S/1780/17-18	52	21	6.1	13.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
20	15.12.2017	GCS/LAB/S/1780/17-18	63	25	6.9	16.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
21	18.12.2017	GCS/LAB/S/1780/17-18	65	28	6.2	15	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
22	22.12.2017	GCS/LAB/S/1780/17-18	68	30	6.7	15.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
23	26.12.2017	GCS/LAB/S/1780/17-18	64	26	7	15.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
24	29.12.2017	GCS/LAB/S/1780/17-18	62	23	6.1	14.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
25	02.01.2018	GCS/LAB/S/1866/17-18	64	27	6.9	15.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
26	05.01.2018	GCS/LAB/S/1866/17-18	59	25	6.3	15.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
27	08.01.2018	GCS/LAB/S/1866/17-18	57	23	6.6	14.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
28	12.01.2018	GCS/LAB/S/1866/17-18	55	20	7.3	15.4	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
29	16.01.2018	GCS/LAB/S/1866/17-18	67	26	7.8	16	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
30	19.01.2018	GCS/LAB/S/1866/17-18	62	24	6	15.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
31	22.01.2018	GCS/LAB/S/1866/17-18	67	28	7.5	15.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
32	29.01.2018	GCS/LAB/S/1866/17-18	58	21	6.7	15.5	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
33	02.02.2018	GCS/LAB/S/1958/17-18	54	21	6.2	15.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
34	06.02.2018	GCS/LAB/S/1958/17-18	64	27	5.8	14.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
35	09.02.2018	GCS/LAB/S/1958/17-18	62	25	6.9	15.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
36	12.02.2018	GCS/LAB/S/1958/17-18	66	28	6.0	15.1	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
37	16.02.2018	GCS/LAB/S/1958/17-18	60	24	7.3	16.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
38	19.02.2018	GCS/LAB/S/1958/17-18	65	26	7.8	16.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
39	23.02.2018	GCS/LAB/S/1958/17-18	57	23	6.5	16.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
40	26.02.2018	GCS/LAB/S/1958/17-18	63	25	7.4	16.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
41	05.03.2018	GCS/LAB/S/2050/17-18	67	29	7.5	16.9	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
42	09.03.2018	GCS/LAB/S/2050/17-18	60	24	6.6	15.7	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
43	12.03.2018	GCS/LAB/S/2050/17-18	66	27	7.2	16.0	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
44	16.03.2018	GCS/LAB/S/2050/17-18	57	20	5.9	15.8	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
45	19.03.2018	GCS/LAB/S/2050/17-18	69	30	6.5	16.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
46	23.03.2018	GCS/LAB/S/2050/17-18	58	22	7.0	15.6	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
47	26.03.2018	GCS/LAB/S/2050/17-18	61	25	8.1	16.3	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1
48	30.03.2018	GCS/LAB/S/2050/17-18	59	23	7.9	17.2	<0.1	<1.0	<10	<2	<2	<2	<1	<0.1



KATTUPALLI VILLAGE (AAQ3)													
Parameters		Particular matter PM ₁₀	Particular matter PM _{2.5}	Sulphur dioxide as SO ₂	Nitrogen dioxide as NO ₂	Lead as Pb	Carbon monoxide as CO	Ozone as O ₃	Ammonia as NH ₃	Arsenic as As	Nickel as Ni	Benzene as C ₆ H ₆	Benzo (a) pyrene as BaP
Unit		µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³	ng/m ³	ng/m ³	µg/m ³	ng/m ³
National AAQM Standard		100	60	80	80	1	4	180	400	6	20	5	1
S.No.	Sampling Date	Report Number											
1	03.10.2017	GCS/LAB/S/1591/17-18	52	24	5.6	13.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
2	06.10.2017	GCS/LAB/S/1591/17-18	50	21	5.9	13.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
3	09.10.2017	GCS/LAB/S/1591/17-18	44	18	5.1	14.1	<0.1	<1.0	<10	<2	<2	<1	<0.1
4	13.10.2017	GCS/LAB/S/1591/17-18	47	19	4.8	14.3	<0.1	<1.0	<10	<2	<2	<1	<0.1
5	16.10.2017	GCS/LAB/S/1591/17-18	35	13	5	13.6	<0.1	<1.0	<10	<2	<2	<1	<0.1
6	20.10.2017	GCS/LAB/S/1591/17-18	38	14	5.7	13.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
7	23.10.2017	GCS/LAB/S/1591/17-18	45	17	5.4	13.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
8	27.10.2017	GCS/LAB/S/1591/17-18	42	16	4.9	13	<0.1	<1.0	<10	<2	<2	<1	<0.1
9	03.11.2017	GCS/LAB/S/1686/17-18	33	11	4	10.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
10	06.11.2017	GCS/LAB/S/1686/17-18	36	12	4.3	10.1	<0.1	<1.0	<10	<2	<2	<1	<0.1
11	11.11.2017	GCS/LAB/S/1686/17-18	40	15	4.7	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
12	15.11.2017	GCS/LAB/S/1686/17-18	43	17	5.1	12.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
13	17.11.2017	GCS/LAB/S/1686/17-18	45	18	4.6	13	<0.1	<1.0	<10	<2	<2	<1	<0.1
14	20.11.2017	GCS/LAB/S/1686/17-18	42	16	4.9	12.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
15	24.11.2017	GCS/LAB/S/1686/17-18	47	18	5	13.6	<0.1	<1.0	<10	<2	<2	<1	<0.1
16	27.11.2017	GCS/LAB/S/1686/17-18	39	14	4.5	12.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
17	04.12.2017	GCS/LAB/S/1780/17-18	37	13	4.6	10.1	<0.1	<1.0	<10	<2	<2	<1	<0.1
18	08.12.2017	GCS/LAB/S/1780/17-18	41	14	4.4	10.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
19	11.12.2017	GCS/LAB/S/1780/17-18	44	15	4.2	10.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
20	15.12.2017	GCS/LAB/S/1780/17-18	46	18	5.7	11.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
21	18.12.2017	GCS/LAB/S/1780/17-18	42	14	4.9	12.1	<0.1	<1.0	<10	<2	<2	<1	<0.1
22	22.12.2017	GCS/LAB/S/1780/17-18	45	17	4.5	11.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
23	26.12.2017	GCS/LAB/S/1780/17-18	43	16	5.3	11.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
24	29.12.2017	GCS/LAB/S/1780/17-18	47	19	4.8	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
25	02.01.2018	GCS/LAB/S/1866/17-18	43	15	5	11.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
26	05.01.2018	GCS/LAB/S/1866/17-18	38	12	4.7	11.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
27	08.01.2018	GCS/LAB/S/1866/17-18	41	13	5.5	11.6	<0.1	<1.0	<10	<2	<2	<1	<0.1
28	12.01.2018	GCS/LAB/S/1866/17-18	54	21	6.3	12.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
29	16.01.2018	GCS/LAB/S/1866/17-18	47	18	5.6	11.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
30	19.01.2018	GCS/LAB/S/1866/17-18	42	14	4.8	10.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
31	22.01.2018	GCS/LAB/S/1866/17-18	48	19	5.1	12.0	<0.1	<1.0	<10	<2	<2	<1	<0.1
32	29.01.2018	GCS/LAB/S/1866/17-18	51	22	5.3	11.7	<0.1	<1.0	<10	<2	<2	<1	<0.1
33	02.02.2018	GCS/LAB/S/1958/17-18	46	16	5.3	11.7	<0.1	<1.0	<10	<2	<2	<1	<0.1
34	06.02.2018	GCS/LAB/S/1958/17-18	44	15	5.1	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
35	09.02.2018	GCS/LAB/S/1958/17-18	48	17	5.0	10.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
36	12.02.2018	GCS/LAB/S/1958/17-18	51	19	5.7	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
37	16.02.2018	GCS/LAB/S/1958/17-18	55	23	6.1	10.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
38	19.02.2018	GCS/LAB/S/1958/17-18	49	18	5.5	11.3	<0.1	<1.0	<10	<2	<2	<1	<0.1
39	23.02.2018	GCS/LAB/S/1958/17-18	53	21	5.9	11.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
40	26.02.2018	GCS/LAB/S/1958/17-18	47	20	6.4	12.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
41	05.03.2018	GCS/LAB/S/2050/17-18	53	20	5.8	10.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
42	09.03.2018	GCS/LAB/S/2050/17-18	49	17	5.5	11.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
43	12.03.2018	GCS/LAB/S/2050/17-18	56	24	6.2	11.3	<0.1	<1.0	<10	<2	<2	<1	<0.1
44	16.03.2018	GCS/LAB/S/2050/17-18	43	16	5.0	10.1	<0.1	<1.0	<10	<2	<2	<1	<0.1
45	19.03.2018	GCS/LAB/S/2050/17-18	51	22	6.7	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
46	23.03.2018	GCS/LAB/S/2050/17-18	58	25	6.0	12.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
47	26.03.2018	GCS/LAB/S/2050/17-18	45	19	5.1	10.3	<0.1	<1.0	<10	<2	<2	<1	<0.1
48	30.03.2018	GCS/LAB/S/2050/17-18	52	23	5.9	10.8	<0.1	<1.0	<10	<2	<2	<1	<0.1

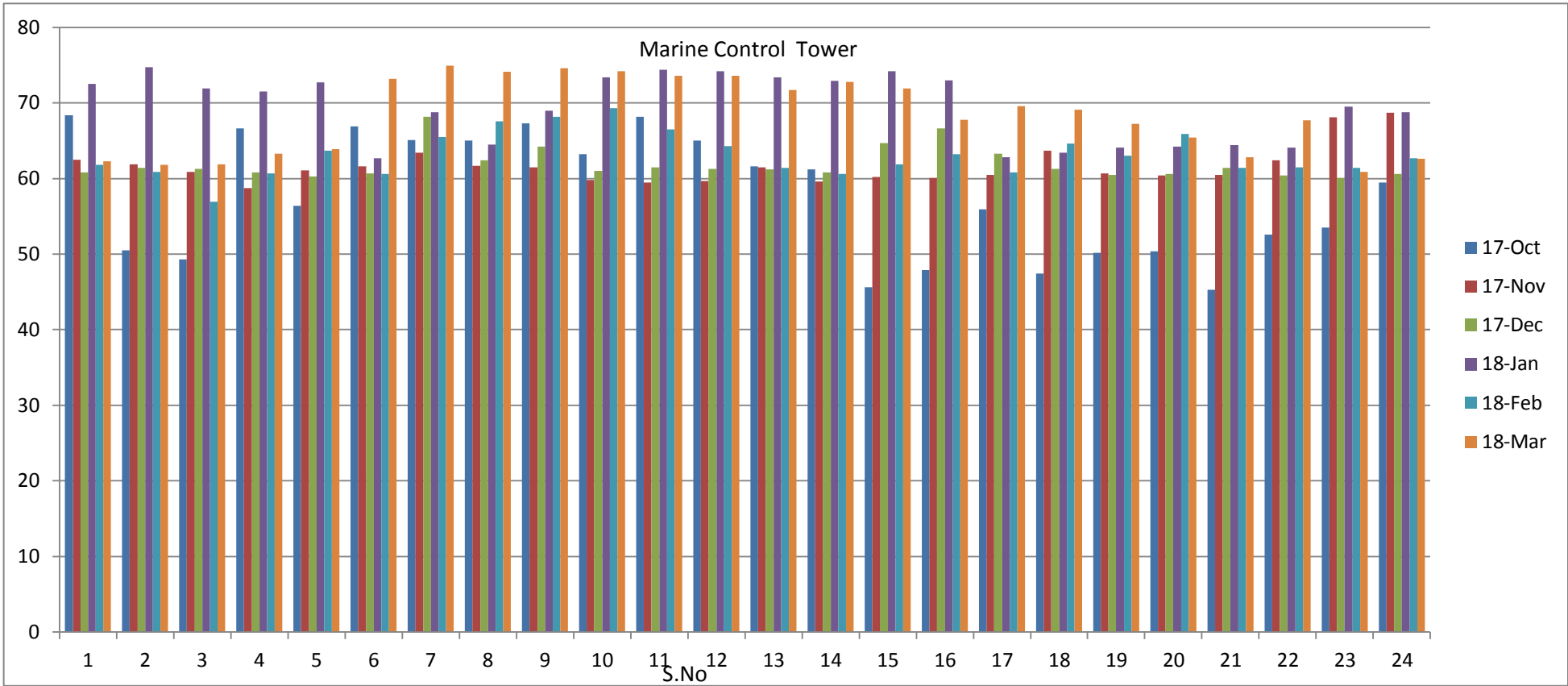
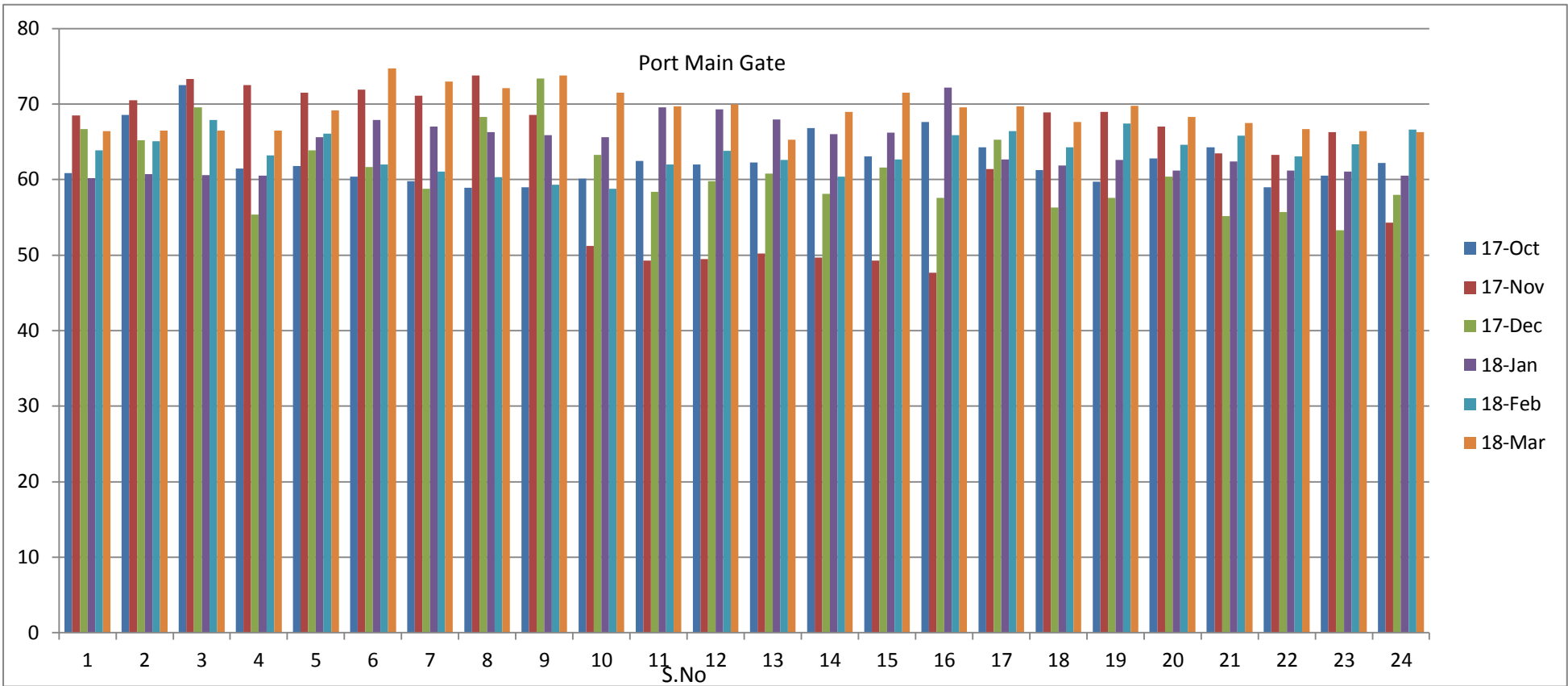


KALANJI VILLAGE (AAQ4)													
Parameters		Particular matter PM ₁₀	Particular matter PM _{2.5}	Sulphur dioxide as SO ₂	Nitrogen dioxide as NO ₂	Lead as Pb	Carbon monoxide as CO	Ozone as O ₃	Ammonia as NH ₃	Arsenic as As	Nickel as Ni	Benzene as C ₆ H ₆	Benzo (a) pyrene as BaP
Unit		µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³	ng/m ³	ng/m ³	µg/m ³	ng/m ³
National AAQM Standard		100	60	80	80	1	4	180	400	6	20	5	1
S.No.	Sampling Date	Report Number											
1	03.10.2017	GCS/LAB/S/1591/17-18	49	21	5.2	13.6	<0.1	<1.0	<10	<2	<2	<1	<0.1
2	06.10.2017	GCS/LAB/S/1591/17-18	47	18	5.5	12.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
3	09.10.2017	GCS/LAB/S/1591/17-18	45	16	5.3	13.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
4	13.10.2017	GCS/LAB/S/1591/17-18	51	22	5.8	13	<0.1	<1.0	<10	<2	<2	<1	<0.1
5	16.10.2017	GCS/LAB/S/1591/17-18	37	14	5	12.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
6	20.10.2017	GCS/LAB/S/1591/17-18	40	17	5.6	13.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
7	23.10.2017	GCS/LAB/S/1591/17-18	48	19	4.8	12.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
8	27.10.2017	GCS/LAB/S/1591/17-18	44	15	5.1	12.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
9	03.11.2017	GCS/LAB/S/1686/17-18	34	10	3.9	10.7	<0.1	<1.0	<10	<2	<2	<1	<0.1
10	06.11.2017	GCS/LAB/S/1686/17-18	32	11	4.3	10	<0.1	<1.0	<10	<2	<2	<1	<0.1
11	11.11.2017	GCS/LAB/S/1686/17-18	38	14	4.9	11.7	<0.1	<1.0	<10	<2	<2	<1	<0.1
12	15.11.2017	GCS/LAB/S/1686/17-18	44	18	5.1	12.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
13	17.11.2017	GCS/LAB/S/1686/17-18	46	19	4.5	12	<0.1	<1.0	<10	<2	<2	<1	<0.1
14	20.11.2017	GCS/LAB/S/1686/17-18	43	16	5	12.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
15	24.11.2017	GCS/LAB/S/1686/17-18	45	17	5.4	12.1	<0.1	<1.0	<10	<2	<2	<1	<0.1
16	27.11.2017	GCS/LAB/S/1686/17-18	40	13	4.7	11.6	<0.1	<1.0	<10	<2	<2	<1	<0.1
17	04.12.2017	GCS/LAB/S/1780/17-18	39	15	5.4	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
18	08.12.2017	GCS/LAB/S/1780/17-18	36	13	4.6	11.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
19	11.12.2017	GCS/LAB/S/1780/17-18	43	17	4	10.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
20	15.12.2017	GCS/LAB/S/1780/17-18	47	20	4.9	12.1	<0.1	<1.0	<10	<2	<2	<1	<0.1
21	18.12.2017	GCS/LAB/S/1780/17-18	40	16	4.2	11.6	<0.1	<1.0	<10	<2	<2	<1	<0.1
22	22.12.2017	GCS/LAB/S/1780/17-18	46	18	4.4	11.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
23	26.12.2017	GCS/LAB/S/1780/17-18	42	14	4.8	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
24	29.12.2017	GCS/LAB/S/1780/17-18	45	17	5.1	12	<0.1	<1.0	<10	<2	<2	<1	<0.1
25	02.01.2018	GCS/LAB/S/1866/17-18	42	16	5	10.7	<0.1	<1.0	<10	<2	<2	<1	<0.1
26	05.01.2018	GCS/LAB/S/1866/17-18	39	14	4.3	11.0	<0.1	<1.0	<10	<2	<2	<1	<0.1
27	08.01.2018	GCS/LAB/S/1866/17-18	45	18	4.6	11.3	<0.1	<1.0	<10	<2	<2	<1	<0.1
28	12.01.2018	GCS/LAB/S/1866/17-18	55	22	5.4	12.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
29	16.01.2018	GCS/LAB/S/1866/17-18	46	17	4.5	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
30	19.01.2018	GCS/LAB/S/1866/17-18	40	15	4.1	10.3	<0.1	<1.0	<10	<2	<2	<1	<0.1
31	22.01.2018	GCS/LAB/S/1866/17-18	44	18	4.2	10.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
32	29.01.2018	GCS/LAB/S/1866/17-18	48	20	4.7	10.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
33	02.02.2018	GCS/LAB/S/1958/17-18	38	14	5.7	11.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
34	06.02.2018	GCS/LAB/S/1958/17-18	46	17	4.9	9.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
35	09.02.2018	GCS/LAB/S/1958/17-18	48	19	5.2	10.3	<0.1	<1.0	<10	<2	<2	<1	<0.1
36	12.02.2018	GCS/LAB/S/1958/17-18	44	18	6.0	9.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
37	16.02.2018	GCS/LAB/S/1958/17-18	41	15	5.3	10.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
38	19.02.2018	GCS/LAB/S/1958/17-18	51	22	4.8	11.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
39	23.02.2018	GCS/LAB/S/1958/17-18	49	20	4.7	10.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
40	26.02.2018	GCS/LAB/S/1958/17-18	42	16	4.1	11.8	<0.1	<1.0	<10	<2	<2	<1	<0.1
41	05.03.2018	GCS/LAB/S/2050/17-18	44	18	5.2	10.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
42	09.03.2018	GCS/LAB/S/2050/17-18	52	20	5.8	10.7	<0.1	<1.0	<10	<2	<2	<1	<0.1
43	12.03.2018	GCS/LAB/S/2050/17-18	45	16	6.3	11.6	<0.1	<1.0	<10	<2	<2	<1	<0.1
44	16.03.2018	GCS/LAB/S/2050/17-18	42	14	5.0	10.5	<0.1	<1.0	<10	<2	<2	<1	<0.1
45	19.03.2018	GCS/LAB/S/2050/17-18	47	19	6.1	11.4	<0.1	<1.0	<10	<2	<2	<1	<0.1
46	23.03.2018	GCS/LAB/S/2050/17-18	40	15	5.7	10.9	<0.1	<1.0	<10	<2	<2	<1	<0.1
47	26.03.2018	GCS/LAB/S/2050/17-18	54	23	5.5	11.2	<0.1	<1.0	<10	<2	<2	<1	<0.1
48	30.03.2018	GCS/LAB/S/2050/17-18	48	20	5.3	10.1	<0.1	<1.0	<10	<2	<2	<1	<0.1

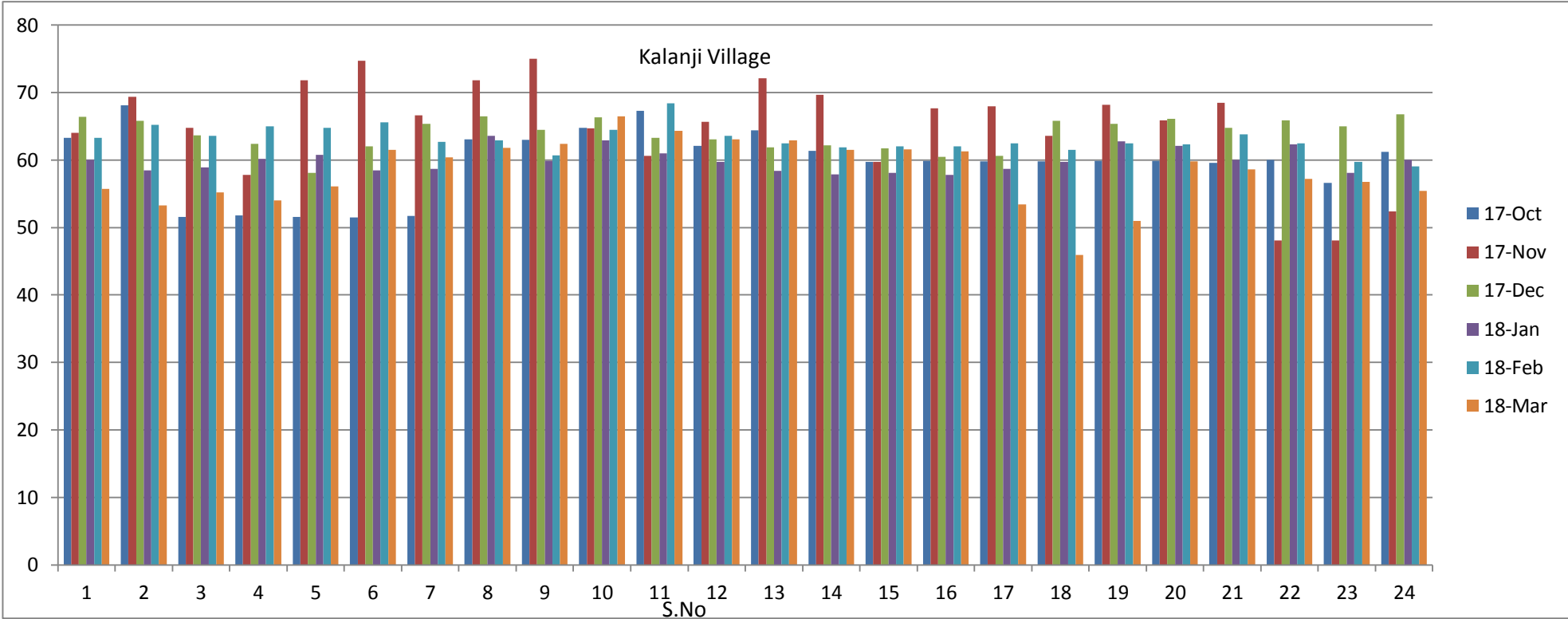
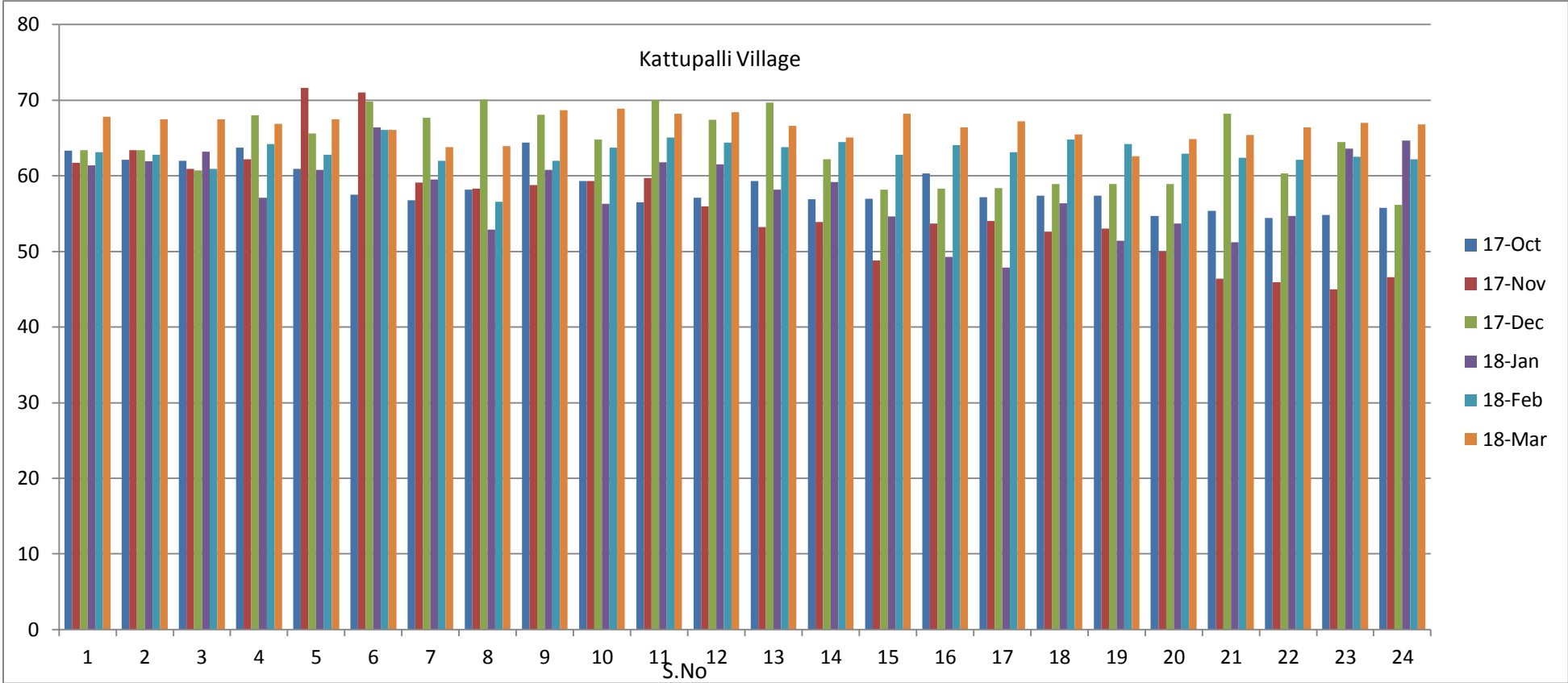


AMBIENT NOISE LEVEL MONITORING

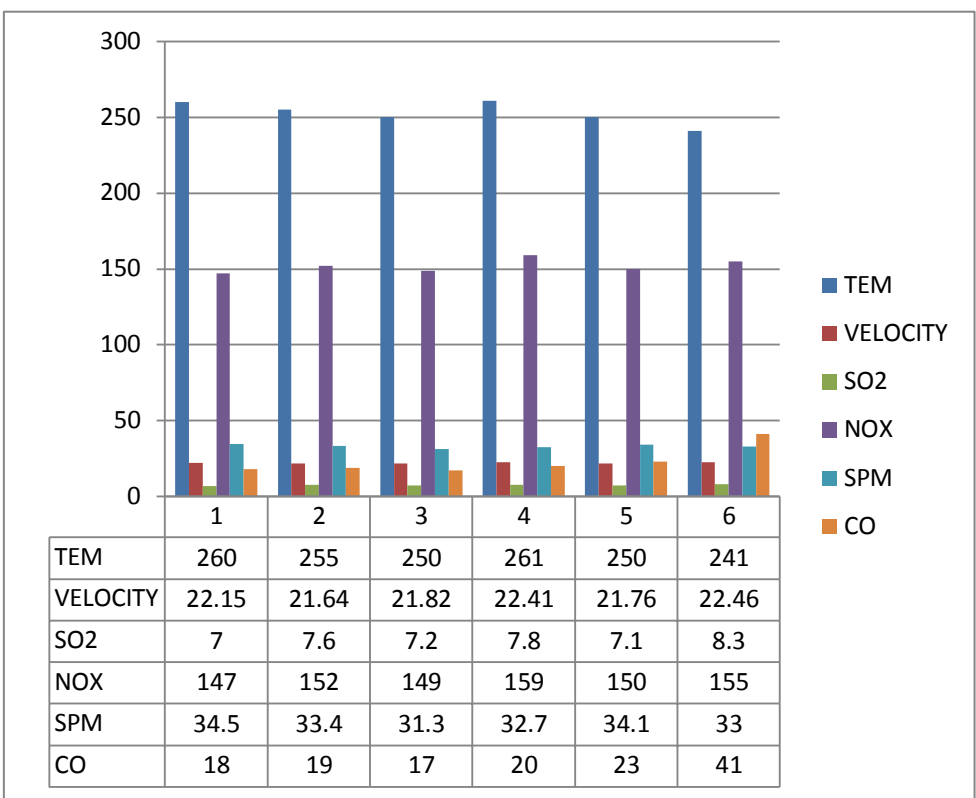
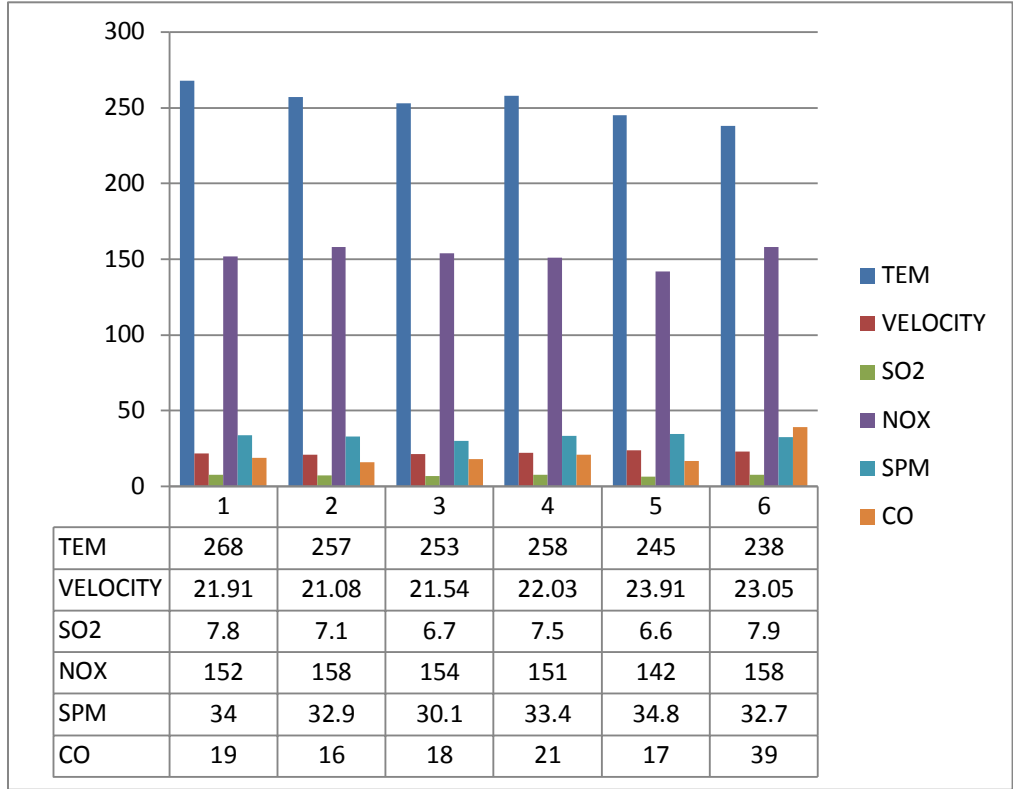
Location		PORT MAIN GATE						MARINE CONTROL					
Month & Year		Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
Parameter & Unit		Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)
S.No.	Time of Sampling												
1	06.00 – 07.00 (Day)	60.9	68.5	66.7	60.2	63.9	66.4	68.4	62.5	60.8	72.5	61.8	62.3
2	07.00 –08.00	68.6	70.5	65.2	60.7	65.1	66.5	50.5	61.9	61.4	74.7	60.9	61.8
3	08.00 – 09.00	72.5	73.3	69.6	60.6	67.9	66.5	49.3	60.9	61.3	71.9	56.9	61.9
4	09.00 – 10.00	61.5	72.5	55.4	60.5	63.2	66.5	66.6	58.7	60.8	71.5	60.7	63.3
5	10.00 – 11.00	61.8	71.5	63.9	65.6	66.1	69.2	56.4	61.1	60.3	72.7	63.7	63.9
6	11.00 – 12.00	60.4	71.9	61.7	67.9	62	74.7	66.9	61.6	60.7	62.7	60.6	73.2
7	12.00 – 13.00	59.8	71.1	58.8	67.0	61.1	73	65.1	63.4	68.2	68.8	65.5	74.9
8	13.00 – 14.00	58.9	73.8	68.3	66.3	60.3	72.1	65.0	61.7	62.4	64.5	67.6	74.1
9	14.00 – 15.00	59.0	68.6	73.4	65.9	59.3	73.8	67.3	61.5	64.2	69.0	68.2	74.6
10	15.00 – 16.00	60.1	51.2	63.3	65.6	58.8	71.5	63.2	59.8	61.0	73.4	69.3	74.2
11	16.00 – 17.00	62.5	49.3	58.4	69.6	62	69.7	68.2	59.5	61.5	74.4	66.5	73.6
12	17.00 – 18.00	62.0	49.5	59.8	69.3	63.8	70	65.0	59.7	61.3	74.2	64.3	73.6
13	18.00 – 19.00	62.3	50.2	60.8	68.0	62.6	65.3	61.6	61.5	61.2	73.4	61.4	71.7
14	19.00 –20.00	66.8	49.7	58.1	66.0	60.4	69	61.2	59.6	60.8	72.9	60.6	72.8
15	20.00 – 21.00	63.1	49.3	61.6	66.2	62.7	71.5	45.6	60.2	64.7	74.2	61.9	71.9
16	21.00 – 22.00	67.6	47.7	57.6	72.2	65.9	69.6	47.9	60.1	66.6	73.0	63.2	67.8
17	22.00 – 23.00 (Night)	64.3	61.4	65.3	62.7	66.4	69.7	55.9	60.5	63.3	62.8	60.8	69.6
18	23.00 – 00.00	61.3	68.9	56.3	61.9	64.3	67.6	47.4	63.7	61.3	63.4	64.6	69.1
19	00.00 – 01.00	59.7	69.0	57.6	62.6	67.4	69.8	50.2	60.7	60.5	64.1	63	67.2
20	01.00 – 02.00	62.8	67.0	60.4	61.2	64.6	68.3	50.4	60.4	60.6	64.2	65.9	65.4
21	02.00 – 03.00	64.3	63.5	55.2	62.4	65.8	67.5	45.3	60.5	61.4	64.4	61.4	62.8
22	03.00 – 04.00	59.0	63.3	55.7	61.2	63.1	66.7	52.6	62.4	60.4	64.1	61.5	67.7
23	04.00 – 05.00	60.5	66.3	53.3	61.1	64.7	66.4	53.5	68.1	60.1	69.5	61.4	60.9
24	05.00 – 06.00	62.2	54.3	58.0	60.5	66.6	66.3	59.5	68.7	60.6	68.8	62.7	62.6



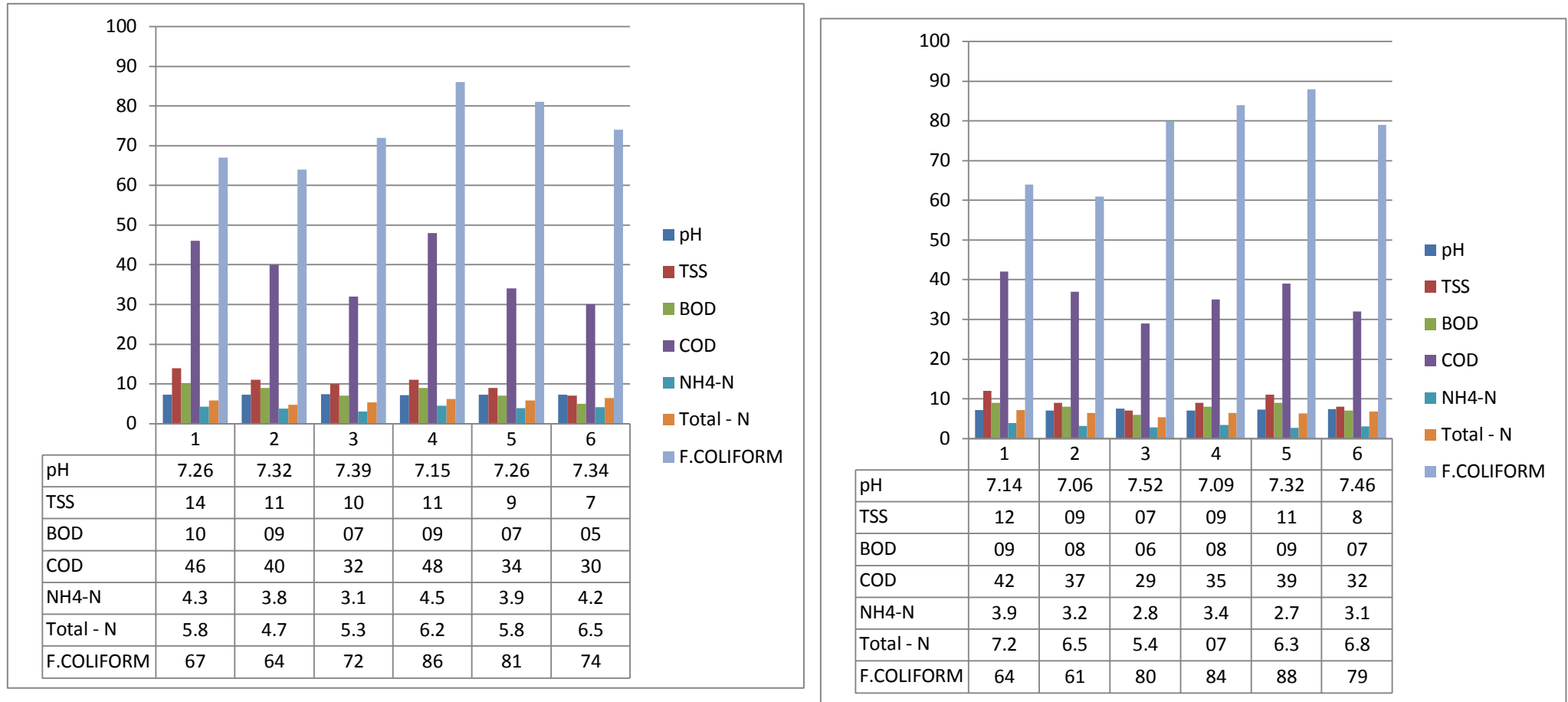
Location		KATTUPALLI VILLAGE						KALANJI VILLAGE					
Month & Year		Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
Parameter & Unit		Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)	Leq dB(A)
S.No.	Time of Sampling												
1	06.00 – 07.00 (Day)	63.3	61.7	63.4	61.4	63.1	67.8	63.3	64	66.4	60.0	63.3	55.7
2	07.00 –08.00	62.1	63.4	63.4	61.9	62.8	67.5	68.1	69.4	65.8	58.5	65.2	53.3
3	08.00 – 09.00	62.0	60.9	60.7	63.2	60.9	67.5	51.6	64.8	63.7	58.9	63.6	55.2
4	09.00 – 10.00	63.7	62.2	68.0	57.1	64.2	66.9	51.8	57.8	62.4	60.2	65	54
5	10.00 – 11.00	60.9	71.6	65.6	60.8	62.8	67.5	51.6	71.8	58.1	60.8	64.8	56.1
6	11.00 – 12.00	57.5	71	69.8	66.4	66.1	66.1	51.5	74.7	62.0	58.5	65.6	61.5
7	12.00 – 13.00	56.8	59.1	67.7	59.5	62	63.8	51.7	66.6	65.4	58.7	62.7	60.4
8	13.00 – 14.00	58.2	58.3	70.1	52.9	56.6	63.9	63.1	71.8	66.5	63.6	62.9	61.8
9	14.00 – 15.00	64.4	58.8	68.1	60.8	62	68.7	63.0	75.0	64.5	59.9	60.7	62.4
10	15.00 – 16.00	59.3	59.3	64.8	56.3	63.7	68.9	64.8	64.7	66.3	62.9	64.5	66.5
11	16.00 – 17.00	56.5	59.7	70.0	61.8	65.1	68.2	67.3	60.6	63.3	61.0	68.4	64.3
12	17.00 – 18.00	57.1	56.0	67.4	61.5	64.4	68.4	62.1	65.7	63.1	59.7	63.6	63.1
13	18.00 – 19.00	59.3	53.2	69.7	58.2	63.8	66.6	64.4	72.1	61.9	58.4	62.5	62.9
14	19.00 –20.00	56.9	53.9	62.2	59.2	64.5	65.1	61.4	69.7	62.2	57.9	61.9	61.5
15	20.00 – 21.00	57.0	48.8	58.2	54.6	62.8	68.2	59.7	59.7	61.7	58.1	62	61.6
16	21.00 – 22.00	60.3	53.7	58.3	49.3	64.1	66.4	59.9	67.7	60.5	57.8	62	61.3
17	22.00 – 23.00 (Night)	57.2	54.0	58.4	47.9	63.1	67.2	59.8	68.0	60.6	58.7	62.5	53.4
18	23.00 – 00.00	57.4	52.6	58.9	56.4	64.8	65.5	59.8	63.6	65.8	59.7	61.5	45.9
19	00.00 – 01.00	57.4	53.0	58.9	51.4	64.2	62.6	59.9	68.2	65.4	62.8	62.5	51
20	01.00 – 02.00	54.7	50.0	58.9	53.7	62.9	64.9	59.9	65.9	66.1	62.1	62.3	59.8
21	02.00 – 03.00	55.4	46.4	68.2	51.2	62.4	65.4	59.6	68.5	64.8	60.0	63.8	58.6
22	03.00 – 04.00	54.4	45.9	60.3	54.7	62.1	66.4	60.0	48.1	65.9	62.3	62.5	57.2
23	04.00 – 05.00	54.8	45.0	64.5	63.6	62.5	67	56.6	48.1	65.0	58.1	59.7	56.8
24	05.00 – 06.00	55.8	46.6	56.2	64.7	62.2	66.8	61.2	52.4	66.8	60.0	59.1	55.4



STACK MONITORING													
Location		DG 2000KVA - 1						DG 2000KVA - 2					
Month & Year		Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
S.No.	Parameters												
1	Stack Temperature, °C	268	257	253	258	245	238	260	255	250	261	250	241
2	Flue Gas Velocity, m/s	21.91	21.08	21.54	22.03	23.91	23.05	22.15	21.64	21.82	22.41	21.76	22.46
3	Sulphur Dioxide, mg/Nm3	7.8	7.1	6.7	7.5	6.6	7.9	7	7.6	7.2	7.8	7.1	8.3
4	NOX (as NO2) in ppmv	152	158	154	151	142	158	147	152	149	159	150	155
5	Particular matter, mg/Nm3	34	32.9	30.1	33.4	34.8	32.7	34.5	33.4	31.3	32.7	34.1	33
6	Carbon Monoxide, mg/Nm3	19	16	18	21	17	39	18	19	17	20	23	41
7	Gas Discharge, Nm3/hr	5425	5328	5485	5557	6183	6042	5567	5490	5589	5622	5573	5854



STP OUTLET WATER													
Location		STP 30KLD OUTLET						STP 5KLD OUTLET					
Month & Year		Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
S.No.	Parameters												
1	pH @ 25°C	7.26	7.32	7.39	7.15	7.26	7.34	7.14	7.06	7.52	7.09	7.32	7.46
2	Total Suspended Solids	14	11	10	11	9	7	12.0	9.0	7.0	9.0	11.0	8
3	BOD at 27°C for 3 days	10.0	9.0	7.0	9.0	7.0	5.0	9.0	8.0	6.0	8.0	9.0	7.0
4	COD	46	40	32	48	34	30	42	37	29	35	39	32
5	Ammonical Nitrogen as NH4-N	4.3	3.8	3.1	4.5	3.9	4.2	3.9	3.2	2.8	3.4	2.7	3.1
6	Total Kjeldahl Nitrogen as N - Total	5.8	4.7	5.3	6.2	5.8	6.5	7.2	6.5	5.4	6.5	6.3	6.8
7	Fecal Coliform	67	64	72	86	81	74	64	61	80	84	88	79



DRINKING WATER							
Month & Year		Unit	Oct-17	Dec-17	Jan-18	Feb-18	Mar-18
S.No.	Parameters						
1	pH @ 25°C	-	7.13	6.55	6.61	6.63	6.72
2	Total Hardness as CaCo3	mg/L	85	3.04	BDL(DL1.0)		
3	Chloride as Cl	mg/L	122	18.6	14	12	8.9
4	Total Dissolved Solids	mg/L	256	30	25	23	25
5	Calcium as Ca	mg/L	21	0.81	BDL(DL:0.4)		
6	Sulphate as SO4	mg/L	24	1.25	BDL (DL:1.0)		
7	Nitrate as No3	mg/L	1.57	BDL	BDL(DL:1.0)		
8	Total Alkalinity as CaCo ₃	mg/L	32	9.05	11	10	18
9	Magnesium as Mg	mg/L	7.68	0.24	BDL(DL:0.24)		
10	Color	Hazen	<1.0				
11	Odour	-	Unobjectionable				
12	Taste	-	Agreeable				
13	Turbidity	NTU	<0.5				
14	Iron as Fe	mg/L	BDL(DL 0.05)				
15	Total Residual Chlorine	mg/L	BDL(DL 0.1)				
16	Copper as Cu	mg/L	BDL(DL 0.05)				
17	Manganese as Mn	mg/L	BDL(DL 0.05)				
18	Fluoride as F	mg/L	BDL(DL 0.1)				
19	Phenolic compounds as C ₆ H ₅ OH	mg/L	BDL(DL 0.001)				
20	Mercury as Hg	mg/L	BDL(DL 0.001)				
21	Cadmium as Cd	mg/L	BDL(DL 0.003)				
22	Selenium as Se	mg/L	BDL(DL 0.01)				
23	Arsenic as As	mg/L	BDL(DL 0.01)				
24	Lead as Pb	mg/L	BDL(DL 0.01)				
25	Zinc as Zn	mg/L	BDL(DL 0.05)				
26	Anionic Detergents as MBAS	mg/L	Nil				
27	Total Chromium as Cr	mg/L	BDL(DL 0.05)				
28	Phenolphthalein Alkalinity as CaCo ₃	mg/L	Nil				
29	Aluminium as Al	mg/L	BDL(DL 0.05)				
30	Boron as B	mg/L	BDL(DL 0.1)				
31	Mineral Oil	mg/L	Nil				
32	Polynuclear Aromatic Hydrocarbons as [PAH]	mg/L	Nil				
33	Pesticides	mg/L	Nil				
34	Cyanide as CN	mg/L	BDL (DL : 0.01)				
35	E. coli	MPN/100ml	Absence				
36	Total Coliform	MPN/100ml	Absence				

MARINE WATER														
Location		CB - 1 Surface Water							CB - 2 Surface Water					
Month & Year		Unit	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
S.No.	Parameters													
1	pH @ 25°C	-	8.02	8.09	8.15	8.21	8.04	7.98	8.27	8.21	8.16	8.09	8.17	8.23
2	Temperature	°C	29	29	29	29	29	29	29	29	29	29	29	29
3	Total Suspended Solids	mg/L	14	12	16	18	17	20	12	10	12	16	14	16
4	BOD at 27 °C for 3 days	mg/L	6	5	7	9	8	10	5	4	8	10	7	9
5	Dissolved oxygen	mg/L	4.8	5.1	4.9	4.2	4.5	4.7	4.9	5.1	4.9	4.7	4.5	4.2
6	Salinity at 25 °C	-	32	31.8	31.5	32.3	33.4	35.6	31.4	30.8	30.4	31.2	32.9	34
7	Oil & Grease	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
8	Nitrate as No ₃	mg/L	6.59	6.14	5.83	6.15	5.96	6.09	4.43	4.36	4.13	5.8	4.5	4.6
9	Nitrite as No ₂	mg/L	5.85	5.67	5.12	5.79	5.42	5.54	3.86	3.62	3.05	4.1	3.8	3.9
10	Ammonical Nitrogen as N	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
11	Ammonia as NH3	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
12	Kjeldahl Nitrogen as N	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
13	Total phosphates as PO4	mg/L	1.83	1.72	1.51	1.63	1.57	1.61	1.65	1.57	1.47	1.73	1.62	1.66
14	Total Nitrogen	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
15	Total Dissolved Solids	mg/L	36057	35016	34986	35116	34870	35650	36012	35814	34976	35109	34853	35738
16	COD	mg/L	51	48	42	49	45	52	60	53	65	72	69	71
17	Total bacterial count	cfu/ml	54	51	49	52	59	67	54	50	53	56	60	63
18	Coliforms	Per 100 ml	Absence						Absence					
19	Escherichia coli	Per 100 ml	Absence						Absence					
20	Salmonella	Per 100 ml	Absence						Absence					
21	Shigella	Per 100 ml	Absence						Absence					
22	Vibrio cholerae	Per 100 ml	Absence						Absence					
23	Vibrio parahaemolyticus	Per 100 ml	Absence						Absence					
24	Enterococci	Per 100 ml	Absence						Absence					
25	Octane	µg/L	185	179	165	168	157	160	190	186	182	184	176	180
26	Nonane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
27	Decane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
28	Undecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
29	Tridecane	µg/L	10.3	9.7	8.4	9.4	8.6	8.9	9.8	8.9	7.8	8.5	7.8	8
30	Tetradecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
31	Pentadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
32	Hexadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
33	Octadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
34	Nonadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
35	Elcosane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
36	Primary Productivity	mg C/m ³ /hr	8.82	8.09	8.82	8.68	8.42	8.35	9.76	9.18	9.47	8.94	9.24	9.06
37	Chlorophyll a	mg /m ³	3.65	4.02	4.18	4.84	4.26	4.2	4.6	4.94	4.56	4.97	4.63	5.12
38	Phaeophytin	mg /m ³	0.73	0.77	0.71	0.75	0.73	0.69	0.88	0.92	0.84	0.92	0.85	0.94
39	Oxidisable Paticular Organic carbon	mg /L	5.02	5.56	5.01	5.62	5.35	5.42	4.75	4.95	5.58	6.19	6.92	6.78
PHYTOPLANKTON														
40	Bacteriastrium hyalinum	nos/ml	11	14	12	15	18	16	14	18	15	17	15	18
41	Bacteriastrium varians	nos/ml	8	6	7	8	6	13	10	9	8	10	12	14
42	Chaetoceros didymus	nos/ml	13	11	10	7	9	5	15	13	11	8	7	9
43	Chaetoceros decipiens	nos/ml	7	9	8	10	12	9	12	14	13	11	10	12
44	Biddulphia mobiliensis	nos/ml	6	5	6	9	10	12	8	9	12	7	9	6
45	Ditylum brightwellii	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
46	Gyrosigma sp	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
47	Cladophyxis sps	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
48	Coscinodiscus centralis	nos/ml	6	8	6	5	7	10	11	13	9	6	8	11
49	Coscinodiscus granii	nos/ml	10	11	9	8	5	9	8	9	10	9	6	8
50	Cylcotella sps	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
51	Hemidiscus hardmanianus	nos/ml	3	4	3	4	5	7	9	10	7	3	5	3
52	Laudaria annulata	nos/ml	2	3	4	5	3	4	6	8	6	4	6	7
53	Pyropacus horologicum	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
54	Pleurosigma angulatum	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
55	Leptocylindrus danicus	nos/ml	4	2	Nil	2	Nil	Nil	2	3	2	Nil	4	6
56	Guinardia flaccida	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
57	Rhizosolenia alata	nos/ml	9	12	11	9	10	8	11	14	15	12	11	13
58	Rhizosolenia impricata	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
59	Rhizosolenia semispina	nos/ml	10	12	13	10	8	11	18	20	18	16	14	16
60	Thalassionema nitzschioides	nos/ml	8	11	12	13	11	14	15	17	12	14	12	11
61	Triceratium reticulatum	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
62	Ceratium trichoceros	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
63	Ceratium furca	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
64	Ceratium macroceros	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
65	Ceracium longipes	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
ZOOPLANKTONS														
66	Acrocalanus gracilis	nos/ml	11	13	12	10	8	11	8	11	13	12	10	13
67	Acrocalanus sp	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
68	Paracalanus parvus	nos/ml	9	8	7	12	10	13	13	14	16	11	8	6
69	Eutintinus sps	nos/ml	6	7	8	7	9	6	8	10	7	9	11	14
70	Centropages furcatus	nos/ml	8	9	6	5	7	4	12	9	10	8	13	10
71	Corycaeus dana	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
72	Oithona brevicornis	nos/ml	13	10	12	13	11	12	16	14	11	10	12	11
73	Euterpina acutifrons	nos/ml	5	6	5	7	5	8	3	4	6	5	4	7
74	Metacalanus aurivilli	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
75	Copipod nauplii	nos/ml	7	8	10	9	11	10	10	11	9	6	9	12
76	Cirripede nauplii	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
77	Bivalve veliger	nos/ml	11	12	10	11	12	14	10	11	12	14	10	15
78	Gastropod veliger	nos/ml	10	7	9	10	6	9	11	12	8	11	7	13

Location		CB - 1 Bottom Water							CB - 2 Bottom Water					
Month & Year		Unit	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
S.No.	Parameters													
1	pH @ 25°C	-	8.07	8.12	8.23	8.17	8.21	8.28	8.25	8.19	8.24	8.16	8.29	8.37
2	Temperature	°C	29	29	29	29	29	29	29	29	29	29	29	29
3	Total Suspended Solids	mg/L	11.0	7	9	13	10	12	14	12	15	19	16	13
4	BOD at 27 °C for 3 days	mg/L	5.2	4.8	4.6	5.8	4.7	5.3	4.2	4.8	5.3	6.1	5.7	5.5
5	Dissolved oxygen	mg/L	1.3	1.5	1.2	1.1	1.3	1.6	1.7	1.6	1.4	1.2	1.5	1.2
6	Salinity at 25 °C	-	32.1	31.7	31.3	31.9	34.4	38.7	31.8	31.3	31	31.8	34.1	35.5
7	Oil & Grease	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
8	Nitrate as No ₃	mg/L	5.06	4.89	6.15	6.74	6.36	6.19	4.99	4.05	4.27	5.14	4.63	4.54
9	Nitrite as No ₂	mg/L	4.83	3.96	5.81	6.12	5.95	5.77	3.63	3.61	3.88	4.17	4.08	4
10	Ammonical Nitrogen as N	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
11	Ammonia as NH ₃	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
12	Kjeldahl Nitrogen as N	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
13	Total phosphates as PO ₄	mg/L	1.65	1.23	1.05	1.16	1.08	1.05	1.67	1.58	1.52	2.05	1.74	1.7
14	Total Nitrogen	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
15	Total Dissolved Solids	mg/L	37108	36245	35913	36125	35964	38990	36978	35894	35712	36143	35627	34948
16	COD	mg/L	59	52	64	73	69	64	47	53	61	67	59	54
17	Total bacterial count	cfu/ml	56	54	56	64	71	76	46	42	43	48	53	51
18	Coliforms	Per 100 ml	Absence						Absence					
19	Escherichia coli	Per 100 ml	Absence						Absence					
20	Salmonella	Per 100 ml	Absence						Absence					
21	Shigella	Per 100 ml	Absence						Absence					
22	Vibrio cholerae	Per 100 ml	Absence						Absence					
23	Vibrio parahaemolyticus	Per 100 ml	Absence						Absence					
24	Enterococci	Per 100 ml	Absence						Absence					
25	Colour	Hazan	7	3	10	12	9	7	8	6	10	12	8	6
26	Odour	-	Unobjectionable						Unobjectionable					
27	Taste	-	Disagreeable						Disagreeable					
28	Turbidity	NTU	21	18	21	24	20	25	23	18	21	28	20	17
29	Calcium as Ca	mg/L	432	426	420	436	460	447	406	394	387	392	406	398
30	Chloride as Cl	mg/L	19854	19247	19054	19128	19045	21422	19054	18957	18924	19114	18895	16874
31	Cyanide as CN	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
32	Fluoride as F	mg/L	0.63	0.59	0.52	0.59	0.56	0.51	0.68	0.65	0.69	0.73	0.64	0.62
33	Magnesium as Mg	mg/L	1517	1406	1403	1435	1378	1340	1592	1495	1492	1506	1486	1453
34	Total Iron as Fe	mg/L	0.25	0.17	0.24	0.27	0.26	0.23	0.27	0.21	0.26	0.29	0.27	0.25
35	Residual Free Chlorine	mg/L	BDL(DL 0.1)						BDL(DL 0.1)					
36	Phenolic Compounds as C ₆ H ₅ OH	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
37	Total Hardness as CaCO ₃	mg/L	7402	6924	6895	7069	6891	6704	7648	7213	7185	7255	7206	7068
38	Total Alkalinity as CaCO ₃	mg/L	153	149	157	171	164	159	162	157	163	168	165	162
39	Sulphide as H ₂ S	mg/L	BDL(DL 0.5)						BDL(DL 0.5)					
40	Sulphate as SO ₄	mg/L	3375	3345	3326	3375	3346	3255	3129	3018	2997	3031	3012	2955
41	Anionic surfactants as MBAS	mg/L	BDL(DL 1.0)						BDL(DL 1.0)					
42	Monocrotophos	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
43	Atrazine	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
44	Ethion	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
45	Chiorpyrifos	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
46	Phorate	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
47	Mehyle parathion	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
48	Malathion	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
49	DDT (o,p and p,p-Isomers of DDT,DDE and DDD	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
50	Gamma HCH (Lindane)	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
51	Alppha HCH	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
52	Beta HCH	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
53	Delta HCH	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
54	Endosulfan (Alpha,beta and sulphate)	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
55	Butachlor	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
56	Alachlor	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
57	Aldrin/Dieldrin	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
58	Isoproturon	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
59	2,4-D	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
60	Polychlorinated Biphenyls (PCB)	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
61	Polynuclear aromatic hydrocarbons (PAH)	µg/L	BDL(DL 0.01)						BDL(DL 0.01)					
62	Arsenic as As	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
63	Mercury as Hg	mg/L	BDL(DL 0.001)						BDL(DL 0.001)					
64	Cadmium as Cd	mg/L	BDL(DL 0.003)						BDL(DL 0.003)					
65	Total Chromium as Cr	mg/L	BDL(DL 0.05)						BDL(DL 0.05)					
66	Copper as Cu	mg/L	BDL(DL 0.05)						BDL(DL 0.05)					
67	Lead as Pb	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
68	Manganese as Mn	mg/L	BDL(DL 0.05)						BDL(DL 0.05)					
69	Nickel as Ni	mg/L	BDL(DL 0.05)						BDL(DL 0.05)					
70	Selenium as Se	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
71	Barium as Ba	mg/L	BDL(DL 0.1)						BDL(DL 0.1)					
72	Silver as Ag	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
73	Molybdenum as Mo	mg/L	BDL(DL 0.01)						BDL(DL 0.01)					
74	Octane	µg/L	185	182	174	182	178	173	180	172	167	172	165	169
75	Nonane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
76	Decane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
77	Undecane	µg/L	8.7	7.9	7.5	8.3	7.9	7.6	9.1	8.6	8.1	8.8	8.3	7.8
78	Tridecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
79	Tetradecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
80	Pentadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
81	Hexadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					

Location		CB - 1 Bottom Water							CB - 2 Bottom Water					
Month & Year		Unit	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
S.No.	Parameters													
82	Heptadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
83	Octadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
84	Nonadecane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
85	Elcosane	µg/L	BDL(DL 0.1)						BDL(DL 0.1)					
86	Primary Productivity	mg C/m ³ /hr	8.18	8.76	8.91	9.05	8.97	8.83	9.81	9.24	9.35	9.46	9.38	9.42
87	Chlorophyll a	mg /m ³	3.42	3.89	3.42	3.91	3.82	3.97	4.37	4.76	4.01	4.38	4.11	4.17
88	Phaeophytin	mg /m ³	0.79	0.7	0.78	0.83	0.81	0.75	0.95	0.87	0.93	0.89	0.94	0.86
89	Oxidisable Paticular Organic carbon	mg /L	5.44	5.78	5.42	6.04	5.63	5.8	4.9	5.01	5.27	6.57	5.86	5.49
PHYTOPLANKTON														
90	Bacteriastrum hyalinum	nos/ml	13	15	17	19	21	23	17	16	18	22	20	21
91	Bacteriastrum varians	nos/ml	9	8	10	12	10	9	11	12	11	14	16	15
92	Chaetoceros didymus	nos/ml	10	9	12	9	11	12	13	11	14	11	8	12
93	Chaetoceros decipiens	nos/ml	8	11	9	13	15	10	11	15	12	15	13	11
94	Biddulphia mobiliensis	nos/ml	7	6	8	11	12	8	10	11	15	12	14	16
95	Ditylum brightwellii	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
96	Gyrosigma sp	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
97	Cladophyxis sps	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
98	Coscinodiscus centralis	nos/ml	8	7	10	8	9	7	12	10	13	9	11	8
99	Coscinodiscus granii	nos/ml	12	10	11	13	8	12	9	7	8	10	7	13
100	Cylcotella sps	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
101	Hemidiscus hardmanianus	nos/ml	6	5	6	7	6	11	8	11	9	7	9	6
102	Laudaria annulata	nos/ml	2	4	5	8	4	6	5	8	10	6	8	9
103	Pyropacus horologicum	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
104	Pleurosigma angulatum	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
105	Leptocylindrus danicus	nos/ml	3	4	3	4	3	5	4	5	4	3	5	4
106	Guinardia flaccida	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
107	Rhizosolenia alata	nos/ml	11	8	12	15	17	19	7	10	13	16	13	15
108	Rhizosolenia impricata	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
109	Rhizosolenia semispina	nos/ml	15	13	15	14	13	15	20	19	16	12	10	13
110	Thalassionema nitzschioides	nos/ml	10	14	16	17	15	18	14	16	18	17	14	17
111	Triceratium reticulatum	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
112	Ceratium trichoceros	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
113	Ceratium furca	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
114	Ceratium macroceros	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
115	Ceracium longipes	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
ZOOPLANKTONS														
116	Acrocalanus gracilis	nos/ml	14	10	14	15	12	14	10	9	15	17	15	12
117	Acrocalanus sp	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
118	Paracalanus parvus	nos/ml	12	9	11	14	11	17	15	13	17	13	10	14
119	Eutintinus sps	nos/ml	5	7	12	10	13	9	7	11	9	11	14	10
120	Centropages furcatus	nos/ml	10	11	8	7	9	6	11	12	14	10	16	17
121	Corycaeus dana	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
122	Oithona brevicornis	nos/ml	10	12	15	17	14	18	12	15	13	14	17	15
123	Euterpina acutifrons	nos/ml	4	7	6	8	7	10	6	5	7	9	6	5
124	Metacalanus aurivilli	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
125	Copipod nauplii	nos/ml	9	6	8	7	8	5	12	14	7	5	7	9
126	Cirripede nauplii	nos/ml	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
127	Bivalve veliger	nos/ml	13	15	13	15	16	12	14	16	18	19	13	18
128	Gastropod veliger	nos/ml	8	10	11	13	10	8	13	15	10	15	11	16

SEA SEDIMENT														
Location		CB - 1 Sea Sediment							CB - 2 Sea Sediment					
Month & Year		Unit	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
S.No.	Parameters													
1	Total organic matter	%	0.35	0.31	0.38	0.42	0.36	0.41	0.31	0.29	0.23	0.25	0.21	0.23
2	% Sand	%	32	28	31	34	31	37	32	34	36	38	35	34
3	%silt	%	14	15	16	15	14	13	17	16	12	14	16	10
4	%Clay	%	54	57	53	51	55	50	51	50	52	48	49	56
5	Iron (as Fe)	mg/kg	18.3	17.4	18.2	19.6	18.3	19.8	21.5	20.8	21.2	22	20	23
6	Aluminium (as Al)	mg/kg	15821	15796	15781	15879	15790	15120	16026	15972	15018	15073	15067	15380
7	Chromium (as cr)	mg/kg	58	55	52	54	53	51	74	71	65	67	63	65
8	Copper (as cu)	mg/kg	73	71	68	71	69	66	82	79	83	86	84	86
9	Manganese (as Mn)	mg/kg	469	458	441	453	476	458	467	455	432	441	428	437
10	Nickel (as Ni)	mg/kg	15.2	14.9	15.2	16.7	15.8	15.2	15.3	14.8	12.9	13.7	12.6	12.9
11	Lead (as Pb)	mg/kg	34	32	29	32	30	27	35	32	36	39	37	38
12	Zinc (as Zn)	mg/kg	236	228	223	230	221	214	306	303	291	302	295	301
13	Mercury(as Hg)	mg/kg	0.55	0.53	0.48	0.53	0.5	0.48	0.62	0.57	0.47	0.51	0.49	0.52
14	Total phosphorus as P	mg/kg	182	179	177	188	174	166	189	180	186	193	184	188
15	Octane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
16	Nonane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
17	Decane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
18	Undecane	mg/kg	0.24	0.21	0.18	0.29	0.22	0.2	0.17	0.15	0.2	0.24	0.2	0.23
19	Dodecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
20	Tridecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
21	Tetradecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
22	Phntadecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
23	Hexadecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
24	Heptadecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
25	Octadecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
26	Nonadecane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
27	Elcosane	mg/kg	BDL(DL 0.1)						BDL(DL 0.1)					
I. Nematoda														
28	Oncholaimussp	nos/m ²	11	14	18	21	19	17	13	16	19	23	21	20
29	Tricomasp	nos/m ²	18	16	13	16	14	12	16	12	10	14	12	13
II. Foraminifera														
30	Ammoniaabecarii	nos/m ²	10	11	12	14	12	15	12	14	15	17	15	14
31	Quinquilinasp	nos/m ²	17	20	22	20	23	21	14	18	20	22	19	23
32	Discorbinellasp.,	nos/m ²	19	15	17	13	15	13	17	13	16	19	17	20
33	Bolivinaspathulata	nos/m ²	6	9	11	15	17	16	8	10	12	13	10	15
34	Elphidiumsp	nos/m ²	14	10	14	12	11	10	15	11	9	11	8	10
35	Noniondepressula	nos/m ²	13	17	15	17	16	18	11	15	12	15	13	12
III. Molluscs-Bivalvia														
36	Meretrixveligers	nos/m ²	25	28	25	28	25	27	24	27	23	26	27	25
37	Anadoraveligers	nos/m ²	20	19	21	26	22	25	26	22	24	21	24	27
	Total No. of individuals	nos/m ²	153	159	168	182	174	174	156	158	160	181	166	179
	Shanon Weaver Diversity Index		2.24	2.25	2.27	2.26	2.27	2.26	2.25	2.26	2.25	2.27	2.24	2.25



L&T Shipbuilding



L&T PORTS - KATTUPALLI

TAMIL NADU, INDIA

Contents

RECORD OF AMENDMENTS.....	5
DISTRIBUTION LIST.....	6
ABBREVIATIONS	7
1. INTRODUCTION	8
1.1 Health, Safety & Environment Policy (HSSE)	8
1.2 Objectives.....	8
1.3 Revision & Update of the OSCP	9
1.4 Legislation.....	9
1.5 Jurisdictional Boundaries and Local Notifications.....	10
1.6 Authorities and Responsibilities	11
1.7 Coordinating Committee.....	12
1.8 Statutory Requirement.....	12
1.9 Mutual Aid Agreements.....	13
1.10 Geographical Limits of Plan	13
1.11 Interface with NOSDCP, EROS-DCP, DOS-DCP & LCP –TN	13
2. RISK ASSESSMENT.....	15
2.1 Kattupalli Shipyard cum Minor Port.....	15
2.2 Identification of activities and risks.....	15
2.3 Types of oil likely to be spilled	16
2.4 Probable fate of spilled oil.....	16
2.5 Development of oil spill scenarios including worst case Discharge	19
2.6 Shoreline Sensitivity Mapping.....	21
2.7 Shoreline resources, priorities for protection	22
2.8 Development of ESI Map.....	24
2.9 Special Local Considerations.....	29
3. RES PONSE STRATEGY	35
3.1 Philosophy and Objectives	35
3.2 Limiting and Adverse Conditions.....	35
3.3 Oil Spill Response in Coastal Zone & Shoreline	35
3.4 Methods of Removing Oil from Shore-Lines.....	36
3.5 Storage and Disposal of Oil and Oily Waste	47

4. EQUIPMENT	53
4.1 Marine Oil Spill Response Equipment.....	53
4.2 Inspection, Maintenance and Testing.....	54
4.3 Oil Spill / Shoreline Equipments Usage	55
4.4 Additional Equipment, Supplies and Services Availability	55
5. MANAGEMENT	57
5.1 Oil Spill Response Organisation.....	57
5.2 Funding and Reimbursement of Clean-up Costs.....	60
5.3 Incident Organization chart.....	61
5.4 Manpower availability	62
5.5 Advisors and experts – Spill response, Wildlife & marine environment.....	62
5.6 Training/Safety Schedules and Drill/Exercise Programme.....	63
6. COMMUNICATIONS	66
6.1 Incident Control Room and Facilities	66
6.2 Field Communication Equipment.....	66
6.3 Reports, Manuals, Maps, Charts and Incident Logs	66
7. INITIAL PROCEDURES.....	68
7.1 Preliminary Spill Assessment	68
7.2 Continuing Assessment	68
7.3 Spill Prediction.....	68
7.4 Oil Behaviour	69
7.5 Tier Definitions	70
7.6 Table of Participation.....	70
7.7 Notification of Oil Spill to Concerned Authorities	70
7.8 Preliminary Estimate of Response Tier	71
7.9 Notifying key Team Members and Authorities.....	72
7.10 Manning Control Room	72
7.11 Collecting Information.....	72
7.12 Estimating Fate of slick with Respect to Time & Location.....	72
7.13 Identifying Resources Immediately at Risk, Informing Parties	72
7.14 Notice to Polluter	72

8. OPERATIONS PLANNING.....	73
8.1 Initiation of the Oil Spill Response Involves:.....	73
8.2 Assembling Full Oil Spill Response Team.....	73
8.3 Identifying Immediate Response Priority	73
8.4 Mobilizing Immediate Response	73
8.5 Use of Dispersants	74
8.6 Operation in Cyclonic & Poor Weather.....	74
8.7 Media Briefing.....	74
8.8 Planning Medium-Term Operations (24-48- And 72- Hours).....	74
8.9 Deciding to Escalate Response to Higher Tier	75
8.10 Mobilizing or Placing On Standby Resources Required.....	75
8.11 Establishing Field Command Post and Communications	75
8.12 POLREP Message Format: Imo – 560 (1995).....	76
PART B.....	78
9. Control of Operations	78
9.1 Establishing a Management Team with Experts and Advisors.....	78
9.2 Reviewing and Planning Operations.....	79
9.3 Obtaining Additional Equipment, Supplies and Manpower	79
9.4 Preparing Daily Incident Log and Management Reports	79
9.5 Preparing Operations Accounting and Financing Reports	79
9.6 Preparing Releases for Public and Press Conferences	79
9.7 Intimating Local and Government Officials	79
10. Termination of Operations.....	80
10.1 Deciding Final and Optimal Levels of Beach Clean-Up.....	80
10.2 Standing-Down Equipment, Cleaning, Maintaining, Replacing	80
10.3 Preparing Formal Detailed Report.....	81
10.4 Reviewing Plans and Procedures From Lessons Learnt.....	81
APPENDICES.....	82
APPENDIX 1 - APPLICATION OF THE UNCLOS CONVENTION.....	83
APPENDIX 2 – DETAIL FUNCTIONS OF VARIOUS GOVT. AGENCIES.....	84
APPENDIX 3 – MUTUAL AGREEMENT FORMAT.....	91
APPENDIX 4 – PORT LAYOUT & LIMITS.....	94
APPENDIX 5 – RISK ASSESSMENT	95

APPENDIX 6 – DETAILS OF EQUIPMENT WITH KATTUPALLI PORT	158
APPENDIX 7 – DETAILS OF EQUIPMENT WITH ADJACENT FACILITIES.....	159
APPENDIX 8 – COST RECOVERY	163
APPENDIX 9 – GUIDELINES FOR THE COLLECTION OF OIL SAMPLES.....	167
APPENDIX 10 – PREDICTION OF OIL SPILL MOVEMENT	168
APPENDIX 11 – IMPORTANT TELEPHONE NUMBERS.....	169
APPENDIX 12 -DETAILS OF WEATHER IN THE SOUTH ASIAN SEAS EXTRACT OF NOSDCP ..	171
APPENDIX 13 – GUIDANCE FOR EQUIPMENT SELECTION	174
APPENDIX 14 – NOTICE UNDER ARTICLE 356 J & 356 K	176
APPENDIX 15 – LETTER OF UNDERTAKING.....	179
APPENDIX 16 – SITE SAFETY ASSESSMENT FORM.....	182
APPENDIX 17 – LIST OF APPROVED OIL DISPERSANTS (OSD)	184
APPENDIX 18 – OSCP OBSERVATION & REPORTING FORMS.....	187
APPENDIX 19 – CONVERSION FACTORS.....	198
APPENDIX 20 – IMO LEVEL TRAINED PORT PERSONNEL.....	200

RECORD OF AMENDMENTS

SL.NO	AMENDMENT NO.	DETAILS OF AMENDMENT	AUTHORITY	DATE	SIGNATURE

DISTRIBUTION LIST

COPY NO.	COPY HOLDER	COPY NO.	COPY HOLDER
	External		Internal
100	District Collector Tiruvallur	200	Chief Operating Officer
101	Supdt. Of Police Tiruvallur	201	GM (Marine)
102	Coast Guard RHQ (E)	202	Terminal Manager GM
103	Coast Guard, Tamil Nadu	203	Head HR & Admin
104	NOIC Tamil Nadu	204	Pollution Control Officer
105	Disaster Management Coordinator	205	Port Signal Station
106	Tamil Nadu Maritime Board	206	Safety Manager
107		207	Head Security
108		208	Head Operation
109		209	
110		210	
111		211	
112		212	
113		213	
114		214	
115		215	
116		216	
117		217	
118		218	
119		219	
120		220	

ABBREVIATIONS

Brown Oil	-	Typically 0.1 to 1.0 mm Thick Layer of Water in Oil Emulsion (Thickness)
COMCGE (E)	-	Commander Coast Guard Region (East)
DGS	-	Director General of Shipping
DRPRO	-	ICG Deputy Regional Response Officer act as Dy. On Scene Commander
ICG	-	Indian Coast Guard
MMD	-	Mercantile Marine Department
NOSDCP	-	National Oil Spill Disaster Contingency Plan
OSRT – L&T Ports	-	Kattupalli Oil Spill Response Team
OSCP – L&T Ports	-	Kattupalli Oil Spill Contingency Plan
PCMT – L&T Ports	-	Kattupalli Pollution Crisis Management Team
PCO – L&T Ports	-	Kattupalli Pollution Control Officer
RPRO	-	ICG Regional Pollution Response Officer act as On Scene Commander
SPT - L&T Port	-	Kattupalli Site Pollution Team
TNMB	-	Tamil Nadu Maritime Board
UNCLOS	-	United Nation Convention on Laws at Sea

1. INTRODUCTION

1.1 Health, Safety & Environment Policy (HSSE)

At L&T Ports Kattupalli, it is the primary responsibility of the senior management and executives to ensure that the organisation will develop, educate and implement a Health, Safety and Environment policy and working culture that protects our personnel, environment and equipment from harm; as well as protecting our customers interests.

This culture must be initiated from the moment the L&T Ports Kattupalli begins and carried through, on a daily basis. We believe that accident and injury prevention as well as environmental protection is equal in importance to production, quality, efficiency, service, delivery and cost control.

Therefore, we must protect all personnel, visitors, contractors and our environment from the inherent dangers of our business. To consistently accomplish this, it is necessary that:

- ❖ All supervisory personnel understand, practice and accept accountability for preventing environmental damage in their workplace and personal injury to the people they supervise;
- ❖ All employees understand, practice and accept the responsibility to work safely and to extend this concern for our environment and personal safety to fellow employees;
- ❖ All equipment, vehicles, machinery and tools in new and existing facilities be properly designed, maintained and serviced; and
- ❖ All employees be encouraged through training and leadership to appreciate the need for safety and environmental awareness on and off the job.

It is our duty to ensure we protect those whom we are responsible for, as well as those we are responsible to; on a daily basis.

1.2 Objectives

The primary objectives of L&T Kattupalli Port Oil Spill Contingency Plan is to be part of National Oil Spill Contingency Plan hierarchy outlined NOSDCP at the apex level to coordinate significant or disaster type spills, the Regional Oil Spill Disaster Contingency Plan (ROSDCP) to coordinate spill in the Eastern seaboard, utilizing the resources available within the region. The District Oil Spill Disaster Contingency Plan (DOSDCP) coordinates minor oil spills that affect maritime area within the coastal state limits. The L&T Ports – Kattupalli Oil Spill contingency Plans is integrated with respective DOSDCP so that a combined effort is made for oil spill response with aim to develop

- a. To develop appropriate and effective systems for the detection and reporting of spillage of oil.
- b. To ensure prompt response to prevent, control and combat oil pollution.
- c. To ensure that adequate protection is provided to the public health and welfare, and the marine environment.

- d. To ensure that appropriate response techniques are employed to prevent, control, and combat oil pollution, and dispose of recovered material in an environmentally accepted manner.
- e. To ensure that complete and accurate records are maintained of all expenditure to facilitate cost of recovery.

The objective is to be achieved by

- a. Minimising spread of oil spilt on sea surface.
- b. Recovering spilt oil on water.
- c. Protecting key marine and coastal resources from impact by oil.
- d. Choosing spill management strategies which are efficient and do not damage environment.
- e. Cleaning oiled shorelines.

It is responsibility of all Port staff to

- a. Be familiar with OSCP and to know their role in spill response.
- b. Maintain their spill response skill and those of their staff by regular training.
- c. Maintain their copy of the OSCP so that it is: complete; updated; and readily available.
- d. Structure of the Oil Spill Contingency Plan (OSCP)

The Oil Spill contingency plan will be grouped in 3 parts

Part A – Management (Section 1- 8) – Includes Planning, Policy & Administration

Part B – Action Plan (Section 9 – 12) – Includes Operation Plan

Part C – Appendices including Extracts from NOSDCP, Port equipment and Layout Maps

1.3 Revision & Update of the OSCP

The OSCP shall be reviewed after each spill incident or every six (6) months / one (1) year and an assets holding update every three (3) months. This will include:

- a. Checking telephones and fax numbers
- b. Checking names of office holders
- c. Changes to response action thought necessary on the basis of training and spill response

1.4 Legislation

The oil pollution from ships and offshore installations including the single buoy moorings and pipelines are regulated by part XIA of the Merchant Shipping Act 1958. The DG Shipping and the Indian Coast Guard are empowered to take action against the polluting ship by issuing notices for clean-up and other necessary actions against the ship-owner/master of the ship/ offshore installation operator. If the oil pollution reaches the shorelines, the Master of the polluting ship can also be prosecuted under the Environment Protection Act 1986 if he failed to take action to prevent and mitigate the oil pollution. The legal action can also be taken by the affected parties by instituting a suit in the civil court of damages in tort for civil wrong. Extract of relevant Clauses of UNCLOS relating to assistance and salvage at sea is given in **Appendix 1**.

1.5 Jurisdictional Boundaries and Local Notifications

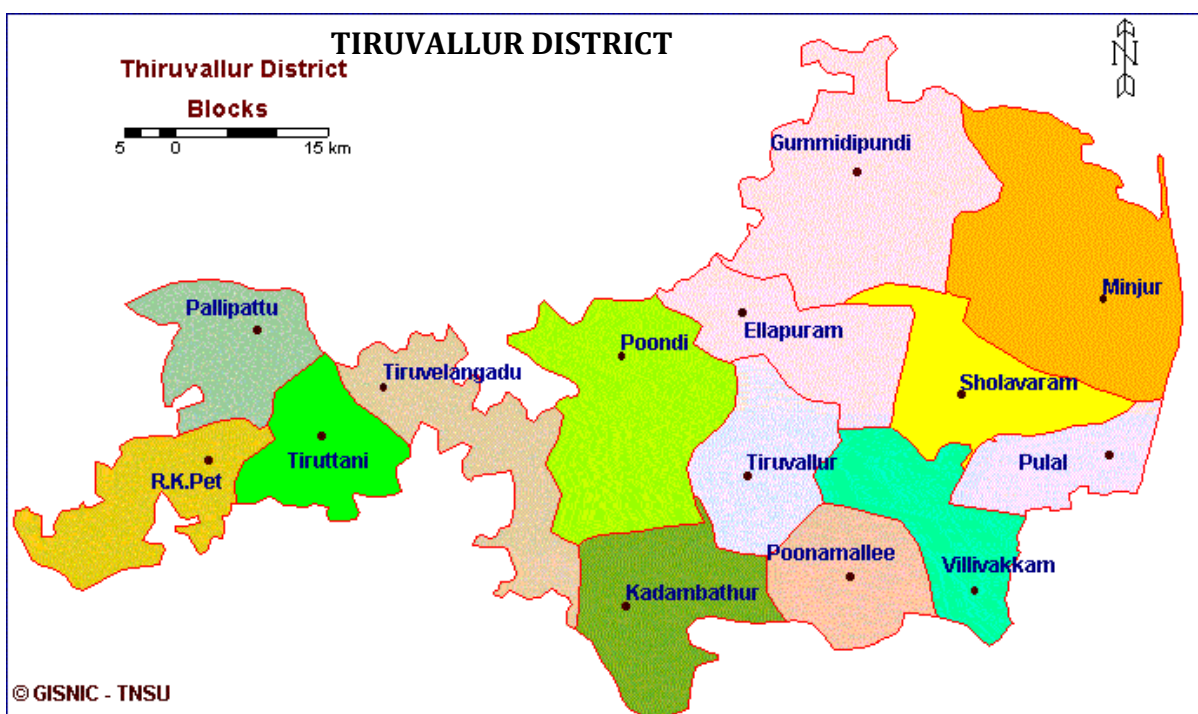
1.5.1 Coastal District Profile

Thiruvallur district, a newly formed district bifurcated from the erstwhile Chengalpattu district (on 1st January 1997), is located in the North East part of Tamil Nadu.

Latitude between 12°15' and 13°15' North

Longitude between 79°15' and 80°20' East

The district is surrounded by Kancheepuram district in the South, Vellore district in the West, Bay of Bengal in the East and Andhra Pradesh State in the North. The district spreads over an area of about 3422 Sq.kms.



1.5.2 Physical Features

The Coastal region is mostly flat while certain areas in Tiruttani and Pallipattu taluks are undulated and even hilly. The types of soil predominantly found are red non-calcareous and coastal alluvial. Also found are, sandy soil mixed with soda or other alkalis. The soil found in the coastal region is of the erinaceous type (sandy), suitable for casuarinas plants.

1.5.3 Land Use Pattern

The total geographical area of the district is 3,42,243 hectares of which not sown area constitute 35% whereas forest covers 5.8% of the total area.

1.5.4 Fisheries

The total coastal area of the district is about 49803 ha and has a coast line of 80 kms for marine fisheries. Prawn/shrimp culture is famous at the coast line of Gummidipoondi and Minjur. The total fish production is to the tune of 11372 tonnes.

1.5.5 Industries

Tiruvallur district is one of the fastest developing districts in Tamil Nadu in terms of Industrial Development. The district has many leading industries like Madras Refineries, Madras Fertilizers, Manali Petro Chemicals, MRF, Ashok Leyland, TI Cycles, Britannia India Ltd, Parry India Ltd and Hindustan Motors. It also boasts of the Ennore Thermal Power Station and the Avadi Tank Factory. The District has 16 Industrial Estates; all are in operation out of which 11 developed by the Government and 5 by Private Organisation.

1.6 Authorities and Responsibilities

1.6.1 Directives of TNMB for Preparation of OSCP

Under the directive issued by MARITIME STATES DEVELOPMENT COUNCIL (MSDC), to all coastal States that every Port under their jurisdiction must prepare a Contingency Plan for tackling Oil Spills in their respective Maritime Port Limits. Accordingly, all the non-major ports on the coast of State of Tamil Nadu under the jurisdiction of Tamil Nadu Maritime Board have been directed as per their letter No. 7018 /S4 /2010 dated 25th March 2011 for Establishment of Tier -1 Pollution Response Facilities – Non Major Ports maintaining pollution response equipment as per directive received from the Commander , Coast Guard Head Quarters , New Delhi 110001 under their directive issued to The Chairman, Tamil Nadu Maritime Board under letter EP /0720/ Tier -1 dated 15th March 2011 to prepare Oil Spill Contingency Plan as per National Oil Spill Contingency Plan (NOS –DCP) .

1.6.2 Authority

The Committee of Secretaries to the Government of India while allocating functional responsibilities to various Ministries and Departments for Oil Spill Response in the maritime zone of India, have approved on 04 Nov 93, the National Oil Spill Disaster Contingency Plan (NOS-DCP). EROS – DCP is drawn in pursuance of the directives and objectives of NOS-DCP. The EROS-DCP is binding in its operational phase. Consistent with the NOS-DCP, the Commander Cost Guard Region (East) is responsible to the Director General Coast Guard (DGICG) in centrally coordinating marine oil spill response activities in the Eastern Region.

1.6.3 Area of Responsibility

Oil Spills upto Tier I will be the responsibilities of the agencies as mentioned below

- a. **Port** - Area in and around port upto port limits including anchorage
- b. **Oil Handling Agencies** – With in the area of operation
- c. **State Government** – Shore line cleanup including inland waters

Table of Participation

Level	Organization	Joint Participation by Organizations
TIER –I	Port Authority	Ship + Port Authority + Mutual Aid Agencies
TIER –II	City Administration & State Government of Tamil Nadu	Ship + Port Authority + City Administration + State Government of Tamil Nadu
TIER-III	Central Government	Ship + Port Authority + City Administration + State Government of Tamil Nadu+ Central Government

The Tiruvallur District administration will be lead agency for coordinating shoreline response with other agencies and polluter within the district.

1.7 Coordinating Committee

Agency	Functions
Ministry of Defence	Nodal and Administrative Ministry for implementation of Contingency Plan by ICG
Director General Coast Guard	Central Coordinating Agency
COMCG (E)	Assist CCA (Regional Coordinating Authority)
RPRO	On Scene Commander (Coast Guard HQ East)
OCA	Operation Control Officer of the Area (COMDIS 5)
PRO	COMDIS 5 to depute to act as Dy. On Scene Commander
District Collector Tiruvallur	First Point of Contact & Lead Coordinator

Appendix 2 lists out role of various Govt. Agencies.

1.8 Statutory Requirement

- a. Allocation of Business Rules (ABR) 1961 states that ports shall combat oil spills within their port limits and accordingly every owner or operator of a port facility, oil installation, or offshore installation is required to maintain an Oil Spill Contingency Plan duly approved by the Indian Coast Guard (Chairman NOSDCP Circular No:02/2012).
- b. The pollution response equipment maintained by Kattupalli Port is as required by CGHQ Lr. No EP/0720/Tier 1 dated 15 Mar 2011. for Tier 1 pollution response for category 'C' ports.

1.9 Mutual Aid Agreements

Kattupalli Port is in the process of establishing Mutual Aid Agreements with the adjacent Major port of Ennore Port and Chennai Port Trust.

A format of the mutual aid agreement is at **Appendix 3**.

1.10 Geographical Limits of Plan

Plan Location & Scope

- a. The OSCP has been prepared by L&T Kattupalli Port in accordance with requirements of the Government and is consistent with the National Oil Spill Disaster Contingency plan (NOSDCP) directives which are the state plan for the response to an oil spill for any size.
- b. Kattupalli Port Limits - The subjacent land underlying, and adjacent land extending from, the waters, rivers, creeks and inlets to high water mark as indicated in **Appendix 4**. The limit of the Port is bounded by:

Sl. No.	Latitude	Longitude
A	13° 18' 57.26" N	80° 20' 45.68" E
B	13° 20' 45.33" N	80° 22' 54.72" E
C	13° 20' 45.41" N	80° 23' 27.96" E
D	13° 17' 40.15" N	80° 23' 28.01" E
E	13° 17' 39.76" N	80° 20' 49.00" E

GO Ms. 194, Highways & Minor Ports (HN2) Department dated 01.08.2008

- c. Environment sensitivity index and risk assessment forms the basis of this Oil Spill Contingency Plan.

1.11 Interface with NOSDCP, EROS-DCP, DOS-DCP & LCP -TN

A major spill could affect several areas around the coast making it desirable to coordinate activities amongst a number of agencies. The density of marine traffic, specially oil tankers, in close proximity of the Indian coast and offshore petroleum exploration and production platforms, make our region a high risk area. The pollution from blow out, collision, stranding, and other marine accidents can threaten marine life in the inter-tidal zones, fisheries, sea birds, recreational beaches and tourism with subsequent loss of revenue. The Indian Coast Guard through the NOSDCP identifies the national capabilities and resources, the Eastern Region Oil Spill Disaster Contingency Plan (EROS-DCP), identifies the regional capability and resources on the East Coast of India and the District Oil Spill Disaster Contingency

Plan (DOS-DCP TN) in order to establish an organisational structure to combat marine pollution so that focal points and lead agencies are identified. The Local Contingency Plan – Tamil Nadu (LCP –TN) provides the necessary instructions to all the State Environment Ministry, District Collectors, Revenue administration officials, State Pollution Control Boards, State Maritime Boards, Fisheries Department, Forest Department, Ports and other stake holders regarding their role to be played during an oil spill that washes ashore in the coastal areas of Tamil Nadu. The OSCP of Kattupalli Port strives to be integrated with the LCP-TN, EROS-DCP & NOSDCP so that a companioned effect is made for Oil Spill Response.

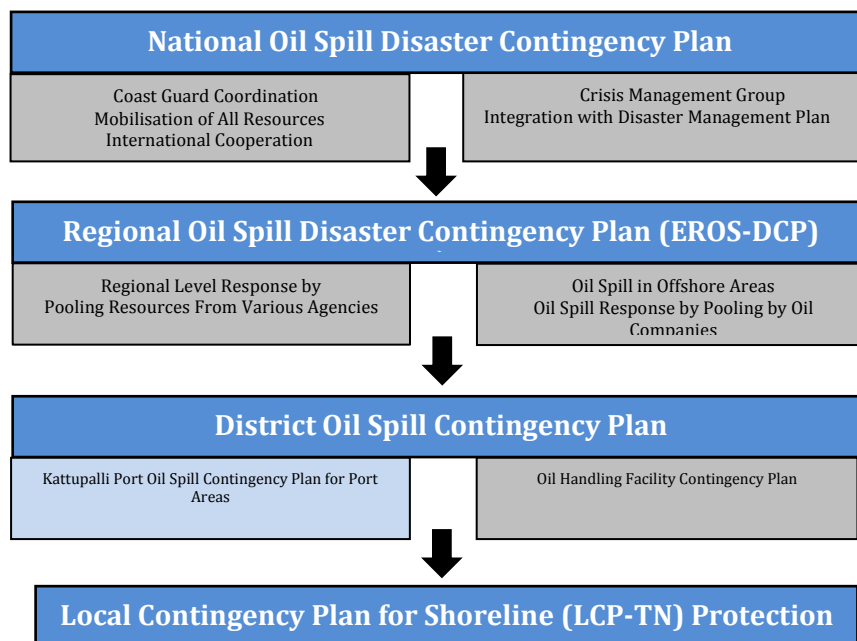


Figure 1 Contingency Plan Hierarchy

2. RISK ASSESSMENT

2.1 Kattupalli Shipyard cum Minor Port

Kattupalli Shipyard cum Minor Port is 32 km north of Chennai and is located just north of Ennore Port. The port basin is protected with northern (1775m) and southern (1665m) breakwater to provide required tranquility inside the port. The approach to the port is from the East with channel dredged depth of (-) 14m below CD. The Phase -I development of port is completed with two operational container berths, one ship lift and Modular Fabrication Facility. The port has annual container handling capacity of 1.2 million TEUs. The Phase – I layout of port is presented in the following **Appendix 4**.

During the operational phase the port will witness routine vessel movement. There are chances of oil spill during the operation of the port due to accidental spills caused due to collision, pipe rupture, grounding of vessels etc.

L&T Kattupalli port appointed M/s. L&T Ramboll for preparation of oil spill risk assessment study for Kattupalli shipyard cum minor port. The study included carrying out oil spill modelling to assess the risk of oil spill and its impacts on the sensitive environment in the vicinity.

Scope of the Study

The scope of the study (considering only Tier – 1 Spill) is as follows:

- a. Setting up a calibrated hydrodynamic model with the measured tide and current
- b. Identification of environmental scenario representative of different seasons
- c. Hydrodynamic simulations for representative environmental scenarios
- d. Oil spill simulation for different hydrodynamic scenario and different spill quantities
- e. Prediction of weathering characteristics of spilled oils at different time intervals
- f. Prediction of spillage area at different time intervals to estimate the risk to nearby sensitive areas
- g. Quantitative assessment of the impact for each environmental scenario

2.2 Identification of activities and risks

Risk Assessment Structure

This assessment is organised in following manner:

- a. Meteorological and ocean data
- b. Hydrodynamic model study
- c. Statistical analyses of spill trend and accidents
- d. Categorization of oil spill
- e. Oil spill modelling
- f. Summary

Simulation of spill trajectory and weathering processes has been carried out using an in house oil spill model and simulation of HD using TELEMAC 2D model. The description of the models is discussed in the subsequent sections.

The limited measured wind and current data available to the study prevents a full scale statistical analysis of likely spill patterns for different seasons, but a range of different representative conditions can be simulated to provide a basic indication of the variability within the seasons. The measured data has been used for calibration and comparison of simulated results.

The spill quantity can range from few litres to 700tons for tier 1 spill. The spill quantity for this oil spill model study has been considered based on minimum and maximum perceived spill with respect to the spill location. Trajectory and weathering characteristics are simulated for the identified spill quantities and locations. The simulated result will be analysed for the spreading, thickness and arrival time with respect to the sensitive location.

2.3 Types of oil likely to be spilled

The port facility will cater to the container vessel and those vessels that will be arriving for repair and routine maintenance. It is apparent major type of oil in this types of vessel will be only fuel oil (Marine diesel and Heavy oil fuel), hence the same has been considered for the oil spill model study.

The OSCP has been designed to cover all spillages of oils carried by vessels and when arriving and departing Kattupalli ports. The under mentioned sources may cause an oil spill in the port area as well as at anchorage:-

- a. Bunkering on jetty
- b. External damage to vessels entering/ leaving Harbour due to collision grounding etc.
- c. Accidental leakage from vessel berthed alongside due to fire explosion etc.
- d. Intentional discharge of oil or oily ballast water and tank washing or by any other means within port limits

Oil Name	Sp. Gravity @	Flash Point (°C)	Pour Point	Viscosity (cST)		Oil Group
				@40°C	@30°C	
Bunker Fuel Oil	0.98	-	2+	400-1000+	1000-2500+	IV P

2. + Estimated * unreported but very low i.e. below operational constraints.
3. Using the classification system of ITOPF P = Persistent Oils.

The largest size of vessel calling at port is 6000 TEUs with anticipated maximum spillage quantity of fuel 700 Tonnes (**Appendix 5**). If oils are being trade the OSCP shall be revised.

2.4 Probable fate of spilled oil

2.4.1 Analysis of Simulated Results

The simulated results from oil spill model were analysed for the following:

- ❖ Spreading of oil with respect to the spill location
- ❖ Arrival time of spilled oil with respect to the sensitive environment in the vicinity
- ❖ Influence of wind on the spreading of spilled oil

The weathering results from the combination of oil spill location, quantity and environment for three monsoon seasons are analysed and presented in the following sections. The areas sensitive to the spill was identified based on utility, usage and ecological importance. The sensitive areas around the project stretch were identified as Pulicat, Ennore creek, CPCL intake, CWDL intake and beaches in vicinity to the project site. The analysis was carried out with respect to arrival time and maximum thickness of oil spill reaching the sensitive areas. Simulations were carried out for available short duration wind data from the site for all the spill locations considered in the model studies.

The simulated result for marine diesel spill indicates that 18 - 25% of the oil is evaporated immediately after the spill. Figure 20, Figure 21, Figure 22 & Figure 23 in **Appendix 5** presents the percentage evaporation of spilled oil for typical spill inside and outside the port basin.

Similarly rate of evaporation for diesel is in the range of 32 to 45% immediately after the spill. Higher evaporation rate is noticed with respect to larger spread **Appendix 5** presents the percentage evaporation of spilled oil for typical spill inside and outside the port basin.

Heavy oil has asphalt and wax content due to which portion of spilt oil gets deposited to the seabed. The rate of evaporation after the spill is in the range of 7 to 15%. Figure 24 & Figure 25 in **Appendix 5** presents the percentage evaporation of spilled oil for typical spill inside and outside the port basin.

Typical trajectory and arrival time of oil spill simulations for observed wind during south-west and north-east monsoon for representative hydrodynamic condition is presented in Figure 26 & figure 27 in **Appendix 5**.

Considering short duration of observed data availability, the simulations were also carried out for representative annual environment scenarios presented in **Appendix 5**.

2.4.2 Oil Spill at Berth

Based on the analysis of the of oil spill trend it is noticed that during loading/discharging operation occurrence of oil spill is maximum. Hence the probability of oil spill at berth is the highest of all the locations for oil spill considered in this study. The simulations were carried out for 100litres, 1 ton and 100 ton spill quantities to have range of perceived spill quantity at the berth. The analysis of trajectory and arrival time of spill indicates the oil being confined to the port basin during fair weather and south-west monsoon. During north-east monsoon probability of slick getting carried out of basin due to the influence of wind is high particularly for larger quantities and corresponding spill duration. The chances of spilled oil moving towards the sensitive areas are small.

Typical spill trajectory, arrival time and thickness of oil spilled in proximity to berth is presented in Figure 28, Figure 29, Figure 30 & Figure 36 in **Appendix 5**. Simulated pattern trajectory, arrival time is similar for all the three types oil considered in the study.

2.4.3 Oil Spill at Turning Circle

Oil spill simulation at turning circle was carried out for 200 ton and 700 ton of spill quantities covering maximum and minimum perceived spill quantity. The analysis of trajectory and arrival time of spilled oil indicates the oil being confined to the port

basin during fair weather and south-west monsoon similar to the spill trajectory for spills at the berth. The spilled oil can move out of the basin during the north-east monsoon when due to the wind effect along with the quantity of spilled oil and duration. Analysis of simulated result indicates the plume being confined to deeper water.

Typical spill trajectory, arrival time and spill thickness of oil spilled at turning circle is presented in Figure 30, Figure 31 & Figure 37 in **Appendix 5**.

2.4.4 Oil Spill at Port Entrance

The oil spill simulations were carried out for 200 ton and 700 ton of spill quantities covering maximum and minimum perceived spill quantity. Simulated scenarios for oil spill at the port entrance during north-east monsoon indicates spilled oil beaching between Kattupalli and Ennore port and coast further south of Ennore port. The chances of spilled oil reaching Ennore creek is also significant during north-east monsoon.

The spilled plume is confined to deeper water during south-west monsoon and chances of beaching of spilled oil towards coast north of Kattupalli port and coast abutting the Pulicat lake is very insignificant. Typical spill trajectory, arrival time and spill thickness of oil spilled at port entrance circle is presented in Figure 32 & Figure 38 in **Appendix 5**.

2.4.5 Oil Spill at Approach Channel

The spill at port approach channel was carried out for 200 ton and 700 ton spill quantities. The analysis of the simulated scenarios indicates the spill plume being confined to the deeper water and is less likely to beach in the immediate vicinity of the port. This has been observed for the all the prevailing environmental scenarios and seasons.

Typical trajectory and arrival time of oil spill simulations for observed wind during south-west and north-east monsoon for representative hydrodynamic condition is presented in Figure 33, Figure 34, Figure 35 & Figure 39 in **Appendix 5**.

2.4.6 Influence of Oil Spill on CPCL and CWDL intake

There exist two intakes for desalination plants owned by CPCL and CWDL located on the north and south of the port respectively. Oil spill can significantly influence the operations of the desalination plant and can even damage the plant. Based on the analysis of the simulated results it is noticed that there is high probability of CPCL intake getting affected due to spilled oil during north east monsoon. The thickness of spilled oil can range from 0.5 to 1.9mm with arrival time ranging from 1 to 18 hours.

However the probability of spilled oil reaching CWDL intake is very low for the spill location considered in the model study.

Detailed analysis of the spilled oil considering the sensitive environment with respect to arrival time and thickness is presented in Table 12 in **Appendix 5**.

2.4.7 Summary

Oil spill model was setup for different environmental and hydrodynamic scenario representing seasons prevailing around the project stretch. The sensitive areas around the project stretch were identified as Pulicat, Ennore creek, CPCL intake, CWDL intake and beaches in vicinity to the project site. The analysis of the simulated result indicates that the oil spill at the berths and turning circle are confined within the port basin during non-monsoon and south-west monsoon. However during northeast monsoon spill spreads out of the port basin and the plume is carried along with the coastal currents without beaching.

The spill plume at the port entrance and approach is carried towards the coast during non monsoon seasons. The spill during this period is beaching between Kattupalli and Ennore port and coast further south of Ennore port. The probability of Ennore creek getting affected to oil spill is high under these conditions. The expected arrival time for the spilled oil reaching Ennore creek is about 10 hours and about 0.8mm oil can be expected to reach this coast.

During monsoons the spill plume is confined to offshore moving nearly parallel to the coast. The spill plume during monsoon is pushed towards north during south west monsoon and towards south during north-east monsoon. The spill at the port entrance and approach during these periods will be confined in the deep water and may not beach in the vicinity of the sensitive environment.

There is high probability of CPCL intake getting affected due to spilled oil during north east monsoon. The thickness of spilled oil can range from 0.5 to 1.9mm with arrival time ranging from 1 to 18 hours. The probability of spilled oil reaching CWDL intake is low for the spill locations and scenario considered for the model study.

The simulated spill conditions are hypothetical based on the averaged environment and hydrodynamic conditions. The results obtained from the simulated scenario are only representative of seasons.

2.5 Development of oil spill scenarios including worst case Discharge

2.5.1 Categorization of Oil Spill

Indian coast guard provides guide to tiered preparedness for responding to the small operational spill to worst case spill incidents. Tiered preparedness is a concept which considers the size and location of potential spill wherein higher the tier bigger the collateral response required. Tiered preparedness are categorised in terms of their potential severity and the capability that needs to be in place to respond. Tiered system is defined in three tiers. Figure 2 presents the tiered preparedness and response in terms of magnitude of spill and response capability required as provided in guide to tiered preparedness of International Petroleum Industry Environmental Conservation Association (IPIECA).

2.5.1.1 Tier 1 Spill

Tier 1 events are characterized as being related generally to the operational activities at a fixed location or facility. Examples of Tier 1 spills include bunkering operation, overfilling of sumps, leakage of tank, leakage from valves/pipelines or transfer hoses, accidental discharge of bilge water from vessels etc. As such the Tier 1 spill events are relatively small and onsite capability is mostly sufficient for such events. 700 tons is often cited as the upper limit of Tier – I spill, however spill can acquire comparatively larger scenario due to the prevailing environments i.e. wind, wave and currents.

2.5.1.2 Tier 2 Spill

Tier 2 spill may arise from variety of circumstances wherein quantity and location of spill of oil spill is such that it cannot be responded with the Tier 1 capability. IPIECA describes the Tier 2 scenario can develop in a number of ways which may be one of the following

- ❖ A spill which moves beyond geographical remit (port limit) of any local Tier 1 arrangement or an event occurring outside this geographical area;
- ❖ A Tier 1 spill event growing in scale and severity such that Tier 1 capability is overwhelmed.
- ❖ The scale and severity of Tier 1 event not entirely clear and, as a result Tier 2 resources potentially being needed as a precautionary measure.
- ❖ An event being initially classified as Tier 3, but as the situation develops it becomes clear a Tier 2 capability is sufficient.
- ❖ A major event when Tier 2 capability is mobilised prior to the arrival of Tier 3 resources.

Tier 2 spill would involve a larger number of organizations and people for which clear roles and responsibilities will be defined and agreed. Tier 2 response will start with initial deployment of Tier 1 capability.

2.5.1.3 Tier 3 Spill

A Tier 3 oil spill event is broadly portrayed as one where all available local and additional Tier 2 resources are not enough to respond effectively to the scenario. As with any scenario that goes beyond a Tier 1, commonly there will be an extensive range of sensitivities impacted and stakeholders involved. The conventional view of a Tier 3 scenario is one involving an exceptionally large volume of spilled oil, for example from a major ship-sourced accident, an offshore or inland well blowout, or other such rare but highly significant event. In reality, a Tier 3 response may also be required for more modest volumes, perhaps where Tier 2 arrangements may be largely absent or overwhelmed, highly sensitive areas threatened, or highly-specialized strategies being required that are not available locally. With the growth of oil production activities in increasingly remote and sensitive areas, the need for additional Tier 3 support has become greater than generally perceived in the past.

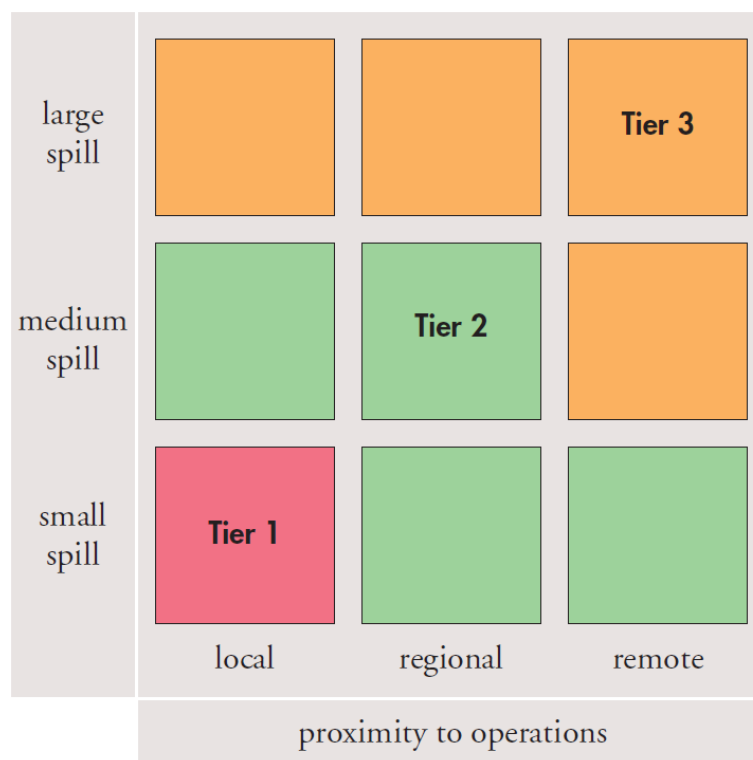


Figure 2 Tiered Preparedness and Response (Source: IPIECA)

2.6 Shoreline Sensitivity Mapping

2.6.1 Introduction

In compliance with Indian Coast Guard Circular No: EP/0720/Circular on “Guidelines on elements of facility Oil Spill Contingency Plan” dated August 09, 2012, L&T Kattupalli Port awarded L&T Ramboll to carry out shoreline sensitivity mapping as an important aspects of oil spill risk assessment study for the Kattupalli shipyard cum minor port developed in Kattupalli, Ponneri Taluk, Tiruvallur District, Tamil Nadu.

The study was carried out at a stretch of 30 km extending from Pulicat lake in north and Ennore in the south. The ESI map is prepared with buffer of 2 km in land side from shoreline. The study area map is given in Figure 2.1. This study highlights basic information related to Sensitivity maps and ESI maps along with sensitive resources in the study area.

2.6.2 Study Area & Methodology

Environmental Sensitivity Index maps are a key element in an oil spill contingency plan. As per Participant’s Manual on Oil Pollution Preparedness Response and Cooperation (OPRC) Model Course – Level 2 which follows The International Petroleum Industry Environmental Conservation Association (IPIECA) Volume 1 – Sensitivity mapping for Oil Spill Response, identification and classification of sensitive resources (Economic, Social and Environmental) are the most important aspects. The type of resources which shall be considered as sensitive as follows:

2.6.2.1 Economic Resources

The following are the economic resources should be considered as sensitive:

- ❖ Tourism Areas
- ❖ Fishing Areas
- ❖ Fish and Crustacean Nursery Areas
- ❖ Beaches with Fishing Activities
- ❖ Permanent or Semi-permanent Fish Traps
- ❖ Aquaculture Facilities for fish etc.,
- ❖ Seaweed Gathering

2.6.2.2 Social Resources

The following are the social resources should be considered as sensitive:

- ❖ Residential Areas
- ❖ Recreational Resources
- ❖ Sites of Cultural, Historical or Scenic Significance

2.6.2.3 Environmental Resources

The following are the environmental resources should be considered as sensitive:

- ❖ Seabird colonies & estuaries important for shorebirds
- ❖ Bird Feeding & Breeding Areas
- ❖ Turtle Nesting Beaches
- ❖ Endangered Species
- ❖ Protected Areas like National Park, Sanctuary, Reserve Area, RAMSAR sites
- ❖ Coastal habitats like Marshes, Mangroves, Coral Reefs

2.7 Shoreline resources, priorities for protection

Identification of Sensitive Resources

The identification of sensitive resources in the study area were established based on data collected from survey of India topo sheet, satellite imagery, Google earth, various secondary sources and also by carrying out field surveys and investigations. The Land Use Land Cover (LULC) map was prepared and given as Figure 2.2. The following are the sensitive resources identified in study area and present in Figure 2.3.

A. Type of Shore Line

The shoreline in the North of Kattupalli port is mostly sandy beaches upto Pulicat Lake. Pulicat Lake has an opening in the Bay of Bengal. The Buckingham canal connects Ennore creek to Karungali Creek at Kalanji village and runs parallel to shoreline. In the northern part of study area tidal flats were found along the course of Kosasthailaiyar River and near Pulicat Lake also. Salt pans and Mangroves were observed in the study area along the course of Kosasthailaiyar River and near inner banks of Pulicat lake. Based upon the site visit and secondary data like Shoreline change maps for Tamil Nadu and latest Google imagery, it was found that the shoreline in northern part of the study area from Kattupalli port upto Pulicat Lake is mostly stable in nature with some of the patches showing medium to high accretion of shoreline.

In the southern part of study area, shorelines between Kattupalli port and Ennore port and also between Ennore port to Ennore creek are of sandy nature. At the mouth of Ennore creek low erosion was observed on either side. During site visit towards south from Ennore Creek to Chennai port, the entire coastal stretch was protected with **Rock Armour** for the protection of coast. There are certain patches in the southern stretch where sandy beaches were found. It was observed that during high tide the Karungali creek also has tidal water influence. Tidal flats and mud flats are also observed in the landward side in the study area. Scattered patches of mangroves and brackish water marshes were also present in the study area.

B. Human use Features

Based on the available data and information gathered during site visit, important human use features were identified in the study area and details are given in Table 2.1. CWDL intake is located north of Kattupalli port. The existing intake of CPCL is within the port breakwaters and LTSB is constructing new intake location towards south of Kattupalli port for CPCL. The major fish landing centres are at Pulicat and Ennore. Apart from these major fish landing centres, fishing hamlets were found in the study area. Based on information gathered during site visit a recreational beach near Pulicat was also identified. Pulicat Lake is also important human use features as it is associated with livelihood of thousands of people for fishing. Near Pulicat, Light house was observed.

Table 2.1 : Classification of Human use Resources in study area

Human Use Resources			
Commercial	Management areas	Cultural	Recreational
Cropland	Pulicat Lake	Temple	Beaches
Plantation	Protected Coastline	Fishing	-
		Hamlets	
Intake Locations	Light house	-	-
Industries	-	-	-

C. Biological Resources

The study area is not very significant in terms of the sensitive biological resources except for Pulicat Lake in the north. Mangroves were observed near mouth of Ennore creek and Karungali creek and also near mouth of Kosasthailaiyar River near Pulicat Lake. Scattered patches of mangroves were observed in the inner part on the banks of river Kosasthailaiyar. No significant fishing grounds were observed along the shoreline in the study area.

Table 2.2 Details of Biological Resources in study area

Birds	Fish	Habitats & Plants
Birds Breeding/ Flocking Areas at Pulicat Lake	Fisheries	Mangroves (Directly exposed to sea)
		Mangroves (directly not exposed to sea)

Pulicat Lake is the second largest brackish water lake in India and is located between 13°26' and 13°43'N latitude and 80°03' and 80°18'E longitudes. The dried parts of the lagoon extend up to 13° 60' N latitude. It opens into the Bay of Bengal through the south-eastern margin near the Pulicat town which is located 40 km north of Chennai city. Pulicat lake is lying almost parallel to the Bay of Bengal. The Pulicat Lake is

extending over Thiruvallur district in Nellore district in Andhra Pradesh and covers an area of about 461 km². The lake extends to about 59km from north to south direction with a maximum width of 19 km in east - west direction in the northern sector of the lake. The narrowest region of the lake is near Pazhaverkadu (Pulicat) village measuring about 250m with a narrow channel part. The average depth of the lake is about 1.5m and the minimum and maximum depth varies between 0.5 to 6.0m respectively. The entire portion within Tamil Nadu (6000 ha) was declared as a Sanctuary in October 1980. The lake is confluent with the Bay of Bengal across a bar of about 3 Km from the Pulicat light house on the Tamil Nadu side. The resources of the lake forms as a livelihood for nearly 40,000 fisher folk.

D. Environmental Sensitivity

The lake is an extremely important area for a wide variety of resident and migratory waterfowl, notably pelicans, herons and egrets, storks, flamingos, ducks, shorebirds, gulls and terns. Pulicat is the third most important wetland for migratory shorebirds on the eastern seaboard of India, and is especially important during the spring and autumn migration seasons. This lagoon provides nursery and breeding grounds for many species of marine fauna and supports commercial fishing with major fish landing centers at Pulicat and Arambakkam. The water of the Pulicat Lake is very rich in population diversity and density of planktonic organisms. The rooted and submerged aquatic macrophytes and filamentous algae constitute the benthic flora of this lake. They are generally seen in shallow regions and around islands. Birds are the important components in the Pulicat Lake ecosystem and this lagoon area has been announced as a RAMSAR site.

2.8 Development of ESI Map

2.8.1 Methodology

The entire methodology and all activities for development of ESI map were divided into three phases.

Phase I: Pre- Survey Activities

- ❖ Collection of secondary data like vulnerable areas, ecologically sensitive areas, flora & fauna, human use resources etc.
- ❖ Preparation of base map for study area using Survey of India Topo sheet, recent Google imaginary etc.
- ❖ Development of LULC map to identify the various features in the study area.

Phase II: Onsite Survey Activities

On site survey for entire stretch of 30 km was carried out for 2 days. Handled GPS was used to verify survey sites and data accuracy. Sensitive areas were marked on the maps. Throughout the site visit, digital photographs were taken, detailed notes were made and GPS coordinates were recorded.

Phase III: Post survey Activities

- ❖ Digitalization of maps & Updating of base maps with accurate data
- ❖ Sensitivity and prioritization analysis
- ❖ Classification of all resources and features in High, Medium and low sensitivity

2.8.2 Sensitivity Analysis & Prioritization

Methodology

In order to prepare ESI map, all the identified sensitive resources were given scale from 1 to 10 for various parameters such as Oil sensitivity, social & cultural, scientific importance, environmental and economic aspects. The scale 1 represents the minimum sensitivity and importance and scale of 10 represents highest importance and sensitivity. The scale/rank is given based on available information, site surveys and understanding of the sensitivity of the study area. The sensitivity index for the study area is worked out based on the methods of Abdel Kader et al (1998) which considered Oil sensitivity, social & cultural, scientific importance, environmental and economic aspects and has assigned the weightage factor of 30%, 10%, 20%, 30% and 10% to each criteria respectively.

Priority Index

“Priority index” is developed by assigning risk factor, importance and sensitivity of various parameters. The risk factor was assigned 1, 2 or 3 for low, medium and high risk, respectively, for each resources based upon the probable threat to each resources by considering hydrodynamic, meteorological, and other logistic conditions. The priority index for sensitive resources is presented in Table 2.3.

In order to prepare sensitivity map for three categories, based on the priority index value the sensitivity scaling is given as 1 -10 for Low Sensitivity, 10-20 for Medium Sensitivity and 20-30 for High Sensitivity. The overall sensitivity of identified resources is presented in Table 2.4.

Table 2.3: Priority Index for the Sensitive Resources

	Sensitivity for Oil Pollution		Social & Cultural		Scientific		Environmental Importance		Economic		Total Relative response of Sensitivity	Risk	Priority Index
Resources	Wi 30%	Relasensitivity	Wi30%	Relasensitivity	Wi30%	Relasensitivity	Wi30%	Relasensitivity	Wi30%	Relasensitivity	a=Wi*Si	B	a*b
Birds Breeding / Flocking Areas	10	3	8	0.8	9	1.8	10	3	7	0.7	9.3	3	27.9
Mangroves (Directly Exposed)	10	3	7	0.7	9	1.8	10	3	6	0.6	9.1	3	27.3
Creeks	9	2.7	4	0.4	10	2	10	3	9	0.9	9	3	27
Recreational Beaches		2.4	10	1	4	0.8	7	2.1	10	1	7.3	3	21.9
Intake Locations	10	3	8	0.8	2	0.4	6	1.8	10	1	7	3	21
Salt Pans	8	2.4	9	0.9	2	0.4	5	1.5	9	0.9	6.1	3	18.3
Mangroves (Inside River / Creek)	10	3	7	0.7	9	1.8	10	3	6	0.6	9.1	2	18.2
Fisheries	9	2.7	10	1	5	1	10	3	10	1	8.7	2	17.4
Cropland	8	2.4	10	1	6	1.2	9	2.7	9	0.9	8.2	2	16.4
Tida-flats	9	2.7	8	0.8	8	1.6	6	1.8	3	0.3	7.2	2	14.4

	Sensitivity for Oil Pollution		Social & Cultural		Scientific		Environmental Importance		Economic		Total Relative response of Sensitivity	Risk	Priority Index
Resources	Wi 30%	Relasensitivity	Wi30%	Relasensitivity	Wi30%	Relasensitivity	Wi30%	Relasensitivity	Wi30%	Relasensitivity	a=Wi*Si	B	a*b
Rainfed Ponds	4	1.2	8	0.8	9	1.8	8	2.4	4	0.4	6.6	2	13.2
Temple	7	2.1	10	1	3	0.6	7	2.1	7	0.7	6.5	2	13
Fishing Hamlets	9	2.7	10	1	2	0.4	6	1.8	5	0.5	6.4	2	12.8
Mudflats	7	2.1	3	0.3	7	1.4	7	2.1	3	0.3	6.2	2	12.4
Ports	5	1.5	7	0.7	5	1	5	1.5	10	1	5.7	2	11.4
Industries	4	1.2	8	0.8	4	0.8	2	0.6	10	1	4.4	2	8.8
Protected Coast	2	0.6	8	0.8	8	1.6	7	2.1	5	0.5	5.6	1	5.6
Sandy Beaches	6	1.8	7	0.7	4	0.8	4	1.2	3	0.3	4.8	1	4.8
Plantation	4	1.2	7	0.7	2	0.4	5	1.5	7	0.7	4.5	1	4.5
Light House	1	0.3	8	0.8	1	0.2	3	0.9	10	1	3.2	1	3.2

Table 2.4: Overall Sensitivity of Resources

Resources	Priority Index	Overall Sensitivity
Birds Breeding/ Flocking Areas	27.9	High
Mangroves (Directly exposed to sea)	a27.3	
Creeks	27	
Recreational Beaches	21.9	
Intake Locations	21	
Salt Pans	18.3	Medium
Mangroves (inside river/creek)	18.2	
Fisheries	17.4	
Cropland	16.4	
Tidal-flats	14.4	
Rainfed Ponds	13.2	
Temple	13	
Fishing Hamlets	12.8	
Mudflats	12.4	
Ports	11.4	
Industries	8.8	Low
Protected Coast	5.6	
Sandy Beaches	4.8	
Plantation	4.5	
Light House	3.2	

The ESI map showing high, medium and low sensitivity on LU/LC map is given as Figure 2.4 and on Topo sheet is given as Figure 2.5.

2.9 Special Local Considerations

- a. Analysis of sensitivity index suggests that highest ranking goes to birds breeding, flocking area in Pulicat lake. Also as Pulicat Lake is declared as Bird sanctuary it is high sensitive resource.
- b. As mangroves are extremely important from ecological point of view, the mangroves patches present near mouth of Ennore & Karungali creeks and near Pulicat Lake which are directly exposed to sea are high priority resources in event of oil spill. Mangroves found near the course of rivers which are not directly exposed to sea are of medium priority resources.
- c. Intake locations are another high priority human use resources in the study area.
- d. Ennore port and other major fishing hamlets are of medium priority human use features.
- e. Major portion of shoreline between Ennore port to Pulicat is sandy beach. The shoreline between Ennore creek to Chennai has mostly rock armours for protection of coast.

References

Participant's Manual on OPRC Model Course – Level 2

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(<http://www.ipieca.org/publications/oilspill.html>)

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Database on Coastal Information of Tamilnadu - Institute for Ocean Management Anna University Chennai - 600 025 -January 2008

NOAA Publication – Environmental Sensitivity Index Guidelines Version 2.0

Figure 2.1 ESI STUDY AREA

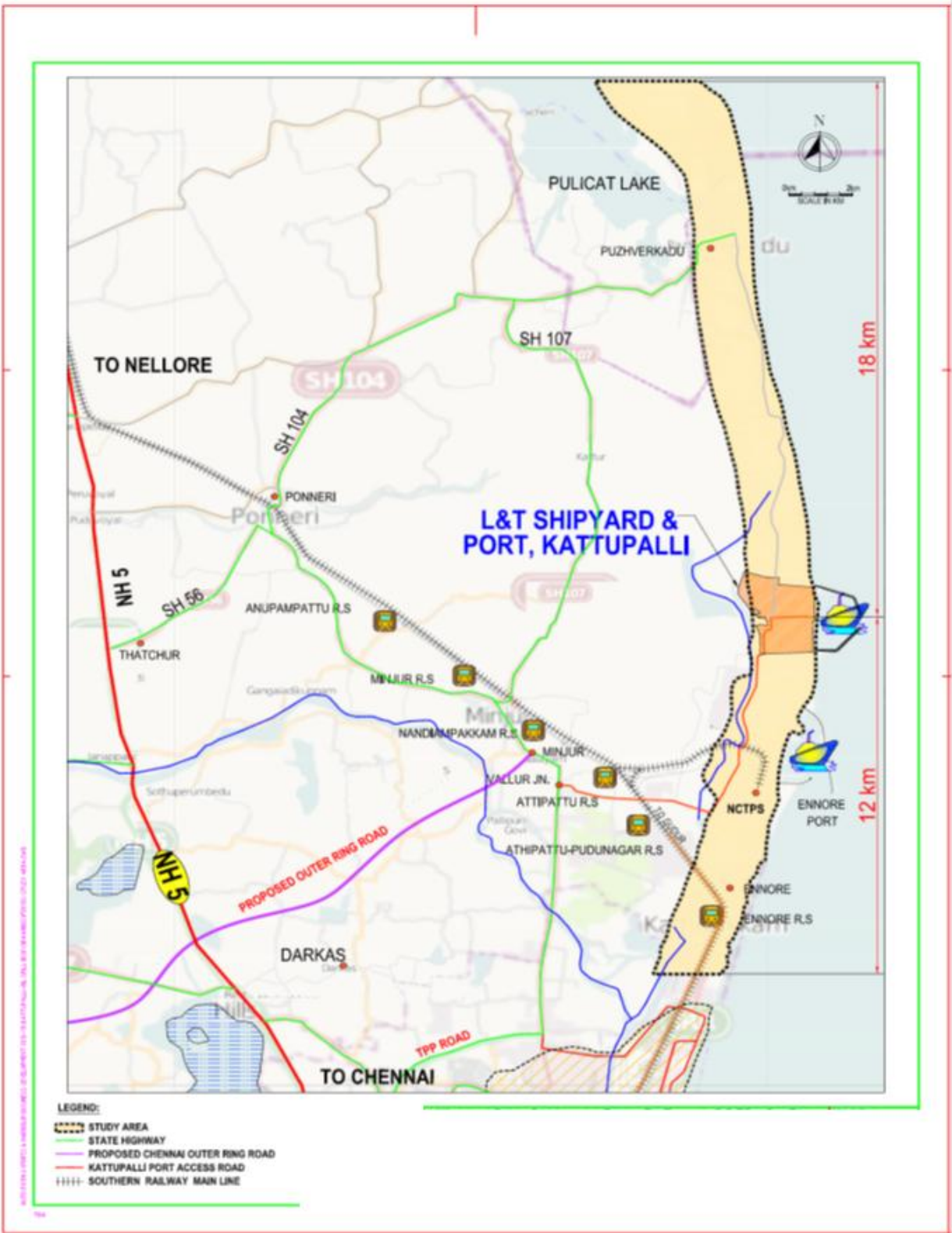


Figure 2.2 LAND USE COVER MAP

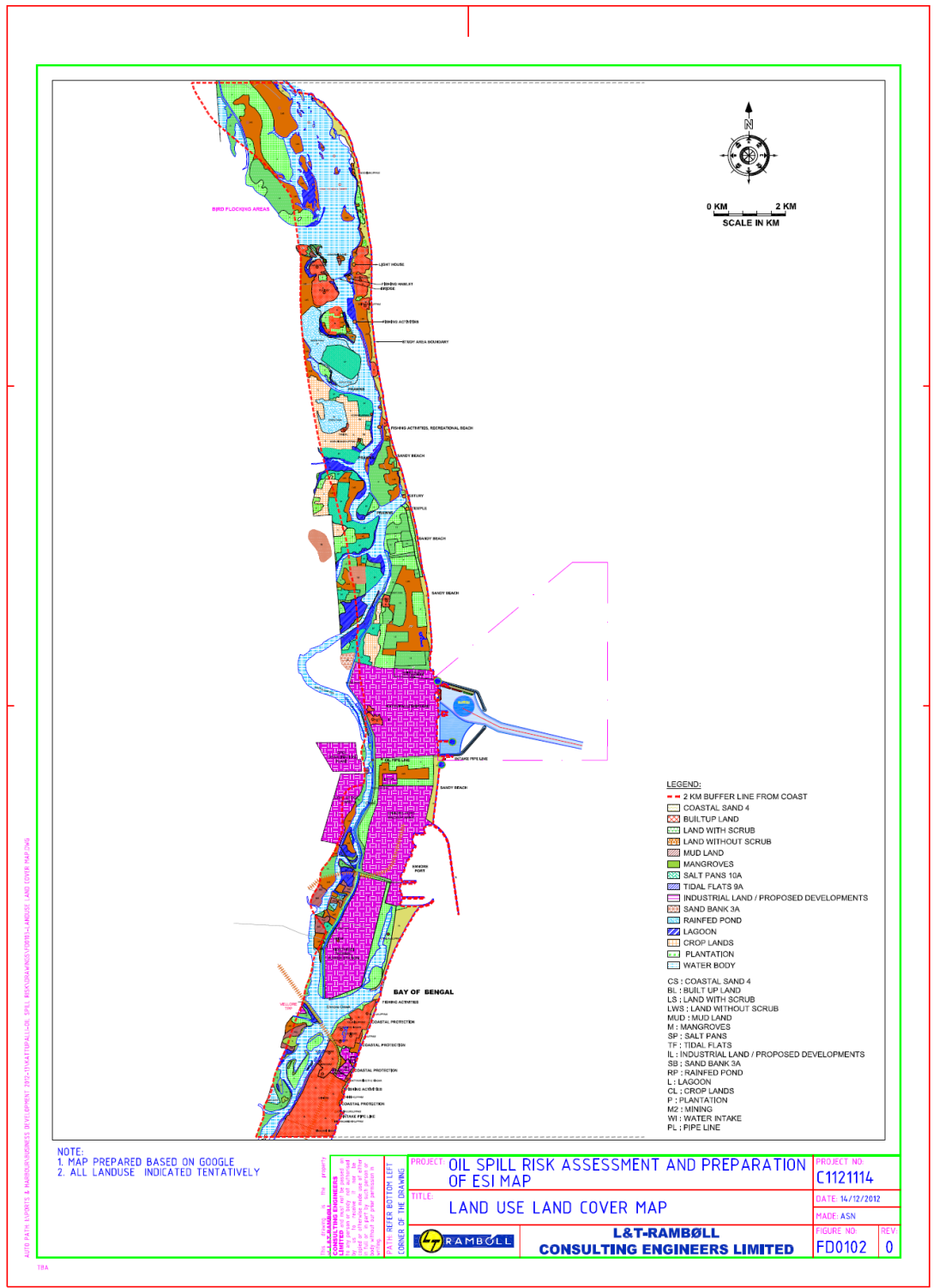


Figure 2.3 SENSITIVE FEATURES

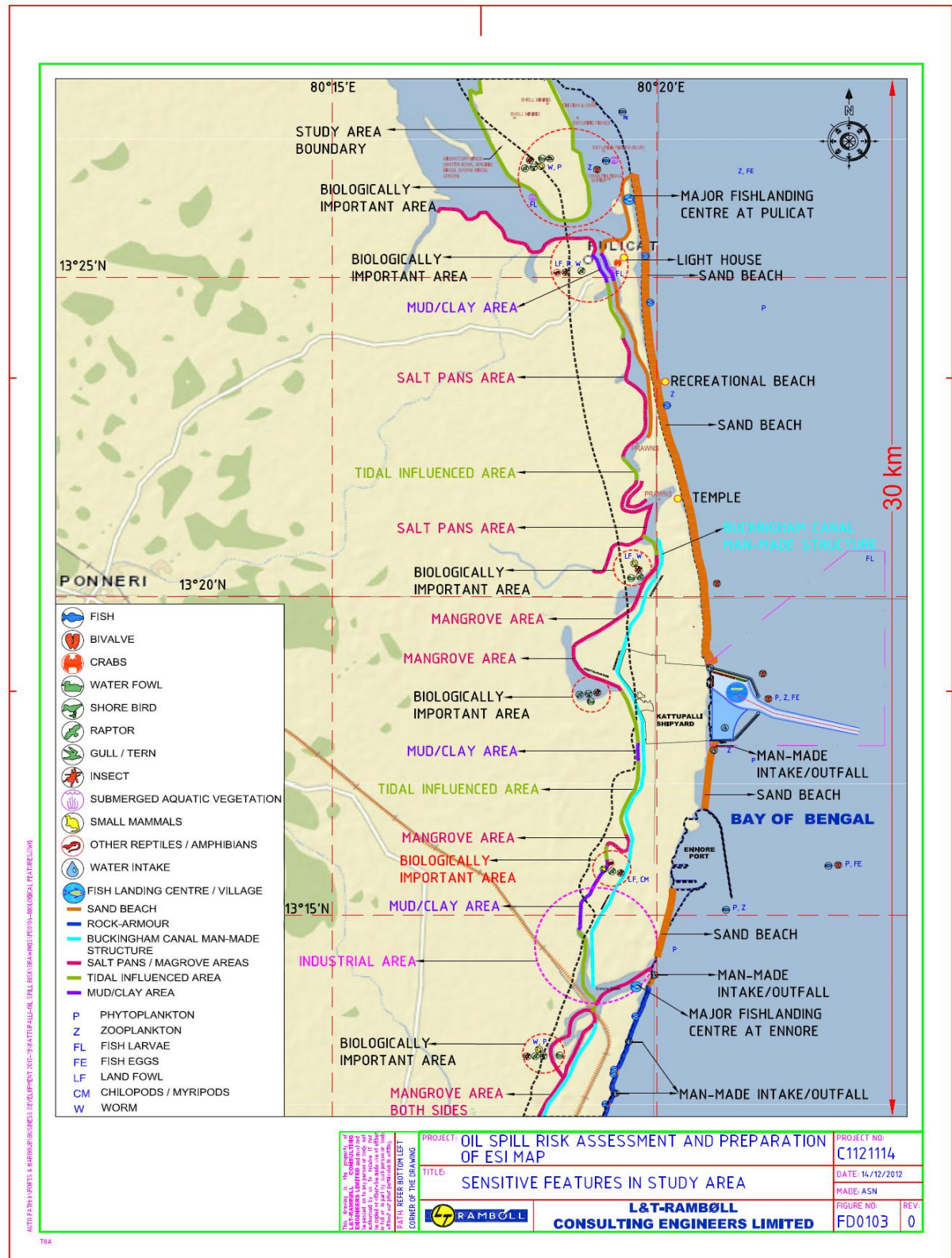


Figure 2.4 ESI MAP WITH LULC

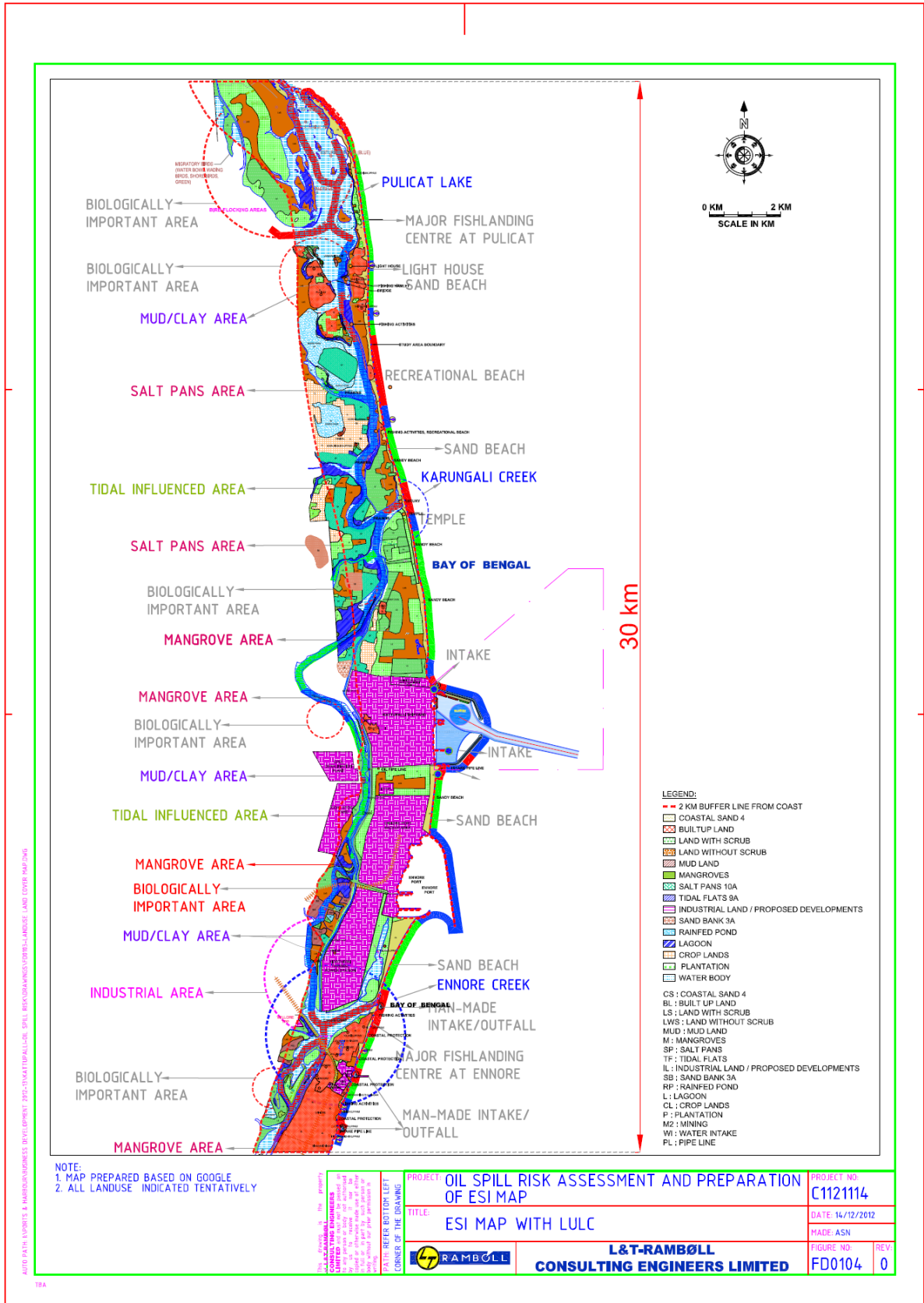
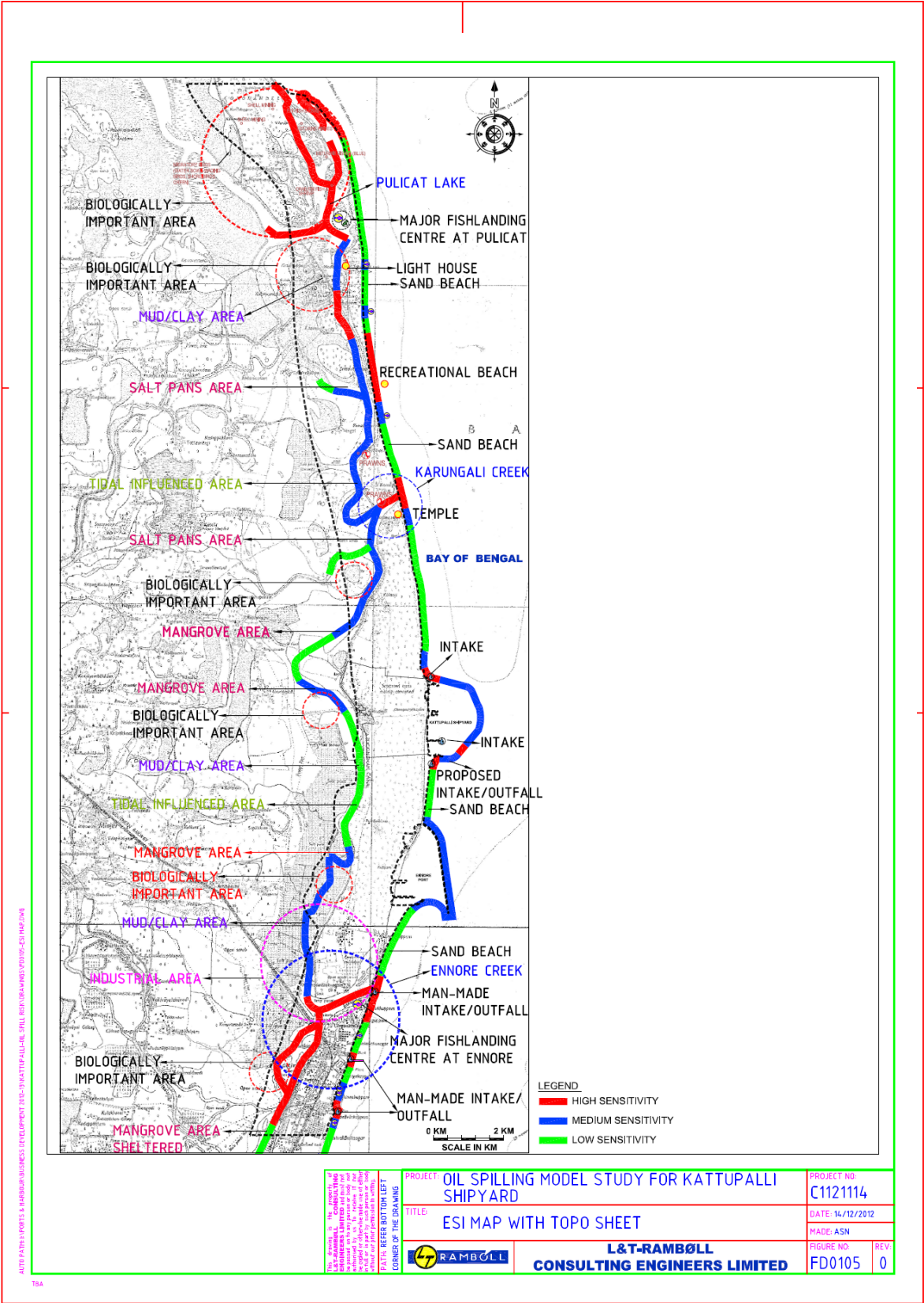


Figure 2.5 ESI MAP WITH TOPO SHEET



3. RES PONSE STRATEGY

3.1 Philosophy and Objectives

Aims of Shoreline Response

- a. Protect sensitive shorelines from the impact of oil by the use of booms.
- b. Minimise any immediate environmental effects from the oil.
- c. Minimise any adverse effects from the cleanup efforts.
- d. Facilitate the natural recovery of the shorelines
- e. Restore the shoreline as close as possible to its condition before oil impact.
- f. Rehabilitate oil affected biological communities if necessary.

3.2 Limiting and Adverse Conditions

All operation during poor weather and cyclonic condition will be kept at abeyance.

3.3 Oil Spill Response in Coastal Zone & Shoreline

Factors For Shoreline Clean Up

Regardless of response measures taken at sea, some oil will reach the coast. This can result in contamination of shoreline, and cleaning operations may be necessary to allow coast to recover its natural state and socioeconomic value. The decision whether or not to clean affected shore-line will depend on factors such as:

- a. The impact of stranded oil on the environment.
- b. The impact of stranded oil on commercial activities.
- c. The possibility that stranded oil might contaminate another part of the shore-line.
- d. The feasibility of clean-up operations.

The choice of the best method and appropriate equipment in each case will be determined by the factors such as:

- a. Nature, amount and distribution of stranded oil
- b. Type of Coastline
- c. Tidal Range
- d. Meteorological Conditions
- e. Period of the Year
- f. Accessibility of the Contaminated Areas for Heavy Equipment
- g. Availability of Personnel and Equipment
- h. Collection Rate and Effectiveness of available Equipment
- i. Impact of Cleaning Operations on the Environment
- j. Availability of Local Transport, Storage and Treatment facilities for the recovered Material Costs
- k. National Policy

The technique employed may range from manual clean-up to the use of specialized cleaning equipment. Different methods have to be selected as clean-up progresses.

The decision whether or not to clean shore-line and selection of techniques to be used should be made in advance as part of the contingency plan for the area. Delay could allow the oil to become mixed with sand and adhere to rocks or vegetation. The pollutant could spread and penetrate further into the beach material, consequently increasing the difficulty and costs of cleaning.

3.4 Methods of Removing Oil from Shore-Lines

Cleaning of shore-lines is usually carried out in two stages:

- a. The primary phase, which consists of removal of floating oil and heavy contamination as soon as possible in order to avoid further pollution.
- b. The final cleaning phase, which is to removal the final traces of oil and oil stains.

3.4.1 Collection of Stranded Oil

This can involve pumping, mechanical or manual removal of oil, or the use of specialised collection equipment.

3.4.2 Pumping / Skimming Oil

Pumping liquid oil is easiest way of collection. Vacuum devices are most efficient way of pumping oil because pollutant, which generally contains debris and sand, need not come into contact with pump mechanism. Industrial, sanitary or agricultural vacuum trucks can be used to pump oil from open water or pools provided there is good access to beaches. The efficiency of pumping equipment may be increased by attaching a flattened (fish tail) suction head to the hose, which permits collection of thin layers of oil. A specialised suction may be attached to vacuum truck to allow continuous pumping. Other portable vacuum devices, especially designed to collect oil, are now available in the market. Other pumping methods may be useful if depth of oil is sufficient, although the pump must have high tolerance to solids. The throughput of such pumping devices varies from 15 m³/day to 100 m³/day or more.

The oil sucked or pumped directly from beach or at water's edge through hoses into collection vessels. Entrapment of air into the hoses will often reduce efficiency and should be avoided, except in the case of very viscose oil, where entrained air or water can assist the flow through the hoses. If flattened suction heads are mounted on vacuum trucks, the trucks may drive along the beach at the edge of the oil, although it should first be ascertained that the beach is firm enough to support the weight of the loaded trucks. Alternatively, oil can be scraped into trenches dug into the sand, from whence it can be pumped.

Depending on local conditions, various types of earth-moving machinery such as graders, bulldozers, scrapers and front-end loaders can be used. On large accessible beaches, such machines can handle up to 250 m³/ day of oiled sand, but selectivity is low, typically 1% to 5% of oil in sand, especially on this layers of oil. Furthermore, the use of these heavy machines can result in the mixing of the oil into the beach. Wherever possible the use of tracked vehicles should be avoided and care must be exercised to ensure that excessive removal of sand does not result in beach erosion.

This method is not recommended for sensitive areas, but might be applicable in the case of heavy pollution of recreational beaches.

The oiled material is usually skimmed by graders into ridges parallel to the shore-line, working down from the top of the beach. Front-end loaders or elevating scrapers then pick it up. Heavy equipment must not cross areas which have been cleared in this way more than necessary, to avoid mixing the remaining oil further into the sand.

Various specialised devices for picking up stranded or floating oil are available. The main principles used include:

- a. **Adhesion** : Oil is picked up on a roller surface.
- b. **Scraping** : Oiled surface layer of beach is removed with a blade.
- c. **Scooping** : An elevating belt scoops the oil from the beach or Water

Generally, separation of the collected material is achieved by saving (sediment/tar balls) or by gravity (oil/ water). These devices can deal effectively with fresh and viscous oil on sandy beaches.

The precise method of use depends on the equipment, but it usually operates alongside the oil, parallel to the surf line, from the clean side of the beach. The oil picked up is then either conveyed directly to a vehicle alongside, or into temporary storage.

3.4.3 Manual Removal of Oiled Material

Manual collection is particularly appropriate for sensitive and inaccessible areas. It is more selective than techniques involving heavy machinery, but productivity is low (up to 2m³/day per person). The recovery of manually cleaned areas tends to be more rapid, due to less physical disturbance.

Oiled material is collected with rakes, shovels or scrapers, depending on the type and form of pollution. It is then transported either using vehicles, or manually, in dustbins or heavy gauge plastic bags. If bags or bins are to be removed manually they should not be overloaded.

3.4.4 Washing in the Surf Zone

This technique can be used to clean lightly contaminated boulders, cobble, pebble and gravel. It is particularly appropriate before or during those seasons when storms and heavy seas are expected. The contaminated material is pushed into the surf where wave action and abrasion will remove the oil. Material which is pushed into the sea will eventually be returned to the beach by natural wave and tidal movements, but the method could result in a change of beach profile.

A grader pushes the contaminated material directly into the surf zone. The grader is then reversed along the cleaned path and repositioned in such a way that a second path is cut parallel to and overlapping the first one.

3.4.5 Natural Recovery

In certain cases the only practical option, will be to leave stranded oil to dissipate naturally. This may be justifiable in areas of very high ecological sensitivity in which any clean-up operation is likely to cause more damage than the oil itself. Alternatively, it may be applicable in areas of insignificant commercial or environmental importance especially those exposed to rough sea conditions where natural cleaning may be rapid. Oil may have to be left to degrade naturally if access to the contaminated areas is difficult.

Periodic monitoring is recommended in order to measure the rate of natural degradation or cleaning of the oiled areas. Notices should be posted warning the public of the presence of stranded oil.

3.4.6 Final Cleaning

BEACH CLEANERS - Beach cleaning machines have been specially designed for cleaning recreational beaches polluted by litter and other solid debris. They are also suitable for collection of solid oil in the form of tar balls and lumps. They can be self-propelled or towed by a tractor. The most common operating principle is the removal of top layer of polluted beach followed by separation of pollutant from sand by sifting. Beach cleaners typically operate at a speed of 3 to 10 km/h, which corresponds to a working area of 5,000 to 15,000 m² per hour. The operation of these devices should be in a similar manner to the use of earth moving machinery and specialised collection equipment, i.e. working from the top of the polluted beach towards the water.

LOW PRESSURE FLUSHING - Flooding the beach with sea water can be used to float away fluid oils from practically any type of beach with a high water table. Provided the substrata is not significantly disturbed, the technique can be used in some sensitive areas. Since the oil displaced could contaminate another part of the shore-line, it should be contained by booms or channelled to collection sumps and recovered by skimmers, pumps or vacuum units. Since high pressure flushing may cause the oil to penetrate into the beach or damage flora and fauna, low pressure is used gently to flood the beach. Flushing should begin at the highest contaminated point and continue towards the water's edge. Efficiency can be improved by digging shallow parallel trenches to collect the oil and water.

HIGH PRESSURE HOT WATER WASHING - The use of high pressure hot water jets is used to remove weathered oil from hard surfaces. Suitable equipment delivers water at a pressure ranging between 80 to 150 bars and a temperature between 60 Deg C and 95 Deg C. The use of sea water is not recommended and a plentiful supply of fresh water is required. Some devices can also deliver steam at 150 Deg C and 20 bars, but it appears that in practice steam cleaning is less efficient than hot water cleaning. High pressure washing should only be used on hard surfaces such as rocky shores, boulders and artificial structures. The technique is less efficient on very weathered oil. The washing should begin at the top of the surface which has to be cleared and proceed downwards to its base. Bunds, trenches or booms should be used to concentrate the oil and water mixture before collection. This technique will destroy most of the marine biota living on the surface.

SAND OR GRIT BLASTING - This method can be very efficient on flat hard areas, such as artificial structures and leaves a very clean finish, but displaced oil, sand and surface material needs to be collected. On a rocky shore, the collection of waste is very difficult. There is a risk of silicosis from this method and in some countries the use of sand is prohibited. Clean-up should proceed from top downwards. People using this equipment or nearby must be protected and operators properly trained to avoid damaging artificial structures. Removed material can be picked up from the beach by manual or mechanical means.

USE OF DISPERSANTS - The efficiency is limited by viscosity of the oil, although to a much lesser extent than at sea, and the energy in surf zone. Furthermore, environmental considerations will limit considerably use of dispersants in sensitive areas such as salt-marshes, mangroves, corals, estuaries, etc. They should not be used near sea water intakes where the oil could be carried further into the substrate, e.g. cobbles and pebbles. Dispersant may be sprayed undiluted on polluted beach areas, from backpacks

or specialized equipment. In some countries aircraft are used. The oil may then either be dispersed by flushing with sea water or left to tidal action. The use of gelling agents to hold dispersant against the oil on vertical surfaces such as sea walls, etc. can improve efficiency. In view of possible health hazards of dispersant, personal protective equipment should be worn by the operators when applying dispersants.

USE OF SORBENTS - Sorbents assists in the recovery of thin floating layers of oil after cleaning operations. They can also be used to protect beaches from incoming oil or to collect oil dislodged by washing. Sorbents may be spread manually or by using special application equipment. Oiled sorbents may be collected manually or with recovery units, depending on the type and quantity to be picked up.

AERATION BY HARROWING OR PLOUGHING - If a lightly contaminated sand or gravel beach has no recreational value or is not in use at the time, oil can be left to degrade naturally. The rate of natural degradation can be increased by aeration. A harrow, such as a disc- plough or a rotavator towed by a tractor, is used to achieve an even mixing of the contaminated layer of sand or gravel with clean beach substrata. This method can be used only on beaches with sufficient load bearing capacity for agricultural machinery. The harrow is operated along the entire length of the beach, parallel to the water's edge starting from the backshore edge of the contaminated area. The next path should be parallel to the first one and slightly overlapping it. The operation should be repeated from time to time.

3.4.7 Site Restoration

The final phase of cleaning shore-lines consists of repairing damage caused to environment by oil contamination or combating operations.

In all cases it is recommended that advice of specialists be sought in choosing the best way of restoring the affected sites. The three main restoration techniques are:

- a. Beach material replacement
- b. Stabilisation of sand dunes
- c. Replanting vegetation

Beach Material Replacement

On sandy beaches, use of heavy machinery may disturb beach profile which could lead to erosion. This may be prevented by replacing removed substrata with clean material of approximately same particle size range. This will enhance recovery of ecosystems in a sandy beach, where fauna are highly dependent on granular sizes. Pebble banks often offer important protection against coastal erosion. If they are pushed into surf to remove oil, it is necessary to ensure that they will be re-established by tide and wave action. If possible, it is recommended to use this method during the beach accretion period. If not, action should be taken to replace banks.

Restoration of Sand Dunes

Sand dunes may be affected by movement of heavy machinery, vehicles or people to and from beach. In order to limit damage, traffic must be directed along a few selected routes. After operation, these may have to be replanted and protected by limiting access. Specialists, according to types must make the choice of vegetation indigenous to the affected area. Planting of sand stabilising grasses is generally recommended and commonly used in dune rehabilitation programmes.

Replanting Vegetation on Salt-Marshes

As a first step, it is necessary to evaluate the nature of any damage in order to determine if natural recovery is likely. If so, a monitoring programme should be established to observe the rate of natural recovery. Re-vegetation may be advisable if.

- a. The affected area is used by rare or endangered species or migratory birds, lack of cover for a season could endanger the biota.
- b. The marshland is exposed to erosion.
- c. The marshland is used for fishing, hunting or recreation.

Two techniques are available to restore marsh vegetation, each with its advantages and disadvantages:

- a. Seeding Seeds can be sowed manually or by aircraft. This technique can be low cost but has limitations; waves and currents may wash the seeds away before growth, migrating water birds may damage young plants, and there will be some delay before the cover will be high enough to protect wildlife and prevent erosion.
- b. Transplanting this consists of planting young seedlings in cleaned area. Planting is done manually, ensuring precise control concerning depth of planting, spacing between seedlings, seasonal timing and tidal elevation, which required advice from experts. This technique is labour intensive, but gives rapid results; it is advisable to concentrate on the most important sites, i.e. those susceptible to erosion or providing special habitats.

Mangrove Restoration

Restoration of mangroves following oil spill damage is feasible in some cases once oil in and on sediments has weathered, although success to date has been variable. Success is dependent on expert control as well as a range of natural factors such as wave action, tidal elevation and availability of seeds / propagates or young seedlings. Several techniques have been used, including manual or aerial sowing of seeds / propagates and transplanting of local or nursery seedlings. Planting is unlikely to be feasible in remote locations or for restoring large areas. The sowing of seeds / propagates has greatest potential since it is likely to cause least physical damage, and if obtained from local sources, minimal logistic and equipment support is required.

Care of Wildlife

When an oil spill occurs, efforts should be made to minimise direct and indirect effects on fish, shore ecosystems, sea mammals and the most noticeably affected group, birds.

Aerial and boat surveillance should be conducted to determine concentration of mammals and birds and how oil may affect them. Such surveillance should be conducted so as not to cause unnecessary disturbance. Important mammal and bird feeding, resting and breeding areas can sometimes be protected by boom deployment. The sensitivity of coastal areas and priorities for protection should be established by contingency plans.

Noise-making devices, such as propane cannons, and other harassment methods have been effective in driving away some bird species threatened by oil spills from bays, estuarine and river areas.

The effective and humane treatment of oiled wildlife is specialised matter and be left to experts assisted by trained personnel. Particular concerns to be borne in mind include the following. Wildlife can be dangerous to handle and require specialized management. If capture and treatment is necessary, it must be undertaken only by those with experience in appropriate immobilization and anesthesia techniques and in the treatment of concomitant medical problems, such as zoo or wildlife veterinarians or wildlife agency personnel.

Experience has demonstrated that oiled birds are generally free from disease when captured. However, the potential for disease outbreaks when in captivity means that they must be monitored as a precautionary measure against transmission to wild population. Veterinarians experienced in avian pharmacology must treat diseased wildlife. Rehabilitation centers may have to be set up for cleaning and, if disease outbreaks occur, for quarantine. It must be stressed that wildlife rehabilitation efforts must be conducted with the view that birds are only to be held captive for a brief period of time. Released birds must be disease-free. Care must be taken to assure that any medical treatment employed during rehabilitation does not later pose a threat to the health of a hunter or predator, especially an endangered species, which may consume the bird released back to the wild. For this same reason corpses should be disposed of properly.

3.4.8 Guidelines for Use of Dispersants

Once an oil spill occurs, time is of the essence, particularly in regard to use of dispersant. Agreements and period approval for dispersant use are essential to facilitate a successful response. PCMT to seek ICG approval for use of dispersant prior use. To cut down on time which is the essence, each facility / response center should submit their Dispersant usage plan to the ICG for sanction and approval.

The first step is to collect as much information as possible on oil characteristics of oil, current and predicted weather / wind conditions. A key question will be whether a shoreline or sensitive resource is threatened. If there is no threat, surveillance of the oil should continue, since it should always be borne in mind that conditions might change quickly.

If sensitive resource is threatened, all response options in contingency plan should be considered. Some options can be quickly eliminated due to size / location / weather / logistics. In some cases, one or more options may be appropriate to achieve the best possibility of minimising environmental impact of spill. Different areas of slick may be handled with different response techniques.

The anticipated effectiveness of each response technique should be considered in net environmental benefit analysis. Based on the net environmental benefit analysis, one or more response options will be selected. If approvals are needed- for example, for use of dispersant or for in-situ burning-they must be obtained within hours. Therefore, a mechanism for approvals must be available in advance. Preparations to mobilise equipment and plans to carry out options that need approval should begin before the actual approval is obtained, to save time.

Four options are considered-that is, mechanical recovery, dispersant use, in-situ burning, and allowing the oil to come ashore. If this last option is chosen, consideration should be given to protecting sensitive shorelines by booming and to how the shoreline will be cleaned. The expected effectiveness (or range of effectiveness) for each option should be estimated, based on the available equipment, weather conditions and logistics

of spill. Surveillance and monitoring of effectiveness of response options should continue throughout the operation. If effectiveness is not as expected, the spill response be modified to ensure that money, time and effort are not wasted.

Application

Due to weathering of the oil there is a short time window during which dispersant works efficiently. This is generally in the order of 24 hrs. to a few days (in case of any instantaneous release). Treatment operations should therefore start as soon as possible.

The efficiency of dispersant treatment is also closely related to the way the dispersant is applied. Poor treatment results have often been related to inappropriate application of dispersant.

The choices of the application method and the operational procedures have to be carefully considered

General Consideration On Dispersant Application At Sea

For an effective treatment, the dispersant must be applied to the oil

- a. In sufficient quantities to account for product losses
- b. By means of spray, to obtain uniform distribution of dispersant over oil and good dispersant / oil contact.

This can be achieved by using specialised equipment

The quantity of concentrated dispersant required is proportional to the amount of pollutant to be treated. Typical dispersant-to-oil ratios vary from about 1:10 to 1:20 for concentrate dispersant, and 1:1 to 1:3 for hydrocarbon-based dispersant. The manufacturer's recommendations should be referred to when determining the proper dispersant-oil ratio.

However, it is very difficult to determine the quantities of oil to be treated in a given area since oil spilled at sea can quickly spread to occupy large areas over which there is considerable variation in thickness.

The fineness of spray is an important parameter for ensuring even distribution and maximum dispersant / oil contact. Obtaining correct spray fineness will prevent:

- a. Large dispersant droplets sink and thus lost in water beneath slick. Dispersant which are denser than sea water or which are water-based types tend to sink.
- b. Droplets which are too fine are deflected from targeted oil by wind.
- c. Drops with an average diameter of 400 to 700 um are usually recommended.
- d. Concentrate dispersant can sometimes be applied pre-diluted in sea water. However, neat application is strongly recommended, as it is more efficient.

3.4.9 Shoreline Response Team Organisation

The Shoreline Clean up team is responsible to Pollution Control Officer.

- a. **Shoreline Cleanup Team Officers** is responsible for supervising clean up team on shorelines, team working inshore on shoreline clean up. Clean up teams will comprise personnel from port or outside agencies.
- b. **Organisation** - All clean-up operations should be directed by Head of the response team. Accordingly, a base should be easily accessible, signposted if necessary and equipped with Hand held VHF sets and basic office facilities. Food, water & First aid of the response team will be kept at base. SCTO will organise and allocate clean up equipment use, ensure efficiency of cleanup operation, and submit details to PCO. Restrict public access to polluted areas.
- c. **Communication** - Communication by means of VHF will be established between each shore line clean up team and PCO. Head of these teams should report to the base once or twice daily.
- d. **Surveillance** - Surveillance by Port craft or aircraft (If available) will be done regularly for effective control of shoreline cleanup operations. A mechanism for regular reporting of progress made by working teams should be established.
- e. **Training** - It is often necessary to provide on-site training on appropriate techniques and use of equipment. This is especially the case during a long operation, when the working teams may be changed.
- f. **Maintenance** - Maintenance of equipment used in the marine environment is prone to mechanical failures. A mechanic should be available to assist operators in maintaining and repairing equipment.
- g. **Government Agencies** - A number of government or non-government agencies may have authority over the shoreline. If confusion exists over who has authority over a sector of shoreline, staff should refer to either PCO or PCMT.

3.4.10 Shoreline Response Planning and Strategy

When oil reaches shoreline, following information are to be obtained:-

- a. Type of shoreline impacted
- b. Characteristics of oil/oily material-tar balls, viscous oil, liquid oil, oiled seaweed, oiled sand
- c. Extent of oiling-upper shore/lower shore, heavy, moderate, patchy, light staining.
- d. Depth of penetration, oiling of attached algae
- e. Sketch maps/profile of shore showing extent of oiling
- f. Assess volumes of oily materials in tonnes/barrels/gallons etc.

3.4.11 Shoreline Accessibility

Accessibility to affected shoreline can be difficult in some terrains and vehicles will not be able to move. In order to prevent such stranding of vehicles, it is essential that the accessibility routes are identified. The following factors are to be taken into consideration:-

- a. Ease of access by personnel, vehicles and equipment.
- b. Access difficulties- determine distance to good roads/parking area rough tracks, locked gates and who has keys/private ownership of access roads, high / low cliff.
- c. Load bearing capacity of substratum (upper shore/lower shore), roughness of terrain
- d. Slope of shore (upper shore/lower shore), (cliff, very steep, steep, gradual, flat)
- e. Mark access points on map and sketches

3.4.12 Accessibility from Sea

If road access is not possible in riverside areas, backwaters, creeks areas etc, then area be accessed through sea routes using rubber inflatable dinghies or other fishing craft which can land near shorelines. While approaching such shorelines then maximum draft of boat and potential sea conditions are deciding factors.

3.4.13 Temporary Storage And Removal Of Oily Waste

The following factors are to be taken into consideration during the planning state for temporary storage and removal of oily wastes from the shorelines:-

- a. Suitability for pre-fabricated tanks, skips, lined pits, piles of oily material/bin bags
- b. Ease of access by vacuum trucks, skip lorries, light trailers
- c. Requirement for transfer pumps

3.4.14 Shoreline Clean-Up Equipment

The shoreline clean-up equipment which are essential for the oil removal operations at beaches are as follows:-

- a. Protective clothing (e.g. coveralls, boots and gloves) for everyone
- b. Cleaning material, rags, soap, detergents, brushes
- c. Equipment to clean clothes, machinery, etc. with jets of hot water
- d. Plastic bags (heavy duty) for collecting oily debris

3.4.15 Main Steps In Shoreline Clean-Up Methods

The four main steps in a shoreline clean-up operation are

Step 1 : Assessment

- a. Determine the need to clean, setting priorities in line with this contingency plan
- b. Determine required degree of clean-up for each area in accordance with priorities
- c. Attain agreement between clean-up team, ecological experts, government authorities

Step 2 : Select Clean-Up Method

- a. Choose method appropriate to type of shoreline, access, degree of oiling
- b. Minimize damage caused by choice of clean –up technique, degree of clean-up
- c. Address conflicts of interest (e.g. needs of amenity use versus environment or response speed versus aggressiveness)

Step 3: Clean-Up Operations

- a. Monitor clean-up, confirm choices made above, re-evaluate if necessary
- b. Minimize disturbance of shoreline features
- c. Minimize collection of un-oiled debris, sediments

Step 4: Termination/Monitoring

- a. Ongoing assessment of clean-up Operations
- b. Determine when clean-up objectives have been met
- c. Post-spill monitoring to confirm recovery of shoreline features, biota

3.4.16 Net Environment Benefit Analysis

Once oil has been spilled and reaches shoreline, urgent decisions need to be made about the options available for response and clean-up in order that environmental and socioeconomic impacts are kept to minimum. Getting correct balance is always a difficult process and conflicts inevitable arise which need to be resolved in best practicable manner. The advantages and disadvantages of different response options need to be considered and compared, both with each other and with the advantages and disadvantages of natural recovery. This assessment process is sometimes known as Net Environmental Benefit Analysis (NEBA).

The process requires taking into account the circumstances of the spill, the practicalities of clean-up response, scientific understanding of the relative impacts of oil and clean-up options, and some kind of value judgment of the relative importance of social, economic and environmental factors. Common sense and consensus-forming are just as important in this decision making as quantifiable scientific information. Decisions are best made if the shoreline clean-up planning process has included consultations and agreements with all the stakeholders and other appropriate organizations.

The NEBA evaluation process typically involves the following steps:-

- a. Collecting information on the physical characteristics, ecology and human use of environmental and other resources of the area of interest
- b. Reviewing previous spill case histories and experimental results which are relevant to the area and to response methods which could possibly be used
- c. On the basis of previous experience, predicting the likely environmental outcomes if the proposed response is used
- d. Alternatively if the area is left for natural cleanup
- e. Comparing and weighing the advantages and disadvantages of possible responses with each other and with natural clean-up

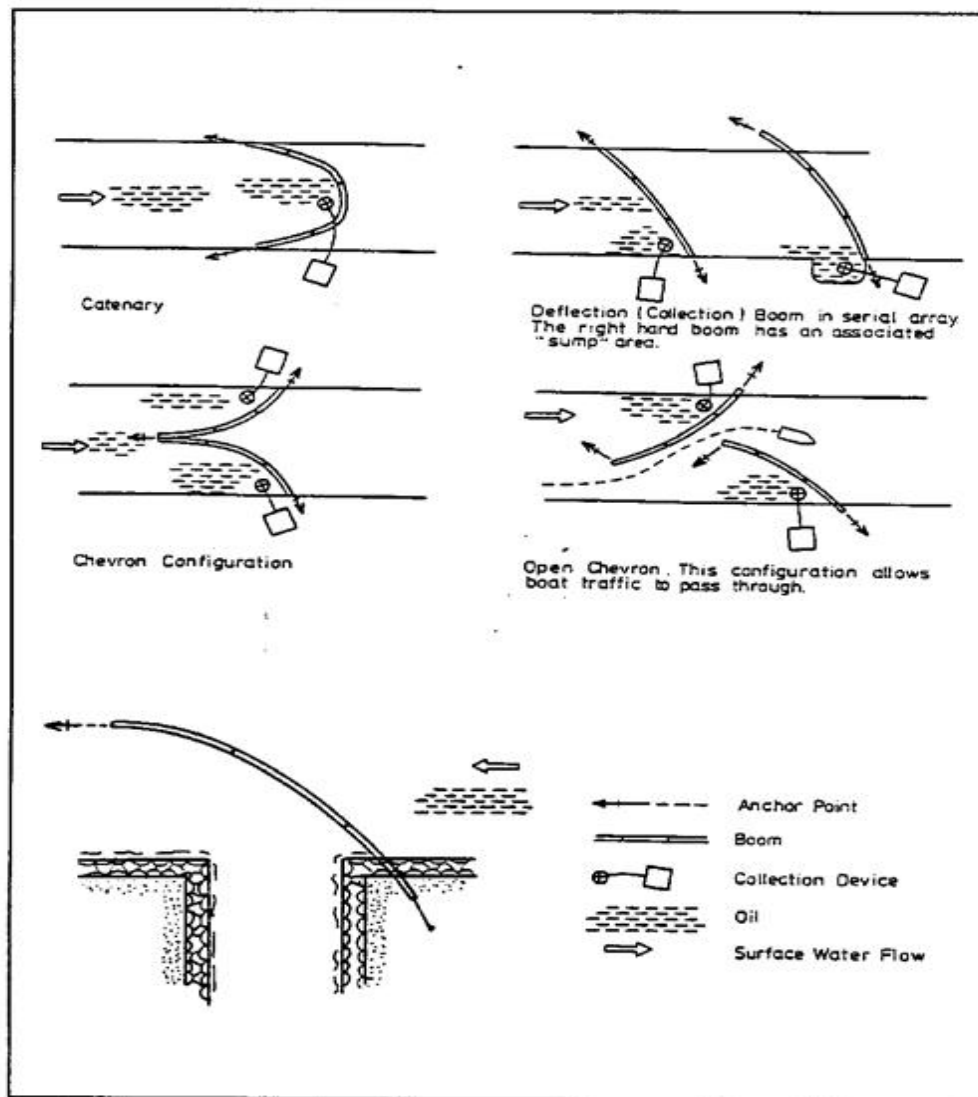


FIGURE 3.1 PROTECTION OF SHORELINES, MARINAS AND TIDAL INLETS,

3.5 Storage and Disposal of Oil and Oily Waste

3.5.1 General

The Waste Material Coordinator (WMC) is responsible for implementing a Waste Management strategy for each spill. The recovered oil and debris will be

- a. Pump directly ashore for storage in holding tanks.
- b. Placed in temporary holding tanks, drums or lined pits
- c. Held in temporary, banded, piles (if solid)
- d. Disposed to SPCB authorised vendors

If large areas of shoreline are impacted, and cleanup is proceeding, the Waste Materials Coordinator may appoint Waste Management Officers to advise shoreline response teams on waste handling and storage, and to facilitate collection of waste

3.5.2 Priorities

Waste Management strategy to ensure

- a. Oil and oily debris is stored at the point of collection.
- b. Oil and oily debris is rapidly collected and taken to designated sites for storage and disposal.

Options available in order of priority are

- a. Treatment (Biodegradation)
- b. Direct disposal (Land filling) / Off loaded to vendor

3.5.3 Waste Management Coordinator (WMC)

The PCO will advise WMC on

- a. Size of oil spill
- b. Likelihood of effective marine containment and recovery
- c. Potential for coastal impact
- d. Likely location of coastal impact

The WMC will

- a. Make preliminary estimates of possible volumes of debris generated.
- b. Await notification from the PCO, that oil has been recovered, or that shoreline cleanup is commencing.
- c. Notify assistants as required and place on standby.
- d. If oil is recovered and pumped ashore the Waste Materials Coordinator will determine vendor for disposal of recovered oil and advise the PCO;
- e. Notify and mobilise industry resources or contractors to transport oil or debris to disposal sites
- f. Arrange transport
- g. Store oil or oily water temporarily at port
- h. Advise on safe handling procedures, and temporary waste storage
- i. Inform PCO on the volumes, and type of waste, generated
- j. Keep an accurate record of waste collected i.e. volumes, contractor times etc

3.5.4 Disposal of Oil & Debris

One of the greatest logistical problems encountered in any oil spill is the disposal of the recovered oil and oily debris including items of protective clothing and equipment used in cleanup operations. Ideally, as much of the collected oil as possible should be processed through a refinery or oil recycling plant. Unfortunately this is rarely possible due to weathering of the oil and contamination with debris and so some other form of disposal is usually required. This includes

- a. Direct dumping;
- b. Stabilisation for use in land reclamation or construction of minor roads;
- c. Destruction through biological processes or burning.

The disposal option chosen will depend upon the amount and type of oil and debris, the location of the spill, environmental and legal considerations, and the likely costs involved.

As a general rule, only spills of persistent oils such as crude, heavier grades of fuel oil and some lubricants are likely to require treatment and disposal since clean-up of non-persistent oils is not usually necessary. If the oil can be collected soon after being spilled, it is likely to be fluid and relatively free of contamination. In most cases, however, collected oil will be viscous due to weathering. Oil collected from the water will probably be relatively free of solid debris but is likely to contain large amounts of water present as an emulsion. On the other hand, oil stranded on the shore is normally associated with considerable quantities of solids and is often difficult to separate it in a form suitable for recycling. There are three main types of waste, which are likely to be collected from the shore; oil mixed with sand; oil mixed with wood, plastic or seaweed; and solid tar balls. Each type of waste will require a different method of treatment and disposal.

As far as possible, bulk oil should be stored separately from oily debris so that different methods of treatment and disposal can be followed. However, care should be exercised in the bulk storage of more viscous materials, particularly if the tanks are not fitted with heating coils, as it may prove difficult to empty them. Highly viscous oils are best stored in open containers such as barges, skips or drums to facilitate treatment and transfer operations. If special purpose containers are not available, bulk oil from shorelines can often be held within compacted earth walls or in simple storage pits lined with heavy gauge polyethylene (or other suitable oil-proof material). Pits should be filled in after complete removal of the oil and, as far as possible, the area restored to its original state. Plastic bags should be regarded as a means of transporting oily material rather than storage since they tend to deteriorate rapidly under the effect of sunlight. It should also be borne in mind that if the contents are ultimately to be treated in some way prior to disposal, it will usually be necessary to empty the bags and dispose them off separately.

It is beneficial to reduce the amount of material to be transported by separating oil from water and from sand during temporary storage. Water-in-oil emulsions can be broken to release the water; oil seeping from heaped beach material and debris can be collected in a ditch surrounding the storage area and sieving techniques can be used to separate clean sand from tar balls.

The list of SPCB authorised vendor registered with port are as follows

S.N.	Vendor Name	Address	Contact details
1	M/S Quality Lube Products	No.35A,35B,35C&36A,SIDCI Industrial Estate, Manali New Town, Vichoor, Chennai – 600 103	044 4217 0488
2	M/S Supreme Petro Products	AP- 200, I Block, 10 th Street, Vallalar Kudyirippu, Anna Nagar West, Chennai – 600 020	044 2618 4222
3	M/S Sun Reclaimery	Plot No. A 25-29, A 47-51, Madurai Automobile Co-op Industrial Estate, Kappalur, Madurai 625 005	0452 2489898

3.5.5 Disposal of Collected Oil/Waste

In most spills, even where the at-sea response and shoreline protection operations have been relatively successful, significant quantities of oil will come ashore where it will mix with the beach material. The end result of shoreline clean-up activities is that significant quantities of waste material have to temporarily stored and transported to their final disposal sites. A critical factor to consider during disposal operations is to minimise the amount of wastes that must be processed. Waste disposal can be the most expensive and time-consuming portion of the spill response, and all efforts should be made to reduce the volume to waste requiring disposal, particularly when waste materials must be transported to a disposal site. Also, wastes should be segregated as much as possible to maintain flexibility in the choice of disposal options. Disposal techniques for fluid wastes are generally much cheaper and environmentally benign than the techniques for solid wastes. When handling and temporarily storing wastes, care should be taken to minimise additional contamination. Wastes should be stored and transferred in secure containers, and secondary containment such as drums or synthetic liners should be used at storage locations. Covers should be provided for open storage containers and piles of waste material in order to prevent rainwater accumulation and runoff.

The main techniques for waste disposal can be grouped according to type of waste liquid or solid.

For liquid wastes, the main options are:

- Reprocessing / recycling, in which contaminants are removed from the wastes and the clean product reused
- Combustion techniques, in which the waste fluids are burned, either in-situ or using specially designed incinerators

For solid wastes, the main options are:

- Combustion techniques, either in-situ or using specially-designed incinerators
- Stabilization with quick-lime and/or cement
- Burial in specially designed landfills
- Biological techniques, in which natural degradation processes are enhanced either in-situ or at treatment site

The most favorable from an environmental and cost perspective would be recycling and biological techniques. However, both are very limited in their applicability. Generally, only water and debris-free oil is acceptable in reprocessing facilities; and only lightly oiled beach sediments are generally acceptable for biological treatment. For waste fluids, incineration techniques are also generally favorable from a cost and environmental viewpoint, but these are also limited in applicability, being suitable only for fluid oils and emulsions containing little debris.

3.5.6 Disposal Options

Under some circumstances it may be possible to recover the oil for eventual processing or blending with fuel oils. This should always be the first option to consider. Possible recipients for processing or blending are refineries, power stations, cement and brick works and contractors who specialize in recycling waste oils. However, the quality of the oil must be high since most plants can only operate with feed stocks meeting the correct specification. For example, the oil should be pumpable, low in solids and have a salt content of less than 0.1% for processing through a refinery or less than 0.5% for blending into fuel oil. Small pieces of debris can be removed by passing the oil through a wire mesh screen. Assuming that the oil is suitable for recycling, it is likely that the potential refiners or other users may not have much spare storage or processing capacity and hence alternative intermediate storage may be required.

3.5.7 Separation Techniques

Oil collected from the water is likely to be the easiest to prepare for processing since the requirement will be only to separate water. This separation can frequently be achieved by gravity either in collection devices such as vacuum trucks or in portable tanks, where the water is allowed to run-off or pumped from the bottom of the tank. The extraction of water from water-in oil emulsions (mousse) is sometimes more difficult. Unstable emulsions can usually be broken by heating up to 80°C and allowing the oil and water to separate by gravity. More stable emulsions may require the use of chemicals known as emulsion breakers or demulsifiers, which also tend to reduce the viscosity of most oils rendering them more pumpable. There is no single chemical suitable for all types of emulsion and it may be necessary to carry out trials on site to determine the most effective agent and optimum dose rate. The emulsion breaker can be injected at the inlet side of a pump or into an in-line static mixer incorporated into a vacuum intake. After separation, the water part will contain mostly the emulsion breaker and up to 0.1% of oil.

Hence, care should be exercised over its disposal. Recent experiments have suggested that emulsions can be partially broken by mixing thoroughly with sand in standard equipment such as concrete mixers. If an emulsion with 70% water is mixed with about 50% by volume of sand, the water content can be reduced by half and returned to the beach together with separated clean sand. On occasions it may be possible to recover oil from contaminated beach material. This usually involves washing the oiled beach material with water, sometimes in conjunction with a suitable solvent such as diesel to release the oil. Water washing using low pressure hoses can be used to loosen and lift off oil from debris contained in a temporary storage pit. The resulting oil/water mixture can then be pumped away and separated by gravity. Separation can also be achieved in a closed system using water or a solvent. Devices have been developed based on a range of readily available equipment from cement mixers for small-scale batch operations to mineral processing equipment for large-scale continuous treatment. Although these systems have proved successful in trials, they have not yet found widespread application at oil spill incidents. The cost of cleaning large amounts of oiled beach

material on site could compare favorably with other methods, which involves transporting the material to some distance from the coast for subsequent disposal.

3.5.8 Direct Disposal

A common disposal route adopted when recovery of oil is impractical is dumping in designated landfill sites. Materials intended for direct dumping should have maximum oil content of about 20%.

Sites should be located well away from fissured or porous strata to avoid the risk of contamination of ground water, particularly if this is abstracted for domestic or industrial use. Disused quarries and mines are often ideal. The co-disposal of oil and domestic waste is often an acceptable method even though degradation of the oil is likely to be slow due to the lack of oxygen. However, oil appears to remain firmly absorbed by all types of domestic waste with little tendency to leach out. The oily waste should be deposited on top of at least 4 m of domestic refuse either in surface strips 0.1 m thick or in slit trenches 0.5 m deep to allow free drainage of water. The oily material should be covered by a minimum of 2 m of domestic waste to prevent the emergence of oil to the surface when subjected to compression from site vehicles. The total quantity of oil should not exceed 1.5% of the total volume of the site. In the case of shorelines lightly contaminated with oily debris or tar balls, it may be possible to bury the collected material at the back of the beach well above high water mark provided there is no risk of damage to vegetation or that the oil could be uncovered through normal beach erosion. A covering of at least one meter should be sufficient.

3.5.9 Stabilisation

An inorganic substance such as quicklime (calcium oxide) can be used to bind oily sand, provided there are no large pieces of debris. An inert product is formed preventing the oil from leaching out. The stabilized material can be disposed off under less stringent conditions than unstabilised oily sand and can also be used for land reclamation and road construction where high load-bearing properties are not needed. If the material is to be used for construction, it is essential to compact it using road-building equipment.

Although quicklime appears so far to be the best binding agent, other materials might also be applicable such as cement and pulverized fuel ash waste from coal fired power stations. There are also a number of commercial products that are based on the same raw materials but which have been treated to improve their efficacy. Practical experience at spills so far suggests that these are not as cost effective as the untreated raw materials. One advantage of quicklime over other materials is that the heat generated by its reaction with water in the waste reduces the viscosity of the oil, which facilitates absorption. Clearly the suitability of the technique is dependent upon a plentiful supply of stabilizing material close to the spill location. Quicklime can usually be obtained from cement works. The optimum amount of binding agent required is primarily dependent on the water content of the waste rather than the amount of oil.

Typically, for quicklime the amount required is between 5 and 20% by weight of the bulk material to be treated. Treatment can either be carried out using a mixing plant or a layering technique. The former, whilst offering better quality control and needing less land area, requires the use of expensive equipment including a continuous drum mixer. Smaller quantities can be treated in a batch process using standard concrete mixers. Provided there is sufficient land available close to the location of the spill, a layering technique is probably the most cost-effective. The waste is spread out to a depth of about 0.2-0.3 meters and the lime incorporated using a pulverizing mixer. On occasions it may be preferable to carry out primary mixing in pits at the site of the spill to render the oiled material more suitable for transport. The final treatment can then be undertaken at a larger reception facility using specialized equipment. Inevitably, the above technique gives rise to a great deal of corrosive dust and, if possible, the treatment site should be selected so as to minimize its spread to adjacent property. It is also important that operating personnel wear protective clothing and face masks to protect skin, lungs and eyes.

4. EQUIPMENT

4.1 Marine Oil Spill Response Equipment

Particulars	Details of Equipment/Availability /etc.,
Inventory of oil pollution response equipment	a. Oil Containment boom 600mtrs. b. Skimmer 2 No.(20 TPH) c. OSD applicator 2 Nos.Tug Mounted d. OSD -3000 ltrs e. Flex barge 2 Nos. of 10 tons capacity each
Vessel and crafts available for pollution response operation.	a. One each Pilot, mooring and security boat available b. One tugs to tow containment boom in tandem c. One tug for towing reception barge d. One multipurpose barge for receiving oily sludge and debris up to 50 tons
Air capability for spray of dispersants, surveillance and assessment of spill. as well as response activity	No air effort available with Kattupalli Port but can be out sourced through Coast Guard if required.
Kattupalli Port reception facilities	No reception facilities with port
Oil Spill Contingency Plan update	Plan to be updated at regular intervals
General information	a. Re-processing and re-cycling of collected spill b. Disposal of oily waste ,sludge and debris c. Cleaning up of beaches d. Cleaning up of permanent structures of port

4.2 Inspection, Maintenance and Testing

Oil Spill Equipment Maintenance Schedule						Operation Schedule		
SN	Equipment	Fortnight	Month	Quarter	6 month	Month	Quarter	6 month
1	Boom							
	Fence boom fabric				Visual Check clean with fresh water after ops.			Deploy in water
	Reels		Manually Rotate	Rotate by motor				
	Quick Connectors	Physical check		Apply Oil / grease				
	Towing Eqpt with ASTM Connectors		Check visually	Load test				
	Anti-abrasion mat		Remove dust	Washing				
	Hydraulic Power Pack	Battery Check	Check oil level	Operate motor				
	Hydraulic hose	Physical check	Remove connector & oil release	Pressure test with water				
	Anchors		Physical check	Check connecting ropes and D Shackles				
2	Weir Skimmer							
	Skimmer	Physical check	Configure all parts			Configure & layout on deck	Operate in water	
	Selwood spate pump	Wheel Rotation	Run engine & check					
	Suction hose	Physical check	Leak check					
	Discharge hose	Physical check	Leak check					
3	Multipurpose Skimmer							
	Skimmer		Configure all parts			Configure & layout on deck	Operate in water	
	Selwood spate pump	Wheel Rotation	Operate engine					
	Suction hose	Physical check	Leak check					
	Discharge hose	Physical check	Leak check					

4	Hydraulic power pack	Oil level, Physical inspection	Operate power pack				Operate	
5	Floating Tank		Physical check		Fill with air/water			Float in water

4.3 Oil Spill / Shoreline Equipments Usage

The various types of oil spill equipments and their usage are

BOOMS - Caution: To contain / deflect slicks

Localise the spill and thus minimize pollution.

Facilitate removal of the oil by causing it to concentrate in thicker layers on the surface.

Containment of an oil spill relies on the effective and efficient use of booms in suitable sea conditions.

SKIMMERS

Once oil has been contained by a boom, it is essential that recovery of collected oil be undertaken as soon as possible. This is normally done through skimmers. The nominal pick up rate is seldom maintained due to the difficulty of keeping skimmers in the thickest oil.

Fig 4.1 Indicates possible layout of Boom & Skimmers for containment and recovery of oil spill.

STORAGE

Temporary storage systems are required for oil, which is recovered by skimming devices from within containment booms. Most vessels and recovery devices do not incorporate any significant storage capacity and at sea storage systems must be provided by a towed barge, floating storage tanks or collapsible tanks.

DISPERSANTS

Dispersants act to 'break-up' surface slicks and results in oil becoming mixed into the upper layers of water. They will be used with care and only when permission for their use has been granted by PCMT after obtaining permission from ICG.

AERIAL SURVEILLANCE EQUIPMENT

Aerial application equipment comes in a greater variety of forms than vessel spray equipment. Because of the need to consider both helicopter and fixed wing aircraft and to utilize a wide size range of aircraft. Aerial application can only be accessed / initiated by the Coast Guard or through private firm.

4.4 Additional Equipment, Supplies and Services Availability

The detail of oil spill equipment held with port is enclosed in **Appendix 6** and of adjacent facilities in **Appendix 7**.

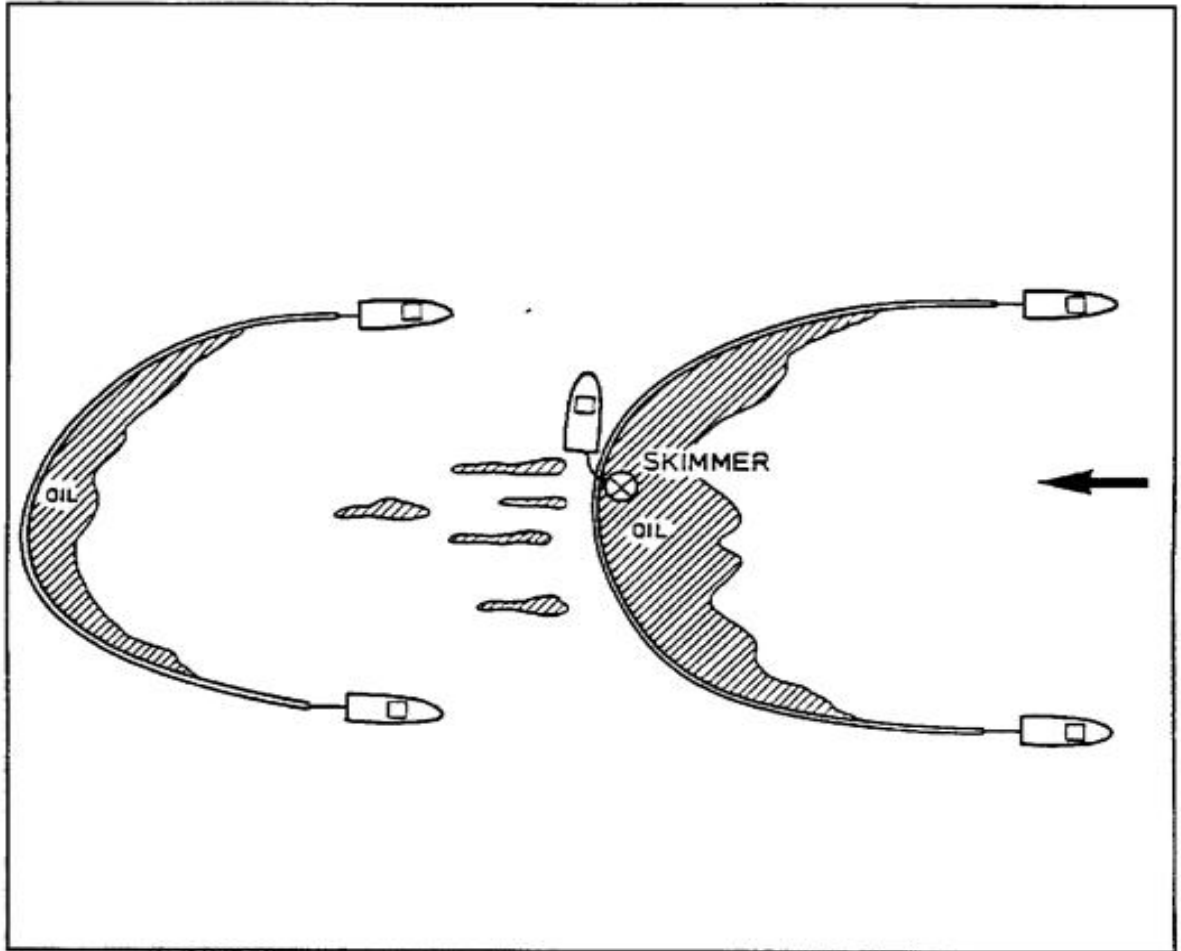


FIGURE 4.1 BOOM LAYOUT & SKIMMER SETTING

5. MANAGEMENT

5.1 Oil Spill Response Organisation

5.1.1 Table of Roles & Responsibilities

The roles and the responsibilities of various members of the Oil Spill Response Team in combating potential oil spills in the port are detailed in this section.

The key roles for various members of the oil spill response team is enumerated in the table below:

POLLUTION CRISIS MGMT. TEAM			
Team Members			Station
COO, GM (Marine), Head Container Terminal, Head HR, Head Finance, Head Marketing, Head HSE, Medical Officer			Conference Hall (Admin Building)
SITE POLLUTION CONTROL TEAM			
Actual		Stand by	
On Scene Commander	Pollution Control Officer Dy. Marine Head	Duty Pilot	PSS / Containment Point
Marine Coordinator	Marine Supdt.	Marine Supervisor	Containment Point
Logistics Coordinator	Mgr. Purchase & Mgr. Finance	Purchase Incharge	Conf Hall Ops Bldg
Communication Officer	Duty Communication Officer	Stand By Communication Officer	PSS
Shoreline Clean up team	Manager HR / AM HR / AM Admin (Each group assisted by Safety Officer)		Containment point
Waste Material Coordinator	Head Safety	Safety Manager	
Port Craft Coordinator	Marine Supdt.	Marine Supervisor	

5.1.2 TIER 1 Response Team

- The Tier 1 Response is under the direct control of the PCMT.
- The PCMT will take necessary action to ensure appropriateness of response.
- The PCO is assisted by Site Pollution Control Support Team in containing, recovery, disposal and cleanup of shorelines.

5.1.3 TIER 2 & 3 Response Team

- If spill is assessed to be greater than Tier 1, Tier 2 and Tier 3 Responses are under the direct control of the Tiruvallur District administration who will be the lead agency for coordinating with the ICG and shoreline response with other agencies, L&T Port and polluter.
- The ICG will assume control of the response and activate the NOSDCP and the L&T Kattupalli Port OSCP will be suspended. Should this occur Port personnel are to fully cooperate with ICG.

- c. If Tier 2 or 3 oil spills is within port boundary then Port Oil Spill Response Team to assist the ICG.

5.1.4 Port Oil Spill Response Team

The L&T Kattupalli Port Oil Spill Response Team (OSRT) undertakes responses to all Tier 1 oil spills at Kattupalli Port limits. The OSRT consists of two main groups:

- a. Pollution Crisis Management Team (PCMT) headed by COO / Head (Marine) responsible for overall Management of OSRT.
- b. Site Pollution Control Team consisting of Marine Response Team, Logistic Team, Shoreline Clean Up Team and Waste Material Coordinator is coordinated by the PCO.

The structure of the OSRT is shown in the Incident organisation chart at 5.3 and Para 5.1.1 lists the personnel who are assigned to each of the key roles. Detailed descriptions of each staff member's role in spill response are provided in successive paragraph of this chapter.

5.1.5 Duties & Responsibilities of Oil Spill Response Team

A. Pollution Crisis Management Team – Basic Function

- a. Monitor and analyze reports from PCO and identify area / population in emergency zone and strategies for priority areas.
- b. Activate the Oil Spill Response Plan
- c. Declare tier of spill
- d. Support ERT with materials, equipment, information and human resources
- e. Monitoring and analyzing reports from action team and making alterations in the current mode of action if deemed necessary.
- f. Ensures stoppage of shipment operation & evacuation of vessel during disaster
- g. Coordinate with aid agency as deemed necessary
- h. Make the necessary arrangements and funds for evacuation, transportation, food & supplies.
- i. Make media statements and reports to State Govt. / MOS
- j. Obtaining ICG permission for use of dispersant
- k. Situation, draw conclusions and make necessary amendments to the plans If required transiting action from port to ICG at level 2&3
- l. Review and takes decision to terminate Spill Plan
- m. Gathering and collating information
- n. Controlling general financial aspects of the operation
- o. Preparing formal detailed management and situation reports
- p. Termination of the Plan and declaration Port safe for activity

B. Site Pollution Control Team

1. Pollution Control Officer

- a. The PCO is responsible to PCMT
- b. Inform & brief PCMT on oil spill
- c. Responsible for all actions necessary for containment and recovery of Oil Spill for Tier 1 response operations.
- d. Direct Shoreline Team in containment, clean-up and disposal operations
- e. Ensure the appropriate safety procedures are implemented

- f. Liaise with PCMT on progress, future plans and resource requirements
- g. Maintain records of manpower, equipment and supplies used in operations
- h. Advising other vessels in the area
- i. Co-ordinate transfer of recovered oil from sea storage to shore facilities
- j. Controlling source of spill if this is from jetty or ship at berth
- k. Realistically assess situation and recommend termination of OSCP to PCMT

Should a Tier 2 or 3 Response be initiated then the PCO shall assist as below:

- a. At direction of ICG deploy manpower and equipment for containment and clean-up
- b. Meet with the Coast Guard to review plans, are required
- c. Liaise with Coast Guard on progress, future plans and resource requirements of operations at sea.
- d. Assist the Coast Guard in advising other vessels in the area

2. Marine Coordinator

- a. Shall arrange for Marine Craft to load necessary Oil Spill Response Equipment for deployment, as per directions of PCO.
- b. Shall establish locations of staging areas for delivery and deployment of resources to vessels.
- c. Co-ordinate all logistic requirements of Marine Crafts.
- d. Arrange for issue of Oil Spill response equipment to Shore Clean up Team
- e. Shall be supported by Mooring Supervisor and his team

3. Communication Officer

- a. Shall receive first information on oil spill incident and immediately inform PCO
- b. Maintain chronological record of all activities subsequent to reporting of incident
- c. Monitor all communications weather details, wind, tide, state etc. and record the same
- d. Collect information as per the POLREP and inform PCO
- e. Communicate Vessels & Port Craft based on directions from PCO
- f. Act as historian for recording all Oil Spill Response activities

4. Logistics Coordinator

- a. Hiring/ Procurement of earth moving equipment
- b. Hiring of vehicle for shifting of disposed oil / debris
- c. Maintain sufficient cash for off the shelf purchase
- d. Procurement in consultation with PCO

5. Shoreline Cleanup Team

- a. Supervising clean up team on shorelines
- b. Put up sign post
- c. Status update to PCO through radio communication
- d. Allocate cleanup equipment
- e. Efficiency of cleanup operation
- f. Ensure that appropriate safety procedures are implemented
- g. Restrict public access to clean up area
- h. Submit clean up details to PCO

6. Waste Material Coordinator

- a. Make preliminary estimates of possible volumes of debris generated
- b. Await notification from the PCO, that oil has been recovered, or that shoreline cleanup is commencing
- c. Notify assistants as required and place on standby
- d. If oil is recovered and pumped ashore the Waste Materials Coordinator will determine vendor for disposal of recovered oil and advise the PCO;
- e. Notify and mobilise industry resources or contractors to transport oil or debris to disposal sites
- f. Arrange transport
- g. Store oil or oily water temporarily at port
- h. Advise on safe handling procedures, and temporary waste storage
- i. Inform PCO on the volumes, and type of waste, generate
- j. Keep an accurate record of waste collected i.e. volumes, contractor times etc.

7. Port Craft Coordinator

- a. Deploy booms or skimmers on directives of PCO
- b. Hold boom or skimmer on position on directives of PCO
- c. Direct activities of crews engaged in containment and cleanup operations
- d. Deploy dispersant spraying gear if required
- e. Supervise transfer or recovered oil to floating storage systems
- f. Maintain radio contact with the Port Signal Station
- g. Maintain time sheets for the crew

5.2 Funding and Reimbursement of Clean-up Costs

Appropriate funding mechanism for emergency expenditure from the Organisation Funds shall be arranged.

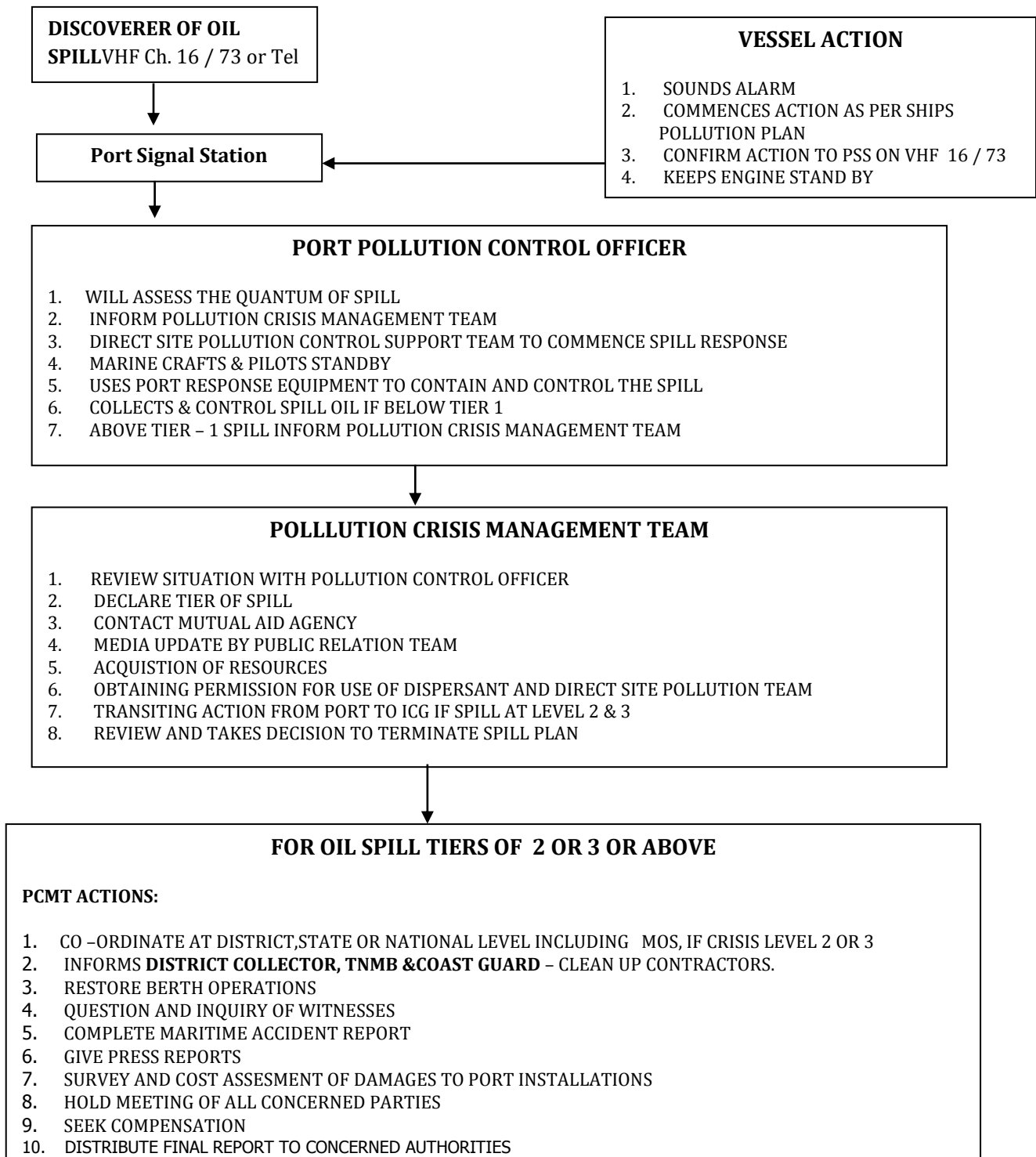
The advance clean-up cost or compensation cost from the insurer/polluter may also be obtained.

Whenever there is an oil spill and it reaches the shoreline, the affected people want to be reimbursed for the costs of cleaning up the environment or compensated for the damage they have suffered. It generally involves the fishermen who use the sea for their livelihood. The international regime for liability and compensation applicable to ship spills has been established to provide a mechanism for making legitimate claims for compensation. The IOPC fund claim procedures will be provided by DG Shipping to the concerned lead agency (District Administration, Thiruvallur).

Under the 1992 Civil Liability Convention (CLC) to which India is party, claims for compensation for oil pollution damage may be brought against the owner of the vessel which caused the damage (or his insurer). Under the CLC, the ship owner has "Strict Liability" for pollution damage caused by the escape or discharge of persistent oil from his vessel. This means that he is liable even in the absence of fault on his part. Anyone who has suffered pollution damage in the State of Tamil Nadu on account of an oil spill can make a claim for compensation to the shipowner or his insurer. Claimants may be private individuals, partnerships, companies, private organisations or public bodies, including District or local authorities. If several claimants suffer similar damage, it will be more convenient to submit co-ordinated claims.

Furthermore, on some occasions the oil discharge may be deliberate. Legal action can be taken in accordance with the provisions of the Merchant Shipping Act 1968 and the Environment Protection Act 1986. In many cases prosecutions will be based on the allegation that there has been a contravention of the International convention for the Prevention of Pollution from Ships (MARPOL 73/78) which are inscribed in the Merchant Shipping (Prevention of Oil Pollution from Ships) Rules 2010. Guidance for cost recovery and claims may be taken from **Appendix 8**.

5.3 Incident Organization chart



5.4 Manpower availability

On-site / On- Call

All on site personnel will be distributed by the PCMT to the Site Pollution Control Team. HR/Admin shall contact off duty personnel and instruct to remain on standby / call basis for immediate mobilization if required.

5.5 Advisors and experts – Spill response, Wildlife & marine environment

OIL SPILL RESPONSE LIMITED (OSRL)

(For Response and Consultancy Enquiries)

Lower William Street

Southampton

SO14 5QE UK

Telephone : +44(0)23 8033 1551

Fax : +44(0) 23 8033 1972

Web : www.oilspillresonse.com

E-Mail : osrl@osrl.co.uk

EAST ASIA RESPONSE LIMITED, (EARL)

(For All Enquiries)

2, JalanSamulun

Singapore-629120

Telephone : 00 65 266 1566

Fax : 00 65 266 2312

Web : www.earl.com.sg

E-Mail : admin@earl.com.sg

5.6 Training/Safety Schedules and Drill/Exercise Programme

The Port will conduct training either internally or by hiring professional from outside in the operation and maintenance of their equipment.

However the training will continue on a regular basis until Ports operators are thoroughly familiar with the operation of equipment. **The details of personnel trained on IMO level is enumerated in Appendix 20.**

The Port staff and out sourced personnel will be encouraged to participate in spill response exercises which are conducted by Port or through ICG.

Spill Response Exercise

In order to ensure that the OSCP remains current and is updated on a regular basis it is intended to run "Table Top Oil Spill Simulation Exercises" at least twice yearly

These simulation exercises will, inter alia, include reporting, alerting of concerned agencies, verification of contact numbers, and assessment of trajectories of simulated oil spills. Each exercise will be observed and the overall response evaluated independently. A report on the exercise will be prepared together with any recommendation for revision of the OSCP.

S N	Month	Lecture	Equipment Deployment	Table Top Drill& Mock Drill	Mock drill with Coast Guard
1	January	✓			On Coast Guard Availability
2	February	✓	✓		
3	March	✓		✓	
4	April	✓	✓		
5	May	✓			
6	June	✓	✓	✓	
7	July	✓			
8	August	✓	✓		
9	September	✓		✓	
10	October	✓	✓		
11	November	✓			
12	December	✓	✓	✓	

Check off List for Oil Spill Exercise

Actions Prior Exercise Programme by coordinating unit.

- Schedule the programme for exercise on receipt of Annual Training Programme.
- Select the components to be exercised
- Inform all resource agencies and stakeholders for their roles expected during the exercise at least two months in advance
- Obtain all resource information and their operational conditions.
- Obtain the list of key personnel
- Establish communication procedures and designated control frequencies.
- Inform NIOT, INCOIS, NRSA and Meteorology Dept regarding providing inputs for spill tracking will in advance.

- h. Prepare area sensitivity map well in advance to protect vital areas during spill scenario
- i. Keep a copy of all stake holders contingency plans who are participating in the exercise and make sure they are current.
- j. Establish an organisation tree for effective command and control

Actions During Exercise.

- a. Raising POLREP to ICG Ops Centre/MRCC
- b. Notify all stakeholders regarding the incident
- c. Inform DG Shipping
- d. Send notice to ship owner IAW section 356J of MSA 1958 to the party that has been responsible for the spill
- e. Inform the relevant District Collectorate, State Pollution Control Boards, Fisheries Associations, Fisheries Dept., Hotel Owners and recreational facilities and centers about the incident and the restricted area.
- f. Control of discharge – ICG or other units can perform damage control and prevent further discharge
- g. Ascertain the quantity of oil discharged.
- h. Obtain weather and oceanographic inputs like current, tidal conditions and wind parameters
- i. Ascertain physical and chemical characteristics of oil
- j. Carryout aerial assessment and issue necessary orders
- k. Start a log for actions taken and assets utilized for processing claims
- l. Send out communication for mobilisation of PR equipment
- m. Send out communication to relevant authorities to provide for support utilities like barges, tugs, small tankers for transfer of cargo, other material and men required through sub-contractors etc.
- n. Send information to NAVAREA Coordinator for restriction of area
- o. On obtaining inputs, carryout assessment of the spill, likely movement and the area likely to be affected with the core team.
- p. Calculate the time and space for effective deployment of boom for containment or diversion of slick
- q. Carryout preventive booming in sensitive areas
- r. Carryout Net Environment Benefit Analysis and establish the best possible response with regard to time and space.
- s. If time and space does not permit deployment of boom and recovery of oil, decide for the best alternative response measure available after weighting the cost benefit analysis. In some cases shore booming and deviation methods are effective to collect oil on shore than on sea.
- t. Deploy necessary personnel and equipment for shoreline cleanup, if required.
- u. Assume oil drifted to respective oil handling agencies control areas and exercise the plan holders to mobilize their PR equipment.
- v. All plan holders should exercise their respective procedures for cleanup their water (upto 500 m) around oil rigs, SBMs etc and the entire port limit by respective port).

- w. The shore line cleanup team should identify dispersal area and wear protective clothing.
- x. If the oil does not hit the coast immediately and if time and space permit, the possibility of application of OSD to be examined, subject to strict adherence to OSD guidelines 2009 for application
- y. Check availability of air and surface assets for OSD application
- z. Mobilise OSD to the place of embarkation (port or airfield etc)
- aa. Carry out continuous aerial surveillance for assessment and dispersion details of oil
- bb. Carryout resource damage assessment with scientific community
- cc. Carryout documentation
- dd. Carryout claims processing
- ee. Forward claims to DG Shipping for award of compensation and clean up cost.
- ff. Complete the documentation of the exercise as per para 1.34.
- gg. Evaluation team to provide details of the short comings as per para 1.32. (j) of the response action of participating agencies
- hh. Issue stand down notice to all agencies

6. COMMUNICATIONS

6.1 Incident Control Room and Facilities

The Communications Officer (CO) at Port Signal Station is responsible for maintaining effective communication between various response groups operating during an oil spill response. The port also has a Communication Command Centre (CCC) within the Port Administration Building which is equipped with telephone, VHF & UHF communication and also includes a Public Address System. Contact details of important external agencies is available in the CCC.

6.2 Field Communication Equipment

6.2.1 Port Communication

The Port has VHF base stations at Port signal station with multi-channel capability. There are numerous hand-held portable VHF units for use by jetty staff.

Tugs and workboats all have VHF and along with all other vessels will have a listening watch on CH.16. In addition, all ships will be instructed to broadcast Emergency on CH. 73. One telephone and one facsimile is a silent, unlisted number to ensure that personnel conducting the operation have access to outside authorities.

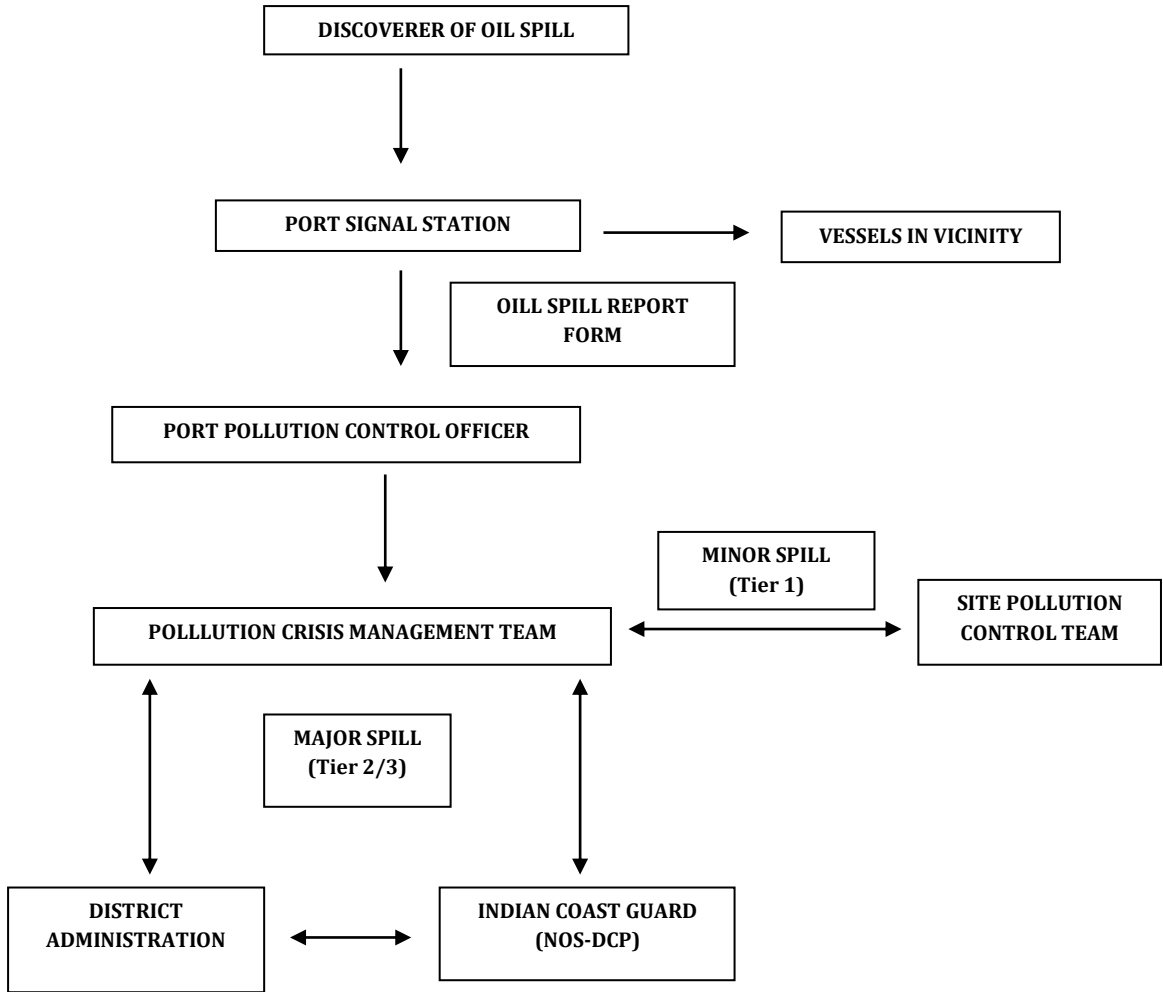
6.2.2 Ground to Ground

In the event that shoreline clean-up is necessary, good communications are essential. A number of handheld UHF units are held by Port and Operation Terminal, same would be used by Shoreline Clean-up Team Officers.

6.3 Reports, Manuals, Maps, Charts and Incident Logs

- ❖ Manuals for the response equipment are available in the PSS
- ❖ Charts and Maps of the area are kept in the PSS for immediate access.
- ❖ POLREP reports and messages are to be filed systematically.
- ❖ An incident log should be kept of all activities, calls and fax messages.
- ❖ The voice recorder is available for recording all communication in PSS.

FIGURE 6.1 COMMUNICATION MATRIX FOR OIL SPILL RESPONSE TEAM



7. INITIAL PROCEDURES

7.1 Preliminary Spill Assessment

An accurate estimation of spill volumes, and the type of oil spilt is essential if an appropriate level of response is to be mobilised and effective strategies and equipment used. Thus a follow up assessment of the spill is therefore required. However, the size of an oil slick and the nature of the oil are not constant. Weathering processes act to either increase or decrease slick volumes and, generally, the viscosity of oil will increase over time. This has implications for the effectiveness of spill response strategies. Ongoing surveillance and assessment of the spill is required. Guidance will be taken from the Risk Assessment in **Appendix 5**.

The preliminary assessment of oil spill is to be undertaken by PCO and intimated to PCMT and following parameters be recorded.

- a. Volume - Estimates of spill volumes be made on basis of cause of spill and duration of spill event. It is also possible to estimate volume of a slick on basis of its appearance and area covered (**Appendix 5**, Table 12)
- b. Nature of the Incident - Cause of the spill is important in determining whether there is, or is likely to be, a threat to human health and safety or calculating the volume, or potential volume, of a spill
- c. Wind Speed and Direction - Wind speed and direction at the time of a spill assist in determining the initial trajectory of the slick. The Duty Communication Officer should obtain wind speed and direction from anemometer at Port Signal Station.
- d. Tides - Tidal currents are the main influence on oil movement within port limits. The time of the spill should be noted, and current tide tables consulted in order to determine tidal direction and time of next change. (**Appendix 5**, Table 4)
- e. Sea State - Sea conditions influence not only the behavior of spilt oil but also determine whether some spill management strategies are possible. (**Appendix 5**, Table 5)

7.2 Continuing Assessment

For any spill requiring a Response, continuing surveillance of the slick is required.

Vessels - Vessels to monitor an oil slick and to confirm shoreline impact of oil and to retrieve samples of the oil if required. Collection of samples should be carried out under the direction of PCO taking guidance from **Appendix 9**. Any port craft can be used in this role. Boats with outboard motors should generally not be used to sample surface oil, due to their tendency to contaminate surface waters with films of light fuel oil. Surveillance of spill by port craft at every 8 hours and by aircraft every 24 – 36 hours will be carried out.

7.3 Spill Prediction

Predicting the movement and behaviour of an oil slick may be undertaken approximately. Spill trajectory can be estimated by adding the vectors of current velocity to approximately 3% of the wind velocity. (**Appendix 10**)

The L&T Kattupalli Port has installed radar make – Koden having model number MDC – 2900. The radar has the ability to detect large oil spill and spill trajectory software can be integrated with the radar.

7.4 Oil Behaviour

The volume, and area of a slick, and the character of the oil will change in time. Estimates of slick area are seldom accurately predicted. These are best estimated by observation.

Table 7.1

Code	Description Appearance	Layer Thickness Interval (µm)	Liters /Sq. KM	Description of Appearance
1	Sheen (Silvery / Grey)	0.04 – 0.30	40 - 300	Light reflecting from very thin oil films
2	Rainbow	0.30 – 5.0	300 – 5000	Range of colours
3	Metallic	5.0 – 50	5000 – 50000	Homogeneous colour i.e. brown, blue or purple
4	Discontinuous True oil colour	50 – 200	50000 – 200000	Broken nature of colour
5	Continuous True oil colour	200 to more than 200	More than 200000	Diffuse in overcast condition

- a. Oils are not light volatile products or condensates
- b. Sea states are less than Force 5
- c. Wind velocities are less than 20 knots
- d. Tidal currents at the spill site are under 2.0 knots

7.4.1 Oil Spill Response

Any oil spill within boundaries of the Port, or adjoining areas that may impact on the Port must be immediately reported to the Port Signal Station. Using Oil Spill Report Form and POLREP message format the signal station operator will seek to gather the information required by the OSCP and notify the PCO. The PCO will activate the OSCP in accordance with the plan. Any spill regardless of size must be reported to District Collector, ICG & TNMB.

Upon receipt of a report of an oil spill the PCO will initiate an immediate response to determine the extent of the spill and to take action to prevent further pollution, safeguard the public, port customers and infrastructure, and to contain or limit the spread of oil during the early stages of the spill.

7.4.2 Levels of Response: The Tiered Approach

Marine pollution response is based on an escalating scale whereby amount of equipment, resources and personnel mobilised for response, and agency in control, will vary according to incident characteristics.

7.5 Tier Definitions

OIL SPILL RISK ASSESSMENT	TIER – I	TIER –II	TIER –III
RISK LEVEL	MARGINAL	CRITICAL	CATASTROPHIC
OIL SPILL QUANTITY LEVELS	1-700 MT	700 – 10,000 MT	10, 000 and above
RESOURCES REQUIRED	PORT RESOURCES & FACILITIES	PORT + INDIAN CG FACILITIES	PORT +CG + NATIONAL & INTERNATIONAL SUPPORT
EFFECT OF OIL SPILL	LOCALIZED WITHIN PORT DOCK AREA	PORT LIMITS	PORT LIMITS & ADJACENT AREAS

7.6 Table of Participation

Level	Organization	Joint Participation by Organizations
TIER –I	Port Authority	Ship + Port Authority + Mutual Aid Agencies
TIER –II	City Administration & State Government of Tamil Nadu	Ship + Port Authority + City Administration + State Government of Tamil Nadu
TIER-III	Central Government	Ship + Port Authority + City Administration + State Government of Tamil Nadu+ Central Government

7.7 Notification of Oil Spill to Concerned Authorities

7.7.1 Notifying Authorities

It is the responsibility of the PCMT to ensure that spills are reported to all concerned authorities. The Collector, Tiruvallur is to be informed when oil spill is likely to affect the shoreline.

7.7.2 Govt. & Other Authorities to be Notified In Event of Oil Spill

Level	Organization	Joint Participation by Organizations
TIER –I	Port Authority	Ship + Port Authority
TIER –II	Coast Guard & District Administration	Ship + Port Authority + Coast Guard + District Administration + TNMB
TIER-III	Coast Guard & Central Government	Ship + Port Authority + Coast Guard + State Government of Tamil Nadu+ Central Government

7.7.3 Oil Spill Report Form

Name of Person Reporting Incident :

Title :

Company :

Telephone/Telex Numbers :

Date/Time :

Spill Location :

Type and Quality of Oil Spill :

Cause of Spill :

Response to Spillage, if any :

Any Other Information :

7.7.4 Notification from Port Personnel

All Port staff and contractors (including boat crews) must report any observation of oil or oil-like substance on the sea or shoreline.

All staff and contractors must:

- a. Contact Port Signal Station on Ch. 16/ 14 or, Land line no. 044-27968500 / 7299090542 who will then contact PCO who in turn will inform PCMT.
- b. If oil is observed, determine
 - i. The source of the spill
 - ii. Whether the spill is continuing
 - iii. Whether a risk exists to human health and safety
- c. Take immediate actions to stop the cause of the spill if these can be done safely

7.7.5 Notification from Public

The public will be encouraged by publication of phone no. and from other sources to contact Port Signal Station to report oil spill who in turn will inform PCO as necessary

- a. Time of observation
- b. Position of the oil or oil like substance
- c. Description of the substance i.e. colour, area etc.

7.8 Preliminary Estimate of Response Tier

The Communication Officer is responsible for providing the PCO with enough detail to enable an initial spill assessment of the size and nature of any oil spill.

This can be done by completing Oil Spill report form at 7.7.3. This may be done initially by radio. Spill report shall not be held up due to lack of some details. Where information not available this be clearly stated. Spill size should not be understated on the basis of

lack of information. The PCO in consultation with PCMT determines level of spill response required.

7.9 Notifying key Team Members and Authorities

It is the responsibility of the PCMT to ensure that spills are reported to all concerned authorities. The Collector, Tiruvallur is to be informed when oil spill is likely to affect the shoreline. Important telephone number are given in **Appendix 11**.

7.10 Manning Control Room

Port Emergency Control Centre

The Port Signal Station will act as ECC and will be activated by PCO under directives of PCMT for use during response.

ECC will have

- a. Additional Hand held portable VHF Marine Band are available
- b. Telephone and fax lines in the ECC are connected and operational.
- c. Possession of additional portable radios
- d. Stand by Communication Officer to be available

In the event of a Tier 2/3 spill the Coast Guard / District Administration may establish an ECC at another SITE.

7.11 Collecting Information

Information would be collected on the oil type, sea and wind forecast etc.,. Information for Aerial Surveillance, Marine Fauna Sighting, Vessel Surveillance and Beach reporting would be collected.

7.12 Estimating Fate of slick with Respect to Time & Location

Considering the weather and wind and taking guidance from **Appendix 12** and estimate of the fate of slick with respect to time and location can be made. Table 13 in **Appendix 5** gives an analysis of the Spill arrival time and thickness with respect to sensitive locations in the vicinity of Kattupalli Port. Guidance for equipment selection can be taken from **Appendix 13**.

7.13 Identifying Resources Immediately at Risk, Informing Parties

Based on the spill location, estimated spill quantity and the season the resources immediately at risk are identified and the parties including the District administration are informed.

7.14 Notice to Polluter

As given in **Appendix 14**, if the polluter is a marine craft necessary notice under article 356J & article 356K of the Merchant Shipping Act 1958 is to be given. The district administration may issue notice under section 133 of the Code of Criminal Procedure 1973 and under section 280 of the Indian Penal Code. Letter of undertaking as to be obtain from the polluter or his representative (ship owner / insurance club etc) as per sample given in **Appendix 15**.

8. OPERATIONS PLANNING

8.1 Initiation of the Oil Spill Response Involves:

- a. Reporting of oil spill
- b. Preliminary spill assessment
- c. Notification to authorities
- d. Mobilisation

8.2 Assembling Full Oil Spill Response Team

8.2.1 Mobilisation of Oil Spill Response Team

- a. The PCO will initiate Immediate Response in consultation with PCMT.
- b. The PCO is responsible for mobilizing personnel and equipment based on his assessment.

8.2.2 Safety Assessment

Safety Assessment and requirement for PPE and support facilities will be carried out by safety officer as per format given in **Appendix 16**.

8.2.3 Equipment, Material, Labour and Logistics Support

- a. The Logistics Officer (LO) is responsible for ensuring that adequate Ports materials are mobilised (Excluding Oil Spill equipment under Marine Superintendent) for the spill response and distributed as required.
- b. The LO upon directives from PCMT, acquire materials or equipment from the sources in vicinity.

8.3 Identifying Immediate Response Priority

The preferred response action, in all spills, is to contain and recover oil from the water surface. If containment and recovery is not possible then shoreline protection methods, deflection boom arrays or dispersant options be considered. The PCO will consult with PCMT to identify the immediate response priority and the nature of Response within Port limits. Generally, containment and recovery strategies to be used only if:

- a. Oils are not light volatile products or condensates
- b. Sea states are less than Force 5
- c. Wind velocities are less than 20 knots
- d. Tidal currents at the spill site are under 2.0 knots

8.4 Mobilizing Immediate Response

Initiation of the Immediate Response to spills at the Port Jetties for containment and recovery is the responsibility of the PCO. Upon receiving a spill report the OSC will do the following:

- a. Dispatch the oil pollution equipment and activate the response
- b. Dispatch a vessel to collect a reel of boom, power pack, towing bridles, etc., a skimming unit and to take a slop barge alongside. Assisted by one of the line boats, the vessel will maintain 'J' configuration or take instruction from PCO.
- c. Once in position with the boom deployed, the vessel will deploy the recovery unit into the oil and commence recovery into flexi barge.
- d. In high sea states or currents a second vessel may need to assist.
- e. If oil travelled past the fixed boom, the vessels should proceed to the leading edge of the slick, deploy the boom, retaining one end, and passing the other end to other available vessel. The vessel should then take up station such that the boat forms 'J' configurations. The vessel on the short leg of the boom with the slop barge alongside will deploy the skimmer unit and recover oil into the slop barge.
- f. In the event of a large or continuing spillage a second boom should be deployed with two vessels, one of which will have storage capacity and a recovery unit onboard. This second containment system will take up station astern of the first boom array. Any oil escaping from the first system will then be contained by the second boom.

8.5 Use of Dispersants

PCMT will obtain authorization from ICG. To obtain this, following steps should be followed:

- a. If oil is not contained, or is unlikely to be contained, PCO recommend PCMT who will seek approval from ICG for use of dispersants.
- b. While permission is being sought one or two vessels proceed to the leading edge of slick, deploying dispersant spraying equipment during transit.
- c. Once on station after firm instruction of PCMT on receipt of permission, vessel shall commence applying dispersant

List of approved Oil spill dispersants is given in **Appendix 17**.

8.6 Operation in Cyclonic & Poor Weather

All operation during poor weather and cyclonic condition will be kept at abeyance.

8.7 Media Briefing

The administration department of the Port will coordinate the media briefing in consultation with the PCMT and will be available at the CCC.

8.8 Planning Medium-Term Operations (24-48- And 72- Hours)

Necessary logistics arrangements are to be made if it is estimated that the response activity is likely to be extended. Preparations for the next days activities should be developed at the end of the days activities and adjusted, if necessary first thing the following morning on the basis of the latest reports. Stress can cause unusual behavior among the response staff and severally affect the discussion making capability of the response management team. It is important that the PCMT is conscious of team needs and provides the logistics support necessary to ensure the well being through the response.

8.9 Deciding to Escalate Response to Higher Tier

The PCO in consultation with Pollution Crisis Management Team (PCMT) is responsible for determining Response Tier and subsequently escalate the response to a higher tier in consultation with ICG.

8.10 Mobilizing or Placing On Standby Resources Required

Additional resources if required will be mobilized / requested to be kept on standby from adjacent facilities. Administration would be informed to make necessary logistic arrangements.

8.11 Establishing Field Command Post and Communications

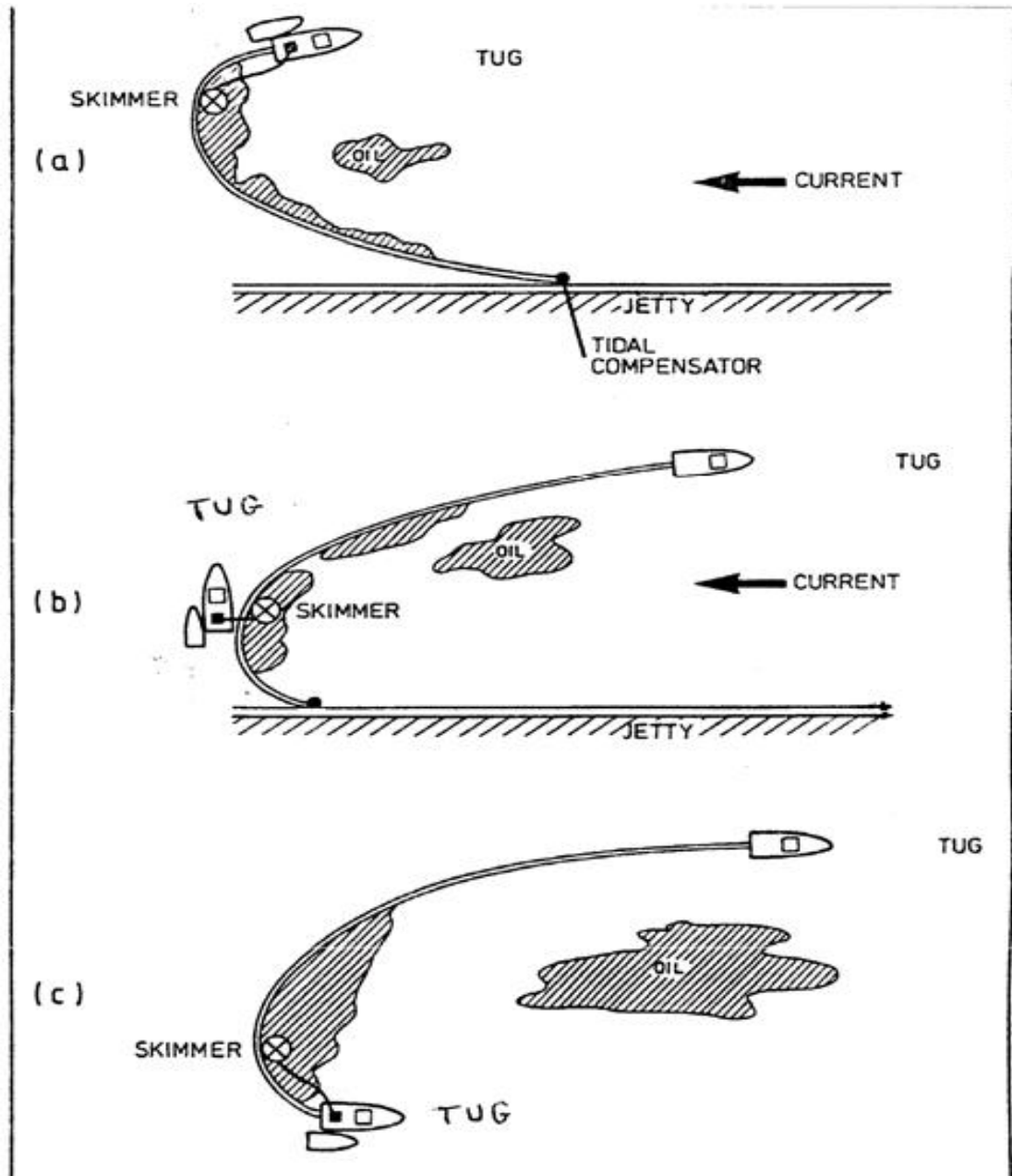
Field command post and communications would be established, in consultation with ICG and District administration, in-case the response is escalated to Tier 2 or 3.

8.12 POLREP Message Format: Imo - 560 (1995)

Address	From	To
Date		Time Group
Identification		
Serial Number		
Part I		
1. Date and time (POLWARN)		
2. Position		
3. Incident		
4. Outflow		
5. Acknowledge		
<hr/>		
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 state and pollution		
47. Drift of pollution		
Part II		
48. Forecast (POLINF)		
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		
<hr/>		
80. Date and time		
81. Request for assistance		
Part III		
82. Coast (POLFAC)		
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		

Figure 8.1 Immediate Response Boom Configuration

at Jetty (a) and (b) and at Sea (c)



PART B

9. Control of Operations

9.1 Establishing a Management Team with Experts and Advisors

The L&T Kattupalli Port Oil Spill Response Team (OSRT) undertakes responses to all Tier 1 oil spills at Kattupalli Port limits. The OSRT consists of two main groups:

- a. Pollution Crisis Management Team (PCMT) headed by COO / Head (Marine) responsible for overall Management of OSRT.
- b. Site Pollution Control Team consisting of Marine Response Team, Logistic Team, Shoreline Clean Up Team and Waste Material Coordinator is coordinated by the PCO.

The structure of the OSRT is shown in the Incident organisation chart at 5.3 and Para 5.1.1 lists the personnel who are assigned to each of the key roles. Detailed descriptions of each staff member's role in spill response are given in 5.1.5.

S. N.	Pollution Crisis Management Team
1	Chief Operating Officer
2	General Manager (Marine)
3	Head Container Terminal
4	Head Marketing
5	Head Human Resource
6	Head Finance
7	Head Environment (L&T Ramboll)
8	L&T Medical Officer

The PCMT will act from the Port Administrative Building (PAB) & the Site pollution control team will function for the Port Signal Station (PSS). The PCMT shall make regular reports to the external agencies given in the table below to appraise them of the progress of containment and response.

S. N.	External
1	District Collector Tiruvallur
2	On Scene Commander / Dy. OSC – Coast Guard
3	Supdt. of Police Tiruvallur
4	MMD Chennai
5	Member of National Institute of Oceanography
6	Dept. of Environment & Forest
7	TN Pollution Control Board
8	Asst. Director Fishery
9	District Fire Officer
10	District Medical Officer
11	Municipal Commissioner

9.2 Reviewing and Planning Operations

Surveillance of Spillage area – The surveillance of the spillage area by air or surface will be carried out either by Port or Coast Guard. The format for reporting the surveillance including Marine Fauna sighting near spillage area is given in form 1, 1A, 1B & 2 in **Appendix 18**.

9.3 Obtaining Additional Equipment, Supplies and Manpower

The additional requirement for equipment, supplies and manpower will be organised from neighbouring Port / Agency. The list of equipment held by close by facility is enclosed in **Appendix 18**.

9.4 Preparing Daily Incident Log and Management Reports

The PCMT will be submitted incident & management report prepared by PCO. The format of report is given in Form 3 in **Appendix 18**.

9.5 Preparing Operations Accounting and Financing Reports

The daily expenditure report will be submitted to PCMT as per Accounting and Financing Reports. The format of report is given in Form 4 in **Appendix 18**.

9.6 Preparing Releases for Public and Press Conferences

The press release and conference will be performed under the guidance of Chief Operating Officer. The format of Press release is given in Form 5 in **Appendix 18**.

9.7 Intimating Local and Government Officials

The daily status to Local & Government official will be informed by COO as per format of incident and management report as given in Form 6 in **Appendix 18**.

10. Termination of Operations

10.1 Deciding Final and Optimal Levels of Beach Clean-Up

Responsibility For Terminating The Response

The PCMT is responsible for terminating Tier 1 Response on recommendation of PCO.

Termination of Tier 2 response is responsibility of ICG. Verbal notification must be followed by a written notification via fax showing date and time of instruction.

Marine Response Operations should be terminated when:

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

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

10.2 Standing-Down Equipment, Cleaning, Maintaining, Replacing

10.2.1 Stand Down Procedures

Response personnel may be located in a number of areas. It is essential that all appropriate coordinators, managers and officers are informed that response activities are being terminated and that all personnel are informed as quickly as possible.

Upon receipt of response termination instructions PCO will ensure that:

- a. All equipment is recovered from the water
- b. All vessels return to their respective berths
- c. All personnel are accounted for
- d. Equipment is safely offloaded and transported to a site for cleaning or repair
- e. All equipment return is logged
- f. All equipment once cleaned is returned to the correct owner and location

10.2.2 Shoreline Clean Up Teams

Upon receipt of response termination instructions each Shoreline Cleanup Team Manager will ensure that

- a. All equipment is retrieved and stowed away in trailers
- b. All equipment is retrieved and returned to Port for cleaning and redistribution
- c. Any equipment not collected is secured;
- d. All cleanup team members are transported back to Port Terminal for demobilization
- e. All shorelines are left free of litter or other refuse
- f. Submit report to PCO

At Port the Shoreline Clean Up Team Manager or nominee will

- a. Undertake a roll call
- b. Log all equip Ensure that returning personnel are provided with washing facilities
- c. Equipment returned and note whereabouts of outstanding equipment
- d. Arrange transport for staff if required

10.3 Preparing Formal Detailed Report

A detailed report in the format given in Form 6 of **Appendix 18**.

10.4 Reviewing Plans and Procedures From Lessons Learnt

Assessment of Spill Response Activities

- a. It is the responsibility of the PCO to ensure that all field reports are completed and submitted.
- b. Where appropriate the report will make recommendations for improving performance or revising the OSCP.
- c. It is the responsibility of the ICG to ensure that adequate debriefing of all Port staff and contractors is undertaken after a Tier 2 or Tier 3 Response. The PCO will do this after a Tier 1 Response.

PART C

APPENDICES

APPENDIX 1 - APPLICATION OF THE UNCLOS CONVENTION (EXTRACT FROM NOSDCP)

Introduction

International Convention on Salvage, 1989 (1989 Salvage Convention), replaces, for States which become party to both, the 1910 Convention for the Unification of Certain Rules of Law relating to Assistance and Salvage at Sea (Brussels Convention). A salvage operation means any act or activity undertaken to assist a vessel or any other property in danger in navigable waters or in any other waters. Any other property is defined as any property not permanently and internationally attached to the shoreline and includes freight at risk. Also included in the definition are aircraft used in salvage operations or even wrecks that might be salvaged. The Convention does not apply to the sea only, but also to the inland waters of a State.

Some of the highlights of the Salvage Convention, 1989, are discussed in paragraphs.

Article 5 (3). Salvage operations controlled by public authorities

Article 5(3) stipulates that the extent to which a public authority under a duty to perform salvage operations might avail itself of the rights and remedies provided for shall be determined by the law of the State where such authority is situated.

Article 6. Salvage contracts

According to article 6, the master shall have the authority to conclude contracts for salvage operations on behalf of the owner of the vessel. The master or the owner of the vessel shall have the authority to conclude such contracts on behalf of the owner of the property on board the vessel. See chapter 6 of this section for more information on contracts.

Article 8. Duties of the Salvor and of the owner and master

Article 8 imposes a duty on the salvor to exercise due care while carrying out salvage operations, to prevent to minimise damage to the environment.

Article 9. Rights of coastal States

Nothing in this Convention shall affect the right of the coastal State concerned to take measures in accordance with generally recognised principles of international law to protect its coastline or related interests from pollution or the threat of pollution following upon a maritime casualty or acts relating to such a casualty which may reasonably be expected to result in major harmful consequences, including the right of a coastal state to give directions in relation to salvage operations.

Article 14. Special compensation

The 1989 Salvage Convention keeps up the normal principle of no cure- no pay, but according to article 14, who has carried out a salvage operation in respect of a vessel which by itself or its cargo threatened damage to the environment and failed to earn reward because the operation has not had a useful result, shall be entitled to a special compensation from the owner of that vessel equivalent to the salvor's expenses as herein defined. The special compensation might be increased up to of 30% of the expenses incurred.

Also, upon the request of the salvor, a person liable for payment due under the convention shall provide satisfactory security for the claim, including interest and costs of the salvor.

APPENDIX 2 – DETAIL FUNCTIONS OF VARIOUS GOVT. AGENCIES (EXTRACT FROM NOSDCP)

- 1. MINISTRY OF DEFENCE** – It is the Nodal and Administrative Ministry for implementation of NOSDCP and for coordinating with other ministries.
- 2. INDIAN COAST GUARD** - Central Coordinating Authority
 - a. To receive the report of significant spillage of oil at sea.
 - b. To keep the Ministry of Defence apprised of the development on receipt of information about oil spill.
 - c. 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.
 - d. To arrange for chartering of tankers / oil transshipment operations.
 - e. 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/local action groups/authorities.
- 3. COAST GUARD COMMANDER REGION (EAST)**
 - a. Receiving reports of oil pollution at sea.
 - b. Coordinating the activities of RCC when activated.
 - c. Keeping the Director General, Coast Guard apprised of developments.
 - d. Processing and coordinating claims of the affected parties and participating agencies with a view to complete and forward for processing by DG shipping.
 - e. Mobilising Coast Guard resources to support OSC action at spill area.
 - f. Maintaining the RCP and forward revised plans to members as may be required by RCC.
 - g. Receiving periodic reports from resource agencies on account of pollution equipment and material with a view to have an upto date inventory list in the Coast Guard Western Region, Eastern Region, and Andaman and Nicobar Region.
 - h. Providing the administrative infrastructure to the RCC for conduct of routine and operational tasks.
 - i. Providing additional sampling effort during spills when requested by OSC. Maintaining a list of national and international agencies that may be called upon to assist for pollution response at the discretion of RCC.
 - j. Arranging for periodical exercises in pollution response.
 - k. Providing sensor data to RCC/OSC as required.
 - l. Pre-designating a Coast Guard OSC
- 4. INDIAN NAVAL / INDIAN AIR FORCE AUTHORITIES**
 - a. Augment aerial surveillance capability of Coast Guard as necessary in the area when oil spill has occurred.
 - b. To make arrangements for oil transshipment operations from any tanker which has caused or is causing or is expected to cause oil spillage.

- c. Promulgate general cautionary messages
- 5. DEPARTMENT OF OCEAN DEVELOPMENT / NIO**
- a. Mapping of ecologically sensitive areas in the coastal and offshore region in consultation with Ministry of Environment and Forests.
 - b. Review of the sensitivity mapping listed by other agencies.
 - c. 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.
 - d. To organise research on impact of pollution on marine life based on actual oil pollution incidents.
 - e. To provide scientific support through Coastal Ocean Monitoring and prediction system (COMAPS) centre and units in investigations of oil spills and also deployment of its research vessels for this purpose, whenever, necessary.
- 6. DEPARTMENT OF ENVIRONMENT & FORESTS**
- a. Determining policy for usage of dispersants in the sea areas of the territorial waters over which the state exercises jurisdiction.
 - b. Mapping of ecologically sensitive areas and biosphere reserve along the coastal areas of the country.
- 7. DEPARTMENT OF AGRICULTURE AND CO-OPERATION**
- a. To arrange for suitable fishing vessels on which oil dispersant equipment can be mounted if the local action group concerned is unable to mobilise this requirement locally.
 - b. Sensitivity mapping of the sea areas within the territorial waters of the state with specific information on fish breeding grounds.
- 8. ONGC / OIL PLATFORMS IN THE REGION**
- a. To assist for chartering of tanker/s when required by regional headquarters in consultation with DG shipping for oil transshipment operations.
 - b. To make available to regional headquarters concerned anti-pollution equipment and chemicals as are available with them.
 - c. To assist in storage ashore of oil transhipped from wrecked or damaged tanker.
 - d. To assist in assessment of value of oil transshipped.
- 9. MINISTRY OF FOOD PROCESSING INDUSTRIES**
- To direct Fishery Survey of India to arrange for suitable fishing vessels on which oil dispersant equipment can be mounted if local action group concerned is unable to mobilise this requirement locally.

10. DIRECTORATE GENERAL OF SHIPPING

- a. To assist Coast Guard on monitoring pollution from ships.
- b. To keep the Ministry of Surface Transport apprised of the developments on receipt of information from Coast Guard.
- c. Initiation of reports emphasized in Merchant Shipping Act, 1958 on receiving reports from Coast Guard regarding oil pollution.
- d. 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.
- e. To take administrative and legal action for processing claims compiled by Coast Guard and other agencies relating to any other oil pollution incidents.
- f. To serve as a legal advisor to the RCC/OSC in matters related to oil pollution and response at sea.
- g. To advise the appropriate receiver of wrecks as regards to action to be taken.
- h. To arrange for chartering of tankers when oil transshipment operations are considered necessary by RCC.
- i. To take whatever action is necessary to realise the claims from parties responsible for the oil spillage through the TOVALOP agreement or through any other manner.

11. SHIPPING CORPORATION OF INDIA

- a. To arrange tankers or ships or tank barges for transport and collection of recovered oil.
- b. To arrange for any personnel required to assist oil transshipment operation or to assist otherwise as may be required

12. CHENNAI PORT TRUST & ENNORE PORT

- a. To be in charge of the overall co-ordination of actions in the area within port limits as regards to anti-oil pollution. In this connection, the major port authority concerned is to arrange for the preparation of a Local Contingency Plan in consultation with the Coast Guard regional headquarters/Central Coordinating Authority.
- b. To identify a suitable sea going tug when required for the operations.
- c. To identify surface crafts, (i) on which dispersant spraying equipment can be mounted, and (ii) which can be used for rigging the boom
- d. 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.
- e. To ensure that at least the following minimum equipment are kept available locally at all times:
 - I. Inflatable boom
 - II. Dispersant spraying equipment capable of being mounted on surface craft

- III. Suitable dispersant chemicals of the nature and quantity estimated as requirement of the Local Action Group as part of the Local Contingency Plan
 - IV. Oil Simmer Equipment
 - V. Surface craft on which above dispersant equipment can be mounted and can be used for rigging boom, etc.
- f. To arrange for training of personnel expected to be engaged in above operations.
 - g. To arrange for periodical exercise under the guidance of the RCC to keep equipment and personnel on continuous readiness for oil spill response operations.
 - h. To consult the CG, the DG Shipping, or any other authority, when further advice/ assistance is required.
 - i. To keep the CG apprised of action being taken

13. TAMIL NADU POLLUTION CONTROL BOARDS

- a. To take all suitable measures to prevent pollution on shoreline
- b. To render all possible assistance to the coordinator of the On Scene Commander, Local Action Group and District Commander particularly in accordance with the contingency plan.
- c. To maintain adequate quantity of basic pollution response equipment like deflective booms, fence booms, spray equipment along with specialized equipment for beach protection and shoreline cleanup.
- d. To identify suitable type of tug / boat / fishing vessel in consultation with On Scene Commander / Coast Guard for mounting the dispersant spraying equipment.
- e. To identify places for waste oil disposal / pits.

14. MERCANTILE MARINE DEPARTMENT

- a. To render all possible assistance to the coordinator of the Local Contingency/ Action Plan.
- b. To provide technical advice to Local Action Group and CCA.
- c. To assist Local Action Group in identifying surface craft suitable for mounting dispersant spraying equipment.
- d. To assist Local Action Group in preparation of Local Contingency / Action Plan.
- e. To assist the CG/RCC in examining ships for efficiency of anti-pollution equipments fitted on board as per Merchant Shipping Act, 1958.
- f. If deemed necessary, to restrict movement of ships and personnel involved in oil pollution on receipt of related information.

15. LOCAL FISHERIES AUTHORITY (Tamilnadu Fishery Department)

- a. 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.
- b. The local action groups in consultation with Coast Guard regional headquarters to identify the fishing vessels suitable for mounting the oil spill dispersant equipment.

16. COASTAL OIL REFINERIES AND CRUDE UNLOADING TERMINALS

- a. To assist the local action group in the implementation of the Local Action Plan.
- b. To assist the local action group in obtaining from their headquarters available additional equipment and chemicals if and when required.
- c. To assist in chartering of tankers to undertake transportation / transshipment operations.
- d. To arrange for the storage of oil transshipped.
- e. To make assessment of the value of oil transshipped and cost of refining or disposal as the case may be.

17. OIL AND NATURAL GAS CORPORATION

- a. ONGC can decide their own requirement of equipment and facilities keeping in view the Govt./Coast Guard suggestions from time to time regarding the type of equipment suitable in Indian conditions.
- b. Periodically forwarding a list of response inventory to the RCC for scrutiny, evaluation and updating holdings.
- c. Providing response equipment, material, trained personnel, and ships when required by the RCC/OSC as on available basis and without affecting their operations or their safety.
- d. ONGC will also immediately respond to combating oil pollution around its installations up to 500 mts. and will continue to provide equipment, material, trained manpower, sampling efforts, and vessels as may be required by RCC/OSC when such oil spill will spread beyond 500 mts. subject to conditions referred to under 14(c) above.
- e. Providing data on crude oil and oil discharges.
- f. Providing data on sub sea pipe lines which may be required by RCC/OSC.
- g. Providing oil transshipment facilities in case of ONGC or any agency under its control being the polluter.
- h. Provide staging facilities for helicopters in the offshore areas when engaged in pollution response in the vicinity whether or not ONGC and agencies under its control area the polluters.

18. RECEIVER OF WRECKS

- a. To assist Local Action Groups in whatever manner necessary and possible.
- b. 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).
- c. In situations where he has the local responsibility for certain actions and/or operations, he may authorise other agencies, who are better equipped
- d. Port Conservator will be the receiver of the wreck.

19. DISTRICT COLLECTOR TIRUVALLUR

- a. To take all suitable measures to prevent pollution on shoreline
- b. Conduct the planning and strategy meeting
- c. Establish Emergency Response Centre (ERC)
- d. Nominate OSC or shoreline/Beach Supervisor for shoreline clean-up

- e. Arrange for volunteers from NGOs, civic agencies, colleges and schools for clean-up measures
- f. Arrange the logistics for clean-up personnel
- g. To render all possible assistance to the Coast Guard coordinator of the shoreline clean-up and the On Scene Commander, in accordance with the contingency plan.
- h. To obtain from resource agencies or any service provider 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 cleanup.
- i. To identify suitable type of tug/boat/fishing vessel in consultation with On Scene Commander/Coast Guard for mounting the dispersant spraying equipment.
- j. Identify places for waste oil disposal through collection pits, recycling facility or to the incinerators.
- k. Promulgate general precautionary messages
- l. Arranging for periodical exercise for shoreline clean-up
- m. Provide administrative infrastructure to the agencies assisting in shoreline clean-up
- n. Arrange for disposal of collected waste in coordination with the State Pollution Control Board
- o. To take action as receiver of wrecks, if the ships involved in oil pollution incident becomes a wreck
- p. To take whatever action necessary to realize the claims from the party/parties responsible for the oil spill through DG shipping

20. TAMIL NADU MARITIME BOARD

- a. Assists the non major ports for clean- up of the oil spill in their areas
- b. Take necessary action against the polluting vessel in the non major port area for clean-up
- c. Coordinate with Coast Guard and DG Shipping for issuing notice against the polluting ship master/owner for clean-up
- d. Coordinate with the local administration for clean-up
- e. Provide necessary resources to the non major ports such as tugs/boats/ barges for clean-up
- f. Assist the District Collector in shoreline clean-up measures by providing necessary resources available with the non major ports

21. STATE/COASTAL POLICE DEPARTMENT

- a. Provide resources such as boats for conveying PR personnel and operation of PR equipment such as Dispersant applications, etc.
- b. Secure the area from the access of the general public
- c. Assist the District Administration for shoreline clean-up measures

List of Pre-Designated OSC (Tamilnadu Region)

Name	Address	Emergency Call
Tamilnadu		
COMDIS -5	Coast Guard Dist Hqrs. NO.5 Fort St. .George Chennai – 600 009	044 -23460456
TUTICORIN	The Commanding Officer CGS Tuticorin, Harbour Estate, Tuticorin	0461-2353503/ 2352199
MANDAPAM	The Commanding Officer CGS Mandapam	(04573) 241519
TNPCB, Chennai	Tamilnadu State Pollution Control Board, 76, Mount Salai, Guindy, Chennai	044-22352647 22353134
Chennai Port Trust	Rajaji Salai, Chennai	044-25362201(Ext.2269) 25361652
Tuticorin Port Trust	The Chairman, Tuticorin Port Trust, Tuticorin	0461-2352500

APPENDIX 3 – MUTUAL AGREEMENT FORMAT

PREAMBLE

Emergency situations can arise in a Port Operation above and beyond the resources available. It is for that reason a mutual aid agreement should be on file before it is needed. A mutual aid agreement is a document that formalizes and defines the assistance that one Port can and will provide to another in times of crisis.

While we most often talk of a mutual aid agreement only applying in times of a major disaster, it can also help to institute a borrow/replace program among the parties for other critical matters.

In the event of a major disaster it is most important that mutual aid agreements are spelled out. This includes the amount of assistance that will be available, expenses (if any), the responsible persons in charge, and the availability of each party based upon its own needs.

Following is a sample mutual aid agreement that can be tailored to the particular needs of the parties. Both parties may review the agreement through their legal counsel before ratification.

AGREEMENT TO RENDER AID

WHEREAS, the and **L&T Shipbuilding Ltd.(Port Division)** in the state of Tamil Nadu, have rendered mutual aid to one another in the past, and anticipate a continuing demand for such mutual aid and cooperation in the use of their personnel and equipment in the future, for the safety, health and welfare of the people of their Ports during a time of emergency, and hereby agree to become partners in providing such aid to each party of the agreement.

THEREFORE, the parties hereby agree that their Marine department and Safety department of respective Ports will render mutual aid to each other under the following conditions,

1. In the event of a serious man-made or natural emergency, the parties of this agreement shall cooperate in any effort to provide service, subject to the terms and conditions prescribed in this agreement, and to the extent possible.
2. The Head of Operations of the participating Port, shall have the authority, in the event of a serious emergency, to determine whether manpower and/or equipment shall be sent beyond the jurisdictional limits of its Port.
3. It is the intention of this agreement to vest in each party the sole right to determine when its need will permit it to respond to a request by another Port, and it is further agreed by the parties hereto, that if the Marine/Safety department refrains from sending any manpower and/or equipment beyond its jurisdiction, that such unit thus failing to respond, shall not be liable for any damages to the requesting party or any third party.
4. The Supervisor of the Marine/Safety department, or such person acting in the capacity, SHALL BE IN TOTAL COMMAND of the responding party. All personnel and/or equipment of the respondents shall be under the immediate command of the person(s) attached to the responding Port. All commands or orders for the use of such personnel and/or equipment

shall be made by the supervisor of the Marine/Safety department, or such person acting in that capacity, of the requesting Port, through the person(s) in charge of the responding Port's personnel/equipment, whenever it is practical. However, the person(s) acting in authority for the responding Port shall, at all times, have the authority to recall the responding Marine/Safety personnel and/or equipment from an emergency assistance mission upon direct notice to the person(s) in authority for the requesting Port.

5. It is understood that personnel and equipment of the responding Port shall be utilized in the capacity for which they are intended, and further, SHALL NOT be held in "STAND BY" capacity for a period exceeding Two (2) hours. If said personnel and/or equipment are not needed in the emergency area by the requesting party, they will be returned to the responding Port.
6. Each Port entering into this agreement shall continue to provide the same salaries, compensation for death or disability, and retirement and furlough payments, to their respective employees or volunteers who are assigned to render aid or other assistance to the requesting Port, as that employee or volunteer would receive if on duty within the jurisdictional limits of the Port by which he or she is employed.
7. Costs of repairs and maintenance of equipment used or expended while rendering assistance under this agreement will be borne by the Port owning the equipment, if said equipment is operated by employees or volunteers of the responding Port for a period not exceeding 24 hours. If said equipment is operated by personnel from the requesting Port, or is requested for a period of more than 24 hours, then the requesting Port or Port will assume the expense of any repairs and/or maintenance required by the said equipment. It is further agreed, that if said equipment is required by the requesting Port or Port for a period exceeding 24 hours, that the requesting Port or Port will be responsible for returning the requested equipment, in good condition, to the responding Port. Where the cost of replacement of equipment used is recoverable under insurance or from a third party, the replacement of the used equipment of the responding party shall also be included in the same.
8. It shall be the responsibility of the requesting Port or Port to notify the appropriate state or other agencies of governmental authority, in accordance with all applicable laws and/or policies, the nature and extent of the emergency.
9. To prevent haphazard and/or unauthorized response to a request by a Port or Port's Marine/Safety department to emergencies outside of the jurisdiction of the responding party, NO PERSONNEL OR EQUIPMENT WILL BE DISPATCHED, except by the direct request of authorized person(s), identified in this agreement, from the responding Port or Port or an authorized representative of the District of Tiruvallur, Tamil Nadu responsible for Disaster Management.
10. Cost of meals, lodging and/or fuel, expended or consumed by personnel or equipment of the responding Port, shall be borne by the requesting party to this agreement, unless otherwise expressly stated in a separate, attached mutual aid agreement between the parties to this agreement.
11. Each party to this Agreement waives all claims against the other party to this Agreement for compensation of any loss, damage, personal injury, or death occurring in consequence of the performance of the terms of this Agreement.

12. Each party to this Agreement waives all claims identified in Paragraph 14 against signatories to any other mutual aid agreements that may exist between each of the parties to this Agreement and other jurisdictions when those signatories are performing emergency response activities within the region at the request of one of the parties to this Agreement.
13. All services performed under this Agreement shall be rendered without reimbursement to the assisting jurisdiction by the host jurisdiction unless otherwise specified by law. However, nothing in this Agreement shall be construed to prevent either party from seeking reimbursement of the costs of emergency assistance from other individuals or entities or from state or federal funding sources, as may be provided by law.
14. Any party to this agreement may, upon thirty (30) days written notice to all parties to this agreement, withdraw from further participation.

EXECUTION OF AGREEMENT

IN WITNESS WHEREOF, the parties do sign and execute this Mutual Aid Agreement.

KATTUPALLI PORT
 12° 00' N 79° 50' E
 12° 00' N 79° 50' E

Scale:
 1:10,000

Compass:
 True North
 Magnetic North
 Deviation

Legend:
 Shaded areas: Land
 Blue areas: Water
 Yellow areas: Sandbars
 Green areas: Mangroves
 Red areas: Rocks
 Black areas: Dredged channels
 White areas: Uncharted areas

Chart Details:
 The chart shows the port area of Kattupalli, India, with a large circular area marked by a dashed line and a rectangular area marked by a solid line. The chart is overlaid with a grid of latitude and longitude lines. The title block includes the port name, coordinates, and scale. The legend defines the symbols used for land, water, sandbars, mangroves, rocks, dredged channels, and uncharted areas. The chart also includes a compass rose showing true and magnetic north and a scale bar.

APPENDIX 5 – RISK ASSESSMENT

1. Introduction

Kattupalli Shipyard cum Minor Port is 32 km north of Chennai and is located just north of Ennore Port. The port basin is protected with northern (1775m) and southern (1665m) breakwater to provide required tranquillity inside the port. The approach to the port is from the East with channel dredged depth of (-) 14m below CD. The Phase -I development of port is completed with two operational container berths, one ship lift and Modular Fabrication Facility. The port has annual container handling capacity of 1.2 million TEUs. The Phase – I layout of port is presented in the following **Appendix 4**.

During the operational phase the port will witness routine vessel movement. There are chances of oil spill during the operation of the port due accidental spills caused due to collision, pipe rupture, grounding of vessels etc.

L&T Kattupalli port appointed M/S L&T Ramboll for preparation of oil spill risk assessment study for Kattupalli shipyard cum minor port. The study included carrying out oil spill modelling to assess the risk of oil spill and its impacts on the sensitive environment in the vicinity.

1.1. Scope of the Study

The scope of the study (considering only Tier – 1 Spill) is as follows:

- a. Setting up a calibrated hydrodynamic model with the measured tide and current
- b. Identification of environmental scenario representative of different seasons
- c. Hydrodynamic simulations for representative environmental scenarios
- d. Oil spill simulation for different hydrodynamic scenario and different spill quantities
- e. Prediction of weathering characteristics of spilled oils at different time intervals
- f. Prediction of spillage area at different time intervals to estimate the risk to nearby sensitive areas
- g. Quantitative assessment of the impact for each environmental scenario

1.2. Risk Assessment Structure

This assessment is organised in following manner:

- a. Meteorological and ocean data
- b. Hydrodynamic model study
- c. Statistical analyses of spill trend and accidents
- d. Categorization of oil spill
- e. Oil spill modelling
- f. Summary

Simulation of spill trajectory and weathering processes has been carried out using an in house oil spill model and simulation of HD using TELEMAR 2D model. The description of the models is discussed in the subsequent sections.

The hydrodynamic modelling, key to simulating the convection of the oil slick away from the spill location, is carried out in a depth-averaged model. The modelling has been carried out for the two monsoon seasons – North-east and South-West monsoon.

The limited measured wind and current data available to the study prevents a full scale statistical analysis of likely spill patterns for different seasons, but a range of different representative conditions can be simulated to provide a basic indication of the variability within the seasons. The measured data has been used for calibration and comparison of simulated results.

The spill quantity can range from few litres to 700tons for tier 1 spill. The spill quantity for this oil spill model study has been considered based on minimum and maximum perceived spill with respect to the spill location. Trajectory and weathering characteristics are simulated for the identified spill quantities and locations. The simulated result will be analysed for the spreading, thickness and arrival time with respect to the sensitive location.

2. Meteorological and Oceanographic Data

Meteorological conditions are important for predicting the fate of oil spill. Long term meteorological observation in proximity to the site is unavailable and the meteorological observation for Nungambakkam in proximity to the project site has been considered for the study. Indian Meteorological Department (IMD) has published the meteorological condition at Chennai, based on its 30 years daily observations. The monthly variations of the relevant meteorological parameter are elaborated in the following sections.

2.1 Monsoons

The region experiences three distinct season i.e. the South-West (SW) monsoon from mid April to mid August, the North-East (NE) monsoon from mid October to mid January and rest being the fair weather season. The SW monsoon is normally moderate in strength and the NE monsoon has significant strength. The transition period, April & May, is the hot season with very variable weather and thunder squalls.

Based on the observations and published data, monthly mean environmental states were prepared as shown in Table 1.

Table 1 Monthly mean environmental states (Climatological Table, IMD)

Wind Direction		Wind Speed in m/s	Representative Month
Morning	Evening		
W-N	N-E	4	January
W-N	NE-SE	4	February
S-W	E-S	4	March, April & May
S-W	SE-SW	4	June, July, August & September
SW-W	SE-SW	4	June, July, August & September
SW-N	N-SE	5	October
N-NW	N-NE	5	October, December

Wind Direction		Wind Speed in m/s	Representative Month
Morning	Evening		
W-NW	N-E	4	November
N-NE	N-E	4	December

2.2 Air Temperature and Relative Humidity

The region has a tropical climate with small variation in the recorded temperature during morning and evening. Table 2 presented below shows the daily average minimum and maximum recorded temperature at Nungambakkam.

Table 2: Average Maximum and Minimum Temperatures Recorded at Chennai

Temperature (° C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly max	28.4	29.9	31.9	33.6	36.4	36.6	34.7	33.9	33.5	31.4	29.2	28.1
Monthly min	20.6	21.2	23.1	25.9	27.6	27.2	25.9	25.3	25.3	24.3	22.8	21.6

May and June are the hottest months of a year with highest average maximum and the highest average minimum temperatures. December and January have the lowest average maximum and lowest average minimum temperatures.

Maximum relative humidity of 82% is experienced in the month of October. The minimum occurs in June i.e. 62%.

Table 3 provides the averaged relative humidity over different months.

Table 3: Average Relative Humidity Over a Year at the IMD Observatory

Relative humidity (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8:30	79	79	77	74	66	62	70	74	76	82	82	81
17:30	67	67	69	73	68	63	65	68	72	76	77	73

2.3 Tide

Tide measurement at the site was carried out during March 2008 for about 15 days. The measured tide data show maximum spring tide range of 0.85m and neap tide range of 0.3m. The reference tide levels in the study stretch are as follows

Mean high water spring	-	1.1m
Mean high water neap	-	0.8m
Mean low water neap	-	0.4m
Mean low water spring	-	0.1m
Mean sea level	-	0.6m

2.4 Current

Current measurement was carried out at the site for 15 days at 9m water depth. The maximum current speed recorded was about 0.3m/s and predominant direction of current flow is towards the north during the observation period. The current pattern is mainly influenced by the general monsoon climate as the strong currents are of monsoonal origin. Strength of tidal current along the coast is weak and does not influence the current direction. The current rose obtained from the measured current at the site is presented in Figure 1.

Based on the review of annual current speeds and direction from Admiralty charts and Bay of Bengal Pilot Atlas the current flow is parallel to the coast. The general current direction at the site fluctuates between northerly and southerly from February to April, whereas the current direction is northerly from May to September (SW Monsoon) and southerly from October to January (NE Monsoon). The annual variation of current speed at the project site has been reviewed and grouped under different flow conditions representing the seasons. Table 4 present the representative current speed and direction prevailing in the project site. The detail of hydrodynamic model simulation for the representative current scenarios for different season is available in section – 3

Table 4 Hydrodynamic flow scenario for the representative month

Current		Representative season	Representative month	Hydrodynamic Scenario
Flow Direction	Speed (m/s)			
Northerly	< 0.2m/s	Non monsoon	January	Scenario - I
Southerly	<0.2m/s	Non monsoon	February	Scenario - II
Northerly	0.2 – 0.5 m/s	Monsoon	March, April, May, June, July, August and September	Scenario - III
Southerly	0.2 - 0.5 m/s	Monsoon	October, November and December	Scenario - IV

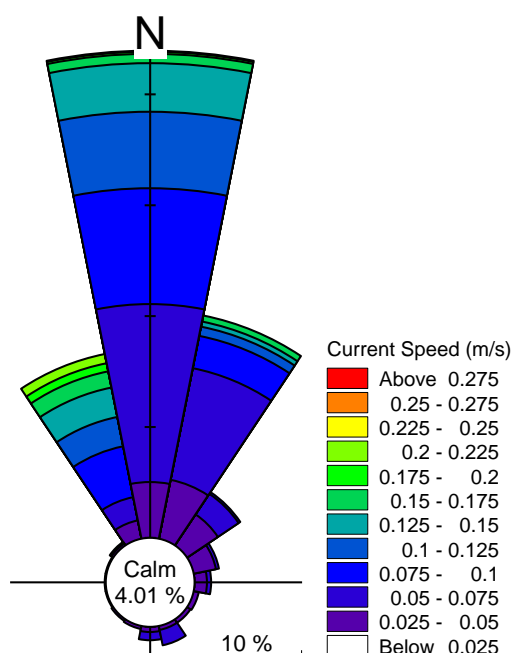


Figure 1 Current rose for the month of March, 2008

2.5 Representative Environmental Scenario

The objective of this study is to carry out oil spill modelling for various oil spill quantities under different environmental conditions. It is not always possible to carry out oil spill model study for the annual environmental variation. However it is always possible to carry out these studies for the representative environmental conditions. Based on the analysis of the available in-house data and measured wind data (August, September and October) provided by the client following environmental combinations have been arrived as presented in Table 5.

Table 5 Environmental Scenario for Oil Spill Model Study

Wind Direction Morning	Wind Direction Evening	Wind Speed m/s	Temperature in ° C	Hydrodynamic scenario	Representative month	Environment Scenario
W-N	N-E	4	27.0	Scenario - I	January	Scenario - I
W-N	NE-SE	4	29.0	Scenario - II	February	Scenario - II
S-W	E-S	4	32.7	Scenario - III	March, April & May	Scenario - III
S-W	SE-SW	4	33.0	Scenario - III	June, July, August & September	Scenario - IV
SW-W	SE-SW	4	33.0	Scenario - III	June, July, August & September	Scenario - V
SW-N	N-SE	5	30.0	Scenario - IV	October	Scenario - VI
N-NW	N-NE	5	29.0	Scenario - IV	October, December	Scenario - VII

Wind Direction Morning	Wind Direction Evening	Wind Speed m/s	Temperature in ° C	Hydrodynamic scenario	Representative month	Environment Scenario
W-NW	N-E	4	28.0	Scenario - IV	November	Scenario - VIII
N-NE	N-E	4	27.0	Scenario - IV	December	Scenario - XI

3. Hydrodynamic Model Study

The study of hydrodynamics encompasses the study of fluids in motion and the consequence of it. For a marine environment, the effects are more pronounced. Marine hydrodynamics is a vast sphere of study and one of the major components of it is the study of currents and the effects of it. The effects are identified as forces on marine structures, transport of sediments, advection-dispersion, erosion and accretion along coast leading to changes in shoreline etc. The final aim of this study is to estimate the fate of spilled oil in and around the study area. Detail study of hydrodynamic conditions at and around study location is necessary to simulate the fate of oil spilled near that area and the effect of it on the surrounding sensitive environment. The flow conditions around an area will have a major role in deciding the fate of oil spilled in that area, as this can act as the major driving force in the dispersion of oil in open sea and coastal areas.

With development in advanced computing methods, numerical modelling has replaced the earlier methods of study. Various numerical modelling software have been developed for this purpose. These software have the ability to solve complex equations involved in the study of hydrodynamics in efficient and less time consuming manner.

This study aims at setting up a calibrated hydrodynamic model using numerical modelling software to simulate the ground conditions. The calibrated model will be then used for carrying out further studies on oil spill model.

3.1 Bathymetry

The bathymetry of the study area is reconstructed by digitising the Naval Hydrographic Office (NHO) chart No's 313 and 3028, blended with ETOPO - I data and site specific bathymetry survey by M/s Indomer Coastal Hydraulics (P) Limited, Chennai (INDOMER). Other bathymetric features like dredge channels and breakwaters were obtained from the DPR for the development of Shipyard cum Port complex at Kattupalli. The general bathymetry of the study area has been prepared with a reasonable mesh resolution so that the shoals and other features like dredged channels can be reproduced without compromising on the simulation time. The model is shown in Figure 2.

3.2 Methodology

The purpose of this model study is to setup a hydrodynamic model of the area and to calibrate the model so as to achieve a similarity between the observed and simulated conditions to the maximum possible extent. This is necessary because the calibrated model will then be used for the subsequent studies. To achieve a properly calibrated model, a proper methodology has to be laid down and it has to be ensured that each of the steps is done with minimum possible errors.

The following steps were adopted to conduct the study:

- a. Identification of Inputs
- b. Setting up of model domain
- c. Application of boundary conditions
- d. Model calibration

The following sections are prepared on the lines of the identified methodology.

3.3 Model Inputs

Good quality inputs are necessary for carrying out a good model study. Various inputs required for the study were collected from reliable sources and analyzed to ensure its quality. Inputs used in this model study are bathymetry, tide, current and wind, detail descriptions of which are given in section 2.

3.4 Model Setup

Hydrodynamic model was set up using TELEMAC-2D module of TELEMAC modelling system. A brief description of the TELEMAC-2D is provided in the following section, which is followed the sections on model calibration using TELEMAC-2D and the results of hydrodynamic simulations for various seasons.

3.4.1 TELEMAC-2D

The TELEMAC is a set of finite element programs developed by National Hydraulics and Environment Laboratory (Laboratoire National d'Hydraulique et Environnement - LNHE) of the Research and Development Directorate of the French Electricity Board (EDF-DRD). It uses a string of common processes (digitization and graphics) and contains two and three dimension modules for the study of currents, sedimentation, waves and water quality.

TELEMAC-2D is a program forming the core of TELEMAC Modeling System for the solution of the two dimensional Saint-Venant equations. The water depth and the velocity averaged on the vertical are the main variables, but the transport of a passive tracer as well as turbulence can be taken into consideration. It uses triangular finite element discretization and can work with quadrilateral elements also. TELEMAC-2D can be used for numerous studies in fluvial and maritime hydraulic applications.

The appropriate governing equations for studying water environment in coastal and estuarine areas are the two-dimensional shallow water equations. These are obtained by vertically integrating the three dimensional Navier-Stokes equations of motion making the following simplified assumptions,

- ❖ The flow is incompressible
- ❖ The flow is well mixed
- ❖ Vertical acceleration is negligible
- ❖ Bed stress can be modelled

Simulation of hydrodynamics is based on the following non-linear vertically integrated 2-D equations of conservation of mass and momentum.

3.5 Continuity Equation

$$\frac{\partial z}{\partial t} + \frac{\partial uh}{\partial x} + \frac{\partial vh}{\partial y} = 0$$

Equation of Motion in X-direction

$$\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} + g \frac{\partial z}{\partial x} + \tau_{hx} - C_f v - E_c \nabla^2 u = 0$$

Equation of Motion in Y-direction

$$\frac{\partial v}{\partial t} + u \frac{\partial v}{\partial x} + v \frac{\partial v}{\partial y} + g \frac{\partial z}{\partial y} + \tau_{hy} + C_f u - E_c \nabla^2 v = 0$$

Where,

z : Water surface elevation

h : Total water depth ($z+d$)

u, v : Velocity components in X & Y direction

C_f : Coriolis force

E_c : Eddy viscosity coefficient

d : Depth with respect to CD

These equations are numerically solved by finite element technique in TELEMAC.

3.6 Model Calibration with TELEMAC-2D

The above-described, TELEMAC-2D of the TELEMAC Modelling System was used to simulate the conditions for the model domain using the inputs available. The following is a description of the process that was adopted for the simulation and the results that were derived from it.

3.7 Model Domain and Bathymetry

The aim of present study is to predict the fate of oil spilled in the study location and the effect of it on the nearby sensitive and important areas. The farthest sensitive and important areas which can be affected by the oil spill in the study location are identified as Pulicat in the north and Chennai Port in the south. Therefore, the domain includes a shoreline of approximately 62 km, including mouth of Pulicat Lake in the north and Chennai Port in the south. The model domain extends till about 200m depth in offshore and the offshore boundary is kept almost parallel to the coastline. The model domain covers a region of about 62X25km². The mesh size near target location was kept low (restricted to 60m) to resolve the proposed schemes and velocities properly. The model bathymetry was prepared using the bathymetric input as discussed in section 4 and is shown in Figure 2.

3.8 Boundary Conditions

Tidal levels were applied along northern and southern boundaries of the model domain. In order to set up the model, tidal elevations along North and South boundaries were predicted using OTPS developed by OSU.

OTPS accomplish 2 tasks:

- ❖ Extracting harmonic constants from barotropic tidal solutions in OTIS format at given locations
- ❖ Predicting tides at given times and locations

Predictions are based on global and/or regional barotropic inverse tidal solutions obtained with OTIS.

Tide prediction was done for the period from 17-March-2008 to 31-March-2008 as there is an available long term observation of tidal elevations and current velocities which coincides with this time period.

The effect of wind on the local hydrodynamics was accounted by applying time varying wind field, representative of different seasons for entire domain.

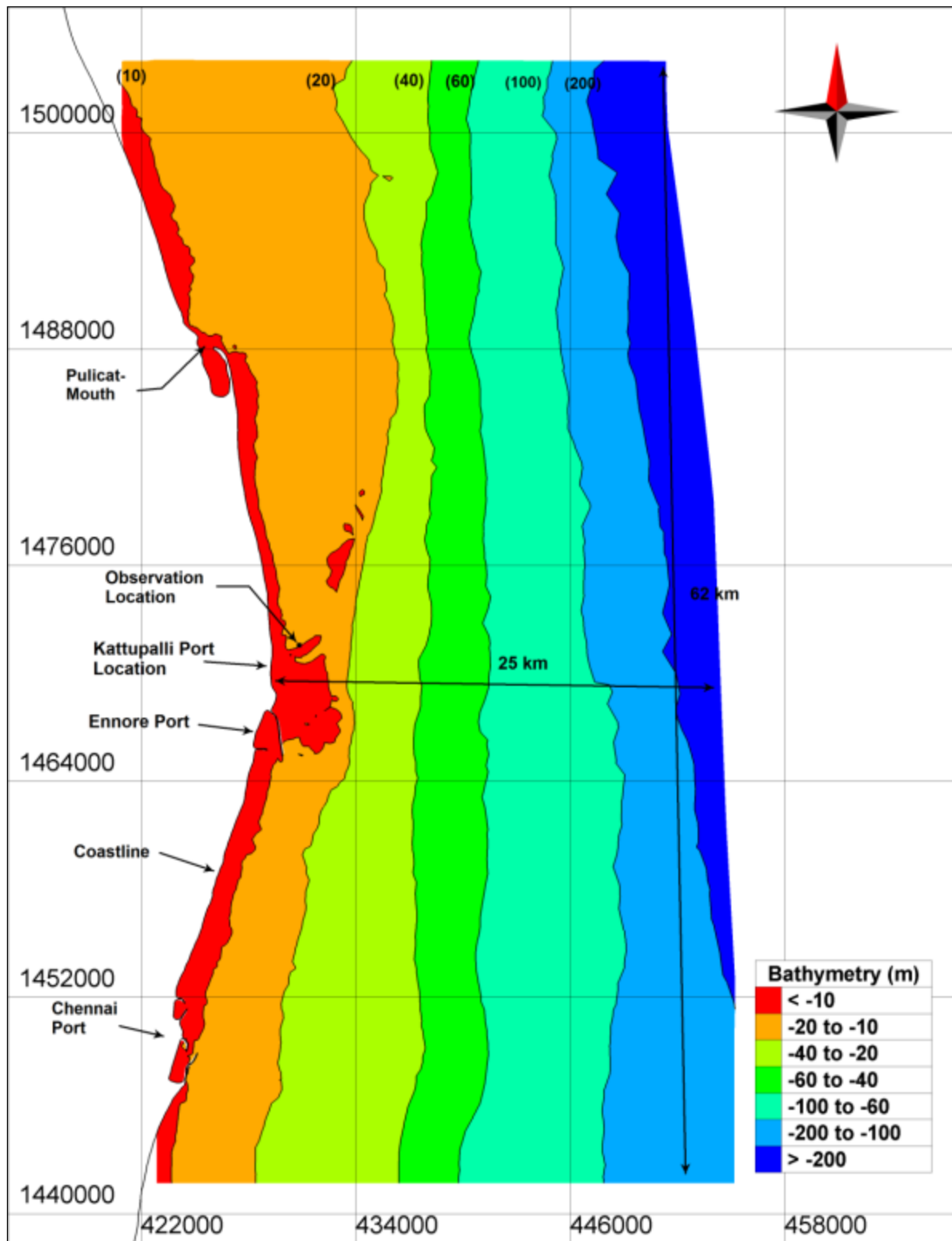


Figure 2 Model Bathymetry for Calibration

3.9 Model Calibration and Results

Using the parameters specified in the previous section, simulations were carried out in TELEMAC-2D for the period 17-March-2008 to 31-March-2008. Various parameters were adjusted during simulations to achieve proper calibration of model. Calibration of model was done by comparing the observed current and tide with the simulated current and tide at the same point. The results showed good correlation with the observed data. The following Figure 33 shows the flow pattern at the site obtained from the simulation.

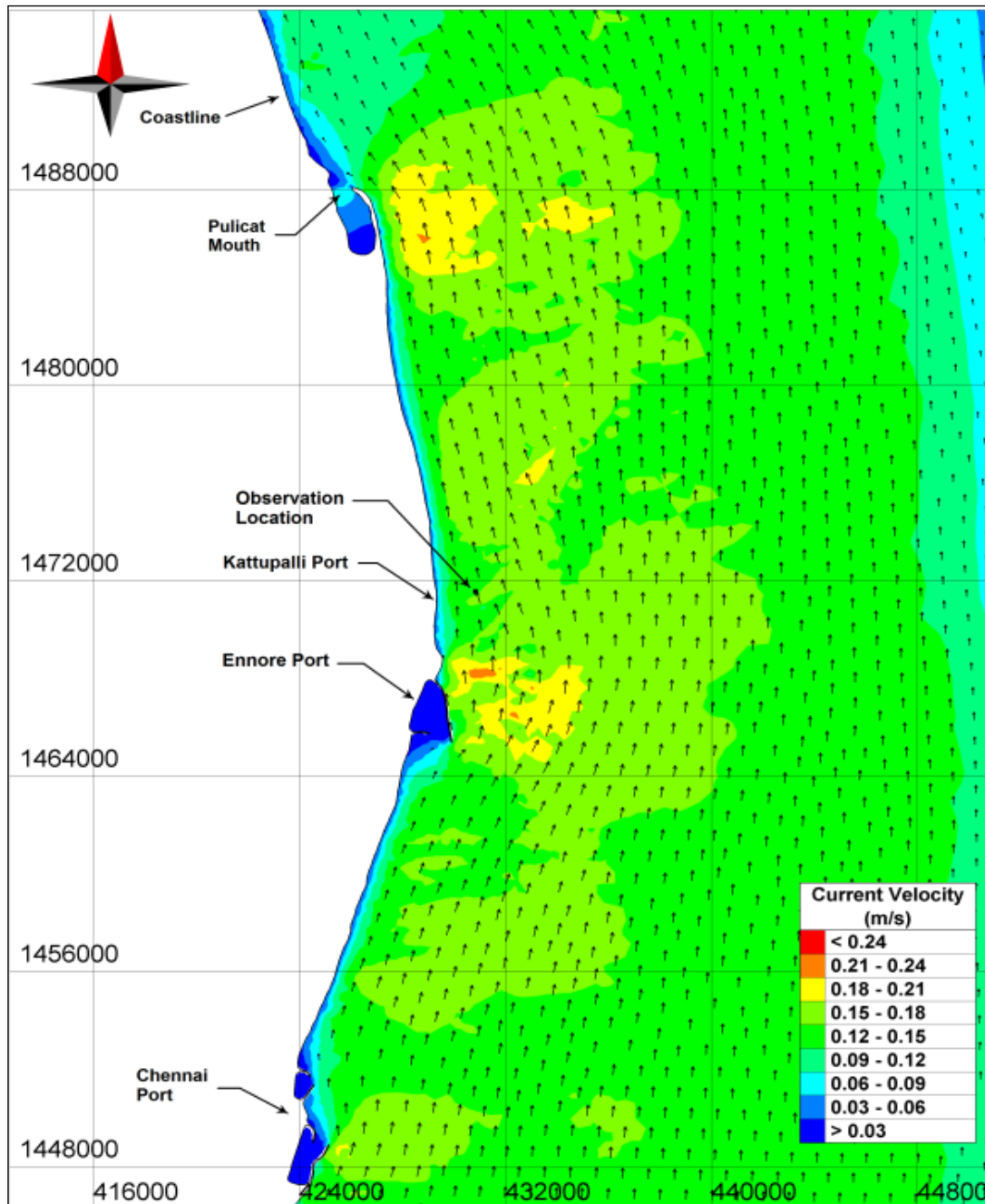


Figure 3 Plot Showing Typical Flow Pattern (Northerly)

Comparison of simulated tide and currents with those observed (at 13°18'38"N, 80°21'41"E) at site were made and are shown in Figure 44 and Figure 5 respectively.

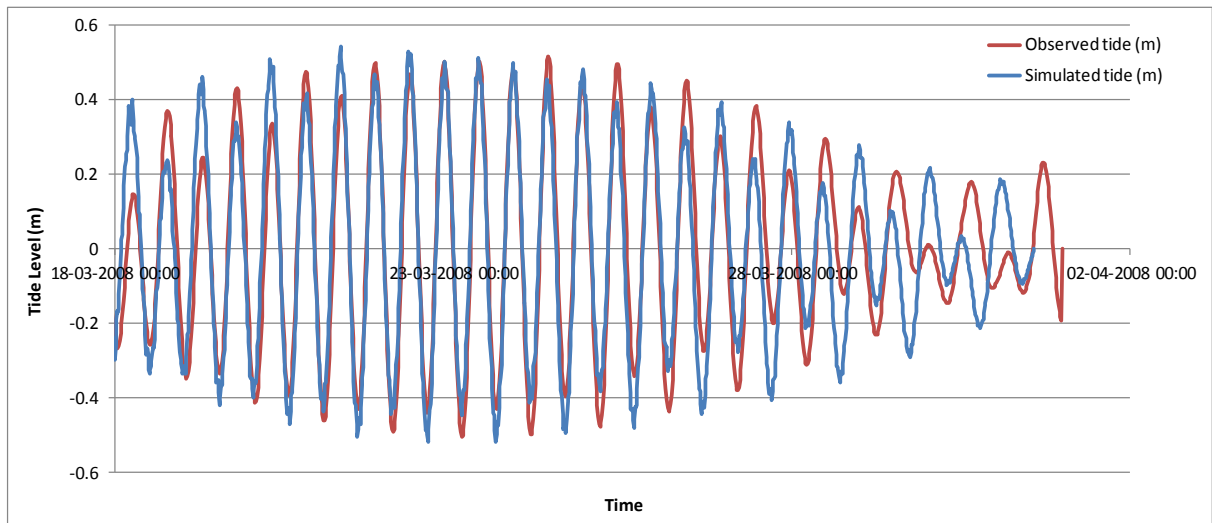


Figure 4 Comparison of Tidal Elevations

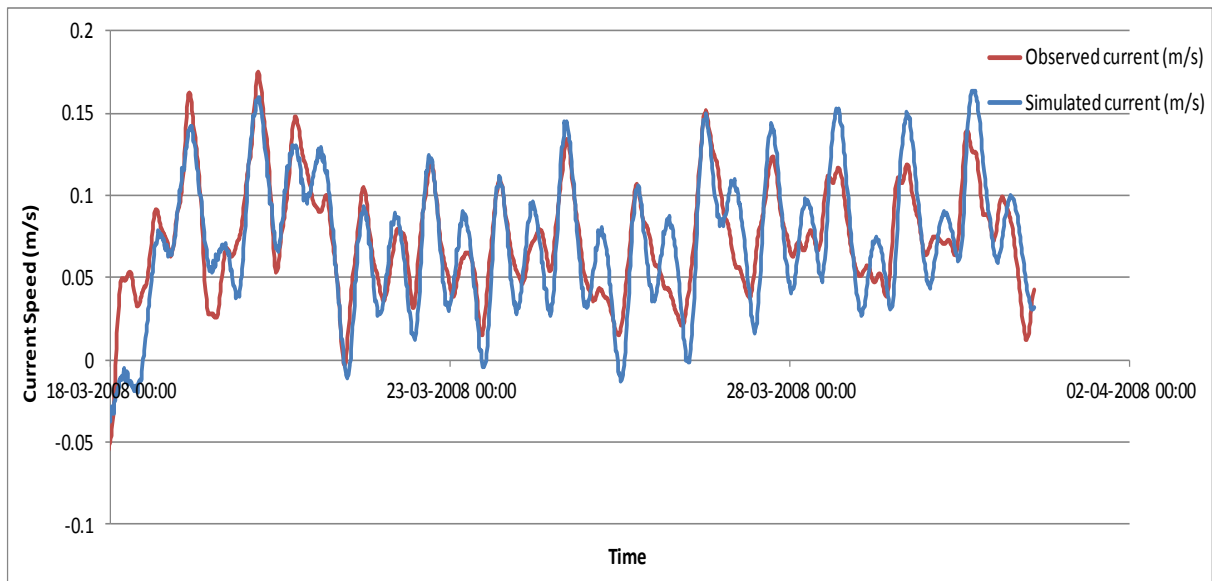


Figure 5 Comparison of Current Velocity

3.10 Model Setup Including Kattupalli Port Layout

A similar model was setup to that as described in previous section with the layout of Kattupalli Port incorporated into it. The bathymetry for the same is shown in Figure 6.

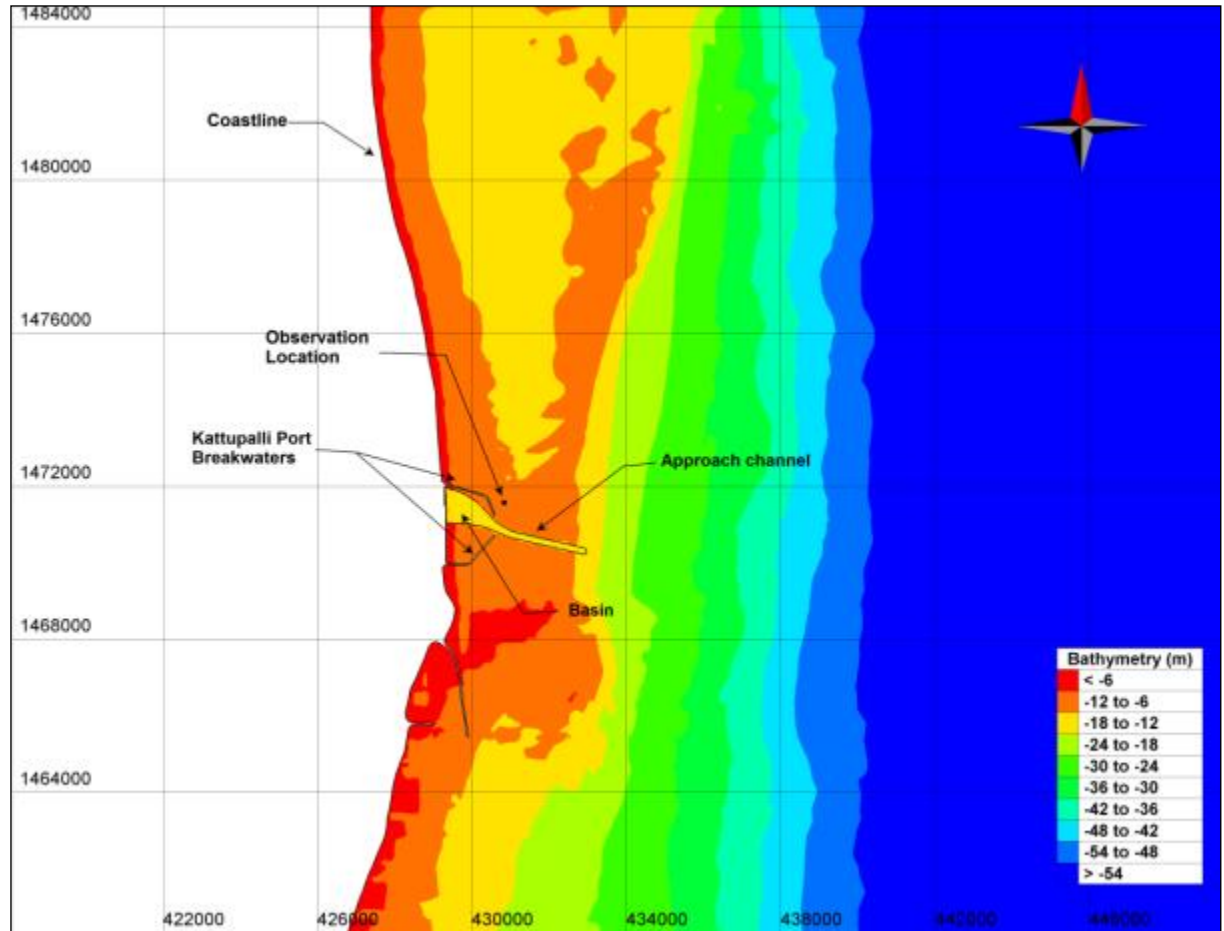


Figure 6 Bathymetry Incorporating Kattupalli Layout

Simulations were carried out for various seasons and typical results are shown from Figure 7 to Figure 11.

The flow at the study location is parallel to the coast in general, but the direction and magnitude is found to be varying with seasons and environmental conditions. Simulation results shows a maximum current speed of around 0.2m/s during non-monsoon season, which increases upto 0.5m/s during monsoon season. Current speed is very low during calm weather condition, which is around 0.05m/s. The flow shows an increase in velocity at the entrance of Kattupalli port due to the presence of breakwater, deeper channel depth and the shallow depths due to shoals. The velocity at this location reaches upto 0.75m/s during south-west monsoon. A weak eddy is also found to be forming on the north-west side of Kattupalli port, during northerly flow of non-monsoon season.

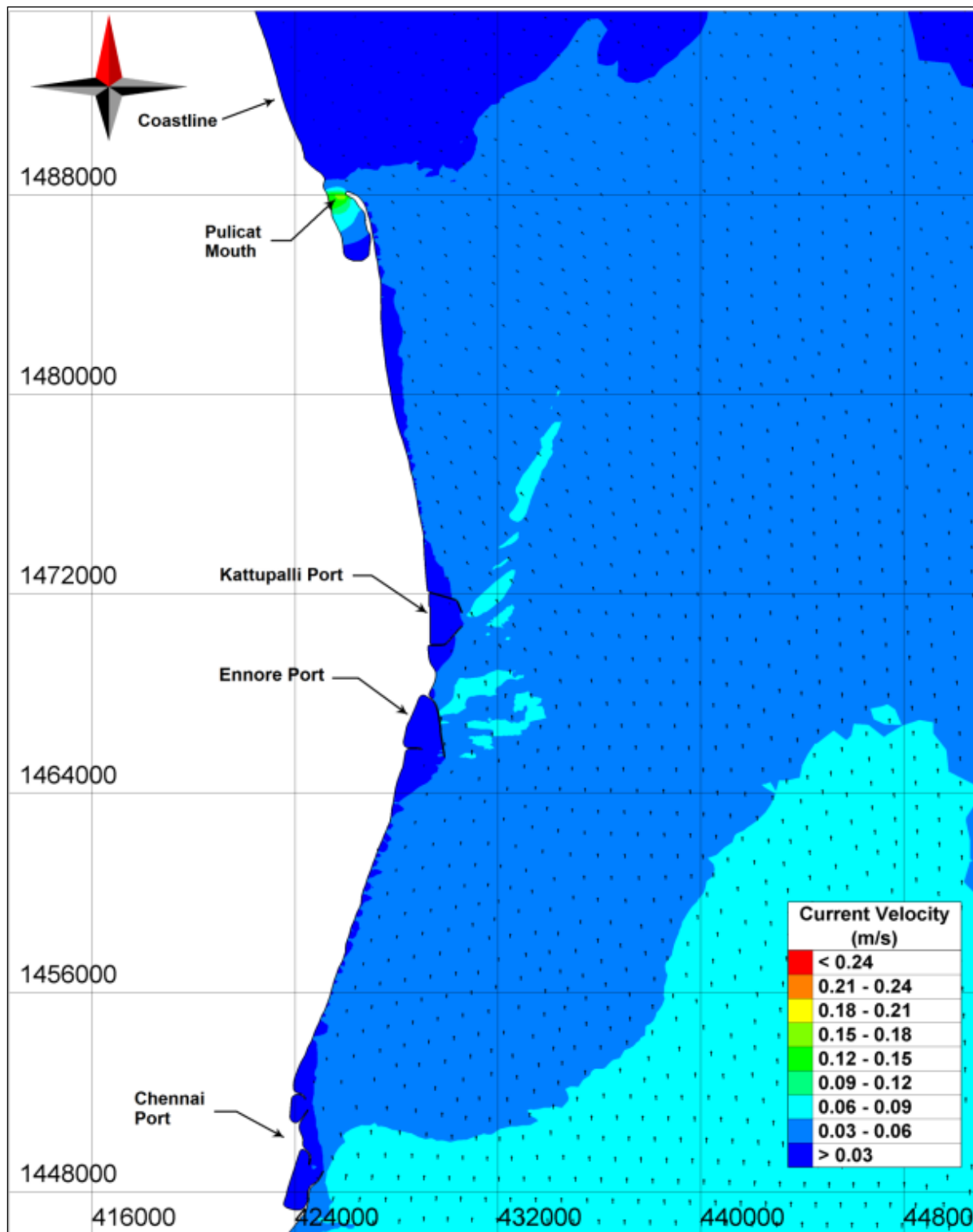


Figure 7 Plot Showing Typical Flow Pattern during Calm Condition

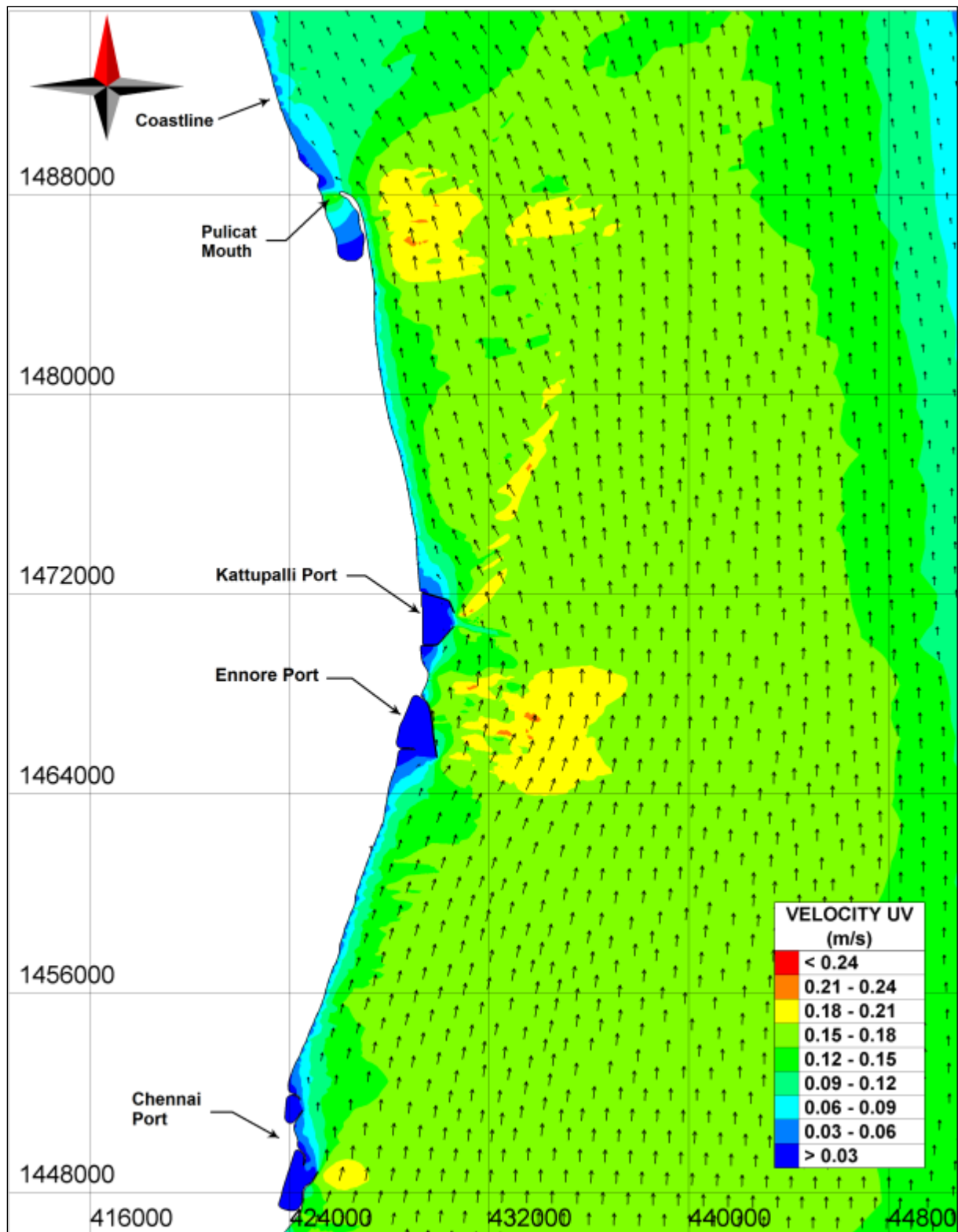


Figure 8 Plot Showing Typical Flow Pattern during Non-Monsoon Season (Northerly)

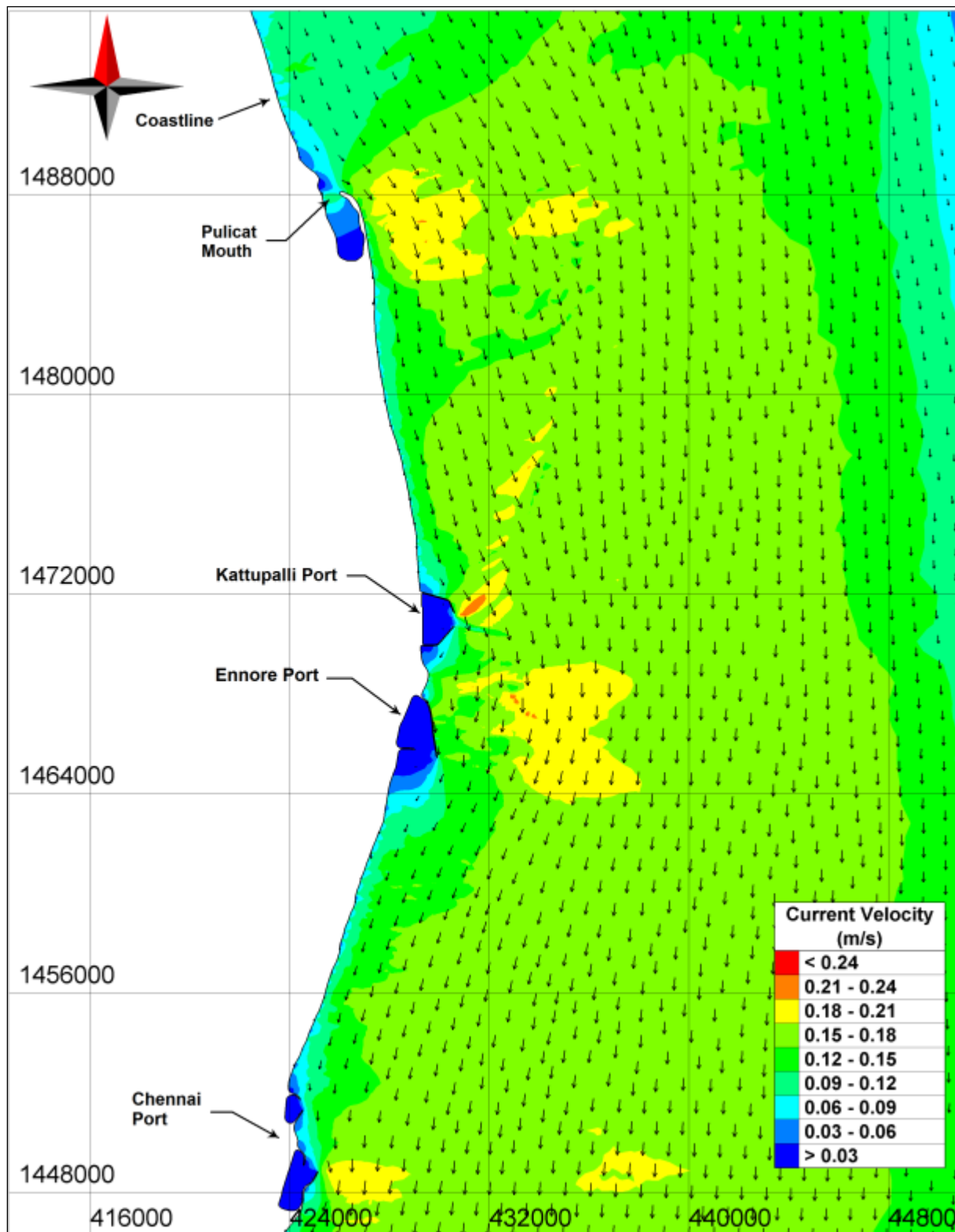


Figure 9 Plot Showing Typical Flow Pattern during Non-Monsoon Season (Southerly)

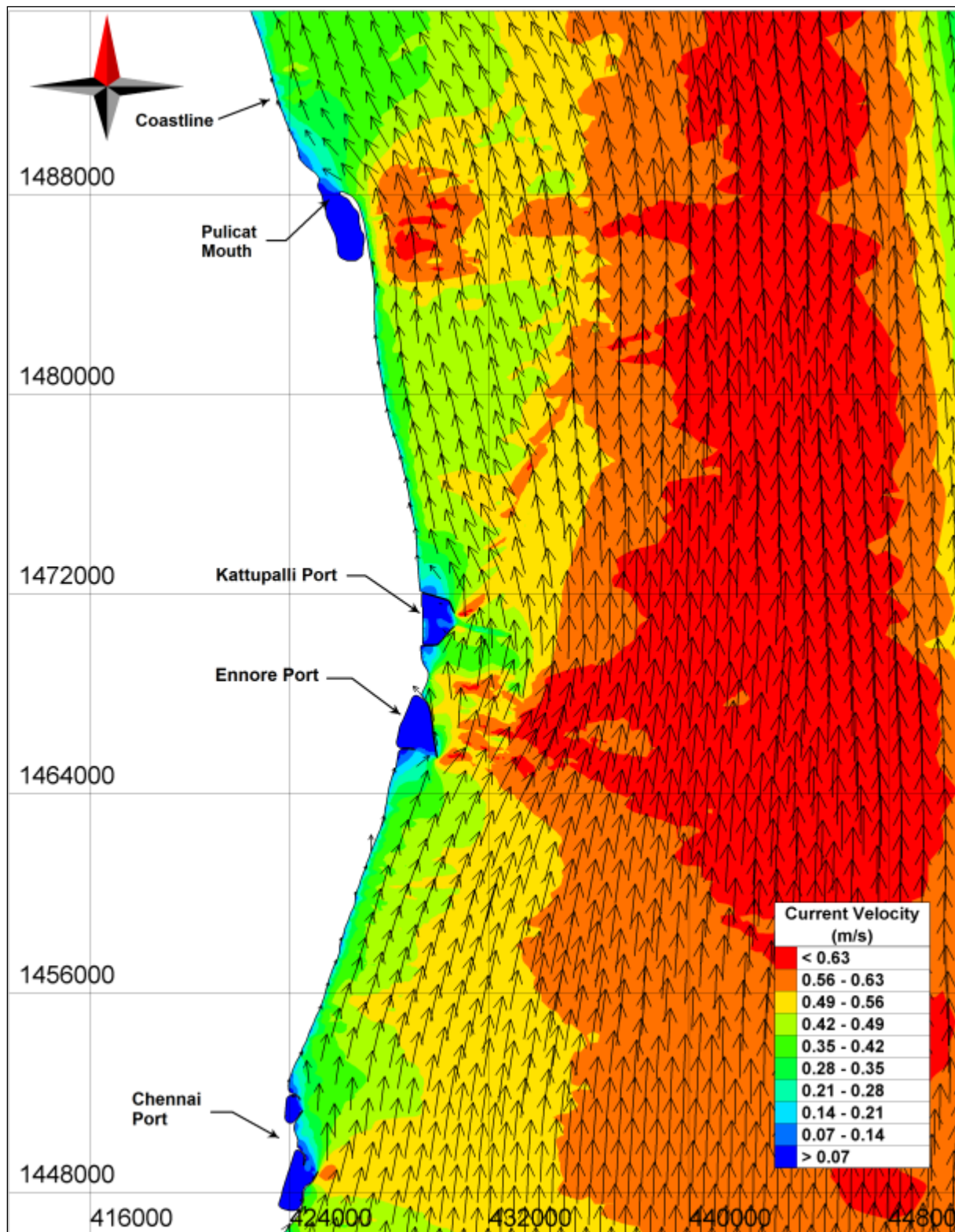


Figure 10 Plot Showing Typical Flow Pattern during Monsoon Season (Northerly)

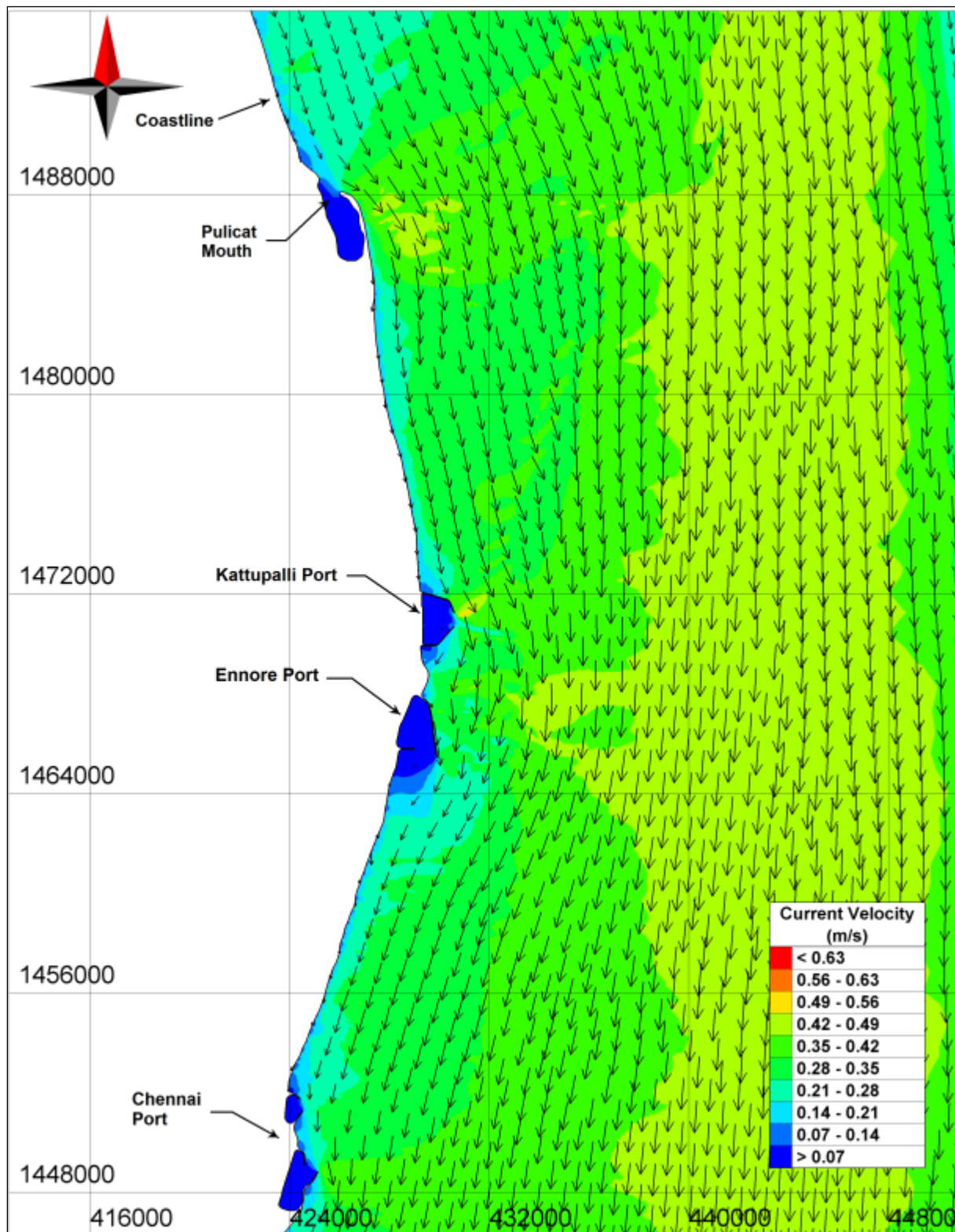


Figure 11 Plot Showing Typical Flow Pattern during Monsoon Season (Southerly)

4. Oil Spill Scenario and Location

The vessel traffic in Kattupalli Port can be categorized as follow:

- ❖ Newly built vessel from shipyard
- ❖ Vessel coming for repair and maintenance
- ❖ Container & Project Cargo vessel
- ❖ Port crafts

The frequency of vessel traffic at the port is high for Container, Project cargo vessels and port crafts, accordingly the probability of oil spill from these vessels are also relatively high. The data of typically largest size vessel expected to call will be post panama data is presented below in Table 10-1.

Table 10-1 Information on the typical vessel (MV Maersk Dalton called Port in Jan 13)

Dimensions of the vessel	
Length overall	292.0 m
Beam	32.0 m
Draft	13.0 m
Details of fuel tanks	
Number of storage tanks with capacity greater than 1880 M ³	2 Nos
Number of storage tanks with capacity greater than 1530 M ³	2 Nos
Number of storage tanks with capacity greater than 950 M ³	3 Nos
Number of storage tanks with capacity greater than 750 M ³	1 Nos
Number of storage tanks with capacity greater than 50 M ³	9 Nos
Number of storage tanks with capacity less than 50 M ³	2 Nos

Typically the fuel tanks of the vessels are store upto 90% of its total storage capacity. The capacity largest fuel tank of the vessel considered is 1880 m³ and with 90% storage the total fuel oil stored will be approximately 1692 ton. Considering fuel consumption of 30% to 40% on account of voyage from last port of call the likely maximum quantity of fuel available in tank will be 1000 Ton.

It is highly unlikely that entire fuel will be spilled due to collision, considering the fact that oil is stored in bunker tanks that are uniformly distributed across the ship's hull. In case of collision only the tanks that are in the vicinity to the impact zone has the risk of spilling oil. Since the navigation of vessel in port will be carried out by experienced harbour pilot who has thorough knowledge of Port navigational condition. , The berthing / de-berthing operations will be carried out with assistance of Tugs. Considering the operating conditions of port, probability of large spill inside port and within port limits is very small.

However there is high probability of small spill occurring during bunkering operation, overfilling of sumps, leakage of tank, leakage from valves/pipelines or transfer hoses, accidental discharge of bilge water from vessels etc. This spill generally fall under Tier –I and onsite capability is mostly sufficient for such events.

The ports have the capacity to manage Tier – I spills up to 700 tons occurring within the port limits. This capacity is generally effective to contain the spill within the enclosed basin of the port. The spill closer to the port entrance and outer channel can spread out into the open sea faster under the influence of the prevailing winds which are generally contained when the spill quantities small and prevailing weather conditions favourable.

The worst case scenario for oil spill will be limited to 200 – 700 Tons at the port entrance and outer approach channel. The spill when takes place during the monsoon spreads faster making the combat infrastructure of the port insufficient and calling for Tier – II infrastructure to be mobilized. Therefore any oil spill closer to the port entrance and outside port basin is considered to be worst case scenario for oil spill management particularly when the spill happens during monsoon.

Based on the analysis of the spill trend in section 5, it is noticed that majority of the spills have occurred inside or in vicinity to the port with volume of spills ranging from few litres to over 700ton. Hence the spill trend from these analyses has been considered for framing the spill scenario representative of the cause. It is not always possible to simulate the entire range of scenario for each spill hence minimum and maximum perceived spill has been considered for oil spill model study.

Error! Reference source not found. presents the spill quantities and duration for representative spill condition and the probable location of spill.

Table 10-2 Spill scenario and representative spill condition

S.No.	Spill location	Spill quantity	Spill Duration	Representative condition
1	Container berth	100 litre & 1 ton	0.5 hour & 1 hour respectively	Leakage from valves & bunkering
2	Container berth	100 ton	4 hours	Collision during berthing
3	Turning circle	200 ton	2 hours	Collision
4	Turning circle	700 ton	4 hours	Collision
5	Port Entrance	200 ton	2 hours	Collision / grounding
6	Port Entrance	700 ton	4 hours	Collision / grounding

S.No.	Spill location	Spill quantity	Spill Duration	Representative condition
7	Approach Channel	200 ton	2 hours	Collision
8	Approach Channel	700 ton	4 hours	Collision

The Sl. No. 4, 6 & 8 is considered as worst case scenario.

5. Statistical Analysis of Oil Spill Trends and Accidents

Whenever oil is produced, refined or transported in any form, there is a risk of environmental degradation from the crude and refined petroleum products due to spill. While most of the spills are small, but few of the spills are large enough which can cause serious impact to the sensitive environment (like mangroves, bird sanctuary, marine biota etc) having short and long term implications.

Occurrence of oil spill is likely (perceived risk) considering over 75% of India's oil requirement is met through import. Trend of oil spill incident are low from what it has been four decades ago, due implementation of several measures to prevent spill. But the environmental impacts involved with oil spill are high for every single spill and once oil spill has taken place, quick preventive measures have to be adopted to prevent further damage. Having contingency plan of a perceived oil spill can significantly control the potential harm caused to the environment.

Examination of worldwide historical data on shipping accidents identifies grounding and collision as the major causes of oil spill. The risk of a serious marine spill is directly related to:

- ❖ Frequency of ship movement
- ❖ Physical and mechanical condition of the ship and its equipment
- ❖ Performance of ship's crew, including pilot
- ❖ Traffic density
- ❖ Hydrographic and meteorological conditions

5.1 Causes of Oil Spill

The causes of spill and the circumstances under which the spills have occurred are different and no two spill scenarios are alike, but they have a significant influence on the final spill quantity. Most of the spill is caused by human error or sometimes intentionally when the ship crew members do not follow the protocol procedures. International Tanker Owners Pollution Federation (ITOPF) has analysed the incidence of spills of different sizes in terms of the operation and the activity the vessel was under taking at the time of the incident and the primary cause of spill. The cause of spill can be grouped under the following categories for Tier -1 Spill

- I. Collision between vessels - Spill due to striking or being struck by another ship, whether under way, anchored or moored. This excludes striking wrecks.
- II. Collision involving vessel and fixed installation – Spill due to striking with fixed installation.
- III. Fire/ Explosion – Spill due to fire and/or explosion.
- IV. Hull damage – Spill due to structural failure.
- V. Bunkering – Spill due to failure or error during loading/unloading cargo or fuel oil. This includes loading/unloading in port and during ship to ship transfer. Typical cause of spill is over flow, hose failure, errors in setting valves etc.
- VI. Vessel Grounding – Rugged near shore terrain has been cause for many ships getting grounded and being wrecked.
- VII. Other – Spill due to accidental discharge, hydraulic line failure, error due to internal fuel transfer.

5.2 Analysis of World Statistics of Oil Spill

Historical data analysis is a tool widely used in the field of risk analysis and accident investigation for various purposes. In the case of oil spills, it can be used to determine statistical trends capable of describing the factors most likely to cause an accidental spill, as well as the most frequent locations of the accidents.

ITOPF maintains a database of oil spills from tankers, combined carriers and barges, which contains information on spillages since 1970 accounting over 10,000 incidents of oil spill.

Information in the database is consolidated from published sources, such as the shipping press. The information from published sources generally relates to large spills, often resulting from collisions, groundings, structural damage, fires and explosions and hence is better documented. Whereas the majority of individual reports relate to small operational spillages and complete information of type of spill is rarely available with respect to quantity, duration and cause of spill.

ITOPF provides yearly statistical bulletin about maritime oil spills from tankers, barges and combined carriers. Figure 12 provides the accounted oil spill quantity during 1970 -2011. It can be observed that few big spills in a decade have largely contributed to the overall average spill quantity. ITOPF have classified the spills according to their size i.e. < 7 tons, 7 - 700 ton and > 700 ton. The percentage distribution of oil spill and number of spill greater than 700 ton over the past four decades is presented in the Figure 13 and Figure 14.

The figures show an evident decrease in the number of spills after 1980. During the 1990s, the annual spill volume from tankers has been less than one-tenth of the spill volume experienced during the 1980s. Stringent measures are being adopted by world bodies to prevent oil spills and this has brought the numbers down. The measures include structural modification of oil tankers, owners being made accountable for clean up etc.

At the same time, recent fuel oil spills from freighters involved in collisions and groundings have raised awareness of the risk of oil spills from bunker tanks of sea going vessel. The

average percentage of spills in the 2000s was close to 15, whereas same in the 1990s was almost double this number. Table 6 presents the number of spills in the range of 7-700 ton.

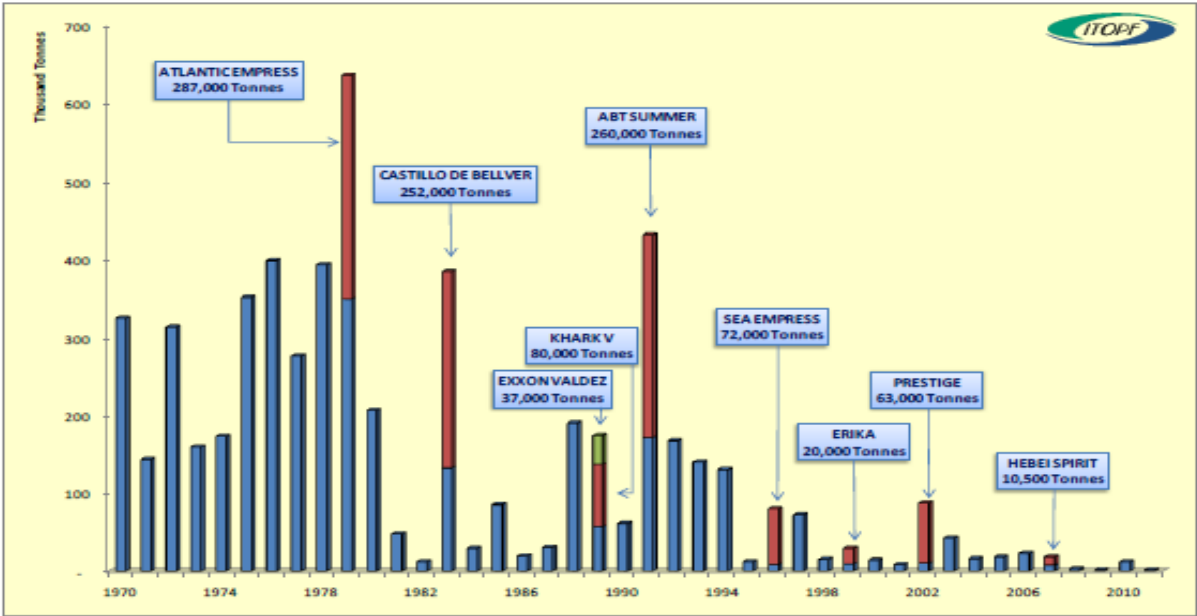


Figure 12 Accounted Oil Spill Quantity Over 7 ton, 1970 – 2011

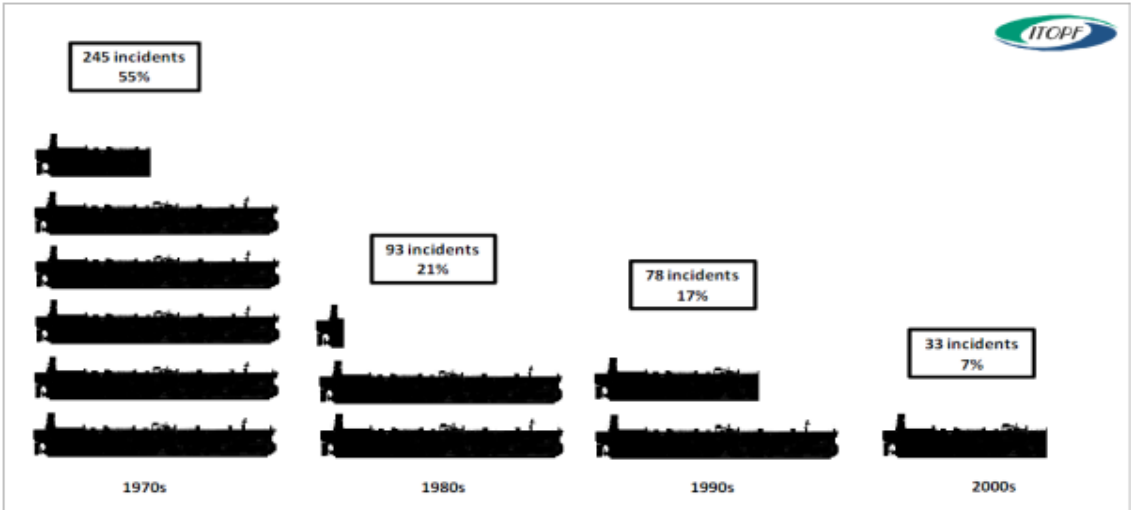


Figure 13 Percentage of Major Oil Spill >700 ton Incident during 1970 – 2011

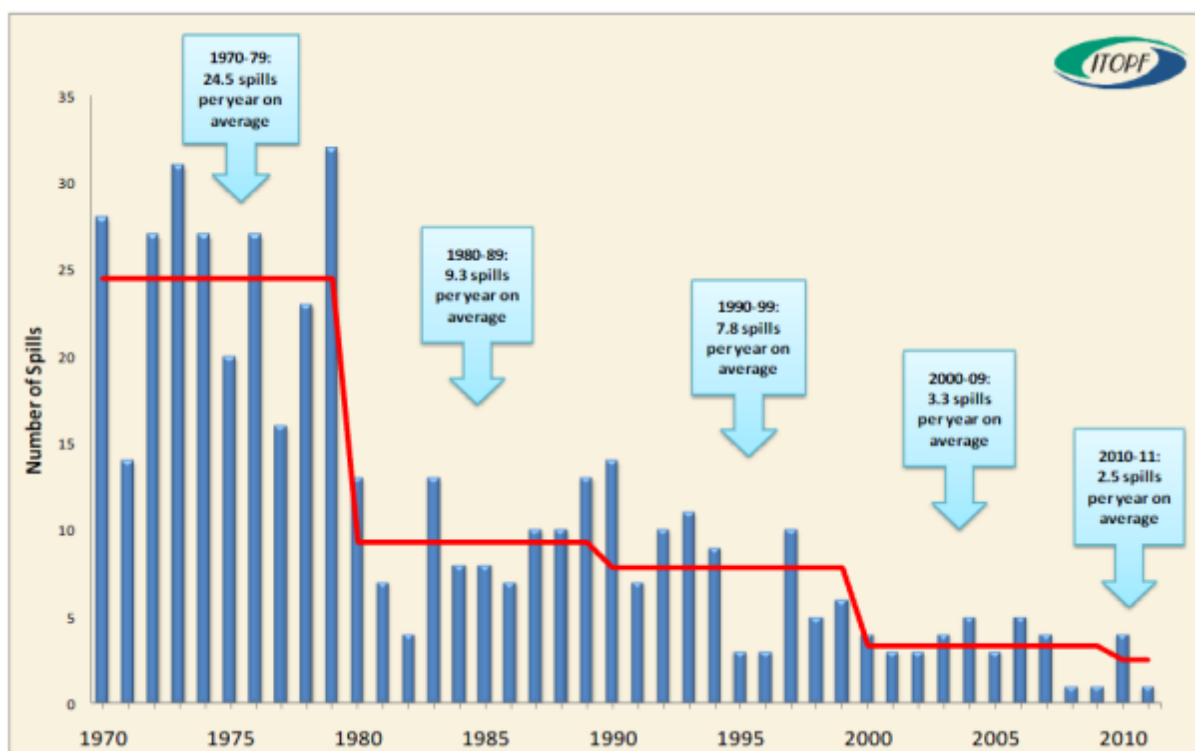


Figure 14 Average Number of Spill Incidents During 1970 to 2011

Table 6 Recorded Oil Spill During 1970 to 2011

Year	7-700 ton	Year	7-700 ton	Year	7-700 ton	Year	7-700 ton	Year	7-700 ton
1970	7	1980	52	1990	51	2000	21	2010	4
1971	18	1981	54	1991	30	2001	17	2011	4
1972	48	1982	46	1992	31	2002	13		
1973	28	1983	52	1993	31	2003	17		
1974	90	1984	26	1994	26	2004	17		
1975	96	1985	33	1995	20	2005	22		
1976	67	1986	27	1996	20	2006	13		
1977	69	1987	27	1997	28	2007	13		
1978	59	1988	11	1998	26	2008	8		
1979	60	1989	33	1999	20	2009	7		
Average Spill Quantity	54.2		36.1		28.3		14.9		

The small and medium spill incidents account to 95% of the total spill recorded of which 69% account for spills during loading and discharge of fuels. The predominant causes of these spills are equipment and hull failure.

Table 7 presents the number of spill incidents less than 7 tons with respect to the causes and operation linked to the spill. Small spills are of importance to the present study wherein the probability of small spill is relatively high during the operation of the port.

Table 7 Number of Spill for Spill Incidents Less than < 7 tonnes

Causes	Operation			
	Loading / Discharging	Bunkering	Other operations	Unknown
Collision	1	2	11	168
Grounding	2	0	9	228
Hull failure	324	10	47	196
Equipment failure	1123	104	250	202
Fire / Explosions	50	5	34	84
Other unknown /	1656	442	919	1974
Total	16	563	1270	2852
<i>Source: oil Tanker Spill Statistics 2011</i>				

The primary cause of an accident in coastal areas will be grounding or collision. These incidents will normally result due to human error but machinery fault (propulsion or steering gear) may also be a contributory factor for grounding within confined waters. Accident due to these reasons have decreased due to the improvement in the vessel design, navigation aids communication and most importantly the legislation incorporated by the world bodies. However it should be noted that accidents due to human error is still primary cause for accidents.

5.3 Oil Spill trend in India

The trend of oil spill in India is not very different when compared with the world scenario. India has a vast coast line of about 7500 km and is dotted with very sensitive ecosystem such as coral reef, mangroves, estuaries and delta which are rich in biodiversity. India contributes 7% of the world wetland forest, which are very sensitive to oil spills.

India has 13 major ports and 130 minor sea ports located in its coastal zones which are the gear to the growing Indian economy. Government of India through National Oil Spill Disaster Contingency Plan (NOS-DCP) have put in place several oil spill management policy in the country to reduce and prevent the oil spill incident with Indian Coast Guard as its nodal agency.

Indian Coastguard also documents the oil spill incidents being reported in various parts and at different time periods along the coast. Several of these spills were of small quantity and have not been estimated or reported properly. Some of the major / minor oil spills in the Indian coastal zone during 1970 to 2011 have been summarized and presented below in Table 8.

Table 8 Major and Minor Spill Along Indian Coast

S.No.	Date	Spilled quantity in Ton	Oil Type	Location with respect to nearest coast	Vessel involved
1	Aug '70	15,622	FO	NW coast of India (off Kutch)	Greek oil tanker Ampuria
2	Jun '73	18,000	LDO	NW coast of India of the Arabian Sea	MT Cosmos Pioneer
3	Sep '74	3325	FO	Kiltan, Lakshadweep	American oil tanker Transhuron
4	Jul '76	29,000	Not available	Off Mumbai	Crestan Star
5	Jun '79	11,000	Not available	Cochin	Aviles
6	1982	Not estimated	Not available	West coast	Sagar Vikas
7	Oct-88	1000	Not available	Bombay Harbour, Maharashtra	Lajpat Rai
8	1989	Not estimated	Not available	West coast	SEDCO 252
9	1989	5500	Diesal oil	795 n mile SW of Mumbai	MT Puppy
10	Aug-89	Not estimated	Not available	Bombay Harbour	ONGC tanker
11	Aug-89	Not estimated	Not available	Saurashtra coast	Merchant ship
12	Aug-89	Not estimated	Not available	Bombay Harbour	Not Known
13	Mar-90	Not estimated	Not available	NW of Kochi	Merchant ship
14	Sep-91	692	FO	Gulf of Mannar	MT Jayabola
15	Nov-91	40,000	Crude	Bombay High	MT Zakir Hussain
16	Feb-92	Not estimated	Tanker wash	40 nautical mile south of New Moore Island, Bay of Bengal	Not Known
17	Apr-92	1000	Crude	54 nautical mile west of Kochi, Kerala	MT Homi Bhabha
18	Aug-92	1060	SKO	Madras Harbour	MT Albert Ekka
19	Nov-92	300	FO	Bombay Harbour	MV Moon River
20	Jan-93	40000	Not available	Off Nicobar	Maersk navigato

S.No.	Date	Spilled quantity in Ton	Oil Type	Location with respect to nearest coast	Vessel involved
21	Mar-93	Not estimated	Crude	Off Narsapur, Andhra Pradesh	ONGC rig, Kumarada
22	Apr-93	110	Crude	Bombay Harbour, Maharashtra	MT Nand Shivchand
23	May-93	90	FO	Bhavnagar, Gujarat	MV Celelia
24	May-93	6000	Crude	Bombay High, Maharashtra	Riser pipe rupture
25	Aug-93	260	FO	Off New Mangalore	MV Challenge
26	Oct-93	90	FO	Cochin Harbour, Kerala	MT Nand Shivchand
27	May-94	1600	Crude	Off Sac Romanto	Innovative-1
28	May-94	Not estimated	FO	360 NM SW of Porbandar	MV Stolidi
29	Jun-94	1025	Crude	Off Aguada Lighthouse, Goa	MV Sea Transporter
30	Jun-94	100	FO	Bombay Harbour, Maharashtra	MV Maharshi Dayananad
31	Nov-94	288	HO	Off Madras, Tamil Nadu	MV Sagar
32	Mar-95	200	Diesal	Off Vizag, Andhra Pradesh	Dredger Mandovi-2
33	Sep-95	Not estimated	FO	Off Dwarka, Gujarat	MC Pearl
34	Nov-95	Not estimated	Tanker wash	Eliot beach, Chennai	Not Known
35	May-96	370	FO	Hooghly River	MV Prem Tista
36	Jun-96	120	FO	Off Prongs Lighthouse, Maharashtra	MV Tupi Buzios
37	Jun-96	132	FO	Off Bandra, Maharashtra	MV Zhen Don
38	Jun-96	128	FO	Off Karanja, Maharashtra	MV Indian Prosperity
39	Jun-96	110	FO	Off Worli, Maharashtra	MV Romanska
40	Aug-96	124	FO	Malabar coast, Kerala	MV Al-Hadi
41	Jan-97	Not estimated	Tanker wash	Kakinada coast, Andhra Pradesh	Not Known
42	Jun-97	210	FO	Off Prongs Lighthouse, Maharashtra	MV Arcadia Pride
43	Jun-97	Not estimated	Not available	Hooghly River, West Bengal	MV Green Opal
44	Sep-97	Not estimated	Naptha, diesel petrol	Vizag, Andhra Pradesh	HPC refinery
45	Aug-97	70	FO	Off Mumbai, Maharashtra	MV Sea Empress
46	Mar-98	Gas leak	Not available	Bombay high	Drill Rig Noble

S.No.	Date	Spilled quantity in Ton	Oil Type	Location with respect to nearest coast	Vessel involved
47	May-98	Gas leak	Not available	Bombay high	Bombay high platform
48	Jun-98	20	Crude	Off Vadinar	Vadinar SBM
49	Jun-98	Not Estimated	Not available	Off Porbandar	Ocean Barge
50	Jun-98	Not estimated	Not available	Off Veraval	Ocean Pacific
51	Jul-99	500	FO	Mul Dwarka	MV Pacific Acadian
52	Jul-00	Not estimated	Not available	Off sagar island	MV Prime value
53	Sep-00	Not estimated	Not available	Off Aguada fort	MV River Princess
54	Dec-00	1	FO	Bombay Harbour	MV Stonnesewall Jackson
55	Jun-01	1305	Diesel Oil	Hoogkly river	MV Lucnam
56	Sep-02	Not estimated	Not available	220 n mile off Pt Calimare	MV Hiderbahy
57	Apr-03	2000 litres	light crude oil	5 miles off Kochi, Kerala	MT BR Ambedkar
58	May-03	2000	Naptha	Mumbai Harbour (SW of west colaba PT).	MT UPCO_III
59	May-03	145	FFO	Off Haldia	MV Segitega Biru
60	Aug-03	300	Crude oil	ONGC Rig	Uran pipeline
61	Feb-04	1	Crude	ONGC pipeline at Mumbai port Jetty	ONGC Trombay
62	Oct-04	600 litres	Not available	Berth MPT, Goa	During oil transfer
63	Mar-05	110	Not available	Off Goa (Aguada Light house)	MV Maritime wisdom
64	Jul-05	80	Not available	Fire in Bombay high platform	
65	Aug-05	8	FO	Sunken ship off Tuticorin	MV IIDA
66	Apr-06	90	Not available	Sunken ship off GOA	INS Prahar
67	May-06	less tha 100 litres	Not available	Sunken Tug off Goa	DCI Tug-IV
68	May-06	70	FFO	Grounded off Karawar Port	MV Ocean Seraya
69	Aug-06	4500	FO	outside EEZ near A&N Islands	MV Bright Artemis & MV Amar

S.No.	Date	Spilled quantity in Ton	Oil Type	Location with respect to nearest coast	Vessel involved
70	Oct-07	13.9	FO	OFF JAKHAU, Gujarat	MV Star Leikanger & barge dhanalakshmi due to collision
71	Oct-07	Not estimated	Not available	S Yanam Beach, Kakinada	Oil drifted to shore from oil rigs
72	Jul-09	50 litres	Not available	Off Mangalore	MV Asian Forest
73	Aug-09	200 (Approx)	Not available	South Gujarat and North Maharashtra	Not Known
74	Sep-09	200-500 litres	Not available	Paradip anchorage	MV Black Rose
75	Apr-10	8 to 10	FO	Gopalpur in Orissa	MV Malavika
76	Aug-10	700 (approx)	Not available	Mumbai Harbour	MV MSC Chitra and MV Khalijia 3
77	Aug-10	20KL	Not available	Eastern side of Kavaratti Island	MV Nanda Aprajita
78	Nov-10	12	Not available	Off Hugli Point	Collission between MV Tiger Spring & MV Spring valley
79	Jan-11	40	Crude	Mumbai High	Ongc Mumbai Uran Pipeline
80	Jan-11	10	Not available	Haldia Jetty	MV Ratna Urvi
81	Mar-11	Note estimated	Not available	Off SW of Tamil nadu	Sinking of MV Mirach
82	Aug-11	180	Not available	Off Mumbai	Sinking of Rak Carrier
Source: Coast Guard News Letter Blue water Jan 2012					

Based on the review and analysis of the data on oil spill along the Indian coast, it is observed that majority of the spill are of small quantity less than 700 tons. However their influence area depends on the location of spill.

There are 82 documented incidents of oil spill along the Indian coast. Figure 15 presents the recorded and accounted oil spill along the Indian coast during 1970 – 2011. The analysis available data on oil spill for last four decades indicate 29% of oil spill being less than 10 tons (this includes data of not estimated quantities of oil spill), 34% of the oil spill has been in the range 10 to 700 tons and only 17% of the oil spill has been greater than 700 tons.

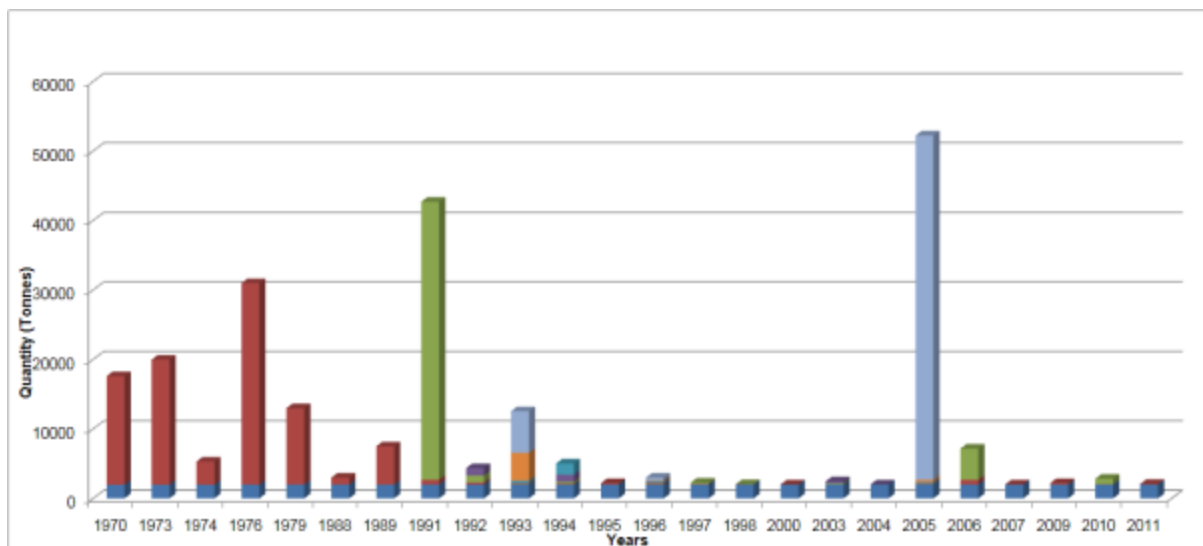


Figure 15 Accounted Oil Spill Quantities along Indian Coast During 1970 - 2011

It is also noticed that significant percent of oil spill having quantities less than 10 tons have taken place in proximity to the port, but the cause of the spill have not been documented.

The analysis of the spill trend with respect to the port operations indicate the majority of the spill have occurred during the operations (loading/discharging, bunkering etc) inside the port.

6. Categorization of Oil Spill

Indian coast guard provides guide to tiered preparedness for responding to the small operational spill to worst case spill incidents. Tiered preparedness is a concept which considers the size and location of potential spill wherein higher the tier bigger the collateral response required. Tiered preparedness are categorised in terms of their potential severity and the capability that needs to be in place to respond. Tiered system is defined in three tiers. Figure 16 presents the tiered preparedness and response in terms of magnitude of spill and response capability required as provided in guide to tiered preparedness of International Petroleum Industry Environmental Conservation Association (IPIECA).

6.1 Tier 1 Spill

Tier 1 events are characterized as being related generally to the operational activities at a fixed location or facility. Examples of Tier 1 spills include bunkering operation, overfilling of sumps, leakage of tank, leakage from valves/pipelines or transfer hoses, accidental discharge of bilge water from vessels etc. As such the Tier 1 spill events are relatively small and onsite capability is mostly sufficient for such events. 700 tons is often cited as the upper limit of Tier – I spill, however spill can acquire comparatively larger scenario due to the prevailing environments i.e. wind, wave and currents.

6.2 Tier 2 Spill

Tier 2 spill may arise from variety of circumstances wherein quantity and location of spill of oil spill is such that it cannot be responded with the Tier 1 capability. IPIECA describes the Tier 2 scenario can develop in a number of ways which may be one of the following

- ❖ A spill which moves beyond geographical remit (port limit) of any local Tier 1 arrangement or an event occurring outside this geographical area;
- ❖ A Tier 1 spill event growing in scale and severity such that Tier 1 capability is overwhelmed.
- ❖ The scale and severity of Tier 1 event not entirely clear and, as a result Tier 2 resources potentially being needed as a precautionary measure.
- ❖ An event being initially classified as Tier 3, but as the situation develops it becomes clear a Tier 2 capability is sufficient.
- ❖ A major event when Tier 2 capability is mobilised prior to the arrival of Tier 3 resources.

Tier 2 spill would involve a larger number of organizations and people for which clear roles and responsibilities will be defined and agreed. Tier 2 response will start with initial deployment of Tier 1 capability.

6.3 Tier 3 Spill

A Tier 3 oil spill event is broadly portrayed as one where all available local and additional Tier 2 resources are not enough to respond effectively to the scenario. As with any scenario that goes beyond a Tier 1, commonly there will be an extensive range of sensitivities impacted and stakeholders involved. The conventional view of a Tier 3 scenario is one involving an exceptionally large volume of spilled oil, for example from a major ship-sourced accident, an offshore or inland well blowout, or other such rare but highly significant event. In reality, a Tier 3 response may also be required for more modest volumes, perhaps where Tier 2 arrangements may be largely absent or overwhelmed, highly sensitive areas threatened, or highly-specialized strategies being required that are not available locally. With the growth of oil production activities in increasingly remote and sensitive areas, the need for additional Tier 3 support has become greater than generally perceived in the past.

large spill			Tier 3
medium spill		Tier 2	
small spill	Tier 1		
	local	regional	remote
proximity to operations			

Figure 16 Tiered Preparedness and Response (Source: IPIECA)

6.4 Oil Types for Consideration in Oil Spill Study

The port facility will cater to the container vessel and those vessels that will be arriving for repair and routine maintenance. It is apparent major type of oil in this types of vessel will be only fuel oil (Marine diesel and Heavy oil fuel), hence the same has been considered for the oil spill model study. LTSB provided the properties of oil types for consideration in the oil spill model study and same is presented in the Table 11 below.

Table 11 Properties of Spilled Oil

Oil Properties	Diesel Fuel	Marine Diesel	Heavy Oil Fuel
API gravity	@15°C 0.82 – 0.88	@ 15°C 0.84 – 0.92	@ 15° C > 0.98
Wax content (% weight)	0	0	7
Asphaltens content (% weight)	0	0	8
Oil Properties in fractions percentage volume			
C ₆ – C ₁₂ (Paraffin)	15	6	4.3
C ₁₃ –C ₂₅ (Paraffin)	20	26	19.1
C ₆ – C ₁₂ (Cycloparaffin)	20	13	1.4
C ₁₃ –C ₂₃ (cycloparaffin)	20	15	3.4
C ₆ – C ₁₁ (Aromatic)	15	2.1	1.8
C ₁₂ – C ₁₈ (Aromatic)	2	10	4.3
C ₉ – C ₂₅ (Nephteno - aromatic)	8	12.9	0
Viscosity (cP)	3	4	211
Reference Temperature (Deg)	13°C	13°C	50°C

7. Oil Spill Modelling

Oil spill trajectory and weathering simulations were carried out using an in-house numerical model for oil spill analysis. The model requires results from a hydrodynamic model and the details of environmental conditions for carrying out the oil spill model study. This part of the report contains the details of the oil spill model study and analysis of the simulated model results.

7.1 Oil Spill and Weathering Process

Oil is considered as a major pollutant of marine environment due to its complex chemical composition. During any oil spill incident, the properties of the spilled oil, including the oil composition and oil compositional changes due to weathering, should be known immediately, so that numerical models can be used to predict the environmental impacts of the oil spill with reasonable accuracy. The knowledge of oil properties is important to understand the physical and chemical changes of the spilled oil in time and space.

Spilled oil also undergoes changes in physical and chemical properties due to the interaction of oil with surrounding environment. This process is known as weathering. The spilled oil will be transported from source through the action of waves, current and wind, broadening the coverage area of spilled oil.

Processes related to the physical and chemical actions of air, water and organisms after oil spill. Figure 17 presents the weathering process of oil spill. The processes altering the spill characteristics are spreading, evaporation, emulsification and dispersion. Evaporation depends on the area of the slick, wind speed, oil temperature and oil composition. In case of marine diesel and diesel about 50 to 70% of the oil will be evaporated within 10 hours of the spill. Emulsification is the process of water droplets getting entrapped in the oil. This affects properties of slick such as density and viscosity significantly affecting the clean up process. Percentage of asphalt and wax contents play major role in emulsification. The process is more pronounced in crude oil. Marine diesel and diesel oil does not have any wax or asphalt content, the emulsification will not be stable. Figure 18 presents the fate of crude oil spill showing changes in the relative weathering process with time.

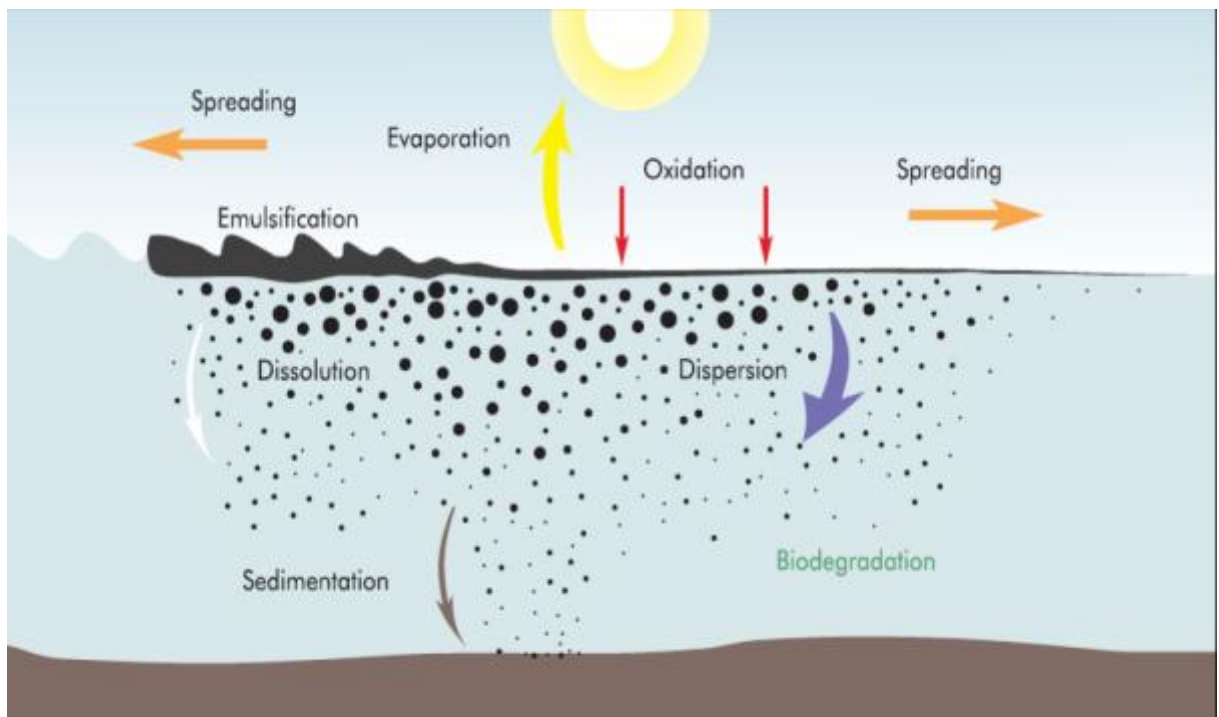


Figure 17 Weathering Process

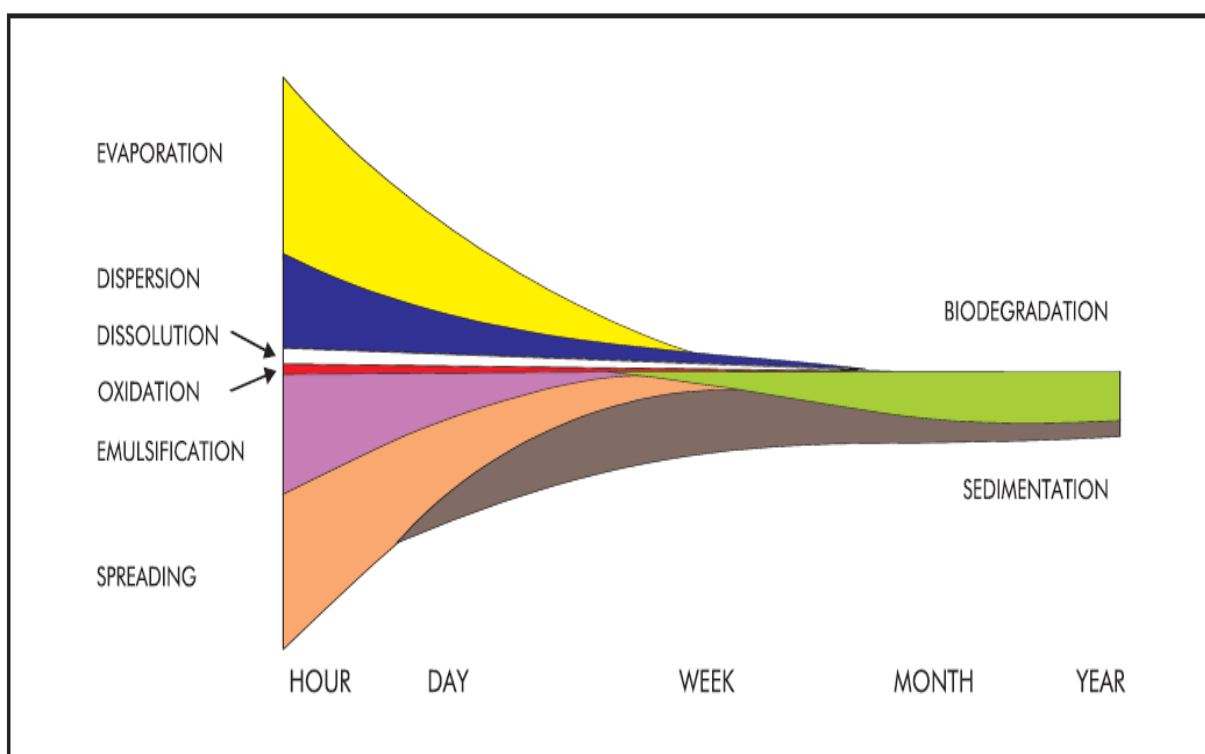


Figure 18 Weathering Process Relative to Time

7.2 Methodology

The objective of the model study is to analyse the trajectory, weathering characteristics of an oil spill which will be used in the oil spill contingency plan. An in-house model oil spill model capable of simulating the trajectory of oil under different hydrodynamic and environmental conditions as well as capable of addressing variation in oil properties with time was used. It is important for the oil model to account for all these requirements as no two oil spill takes place under similar conditions. Therefore for the completeness of the oil spill study the variations in environmental and hydrodynamic conditions as well as the oil properties were considered.

The variation in the hydrodynamic conditions were analysed and representative scenarios were simulated, the detailed description are provided in section 3.

The oil spill model used in this study is based on a lagrangian particle tracking model where the path of a particle is tracked using a random walk technique. The model is capable of accounting for variations in different environmental conditions such as wind, relative humidity, temperature (air and water), cloudiness etc. The model uses a previously defined hydrodynamic condition for tracking of spilt oil. The main outputs at each time step from the model are the oil thickness, water content and oil viscosity. The model also provides the arrival time of the oil at each node point. The oil spill model was used to simulate different oil spill conditions by accounting for the spill being taking place at different locations, oil quantities and oil types as described in Table 12. The spill locations are shown in Figure 19.

Table 12 Scenario for Oil Spill Model Study

Spill Location	Spill Quantity	Oil types	Environment Scenario	Hydrodynamic Scenario	Total no of Simulation
Berth	100 litres, 1 ton and 100 ton	Diesel, Marine Diesel and Heavy oil fuel	Refer Table 12.3.9	Refer Table 12.3.4	27 (for each oil type)
Turning Circle	200 ton and 700 ton	Diesel, Marine Diesel and Heavy oil fuel	Refer Table 12.3.9	Refer Table 12.3.4	18 (for each oil type)
Approach Channel	200 ton and 700 ton	Diesel, Marine Diesel and Heavy oil fuel	Refer Table 12.3.9	Refer Table 12.3.4	18 (for each oil type)
Port Entrance	200 ton and 700 ton	Diesel, Marine Diesel and Heavy oil fuel	Refer Table 12.3.9	Refer Table 12.3.4	18 (for each oil type)

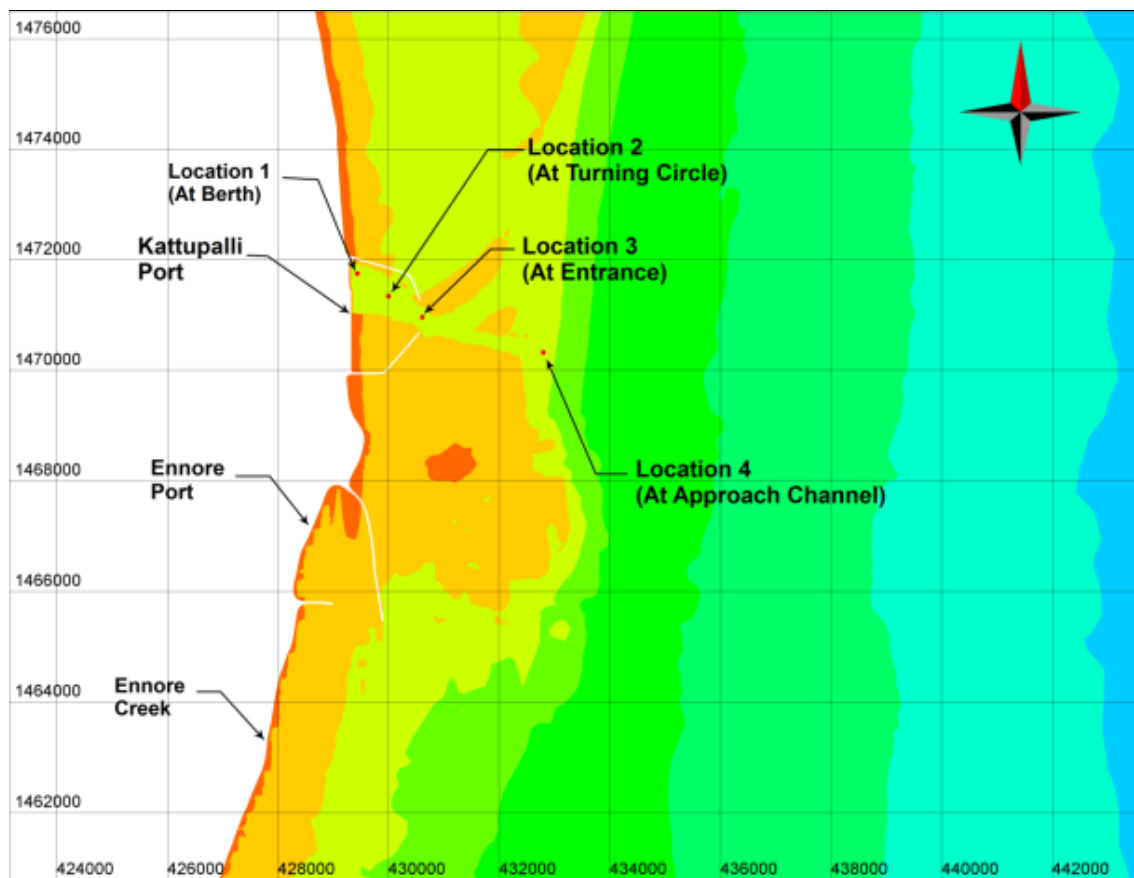


Figure 19 Spill Locations

7.3 Analysis of Simulated Results

The simulated results from oil spill model were analysed for the following:

- ❖ Spreading of oil with respect to the spill location
- ❖ Arrival time of spilled oil with respect to the sensitive environment in the vicinity
- ❖ Influence of wind on the spreading of spilled oil

The weathering results from the combination of oil spill location, quantity and environment for three monsoon seasons are analysed and presented in the following sections. The areas sensitive to the spill was identified based on utility, usage and ecological importance. The sensitive areas around the project stretch were identified as Pulicat, Ennore creek, CPCL intake, CWDL intake and beaches in vicinity to the project site. The analysis was carried out with respect to arrival time and maximum thickness of oil spill reaching the sensitive areas. Simulations were carried out for available short duration wind data from the site for all the spill locations considered in the model studies.

The simulated result for marine diesel spill indicates that 18 - 25% of the oil is evaporated immediately after the spill. Figure 20 & Figure 21 presents the percentage evaporation of spilled oil for typical spill inside and outside the port basin.

Similarly rate of evaporation for diesel is in the range of 32 to 45% immediately after the spill. Higher evaporation rate is noticed with respect to larger spread. Figure 22 & Figure 23 presents the percentage evaporation of spilled oil for typical spill inside and outside the port basin.

Heavy oil has asphalt and wax content due to which portion of spilt oil gets deposited to the seabed. The+ rate of evaporation after the spill is in the range of 7 to 15%. Figure 24 & Figure 25 presents the percentage evaporation of spilled oil for typical spill inside and outside the port basin.

Typical trajectory and arrival time of oil spill simulations for observed wind during south-west and north-east monsoon for representative hydrodynamic condition is presented in Figure 26 & Figure 27.

Considering short duration of observed data availability, the simulations were also carried out for representative annual environment scenarios presented in Table 5.

7.3.1 Oil Spill at Berth

Based on the analysis of the of oil spill trend it is noticed that during loading/discharging operation occurrence of oil spill is maximum. Hence the probability of oil spill at berth is the highest of all the locations for oil spill considered in this study. The simulations were carried out for 100litres, 1 ton and 100 ton spill quantities to have range of perceived spill quantity at the berth. The analysis of trajectory and arrival time of spill indicates the oil being confined to the port basin during fair weather and south-west monsoon. During north-east monsoon probability of slick getting carried out of basin due to the influence of wind is high particularly for larger quantities and corresponding spill duration. The chances of spilled oil moving towards the sensitive areas are small.

Typical spill trajectory, arrival time and thickness of oil spilled in proximity to berth is presented in Figure 28, Figure 29, Figure 30 and Figure 36. Simulated pattern trajectory, arrival time is similar for all the three types oil considered in the study.

7.3.2 Oil Spill at Turning Circle

Oil spill simulation at turning circle was carried out for 200 ton and 700 ton of spill quantities covering maximum and minimum perceived spill quantity. The analysis of trajectory and arrival time of spilled oil indicates the oil being confined to the port basin during fair weather and south-west monsoon similar to the spill trajectory for spills at the berth. The spilled oil can move out of the basin during the north-east monsoon when due to the wind effect along with the quantity of spilled oil and duration. Analysis of simulated result indicates the plume being confined to deeper water.

Typical spill trajectory, arrival time and spill thickness of oil spilled at turning circle is presented in Figure 31 and Figure 37.

7.3.3 Oil Spill at Port Entrance

The oil spill simulations were carried out for 200 ton and 700 ton of spill quantities covering maximum and minimum perceived spill quantity. Simulated scenarios for oil spill at the port entrance during north-east monsoon indicates spilled oil beaching between Kattupalli and Ennore port and coast further south of Ennore port. The chances of spilled oil reaching Ennore creek is also significant during north-east monsoon.

The spilled plume is confined to deeper water during south-west monsoon and chances of beaching of spilled oil towards coast north of Kattupalli port and coast abutting the Pulicat lake is very insignificant. Typical spill trajectory, arrival time and spill thickness of oil spilled at port entrance circle is presented in Figure 32 and Figure 38.

7.3.4 Oil Spill at Approach Channel

The spill at port approach channel was carried out for 200 ton and 700 ton spill quantities. The analysis of the simulated scenarios indicates the spill plume being confined to the deeper water and is less likely to beach in the immediate vicinity of the port. This has been observed for the all the prevailing environmental scenarios and seasons.

Typical trajectory and arrival time of oil spill simulations for observed wind during south-west and north-east monsoon for representative hydrodynamic condition is presented in Figure 33, Figure 34, Figure 35 & Figure 39.

7.3.5 Influence of Oil Spill on CPCL and CWDL intake

There exist two intakes for desalination plants owned by CPCL and CWDL located on the north and south of the port respectively. Oil spill can significantly influence the operations of the desalination plant and can even damage the plant. Based on the analysis of the simulated results it is noticed that there is high probability of CPCL intake getting affected due to spilled oil during north east monsoon. The thickness of spilled oil can range from 0.5 to 1.9mm with arrival time ranging from 1 to 18 hours.

However the probability of spilled oil reaching CWDL intake is very low for the spill location considered in the model study.

Detailed analysis of the spilled oil considering the sensitive environment with respect to arrival time and thickness is presented in Table 12.

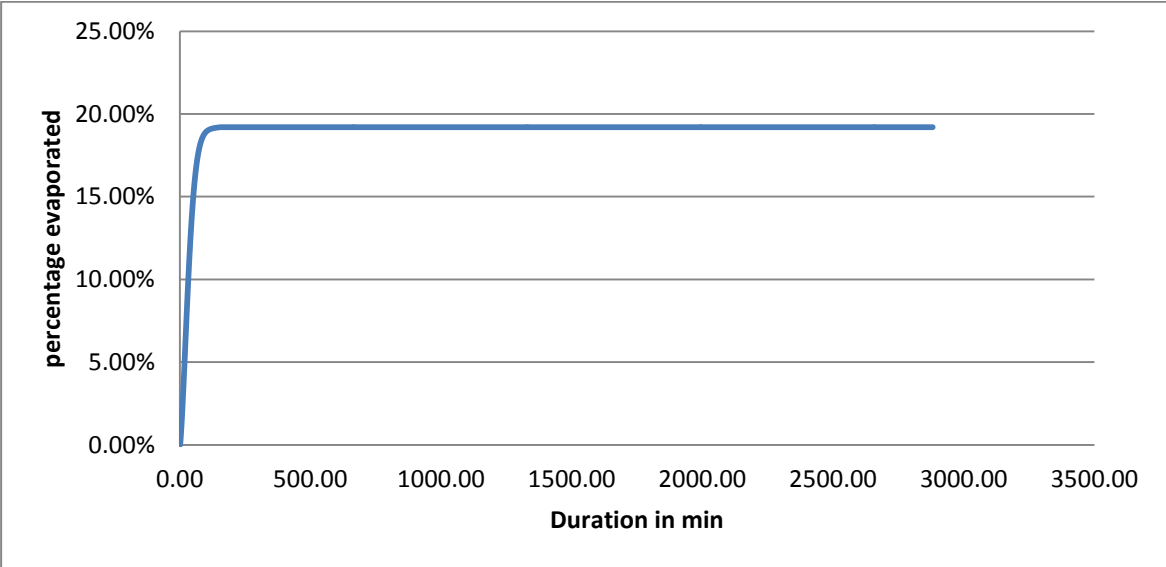


Figure 20 Typical Evaporation of Marine Diesel Spill with in Port Basin

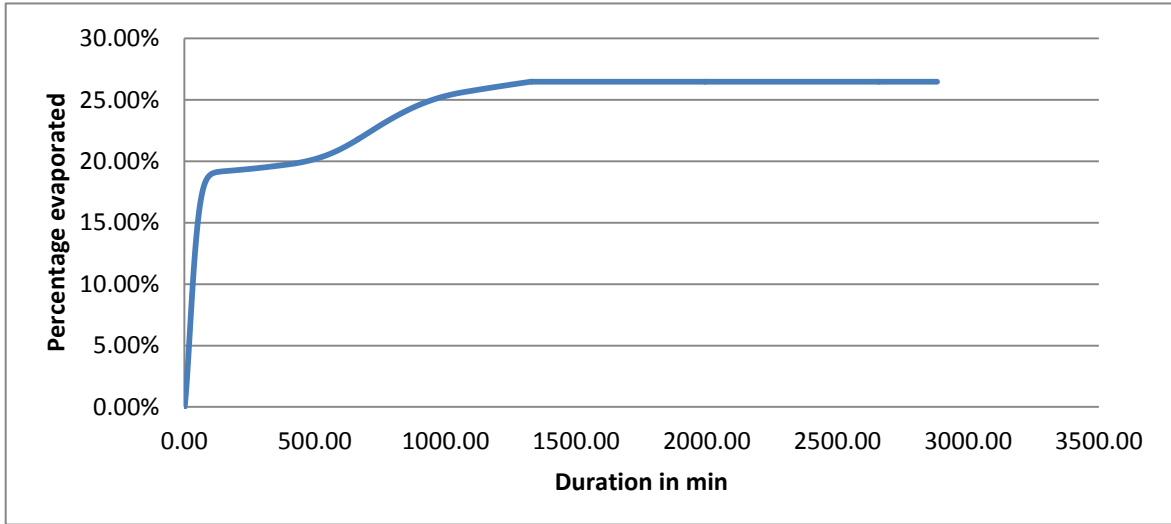


Figure 21 Typical Percentage Evaporation of Marine Diesel Spill Outside Port Basin

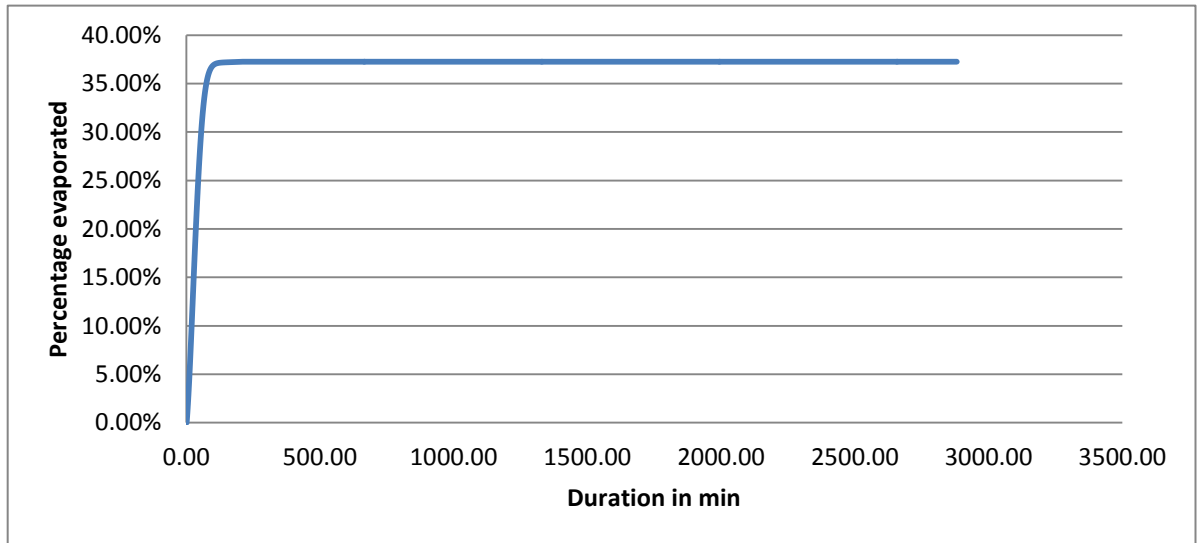


Figure 22 Typical Evaporation of Diesel Spill with in Port Basin

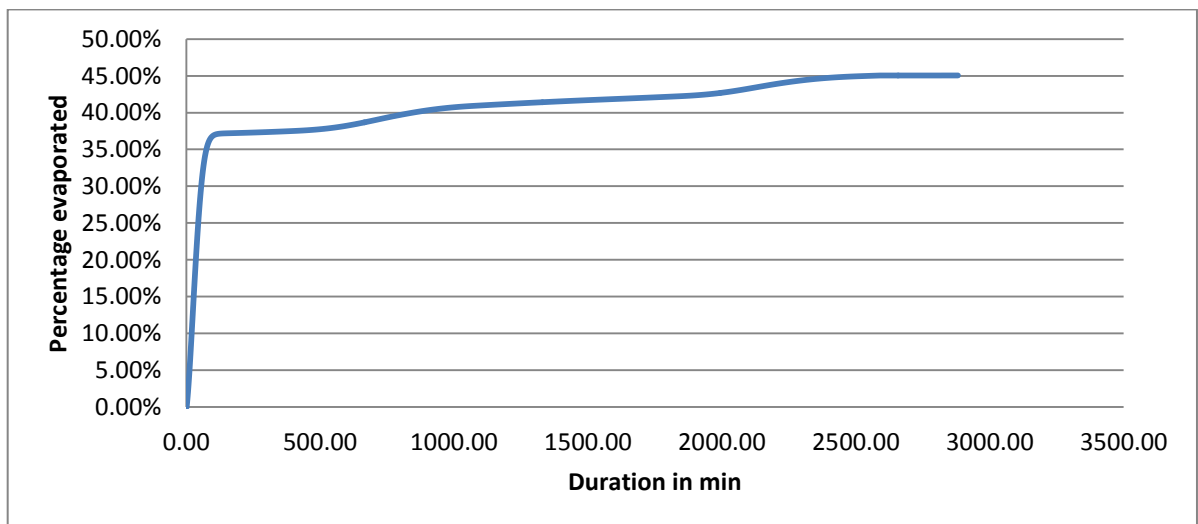


Figure 23 Typical Percentage Evaporation of Diesel Spill Outside Port Basin

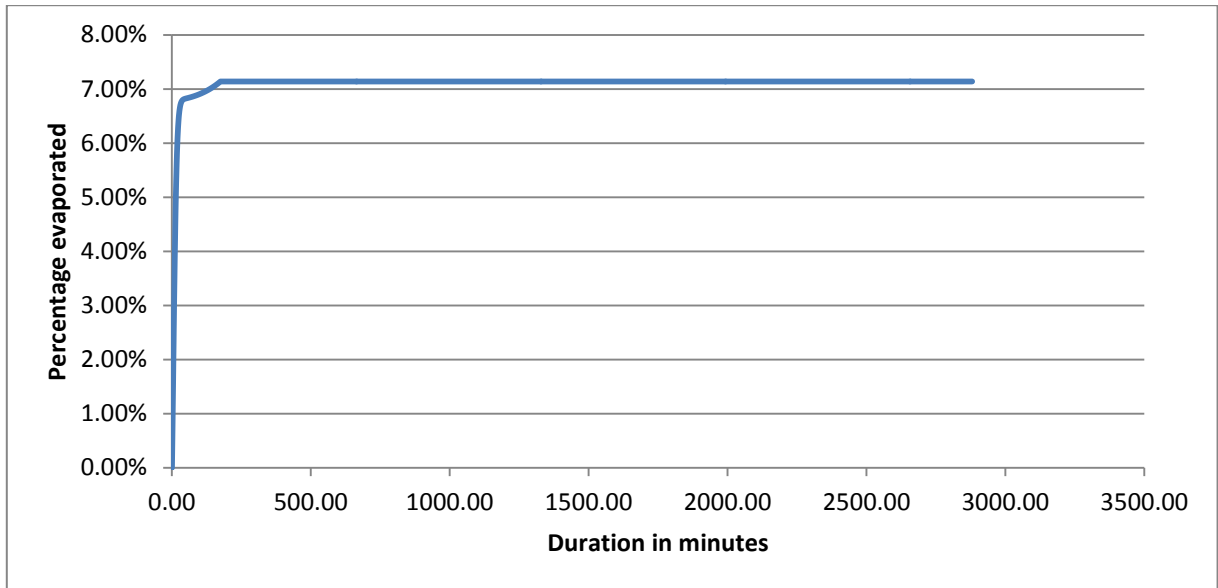


Figure 24 Typical Evaporation of Diesel Spill with in Port Basin

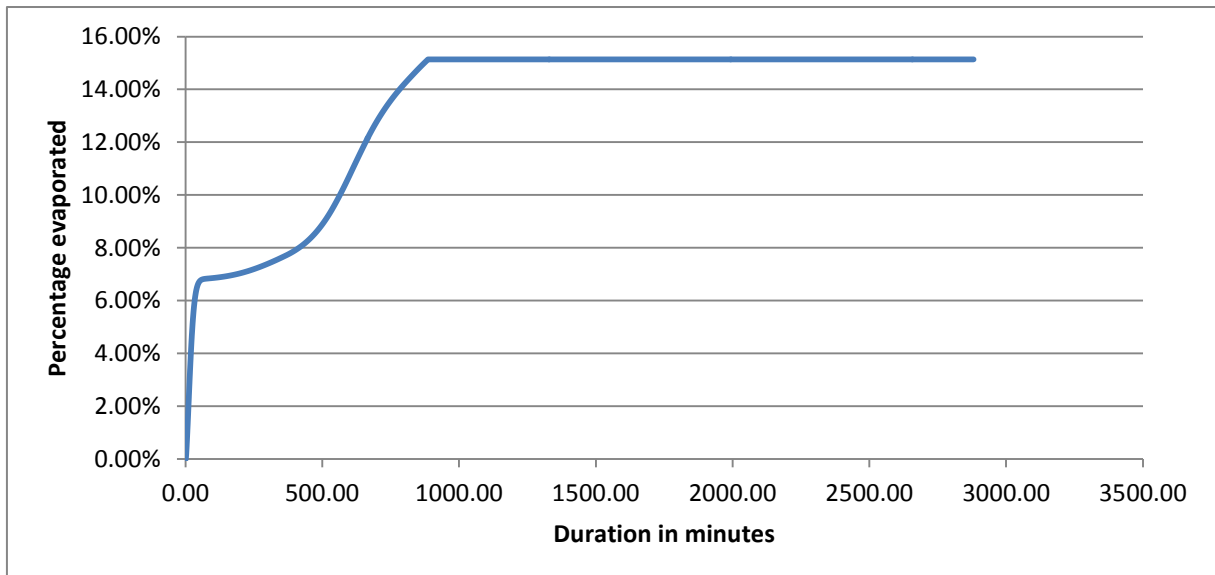
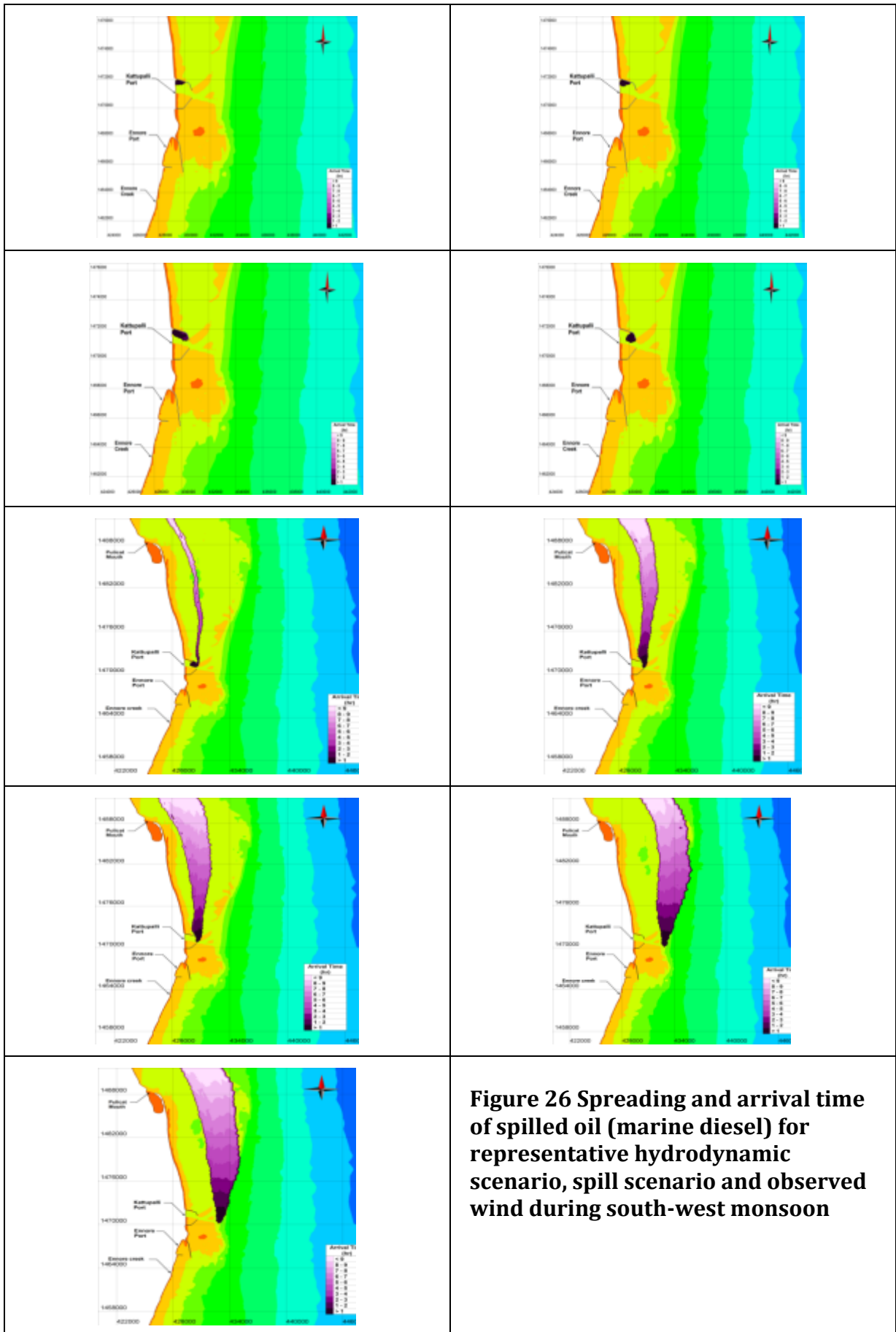


Figure 25 Typical Percentage Evaporation of Heavy Spill Outside Port Basin



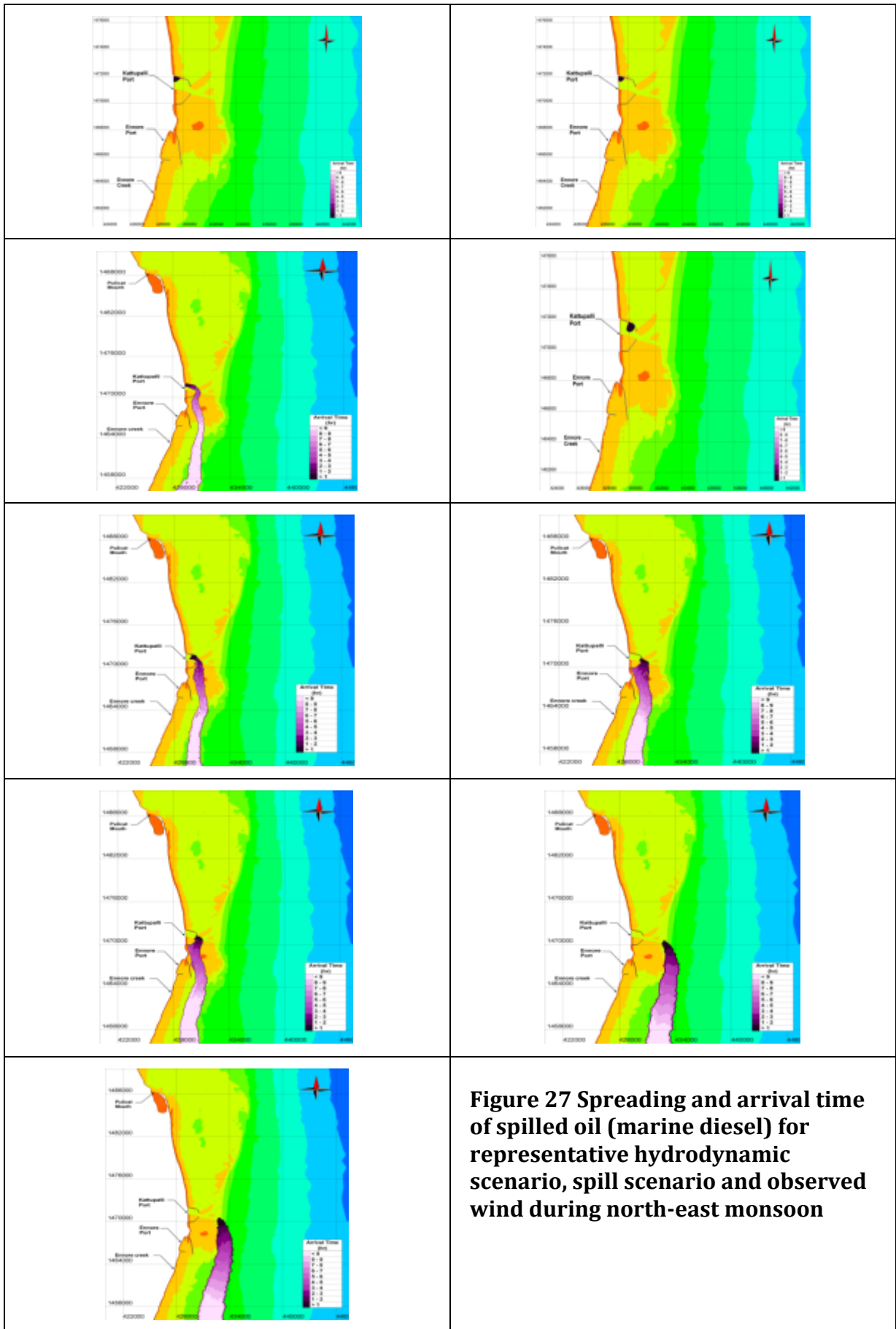


Figure 27 Spreading and arrival time of spilled oil (marine diesel) for representative hydrodynamic scenario, spill scenario and observed wind during north-east monsoon

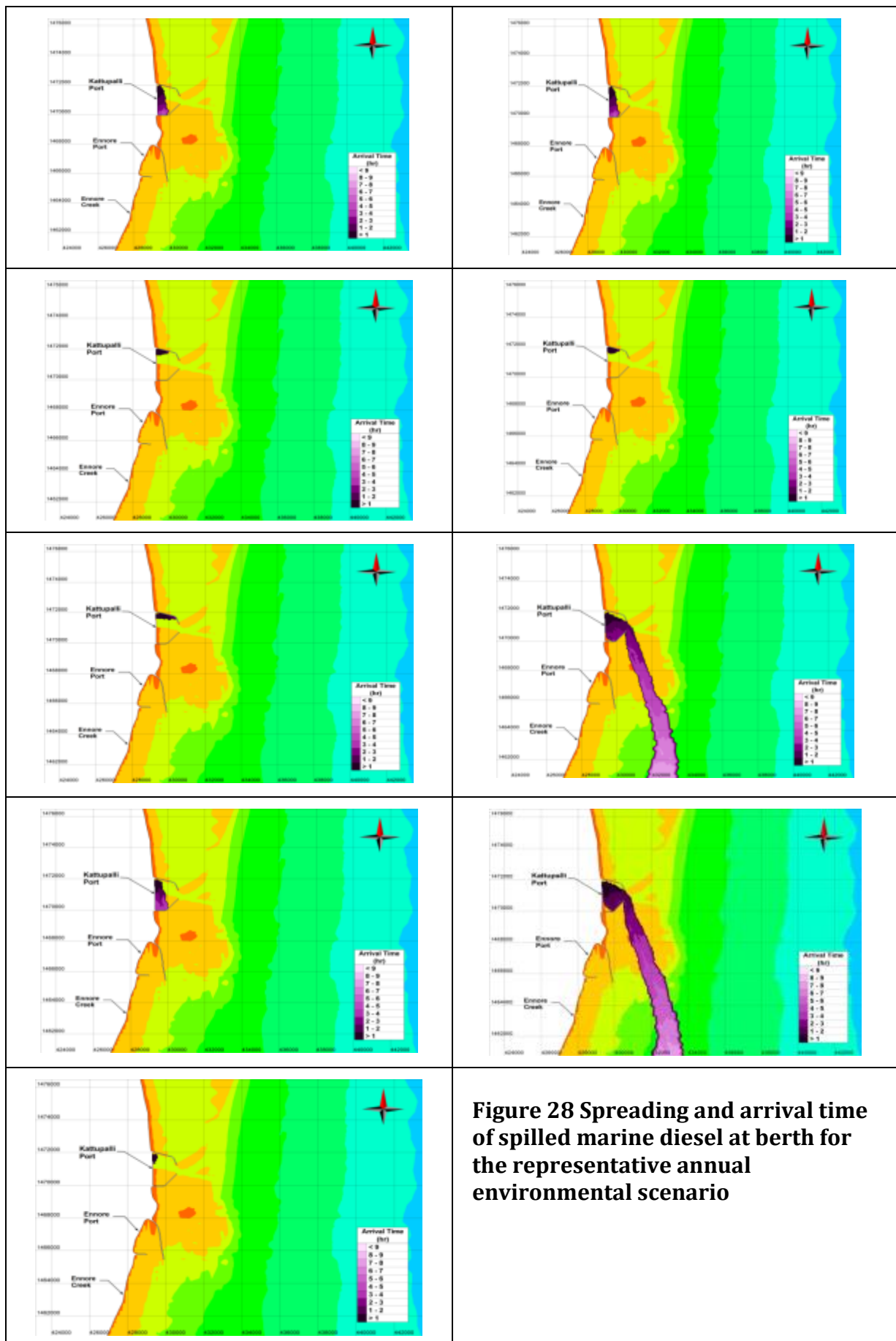
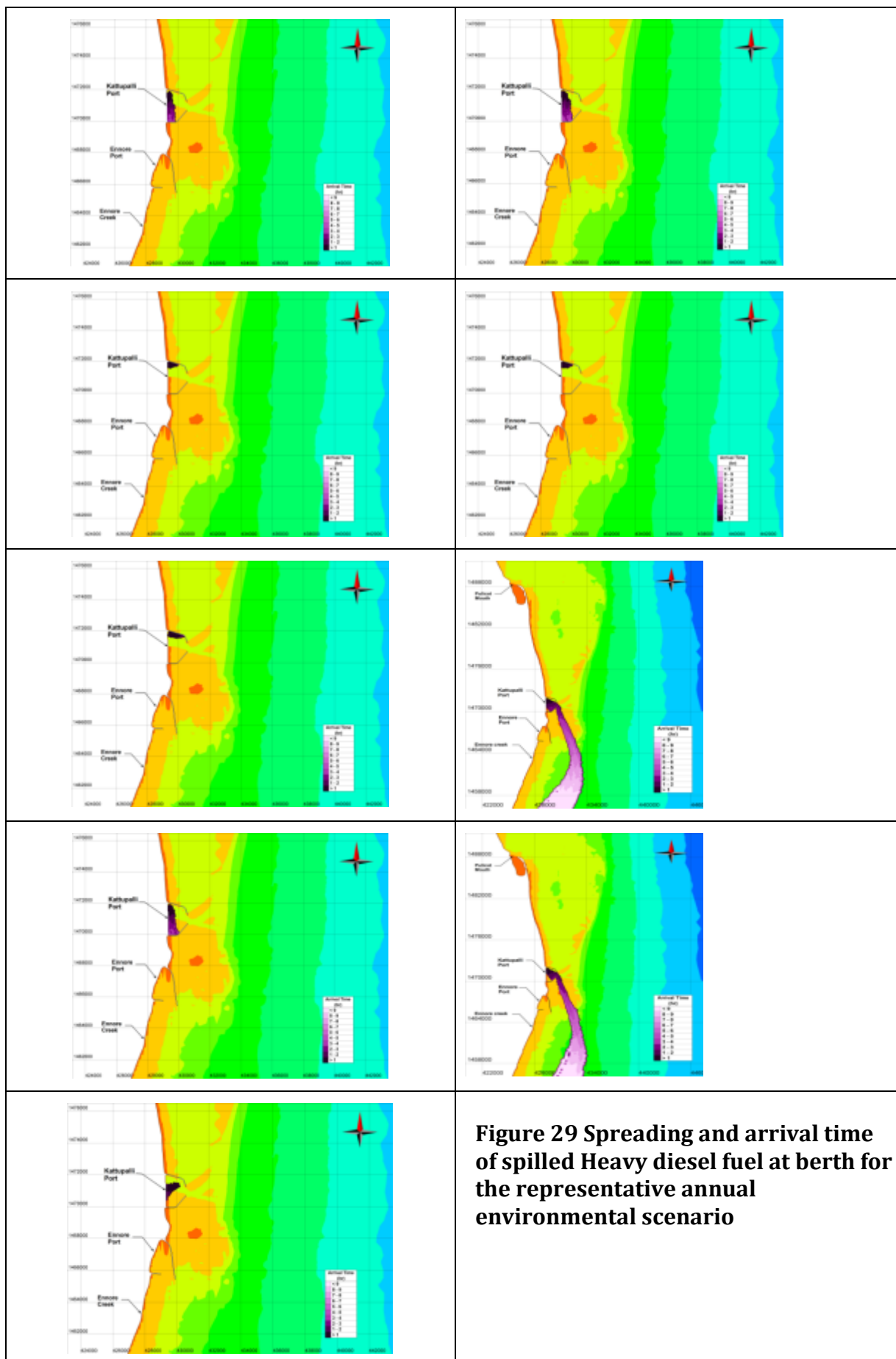
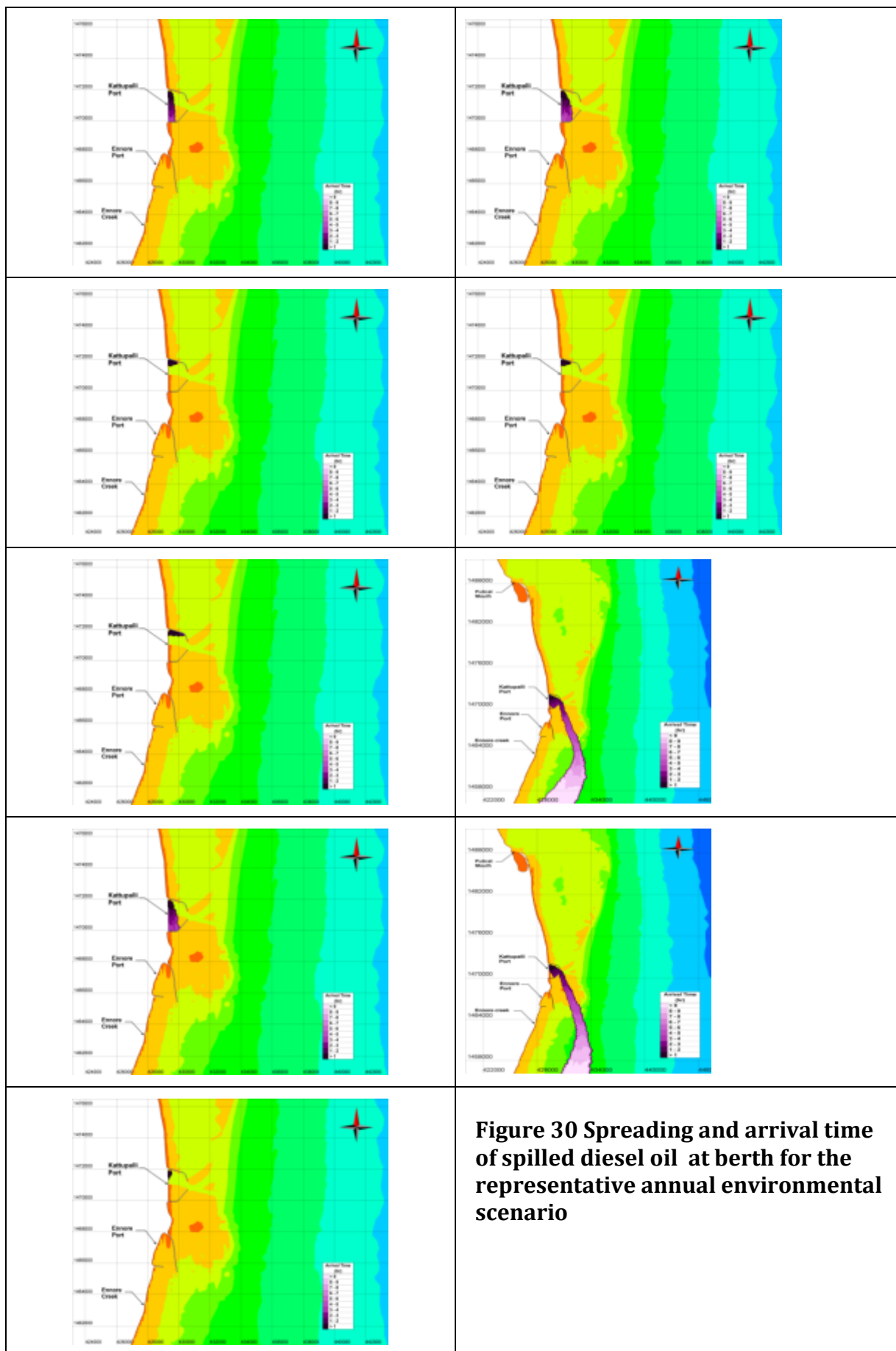


Figure 28 Spreading and arrival time of spilled marine diesel at berth for the representative annual environmental scenario





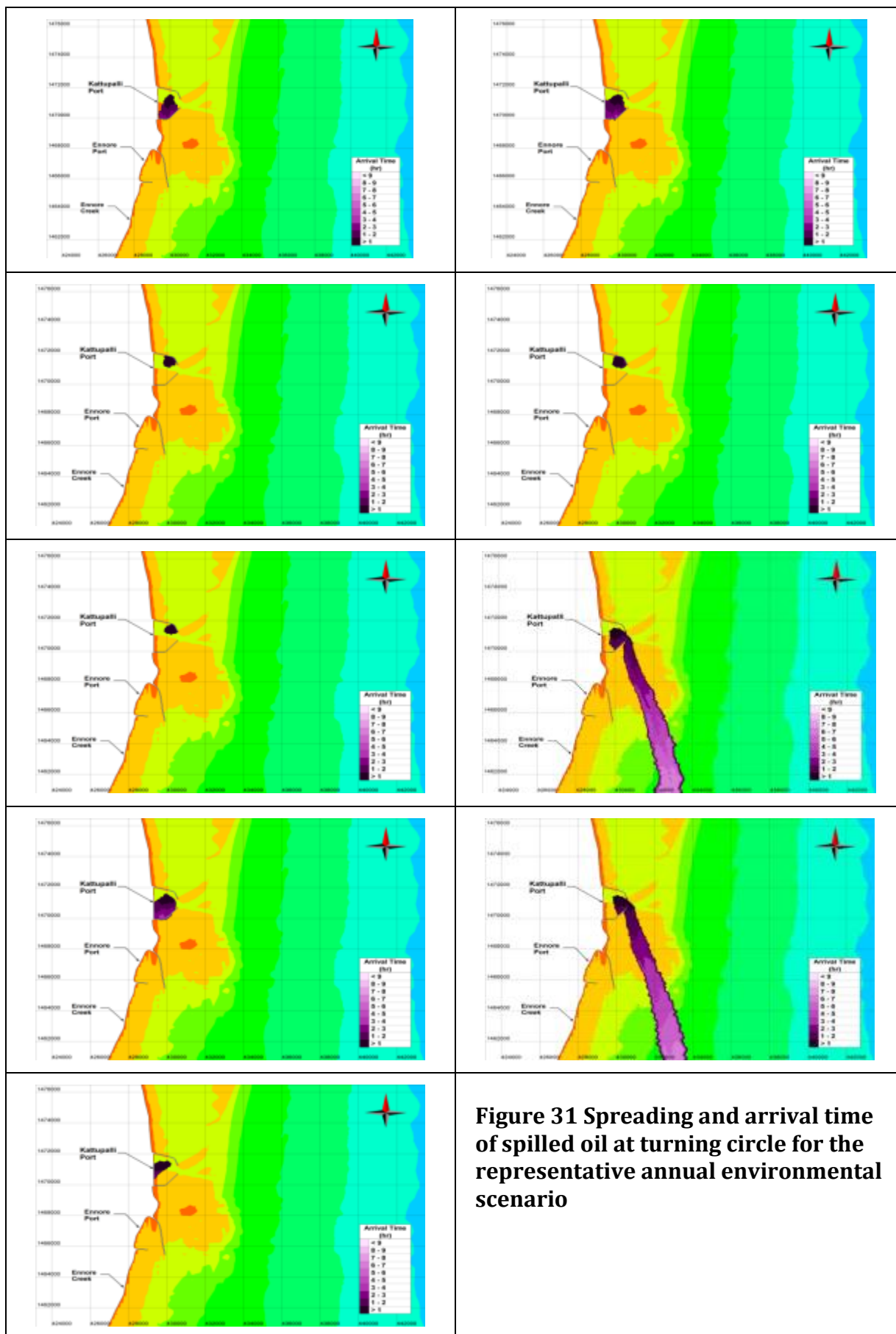


Figure 31 Spreading and arrival time of spilled oil at turning circle for the representative annual environmental scenario

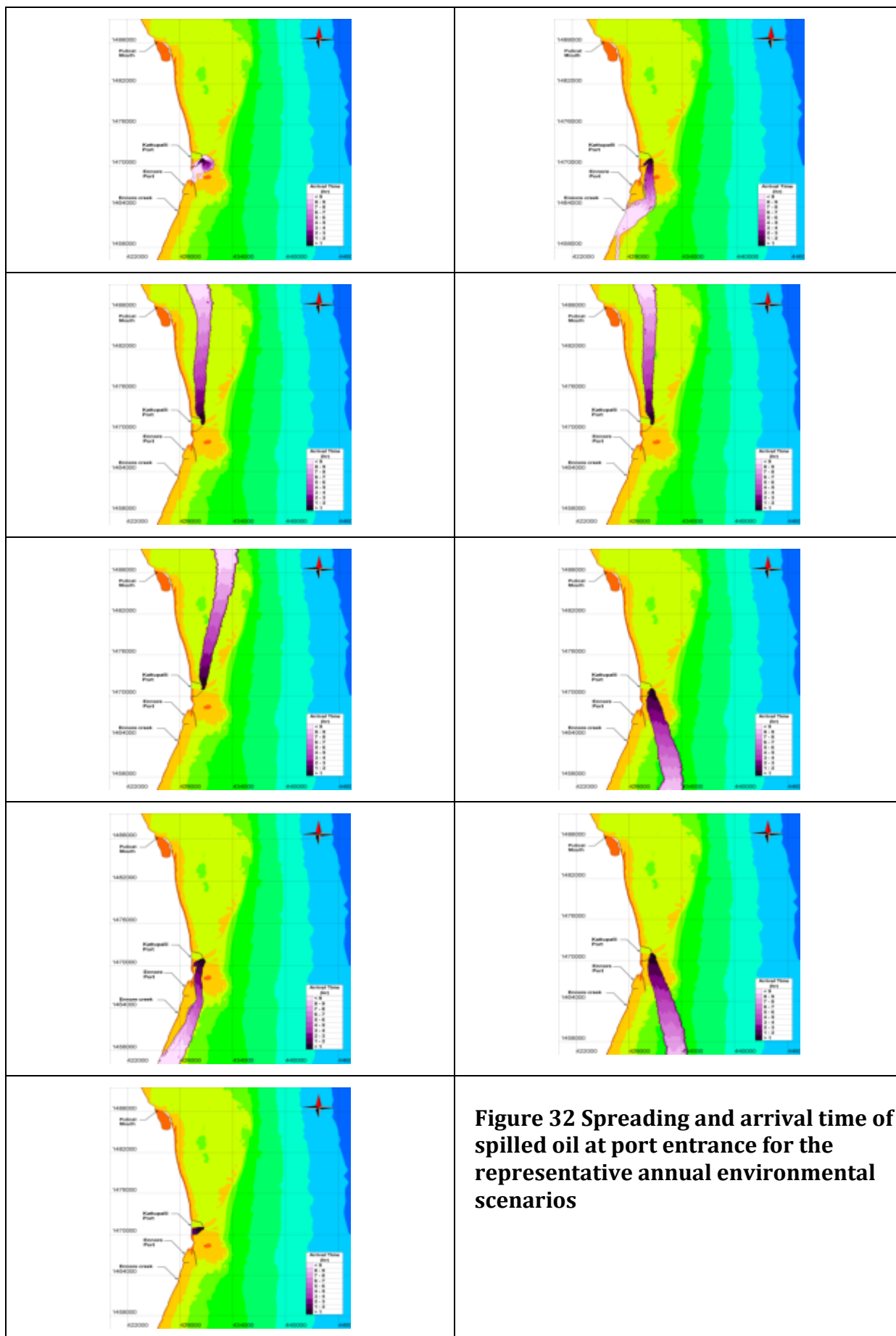
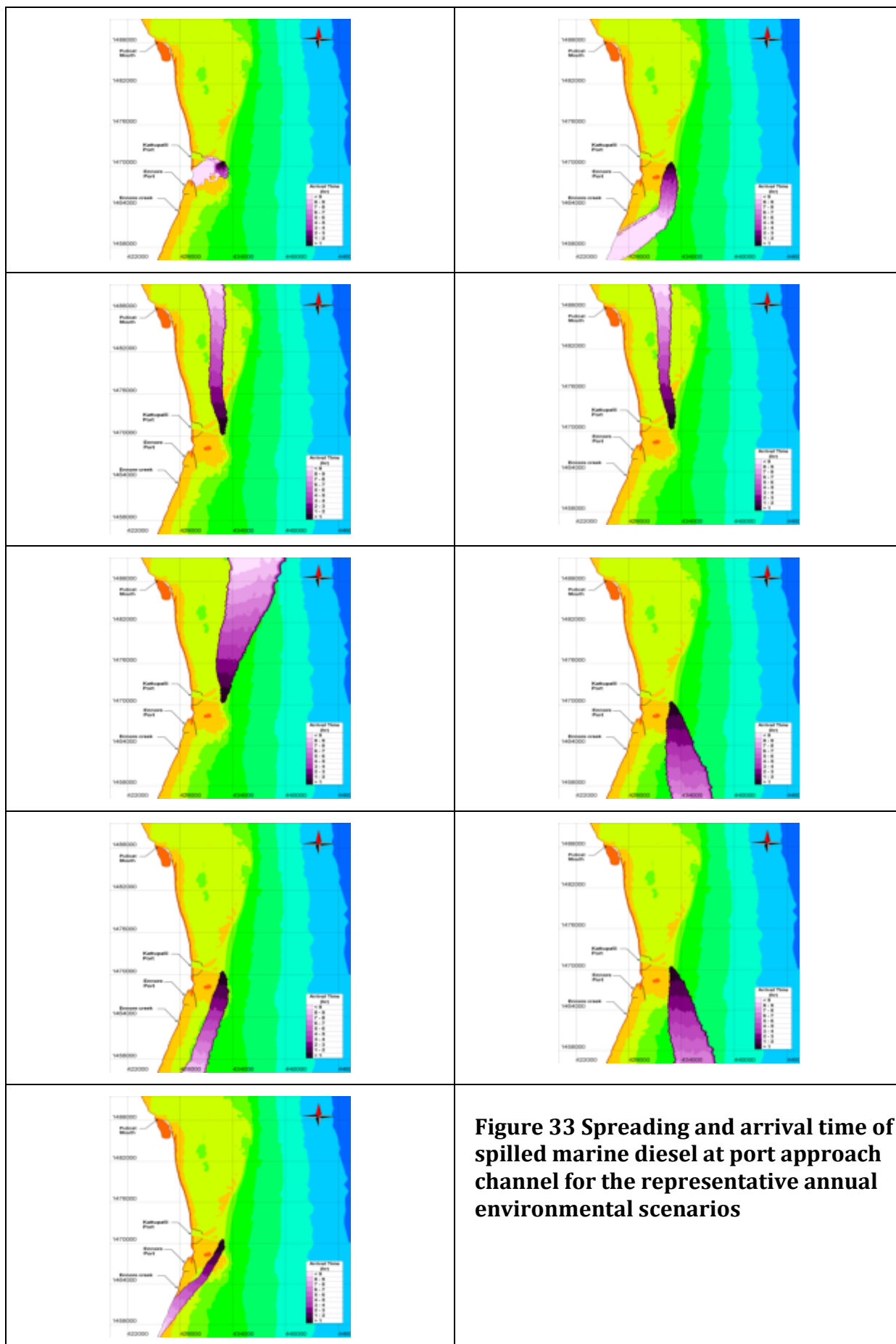
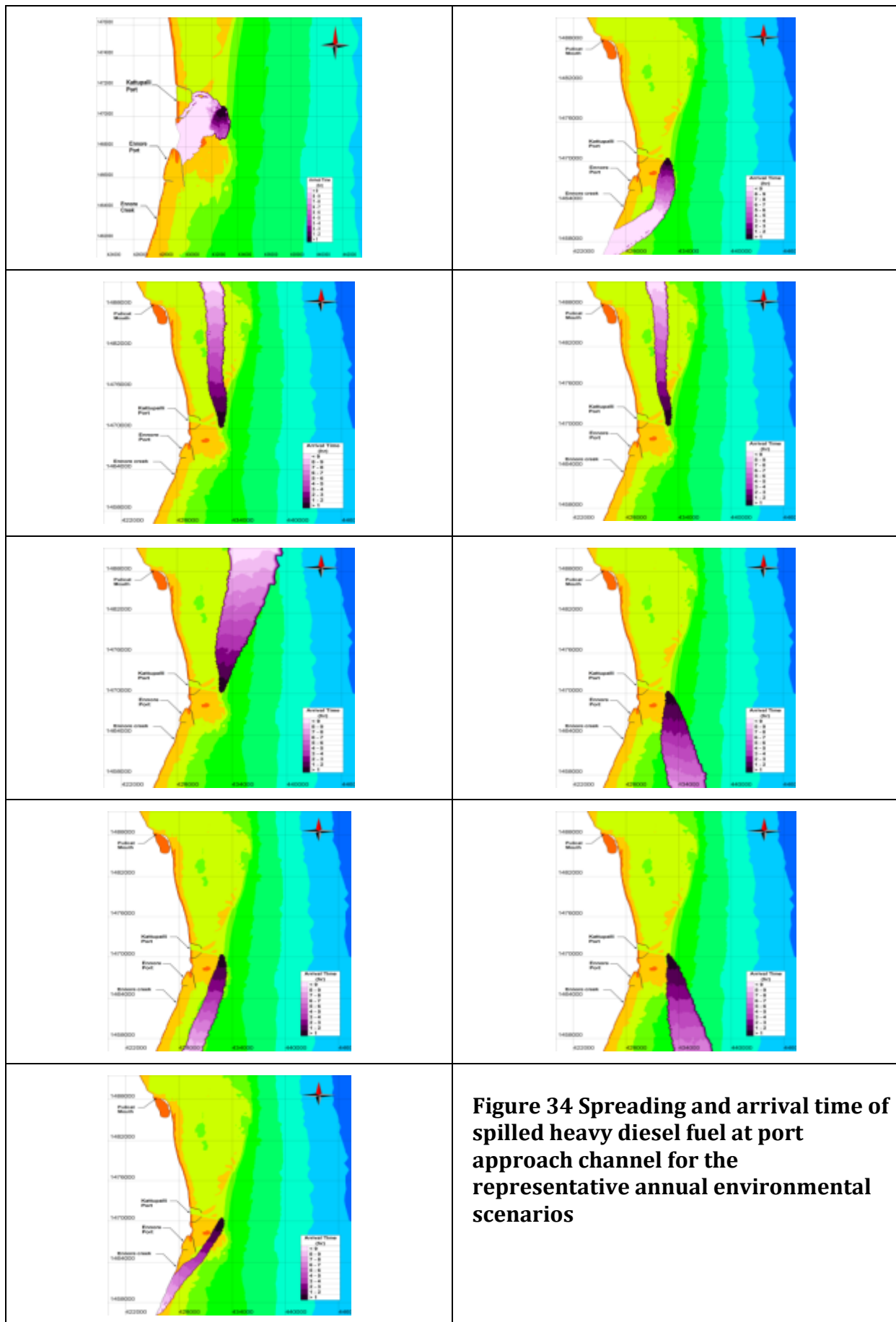
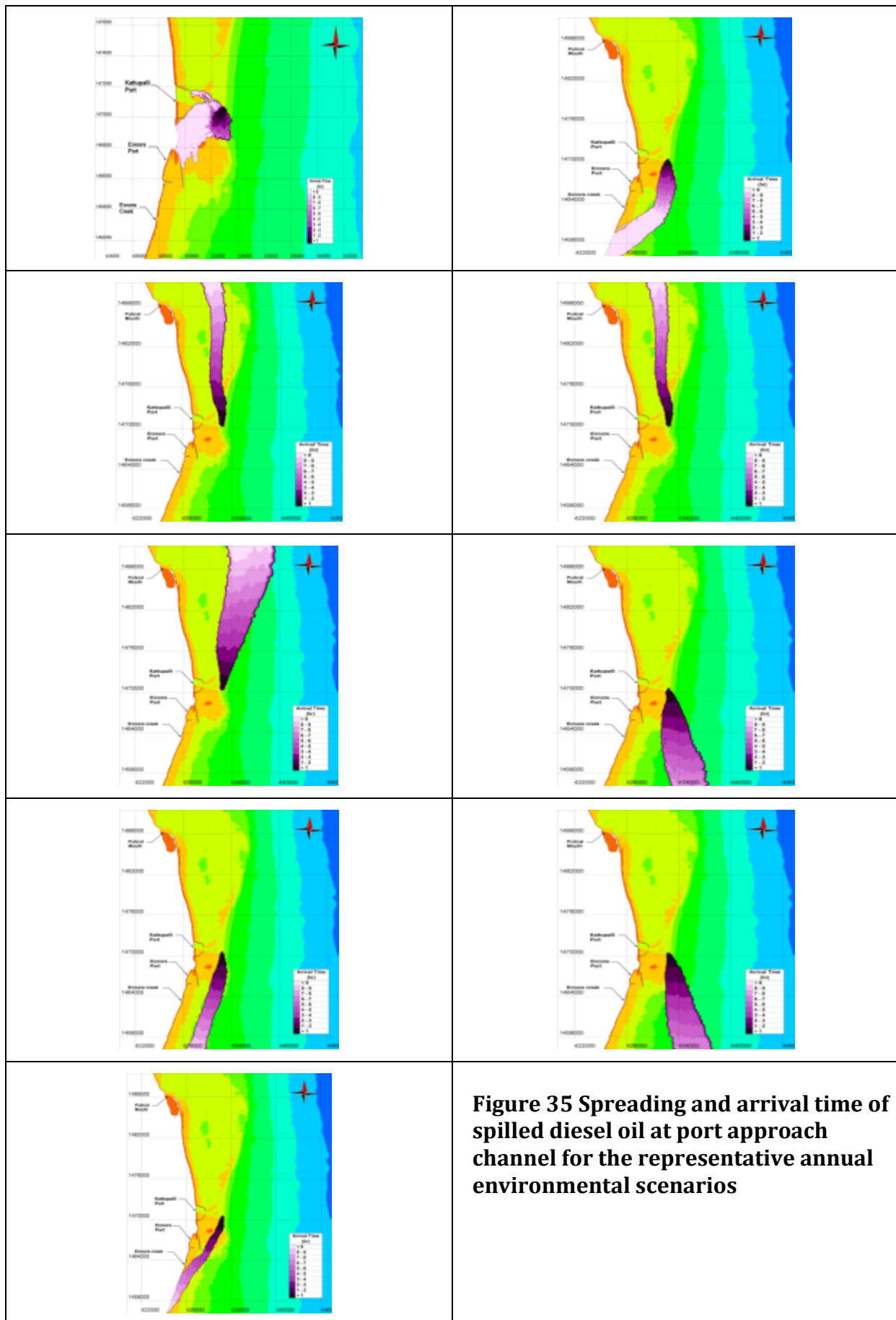


Figure 32 Spreading and arrival time of spilled oil at port entrance for the representative annual environmental scenarios







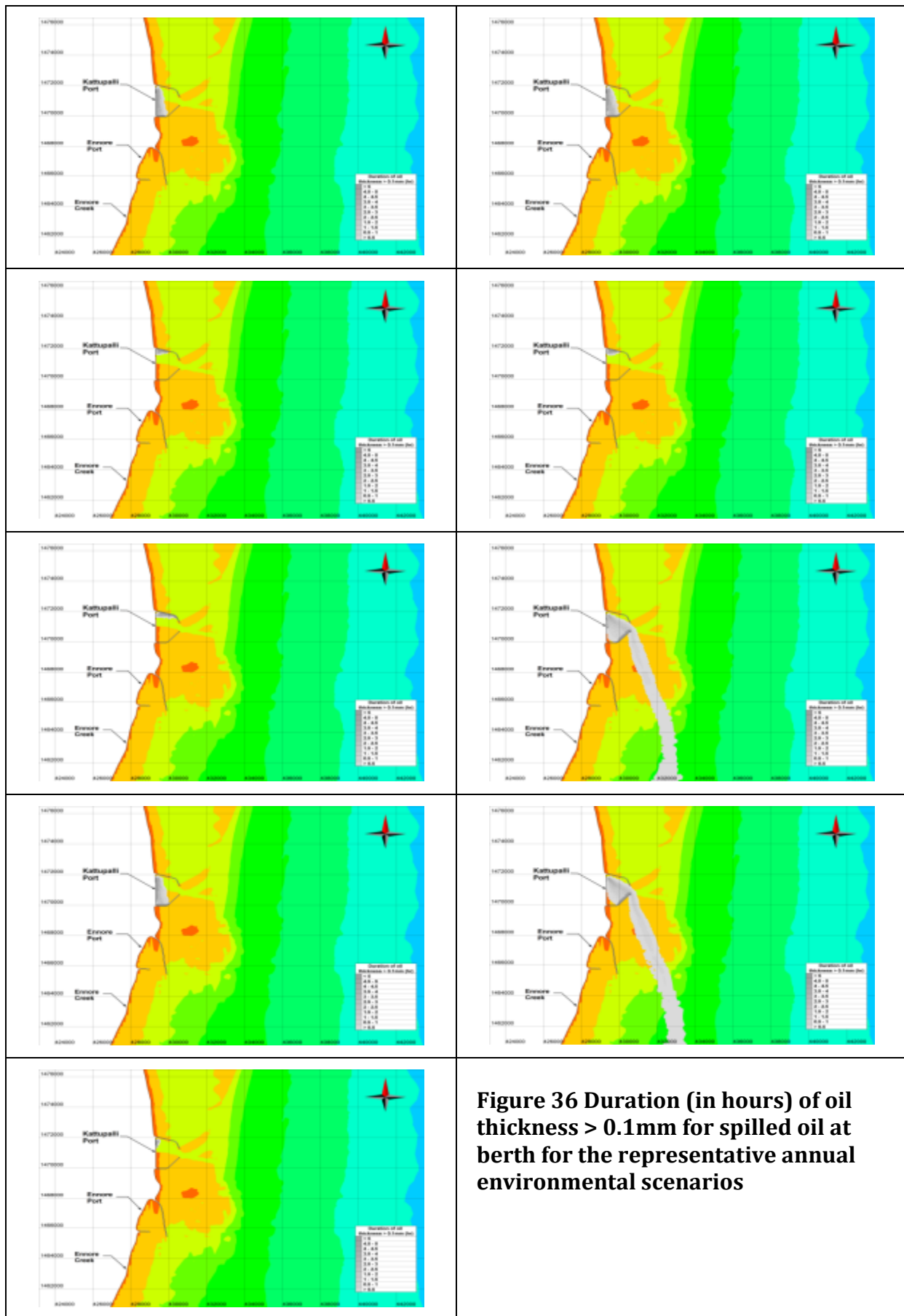


Figure 36 Duration (in hours) of oil thickness > 0.1mm for spilled oil at berth for the representative annual environmental scenarios

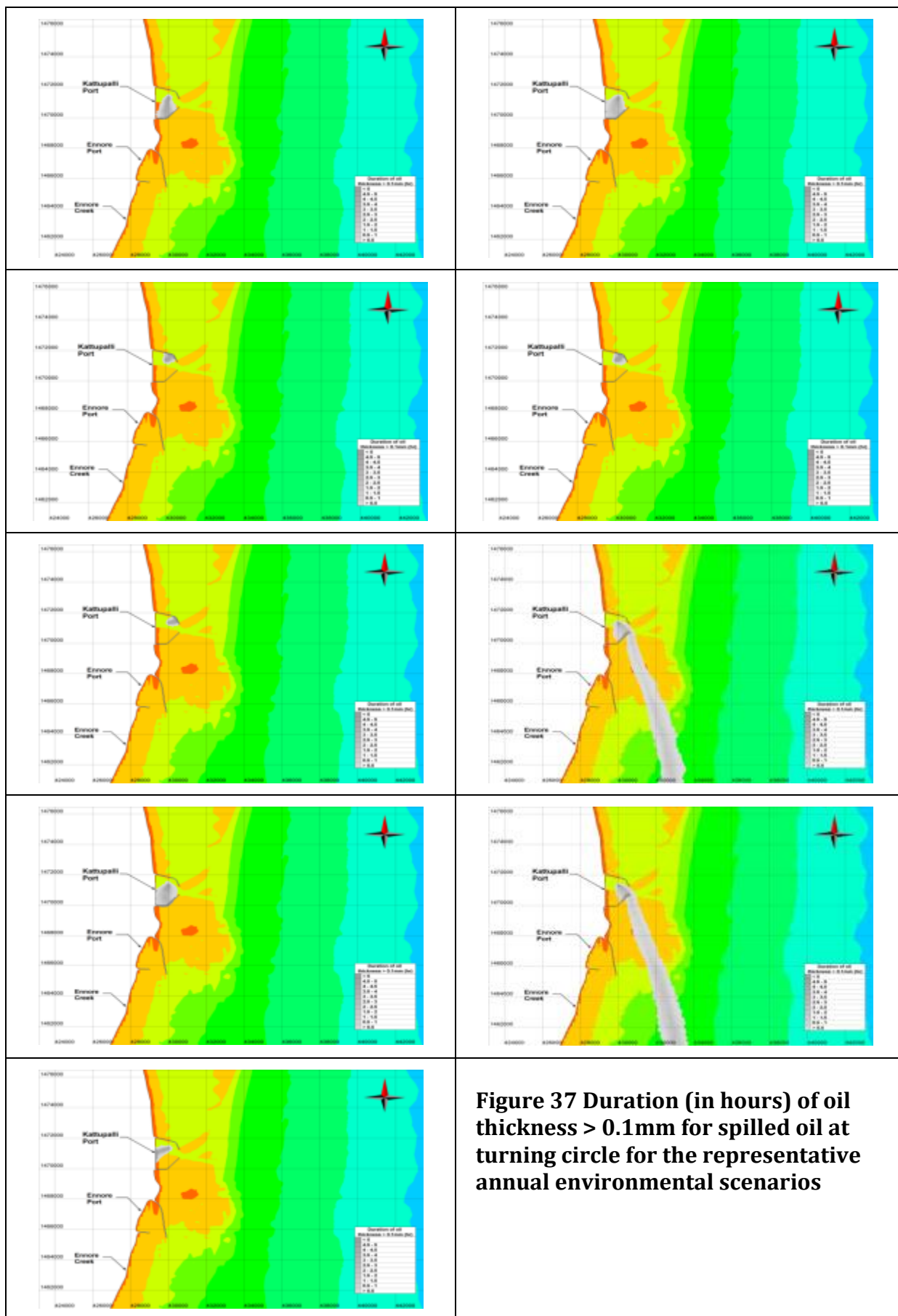
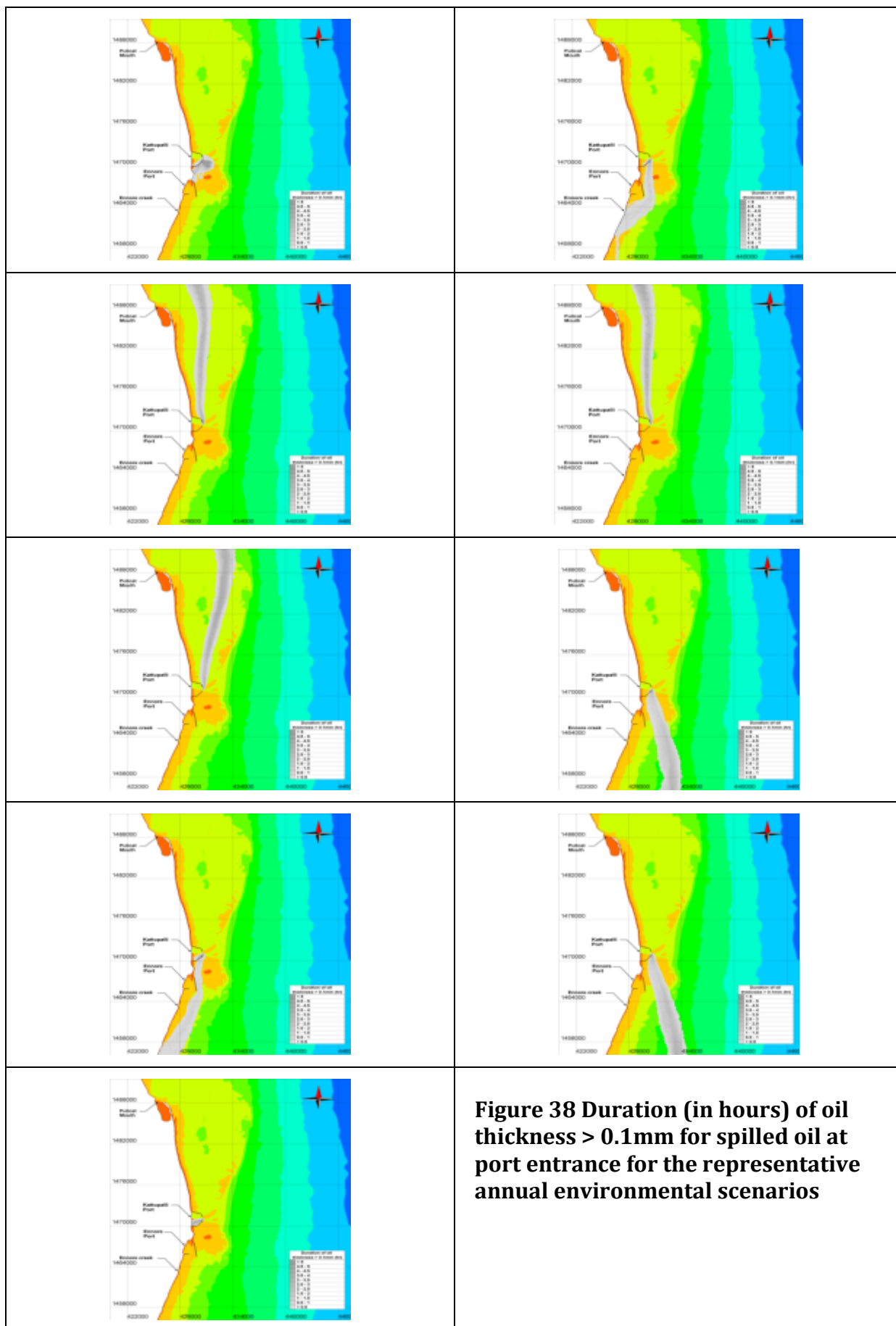


Figure 37 Duration (in hours) of oil thickness > 0.1mm for spilled oil at turning circle for the representative annual environmental scenarios



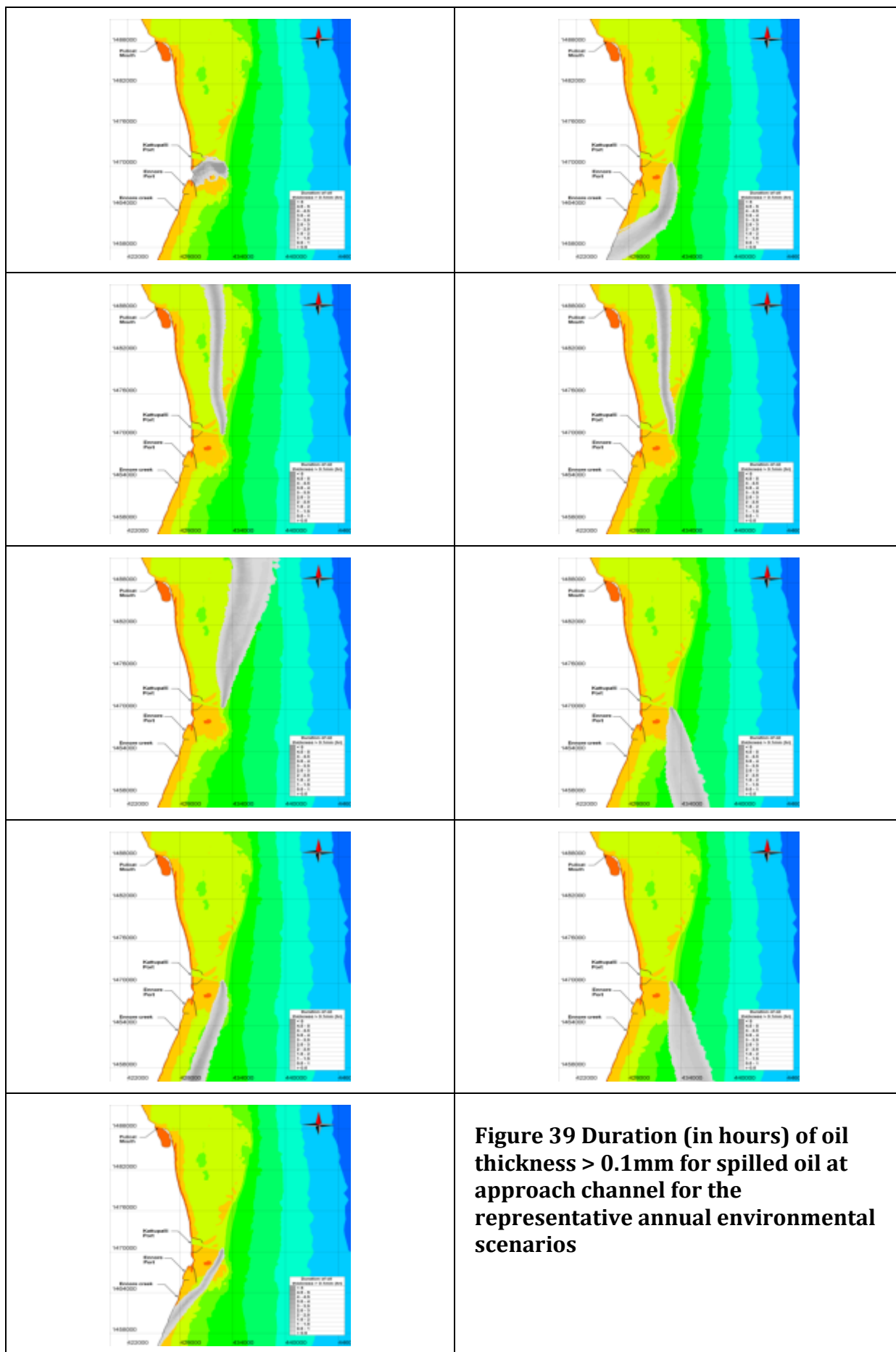


Figure 39 Duration (in hours) of oil thickness > 0.1mm for spilled oil at approach channel for the representative annual environmental scenarios

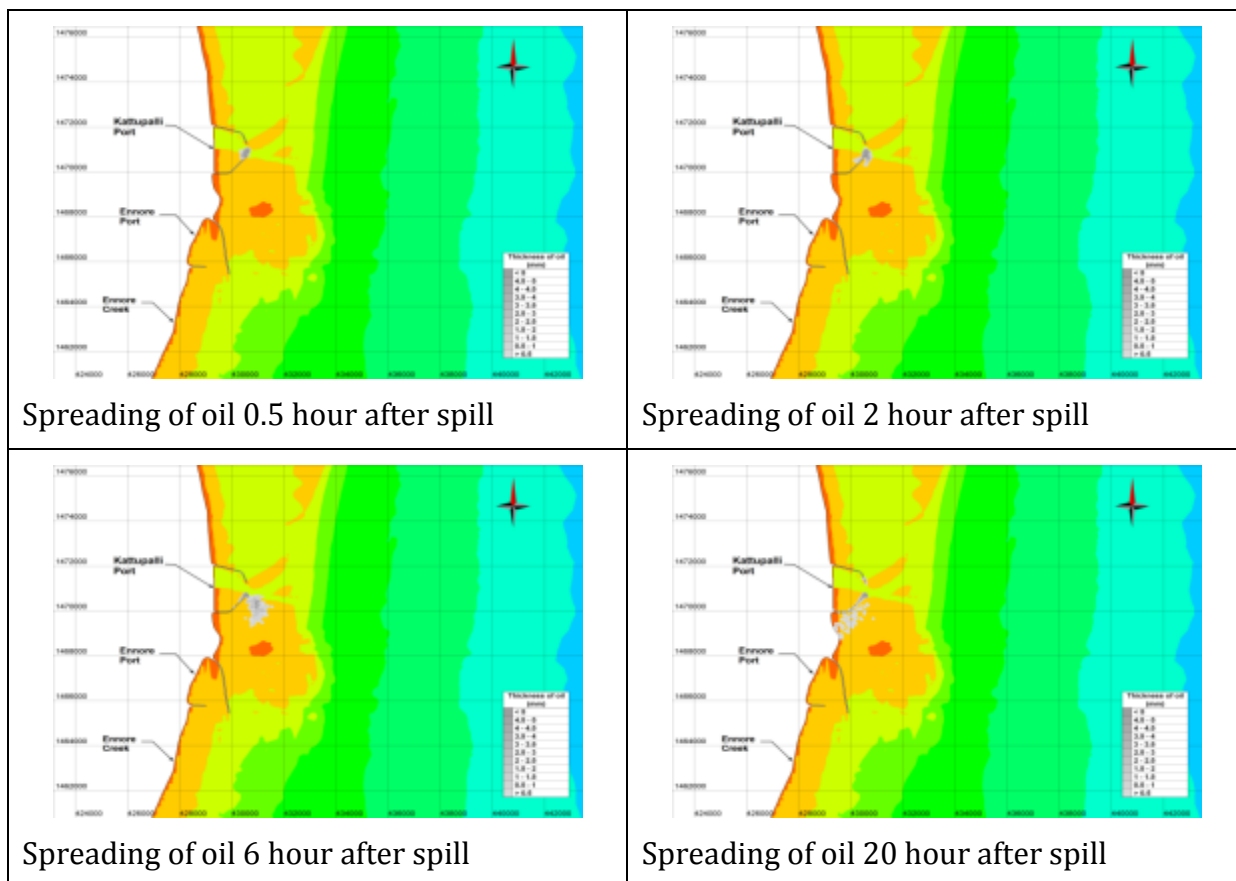


Figure 40 Spreading of Oil with Respect to Spill Time at Port Entrance for Typical Non Monsoon Scenario

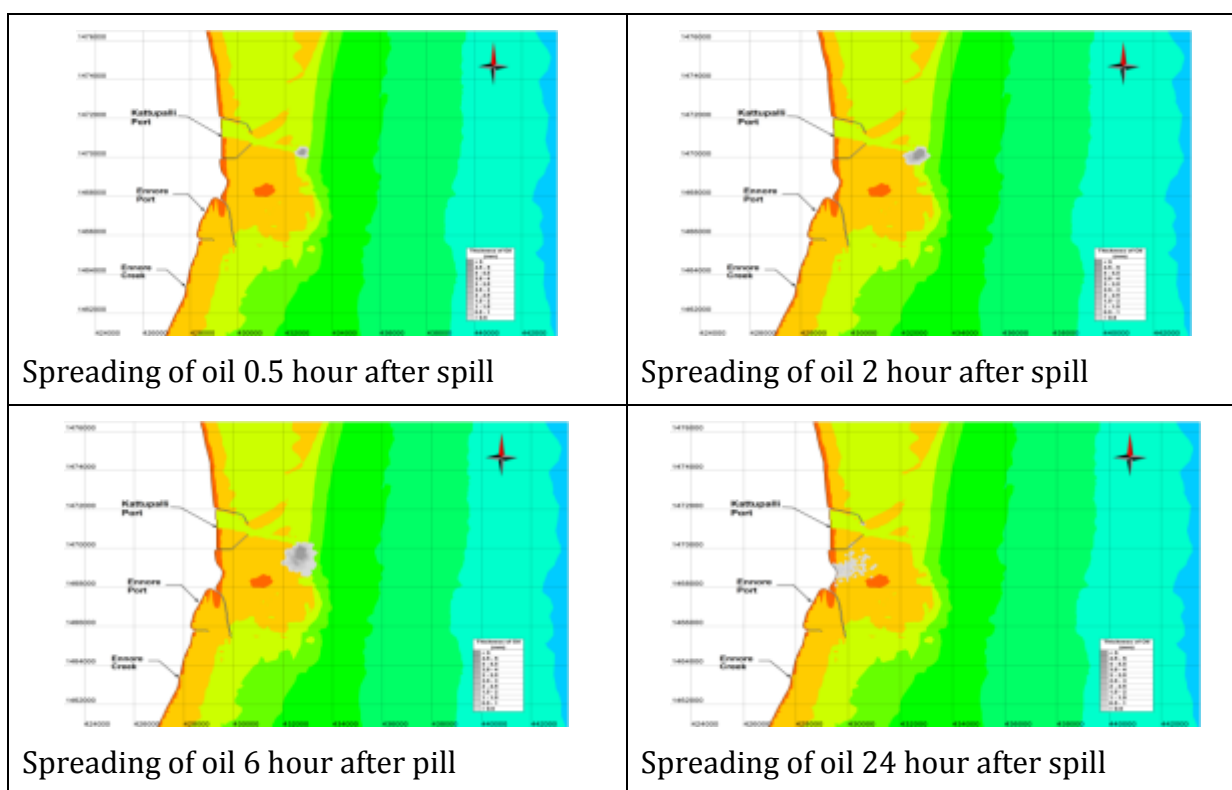
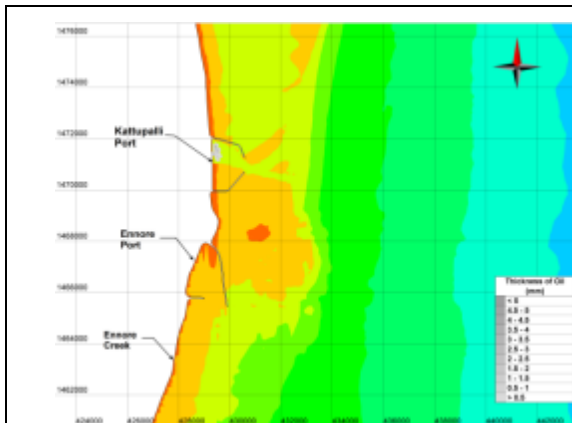
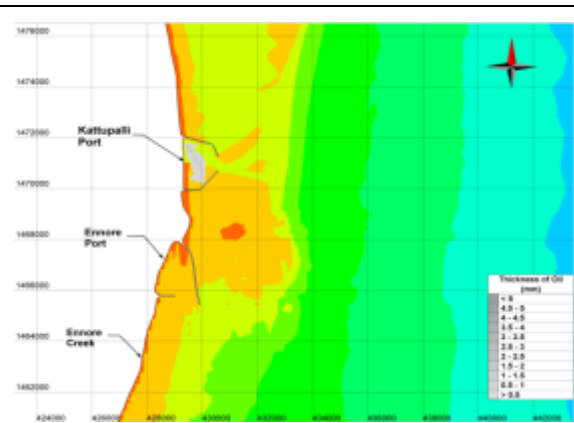


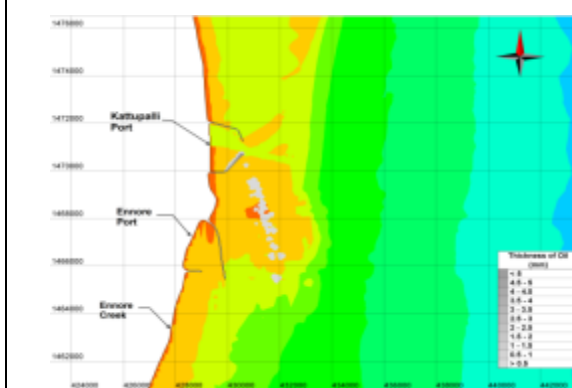
Figure 41 Spreading of Oil with respect to spill time at approach channel for typical non monsoon scenario



Spreading of oil 0.5 hour after spill



Spreading of oil 2 hour after spill



Spreading of oil 6 hour after spill

Figure 42 Spreading of Oil with Respect to Spill Time at Berth for Typical Non Monsoon Scenario

Table 13 Analysis of Spill Arrival Time and Thickness with Respect to Sensitive Locations

Season / Flow Condi- tion	Spill Location	Spill Quantity	Ennore Creek		Ennore Port Entrance		5km north from Kattupalli Port		10km north from Kattupalli Port		1.5km south from Kattupalli Port		500m south from Kattupalli Port		Pulicat Lake Mouth		Coast Between Kattupalli and Ennore Port		Coast between Kattupalli and Pulicat Lake		CPCL Intake	
			Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)
Non- monsoon- Northernly flow	Berth	100 lit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		1 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		100 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Turni- ng Circle	200 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Entra- nce	200 t	x	x	x	x	x	x	x	x	22.0	0.4	5.2	1.0	x	x	18.9	1.3	x	x	17.0	1.0
		700 t	x	x	x	x	x	x	x	x	22.4	0.8	4.5	0.9	x	x	17.0	11.5	x	x	14.1	1.3

Season / Flow Condition	Spill Location	Spill Quantity	Ennore Creek		Ennore Port Entrance		5km north from Kattupalli Port		10km north from Kattupalli Port		1.5km south from Kattupalli Port		500m south from Kattupalli Port		Pulicat Lake Mouth		Coast Between Kattupalli and Ennore Port		Coast between Kattupalli and Pulicat Lake		CPCL Intake	
			Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)
	Approach Channel	200 t	x	x	x	x	x	x	x	x	21.1	0.5	2.3	2.8	x	x	19.9	3.0	x	x	18.1	0.5
		700 t	x	x	x	x	x	x	x	x	5.1	0.8	2.7	4.7	x	x	18.4	11.9	x	x	15.4	1.9
Non-monsoon-Southerly flow	Berth	100 lit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		1 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		100 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Turning Circle	200 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Season / Flow Condition	Spill Location	Spill Quantity	Ennore Creek		Ennore Port Entrance		5km north from Kattupalli Port		10km north from Kattupalli Port		1.5km south from Kattupalli Port		500m south from Kattupalli Port		Pulicat Lake Mouth		Coast Between Kattupalli and Ennore Port		Coast between Kattupalli and Pulicat Lake		CPCL Intake	
			Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)
	Entrance	200 t	x	x	x	x	x	x	x	x	3.3	1.3	2.1	0.7	x	x	x	x	x	x	x	x
		700 t	11.7	0.8	x	x	x	x	x	x	3.1	2.6	1.8	3.7	x	x	x	x	x	x	x	x
	Approach Channel	200 t	x	x	x	x	x	x	x	x	2.2	3.2	1.1	3.6	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	x	x	x	x	1.9	4.5	1.1	7.1	x	x	x	x	x	x	x	x
Monsoon-Northerly flow	Berth	100 lit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		1 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		100 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Season / Flow Condition	Spill Location	Spill Quantity	Ennore Creek		Ennore Port Entrance		5km north from Kattupalli Port		10km north from Kattupalli Port		1.5km south from Kattupalli Port		500m south from Kattupalli Port		Pulicat Lake Mouth		Coast Between Kattupalli and Ennore Port		Coast between Kattupalli and Pulicat Lake		CPCL Intake	
			Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)
	Turning Circle	200 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Entrance	200 t	x	x	x	x	3.3	2.0	5.6	1.1	x	x	x	x	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	3.2	3.0	5.6	2.1	x	x	x	x	x	x	x	x	x	x	x	x
	Approach Channel	200 t	x	x	x	x	2.9	1.3	5.2	1.9	x	x	x	x	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	2.9	3.4	5.1	2.7	x	x	x	x	x	x	x	x	x	x	x	x
Monsoon-	Berth	100 lit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Season / Flow Condition	Spill Location	Spill Quantity	Ennore Creek		Ennore Port Entrance		5km north from Kattupalli Port		10km north from Kattupalli Port		1.5km south from Kattupalli Port		500m south from Kattupalli Port		Pulicat Lake Mouth		Coast Between Kattupalli and Ennore Port		Coast between Kattupalli and Pulicat Lake		CPCL Intake	
			Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)	Arrival Time (hrs)	Maximum Thickness (mm)
Southerly flow		1 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		100 t	x	x	x	x	x	x	x	x	2.8	0.3	2.2	0.5	x	x	x	x	x	x	x	x
	Turning Circle	200 t	x	x	x	x	x	x	x	x	2.3	0.6	1.7	0.6	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	x	x	x	x	1.9	1.9	1.5	3.4	x	x	x	x	x	x	x	x
	Entrance	200 t	x	x	x	x	x	x	x	x	1.5	2.6	1.0	3.1	x	x	2.2	1.0	x	x	1.1	0.5
		700 t	x	x	x	x	x	x	x	x	1.4	3.9	1.0	5.1	x	x	x	x	x	x	x	x
	Approach Channel	200 t	x	x	x	x	x	x	x	x	1.1	2.2	x	x	x	x	x	x	x	x	x	x
		700 t	x	x	x	x	x	x	x	x	1.0	4.3	x	x	x	x	x	x	x	x	x	x

8. Summary

Oil spill model was setup for different environmental and hydrodynamic scenario representing seasons prevailing around the project stretch. The sensitive areas around the project stretch were identified as Pulicat, Ennore creek, CPCL intake, CWDL intake and beaches in vicinity to the project site. The analysis of the simulated result indicates that the oil spill at the berths and turning circle are confined within the port basin during non-monsoon and south-west monsoon. However during northeast monsoon spill spreads out of the port basin and the plume is carried along with the coastal currents without beaching.

The spill plume at the port entrance and approach is carried towards the coast during non monsoon seasons. The spill during this period is beaching between Kattupalli and Ennore port and coast further south of Ennore port. The probability of Ennore creek getting affected to oil spill is high under these conditions. The expected arrival time for the spilled oil reaching Ennore creek is about 10 hours and about 0.8mm oil can be expected to reach this coast.

During monsoons the spill plume is confined to offshore moving nearly parallel to the coast. The spill plume during monsoon is pushed towards north during south west monsoon and towards south during north-east monsoon. The spill at the port entrance and approach during these periods will be confined in the deep water and may not beach in the vicinity of the sensitive environment.

There is high probability of CPCL intake getting affected due to spilled oil during north east monsoon. The thickness of spilled oil can range from 0.5 to 1.9mm with arrival time ranging from 1 to 18 hours. The probability of spilled oil reaching CWDL intake is low for the spill locations and scenario considered for the model study.

The simulated spill conditions are hypothetical based on the averaged environment and hydrodynamic conditions. The results obtained from the simulated scenario are only representative of seasons.

APPENDIX 6 – DETAILS OF EQUIPMENT WITH KATTUPALLI PORT

Particulars	Details of Equipment/Availability /etc.,
Inventory of oil pollution response equipment	<ul style="list-style-type: none"> a. Oil Containment boom 600mtrs. b. Skimmer 2 No.(20 TPH) c. OSD applicator 2 Nos.Tug Mounted d. OSD -3000 ltrs e. Flex barge 2 Nos. of 10 tons capacity each
Vessel and crafts available for pollution response operation.	<ul style="list-style-type: none"> a. One each Pilot, mooring and security boat available b. One tugs to tow containment boom in tandem c. One tug for towing reception barge d. One multipurpose barge for receiving oily sludge and debris up to 50 tons
Air capability for spray of dispersants, surveillance and assessment of spill. as well as response activity	No air effort available with Kattupalli Port but can be out sourced through Coast Guard if required.
Kattupalli Port reception facilities	No reception facilities with port
Oil Spill Contingency Plan update	Plan to be updated at regular intervals
General information	<ul style="list-style-type: none"> a. Re-processing and re-cycling of collected spill b. Disposal of oily waste ,sludge and debris c. Cleaning up of beaches d. Cleaning up of permanent structures of port

APPENDIX 7 – DETAILS OF EQUIPMENT WITH ADJACENT FACILITIES

ENNORE PORT POLLUTION RESPONSE EQUIPMENT

S. No.	Equipment	Qty
1	Sea going tugs (Ilango, Kamber, Pugazhendhi)	3 Nos.
2	Pilot launch Surface crafts (Arani, Kortaliyar)	2 Nos.
3	Mooring launches (Cheran, Chozhen, Pandiyan)	3 Nos.
4	Oil Containment Boom Globe Model ED-24 in 30.5 m section with slide end connectors as per ASTM 'Z' Specifications.	1 No.
5	Oil Skimmer	1 No.
6	Portable Compressor	1 No.
7	OSD type-III	1000 Ltrs
8	OSD spray pump	1 No.
9	Oil absorbent pads	21 Nos.
10	Oil absorbent boom	18 Nos.
11	Saw dust	300 Kgs
12	Sand bags	500 Kgs
13	Containment trays	6 Nos.
14	Slop receipt tank (1100 KL each)	2 Nos.
15	Slop sump pit at MLT (10KL each)	2 Nos.
16	Dispersant spraying equipment	1 No.
17	Disp Chemical	200 Ltrs
18	Absorbent Pads	1000Nos.

**DETAILS OF OIL POLLUTION RESPONSE EQUIPMENT HELD WITH
COAST GUARD PRT (EAST), CHENNAI**

S. No.	Equipment	Qty
1	DS250 (WEIR type skimmer)	1 No.
2	SS 50-Sea skimmer (Disc Type0	1 No.
3	Destroil Skimmer	2 Nos.
4	Oil Mop MK II	1 No.
5	RO Boom	9 Nos.
6	RO Boom Power Pack	1 Nos.
7	Hi – Sprint Boom	1 No.
8	RO Trawl	1Nos.
9	RO Sweep	1 Nos.
10	Thune Eureka (CCN pump)	1 No.
11	TC – III Bucket	5 Nos.
12	Heli Skimmer	1 No.
13	Spill Spray System	2 Nos.
14	Beach Cleaning Unit	1 No.
15	River Boom Blower	1 Nos.
16	RO Clean Unit	1 No.
17	Settling Tank	1 No.
18	Hot Water Cleaner	1 No.
19	HP Cleaner	2 Nos.

DETAILS OF POLLUTION RESPONSE CAPABILITY

CHENNAI PORT TRUST

S.No.	Particulars	Details	
1	Chennai Port Trust	1. Inflatable boom in reel with power pack 2. Sweeping arm 3. Permanent boom 4. Inflatable Pneumatic boom 5. Boom storage reel for inflatable boom 6. Spill spray unit with spray arm 7. Oil skimmer interchangeable with drum cap. 20 kl/hr approx 8. Drum skimmer of capacity 7 KL/hr 9. Weir type skimmer of capacity 30 KL/hr 10. Power sprayer 11. Oil Absorbent pads 12. Oil spill dispersant	100 mtrs 25 mtrs 600 mtrs 400 mtrs 2 nos 1 set 1 no 1 no 1 no 1 no 1000 nos 2000 ltrs
2	Ennore Port Limited	1. Sea going tugs (Ilango, Kamber, Pugazhendhi) 2. Pilot launch Surface crafts (Arani, Kortaliyar) 3. Mooring launches (Cheran, Chozhan, Pandiyan) 4. Oil Containment Boom Globe Model ED -24 in 30.5 m section with slide end connectors as per ASTM 'Z' Specifications 5. Oil Skimmer 6. Portable Compressor	3 nos 2 nos 3 nos 1 no 1 no 1 no
3	CPCL Chennai	1. Oil Spill Containment boom suitable for open sea jetty as acceptable to NIO, Goa and Indian Coast Guard 2. Fencing / Intertidal boom to deploy at the creek mouth 3. Tow Bridles for Booms 4. Boom repair kit 5. Ground clothes for quick Tank Qet 1400 Gc 6. PVC Hand Gloves- Small 14" 7. Mops with handle 8. Hand shovel with wooden handle	500 mtrs 150 mtrs 04 Nos 02 Nos 04 Nos 60 Nos 20 Nos 20 Nos

		9. Wheel barrow 10. Rake with handle 11. Tarpaulin standard size 30'x27' 12. Gunny bags 13. HDPE bags 14. Safety helmets 15. Liquid soap 16. Coleman water flask(20 ltrs) 17. Saw Dust packed in gunny bags 18. Disposal coveralls – small 19. Disposal coveralls – Medium 20. Disposal coveralls – Large 21. Disposal coveralls – Extra Large 22. Gum Boots - Small 23. Gum Boots – Medium 24. Gum Boots – Large 25. Plastic Buckets – 10 Ltrs 26. Plastic Buckets – 20 Ltrs 27. Plastic Mugs – 01 Ltrs 28. Cotton Rag 29. Trolleys 30. Detergent Powder 31. Disposal cups 32. Work / Life Vests 33. Danforth Anchors with shackle – 60 Kg 34. Interconnecting chain for above Anchors 35. Oil Absorbent pads 36. Boom Inflating Blowers 37. Oil Spill Dispersant 38. Boom connectors and Buoys 39. Hydraulic disc skimmer, capacity 30 Mt/Hr complete with following : Skimmer head with storage and transit cover Hydraulic power pack. Hydraulic hoses of suitable length for work. discharge hose kit suitable length for works with quick disconnect fittings. Tool kit. 40. Hydraulic disc skimmer spares	10 Nos 10 Nos 04 Nos 50 Nos 50 Nos 15 Nos 50 Ltrs 02 Nos 100 Kg 10 Nos 20 Nos 20 Nos 20 Nos 10 Nos 10 Nos 10 Nos 15 Nos 15 Nos 15 Nos 100 Kgs 03 Nos 25 Kgs 50 Nos 04 Nos 03 Nos 02 Nos 100 Nos 02 Nos 1000 Ltrs 02 Nos 01 Set 01 No
4	Reception Facilities	a) Shore reception facility of capacity 4400 KL to receive Slops/dirt ballast from tankers. b) Tanker trailer of 10 KL capacity to receive oily bilge/sludge from vessel c) Garbage bins provided at all berths for ships to dispose off segregated garbage	

APPENDIX 8 – COST RECOVERY

1. INTRODUCTION

- a. When an oil spill occurs claims for clean-up costs and damages can be brought against its ship owner responsible for the incident and his insurer.
- b. ITOPF, to which virtually all of the world's tanker tonnage belongs, in an agreement entered into by tanker owners and bareboat charter to which the parties agree to assume certain obligations for which they might not otherwise be legally liable. For TOVALOP to apply it is not necessary to demonstrate that the tanker owner or bareboat charter was at fault, and there are only a very limited number of circumstances in which a policy will be totally free of any obligation under the Agreement (i.e. war or terrorism)
- c. The Two International Conventions are the International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC) and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 1971 (Fund Convention)

2. PREPARATION OF CLAIMS

Normally an Administration will co-ordinate the submission of the various claims and it is essential that accurate detailed records are kept to support such claims. Each claim should contain the following particulars

- a. The name and address of the claimant and his representative, if any;
- b. The identity of the ship involved in the incident;
- c. The date, the place and specific details of the incident;
- d. The type of oil, clean up charges, pollution damage as the place where it experienced.
- e. The amount of claim

Depending on amount and nature of claim, claims report be broken down into categories i.e.

- a. Costs of preventive measures and cleanup
- b. Replacement and repair costs
- c. Economic loss

3. COSTS OF PREVENTIVE MEASURES AND CLEANUP

- a. Summary of events, including description of work carried out in different areas and of working methods chosen in relation to circumstances prevailing during incident.
- b. Delineation of area affected, describing extent of pollution and identifying areas most heavily contaminated. This should be presented in the form of a map or chart supported by photographs or videotapes.

- c. Analytical or other evidence linking oil pollution with ship involved in incident (e.g. chemical analysis, wind, tide or current data, observation and plotting off floating oil movement).
- d. Dates on which work was carried out (weekly or daily costs)
- e. Labour costs (number and categories of response personnel, regular and overtime rates of Pay, days/hours worked).
- f. Equipment and material cost (types of equipment used, rate of hire, consumable material, quantity and cost.
- g. Transport costs (number and types of vessels/aircraft, vehicles use, number of days/hours operated, rate of hire or operating cost).
- h. Costs of temporary storage (if applicable) and final disposal of recovered oily material.
- i. Comprehensive records to be kept detailing all operations and expenditures. Daily work sheets will be compiled by supervisory personnel of operations in progress, equipment in use, where and how it is being used, the number of personnel employed, how and where they are deployed and the materials consumed.
- j. The foregoing activities usually result in the major expenditures in an oil spill incident, which may involve aircraft, vessels, specialized equipment, heavy machinery trucks and manpower. Some of these resources will be government owned and others will be the subject of contractual arrangements. To ensure that adequate control of expenditures is kept a Finance Manager is assigned to the response team.

4. REPLACEMENT AND REPAIR COSTS

- a. Extent of pollution damage to property.
- b. Description of items destroyed, damaged or needing replacement or repairs (e.g. boat, fishery, net, sail) including its location at the time of oil pollution damage.
- c. Cost of repair work or replacement of item.
- d. Age of item to be replaced

It is likely that numerous claims will be made from public, and private sector, such as fishermen, pleasure boat owners, marina operators, etc. In this case it may be desirable to arrange through vessel's insurers to appoint insurance adjusters to whom claimants may be referred by Finance Manager. Special telephone number and office will be established to process claims and public advised through the media that this service is available.

5. ECONOMIC LOSS

- a. Nature of loss, including demonstration that loss resulted directly from the incident.
- b. Comparative figures for profits earned in previous periods and for the period during which such damage was suffered.

- c. Comparison with similar areas outside the area affected by the spill.
- d. Method of assessment of loss.

These losses can include but are limited to: restriction of fishing activity, closure of coastal industrial and processing installations, loss of income by resort operators, etc. In many cases the financial records for previous years may be readily available, although difficulties may arise in distinguishing losses caused by the oil spill from those caused by other unrelated factors such as bad weather or overfishing.

6. CONCLUSIONS

The principal categories of claims, which are likely to prove acceptable, have been discussed.

However, there may be other categories of claims. In all cases the claim should be presented clearly and in sufficient detail so that it is possible to assess the amount of damage suffered on the basis of the facts and the documentation presented. In order to assist Administrations in preparing and presenting claims for compensation for oil pollution damage an example of a claim for reimbursement of clean-up costs is attached. It should be noted that an invoice or other relevant documentation such as daily work sheets and explanatory notes must support each item of the claim.

Examples of Costs for cleanup operations of 4Kms beach north of Kattupalli Port

Personnel

1-10 April 10 days use of workforce of 25 men

- a. 2000 working hours at \$5 per hour = \$10000
- b. Overtime 150 hours at \$2.50 = \$375

Consumable Material

- a. 10 bales of sorbent pads at \$50 per bale = \$500
- b. 250 gloves at \$1 = \$250
- c. 25 protective overalls, which became too polluted to be cleaned, at \$10 = \$250

Transport

- a. Use of three lorries with drivers on the beach for the removal of collected oil and debris: the lorries were hired at \$120 per day, for 10 days = \$3600
- b. Hire of front-end loader and operator at \$200 per day for 10 days = \$2000
- c. Transport of personnel to and from the beach by bus every morning and afternoon for 10 days, hire of bus \$50 per day = \$500

Disposal

Costs for handling oily debris at municipal dumpsite 50 tons at \$20 = \$1000

Food for Personnel

Packed meals brought to the site of the clean-up operation; 250 lunches at \$2.50 = \$625

Clean-up Operations at sea

- a. Helicopter surveillance at sea on 31 March and 2 April, 3 hours per day at \$100 per hour = \$900
- b. Hire of vessel for 6 hours at \$35 per hour used for spraying dispersants = \$210
- c. Costs of dispersants, 10-200 litre drums at \$300 per drum = \$3000
- d. Hire of vessel laying and recovering booms on 1 and 3 April, 2 days at \$400 = \$800
- e. Boom rental charges, 3 days at 2000 metres at \$6 per metre per day = \$36000
- f. Skimmer rental charges, 3 days at \$100 per day = \$300
- g. Rental of tank truck and driver to remove recovered oil, \$180 per day for 3 days= \$540
- h. Costs of cleaning boom – 2000 meters at \$5 per meter = \$10000

Grand Total = \$70850

APPENDIX 9 – GUIDELINES FOR THE COLLECTION OF OIL SAMPLES

- a. The following guidelines are to be adhered to for the taking of oil samples and the transportation of samples.
- b. Samples of at least 100 grams must be taken with the minimum of delay to minimize changes in composition. Every effort should be made to obtain an uncontaminated sample of oil for comparison purpose, particularly if prosecution is envisaged. It is imperative that an application for testing accompanies the samples to the designated laboratory.
- c. Samples are to be placed in clean glass jars/bottles and are to be individually sealed with paper/ wax seal.
- d. Sample bottles are to be appropriately numbered and noted with

Name of officer taking the sample

Time and date of sample taken

Location at which sample was taken

Reference to the incident being investigated

For those samples taken from a vessel, certification from representative of vessel

Details of direction of the movement of the oil, wind and current

- e. Once taken, the sample bottles are to be placed in a lockable transportation box, locked and sealed. If more than one officer is involved with the collection of samples, each officer should have a box for the samples that they have taken.
- f. When the sampling has been completed, the transportation box is to be kept in the possession of the officer who collected the samples until he/she sends it by courier to the designated laboratory.

The sealed transportation box is then delivered by courier to the designated laboratory, where written confirmation of delivery is obtained.

APPENDIX 10 – PREDICTION OF OIL SPILL MOVEMENT

The main factors affecting the fate of spilled out are :

- (i) Oil properties- surface tension, specific gravity, temperature;
- (ii) Spreading;
- (iii) Advection - waves, winds and current; and
- (iv) Weathering.

CALCULATING MOVEMENT

Oil will move at approximately 3.5% of the wind velocity and at the surface current velocity. In the presence of wind and currents, it is generally accepted to add their effects vector ally. The procedure for vector addition is given below. This provides only an estimate of slick movement and so should not be considered absolute.

PREDICTION OF SLICK MOVEMENT BY VECTOR ADDITION

V_w = Wind Speed vector x 0.35 (knots)

V_c = Water current speed vector (knots)

V_s = Slick speed vector (knots)

O = Point of discharge

PROCEDURE

- (a) Plot location of spill at point O.
- (b) Layout V_w and V_c from known heading, using the same scale for both vector lengths.
- (c) Draw line parallel to V_w at the tip of V_c (A-A) and a line parallel to V_c at the tip of V_w (B-B).
- (d) Draw a line connecting O and the intersection A-A, B-B. This is V_s .
- (e) Measure the length of V_s and determine speed in knots from scale.

APPENDIX 11 – IMPORTANT TELEPHONE NUMBERS

S N	Points	Land line No. (044)	Mobile No.	Radio VHF Channel
01	Port Signal Station (PSS)	27968500	7299090542	Calling - 16 Working - 73
02	Communication Command Centre (CCC)	27968222	7299090540	UHF 14
03	Port Fire Station	27968555	9094164623	UHF 13
04	First Aid Center (Port)	27968556	---	UHF 13
05	Medical Officer (Shipyard)	33464365	8939441885	
06	Port Security Gate	27968051	9962012328	UHF 14
CRISIS MANAGEMENT TEAM				
07	COO	27968100	9444399132	
08	GM (Marine) / PFSO	27968105	9445046060	
09	GM (KICT)	27978401	7299088907	
10	DGM (HR)	27968112	9600127896	
11	PR In charge	27968500	7299090542	
12	Head Finance	27968109	9840227628	
SITE POLLUTION CONTROL TEAM				
13	Pollution Control Officer (Duty Pilot)	27968500	7299090542	Ch. 73
14	Marine Coordinator	27968110	9884427123	Ch. 73
15	Logistics Coordinator	27968450	7299944780	
16	Communication Officer	27968500	7299090542	Ch. 16 / 73
17	Shore Line Clean up Team	27968470	7299977154	
18	Waste Material Coordinator	27968470	7299977154	
19	Waste Management Officer	27968470	7299977154	
20	Port Graft Coordinator	27968502	-	Ch. 16 / 73

Organisation	Tel No	Fax No	Email ID
National Disaster Mgmt Authority	011-25655014	011-25655003	
Chief Secretary, GOTN	044-25671555		
Principal Secretary, Home, Prohibition and Excise Dept., GOTN	044-25671113	044-25670596	homesecc@tn.gov.in
Secretary, Co-Operation Food and Consumer Protection Dept., GOTN	044-25672224	044-25675229	
Secretary, Highways and Minor Ports Dept. GOTN	044-25670959	044-25673035	
Vice Chairman & CEO, Tamil Nadu Maritime Board (TNMB)	044-28150425	044-28151632	tnmb@md5.vsnl.net.in
State Port Officer, TNMB	044-28150979	044-28151632	Sainath.tnmb@gmail.com
Chairman-cum-Managing Director, TANGEDCO	044-28521300	044-28544528	chairman@tnebnet.org
Member Secretary, Tamil Nadu Pollution Control Board,	044-22353145	044-22353068 044-22353156	forsec@tn.gov.in
Dir. General of Police, Chennai	044-28447777 044-28447755	044-28447703	phq@tn.nic.in
Directorate General of Shipping	022-22613651 022-22613652	044-22613655	dgship@dgshipping.com
Nautical Advisor to the GOI	022-22670863	044-22694352	na@dgshipping.com
DG com Centre	022-22614646	044-22613636	dgcomcentre@satyammail.net dgcomcentre@gmail.com
District Collector, Tiruvallur	044-27661600	044-27661200	collrtir@nic.in
Superintendent of Police, Tiruvallur	044-27666555 9445465669		sptvtr@gmail.com
RDO, Ponneri	044-27974073 9445000410		Pnrdo.tntir@nic.in
Police Station – Minjur	044-27934268 9445465722		
District Fire Officer	044-27660101 9445086156		
Dist. Coordinator, Disaster Management cell	903337698		
Fire Station, Ponneri	04119-74064		
Mercantile Marine Department (MMD), Chennai	044-25251107 044-25251108	044-25232929	mmdchennai@vsnl.net
Indian Navy (INS Adyar) Maritime Operation Centre	044-25394240		
Indian Navy (INS Adyar) Exchange	044-25395031		
Coast Guard (RHQ East)	044-23460404		
Coast Guard DHQ 5	044-25671718 Extn 222		
Marine Police (Coastal Security Group)	28447752	28447748	
Chennai Port Trust	044-25362201		
Ennore Port	044-25251666	27950002	
Fisheries Dept. Secretary TNFD	044-25672397		
NIOT	044-66783300		
ICMAM-PD	044-22460276		
National Biodiversity Authority	044-22541071		
Forest Department	044-25671511		
National Service Scheme	044-22301795		
NGOs Chennai	9894175009 9994984403		
MS Swaminathan Foundation	044-22541229		

APPENDIX 12 -DETAILS OF WEATHER IN THE SOUTH ASIAN SEAS

EXTRACT OF NOSDCP

1. A number of types topographical features are found in the South Asian area, such as shallow continental shelves, deep sea basins, troughs, trenches, continental slopes and coral islands. In addition, the seasonal monsoons dramatically affect the ocean currents and winds in both direction and velocity. In order to accurately predict the movement of oil on the surface of the water, all of these influences must be taken into account.
2. Computer modeling has the ability to assist in determining the direction that spilled oil will move but only after all the data concerning ocean currents and wind direction velocities has been programmed into the computer. It may be some time before computer modeling will be available to cover large areas of high-risk sea-lanes. Until computer modeling becomes a reality, On-Scene-Commanders will need to rely on meteorology information from their national weather service organisations, as defined in each country's National Contingency Plan.
3. Monthly meteorology and oceanography pilot charts for the South Asian area are included in the South Asia Action Plan for guidance in evaluating the general movement of oil on the surface of the water in the open sea. The wind and ocean current information, though general in nature, will assist, the OSC in predicting the movement of oil. As a spill moves near shore, it will come under the influence of tidal currents and coastal eddies which will require close monitoring.
4. Most of the currents in the region are wind-driven. In the open sea, the drift is recognisably associated with the monsoon winds but, close to land, the winds, and hence the currents, are variable. In the Arabian Sea and the Bay of Bengal, a general easterly drift prevails during the SW monsoon as far as Sumatra where rips may develop at the intersection with a westerly flow out of the Malacca strait. Off Bangladesh, a gyre develops, extending further south during November/December but weakening in the process, except near the Indian coast where currents are in excess of 1 knot. In the Arabian sea, the flow is northwesterly until March/April when a reversal to a clockwise circulation takes place in both basins.
5. General monthly wind is given for the South Asian area.
 - a. January: Winds average 5 to 15 knots across the Indian Ocean. North of the equator, the prevailing wind direction is north or northeast (the northeast winter monsoon).
 - b. February: North of the equator, the prevailing winds are from the north or northeast (the northeast winter monsoon), averaging 5 to 15 knots.

- c. March: North of 10 Deg N, the prevailing winds are out of the north or northwest and average 5 to 15 knots, Between the equator and 10 Deg N , the average winds drop to 2 to 10 knots and vary somewhat in direction.
- d. April: North of the equator, The winds average 5 to 10 knots. Over the Arabian Sea, they are from the northern quadrants and over the Bay of Bengal, they are from the south to southeast.
- e. May: During May, with the established lows over India, the southwest winds are well entrenched. Across the Arabian sea and Indian Ocean, the average force has increased significantly to 10 to 20 knots.
- f. June: The southwest monsoon is fairly well established across Southern Asia and the prevailing southwesterly winds have crossed the equator by 5 Deg. The force of the southwesterly winds has increased markedly from the previous month, especially over the Arabian Sea, with 10 to 20 knots over the Bay of Bengal.
- g. July: The southwest monsoon produces it's strongest winds during July. Prevailing southwesterly winds 10 to 20 knots over the Bay of Bengal and 15 to 30 knots over the Arabian Sea.
- h. August: Southwesterly winds still prevail north of the equator. Across the Arabian sea, the winds average 15 to 25 knots while over the Bay of Bengal, they average 10 to 15 knots.
- i. September: Southwesterly winds still prevail across the north Indian Ocean even though the southwest monsoon has begun it's retreat. Winds average 10 to 20 knots across the Arabian Sea and 10 to 15 knots across the Bay of Bengal.
- j. October: The influence of the southwest monsoon has disappeared and prevailing winds have become northwesterly, averaging 5 to 10 knots. Over the Bay of Bengal, the prevailing winds are west or southwest.
- k. November: Winds of average 5 to 10 knots are encountered across the Arabian Sea and the Bay of Bengal with northeast winds prevailing north 10 Deg N and west winds south of 10 Deg N.
- l. December: The prevailing winds across the north Indian Ocean are from the northeast with an average 10 to 15 knots across the Arabian Sea and Bay of Bengal. Between the equator and 5 Deg N, the prevailing winds north westerly at an average 5 to 10 knots.

Beaufort Scale Conversion

Beaufort Number	Knots per Hour
1.	Less than 1
2.	1 to 3
3.	4 to 6
4.	7 to 10
5.	11 to 16
6.	17 to 21
7.	22 to 27
8.	28 to 33
9.	34 to 40
10.	41 to 47
11.	48 to 55
12.	56 to 63
12 or more	64 or more

APPENDIX 13 – GUIDANCE FOR EQUIPMENT SELECTION

SKIMMER SELECTION MATRIX

Legend 1-Good 2-Fair 3-Poor		Generic Type of Skimmer																	
		Oleophilic Surfaces						Weir			Vacuum Units		Hydrodynamic Devices		Other Methods				
		Brush Disc Rope Rope/Belt (Catamaran Mounted) Sorbent Belt (Downward Moving) Sorbent Belt (Upward Moving)						Advancing Combination Weir/Boom Saucer Screw/Auger Self-Leveling Vortex	Vacuum system with Weir Skimmer head Rope Rope/Belt (Catamaran Mounted)		Hydro cyclone Submersion Plane Water Jet		Combination Trawl/Boom Paddle Belt						
Operating Environment	Open Seas Hs>3FT; V<1kt	2	2	1	1	1	1	2	2	3	3	3	2	3	3	3	1	3	
	Harbours and Bays Hs>3FT; V<0.7kt	1	1	1	1	1	1	1	1	2	3	3	1	2	3	2	2	1	3
	Protected In Shore Hs>1FT; V <0.5kt	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	High Currents <2kt	2	3	2	1	1	2	1	2	3	2	3	2	3	2	2	2	2	2
	Shallow waters <1ft	2	2	1	3	3	3	3	3	1	3	2	2	1	3	2	3	2	1
	Debris (including Ice)	1	3	1	1	2	1	2	3	3	2	3	3	3	3	1	3	2	3
Oil Viscosity	High Viscosity (>1000cSt)	1	2	2	2	2	1	2	2	2	1	3	2	2	3	2	1	1	1
	Medium Viscosity (100-1000cSt)	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	2	1
	Low Viscosity (<100 cSt)	1	2	2	2	1	3	1	1	1	2	1	1	1	1	1	1	2	2
Skimmer Characteristics	O/W Pickup Ratio*	1	2	1	1	2	2	2	2	3	2	3	2	3	3	2	2	1	2
	Pickup Rate	2	2	3	2	2	2	2	1	2	3	3	2	3	2	2	3	2	2
	Ease of Deployment	1	1	2	1	1	1	2	3	1	2	1	2	1	1	2	3	2	3
* O/W Pickup Ratio = % Oil in skimmed Products HS = Significant wave height CST = Centistokes V = Velocity of surface current																			
Source : Manual on oil spill																			

BOOM SELECTION MATRIX

		Type of Boom				
		Internal Foam Flotation	Self Inflatable	Pressure Inflatable	External Tension Member	Fence
Legend 1-Good 2-Fair 3-Poor						
Environmental Conditions	Offshore Hs > 3ft; V < 1kt	2	2	1	1	3
	Harbor Hs < 3ft; V < 1kt	1	1	1	2	2
	Calm Water Hs < 1 ft; V < .5 kt	1	1	1	2	1
	High Currents V > 1 kt	2*	3	2	1	3
	Shallow Water (Depth < 1 ft)	1	2	2	3	3
Performance Characteristics	Operation in Debris	1	3	2	3	2
	Excess Buoyancy	2	1	1	2	3
	Wave Response	2	2	1	1	3
	Strength	2	3	1	1	1
Convenience Characteristics	Ease of Handling	2	1	2	3	2
	Ease of Cleaning	1	1	1	3	1
	Compactability	3	1	1	2	3
	Cost/Ft 1-Low 2-Medium 3-High	1	3	2	3	2
<p>Notes: *Hs = Significant Wave Height *V = Velocity of Surface Current</p> <p style="text-align: right;"><i>Source : IMO Manual on Oil Pollution</i></p>						

APPENDIX 14 – NOTICE UNDER ARTICLE 356 J & 356 K

(I) Notice under Article 356 J & 356 K of Merchant Shipping Act, 1958 has to be issued to the polluter if the polluter is a marine craft.

1. Where the Central Government is satisfied that -
 - a. Oil is escaping or is likely to escape from a tanker, ship other than a tanker or any off-shore installation; and
 - b. The oil so escaped or likely to escape is causing or threatens to cause pollution of any part of coasts or coastal waters or India, it may, for the purpose of minimizing the pollution already caused, or, for preventing the pollution threatened to be caused, require –
 - i. The owner, agent, master or charterer of the tanker,
 - ii. The owner, agent, master or charterer of the ship other than a tanker,
 - iii. The owner, agent master, character or operator of a mobile offshore installation,
 - iv. The owner, operator, lessee or licensee of off-shore installation of any other type, or all or any off them, be notice served on him or as the case may be on them, to take such action in relation to the tanker, ship other than a tanker, mobile off-shore installation, or, as the case may be, off-shore installation or any other type or its cargo or in relation to both, as may be specified in such notice.
2. Without prejudice to the generality of sub-section(1) the notice issued under that sub-section may require the person or persons on whom such notice is served to take action relating to any or all of the following matters, namely :-
 - a. Action for preventing the escape of oil from the tanker, ship other than a tanker, mobile off-shore installation or off-shore installation of any other type:
 - b. Action for removing oil from the tanker, ship other than a tanker, mobile off-shore installation or off-shore installation of any other type in such manner, if any, and to such place, if any, as may be specified in the notice;
 - c. Action for removal of the tanker, ship other than a tanker, mobile off-shore installation or off-shore installation of any other type to a place, if any as may be specified in the notice;
 - d. Action for removal of the oil slicks on the surface of the sea in such manner, if any, as may be specified in the notice;
 - e. Action to disperse the oil sticks on the surface of the sea in such manner, if any, as may be specified in the notice;

3. The Central Government may, by any notice issued under sub-section (1), prohibit the removal –
 - a. Of the tanker, ship other than a tanker, mobile off-shore installation or off-shore installation of any other type, from a place specified in the notice,
 - b. From the tanker, ship other than a tanker, mobile off-shore installation or off-shore installation of any other type, of any cargo or stores as may be specified in the notice. Except with its previous permission and upon such conditions, if any, as may be specified in the notice.
4. Notwithstanding anything contain in sub-section (2), the Central Government may, if it is of the opinion that the pollution caused or likely to be caused has or may present a grave emergency, proceed to take such measures as may be deemed necessary and any measures so taken shall be deemed to have been taken under section 356K.

356k 1. Where any person fails to comply, or fails to comply in part, with any notice served on him under section 356J, the Central Government may, whether or not such person is convicted of an offence under this Part by reason of his having so failed to comply, cause such action to be taken as it may deem necessary for –

- i. Carrying out the directives given in the notice issued under section 356J;
and
 - ii. Containing the pollution already caused or preventing the pollution threatened to be caused, of coastal waters, or, as the case may be, of any part of the coast of India by oil escaped or threatening to escape from the tanker, a ship other than a tanker, a mobile off-shore installation or off-shore installation of any other type.
2. Subject to the provisions of Part XB, any expenditure or liability incurred by the Central Government in, or by reason of, the exercise of powers under sub-section (1) in relation to any tanker, ship other than a tanker, mobile off-shore installation or off-shore installation of any other type in respect of which a notice had been issued under section 356J, or its cargo of oil that had escaped or was discharged into the sea, shall be a debt due to the Central Government by the person or persons on whom the notice was served and may be recovered from that person, or as the case may be, from all or any of those persons and shall be a charge upon all or any tanker, ship other than a tanker, mobile off-shore installation or off-

shore installation of any other type owned by that person or persons which may be detained by the Central Government until the amount is paid. Provided that provisions of Part XB of this Act shall not apply to measures taken in respect of any off-shore installation which is not a ship within the meaning of this Act except that in the event of pollution damage caused by any such off-shore installation the person who is liable for the damage may claim exoneration from, any liability if he proves that such damage –

- (a) Resulted from an act of war, hostilities, civil war, insurrection or a natural phenomenon of an exceptional, inevitable and irreparable character; or Powers to take measures for preventing or containing oil pollution
- (b) Was wholly caused by an act or omission done with intent to cause that damage by any other person; or
- (c) Was wholly caused by the negligence or other wrongful act of any government or other authority responsible for the maintenance of lights or other navigational aids exercise of its functions in that behalf

(II) Notice under Judicial powers of District Magistrate has to be issued as per The Code of Criminal Procedure, 1973 (CrPc)

133. Conditional order for removal of nuisance

- a. That any unlawful obstruction or nuisance should be removed from any public place or from any way, river or channel, which is or may be lawfully used by the public: or

Explanation. A "public place" includes also property belonging to the state, camping grounds and grounds left unoccupied for sanitary or recreative purposes.

(III) Notice under Judicial powers of District Magistrate has to be issued as per Indian Penal Code (IPC)

Section 280. Rash Navigation of Vessel

Whoever navigates any vessel in a manner so rash or negligent as to endanger human life, or to be likely to cause hurt or injury to any other person, shall be punished with imprisonment of either description for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both.

APPENDIX 15 – LETTER OF UNDERTAKING

(V) Letter of Undertaking has to be obtained from the polluter – like ship owners, insurance clubs etc. (sample letter of undertaking for an aground vessel M.V.Mirach is attached)

DRAFT LETTER OF UNDERTAKING

To,

Directorate General of Shipping,

Jahaz Bhavan,

Walchand H. Marg,

Mumbai - 400 001

To ,

The District Magistrate

Kanyakumari District,

Nagarcoil,

Tamil Nadu.

Dear Sir,

Ref: M.V. Mirach - Grounding at Crocodile Rock, coordinates 08° 04' 999" North, 77° 17'201" East on 29 March 2011.

In consideration of your refraining from arresting, re-arresting or otherwise detaining or taking any action whatsoever against the vessel M.V. "Mirach" or any other vessel, asset or property in the same and/ or associated and/or same beneficial ownership and/or management and/or possession or control in any part of the world in pursuance of the expenses associated with the above mentioned incident, except in the case of violation/non compliance of any or all of the undertakings stipulated in the LOU, we Rates Marine Insurance B.V. hereby undertake and guarantee as follows:

i) that in the event of any oil residue from the M.V. Mirach being noticed by the Indian Authority or any oil or oil residue found in the Indian Territorial waters and/or coastline which may reasonably be considered as being that which spilt out of the M.V. Mirach and upon your first demand we shall mobilize International and/or National Salvors of

international competence for the purpose of removal of all such oil pollution forthwith and in the event the Indian Authorities are required to take any interim step to contain such pollution immediately reimburse such sums as may be incurred by the Indian Authority on your first demand.

ii) to reimburse to you on demand such sum or sums as may have been reasonably incurred by any Indian Authority including the District Magistrates Office, Fisheries Department, State or Central Pollution Department, in dealing with the potential environmental damage and loss of livelihood by reason of the captioned incident or that may be reasonably incurred by the Indian Authorities for the said purpose on behalf of the owners of the MV Mirach together with interest and cost which may be agreed in writing between the parties hereto or which may be found due to you or any Indian Authority by the owners of the Mirach relating to the captioned incident by final award in arbitration in Chennai or an appeal there from by final unappellable judgment from a competent Court including but not limited to the High Court of Chennai and/or Supreme Court of India, New Delhi or by a judgment/ decree of the Chennai High Court or on appeal there from by a final unappellable judgment of the Supreme Court of India.

iii) We further undertake that on behalf of the owners we would arrange to raise, destroy or remove the wreck as directed by you, or, alternatively, if you do the same, reimburse you the cost of wreck removal plus 20% thereof, provided always that the Owners of the Mirach or We are liable to do so under Indian law currently in force or directed to do so by a final unappellable judgment from a Competent Court. In the event of such a wreck removal you will render reasonable cooperation in facilitating the operations on the administrative side where possible.

We hereby warrant that the registered owner of the vessel M.V. Mirach at the time of grounding was Messrs. KumsalDenizcilikveNakliyat AS and that the M.V. Mirach was not demised chartered out at such time.

All claims under this undertaking will be limited to the amount of UDS 50 million (say fifty million United States Dollars) including interest and costs or to the limit of owners' Ship owners' P&I policy with Rates Marine Insurance B.V., whichever is higher.

This undertaking shall be governed by and construed in accordance with Indian law and any dispute here under shall be subject to the exclusive jurisdiction of the High Court of Chennai. For the purpose of proceedings in relation to this Undertaking we appoint Mr. V. Subramanian of 114, Maker Chambers III, Nariman Point, Mumbai - 400 021, India as our agents for service of process.

Yours faithfully,

Director.

(VI) The guide lines for taking immediate steps in case of Oil Pollution Disaster.

- ❖ Mercantile marine Department or DG Shipping has to conduct an enquiry and submit a report.
- ❖ Letter has to be sent to the Director, Environment – for information and necessary action.
- ❖ Seek assistance from Indian Coast Guard East if incident occurs between Pulicat lake and Kanyakumari and Indian Coast Guard West if incident occurs between Kanyakumari and Colachel (till Kerala State Boundary in Arabian Sea)
- ❖ Seek assistance from Indian Navy if required
- ❖ Director General of Shipping, Communication Centre, Mumbai has to be kept informed.
Tel: 022 2261 0606, 2261 4646, 32959320
Fax: 022 2261 3636
E-mail:dgcommcentre@satyammail.net; dgcommcentre@vsnl.net
- ❖ To keep informed the Secretary Highways & Minor ports Department, Tamilnadu.

APPENDIX 16 – SITE SAFETY ASSESSMENT FORM

Incident: _____

Date: _____ Time: _____ Site Safety Officer: _____

Site / Location: _____ Site Map attached : Yes / No

Team Leader: _____ Working Group No: _____

Location of First Aid: _____ Emergency Contact No.: _____

SUPPORT FACILITIES	
Facility	Location
Cleaning Station / Changing rooms	
Toilet	
Food Station	
Nature of work carried out	

Material Spilled:

Air Samples Required? Yes / No

Description of Risk Hazard

Description	Risk Factor	Remedial Action
Heavy Plant		
Vaccum		
Skimmers		
Booms		
Storage		
Hand tools		
Other		
Dispersant use type		

Manual Handling Assessment needed

Yes / No

Personal Protective Equipments

Clothing

☐

Respiratory

☐

Footwear

☐

Headgear

☐

Ear Protection

☐

Eye Wear

☐

Other Information

Signed

APPENDIX 17 – LIST OF APPROVED OIL DISPERSANTS (OSD)

The NIO and Coast Guard approved list of oil spill dispersants (OSD) are enumerated below.

Type II - Water dilutable (1 part of dispersant: 10 parts of Type III - Concentrate (to be used neat in the ratio 1 sea water is to be used in the ratio 1 part of diluted part of dispersant : 25 parts of oil) dispersant: 2-3 parts of oil)

COREXIT-9500 - (JAN 2003)

BG Exploration & Production India Ltd.,
1st Floor, Midas Sahar Palza
Kondivita, MV Road, Andheri (E), Mumbai - 400 059
Phone : 022-28395841 Fax : 022-28395201

GOLD CREW - (FEB 2003)

MS Centerprise
Mayurpankh, 5th Floor
Agianyan, Jambli Naka, Thana (W) - 400 601
Phone : 022-25401010/25971880 Fax: 022-25373542

FIRECHEM - (FEB 2003)

M/s Fire Chem Private Ltd
B-4, Rana Commercial Complex
Sector-20 B, Near Ajronda, Faridabad - 121 007
Phone : 0129-25288196/25288197 Fax : 0129-25288700

SPILCARE-O - (DEC 2004)

Spilcare - O Metaclean Pvt. Ltd
AB-146, 3rd Main Road, Anna Nagar,
Chennai - 600 040, Phone : 044-26200482 Fax : 044-26281457

Type III – Concentrate (to be used neat in the ratio 1 part of dispersant: 25 parts of oil)

COREXIT-9500 - (JAN 2003)

BG Exploration & Production India Ltd.

1st Floor, Midas Sahar Plaza

Kondivita, MV Road, Andheri (E) Mumbai -400 059

Phone : 022-28395841 Fax : 022-28395201

CHALLENGER-OSD EF III - (AUG 2003)

Challenger Chemicals & Polymers Private Ltd.

PR No. 6917, 3 Balasundaram Lay Out

Siddhanaidu School Road, New Siddhanaidu, Coimbatore - 641 044

Phone : 044-2216224 Fax : 0422-2213181

Spilcare-O – (Dec 2004)

Spilcare- O Metaclean Pvt. Ltd.

AB-146, 3rd Main Road, Anna Nagar,

Chennai – 600040

NOVA CHEMICALS - (JUNE 2005)

Pragji Vrindavan CHS

Room No.50, 4th floor, 20/24 Old Hanuman Lane

Kalbadevi, Mumbai - 400 002. Phone/Fax : 022-56347337

ICG REQUIREMENTS FOR SELECTION OF OSD :

Physical State	: Flowing clear and homogenous liquid free from suspended solid.
Stability	: Between 100-90%
Efficiency	: Above 60% for Type-III Above 50% for Type-II after dilution
Flash Point	: 60°C Minimum
Cloud Point	: 0 to -5°C
Shelf Life	: 5 to 10 years
Validity	: Should be in possession of valid NIO evaluation certificate
Date of Manufacture	: Within 3 months of date of supply

APPENDIX 18 – OSCP OBSERVATION & REPORTING FORMS

Form 1 A - Air Surveillance Observation

Survey Details										
Date		Start Time:		End Time:		Observers:				
Incidents:						Area of Survey				
Aircraft type		Call sign			Average Altitude		Remote sensing used			
Weather Conditions										
Wind speed (knots)				Wind direction:						
Cloud base (feet)				Visibility						
Time high water				Current direction						
Time low water				Current speed (KN)						
Slick Details: Sea & Beach										
Slick grid parameters by lat/long:				Slick grid parameters (air speed)			Slick grid dimensions:			
Length Axis:		Width Axis:		Length Axis: N/A			Width Axis		Length	nm
Start Latitude		Start Latitude		Time (Seconds)			Time (seconds)		Width	nm
Start Longitude		Start Longitude							Length	nm
End Latitude		End Latitude		Speed (knots)			Speed (knots)		Width	nm
End Longitude		End Longitude							Grid area	Km ²
Code	Colour	% age cover observed	Total gird area		Area per oil code		Factor	Oil volume		
1	Silver			Km ²		Km ²	40-300 L/ Km ²		L	
2	Iridescent (rainbow)			Km ²		Km ²	300-5,000 L/ Km ²		L	
3	Discontinuous true oil color (Brown to black)			Km ²		Km ²	5,000-50,000 L/ Km ²		L	
4	Continuous true oil color (Brown to black)			Km ²		Km ²	50,000-200,000 L/ Km ²		L	
5	Brown / Orange			Km ²		Km ²	>200,000 L/ Km ²		L	

Form 1 B - Aerial Surveillance Marine Fauna Sighting Record Sheet

Resource	Type/species	Number	Location	Behaviour / Comments
Cetaceans				
Turtles				
Dugongs				
Sharks				
Sea Snakes				
Seabirds				
Vessels				
Other Details for each observation location				
Ambient conditions at each locations	Date	Photographic record	Date and Time of Each	
	Time		Photo / video Clip number	
	Weather Conditions		Brief description	
	Visibility (atmospheric)			
	Water turbidity			

Form 1 C - Aerial Surveillance Marine Fauna Sighting Record Sheet

2500 m

2000 m

1500 m

1000 m

500 m

0 m

500 m

1000 m

1500 m

2000 m

2500 m

1°20'

1°10'

1°00'

0°50'

0°40'

0°30'

0°20'

0°10'

0°

0°10'

0°20'

0°30'

0°40'

0°50'

1°00'

1°10'

1°20'

1500 m

1000 m

500 m

0 m

500 m

1000 m


1500 m

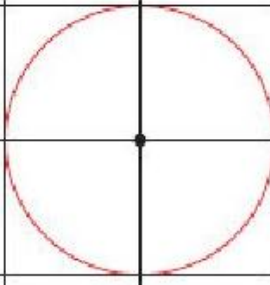
7 May 2012

14:12:36

7 May 2012 14:12:36 (Template) 00100006

NORTH





500 m Exclusion Zone

	NAME:	VESSEL / AIRCRAFT:
	DATE / HOUR:	OTHER REFERENCE:

Form 2 - Vessel Surveillance Observer Log – Oil Spill

Survey Details									
Date		Start Time:		End Time:		Observers:			
Incidents:						Wind Direction:			
Vessel:						Master:			
Weather Conditions									
Wind speed (knots):					Wind direction:				
Time high water and height (LAT):					Current direction:				
Time low water and height (LAT):					Current speed (nM):				
Tide during observations:					Sea state:				
Stage of tide during observations (incoming/falling):					Other weather observations:				
Slick Details									
Slick grid parameters by lat/long:					Slick grid parameters (vessel speed)			Slick grid dimensions: N/A	
Length Axis:		Width Axis:		Length Axis: N/A		Width Axis		Length	nm
Start Latitude		Start Latitude		Time (Seconds)		Time (seconds)		Width	nm
Start Longitude		Start Longitude						Length	nm
End Latitude		End Latitude		Speed (knots)		Speed (knots)		Width	nm
End Longitude		End Longitude						Grid area	Km ²
Code	Colour	% age cover observed	Total gird area		Area per oil code		Factor	Oil volume	
1	Silver			Km ²		Km ²	40-300 L/ Km ²		L
2	Iridescent (rainbow)			Km ²		Km ²	300-5,000 L/ Km ²		L
3	Discontinuous true oil color (Brown to black)			Km ²		Km ²	5,000-50,000 L/ Km ²		L
4	Continuous true oil color (Brown to black)			Km ²		Km ²	50,000-200,000 L/ Km ²		L
5	Brown / Orange			Km ²		Km ²	>200,000 L/ Km ²		L

Form 3 - Daily Incident Log and Management Reports

Precedence	Urgent <input type="checkbox"/>	Immediate <input type="checkbox"/>	Standard <input type="checkbox"/>	Ref. No.	
Final SITREP? Yes <input type="checkbox"/> No <input type="checkbox"/>		Next SITREP: on / /		
Date / Time					
POLREP Reference					
INCIDENT	Name				
	Latitude		Longitude		
SITREP Prepared By	Name				
	Agency				
	Position? Role				
	Contact Details	Telephone			
		Fax			
		Mobile			
Summary of Events Since Last Report (POLREP/SITREP)					
2. Expected Developments					
3. Areas Threatened					
4. Planned Actions					
5. Details of Assistance Required					
6. Other Information					

Form 4 - Operations Accounting and Financing Reports

	Vessel IMO No.							
	Master of Vessel	Vessel Agent						
	Charterer of Vessel							
	Insurance Company							
	Date & Place of Oil Spill							
	Type of Oil Discharge							
S N	Description	Days /Unit	No of Mens	Workin g Hours	Rate Per Hour /Metre	Amou nt	S.Tax	Tot al
A	Costs of Preventive Measures and Cleanup							
1	Personnel							
a	Mandays							
b	Workforce Overtime							
c	Food for Personnel							
2	Consumable Material							
a	Gloves							
b	Sorbent Pads							
c	Broom							
d	Over all							
e	Rag piece							
f	Saw dust							
g	Sand bags							
h	Containment Tray							
i	Spade							
3	Transport Equipment							
a	Transport - for Personnel							
b	Slop tank bowser							
c	Lorry							
d	Light Vehicle							
4	Disposal Cost							
a	Oily debris by SPCB authorised vendor							
b	Debris oil storage cost							

S N	Description	Days /Unit	No of Mens	Working Hours	Rate Per Hour /Metre	Amount	S.Tax	Total
5	Operational Cost							
a	Air Surveillance							
b	Vessel Surveillance							
c	Dispersant procurement							
d	Vessel laying and recovering booms = Days							
e	Boom rental charges-Day							
f	Skimmer rental charges-Day							
C	Replacement & Repair Cost							
1	Equipment Repair							
2	Equipment Replacement							
D	Economic Loss							
1								
2								
3								
	Grand Total							
	Name & Address of Claimant -							
			General Manager (Marine)					
			L&T Kattupalli Port					

Form 5 – Media Releases for Public and Press Conferences

Precedence of Release – Regular / Immediate	
Type:	Media Advisory News Release
Contact Name	
Contact Details	Land Line Mob
	Fax
Email	
Head Line:	
Sub Heading:	
Location:	
Lead Paragraph & Quotes:	
Supporting Paragraph & Quotes:	
Conclusion:	
Attachment:	

Form 6 – Incident and Management Report

ALL MARPOL INCIDENTS TO BE REPORTED				
Any discharge or probable discharge of oil or noxious liquids substances in excess of MARPOL discharge rates				
Any discharge or probable of harmful substance in packaged form (including freight containers and portable tanks)				
This form is to be completed with as much information as possible (regardless of the size of the incident)				
Date / Time of Report			Ref. No.	
Date / Time of Incident				
Location of Incident				
	Latitude		Longitude	
INCIDENT				
Description of Incident				
Pollution Source (x)	Land (given details)	<input type="checkbox"/>		
	Other (given details)	<input type="checkbox"/>		
	Vessel (given details)	<input type="checkbox"/>		
Vessel Details	Type		Flag State / call sign	
	Vessel Name		P.O.B.	
Identity & Position of Adjacent Vessels				
Point of Discharge from Source				

POLLUTANT						
Pollutant – Oil (x)	Blige	<input type="checkbox"/>	Diesel	<input type="checkbox"/>	Crude	<input type="checkbox"/>
	Unknown	<input type="checkbox"/>	Other			
	Specify type	Details				
Pollutant – Chemical	Name					
Pollutant (x)	Garbage	<input type="checkbox"/>	Details			
	Packaged	<input type="checkbox"/>				
	Sewage	<input type="checkbox"/>				
	Other	<input type="checkbox"/>				
EXTENT						
ADDITIONAL INFORMATION <ul style="list-style-type: none"> • Nature & Extent of Pollution • Direction and speed of movement • Has Discharge Stopped? • Identity & Position of Adjacent Vessels (if source unknown) 						
Weather / Sea Tide Conditions						
Lead Combat Agency						

Incident Controller	Name		
	Contact:	Telephone	
		Fax	
		Mobile	
Statutory Agency			
Initial Response Actions			
Sample Taken? Yes/No			
Images Taken? Yes /NO	Photographs: Yes/No	Video: Yes/NO	
When will next report be issued? (eg SITREP)			
POLREP Prepared By	Name		
	Agency		
	Positions / Role		
	Contact	Telephone	
		Fax	
		Mobile	
Attachments? Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes Note No of Pages Attached:			

APPENDIX 19 – CONVERSION FACTORS

VOLUME

1 barrel (US) = 42 gallons (US) = 159 litres
1 barrel (Imp) = 45.1 gallons (Imp) = 205 litres
1 gallon (Imp) = 1.2 gallons (US) = 4.546 litres
1 cubic metre = 1000 litres = 6.29 barrels (US)
1 litre = 0.22 gallons (Imp) = 0.03531 cubic feet
1 cubic yard = 0.765 cubic metres
1 cubic foot = 0.0283 cubic metres
1 cubic decimeter = 0.001 cubic metres = 1 litre
1 tonnes (metric) = approx. 7.5 barrels (US) 262 gallons (Imp)

AREA

1 acre = 0.405 hectares = 4050 square metres
1 hectare = 10 square metres = 2.471 acres
1 square kilometer = 100 hectares = 247 acres
1 square metre = 1.196 square yards
1 square yard = 0.836 square metres = 9 square feet
1 square foot = 0.093 square metres
1 square mile = 2.59 square kilometers = 640 acres

LENGTH/DISTANCE

1 kilometre = 0.54 nautical miles = 0.622 miles
1 nautical mile = 1.852 kilometres = 1.151 miles
1 mile = 1.609 kilometres = 1760 yards
1 metre = 1.094 yards = 3.282 feet
1 yard = 0.914 metres
1 foot = 0.305 metres
1 inch = 25.4 millimetres

SPEED

1 knot = 1.85 km/hour = 0.51 metres/second
1 metre/second = 3.6 km/hour = 1.94 knots

MASS

1 tonne (metric) = 1000 Kilograms = 0.984 tons (Imp)

1 ton (Imp) = 20 hundredweight = 1016.05 tonnes
(metric)

1 hundredweight = 50.8 kilograms = 112 pounds

1 kilogram = 2.205 pounds = 1 litre of water

1 gram = 0.035 ounces

FLOW

(Note: Gallons in this table are Imperial, unless otherwise noted.)

1 cubic metre / hour = 16.7 litres / minute = 3.671 gallons / minute

1 litre / second = 2.119 cubic feet / minute = 13.21 gallons / minute

1 cubic foot / minute = 0.1039 gallons / second = 0.472 litres / second

1 gallon / minute = 0.0631 litres / second

1 barrel / hour = 2.65 litres / minute = 0.5825 gallons / minute

1 gallon (US) / acre = 11.224 litres / hectare

PRESSURE

1 psi = 0.069 bar = 6.901 Pascal

1 bar = 100 Pascal = 14.49 psi

1 bar = 30 feet of water

ENGINE POWER

1 horsepower = 0.7457 kilowatts

TEMPERATURE

$^{\circ}\text{F}$ to $^{\circ}\text{C}$ deduct 32, multiply by 5, divide by 9

$^{\circ}\text{C}$ to $^{\circ}\text{F}$ multiply by 9, divide by 5, add 32

$^{\circ}\text{C}$	0	10	20	30	40	50	60	70	80	90	100
$^{\circ}\text{F}$	32	50	68	86	104	122	140	158	176	194	212

APPENDIX 20 – IMO LEVEL TRAINED PORT PERSONNEL

Name	Designation	IMO Level
Capt. N Viswanathan	General Manager (Marine Operation)	2
Rishi Prasad	AGM (Marine Operation)	2
Samit Nath	Marine Supdt.	1
A Ramakrishnan	Marine Supdt	1
Sri Hari	Head HSSE	1
Michael Sasper	Communication Officer	1
R Venkatesh	Communication Officer	1
M Sathiyamarayanan	Communication Officer	1
Sekar P	Marine Supervisor	1
Ravi	Marine Supervisor	1
Ravindhar	Marine Supervisor	1

OIL SPILL CONTROL EQUIPMENT INVENTORY

April 2018

1	Name of Port / Oil Spill Handling Agency	Kattupalli Port
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		DESCRIPTION	LENGTH	QUANTITY	OPERATIONAL STATUS
2	Container Equipment	Fence boom FE 2000 800 PVC ASTM, Freeboard 240 mm, draft 385 mm	600 m	1	Operational
		Book Reel ER12CP		1	Operational
		Towing equipment with ASTM connector		2	Operational
		Anti-abrasion mat	6 X 3 (m)	1	Operational
		Hydraulic hose with quick connector	10 m	1	Operational
		Mooring equipment of 15 KG		13	Operational

		DESCRIPTION	CAPACITY	QUANTITY	OPERATIONAL STATUS
3	Recovery Equipment	Weir Skimmer SK 30W with aluminium camlock connector with accessories	30 cum / hr.	1	Operational
		Selwood Spate 75 motor pump, suction lift 9.1 mm, max solid size 6 mm	30 cum / hr.	1	Operational
		Multi skimmer SK30M with aluminium camlock connector with accessories	30 cum / hr.	1	Operational
		Discharge hose with 3" camlock connector	20 m	1	Operational
		Suction hose with 3" camlock connector	20 m	1	Operational
		Hydraulic Power Pack EP04D1CA_I	4 KW	1	Operational
		Sorbent pads	40 X 50 CM	2000	Operational

		DESCRIPTION	CAPACITY	QUANTITY	OPERATIONAL STATUS
4	Temporary storage facility	Towable floating Tank EFT12 with towing ropes & aluminium coupling	12 cum	2	Operational

		DESCRIPTION	CAPACITY	QUANTITY	OPERATIONAL STATUS
5	OSD Spraying system	OSD Boom spray system each 3 m length with 6 nozzle	860 Lt. / Hr. each	4	Operational

		Make	QUANTITY	Expiry Date
6	Oil Spill Dispersant	Spill Care ADT Concentrate Type 2 & 3	3000 Lt.	22.06.2022

		DESCRIPTION	CAPACITY	QUANTITY	OPERATIONAL STATUS
7	Shore Line Response Equipment	Manual Capability	2 cum / Man-days	20 cum / day	Operational

		Name	Designation	Contact No.	IMO OPRC LEVEL 1/2
8	IMO OPRC LEVEL TRAINED RESPONDERS	Capt. Sansarchandra Chaube	AVP (Head Marine Operation)	+91 99252 23674 / 044 27969199	2
		Capt. Sachin Srivastava	Marine (Pilot)	89800 48817	
		Anantha Ramakrishnan N	Dy Manager Marine.	Port Signal Station 7299090542 / 044 27969050 Fax No. 044 27968515 / 27968200	1
		Michael Sasper	Asst. Manager Marine.		
		Mujubur Rehman K	Safety Officer		
		Moro R Sathiyarayanan	Radio Officer		
		R Venkatesh	Radio Officer		
		Jerold	Radio Officer		
		Sekar P	Radio Officer		
		Ravi S	Marine Supervisor		
		Ravindar B	Marine Supervisor		
		Srinivasan	Marine Supervisor		

		Craft Name	Description	Response Capability
9	Oil Spill Response Craft	Dolphin 2	Tug	45 Ton BHP each, with oil spill arm spray on each side
		Dolphin 12	Tug	
			Security Boat	Holding Boom in position
			Mooring Boat	

10	OSRO Particulars (If outsourced)	Not Applicable		
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		Year of published	Date of last revision	Status of approval by Coast Guard
11	Oil Spill Contingency Plan	2014	27.01.2014	RHQ (East) approved Oil Spill Contingency Plan by Lr 7626 dated 27 th Mar 2014

		Name	Designation	Contact Particulars
12	Personnel to be contacted in case of spill	Capt. Sansarchandra Chaube	AVP	Landline – 044 – 27969199
				Mobile - +91 99252 23674
				Fax – 044 27968200 / 27968515
				Email: sansar.chaube@adani.com

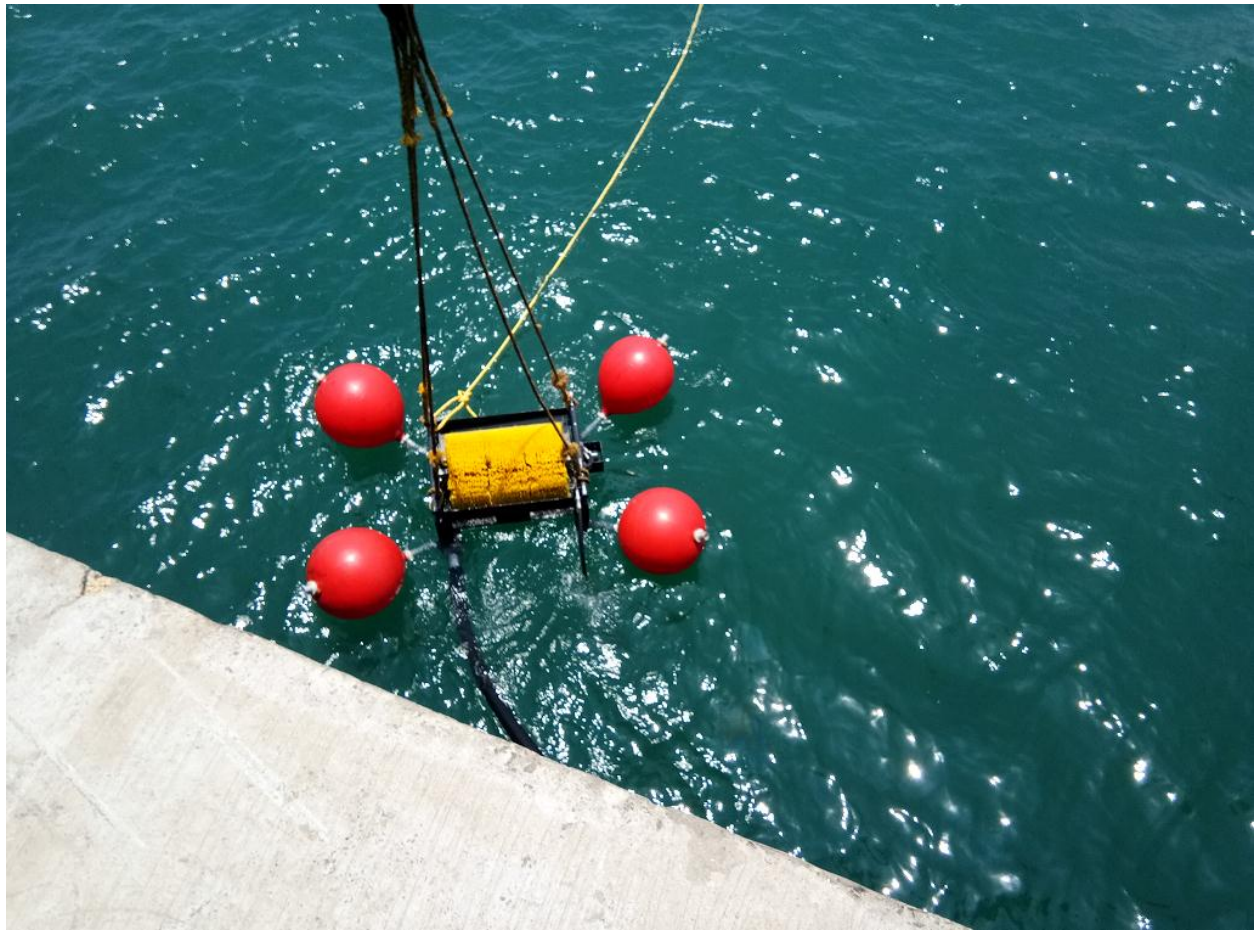
13	MOU DETAILS (if any)	Nil		
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Annexure – 5**Compliance to Tamil Nadu Coastal Zone Management Authority (TNCZMA) vide letter no. 6064/EC.3/2014-1 dated 26.06.2014**

Sr. No	Conditions	Compliance
i	The unit shall compliance with all the conditions stipulated in Environment Clearance issued in No. 10-130/2007-IA-III, Ministry of Environment & Forest, Government of India, dated 3rd July 2009	Being complied
ii	The proposed activities should not cause coastal erosion and alter the beach configuration. The shoreline changes shall be monitored continuously	This EC is just a bifurcation of original EC of LTSB. In past, LTSB has been continuously monitoring shoreline studies through Institute of Ocean Management, Anna University, Chennai. Further, MIDPL shall further carry out shoreline studies of the concerned area.
iii	Chemical waste generated and the sewage generated, if any should not be discharged in to the sea and shall be properly handled	Complied No chemical waste generated. Sewage waste water generated is being treated in STP for further usage in horticulture / greenbelt
iv	The waste water generated shall be collected, treated and reused properly	Complied. Domestic waste water generated is being treated in 45 KLD STP. Treated water is being reused for Horticulture / green belt purpose
v	The proponent shall implement oil spill mitigation measures without fail	Oil Spill contingency plan (OSCP) is being implemented at site. OSCP along with list of Oil spill control equipment is enclosed as Annexure-4
vi	Disaster management plan shall be implemented and mock drills shall be carried out properly and periodically.	Complied MIDPL has already formulated detailed Disaster Preparedness & Management Plan to handle any Natural and industrial hazards at site. Regular Mock Drills are conducted as per the Crisis Management Plan. The details of drills conducted towards dock safety for the period Oct 2017 - Mar 2018 is enclosed as Annexure- 8



TAMILNADU POLLUTION CONTROL BOARD

CONSENT ORDER NO. 170629762139 DATED: 26/12/2017.



PROCEEDINGS NO.TI/TNPCEB/F.0491GMP/RL/GMP/A/2017 DATED: 26/12/2017

SUB: TNPC Board-Consent for Establishment FOR EXPANSION- I MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED, S.F. No. Survey Numbers : 14/18B, 15, 168/1, 168/2, 169, 170/1, 170/2, 171/1, 171/2, 172/1, 172/2, 173/1, 173/2, 174, 175, 176, 177, 178/1, 178/2, 178/3, 178/4, 179/1, 179/2, 179/3, 179/4, 180, 181, 182, 183, 184/1, 184/2, 184/3, 186, 187, 188/1, 188/2A, 188/2B, 188/2C, 189, 190, 191, 192/1, 192/2, 193/1, 193/2, 193/3, 193/4, 194, 195, 196, 197/1, 197/2, 197/3, 199, 200/1, 200/2, 202/1, 202/2, 203, 206/1, 206/2A, 206/2B, 206/3, 206/4A, 206/4B, 207/2B, 208/2, 209/1, 209/2, 209/3, 210/1, 210/2, 211/1, 211/2, 211/3, 211/4, 211/5, 211/6, 211/7, 212, 213, 214/1, 214/2, 214/3, 214/4, 215/1, 215/2, 216, 217, 218/1, 218/2, 218/3, 218/4, 218/5, 219/1, 219/2, 220, 223/1, 223/2, 224/1, 224/2, 224/3, 224/4, 224/5, 225, 226, 227, 228/1, 228/2, 228/3, 228/4, 228/5, 229, 230, 231/1, 231/2, 231/3, 231/4, 231/5, 232, 233/1, 233/2, 233/3, 233/4, 234/1, 234/2, 234/3, 234/4, 235/1B, 235/2, 235/3B, 236/3B, 236/4, 234/1, 234/2, 234/3, 234/4, 235/1B, 235/2, 235/3B, 236/4, 242/1, 242/2, 243/2B, 244/2, 247/1, 248/1, 248/2, 249/1A2, 249/2B, 198/1, 205/1A, 205/1B, 205/2, 205/5, 1/4A1, 1/4A2, 1/4B, 1/5, 16/1, 16/2, 17/1, 17/2, 17/3A, 17/3B, 143, 151/1, 151/2, 151/3, 151/4, 152, 153, 154/1, 154/2, 166, 167/1, 167/2, 204/1, 204/2, 204/3, 166, 167/1, 167/2, 204/1, 204/2, 204/3, 221, 221/1, 222/2, 330/1, 330/2, 330/3, 330/4, 12, 16/3, 198/2, 201, 205/3, 205/4, KATTUPALLI Village, Ponneri Taluk, Tiruvallur District- for the establishment or take steps to establish the industry for Expansion under Section 21 of the Air(Prevention and control of Pollution)Act,1981, as amended in 1987 (Central Act, 14 of 1981)- Issued- Reg.

- REF:** 1. Unit's application No. 9762139, dated 13-07-2017/ 14-11-2017/26.12.2017.
2. IR.No : F.1409AMB/RL/DEE/AMB/2017 dated 08/08/2017.
3. Report of DEE on 28-11-2017.
4. Board's (Technical Sub Committee) Resolution Item No.160 –02, dated: 13.12.2017.

Consent to establish or take steps to establish for Expansion is hereby granted under Section 21 of the Air (Prevention and control of Pollution) Act, 1981, as amended in 1987 and the Rules and Orders made there under to

The Chief Executive Officer,

M/s. MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED

Authorizing occupier to establish or take steps to establish the industry in the site mentioned below:

S.F.No.Survey Numbers : 14/18B, 15, 168/1, 168/2, 169, 170/1, 170/2, 171/1, 171/2, 172/1, 172/2, 173/1, 173/2, 174, 175, 176, 177, 178/1, 178/2, 178/3, 178/4, 179/1, 179/2, 179/3, 179/4, 180, 181, 182, 183, 184/1, 184/2, 184/3, 186, 187, 188/1, 188/2A, 188/2B, 188/2C, 189, 190, 191, 192/1, 192/2, 193/1, 193/2, 193/3, 193/4, 194, 195, 196, 197/1, 197/2, 197/3, 199, 200/1, 200/2, 202/1, 202/2, 203, 206/1, 206/2A, 206/2B, 206/3, 206/4A, 206/4B, 207/2B, 208/2, 209/1, 209/2, 209/3, 210/1, 210/2, 211/1, 211/2, 211/3, 211/4, 211/5, 211/6, 211/7, 212, 213, 214/1, 214/2, 214/3, 214/4, 215/1, 215/2, 216, 217, 218/1, 218/2, 218/3, 218/4, 218/5, 219/1, 219/2, 220, 223/1, 223/2, 224/1, 224/2, 224/3, 224/4, 224/5, 225, 226, 227, 228/1, 228/2, 228/3, 228/4, 228/5, 229, 230, 231/1, 231/2, 231/3, 231/4, 231/5, 232, 233/1, 233/2, 233/3, 233/4, 234/1, 234/2, 234/3, 234/4, 235/1B, 235/2, 235/3B, 236/3B, 236/4, 242/1, 242/2, 243/2B, 244/2, 247/1, 248/1, 248/2, 249/1A2, 249/2B, 198/1, 205/1A, 205/1B, 205/2, 205/5, 1/4A1, 1/4A2, 1/4B, 1/5, 16/1, 16/2, 17/1, 17/2, 17/3A, 17/3B, 143, 151/1, 151/2, 151/3, 151/4, 152, 153, 154/1, 154/2, 166, 167/1, 167/2, 204/1, 204/2, 204/3, 221, 221/1, 222/2, 330/1, 330/2, 330/3, 330/4, 12, 16/3, 198/2, 201, 205/3, 205/4.,

KATTUPALLI Village,

Ponneri Taluk,

Tiruvallur District.

This Consent to establish for Expansion is valid upto **July 02, 2019** , or till the industry obtains consent to operate under Section 21 of the Air (Prevention and control of Pollution) Act, 1981, as amended in 1987 whichever is earlier subject to special and general

POLLUTION PREVENTION PAYS

சுற்றுச்சூழல் மாசுபாடு கட்டுப்பாட்டு வாரியம்



conditions enclosed.

TAMILNADU POLLUTION CONTROL BOARD

Digitally signed by R. KANNAN
Date: 2017.12.26
17:45:48 +05'30'

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

To

The Chief Executive Officer,

M/s.MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED,

PB No. 001, KATTUPALLI PORT, KATTUPALLI VILLAGE,

Pin: 600120

Copy to:

- 1.The Commissioner, MEENJUR-Panchayat Union, Ponneri Taluk, Tiruvallur District.
2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, GUMMIDIPPOONDI.
3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Chennai.
4. File



TAMILNADU POLLUTION CONTROL BOARD

SPECIAL CONDITIONS

1. This consent to establish for Expansion is valid for establishing the facility for the manufacture of products/byproducts (Col. 2) at the rate (Col 3) mentioned below. Any change in the product/byproduct and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Containers	21.60	MMTPA
2.	Ro-Ro	0.22	MMTPA
3.	Project Cargo	0.44	MMTPA
4.	Break Bulk/general cargo (Barytes/Gypsum/Limestone/Granite/Steel Cargo)	1.82	MMTPA
5.	Edible oil, CBFS, Base Oil, Lube Oil and Non-Hazardous Liquid Cargo	0.57	MMTPA
6.	Total length of Berths & Storage yards for Handling of 24.65 MMTPA	1400	meters

2. This consent to establish for Expansion is valid for establishing the facility with the below mentioned emission/noise sources along with the control measures and/or stack .Any change in the emission source/control measures/change in stack height has to be brought to the notice of the Board and fresh consent has to be obtained if necessary.

I	Point source emission with stack :			
Stack No.	Point Emission Source	Air pollution Control measures	Stack height from Ground Level in m	Gaseous Discharge in Nm ³ /hr
1	DG Set	Acoustic enclosures with stack	4	
II	Fugitive/Noise emission :			
Sl. No.	Fugitive or Noise Emission sources	Type of emission	Control measures	
1.	DG Set	Noise	Acoustic Enclosures	

3 Additional Conditions:

1. The unit shall operate and maintain the APC measures efficiently and continuously so as to satisfy the Ambient Air Quality / emission standards prescribed by the Board.
2. The unit shall adhere to the Ambient Noise Level standards prescribed by the Board.
3. The unit shall provide Continuous Ambient Air Quality Monitoring station for the parameters PM 10, PM 2.5 and VOC and shall connect the same to the care Air Centre, TNPCB, Gundry.
4. The unit shall utilize the Power obtained from the DG Sets for captive use only and shall not supply Power to Grid.
5. The unit shall liable to pay the consent fee and shall remit the difference in amount in case of any revision of consent fee by the Government.

Digitally signed by R.
KANNAN
Date: 2017.12.26
17:46:05 +05'30'
For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai



GENERAL CONDITIONS

1. This consent to establish cannot be constituted as consent to operate and the unit shall not commence the operation without obtaining the Consent to operate.
2. The applicant shall make a request for grant of consent to operate at least thirty days, before the commissioning of trial production.
3. Any Change in the details furnished in the conditions has to be brought to the notice of the Board and got approved by the Board, before obtaining consent to operate under the said Act.
4. The unit has to comply with the provisions of Public Liability Insurance Act, 1991 to provide immediate relief in the event of any hazard to human beings, other living creatures/plants and properties while handling and storage of hazardous substances (wherever applicable).
5. Consent to operate will not be issued unless the unit complies with the conditions of consent to establish.
6. The unit shall provide adequate water sprinklers for the control of dust emission during the loading and unloading of construction material so as to minimize the dust emission.
7. The unit shall provide water sprinklers along the temporary roads inside the premises to avoid fugitive dust emission during the vehicle movements.
8. The unit shall develop green belt of adequate width around the premises.
9. In case there is any change in the management, the unit shall inform the change with relevant documents immediately.

Digitally signed by R.
KANNAN
Date: 2017.12.26
17:46:16 +0530'
For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai



TAMILNADU POLLUTION CONTROL BOARD

CONSENT ORDER NO. 170619762139

DATED: 26/12/2017.

PROCEEDINGS NO.TI/TNPCB/F.0491GMP/RL/GMP/W/2017 DATED: 26/12/2017

SUB: TNPC Board-Consent for Establishment FOR EXPANSION- I MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED , S.F. No. Survey Numbers : 14/18B, 15, 168/1, 168/2, 169, 170/1, 170/2, 171/1, 171/2, 172/1, 172/2, 173/1, 173/2, 174, 175, 176, 177, 178/1, 178/2, 178/3, 178/4, 179/1, 179/2, 179/3, 179/4, 180, 181, 182, 183, 184/1, 184/2, 184/3, 186, 187, 188/1, 188/2A, 188/2B, 188/2C, 189, 190, 191, 192/1, 192/2, 193/1, 193/2, 193/3, 193/4, 194, 195, 196, 197/1, 197/2, 197/3, 199, 200/1, 200/2, 202/1, 202/2, 203, 206/1, 206/2A, 206/2B, 206/3, 206/4A, 206/4B, 207/2B, 208/2, 209/1, 209/2, 209/3, 210/1, 210/2, 211/1, 211/2, 211/3, 211/4, 211/5, 211/6, 211/7, 212, 213, 214/1, 214/2, 214/3, 214/4, 215/1, 215/2, 216, 217, 218/1, 218/2, 218/3, 218/4, 218/5, 219/1, 219/2, 220, 223/1, 223/2, 224/1, 224/2, 224/3, 224/4, 224/5, 225, 226, 227, 228/1, 228/2, 228/3, 228/4, 228/5, 229, 230, 231/1, 231/2, 231/3, 231/4, 231/5, 232, 233/1, 233/2, 233/3, 233/4, 234/1, 234/2, 234/3, 234/4, 235/1B, 235/2, 235/3B, 236/3B, 236/4, 242/1, 242/2, 243/2B, 244/2, 247/1, 248/1, 248/2, 249/1A2, 249/2B, 198/1, 205/1A, 205/1B, 205/2, 205/5, 1/4A1, 1/4A2, 1/4B, 1/5, 16/1, 16/2, 17/1, 17/2, 17/3A, 17/3B, 143, 151/1, 151/2, 151/3, 151/4, 152, 153, 154/1, 154/2, 166, 167/1, 167/2, 204/1, 204/2, 204/3, 205/3, 205/4, KATTUPALLI Village, Ponneri Taluk, Tiruvallur District- for the establishment or take steps to establish the industry for Expansion under Section 25 of the Water(Prevention and control of Pollution)Act,1974 , as amended in 1988 (Central Act 6 of 1974) –Issued- Reg.

- REF:** 1. Unit's application No. 9762139, dated 13-07-2017/ 14-11-2017/26.12.2017.
2. IR.No : F.1409AMB/RL/DEE/AMB/2017 dated 08/08/2017.
3. Report of DEE on 28-11-2017.
4. Board's (Technical Sub Committee) Resolution Item No.160 –02, dated: 13.12.2017.

Consent to establish or take steps to establish for Expansion is hereby granted under Section 25 of the Water (Prevention and control of Pollution) Act,1974, as amended in 1988(Central Act 53 of 1988) (hereinafter referred to as 'The Act') and the Rules and Orders made there under to

The Chief Executive Officer,

M/s. MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED

Authorizing occupier to establish or take steps to establish the industry in the site mentioned below:

S.F.No.Survey Numbers : 14/18B, 15, 168/1, 168/2, 169, 170/1, 170/2, 171/1, 171/2, 172/1, 172/2, 173/1, 173/2, 174, 175, 176, 177, 178/1, 178/2, 178/3, 178/4, 179/1, 179/2, 179/3, 179/4, 180, 181, 182, 183, 184/1, 184/2, 184/3, 186, 187, 188/1, 188/2A, 188/2B, 188/2C, 189, 190, 191, 192/1, 192/2, 193/1, 193/2, 193/3, 193/4, 194, 195, 196, 197/1, 197/2, 197/3, 199, 200/1, 200/2, 202/1, 202/2, 203, 206/1, 206/2A, 206/2B, 206/3, 206/4A, 206/4B, 207/2B, 208/2, 209/1, 209/2, 209/3, 210/1, 210/2, 211/1, 211/2, 211/3, 211/4, 211/5, 211/6, 211/7, 212, 213, 214/1, 214/2, 214/3, 214/4, 215/1, 215/2, 216, 217, 218/1, 218/2, 218/3, 218/4, 218/5, 219/1, 219/2, 220, 223/1, 223/2, 224/1, 224/2, 224/3, 224/4, 224/5, 225, 226, 227, 228/1, 228/2, 228/3, 228/4, 228/5, 229, 230, 231/1, 231/2, 231/3, 231/4, 231/5, 232, 233/1, 233/2, 233/3, 233/4, 234/1, 234/2, 234/3, 234/4, 235/1B, 235/2, 235/3B, 236/3B, 236/4, 242/1, 242/2, 243/2B, 244/2, 247/1, 248/1, 248/2, 249/1A2, 249/2B, 198/1, 205/1A, 205/1B, 205/2, 205/5, 1/4A1, 1/4A2, 1/4B, 1/5, 16/1, 16/2, 17/1, 17/2, 17/3A, 17/3B, 143, 151/1, 151/2, 151/3, 151/4, 152, 153, 154/1, 154/2, 166, 167/1, 167/2, 204/1, 204/2, 204/3, 221, 221/1, 222/2, 330/1, 330/2, 330/3, 330/4, 12, 16/3, 198/2, 201, 205/3, 205/4.,

KATTUPALLI Village,

Ponneri Taluk,

Tiruvallur District.

POLLUTION PREVENTION PAYS

அகம் தூய்மை வாய்மைக்கு! புறம் தூய்மை வாழ்வுக்கு!



This Consent to establish for Expansion is valid upto **July 02, 2019**, or till the industry obtains consent to operate under Section 25 of the Water (Prevention and control of Pollution) Act, 1974 as amended in 1988 whichever is earlier subject to special and general conditions enclosed.

TAMIL NADU POLLUTION CONTROL BOARD

Digitally signed by R.
R. KANNAN KANNAN
Date: 2017.12.26 17:46:39
+05'30'

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

To

The Chief Executive Officer,

M/s.MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED,
PB No. 001, KATTUPALLI PORT, KATTUPALLI VILLAGE,
Pin: 600120

Copy to:

1. The Commissioner, MEENJUR-Panchayat Union, Ponneri Taluk, Tiruvallur District.
2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, GUMMIDIPONDY.
3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Chennai.
4. File



TAMILNADU POLLUTION CONTROL BOARD

SPECIAL CONDITIONS

1. This consent to establish for Expansion is valid for establishing the facility for the manufacture of products/byproducts (Col. 2) at the rate (Col 3) mentioned below. Any change in the product/byproduct and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Containers	21.60	MMTPA
2.	Ro-Ro	0.22	MMTPA
3.	Project Cargo	0.44	MMTPA
4.	Break Bulk/general cargo (Barytes/Gypsum/Limestone/Granite/Steel Cargo)	1.82	MMTPA
5.	Edible oil, CBFS, Base Oil, Lube Oil and Non-Hazardous Liquid Cargo	0.57	MMTPA
6.	Total length of Berths & Storage yards for Handling of 24.65 MMTPA	1400	meters

2. The unit shall provide Sewage Treatment Plant and /or Effluent Treatment Plant as indicated below.

POLLUTION PREVENTION PAYS

உதாரணம் கழிவுநீர் கட்டணம்/கட்டணம் கட்டணம் கட்டணம்/கட்டணம்



a Sewage Treatment Plant:

Treatment status: Individual STP		
SL. No	Name of the Treatment Unit	No. of Units
Dimensions in metres		
1.	Bar screen pit	1X1.5
2.	Collection tank	4X4X1.1
3.	Sewage Treatment Plant	30 KLD Existing
4.	FBBR	1.5 X 2.4 X 3.5
5.	Clarifier	1.4 x 1.3 x 3.5
6.	Clarifier Water tank	1.4 x 1.1 x 3.5
7.	PSF	3.3 DIA X 1.37
8.	ACF	3.3 DIA X 1.37
9.	Treated water tank	10x5x2.7
10.	Sludge Holding tank	1x4.9x2.7
11.	Filter press	1x0.5
12.	Sewage Treatment Plant	10 KLD Existing
13.	Collection tank	2.5x2.1x1
14.	Bio Aeration tank	2.5x2x2.5
15.	Secondary Settling Tank	1.5x1.5x2.5
16.	PSF	0.4 dia x 1.5
17.	ACF	0.4 dia x 1.5
18.	Treated water tank	6x5x1.5
19.	Sludge drying bed	0.5x0.5x1
20.	Sewage Treatment Plant	5 KLD Existing
21.	Bar screen pit	1x1.5x2
22.	Collection tank	2.5x2.1x1
23.	FBBR	1.1x2.2x3.5
24.	Settelling tank	1x1.2x3.5
25.	Clear Water tank	1x1x3.5
26.	PSF	0.3 dia x 1.5
27.	ACF	0.3 dia x 1.5
28.	Treated water tank	6x5x1.5
29.	Sludge drying bed	0.5x0.5x1
b Effluent Treatment Plant:		

Treatment status: Individual ETP



TAMILNADU POLLUTION CONTROL BOARD

SL. No.	Name of the Treatment Unit	No. of Units	Dimensions in metres
1.	Oil water separator	1	5X5X4
2.	Neutralisation tank	1	6X5X4
3.	Clarifier	1	3X3X5
4.	Aeration Tank	1	8X8X10
5.	Chlorine contact cum treated water tank	1	5X5X4
6.	Clarifier	1	3X3X5
7.	Sludge tank	1	3X4X2
8.	Sludge bed & filter press	1	3X3X4
9.	Aerobic sludge tank	1	5X4X3
10.	DMF	1	2X3X3

3. This consent to establish for Expansion is valid for establishing the facility with the below mentioned outlets for the discharge of sewage/trade effluent. Any change in the outlets and the quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Outlet No.	Description of Outlet	Maximum daily discharge in KLD	Point of disposal
Effluent Type : Sewage			
1.	Treated Sewage	45.0	On land for gardening
Effluent Type : Trade Effluent			
1.	Treated trade effluents	150.0	On land for gardening

4. Additional Conditions:



1. The unit shall operate and maintain the existing STP efficiently and continuously so as to satisfy the standards prescribed by the Board.
2. The unit shall utilize the treated sewage on its own land for gardening purposes thereby developing green belt.
3. The unit shall provide ETP for the treatment of Trade effluent generated from the unit and the treated trade effluent shall be utilized for gardening purposed after ensuring that the treated trade effluent satisfies the standards prescribed by the Board.
4. The unit shall ensure that the operation of port activity does not create any adverse effect on the marine eco system or marine water quality of the sea water intake point of M/s. Chennai Water Desalination Plant.
5. The unit shall ensure that the operation activity of the unit shall not create any hindrances to the Kattupalli village under any circumstances.
6. The unit shall continue to develop green belt inside the premises.
7. The unit shall adhere to the conditions as stipulated in the Letter No.: 10 – 130 / 2007 – IA.III, Dated: 03.07.2009, 17.12.2014 and 12.05.2010 issued by the Ministry of Environment, Forests and Climate Change, Government of India.
8. The unit shall ensure that no oil spill shall occur in the marine coastal areas due to the operation activities.
9. The Port shall ensure that the dredged material arising from dredging operations is not dumped in the areas attracting CRZ Notification and the material shall be used for further beneficial use.
10. The Port shall have containment Boom facility with skimmer to contain and recover the spillages of Liquid Cargo in to the sea if any.
11. The Port shall ensure that the dredged material shall not be dumped in the areas attracting CRZ Notification and the material shall be used for further beneficial use.
12. The unit shall maintain the water quality of Marine Sea so as to meet the Marine Water quality prescribed for Harbour Sea Water and ensure that the marine water quality is monitored at regular intervals by engaging competent agencies.
13. The unit shall furnish carry out impact assessment study once in a year with respect to marine and land environment and the report shall be furnished to Board.
14. The Port shall ensure that adequate oil spill response equipment shall be made available as per the Appendix B of the Tamil Nadu State Oil Spill Disaster Contingency Plan, September 2016.
15. The Port shall ensure participation in the oil spill combating training along with the State Agencies such as Tamil Nadu Maritime Board organised by the Indian Coast Guard time to time.
16. The port shall ensure the formation and regular functioning of dedicated Environment Cell and Oil Spill Contingency Response Cell in order to have timely response to incidents of oil spill and any other contingency in the Port area.
17. The unit shall furnish the amendment to CRZ & Environment Clearance issued by MoEF vide letter No. 10 – 130 / 2007 – IA.III, Dated 03.07.2009, within 3 months.
18. The unit shall be liable to pay the consent fee and remit the difference in amount in case of any revision of consent fee by the Government.
19. The unit shall provide adequate toilet facilities as prescribed under Tamilnadu Factories Rule, 1950.

R. KANNAN

Digitally signed by R.
KANNAN
Date: 2017.12.26 17:47:01
+0530'

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai



TAMILNADU POLLUTION CONTROL BOARD

GENERAL CONDITIONS

1. This consent to establish cannot be construed as consent to operate and the unit shall not commence the operation without obtaining the Consent to operate.
2. The applicant shall make a request for grant of consent to operate at least thirty days, before the commissioning of trial production.
3. Any Change in the details furnished in the conditions has to be brought to the notice of the Board and got approved by the Board, before obtaining consent to operate under the said Act.
4. The unit has to comply with the provisions of Public Liability Insurance Act, 1991 to provide immediate relief in the event of any hazard to human beings, other living creatures/plants and properties while handling and storage of hazardous substances (wherever applicable).
5. Consent to operate will not be issued unless the unit complies with the conditions of consent to establish.
6. The unit shall provide adequate water sprinklers for the control of dust emission during the loading and unloading of construction material so as to minimize the dust emission.
7. The unit shall provide water sprinklers along the temporary roads inside the premises to avoid fugitive dust emission during the vehicle movements.
8. The unit shall develop green belt of adequate width around the premises.
9. In case there is any change in the management, the unit shall inform the change with relevant documents immediately.

R. KANNAN

Digitally signed by R.
KANNAN
Date: 2017.12.26 17:47:12
+05'30'

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

POLLUTION PREVENTION PAYS

அகம் தூய்மை வாய்மைக்கு! புறம் தூய்மை வாழ்வுக்கு!



TAMILNADU POLLUTION CONTROL BOARD

Registered on
8/10/1985
Gm No. 10/1985

POLLUTION PREVENTION PAYS

அகம் காய்மை வாய்மைக்கு! ப்ம் காய்மை வாங்குக்கு!

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On or before 10.03.2018

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PUBLIC NOTICE

M/s L & T Shipbuilding Limited
Ground Floor, TG-1 Building, L&T Construction Complex, Mount Pooneri Road, Manipalakkam, Chennai - 600 085 (Tamil Nadu)

NOTICE FOR PUBLIC

This is to notify the general public that the bifurcation of the existing Environmental & CRZ Clearance issued vide Letter No. 10-130/2007-IA.III dated July 03, 2009 in favour of M/s L & T Shipbuilding Limited (Joint venture of L&T and TIDCO) for the development of Shipyard-cum-Minor Port Complex at Kattupalli, Ponneri Taluk, Tiruvallur District/Tamil Nadu in to L&T Shipbuilding Limited (LTSB) and Marine Infrastructure Developer Private Limited (MIDPL) has been granted under the EIA Notification 2006 (as amended) and CRZ Notification 2011 (as amended) by Ministry of Environment, Forest and Climate Change (IA-III Division) vide their letter no. F. No.10-130/2007-IA.III dated February 09, 2018.

The copy of the above letter of Environment and CRZ Clearances is available with the Tamil Nadu Pollution Control Board (TNPCB) and may also be seen at website of MoEF&CC at <http://envfor.nic.in>

Date: February 19, 2018

SITUATION

SITUATION VACANT

BPO

BPO MED.BILLING @ Royapettah Fresh/ Exp Charges & Payment Posting-26130 124/9940109520/suresh@flagshipind.com

FINANCE

PUBLIC NOTICE

M/s Marine Infrastructure Developer Private Limited
Ground Floor, TG-1 Building, L&T Construction Complex, Mount Pooneri Road, Manipalakkam, Chennai - 600 085 (Tamil Nadu)

NOTICE FOR PUBLIC

This is to notify the general public that the bifurcation of the existing Environmental & CRZ Clearance issued vide Letter No. 10-130/2007-IA.III dated July 03, 2009 in favour of M/s L & T Shipbuilding Limited (Joint venture of L&T and TIDCO) for the development of Shipyard-cum-Minor Port Complex at Kattupalli, Ponneri Taluk, Tiruvallur District/Tamil Nadu in to L&T Shipbuilding Limited (LTSB) and Marine Infrastructure Developer Private Limited (MIDPL) has been granted under the EIA Notification 2006 (as amended) and CRZ Notification 2011 (as amended) by Ministry of Environment, Forest and Climate Change (IA-III Division) vide their letter no. F. No.10-130/2007-IA.III dated February 09, 2018.

The copy of the above letter of Environment and CRZ Clearances is available with the Tamil Nadu Pollution Control Board (TNPCB) and may also be seen at website of MoEF&CC at <http://envfor.nic.in>

Date: February 19, 2018

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அதிக விலைக்கு விற்க
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அடகு கி.ரூ.2400 வரை
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வரை விற்பு உடனே
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எல் அண்டு டி லிமிடெட் லிமிடெட்
தலைநகரம் TC-1 கட்டிடம்,
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(சுட்டி) நிறுவனமான எல் அண்டு டி
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எண். 10-130/2007-IA/III/ 03.07.2009ல்
தமிழ்நாடு திருவள்ளூர் மாவட்டம்
பொன்னேரி தாலுக்கா, காட்டுப்
பள்ளியில் கப்பல் கட்டுமானம்
மேம்படுத்துதல் மற்றும் துறைமுக
வளாகம் அமைப்பது சம்மந்தமாக
சுற்றுமூலம் மற்றும் CRZ வழங்கிய
அனுமதி தற்போது எல் அண்டு டி
லிமிடெட் லிமிடெட் (LTSE) மற்றும்
மனை இன்பிராஸ்ட்ரக்சர் டெவலப்மன்ட்
பிரைவேட் லிமிடெட் (MIDPL) என்கிற
நிறுவனங்களுக்கு வழங்கப்பட்டு மேற்படி
ஆணை சுற்றுமூலம் மற்றும் காடு /
பருவநிலை மற்றும் (IA-III பிரிவின்படி)
அனுமதிக்கப்பட்ட, EIA 2006 (திருத்தப்பட்ட)
மற்றும் CRZ 2011 (திருத்தப்பட்ட)
படிவங்களின்படி அறிவிக்கப்பட்டு கடிதம்
எண். F.No.10-130/2007-IA/III/ 03.02.2018
வழங்கப்பட்டுள்ளது.

மேற்குறிப்பிட்ட சுற்றுமூலம் மற்றும் CRZ
அனுமதி கடிதம் நகல் தமிழ்நாடு மாசு
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MoEF&CCல் உள்ள <http://envfor.nic.in>
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பட்டுள்ளது.
தேதி 19.2.2018

மனை இன்பிராஸ்ட்ரக்சர் டெவலப்மன்ட் லிமிடெட்
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தேதி 19.2.2018

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PUBLIC NOTICE

M/s L & T Shipbuilding Limited
Ground Floor, TC-1 Building, L&T Construction Complex,
Mount Poonamallee Road, Manapakkam, Chennai - 600 069 (Tamil Nadu)

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Mount Poonamallee Road, Manapakkam, Chennai - 600 069 (Tamil Nadu)

NOTICE FOR PUBLIC

This is to notify the general public that
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Environmental & CRZ Clearance issued
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only on CPP portal.

HINDU Feb 28.

EMERGENCY RESPONSE

AND

DISASTER MANAGEMENT PLAN

OF

**MARINE INFRASTRUCTURE DEVELOPER
PRIVATE LIMITED**

KATTUPALLI

	UPDATED BY	REVIEWED BY	APPROVED BY
NAME	Krishnaraja Ponraj	Srinivasa Reddy	Capt. Jeyaraj Thamburaj
DESIG.	Senior Manager – OH &S	AGM- HR / IR	Business Unit Head
SIGN.			
Date			

A. DISTRIBUTION LIST

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[illegible]

C. AUTHORIZATION

- This "EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN" is the property of Adani Kattupalli Port Private Limited and is authorized for use in the MIDPL premises.

- **MANAGEMENT APPOINTEE/ MANAGEMENT REPRESENTATIVE**

D. FOREWORD

The management of Adani Kattupalli Port Private Limited, referred to as MIDPL is committed to the establishment and maintenance of action plans to meet any emergency for the purpose of fulfilling. The objectives of occupational health & safety and protection of environment.

In order to harmonize the actions during an emergency, a set of guidelines have been identified and included in this plan.

Individual departments shall take into account the guidelines given in this plan.

The guidelines given in this plan are broadly directional, and nothing in this plan shall restrict the Site Main Controller and/ or Site incident Controller to take additional measures in the interest of safety of men, machine and for the protection of environment.

- **MANAGEMENT APPOINTEE/ MANAGEMENT REPRESENTATIVE**

E. Schedule – 8 A

1.	Name and Address of the person furnishing the information	:	<p>Full Name of Company</p> <p>Marine Infrastructure Developer Pvt. Ltd.,</p> <p>Kattupalli Village, Ponneri Taluk,</p> <p>Thiruvalluvar, Dist.</p> <p>Chennai - 600102</p> <p>Phone Factory : 044 – 27969107</p> <p>Tel Fax :</p> <p>Full Name & Address of the Occupier:</p> <p>Ennarasu Karunesan ,</p> <p>CEO, Southern Ports,APSEZ</p> <p>No ½ Ramcon Fortuna Towers</p> <p>4thFloor, Kodambakkam High Road,</p> <p>Nungambakkam</p> <p>Chennai- 600 034</p> <p>Phone No Office 044-4274 2669</p> <p>Full Name & Address of the Factory Manager</p> <p>Capt. Jeyaraj Thamburaj</p> <p>Marine Infrastructure Developer Pvt Ltd & Adani Ennore Container terminal</p> <p>Mob +91 90999 00994 ;</p> <p>Off +91 44 27969107 Ext 69107 </p> <p>Kattupalli Village, Ponneri taluk,</p> <p>Thiruvalluvar. Dt Chennai 600 102</p>
2.	Key personnel of the organization and responsibilities assigned to them in case of an emergency	:	<p>As per Chapter 10, Annexure 14, 15, 16, 17, 18, 29.</p>
3.	Outside organizations if involved in assisting during On-Site Emergency	:	<p>As per Chapter 11, Annexure 28, Appendix G.</p>

MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Sr.Manager (OH &S)

	(a)	Type of accidents	:	Fire, Explosion, Spillage, Release of Corrosive/Toxic liquids and leakage of radiation
	(b)	Responsibility assigned	:	Mutual understanding as per Annexure 23.
4.	Details of liaison arrangement between the organizations		:	Telephone, Mobiles, Messengers, Wireless, Fax, Internet, Emergency Vehicles.
5.	Information on the preliminary hazard analysis		:	As per Chapter-7
	(a)	Type of accidents	:	As per Chapter-7
	(b)	System elements or events that can lead to a main accident.	:	As per Chapter-7
	(c)	Hazards.	:	As per Chapter-7
	(d)	Safety relevant components	:	As per Chapter-16, Appendix C, H
6.	Details about the site		:	
	(a)	Location of dangerous substances.	:	Loading / Unloading facilities at MIDPL, Kattupalli Village, Ponneri Taluk, Dist. Thiruvalluvar
	(b)	Seat of key personnel	:	Port Operation Building & all plant complexes. As per Annexure 17
	(c)	Emergency control room	:	As per Annexure-20
7.	Description of hazardous chemicals at plant site		:	
	(a)	Chemicals (quantities and toxicological data).	:	As per Annexure 4 & 5

	(b)	Transformation if any which could occur.		As per Annexure 5
8.		Likely dangers to the plant	:	Refer Chapter-6, Chapter - 7
9.		Enumerate effects of	:	
	(i)	stress and strain caused during normal operations		<p>Equipment – properly designed and tested before use</p> <p>Human being-Stress & Strain can cause various type of frustration like Aggression, fixation, resignation, negativism, repression and withdrawal.</p> <p>To overcome stress & strain company is providing various stress management training program.</p>
	(ii)	Fire and explosion inside the plant and effect if any of fire and explosion outside.		As per Chapter 7, Annexure-10,11
10.		Details regarding	:	
	(i)	Warning, alarm and safety and security systems.		As per Annexure-21
	(ii)	Alarm and hazard control plans in line with disaster control and hazard control planning, ensuring necessary technical and organizational precaution.		<p>Details of Alarm & Siren are given in Annexure 21, Chapter – 5.</p> <p>Hazard & Control systems are given in Annexure – 4 & 6.</p>

	(iii)	Reliable measuring instruments, control units and servicing of such equipment's		Periodically Calibration of Equipment's
	(iv)	Precautions in designing of the foundation and load bearing parts of the building		Various Prevailing Standards followed & Stability Certificate obtained
	(v)	Continuous surveillance of operations.		Preventive Maintenance and inspection
	(vi)	Maintenance and repair work according to the generally recognized rules of good engineering practices		Yes
11.	Details of communication facilities available during emergency and those required for an Off-Site Emergency.		:	<p>Telephone, Mobiles, Messengers, Wireless, Fax, Internet, Emergency Vehicles, Security Jeep with PA system, Golf cart fixed with PA System</p> <p>Chapter 14 Communication and Public affairs</p> <p>Important Telephone Nos. are given in Chapter 12, Annexure 27, Appendix – A , B,</p>
12.	Details of firefighting and other facilities available and those required for an off-site emergency.		:	As per Chapter 16, Annexure-16, Appendix – H
13.	Details of first aid and hospital services available and its adequacy.		:	First Aid Box is provided in all departments. Facility available at own Medical Centre is given in Annexure - 22, List of First Aid Trained Persons are given in Appendix – D. Telephone Nos. of Important Hospital are given in Annexure 17.

F. TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
A	Distribution List	2
B	Revision Record Sheet	3
C	Authorization	4
D	Foreword	5
E	Schedule 8 A	6
F	Table of Content	10
1	Introduction	13
2	Abbreviations	14
3	Glossary	15
4	Purpose, Scope & Objectives	17
5	Classification of Emergency Situation	19
6	Identification of Potential Emergency Situation	20
7	Emergency Management Planning	22
8	Emergency Response Organization	22
9	Duties and Responsibility	38
9.1	Site Main Controller	38
9.2	Night Duty Officer	38
9.3	Site Incident Controller	39
9.4	Emergency Support Officers	40
9.5	HOS- Administration	40
9.6	HOD-HR	40
9.7	HOD- Corporate Affairs	40
9.8	HOD-Engg. Services	41
9.9	HOD Security	41
9.10	HOD – Finance & Accounts	41

9.11	HOS – Security	41
9.12	HOS – Fire Services	42
9.13	HOD – Safety	42
9.14	HOS – Occupational Health Centre	42
9.15	HOD – Information Technology	42
10	External and Mutual Aid	42
11	Emergency Telephone Numbers	44
12	Reporting & Investigation	46
13	Communication and Public Affairs	47
14	Drills & Training	48
15	Action Plan for Responding to Specific Emergency	49
16	EMERGENCY KIT, FIRE FIGHTING FACILITES, SAFETY ARRRRANGMENT	71
17	Action Plan for Off Site Emergency	72

LIST OF ANNEXURES

ANNEXURE-1	IDENTIFICATION OF FACTORY	80
ANNEXURE-2	MAP OF THE AREA	82
ANNEXURE-3	FACTORY LAY OUT	83
ANNEXURE-4	OTHER HAZARDS AND CONTROLS	84
ANNEXURE-5	TRADE-WASTE DISPOSALS	85
ANNEXURE-6	RECORDS OF PAST INCIDENTS	87
ANNEXURE-7	ENVIORNMENTAL IMPACT ASSESSMENT	88
ANNEXURE-8	WEATHER CONDITIONS	90
ANNEXURE-9	INCIDENT CONTROLLERS	92
ANNEXURE-10	DEPUTY INCIDENT CONTROLLERS	93
ANNEXURE-11	SITE MAIN CONTROLLERS	94
ANNEXURE-12	KEY PERSSONEL	95

MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Sr.Manager (OH &S)

ANNEXURE-13	ESSENTIAL WORKERS	97
ANNEXURE-14	ASSEMBLY POINTS	99
ANNEXURE-15	EMERGENCY CONTROL CENTRE	100
ANNEXURE-16	FIRE AND TOXICITY CONTROL ARRANGEMENTS	101
ANNEXURE-17	MEDICAL ARRANGEMENTS	102
ANNEXURE-18	TRANSPORT & EVACUATION ARRANGEMENTS	104
ANNEXURE-19	POLLUTION CONTROL ARRANGEMENTS	106
ANNEXURE-20	OTHER ARRANGEMENTS	108
ANNEXURE-21	ALARMS & SIRENS	109
ANNEXURE-22	INTERNAL PHONES	110
ANNEXURE-23	EXTERNAL PHONES	112
ANNEXURE-24	NOMINATED PERSONS TO DECLARED MAJOR EMERGENCY	115
ANNEXURE-25	A FORM TO RECORD EMERGENCY TELEPHONE CALLS	116
ANNEXURE-26	STATUTORY COMMUNICATION	118
ANNEXURE-27	EMERGENCY INSTRUCTION BOOKLET	120

Appendix No. A to G

APPENDIX	SUBJECT	PAGE NO.
A	Local Crisis Group Important Phone Nos.	125
B	Important Phone Nos. of District Crisis Group	126
C	List of PPEs	128
D	List of First Aid Trained Persons	130
E	Procedure for Spillage Control & Clean up	131
F	Details of alternate shelter	132
G	Neighboring Industries	133
H	Fire Fighting Facilities	134

1.0 INTRODUCTION

- This "EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN" is the property of Marine Infrastructure Developer Pvt Ltd., herein after referred to as MIDPL, and shall not be removed from the Company's premises.
- MIDPL maintains this EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN in soft copy at location U:\ER & DMP of the common drive of MIDPL.
- The holder of the control copy shall ensure that the persons working under him, who are responsible for any activity described in this EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN, are made aware of such responsibility. All persons to whom the EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN has been circulated shall also be made aware of any revisions there to by the holder of the controlled copy of the EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN. Preliminary and periodic ER & DMP trainings will be conducted and records for the same will be maintained.
- A signed copy of this document shall be made available in BUH, and also as and when any changes are made to it.

Details of MIDPL are mentioned in Annexure 1 Identification of Factory. The Map of the area – General Lay out is also mentioned in Annexure 2.

2.0 ABBREVIATIONS

MIDPL	:	Marine Infrastructure Developer Pvt Ltd
CG	:	Close Go down
Cont.	:	Continue
CT	:	Container Terminal
DC	:	Dry Cargo
Dept.	:	Department
ER & DMP	:	Emergency Response & Disaster Management Plan
ES	:	Engineering Services
Ex.	:	Example
GEN.	:	General
GM	:	General Manager
GMB	:	Gujarat Maritime Board
Govt.	:	Government
HOD	:	Head of Department
HOS	:	Head of Section
HR	:	Human Resources
ICG	:	Indian Coast Guards
MP	:	Multi-Purpose
MPT	:	Multi-Purpose Terminal
OSY	:	Open Stack Yard
P & A	:	Planning & Allocation
POC	:	Port Operation Control
PPEs	:	Personal Protective Equipment's
PRO	:	Public Relation Officer
PROC.	:	Procedure
QHSE & F	:	Quality, Health, Safety, Environment & Fire
R & D	:	Research & Development
SCBA	:	Self-Contained Breathing Apparatus

3.0 GLOSSARY

Accident	An undesired event that has a probability of causing personal injury or damage to property or environment or both.
Cold Zone	Area outside the warm zone that poses minimal or negligible hazards to emergency response personnel. The command post, deployed apparatus and the resource staging area should be located in this zone.
Contingency	A future event or circumstance which is possible but cannot be predicted with certainty, Any unforeseen event
Coordinator	HOD or senior most functionaries in the respective services and other critical personnel available at site at the time of an emergency. They will report at the Emergency Control Center, unless and otherwise instructed by the site main controller.
Crisis	Is any event that is, or is expected to lead to, an unstable and dangerous situation affecting an individual, group, community, or whole society.
Disaster	Disaster is as catastrophic situation and is a result of sudden occurrence of chain of unforeseen events due to natural causes which affects normal working within the factory premises and also in the vicinity, causing serious injuries, loss of lives and extensive damage to the property.
Emergency	Any situation which presents a threat to safety of persons, property and/ or the environment. It may require call for outside help.
Emergency Control Center	In the event of an emergency, Port Operation Center has been declared as Emergency Control Center (POC). Port Operation Center (POC) is situate at Marine Control,
Emergency Support Officers	Personnel who is in control of the area, dept., manpower and with his help the emergency can be tackled.
Hazard	source, situation, or act with a potential for harm in terms of human injury or ill health (3.8), or a combination of these
Hazardous Occurrence	An undesired situation having potential to result in an accident, if left as such.
Hot Zone	Area of maximum hazard surrounding the damaged or fire area that may only be entered by specially equipped and trained response personnel.

MARINE INFRASTRUCTURE DEVELOPER PRIVATE LIMITED
 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
 AUTHORIZED BY: Sr.Manager (OH &S)

Incident	An undesired event which under slightly different condition, could have resulted in harm to people, property or environment. Ex. 'A near miss'.
Major Accident	It is a sudden, unexpected, unplanned event resulting from uncontrolled developments during an industrial activity.
Non-Essential Personnel	Consists of employees, contractor's employees, visitors etc. (other than emergency response personnel) present at the incident site. In the event of an emergency, these persons shall assemble at the emergency assembly point of the plant/ area and shall respond as instructed by the site incident controller. They shall assemble in a manner as directed by Assembly point incharge so that counting is easy – preferably 6X4 format.
Plant Key Person	Head of Department of individual process plant(s). {Should assume charge of Site Incident Controller in case of an emergency in their respective plant(s)}.
Warm Zone	Area of moderate hazard outside the hot zone in which properly equipped and trained back-up crews remain standby and decontamination can be carried out.

4.0 PURPOSE, SCOPE & OBJECTIVE

04.01. PURPOSE

The purpose of this plan is to:

- Establish & define roles of coordinators, key personnel and other emergency response personnel.
- Establish guidelines for effective response to any emergency.
- Ensure a smooth interface between various emergency procedures and the MIDPL Emergency Action Plan.

This document describes the structure for the management for emergencies and evacuation plans at MIDPL. The prime objective of the emergency response plan is to ensure that the activities are carried out in the following priorities:

- Safeguard lives
- Protect the environment
- Protect company and third party assets
- Maintain company image and reputation
- Manage external stakeholders
- Resume normal activities
- Identify pre incident scenarios and outline mitigation process.

Personnel involved with dealing with emergencies shall follow these priorities when making decisions and developing strategies.

04.02 SCOPE & OBJECTIVE

Disaster and MIDPL:

A major emergency in Port is one, which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the port. Sometimes, it would require the assistance of outside emergency services to handle it effectively. Although an emergency may be caused by a number of different factors, viz. plant failure, human error, earthquake, Cyclone, flood, vessel collide, vehicle crash, major spillage or sabotage, it will normally manifest itself in basic forms viz. - Fire, Major Liquid release, Explosion.

Need of Disaster Response Plan:

In spite of universal acceptance of excellent codes of practices for design and operation of plants and storage, there have been occurrences of a number of losses due to major accidents of varying degree of severity. In fact, no industrial plant or office and no commercial or mercantile organization can be totally immune from disaster. These disasters could be attributed to various causes including failure of adherence to codes of practice.

The first few minutes after an emergency situation occurs are generally the most critical. The wrong action or a few seconds delayed action in crises can make all the difference. A quick and effective response at that time can have tremendous significance on whether the situation is controlled with little loss or whether it turns into a disaster.

Contingency planning increases thinking accuracy and reduces thinking time in an emergency, which reduces loss. The effectiveness of what we should do if disaster strikes will depend upon how well we have prepared the contingency plans and trained the people who will have to implement them. Even if the plans generated and equipment provided are never used, the very fact that the plans have been developed and equipment have been provided creates confidence among employees and from an economic point, may reduce the insurance rates.

The Social and legal consequences of "Bhopal" Gas Tragedy have sufficiently demonstrated that these considerations alone are important enough to persuade management of hazardous plants to develop suitable plans.

Thus disaster is a situation generally arising with little or no warning and causing or threatening death, injury or serious disruption to people and services which cannot be controlled, by fire, police and services operating alone. The incident will require special mobilization and co-operation of other bodies and voluntary organization.

The very purpose of this plan is to activate the emergency response organization smoothly and effectively, once the emergency is declared. The plan details the arrangements for responding to emergency scenarios, covering in details the following aspects:

- To assess and define emergency including level of risk.
- To contain the incident and bring it under control.
- To coordinate with mutual aid members and Government authorities.
- To minimize damage to lives, property and the environment.
- To rescue and evacuate workers to safe areas.
- To provide necessary assistance to casualties.

This response plan will identify what needs to be done during various situation and how. However, the action plan to achieve the recommended objectives can only be met if all the assigned responsibilities either for a particular person or dept. are performed.

For this plan to be effective, it is necessary that:

- Coordinators, key personnel and other emergency response personnel are familiarized with this action plan.
- On-site resources are mobilized in minimum time.
- Assistance from outside agencies is readily available.
- The drills for identified emergencies are regularly exercised.

- The emergency responses are reviewed and updated based on latest developments, other information and requirements in order to improve effectiveness of the MIDPL-ER & DMP

EMERGENCY NUMBERS

<i>Dept</i>	<i>Ext.</i>	<i>Mobile</i>
Marine Control Room	69050	7823941713
Security Control Room	69065	7823941712
Fire Control Room	69155	7823941711
Ambulance/ Medical Centre	69156	7823941711
CT – Operations	69168	7823941715
Safety Common	69171	7823941711

5.0 CLASSIFICATION OF EMERGENCIES

Different types of emergencies that may arise at MIDPL can be broadly classified as:

a) Nature – I (On – Site Emergency) –

Any Incident that possess the potential to cause injuries to personnel & damage to property and Environment in the vicinity of incident & which can be controlled within company by plant personnel without outside help.

It can be further subdivided into two levels:

Level – I The emergency is perceived to be a kind of situation arising due to an incident which is confined to a small area and does not pose an immediate threat to life and property and which can be handled with the resources available within the premises.

Level – II The emergency is perceived to be a kind of situation arising due to an incident which poses threat to human lives and/ or property, having potential to affect large area within the factory premises. This kind of situation is beyond the control of internal resources and requires mobilization of additional resources from other sections/ departments and help from outside agencies. The situation requires declaration of On – Site emergency.

b) Nature – II (Off – Site Emergency – Level III)

Outside emergency deals with measures to prevent and control emergencies affecting public and Environment outside the factory.

The emergency is perceived to be a kind of situation arising out of an incident having potential threat to human lives and property not only within MIDPL but also in surrounding areas and environment. It may not be possible to control such situations with the resources available within MIDPL. The situation may demand prompt response of multiple emergency response groups as have been recognized under the District Emergency plan for Kattupalli.

A similar situation in neighboring industry that may affect MIDPL and also falls under this category.

Only Site Main Controller will be having the authority to declare Level – III Emergency.

6.0 IDENTIFICATION OF POTENTIAL EMERGENCY SITUATION

MIDPL has established procedures to conduct HSE meetings, HSE audits, HSE walk and risk / aspect assessment to identify potential accident and emergency situations in the plant. The emergency situations, besides natural / man-made calamities, which have potential to cause serious injuries or loss of lives, damage to property and serious disruption inside and outside the organization or to environment, have been identified as fire, explosion and toxic/corrosive liquid release due to following locations / reasons – apart from physical common hazards eg fall from height, electrocution, fall of material, drowning etc.

SITE LOCATION and PROBABLE FAILURE / Hazard	TYPE OF INCIDENT
GAS CYLINDERS	FIRE, EXPLOSION
HARBOUR AND YARD (COLLAPSE/FALL OF EOT, GANTRY, RTG CRANE, HYDRA, FALL OF PERSON, DROWNING,VEHICULAR HAZARDS)	PERSONAL INJURY TO MORE THAN 1 PERSON
OIL, CHEMICAL SPILLAGE, LEAKAGE, SPILL OF RADIATION	LAND CONTAMINATION, WATER CONTAMINATION, FIRE , PERSONAL INJURY
NEIGHBOURING INDUSTRIES	FLAMMABLE GAS RELEASE

For more detail on, storage hazards, process vessels hazards and controls, other hazards & trade waste disposals refer **Annexure: - 4, 6, 7, 8** respectively.

6.1 POTENTIAL EMERGENCIES

Sr. No.	Emergencies
1	Cyclonic Storm/ Hurricane
2	Earthquake
3	Tsunami
4	Flood
5	Industrial unrest
6	Bomb Threat
7	War
8	Food/ Water Poisoning
9	Fire / Explosion
10	Transportation / Storage Accidents involving Hazardous Material- leakage of flammable, corrosive, toxic substance or radiation
11	Medical Emergencies & Response
12	Marine Emergency

6.2 STAGES OF EMERGENCY PLAN

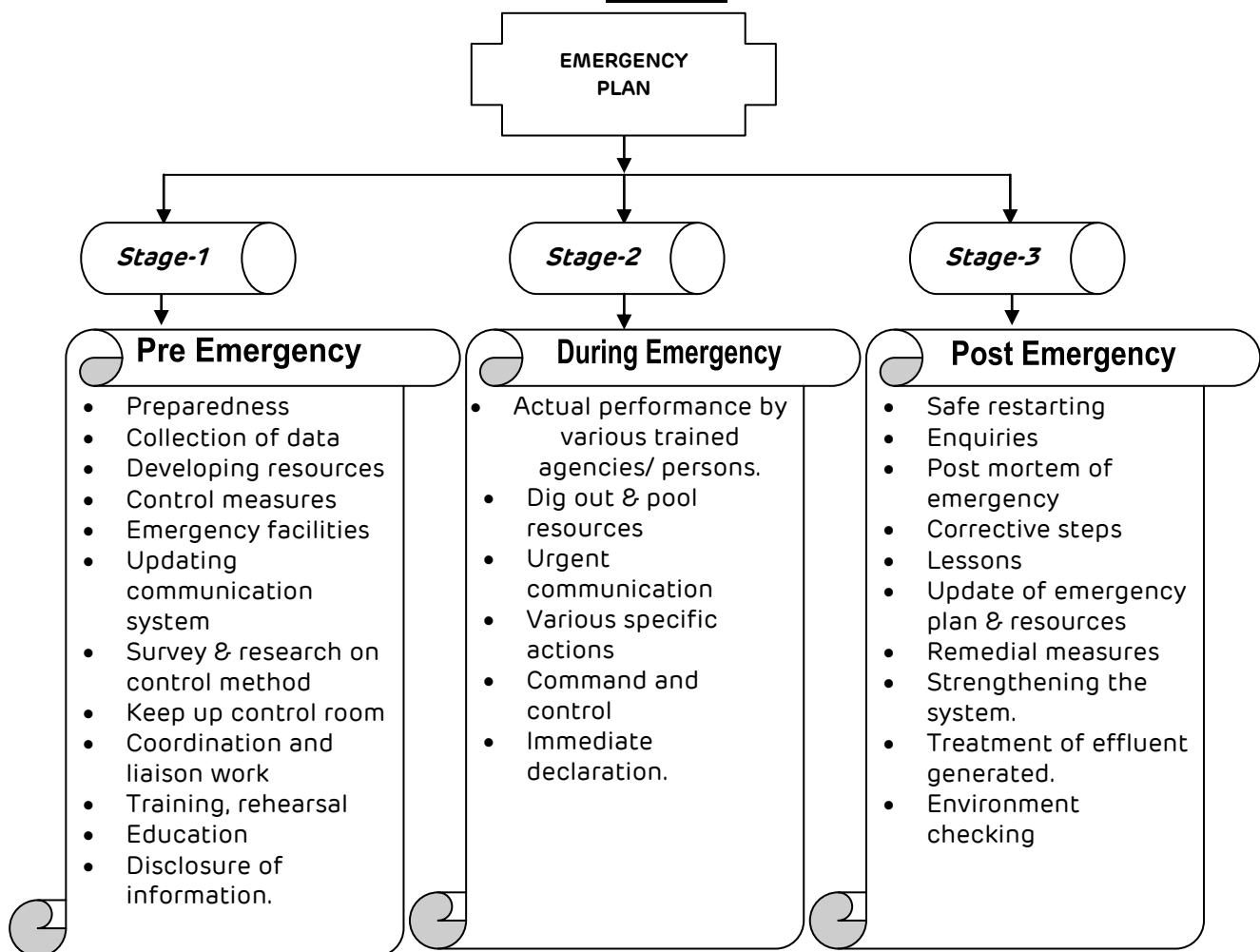
The plan consists of the actual performance of duties & responsibilities by designated personnel and other agencies. Therefore, the plan is divided into three stages.

The stage one is pre-emergency period preparedness, awareness and training parts during normal activities, and prior to emergency.

While stage second explains actions during emergency period i.e. during actual emergency period, specific duties and responding actions are to be performed by designated person by using available resources to control the emergency by various persons in systematic ways within shortest period.

The third stage indicates post-emergency period which describes rehabilitation and normalcy after the emergency and to preserve evidences and records for remedial measures, and to face inquiry as required by various authorities. It also explains corrective steps learnt from the incident and investigation of reasons behind the emergency to prevent re-occurrence of such type emergency.

CHART



7.0 EMERGENCY MANAGEMENT PLANNING

Flow Chart of Emergency Response during the emergency is given in Chapter 9.4, which foresees the order of command, channel of information flow and action with gravity of situation as required to deal with the emergency. The single organization structure has been constituted and same shall be continued till the emergency is over. The Shift Incharge / senior most person / Night Duty Officer (during night hours) present at the time of emergency in the department will be Dy. Incident Controller. On assessing the situation he will initiate the action and also inform Head of the Dept. On arrival at site, HOD of the respective department shall take the initial charge as Site Incident Controller, and he will co-ordinate with different department including Fire & Safety and Security to respond to the situation. The **Marine Control Room** will be used as emergency control centre and **alternatively Security Control Room** at GHC will be used as emergency control centre. On arrival of Site Main Controller - (Chief Operating Officer) to the site, he gets status of situation from the HOD (Site Incident Controller), Head HSE. After assessing situation, he will declare the "EMERGENCY" & he will act as site main controller and put On Site Emergency Plan in action.

8.0 EMERGENCY RESPONSE ORGANIZATION

MIDPL shall be responsible for dealing with all emergencies in operations under their operational control and within the Multi Cargo Berth area. MIDPL shall respond to emergencies within the port and its port limits.

For control of an emergency, MIDPL has established an Emergency Response Organization headed by **Business Unit Head (alternate – next Sr. Officer In-charge)**, who shall be the Site Main Controller. This emergency response organization will provide the command and control structure to coordinate and direct the response to an emergency, and depending on the circumstances of the emergency will consist of:

8.1 Management Team

Business Head (Site Main Controller)

HSE & Fire – HOD or senior most functionary of the department

Site Incident Controller – HOD or senior most functionaries available at site

Deputy Site Incident Controller – Section Head

8.2 Primary Support Team

Coordinators (HOD or senior most functionaries)

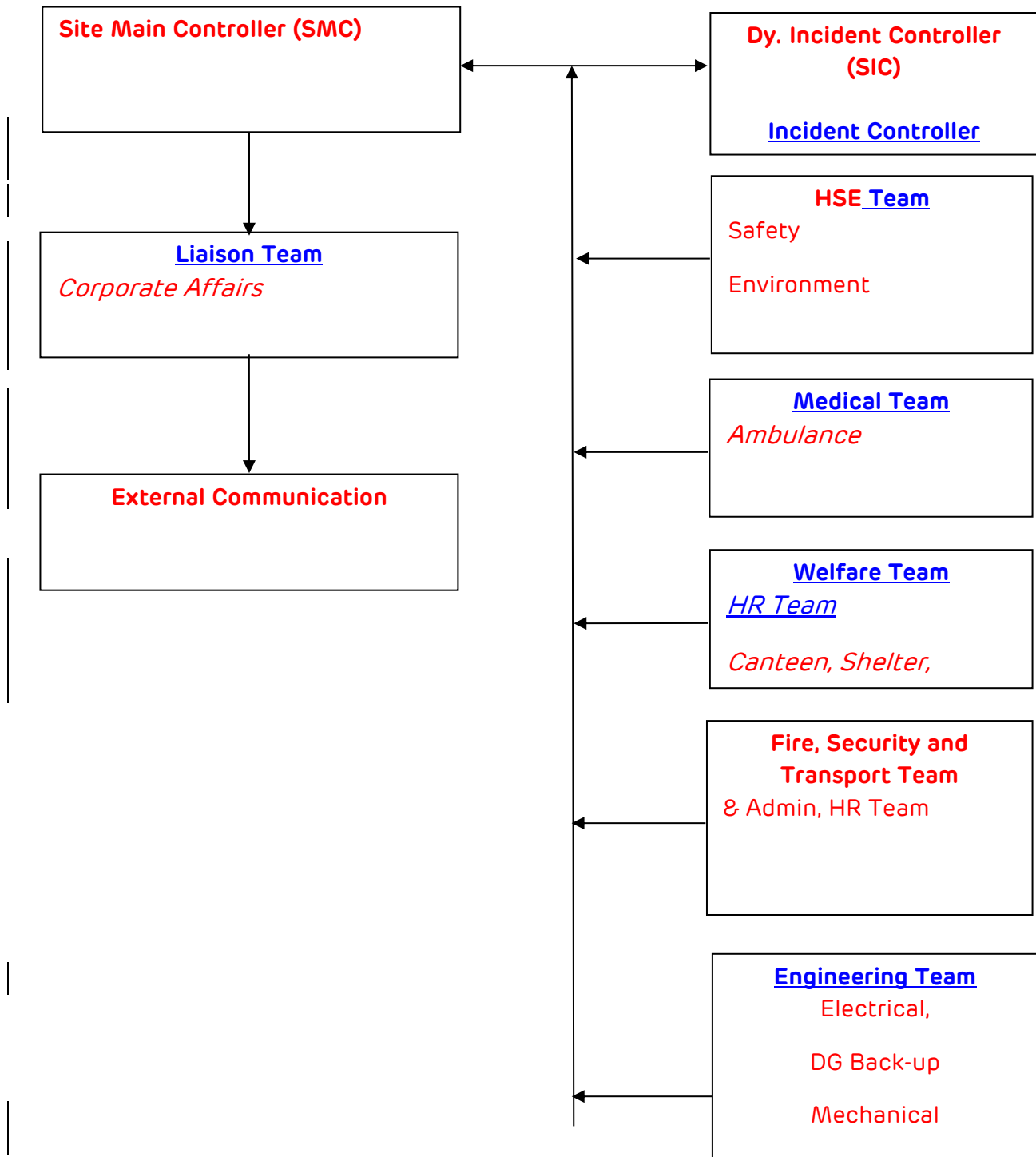
- **HSE & Fire Services**
- **Marine**
- **Security Services**
- **Occupational Health Center**
- **Engineering Services**
- **Human Resource**
- **Administration**

8.3 Secondary Support Team

Coordinators (HOD or senior most functionaries)

- **Finance & Accounts**
- **Commercial**
- **Administration (Transport Cell)**
- **Administration (Welfare & Canteen)**
- **Corporate Communication**

8.4 ORGANIZATION CHART FOR ONSITE EMERGENCY PLAN

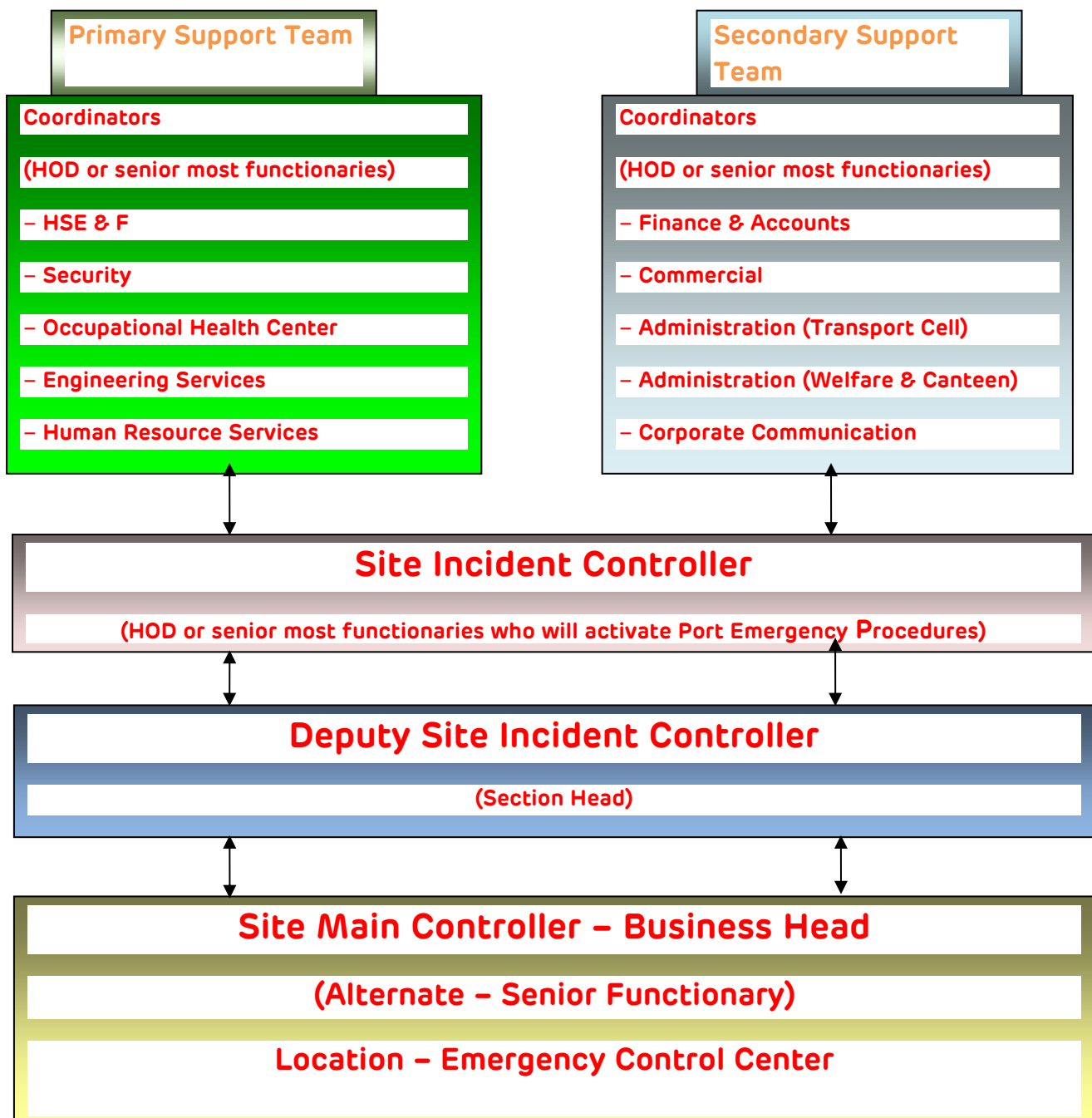


Only Site Main controller can activate the emergency response organization. An Emergency Control Center has been established in the Marine Control Room (Alternate – Security Control Room – Port Operation Building).

The primary role of the emergency response organization in an emergency shall be:

- Determine the degree to which the emergency response organization shall be activated.
- Determine extent of actual action required, organize and render assistance to Site Incident Controller.
- Coordinate with all other concerned.

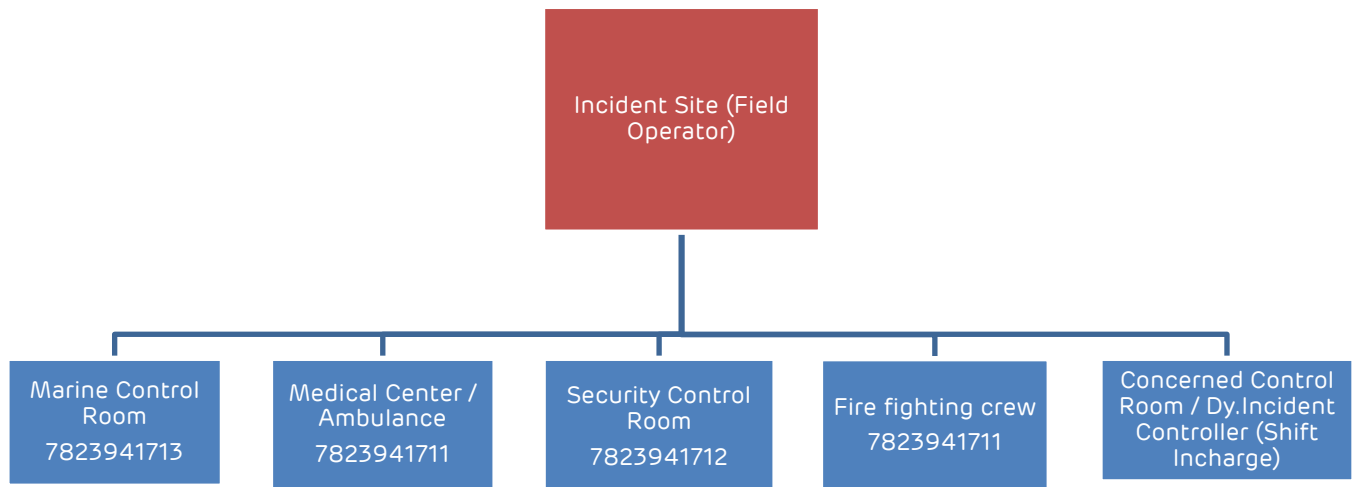
8.5 EMERGENCY TEAM REPORTING PLAN



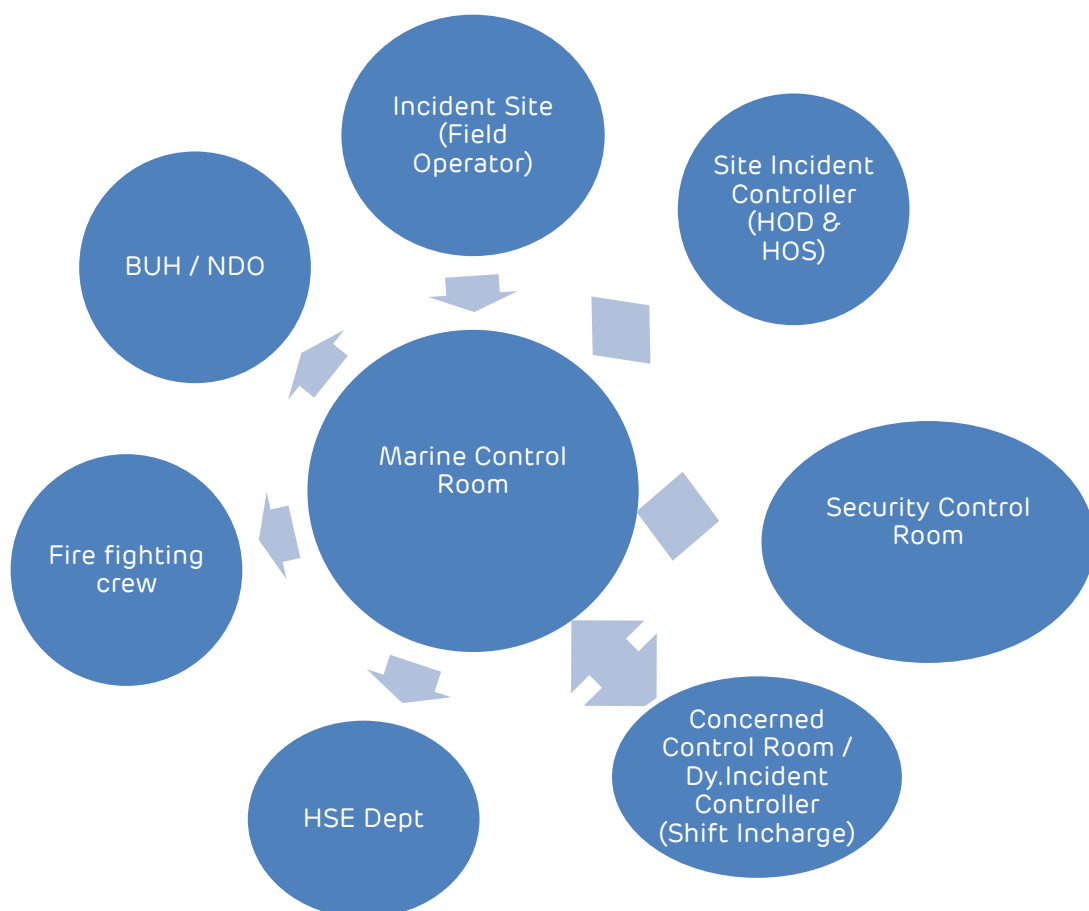


FLOW OF INFORMATION

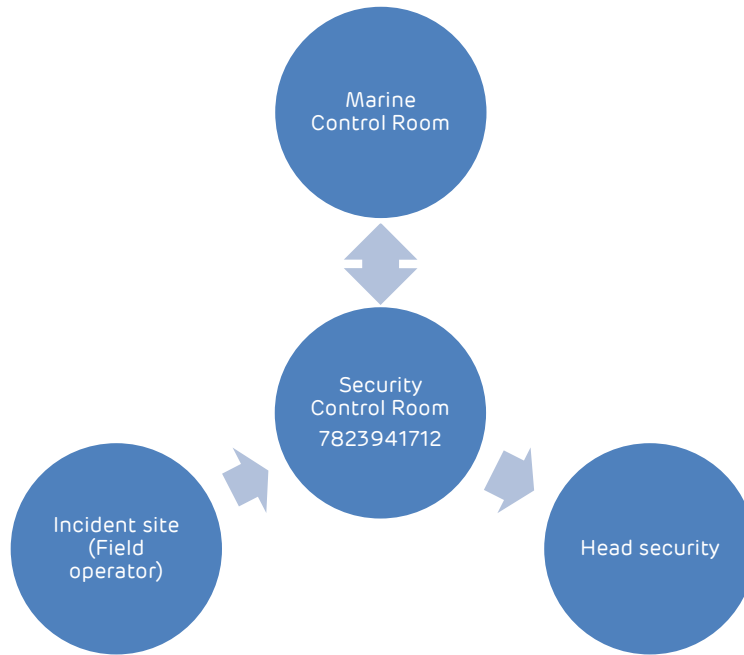
Information flow diagrams - Incident Site (Field Operator)



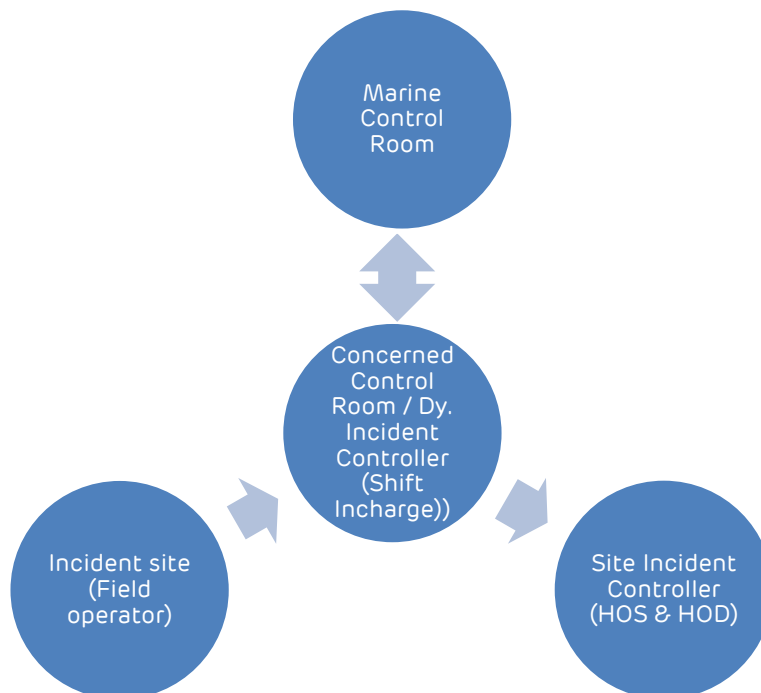
Marine Control Room

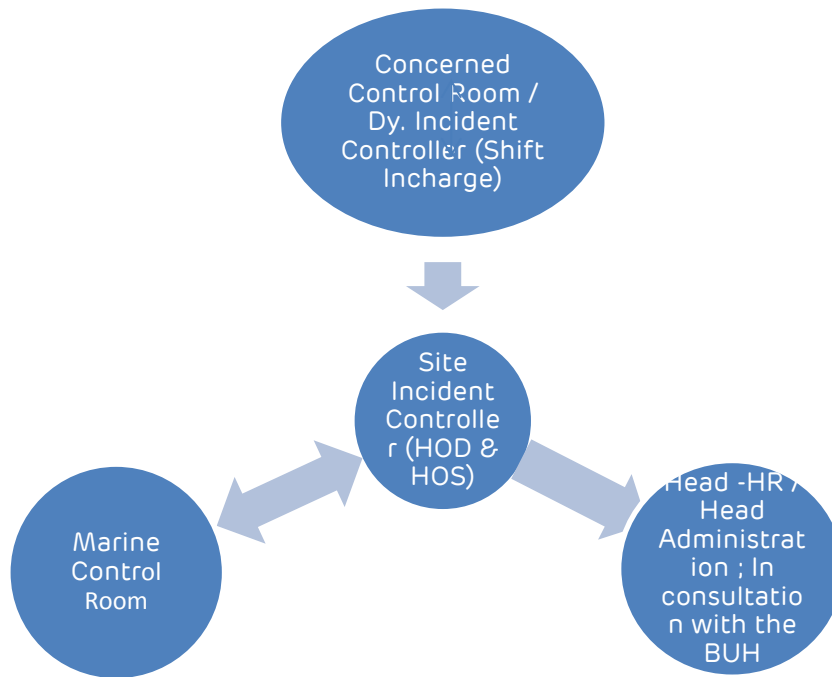


Security Control Room



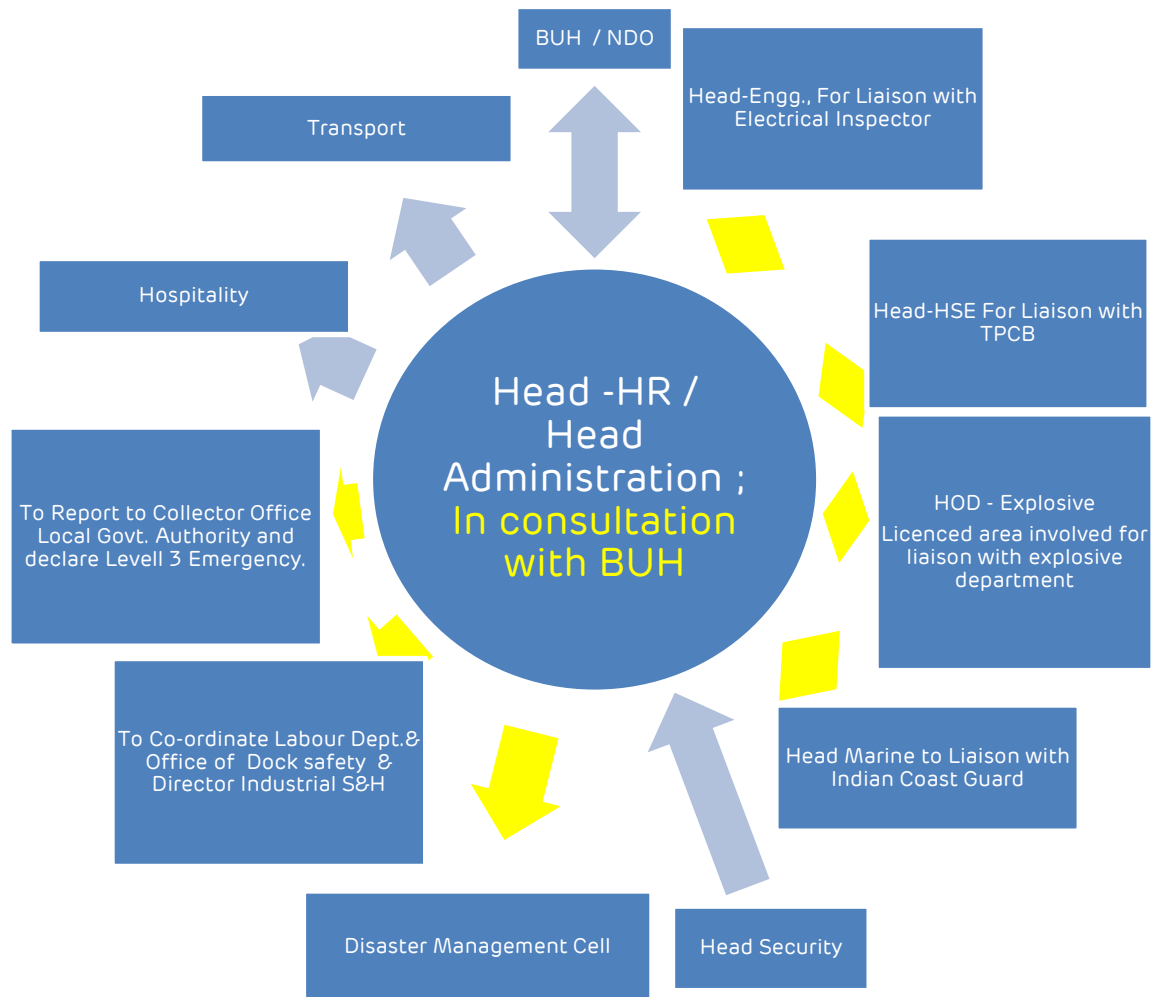
Concerned Control Room / Dy. Incident controller (Shift In-charge)

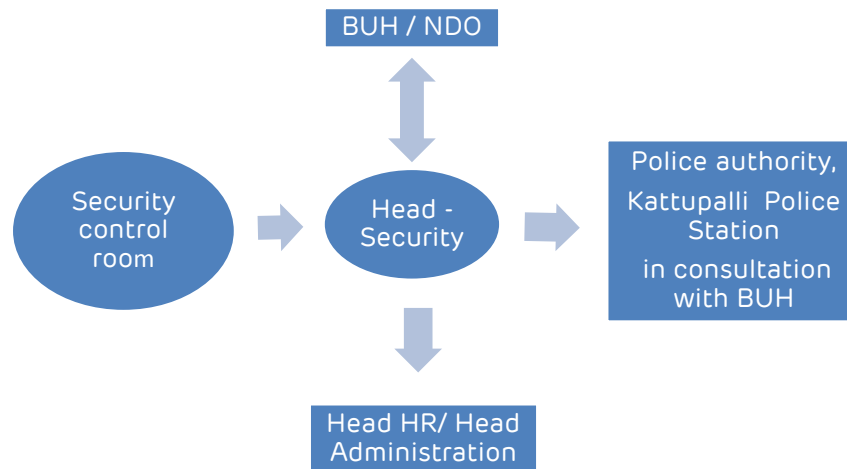




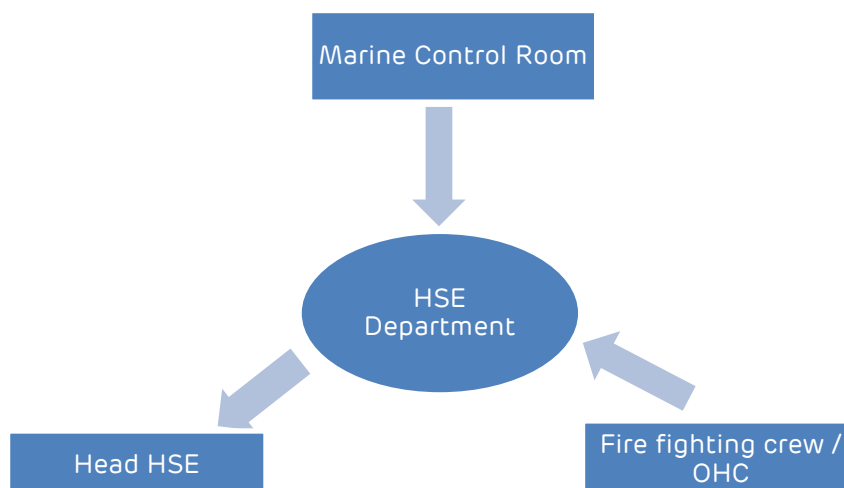
AUTHORIZED BY: Head (HSE)

Head HR/ Head Administration (In consultation with the BUH)

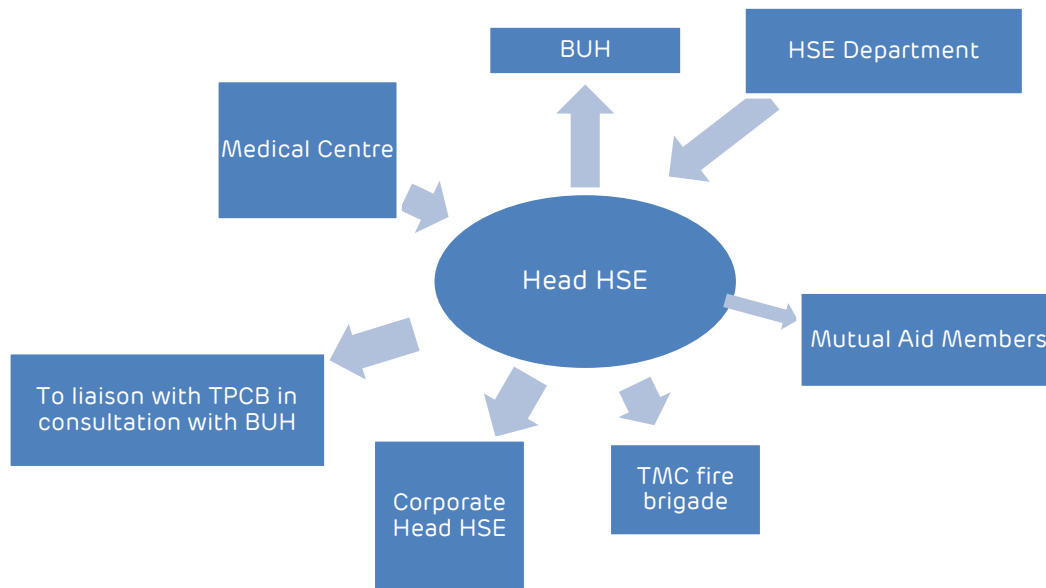




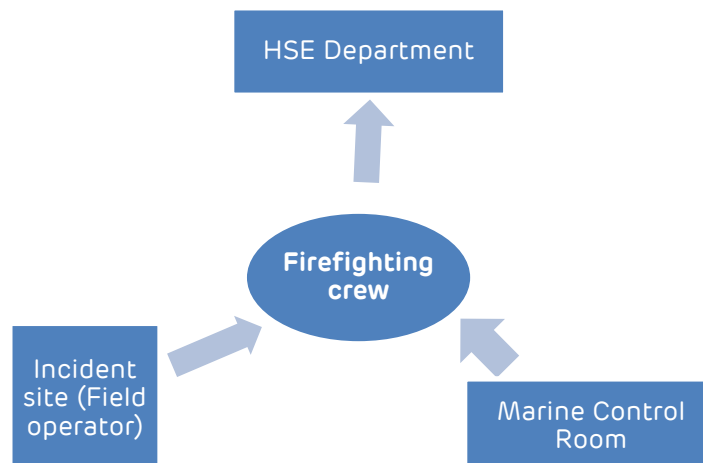
HSE Department



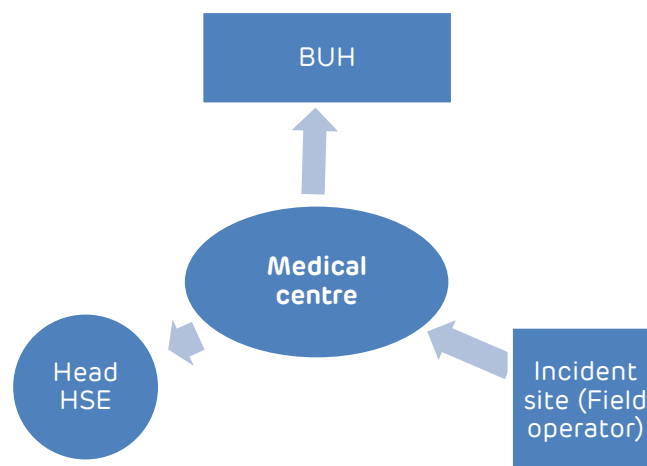
Head - HSE



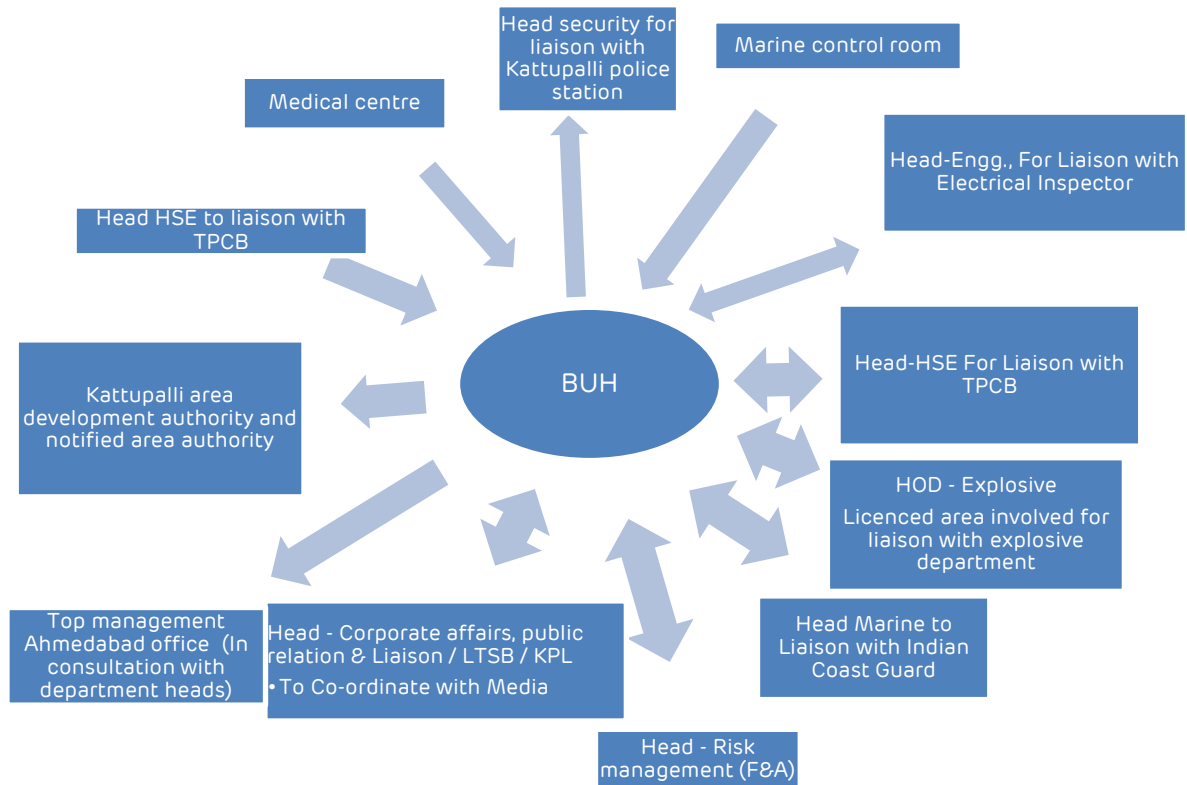
Firefighting crew



Medical Centre



BUH



FLOW OF PEOPLE

Flow of people to incident site



8.7 CATEGORIES OF EMERGENCIES

The general action plan to deal with various categories is explained below :

Emergencies
(Occurrence – with due warning)
<ul style="list-style-type: none">▪ Cyclonic Storm/ Hurricane▪ Earthquake▪ Flood▪ Tsunami▪ Industrial Unrest▪ Bomb Threat▪ War

Emergencies
(Occurrence – without warning)
<ul style="list-style-type: none">▪ Food/ Water Poisoning▪ Fire▪ Major Release of Flammable/ Toxic Chemicals& Radiation▪ Transportation accidents involving Hazardous Materials▪ Marine Emergency▪ Medical Emergency

8.7.1 EMERGENCIES (WITH DUE WARNING)



Planning & Preparedness

- **Constitute an emergency response team**
- **Maintain inventory of emergency items & supplies**



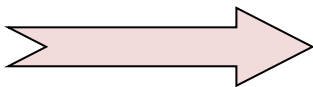
Action before Effective Period

Mobilize emergency response team
Release non-essential personnel
Initiate shut down of Port(s) if required
Audit port safety measures



Action during Effective Period

Stop field activities
Remain indoors & be observant
Respond to emergency calls
Help the emergency teams to tackle the emergency



Action after Effective Period

Inspect port areas(s)
Implement restorative and repair measures
Investigate, Analyze to prevent reoccurrence
Restart the port activities

8.7.2 EMERGENCIES (WITHOUT DUE WARNING)

Any emergency may start as a small incident that may become a major accident if not controlled in time. At the initial stages, the emergency organization chart shall be put into action. If the incident goes beyond control, the site main controller will actuate the DMP at the appropriate stage as considered necessary.

The plan is to be drawn by appointing key personnel and defining their specific duties that will be handy in emergency. To control the emergency in the most effective manner it is important that roles and responsibilities are well defined and the command structure is absolutely clear.

The key roles exercised during the emergency are those of "site main controller" (whose main function is to take charge of the incident) and of the "incident controller" (whose main function would be to take overall charge of rescue, facilitation, coordination, communication etc.). In addition, other individuals would be assigned specific responsibilities. These people would report to "site main controller" or "incident controller" during the time of emergency and would work under his instructions. The functions and their key responsibilities are discussed in Chapter 10.

9.0 DUTIES & RESPONSIBILITIES

9.1 Site Main Controller

- Has overall responsibility for the conduct of all emergency operations within the port complex. During off-duty hours, he will coordinate with NDO/ Deputy Incident Controller and if required rush to the site and take control of the situation from the NDO/ Deputy Incident Controller.
- The CEO/ BUH will be stationed at the Marine Control room.
- Shall immediately assess the situation and its consequences, formally declare the level of emergency and order appropriate action with minimum extent of casualties.
- If required, he will discuss with Incident Controller, Head-HR and Head – HSE and instruct concerned person to call for help from outside or to Govt. authority for escalation of response action including Offsite emergency declaration.
- Responsible for the overall effective & swift emergency response
- Ensure that information to key partner has been provided.
- Arrange all required facilities through different teams for the necessary medical aid, manpower, money, conveyance etc. Shall direct all emergency operations within the port premises with the following priority:
 - Safety of personnel, property and equipment
 - Pollution and environmental impact control
 - Damage and loss control
 - Minimum curtailment of port activities
 - Oversees the functioning of several subordinate teams
 - Informs to the statutory authorities if necessary
 - After the emergency is over, declares the normal situation and rehabilitate the site activity.
 - Ensure the accounting of personnel.
- HODs in absence of CEO/BUH should take care of the responsibilities in their respective sites and will be in constant contact with the CEO/ BUH.

9.2 Night Duty Officer

The NDO is bound to act as the 'Site main controller' during emergencies that happen at night in the absence of BUH. He will station himself at the Marine Control Room. He will be in touch with Deputy Incident Controller at incident site and appraise concerned HODs. He will inform the status and hand over the charge of SMC to CEO/BUH once he reaches site.

- Has overall responsibility for the conduct of all emergency operations within the port complex.
- Shall immediately assess the situation and its consequences, will stay in contact with the CEO/ BUH and in coordination with him declare the level of emergency and order appropriate action with minimum extent of casualties.

AUTHORIZED BY: Head (HSE)

- If required, he will discuss with Incident Controller, Head-HR and Head – HSE and instruct concerned person to call for help from outside.
- In case of instructions from CEO/BUH, NDO will inform Govt. authority for escalation of response action including Offsite declaration.
- Responsible for the overall effective & swift emergency response
- Coordinates at site with the mutual aid team members and effectively utilize their services.
- Arrange all required facilities through different teams for the necessary medical aid, manpower, money, conveyance etc. with consent from the CEO/BUH.
- Shall direct all emergency operations within the port premises with the following priority:
- Safety of personnel, property and equipment
- Pollution and environmental impact control
- Damage and loss control
- Minimum curtailment of port activities
- Oversees the functioning of several subordinate teams
- As per instructions from CEO/ BUH, he will inform the statutory authorities if necessary.
- After the emergency is over, declares the normal situation and rehabilitate the site activity.
- Ensure the accounting of personnel.

9.3. Site Incident Controller

- The Shift in-charge is bound to act as the 'Site incident controller' during emergencies that happen at night in the absence of the respective HOD. He will be in touch with Site Main Controller at incident site and appraise concerned HODs. He will inform the status and hand over the charge of SIC to HOD/ HOS once he reaches site as required by the CEO/BUH.
- He shall take charge of incident and remedial actions.
- Shall ensure that all emergency teams are available at site and necessary resources are available.
- He will remain in constant communication with respective control room and Emergency control centre to update site situation and also render any assistance required.
- He shall keep coordination with all primary support teams at incident site.
- He shall ensure that Rescue, Medical assistance is provided with minimum response time.
- Shall arrange for equipment, resources and personnel to incident location and ensure all measures, action are taken to tackle the emergency in an effectively and timely manner with minimum extent of Casualties, damage to equipment, plant, and environment.
- Shall liaise closely with Head- Administration to facilitate the transfer of equipment, resources and personnel to incident location as appropriate.
- Shall carefully evaluate the risks, effects and possible consequences thereof.
- The incident to his area of responsibility and propose further course of action to the Site Incident Controller with particular concern about safety of personnel, protection of environment and control of Operation.

9.4. Emergency Support Officers – Area Officers/Key personnel

- Shall immediately assess the scale of emergency and report to Site Main Controller for instructions/directions.
- Shall be responsible for operations in affected area with priorities as under:-
 - Safety of personnel, property and equipment
 - Pollution and environmental impact control
 - Damage and loss control
 - Minimum curtailment of port activities
- Shall liaise with other heads of department for their support and assistance.
- Shall ensure continual reporting of situation to Site Main Controller and shall recommend calling for external resources as appropriate.

9.5. HOS – Administration (Transport Cell, Welfare & Canteen)

- Shall report to Site Incident Controller immediately and assist him as directed.
- Shall coordinate the activities of administration units.
- Shall arrange for transportation of whatever nature for use in the situation.
- Arrange for hot drinks / snacks / foods as requires at incident location.
- Arrange for transport of higher authorities to the terminal
- Transport vehicles would be provided near emergency control center.

9.6. HOD – Human Resources

- Shall report immediately to Site Incident Controller and assist him as directed.
- Shall ensure Assembly Points are manned and all persons reporting there properly identified.
- Shall ensure that persons reporting are assembled in a manner so that counting is easy.
- Shall arrange to record full details of all persons affected by the incident and to inform next of kin as appropriate.
- Shall inform and liaise with local bodies and authorities in respect of the incident/ emergency.
- Shall arrange for the transfer of all affected persons to suitable places for first aid or further medical attention as appropriate.
- Shall arrange for the evacuation, from the location of incident of all personnel not essential.
- Shall arrange to depute company personnel to each location where affected persons are being treated or are gathered for whatever reasons, to render assistance.
- Shall arrange to keep regularly informed of status and facts pertaining to incident to the families of company personal in its residential area.
- Shall inform to Government Authorities & Liaise with them

9.7. HOD – Corporate Affairs

- Shall assume the role of Public Relation Officer (PRO) for communication, dissemination of information, status and facts (preparation of communiqués, statements etc.)
- Shall co-ordinate with business related statutory and Government organization.

9.8. HOD – Engineering Services

- Shall ensure immediate electrical isolation of the incident location thereafter; arrange availability of power after ascertaining safety of doing so.
- Shall liaise with the Engineering Services of organizations in close neighborhood for sourcing of supplemental equipment resources and assistance.
- Arrange for emergency lighting / power should the need arise through the shift electrician.
- Organize for evacuation of material inventory should there arise the possibility of fire.
- Ensure that machines such as lifting tools, tackles, pump, torch lights, ropes etc. are available for emergency purposes in good conditions at all times.
- Ensure that water pumps are available in case required and tanks are filled up.
- Ensure that all necessary mechanical drives are available and in working condition for emergency and that the DG set is available for emergency power.

9.9. HOD – Security

- Stop the visitors' entry and he shall ensure for access control and restriction of unauthorized entry at port premises.
- Instruct the security to occupy pre-determined post for controlling security of installation.
- Call up additional help from Barracks.
- Ensure that unauthorized persons / vehicles do not enter the gate.
- Provide security men for firefighting & rescue.
- Shall inform and liaise with local bodies and police department in respect of the incident/ emergency.
- Depute security guards for controlling traffic at scene of disaster.
- Produce a list of port staff on duty in co-ordination with gate office.
- Ensure availability of security men at gates so that they can lead authorities to disaster site.
- Ensure that non-essential persons do not crowd the affected area.

9.10. HOD – Finance & Accounts

- Shall report immediately to Site Incident Controller and assist him as directed.
- Shall ensure availability of funds and cash for all emergent requirements.
- Shall depute all available department personnel to assist HR in their activities.
- Shall ensure that under writers, shareholders, lenders, bankers and other Financial Institutions and statutory bodies are kept advised of the situation as appropriate.

9.10. HOD – Stores / Commercial

- Ensure availability of materials required by the Site Incident Controller.
- Issue materials from central stores round-the-clock (if required).
- Arrange emergency procurements from local dealers/ vendors or from neighboring industries.
- Arrange transportation of materials from central stores to the site of incident in coordination with the Coordinator (Transport Cell).

9.11. HOS – Fire Services

- He will report to Site Incident Controller and has the single motive – concern for safety of personnel during emergency response operations.
- He will lead and guide the fire crew.
- He will ensure that the firefighting, rescue and search operations are carried out in safe manner.
- He will ensure that additional firefighting media, manpower or resources are available and used.
- He will ensure safety of fire crew members and fire fighting vehicles.
- He will update fire control room about the site situation and additional assistance – if required.

- Mobilize off-duty personnel for assistance

9.12. HOD – Safety

- He will normally function as an advisor to the Site Incident Controller.
- Coordinate with Commercial/other resources to mobilize additional resources, viz. spill containment equipment/ firefighting equipment/ personal protective equipment, spare breathing air cylinders etc., as may be required at the site of incident.
- He shall ensure that critical spares and equipment related to safety are identified and minimum stock is available at store.
- He shall ensure that immediate treatment has been given to causality.
- He shall ensure availability of ambulance round the clock

9.13. Occupational Health Center

- Contact Site Main Controller. Report at Emergency Control Center or at Occupational Health Center as instructed by the Site Main Controller. He shall ensure that ambulance with paramedics/self-report to incident site in time.
- Organize first aid arrangements for the affected persons at the site of incident (in cold zone) as may be necessary.
- Ensure that adequate paramedical staff, equipment and medicines are available at the Occupational Health Center. Mobilize additional resources (if necessary).
- Liaise with the local medical authorities and city hospitals, if the casualties are high and situation demands external medical help.
- Coordinate with the Coordinator - Transport for transporting victims to various hospitals.

9.14. HOD – Information Technology

- Shall ensure that internal and external communication systems are available.
- He shall ensure that all IT related infrastructure / resources are available for emergency team in working condition.

10.0. EXTERNAL and MUTUAL AID

10.1. General

In case of an emergency, which poses threat to human lives or/ and property, within MIDPL as well as in the surrounding neighborhood areas, it may not be possible to control such situations with the resources available at MIDPL. In such situations, additional resources are mobilized from other department, agencies, which include:

- Neighboring Industries (Mutual Aid Members)
- Government Authorities

If it may not be possible to confine the emergency situations within the MIDPL area, in such situations, information will be passed on to Govt. Authorities to activate Off Site Emergency Plan. Information/details of authorities, Telephone no., are mentioned in, Chapter 14, Chapter 18, Annexure 10, 11, 28, 29, and Appendix A, B, G

10.2. Mutual Aid Members

Marine Infrastructure Developer Pvt Ltd. will enter into an agreement for mutual aid with LTSB for help/ assistance in the event of an emergency, MIDPL, is also a member of the Kattupalli Area Industrial Association (KAIA) including other Major industries of the area. The mutual aid members shall:

AUTHORIZED BY: Head (HSE)

- Respond promptly to the emergency call as and when communicated.
- Send their fire tenders/ crewmembers along with necessary supplies/ materials at the site of incident (as requested) and report at the MIDPL Security Gate and get instructions from security personnel on duty. These resources and personnel shall be deployed as directed by Site Incident Controller.
- The crew in-charges of the mutual aid members shall be responsible for safety of their crew engaged in emergency operations.

10.3. Government Authorities

If the situation demands response from multiple groups / teams,

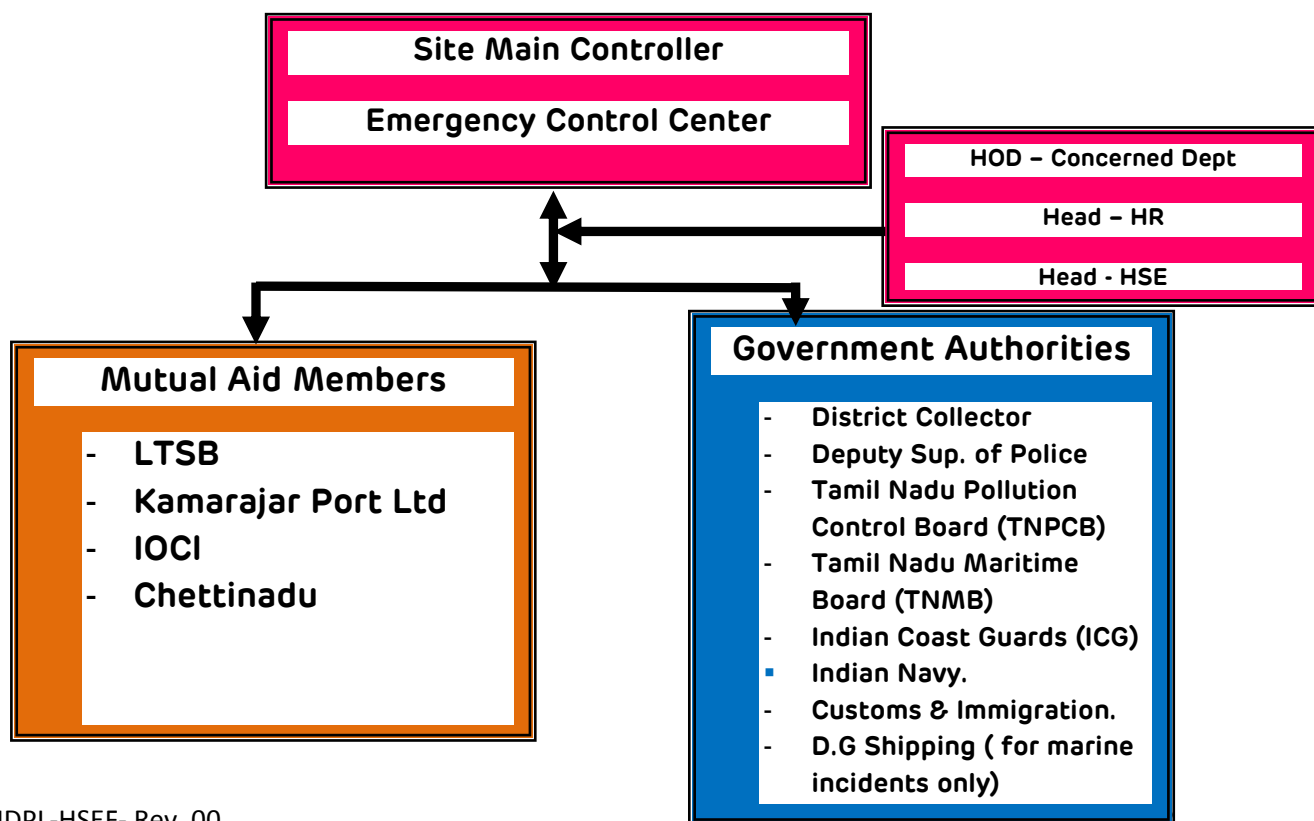
MIDPL shall report and may seek assistance from various Government Authorities as have been recognized under the District Disaster Management Plan.

These may include:

- District Collector
- Fire Brigade – Tamil nadu Municipal Corporation
- Police Commissioner
- Tamil Nadu Pollution Control Board (TNPCB)
- Tamil Nadu Maritime Board (TMB)
- Indian Coast Guards (ICG)
- Indian Navy
- Immigration & Customs
- MMD / Director General Of Shipping
- Radiation protection office

Refer Annexure 28, Appendix A, B

10.4 EXTERNAL AID PROVIDERS



11.0 EMERGENCY TELEPHONE NUMBERS

First Person to be contacted in case of emergency:					
Sr. No	Name	Designation	Mobile No.	Internal Phone No.	
				Office	Res.
1	Capt. Jeyaraj Thamburaj	Business Unit Head	9099900994		
2	Mr. A Madhu	Operational Manager	8939709979		
3	Mr. Ramkumar	BHO	7823953573		
4	Mr. Krishnaraja	Head - HSE	9099995912		
5	Capt. Anubhav Jain	Head - Marine	8980015245		
6	Mr. Vijay Majji	Head - Dry Cargo	7731003330		
7	Mr. Subash Babu	CT – Operation	7574894379		
8	Mr. Ayush	HSE	7823990358		
9	Mr. Mujubur Rahman	HSE	7299990151		
10	Mr. Pappayya	Fire	9790805142		
11	Mr. Venkatachalapathi	Engg. Service	7299972522		
12	Mr. Selvankar	Engg. Service	7299991959		
13	Mr. Siddhant	Engg. Service	9099005643		
14	Mr. Sundararajan	Head - Security	8939822617		
15	Mr. Rajasekaran Nair	Security	7299034552		
16	Mr. Srinivasa Reddy	Head – HR	9909927243		
17	Mr. Uthiramoorthy	HR	8939822607		
18	Mr. Venkesh	IR / Admin	9941015554		
19	Mr. Srinivasa kurri	Head - Commercial	8939822696		
20	Mr. Kesavan	Store	7299990767		

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

21	Mr. Ananda Ramakrishnan	Marine	9841044132		
22	Security Control Room	-			
23	Fire & Safety Control Room	-			
24	Occupational health Centre	-			
25	Ambulance	-			
26	Mr. Krishnanand Mavinkurve	Corporate Head – OH&S	9099900383		
27	Mr. Rajkumar	Head - Corporate Affairs			
28	Marine Control Room				
29	LTSB	---			
30	KPL				
Other important Telephone nos are mentioned in Appendix A & B					

12.0 REPORTING & INVESTIGATION

12.1 Reporting

Any incident / accident (whether minor or major) shall be reported. The main objective of incident reporting is to:

- Provide first-hand information to all the concerned
- Initiate investigation
- Prepare failure analysis report
- Report to the Government authorities (if required)

References

- Procedure for Incident Reporting
- Incident Report Format
- Work Injury Report

12.2. Investigation

All incidents / accidents (whether minor or major) shall be investigated. The main objectives of incident investigation is to:

- Identify the root cause(s) of the incident.
- Take appropriate preventive measures to prevent recurrence.
- To comply with the statutory requirements.

References

- Incident Investigation Procedure

13.0 COMMUNICATION & PUBLIC AFFAIRS

13.1. Communication

Communication, an integral part for handling any emergency, helps in taking quick decisions, efficient & effective control of the emergency. Communication between the Emergency Control Center & the Field Command Post is established by means of:

- Telephone
- Mobile
- Port Announcement System
- Wireless Radio
- E – Mail
- Emergency Vehicle

Communication, including Offsite declaration between the Emergency Control Center and external authorities will be by:

- Telephone
- E – Mail
- Fax
- Emergency Vehicle

Communication to persons working in the field, other stack holders and general public outside the premises is established by means of:

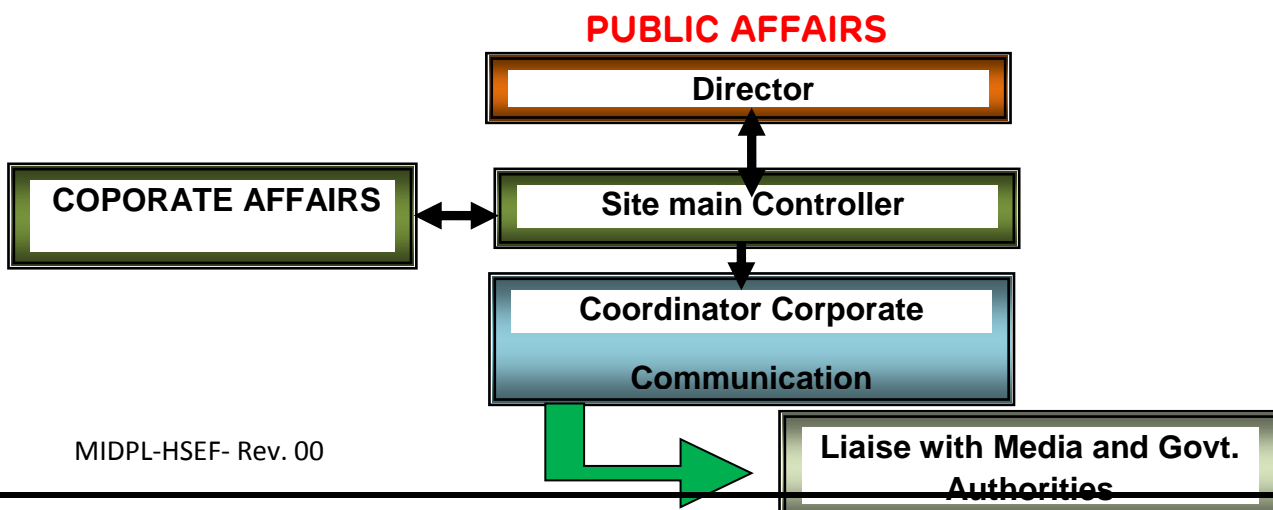
- Port Announcement System
- Siren installed on GHC-1 and MRSS-1
- Vehicle mounted Public Announcing System – 1 nos.
- Mobile hand held Public Announcing System
- Messengers

Communication to Mutual Aid members / Neighboring industries shall be initiated by Site Main Controller.

Concerned Head of the Department where the incident happened will inform Site Main Controller for communication to Govt Authorities and after discussion – SMC will advise concerned agency / corporate affairs to communicate with Govt. Authorities.

13.2. Public Affairs

ALL PRESS STATEMENTS SHOULD BE DISCUSSED WITH THE MIDPL CORPORATE AFFAIR AND AGREED BEFORE RELEASE. THE PRESS STATEMENT WILL BE MADE BY MIDPL CORPORATE AFFAIR.



14.0 DRILLS & TRAINING

14.1 Drills

Emergency response drills are conducted on quarterly basis to ensure effective response by not only the staff within MIDPL complex but also by external aid members (as required). The participation & actions will depend on the level of emergency drill planned, as per following table:

Drill	Duration	Port Level	Complex Level (MIDPL + LTSB / KPL)	Multi Stakeholder Level	Notes
Siren Testing Drill(Proposed)	2 Minutes	Every Week (Tuesday)	--	--	Test of siren condition.
Emergency Response Drill	1 – 2 hours	Monthly	Yearly	Yearly	Consists of interactive discussions of a simulated scenario among members of Emergency response team and also involve mobilization of personnel & equipment.
ISPS Drill	1 – 2 hours	Quarterly	Yearly	Yearly	Consists of interactive discussions of a simulated scenario among members of emergency response team but does not involve mobilization of personnel & equipment.
Oil Spill Response Drill	1 – 2 hours	Quarterly	Yearly	Yearly	Consists of interactive discussions of a simulated scenario among members of emergency response team but does not involve mobilization of personnel & equipment.

14.2. Training

The importance of training to personnel involved in responding to any emergency scenario is recognized and acknowledged. The training to employees at MIDPL is as per following table:

COURSE	DURATION	NEW RECRUIT	EXISTING STAFF	FREQUENCY	NOTES
Induction Training	One Day	X	--	On joining the organization	All employees on joining shall undergo the training
Fire Fighting Training	Half Day		All new and existing staff	Once in a year	For Basic Fire Fighting and Practical Fire Extinguisher demo
First Aid Training	2 Day		Selected staff	Once in two year	External agency to train staff on First Aid

15.0 ACTION PLAN FOR RESPONDING TO SPECIFIC EMERGENCY

INDIVIDUAL PLANS ARE DEVELOPED AS PER GUIDELINES PROVIDED IN SAMPLE PLANS

15.1 CYCLONIC STORMS / HURRICANE

Cyclonic storms/ hurricanes are intense depressions, which develop in tropical latitudes and are often the cause of very high winds and seas. The wind blows around the center of a tropical storm in a spiral flow inward, anti-clockwise in Northern Hemisphere and clockwise in Southern Hemispheres. Plan for tackling cyclonic storm/ hurricane can be broadly divided in following stages:

Action By	Activity
PLANNING & PREPAREDNESS	
Port Key Person	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Port Engineer (01), Safety HOD, Security HOD, Fire Team Member (01), Marine HOD , Electrician (01). <p>Note</p> <ul style="list-style-type: none"> ➤ Each member of the team shall have a designated alternate member. <ul style="list-style-type: none"> ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary, including but not limited to items specified in Chapter-20 <p>Note</p> <ul style="list-style-type: none"> ▪ Liaise with HOD – ES for Civil & Mechanical Support (including supply of spares). ▪ Liaise with HOD – HR for food stock, water, blankets & bedding and medicine. ▪ Liaise with Port Operation Control. ▪ Liaise with Site Main Controller ▪ Mobilize Emergency Response Team(s). <p>Note</p> <ul style="list-style-type: none"> ➤ Members to be briefed about the emergency. ➤ Members to be informed that they may be required to stay at site during & after the emergency. <ul style="list-style-type: none"> ▪ Release non-essential personnel. <p>ACTION BEFORE EFFECTIVE PERIOD</p>
Port Key	Note

<p>Person</p>	<ul style="list-style-type: none"> ➤ Port key person reserves prerogative on the release of employees. ➤ Personnel to be briefed on the possible time of return to work. ▪ Initiate Port shut down based in: <ul style="list-style-type: none"> ● Consultation with Site Main Controller. ▪ Audit Port area(s) for safety measures to ensure that: <ul style="list-style-type: none"> ● Loose items are secured. ● Electric machinery is covered and protected against water ingress. ● Storm water drains are cleared of any obstructions. ▪ Implement preventive & precautionary measures (including but not limited) to ensure: <ul style="list-style-type: none"> ● Inventory of emergency supplies is maintained. ● Material and equipment that can possibly be damaged by water ingress is elevated. ● Windows & doors are weather tight. ● Roof mounted equipment are braced. ● Material & equipment that cannot be moved are covered. ● Sandbags are placed in doorways where flooding from storm water can occur.
<p>ACTION DURING EFFECTIVE PERIOD</p>	
<p>Port Key Person</p>	<p>Stop</p> <ul style="list-style-type: none"> ▪ All field activities. ▪ All permits to work. <p>Note</p> <ul style="list-style-type: none"> ▪ All personnel to be notified against venturing out during effective period.
<p>Emergency Response Team</p>	<ul style="list-style-type: none"> ▪ Ensure all personnel remain indoor, observant and be alert to: <ul style="list-style-type: none"> ● Detect any damage to equipment or buildings. ● Development of unsafe conditions. <p>Note</p> <ul style="list-style-type: none"> ▪ In case of any emergency warranting immediate response, communicate to Site Main Controller ▪ In consultation with Site Main Controller: <ul style="list-style-type: none"> ● Make all possible efforts to reach the site of incident/ damage.
<p>Port Key Person</p>	<ul style="list-style-type: none"> ▪ Act appropriately to control prevalent incident/ damage.
<p>ACTION AFTER EFFECTIVE PERIOD</p>	

Port Key Person & Emergency Response Team	<ul style="list-style-type: none"> ▪ Audit Port area(s) for damage assessment & prepare report. ▪ Undertake restorative measures & repairs based on audit report on: <ul style="list-style-type: none"> • Damaged equipment & buildings. • Unsafe conditions. <p>Note</p> <ul style="list-style-type: none"> ▪ Clearance report to be submitted to Site Main Controller through Port Key Person.
Port Process Group	Initiate restart up of the Port.
	Department Wise Emergency Action Plan for Cyclone
Dry Cargo Department	<ul style="list-style-type: none"> ▪ Stop all stevedoring activities, bring all Mobile Harbour cranes to shore, safely park the cranes and down its booms. ▪ Inform all contractors to remove all their equipment from jetty area and safely park at shore, in case of crane down its boom. ▪ Arrest all barge / ship loaders, and Mobile truck loading hoppers at its wheel to prevent horizontal movement due to wind and secure from its top by arranging guy ropes. ▪ Stop loading / unloading of ship and measure the ship cargo quantities along with clients surveyor and communicate Marine Dept. / shipping agencies to take the ship to anchorage area
Container Terminal Department	<ul style="list-style-type: none"> ▪ All Mobile cranes to park safely with brakes on and anchor fixed.. ▪ Inform all contractors' workmen to move from jetty area at safe location. ▪ Close the doors of all containers which are stored in yard. ▪ All containers in single stack to be removed. ▪ Stop loading / unloading of ship.
Marine Department	<ul style="list-style-type: none"> ▪ Receive forecast from time to time and inform the following:- 1. Marine HOD 2. Pilots 3. Flotilla 4. all concerned dept. ▪ Monitor weather parameters ▪ In coordination with Cargo Operations Department, instruct all ship captains to take the ships anchorage basis wind/swell parameters exceed. ▪ Stop all activities at jetty area. ▪ Ensure the jetty areas are free from loose and unsecured materials / equipment's. ▪ Update all departments about the latest weather conditions. ▪ Ensure TUG's are secured in protected part of basin.
Security Department	<ul style="list-style-type: none"> ▪ Close the gate and stop allowing visitors and transport trucks either inward or out ward. ▪ Ensure vehicles are parked at designated parking areas, with wheels are blocked. ▪ Instruct all drivers to take shelter at canteens (concrete buildings).
Fire Department	<ul style="list-style-type: none"> ▪ Equip the fire tender with rescue equipment, safely park the fire tender and secure its wheel by providing blocks. ▪ Drainage and stormwater channels checked for clearance

Project Management Cell	<ul style="list-style-type: none"> Stop all activities, park the cranes and equipment at safe location, lower the booms of cranes and secure them. Ensure all erected structures are secured with guy ropes and ties are provided. Remove all loose materials from top of buildings and structures or secure them. Ensure all workmen are sheltered at safe locations like canteens (concrete buildings). Secure the Jetty area piling rigs and cranes by tying with guy ropes. Stop all project vehicle movements and ensure the vehicles are parked at safe location with wheels are blocked. Ensure all vehicles and cranes are removed from break water embankments.
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For further details, pl. refer detailed procedure

15.2 EARTHQUAKE

Earthquake is most likely to occur without pre-warning and so its severity and destructive potential are highly unpredictable. Earthquake can result in collapse of buildings, structures & elevated equipment, heavy casualties apart from fracture of underground pipelines and uprooting of energized wires etc. The plan to deal with earthquake can be divided in following stages:

Action By	Activity
PLANNING & PREPAREDNESS	
Port Key Person	<ul style="list-style-type: none"> Constitute Emergency Response Team(s) comprising of at least: Port Engineer (01), Fire Team Member (01), Port Operators (02), Electrician (01). <p>Note</p> <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. <ul style="list-style-type: none"> Maintain inventory of emergency items (Hardware) & supplies as necessary, including but not limited to items specified in Chapter-20: <p>Liaise with HOD – HR to identify control centers equipped with:</p> <ul style="list-style-type: none"> Communication facilities. Emergency vehicles/ equipment. List of emergency contacts & suppliers. Medical facilities.
ACTION DURING EFFECTIVE PERIOD	
Individuals	<ul style="list-style-type: none"> Do not panic. Avoid standing near windows, external walls. Stand near columns or duck under sturdy furniture. Assemble at emergency assembly point.
ACTION AFTER EFFECTIVE PERIOD	
Site Incident Controller	<ul style="list-style-type: none"> Take head count. Activate Port emergency plan. Liaise with Site Main Controller for shut down of Port(s) if required. Liaise with HOS – Fire Services to initiate search & rescue. Liaise with – Occupational Health Center Services to provide first aid to the victims and remove casualties (if any).

Port Key Person	<ul style="list-style-type: none"> ▪ Report at site. ▪ Assess damage. ▪ Undertake restorative measures & repairs. ▪ Liaise with HOS –Occupational Health Centre to follow up on causalities.
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For further detail pl. refer detailed procedure

15.3 TSUNAMI

Tsunami is Japanese for "harbor wave" which is a huge ocean wave that can travel at speeds up to 600mi/hr (965 km/hr) can have heights of up to 30 m (98 ft), wavelengths of up to 200km. and long periods, usually between 10 and 60 minutes. Sometimes incorrectly called a tidal wave, a tsunami is usually caused by an underwater earthquake or volcanic eruption and often causes extreme destruction when it strikes land. It is a series of waves which travel outward on the ocean surface in all directions in a kind of ripple effect. Since the waves can start out hundreds of miles long and only a few feet high, they would not necessarily be noticeable to a passing ship or a plane flying overhead. The plan to deal with Tsunami can be divided in following stages:

Action By	Activity
	PLANNING & PREPAREDNESS
Port Key Person	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Port Engineer (01), Fire Team Member (01), Port Operators (02), Electrician (01), Marine Control Officer (01), POC Officer (01). <p>Note</p> <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. <ul style="list-style-type: none"> ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary, including but not limited to items specified in Chapter-20: ▪ Liaise with HOD – Marine to identify control centers equipped with: <ul style="list-style-type: none"> • Communication facilities. • Emergency vehicles/ equipment (tugs, speed/mooring boat). • List of emergency contacts (POC, Marine Control, Deputy PFSO, Port Security) • Occupational Health Facilities.
Marine Department	<p>ACTION BEFORE EFFECTIVE PERIOD AFTER GETTING WEATHER WARNING</p> <ul style="list-style-type: none"> ▪ Receive forecast from time to time and inform the following:- 1. Marine HOD 2. Pilots 3. Flotilla 4. all concerned dept. ▪ Monitor weather parameters ▪ In coordination with dry cargo instruct all ship captains to take the ships to anchorage. ▪ Stop all activities at jetty area. ▪ Ensure the jetty areas are free from loose and unsecured materials / equipments. ▪ Update all departments about the latest weather conditions. ▪ Ensure TUG's are secured in protected part of basin.
	ACTION DURING EFFECTIVE PERIOD
Individuals	<ul style="list-style-type: none"> ▪ Do not panic. ▪ Avoid standing near to sea side.

	<ul style="list-style-type: none"> Stand near columns or duck under sturdy furniture. Assemble at emergency assembly point.
	ACTION AFTER EFFECTIVE PERIOD
Site Incident Controller	<ul style="list-style-type: none"> Liaise with Site Main Controller for shut down of Port(s) if required. Liaise with HOS – Security and HOS – Fire Services to search & rescue. Liaise with HOS – Occupational Health Center to provide first aid to the victims and remove casualties (if any).
Port Key Person	<ul style="list-style-type: none"> Report at site. Assess damage. Undertake restorative measures & repairs. Liaise with HOD – Human Resources & Administration.

For further details, pl. refer detailed procedure

15.4 FLOOD

An overflowing of water onto land that is normally dry. A flood tide is an abundant flow or outpouring. It is a temporary rise of the water level, as in a river or lake or along a seacoast, resulting in its spilling over and out of its natural or artificial confines onto land that is normally dry. Floods are usually caused by excessive runoff from precipitation or snowmelt, or by coastal storm surges or other tidal phenomena. Floods are sometimes described according to their statistical occurrence. A fifty-year flood is a flood having a magnitude that is reached in a particular location on average once every fifty years. In any given year there is a two percent statistical chance of the occurrence of a fifty-year flood and a one percent chance of a hundred-year flood.

Action By	Activity
Port Key Person	<ul style="list-style-type: none"> Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> Port Engineer (01), Fire Team Member (01), Port Operators (02), Electrician (01). <p>Note</p> <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member <ul style="list-style-type: none"> Maintain inventory of emergency items (Hardware) & supplies as necessary Liaise with HOD – HR to identify control centers equipped with: <ul style="list-style-type: none"> Communication facilities. Emergency vehicles/ equipment. List of emergency contacts & suppliers. Medical facilities.
	ACTION DURING EFFECTIVE PERIOD
Individuals	<ul style="list-style-type: none"> Do not panic. Avoid standing near to sea side. Stand near columns or duck under sturdy furniture. Assemble at emergency assembly point.
	ACTION AFTER EFFECTIVE PERIOD

Site Incident Controller	<ul style="list-style-type: none"> ▪ Liaise with Site Main Controller for shut down of Port(s) if required. ▪ Liaise with HOS – Security and HOS – Fire Services to search & rescue. ▪ Liaise with HOS – Occupational Health Center Services to provide first aid to the victims and remove casualties (if any). ▪ Report at site.
Port Key Person	<ul style="list-style-type: none"> ▪ Assess damage. ▪ Undertake restorative measures & repairs. ▪ Liaise with HOD – Human Resources & Administration.
	Department Wise Emergency Action Plan for Flood
Dry Cargo Department	<ul style="list-style-type: none"> ▪ Stop all stevedoring activities outside near jetty side, bring all Mobile Harbour cranes to shore, safely park the cranes and down its booms – switch off the power supply. ▪ Inform all contractors to remove all their equipment from jetty area and safely park at shore, in case of crane down its boom. ▪ Arrest all barge / ship loaders, and Mobile truck loading hoppers at its wheel to prevent horizontal movement due to water flow and secure from its top by arranging guy ropes. ▪ Stop loading / unloading of ship and measure the ship cargo quantities along with clients surveyor and communicate Marine Dept. / shipping agencies to take the ship to anchorage area
Container Terminal Department	<ul style="list-style-type: none"> ▪ All Mobile cranes to park safely with brakes on and anchor fixed.. ▪ Inform all contractors workmen to move away from jetty area at safe higher elevation location. ▪ Close the doors of all containers which are stored in yard. ▪ All containers in single stack to be removed. ▪ Stop loading / unloading of ship.
Marine Department	<ul style="list-style-type: none"> ▪ Receive forecast from time to time and inform the following:- 1. Marine HOD 2. Pilots 3. Flotilla 4. all concerned dept. ▪ Monitor weather parameters ▪ In coordination with dry cargo instruct all ship captains to take the ships to anchorage. ▪ Stop all activities at jetty area. ▪ Ensure the jetty areas are free from loose and unsecured materials / equipment. ▪ Update all departments about the latest weather conditions. ▪ Ensure TUG's are secured in protected part of basin.

For further details, pl. refer detailed procedure

15.5 INDUSTRIAL UNREST

Industrial relation between personnel and management may deteriorate because of any reason. Problems, which may arise due to industrial unrest, include:

- Dharna / Strike/ Hunger strike
- Unofficial gatherings/ Gate meetings/ Forceful entry
- Work to rule/ Go slow/ Disobedience

- Gherao / Rasta roko
- Intimidation & Use of force
- Support from local & criminal elements
- Sabotage

In such a scenario, to ensure smooth operation of Port, protection of lives and property, well-coordinated effort is needed from all concerned. Plan to deal with industrial unrest can be broadly divided in following stages:

Action By	Activity
PLANNING & PREPAREDNESS	
Port Key Person	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Security Officer (01), Port Engineer (01), Fire Team Member (01), Port Operators (02) Note <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary, including but not limited to items specified in Chapter-20 ▪ Plan 8 hours shift. ▪ Liaise with HOD – HR for food stock, water, blankets & bedding and medicine.
ACTION BEFORE EFFECTIVE PERIOD	
Port Key Person	<ul style="list-style-type: none"> ▪ Liaise with Site Main Controller ▪ Liaise with HOD – Security for security & vigilance requirements. ▪ Liaise with HOD – HR for planning of accommodation of additional personnel and transport for additional requirements of vehicle (if any).
ACTION DURING EFFECTIVE PERIOD	
Port Key Person	<ul style="list-style-type: none"> ▪ Liaise with HOD – Security for <ul style="list-style-type: none"> • Strengthening security at sensitive points. • Ensuring protection of lives & property. • Vigilance & patrolling. • Maintaining law & order. ▪ Liaise with Site Main Controller for <ul style="list-style-type: none"> • Updates on the situation.

ACTION AFTER EFFECTIVE PERIOD

Port Key Person	<ul style="list-style-type: none"> Assess damage (if any). Liaise with Site Main Controller for restoring normalcy.
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For further details, pl. refer detailed procedure

15.6 BOMB THREAT

Bombs can have devastating effect not only on the Adani Kattupalli Port but also on neighboring areas. Hence any threat received regarding plantation of the bomb shall be viewed seriously.

Plan to deal with bomb threat can be divided in following stages:

Bomb scare / Terrorist Attack

Objective: The primary objective during any bomb threat or security threat is to minimize loss of life, minimize injury, minimize damage to assets and prevent any pollution. Hence the area under threat to be evacuated and cordoned.

Key Person	Action
Receiver of threat call	Inform MIDPL control Room Try to remember/write the information received verbatim
MIDPL control	Inform PFSO & Dy. PFSO (MIDPL) Inform Security Control Room and pass the information received Inform Fire and Safety Dept Inform Medical Team
Security	Isolate the area/port Evacuate the suspected area Care would be exercised to distribute the staff in small groups preferably away from known assembly points. This is required as terrorists may send bomb scare at site and then explode devices by remote at assembly points to inflict greater damage. Bomb snuffing and diffusing squad would be requested from the police. All transport vehicles incoming and outgoing would be checked for unidentified objects. No personnel would be allowed to remain at site until site is declared safe In case of any terrorist attack on terminal/jetty area, efforts would be made to protect life of the people. No firearms are allowed in the terminal. No action should be taken in haste by anyone as it could be misread by the terrorists. Police and other agencies would be informed and all support would be extended to them.
Medical team	Stand by for any casualty
Fire team	Stand by for any blast and fire out break
Dy. PFSO (MIDPL)	Act in consultation with the PFSO Report to Coast Guard Report to Marine Police Report to DG Shipping

For further details, pl. refer detailed procedure

15.7 WAR

During an outbreak of war, bombarding by enemy planes at Kattupalli site can have devastating effects. Plan to deal with bomb threat can be divided in following stages:

	PLANNING & PREPAREDNESS
Port Key Person	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Port Engineer (01), Fire Team Member (01), Port Operators (02), Electrician (01). <p>Note</p> <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. <ul style="list-style-type: none"> ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary, including but not limited to items specified in Chapter-20 ▪ Make arrangements for camouflage the flares. ▪ Liaise with HOD – Security to increase awareness in the Port personnel regarding war.
	ACTION BEFORE EFFECTIVE PERIOD
Port Key Person	<ul style="list-style-type: none"> ▪ Liaise with Port Operation Centre. ▪ Liaise with HOD – Security for <ul style="list-style-type: none"> • Intensifying vigilance & patrolling.
	ACTION DURING EFFECTIVE PERIOD
Port Key Person	<ul style="list-style-type: none"> ▪ Liaise with Site Main Controller for minimizing light (during night) & obtaining updated information. ▪ Liaise with HOD – Security for evacuation of non-essential personnel.
	ACTION AFTER EFFECTIVE PERIOD
Port Key Person	<ul style="list-style-type: none"> ▪ Assess damage (if any). ▪ Liaise with Site Main Controller to restore normalcy.

For further details, pl. refer detailed procedure

15.8 FOOD/WATER POISONING

Plan to deal with food / water poisoning can be divided in following stages:

Action By	Activity
PLANNING & PREPAREDNESS	

Port key person	<ul style="list-style-type: none"> ▪ Liaise with HOS – Occupational Health Services: <ul style="list-style-type: none"> • To impart training regarding food/ water poisoning. • For supply of medicines, saline water etc.
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ACTION DURING EFFECTIVE PERIOD

Port Key Person	<ul style="list-style-type: none"> ▪ Liaise with Site Main Controller & HOS – Occupational Health Services to: <ul style="list-style-type: none"> • Identify the contaminant source. • Seize contaminated material. • Take preventive measures to avoid recurrence. • Inform all concerned. • Arrange sample analysis & alternate supplies. • Arrange medical assistance to the victims.
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ACTION AFTER EFFECTIVE PERIOD

Port Key Person	<ul style="list-style-type: none"> ▪ Liaise with Site Main Controller & HOS – Occupational Health Services to: <ul style="list-style-type: none"> • Conduct epidemiological investigation to identify the cause. • Take preventive measures to avoid recurrence. • Follow up on causalities.
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15.9 FIRE / EXPLOSION

A complete fire protection system that includes fire extinguishers, fire hydrant system and communication facilities, has been installed. MIDPL is having a system for maintaining all fire protection systems and training employees for emergency preparedness. The fire extinguishers are being checked / inspected periodically by a trained staff. Telephones provided at all control rooms to communicate in case of any fire situation.

Plan to deal with fire can be divided in following stages:

Action By	Activity
	PLANNING & PREPAREDNESS
Port Key Person	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Port Engineer (01), Fire Team Member (01), Port Operators (02), Electrician (01). <p>Note</p> <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. ➤ Disconnect the affected area's electric supply. ➤ Attempt to extinguish fire with the help of appropriate type of fire extinguishers.

	<ul style="list-style-type: none"> ➤ If fire is not extinguished, extinguish by spraying water with fog nozzle after ensuring complete isolation of electric circuit. ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary ▪ Liaise with HOS – Fire Services to: <ul style="list-style-type: none"> • Maintain adequate fleet of fire tenders & firefighting equipment. • Maintain patrolling to eliminate potential sources of fire hazard. • Impart regular refresher training to auxiliary fire squad members.
	ACTION DURING EFFECTIVE PERIOD
Emergency Response Team	<ul style="list-style-type: none"> ▪ Activate / Raise an alarm. Try to contain fire. ▪ Liaise with Site Main Controller, HOS – Fire and HOS – Occupational Health Services to: <ul style="list-style-type: none"> • Evacuate non-essential personnel • Ensure all action, material, equipment are in place to tackle the emergency in a shortest possible time. • Ensure that the fire spread should be within minimum area and all possibilities of escalation to be checked and corrective action should be in place. • Ensure search & rescue • Ensure casualties receive attention. ▪ Liaise with HOD – Security to restrict movement in affected area.
	ACTION AFTER EFFECTIVE PERIOD
Emergency Response Team	<ul style="list-style-type: none"> ▪ Assess damage. ▪ Implement fire preventive measures. ▪ Undertake restorative measures & repairs. ▪ Liaise with HOS – Occupational Health Services to follow up on casualties

For further details, pl. refer detailed procedure

15.10 Danger associated with the exposure to ionizing radiation

The machine makes use of X-ray emissions and is intended to inspect only vehicles and the objects they contain.

Plan to deal with radiation can be divided in following stages:

Action By	Activity
	PLANNING & PREPAREDNESS
Port Key Person	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Operator / accelerator (01), Fire Team Member (01), Electrician (01).& Qualified Technician (01) <p>Note</p> <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. ➤ Only those people that have the appropriate technical qualifications are authorized to install the machine. ➤ Only qualified technicians are authorized to perform maintenance work on the machine ➤ WARNING: X-RAY ➤ It is strictly forbidden to knowingly inspect human beings with the system.

	<ul style="list-style-type: none"> ➤ It is strictly forbidden to enter the inspection area when a check is taking place. ➤ Unless otherwise specified by Smiths Detection, the machine must be powered off during servicing and maintenance operations. ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary ▪ Liaise with HOS – Fire Services to: <ul style="list-style-type: none"> • Maintain adequate fleet of fire tenders & firefighting equipment. • Maintain patrolling to eliminate potential sources of fire hazard. • Impart regular refresher training to system operator .
	ACTION DURING EFFECTIVE PERIOD
Emergency Response Team	<ul style="list-style-type: none"> ▪ Activate / Raise an alarm. Try to protection of radiation . ▪ Liaise with Site Main Controller, HOS – Fire and HOS – Occupational Health Services to: <ul style="list-style-type: none"> • The radiological safety system provides protection for personnel by monitoring the • following: • authorization for the accelerator to be switched on, • shutdown of emission in the scanning zone and/or complete shutdown of the accelerator, • access to the scanning zone. • Evacuate non-essential personnel • Ensure all action, material, equipment are in place to tackle the emergency in a shortest possible time. • Cover the spill with absorbent pads, but do not attempt to clean up.confine the movement of all potentially contaminated personal to prevent the further spread of contamination .prevent personnel from entering the contaminated area • If the spill is on the skin ,flush thoroughly and wash with mild soap and lukewarm water. • Ensure casualties receive attention. ▪ Liaise with HOD – Security to restrict movement in affected area.
	ACTION AFTER EFFECTIVE PERIOD
Emergency Response Team	<ul style="list-style-type: none"> ▪ Determine contamination extent with most frequent sensitive detector ▪ Remove contaminated clothing ▪ Flush the affected area with copious quantities of lukewarm water for 15 to 20 minutes ▪ Wash with mild soap and water work lather into contaminated area by rubbing gently for 3 minutes . Rinse thoroughly ▪ Implement fire preventive measures. ▪ Undertake restorative measures & repairs. ▪ Liaise with HOS – Occupational Health Services to follow up on casualties

For further details, pl. refer detailed procedure

15.11 TRANSPORTATION / STORAGE ACCIDENTS INVOLVING HAZARDOUS MATERIAL / TRANSPORT ACCIDENT

Various material including hazardous materials are transported to and from Adani Kattupalli Port by tank Lorries, containers. These hazardous materials are stored in Tanks or containers of suitable material and design in Liquid Terminal, container terminal or in Dry Cargo area. These containers / tank

lorries have the potential to mechanical failures & road accidents (within and/ or outside the complex) and tanks in tank farm having potential to mechanical failures, operational failures resulting in the possible scenarios viz. spillage, leakage, fire & explosion that might pose an imminent danger to surrounding populations/area and vehicular traffic (in case of tank lorries) apart from threat to an environment. The plan to deal with such type of emergencies involving hazardous material may be divided in following stages:

Besides involvement of hazardous goods, the vehicular accidents can also lead to serious consequence. This also can lead to serious injuries, traffic issues. The emergency handling during Vehicular incident also requires to deal with Medical emergencies and rescue operations.

15.11.1 Tank Lorry / trailer Incident

PLANNING & PREPAREDNESS	
Port Key Person – HOD of Operation – till the vehicle is inside	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Port Engineer / In charge (01), Fire Team Member (01), Port Operators (02), Electrician (01). Note <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary ▪ Collect information about the product and specification/ design of the tanker for the product/vehicle. ▪ Material Safety Data Sheet to be referred. ▪ Liaise with HOD – Security for: <ul style="list-style-type: none"> • Ensuring safety equipment & fitness certificates are valid. • Auditing the tankers. • Awareness program for transporters, drivers etc.
ACTION DURING EFFECTIVE PERIOD	
Emergency Response Team	<ul style="list-style-type: none"> ▪ Liaise with HOD – Security/ Driver/ Transporter to: <p>During an emergency of particular nature Fire, Leak, Explosion, Medical emergency– refer the plan above</p> <ul style="list-style-type: none"> • Ascertain extent of damage and impact. • Control, block or contain leakage. • Inform various agencies. • Request for assistance. • Restrict movement in the affected area.
ACTION AFTER EFFECTIVE PERIOD	
Emergency Response Team	<ul style="list-style-type: none"> ▪ Assess damage. ▪ Undertake restorative measures & repairs. ▪ Liaise with HOS – Occupational Health Services to follow up on casualties

15.12 MEDICAL EMERGENCIES & RESPONSE

MEDICAL FACILITIES

- Ambulance service shall be provided within the port premises round the clock to provide medical assistance and help to the employees and contractors workmen receiving major injuries at work or illness that cannot move and need assistance to reach site OHC or to the hospital for medical attention.
- However, first aid facilities (first aid box) are available to each of the Terminals as well as in the Marine Control Room for providing immediate first aid by a trained person for minor injuries.
- A well-equipped Occupational Health Center (OHC) is established centrally inside the MIDPL premises at Kattupalli to provide first aid, medical assistance and implementing occupational health programs for employees and the contractors. The OHC is managed by a qualified male nurse / paramedical staff. An ambulance facility is available at MIDPL for emergency, on call (Intercom No. 69156; Firefighting services at site available on call at Intercom No. 69155).

ACCIDENT REPORTING

- As per the Port policy all injuries/dangerous occurrences/incident are to be reported and recorded. An accident investigation procedure will be followed and training will be delivered to the site supervision in support of it. The procedure and protocol developed shall include the following:-
- Marine Control, Security Control, Concerned Engineer, Safety Department must be informed immediately (by telephone) in the event of an accident/ emergency.
- In case of an injured person is unable to move, the site medical Centre should be contacted for ambulance and on the spot Medical Assistance.
- First aid training will be given on site and a register of training maintained, personnel trained in first aid will be available throughout the site for any emergency purposes.
- All injuries including medical treatments and first aid cases will be recorded and detailed records will be sent to the Management (weekly /monthly reports).
- Government regulations concerning notification of any serious incident/fatality etc. should be followed as per the statutory requirement/ local regulations and will be dealt with as per the MIDPL policy/procedure.

PLANNING & PREPAREDNESS

<p>Port Key Person</p>	<ul style="list-style-type: none"> ▪ Constitute Emergency Response Team(s) comprising of at least: <ul style="list-style-type: none"> • Port Engineer (01), First Aider (01), Fire Team Member (01), Safety Personnel (01), Security Personnel (01). <p>Note</p> <ul style="list-style-type: none"> ➤ Based on total strength of the individual plant, more than one team may be constituted. ➤ Each member of the team shall have a designated alternate member. <ul style="list-style-type: none"> ▪ Maintain inventory of emergency items (Hardware) & supplies as necessary
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ACTION DURING EFFECTIVE PERIOD

Emergency Response Team – HOD/ Area personnel	<ul style="list-style-type: none"> ▪ Liaise with Occupational Health personnel / Doctor /Male Nurse, Area personnel and HOD – Security/ HSEF: • Get the information on extent of injury and action taken for First Aid to injured person. • Ensure that the injured person gets immediate Medical attention. • If required, ensure that the injured person sent to hospital for further treatment. • Ensure that the affected area is barricaded and hazards are well taken care of to avoid further injuries • Inform concerned department to initiate the repair / restoration. • Request for assistance. • Restrict movement in the affected area.
Individual	<p>Accident: If you witness an incident or dangerous occurrence (Major Injury due to fall from height, Physical contact with moving machineries / vehicle, Burn, Electrocution, Drowning or Occupational & Personnel Disease etc.):</p> <ul style="list-style-type: none"> • Contact Occupational Health Centre (OHC) on Intercom No.69156 Telephone No. or Marine Control Room on Intercom 69050, Tel. No. 7823941713 • Contact Security Control Room on Telephone No. 69065 / 7823941712 and Fire Control Room on 69155 or 7823941711 for any help. • Give your Location, Name and ID No./ E.C. No. when giving some information. • State the nature of the accident or incident. It is important to report even when there are no injuries or damage. • Provide relevant First Aid if competent to do so /or Rush the victim to the Occupational Health Centre at site • Stay with the injured person until Medical Assistance arrive and a report of the circumstances has been taken
ACTION AFTER EFFECTIVE PERIOD	
Emergency Response Team	<ul style="list-style-type: none"> ▪ Assess / investigate the incident. ▪ Undertake restorative measures & repairs. ▪ Investigate / analysis the incident to prevent reoccurrence. ▪ Liaise with HOS – Occupational Health Services to follow up on casualties

For further details, pl. refer detailed procedure

15.13 MARINE EMERGENCY

Marine- HOD is the **Site Incident Controller** and will be leading the response team until the emergency is totally brought under control or he is substituted under ERC instruction. This is irrespective of the time taken to control the emergency. The following action plans for emergencies are defined in this plan.

15.13.01. Emergency Alert Ship's Engine Failure

Ship Master is always in-charge of his vessel.

Objective: Prevent vessel grounding or damage to ship/port assets and environment.

Key Person	Action
Master of vessel	Inform Port Control room on VHF Inform Pilot Activate Ship Emergency Response Plan
Pilot	Inform MIDPL control Room Review Vessel's position Tugs/Mooring boats standby for use If engine failure during approach, ready anchors and consider using anchors <ul style="list-style-type: none"> - Use tugs - Abort approach, turn to sea - Tow the vessel to safety If engine failure after abort point, ready anchors and consider using anchors <ul style="list-style-type: none"> - Use tugs - Enter turning basin and drop anchor If engine failure at berth ,while unberthing <ul style="list-style-type: none"> - Stay at berth
MIDPL Control Room	Inform LTSB Control Inform Marine HOD Inform Port tugs/ crafts and activate other tugs Navigational warnings Monitor and log communications
HOD –Marine(<u>Site Incident Controller</u>)	Standby on VHF and maintain contact pilot. Assess damage caused to port property and notify the agent accordingly for damage claims

For further details, pl. refer detailed procedure

15.13.02. Vessel's Grounding in Approaches to Port

Ship Master is always in-charge of his vessel.

Objective : Restrict damage to ship, protect port assets and environment, rescue/evacuation

Key Person	Action
Master of vessel	Inform Port Control room on VHF Inform Pilot Activate Ship Emergency Response Plan Assess situation and damage/possibility of damage to environment; render damage control assistance as required. Consider re-floating options
Pilot	Inform Port control Room Review Vessel's position Call additional Tugs/Mooring boats for use Assess damage to ship. Do not attempt immediate re-floating using ships engines Arrange tugs/mooring boats/ fire fighting assistance as required Ensure personnel are safe/ consider evacuation Activate oil spill response (if required) Consider re-floating options -
MIDPL Control Room	Inform LTSB / KPL Marine Control Inform Marine HOD Inform Port tugs/ crafts and activate other tugs Navigational warnings Monitor and log communications
HOD -Marine(Site Incident Controller)	Standby on VHF and maintain contact pilot. Assess damage caused to port property and notify the agent accordingly for damage claims

For further details, pl. refer detailed procedure

15.13.03. Collision between Ships in Approaches to Kattupalli / Ennore Port Channel

Ship Master is always in-charge of his vessel.

Objective : Minimize damage to vessels / environment. Rescue personnel

Key Person	Action
Master of vessel	Inform Port Control room on VHF Activate Ship Emergency Response Plan Activate Ship Damage Control Plans Activate Oil Spill Response, as required
Pilot	Inform MIDPL Port control Room Review ship position Tugs/mooring boats Liaise with Masters, monitor situation Abort approach, turn to sea Tow the vessel to safety, if required Evacuation, if require

MIDPL Control Room	Inform LTSB Marine Control / KPL Inform Marine HOD Inform Port tugs/ crafts/ diving support Issue Navigational warnings Inform medical / Clinic Monitor and log communication
HOD –Marine (<u>Site Incident Controller</u>)	Standby on VHF and maintain contact pilot. Assess damage caused to port property and notify the agent accordingly for damage claims

For further details, pl. refer detailed procedure

15.13.04. Vessel contact with Jetty structure

Ship Master is always in-charge of his vessel

Objective: Minimize damage to vessels / environment. Rescue personnel

Key Person	Action
Master of vessel	Inform Port Control room on VHF Inform Pilot Activate Ship Emergency Response Plan Activate Ship Damage Control Plans Activate Oil Spill Response, as required
Pilot	Inform MIDPL Port control Room Pull Ship away from the berth Assess damage to ship and jetty Consider re-berthing or abort approach and proceed to sea
MIDPL Control Room	Inform LTSB / KPL Control Inform Marine HOD Inform Engineering Services In charge to make assessment of Jetty damage Monitor and log communications Take photographic evidence
HOD -Marine(<u>Site Incident Controller</u>)	Standby on VHF and maintain contact pilot. Assess damage caused to port property and notify the agent accordingly for damage claims
Security	Isolate Jetty

For further details, pl. refer detailed procedure

15.13.05. Ship at berth mooring failure

Ship Master is always in-charge of his vessel.

Objective: Prevent damage to ship/ protect port assets and environment

Key Person	Action
Master of vessel	Stop all cargo operations Commence heaving ship's gangway or assist Inform Port Control room on VHF Inform Pilot Activate Ship Emergency Response Plan
MIDPL Control Room	Inform Port tugs to start engines and approach the vessel Instruct Jetty Supervisor to reach the berth, see the possibility of receiving mooring lines. Call Pilot Inform LTSB / KPL Control Inform Marine HOD Inform Engineering Services In charge to make assessment of Jetty damage Monitor and log communications
Pilot	Approach the vessel on tug Establish contact with the Master for planning and boarding Ships engines to immediate readiness Use stand by tug Arrange tugs/mooring boats/ fire fighting assistance as required Analyze cause
HOD -Marine(<u>Site Incident Controller</u>)	Standby on VHF and maintain contact pilot Consider re-berthing option or proceed to sea Assess damage caused to port property and notify the agent accordingly for damage claims

For further details, pl. refer detailed procedure

15.13.06. Fire/Explosion on board any vessel in port

Ship Master is always in-charge of his vessel.

Objective: Minimize damage to ship/port assets and environment / rescue

Key Person	Action
Master of vessel	Stop all cargo operations Inform Port Control room on VHF Activate Ship Emergency Response Plan
MIDPL Control Room	Inform Port tugs to start engines and approach the vessel, with fire pumps and Fi Fi on stand by and assist if required. Inform Fire Dept. Inform Marine HOD Call Pilot Inform LTSB / KPL Control Inform Safety Dept Inform Medical Cell

	Inform Security Monitor and log communications
HOD -Marine(<u>Site Incident Controller</u>)	Standby on VHF and maintain contact pilot Ensure safety of all personnel / treatment to injured/ evacuation Consider, pulling out the vessel to safe berth / anchorage Proceed to safe position/anchorage off port Assess damage caused to port property and notify the agent accordingly for damage claims
Pilot	Approach the vessel on tug incase planned to remove to safe berth/anchorage Establish contact with the Master for planning and boarding Ships engines to immediate readiness Use stand by tug
Medical Team	Stand by on Jetty
Fire Squad	Stand by on Jetty
Security Team	Isolate Jetty and remove unnecessary personnel

For further details, pl. refer detailed procedure

15.13.07. Man over board from ships / tug / Jetty

Ship/tug Master is always in-charge of his vessel.

Objective: Retrieve missing person

Key Person	Action
Master of vessel/Observer	Inform Port Control room on VHF Activate Ship Emergency Response Plan
MIDPL Control Room	Inform HOD Marine Inform Pilot / Port tugs/ crafts Mobilize Rescue Boats, Life Saving Appliances, Lights, Lookout Monitor and log Communications Confirm Navigational Warning issued by Port Control
HOD -Marine(<u>Site Incident Controller</u>)	Standby on VHF and maintain contact with Master / Pilot Assemble Emergency Response Team Assess situation
Medical Team	Stand by on Jetty for Medical Assistance

For further details, pl. refer detailed procedure

15.13.08. Oil Spill during re-fuelling of port tugs / crafts

Ship Master is always in-charge of his vessel.

Objective: Minimize spill quantity, contain, collect and clean

Key Person	Action
Master of vessel	Inform MIDPL Port Control room on VHF Stop bunkering & close all valves Activate Ship Emergency Response Plan
MIDPL Control Room	Inform LTSB / KPL control room Inform Harbor tugs/ crafts Monitor and log communications Ensure Oil Spill Gear Readiness and shifting to site

HOD -Marine(<u>Site Incident Controller</u>)	Maintain VHF contact with re-fueling tug / craft Maintain VHF contact with Port Control Assess situation Activate Oil Spill Response Plan (see section 6,7 & 8) Inform Coast Guard Inform DG Shipping Assess damage caused to port property and notify the agent accordingly for damage claims
Fire Team	Stand by for any fire outbreak
Medical Team	Stand by on Jetty

For further details, pl. refer detailed procedure

15.13.09. Medical Emergency offshore (Ship / Harbour craft)

Ship Master is always in-charge of his vessel.

Objective: Evacuation / medical attention.

Key Person	Action
Master of vessel/harbor craft	Inform Port Control room on VHF Request nature of assistance required
MIDPL Control Room	Inform Port Medical Inform LTSB / KPL control Room Inform Marine HOD Port tug / craft standby for evacuation Monitor / log communication
HOD -Marine(<u>Site Incident Controller</u>)	To be in VHF contact with Ship / Craft Assess situation Assess damage caused to port property and notify the agent accordingly for damage claims
Medical Team	Standby for Medical Assistance Call Company doctor for advise Provide Advanced First Aid Evacuation to Hospital

For further details, pl. refer detailed procedure

15.13.10. Ship's Security Alert System Activation

Ship Master is always in-charge of his vessel.

Objective: Minimize damage to ship/port assets and environment / rescue.

Actions to be taken in case of activation of ship security alert system when the vessel is at berth.

Key Person	Action
Master of vessel	Stop all cargo operations Inform Port Control room on VHF Activate Ship Security Plan
MIDPL Control	Inform PFSO/ DY PFSO

Room	Inform Security Inform Port tugs to start engines and approach the vessel, with fire pumps and Fi Fi on stand by and assist if required. & patrol on the sea side Inform Fire Dept. Inform Marine HOD Call Pilot Inform LTSB / KPL Control Inform Safety Dept Inform Medical Cell Monitor and log communications
HOD –Marine/ Dy PFSO(<u>Site Incident Controller</u>)	Standby on VHF and maintain contact pilot Ensure safety of all personnel / treatment to injured/ evacuation Consider, pulling out the vessel to safe berth / anchorage Inform DG Comm centre in consultation with the PFSO
Security Team	Isolate Jetty / vessel and remove unnecessary personnel Remove gangway
	Approach the vessel on tug incase planned to remove to safe berth/anchorage Establish contact with the Master for planning and boarding Ships engines to immediate readiness Use stand by tug
Medical Team	Stand by on Jetty
Fire Squad	Stand by on Jetty

For further details, pl. refer detailed procedure

15.13.11. Hostage Situation

Objective: Minimize damage to ship/port assets and environment / rescue.

Key Person	Action
MIDPL Control Room	Inform PFSO/ DY PFSO Inform Security Inform Fire Dept. Inform Marine HOD Call Pilot Inform LTSB / KPL Control Inform Safety Dept Inform Medical Cell Monitor and log communications
Security Team	Isolate Jetty / vessel and remove unnecessary personnel Stand by for any escalation Inform Police
HOD –Marine/ Dy PFSO(<u>Site Incident Controller</u>)	Plan out means to contact the belligerent parties for understanding reason for hostage situation Ensure safety of all personnel / treatment to injured/ evacuation Consider, pulling out the vessel to safe berth / anchorage Inform DG Comm centre in consultation with the PFSO
Medical Team	Stand by
Fire Squad	Stand by

For further details, pl. refer detailed procedure

16.0 EMERGENCY KIT, FIRE FIGHTING FACILITIES, SAFETY ARRANGMENT

The following items of hazard / emergency kits are under procurement/have been procured.

16.1 Protective Clothing

- Proximity suit – 2 nos.
- High voltage lineman's gloves – 2 nos.
- Overalls – 10 nos.
- Goggles (polycarbonate lens) – 5 nos.
- Hard hats – 10 nos.
- Boots (steel toe) – 2 nos.
- Safety harness – 5 nos.

16.2 Breathing Apparatus

- Positive pressure self-contained breathing apparatus – 1 nos.
- Spare cylinders – 1 nos.

16.3 First Aid Equipment

- Extinguishers capable for handling Class A, B, C and D fires. – 231 nos.
- First aid kit – 15 nos.
- Resuscitator– 2 nos.
- Well equipped ambulance – 1 no.
- First Aid Trained personnel

Refer Appendix D List of First Aid Trained Persons

16.4 Spill Care Kit

- Heavy Duty Sorbent pads (15"X19") – 12 nos.
- Sorbent Booms (5" X 10") – 03 nos.
- Polypropylene sorbent Pillows (18" X 18") – 03 nos.
- Sorbent roll (30" X 150')- 02 nos.
- Nitrile Gloves – 02 pairs
- Safety Goggles – 01 nos.
- Disposable bags – 01 nos.
- Disposal Coveralls – 4 nos.
- Barricading Tap – 01 nos
- Instruction Book – 01 Nos
- Chemical Gum boots – 01 Nos
- ABEK Mask – 01 Nos

16.5 Monitoring Devices

- pH paper strips
- Indication wind system – Wind Sock - 18 nos
- Hand held Multi Gas Detector – 5 no.
- Gas Detection pump – 1 No.

16.6 Adequate number of fire tender

16.7 Personal Protective Equipment

Sufficient nos. of PPEs viz. Safety Helmets, Safety Shoes, Safety Goggles, Hand Gloves, Ear Plugs / Muffs, Dust Masks, Life Jackets, Hi visibility jackets, Full Body Harness etc. considering the work strength as well as buffer stock will be kept ready for routine consumption and to deal with any emergency.

Refer Appendix C List of PPEs

16.8 FOLLOWING FIRE FIGHTING FACILITIES / SYSTEMS ARE AVAILABLE AT MIDPL

■ GENERAL

Adequate firefighting systems are provided for protection of berths, buildings and facilities of the port.

The firefighting facilities are based upon OISD guidelines.

The pumps and fire water pipe network system are provided to serve hydrants suitably located around the entire premises with Extinguishers, Hydrants, Hose boxes and Monitors. The Fire & Safety staff of the MIDPL Port covers the entire premise and provides suitable fire protection coverage with mobile equipment, personnel, etc.

■ FIRE STATION

The Fire station is the Control Centre of the Fire & Safety concerned matters. The Fire Station Control Room is active continuously 24 hours a day, 365 days a year. The control room is equipped with modern communication gadgets like, Wireless set, internal telephone & Mobile phones. Apart from the communication systems, the Fire fighting vehicle - Water Tender is stationed there. All sorts of firefighting equipment and appliances are stowed in the Fire Station.

The below given is the list of some of the equipment stowed at Fire Station.

- Spare fire extinguishers and foam compound drums (25% of distribution quantity) – 25 nos.
- Delivery Hose pipe – 10 nos.
- Branch Pipes & Foam making equipment. – 10 nos.
- Fire suits – 2 nos. (Foam tender)
- First aid kit – 02 nos. (Foam tender and Water tender)
- Safety Harness – 5 nos.
- Ropes – 5 nos.
- SCBA – 08 no's (Foam tender & Water tender)
- PPEs - goggles, Apron, shoes, gloves, nose mask, gumboots – Sufficient in spare qty.

17.0 ACTION PLAN FOR OFF SITE EMERGENCY

17.1 OFF – SITE EMERGENCY When the industrial disaster cannot be controlled by using unit's own resources, then it is necessary to involve outside resources to control such emergency. Even when Industrial disaster spread outside its premises and likely to affect or affect surrounding population, other industries, etc. then also outside resources needed to control it. This

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emergency called as Off Site Emergency & it will be controlled by either local or district authority.

The emergency location will not change but the line of actions will govern by crisis group instead of units' authorities. The unit own Authority has to extend facilities, liaison, and coordination to the local crisis group or district crisis group as per requirement or situation.

17.2 PROBABILITY FOR OFF-SITE EMERGENCY

The Fire/Explosion incidents at Tank farm may not create situation which requires Off Site Emergency from On Site Emergency. The spread of emergency situation created at other industries by handling and storing activities in the premise would be within kattupalli area and can be tackled by own resources. But transportation of hazardous material by Tanker or Transportation through pipe line may create situation requires Off Site Emergency.

17.3 OUTSIDE PARTICIPATION

The emergency operations outside the factory premises are not different in character from those applicable to on sites. Hence the approach to and preparation for on-site emergency detailed in previous chapters will be applicable in case of Off-Site action also. However, the following points should be kept in mind:

- ❖ The groups involved are not as enlightened and responsible as those within the factory.
- ❖ In off-site actions, the local participants particularly the administration, fire & police play the dominant role. Industrial management has a limited and comparatively submissive role.
- ❖ The diversities of the problems and response are bigger.
- ❖ Humanitarian work assumes more importance.

The correct management strategy in this situation will be to involve the local participants' fully in emergency operation and provide technical and financial support to them to manage the emergency. This task is more difficult than managing the on-site emergency operation in many ways and call for elaborate and consistent efforts.

17.4 MUTUAL AID AND INTERACTION

At present unit is not having interaction for Mutual Aid arrangement with M/s.LTSB, KPL,IOCL, Kattupalli. If required any necessary vehicles / equipment can be made available from nearby Industries.

The benefits from mutual help will in term of: -

- ⊕ Availability of more numbers of technical persons in time of need.
- ⊕ Gains from sharing of experience.

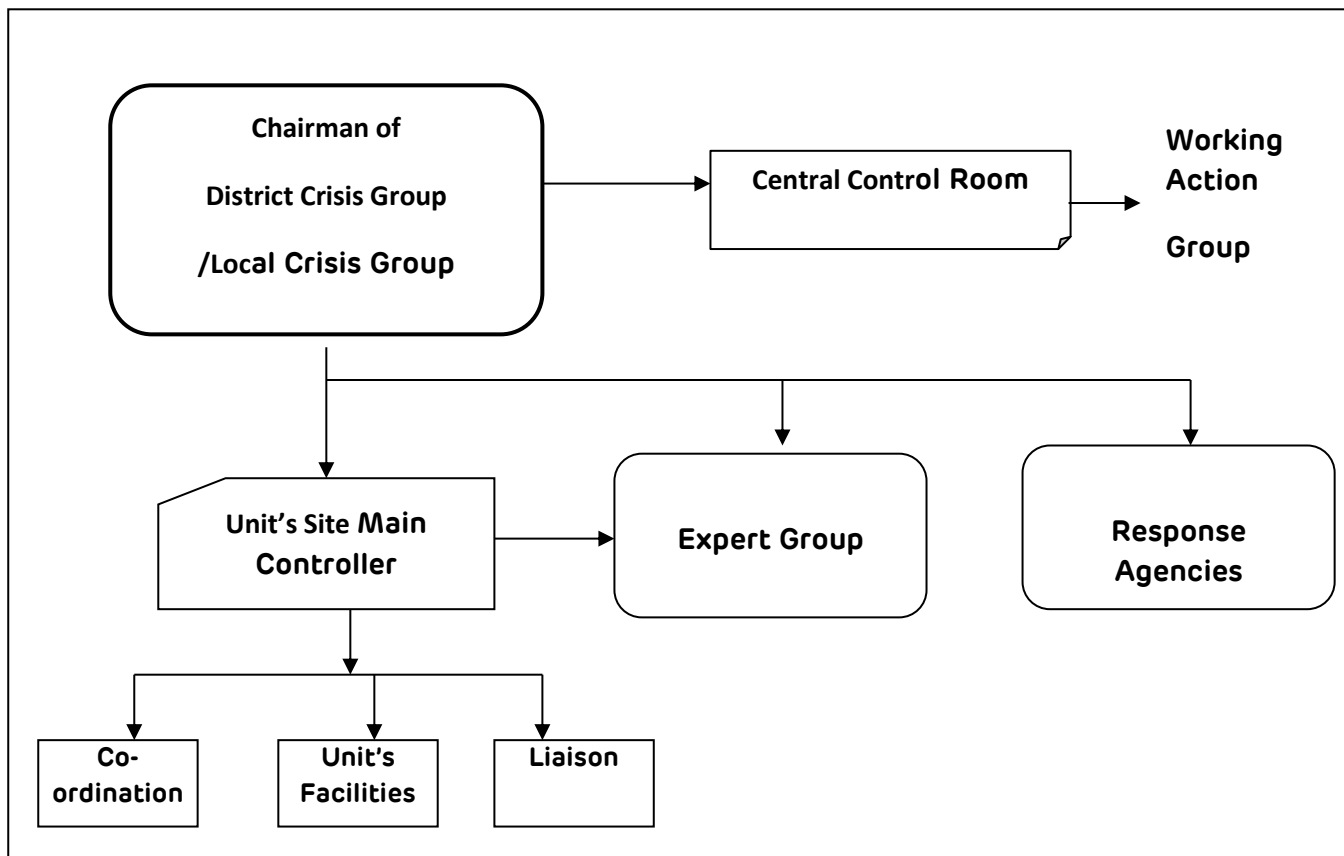
- ⊕ Resources like cars, rescue equipment's, protective equipment's and tools to meet the emergency can be pooled.
- ⊕ Facilities of first aid, and services of medical officers and para-medical staff in all units available for use for the unit in distress.
- ⊕ In drafting the Off-Site Program all units can work together and evolve a common plan with participation of all units.
- ⊕ In terms of communication with other local participants and giving information to public, a joint approach will be more successful.
- ⊕ In case of emergencies involving the community, the workload in connection with rescue, relief and medical aid can be shared.

In order to derive maximum benefit from mutual help it will be necessary for all the participating units to interact with each other, share information and experience and also establish reliable communication links. Apart from facilities like communication facilities and codes for priority in calling during emergencies, methods of contact and nodal persons for contact should be decided in advance.

17.5 Action by SMC & IC during OFFSITE EMERGENCY in brief

During off site emergency, Duties and responsibility of unit's Site Main Controller and Incident Controller will be different from onsite emergency plan. In offsite emergency plan, Government Authority (Chairman of District Crisis Group/Local Crisis Group) will take charge of disaster and now he will be site main controller for Off Site Emergency plan.

Now Unit's site main controller became Site Co-ordinator & Liaison Man, while, as Incident controller will become incident coordinator, which is highlighted in chart as shown below.



A. DUTIES OF (CHIEF OPERATING OFFICER) AS SITE MAIN CONTROLLER

(NOW coordinator & Liaison Man)

During Off Site Emergency, Unit's Site Main Controller becomes Co-ordinator & Liaison Man and his duties are as follows:

1. He has to extend liaison, co-ordination and facility to the Chairman of local crisis group or Chairman of district crisis group.
2. He has to explain about disaster, his efforts and what type of help is needed in brief to Chairman of Local Crisis group (Govt. Authority) and Central Control Room.
3. He has to communicate about available resources, fatality/injury to his own employees and probable affected surrounding area with maximum credible scenario.
4. He has to keep ready with maps, layout of unit, records, documents, On Site Emergency Plan, M.S.D.S., Details of Process Hazards, Safe Handling procedure on specific hazardous chemicals etc.
5. He has to advise for special medical treatment and availability of antidotes.

6. He has to divert Communication system for Off site emergency.
7. He has to divert all available resource for Off site emergency.
8. He has to provide aid and assistance for Off Site Emergency.
9. Shutdown plant safely, if hazards is not involved.
10. He has to reorganize the work of Key personal & essential worker.
11. Arrangement of food, water, rest etc. for the person engaged in the duty.
12. Arrangement of disposal of contaminated water, effluent, solid waste, etc.

B. DUTIES OF UNIT'S INCIDENT CONTROLLER(HOD)

(NOW INCIDENT COORDINATOR)

1. He has to show the actual incident place to off site action group.
2. He has to provide proper information to all incoming off site action group.
3. He has to also explain safe route for off site team members, fire crew members, etc.
4. He has to describe available resources, other hazardous material near disaster, available PPE, Neutralizing Media, etc.
5. He has to show safe & proper parking arrangement for off site action group members.

17.6 WITHDRAWAL OF EMERGENCY (CALLING OFF EMERGENCY)

The emergency declared both within the works and the community should be called off only after making sure that the incident is brought under control and that no further dangers are possible to property or life. The Site Main controller, Govt. Authority in consultation with the work groups concerned, should take a decision to this effect. The decision has to be based on prudence and actual information of assessment by work groups and should not be one based on hearsay or speculation. A system of documentation recording the recommendations of work groups, opinion of senior officers and endorsement by the works main controller – will be a check against hurried decisions.

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Once the decision to call off the emergency is taken, the concerned persons should be informed. The coordinator of the off-site emergency operation and local participants have to be informed. The coordinator in turn will give information to the other local participants and members of the public.

Even after calling off the emergency certain operations may need to continue. Hence the work groups should be released only after ensuring that the jobs attended to by them are over. The works main controller should take the decision. Also after the cessation of emergency the plant involved should not be left unmanned for quite some time and should be watched.

LIST OF ANNEXURES

ANNEXURE-1	IDENTIFICATION OF FACTORY
ANNEXURE-2	MAP OF THE AREA
ANNEXURE-3	FACTORY LAY OUT
ANNEXURE-4	OTHER HAZARDS AND CONTROLS
ANNEXURE-5	TRADE-WASTE DISPOSALS
ANNEXURE-6	RECORDS OF PAST INCIDENTS
ANNEXURE-7	ENVIRONMENTAL IMPACT ASSESSMENT
ANNEXURE-8	WEATHER CONDITIONS
ANNEXURE-9	INCIDENT CONTROLLERS
ANNEXURE-10	DEPUTY INCIDENT CONTROLLERS
ANNEXURE-11	SITE MAIN CONTROLLERS
ANNEXURE-12	KEY PERSONNEL
ANNEXURE-13	ESSENTIAL WORKERS
ANNEXURE-14	ASSEMBLY POINTS
ANNEXURE-15	EMERGENCY CONTROL CENTRE
ANNEXURE-16	FIRE AND TOXICITY CONTROL ARRANGEMENTS
ANNEXURE-17	MEDICAL ARRANGEMENTS
ANNEXURE-18	TRANSPORT & EVACUATION ARRANGEMENTS
ANNEXURE-19	POLLUTION CONTROL ARRANGEMENTS
ANNEXURE-20	OTHER ARRANGEMENTS
ANNEXURE-21	ALARMS & SIRENS
ANNEXURE-22	INTERNAL PHONES
ANNEXURE-23	EXTERNAL PHONES
ANNEXURE-24	NOMINATED PERSONS TO DECLARED MAJOR EMERGENCY
ANNEXURE-25	A FORM TO RECORD EMERGENCY TELEPHONE CALLS
ANNEXURE-26	STATUTORY COMMUNICATION
ANNEXURE-27	EMERGENCY INSTRUCTION BOOKLET

IDENTIFICATION OF THE FACTORY

Full Name of Company	
Marine Infrastructure Developer Pvt Ltd., Kattupalli Village, Ponneri Taluk Thiruvalluvar dist. Chennai 600 120	
Phone Factory :	Off +91 44 27969107 Ext 69107
Tel Fax :	

Full Name & Address of the Occupier:	Phone No.		
	Office / Factory	Residence	Mobile
Ennarasu Karunesan , CEO, Southern Ports,APSEZ No ½ Ramcon Fortuna Towers 4thFloor, Kodambakkam High Road, Nungambakkam Chennai- 600 034	044-42742669	-	+91 9884305955
Full Name & Address of the Factory Manager:	Phone No.		
	Office / Factory	Residence	Mobile
Capt. Jeyaraj Thamburaj Marine Infrastructure Developer Pvt Ltd & Adani Ennore Container terminal Kattupalli Village, Ponneri taluk, Thiruvalluvar Dt, Chennai 600 102	91 44 27969107 Ext 69107	-	+91 9099900994 ;

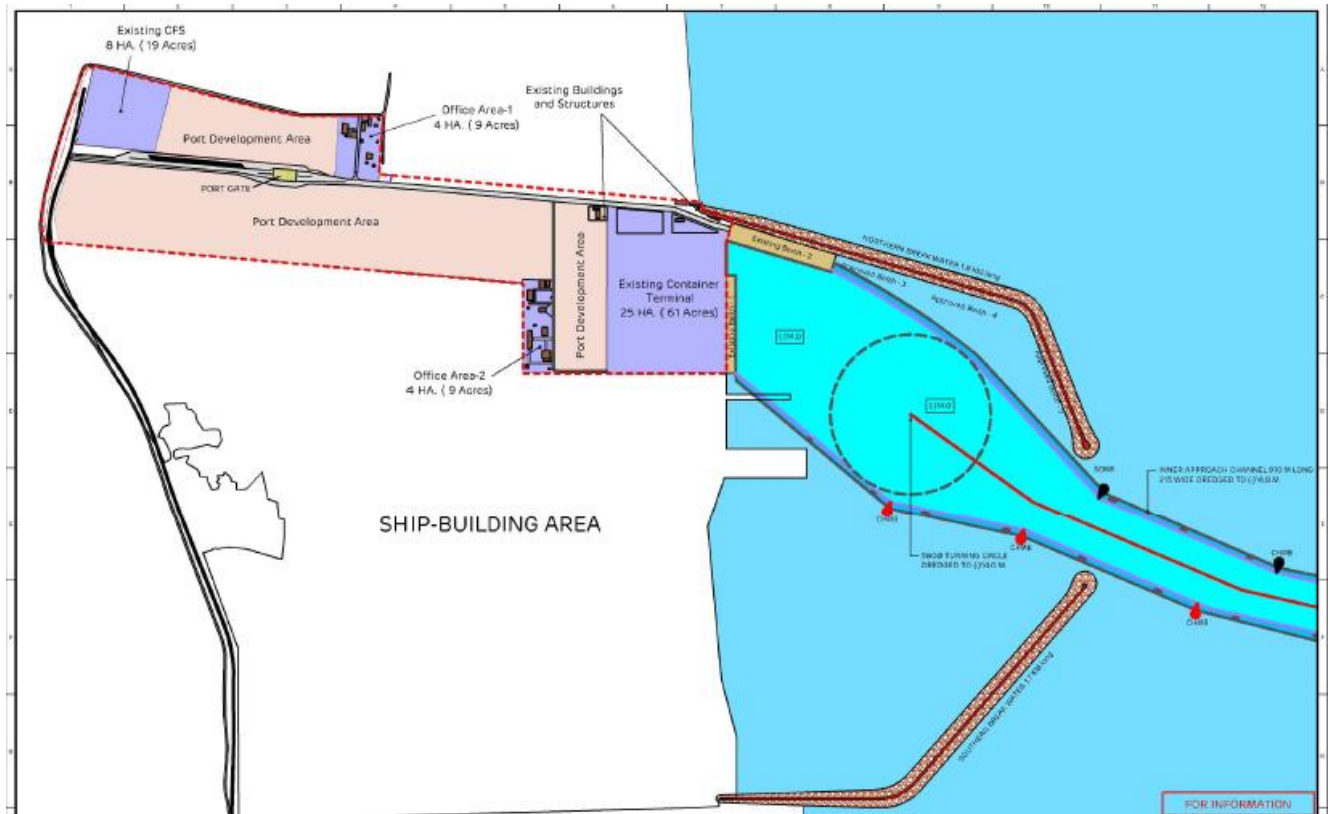
MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

First Person to be contacted in case of emergency: Capt. Jeyaraj, Mr. A. Madhu, Mr. Srinivasa Reddy (HR),
Capt. Anubhav Jain (Marine), Mr. Vijay Majji (Dry Cargo), Mr. Venkatachalapathi (Engg. Services)

Sr.No	Name	Department	Mobile No.	Internal Phone No.	
				Office	Res.
General Shift					
1	Mr. A Madhu	CT Operations	8939709979	69160	
2	Mr. Vijay Majji	Dry Cargo	7731003330	69045	
3	Mr.Venkatachalapathi	Engg. Services	7299972522	69144	
5	Capt. Anubhav Jain	Marine	8980015245	69102	
6	Mr. Srinivasareddy	HR / IR	9909927243	69043	
Shift (A, B, C)	Fire & Safety Control Room DUTY OFFICER	HSEF	7823941711	690155	
Shift (A, B, C)	Marine Control Room	Marine Control Room	7823941713	69050	
Shift (A, B, C)	Security Control Room	Security Control Room	7823941712	69065	
Shift (A, B, C)	Occupational health Centre	Occupational health Centre	7823941711	69156	
Shift (A, B, C)	Ambulance	Ambulance	7823941711	69156	

[CONTENT](#)

MAP OF THE AREA



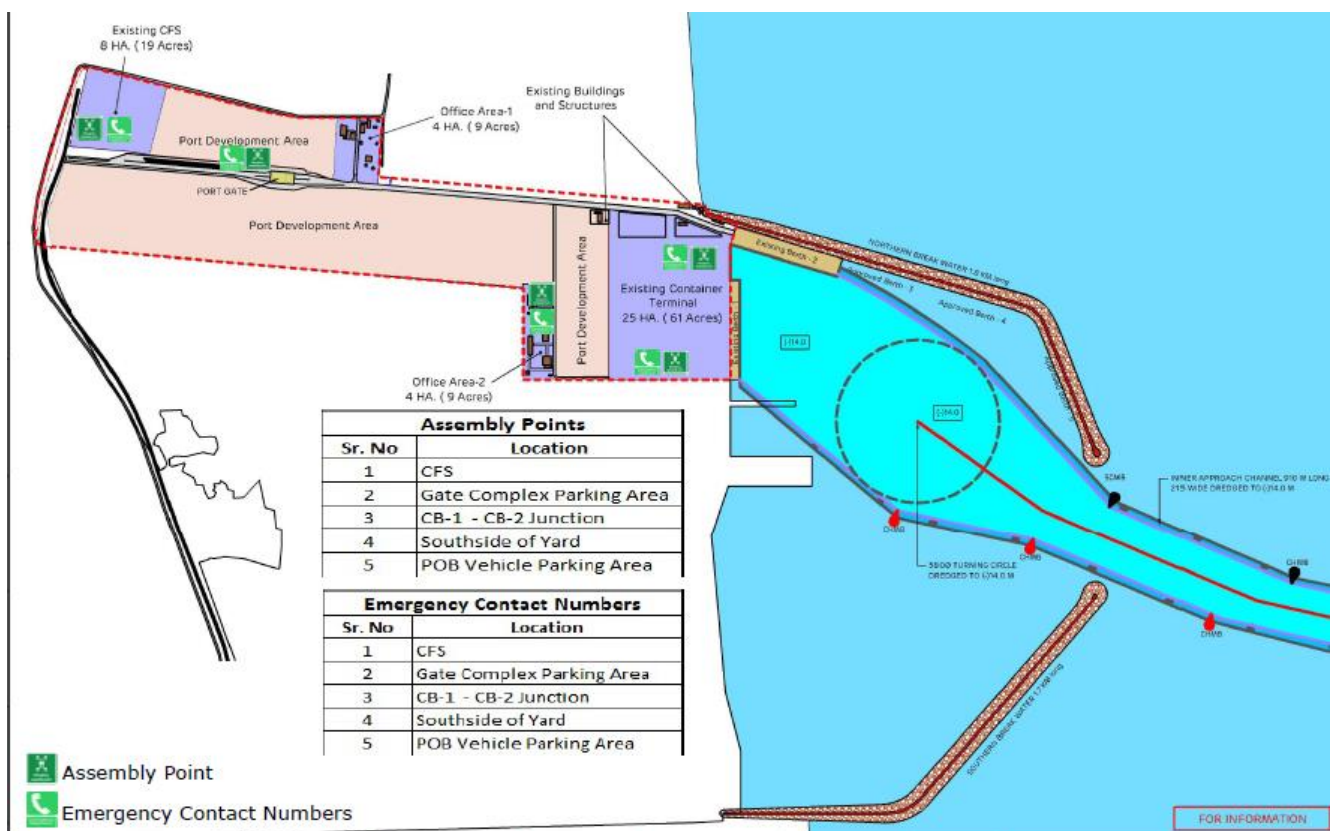
AREA LAY OUT

GENERAL PLANT LAYOUT - EMERGENCY ESCAPE ROUTE & ASSEMBLY POINTS

The details of Safe Assembly Points are mentioned in Annexure 19 and Shelter en-route are mentioned in the Appendix F

CONTENT

Personal Protection in Case of a Large Spill:	Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.
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OTHER HAZARDS AND CONTROLS

Sr. no.	Name of The Possible Hazard or Emergency	Its Source & Resource	Its effect on persons, property & environment	Place of Effect	Control Measures Provide	In Charge Person	
						Name Designation	Phone
1	Collapse/fall of crane / Failure of crane/ falling of material	Crane operation	Injury to person Damage to property	Each Shop	Preventive Maintenance & routine check up	HOD	
2	Fall of hydra crane	Crane operation	Injury to person Damage to property	Each Shop	Preventive Maintenance & routine check up	HOD	
3	Gas release from IOCL	Leakage	Injury to person & environment	Full Premises	Emergency Plan	BUH	
4	Fall of person	Fall	Injury to person Damage to property	Full Premises	Preventive Maintenance & routine check-up, PPEs, Permit	HOD	
5	Drowning	Fall from Jetty	Injury to person	Full Premises	Routine check-up, PPEs, Permit	HOD	
6	Vehicular Hazards	Vehicles	Injury to person Damage to property	Full Premises	Preventive Maintenance & routine check-up, Speed limits	HOD	

TRADE WASTE DISPOSAL

S. No .	Name of Trade Wastage	Generation per Day or per Year	Place of disposable Site	Terminate method of disposable	Alarm indicating	Monitoring
Effluents						
1	Industrial Effluent	125 m3/Day	Recycle/Reuse	Effluent treatment Plant	Sample analysis	Monitoring of key characteristics
2	Domestic Effluent	950 m3/Day	Recycle/Reuse	Sewage treatment Plant		
Hazardous Waste						
1	Oil containing cargo residue, washing water & sludge	6000 MT / Year	CHWIF / CHWTSDF	Collection Storage, transport and disposal	Form-4	Maintain Form-3 & Handling As per Waste Management Manual
2	Used Oil	120 MT / Year	Selling to Registered recycler	Collection Storage, transport and disposal	Form-4	Maintain Form-3 & Handling As per Waste Management Manual
3	Discarded Containers	30 MT/Year	Decontamination	Collection Storage, Decontamination	Form-4	Maintain Form-3 & Handling As per Waste Management Manual
4	Process waste, residues & sludge (Paint)	18 MT / Year	CHWIF / CHWTSDF	Collection Storage, transport and disposal	Form-4	Maintain Form-3 & Handling As per Waste Management Manual
5.	Sludge & filter contaminated with oil	18 MT/Year	CHWIF / CHWTSDF	Collection Storage, transport and disposal	Form-4	Maintain Form-3 & Handling As per Waste Management Manual

RECORD OF PAST INCIDENTS

Sr. No.	Description	2014	2015(Jan to Dec)	2015	2016
1	No. of Employees	Operation start from Nov 2014	210	286	315
2	Total No. of Man-hours worked		19800	52680	79700
3	No. of Fatal injuries		0	0	0
4	No. of Reportable Accidents		0	0	0
5	No. of Danger Occurrences		0	0	0
6	Total Mandays lost due to Accidents		0	0	0
7	No. of Occupational Diseases		0	0	0
8	Fire Accident		0	0	0
9	Loss due to Fire		0	0	0
10	Frequency Rate of Accidents		0	0	0
11	Severity Rate of Accidents		0	0	0
12	Incidents Rate		0	0	0

ANNEXURE 7

ENVIRONMENTAL IMPACT ASSESSMENT

Sr. No	Distance (Radius) from the factory	Environment (employees, hutment, neighboring factory, residential colony etc.)	Population with Composition						Possible Consequence & Assessment					Type of Control Measures necessary	
			Day Time			Night Time			Type of risk & effect possible	Duration of risk	Risk Assessment			Available in the factory	Required from Outside
			Healthy	Vulnerable	Total	Healthy	Vulnerable	Total			No. of people, name & amount (Rs.) of property & other environment that may be affected	Frequency of the hazard (i.e. on such incident in what time)	Acceptable criteria		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
 AUTHORIZED BY: Head (HSE)

1	250	Own Premises	400	10	410	50	1	51	Radiation Heat / Shock wave/Fumes	Types of Fire/ Explosion	-	-	-	Fire Fighting Equipment's, Fire Crew, Fire Tender, etc.	Fire Tender, PPE., etc.
2	500	Owner Premises/ Hutment	450	25	475	60	5	65	Radiation Heat / Shock wave/fumes	Types of Fire/ Explosion	-	-	-	SBA sets PPE Vehicles etc	

WEATHER CONDITIONS

METEOROLOGICAL DETAILS

Sr. No.	Period of Year		Max. Temp °C (Avg.)	Min. Temp °C (Avg.)	Wind Velocity	Wind Direction	Weather Conditions
	From	To					
1	1st January	15th January	28	12	4.2	NE/N	Cold
2	16th January	31st January			5.1	NW/W	Cold
3	1st February	15th February	30.0	14.0	3.7	NE/N	Calm (25%)
4	16th February	31st February			4.7	NW/SW	Cold
5	1st March	15th March	36.0	19.0	4.2	NE/SE	Calm (23%)
6	16th March	31st March			5.1	NW/SW	Dry
7	1st April	15th April	39.0	23.0	4.2	S/SW	Calm (18%)
8	16th April	31st April			5.1	SW/NW	Hot
9	1st May	15th May	41.0	26.0	4.75	SW/S	Dry/Hot
10	16th May	31st May			4.75	SW/S	Dry/Hot
11	1st June	15th June	38.0	27.0	4.7	SW/S	Moist
12	16th June	31st June			4.2	SW/S	Moist
13	1st July	15th July	33.0	26.0	4.75	SW/S	Rainy
14	16th July	31st July			4.57	SW/S	Rainy
15	1st August	15th August	32.0	24.0	4.93	SW/W	Moist
16	16th August	31st August			4.75	SW/S	Moist

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
 AUTHORIZED BY: Head (HSE)

17	1st September	15 th September	34.0	24.0	4.1	SW/W	Calm (21%)
18	16th September	31 st September			4.75	SW/W	Cool
19	1st October	15th October	36.0	21.0	4.4	NE/E	Calm (21%)
20	16th October	31st October			5.1	SW/NW/NE	Cool
21	1st November	15th November	33.0	16.0	4.57	E/NE	Cool
22	16th November	31st November			4.75	NE/NW	Cool
23	1st December	15th December	29.0	13.0	4.57	NE/E	Cold
24	16th December	31st December			4.93	NW/NE	Cold

ANNEXURE – 9

INCIDENT CONTROLLERS

Shift / Area	INCIDENT CONTROLLER							RUNNERS		
	Sr. No.	Name	Designation	Place of availability		Phone number		Name and Designation	Place of availability	Phone Number
				In Factory	Residence	In Factory	Residence		In Factory	Mobile
General / Marine	1	Capt. Anubhav Jain	Head - Marine	POB	Chennai	8980015245		Mr. Ananda Ramakrishnan	POB	9841044132
General / Dry Cargo	2	Mr. Vijay Majji	Head-Dry Cargo		Chennai	7731003330		Mr. Chandra Mohan	TNMP Building	7299990896
General / Container Terminal	3	Mr. A Madhu	Head-Container Terminal	POB	Chennai	8939709979		Mr. Sathish P	TNMP Building	9884101224
General/ Engg. Service	4	Mr. Venkatachalapathi	Engg. Services	Engg Workshop	Chennai	7299972522		Mr. Siddhant	Engg Workshop	9912358976

ANNEXURE – 10

DEPUTY INCIDENT CONTROLLERS

Sr No	Department	Deputy Incident Controllers							Person to be called, if IC & Dy. IC, both are not available		
		Name	Designation	Place of Availability		Phone No.			Name & Designation	Place of availability	Phone No.
				In Factory	Residence	Internal	Residence	Mobile			
1	2	3	4	5	6	7	8	9	10	11	12
1	Marine	Mr. Anandaramakrishnan	Asst. Manager	POB	Chennai		Chennai	9841044132	Shift Marine Officer	Marine Control Room	
2	Dry Cargo	Mr. Chandra Mohan	Superintendent	TNMP Building	Chennai		Chennai	7299990896	Shift superintendent		
3	Container Terminal	Mr. P. Sathish	Asst. Manager	TNMP Building	Chennai		Chennai	9884101224	Shift In Charge - CT	CT Container Office	09909958659

SITE MAIN CONTROLLERS

Sr. No.	SITE MAIN CONTROLLER						RUNNER'S		
	Name in priority order	Designation	Place of Availability		Phone Number		Name & designation	Place of Availability	Phone
			In the factory	Residence address	In the factory	Residence			
1	Capt. Jeyaraj Thamburaj	BUH	POB	Chennai	9099900994		Mr. A Madhu – Head Operations	POB (Port Operation Building)	8939709979

ANNEXURE – 12

KEY PERSONNEL

Sr. No.	Key Person's								Next Person's					
	Dept.	Name	Designation	Place of Availability		Phone No.			Name & Designation	Place of Availability		Phone No.		
				In the Factory	Res.	In the Factory	Res.	Mobile No.		In the Factory	Res.	In the Factory	Res.	Mobile No.
1	2	3	4	6	7	8	9	10	11	12	13	14	15	16
1	Overall	Capt. Jeyaraj Thamburaj	BUH	POB	Chennai	69107	-	9099 9009 94	Mr. A. Madhu	POB	Chennai	69160		8939709 979
2	Container Terminal	Mr. A Madhu	Head - Container Terminal-Operation	POB	Chennai	69160		89397 0997 9	Mr.P.Sathish - Asst.Manager		Chennai	69196		98841012 24
4	Dry Cargo	Mr. Vijay Majji	Head - Dry Cargo		Chennai	69045		77310 03330	Mr. Chandra Mohan		Chennai			72999908 96

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

5	Engineering Service	Mr. Venkatachalapathi	Engineering Service	ES Workshop	Chennai	69144		7299972522	Mr. Siddhant	ES Workshop	Chennai			9912358976
6	Marine	Capt. Anubhav Jain	Head - Marine	POB	Chennai	69102		8980015245	Mr. Ananda Ramakrishnan	POB	Chennai			9841044132
7	HSEF	Mr. Krishnaraja	Head - OH & S	POB	Chennai	69170		9099995912	Mr. Dontala siva prasad	POB	Chennai	3529		8939822351
8	Security	Mr. Sundararajan	Head - Security	Security Office	Chennai	69062		8939822617	Mr. Venkatesh Nair	Security Office	Chennai	69065		
9	HR & Admin.	Mr. Srinivasa Reddy	Head - HR & Admin.	POB	Chennai	69043		9909927243	Mr. Uthiramoorthy	POB	Chennai	69113		8939822607

ESSENTIAL WORKERS

Sr. No.	Department	Name	Place of Availability	Phone No.		
			Department	Internal	Resident	Mobile
1	2	3	4	5	6	7
1.	Fire	Mr. Papayya	Fire			9790805142
2.	HSE	Male Nurse	Occupational Health Centre			7823941711
3.	Admin	Mr. Senthil	POB			7823941717
4.	Security	Mr. Rajasekar Nair	Security Control Room			7299034552
5.	Finance	Mr. Anandan	POB			7299958515
6.	IT	Mr. Prashant	POB			9867679846
7.	Store	Mr. Kesavan	POB			7299990767
8.	Container Terminal	Mr. P.Sathish	CT			9884101224
9.	Marine	Mr. Ananda Ramakrishnan	Marine			9841044132
10.	Dry Cargo	Mr. Chandra Mohan	Dry Cargo			7299990896
11.	Engg. Services	Mr. Siddhant	Engg. Services			9912358976
12.	Engg. Services – FMS	Mr. Selvankar	Engg. Services			7299991959

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

13.	Corporate Affairs	Mr. Rajkumar / Mr. Natarajan	Marketing / Corporate Affairs			9884305901 / 8939822303
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ASSEMBLY POINTS

ASSEMBLY POINT	AREA
ASSEMBLY POINT - 1	CFS
ASSEMBLY POINT – 2	Gate Complex Parking area
ASSEMBLY POINT – 3	CB1& CB2 Junction
ASSEMBLY POINT – 4	South side of yard
ASSEMBLY POINT – 5	Opp. Port Operation Building- Vehicle parking area

The safe escape route map and Assembly Point map is in Annexure 3 and Shelters en-route are mentioned in Appendix F

EMERGENCY CONTROL CENTRE

Location of the Centre:		Marine Control Room		Security Control Room at GHC	
Telephone Nos. of the Centre:		Mobile: 7823941713		Mobile : 7823941712	
		1.1 Internal : 69050		Internal : 69065	
ITEMS AVAILABLE AT EMERGENCY CONTROL ROOM		Quantity	Person who will operate this item		Notes
1	Walkie Talkie	8	On Duty Marine Officer		Channel 14
2	Landline Phone	1	On Duty Marine Officer		69050
3	Mobile Phone	1	On Duty Marine Officer		7823941713
4	Site lay out	1	On Duty Marine Officer		Displayed
5	Emergency Escape Route	1	On Duty Marine Officer		Displayed
Fire Tenders is stationed at Fire control room Near POB ,respectively with all necessary Emergency Equipment					
Medical Centre & Ambulance services are available round the clock. The Ambulance is stationed at OHC in Fire control room					

ANNEXURE - 16

FIRE AND TOXICITY CONTROL ARRANGEMENTS

Water Sources & Capacity	Nos.	No. of Fire Pumps, Type & Capacity		No. of Hose Reels & Total Length	No. of Fire Tenders and Capacity	Hydrant		Monitor		Alternative Power arrangement	Nos. of CO2 Extinguishers	
						Type	Nos	Type	Nos.			
1	2	3	4	5	6	7	8	9	10	11	12	13
Above ground storage	03	Types	Nos	-	1) Water Tender cum Foam tender Water:12000 Lit	Double Headed	176	Fixed Type Portable Type	40 02	Diesel Generating Set & Diesel Pump Set (100% stand by)	Cap.	Qty.
		Diesel pump, 610 m3/hr at 07 Bar	2								4.5/6.8/9 Kg	32
		Elect. pump, 273 m3/hr at 07 Bar	2								5Kg/9Kg/22.5 Kg / 50 Kg / 75 Kg	184
		Jockey pump 92 M ³ /Hr 7 Bar	1									

MEDICAL ARRANGEMENTS

1	Name	MIDPL Occupational Health Centre (OHC)
2	Location	Near Port Operation Building
3	Telephone number	044 27698156
4	In charge Person Name and Designation	M/s Apollo Pharmacy / Male Nurse
5	Qualification	Nursing Course
7	Resident Phone Number	----
8	Address	MIDPL OHC
Facilities and equipment		
9	Existing medical facility	Pre-employment check-up /Periodic medical check up, Treatment for the sickness cases, First aid kit , All Medicines , Trained First Aiders, Nebulizer, Emergency Medicines, gluco Meter, Pulse oximeter, ambu bag, Fully Equipped Ambulance.
10	Equipment	Well- equipped emergency / dressing room
11	Antidotes Available	YES (Anti Snake Venom – 02 nos.) (Exp. May. 2019) Burn injury – Silver Nitrate ointment, Eye injury – Eye irrigation can, Gas/Respiration – Oxygen Cylinder
12	First-aiders available	Yes
13	Accommodation	Yes at Fire & Safety Building.
Ambulance van or alternative arrangement		
14	Place of availability	Near OHC
15	Capacity	2
16	Facility in Van	First aid kit, Oxygen cylinder, All medicines, Nebulizer
17	Doctors all near by	Mentioned below

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

19	Name	Address and contact :
20	CMO	LTSB medical centre ,CMO
21	CMO	KPL medical centre ,CMO
22	CMO	IOCL medical centre, CMO
Residential Phone of Medical Staff Ambulance Room		
24	On duty male nurse	7823941711
25	On duty male nurse	
Outside Hospital arrangement Name Address of the factory hospital		
26	J.D. (HS) Tiruvallur	27666620
27	D.D. (HS) Tiruvallur	27661562
28	I.P.H . Poonamallee	26272062
29	Govt. Headquarters Hospital, Tiruvallur	27660242
30	Approximate Distance	25kM
Facilities Available		
31	Doctor	08 HRS
32	Other Staff	24 HRS
33	Antidotes	YES
34	Ambulance Van	YES

TRANSPORT & EVACUATION ARRANGEMENTS

For Key Personnel & Essential Workers See Annexure-17 & 18 and for Assembly Points See Annexure-19

Type of Siren:									
Electrically Operated Double mounting siren of 11 km radius									
Own Transport Centre					Own Vehicles				
Name of Location	Phone No.	In-Charge Person			Sr. No.	Type & No.	Capacity	No. & Type of Public Warning Instruments	Driver's Name & Address
		Name & Designation	Residence						
			Phone	Address					
1	2	3	4	5	6	7	8	9	10
Port Operation Building		Mr. Senthil	7823941717	Chennai	1	Mini Bus	20	---	
					2	Mini Bus	20	---	
					3	Car	05		
					4	Golf cart	2	PA System	Operation
					5	QRT jeep	7	PA System	Security

Details of Shelters and facilities

Outside Shelters for Evacuated Persons are mentioned in Annexure 28 and alternate Shelters are mentioned in Appendix F

Sr · N o.	Name, Address & Distance	Phone No.	In-Charge Person			Accommodation Capacity	Facilities Available
			Name & Designation	Residence			
				Phone	Address		
1	2	3	4	5	6	7	8
1	POB		On duty Officer		Chennai	250	
2	Gate House Complex		Rajasekaran Nair		Chennai	150	

POLLUTION CONTROL ARRANGEMENTS

For Key Personnel & Essential Workers see Annexure-17 & 18 and For Trade Waste Disposal see Annexure-8

Water Pollution Control					Ambient Air Quality & Noise Level Monitoring					
Type & Capacity of effluent treatment plant	No. of sample monitoring centers & its frequency	Other Control Measures	Log Book & Records	In-Charge Person's Name, Address & Phone No.	No. & Places of sample monitoring centers	Type, parameters & frequency of tests	Wind direction & velocity meters	Instrument Available	Log Book & Records	In-Charge Person's Name & Address & Phone No.
1	2	3	4	5	6	7	8	9	10	11
Advance MBBR Technology based Effluent & Sewage Treatment Plant	Weekly 2 Samples	Sampling	Results	Mr. Dontala Siva prasad Environment Department	5 Locations	Twice in a Week Ambient Air Quality all 12 parameters	Yes	Monitoring by MoEF &CC and NABL Approved Laboratory	Results	Mr. Dontala Siva Prasad Environment Department
Sea Water and Sea Sediment	Monthly 3 Samples/each	Sampling	Results	Mr. Dontala Siva Prasad Environment Department	5 Locations	Once in a month Ambient Noise Level Monitoring	Yes	Monitoring by MoEF &CC and NABL Approved Laboratory	Results	Mr. Dontala Siva Prasad Environment Department

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

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Stack Emission Monitoring						Land Pollution Controls				TNPCB	
No. of Location of sample places	Type, Parameters & frequency of tests	Control Measures provided	Instrument available	Log Book & Records	In-charge person's Name, address & phone No.	No. of sample monitoring centers & its frequency	Other control measures	Log Book & Records	In-Charge Person's Name, Address & Phone No.	Permission Obtained?	Conditions fulfilled?
DG Sets	Once in six month PM, SO ₂ , NO _x	Adequate stack height & acoustic enclosure	Stack Monitoring	Results	Mr. Dontala Siva Prasad Environment Department	2 Nos. of Samples Bi-Annual	--	Results	Mr. Dontala Siva Prasad Environment Department	Yes	Yes

Other Arrangements

ANNEXURE -20

For Key Personnel and Essential Workers see Annexure-17 & 18

Sr . N o.	Type & Name of Arrangements available	Qty.	Place of Availabilit y	Phone No.	In-Charge Person's			Mutual Aid Arrangement					
					Name & Designatio n	Residence		Place from where the same thing is available	Quantity Available	In-Charge Person's			
						Phone	Address			Name & Designation	Phone		Address
											Offic e	Res.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Dumpers	01	DC	61729	Chandra Mohan			We have Mutual arrangement with nearby Industries for vehicles, personnel					
2	Trailers	02	CT	61553	P Sathish								
3	Hydra	01	Store	61543	Selvankar								
4	Utility Vehicles	02	Across site	61651	Senthil								
4	DG Sets - LT	02	Across site	61648	Siddhant								
5	DG Sets - HT	03	DG Room	61648	Siddhant								

Availability of Heavy Vehicles, will be from Project, Dry Cargo and small vehicle, Car, etc will be from Admin Dept.

ALARMS & SIRENS

S r. N o.	Plant wise Alarm Points (Manual Fire Call Point)						The Alarm (signal) is heard (seen) at	Sound difference if any			
	Plant / Dept. / Location		Sr. No. of the Alarm point	Its place of location (with floor No. if any)	Type of the Alarm or Siren	Its Period of checking		Type of Emergen cy	Type of Alarm or Siren	Duration of Sounding	Type of sound of alarm / siren
	Name & Location	No. of Point s									
1	At Marine Control Building (Marine Control Room)	- -	-	On the Top of the Building	Double mounding, motor driven	Weekly (Tuesday 11.00 hrs. and 11:30 hrs)	All Places (Range of the siren is 11 km)	Liquid spillage / Gas leakage Fire	Wailing Wailing	2 minutes 2 times – 2 minutes	Wailing Sound
								All Clearing /Testing	—————	Continuous sound for one minutes	Continuous (02 minutes)
2	Vehicle mounted sirens	2	-	Mobile	Mobile, Battery operated	Weekly	500 mts	Need based	Need based	Need based	Need based

INTERNAL PHONE NUMBERS

Area	Name of Person	Office	Mobile
CEO Southern Ports	Mr. Ennarasu Karunesan	044 4274 2669	91 98843 05955
BUH	Capt. Jeyaraj Thamburaj	044 - 27698107	9099900994
Head – Dry Cargo	Mr. Vijay Majji		7731003330
Head – Container Terminal	Mr. A Madhu	044- 27698160	8939709979
Head - Marine	Capt. Anubhav Jain	044- 27698199	8980015245
Engg. Services	Mr. Venkatachalapathi	044- 27698144	7299972522
Head – Security	Mr. Sundararajan	044- 27698062	8939822617
Head – HR & Admin	Mr Srinivasa Reddy	044- 27698043	9909927243
Head – IT	Mr. Prashant	044- 27698192	9867679846
Head - HSE	Mr. Krishnaraja	044- 27698170	9099995912
Head - Commercial	Mr. Srinivasa kurri	044- 27698150	8939822696
Fire	Mr. Papayya	044- 27698155	9790805142
BHO	Mr. Ramkumar	044- 27698191	7823953573
Environment	Mr. Dontala Siva Prasad	044- 27698129	8939822351
HSE	Mr. Mujubur Rahman	044- 27698171	7299990151
DC	Mr. Chandra Mohan		7299990896
Engg. Service	Mr. Siddhant	044 -27698143	9912358976
Engg. Service	Mr. Selvankar	044- 27698148	7299991959
Site Head –	Mr. Ramachandra		

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
 AUTHORIZED BY: Head (HSE)

Project	Palaka		
Security	Mr. Venkatesh nair	044- 27698065	
HR	Mr. Uthiramoorthy	044- 27698113	8939822607
Admin	Mr. Venkatesh	044- 27698130	9941015554
Transportation	Mr. Senthil	044- 27698098	7823941717
Store	Mr. Kesavan		
-	Marine Control Room		
-	Security Control Room		
-	Fire & Safety Control Room		
-	Occupational health Centre		
-	Ambulance		
Corporate Head – OH&S	Mr.Krishnanand Mavin Kurve		
Head - Corporate Affairs			
	LTSB / KPL Marine Control Room		

EXTERNAL PHONE NUMBERS

Sr. No.	Name	OFFICE	Resident
A.	OTHERS, EXTERNAL		
1.	Collector, Chennai	27661600, 27662533	
2.	Addl. Director Dock Safety –Chennai	9840203259	
3.	District Revenue Officer	27662222	
4.	District Environmental Engineer (Ambattur & Ponneri Taluk)	26880130 /26246522	
5.	District Environmental Engineer (TRT, TLR, PME & GPD Taluks)	27664425	
6.	FIRE SERVICES		
	L&T-PORT	044-27968555/37904774	
	L&TSB	044-33464040/33464004	
	CONTROL ROOM	101, 102	
	PONNERI	044-27974064	
7.	POLICE		
	SP. OFFICE	044-27661010/27665522	
	SPL BRANCH	044-27661010	
	DY.SP [Ponneri] & OFFICE	044-27974013/9445465730	
	PONNERI	044-27929253	
Sr. No.	<i>Name of Emergency Services</i>		
	PONNERI	044-27929253	-
	MINJUR	044-27934268/8428874250	-

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

	KATTUR	044-27980542/9840483734	-
	Asst. COMMISSIONER(Office)	044-23452782	-
8.	MEDICAL (HOSPITAL)-		
	LTSB	044-33464365, 8939441885	
	LTSB	044-33464020	
	RATHNA HOSPITAL	044-27932114	
	SUGAM HOSPITAL	25733830/25733296	
9.	BLOOD BANK		
10.	OTHERS (PWD)		
	E.E. (Building), Tiruvallur	27661174	
11.	SOCIAL SERVICES		
	District Social Welfare	27663912	

Sr. No.	<i>Name of Emergency Services</i>	<i>OFFICE</i>	<i>Resident</i>
12.	EDUCATIONAL INSTITUTES FOR SHELTER		
	Principal, D.I.E.T, Tirur	27620239	
	D.E.O, Tiruvallur	7373002993	
	D.E.O, Ponneri	27972602	7373002996
	District Elementary Education Officer		9750982926
	Inspector of Matriculation Schools	27641844	
13.	MEDICAL FACILITIES		
	DOCTOR ANAND	33464365,	

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

		8939441885	
	L&T SB OHC	33464020	
	RATHNA HOSPITAL	27932114 (MINJUR)	
	SUGAM HOSPITAL	25733830, 25733296 (THIRUVOTTRIYUR)	
14.	PRESS MEDIA FOR INFORMATION.		
	1. Dy. Director Information		
	2. All India Radio		
	3. Daily Thanthi		
	4. Times of India		
	5. Indian Express		
15.	MEDIA		
	1. Doordarshan		
	2. Akashwani (All India Rasdio)		
16.	EXPERTS (INDUSTRIAL SAFETY & HEALTH)		
	Labour Officer	27667117	
	Inspector of Labour	27665160	
	Inspector	27666655	
17.	ELECTRICITY		
	E.E., Tiruvallur	27660218	
	E.E., Ponneri	27974117	
18.	Marine		
	1. Tamil nadu Maritime Board (GMB)		
	2. Indian Coast Guard (ICG)		

NOMINATED PERSONS TO DECLARED MAJOR EMERGENCY

Sr. No.	Name of the plant, department or location	Name & Designation of the nominated person to declare major emergency	Duty of designation given, if any, under the on-site / off- site emergency plan	Phone			Residence Address
				Mobile	Office	Res.	
1	2	3		4	5	6	7
1	Entire Port	Capt. Jeyaraj Thamburaj	Site Main Controller				Chennai
	Port	Mr. A Madhu	Site Dy. Controller				Chennai
	Port	Mr. Srinivasa Reddy – HR - AGM	Incident Controller				Chennai
	Dry Cargo Area	Mr. Vijay Majji	Incident Controller				Chennai
	Marine Area	Capt. Anubhav Jain – AGM Marine	Incident Controller				Chennai

A FORM TO RECORD EMERGENCY TELEPHONE CALLS

Details of call as reported					
Caller' s Name		Caller's Phone No.		Date	
Designation				Time	
Part A: Essential Information					
Brief Description of Incident					
Fire / Explosion / Liquid Spill / Gas Release					
Location of Incident					
Name of Chemicals To be spelt out clearly					
Quantity (Rough Estimate)					
Packaging / Storing / Handling / Using details					
Cause, if known, if brief					
Part B : Essential to be obtained if readily available					
Has anyone been injured?		Yes/No (If yes, how many)			
Affected by Chemicals?		Yes/No (If yes, how many)			
What First-Aid has been given?					
Has anyone been taken to hospital?		Yes/No If yes, address of the Hospital			

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

Is the road Approach blocked?	Yes/No
Closed to traffic?	Yes/No
Who owns the Chemicals? Has the owner been informed?	Yes/No
If caused by Vehicle, Vehicle Number	
Name & Address of the Owner	
Has the owner been informed?	Yes/No
To whom was the load consigned?	

ANNEXURE – 26

STATUTORY COMMUNICATION

Sr. No.	Statutory Information to be given to :	Periodicity of such information to be given. (statutory or self-decided)	Date of last information given	To how many person	Suggestions received if any	Last date of implementation of useful suggestions
1	2	3	4	5	6	7
1	The Workers:					
	a. Disclosure of Information (68-K)	Once & Update		All level of employees		
	b. Hazards of Chemicals and safety aspect (68-K)	Once & Update				
	c. Emergency action sequence (68-K)	Once & Update				
2	The general public and neighboring units:					
	a. Disclosure of Information (68-K)	Once & Update		All the neighboring Units & public in vicinity		
	b. Emergency action sequence (68-K)	Once & Update				
3	Local Crisis Group					
	a. M.S.D.S.	Once & Update		SDM, Emergency		

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

	b. On-site emergency plan	Once & Update		Control Room, Police Station, Fire Brigade, Mutual Aiders.		
	c. Emergency action sequence	Once & Update				
	d. Disclosure of Information	Once & Update				
3	District Crisis Group:					
	a. M.S.D.S.	Once & Update		Dist. Collector ,		
	b. On-site emergency plan	Once & Update		Dy. Collector, Central Control Room, DSP, Fire Brigade.		
	c. Emergency action sequence	Once & Update				
	d. Disclosure of Information	Once & Update				
4	<i>Office of Director Industrial Safety & Health</i>					
	a. On Site Emergency Plan	Once & Update		Office of Director, Industrial Safety & Health		
	a. M.S.D.S.	Once & Update				
	c. Emergency Action Sequence	Once & Update		Joint Director, Industrial Safety & Health		
	d. Disclosure of Information (68-L)	Once & Update		Dy. Director Industrial Safety & Health		

EMERGENCY INSTRUCTION BOOKLET

Sr. No.	Role to be played as (Name emergency designation)	His emergency duties / Function	Also refer (other relevant document of the factory)	He should report at (the incident place or control room)
1	2	3	4	5
1	Site Main Controller (SMC)	<ol style="list-style-type: none"> 1. He will reach to the incident place. 2. He will assess the situation in consultation with Incident controller (HOD), HEAD (FIRE & SAFETY), Head- Security, and categorized the level of emergency and declare emergency accordingly. 3. He will ensure the mobilization of emergency response according to scale of emergency. 4. He will ensure the constant availability of HOD, section head and other required persons at the site of incident. 5. He will ensure that the information will reach to the Head Office. 6. He will ensure necessary shut down of other related plants to control the emergency situation. 7. He will ensure adequacy of firefighting and rescue aid at site to control the incident. 8. He will ensure that all statutory authorities (such as District collector, local crisis group, Director, Industrial Safety & Health / Dock safety, Explosive department, TNPCB, Boiler, Electric Inspector, as applicable are kept informed about the incident. 9. He will ensure that in case of scale of emergency turn to level - 2 or level - 3, mutual members, local crisis group/ District crisis group called upon at the scene of site. 10. He will ensure that injured or casualties are receiving adequate attention for medical treatment and their relatives are kept informed. 11. He will continuously review the possible development of emergency and rescue operation. 12. He will ensure the counting of total number of persons at site, list of missing/trapped person, injured person and fatality. Further, he will ensure to convey the message to the relatives of injured or death. 13. He will ensure press release about the incident for information to the public. 14. If the scale of emergency escalates to level-2, he will ensure that information is passed on to the public likely to be affected in the area. 15. He will ensure that victims are get rehabilitation, if required. 16. Arrange chronological records on the emergency to be maintained. 17. On controlling situation and attending the normalcy, he reviews the situation with IC and HEAD (FIRE & SAFETY) then he will declare the withdrawal of emergency. 	<p>M.S.D.S.,</p> <p>On-site E-Plan,</p> <p>Operational Manual</p>	<p>Emergency Control Centre,</p> <p>Central Control Room,</p> <p>District Crisis Group.</p>

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

Sr. No.	Role to be played as (Name emergency designation)	His emergency duties / Function	Also refer (other relevant document of the factory)	He should report at (the incident place or control room)
1	2	18. He will constitute the internal investigation committee to investigate the incident, recommendations, and corrective measures to prevent reoccurrence of incident.	4	5
		19. Before restarting the plant, he ensures environment clearance from the Environment expert for safe restarting and from Director, Industrial Safety & Health as required.		
		20. He will ensure reporting to the statutory authorities in the format as prescribed.		
1	Incident Controller (I. C.)	1. Immediately rush to emergency site. 2. He will ensure that emergency information passed to the all emergency services i.e Fire Control Room, Security Control Room, Medical Centre, for responding action at incident site. 3. He ensures that all steps are taken for mechanical and electrical isolation to control the situation. 4. He ensures that all key personals will informed and available at site. 5. He ensures co-ordination among all working agencies on the site. 6. He ensures that persons available at site are deployed for emergency handling such as Fire Fighting, Causality searching, rescue and first aid. 7. He ensures the availability of equipments, machineries and devices available in the complex is mobilized at site for lifting and shifting of material from the scene of emergency site. 8. He passes on the information about emergency to HR Department, Administration Department, Chief Security Officer and Site Main Controller. 9. He will ensure that affected area is barricaded and evidences of incident are retained at site. 10. He will take all appropriate decision for the operation / running of the plant. 11. He will ensure to post the person at strategic location to guide the route of incident to the out-side agencies/authority. 12. He will keep update about the happening on site to SMC. 13. On withdrawal of emergency and getting clearance from SMC, he will initiate the start-up procedure of plant. 14. He will ensure to preserve all documents, relevant evidence etc. for subsequent investigation & inquiry. 15. Minimize damage to property, environment and material loss by taking necessary action within control.	M.S.D.S., On-site E-Plan, Operational Manual	Emergency Control Centre, Site Main Controller, Local Crisis Group.
		1. Rush to the site, with required equipments & gadgets and act as assigned their respective duties for handling emergency in consultation with IC & SMC. 2. Will take other directives from IC & SMC.	On-site E-Plan	Incident Place

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
 AUTHORIZED BY: Head (HSE)

3	Key Personnel (K. P.)	3. Direct and help the mutual aiders, outside agencies, traffic vehicles etc. according to the instruction. 4. Do not leave the place of incident unless permitted. 5. Do not take any decision on your own. If any self generated idea for control measures first consult with IC/SMC then put in action, as per discussion. 6. Keep proper and exact all records of relevant matters pertaining to emergency / incident.	M.S.D.S.	Emergency Control Centre, Incident Controller, Site Main Controller
Sr. No.	Role to be played as (Name emergency designation)	His emergency duties / Function	Also refer (other relevant document of the factory)	He should report at (the incident place or control room)
1	2	3	4	5
4	Essential Workers (E. W.)	1. On hearing siren, immediately rush to the scene of incident and act according to directives given by IC/SMC or assigned duties role of emergency plans. 2. Assist & help fire fighting, leak control, first aid, closing valves or supply or other work. 3. Do not take any decision on your own. However, any good idea pertaining to handle emergency effectively, get consulted with IC/SMC & do accordingly. 4. Do not act which will duplicate the same work & without wasting of time & delay, carryout your assigned function with personal protective equipments. 5. Do not leave the place of incident without permission. 6. Report all matters pertaining to emergency to IC / SMC.	On-site E-Plan M.S.D.S.	Incident Place Emergency Control Center, Incident Controller, Site Main Controller
		1. On hearing emergency siren take instructions from shift in charge or supervisor and act accordingly. 2. Assemble at safe assemble points if situation demand or check wind direction and rush to the safe place. They shall assemble in a manner as directed by Assembly point incharge so that counting is easy – preferably 6X4 format.	Disclosure of Information	Supervisor Safe Assembly Point

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

5	Non-Essential Workers	3. Do not get panicky.		
		4. Do not obstruct any activity being done for controlling emergency.		
		5. Do not engage any phone to know about emergency.		
		6. Be alert to hear clear instruction from authority.		
		7. Ensure your presence and help to count numbers.		

Appendix No. A to G

APPENDIX	SUBJECT
A	Local Crisis Group Important Phone Nos.
B	Important Phone Nos. of District Crisis Group
C	List of PPEs
D	List of First Aid Trained Persons
E	Procedure for Spillage Control & Clean up
F	Details of Alternate Shelters
G	Neighboring Industries
H	Fire Fighting Facilities

LOCAL CRISIS GROUP

KATTUPALLI

TELEPHONE NUMBERS

Sr. No.	Name	<i>OFFICE</i>	<i>RESIDENCE</i>
1	Collector	27661600, 27662533	
2	Dy. Director of Industrial, Safety and Health, (Factory Inspector),	27666655	
3	District Adi Dravidar Welfare Officer	27661222	
4	S.P. Tiruvallur	27666555	
5	DPO, Tiruvallur	27661010/27660101	
6	Control Room	27691906	
7	DOCTOR ANAND	044-33464365, 8939441885	
8	Public Relations Officer	27662865	
9	P. A. (Panchayat Development)	27662501	
10	P. A. (Small Savings)	27664012	
11	District Supply Officer	27662400	9445000176
12	District Adi Dravidar Welfare Officer	27661222	
13	Joint Registrar	27662622	
14	Dy. Registrar (Circle)	27660283	

APPENDIX - B

DISTRICT CRISIS GROUP

Thiruvalluvar -

TELEPHONE NUMBERS

Sr. No.	Name	OFFICE	RESIDENCE
1	Collectorate	27662451, 27662452, 27662453, 27662454	
2	Collector	27661600, 27662533	9444132000
3	Addl. Collector / PD (Development)	27663731, 27663808	7373704202
4	District Revenue Officer	27662222	9445000902
5	District Fire Officer	27660299 /27662483	
6	Assistant Fire Officer, Tiruvallur	27660299	
7	Station Fire Officer, Tiruvallur	27660299	
8	Inspector, S.B.(CID)	27664352	
9	Assistant Commissioner (Excise)	27662482	
	Block Development Officers		
10	Villivakkam	26250511	
11	Puzhal	26591026	
12	Sholavaram	26331014	
13	District Environmental Engineer (Ambattur & Ponneri Taluk)	26880130 /26246522	
14	District Environmental Engineer (TRT, TLR, PME & GPD Taluks)	27664425	
15	Chief Education Officer	27601034	
16	District Fire Officer	27660299/27662483	

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

17	Assistant Fire Officer, Tiruvallur	27660299	
18	Station Fire Officer, Tiruvallur	27660299	
19	E.E. (Agri. Engineering.)	27663843	
20	A.E.E (Agri. Eng.)	27661737	
21	Dy. Registrar (PDS), Tiruvallur	27665070	
22	Dy. Registrar, Ponneri	27974081	
23	RM, Civil Supplies	27662417/27664016	
24	Transport - Managing Director	27222302/27222303	
25	General Manager	27660342	9445021399
26	Divisional Manager	27660342	9445021356
27	Branch Manager, Tiruvallur	27660342	9445021368

List of PPE's

Sr. No.	Hazards / Job	Recommended specification for PPE
Head Protection		
A.	Fall of Materials on head	Helmet – conforming to IS:2925
Eye & Face Protection		
B.	Chemical Contact	Panorama goggles/ Face Shield
C.	Contact with liquid / cold vapour of Argon / Nitrogen / Oxygen	Face Shield
D	Gas cutting	Gas cutting goggles
E	Welding	Face Shield
F	Flying body - e.g. Grinding, chipping, de-dusting etc.	Panorama Goggles/ Safety spectacles with side shield / goggles
Protective Clothing		
G	Handling of Chemicals	Apron or suit suitable for Acid & Alkali
H	Welding and Gas cutting operations	Leather apron / leather hand sleeve,
I	Electrical Work	Electrical Flash Protection Suit
Hand Protection		
J	Handling of Cryogenic Liquid	Hand Gloves for cryogenic purpose
K	Handling of Chemicals	Rubber gloves suitable of acid * Alkaloid, IS:4149
L	Welding & Gas cutting operation	Leather hand gloves, IS:6994
M	Electrical work	Electrical hand gloves conforming, IS: 4770
N	Material Handling	Leather cum canvas hand gloves
Feet Protection		
O	Fall of material	Safety shoes with Steel Toe Cap, IS:11226
R	Electrical Hazard	Safety Shoes with electrical test certificate.
S	Chemical Hazard	Safety shoes with Chemical resistance sole
Leg Protection		
T	Handling of Cryogenic liquid	Leg guards of suitable material same as of hand gloves
U	Welding & Gas cutting operation	Leg guard of leather

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
 AUTHORIZED BY: Head (HSE)

Protection of Lungs		
V	Chemical / Fumes	Respirator suitable for chemical; IS:8522 or Breathing apparatus conforming to IS:10245
W	Rust / Paint / Dust removal form material / Wall	Respirator, Canister type (gas mask), IS 8523 or Dust mask of Dusters as per the need.
X	Confined space	Breathing apparatus IS:10245
Y	Fire / Rescue	Close circuit breathing apparatus,
Ear Protection		
Z	Noise	Ear Muff / Ear Plug; IS:3521
Protection to fall from heights		
AA	Fall from heights	Full body harness with components permitting 2200 Kg. tensile strength and to limit wearers free fall to 1.8 m

LIST OF FIRST AID TRAINED PERSONS

Sr. No.	Batch	Name of Participant	Company	Department	Grade	Contact No.
1	4.08.2017 & 5.08.2017 St. Johns Ambulance	Aron Gnanamani	Global	HSE	Safety Officer	9962065571
2		Nameer	MIDPL	HSE	Management Trainee	9846302678
3		Rajasekaran Nair	L&T	Security	Security Officer	7299034552
4		Venkatesh	L&T	Security	Security Officer	7299211446
5		S Palanivel	L&T	Store	Officer	7299312200
6		Jayakumar	L&T	Engg Services		
7		Sathyajit Malik	Global	Admin	Officer	9659977997
8		Dayalan	Global	Operations	Operator	
9		Sakthi prasad	Global	Operations	Operator	
10		K Chandrasekaran	L&T	Operations	Operator	9841460134
11		Anandan	L&T	Engg Services	Engineer – Electrical	

APPENDIX - E

Procedure for On Shore Chemical / Oil Spillage Control & Clean up
Information of "Emergency Handling Plan for Spill Control" is given in the training program/demonstration at site/table top exercise to the participants as per the procedure.
Minor Emergency: To inform the area in-charge & HSE department through mail/ register or NC report.
Direct the shift in-charge to handle the emergency/ Nonconformance.
Handle the Emergency/Non Conformance as per instruction of shift in-charge.
Properties of spilled item (Chemical, Oil etc.) must be known before handling the spillage. Refer the MSDS, before handling the spillage.
Barricade of the area must be done in spillage area with mandatory signage.
Curb the spillage with the help of soil curbing or absorbent material.
After curbing, Collect spilled hazardous chemical with absorbent, scarp out the contaminated soil & put in to separate drums/HDPE bags. Use appropriate PPE.
Collect the spilled material, with the help of pump from sump if any and take them in appropriate container. Dilute the spillage with water if needed.
Take the contaminated effluent with chemical in separate container from the sump with the help of pumping. Take that effluent in effluent treatment plant for further treatment.
Provide firefighting equipment at the side as standby.
Declare the emergency.
Provide information about Emergency/Non Conformance to government authority if required.
Collected spilled material must be sent to waste storage yard with identification tags mentioning the contents.
Proper storage of spilled material received from respective area & update records of receipts.
Arrange disposal of wastes either to GPCB-approved CHWTSD/CHWIF or to the SPCB /CPCB/MoEF-approved vendor with proper MANIFEST system as per the HW (MH&TM) Rules, 2008.
Handover drums containing oil sludge to GPCB/CPCB/MoEF-approved vendors for disposal & update the records of issue. The vendors should have a valid Authorization from SPCB/CPCB/MoEF.

The off-shore leak should be handled as per the Marine Oil / Chemical Spill Response Plan

APPENDIX F

DETAILS OF ALTERNATE SHELTER

Sr. No. of Assembly point	Location	Accommodation Capacity	At the time of emergency	
			Person in charge	Phone number
1	In front of Site office – Near Office Gate	100 nos.	Mr. Sundararajan Head - Security	
2	Near Container Yard	100 nos.	Incharge – Container operations	
3	Near Custom Office Crossing	150 nos.	Incharge – Container operations	
4	Near Port Gate House Complex	150 nos.	Mr. Sundararajan Head - Security	

The shelters and facilities available in Annexure 23

The Safe Escape Route to Shelters are marked in Escape Route Map in Annexure 3

NEIGHBORING INDUSTRIES

MIDPL is situated in Kattupalli closed to L & T Ship Building, Kattupalli and Kamarajar Port Ltd.

The following industries / organization are helping each other during time of crisis.

Sr.	Name of Organization	Equipment / Facility available with the Industry
1	Marine Infrastructure Developer Pvt Ltd	Fire Tender -1 nos. Ambulance – 1 no Fire Crew BA Sets
2	LTSB	Fire Tender -1nos. Fire Crew BA Sets
3	KPL	Fire Tender -1 no. Ambulance – 1 no Fire Crew BA Sets
4	Athipattu Pudhu Nagar - fire Station	Fire Tender -1nos. Fire Crew BA Sets Al. Suits

The procedure for communication to External agencies is mentioned in Chapter 14 and Chapter 11.

The Telephone no. of above Industries / Organizations are mentioned Chapter 11 and in Annexure 26, Appendix A & B

FIRE FIGHTING FACILITIES

FIRE FIGHTING & PROTECTION SYSTEM

3.0 Fire Hydrant System for Multi-Purpose Terminal / Jetty

Water Storage: Fire water inlet is taken from sweet water from desalination plant (TN) to Fire Pump House Sump.

Details of Fire Water Pump House are as given below.

Sr.No.	Type of Pump	Quantity	Capacity	RPM	Head	Make	Details
1	Jockey	01	75 m ³ /hr	2965	131.5 Mtr	FLOWMORE Vertical Pumps	Pump Input 35.46KW SR No. 15122382-20-1 & 15122382-20-2
2	Main (Diesel)	02	720 m ³ /hr	1500	131.5 Mtr	AMRILLO	536HP, Model S600AS Sr No. 333380/333359/333361
3	Main (Electrical)	02	33 m ³ /hr	1475	NA	Crompton Greaves	Sr No. 16-02425 Model- RDZX-1-300-L Rotary Gear Pump

4.1.1 Portable Firefighting Equipment's.

S.NO	EXT NO.	TYPE OF EXT.	CAPACITY	LOCATION	SUB LOCATION
1	L&T-FE-110	CO2	4.5kg	Work shop	Shutter entrance inside left
2	L&T-FE-111	CO2	4.5kg	Work shop	Shutter entrance opposite wall
3	L&T-FE-045	BC	5kg	Work shop	Shutter Entrance Rightside
4	L&T-FE-400	ABC	6kg	Work shop	Shutter Entrance Rightside
5	L&T-FE-322	ABC	6kg	Work shop	Dressing room entrance
6	L&T-FE-323	ABC	6kg	Work shop	Shift Engineer Room
7	L&T-FE-231	CO2	4.5kg	Work shop	Near ETP
8	L&T-FE-011	Foam	9 litre	Work shop	
9	L&T-FE-010	Foam	9 litre	Store	
10	L&T-FE-004	Foam	50 litre	Store	
11					
12	L&T-FE-112	CO2	4.5 kg	Store	
13	L&T-FE-226	CO2	4.5 kg	work shop substation	Near work shop north side wall
14	L&T-FE-325	ABC	6 kg	work shop substation	Near work shop
15	L&T-FE-113	CO2	4.5 kg	work shop substation	Near work shop
16	L&T-FE-114	CO2	4.5 kg	work shop substation	Near work shop
17	L&T-FE-321	ABC	6 kg	FS(POB)	Fuel Station
18	L&T-FE-109	CO2	4.5 kg	FS(POB)	Fuel Station
19	L&T-FE-002	Foam	50 lts	FS(POB)	Fuel Station
20	L&T-FE-003	Foam	50 lts	FS(POB)	Fuel Station
21	L&T-FE-046	BC	10 kg	FS(POB)	Bowser Vehicle
22	L&T-FE-375	ABC	6kg	CFS(ADMIN)	

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

23	L&T-FE-376	ABC	6kg	CFS(ADMIN)	
24	L&T-FE-376	ABC	6kg	CFS(ADMIN)	
25	L&T-FE-377	ABC	6kg	CFS(ADMIN)	
26	L&T-FE-378	ABC	6kg	CFS(ADMIN)	
27	L&T-FE-390	ABC	6kg	CFS(ADMIN)	Executive Canteen
28	L&T-FE-395	ABC	6kg	CFS(ADMIN)	ETP-CFS office back side
29	L&T-FE-238	CO2	2kg	CFS(ADMIN)	Server room
30	L&T-FE-374	ABC	6 kg	CFS	Near to transformer
31	L&T-FE-387	ABC	6 kg	CFS	Entry gate security office
32	L&T-FE-388	ABC	6 kg	CFS	Security out gate
33	L&T-FE-389	ABC	6 kg	CFS	Weigh bridge
34	L&T-FE-228	CO2	4.5kg	CFS	CFS substation
35	L&T-FE-229	CO2	22.5kg	CFS	CFS substation
36	L&T-FE-008	Foam	50 lts	Fuel storage area	Near CFS
37	L&T-FE-009	Foam	50 lts	Fuel storage area	Near CFS
38	L&T-FE-371	ABC	6kg	MRSS	GF, Passage
39	L&T-FE-372	ABC	6kg	MRSS	GF, Passage
40	L&T-FE-373	ABC	6kg	MRSS	GF, Passage
41	L&T-FE-133	CO2	22.5kg	MRSS	GF, Passage North side
42	L&T-FE-134	CO2	22.5kg	MRSS	GF, Passage South side
43	L&T-FE-135	CO2	22.5kg	MRSS	GF, East entrance inside
44	L&T-FE-136	CO2	22.5kg	MRSS	Switch Yard inside
45	L&T-FE-006	Foam	50 lts	DG	Gen-set
46	L&T-FE-007	Foam	9 lts	DG	Gen-set
47	L&T-FE-137	CO2	22.5 kg	DG	Electrical panel
48	L&T-FE-138	CO2	22.5 kg	DG	Gen-set
49	L&T-FE-139	CO2	4.5 kg	DG	Gen-set
50	L&T-FE-233	CO2	4.5 kg	Porta cabin	Near DG(Gate complex)

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

51	L&T-FE-406	ABC	6 kg	Porta cabin	Near DG (Gate complex)
52	L&T-FE-227	CO2	4.5Kg	Raw Water pump house	Entrance left side
53	L&T-FE-370	ABC	06Kg	Raw Water pump house	North side wall inside
54	L&T-FE-361	ABC	6Kg	Immigration building passage	
55	L&T-FE-347	ABC	06Kg	Custom Building	G.F Indian bank
56	L&T-FE-348	ABC	02Kg	Custom Building	G.F Indian bank
57	L&T-FE-349	ABC	06Kg	Custom Building	G.F Customs
58	L&T-FE-350	ABC	06Kg	Custom Building	G.F Customs
59	L&T-FE-408	ABC	6 kg	Custom building	battery room in bank
60	L&T-FE-351	ABC	6kg	Custom Building	First Floor server left wing
61	L&T-FE-352	ABC	6kg	Custom Building	First floor
62	L&T-FE-129	CO2	4.5kg	Custom Building	GF ,South side
63	L&T-FE-130	CO2	4.5kg	Custom Building	First floor right wing-
64	L&T-FE-354	ABC	6kg	Custom Building	First floor left wing
65	L&T-FE-355	ABC	2kg	Custom Building	First floor left wing
66	L&T-FE-356	ABC	6kg	Custom Building	Second floor right wing-
67	L&T-FE-357	ABC	2kg	Custom Building	Second floor right wing-
68	L&T-FE-358	ABC	6kg	Custom Building	Second floor left wing-
69	L&T-FE-359	ABC	6kg	Custom Building	Second floor left wing- B
70	L&T-FE-360	ABC	6kg	Custom Building	Second floor left wing- B
71	L&T-FE-327	ABC	06Kg	Quay sub station	G.F Below steps
72	L&T-FE-328	ABC	06Kg	Quay sub station	First Floor
73	L&T-FE-115	CO2	4.5Kg	Quay sub station	First Floor
74	L&T-FE-116	CO2	4.5Kg	Quay sub station	First Floor
75	L&T-FE-117	CO2	4.5Kg	Quay sub station	First Floor
76	L&T-FE-118	CO2	22Kg	Quay sub station	First Floor
77	L&T-FE-379	ABC	6 kg	CFS	Ware house Inside shutter(north Wall)

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

78	L&T-FE-380	ABC	6 kg	CFS	Ware house Inside shutter(north Wall)
79	L&T-FE-381	ABC	6 kg	CFS	Ware house Inside shutter(north Wall) near DB-4
80	L&T-FE-382	ABC	6 kg	CFS	Ware house Inside shutter(north Wall)
81	L&T-FE-383	ABC	6 kg	CFS	Ware house Inside shutter (South Wall)
82	L&T-FE-384	ABC	6 kg	CFS	Ware house Inside shutter (South Wall)
83	L&T-FE-385	ABC	6 kg	CFS	Ware house Inside shutter (South Wall)
84	L&T-FE-386	ABC	6 kg	CFS	Ware house Inside shutter (South Wall)
85	L&T-FE-140	Co2	4.5 kg	CFS	Ware house near panel board west side
86	L&T-FE-141	Co2	4.5 kg	CFS	Ware house near panel board west side
87	L&T-FE-333	ABC	6kg	Firewater pump house	Southside wall inside
88	L&T-FE-334	ABC	6kg	Firewater pump house	Southside wall inside
89	L&T-FE-335	ABC	6kg	Firewater pump house	Southside wall inside
90	L&T-FE-120	CO2	4.5kg	Firewater pump house	Entrance near right side panel
91	L&T-FE-121	CO2	4.5kg	Firewater pump house	Southside wall inside near panel
92	L&T-FE-005	Foam	9litre	Firewater pump house	Near Diesel Driven Pump
93	L&T-FE-362	ABC	6kg	Security office	Near Gate complex(North)
94	L&T-FE-363	ABC	6 kg	Security office	Near Gate complex(South)
95	L&T-FE-131	Co2	2 kg	Security office	Near Gate complex(North)
96	L&T-FE-132	Co2	4.5 kg	Security office	Near Gate complex(South)
97	L&T-FE-364	ABC	2kg	Gate house complex	In gate-1
98	L&T-FE-365	ABC	2kg	Gate house complex	In gate-2
99	L&T-FE-366	ABC	2kg	Gate house complex	In gate-3
100	L&T-FE-367	ABC	2kg	Gate house complex	Out gate-1
101	L&T-FE-368	ABC	2kg	Gate house complex	Out gate-2
102	L&T-FE-369	ABC	2kg	Gate house complex	Out gate-3
103	L&T-FE-329	ABC	6 kg	Port signal station	Port Side Hall
104	L&T-FE-330	ABC	6 kg	Port signal station	Sea Side Hall
105	L&T-FE-331	ABC	6 kg	Port signal station	6th floor Office entrance(out side)
106	L&T-FE-332	ABC	6 kg	Port signal station	G.F Near Lift
107	L&T-FE-119	Co2	2 kg	Port signal station	6th Floor Back Side

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

108	L&T-FE-302	ABC	06 kg	POB	G.F. Operator Rest Room
109	L&T-FE-303	ABC	06 kg	POB	G.F. Canteen dining Hall
110	L&T-FE-304	ABC	02 kg	POB	G.F. Canteen store Room
111	L&T-FE-306	ABC	06 kg	POB	F.F. Electrical Dp Box Room opposite
112	L&T-FE-307	ABC	06 kg	POB	F.F. Passage
113	L&T-FE-308	ABC	06 kg	POB	F.F. Passage
114	L&T-FE-309	ABC	06 kg	POB	F.F. Passage
115	L&T-FE-310	ABC	06 kg	POB	F.F. Near punching machine
116	L&T-FE-311	ABC	06 kg	POB	S.F. Passage
117	L&T-FE-312	ABC	06 kg	POB	S.F. Passage
118	L&T-FE-313	ABC	06 kg	POB	S.F. Passage
119	L&T-FE-314	ABC	06 kg	POB	S.F. Operation planning Room
120	L&T-FE-315	ABC	06 kg	POB	S.F. punching machine
121	L&T-FE-316	ABC	06 kg	POB	S.F. opposite DP Box Room
122	L&T-FE-401	ABC	6kg	POB	Executive Canteen
123	L&T-FE-402	ABC	6kg	POB	G.F canteen (Cooking Area)
124	L&T-FE-403	ABC	06kg	POB	G.F canteen (Gas cylinder storage area)
125	L&T-FE-101	CO2	4.5 kg	POB	G.F Electrical room(IR DEPT)
126	L&T-FE-102	CO2	4.5 kg	POB	G.F Electrical DP box(punching mech.)
127	L&T-FE-103	CO2	4.5 kg	POB	G.F Canteen (dining hall)
128	L&T-FE-104	CO2	4.5 kg	POB	G.F canteen (Freezer room entrance)
129	L&T-FE-105	CO2	4.5 kg	POB	F.F Electrical DP box room
130	L&T-FE-235	CO2	2kg	POB	S.F.Behind IT manager room
131	L&T-FE-236	CO2	2kg	POB	IR Dept Room
132	L&T-FE-106	CO2	4.5 kg	POB	S.F Electrical DP box room
133	L&T-FE-107	CO2	4.5 kg	POB	S.F Server room
134	L&T-FE-001	Foam	09ltr	POB	G.f Canteen(cooking area)
135	L&T-FE-336	ABC	6 kg	PAB	G.F, Passage
136	L&T-FE-337	ABC	6 kg	PAB	G.F, Passage
137	L&T-FE-338	ABC	6 kg	PAB	G.F, Passage

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

138	L&T-FE-339	ABC	2 kg	PAB	G.F,Referesh room
139	L&T-FE-340	ABC	6 kg	PAB	G.F, Passage
140	L&T-FE-341	ABC	6 kg	PAB	F.F, Passage
141	L&T-FE-342	ABC	6 kg	PAB	F.F, Passage
142	L&T-FE-343	ABC	6 kg	PAB	F.F, Passage
143	L&T-FE-344	ABC	6 kg	PAB	F.F, Punching mechine
144	L&T-FE-345	ABC	6 kg	PAB	F.F, UPS DB room oppsite
145	L&T-FE-346	ABC	6 kg	PAB	F.F, UPS DB room oppsite room back side
146	L&T-FE-122	Co2	4.5 kg	PAB	G.F, Electrical room
147	L&T-FE-123	Co2	4.5 kg	PAB	G.F,Electrical DB room
148	L&T-FE-124	Co2	4.5 kg	PAB	G.F,UPS DB room outside
149	L&T-FE-125	Co2	4.5 kg	PAB	F.F,Electical DB room inside
150	L&T-FE-126	Co2	4.5 kg	PAB	F.F,UPS DB room inside
151	L&T-FE-127	Co2	2 kg	PAB	Server room inside
152	L&T-FE-128	Co2	2 kg	PAB	Server room inside
153	L&T-FE-132	Co2	4.5kg	PAB	UPS Room
154	L&T-FE-398	ABC	6.0kg	PAB	Reception
155	L&T-FE-399	ABC	2.0kg	PAB	First Floor server room inside
156	L&T-FE-234	Co2	4.5kg	PAB	Second floor UPS DB room inside
157	L&T-FE-108	Co2	4.5	Fire station	Fire store room
158	L&T-FE-320	ABC	2kg	Fire station	OHC Entrance
159	L&T-FE-396	ABC	6kg	Main gate security office	Main gate security office
160	L&T-FE-392	ABC	6kg	Weigh bridge 1	
161	L&T-FE-391	ABC	6kg	Weigh bridge 2	
162	L&T-FE-393	ABC	6kg	Port user facility building	Near by Truck lay bay
163	L&T-FE-166	Co2	2 kg	RTG-21	E. House entrance
164	L&T-FE-167	Co2	2 kg	RTG-21	Operator Cabin entrance
165	L&T-FE-168	Co2	2 kg	RTG-21	Trally House
166	L&T-FE-169	Co2	2 kg	RTG-21	Engine Side

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

167	L&T-FE-048	BC	5kg	RTG-21	G.F,E.House side
168	L&T-FE-049	BC	5 kg	RTG-21	G.F, Engine side
169	L&T-FE-170	Co2	2 kg	RTG-22	E. House entrance
170	L&T-FE-171	Co2	2 kg	RTG-22	Operator Cabin entrance
171	L&T-FE-172	Co2	2 kg	RTG-22	Trally House
172	L&T-FE-173	Co2	2 kg	RTG-22	Engine Side
173	L&T-FE-409	ABC	6 kg	RTG-22	G.F,E.House side
174	L&T-FE-410	ABC	6 kg	RTG-22	G.F, Engine side
175	L&T-FE-174	Co2	2 kg	RTG-23	E. House entrance
176	L&T-FE-175	Co2	2 kg	RTG-23	Operator Cabin entrance
177	L&T-FE-176	Co2	2 kg	RTG-23	Trally House
178	L&T-FE-177	Co2	2 kg	RTG-23	Engine Side
179	L&T-FE-411	ABC	6 kg	RTG-23	G.F,E.House side
180	L&T-FE-050	BC	5 kg	RTG-23	G.F, Engine side
181	L&T-FE-178	Co2	2 kg	RTG-24	E. House entrance
182	L&T-FE-179	Co2	2 kg	RTG-24	Operator Cabin entrance
183	L&T-FE-180	Co2	2 kg	RTG-24	Trally House
184	L&T-FE-181	Co2	2 kg	RTG-24	Engine Side
185	L&T-FE-412	ABC	6 kg	RTG-24	G.F,E.House side
186	L&T-FE-413	ABC	6 kg	RTG-24	G.F, Engine side
187	L&T-FE-182	Co2	2 kg	RTG-25	E. House entrance
188	L&T-FE-183	Co2	2 kg	RTG-25	Operator Cabin entrance
189	L&T-FE-184	Co2	2 kg	RTG-25	Trally House
190	L&T-FE-185	Co2	2 kg	RTG-25	Engine Side
191	L&T-FE-414	ABC	6 kg	RTG-25	G.F,E.House side
192	L&T-FE-415	ABC	6 kg	RTG-25	G.F, Engine side
193	L&T-FE-186	Co2	2 kg	RTG-26	E. House entrance
194	L&T-FE-187	Co2	2 kg	RTG-26	Operator Cabin entrance
195	L&T-FE-188	Co2	2 kg	RTG-26	Trally House
196	L&T-FE-189	Co2	2 kg	RTG-26	Engine Side

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

197	L&T-FE-416	ABC	6 kg	RTG-26	G.F,E.House side
198	L&T-FE-417	ABC	6 kg	RTG-26	G.F, Engine side
199	L&T-FE-190	Co2	2 kg	RTG-27	E. House entrance
200	L&T-FE-191	Co2	2 kg	RTG-27	Operator Cabin entrance
201	L&T-FE-192	Co2	2 kg	RTG-27	Trally House
202	L&T-FE-193	Co2	2 kg	RTG-27	Engine Side
203	L&T-FE-418	ABC	6 kg	RTG-27	G.F,E.House side
204	L&T-FE-419	ABC	6 kg	RTG-27	G.F, Engine side
205	L&T-FE-194	Co2	2 kg	RTG-28	E. House entrance
206	L&T-FE-195	Co2	2 kg	RTG-28	Operator Cabin entrance
207	L&T-FE-196	Co2	2 kg	RTG-28	Trally House
208	L&T-FE-197	Co2	2 kg	RTG-28	Engine Side
209	L&T-FE-051	BC	5 kg	RTG-28	G.F,E.House side
210	L&T-FE-052	BC	5 kg	RTG-28	G.F, Engine side
211	L&T-FE-198	Co2	2 kg	RTG-29	E. House entrance
212	L&T-FE-199	Co2	2 kg	RTG-29	Operator Cabin entrance
213	L&T-FE-200	Co2	2 kg	RTG-29	Trally House
214	L&T-FE-201	Co2	2 kg	RTG-29	Engine Side
215	L&T-FE-053	BC	5 kg	RTG-29	G.F,E.House side
216	L&T-FE-054	BC	5 kg	RTG-29	G.F, Engine side
217	L&T-FE-202	Co2	2 kg	RTG-30	E. House entrance
218	L&T-FE-203	Co2	2 kg	RTG-30	Operator Cabin entrance
219	L&T-FE-204	Co2	2 kg	RTG-30	Trally House
220	L&T-FE-205	Co2	2 kg	RTG-30	Engine Side
221	L&T-FE-055	BC	5 kg	RTG-30	G.F,E.House side
222	L&T-FE-056	BC	5 kg	RTG-30	G.F, Engine side
223	L&T-FE-206	Co2	2 kg	RTG-31	E. House entrance
224	L&T-FE-207	Co2	2 kg	RTG-31	Operator Cabin entrance
225	L&T-FE-208	Co2	2 kg	RTG-31	Trally House
226	L&T-FE-209	Co2	2 kg	RTG-31	Engine Side

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
AUTHORIZED BY: Head (HSE)

227	L&T-FE-420	ABC	6 kg	RTG-31	G.F,E.House side
228	L&T-FE-421	ABC	6 kg	RTG-31	G.F, Engine side
229	L&T-FE-210	Co2	2 kg	RTG-32	E. House entrance
230	L&T-FE-211	Co2	2 kg	RTG-32	Operator Cabin entrance
231	L&T-FE-212	Co2	2 kg	RTG-32	Trally House
232	L&T-FE-213	Co2	2 kg	RTG-32	Engine Side
233	L&T-FE-422	ABC	6 kg	RTG-32	G.F,E.House side
234	L&T-FE-423	ABC	6 kg	RTG-32	G.F, Engine side
235	L&T-FE-214	Co2	2 kg	RTG-33	E. House entrance
236	L&T-FE-215	Co2	2 kg	RTG-33	Operator Cabin entrance
237	L&T-FE-216	Co2	2 kg	RTG-33	Trally House
238	L&T-FE-217	Co2	2 kg	RTG-33	Engine Side
239	L&T-FE-057	BC	5 kg	RTG-33	G.F,E.House side
240	L&T-FE-058	BC	5 kg	RTG-33	G.F, Engine side
241	L&T-FE-218	Co2	2 kg	RTG-34	E. House entrance
242	L&T-FE-219	Co2	2 kg	RTG-34	Operator Cabin entrance
243	L&T-FE-220	Co2	2 kg	RTG-34	Trally House
244	L&T-FE-221	Co2	2 kg	RTG-34	Engine Side
245	L&T-FE-059	BC	5 kg	RTG-34	G.F,E.House side
246	L&T-FE-424	ABC	6 kg	RTG-34	G.F, Engine side
247	L&T-FE-222	Co2	2 kg	RTG-35	E. House entrance
248	L&T-FE-223	Co2	2 kg	RTG-35	Operator Cabin entrance
249	L&T-FE-224	Co2	2 kg	RTG-35	Trally House
250	L&T-FE-225	Co2	2 kg	RTG-35	Engine Side
251	L&T-FE-060	BC	5 kg	RTG-35	G.F,E.House side
252	L&T-FE-061	BC	5 kg	RTG-35	G.F, Engine side
253	L&T-FE-142	Co2	9 kg	CB-1	QC-1/Computer Room
254	L&T-FE-143	Co2	9 kg	CB-1	QC-1/Electrical Room
255	L&T-FE-144	Co2	4.5 kg	CB-1	QC-1/Boom House cabin
256	L&T-FE-145	Co2	4.5 kg	CB-1	QC-1/Operator Cabin

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
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257	L&T-FE-021	BC	5 kg	CB-1	QC-1/Checker Cabin
258	L&T-FE-022	BC	5 kg	CB-1	QC-1/Electrical Room
259	L&T-FE-023	BC	5 kg	CB-1	QC-1/Machine House
260	L&T-FE-024	BC	10 kg	CB-1	QC-1/Machine House
261	L&T-FE-146	Co2	9 kg	CB-1	QC-2/Computer Room
262	L&T-FE-147	Co2	9 kg	CB-1	QC-2/Electrical Room
263	L&T-FE-148	Co2	4.5 kg	CB-1	QC-2/Boom House cabin
264	L&T-FE-149	Co2	4.5 kg	CB-1	QC-2/Operator Cabin
265	L&T-FE-025	BC	5 kg	CB-1	QC-2/Checker Cabin
266	L&T-FE-026	BC	5 kg	CB-1	QC-2/Electrical Room
267	L&T-FE-027	BC	5 kg	CB-1	QC-2/Machine House
268	L&T-FE-028	BC	10 kg	CB-1	QC-2/Machine House
269	L&T-FE-150	Co2	9 kg	CB-1	QC-3/Computer Room
270	L&T-FE-151	Co2	9 kg	CB-1	QC-3/Electrical Room
271	L&T-FE-152	Co2	4.5 kg	CB-1	QC-3/Boom House cabin
272	L&T-FE-153	Co2	4.5 kg	CB-1	QC-3/Operator Cabin
273	L&T-FE-029	BC	5 kg	CB-1	QC-3/Checker Cabin
274	L&T-FE-030	BC	5 kg	CB-1	QC-3/Electrical Room
275	L&T-FE-031	BC	5 kg	CB-1	QC-3/Machine House
276	L&T-FE-032	BC	10 kg	CB-1	QC-3/Machine House
277	L&T-FE-154	Co2	9 kg	CB-2	QC-5/Computer Room
278	L&T-FE-155	Co2	9 kg	CB-2	QC-5/Electrical Room
279	L&T-FE-156	Co2	4.5 kg	CB-2	QC-5/Boom House cabin
280	L&T-FE-157	Co2	4.5 kg	CB-2	QC-5/Operator Cabin
281	L&T-FE-033	BC	5 kg	CB-2	QC-5/Checker Cabin
282	L&T-FE-034	BC	5 kg	CB-2	QC-5/Electrical Room
283	L&T-FE-035	BC	5 kg	CB-2	QC-5/Machine House
284	L&T-FE-036	BC	10 kg	CB-2	QC-5/Machine House
285	L&T-FE-158	Co2	9 kg	CB-2	QC-6/Computer Room
286	L&T-FE-159	Co2	9 kg	CB-2	QC-6/Electrical Room

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
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287	L&T-FE-160	Co2	4.5 kg	CB-2	QC-6/Boom House cabin
288	L&T-FE-161	Co2	4.5 kg	CB-2	QC-6/Operator Cabin
289	L&T-FE-037	BC	5 kg	CB-2	QC-6/Checker Cabin
290	L&T-FE-038	BC	5 kg	CB-2	QC-6/Electrical Room
291	L&T-FE-039	BC	5 kg	CB-2	QC-6/Machine House
292	L&T-FE-040	BC	10 kg	CB-2	QC-6/Machine House
293	L&T-FE-162	Co2	9 kg	CB-2	QC-7/Computer Room
294	L&T-FE-163	Co2	9 kg	CB-2	QC-7/Electrical Room
295	L&T-FE-164	Co2	4.5 kg	CB-2	QC-7/Boom House cabin
296	L&T-FE-165	Co2	4.5 kg	CB-2	QC-7/Operator Cabin
297	L&T-FE-041	BC	5 kg	CB-2	QC-7/Checker Cabin
298	L&T-FE-042	BC	5 kg	CB-2	QC-7/Electrical Room
299	L&T-FE-043	BC	5 kg	CB-2	QC-7/Machine House
300	L&T-FE-044	BC	10 kg	CB-2	QC-7/Machine House

5.0 PPE & Safety Equipment in Fire Tender

PPE & Safety Equipment		
Sr.No.	Type	No.
1.	Self-Breathing Apparatus – Fire Tender	01

6.0 Fire Trained Persons

2016		2017	
EMPLOYEE	CONTRACTOR	EMPLOYEE	CONTRACTOR
15	08	30	42

7.2 Fire Vehicle - Water cum foam Tender

Vehicle Data		
Sr.No.		
1	Vehicle Number :	TN18 P 1734
2	Vehicle Make by :	TATA Motors
3	Vehicle Model :	1616
4	Engine Number No :	
5	Chassis Number No :	Water cum foam
6	Fire Engine Type :	Water & Foam
7	Manufacturing Date :	19.03.2012
8	Fire Pump Make by :	NK Fire safety
9	Fire Pump Model :	SS304
10	Water Tank Capacity :	5500Ltrs
11	Foam Tank Capacity :	500 Ltrs
12	Pump Capacity :	32002250 Ltrs/ Per Min
13	Fire Pump Sr. no :	

7.2.1 Equipment & Material in Water cum Foam Tender

Sr No.	Equipment Name	Qty
1	Torch	1 no
2	Fireman Axe	01no
3	B.A. Sets	01 no
4	Wheel Spanners	01 no
5	Jack & Tommy	01 no
6	Life Buoy	01 no
7	First Aid kit	01 no
8	Battery (12V, 100Ah)	02no's

9	Parking Tringles	02no's
10	Battery Charger	01 no
11	Tool Box	01 no
12	Hose Clamp	04no's
13	Hose Bandages	05no's
14	Inline inductor's with pickup tubes	01no
15	Proximity suite	01 no
16	Pick axe (Trikam)	01 no
17	Spade	01 no
18	Hammer	01 no
19	Manila Rope 20mts-03	01no
20	Basket Strainer	01no
21	Metal Strainer	01no
22	Delivery Hose Pipes (RRL 15mts)	04no's
23	TP Branches	01 no
24	Fog Branch	01no's
25	Universal Branch	01no's
26	Revolving Branch	01no's
27	Short Branch	01no's
28	London Pattern Hand control	01no's
29	Female to Female Adaptor	01no's
30	Hand Control Dividing Breaching	01no's
31	Three-way Collecting Head	01no's
32	Suction Hose	03no's
33	Celling Hook	01 no
34	Co2 Extinguishers	02no's
35	Ext Ladder at FWPH	01 no

9.0 FIXED FIRE SYSTEM

Fixed firefighting system:

1. POB Building – FM 200 Suppression system with manual actuation.
2. Foam System with Water cum Foam Monitor

10.0 DETAILS OF FIRE ALARM / DETECTION SYSTEMS

Sr. No.	LOCATION	ISD	GD	MCP	HOOTER	TOTAL
1	Marine	06	00	01	00	07
2	Engg – Workshop	02	00	12	05	19
3	Port Operation	11	00	06	05	22

MARINE INFRASTRUCTURE DEVELOPER PVT. LTD.
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN
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	Building					
4	CFS	12	00	02	02	16
5	Port Admin Building	08	00	03	02	13
6	MRSS	14	00	01	01	16
7	Quay Sub station	23	00	02	02	27
	TOTAL	76	00	27	17	120

LEGENDS

ISD : IONIZED SMOKE DETECTORS

HD : HEAT DETECTOR

MCP : MANUAL CALL POINT

GD : GAS DETECTOR

11.0 DETAILS OF GAS DETECTORS / KIT INSTALLED IN FIELD

Sr. No	Description	Qty.
1	GAS Detector VOC type – Pump House	1No

Mock Drills Oct-2017 to April-2018

S.No.	Date	Time	Scenario	Participants
1	18.10.17	23:40	Fire at Fuel Station	12
2	12.11.17	16:01	Unconscious RTG operator	14
3	31.01.17	21:46	Fire at reefer yard	27
4	20.03.18	11:32	Diesel spillage	23
5	30.03.18	12:30	Snake Bite	15
6	16.04.18	14:45	Fire at backup area	51
7	28.04.18	10:31	Heat Stroke	22



