Deendayal Port Authority
(Erstwhile :Deendayal Port Trust)

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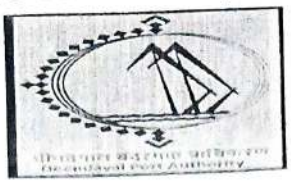

Office of the Dy.CE & EMC (i/c),
ANNEX. Administrative Office
Gandhidham - Kutch
Pin – 370 201.

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EG/WK/4751/Part (Revamping – EC onwards)/ 22

Dated: 03/02/ 2025

To,
The Deputy Director General of Forests (C),
Ministry of Environment, Forest & Climate Change,
Integrated Regional Office,
Gandhinagar, A wing-407 & 409,
Aranya Bhavan Near CH-3 Circle,
Sector 10 A, Gandhinagar -382010.
Email : eccompliance-guj@gov.in

Sub: "Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernisation of Existing Pipeline Network at Oil Jetty Area, Deendayal Port Trust, Kandla – **Pointwise Compliance of the conditions stipulated in the EC & CRZ Clearance and Monitoring Report in Datasheet reg.**
(EC Identification No. EC24A033GJ192347 and Proposal No. IA/GJ/NCP/280634/2018)

Ref.: 1) EC & CRZ Clearance accorded by the SEIAA, Gujarat vide letter no. 10-26/2018-IA.III dated 01/01/2024.
2) DPA letter no. EG/WK/4751/Part (Revamping – EC onwards)/100 dated 29/07/2024 – Compliance Report submitted in PARIVESH 2 PORTAL (Period up to May,2024).

Sir,

It is requested to kindly refer above cited reference for the said subject.

In this connection, it is to state that, MoEF&CC, GOI had accorded EC&CRZ Clearance dated 01/01/2024 to the subject project of the DPA. In the said clearance letter, in the Para B STANDARD CONDITIONS, No. XI Miscellaneous (sub para no. iv), the MoEF&CC, GOI has stipulated the condition that, ***"The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the Ministry of Environment, Forest and Climate Change at environment clearance portal"***.

Accordingly, DPA vide communication dated 29/7/2024 had submitted Pointwise Compliance of the conditions stipulated in the EC & CRZ Clearance and Monitoring Report in Datasheet (for the period up to May, 2024), in the PARIVESH 2 PORTAL. However, due to procedural issues, we are unable to upload compliance report for present period (June24 to Sep,24). After resolution of the issues, the periodic compliance reports will be submitted in the PARIVESH 2 PORTAL.

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In view of the above and in order to avoid non-compliance of above EC condition, we are submitting herewith compliance report of the stipulated conditions mentioned in the EC & CRZ Clearance granted by the MoEF & CC, GOI dated 01/01/2024 as **Annexure 1** and Monitoring Report in Data Sheet as **Annexure 2 (Period: June, 2024 to September, 2024)** (in soft copy) through email in ID : eccompliance-guj@gov.in & iro.gandhinagar-moef@gov.in.

This is for kind information and record, please.

This has the approval of Chief Engineer, Deendayal Port Authority.

Yours faithfully,

03/12/24

Dy. Chief Engineer & EMC(I/c)
Deendayal Port Authority

Copy along with Point wise compliance of stipulated conditions, to :

1) Shri Amardeep Raju,
Scientist E, Ministry of Environment, Forest and Climate Change,
& Member Secretary (EAC-Infra.1),
Indira Paryavaran Bhawan,
3rd Floor, Vayu Wing, Jor Bagh Road, Aliganj,
New Delhi- 110 003;
E-mail:ad.raju@nic.in

2) Shri Prasoon Gargava,
Scientist E &Regional Director,
Central Pollution Control Board,
Parivesh Bhawan,
Opp. VMC Ward Office No.10, Subhanpura,
Vadodara – 390 023.
Email Id.Prasoon.cpcb@nic.in

3) Shri T. C. Patel,
The Unit Head, Kachchh,
Gujarat Pollution Control Board,
Paryavaran Bhavan,
Sector 10A,
Gandhinagar- 382 010.
Email-kut-uh-gpcb@gujarat.gov.in

4)The Regional Officer,
Gujarat Pollution Control Board,
Regional Office (East Kutch)
Administrative Office Building,
Deendayal Port Authority,
Gandhidham 370201
Email Id. ro-gpcb-kute@gujarat.gov.in

ANNEXURE 1
Point wise compliance

COMPLIANCE REPORT (Period : up to September, 2024).

Subject: Compliance of conditions stipulated by the Ministry of Environment, Forests & Climate Change (MoEF&CC), GoI in Environmental & CRZ Clearance granted for "**Augmentation of liquid cargo handling capacity from 8 MMTPA to 23.8 MMTPA through modernization of existing pipeline network at oil Jetty area, Deendayal Port Trust, Kandla** ".

Reference: Environmental and CRZ Clearance granted by MoEF&CC, GoI vide letter F. No. 10-26/2018-IA-III dated 01/01/2024.

Sr. No	EC Conditions	Compliance status
	A. Specific conditions	
i.	Construction activity shall be carried out strictly according to the provisions of the CRZ Notifications 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Zone Regulation Zone Area.	Construction activity is being carried out as per the EC & CRZ Clearance accorded by the MoEF&CC,GoI vide F.No. 10-26/2018-IA-III dated 1/1/2024.
ii.	All recommendation and conditions specified by the Gujarat State Coastal Zone Management Authority (GCZMA) vide letter No. ENV-10-2021-41-T dated 25/08/2022 shall be complied with	Compliance Report of GCZMA Recommendation dated 25/8/2022 is attached herewith as **Annexure A**.
iii.	Consent to Establish/Operate for the project shall be obtained from the State Pollution Control Board as required under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974	The Consent to Establish (CTE) from the GPCB had already been obtained vide CTE amendment (CTE 115467) granted by the GPCB vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/609592 dated 23/12/2021 with a validity period 11/2/2026. A copy of same had already been submitted along with compliance report submitted on 29/07/2024.
iv.	PP shall ensure while scrapping of 125 old pipeline and laying of 84 new process shall not cause any spillage/leakage	Due care is being taken while scrapping of 125 old pipeline and laying of 84 new pipeline process to avoid spillage/leakages.
v.	As proposed by PP steel scrap will be temporarily stored in designated area before being auctioned off. The storage of steel scrap and any other scrapped material shall be stored temporarily outside the CRZ area.	The steel scrap is being stored temporarily in designated area, as per the stipulated condition.
vi.	Wastes discharged from ships will be handed over to the Ports licensed waste disposal contractor	DPA already issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port through DPA contractors to the GPCB authorized recyclers .
vii.	No new berths will be constructed nor there any proposal to increase the size of the ships presently being handled at the oil jetties. Hence no dredging shall be carried out.	Point noted. No dredging is envisaged in the subject project.
viii.	The project proponent shall install system carryout to Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutant released (e.g PM 10 and PM2.5 in reference to PM emission, and SO2 and NOx in reference to SO2 and NOX emissions) within and outside the port area at least at four locations (one within and three outside the port area at an angle of 120^{o} each), covering upwind and downwind directions.	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Air Quality Monitoring vide work order dated 15/02/2023. Latest monitoring report is attached herewith as **Annexure B**
ix.	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed fugitive emission standards.	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla

		(Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines)
x.	The project proponent shall submit monthly summary report of continuous stack emission and air quality monitoring and results of manual stack monitoring manual monitoring of air quality/fugitive emissions to regional office of MoEF&CC, Zonal office of CPCB and regional office of SPCB along with six monthly monitoring report.	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Air Quality Monitoring vide work order dated 15/02/2023. Latest monitoring report is attached herewith as **Annexure B**
xi.	Effective safeguard measures, such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high level of particulate matter such as around loading and unloading point and all transfer points. Extensive water sprinkling shall be carried out on haul roads. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines).
xii.	Risk assessment for spill scenarios and Disaster Management Plan as prepared shall be in place in the environment Management cell of Deendayal Port Authority with all SOP's for various scenarios.	DPA is already having Disaster Management Plan including the spill scenarios. A copy of updated DMP is attached herewith as **Annexure C**
xiii.	Spillage of fuel/engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life, particularly benthos. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.	DPA is already having oil spillage contingency plan in place for the whole port area. A copy of same is placed herewith as (**Annexure D**)
xiv.	Oil spillage prevention and mitigation scheme shall be prepared. In case of oil spillage/contamination, action plan shall be prepared to clean the site by adopting proven technology. The recyclable waste (oily sludge) and spent oil shall be disposed of to the authorized recyclers	DPA is already having oil spillage contingency plan in place for the whole port area. DPA already issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port through DPA contractors to the GPCB authorized recyclers
xv.	Construction spoils, including bituminous material and other hazardous materials, must not be allowed to contaminate watercourses and the dump sites for such material must be secured so that they should not leach into the ground water	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines).
xvi.	The proponent shall put in place the detailed on site and off site Emergency Management Plan as per the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989, as amended to date which may cover the natural disasters also	DPA is already having Disaster management plan in place.
xvii.	The company shall develop a contingency plan for H2S release including all necessary aspects from evacuation to resumption of normal operations. The workers shall be provided with personal H2S detectors in locations of high risk of exposure along with self-containing breathing apparatus	03 Nos. of Multi Gas Detectors and 16 Nos. of Self Contained Breathing Apparatus Sets are presently available at Fire Brigade Section. Also the liquid terminal operators brings the Multi gas detectors whenever their vessel berths at oil jetties.

		Further the updating in Risk assessment and Disaster Management Plan is completed in consultation with M/s IR CLASS by Marine Department. (**Annexure D**)
xviii.	Emergency Response Plan (ERP) shall be based on the guidelines prepared by OISD, DGMS and Govt. of India	DPA is already having Disaster management plan in place.
xix.	Sediment analysis of harbor at identified locations shall be analyzed and records for past and present period shall be maintained	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Air Quality Monitoring vide work order dated 15/02/2023. Latest monitoring report is attached herewith as **Annexure B**
xx.	The Project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site and free flow of water is maintained	Point noted. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines) located on existing Pipeline trestle.
xxi.	No underwater blasting is permitted	Not applicable. No underwater blasting is envisaged.
xxii.	Necessary approvals be taken during implementation and commissioning from statutory bodies concerned	Point noted for compliance
xxiii.	A site specific biodiversity conservation plan including mitigation measures to be developed from competent nationally/internationally recognized institute with appropriate financial allocation for its implementation.	DPA had appointed GUIDE, Bhuj for the preparation of Marine Biodiversity Management plan vide work order dated 03/05/2021. A copy of the Final Report (prepared by GUIDE, Bhuj) had already been submitted along with compliance report submitted on 29/07/2024.
xxiv.	Shoreline should not be disturbed due to dumping. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring report	Point noted for compliance Earlier, w.r.t. compliance of stipulated conditions of some other EC & CRZ Clearances, DPA had assigned the work "Shoreline Change Study for Deendayal Port Authority (Erstwhile Deendayal Port Authority), Kandla, Kachchh District, Gujarat, to Study the Effect of Dumping, if any" vide their work order dated 12/10/2021 to NCSCM, Chennai. The work has been completed and final report has already been submitted by DPA to the concerned authorities in compliance reports submitted. A copy of same had already been submitted along with compliance report submitted on 29/07/2024.
xxv.	A continuous monitoring programme covering all the seasons on various aspects of the coastal and marine environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes/renowned Universities/accredited Consultant with rich experiences in marine science aspects. Monitoring should include sea weeds, sea grasses, mudflats, sand dunes, fisheries, mangroves and other marine	DPA issued work order to Gujarat Institute of desert Ecology, Bhuj (expert agency in the field) vide letter no. EG/WK/ 4751 /Part (Marine Ecology Monitoring) / 72 dated 10/06/2024 for *"Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine*

	biodiversity components as part of the management plan	*water and marine sediment samples coupled with biological indices (for three years 2024-2027) reg.".* A copy work order had already been submitted along with compliance report submitted on 29/07/2024. The work is in progress.
xxvi.	Necessary arrangements for the treatment of the effluents and solid wastes/ facilitation of reception facilities under MARPOL must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986. The provisions of Solid Waste Management Rules, 2016. E- Waste Management Rules, 2016, and Plastic Waste Management Rules, 2016 shall be complied with	DPA already issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port through DPA contractors to GPCB authorized recycler. Further, it is to state that, all ships are required to follow DG Shipping circulars regarding the reception facilities at Swachch Sagar portal DPA has appointed GEMI, Gandhinagar for the "Preparation of Plan for management of Plastic waste, Solid Waste including C&D wastes, E-waste, hazardous waste including biomedical waste and Non-hazardous waste in DPA vide work order dated 24/01/2023" . The work is completed final report is attached herewith as **Annexure E**
xxvii.	All the commitments made to the public during public hearing/public consultation meeting shall be satisfactorily implemented and adequate budget provision shall be made accordingly.	DPA has assigned the work of Planning and monitoring of the of the activities to be undertaken under Environment Management Plan under EIA and EC to GEMI, Gandhinagar vide work order dated 25/10/2023. The work is in process.
xxviii.	All the recommendations mentioned in the risk assessment report, disaster management plan and safety guidelines shall be implemented	Point noted for the compliance
xxix.	As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 30th September, 2020, the project proponent shall abide by all the commitments made by them to address the concerns raised during the public consultation. The project proponent shall initiate the activities proposed by them, based on the commitment made in the public hearing, and incorporate in the Environmental Management Plan and submit to the Ministry. All other activities including pollution control, environmental protection and conservation, R&R, wildlife and forest conservation/protection measures including the NPV, Compensatory Aforestation etc, either proposed by the project proponent based on the social impact assessment and R&R action plan carried out during the preparation of EIA report or prescribed by EAC, shall also be implemented and become part of EMP	DPA has assigned the work of Planning and monitoring of the of the activities to be undertaken under Environment Management Plan under EIA and EC . To GEMI, Gandhinagar vide work order dated 25/10/2023. The work is in process
B.	**STANDARD CONDITIONS**	
I.	**Statutory Compliance**	
i.	The project proponent shall prepare a Site-Specific Conservation Plan & Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the approved Site-Specific Conservation Plan / Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be	For compliance of the stipulated condition, DPA is in process of consulting expert agency viz M/s MECON Ltd, Ranchi, GUIDE, Bhuh etc. once finalized task will we assigned to them

	furnished along with the six-monthly compliance report (in case of the presence of schedule I species in the study area).	
ii.	The project proponent shall obtain the necessary permission from the Central Ground Water Authority, in case of drawl of ground water / from the competent authority concerned in case of drawl of surface water required for the project	DPA is not using ground water for any of its activities. The Water requirement is being met through GWSSB (Narmada Pipeline) and through private tankers
iii.	All excavation related dewatering shall be as duly authorized by the CGWA. A NOC from the CGWA shall be obtained for all dewatering and ground water abstraction	DPA is not using ground water for any of its activities. The Water requirement is being met through GWSSB (Narmada Pipeline) and through private tankers
iv.	A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project should be obtained	Power requirement for the proposed activity will not change from the existing requirement. Power is supplied by Paschim Gujarat Vij Company Limited a Govt. of Gujarat organization
v.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Coast Guard, Civil Aviation Department shall be obtained, as applicable by project proponents from the respective competent authorities	Point noted for compliance
II.	**Air quality monitoring and preservation**	
i.	The project proponent shall install system to carryout Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM10 and PM2.5 in reference to PM emission, and SO2 and NOx in reference to SO2 and NOx emissions) within and outside the project area at least at four locations, covering upwind and downwind directions	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Air Quality Monitoring vide work order dated 15/02/2023. Latest monitoring report is attached herewith as **Annexure B**
ii.	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed emission standards	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines)
iii.	Shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines)
iv.	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines)
v.	Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all	Available D.G sets are enclosed type and conforms to rules made under the Environment (Protection) Act, 1986

	proposed DG sets. Use of low sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board	
vi.	A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the participation of these departments	DPA is already having traffic management plant. A Copy of same had already been submitted along with the compliance report submitted on 29/07/2024
III.	**Water quality monitoring and preservation**	
i.	Total fresh water use shall not exceed the proposed requirement as provided in the project details. Prior permission from competent authority shall be obtained for use of fresh water	Looking at the small quantity of Waste water generated it will be treated in the Septic tanks/Soak pits
ii.	Sewage Treatment Plant shall be provided to treat the wastewater generated from the project. Treated water shall be reused for horticulture, flushing, backwash, HVAC purposes and dust suppression	Looking at the small quantity of Waste water generated it will be treated in the Septic tanks/Soak pits
iii.	A certificate from the competent authority for discharging treated effluent/ untreated effluents into the Public sewer/ disposal/drainage systems along with the final disposal point should be obtained	Looking at the small quantity of Waste water generated it will be treated in the Septic tanks/Soak pits
iv.	No diversion of the natural course of the river shall be made without prior permission from the Ministry of Water resources	It is assured that, no diversion of the natural course of the river is made.
IV.	**Noise monitoring and prevention**	
i.	Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Noise parameter vide work order dated 15/02/2023. A copy of latest monitoring report is attached herewith as **Annexure B**
ii.	Noise from vehicles, power machinery and equipment on-site should not exceed the prescribed limit. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipments.	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Noise parameter vide work order dated 15/02/2023. A copy of latest monitoring report is attached herewith as **Annexure B**
iii.	Acoustic enclosures for DG sets, noise barriers for ground-run bays, ear plugs for operating personnel shall be implemented as mitigation measures for noise impact due to ground sources	Available D.G set is provided with the acoustic enclosures, noise barriers for ground-run bays, ear plugs are provided for operating personnel
iv.	The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Noise parameter vide work order dated 15/02/2023. A copy of latest monitoring report is attached herewith as **Annexure B**
V.	**Energy Conservation measures**	

i.	Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly	DPA has installed the solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham of 45 KWp in 2022 and at Jeev Seva Samiti, Gandhidham of 5.5 KWp in 2024. DPA has installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham DPA has installed 400 KWP solar plant and 600 KWP to be installed this year by PPP operator 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park
ii.	Provide LED lights in their offices and residential areas	All the conventional HPSV lights have been replaced by Energy efficient LED lights
VI.	**Waste management:**	
i.	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986	Looking at the small quantity of Waste water generated it will be treated in the Septic tanks/Soak pits
ii.	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016	Companies authorized by Central Pollution Control Board(CPCB) and State Pollution Control Board (SPCB) have been awarded the work of Grant of Permission / License for removal of Dry Solid Waste(Non-Hazardous) from Vessels calling at Deendayal Port" for collection, transporting and disposal of solid waste by the Deendayal Port Trust
iii.	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Waste Management Rules, 2016	Demolition of any building or masonry structure is not envisaged in the present project
iv.	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project	A MoU has been signed for the Municipal solid waste management along with the Gandhiham Municipal Corporation
v.	Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/ rules of the regulatory authority to avoid mercury contamination	DPA has entered in agreement with MSTC Ltd. Vadodara for selling / auction of all scrap items including e-waste
VII.	**Green Belt:**	
i.	An overall green area of at-least 33% of the Industrial Area should be developed with native species. The green area shall be 40% in case of critically polluted area. The project proponent of the Industrial Area shall comply with the additional commitment made by them in the EIA report regarding the development of green belt	DPA entrusted the work for Greenbelt development to the Forest Department, GoG for plantation in an area of 32.5 Ha. The work is completed. DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-I)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May, 2022. The work completed (5000 saplings) .

		Further, DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed and final report is attached herewith as **Annexure F**
ii.	The Industrial Areas are directed to accordingly allocate the area to be developed as green cover to respective individual industrial units so as to achieve the above mentioned condition	DPA not covers under the Industrial Unit. However, DPA entrusted the work for Greenbelt development to the Forest Department, GoG for plantation in an area of 32.5 Ha. The work is completed. DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l) vide Work Order No.EG/WK/4757/Part Greenbelt GUIDE, dated 31st May, 2022. The work completed (5000 saplings) . Further, DPA has accorded the work of Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed and final report is attached herewith as **Annexure F**
iii.	The individual industrial unit, at the time of obtaining EC, shall bring a letter from the Industrial Area for the area allocated to them to be developed as green cover as a part of obligation from the Industrial Area	DPA not covers under the Industrial Unit
iv.	Wherever possible, plantations around the periphery of the Industrial Area, in the downwind direction and along the road sides shall be provided for containment of pollution and for formation of a screen between the industrial area and the outer civil area. The choice of plants should include shrubs of height 1 to 1.5 m and tree of 3 to 5 m height. The intermixing of trees and shrubs should be such that the foliage area density in vertical is almost uniform	DPA entrusted the work for Greenbelt development to the Forest Department, GoG for plantation in an area of 32.5 Ha. The work is completed. DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l) vide Work Order No.EG/WK/4757/Part Greenbelt GUIDE, dated 31st May, 2022. The work completed (5000 saplings) . Further, DPA has accorded the work of Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed and final report is attached herewith as **Annexure F**
v.	The parameters like selection of plant species, procedure for plantation, density of tree plantation etc shall be as per the CPCB guidelines	Selection of plant species procedure for plantation, density of tree plantation etc

		done as per the CPCB guidelines for the plantation activities carried out
VIII.	**Public hearing and human health issues:**	
i.	Workers shall be strictly enforced to wear personal protective equipments like dust mask, ear muffs or ear plugs, whenever and wherever necessary/ required. Special viscos-elastic gloves will be used by labour exposed to hazards from vibration	Personal protective equipments like dust mask, ear muffs or ear plugs are being provided to the workers wherever required
ii.	Safety training shall be given to all workers specific to their work area and every worker and employee will be engaged in fire hazard awareness training and mock drills which will be conducted regularly. All standard safety and occupational hazard measures shall be implemented and monitored by the concerned officials to prevent the occurrence of untoward incidents/ accidents	Regular safety trainings are being given to the workers.
iii.	Emergency preparedness plan based on the Hazard identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented	DPA is already having Disaster Management Plan including the spill scenarios. A copy of same had already been submitted along with the compliance report submitted on 29/07/2024.
iv.	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project	Provision is made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc are provided
v.	Occupational health surveillance of the workers shall be done on a regular basis	Occupational health surveillance of the workers is being carried out
X.	**Environment Responsibility**	
i.	The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental / forest /wildlife norms/ conditions. The company shall have defined system of reporting infringements / deviation / violation of the environmental / forest / wildlife norms / conditions and / or shareholders / stake holders. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report	DPA is already having Environmental Policy duly signed by Chairperson of the DPA
ii.	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization	DPA is already having Environment Management cell. Further, DPT has also appointed expert agency for providing Environmental Experts from time to time. DPT appointed M/s Precitech Laboratories, Vapi for providing Environmental Experts vide work order dated 5/2/2021. Further, DPA has appointed manager Environment on contractual basis for the period of 3+2 years.
iii.	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the	DPA has assigned the work of Planning and monitoring of the of the activities to be undertaken under Environment Management Plan under EIA and EC to GEMI, Gandhinagar vide work order dated 25/10/2023. The work is in progress.

	Ministry/Regional Office along with the Six Monthly Compliance Report	
iv.	Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out	DPA has appointed GUIDE, Bhuj for the work of " To carry out Environment Audit of the DPA" with work order dated 15/07/2023. The work is completed final audit report is attached herewith as **Annexure G.**
XI.	**Miscellaneous**	
i.	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently	DPA has already displayed the EC copies in their website www.deendayalport.gov.in DPA has given advertisement in the local newspaper regarding Environmental Clearance granted by the MoEF and CC, GoI for the subject project as under dated 10/01/2024. A copy of same submitted along with the compliance report submitted on 29/07/2024
ii.	The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt	DPA vide letter dated 04/01/2024 has already been communicated copy of EC & CRZ Clearance accorded by the MoEF&CC, GoI dated 01/01/2024 to the Heads of Local bodies, Panchayats and Municipal Bodies etc. A copy of same submitted along with the compliance report submitted on 29/07/2024
iii.	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis	DPA has already submitted the six-monthly compliance reports of the stipulated environment clearances including results of monitored data to MoEF&CC vide its letter dated 29/07/204. The same is also uploaded on the official website of Deendaya Port Authority (www.deendayalport.gov.in).
iv.	The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal	DPA has already submitted the six-monthly compliance reports of the stipulated environment clearances including results of monitored data to MoEF&CC vide its letter dated 29/07/204.
v.	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company	DPA is regularly submitting the environmental statement for each financial year in Form-V to the GPCB. Copy already communicated with compliance report submitted on 29/07/2024.
vi.	The criteria pollutant levels namely; PM2.5, PM10, SO2, NOx (ambient levels) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area vide work order dated 15/02/2023. A copy of latest monitoring report is attached herewith as **Annexure B**
vii.	The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project	DPA board approved the project at cost of Rs 211.61 Crores .
viii.	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government	Point noted

ix.	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee	Point noted
x.	No further expansion or modifications in the Industrial Area shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).	Point noted
xi.	Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.	Point noted
xii.	The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory	Point noted
xiii.	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions	Point noted
xiv.	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports	Point noted
xv.	The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter	Point noted
xvi.	Any appeal against this EC shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010	----------

ANNEXURE A
CRZ Compliance

COMPLIANCE REPORT (for the period up to September 2024)

Subject: Status of Compliance with the conditions stipulated By Gujarat State Coastal Zone Management Authority, Gandhinagar, in CRZ Recommendation Letter granted for "**Augmentation of liquid handling capacity from 8 MMTPA to 23.8 MMTPA through modernization of existing pipeline network at oil jetty area of Deendayal Port Trust** ".

CRZ Recommendations: Letter No. ENV-I0-2021-41-T dated 25 August 2022, of Director (Environment) & Member Secretary, GCZMA, Forest & Environment Department, GoG.

**Note: Based on the recommendation of* the GCZMA, MoEF&CC, GoI *had accorded Environmental & CRZ Clearance vide letter dated 01/01/2024*

Sr. No.	Conditions in CRZ Recommendation Letter	Compliance
	Specific Conditions	
1	Project proponent unit shall scrap of existing 125 pipelines and remaining 42 pipelines may be maintain while 84 new pipeline will be laid.	It is assured that due care is being taken while scrapping of existing 125 pipelines.
2	Project proponent shall carry out proposed activities, replacement & revamping of existing pipeline network at oil jetty area and no new land shall be use.	Activities of replacement & revamping is being carried out at the existing oil jetty area and no new land is used.
3	Project proponent shall obtain consent to establish for their proposed expansion from 8 MMTPA to 23.08 MMTPA from GPCB.	The Consent to Establish (CTE) from the GPCB had already been obtained vide CTE amendment (CTE 115467) granted by the GPCB vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/609592 dated 23/12/2021 with a validity period 11/2/2026 A copy of same had already been submitted along with compliance report submitted on 29/07/2024.
4	Project proponent shall not carry out any construction activities or any activities till obtaining CRZ Clearance from MoEF&CC, new Delhi	DPA has already received CRZ recommendation from GCZMA vide letter no. ENV-10-2021-41-T cell dated 25/08/2022. Additionally, DPA has also received EC and CRZ clearance from MoEF&CC vide file no. letter F. No. 10-26/2018-IA-III dated 01/01/2024.
5	Project Proponent shall adhere to all recommendation given by MECON Ltd. Ranchi, Jharkhand.	It is assured that, recommendation given by MECON Ltd. Ranchi, Jharkhand is being adhered to
6	Project Proponent shall adhere to undertaking dated 25.01.202	It is assured that, undertaking dated 25/01/202 being adhered to.
7	Project Proponent shall carry out Mangrove Plantation in 50 Ha area with consultant of concern District Forest Office of District and Gujarat Ecology commission. Necessary report in this regard may be submitted periodically to this office.	DPA has assigned the work for the "Mangrove Plantation in an area of 50 Ha for the Deendayal Port Authority to GUIDE, bhuj vide work order dated 10/06/2024. A copy of inception report is attached herewith as **Annexure A** Additionally, as per the As per the directions of the GCZMA and MoEF&CC GoI, to date, DPA has undertaken a Mangrove Plantation in an area of 1600 Hectares since the year 2005
8	Project Proponent shall strictly adhere to all conditions of Terms of Reference issued by MoEF&CC, GOI vide F.No. 10-26/2018-IA-III dated 14/06/2018.	DPA has already received the EC and CRZ clearance from MoEF&CC vide file no. letter F. No. 10-26/2018-IA-III dated 01/01/2024. A copy of same had already been submitted along with compliance report submitted on 29/07/2024
9	Project Proponent shall strictly adhere to all conditions of Amendment Terms of Reference issued by MoEF&CC, GOI vide F.No. 10-26/2018-IA-III dated 11/06/2020.	

ANNEXURE B
Monitoring Report

Environmental Monitoring Report (EMR)
prepared under
"Preparing and monitoring of environmental monitoring and management plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years"

(Monitoring Period: June-July 2024)

Document Ref No.: GEMI/DPA/782(2)(3)/2024-25/121

Submitted to:

Deendayal Port Authority (DPA), Kandla

Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

GEMI Bhavan, 246-247, GIDC Electronic Estate, Sector-25, Gandhinagar-382025

"AN ISO 9001:2015, ISO 14001:2015 AND ISO 45001:2018 Certified Institute"

About this Document

Gujarat Environment Management Institute (GEMI) has been assigned with the work of "Preparing and monitoring of Environmental monitoring and Management plan for Deendayal Port Authority (DPA) at Kandla and Vadinar for a period of 3 years" by DPA, Kandla. Under the said project the report titled *"Environment Monitoring Report (June-July 2024)"* is prepared.

- **Name of the Report:** *Environment Monitoring Report (June-July 2024)*
- **Date of Issue:** 10/09/2024
- **Version:** 1.0
- **Report Ref.:** GEMI/DPA/782(2)(3)/2024-25/121

Table of Contents

List of Tables

List of Maps

List of Figures

List of Graphs

List of Abbreviations

A	Acceptable Limits as per IS: 10500:2012
AAQ	Ambient Air Quality
AWS	Automatic Weather monitoring stations
BIS	Bureau of Indian Standards
BOD	Biochemical Oxygen Demand
BQL	Below Quantification Limit
CCA	Consolidated Consent & Authorization
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
DO	Dissolved Oxygen
DPA	Deendayal Port Authority
EC	Electrical Conductivity
EMMP	Environmental monitoring and Management Plan
EMP	Environment Management Plan
FPS	Fine Particulate Sampler
FY	Financial Year
GEMI	Gujarat Environment Management Institute
IFFCO	Indian Farmers Fertiliser Cooperative Limited
IMD	India Meteorological Department
IOCL	Indian Oil Corporation Limited
LNG	Liquefied Natural Gas
MGO	Marine Gas Oil
MMTPA	Million Metric Tonnes Per Annum
MoEF	Ministry of Environment & Forests
MoEF&CC	Ministry of Environment, Forest and Climate Change
NAAQS	National Ambient Air Quality Standards
NO_x	Nitrogen oxides
NTU	Nephelometric Turbidity Unit
OOT	Off Shore Oil Terminal
OSR	Oil Spill Response
P	Permissible Limits as per IS: 10500:2012
PAH	Poly Aromatic Hydrocarbons
PM	Particulate Matter
PTFE	Polytetrafluoroethylene
RCC	Reinforced Concrete Cement
RDS	Respirable Dust Sampler
SAR	Sodium Adsorption Ratio
SBM	Single Bouy Mooring
SO_x	Sulfur oxides
STP	Sewage Treatment Plant
TC	Total Coliforms
TDS	Total Dissolved Solids
TOC	Total organic Carbon
TSS	Total Suspended Solids
VOC	Volatile Organic Compounds

CHAPTER 1: INTRODUCTION

1.1 Introduction

Kandla Port, also known as the Deendayal Port is a seaport in Kachchh District near the city of Gandhidham in Gujarat state in western India. Located on the Gulf of Kachchh, it is one of major ports on the western coast, and is located at 256 nautical miles southeast of the Port of Karachi in Pakistan and over 430 nautical miles north-northwest of the Port of Mumbai (Bombay). It is the largest port of India by volume of cargo handled. Deendayal Port's journey began in 1931 with the construction of RCC Jetty by Maharao Khengarji. Kandla was constructed in the 1950s as the chief seaport serving western India, after the independence of India. On 31st March 2016, Deendayal Port created history by handling 100 MMT cargo in a year and became the first Major Port to achieve this milestone. Deendayal Port Authority (DPA), India's busiest major port in recent years, is gearing up to add substantial cargo handling capacity with private sector participation. DPA has created new record by handling 137 MMTPA (at Kandla and Vadinar) during the financial year 2022-23. The DPA had commissioned the Off-shore Oil Terminal facilities at Vadinar in the year 1978, for which M/s. Indian Oil Corporation Limited (IOCL) provided Single Bouy Mooring (SBM) system, with a capacity of 54 MMTPA. Further, significant Quantum of infrastructural upgradation has been carried out & excellent maritime infrastructure has been created at Vadinar for the 32 MMTPA Essar Oil Refinery in Jamnagar District.

1.2 Green Ports Initiative

DPA is committed to sustainable development and adequate measures are being taken to maintain the Environmental well-being of the Port and its surrounding environs. Weighing in the environmental perspective for sustained growth, the Ministry of Shipping had started, Project Green Ports" which will help in making the Major Ports across India cleaner and greener. "Project Green Ports" will have two verticals - one is "Green Ports Initiatives" related to environmental issues and second is "Swachh Bharat Abhiyaan".

The Green Port Initiatives include twelve initiatives such as preparation and monitoring plan, acquiring equipment required for monitoring environmental pollution, acquiring dust suppression system, setting up of sewage/waste water treatment plants/ garbage disposal plant, setting up Green Cover area, projects for energy generation from renewable energy sources, completion of shortfalls of Oil Spill Response (OSR) facilities (Tier-I), prohibition of disposal of almost all kind of garbage at sea, improving the quality of harbour wastes etc.

DPA had also appointed GEMI as an Advisor for "Making Deendayal Port a Green Port-Intended Sustainable Development under the Green Port Initiatives. DPA has also signed MoU with Gujarat Forest Department in August 2019 for Green Belt Development in an area of 31.942 Ha of land owned by DPA. The plantation is being carried out by the Social Forestry division of Kachchh.

1.3 Importance of EMP

Port activities can cause deterioration of air and marine water quality in the surrounding areas due to multifarious activities. The pollution problems usually caused by port and harbour activities can be categorized as follows:

1. Air pollutant emissions due to ship emissions, loading and unloading activities, construction emission and emissions due to vehicular movement.
2. Coastal habitats may be destroyed and navigational channels silted due to causeway construction and land reclamation.
3. Deterioration of surface water quality may occur during both the construction and operation phases.
4. Harbour operations may produce sewage, bilge wastes, solid waste and leakage of harmful materials both from shore and ships.
5. Human and fish health may be affected by contamination of coastal water due to urban effluent discharge.
6. Oil pollution is one of the major environmental hazards resulting from port/harbour and shipping operations. This includes bilge oil released from commercial ships handling non-oil cargo as well as the more common threat from oil tankers.
7. Unregulated mariculture activities in the port and harbour areas may threaten navigation safety.

Hence, for the determination of levels of pollution, identification of pollution sources, control and disposal of waste from various point and non-point sources and for prediction of pollution levels for future, regular monitoring and assessment are required during the entire construction and operation phase of a major port. As per the Ministry of Environment, Forest and Climate Change **(MoEF&CC)**, The Environmental Management Plan (EMP) is required to ensure sustainable development in the area surrounding the project. Hence, it needs to be an all encompasses plan consist of all mitigation measures for each item wise activity to be undertaken during the construction, operation and the entire life cycle to minimize adverse environmental impacts resulting from the activities of the project. for formulation, implementation and monitoring of environmental protection measures during and after commissioning of projects. The plan should indicate the details of various measures are taken and proposed to be taken for appropriate management of the environment of Deendayal Port Authority.

It identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of operational activities associated with the port. An EMP is a required part of environmental impact assessment of a new port project but could also be evolved for existing ports. It is useful not only during the construction and operational phases of the new port but also for operation of existing ports to ensure the effectiveness of the mitigation measures implemented and to further provide guidance as to the most appropriate way of dealing with any unforeseen impacts.

It is extremely essential that port and harbour projects should have an Environmental Monitoring and Management Plan (EMMP), which incorporates monitoring of Ambient Air, Drinking Water, Noise, Soil, Marine (water, sediment, ecology) quality along with the collection of online meteorological data throughout the duration of the project.

To ensure the effective implementation of the EMP and weigh the efficiency of the mitigation measures, it is essential to undertake environmental monitoring both during construction and operation period. In view of the above, Gujarat Environment Management Institute (GEMI) has been awarded with the work "**Preparing and Monitoring of Environmental Monitoring and Management Plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years**" vide letter No. EG/WK/EMC/1023/2011/III/239 dated: 15/02/2023 by DPA.

This document presents the Environmental Monitoring Report (EMR) for Kandla and Vadinar for the environmental monitoring done during the period from 17th March-16th April 2024.

1.4 Objectives and scope of the Study

In line with the work order, the key objective of the study is to carry out the Environmental Monitoring and preparation the Management Plan for Kandla and Vadinar for a period of 3 years". Under the project, Environmental monitoring refers to systematic assessment of ambient air, water (drinking and surface), soil, sediment, noise and ecology in order to monitor the performance and implementation of a project in compliance with Environmental quality standards and/or applicable Statutory norms.

The scope of work includes not limited to following:

1. To review the locations/stations of Ambient Air, Ambient Noise, drinking water, and Marine Water, Soil and Sediments monitoring within the impacted region in-and-around DPA establishment, in view of the developmental projects.
2. To assess the Ambient Air quality, quality at 6 stations at Kandla and 2 at Vadinar in terms of gases and particulate matter.
3. To assess the DG stack emissions (gases and particulate matter).
4. To assess Drinking water quality at twenty locations (18 at Kandla and 2 at Vadinar) in terms of Physical, Chemical and Biological parameters viz., Color, Odor, turbidity, conductivity, pH, Total Dissolved Solids, chlorides, Hardness, total iron, sulfate, NH_4, PO_4, and bacterial count on a monthly basis.
5. To assess the Marine water quality in terms of aquatic Flora and Fauna and Sediment quality in terms of benthic flora and fauna.
6. To assess Marine Water Quality and sediment in term of physical and chemical parameter.
7. To assess the trends of water quality in terms of Marine ecology by comparing the data collected over a specified time period.
8. Weekly sample collection and analysis of inlet & Outlet points of the Sewage Treatment Plant (STP) to check the water quality being discharged by DPA as per the CC&A.
9. Carrying out monthly Noise monitoring; twice a day at the representative stations for a period of 24 hours.
10. Meteorological parameters are very important from air pollution point of view, hence precise and continuous data collection is of utmost importance. Meteorological data on wind speed, wind direction, temperature, relative humidity, solar radiation and

rainfall shall be collected from one permanent station at DPA, Kandla and one permanent station at Vadinar.

11. To suggest mitigation measures, based on the findings of this study and also check compliance with Environmental quality standards, Green Port Initiatives, MIV 2030, and any applicable Statutory Compliance.
12. To recommend Environment Management Plans based on Monitoring programme and findings of the study.

CHAPTER 2: METHODOLOGY

2.1 Study Area

Under the study, the locations specified by Deendayal Port Authority for the areas of Kandla and Vadinar would be monitored. The details of the study area as follows:

a. Kandla

Deendayal Port (Erstwhile Kandla Port) is one of the twelve major ports in India and is located on the West Coast of India, in the Gulf of Kutch at 23001'N and 70013'E in Gujarat. The Major Port Authorities Act 2021 is the governing statute for Administration of Major Ports, under which, Deendayal Port Trust (DPT) has become Deendayal Port Authority (DPA). At Kandla, DPA has sixteen (16) cargo berths for handling various types of Dry Bulk Cargo viz, fertilizer, food grains, Coal, sulphur, etc.

- **Climatic conditions of Kandla**

Kandla has a semi-desert climate. Temperature varies from 25°C to 44°C during summer and 10°C to 25°C during winter. The average annual temperature is 24.8 °C. The average rainfall is 410 mm, most of which occurs during the monsoon from the months of June-to-September.

b. Vadinar

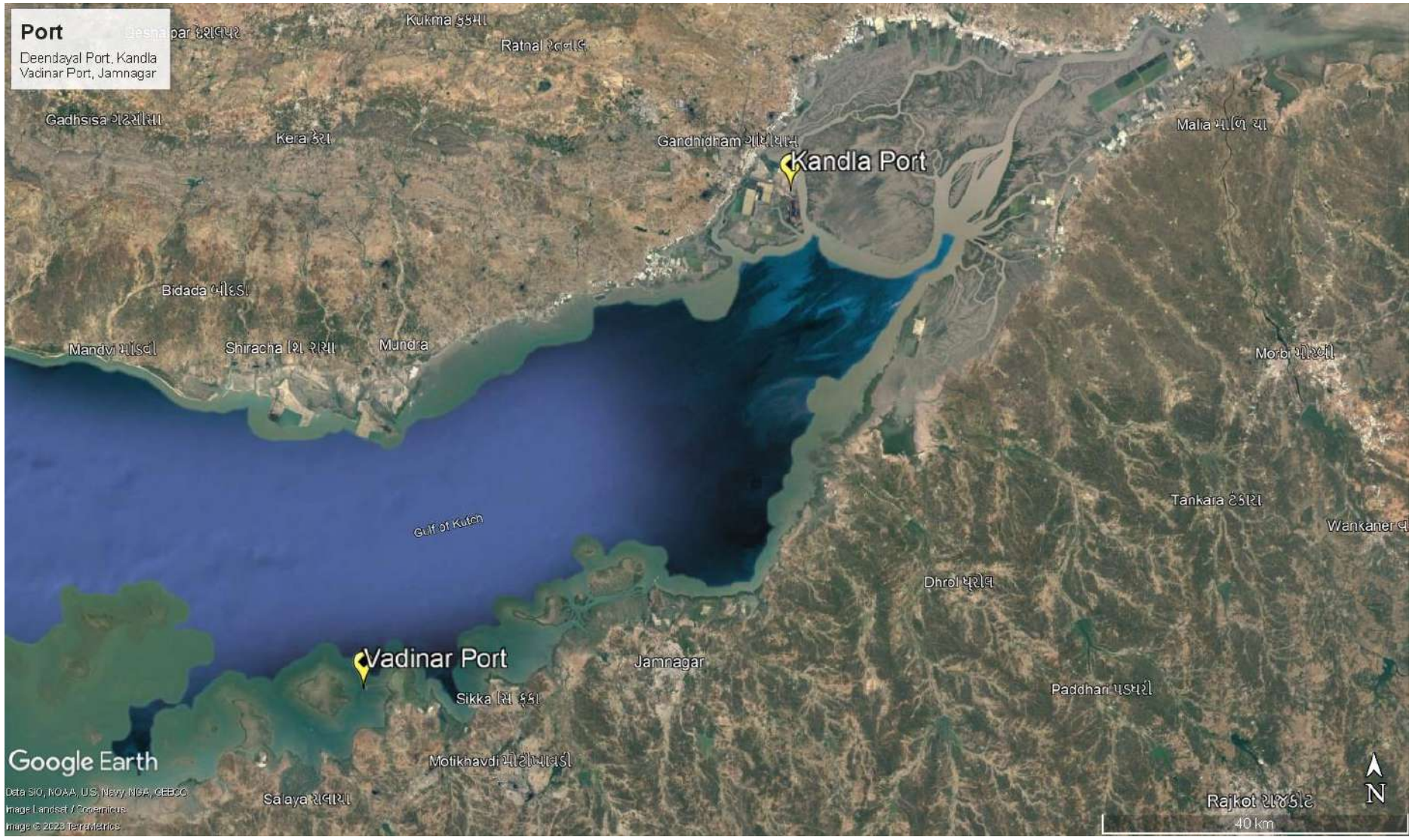
Vadinar is a small coastal town located in Devbhumi Dwarka district of the Gujarat state in India located at coordinates 22° 27' 16.20" N - 069° 40' 30.01". DPA had commissioned the Off Shore Oil Terminal (OOT) facilities at Vadinar in the year 1978, for which M/s. Indian Oil Corporation Limited (IOCL) provided Single Bouy Mooring (SBM) system, with a capacity of 54 MMTPA. The OOT of the DPA contributes in a large way to the total earnings of this port. Vadinar is now notable due to the presence of two refineries-one promoted by Reliance Industries and Essar Oil Ltd.

DPA also handled 43.30 MMT at Vadinar (which includes transhipment), the containerized cargo crossed 4.50 lakh TEU, grossing a total of 100 MMT overall. Major commodities handled by the Deendayal Port are Crude Oil, Petroleum product, Coal, Salt, Edible Oil, Fertilizer, etc.

- **Climatic conditions of Vadinar**

Vadinar has a hot semi-arid climate. The summer season lasts from March-to-May and is extremely hot, humid, but dry. The climatic conditions in Vadinar are quite similar to that recorded in its district head quarter i.e., Jamnagar. The annual mean temperature is 26.7 °C. Rainy season with extremely erratic monsoonal rainfall that averages around 630 millimetres. The winter season is from October-to-February remains hot during the day but has negligible rainfall, low humidity and cool nights.

The Kandla and Vadinar port have been depicted in the **Map 1** as follows:



Map 1: Locations of Kandla and Vadinar Port

Map 2: Locations of Kandla Port

Map 3: Locations of Vadinar Port

2.2 Environmental Monitoring at Kandla and Vadinar

Regular monitoring of environmental parameters is of immense importance to assess the status of environment during project operation. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for identifying any deterioration in environmental conditions, thereby assist in recommending suitable mitigatory steps in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by a well-defined monitoring program. Environmental Monitoring is vital for monitoring the environmental status of the port for sustainable development. The list of main elements for which Environmental monitoring is to be carried out have been mentioned below:

- Meteorology
- Ambient Air
- DG Stack
- Noise
- Soil
- Drinking Water
- Sewage Treatment Plant
- Marine (Surface) water
- Marine Sediments
- Marine Ecology

GEMI has been entrusted by DPA to carry out the monitoring of the various aforementioned environmental aspects at the port, so as to verify effectiveness of prevailing Environment Management plan, if it confirms to the statutory and/or legal compliance; and identify any unexpected changes. Standard methods and procedures have been strictly adhered to in the course of this study. QA/QC procedures were strictly followed which covers all aspects of the study, and includes sample collection, handling, laboratory analyses, data coding, statistical analyses, interpretation and communication of results. The analysis was carried out in GEMI's NABL/MoEF accredited/recognized laboratory.

Methodology adopted for the study

Methodology is a strictly defined combination of practices, methods and processes to plan, develop and control a project along the continuous process of its implementation and successful completion. The aim of the project management methodology is to allow the control of whole process of management through effective decision-making and problem solving. The methodology adopted for the present study is shown in **Figure 1** as given below:

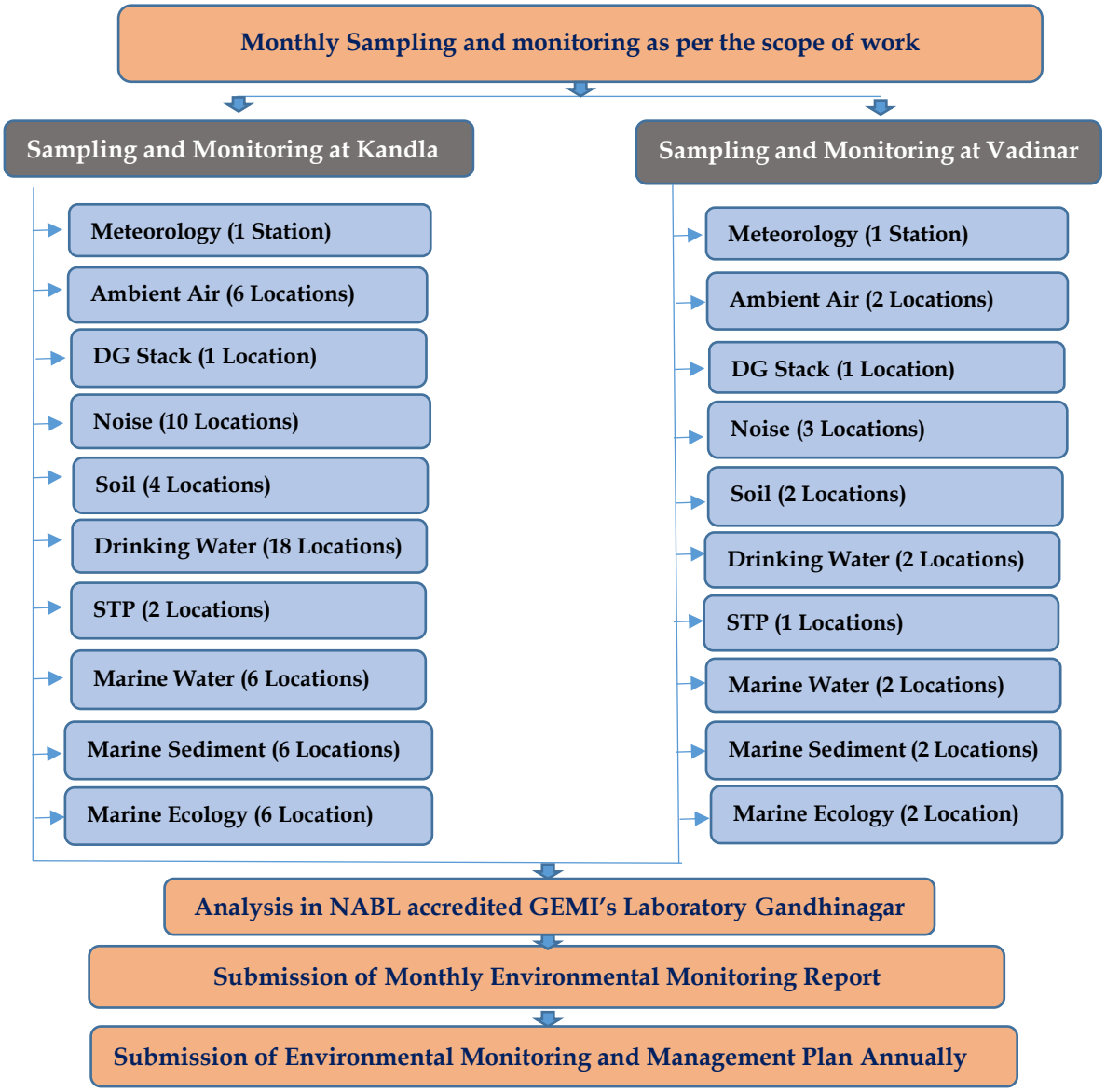


Figure 1: Methodology flow chart

The details of various sectors of Environment monitoring are described in subsequent chapters.

CHAPTER 3: METEOROLOGY MONITORING

3.1 Meteorology Monitoring

Meteorological conditions play a crucial role in dispersion of air pollutants as well as in environmental pollution studies particularly in pollutant transport irrespective of their entry into the environment. The wind speed and direction play a major role in dispersion of environment pollutants. In order to determine the prevailing micro-meteorological conditions at the project site an Automatic Weather Monitoring Stations (AWS) of Envirotech make (Model: WM280) were installed at both the sites of Kandla and Vadinar at 10 m above the ground. The details of the AWS installed have been mentioned in **Table 1** as follows:

Table 1: Details of Automatic Weather Station

Sr. No.	Site	Location Code	Location Name	Latitude Longitude
1.	Kandla	AWS-1	Environment Laboratory (DPA)	23.00996N 70.22175E
2.	Vadinar	AWS-2	Canteen Area	22.39994N 69.716608E

Methodology

During the study, a continuous automatic weather monitoring station was installed at both the sites to record climatological parameters such as Wind speed, Wind Direction, Relative Humidity, Solar Radiation, Rainfall and Temperature to establish general meteorological regime of the study area. The methodology adopted for monitoring meteorological data shall be as per the standard norms laid down by Bureau of Indian Standards (BIS) and the India Meteorological Department (IMD). The details of Automatic Weather Monitoring Station have been mentioned in **Table 2**.

Table 2: Automatic Weather Monitoring Station details

Sr. No.	Details of Meteorological Data	Unit of Measurement	Instrument	Frequency
1.	Wind Direction	degree	Automatic Weather Monitoring Station (Envirotech WM280)	Hourly Average
2.	Wind Speed	Km/hr		
3.	Rainfall	mm/hr		
4.	Relative Humidity	% RH		
5.	Temperature	^{o}C		
6.	Solar Radiation	W/m^2		

The Meteorological parameters were recorded at an interval of 1 hour in a day and the average value for all the Meteorological parameters were summarized for the sampling period of at both the observatory site.

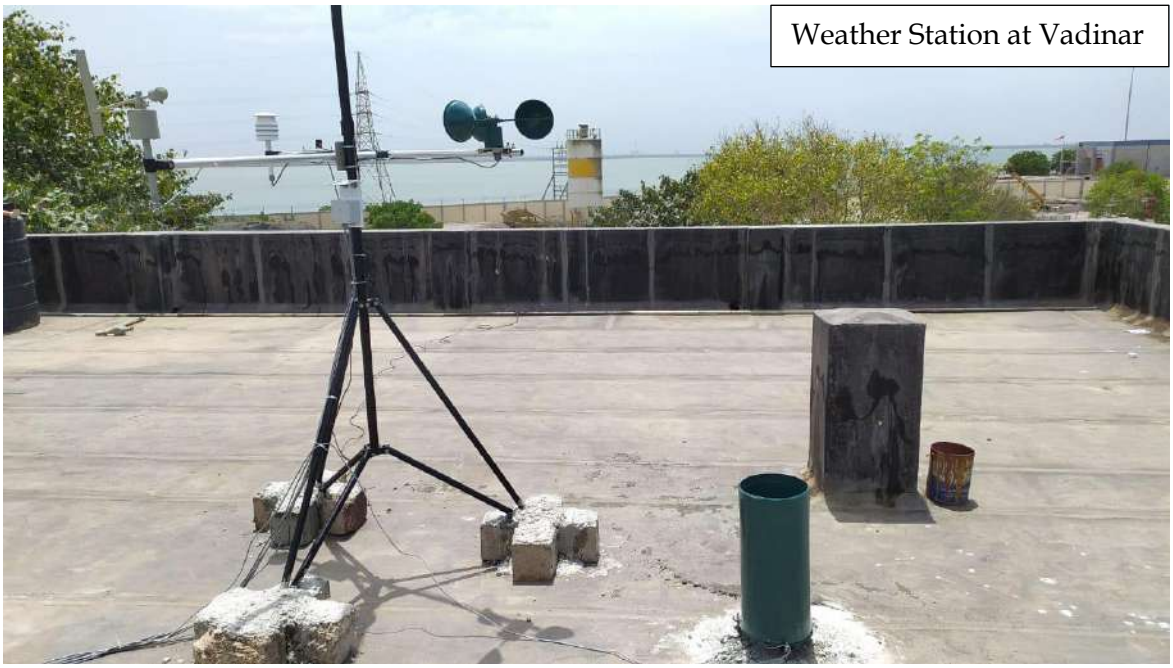


Figure 2: Photographs of Automatic Weather Monitoring Station at Kandla and Vadinar

3.2 Results and discussion

The summary of hourly climatological observations recorded at Kandla and Vadinar during the monitoring period, with respect to significant parameters has been mentioned in **Table 3** as follows**:**

Table 3: Meteorological data for Kandla and Vadinar

Details of Micro-meteorological data at Kandla Observatory												
Monitoring Period	**Wind Speed (Km/h)**			**Temperature (°C)**			**Relative humidity (%)**			**Solar Radiation (W/m²)**	**Wind Direction (°)**	**Rainfall (mm)**
Stat.	**Mean**	**Max.**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Max**	**Min**			
March-April, 2024	3.24	86	1.3	32.24	41.4	26.2	73.15	89.8	43.8	67.97	From West-South-West	3.96
Details of Micro-meteorological data at Vadinar Observatory												
Monitoring Period	**Wind Speed (Km/h)**			**Temperature (°C)**			**Relative humidity (%)**			**Solar Radiation (W/m²)**	**Wind Direction (°)**	**Rainfall (mm)**
Stat.	**Mean**	**Max.**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Max.**	**Min**			
March-April, 2024	9.69	139.4	3.98	30.13	36	24.4	77.43	91.5	55.3	71.63	From South-West	0.43

3.3 Data Interpretation and Conclusion

- **Temperature**

a. **Kandla:** The ambient temperature for the monitoring period varies between the range of 26.2 – 41.4°C for Kandla, with average temperature of 32.24°C.
b. **Vadinar:** The ambient temperature for the monitoring period varies between the range of 24.4 -36°C for Vadinar, with average temperature of 30.13°C.

- **Relative Humidity**

a. **Kandla**: The Relative Humidity recorded between the range of 43.8 – 89.8%, with average Humidity of 73.15%.
b. **Vadinar:** During the study period, the Relative Humidity varies between 55.3 - 91.5%, with average Humidity of 77.43%.

- **Rainfall**

a. **Kandla:** 3.96 rainfall was observed at Kandla.
b. **Vadinar:** 0.43 rainfall was observed at Vadinar.

- **Wind Speed**

Wind speed and Direction play a significant role in transporting the pollutants and thus decides the air quality.

c. **Kandla:** Wind speed recorded ranges between 1.3 – 86, with average Wind Speed of 3.24 Km/hr.
a. **Vadinar:** During the monitoring period, the Wind speed recorded ranges between 3.98 – 139.4, with average Wind Speed of 9.69 Km/hr.

- **Solar Radiation:**

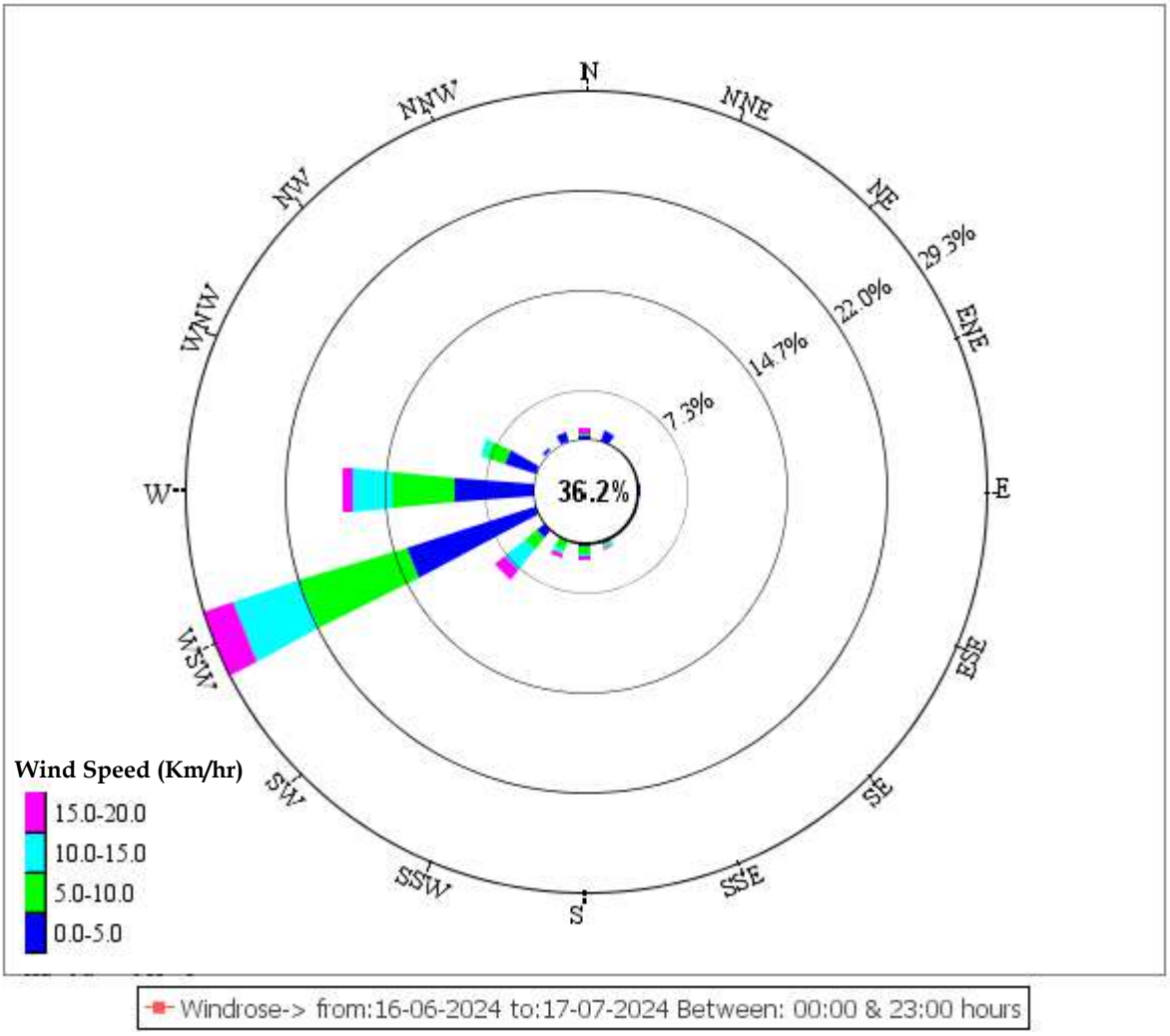
a. **Kandla:** The average Solar Radiation for the monitoring period was recorded as 67.97 W/m^2.
b. **Vadinar:** The average Solar Radiation was recorded as 71.63 W/m^2.

- **Wind rose diagram -**

The wind-rose diagram for the monitoring period has been drawn on the basis of hourly wind speed and direction data.

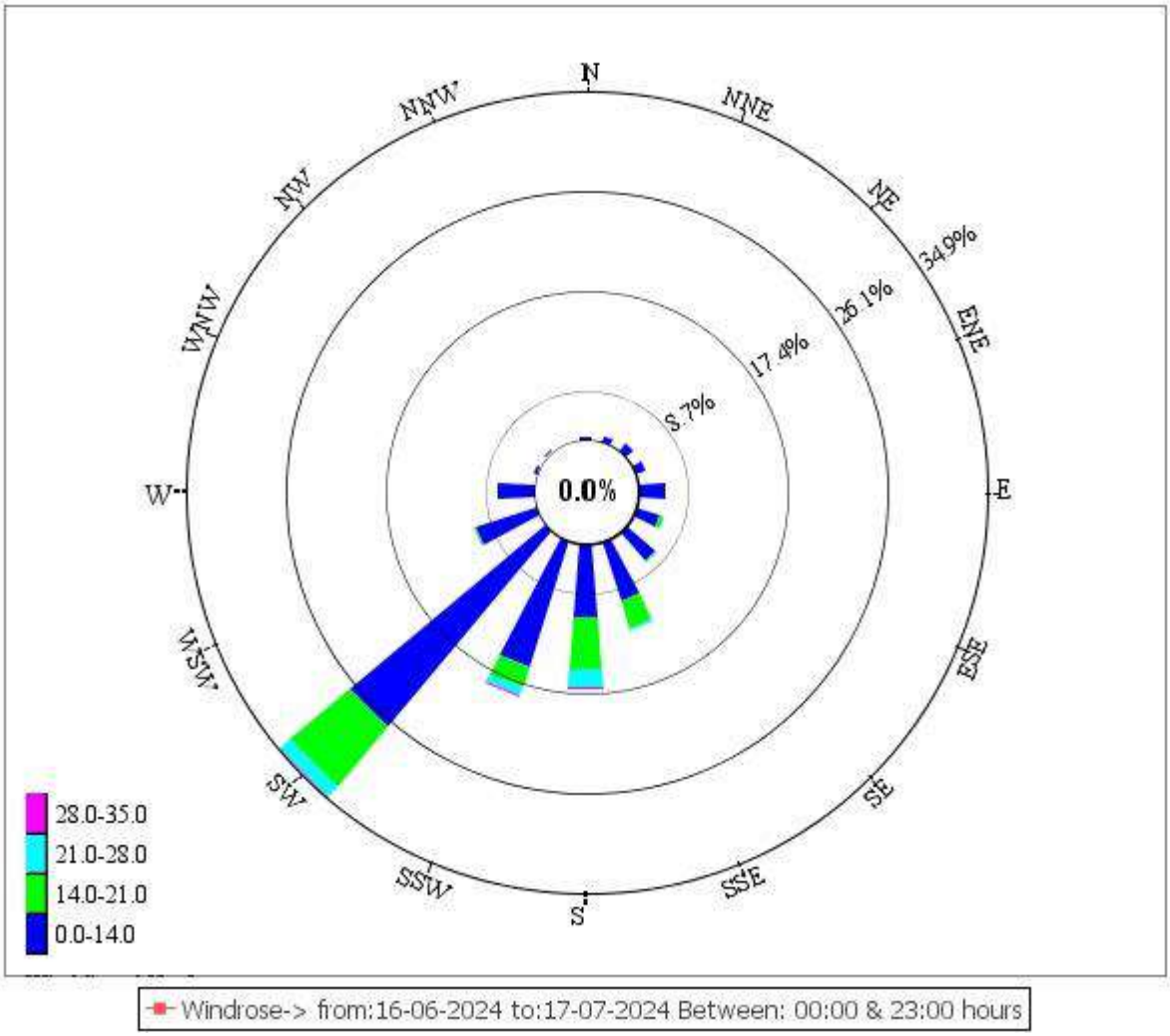
This Wind Rose Diagram reveals that at Kandla and Vadinar, during the monitoring period, the prevailing winds predominantly blow from the West South West direction at Kandla, whereas, high speed winds were also observed to blow from West direction. At Vadinar, the winds were observed to blow from From South West direction.

Wind Rose Plot M/s Deendayal Port Authority Site: Kandla Port (Environment Laboratory)	Display: Wind Direction Wind Speed (Km/hr)



Modeler: Envirotech Instruments Pvt. Ltd. Delhi.

Wind Rose Plot **M/s Deendayal Port Authority** **Site: Vadinar Port (Canteen Area)**	**Display: Wind Direction** **Wind Speed (Km/hr)**



Modeler: Envirotech Instruments Pvt. Ltd. Delhi.

CHAPTER 4: AMBIENT AIR QUALITY MONITORING

4.1 Ambient Air Quality

It is necessary to monitor the ambient air quality of the study area, in order to determine the impact of the shipping activities and port operations on the ambient air quality. The prime objective of ambient air quality monitoring is to assess the present air quality and its conformity to National Ambient Air Quality Standards i.e. NAAQS, 2009. Ambient air quality has been monitored from 17th June to 16th July, 2024.

Methodology

The study area represents the area occupied by DPA and its associated Port area. The sources of air pollution in the region are mainly vehicular traffic, fuel burning, loading & unloading of dry cargo, fugitive emissions from storage area and dust arising from unpaved village roads. Considering the below factors, under the study, as per the scope specified by DPA eight locations wherein, 6 stations at Kandla and 2 at Vadinar have been finalized within the study area

- Meteorological conditions;
- Topography of the study area;
- Direction of wind;
- Representation of the region for establishing current air quality status
- Representation with respect to likely impact areas.

The description of various air quality stations monitored at Kandla and Vadinar have been specified in **Table 4**.

Table 4: Details of Ambient Air monitoring locations

Sr. No.	Location Code		Location Name	Latitude Longitude	Significance
1.	**Kandla**	A-1	Oil Jetty No. 1	23.029361N 70.22003E	Liquid containers and emission from ship
2.		A-2	Oil Jetty No. 7	23.043538N 70.218617E	
3.		A-3	Kandla Port Colony	23.019797N 70.213536E	Vehicular activity and dust emission
4.		A-4	Marine Bhavan	23.007653N 70.222197E	Construction and vehicular activity, road dust emission,
5.		A-5	Coal Storage Area	23.000190N 70.219757E	Coal Dust, Vehicular activity
6.		A-6	Gopalpuri Hospital	23.081506N 70.135258E	Residential area, dust emission, vehicular activity
7.	**Vadinar**	A-7	Admin Building	22.441806N 69.677056E	Vehicular activity
8.		A-8	Vadinar Colony	22.401939N 69.716306E	Residential Area, burning waste, vehicular activity

The monitoring locations at Kandla and Vadinar have been depicted in map in **Map 4 and 5** respectively.

Ambient Air monitoring photos

Kandla

A-1: Oil Jetty No. 1

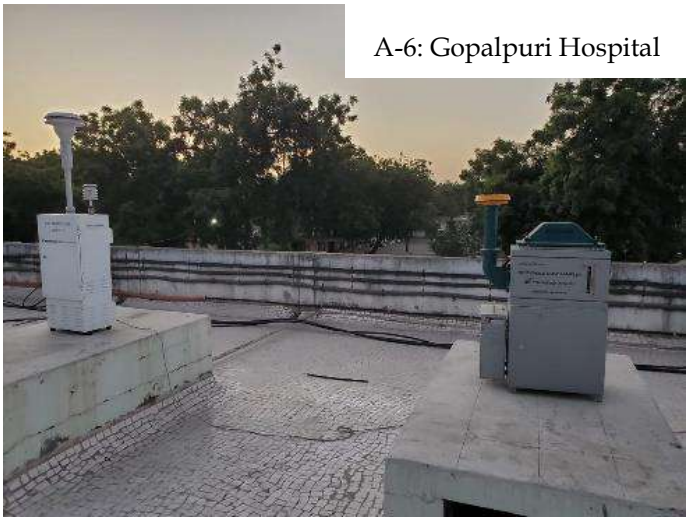
A-2: Oil Jetty No. 7

A-3: Kandla Port Colony

A-4: Marine Bhavan

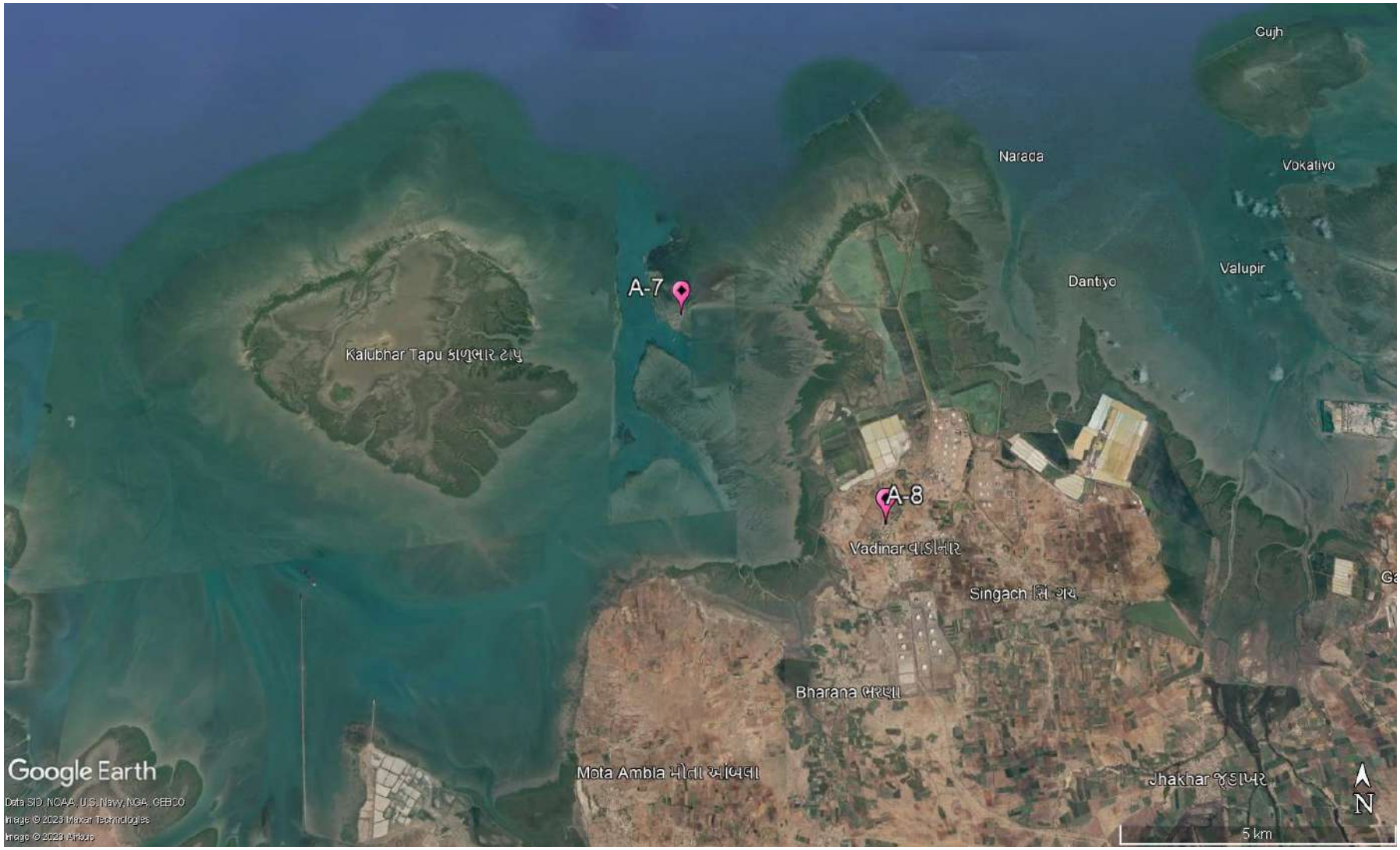
A-5: Coal Storage Area

A-6: Gopalpuri Hospital



Vadinar	
 A-7: Admin Building	 A-8: Vadinar Colony

Map 4: Locations for Ambient Air Monitoring at Kandla



Map 5: Locations for Ambient Air Monitoring at Vadinar

Frequency

The sampling for Particulate matter i.e. PM_{10} and $PM_{2.5}$ and the gaseous components like SO_x, NO_x, CO as well as the Total VOCs were monitored twice in a week for a period of 24 hours a day. Whereas, the sampling for the components of PAH, Benzene and non-Methane VOCs was conducted on monthly basis.

Sampling and Analysis

The Sampling of the Ambient Air Quality parameters and analysis is conducted as per the CPCB guidelines of National Ambient Air Quality Monitoring. The sampling was performed at a height of 3.5 m (approximately) from the ground level. For the sampling of PM_{10}, calibrated 'Respirable Dust Samplers' were used, where Whatman GF/A microfiber filter paper of size 8"x 10" were utilized, where the Gaseous attachment of the make Envirotech instrument was attached with Respirable Dust Sampler for the measurement of SO_x and NO_x. The Fine Particulate Sampler for collection of $PM_{2.5}$ was utilized for the particulate matter of size <2.5 microns. A known volume of ambient air is passed through the cyclone to the initially pre-processed filter paper. The centrifugal force in cyclone acts on particulate matter to separate them into two parts and collected as following:

- Particles <10 µ size (Respirable): GF/A Filter Paper
- Particles <2.5 µ size (Respirable): Polytetrafluoroethylene (PTFE)

Sampling and analysis of ambient SO_2 was performed by adopting the 'Improved West and Gaeke Method'. The ambient air, drawn through the draft created by the RDS, is passed through an impinger, containing a known volume of absorbing solution of Sodium tetrachloromercurate, at a pre-determined measured flow rate of 1 liter/minute (L/min). Similarly, NO_x was performed by adopting the 'Jacob Hochheister Modified' (Na arsenite) method. The impinger contains known volume of absorbing solution of Sodium Arsenite and Sodium Hydroxide.

Data has been compiled for PM_{10}, $PM_{2.5}$, SO_x and NO_x samples of 24-hour carried out twice a week. In case of CO, one hourly sample were taken on selected monitoring days using the sensor-based CO Meter. For the parameters Benzene, Methane & Non-methane and Volatile Organic Carbons (VOCs), the Low Volume Sampler is used, where the charcoal tubes are used as sampling media. The sampling in the Low Volume Sampler (LVS) is carried out as per IS 5182 (Part 11): 2006 RA: 2017, where the ambient air flow rate is maintained at 200 cc/min, the volume of air that passes through the LVS during two hours monitoring is approx. 24 L.

The sampling of PAHs is carried out as per IS: 5182 (Part 12): 2004. Where, the EPM 2000 Filter papers are utilized in the Respirable Dust Sampler (RDS). For the parameters, Benzene, PAH & Non-methane VOC's, monthly monitoring is carried out. The details of the parameters with their frequency monitored are mentioned in **Table 5:**

Table 5: Parameters for Ambient Air Quality Monitoring

Sr. No.	Parameters	Units	Reference method	Instrument	Frequency
1.	PM_{10}	µg/m³	IS 5182 (Part 23): 2006	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-23): 2006	Twice in a week
2.	$PM_{2.5}$	µg/m³	IS:5182 (Part:24):2019	Fine Particulate Sampler (FPS) conforming to IS:5182 (Part-24): 2019	
3.	Sulphur Dioxide (SO_x)	µg/m³	IS 5182 (Part:2): 2001	Gaseous Attachment conforming to IS:5182 Part-2	
4.	Oxides of Nitrogen (NO_x)	µg/m³	IS:5182 (Part-6): 2006	Gaseous Attachment conforming to IS:5182 Part-6	
5.	Carbon Monoxide (CO)	mg/m³	GEMI/SOP/AAQM/11 ; Issue no 01, Date 17.01.2019: 2019	Sensor based Instrument	
6.	VOC	µg/m³	IS 5182 (Part 17): 2004	Low Flow Air Sampler	
8.	PAH	µg/m³	IS: 5182 (Part 12): 2004	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-12): 2004	Monthly
7.	Benzene	µg/m³	IS 5182 (Part 11): 2006 RA: 2017	Low Flow Air Sampler	
9.	Non-methane VOC	µg/m³	IS 5182 (Part 11): 2006	Low Volume Sampler	

4.2 Result and Discussion

The summarized results of ambient air quality monitoring for the study period are presented in **Table-6 to 9** along with the graphical representation from **Graph 1 to Graph 6.** Various parameters monitored during the study have been presented by their maximum, minimum, average and Standard deviation.

Table 6: Summarized results of PM_{10}, $PM_{2.5}$, SO_2, NO_x, VOC and CO for Ambient Air quality monitoring

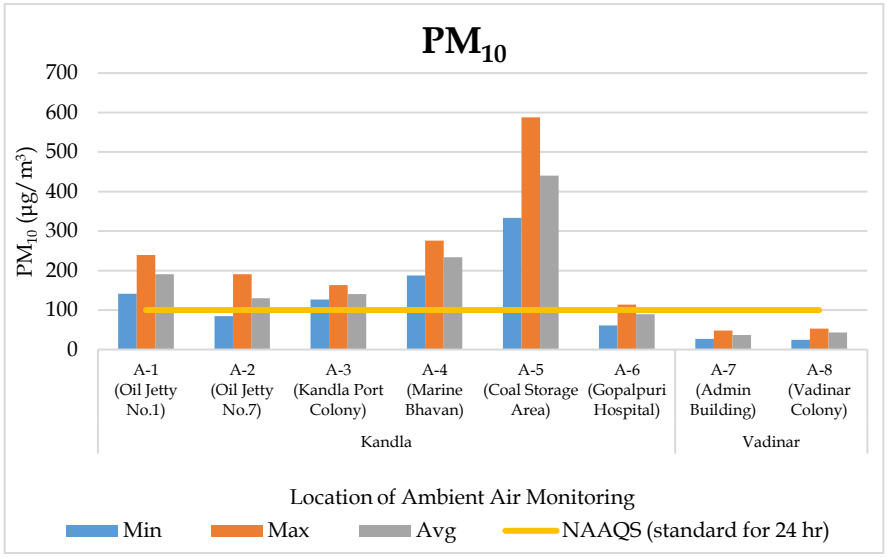
Station Code & Name	Unit of Average Concentration	Average Pollutant Concentration					
	Pollutants	**PM_{10} (µg/m³)**	**$PM_{2.5}$ (µg/m³)**	**SO_2 (µg/m³)**	**NO_X (µg/m³)**	**VOC (µg/m³)**	**CO (mg/m³)**
	Duration	**(24 hr)**				**(2 hr)**	**(1 hr)**
	NAAQS by CPCB / **Monitoring days**	**100**	**60**	**80**	**80**	**-**	**2**
A-1: Oil Jetty No.1,	17/06/2024	225.63	39.64	18.34	12.68	0.11	0.80
	19/06/2024	239.33	41.33	22.50	19.33	0.07	0.86
	24/06/2024	196.37	30.50	4.96	6.28	0.22	0.81
	27/06/2024	208.63	34.6	16.64	9.29	0.14	0.74

Station Code & Name	Unit of Average Concentration	Average Pollutant Concentration					
	Pollutants	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_X (µg/m³)	VOC (µg/m³)	CO (mg/m³)
	Duration	(24 hr)				(2 hr)	(1 hr)
	NAAQS by CPCB / Monitoring days	100	60	80	80	-	2
Kandla	2/7/2024	188.37	31.19	23.83	11.51	0.18	0.66
	4/7/2024	141.41	29.24	4.88	<6	0.12	0.84
	8/7/2024	168.27	33.12	11.45	14.2	0.07	0.82
	10/7/2024	156.88	32.79	13.38	21.37	0.14	0.79
	Minimum	**141.41**	**29.24**	**11.45**	**6.28**	**0.07**	**0.66**
	Maximum	**239.33**	**41.33**	**23.83**	**21.37**	**0.22**	**0.86**
	Average	**190.61**	**34.05**	**17.69**	**13.52**	**0.13**	**0.79**
	Std. Deviation	**33.85**	**4.32**	**4.90**	**5.34**	**0.05**	**0.06**
A-2: Oil Jetty No.7, Kandla	17/06/2024	182.61	43.13	36.12	18.21	0.08	0.81
	19/06/2024	191.11	40.62	48.62	10.74	0.03	0.79
	24/06/2024	110.57	36.00	4.92	5.93	0.11	0.78
	27/06/2024	146.32	34.38	30.40	16.77	0.16	0.74
	2/7/2024	119.29	38.64	22.56	8.38	0.09	0.77
	4/7/2024	84.43	23.11	4.89	5.96	0.12	0.75
	8/7/2024	105.63	26.14	16.21	11.41	0.18	0.76
	10/7/2024	96.47	30.22	26.33	10.16	0.05	0.78
	Minimum	**84.43**	**23.11**	**4.89**	**5.93**	**0.03**	**0.74**
	Maximum	**191.11**	**43.13**	**48.62**	**18.21**	**0.18**	**0.81**
	Average	**129.55**	**34.03**	**23.76**	**10.95**	**0.10**	**0.77**
	Std. Deviation	**39.74**	**7.05**	**15.08**	**4.54**	**0.05**	**0.02**
A-3: Kandla Port Colony, Kandla	17/06/2024	146.07	13.39	4.87	5.78	0.20	0.87
	19/06/2024	129.49	14.12	4.96	5.84	0.13	0.86
	24/06/2024	134.77	28.61	29.38	12.34	0.19	0.84
	27/06/2024	163.17	31.16	21.16	9.46	0.12	0.82
	2/7/2024	141.42	27.42	10.27	19.7	0.16	0.85
	4/7/2024	150.52	24.32	4.79	5.94	0.11	0.82
	8/7/2024	126.63	18.38	16.83	12.75	0.27	0.83
	10/7/2024	131.31	21.15	14.77	22.87	0.32	0.86
	Minimum	**126.63**	**13.39**	**4.79**	**5.78**	**0.11**	**0.82**
	Maximum	**163.17**	**31.16**	**29.38**	**22.87**	**0.32**	**0.87**
	Average	**140.42**	**22.32**	**13.38**	**11.84**	**0.19**	**0.84**
	Std. Deviation	**12.40**	**6.67**	**8.92**	**6.52**	**0.07**	**0.02**
A-4: Marine Bhavan, Kandla	17/06/2024	272.90	22.25	4.84	5.76	0.16	0.89
	19/06/2024	253.03	18.10	4..93	5.72	0.21	0.86
	24/06/2024	275.72	22.69	4.89	5.83	0.04	0.84
	27/06/2024	264.42	27.55	27.57	12.25	0.09	0.88
	2/7/2024	218.13	23.41	19.38	14.07	0.11	0.87
	4/7/2024	193.37	25.45	4.97	5.85	0.23	0.85
	8/7/2024	187.73	21.76	13.49	16.19	0.21	0.84
	10/7/2024	203.38	18.93	17.38	23.89	0.25	0.87
	Minimum	**187.73**	**18.10**	**4.84**	**5.72**	**0.04**	**0.84**
	Maximum	**275.72**	**27.55**	**27.57**	**23.89**	**0.25**	**0.89**

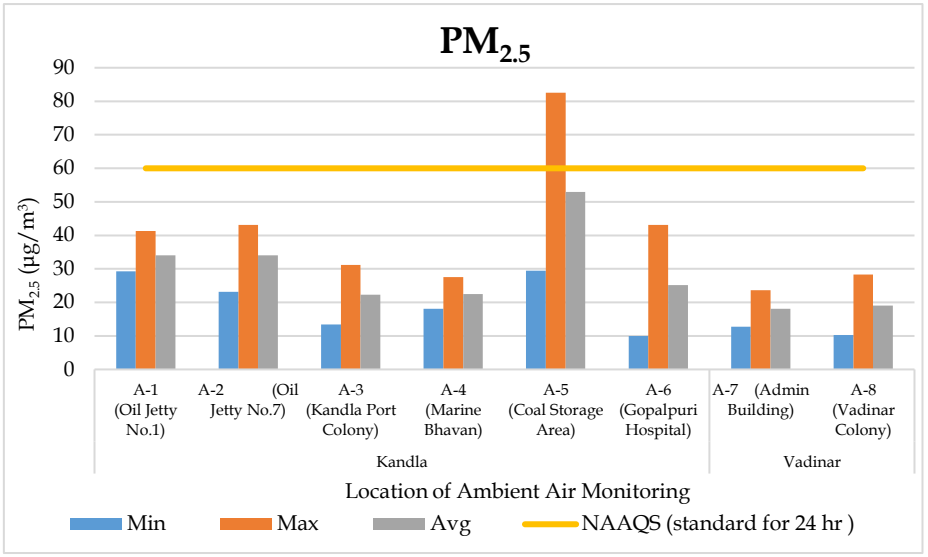
Station Code & Name	Unit of Average Concentration	Average Pollutant Concentration					
	Pollutants	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_X (µg/m³)	VOC (µg/m³)	CO (mg/m³)
	Duration	(24 hr)				(2 hr)	(1 hr)
	NAAQS by CPCB / Monitoring days	100	60	80	80	-	2
	Average	**233.59**	**22.52**	**13.22**	**11.20**	**0.16**	**0.86**
	Std. Deviation	**36.88**	**3.11**	**8.84**	**6.68**	**0.08**	**0.02**
A-5: Coal Storage Area, Kandla	17/06/2024	469.24	58.31	36.74	32.68	0.21	0.88
	19/06/2024	522.30	68.62	43.86	10.44	0.14	0.92
	24/06/2024	411.80	82.57	4.94	6.76	0.13	0.94
	27/06/2024	588.16	53.67	31.45	18.87	0.18	0.93
	2/7/2024	446.39	49.22	24.76	26.92	0.10	0.89
	4/7/2024	383.47	29.42	18.66	12.80	0.07	0.91
	8/7/2024	366.11	38.11	29.49	15.37	0.22	0.94
	10/7/2024	333.28	43.66	37.09	18.47	0.12	0.90
	Minimum	**333.28**	**29.42**	**4.94**	**6.76**	**0.07**	**0.88**
	Maximum	**588.16**	**82.57**	**43.86**	**32.68**	**0.22**	**0.94**
	Average	**440.09**	**52.95**	**28.37**	**17.79**	**0.15**	**0.91**
	Std. Deviation	**84.90**	**17.01**	**12.27**	**8.56**	**0.05**	**0.02**
A-6: Gopalpuri Hospital, Kandla	17/06/2024	113.68	43.07	4.97	5.87	0.11	0.73
	19/06/2024	95.01	10.01	4.88	5.92	0.22	0.67
	24/06/2024	78.76	21.78	4.79	5.68	0.19	0.67
	27/06/2024	105.1	29.38	16.23	8.37	0.13	0.7
	2/7/2024	98.34	36.44	11.74	11.33	0.08	0.75
	4/7/2024	61.27	16.27	4.85	5.94	0.16	0.85
	8/7/2024	78.58	25.71	23.58	11.96	0.24	0.78
	10/7/2024	83.67	18.87	9.68	9.79	0.20	0.82
	Minimum	**61.27**	**10.01**	**4.79**	**5.68**	**0.08**	**0.67**
	Maximum	**113.68**	**43.07**	**23.58**	**11.96**	**0.24**	**0.85**
	Average	**89.30**	**25.19**	**10.09**	**8.11**	**0.17**	**0.75**
	Std. Deviation	**16.91**	**10.86**	**6.88**	**2.63**	**0.06**	**0.07**
A-7: Admin Building, Vadinar	17/06/2024	44.86	15.69	15.82	11.76	0.12	0.71
	19/06/2024	47.70	12.78	4.98	5.98	0.10	0.70
	24/06/2024	38.91	13.49	6.68	12.09	0.19	0.68
	27/06/2024	29.72	23.66	4.88	6.33	0.14	0.69
	3/7/2024	27.40	19.44	4.93	5.89	0.04	0.72
	4/7/2024	34.3	21.66	19.73	9.63	0.09	0.7
	8/7/2024	27.08	17.55	22.32	5.91	0.23	0.73
	10/7/2024	42.52	20.69	4.85	5.73	0.11	0.72
	Minimum	**27.08**	**12.78**	**4.85**	**5.73**	**0.04**	**0.68**
	Maximum	**47.70**	**23.66**	**22.32**	**12.09**	**0.23**	**0.73**
	Average	**36.56**	**18.12**	**10.52**	**7.92**	**0.13**	**0.71**
	Std. Deviation	**8.10**	**3.92**	**7.49**	**2.79**	**0.06**	**0.02**
A-8: Vadinar Colony,	17/06/2024	49.61	13.63	9.37	16.18	0.13	0.74
	19/06/2024	52.72	10.30	4.84	5.91	0.18	0.75
	24/06/2024	51.67	28.30	8.37	19.38	0.23	0.72
	27/06/2024	35.58	25.44	4.93	6.52	0.07	0.73

Station Code & Name	Unit of Average Concentration	Average Pollutant Concentration					
	Pollutants	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_X (µg/m³)	VOC (µg/m³)	CO (mg/m³)
	Duration	(24 hr)				(2 hr)	(1 hr)
	NAAQS by CPCB / Monitoring days	100	60	80	80	-	2
Vadinar	3/7/2024	24.57	14.60	4.98	5.78	0.16	0.80
	4/7/2024	47.58	23.53	11.91	8.48	0.11	0.76
	8/7/2024	51.39	15.43	12.55	5.76	0.18	0.79
	10/7/2024	30.02	21.41	4.91	5.93	0.09	0.78
	Minimum	**24.57**	**10.30**	**4.84**	**5.76**	**0.07**	**0.72**
	Maximum	**52.72**	**28.30**	**12.55**	**19.38**	**0.23**	**0.80**
	Average	**42.89**	**19.08**	**7.73**	**9.24**	**0.14**	**0.76**
	Std. Deviation	**11.13**	**6.45**	**3.28**	**5.41**	**0.05**	**0.03**

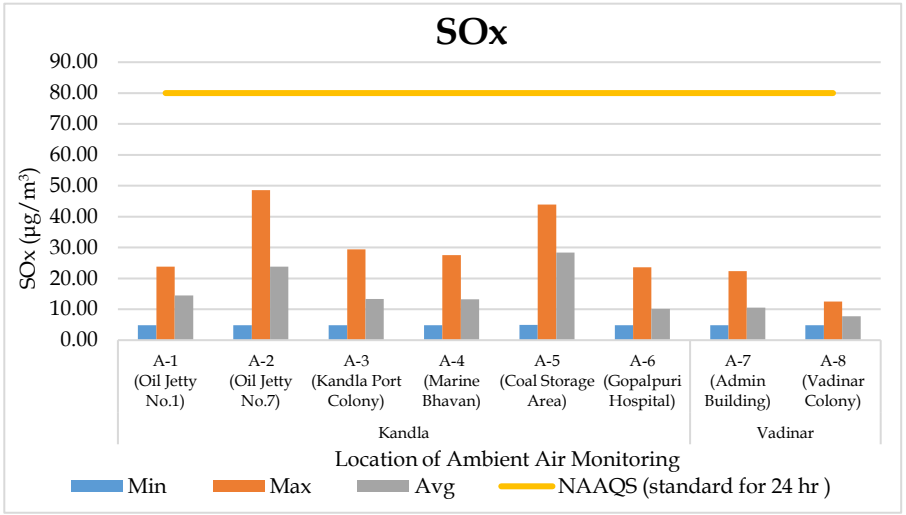
Graphs 1-6 shows spatial trend of ambient air parameter at all the eight-monitoring location (six at Kandla and 2 at Vadinar



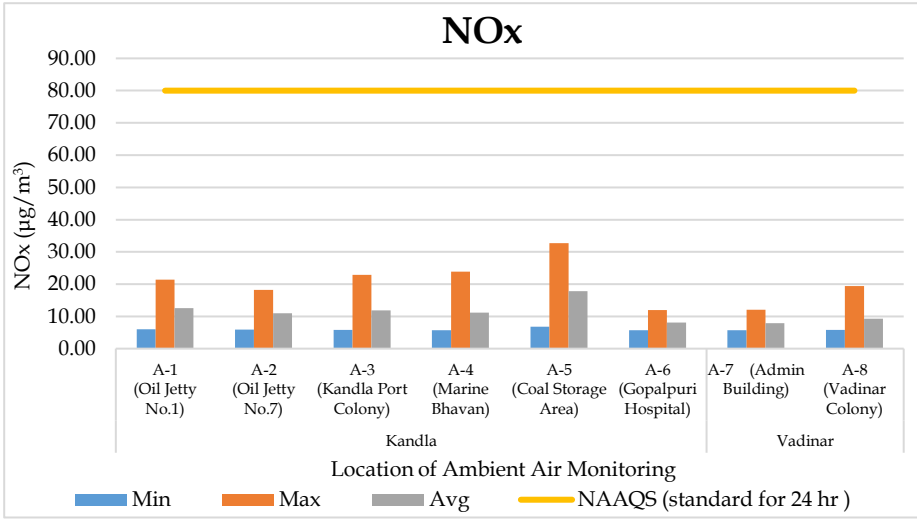
Graph 1: Spatial trend in Ambient PM_{10} Concentration



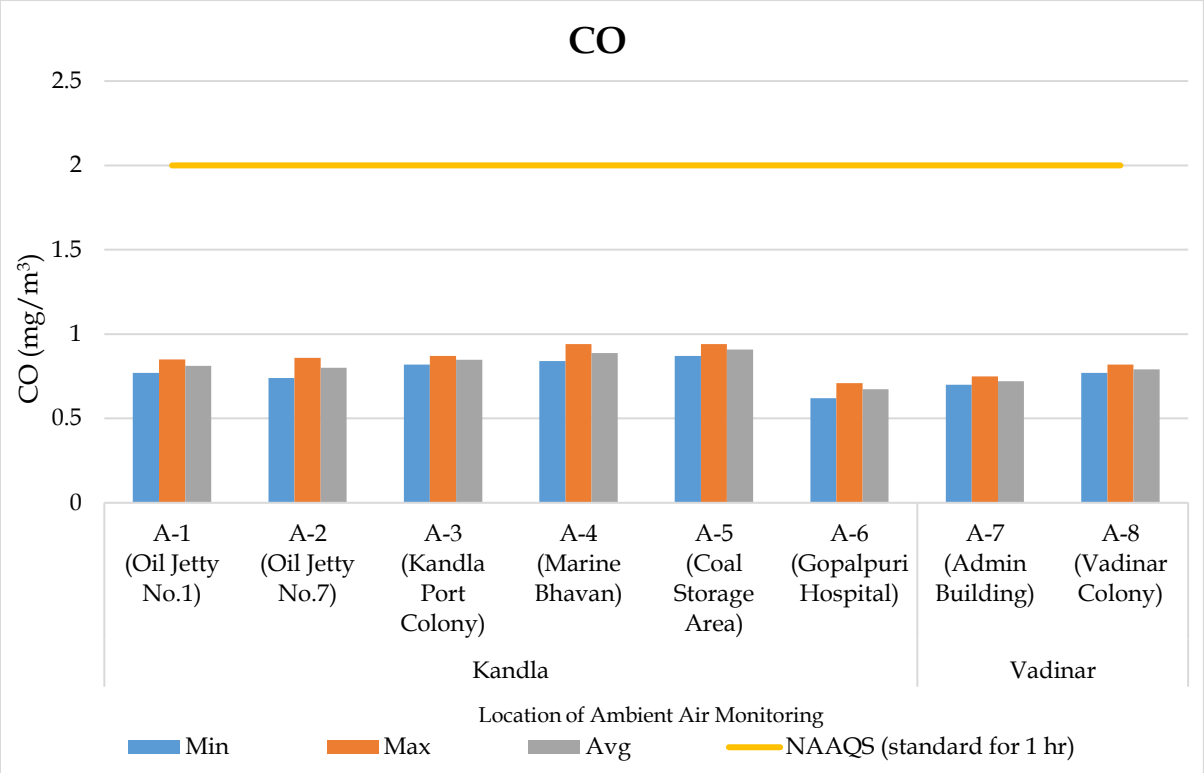
Graph 2: Spatial trend in Ambient $PM_{2.5}$ Concentration



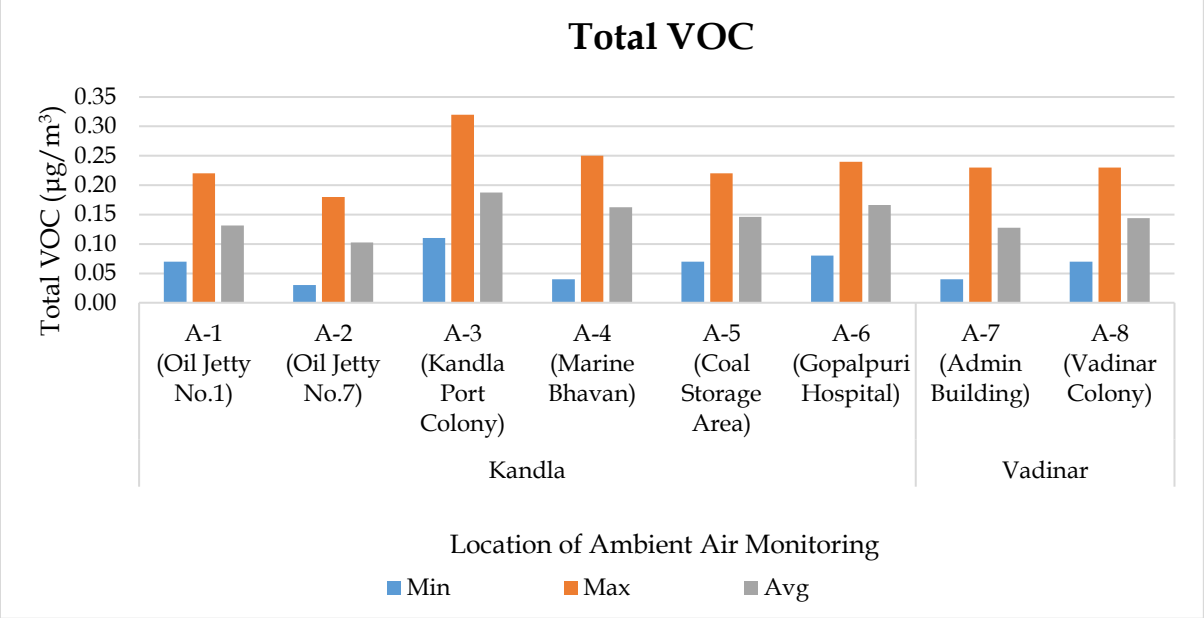
Graph 3: Spatial trend in Ambient SOx Concentration



Graph 4: Spatial trend in Ambient NOx Concentration



Graph 5: Spatial trend in Ambient CO Concentration



Graph 6: Spatial trend in Ambient Total VOCs

Table 7: Summarized results of Benzene for Ambient Air quality monitoring

Benzene (µg/m³)									
Sr. No	Kandla						Vadinar		NAAQS standards (24 hr)
	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
1	0	0	0	0	0	0	0	0	5 µg/m³

Table 8: Summarized results of Polycyclic Aromatic Hydrocarbons

Sr. No.	Components	Kandla						Vadinar	
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8
1	Napthalene	0.25	0.44	0.48	0.60	0.43	0.46	0.01	0.04
2	Acenaphthylene	0.05	0.02	0.08	0.05	0.04	0.08	0.01	0.01
3	Acenaphthene	0.01	0.03	0.00	0.01	0.04	0.03	0.00	0.00
4	Fluorene	0.05	0.02	0.19	0.13	0.56	0.11	0.03	0.02
5	Anthracene	0.07	0.16	0.22	0.51	2.64	0.53	0.18	0.11
6	Phenanthrene	0.00	0.02	0.26	0.18	0.53	0.06	0.01	0.00
7	Fluoranthene	0.03	0.09	0.07	0.21	0.35	0.19	0.09	0.04
8	Pyrene	0.00	0.05	0.42	0.51	0.84	0.31	0.13	0.03
9	Chrycene	0.17	0.20	0.37	0.54	1.22	0.48	0.00	0.00
10	Banz(a)anthracene	0.11	0.06	0.06	0.23	0.58	0.20	0.05	0.02
11	Benzo[k]fluoranthene	0.03	0.01	0.20	0.15	0.36	0.10	0.00	0.00
12	Benzo[b]fluoranthene	0.03	0.05	0.10	0.17	0.32	0.11	0.00	0.00
13	Benzopyrene	0.03	0.04	0.00	0.14	0.84	0.25	0.02	0.04
14	Indeno [1,2,3-cd] fluoranthene	0.08	0.13	0.02	0.12	0.23	0.28	0.04	0.26
15	Dibenz(ah)anthracene	0.03	0.06	0.17	0.15	0.46	0.02	0.02	0.09
16	Benzo[ghi]perylene	0.00	0.01	0.00	0.00	0.00	0.00	0.07	0.18

Table 9: Summarized results of Non-methane VOC

Sr No	Kandla						Vadinar	
	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8
1	1.11	1.08	1.63	1.24	1.43	1.69	1.53	1.27

4.3 Data Interpretation and Conclusion

The results were compared with the National Ambient Air Quality Standards (NAAQS), 2009 of Central Pollution Control Board (CPCB).

- The concentration of PM_{10} at Kandla varies in the range of 61.27 to 588.16 µg/m³ with an average value of 203.93 µg/m³. PM_{10} exceeded NAAQS of all the monitoring locations in Kandla. Whereas, at Vadinar, the concentration varies from 24.57 to 52.72 µg/m³, with an average value of 39.73 µg/m³, and complies with the stipulated norm (100 µg/m³).
- The highest concentration of PM_{10} at locations A-5 i.e. Coal Storage Area could be attributed to the presence of heavy vehicular traffic in upwind areas which bring

higher impact causing the dispersion of emitted particulate matter in the ambient air. The unloading of coal directly in the truck, using grabs causes the coal to disperse in the air as well as coal dust to fall and settle on the ground. This settled coal dust again mixes with the air while trucks travel through it. Also, the coal-loaded trucks are generally not always covered with tarpaulin sheets and this might result in increased suspension of coal from trucks/dumpers during its transit from vessel to yard or storage site. This might increase the PM_{10} in and around the Coal storage area and Marine bhavan.

- The **$PM_{2.5}$** concentrations at Kandla vary from 10.01 to 82.57 µg/m3, with an average of 31.84 µg/m3. While the **$PM_{2.5}$** concentrations at most locations in Kandla fall within the NAAQS limits, the concentration at location A-5, with a value of 82.57 µg/m3, exceeds the permissible limit. Whereas, at Vadinar its concentration varies from 10.30 to 28.30 µg/m^3 with average 18.60 µg/m^3 which falls within the limit of NAAQS of 60 µg/m^3.
- The concentration of **SO_x** varies from 4.79 to 48.62 µg/m^3 with average concentration as 17.22 µg/m^3 at Kandla and 4.84 to 22.32 µg/m^3 with average as 9.13 µg/m^3 at Vadinar. The average concentration of SO_x complies with the prescribed limit of NAAQS (80 µg/m^3) for both the monitoring site.
- The concentration of **NO_x** varies from 5.68 to 32.68 µg/m^3 with average 12.08 µg/m^3 at Kandla and 5.73 to 19.38 µg/m^3 with average 8.58 µg/m^3 at Vadinar. The concentration of **NO_x** falls within the prescribed limit of NAAQS i.e. 80 µg/m^3 at both the monitoring site of Kandla and Vadinar.
- The concentration of **CO** varies from 0.66 to 0.94 µg/m^3 with average 0.82 µg/m^3 at Kandla and 0.68 to 0.80 µg /m^3 with average 0.73 µg/m^3 at Vadinar. The concentration falls within the norm of 2 mg/m^3 specified by NAAQS at both the monitoring sites
- The concentration of **Total VOCs** levels was recorded in range of 0.03 to 0.32 µg/m^3 and 0.04 to 0.23 µg/m^3 at Kandla and Vadinar respectively. The main source of VOCs in the ambient air may be attributed to the burning of Gasoline and Natural gas in Vehicle exhaust and burning fossil fuels, and garbage that release VOCs into the atmosphere. During the monitoring period, the wind flows towards South direction at Kandla, and hence the wind direction and speed also contribute to increased dispersion of pollutants from the upward areas towards the downward areas.
- **Benzene** was not detected at any of locations of Kandla and Vadinar.
- **Polycyclic Aromatic Hydrocarbons (PAHs)** are ubiquitous pollutants in urban atmospheres. Anthropogenic sources of total PAHs in ambient air emissions are greater than those that come from natural events. These locations are commercial areas where Vehicular activity and dust emission is common. PAHs are a class of chemicals that occur naturally in coal, crude oil, and gasoline. The higher concentration which results from burning coal, oil, gas, road dust, etc. Other outdoor sources of PAHs may be the industrial plants in-and-around the DPA premises.

- The Ambient air Monitoring location of Kandla recorded the **Non-methane VOC** (NM-VOC) concentration in the range of 1.08 to 1.69 µg/m^3. While at Vadinar, the concentration of NM-VOC falls in the range of 1.27 to 1.53 µg/m^3.

With reference to the Ambient Air Quality monitoring conducted under the study, it may be concluded that the particulate matter PM_{10}, were reported in higher concentration and apparently exceeds the NAAQS particularly at locations of Kandla., whereas $PM_{2.5}$ complies with the NAAQS at majority of the locations. For both the ambient air monitoring parameters (PM_{10} and $PM_{2.5}$), the major exceedance was observed at location A-5 i.e. Coal Storage Area. The gaseous pollutants (NO_x, SO_x, CO, VOCs etc.) falls within the permissible limit. The probable reasons contributing to these emissions of pollutants into the atmosphere in-and-around the port area are summarized as follows: -

1. **Port Machinery:** Port activities involve the use of various machinery and equipment, including cranes, for lifts, tugboats, and cargo handling equipment. These machines often rely on diesel engines, which can emit pollutants such as NO_x, Particulate matter, and CO. Older or poorly maintained equipment tends to generate higher emissions.
2. **Port Vehicles:** Trucks and other vehicles operating within port and port area contributes to air pollution. Similar to port machinery, diesel-powered vehicles can emit NO_x, PM, CO, and other pollutants such as PAH, VOCs etc. Vehicle traffic and congestion in and around port areas can exacerbate the air quality issues.

4.4 Remedial Measures:

Efficient mitigation strategies need to be implementation for substantial environmental and health co-benefits. To improve air quality, DPA has implemented a number of precautionary measures, such as maintaining Green zone, initiated Inter-Terminal Transfer of tractor-trailers, Centralized Parking Plaza, providing shore power supply to tugs and port crafts, the use of LED lights at DPA area helps in lower energy consumption and decreases the carbon foot prints in the environment, time to time cleaning of paved and unpaved roads, use of tarpaulin sheets to cover dumpers at project sites etc. are helping to achieve the cleaner and green future at port. To address air pollution from port shipping activities, various measures that can be implemented are as follows:

- Practice should be initiated for using mask as preventative measure, to avoid Inhalation of dust particle-Mask advised in sensitive areas. Covering vehicles with tarpaulin during transportation will help to reduce the suspension of pollutants in air.
- Ensuring maintenance of engines and machinery to comply with emission standards.
- Frequent water sprinkling on roads to reduce dust suspension due to vehicular movement, this can be use during transporting coal to avoid suspension of coal dust.
- Use of proper transport methods, such as a conveyor belt, for excavated material and screens around the construction site.
- Temporary pavement of roads in construction site could considerably reduce dust emission. Prohibition of use of heavy diesel oil as fuel could be possibly reduce pollutants. Encouraging use of low-sulfur fuels (viz. Marine Gas Oil (MGO)/ Liquefied Natural Gas (LNG), can significantly reduce sulfur and PM emissions from ships.

- Retrofitting ships with exhaust gas cleaning systems can help reduce sulfur emissions. Engine upgrades, such as optimizing fuel combustion and improving engine efficiency, can reduce overall emissions.
- Investing in infrastructure for cold ironing allows ships to connect to the electrical grid while docked, reducing the need for auxiliary engines and associated emissions.
- Implementing efficient cargo-handling processes, optimizing logistics to reduce congestion and idling times, and encouraging use of cleaner port machinery and vehicles can all contribute to reducing air pollution in port areas.

CHAPTER 5: DG STACK MONITORING

5.1 DG Stack Monitoring

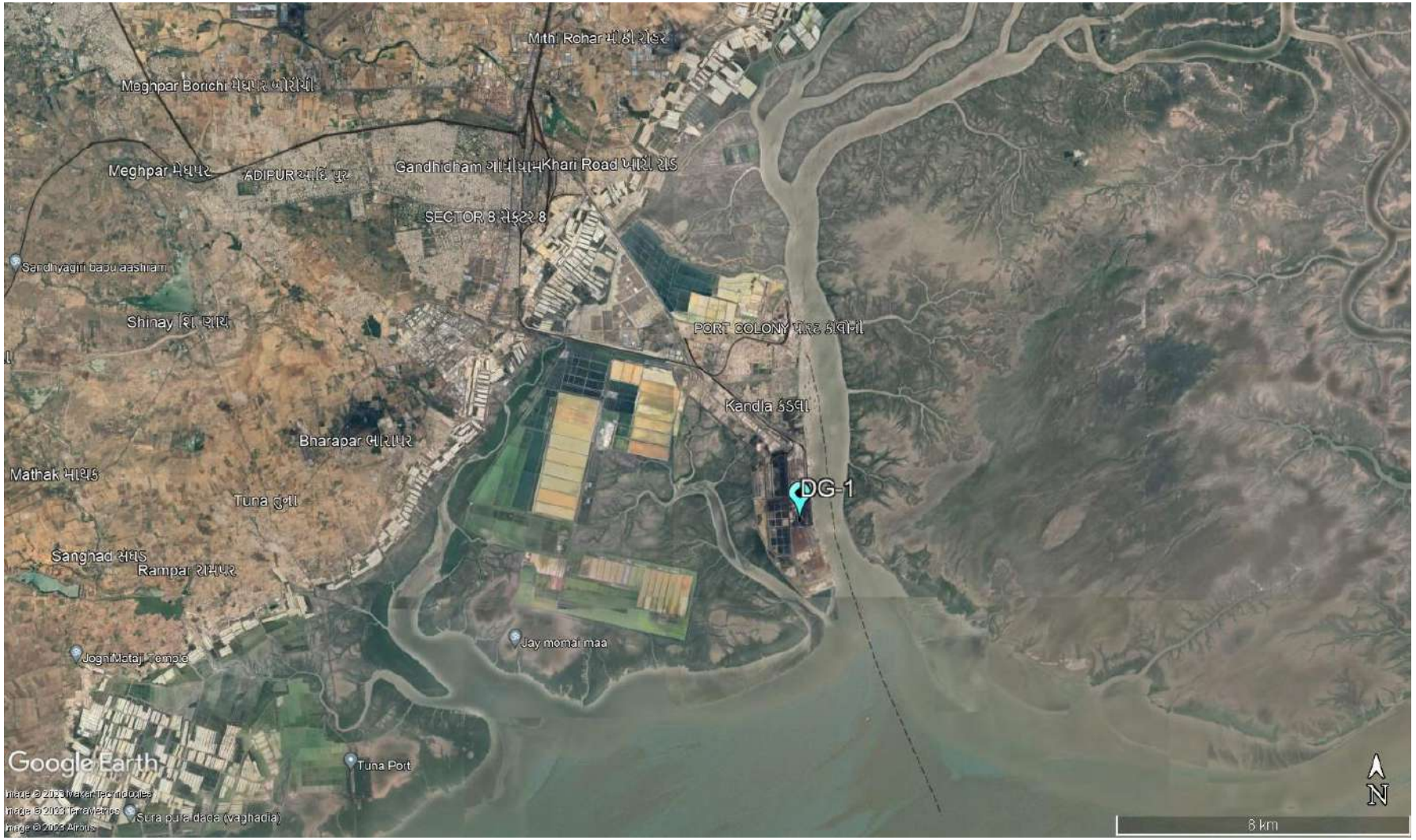
A diesel generator is a mechanical-electrical machine that produces electrical energy (electricity) from diesel fuel. They are used by the residential, commercial, charitable and governmental sectors to provide power in the event of interruption to the main power, or as the main power source. Diesel generating (DG) sets are generally used in places without connection to a power grid, or as an emergency power supply if the grid fails. These DG sets utilize diesel as fuel and generate and emit the air pollutants such as Suspended Particulate Matter, SO_2, NO_x, CO, etc. from the stack during its functioning. The purpose of stack sampling is to determine emission levels from plant processes to ensure they are in compliance with any emission limits set by regulatory authorities to prevent macro environmental pollution. The stack is nothing but chimney which is used to disperse the hot air at a great height, emissions & particulate matters that are emitted. Hence, monitoring of these stacks attached to DG Sets is necessary in order to quantify the emissions generated from it.

As defined in scope by DPA, the monitoring of DG Stack shall be carried out at two locations, one at Kandla and one at Vadinar. The details of the DG Sets at Kandla and Vadinar have been mentioned in **Table 10** as follows:

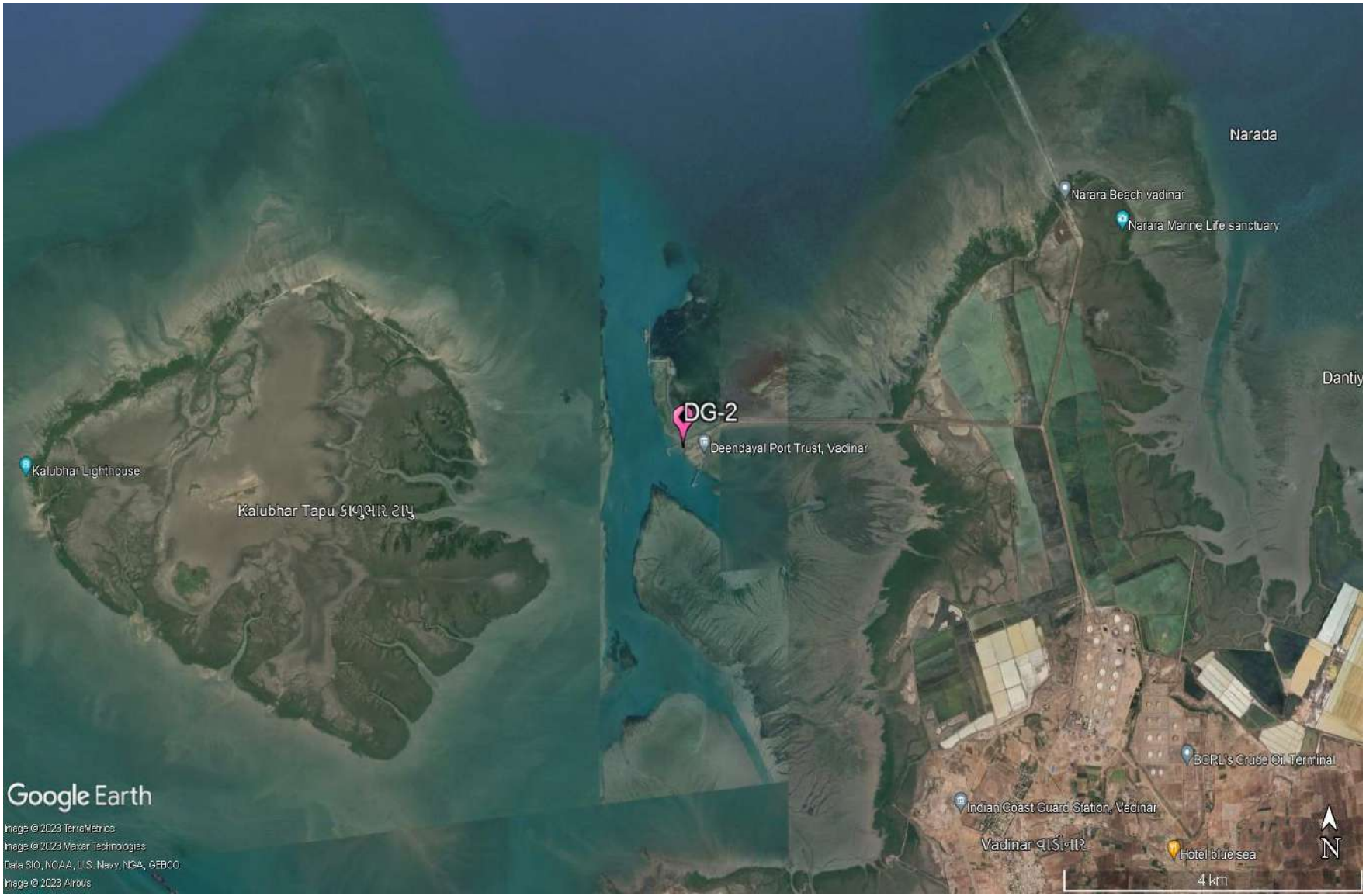
Table 10: Details of DG Stack monitoring locations

Sr. No.	Location Code	Location Name	Latitude/ Longitude
1.	DG-1	Kandla	22.98916N 70.22083E
2.	DG-2	Vadinar	22.44155N 69.67419E

The map depicting the locations of DG Stack Monitoring to be monitored in Kandla and Vadinar have been mentioned in **Map 6 and 7** as follows:



Map 6: Locations for DG Stack monitoring at Kandla



Map 7: Locations for DG Stack monitoring at Vadinar

Methodology:

Under the study, the list of parameters to be monitored under the projects for DG Stack Monitoring has been mentioned in **Table 11** as follows:

Table 11: DG stack parameters

Sr. No.	Parameter	Unit	Instrument
1.	Suspended Particulate Matter	mg/Nm^3	Stack Monitoring Kit
2.	Sulphur Dioxide (SO_2)	PPM	Sensor based Flue Gas Analyzer (Make: TESTO, Model 350)
3.	Oxides of Nitrogen (NO_x)	PPM	
4.	Carbon Monoxide	%	
5.	Carbon Dioxide	%	

The methodology for monitoring of DG Stack has been mentioned as follows:

The monitoring of DG Stack is carried out as per the IS:11255 and USEPA Method. The Stack monitoring kit is used for collecting representative samples from the stack to determine the total amount of pollutants emitted into the atmosphere in a given time. Source sampling is carried out from ventilation stack to determine the emission rates/or characteristics of pollutants. Sample collected must be such that it truly represents the conditions prevailing inside the stack. Whereas the parameters Sulphur Dioxide, Oxides of Nitrogen (NO_x), Carbon Monoxide and Carbon Dioxide, the monitoring is carried out by using the sensor-based Flue Gas Analyzer.

Frequency

Monitoring is required to be carried out once a month for both the locations of Kandla and Vadinar.

5.2 Result and Discussion

The sampling and monitoring of DG stack emission was carried out at Kandla and Vadinar and its comparison with CPCB or Indian standards for Industrial Stack Monitoring the flue gas emission from DG set has given in **Table 12.**

Table 12: DG monitoring data

Sr. No.	Stack Monitoring Parameters for DG Sets	Stack Monitoring Limits / Standards As per CPCB	DG- 1 (Kandla)	DG-2 (Vadinar)
1.	Suspended Particulate Matter (SPM) (mg/Nm^3)	150	85.36	39.56
2.	Sulphur Dioxide (SO_2) (PPM)	100	6.31	N.D.
3.	Oxides of Nitrogen (NO_x) (PPM)	50	38.21	10.32
4.	Carbon Monoxide (CO) (%)	1	0.26	0.11
5.	Carbon Dioxide (CO_2) (%)	-	2.15	1.35

5.3 Data Interpretation and Conclusion

The results of DG stack emission are compared with the permissible limits mentioned in the consent issued by GPCB, and have been found within the prescribed limit for all the monitored parameters.

CHAPTER 6: NOISE MONITORING

6.1 Noise Monitoring

Noise can be defined as an unwanted sound, and it is therefore, necessary to measure both the quality as well as the quantity of environmental noise in and around the study area. Noise produced during operation stage and the subsequent activities may affect surrounding environment impacting the fauna and as well as the human population. Under the scope, the noise monitoring is required to be carried out at 10 locations in Kandla and 3 locations in Vadinar. The sampling locations for noise are not only confined to commercial areas of DPA but also the residential areas of DPA.

The details of the noise monitoring stations are mentioned in **Table 13** and locations have been depicted in the **Map 8 and 9** as follow:

Table 13: Details of noise monitoring locations

Sr. No.	Location Code		Location Name	Latitude/ Longitude
1.	Kandla	N-1	Oil Jetty 7	23.043527N 70.218456E
2.		N-2	West Gate No.1	23.006771N 70.217340E
3.		N-3	Canteen Area	23.003707N 70.221331E
4.		N-4	Main Gate	23.007980N 70.222525E
5.		N-5	Main Road	23.005194N 70.219944E
6.		N-6	Marin Bhavan	23.007618N 70.222087E
7.		N-7	Port & Custom Building	23.009033N 70.222047E
8.		N-8	Nirman Building	23.009642N 70.220623E
9.		N-9	ATM Building	23.009985N 70.221715E
10.		N-10	Wharf Area/ Jetty	22.997833N 70.223042E
11.	Vadinar	N-11	Near Main Gate	22.441544N 69.674495E
12.		N-12	Near Vadinar Jetty	22.441002N 69.673147E
13.		N-13	Port Colony Vadinar	22.399948N 69.716608E

Map 8: Locations for Noise Monitoring at Kandla

Map 9: Locations for Noise Monitoring at Vadinar

Methodology:

The intensity of sound energy in the environment is measured in a logarithmic scale and is expressed in a decibel (dB(A)) scale. The ordinary sound level meter measures the sound energy that reaches the microphone by converting it into electrical energy and then measures the magnitude in dB(A). Whereas, in a sophisticated type of sound level meter, an additional circuit (filters) is provided, which modifies the received signal in such a way that it replicates the sound signal as received by the human ear and the magnitude of sound level in this scale is denoted as dB(A). The sound levels are expressed in dB(A) scale for the purpose of comparison of noise levels, which is universally accepted. Noise levels were measured using an integrated sound level meter of the make Envirotech Sound Level Meter (Class-I) (model No. SLM-109). It has an indicating mode of Lp and Leq. Keeping the mode in Lp for few minutes and setting the corresponding range and the weighting network in "A" weighting set the sound level meter was run for one-hour time and Leq was measured at all locations.

Frequency

Monitoring was carried out at each noise monitoring station for Leq. noise level (Day and Night), which was recorded for 24 hours continuously at a monthly frequency with the help of Sound/Noise Level Meter (Class-1). The details of the noise monitoring have been mentioned in **Table 14**.

Table 14: Details of the Noise Monitoring

Sr. No.	Parameters	Units	Reference Method	Instrument
1.	Leq (Day)	dB(A)	IS 9989: 2014	Noise Level Meter (Class-I) model No. SLM-109
2.	Leq (Night)	dB(A)		

Standard for Noise

Ministry of Environment & Forests (MoEF) has notified the noise standards vide the Gazette notification dated February 14, 2000 for different zones under the Environment Protection Act (1986). The day time noise levels have been monitored from 6.00 AM to 10.00 PM and night noise levels were measure from 10.00 PM to 6.00 AM at all the thirteen locations (10 at Kandla and 3 at Vadinar) monthly. The specified standards are as mentioned in **Table 15** as follows:

Table 15: Ambient Air Quality norms in respect of Noise

Area Code	Category of Area	Noise dB(A) Leq	
		Daytime	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

6.2 Result and Discussion

The details of the Noise monitoring conducted during the monitoring period have been summarized in the **Table 16** as below:

Table 16: The Results of Ambient Noise Quality

Sr. No.	Station Code	Station Name	Category of Area	Standard	Day Time			Standard	Night Time		
					Max.	Min.	Leq dB(A) Total		Max.	Min.	Leq dB(A) Total
1	N-1	Oil Jetty 7	A	75	58.1	38.9	48.5	70	42.6	35.4	39.0
2	N-2	West Gate No.1	A	75	66.1	48.0	57.1	70	50.1	41.1	45.6
3	N-3	Canteen Area	B	65	60.2	44.2	52.2	55	49.2	36.7	43.0
4	N-4	Main Gate	A	75	58.4	46.9	52.7	70	45.4	36.2	40.8
5	N-5	Main Road	A	75	60.2	39.4	49.8	70	47.6	35.6	41.6
6	N-6	Marin Bhavan	B	65	61.9	39.5	50.7	55	42.0	34.6	38.3
7	N-7	Port & Custom Building	B	65	54.6	39.4	47.0	55	46.6	36.4	41.5
8	N-8	Nirman Building	B	65	54.5	42.6	48.6	55	48.1	37.1	42.6
9	N-9	ATM Building	B	65	58.1	41.6	49.9	55	45.9	35.9	40.9
10	N-10	Wharf Area/ Jetty	A	75	61.5	42.6	52.1	70	47.2	40.6	43.9
11	N-11	Near Main Gate	A	75	67.4	57.2	60.3	75	50.4	54.6	62.3
12	N-12	Near Vadinar Jetty	A	75	69.3	63.2	63.7	75	52.1	56.3	59.6
13	N-13	Port Colony Vadinar	C	55	53.5	45.1	45.3	55	43.3	44.7	52.1

6.3 Data Interpretation and Conclusion

The noise level at both the locations (Kandla and Vadinar) was compared with the standard limits specified in NAAQS by CPCB. During the Day Time, the average noise level at all 10 locations at Kandla ranged from 47.0 dB(A) to 57.1 dB(A), while at Vadinar, the noise levels for the three-location ranged from 45.3 dB(A) to 63.7 dB(A). Whereas, during Night Time the average Noise Level ranged from 38.3 dB(A) to 45.6 dB(A) at Kandla and 52.1 dB(A) to 62.3 dB(A) at Vadinar, which was within the permissible limits for the industrial and commercial area, but exceeded slightly for location N-12, which is a residential zone. Overall, the noise levels at Kandla and Vadinar fall within the prescribed norms for both Day and Night times.

6.4 Remedial Measures

Though, the noise levels detected at the locations of Kandla and Vadinar, are found within the prescribed norms, the noise can further be considerably reduced by adoption of low noise equipment or installation of sound insulation fences. Green belt of plants can be a good barrier. If noise exceeds the applicable norms, then the working hours may be altered as a possible means to mitigate the nuisances of construction activities.

CHAPTER 7: SOIL MONITORING

7.1 Soil Quality Monitoring:

The purpose of soil quality monitoring is to track changes in the features and characteristics of the soil, especially the chemical properties of soil occurring at specific time intervals under the influence of human activity. Soil quality assessment helps to determine the status of soil functions and environmental risks associated with various practices prevalent at the location.

As defined in scope by Deendayal Port Authority (DPA), Soil Quality Monitoring shall be carried out at Six locations, four at Kandla and two at Vadinar. The details of the soil monitoring locations within the Port area of DPA are mentioned in **Table 17:**

Table 17: Details of the Soil quality monitoring

Sr. No.	Location Code		Location Name	Latitude Longitude
1.	Kandla	S-1	Oil Jetty 7	23.043527N 70.218456E
2.		S-2	IFFCO Plant	23.040962N 70.216570E
3.		S-3	Khori Creek	22.970382N 70.223057E
4.		S-4	Nakti Creek	23.033476N 70.158461E
5.	Vadinar	S-5	Near SPM	22.400026N 69.714308E
6.		S-6	Near Vadinar Jetty	22.440759N 69.675210E

Methodology

As per the defined scope by Deendayal Port Authority (DPA), the sampling and analysis of Soil quality has been carried out on monthly basis.

The samples of soil collected from the locations of Kandla and Vadinar and analyzed for the various physico-chemical parameter. Collection and analysis of these samples was carried out as per established standard methods and procedures. The samples were analyzed for selected parameters to get the present soil quality status and environmental risks associated with various practices prevalent at the location. GEMI has framed its own guidelines for collection of soil samples titled as ***'Soil Sampling Manual'***. Soil samples were collected from 30 cm depth below the surface using scrapper, filled in polythene bags, labelled on-site with specific location code and name and sent to GEMI's laboratory, Gandhinagar for further detailed analysis. The samples collected from all locations are homogeneous representative of each location. The list of parameters to be monitored under the projects for the Soil Quality Monitoring been mentioned in **Table 18** as follows:

Frequency

Monitoring is required to be carried out once a month for both the locations of Kandla and Vadinar.

Table 18: Soil parameters

Sr. No.	Parameters	Units	Reference method	Instruments
1.	TOC	%	Methods Manual Soil Testing in India January, 2011, 09. Volumetric method (Walkley and Black, 1934)	Titration Apparatus
2.	Organic Carbon	%		
3.	Inorganic Phosphate	Kg/Hectare	Practical Manual Chemical Analysis of Soil and Plant Samples, ICAR-Indian Institute of Pulses Research 2017 Determination of Available Phosphorus in Soil	UV-Visible Spectrophotometer
4.	Texture	-	Methods Manual Soil Testing in India January 2011,01	Hydrometer
5.	pH	-	IS 2720 (Part 26): 1987	pH Meter
6.	Conductivity	µS/cm	IS 14767: 2000	Conductivity Meter
7.	Particle size distribution & Silt content	-	Methods Manual Soil Testing in India January 2011	Sieves Apparatus
8.	SAR	meq/L	Procedures for Soil Analysis, International Soil Reference and Information Centre, 6th Edition 2002 13-5.5.3 Sodium Absorption Ratio (SAR), Soluble cations	Flame Photometer
9.	Water Holding Capacity	%	NCERT, Chapter 9, 2022-23 and Water Resources Department Laboratory Testing Procedure for Soil & Water Sample Analysis	Muffle Furnace
10.	Aluminium	mg/Kg	EPA Method 3051A	ICP-OES
11.	Chromium	mg/Kg		
12.	Nickel	mg/Kg		
13.	Copper	mg/Kg	Methods Manual Soil Testing in India January, 2011, 17a	
14.	Zinc	mg/Kg	Methods Manual Soil Testing in India January, 2011, 17a	
15.	Cadmium	mg/Kg	EPA Method 3051A	
16.	Lead	mg/Kg		
17.	Arsenic	mg/Kg		
18.	Mercury	mg/Kg		

The map depicting the locations of Soil Quality Monitoring to be monitored in Kandla and Vadinar have been mentioned in **Map 10 and 11** as follows:

Map 10: Locations for Soil Quality Monitoring at Kandla

Map 11: Locations for Soil Quality Monitoring at Vadinar

7.2 Result and Discussion

The analysis results of physical analysis of the soil samples collected during environmental monitoring mentioned in **Table 19** are shown below:

Table 19: Soil Quality for the sampling period

Sr. No	Location / Parameters	Unit	Kandla				Vadinar	
			S-1 (Oil Jetty 7)	S-2 IFFCO Plant)	S-3 (Khori Creek)	S-4 (Nakti Creek)	S-5 (Near SPM)	S-6 (Near Vadinar Jetty)
1	pH	-	7.34	7.3	8.64	8.45	7.74	8.14
2	Conductivity	µS/cm	45300	27200	226	219	102	272
3	Inorganic Phosphate	Kg/ha	2.06	2.22	3.14	3.03	0.59	0.55
4	Organic Carbon	%	0.56	0.5	0.29	0.23	0.1	0.52
5	Organic Matter	%	0.96	0.86	0.49	0.39	0.17	0.89
6	SAR	meq/L	24.88	10.06	0.39	0.38	0.09	0.17
7	Aluminium	mg/Kg	11277.15	14127.51	10350.29	7708.929	12783.28	13457.49
8	Chromium	mg/Kg	53.599	62.015	53.667	35.6	51.109	55.378
9	Nickel	mg/Kg	14.22	5.764	13.391	5.668	18.72	24.346
10	Copper	mg/Kg	83.233	123.235	14.591	14.22	63.292	67.75
11	Zinc	mg/Kg	146.081	45.517	32.38	17.203	37.242	55.477
12	Cadmium	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL
13	Lead	mg/Kg	15.314	5.068	2.698	1.591	BQL	BQL
14	Arsenic	mg/Kg	0.198	BQL	2.298	0.795	BQL	BQL
15	Mercury	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL
16	Water Holding Capacity	%	37.98	43.96	40	39.97	37.95	51.9
17	Sand	%	61.52	65.55	77.54	75.53	72.81	74.8
18	Silt	%	33.44	31.41	11.43	13.44	26.15	24.16
19	Clay	%	5.04	3.04	11.03	11.04	1.04	1.04
20	Texture	-	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Loamy sand	loamy sand

7.3 Data Interpretation and Conclusion

Soil samples were collected from 6 locations (4 at Kandla and 2 at Vadinar) and further analysed for its physical & chemical characteristics. Each of the parameters have been given an interpretation based on the observations as follows:

- The value of **pH** ranges from **7.3 to 8.64**, highest at location S-3 (Khori Creek) and lowest at S-2 (IFFCO Plant); while the average pH for Kandla was observed to be 7.93. Whereas, at Vadinar the pH was observed as 7.74 at S-5 i.e., Near SPM and 8.14 at S-6

i.e., Near Jetty Area. The pH in Kandla varies from the **Slightly alkaline to strongly alkaline.** Whereas, pH of Soil at Vadinar was found to be **Slightly alkaline**.

- At entire monitoring locations of Kandla the value of **Electrical Conductivity** ranges from **219 to 45300 µs/cm**, highest at location S-1 (Oil Jetty 7) and lowest at S-4 (Nakti Creek), with the average as **18236.25** µs/cm. Whereas, at Vadinar the conductivity falls within the range of **102 to 272** µs/cm with an average value of **187 µs/cm.**

- At Kandla, the concentration of **Inorganic Phosphate** varied from **2.06 to 3.14 Kg/ha**, with average 2.61 Kg/ha. Whereas, at the locations of Vadinar, the Inorganic Phosphate was observed as 0.59 Kg/ha at S-5 (Near SPM) and 0.55 Kg/ha at S-6 (near Jetty Area), with the average 0.57 Kg/ha. The phosphorus availability in soil solution is influenced by a number of factors such as Organic matter, clay content, pH, temperature, etc.

- The concentration of **Total Organic Carbon** ranges from 0.23 to 0.56% while the average TOC at Kandla was detected as 0.39%. Whereas, at Vadinar the average TOC was found to be 0.31% where the observed TOC value found at S-5 and S-6 to be 0.1% and 0.52% respectively.

- The **Sodium Adsorption Ratio** ranges from **0.38 to 24.88 meq/L** with an average value 8.92 meq/L at Kandla. Whereas, at Vadinar, the average SAR was found to be 0.13 meq/L where the observed SAR value found at S-5 (0.09 meq/L) and S-6 (0.17 meq/L).

- The **Water Holding Capacity** in the soil samples of Kandla and Vadinar varies from 37.98 to 43.96% and 37.95 to 51.9% respectively.

- The Soil Texture was observed as "Sandy loam" at all the monitoring locations in Kandla and Vadinar, except the location S-6 of Vadinar which is "loamy sand".

Heavy Metals

- For the sampling period, the concentration of **Aluminium** varied from **7708.929 to 14127.509 mg/kg** at Kandla, and **12783.28 to 13457.493 mg/kg** at Vadinar. Whereas, the average Aluminium concentration was observed to be 10865.97 and 13120.39 mg/kg at Kandla and Vadinar monitoring station respectively.

- The concentration of **Chromium** varied from **35.6 to 62.015 mg/kg** at Kandla and **51.109 to 55.378 mg/kg** at Vadinar and the average value was observed to be 51.22 and 53.24 mg/kg at Kandla and Vadinar monitoring station, respectively.

  The concentration of **Nickel** varied from **5.668 to 14.22 mg/kg** at Kandla and **18.72 to 24.346 mg/kg** at Vadinar and the average value was observed to be 9.76 and 21.533 mg/kg at Kandla and Vadinar monitoring station, respectively.

- The concentration of **Zinc** varied from **17.203 to 146.081 mg/kg** at Kandla and **37.242 to 55.477 mg/kg** at Vadinar and the average value was observed to be 60.29 and 46.35 mg/kg at Kandla and Vadinar monitoring station, respectively.

- The concentration of **copper** varied from **14.22 to 123.235 mg/kg** at Kandla and **63.292 to 67.75 mg/kg** at Vadinar and the average value was observed to be 58.81 and 65.52 mg/kg at Kandla and Vadinar monitoring station, respectively.

- Concentration of **Lead** varied from **1.59 to 15.31 mg/kg** at Kandla with average value 6.16 mg/Kg, whereas for Vadinar, the values recorded 6.57 mg/Kg at S-5 and "Below Quantification Limit" at location at S-6 location.

- The concentration of **Arsenic** varied from **0.19 to 2.29 mg/kg** at Kandla with average value 1.09 mg/Kg, whereas for Vadinar, the values recorded 6.57 mg/Kg at S-5 and "Below Quantification Limit" at location at S-6 location.

- While other heavy metals in the Soil i.e., **Mercury and Cadmium** were observed "Below Quantification Limit" for the soil samples collected at Kandla and Vadinar.

CHAPTER 8: DRINKING WATER MONITORING

8.1 Drinking Water Monitoring

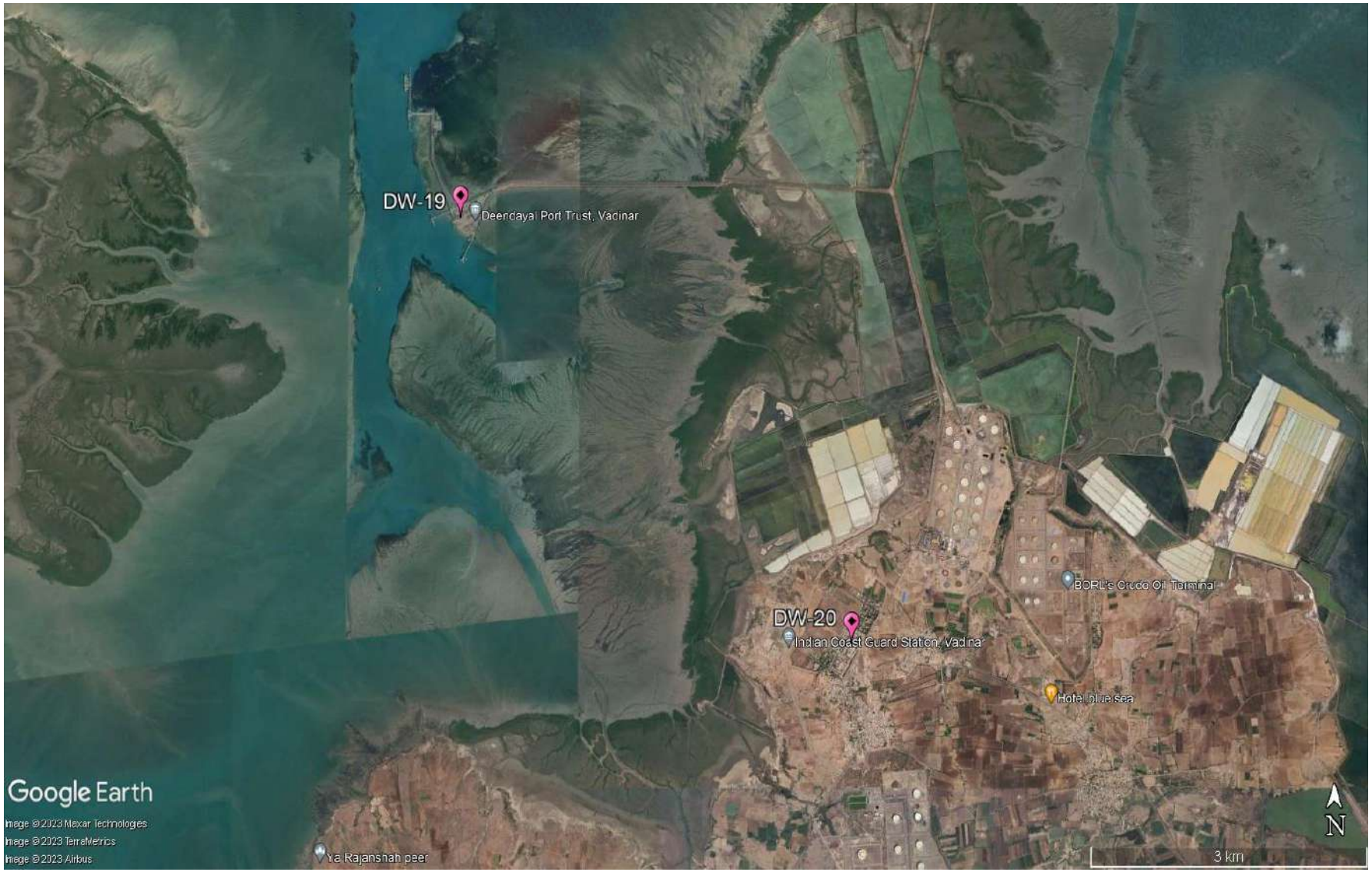
It is necessary to check with the drinking water sources regularly so as to know whether water quality conforms to the prescribed standards for drinking. Monitoring the drinking water quality is essential to protect human health and the environment. With reference to the scope specified by DPA, a total of 20 locations (18 at Kandla and 2 at Vadinar) were monitored to assess the Drinking Water quality.

The details of the drinking water sampling stations have been mentioned in **Table 20** and the locations have been depicted through Google map in **Map 12 and 13.**

Table 20: Details of Drinking Water Sampling Locations

Sr. No.	Location Code		Location Name	Latitude/ Longitude
1.	Kandla	DW-1	Oil Jetty 7	23.043527N 70.218456E
2.		DW-2	Port & Custom Building	23.009033N 70.222047E
3.		DW-3	North Gate	23.007938N 70.222411E
4.		DW-4	Workshop	23.009372N 70.222236E
5.		DW-5	Canteen Area	23.003707N 70.221331E
6.		DW-6	West Gate 1	23.006771N 70.217340E
7.		DW-7	Sewa Sadan -3	23.009779N 70.221838E
8.		DW-8	Nirman Building	23.009642N 70.220623E
9.		DW-9	Custom Building	23.018930N 70.214478E
10.		DW-10	Port Colony Kandla	23.019392N 70.212619E
11.		DW-11	Wharf Area/ Jetty	22.997833N 70.223042E
12.		DW-12	Hospital Kandla	23.018061N 70.212328E
13.		DW-13	A.O. Building	23.061914N 70.144861E
14.		DW-14	School Gopalpuri	23.083619N 70.132061E
15.		DW-15	Guest House	23.078830N 70.131008E
16.		DW-16	E- Type Quarter	23.083306N 70.132422E
17.		DW-17	F- Type Quarter	23.077347N 70.135731E
18.		DW-18	Hospital Gopalpuri	23.081850N 70.135347E
19.	Vadinar	DW-19	Near Vadinar Jetty	22.440759N 69.675210E
20.		DW-20	Near Port Colony	22.401619N 69.716822E

Map 12: Locations for Drinking Water Monitoring at Kandla



Map 13: Locations for Drinking Water Monitoring at Vadinar

Methodology

The water samples were collected from the finalized sampling locations and analyzed for physico-chemical and microbiological parameter, for which the analysis was carried out as per APHA, 23rd Edition and Indian Standard method in GEMI's NABL Accredited Laboratory, Gandhinagar. GEMI has followed the CPCB guideline as well as framed its own guidelines for the collection of water/wastewater samples, under the provision of Water (Preservation and Control of Pollution) Act 1974, titled as '**Sampling Protocol for Water & Wastewater**'; approved by the Government of Gujarat vide letter no. ENV-102013-299-E dated 24-04-2014. The samples under the study were collected and preserved as per the said Protocol. The parameters finalized to assess the drinking water quality have been mentioned in **Table 21** as follows:

Table 21: List of parameters for Drinking Water Quality monitoring

Sr. No.	Parameters	Units	Reference method	Instrument
1.	pH	-	APHA, 23rd Edition (Section-4500-H+B):2017	pH Meter
2.	Colour	Hazen	APHA, 23rd Edition, 2120 B:2017	Color Comparator
3.	EC	µS/cm	APHA, 23rd Edition (Section-2510 B):2017	Conductivity Meter
4.	Turbidity	NTU	APHA, 23rd Edition (Section -2130 B):2017	Nephlo Turbidity Meter
5.	TDS	mg/L	APHA, 23rd Edition (Section-2540 C):2017	Vaccum Pump with filtration assembly and Oven
6.	TSS	mg/L	APHA, 23rd Edition, 2540 D: 2017	
7.	Chloride	mg/L	APHA, 23rd Edition (Section-4500-Cl-B):2017	Titration Apparatus
8.	Total Hardness	mg/L	APHA, 23rd Edition (Section-2340 C):2017	
9.	Ca Hardness	mg/L	APHA, 23rd Edition (Section-3500-Ca B):2017	
10.	Mg Hardness	mg/L	APHA, 23rd Edition (Section-3500-Mg B):2017	
11.	Free Residual Chlorine	mg/L	APHA 23rd Edition, 4500	
12.	Fluoride	mg/L	APHA, 23rd Edition (Section-4500-F-D):2017	UV- Visible Spectrophotometer
13.	Sulphate	mg/L	APHA, 23rd Edition (Section 4500-SO4-2-E):2017	
14.	Sodium	mg/L	APHA, 23rd Edition (Section-3500-Na-B):2017	Flame Photometer
15.	Potassium	mg/L	APHA,23rd Edition, 3500 K-B: 2017	
16.	Salinity	mg/L	APHA, 23rd Edition (section 2520 B, E.C. Method)	Salinity /TDS Meter
17.	Nitrate	mg/L	APHA, 23rd Edition, 4500 NO3- B: 2017	UV- Visible Spectrophotometer
18.	Nitrite	mg/L	APHA, 23rd Edition, 4500 NO2-B: 2017	

Sr. No.	Parameters	Units	Reference method	Instrument
19.	Hexavalent Chromium	mg/L	APHA, 23rd Edition, 3500 Cr B: 2017	
20.	Manganese	mg/L	APHA,23rd Edition, ICP Method 3120 B: 2017	ICP-OES
21.	Mercury	mg/L	EPA 200.7	
22.	Lead	mg/L	APHA ICP 23rd Edition (Section-3120 B):2017	
23.	Cadmium	mg/L	APHA ICP 23rd Edition (Section-3120 B):2017	
24.	Iron	mg/L	APHA ICP 23rd Edition (Section-3120 B):2017	
25.	Total Chromium	mg/L	APHA ICP 23rd Edition (Section-3120 B):2017	
26.	Copper	mg/L	APHA,23rd Edition, ICP Method 3120 B: 2017	ICP-OES
27.	Zinc	mg/L	APHA ICP 23rd Edition (Section-3120 B):2017	
28.	Arsenic	mg/L	APHA ICP 23rd Edition (Section-3120 B):2017	
29.	Total Coliforms	MPN/ 100ml	IS 15185: 2016	LAF/ Incubator

8.2 Result and Discussion

The drinking water quality of the locations at Kandla and Vadinar and its comparison with the to the stipulated standard (Drinking Water Specifications i.e., IS: 10500:2012) have been summarized in **Table 22** as follows:

Table 22: Summarized results of Drinking Water quality

Sr. No.	Parameters	Units	Standard values as per IS		Kandla																	Vadinar	
			A	P	DW-1	DW-2	DW-3	DW-4	DW-5	DW-6	DW-7	DW-8	DW-9	DW-10	DW-11	DW-12	DW-13	DW-14	DW-15	DW-16	DW-17	DW-18	DW-19	DW-20
1.	pH	-	6.5-8.5	-	8.34	6.41	7.67	8.78	7.63	8.26	8.48	8.50	7.79	8.15	7.87	7.88	7.90	8.10	7.85	7.01	6.99	6.91	7.58	7.30
2.	Colour	Hazen	5	15	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3.	EC	µS/ cm	-	-	15	44.56	677	48.7	1004	88.4	14.05	31	703	210	1041	57.9	123.7	173	169.9	165	158.6	68	499	113.9
4.	Salinity	PSU	-	-	0.02	0.21	0.33	0.03	0.49	0.05	0.02	0.02	0.34	0.10	0.51	0.03	0.06	0.09	0.08	0.08	0.08	0.04	0.24	0.06
5.	Turbidity	NTU	1	5	BQL	BQL	0.52	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	0.68	BQL
6.	Chloride	mg/L	250	1000	4.96	8.55	119.11	6.95	193.56	17.87	4.47	7.94	119.11	45.16	203.48	14.39	23.33	33.25	36.23	32.26	35.73	17.87	71.47	17.87
7.	Total Hardness	mg/L	200	600	2.5	8	165	13	200	7	BQL	3.5	170	20	210	4	25.0	40	12.5	25	7.5	12	130	20
8.	Ca Hardness	mg/L	-	-	1.5	6	100	10	115	5.5	1	2.5	85	5	125	3	12.5	15	7.5	12.5	2.5	5	60	5
9.	Mg Hardness	mg/L	-	-	1	2	65	3	85	1.5	BQL	1	85	15	85	1	12.5	25	5	12.5	5	7	70	15
10.	Free Residual Chlorine	mg/L	0.2	1	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	4.96	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
11.	TDS	mg/L	500	2000	8	22	356	26	516	46	8	16	362	108	538	30	66	94	88	86	82	36	258	60
12.	TSS	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
13.	Fluoride	mg/L	1.0	1.5	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	0.318	BQL	BQL	BQL	BQL	BQL	BQL	BQL	0.500	0.360
14.	Sulphate	mg/L	200	400	BQL	BQL	33.516	BQL	52.375	BQL	BQL	BQL	38.326	BQL	66.402	BQL	BQL	BQL	BQL	21.771	BQL	BQL	33.620	BQL
15.	Nitrate	mg/L	45	-	BQL	BQL	2.783	BQL	28.36	5.037	BQL	BQL	2.242	1.865	30.93	BQL	BQL	1.330	1.353	BQL	4.432	BQL	3.584	BQL
16.	Nitrite	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	1.638	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

Sr. No.	Parameters	Units	Standard values as per IS		Kandla																	Vadinar	
			A	P	DW-1	DW-2	DW-3	DW-4	DW-5	DW-6	DW-7	DW-8	DW-9	DW-10	DW-11	DW-12	DW-13	DW-14	DW-15	DW-16	DW-17	DW-18	DW-19	DW-20
17.	Sodium	mg/L	-	-	BQL	BQL	72.16	BQL	109.19	16.59	BQL	BQL	78.98	28.79	109.58	10.72	16.16	19.30	27.45	21.13	28.99	13.51	54.54	17.05
18.	Potassium	mg/L	-	-	BQL	BQL	BQL	BQL	7.22	BQL	BQL	BQL	BQL	BQL	7.89	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
19.	Hexavalent Chromium	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
20.	Odour	TON	Agreeable		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21.	Arsenic	mg/L	0.01	0.05	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
22.	Cadmium	mg/L	0.003	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
23.	Copper	mg/L	0.05	1.5	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
24.	Iron	mg/L	0.3	-	BQL	BQL	BQL	0.119	BQL	BQL	BQL	BQL	BQL	0.126	BQL	0.872	BQL	0.121	BQL	0.252	BQL	0.109	0.128	BQL
25.	Lead	mg/L	0.01	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
26.	Manganese	mg/L	0.1	0.3	BQL	BQL	BQL	BQL	BQL	BQL	BQL	0.059	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
27.	Mercury	mg/L	0.001	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
28.	Total Chromium	mg/L	0.05	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
29.	Zinc	mg/L	5	15	BQL	BQL	BQL	BQL	BQL	BQL	BQL	3.964	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
30.	Total Coliform*	MPN/ 100ml	Shall not be detected		5110	380	695	BQL	3100	130	10	2018	1060	BQL	4250	BQL	35	BQL	3400	BQL	385	85	85	75

A: Acceptable, P:Permissible, BQL: Below Quantification limit Turbidity (QL=0.5 NTU), Free Residual Chlorine (QL=2 mg/L), Total Suspended Solids (QL=2 mg/L), Fluoride (QL=0.3 mg/L), Sulphate (QL=10 mg/L), Nitrate as NO_3 (QL=1 mg/L), Nitrite as NO_2 (QL=0.1mg/L), Sodium as Na (QL=5mg/L), Potassium as K (QL=5mg/L), Hexavalent Chromium (QL=0.01 mg/L), Arsenic (QL=0.005 mg/L), Cadmium (QL=0.002 mg/L), Copper (QL=0.005 mg/L), Iron (QL=0.1mg/L), Lead (QL=0.002 mg/L), Manganese (QL=0.04 mg/L), Mercury (QL=0.0005 mg/L), Total Chromium (QL=0.005 mg/L), Zinc (QL=0.5 mg/L), Total Coliforms (QL=1 MPN/ 100ml)

*Note: For Total Coliform, one MPN is equivalent to one CFU. The use of either method; MPN or CFU for the detection of bacteria are considered valid measurements for bacteria limits.

8.3 Data Interpretation and Conclusion

Drinking water samples were taken from 20 locations (18 at Kandla and 2 at Vadinar), and their physical and chemical properties were analyzed. The analysis's results were compared with standard values as prescribed in IS 10500:2012 Drinking Water Specification.

- **pH:** The pH values of drinking water samples in Kandla were reported to be in the range of **6.41 to 8.78**, with an average pH of 7.80. In Vadinar, its values ranged from **7.30 to 7.58**, with an average pH of 7.44. Notably, the pH levels at both project sites fall within the acceptable range of 6.5 to 8.5, except the location DW-2 & DW-4, as specified under IS:10500:2012.
- **Colour:** The colour varies from 1 to 5 at the monitoring locations of Kandla. Only locations DW-3 showed the value of 5 Hazen, whereas, all the other locations showed a value of 1 in Hazen at Kandla. At Vadinar, the color was observed to be 1 Hazen at both the monitoring locations.
- **Electrical Conductivity (EC):** It is a measure of the ability of a solution to conduct electric current, and it is often used as an indicator of the concentration of dissolved solids in water. During the monitoring period, the EC values for samples collected in Kandla were observed to range from **14.05 to 1041 µS/cm**, with an average value of 266.26 µS/cm. In Vadinar, the EC values showed variation from **113.9 to 499 µS/cm**, with an average value of 306.45 µS/cm. It's important to regularly monitor EC levels in drinking water as it can provide valuable information about water quality and presence of dissolved substances.
- **Salinity:** Salinity at Kandla varies from **0.02 to 0.51 PSU** with an average of 0.14 PSU, while at Vadinar, salinity was observed to be 0.24 and **0.06 PSU** for locations DW-19 & DW-20 respectively.
- **Turbidity:** At the drinking water locations of Kandla, the turbidity was found BQL for all locations except locations DW-3 (0.52 NTU. Whereas, at Vadinar the value of turbidity was reported 0.68 NTU at DW-19 and BQL at DW-20 respectively.
- **Chlorides:** The chloride concentrations in Kandla varied from **4.47 to 203.48 mg/L**, with an average value of 51.34 mg/L. At Vadinar the locations DW-19 and DW-20, the chloride concentration was observed as 71.47 mg/L and 17.87 mg/L, with an average value of 44.67 mg/L. Thus, the chloride levels at both project sites fall within the acceptable limit of 250 mg/L, as specified under IS:10500:2012.
- **Total Hardness (TH):** The concentration of Total Hardness varies from **2.5 to 210 mg/L**, with an average concentration of 54.41 mg/L. At location DW-11, the total hardness was observed 210 mg/L, which exceeds the acceptable limit but falls within the permissible limit. While at Vadinar, the observed values were 130 & 20 mg/L; at locations DW-19 & D-20, with an average concentration of 75 mg/L. which was found to be within the acceptable norm of 200 mg/L as specified by IS:10500:2012 and is not harmful for local inhabitants.
- **Total Dissolved Solids (TDS):** Monitoring TDS is crucial because it provides an indication of overall quality of the water. During the monitoring period, the TDS concentrations in Kandla were observed to vary in a wide range i.e., between 8 to 538 mg/L, with an average concentration of 138.22 mg/L. At Locations DW-11, the TDS

value is 538 mg/L, which is more than the acceptable limit but within the permissible limit. while in Vadinar, it ranged from 60 to 258 mg/L, with an average of 159 mg/L. It is important to note that the TDS concentrations in both Kandla and Vadinar fall well within the acceptable limit of 500 mg/L.

- **Fluoride:** The concentration was found BQL, at all of the monitoring location except for locations DW-11 (0.31 mg/L) at Kandla. While at Vadinar Fluoride concentration was reported to be 0.500 & 0.360 mg/L respectively at both of the monitoring location.
- **Sulphate:** At the monitoring locations of Kandla, the sulphate concentrations were recorded BQL for majority of the locations except the locations DW-3(33.516 mg/L), DW-5 (52.375 mg/L), DW-9 (38.326 mg/L), DW-11 (66.402 mg/L), and DW-16 (21.771 mg/L). In Vadinar, the sulphate concentration was observed 33.620 mg/L at location DW-19 and BQL at location DW-20. During monitoring period in Kandla and Vadinar, the sulphate concentrations were found to be within the acceptable limits i.e., 200 mg/L as per the specified norms.
- **Nitrate:** During the monitoring period, at Kandla & Vadinar variation in the concentration of Nitrate was observed to be in the range of **1.33 to 30.93 mg/L,** with the average concentration of 8.70 mg/L and locations DW-1, DW-2, DW-4, DW-7, DW-8, DW-12, DW-13, DW-16 and DW-18 were recorded as "BQL". While at Vadinar, the concentration recorded 3.584 mg/L at location DW-19 and BQL at location DW-20.
- **Nitrite:** Except locations DW-11 (1.638 mg/L), all monitoring locations showed the Nitrite concentration as BQL at Kandla & Vadinar.
- **Sodium:** During the monitoring period, at Kandla variation in the concentration of Sodium was observed to be in the range of **10.72 to 109.58 mg/L**, with the average concentration of 42.50 mg/L and Location DW-1, DW-2, DW-4, DW-7 & DW-8 showed the BQL concentration for Sodium. While at Vadinar, the concentration recorded 54.54 mg/L at DW-19 and 17.05 mg/L at DW-20.
- **Odour:** Odour values recorded 1 TON at all monitoring locations of Kandla and Vadinar.
- **Arsenic:** In Kandla & Vadinar, the Arsenic concentrations were recorded BQL for all of the locations.
- **Copper:** In Kandla & Vadinar, the Copper concentrations were recorded BQL for all of the locations.
- **Iron:** Except for locations DW-4 (0.119 mg/L), DW-10 (0.126 mg/L), DW-12 (0.872 mg/L), DW-14 (0.121 mg/L), DW-16 (0.252 mg/L), and DW-18 (0.109 mg/L), the other locations were observed to have concentrations Below the detection Limit at Kandla. Whereas, at Vadinar the Copper concentrations were recorded 0.128 mg/L & BQL for locations DW-19 and DW-20 respectively.
- **Lead:** In Kandla & Vadinar, the Lead concentrations were recorded BQL for all of the locations.
- **Manganese:** All of locations observed to have BQL concentration for both the monitoring locations at Kandla and Vadinar except the location DW-8 (0.059 mg/L).
- **Free Residual Chlorine:** Free Residual Chlorine concentrations at all monitoring locations, including Kandla and Vadinar, were observed to be below quantifiable limits (BQL) except at location DW-11, where a concentration of 4.96 mg/L was

recorded. According to health standards, concentrations exceeding 4 mg/L are considered unsafe for human health, potentially leading to adverse health effects.

- The parameters such as **Free Residual Chlorine, Toal Suspended Solid, Potassium Hexavalent Chromium** and **the metals (Cadmium, Mercury, Total Chromium and Zinc)** were all observed to have concentrations "Below the Quantification Limit (BQL)" at majority of the locations during the monitoring period.
- Bacteriological Analysis of the drinking water reveals that **Total Coliforms (TC)** were detected in higher number at location DW-1 (5110 MPN/100ml), DW-11 (4250 MPN/100ml), DW-15 (3400 MPN/100ml), DW-5 (3110 MPN/100ml) & DW-8 (2018 MPN/100ml). Whereas, TC were also detected at locations DW-2 (380 MPN/100ml), DW-3 (695 MPN/100ml), DW-6 (130 MPN/100ml), DW-7 (10 MPN/100 ml), DW-9 (1060 MPN/100 ml), DW-13 (35 MPN/100 ml), DW-17 (385 MPN/100 ml), DW-18 (85 MPN/100 ml), DW-19 (75 MPN/100 ml) and DW-20 (5 MPN/100 ml) and for the rest of the monitoring locations of Kandla and Vadinar were detected "Below the Quantification Limit (BQL)". Reporting such concentration of Coliforms indicates certain external influx may contaminate the source. Hence, it should be checked at every distribution point.

8.4 Remedial Measures

Appropriate water treatment processes should be administered to eradicate coliform bacteria. The methods of disinfection such as **chlorination, ultraviolet (UV), or ozone** etc, apart from that, filtration systems can also be implemented to remove bacteria, sediment, and other impurities.

The following steps can be implemented to ensure that the water being supplied is safe for consumption:

- Regular monitoring should be carried out to assess the quality of drinking water at various stages, including the source, purification plants, distribution network, and consumer endpoints would help in early detection of coliform bacteria or other contaminants in the drinking water.
- It is necessary to carry out a system assessment to determine whether the drinking-water supply chain (up to the point of consumption) as a whole can deliver water of a quality that meets identified targets. This also includes the assessment of design criteria of the treatment systems employed.
- Identifying control measures in a drinking-water system that will collectively control identified risks and ensure that the health-based targets are met. For each control measure identified, an appropriate means of operational monitoring should be defined that will ensure that any deviation from required performance (water quality) is rapidly detected in a timely manner.
- Management and communication plan should be formulated describing actions to be taken during normal operation as well as during incident conditions (such as drinking water contamination) and documenting the same.

CHAPTER 9: SEWAGE TREATMENT PLANT MONITORING

9.1 Sewage Treatment Plant (STP) Monitoring:

The principal objective of STP is to remove contaminants from sewage to produce an effluent that is suitable to discharge to the surrounding environment or an intended reuse application, thereby preventing water pollution from raw sewage discharges. As defined in the scope by Deendayal Port Authority (DPA), Kandla, the STP Monitoring is to be carried out weekly at three locations, one at Kandla, one at Gopalpuri and one STP at Vadinar. The samples from the inlet and outlet of the STP have been collected weekly. The details of the locations of STP to be monitored for Kandla and Vadinar have been mentioned in **Table 23** as follows:

Table 23: Details of the monitoring locations of STP

Sr. No.	Location Code		Location Name	Latitude Longitude
1.	Kandla	STP-1	STP Kandla	23.021017N 70.215594E
2.		STP-2	STP Gopalpuri	23.077783N 70.136759E
3.	Vadinar	STP-3	STP at Vadinar	22.406289N 69.714689E

The Consolidated Consent and Authorization (CC&A) issued by the GPCB were referred for the details of the STP for Kandla and Gopalpuri. The CC&A of Kandla and Gopalpuri entails that the treated domestic sewage should conform to the norms specified in **Table 24**. The treated effluent conforming to the norms shall be discharged on the land within the premises strictly for the gardening and plantation purpose. Whereas, no sewage shall be disposed outside the premises in any manner.

Table 24: Treated effluent Standards (as per CC&A of Kandla STP)

Sr. No.	Parameters	Prescribed limits
1.	pH	6.5-8.5
2.	BOD (3 days at 27°C)	30 mg/L
3.	Suspended Solids	100 mg/L
4.	Fecal Coliform	< 1000 MPN/100 ml

The detailed process flow diagram of the Kandla and Gopalpuri STP have been mentioned in **Figure 3 and 4** as follows:

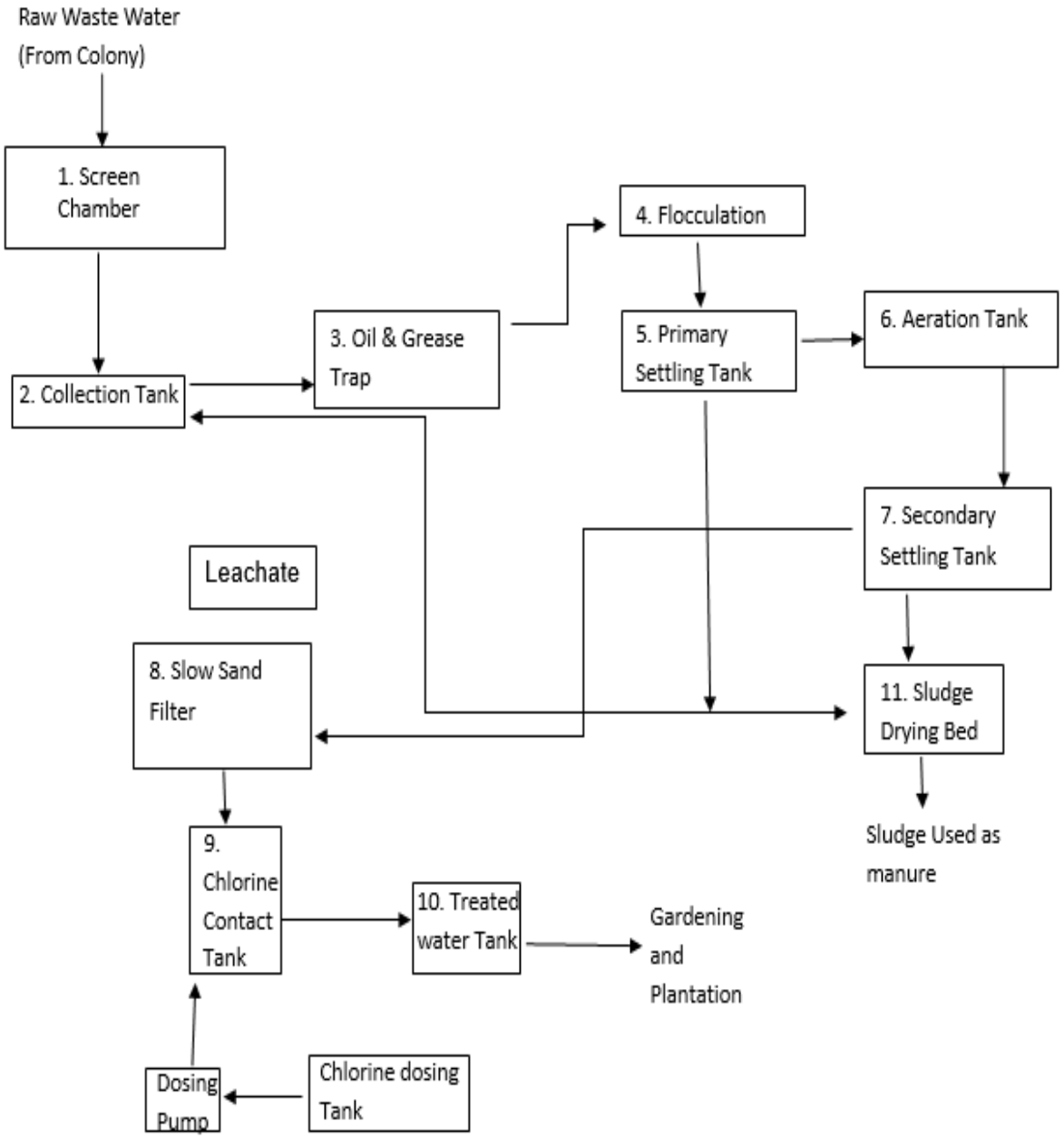


Figure 3: Process flow diagram of STP at Kandla

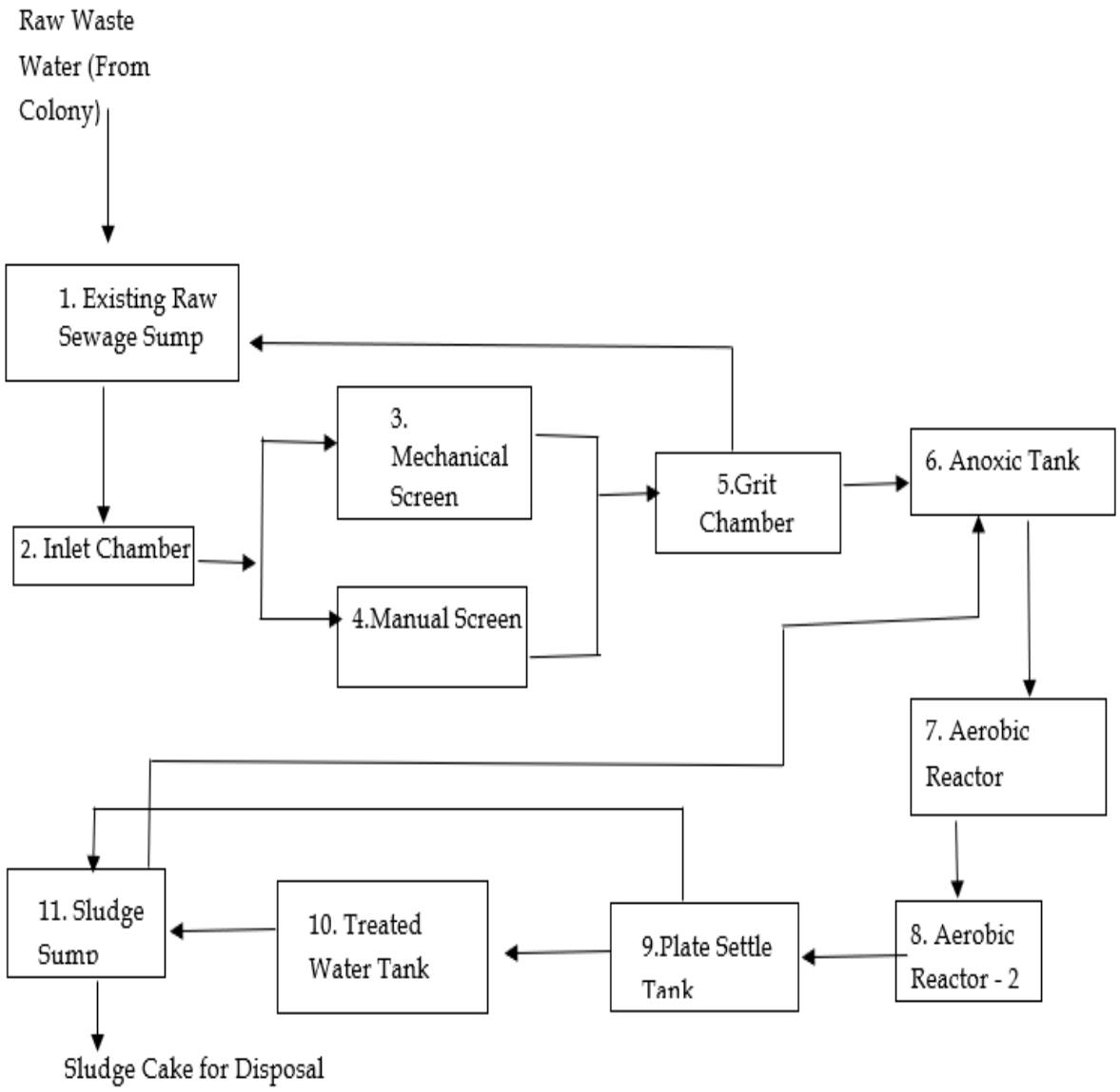


Figure 4: Process flow diagram of STP at Gopalpuri

STP at Vadinar

The STP at Vadinar has been built with a treatment capacity of 450 KLD/day. The Consolidated Consent and Authorization (CC&A) issued by the GPCB has been referred for the details of the said STP. The CC&A of the Vadinar STP suggests that the domestic effluent generated shall be treated as per the norms specified in **Table 25**. The treated effluent conforming to the norms shall be discharged on the land within the premises strictly for the gardening and plantation purpose. Whereas, no sewage shall be disposed outside the premises in any manner.

Table 25: Norms of treated effluent as per CC&A of Vadinar STP

Sr. No.	Parameters	Prescribed limits
1.	pH	5.5-9
2.	BOD (3 days at 27°C)	10 mg/L
3.	Suspended Solids	20 mg/L
4.	Fecal Coliform	Desirable 100 MPN/100 ml Permissible 230 MPN/100 ml
5.	COD	50 mg/L

The detailed process flow diagram of the Vadinar STP have been mentioned in **Figure 5** as follows:

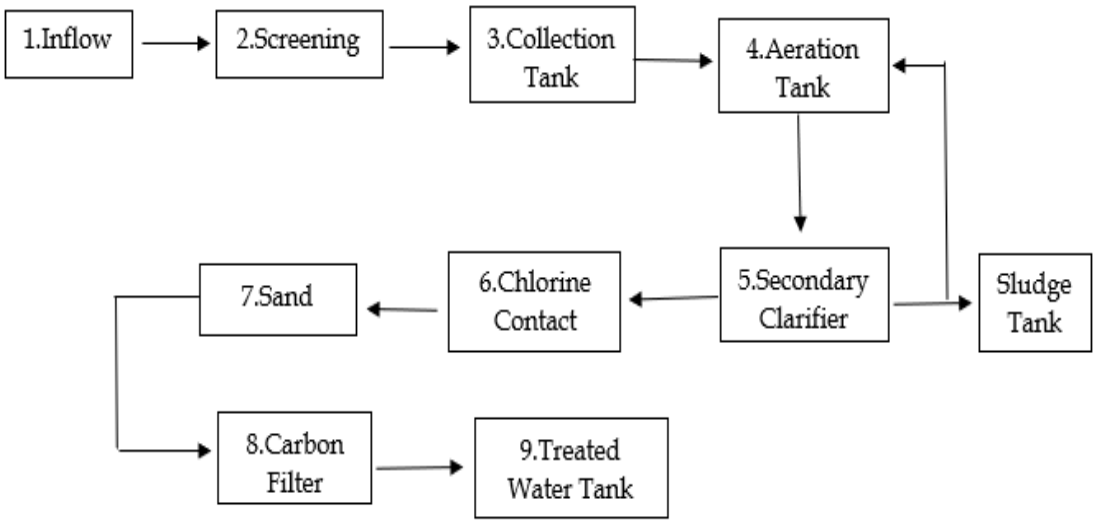
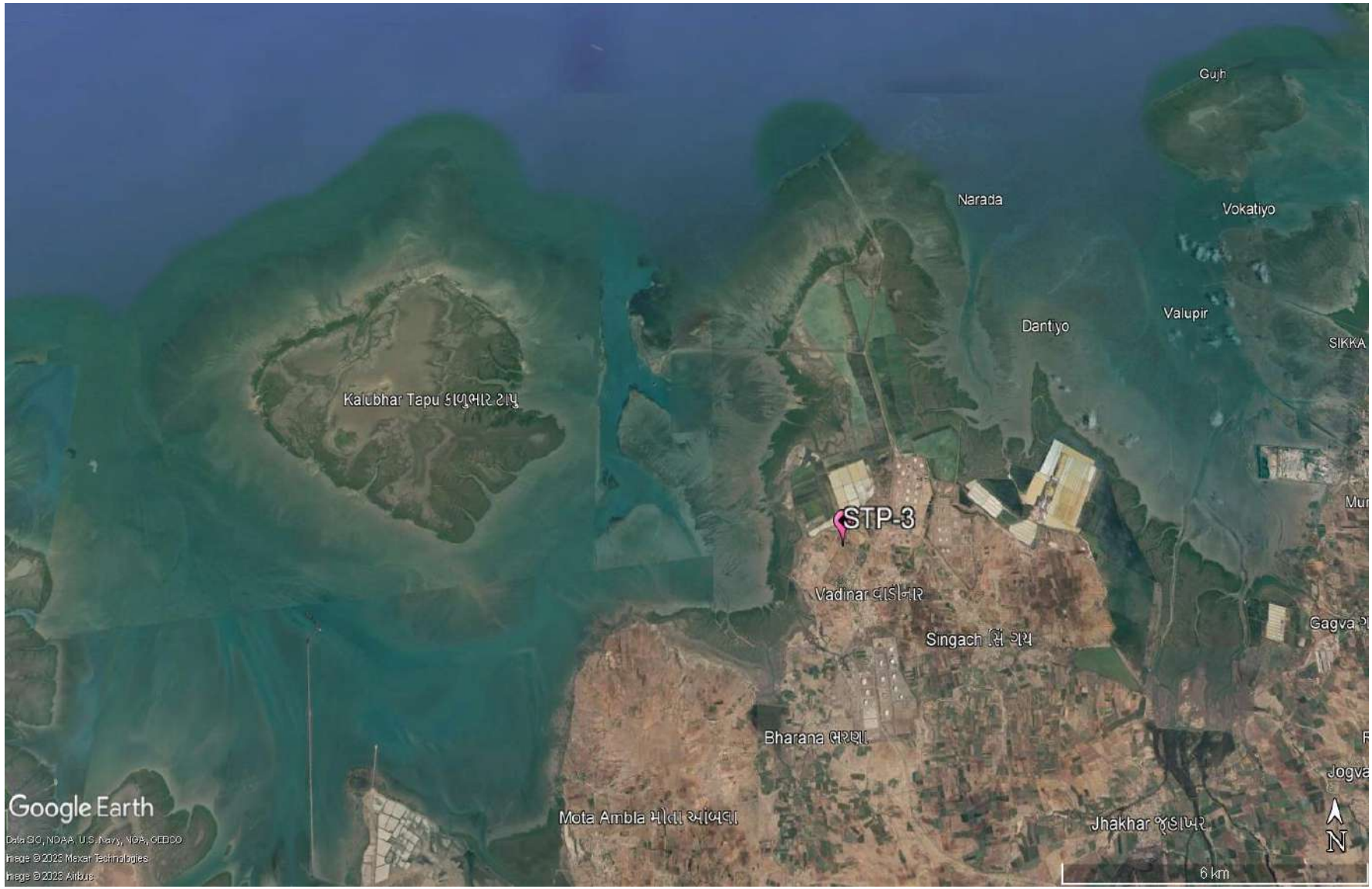


Figure 5: Process flowchart for the STP at Vadinar

The map depicting the locations of STP to be monitored in Kandla and Vadinar have been shown in **Map 14 and 15** as follows:

Map 14: Locations for STP Monitoring at Kandla



Map 15: Locations for STP Monitoring at Vadinar

Methodology

As per the defined scope by DPA, the sampling and analysis of water samples from the inlet and outlet of the STP's of Kandla and Vadinar are carried out once a week, i.e., four times a month.

The water samples were collected from inlet and the outlet of the STP's and analyzed for physico-chemical and microbiological parameter. Collection and analysis of these samples was carried out as per established standard methods and procedures for the examination of water. The samples were analyzed for selected parameters to establish the existing water quality of the inlet and outlet points of the STP. GEMI has framed its own guidelines for collection of water/wastewater samples titled as 'Sampling Protocol for Water & Wastewater'; which has been approved by the Government of Gujarat vide letter no. ENV-102013-299-E dated 24-04-2014 under the provision of Water (Preservation and Control of Pollution) Act 1974. The sample collection and preservation are done as per the said Protocol. Under the project, the list of parameters to be monitored for the STP have been mentioned in **Table 26** as follows:

Frequency

Monitoring is required to be carried out once a week for monitoring location of Kandla and Vadinar i.e., two STP station at Kandla and one STP station at Vadinar.

Table 26: List of parameters monitored for STP's at Kandla and Vadinar

Sr. No.	Parameters	Units	Reference method	Instruments
1.	pH	-	APHA, 23rd edition, 4500- H^+ B, 2017	pH Meter
2.	TDS	mg/L	APHA, 23rd Edition, 2540 C: 2017	Vacuum Pump with filtration assembly and Oven
3.	TSS	mg/L		
4.	DO	mg/L	APHA, 23rd Edition, 4500 C: 2017	Titration Apparatus
5.	COD	mg/L	APHA, 23rd Edition, 5220 B: 2017	Titration Apparatus plus Digester
6.	BOD	mg/L	IS-3025, Part 44, 1993	BOD Incubator plus Titration Apparatus
7.	SAR	meq/L	IS 11624: 2019	Flame Photometer
8.	Total Coliforms	MPN/100ml	IS 1622: 2019	LAF/ Incubator

9.2 Result and Discussion

Analytical results of the STP samples collected from the inlet and the outlet of the STP's of Kandla and Vadinar have been summarized in **Table 27 & 28**. Further it was compared with the standard norms specified in the CC&A of the respective STPs.

Table 27: Water Quality of inlet and outlet of STP of Kandla

Sr No.	Parameter	Units	GPCB Norms (Kandla)	Kandla															
				Week 3 of June				Week 4 of June				Week 1 of July				Week 2 of July			
				STP-1 (Inlet)	STP-1 (Outlet)	STP-2 (Inlet)	STP-2 (Outlet)	STP-1 (Inlet)	STP-1 (Outlet)	STP-2 (Inlet)	STP-2 (Outlet)	STP-1 (Inlet)	STP-1 (Outlet)	STP-2 (Inlet)	STP-2 (Outlet)	STP-1 (Inlet)	STP-1 (Outlet)	STP-2 (Inlet)	STP-2 (Outlet)
1.	pH	-	**6.5-8.5**	7.02	7.22	7.08	7.36	7.18	7.41	7.12	7.29	7.22	7.56	7.08	7.21	7.12	7.48	6.94	7.48
2.	TDS	mg/L	-	1896	1438	708	682	3948	3583	977	745	1869	1624	766	498	6643	3814	962	894
3.	TSS	mg/L	**100**	126	8	88	10	88	12	126	18	72	14	108	10	78	6	62	8
4.	COD	mg/L	-	249	92.4	257	52.2	229	66.47	236	42.7	173.7	66.21	385.7	54.7	233	71.2	184	52
5.	DO	mg/L	-	BQL	5	BQL	3	BQL	4.8	BQL	4.2	BQL	3.9	BQL	5.4	BQL	2.3	BQL	4
6.	BOD	mg/L	**30**	77.81	11.55	80.32	6.53	71.19	14.16	87.19	9.26	68.34	8.27	118.54	7.59	79.46	6.89	57.5	6.5
7.	SAR	meq/L	-	10.69	8.54	4	3.58	18.47	13.91	7.41	5.34	8.79	8.13	4.92	2.78	16.72	5.63	4.75	5.14
8.	Total Coliforms	MPN/ 100ml	**<1000**	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600

Table 28: Water Quality of inlet and outlet of STP of Vadinar

Sr No.	Parameter	Units	GPCB Norms (Vadinar)	Week 3 of June		Week 4 of June		Week 1 of July		Week 2 of July	
				STP-3 (Inlet)	STP-3 (Outlet)	STP-3 (Inlet)	STP-3 (Outlet)	STP-3 (Inlet)	STP-3 (Outlet)	STP-3 (Inlet)	STP-3 (Outlet)
1.	pH	-	**5.5-9**	7.21	7.07	7.22	7.04	7.24	7.05	7.2	7.48
2.	TDS	mg/L	-	584	578	532	442	436	378	452	366
3.	TSS	mg/L	**20**	8	4	8	2	12	6	18	4
4.	COD	mg/L	**50**	116.9	36.3	149.2	52.4	132	52	148.6	36.1
5.	DO	mg/L	-	BQL	4.5	BQL	5.6	BQL	7	0.9	7.8
6.	BOD	mg/L	**10**	36.53	4.54	46.63	6.55	39.6	7.8	46.44	6.77
7.	SAR	meq/L	-	3.08	2.59	3.51	2.96	2.32	2.2	2.4	1.99
8.	Total Coliforms	MPN/100ml	**100-230**	1600	1600	1600	1600	1600	1600	1600	1600

BQL: Below Quantification limit; Total Suspended Solids (QL=2), Dissolved Oxygen (QL=0.5), Biochemical Oxygen Demand (QL=3 mg/L)

9.3 Data Interpretation and Conclusion

For physicochemical analysis, the treated sewage water was gathered from the Kandla STP, Gopalpuri STP, and Vadinar STP and the analytical results were compared with the standards mentioned in the Consolidated Consent and Authorization (CC&A) by GPCB.

- The **pH** of treated effluent from STPs at Kandla (STP-1 and STP-2) and Vadinar (STP-3) conform to their respective stipulated norms of 7.21-7.56 at Kandla and 7.04–7.48 at Vadinar respectively.
- The **TDS** of treated sewage at Kandla was ranges from 498 to 3814 mg/L, whereas for Vadinar it ranges from 366 to 578 mg/L.
- The **TSS** of the Treated effluent for the STP-1 and STP-2 at Kandla and STP-3 at Vadinar falls within the stipulated norms of 100 and 20 mg/L respectively as mentioned in their respective CCA.
- **COD** value for Kandla was observed in the range of 42.7 to 92.4 mg/L. Whereas for Vadinar the value of COD falls within the range of 36.1 – 52.4 mg/L, and conforms the CCA norms of 50 mg/L, except the 4th & 1st week sample of June & July.
- The value of **DO** was observed in the range of 2.3 to 5.4 mg/L, whereas for Vadinar it was observed in the range of 4.5 to 7.8 mg/L.
- The **BOD** of the outlet for the STPs of Kandla and Vadinar falls within the stipulated norms.
- The value of **SAR** for Kandla was observed in the range of 2.78 to 13.91 meq/L, whereas for Vadinar, it was observed in the range of 1.99 to 2.96 meq/L.
- The **Total Coliforms** was observed to exceed the norms at the locations of the STP-1 & STP-2 for the treated effluent at Kandla and STP-3 at Vadinar.

During the monitoring period, only Total Coliforms were observed to be exceeding the limits at STPs of Kandla and Vadinar while rest of the treated sewage parameters for STP outlet were within norms as specified under the CCA at both the monitoring sites. Regular monitoring of the STP performance should be conducted on regular basis to ensure adequate treatment as per the norms.

9.4 Remedial Measures:

- The quantum of raw sewage (influent) entering the STP should be monitored by installation of the flow meter. If the quantity of the sewage exceeds the treatment capacity of the treatment plant, then provision of additional capacity of collection sump should be provided.
- The adequacy and efficacy of the stages of Sewage treatment units shall be conducted.
- The results show the presence of total coliforms; hence the method of disinfection (Chlorination) sodium or calcium Hypochlorite can be used.
- Effectiveness of any technology depends on factors such as the specific pollutants in the wastewater, plant size, local regulations, and available resources. There are several processes that may be implemented such as - Advanced oxidation process involve using strong oxidants to break down complex organic compounds. Methods like Fenton's

reagent (hydrogen peroxide and iron catalyst) and UV/H_2O_2 treatment can help in reducing COD through oxidation.

- Electrochemical processes like Electrocoagulation (EC) and Electrooxidation (EO) that involve the application of an electric current to facilitate the removal of pollutants through coagulation, flocculation, and oxidation. These methods can be useful for treating sewage containing various pollutants.

CHAPTER 10: MARINE WATER QUALITY MONITORING

10.1 Marine Water

Deendayal Port is one of the largest ports of the country and thus, is engaged in wide variety of activities such as movement of large vessels, oil tankers and its allied small and medium vessels and handling of dry cargo several such activities whose waste if spills in water, can cause harmful effects to marine water quality.

Major water quality concerns at ports include wastewater and leakage of toxic substances from ships, stormwater runoff, etc. This discharge of wastewater, combined with other ship wastes which includes sewage and wastewater from other on-board uses, is a serious threat to the water quality as well as to the marine life. As defined in the scope by DPA, the Marine Water sampling and analysis has to be carried out at a total of eight locations, six at Kandla and two at Vadinar. The marine water sampling has been carried out with the help of Niskin Sampler with a capacity of 5L. The Niskin Sampler is a device used to take water samples at a desired depth without the danger of mixing with water from other depths. Details of the locations to be monitored have been mentioned in **Table 29:**

Table 29: Details of the sampling locations for Marine water

Sr. No.	Location Code		Location Name	Latitude Longitude
1.	Kandla	MW-1	Near Passenger Jetty One	23.017729N 70.224306E
2.		MW-2	Kandla Creek (nr KPT Colony)	23.001313N 70.226263E
3.		MW-3	Near Coal Berth	22.987752N70.227923E
4.		MW-4	Khori Creek	22.977544N 70.207831E
5.		MW-5	Nakti Creek (nr Tuna Port)	22.962588N 70.116863E
6.		MW-6	Nakti Creek (nr NH-8A)	23.033113N 70.158528E
7.	Vadinar	MW-7	Near SPM	22.500391N 69.688089E
8.		MW-8	Near Vadinar Jetty	22.440538N 69.667941E

The map depicting the locations of Marine Water to be sampled and analysed for Kandla and Vadinar have been mentioned in **Map 16 and 17** as follows:

Map 16: Locations for Marine Water Monitoring at Kandla

Map 17: Locations for Marine Water Monitoring at Vadinar

Methodology

The methodology adopted for the sampling and monitoring of Marine Water was carried out as per the '**Sampling Protocol for Water & Wastewater'** developed by GEMI. The water samples collected through the Niskin Sampler are collected in a clean bucket to reduce the heterogeneity. The list of parameters to be monitored under the project for the Marine Water quality have been mentioned in **Table 30** along with the analysis method and instrument.

Frequency:

As defined in the scope by DPA, the sampling and analysis of Marine Water has to be carried out once in a month at the eight locations (i.e., six at Kandla and two at Vadinar).

Table 30: List of parameters monitored for Marine Water

Sr. No	Parameters	Units	Reference method	Instrument
1.	Electrical Conductivity	µS/cm	APHA, 23rd Edition (Section-2510 B):2017	Conductivity Meter
2.	Dissolved Oxygen (DO)	mg/L	APHA, 23rd Edition, 4500 O C, 2017	Titration Apparatus
3.	pH	-	APHA, 23rd Edition (Section-4500-H+B):2017	pH meter
4.	Color	Hazen	APHA, 23rd Edition, 2120 B: 2017	Color comparator
5.	Odour	-	IS 3025 Part 5: 2018	Heating mantle & odour bottle
6.	Turbidity	NTU	IS 3025 Part 10: 1984	Nephlo Turbidity Meter
7.	Total Dissolved Solids (TDS)	mg/L	APHA, 23rd Edition (Section-2540 C):2017	Vaccum Pump with Filtration Assembly and Oven
8.	Total Suspended Solids (TSS)	mg/L	APHA, 23rd Edition, 2540 D: 2017	
9.	Particulate Organic Carbon	mg/L	APHA, 23rd Edition, 2540 D and E	TOC analyser
10.	Chemical Oxygen Demand (COD)	mg/L	IS-3025, Part- 58: 2006	Titration Apparatus plus Digester
11.	Biochemical Oxygen Demand (BOD)	mg/L	IS-3025, Part 44,1993,	BOD Incubator plus Titration apparatus
12.	Silica	mg/L	APHA, 23rd Edition, 4500 C, 2017	UV- Visible Spectrophotometer
13.	Phosphate	mg/L	APHA, 23rd Edition, 4500 P-D: 2017	
14.	Sulphate	mg/L	APHA, 23rd Edition, 4500 SO4-2 E: 2017	
15.	Nitrate	mg/L	APHA, 23rd Edition, 4500 NO3-B: 2017	

Sr. No	Parameters	Units	Reference method	Instrument
16.	Nitrite	mg/L	APHA, 23rd Edition, 4500 NO2- B: 2017	
17.	Sodium	mg/L	APHA, 23rd Edition, 3500 Na-B: 2017	Flame photometer
18.	Potassium	mg/L	APHA, 23rd Edition, 3500 K-B: 2017	
19.	Manganese	µg/L	APHA, 23rd Edition, ICP Method 3120 B: 2017	ICP-OES
20.	Iron	mg/L	APHA, 23rd Edition, ICP Method 3120 B: 2017	
21.	Total Chromium	µg/L	APHA, 23rd Edition, 3500 Cr B: 2017	
22.	Hexavalent Chromium	µg/L		UV- Visible Spectrophotometer
23.	Copper	µg/L	APHA, 23rd Edition, ICP Method 3120 B: 2017	ICP-OES
24.	Cadmium	µg/L		
25.	Arsenic	µg/L		
26.	Lead	µg/L		
27.	Zinc	mg/L		
28.	Mercury	µg/L	EPA 200.7	
29.	Floating Material (Oil grease scum, petroleum products)	mg/L	APHA, 23rd Edition, 5520 C: 2017	Soxhlet Assembly
30.	Total Coliforms (MPN)	MPN/ 100ml	IS 1622: 2019	LAF/ Incubator

10.2 Result and Discussion

The quality of the Marine water samples collected from the locations of Kandla and Vadinar during the monitoring period has been summarized in the **Table 31**. The said water quality has been represented in comparison with the standard values as stipulated by CPCB for Class SW-IV Waters.

Table 31: Results of Analysis of Marine Water Sample for the sampling period

Sr. No.	Parameters	Unit	Primary Water Quality Criteria for Class SW-IV Waters	Kandla						Vadinar	
				MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
1.	Density	kg/m³	-	1.018	1.024	1.022	1.019	1.02	1.023	1.02	1.023
2.	pH	-	6.5-9.0	7.79	7.89	7.85	7.80	7.79	7.82	7.83	7.88
3.	Color	Hazen	No Noticeable	5	5	5	5	5	5	5	1
4.	EC	µS/cm	-	62,600	57,800	59,400	60,500	61,500	58,900	53,300	55,100
5.	Turbidity	NTU	-	>500	150	>500	323	>500	424	11.7	18.2
6.	TDS	mg/L	-	42,638	39,356	41,264	41,884	42,728	43,544	36,178	37,296
7.	TSS	mg/L	-	744	152	568	348	608	348	12	14
8.	COD	mg/L	-	68.1	58.7	89.4	60.4	88.5	80.9	57.9	46.8
9.	DO	mg/L	3.0 mg/L	5.7	6.2	5.5	5.6	5.6	5.8	6.5	7.8
10.	BOD	mg/L	5.0 mg/L	4.26	3.67	5.59	3.78	5.53	5.05	3.62	5.85
11.	Oil & Grease	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
12.	Sulphate	mg/L	-	3444.7	3473.1	3160.3	3452.6	3344	3045.9	3041.8	2772.6
13.	Nitrate	mg/L	-	4.144	3.599	4.578	3.678	5.200	3.834	2.963	2.371
14.	Nitrite	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
15.	Phosphate	mg/L		0.901	BQL	BQL	BQL	BQL	BQL	BQL	BQL
16.	Silica	mg/L	-	4.23	3.67	3.15	3.75	4.74	3.94	1.80	1.60
17.	Sodium	mg/L	-	>10,000	>10,000	>10,000	>10,000	>10,000	>10,000	>10,000	>10,000
18.	Potassium	mg/L	-	444	336	454	428	419	441	382	384
19.	Hexavalent Chromium	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
20.	Odour	-	-	1	1	1	1	1	1	1	1
21.	Arsenic	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
22.	Cadmium	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
23.	Copper	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
24.	Iron	mg/L	-	4.477	0.970	3.887	2.861	4.058	2.876	BQL	0.225
25.	Lead	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
26.	Manganese	mg/L	-	0.17	BQL	0.14	0.094	0.16	0.10	BQL	BQL
27.	Total Chromium	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
28.	Zinc	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
29.	Mercury	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
30.	Particulate Organic Carbon	mg/L	-	4.82	1.27	3.92	2.86	3.26	4.28	0.08	BQL
31.	Total Coliforms	MPN/ 100ml	500/100 ml	8	2	2	1600	13	4	BQL	9

Sr. No.	Parameters	Unit	Primary Water Quality Criteria for Class SW-IV Waters	Kandla						Vadinar	
				MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
32.	Floating Material (Oil grease scum, petroleum products)	mg/L	10 mg/L	1.018	1.024	1.022	1.019	1.02	1.023	1.02	1.023

10.3 Data Interpretation and Conclusion

The Marine water quality of Deendayal Port Harbor waters at Kandla and Vadinar has been monitored for various physico-chemical and biological parameters during the monitoring period. The detailed interpretation of the parameters in comparison to the Class SW-IV for Harbour Waters is as follows:

- **Density** at Kandla was observed in the range of **1.018 to 1.024 kg/m³**, with the average of 1.021 **kg/m³.** Whereas for the location of Vadinar, it was observed 1.02 **kg/m³** at MW-7 and 1.023 **kg/m³** at MW-8, with the average of 1.021 **kg/m³**.
- **pH** at Kandla was observed in the range of **7.79 to 7.89**, with the average pH as 7.89. Whereas for the locations of Vadinar, it was observed in the range of be **7.83 to 7.88**, with the average pH as 7.85. For the monitoring location of both the study areas, pH was found to comply with the norms of 6.5-8.5.
- **Color** range varied from **5 Hazen** at all the monitoring locations in Kandla, and for Vadinar, it found **5 Hazen** at MW-7 and **1 Hazen** at MW-8 location.
- **Electrical conductivity (EC)** was observed in the range of **57,800 to 62,600 µS/cm**, with the average EC as 60116.7 µS/cm for the locations of Kandla, whereas for the locations of Vadinar, it was observed in the range of **53,300 to 55,100 µS/cm**, with the average EC as 54,200µS/cm.
- For all monitoring locations of Kandla the value of **Turbidity** was observed in the range of **150 to 424 NTU**, with average value of 299 NTU, and location MW-1, MW-3 & MW-5 exceeds the quantification limit of 500 NTU. For Vadinar it ranges from **11.7 to 18.2 NTU**, with average of 14.95 NTU. Materials that cause water to be turbid include clay, silt, finely divided organic and inorganic matter, soluble coloured organic compounds, plankton and microscopic organisms. Turbidity affects the amount of light penetrating to the plants for photosynthesis.
- For the monitoring locations at Kandla the value of **Total Dissolved Solids (TDS)** ranged from **39,356 to 43,544 mg/L**, with an average value of 41,902.3 mg/L. Similarly, at Vadinar, the TDS values ranged from **36,178 to 37,296 mg/L**, with an average value of 36,737 mg/L.

- **TSS** values in the studied area varied between **152 to 744 mg/L** at Kandla and **12 to 14 mg/L** at Vadinar, with the average value of 461.33 mg/L and 13 mg/L respectively for Kandla and Vadinar.
- **COD** varied between **58.7 to 89.4 mg/L** at Kandla and **46.8 to 57.9 mg/L** at Vadinar, with the average value as 74.33 mg/L and 52.35 mg/L respectively for Kandla and Vadinar.
- **DO** level in the studied area varied between **5.5 to 6.2 mg/L** at Kandla and **6.5 to 7.8 mg/L** at Vadinar, with the average value of 5.73 mg/L and 7.15 mg/L respectively for Kandla and Vadinar. Which represents that the marine water is suitable for marine life.
- **BOD** observed was observed in the range of **3.67 to 5.59 mg/L**, with average of 4.64 mg/L for the location of Kandla and for the locations of Vadinar, it was observed in the range of **3.62 to 5.85 mg/L**, with an average value of 4.73 mg/L.
- **Sulphate** concentration in the studied area varied between **3045.9 to 3473.1 mg/L** at Kandla and **2772.6 to 3041.8 mg/L** at Vadinar. The average value observed at Kandla was 3320.1 mg/L, whereas 2907.2 mg/L was the average value of Vadinar. Sulphate is naturally formed in inland waters by mineral weathering or the decomposition and combustion of organic matter.
- **Nitrate** in the study area was observed in the range of **3.59 to 5.2 mg/L**, with the average of 4.17 mg/L. Whereas for the Vadinar, recorded value was observed as 2.96 mg/L at MW-7 and 2.37 mg/L at MS-8.
- In the study area of Kandla the concentration of **Potassium** varied between **336 to 454 mg/L** and **382 to 384 mg/L** at Vadinar, with the average value as 420.33 mg/L and 383 mg/L respectively for Kandla and Vadinar.
- **Silica** in the studied area varied between **3.15 to 4.74 mg/L**, with the average of 3.91 mg/L, at Kandla. Vadinar, observed value was found to be 1.80 mg/L at MW-7 and 1.60 mg/L at MS-8 locations.
- **Sodium** in the study area at both Kandla & Vadinar the sodium concentration value recorded Above the quantification limit.
- **Odour** was observed 1 for all locations of Kandla and Vadinar.
- **Copper** at the Kandla site as well as both locations at the Vadinar site, had levels below the quantification limit (BQL)."
- **Iron** in the studied area varied between **0.97 to 4.47 mg/L**, with the average of 3.18 mg/L, at Kandla, and for Vadinar value were recorded BQL for location MW-7 and 0.225 mg/L for location MW-8.
- **Lead** concentration was observed BQL at both site of Kandla & Vadinar.
- **Manganese** in the studied area varied between **0.094 to 0.17 mg/L**, with the average of 0.13 mg/L, at Kandla. At Vadinar both location MW-7 and MW-8 observed BQL.
- **Particulate Organic Carbon** in the study area was observed in the range of **1.27 to 4.82**, with the average value of 3.40. Whereas for the Vadinar, the value observed was 0.08 at MW-7 and BQL at MW-8.
- **Oil & Grease, Nitrite, Phosphate, Hexavalent Chromium, Arsenic, Cadmium, Total Chromium, Zinc, Mercury and Floating Material (Oil grease scum, petroleum**

products) were observed to have concentrations **"Below the Quantification Limits (BQL)"** for most of the locations of Kandla and Vadinar.

- **Total Coliforms** were detected complying with the specified norm of 500 MPN/100ml for all the locations of Kandla and Vadinar, except the location MW-4, which is 1600 MPN/100ml.

During the Monitoring period, marine water samples were analysed and found in line with Primary Water Quality criteria for class-IV Waters (For Harbour Waters).

However, as a safeguard towards marine water pollution prevention, appropriate regulations on ship discharges and provision of reception facilities are indispensable for proper control of emissions and effluent from ships. Detection of spills is also important for regulating ship discharges. Since accidental spills are unavoidable, recovery vessels, oil fences, and treatment chemicals should be prepared with a view to minimizing dispersal. Proper contingency plans and a prompt reporting system are keys to prevention of oil dispersal. Periodical clean-up of floating wastes is also necessary for preservation of port water quality.

CHAPTER 11: MARINE SEDIMENT QUALITY MONITORING

11.1 Marine Sediment Monitoring

Marine sediment, or ocean sediment, or seafloor sediment, are deposits of insoluble particles that have accumulated on the seafloor. These particles have their origins in soil and rocks and have been transported from the land to the sea, mainly by rivers but also by dust carried by wind. The unconsolidated materials derived from pre-existing rocks or similar other sources by the process of denudation are deposited in water medium are known as sediment. For a system, like a port, where large varieties of raw materials and finished products are handled, expected sediment contamination is obvious.

The materials or part of materials spilled over the water during loading and unloading operations lead to the deposition in the harbour water along with sediment and thus collected as harbour sediment sample. These materials, serve as receptor of many trace elements, which are prone to environment impact. In this connection it is pertinent to study the concentration and distribution of environmentally sensitive elements in the harbour sediment. However, human activities result in accumulation of toxic substances such as heavy metals in marine sediments. Heavy metals are well-known environmental pollutants due to their toxicity, persistence in the environment, and bioaccumulation. Metals affect the ecosystem because they are not removed from water by self-purification, but accumulate in sediments and enter the food chain.

Methodology

As defined in the scope by DPA, the Marine Sediment sampling is required to be carried out once in a month at total eight locations, i.e., six at Kandla and two at Vadinar. The sampling of the Marine Sediment is carried out using the Van Veen Grab Sampler (make Holy Scientific Instruments Pvt. Ltd). The Van Veen Grab sampler is an instrument to sample (disturbed) sediment up to a depth of 20-30 cm into the sea bed. While letting the instrument down on the seafloor, sediment can be extracted. The details of locations of Marine Sediment to be monitored under the study are mentioned in **Table 32** as follows:

Table 32: Details of the sampling locations for Marine Sediment

Sr. No	Location Code		Location Name	Latitude Longitude
1.	Kandla	MS-1	Near Passenger Jetty One	23.017729N 70.224306E
2.		MS-2	Kandla Creek	23.001313N 70.226263E
3.		MS-3	Near Coal Berth	22.987752N 70.227923E
4.		MS-4	Khori Creek	22.977544N 70.207831E
5.		MS-5	Nakti Creek (near Tuna Port)	22.962588N 70.116863E
6.		MS-6	Nakti Creek (near NH-8A)	23.033113N 70.158528E
7.	Vadinar	MS-7	Near SPM	22.500391N 69.688089E
8.		MS-8	Near Vadinar Jetty	22.440538N 69.667941E

The map depicting the locations of Marine Sediment sampling at Kandla and Vadinar have been mentioned in **Map 18 and 19** as follows:

Map 18: Location of Marine Sediment Monitoring at Kandla

Map 19: Locations of Marine Sediment Monitoring at Vadinar

The list of parameters to be monitored under the projects for the Marine Sediment sampling been mentioned in **Table 33** as follows:

Table 33: List of parameters to be monitored for Sediments at Kandla and Vadinar

Sr. No.	Parameters	Units	Reference method	Instruments
1.	Texture		Methods Manual Soil Testing in India January 2011,01	Hydrometer
2.	Organic Matter	%	Methods Manual Soil Testing in India January, 2011, 09. Volumetric method (Walkley and Black, 1934)	Titration apparatus
3.	Inorganic Phosphates	mg/Kg	Practical Manual Chemical Analysis of Soil and Plant Samples, ICAR-Indian Institute of Pulses Research 2017	UV- Visible Spectrophotometer
4.	Silica	mg/Kg	EPA METHOD 6010 C & IS: 3025 (Part 35) – 1888, part B	
5.	Phosphate	mg/Kg	EPA Method 365.1	
6.	Sulphate as SO^{4-}	mg/Kg	IS: 2720 (Part 27) - 1977	
7.	Nitrite	mg/Kg	ISO 14256:2005	
8.	Nitrate	mg/Kg	Methods Manual Soil Testing in India January, 2011, 12	
9.	Calcium as Ca	mg/Kg	Methods Manual Soil Testing in India January 2011, 16.	Titration Apparatus
10.	Magnesium as Mg	mg/Kg	Method Manual Soil Testing in India January 2011	
11.	Sodium	mg/Kg	EPA Method 3051A	Flame Photometer
12.	Potassium	mg/Kg	Methods Manual Soil Testing in India January, 2011	
13.	Aluminium	mg/Kg	EPA Method 3051A	ICP-OES
14.	Chromium	mg/Kg		
15.	Nickel	mg/Kg		
16.	Zinc	mg/Kg		
17.	Cadmium	mg/Kg		
18.	Lead	mg/Kg		
19.	Arsenic	mg/Kg		
20.	Mercury	mg/Kg		

11.2 Result and Discussion

The quality of Marine Sediment samples collected from the locations of Kandla and Vadinar during the monitoring period has been summarized in the **Table 34.**

Table 34: Summarized result of Marine Sediment Quality

Sr No.	Parameters	Unit	Kandla						Vadinar	
			MS-1	MS-2	MS-3	MS-4	MS-5	MS-6	MS-7	MS-8
1.	Inorganic Phosphate	kg/ ha	2.12	2.41	3.64	2.88	3.42	1.71	1.85	1.06
2.	Phosphate	mg/Kg	288.72	329.62	467.84	363.18	319.45	213.507	217.339	339.31
3.	Organic Matter	%	1.12	1.36	1.02	1.28	0.94	1.43	1.13	1.52
4.	Sulphate as SO^{4-}	mg/Kg	170.55	146.88	133.90	122.57	189.41	169.42	145.05	126.34
5.	Calcium as Ca	mg/Kg	3680.00	3850.00	4600.00	4100.00	3740.00	3500.00	3400.00	3800.00
6.	Magnesium as Mg	mg/Kg	1928.00	2473.00	2541.00	2849.00	2473.00	1342.00	976.00	1865.00
7.	Silica	g/Kg	519.37	521.29	534.91	546.62	554.35	523.5	507.02	534.29
8.	Nitrite	mg/Kg	0.68	0.79	0.61	0.72	0.77	0.29	0.22	0.31
9.	Nitrate	mg/Kg	6.83	7.42	6.21	5.88	6.12	15.28	11.6	5.79
10	Sodium	mg/Kg	8190	10687	7526	13760	9149	11972	9548	12586
11	Potassium	mg/Kg	2671	2149	2375	3460	2549	6376	4447	1172
12	Aluminium	mg/Kg	7234.11	6841.64	8423.36	9864.22	7246.18	12327.688	10215.74	12643.2
13	Chromium	mg/Kg	49.21	53.46	52.15	56.51	48.72	50.009	48.941	86.61
14	Copper	mg/Kg	5.52	5.63	5.75	6.29	5.31	48.227	30.463	4.25
15	Nickel	mg/Kg	24.87	21.79	25.48	27.62	26.73	29.24	22.776	24.37
16	Zinc	mg/Kg	58.75	52.4	61.85	82.41	55.12	62.49	41.691	40.85
17	Cadmium	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
18	Lead	mg/Kg	6.08	6.41	6.19	6.77	6.28	6.54	2.97	4.494
19	Arsenic	mg/Kg	4.61	4.82	4.58	4.72	4.42	4.61	1.485	2.497
20	Mercury	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
21	Texture	-	Sandy loam	Sandy loam	Silt loam	Sandy loam	Silt loam	Silt loam	Sandy loam	Loam

11.3 Data Interpretation and Conclusion

The Marine sediment quality at Kandla and Vadinar has been monitored for various physico-chemical parameters during the monitoring June-July. The detailed interpretation of the parameters is given below:

- **Inorganic Phosphate** for the sampling period was observed in range of **2.12 to 3.64** Kg/ha for Kandla. Whereas for Vadinar the value observed at location MS-7 (Nakti creek) is 1.71 Kg/ha and MS-8 (Near Vadinar Jetty) is 1.85 Kg/ha. For Kandla and Vadinar the average value of Inorganic Phosphate was observed 2.81 and 1.78 Kg/ha respectively.

- The concentration of **Phosphate** was observed in range of **288.72 to 467.84 mg/Kg** for Kandla and for Vadinar the value observed at location MS-7 (Nakti creek) as 213.507 mg/Kg and MS-8 (Near Vadinar Jetty) as 217.339 mg/Kg. For Kandla and Vadinar the average concentration of Phosphate was observed 367.238 and 215.423 mg/Kg respectively.
- The **Organic Matter** for the sampling period was observed in the range of **0.94 to 1.36** % for Kandla with the average value of 1.16% and for Vadinar the value recorded at location MS-7 and MS-8 was observed 1.43% & 1.13% respectively, with average concentration as 1.28 %.
- The concentration of **Sulphate** was observed in the range of **122.57 to 212.27 mg/Kg** for Kandla and for Vadinar the value observed at MS-7 is 169.42 mg/Kg and at MS-8 is 145.05 mg/Kg. For Kandla and Vadinar the average value of Sulphate was observed 162.596 and 157.235 mg/Kg respectively.
- The value of **Calcium** was observed in the range of 3680 **to 4900 mg/Kg** for Kandla and for Vadinar the value observed at MS-7 is 3500.00 mg/Kg and at MS-8, is 3400.00 mg/Kg. The average value of Calcium for the monitoring period was observed 4145 mg/Kg and 3450 mg/Kg at Kandla and Vadinar, respectively.
- The value of **Magnesium** for the sampling period was observed in the range of **1928 to 2849 mg/Kg** for Kandla and for Vadinar the value observed at MS-7 is 1342.00 mg/Kg and at MS-8, is 976.00 mg/Kg. For Kandla and Vadinar the average value of Magnesium was observed 2427 mg/Kg and 1159 mg/Kg respectively.
- For the sampling period **Silica** was observed in the range of **519.27 to 559.73 mg/Kg** for Kandla with average value 539.37 mg/Kg and for Vadinar the value observed to be 523.5 and 507.02 mg/Kg at MS-7 and MS-8, respectively with average 515.26 mg/Kg.
- The value of **Nitrate** was observed in the range of **5.88 to 8.19 mg/Kg** for Kandla with average value 6.77 mg/Kg and for Vadinar the value observed to be 15.28 and 11.6 mg/Kg at MS-7 and MS-8, respectively with average 13.44 mg/Kg.
- The value of **Nitrite** was observed in the range of **0.61 to 0.83 mg/Kg** for Kandla with average value 0.73 mg/Kg and for Vadinar the value observed to be 0.29 and 0.22 mg/Kg at MS-7 and MS-8, respectively with average 0.25 mg/Kg.
- The value of **Sodium** was observed in the range of **7526 to 13760 mg/Kg** for Kandla with average value 10327.66 mg/Kg and for Vadinar the value observed to be 11972 and 9548 mg/Kg at MS-7 and MS-8, respectively with average 10760 mg/Kg.
- The value of **Potassium** was observed in the range of **2149 to 3671 mg/Kg** for Kandla with average value 2812.5 mg/Kg and for Vadinar the value observed to be 6376 and 4447 mg/Kg at MS-7 and MS-8, respectively with average 5411.5 mg/Kg.
- The value of **Aluminium**, was observed in the range of **6841.64 to 10157.25 mg/Kg** for Kandla with average value 8294.46 mg/Kg and for Vadinar the value observed to be 12327.68 and 10215.74 mg/Kg at MS-7 and MS-8, respectively with average 11271.7 mg/Kg.

- The value of **Mercury** was observed "Below the Quantification Limit" at all the eight-monitoring location of Kandla and Vadinar.
- Texture was observed to be "**Sandy Loam**" at location MS-1, MS-2, and MS-4 "**Silt loam"** at location MS-3, MS-5 & MS-6 in Kandla. "**Sandy Loam**" at location MS-7 & "**loam"** at location MS-8 in Vadinar during sampling period.

Heavy Metals

The sediment quality of Kandla and Vadinar has been compared with respect to the Average Standard guideline applicable for heavy metals in marine sediment specified by EPA have been mentioned in **Table 35.**

Table 35: Standard Guidelines applicable for heavy metals in sediments

Sr. No.	Metals	Sediment quality (mg/kg)			Source
		Not polluted	Moderately polluted	Heavily polluted	
1.	As	<3	3-8	>8	EPA
2.	Cu	<25	25-50	>50	
3.	Cr	<25	25-75	>75	
4.	Ni	<20	20-50	>50	
5.	Pb	<40	40-60	>60	
6.	Zn	<90	90-200	>200	
7.	Cd	-	<6	>6	
ND = Not Detected					

(Source: G Perin et al. 1997)

Table 36: Comparison of Heavy metals with Standard value in Marine Sediment

Sr. No.	Parameters	Unit	Kandla						Vadinar	
			MS-1	MS-2	MS-3	MS-4	MS-5	MS-6	MS-7	MS-8
1.	Arsenic	mg/Kg	4.61	4.82	4.58	4.72	4.42	4.61	1.485	2.497
2.	Copper	mg/Kg	5.52	5.63	5.75	6.29	5.31	48.227	30.463	4.25
3.	Chromium	mg/Kg	49.21	53.46	52.15	56.51	48.72	50.009	48.941	86.61
4.	Nickel	mg/Kg	24.87	21.79	25.48	27.62	26.73	29.24	22.776	24.37
5.	Lead	mg/Kg	6.08	6.41	6.19	6.77	6.28	6.54	2.97	4.494
6.	Zinc	mg/Kg	58.75	52.4	61.85	82.41	55.12	62.49	41.691	40.85
7.	Cadmium	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

- **Arsenic** was observed in the range of **4.42 to 4.82 mg/Kg** for Kandla with average value 4.62 mg/Kg and for Vadinar the value observed to be 1.48 and 2.49 mg/Kg at MS-7 and MS-8, respectively with average 1.99 mg/Kg. With reference to the guidelines mentioned in table 35, the sediment quality with respect to arsenic falls in moderately polluted class.
- **Copper** was observed in the range of **5.31 to 6.54 mg/Kg** for Kandla with average value 5.84 mg/Kg and for Vadinar the value observed to be 48.22 and 30.46 mg/Kg at MS-7 and MS-8, respectively with average 39.74 mg/Kg. With reference to the guidelines mentioned in table 35, the sediment quality with respect to copper falls in non-polluted class.

- **Chromium** was observed in the range of **48.72 to 59.81 mg/Kg** for Kandla with average value 53.31 mg/Kg and for Vadinar the value observed to be 50 and 48.94 mg/Kg at MS-7 and MS-8, respectively with average 49.47 mg/Kg. With reference to the guidelines mentioned in table 35, the sediment quality with respect to chromium falls in moderately polluted class.
- **Nickel** was observed in the range of **21.79 to 29.24 mg/Kg** for Kandla with average value 25.95 mg/Kg and for Vadinar the value observed to be 22.77 and 24.37 mg/Kg at MS-7 and MS-8, respectively with average 38.1mg/Kg. With reference to the guidelines mentioned in table 35, the sediment quality with respect to nickel falls in moderately polluted class.
- **Lead** was observed in the range of **6.08 to 6.77 mg/Kg** for Kandla with average value 6.37 mg/Kg and for Vadinar the value observed to be 2.97 and 4.49 mg/Kg at MS-7 and MS-8, respectively with average 3.73 mg/Kg. With reference to the guidelines mentioned in table 35, the sediment quality with respect to lead falls in moderately polluted class.
- **Zinc** was observed in the range of **52.4 to 82.41 mg/Kg** for Kandla with average value 62.17 mg/Kg and for Vadinar the value observed to be 41.69 and 40.85 mg/Kg at MS-7 and MS-8, respectively with average 56 mg/Kg. With reference to the guidelines mentioned in table 35, the sediment quality with respect to zinc falls in non-polluted class.
- **Cadmium** was observed BQL for all locations at Kandla and Vadinar during sampling period. With reference to the guidelines mentioned in table 35, the sediment quality with respect to cadmium falls in non-polluted class.

Analysis of the sediments indicates moderate pollution. However, it may be noted that, the sediments are highly dynamic being constantly deposited and carried away by water currents. Hence maintaining the quality of sediments is necessary as it plays a significant role in regulating the quality of the marine water and the marine ecology.

The presence of anthropic activity in the coastal areas has an effect upon the marine water and sediment. One of the primary risks associated with contaminated sediments is bioaccumulation in benthic organisms, which is a route of entry into the food chain. Generally adopted sediment remediation approaches include dredging, capping of contaminated areas, and monitored natural recovery (MNR). Dredging can remove contaminated sediments, but it requires large areas of land for sediment disposal. It is expensive and may cause secondary contamination of the water column during re-suspension. MNR relies on ongoing naturally occurring processes to decrease the bioavailability or toxicity of contaminants in sediment. These processes may include physical, biological, and chemical mechanisms that act together to reduce the environmental risks posed by contaminated sediments. MNR require longer monitoring time and can be even more expensive than for dredging and capping. Capping consists of in situ covering of clean or suitable isolating material over contaminated sediments layer

to limit leaching of contaminants, and to minimize their re-suspension and transport. Hence appropriate remedial measures for the polluted sediment sites may be implemented, to reduce the concentration of the heavy metals.

CHAPTER 12: MARINE ECOLOGY MONITORING

12.1 Marine Ecological Monitoring

The monitoring of the biological and ecological parameters is important in order to assess the marine environment. A marine sampling is an estimation of the body of information in the population. The theory of the sampling design is depending upon the underlying frequency distribution of the population of interest. The requirement for useful water sampling is to collect a representative sample of suitable volume from the specified depth and retain it free from contamination during retrieval. Deendayal Port and its surroundings have mangroves, mudflats and creek systems as major ecological entities.

As defined in the scope by DPA, the Marine Ecological Monitoring is required to be carried out once a month specifically at eight locations, six at Kandla and two at Vadinar. The sampling of the Benthic Invertebrates has been carried out with the help of D-frame nets, whereas the sampling of zooplankton and phytoplankton has been carried out with the help of Plankton Nets (60 micron and 20 micron). The details of the locations of Marine Ecological Monitoring have been mentioned in **Table 37** as follows:

Table 37: Details of the sampling locations for Marine Ecological

Sr. No.	Location Code		Location Name	Latitude Longitude
1.	Kandla	ME-1	Near Passenger Jetty One	23.017729N 70.224306E
2.		ME-2	Kandla Creek (near KPT Colony)	23.001313N 70.226263E
3.		ME-3	Near Coal Berth	22.987752N 70.227923E
4.		ME-4	Khori Creek	22.977544N 70.207831E
5.		ME-5	Nakti Creek (near Tuna Port)	22.962588N 70.116863E
6.		ME-6	Nakti Creek (near NH - 8A)	23.033113N 70.158528E
7.	Vadinar	ME-7	Near SPM	22.500391N 69.688089E
8.		ME-8	Near Vadinar Jetty	22.440538N 69.667941E

The map depicting the locations of Marine Ecological monitoring in Kandla and Vadinar have been mentioned in **Map 20 and 21** as follows:

Map 20: Locations of Marine Ecological Monitoring at Kandla

Map 21: Locations of Marine Ecological Monitoring at Vadinar

The various parameters to be monitored under the study for Marine Ecological Monitoring are mentioned in **Table 38** as follows:

Table 38: List of parameters to be monitored for Marine Ecological Monitoring

Sr. No.	Parameters
1.	Productivity (Net and Gross)
2.	Chlorophyll-a
3.	Pheophytin
4.	Biomass
5.	Relative Abundance, species composition and diversity of phytoplankton
6.	Relative Abundance, species composition and diversity of zooplankton
7.	Relative Abundance, species composition and diversity of benthic invertebrates (Meio, Micro and macro benthos)
8.	Particulate Oxidisable Organic Carbon
9.	Secchi Depth

Methodology

- **Processing for chlorophyll estimation:**

  Samples for chlorophyll estimation were preserved in ice box on board in darkness to avoid degradation in opaque container covered with aluminium foil. Immediately after reaching the shore after sampling, 1 litre of collected water sample was filtered through GF/F filters (pore size 0.45 µm) by using vacuum filtration assembly. After vacuum filtration the glass micro fiber filter paper was grunted in tissue grinder, macerating of glass fiber filter paper along with the filtrate was done in 90% aqueous Acetone in the glass tissue grinder with glass grinding tube. Glass fiber filter paper will assist breaking the cell during grinding and chlorophyll content was extracted with 10 ml of 90% Acetone, under cold dark conditions along with saturated magnesium carbonate solution in glass screw cap tubes. After an extraction period of 24 hours, the samples were transferred to calibrated centrifuge tubes and adjusted the volume to original volume with 90% aqueous acetone solution to make up the evaporation loss. The extract was clarified by using centrifuge in closed tubes. The clarified extracts were then decanted in clean cuvette and optical density was observed at wavelength 664, 665 nm.

- **Phytoplankton Estimation**

  Phytoplankton are free floating unicellular, filamentous and colonial eutrophic organisms that grow in aquatic environments whose movement is more or less dependent upon water currents. These micro flora acts as primary producers as well as the basis of food chain, source of protein, bio-purifier and bio-indicators of the aquatic ecosystems of which diverse array of the life depends. They are considered as an important component of aquatic flora, play a key role in maintaining equilibrium between abiotic and biotic components of aquatic ecosystem. The phytoplankton includes a wide range of photosynthetic and phototrophic organisms. Marine phytoplankton is mostly microscopic and unicellular floating flora, which are the

primary producers that support the pelagic food-chain. The two most prominent groups of phytoplankton are Diatoms (*Bacillariophyceae*) and Dinoflagellates (*Dinophyceae*). Phytoplankton also include numerous and diverse collection of extremely small, motile algae which are termed micro flagellates (naked flagellates) as well as Cyanophytes (Bluegreen algae). Algae are an ecologically important group in most aquatic ecosystems and have been an important component of biological monitoring programs. Algae are ideally suited for water quality assessment because they have rapid reproduction rates and very short life cycles, making them valuable indicators of short-term impacts. Aquatic populations are impacted by anthropogenic stress, resulting in a variety of alterations in the biological integrity of aquatic systems. Algae can serve as an indicator of the degree of deterioration of water quality, and many algal indicators have been used to assess environmental status.

- **Zooplankton Estimation**

Zooplankton includes a taxonomically and morphologically diverse community of heterotrophic organisms that drift in the waters of the world's oceans. Qualitative and quantitative studies on zooplankton community are a prerequisite to delineate the ecological processes active in the marine ecosystem. Zooplankton community plays a pivotal role in the pelagic food web as the primary consumers of phytoplankton and act as the food source for organisms in the higher trophic levels, particularly the economically essential groups such as fish larvae and fishes. They also function in the cycling of elements in the marine ecosystem. The dynamics of the zooplankton community, their reproduction, and growth and survival rate are all significant factors determining the recruitment and abundance of fish stocks as they form an essential food for larval, juvenile and adult fishes. Through grazing in surface waters and following the production of sinking faecal matters and also by the active transportation of dissolved and particulate matter to deeper waters via vertical migration, they help in the transport of organic carbon to deep ocean layers and thus act as key drivers of 'biological pump' in the marine ecosystem. Zooplankton grazing and metabolism also, transform particulate organic matter into dissolved forms, promoting primary producer community, microbial demineralization, and particle export to the ocean's interior. The categorisation of zooplankton into various ecological groups is based on several factors such as duration of planktonic life, size, food preferences and habitat. As they vary significantly in size from microscopic to metazoic forms, the classification of zooplankton based on size has paramount importance in the field of quantitative plankton research.

- **Benthic Organisms Estimation**

Benthic macroinvertebrates are small aquatic animals and the aquatic larval stages of insects. They include dragonfly and stonefly larvae, snails, worms, and beetles. Use of benthic macroinvertebrates has been in vogue as indicator organisms for water quality monitoring since long. Traditional methods of water quality monitoring incorporates mostly monitoring of physicochemical parameters. Benthic macroinvertebrates are majorly insects that dwell on the floor of water bodies. They are found in all water bodies, as they have a wide range of pollution tolerance among various species. The benthic

macro-invertebrate's community structure depends on the exposure to pollution it receives. Benthic macroinvertebrates have been used as indicator organisms to measure the water quality of water bodies across the world. Evaluating the abundance and variety of benthic macroinvertebrates in a waterbody gives us an indication of the biological condition of that waterbody. Generally, waterbodies in healthy biological condition support a wide variety and high number of macroinvertebrate taxa, including many that are intolerant of pollution. Samples yielding only pollution–tolerant species or very little diversity or abundance may indicate a less healthy waterbody. Biological condition is the most comprehensive indicator of waterbody health. When the biology of a waterbody is healthy, the chemical and physical components of the waterbody are also typically in good condition.

- **Diversity Index**

A diversity index is a measure of species diversity within a community that consists of co-occurring populations of several (two or more) different species. It includes two components: richness and evenness. Richness is the measure of the number of different species within a sample showing that more the types of species in a community, the higher is the diversity or greater is the richness. Evenness is the measure of relative abundance of the different species with in a community.

1. **Shannon-Wiener's index:**

An index of diversity commonly used in plankton community analyses is the Shannon-Wiener's index (H), which emphasizes not only the number of species (richness or variety), but also the apportionment of the numbers of individuals among the species. Shannon-Wiener's index (H) reproduces community parameters to a single number by using an equation are as follow:

$$H' = \sum p_i * \ln (p_i)$$

Where, ∑ = Summation symbol,
pi = Relative abundance of the species,
ln = Natural logarithm

More diverse ecosystems are considered healthier and more resilient. Higher diversity ecosystems typically exhibit better stability and greater tolerance to fluctuations. e.g., The Shannon diversity index values between 2.19 and 2.56 indicate relatively high diversity within the community compared to communities with lower values. It suggests that the community likely consists of a variety of species, and the species are distributed somewhat evenly in terms of their abundance.

2. **Simpson's index:**

A reasonably high level of dominance by one or a small number of species is indicated by the range of **0.89 to 0.91**. The general health and stability of the ecosystem may be impacted by this dominance. Community disturbances or modifications that affect the dominant species may be more likely to have an impact. The dominating species

determined by the Simpson's index can have big consequences on how the community is organised and how ecological interactions take place.
The formula for calculating D is presented as:

$$D = 1 - \sum (p_i \hat{} 2)$$

Where, ∑ = Summation symbol, pi = Relative abundance of the species

3. Margalef's diversity index:

The number of species is significantly related to the port's vegetation cover surface, depth, and photosynthetic zone. The habitat heterogeneity is a result of these three elements. Species richness is related to the number of distinct species present in the analysed area. Margalef's index has a lower correlation with sample size. Small species losses in the community over time are likely to result in inconsistent changes.
Margalef's index D_{Mg}, which is also a measure of species richness and is based on the presumed linear relation between the number of species and the logarithm of the number of individuals. It is given by the formula:

$$D_{Mg} = \frac{S-1}{lnN}$$

Where, N = total number of individuals collected
S = No. of taxa or species or genera

4. Berger-Parker index:

This is a useful tool for tracking the biodiversity of deteriorated ecosystems. Environmental factors have a considerable impact on this index, which accounts for the dominance of the most abundant species over the total abundance of all species in the assemblage. The preservation of their biodiversity and the identification of the fundamental elements influencing community patterns are thus critical for management and conservation. Successful colonising species will dominate the assemblage, causing the Berger-Parker index to rise, corresponding to well-documented successional processes. The environmental and ecological features of the system after disturbance may therefore simply but significantly determine the identity of the opportunistic and colonising species through niche selection processes.
The Berger-Parker index is a biodiversity metric that focuses on the dominance or relative abundance of a single species within a community. It provides a measure of the most abundant species compared to the total abundance of all species present in the community. Mathematically, it can be represented as follows:

$$d = \frac{N_{max}}{N_i}$$

Where, N_{max} = Max no of individuals of particular genera or species
$\sum N_i$ = Total no of individuals obtained.
The resulting value of the Berger-Parker index ranges between 0 and 1. A higher index value indicates a greater dominance of a single species within the community. Conversely, a lower index value suggests a more even distribution of abundance among different species, indicating higher species diversity. The range of the Berger-Parker

index can be interpreted as when the index value is close to 0, it signifies a high diversity with a more even distribution of abundances among different species. In such cases, no single species dominates the community, and there is a balanced representation of various species.

5. **Evenness index–**

Evenness index determines the homogeneity (and heterogeneity) of the species' abundance. Intermediate values between 0 and 1 represent varying degrees of evenness or unevenness in the distribution of individuals among species. Value of species evenness represents the degree of redundancy and resilience in an ecosystem. High species evenness = All species of a community can perform similar ecological activities or functions= even utilization of available ecological niches = food web more stable = ecosystem is robust (resistant to disturbances or environmental changes). Intermediate values between 0 and 1 represent variable degrees of evenness or unevenness.

$$EI = \frac{H}{\ln(S)}$$

Where, H= Shannon value

ln(S) = the natural logarithm of the number of different species in the community

Relative Abundance: The species abundance distribution (SAD) from disturbed ecosystems follows even/ uneven pattern. E.g., If relative abundance is 0.15, then the found species are neither highly dominant nor rare.

$$RA = \frac{No.\,of\ Individuals\ of\ Sp.}{Total\ no.\,of\ Individual} * 100\%$$

The basic idea of index is to obtain a quantitative estimate of biological variability that can be used to compare biological entities composed of discrete components in space and time. Biodiversity is commonly expressed through indices based on species richness and species abundances. Biodiversity indices are a non-parametric tool used to describe the relationship between species number and abundance. The most widely used bio diversity indices are Shannon Weiner index and Simpson's index.

12.2 Result and Discussion

The details of Marine Ecological Monitoring conducted for the locations of Kandla and Vadinar during the monitoring period has been summarized in the **Table 39.**

Table 39: Values of Biomass, Net Primary Productivity (NPP), Gross Primary Productivity (GPP), Pheophytin and Chlorophyll for Kandla and Vadinar

Sr. No.	Parameters	Unit	Kandla						Vadinar	
			ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
1.	Biomass	mg/L	158	220	92	147	130	108	115	158
2.	Net Primary Productivity	mg/L/hr	0.58	BQL	0.82	BQL	0.72	BQL	BQL	BQL
3.	Gross Primary Productivity	mg/L/hr	1.12	BQL	1.22	0.78	1.19	0.66	0.76	BQL
4.	Pheophytin	mg/m^3	0.88	4	0.78	0.84	1.12	0.97	1.32	BQL

Sr. No.	Parameters	Unit	Kandla						Vadinar	
			ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
5.	Chlorophyll-a	mg/m^3	0.93	1.210	1.87	1.19	1.86	1.52	1.44	1.26
6.	Particulate Oxidisable Organic Carbon	mg/L	1.11	0.78	0.74	0.81	0.92	1.08	0.61	0.62
7.	Secchi Depth	ft	0.62	0.59	0.53	0.71	0.64	0.68	1.05	1.16

- **Biomass:**
  With reference to the **Table 39**, the concentration of **Biomass** reported from location ME-1 to ME-6 in range between **92-220mg/L** where lowest biomass presents in ME-3 (Near Coal Berth) and highest biomass present in ME-2 (Kandla Creek) during sampling period. In Vadinar, the value of biomass was observed 115 mg/L at ME-7 (Near SPM) and 158 mg/L in ME-8 (Near Vadinar Jetty) monitoring station.

- **Productivity (Net and Gross)**
  Gross primary productivity (GPP) is the rate at which organic matter is synthesised by producers per unit area and time (GPP). The amount of carbon fixed during photosynthesis by all producers in an ecosystem is referred to as gross primary productivity. The monitoring location of Kandla reported GPP value in range between **0.66 to 1.22 mg/L/48 Hr** where the highest value recorded for ME-3 and lowest recorded at ME-6 (Nakti Creek (near NH - 8A)). In Vadinar, the value of **GPP** was observed 0.76 at ME-7 (Near SPM) and BQL at ME-8 (Near Vadinar Jetty) monitoring station.

  Net primary productivity, is the amount of fixed carbon that is not consumed by plants, and it is this remaining fixed carbon that is made available to various consumers in the ecosystem. The Net primary productivity of the monitoring location at Kandla from (ME-1 to ME-6) has been estimated to be between **0.58 to 0.82 mg/L/48 Hr**. While in Vadinar, the value of **NPP** was observed BQL at ME-7 (Near SPM) and ME-8 (Near Vadinar Jetty) monitoring station.

- **Pheophytin**
  The level of Pheophytin was detected in the range from **0.78 to 4 mg/m^3** where the highest value observed at ME-2 (Kandla Creek (near KPT Colony)) and the lowest value observed at ME-3 (Near Coal Berth). While in Vadinar, the value of Pheophytin was observed 1.32mg/m^3 at ME-7 and BQL at ME-8 monitoring station.

- **Chlorophyll-a**
  In the sub surface water, the value of Chlorophyll-a reported in range from **0.93 to 1.87 mg/m^3**. The highest value observed at ME-3 (Near Coal Berth) while the lowest value observed at ME-1 (Near Passenger Jetty One). In Vadinar, the value of chlorophyll-a was observed 1.44 mg/m^3 at ME-7 (Near SPM) and 1.26 mg/m^3 in ME-8 (Near Vadinar Jetty) monitoring station.

- **Particulate Oxidisable Organic Carbon**

During the sampling period, the particulate oxidisable organic carbon falls within the range of **0.74 to 1.11 mg/L** from monitoring location ME-1 to ME-6 at Kandla, whereas for Vadinar, the value of POC observed 0.61 mg/L at ME-7 (Near SPM) and 0.62 mg/L in ME-8 (Near Vadinar Jetty) monitoring station.

- **Secchi Depth**

  In monitoring station of Kandla (ME-1 to ME-6) the level of Secchi Depth was observed between **0.53 to 0.71 ft** whereas at Vadinar, the value recorded at ME-7 i.e. Near SPM is 1.05 ft and in Near Vadinar Jetty is 1.16 ft.

Ecological Diversity

Phytoplankton: For the evaluation of the Phytoplankton population in DPA Kandla and Vadinar within the immediate surroundings of the port, sampling was conducted during the study period. Total 8 sampling locations were studied i.es. sampling locations (6 from Kandla and two from Vadinar).

The details of variation in abundance and diversity in phytoplankton communities is mentioned in **Table 40**.

Table 40: Phytoplankton variations in abundance and diversity in sub surface sampling stations

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Bacillaria sp.	-	253	-	-	258	155	-	-
Biddulphia sp.	219	-	377	116	-	-	129	211
Chaetoceros sp.	-	-	-	-	119	-	-	-
Chlamydomonas sp.	189	129	-	268	-	262	355	282
Cyclotella sp.	202	-	324	-	143	-	-	-
Coscinodiscus sp.	-	156	-	179	-	154	166	197
Ditylum sp	225	-	170	-	-	-	-	-
Fragilaria sp.	-	344	-	-	264	255	-	208
Bacteriastrum sp.	176	-	432	202	187	-	345	-
Pleurosigma sp.	-	181	-	-	-	192	-	-
Navicula sp.	281	-	186	-	246	-	-	149
Merismopedia sp.	-	191	-	161	-	164	250	-
Synedra sp.	217	-	-	-	266	-	-	-
Skeletonema sp.	-	131	-	153	-	238	-	294
Oscillatoria sp.	-	-	166	-	169	-	192	-
Thallassiosira	297	198	-	232	-	356	-	189
Gomphonema sp.	-	-	158	-	188	-	221	-
Density-Units/L	**1806**	**1583**	**1813**	**1311**	**1840**	**1776**	**1658**	**1530**
No. of genera	**8**	**8**	**7**	**7**	**9**	**8**	**7**	**7**

The phytoplankton community of the sub surface water in the Kandla and Vadinar was represented by, Diatoms, green algae and filamentous Cynobacteria. Diatoms were represented by 15 genera; green algae were represented by 1 genera and filamentous Cynobacteria were represented by 1 genera during the sampling period.

The density of phytoplankton of the sampling stations from ME-1 to ME-6 (Kandla) varying from 1311 to 1840 units/L, while for Vadinar its density of phytoplankton observed 1658 units/L at ME-7 and 1530 units/L at ME-8. During the sampling, phytoplankton communities were dominated by *Thallassiosira* and *Cyclotella sp.* in Kandla, while *Chlamydomonas sp.* in Vadinar.

The details of Species richness Index and Diversity Index in Phytoplankton is mentioned in **Table 41**.

Table 41: Species richness Index and Diversity Index in Phytoplankton

Indices	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Taxa S	8	8	7	7	9	8	7	7
Individuals	1806	1583	1813	1311	1840	1776	1658	1530
Shannon diversity	2.06	1.89	1.87	1.62	2.18	2.02	1.81	1.77
Simpson 1-D	0.87	0.86	0.83	0.85	0.88	0.86	0.84	0.85
Species Evenness	0.99	0.91	0.96	0.83	0.99	0.97	0.93	0.91
Margalef richness	0.93	0.95	0.80	0.84	1.06	0.94	0.81	0.82
Berger-Parker	0.16	0.22	0.24	0.20	0.14	0.20	0.21	0.19
Relative abundance	0.44	0.51	0.39	0.53	0.49	0.45	0.42	0.46

- **Shannon- Wiener's Index (H)** of phytoplankton communities was in the range of **1.62 to 2.18** between selected sampling stations from ME-1 to ME-6 with an average value of 1.94 at Kandla creek and its nearby creeks. While for Vadinar, Shannon Wiener's index of phytoplankton communities recorded to be **1.81** at location ME-7 and **1.77** at ME-8 with an average value of 1.79. The apportionment of the numbers of individuals among the species observed higher stability at all monitoring location of Kandla.

- **Simpson diversity index (1-D)** of phytoplankton communities was ranged between **0.83 to 0.88** at all sampling stations in the Kandla creek and nearby creeks, with an average of 0.86 Similarly, for Vadinar Simpson diversity index (1-D) of phytoplankton communities was 0.84 at location ME-7 and 0.85 at ME-8 with an average of 0.85.

- **Margalef's diversity index** (Species Richness) of phytoplankton communities in Kandla and nearby creeks sampling stations was varying from **0.80 to 1.06** with an average of 0.92 during the sampling period. While for Vadinar, Margalef's diversity index (Species Richness) of phytoplankton communities observed 0.81 at ME-7 and 0.82 at ME-8 with an average value of 0.82.

- **Berger-Parker Index (d)** of phytoplankton communities was in the range of **0.14 to 0.24** between selected sampling stations from ME-1 to ME-6 with an average value of 0.19 at Kandla creek and nearby creeks. Berger-Parker Index (d) of phytoplankton communities in the sampling stations of Vadinar, was in the range of 0.19to 0.21 with an average value of 0.20. All the monitoring station signifies a low diversity with an even distribution among the different species.

- The **Species Evenness** is observed in the range of **0.83 to 0.99** for all the six-monitoring station of Kandla and for the Vadinar the species evenness is observed 0.93 at location ME-7 & 0.91 at ME-8 location.

- During the sampling period, **Relative Abundance** of phytoplankton communities was in range of **0.39 to 0.53** between selected sampling stations from ME-1 to ME-6 with an average value of 0.47 at Kandla creek and nearby creeks. Whereas for Vadinar the Index value 0.42 at ME-7 and 0.46 at ME-8 with an average value 0.44, thus it is concluded that the studied species can be stated as neither highly dominant nor rare.

The details of variation in abundance and diversity in zooplankton communities is mentioned in **Table 42**.

Table 42: Zooplankton variations in abundance and diversity in sub surface sampling stations

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Acartia sp.	-	2	1	-	1	-	-	1
Acrocalanus	1	-	-	1	-	2	1	-
Amoeba	-	1	1	-	-	1	-	-
Brachionus sp.	2	-	-	-	2	-	1	1
Calanus sp.	2	1	-	2	-	1	-	-
Cladocera sp.	-	-	2	-	1	-	2	2
Cyclopoid sp.	-	-	-	1	1	-	-	-
Copepod larvae	1	1	-	1	-	1	-	1
Diaptomus sp.	-	-	1	-	-	1	1	-
Eucalanus sp.	1	-	-	1	2	-	1	1
Mysis sp.	1	2	2	-	-	2	-	-
Paracalanus sp.	-	1	-	2	1	-	2	1
Density Unit/L	**8**	**8**	**7**	**8**	**8**	**8**	**8**	**7**
No. of genera	**6**	**6**	**5**	**6**	**6**	**6**	**6**	**6**

A total of 12 groups/taxa of zooplankton were recorded in Kandla and Vadinar during the study period which mainly constituted by *Mysis*, *brachionus*, *Calanus*, fish and shrimp larval forms. *Cladocera, Mysis* and *Paracalanus* had the largest representation at all stations from (ME-1 to ME-8). The density of Zooplankton of the sampling stations from ME-1 to ME-6 (Kandla) varying from 7 to 8 units/L, while for Vadinar its density of zooplankton observed 8 units/L at ME-7 and 8 units/L at ME-8. During the sampling, zooplankton communities were dominated by *Mysis sp.* in Kandla, while, *Cladocera* and *Paracalanus* had the largest representation at monitoring location of Vadinar.

The details of Species richness Index and Diversity Index in Zooplankton communities is mentioned in **Table 43**.

Table 43: Species richness Index and Diversity Index in Zooplankton

Indices	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Taxa S	6	6	5	6	6	6	6	6
Individuals	8	8	7	8	8	8	8	7
Shannon diversity	1.73	1.73	1.47	1.73	1.73	1.73	1.73	1.65
Simpson (1-D)	0.93	0.93	0.9	0.93	0.93	0.93	0.93	0.95
Species Evenness	0.97	0.97	0.91	0.97	0.97	0.97	0.97	0.92
Margalef	2.4	2.4	2.06	2.4	2.4	2.4	2.4	2.57
Berger-Parker	0.25	0.25	0.29	0.25	0.25	0.25	0.25	0.29
Relative abundance	75	75	71.43	75	75	75	75	85.71

- **Shannon- Wiener's Index (H)** of zooplankton communities was in the range of **1.47 to 1.73** between selected sampling stations from ME-1 to ME-6 with an average value of 1.68 at Kandla creek and its nearby creeks. While for Vadinar, Shannon Wiener's index of zooplankton communities recorded to be 1.73 at ME-7 and 1.65 at ME-8 with an average

value of 1.69. The apportionment of the numbers of individuals among the species observed higher stability at all monitoring location of Kandla and Near SPM (Vadinar).

- **Simpson diversity index (1-D)** of zooplankton communities was ranged between **0.9 to 0.93** at all sampling stations in the Kandla creek and nearby creeks, with an average of 0.92 Similarly, for Vadinar Simpson diversity index (1-D) of zooplankton communities was 0.93 at ME-7 and 0.95 at ME-8 with an average of 0.94.

- **Margalef's diversity index** (Species Richness) of zooplankton communities in Kandla and nearby creeks sampling stations was varying from **2.06 to 2.4** with an average of 2.34 during the sampling period. While for Vadinar, Margalef's diversity index (Species Richness) of zooplankton communities observed 2.4 at ME-7 and 2.57 at ME-8 with an average value of 2.48.

- **Berger-Parker Index (d)** of zooplankton communities was in the range of **0.25 to 0.29** between selected sampling stations from ME-1 to ME-6 with an average value of 0.25 at Kandla creek and nearby creeks. Berger-Parker Index (d) of zooplankton communities in the sampling stations of Vadinar, was in the range of 0.25 to 0.29 with an average value of 0.27. All the monitoring station signifies a low diversity with an even distribution among the different species.

- The **Species Evenness** is observed in the range of **0.91 to 0.97** for all the six-monitoring station of Kandla whereas, for the Vadinar the species evenness was observed in the range of 0.92 to 0.97, during the monitoring month.

- During the sampling period, **Relative Abundance** of zooplankton communities was in range of 71.43 to 75 between selected sampling stations from ME-1 to ME-6 with an average value of 74.40 at Kandla creek and nearby creeks. Whereas for Vadinar the Index value 75 at ME-7 and 85.71 at ME-8 with an average value 80.36, thus it can be concluded that the studied species is stated as neither highly dominant nor rare.

The details of variation in abundance and diversity in **Benthic organism** is mentioned in **Table 44.**

Table 44: Benthic Fauna variations in abundance and diversity in sub surface sampling

Family/Class	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Thiaridae	1	-	-	-	1	-	-	-
Mollusca	-	1	1	-	-	2	1	-
Odonata	-	-	1	2	-	-	1	1
Lymnidae	1	-	-	1	1	-	-	-
Planorbidae	-	2	2	-	-	1	-	-
Talitridae	2	-	-	-	-	-	2	3
Trochidae	-	1	-	1	2	1	-	2
Atydae	1	-	1	2	-	-	1	3

Family/Class	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Gammaridae	-	-	-	-	1	2	-	-
Portunidae	-	-	1	-	-	-	-	-
Turbinidae	2	1	1	1	1	1	1	-
Palaemonidae	-	-	-	-	1	-	1	-
No. of Family	**7**	**5**	**7**	**7**	**7**	**7**	**7**	**9**
No of Class	**5**	**4**	**6**	**5**	**6**	**5**	**6**	**4**

Few Benthic organisms were observed in the collected sample by using the Van-Veen grabs during the sampling conducted for DPA Kandla and Vadinar. Majority of the species were found under the Macro-benthic organisms during the sampling period were represented by *Odonta, Portunidae sp.*, etc. The No. of Family of benthic fauna was varying from 5 to 9. The dominating benthic communities at Kandla Creek and nearby creek (Nakti and Khori creek) were represented Atydae, Turbinidae. While lowest number of benthic species was represented by Portunidae.

The details of Species richness Index and Diversity Index in Benthic Organisms is mentioned in **Table 45.**

Table 45: Species richness Index and Diversity Index in Benthic Organisms

Indices	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Taxa S	5	4	6	5	6	5	6	4
Individuals	7	5	7	7	7	7	7	9
Shannon diversity	1.55	1.19	1.75	1.55	1.75	1.55	1.75	1.36
Simpson 1-D	0.9	0.9	0.95	0.9	0.95	0.9	0.95	0.81
Species Evenness	0.96	0.86	0.98	0.96	0.98	0.96	0.98	0.98
Margalef	2.06	1.86	2.57	2.06	2.57	2.06	2.57	1.37
Berger-Parker	0.29	0.4	0.29	0.29	0.29	0.29	0.29	0.33
Relative abundance	71.43	80	85.71	71.43	85.71	71.43	85.71	44.44

- **Shannon- Wiener's Index (H)** of benthic organism was in the range of **1.19 to 1.75** between selected sampling stations from ME-1 to ME-6 with an average value of 1.55 at Kandla creek and its nearby creeks. While for Vadinar, Shannon Wiener's index of benthic organism recorded to be 1.75 at ME-7 & 1.36 at ME-8 location with an average value of 1.55. The apportionment of the numbers of individuals among the species observed higher stability at all monitoring location of Kandla and Vadinar.

- **Simpson diversity index (1-D)** of benthic organism was ranged between **0.9 to 0.95** at all sampling stations in the Kandla creek and nearby creeks, with an average of 0.91. Similarly, for Vadinar Simpson diversity index (1-D) of benthic organism was 0.95 at ME-7 and 0.81 at ME-8 location with an average of 0.88.

- **Margalef's diversity index** (Species Richness) of benthic organism in Kandla and nearby creeks sampling stations was varying from **1.86 to 2.57** with an average of 2.19 during the sampling period. While for Vadinar, Margalef's diversity index (Species Richness) of

benthic organism observed to be 2.57 at ME-7 and 1.37 at ME-8 location with an average of 1.97.

- **Berger-Parker Index (d)** of benthic organism was in the range of **0.29 to 0.4** between selected sampling stations from ME-1 to ME-6 with an average value of 0.30 at Kandla creek and nearby creeks. Berger-Parker Index (d) of benthic organism in the sampling stations of Vadinar, was observed to be 0.29 at ME-7 and 0.33 at ME-8 location with an average value of 0.31. All the monitoring station signifies a low diversity with an even distribution among the different species.

- The **Species Evenness** is observed in the range of **0.86 to 0.98** for all the six-monitoring station of Kandla and for the Vadinar the species evenness is observed 0.98 at both of the location.

- During the sampling period, **Relative Abundance** of Benthic organisms was in range of **71.43 to 85.71** between selected sampling stations from ME-1 to ME-6 with an average value of 77.61 at Kandla creek and nearby creeks. Whereas for Vadinar the Index value 85.71 at ME-7 and 44.44 at ME-8 location, with an average value 65.08, thus it is concluded that the studied species can be stated as neither highly dominant nor rare.

Annexure 1: Photographs of the Environmental Monitoring conducted at Kandla

STP Monitoring

Noise Monitoring

Soil Monitoring

Marine Monitoring

Air Monitoring

Drinking Water Monitoring

Annexure 2: Photographs of the Environmental Monitoring conducted at Vadinar

Air Monitoring

Noise Monitoring

STP Monitoring

Drinking water Monitoring

Marine Monitoring

Soil Monitoring

Source: GEMI

Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

'An ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 Certified Institute

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ANNEXURE C
Disaster management plan

DEENDAYAL PORT AUTHORITY

DISASTER MANAGEMENT PLAN (DMP)

By

IRCLASS
Indian Register of Shipping

September - 2024

This is to state that at the request of Deendayal Port Authority (DPA), the undersigned surveyors have undertaken visit to Kandla Port to carry out a Risk Assessment and preparation of Disaster Management Plan. The scope of the analysis and the work undertaken are given in the attached report.

ISSUED BY:

Indian Register of Shipping

Prepared by

Somesh Gupta

Sudarshan Daga

Reviewed by

Dipak Sonawane

Approved by

A. Samanta

REPORT REVISION RECORD

Revision No.	Revision Details	Date
00	Draft report issued for review and comment to DPA.	02-07-2024
01	Final report issued to DPA.	02-08-2024
02	Final report issued to DPA.	26-09-2024

Disclaimer

The tasks of preparation of Disaster Management Plan have been executed by IRS as a consulting service at the request of Deendayal Port Authority. Conclusions and recommendations resulting from the consulting services have been formed in good faith and on the basis of the best information available from sources believed by IRS to be reliable.

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INDIAN REGISTER OF SHIPPING (IRS)

IRS is a classification society established for the promotion of safety of life and protection of property at sea & promotion of knowledge base. It is therefore engaged in the Management of Safety & Reliability through Development of Rules and Regulations, Surveys, Audits, Certification and Training. It is a member of the 'International Association of Classification Societies' (IACS) which is a consultative body to International Maritime Organisation, a subsidiary body of the 'United Nations Organisation'.

Indian Register of Shipping (IRS) is a public limited company incorporated under section 25 of the Indian companies Act 1956 (Section 8 Indian companies Act 2013), without any shareholders. Therefore, it has no beneficiary owners and no profit distribution. The Company charges fees for the services provided and these fees are its source of income. This is used for self-support, self-perpetuation and growth through continual improvement in its service quality, service coverage, research and development. All these activities are directed towards the enhancement of safety, reliability, quality and protection of the environment.

IRS is a recognized R&D organization by the Department of Scientific and Industrial Research (DSIR), Ministry of Science & Technology, 'Govt. of India' for its research related to the maritime industry.

In NOS-DCP, IRS has been identified as one of the technical specialists (support agency) to provide advice relating to ship safety, structural integrity and stability of marine casualties and to depute representatives to attend to a casualty and salvage at the SMCU when established.

A strong team of highly qualified and experienced experts in various disciplines of engineering and marine sciences/technology is engaged in IRS to offer prompt technical solutions to marine and other industry.

TABLE OF CONTENTS

ABBREVIATIONS

AERB	Atomic Energy Regulatory Board
BARC	Bhabha Atomic Research Centre
CBRN	Chemical, Biological, Radiological and Nuclear
CCA	Central Coordinating Authority
CEC	Chief Emergency Controller
CMO	Chief Medical Officer
CIC	Chief Incident Controller
CISF	Central Industry Security Force
CMG	Crisis Management Group
CWC	Cyclone Warning Centers
DCA	District Coordinating Authority
DCC	District Contingency Committee
DDMA	District Disaster Management Authority
DMP	Disaster Management Plan
DPA	Deendayal Port Authority
EAP	Emergency Action Plan
EOC	Emergency Operation Centre
ERDMP	Emergency Response Disaster Management Plan
GEB	Gujarat Electricity Board
GWSSB	Gujarat Water Supply and Sewerage Board
IDRN	Indian Disaster Resource Network
INCOIS	Indian National Centre for Ocean Information Services
IMD	India Meteorological Department
IMO	International Maritime Organization
IAP	Incident Action Plan
IRT	Incident Response Team
MMD	Mercantile Marine Department
MRCC	Maritime Rescue Coordination Centre
MSDS	Materials Safety Data Sheet
NDMA	National Disaster Management Authority
NIDM	National Institute of Disaster Management
NOSDCP	National Oil Spill Disaster Contingency Plan
OH&S	Occupational Health and Safety
OSRO	Oil Spill Response Organization
PAS	Public Address System
PESO	Petroleum and Explosives Safety Organisation
PNGRB	Petroleum and Natural Gas Regulatory Board
PRO	Public Relation Officer
RMC	Regional Meteorological Centre
SIC	Site Incident Controller
SDMA	State Disaster Management Authority

1. EXECUTIVE SUMMARY

Kandla port situated in Gulf of Kutch is a major port handling multipurpose cargo and serves the northwestern region giving a major fillip to the economy due to its suitably sheltered location and connectivity to the North western India, it is administratively controlled by the Ministry of Ports, shipping and waterways, Government of India.

This plan outlines the process for the management of response to Natural and Operational (man-made) disasters that are the responsibility of the port and stakeholders within port. The plan has been prepared as per the Guidelines and template issued by National Disaster Management Authority (NDMA)-2024 and National Disaster Management Plan (NDMP)-2019.

Sea ports face unique challenges in terms of both security and safety and are vulnerable. It may be emphasized that preventing a crisis to develop into a serious disruption is a key element that would address the roles and the responsibility of port employee and workers in high-risk areas of the port.

Quick and rapid response in a emergency situation helps in risk reduction and averting a crisis. This plan provides guidance for quick response in case of an emergency and helps in realizing sustainable Disaster Risk Reduction for the Port. It serves to seek and address all identified hazards and their risk and vulnerability analysis, elements at risk and the level of impact if any. The plan provides clarity on the roles, delegation of authority and responsibility of the Crisis Management Group (CMG) and Incident Response Team (IRT) members in the organization

2. INTRODUCTION

2.1RATIONALE – KEY LEGISLATION MEASURES INVOLVING DISASTER MANAGEMENT

2.1.1 Disaster Management Act, 2005;

The Disaster Management Act, 2005 (DM Act, 2005) lays down institutional and coordination mechanisms for effective Disaster Management at the national, state, district and local levels.

The Disaster Management Act 2005, Section 36;

This section of the act lays down the primary responsibility of ministries in the GoI and departments with respect to institutional framework for prevention, mitigation, preparedness and capacity building of disasters, allocating sufficient funds and other resources to the National and State government agencies. Enactments and review of its policies, rules and regulations for prevention of disasters, mitigation or preparedness.

The Disaster Management Act 2005, Section 37;

This section of the act lay down the primary responsibility of ministries in the GoI and departments with respect to preparation of Disaster Management Plan, their review, updation and its approvals. Measures for financing the activities within the plan are also required to be spelled out in the plan.

2.1.2 Guidelines for Preparation of DMP for Ministries/Dept. issued by National Disaster Management Authority (NDMA), 2024

The guidelines provide a framework in accordance with National Disaster Management Plan - 2019 and provides direction to the port and its stakeholders for all phases of the disaster management cycle.

2.1.3 Prime Minister of India – Ten-Point Agenda for Disaster Risk Reduction

1. All development sectors must imbibe the principles of disaster risk management
2. Risk coverage must include all, starting from poor households to SMEs to multi-national corporations to nation states
3. Women's leadership and greater involvement should be central to disaster risk management
4. Invest in risk mapping globally to improve global understanding of Nature and disaster risks
5. Leverage technology to enhance the efficiency of disaster risk management efforts
6. Develop a network of universities to work on disaster-related issues
7. Utilize the opportunities provided by social media and mobile technologies for disaster risk reduction
8. Build on local capacity and initiative to enhance disaster risk reduction
9. Make use of every opportunity to learn from disasters and, to achieve that, there must be studies on the lessons after every disaster
10. Bring about greater cohesion in international response to disasters.

2.1.4 Sendai International framework for Disaster Risk Reduction (SFDRR-2015-2030)

The post-2015 goals and agenda are set forth in the three landmark global agreements reached in2015 – the Sendai Framework for Disaster Risk Reduction (Sendai, Japan, March 2015), Sustainable Development Goals (UN General Assembly, New York, September 2015) and Climate Change Agreement (Conference of Parties, COP21, Paris, December 2015). The four priorities for action under the Sendai Framework are:

Figure 2.1: Sendai Framework

2.1.5 Safety initiatives to address Natural Disasters

NDMA guidelines on Disasters like Wind & Cyclone, Tsunami, Earthquake and Floods Management are relevant and these have been prepared to provide the directions to ministries, departments and state authorities for the preparation of their detailed Disaster Management Plans.

2.2 OBJECTIVE AND SCOPE OF THE PLAN

The objectives of the DMP are to:

a. Contain and control the emergency incidents,
b. Proactively safeguard the lives of the port employees, contractors, stakeholders, visitors and neighboring population,
c. Mitigate the effect and minimize the damage to the environment,
d. Limit damages of port assets,
e. Ensure that the port responds according to the priorities set by the Chief Incident Controller (CIC) during response operation,
f. Safely restore operations back to normal as quickly as possible after occurrence of any accident, to enable business to be resumed at the earliest,
g. Initiate off-site emergency plan in case of necessity as and when required.

The scope covers –

a. The existing preventive and mitigation measures;
b. Identification of potential scenarios that are likely to occur considering risk profile of port;
c. The preparedness to develop plans for actions when disaster or emergencies occur;
d. The responses that mobilize the necessary emergency services including responders like fire service, police service, medical service including ambulance, government as well as non-governmental agencies;
e. The initiation of off-site emergency plan, should the situation escalate to call for support of civic administrations (district and/or state) and their resources;
f. The post disaster recovery with aim to restore the affected area to its original condition.

3. PROFILE OF THE PORT

3.1 PROFILE

Deendayal Port, a major port since 1955, is situated on the shores of the Kandla Creek The total length of Deendayal Port approach Channel is around 23 kms and minimum width 250 meters. The port is an all-weather port.

It is well connected by the network of rail and road and provides gate way for export and import of traffic from all North Indian States.

Pilotage is compulsory; and is available round the clock except for tankers (LPG and Ammonia vessels are handled during daylight hours only).

Dedicated anchorage areas for the calling vessels are at outer Tuna Buoy (OTB) and for barges it is located inside the Kandla creek.

Existing Facilities inside the port area are as follows:

1. Dry cargo on berths 1 to 10 and 13 to 16 (Iron Scrap, Steel, Food Grains, Ore, Timber Logs, Salt Extractions, etc.)
2. Container berth 11-12
3. Liquid cargo on oil jetties 1 to 7 (LPG, Ammonia, POL Products, Edible Oils, Other Chemicals, etc.)
4. IFFCO barge jetty
5. Floating Dry Dock Facility

3.2 LOCATION OF THE PORT

The port lies near the city of Gandhidham in Gujarat.

Table 3.1: Location of Port

Latitude	23° 3'47.33"N
Longitude	70°11'50.30"E

3.2.1 Port Layout and Port limit map

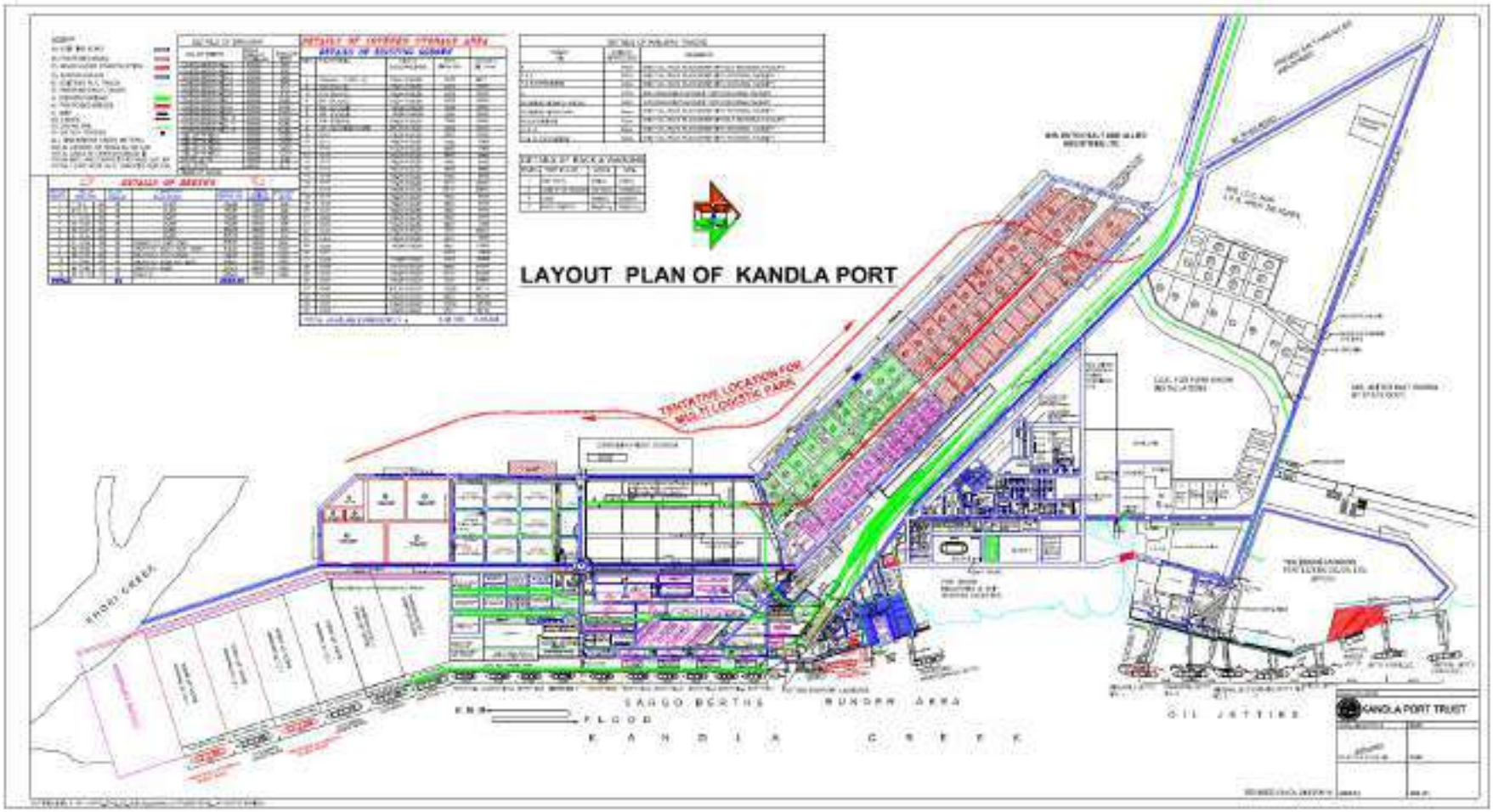


Figure 3.1: DPA Layout

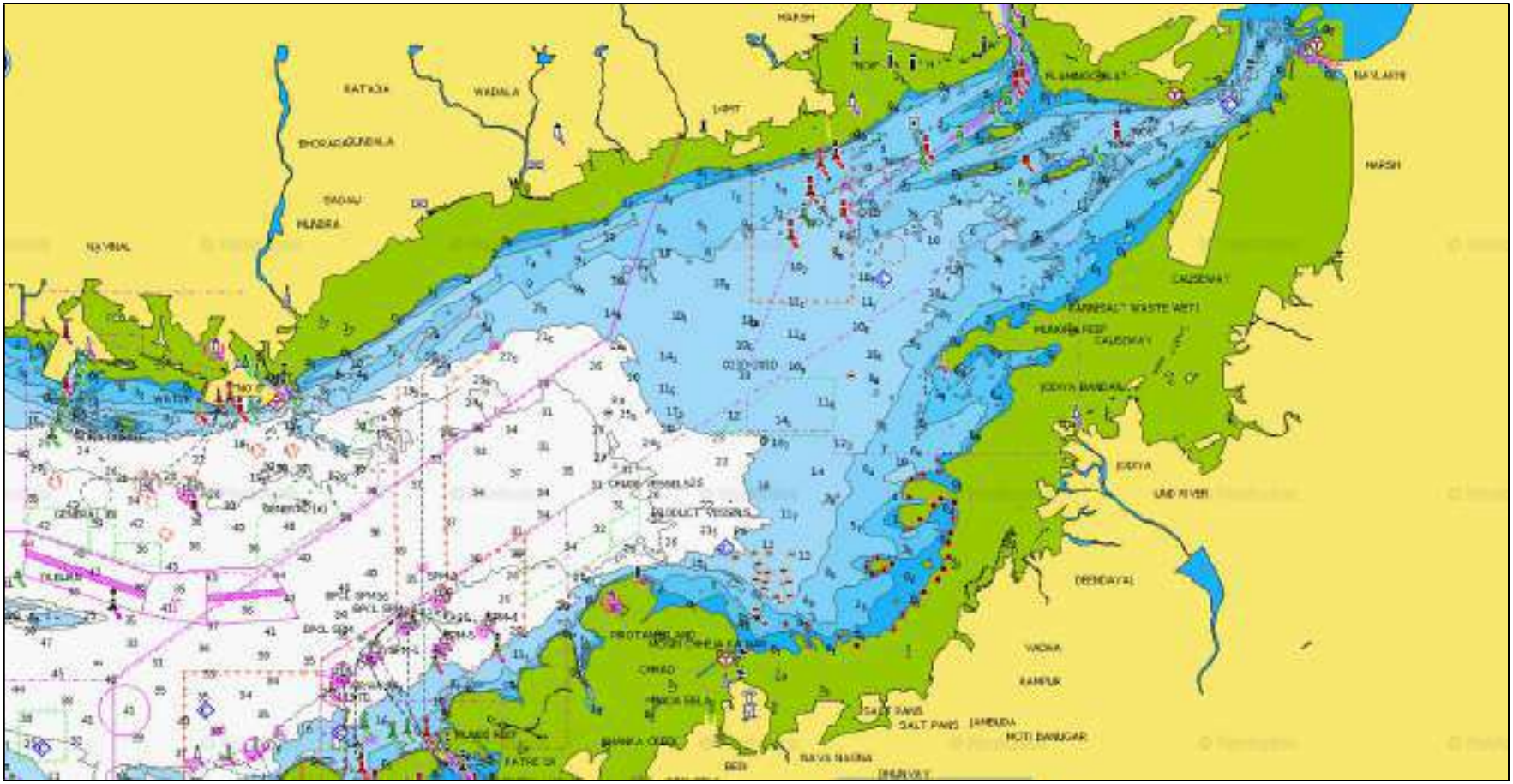


Figure 3.2: Port Limit Map

4. RISK ASSESSMENT

4.1 DISASTER RISKS AND VULNERABILITIES

4.1.1 Chemical Disaster (Fire/ Explosion/ Toxic gas/ liquid release)

These can be caused due to loss of containment of hazardous cargo such as LPG, Motor Spirit, Toluene, Butadiene, Naphtha, Acrylonitrile, Ammonia etc.

4.1.2 Fire Disaster- Class A (solid combustible) & E (electrical) - Fire incidents can occur in areas such as the administration building, control rooms, electrical substations, etc.

4.1.3 Navigational Disaster

Potential scenarios such as Collision, Grounding, Oil Spill, Fire on ships. These were identified on the basis of HAZID assessment and discussion with stakeholders.

4.1.4 Natural Disasters

- Wind and Cyclone: In accordance with national and regional hazard map available with BMTPC the Kutch district falls under ***very high damage risk zone (max. wind speed of 50 m/s)***.
- Flood: Due to its geographical situation, the Kutch district is ***not vulnerable to occurrence of Flood***.
- Earthquake: Kutch district fall under ***High to Very High earthquake damage Risk zone (zone category IV & V).***
- Tsunami predictable with technological information.

4.1.5 Terrorism Disaster

These are situations that develop mostly without warning and need specialized handling.

4.2VULNERABILITY & THREAT MATRIX

An assessment of port vulnerable areas vis-a-vis threats due to disasters is prepared depicting low, moderate and high vulnerability categories.

Table 4.1: Vulnerability and Threat Matrix

Threats → / Vulnerable Areas ↓	Vessel Accidents: Collision/ Grounding/ Fire/ Explosion	Fire & Explosion: Manifold/ Pipeline/ Hose/any other fire	Toxic Gas Leakage: Pipeline/ Manifold/ hose	Pollution (Land/ Sea): Oil/ Chemical	Technical Failures: Power/ Transport / Communi-catio/ Infrastructure	War & Terrorism: Bomb Threat	Cyclone, Floods	Tsunami/ Earth Quake
VESSEL MOVEMENT								
Navigational Channel	xx	-	-	xx	xx	xx	xx	xx
Anchorage area (OTB and Inner anchorage)	xx	-	-	xx	xx	xx	xx	xx
General Cargo Jetty	x	x	-	x	xx	xx	xx	xxx
Oil Jetties	xx	xx	xx	xx	xx	xx	xx	xxx
Tug Jetties	x	-	-	x	-	x	xx	xx
STORAGE-TRANSFER								
Stack yards (Coal, timber, Sulphur, container etc.)	-	x	-	-	-	x	xx	x
Godowns	-	x	-	-	-	x	xx	xx
CARGO TRANSFER								
Pipelines and loading arms	-	xx	xx	xx	xx	xx	xx	xx
Cranes & Ship Loaders	x	x	-	-	x	x	xx	xx
SERVICES								
Security gates	-	x	x	-	x	xx	x	x
Electric Substations	-	xx	-	-	xx	x	x	xx
Dry Dock	-	x	x	-	x	xx	xx	xx
Port Fire station/ Signal Station	-	x	x	x	xx	x	x	xx
Port tugs, crafts, dredger, launchers	x	x	-	x	x	x	xxx	x
ADMINISTRATION								
Buildings (Admin, hospital)	-	xx	-	-	x	x	xx	xx

Note: x=slightly vulnerable; xx=moderately vulnerable; xxx=highly vulnerable

4.3LEVEL OF DISASTERS

The different levels of disaster in order to facilitate the responses and assistance to ports are as follows

Level 0 – denotes normal times which will be utilized for close monitoring, documentation, prevention and preparatory activities. Training on search and rescue, drills, evaluation and inventory updating for response activities will be carried out during this time

Level 1 – specifies disaster that can be managed at Port level; however, the neighboring industries and district will remain in the state of readiness.

Level 2 – disaster situations are those which require assistance and active participation of the port, the neighboring industries and district/State.

Level 3 – disaster situation is in case of large-scale disaster where the state and district authorities have been overwhelmed and require assistance from the Central Government for rescue, relief, and other response and recovery measures. In most cases, the scale and intensity of the disaster as determined by the concerned technical agency like IMD, INCOIS etc. are sufficient for the declaration of Level 3 disaster.

5. ROLES AND RESPONSIBILITIES

5.1 HUMAN RESOURCE PLANNING

Refer **Figure** 5.1 and 5.2 for Onsite and Offsite Emergency Organization chart respectively.

5.1.1 Crisis Management Group

The Crisis Management Group consists of all HOD`s under the head of the Chairman/Dy. Chairman (CEC) which lays down the policies and decisions.

1. Chairman/Dy. Chairman;
2. Deputy Conservator;
3. Traffic Manager;
4. Chief Engineer (Civil);
5. Chief Mechanical Engineer;
6. Fire Cum Safety Officer;
7. Sr. Commandant-CISF;
8. Chief Medical Officer;
9. Chief Vigilance officer;
10. Secretary (General Administration);
11. Chief Law Officer;
12. Financial Advisor and Chief Account Officer;
13. Sr. Dy. Materials Manager;
14. Environment Cell (External);
15. Public Relation officer;
16. Port Berth Operator/Terminal Managers.

5.1.2 Action Group (Incident Response Team)

The action group carries out the decisions made by CMG. It shall be formed at the time of crisis with Harbour Master (SIC) as the head.

1. Harbour Master;
2. Signal Station Superintendent;
3. Dy. Fire Officer;
4. Dy. Traffic Manager;
5. Pilots;
6. Safety Officer;
7. Dy. Chief Mechanical Engineer;
8. Dy. Chief Engineer (Civil);
9. Sr. Dy. Secretary (General Administration);
10. Flotilla Superintendent;
11. Mooring Team;
12. Dy. CMO (Medical);
13. Dy. Commandant -CISF;
14. Dy. Financial Advisor and Chief Account Officer;
15. Dy. Material Manager;
16. Oil Spill Response Organization (OSRO);
17. Port Berth Operators.

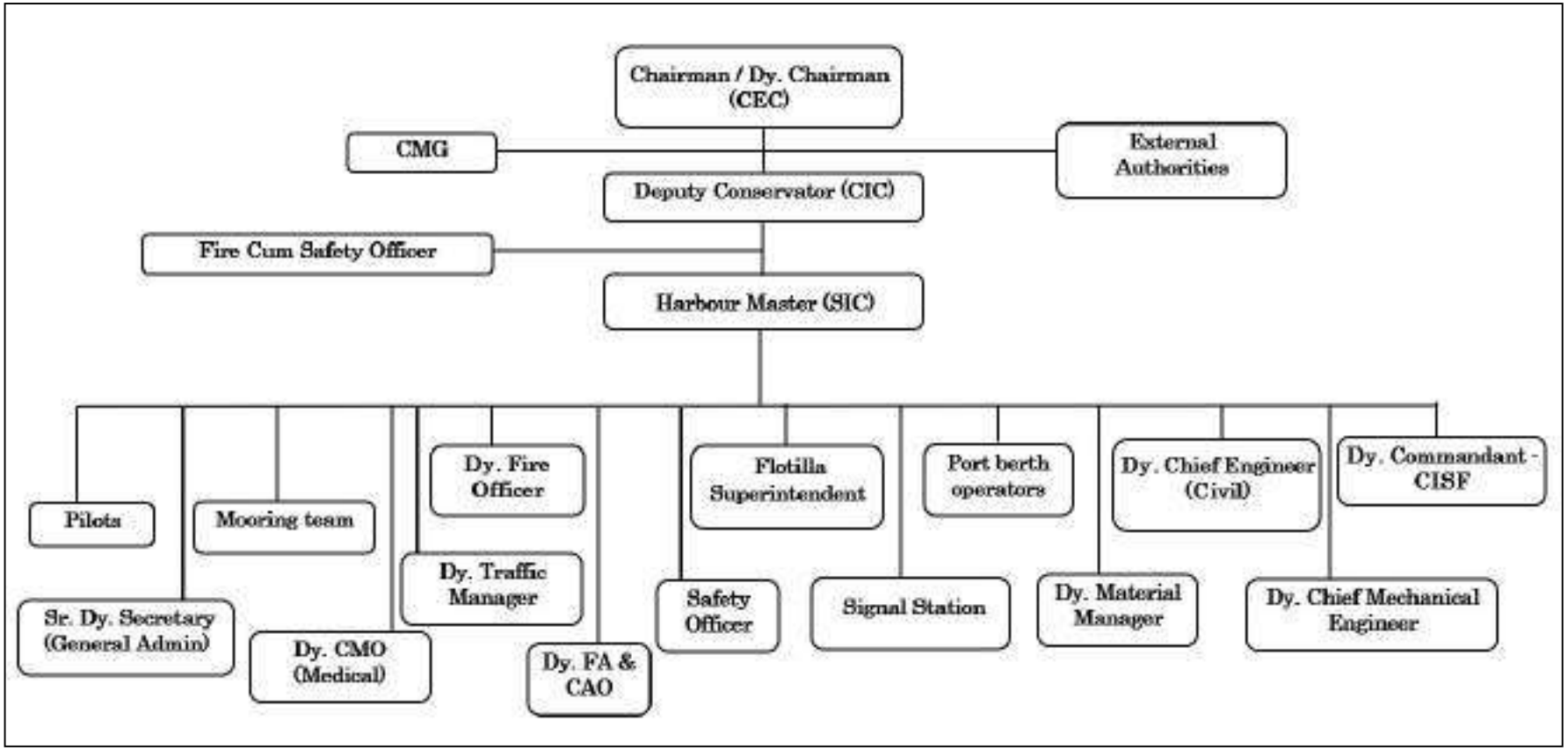


Figure 5.1: On-Site Emergency Organization Chart

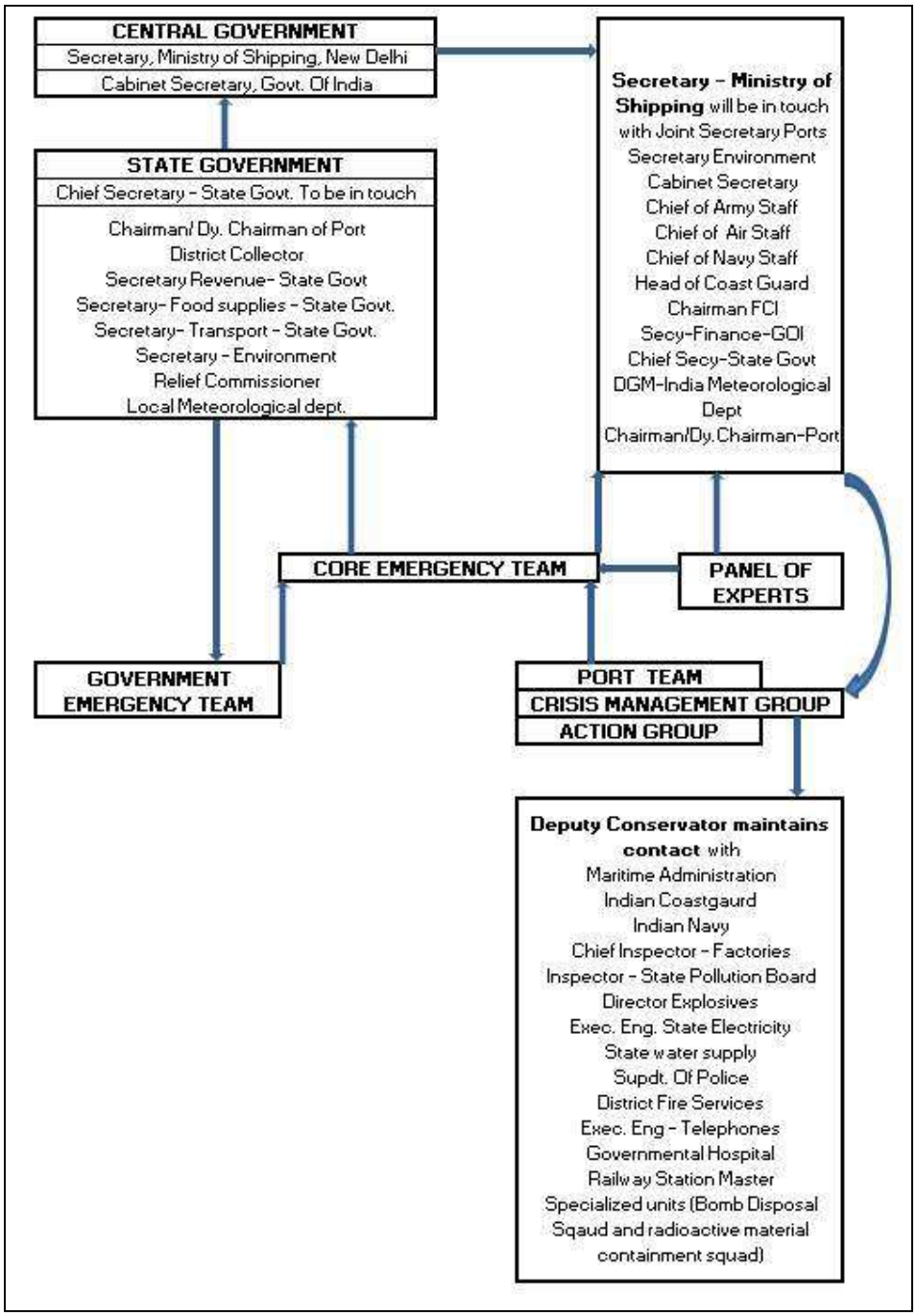


Figure 5.2: Off-Site Emergency Organization Chart – Level 2 and 3

5.1.3 Roles of Terminal/Berth Operators and Port Authority

Role	Terminal/Berth Operators	Port Authority
Prevention	•Prepare, revise, test and exercise own facility EAP/ERDMP, •Train own staff, •Conduct and participate emergency drills and exercises.	• Prepare DMP, •Conduct emergency exercises, •Guideline to encourage all Port Facility Operators to have Emergency Management Plans.
During Response	Undertake following: •First Aid, •Advise staff, •Contain (if possible), •Evacuation (as appropriate), •Partial or Full Shutdown (as appropriate), •Security. When external emergency services arrive: •Provide specialist advise/liaison, •Media Advise as required, •Advise Port, Security, and Harbour Master and neighbouring facilities as required.	•Monitor •Make Strategic decisions regarding: o Shipping movements o Threats to Port facility operators and effects on their business operations •Advice and assist ~~to~~ affected Port facility Operators on matters where qualified to do so. •Escalate response level by obtaining assistance from Local Crisis Groups.
Recovery and reconstruction	•Establish business continuity of terminal.	•Assist Port facility operators &/or shipping to resume operations. •Establish business continuity of terminal.

Table 5.1: Roles Terminal/Berth Operators and Port Authority

5.1.4 Roles and Responsibility of key personnel

CHIEF EMERGENCY CONTROLLER (CEC) CHAIRMAN/DEPUTY CHAIRMAN		
Phase		**Action**
Mobilization /Activation	1	Obtain details of incident and of any mitigative actions taken from CIC.
	2	Communicate with and coordinate with
		a. Local, District, State and National Authorities
		b. Crisis Management Group (CMG)
		c. Chief Incident Controller (CIC)
		d. D.G. Shipping
Establishing Control	3	Nominate alternate person if any functionary is not available.
	4	Establish radio or telephone contact with CIC and CMG.
Planning	5	Advice and provide support to CIC on
		a. Propriety of response level
		b. Location of EOC
		c. Additional Human Resource, materials, equipment and information.
		d. Authorizes the release of required funds for the necessary arrangements for evacuation, transportation, food & supplies.
	6	Advice CIC on activation of DMP.
Ongoing Response	7	Activate Off Site Plan, if necessary.
	8	To issue Media briefings when required.
Response Termination	9	Terminating response advice given to CIC if conditions are met.
	10	Receive incident reports from CIC/ nominated alternate person.
	11	Advise on further course of action in consultation with CIC/ nominated alternate person.

CHIEF INCIDENT CONTROLLER (CIC) DEPUTY CONSERVATOR		
Phase		**Action**
Mobilization / Activation	1	Obtain details of incident and of any mitigative actions taken.
	2	Start recording of events in the Personal Log.
	3	Activate DMP and/or OSCP.
	4	Communicate and coordinate with
		a. Chairman/Dy. Chairman -CEC
		b. IRT and CMG
		c. Salvage Association
		d. CISF-Security and Marine Police
		e. Local Authorities and Neighboring industries, District, State and National Authorities
		f. Respective Terminal Managers/Operators
		g. Relevant external agencies for Natural Disasters.
Establishing Control	5	Assess the level of incident, nature, location, severity, casualties and resource requirement.
	6	Proceed to the EOC and conduct briefing meeting.
	7	Authorize any immediate action required by on site staff and contract agencies.
	8	Establish contact with CIC and CMG.
Evaluation	9	Determine resources at risk and the level of disaster.
	10	Evaluate the assessment of the incident, in consultation with the SIC.
Planning	11	Arrange for monitoring of the event/incident.
	12	Convene planning meeting.
	13	Instruct Material Manager to make a list of required needs: Personnel, equipment, transport etc. Authorize acquisition.
Ongoing Response	14	Implement response actions as per DMP and OSCP.
	15	Continue to monitor incident.
	16	Monitor the response by scheduling and undertaking regular briefings/debriefings of IRT.
	17	Amend the SOP and Action Plan as required.
	18	Ensure that IRT is supplied with necessary personal needs such as tugs, walkie-talkies, PPE, food etc.
	19	Monitor casualties and vessel traffic movements.
	20	Terminate response if conditions are met.
Response Termination	21	Advise the SIC and inform CEC.
	22	Ensure that all IRT members, combat and support agencies are informed of termination of response.
	23	Monitor to ensure safe and complete demobilization.
	24	Debrief CMG.
	25	Ensure that all records are collated and stored.

SITE INCIDENT CONTROLLER (SIC) HARBOUR MASTER		
Phase		**Action**
Mobilization /Activation	1	Obtain details of incident and of any mitigative actions taken.
	2	Start recording of events in the Personal Log.
	3	Initiate
		a. DMP, OSCP as required
	4	Communicate and coordinate with
		a. CIC
		b. IRT
		c. CMG
		d. Master of the vessel
		e. Terminal, Berth Managers and Operators
		f. Functional Heads of the Port
		g. OSRO
Establishing Control	5	Assess the level of incident, nature, location, severity, casualties and resource requirement.
	6	Conduct initial briefing.
	7	Authorize any immediate action required by on site staff and contract agencies.
	8	Establish radio or telephone contact with CIC and CMG.
Planning	9	Arrange for
		a. Deployment of Pollution and Fire- extinguishing response equipment.
		b. Multi-Purpose Vessels
		c. Tugs, etc.
		d. Ensure evacuation of personnel to assembly areas.
	10	Assist Material Manager to compile a list of needs: Personnel, equipment, transport etc.
Ongoing Response	11	Implement response actions as per OSCP and DMP.
	12	Continue to monitor incident.
	13	Monitor the response as per CIC schedule and undertake regular briefings/debriefings of IRT.
	14	Coordinate Search and Rescue operations.
	15	If necessary, call for additional resources.
	16	Arrange relief for IRT members & Monitor OH&S performance.
	17	Monitor waste volumes, if any.
Response Termination	18	Terminate response if conditions are met on permission of CIC.
	19	Ensure that all IRT members, Contract Agencies and CIC are informed of termination of response.
	20	Monitor to ensure safe and complete demobilization.
	21	Ensure that all records are collated and stored.

SENIOR PILOT		
Phase		**Action**
Mobilization / Activation	1	Upon callout, report to CIC/SIC.
	2	Start recording of events in the Personal Log.
	3	Attend Initial Briefing.
Assessment	4	Assist and coordinate with SIC, Signal Station Superintendent and Chief hydrographer to obtain and collate available data:
		a. Weather.
		b. Tides, currents.
		c. Latest update on action taken.
Planning	5	Determine field response equipment/ labor/ transport requirements and provide to CIC.
Ongoing Response	6	Direct and coordinate marine response activities.
	7	Prepare all tugs/crafts for mobilization at the earliest. Coordinate with Flotilla Superintendent.
	8	Coordinate with dredging superintendent.
	9	Ensure that field response teams receive required
		a. Information i.e. Briefings/Inductions/Weather.
		b. Personal protective equipment (PPE).
		c. Essential supplies (e.g. food, first aid etc.).
		d. Weather conditions.
		e. Monitoring of response activities.
	10	Coordinate dispersant operations when permitted.
	11	Seek for necessary means for aerial observation, containment and recovery actions and vessel dispersant spraying operations.
	12	Inform in-charge of pollution response cell (OSRO) of anticipated waste quantity and type.
Response Termination	13	Advise for termination of response operation.
	14	Ensure safe return of response personnel.
	15	Ensure that all equipment is cleaned and returned to stores.
	16	Attend debriefing.
	17	Ensure that all records are collated and stored.

SAFETY OFFICER			
Phase		**Action**	
Mobilization / Activation	1	Start recording of events in the Personal Log.	
	2	Communicate and coordinate with	
		a.	CIC
		b.	SIC
		c.	Fire cum Safety Officer
		d.	Ship owners / Agents / C & F agents / stevedores.
		e.	Terminal and Berth/Jetty Managers
		f.	Environmental cell
		g.	Waste/ Sludge disposal agencies
Establishing Control	3	Establish radio or telephone contact with CIC and SIC.	
	4	Furnish information to the SIC with regards to the safety.	
	5	Inform GPCB and other environmental agencies about the incident for getting necessary guidance.	
Initial Action	6	Coordinate and consolidate list of dangerous goods including tanker in port.	
	7	To collect necessary evidence required for detailed investigation of any accidents.	
	8	Coordinate with the salvage association and waste/sludge disposal agencies.	
Ongoing Response	9	Assist in the safe evacuation of the personnel.	
Response Termination	10	Terminate response if conditions are met on permission of CIC/SIC.	
	11	Submit detailed report regarding the accidents to CIC/SIC.	
	12	Ensure that all records are collated and stored.	

CHIEF MECHANICAL ENGINEER (CME)		
Phase		**Action**
Mobilization / Activation	1	Start recording of events in the Personal Log.
	2	Communicate and coordinate with
		a. CIC
		b. SIC
		c. Port Electrical, Workshop divisions
		d. Maintenance Department
		e. Engineering Department (Electrical and Civil)
		f. Fire cum Safety Officer
		g. Material Management Department
		h. State Electricity Board
Establishing Control	3	Depute engineers on-site.
	4	Establish radio or telephone contact with CIC and SIC.
Initial Action	5	Implements elaborate plans for providing continuity of emergency supplies and services such as, electric power, emergency lighting, communication system, dry docks, vehicles, floating crafts etc.
	6	Keep alert on duty for any electrical isolation of equipment during an emergency.
	7	Suggests optimal strategies for conducting emergency isolation operations of damaged equipment, the emergency transfer of materials and all other process related emergency operations
	8	Maintain sufficient stock of required equipment/materials.
	9	Coordinate with CIC, SIC and CISF.
	10	Ensure water supply to the hydrants.
Ongoing Response	11	Provide necessary advice and supports.
	12	Arrange for Bulldozers, mobile cranes, forklifts or any other specialized equipment.
	13	Mobilize cargo handling equipment.
Response Termination	14	Terminate response if conditions are met on permission of CIC/SIC.
	15	Ensure that all records are collated and stored.

CHIEF ENGINEER (CE) – (Civil)		
Phase		**Action**
Mobilization / Activation	1	Start recording of events in the Personal Log.
	2	Communicate and coordinate with
		a. CIC
		b. SIC
		c. Engineering Department (Electrical and Civil)
		d. Workshop Division
		e. Material Management Department
		f. Maintenance department
		g. Fire cum Safety Officer
Establishing Control	3	Establish radio or telephone contact with CIC and SIC. Depute engineers on-site.
Initial Action	4	Arrange sandbags, Diesel pumps, sufficient quantities of bleaching powder etc., for the event of Cyclone/flood. Plans/strategy, as contemplated, to be forwarded to higher levels.
	5	Will look after fenders, sea wall, roofs etc.
	6	Identify local contractors and keep them as standby to meet emergency requirements such as manpower, equipment etc.
	7	Render and Monitor assistance for extricating trapped personnel by cutting structures etc.
	8	To ensure that adequate clean water is available in the reservoirs.
	9	Instruct the contractors to carry out urgency civil works if required.
	10	Coordinate with CIC, SIC and CISF.
Ongoing Response	11	Provide necessary advice and support.
	12	In case of fire and especially if the fire involves toxic/flammable materials, contain the runoff fire water and other water from the damaged units.
	13	Cooperate with IRT to conduct the actual cleanup work during and after the emergency including clearing of debris.
Response Termination	14	Terminate response if conditions are met on permission of CIC/SIC.
	15	Undertake strengthening of shoreline, buildings and other civil works, in case of damage.
	16	Ensure that all records are collated and stored.

TRAFFIC MANAGER		
Phase		**Action**
Mobilization / Activation	1	Start recording of events in the Personal Log.
	2	Communicate and coordinate with
		a. CIC
		b. SIC
		c. Terminal and Berth Managers
		d. Safety officer
Establishing Control	3	Prepares vessels to vacate from berth.
	4	Establish radio or telephone contact with CIC and SIC.
Initial Action	5	Prepare consolidated list of dangerous goods including tankers in port and provide details to SIC.
	6	Arranges to protect cargo in vicinity from damage.
	7	Arranges to segregate and shift cargo in sheds.
	8	Provide necessary advice and supports.
Response Termination	9	Terminate response if conditions are met on permission of CIC/SIC.
	10	Ensure that all records are collated and stored.

FIRE CUM SAFETY OFFICER		
Phase		**Action**
Mobilization / Activation	1	Obtain details of spill/fire and of any mitigative actions taken.
	2	Start recording of events in the Personal Log.
	3	Communicate and coordinate with
		a. SIC
		b. CIC
		c. Signal Station and Fire Station
		d. Terminal and Berth Managers
	4	Activate Fire Station.
Establishing Control	5	Lead Fire Fighting Team
	6	Establish radio or telephone contact with SIC
Initial Actions	7	Announce Fire Incident Point on PAS.
	8	Be updated about wind direction.
	9	Arrange for
		a. • Fire Extinguishers • Maintain sufficient water pressure in fire hydrant system.
		b. Safety Equipment
		c. Rescue of injured persons to medical centers
		d. In consultation with SIC evacuate workers to assembly areas.
	10	Assist SIC to compile a list of needs: personnel, equipment, transport etc.
Response Actions	11	Implement response actions as per OSCP and DMP as per SIC/CIC instructions.

	12	If necessary, call for additional resources
Response Termination	13	Terminate response if conditions are met on consultation with SIC.
	14	Ensure safe return of response personnel.
	15	Ensure that all records are collated and stored.

SIGNAL STATION			
Phase		**Action**	
Mobilization / Activation	1	Communicate with	
		a	CIC
		b	SIC
		c	Kandla VTMS, Tuna Tekra and Vadinar
		d	Master of the vessel
		e	Pilots
		f	Meteorological department
		g	Marine Police
Initial Action	2	Gather detailed information about the incident.	
	3	On receipt of instructions from SIC, notify the Master of the Vessel, craft, security boat	
Ongoing Response	4	Coordinate with SIC and provide necessary information.	
Response Termination	5	Terminate response on instructions of CIC/SIC	
	6	Ensure that all records are collated and stored.	

SR. DEPUTY MATERIAL MANAGER			
Phase		**Action**	
Mobilization / Activation	1	Communicate with	
		a	CIC/SIC
		b	Engineering Department
		c	Workshops Division
Initial Action	2	Arrange for material and equipment	
	3	Ensure stock of emergency equipment such as diesel, petrol and such other oils, fire-fighting items such as foam, damage control stores such as cement and other stores required to keep plants, machinery road vehicles and water-craft running.	
	4	One officer to liaise with suppliers of all items mentioned above, so that they can be procured as and when required.	
Response Termination	5	Terminate response if conditions are met on permission of CIC/SIC.	
	6	Ensure that all records are collated and stored.	

Sr. COMMANDANT - CISF (SECURITY)		
Phase		**Action**
Mobilization / Activation	1	Obtain details of incident and of any mitigative actions taken.
	2	Start recording of pertinent facts and figures in the Personal Log.
	3	Communicate and coordinate with
		a. CIC
		b. SIC
		c. Kutch Police Authorities and other relevant authorities
		d. State Relief and Rehabilitation department
Establishing Control	4	Authorize any immediate action required by on site staff.
	5	Establish a special task force for the rescue operation.
	6	Establish radio and telephone contact with CIC and SIC
Initial Action	7	Obtain necessary instructions from SIC.
Ongoing Response	8	Keep extra vigilance on the location or sites which are likely to be affected by cyclone for e.g. electrical substation, store, workshop, cargo berth, dry dock, administration building etc.
	9	Control entry of unauthorized persons.
	10	Facilitate entry of authorized persons, agencies.
	11	Facilitate entry of emergency vehicles such as ambulance etc.
	12	Assist in Search and Rescue operation.
	13	Ensures that residents within port area are notified about disaster and instructions to evacuate if necessary.
Response Termination	14	Carry out a reconnaissance of the evacuated area before declaring the same as evacuated.
	15	Terminate response if conditions are met on permission of CIC or SIC.
	16	Ensure that all records are collated and stored.

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

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

SECRETARY (GENERAL ADMINISTRATION)		
Phase		**Action**
Mobilization / Activation	1	Communicate and coordinate with
		a. CEC
		b. CIC
		c. Administration Department
		d. FA&CAO
		e. Legal Department
Initial Action	2	Will remain In-Charge of the Admin. department.
	3	In the event of evacuation, assist Management Group to co-ordinate with State Transport Authority and the Police authority for evacuation. Arrange for food and water and accommodation.
	4	Liaise with Municipal Corporation and the Civil Defence Organisation for arrangements for shelters for the evacuated persons, food for them and later for their rehabilitation.
	5	Keep in close liaison with the evacuating authority and collect all details regarding the evacuated people. This will be necessary to settle claims, if any, at a later date.
	6	Mobilise all vehicles for the transportation needs of the Management Team, the Action Team and support services.
	7	Keep the Legal Advisor of the Port informed of the situation at all times and obtain his advice for legalising all the port's actions.
	8	Draw lists of Port Personnel affected and involved in an incident, and keep their families informed correctly through Information Centre.

	9	Make proper arrangements for the Port's personnel engaged in combating an emergency for their food and rest.
Response Termination	10	Liaises with media under guidelines provided by the CEC.

CHIEF LAW OFFICER		
Phase		**Action**
Mobilization / Activation	1	Communicate and coordinate with
		a. CEC
		b. CIC
Initial Action	2	Gather information
Ongoing Response	3	To assist in issuing notice under Major Port Trust Act, Indian Ports Act, Major Port Prevention and Control of Pollution Rules etc. to the defaulters.
Response Termination	4	Arrange for settlement of related claims
	5	Liaises with media under guidelines provided by the CEC.

FINANCIAL ADVISOR & CHIEF ACCOUNT OFFICER		
Phase		**Action**
Mobilization / Activation	1	Communicate and coordinate with
		a. CEC
		b. CIC/SIC
Initial Action	2	Gather information
Ongoing Response	3	Process agreements and/or arrange payments to all departments for their requirements such as leasing/ immediate procuring of equipment.
	4	Take appropriate action for hiring of specialist services, food, and shelter and transport arrangements, as the situation demands.
	5	Depute a senior officer to each department involved in combating action, to look after its needs.
	6	Monitor the expenditure, and services rendered by outside agencies to the Port and vice versa, to avoid disputes later and to facilitate smooth working of mutual aid.
	7	Depute senior officer of this department assisted by an officer from the General Administration Department, Engineering, Marine Department to document all events, damages and claims.
Response Termination	8	Liaises with media under guidelines provided by the CEC.

PUBLIC RELATIONS OFFICER		
Phase		**Action**
Mobilization / Activation	1	Communicate and coordinate with a. CEC b. CIC
Initial Action	2	Set up an Information Centre.
Ongoing Response	3	Liaise between the EOC and outside agencies participating in the emergency.
	4	Provide information to the Police regarding developments as authorised.
Response Termination	5	Liaises with media under guidelines provided by the CEC.

5.2 COORDINATION - HORIZONTAL AND VERTICAL LINKAGES

Coordination with the following external agencies would be required and the Emergency Operation Centre (EOC) will function as the focal point of coordination.

- Gujarat State Disaster Management Authority (GSDMA),
- District Disaster Management Authority (DDMA) – Kutch,
- District Level Committee on Natural Calamity (DLCNC) - Kutch,
- Gujarat Disaster Rapid Action Force (GDRAF),
- State and National Crisis Group,
- Indian Coast Guards, Indian Navy,
- DG Shipping, MMD,
- GPCB, PESO, AERB,
- Gujarat Water Supply and Sewerage Board (GWSSB);
- DD, AIR for media briefing,
- Gujarat Electricity Board (GEB), Gujarat State Electricity Corporation Limited (GSECL),
- Gujarat State Road Transport Corporation (GSRTC),
- IMD, Meteorological Centre – Ahmedabad,
- Co-ordinate with the NGOs and aid agencies,
- P & I Club and their local correspondent,
- Salvage association,
- Public Health Organization.

5.2.1 State and District Level Coordination Mechanism

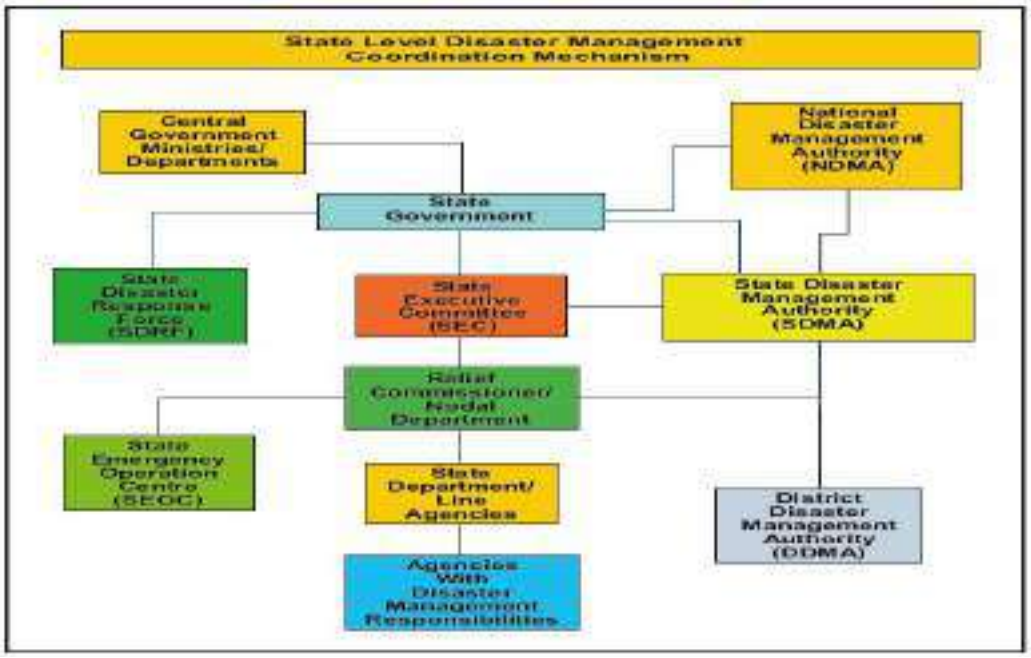


Figure 5.4: State –level disaster management – basic institutional framework

5.2.2 District Level

The DDMA is headed by the District Collector or Deputy Commissioner as the case may be, with the elected representative of the local authority as the Co-Chairperson.

6. PREPAREDNESS MEASURES

6.1 EMERGENCY OPERATION CENTRE

The EOC will be located in the E-Drishti Command and Control Centre or as directed by the CEC/CIC.

6.2 CAPACITY DEVELOPMENT

The capacity development covers all aspects of disaster management. The broad thematic areas for capacity development are summarized in **Table** 6.1.

Table 6.1: Summary of Broad Capacity Development Themes

	Capacity Development Themes
Key Aspect	**Thematic Areas**
Prevention or mitigation for disaster risk reduction	Hazards, Risk, and Vulnerability Assessment • Preparing DM plans, regular updation and mock drills, • Institutional arrangements, policies, legal support, and regulatory framework, • Safety awareness and training, • Mainstreaming of DRR into development plans and programs, • Training and skill development, • Documenting lessons from previous disasters and ensuring their wide dissemination, • Developing appropriate risk transfer instruments by collaborating with insurance companies and financial institutions, • Integrate DRR into business models and practices, • Preparedness and response plans at all levels, • Disaster resilience by maintaining list of nearby hospitals and health care centers, • Business resilience of productive assets by strengthening the supply chains and service providers, ensuring continuity of services.
Effective preparedness and response	Emergency response capabilities – EOCs, infrastructure, equipment upgrades and adoption of best available technologies • Effective coordination with external agencies and relevant stakeholders, • Adoption and adaptation of emerging global good practices, • Early warnings, maps/ satellite data/ effective dissemination of information, • Table-top exercises, simulations, and mock drills to improve operational readiness of the plans, • Strengthening of the Fire and Emergency Service through revamping and modernization, • Transportation systems and network, • Power and fuel supply management,
Recovery and Build Back Better	• Port infrastructure damage assessment mechanism and award of reconstruction projects, contracting including revised specifications for resilient infrastructure, • Studies on past disasters and recovery to draw useful lessons.

6.3 TRAINING

Regular trainings are provided to all personnel who have a role in planning and operational response to an emergency. A well-coordinated programme of training exercises includes activities of varying degrees of interaction and complexity.

6.4 DRILLS & EXERCISES

Emergency drills and integrated exercises have the following objectives:

1. To ensure that the emergency organization personnel are familiar with their duties and responsibilities,
2. Provide hands-on experience with the procedures to be implemented during emergency,
3. To test the adequacy of the effectiveness, timing, and content of the plan and implementing procedures.

The frequency of the drills are depends on the severity of the hazard. However, drills should be conducted at least once a year.

6.5 COMMUNICATION

Communication technology is an integral part of disaster management. It plays an important role in all the four distinct phases of disaster management namely mitigation, preparedness, response and recovery.

The following table provides information on the communication equipment available with the services and authorities.

Table 6.2: Communication Network within the Port

Services & Authorities	Communication Network Element
CMG and IRT	Special fire alarm and normal communication system-VHF-TELEPHONE-WALKIE TALKIE- MOBILE-SATCOM
Fire-fighting craft and Rescue launches, tugs and other harbour craft	UHF/VHF Radio telephones-Mobile
Ships at Berth	Normal UHF/VHF Radio telephone link used in cargo operations. Terminal/Berth Operator representative at tanker berth to also have own radio-SATCOM
District Collector or State Secretary	UHF/VHF Radio telephone, public telephone-hot line for emergency level 2 & 3-SATCOM
Civil authorities Including fire services, Police and medical services	UHF/VHF radio, telephone or public telephone system. SATCOM
Jt. Secretary-Ministry of Ports, Shipping and Waterways, New Delhi	Public telephone-hot line for emergency level 2 & 3 SATCOM

6.6 TEMPORARY SHELTER

In the event of an impending disaster the affected population would have to be transported to intermediate temporary shelter.

Help of the voluntary organizations i.e. NGO may be taken for the rescue and relief operation.

6.7 TRANSPORTATION

All port vehicles (owned or hired) will be used during emergency.

6.8 GENERATOR SETS

Wherever generator sets are required, the engineering department will be contacted, who will immediately hire/procure.

6.9 DECONTAMINATION

Decontamination is employed to remove hazardous materials from people and equipment. The various types are as below:

- ***Clinical decontamination*** - treatment by health professionals of patients affected by or contaminated with hazardous materials;
- ***Personnel decontamination***, meaning the decontamination of uninjured exposed persons;
- ***Equipment decontamination*** is the procedure used to clean the specialist equipment/protective suits which personnel use in dealing with hazardous material incidents.

6.10 MEDICAL FACILITIES

Depending on the nature of the emergency, it may be necessary to alert medical facilities.

6.10.1 FIRST AID CENTER

First Aid treatments provided at the port and the Port ambulance placed at every First Aid center and hired vehicles, can be used for taking the person to the medical center.

6.11 RESOURCE MANAGEMENT

Resources available with the port for the preparedness program can be found in **Chapter 10 and Annex B.**

The various equipment and systems should always be maintained, inspected and tested periodically.

6.12 LOGISTICS/SERVICE DELIVERY MECHANISM

The required/necessary equipment and assistance during various types of emergencies can be requested from the Local Industry crisis groups, District crisis groups, neighboring industries. Additional resources available for disaster relief with the various departments in the Kutch District can be found from IDRN (https://idrn.nidm.gov.in/).

7. RESPONSE STRATEGIES

7.1 EARLY WARNING/ ALERT SYSTEM

7.1.1 Receiving and managing alerts

Information of the occurrence of incidents in and around the port area may come from a variety of sources. On receipt of information designated personnel must carry out investigation to confirm the incident and gather as many details and as quickly as possible:

- Prepare an incident report.
- Immediately forward the report to and inform the Deputy Conservator/Harbour Master.

7.1.2 Activation of Emergency Operation Centre (EOC) and initial resource coordination (Refer Procedure-A)

7.1.3 Resource mobilization

The CIC/SIC will ensure mobilization of sufficient equipment and personnel resources required to manage the response.

7.1.4 Direction, control and coordination –amongst IRT

The overall responsibility of the Emergency management lies with the CIC.

Table 7.1: Procedure for Establishing EOC

PROCEDURE-A	**ESTABLISHING THE EMERGENCY OPERATION CENTRE (EOC)**			
Task	**Action**			**Status**
1.0	Obtain and/or assign EOC equipment.			
1.1	**Communications**			
	a	Telephone lines. (1 Hot line linking Dy. Commissioner of the district)		
	b	Fax lines.		
	c	Radio frequency (as required).		
1.2	Information Display.			
	a	Set of forms (minimum of 5 sets).		
	b	Regional Maps and Charts:		
		i	Nautical charts.	
		ii	Topographic maps	
	c	Overhead projector (in nominated briefing room).		
	d	Whiteboards.		
1.3	Copy(s) of the port Risk Assessment, DMP and OSCP.			
1.4	Computer and Printer.			
1.5	Stationary: Markers, Pens, Pencils and A4 white paper.			
1.6	Tables and chairs			
1.7	Order and obtain any items needed (1.1-1.6)			
1.8	Advise reception to direct incoming calls to the EOC.			

7.1.5 Competent Agencies

The competent agencies are responsible for keeping track of developments in respect of specific hazards assigned to them and inform the designated authorities/agencies at National, State and District levels about the impending disasters.

Table 7.2: Competent agencies for issuing warnings

Disaster	Agencies
Earthquake	IMD/Ministry of Earth Sciences
Flood	Central Water Commission
Cyclone	IMD, Regional Specialized Meteorological Centre (RSMC)
Tsunami and Storm Surge	INCOIS

7.1.6 Communication Flowchart

Communication flowcharts between the key agencies and key personnel of the CMG/IRT for various hazards are as follows

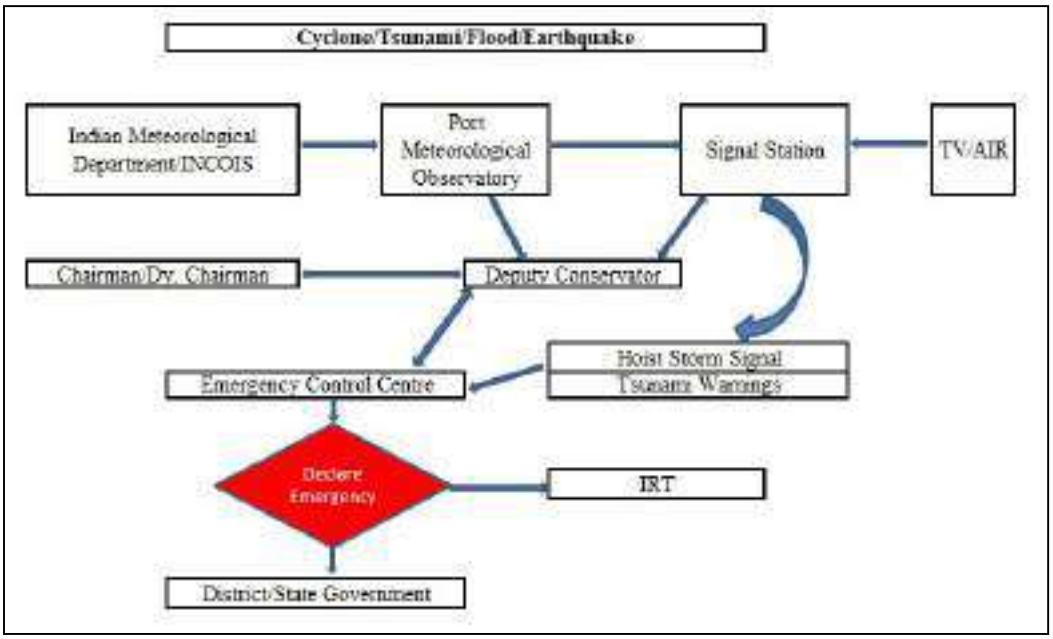


Figure 7.1: Cyclone /Tsunami/Flood/Earthquake

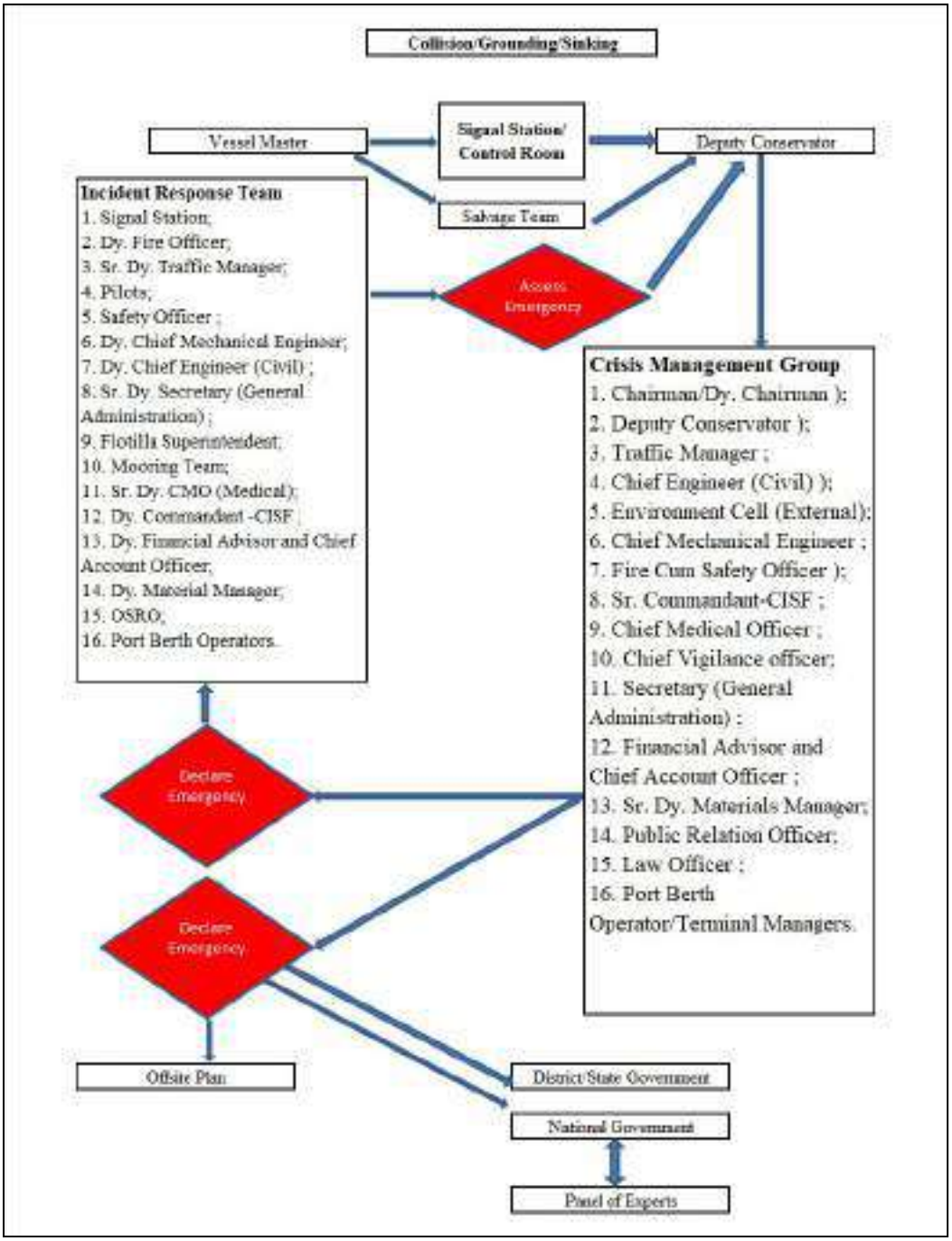


Figure 7.2: Collision/Grounding/Sinking

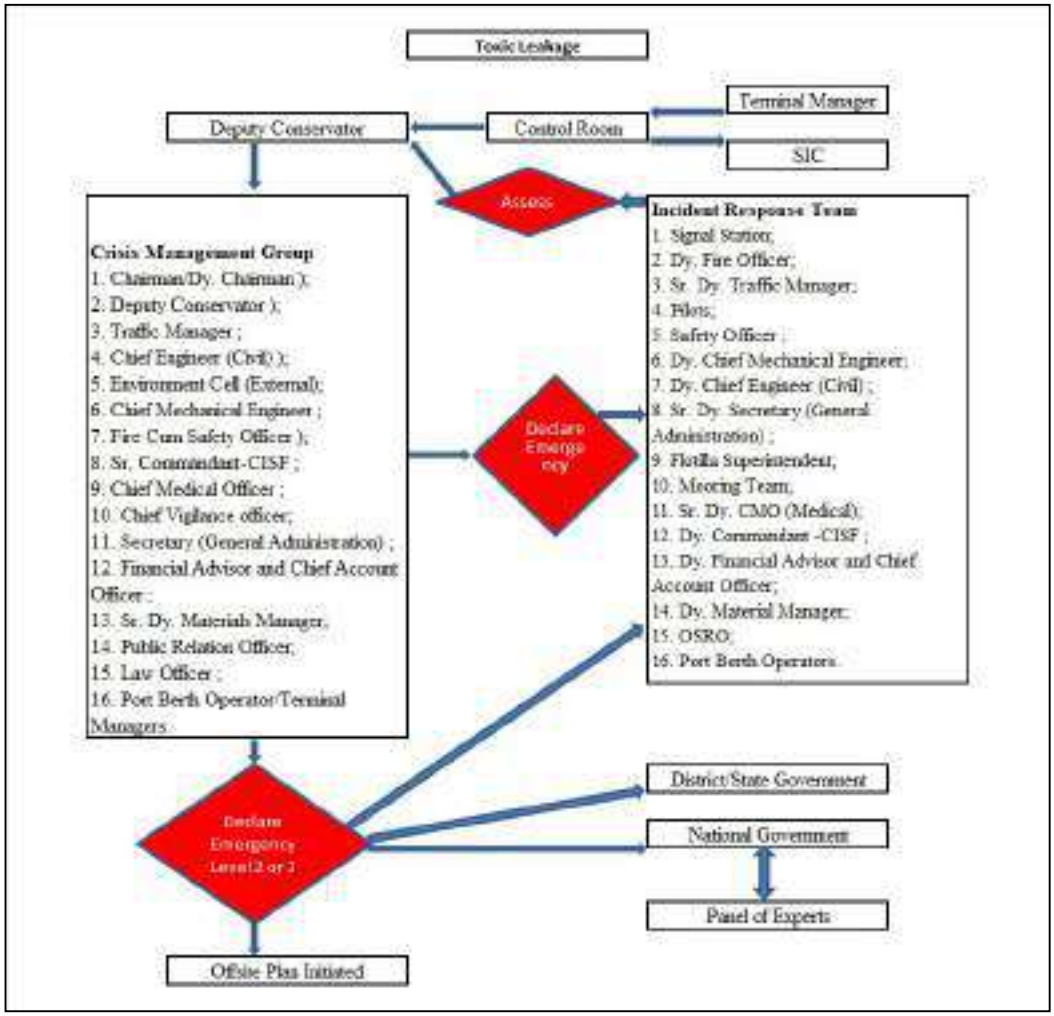


Figure 7.3: Toxic

Note: *For Level of disaster refer paragraph 4.3.*

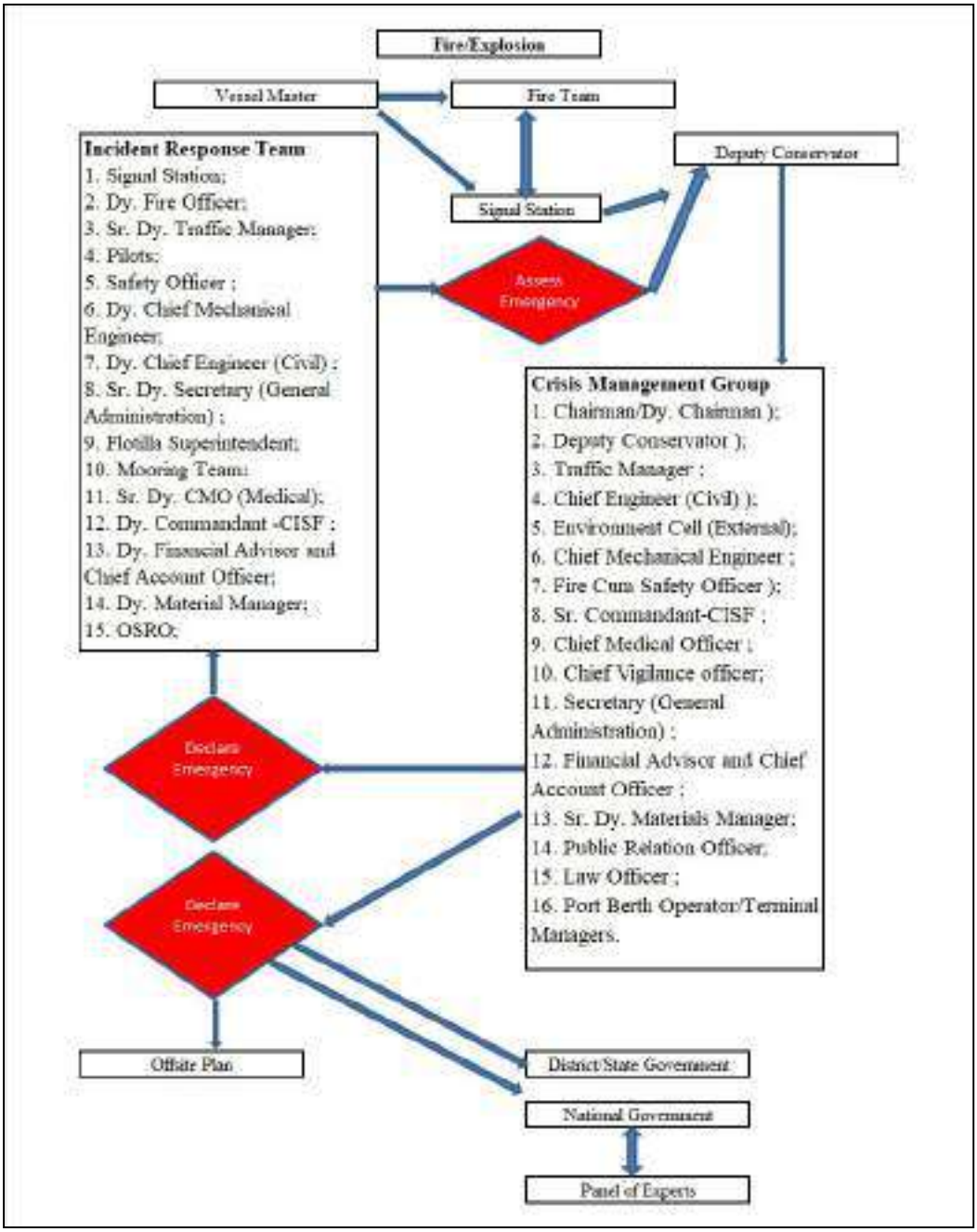


Figure 7.4: Fire/Explosion

Note: *For level of disaster refer paragraph 4.3.*

7.2 ACTIVATION OF RESPONSE PLAN

7.2.1 Action implementation plan

The observer, noticing an unusual occurrence like a fire / gas release / collapse of structure etc., should immediately notify the Port / Jetty Control Room with available means of communication and contact the concerned officer of the area.

He should:

1. Raise alarm
2. Call Port / Jetty Control room and pass on following information:
   - Introduce himself
   - State briefly the type of emergency
   - Give the location of the incident.
3. Proceed to a safe place. However, he would return to the location of the incident and place himself in a safe area and standby to give assistance if he is part of the action group.
4. After receiving information from the observer, the signal station would notify all the key personnel of the Port.
5. All concerned personnel would move to their respective positions and will begin actions as documented in the action plan.

7.2.2 Site Control Procedure

Table 7.3: Site Control Procedure

SITE CONTROL PROCEDURE			
Site Control should be established for every site where access is to be controlled. This includes the EOC, sites of shoreline cleanup, waste storage, response vessel mooring areas or any site containing hazards or hazardous materials.			
Task	**Action**		**Status**
1	Identify perimeter of the "Hot" (secure or prohibited) zone. This may be:		
	i	Area around the incident (e.g., Fire and Explosion).	
	ii	Jetty/berth area	
	iii	Oiled shoreline. (Note: This zone should contain all hazards and sensitive areas where access should be restricted).	
2	Identify the "Hot" zone perimeter by cordoning.		
3	Identify the "Warm" (exclusion, controlled or support) zone. (Note: This is a non-contaminated/ non-hazardous zone). For e.g.: Shelter, canteen, car parking, etc.		
4	Identify the "Warm" zone perimeter by cordoning.		
5	Establish any required "Hot" zone perimeter facilities. For e.g. (i) and (ii):		
	i	Decontamination facility.	
	ii	Temporary waste storage.	
6	Establish "Warm" zone perimeter facilities.		
7	Establish support facilities within Warm zone as required.		

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

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

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

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

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

7.2.3 Mechanism for access control and isolation of the Danger area

1. All gates and berths/jetties should be guarded,
2. Unauthorized person should not be allowed to the restricted area,
3. Authorized person will be entering the zone with all the necessary PPEs,
4. The area should be cordoned off during operation,
5. Proper signage board and warning should be displayed at the place of the operation,
6. Fire-fighting facilities and other required resources should be available till the operation is terminated,
7. The restricted areas should be under surveillance at all times.

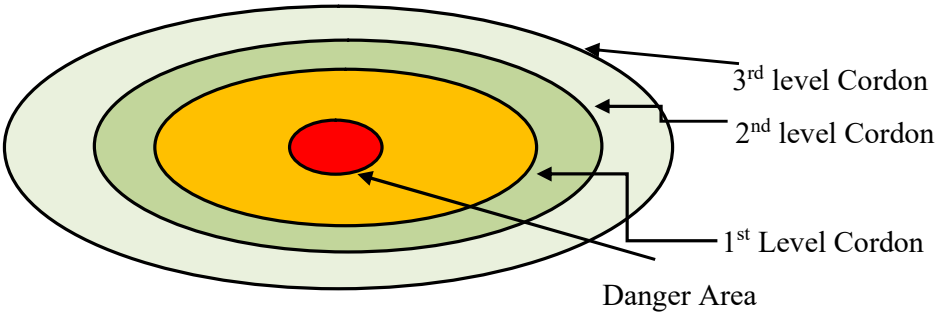


Figure 7.5: Isolation of Danger Area

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

Note: *Positions will depend on the wind directions*

7.2.4 Search and rescue operation

Search and Rescue shall start as soon as the public warning signal has been issued and should be carried out as per the instructions of CIC/SIC.

7.2.5 Evacuation

On blast of siren, the workers will assemble at the respective assembly points to be transported to the refuge centers.

7.2.5.1 Evacuation Routes and Assembly Points

In case of a general emergency one of the first duties of the CIC is to alert outside authorities and advise them about the actions that should be taken to protect the public, if any.

The evacuation route could be by two ways

a. Land;
b. Sea/creek

1. The vehicle-carrying casualty should be given priority in traffic movement.
2. While assessing the evacuation route, constant communication link should be maintained with the EOC as well as with the individual assembly point station from where the evacuation is to be undertaken.

The evacuation route is as follows

Table 7.4: Evacuation Routes

Sr. no.	Disaster	Evacuation routes
1.	Natural Calamities	Assemble near assembly points to proceed to the Relief Centers or to other shelters (Coordinated by CISF-Security)
2.	Fire at Oil Jetties	Assemble near assembly points to proceed out from Gate as directed (Coordinated by Port Fire dept. & CISF-Security)
3.	Toxic gas Release	The route decision will be determined depending upon the wind direction at the time of the incident. It will be in the up-wind direction of the outflow source direction. (Coordinated by Port Fire dept. and CISF-Security)
4.	Fire at General Cargo berths, Container terminal	Assemble at the Assembly points near to berth (Coordinated by Port Fire dept. & CISF-Security)
5.	Fire at Office buildings	Assemble at the Assembly points near the buildings (Coordinated by CISF-Security & Port Fire dept.)

7.3 HAZARD SPECIFIC RESPONSE PLAN

Following potential accidental scenarios have been identified in accordance with the risk assessment for the port. The action flowchart and action plan for each scenario has been prepared in accordance with the Incident Response System (IRS-NDMA).

S1: Scenario 1

Part A

1. **Fire due to rupture/leakage of POL/Chemical from pipeline/hose at oil jetty (oil jetties 1-7) – on vessel or ashore**
2. **Precautions:** MSDS, SOP of operator and berthing and un-berthing procedure, Periodic inspection and maintenance of hoses and pipelines.
3. **Impact Zone:** Oil Jetty and surrounding area.
   Consequence analysis indicates that the Naphtha leak from pipeline would cover approx. 345 meters for Jet Fire scenario (Refer Risk assessment report).
4. **Resources required:** Organizational setup enumerated in Figure S1.2 and material and equipment resources as given in Chapter 10.

Figure S1.1: Action Flow Chart

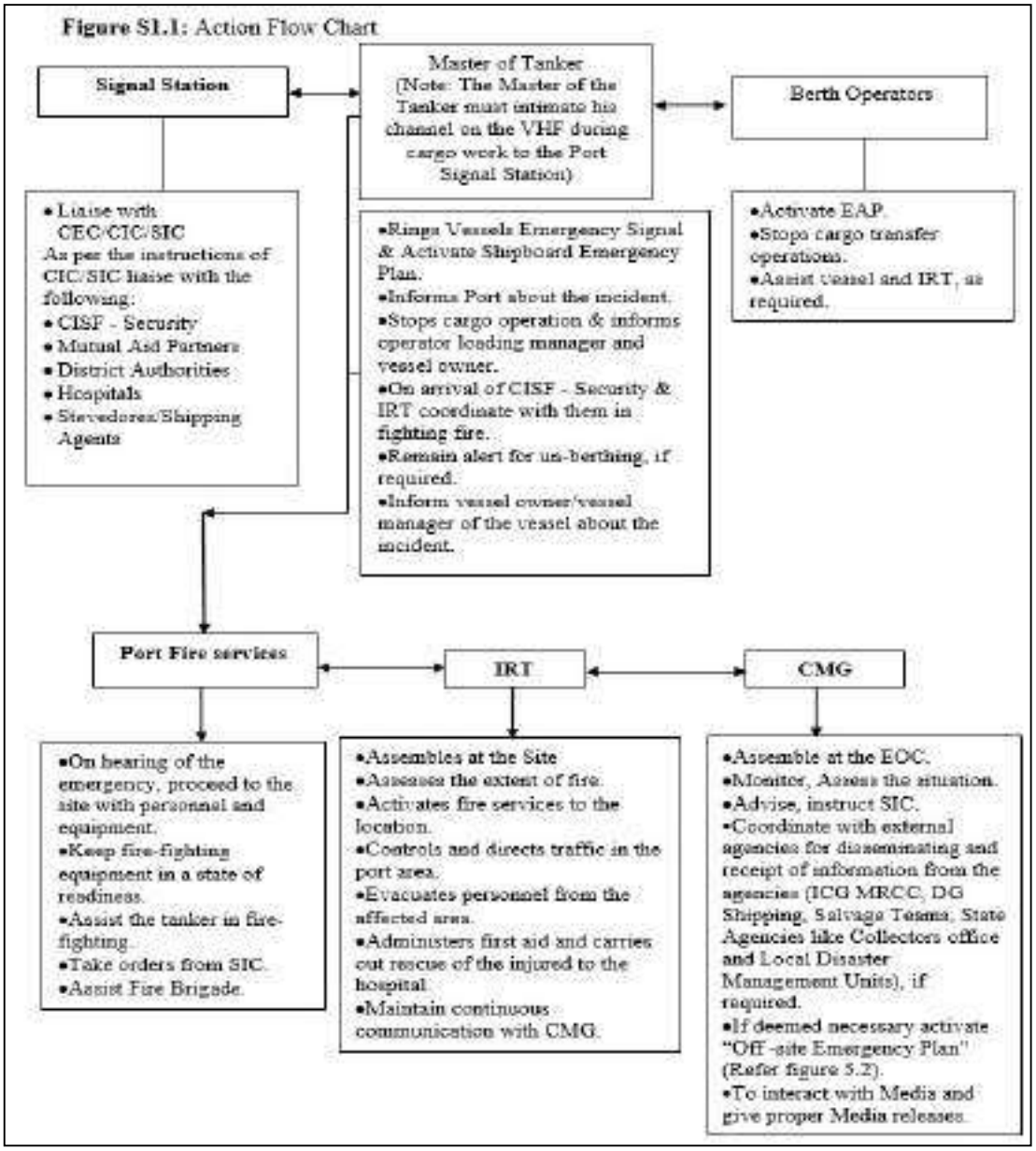
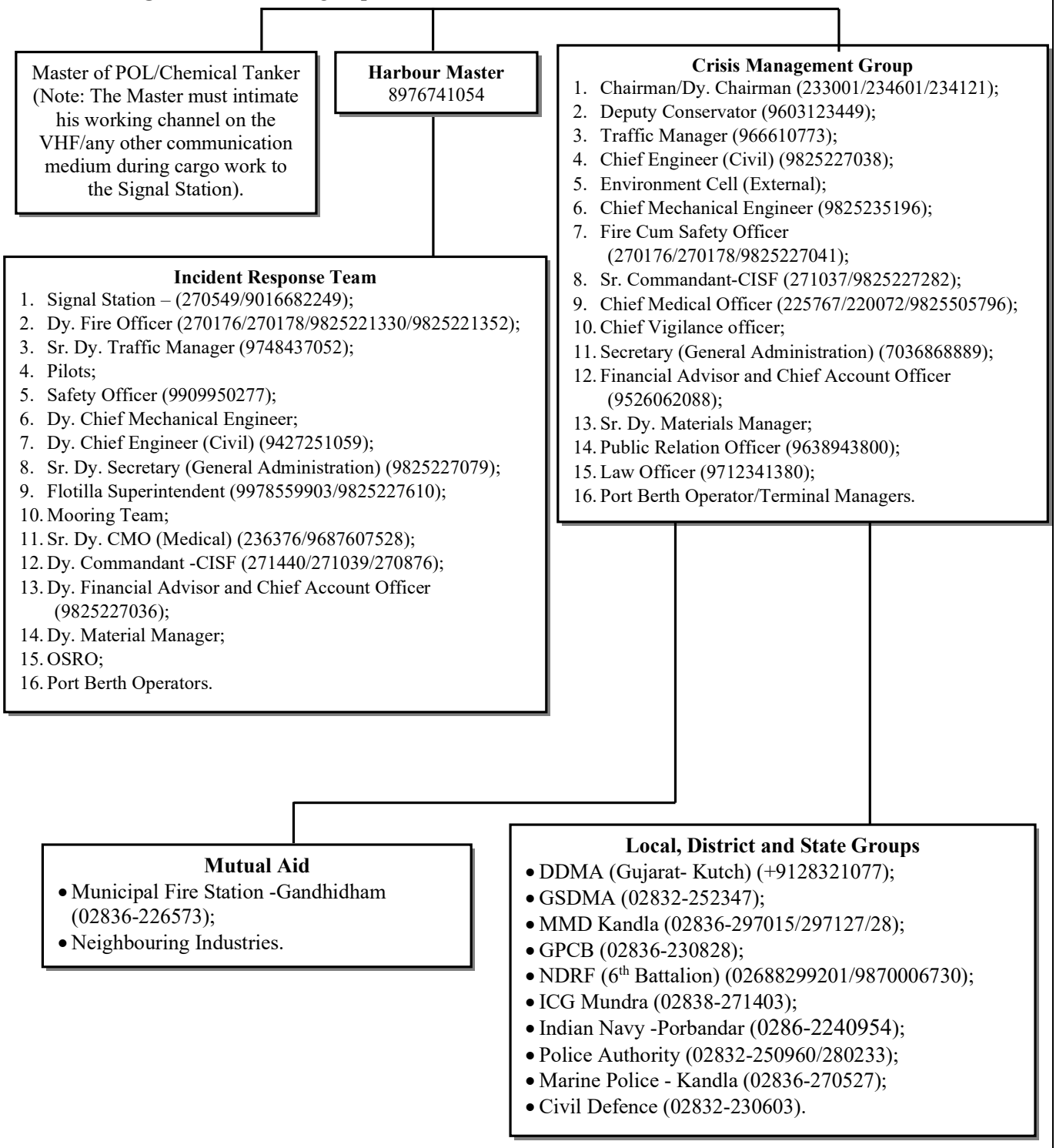


Figure S1.2: Action group



Part B: Action Plan

The vessel upon berthing, berth operator will follow standard procedures. However, in a less likely scenario a leak from the pipeline system may occur at the jetty or from the jetty along the route to the terminal (within the port area) leading to self-detection by vessel personnel or by the terminal/operator automatic alarm system. Further in a more unlikely situation due to a possible ignition the leakage might catch fire. The following action will be required:

1. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate vessel board emergency action plan.
b. Stop POL/Chemical transfer operation (as per SOP).
c. Berth operator, Vessel in the vicinity and Port should be informed of any incident on the vessel without delay.
d. Personnel to remain stand-by to disconnect hoses.
e. Shall be responsible for fighting the fire with vessels own resources as well as with the available support from IRT.
f. Also, to remain prepared to un-berth the vessel to the safe area.
g. The siren should be continued till the vessel is taken to a safe location as per CIC instructions.

2. The berth operator tasked with POL/Chemical cargo operations at the Jetty should

Response Action
a. Activate EAP and inform Port.
b. Shut off isolation valve on POL/Chemical pipeline at the berth (action as per SOP).
c. Area should be cordoned off.
d. Pour foam/dry chemical powder on POL/Chemical spillage to reduce rate of vaporization.
e. Assist IRT and provide all necessary equipment.
f. He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the level of disaster and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Decide on clearing of vessels in close proximity to the incident location and evacuating the people.
f. Assess the condition of site and of potential affected area and take decision on evacuation in consultation with SIC.
g. Be in constant touch with District and Local Administration for rescue and relief operation.
h. Terminate the response and debrief before allowing normal operation.

4. The Signal Station

Response Action
a. Gather information related to the weather conditions and accordingly convey the message to CIC/SIC and Fire cum Safety Officer.
b. Liaise with Master of the Vessel/Pilot.
c. Listening watch to be maintained on VHF channel-08/10/16.
d. Notify to CIC, SIC and the vessels moving into, through and inside the port. Keep CIC/SIC informed of all the messages received by telephone, VHF sets or by messenger.
e. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CIC/SIC.
f. Notify the information to the owner of the vessel as per the instruction of CIC/SIC/ Master of the Vessel.

5. The Fire cum Safety Officer should

Response Action
a. Ensure raising of Alarm (siren)
b. Shall take orders from the SIC.
c. Lead the fire-fighting team and mobilize fire tenders, men & fire-fighting equipment to the scene & extend all necessary support to the Master of the vessel/berth operator for fire-fighting.
d. Assist CISF in evacuation of workers to the assembly points.
e. Inform SIC for arrangement of any additional equipment as required.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect all information from the Master of the Tanker and berth operator.
		Conduct initial briefing and report the situation to the CIC and assist in assessing the incident.
		Alert vessels within the vicinity.
		Assess the condition of site and of potential affected area and take decision on evacuation in consultation with CIC.
		Extend all necessary help to the Master of the vessel to fight the fire.
		Instruct the fire-fighting team to keep the water tenders in a state of readiness & activate if required.
		Instruct flotilla superintendent/ pilots to keep tugs ready for fire-fighting.
		Coordinate with all functional heads to take actions.
Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC /SIC.
		Responsible for organizing tugs, mooring boats and pilots for combating the fire and rescue.
		Hire additional crafts as necessary.
		Shall be ready for taking the vessel out of berth and be ready for providing any assistance on site.
		Maintain Log of events.
Berth operator (Alternate: Officer)	Cargo Work	Shall be responsible of shutting down of cargo operation & coordinating with Port and rendering necessary assistance to the SIC by providing additional fire-fighting & emergency equipment as required.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from Fire cum Safety Officer/SIC.
		Use water sprays and portable nozzles to maintain curtain.
		Ensures availability of the fire tenders and fire-fighting tugs.
		In case of fire onboard assist Master in fighting fire as per Masters Instructions.

		Ensure all the ignition sources in the vicinity are extinguished if fire has not occurred.
		If the fire is under control and extinguished, give all clear signal.
Dy. Commandant- CISF (Alternate: Commandant- CISF)	Security and Evacuation	Shall take orders from the Sr. Commandant – CISF /SIC.
		Cordon off the area.
		Controls & Directs gate security and traffic in the area.
		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Check for entry of emergency vehicles.
		Liaise with the Police authorities.
		Responsible the head count of the personnel.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Shall take orders from Traffic Manager/SIC.
		Submits consolidated list of dangerous goods in port.
		Coordinates with vessel owners/ agents/C & F agents/stevedores and with labour officer to arrange and ensure evacuation.
Safety Officer (Alternate: Officer)	Safety Coordinator	Shall take orders from SIC/CIC.
		Shall mobilize and dispatch sufficient number of vehicles to the site of emergency.
		Assist in evacuation of the personnel to the assembly point or as directed by SIC.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Shall be responsible to carry out urgent civil works as required.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall be responsible for uninterrupted electrical supply to vital equipment and utility at the berth.
		Shall remain alert on duty for any electrical isolation of equipment during emergency.
Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	In coordination with CMO, shall be responsible to organize and dispatch first aid team with ambulance as required.
		Make arrangements for transportation and treatment of injured persons.
		Check updated list of Blood group of employees is available.

		Shall coordinate with the local hospitals.
Environment Cell and OSRO (Alternate: Officer)	Pollution Control Coordinator	Ensure clean- up work conducted by terminal personnel after spill containment.
		Coordinate with SIC and GPCB and agencies.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.
		Authorize any immediate action required by on site staff and contract agencies.
Material Manager (Alternate: Officer)	Material procurement Coordinator	Maintain sufficient inventory and provide the same during emergency as per the order of SIC/CIC.

S2: Scenario 2

Part A:

1. **Fire /Explosion due to LPG leakage at Oil Jetty 1 – on vessel or ashore**
2. **Precautions:** MSDS, SOP of LPG terminal and berthing and un-berthing procedures of port.
   Leaks from LPG pump glands, pipes flanges or pipeline ruptures or from vent emissions due to cargo tank over-pressure or relief valve failure will initially produce vapour. This vapour will not ignite immediately but, if the vapour production is large, there is a hazard of the resultant cold and dense vapour cloud of LPG spreading to a source of ignition before it is diluted below the lower explosive limit. Therefore, in case of release of large quantity of flammable vapour cloud, immediate effort should be directed to eliminate such source of ignition. In such an event, eliminate all sources of ignitions i.e. open flames, welding, cutting, operation etc. in the entire port area.
3. **Impact Zone:** Refer Risk Assessment report.
   Consequence analysis indicates that the LPG (Propane/Butane) leak from pipeline would cover approx. 700 meters for Vapor cloud explosion (VCE) scenario.
4. **Resources required:** Organizational setup enumerated in Figure S2.2 and major material and equipment resources as given in Chapter 10.

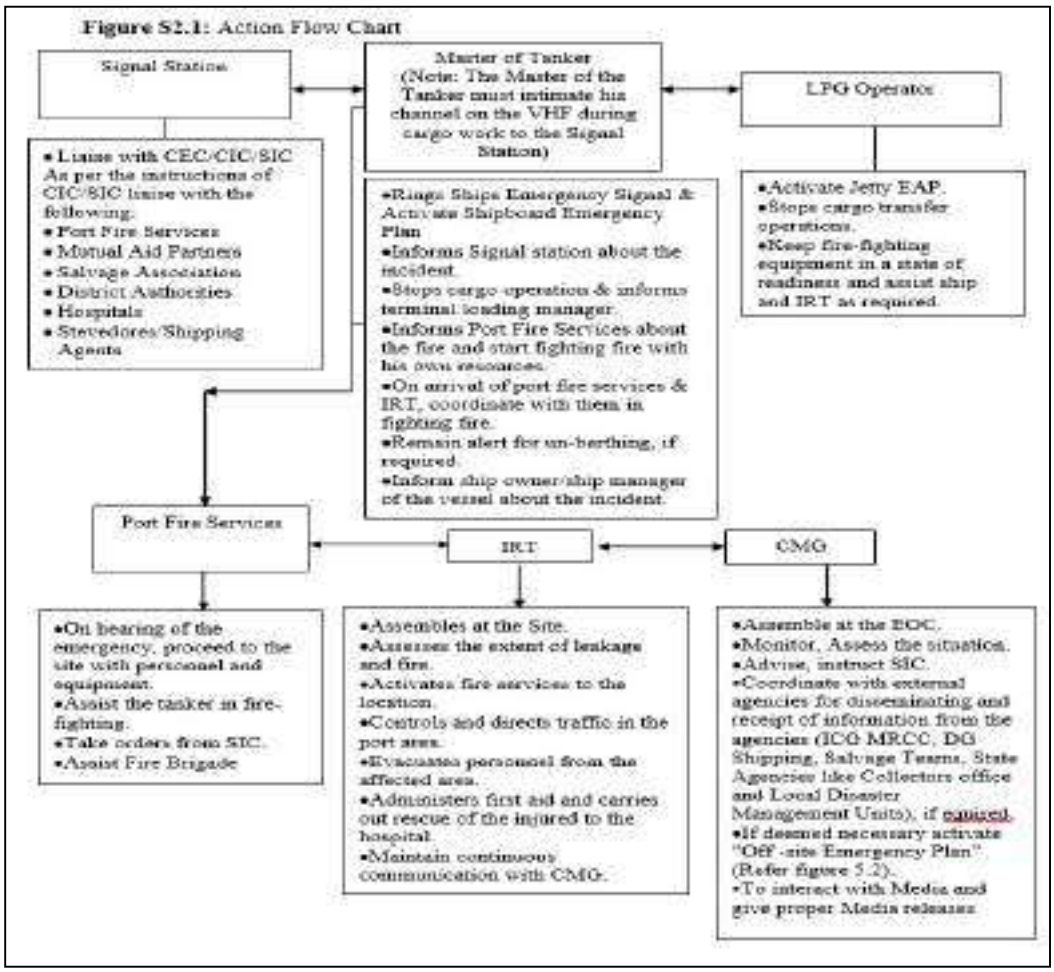
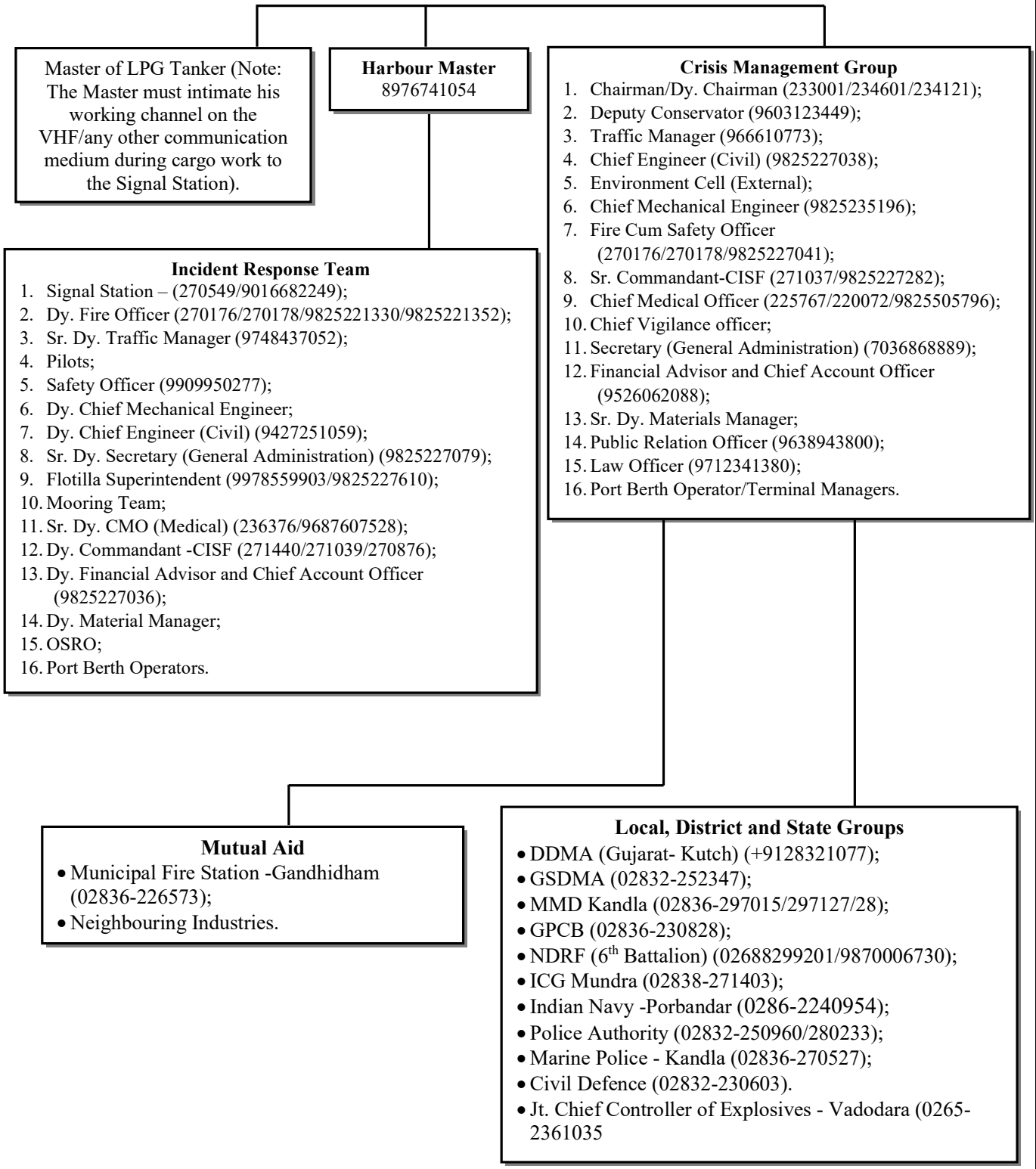


Figure S2.2: Action group



Part B: Action Plan

The vessel upon berthing at the LPG berth will follow standard procedures. However, in a less likely scenario, a leak from the pipeline system may occur at the jetty leading to self-detection by vessel personnel or by the terminal automatic alarm and detection system. Further in a more unlikely situation, due to a possible ignition the leakage might catch fire and lead to an explosion. The following actions will be required

1. The Master of the Ship (Alternate: Chief Officer)

Response Action
a. Should raise ships emergency alarm and activate shipboard emergency action plan.
b. Stop LPG transfer operation (as per SOP of the ship).
c. Terminal, Vessel in the vicinity and Port should be informed of any incident on the ship without delay.
d. Personnel to remain stand by to disconnect metal arms.
e. Shall be responsible for fighting the fire with ships own resources as well as with the available support from IRT.
f. Also, to remain prepared to un-berth the ship to the safe area (high sea).
g. The siren should be continued till the ship is taken to a safe location as per CIC instructions.

2. The berth operator should

Response Action
a. Activate Jetty EAP (prepared by the terminal) and inform port.
b. Shut off isolation valve on LPG pipeline at the berth (action as per SOP of the terminal).
c. Area should be cordoned off.
d. Pour Dry Chemical Powder.
e. Assist IRT and provide all necessary equipment.
f. He will direct operation staff. Coordinate with the ship in-charge/C&F agents/stevedores.

3. Deputy Conservator (Alternate: Harbour Master) should

Response Action
a. Assess the level of disaster and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the CMG.
e. Assess the condition of site and of potential affected area and take decision on evacuation in consultation with SIC.
f. Decide on clearing of vessels in close proximity to the incident location and evacuating the people.
g. Coordinate with external agencies/authorities within port area such as Indian Navy

and ICG, if any.
h. Be in constant touch with District and Local Administration for rescue and relief operation.
i. Terminate the response and debrief before allowing normal operation.

4. Signal Station

Response Action
a. Gather information related to the weather conditions. Monitor the wind directions and accordingly convey the message to CIC/SIC and Fire cum Safety Officer.
b. Liaise with Master of the Vessel/Pilot.
c. Listening watch to be maintained on VHF.
d. Notify to CIC, SIC and the vessels moving into, through and inside the port. Keep CIC/SIC informed of all the messages received by telephone, VHF sets or by messenger.
e. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CIC/SIC.
f. Notify the information to the owner of the vessel as per the instruction of CIC/SIC/ Master of the Vessel.

5. The Fire cum Safety Officer should

Response Action
a. Ensure raising of Alarm (siren)
b. Shall take orders from the SIC.
c. Lead the fire-fighting team and mobilize fire tenders, men & fire-fighting equipment to the scene & extend all necessary support to the Master of the vessel/berth operator for fire-fighting.
d. Assist CISF in evacuation of workers to the assembly points.
e. Inform SIC for arrangement of any additional equipment as required.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect all information from the Master of the Tanker and Terminal Manager.
		Conduct initial Briefing and report the situation to the CIC/CMG and assist CIC in assessing the incident.
		Initiate DMP.
		Alert vessels within the vicinity.
		Assess the condition of site and of potential affected area and take decision on evacuation in consultation with CIC.
		Extend all necessary help to the Master of the vessel to fight the fire.
		Instruct the Fire cum Safety Officer to keep the fixed fire-fighting installation ready and instruct Flotilla superintendent to keep fire-fighting tugs in a state of readiness & activate if required.
		Instruct Flotilla superintendent to keep tugs ready for un-berthing of vessel.
		Coordinate with all functional heads to take actions.
Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC /SIC.
		Responsible for organizing tugs, mooring boats and pilots for combating the fire and rescue.
		Hire additional crafts as necessary.
		Shall be ready for taking the vessel out of berth and be ready for providing any assistance on site.
		Maintain Log of events.
Terminal Manager (Alternate: Assistant Terminal Manager)	Cargo Work	Shut down of cargo operation
		Coordinate with port and render necessary assistance to the SIC by providing additional fire-fighting & emergency response equipment as required.
		Direct operation staff.
		Coordinate with the ship in-charge/C&F agents/stevedores.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue	Shall take orders from Fire cum Safety Officer/SIC.

	Coordinator	Use water sprays and portable nozzles to maintain curtain.
		Ensures availability of the fire tenders and fire-fighting tugs.
		In case of fire onboard assist Master in fighting fire as per Masters Instructions.
		Ensure all the ignition sources in the vicinity are extinguished if fire has not occurred.
		If the fire is under control and extinguished, give all clear signal.
Safety Officer (Alternate: Officer)	Safety Coordinator	Shall take orders from SIC/CIC.
		Shall mobilize and dispatch sufficient number of vehicles to the site of emergency.
		Assist in evacuation of the personnel to the assembly point or as directed by SIC.
Dy. Commandant-CISF (Alternate: Alternate Commandant- CISF)	Security and Evacuation	Shall take orders from the Sr. Commandant – CISF /SIC.
		Cordon off the area.
		Controls & Directs gate security and traffic in the area.
		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Check for entry of emergency vehicles.
		Liaise with the Police authorities.
		Responsible the head count of the personnel.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Shall take orders from Traffic Manager/SIC.
		Submits consolidated list of dangerous goods in port.
		Coordinates with vessel owners/ agents/C & F agents/stevedores and with labour officer to arrange and ensure evacuation.
Executive Engineer (Alternate: Executive Engineers)	M & E Coordinator	Shall be responsible for uninterrupted electrical supply to vital equipment and utility at the berth.
		Shall remain alert on duty for any electrical isolation of equipment during emergency.
Executive Engineer (Alternate: Executive Engineers)	Civil Coordinator	Carry out urgent civil works as required.
		Liaise with SIC.

Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	In coordination with CMO, shall be responsible to organize and dispatch first aid team with ambulance as required.
		Make arrangements for transportation and treatment of injured persons.
		Check updated list of Blood group of employees is available.
		Shall coordinate with the local hospitals.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.
		Authorize any immediate action required by on site staff and contract agencies.
Material Manager (Alternate: Officer)	Material procurement Coordinator	Maintain sufficient inventory and provide the same during emergency as per the order of SIC/CIC.

S3: Scenario 3

Part A:

1. **Toxic product (e.g. ammonia) leak from pipeline/hose at jetty during operation (oil jetties 2-5) – on Vessel or Ashore**
2. **Precautions:** MSDS**,** SOP, berthing and un-berthing procedures and Periodic inspection and maintenance of hoses and pipelines.
   Stay upwind and wear positive pressure breathing apparatus and full protective clothing, as necessary.
3. **Impact Zone:** Consequence analysis indicates that the Ammonia leak from transfer pipeline would cover 2165 meters for toxic dispersion with IDLH level of 300 ppm. (Refer Risk Assessment report)
4. **Resources required:** Organizational setup enumerated in Figure S3.2 and major material and equipment resources as given in Chapter 10.

Figure S3.1: Action Flow Chart

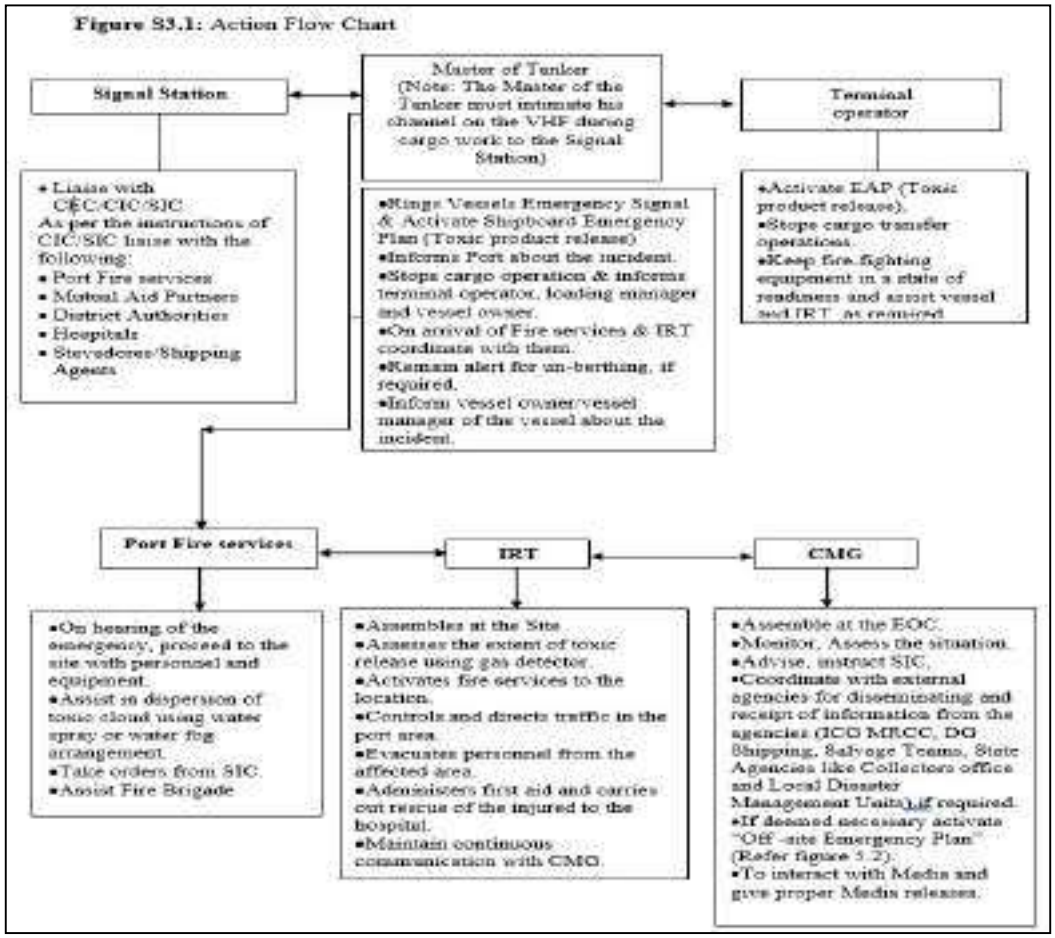
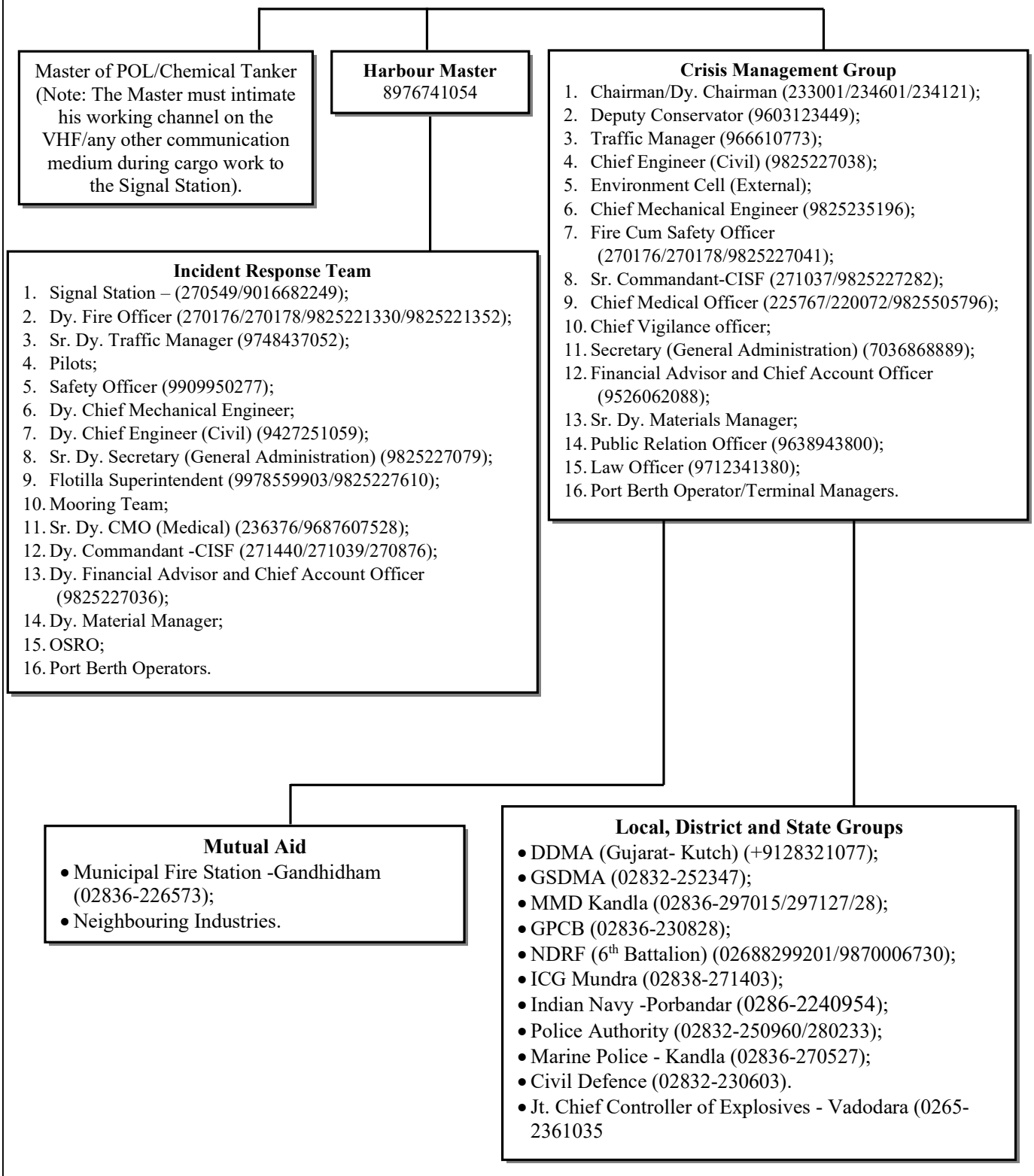


Figure S3.2: Action group



Part B: Action Plan

The vessel upon berthing, operator will follow standard procedures. However, in a less likely scenario a leak from the pipeline system may occur at the jetty or from the jetty along the route to the terminal (within port area) leading to self-detection by personnel or by the terminal/operator automatic alarm system. The following action will be required

Spill handling: Evacuate and restrict person's not wearing PPE from area of spill or leak until cleanup is complete. Remove all ignition sources. Stop the flow of gas if it can be done safely. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and full protective clothing.

1. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate vessel board emergency action plan.
b. Stop cargo transfer operation (as per SOP).
c. Terminal operator, Vessel in the vicinity and Port should be informed of any incident on the vessel without delay.
d. Personnel to remain stand by to disconnect hoses.
e. Shall be responsible to arrest the leak and for fighting the fire with vessels own resources as well as with the available support from IRT.
f. Also, to remain prepared to un-berth the vessel to the safe area.
g. The siren should be continued till the vessel is taken to a safe location as per CIC instructions.

2. The terminal operator tasked with cargo operations at the wharf should

Take personal precautions, protective equipment and follow emergency procedures. Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. Environmental precautions: Prevent further leakage or spillage if safe to do so.

Contain spillage, and then collect with an electrically protected vacuum cleaner (vehicle mounted in some cases) or by wet-brushing and place in container for disposal.

Response Action
a. Activate EAP and inform Port.
b. Shut off isolation valve on pipeline at the jetty (action as per SOP).
c. Area should be cordoned off.
d. Assist IRT and provide all necessary equipment.
e. He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the level of disaster and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC/ Mooring team and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Consult with Chairman / Dy. Chairman and decide on clearing of vessels in close proximity to the incident location or to sail the tanker to the safe area and evacuating the people from the likely affected zone.
f. Take decision on evacuation in consultation with SIC.
g. Be in constant touch with District and Local Administration for rescue and relief operation.
h. Terminate the response and debrief before allowing normal operation.

4. The Signal Station

Response Action
a. Gather information related to the weather conditions. Monitor the wind directions and convey the message to Master of the vessel, CIC/SIC and Fire cum Safety Officer.
b. Liaise with Master of the Vessel/Pilot.
c. Listening watch to be maintained on VHF channel-08/10/16.
d. Notify the CIC, SIC and the vessels moving into, through and inside the port. Keep CIC/SIC informed of all the messages received.
e. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CIC/SIC.
f. Notify the information to the owner of the vessel as per the instruction of CIC/SIC/ Master of the Vessel.

5. The Fire-fighting Personnel should

Response Action
a. Ensure raising of Alarm (siren).
b. Shall take orders from the SIC.
c. Lead the fire-fighting team and mobilize fire tenders, men & fire-fighting equipment to the scene & extend all necessary support to the Master of the vessel/berth operator for fire-fighting.
d. Assist CISF in evacuation of workers to the assembly points.
e. Inform SIC for arrangement of any additional equipment as required.
f. In case of leakage/fire onboard assist Master in arresting the leak/diluting the vapour/ fighting fire as per Masters Instructions.
g. Announce in mobile van with PA system in the effecting zones to evacuate the zone. Ensure complete evacuation and report to the EOC.
h. If the situation is under control, give all clear signals.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect all information from the Master of the Tanker and terminal operator.
		Conduct initial briefing.
		Report the situation to the CIC and assist in assessing the incident.
		Alert vessels within the vicinity.
		Shall assess and decide on the evacuation of the personnel considering the direction of wind and dispersion and will instruct CISF-Security, and Safety Officer to carry out the evacuation in a safe manner.
		He will extend all necessary help to the Master of the vessel to fight the fire, if any.
		Instruct the Fire cum Safety Officer to keep the fire-fighting installation and tenders in a state of readiness & activate if required to fight fire or for disperse the vapour cloud.
		Instruct flotilla superintendent/ pilots to keep tugs ready for fire-fighting.
		Coordinate with all functional heads to take actions.
Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC /SIC.
		Responsible for organizing tugs, mooring boats and pilots for combating the fire and rescue.
		Hire additional crafts as necessary.
		Shall be ready for taking the vessel out of berth and be ready for providing any assistance on site.
		Maintain Log of events.
Terminal Operator (Alternate: Officer)	Cargo Work	Shall be responsible of shutting down of cargo operation & coordinating with Port and rendering necessary assistance to the SIC by providing additional emergency equipment as required.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from Fire cum Safety Officer/SIC.
		Start the pumps as per the requirement.

		Use water sprays and portable nozzles to maintain curtain and dilution.
		Open the valves of the monitors and direct the jet on the seat of fire, in case of fire.
		In case of leakage/fire onboard assist Master in arresting the leak/diluting the vapour/ fighting fire as per Masters Instructions.
		Make use of portable DCP, CO2, Foam extinguisher (alcohol-resistant foam) from upwind position.
		Announce in mobile van with PA system in the effecting zones to evacuate the zone.
		Assist CISF-Security in evacuation of workers to the assembly point.
		Inform SIC for arrangement of any additional equipment as required.
Dy. Commandant-CISF (Alternate: Commandant- CISF)	Security and Evacuation	Shall take orders from the Sr. Commandant – CISF /SIC.
		Cordon off the area.
		Controls & directs gate security and traffic in the area.
		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Check for entry of emergency vehicles.
		Liaise with the Police authorities.
		Responsible for the head count of the personnel.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Shall take orders from Traffic Manager/SIC.
		Coordinates with vessel owners/ agents/C & F agents/stevedores and with labour officer to arrange and ensure evacuation.
		Submits consolidated list of dangerous goods in port.
Safety Officer and (Alternate: Officer)	Safety Coordinator	Inform GPCB and other environmental agencies and take necessary guidance. Coordinate with Environment cell.
		Shall mobilize and dispatch sufficient number of vehicles to the site of emergency.
		Assist in evacuation of the personnel to the assembly point or as directed by SIC.

Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Shall be responsible to carry out urgent civil works as required.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall be responsible for uninterrupted electrical supply to vital equipment and utility at the berth.
		Shall remain alert on duty for any electrical isolation of equipment during emergency.
Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	In coordination with CMO, shall be responsible to organize and dispatch first aid team with ambulance as required.
		Make arrangements for transportation and treatment of injured persons.
		Check updated list of Blood group of employees is available.
		Shall coordinate with the local hospitals.
Material Manager (Alternate: Officer)	Material procurement Coordinator	Maintain sufficient inventory and provide the same during emergency as per the order of SIC/CIC.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.
		Authorize any immediate action required by on site staff and contract agencies.

S4: Scenario 4

Part A

1. **Corrosive Acid - Leakage (e.g. Sulphuric acid, phosphoric acid) at oil jetty-5 during operation – on Vessel or Ashore**
2. **Precautions:** MSDS, HAZMAT kit, SOP of terminal/operator and berthing and un-berthing procedures, periodic inspection and maintenance of hoses and pipelines, PPE and Eye wash station.
3. **Impact Zone:** Oil jetty 5.
4. **Resources required:** Organizational setup enumerated in Figure S4.2 and major material and equipment resources as given in Chapter 10.

Figure S4.1: Action Flow Chart

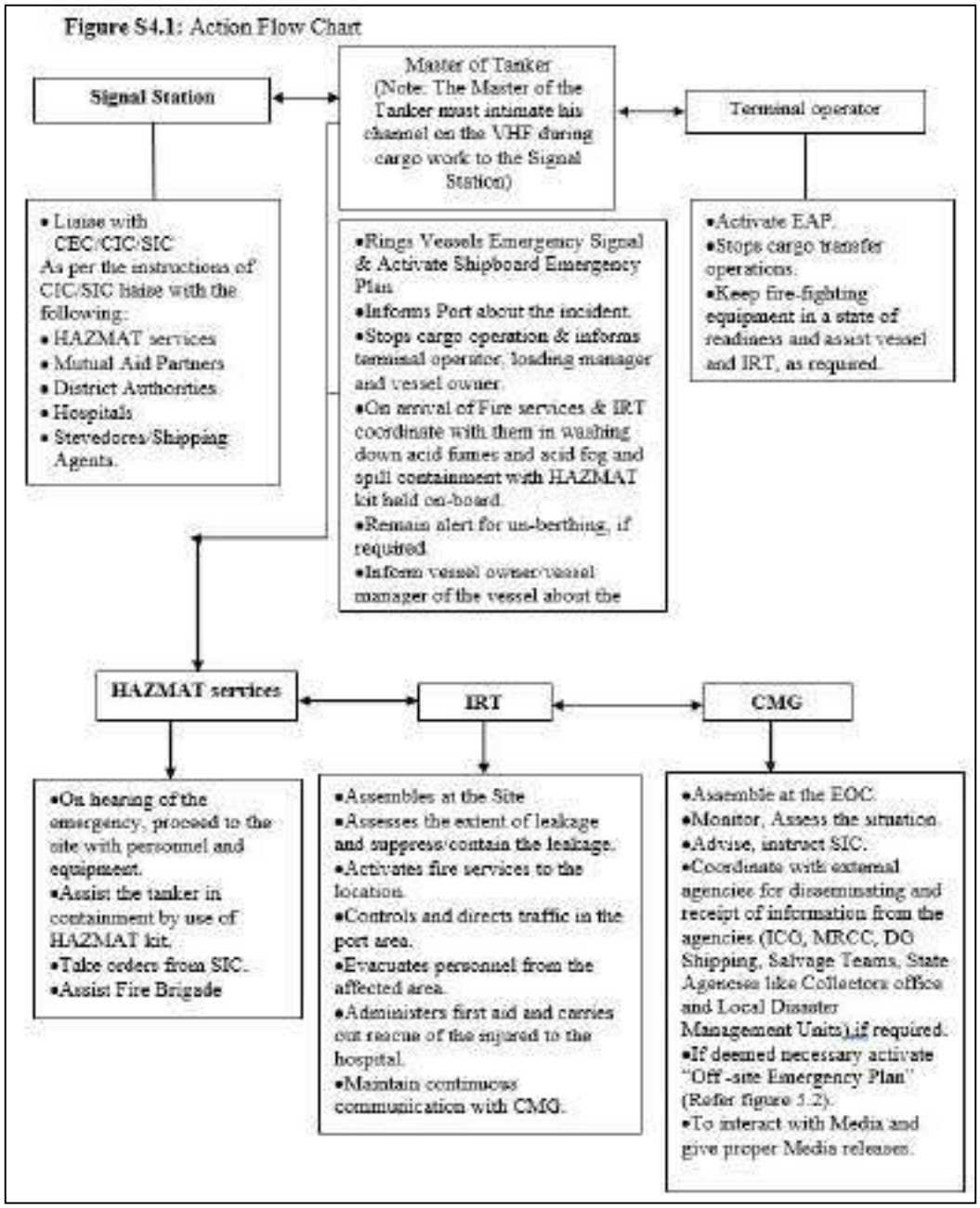
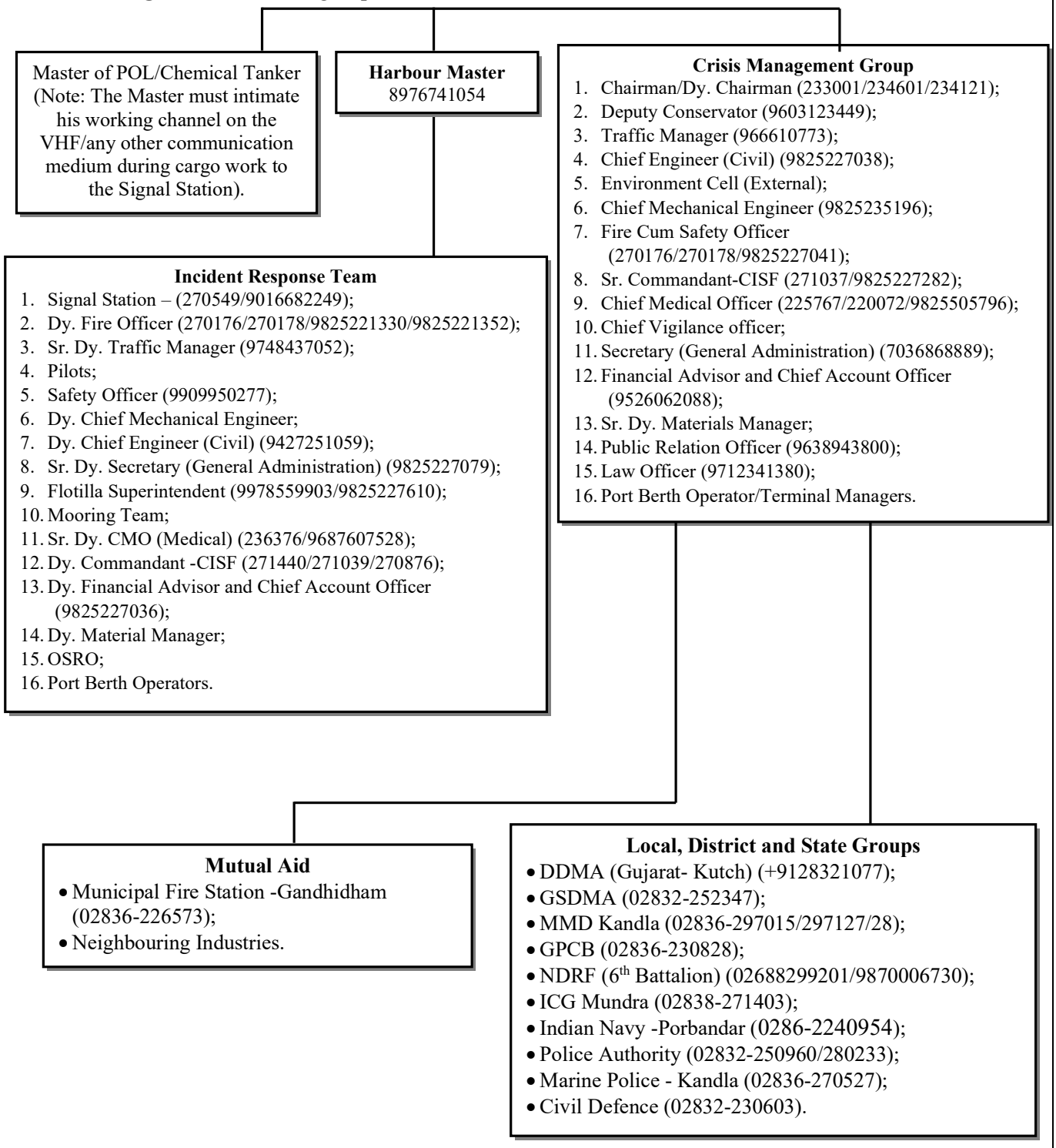


Figure S4.2: Action group



Part B: Action Plan

The vessel upon berthing, berth operator will follow standard procedures. However, in a less likely scenario a leak from the pipeline system may occur leading to detection by vessel personnel or by the terminal/operator alarm system. The following action will be required.

1. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate vessel board emergency action plan.
b. Stop transfer operation (as per SOP).
c. Terminal operator, Vessel in the vicinity and Port should be informed of any incident on the vessel without delay.
d. Personnel to remain stand by to disconnect hoses;
e. Shall be responsible to arrest the leak with vessels own resources as well as with the available support from IRT.
f. Also, to remain prepared to un-berth the vessel to the safe area (high sea).
g. The siren should be continued till the vessel is taken to a safe location as per CIC instructions.

2. Terminal operator persons tasked with cargo operations at the jetty should

Response Action
a. Activate EAP and inform Port.
b. Shut off isolation valve on pipeline at the berth (action as per SOP of the terminal).
c. Area should be cordoned off.
d. Assist IRT and provide all necessary equipment.
e. Responsible for diluting and neutralizing the acids and disposal of the neutralized liquids.
~~f.~~ He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the level of disaster and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC/ Asst. Mooring Master and Port and arrange for external aid as necessary.
d. Review the situation and accordingly inform the Chairman/ Dy. Chairman.
e. Decide on clearing of vessels in close proximity to the incident location and evacuating the people.
f. Assess the condition of site and take decision on evacuation in consultation with SIC.
g. Be in constant touch with District and Local Administration for rescue and relief

	operation.
h.	Terminate the response and debrief before allowing normal operation.

4. The Signal Station

Response Action	
a.	Gather information related to the vessel type, cargo quantity and position.
b.	Gather information related to the weather conditions and accordingly convey the message to Master of the vessel, SIC and Fire cum Safety Officer.
c.	Liaise with Master of the Vessel/Pilot.
d.	Listening watch to be maintained on VHF channel-08/10/16.
e.	Notify to CIC, SIC and the vessels moving into, through and inside the port. Keep CIC/SIC/ Asst. Mooring Master informed of all the messages received by telephone, VHF sets or by messenger.
f.	Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CIC/SIC.

5. The Fire cum Safety Officer should

Response Action	
a.	Ensure raising of Alarm (siren)
b.	Shall take orders from the SIC.
c.	Lead the fire-fighting team and mobilize fire tenders, men & fire-fighting equipment to the scene & extend all necessary support to the Master of the vessel/berth operator for firefighting.
d.	Assist CISF in evacuation of workers to the assembly points.
e.	Inform SIC for arrangement of any additional equipment as required.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect all information from the Master of the Tanker and terminal operator.
		Conduct initial briefing and report the situation to the CIC and assist in assessing the incident.
		Assess the condition of site and of potential affected area and take decision on evacuation in consultation with CIC.
		Alert vessels within the vicinity.
		Extend all necessary help to the Master of the vessel.
		Instruct the fire-fighting team to keep the water tenders in a state of readiness & activate if required.
		Instruct flotilla superintendent/ pilots to keep tugs ready for fire-fighting.
		Coordinate with all functional heads to take actions.
Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC /SIC.
		Responsible for organizing tugs, mooring boats and pilots for combating the fire and rescue.
		Hire additional crafts as necessary.
		Shall be ready for taking the vessel out of berth and be ready for providing any assistance on site.
		Maintain Log of events.
Terminal Operator (Alternate: Officer)	Cargo Work	Shall be responsible of shutting down of cargo operation & coordinating with Port and rendering necessary assistance to the SIC by providing additional fire-fighting & emergency equipment as required.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator/ HAZMAT Coordinator	Shall take orders from Fire cum Safety Officer/SIC.
		Ensures availability of the fire tenders and fire-fighting tugs.
		Assist CISF-Security in evacuation of workers to the assembly points.
		Inform SIC for arrangement of any additional equipment as required.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Shall take orders from the Sr. Commandant – CISF /SIC.
		Cordon off the area.
		Controls & Directs gate security and traffic in the area.

		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Check for entry of emergency vehicles.
		Liaise with the Police authorities.
		Responsible the head count of the personnel.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Shall take orders from Traffic Manager/SIC.
		Submits consolidated list of dangerous goods in port.
		Coordinates with vessel owners/ agents/C & F agents/stevedores and with labour officer to arrange and ensure evacuation.
Safety Officer (Alternate: Officer)	Safety Coordinator	Shall mobilize and dispatch vehicles containing HAZMAT kit to the site of emergency.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Shall be responsible to carry out urgent civil works as required.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall be responsible for uninterrupted electrical supply to vital equipment and utility at the jetty.
		Shall remain alert on duty for any electrical isolation of equipment during emergency.
Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
		Setup casualty receiving center and arrange for first aid.
		Make arrangements for transportation (ambulance) and treatment of injured persons.
		Check updated list of Blood group of employees is available.
		Shall coordinate with the local hospitals.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.
Material Manager (Alternate: Officer)	Material procurement Coordinator	Maintain sufficient inventory and provide the same during emergency as per the order of SIC/CIC.
Environment Cell and OSRO (Alternate: Officer)	Pollution Control Coordinator	Ensure clean- up work conducted by terminal personnel after spill containment.
		Coordinate with SIC and GPCB and agencies.

S5: Scenario 5

Part A

1. **Fire /leakage due to Crane Accidents (Container drop/crane fall) at container berth/yard – secondary event.**
2. **Precautions:** Trained personnel for operation of crane, SOP of the container terminal, HAZMAT training and MSDS.
3. **Impact Zone:** Incident location and **s**urrounding area.
4. **Resources required:** Organizational setup enumerated in Figure S5.2 and major material and equipment resources as given in Chapter 10.

Figure S5.1: Action Flow Chart

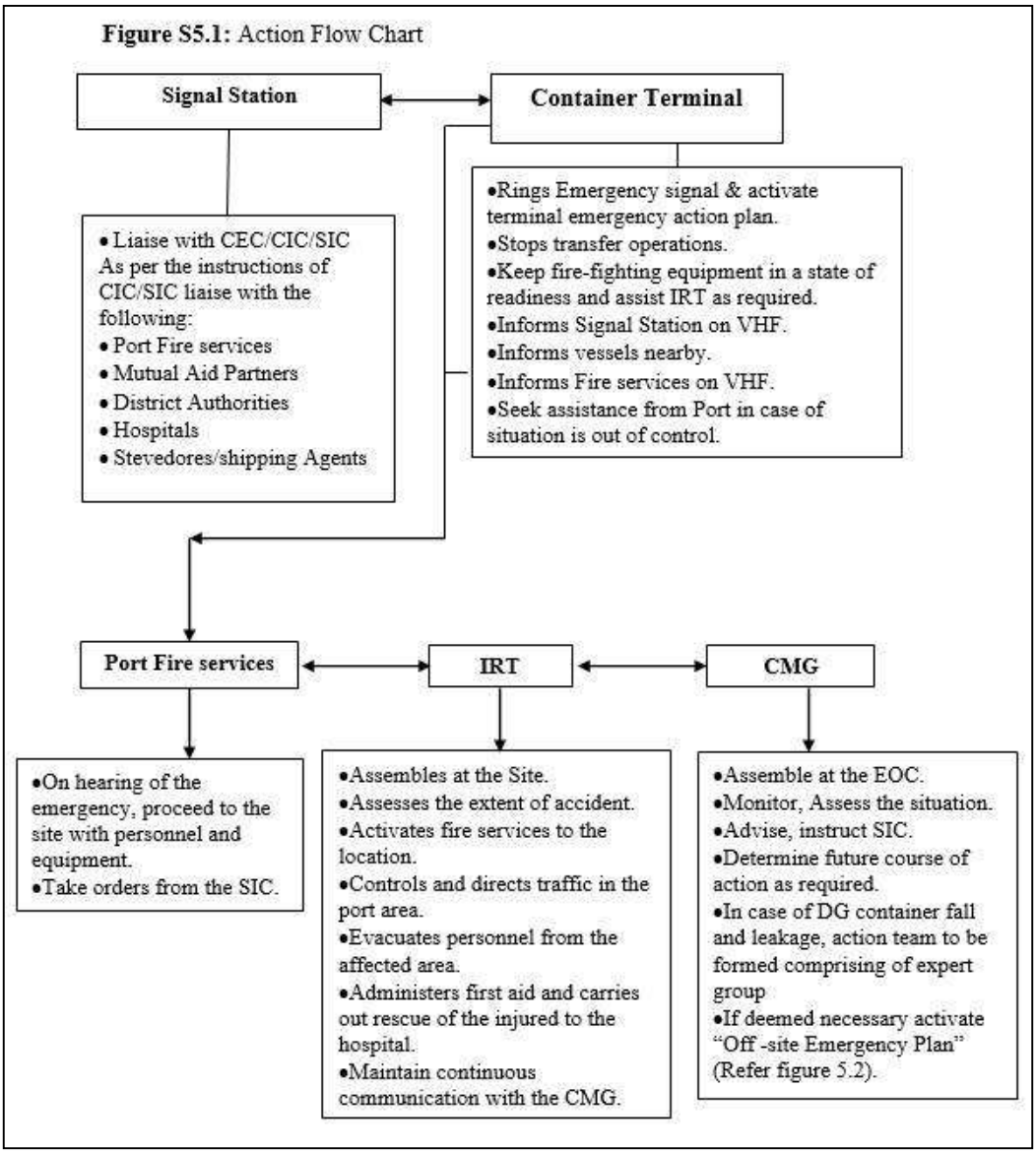
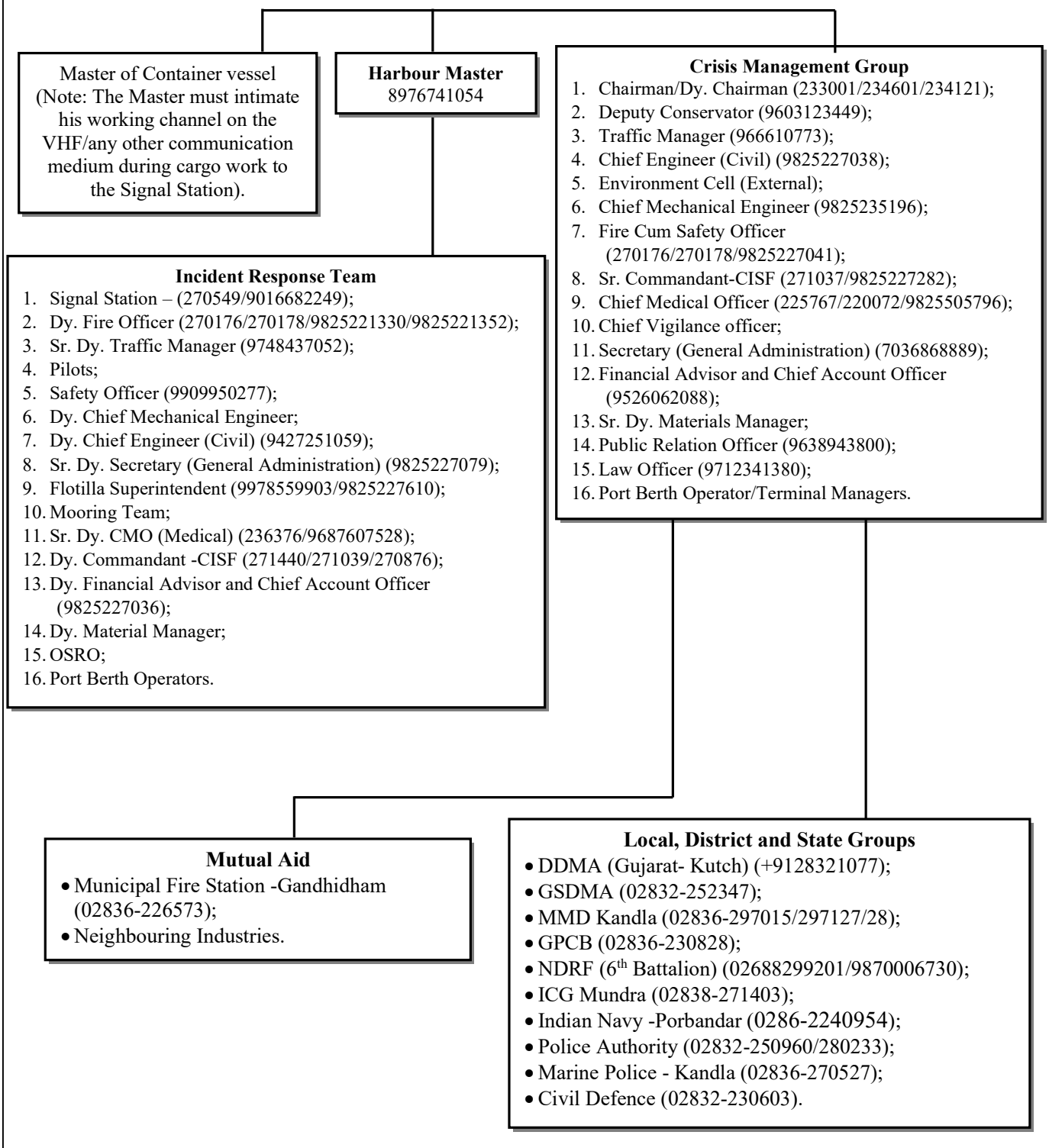


Figure S5.2: Action group



Part B: Action Plan

1. The crane operator

a. Should raise the emergency alarm and inform Terminal operator and Port.

2. The terminal person at the berth should

Response Action
a. Activate EAP and inform Port and ask for assistance, if required.
b. Area should be cordoned off.
c. Stop transfer operations at the berth.
d. Manage Truck movements.
e. Assist IRT and Master of the Vessel and provide all necessary equipment.
f. He will direct operation staff.
g. Interview operator and witnesses.
h. Contact expert agency in case of DG container fire/explosion.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Will be stationed at the EOC to review & assess possible developments to determine the most necessary course of action.
b. He will give necessary instructions to SIC & arrange for external aid as necessary.
c. Provide assistance to the Terminal.

4. The Signal Station

Response Action
a. Gather information regarding the incident and accordingly convey the message to CIC/SIC and Fire cum Safety Officer.
b. Liaise with terminal operator and Master of the vessels/pilot.
c. Listening watch to be maintained on VHF channel-08/10/16.
d. Keep CIC/SIC informed of all the messages received by telephone, VHF sets or by messenger.
e. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CIC/SIC.

5. The Fire cum Safety Officer should

Response Action
a. Shall take orders from the SIC.
b. Lead the fire-fighting team and mobilize fire tenders, men & fire-fighting equipment to the scene & extend all necessary support.
c. Assist CISF and terminal in evacuation of workers to the assembly points.
d. Inform SIC for arrangement of any additional equipment as required.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect all information from the crane operator/terminal manager and coordinate actions.
		Assess and report the situation to the CIC/CMG (if required).
		Alert vessels/trucks within the vicinity.
		Instruct the fire-fighting team to keep the fire-fighting installation in a state of readiness & activate if required.
Safety Officer (Alternate: Officer)	Safety Coordinator	Investigate the incident and provide necessary guidance.
		Assist in Rescue.
Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC/SIC.
		Shall prepare vessels to vacate from berth (if required).
		Responsible for organizing tugs for rescue.
		Hire additional crafts as necessary.
		Maintain Log of events.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the Fire cum Safety Officer/SIC.
		Mobilize fire tenders, men & fire- fighting equipment to the scene & extend all necessary support in case of fire.
		Assist the terminal operator and CISF-Security in evacuation.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Controls & directs traffic in the area.
		Shall supervise evacuation of personnel from the scene at the time of emergency.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Assist terminal, if required on emergency basis.

Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Assist terminal, if required on emergency basis.
Dy. CMO (Alternate: Medical Pilot)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Shall mobilize and dispatch enough vehicles to the site of emergency.
		Coordinates with SIC and Terminal.

S6: Scenario 6

Part A:

1. **Fire on vessel (non-tankers) at berth**
2. **Precautions:** Vessel fire-fighting system, Port fire station, SOP of the berth operator.
3. **Impact Zone:** Incident location and vicinity of the vessel involved.
4. **Resources required:** Organizational setup enumerated in Figure S6.2 and major material and equipment resources as given in Chapter 10.

Figure S6.1: Action Flow Chart

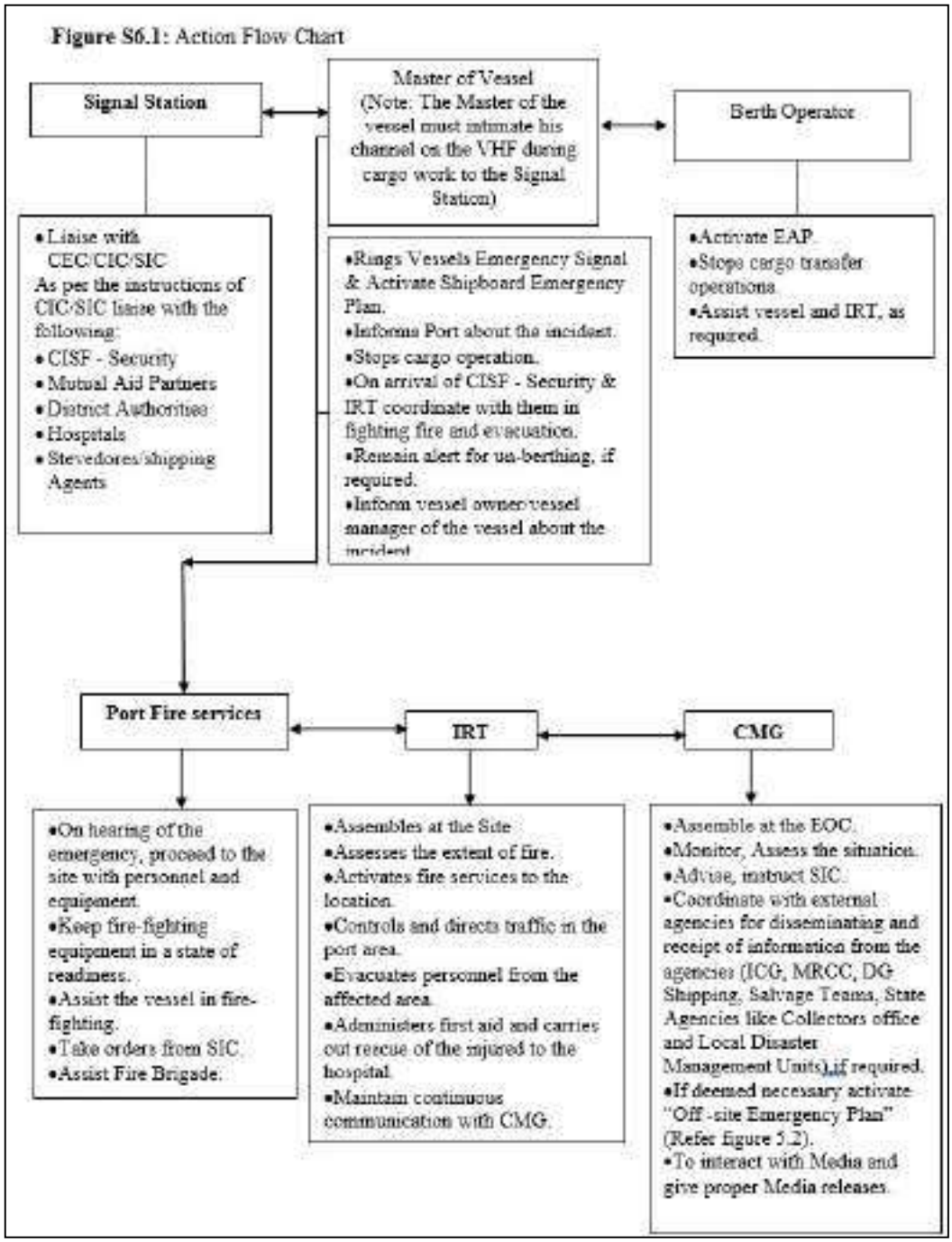
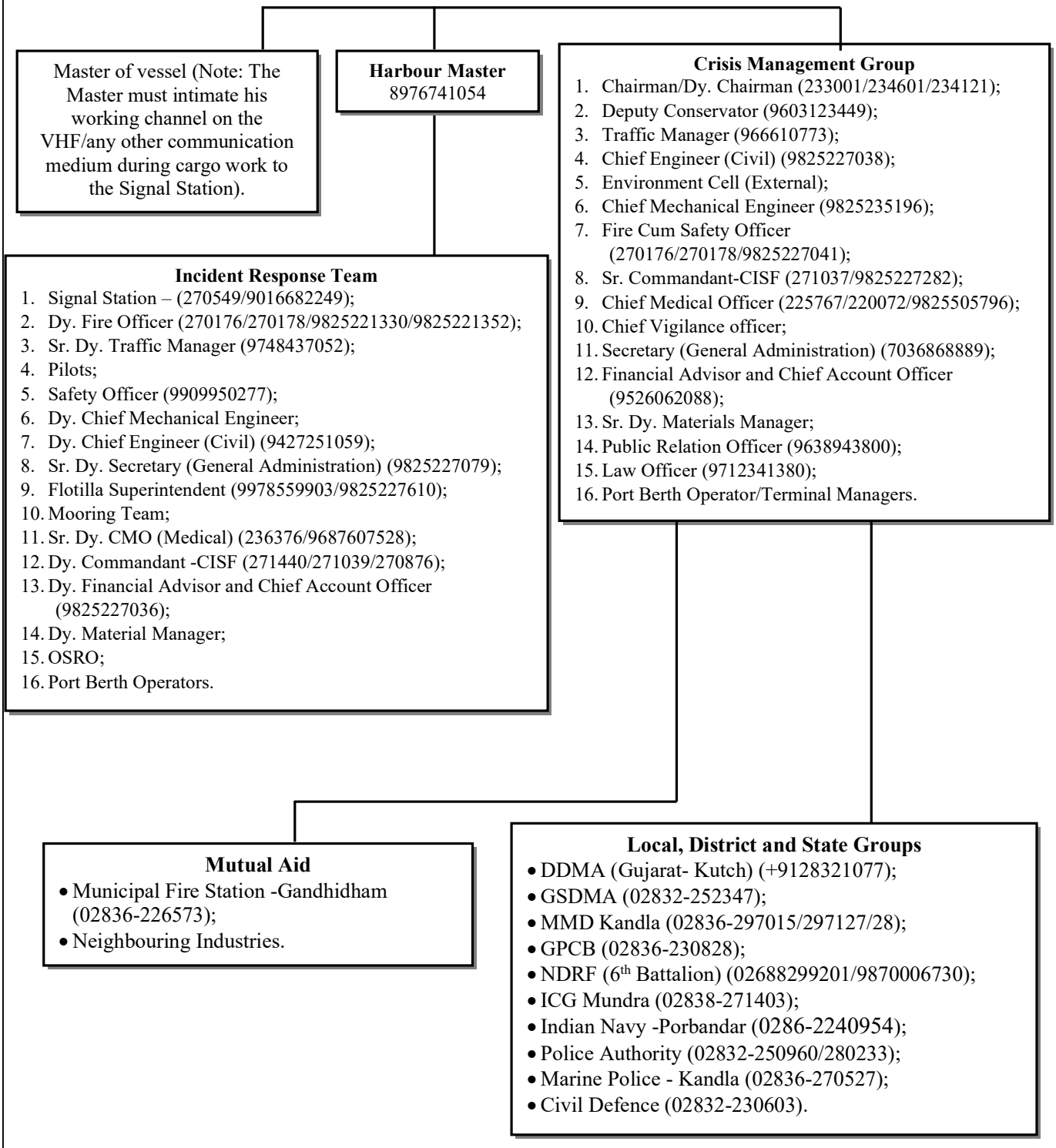


Figure S6.2: Action group



Part B: Action Plan

The vessel upon berthing, terminal/berth operator will follow standard procedures. However, in a less likely scenario a fire may occur on the vessel during transfer operation. The following action will be required:

1. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate vessel board emergency action plan.
b. Stop transfer operation (as per SOP).
c. Terminal/Berth operator, Vessel in the vicinity and Port should be informed of any incident on the vessel without delay.
d. Shall be responsible for fighting the fire with vessels own resources as well as with the available support from IRT.
e. Also, to remain prepared to un-berth the vessel to the safe area.
f. The siren should be continued till the vessel is taken to a safe location as per CIC instructions.

2. The berth operator tasked with cargo operations should

Response Action
a. Activate EAP and inform Port.
b. Area should be cordoned off.
c. Assist IRT and provide all necessary equipment.
d. He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the level of disaster and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC and Port & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Assess the condition of site and of potential affected area and take decision on evacuation in consultation with SIC.
f. Be in constant touch with District and Local Administration for rescue and relief operation.
g. Terminate the response and debrief before allowing normal operation.

4. The Signal Station

Response Action
a. Gather information related to the weather conditions and accordingly convey the message to CIC/SIC and Fire cum Safety Officer.
b. Liaise with Master of the Vessel/Pilot.
c. Listening watch to be maintained on VHF channel-08/10/16.
d. Notify to CIC, SIC and the vessels moving into, through and inside the dock. Keep CIC/SIC informed of all the messages received by telephone, VHF sets or by messenger.
e. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CIC/SIC.
f. Notify the information to the owner of the vessel as per the instruction of CIC/SIC/ Master of the Vessel.

5. The Fire cum Safety Officer should

Response Action
a. Ensure raising of Alarm (siren)
b. Shall take orders from the SIC.
c. Lead the fire-fighting team and mobilize fire tenders, men & fire-fighting equipment to the scene & extend all necessary support to the Master of the vessel/berth operator for firefighting.
d. Ensures availability of the fire tenders and fire-fighting tugs.
e. In case of fire onboard assist Master in fighting fire as per Masters Instructions.
f. If the fire is under control and extinguished, give all clear signal.
g. Inform SIC for arrangement of any additional equipment as required.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect information from the Master of the vessel and berth operator.
		Conduct initial briefing and report the situation to the CIC and assist in assessing the incident.
		Alert vessels within the vicinity.
		Assess the condition of site and of potential affected area and take decision on evacuation in consultation with CIC.
		Extend all necessary help to the Master of the vessel to fight the fire.
		Instruct the fire-fighting team to keep the water tenders in a state of readiness and activate if required.
		Instruct flotilla superintendent/ pilots to keep tugs ready for fire-fighting.
		Coordinate with all functional heads to take actions.
Pilot (Alternate: Pilot)	Signal Station Coordinator	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC /SIC.
		Responsible for organizing tugs, mooring boats and pilots for combating the fire and rescue.
		Hire additional crafts as necessary.
		Shall be ready for taking the vessel out of berth and be ready for providing any assistance on site.
		Maintain Log of events.
Terminal/ Berth operator (Alternate: Officer)	Cargo Work	Shall be responsible of shutting down of cargo operation & coordinating with Port and rendering necessary assistance to the SIC by providing additional fire-fighting and emergency equipment as required.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from Fire cum Safety Officer/SIC.
		Ensures availability of the fire tenders and fire-fighting tugs.
		In case of fire onboard assist Master in fighting fire as per Masters Instructions.
		Assist CISF in evacuation of workers to the assembly points.
		Inform SIC for arrangement of any additional equipment as required.
Dy. Commandant-CISF	Security and Evacuation	Shall take orders from the Sr. Commandant –CISF /SIC.
		Cordon off the area.
		Controls & Directs gate security and traffic in the area.

(Alternate: Commandant-CISF)		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Liaise with the Police authorities.
		Responsible for the head count of the personnel.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Shall take orders from Traffic Manager/SIC and assist Shift Incharge.
		Submits consolidated list of dangerous goods in port.
		Coordinates with ship owners/ agents/C & F agents/stevedores and with labour officer to arrange and ensure evacuation.
Safety Officer (Alternate: Officer)	Safety Coordinator	Inform GPCB and other environmental agencies and take necessary guidance. Coordinate with Environment cell.
		Shall mobilize and dispatch sufficient number of vehicles to the site of emergency.
		Assist in evacuation of the personnel to the assembly point or as directed by SIC.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Shall be responsible to carry out urgent civil works as required.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall be responsible for uninterrupted electrical supply to vital equipment and utilities berth.
		Shall remain alert on duty for any electrical isolation of equipment during emergency.
Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
		Make arrangements for transportation and treatment of injured persons.
		Check updated list of Blood group of employees is available.
		Shall coordinate with the local hospitals.
Environment Cell and OSRO (Alternate: Officer)	Pollution Control Coordinator	Ensure clean- up work conducted by terminal personnel after spill containment.
		Coordinate with SIC and GPCB and other agencies.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.
		Authorize any immediate action required by on site staff and contract agencies.

S7: Scenario 7

Part A:

1. **Fire in Coal Stackyard**
2. **Precautions:** Water tenders, Sprinkler system.
3. **Impact Zone:** Incident Location and vicinity of the area involved.
4. **Resources required:** Organizational setup enumerated in Figure S7.2 and major material and equipment resources as given in Chapter 10.

Figure S7.1: Action Flow Chart

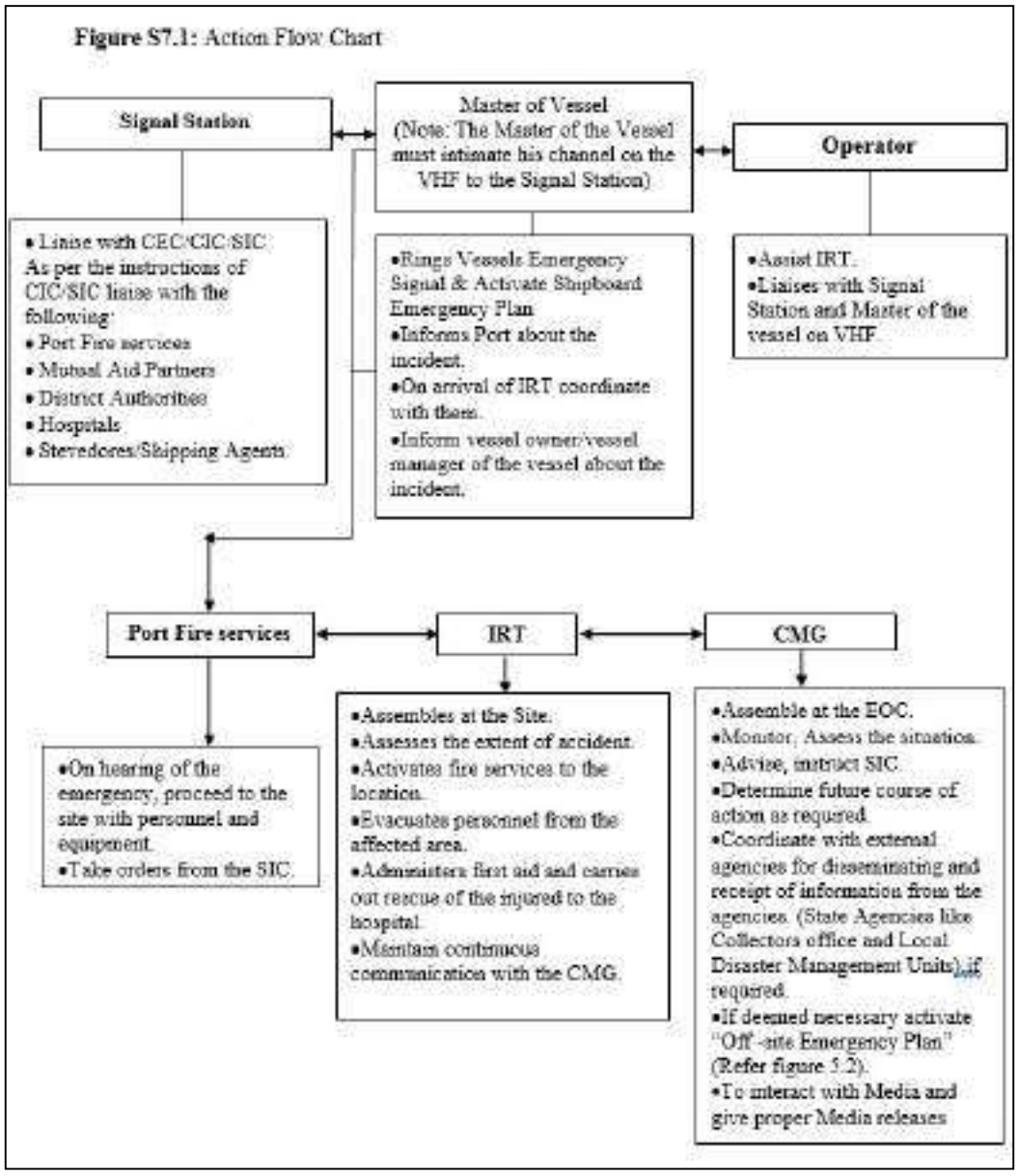
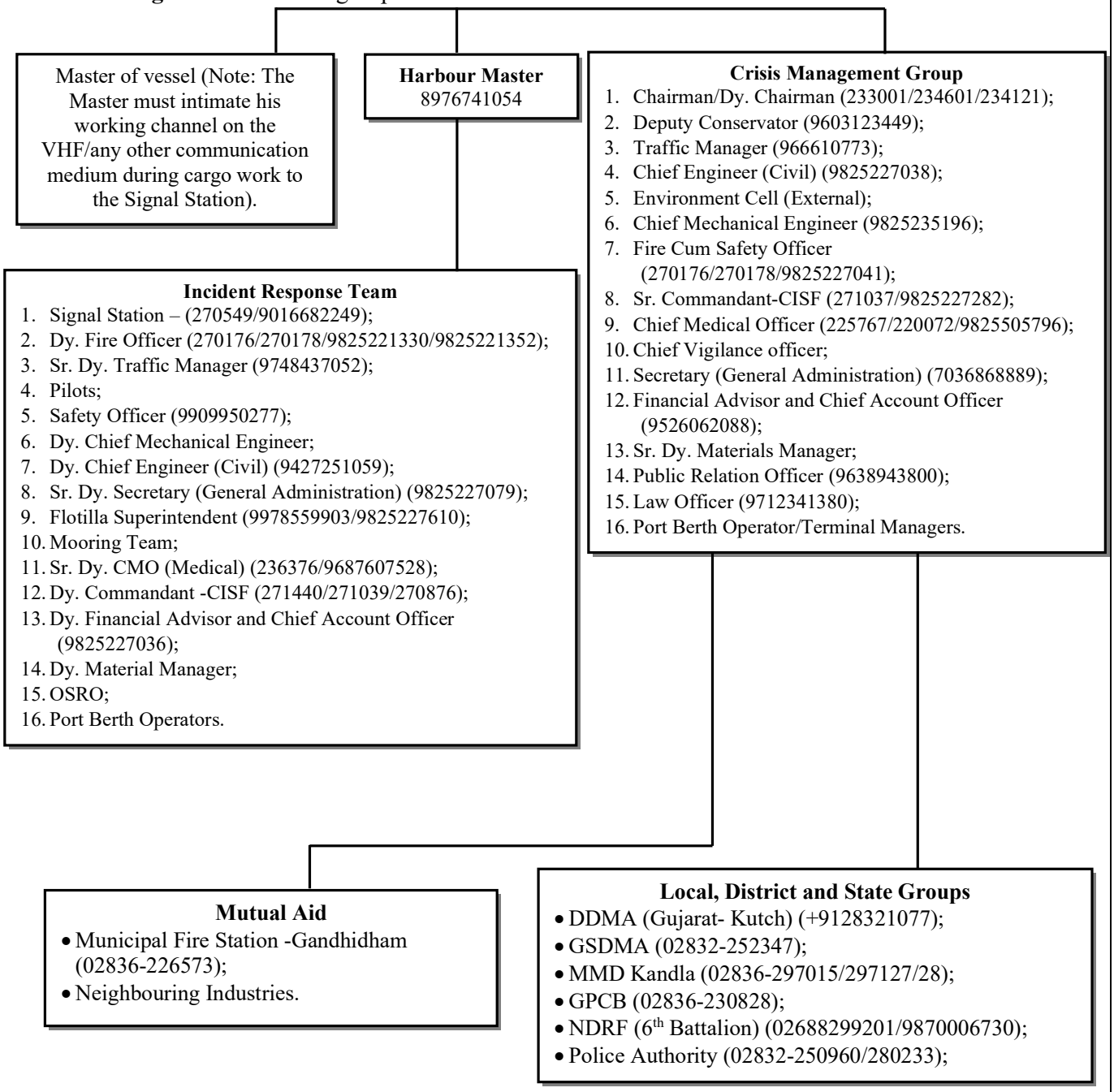


Figure S7.2: Action group



Part B: Action Plan

1. Signal Station should

Response Action
a. Gather information related to the coal stack yard fire and time of incident.
b. Notify to CIC, SIC and the nearby vessels through general alert.
c. Gather information about the wind speed and directions and notify CIC/SIC.

2. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the level of disaster and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC and Port & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Decide on clearing of vessels in close proximity to the incident location.
f. Be in constant touch with District and Local Administration for rescue and relief operation.
g. Terminate the response and debrief before allowing normal operation.

3. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect all information from the coal operator.
		Assess and report the situation to the CIC/CMG (if required).
		Alert vessels within the vicinity.
		Extend all necessary help to the operator.
		Instruct Pilot to keep tugs ready.
		He will coordinate with all functional heads to take actions.
Safety Officer (Alternate: Officer)	Safety Coordinator	Ensure safety of all the personnel.
		Assist SIC and CISF and maintain Log of events.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from Fire cum Safety Officer/SIC.
		Mobilize fire tenders, men & firefighting equipment to the scene & extend all necessary support.
		Assist the coal stack yard operator and CISF-Security in evacuation, if required.

Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC/SIC.
		Shall prepare vessels to vacate from berth (if required).
		Responsible for organizing tugs and Pilots.
		Assist SIC and maintain Log of events.
Coal Stack yard Operator (Alternate: Officer)	Fire, Search and Rescue Coordinator	Provide assistance to port and vessel.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Shall take orders from the Sr. Commandant–CISF /SIC.
		Cordon off the area and take head count of the personnel
		Controls & Directs gate security and traffic in the area.
		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Liaise with the Police authorities.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Liaise with SIC.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Arrange for specialized equipment if required as per the instruction of the SIC and requirement of operator.
Dy. CMO (Alternate: Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Coordinates with Coal Stack yard Operator.
		Shall mobilize and dispatch sufficient number of vehicles to the site of emergency.
Material Manager (Alternate: Officer)	Material procurement Coordinator	Maintain sufficient inventory and provide the same during emergency as per the order of SIC/CIC.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.

S8: Scenario 8

Part A

1. **Vessel Grounding/Collision within port limit.**
2. **Precautions:** Navigational Aid, Designated Pilots, Continuous monitoring and communication with the Signal Station and Pilot.
3. **Impact Zone:** Navigational and creek channel, Anchorage area.
4. **Resources required:** Organizational setup enumerated in Figure S8.2 and major material and equipment resources as given in Chapter 10.

Figure S8.1: Action Flow Chart

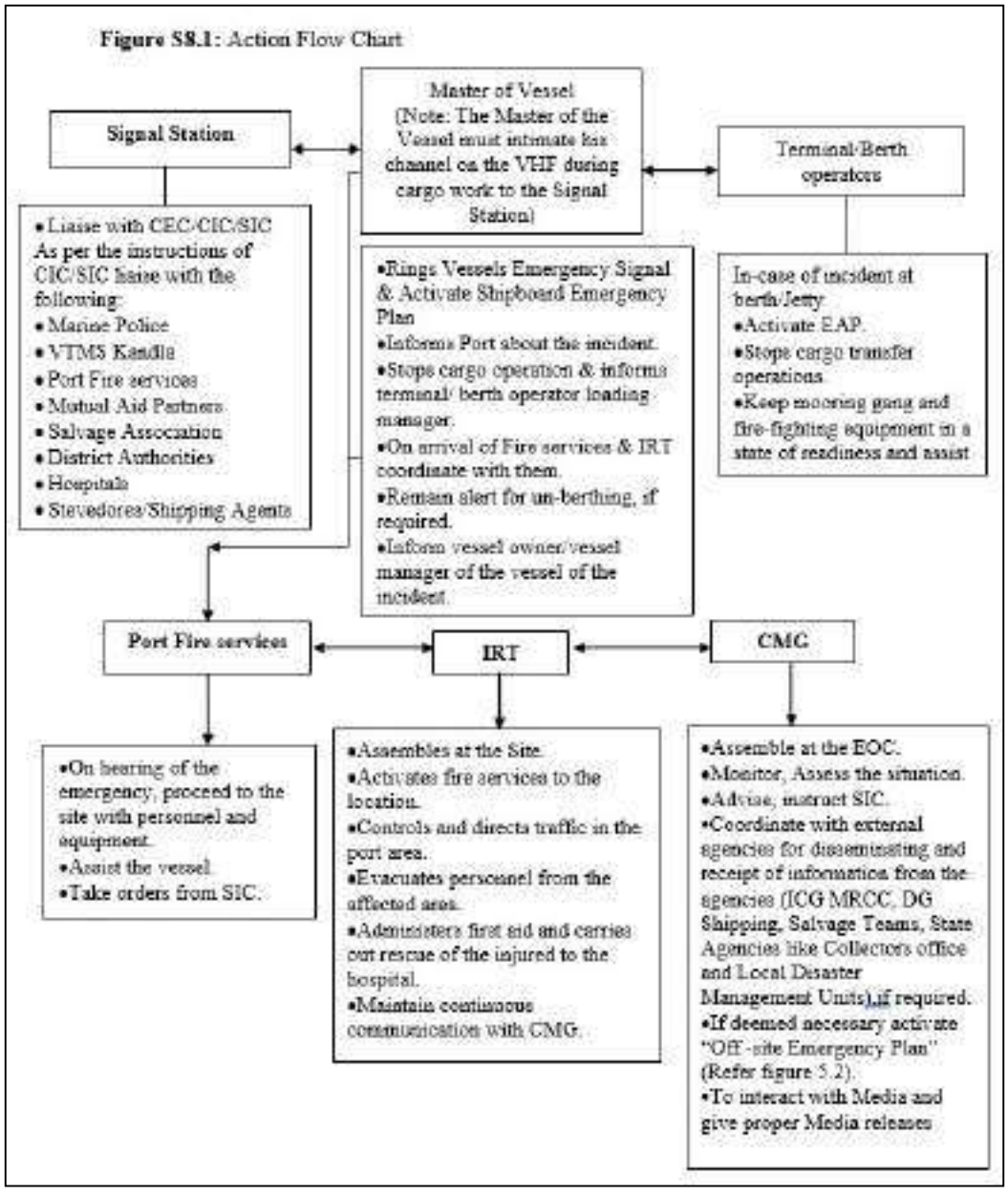
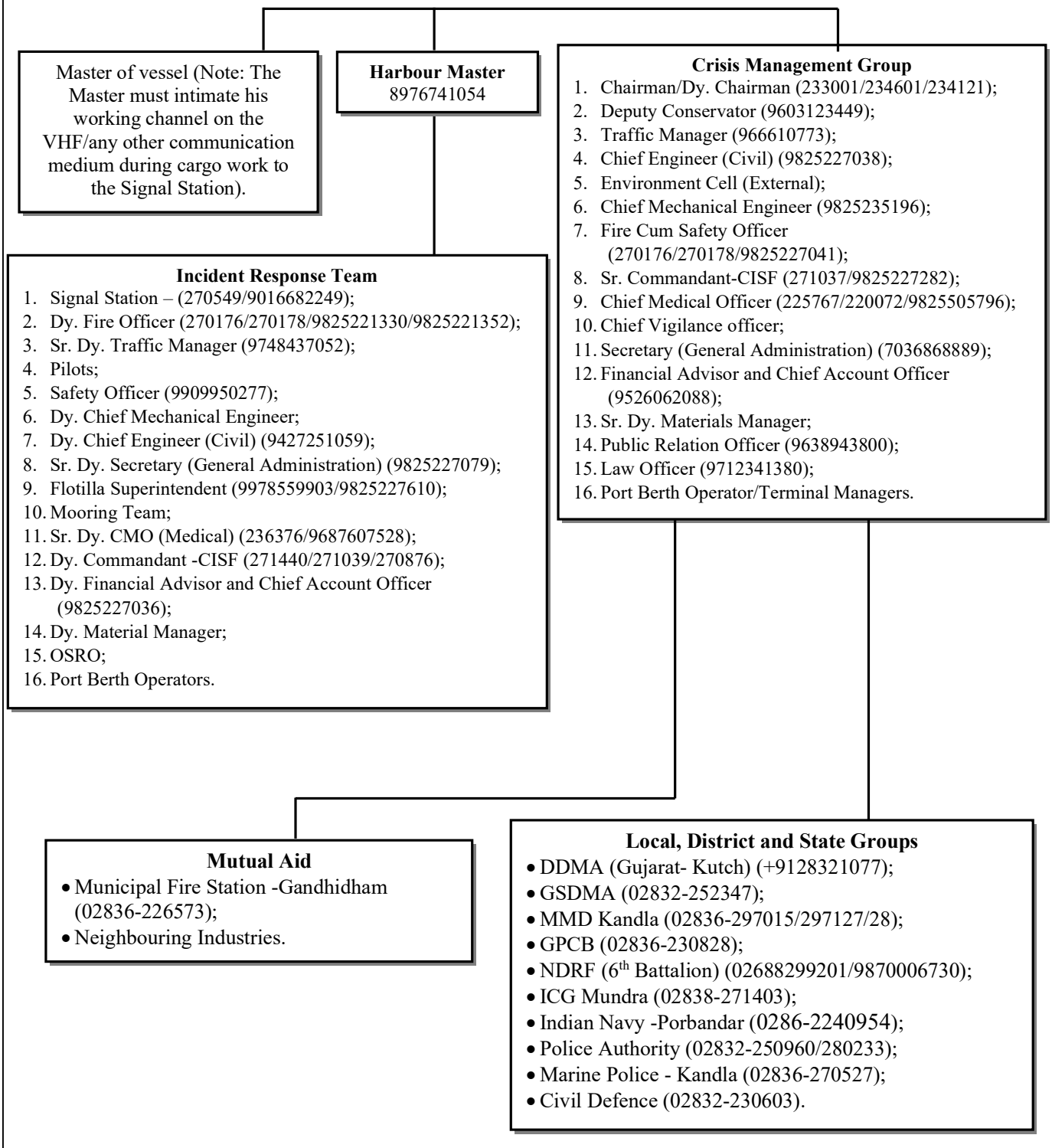


Figure S8.2: Action group



Part B: Action Plan

1. The Master of the Vessels (Alternate: Chief Officers)

Response Action
a. Should raise vessels emergency alarm and activate vessel board emergency action plan including evacuation of the personnel.
b. Vessel in the vicinity, Terminal/berth operator and Port should be informed of any incident without delay.
c. Shut down transfer operation (if at berth).
d. Take appropriate damage control measures in case of flooding including leak stoppage and pumping out, vessel list correction etc.
e. Estimate the extent of under water damage, sounding of tanks and actions for the refloating of the vessel.
f. Shall be responsible for fighting the fire (in case of fire) with vessels own resources as well as with the available support from IRT.

2. The Signal Station

Response Action
a. Liaise with Master of the Vessel/Pilot and gather the information about the type of vessels involved in the incident, cargo and location of the incident and convey the message to CIC/SIC and VTS Kandla.
b. Gather information related to the weather conditions. Monitor the wind directions and accordingly convey the message to CIC/SIC and Fire cum Safety Officer.
c. Listening watch to be maintained on VHF channel-08/10/16.
d. Notify to CIC, SIC, VTS Kandla and the vessels moving into, through and inside the port. Keep CIC/SIC informed of all the messages received by telephone, VHF sets or by messenger.
e. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CIC/SIC.
f. Notify the information to the owner of the vessel as per the instruction of CIC/SIC/ Master of the Vessel.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the level of disaster and activate the DMP and OSCP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC and Port & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Decide on clearing of vessels in close proximity to the incident location.
f. Be in constant touch with District and Local Administration for rescue and relief operation.
g. Terminate the response and debrief before allowing normal operation.

4. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During emergency, he shall proceed to the affected location (if vessel is in creek/jetty area) & communicate & collect all necessary information's from the Master of the vessel.
		Report the situation to the CIC/CMG.
		In case of fire on board the vessel after collision or contact, he will extend all necessary help to the Master of the vessel.
		Instruct flotilla superintendent/ pilots to keep tugs ready for firefighting.
		Alert other vessels within the vicinity.
		Ascertain oil pollution- leak source, if any.
		Obtain information regarding stability and hull stress of the vessel.
		If vessels have blocked or a possibility of blocking the channel, in co-ordination with the Master, the vessel shall be taken to berth / anchorage.
		In case of grounding, make arrangements through Harbour Master/Pilots to proceed to the spot and to take soundings, plot them in a chart and to ascertain the location of grounding damage on the hull.
		Depending on the way the vessel is grounded and the available high tide on the day, all advance preparations should be made to commence the towing operation at least two hours before the high water or as advised by CIC/SIC.
		Inform MoEF and GPCB approved parties for safe disposal and providing reception facilities for Oil/Sludge. Also, inform Salvage association.
Pilot (Alternate: Pilot)	Signal Station Coordinator	Shall be ready for taking the instructions from CIC/SIC and evacuate/move/shift the vessel from the area.
		If possible, accompany SIC to inspect the vessel.
		Plot exact location of the incident in coordination with the hydrographic surveyor.
		Responsible for organizing tugs for rescue. Instruct pilots.
		Hire additional crafts as necessary.
Environment cell and OSRO	Marine Pollution	Supervise and direct personnel to follow the instructions given by SIC/CIC.

(Alternate: Officer)	Control Coordinator	OSRO shall use the OSR in case of oil spill in coordination with the environment cell and ICG.
		Coordinate with the party involved in disposal of the Oil/sludge in a safe manner.
		Maintain records of the claims.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the Fire cum Safety Officer/SIC.
		Mobilize fire tenders, men & firefighting equipment to the scene & extend all necessary support to the master of the vessel for firefighting.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Shall take orders from the Sr. Commandant – CISF /SIC.
		Cordon off the area and take head count of the personnel
		Controls & directs gate security and traffic in the area.
		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Check for entry of emergency vehicles.
		Liaise with the Police authorities.
Dy. CMO (Alternate: Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
		Make arrangements for transportation and treatment of injured persons.
		Shall coordinate with the local hospitals.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Instruct the contractors to carry out urgent civil works as required.
		Hire the barges for collecting the spilled oil and coordinate with the parties involved in the safe disposal of the oil/sludge.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Coordinates with vessel owners/agents/stevedores.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.
Material Manager (Alternate: Officer)	Material procurement Coordinator	Maintain sufficient inventory and provide the same during emergency as per the order of SIC/CIC.

S9: Scenario 9

Part A

1. **Fire in Office buildings, Hospital, Electrical substations, Fire stations, Dry docks, Godowns**
2. **Precautions:** Periodic Maintenance and Inspection, Protected/covered Electrical installations, protection from flood (equipment raising from ground level), Fire-fighting systems, trained personnel to combat fire, No-smoking zone, House Keeping.
3. **Impact Zone:** Incident location and immediate surroundings.
4. **Resources required:** Organizational setup enumerated in Figure S9.2 and major material and equipment resources as given in Chapter 10.

Figure S9.1: Action Flow Chart

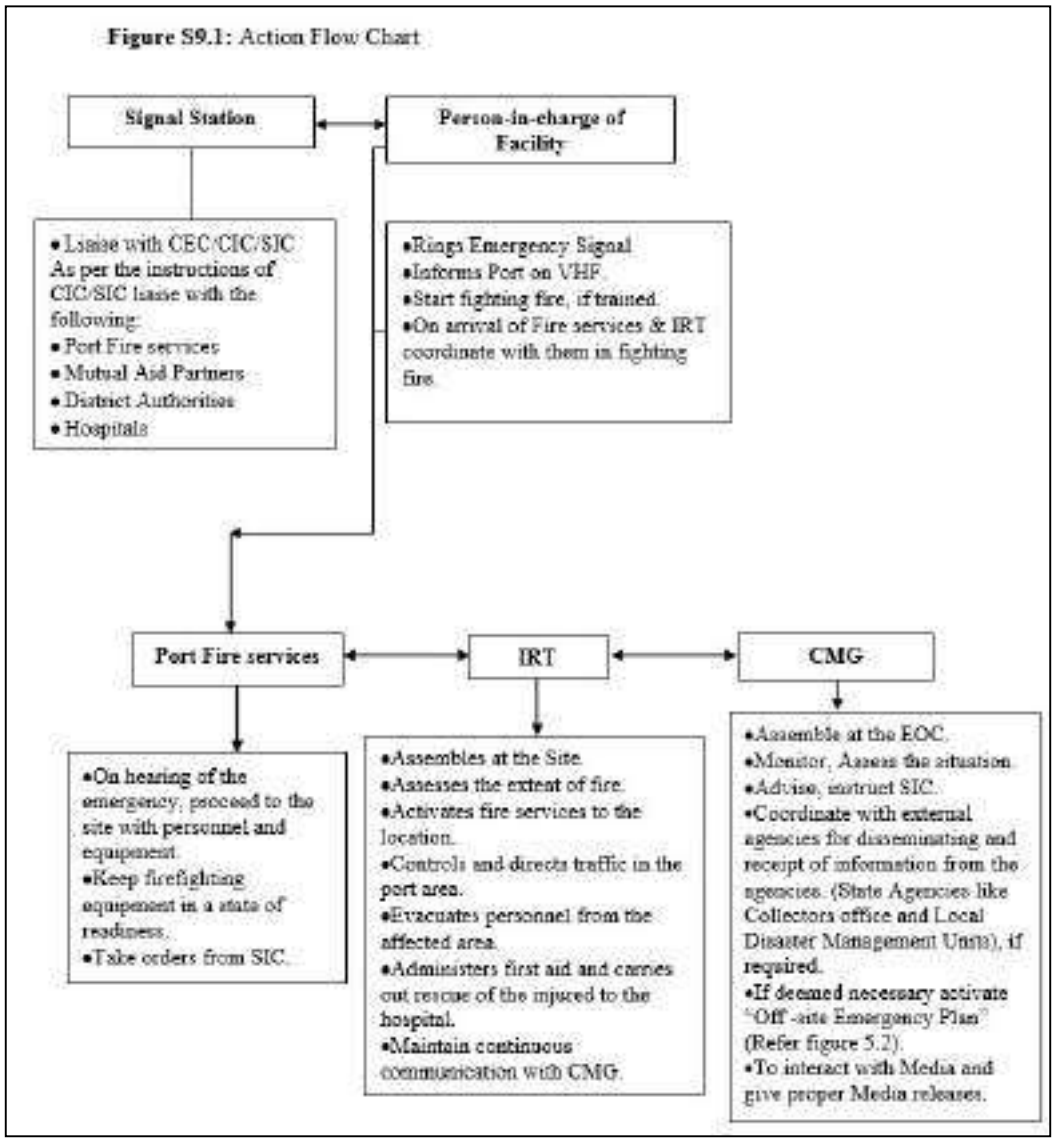
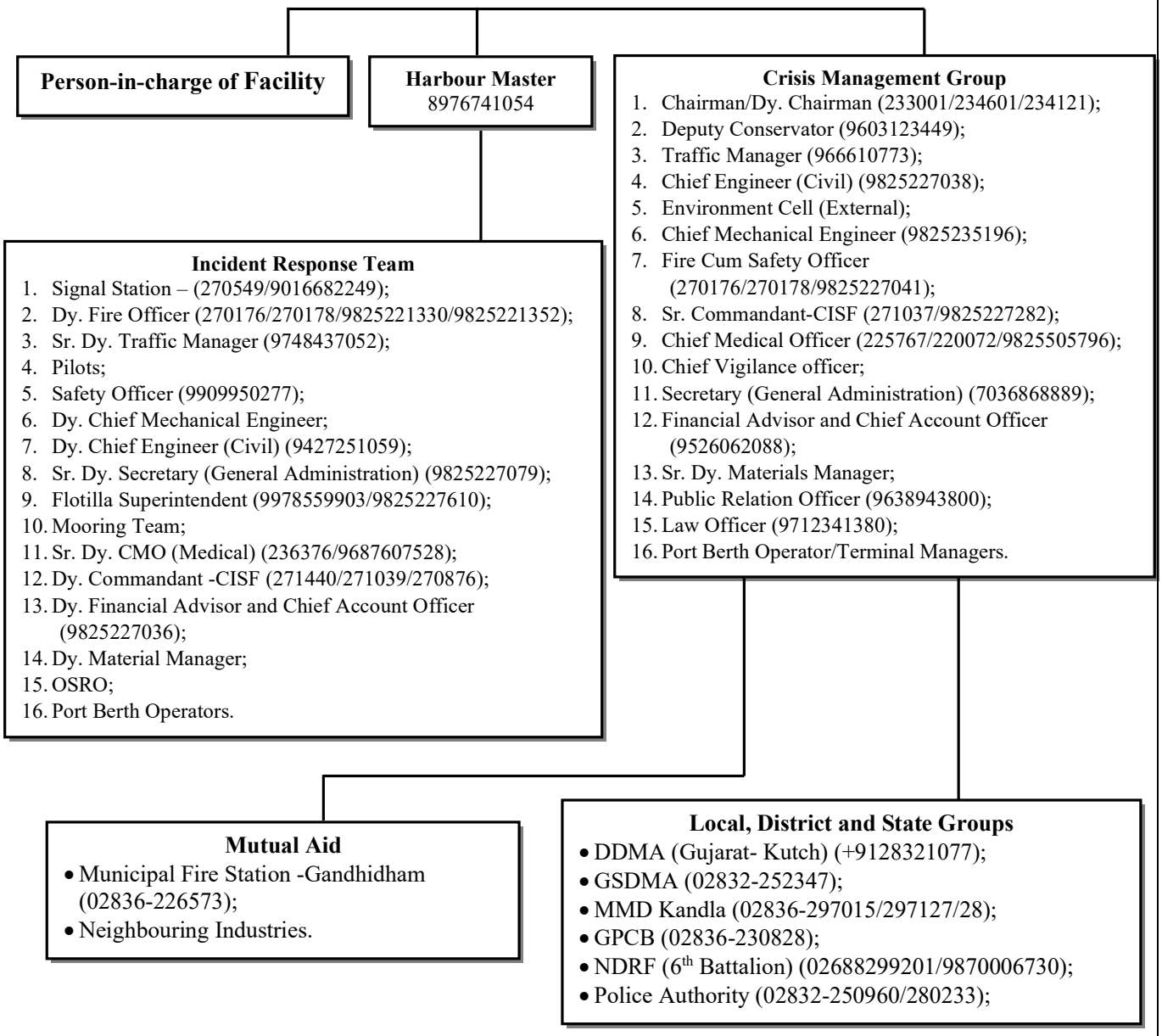


Figure S9.2: Action group



Part B: Action Plan

1. The Person-in-charge of Facility

Response Action
a. Should raise emergency alarm.
b. Fire cum Safety officer/Signal Station should be informed of any incident without delay.
c. Shall be responsible for fighting the fire with resources available as well as with the available support from IRT.

2. Signal Station should

Response Action
a. Gather information related to the time of incident.
b. Notify to CIC, SIC and the Fire cum Safety officer.
c. Gather information about the wind and notify CIC/SIC and Fire cum Safety officer.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the level of disaster and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC, Fire cum Safety officer and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Decide on clearing of vehicles in close proximity to the incident location.
f. Be in constant touch with District and Local Administration for rescue and relief operation.
g. Terminate the response and debrief before allowing normal operation.

4. The Fire cum Safety Officer

Response Action
a. Collect the information from Signal Station/ Person-in-charge of Facility and SIC.
b. Lead the fire-fighting team and provide assistance person-in-charge of facility in fighting fire as per SIC/CME Instructions.
c. He will mobilize personnel & fire-fighting equipment to the scene & extend all necessary support in case of fire, if required.
d. Provide assistance in evacuation of the personnel as directed by SIC.
e. Inform SIC for arrangement of any additional equipment as required.

5. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the scene & communicate & collect all information from the person-in-charge/Fire cum Safety Officer.
		Report the situation to the CIC/CMG and assist in assessing the incident.
		Assess the condition of site and of potential affected area and take decision on evacuation in consultation with CIC.
		Alert vehicles within the vicinity.
		Extend all necessary support to the Fire Team to fight the fire.
		Instruct the Fire Team to keep the fire-fighting installation.
		Instruct flotilla superintendent/ pilots to keep tugs ready for fire-fighting.
		Coordinate with all functional heads to take actions.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Assist SIC or lead the IRT in coordination with SIC.
		Coordinate with Electricity board.
		Shall be responsible for Electrical connections and disconnections to vital equipment and systems and provide alternate supply if required.
Safety Officer (Alternate: Officer)	Safety Coordinator	Shall take orders for SIC.
		Ensure safely rescue of personnel and labors.
		Ensure cleanup work during and after the emergency as quick as possible.
Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall take orders from the SIC.
		Maintain Log of events.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the Fire cum Safety Officer/SIC.
		Direct the fire-fighting team and mobilize fire tenders, men & fire-fighting equipment to the scene for fire-fighting.
		Assist in safely rescuing of the personnel, if trapped.

		Inform SIC and Fire cum Safety officer for the arrangement of any additional equipment as required.
		If the fire is under control and extinguished, give all clear signal.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Shall take orders from the Sr. Commandant – CISF /SIC.
		Cordon off the area and take head count of the personnel.
		Controls & Directs gate security and traffic in the area.
		Shall facilitate evacuation, transport, first aid and rescue of personnel from the scene at the time of emergency.
		Control the entry of unauthorized persons and vehicles.
		Check for entry of emergency vehicles.
		Liaise with the Police authorities.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Liaise with SIC.
Dy. CMO (Alternate: Officer)	First Aid and Medical Coordinator	In coordination with CMO, shall be responsible to organize and dispatch first aid team with ambulance as required.
		Make arrangements for transportation and treatment of injured persons.
		Shall coordinate with the local hospitals.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Shall prepare vehicles in the vicinity to vacate.
		Shall mobilize and dispatch sufficient number of vehicles to the site of emergency.
		Coordinates with vessel owners/agents/stevedores.
Material Manager (Alternate: Officer)	Material procurement Coordinator	Maintain sufficient inventory and provide the same during emergency as per the order of SIC/CIC.

S10: Scenario 10

Part A:

1. **War and Terrorism.**
2. **Precautions:** Protection of the port facilities receiving seagoing vessels from terrorist attacks is as per the provision of the "The International Vessel and Port Facility Security Code (ISPS Code)".
   Security of the port is being provided by CISF.
   The measures for port security include "installation of signal station, CCTVs, Biometric Access Control System, patrolling of port areas by vehicles, creation of deterrence by creating proper perimeter wall, illuminating port area, cancelling access to ports and vessels, conducting physical verification etc."
3. **Impact Zone:** Entire port.
4. **Resources required:** Intelligence inputs from agencies and organizational setup enumerated in Figure S10.2 and major material and equipment resources as given in Chapter 10.

Part B: Action Plan

When war like situation is developed or during the declaration of war the priority is to be given to all important/critical areas to remain vigilant to prevent sabotage, to remain ready to combat emergency and to keep normal operation going.

B.1 Prior Emergency Situation (after warnings/inputs)

- Set up Crisis management centre and manned continuously.
- CMG to declare plan/guideline to be followed which could be based on CISF Contingency Plan/Government of India/Statutory bodies/Indian Navy/Air Force/Government of Gujarat etc. instructions.
- CMG to ensure utmost vigilance in identified area to ensure the adequate resources in terms of security personnel, experts in handling equipment, trained manpower, and flood lights, earth moving equipment, mobile cranes, and rescue crafts are available to guard all gates, roads etc. In case of any unidentified/unauthorized person is found, the person must be handed over to police.
- CMG to ensure that evacuation plan is prepared and backup systems such as power generator, communication equipment, and safety systems are working. CMG should also ensure that all required manpower such as electricians/technicians/laborer is available all time.
- All terminal/berth operators and sensitive locations should be informed.
- No movement of the vessels in the port vicinity will be allowed.

B.2 During Emergency

- CMG to adopt relevant DMP to combat the emergency.
- In case of an enemy attack inform relevant authorities & internal security to defend installations till the external support arrives.
- When additional security (State ATF/army/BSF) arrives, situation is to be handled jointly.
- CMG to ensure sufficient supply of food and water.
- All vessels inside the port and at the anchorage will observe blackout as per the instruction of CMG.

Figure S10.1: Action Flow Chart

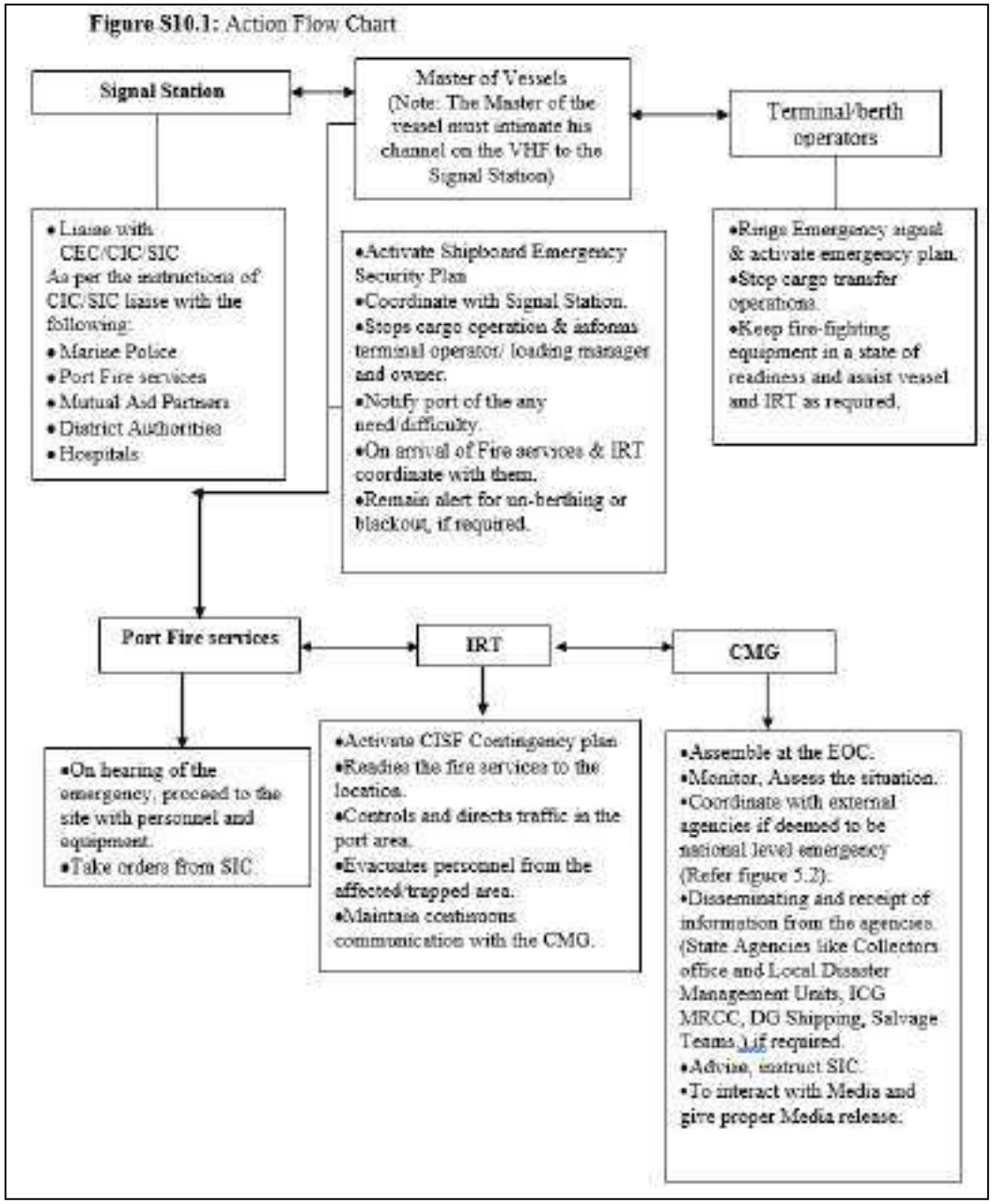
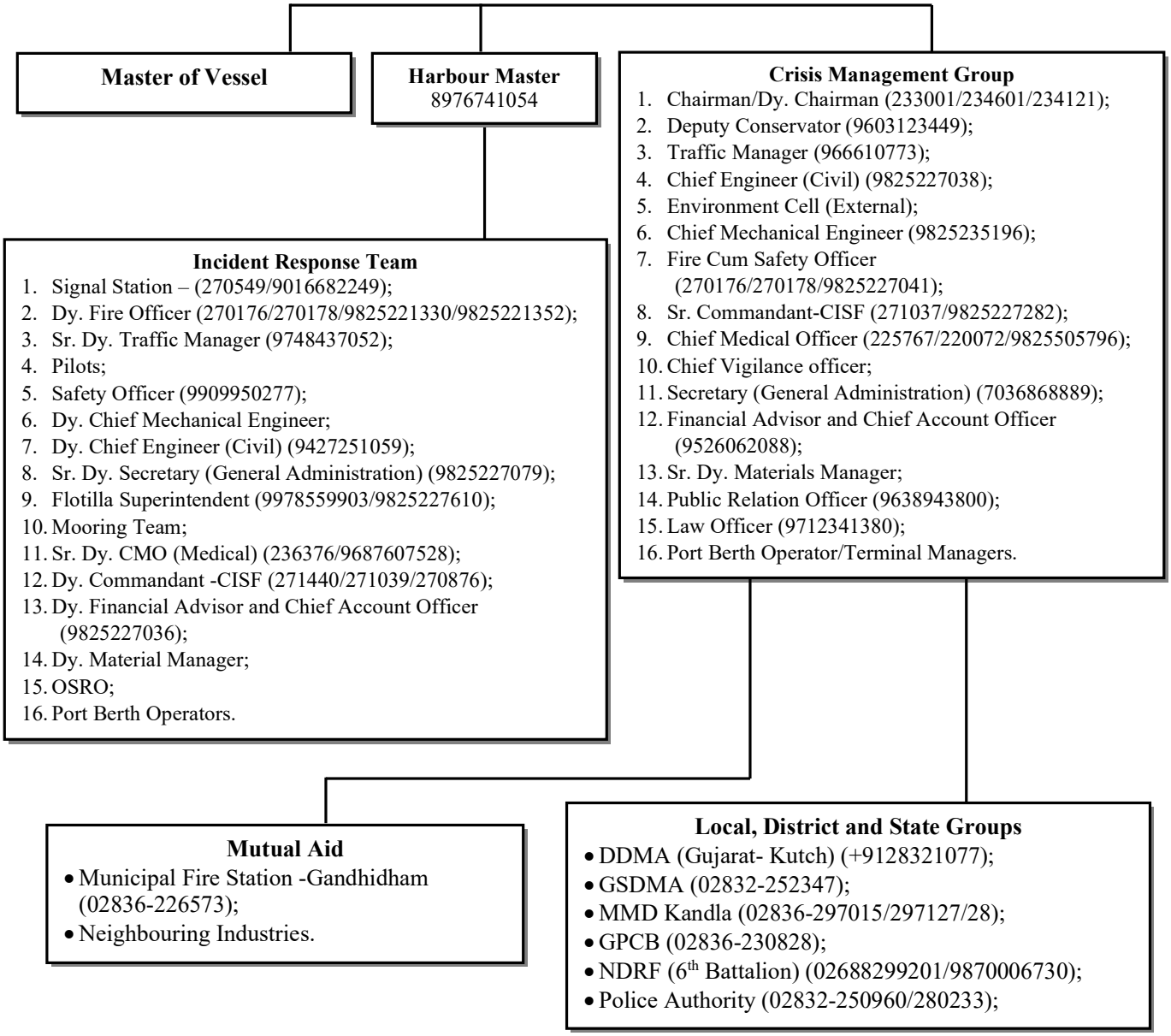


Figure S10.2: Action group



Part B: Action Plan

1. Sr. Commandant - CISF (Alternate: Dy. Commandant- CISF) should

Response Action
a. Act as per the CISF Contingency plan.
b. Controls & directs traffic in the area.
c. Shall supervise evacuation of personnel from the scene at the time of emergency and shift to shelter stations.

2. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the situation and activate the DMP and CISF Contingency Plan.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action in coordination with CISF-Security.
c. Give necessary instructions to SIC and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Be in constant touch with District and Local Administration for rescue and relief operation.
f. Terminate the response and debrief before allowing normal operation.

3. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall communicate & collect all information.
		Report the situation to the CIC/ CMG.
		Extend all necessary help to CISF (Security) as and when required.
		Ensure that there is blackout at the port and the vessels at the anchorage area as per the guidance and instruction of CMG/CIC/CISF.
Pilot (Alternate: Pilot)	Signal Station Coordinator	Shall be ready for taking the instructions from CIC/SIC and evacuate/move/shift the vessel from the area.
Master of the vessel (Alternate: Chief Officer)	In-Charge of operation on board vessel	Be ready to take the vessel out of the port as per the instructions of CIC/SIC.
		Coordinate with IRT leader and will be responsible for shutting down all cargo operation on board in coordination with terminal/operator In-Charge.
Terminal/ Berth Operators (Alternate: Officer)	Cargo Work	Shall be responsible of shutting down of cargo operation & coordinating with Port and render necessary assistance to the SIC by providing additional fire-fighting & emergency equipment

		as required.
		Arrange to protect cargo in vicinity from damage.
Safety Officer (Alternate: Officer)	Safety Coordinator	Ensure all employees (port and contract) within port shifted to safe locations.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the Fire cum Safety Officer/SIC.
		Keep the fire –fighting installation in a state of readiness and be in continuous liaise with SIC/CIC.
		Ensure all employees (port and contract) within port shifted to safe locations.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Assist SIC.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Arrange for specialized equipment if required as per the instruction of the SIC.
		Take orders from CIC/SIC with regards to power supply and shutdown.
Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required. Ensure the hospital is in a state of readiness.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Submits consolidated list of dangerous goods in port area.
		Coordinates with the truck contractors.
		Ensure sufficient numbers of vehicles are available.

S11: Scenario 11

Part A

1. **Bomb Threat**
2. **Precautions:** Protection of the port facilities receiving seagoing vessels from terrorist attacks is as per the provision of the "The International Vessel and Port Facility Security Code (ISPS Code)".
   Security of the port is being provided by CISF.
   The measures for port security include "installation of signal station, CCTVs, Biometric Access Control System, patrolling of port areas by vehicles, creation of deterrence by creating proper perimeter wall, illuminating port area, cancelling access to ports and vessels, conducting physical verification etc."
3. **Impact Zone:** Entire port.
4. **Resources required:** Organizational setup enumerated in Figure S11.2 and major material and equipment resources as given in Chapter 10.

Figure S11.1: Action Flow Chart

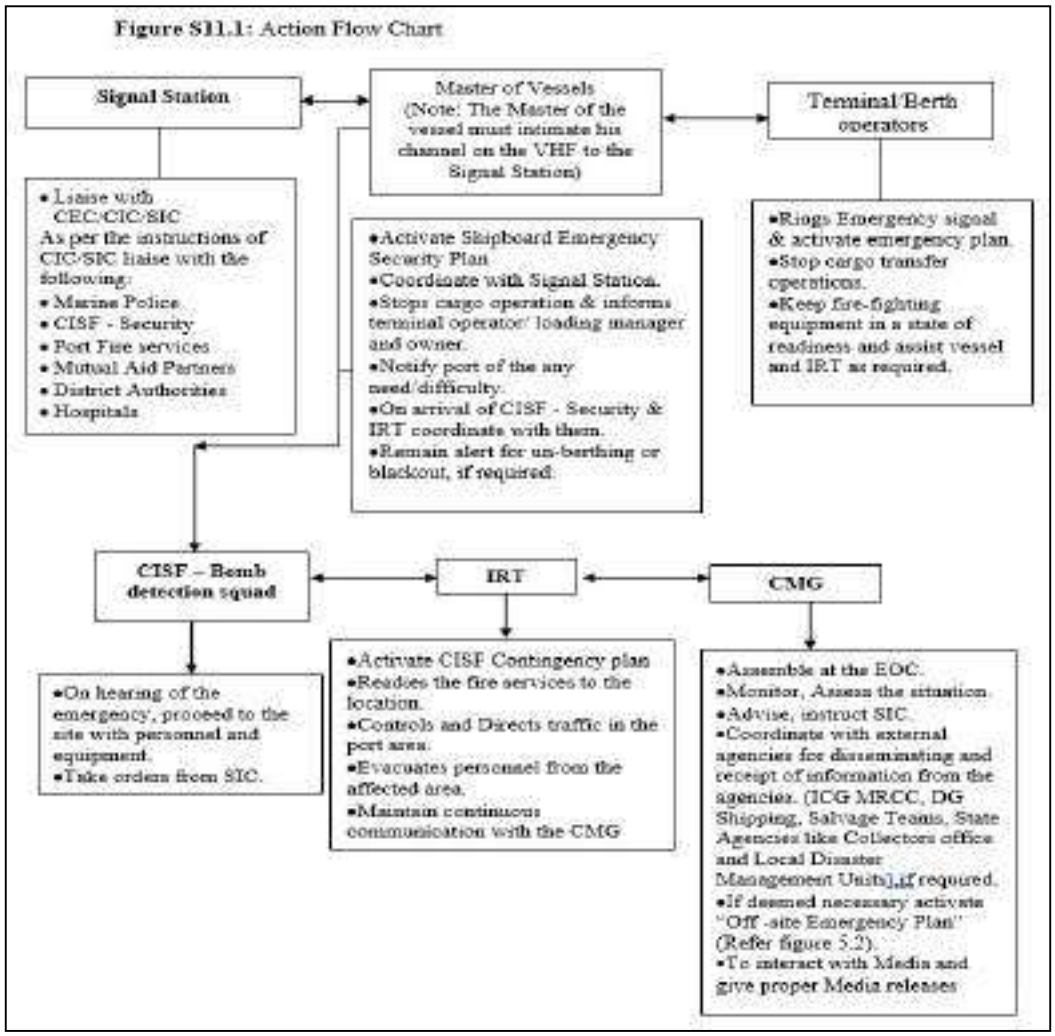
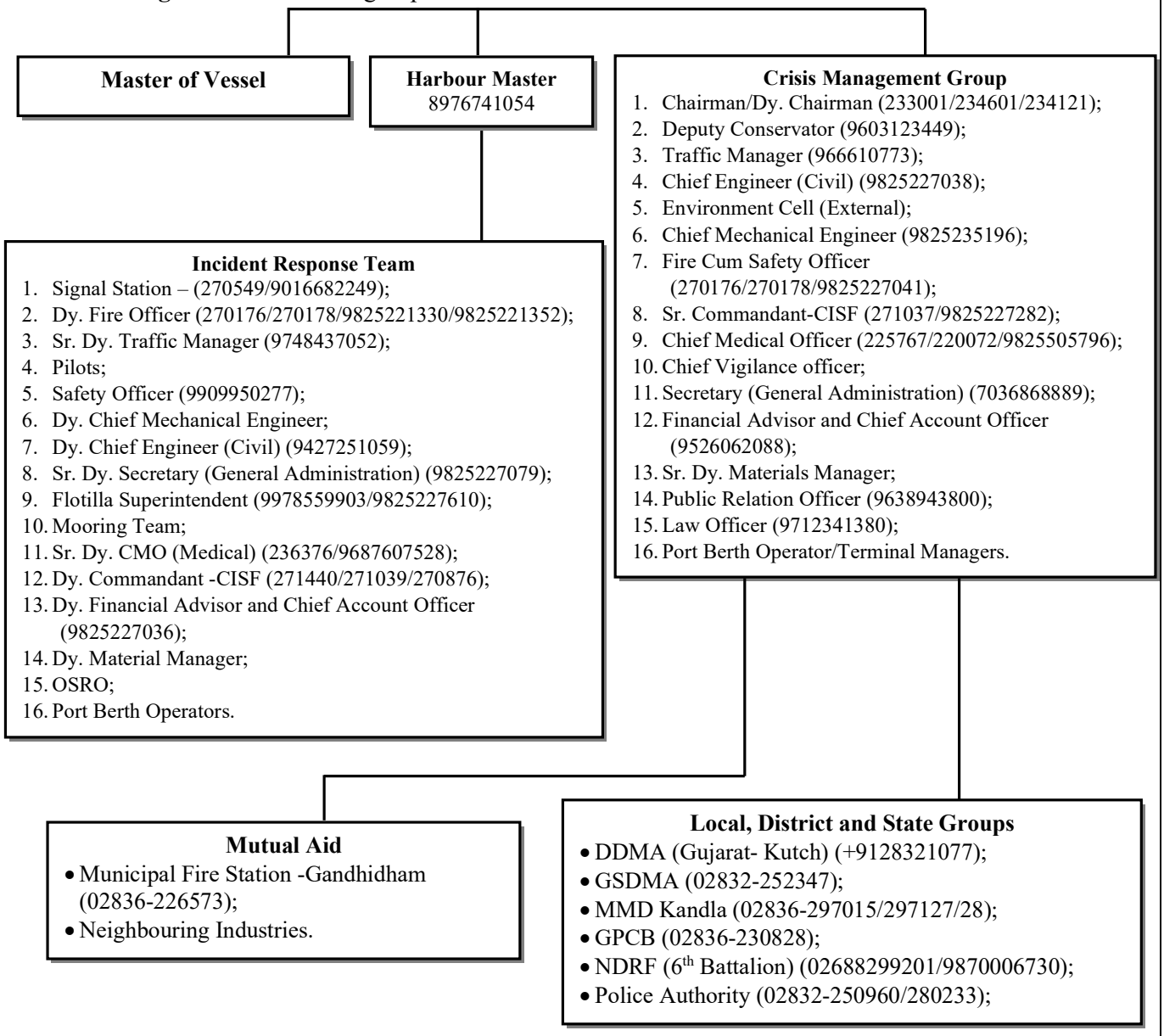


Figure S11.2: Action group



Part B: Action Plan

1. The Observer

Response Action
a. Signal Station/CISF should be informed without delay.

2. Sr. Commandant - CISF (Alternate: Dy. Commandant- CISF) should

Response Action
a. Gather the information as per CISF bomb threat checklist based on Intelligence inputs.
b. Should Implement/activate CISF Contingency Plan and search operation as per the message received of the location.
c. Identify the location and cordon off the area.
d. Assist District Police and Bomb Squad as required.
e. All terminal/operators should be informed.
f. Relevant port area should be shut down and people inside the port should be taken to a safe location.

3. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Assess the situation and activate the DMP.
b. Establish EOC and be stationed to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC, CISF and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Be in constant touch with District and Local Administration for rescue and relief operation.
f. Terminate the response and debrief before allowing normal operation.

4. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall communicate & collect all information.
		Ensure that the identified location is cordoned off and the people are evacuated.
		Report the situation to the CIC/ CMG.
		Extend all necessary help to CISF as and when required.
Pilot (Alternate: Pilot)	Signal Station Coordinator and Pilotage	Shall be ready for taking the instructions from CIC/SIC and evacuate/move/shift the vessel from the area.
Safety Officer (Alternate: Officer)	Safety Coordinator	Ensure all employees (port and contract) within port shifted to safe locations.
Master of the vessel (Alternate: Chief Officer)	In-Charge of operation on board vessel	Be ready to take the vessel out of the port as per the instructions of CIC/SIC.
		Coordinate with IRT leader and will be responsible for shutting down all cargo operation on board in coordination with terminal/operator In-Charge.
Terminal/ Berth Operator (Alternate: Officer)	Cargo Work	Shall be responsible of shutting down of cargo operation & coordinating with Port and rendering necessary assistance to the SIC by providing additional equipment as required.
		Coordinate with the agencies for screening of their cargoes.
		Arrange to protect cargo in vicinity from damage.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the SIC/Fire cum Safety Officer.
		Keep the fire –fighting installation in a state of readiness and be in continuous liaise with SIC/CIC.
		Ensure all employees (port and contract) within port shifted to safe locations.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Assist SIC.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Arrange for specialized equipment if required as per the instruction of the SIC.
		Take orders from CIC/SIC with regards to power supply and shutdown.

Dy. CMO (Alternate: Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required. Ensure hospital is in a state of readiness.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Submits consolidated list of dangerous goods in port area.
		Coordinates with the truck contractors.
		Ensure sufficient number of vehicles is available.
		Controls traffic in the Port area.

S12: Scenario 12

Part A:

1. **Natural Disaster (Cyclone)**
   Note: *The action plan will come into force as soon as the storm warning signal no.5 or higher is hoisted.*
2. **Precautions:** SOP for Cyclone, Continuous weather monitoring, Early warning system, Cyclone Shelters.
3. **Impact Zone:** Entire port**.**
   Note: *The Gujarat - Kutch districts fall under very high damage risk zone (max. wind speed of 50 m/s) as per the vulnerability hazard map of the region.*
4. **Resources required:** Refer Figure S12.2 and Chapter 10 for resources.

Figure S12.1: Action Flow Chart

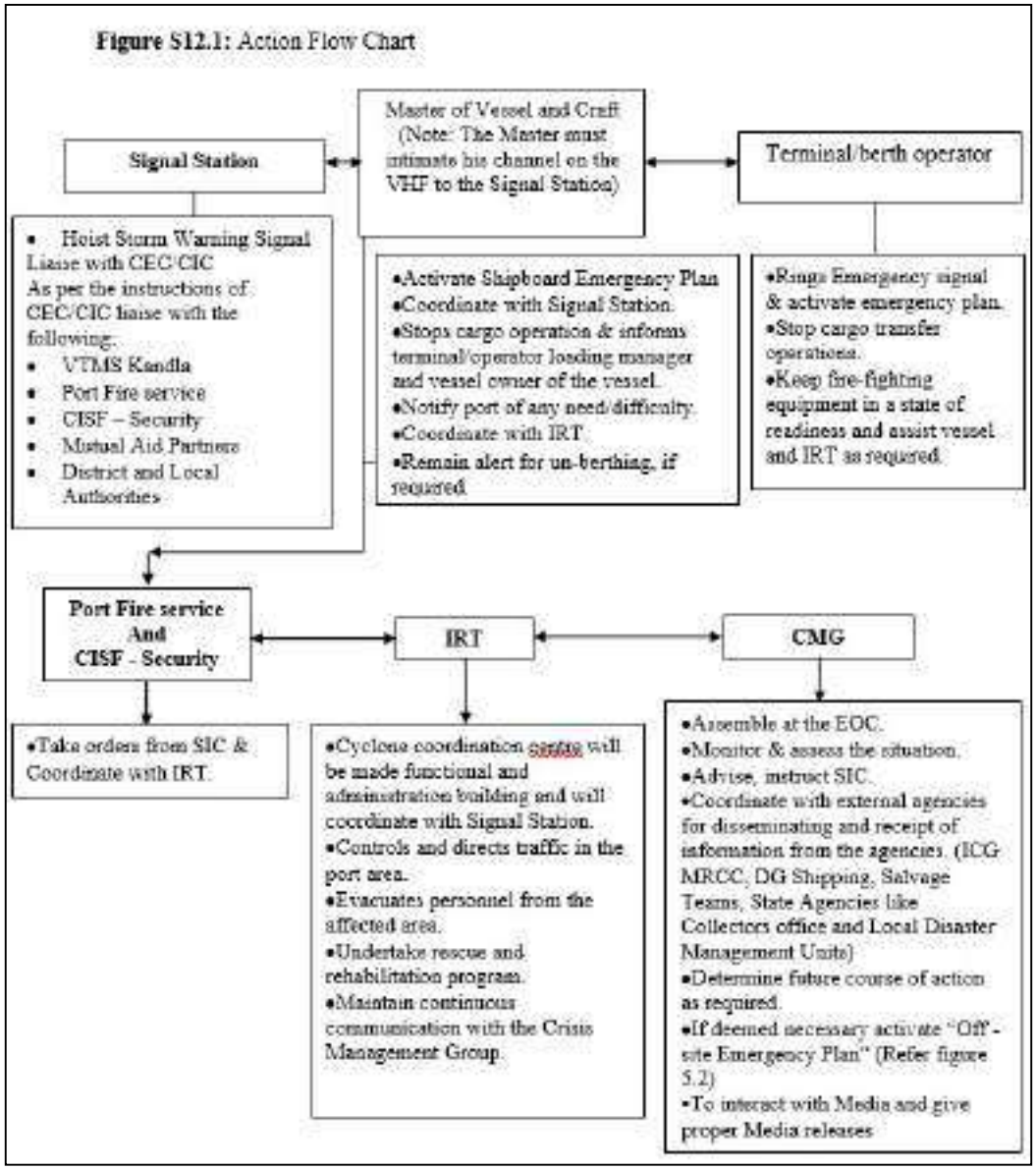
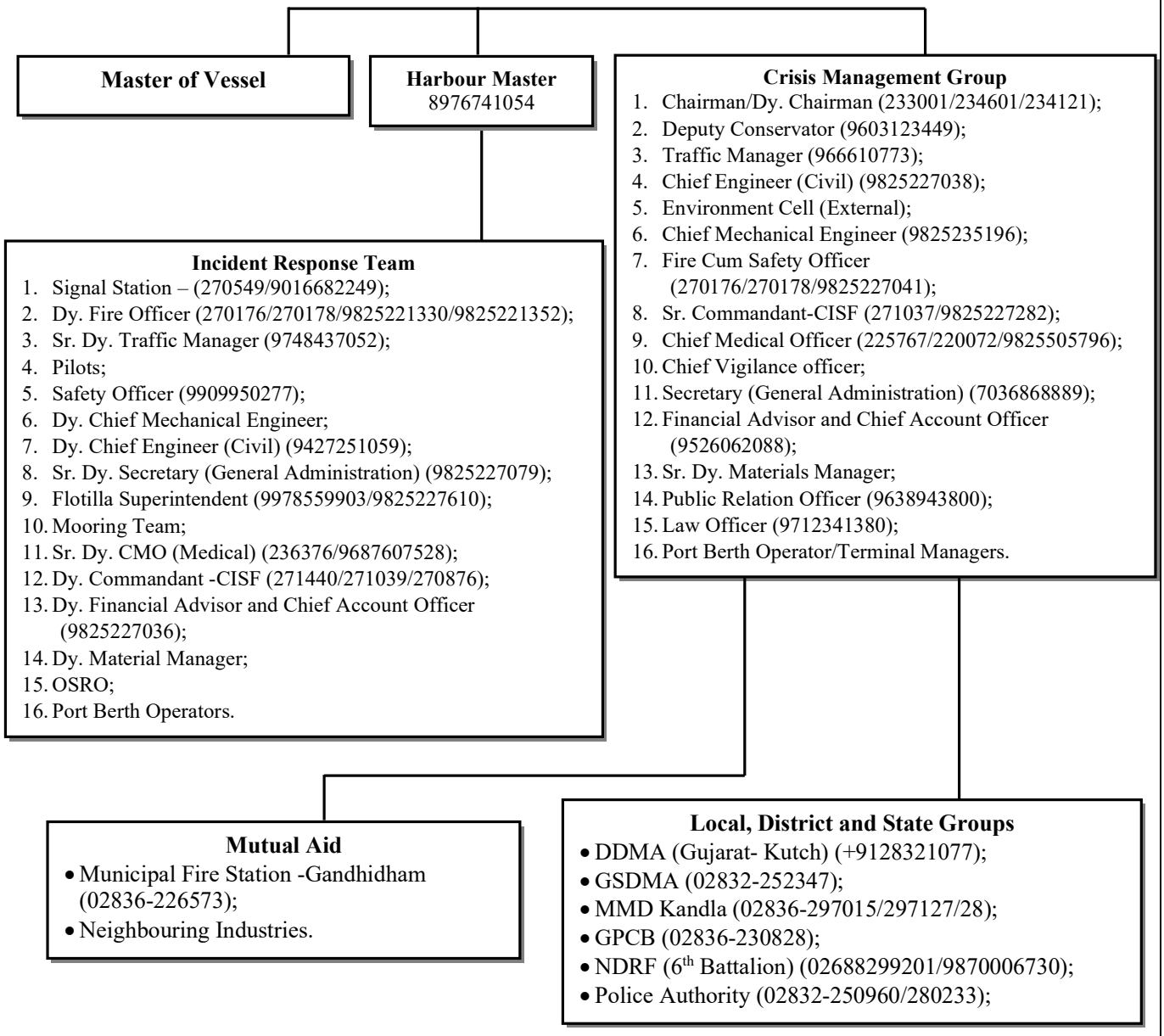


Figure S12.2: Action group



Part B: Action Plan

1. Signal Station

Response Action
a. Gather information related to the vessel type and position in the port limit.
b. Gather information related to the weather conditions by liaising with competent agencies for issuing warnings and other media. Monitor the weather map either through Internet or Television and record approximate position of the weather and information about its movement as given in the news.
c. As per the instructions of SIC, sufficient number of staff will be detailed. The staff of Signal Station will remain on duty until they are relieved by next shift staff or till alternative arrangements are made or till the storm has passed and the Harbour Master releases them.
d. Every two hourly barometer reading will be recorded after cyclone warning signal No. 3 is hoisted but the same will be made hourly if further upward signal is placed.
e. Liaise with Master of the Vessel/Pilot.
f. Ensure that telephones, one VHF and one walkie-talkie all are operational. Listening watch to be maintained on VHF channel-08/10/16.
g. Notify CIC/SIC, HOD and the vessels moving into, through and inside the port. Keep CIC/SIC informed of all the messages received by telephone, VHF sets or by messenger.
h. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CEC/CIC.
i. Inform the Harbour Master/Flotilla Superintendent of any buoys or crafts or any Port installation is seen adrift.
j. Hoist signals or raise alarms, as per the warnings received by the competent agencies for issuing warnings.

2. Tidal observatory

Response Action
a. The Gauge Clerk will record the range of tide, time and heights of high and low water and will report to Chief hydrographer who in turn will apprise the CIC and the SIC of the actual and predicted tides.

3. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate shipboard emergency action plan.
b. Having raised the alarm, the Master will be responsible for taking all immediate steps to safeguard his vessel.
c. The Master will provide the Port Authority with details of the vessel.
d. Should follow the instruction of the CIC/SIC and be in continuous liaison with the CIC/SIC/Signal Station.
e. Should be in a state of readiness to take the vessel out of the port.

4. The terminal/berth operator personnel should

Response Action
a. Activate EAP and inform Port.
b. Shall be responsible of shutting down of cargo operation (as per SOP and/ contingency plan) & coordinate with Port and Master of the Vessel and rendering necessary assistance to the SIC and vessel by providing emergency equipment as required.
c. Submit consolidated list of dangerous goods in port and Vessels in port. Make arrangements to protect cargo.
d. Assist IRT and provide all necessary equipment.
e. He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

5. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. He will keep himself apprised of the weather developments. If the storm is observed on the radar screen, the Deputed officer will inform Chairman/ Dy. Chairman and cyclone station.
b. He will be stationed in EOC to review & assess possible developments to determine the necessary course of action.
c. Give instructions to SIC and Signal Station & arrange for external aid as necessary.
d. Review the situation periodically and accordingly inform to the Chairman/ Dy. Chairman.
e. Consult with Chairman / Dy. Chairman and decide on berthing of vessels as soon as the cyclone is confirmed to pass in close proximity to the Port.
f. Plan movements of vessels such that the vessels are cleared in shortest possible time.
g. Coordinate with external agencies/authorities such as Indian Navy and ICG.
h. Be in constant touch with District and Local Administration for rescue and relief operation.
i. Terminate the response and debrief before allowing normal operation.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the Signal Station & communicate & collect all information.
		Take over the charge and ensure the action plan is promulgated as per the instructions of CIC.
		Inform vessels, Mooring team and Flotilla superintendent alongside berths to double up their moorings, provide shore gang assistance and ask Masters to keep their vessels ready to proceed to the sea at short notice as per the instruction of CIC.
		He will keep close liaison will IMD, Radar Station, Police Wireless Station, ICG and Vessels in Port in regard to the likely weather conditions in the near further.
		Ensure Signal Station, hoists appropriate storm signal as per the situation.
		Report the situation to the CIC & the CMG.
		Keep rescue team ready with rubber boats, Life jackets etc.
		Ensure that the hazardous cargoes are shifted out of the port or secured/stored in a safe manner.
		Ensure that the operations are brought back to normal after the termination of the emergency procedure.
Pilot (Alternate: Pilot)	Signal Station Coordinator	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC/SIC.
		Instruct Flotilla superintendent to secure tugs, crafts and workboats.
		Ensure securing of dock cranes and loose equipment/items.
		He will maintain log of events.
Safety Officer (Alternate: Officer)	Safety Coordinator	Ensure workers within perimeter of safety dangerous / chemical tank farms shifted to sheltered location.
		All non-essential workers to move out of port area.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the Fire cum Safety Officer/SIC.
		Keep fire tenders and fire-fighting equipment in a state of readiness.
		Ensure the FIFI tugs is properly manned and secured with double ropes and engines running in idling condition.

		Responsible for mobilizing fire tenders, men & fire-fighting equipment to the scene & extend all necessary support.
		Liaise with State Fire brigade for any assistance.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Shall take orders from Sr. Commandant- CISF/SIC.
		Shall be responsible for forming a cyclone task force and will lead the same.
		Controls & directs traffic in the area.
		Shall supervise evacuation of personnel from the scene at the time of emergency and Responsible for rescue operation.
		Till normality is restored, arrangements will be made for thorough checks on all out-going vehicles to guard against pilferage.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Submits consolidated list of dangerous goods in port area.
		Coordinate with the truck contractors.
		Ensure availability of vehicles and mobilize and dispatch sufficient number of vehicles to the site during emergency.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Shall ensure the standard procedure before the monsoon has been followed and complied with by all the divisions.
		All types of cranes, forklifts, heavy earth moving equipment to be secured in a safe manner.
		Keep enough number of cement bags ready as per SIC instructions.
		Pumphouse equipment and all generator sets shall be tried out and kept ready.
		Ensure all the drains and obstructions in the creeks/ culverts are cleaned for easy discharge of sludge water.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall ensure the standard procedure before the monsoon has been followed and complied with by all the divisions.
		Shall form and head Cyclone mitigation Team comprising of Electrical, Mechanical and Maintenance Engineers.
		Shall ensure that all the installations and equipment are secure. All division and workshops shall follow their standard procedures for securing the equipment and installations.
		Shall be responsible for alternate electrical supply to vital equipment and systems at the berth.

		All electrical sub stations will be manned round the clock or person should be readily available incase of any emergency requirement.
Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
Executive Engineer (Alternate: Executive Engineer)	Hydrographic Survey	Assist SIC.
Duty Pilot (Alternate: Pilot)	In-Charge of Pilotage	Shall be ready on site for taking the vessel out of berth or will not bring the vessel to berth as per the instruction given by CIC/SIC.
		Inform the Masters of all vessels at the berths to double the moorings and to keep engine ready to proceed out to sea if situation warrants.
		Decision regarding moving vessels to the anchorage will be taken depending on the strength of the wind likely to be encountered and number of vessels in the Port.
		Maintain a close liaison and co-ordination with the Operations In-charge.
		Take all necessary steps for the safety of the Port crafts.
		Fender and extra lengths of ropes/wires will be kept ready so as to attend to any craft whose moorings may part.
		Inform the Signal Station/ Flotilla superintendent immediately in the event any craft is seen adrift or any other Port installation is seen in danger. Arrange an Emergency Maintenance team.
		Responsible for directing tugs for combating the fire and rescue.
Mooring Master (Alternate: Officer)	Mooring Coordinator	Act as per the instruction of SIC/CIC.
		Assess the level of crisis, nature, location, severity, casualties and resource equipment.
		Authorize any immediate action required by on site staff and contract agencies.
Material Manager (Alternate: Officer)	Material Management	During cyclonic season sufficient stock of stores like corrugated iron sheets, J.Hooks, screw hinges, gunny bags, tarpaulins, ropes and wires for Port Crafts, diesel oil, kerosene oil, hurricane lantern, kerosene lamps, torch lights with batteries and bulbs, electrical items etc. is kept.

POST-CYCLONE DUTIES	
Sr. no.	**Duty**
1.	All the Heads of the Departments are required to assess the damage and submit a detailed report indicating the estimate to the Chairman/Dy. Chairman. For this, a team may be formed comprising Officers of Executive Engineer and above in rank at departmental level and may associate one Officer from Finance Department. The preliminary report is to be submitted within 3 hours and detailed report within three days.
2.	Hydrographic survey to be conducted to assess the channel condition and Shipping to resume as early as possible.
3.	In case of any small craft sunk or grounded, the same to be removed to make the channel/ berth safe for navigation. SIC/CIC will detail a salvage party.
4.	A team of Officers to be nominated by Secretary to supervise the rescue and relief operation and disposal of carcasses in co-ordination with the local and District Administration.
5.	Mobile medical service, if required, to be provided by CMO. Preventive measures for epidemics to be taken.
6.	All the operating systems need to be attended urgently and made operational as early as possible on war footing basis to resume operation.
7.	Spot tendering procedure can be followed if required in emergency.
8.	Water supply and electricity to be given priority. The Chief Engineer (Mechanical/Electrical/Civil) shall be authorized to extend all assistance for manpower, conveyance, equipment and materials etc. to electrical board, if required, for resuming power supply. The electrical cabling network to be checked area wise.
9.	All the damaged temporary roofed warehouses are to be repaired.
10.	The Material Manager will nominate a team of officers and staff for procurement and supply of essential materials for repair of various structures and equipment as reported.
11.	To assess the progress of repair works, HOD meeting will be held daily till normalcy is restored.
12.	Damage to furniture, building fixtures may be prepared.

S13: Scenario 13

Part A:

1. **Natural Disaster (Flood due to high tide and/or heavy rains)**
   Note: *Instances of flooding increase due to storm/cyclonic conditions coupled with infrastructural challenges such as drainage systems, bulk handling and storage yards, internal roads and natural topography of the area. Instances of flooding can also occur as a result of heavy rainfall coupled with high tide. Similar organizational setup for managing this emergency on the lines of cyclone situation will be required.*
2. **Precautions:** Pre-monsoon preparation, Continuous weather monitoring, Early warning system.
3. **Impact Zone:** Entire port**.**
4. **Resources required:** Refer Figure S13.2 and Chapter 10 for resources.

Figure S13.1: Action Flow Chart

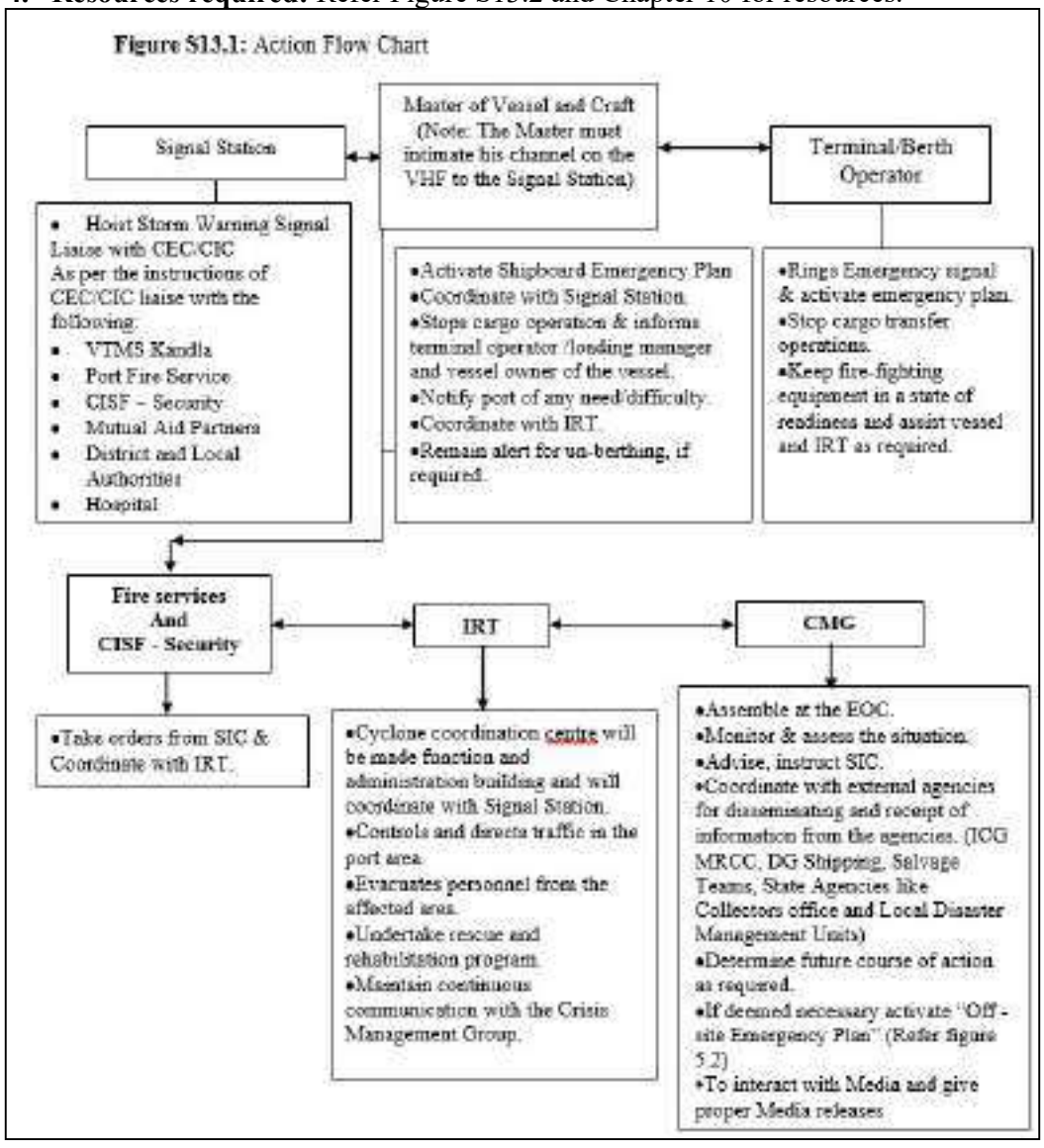
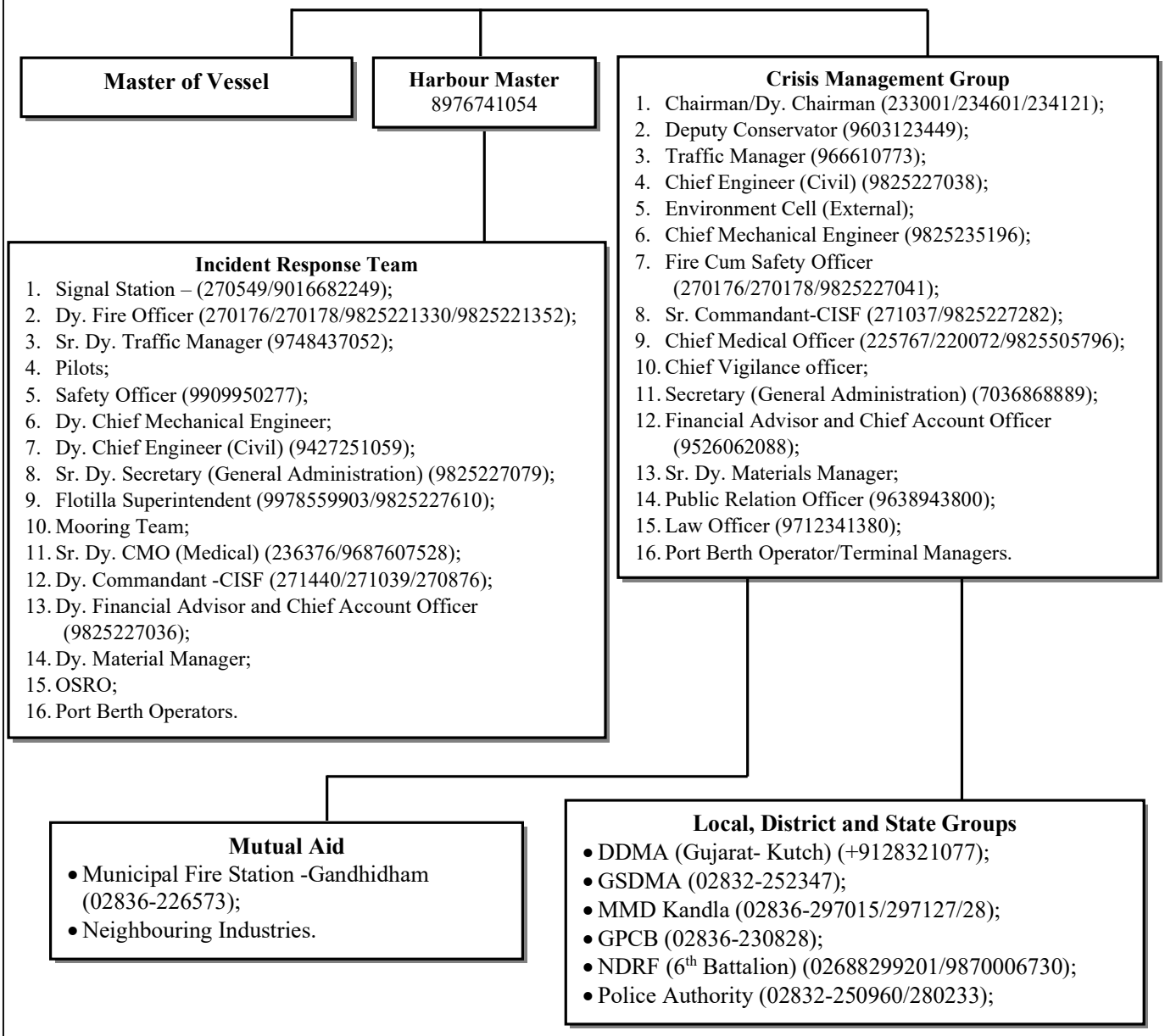


Figure S13.2: Action group



Part B: Action Plan

1. Signal Station

Response Action
a. Gather information related to the vessel type and position in the port limit.
b. Gather information related to the weather conditions by liaising with competent agencies for issuing warnings and other media. Monitor the weather map either through Internet or Television and record approximate position of the weather and information about its movement as given in the news.
c. Liaise with Master of the Vessel/Pilot.
d. Ensure that telephones, one VHF and one walkie-talkie all are operational in the Port Signal Station. Listening watch to be maintained on VHF channel-08/10/16.
e. Notify to CEC, CIC, HOD and the vessels moving into, through and inside the port. Keep CIC informed of all the messages received by telephone, VHF sets or by messenger.
f. Notify the other Authorities (ICG, Navy) and stakeholders within Port as per instructions of CEC/CIC.
g. Inform the Harbour Master/Flotilla Superintendent of any buoys or crafts or any Port installation is seen adrift.
h. As per the instructions of SIC, sufficient number of staff will be detailed. The staff of Signal Station will remain on duty until they are relieved by the next shift staff or till alternative arrangements are made or till the storm has passed and the Harbour Master release them.

2. Tidal observatory

Response Action
a. The Gauge Clerk will record the range of tide, time and heights of high and low water and will report to Chief Hydrographer who in turn will apprise the CIC and SIC of the actual and predicted tides.

3. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate vessel board emergency action plan.
b. Having raised the alarm, the Master will be responsible for taking all immediate steps to safeguard his vessel.
c. The Master will provide the Port Authority with details of the vessel.
d. Should follow the instruction of the CIC/SIC and be in continuous liaise with the CIC/SIC/Signal Station.
e. Should be in a state of readiness to take the vessel out of the port.

4. The terminal/berth operator should

Response Action
a. Activate EAP and inform Port.
b. Shall be responsible of shutting down of cargo operation (as per SOP and/ contingency plan) & coordinate with Port and Master of the Vessel and rendering necessary assistance to the SIC and vessel by providing emergency equipment as required.
c. Submit consolidated list of dangerous goods in port and Vessels in port. Make arrangements to protect cargo.
d. Assist IRT and provide all necessary equipment.
e. He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

5. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. He will apprise himself of weather the developments.
b. He will be stationed at EOC to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Consult with Chairman / Dy. Chairman and decide on clearing of vessels as soon as the cyclone is confirmed to pass in close proximity to the Port.
f. Plan movements of vessels such that the vessels are cleared in shortest possible time.
g. Coordinate with external agencies/authorities such as Indian Navy and ICG.
h. Be in constant touch with District and Local Administration for rescue and relief operation.
i. Terminate the response and debrief before allowing normal operation.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the Signal Station and communicate & collect all information.
		Take over the charge and ensure the action plan is promulgated as per the instructions of CIC.
		Inform vessels alongside berths to double up their moorings, provide shore gang assistance and ask Masters of vessels to keep their vessels ready to proceed to the safe area at short notice as per the instruction of CIC.
		He will keep close liaison with IMD, CWC, Radar Station, Police Wireless Station, ICG, and Vessels in Port in regard to the likely weather conditions in the near further.
		Report the situation to the CIC & the CMG.
		Keep rescue team ready with rubber boats, Life jackets etc.
		Ensure that the hazardous cargoes are shifted out in a safe manner.
		Ensure that the operations are brought back to normal after the termination of the emergency procedure.
Pilot (Alternate: Pilot)	Signal Station Coordinator	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC/SIC.
		Instruct Flotilla Superintendent to secure tugs, crafts and workboats.
		He will maintain log of events.
Safety Officer (Alternate: Officer)	Safety Coordinator	Shall take orders from the SIC. Assist in evacuation of the personnel to the assembly point or as directed by SIC.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the SIC.
		Keep fire tenders and fire-fighting equipment in a state of readiness.
		Responsible for mobilizing fire tenders, men & fire-fighting equipment to the scene & extend all necessary support, if required.
		Liaise with State Fire brigade for any assistance.
Dy. Commandant-CISF (Alternate:	Security and Evacuation	Shall take orders from Sr. Commandant- CISF/SIC.
		Shall be responsible for forming a cyclone/flood task force and will lead the same.

Commandant-CISF)		Controls & directs traffic in the area.
		Shall supervise evacuation of personnel from the scene at the time of emergency.
		Till normality is restored, arrangement will be made for thorough checks on all out-going vehicles to guard against pilferage.
		Shall be responsible for rescue of the personnel.
Dy. Traffic Manager (Alternate: Officer)	Cargo Storage, Shed and Labour Coordinator	Submits consolidated list of dangerous goods in port area.
		Coordinate with the truck contractors.
		Ensure availability of vehicles and mobilize and dispatch sufficient number of vehicles to the site during emergency.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Shall ensure the standard procedure before the monsoon has been followed and complied with by all the divisions.
		Keep enough number of cement bags ready as per SIC instructions.
		Pump house equipment and all generator sets shall be tried out and kept ready.
		Ensure all the drains and obstructions in the creeks/ culverts are cleaned for easy discharge of sludge water. Also, make arrangements for additional dewatering pumps as required.
		As soon as the contingency plan is made operational all the water tanks should be filled up and standby arrangement for supply of water to be made.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall ensure the standard procedure before the monsoon has been followed and complied with by all the divisions.
		Shall form and head Cyclone/Flood mitigation Team comprising of Senior Electrical, Mechanical and Maintenance Engineers.
		Ensure that all division and workshops standard procedures has been followed and equipment and installations are secured in a safe manner.
		Shall be responsible for alternate electrical supply to vital equipment and systems.
		All electrical sub stations will be manned round the clock or person should be readily available in case of any emergency requirement.
Dy. CMO (Alternate:	First Aid and Medical	Shall be responsible to organize and dispatch first aid team with ambulance as required.

Medical Officer)	Coordinator	
Executive Engineer (Alternate: Executive Engineer)	Hydrographic Survey	Assist SIC.
Duty Pilot (Alternate: Pilot)	In-Charge of Pilotage	Shall be ready on site for taking the vessel out of berth or will not bring the vessel to berth as per the instruction given by CIC/SIC.
		Inform the Masters of all vessels at the berths to double the moorings and to keep engine ready to proceed out to sea if situation warrants.
		Decision regarding moving vessels to the anchorage will be taken depending on the strength of the wind likely to be encountered and number of vessels in the Port.
		Take all necessary steps for the safety of the Port crafts.
		Ensure all other crafts are placed at safe place and properly secured excepting one pilot launch and one stand by launch used for inspection and emergency duties.
		Fender and extra lengths of ropes/wires will be kept ready so as to attend to any craft whose moorings may part.
		Inform the Signal Station immediately in the event any craft is seen adrift or any other Port installation is seen in danger. Arrange an Emergency Maintenance team.
		Responsible for directing tugs for combating the fire and rescue.
Material Manager (Alternate: Officer)	Material Management	During cyclonic season sufficient stock of stores like Corrugated iron sheets, J.Hooks, screw hinges, gunny bags, tarpaulins, ropes and wires for Port Crafts, diesel oil, kerosene oil, hurricane lantern, kerosene lamps, torch lights with batteries and bulbs, electrical items etc. is kept.
		All the materials which are likely to get damaged in rain and flood are covered with tarpaulin.

POST FLOOD DUTIES	
Sr. no.	**Duty**
1.	All the HODs are required to assess the damage and submit a detailed report indicating the estimate to the Chairman. For this, a team may be formed comprising Officers of Executive Engineer and above in rank at departmental level and may associate one Officer from Finance Department. The preliminary report is to be submitted.
2.	Hydrographic survey to be conducted to assess the channel condition and Shipping to resume as early as possible.
3.	A team of Officers to be nominated by Secretary to supervise the rescue and relief operation and disposal of carcasses in co-ordination with the local and District Administration.
4.	Mobile medical service, if required, to be provided by CMO. Preventive measures for epidemics to be taken.
5.	All the operating systems to be attended urgently and made operational as early as possible on war footing basis to resume operation.
6.	Spot tendering procedure can be followed for repairs.
7.	Water supply and electricity to be given priority. The Chief Engineer (Mechanical/Electrical/Civil) shall be authorized to extend all assistance for manpower, conveyance, equipment and materials etc. to electrical board, if required, for resuming power supply. The electrical cabling network to be checked area wise.
8.	The Material Manager will nominate a team of Officers and staff for procurement and supply of essential materials for repair of various structures and equipment as reported.
9.	To assess the progress of repair works, HOD meeting will be held daily till normalcy is restored.
10.	Damage to furniture, building fixtures may be prepared.

S14: Scenario 14

Part A:

1. **Natural Disaster (Tsunami)**
2. **Precautions:** Continuous weather monitoring, Early warning system, Tsunami Shelters.
   Note: *INCOIS and its monitoring centres will provide early warning by way of messages to the port about the occurrence of tsunami.*
3. **Impact Zone:** Entire port**.**
   Note: *While in the past the Indonesian tsunami (2004) generated a small wave the damages in the event of a higher wave would be in proportion to the proximity to the earthquake zone and the resultant height of wave generation. Thus, the wave energy would impact the port and its constituents including marine and fixed assets in proportion to its severity. Actions at the National and State level for evacuation measures will be taken if the impact assessment is of a high magnitude. Thus, necessary coordination with District and State agencies will be required in case of "Red" and "Orange" alerts.*
4. **Resources required:** Refer Figure S14.2 and Chapter 10 for resources.

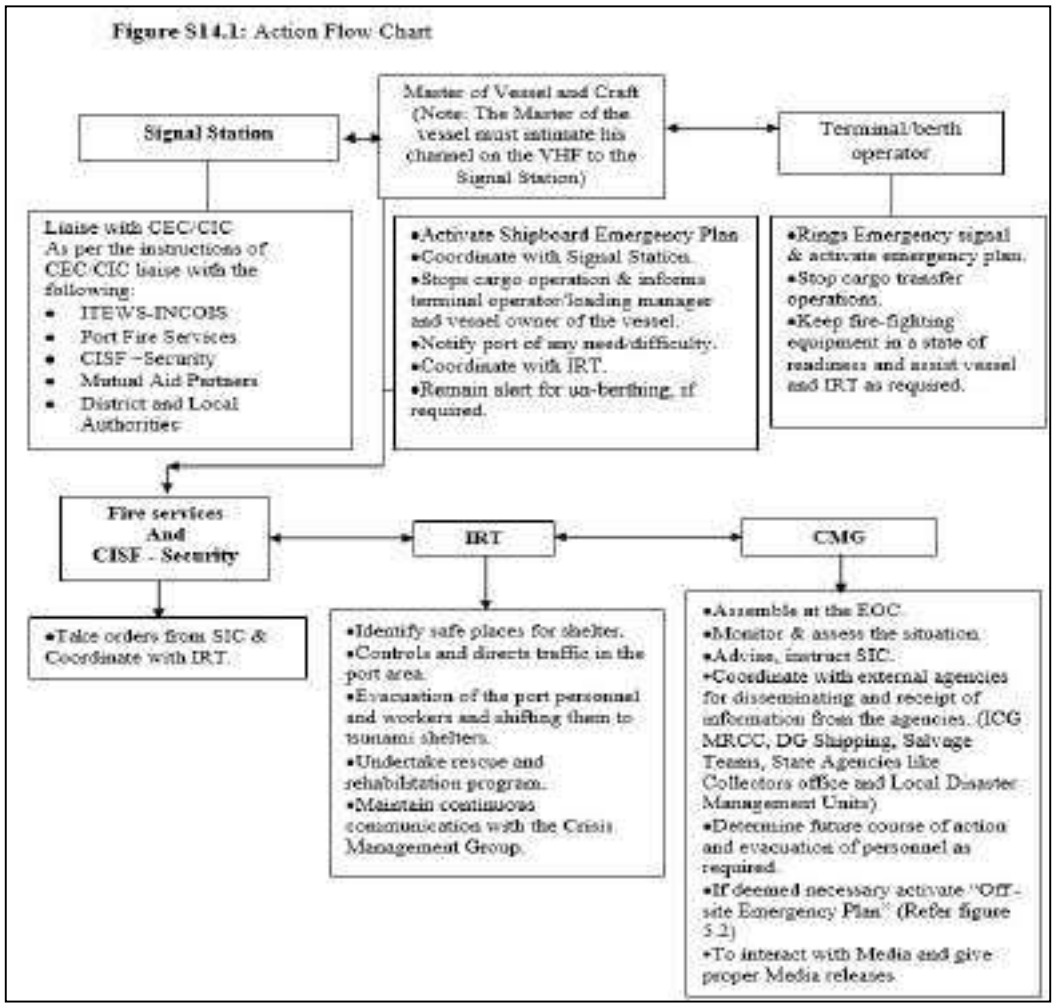
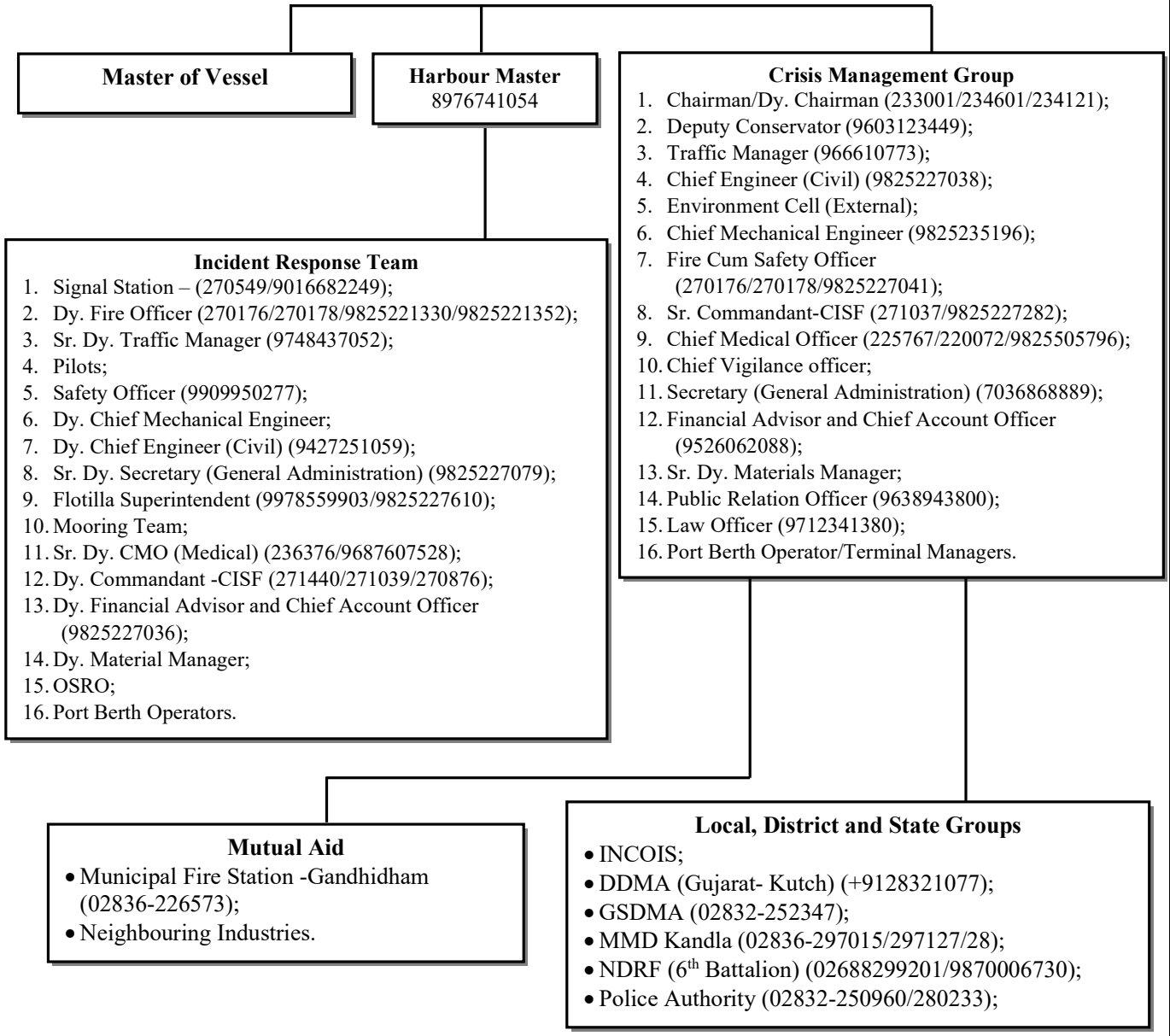


Figure S14.2: Action group



Part B: Action Plan

1. Signal Station

Response Action
a. Gather information related to the vessel type and position in the port limit.
b. Gather information related to the tsunami conditions by liaising with competent agencies for issuing warnings and other media. Monitor the conditions through Internet or Television and record approximate position of the tsunami and information about its movement as given in the news.
c. Liaise with Master of the Vessel/Pilot.
d. Ensure that telephones, one VHF and one walkie-talkie all are operational in the Port Signal Station. Listening watch to be maintained on VHF channel-08/10/16.
e. Notify to CEC, CIC, HOD and the vessels moving into, through and inside the port. Keep CIC informed of all the messages received by telephone, VHF sets or by messenger.
f. Notify the other Authorities and stakeholders within Port as per instructions of CEC/CIC.
g. Inform the Harbour Master/Flotilla Superintendent of any buoys or crafts or any Port installation is seen adrift.
h. Hoist signals or raise alarms, as per the warnings received by the competent agencies for issuing warnings.

2. Tidal observatory

Response Action
a. The Gauge Clerk will record the range of tide, time and heights of high and low water and will report to Chief Hydrographer who in turn will apprise the CIC and SIC of the actual and predicted tides.

3. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate shipboard emergency action plan.
b. Having raised the alarm, the Master will be responsible for taking all immediate steps to safeguard the vessel.
c. The Master will provide the Port Authority with details of the vessel.
d. Should follow the instruction of the CIC/SIC and be in continuous liaison with the CIC/SIC/Signal Station.
e. Should be in a state of readiness to take the vessel out of the port.

4. The terminal/berth operator should

Response Action
a. Activate EAP and inform Port and be in a state of readiness to move out all types of cargo, equipment and vehicles (mobile cranes) outside the port area.
b. Shall be responsible of shutting down of cargo operation (as per SOP and/ contingency plan) & coordinate with Port and Master of the Vessel and rendering necessary assistance to the SIC and vessel by providing emergency equipment as required.
c. Submit consolidated list of dangerous goods in port and Vessels in port. Make arrangements to protect cargo.
d. Assist IRT and provide all necessary equipment.
e. He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

Note: *It is important to understand that movable objects and structures which may float as a result of high-water levels will tend to generate flotsam and move with the current during the flooding and ebb situation of tsunami. This normally results in floating debris in large swaths causing structural, environmental and living beings damages.*
As a lifesaving measure multi-storey building higher than 45ft are considered as safe zones in coastal areas.

5. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Activate the DMP.
b. He will be stationed at EOC to review & assess possible developments to determine the most necessary course of action.
c. Give necessary instructions to SIC and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Consult with Chairman / Dy. Chairman and decide on clearing of vessels as soon as the tsunami is confirmed.
f. Plan movements of vessels such that the vessels are cleared in shortest possible time.
g. Coordinate with external agencies/authorities such as Indian Navy and ICG.
h. Be in constant touch with District and Local Administration for rescue and relief operation.
i. Terminate the response and debrief before allowing normal operation.

6. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	During Emergency shall proceed to the Signal Station and communicate & collect all information.
		Take over the charge and ensure the action plan is promulgated as per the instructions of CIC.
		Inform vessels alongside berths to double up their moorings, provide shore gang assistance and ask master's to keep their vessels ready to proceed to the sea at short notice as per the instruction of CIC.
		Keep close liaison with INCOIS, Radar Station, Police Wireless Station, ICG, and Vessels in Port.
		Ensure Signal Station, hoists appropriate signal.
		Report the situation to the CIC & the CMG.
		Keep rescue team ready with necessary equipment.
		Ensure that the hazardous cargoes are shifted out or secured/stored in a safe manner.
		Ensure that the operations are brought back to normal after the termination of the emergency procedure.
Pilot (Alternate: Pilot)	Signal Station Coordinator	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC/SIC.
		Instruct Flotilla Superintendent to secure tugs, crafts and workboats.
		He will maintain log of events.
Safety Officer (Alternate: Officer)	Safety Coordinator	Shall take orders from the SIC. Assist in evacuation of the personnel to the assembly point or as directed by SIC.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from the SIC.
		Liaise with State Fire brigade for any assistance.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Shall take orders from Sr. Commandant- CISF/SIC.
		Shall be responsible for forming a task force and will lead the same.
		Controls & directs traffic in the area.
		Shall supervise evacuation of personnel from the port at the time of emergency and moving them to identified tsunami shelters.
		Responsible for rescue operation.
Dy. Traffic Manager (Alternate:	Cargo Storage, Shed and Labour	Submits consolidated list of dangerous goods in port area.
		Coordinate with the truck contractors.

Officer)	Coordinator	Ensure availability of vehicles and mobilize and dispatch sufficient number of vehicles to the site during emergency.
		Ensure all the drains and obstructions in the creeks/ culverts are cleaned for easy discharge of sludge water.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall ensure the standard procedure has been followed and complied with by all the divisions.
		Shall form and head mitigation Team comprising of Electrical, Mechanical and Maintenance Engineers.
		All types of cranes, forklifts, heavy earth moving equipment to be secured in a safe manner.
		Shall be responsible for alternate electrical supply to vital equipment and systems at the berth.
		All electrical sub stations will be manned round the clock or person should be readily available in case of any emergency requirement.
Dy. CMO (Alternate: Medical Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
Hydrographer (Alternate: Officer)	Hydrographic Survey	Assist SIC.
Duty Pilot (Alternate: Pilot)	In-Charge of Pilotage	Shall be ready on site for taking the vessel out of berth or will not bring the vessel to berth as per the instruction given by CIC/SIC.
		Inform the Masters of all vessels at the berths to double the moorings and to keep engine ready to proceed out to sea if situation warrants.
		Decision regarding moving vessels to the anchorage will be taken depending on the strength of the tsunami likely to be encountered and number of vessels in the Port.
		Take all necessary steps for the safety of the Port crafts.
		Ensure all other crafts are placed at safe place and properly secured excepting one pilot launch and one stand by launch used for inspection and emergency duties.
		Fender and extra lengths of ropes/wires to be kept ready so as to attend to any craft whose moorings may part.

		Ensure shifting of crafts at suitable places as directed by the SIC and will secure them suitably with additional moorings.
		Extra fenders will be kept ready on board the Tug for use as required.
Material Manager (Alternate: Officer)	Material Management	Ensure availability of sufficient stock of stores like Corrugated Iron sheets, J.Hooks, screw hinges, gunny bags, tarpaulins, ropes and wires for Port Crafts, diesel oil, kerosene oil, hurricane lantern, kerosene lamps, torch lights with batteries and bulbs, electrical items etc. is kept.

POST TSUNAMI DUTIES	
Sr. no.	**Duty**
1.	All the HODs are required to assess the damage and submit a detailed report indicating the estimate to the Chairman/Dy. Chairman. For this, a team may be formed comprising Officers of Executive Engineer and above in rank at departmental level and may associate one Officer from Finance Department. The preliminary report is to be submitted. The level of restoration and efforts required to clear the area of debris, carcasses and damaged equipment will depend on the level of disaster.
2.	Hydrographic survey to be conducted to assess the channel condition and Shipping to resume as early as possible.
3.	In case of any small craft sunk or grounded, the same to be removed to make the channel/ berth safe for navigation. SIC will detail a salvage party.
4.	A team of Officers to be nominated by the Secretary to supervise the rescue and relief operation and disposal of carcasses in co-ordination with the local and District Administration.
5.	Mobile medical service, if required, to be provided by CMO. Preventive measures for epidemics to be taken.
6.	All the operating systems need to be attended urgently and made operational as early as possible on war footing basis to resume operation.
7.	Spot tendering procedure can be followed for repairs.
8.	Water supply and electricity to be given priority. The Chief Engineer (Mechanical/Electrical/Civil) shall be authorized to extend all assistance for manpower, conveyance, equipment and materials etc. to electrical board, if required, for resuming power supply. The electrical cabling network to be checked area wise.
9.	All the damaged temporary roofed warehouses are to be repaired.
10.	Material Manager will nominate a team of Officers and staff for procurement and supply of essential materials for repair of various structures and equipment as reported.
11.	To assess the progress of repair works, HOD meeting will be held daily till normalcy is restored.
12.	Damage to furniture, building fixtures may be prepared.

S15: Scenario 15

Part A:

1. **Natural Disaster (Earthquake)**
   Note: *As there are no warning signals for major earthquake the action plan will be for the aftermath of the emergency.*
2. **Precautions:** Earthquake resilient buildings, equipment (cranes), pipeline infrastructure (as per relevant standards), Periodic inspection of old structures, pipelines and their support structures etc.
3. **Impact Zone:** Entire port**.**
   Note: *The Gujarat - Kutch district falls under Seismic zone category IV/V as per the vulnerability hazard map of the region.*
4. **Resources required:** Refer Figure S15.2 and Chapter 10 for resources.

Figure S15.1: Action Flow Chart

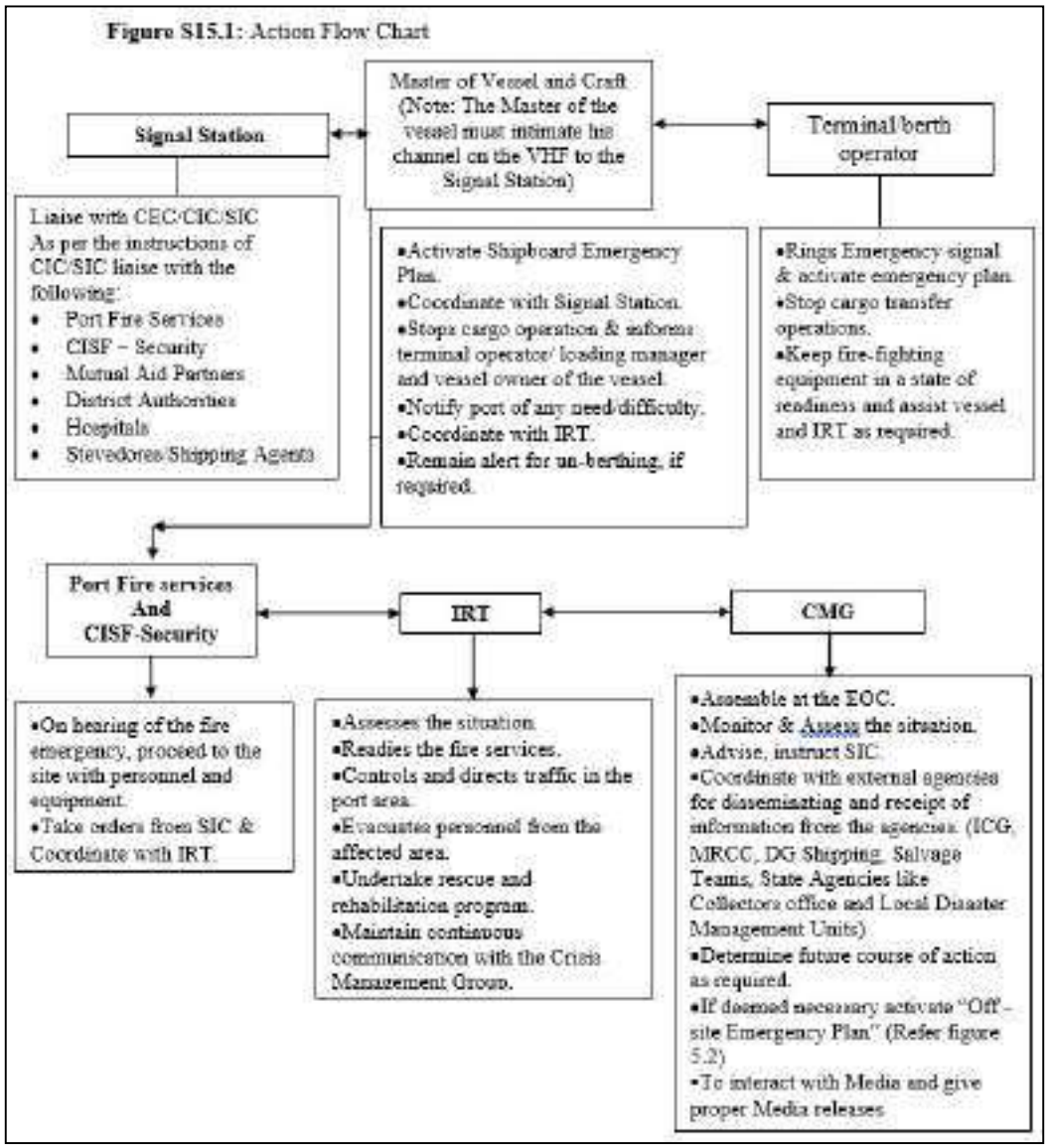
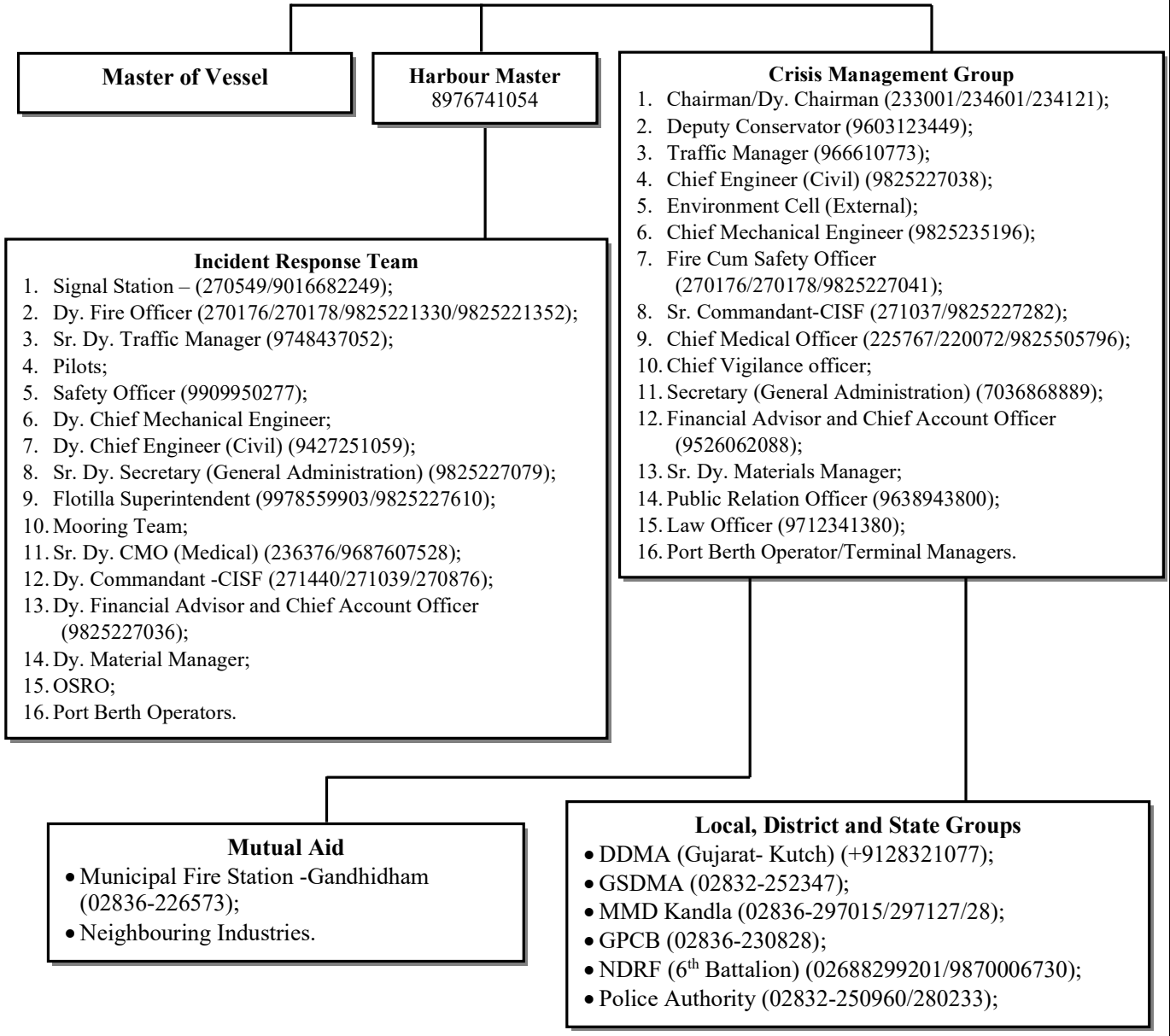


Figure S15.2: Action group



Part B: Action Plan

1. The Signal Station

Response Action
a. Gather information related to the vessel type and position in the port limit.
b. Liaise with Master of the Vessel/Pilot.
c. Ensure that telephones, one VHF and one walkie-talkie all are operational in the Port Signal Station. Listening watch to be maintained on VHF channel-08/10/16.
d. Notify to CIC, SIC and the vessels moving into, through and inside the port. Keep CIC/SIC informed of all the messages received by telephone, VHF sets or by messenger.
e. Notify the other Authorities and stakeholders within Port as per instructions of CIC/SIC.
f. Notify the information to the owner of the vessel as per the instruction of CIC/SIC/ Master of the Vessel. Pass the information to various Port departments and other Port related organizations through telephones and VHF.

2. The Master of the Vessel (Alternate: Chief Officer)

Response Action
a. Should raise vessels emergency alarm and activate ship board emergency action plan.
b. Having raised the alarm, the Master will be responsible for taking all immediate steps to safeguard his vessel.
c. The Master will provide the Signal Station with details of the vessel.
d. Should follow the instruction of the CIC/SIC and be in continuous liaise with the CIC/SIC/Signal Station.
e. Should be in a state of readiness to take the vessel out of the port, if required.

3. The terminal/berth operator should

Response Action
a. Activate EAP and inform Port.
b. Shall be responsible of shutting down of cargo operation (as per SOP and/ contingency plan) & coordinate with Port and Master of the Vessel and rendering necessary assistance to the SIC and vessel by providing emergency equipment as required.
c. Submit consolidated list of dangerous goods in port and Vessels in port. Make arrangements to protect cargo.
d. Assist IRT and provide all necessary equipment.
e. He will direct operation staff. Coordinate with the vessel in-charge/C&F agents/stevedores.

4. Deputy Conservator (Alternate: Harbour Master)

Response Action
a. Activate the DMP and OSCP (if any pollution).
b. He will be stationed in EOC to review & assess the damage and determine the most necessary course of action.
c. Give necessary instructions to SIC and Signal Station & arrange for external aid as necessary.
d. Review the situation and accordingly inform to the Chairman/ Dy. Chairman.
e. Consult with Chairman / Dy. Chairman and decide on clearing of vessels.
f. Be in constant touch with District and Local Administration for rescue and relief operation.

5. Duties of IRT

Designated Officer	Role	Duties
Harbour Master (Alternate: Pilot)	Site Incident Controller	Communicate & collect all information.
		Take charge of Signal Station and ensure the action plan is promulgated as per the instructions of CIC.
		Ensure that the operations are brought back to normal after the termination of the emergency procedure.
Pilot (Alternate: Pilot)	Signal Station Coordinator	Shall monitor the communication on VHF/any other communication medium & convey and relay messages on the advice from CIC/SIC.
		He will maintain log of events.
Safety Officer (Alternate: Officer)	Safety Coordinator	All other workers to move out to safe (open) area. Assist in evacuation of the personnel to the assembly point or as directed by SIC.
Dy. Fire Officer (Alternate: Officer)	Fire, Search and Rescue Coordinator	Shall take orders from Fire cum Safety Officer/SIC.
		Responsible for mobilizing fire tenders, men & fire-fighting equipment to the scene & extend all necessary support after the earthquake.
		Liaise with State Fire brigade for any assistance.
Dy. Commandant-CISF (Alternate: Commandant-CISF)	Security and Evacuation	Controls & directs traffic in the area.
		Shall search and rescue operations of the personnel trapped under the debris. A special task force can be formed for the same. Shifting of the injured and causalities to hospital.
		Till normality is restored, arrangements will be made for thorough checks on all out-going vehicles to guard against pilferage.
		Coordinate with the truck contractors.

		Ensure availability of vehicles and mobilize and dispatch sufficient number of vehicles to the site during emergency.
Executive Engineer (Alternate: Executive Engineer)	Civil Coordinator	Assist SIC/CIC and CISF after an earthquake emergency.
		Deploy engineers to direct or guide earth moving equipment and cranes to remove debris.
Executive Engineer (Alternate: Executive Engineer)	M & E Coordinator	Shall be responsible for Electrical supply to vital equipment and systems.
		Ensure that all Sub Stations, Power Control rooms will be inspected and made operation.
Dy. CMO (Alternate: Officer)	First Aid and Medical Coordinator	Shall be responsible to organize and dispatch first aid team with ambulance as required.
		Mobile medical service, if required, to be provided.
Material Manager (Alternate: Officer)	Material Management	Ensure availability of sufficient stock of stores like Corrugated iron sheets, J.Hooks, screw hinges, gunny bags, tarpaulins, ropes and wires for Port Crafts, diesel oil, kerosene oil, hurricane lantern, kerosene lamps, torch lights with batteries and bulbs, electrical items etc. is kept.
		Will nominate a team of officers and staff for procurement and supply of essential materials for repair of various structures and equipment as reported.

ADDITIONAL POST-EARTHQUAKE DUTIES	
Sr. no.	**Duty**
1.	All the HODs are required to assess the damage and submit a detailed report indicating the estimate to the Chairman/Dy. Chairman. For this, a team may be formed comprising Officers of Executive Engineer and above in rank at departmental level and may associate one Officer from Finance Department. The preliminary report is to be submitted.
2.	A team of Officers to be nominated by Secretary to supervise the rescue and relief operation and disposal of carcasses in co-ordination with the local and District Administration.
3.	All the operating systems to be attended urgently and made operational as early as possible on war footing basis to resume operation.
4.	Spot tendering procedure can be followed for repairs.
5.	Water supply and electricity to be given priority. The Chief Engineer (Mechanical/Electrical/Civil) shall be authorized to extend all assistance for manpower, conveyance, equipment and materials etc. to electrical board, if required, for resuming power supply. The electrical cabling network to be checked area wise.
6.	To assess the progress of repair works, HOD meeting will be held daily till normalcy is restored.

8. DISASTER RISK REDUCTION AND MITIGATION

DMP incorporates the framework for Disaster Risk Reduction (DRR) under the **six thematic areas** for action as follows

1. Understanding Risk
2. Inter-Agency Coordination
3. Investing in DRR – Structural Measures
4. Investing in DRR – Non-Structural Measures
5. Capacity Development
6. Climate change risk management.

The Disaster Risk Reduction (DRR) requires responsibilities to be shared by different divisions/departments of port and stakeholders. The effectiveness of DRR will depend on coordination mechanisms with all stakeholders.

In accordance with the Sendai framework, the measures illustrated in para 8.1 provides a brief description of actions by the port and their relevant time frames for each thematic areas in the form of responsibility matrix.
The timeframes considered for these measures are as below:

Short Term	Two years
Medium Term	Two to five years
Long Term	Ending up to 2030

8.1 HAZARD-WISE RESPONSIBILITY MATRICES FOR DISASTER RISK MITIGATION

For the successful implementation of DM plans, it is necessary to identify various stakeholders within the port and clearly specify their roles and responsibilities. For each hazard/disaster, in the subsections that follow, themes for action are presented in a separate responsibility matrix for each of the five thematic areas for action. The port will play a pro-active role in disaster situations. In the domains of DM planning, preparedness, and capacity building, the port will constantly work to upgrade DM systems and practices. This section covers the matrices for the identified hazards relevant to port as listed below:

Hazard	Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
1. Thematic area	Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Information Systems and Research	Support and coordination	• DPA, • Terminal/ Berth Operators.	• Coordination with vessel for port entry Ship to Shore checklist, • Berthing and Unberthing schedule • Allotment of tugs, • Deployment of Competent and experienced pilot, • Provision and maintenance of safe navigational channel, • Navigation support through Port Control Room, • Inventory of oils/chemicals/IMDG cargo handled.			
		Information on (operation and during emergency) dealing with HAZCHEM	• DPA, • Terminal/ Berth Operators.	• MSDS copy maintained, • Hazardous Waste Management Plan.			
		Chemical Accident Information Reporting System	• DPA, • Terminal/ Berth Operators.	• Incidents records maintained with Signal Station, Fire Cum Safety officer and terminals	• Centralized mechanism for data collection /incident database with DPA		

Hazard	Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
1. Thematic area	Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
2	Zoning/ Mapping	Industrial zones on basis of hazard potential and effective disaster management for worst case scenarios	• DPA, • Terminal/ Berth Operators.	• Navigational charts and passage plan, • Hazardous area classification for oil jetties, • Dedicated area for pipeline connections at the jetty and Y- junction.	• PESO approval for oil jetties (in process), • Safety instructions to be displayed and ensured for oil cargo handling, • Updation of zoning carried out regularly after any addition or up-gradation of the facility.		
		Carry out the mapping and related studies in collaboration with central agencies/ technical organizations	• DPA, • Terminal / Berth Operators.	• Port limit and Port layout maps, • Hydrographic survey, • Pipeline layout map, • Firefighting system layout map, • Mapped DG cargo storage and Hazardous bund area	• Updation of maps	Adhere to CRZ mapping	Land Use Plan
3	Monitoring	Monitoring compliance with safety norms for HAZCHEM	• DPA, • Terminal / Berth Operators.	• Compliance of Statutory norms, • Standard Operating Procedure,	• Installation of fire fighting system as per OISD 156		

Hazard		Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
1. Thematic area		Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
				• CCTV surveillance • Record keeping of MSDS	standard at oil jetties.		
		Disposal of hazardous waste	• DPA, • Terminal / Berth Operators.	• Recording and Monitoring of generation of hazardous waste, • Disposal of waste through GPCB approved waste management parties.			
4	Hazard Risk Vulnerability and Capacity Assessment (HRVCA)	Undertake and provide technical support to HRVCA as part of preparing and periodic revision of plans and risk assessment	• DPA, • Terminal / Berth Operators.	• Port DMP as per Disaster Management Act -2005, NDMA Guidelines 2018 and NDMP 2019, • Risk Assessment, • Port OSCP, • Port CMP, • Navigational Risk Assessment, • Emergency Action Plan (EAP), • Emergency Response Disaster Management Plan (ERDMP).	• Periodic update plans and related documents		
		Constitute/ strengthen the mechanism for consultation with experts and stakeholders	• DPA, • Terminal / Berth Operators.	• SOPs, • Revamping of oil jetty product pipeline, • Audits (Structural, Fire,	• Execute plans for removal of abandoned pipelines at Oil		• Land Use Plan, • Business Development

Hazard		Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
1. Thematic area		Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
				Safety and Navigational, Electrical), • Safety Committee Meetings, • Mock Drills, • Training and Awareness, • Land use planning.	Jetties. • Implementation/ execution of the decision taken during the safety committee meetings in a time bound manner.		Plan, • Environment Management Plan.

Hazard	Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
2. Thematic area	Inter- agency coordination					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Overall disaster governance	Providing coordination, technical inputs, and support, Periodical inspection from competent agencies.	• DPA, • Terminal / Berth Operators.	• EOC - E-Drishti Command and Control Centre, • Coordination with DRR Cell (at Ministry level), • Coordination with SDMA and DDMA, • PNGRB, PESO, GPCB, OISD, MoEF, ICG, Navy, NDRF, Dock Safety, Electrical inspector.	• Compliance to recommendations.		
		Address/ identify gaps in equipment/ infrastructure and human resources with DM tasks	• DPA, • Terminal / Berth Operators.	• Developmental project reports, • Safety Committee Meetings, • Audits.	• Gap analysis / Periodic reviews in equipment/ infrastructure and human resources.		
2	Warnings, Information, data	Effective coordination and seamless communication among various stakeholders	• DPA, • Vessel Master, • CISF, • Terminal Operators.	• Signal Station, • VHF/UHF, • Satellite Phone, • Mobile/Landline, • PA system, • Emergency Siren, • Email.			
		Dissemination of warnings and information	• DPA, • Vessel Master, • CISF,	Dissemination of information to/from • Vessel Master,			

Hazard		Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
2. Thematic area		Inter- agency coordination					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
			• Terminal / Berth Operators, • Local and District Authority.	• CMG, • MoPSW, DG shipping, DDMA/SDMA, IMD, ICG, MMD, PESO, GPCB, Navy, Marine Police, Local Authorities,			
3	Response	Organizing and coordinating with Government agencies and stakeholders of the port	• DPA, • Vessel Master, • CISF, • Terminal / Berth Operators.	• Coordinating with CMG, • Coordinating with Vessel Master, • Coordinating with DG Shipping, NDMA, SDRF, DDMA, Local admin., ICG, IMD, MMD, PESO, GPCB, Navy, etc., • Vessel restriction guideline.	• Mutual aid agreement with relevant stakeholders.		

Hazard	Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
3. Thematic area	Investing in DRR – Structural measures					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Evacuation and support facilities. Multiple routes for reliable access and escape. Decontamination facilities	• Identification of hospitals and first aid	• DPA, • CISF, • Terminal / Berth Operators, • Local Authorities.	• Port Hospital, • Tie up with nearby hospitals, • First Aid centers, • Ambulances.		• Expansion of Hospital facilities	
		• Ensuring freshwater storage facilities for drinking purpose	• DPA	• Municipal water supply, • Water tankers.			
		• Providing wide roads and multiple routes to allow quick access by first responders and to ensure escape pathways	• DPA	**Evacuation by Land facilities** • Entry-exit Gate available, • Internal roads, • Port and hired vehicles, • Individual terminal vehicles, • Coordination with Local administration, • Land Use Planning **Evacuation by sea route facilities** • Port owned/hired crafts	• Vehicle Traffic management should be made available. • Repair of access roads, • Providing alternate evacuation/emergency gates		
		• Establish decontamination facilities	• DPA	Personnel decontamination • Port Hospital, • Tie up with nearby hospitals, • First Aid Facilities, • Eyewash and Safety			

Hazard		Chemical Disaster (Oil Jetties 1 -7, Container Terminal, Navigational Channel)					
3. Thematic area		Investing in DRR – Structural measures					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
				Showers.			
2	Disaster Response equipment	Ensuring and maintaining fire-fighting equipment (as per OISD and other relevant requirements)	• DPA, • Terminal / Berth Operators.	• Fire-fighting systems as per relevant standards, • Port Fire Station, • Fire Water storage facilities, • FIFI Tugs.	• Provision of Fire-fighting as per OISD-156 at Oil Jetties.		
		Ensuring and maintaining oil pollution response equipment (as per ICG requirements)	• DPA, • Terminal / Berth Operators.	• Pollution response equipment of Port maintained by OSRO – Sadhav Shipping Ltd.	• Provision of OSR equipment as per ICG requirement for Tier I facility.		

Hazard		Chemical Disaster (Oil Jetties 1 -7, Container Terminal)					
4. Thematic area		Investing in DRR – Non- Structural measures					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Laws Regulations, Techno Legal regimes Enforcement, compliance and Monitoring Institutional arrangements	Formulate/ strengthen the SOP for the compliance w.r.t. the statutory requirements ensuring greater safety in hazardous industries and reduce the likelihood of disasters	• DPA, • Terminal / Berth Operators.	• Periodical inspection and testing of Oil/chemical Pipelines, • Periodical inspection and testing of Hoses and fire-fighting systems, • Audits - Fire, Safety, • Navigational Safety Audit, • Risk Assessment, • Safety committee meetings.	• Compliance of recommendations.		
2	Risk Transfer	Insurance	• DPA, • Terminal / Berth Operators.	• Workmen Compensation Policy, • Public Liability Insurance, • Port Package Policy for entire set of risk to the port.	• Periodic Renewals of Policies.		

Hazard	Chemical Disaster (Oil Jetties 1 -7, Container Terminal)					
5. Thematic area	Capacity Development					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Training	• Training and orientation programs on management (handling, storage and transfer) and disposal of HAZCHEM • Incorporating disaster response, search and rescue in the training programs	• DPA, • Terminal / Berth Operators, • CISF.	• IMO level training (OSR) for the identified personnel, • ISO and OHSAS training, • Fire-fighting training, • Safety Training, • First Aid training, • CBRN training, • Hazard identification and management training, • Annual training schedule.			
2	Mock drills/ Exercises	• Planning and execution of emergency drills by all the stakeholders	• DPA, • Terminal / Berth Operators, • CISF, • Other stakeholders.	• Mock drills, • Annual drill schedule.	• Mock Drill should be conducted regularly with all the stakeholders		
		• Joint planning and execution of emergency drills	• DPA • Terminal / Berth Operators, • CISF, • Other stakeholders.	• Organize and participation (involving all the stakeholders) mock-drills through various government agencies like ICG, CISF, NDRF, NSG, SDMA, Local authorities, etc.			

Hazard	Chemical Disaster (Oil Jetties 1 -7, Container Terminal)					
5. Thematic area	Capacity Development					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
3	Documentation	Ensure accurate documentation of all aspects of disaster events for creating good historical records for future research and Risk Management planning	• DPA, • Terminal / Berth Operators, • CISF.	• Maintenance of the incident and near miss record. • Accident/incident reporting, analysis, investigation and implementation of recommendations.	• Centralized mechanism for documentation		
4	Awareness	Promote culture of disaster risk prevention, mitigation, and better risk management	• DPA, • Terminal / Berth Operators, • CISF, • Other stakeholders.	• Quarterly Dock Safety committee meeting • Safety Campaigns, Dock Safety week, • Notification for Dangerous Goods as per relevant Regulation of Dock workers (Safety, Health and Welfare). • Safety Inspection of port, • Training center for safety and productivity re-engineering & container-based training center, • Preparation and updation of Safety manual, • Preparation of Ship bunkering guideline,			

Hazard	Chemical Disaster (Oil Jetties 1 -7, Container Terminal)						
5. Thematic area	Capacity Development						
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
				• Circular for restriction of usage of mobile phones in oil jetty and promote safety culture, • Safety Advisories to port users for preventing dangerous occurrence of incidents, • Pocket booklet of traffic safety management.			

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station / Godown/ Hospital / Command and Control Center)					
1. Thematic area		Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Information Systems and Research	Support and coordination	• DPA	• Port Fire Stations, • Support from terminals and neighboring industries, • Nearby - fire station.			
2	Zoning/ Mapping	Mapping of sites that pose fire risks	• DPA, • Terminal / Berth Operators.	• Fire system layout, • Electrical system layout, • Coal and sulphur stack yard identified as a fire risk zone.	• Update layout plans.		
3	Monitoring	Monitoring compliance with safety norms	• DPA, • Terminal / Berth Operators.	• Firefighting and extinguishing system as per the requirements, • CCTV surveillance, • Manning/Patrolling of the areas.	• Periodic reviews about the efficacy.		
4	Hazard Risk Vulnerability and Capacity Assessment (HRVCA)	Undertake HRVCA as part of preparing and periodic revision of DM plans	• DPA, • Terminal / Berth Operators.	• Port DMP as per Disaster Management Act -2005, NDMA Guidelines and NDMP, • Port CMP, • Emergency Action Plan (EAP)	• Periodic updation of plans.		
		Constitute/ strengthen the mechanism for consultation	• DPA, • Terminal / Berth Operators.	Mechanism for strengthening of the port disaster management through • Periodical inspection and testing of response equipment,	• Compliance of recommendations		

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station / Godown/ Hospital / Command and Control Center)					
1. Thematic area		Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
		with experts and stakeholders		• Fire Audit, • Capacity analysis, • Drills, • Training and Awareness, • Safety Committee meetings.			

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station / Godown/ Hospital / Command and Control Center)					
2. Thematic area		Inter- agency coordination					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Overall disaster governance	Identify and address the gaps in existing capabilities, equipment, infrastructure, and human resources	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• EOC - E-Drishti Command and Control Centre, • Periodic reviews and upgradation of the fire systems/equipment and manpower as per the relevant standards and best practices.	• Mutual aid agreement for sharing of resources.	• Install and upgrade systems as per periodic reviews	
		Establish fire stations	• DPA.	• Port Fire stations, • Identified list of nearby Fire Stations.			
		Implementation of DM plans	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Conducting fire and evacuation drills, • Training and Awareness.	• Implementation of the updated DMP.		
2	Warnings, Information, data	Effective coordination and seamless communication	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	Coordination and effective dissemination of warnings, information and data via • VHF, • Landline, • PA system, • Mobile Phones, • Emergency Siren, • Email.			

Hazard	Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station / Godown/ Hospital / Command and Control Center)						
2. Thematic area	Inter- agency coordination						
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
3	Response	Organizing and coordinating the immediate response Coordinate with Government agencies and stakeholders of the port	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Activation of DM Plan, • Coordinating with Fire stations (Port & External), • Coordination with SDMA and DDMA.			

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station /Godown/ Hospital / Command and Control Center)					
3. Thematic area		Investing in DRR – Structural measures					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Smoke, Heat, Fire detection and fire-fighting systems	Procurement and maintenance of fire Fighting systems as per relevant Standard and Rules	• DPA, • Terminal / Berth Operators.	• Periodical testing and maintenance of the Portable and fixed fire-fighting facility.	• Installation/ up-gradation of the fire-fighting system.		
2	Evacuation and support facilities. Multiple routes for reliable access and escape.	Identification of Assembly points	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Identified assembly points.	• Updation of assembly points and sign boards. • Display of evacuation maps at suitable locations for buildings.		
		Providing vehicles for safe transportation	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	List of • Passenger vehicles of DPA (hired or tie up). • Passenger vehicles of operators, • Passenger vehicles of CISF.	• Periodical repair of Internal roads.		

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station /Godown/ Hospital / Command and Control Center)					
3. Thematic area		Investing in DRR – Structural measures					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
3	First aid and Decontamination facilities	• Establish First aid and decontamination facilities • Identification of hospital	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	Personnel first aid and decontamination • First Aid Centre • Port Hospital, • Other identified hospitals as per **Annex B**.			

Hazard	Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station /Godown/ Hospital / Command and Control Center)						
4. Thematic area	Investing in DRR – Non- Structural measures						
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Rules, laws, guidelines	Strict implementation and strengthening of fire safety rules	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Safety Committee Meeting, • Environment, Health and Safety Policy, • Safety budget, • Work Permit System.	• Fire-fighting and evacuation plan.		
2	Fire safety audit of structures and buildings	Carry out fire safety audit of buildings and critical infrastructure	• DPA, • Terminal / Berth Operators.	• Periodical Fire audit, • Periodical Electrical audit. • External Safety Audit by OISD and NSC, • Compliance of Statutory requirements in coordination with Inspectorate of Dock Safety	• Compliance of recommendations.		
3	Risk Transfer	Insurance	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Workmen Compensation Policy, • Public Liability Insurance, • Port Package Policy for entire set of risk to the port.	• Periodical renewal of policies.		

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station /Godown/ Hospital / Command and Control Center)					
5. Thematic area		Capacity Development					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Training	Incorporating disaster response in the training programs	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Induction/Refresher Training, • Fire-fighting training, • First Aid training.			
2	Mock drills/ Exercises	Planning and execution of emergency drills by all the stakeholders Joint planning and execution of emergency drills	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Fire and evacuation Mock drills.	• Annual Drill schedule.		

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station /Godown/ Hospital / Command and Control Center)					
5. Thematic area		Capacity Development					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
3	Documentation	Ensure accurate documentation of all aspects of disaster events for creating good historical records for future research and Risk Management planning	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Maintenance of the incident and near miss record, • Accident/incident reporting, analysis, investigation and implementation of recommendations.	• Centralized mechanism for the accident / incident and near miss record.		
4	Awareness	Promote culture of disaster risk prevention, mitigation, and better risk management	• DPA, • CISF, • Terminal / Berth Operators, • Hospital.	• Quarterly Dock Safety committee meeting • Safety Campaigns, Dock Safety week, • Notification for Dangerous Goods as per relevant Regulation of Dock workers (Safety, Health and Welfare). • Safety Inspection of port, • Training center for safety and productivity re-engineering &	• Promote awareness by posting details of activities on social media platforms regarding important events.		

Hazard		Fire (Coal stackyard/ Office Buildings / Fire station / Electrical Substation / Signal Station /Godown/ Hospital / Command and Control Center)					
5. Thematic area		Capacity Development					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
				container-based training center, • Preparation and updation of Safety manual, • Preparation of Ship bunkering guideline, • Circular for restriction of usage of mobile phones in oil jetty and promote safety culture, • Safety Advisories to port users for preventing dangerous occurrence of incidents, • Pocket booklet of traffic safety management.			

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
1. Thematic area		Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring /Regular measures**	**Short term**	**Medium term**	**Long term**
1	Observation networks, Information systems, Research, Forecasting, Early warning	Enhancement of Observational Network Stations (ONS)	• DPA	Wind and cyclone: • Internet sources, • IMD Bulletins, • NAVAREA warnings. Flood: • Tide/Bore tide gauging, • Sea and creek water level monitoring, • IMD bulletins, • CWPRS/PWD bulletins, • Hydrographic study.			
		Establishment of at least one High Wind Speed Recorder and one surge recorder		• Wind speed recorder at Signal Station.	• Surge Recorder.		
2	Zoning / Mapping	Identification of the vulnerable areas	Not applicable to port for zoning and mapping.	• Cyclone hazard map (Very High damage risk zone – maximum wind speed of 50 m/s). • Flood: Due to its geographical situation, the Kutch district is not vulnerable to occurrence of Flood. • Earthquake: Kutch district fall	Maintenance and new construction of drainage system		

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
1. Thematic area		Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring /Regular measures**	**Short term**	**Medium term**	**Long term**
				under High to Very High earthquake damage Risk zone (zone category IV & V).			
				• Earthquake hazard map as given in BMTPC.	The requirements of BIS standard 1893-2016 are to be complied with for seismic zone V as per BMTPC chart.		
				Tsunami hazard map as per Gujarat State Disaster Management Authority.			
3	Monitoring	System to monitor natural disaster	• DPA	Wind and Cyclone, Flood monitoring via • TV /Radio, • IMD bulletins. Tsunami monitoring via • Forecasting agencies, • INCOIS.			
4	Hazard Risk Vulnerability and Capacity	Undertake HRVCA as part of	• DPA, • Terminal / Berth Operators	• Port DMP as per Disaster Management Act -2005, NDMA Guidelines and NDMP,	Periodic update Plans		

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
1. Thematic area		Understanding Risk					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring /Regular measures**	**Short term**	**Medium term**	**Long term**
	Assessment (HRVCA)	preparing and periodic revision of DM plans		• Emergency Action Plan (EAP), • Port CMP, • Emergency Response Disaster Management Plan.			
		Constitute/ strengthen the mechanism for consultation with experts and stakeholders	• DPA, • Terminal / Berth Operators	Mechanism for strengthening through • Project development reports incorporating effective draining and anti-flooding measures, • Hydrographic Survey.			Land use planning

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
2. Thematic area		Inter- agency coordination					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Overall disaster governance	Providing coordination, technical inputs, and support.	• DPA, • Terminal / Berth Operators.	• EOC - E-Drishti Command and Control Centre, • Coordination with IMD, CWPRS, PWD, INCOIS • Coordination with DRR Cell (at Ministry level), DG Shipping, SDMA and DDMA, • As per NDMA Guidelines for Cyclone, Flood and Earthquakes			
2	Warnings, Information, data collection	Effective communication to ensure quick, clear, effective dissemination of warnings, information and data.	• DPA, • Terminal / Berth Operators, • Vessel Master, • CISF.	Effective communication via: • Signal Station, • VHF/UHF, • Landline/Mobile, • Satellite phones, • Email, • PA System. • Tide tables.			
3	Response	Coordinating with port stakeholders and Government agencies	• DPA, • Terminal / Berth Operators, • Vessel Master, • CISF.	• CMG group, • Vessel Master, • NDRF, SDRF, GPCB, Civil Defense, Local authorities, • ICG and Navy.			

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
3. Thematic area		Investing in DRR – Structural measures					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Multi-Purpose Shelters	Identification of safe buildings and sites with basic facilities like drinking water, food, sanitation and first aid to serve as temporary shelters for people evacuated from localities at risk.	• DPA, • Terminal / Berth Operators.	• Identified nearby shelters such as schools, community halls, etc. • Identified shelters for tugs and crafts (Refer Chapter 10)			
2	Hospitals and First Aid Centres	• Identification hospitals and first aid	• DPA, • Terminal / Berth Operators, • Hospital.	• Port Hospital, • Tie up with nearby hospitals, • First Aid centers.			
3	Civil works	• Upgrade and maintenance of the existing systems/ facilities	• DPA, • Terminal Operators/ Berth.	• Periodic maintenance of drainage system, • Availability of dewatering pump system. • Refurbishment of old dry cargo berths, open plots, roads, drainages and warehouses. • Seismically safe design and construction of jetties, trestles,	• CSR activity like improving/ providing the drainage system • Strengthening and seismic retrofitting as per recommendatio		

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
3. Thematic area		Investing in DRR – Structural measures					
Sr. no.	**Sub-thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
				pipeline trestles, office buildings and utilities.	ns of structural audits		
4	Strengthening and retrofitting of prioritized vulnerable and critical structures	• Ensure compliance with relevant building codes or hazard resistant construction	• DPA, • Terminal /Berth Operators.	• Implementation in compliance with relevant building codes/ standards/ technical guidance. e.g. NDMA guidelines for Tsunami and Earthquake			
		Identification and repair/ retrofitting of houses and buildings as per the recommendations of structural audit Detailed assessment of hazard to the structure and foundation and the benefits of strengthening	• DPA, • Terminal /Berth Operators.	• Periodic inspection of vulnerable/critical structures (electrical sub stations, warehouse, fire station, office buildings, marine structures, etc.). • Repairs/ retrofitting done as and when required for tsunami resistance, • Refurbishment of old dry cargo berths, open plots, roads, drainages and warehouses.			

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
4. Thematic area		Investing in DRR – Non- Structural measures					
Sr. no.	**Sub- thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Regulation and enforcement of relevant laws	Ensure compliance with coastal environment protection laws and regulations such as the CRZ	• DPA, • Terminal / Berth Operators.	• EIA / EMP recommendations regarding environment sustainability measures viz air quality, sewage and effluent. • Implementing land-use regulation as per flood control norms. • Implementation of GSCZR			• Land-use planning
2	Operation and Maintenance of Drainage Systems	Budgetary Provision	• DPA	• Adequate budget to be provided to take care of the men, material, equipment and machinery for O&M of drainage systems.			
3	Non-structural shore stabilization measures and bio-shields	Establishment of bio-shields like mangroves, as natural defense	• DPA	• Plantation of mangroves			
3	Risk Transfer	Insurance	• DPA, • Terminal / Berth Operators.	• Workmen Compensation Policy, • Public Liability Insurance, • Port Package Policy for entire set of risk to the port.	• Periodic Renewals of Policies		

Hazard	Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
5. Thematic area	Capacity Development					
Sr. no.	**Sub- thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Training	Training and awareness regarding cyclone related emergencies and do's and don'ts	• DPA, • Terminal / Berth Operators, • Hospital.	• Training and awareness as per NDMA guidelines • Training by Civil Defense and other agencies			
2	Mock drills/ Exercises	Joint planning and execution of emergency drills	• DPA, • Terminal / Berth Operators, • Hospital.	• Participation in drills/exercises with the District and State Disaster Authorities.			

Hazard		Natural Disaster (Wind and Cyclone, Flood, Earthquake, Tsunami)					
6. Thematic area		Climate change risk management					
Sr. No	**Sub- thematic area**	**Plan components**	**Responsible section**	**Recurring / Regular measures**	**Short term**	**Medium term**	**Long term**
1	Climate change adaptation (CCA)	Sensitization and awareness creation	• DPA, • Terminal / Berth Operators.	Port has taken an initiative related to environmental protection as part of Green Port Initiative from GoI. This includes • Monitoring of the level of air, water and soil pollution regularly, • Provision of curtain barrier for coal dust pollution, • Installation of Dry fogging and sprinkler system (Dust suppression system). • Prohibition of disposal of all kind of garbage in creek. • Capital and Maintenance Dredging.	• Use of renewable energy • Use of Ship-shore power supply	• Use of battery power tugs	• Setting of Hydrogen Hub

8.2 MAINSTREAMING DISASTER RISK REDUCTION

The objective of mainstreaming is ensuring the ongoing and new development projects of the port leading to integration measures. The sub-thematic areas where such measures can lead to DRR are as follows:

1. Awareness and understanding of disaster risk;
2. Disaster governance;
3. Disaster risk transfer;
4. Institutional arrangements and capacity development;
5. Budget allocations for integrating DRR into development programs;
6. Project appraisals, scrutiny of development plans, effective and detailed land-use plans, from the point of view of expected hazards;
7. Setting targets and monitoring mechanisms.

In the context of above sub-thematic areas, the following measures may lead to mainstreaming DRR:

8.2.1 INVESTING IN DRR – STRUCTURAL MEASURES

The port is constructing marine and critical infrastructure (e.g., Jetty, Transfer pipeline and support structure, Drainage system, buildings, godowns etc.) as per relevant standards.

8.2.2 INVESTING IN DRR – NON-STRUCTURAL MEASURES

Port land area is being used for activities such as harbour area, industrial area, road network, water supply network, storm water drainage system and greenbelt/green cover.

Measures instituted includes Preparation and Implementation of the following:

- Port Policy, Rules and Regulations,
- Circulars,
- Notices,
- SOPs,
- Operational Manuals and Guidelines.

8.2.3 CAPACITY BUILDING

Port takes initiative by deputing various personnel to attend and undergo various trainings such as Disaster and Safety Management, Oil Spill Management, Fire & Safety, Dock Safety, First Aid etc.

Port undertakes consultative measures with expert agencies such as IITs, Govt. Departments, technical Universities and private institutions for advice in Land use planning, port development, projects implementation, environmental management and training of personnel. It will also conduct and participate in awareness programme through agencies such ICG, Civil Defence, NDRF, SDRF, GSDMA, DGFASLI, Security services etc.

8.3 DISASTER RISK GOVERNANCE PROGRAMMES AND PRACTICES

8.3.1 Environmental macro level-Coastal zone monitoring

The macro level monitoring includes following aspects.

1. Master planning of the port facilities with respect to the traffic forecast and identification of projects.
2. Environmental impact analysis, land use planning and finalisation of the location of the projects.
3. Finalisation of the Port's conceptual plan for future development.
4. The port's plans for Integrated Management System (IMS), including ISO-14001 Environment Management System.
5. Obtaining statutory permissions like Environmental Clearance, Consent to Establish/Operate from the MoEF & CC, PESO approval and State Pollution Control Board.

8.3.2 Micro Level Monitoring

The port undertakes various initiatives at the micro level which are as follows:

- Plantation of trees for a green belt.
- The level of air, water pollution to be monitored regularly and required steps to retain the pollution level within the permissible limit taken.
- Maintenance of Drainage system.
- Obtaining environmental clearances for projects and monitoring of the pollutants during the execution of the project as per the approved Environmental Management Plan (EMP).

In addition, the port maintains the CSR program and issues are highlighted periodically for implementation.

8.4 CLIMATE CHANGE RISK MANAGEMENT AND DRR

The SDG Goal 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) has set targets for significant reduction of marine pollution and aims to minimize.

In respect of aspects relating to climate change the following plan/procedures by port have been identified having bearing on disaster risk reduction and resilience:

- Plantation of trees for green belt and utilisation of non-conventional energy sources.
- The level of air, water and soil pollution to be monitored regularly and required steps to retain the pollution level within the permissible limit taken.
- Sea level rise – Minimum height of landside construction above Mean Sea Level (MSL) will be adequately planned for developmental activities.
- Heavy rainfall (cloudburst) and flooding – Land use planning and the detailed development thereafter will factor-in the requirements of natural slope, land topography, storm water drainage, height and width of culverts, natural drainage for ponds.
- High wind and cyclone – Implementation of SOPs for preventing damage during an event.

8.5 BUDGETING AND FINANCIAL ARRANGEMENTS

8.5.1 DM Budget

The port will assign sufficient funds towards disaster management under following broad categories as follows:

i. DRR measures (Structural and Non-structural):

- Firefighting and Oil Spill Response Equipment;
- Tugs;
- Navigational aids;
- Training of Personnel;
- Risk Transfer – Insurance;
- Civil works –Jetty-fenders-Repair and maintenance.

ii. Restoration Measures:

- Administrative building damage;
- Power Supply;
- Damage to tugs;
- Damaged buoys- loss of buoys;
- Repair of damaged roads;
- Injury & infection-medical treatment;
- Flooding & stagnant water - clean drains;
- Electrical & Mechanical works;
- Civil works –Jetty-fenders-Damage Repair.

8.5.2 Insurance of Port Assets

The Insurance cover for the port assets/properties should be as follows

1. Building, workshop and other structure inside port;
2. Navigational aids structures and equipment;
3. Fire-fighting aids;
4. Jetty;
5. Port Equipment;
6. Floating craft;
7. Electrical Installations.

9. RECOVERY AND BUSINESS CONTINUITY

9.1 RESPONSIBILITY FOR TERMINATING THE RESPONSE

The decision to terminate a response is taken by the CIC in consultation with the CEC.

9.2 CONDITIONS FOR TERMINATION

9.2.1 **In the case of Natural Disasters** Response action can also be terminated as per the information received from the "Competent early warnings agencies e.g., IMD" (Refer 7.1.5)**.**

9.2.2 **Fire Extinguishing operation** should be terminated when:

- Fire has been completely extinguished,
- Area has been declared as "Risk or Hazardous or Smoke' free area.

9.2.3 **Marine Response Operations in case of oil spill** should be terminated when:

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

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

9.2.4 **Shoreline Response Operations** should be terminated when:

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

Shoreline cleanup operations may be terminated only upon the instruction of the **GPCB/ICG.**

9.2.5 **Land Spill Response Operations** should be terminated when:

- Area has been declared "Risk or Hazardous" free.
- Source of leakage is stopped and the condition of the area is safe for operation.

9.2.6 **Human Induced Disasters** response may be terminated when

a. War and terrorism threats are evaluated by the security agencies and as such the response will be terminated gradually in stages as per the input received from them.
b. Bomb threat related response will be terminated on case to case to basis as per instructions from district and state authorities.

9.3 STAND-DOWN PROCEDURES

9.3.1 Return of Equipment

Upon completion of the response, the SIC (or delegate) will:

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

9.3.2 Debrief

The SIC may hold a post-incident debriefing. Debriefing should address:

- Spill causes (if known) and future prevention methods.
- Speed of response activation.
- Effectiveness or suitability of strategies, tactics and equipment.
- Health and Safety issues (if any).
- Any other issues required to be communicated.
- Damage in terms of life, injury and loss of property should be assessed.

9.3.3 Incident Report

The CEC may request the preparation of an Incident Report.

9.3.4 Cost recovery

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

9.4 DAMAGE, LOSS AND NEED ASSESSMENT

9.4.1 Initial Damage Assessments

Following any major disaster, rapid assessment of damage is important for restoring the facilities, resuming Port operations and cost recovery. In certain cases e.g. terrorism and security related, thorough site or damage assessment is not possible immediately after an event. Access to, and assessment of Port facilities and its contents may be delayed for a period of time. The delays may be due to possible loss of structural integrity, necessary forensic investigation, or the existence or potential existence of hazardous materials.

Immediately following a disaster and as soon as it is safe to do so, the designated team shall conduct a preliminary damage assessment.

9.4.2 Secondary Damage Assessments/Temporary Repairs

Once the affected site is approved for entry, a Damage Assessment Team will conduct a thorough assessment. This assessment will focus on those assets needed to facilitate a rapid recovery such as electric power, communications and transportation. The assessment should also identify any potential environmental issues that require immediate attention. Damage should be noted in enough detail to allow it to be communicated to begin developing action plans for recovery. Local utility companies need to be contacted at this time for anticipated schedules for restoration of critical utility services.

9.4.3 Assessment of Damage to Navigational Channel

Assessment of damage to the berthing and navigation portion area of the channel and Aids to Navigation is under the jurisdiction of the port. The Harbour Master will provide a status report of the condition of the channel to the Deputy Conservator.

9.4.4 Potential loss estimates analyzed include

- Physical damage to buildings, critical facilities and infrastructure.
- Economic loss, business interruptions, repair and reconstruction costs.
- The decision to rehabilitate or abandon port structures depends on the extent of damage, importance of the structure, and limits on its use. Aspects of an inspection may include:
  - An underwater inspection by divers to check for possible demolition damage or deterioration of footings.
  - An inspection of the piling at low water from a boat to check for decay or damage. The stringers and deck are examined from below to determine the need for repair.
  - Jetty will be inspected for damage.
  - Assessment of buildings to ensure that damaged or repaired buildings are safe for occupancy.

9.5 RECOVERY PLANNING

9.5.1 Short-term recovery planning

Short-term recovery planning runs parallel to short term response and begins during and immediately after an incident.

9.5.2 Medium-term recovery planning

In the medium-term recovery planning, port will engage in contracting and setting up for large scale reconstruction and reconstitution operations. This may include financial planning, contracting, and the formation of joint venture agreements to assist in long-term business continuity.

The reconstruction activities may require an Environmental Impact Assessment. The lessons learned about the disaster impact and failures will be incorporated based on reviews of latest standards and global best practices to ensure a "**Build Back Better"** approach.
These steps will involve the following;

a. Debris Removal,
b. Emergency Protective Measures,
c. Repair to Pre-Disaster Condition including improved resilience.

9.5.3 Long-term recovery planning

In the event that a part or the entire port becomes unusable or requires rebuilding, the long-term reconstruction considerations will be taken by stakeholders considering the financial planning, budgetary support and other resources.

9.6 RE-OPENING OF BERTHS TO VESSELS

In the event of damage to the port infrastructure during the disaster and subsequent recovery, steps will be taken by the management in consultation with MoPSW to open the port and navigational channel to resumption.

9.7 ENSURING BUSINESS CONTINUITY (General Guidelines)

9.7.1 OBJECTIVES

- Port resuming business operations as quickly and efficiently as possible.
- Preservation of cargo transport and supply chains.
- Developing partnerships between the public and private sector with a view to improve resiliency.
- Assessing and determining resources required to mitigate economic impacts of an incident on the port and its businesses.
- Determining how to create redundant and resilient power, water, sanitation, and data storage systems.

9.7.2 BUSINESS IMPACT ASSESSMENT

In the case of Level 2 and Level 3 disasters where serious disruptions in port business is possible due to collapse and damage to infrastructure and services in addition to human casualties, the process of recovery is conducted by undertaking a Business Impact Assessment (BIA). The following table lists the involvement of various authorities in case of major disasters.

Table 9.1: Involvement of Authorities for Level 2 and 3 type disasters

SCENARIOS	LEVEL 2 & 3 – ACTION BY
Vessel- Collision/Grounding-Evacuation	IRT + CMG + Salvage efforts + Navy + ICG
Casualties	Port + District + State
Fire & Explosion on Vessel or Terminal	IRT + CMG + Terminal + District (Fire wing)
Fire in Office buildings, Hospital, Electrical substations, Pump houses and control rooms, Dry docks, Godowns, Coal stack yard	IRT + CMG + Port Fire team + District (Fire wing)
Oil or Chemical Spill	IRT +CMG + Master of vessel + OSRO + ICG + District/state assistance
Toxic Gas Leakage	IRT + CMG + Master of vessel + District/state assistance + outside agencies
Cyclone, Tsunami, Flood, Earthquake	IRT + CMG + Master of vessel + Terminal +National Disaster Management Group + CMG + District + State
Human related – Bomb threat, War and terrorism	CISF (Security) + CMG+ Terminal + National Disaster Management Group + District + State

9.7.2.1 TOLERABLE RECOVERY TIME

The Port EOC will provide the initial response to a major disaster and stakeholders will have assigned unique functions on their respective parts for recovery and restoration efforts. Each stakeholder is expected to maintain their respective business recovery plan for use and activation. It has to be kept in mind that the business impact of the identified disasters will be in accordance the vulnerability profile of the port. Thus, a concept of "tolerable recovery time" for resuming business operations after an emergency is an important part of business continuity plan. The maximum tolerable recovery duration for some of the emergencies will be as follows:

1. 2 days for transport accident scenarios (rail and road);
2. 2 days hours for utility functional failures;
3. 4 days for collision, grounding and fire related disasters;
4. 2-4 days for disasters in service and administration facilities;
5. 21 days for Natural disasters;
6. 30 days for disasters during cargo storage or transfer.

The following table list the tolerable recovery times for the port for various identified scenarios as per HRVCA (Refer Risk assessment report).

Table 9.2: Time to Restore for identified scenarios

EVENT/SCENARIO SPECTRUM	TIME TO RESTORE FACILITIES
DISASTER DURING CARGO STORAGE/TRANSFER	
Fire due to rupture/leakage of POL/Chemical from pipeline/hose at oil jetty (oil jetties 1-7) – on vessel or ashore	2-30 days
Fire /Explosion due to LPG leakage at Oil Jetty 1 – on vessel or ashore	2-30 days
Toxic product (e.g. ammonia) leak from pipeline/hose at jetty during operation (oil jetties 2-5) – on Vessel or Ashore	2-7 days
Corrosive Acid - Leakage (e.g. Sulphuric acid, phosphoric acid) at oil jetty-5 during operation – on Vessel or Ashore	2-4 days
Fire /leakage due to Crane Accidents (Container drop/crane fall) at container berth – secondary event.	2-7 days
Fire on vessel (non-tankers) at berth	2-4 days
Fire in Coal Stackyard	2 days
NAVIGATIONAL DISASTERS	
Collision of small craft with Tanker/Container/BC/Dredger/Barge	4-96 hours
Collision between two vessels	4-96 hours
Collision of Vessel with dredger	4-96 hours
Dragging anchor at Anchorage area	4-96 hours
Grounding- Tanker/Container/BC- Pilot onboard	4-96 hours
Grounding- Tanker/Container/BC- Pilot not onboard	4-96 hours
Tanker /Container/BC vessel tug assisted berthing - Contact with Berth/Jetty/Shore installations	12-96 hours

Contact with channel marking buoys	12-96 hours
Fire on vessel in the navigational channel	12-96 hours
Fire on vessel at the anchorage	
Fire on vessel at the Berth/Jetty	
DISASTER IN SERVICE AND ADMINISTRATION FACILITIES	
Fire in Office buildings, Hospital, Electrical substations, Fire stations, Dry docks, Godowns, Coal stack yard	12 hours – 96 hours
NATURAL DISASTER	
Cyclone/ Floods/ Tsunami/ Earthquake	7-21days
UTILITY FUNCTION FAILURE	
Electrical sub station	12-96 hours
Pump house	12-48 hours

9.7.3 PLANNING CONSIDERATIONS FOR BUSINESS CONTINUITY

In actual practice, deviations may occur due to reasons beyond control and same can be recorded so as to gain from experiences and work towards a "Build Back Better" approach. The recovery planning outlined for short, medium- and long-term measures will therefore need to be objective enough to meet these timelines. The lessons learned from earthquake damage to Kandla Port during Bhuj earthquake 2001 reveals damage to jetties, piles and RCC structures such as godowns, the signal control tower and office building. In such an eventuality occurring at port steps to restore the functioning of the affected cargo berths and control stations will need extensive repair and rehabilitation measures.

In case of major incident or following a natural disaster resulting in stoppage of port operations, a BIA will be undertaken. Priority areas will be identified for short term recovery amounting to approx. 30 % capacity of cargo handling, medium term recovery amounting to approx. 70 % capacity of cargo handling and long-term recovery for 100 % capacity cargo handling.

Port will consider short-, medium-, and long-term priorities to better organize and improve recovery

- Local priorities would be taken into account when determining where to focus recovery efforts.
- Assess the port functions, both internally and externally, to determine which manpower, materials, procedures and equipment are necessary to keep the port operating.
- Create a contact list for existing critical business contractors and others that the port can use in an emergency.

9.7.4 SHORT-TERM RECOVERY PLANNING

9.7.4.1 Damage Assessment and Prioritization of Restoration Work

Tasks during initial damage assessment will include the following.

- Assessment of Engineering Assets
- Assessment of Current Condition of Facilities
- Assessment of Utility Infrastructure

9.7.4.2 Actions that assist in damage assessment will include the following.

- Documentation of Replacement Costs
- As-Built Building Plans, Specifications and Other Facility Records
- Determining, positioning, and planning for assistance to obtain Critical Recovery Resources

9.7.4.3 Scope of inspection may include the following:

- Assessment of facilities by civil engineers to ensure compliance with local building and architectural codes and to ensure that damaged or repaired buildings are safe for occupancy.
- An underwater inspection by divers to check for possible demolition damage or deterioration of footings.
- An inspection of the piling at low water from a boat to check for damage. The stringers and deck are examined from below to determine the need for repair.
- Berths/jetties, or seawalls are inspected for damage.

9.7.5 MEDIUM-TERM RECOVERY PLANNING

In medium-term recovery planning, the port will engage in contracting and setting up for reconstruction and resumption of operations at the affected site. This may include financial planning, contracting and the formation of mutual aid agreements to assist in business continuity.

9.7.5.1 Mutual Assistance

The port may include the recovery operations plans, provisions for the pooling of recovery and business resources (heavy lift equipment, for example), and pre-positioning where needed.

Port may require to develop an alternate operational logistics support plan for cargo diversion in an incident at the port. It may also explore the agreements with Railways regarding goods movement in the event of an incident.

In case of damage to road infrastructure, port may also consider examining alternative transportation routes to and from the port and also within the port itself.

9.7.5.2 Medium-term reconstruction projects include:

- Expedient repair of existing structures.
- Repair of unloading facilities e.g. quay cranes, pipelines etc.

9.7.5.3 Marketing and Communications

Post-incident, port may consider publishing press releases and advertisements to demonstrate to the public that the port is open for business and still functional.

9.7.6 LONG-TERM RECOVERY PLANNING

This may include assessment and short- and medium-term measures as discussed earlier to provide temporary relief and alternate sites for cargo handling. For full recovery steps including as listed below will be required.

- Determining the financial impact of the emergency on the port and the budget needed for recovery, including insurance reimbursement and non-reimbursement issues, and central govt. assistance;
- Building relationships with emergency management and first responders based on unmet coordination needs;

- Initiating public relations activities to rebuild confidence in the transition period on the part of customer and the community in its entirety;
- Administering a comprehensive cargo movement recovery policy;
- Provide support for Construction & Maintenance, repair, alteration and reconstruction of port facilities and infrastructure;
- Laying out of plans and specifications and other contract documents necessary for the construction of new facilities and for any modifications to existing port facilities by engineering department;
- Repair of extensive damage to port buildings and properties and its maintenance;
- Assessment of environmental impacts of reconstruction projects and determining mitigation measures as appropriate by Environment department.

10. RESOURCE INVENTORY

10.1 Fire - fighting equipment details of OJ-1:

There are three nos. sea water fire pumps as follows.

1. Diesel driven fire pump – Capacity 500 m^3/hr., Head 156 m.
2. Electrical driven fire pump – Capacity 500 m^3/hr., Head 156 m
3. Electrical driven flushing pump – Capacity 500 m^3/hr., Head 156 m.
4. There are 2 nos. foam tanks of capacity 250 liters each provided with fixed firefighting monitor.

10.2 Fire - fighting equipment details of OJ-2:

This jetty is provided with the following firefighting infrastructure.

1. Diesel driven fire pumps 2 nos. – capacity 820 m^3/hr., Head 105 m;
2. Electrical driven jockey pump 2 nos. – Capacity 30 m^3/hr., Head 105 m;
3. Two Foam pump (One Electrical & One Diesel driven) Capacity 22 m^3/hr., Head 150m (both);
4. One Foam storage tank inside pump house – Capacity 14 m^3;
5. Six No water curtains of capacity 180 m^3/hr;
6. There are two water cum foam tower monitors of capacity, 3000 LPM at 7 kg/cm^2.

10.3 Fire - fighting equipment details of OJ-3:

This jetty has the following facilities.

1. Two Foam pump (One Electrical & One diesel driven) capacity 250 LPM, Head 150 m (Both);
2. One foam storage tank of capacity 15 KL;
3. There are two Nos. Water curtain of capacity 3000 LPM each;
4. There are two water cum foam tower monitors of capacity, 3,000 LPM at 7 kg/cm^2.

10.4 Fire - fighting equipment details of OJ-4:

1. There are three nos. Sea Water Fire pumps as follows:
    a. Diesel driven Fire Pump – capacity 500 m^3/hr., Head 156 m;
    b. Electrical driven fire pump – capacity 500 m^3/hr., head 156 m;
    c. Electrical driven Flushing pump – capacity 500 m^3/hr., Head 156 m;
2. Two Foam pump (One Electrical & One Diesel driven) Capacity 250 LPM, Head 150M(Both);
3. One Foam storage tank inside the pump house 15 KL capacity;
4. There are Two No water curtains, capacity 3000 LPM;
5. There are two water cum foam tower monitors of capacity 3000 LPM at 7 kg/cm^2.

10.5 Manpower resource – Fire Brigade section

Sr. no.	Name	Designation	Training details
1.	Aseem C	FcSO	Divisional officer course – NFSC, Nagpur
2.	DS Gurjar	Dy. FO	Divisional officer course – NFSC, Nagpur
3.	Edward Brady	STO	Sub officer course – NFSC, Nagpur
4.	G Nethaji	STO	Station officer & instruction course - NFSC, Nagpur
5.	GR Vaghela	STO	Sub officer course - NFSC, Nagpur
6.	HV Patel	STO	Sub officer course - NFSC, Nagpur
7.	KG Khalsa	STO	Sub officer course - NFSC, Nagpur
8.	MB Makwana	STO	Sub officer course - NFSC, Nagpur
9.	MR Vadaviya	STO	Sub officer course - NFSC, Nagpur
10.	NK Maheshwari	STO	Sub officer course - NFSC, Nagpur
11.	NM Jogi	STO	Sub officer course - NFSC, Nagpur
12.	NP Rajput	STO	Sub officer course - NFSC, Nagpur
13.	RS Maheshwari	STO	Sub officer course - NFSC, Nagpur
14.	S Mandal	STO	Station officer & instruction course - NFSC, Nagpur
15.	SK Saha	STO	Sub officer course - NFSC, Nagpur
16.	TR Pariyani	STO	Sub officer course - NFSC, Nagpur

10.6 Major Fire equipment and Appliances – Fire Brigade section

Sr. No.	Name of the Appliances	Quantity
1.	Safety Jeep (Bolero)	1 No.
2.	Water Tender Fire engine	04
3.	Foam Tender Fire engine	02
4.	Multipurpose Tender	01
5.	Dry Chemical Powder Tender	01
6.	Portable Fire Pump (Single Delivery)	06
7.	Trailer Fire Pump	04
8.	DCP Fire Extinguisher 50 kg	05
9.	Two wheeled Trolley Trailer	01
10.	Sea water Fire pump Electrically Operated (Oil jetty)	04
11.	Sea water Fire pump Diesel Operated (Oil jetty)	04
12.	Sea water Fire pump Electrically Operated (Cargo jetty)	01
13.	Sea water Fire pump Diesel Operated (Cargo jetty)	03

14.	Ground monitor	01
15.	Compressed Air B.A. Set	16
16.	RRL Delivery hose	500
17.	Gasometer	03
18.	Explosive meter	01
19.	Motorola VHF Base station set	03
20.	Walkie Talkie set	12
21.	Deep lift pump	01
22.	Sea water fire hydrants double headed – oil jetty	157
23.	Sea water fire hydrants – cargo jetty	750
24.	Air compressor for BA set cylinder	01
25.	Fire entry suit	04
26.	Ejector pump	01
27.	Multipurpose fireman axe	05
28.	Hose washing machine	01
29.	Foam compound AFFF	30000 ltrs
30.	Alcohol resistance (ARFFF)compound	10000 ltrs
31.	Air compressor (for vehicle)	01
32.	Car washer	01
33.	Multi gallobage hand held nozzle	10
34.	Multipurpose hand held nozzle	10
35.	Water mist & CAF fire extinguisher	07
36.	Life gear full body safety harness	12
37.	Life gear safety stretcher	01
38.	Chemical Protective suit	15
39.	Chemical & Gas protective suit	01
40.	Combustible gas alarm (pocket type)	10
41.	Gastight suit for LPG & Ammonia	10
42.	Fire proximity suit	08

10.7 Fire Engines – Fire Brigade section

Sr. No.	Fire engines	Nos.	Capacity
1.	Water Tender Fire engine	04	6000 ltrs. Water for each fire engine
2.	Foam tender fire engine	02	5000 ltrs. Water, 1000 ltrs. Foam compound & 2 nos. vessel * 75 kgs DCP for each fire engine
3.	Multipurpose tender	01	5000 ltrs. Water, 1000 ltrs. Foam compound, 2 nos. vessel * vessel 75 kgs DCP & 4 nos. CO2 cylinder – 22.5 kg. capacity each
4.	Dry chemical powder tender	01	2 nos. vessel * 1000 kg DCP each vessel

10.8 Protective Equipment

Sr. No.	Type of Equipment	ERC	OJ-1	OJ-2	OJ-3	OJ-4
1	Breathing apparatus (SCBA)	05	01	01	01	01
2	First Aid Box	02	01	01	01	01
3	Gas Tight Suit for LPG & Ammonia	--	03	01	01	01
4	Proximity Suit	04	--	--	--	--
5	Chemical Suit	07	01	01	01	01
6	Fire Entry Suit	02	01	--	--	--
7	Stretcher	02	--	--	--	--
8	Full body safety harness	01	--	--	--	--
9	Respirator	02	01	01	01	01

10.9 FIRE PROTECTION FACILITIES AT IFFCO JETTY, i.e. Jetty No.5

1. Two Fire pumps - one electrical driven and one diesel engine driven having capacity of 273 m^3/hr installed.
2. Diesel Tank of 1000 ltr. provided for requirement of Diesel Driven Fire pump
3. One jockey pump of 15 m^3/hr capacity installed to keep fire line pressurised
4. There are two foam monitors with 1000 ltr. foam tank and 2250 lpm capacity installed on the both ends of wharf area of the jetty.
5. Total 4 Nos. of double headed hydrants on main berth.
6. Jetty fire water network is connected with Plant fire water network which is pressurised all the time and four 273 m^3/hr pumps are installed in the plant so they can be used in extreme emergency.
7. Fire Hydrant network is connected to Deendayal Port Authority's Jetty No. 4 Fire Pump House.
8. Two ammonia gas detectors are installed on Jetty having indication on local and in Ammonia Control Room.
9. DCP, CO_2 Fire Extinguishers and Fire Hoses are available at Jetty.

10. Safety Shower provided at Jetty.
11. Self-Contained Breathing Apparatus available during ammonia ship unloading.
12. Explosion proof lighting fixture provided.
13. Hand Gloves, Chemical Protective suit, Safety Goggles, Face Shield, life bouy, & life jacket are provided at Jetty.

10.10 Floating Crafts

Sr. No.	Type of Floating Crafts	Number	Name
1.	Tugs (Shipping)	02	Jyeshte
			Kritika
2.	Pilot Launches	03	Magh
			Rohini
			Swati
3.	Survey Launches	01	Nirikshak
4.	Mooring launches	04	Alok
			Atri
			Hasta
			Vishakha
5.	OSR Dumb barge	01	Karishma

***Note:** During cyclone all the port crafts will be sheltered inside the Bunder area.*

10.11 Pollution Response equipment

Sr. no.	Equipment	Make, Type, Model	Qty.	Ops	Non-Ops	Total
1.	Pressure Inflatable Boom. H-630mm, F-250mm, D-360mm Containment Boom	ECO-AB630N	1200 mtr	1100 mtr	100 mtr	1100 mtr
2.	Boom Reel	ECO-BR2	06 nos	06 nos	0	06 nos
3.	Hydraulic Diesel Power unit 8 KW for Boom Reel.	ECO-PD10W/PUMP	06 nos	06 nos	0	06 nos
4.	Temporary storage/Tow Tank Capacity-10 Ton	ECO-MT10	05 nos	05 nos	0	05 nos
5.	Fast flow Belt skimmer 49m3/hr capacity with suitable pump & Power pack	ECO – OBWS	02 set	02	0	02

6.	Dispersant Spray System Capacity-100 LPM,	ECO-DSS8-01 & DESMI-02	03 nos	03 nos	0	03 nos
7.	Permanent Boom. H-500mm, F-230mm, D-270mm, Containment Boom	ECO-CB500U	1000 mtr	940 mtr	60 mtr	940 mtr
8.	DBD Skimmer 20 m3/hr capacity with Suitable pump & Power pack 7.5 KW	DESMI	01 set	01 set	0	01 set
9.	Air Blower for Inflating Boom	STITHL BR550	03 nos	03 nos	0	03 nos
10.	Mini Vaccume Pump set	DESMI	01 set	01 set	0	01 set
11.	Sorbent Pads	40 x 50 cm	1900 nos	1900 nos	0	1900 nos
12.	Oil Spill Dispersant (Nova 4G OSD NIO/CG Approved	Type III &II	5000 lits	-	-	5000 lits

10.12 IMO Level Trained Personnel

Sr. no.	IMO Level – I	IMO Level - II
1.	Gajendra Behera (Site In-charge)	Pawan Sontakke (Manager)
2.	Saroj Kumar Swain (Responder)	Tohid Shaikh (Manager)
3.	Pawan Bharti (Responder)	
4.	Kartik Kumar N R (Responder)	
5.	Manoj Kumar (Responder)	
6.	Abhishek Kumar (Responder)	

10.13 Port maintains following schedule for the contingency mock drills

10.14 Navigational Buoys and Leading lights

22 lighted navigational buoys with solar light, as per IALA system, are provided in the Kandla navigational channel.

Sathsaida Leading Lights lead through Sogal Channel; a second pair, leads across the inner bar to Kandla Creek

Outer Tuna Lighted Buoy (22°51'N., 70°07'E.), painted red, marks the entrance of the channel to Kandla.

10.15 Available Emergency Control Room equipment

Sr. no.	Equipment
1.	BSNL satellite phone
2.	VHF sets
3.	Telephones
4.	Walkie-talkie sets & mobile
5.	Charts
6.	Emergency lights and torches
7.	Portable PA/loud hailer set

10.16 Mutual Aid Agreement

All Port operators/agencies/institutions, where possible, will supply resources to support emergency response operations when requested by CEC/CIC/SIC or whole of Port Emergency Operation Centre as per the Mutual Aid Agreement.

10.17 Resource Inventory (IDRN)

India Disaster Resource Network is an online inventory designed as a decision-making tool for the Government administration and crisis managers to coordinate effective emergency response operations in the shortest possible time.

The Ministry of Home Affairs, Government of India has developed a web-based database of resource named India Disaster Resource Network (IDRN). This database contains information about equipment (such as boats, bulldozers, etc.), manpower (divers, swimmers, etc.) and critical supplies (oxygen cylinder, firefighting foams, etc.) required during the response.

Resources which are available with the various departments in the Gujarat - Kachchh are uploaded in IDRN.

Gujarat-Kachchh: https://idrn.nidm.gov.in/

11. PLAN MAINTENANCE

11.1 DEVELOPMENT, APPROVAL, IMPLEMENTATION, REVIEW AND REVISION

- This plan is developed in accordance with the guidelines issued by NDMA (2024), NDMP (2019) and NDMA guidelines and structured to suit the port organization. The implementation will be undertaken by the Deputy Conservator in association with stakeholders. It is understood that lessons learned from previous near disaster/disaster situations have been studied and cognizance of the after effect of these disasters have been considered. Understanding of risk and preventive measures has thus been analyzed and mitigation plan prepared. Prioritization of risks has been done as per risk assessment.
- Plan would be circulated to stakeholders.
- Regular Drills/exercises would be conducted to test the efficacy of the plan and check the level of preparedness.
- NDRF, SDRF and other agencies e.g., civil defense, local govt. departments suggestions would be integrated into the plan.
- Review and updating of the plan would be carried out annually as per Disaster Management Act, 2005.
- Consequent to any modification/expansion in the infrastructure, the Deputy Conservator is responsible for updating and maintaining the DMP.

ANNEX A
CHECKLIST

A.1 Checklist for POL's & Chemicals

A.1.1 Vessel and Berthing details

1.	Name of the Tanker	
2.	Name of the Berth	
3.	Berthing Date & Time	
4.	Checking Date & Time	

A.1.2 Shift In-charge should check the following before berthing of the Tanker.

Sr. No	Check Points	Yes	No
1.	Fire Fighting System in Remote Mode		
2.	Functioning of Siren		
3.	No Hot Job is permitted within 100m radius		
4.	Compliance to "NO SMOKING" regulations		
5.	Concerned Staff wear PPE		
6.	MSDS is displayed for the product being handled		

Note: If any laps are found, immediately the same is to be brought to the notice of Fire Officer for necessary action.

A.1.3 Signature

Shift-in-charge	**Loading / unloading Master**	**Fire cum Safety Officer**

A.2 Checklist for LPG

A.2.1 Vessel and Berthing details

1.	Name of the Tanker	
2.	Name of the Berth	
3.	Berthing Date & Time	
4.	Checking Date & Time	

A.2.2 Shift In-charge should check the following before berthing of the LPG Tanker.

Sr. No	Check Points	Yes	No
1.	Monitor line should be pressurized with Jockey pumps		
2.	Monitor Motor driven pump in auto mode		
3.	Monitor Engine driven pump in auto mode		
4.	Hydrants, water curtains and ground monitor motor driven pump in remote mode		
5.	Hydrants, water curtains and ground monitor motor engine driven pump in remote mode		
6.	Gas detection system is in 'ON' position		
7.	Siren and Manual call points system is in 'ON' position		
8.	PA System is in 'ON' position		
9.	Keep adequate number of extinguishers at the unloading platform		
10.	MSDS should be displayed by Terminal		
11.	Wind Sock is erected		
12.	BA Sets and canisters are available		
13.	All the concerned staff including unloading master and hose fitters of concerned handing company should wear PPE		
14.	No Hot Job is permitted near the operational area		
15.	Compliance to 'NO SMOKING' regulations		
16.	Area must be continuously manned		
17.	Remote control room must be continuously manned		
18.	Generator should be in auto mode and electrical staff to be available at sub-station round the clock		
19.	Pump house to be manned round the clock by Mechanical staff		

Note: If any laps are found, immediately the same is to be brought to the notice of Fire Officer for necessary action.

A.2.3 Signature

Shift-in-charge	**Loading / Unloading Master**	**On-duty Officer (LPG Berth)**	**Fire cum Safety Officer**

A.3 Checklist for Toxic Cargo

A.3.1 Vessel and Berthing details

1.	Name of the Tanker	
2.	Name of the Berth	
3.	Berthing Date & Time	
4.	Checking Date & Time	

A.3.2 Shift In-charge should check the following before berthing of the Tanker.

Sr. No	Check Points	Yes	No
1.	Standby of Water tender and Trailor pump at manifold area is in readiness		
2.	Functioning of freshwater shower on the berth		
3.	Functioning of eye wash		
4.	Chemical suit is made available at the manifold area by the receiver of cargo		
5.	Functioning of Siren		
6.	Wind sack is erected		
7.	BA Sets are made available by Fire team		
8.	Concerned Staff wear PPE		
9.	MSDS for product displayed		

Note: If any laps are found, immediately the same is to be brought to the notice of Fire Officer for necessary action.

A.3.3 Signature

Shift-in-charge	**Loading / unloading Master**	**Fire cum Safety Officer**

A.4 Checklist for Sulphuric Acid / Phosphoric Acid

A.4.1 Vessel and Berthing details

1.	Name of the Tanker	
2.	Name of the Berth	
3.	Berthing Date & Time	
4.	Checking Date & Time	

A.4.2 Shift In-charge should check the following before berthing of the Cargo Tanker.

Sr. No	Check Points	Yes	No
1.	Fresh water Shower functioning on Berth		
2.	Eyewash Functioning		
3.	Neutralizing agent is readily available nearer to the manifold area		
4.	Unloading Staff wear PPE while handling above Chemicals		
5.	Chemical Suit is made available at the manifold area by the receiver of the cargo		
6.	30Mtrs area around the manifold barricaded		
7.	MSDS is displayed for the Chemical, that is being handled		

Note: If any laps are found, immediately the same is to be brought to the notice of Fire Officer for necessary action.

A.4.3 Signature

Shift-in-charge	**Loading / unloading Master**	**Fire cum Safety Officer**

A5. Grounding of a Vessel within Port Limit

A.5.1 Vessel and Incident details

1.	Name and Type of the Vessel	
2.	Master of the Vessel	
3.	Name of the Agent	
4.	Incident Date & Time	
5.	Vessel Length and Draft	
6.	Pilot on Board, if any	
7.	Location of the incident	
8.	Current location of the vessel	
9.	Port Launches Order (time)	

A.5.2 Other details

1.	Time of Grounding	
2.	Cause of Grounding	
3.	Extent of Grounding	
4.	Weather Conditions	
5.	Direction of Vessels head	
6.	Movement of other vessels stopped	
7.	Pollution type (oil/chemical)	
8.	Location and Extent (impact on environment) of Pollution	
9.	Fire/Explosion	
10.	Evacuation of Passengers (if any)	
11.	Plans to refloat vessel	
12.	Additional actions taken by port	
13.	Divers required	
14.	Salvage company informed	
15.	Remarks	

A6. Sinking/Capsize of a Vessel within Port Limit

A.6.1 Vessel and Incident details

1.	Name and Type of the Vessel	
2.	Master of the Vessel	
3.	Name of the Agent	
4.	Incident Date & Time	
5.	Vessel Length and Draft	
6.	Pilot on Board, if any	
7.	Location of the incident	
8.	Current location of the vessel	
9.	Port Launches Order (time)	

A.6.2 Other details

1.	Time of Sinking/Capsize	
2.	Cause of Sinking/Capsize	
3.	Extent of Sinking/Capsize	
4.	Weather Conditions	
5.	Direction of Vessels head	
6.	Movement of other vessels stopped	
7.	Pollution type (oil/chemical)	
8.	Location and Extent (impact on environment) of Pollution	
9.	Fire/Explosion	
10.	Evacuation of Passengers (if any)	
11.	Plans to refloat vessel	
12.	Additional actions taken by port	
13.	Divers required	
14.	Salvage company informed	
15.	Remarks	

A7. Collision between two Vessels within Port Limit

A.7.1 Vessels and Incident details

1.	Name and Type of the Vessels	Vessel 1: Vessel 2:
2.	Master of the Vessel	
3.	Name of the Agent	
4.	Incident Date & Time	
5.	Vessel Length and Draft	
6.	Pilot Onboard, if any	
7.	Location of the incident	
8.	Current location of the vessel	
9.	Port Launches Order (time)	

A.7.2 Other details

1.	Time of Collision	
2.	Cause of Collision	
3.	Extent of Collision (condition of vessels)	
4.	Weather Conditions	
5.	Direction of Vessels head	
6.	Movement of other vessels stopped	
7.	Pollution type (oil/chemical)	
8.	Location and Extent (impact on environment) of Pollution	
9.	Fire/Explosion	
10.	Evacuation of Passengers (if any)	
11.	Plans to move the vessel	
12.	Additional actions taken by port	
13.	Remarks	

A8. Fire Onboard a vessel within Port Limit

A.8.1 Vessels and Incident details

1.	Name and Type of the Vessels	
2.	Master of the Vessel	
3.	Name of the Agent	
4.	Incident Date & Time	
5.	Vessel Length and Draft	
6.	Pilot Onboard, if any	
7.	Location of the incident	
8.	Current location of the vessel	
9.	Number of Passengers Onboard	
10.	Fire Fighting facilities on vessel	
11.	Location of Fire	
12.	Substance burning	
13.	Details of dangerous goods on board, if any	
14.	Port Launches Order (time)	

A.8.2 Other details

1.	Cause of Fire	
2.	Extent of Fire (condition of vessel)	
3.	Weather Conditions	
4.	Direction of Vessels head	
5.	Movement of other vessels stopped	
6.	Actions taken, by Master of vessel	
7.	Master consulted with the Port/Fire Officer	
8.	Evacuation of Passengers (if any)	
9.	Plans to move the vessel	
10.	Additional actions taken, by port	• Protection of Port property • Precautions against re-ignition • Security
11.	Remarks	

A9. Fire onboard a tanker within Port Limit

A.9.1 Vessels and Incident details

1.	Name and Type of the Vessels	
2.	Master of the Vessel	
3.	Name of the Agent	
4.	Incident Date & Time	
5.	Vessel Length and Draft	
6.	Pilot Onboard, if any	
7.	Location of the incident	
8.	Current location of the vessel	
9.	Number of Passengers Onboard	
10.	Fire Fighting facilities on vessel	
11.	Location of Fire	
12.	Substance burning	
13.	Details of cargo on board	Type Quantity
14.	Port Launches Order (time)	

A.9.2 Other details

1.	Cause of Fire	
2.	Extent of Fire/Explosion (condition of vessel) or Likelihood of Explosion	
3.	Weather Conditions	
4.	Cargo Operations ceased	
5.	Hoses/Metals arms disconnected	
6.	Movement of other vessels stopped or area cleared	
7.	Actions taken, by Master of vessel	
8.	Master consulted with the Port/Fire Officer	
9.	Evacuation of Passengers (if any)	
10.	Plans to move the vessel or other vessels	
11.	Additional actions taken, by port	• Protection of Port property • Precautions against re-ignition • Security
12.	Remarks	

ANNEX B
EMERGENCY CONTACT NUMBERS

PORT KEY PERSONNEL		
Sr. no.	**Designation**	**Telephone Nos.**
1.	Chairman	02836- 233001/234601
2.	Dy. Chairman	02836- 234121/236323
3.	Deputy Conservator	9603123449
4.	Harbour Master	8976741054
5.	FA&CAO	9526062088
6.	Traffic Manager	9666107773
7.	Chief Engineer (Civil)	9825227038
8.	Chief Mechanical Engineer	9825235196
9.	Chief Medical Officer	9825505796
10.	Deputy FA&CAO	9825227036
11.	Dy. Chief Engineer (Civil)	9427251059
12.	Sr. Dy Traffic Manager	9748437052
13.	Sr. Dy. Chief Medical Officer	9687607528
14.	Signal Station	270549/ 9016682249

GENERAL ADMINISTRATION DEPARTMENT		
Sr. no.	**Designation**	**Telephone nos.**
1.	Secretary	7036868889
2.	Sr. Deputy Secretary	9825227079
3.	TP & PRO	9638943800
4.	Law Officer	9712341380

CISF			
Sr. no.	**Designation/Location**	**Telephone nos.**	
		Office	**Mobile**
1.	Commandant	271037	9825227282
2.	PA to Sr. Comdnt.	271037	9951492174
3.	Control Room	270140	
4.	North Gate	271440	-
5.	West Gate – I	271039	-
6.	West Gate II	270876	-

FIRE STATION		
Sr. no.	**Designation**	**Telephone nos.**
1.	Main Station (Emergency Response Centre)	270176 / 270178
2.	Cargo Jetty West Gate No. 1 (Tilak Fire Station)	9825221330
3.	Cargo Jetty (Azad Fire) Nr. Berth No. 8	9825221352
4.	Fire cum Safety Officer	270176 (O) / 227512/ 9825227041

FLOTILLA SECTION		
Sr. no.	**Section**	**Telephone nos.**
1.	Flotilla Section	9825227630
2.	Flotilla Supdt.	9978559903/9825227610

VADINAR CONTROL ROOM		
Sr. no.	**Designation**	**Telephone nos.**
1.	Signal Station	02833-2573026/9825212359

POLICE DEPERTMENT		
DESIGNATION	**Telephone nos.**	**Address and Email**
SP Kutch (East)	02832-280233	SP Office, Near Court, DC-5, Gandhidham sp-east-kut@gujarat.gov.in
SP Kutch (West)	02832-250960	SP Office, Near District court, Bhuj-370001 sp-kut@gujarat.gov.in

GUJARAT STATE DISASTER MANAGEMENT AUTHORITY (GSDMA)		
Address	**Email id**	**Telephone nos.**
Block No.11, 5thFloor, Udyog Bhavan, Sector-11, Gandhinagar, Gujarat.	info@gsdma.org	079-23259283 State Control Room: 1070
Kutch Office	mehul.nitb04@gmail.com	02832-252347

Name Of Office	Telephone nos./Email
IMD, Ahmedabad	079-29705010, 9428909340 m.mohanty@imd.gov.in met_mm@yahoo.co.in
INCOIS, Hyderabad	040-23886000 webmaster@incois.gov.in, director@incois.gov.in
District Collector, Collector Office, Jilla Seva Sadan, Bhuj-370001	02832-250020 collector-kut@gujarat.gov.in
District Emergency operation Centre	02832-250923/252347 dismgmt-kut@gujarat.gov.in
Kandla Airport	02836 269 401
Indian Navy -Porbandar	0286-2240954
Indian Railways	139/182
GSRTC Inquiry	02836 – 220198/1800 233 666666
Water Supply	1916/ 079-23220859
Ambulance	102/108

MUNICIPAL FIRE STATIONS	
Station name	**Telephone nos.**
Fire Station Gandhidham Municipality	02836-226573
Fire Station IFFCO Kandla	02836-270352

NDRF – 6TH BATTALION		
Designation	**Address**	**Telephone nos. & email id**
Commandant	6th Bn NDRF, Jarod Camp, Teh-Wagodia, Vadodara, Pin - 391510	02688-29920/09870006730/ 09429199493 guj06-ndrf@nic.co.in

EXPERTS	
Name of Body	**Telephone nos.**
Nautical Advisor cum addl. DG (Nautical), DG Shipping	022-25752009/ 25752005 / 25752010
MMD, Kandla	02836-297015/127/28 kandla-mmd@gov.in
Indian Register of Shipping, Mumbai	022-30519400 / 25703611 ho@irclass.org
Ministry of Environment, Forest and Climate Change (MoEF &CC), Admin, New Delhi	011-24695328
The National Environmental Engineering & Research Institute (NEERI), Nagpur	0712-2249885-88 / 2249970-72

Ministry of Petroleum & Natural Gas	011-23382426 / 23383100
National Institute of Ocean Technology (NIOT), Chennai	044-66783300 / 22460275 / 22460645
Jt. Chief Controller of Explosives, Vadodara (Gujarat)	0265-2225159/2361035 dyccebaroda@explosives.gov.in
GPCB – Regional office; Room No. 215-217 Administrative Office Building, Kandla Port Trust, Sector 8, Gandhidham, Kutch	02836- 230828 ro-gpcb-kute@gujarat.gov.in
Inspectorate Dock Safety, Kandla	02836 – 270249 idskandla@dgfasli.nic.in sp@dgfasli.nic.in
Office of Industrial Safety and Health, Kutch	02836-260020/262 dd1-dish-adi@gujarat.gov.in dydish-kutch@gujarat.gov.in
Civil Defence	02832-230603 dg-homegrd-ahd@gujarat.gov.in

STATE/DISTRICT EMERGENCY OPERATION CENTRE		
Sr. No.	**EOCs / Control rooms**	**Telephone nos.**
1.	State Emergency Operation Centre	079 - 23251900 / 23251902 / 23251914 /1070
2.	District Emergency operation Centre	02832-250923/252347 dismgmt-kut@gujarat.gov.in

MARINE POLICE NUMBERS				
Sr. No.	**Marine Police Station**	**Designation of In-charge**	**Telephone nos.**	**Mobile**
1.	Okha	Police sub-inspector	02892-262396	9376200200
2.	Vadinar	Police sub-inspector	02833-256541	9979899110
3.	Bedi	Police sub-inspector	0288-2755293	9913653885
4.	Mundra	Police sub-inspector	02838-224077	8000648100
5.	Kutch	DSP	02836-250444	
6.	Kandla	Police sub-inspector	0283-6270527	9879252427 9979904919
7.	Salaya	Police sub-inspector	0283-3285338	9426979493 9979904919

INDIAN COASTGUARD		
Sr. no.	**Station**	**Telephone nos.**
1	Mundra	02838-271403
2	Vadinar	02833-256560
3	Okha	02892-263450

HOSPITALS		
Sr. no.	**Name**	**Telephone nos.**
1	Rambaugh Hospital, Gandhidham	02836-261626
2	Railway Hospital, Gandhidham	02836-231874
3	General Hospital, Bhuj Civil Surgeon, Bhuj	02832- 246417/18 02832-258071/ 258080
4	Referal Hospital, Anjar	02836-232455

VEHICLE SUPLIERS		
Sr. no.	**Name of travels**	**Telephone nos.**
1.	M/s. Rohit Enterprise / Rishabh Enterprise	228550/237538 237547 (O); 234140 (R) 9825225121
2.	M/s. Jai Somnath Travels (GIM)	9825386739

SALVAGE ASSOCIATIONS	Telephone nos.
Vishwakarma Marine Pvt. Ltd., Porbandar - 360575	0286-2242836
Sealord Diving & Salvage Pvt. Ltd., Navi Mumbai - 400706	022-27682825
http://www.marine-salvage.com/membership/#tabs-1-4	

NON-GOVERNMENTAL ORGANISATION https://kachchh.nic.in/public-utility-category/ngos/		
NGO	**Contact**	**Email**
Arid Communities & Technologies	02832-645152	mail@act-india.org
Arya Samaj Gandhidham Charitable Trust	02836-231223	aryagan@aryagan.org
Kandla Seafarers Welfare Association	02836-224013	pwckandla@gmail.com
SANKALP	02836-296109	sankalp.gandhidham@gmail.com

STEVEDORES AT THE PORT			
Sr. No.	**Name**	**Address**	**Telephone Nos.**
1.	M/s. A.V.Joshi & Co.	Plot No. 18, Sector-8, Maitry Bhavan, Nr. Post Office, Gandhidham –Kutch	231070/232227/231588
2.	M/s. Agarwal Handling Agencies	DBZ-N-47, Gandhidham – Kutch	220282/233187
3.	M/s. ACT Shipping P. Ltd.	Seva Sadan-II, Room No. 206/207, New Kandla	270111/270112/270015/229967/231734
4.	M/s. J.M. Baxi & Co.	Seva Sadan – II, Room No. 301 / 306, New Kandla	270630/270550/270448
5.	Rishi Shipping	Plot 50, Sector 1/A GIM	229830/229831
6.	Parekh Marine Agency	C-8, Shaktinagar GIM	229297/221158/ 230587
7.	Krishna Shipping and Allied Services	Transport Nagar, NH GIM	230501/223814/ 229085
8.	Velji P & Sons(P) Ltd	2nd Floor, Deepak Compex, 315, 12/B GIM	231545/231546/ 225466
9.	Rishikiran Roadlines	Kiran House, Plot 8 Sector 8, GIM	231894/234108
10.	Seaways Shipping (P) Ltd	2nd Floor, Plot 351 Ward 12/B, GIM	226183/237147
11.	Liladhar Pasoo Forwarders P.Ltd	Plot 4, Sector –1 KASEZ, GIM	252286/252297/252612
12.	Patel Shipping Agency	Patel Avenue, Floor 2, Plot 170, Sector 1/A GIM	224024

VTS GOK OFFICERS OF MASTER CONTROL CENTER (MCC) KANDLA		
Sr. No.	**Designation**	**Mobile number**
1.	Deputy Director	7383576832
2.	Deputy Director	9428863924
3.	Asst. Executive Engineer	9016106566
4.	Asst. Executive Engineer	9408553192

TANK FARM TERMINAL					
Sr. No.	**Name of Terminal**	**Storage**	**Name of Person**	**Contact**	**Email ID.**
1	M/S N P Patel (l) Pvt Ltd.	Chemical/Edible	Kumaresan	9099075877	kumaresan@thekirangroup.com
2	M/S Kesar Terminal and Infrastructure Ltd -	Chemical/Edible	Shekhar Pradhan	9974248587	shekharpradhan@kesarindia.com
3	M/S Kesar Terminal and Infrastructure Ltd	Chemical	Nitin Bhoyar	9375349181	nitinbhoya@kesarindia.com
4	M/S Chemical Resins Ltd. - I	Chemical	Ashish Kachoriya	9998954375	ashish.kachoriya@aegisvopak.com
5	M/S Chemical Resins Ltd. - Il	Edible	Ashish Kachoriya	9998954375	ashish.kachoriya@aegisvopak.com
6	M/S Chemical Resins Ltd. - Ill	Chemical	Paresh Choxi	7359074019	paresh.choxi@aegisvopak.com
7	M/S Rishi Kiran Logistic Pvt Ltd	Chemical	Kumaresan	9099075877	kumaresan@thekirangroup.com
8	M/.s Aegis Vopak Terminal Ltd- I	Chemical	Suresh Joshi	9974812277	suresh.joshi@aegisvopak.com
9	M/.s Aegis Vopak Terminal Ltd-	Chemical	Paresh Choxi	7359074019	paresh.choxi@aegisvopak.com
10	M/.s Aegis Vopak Terminal Ltd- Ill	Edible	Paresh Choxi	7359074019	paresh.choxi@aegisvopak.com
11	M/.s Aegis Vopak Terminal Ltd- IV	Edible	Devender Musterya	7710954748	devender.musterya@aegisvopak.com
12	M/S JRE Tank Terminal	Chemical	Mahesh N Shah	9898500289	maheshshah@imc.net.in
13	M/S Indo Nipoon Chemical Company	Chemical	Amit Pathak	9879546836	kandla@indo-nippon.com
14	M/S Ahir Salt & Allied Products Ltd.	Chemical/Edible	Dharamsi B Agariya	9925247904	agriyadb@neelkanth.co.in
15	M/S Shreeji Liquid Storage Terminal	Chemical/Edible	Murali Krishna	9940666336	muralikrishna@shreeji-group.com

16	M/S Kutch Oil & Soap Industries	Edible	Asgarali Khoja	9825237214	kutchppl@rediffmail.com
17	M/S Sunshine Liquid Storage Terminal	Edible	Ramesh Chaturani	9825226026	sunshineliquidl@gmail.com
18	M/S Ambaji Import Ltd.	Edible	Sushil Rao	9081244117	gm@ambajimports.com
19	M/S Seabridge Terminals Pvt. Ltd.	Edible	Ambati K Rao	9909008876	arao@seabridge.co.in
20	M/S Gokul Agro Resources Ltd.	Edible	Mahendra G T	9825229260	mahendra.terminal@gokulagro.com
21	M/S Emperious Infra Logistics Pvt Ltd.	Edible	Hemant Rangwani	9426965566	hemant.rangwani@emperiusindia.com
22	M/S Deepak Estate Agency	Edible	Narendrabhai Thakkar	9879611243	dipakterminall@gmail.com
23	M/S Parker Agrochem Exports	Edible	Vidhanbhai Acharya	9638138833	parkeragrochem@gmail.com
24	M/S Tejumalbhai & Co.	Edible	Ashok Chandan	9825225101	tejmalbhaico@yahoo.com
25	M/S Liberty Investments	Edible	Thomas C D	9099011340	thomas@libertyoilmills.com
26	M/S Agency and Cargo Care	Edible	Vaibhav Aggarwal	9699667152	operation@acclkandla.com
27	M/S Avean International	Edible	Bharat Rathod	9375310260	aipkdl@gmail.com
28	M/S IMC Dry Cargo Jetty - New Kandla	Petroleum	Mahesh N Shah	9898500289	maheshshah@imc.net.in
29	M/S IMC Ltd Gas Terminal	Petroleum	Mahesh N Shah	9898500289	maheshshah@imc.net.in
30	M/S IMC Ltd Near Shirva	Chemical	Mahesh N Shah	9898500289	maheshshah@imc.net.in
31	M/S IFFCO	Gas/Acid	A K Sharma	9099982004	aksharma@iffco.in
32	M/S Indian Oil Corporation Ltd Foreshore Terminal	Petroleum	R K Mishra	9913716108	mishrark@indianoil.in

33	M/S Indian Oil Corporation Ltd Viramgam Kandla Pipeline	Petroleum	Rajesh kumar C	9047535311	rajeshkumar3@indianoil.in
34	M/S Indian Oil Corporation Ltd - LPG Import Plant	Gas	Bhaveshkumar Chauhan	7657888122	bkchauhan@indianoil.in
35	M/S Indian Oil Corporation Ltd - Main Terminal	Petroleum	S K Bandhe	7440937432	sbandhe@indianoil.in
36	M/S Hindustan Petroleum Corporation Ltd	Petroleum	Yasvendra Singh	9996620338	yasvendarsingh@hpcl.in
37	M/S Bharat Petroleum Corporation Ltd.	Petroleum	S Mandal	9874444332	mandals@bharatpetroleum.in
38	M/S J K Synthetics	Chemical	Kumaresan	9099075877	kumaresan@thekirangroup.com
39	M/S Bharat Food Company Ltd.	Edible	Nitin Patel	9315338532	nitin.pate1789@gmail.com

LICENSE HOLDERS TO KEEP CRAFTS INSIDE THE PORT AREA		
Sr. no.	**Name of Party**	**Name of Craft**
1.	POLESTAR MARITIME LTD	JASMINE STAR
		SUNFLOWER STAR
		COSMOS STAR
		MT BAHUDA
2.	EMERALD MARINE SYSTEMS	BURAQ V
		DEFENDER
		MT QASWA
3.	SHREE KRISHNA QUARRY PVT.LTD.	SONAL
		VIDHYALAXMI-1
4.	Adani Bunkerings Pvt. Limited	AEL II
5.	OCEAN SPARKLE LIMITED	MT OCEAN LANCER
		OCEAN PROGRESS
		MT OCEAN CHALLENGER
		DOLPHIN NO 30
6.	GAUTAM FREIGHT PVT.LTD	MV GAUTAM SHIVANK
		MT GAUTAM SHLOK
		MT GAUTAM JAYANI
		MT GAUTAM HANUMAN
		MT LUV KUSH
		MT GAUTAM VARUN
		MV GAUTAM REHANSH
		MV GAUTAM ATHARV
		MV GAUTAM ANANYA
		MV GAUTAM ADITI
		MV GAUTAM KRISHAV

		MV GAUTAM BHIMJI
		MV GAUTAM AARAY
		MV GAUTAM KAVYA
		PONTOON GAUTAM -I
		MV GAUTAM AROHI
7.	BAPU'S SHIPPING JAMNAGAR PVT.LTD	MT ADINATH-8
		MT VAILANKANNI
		MT SAGAR URMIKA
		DWARKESH
		MV SOMNATH
8.	INTEROCEAN NAVIGATION LIMITED	MT KCS-I
9.	WATERWAYS MARITIME GANDHIDHAM	MT KB-IV
		MT MUC LAXMI
10.	RISHI SHIPPING INDIA PVT.LTD	RISHI-XXI
		DUMB BARGE RISHI-XVII
		MAHARUDRA HANUMAN
		MV RISHI-IV
		MV RISHI-XXIX
		MV RISHI-II
		MV RISHI-XXIV
		MV RISHI-XXIII
		MV SRIJOY-1
		MT SAI VISTARA 2
		MT SHANIYA
		MV BARGE JAYRAM-III
		MT MARIGOLD
		MV BARGE JAYRAM-IV

		MV SAI GAURESH
		MV JAY ASHWINI
		MV AJIT
		MILIKA
11.	GENESIS SHIPPING SERVICE	MT GENESIS-III
12.	Rishi Mansukhani Port & Infrastructure P.Ltd.	MT RISHI-XXX
		MT RISHI-XIV
		MT KARMA-VIII
		MT RISHI -XXV
		MT BDS-SP-2
		MV RISHI-XII
13.	SILVER PORT SERVICES PVT.LTD.	MT SPS PHALGUNI
		MT SPS ROHINI
		SPS ASHWINI
		CHITRA
		SPS REVATI
14.	APEX OFFSHORE LLP	DULDUL
		MV SUCCESS GLORY
		MV MANALI -III
		MV MANALI -II
		MV MANALI -V
		MV RAMA
15.	OMEGA OFFSHORE	MV ZEENNE
		MT MARS
16.	MALARA SEA LOGISTICS	MV MALARA PRIDE

MAJOR HEAVY LIFT OPERATORS		
Name Of Party	**Contact Person**	**Phone Number**
Swastik Heavy Lifters	Mr. Jigneshbhai Mr. Aslambhai	9825758151 9825228421
Kutch Carrier Transport Co	Mr. C. R. Thackar	9825225591
Agarwal Handling Agency	Mr. Rakesh Thackar	9426928728
Active Cargo Movers	Mr. Narendra	9825220411
Raghuvirsingh & Sons	Mr. Harcharan	9879104853
Thacker Brothers	Mr. Kamleshbhai	9825296107
Kiran Roadlines	Mr. Pankaj Gadvi	9879104552
Regal Shipping	Mr. Ashok Dudi	9825326328
Rathore Freight Carriers		220759/ 220380

ANNEXURE D
Oil Spill contingency plan

दीनदयाल पत्तन प्राधिकरण
DEENDAYAL PORT AUTHORITY

OIL SPILL RESPONSE CONTINGENCY PLAN

DPA KANDLA AND OOT VADINAR

INDEX

Contingency Planning Compliance Checklist

NAME OF PORT / OIL HANDLING AGENCY		**DPA KANDLA AND OOT VADINAR / SADHAV SHIPPING LIMITED**

	DESCRIPTION	**COMPLIED YES / NO**	**REMARKS**
1	Whether the facility procedures / handles / uses / imports / stores any type of petroleum product	YES	Page-28, Para- 2.1.2.
2	Whether risk assessment is done	YES	Page-25, Para-2.1
3	Who did the risk assessment	Environ Software Pvt. Ltd.	Page-94, Para- 8, Annexure-26
4	whether maximum volume of oil spill that can occur in the worst-case scenario is considered	YES	Page-32, Para- 2.2 Annexure-11
5	Whether relative measure of the probability and consequences of various oil spills including worst case scenario are considered	YES	Page -33, Para-2.4
6	Whether all types of spills possible in the facility are considered including Grounding, Collision, Fire, Explosion, Rupture of hoses.	YES	Page -31, Para-2.1.3
7	Please specify the list of oils considered for risk assessment	YES	Heavy oils & Crude oil, Furnace oil. Page-32, Para-2.2
8	Whether the vulnerable areas are estimated by considering maximum loss scenario and weather condition.	YES	Page -33, Para-2.2.1, Annexure -15
9	Whether impacts on the vulnerable areas are made after considering the Marine protected areas, population, fishermen, saltpans, mangroves, corals, and other resources within the area	YES	Shoreline Maps Attached Page – 36, Para-2.5.3
10	Whether measures for reduction of identified high risks are included by reducing the consequences through spill mitigation measures.	YES	Page – 33, Para- 2.3.

11	Whether steps have been considered to reduce risks to the exposed population by increasing safe distances by acquiring property around the facility, if possible	YES	No Population along the coast at least about 10 Km
12	Whether risk levels are established for each month after consideration the probability with tide and current and consequences of each such spill	YES	Page 115, Annexure 15
13	Whether prevention and mitigation measures are included in the plan	YES	Page 33, Para 2.3, Annexure-7
14	Whether the spill may affect the shoreline.	YES	Annexure -15 Page -115
15	Whether time taken the oil spill to reach ashore in each quantity of spill in various months are mentioned in the plan	YES	Annexure-15, Page - 115
16	Whether sensitivity mapping has been carried out	YES	Page 147, Annexure-26
17	Does the sensitivity mapping clearly identify the vulnerable areas along with MPAs, corals, fishermen community, saltpans, mangroves and other socio-economic elements in the area	YES	Page 147, Annexure-26
18	Do the sensitivity maps indicate area to be protected on priority	YES	Page 39, Para – 2.7
19	Does the map indicate boom deployment locations	YES	Page 39, Para – 2.7
20	Whether any Marine Protected Area will be affected	YES	Annexure– 15, Para 2.5.3, Page - 36
21	Whether total number of fishermen likely to be affected is mentioned in the plan	YES	Page 30, Para 2.6.2
22	Whether any saltpan in the area is going to be affected	YES	Page 30, Para 2.6.2
23	Whether any mangroves in the area will be affected by a spill	YES	Page 30, Para 2.6.2

Preparedness:

24	Whether any containment equipment is Available	YES	Annexure– 7. Page-105.
25	Whether any recovery equipment is Available	YES	Annexure– 7 Page-105
26	Whether the facility is having any temporary storage capacity	YES	Page - 105, Para 7 Annexure– 7
27	Whether location of the oil spill response equipment is mentioned in the plan	YES	Annexure– 7 Page-105
28	Whether suitable vessels Available for deploying the boom, skimmer etc.	YES	Annexure-7 Page-106.
29	Whether OSD held with facility	YES	3000 Liters Annexure -7 Page-105
30	Whether the OSD held with the facility is approved for use in Indian Water	YES	YES
31	Whether the facility has MOU with other operators for Tier-1 preparedness	YES	MOU With IOCL & NAYARA Energy. Annexure – 25, Page No. 140
32	Whether the list of oil spill response equipment Available with each agency in MOU is deliberated	YES	Annexure– 25. Page-144
33	Whether the facility has MOU with private OSRO	NO	NO
34	Whether the procedure for evoking the mutual aid is clearly described in the plan	YES	Page – 141 of MoU, Para-1
35	Whether additional manpower is Available	YES	Page –144
36	Whether list of approved recyclers is mentioned in the plan	YES	Annexure-22, Page-136
37	Whether NEBA (Net Environmental Benefit Analysis) has been undertaken	YES	Annexure-15, Detailed Report of NEBA carried out by National Institute of Oceanography is enclosed
38	Whether the areas from priority protection have identified in the plan	YES	Page – 36 Para – 2.5.3
39	Whether relevant authorities and stakeholders were consulted for NEBA and during the areas for priority protection	YES	YES
40	Whether District administration has been appraised of the risk impact of oil spills?	YES	YES

	Action Plan		
41	Whether the plan outlines procedure for reporting of oil spills to Coast Guard	YES	Page – 57, Para. – 7.1
42	Whether the oil spill response action is clearly mentioned	YES	Page – 71, Para. – 8.1.
43	Whether the action plan includes all duties to be attended in connection with an oil spill	YES	Page – 71, Para. –9.1.
44	Whether the action plan includes key personnel by their names and designation viz. C/C, S/C	YES	Page-76, Para-9.1
45	Whether alternate coverage is planned to take care of the absence of a particular person (in case where action plan is developed basis names)	YES	Page-76, Para-9.1
46	Whether the plan includes assignment of all key coordination's viz, the communication Controller, Safety Coordinator, Emergency management team, Administration and Communication Coordinator and Safety Coordinator	YES	Page-76, Para-9.1 Page-48, Para-5.1
47	Whether contact directory containing numbers of key response and management personnel is intimated in the plan	YES	Annexure-1, Page – 96 Annexure-3, Page- 98 Annexure-18, Page-121
48	whether approved recyclers are identified for processing recovered oil and oily debris	YES	Annexure -23, Page - 136
49	Whether the shoreline likely to be affected is identified	YES	Page – 115, Annexure -15
50	Whether final report on the incident is submitted to CGHQ as per NOS-DCP 2014	NA	NA
51	Whether the spill incident and its consequences are informed to fishermen and other NGOs for environment protection through media.	NA	NA

Training and Exercises:

52	Whether mock Drill / emergency response drills are specified in the plan	YES	Page-53, Para 5.6.2
53	Whether the mock drills cover all types of probable oil spills	YES	YES
54	Whether the plan mentions list of trained manpower	YES	Page-136-137, Annexure-23-24
55	Whether the plan to updated according to the findings in mock drills and exercises	YES	YES
56	Whether the records for periodic mock drills are maintained in a well-defined format	YES	Also, entry is made in monthly log book.
57	What is the frequency of updating / revise of contingency plan?	YES	As and when required
58	Periodicity of joint exercise with mutual aid partners	YES	Once In 3 Months
59	Frequency of mock drills for practice	YES	Once In 6 Months

I hereby, declare that all the information appended above is true and correct to my knowledge or belief.

Date: Dy. Conservator, DPA

Verified:

Date (District Commander ICG)
Or his representative

Date (Regional Commander ICG)
Or his representative

Certificate of Endorsement

I hereby certify that:

1. The oil spill contingency plan for the facility under my charge has been prepared with due regard to the relevant international best practices, international conventions, and domestic legislation.

2. The nature and size of the possible threat including the worst-case scenario, and the resources consequently at risk have been realistically assessed bearing in mind the probable movement of any oil spill and clearly stated.

3. The priorities for protection have been agreed, considering the viability of the various protections and clean up options and clearly spelt out.

4. The strategy for protecting and cleaning the various areas have been agreed and clearly explained.

5. The necessary organization has been outlined, the responsibilities of all those involved have been clearly stated and all those who have a task to perform are aware of what is expected of them.

6. The levels of equipment, materials and manpower are sufficient to deal with the anticipated size of spill. If not, back-up resources been identified and, where necessary, mechanisms for obtaining their release and entry to the country have been established.

7. Temporary storage sites and final disposal routes for collected oil and debris have been identified.

8. The alerting and initial evaluation procedures are fully explained are fully explained as well as arrangement for continual review of the progress and effectiveness of the clean-up operation.

9. The arrangements for ensuring effective communication between shore, sea and air have been described.

10. All aspects of plan have been tested and nothing significant found lacking.

11. The plan is compatible with plans for adjacent areas and other activities.

12. The above is true to the best of my knowledge and belief.

13. I undertake to keep the plan updated at all times and keep the Indian Coast Guard informed of any changes through submissions of a fresh certificate of endorsement.

Seal

Signature :

Name :

Designation: Dy. Conservator

Organization: Deendayal Port Authority

Place: Gandhidham

Date :

DISCLAIMER

The task of preparation of OSCP has been done by Sadhav Shipping Limited at the request of DPA.

Conclusion and recommendations resulting from the consulting services has been informed in good faith and on the basis of the best information Available from sources believed to be reliable.

Sadhav Shipping Limited provides no Warranty, express or implied, as for the accuracy, completeness or correctness of the analysis and report preparation work.

Sadhav Shipping Limited accepts no liability arising out of or in connection with the results, recommendations, or omissions. It is concluded that any usage / implementation / interpretation of the recommendation is at the client's risk. In particular, the recommendations should not be considered as certified, legal, or otherwise.

IMPORTANT NOTE

The oil spill contingency plan outlines the steps required for the management of responses to marine oil spills that are the responsibility of the Deendayal Port Authority (DPA), KANDLA and OOT VADINAR

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

This document is prepared in three Parts:

Parts- I Including Strategy.

Parts- II Including Action and Operations.

Parts- III Includes Data Directory.

ABBREVIATIONS

COT	Crude Oil Tank farm
CRZ	Coastal Regulatory Zone
DPC	Duty Port Captain
DPA	Deendayal Port AUTHORITY
DWT	Dead Weight Tonnage
NBTSL	NAYARA Bulk Terminal SALAYA Limited
ECT	Emergency Control Team
ERDMP	Emergency Response Disaster Management plan
ESD	Emergency Shutdown
FCA	Forest Conversation Act
HS&F	Health, Safety & Fire
HSEF	Health, Safety, Environment & Fire
ICG	Indian Coast Guard
IOCL	Indian Oil Corporation Limited
ITOPF	International Tanker Owners Pollution Federation
ICMAM	Integrated Coastal and Marine Area Management
IPIECA	International Petroleum Industry Environmental Conservation Association
KPT	Kandla Port AUTHORITY
LFP	Land Fall Point
MTCB	Marine Terminal Control Building
NOSDCP	National Oil spill Disaster Contingency plan
OSC	On Scene Commander
OOT	Offshore Oil Terminal
OSR	Oil Spill Response
OHC	Occupational Health Centre
P & I	Protection and Indemnity
PIT	Product Intermediate Tank Farm
PMC	Pollution Management Cell
PO	Port Officer
SPM	Single Point Mooring
SIC	Shift In-charge
VLCC	Very Large Crude Carrier
VOTL	Vadinar Oil Terminal Limited
WLPA	Wild Life Protection Act

DEENDAYAL PORT AUTHORITYOSCP ACTION FLOWCHART

On Observation of Oil/HNS Spill

OBSERVER ON VESSEL

- Inform Vessel Master.
- Take necessary steps to safely stop the release of Oil/HNS

VESSEL MASTER

- Verify report and obtain details
- Report to:
  - DC / COM
  - VTS, DPA
  - Monitor slick and keep the above informed.

DC / COM

- Obtain all information Available
- Authorize for urgent responses required to:
  - Ensure safety of Personnel and protection of Port.
  - Contain the Spill
  - Protect sensitive resources at imminent risk
- Inform other vessels in the area of oil spill and advise of any hazards
- Communicate incident to Berth operator
- If a hazardous substance is involved contact specialized agencies/ contractor/Berth operator for assistance
- Prepare a POLREP and send to:
  - Duty Officer Coast Guard
- Consult On-Scene Commander (OSC) for appropriate action.
- Initiate response
- Monitor the development and keep in constant touch with relevant authorities.
- Maintain a log of events.

OBSERVER ON WHARF

- Inform nearest Supervisor or Person In Charge.
- Take necessary steps to safely stop the release of Oil/HNS

SUPERVISOR/PERSON IN CHARGE

- Verify report and obtain details.
- Report to DC / COM
- Stop/Contain/Monitor slick/spill and keep the DC / COM informed.

DC / COM

- On receipt of initial information ensure that Indian Coast Guard, Maritime Rescue Coordination Centre (MRCC)/District Headquarters has been duly informed.
- On receipt of POLREP, the DC / COM will initiate communication/coordination with the advice and provide support to the designated Chief Incident Controller DC / COM on the issues including the following points.
  - Priority of the response Tier,
  - Location of EOC,
  - Additional human resources etc.

IMT Members

- Initiate resource mobilization on receipt of instruction.
- Deployment of members to EOC or muster point.
- Response actions as per instructions.
- Maintain a Log of Events.

PART – I

STRATEGY

1. INTRODUCTION

A. CONTINGENCY PLANNING:

In spite of best intentions to avoid oil spills through best and safe practices and rigid enforcement of good intentions in work place, the spills still occur and will keep on occurring. The next best post spill activity, then, is to address them in terms of containment and recovery within shortest possible time and through best Available means that need to be planned and kept ready in advance and spelled through a Contingency Plan for the facility or area handling oil, oil products or other pollutants.

Increase in density of marine traffic, especially oil tankers and petroleum-based installations along the Indian coast has increased the risks for occurrence of spills in harbor, coastal waters and during terminal operations apart from spills that could occur from collision, grounding of vessels and stranding. To address the fallout of incidents and accidents that could lead to pollution of marine environment, all countries handling polluting agents are required to have capabilities and create infrastructure and set up means that could handle the pollution response activity in case of any spill. The working parameters and strategy to address the response activities are spelled through a Contingency Plan.

B. PURPOSE AND OBJECTIVES:

India being signatory to number of international agreements and conventions aimed at controlling marine pollution through measures and rules applicable to marine facilities or surface units, is under an obligation to honor and implement the same through municipal legislation and through adopting means, practices and rules in accordance with Article I of the Convention 73 and Protocol 78 i.e. MARPOL 73/78.

The article has placed an obligation on the parties to the convention including India "to give effect to the provisions of the present convention and those Annexes there to by which they are bound, in order to prevent the pollution of the marine environment by the discharge of harmful substances or effluents containing such substances in contravention of the convention".

Apart from the specific obligations imposed by MARPOL, being a signatory to UN Convention on the Laws of the Sea (UNCLOS), India has an obligation to protect and preserve the marine environment in addition to obligations under International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC Convention).

Accordingly, India too had to formulate rules or administrative directions giving effect to international procedures through structures to be developed by ports and facilities handling vessels and oil cargo.

While, regulatory procedures are expected to be put in place through rules- implementing the various provisions and annexure of MARPOL 73/78, the practical aspects of marine pollution to set up a mechanism on the ground are dealt by OPRC – National Oil Spill Disaster Contingency Plan being an instrument for the same.
NOS-DCP has its origin in IMO convention OPRC – 1990, ratified by India. As per the convention it is imperative upon each signatory state to have laws and mechanisms to respond to oil spills in its waters.

National Oil Spill Disaster Contingency Plan is aimed at coordination of resource agencies to combat an oil spill in Indian waters and also spells the actions required of oil handling facilities i.e. to prepare contingency plans for respective facilities and to develop Tier I response capabilities and also to report oil spills. NOSDCP mandates a number of resource agencies comprising of 03 ministries and 15 departments apart from oil industry, off shore terminals etc. to an obligation to Render resources for pollution response when called for, Report Oil Spills,

prepare contingency plans for respective spill scenario, Set up Tier I response facilities and Use of Oil Spill dispersants (OSD) in accordance with Plan.
Of the three tiers of response envisaged and planned to handle a spill situation in consonance with quantum of spill, Tier 1 is the primary and first step of responses, to be mounted by the facility where the spill takes place.

While, NOS-DCP outlines the response activities as per Tier system of addressable of spill, the facility plan is the instrument to address the spill scenario at local level. Tier 1 being the first and primary response level has to be executed and undertaken by the facility handling polluting cargo, for which purpose drafting of a CP is the primary requirement.

The National Oil Spill Disaster Contingency Plan was first drafted in India by Coast Guard during 1996 with an objective to put in place the machinery and mechanisms to combat oil spills in Maritime zones of India. The Plan has since been updated in 2002.

C. AIMS & OBJECTIVES:

The aims and objectives of the Oil Spill Response Contingency Plan (here after termed the Plan or CP) of a port or facility are to draw a methodology and strategy to indicate actions required to be taken by responders to:

- Ensure Availability of timely, measured and effective response to incident so oil spill in waters under jurisdiction of the porter facility,
- Take measures to control the spill within minimum area,
- Minimize volume of spill by securing the source in most appropriate way,
- Minimize extent of movement of released oil from the source by timely containment,
- Minimize environmental impact by timely containment and recovery response,
- Maximize effectiveness of recovery actions through selection of appropriate equipment and techniques,
- Maximize response effectiveness through trained and competent, operational and response teams,
- Guide response personnel through the process of managing a spill originating within their area of operation, Mitigate consequences of oil pollution incidents,
- Allow those involved in response to rapidly disseminate information to parties involved and to ensure optimum deployment of Available equipment.

1.1 AUTHORITIES & RESPONSIBILITIES

This OSCP has been prepared and issued in accordance with:
The provisions of Merchant Shipping Act, 1958 as amended and /Major Ports AUTHORITYs Act, 1963 as amended.

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

1.1.1 Deendayal Port Authority will

- Maintain an adequate response preparedness (Tier-1 level) in Port by (Pollution response equipment preparedness)
- Providing equipment
- Providing PPE to the personnel
- Actively participate in the local, district, state, and national level committees / forums for Oil Spill Response contingency.

- Make all responsible efforts to act as early as possible on occurrence of oil spill and becomes the "First Response Agency" in the DPA.

1.1.2 Berth Operators, Associated staff, and Ship's crew

- It is the responsibility of berth operators, associated staff, stevedores, and ship's crew to report all identified Oil / HNS spills.
- Take all steps necessary to effectively prevent spills or limit the spread of spills that have occurred.

1.1.3. Other Government Agencies and CMG

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

1.2 a. COORDINATING COMMITTEE DPA KANDLA

Chairman
Deputy Chairman
Management Team DPA, KANDLA

1) Deputy Conservator
2) Harbour Master
3) Lead HSEF
4) Shift in charges
5) Lead Diving team
6) Support Team Outsourced Agency.

b. COORDINATING COMMITTEE DPA OOT VADINAR

Chairman
Deputy Chairman
Management Team DPA, OOT Vadinar

1) Chief Operations Manager
2) Marine engineer
3) Lead HSEF
4) Shift in charges
5) Lead Diving team
6) Support Team Outsourced Agency.

The callout system for an oil spill incident is identical to any other emergency as contained in disaster management plan of DPA. Emergency Control Team (ECT) will arrange mobilization of additional resource like Emergency Response Team (ERT) as and when, required.

HEAD VOTL

Responsibilities: a) Liaise with Mutual Aid Organizations
b) Liaise with corporate communication for press statements release.
c) Liaise with Coast Guard Monitor as appropriate
d) Confirm / amend initial classification
e) Manage the VOTL response
f) Authorize expenditure

Note: Port Captain will take the charge till the Head VOTL arrives, after that he will assist the Head VOTL.

MARINE ENGINEER

Responsibilities: a) Observe or receive report of oil spill incident
b) Initiate measures to prevent/reduce further spillage
c) Maintain communication with all other vessels
d) Act as per instruction of SIC

Lead HSEF

Responsibilities: a) Initially access the situation and initiate action
b) Verify classification
c) Provide accurate situation to Head VOTL
d) Manage the pollution prevention response & Resources

SHIFT IN-CHARGE

Responsibilities: **a)** Initially assess situation and initiate action
b) Verify classification
c) Provide accurate situation reports to Head VOTL/Port Captain
d) Collect evidence and / or statements
e) Liaise with Lead HSEF (as applicable)
f) Liaise with incident vessel regarding status of oil spill (if applicable)

LEAD DIVING

Responsibilities: **a)** Observe and Initiate action upon information
b) Provide accurate situation reports to PMC
c) Assist in Collecting evidence and / or statements
d) Liaise with incident vessel regarding status of oil spill (if applicable)

1.3 STATUTORY REQUIREMENTS:

1.3.1 MARPOL 73/78:

India being signatory to number of international agreements and conventions aimed at controlling marine pollution through measures and rules applicable to marine facilities or surface units, is under an obligation to honor and implement the same through municipal legislation and through adopting means, practices and rules in accordance with Article I of the Convention 73 and Protocol 78 i.e. MARPOL 73/78.
BROAD CLASSIFICATION OF OILS AS PER MARPOL 73/78 is placed at **Annexure- 6**

1.3.2 International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC), 1990:

Apart from the specific obligations imposed by MARPOL, being a signatory to UN Convention on the Laws of the Sea (UNCLOS), India has an obligation to protect and preserve the marine environment in addition to obligations under International Convention on Oil Pollution Preparedness, Response and Co-operation 1990(OPRC Convention).

NOS-DCP has its origin in IMO convention OPRC – 1990, ratified by India. As per the convention it is imperative upon each signatory state to have laws and mechanisms to respond to oil spills in its waters.

1.3.3 National Regulations includes:

- Indian Port Act, 1908
- Coastguard Act, 1978
- Merchant Shipping Act, 1958
- Major Port Act, 1963
- Water (Prevention & Control of Pollution) Act, 1974, amended in 1988
- Environmental Protection Act, 1986 (amended 1991)
- Coastal Regulation Zones Notification – 1991

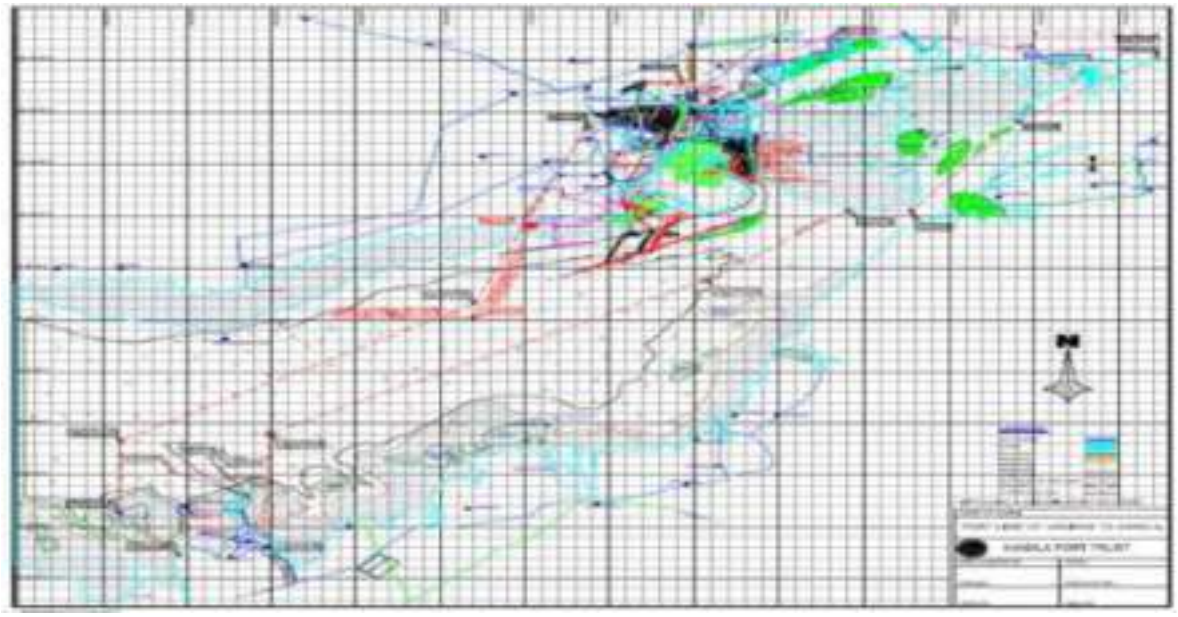
1.4 MUTUAL AID AGREEMENTS:

Refer Annexure – 25, Page -138

1.5 GEOGRAPHICAL LIMITS OF PLAN:

Deendayal Port Authority is located along the west bank of the Kandla creek situated at the north-east head of Gulf of Kutch which is at the west coast of India. Ships calling at Deendayal Port Authority therefore have to traverse across the GOK. This plan is limited to Deendayal Port Authority and up to anchorage area.

The plan contains details of contingency arrangements required for responding to the actual or threatened oil pollution incidents within the marine terminal area, as below. BETWEEN POINT A, B, C & D MENTIONED BELOW PIC



Response strategy for the DPA KANDLA plan has been developed taking into account the spill risks, and possible sources of spillage associated with Marine Terminal operations including those at the SPM and Jetty berths and other facilitates within the Port.

The geographical area of operations is bound by, but not limited to, one mile either side of the line joining following coordinates.

POINT A COORDINATES: LAT 23° 3'7.00"N, LONG 70°13'3.17"E
POINT B COORDINATES: LAT 23° 3'6.71"N, LONG 70°13'34.73"E
POINT C COORDINATES: LAT 22°57'59.87"N, LONG 70°13'38.65"E
POINT D COORDINATES: LAT 22°58'49.71"N, LONG 70°14'21.28"E

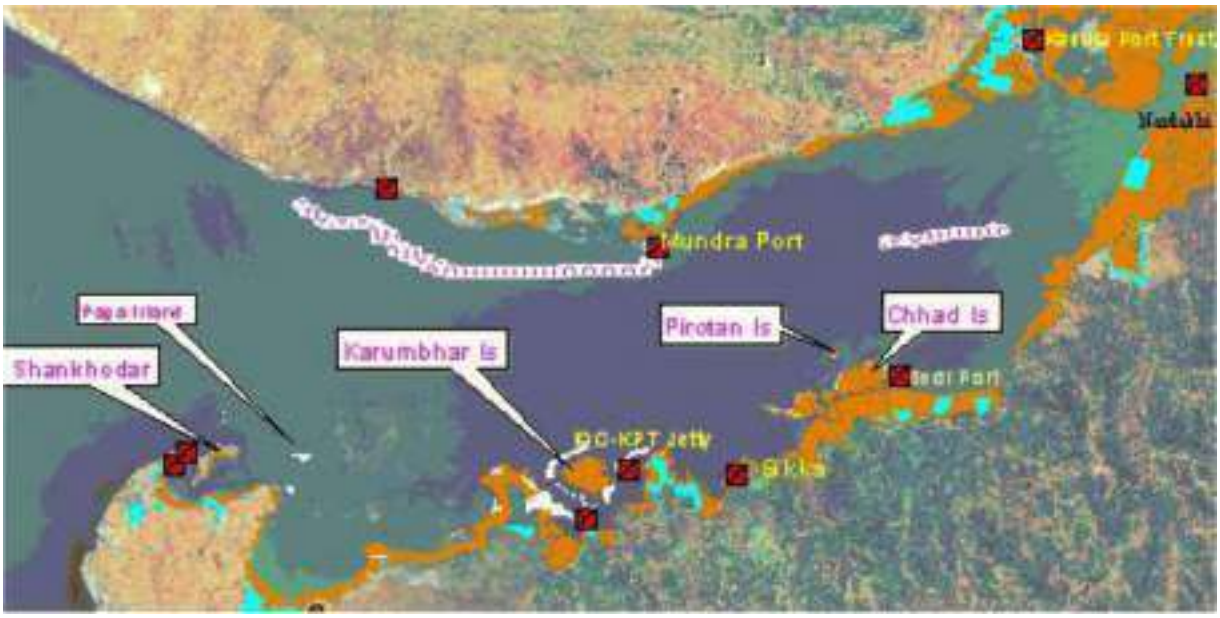
OIL JETTY –I LAT, 23°01.6’ N LONG 70°13.3'E
OIL JETTY –II LAT, 23°01.7’ N LONG 70°13.3'E
OIL JETTY –III LAT, 23°01.9’ N LONG 70°13.3'E
OIL JETTY –IV LAT, 23°02.0’ N LONG 70°13.3'E
OIL JETTY –V LAT, 23°02.2’ N LONG 70°13.3'E
OIL JETTY –VI LAT, 23°02.4’ N LONG 70°13.3'E

DRY DOCK: LAT, 23°00.9’ N LONG 70°13.3'E
SNA JETTY: LAT, 23°00.6’ N LONG 70°13.3'E

CARGO JETTY STARTING FROM NORTH TO SOUTH IN STRAIGHT LINE STARTING FROM NORTHERN END OF CARGO JETTY 1 LAT, 23°00.4’ N LONG 70°13.4'E TO END OF LAST CARGO JETTY NO. 16’S SOUTHERN END LAT, 22°58.4’ N LONG 70°13.8'E DISTANCE 2.030NAUTICAL MILES.

DPA KANDLA AND OOT VADINAR Port is located along the west bank of the Kandla creek situated at the north-east head of Gulf of Kutch which is at the west coast of India. Ships calling at DPA KANDLA AND OOT VADINAR port therefore have to traverse across the GOK. This plan is limited to DPA KANDLA AND OOT VADINAR port and up to anchorage area, which is 4 nautical miles from port.

The plan contain details of contingency arrangements required for responding to the actual or threatened oil pollution incidents within the marine terminal area, as below.



Response strategy for the DPA KANDLA AND OOT VADINAR plan has been developed taking into account the spill risks, and possible sources of spillage associated with Marine Terminal operations including those at the SPM and Jetty berths and other facilitates within the Port.

Note: Deendayal Port Authority port limit extends from Kandla to Vadinar and IOCL & Nayara Energy installations are located at Vadinar under port limits.

The geographical area of operations is bound by, but not limited to, one mile either side of the line joining following coordinates.

SPM1:	22°30'14" N/69°39'35" E
LFP:	22°27'59" N/69°43'26" E
Berth B (North End):	22° 27' 15" N 069° 40' 10" E
Berth A (South End):	22°26' 54" N 069° 40' 11" E
Sea Water Intake:	22°26' 11" N 069° 40' 32" E
LO- LO/ RO-RO Jetty:	22°26' 24" N 069° 40' 29" E
SPM2 (proposed):	22°31' 48" N 069° 40' 18" E
Berth C (proposed):	22°27' 21 N 069° 40' 09" E
Berth D (proposed):	22°27' 27 N 069° 41' 10" E

1.6. INTERFACE WITH ROSDCP & NOSDCP

Oil company and port oil spill contingency Plans (Kandla)

The companies whose installations are located in nearby area have individually prepared their own contingency plans, which detail their response to tier one incident. Agreement dated 28.12.2019 of Mutual Aid- Scheme for Oil Spill Response and control by oil handling Member Organization Between IOCL, BPCL, HPCL, strengthens Oil Spill response capability in the area, the agreement is valid for five years.

Sl. No	Owner
1	Indian Oil Corporation Limited, KANDLA
2	Kesar enterprises Ltd.
3	J.R Enterprises
4	IFFCO Kandla unit
5	BPCL
6	Friends oil & chemical terminals Pvt Ltd.
7	Indo Nippon co Ltd.
8	HPCL
9	IMC Ltd.
10	Mother diary fruit & vegetables Pvt Ltd.
11	Parker agro hem product ltd.

Oil Company and port oil spill contingency Plans (OOT Vadinar)

The companies whose installations are located in nearby area have individually prepared their own contingency plans, which detail their response to tier one incident. Agreement dated 28.12.2019 of Mutual Aid- Scheme for Oil Spill Response and control by oil handling Member Organization Between VOTL, IOCL, BORL, RIL, EBTSL & Cairn India Ltd, strengthens Oil Spill response capability in the area, the agreement is valid for five years.

Sl. No	Owner
1	Indian Oil Corporation Limited, Vadinar
2	Reliance Industries Ltd, Sikka
3	Bharat Oman Refinery Ltd, Sikka
4	Cairn India Limited, Bhogat
5	Vadinar Oil Terminal Limited, NAYARA ENERGY

District Plans
In the event of actual or threatened spread of oil extent of which is or is likely to be beyond the mitigating resources Available with DPA, then the **ICG Oil Pollution plan** may be implemented. In such case nominated officer of ICG will assume the function of On Scene Commander

National Oil Spill Disaster Contingency Plan (NOS – DCP)
In the event of an oil spill incident which calls for a Tier-III response, the coast guard will implement the NOS – DCP. DPA and all Mutual Aid Partners will continue to deploy their anti-pollution resources, as directed by the Coast Guards on scene commander

2. RISK ASSESSMENT

As required of a Contingency Plan, this Plan has tried to compare the hazard and vulnerability in a particular location to see the kind of risk that are posed and then to addresses those problems by determining how best to control the spill, how to prevent certain ecological elements or environments from exposure to oil, and how best to advise the local civil authority of the dangers that could be posed by the spill and how to address them and to repair the damage done by the spill.

2.1. IDENTIFICATION OF ACTIVITIES AND RISK:

In spite of best intentions to conduct cargo work under best practices, a spill could still occur at a port or terminal during cargo work because of the failure of pipelines, loading arms, flanges or equipment. The potential accidents associated with a plant, port, terminal or pipeline can be divided into two categories in terms of Generic and Specific operating failures.

Generic failures are associated with mechanical component of the facility or terminal like vessels, pipelines, pumps or compressors. The failures under this category could be caused by factors as corrosion, vibration or external impact. A small event like a leak may escalate into a bigger event by itself causing a bigger failure.

Specific operating failures is the prime cause of human errors but they can also include accidents.

Every significant mechanical component that could fail with its operating conditions, contents and inventory, is a contributor to failure identification. The study of Generic failures requires consideration of each component under their normal operating conditions.

The possible range of failures being large in number are generally considered under the following heads and incidents

For vessel/ storage tanks
Rupture (Full bore)

- Large leaks (20%mm equivalent leaks)
- Medium and small leaks (due to corrosion, impact and other such cases)

For pipelines

- Full bore ruptures
- Large, medium and small leaks

2.1.1 Failure frequencies - Pipelines

The failure frequency of pipelines is subject to a number of factors like rate of corrosion, age of pipeline, duration of use, size of damage and length etc. Different value of any of these will give different figures for failure frequency. The data as per table 1 gives the failures frequencies in relation to type or size of leak and represents the chances of occurrence of mentioned type of leak per unit length of pipeline per unit diameter.

TYPE	% of cross sectional	Frequency per year
Small leak	< 1	$2.8x10^{-7}$ L/D
Big leak	5	$1.2x\ 10^{-7}$ L/D
Catastrophic leak	20	$5.0x10^{-7}$ L/D
Rupture(guillotine failure)	100	$2.2x10^{-7}$ L/D

Table1. – Pipe leak frequencies as per size of leak.

With respect to causes of leak as per the failure of different systems, the frequencies are as per table 2

The following scenarios are identified for probable oil spills in marine operations of DPA KANDLA AND OOT VADINAR:

I. Spill due to floating hose failure at SPM.
II. Spill due to rupture of subsea crude oil pipeline from SPM to LFP (iii) Spill due to collision at SPM & tanker route.
III. Spill due to overflow from tanker while transfer of Oil at Jetty.
IV. Spill due to Loading arm failure at Jetty.
V. Spills due to tanker collision / grounding in the vicinity of Jetty.

Kandla Port established under Major Ports Act, 1963 is now renamed as Deendayal Port Authority one of the busiest major multi-product port of India located in the Kachchh district of Gujarat. Kandla has 16 dry cargo berths with a total of 2.57 km in a straight-line and 6 dedicated LIQUID CARGO berths for handling EDIBLE OILS, PETROLEUM, POL and chemicals.

During 2019 - 20 the port handled 115 MMT of cargo and thereby retaining number one position for volume of cargo handled among the Major Ports of India. Deendayal Port is located in inner most eastern part of Gulf of Kutch, It is connected by Road by national Highway, Port is also connected with Rail connectivity Nearest Railway Stations are Kandla and Gandhidham, Port handles various types and sizes of the ships, tankers and container ships, Maximum DWT permitted at Deendayal Port is 75000mt, Max draft permitted is 14 Mtrs, Max draft permitted is 13.5 Mtrs.

DPA's Satellite Port, Vadinar Oil Terminal is located close to Jamnagar. It is connected by road through SH-25. 12.5 km spur line connects the rail gantry of Vadinar Terminal to Jodhpur railway station. Nearest railway station is Jamnagar. Oil Jetties can handle up to a maximum size of vessel 56,000 DWT. SPM handle Very Large Crude Oil Vessels (VLCC) with a maximum pumping capacity of 10000 tons per hour. Hence, it should be inferred that the area is having high density of potential sources. Images of KPT & Vadinar Terminal are given in **Figure 2.1**

DPA Kandla

DPA Kandla oil jetty

Figure2.1. Layout of Deendayal Port & Vadinar Terminal

The port has been achieved the first position among all major ports of India, of so last decade. Presently, the port can handle dry bulk, break-bulk; liquid bulk and container cargo. Important commodities handled at the port are Coal, Petroleum Oil PRODUCTS and Lubricants (POL), Food Grains and Container Cargo, Ports, various Chemicals Oil handling facilities & Ships in and around the Deendayal Port Limit are the other potential sources of oil spill. The location map of Ports, SPMs & Captive Jetties of Gulf of Kachchh is given as

Figure 2.2. Majority of Installations are located within the DPA limit or very close to it.

Figure2.2. Location of Ports and allied Facilities in Gulf of Kachchh

2.1.2. Existing Facilities at Kandla Port

Deendayal Port has 16 berths, 7 oil jetties, 1 maintenance jetty, 1 dry-dock and a few small jetties for small vessels. Adjacent to all these terminals and jetties there are storage facilities for covering cargo received by pipelines, containers to petroleum products.

There is an existing steel **floating dry dock** within the port caters the need of port crafts as well as outside organizations and has capacity to accommodate vessels of following parameters.

- Length Overall (LOA) - maximum up to 95meters.
- Breadth - maximum up to 20meters.
- Draft - maximum up to 4.5meters.
- Lift displacement - maximum up to 2700tones.

Port's Chemical and Liquid Handling Complex has total storage capacity for 21.9 lakh kiloliters. Private sector storage terminals have capacity for 9.8 lakh kiloliters.

Port consists of 185 hectares of custom bonded port area. Port offers an excellent and vast Dry Cargo Storage Facilities inside the Custom Bonded Area for storage of Import and Export cargoes, on very competitive rates. Also, it has the largest capacity in India for storing liquid cargoes, and it is served by a modern pipeline network. The storage facility for liquefied petroleum gas has capacity for 30 thousand cubic meters. The container handling facilities include 545 m of quays equipped with four rail-mounted quay cranes and two harbor or mobile cranes. The container facilities include an almost 11- hectare container yard, a 6.5 thousand square meter container freight station, and 90 reefer points for refrigerated containers.

2.1.2. Offshore Oil Terminal (OOT), Vadinar

DPA had commissioned offshore oil terminal facilities at Vadinar in 1978, jointly with Indian Oil Corporation. It has capacity of 58 MMTP and handle crude oil and petroleum products. Vadinar one of the deepest natural draft terminals in India and it does not require any maintenance dredging. The facilities consist of three offshore Single Point Mooring (SPM), two jetties for handling liquid petroleum products, tanks for storage of crude oil and petroleum products and rail and road gantries for dispatch of petroleum products.

The features of the OOT Vadinar is as presented below:

- A draft of up to 33 m at SPMs and Lighterage Point Operations(LPO)
- Handling VLCCs of 300000 DWT and more.
- Providing crude oil for the refineries of Koyali (Gujarat), Mathura (Uttar Pradesh), Panipat (Haryana) and NAYARA Refinery, Jamnagar(Gujarat)
- Simultaneous handling of three VLCCs possible at the SPMs with vast crude tank age facility.
- Two nos. of 50 Tons state-of-art B.R SRP Pull-back tugs are Available for smooth and simultaneous shipping operations on the SPMs and product jetty.
- One oil and debris recovery tug for oil pollution control has been acquired and stationed at Vadinar.
- Excellent infrastructure facilitating transshipment operations, even during the monsoon.

2.1.3. Traffic Handled at Kandla

Deendayal Port has shown buoyant growth in cargo handling in the recent past. The port's share in traffic handled by all major ports has risen steadily over the years. The past traffic profile of the port is shown in **Figure 2.3.** During 2018-19 & 2019-20 total traffic handled are 115.40 MMT and 122.61 MILLION METRIC TONNES respectively

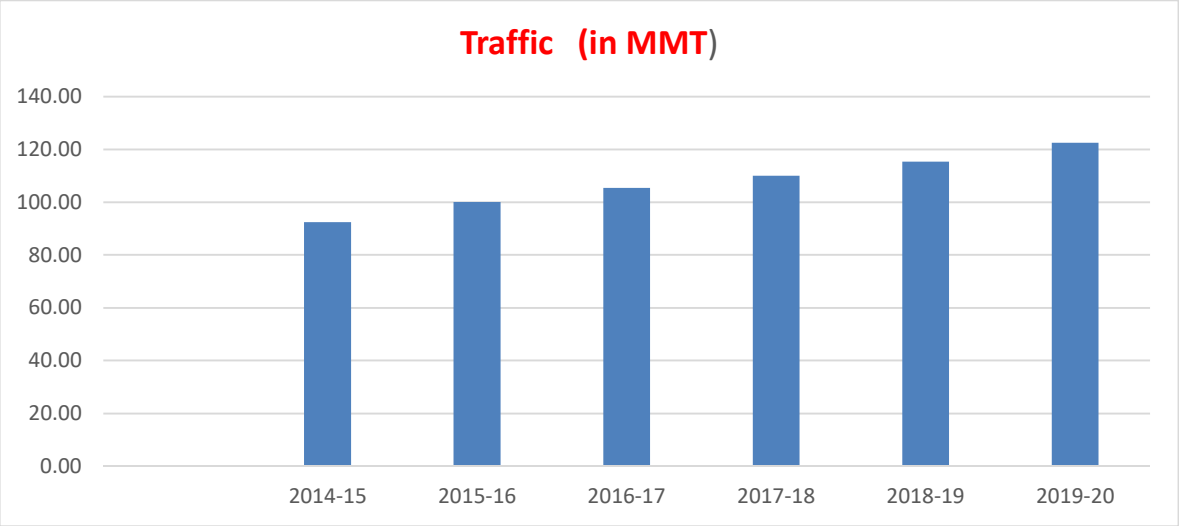
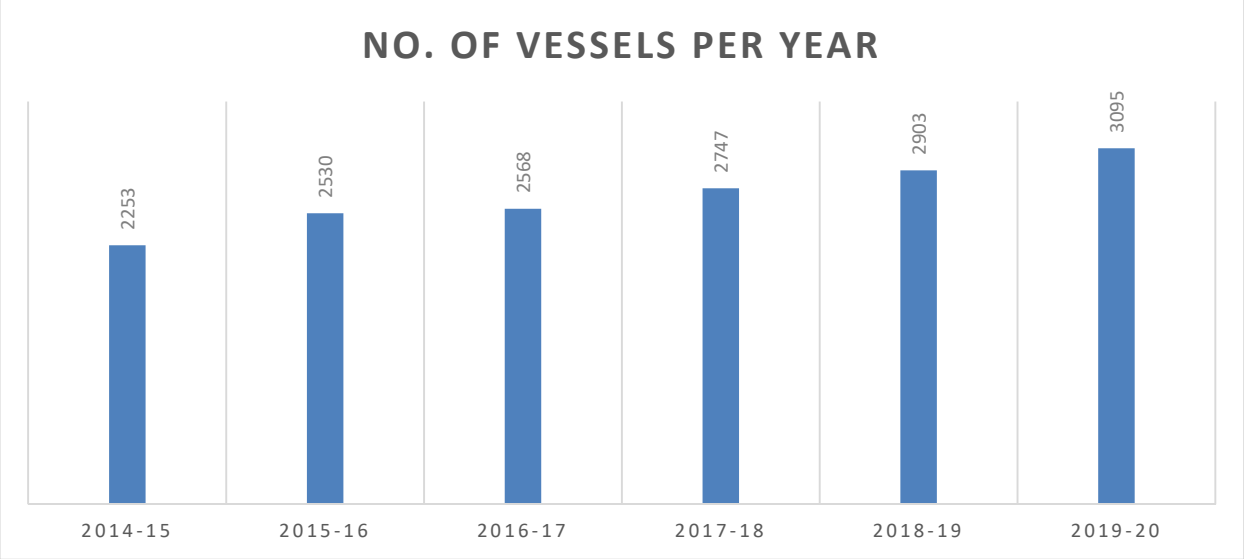


Figure2.3 Traffic Profile OF DEENDAYAL PORT AUTHORITY

Total number of ships visited KPT during the year 2014-2020 are given as shown in **Figure.2.4.**
Among them almost 75 % visited KPT and remaining 25 % visited Vadinar.



Total number of ships handled at DPA commodity wise during the period of 2014-2020 is as presented in **Figure2.5**

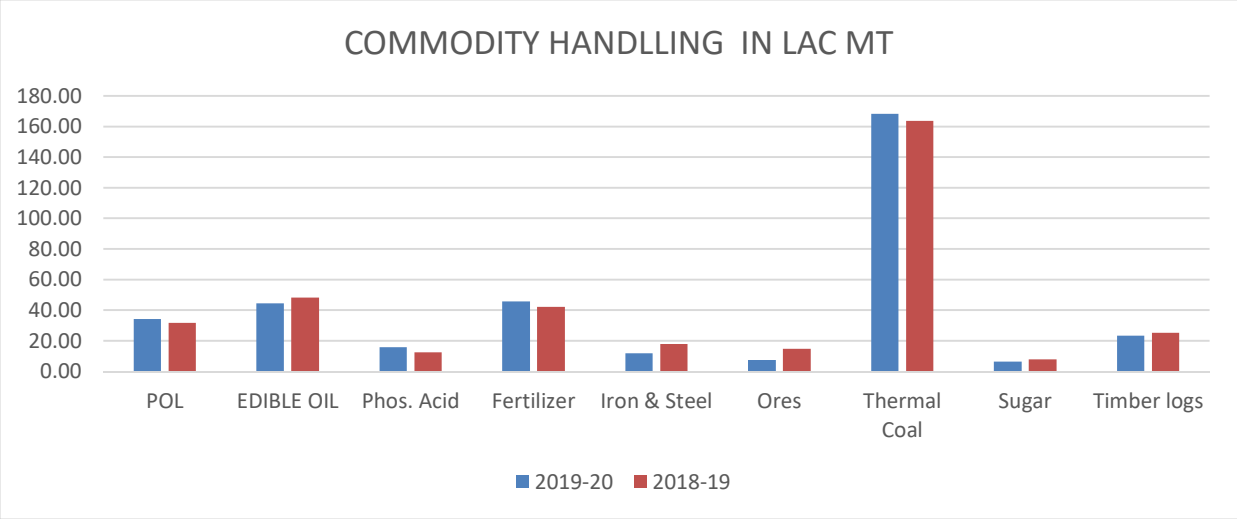


Figure2.5. COMMODITY Handled at DPA

Risk Assessment Summary for Maximum Oil Spillages:

Cause	Assessed Risk	Spill Quantity
SPM – Floating Hose Failure	Rare Phenomenon	153 T
Overflow from tanker while transfer of oil at Jetty	Rare Phenomenon	56 T
Jetty Berths –Loading Arm Failure	Extremely Low	10 Liter.
Rupture of subsea crude oil pipeline from SPM to shore tanks	Rare Phenomenon Very rare, Not Likely	1-2 Liter

2.1.4. Cargo Ops or Transfer Spill Frequencies

Transfer spill is defined as an event where the oil is released to sea due to failure or error during loading/ unloading of cargo or fuel oil. This includes loading in port and ship-to-ship transfer also. Typical causes for this spill include overflow, hose failure, errors in setting valves etc.
As per figures compiled by DNV, during 2000-10, ten transfer spills on oil tankers with known quantities were reported. The oil tanker exposure during this period was 74,471 ship years. Based on an Average of 80 port visits per ship year, a total of 5.6 million cargo transfers were undertaken. This figure gives a transfer spill frequency of $1.7x\ 10^{-6}$ per cargo transferred.

2.1.5. Spill Volume Calculations – Pipelines

The quantity of oil spilled can be calculated in terms of total rapture and also for pin hole leaks using software taking into account the diameter of hole and flow rate. The formula for total rapture calculation is:
Volume of Spill = 2 Pie X Radius of Pipeline X Length of Pipeline X Flow Volume. (Refer Annexure-11)

2.2. TYPES OF OIL LIKELY TO BE SPILLED: Characteristics of different classes of oils is placed at an Annxure-9

No	Oil Type	Specific Gravity	Genre	Characteristics	Examples
1	Light oil	< 0.84	White oils	Non-persistent, Volatile	Aviation fuel, Kerosene, Motor spirit, Naphtha, HSD.
2	Crude oil	>0.84	Black oils	Persistent, Viscous, Emulsion. Fresh oil amenable to dispersants	Arabian Light, Arabian Heavy etc.
3	Heavy oil	>0.95	Black oils	Persistent, Viscous, Emulsion, Generally not amenable to dispersants	Fuel Oils, LSWR

Table 3

Flammability (Nf) 3 – Liquids and solids that can be ignited under almost all ambient temperature conditions
2– Materials that must be moderately heated or exposed to relatively high ambient Temperatures before ignition can occur

Health (NH) **0** - Materials which on exposure under fire conditions would offer no hazard beyond that of Ordinary combustible material
1 – Materials which on exposure would cause irritation but only minor residual injury if no Treatment is given

Reactivity (Nr) **0** – materials which in themselves are normally stable, even under fire exposure conditions and which are not reactive with water

It is apparent that risks to human life caused by most of the hydrocarbons in terms of flammability, health and reactivity are not very significant and can be handled with some degree of expertise.

2.2.1. **CAUSES OF OIL SPILL**

The common causes of spill are:

- Cargo operations- loading, discharge
- Ship collision, or grounding
- Bunker/ fueling operations
- Ship distress / sinking

Pipeline ruptures /accidental spills from sub-sea/over the sea/shore approach (in the tidal zone) pipelines Location of spill within the scope of this Plan. Based on the location of vessel at the particular time of incident within the area of operation, the likely spill could occur at any of the following locations.

I. Sea or in channel due collision etc. during passage
II. Close shore due grounding or
III. Alongside at jetty or at the terminal during cargo operations
IV. Iv. Sea or at landfall point from interbreed pipelines.

Notwithstanding the above locations, it is possible that an eventuality occurring at sea like a collision or mechanical failure could lead to a situation where the consequences would be felt in some other location at a coastal location.

2.3. SPILLED OIL MITIGATION

DPA KANDLA AND OOT VADINAR is prepared to mitigate Oil Spills of Importance from routine operations, while oil spill situations of higher magnitude are dealt with neighboring industries viz. IOCL, NAYARA ENERGY, Indian coast Guard cooperation and external intervention. However, accidental leakages are arrested immediately with Remote operating controls/QSD valves by automated sensors. The exact quantities from each incident is difficult to predict due to the variables of operating conditions and the length of risk exposure, optimum risks associated with the events has been considered while devising the oil spill contingency plan

2.4. DEVELOPMENT OF OIL SPILL SCENARIOS INCLUDING WORST CASE DISCHARGE CONSIDERING MAXIMUM LOSS AND WEATHER CONDITION

DPA KANDLA AND OOT VADINAR is operating 02Nos.Berths (A & B) which can accommodate vessels ranging from 25,000 to 100,000 DWT for oil handling & one SPM which can accommodate vessels ranging from 87,000 to 350,000 DWT for crude oil. Marine Terminal is located within an area which has been declared as a Marine National Park/ Marine Sanctuary. The mean tidal range is approximate 6 meters and current speed in excess of 2 knots may be experienced alongside the jetty.

2.5. SHORELINE SENSITIVITYMAPPING:

The quantity of the spill reaching to the coast and affected areas for various seasons for various hydrological and meteorological conditions and predicted BY use of Hyrodyn-OILSOFT software is as follows.

2.5.1. Main Approach Channel

The least depth in the main approach channel to the tanker jetty is 14 meters; the maximum acceptable draft alongside jetty berths is 14 meters. A minimum under keel clearance of 6% of vessel's maximum sea going draft plus 0.60 meters is applied to all vessels under way.
While the risk of grounding is low, it cannot be totally eliminated. The most likely cause is steering or propulsion system failure which could result in grounding on the channel margins with consequent damage to the bottom and/or the mid body plating. The potential spill quantities depend upon the size / type of tanker and the area of impact damage. The vessels calling the product terminal, in bound and out bound will be escorted by minimum two tugs in fair weather condition. This considerably reduces the risk of the vessel running aground in the channel.

Deendayal Port located in the northern plank of the GOK, in an area with irregular and dissected configurations, with numerous creeks surrounded by marshy lands on the bank of Kandla creek. Located at the juncture of Kathiawar and Saurashtra peninsula, i.e., at a transition zone between arid and semi-arid zone having striking characteristics of the arid area.

The port limits extend from Navlakhi at the head of GOK to NARARA Bet in the southern arm. While from Tuna in the north coast to Kalumbhar Bet in the southern arm. The limit is bounded by Kachchh in the North & North-East, Morbi at East and Devbhoomi Dwarka and parts of Jamnagar district towards South & South- East respectively. Along the coast there are numerous coastal villages with people engaged in traditional occupation of fishing hosting large and small fish landing centers. Also, being the adjoining land masses of ports, many of them have been developed into port towns and subsequently developed as industrial pockets.

Sathsaida bet, flamingo flats, IFFCO Intake location, Fishermen Residence, Saltpans surrounding port are important sensitive areas of DPA. Important organisms include algae, mangroves, corals, sponges, mollusks, prawns, fishes, reptiles, birds and mammals. In order to protect the rich biodiversity of the GOK, several intertidal mudflats and coral reefs along its southern shore are declared as Marine National Park and Marine Sanctuary (MNPS). There are also are as declared as Important Bird and Biodiversity Areas (IBAs) and Important Within the port limit is one of the most productive and diversified habitats along the West coast of India. The high tidal influx covers vast low-lying areas comprising a network of creeks, marshy tidal flats and rocky regions, which provide congenial environment to a wide variety of marine biota. The northern shore is predominantly sandy or muddy confronted by numerous shoals, creeks and sustains large stretches of mangroves. There are vast mudflats towards the Mundra coast. There are narrow beaches along the coast behind the mudflats. Towards the southern limit, shoreline is comprised of numerous islands and inlets, which harbor vast areas of mangroves and coral reefs with living corals Coastal and Marine Biodiversity Areas (ICMBAs).

Thus, the peculiarities of Deendayal Port area which are to be duly considered with respect to oil spill sensitivity can be briefed as follows:

- An all-weather Major Port with several oil handling facilities including SPMs within port limits
- Dry Weather and Mild Monsoon
- High tidal ranges and strong tidal currents
- Extensive creek system acting as tidal channels
- Valuable ecological resources such as Corals, Mangroves, Mudflats and bird flocking areas around the vast creek system

Association (IPIECA), & International Association of Oil & Gas Producers (OGP). NOS-DCP-2015 put forwards the same scheme for the preparation oil spill contingency plan at various levels in the Indian context.

- ESI index is based on three parameters including Extensive socio-economic activities including Special Economic Zone (SEZ), saltpans, fishing areas and intake points of shore-based industries.

Environmental Sensitivity Index (ESI) is an international scheme used for classifying as well as ranking the shoreline based on their sensitivity towards oil spill. This methodology was prepared by National Oceanic and Atmospheric Administration (NOAA) further promulgated jointly by IMO, The International Petroleum Industry Environmental Conservation:

- Shoreline Classification, which takes sensitivity of the shore habitats, natural persistence of oil and ease of cleanup.
- Biological Resources including oil-sensitive animals, rare plants
- Human-Use Resources that have sensitivity because of their typical use, such as beaches, parks and

marine sanctuaries, water intakes, and archaeological sites.

While preparing the ESI maps, the sensitivity of the shore is represented by color-codes along the coast while, biological and human-use resources are represented by symbols. The coastal area has been studied and the ecological resources have been mapped for the Deendayal Port Area.

2.5.2. Approach to SPM

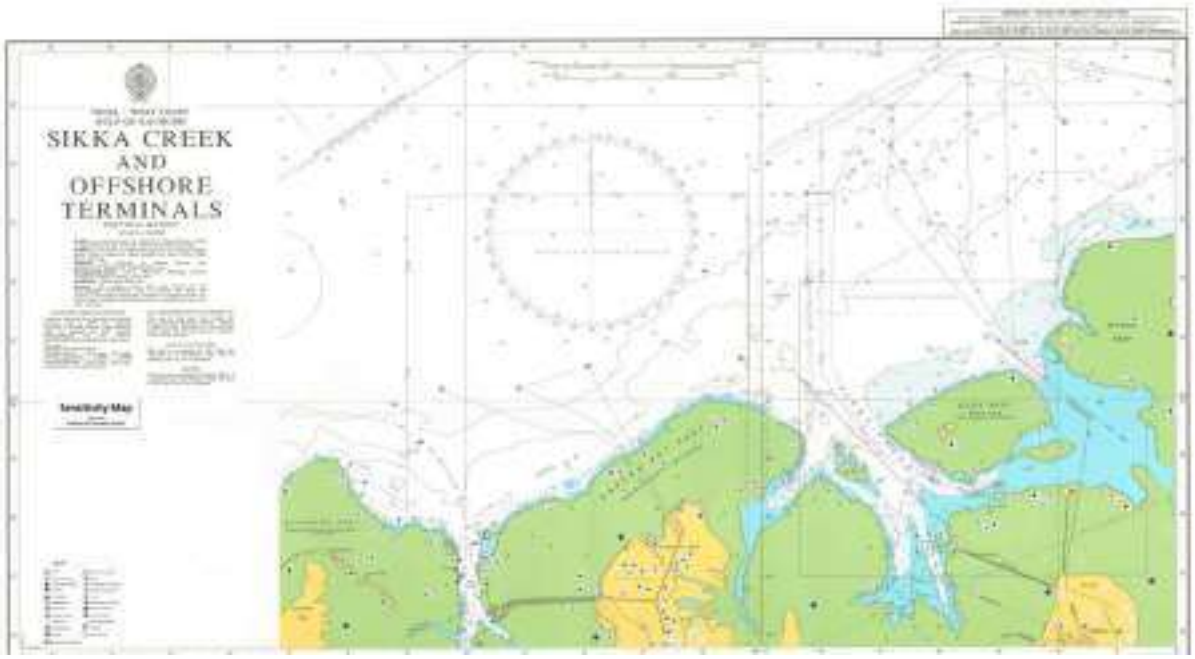
Tankers bound for SPM will follow the deep-water route. Berthing and unberthing of the tankers on to the SPM will be done by DPA Pilots. Charted depth at SPM location is 34.5 meters. Grounding of Tankers in the SPM area is considered as very remote.

A detailed shore line sensitive mapping has been carried out. The Sensitivity chart is attached below for reference. Further CZMP map is showing sensitive shoreline is attached as Annex – 06 for our area. Map showing sensitive areas i.e. Saltpans, Mangroves, Fishing Grounds Landing ground, Boat jetty etc.

Map-1
Sensitive areas - Overview

AREA CHART OF DPA KANDLA AND OOT VADINAR PORT

Map-2



2.5.3 ENVIRONMENTAL SENSITIVITY INFORMATION (Refer Annexure15)

This section summarizes the environmental sensitivity information derived from a variety of studies. It should be consulted, in conjunction with the Spill Response Guidelines to identify priority Areas for protection and the most appropriate response technique(s).

The Marine Terminal is located within an area which has been designated a National Marine Park / Marine Sanctuary. The Authorities have listed the following as their priorities for protection, in descending order, from spilled oil;

1. Marine National Park
2. Marine Sanctuary
3. Salt works
4. Forest Areas
5. NAYARA refinery intake location
6. Mangroves area

2.6. SHORELINE RESOURCES, PRIORITIES FOR PROTECTION:

2.6.1. SHORELINE RESOURCES

The adequate shoreline clean up equipment Available to deploy and effective clean up shall be done. **Annexure-7**

Deendayal Port is located inside extensive creek system surrounded by bets including intertidal and high tidal mudflats, while its limit extends to the Port. Because of its geographical extent, the area is described as two zones- Kandla Zone for the areas in Northern side of the port limit and Vadinar Zone is located towards the southern side of port limit. The inner portion of Gulf area has more uniform and stable environmental conditions. The important shoreline features of the port limit are given as **Table 2.1.** Deendayal Port limit is free from significant wave disturbances while the Vadinar has marine meteorological conditions dominated by tides and monsoons.

Table 2.1. Important Shoreline Features of the Port Limit

Sl. No.	Nature of Coast	Coastal Stretch	Length(km)	Major Feature
1	Mix- Wave & Tide dominating Coast	Mundra - Tuna	45	Mudflat, Paleo-mudflat/ Salt Pan, Ebb Delta/ Sand Ridges
2	Tide Dominating Coast	Tuna – Kandla	15	Mudflat including Hard Mudflats bordering LRK, Paleo-mudflat/ Salt Pan, Mangrove
3	Tide Dominating Coast	Kandla – Vadinar	60	Islands of southern arm such as Kalumbhar and NARARA with Corals, Mangroves & Mudflats.

2.6.2. PRIORITIES FOR PROTECTION AND CLEAN-UP

In the event of a major oil spill, large stretches of the coastline may be threatened and, ultimately, impacted by oil. The response to such a spill can be divided into two aspects:
a) Protection
b) Clean-up
The priority shall be given as per sensitivity mapping as shown in Map-1, like Marine national park and marine sanctuary where corals and mangroves are surviving.

Prioritization of resources is an integral part of sensitivity mapping since it will be helpful in determining the response priorities, achieving optimal resource use and essentially ensure maximum resource protection. This was done by giving ranks to each resource types which has been already described under the heads of Environmental sensitivity i.e. Sensitivity to Oil Pollution, Environmental Value, Cultural & Social values and Economic values (Kandla et al, 2008). Ranks between 10 were assigned for the resource. Same rank was given to different resource when the occupied same position in different heads. Two resources may take a same value as required by the circumstance. Hence, it is not necessary that all the values must be present under one category at a time. Intake points considered here are only of industrial use. Weight ages were given to each head i.e., Sensitivity to Oil Pollution (30), Environmental Value (30), Cultural & Social values (20) and Economic values (20). Priority Index (PI) was worked out based on this. Details of Prioritization of Resources are given as **Table 2.2.** below.

Table 2.2. Prioritization of Resources

Resources	Sensitivity for Oil Pollution (1-10) Weight (30%)	Cultural & Social Values (10%)	Scientific Values (20%)	Environmental Importance (30%)	Economic Considerations (10%)	Total Relative Response of Sensitivity	Risk Value	Priority	
								Index	Order
Rocky Coast	3	1	2	2	1	2.1	1	2.1	D
Port/ Harbor/ Jetties	1	7	2	4	8	3.4	2	6.8	C
Intake Locations	10	2	1	1	2	3.9	3	11.7	B
Salt Pans	3	8	2	6	5	4.4	1	4.4	D
Sandy Beach	6	8	3	5	2	4.9	2	9.8	D
Fishing Grounds	7	8	5	6	8	6.2	2	12.4	B
Sub tidal Coral Reefs	2	9	10	9	6	6.8	1	6.8	C
Intertidal Mudflats	7	4	7	8	3	6.6	2	13.2	B
Mangroves	9	10	8	10	8	9.1	3	27.3	A
Intertidal Corals	10	9	10	9	9	9.5	3	28.5	A

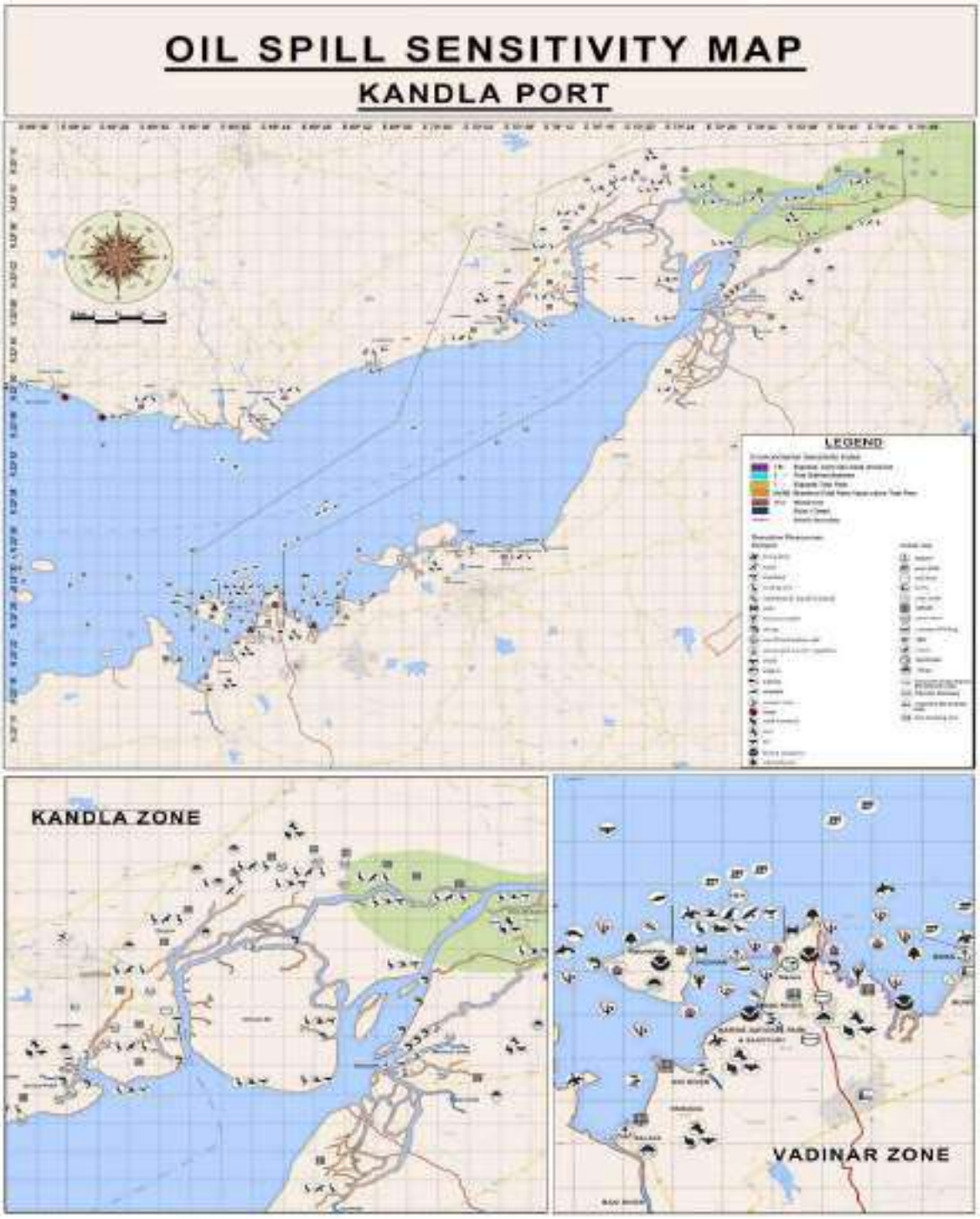
Areas requiring special consideration include presence of protected areas such as SATHSAIDA BET, MANGROVES, birding areas and other animal frequenting areas, estuaries, mangroves & fish breeding areas, tourist areas including recreational & heritage areas, industrial water intake points, resource extraction areas such as salt pans and aquaculture ponds and multi-featured areas - especially in the coral islands with variable features within a short distance from the shoreline along the southern arm.

2.7. SPECIAL LOCAL CONSIDERATION

Marine National Park/Marine Sanctuary in Gulf of Kutch is located in close vicinity of DPA KANDLA AND OOT VADINAR. Special consideration be made for handling of crude & product oil in the area.
The area identified in this region is mangroves habitat, corals reef and mudflats which needs a special consideration.

The Authorities have listed the following as their priorities for protection, in descending order,

a) Marine National Park
b) Marine Sanctuary
c) Salt pans
d) Forest Areas
e) NAYARA refinery intake location



AREA CHART OF DPA DEENDAYAL PORT

2.8. FATE AND EFFECTS

Oil spilled on water undergoes a progressive series of changes in physical and chemical properties which are referred to as weathering. The weathering of oil starts immediately after it has been spilled and proceeds at a rate which varies according to the type of oil involved and ambient climatic conditions. Weathering rates are not constant throughout the duration of an oil spill, and are usually highest in the first few hours. The process of weathering occurs simultaneously with the spreading and movement of an oil slick. Major processes which contribute to the weathering of oil spilled on water include evaporation, dissolution, oxidation, emulsification, and microbial degradation. In effect, weathering is the loss of certain components of the oil through a series of natural processes which begin when the spill occurs and continue indefinitely while oil remains in the environment. The lighter and more volatile components of the spilled oil are lost most rapidly. Consequently, the rate of weathering is highly dependent on the type of oil spilled light crude and fuel oils typically weather at a much faster rate than heavy crude or heavy fuel oils which contain a smaller proportion of light fractions.
Indefinitely while oil remains in the environment. The lighter and more volatile components of the spilled oil are lost most rapidly. Consequently, the rate of weathering is highly dependent on the type of oil spilled; light crude and fuel oils typically weather at a much faster rate than heavy crude or heavy fuel oils which contain a smaller proportion of light fractions.

Movement of Oil on Water

In large oil slicks, the waves will be partly suppressed and wave transport will be reduced. The movement of an oil slick on the surface of water is determined mainly by the current and wind velocity in the area.
Current velocities depend on wind velocities, geographical latitude, eddy viscosity, position in the water column, water depth, and proximity to coasts. Surface currents are directed to the right decreasing and turning more to the right with depth.
Winds can be broadly divided into prevailing winds, which vary over time periods of weeks to seasons, and short-term winds which vary over time periods of hours to weeks. High winds are also generated infrequently by summer tropical storms and cyclones.
When wind and currents are in different directions, they can interact in a complex manner to break up an oil slick into windrows. Windrows are long, narrow columns of relatively thick oil separated by wide bands of relatively oil-free water. In most mathematical models of oil slick drift, the oil is assumed to drift with the same velocity as the surface current. A floating oil slick is dragged along the water surface by wind friction whereas oil dispersed into the water column is not. When wind and current are not in the same direction, each tends to drive the slick in a different direction at a different speed.
The spilled crude oil and products such as FO (Fuel Oil), HSD (High Speed Diesel) and MS
(Motor Sprit) undergo a number of physical and chemical changes (weathering).

2.9 Weathering Processes:

WEATHERING PROCESSES AND TIME SCALES
Refer Annexure-10

3. RESPONSE STRATEGY:

3.1 PHILOSOPHY AND OBJECTIVES:

Within the scope of this Plan, a response action required to be mounted could be at any of these locations

I. Sea or channel, incident due collision etc. during passage,
II. Close shore due grounding or stranding,
III. Alongside at jetty or at the terminal during cargo operations.

It is feasible that a casualty occurring at sea like a collision or mechanical failure could lead to a situation where the consequences would be felt in some other location or at a coastal location due movement of pollutants from the site of incident.

The factors that would dictate immediate and long-term strategies to deal with the spill are

I. Location of discharge,
II. Spill movement and likely fate of spilled oil,
III. Time window Available for response before hitting the coastline,
IV. Nature of shoreline and priority for protection.

Keeping in account the location of spill, the response will be required to be initiated either at the jetty / terminal or at sea and guided by this OPERATIONS MANUAL. The actions required to be initiated would be immediate and long term, depending on a study and analysis of spill movement.

3.2 LIMITING AND ADVERSE CONDITION:

Weather and Time play very important role in conducting the Oil Spill Response activities. However other factors also play important role in OSR operation:

i. **Weather:** Weather, sea conditions and time factor play an important role in oil spill response operations. While, operations could continue at terminal or at the jetty most of the time, operations at sea would be largely restricted during night hours and sea conditions. The area of operations of this CP is subject to rough and severe weather conditions during SW monsoon i.e. June to September. An appreciable weather change in the area is subject to heavy rains, high winds and waves. The sea conditions being rough, it is not possible to mount sustained operations or deploy equipment at the Harbor mouth or in the channel. However, it is possible to continue operations at DPA and KPT, though at a restricted scale. Best use of good weather windows would be required to be made to mount operations.

ii. **Terrain**: A large portion of the area being mudflats is not accessible from sea and is constrained by Availability of depths for vessels to approach.

iii. **Site approach:** Certain areas especially mudflats and mangrove vegetation stretching long distances are not approachable by road or tracks from the shore.

iv. **Other limitations**: that might need consideration while planning response activity could include the Following:

- Safety factors including vessel limits, night movements, risk of fire and explosion, toxicity (oil contact/inhalation/ingestion) and hazardous environments such as fast flowing rivers and steep terrain.

- Environmental conditions that can influence logistics including inclement weather, hazardous terrain and accessibility including condition of roads.

3.3 OIL SPILL RESPONSE IN OFFSHORE ZONES:

Containment and recovery will be the strategy for offshore zones. Immediately on noticing the oil slick/oil spill, all endeavors will be to contain the spill by deploying suitable Oil Spill Response equipment and then efforts will be made to recover the oil as soon as possible.

Allowing the oil slick to hit the shores and then initiate shore cleanup measures will be the last resort, as it leads to excessive manpower requirements and also time-consuming effort.

The strategies for responding to Offshore Oil Spills are as follows:

a) Monitor and Evaluate
b) Containment & Recovery
c) Dispersant Spraying

3.4 OIL SPILL RESPONSE IN COASTALZONES:

The strategies for responding to Offshore Oil Spills are as follows:

a) Monitor and Evaluate
b) Containment & Recovery
c) Dispersant Spraying

Containment of Oil

Booms are the primary method used to contain, deflect, or exclude oil floating on the water. Booms are typically classified according to form or location of use and have the following characteristics:

1. A flotation unit or freeboard designed to contain or divert the oil as well as to resist oil splashing over the top;
2. A skirt or curtain to prevent oil from being carried beneath the boom;
3. A longitudinal strength member (usually, cable, chain, or high tensile strength fabric) that serves to join boom sections and provide anchoring points; and
4. A ballast unit or weight designed to hold the skirt perpendicular to the current flow. Containment booming encircles and contains the floating oil so that it can be collected and recovered. A simple spill in calm weather and with minimal current movement can be contained by stretching a boom across a waterway perpendicular to the path of the spill.

Deflection booming attempts to intercept, deflect, or shunt a slick towards a more desirable recovery site. Deflection booming is used when swift currents render containment booming ineffective.

Exclusion booming is largely a protective measure. Instead of being deployed to contain or intercept the oil slick, exclusionary boom is used to protect sensitive areas such as marshlands, water intakes, and shorelines by keeping oil out of an area. Exclusionary booming may have to be coupled with deflection booming to provide the best overall defense.

Mechanical Recovery of Oil

In offshore areas, mechanical clean-up with skimmers is usually begun immediately after containment measures have been implemented. Oil skimmers are used to recover oil from the surface of the water. Skimmers come in a variety of designs and sizes. Small skimming units can be used successfully on spills ranging from minor spills to major offshore disasters. Large skimming vessels are generally used on larger, open-water spills. They are usually self-propelled and are much more expensive to purchase and maintain than small skimming units.

In shoreline areas, clean-up efforts are not subject to the same time constraints imposed upon protection efforts. As a result, planning may be conducted with greater attention to detail, damage assessment, selection of techniques, and cost effectiveness. Shoreline cleanup, however, should be implemented as rapidly as possible to reduce the effects of oil migrating to adjacent clean shorelines.

In Situ Burning

In situ burning involves the containment of oil with fire-proof boom so it can be ignited. In order for in situ burning to be effective in most situations, the burn must take place within a few hours after the spill, or the oil will have dispersed too much to be burned successfully.

Use of Dispersants

Dispersants are chemicals that reduce the interfacial tension between oil and water. This enables waves to break an oil slick into tiny droplets and suspend them in the water column. As a result, the oil will present less of a threat to shorelines and coastal resources. Once the oil is dispersed into the water, chemical and biological processes convert it to carbon dioxide, oxygen, salts and other materials. High sea states which prevent oil spill containment and clean-up with booms and skimmers will mix the oil and dispersant together, providing excellent conditions for dispersant effectiveness. Chemical dispersants are effective in areas where environmental or logistical considerations will not allow the deployment of clean-up equipment and personnel. Dispersants are most effective if used within 24 hours after the spill occurs, and will:

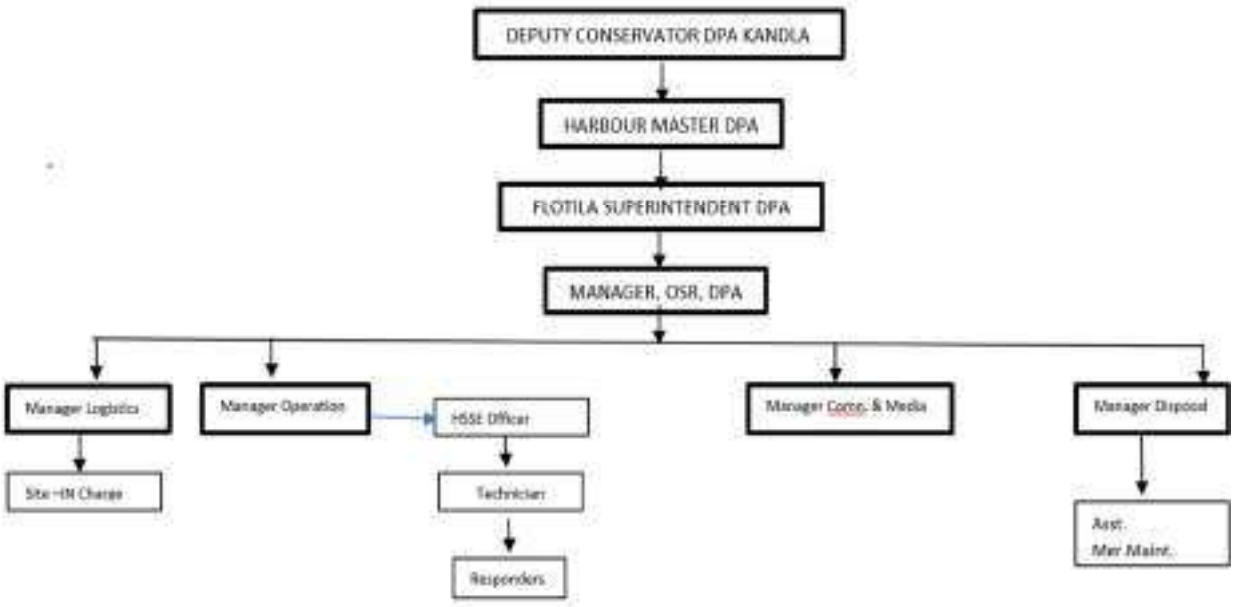
1. Remove oil slicks from the water surface;
2. Break the slick into tiny droplets which expedites biodegradation and decomposition of the oil spill;
3. Reduce the overall level of effort and manpower requirements necessary for responding to major spills; and
4. Prevent or reduce adverse effects on birds and mammals.

However, dispersants are not effective for oil spills in waters with low temperatures, low salinity, broken ice, or high energy. They accelerate the transfer of oil into the water column and thereby temporarily create high localized concentrations of dispersant/oil mixtures which could be toxic to some marine life.

The use of dispersants at and in the vicinity of our site is prohibited. The decision to use the dispersants rests with the ICG. Reference is made of Policy and Guidelines for use of oil spill Dispersants (OSD) in Indian Water.

Refer Annexure- 20

Pollution Management Cell under the chairman ship of Chairman, DPA / Dy. Chairman, will be established at MTCB to manage the initial response to the incident.



3.5. SHORELINE OIL SPILL RESPONSE: ORGANIZATION CHART

The Vadinar Oil Terminal Port (DPA KANDLA AND OOT VADINAR) is situated in the middle of the most ecological sensitive marine environment. In order to conserve and protect this precious marine environment, Government has the area around it as Marine National Park and Marine Sanctuary

The response to shoreline oiling, clean-up effectiveness, and eventually, to conduct final evaluations of shorelines to ensure they meet clean-up end points.

Shoreline oil spill response process includes eight basic steps:

1. Conduct reconnaissance survey(s).
2. Segment the shoreline.
3. Assign teams.
4. Develop clean-up guidelines and endpoints.
5. Monitor effectiveness of cleanup.
6. Conduct post-cleanup inspections.
7. Conduct final evaluation of cleanup activities.

Manual recovery is the most common method of shoreline cleanup, involving teams of workers using rakes, shovels and the like to pick up oil and debris. The oily materials are collected in buckets and drums for transfer to a processing station. Workers may also use suction hoses, pumps and vacuum trucks to recover spilled oil. While manual cleanup is a slow, painstaking process, it generates less waste than other techniques.

Monitor Only: Spill clean-up operations inevitably have their own environmental impacts. For example, heavy equipment can damage sensitive plants and disrupt wildlife habitats. When the potential harm caused by a spill is less than the potential harm caused by attempts to remove it, spilled petroleum products are allowed to degrade naturally. Technicians periodically monitor the breakdown of the spill to be sure there is no unforeseen threat to sensitive ecosystems and/or groundwater supplies.

Wildlife Cleanup: Oiled fish, birds and animals may absorb potentially lethal toxins through their skin. Following spills, birds, otters, seals and walruses may be collected for cleaning and treatment, and then returned to the environment. This is an expensive, time-consuming undertaking and, although techniques have improved greatly in the past few years, recovery rates are often poor. Many other species cannot be rehabilitated because they are either too difficult to capture, or the stress of captivity is likely to have more negative effect than the oiling.

3.5.1. PORT- VESSEL POLLUTION EMERGENCY INTERPHASE: For appropriate action & responsibility to be initiated as per table placed at an**Annexure-13**

The spilled oil contained on the terminal/ jetty will be handled manually. While, use of vacuum pumps could be made, the absorbents will be required to be used to collect the spilled oil. In respect of oil released or introduced into water, response as per water body procedures are to be initiated. (Refer Annexure-13).

3.5.2. Water Response:

The spill at sea could occur at anchorage or in channel due any eventuality or accident. An oil spill occurring due damage to vessel is a point source spill which would need to be addressed earliest. Taking into account the fact that a multiple response may be required, the vessel and responders will have to mount a rapid reaction.

3.5.3. Vessel Response

While, the first action is expected of the vessel operator in containing the spill by way of plugging of leak as far as possible, the first action of the response team is to be to contain the spill by placing booms attached to ship's hull to isolate the damaged area. Recovery of spilled oil would also be required to be undertaken simultaneously.

OSR Response

The response team being stationed afloat with equipment placed on response vessel, would deploy the equipment to contain the spill. In the event of a spill originating from the ship side, containment will be handled by placing booms along the ship side.

In case of a large spill, the actions to lighter the ship or transfer the cargo will be initiated by the port authority or ship owners.

While, Containment and recovery would be the preferred option, the other alternatives like dispersion could also be put to use subject to local restriction

3.6. REFINERIES AVAILABLE IN GUJRAT & IN INDIA

The details of Refineries Available near DPA KANDLA AND OOT VADINAR, In Gujarat State and in India are placed as an **annexure- 8**

3.7. STORAGE AND DISPOSAL OF OIL AND OILY WASTE:

3.7.1. Storage:

Initially, when the skimmer recovers the oil, it is to be stored in the floating storage tank onboard Oil Spill Response Vessel and OSRO Centre, specially designed for the purpose.

3.7.2. Disposal:

Disposal of recovered oily waste is an integral part of the Operation Manual and is explained in detail in "WASTE DISPOSAL PLAN". The purpose of disposal is not only to direct the recovered oil and waste to a final processing facility but also to bring to attention of responders, the methods to minimize the amount of waste generated during operations.

All disposal is to be undertaken keeping in view the provisions of different statutes and legal parameters like 'The Environmental Protection Act 1986' and the Hazardous Waste (Management & Handling and Trans boundary Movement) Rules 2008. Disposal of certain waste like solids and debris etc. that cannot be processed by participating oil companies will be required to be undertaken in close consultation with local administrative authority. In the event, where, spill originates from any unit of the participating oil companies, the custody of waste and recovered oil is to be handed over to the company for transportation, storage and disposal.

Any dispute arising on this account will be settled by respective CMT, whose decision will be final and binding.

The details of refineries Available in Gujarat & in India are placed as below:

Refer Annexure – 23

LIST OF DISPERSANTS APPROVED FOR APPLICATION BY COAST GUARD

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 sea water is to be used in the ratio 1 part of diluted dispersant: 2-3 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

Gold Crew - (Feb 2003)
MS Centerprise
Mayurpankh, 5th Floor
Agiary Lan, Jambli Naka, Thane (W) - 400 601
Phone : 022-25401010/25971690 Fax: 022-25373842

FireChem - (Feb 2003)
M/s Fire Chem Private Ltd
B-4, Rana Commercial Complex
Sector-28 B, Near Ajronda, Faridabad - 121 007
Phone : 0129-25286199/25286197 Fax : 0129-25286700

Spilcare-O - (Dec 2004)
Spilcare - O Metaclean Pvt. Ltd
AB-146, 3rd Main Road, Anna Nagar,
Chennai - 600 040, Phone : 044-26200482 Fax : 044-26261457

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.
PB No. 6917, 3 Balasundaram Lay Out
Siddhanaidu School Road,
New Siddhanaidu, Coimbatore - 641 044
Phone : 044-2218224 Fax : 0422-2213181

Spilcare-O - (Dec 2004)
Spilcare - O Metaclean Pvt. Ltd
AB-146, 3rd Main Road, Anna Nagar,
Chennai - 600 040
Phone : 044-26200482 Fax : 044-26261457

NOVA CHEMICALS - (JUNE 2005)
Pragji Vrindavan CHS
Room No.50, 4th floor, 20/24 Old Hanuman Lane
Kalbadevi, Mumbai - 400 002. Phone/Fax : 022-66947337

ICG requirements for selection of OSD :

Physical State	: Flowing clear and homogenous liquid free from suspended solid.
Stability	: Between 100-60%
Efficiency	: Above 80% for Type-II Above 50% for Type-III 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 N/O evaluation certificate
Date of Manufacture	: Within 3 months of date of supply

4. EQUIPMENT:

4.1. Marine Oil Spill Response Equipment:

The typical response equipment required for mounting an operation consists of equipment for water response and shoreline operations and could include:

Off Shore

Control Station
Booms
Skimmers
Absorbents
Sprayers & dispersants
Radio communication Equipment
Boats / tugs / response vessel
Pumps / hoses
Aircraft Transportation

4.2 INSPECTION, MAINTAINANCE AND TESTING:

Inspection & maintenance are being carried out as per manufacturer's manuals.
(Annexure- 4)

4.3. SHORELINE EQUIPMENT, SUPPLIES AND SERVICES:

General provisions

1) Control Station
2) Protective clothing for everybody (including boots and gloves), spare clothing cleaning material, rags, soap, detergents, brushes
3) Equipment to clean clothes, machinery etc. with jets of hot water
4) Plastic bags (heavy duty) for collecting oily debris.
5) Heavy duty plastic sheets for storage areas especially
6) temporary storage pits
7) Spades, shovels, scrapers, buckets, rakes
8) Ropes and lines
9) Anchors, buoys
10) Lamps and portable generators
11) Whistles
12) First Aid Material
13) Special equipment which may be used
14) Workboats
15) Trucks / cars (fours wheel drive)
16) Radio transmitter/ receivers
17) Workshop / repair facilities
18) Bulldozers, mechanical scrapers and similar earthmoving Equipment
19) Vacuum trucks Tank trailers
20) Life vests
21) Explosive meters

5. MANAGEMENT:

5.1 CRISIS MANAGEMENT AND FINANCIAL AUTHORITIES CHART: ReferAnnexure-15

5.1.1 Crisis Management Team:

	DESIGNATION	APPOINTED MEMBER
1	**Chief Incident Controller (CIC)**	Dy. Conservator
2	**On Scene Commander**	Sr. Manager OSR/ Harbour Master
3	**Member Admin & Finance**	FA&CAO
4	**Member HSE & Media**	Port safety and Fire officer
5	**Member legal**	Secretary
6	**Member Tech**	Chief Mechanical Engineer
7	**OSRO/ Response Specialist**	To be appointed by OSRO, in case response being undertaken by OSRO

	DESIGNATION	APPOINTED MEMBER
1	**Chief Incident Controller (CIC)**	Chief Operations Manager
2	**On Scene Commander**	Sr. Manager OSR/ ME Gr.– I
3	**Member Admin & Finance**	Accounts Officer OOT
4	**Member HSE & Media**	Port safety and Fire officer
5	**Member legal**	Secretary
6	**Member Tech**	XEN (E&M)
7	**OSRO/ Response Specialist**	To be appointed by OSRO, in case response being undertaken by OSRO

CMT is the primary unit for incident management and is composed of senior managers from various departments for providing advice and resources and take 'on the spot decisions' to meet any immediate requirements arising during the response.

The major functions that would need to be carried out by CMT to discharge the Plan are as per table below:

Field Operations	• Initiation, Control of Operations and response activity • Emergency Control room functions • Implementing tired response and disposal • Shoreline cleaning (when initiated through this CP) • Planning and strategy
	• Victuals • Transport • Additional Manpower and Equipment • Security
Technical matters	• Cargo ops, Availability of response items, repairs • Communication- operational and with other • Government / non govt. authorities, Media
Legal	• Documentation of damages, claims and compensation, notifications

Health and safety	• Medical assistance

TABLE 12 Major functions of Crisis Management Team

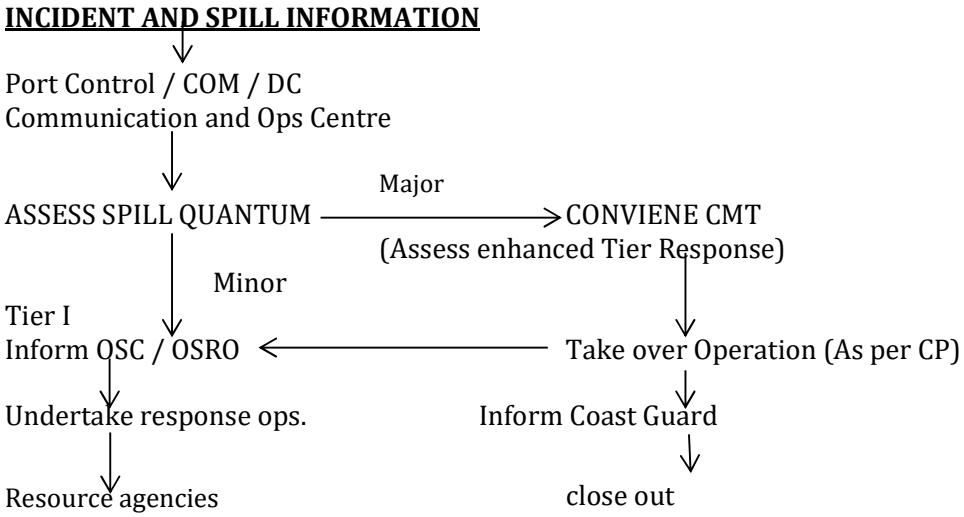
5.1.2 Financial Authorities:

The Financial Authorities of DPA is as per the existing organization structure. At the time of the crisis, the need of the hour will be understood and requirements of OSC /ERT will be met at a faster rate than normal. Since all Head of Departments (HODs) would be Available, immediate on the spot approval will be accorded.

5.2 Incident Organization chart:

CMT is the primary unit for incident management and is composed of senior managers from various departments for providing advice and resources and take 'on the spot decisions' to meet any immediate requirements arising during the responses. Organization Chart is as follows: Refer **Annexure -14**

INCIDENT ORGANIZATION CHART:

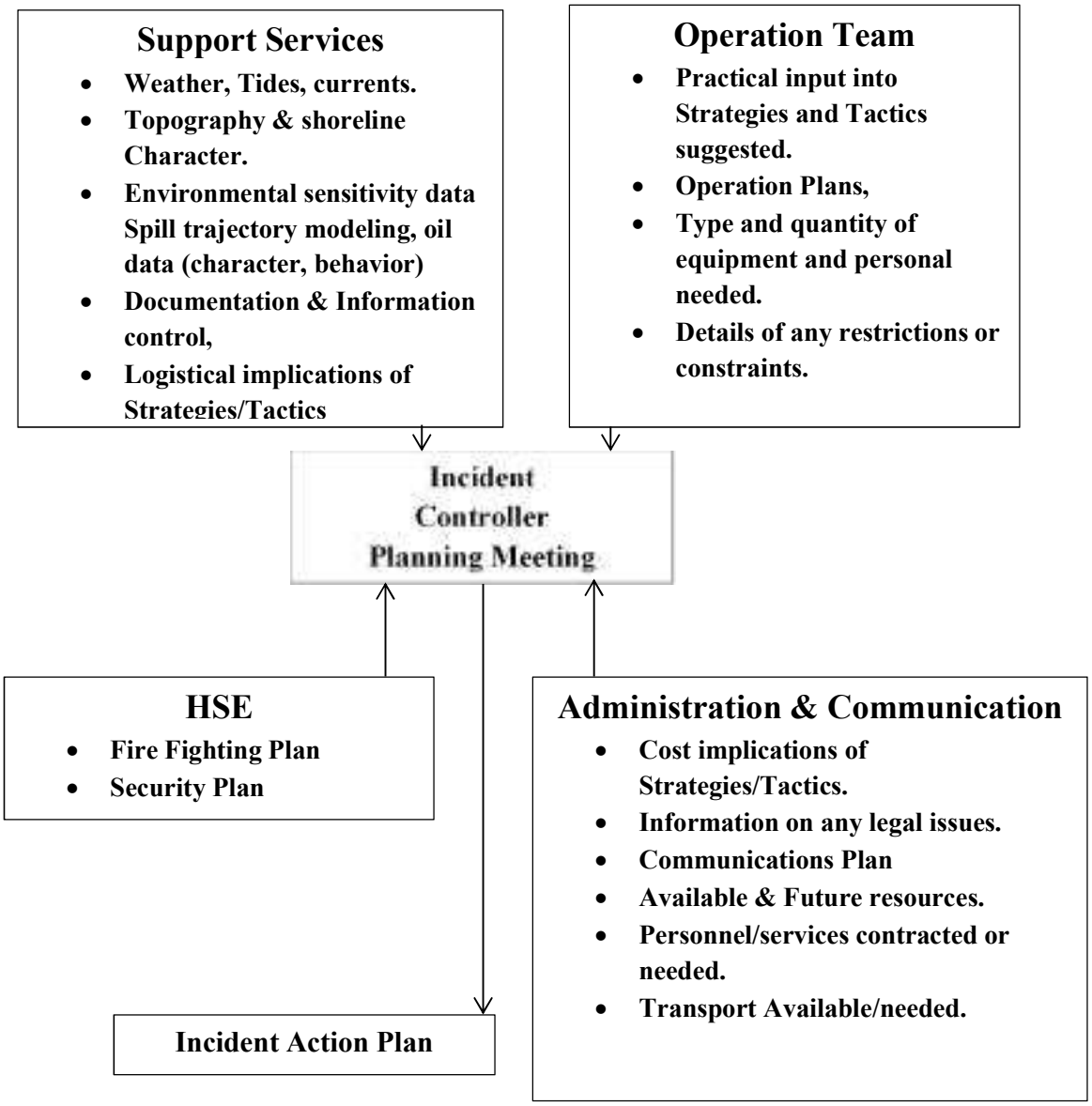


Responsibilities: -

Liaise with Mutual Aid Organizations
Liaise with corporate communication for press statements release
Liaise with Coast Guard Monitor as appropriate
Confirm / amend initial classification
Manage the DPA KANDLA AND OOT VADINAR response
Authorize expenditure

Alert

Indian Coast Guard, Mutual Aid Partners, OISD and other External organizations.


Support Services
Weather, Tides, currents.
Topography & shoreline Character.
Environmental sensitivity data Spill trajectory modeling, oil data (character, behavior)
Documentation & Information control,
Logistical implications of Strategies/Tactics
Operation Team
Practical input into Strategies and Tactics suggested.
Operation Plans,
Type and quantity of equipment and personal needed.
Details of any restrictions or constraints.
Incident Controller Planning Meeting
HSE
Fire Fighting Plan
Security Plan
Administration & Communication
Cost implications of Strategies/Tactics.
Information on any legal issues.
Communications Plan
Available & Future resources.
Personnel/services contracted or needed.
Transport Available/needed.
Incident Action Plan

5.2.1 Functional Designations:

Following functional designations stand identified and notified through the Plan, to give effect to this Plan:

(i) Crisis Management Team
(ii) Chief Incident Controller
(iii) Incident Controller (On Scene Commander)
(iv) Incident Manager / OSRO Manager
(v) On Scene Coordinator / Response Specialist
(vi) Responders

5.3 Manpower Availability (on-site, on-call):

Terminal Area is manned on 24x7 hours basis; manpower is Available at site to meet any exigency. However, DPA department will provide assistance of water craft, vehicles, cranes etc. for movement of men and material.

5.3.1 Afloat Operations and Response Team/ Teams

Incident operations and response team comprises of CMT or part thereof, as decided by CIC as per the magnitude of spill (Reference 9.2.1 Note v). While, the CMT would be activated to meet in the event of a major accident, a comparatively small incident may need only limited action of CMT to be performed by a part of team.

I. **Chief Incident Controller (CIC)** - DC / COM is nominated permanent Chief Incident Controller irrespective of the magnitude of spill. While, in the event of a large spill, major decisions and duties are expected of him to be discharged along with CMT, in the event where the spill can be handled by response team alone, the incident will be handled by Incident Controller (IC). The appointed IC will carry out the functions of On Scene Commander for the operation. However, the CIC is to keep account of the operation and ensure to be kept informed.

II. **Incident Manager (IM) –** is a member appointed by DC / COM or respective CMT leader to undertake the responsibilities associated with administration of operations and giving effect to decisions arrived at by CMT. He is to ensure timely execution of demands and decisions with a view to provide continuity to operations. To facilitate ease of operations and administration, a permanent IM is to stand nominated at all times by DC / COM or CMT leader.
In the event, the response activity is assigned by the port to an OSRO; the OSRO will appoint a manager in addition to Incident Manager to undertake the responsibility of meeting the demands of response teams.

III. **Operations Response Team (OSRO specialist/ Responder / OSC)** - the response team is to have a permanent status and is to be nominated by CIC on behalf of CMT. The team would comprise of persons specifically nominated on account of their experience of response operations, their qualification or expertise in the matter. The nominated members could be employee of the port or any department in addition to nomination to response team. Being of permanent status, the details of identified members are to be Available at Communication and Operations Center at all times and is to be inserted as a temporary enclosure to this plan. All responders are to be qualified in terms of having undergone IMO Level I course are to be inserted as a temporary enclosure to this plan.

The functions of response team can be assigned to an identified and qualified OSRO also. (The details of National & International OSRO are placed at an **Annexure-2** in such an event of nomination, all functions with respect to response team and On Scene Co-coordinator will be carried out by the OSRO or OSRO representative, while, CMT and CIC will continue to function hitherto.
Response resources like equipment to be deployed having been identified in terms of quantity and location, additional resources like spill response vessel (SRV) and work boat etc. along with responders would be as per identification and notification by CMT leader. In the event of an OSRO being assigned the responsibility to provide resources, OSRO will have to mobilize the different units.

5.4 AVAILABILITY OF ADDITIONAL MANPOWER:
The response team is to comprise of a Manager, Specialists, responders and response workers apart from the crew of the vessel or work boat assigned to response duties. The team and additional resource composition is

(i) Incident Manager / OSRO Manager
(ii) OSC- Incident Controller/On Scene Coordinator
(iii) SR Vessel and Captain
(iv) Responders
(v) Vessel crew
(vi) Work boat, master and crew

Additional responders or additional teams could be assembled during response ops as the requirement demands.

5.5 ADVISORS AND EXPERTS (Contact details are placed at an**Annexure-1) – SPILL RESPONSE, WILDLIFE, AND MARINE ENVIRONMENT:**

The following Authorities and Organization have been consulted during the preparation of this plan:
1. Indian Coast Guard
2. Integrated Marine Facilities at Kandla & Vadinar.

Oil Industry Safety Directorate (OISD) has decided that, all the Ports and Oil companies should create Tier 1 facilities for maintenance and combating oil spills, Therefore, DPA KANDLA AND DPA OOT VADINAR has established Tier-1 facilities.
This report presents the methodology and results of an assessment of the risk of a significant oil spill occurring at DPA KANDLA AND DPA OOT VADINAR in or around SPM, channel route, along pipeline corridor at product jetty and in the area proposed for expansion in the Gulf of Kutch. The assessment has considered low to moderate frequency with low to moderate impact events, i.e. Tier-I spills.
5.6 TRAINING / SAFETY SCHEDULES AND DRILL / EXERCISE PROGRAMME:

5.6.1 Training:
Oil Spill Response Requires Specialist Training which should be developed at all levels of the response. Also, the Management of an oil spill incident is a major task and has a crucial bearing on the outcome of an oil spill response, issues such as the control of crisis situations, political interest, media pressure, public environmental awareness and legal and financial implications can add substantial burdens to the oil spill response team and must be effectively handled if the overall response has to be successful. Effective Training hence becomes crucial for the response team in order to handle the situation aptly and correctly. There is no denying the fact that oil spill combating in any capacity is a rare event for most people and therefore, it is important to keep in touch with skills and knowledge gained as a part of ongoing personnel Training. This too, will help in ensuring that all those involved in the response operation understand each other's role in an oil spill incident.
At present Organization has 10 employees trained in IMO Level-I Oil spill response and 04 employees trained in IMO Level-II Oil spill response.

5.6.2 Exercises and Drills

The purpose of exercises and drills is to test the knowledge of persons and members associated with response activity and maintain them in the highest state of readiness and professional competence. The exercises would aim to assess acquaintance of response teams with operation ability and initiation of Plan and also the knowledge of operational parameters.
For this purpose, it is required to conduct both in house training and evaluation exercises and also multi agency co-ordination exercises are being conducted at regular intervals.
In addition to classroom training, the responders would need to go through regular internal and external exercises that would include deployment of equipment to demonstrate level of proficiency. With respect to management of operations in consonance with the plan, it is desirable to conduct real time CP exercises with all industrial stake holders involved. Such an exercise conducted at a large magnitude would need to incorporate the staff from DPA, Participating Oil Companies and the Indian Coast Guard and scheduled as mutually agreed.

The purpose of exercises and drills would be to check the following:

1. **Organizational and Planning**
   (a) Knowledge of Contingency Plan and Procedures
   (b) Personnel Notifications and Staff Mobilization
   (c) Ability to operate as per CP and Operations Manual

2. **Operational Response**
   (a) Oil spill assessment
   (b) Response equipment selection
   I Containment strategies
   (d) Spilled oil recovery techniques
   (e) Disposal of recovered oily water and contaminated material

3. **Response Support**
   (a) Communications
   (b) Logistics
   (c) Personnel support
   (d) Documentation

5.6.3 SAFETY-Refer Page-64
5.6.4 Types of exercise:
Exercise requirement as per contract is to conduct internal and external exercise. In addition to classroom training, Exercises are to include deployment of equipment to demonstrate satisfactory levels of proficiency. External exercises are to incorporate with the staff from DPA, participating oil companies and the Indian Coast Guard.

(i) **Type A:** Internal exercises lasting approx. One day for ensuring OSR readiness of all equipment, services and personnel.
ii. Type **B**: Emergency Response Exercise (Tier-I) is to be conducted once a year.
iii. **Type C:** These exercises designed to test either specific scenarios or emergency plans and include external participation (i.e. mutual aid, govt. agencies)

6. COMMUNICATION

6.1 INCIDENT CONTROL ROOM AND FACILITIES:

Communications plan

Communications between the MTCB, COT and PIT Control Room and Marine personnel during the response to any oil spill within the local area will be primarily by VHF private channel radio.
Communications between the MTCB and other vessels will be established on VHF
Radio Channel 16**/12.**
Use of cellular telephones is to be kept to minimum. Cellular phones are **NOT** to be used in the vicinity of spill.

Contact details OOT Vadinar:

Port Control	Landline - DPA	02882573005
	VHF - DPA	Marine channel 12, 16 Marine Channel 13
COC/ME Gr-I	Landline number	02882573033
	Mobile	9979126681
	VHF	Marine Channel 12 and 13,16
COM /CIC	Landline- KPT	02882573001
	Mobile	9819999227
Marine Engineer Grade - I	Mobile	9979126681

Table 13

Contact details Kandla:

Port Control	Landline - Kandla/Gandhidham	Kandla-02836-270529/270194 Gandidham-02836-233585
	VHF - Kandla	Marine channel, 08,10,12,16
COC/HM	Landline number	02836270201
	Mobile	8976741054
	VHF	Marine Channel 08 and 10,16
DC / CIC	Landline- DPA	02836233585
	Mobile	9603123449
Flotilla Superintendent	Mobile	9825227610

Table 14

6.2 FIELD COMMUNICATION EQUIPMENT:

6.2.1 Equipment:

The communication center is to be provided the following equipment

i. VHF – 2 numbers
ii. Walkie-talkies – as per the number of response teams and functional team leaders
iii. Telephone (landline or wireless) – 1
iv. Computer and printer with internet and projector facility

6.2.2 Publications: NOS-DCP

6.3 REPORTS, MANUALS, MAPS CHARTS AND INCIDENT LOGS:

For Reports use formats described

1) Map of Local Area
2) Geographical limit and sensitivity map
3) Sensitivity Mapping CZMP as annexure -
4) Refer the logs maintain by MTCB & Individuals log if any

The Log Incident Report form as per **Annexure-17** sample has to be developed to ensure that the basic information required to formulate a response to an Oil Spill Emergency is obtained during the notification (if required). Port Control / COM /Communication and Ops Centre will complete the form and dispatch to the concerned authorities by the fastest means. In all cases, the original status report forms will be handed over to ECT, who, in turn, would maintain record of all such documents.

The personal log form and continuation sheets have to be as per **Annexure -18** to allow all personnel involved on the emergency response to maintain a personal log of event. The personal log forms and the continuation sheets are to be used during the oil spill response to record the contacts and activities carried out during such emergency.

Incident Logs are for logging of all the events taking place. This will help in preparing a comprehensive Incident Report on a day to day basis as well as on completion of operation.

After the response work is over, the personal log form as per sample at annexure-18and the continuation sheets are to be numbered, signed and handed over to the COM.

PART II

ACTIONS AND OPERATIONS

7. INITIAL PROCEDURS

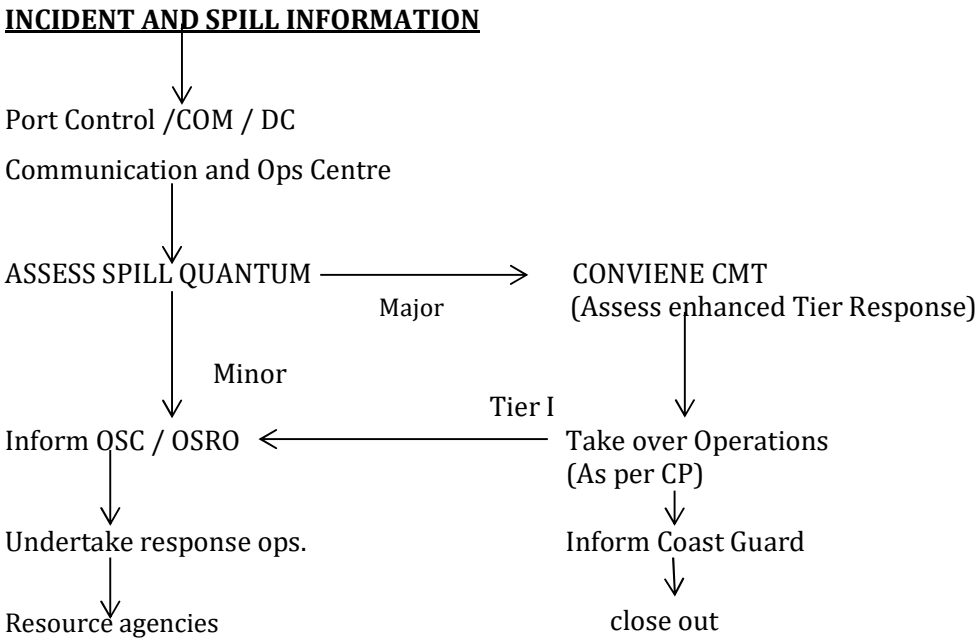
7.1 NOTIFICATION OF OIL SPILL TO CONCERNED AUTHORITIES

Any INFORMATION RECEIVED WITH RESPECT TO A SPILL, BEING OF IMPORTANCE TO ARRIVE AT A DECISION FOR ACTIVATION OF CMT and RESPONSE REQUIRED TO BE TAKEN, HAS TO BE RECORDED WITH CARE AND WITH ALL POSSIBLE DETAILS.

Correct knowledge of the quantity of spill is a factor that would facilitate the CMT and other responders to decide on the scale of response action and also the requirements to decide on Tier responsibility. The information has to contain the following details

- Authority reporting spill (with all details)
- Time and position of spill
- Type of oil
- Assessed quantum of spill

INCIDENT AND INFORMATION FLOW CHART



Notification matrix

The matrix gives the primary telephone contact number; alternative telephone and facsimile numbers are included in **Annexure-19**

7.1.1 ADDITIONAL INFORMATION:

In addition to the above information, following info is also to be recorded and provided to the responder or OSRO,

- Detailed weather conditions – wind, direction and speed
- Sea conditions

7.2 PRELIMINARY ESTIMATE OF RESPONSETIER:

The moment oil spill takes place or is detected**,** immediately the time and place of the spill started and stopped should be ascertained from the originator of the oil spill. The information about diameter of pipe, rate of pumping /flow of oil would help in determining the quantity of oil that has spilled into water. In case, accident is due to collision the sounding of the tank would talk about the quantum of oil spilled into the water and then only magnitude of spill could be established. The notification as per NOSDCP will be adopted for declaring Tier I, II or Tier III spill or spill of a minor nature.

7.3 NOTIFYING KEY TEAM MEMBERS AND AUTHORITIES:

The Key Team Members are – COM, Marine ENGG GR -I, Fire Officer, Sr. Manager OSRC and other HODs. These members can be informed over Phone /Mobile phone, and same be also logged at ECR.

7.4 MANNING CONTROL ROOM:

Marine Terminal Control Building (MTCB) will be the control room, unless otherwise location nominated by the Head DPA KANDLA AND OOT VADINAR

7.5 COLLECTING INFORMATION (OIL TYPE, SEA / WIND FORECASTS, AERIAL SURVEILLANCE, BEACH REPORTS):

Samples to be collected from various points, clearly marked and sealed. Samples to be stored for further investigations, as required. The following equipment shall be held for the purpose of storing samples
a) At least 6 sampling bottles,
b) One seal tag for each sampling bottle
c) Prognosis and Synopsis weather reports
d) Any other relevant matter

The moment oil spill is reported /intimated to the various departments, the action by

i. Marine department will provide all the relevant data for that day to ECR i.e. Tide conditions at that time, Tide timings, Current, Wind direction /speed, Weather forecast, Vessel movements, Vessel position in DPA Port, Water crafts Availability for pollution response activities. Relevant Navigation Charts and any other important data /information Available may also be provided. Also number of Security Personnel Available at that time will be made Available.
ii. Traffic department to provide information regarding Availability of type and number of vehicles Available for transportation of men and equipment. Also, number of Casual Labors Available at that time will be made Available.

iii. Fire department to indicate readiness about FIRE CONTINGENCY including OIL FIRE and also number of spare Life Jackets Available.
iv. ECT Ensure that no individual is working / supervising / observing OSR operations/ Exercise Without Life Jackets "ON".

OSC is to collect following information immediately in case of oil spill:

- Time of oil spill occurred.
- Position with reference to prominent land mark and also, if possible, in latitude and longitude.
- Visual appearance, apparent thickness of oil and extent of area covered.
- Percentage covers of various thickness of oil.
- Existing weather condition and weather forecast
- Current and tide conditions
- Immediate Availability of support vessel, equipment and manpower.
- Estimate oil spill trajectory and likely area and time of its landfall.

7.5.1Information Display:

The following latest information is to remain displayed at all times on wall boards in the Control and Operations Center:

- Vessels working cargo in port – quantity of cargo, location and expected times of completion
- Prevailing weather conditions and future forecast
- Vessels expected to arrive and depart port in next 24 hrs., cargo and quantity
- Important contact numbers of CMT, OSRO and other CP aid agencies

  Continuous watch on working frequencies used by ships, port and terminal for POL cargo ops
- Watch on Ch 16 at all times
- Log all information in respect of an oil spill (with maximum details) received through keeping watch or from any other source
- In case of first receipt of information, pass all the details regarding spill to CMT leader to facilitate complete or partial activation of team or response actions by OSRO
- Pass all information regarding spill to OSRO and duty vessel or tug assigned response duties.
- Remain in constant touch with designated response team leader and response / support vessels as per working channel decided for operations
- Collect latest information from MET dept. on weather conditions in the area including wind direction & speed, tide condition and other weather parameters (all received information is to be logged)
- Provide weather data to operational teams as demanded

7.6 ESTIMATED FATE OF SLICK&PLANNING MEDIUM-TERM OPERATIONS (24-48 AND 78 HOURS):

The likelihood of oil spill taking place are from two factors mostly, during vessel operations and secondly due to collision. Since, during vessel operations, OSRO personnel as well as ship's staff present at the site, any mishap taking place could be tackled immediately as reaction time will be very less and damage control could be done very fast. Therefore, quantity of oil spilling into water is expected to be minimum and the spill could be neutralized quiet easily. Here in this case dispersants, sorbents may be used and whole operation is likely not to last more than 24 hours. In fact, OSR items are kept handy in OSRV to use any time.
However, in case of oil spill occurring due to Collision, it is certainly going to be at a higher magnitude. As, when the collision takes place, everybody's attention is likely to be toward safety of the vessel i.e. to Avoid vessel getting grounded, Avoid colliding with other vessels, preventive action against fire or carryout firefighting, damage control action against flooding and so on. It is anticipated that in case of collision the oil spill is likely to occur due to rupture of or crack in fuel tanks. It should be clearly understood that

i. In case of rupture of fuel tanks a sudden gush of oil will be there, and for some time it will be uncontrollable. By the time any effective damage control action is taken, a substantial amount of oil would have already gone overboard. This would necessitate immediate oil containment measures, as well as starting of oil recovery action. This oil spill recovery action may go well beyond 48 hours, keeping weather and sea conditions in mind, because one does not know at what time of the Day or Night accident takes place which will determine the time delay in appreciation of the situation and mobilization of OSR team and equipment. It may clearly be understood that appreciation of oil slick between sunset and sunrise is quite difficult and at times it may be fully incorrect, hence slight time delay may be anticipated.

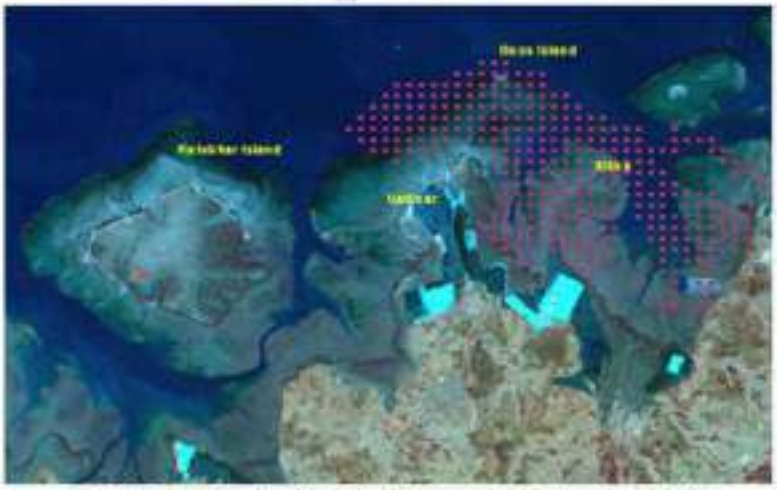
Such accidents don't happen quite often, but very rarely. Hence readiness of OSR team and Equipment shall be maintained at all times.

ii. The oil spill scenario through cracked fuel tank /tanks is not very different than the previous one, because due to cracked/fractured /material failure occurred in the fuel oil tank/tanks, oil would continue leaking in a small /moderate rate. But it would be difficult to locate the source/point of oil leak and by the time source /point of leak is detected, suitable action is initiated and leak is arrested, a sizeable quantity of oil would have already been over board. Detection of oil leak will become more difficult if the crack /fracture develops after some time due Collision related structural stress and ship is secured alongside jetty with the damaged /leaking side situated between shipside and jetty. The problem will become more compounded if the accident takes place after sunset during severe monsoon conditions and detection of oil slick in the night would be really quiet difficult. Like above serial (i), here also one cannot deploy OSR men and equipment preciously and reaction time to deploy OSR men and equipment, subsequently recovery of spilled oil is going to take more or less the same time.

Here the vessels taken on consideration are visiting ships of various sizes in all weather conditions but not the minor vessels or tug boats.

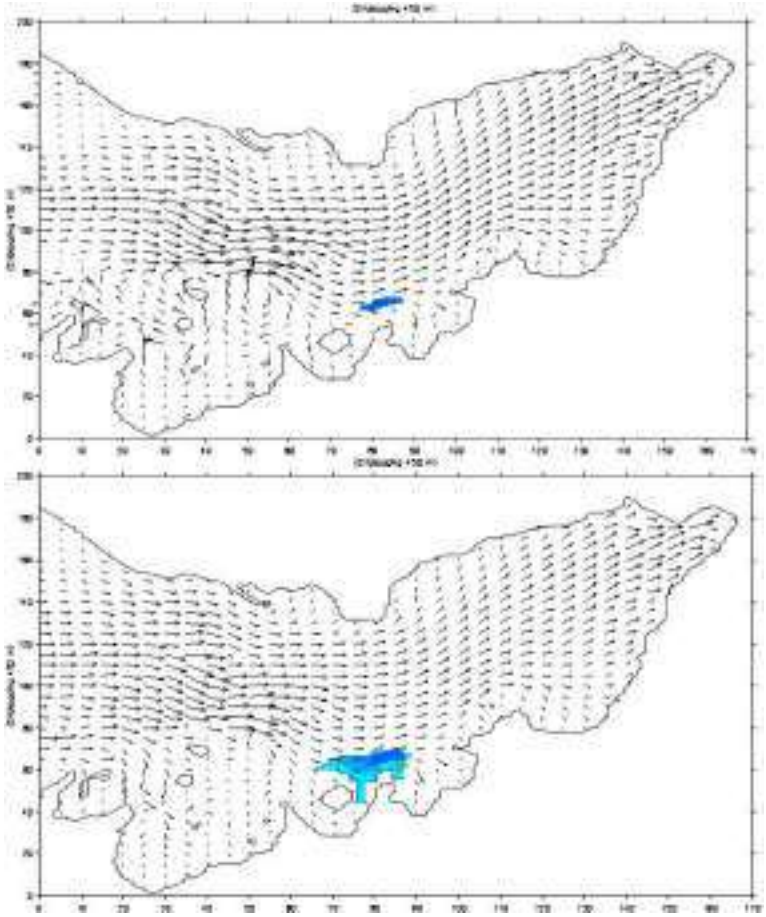
7.7.1 ESTIMATED FATE OF SLICK: (24, 48 AND 72 HOURS):

Please refer to the picture below and apply the prevailing factors deduced from the weather reports.

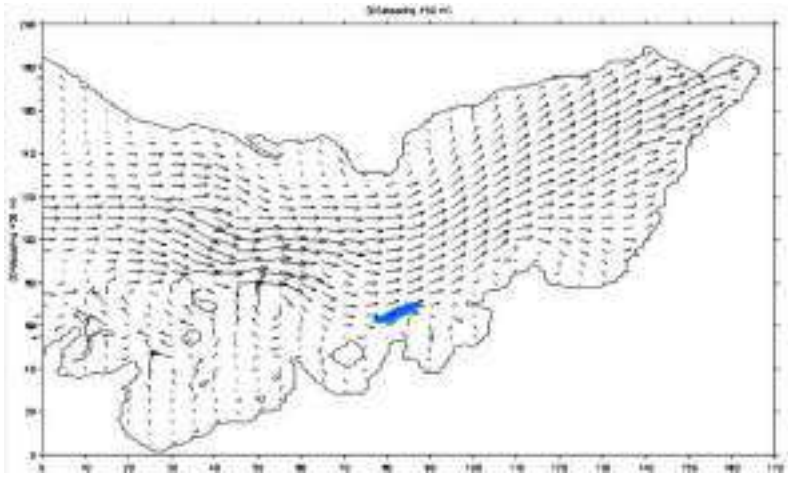


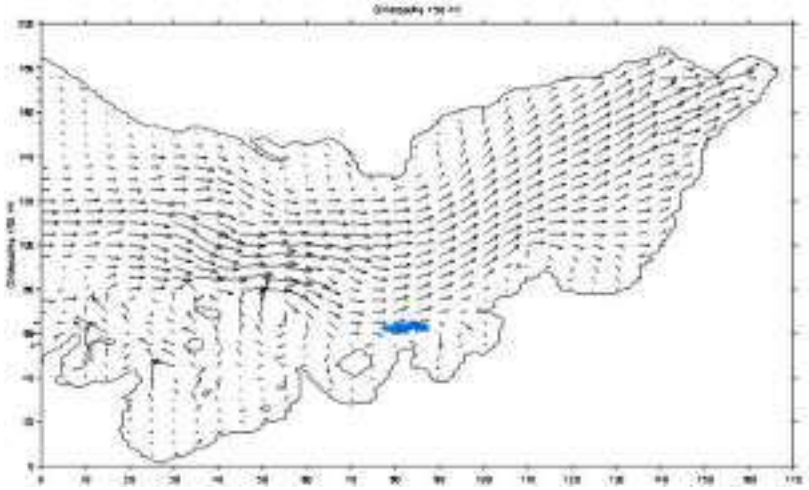
Estimating fate of slick.

Oil trajectories at the end of 2 hour and 24 hours for scenario I: No wind condition:

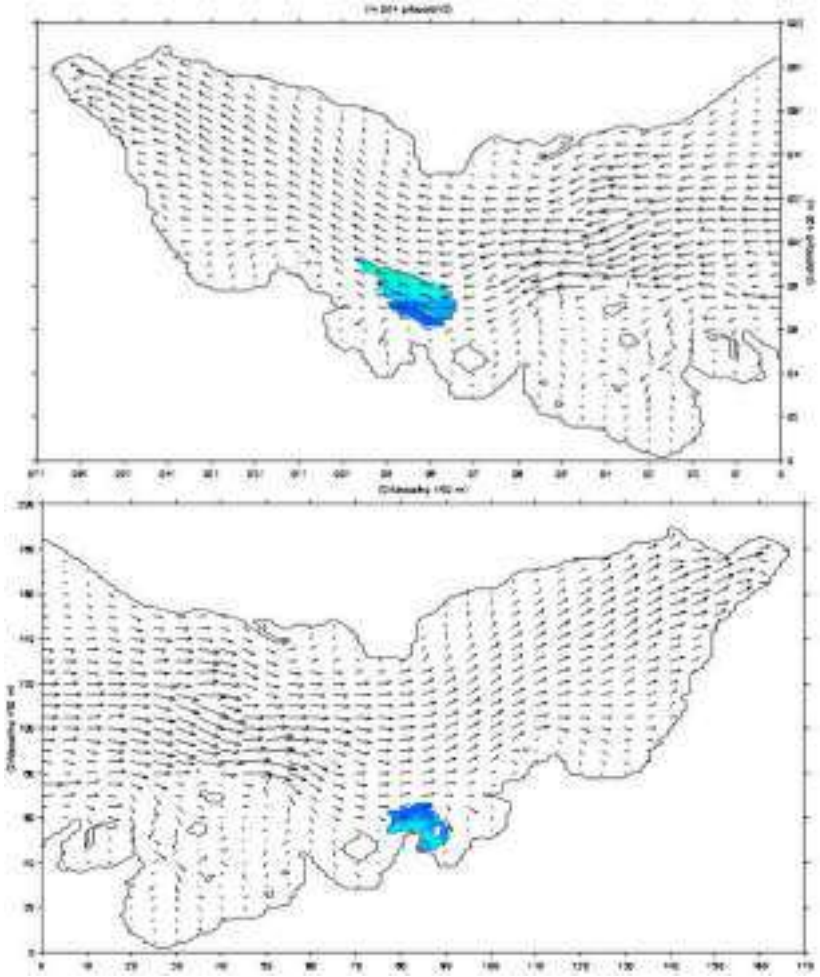


Oil trajectories at the end of 2 hour and 24 hours for scenario II: 5m/s wind from 240 degree N





Oil trajectories at the end of 2 hour and 24 hours for scenario III: m/s wind from 330 degree N



7.6 IDENTIFYING RESOURCES IMMEDIATELY AT RISK, INFORMINGPARTIES:

There are no resources which will be immediately at risk except Marine national park & ESSR intake. No population along the coast up to about 10 km, the mangroves are at about 5 km. salt pans are at about 7-8 km. The mangroves and salt pans are likely to be affected only at highest high water during NE monsoon
. Depending upon the place of spill, the resources at risk will be assessed.

7.7. Surveillance

The aim of surveillance is to detect, characterize and preferably quantify spilled oil that may be present in a range of settings (on-water, in-water and onshore). This is of critical importance in enabling the incident command to effectively determine the scale and nature of the oil spill scenario, make decisions on where and how to respond, control various response operations and, over time, confirm whether or not the response ineffective. Irrespective of the final response strategy selected monitoring of oil spill will commence immediately after the oil spill and will continue until the response operation is terminated. The information gathered through monitoring and evaluation will be used by the IMT to steer the response, and ensure that the most effective and efficient response strategies are being adopted.

Five monitoring and evaluation methods are discussed in this section:

- Aerial Surveillance
- Vessel Surveillance
- Satellite Surveillance
- Surface Plume Tracking
- Spill Trajectory Modeling.

7.7.1 Aerial Surveillance

Aerial surveillance is the first response for any ongoing reportable incident as it allows the Incident Management Team to quickly gather initial information about the incident and formulate tactical plans to combat the spill. Aerial surveillance can be carried out throughout the incident management process to provide feedback to the command Centre on daily progress and to help evaluate the success of the response strategies.

A written or verbal flight task is given to the aerial observer detailing the purpose of the mission, such as:

- Confirming the location of the spill using ladder or spiral search path
- Quantifying the amount of oil on the water and verifying the results from modeling
- Directing response operations such as directing vessels/aerial dispersant application planes onto the thickest part of the oil
- Conducting shoreline surveys to identify areas that may have been, or may be impacted.

Followed by the aerial surveillance and preliminary shoreline survey substantiated by notes, sketches, photographs and videos supported by GPS readings. In case considerable part of oil spill sunk due to environmental conditions, oil characteristics or both, under water survey may be required. The survey may be undertaken using visual assessment, divers, remotely operated vehicles, acoustic sensors or sorbents. Environmentally hazardous areas must be marked specifically based on the secondary data already Available so that many accidents resulting in loss of life and property can be Averted.

7.7.2 Vessel Surveillance

Before the arrival of aircraft for aerial surveillance, vessels Available on the scene can help to conduct initial visual surveillance by following the leading edge of the slick. This location in formation can then be communicated to the Incident Management Team to guide the aerial surveillance aircraft to the slick. This is only a temporary measure as the vessel's visibility ranges restricted and there is a risk of secondary contamination of the vessel.

7.7.3 Satellite Surveillance

Surveillance of oil spill is also possible through satellites with sensors such as SAR (Synthetic Aperture RADAR–an active sensor that send out a micro wave pulse and reads there turn) and Optical sensors– (Relies on reflected energy). RADAR imagery is the preferred option as the active pulse from space reacts with surface textures giving all-weather day / night imaging. This service may be gauged through Space Application Centre, Ahmedabad.

7.8. SAMPLING

Identification of the responsible source for an oil spill incident is essential because of its legal implication. Laboratory analysis of the oil samples is thus required following a spill incident. From the same it is possible to identify differences between one type of oil & the other and also to determine the similarities between spilled oil and its source. Source of the oil could be identified by the comparison of the spilled with the potential source samples. Sampling is as important as laboratory analysis and investigation.

Sampling of both biotic and abiotic resources from spill affected area is the first and foremost part of the oil spill testing. Resources can be water, oil, sediment, air or biota. Samples should be representative, since they are used to quantify the oil, predict its weathering characteristics and to identify the source.

Improper samples or sampling will lead to wrong results and conclusions that will not stand up in legal examination and subsequently laboratory analysis and investigations will become mere wastage. Personnel who are supposed to collect the samples should be given minimum training and practice to do better response in a real spill situation. A sampling plan shall be adopted that will describe the sampling procedures in brief and will ensure that all the required operations are taking place accurately and sequentially without any missing.

Sampling of oil from different environment site, from vessel engine to water body or even from an organism will be required. Also they can be of varied forms mainly of heterogeneous nature some of which are given below.

- Oil, oily water, heavily emulsified oil, tar balls or lumps on the water surface
- Mixtures of oil, sorbents or other materials which are soaked with oil
- Oiled animals on the water surface or on beaches mainly in the intertidal area
- Oil in tanks on ships, offshore constructions or land facilities
- Oily water bilges and slop tanks on ships, offshore constructions or land facilities
- Oily sludge in the sludge tanks on ships, offshore oil installations/ drilling rigs or land facilities.

Sampling equipment shall be pre cleaned to remove any oil residues including finger oils that may mix with the oil collected and interfere with the laboratory analysis. Oil contaminated sampling containers should be Avoided. Sampling equipment if not purchased preleased shall be cleaned with a detergent wash, rinsed with distilled water and then rinsed with solvents like dichloromethane, hexanes. Pre cleaned supplies can be wrapped in aluminum foil to prevent contamination while being stored or transported to the spill.

Table 7.1: Details for Oil Spill Sampling

Sl. No	Sample Type	Sample Container	Quantity of Sample	
1	Oil	Glass Bottle 500 ml Clean. Colored (dark) glass is preferred for water samples. Preferably supplied by laboratory. Top should be sealed with aluminum foil under the cap.	Pure Oil Source Sample	30-50 ml
			Contaminated Oil (Emulsified Oil, oil from the sea or shore, sandy tar ball)	10-20 g
			Debris with oil, oil stained sand	Sufficient quantity that oil content is approx.10g
2	Water		Water sample with visible oil	1 liter
			Water sample with no visible oil	3-5 liter
3	Sediment	Fine: Silt - Pebble	Glass Jar 250 ml Clean. Colored (dark) glass is preferred for water containing samples. Preferably supplied by laboratory. Top should be sealed with aluminum foil under the cap.	
		Coarse: Cobble	Wrapped in aluminum foil Once wrapped they can be stored in plastic bags.	
4	Biota	Glass Jar same as Glass Bottle/ Jar	Oiled feather	5-10 feathers depending on the quantity of oil present
		Wrapped in aluminum foil Whole specimens. Once wrapped they can be stored in plastic bags.	Fish, shellfish (flesh and organs)	Multiple individuals of the same species totaling 30g

A sampling kit may be arranged for this with necessary sampling equipment's as described in the **Table 7.2** given below.

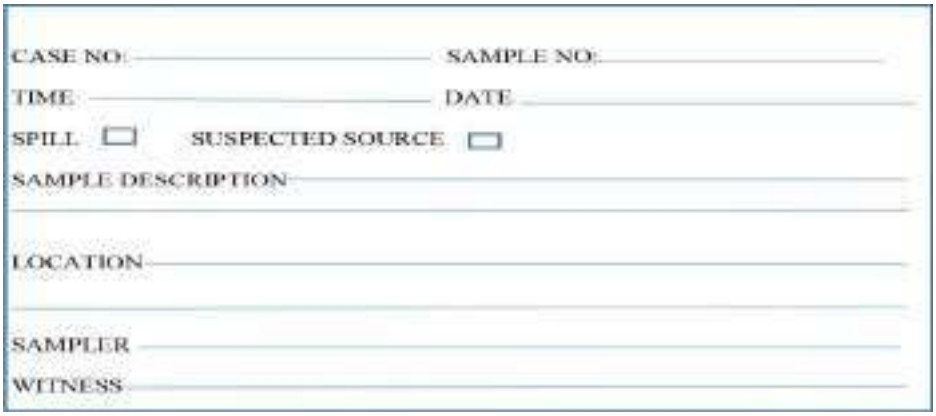
Table 7.2 Components of the Sampling Kit

Sl. No	Item	Details
1	Sample jars (250 ml or other size)	Pre cleaned, Teflon or aluminum cap or Alf oil barrier as required. Plastic should not be used
2	Slick/pooled oil sampling equipment	Wooden spatulas/tongue depressors or stainless-steel spatulas/spoons.
3	Sheen sampling equipment	TFE fluorocarbon polymer nets or small squares of sorbent. Polymer nets or bags with rings and extension poles, TFE polymer sheets of mesh fabric can also be used.
4	Disposable gloves	100% nitrile medical examination gloves
5	Sorbent padding for storage cooler.	
6	Sample storage coolers with pre-frozen freezer blocks.	
7	Waterproof plastic envelope.	
8	Sample identification labels	>1/sample. White Adhesive 5cm to 10cm water and oil resistant
9	Sample Log Sheets.	
10	Chain of Custody Forms.	
11	Decontamination equipment if needed,	
12	Cardboards Shipping Tubes, &Fiber board boxes	(25cm x 25cm x 25cm), For packing sample jars for shipment
	Sorbent material	
	Grease proof plastic bags 50cm x 65cm	
13	Tape for sealing jars, shipment tubes and fiberboard box 2 to 10 cm wide	
14	Towels absorbent cloth or paper, twine	
15	Tongue depressors or pre-cleaned metal scoop	To aid collecting samples of heavy oil or tar Balls
16	Sediment Sampler	
17	Onsite Probes	e.g. DO, Turbidity, Conductivity, Odor, Ambient Hydrocarbon Detector, Multi Wavelength Fluor meter etc.
18	Kit/ Pouch to hold all sampling equipment to spill location	

7.8.1. Sample Identification and Security

Sample identification, labeling and security are very important part of oil spill sampling, especially when it has a forensic value. The sample jar is to be sealed using tape to seal the lid to the jar, before placing the labels on the jar. While placing the labels on the jar, two labels should be kept one for the purpose of sample identification and the other for chain of custody. Writings on the jar should be legible and written using indelible ink. A sample identification label has been shown in **Figure7.1.** Below.

Figure7.1. Sample Identification Label



7.8.2. LABELING AND SEALING

All necessary information required for identification of the sample shall be there on the label such as geographic location, signature on suspected source sample from master or crew man, dates sealed and who sealed sample, etc., should be a part of the label.

Case number is a unique number as signed by investigator to help keep track of spills overtime. Sample number stands for serial number given for each sample 1, 2, 3 etc. Sample description used to distinguish one sample from another sample. For water samples the description should have information relating the sample to a fixed point like name of creek, distance from a bridge pier or any other identifiable structure. For sample from suspected vessels, the description should have the name of the vessel and specific location of the sample such as engine oil bilge. Samples taken from a shore facility should include the name of the facility including a city, location of the sample on the facility (IMO).

7.8.3. SAMPLE LOG

For each sampling operation a sample log should be prepared and transferred along with along with sampling jars and kept in safe custody. It should contain all the Available details regarding the sample including the necessary things given below.

A. Sample number or code (Optional, but advisable for multiple sampling at a single location).
B. Sample description (oil, debris, thick slick, film, sediment, air and biotitic).
C. Time and Date (24 hr. Clock, Day/Month/Year).
D. Location (GPS coordinates or other description).
E. Name of person taking the sample.
F. Witness (If a sample for legal purposes).
G. Identification and description of samples and locations.
H. Subcontractor information and name(s) of on-site personnel.
I. Dates and times of sample collections and chain-of-custody information.
J. Records of photographs.
K. Site sketches of sample location including identification of nearest roads and surrounding developments.
L. Calibration results

7.8.4. CHAIN OF CUSTODY (COC)

8. After sampling it is important that samples are to be kept in a person's custody or possession so that either he can see them or they are locked up. The sample description here should be exactly same as that of sample label. All persons who have control of the samples need to sign in the signature part of the COC as well as the chain of custody label on the sample. COC document should be sent with the samples to the laboratory. Format for chain of custody is attached as **Table 7.3**.

Table 7.3. Format for Chain of Custody

Chain of Custody Record			
Organization's name			
Address:			
Spill	Source	Sample no	Description of samples for case no:
Person Assuming Responsibility for Samples			Time/ Date

Chain of Custody Record					
Sample number	Relinquished by:	Time/ date	Received by	Time/ date	Reason for change of custody
Sample number	Relinquished by:	Time/ date	Received by	Time/ date	Reason for change of custody
Sample number	Relinquished by:	Time/ date	Received by	Time/ date	Reason for change of custody

Page of _

7.8.5. HANDLING THE SAMPLES

Samples must be handled, stored and transported with care so that they remain uncontaminated, intact and fit for purpose. Handling procedures should also be documented such that sample integrity can be demonstrated. Containers should be filled as full as possible toe clued air and Avoid vocative losses of light hydro carbons. All samples should be labeled immediately. Labels should not be placed inside the sample container. Labels should be applied to containers after the sample has been sealed. This will allow the container' exterior to be cleaned and dried before the label is attached. While sampling care should be taken that there is no contamination from exhausts of engines or cooling water of sampling vehicles.

7.8.6. Storing the Samples

Samples should be held overnight or for any extended time in a secure room, with in a suitable containerize. a refrigerator. A sample room may be established and a sample room controller may be appointed and log may also be kept for the room. Samples should have a Chain of Custody record attached to track the location and handling of samples. Samples are stored in a cool dark room. Weathering may be accelerated in the presence of heat and sunlight. The samples may be placed in an

insulated pouch or Stay of a cooler's closed vehicle is no desirable especially in summer even when a cooler issued. Hence it is better to Avoid such journeys or for the optimum condition i.e., keep the samples in an explosion proof refrigerator at 2 to 7°C. Samples should not be freeze and hence the temperature should be maintained above - 4°C. The preservation methods are given **Table 7.5**below.

Table 7.5. Preservation Methods for Different Types of Samples

Sl. No.	Sample Type	Preservation Method
1	Sediment	Chilled to < 4 °C- but not frozen
2	Oil	Chilled to < 4 °C- but not frozen
3	Soft Marine Fauna/Fish	10 % formalin in sea water Or freshwater if sample is from fresh water
4	Crustaceans/ Fish	Freezing (for large fish and crustaceans)

All areas where samples are handled or stored must be decontaminated before and after use, designated to be NO smoking areas, isolated from combustion engines, exhausts or other sources of hydrocarbon contamination. Samples will be transferred to the sample intake team to be frozen as soon as possible especially for sediment and tissue chemistry samples. Water samples will be analyzed immediately due to holding time limitations, while sediment and tissue samples collected for VOC and PAH analyses will be archived. Sediment samples collected for nutrient analyses will be analyzed within the 28-day holding time. (*MC252OilSpill–Jean Lafitte National Historic Park and Preserve Submerged Aquatic Vegetation NRDA*)

7.8.7. Shipping of Samples

The guidelines for this are laid down by International Air Transport Association (IATA). This ensures safe, intact arrival of samples and prevents damage to other parcels. Packaging and Shipping of the mis regulated under IATA's Dangerous Goods Regulations. Most of the samples belongs to the following to categories Flammable Liquid, packaging group II consists of oils with flash points less than 23°C e.g. gasoline, naphtha and most of the crude oil. Flammable Liquid, packaging group with flashpoints more than 23°C but less than 60.5°C e.g. Kerosene, jet fuels, turbine fuels, No.1 fuel oils etc.

8. OPERATIONS PLANNING

8.1 ASSEMBLING FULL RESPONSE TEAM

Area of operation of this Plan being confined to DPA Port. All responses and actions would get limited to coastal zone and within the estuary.

8.1.1 Crisis Management Team/s (CMT)

The core operational team discharging the functions of incident control, administration and management is designated as Crisis Management Team/s (CMT) operating from the identified control center located in the Port Administrative building.

8.1.2CMG:

Apart, from the designated CMT, another senior level team designated as Core Management Group (CMG), headed by the respective head of DPA, will get activated in times of major spill crisis that may require liaison with senior level state, center authorities or other agencies. The other team members of CMG will be the heads of departments. The functions of CMG will be the same as CMT with a view to provide support to operations in terms of administrative requirements. CMG will assemble on the recommendation of Chief Incident Controller.

This Plan formulates the policies and strategies to be followed in case of a response and to be executed on the ground by CMT along with response team or Oil Spill Response Organization (OSRO).

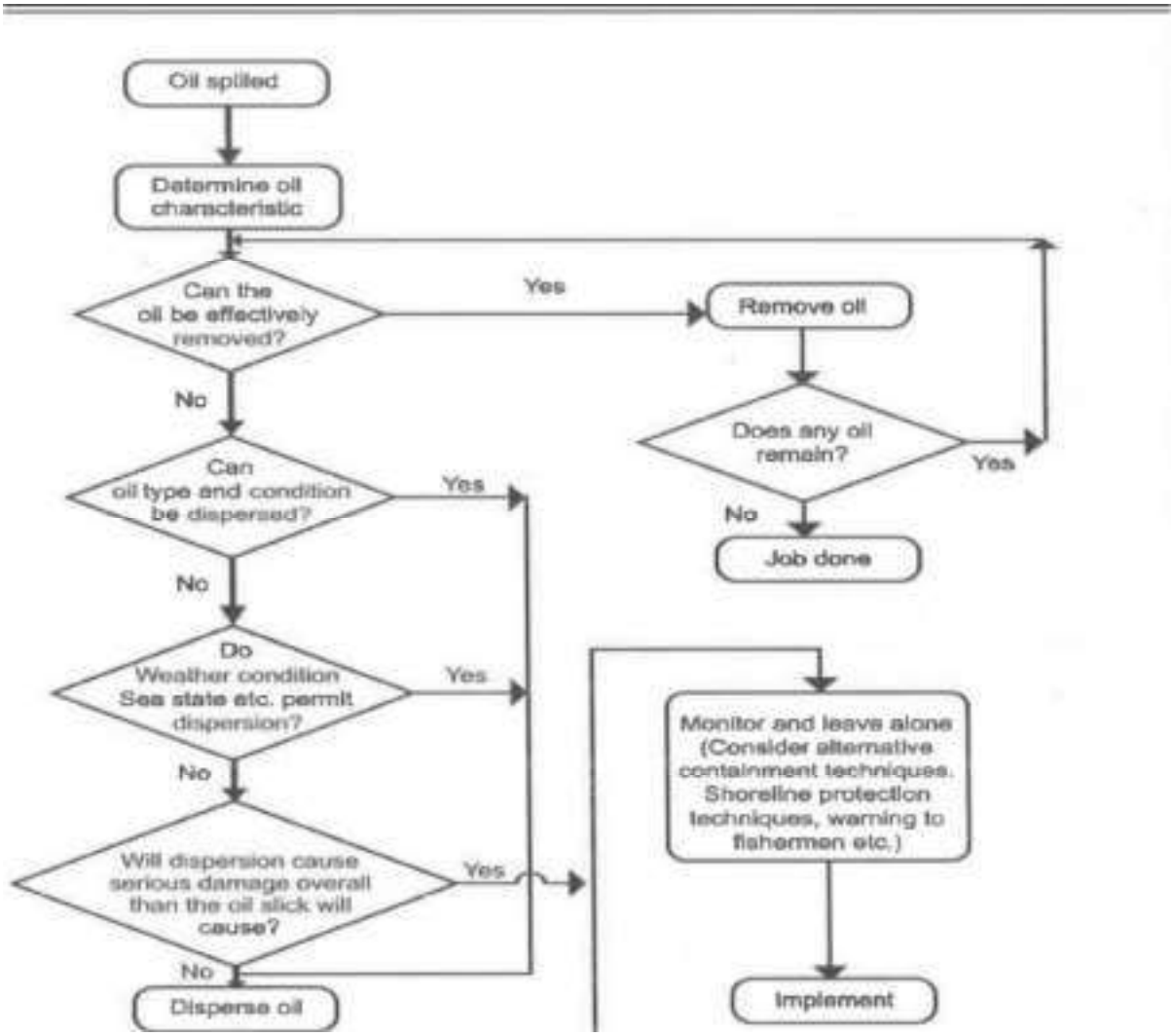
The operational spill prevention provisions of this CP will be discharged by three CMTs - headed by Chief Incident Controller, one each for the area of jurisdiction of DPA, NAYARA, Reliance. Duties and responsibilities of all the three teams would largely remain the same- as spelled in this CP, with additions and amendments undertaken by each team as per operational situation and requirements particular to their area of operation. Each team would be responsible for operations in their respective area of Jurisdiction.

8.2 IDENTIFYING IMMEDIATE RESPONSE PRIORITIES

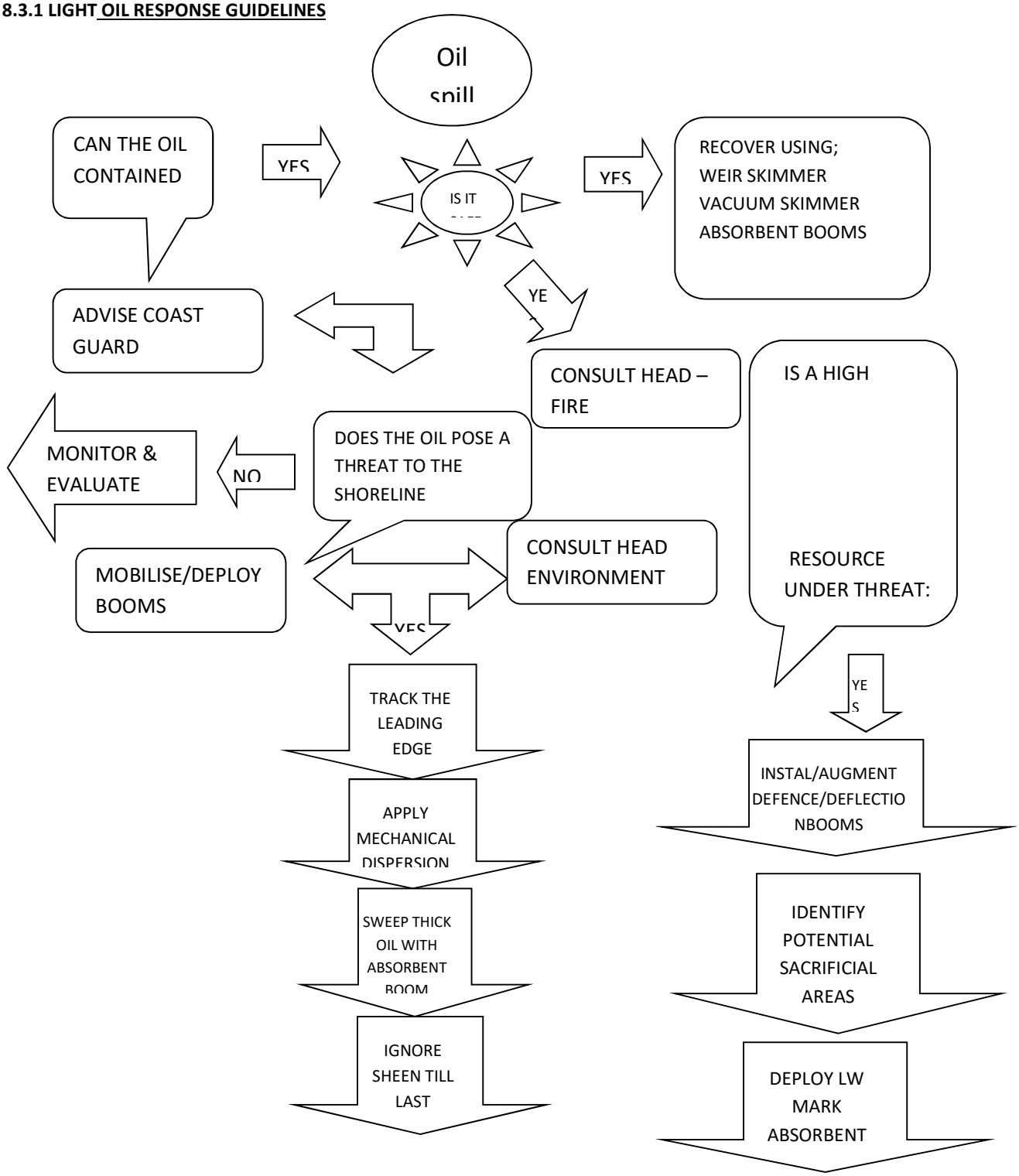
Major actions that would be required to be taken when a spill occurs are mentioned below. While, some actions like containment are required to be initiated immediately following a spill, some actions like shore line clean up etc. will get initiated in due time. The purpose of fast response is to minimize hazards to human health and environment. The following response is accordingly addressed through the Contingency Plan and Operations Manual:

- Stoppage of discharge and containing spill within a limited area.
- Defining size, position and content of spill, direction and speed of movement and likelihood of Affecting sensitive habitats.
- Notification to private companies or government agencies responsible for cleanup actions.
- Movement of trained personnel and equipment to site.
- Initiation of Response activity.
- Ensuring safety of response personnel and public.
- Oil removal and disposal.

8.3 MOBILIZING IMMEDIATE RESPONSE:



8.3.1 LIGHT OIL RESPONSE GUIDELINES



8.4 MEDIA BRIEFING:

Release of Information to media is to be as per 'Media policy' of the respective organization heading the CMT for particular operation. Refer **Annexure-5**

Media Holding Statement (Tier 1 incident)

Timed at: ……hrs. ……day …… Date
At ……hrs. on …… Date
……day

An oil spill current at (location) ……
The estimated quantity of oil (state type) spilled is……liters/tones or
The quantity of oil (state type) spilled is not yet known.
DPA KANDLA AND OOT VADINAR has initiated spill response measures and is investigating the cause. The Indian Coast Guard and all other concerned authorities have been informed

NEXT PRESS STATEMENTS AT …….. HRS IST

8.5 PLANNING MEDIUM-TERM OPERATIONS (24-48 AND 78 HOURS):

The likelihood of oil spill taking place are from two factors mostly, during vessel operations and secondly due to collision.
Since, during vessel operations, OSRO personnel as well as ship's staff present at the site, any mishap taking place could be tackled immediately as reaction time will be very less and damage control could be done very fast. Therefore, quantity of oil spilling into water is expected to be minimum and the spill could be neutralized quiet easily. Here in this case dispersants, sorbents may be used and whole operation is likely not to last more than 24 hours. In fact, OSR items are kept handy in OSRV to use any time.

However, in case of oil spill occurring due to Collision, it is certainly going to be at a higher magnitude. As, when the collision takes place, everybody's attention is likely to be toward safety of the vessel i.e. to Avoid vessel getting grounded, avoid colliding with other vessels, preventive action against fire or carryout firefighting, damage control action against flooding and so on. It is anticipated that in case of collision the oil spill is likely to occur due to rupture of or crack in fuel tanks. It should be clearly understood that

i. In case of rupture of fuel tanks, a sudden gush of oil will be there, and for some time it will be uncontrollable. By the time any effective damage control action is taken, a substantial amount of oil would have already gone overboard. This would necessitate immediate oil containment measures, as well as starting of oil recovery action. This oil spill recovery action may go well beyond 48 hours, keeping weather and sea conditions in mind, because one does not know at what time of the Day or Night accident takes place which will determine the time delay in appreciation of the situation and mobilization of OSR team and equipment. It may clearly be understood that appreciation of oil slick between sunset and sunrise is quite difficult and at times it may be fully incorrect, hence slight time delay may be anticipated. Such accidents don't happen quite often, but very rarely. Hence readiness of OSR team and Equipment shall be maintained at all times.

ii. The oil spill scenario through cracked fuel tank /tanks is not very different than the previous one, because due to cracked/fractured /material failure occurred in the fuel oil tank/tanks, oil would continue leaking in a small /moderate rate. But it would be difficult to locate the source/point of oil leak and by the time source /point of leak is detected, suitable action is initiated and leak is arrested, a sizeable quantity of oil would have already been over board. Detection of oil leak will become more difficult if the crack /fracture develops

after some time due Collision related structural stress and ship is secured alongside jetty with the damaged /leaking side situated between shipside and jetty. The problem will become more compounded if the accident takes place after sunset during severe monsoon conditions and detection of oil slick in the night would be really quite difficult. Like above serial (i), here also one cannot deploy OSR men and equipment preciously and reaction time to deploy OSR men and equipment, subsequently recovery of spilled oil is going to take more or less the same time.

Here the vessels taken on consideration are visiting ships of various sizes in all weather conditions but not the minor vessels or tug boats.

8.6 DECIDING TO ESCALATE RESPONSE TO HIGHER LEVEL:

If oil spill is larger magnitude and is beyond spill combating capabilities of DPA KANDLA AND OOT VADINAR, in such case Head DPA KANDLA AND OOT VADINAR in consent with senior management, will inform Indian Coast Guard accordingly and shall provide all further assistance required by ICG.

8.6.1 NEBA May be Considered while deciding to escalate if required. Refer **Annexure -15**

8.7 MOBILIZING OR PLACING ON STANDBY RESOURCES REQUIRED

To be decided by the On-scene commander and Head DPA KANDLA AND OOT VADINAR considering the control on spillage, mitigation progress and weather forecast. It should be borne in mind that mobilization of resources from out stations is a time consuming and cumbersome process, therefore the anticipated arrival time of the Pollution Response Equipment should be calculated well before hand on account of:

(i) Transportation time by rail /road /sea/air.
(ii) Time taken by Custom /Government formalities.
(iii) Time taken in loading/unloading.
(iv) Availability of specialized loading /unloading machineries and accessories.

8.8 ESTABLISHING FIELD COMMAND POST AND COMMUNICATIONS

The OSC will be equipped with VHF (Walkie-Talkie) and mobile phone. The OSR team leaders would also be having hand held VHF sets. (They can also be provided with mobile phones). Therefore, establishing Field Command Post is considered not necessary, unless the spill is of large magnitude.

9. CONTROL OF OPERATIONS

9.1 ESTABLISHING A MANAGEMENT TEAM WITH EXPERTS AND ADVISORS: -

The members of the DPA Executive Advisory Committee are:

NAME	DESIGN.	ALTERNATE	DESIGN
Capt. Pradeep Mohanty	Deputy Conservator	Shri Lalji Meena	Harbour Master
Shri A. Ramasamy	Chief Operations Manager	Shri Narendra Naik	ME Gr-I
Shri B Ratna Shekhar Rao	Traffic Manager	Shri Sudipto Mukherjee	Sr. Dy. Traffic Manager
Shri Sushil Chandra Nahak	Chief Mechanical Engineer	Shri Rajdeo Kumar	ME Gr-I
Shri B. Bhagyanath	FA&CAO	Shri Hitesh Thakkar	Dy. CAO

9.2 UPDATING INFORMATION (SEA/WIND/WEATHER FORECASTS, AERIAL SURVEILLANCE, BEACH REPORTS):

VTMS, (Port Control) is entrusted the responsibility of providing initial information pertaining to wind direction & speed, water current, tide position at the time of oil spill, high water & low water timings, sea condition, swell /wave heights, weather forecasts & existing weather warning, navigational warnings, any Coast Guard or Naval aircraft or helicopter sighted /in contact, any other relevant information Available. The moment information about OIL SPILL is received all these data / information is to be provided to ECR. This information is to be automatically updated as and when received. Regular inputs must be obtained from local sources regarding health of the surrounding coastal areas.

9.3 REVIEWING AND PLANNINGOPERATIONS:

The ongoing operations should be assessed and reviewed as and when the ECT considers it necessary or suggested by OSC. This is necessary to upgrade the level of operations or scale down the operations due to different prevailing factors /compulsions. Review of operations is an ongoing process and accordingly the planning is to be reoriented to maximize the utilization of men and machinery without compromising on safety of both. Here operational rest to men and machinery should also be kept in mind because response teams can be rotated at regular intervals but continuous running machinery also needs rest after certain stipulated continuous running hours.

9.4 OBTAINING ADDITIONAL EQUIPMENT, SUPPLIES ANDMANPOWER

The equipment maintained on the vessel will be the first to be deployed for containment and would be augmented by movement of additional equipment as required by the situation. In the event of a decision being taken by the team managing the spill, the equipment held with the participating units will be made Available to response teams.

In the event of an ongoing spill or a spill that requires declaring of Tier 2 or 3 responses, the additional equipment and manpower held with any other OSRO or facility will be sourced in an accelerating manner including resourcing from the international spill handling companies. Contact details of companies holding equipment in India and International OSROs are as follows:

9.5 PREPARING DAILY INCIDENT LOG AND MANAGEMENT REPORT:

To maintain detailed daily log of activities undertaken by OSR Manager / Responders/Control Room and their team including deployment of equipment, advice rendered or demands rose. The log is to mention action taken daily (in narrative form) and observations made as per **Annexure-16 & 17.**

IC/ OSC / VESSEL MASTER DAILY LOG

INCIDENT TITLE: ---------- NUMBER----------

DATE:

Incident Severity – Minor / Major / Tier I / Tier II / Tier III

1. RESPONSE RESOURCES AVAILABLE

VESSEL BOAT

EQUIPMENT

2. ACTION INITIATED

CONTAINMENT

EQUP DEPLOYED

POLLUTION COLLECTED AND DISPOSED TODAY

TODAY TONS: ----------

TOTAL TONS: ----------

3. REPORTING AUTHORITY (DESIGNATION)

9.6 PREPARING OPERATIONS ACCOUNTING AND FINANCING REPORTS:

This will be done by Finance and Legal Department. As one of their members is always in the ECR they would find it easier to take stock of the situation and prepare the accounts and reports on a day-to-day basis.

9.7 PREPARING RELEASES FOR PUBLIC AND PRESS CONFERENCES:

Information to media is to be released by the person identified through respective Media policy of the organization. In the event of non-authorization of any one person, the Media release will be made by CIC or by a person nominated by him after authorization by head of the Organization.

The daily report of actions taken on a particular day as prepared by COC and OSC is to be shared with the person nominated to brief the media. Each press brief is too cleared by CIC prior being provided to media.

While, providing factual details and information to media assists in passing the situational report to public likely to be affected by a spill, it is advisable not to sensualist the information with unwanted figures or actions that could shock or distress the public.

Most of the factual information like precautions required by public to be taken with respect to fishing activity, closure of beaches, demand for beach cleaning volunteers could be disseminated through media.

9.8 BRIEFING LOCAL AND GOVERNMENT OFFICIALS:

Consequent upon releases cleared by Chairman, local and government officials are to be briefed by the PRO or any other person authorized to do so.

10. TERMINATION OF OPERATIONS

10.1. DECIDING FINAL AND OPTIMAL LEVELS OF BEACH CLEAN-UP

The coastal stretches off DPA are varied in terms of ecological sensitivity; with large stretches of mangroves inter spread with sandy beaches and rocky shores. DPA harbor estuary shows differences in physical environment, the degree of exposure to waves and energy levels and currents. Geomorphic features like the terrain greatly influence the distribution and persistence of oil.

While, the first priority would be to stop the ingress of oil onto the coast, still the requirement of coastal or beach cleaning operations cannot be ruled out. The local administration being responsible for shore cleaning activity is to be notified in time about the movement of spill and advised about the strategy to be adopted.

Tactical beach cleaning ops are to be conducted as per the physical properties of the terrain with respect to retention of oil. Operations are to be guided as per OPERATIONAL MANUAL parameter.

10.2. STANDING-DOWN EQUIPMENT, CLEANING, MAINTAINING, AND REPLACING

Once the Pollution Response Operations are over, the equipment and machineries are to be accounted for, consumables are to be accounted for, checked for their serviceability and then stored in their respective places.

All equipment and machineries are to be thoroughly washed with fresh water as per the OEM‟s guidelines, necessary maintenance carried out and then equipment is to be secured.

10.3. PREPARING FORMAL DETAILED REPORT

After the operations are complete, the OSC will prepare a detailed report covering all the aspects of the oil spill cleanup, which will include success and failures as well, lesson learnt recommendations about equipment, man power, plans etc. The report will be forwarded to Deputy Conservator for submission to ECT.
Detailed report for the incident will be prepared by Head-DPA KANDLA AND OOT VADINAR as per prescribed format.

INVESTIGATION

Every oil pollution incidence is followed by investigation both by the Company as well as Nodal agencies
In order to assist such investigations complete and accurate records, as specified below, shall be maintained,

a. Certificates and records of equipment issued by regulatory authorities,
b. Log Book showing weather and details of the incidents,
c. Chronological record of loading / discharging bunkering including agreed plans of such loading / discharging / bunkering,
d. Brief report on spill including:
    i. Time,
    ii. Location,
    iii. Cause and Type of oil.
e. Samples of spilled oil shall be taken as per procedures described g) Estimate of amount spilled and the process of such estimation,
f. Copies of notification & update reports,
g. Record relating to direction and rate of spread,
h. Weather reports and recorded weather in log book and
i. Where possible photographic evidence shall also be collected. Such photographic records shall be identified with date, time and location.

Where any original evidence is demanded by Nodal Authorities, photocopies of such evidence be retained and the concerned authority shall request to certify the same as true copy of the original

10.4 REVIEWING PLANS AND PROCEDURES FROM LESSONS LEARNT:

Contingency Plan being a sequence and layout of dynamic operating procedures and parameters is subject to revision due changes in operational parameters of port, cargo, equipment innovations and changing response strategies. Exercises and real time drills being operational tasks might also necessitate a review of plan to be undertaken to incorporate the observations made, apart from the above mentioned.

Accordingly, a study in detail of observations made during every response operation would be undertaken by CMT with a view to incorporate the observations into the Plan for easy and flaw less implementation.

ROLES AND RESPONSIBILITIES OIL TERMINAL LIMITED (DPA KANDLA AND OOT VADINAR)

DPA KANDLA AND OOT VADINAR has responsibility for dealing with oil spills which occur within the Marine Terminal Local Area.

Responsibility for management of the response remains with DPA KANDLA AND OOT VADINAR unless the slick migrates outside the Local Area or more than 500 meters from the spill source/marine facilities of the company. In the event that the oil migrates to the port area administered by Deendayal Port AUTHORITY, the AUTHORITY will assume responsibility for leading the pollution response.

Should the spill migrate to other areas, or to other areas in addition the Deendayal Port AUTHORITY harbour area, the Coast Guard Monitor will assume the position of On Scene Commander and will direct the response effort. In both cases, DPA KANDLA AND OOT VADINAR will act and deploy their resources as required by the relevant On Scene Commander.

Deendayal Port AUTHORITY (DPA)

The Statutory Port Authority responsible for administering the area embraced by the
Deendayal port AUTHORITY limits. The IOC Terminal along with DPA KANDLA AND OOT VADINAR Marine facilities at Vadinar is located within the port limits.

Indian Coast Guard (ICG)

The Indian Coast Guard has a statutory duty to protect the maritime and other national interests of India in the Maritime Zones of India and to prevent and control marine pollution. Coast Guard is also the Central Co-ordination Authority for marine pollution control in the country. The Indian Coast guard is responsible for implementation and enforcement of the relevant marine pollution laws.

The coast guard will assume the role of On-Scene commander in the event of oil spill exceeding the capability and jurisdiction of DPA (Deendayal Port AUTHORITY)

Gujarat Pollution Control Board

The Gujarat Pollution Control Board is responsible for, and controls, waters up to 5 km from the shoreline. They require to be advised of all pollution incidents.

Gujarat Maritime Board

Gujarat Maritime Board is required to be informed of all pollution incidents; however, DPA KANDLA AND OOT VADINAR facility is not under the jurisdiction of GMB.

Ministry of Environment, Gujarat

The Ministry requires to be informed of all pollution incidents.

Oil Industry Safety Directorate (OISD)

OISD is required to be informed of all oil spill incidents.

Oil Pollution Management cell

Pollution Management Cell (PMC) is the nomenclature used to describe the command-and-control team established for a spill incident within the Marine Terminal Local Area.

The PMC will convene at the MTCB, under the chairmanship of the Head -DPA KANDLA AND OOT VADINAR and will consist of a Management Team and a Support Team.

Nearest Bird Handlers Details:

1. Nature Conservation society, Lakota Nature club Jamnagar,
Contact no. +919377526667, +919879516990

2. "Sir Peter Scott Bird Hospital", Saat Rasta, Jamnagar, Contact No. 7574000108.

11 HEALTH AND SAFETY PLAN

11.1 Introduction

Full account must be taken of the health and safety requirements for all personnel involved in oil spill response activities. The site-Specific Health and safety Plan Assessment Form list site characteristics, site hazards and personnel protective equipment and site facility needs. This plan is intended to act as an aide–memoir to ensure that all applicable health and safety requirements are considered and appropriate action are taken.
The applicable requirements noted in the **Company's HSEF Procedures** must also be observed.
Following Section gives guidance on specific oil spill clean-up tasks and hazards.

11.2. SITE HAZARDS

11.2.1. Bird Handling

Handling or birds must be undertaken by properly trained personnel to ensure the protection of both bird and handler; wild birds have no way of understanding human intentions. Even a greatly weakened bird can inflict serious injury to handlers, especially to their eyes. Open wounds on hands and arms from such injuries can present opportunities for oily contaminants and disease to enter the handler's blood stream.
Handling of oiled birds is usually best left to experts, or to volunteers who have received some training. Chasing and man handling birds puts them under additional stress.

11.2.2. Equipment Required:

a) thick gloves (able to withstand nasty pecks),
b) Overalls
c) Safety footwear
d) Cardboard Box with lid of a suitable size to give the bird some room for movement
e) Goggles to protect eyes,
f) Optional long – handled net to help catch bird

11.2.3. Procedures:

a) Do not let the bird get close to your head, as it may try to peck your eyes.
b) Catch the bird by hand or with the aid of a long-handled net. Do not put the birds under any more stress than necessary. Only attempt capture if it can be done quickly and efficiently.
c) Hold the bird with both hands to hold the wings in.
d) Put the bird in a cardboard box lined with absorbent material (e.g. newspaper), with a lid.
e) Do not wrap the bird up in anything it may get too hot and too stressed.
f) Take the bird to a cleaning station as soon as possible. Let them know where and when the bird was caught.
g) Keep a note of all birds caught and sent to cleaning station. Make a note of species if possible.

11.2.4. Tug & Work Boat Safety

a) Boat operators must familiarize themselves and passengers with safety features and Equipment on their boats.
b) Boats must be operated by qualified individuals.
c) Lifejackets must be worn by personnel on boats.
d) Use of cold-water immersion suits is particularly critical under conditions of cold stress.
e) Boats should generally not be used after sunset for oil recovery. If this is required or poses minimal risk, areas of operation should be carefully prescribed, and individual boat operators should maintain a communication schedule with a shore base. Each boat should be fully equipped with appropriate navigation lights.
f) Distress signals should be carried on all vessels.

g) Boat operators must keep their supervisors informed of their area of operation, especially when they change their work area (if plans call for a boat to move to another location during a shift, the operator should advise the supervisor of his actual time of departure)

h) Portable fuel tanks should be filled outside of the boat. All sources of ignition in the area of refuelling should be isolated.

Personnel working in or operating boats should wear appropriate non-slip footwear.

a) Fixed ladders or other substantial access/egress should be provided at boat transfer locations from low water line to platform.

b) Workers should be cautioned about using their arms or legs to fend off during berthing or getting their hands, arms, or legs between vessels and docks or fixed structures.

11.2.5. Chemical Hazards

Attach appropriate Material Safety Data Sheets for all hazardous substances likely to be used at a spill site.

11.2.6. Cold Stress

Cold stress can occur among responders as a result of prolonged exposure to low environmental air temperatures or from immersion in low temperature water. It can lead to a number of adverse effects including frostbite, chilblain and hypothermia. This single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body.

11.2.7. Drum Handling / Manual Handling

Drum handing at a spill site will primarily involve drums of waste and contaminated clothing. Several types of drums and containers may be used ranging from 25 to 200 litters in size. All drums and containers must be properly labelled. If in doubt as to the contents of a drum – seek advice.

Manual lifting and moving of drums should be kept to a minimum. A guide to manual handling is as allows:

(a) Wear gloves.
(b) Assess the weight of the load and get help if it is beyond your capability.
(c) Where appropriate, use mechanical aids provided.
(d) Size up the job – remove any obstructions; note any snags and make sure there is a clear space where the load has to be set down. Ensure that you can see over the load when carrying it.
(e) Look out for any splinters, projecting nails or sharp edges or wire.
(f) Stand close to the object and with your feet 20 to 30 c apart, place one foot in advance of the other, pointing in the direction you intend to move.
(g) Bend your knees to a crouch position, keeping your back straight.
(h) Get a firm grip at opposite corners of the load with the palm of the hand and the roots of the fingers, arms as close to the body as possible.
(i) Lift with your thing muscles by looking up and straightening your legs.
(j) Bend your knees to a crouch position, keeping your back straight.
(k) Get a firm grip at opposite corners of the load with the palm of the hand and the roots of the fingers, arms as close to the body as possible.
(l) Lift with your thigh muscles by looking up and straightening your legs.

AIR TEMPERATURE CELSIUS

Relative Humidity	21º	24º	26º	30º	32º	35º	38º	40º	44º	46º
20%	19º	22º	25º	28º	31º	34º	37º	41º	45º	49º
40%	20º	24º	26º	30º	34º	39º	*44º	*51º	**58º	**66º
60%	21º	25º	28º	32º	38º	*46º	**56º	**65		
80%	22º	26º	30º	36º	*45º	**58º				
□ Heat cramps or exhaustion likely. Heat stroke										

12. Response to HNS Incidents

12.1. RESPONSE OPTIONS

In many cases, particularly if the release involves a chemical that evaporates or dissolves rapidly, it will not be possible to physically contain or recover the spilled product from the sea. In these cases, the response options may be limited to monitoring and measures designed to mitigate the potential hazards, for example communication to advise local residents to remain indoors or prohibition of fishing.

Following the identification of the hazards posed by the release, including consideration of the effects of fire and potential reactivity, the response operation must evaluate which techniques can be used. It is important to rapidly establish which response techniques are feasible in order to reduce or if possible, eliminate the impacts of the hazardous substance on humans and the environment.

In most chemical incidents the rapid communication of relevant information, both internal and external to the response activities is likely to be the most important action that response agencies need to carry out. The polluter will, therefore, maintain continuous liaison with the chemical/ HNS manufacturer and repositories of data (such as the French Centre of Documentation, Research and Experimentation, or CEDRE) regarding HNS properties and response and promptly provide such data to the responders.

12.2. MONITORING

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

12.2.1 MONITORING GASES IN AIR

It is essential to systematically monitor the concentrations of chemicals in air throughout any incident involving gases or vapors. Key aspects of monitoring include:

- **Oxygen concentrations** any atmosphere having <19.5% oxygen i.e., an oxygen-deficient atmosphere, should be entered only by personnel wearing self-contained breathing apparatus, monitoring is carried out using oxygen cells.
- **Combustible or explosive gas levels** to identify areas where flammable air/fuel mixtures exist; a value below 10% of the Lower Explosive Limit may be considered safe. Typical instruments are combustible gas detectors and explosion meters. Continuous monitoring must be carried out as the situation and the concentration of gas can change rapidly raising the value over 10% LEL.
- **Toxic substances** to identify areas where toxic substances are present and to establish safe outer limits where it is reasonably safe for unprotected personnel. Instruments must be capable of measuring at ppm level and include gas detection tubes, flame ionization detectors, photo- ionization devices, IR trace gas detection (these instruments typically provide only approximate levels) and portable gas chromatographs and portable mass spectrometers (these instruments typically require specialist personnel to operate them).

12.2.2 MONITORING THE WATER COLUMN

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

- **Collecting water samples** – these are then transferred for analysis at fixed or mobile laboratories;
- **Use of towed probes** – a number of monitoring devices can be towed through the water column to establish the extent of a slick and to provide real-time data. Typical measurements include: pH, light absorption, electrical conductivity.

12.2.3 MONITORING SURFACE SLICKS

Thin films on the sea surface can damp capillary waves. A number of techniques have been developed that make use of the altered properties of the sea surface:

- **Side-Looking Airborne Radar** (SLAR) makes use of the reduced intensity of the backscatter and the surface slick appears as a darker area on the SLAR image;
- **UV scanners** can identify changes in the UV reflectivity of the sea surface;
- **IR scanners** and **Forward-Looking Infrared Imagers** (FLIR) identify changes in the radiation Temperature of the sea surface.

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

12.2.4 MONITORING SUNKEN SPILLS

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

12.3 RESPONSE TECHNIQUES

12.3.1 RESPONSE TO GASES AND EVAPORATORS

Plume modeling, air monitoring and defensive strategies such as water sprays are commonly used to respond to gas leaks. When applied as a fine droplet, i.e., as a mist and in calm conditions, they can:

- knock down water soluble gases;
- stop, steer or disperse sparingly soluble or insoluble gas clouds;
- Reduce the risk of fire and explosion in flammable clouds of gases, by cooling hot surfaces, putting out sparks and suppressing flame formation.

When applying water sprays, it is also important to be aware of consequences such as high volume waste streams and, in extreme cases, contributing to the instability of the vessel.

12.3.2 RESPONSE TO FLOATING CHEMICALS

A chemical that floats on the water surface will spread and form a large contact surface with the air. Depending on its vapor pressure, it may evaporate and give rise to a vapor cloud above the slick. Monitoring of air concentrations is important in these situations to assess fire and explosion risks and health risks. The selection of response technique must also take account of these hazards and the overall objective of the response. It is possible to attempt to contain and recover spills of floaters, but only of those substances that evaporate or dissolve slowly i.e., category F substances. Typical techniques involve:

- **Covering the slick with foam** – for flammable substances, this reduces evaporation and hence reduces possible fire and explosion risks (taking care to use the type of foam appropriate to the chemical involved).

It also restricts spread over the water surface and hence can increase the effectiveness of containment and recovery operations. In this case, consideration must be given to the toxicity of the foam to marine life.

- **Application of sorbents** either loose, as mats or in "sausages". As many low viscosity chemical spills rapidly spread to cover a large surface area, these techniques are most applicable if the spread of the chemical can be confined.
- **Bubble curtains** created by releasing compressed air through a perforated hose may be used to contain floating slicks in shallow, slow-flowing waters.
- **Conventional oil spill response booms and skimmers** may be used to contain and recover spills of floating chemicals. The effectiveness of these techniques depends on the physical properties of the substance involved, as the equipment may not be able to deal with the thin films and low viscosity of some floating chemicals. Compatibility of the equipment with the chemical must also be considered.

12.3.3. RESPONSE TO DISSOLVED CHEMICALS

The potential to contain and recover spills of chemicals that dissolve is extremely limited. Response techniques are generally restricted to forecasting their spread, monitoring and mitigation of their effects. In the case of spills in shallow or confined waters, treating agents can include:

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

In practice though, the use of these treating agents is often ineffective as the dosage is difficult to estimate and recovery of the substance may be difficult. Curtain barriers may also be used to contain dissolved chemical spills in shallow and almost stagnant waters. Response to sunken chemicals must consider not only the recovery of the chemical itself, but the removal and treatment of contaminated sediments. The principal technique is that of dredging.

12.4 HNS RESPONSE EQUIPMENT INVENTORY

It is submitted that no HNS being handled at KANDLA. No HNS Inventory held with port however, if at all an importer handling agent has been instructed to maintain required equipment as per MOU/Permission granted for handling.

12.5 DISPOSAL

Before commencing any actions that may lead to the recovery of spilled chemical, it is essential that an appropriate and legal disposal route has been identified for both the recovered chemical and any waste generated. Even temporary storage must take proper account of the physical properties of the chemical and its potential to evaporate or leak. Waste streams may be subject to transportation regulations covering hazardous waste, so relevant national regulations must be identified.

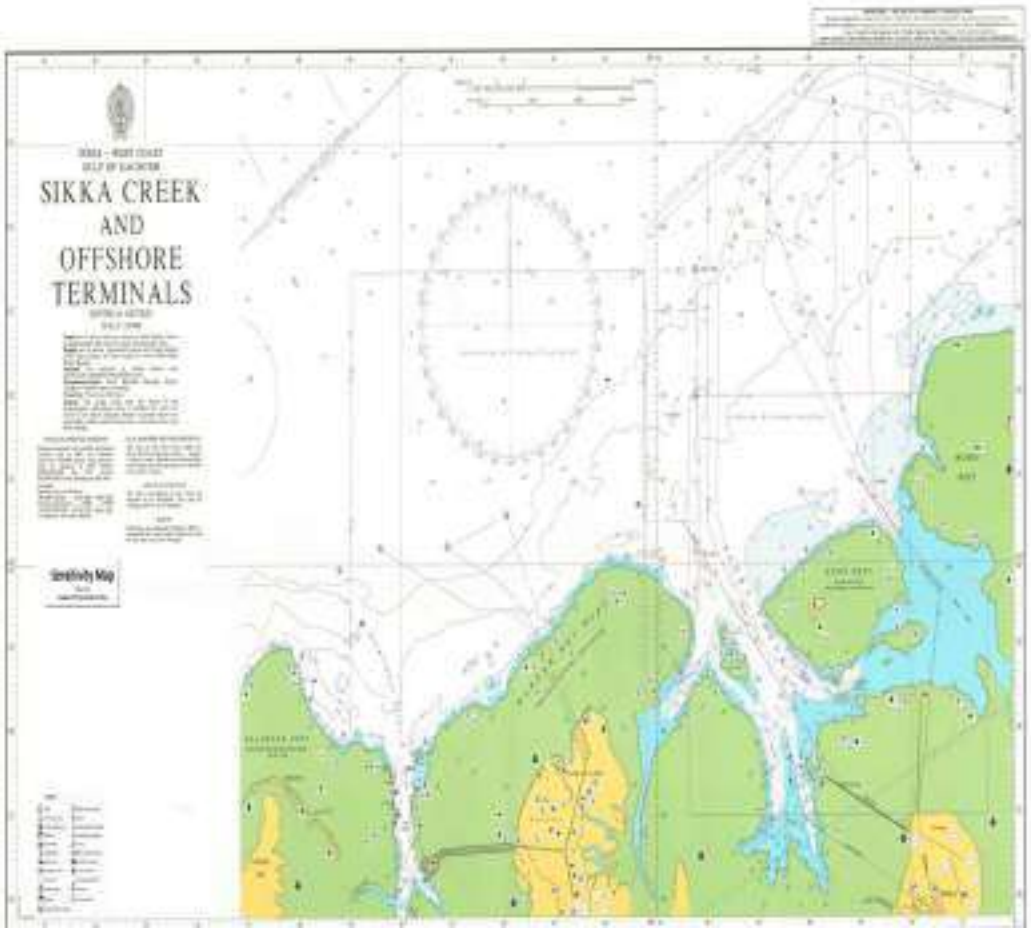
NOTE: It is submitted that no HNS being handled at OOT Vadinar.

PART – III

DATA DIRECTORY

COATAL CHARTS, TIDAL INFORMATION, CURRENTS (RANGES AND STREAMS) PREVAILING WINDS

1.1COASTAL CHART:



REPORTS, MANUALS, MAPS, CHARTS AND INCIDENT LOGS.

A copy of the relevant manual is kept with DPA Office at Vadinar. Maps/charts of creak & the Costal Charts, currents, tidal information prevailing wind are Available with survey section of port.

1.1.1. COASTAL FACILITIES, ACCESS ROADS.

DPA includes jetty area and oil terminal. The distance between these two is about 500 m. These terminals are connected by road as well as by sea.

1.1.2. TIDAL INFORMATION

The dominant tide in the DPA KANDLA AND OOT VADINAR is the semi-diurnal tide with a period of 12 hours and 40 minutes. The following are the particulars of tidal levels related to Chart Datum.

Month	High Tide		Low Tide	
	Max	Min	Max	Min
January	5.87	4.11	2.45	0.15
February	5.89	4.04	2.50	0.29
March	5.77	3.75	2.35	0.43
April	5.74	3.79	2.16	0.31
May	5.72	3.94	2.05	0.32
June	5.62	4.17	2.19	0.41
July	5.76	4.37	2.34	0.30
August	5.90	4.28	2.37	0.22
September	5.90	4.08	2.28	0.31
October	5.90	3.89	2.15	0.13
November	5.84	3.79	2.07	0.16
December	5.68	3.82	2.29	0.32

YEAR	**Tide (Mtrs.)**	
	Max.	Min.
2015	7.27	-0.02
2016	7.27	-0.02
2017	7.19	-0.16
2018	7.25	-0.06
2019	7.25	-0.02

The dominant tide in the DPA KANDLA is the semi-diurnal tide with a period of 4 years 2015-2019 The following are the particulars of tidal levels related to Chart Datum.

1.1.3. CURRENTS:

The currents in DPA and the near shore zones are tide induced with reversal at high and low waters. The current strength ranges from 1.5 to 3 knots.

Current speeds and directions within the Bay and associated tributaries are largely due to the tidal movements and show little variation from non-monsoon to monsoon. The maximum current speed in the outer Bay exceeds 1 m/s and the variation in the water column at any given time is not significant.

Lateral variations in the speed however occur with current in the eastern area being somewhat stronger. The maximum current speeds decrease in the inner creek and are typically around 8.0 m/s, decreasing markedly during neap tide.
As characterized for a tide dominated system, the alongshore components are fairly strong with the dominance of seaward component while cross shore components are relatively weak. Their relative magnitude and directions are indicative of net seaward movement over a tidal cycle though shoreward drift can be significant around the change of tide.

Excursion lengths and Average current speeds observed for the Bay based on the Available drogue trajectories are as per table below:

YEAR	WAVE LENGTH PATTERN AT OTP	
	Significant wave length	Maximum wave length
2015	2.20 mt.	3.70 mt.
2016	2.20 mt.	3.70 mt.
2017	2.20 mt.	3.70 mt.
2018	2.20 mt.	3.70 mt.
2019	2.20 mt.	3.70 mt.
2020	2.20 mt.	3.70 mt.

October	6.5
November	6.2
December	6.5
Total / Average	6.4

Table 15

1.1.4. WIND:

General direction of wind is from the North to the West Quarter, with seasonal variations as shown below:
Seasonal wind Variations

YEAR	Wind Speed	
	Max.	Avg.
2015	46 KMPH(July)	9 KMPH
2016	36 KMPH(June)	9 KMPH
2017	32 KMPH(July)	9 KMPH
2018	32 KMPH(April)	9 KMPH
2019	34 KMPH(July)	9 KMPH
2020	39 KMPH (JULY)	10 KMPH

Month	Wind speed max (Km/hrs.)	Wind speed min (Km/hrs.)
January	28.00	4.00
February	22.00	2.00
March	22.00	2.00
April	22.00	4.00
May	28.00	6.00
June	32.00	8.00
July	38.00	10.00
August	28.00	4.00

September	24.00	4.00
October	14.00	2.00
November	16.00	4.00
December	34.00	4.00
Total/Average	25.66	4.5

Table 16

The physical and chemical characteristics of spilled oil change almost immediately when spilled in the marine environment due to evaporation, dispersion, emulsification, dissolution, oxidation, sedimentation and biodegradation. All of these processes that set in together are collectively referred to as oil weathering and decide the final fate of spilled oil and quantities that would need to be removed physically. An uncertainty in a trajectory fore-cast builds over time due to these processes that the spilled oil goes through.
If the oil is persistent and does not vaporize immediately or disperses and comes ashore, then the costs in terms of cleanup, damages and economic loses can be considerable.

1.1.5 POINT SYMBOLS FOR BIOLOGICAL RESOURCES

Refer **Annexure -12**

2. Risk Locations and probable fate of oil

The Following are the Risk Locations near/vicinity of DPA KANDLA, Gujarat

1) Mangroves inside / Surrounding Port Area
2) Sathsaida bet, consist of 10 sq. Km mangroves & marshy area.
3) IFFCO Intake
4) Fishermen hutments & Basti & fishing boat parking area north of Dry Dock
5) Salt pans
6) Flamingo flat

The Following are the Risk Locations near/vicinity of DPA OOT VADINAR, Gujarat

1) Marine National Park
2) Marine Sanctuary
3) NAYARA Refinery Intake
4) Mangroves
5) Salt pans
6) Forest Areas

The physical and chemical characteristics of spilled oil change almost immediately when spilled in the marine environment due to evaporation, dispersion, emulsification, dissolution, oxidation, sedimentation and biodegradation. All of these processes that set in together are collectively referred to as oil weathering and decide the final fate of spilled oil and quantities that would need to be removed physically. An uncertainty in a trajectory fore-cast builds over time due to these processes that the spilled oil goes through.
If the oil is persistent and does not vaporize immediately or disperses and comes ashore, then the costs in terms of cleanup, damages and economic loses can be considerable.

OIL THICKNESS AND APPEARANCE OF SLICK:

Oil slicks form very thin films on open water. Depending on the properties of the product, the thickness can range from a tenth of a micron to hundreds of microns. The color of oil film post spreading is a good measure of quantity of oil that may be contained within the slick.

When direct light from the sun contacts a very thin oil film (<0.1 micron; μ), much of the light is reflected back to the observer as gray or silver sheen.

If the film is thicker (0.1 to 3 μ), the light passes through the film and is reflected off the oil-water interface and back to the viewer. The observer will then see a film that can range from rainbow to darker-colored sheens.

For very thick films (> 3 μ), the light is absorbed and the slick appears dark- colored (i.e., black or brown) to the observer. However, the viewer can no longer deter- mine film thickness based on color. If the slick is dark-colored, the observer cannot tell whether the film is 3 μ or 100 μ thick.

In order to quantify oil thickness, the following is used as guidelines

Appearance	Thickness
Silver Sheen	0.0001mm
Rainbow sheen	0.003 mm
Light brown/ Black slick	0.1 mm
Dark brown/ Black slick	more than 1 mm

To determine an approximate quantity of spilled oil, the following formula is used:

L (Length of slick) meters X W (Width) X Thickness (mm) = Cubic meters100

The extent of spread in terms of length and breadth along with % of area showing a particular color as per thickness can be used for calculation of quantity of spill through spill calculation software. Calculation of spill quantity as per slick characteristics are placed at **Annexure-12**

3. Shoreline Resources for priority Protection Held At DPA KANDLA AND OOT VADINAR:

ANTI – POLLUTION RESOURCES (Local Area) DPA KANDLA AND OOT VADINAR are placed at **Annexure-7&19**

3.1 LIST OF REFINERIES

Refer **Annexure -8**

4. Shoreline Types:

SHORELINE TYPES AND RANKING

Vulnerability index of shores in order of increasing vulnerability to oil spill damage as per Gundlach and Hayes 1978

1. Exposed rocky headlands	Wave reflection keeps most of the oil offshore. No cleanup necessary.
2. Eroding wave- cut platforms	Most oil removed by natural processes within wave swept weeks.
3.Fine-grained sand beaches	Oil does not usually penetrate into the sediment, facilitating mechanical removal if necessary. Otherwise, oil may persist several months. (Some evidence suggests that penetration can occur)
4. Coarse-grained beaches	Oil may sink and/or be buried rapidly, making clean-up difficult. Under moderate to high-energy condition, oil will be removed naturally from up difficult. Under moderate to high-energy conditions, oil will be removed naturally from most of the

	beach face. Most oil will not adhere to, nor penetrate into, the Compacted tidal flat. Clean-up is usually unnecessary

5. Mixed sand and gravel beaches Oil may penetrate the beach rapidly and become buried. Under moderate to low energy conditions, oil may persist for years.
6. Gravel beaches same as above. Clean-up should concentrate on high-tide/swash area. A solid asphalt pavement may form under heavy oil accumulations.

7. Sheltered rocky coasts	Areas of reduced wave action. Oil may persist for
8. Sheltered tidal flats	Concentration is very heavy.
9. Salt marshes/mangroves	Areas of great biological activity and low wave Most productive of aquatic environments. Oil may persist for years. Cleaning of salt marshes by burning or cutting should be undertaken only if heavily soiled. Protection of these environments by booms or absorbing material should receive first priority

5. Sea Zones and Response Strategies:

Within the scope of this Plan, a response action required to be mounted could be at any of these locations
(i) Sea or channel, incident due collision etc. during passage,
(ii) Close shore due grounding or stranding,
(iii) Alongside at jetty or at the terminal during cargo operations.

Notwithstanding the above locations, it is possible that an eventuality occurring at sea like a collision or mechanical failure could lead to a situation where the consequences would be felt in some other location at a coastal location.

6. Shorelines Zones and Clean-up Strategies:

A number of shoreline response strategies are Available as per table below, but shorelines should be assessed so see whether these are suitable. This will depend on:

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

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

Table : Application of techniques to different shoreline types

V : Viable + = Possibly useful X = Not recommended NA : Not Appicable

7. Oil and Waste Storage / Disposal sites:

An efficient and monitored disposal of waste includes immediate classification, segregation, packaging and labeling at source. List of Approved Recyclers –Placed at Annexure -23

	Packaging	Storage Capacity (m^3)
ON WATER	On board Storage	100 to >1,000
	Barges	10 to 10000
	Flexible / towable bladders or tanks	500 to 15000
SHORELINE	Plastic bags or sacks	0.25 to 15,000
	Super sacks	0.5 to 2.5
	Barrels or drums	~0.2
	Portable tanks	1 to 5
	Skips or dumpsters	10 to 40
	Lined pits	Up to 200
	Vacuum trucks	7.5 to 20

HW: Hazardous Waste, MTA: Metric Tons per Annum, TSDF: Treatment, Storage and Disposal Facility

WASTE DISPOSAL OPTIONS

WASTE	PRIMARY OPTION	SECONDARY OPTION	ALTERNATE OPTION
Fresh Oil	Refining	Fuel Blending	Ex Situ burning
Weathered	Fuel blending	Land Treatment	Landfill
Emulsions	Fuel Blending	Land Treatment	Landfill
Hydraulic Fuels	Refining		
Oil debris	Incineration	Open burning	Landfill
Oily PPE	Incineration	Landfill	
Oily Sand / Gravel	Ex situ burning	Land treatment	Landfill
Oily sorbents	Fuel blending	Incineration	Landfill
Oily Waste water	Electro coagulation treatment		
Animal carcasses	For research	Incineration	
Domestic waste	Incineration	Landfill	
Non oily debris	Incineration	Landfill	
Pallets	Recycle / reuse	Open burning	Landfill
Paper board	Recycle / reuse	Open burning	Landfill
Drums	Recycle / reuse	Landfill	
Hazardous wastes	Social handling, storage treatment		

8. SENSITIVITY MAPS/CHARTS.

The Gulf abounds in marine wealth and is considered as one of the biologically richest marine habitats along the west coast of India. It is endowed with a great diversity of natural ecosystems, of which the major systems are salt pans, intertidal zones, marine algae (seaweeds), sea grass and sand dunes, mangroves, coral reefs, creeks, and Open Ocean. The Risk Assessment Studies for Marine Oil Spill for Jetties and SPMs and sensitive mapping of (Gulf of Kutch) has been carried out by NAYARA Energy Limited, Vadinar recently in February 2024 through Environ Software Pvt. Ltd., and is placed as an **Annexure -26**.

B. LIST OF EQUIPMENT AND MANPOWER REQUIREMENT

1) AUXILIARY EQUIPMENT:

a) OSR DUMP BARGE: ANURADHA
b) Harbor Tugs
c) Pilot Vessels, launches and others

ReferAnnexure-21

2) SUPPORT EQUIPMENT:

a) Computer and printer with internet
b) Walkie-talkie Sets
c) Telephone Lines
d) Mobile Sets

3) SOURCES OF MANPOWER

In the event of oil spill, Traffic, Mechanical as well as Civil department of DPA shall provide required facility with regard to catering, housing, transportation, field sanitation and shelter etc.

The Following are the Sources of Manpower to combat any oil spill incident in DPA KANDLA AND OOT VADINAR:

A. OSR Manager
B. OSR Operational Managers
C. OSR responders
D. DPA Fire Brigade Department

A: OSR Manpower: Following qualified OSR man power are presently available at DPA Kandla & OOT Vadinar:

1. IMO Level - III
2. IMO Level -II
3. IMO Level -I

ReferAnnexure-23 & 24

4) LOCAL AND NATIONAL GOVT. CONTACTS:

Refer Annexure-3

5) CONTACT DETAILS OF LOCAL ADMINISTRATION.

Refer Annexure-18

6) CONTACT DETAILS OF EXPERTS AND ADVISORS

Refer Annexure- 01

ANNEXURE -1
(Page-77, Refer Para 6)

CONTACT DETAILS OF EXPERTS AND ADVISORS:

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

Name of Body	Telephone No.	Fax
Nautical Advisor	022-2613651-54	9122-22613655
DG Shipping, Mumbai	022-22613651-54, 022-226131156	22-22613655
Indian Register of Shipping	022-30519400	022-25703611
IIT- Gujarat	079 2395 2800	022-25723480
Cyclone Detection Radar	022-22150431/ 22174707	-
Area Cyclone Warning Centre (ACWC)- Colaba, Mumbai	022-22150431	022-22160824
Ministry of Environment and Forest (MOEF)	011-24360721, 011-24361896	011-24362746
The National Environmental Engineering & Research Institute (NEERI)	0712-2249999/66	0712-2244900
Directorate of Maharashtra Fire Services	022-26670438/39	022-266600287
Ministry of Petroleum & Natural Gas	011-23387404	011-23383100
National Institute of Ocean Technology (NIOT)	044-667893300	044-22460275/ 22460645
National Ship Design and Research Centre	07386677846	
Department of Explosives	0712-2510248 022-27575946 27575946,27564941	
Inspectorate Dock Safety, Mumbai	022-22692180/ 56565511/56565558 9757222853	022-22613391
GPCB, GUJRAT	079 2323 2152	079 2323 2156
GPCB, JMNAGAR	0288 2752366	0288 2753540
Meteorological Observatory, Ahmedabad	079-22865165	22865449

ANNEXURE-2
(Refer 5.3, Page 40)

LIST OF ADDITIONAL RESOURCES AND INTERNATIONAL OSROs

1. SADHAV Shipping LTD.
Oil Spill Response Unit,
618, Laxmi Plaza
New Link Road, Andheri (West)
Mumbai-400053
Tel- 022-400053, Fax-022-40003366.
Mail- Shipping@SADHAV.com . Web - www.SADHAV.com

2. Australian Marine Oil Spill Centre
PO Box 305
Victoria 3214
Australia
Tel + 61 3 5272 1555 Fax + 61 3 5272 1839
Mail: amose@amosc.com.au Web: http://www.aip.com.au

3. Fast Oil Spill Team
C/o PIM 40 G 23 Tour Elf
92078 Paris- La Defense Cedex France
Tel: + 33 1 4744 5636 Fax : + 33 1 4744 2677 Mail :
giefost@club-internet.fr

4. Oil Spill Response Ltd
Oil Spill Services Centre
Lower William Street Northam
Southampton SOI 1 QE, UK
Tel: + 44 1703 331 551 Fax: + 44 1703 331 972
Mail: osrl@osrl.co.uk Web: http://www.oilsillresponse.com

5. Petroleum association of Japan
Oil Spill response Department Keidanren Building
9-4, 1 – Chome, Ohtemachi Chiyoda Ku,
Tokyo 100, Japan
Tel: + 81 3 3279 3819 Fax: + 81 3 3242 5688
Mail: mail@pcs.gr.ip Web :http://www.pcs.gr.ip

ANNEXURE-3
(Ref Para-4 Page-77)

LOCAL AND NATIONAL GOVT. CONTACTS:

1. The Commander
   Coast Guard Region (North West)
   Gandhinagar, Gujarat
   Tel 079 23243315, 23243316
   Fax: 079 23243305
   Email ID: rhq-nw@indiancoastguard.nic.in

2. The Commander Coast Guard Dist. HQ -15,Okha
   Tel -02892262260, 61223421
   Email ID: cgs-okh@indiancoast.nic.in

3. The Commanding Officer,
   Indian Coast Guard Station, Vadinar.
   Tel 02833256333
   Email ID: vdr@indiancoastguard.nic.in

4. Coast Guard Pollution Response Team (NW)
   Tel- 079 23243315, 23243316
   Ops- 079 23243264, 3283,3292
   Fax 079 23243305
   EmailID-prt-nw@indiancoastguard.nic.in

2. FISHERIES

Nature Conservation society, Lakota Nature club Jamnagar,
Contact no. +919377526667, +919879516990

3. STATE POLLUTION CONTROL BOARD – REGIONAL OFFICES

Sardar Patel Commercial Complex,
Rameshwar Nagar
Kasturba Gandhi Vikas Gruh Marg, Bedi Bandar Road
Jamnagar- 361 008
Tel-(0288) 2752366

CONTACT DETAILS OF STATE GOVERNMENT

DEPARTMENT	DESIGNATION	TELEPHONE	FAX
Gujarat Maritime board, Gandhinagar	Chairman GMB	079-23234696	23234703
	Chief Engineer	079-23234699	23244132
	Traffic manager	079-23246726	23234705
	Dy Secretary Control Room GBM	079-23234706	23234706
	Nautical Officer	079-23234716	23234716
	Officer on Special duty	079-23234698	23240274
Forest & Environment	Principal Chief Conservator of Forests	079-2354100	
	Director Environment, Govt. of Gujarat Gandhinagar	079-23251062	23252156

CONTACT DETAILS OF PORTS

NAME OF PORT	DESIGNATION	TELEPHONE	FAX
Okha	Port officer	02892-262008	262002
Vadinar	Chief Operation Manager	02882573001	
		9819999227	
Bedi Port	Port Supervisor	0288-2755207	
Sikka Port	Port Supervisor	0288-2344230	
Salaya Port	Port Supervisor	02833-285526	
Jakhau Port	Traffic Inspector	02834-223033	230033
Sangchi Port	Port Officer	02831-287233	274115
Kandla Port	Dy Conservator	02836-220235	02836-233585
	VTS GOK	02836-270110	02836-270110
	Harbor Master	02836-270624	270427
	Signal Station Port Officer	02836-270194	270624
Old Port Mundra GMB	Traffic Inspector	02838-222136	222136
Mandvi Port GMB	Port Officer	02834-230033	230033
Tuna Port	Superintendent	02836-299510	271465

CONTACT DETAILS OF OHA

NAME	DESIGNATION	TELEPHONE	FAX
Vadinar			
IOCL	CGM, IOCL	02833-256464	256543
	Manager Marine	07894407768	
Nayara energy	Head VOTL	09909908611	
RIL	Head Security	0288-4011911	4010000,4011253
BORL	Vice President	02833-256499,08238069222	256499
	Port Control Room	9726701985,07069073711	
HPCL-MITTAL, Mundra	DGM Pipe line	02838-271050	271050
APSEZL, Mundra	Marine Services	02838-255671,9825228673	02838-255110

DISTRICT ADMINISTRATION

OFFICE	DESIGNATION	TELEPHONE	FAX
Devbhoomi-Dwarka	District Collector & District Magistrate	02833 232803,	232102
Jamnagar	Office of the Collector	0288-2555869	2555869
Kachchh	District Collector	02832-252347	02832-250020
Morvi	District Collector	02822-240701	02822-243703

ANNEXURE- 4

(Page-36,41, Ref Para-4.2,5.6)

WEEKLY MAINTENANCE / TRAINING PROGRAMME, DPA

Date	Event of the Day	Duty Staff
Monday	Tool Box Meeting General cleaning and maintenance of equipment Training/Starting of Power pack and DBD Skimmer Lecture/Discussion on HSE	
Tuesday	Tool Box Meeting General cleaning and maintenance of equipment Training/Starting of Spate 75 pump and Mini Max skimmer Lecture/Discussion on OSD	
Wednesday	Tool Box Meeting General cleaning and maintenance of equipment Training/Power pack & Terminator Skimmer and Discussion on Firefighting appliances	
Thursday	Tool Box Meeting General cleaning and maintenance of equipment Training and Maintenance of Equipment -Onboard OSR Dumb barge Anuradha. OSD pump and spraying system Training/Instruction on OPRC IMO Level I	
Friday	Tool Box Meeting General cleaning and maintenance of equipment Training/Ro Boom, Anchor and anchor chain Discussion on Booms/Skimmers	
Saturday	Tool Box Meeting. General cleaning and maintenance of equipment Training/Maintenance of Skimmer Disc/brush Davit and OSD back pack sprayer. • Discussion on safety of Men and Materials during loading/unloading of OSR Equipment/items	

ANNEXURE - 5
(Refer Para-8.4, Page-57)

MEDIA COMMUNICATIONS GUIDELINES

The degree of interest from the press in a specific oil pollution incident is unpredictable but normally closely related to the number of other news items at the time of the incident. Experience shows that even quite extensive pollution does not always attract the attention from the media, while minor, rather insignificant pollution can create a media storm when there is little else to report.

The media can be an effective means of ensuring that the public is kept informed of the incident, its effects and what is being done. Therefore, proper attention to the media and providing the correct information is very important.

The responsibilities of First Responders do not include dealing with the media. Though, it is advisable to refer all and any questions to the media liaison officer identified through the Contingency Plan, still the response leaders on all levels should be prepared to answer questions from the press because of media's persistence for news.

The lesson to be learned is that - unless otherwise instructed, it should always be remembered that even precise information can be misinterpreted or misunderstood. It is therefore recommended to obtain the name and telephone number of members of the press who have received information in order to verify or correct wrong news stories based on misunderstood information.

The basic questions from the press are likely to be:

- What happened?
- Why did it happen?
- What are the measures being taken by the authorities with respect to the pollution?
- What is being done to prevent such an incident happening again?

How to deal with these approaches is a matter of experience but the following guidelines can be used by First Responders:

- Tell the truth. If there is something you do not know, then say so to Avoid getting chased by the press,
- comment only about your area of responsibility and do not speculate on other topics, avoid offering opinions,
- Emphasize the positive points of the operation like outcome of operations, objectives going to be achieved etc.,
- Never make assumptions, your information must be verified and solid before released,
- Do not offer a personal opinion,
- Beware of language (e.g. it is better to say that two ships collided than one crashed

into the other if it is not clear which was at fault),

- Be polite, patient and never get personal or sarcastic (you will normally be treated in the same way you treat a person and aggressive behavior from your side can cause you a lot of unnecessary problems),
- Insist that the press observe local safety regulations.

ANNEXURE -6
(Refer 1.3.1Page -20)

BROAD CLASSIFICATION OF OILS AS PER MARPOL 73/78

Asphalt solutions	Gasoline blendings
Blending stocks	Alkylates- fuel
Roofers flux	Reformates
Straight run residue	Polymer - fuel
Clarified	Casing head (natural)
Crude oil	Automotive
Mixtures containing crude oil	Aviation
Diesel oil	straight run
Fuel no. 4,5 and 6	Fuel oil no.1 (Kerosene)
Residual fuel oil	Fuel oil no. 1-D
Road oil	Fuel oil no. 2
Transformer oil	Jet fuels
Aromatic oil (excluding vegetable oil)	Fuel oil no. 2-D
Lubricating oils and blending stocks	JP-1 (Kerosene)
Mineral oil	JP- 3, 4
Motor oil	JP–5 (Kerosene, heavy)
Penetrating oil	naphtha
Spindle oil	Mineral spirit
Turbine oil	Solvent
Straight run	Petroleum
	Heart cut distillate oil

ANNEXURE-7
(Refer Para-3, Page -74)

ANTI – POLLUTION RESOURCES (Local Area) DPA KANDLA AND OOT VADINAR

Equipment List as per NOSDCP 2018	List of Equipment available at DPA Kandla	List of Equipment available at DPA OOT Vadinar	Total List of Equipment available with DPA	Requirement	Shortfall/ Excess (if any)
Inflatable Booms	1200	2000	3200 Mtrs.	1000 Mtrs.	+2200
Fence boom (Material: Neoprene rubber/Neoprene rubber/ PU/ PV)	200	Nil	200 Mtrs.	1000 mtrs	-800
Skimmer (20TPH 50% weir type, 50vo Brush type)	02 Nos.	03 Nos.	05 Nos.	06 Nos.	-01
OSD Applicator with Spray arms type along with 02 Nozzles system and 02 hand lancers (No')	03 Nos.	05 Nos	08 Nos.	07 Nos.	+01
Oil Spill Dispersant (Chemical Dispersant) (liters)	5000 ltrs.	3000 Ltrs.	8000 Ltrs.	5000 Ltrs.	+3000 Ltrs.
Bio-remediation (liters)	Nil	Nil	Nil	3000 Ltrs.	-3000 Ltrs.
Flex Barge 10 Tons (no.)	5 Nos.	4 Nos.	09 Nos.	07 Nos.	+2 Nos.
Weir Boom 100 meters with minimum 02 weirs with power pack and accessories (no's) or integrated containment cum recovery system with power pack and accessories (no's	Nil	02 Nos.	02 Nos.	03 Nos.	-1 Nos.
Sorbent boom size min. 5 inch Dia, min. length 5 feet (no')	Nil	500 Nos.	500 Nos.	700 Nos.	-200 Nos.
Sorbent Pads min. 20 inch x 20 inch (no.)	Nil	2000 Nos.	2000 Nos.	2200 Nos.	-200 Nos.
Mini Vacuum pumps	01 Nos.	04 Nos.	05 Nos.	07 Nos.	-02 Nos.
Portable Oil temporary storage facility capacity 10 m3	Nil	05 Nos.	05Nos.	08 Nos.	-03 Nos.
200 meters Shoreline sealing boom with power pack and accessories (material: Rubber/Neoprene rubber) (nos.)	Nil	Nil	Nil	04 Nos.	-04 Nos.
VOC Portable Monitor	Nil	Nil	Nil	02 Nos.	-02 Nos.
Level A protection: Positive pressure, full faces	Nil	05 Nos.	05 Nos.	08 Nos.	-03 Nos.

piece self-contained breathing apparatus (SCBA) or passive pressure air respirator with escape SCBA; Totally encapsulated chemical and vapor protective suit; Inner and outer chemical resistant gloves; and .Disposable protective suit gloves, and boots					
Level B protection: . Positive pressure, full face piece self-contained breathing apparatus (SCBA) or posiWe pressure supplied air respirator with escape SCBA; . Inner and outer chemical-resistant gloves; . Face shield; . Hooded chemical resisantdathing; .overall; and . Outer chemical-resistant boot.	Nil	Nil	Nil	16 Nos.	-16 Nos.
Level C protection: .Full face air purifying respirators; .inner and outer chemical-resistant gloves; ' Hard hat; ' Escape mask; and . disposable chemical{resistant outer boots"	10 Nos.	20 Nos.	30 Nos.	Nil	30
				Nil	30
				05	25
				Nil	30
				Nil	30
OSR Vessels					
Work Boats	2	2	4	4	NIL
Tugs	4	4	8	4	+4

ANNEXURE – 8
(Refer Para-3.6,page-34)

LIST OF REFINERIES

NEARBY AND IN GUJRAT STATE

Reliance Industries Ltd. (Domestic Tariff Area) (RIL-DTA) (Private Sector). JAMNAGAR (Gujarat)

Reliance Industries Limited – SEZ (RIL-SEZ) (Private Sector). Jamnagar

Nayara Oil Limited (EOL) (Private Sector), Vadinar, Gujarat

REFINERIES AVAILABLE IN INDIA:

Guwahati Refinery (Assam) – Indian Oil Corporation Limited (IOCL)

Barauni Refinery (Bihar) - Indian Oil Corporation Limited (IOCL)

Koyali Refinery (Gujarat) - Indian Oil Corporation Limited (IOCL)

Haldia Refinery (West Bengal) - Indian Oil Corporation Limited (IOCL)

Mathura Refinery (Uttar Pradesh) - Indian Oil Corporation Limited (IOCL)

Digboi Refinery (Assam) – Indian Oil Corporation Ltd (IOCL)

Panipat Refinery (Haryana) - Indian Oil Corporation Ltd (IOCL)

Bongaigaon Refinery (Assam) – Indian Oil Corporation Limited (IOCL)

Visakha Refinery (Andhra Pradesh)- Hindustan Petroleum Corporation Limited (HPCL)

Kochi Refinery (Kerala) – Bharat Petroleum Corporation Limited (BPCL)

Manali Refinery (Tamil Nadu) – Chennai Petroleum Corporation Ltd (CPCL)

Basin Refinery (Nagapattinam-Tamil Nadu) – Chennai Petroleum Cauvery Corporation (CPCL)

NumaligarhRefinery (Assam) - Numaligarh Refinery Limited (NRL)

Mangolare Refinery (Karnataka) – Manglore Refinery Limited (MRL)

Tatipaka Refinery (Andhra Pradesh) – Oil & Natural Gas Corporation Limited (ONGC)

Reliance Industries LTD.(Domestic Tariff Area) (RIL-DTA) (Private Sector).JAMNAGAR (Gujarat)

Reliance Industries Limited – SEZ (RIL-SEZ) (Private Sector). Jamnagar

NAYARA Oil Limited (EOL) (Private Sector), Vadinar, Gujarat

Bina Refinery – Bharat Oman Refineries Limited (BORL) (Madhya Pradesh)

Guru Gobind Singh Refinery – HPCL – Mittal Energy Limited (HMEL), Bhatinda (Punjab)

ANNEXURE-9
(Refer Para-2.2, Page-25)

CHARASTRISTICS OF DIFFERENT CLASS OF OILS

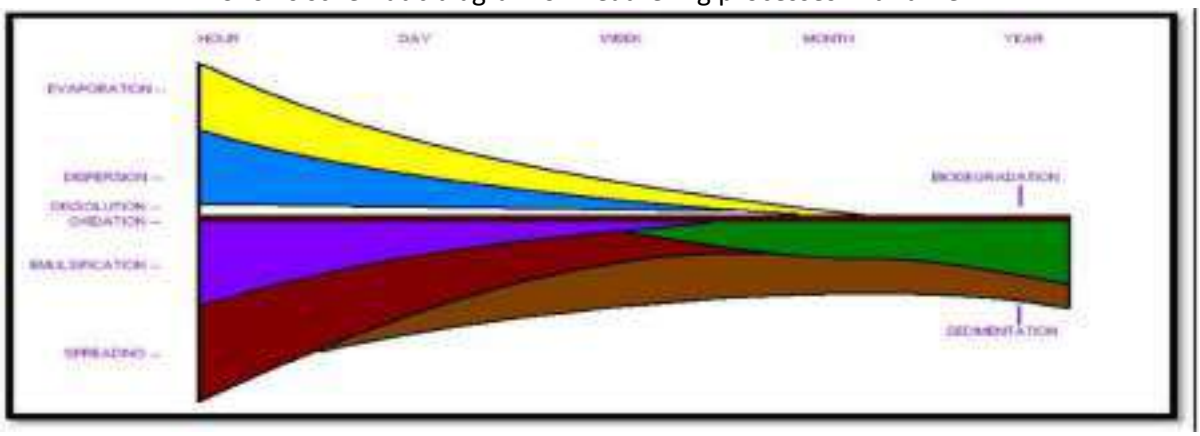
OIL TYPE	DENSITY	Viscosity	Pour point C	Flash point C
	(kg/l) At 15C	mPa at 20C		
Crude oil	0.8- 0.95	1-100	+10 to – 35	Variable
Gasoline	0.70 – 0.78	0.5	Na	Less than 0
Kerosene	0.8	2	Less than – 40	38-60
Jet fuel	0.8	1.5-2	Less than – 40	38-60
Diesel oil	0.85	5	-5 to -30	More than 55
Light FO IFO60	0.9	60 at 50 C	+ 50 to -20	More than 60
Medium FO IFO 180	0.9	180 at 50 C	+ 30 to – 20	More than 60
HeAvgy FO IFO 380	0.99	380 at 50 C	+ 30 to – 20	More than 60

ANNEXURE-10
(Refer Para-2.9,Page-29)

WEATHERING PROCESSES AND TIME SCALES

Process		Importance	Time frame
Evaporation	Conversion of liquid to Gaseous state. Lighter factions are lost first	Major process accounting for loss of oil. At 15 C gasoline will evaporate completely over a 2 day period, 80% of diesel fuel and 40% of light crude , 20% of heavy crude and about 5- 10% Of Bunker C fuel.	< 5 days
Emulsification or mousse formation	Small water droplets get mixed into liquid oil. Water content will reach 50-80%	Will increase the amount of pollutant to be Recovered by a factor of 2-4.	Onset may be delayed but emulsification process will start Rapidly.
Natural dispersion	Breakup of an oil sleek into small droplets	Removes oil from water surface	< 5 days
Dissolution	Mixing of soluble oil components into water	Water soluble components are most toxic	< 5 days
Biodegradation	Breaking of oil by microbes into smaller compounds and finally to water and carbon dioxide	Rate depends on oil type, temperature, nutrients, oxygen and amount of oil	Weeks to months
Formation of tar balls	Breakup of heavy crudes and refined oils into small patches with long persistence	Hard to detect	Days to weeks

Shows schematic diagram of weathering processes with time



The physical and chemical changes, which spilled oil undergo are sometimes collectively known as weathering. However, the main processes are as follows:

2.9.1 Spreading: -Open out (something) so as to extend its surface area, width, or length. Oil spreads out and is pushed across the water by wind and currents.

2.9.2 Evaporation: -The process of turning from liquid into vapour. Oil evaporates very slowly. Oil doesn't mix with water, and most oils are less dense than water.

2.9.3 Photo-oxidation

This process occurring due changes to chemical and physical properties of spilled oil and sets in because of exposure to sunlight and is limited to the surface of oil, resulting in a thin, crusty" skin" on slicks and tar balls. The "skinning" of oil, limits evaporation because the lighter oil components can no longer diffuse through the surface of the slick. Photo-oxidation may increase the ease of emulsification and is considered a long-term weathering process taking weeks to months.

2.9.4 Dispersion: -The action or process of distributing things (oil) over a wide area.

2.9.5 Emulsification: -An emulsion is a mixture of two or more liquids that are normally immiscible

2.9.6 Dissolution: -Water soluble compounds in an oil may dissolve into the surrounding water. ... Most crude oils and all fuel oils contain relatively small proportions of these compounds making dissolution one of the less significant processes.

2.9.7 Oxidation: -Oxidation occurs when oil contacts the water and oxygen combine with the oil to produce water-soluble compounds. This process affects oil slicks mostly around their edges.

2.9.8 Sedimentation: -The process of settling or being deposited as a sediment.

2.9.9 Biodegradation: -Biodegradation is the process by which organic substances are decomposed by micro-organisms into simpler substances such as carbon dioxide, water and ammonia. The processes of spreading, evaporation, dispersion, emulsification and dissolution are most important during the early stages of a spill whilst oxidation, sedimentation and Biodegradation are long-term processes, which determine the ultimate fate of oil.

Emulsification

Mousse begins to form when 19% of the oil has evaporated

Wind and wave conditions

Wind speed – 10 knots from 245 degrees

Wave height – computed from wind speed, unlimited fetch (default)

Water properties

Temperature – 30 degree C Salinity 32ppt
Sediment load – 500g/ m3 (muddy river)
Current – 3.0 knots towards 80 degree

ANNEXURE-11
(Refer Para-2.1.3, Page-23)

CALCULATION OF SPILL QUANTITY AS PER SLICK CHARACTERISTICS

The quantity of oil spilled can be calculated in terms of total rapture and also for pin hole leaks using software taking into account the diameter of hole and flow rate. The formula for total rapture calculation is:

Volume of Spill = 2 Pie X Radius of Pipeline X Length of Pipeline X Flow Volume

SPILL AREA AND OIL VOLUME

Average Slick Length	2.5	Km	TOTAL SPILL AREA	1,500,000 m^2
Average Slick Width	0.6	Km		1.50 Km^2

OIL TYPE	APPEARANCE	THICKNESS (mm)	LOADING m^3 / Km^2	COVER %	AREA Km^2	VOLUME m^3
Sheen	Silvery	0.0001	0.1	40%	0.60	0.060
Sheen	Rainbow	0.0003	0.3	30%	0.45	0.135
Slick	Yellow/Brown	0.01	10	20%	0.30	3.000
Crude/Fuel Oil	Black/Brown	0.1	100	10%	0.15	15.000
Mousse	Brown Orange	1.0	1000	0%	0.00	0.000
				100%	1.50	

TOTAL OIL VOLUME	18,195	L
	18.20	m^3

ANNEXURE-12
(Refer Para 1.1.5, Page-70)

POINT SYMBOLS FOR BIOLOGICAL RESOURCES

ESI HUMAN USE RESOURCE SYMBOLS

Annexure-13
(Refer Para-3.5.1, Page-33)

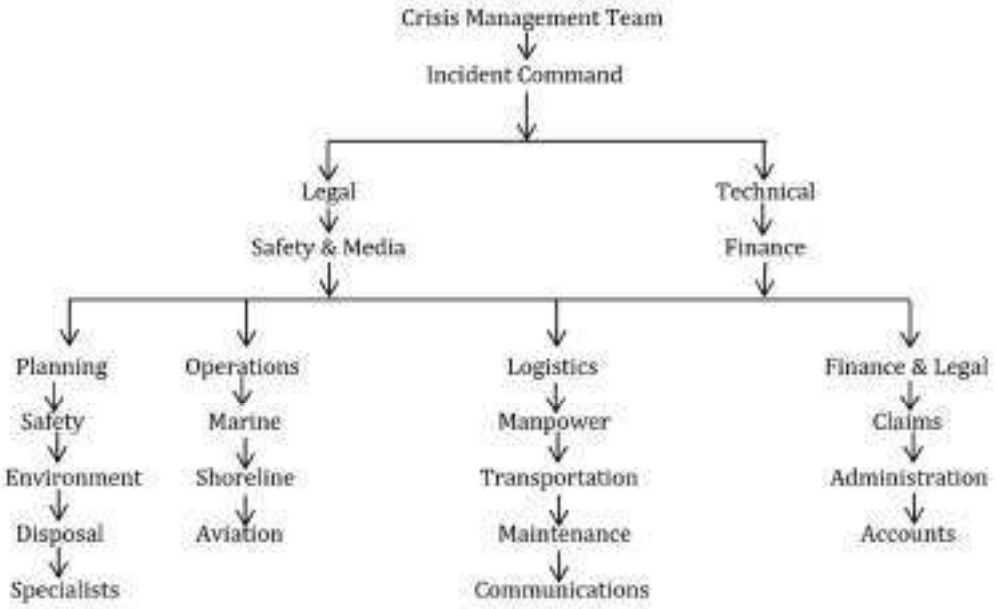
PORT- VESSEL POLLUTION EMERGENCY INTERPHASE

ACTION	RESPONSIBILITY
IMMEDIATE ACTION	
Sounding Emergency Alarm	Person noticing spill
Initiating Vessel Pollution Response Plan	Duty officer
INITIAL RESPONSE	
Suspend cargo ops	Ch. Eng./ Duty officer
Information to Terminal/Port Control / Master	Master / Duty officer/Ch. Engg.
Call crew to Pollution Response Positions	Master/ Duty officer
SECONDARY RESPONSE	
Location of source of spill Assess & consider -	Chief officer
Fire risk & manning of fire positions	Master
Stopping of air intake	Chief Engineer
Transfer of bunker to empty or slack tank, shore /barge	Master/ Ch. Engineer
Prepare detailed report of spill and actions	Master/ Ch. Officer
Inform agent, owners and PI club	Master/ Ch. officer
FURTHER RESPONSE	
Call in external assistance to locate spill (if below waterline)	Master – Port
Consider stability of vessel	Master/ Ch. officer
Follow directions of response authority	Master

Annexure-14

(Refer Para-5.2, Page-38)

ORGANISATIONAL CHART



Annexure-15
(Refer Para-2.5.3 &8.6, page26&57)

NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

Detailed Report of NEBA carried out by National Institute of Oceanography is enclosed

Sensitive areas in an around DPA KANDLA AND OOT VADINAR

PORTS OF NAYARA Energy, IOCL, NAYARA and Reliance

TRANSHIPMENT FACILITIES AT Jetty A & B at OOT Vadinar

SPM

The sensitive areas likely to be threatened in case of oil spill are as follows.

Marine National Park
Mangrove area
Salt pans
Forest area
NAYARA refinery intake
Mangroves Area

MOVEMENT OF OIL:

Spreading and advection are the two major processes that transport oil on water. For small spills (<100 barrels), the spreading process is complete within the first hour of the release, whereas for bigger spills the spreading process could continue for larger durations of time.

Winds, currents, and large-scale turbulence (mixing) are advection mechanisms that transport oil to large distances. For calculation purposes, the oil movement is estimated as the vector sum of the wind drift (using 3% of the wind speed) and 100% of the surface current.

Spreading:

The spreading process occurs quickly and for most spills, mostly within the first hour. In open waters, winds, currents, and turbulence act on and move the oil.

Spreading occurs faster for lighter and for less viscous oils in warm water temperatures and for warm oils. The slick does not spread uniformly but will often have a thick part surrounded by a larger, but thinner sheen. About 90% of the oil is found in 10% of the slick area. A spill is likely to keep spreading until a thickness of about 0.1 mm is reached. At this stage breaking up of slick into windrows is an important source of further spreading.

Vulnerable Areas in case of a spillage

Spill Volume (tones)	SW monsoon	NE monsoon	Post monsoon
700 crudes	-	Marine National Park, NAYARA & IOCL Transshipment Facility at OOT Vadinar Jetty A &B, Mangroves area, Salt Pans, NAYARA Intake.	-
25000 crudes	-	Marine National Park, NAYARA & IOCL Transshipment Facility at OOT Vadinar Jetty A &B, Mangroves area, Salt Pans, NAYARA Intake.	-
700 furnaces	-	NAYARA & IOCL Transshipment Facility at OOT Vadinar Jetty A & B, NAYARA Intake.	-
10000 furnaces	-	NAYARA & IOCL Transshipment Facility at OOT Vadinar Jetty A & B, NAYARA Intake.	-
2200 m^3/h for 15 min	-	NAYARA & IOCL Transshipment Facility at OOT Vadinar Jetty A & B, NAYARA Intake.	-

PAST COMPARATIVE STUDY

SW Monsoon Season (Jun-October)

In the initial period of this season, the surface currents and winds are transition from Northeast to East based on the wind direction. The magnitude of the residual currents is greater than 1 knot. The slick moves transition from Northeast to East direction based on the wind forcing. The effect of wind forcing is significantly higher than surface current drift. The spills at Jetty A& Jetty B would head towards the sea. The behavior of slick movement is more or less similar in various scenarios irrespective of quantities.

NE monsoon (November-February)

In the initial period of this season, the surface currents and winds are towards South west. The magnitude of the residual currents is greater than 1 knot. The slick moves towards South west direction based on the wind and currents forcing. The effect of wind forcing is significantly higher than surface current drift. The spills at landing jetty, Jetty A & B would reach the coast within 10 minutes. The behavior of slick movement is more or less similar in various scenarios irrespective of quantities of oil spilled. The extent of landing of oil differs depending on the source quantities. Nearly 20% of oil volume has been lost due to evaporation and dissolution and remaining will reach the coast.

Post Monsoon Season (November-December)

In the initial period of this season, the surface currents and winds are towards Northeast direction. The magnitude of the residual currents greater than 1 knot. The slick moves towards Northeast direction based on the wind forcing. The effect of wind forcing is significantly higher than surface current drift. The spills at JettyA& Jetty B would reach to shore within 10 minutes. The behavior of slick movement is more or less similar in various scenarios irrespective of quantities of oil spilled.

SHORE LANDING AND SPILL IMPACT AREAS

The quantity of the spill reaching to the coast and affected areas for various seasons for various hydrological and meteorological conditions and predicted BY use of Hyrodyn-OILSOFT software is as follows.

SW monsoon

During this period, no Oil slicks will affect the coast at least for 6-12 hours. No likely areas will be impacted during these seasons for spills of various quantities.

NE monsoon

During this period Oil slicks of approximately 70% spilled at sea reach the coast within an hours after the spill. The likely areas impacted during these seasons for spills of less than 700 Ton are DPA KANDLA AND OOT VADINAR Landing JETTY, NAYARA Intake & adjoin area of jetty. For spills of higher magnitude, the impact zone may extend at NAYARA Intake, Salt Pans& mangrove areas along the coast.

Post monsoon

During this period spilled oil at Jetty A and Jetty B would not reach the coast.

In summary the likely areas affected by the oil spills from oil berths operations at jetties during various seasons are given below:

Spill Analysis: Percentage of oil spill volume reaching the coast

Spill Volume	SW Monsoon	NE Monsoon	Post Monsoon
700 t crude	-	-	70-80
25000 t crude	-	-	75-85
700 t furnace	-	-	85-90
10000 t furnace	-	-	85-90
2200m^3/h for 15 min	-	-	90-95

Extent of oil on the coast (meters)

Spill Volume	SW Monsoon	NE Monsoon	Post Monsoon
700 t crude		-	500
25000 t crude		-	1000
700 t furnace	200	-	1200
10000 t furnace	300	-	1500
2200 m^3/h for 15 min	350	-	2000

SHORE LENGTH AND AREA OF VADINAR

Vadinar Port is covering the **Total area of (12923.9 Sq.Km)** have been notified by the state Govt. to Conserve Biodiversity of the Wetlands.

KPT marine facilities are located at Vadinar near Narara Bet (Lat 22 °26.9', Long69°40.18' E) & in the Pathfinder Inlet, a Natural Creek of the Gulf of Kachchh (Hereinafter referred to as Gulf). The KPT service jetty used for securing the floating crafts, Operational for more than three decades, is located south of the VOTL Terminal. The Pathfinder Inlety is well sheltered from monsoon wags and thereby permits uninterrupted navigation for ships approaching the berths except during cyclones which rarely strike the Gujrat coast.

The Southern Shore of the Gulf in Jamnagar district with abundance of coral reefs and mangroves is demarcated as Marine National Park Sanctuaries. The Inter tidal Zones of Dwarka, Kalyanpur, Khambhalia, Lalpur, Jamnagar and Jodia Talukas along with 42 Islands in the district have been included in the marine protected area. An area of457.92 KM ^{2} stretching from Okha to jodiya comes under Marine National Park and Sanctuary. This area includes 148.92 Km^{2}of small nd big islands and 309 Km^{2}intertidal zone the coast. Area of the MNP is 162.89 Km^2 Whereas the remaining protected areas have the status of Marine Sanctuary.

The MNP&S includes three categories of areas (noticed on 1-1-1983 and 9-11-1983), i.e. (i) 11.82 sq.km Reserve Forests, (ii) 347.90 sq.km unclassified forests notified under sec.4 of IFA 1927, and (iii) 98.20 sq.km territorial waters of india.162.89 sq.km area of MNP is distributed amongst 37 islands and coasts whereas the remaining 295.03. Km area of the sanctuary covers 5 islands and intertidal zone from Navlakhi to Okha. Areas Mentioned under National Park, sanctuary, Reserve Forests and Unclassified Forests are scattered and mostly having no proper specific boundary .398.40 sq.km overlapping area is notified under Port Act before 1980 for maritime activities.

A National Park and four sanctuaries viz. MNP, Jamnagar (162. 9Sq.Km Marine sanctuary (295 sq.km), Khijadia Bird sanctuary (6.1 Sq.km), Wild Ass sanctuary in the Little Rann (4953.7 Sq.km), and Kachchh desert wild life sanctuary (7506.2 Sq.km),

Annexure-16
(Refer Para-9.5 , Page-60)

INCIDENT LOG

INCIDENENT INFORMATION

Incident Title (Name of Vessel) ----------
Incident Number (Sq number/ dd /mm/ yyyy) ----------

1. **DETAILS:**

Time of recording ---------- (24 hr. format) Day ---------- Date ----------

Person / Organization reporting incident

Name ---------- Designation ---------- Contact number ----------

2. **INCIDENT:**

Name of VESSEL ---------- Location ----------

Position (if not alongside) Latitude ---------- Longitude----------
Sounding ----------

Incident details

Time ---------- (Of incident, 24 hrs format) Date ----------
Cause of spill ----------
Type of oil ----------
Estimated quantity of spill ----------
Details of damage to vessel / installation ----------

3. COMMENTS:

1. Recorded by:
Name ----------
Time ----------

Note: FOUR COPIES OF INFORMATION ARE TO BE RECORDED. RETAINING ONE FOR OFFICE RECORD, THREE COPIES ARE TO BE CIRCULATED ONE EACH TO -

- **CHIEF INCIDENT CONTROLER**
- **OSC / RESPONDER/ INCIDENT CONTROLER**
- **VESSEL MASTER**

ANNEXURE-17
(Refer Para-9.5, Page-60)

PERSONAL LOG (ALL MEMBSERS OF SPILL RESPONSE ORGANISATION)

Incident Title ----------Number---------- (as per)
_____ Date ----------

Name ----------Designation (as per C P) ----------

Time of Rx / Forwarding Info	Activity requested by/ demanded of other Member/s
Observations on day's operations: -	

Note – Copy of Personal Log is to be handed over to COC daily or as earliest as possible on completion of a schedule.

ANNEXURE-18
(Refer Para -5, Page-77)

CONTACT DETAILS OF LOCAL ADMINISTRATION – OOT Vadinar

Sr. No.	DESCRIPTION	STD CODE	TELEPHONE NO.	
			OFFICE	Mobile
1	Head DPA OOT VADINAR (COM)	0288	2573001	9819999227
2	Head HSEF, Refinery	02833	662405	9909908685
3	Coast Guard Station, Vadinar	0288	256560	
4	CG PRT (NW), Vadinar	02833	256601	
5	DPA Control Tower, Vadinar	0288	2573009	9825212359
6	Municipal Fire Station, Jamnagar	0288	2672208	9909011502
7	Marine Police, Station, Vadinar.	0288	256541	
8	District Collector, Devbhumi Dwarka, Khambhalia	02833	232805 232102	
9	GPCB, Gandhinagar	079	23237311	
10	Deendayal Port AUTHORITY	0288	2573005	
11	Gujarat Maritime Board (GMB)	0288	2712516	
12	Ministry Of Environment, Gujarat	079	23251062	
13	Principle Chief Conservator Of Forest, Gandhinagar	079	23253903 23254123	
14	Oil Industry Safety Directorate (OISD), New Delhi	011	2593800	

CONTACT DETAILS OF LOCAL ADMINISTRATION – DPA Kandla

Sr. No.	DESCRIPTION	STD CODE	TELEPHONE NO.	
			OFFICE	Mobile
1	Head DPA KANDLA (DC)	02836	233585	9603123449
2	Head HSEF, Refinery	02833	662405	9909908685
3	Coast Guard Station, MUNDRA	02838	271403	
4	CG PRT (NW), KANDLA	02833	256601	
5	DPA Control Tower, KANDLA	02836	270194	9825227246
6	Fire Station, Kandla	02836	270176	9825227041
7	Marine Police, Station, KANDLA.	02836	270527	
8	District Collector, Kutch	02832	2832 250650	
9	GPCB, Gandhinagar	079	23237311	
10	Deendayal Port Authority	02836	233585	
11	Gujarat Maritime Board (GMB)	0288	2712516	
12	Ministry Of Environment, Gujarat	079	23251062	
13	Principle Chief Conservator Of Forest, Gandhinagar	079	23253903 23254123	
14	Oil Industry Safety Directorate (OISD),New Delhi	011	2593800	

ANNEXURE-19
(Refer Para-3, Page -74)

Pollution response equipment specification and details

POWER PACK 42 KW

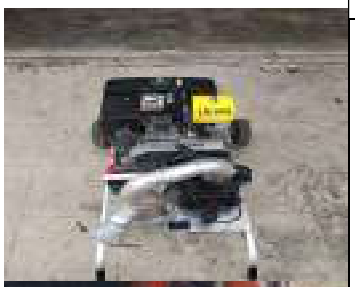
COMPANY- DESMI
MAKE-HATZ, TYPE-3M 41L
DIMENTIONS-L-73", W-40", H-50"
WEIGHT-APPROX 750 KG (EMPTY TANK),
-APPROX 900KG (WITH FULL TANK)
POWER INPUT-AIR COOLED,4 STROKE, DIESEL ENGINE,
ENGINE POWER-42 KW,2800 RPM
AIR FILTER-DRY TYPE,
STARTING –ELECTRIC START
BATTERY-12 V 140 AH
ALTERNATER-14 V,42A (1500 RPM)
AUTOMATIC STOP-IN CASE OF BROKEN V BELT,
IN CASE OF TOO LOW LUBE
OIL PRESSURE MAX, CONT. PRESSURE-210 BAR (3000 PSI)
FLOW RANGE-0-160 L/MIN

TERMINATOR / WEIR SKIMMER

MADE-DESMI(DENMARK)
DIMENSIONS-L-82.7", W-91.7", H-36.6"
DRAFT-27.6"
WEIGHT DRY-WITH DOP 200DUAL PUMP-160 KG
(EXCL. THURSTERS)-183 KG (INCL. THURSTERS)
MAX. PRESSURE-WITH DOP200DUAL MOTOR13 BAR
(188 PSI)
THRUSTERS-OPTIONALS
FLOATS, HOPPER, AND FLOATING COLLAR-OIL
RESISTANT POLYETHYLENE PLASTIC
BELLOWS-OIL RESISTANT NEOPRENE RUBBER,
FLOAT POIPES –STAINLESS STEEL
OTHER PARTS-SS AND SEAWATER RESISTANT
ALUMINIUM
COATING (PUMP)-PRIMER /COMPANY PAINT
MAX RECOVERY RATE - WITH DOP 200 DUAL **PUMP 66 M3/H AT 1 BAR**.

POWER PACK 15 KW

POWERPACK FOR – BOOM WITH REEL WINDER
ENGINE TYPE-15 KW,3000 RPM
PRESSURE -210 BAR
GROSS WEIGHT – APPROX 250-500 KG
FUEL TANK – 5 LTR.



POWER PACK 05 KW WITH RO VACMINI TANK

MACHINE NAME-HATZ 1B30 DIESEL ENGINE
ENGINE TYPE-AIR COOLED FOUR STROKE DIESEL ENGINE
START-ELECTRIC AS WELL AS RECOIL START
PUMP DIMENSION-APPROX (L -1050 MM X W-700 MM X H-740 MM)
NO. OF CYLINDERS-SINGLE
VOLUME-APPROX 0.51 M3
WEIGHT-APPROX 123 KG
VACCUM CAPACITY-0.89 BAR @1500 RPM
BATTERY CAP-MIN-12 V-36/60 AH
FUEL TANK CAP-05 LTRS
TANK STORAGE CAPACITY-
RO VACMINI TANK DIMENSION-

	HOPPER	VACUUM HEAD	ASSEMBLED
APPROX (LxWxH mm)	590X780	950X720X550	950X720X109
VOLUME APPROX(M3)	0.21	0.34	0.67
WEIGHT APPROX (KG)	21	22	43

PD75 SPATE PUMP

ENGINE TYPE-YANMAR
CAPACITY-31.8M3/H (7000 GAL/H)
MAX RPM - 1500
MAX. PRESSURE-3 BAR
WEIGHT - 92 KG
TOTAL HEAD-40 M (130FT)
DELIVERY HEAD-30.5M (100 FT)
SELF PRIMING LIFT-8.8M H2O, (29 FT H2O)
SUCTION LIFT-9.1 M (30 FT)
SOLIDS SIZE-6MM (0.25 INCH)

POWER PACK 3.1 KW WITH OSD SYSTEM

ENGINE DESIGN-AIR COOLED, FOUR-STROKE, DIESEL ENGINE
START-ELECTRIC START AS WELL AS RECOIL START
NO. OF CYLINDERS-SINGLE
ENGINE POWER-3.1 KW,3600 RPM
BATTERY CAP-MAX 12 V/60AMP/H
PUMP DIMENSION-APPROX (1120mm X 700mm X 680 mm)
PUMP TYPE-PISTON DIAPHRAGM
WEIGHT APPROX-116 KG
OSD APPLICATION RATIO-**APPROX 1:20 LTR**
ENGINE TYPE-3 KW, HATZ MODEL 1B20 WITH ELECTRIC START
SPRAY ARMS MAT: - ALUMINIUM PIPES IN 2 OR 3 PARTS
NO. OF DISCHARGE HOSES-02 X 1 ½" WITH PVC CAMLOCKS
SEAWATER SUCTION-01 X 1 ½" WITH PVC CAMLOCKS
DISPERSANT SUCTION-01X 1.25" WITH PVC CAMLOCKS

POWER PACK 7.5 KW & DBD SKIMMER

SKIMMER TYPE-DISC/BRUSH
DIMENTION-L-0.93 MTR, W-1.32 MTR, H-0.66 MTR
DRY WEIGHT-95 KG
DRAFT-0.14 MTR
DRIVE UNIT-2XOMM 50 (50CC)
SPEED-0-60 RPM
DISC SIZE-02 SETS OF 15 PCS (295MMX3MM)
BRUSH SIZE-02 SETS OF 300MM
HYDRAULIC FLOW-0-3 L/M
HYRAULIC PRESSURE-140 BAR (MAX)
OUTLET-RECOVERED OIL-3" CAMLOCK

RO BOOM WITH REEL

BOOM TYPE-**2000 SPEED SWEEP**
BOOM WIDTH-2 MTR
CHAMBER SECTION PITCH-4.90 MTR
BUOYANCY CHAMBER LENGTH-4.50 MTR
FREEBOARD-0.59 MTR
DRAUGHT-1.10 MTR
BALLAST CHAIN-13MM
SECTION CONNECTOR MADE-ASTM
VOLUME OF BUOYANCY CHAMBER-923 LTRS
WEIGHT /MTR ENCL.CHAIN-15 KG
EFFICIENT IN WAVES UPTO-4 MTR
STABLE IN CURRENT UPTO-3 KNOT
ACCESSERIES-TOW BAR, SHACKLE, BRIDLE, TOW ROPE, BUOY, VALVE COVER.
BOOM MOUNTED-ON THE SHAFT A REEL WITH END FLANGED.
BOOM REEL ROTATION BY-GEARBOX WITH HYDRAULIC MOTOR.

	**CURRENT BUSTER BOOM WITH REEL** BOOM TYPE-**1500 SPEED SWEEP** NETS/SCREENS-SCREENS ARE MADE FROM PU-COATED KEVLAR TAAPES SCREENS BUOYANCY BY-FOAM FILLED PU GLOBES BOOM WIDTH-1.50 MTR CHAMBER SECTION PITCH-3.30 MTR BUOYANCY CHAMBER LENGTH-03 MTR FREEBOARD-0.52 MTR DRAUGHT-0.72 MTR BALLAST CHAIN-13MM SECTION CONNECTOR MADE-ASTM VOLUME OF BUOYANCY CHAMBER-657 LTRS WEIGHT /MTR ENCL.CHAIN-12 KG EFFICIENT IN WAVES UPTO-3.5 MTR STABLE IN CURRENT UPTO-3 KNOT **ACCESSORIES**-TOW BAR, SHACKLE, BRIDLE, TOW ROPE, BUOY, VALVE COVER. BOOM MOUNTED-ON THE SHAFT A REEL WITH END FLANGED. BOOM REEL ROTATION BY-GEARBOX WITH HYDRAULIC MOTOR.
	**RO TANK 10 TON** **MATERIALS**-MADE OF SYNTHETIC, OIL AND WEATHER RESITANT RUBBER AND HAVE FOUR INNER PLIES OF POLYESTER/POLYAMIDE REINFORCEMENT FABRIC EMBEDDED IN NEOPRENE RUBBER. COLOUR-BLACK CAPACITY-10 TON FIELD SIZE-9.4X2.1X0.8MTRS HOSE CONNECTION-2X3 INCH(BSP) TANK WEIGHT-230 KG PILLOW-65 KG NUMBER OF FLOATS-2 FLOATS (ONE EACH SIDE)

TROIL TANK

MATERIALS-1000 GRAM PU/PVC ALLOY.
RODS-GLASS FIBRE.
PIPES AND CONNECTORS-PLASTIC
STORAGEPACKED-1300X450X250
CAPACITY-2 TON
HEIGHT ERECTED-900 MM

OIL SPILL DISPERSENT

TYPE-II/III
MANUFACTURE- FOAMTECH ANTIFIRE COMPANY
MFG.DT. – 08/2023
EXP.DT. – 08/2033
QTY. – 3000 liters.

ABSORBENTS PADS

NAME – ABSORBENT PADS
SIZE-40X50 MM
QTY-2000 NOS.

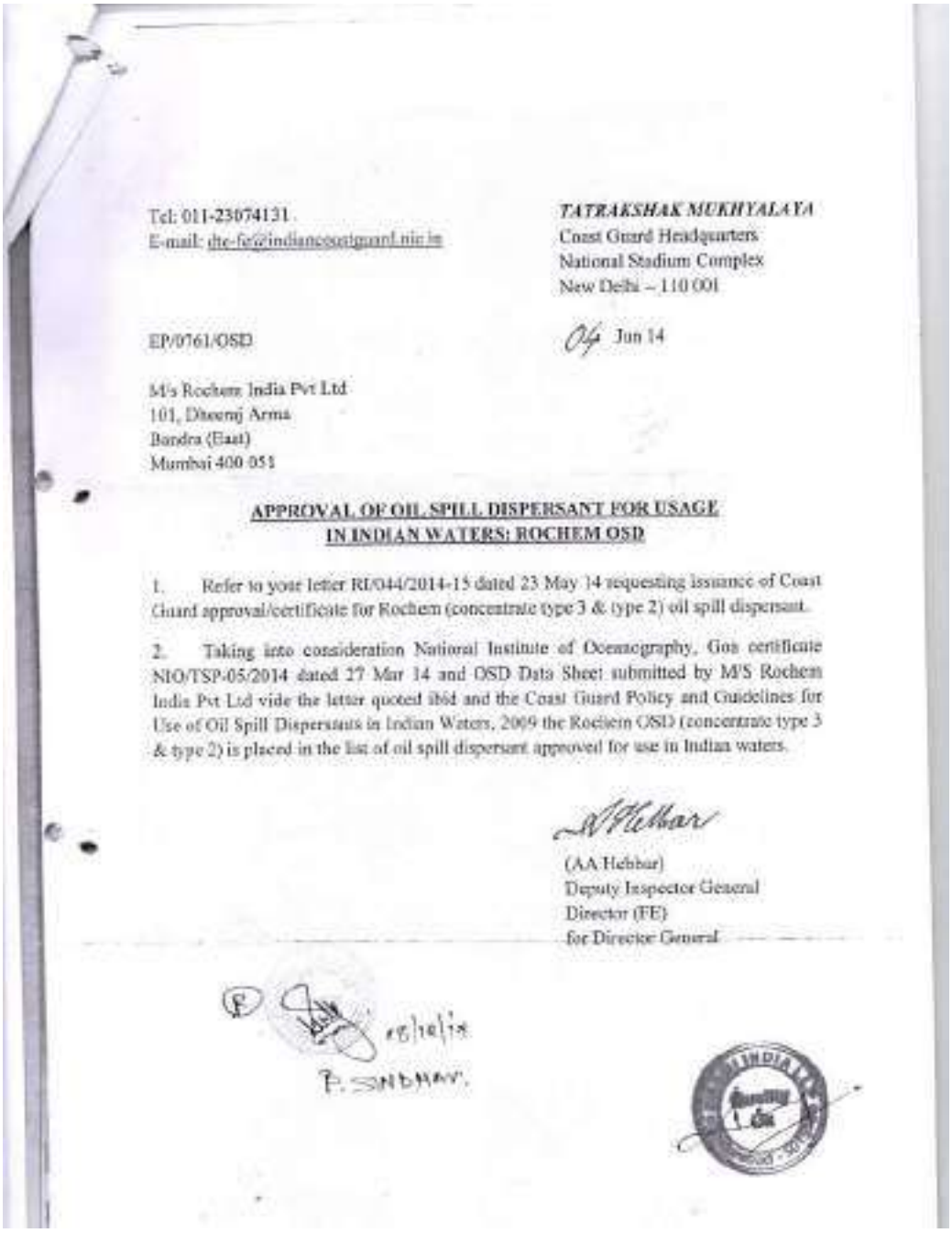
ABSORBENTS BOOM

NAME – ABSORBENT BOOM
SIZE-20 MM X 3CM
QTY-500MTR.

BACKPACK SPRAY

NAME – BACKPACK SPRAYER
CAPACITY- 16 LTRS.
QTY-5 NOS.

ANNEXURE – 20
(Refer page – 32)



Tel: 011-23074131
E-mail: dte-fe@indiancoastguard.nic.in

TATRAKSHAK MUKHYALAYA
Coast Guard Headquarters
National Stadium Complex
New Delhi – 110 001

EP/0761/OSD

04 Jun 14

M/s Rochem India Pvt Ltd
101, Dheeraj Arma
Bandra (East)
Mumbai 400 051

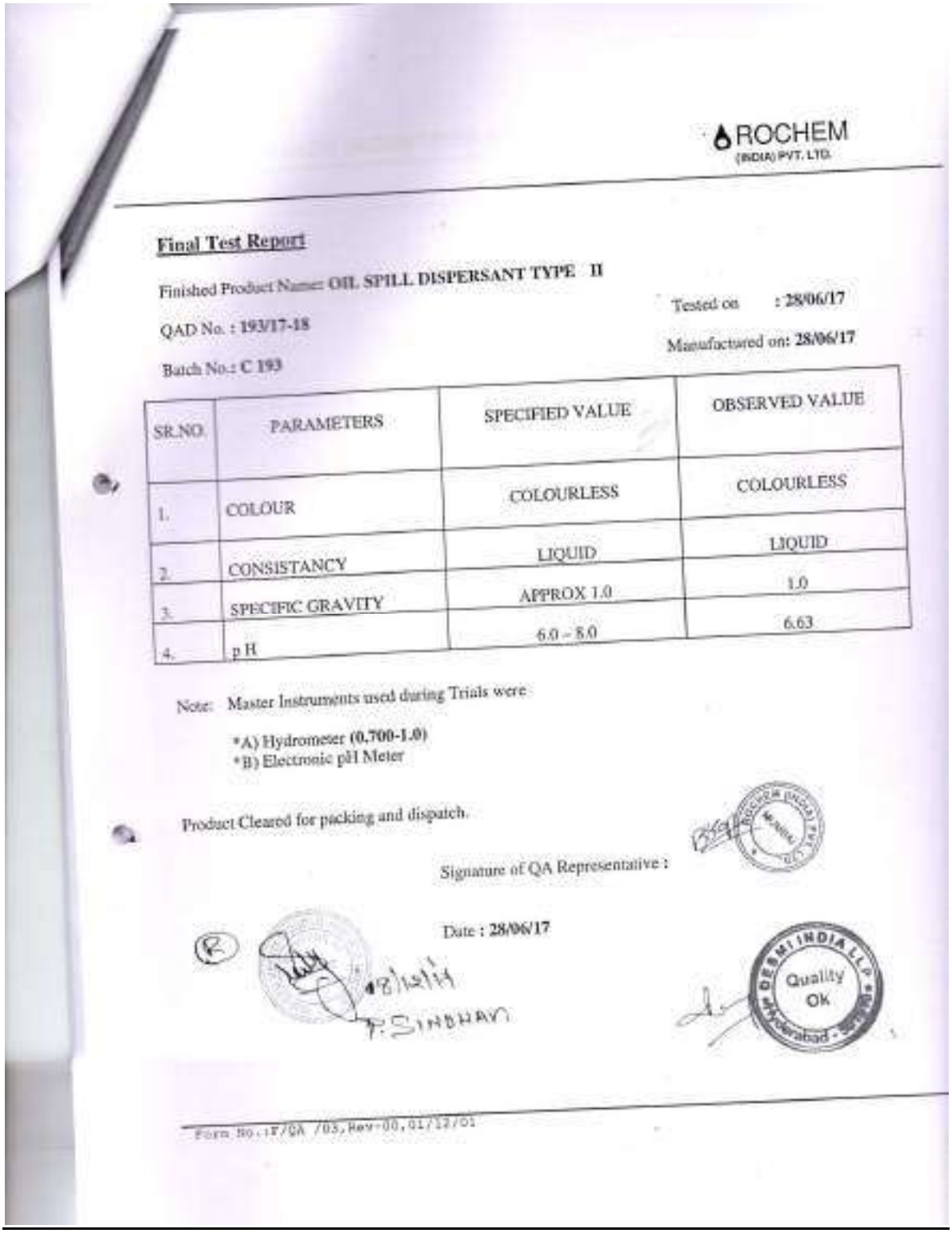
APPROVAL OF OIL SPILL DISPERSANT FOR USAGE IN INDIAN WATERS: ROCHEM OSD

1. Refer to your letter RI/044/2014-15 dated 23 May 14 requesting issuance of Coast Guard approval/certificate for Rochem (concentrate type 3 & type 2) oil spill dispersant.

2. Taking into consideration National Institute of Oceanography, Goa certificate NIO/TSP-05/2014 dated 27 Mar 14 and OSD Data Sheet submitted by M/S Rochem India Pvt Ltd vide the letter quoted ibid and the Coast Guard Policy and Guidelines for Use of Oil Spill Dispersants in Indian Waters, 2009 the Rochem OSD (concentrate type 3 & type 2) is placed in the list of oil spill dispersant approved for use in Indian waters.

(AA Hebbar)
Deputy Inspector General
Director (FE)
for Director General

P. SINHA.



ROCHEM
(INDIA) PVT. LTD.

Final Test Report

Finished Product Name: **OIL SPILL DISPERSANT TYPE II**

QAD No. : **193/17-18**

Tested on : **28/06/17**

Batch No.: **C 193**

Manufactured on: **28/06/17**

SR.NO.	PARAMETERS	SPECIFIED VALUE	OBSERVED VALUE
1.	COLOUR	COLOURLESS	COLOURLESS
2.	CONSISTANCY	LIQUID	LIQUID
3.	SPECIFIC GRAVITY	APPROX 1.0	1.0
4.	p H	6.0 – 8.0	6.63

Note: Master Instruments used during Trials were

*A) Hydrometer **(0,700-1.0)**
*B) Electronic pH Meter

Product Cleared for packing and dispatch.

Signature of QA Representative :

Date : **28/06/17**

18/12/17
P. SINHAN

DESMI INDIA LLP
Quality
Ok
Hyderabad

Form No.:F/QA /03,Rev-00,01/12/01

ANNEXURE – 21
(Refer Page- 77)

DETAILS OF VESSELS USED FOR OIL SPILL RESPONSE

TUG- Lotus Star

Sl	Particulars	Technical Specification
01	Gross Tonnage	493 T
02	Net Tonnage	147 T
03	Bollard Pull (Steady/Sustained & Maximum)	More than 60 T
04	Year of Built	2016
05	LO.A	30.28 Meters
06	Breadth	2.41 M
07	Depth	5.30 M
08	Draft	4 Meters
09	Main Propulsion Engine	NIIGATA 6L28HX2X1654 Kw
10	Propulsion & Steering	ZP31 B(ZELLER)
11	Flag/Nationality	Indian
12	Auxiliaries	Cummins QSB7,2X164Kw
13	Speed	12 Knots
14	Fuel Capacity	225 M3
15	Fresh water capacity	91 M3
16	Towing Arrangement	1) Towing Winch- Maker-Jebsen & Jebsen, Brake Capacity-150 Tons, Double Drum Type, Pull rate at 10 T x 0-10 Mtrs/Min 2) Towing Hook- Maker-Jebsen & Jebsen, Brake Capacity-60 Tons
17	Communication	MF/HF Trans receiver with DSC & Telex VHF, Hand Held VHF Radio
18	NAvgigation Equipment	Marine Radar, AIS, Echo Sounder, Search Light, GPS, Navigates)
19	Details of External Fire Fighting Equipment with discharge capacity and throw distance of monitors	2400 Cu Mtr/Hart 125 Mtr Head
20	Manning(As per requirement of statutory Authority)	As safe manning regulation issued by MMD, India
21	Fuel Consumption Main Engine (At 100% MCR)	380.67 Lit/Hour/engine
	Main Engine (At 90% MCR)	342.20 Lit/Hour/engine
	Main Engine (At 75% MCR)	287.60 Lit/Hour/engine
	Main Engine (At 40% MCR)	159.53 Lit/Hour/engine
	DG Set (At 100% MCR)	46 Lit/hour

TUG- OCEAN EMPIRE

Sr No.	Particulars	Technical Specification
01	Flag	Indian
02	Port of Registry	Kochi
03	IMO No.	9658862
04	Official No.	41000638
05	MMSI NO	4056
06	CALL SING	AVGWU
07	GT	468
08	NT	140
09	LOA	31.50 M
10	LBP	28.8 M
11	BREADTH MLD	11.0 M
12	DEPTH MLD	6.1 M
13	DWT	287
14	CLASS	ABS/IRS
15	PROPULSION POWER	2 X 1654 KW@724 RPM (DERATED) (NIIGATA 6L28HX)
16	AZIMUTH THRUSTER	NIIGATA ZP-4 SRP
17	SPEED	12.0 KTS
18	BOLLARD PULL	60.25 @100 MCR
19	YEAR BUILT	AUG 2012

DUMB BARGE-ANURADHA

Sr No	Particulars	Technical Specification
01	Flag	Indian
02	Length overall	23.1 m
03	Port of Registry	Kandla
04	Breadth (MLD)	6.0 m
05	Depth (MLD)	2.9 m
06	Draft	1.5 m
07	Frame Spacing	500 mm
08	Generator	02 Nos,25 KVA,415 VAC,3 PH
09	OIL SPILLAGE RESPONSE SYSTEMS	RO-BOOM WITH REEL – 02 NOS.
		CURRENT BUSTER BOOM WITH REEL – 01 NOS.
		DBD SKIMMER-01 SET
		WEIR SKIMMER -01 SET
		POWERPACK 42 KW-01 NOS.
		POWERPACK 7.5 KW-01 NOS.
		POWERPACK 15 KW-02 NOS
		OSD SPRAY PUMP & ACCESSORIES-01 SET

TUG- VIHAAN

Sr No	Particulars	Technical Specification
1	FLAG	INDIA
2	IMO NO.	9691383
3	MMSIO NO.	419001130
4	LOA	31.5 M
5	LBP	26.8 M
6	GT/NT	470/141
7	DEAD WEIGHT	284.606 Mt.
8	LIGHT SHIP	621.4 Mt.
9	DRAFT	SUMMER:5.313 M, FREEBOARD: 1.107 M
		TROPICAL:5.409 M, FREEBOARD: 1.011 M
10	DECK LINE	400 MM BELOW MAIN STEEL DECK
11	HEIGHT KEEL TO TOP OF MAST	24.81 M
12	MAIN ENGINES	NIIGETA 6L26HLX-2X1838KW AT 750 RPM FP (2520MM)PROPELLER 2700MM DIA 4 BLADES-CAST NI-AL-BRONCE
13	BOLLARD PULL	70.72 MT
14	TOWING WIRE AFT	52MMX1000M
15	TOWING WIRE FOR D	52MMX220M
16	TUGGER WINCH	200MX22MM WIRE –SWL 10 MT
17	DECK CRANE	PALFINGER 1200-SWL 600KG AT 12.2M
18	RESCUE BOAT	4500MMX2000MMX850MMX1325KG-6 PERSON
19	D.O CAPACITY	235.3CuM (100%)
20	FW CAPACITY	53.1CuM (100%)
21	BALLAST CAPACITY	61 CuM (100%)
22	ANCHOR	500KG
23	ANCHOR CABLE	5 SHACKLES (PORT),6 SHACKELS(STBD)

ANNEXURE – 22

(Refer Page34, Para3.7)

LIST OF APPROVED RECYCLERS

SL.NO	NAME	ADDRESS
01	M/s ALICID ORGANIC INDUSTRIES LIMITED	OFFICE NO. 35, FIRST FLOOR, GRAIN MERCHANT ASSOCIATION BUILDING, PLOT NO. 297, WARD 12/B, GANDHIDHAM-370201
02	M/s UNITED SHIPPING COMPANY	OIL & GRAIN MERCHANT ASSOCIATION BUILDING, OFFICE: NO.46, FIRST FLOOR, WARD 12-B GHANDHIDHAM, KUTCH 370201
03	M/s ALTAS ORGANICS PVT.LTD.	204/206 ELLISBRIDGE SHOPPING CENTER, OPP.TOWN HALL ASHRAM ROAD, AHMADABAD-380006
04	M/s SHANA OIL PROCESS	NEW GOOD LUCK MARKET, Nr AKSHA MASJID, CHANDOLA LAKE, NAROL ROAD, AHMADABAD-3800028
05	M/s PRIYANSI CORPORATION	H/O. MARURI PETROLEUM, SHOP NO.2, NH-8B, SHAPAR(VERAVGAL)
06	M/s. FINE REFINERS PVT. LTD.	PLOT NO.40, GIDC, CHITRA, VARTEJ, BHAVGNAGAR, BHAVGANAGAR-364060
07	M/s. KUTCH PETROCHEM PVT.LTD.	OFFICE: PLOT NO: 121, SECTOR 9/C, BEHIND ASHOK LEYLAND, POST BOX NO.166, GANDHIDHAM and KUTCH 370201.

ANNEXURE-23
(Refer Page-77)

LIST OF OSR PERSONNEL – DPA OOT VADINAR

Sl	NAME	DESIG.	OSR QUAL.
01	Shri A. Ramasamy	Chief Operations Manager	Level-III
02	Shri Narendra Naik	ME Gr-I	Level-III
03	Shri Palash Jadafva	AE(D/T)	Level-II
04	Shri Devang Kanani	JE Gr-I (M)	Level-I
05	Shri Vaikuntah Rao	Casab	Level-I
06	Comdt. Retd. B. H Kumbhare	Sr. Manager	Level-III
07	Vysakh K K	Manager	Level-II
08	Debi Prasad Dash	Manager	Level-II
09	Debasis Sethi	Manager	Level-II
11	Keelu Vinodkumar	Manager	Level-II
12	Ashrit Mishra	Manager	Level-II
14	Rohit Girase	Responder	Level-I
15	Debendra Mohanta	Responder	Level-I
16	Bhola Singh	Responder	Level-I
17	Rajeev N.R.	Responder	Level-I
18	Jitendra Singh	Responder	Level-I
19	Shankar Singh	Responder	Level-I
20	Pintu Kumar	Responder	Level-I
21	Pawan Baryekar	Responder	Level-I
23	Anil Kumar	Responder	Level-I
28	Sunil Kumar	Responder	Level-I

ANNEXURE-24

LIST OF OSR PERSONNEL – DPA KANDLA

Sl	NAME	DESIG.	OSR QUAL.
1	Capt. Pradeep Mohanty	Deputy Conservator	Level -III
2	Capt. Lalji ram Meena	Harbour Master	Level -III
4	Capt Shishir Pathak	Sr. Pilot	Level -III
3	Nitin Keniya	Flotilla Superdt.	Level-II
4	Vanka Krishna Rao	Serang-C	Level-II
5	Pawan Sontakke	Manager	Level-II
6	Deewansinh Jadeja	Ast. Flotilla Supervisor	Level-I
7	B. Mohan Rao	Serang-c	Level-I
8	Ghanshyam Jatav	Ast. Flotilla Supervisor	Level-I
9	Pawan Bharati	Responder	Level-I
10	Gajendra Behera	Responder	Level-I
11	Saroj Kumar	Responder	Level-I
12	Papun Behera	Responder	Level-I
13	Dilson John	OSR Manager	Level-I
14	Manoj Kumar	Responder	Level-I
15	Ishwar Giri Goswami	Serang-c	Level-I
16	Kishan D. Sodham	Lascar	Level-I
17	Harshad Danicha	Lascar	Level-I
18	Hitesh K. Thacker	Master 1st Class	Level-I
19	Jitendra Ninjar	Ast. Flotilla Supervisor	Level-I

20	Jaydipsinh Gohil	Berthing Supervisor	Level-I
21	Bharat Parmar	AFS	Level-I
22	Kishor Goswami	Master 1st Class	Level-I
23	D.S. Gujar	Station Officer	Level-I
24	K.G. Khalsa	Station Officer	Level-I
25	G. Nethaji	Station Officer	Level-I
26	M. R. Vadavia	POCD	Level-I
27	Sahdev Mondal	Station Officer	Level-I
28	Kartik Raval	Responder	Level-I

ANNEXURE-25

MOU BETWEEN DPA VADINAR, IOCL & VOTL

The MOU between DPA Vadinar, IOCL & VOTL (Placed as an Annexure-25, Page -139). Fulfills the total requirement of OSR Personnel as per NOS-DCP circular no.03/2018. (EP/0720/circular dated 19 Dec 18).

The matter has been discussed with Local Coast Guard Authorities & it is intimated that the matter is been taken up with CGHQ to Lower the risk category of DPA port.

INDIA NON JUDICIAL

Government of Gujarat

Rs. 100

सत्यमेव जयते

Certificate of Stamp Duty

Certificate No.	:	IN-GJ50945344766603R
Certificate Issued Date	:	23-Dec-2019 11:14 AM
Account Reference	:	IMPACC (SH)/ gjshimp17/ JAMNAGAR1/ GJ-JM
Unique Doc. Reference	:	SUBIN-GJGJSHIMP17429583009966 83R
Purchased by	:	VADINAR OIL TERMINAL LTD
Description of Document	:	Article 5(h) Agreement (not otherwise provided for)
Description	:	MUTUAL AID SCHEME FOR OIL SPILL RESPONSE AND CONTROL
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	VADINAR OIL TERMINAL LTD
Second Party	:	N A
Stamp Duty Paid By	:	VADINAR OIL TERMINAL LTD
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

SHCIL JAMNAGAR

MA 0004699178

MUTUAL – AID SCHEME

(FOR OIL SPILL RESPONSE AND CONTROL)

MEMBER ORGANISATIONS

1. **Deendayal Port Trust,** a Major Port having its registered office at Administrative building, Tagore Road, Gandhidham, Gujarat-370201 and Offshore oil Terminal at Vadinar, Gujarat.

2. **M/s Indian Oil Corporation Ltd.,** a company registered under Companies Act, 1956 having its Registered Office at Indian Oil Bhawan, G-9 Ali Yavar Jung Marg, Bandra (East) Mumbai – 400 051 and crude oil tank farm station at Vadinar, Distt: Jamnagar - 361010 (Gujarat)

3. **M/s.Vadinar Oil Terminal Ltd. (Subsidiary of M/s.Nayara Energy Limited)** a company registered under Companies Act, 1956 having its Registered Office at Nayara Refinery Site, 39 KM stone, Okha Highway(SH-25), Khambhalia -361305

Member Organizations shall hereinafter individually referred to as "Member" and collectively as "Members"

The above members are operating in the Gulf of Kutch at Vadinar within Deendayal Port Trust Limit. All the operators have facilities for combating oil spill and are individually having oil spill response equipment. In case of oil spill; one member can take the help of another member. In order to act on the aforesaid arrangement, we the members have formulated the following Mutual Aid Scheme for this purpose.

We the Members of MUTUAL – AID SCHEME hereby agree to abide by the terms and conditions mentioned below:

1. Among the Members, whenever an emergency call is received from any calling Member about the occurrence of oil spill within Vadinar Port Limit, the helping member shall immediately send the oil spill control equipment and the response team as per the request received. The call from the calling member is to be made to the Nodal officer or Control Room of the helping Member. The list of oil spill equipment which can be spared and/or used by the Members during such an emergency is annexed to this Mutual Aid Scheme as Annexure No. 1.

2. Subject to the requirement of the calling Member, any additional assistance will be reviewed by helping Member and efforts, as far as possible, will be made to send such necessary additional assistance viz., oil spill equipment, boats/vessels, medical aid, firefighting equipment etc. at the earliest, along with additional man power subject to their availability.

28/12/19 28/12/19 28-12-19

3. Helping member shall mobilize the committed resources as per this Mutual Aid Scheme within a period of one hour or less for the mobilization at oil spill site.

4. The entire emergency crew coming from outside for rendering their assistance will work under the On Scene Commander ("OSC"). The OSC will be appointed by the calling Member.

5. Members having Oil Spill Control Equipment will maintain them in working condition for any such emergency. The use of equipment will be provided free of charge except for any damage to the equipments during such emergency which will be paid for and/or replaced by the calling Member unless such damage is caused due to the negligence of the helping Member and/or its representative(s). The consumables used (Details mentioned in Annexure – 2) will be charged to the calling Member.

6. Calling Member representatives shall use appropriate safety equipment and safety gear and shall respond with due diligence for mitigation and containment of incident and safety of personnel and equipments including but not limited to the equipment/property of calling Member during the course of the emergency.
During emergency any damage caused to calling Member property/personnel from the helping Member actions, shall not be compensated by helping Member, if such actions were taken in good faith and after proper due diligence.

7. In case of any accident in the course of rendering assistance to the calling Member, the calling Member shall handle such situations according to its own policies. In case of any injury to any representative of the helping Member, the first-aid treatment will be given by calling member free of cost if required by helping Member.

8. Detailed log of movement of vessel's mobilization and uses of equipment/consumables and oil spill related information shall be maintained by all the Members. In case of any modification to the list of equipment/consumables the same shall be intimated to the other Members within seven (7) days of such change.

9. Coordination Meeting & Mock drill will be carried out involving all mutual aid agencies, at least once in a year and will be coordinated by Indian Coast Guard.

10. The Members are free to seek assistance from any of the partner/organization as per their requirement in case of any major exigency.

11. The actual charges for repair of equipment rendered unusable to be paid by the calling member.

12. The charges for damage to equipment rendered unusable and consumables are to be submitted within a period of 30 days and to be settled not later than 3 months from the date of such submission.

28/11/19 28/11/19 28-11-19

13. The Mutual Aid Scheme is valid for a term of five (5) years from the date of its execution.

List of Annexure:

Annexure – 1: List of Oil Spill Response Equipment maintained by each organization.

Annexure – 2: Detail of Charges of oil spill response consumables & equipment.

Annexure – 3: List of officer's contact detail from each organization.

Signed as token of acceptance of above terms & conditions:

Name : R K GURAV
Sign :
Designation : C.O.M.
Organisation : D.P.T.

मुख्य प्रचालन प्रबंधक
दीनदयाल पोर्ट ट्रस्ट
अपतट तेल टर्मिनल
वाडीनार - 361010

Name : Chinmoy Ghosh
Sign :
Designation : CGM
Organisation : IOCL

चिन्मय घोष
CHINMOY GHOSH
मुख्य महाप्रबंधक
Chief General Manager
इंडियन ऑयल कॉर्पोरेशन लिमिटेड
INDIAN OIL CORPORATION LTD.

Name : Capt Alok Kumar
Sign : Alok Kumar
Designation : VP & Head VOT
Organisation : VOT- Nayara Energy Ltd.

Vadinar Oil Terminal Limited
NAYARA ENERGY

Sign in presence of:

Name : (Dy. Comdt. Rahul Sinha)
Sign :
Designation : Executive officer
Organization : ICGS Vadinar

ANNEXURE-1
Oil Pollution Inventory Level- as on 23.12.2019 (Consolidated Level and Individual level)

Sr	Description of resources	DPT,Vadinar	Nayara Energy (VOTL)	IOCL,Vadinar	Total of DPT, IOCL & Nayara
1	Inflatable Booms with accessories	2000 mtrs, with 8 power packs	1150 mtrs with 4 power packs	1200 mtrs with 4 power packs	4350 m with 16 power packs
2	Skimmers(20 tph)	4	4	4	12
3	OSD Applicator with Spray arms type along with 02 nozzles systems and 02 hand lancers	6	2	3	11
4	Oil Spill chemical dispersant	10000 liters	10000 liters	11000liters	31000 liters
5	Flex Barge (10 Tons)	4	4	4	12
6	Speed Sweep System	2 nos.	Nil	Nil	2 nos.
7	Sorbent Booms (no)	300	200	100	600
8	Sorbent Pads	2000	7000	1500	10500
9	Mini Vaccum Pumps with capacity of 25m3	5	Nil	1	6
10	Portable Oil Temporary Storage Facility (10m3)	5	Nil	4	9
11	Work Boats (no)	2	2	2	6
12	Tugs (no)	4	1	1	6
13	**Man power**				
	IMO LEVEL -I	10	33	7	50
	IMO LEVEL -II	4	5	5	14
	OTHER / Equipment handlers	15	15	15	45

28/12/19 28/12/19 28-12-19

ANNEXURE 2

Detail of Charges of oil Spill Response Consumables & Equipment.

A. CONSUMABLE CHARGES :

(Charges will be as per actual rates at the time or to be replenished by the calling organization)

S. No.	Item Description
1.	Oil Spill Dispersant /Bioremediation
2.	Absorbent pads
3.	Absorbent pillows
4.	Absorbent boom
5.	Fuel of Workboats/Tugs consumed during response period

28/12/19 28/12/19 28-12-19

Page 5 of 7

ANNEXURE - 3

Contact detail of each Member Organization.

1. Deendayal Port Trust , OOT Vadinar

Primary Contact : Mr. R.K.Gurav, Chief Operations Manager
Mobile : +919819999227
Land Line : 02833- 257301
E-mail : com@deendayalport.gov.in

Secondary Contact : Mr. Narendra Nayak, Marine Engineer Gr-I
Mobile : +919979126681
Land Line : 02833-257333
E-mail : megr1.oot@deendayalport.gov.in

Control Room Contact: Signal Station, Vadinar
Mobile : +919825212359

2. **Indian Oil Corporation, Vadinar**

Primary Contact : Mr. Chinmoy Ghosh, CGM
Mobile : +919437479025
Land Line : 02833-256527
E-mail : ghoshchinmoy@indianoil.in

Secondary Contact : Mr. Anil Meghani, DGM
Mobile : +919212035510
Land Line : 02833-256984
E-mail : anilm@indianoil.in

Control Room Contact: IOCL Control Room

Land Line : 02833-256536
E-mail : controlroomvadinar@indianoil.in

28/12/19 28-12-19

3. M/s Nayara Energy Limited. (Vadinar Oil Terminal Ltd.)

Primary Contact : Capt. Alok Kumar, Head- VOTL

Mobile : +919909908611
Land Line : 02833-661385
Fax : 02833-661366
E-mail : alok.kumar@nayaraenergy.com

Secondary Contact : Mr. Sachin Shah, JGM & Lead HSEF

Mobile : +919879105470

Land Line : 02833-661376
Fax : 02833-661366
E-mail : sachin.shah@nayaraenergy.com

Control Room Contact: Marine Terminal Control Room (Shift Incharge)

Mobile : +919979868460
Land Line : 02833-661386
Fax : 02833-661366
E-mail : simo@nayaraenergy.com

28/12/19 28/12/19 28-12-19

Annexure 26

SENSITIVITY MAPPING, RISK ASSESSMENT STUDIES FOR MARINE OIL SPILL FOR JETTIES, CREEKS AND SPMS

The Gulf abounds in marine wealth and is considered as one of the biologically richest marine habitats along the west coast of India. It is endowed with a great diversity of natural ecosystems, of which the major systems are salt pans, intertidal zones, marine algae (seaweeds), sea grass and sand dunes, mangroves, coral reefs, creeks, and Open Ocean. The Risk Assessment Studies for Marine Oil Spill for Jetties and SPMs and sensitive mapping of (Gulf of Kutch) has been carried out by NAYARA Energy Limited, Vadinar through, 60/4, Environ Towers,4th Floor, Hosur Main Road, Electronic City, Bangalore – 560 100. Recently in February 2024 is placed as an **Annexure -26** as the NAYARA Energy Ltd. Operations are within the area of jurisdiction of Kandla and Vadinar port in Gulf of Kutch. sanstivity mapping GOK.pdf (to open "ctrl + click").

SUBMISSION

- **It is of paramount importance to concentrate on preventing spills.**
- **Response to spills should seek to minimize the severity of the environmental damage.**
- **The response should always seek to complement and make use of natural forces to the fullest extent practicable.**
- **Some damage caused by specific response options may be justified if the response has been chosen for the greatest environmental and socioeconomic benefit overall.**
- **Offshore and near shore dispersant spraying can in some cases lead to an outcome of least environmental harm.**

ANNEXURE E
Final Waste management plan

WASTE MANAGEMENT PLAN

A comprehensive Plan for management of Plastic Waste, Solid Waste, C&D Waste, E-waste, Hazardous Waste including Bio-medical Waste and Non-hazardous waste in the Deendayal Port Authority Area

Prepared For:

Deendayal Port Authority

Prepared By:

Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

"GEMI Bhavan', B 246-247, GIDC Electronic Estate, Sector-25, Gandhinagar-382024

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www.gemi.gujarat.gov.in

Ref. No. GEMI/844(1)/101/2024-25

September 2024

DISCLAIMER

This report has been prepared by Gujarat Environment Management Institute (GEMI), solely as a part of the assignment "Preparation of Plan for management of Plastic Waste, Solid Waste, C&D Waste, E-waste, Hazardous Waste including Bio-medical Waste and Non-hazardous waste in the Deendayal Port Authority Area". This report is based on the data and information furnished by DPA and GEMI is not responsible for the accuracy and correctness of the same. GEMI has taken all reasonable precautions in the preparation of this report. However, it is impossible to dismiss absolutely, the possibility of errors or omissions. GEMI therefore specifically disclaims any liability resulting from the use or application of the information contained in this report.

About this Document

Name of the Document:	Plan for Management of Plastic Waste, Solid Waste, C&D Waste, E-waste, Hazardous Waste including Bio-medical Waste and Non-hazardous waste in the Deendayal Port Authority Area
Name of Client:	Deendayal Port Authority
Date of issue:	11/09/2024
Reference no.:	GEMI/844(1)/101/2024-25
Version:	Final Report

Dedicated Team:

Overall supervision and guidance:	Dr. Jaipal Singh, IFS, PCCF & Director Dr. Nitasha Khatri, Sr. Scientific Officer & Lab Head
Project Head:	Mr. Gunjan Gupta, Dy. Environmental Engineer
Project Manager:	Ms. Niyati Raval, Asst. Environmental Engineer
Project Assistants:	Ms. Honey Panchal, Project Assistant Mr. Jay Italiya, Project Assistant

PART-1

WASTE MANAGEMENT PLAN

Table of Contents

List of Tables

List of Figures

Annexures

Chapter-1

Introduction

1.1. About Kandla Port (Deendayal Port Authority, DPA)

Kandla Port, also known as the Deendayal Port is one of the major seaports on the western coast in Kutch District of Gujarat, India. It is located near the city of Gandhidham. It is situated on the west bank of Kandla creek at Latitude 23º 01' N and Longitude 70º 13' E. It is the largest port of India by volume of cargo handled. This port is operational throughout the year as it is an all-weather port. There are no adverse wave effects as it is a sheltered port situated in a creek. The rainfall is scanty in this region making the port most suitable option for handling food grains. It is well connected with the hinterland by broad gauge railway system and National Highway No. 8-A. This port handles dry bulk, break bulk, liquid bulk and container cargo. Kandla is the closest major port to the Middle East and Europe. It is also enroute port for ships calling at Karachi, Pakistan's only major port handling its seaborne cargo. Presently, the Port has total 1-16 dry cargo berths for handling dry cargo, 6 oil jetties, and one barge jetty at Bunder basin, dry bulk terminal at Tuna Tekra, barge jetty at Tuna and two SPMs at Vadinar for handling oil. The off-shore oil terminals at Vadinar, located in the Devbhumi Dwarka district, roughly 300 km away from Kandla by road and 50 nautical miles by sea, is also managed by DPA.

Since its formation in the 1950s, the Deendayal Port caters to the maritime trade requirements of Rajasthan, Madhya Pradesh, Uttar Pradesh, Haryana and Gujarat. Because of its proximity to the Gulf countries, large quantities of crude petroleum are imported through this port. About 35% of the country's total export takes place through the ports of Gujarat in which the Deendayal port has a considerable contribution. Assortments of liquid and dry cargo are being handled at DPA Port. The dry cargo includes fertilizers, iron and steel, food grains, metal products, ores, cement, coal, machinery, sugar, wooden logs, etc. The liquid cargo includes edible oil, crude oil and other petroleum products. The layout plan of DPA port at Kandla is given in Figure 1. and details of its berths and jetties is given Table 1.

Deendayal Port Authority is committed to sustainable development by taking adequate measures to maintain the Environmental well-being of the Port and its surrounding. The Ministry of Shipping started, "Project Green Ports", an effort to making the major ports across India cleaner and greener. "Project Green Ports" will have two verticals - one is "Green Ports Initiatives" related to environmental issues and second is "Swachh Bharat Abhiyaan". As a part of this initiative DPA has appointed GEMI to formulate a detailed Waste Management Plan for environmentally sound management of all types of waste generated at the Port area and other commercial and residential establishments under jurisdiction of DPA.

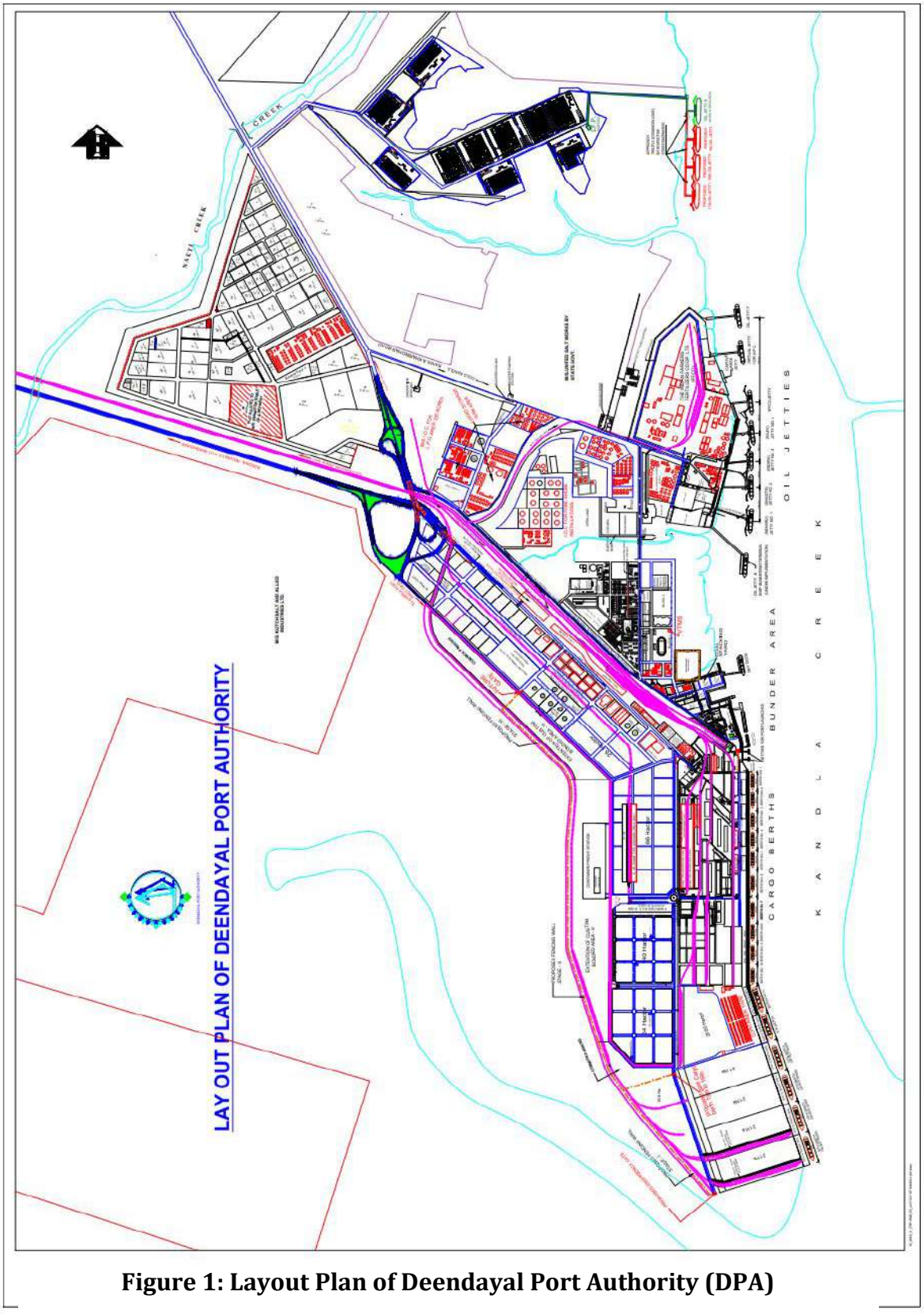


Figure 1: Layout Plan of Deendayal Port Authority (DPA)

Figure 1a. Layout of Gopalpuri Colony

1.2. Details of berths at Kandla and Vadinar ports

Table 1 Details of Jetties at DPA ports

Sr. No.	Berth	No. of Berths	Name of Berth	Type of Berth	Designed/Vessel Depth (Mts) (Draught)
Kandla port					
1	Cargo Berth	16	Cargo Berth 1 to 10	Mainly Dry Bulk	10.5 to 13.50
2			Cargo Berth No. 11 and 12 (KICT)	Container Berth	13.5 to 14.0
3			Cargo Berth 13 to 16	Mainly Dry bulk/Logs	13.5 to 14.0
4	Tuna Tekra	4	Tuna Tekra (AKBPTL) (BOT) Bulk Terminal	Dry Bulk	15.0 (Front) 13.0 (Back)
5	IFFCO Barge Jetty	1	IIFCO Barge Jetty (BOT)	Fertilizer (Captive)	4
6	Oil Jetties	7	Oil Jetty (OJ1)	LPG and Chemicals	10
7			Oil Jetty (OJ2)	Chemicals	10
8			Oil Jetty (OJ3)	Chemicals	9.8
9			Oil Jetty (OJ4)	Chemicals	10.7
10			IFFCO Jetty (OJ5)	Gas Carrier/ Chemicals	9.5
11			IOC Jetty (OJ6)	Petroleum products	10.1
Vadinar Port (SBMs and POL Product jetties)					
12	S.B.M.	3	1st and 2nd SBM: M/s IOCL 3rd SBM: M/s Essar Oil Ltd.	Crude oil	33 m draft
13	Nayra Jetty 1	1	Nayra Jetty 1	Crude oil	-
14	Nayra Jetty 2	1	Nayra Jetty 2	Crude oil	-

1.3. Need for the Waste Management Plan

Having a comprehensive waste management plan, in place, that incorporates all applicable provisions laid by regional and national legislations for the types of wastes generated within its boundary, enables an organization to manage its wastes (generated within its boundary) in environmentally sound manner, from on-site storage, segregation to its final disposal. It acts as a

standalone document guiding the organization in making policy level decisions regarding its overall waste management. Appropriate implementation of the waste management strategies detailed in the plan also helps in ensuring protection of the marine environment by reducing discharges into the sea of ship generated wastes and cargo residues, to improve the availability and use of reception facilities and strengthen the enforcement regime.

1.4. Objectives of the Waste Management Plan

The objectives of the waste management plan are as below:

For non-shipping waste viz. Municipal Solid Waste (MSW), Plastic Waste (PW), E-waste, Bio-medical Waste (BMW), and Construction & Demolition (C&D) Waste:

1. Understand the current waste management scenario at DPA followed by identification of opportunities for improvement in the same.
2. Document the legal requirements pertaining to different types of wastes.
3. Formulation of action plan for an efficient and robust waste management system.
4. Preparation of a training module for capacity building aimed at effective waste management.

For shipping waste

1. Understand the current waste management scenario at DPA followed by identification of opportunities for improvement in the same.
2. Identification and categorization of wastes produced at Kandla and Vadinar ports w.r.t MARPOL and applicable Indian legislations.
3. Assess the requirement of Port Reception Facility (PRF) for ship-generated waste w.r.t the identified ship wastes.
4. Suggest suitable Waste Management System for environmentally sound waste management based on available case studies and Standard Operating Procedures.

1.5. Scope of Work

1. Identification & categorization of various Wastes, into hazardous & non-hazardous Biodegradable wastes, Solid wastes including C & D Wastes, Biomedical Waste, plastic

waste, E- waste etc. with assessment of quantity & disposal.

2. Separate identification of Ship waste into hazardous, non-hazardous & Biodegradable waste as per the MARPOL 73/78 (as amended) and other conventions of IMO as applicable for Port and Harbour.
3. Preparation of Training Module for Port officers & Employees.
4. Provide comprehensive reception and safe disposal facilities plan with subsequent monitoring plan including provision for engagement external agencies/private operators.
5. List out requirement of obtaining necessary clearance/license from statutory authorities under respective category of waste management rules.
6. Review Procedure with respect to Audits/Inspection reports of licensed contractors.
7. Provide consultation to DPA in implementation of waste management plan during the period of contract.
8. Preparation of detailed waste management plan for all wastes as per the provisions of covered under Environment Protection Act, EPA 2006.

Chapter-2

Municipal Solid Waste

2.1. Applicable laws and rules

Solid Waste Management Rules, 2016 (SWM Rules, 2016)

2.2. Responsibility of DPA as per Rules:

Definition of Bulk waste generator as per SWM Rules,2016

"Bulk Waste Generator" means and includes buildings occupied by the Central Government Departments or undertakings, State Government Departments or Undertakings, Local Bodies, Public Sector Undertakings or Private Companies, Hospitals, Nursing Homes, Schools, Colleges, Universities, other Educational Institutions, Hostels, Hotels, Commercial Establishments, Markets, Places of Worship, Stadia and Sports Complexes etc. having an average waste generation rate exceeding 100 kg per day (of all waste streams put together).

Rule 4 of Solid Waste Management Rules, 2016 - Duties of waste generator

- Segregate and store the waste generated in three separate streams namely bio-degradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time.
- Wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities and shall place the same in the bin meant for dry waste or non- bio-degradable waste.
- Store separately construction and demolition waste, as and when generated, in his own premises and shall dispose of as per the Construction and Demolition Waste Management Rules, 2016.
- store horticulture waste and garden waste generated from his premises separately in his own premises and dispose of as per the directions of the local body from time to time.
- No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.
- All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.
- No person shall organize an event or gathering of more than one hundred persons at any unlicensed place without intimating the local body, at least three working days in advance

and such person or the organizer of such event shall ensure segregation of waste at source and handing over of segregated waste to waste collector.

- The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body.

2.3. Handling and Management of Waste

2.3.1. Identification of sources, Quantification and Inventory of waste

Based on the population data provided by DPA for its residential, port and slum establishments at Gandhidham, Kandla and Vadinar, MSW is quantified as per provisions stated in Central Public Health and Environmental Engineering Organization (CPHEEO) Manual.

As per CPHEEO Manual guidelines:

- For residential zones MSW generation rate is 0.3 kg per capita per day.
- For commercial zones MSW generation rate is 0.2 kg per capita per day.
- For Floating population MSW generation rate is 0.2 kg per capita per day.

Note: Factor of commercial zone assumed for port area

The factor of 0.125 kg/per capita/per day as outlined in the research paper titled "Solid Waste Disposal Practices in an Urban Slum Area of South India", is assumed for calculation of MSW by slum population at DPA.

The projection of MSW in next 5 and 10 years is calculated based on the assessment finding reported in CPHEEO manual that states that per capita waste generation increases by about 1.3% per year.

The estimated quantity of Solid waste generation for the area is given in Table 2 below.

Table 2 MSW generation at DPA establishment

Sr. No.	Locality	Population (nos.)	Quantity of waste in kg/day		
			Current	Projected after 5 Years	Projected after 10 Years
For Gandhidham and Kandla					
Residential					
1.	Gopalpuri colony	5000	1500	1600	1700

2.	Port colony (Occupied HH + Barracks)	744**	223.2	238.08	252.96
3.	Slum	500*	100	108	115
Commercial					
1.	A.O. office	1577	315.4	331.17	362.71
2.	Port (employees + workers)	505	101	106.05	116.15
3.	Floating	100*	20	21.6	23
Total for Gandhidham and Kandla		**-**	**2259.6**	**2404.9**	**2569.82**
For Vadinar					
1.	Residential	600	180	190	207
2.	Commercial	50	10	10.5	11.5
3.	Floating	100*	20	21.6	23
Total for Vadinar		**-**	**210**	**226.8**	**241.5**

**Assumed values; ** calculated based on no. of HH / rooms by applying factor adopted from Ministry of Statistics and Program Implementation, GoI*[1]

2.3.2. Segregation

Current scenario: At present, MSW generated at various DPA establishments at Kandla as well as Vadinar like residential colony, administrative offices, Port offices, slum areas etc., is not segregated into wet or dry waste. Dustbins have been provided at various DPA campuses however there is need for providing different colored bins for collection of wet and dry waste to promote waste segregation at source.

Figure 2: Dustbins provided in DPA office premises, Gandhidham

Figure 3: Concrete bins at Gopalpuri colony campus, Gandhidham

[1] Ministry of Statistics and Program Implementation (*https://shorturl.at/8F4Oz*)

2.3.3. Collection

Current scenario: Door to Door collection of waste is practiced at Gandhidham, Kandla and Vadinar DPA establishments on daily basis. Private agencies have been contracted for collection, transportation and disposal of MSW at these locations. The agencies contracted for this purpose at various locations are given in Table 3.

Table 3 Waste Management Agency appointed at DPA ports

DPA establishments	Waste Management Agency
Gopalpuri and KDLB Colony	M/s Patel Construction Co.
New Port Colony, New Kandla	M/s Acer Infra Trade
Vadinar	M/s. Jay Chamunda Enterprise

Figure 4: Door-to-door waste collection

2.3.4. Storage (on-site and centralized)

Door to Door collection is practiced on daily basis at Gandhidham, Kandla and Vadinar hence there is no requirement of designated onsite storage area for MSW. The collected MSW from each household and offices is directly transferred into the bin loaded on the vehicle.

2.3.5. Intramural transportation and transfer

Depending on requirement, trip length and vehicle capacity, intramural transportation and

transfer of waste is carried out by the agency.

2.3.6. Pre-treatment / Pre-processing

No pre-treatment or processing is carried out at present

2.3.7. Disposal

- At Gandhidham, MSW is disposed at a designated site allotted by Gandhidham Municipality.
- At Vadinar, there is a provision of dumpsite behind port colony for dumping of MSW. Here, 12-13 ft. deep trenches are dug into which the MSW is dumped. Once the trench is completely filled, it is systematically covered with layer of top soil.

2.4. Record keeping

There is no statutory requirement of record keeping for MSW, however it is a good practice to maintain the records of MSW generated at various locations and collect the waste receipts for the quantum of waste collected. At DPA establishments record keeping is maintained in terms of no. of trips (for MSW collection) by waste collecting agency.

2.5. Procedure adopted for engagement of external agencies/private operators

The selection of agency is through tendering procedure. The work is a comprehensive maintenance contract for all sanitation works which includes collection, transportation and disposal of MSW, street sweeping etc. The work is awarded to the bidder who meets the minimum eligibility criteria and who has submitted the lowest bid. The contract is usually for a period of 2 years.

2.6. Obtaining Authorization/Clearance/License

DPA is not required to obtain any Authorization/Clearance/License for MSW

2.7. Strategy for management of MSW at DPA

Management of MSW can be broadly categorized into the following steps:

a) Segregation at source
b) Collection
c) Transportation
d) Sorting and Processing
e) Recycling (of recyclable items)

f) Disposal

In the subsequent section, detailed plan for segregation, sorting and processing has been provided. Collection and transportation is already carried out by a dedicated agency.

2.7.1. Segregation at source:

Estimation of no. of bins:

2 different colored bins, Green for wet waste and Blue for dry wastes etc. shall be made available to all households and offices, and awareness be made, encouraging segregating of wastes into designated bins. The provision for collection of waste generated from floating population has been covered under provision of bins made for administrative offices for Gandhidham, Kandla and Vadinar locations, as the bins calculated to be put up on sides of roads inside the colony will suffice, receiving the waste quantum from incoming-outgoing floating population of residential colonies. The bins that are two to be placed along internal roads, DPA may choose to install any of the following type of bins:

a) Conventional bins of 50L capacity OR
b) Smart underground bins of 100L capacity with sensors that sends alert when bins are almost full

Figure 7: Wet and Dry waste collection bins

a) For Kandla and Gandhidham

The current quantum of MSW generation estimated at Gopalpuri is 1.5 tons/day. The calculation

of bins to be provided for MSW collection is done for the projected increase after 10 years i.e 1.7 tons/day. Similarly, for Administrative Office the current MSW generation is 0.35 tons/day and projected quantity after 10 years is 0.4 tons/day. For calculation of no. of bins 0.4 tons/day quantum is considered.

Gopalpuri colony, Gandhidham

a. Waste Quantity (W) =1.7 tons/day
b. As per CPHEEO manual bulk density (D) of MSW is 0.5 tons/m^3
c. Total Volume of Waste = W÷D = 1.7 ÷ 0.5 = 3.4 m^3/day

To accommodate 3.4 m^3/day of generated MSW total of 340 bins would be required. However, since there are approx. 1100 households, 2200 bins are recommended (2 bins, for wet and dry waste at each HH).

The approximate length of internal major roads inside the Gopalpuri colony calculated through GIS tool is 6132 m. (Approx 6 kms.). Adopting the provision of providing 1 set of 2 bins (for wet and dry waste) at a distance of 75 m along the length of roads[2], 82 bins are proposed to be provided along the length of all major internal roads of Gopalpuri.

Port colony, Kandla

Waste Quantity – W=0.25 tons/day

- As per CPHEEO manual bulk density(D) of Municipal solid waste is 0.5 ton/m^3

- Total Waste Quantity is Volume = W÷D = 0.25 ÷ 0.5 = 0.5 m^3/day

Assuming 0.01 m^3 bins on 25 Location (50 Bins), so total waste collected will be 50 X 0.01 = 0.5 m^3. So, total waste collected will be around 0.5 X 0.5 = 0.25 tons/day. Waste collection can be increased if more waste deposited in bins.

The approximate length of internal roads inside the port colony, Kandla is 2148 m. (Approx 2.1 kms.). 58 set of 2 bins (for wet and dry waste) at 29 locations at a distance of 75m are proposed to be provided on all major internal roads.

Administrative Office, Gandhidham

Waste Quantity – W=0.36 tons/day

[2] Optimal Location and Proximity Distance of Municipal Solid Waste Collection Bin Using GIS: a Case Study of Coimbatore City (https://shorturl.at/FPDF4)

- As per CPHEEO manual bulk density(D) of Municipal solid waste is 0.5 ton/m^3

- Total Waste Quantity is Volume = W÷D = 0.36 ÷ 0.5 = 0.72 m^3/day

Assuming 0.01 m^3 bins at 40 office rooms (80 Bins), so total waste collected will be 80 X 0.01 = 0.8 m^3. So, total waste collected will be around 0.8 X 0.5 = 0.4 tons/day, sufficing the waste generation of 0.72 m^3/day.

The approximate length of internal roads inside the AO office at Kandla is 522.4 m. (Approx 0.5 kms.). 07 set of 2 bins (for wet and dry waste) are proposed to be provided on all major internal roads.

Port office (employees + workers), Kandla

Waste Quantity – W=0.12 tons/day

- As per CPHEEO manual bulk density(D) of Municipal solid waste is 0.5 ton/m^3
- Total Waste Quantity is Volume = W÷D = 0.12 ÷ 0.5 = 0.24 m^3/day

Assuming 0.01 m^3 bins on 12 Location (24 Bins), so total waste collected will be 24 X 0.01 = 0.24 m^3. So, total waste collected will be around 0.24 X 0.5 = 0.12 tons/day. Waste collection can be increased if more waste deposited in bins.

The approximate length of internal roads inside the port office, Kandla is 380 m. (Approx 0.3 kms.). 10 set of 2 bins (for wet and dry waste) at 5 locations at a distance of 75m are proposed to be provided on all major internal roads.

Unorganized slum area, Kandla

As per Solid Waste Management Rules, 2016, it is the responsibility of DPA to arrange for door-to-door collection of segregated MSW from all its establishments including slums and informal settlements. 200 bins are proposed to be distributed at these places. In addition, 50 nos. of hand carts are proposed.

Figure 8: Handcart for collection of MSW from slum areas

b) For Vadinar

The current quantum of MSW generation reported at Vadinar port colony is 0.19 tons/day. The calculation of bins to be provided for MSW collection is done for the projected increase in MSW generation after 10 years i.e 0.2 tons/day. Similarly, for administrative office at Vadinar the current MSW generation is 0.02 tons/day and projected quantity after 10 years is 0.023 tons/day. For calculation purpose 0.023 tons/day quantum is considered.

Residential colony

d. Waste Quantity (W)= 0.2 tons/day
e. As per CPHEEO manual bulk density (D) of MSW is 0.5 ton/m^3
f. Total Volume of Waste to be handled = W÷D = 0.2 ÷ 0.5 = 0.42 m^3/day

Since there are around 150 households in the colony, 300 bins would be required.

The approximate length of internal major roads inside the port colony at Vadinar, calculated through GIS is 3687.2 m. (Approx 4 kms.). 50 set of bins (for wet and dry waste) are proposed to be provided on all major internal roads of Gopalpuri.

Administrative Office

g. Waste Quantity (W) = 0.023 tons/day
h. As per CPHEEO manual bulk density (D) of MSW is 0.5 ton/m^3
i. Waste Volume = W÷D = 0.023 ÷ 0.5 = 0.046 m^3/day

A provision of total 50 bins has been estimated.

The approximate length of internal roads inside the AO office at Vadinar is 856 m. 12 set of 2 bins (for wet and dry waste) are proposed to be provided internal roads of the office.

Summary of total no. of bins required is given in Table 4.

Table 4 Summary of total no. of bins required

DPA establishments generating MSW	No. of bins to be provided	Capacity of bin	Identified locations for bins	Remarks (If any)
Gandhidham and Kandla				
Residential				
Gopalpuri colony, Gandhidham	2200	10L (0.01m^3)	1100 HH in the colony	2 bins at each HH: 1 Green (wet waste) and 1 Blue (dry waste)
	82	50 or 100 L	6 km long Internal roads and parks of the colony	bin to be provided at a distance of 75m
Port colony, Kandla	840	10L (0.01m^3)	120 (currently occupied) HH and 300 barracks	2 bins at each HH and barrack: 1 Green (wet waste) and 1 Blue (dry waste)
	58	50 or 100 L	2.1 km long Internal roads and parks of the colony	1 bin to be provided at a distance of 75m
Commercial				
Administrative office, Gandhidham	80	10L (0.01m^3)	2 bins in each office rooms	--
	07	50 or 100 L	On 0.5 km long internal roads inside AO premises	1 bin to be provided at a distance of 75m
Port office, Kandla (Marine + Nirman bhavan)	24	10L (0.01m^3)	2 bins in each office rooms	--
	10	50 or 100 L	On 0.4 km long internal roads inside AO premises	1 bin to be provided at a distance of 75m
Slum				
Unorganized slum, Kandla	50 Handcarts	--	--	--
	200	10L (0.01m^3)	Around 100 HH	2 bins at each HH: 1 Green and 1 Blue
Vadinar				

Port colony	300	10L (0.01m^3)	21 HH in the colony	2 bins at each HH: 1 Green and 1 Blue
	50	50 or 100 L	3.6 km long Internal roads and parks of the colony	1 bin to be provided at a distance of 75m
Administrative office, Vadinar	50	10L (0.01m^3)	2 bins in each office rooms	--
	12	50 or 100 L	On 1 km long internal roads inside AO premises	1 bin to be provided at a distance of 75m
Grand Total: 10 L bins: 3344 nos. for Gandhidham and Kandla and 350 nos. for Vadinar Handcarts: 50 nos. for unorganized slum at Kandla port 50 or 100 L bins: 157 nos. for Gandhidham and Kandla and 62 nos. for Vadinar				

HH- Households in the colony

Figure 9: Indicative sizes of 50L and 10L green and blue bins

Salient features of smart underground roadside bins:

- Fitted inside a concrete bunker below the ground
- Sensor-fitted to send alert when bins are 75-90% full
- Waterproof- these units have rubber fittings to make them waterproof
- Bins are established a few inches above the ground level to ensure that there is no flooding of the bins during the rainy season

Figure 9a: Smart underground roadside bins

2.7.2. Door-to-Door collection:

DPA has outsourced door-to-door collection of wastes from residencies and offices by appointing an agency on annual renewal basis. As per current scenario, the agency dumps the MSW collected from door-to-door to a designated site allotted by Gandhidham Municipality without processing. This gap could be addressed by introducing an on-site Material Recovery Facility (MRF), enabling proper segregation of MSW into Organic and Inorganic sections. Thereby the MSW collected from every household and office will get diverted to the MRF.

The characterization of MSW is an important aspect as the composition will determine the applicability of waste processing technology. On an average, garbage is composed of 40-45% of organic fraction and 20-30% inert fraction, rest being plastics, paper, rags and other components.

NEERI's study "Assessment of Status of Municipal Solid Wastes Management in Metro Cities and State Capitals" in 2004–2005 assessed 59 cities (35 metro cities and 24 state capitals). Studies have revealed that waste generation rate varies from 0.12 to 0.60 kg/capita/day. Analysis of physical composition indicates that total compostable matter in the waste is 40%–60%, while recyclable fraction is 10%–25%. The moisture content in the MSW is 30%–60%, while the C/N

ratio is 20–40. Typical Fractions of Municipal Solid Waste Generated in DPA is given in Table 5

Table 5 Typical fractions of Municipal Solid Waste Generated in DPA

Sr. No.	Type of Waste	Quantity of Waste Generated (kg/day)					
		Gandhidham		Kandla		Vadinar	
		R	C	R	C	R	C
1.	Biodegradables	711	149.49	105.79	11.85	85.32	4.74
2.	Paper	121.5	25.54	18.08	2.025	14.58	0.81
3.	Plastic	138	29.01	20.53	2.3	16.56	0.92
4.	Metal	7.5	1.57	1.11	0.13	0.9	0.05
5.	Glass	15	3.15	2.23	0.25	1.8	0.1
6.	Rags	66	13.87	9.82	1.1	7.92	0.44
7.	Other	60	12.61	8.92	1	7.2	0.4
8.	Inerts	376.5	79.16	56.02	6.27	45.18	2.51
Total		**1500**	**315.4**	**223.2**	**25**	**180**	**10**
Total Waste Generation		**1840.4**		**248.2**		**190**	

R- Residential; C- Commercial

The calorific value of garbage will help to identify the treatment technologies like Waste-to-Energy and other thermal processes. For secondary segregation MRF is proposed as follows for DPA establishments at Gandhidham.

2.7.2.1 Staff requirement for MSW collection

Manpower requirement for various premises as per provisions given under CPHEEO Manual and Swachh Bharat Mission's Standard Operating Procedures (SOPs) is tabulated below:

Table 6: Staff requirement-MSW collection

Area	No. of cleaning staff to be deployed (Illustrative)		Remarks
MSW collection	Gopalpuri colony, Gandhidham (2 LCVs)	2 drivers and 4 laborers	Manpower is calculated based on recommended nos. of LCVs (Light Commercial Vehicle) of 500-700 kg capacity, for waste collection, as per provisions of CPHEEO Manual for collection of MSW.
	Port colony, Kandla (1 LCV)	1 driver and 2 laborers	
	AO office, Gandhidham (1 LCV)	1 driver and 2 laborers	
	Port admin offices, Kandla (1 LCV)	1 driver and 2 laborers	

<table>
<tr><td></td><td>Entire Vadinar premises (1 LCV)</td><td>1 driver and 2 laborers</td><td></td></tr>
<tr><td rowspan="6">Street sweeping</td><td>Gopalpuri colony, Gandhidham</td><td>12 sweepers</td><td rowspan="6">Calculation based on the street sweeping norms for medium density roads i.e., 1 person per 500 running meters of road length, as per provisions of CPHEEO Manual for collection of MSW.</td></tr>
<tr><td>Port colony, Kandla</td><td>04 sweepers</td></tr>
<tr><td>AO office, Gandhidham</td><td>01 sweepers</td></tr>
<tr><td>Port admin offices</td><td>01 sweepers</td></tr>
<tr><td>Residential premises, Vadinar</td><td>07 sweepers</td></tr>
<tr><td>Commercial premises, Vadinar</td><td>02 sweepers</td></tr>
<tr><td>Office/ hospital corridors</td><td colspan="2">Typically, 1 staff per floor for 1-2 corridors</td><td rowspan="5">As per manpower provision made under SOPs for Swachh Resident Welfare Associations and Offices.</td></tr>
<tr><td>Common toilets</td><td colspan="2">Typically, 1 staff per toilet block</td></tr>
<tr><td>Gardens and parks</td><td colspan="2" rowspan="2">Appropriate number as may be needed</td></tr>
<tr><td>Common utilities like Parking, Gym, Library, Clubs, open spaces etc.</td></tr>
<tr><td colspan="4">Additionally, dedicated supervisors should be engaged depending on number of cleaning staff, and number of physically disparate locations (e.g. 1 supervisor per wing/floor).</td></tr>
</table>

Note: *No. of LCVs proposed could be optimized considering the scenario where a single LCV makes multiple trips for waste collection instead of multiple LCVs or as per DPA's discretion.*

Staff requirement should be assessed on annual basis by the Waste Management Cell taking into account following particulars for each DPA establishments:

- Area of the building (Offices, Residential, Recreational etc.)
- Number of rooms
- Area of the open/common spaces like garden, parking etc.
- Number of common toilet blocks
- Number of canteen spaces

2.7.3. Material Recovery Facility (MRF)

A Material Recovery Facility (MRF) is an infrastructure to receive, sort, process and store recyclable/non-recyclables/ RDF and inert materials, with the aim to maximize the quantity of recyclables processed, while producing materials that will generate the highest possible revenues in the market and maximize the reuse of other segregated fraction in different processes/ industries. Schematic of a typical MRF facility is given below:

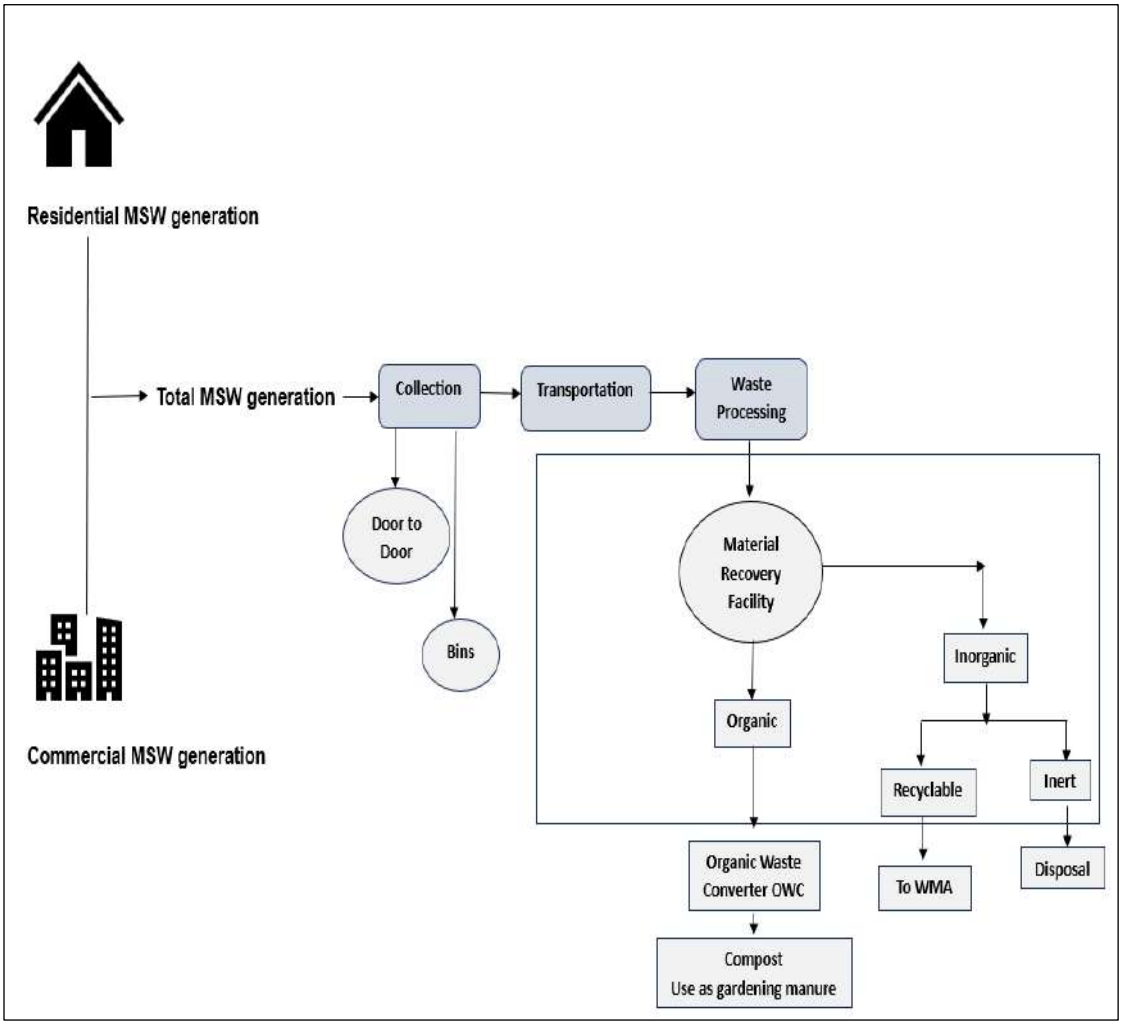


Figure 10: A schematic of proposed MRF for Kandla, Gandhidham

DPA in collaboration with Gandhidham Municipality has proposed to install solid waste processing facility for managing waste of Gandhidham town and DPA premises. There is a provision for a material recovery facility (MRF) to ensure maximum utilization of reusable portion of MSW and minimum waste to be landfilled. The specifications of proposed MRF for Gandhidham are as below:

Table 7 MRF specifications for Gandhidham

MRF Component	Indicative value
Design Capacity	100 tons/day
Infrastructure requirement	Composting shed MRF center Livelihood center
Total area requirement	6 acres

2.7.4. Organic Waste Converter (OWC)

About 40-60% of MSW is comprised of compostable materials. Assuming 50% quantum of MSW to be biodegradable, the calculated biodegradable content in MSW generated from Gopalpuri colony and AO office are 600 kg/day and 200 kg/day respectively. Similarly, for Vadinar, the biodegradable component in MSW is 90kg/day and 10 kg/day for colony and AO office respectively. The nos. and specifications of OWC proposed for DPA establishments at Gandhidham, Kandla and Vadinar are as below:

The following process flow diagram illustrates how organic waste is converted into compost within 30 to 45 days.

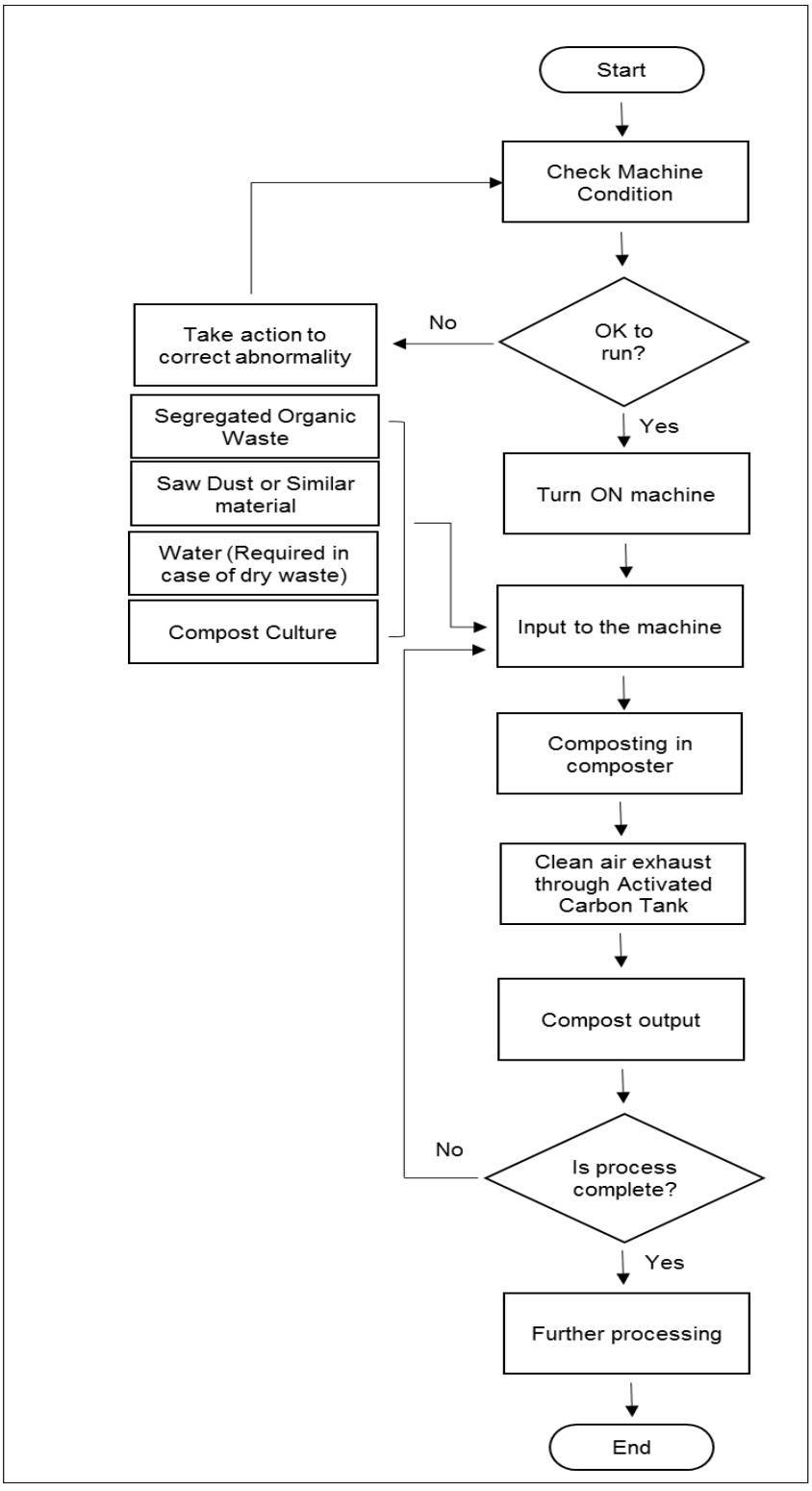


Figure 16: Process flow of Organic Waste Converter

The image of a typical OWC is shown in Figure 17

Figure 17: Typical Organic Waste Convertor

A non-exhaustive list of OWC dealers have been provided at Annexure I. The specifications of the OWC proposed for DPA is given in Table 8.

Table 8 Specifications of OWC proposed for DPA

Sr. No.	Location	Design capacity kg/day	Nos. of OWC proposed	Approx. Space requirement for 1 OWC (m x m X m)	Energy Requirement for 1 OWC Units/day
1	Gopalpuri colony	800	1	3.4×2.3×2.4	57-65
		OR			
		200	4	1.98×1.16×1.68	16-18
2	Kandla AO	200	1	1.98×1.16×1.68	16-18
3	Vadinar colony and AO premises	100	1	5×3×3.5	13-15

2.8. Financial outlay for proposed MSW management

The estimated financial outlay for the proposed provision of MSW management has been given in Table 9. This outlay consists of only capital and recurring cost of items/equipment and does not include manpower and other costs.

Table 9 Financial outlay for proposed MSW management

Sr. no.	Particulars of proposed provisions for management of MSW	Cost per unit in ₹	Capital cost in ₹	Recurring cost per year in ₹
For Kandla and Gandhidham				
1	Waste collection bins HH 10 L capacity	100/-	3,34,400/- (for 3344 bins)	1,00,000/- (considering replacement of around 1000 bins/year due to wear and tear)
2	Waste collection bins (roadside) 50 L capacity 100 L capacity (smart bins)	600/- 15000/-	94200/- (50L) 23,55,000/- (100L) (for 157 bins)	30,000/- (considering replacement of around 50 bins/year due to wear and tear)
3	MRF facility	--	1,50,00,000/-	*
4	OWC units of 800 kg/day for Residential	14,50,000/-	14,50,000/-	145,000/-
5	OWC units of 200 kg/day for Commercial	6,00,000/-	6,00,000/-	60,000/-
6	Handcarts for slum area	8000/-	4,00,000/- (for 50 handcarts)	40,000/- (considering replacement of around 5 handcarts/year due

				to wear and tear)
7	Door-to-door waste collection	As per contract		
Total			**1,77,16,800/- + unaccounted cost***	**20,75,000/- + unaccounted cost***
For Vadinar				
8	Waste collection bins of 10 L capacity	100/-	35000/- (for 350 bins)	5,000/- (considering replacement of around 50 bins/year due to wear and tear)
9	Waste collection bins of 50 L capacity	600/-	37,200/- (for 62 bins)	3000/- (considering replacement of around 05 bins/year due to wear and tear)
10	OWC units of 100 kg/day	3,50,000/-	3,50,000/-	35,000/-
11	Door-to-door waste collection	As per contract		
Total			**4,22,200/- + unaccounted cost***	**43,000/- + unaccounted cost***
Grand Total (for Gandhidham, Kandla and Vadinar)			**1,81,39,000/- + unaccounted cost***	**21,18,000/- + unaccounted cost***

Note: The costs of proposed units have been adopted based on current market price; *unaccounted costs include costs of tendering; costing of roadside smart bins and recurring cost pertaining to MRF.

2.9. Other recommendations:

The Integrated Solid Waste Management (ISWM) hierarchy states 5 approaches for managing wastes.

- Tier 1: Source reduction or waste prevention, which includes reuse, considered the best approach
- Tier 2: Recycling
- Tier 3: Composting of organic matter of waste.
- Tier 4: Energy recovery- the components of waste that cannot be prevented or recycled can be processed for recovering energy
- Tier 5 is disposal of waste in sanitary landfill, which is the least preferred option.

For DPA, Tier 1, 2, 3 and 4 approaches are proposed for management of MSW

Tier 1 & 2: Practicing minimalistic lifestyle by avoiding purchase and use of unnecessary goods/things used in daily lives. Ensuring the usage of goods used in day to day lives for its full

designed period or till end of life thereby avoiding accumulation that ultimately results into MSW

Tier 3: Composting of organic waste produces a good manure that can find utility in gardens, recreational parks and kitchen gardening. Proper segregation of MSW in to wet biodegradable and Dry non-biodegradable waste is key to achieve this. To ensure segregation at source, provision shall be made to provide two separate bins at all households in the colonies and other places for discarding of wet and dry wastes thus enabling waste segregation at the source of generation itself.

- Ensure active participation of the community in reducing overall quantities of waste. The different waste reduction strategies, such as take-back, deposit–refund system, etc. should be promoted.
- Promote source reduction programs in the community and encourage handover of recyclable material to sustainable recycling facilities through informal sector, NGOs, etc.
- Campaign for reducing the use of specific non-recyclable, non-reusable, or toxic material. Practice and promote material substitution where possible.
- Generate awareness among people to avoid littering.
- Sensitize citizens to segregate waste at their premises into biodegradable, dry, and special waste and hand over the segregated waste to the collectors.
- Ensure awareness on existing recyclable collection systems, including dedicated collection points. Enforce extended producer responsibility (EPR) initiatives.
- Management shall hold regular meetings among the MSWM staff and other stakeholders to ensure successful uptake of such programs.
- Ensure active participation of the community for successful implementation of primary and secondary collection systems.
- Generate awareness on bye-laws on waste collection and management system as well as user charges levied on different waste fractions.
- The consumer shall wrap the sanitary waste using self-wrapping straps or keep the sanitary waste in leak-proof pouches provided by producer and dispose the same along with dry waste or keep the waste in separate bin provided at the time of door-to-door collection. In case separate bin is not provided by authorized waste picker, the wrapped/pouched sanitary waste should be placed in dry-waste bin for collection by authorized waste picker.

Chapter-3

PLASTIC WASTE

3.1. Applicable laws and rules

Plastic Waste Management Rules, 2016 and subsequent amendments in 2018, 2021, 2022 and 2023.

3.2. Responsibility of DPA as per PWM Rules

Rule 8 of Plastic Waste Management Rules, 2016

Responsibility of waste generator

- Take steps to minimize generation of plastic waste and segregate plastic waste at source in accordance with the Solid Waste Management Rules, 2000 or as amended from time to time.
- Not litter the plastic waste and ensure segregated storage of waste at source and handover segregated waste to urban local body or gram panchayat or agencies appointed by them or registered waste pickers', registered recyclers or waste collection agencies.
- All institutional generators of plastic waste, shall segregate and store the waste generated by them in accordance with the Municipal Solid Waste (Management and Handling) Rules, 2000 notified vide S.O 908(E) dated the 25th September, 2000 under the Act or amendments and handover segregated wastes to authorized waste processing or disposal facilities.
- All waste generators shall pay such user fee or charge as may be specified in the bye-laws of the local bodies for plastic waste management such as waste collection or operation of the facility thereof, etc.

3.3. Current Scenario - Handling and Management of Waste

3.3.1. Identification and Quantification

At all premises of DPA, plastic waste is not segregated from municipal solid waste. Therefore, for estimation of plastic waste quantum, Central Public Health and Environmental Engineering Organization (CPHEEO) manual has been referred. It states that Plastic waste forms approximately 6.92% of the total MSW. Applying this factor to the quantity of MSW generated at the respective locations, estimated PW generation at Gandhidham, Kandla and Vadinar is calculated as below:

Table 10: Estimated quantum of Plastic waste generation for DPA establishments

Location	Waste Quantum in kg/day			
	Current MSW	Estimated Plastic waste (current)	Estimated Plastic waste (after 5 yrs)	Estimated Plastic waste (after 10 yrs)

Gandhidham and Kandla (Colony + AO + Port + Slum)	2259.6	156.36	166.41	177.83
Vadinar (Colony + AO + Port)	210	14.53	15.69	16.71

3.3.2. Sources of waste

Plastics have become an integral part of human day to day life. All type of establishments, residential, commercial, institutional, health care etc. generate plastic waste in varying quantities. At Gandhidham, Kandla and Vadinar, plastic waste is generated from residential areas (residential colonies), Administrative offices, Port area (including ships and vessels) and slum areas.

3.3.3. Segregation

Segregation of waste at source and its timely collection ensures proper utilization and cleanliness of the area. However, to ensure source segregation, proper awareness activities, and strict compliance system is necessary. Presently the segregation of plastic waste at source is not practiced at locations i.e Gandhidham, Kandla and Vadinar. On-site segregation could be encouraged by:

- Providing different colored bins in households/offices: It is recommended that different bins for wet and dry waste be provided at all sources of waste generation.
- Create awareness on benefits and procedure of segregation.
- Regular monitoring of percentage of segregation in each DPA premises.
- Since source segregation of plastic waste is difficult, an alternative is manual / mechanized segregation at centralized storage area or material recovery facility once door to door collection of waste is done.

3.3.4. Recycling / Processing and Disposal

Recycling of plastic is not practiced at present.

3.4. Record keeping

The PWM Rules do not mandate any record keeping requirement for plastic waste generators, however it is a good practice to regularly collect receipts and maintain records of quantum of PW collected by the registered Waste Management Agency.

3.5. Procedure adopted for engagement of external agencies/private operators

Currently DPA has not engaged any plastic waste management agency for environmentally sound management of the plastic waste generated in its premises. It is imperative for DPA to engage such agency registered with GPCB to ensure sound management of plastic waste. The criteria suggested for appointing a waste management agency is it should be holding a valid authorization from GPCB during the tenure of tie-up with DPA. A non-exhaustive list of Plastic Waste Collection and Recycling Agencies has been provided in Annexure III.

3.6. Obtaining Authorization/Clearance/License

The provisions under PWM Rules do not mandate PW generator to obtain any Authorization, Clearance or License.

3.7. Recommendations and strategies

- Avoid use of single use polyethylene (SUP) packaged bottles and other single use cutlery items at events, meetings, seminars etc. Reusable bottles and cutlery shall be encouraged. It is recommended to issue an office order in this regard to ensure compliance.
- Avoid any kind of packaging products made of SUPs.
- Display posters across various locations to avoid and minimize plastic usage especially SUPs.
- DPA shall tie up with GPCB recognized plastic waste collection and processing agency for recycling of its plastic waste.

3 Rs – Refuse, Reduce and Reuse shall be practiced for plastic waste minimization. It is responsibility of individuals in colonies and offices of DPA to limit the use of plastics in day to day lives by encouraging attitudes like carrying a cloth bag to markets, making use of stainless steel/earthen water bottles, making use of recyclable goods used in day to day lives etc. General Do's and Don'ts regarding plastic usage is as below:

Table 11 Do's and Don'ts regarding plastic usage

S. No.	Do's	Don'ts
1	Permit only use of plastic carry bags/ sheet/ or other with size >50µm	Use of <50 µm plastic carry bags/sheets
2	Practice use of Virgin plastic carry bags for storing/ packaging/ food stuffs.	Use of colored & recycled for storing/ packaging/ food stuffs.
3	Promote recycling of plastics 2-3 times before disposing it to landfill	Littering and unorganized dumping of PW

4	Segregation of PW from MSW	Mixing of PW with bio-degradable waste.
5	Recycling PW for use in co-processing in cement kilns, construction of roads etc.	Burning of PW in open.

- The Plastic Waste Management Amendment Rules, 2021, identified certain Single Use Plastics (SUPs) which have low utility and high littering potential for curbing pollution caused by littered and unmanaged plastic waste. The use of these SUPs as listed in Annexure II shall be strictly banned at all DPA premises.
- For the fourth R – Recycle – it is imperative that plastic waste is segregated from MSW.
- The following action points are recommended for effective plastic waste management system:

Table 12 Action points for effective plastic waste management

Sr. No.	Action points	Infrastructure/ actions required	Priority level
1.	Segregation of plastic waste from municipal solid waste	• Provision of separate bins for PW and MSW at households and offices • Segregation at proposed Material Recovery Facility	Immediate
2.	Setting-up of Plastic Waste Management system for safe collection, transport, recycling and disposal of PW.	• Engaging with GPCB registered PW recycling agency.	As soon as possible
3.	Create awareness among all employees and their families about their responsibilities towards minimizing the use of plastics.	• Through social media, campaigns, co-curricular school activities, hoardings etc.	As soon as possible
4.	Ensure that open burning of plastic waste is not permitted	• Constitution of Vigilance Squad	Immediate

- Community awareness is the best means to reduce and manage plastic waste. DPA should organize activities and competitions in its school and community gatherings to engage its residents especially children to create “Best out of Waste” items. A few ideas are given below:

	
Bird-feeder made of PET bottle	**Planter made of PET bottle**
	
Flower pot made of PET bottle	**Pen-stand made of PET bottles**
	
Sculpture made of PET bottles	**Eco-bricks made from plastic waste' filled in PET bottles**
	
Bench made from eco-bricks	**Brooms made from yarn made of PET bottles**

Figure 11: Best out of Waste

Chapter-4

E-WASTE

4.1. Applicable laws and rules

E-Waste (Management) Rules, 2022

4.2. Responsibility of DPA as per Rules:

Rule 8- Responsibilities of consumer or bulk consumer

Bulk consumers of electrical and electronic equipment listed in Schedule I shall ensure that e-waste generated by them shall be handed over only to the registered producer, refurbisher or recycler.

List of electrical and electronic equipment (E&EE) listed in Schedule I of the Rules are mentioned in the Training Manual.

4.3. Handling and Management of Waste

4.3.1. Identification, Quantification and Inventory of waste

A 'bulk consumer' means *"any entity which has used at least one thousand units of electrical and electronic equipment listed in Schedule I, at any point of time in the particular Financial Year and includes e-retailer"*. Based on this definition, DPA falls under the category of a bulk consumer. The E-waste inventory of Gandhidham, Kandla and Vadinar ports is tabulated below:

Table 13 E-waste inventory for DPA Ports

S.No.	Name of Port	Collection agency	E-waste	Quantity in nos.
1	Gandhidham, Kandla	Under process on MSTC portal	PC	121
			Printer	32
			CPU	40
			Monitor	41
			UPS	18
Total				**252 units**
2	Vadinar	*	Monitor	5
			CPU	3
			Typewriter	2
			Printer	13
			Fax	1
			Keyboard	10
Total				**34 units**
Total E-waste in storage at DPA				252+34 **= 286 Units**

** E-waste collected from Vadinar is sent to Gandhidham for onward disposal.*

4.3.2. Sources of waste:

Major sources of E-waste are Large Household Appliances, IT and Telecom and Consumer Equipment. At DPA, the E-waste to be managed is of IT and Telecom type generated from administrative and port offices at Gandhidham, Kandla and Vadinar. Another major source is E-waste generated from households in colonies.

4.3.3.Segregation

E-waste at Gandhidham AO is separately stored but there is no mechanism for its segregation at Gopalpuri colony. A methodology for E-waste segregation for DPA is covered in the Training Module.

4.3.4.Storage (on-site)

At Gandhidham AO, the discarded electronic equipments are stored at EDP store. The E-waste from Vadinar is brought to Gandhidham AO for onward disposal as per procedure. Currently 252 and 34 units of obsolete PCs, Monitors, Printers etc. at Kandla and Vadinar respectively are stored until the agency appointed through MSTC collects and channelizes the waste for environment-friendly disposal.

4.3.5.Collection

The responsibility of collecting the stored e-waste is of the agency appointed through MSTC portal. As an alternative to the MSTC portal, a non-exhaustive list of E-waste recyclers registered with GPCB is provided at Annexure V.

Figure 12: E-waste storage room at Vadinar

4.3.6.Disposal

The authorized agency appointed through MSTC is responsible for environment-friendly disposal of DPA's E-waste. As on June 2024, the list of scrap items to be disposed through MSTC

portal is attached at Annexure XI.

4.4. Record keeping

The E-Waste rules do not mandate any record keeping requirement for E-waste consumers however it is a good practice to collect receipts and maintain record of E-waste generated on-site and quantity collected by appointed Waste Management Agency. This is being done by Store Department at Gandhidham Administrative Office.

4.5. Procedure adopted for engagement of external agencies/private operators

DPA has entered in agreement with MSTC Ltd. Vadodara for selling / auction of all scrap items including e-waste. This agreement is valid till February, 2025 or until one of the two parties give 1-month notice in writing for termination of the agreement. DPA is in process to engage an E-waste collecting vendor through MSTC Ltd.

4.6. Recommendations and strategies

- It is recommended to maintain records of e-waste generated by them.
- DPA should consider the option of returning the end-of-life electronic items to the producer through its pick up or take back services or through its collection points.
- Create awareness at office as well as residential colonies regarding hazards and harmful environmental impacts of E-waste and not mix E-waste with general waste.

Chapter-5

Bio-medical Waste

5.1. Applicable laws and rules

Bio-Medical Waste Management Rules, 2016 and subsequent amendments in 2018 and 2019.

The biomedical wastes categories and their segregation, collection, treatment, processing and disposal options as per Schedule I of the Rules are specified in Annexure VI

5.2. Responsibility of DPA as per BMWM Rules:

- *It shall be the duty of every occupier (DPA) to*

- Take all necessary steps to ensure that bio-medical waste is handled without any adverse effect to human health and the environment and in accordance with the rules stated above.
- Make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste in colored bags or containers to ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals and the bio-medical waste from such place or premises shall be directly transported in the manner as prescribed in the rules to the common bio-medical waste treatment facility.
- Pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilization on-site and then sent to the Common bio-medical waste treatment facility for final disposal.
- Phase out the use of chlorinated plastic bags (excluding blood bags) and gloves
- Dispose of solid waste other than bio-medical waste in accordance with the provisions of respective waste management rules made under the relevant laws and amended from time to time.
- Avoid mixing of treated bio-medical waste with municipal solid waste.
- Provide training to all its health care workers and others, involved in handling of bio medical waste at the time of induction and thereafter at least once every year and the details of training programs conducted, number of personnel trained and number of personnel not undergone any training shall be provided in the Annual Report.
- Immunize all its health care workers and others, involved in handling of bio-medical waste for protection against diseases including Hepatitis B and Tetanus that are likely to be transmitted by handling of bio-medical waste
- Establish a Barcode System for bags or containers containing bio-medical waste to be sent out of the premises or for the further treatment and disposal
- Ensure segregation of liquid chemical waste at source and ensure pre-treatment or

neutralization prior to mixing with other effluent generated from health care facilities.

- Ensure treatment and disposal of liquid waste in accordance with the Water (Prevention and Control of Pollution) Act, 1974
- Ensure occupational safety of all its health care workers and others involved in handling of biomedical waste by providing appropriate and adequate personal protective equipments.
- In case of bedded health care units, maintain and update on day-to-day basis the bio-medical waste management register and display the monthly record on its website according to the bio-medical waste generated in terms of category and colour coding
- Report major accidents including accidents caused by fire hazards, blasts during handling of biomedical waste and the remedial action taken and the records relevant thereto to the prescribed authority and also along with the annual report; make available the annual report on the web-site; inform the prescribed authority immediately in case the operator of a facility does not collect the bio-medical waste within the intended time or as per the agreed time;
- In case of bedded health care facilities (any number of beds), make available the annual report on its web-site
- Maintain all record for operation of incineration, hydro or autoclaving etc., for a period of five years;

5.3. Handling and Management of Waste

5.3.1. Identification of sources and Quantification of waste

There are 3 healthcare facilities at Gandhidham and Kandla of which one is a 55 bedded hospital located in Gopalpuri colony and two dispensaries, one each at Kandla port and Adipur village.

There is one operational healthcare facility at Vadinar named Shree Samarpan Wellness Pvt Ltd.

Figure 13: Gopalpuri hospital at Gandhidham

The category wise waste generation details for the identified BMW sources is tabulated below:

Table 14 BMW generation at DPA HCFs

Sr. no	Name of the HCF	Category-wise BMW quantity in kg/month			
		Yellow	Red	White	Blue
DPA HCFs in Gandhidham/Kandla					
GPCB consented quantity as per BMW Authorization		250	170.3	15.5	98.1
Average BMW generated in kg/month					
1	Gopalpuri Hospital	47	30	1.6	33
2	Kandla dispensary	02	--	--	--
3	Adipur dispensary	0.5	--	--	--
HCF at Vadinar port area					

GPCB consented quantity as per BMW Authorization		**6.0**	**5.0**	**0.5**	**2.0**
4	Shree Samarpan Wellness Pvt. Ltd.	2.6	0.57	--	0.45

At Goaplpuri HCF the BMW quantity generated is within the consented quantity as per BMW Authorization provided by GPCB.

At Shree Samarpan Wellness Pvt Ltd. in Vadinar, the BMW quantity generated is within the consented quantity as per BMW Authorization provided by GPCB

5.3.2. Segregation:

Segregation at source into different colored bins for different category bio medical waste is imperative for efficient management of Bio-medical waste management system. Following are the observations for Gopalpuri hospital and HCF at Vadinar:

- Waste is being segregated at the point of generation of source.
- Needles and syringes are destroyed at the working desk or collected in puncture proof containers for treatment at CBWTF.
- Posters/ placards for bio-medical waste segregation are provided near bins and in waste storage area.
- Adequate number of colour coded bins / containers and bags are available at the point of generation of bio-medical waste.
- PPEs have been provided to the bio-medical waste handling staff.

Figure 14: Color-coded bins at Gopalpuri Hospital

Figure 15: Color-coded bins at Shree Samarpan Wellness Pvt. Ltd., Vadinar

5.3.3. Storage (on-site and centralized)

At Gopalpuri Hospital, a designated storage room for the generated BMW is provided. The Distormed Kutch Services Pvt. Ltd. directly collects the waste from this storage room. At Shree Samarpan Wellness hospital, Vadinar, the quantum of waste generated is less hence there is no

dedicated storage room.

Figure 16: Designated storage room for BMW at Gopalpuri Hospital

5.3.4. Collection and Intramural Transportation

Ward-wise collection and intramural transportation of BMW is done through trolleys and sent to designated storage room for storage until the waste is picked up the agency.

The GPCB authorized CBWTFs i.e Distormed Kutch Services Pvt. Ltd. and Dev Biomedical Waste Management Services for Gopalpuri and Vadinar respectively have been engaged for collection, transportation and disposal of BMW. The details are as below:

Table 15 Details of CBWTF appointed for DPA HCFs

Sr.no	Name of the CBWTF	Name of HCF
For Gandhidham and Kandla		
1	Distromed Kutch Services Pvt. Ltd.	Gopalpuri Hospital
2		New Kandla Port Hospital
3		Kandla Port Dispensary
Vadinar		
4	Dev Biomedical Waste Management Services	Shree Samarpan Wellness Pvt Ltd

The CBWTFs are responsible for collection, transport, processing, recycling and disposal of BMW. The CBWTFs are mandated to use the vehicles that are specially designed vehicles as per CPCB guidelines and are properly labeled with symbol indicating biohazard, for transporting BMW.

5.3.5. Disposal

The BMW is disposed by CBWTF in accordance with the norms and criteria prescribed in the BMW Rules and CPCB guidelines.

5.4. Record keeping

The Bio-medical Waste Management Rules, 2016 and subsequent guidelines prescribes the below requirements as far as record-keeping is concerned:

- Maintain category-wise records of bio-medical waste generation and its treatment disposal on a daily basis in Annexure VII: Format for Bio-Medical Waste Register / Record
- Category-wise quantity of waste generated from the facility must be recorded in Bio Medical Waste Register/logbook being maintained at the central waste collection area under the supervision of one designated person.
- A weighing machine as per the specifications given in CPCB guidelines for bar code system needs to be kept in central waste collection centre of the HCF having 30 or more than 30 nos. of beds for weighing the quantity of Bio Medical Waste.
- HCFs having less than 30 beds shall maintain records of receipts printed by the CBWTF.
- Records on Annual Report on bio-medical waste management and Accident Report including preventive and corrective actions taken by the HCFs in relation to such accidents shall be submitted to GPCB

- Records shall be maintained on training on BMW Management including both Induction and in service training records.
- Maintain records for Annual Health check-up and Immunization of all the employees.
- Records of testing of Effluent generated from health care facility
- Record of recyclable waste (plastic/glass) handed over to the authorized recycler in kg/annum. The records related to the handling of BMW by healthcare facilities needs to be retained for a period of five years.

The list of information and necessary formats for record keeping have been covered in the Training Manual for Bio-Medical Waste.

5.5. Procedure adopted for engagement of external agencies/private operators

The CBWTFs Association of Gujarat based on CPCB guidelines and in coordination with GPCB have earmarked regions/districts that each CBWTF can cater to. Based on which, no other agency except M/s Distromed Kutch Services Pvt. Ltd. can cater to Kutch district. Same is the case for Devbhumi Dwarka district (HCF at Vadinar). Hence DPA or any other HCF has no choice when it comes to selection of CBWTFs for these regions. All these agencies are registered with GPCB.

5.6. Obtaining Authorization/Clearance/License

Below table 16 lists the requirements for obtaining authorization under Bio-Medical Waste Management Rules, 2016.

Table 16 Requirements of obtaining authorization for HCFs as per BMW Rules

Type of HCF	Type of authorization	Granting authority	Validity	Applicability and status w.r.t DPA's HCFs
Bedded HCF	Fresh authorization and its timely renewal	GPCB	Validity in synchronization with the validity of: Consent under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution) Act, 1974	Both Hospitals at Gopalpuri and Vadinar are having valid licenses (BMW 364004 & BMW 361012). The licenses need to be updated from time to time as per the Act and applicable Rules.
Non-bedded HCF	One-time authorization*		Deemed valid until amendment sought	It, is applicable to Both the dispensaries at

				Kandla and Adipur and authorization should be done as per the rules.
HCFs situated within 75 km reach of CBWTF	Agreement with Common Bio Medical Waste Treatment Facility (CBWTF)	Monitored by GPCB	Generally, for 3 years or varies as per different CBWTF facility	Bedded HCF Both Hospitals at Gopalpuri and Vadinar are having valid agreements with the CBWTF for a period of one year. Non bedded HCF Both the dispensaries at Kandla and Adipur are having valid agreements with the CBWTF for a period of one year. However, all the bedded and non-bedded HCFs need to renew the agreements from time to time.
HCFs beyond 75 km reach from CBWTF but its operator willing to provide required services	Agreement with Common Bio Medical Waste Treatment Facility (CBWTF)			Not Applicable

***** In case there is any change or variance in relation to the activities of HCF, these HCFs have to apply for a fresh authorization to amend earlier authorization

5.7. Recommendations and strategies

At DPA HCFs, Bio-Medical Waste is managed in a sound manner. For further improvement of this system, following points are suggested:

- The substances in bio-medical waste might contain viable microorganism such as bacterium, virus, parasite or fungus that may cause disease in humans or animals.

Therefore, packaging of such bio-medical waste shall be done in triple packaging system comprising of three layers of packaging.

- Exhaust fans should be provided in the waste storage room for ventilation.
- The entrance to the storage room must be labelled with "Entry for Authorized Personal Only".
- DPA shall develop a separate page/web link in its website for displaying the information pertaining to their Gopalpuri hospital. The list of Information for updating on website is provided on Annexure VIII.
- HCF must ensure that a comprehensive health check-up of each employee and other staff involved in BMW handling is carried out at the time of induction and also as a mandatory procedure is followed every year for every employee.
- Concerned HCF authority shall ensure the occupational safety of the healthcare workers and other staff involved in handling of Bio medical waste in the healthcare facility.
- HCF shall impart training to the staff handling BMW in accordance with the Training Manual and maintain Training records in Annual Report (Annexure VII).
- Submit an annual report to the prescribed authority in Form-IV, on or before the 30th June of every year (Annexure VII) for each HCF.

Chapter-6

Construction and Demolition Waste

6.1. Applicable laws and rules

Construction and Demolition Waste Management Rules, 2016.

6.2. Responsibility of DPA as per various Conventions, Acts and Rules:

Rule 4-Duties of the waste generator

- Every waste generator shall prima-facie be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules.
- The generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately.
- Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work and keep the concerned authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis.
- Every waste generator shall keep the construction and demolition waste within the premise or get the waste deposited at collection center so made by the local body or handover it to the authorized processing facilities of construction and demolition waste; and ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains.
- Every waste generator shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities; Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall have to pay for the processing and disposal of construction and demolition waste generated by them, apart from the payment for storage, collection and Transportation. The rate shall be fixed by the concerned local authority or any other authority designated by the State Government.

6.3. Handling and Management of Waste

Since the construction / demolition work is contracted to a civil contractor by DPA, the entire responsibility of transportation, management and disposal of C&D waste lies with the contractor.

6.4. Procedure adopted for engagement of external agencies/private operators

Since the responsibility of handling C&D waste lies with the civil contractor, DPA does not engage any external agency for processing / disposal of C&D waste.

6.5. Recommendations and strategies

- Proper segregation of C&D waste should be practiced to avoid mixing with bio-degradable waste destined for MSW treatment facilities / landfill.
- Explore the possibility of reusing C&D waste materials in construction related activities (Refer Table), thereby decreasing the quantum to be landfilled.
- The Delhi government has issued an advisory on the use of products made out of recycled C&D waste by the Public Works Department (PWD). All Delhi government agencies will be required to incorporate a clause in their tenders that mandates use of a minimum of 2 per cent recycled products from construction waste in all future contracts for building works and 10 per cent recycled products for road works. (Ref. CSE August 26, 2015).
- Filling of low-lying areas, reclamation of land, trenches etc. should be done using C&D wastes.
- Necessary measures to control dust and fugitive emissions must be taken including:
  - Use of water sprinklers
  - Transportation of C&D wastes should be done in covered vehicles to prevent fugitive dust emission

Table 17 Potential uses of C&D waste

C & D waste	Potential use of C & D wastes
Concrete	The utilization of recycled aggregate is particularly very promising as 75% of concrete is made of aggregates.
Bricks	If deconstructed properly, bricks can be reused after removal of mortar. Broken bricks can be used for refilling or for manufacturing debris paver blocks or debris blocks.
Stone	Stone can be reused for plinth formation, masonry construction, landscape purpose, ledges, platforms, window sills, coping etc. depending upon the form of available stones.
Timber	Timber elements from deconstructed building may have aesthetic and antique value. **Opportunity:** Whole timber arising from construction and demolition

	works can be utilized easily and directly for reused in other construction projects after cleaning, de-nailing and sizing.
Plywood and other timber based boards	Plywood and other timber-based boards can be either reused for interior works in new construction or it can be recycled for manufacturing of timber-based boards.
Gypsum	In India, over 10 about of waste gypsum such as phosphor-gypsum, Fluro-gypsum etc., are being generated annually. **Opportunity:** Plaster developed from this waste gypsum has showed improved engineering properties without any harmful effect. Phosphor-gypsum and lime sludge can be recycled for manufacture of Portland cement, masonry cement, sand lime bricks, partition walls, flooring tiles, blocks, gypsum plaster, fibrous gypsum boards, and super-sulphate cement.
Metals & metal alloys-	Ferrous Metals are the most profitable and recyclable material. Scrap steel is almost totally recycled and allowed repeated recycling. Structural steel can be reused as well as 100% steel can be recycled to avoid wastage at construction site. **Advantage:** Generally sold to a scrap metal dealer at a specified price. Metals like scrap iron can be mixed with the virgin metal in the foundry. In India more than 80% scrap arising is recycled.
Nonferrous metal	The main nonferrous metal collected from construction and demolition sites are aluminum, copper, lead and zinc. **Opportunity:** In India aluminum and copper are recycled and are valuable resources
Debris	Construction debris can be recycled to manufacture paver blocks which can be used in light traffic areas and masonry blocks. Other uses of processed debris include use in lean concrete for leveling purpose, as mortar for masonry, as bedding mortar for pavement tiles and used for land filling materials is comparable with new materials.
Composite materials	The plastic wastes are best for recycling if these materials are collected separately and cleaned. Recycling is difficult if plastic wastes are mixed with other plastics or contaminants. Plastic may be recycled and used in products specifically designed for the utilization of recycled plastic, such as street furniture, roof and floor, PVC window noise barrier, cable ducting, panel.

Chapter-7

Shipping Waste

7.1. Applicable laws and rules

The list of international and local legislations applicable to the ports (Port at Kandla and Vadinar) managed by Deendayal Port Authority (DPA) are listed below:

1. MARPOL 73/78 – Consolidated Edition 2002
2. MARPOL 73/78 – Consolidated Edition 1997.
3. Indian Ports Act 1908 (Act No. 15 of 1908)
4. The Merchant Shipping Act 1958 (Act No. 44 of 1958) (2000)
5. International Convention on the Control of Harmful Anti-fouling Systems on Ships
6. Ballast Water Management Convention
7. The Environment (Protection) Act, 1986 and the Environment (Protection) Rules 1986
8. Hazardous and Other Wastes (Management & Handling) Rules, 2016
9. Annex VI of MARPOL 73/78 – Regulation for the Protection of Air Pollution from ships & MOX Technical code.
10. Provision concerning the Reporting of incidents involving harmful substances, under MARPOL 73/78 (1999 Edition)
11. SOLAS consolidated Edition 2001.
12. The Water (Prevention and Control of Pollution) Act, 1974 and Rules 1975
13. The Major Port Trust Act

7.2. Definitions

Important terminologies reflecting in MARPOL documents and other related to shipping wastes have been produced below for ready reference:

1 **Waste from ships** means all waste, including cargo residues, which is generated during the service of a ship or during loading, unloading and cleaning operations and which falls within the scope of Annexes I, II, IV, V and VI to MARPOL Convention, International Convention for the Control and Management of Ships Ballast Water and Sediments (BWM Convention), International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), as well as waste such as expired medicines, pyrotechnics etc.

2 **Port Reception Facility, (PRF)** means any facility which is fixed, floating or mobile and capable of providing the service of receiving the waste from ships;

3 **Port Authority:** Organizations, either public or governmental, that manages the operations of a port, in whole or part.

4 **Cargo residues**: remnants of any cargo material which are not covered by Annexes I, II, IV and VI of the MARPOL convention and which remain on the deck or in holds following loading or unloading, including loading and loading excess or spillage, whether in wet or dry conditions or entrained in wash water but not including cargo dust remaining on the deck after sweeping or dust on the external surfaces of the ship. Dry bulk cargo residues may include substances that are harmful to the marine environment.

5 **Grey water** means drainage from dishwater, shower, laundry, bath and washbasin drains. It does not include drainage from toilets, urinals, hospitals and animal spaces, as defined in regulation 1.3 of MARPOL Annex IV (sewage) and drainage from cargo spaces. Grey water is not considered garbage in the context of MARPOL Annex V.

6 **E-waste**: means electrical and electronic equipment used for the normal operation of the ship or in the accommodation spaces, including all components, subassemblies and consumables, which are part of the equipment at the time of discarding, with the presence of material potentially hazardous to human health and the environment.

7 **Garbage**: means all kinds of food wastes, domestic wastes and operational wastes, all plastics, cargo residues, incinerator ashes, cooking oil, fishing gear, and animal carcasses generated during the normal operation of the ship and liable to be disposed of continuously or periodically except those substances which are defined or listed in other Annexes to the MARPOL Convention. Garbage does not include fresh fish and parts thereof generated as a result of fishing activities undertaken during the voyage, or as a result of aquaculture activities which involve the transport of fish including shellfish for placement in the aquaculture facility and the transport of harvested fish including shellfish from such facilities to shore for processing.

8 **Anti-fouling system** means a coating, paint, surface treatment, surface, or device that is used on a ship to control or prevent attachment of unwanted organisms.

9 **Ballast Water** means water with its suspended matter taken on board a ship to control trim, list, draught, stability or stresses of the ship.

10 **Sediments** means matter settled out of Ballast Water within a ship.

7.3. Responsibility of DPA as per various Conventions, Acts and Rules:

This section details the regulatory requirements for Ports mandated under MARPOL, Anti Fouling Convention, Ballast Water Management Convention and Merchant Shipping Act and Rules.

7.3.1. Regulatory Requirements under MARPOL

i. **Regulation 38 of Annex I:** In Annex I, strict requirements are outlined for the storage and discharge of oil from ships. These covers wastes like Oily bilge water, Oil residues, Oil tank washings, Dirty Ballast water, Scale and sludge from tank cleanings. According to Annex I Regulation 38, Parties to the Convention are required to provide facilities for receiving oily mixtures in the following ports:

- All ports and terminals where crude oil is loaded into oil tankers that have completed a ballast voyage of not more than 72 hours or 1,200 nautical miles before arrival.;
- All ports and terminals where oil other than crude oil in bulk is loaded at a rate of more than 1,000 tonnes per day on average;
- All ports having ship repair yards or tank cleaning facilities which are crucial for conducting efficient and safe maritime operations;
- All ports and terminals that are involved in the handling of ships must possess oil residue (sludge) tanks that comply with regulation 12 of Annex I;
- All ports with regard to oily bilge waters and other wastes that cannot be discarded in accordance with Regulations 15 and 34 of Annex I; and
- All bulk cargo loading ports for combination carriers' oil residues that are not permitted to be discharged in accordance with Annex I's regulation 34.

ii. **Regulation 12 of Annex IV** states that all Party States have to ensure adequate facilities in ports and terminals for receiving wastewater/sewage without causing delays for ships, which are adequate to serve the needs of the ships.

iii. **Annex V** This section mentions the provision of a port recycling program for separating recyclable from non- recyclable garbage. The segregation practices on ship should match the requirements of the recycling program of the port. Information concerning recycling programs and their requirements should be passed to the ships. This makes the re-use or recycling of the waste streams effective.

iv. **Regulation 17 of Annex VI:** According to this provision each Party shall undertake to provide facilities for the reception of ODS or equipment containing such substances, washing water from scrubbers and sediment from treatment plants on board. Ports shall provide to meet for:

- Ships utilizing its repair ports are required to receive ODS and equipment containing such substances when they are removed from the ships for repairs

- Ships using its ports, terminals, or repair ports for the purpose of receiving exhaust gas cleaning residues from an exhaust gas cleaning system;

7.3.2. Regulatory requirements under Anti-Fouling Convention

- A party shall take appropriate measures to ensure that wastes from the application or removal of an anti-fouling system are collected, handled, treated and disposed of in a safe and environmentally sound manner to protect human health and the environment.

7.3.3. Regulatory requirements under Ballast Water Management Convention

- Party shall ensure that, in ports and terminals where cleaning or repair of ballast tanks occur, adequate facilities are provided for the reception of Sediments, such reception facilities shall operate without causing undue delay to ships and shall provide for the safe disposal of such Sediments that does not impair or damage their environment, human health, property or resources or those of other States

7.3.4. Regulatory requirements under Merchant Shipping Act, 1958

i. **Section 356-I** states that the powers of the port authority shall include the power to provide reception facilities. However, where the Central Government is satisfied that there are no reception facilities at any port in India or that the facilities available at such port are not adequate for enabling ships calling at such port to comply with the requirements of the Convention, the Central Government may, after consultation with the port authority in charge of such port, direct, by order in writing, such authority to provide or arrange for the provision of such reception facilities as may be specified in the order. **Chapter VI of Merchant Shipping (Prevention of Pollution by Oil from Ships) Rules, 2010** deals with reception facilities and the requirements related to provision of reception facilities, in line with MARPOL Annex I requirements.

ii. **Chapter VIII** of Merchant Shipping (Control of Pollution by Noxious Liquid Substances in Bulk) Rules, 2010 deals with reception facilities and the requirements related to provision of reception facilities are in line with MARPOL Annex II requirements.

iii. **Rule 9 of Merchant Shipping (Control of Anti-fouling System) Rules, 2016** states that the waste from the application or removal of anti-fouling system are collected, handled, treated and disposed of in a safe and environmentally sound manner in accordance with Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 as notified by the

Central Government in the Ministry of Environment and Forests, vide notification number S.O. 2265 dated the 24th September, 2008".

7.3.5. Regulatory requirements under The Hazardous and Other Wastes Management Rules, 2016

I. DPA shall be responsible for safe and environmentally sound management of hazardous and other wastes.

II. The hazardous and other wastes generated and received at DPA Ports shall be sent or sold to an authorized actual user or disposed of in an authorized disposal facility.

III. The hazardous and other wastes shall be transported from DPA Ports to an authorized actual user or to an authorized disposal facility in accordance with the provisions of the rules.

IV. If DPA intends to get its hazardous and other wastes treated and disposed of by the operator of a treatment, storage and disposal facility shall give to the operator of that facility, such specific information as may be needed for safe storage and disposal.

V. DPA shall take all the steps while managing hazardous and other wastes to-

a) contain contaminants and prevent accidents and limit their consequences on human beings and the environment; and

b) provide persons working in the site with appropriate training, equipment and the information necessary to ensure their safety.

7.3.6. Regulatory Requirement under The Plastic Waste Management Rules, 2016

I. Take steps to minimize generation of plastic waste and segregate plastic waste at source

II. Not litter the plastic waste and ensure segregated storage of waste at source and handover segregated waste to agencies appointed for collection of waste.

7.4. Handling and Management of Waste

At every port, for provision of waste collection from ships, its storage, treatment and disposal, an authorized official is appointed to whom the captain of the ship could get in touch regarding wastes generated on the ship.

The captains of the ships that embark at the ports intimates the authorized agencies engaged by DPA for collection of Hazardous and Non-hazardous wastes generated by the ships. This communication is facilitated through Swachh Sagar Portal. There are 22 such agencies, 11 for

collection of Non-hazardous wastes and other 11 for collection of Hazardous wastes received at the Kandla and Vadinar ports. These agencies are listed in Table 4 in subsequent section.

7.4.1.Source Identification, Quantification and Inventory of waste at Kandla & Vadinar

The shipping waste being received at the ports of Kandla and Vadinar from the ships have been categorized based on the waste categories identified under below tabulated Law/Rule/Convention.

Table 18 General type and source of wastes generated on ships

Law/ Rule/ Convention	Category	Source and Type of waste
MARPOL	Annexure I	Oily bilge water, Oil residues (Sludge), Oil tank washings, Dirty ballast water, Scale and sludge from tank cleanings.
	Annexure II	Category X, Y Z and Other of Noxious Liquid Substances discharged from tank cleaning or de-ballasting operations
	Annexure IV	Sewage that includes drainage and other wastes from any form of toilets and urinals; drainage from medical premises via wash basins, wash tubs and scuppers located in such premises; drainage from spaces containing living animals; or other waste waters when mixed with the drainages defined above
	Annexure V	All kinds of garbage like Plastics, Food wastes, Domestic wastes, cooking oil, Incinerator ashes, Operational wastes, Cargo residues, Animal carcass(es), Fishing gear, E-waste
	Annexure VI	Ozone-depleting substances (ODS) as defined in Montreal Protocol of 1987. Major sources of ODS are refrigeration equipment; air conditioning equipment and fire extinguishing equipment.
Anti-fouling system	Article 5	coating, paint, surface treatment, surface, or device that is used on a ship to control or prevent attachment of unwanted organisms
Ballast Water Management Convention	Article 5	Matter settled out of Ballast Water
HOWM Rules, 2016	Schedule I	Used Spent Oil (Category 5.1) Waste Residue Containing Oil (Category 5.2)

The inventory of Hazardous as well as Non-hazardous waste generation at Kandla and Vadinar ports for 2022-23 is presented in below Table 19. The generated waste has also been categorized

as per the categorization under MARPOL and applicable national legislation i.e., Hazardous Waste Management Rules, 2016.

Table 19 Type and quantum of waste generated at DPA ports

Sr.no	Waste Generated	Waste categorization as per		Waste Generated (MT/ year) during FY 2022-23	Disposal
		HWM Rules	MARPOL		
Hazardous waste quantum received at Kandla and Vadinar ports					
1.	Sludge oil, Used Spent Oil, Slop/Sludge	5.2	Annex I	13,736.37	Collected by authorized agency
2.	Waste Residue containing Oil	5.1	Annex V		
Non-hazardous waste quantum received at Kandla and Vadinar ports					
3.	Garbage including Soild waste, Mooring rope, Drums, Wood etc.	-	Annex V	2,473.19	Collected by authorized agency

The total quantity of Hazardous waste received at Kandla and Vadinar ports per year is 13736.37 MT/year and DPA has a tie-up with agencies for handling Hazardous waste that collectively have GPCB authorization for handling of more than 20,000 MT of waste. Thus, DPA ports have enough provision to cater to the shipping wastes received at its ports.

Similarly, total quantity of Non-hazardous waste received at Kandla and Vadinar ports per year is 2473.19 MT against which the agencies engaged by DPA have a collective provision to cater 2,00,000 MT of waste, thus there is surplus provision to handle non-hazardous waste as well.

7.4.2.Collection, Transport, Processing and Disposal

DPA has a tie-up with 22 agencies that are responsible for management of shipping waste generated from both, Kandla and Vadinar ports. All these agencies are authorized by GPCB for handling of wastes. 11 agencies deal with non-hazardous waste and rest 11 with hazardous waste. Collection, handling, transport and disposal of wastes is the responsibility of these agencies which are listed below.

Table 20 List of Waste Management Agencies operating at Kandla and Vadinar ports

Sr. no	Name of waste collecting agency	Address/Contact of the Agency	Type of waste collected	Name of waste with category	Waste category as per MARPOL	Valid up to
1	**M/S. Harish. A. Pandya***	16, Brahm samaj bldg., Plot No. 106, Sector-8, B/H Oslo Cinema, Gandhidham Kutch Gujarat-370205. **Mobile**-9426218125, 8000008999 **E-mail**-info@harishpandya.com	Haz	Waste Residue containing oil (5.1) Used Spent Oil (5.2)	Annexure I	30-05-2023
			Non Haz	Garbage	Annexure V	
2	**M/S. Chitrakut Trading & Industries ***	**Factory Address:** 56 to 63 Survey No. 323/1, 323/2, Ghanshyam Park, Village: Kukma Tal: Bhuj (Kutch) Guj. India. **Postal Address:** 15, Brahm Samaj Building, Plot No. 106, Sector No. 8, B/H Oslo Cinema, Gandhidham (Kutch) India. **Mobile no**-+919426218125 **E-Mail** -info@chitrakutshippingservices.com	Haz	Waste Residue containing oil (5.1) Used Spent Oil (5.2)	Annexure I	-
			Non Haz	Garbage, Waste Scrap, Mooring rope, Empty Drums		
3	**Vishwa Trade Link Inc.**	Plot No. 170/2/A, T.P.-3, Anjar (Kutch), Gujarat -370110	Haz	Waste Residue containing	Annexure I	03-11-2023

				oil, Used Spent Oil		16-11-2022
			Non Haz	Scrap, Dunnage Wood, Garbage other (Dry, Solid, Ordinary, Non-hazardous) Wet Garbage	Annexure V	
4	**Revolution Petrochem LLP. ***	Office No. C-214, 2nd Floor, Shop no. 234-235, Kutch Arcade "Platinum", Mithirohar, Gandhidham-370201 **Mobile no**: 98795955087 **E-mai**l: revolutionpetrochem@gmail.com	Haz	Waste Residue containing oil (Haz waste/waste oil/sludge) Used Spent Oil	Annexure I	31-03-2023
			Non Haz	1) Container, Scrap, Dunnage Wood, Garbage other (Dry, Solid, Ordinary, Non-hazardous) 2) Wet Garbage	Annexure V	
5		Office No. 2, Plot no. 106, Sector 8,	Haz	Used Oil	Annexure I	-

	Omega Marine Services	Braham Samaj Building, Gandhidham, Kutch Gujarat 370201 **Mobile no**: +919537329203, 9727589185 **E-mail:** operations@omegamarineservices.com, omegamrn@hotmail.com, accounts@omegamarineservices.com	Non Haz	1) Dry garbage 2) Wet Garbage	Annexure V	
6	**United Shipping Company**	Plot no 42, 2nd floor. Opp. Old Court, Sector 1/A. Gandhidham, Kutch **T:** +912836226555 **E-mail:** unitedshipping46@gmail.com	Haz	Waste Residue containing oil (5.1 Sludge oil) Used spent oil (5.2)	Annexure I	
			Non Haz	Dry garbage	Annexure V	
7	**Green Earth Marine Solutions***	Office No. 202, Plot No. 578, Ward 12-C, Shakti Avenue, Gandhidham, (Kachchh) GUJARAT -370201 **Mobile no**: 9537824948 **E-mail:** operation@greenearthmarine.com	Haz	Used Oil (nil)	Annexure I	
			Non Haz	Dry Garbage, Scrap Dunnage, Wood garbage, Other (nil)	Annexure V	
8	**New India Marine Works ***	Plot no:16, Sector 10A, Industrial Area OSLO GIDC, Gandhidham KUTCH-370201 **Mobile no:** +919879072262 **E-mail:** sludgeoil16@yahoo.in	Haz	Waste Residue containing oil (5.1 Sludge oil)	Annexure I	19-02-2024
9	**Naaz Shipping Service**	Office no-35, 1st Floor GMA building, Plot no-297, Ward no-12/B, Grain	Haz	1) Waste Residue containing oil	Annexure I	31-07-2023

	Enterprise *	Merchant Association Building, Nr Old Court Gandhidham **Mobile no:** 9825724120, 9427277088 **E-mail:** naazshippingservice@yahoo.com nasir.khan685@gmail.com		2) Used Spent Oil		
			Non Haz	1) Dry Garbage- Scrap Dunnage Wood Garbage other 2) Wet Garbage	Annexure V	
10	**Alicid Organic Industries Ltd***	207/208, Hanumant Henduva, Opp Gujcomasal, near Khari River Highway, Post- Palavasana, Mehsana -02 (Gujarat) **Mobile no:** 9825604120 **E-mail:** alicidorganic@gmail.com	Haz	1) Waste Residue containing oil 2) Used Spent Oil	Annexure I	05-01-2024
			Non Haz	1) Dry Garbage- Scrap Dunnage Wood Garbage other(nil) 2) Wet Garbage	Annexure V	
11	**Shana Oil Process**	New Good Luck Market, nr Aksha Masjid, Chandola Lake, Narol Road, Ahmedabad-3800028 **Mobile no:** +919824286952, +919879986952 **E-mail:** shanaoil0891@gmail.com	Haz	1) Waste Residue containing oil 2) Used Spent Oil	Annexure I	05-01-2024
			Non Haz	1) Dry Garbage- Scrap Dunnage Wood Garbage other (Dry, Solid, Ordinary, Non-hazardous) 2) Wet Garbage	Annexure V	
12		Kidana Nirmal Nagar, Survey no 133, Plot	Haz	1) Waste Residue	Annexure I	30-05-2023

	Golden Shipping Services*	no 83, Gandhidham-Kutch, Gujarat **Mobile no**: 9638808551 **E-mail**: bharat.ahir8686@gmail.com		containing oil (5.1) 2) Used Spent Oil (5.2)		
			Non Haz	1) Dry Garbage-Scrap Dunnage Wood Garbage other	Annexure V	
13	**K M Enterprise ***	Plot no-13, Sector-8, Near BM Petrol Pump, Opp. Sharma Motors, Gandhidham, Kutch **Mobile no:** 9510514287, 9879986952 or Shop No. 2, Plot No. 16, Sector 1/A, Shakti Nagar Road, Gandhidham-Kutch **Mobile no:** 8141380555 **E-mail:** kmenterprisekandla@gmail.com	Haz	1) Waste Residue containing oil 2) Used Spent Oil	Annexure I	
			Non Haz	1) Dry Garbage-Scrap Dunnage Wood Garbage other (Dry, Solid, Ordinary, Non-hazardous) 2) Wet Garbage	Annexure V	
14	**Atlas Organics Pvt. Ltd.**	Office 204/206, Ellis Bridge Shopping Center, Opp. Town hall, Ashram Road, Ahmedabad - 380006 Mobile no: +919909723532, +918980989015 Email id: atlasorganics@yahoo.com info@sludgeoilindia.com	Non Haz	1) Dry Garbage-Scrap Dunnage Wood Garbage other 2) Wet Garbage	Annexure V	
					Annexure V	
15	**Glorious Marinefuels Pvt. Ltd.**		Haz	1) Used oil 2) Waste oil	Annexure I	

16	**Priyansi Corporation**	C1 804-8096, GIDC, BAMANBORE, TA: CHOTILA, DIST-SURENDRANAGAR **MOBILE NO:** 9825226095, 9825785270 **E-mail::** operation.priyansicorporation@gmail.com	Haz	Sludge oil (5.2)	Annexure I	21/04/2024
17	**Amar Hydrocarbon Pvt. Ltd ***	FF-12, Sahara Complex, B/h, Navajivan Hotel S.G. Highway, Sarkhej, Ahmedabad – 3822210 **Mobile no:** 9328334205 **E-mail:** operations@amarhydrocarbon.com amarhydrocarbon@gmail.com	Haz	1) Used oil 2) Waste oil	Annexure I	30/06/2024
18	**Aditya Marine Ltd**	Room no 11,12,13, Dhiraj Chambers, Plot No. 36, Sector 9/A, Gandhidham, Kutch 37020, Gujarat, India email: info@adityamarine.com Phn no: +912836222053	Haz	1) Used oil 2) Waste oil	Annexure I	-
19	**Fine Refiners Pvt. Ltd.**	Plot no. 40, Vartej GIDC, Tal. Bhavnagar, Dist. Bhavnagar	Haz	1) Used oil 2) Waste oil	Annexure I	30/09/2022
20	**Mahalaxmi Asphalt Pvt. Ltd.**	Survey no. 343, Village: Bandhadi, Tal. Bhachau, Dist. Kutch	Haz	Waste oil	Annexure I	21/09/2027
21	**M/s. Kutch Energies Pvt. Ltd.**	Plot no. 72, shop no. 1,2,3 and 4, Hotel Bansal Building, Sector- 9/C, Gandhidham, Kutch.	Haz	Sludge	Annexure I	27/03/2025

		Email: shree_shree_in2004@yahoo.com Mob. 9998237716 9879072262				
22	**M/s. Bhavya Engineering Works and Multiservices**	Near Tee Bhanushali nagar, Bhuj-Kutch-370001 Email: bhavyaengineeringworks21@gmail.com Mob. 9427704592 9824682718	Non Haz	Garbage	Annexure V	27/05/2025

Waste agencies also operating at Vadinar port

7.4.3.Storage:

The shipping waste of ships calling at DPA ports is directly picked up by Waste Management Agencies in timely manner hence there is no requirement and provision for storage of waste on-site

7.4.4.Intramural transportation

Intramural transportation of any kind of waste is not required as the agency collects the waste from the ships directly, offloads and transfers it through agency's vehicle itself.

7.5. Record keeping

As per HWM Rules, 2016,

a. DPA Ports shall maintain a record of hazardous and other wastes received at ports and collected from port by WMA in a specified Form 3

b) Prepare an annual return containing the details specified in a specified Form 4 and submit it to the Gujarat Pollution Control Board on or before the 30th June following the financial year to which that return relates.

The guidelines for filling of Forms as mandated under the HOWM Rules have been covered in detail in Training Manual.

7.6. Procedure adopted for engagement of external agencies/private operators

DPA has appointed 22 Waste Management Agencies for management of its shipping waste management. It yearly renews the contract of these agencies. The selection criteria of the WMA, as followed by DPA includes:

- The agency dealing in Hazardous wastes shall hold a valid authorization from GPCB
- The agency shall obtain No Objection Certificate (NOC) from DPA customs department and Public Health Officer, Kandla
- The agency shall have required equipments and incinerator installed for environmentally sound management of wastes.
- The waste shall be collected, transported and disposed in timely manner
- The agency should be certified as collector, transporter and actual user. Further uploading on Swachh Sagar Portal with be in-line with entries of hazardous waste collected from each ship to be made in relevant Form (3) and to be uploaded on Swachh Sagar Portal. Form 4 maintained by occupier and pages of passbook required to be maintained by actual user to be uploaded on Swachh Sagar portal annually by 30th June every year.

7.7. Obtaining Authorization/Clearance/License

- DPA is required to and has obtained authorization under Hazardous and Other Waste Management Rules, 2016 from the Gujarat Pollution Control Board as an occupier. The details of Authorization obtained by DPA from GPCB are given below:

Table 21 Details of Authorization

Consent order no.	Date of Issue	Validity	Hazardous waste (HW) at the ports	Consented quantity of HW MT/year
AWH-110594	22/01/2021	21/07/2025	Used spent oil	4250
			Waste residue containing oil	8500

7.8. Recommendations and strategies

- Various types of garbage are received at ports from ships. These wastes differ in type, size and hazardousness. It is recommended that a port recycling program be developed for sustainable management of shipping garbage. The garbage can be segregated into streams like:
  - **Non-recyclable**; Plastics and plastics mixed with non-plastic garbage
  - **Recyclable**: Cooking oil, glass, wood, metal, paper, cardboard, Styrofoam plastic etc.
  - **Potentially Hazardous garbage**: oily rags, light bulbs, acids, batteries, chemicals, medical waste etc.

- **E-waste generated on ships**: electronic cards, gadgets, instruments, equipment, computers, printer cartridges, etc.

- Information of such recycling programs and their requirements should be communicated to the ships. This would enhance the reuse or recycling of the waste streams.
- A procedure for annual assessment should be put in place to assess the need for capacity expansion in terms of employment of various agencies for waste collection, taking into account possible changes in traffic in the upcoming years and data collected from Swachh Sagar portal.
- DPA should formulate and disburse a document describing the procedures for advance notification by ships in accordance with Swachh Sagar requirements and the reception and collection of waste from ships through the Swachh Sagar Portal.
- DPA should have in place the procedure followed for approval and re-approval of agencies for Hazardous waste, taking into account the points mentioned below:

i. The waste receipts shall be collected from each agency which should contain particulars regarding the type and quantity of the waste substances, the means of transport and details regarding the producer or generator, carrier and party attending to the disposal. In this manner, the route taken by the waste material becomes evident step by step for the competent authorities and also for the companies involved.

ii. A storage facility should be provided at port area as a provision of waste storage on account of untimely waste collection by the agencies. These areas should be such that they do not create unhygienic and insanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely:

- Storage facilities shall be created and established by taking into account quantities of waste generation and densities. A storage facility shall be so placed that it is accessible to users; Its design should be such that the wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly.
- Storage facilities or bins shall have 'easy to operate' design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black.
- Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers.

- The vehicles used by the agencies for transportation of wastes to authorized processing facilities shall be covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering.
- The storage facilities set up shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing.
- Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.
- In case the agency responsible for disposal do not provide a receipt of waste collected from transporter, a means for tracking transporting vehicle shall be employed.
- In case of oil spill accidents provisions stated in Oil Spill Management Plan shall be strictly adhered to

- Specific recommendations for waste categories defined under MARPOL are as below:

MARPOL Annexures	**Recommendations**
Annex I	Oily-water mixture collected from an incident to be transferred directly to Reception Facility Area for storage and disposed through Port authorized recycler
	The Waste material containing oil like oil-soaked rags, overalls, sand, saw dust, absorbent pads, absorbent booms etc., collected during an Incident to be disposed to the authorized recycler for incineration
	The authorized recycler must take the permission from the Port and Custom for the disposal of Waste material containing oil etc. generated from an oil spill incident
	The authorized recycler must submit the detailed information on authorized GPS vehicle and details of authorized drivers.
	After collecting the material, the authorized recycler must declare to the Port and Custom as per category of Hazardous waste management rules 2016 schedule I along with Quantity
	E-manifest entries and Form-10 will be generated and it shall be given to authorized recycler for transportation.
	After the incineration the final disposal certificate and pass book copy for the same to be submitted to DPA
	The following documents has to be submitted by the authorized recycler Drive, License Number Vehicle fitness letter Emission certificate

	GPS Number Weigh bridge receipt Form-10 Final Disposal Certificate
Annex V	Through Swachh Sagar Portal, the master/ steamer agent on behalf of vessel to intimate the garbage collecting agency approved by the Port for collection of garbage about the category of waste in order to arrange necessary receptacles and vehicles for proper collection without undue delay.
	On the request from the vessel, the garbage collecting agency has to obtain necessary permission from the Port Authority & Customs for each vessel in order to board the vessel for collection of garbage in each case.
	The garbage should be collected by the designated Agency duly following the terms and conditions of the work order issued by the Port and Segregation of the garbage to be carried out as per the Municipal Solid Waste Rule, no mixing of garbage is allowed at any point of time.
	The copy of waste delivery receipt to be submitted/forwarded to the concerned department after collection of garbage from each and every ship.
	Copies of the Waste Delivery Receipt, Permission letter obtained from the Port/Customs and any other documents as required at the gate are to be produced while going out from the Port.
	The Garbage Collecting Agency of the Port shall provide copies of following to the Port: Permission letters issued by the port/customs for clearing of waste/garbage along with type and quantity. Waste Delivery Certificate signed by the Master of the vessel and issued to the vessel.
Annex V	Through Swachh Sagar Portal the master/ steamer agent on behalf of the vessel to intimate the collecting agency designated by the Port for collection of wastes such as used cooking oil, expired medicine, Fishing Gear, e-waste and used batteries in order to arrange necessary receptacles and vehicles for proper collection before vessel berthing.
	On the request from the vessel, the collecting agency has to obtain necessary permission from the Port & Customs for each vessel in order to board the vessel for collection of cooking oil, expired medicine, Fishing Gear, e-waste and used batteries.
	A standard format of waste delivery receipt provided by the D.G. Shipping to be filled up and signed by the vessel and garbage collecting

	agency for collection of used cooking oil, fishing gear, expired medicine, e-waste and used batteries.
	The copy of waste delivery receipt to be submitted/forwarded to the concerned department by the collecting agency soon after collection for every ship.
	Fishing Gear, used cooking oil, E-waste and used batteries has to be declared to the Customs. Collecting agency has to obtain the bill of entry with applicable duty paid if any or otherwise declaration of customs may be submitted to the concerned department.
	Copies of the Waste Delivery/ Receipt, Permission letter obtained from the Port/Customs and any other documents required at the port gate are to be produced while going out from the Port.

7.8.1 Provision of an Effluent Treatment Plant (ETP)

An effluent treatment plant (ETP) is proposed to be installed at the port to treat the following types of wastes / effluent:

- Wastewater, waste oil or any liquid waste from any ship (Only in case of exigency situation when the waste collection agency is unable to collect waste timely resulting the ship to remain docked and causing delays)
- Effluents from proposed Green Hydrogen plants (salts, waste from electrolysis etc.)
- Waste oil from routine maintenance of tugs, cranes, crafts etc.

The following unit operations and processes are proposed for the ETP:

1. Preliminary Treatment

- **Screening**: to remove large particles and debris from the wastewater.
- **Equalization Tank**: to balance the flow rate and homogenize the wastewater composition as two streams of wastewater from the ships/port and Green Hydrogen unit are to be treated in the ETP.
- **Dissolved Air Flotation (DAF)**: for oil removal

2. Primary Treatment

- **Neutralization**: Use acid dosing (e.g., hydrochloric acid) to neutralize the high pH caused by alkaline salts.

- **Coagulation and Flocculation**: Adding coagulants (like aluminum sulfate) to agglomerate suspended particles and trace metals.

3. Secondary Treatment

- **Chemical Precipitation**: Adding agents (such as lime or sulfides) to precipitate heavy trace metals like nickel, iron, and chromium.
- **Sedimentation**: Settling tanks to remove the precipitated metals and other suspended solids.

4. Tertiary Treatment

- **Reverse Osmosis (RO) or Electrodialysis**: to reduce TDS and conductivity. These processes will help in removing dissolved salts and metals.
- **Deaeration:** To remove dissolved gases like oxygen and hydrogen, typically using vacuum deaeration or stripping.

5. Advanced Treatment

- **Ion Exchange:** To further remove specific ions (e.g., Na+, K+).
- **Adsorption (Activated Carbon):** For any remaining organic contaminants or trace metals.

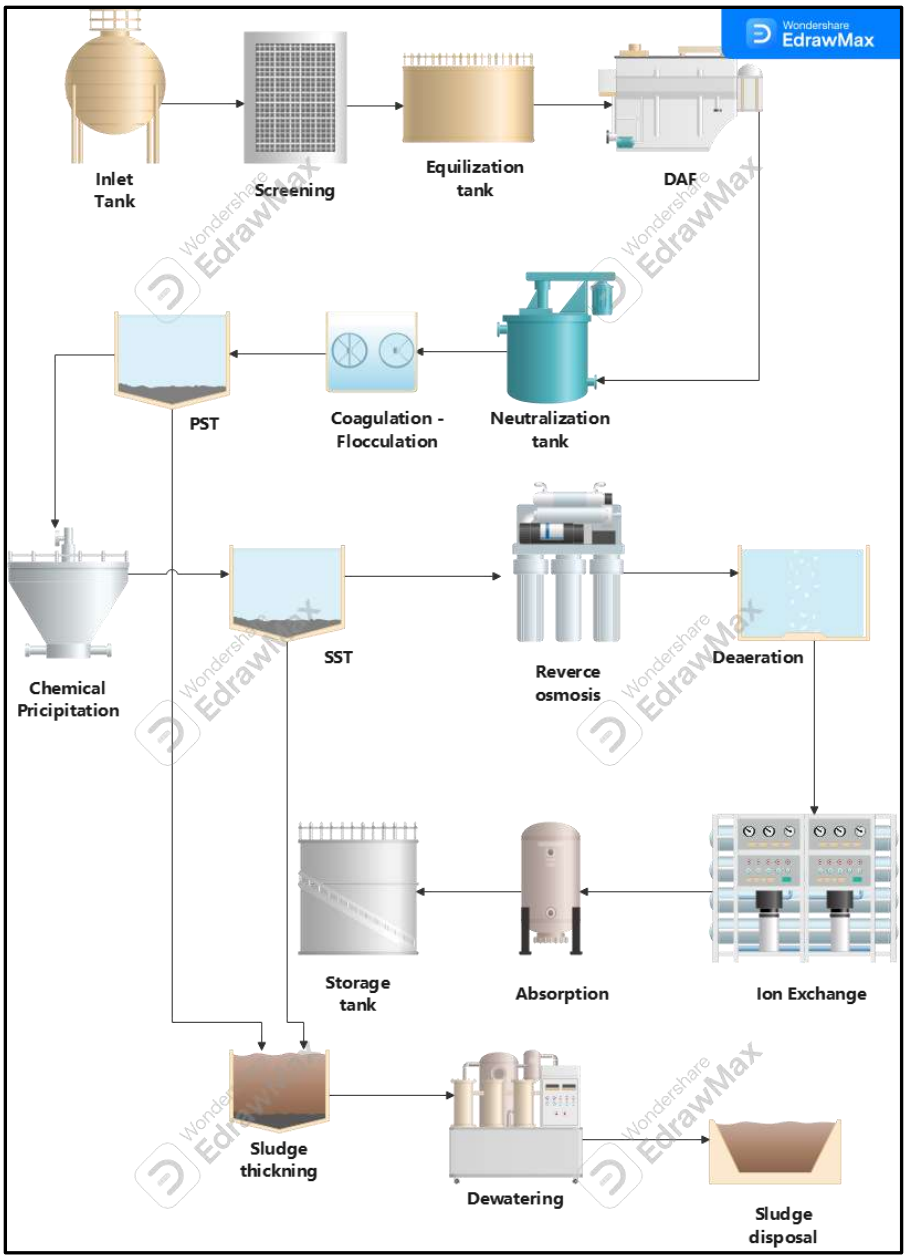
6. Final Treatment

- **pH Adjustment:** Ensuring that the final effluent is within the acceptable pH range for discharge.

7. Sludge Handling

- **Sludge Thickening:** To reduce the volume of sludge.
- **Dewatering:** Use of filter presses or centrifuges to further reduce sludge volume.
- **Sludge Disposal:** Depending on the composition, sludge may be disposed of in landfills or incinerated.

Schematic of proposed ETP is as below:



The proposed ETP, its capacity and treatment processes need to be carefully designed after taking into consideration the following factors:

- Estimated quantity of wastewater to be treated
- Quality of the wastewater to be treated
- Outlet quality of the effluent to be achieved

ANNEXURES

Annexure I: Non-exhaustive list of Organic Waste Convertor (OWC) dealers

Sr. no.	Name	Location	Contact number	Capacity range of available OWC in kg/day	Quantity of Compost produced kg/day
1	Green-era Engineering LLP	Ahmedabad	8048955688	15-1000	10-15 %
2	Greenautics Solution		6353318966	50-700	
3	Unique Industries		9998600358	25-225	
4	Aaspa Equipment Pvt. Ltd.		9898341024	15-1000	
5	Envipure		9998319355	10-1000	
6	Envcure Technocrate LLP		7874757199	15-1000	
7	Envicare Solutions Pvt. Ltd.	Kheda	9727678804	5-2000	

Annexure II: List of Single Use Plastic items banned under the Plastic Waste Management Rules, 2016 (and subsequent amendments)

Sr. no	List of banned Plastic items
1	Plastic Sticks for Balloons
2	Plastic Flags
3	Candy Sticks
4	Ice Cream Sticks
5	Polystyrene (Thermocol) for Decoration
6	Plastic Plates, Cups, Glasses
7	Cutlery Such as Forks, Spoons, Knives, Straw, Trays
8	Wrapping or Packing Films Around Sweet Boxes
9	Invitation Cards
10	Cigarette Packets
11	Plastic or PVC Banners Less Than 100 micron
12	Plastic Stirrers.
13	Plastic carry bags having thickness less than 120 micron

Annexure III: Non-exhaustive list of GPCB approved plastic waste management agencies (Recyclers)

Sr No.	Name & Address of recyclers	Name of Product	Quantity (MT/M
1.	Imperial overseas Pvt Ltd. (U-2)Shed No-93-96, Sec-1, KASEZ, Ta-Gandhidham, Dist.- Kutch	Recycled Agglomerates/Granules	300
2.	Add polymer Pvt Ltd, (U-2) Plot No-3, Sec-2, KASEZ, Ta- Gandhidham, Dist.- Kutch	Recycled Agglomerates/Granules	202
3.	Prasar Enterprises Shed No-335, A-II, MarshalingYard, KASEZ, Ta- Gandhidham, Dist.- Kutch	Recycled Agglomerates/ Granules/ Flakes/ Lumps/ Palltes/ Powder/ Shreddings	500
4.	Harish Processors Ltd.,Shed No- A/305, 408, Marshelling Yard, KASEZ, Ta-Gandhidham, Dist.- Kutch	Recycled Agglomerates/Granules	285
5.	Kutch Polymers (U-1), Shed No- A/1, 180, 181, Sec- 1, KASEZ, Ta-Gandhidham, Dist.- Kutch	Recycled Agglomerates/	250
6.	Kutch Polymers (U-2), Shed No- 334, Sec- 2, KASEZ, Ta- Gandhidham, Dist.-Kutch	Recycled Agglomerates/ Granules	250
7.	Plasto fine Industries (U-1), Plot No-271, 276, Sec-3, KASEZ, Ta-Gandhidham, Dist- Kutch	Recycled Agglomerates/ Granules	300
8.	Luckystar International Pvt Ltd., Shed No-336, Sec-1, KASEZ, Ta-Gandhidham, Dist- Kutch	Plastic agglomerates /Granules /Grindings/Offcuts/Sheets/Extrude d Product/Blow Film/Molded Articles & plastic products	400
9.	Lucky star International Pvt Ltd., Plot No-23, 24, 33, 34, Sec-1, KASEZ, Ta-Gandhidham, Dist- Kutch	Plastic Agglomerate s/ Granules/ Grindings/ Offcuts/ Sheets/ Extruded product/ Blow Film/ Molded Articles & plastic products	900
10.	Mokshstar International, Shed No-337, 338, Sec-1, KASEZ, Ta-Gandhidham, Dist- Kutch	Plastic Agglomerates/ Granules/ Grindings/ Offcuts/ Sheets/ Extruded Product / Blow Film/ Molded Articles & Plastic Products	850
11.	Shreeji Polymers, Plot No-8A, Sec-2, KASEZ, Ta- Gandhidham, Dist- Kutch	Plastic Agglomerates/ Granules/ Grindings/ Offcuts/ Sheets/ Extruded Product/ Blow Film/ Molded Articles & Plastic Products	750
12.	Polyrec Processors Pvt. Ltd., Plot	Recycled Agglomerates/ Granules	250

	No-278, 279, Sec- 3, KASEZ, Ta-Gandhidham, Dist- Kutch		
13.	Oswal Polymers, Plot No-4 & 11, Sec-2, KASEZ, Ta-Gandhidham, Dist-Kutch	Recycled Agglomerates/ Granules	200
14.	Balze International, Shed No- 292, Sec-2, KASEZ, Ta-Gandhidham, Dist-Kutch	Recycled Agglomerates/ Granules	300

Annexure IV: Non-exhaustive list of GPCB approved E-waste Recyclers

Sr. no.	Details of WMA	Services provided	Contact details	Capacity MT/Year	Validity
1	Pruthvi E-recycle Pvt Ltd. Survey No.160/1, Plot no: 12, Tirupati Estate, Lothada-360002, Rajkot- 360002	Collection, Segregation, Transportation, Dismantling, & Primary Processing	9825196768, 9909138598 pruthvirecycle@ymail.com	6600	05/01/2028
2	Galaxy Recycling Sr. no: 36/P1, P2, 37/P2, 38/P2, Plot no: 52 & 53, Near Tirth agro. Pvt. Ltd., At: bharudi, Tal: Gondal, Rajkot	Collection, Segregation, Dismantling, Recycling, transportation	9328259627 galaxyrecyclng@gmail.com	521	25/09/2026
3	Star Recycling, Survey no: 44 P1P1 44P1P2 & 46, Plot no: 45, R K Industrial Zone-09, Kuwadva-Wankaner Road, Ranpur- 360023, Tal & Dist: Rajkot	Collection, Transportation, Storage, Dismantling, Recycling	9925116383 Starrecycling2018@gmail.com	629	10/03/2025
4	GL Recycling LLP, Survey No. 108, Village: Soliya, Ta.:Kotda Sangani, Dist.: Rajkot-360030	Collection, Transportation, Storage, Dismantling, Recycling) Of Items Covered Under Schedule-I Of Except Fluorescent And Other Mercury Containing Lamp	9016864546 info@glrecycling.co.in	14500	27/05/2026
5	Reart Recycling Private Limited., Plot No.365, Survey No.111p1, Golden Green Industrial Park (phase- D), Khambha-360311, Tal:Lodhika, Dist:Rajkot	Collection, Segregation, Transportation, Shredding, Crushing, Grinding Etc. I.E. Primary Processing For PCBs Only	9023566456, 9426320055 cmsavsani@gmail.com	300	23/06/2026

6	Unity E-Recycling Co, Sr. No: 310/p, Plot No: 4, Danilimda, Ahmedabad-380028	collection, transportation, Storage, Dismantling, Recycling) Of Items Except CRT / LCD / Plasma TV, Fluorescent and Other Mercury Containing Lamp	9726810910 unityerecyclingco@gmail .com	383	31/12/2025
7	Mahaarana Industries Pvt. Ltd., Survey No. 466 & 475, Village: Timba, Ta: Daskroi, Dist; Ahmedabad	Collection, Transportation, Storage, Dismantling, Recycling) Of Items Except Fluorescent and Other Mercury Containing Lamp	8866025118 ewastemanagemant216@ gmail.com	16585	15/05/2026
8	Kalpana E-Recyclers, Plot No. 2486, Madhuban Industrial Park, Village: Kuha, Ta: Daskroi, Dist: Ahmedabad	Collection, Storage, Segregation, Dismantling, Transportation, Refurbishing, Repairing, Shredding, Cutting, Recycling	9998680123 prakashnagora1822@gm ail.com	876	22/01/2026
9	E -Ali Recyclers, (GPCB ID: 89636) Plot No.:730, Survey No. 730, Plot No. 3, Village: Paldi Kankaj, C448, Ta. : Daskroi, Dist.: Ahmedabad - 382425	Collection, Transportation, Storage, Dismantling, Recycling) Of Items Except Fluorescent and Other Mercury Containing Lamp	7096969252 ealirecyclers22@gmail.com	730	31/12/2027
10	Mangalam ECS Environment Pvt. Ltd., (Unit -2) Block No 24 Paiki, Vautha, Tal : Dholka, Dist.:	Collection, Transportation, Storage, Refurbishing of items ITEW1, ITEW2, ITEW3	8980005008 8980005066 hardik.mandora@ecscorp oration.com	4999.92	30/09/2027

	Ahmedabad-387810	and ITEW4 as per EPR except Fluorescent and other mercury containing lamps			

Annexure V: List of items to be disposed through GeM portal as on June 2024

Sr.	Items / Lot Description	Qty.	UOM
1	M.L. Mrignayani Mooring Launch	1	No
2	M.L. Megha Mooring Launch	1	No
3	ML Parijatham	1	No
4	M.L. Arali Mooring Launch	1	No
5	Tank Lorry GJ 12G 8128	1	No
6	Tata Xenon Pick Up Van GJ-12-1388	1	Nos.
7	Fire Fighting Pumps - Dismantled condition (As per list)	1	Nos.
8	Fire Fighting Pumps - 02 Nos. Dismantled condition (As per list)	1	Lot
9	Water cum foam Monitor (Mobile)	2	Nos.
10	Trolley Mounted DCP Unit	3	Nos.
11	Workshop Machines	1	Lot
12	Hospital Items	1	Lot
13	Old M.S Propeller hollow shaft (Assorted size)	11	Nos.
14	Old S.S Propeller shaft (Assorted size)	51	Nos.
15	Old engine (Assorted)	5	Nos.
16	Old Propeller Brass (Assorted size)	13	Nos.
17	Empty Mobile Grease/Oil Drums (i.e. 39 (Store) & 50 (Elect. division)	89	Nos
18	Waste Oil (Transformer/Hydraulic Oil)	5000	Ltrs
19	Uniform Cloths	1	Lot
20	Unserviceable Ceiling Fan	1600	Nos.
21	Electronic waste	7	MT
22	Aluminium & Die Cast Light Fittings (Assorted Sizes)	8	Ton
23	Assorted Marine Steel Scrap	1.5	Ton
24	Plastic Scrap	3.112	MT
25	Rubber Scrap	31.75	MT
26	U/s A.c and Water Cooler Scrap	2.45	MT
27	MS Scrap Assorted	16	Ton
	i. Stainless Steel Feeder Piller -02 Ton		
	ii. Control Gear Box with Choke - 05 Ton		
	iii. Iron Cable Drum - 03 Ton		
	iv. Operator Cabin -06 Ton		
28	Aluminium Cable Scrap	5	Ton
29	Wooden Cable Drum	5	Ton

30	Brass Scrap	455	Kgs
31	Slew Bearing	3	Ton
32	Wire Rope	4	Ton
33	Tyre	50	Nos.
34	Water Tender No. 1 GJ-12G-8125	1	Nos.
35	Foam Tender No. 1 GJ-12G-8124	1	Nos.
36	Water Tender No. 1 GJ-12G-8126	1	Nos.
37	Distilled Water Plant (SS) Cap: 4 to 5 Ltr	1	Nos.
38	Water Mist and CAF Fire Extinguisher Back Pack	1	Nos.
39	Air Compressor (BA Set Cylinder)	1	Nos.

Annexure VI

Biomedical wastes categories and their segregation, collection, treatment, processing and disposal options as per Schedule I of BMW Rules, 2016

Category	Type of Waste	Type of Bag or Container to be used	Treatment and Disposal options
(1)	(2)	(3)	(4)
Yellow	**(a) Human AnatomicalWaste:** Human tissues, organs,body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).	Yellow coloured non-chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial*
	(b)Animal Anatomical Waste: Experimental animal carcasses, body parts, organs, tissues, including the wastegenerated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.		
	(c) Soiled Waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residualor discarded blood and blood components.		Incineration or Plasma Pyrolysis or deep burial* In absence of above facilities, autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery

	(d) Expired or Discarded Medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.	Yellow colored non-chlorinated plastic bags or containers	Expired `cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1200 ^{0}C or to common bio-medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >1200^{0}C Or Encapsulation or Plasma Pyrolysis at >1200^{0}C. All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.
	(e) Chemical Waste: Chemicals used in production of biologicaland used or discardeddisinfectants.	Yellow coloured containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility.
	(f) Chemical Liquid Waste: Liquid waste generateddue to use of chemicals in production of biological and used or discarded disinfectants, Silver X-ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids**,** liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other waste water. The combined discharge shall conform to the discharge norms given in Schedule- III.

	(g) Discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask and gown.	Non-chlorinated yellow plastic bags or suitable packing material	Non- chlorinated chemical disinfection followed by incineration or Plazma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or Plazma Pyrolysis.
	(h) Microbiology,Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of micro- organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.	Autoclave or Microwave or Hydroclave safeplastic bags or containers;	Pre-treat to sterilize with non- chlorinated chemicals on-site as per as per World Health Organisation guidelines on Safe management of Waste from healthcare activities and WHO Blue Book,2014 and thereafter sent for incineration;
Red	**Contaminated Waste(Recyclable)** (a) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and *fixed needle syringes*) andvaccutainers with their needles cut) and gloves.	Red coloured non-chlorinatedplastic bags or containers	Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.

White (Translucent)	**Waste sharps including Metals:** Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades,or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps	Puncture proof,Leak-proof, tamper-proof containers	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
Blue	**(a) Glassware:** Broken or discarded and contaminated glassincluding medicine vialsand ampoules except those contaminated withcytotoxic wastes.	Puncture proofand leak proof boxes or containers withblue colored marking;	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.
	(b) Metallic Body Implants	Puncture proof and leak proof boxes or containers with blue colored marking	**Implants**

Annexure VII

ANNUAL REPORT (Form – IV) of BMW Rules, 2016

Sr. No.	Particulars		
1.	Particulars of the Occupier	:	
	(i) Name of the authorised person (occupier oroperator of facility)	:	
	(ii) Name of HCF or CBMWTF	:	
	(iii) Address for Correspondence	:	
	(iv) Address of Facility		
	(v)Tel. No, Fax. No	:	
	(vi) E-mail ID	:	
	(vii) URL of Website		
	(viii) GPS coordinates of HCF or CBMWTF		
	(ix) Ownership of HCF or CBMWTF	:	(State Government or Private or Semi Govt. or any other)
	(x). Status of Authorisation under the Bio-Medical Waste (Management and Handling) Rules	:	Authorisation No.: …… …….. valid up to ……..
	(xi). Status of Consents under Water Act and Air Act	:	Valid up to:
2.	Type of Health Care Facility	:	
	(i) Bedded Hospital	:	No. of Beds:
	(ii) Non-bedded hospital (Clinic or Blood Bank or Clinical Laboratory or Research Institute or Veterinary Hospital or any other)	:	
	(iii) License number and its date of expiry		
	Details of CBMWTF	:	

3.	(i) Number healthcare facilities covered by CBMWTF	:				
	(ii) No of beds covered by CBMWTF	:				
	(iii) Installed treatment and disposal capacity of CBMWTF:	:	_____Kg per day			
	(iv) Quantity of biomedical waste treated or disposed by CBMWTF	:	_____Kg/day			
4.	Quantity of waste generated or disposed in Kg perannum (on monthly average basis)	:	Yellow Category:			
			Red Category:			
			White:			
			Blue Category:			
			General Solid waste:			
5.	Details of the Storage, treatment, transportation, processing and Disposal Facility					
	(i) Details of the on-site storagefacility disposal facilities	:	Size :			
			Capacity:			
			Provision of on-site storage : (cold storage or any other provision)			
			Type of treatment Equipment	No of units	Capacity kg/day	Quantity treated or disposed in kg per annum
			Incinerators			
			Plasma Pyrolysis			
			Autoclaves			
			Microwave			
			Hydroclave			
			Shredder			
			Needle tip cutter Or Destroyer			
			Sharps Encapsulation or concrete pit			
			Deep burials pit:			
			Chemical			

			Disinfection: Any other treatment equipment:			
	(iii) Quantity of recyclable wastes sold to authorized recyclers aftertreatment in kg per annum.					
	(iv) No of vehicles used for collection and transportation of biomedical waste					
	(v) Details of incineration ash and ETP sludge generated and disposed during the treatment of wastes in Kg per annum		Incineration Ash ETP Sludge	Quantity generated	Where disposed	
	(vi) Name of the Common Bio- Medical Waste Treatment Facility Operator through which wastes are disposed of					
	(vii) List of members HCF not handed over bio-medical waste.					
6.	Do you have bio-medical waste management committee? If yes, attach minutes of the meetings held during the reporting period					
7.	Details trainings conducted on BMW					
	(i) Number of trainings conducted on BMW Management.					
	(ii) number of personnel trained					
	(iii) number of personnel trained at the time of induction					
	(iv) number of personnel not undergone any training so far					
	(v) whether standard manual for training is available?					
	(vi) any other information)					
8	Details of the accident occurred during the year					

	(i) Number of Accidents occurred		
	(ii) Number of the persons affected		
	(iii) Remedial Action taken (Please attach details if any)		
	(iv) Any Fatality occurred, details.		
9.	Are you meeting the standards of air Pollution from the incinerator? How many times in last year could not met the standards?		
	Details of Continuous online emission monitoring systems installed		
10.	Liquid waste generated and treatment methods in place. How many timesyou have not met the standards in a year?		
11	Is the disinfection method or sterilization meeting the log 4 standards? How many times you have not met the standards in a year?		
12	Any other relevant information	:	(Air Pollution Control Devices attached with the Incinerator)

Certified that the above report is for the period from

……

……

……

Name and Signature of the Head of the Institution

Date:

Place

Annexure VIII: List of Information related to HCFs to be updated on website

Sr. no.	List of Information to be updated on website
1.	Contact Address and details of the Healthcare Facility:
2.	No. of beds:
3.	Details of: a) Authorisation under BMWM Rules, 2016: b) Consent under Water (Prevention and Control of Pollution) Act, 1974 and Air(Prevention and Control of Pollution) Act, 1981:
4.	Quantity of bio-medical waste generation (in kg/day):
5.	Mode of disposal of bio-medical waste (through CBWTF or through captivetreatment facility):
6.	Name and address of the CBWTF through which waste is disposed off (as applicable)
7.	In case, HCF is having captive treatment facility, a) bio-medical waste treated (in kg/day) b) Details of treatment equipment c) Total nos. and capacity of each treatment equipment (in kg/day) d) Operating parameters of the treatment equipment as per BMWM Rules, 2016
8.	8 Monthly records of bio-medical waste generation (category wise):
9.	No. of trainings conducted on Bio-medical Waste Management in the current year: Stats of immunization of Health Care Workers involved in handling of BMW:

Annexure IX: Potential Uses of C & D Wates

C & D waste	Potential use of C & D wastes
Concrete	The utilization of recycled aggregate is particularly very promising as 75 per cent of concrete is made of aggregates. **Opportunity:** The enormous quantities of demolished concrete can easily be recycled as aggregate and used in concrete. Research & Development activities have been taken up all over the world for proving its feasibility, economic viability and cost effectiveness. Work on recycled concrete has been carried out at few places in India by CBRI and CRRI, but waste and quality of raw material produced being site specific, tremendous inputs are necessary if recycled material has to be used in construction for producing high grade concrete.
Bricks	If deconstructed properly, bricks can be reused after removal of mortar. Broken bricks can be used for refilling or for manufacturing debris paver blocks or debris blocks.
Stone	Stone can be reused for plinth formation, masonry construction, landscape purpose, ledges, platforms, window sills, coping etc. depending upon the form of available stones.
Timber	Timber elements from deconstructed building may have aesthetic and antique value. **Opportunity:** Whole timber arising from construction and demolition works can be utilized easily and directly for reused in other construction projects after cleaning, de-nailing and sizing.
Plywood and other timber based boards	Plywood and other timber-based boards can be either reused for interior works in new construction or it can be recycled for manufacturing of timber-based boards.
Gypsum	In India, over 10 about of waste gypsum such as phosphor-gypsum, Fluro-gypsum etc., are being generated annually. **Opportunity:** Plaster developed from this waste gypsum has showed improved engineering properties without any harmful effect. Phosphor-gypsum and lime sludge can be recycled for manufacture of Portland cement, masonry cement, sand lime bricks, partition walls, flooring tiles, blocks, gypsum plaster, fibrous gypsum boards, and super-sulphate cement.
Metals & metal alloys-	Ferrous Metals are the most profitable and recyclable material. Scrap steel is almost totally recycled and allowed repeated recycling. Structural steel can be reused as well as 100% steel can be recycled to avoid wastage at construction site. **Advantage:** Generally sold to a scrap metal dealer at a specified price. Metals like scrap iron can be mixed with the virgin metal in the foundry. In India more than 80% scrap arising is recycled.
Nonferrous metal	The main nonferrous metal collected from construction and demolition sites are aluminum, copper, lead and zinc. **Opportunity:** In India aluminum and copper are recycled and are valuable resources

Debris	Construction debris can be recycled to manufacture paver blocks which can be used in light traffic areas and masonry blocks. Other uses of processed debris include use in lean concrete for leveling purpose, as mortar for masonry, as bedding mortar for pavement tiles and used for land filling materials is comparable with new materials. **Opportunity:** Market potential on an average in Pune city estimates about 40 crores of bricks in a year.
Composite materials	The plastic wastes are best for recycling if these materials are collected separately and cleaned. Recycling is difficult if plastic wastes are mixed with other plastics or contaminants. Plastic may be recycled and used in products specifically designed for the utilization of recycled plastic, such as street furniture, roof and floor, PVC window noise barrier, cable ducting, panel. **Constraint:** The third largest consumer of composite materials is construction sector, automobile and aeronautics being first two largest consumers. Composite materials like thermoplastics are not only using non-renewable resources, they are non-biodegradable products. Thermoplastics (Polycarbonate, polyethylene, polypropylene, PVC etc.) can be recycled, but recycling involves high costs, whereas thermosets (Epoxy adhesives) are difficult to recycle. The lack of adequate markets, high recycling cost, and lower quality of the recyclates are the major commercialization barriers in recycling of composite materials. PVC-U sourced mostly from window and door fabricators is being recycled into wiring accessories and cable management systems including skirting and trunking. Composite materials can be down-cycled.
Ref : https://www.researchgate.net/publication/256677141_construction_and_demolition_waste_management_with_reference_to_case_study_of_Pune	

Annexure X: Proposed responsibility and constitution of the Waste Management Cell (WMC) for DPA

Note: DPA managed premises mentioned herein refers to all residential, commercial and other area under the control of DPA in Gandhidham, Kandla and Vadinar.

The broad scope of work for proposed WMC are as below:

1. Develop, implement and manage Waste Management Systems for all types of wastes i.e., Municipal Solid, Plastic, Bio-medical, Construction & Demolition, e-waste and Shipping wastes in accordance with the Waste Management Plan.
2. Co-ordinate with all departments of DPA and maintain records pertaining to all generated wastes in designated format.
3. Monitor the segregation and storage of all types of wastes generated at all DPA premises.
4. Monitor the activities like collection, transport and disposal by all Waste Management Agencies appointed by DPA.
5. Maintain all documentation (Waste inventories/Forms/Records/Receipts etc.) as per the requirements mentioned in the Waste Management Plan.
6. To coordinate and comply with all applicable statutory requirements.
7. Prepare and submit documents (Forms/ Returns/ Compliances etc.) to concerned authority.
8. Conduct regular visits, in and surrounding all DPA premises for reviewing implementation and updating of the waste management systems.
9. Training and capacity building of waste management staff from time to time.
10. Assist concerned DPA officials in legal and regulatory matters pertaining to waste management.
11. Remain up to date with any new legal or other requirement pertaining to waste management.
12. Organize awareness programs/ campaigns and other IEC activities from time to time, relating to waste management.

Constitution of WMC

Sr. No	Category of professionals	Qualification	Experience
1.	Manager (Waste): 02 personnel	A Post-graduate in Environmental Sciences/ Environmental Engineering/ Coastal/Marine Environmental Science and Marine Science	Minimum 02-years' experience in waste management and in-depth knowledge about environmental regulations pertaining to all types of wastes i.e., (Municipal Solid, Plastic, Bio-medical, Construction & Demolition, battery, Shipping and E-waste)
2.	Assistant (Waste) -: 04 personnel	A Graduate in Environmental Sciences/ Environmental Engineering/ Coastal/Marine Environmental Science and Marine Science	Minimum 01-year experience in areas like Inventorization, audit, EPR and awareness programs related to waste management.

PART-2
TRAINING MANUAL

Table of Contents

List of Table

List of Figures

Chapter-1
Municipal Solid Waste

1.1. Introduction

Waste (or wastes) is unwanted or unusable material. Waste is any substance which is discarded after primary use, or is worthless, defective and of no use. A by-product by contrast is a joint product of relatively minor economic value. A waste product may become a by-product, joint product or resource through an invention that raises a waste product's value above zero.

Municipal solid waste (MSW) includes waste from households, non-hazardous solid waste from industrial, commercial and institutional establishments (excluding bio-medical waste in present context), market waste, yard waste, agricultural wastes and street sweepings. Industrial and community hazardous waste and infectious waste, is not considered as MSW and should be collected and processed separately. MSW (Management and Handling) Rules 2000 defines MSW as *"commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes"*. MSW management encompasses the functions of collection, transfer & transportation, processing & recycling, and disposal of MSW. Safe and cost-effective management of MSW is a significant environmental challenge for modern society. Inadequately managed waste disposal has the potential to affect the health and environment. Ideally MSW management should incorporate the principles of waste minimization, recycling, resource recovery as well as an integrated processing & disposal facility, leading to effective service delivery in a sustainable manner

1.2. Different categories of Wastes

- **Municipal Solid waste**: Municipal solid waste includes commercial and domestic wastes generated in municipal or notified areas or either solid or semi-solid form excluding industrial hazardous wastes but including treated biomedical wastes.
- **Domestic Waste**: Domestic waste is one of the most important components of MSW. Domestic wastes include food waste, paper, glass, metals, plastics, textiles, etc. A large part of domestic waste consists of plant and animal waste such as vegetables, fruit peel, bone and meat waste etc. which are considered wet wastes. Paper, cardboard, old newspapers, books, plastic items, disposable dishes, toys, metal, glass cans obsolete items etc. also make up another large portion of domestic dry waste.
- **Commercial Waste:** Commercial waste consists of waste from premises used mainly for the general purposes of a business or trade or recreation, education, sport, or entertainment. It does not include household, agricultural, or industrial waste as a result of construction activities. It doesn't matter whether the waste is generated in a residential

or a commercial area. For example, the waste generated by a lawn-mowing company on the premises of the client's home is commercial waste. Commercial waste is non-hazardous

- **Industrial solid waste including Hazardous waste:** The term industrial waste describes toxic waste from industrial operations including mining, refining the metallic and non-metallic resources and using these resources in the manufacturing processes to produce different intermediates of products. Sectors like food processing industries, metallurgical, crude petroleum refining, chemical and pharmaceutical operations, fertilizer, cement, and breweries among other sectors produce industrial waste. The most affected is the health of people residing nearby the dumping sites. Industrial waste causes harm to the water bodies causing the destruction of fish, pollution of groundwater and release of foul odors.

  Hazardous waste: Any waste that poses a threat to human health and the environment if not handled or managed properly. For this reason, many countries have strict regulations on the storage, collection and treatment of hazardous waste. The Basel Convention and the OECD Decision include lists of waste streams, characteristics and components that fall within the definition of hazardous waste. Most hazardous waste originates from industrial production.
- **Agricultural Waste**: The waste generated by agriculture includes waste from crops and livestock. Some of the waste is produced by agro-based industries viz. rice milling, tobacco etc. Agricultural wastes include rice husk, stubble/parali, degasses, ground nut shells and straws of cereals etc.
- **Biomedical Waste**: It is a form of infectious waste and involves waste from the treatment of diseases in humans and animals. This type of waste usually consists of medicines, sharp objects, bandages, chemicals, pharmaceuticals, body fluids and body parts (from amputations and surgery). Healthcare waste may be infectious, toxic or radioactive.
- **Plastic Waste**: Plastic is the general common term for a wide range of synthetic or semi-synthetic organic amorphous solid materials derived from oil and natural gas. The word 'Plastic' is derived from the Greek word 'Plastikos' meaning fit for moulding & 'Plastos' meaning moulded.
- **E-waste:** E-waste is a generic term for waste originating from out of life electric and electronic equipment, such as computers, televisions mobile phones and home appliances etc. Some component of E-waste is categorized as hazardous waste due to their toxic

components, such as lead, quicksilver, cadmium, mercury and brominated flame retardants. These materials can cause health damage if not treated properly.

- **Construction and Demolition waste:** Construction and demolition (C&D) waste is generated from construction, renovation, repair, and demolition of houses, large building structures, roads, bridges, piers, and dams. C&D waste is made up of wood, steel, concrete, gypsum, masonry, plaster, metal, and asphalt. C&D waste is notable because it can contain hazardous materials such as asbestos and lead. Estimates vary, but a commonly accepted estimate is that between 15 per cent and 20 per cent of municipal solid waste comes from construction and demolition projects.

1.3. Training on Municipal Solid Waste Management for various stakeholders

There is an urgent need to train and enhance the capacities of all stakeholders involved in MSW management activities to ensure efficient implementation of MSW management system from handling at the point of generation to its disposal. The following are all stakeholders involved in capacity building in MSWM as shown in figure 1

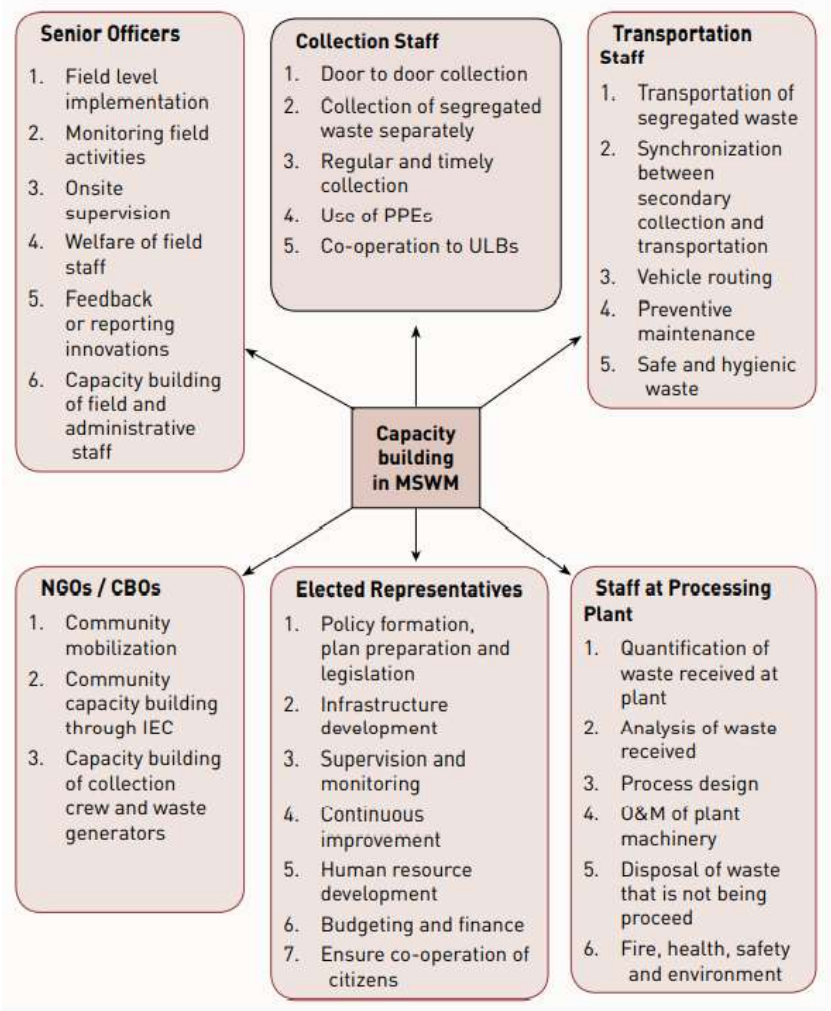


Figure 1 Capacity building in MSWM

Target audience: Citizens (Residents, office and port staff)

Citizen's involvement in MSW management is key to its effective implementation. One of the important role that the citizens can play is minimization and segregation of waste at the source of segregation.

Household-level Storage of Segregated Waste

- At the household level, dry waste, wet waste, and domestic hazardous waste should be stored in separate garbage bins, of appropriate capacity and color. The colour of the garbage bins should be as follows: Wet waste is to be placed in a covered green bin and dry waste in a covered blue bin.
- The general guidelines regarding which waste item to be placed in which bin is shown in Table 1.

BASIC SEGREGATION					
Wet waste (green bin)	**Dry waste (Blue bin)**				**Domestic Hazardous[7]**
	With further sub-segregation BASIC+				
Food wastes of all kinds, cooked and uncooked, including eggshells and bones, flower, fruit and waste including juice, vegetable peels and household garden/plant wastes. Soiled tissues, food wrappers, paper towels; fish and meat	Paper cardboard and cartons	Containers & packaging of all kinds excluding those containing hazardous materials Compound packaging (tetrapak, blisters etc.) Plastics	Rags Rubber Wood Discarded clothing Furniture	Metals Glass (all kinds) Inerts House sweepings and inerts (not garden, yard or street sweepings)	E-waste* Hazardous wastes** Household medical waste*** Batteries from flashlights and button cells. Lights bulbs, tube lights and Compact Fluorescent Lamps (CFL) Car batteries, oil filters and car care products and consumables
* E-waste: Printer & printer cartridges, electronic parts and equipment and others ** Hazardous wastes: Chemicals and solvents and their empty containers, paints, oil, lubricants, glues, thinners and their empty containers, insecticides, pesticides and herbicides and their empty containers, photographic chemicals, bleaches and household kitchen & drain cleaning agents *** Household Medical Waste: Thermometers and other mercury containing products, discarded medicines, injection needles and syringes after destroying them both, sanitary wastes and diapers (should be collected daily)					

Table 1 Basic Segregation

1.3.2. Responsibility and duties of Senior officials

The officials dealing with waste management shall endeavour to create awareness among the citizens regarding adverse impacts of mismanaged MSW along with by implementation and monitoring of the Waste Management Plan.

Rule 4 of Solid Waste Management Rules, 2016 - Duties of waste generator

- Segregate and store the waste generated in three separate streams namely bio-

degradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time.

- Wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities and shall place the same in the bin meant for dry waste or non- bio-degradable waste.
- Store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016.
- store horticulture waste and garden waste generated from his premises separately in his own premises and dispose of as per the directions of the local body from time to time.
- No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.
- All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.
- No person shall organize an event or gathering of more than one hundred persons at any unlicensed place without intimating the local body, at least three working days in advance and such person or the organizer of such event shall ensure segregation of waste at source and handing over of segregated waste to waste collector.
- The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body. The general dry waste items that can be segregated in MRF are listed in Table 3.

Table 2 Checklist for periodic verification of premises of bulk waste generators

S. No	Activities	Yes / No
1.	Is segregation done as per SWM Rules, 2016	
2.	Are all the Segregated wastes being stored in separate bins, containers or bags etc.?	
3.	Has a separate space for the segregation, storage of municipal solid waste in society, gated community, offices etc. been demarcated	
4.	Is storing of Construction and Demolition waste practiced separately?	
5.	Is storing of the Garden and Horticulture waste practiced separately?	
6.	Is recyclable waste handed over to the authorized waste picker or recycler?	

S. No	Activities	Yes / No
7.	Is processing bio-degradable (wet) waste done on-site?	
8.	Mention the process of composting or bio-methanation or any other.	
9.	Is the residual waste from processes handed over to the waste collector oridentified agency?	
10.	Has the bulk waste generator tied up for authorized agency for collection of segregated waste?	

1.3.3.Target audience: Staff involved in collections of MSW

Imparting awareness and training regarding good practices od MSW management will not only build the capacities of workers to perform more effectively and efficiently in the existing conditions, but will also inculcate a sense of responsibility and pride towards their profession.

Figure 2 Wet Waste and Dry Waste Segregation

- The work force involved with door-to-door collection of MSW shall be educated and trained to collect dry and wet waste separately as shown in the figure 2.
- The staff shall be educated regarding ideal MSW storage at various locations

Storage of Municipal Solid Waste in Public Places or Parks

With a view to ensure that streets and public places are not littered with waste, litter bins may be provided at important streets, markets, public places, bus and railway pick up stations, commercial complexes, etc. at a distance ranging from 25m to 250m depending on the local

conditions. The collection from these bins should be segregated into wet and dry waste that has been shown in figure 2.

Storage of Yard Waste or Garden Waste

Horticulture waste from parks and gardens should be collected separately and treated on-site to make optimum use of such wastes and also to minimise the cost of its collection and transportation.

Storage and Processing of Special Wastes Including Domestic Hazardous Waste

Special wastes including domestic hazardous wastes can pose a substantial or potential threat to health and environment because of their constituents which may be hazardous. A municipal waste component is hazardous if it contains one of the following characteristics: (i) ignitability, (ii) corrosivity, (iii) reactivity, and (iv) toxicity.

Care must be taken to not mix special waste including domestic hazardous waste with either the wet waste or dry waste and store such wastes separately and hand-over to the special waste collection centres, established by the urban local bodies or to collection schemes through retail trade.

1.3.4. Responsibility of MRF Operating Staff

Unloading of Incoming Waste

- Unload dry waste in the waste receiving area
- Weigh the incoming dry waste
- Remove wet/inert waste if any

Weighbridge and Weighing Scales:

- Weighing of large quantities of incoming waste
- Weighing of incoming waste and sorted recyclables

Segregation and Sorting:

- The staff is responsible for segregating and sorting non-biodegradable or recyclable solid waste collected from the doorstep into different streams of waste fractions such as paper, plastic, packaging paper, and bottles.

Table 3 Categories of dry waste that can be segregated in MRF

S. No	Paper	Plastic Items (non-PVC)	Plastic items (PVC)
1	Glass Items	Rubber Items	Metal Items (Ferrous)

2	Leather Items	Thermocol	Aluminum Coated Paper
3	Wooden Items	X-ray Films	Clothes
4	Cardboards	Jute bags	Electronic Items
5	Aluminum Coated Plastic	Metal Items (Non- ferrous)	Medical Waste/ Tablet Cover

Recovery of Recyclable Waste:

- Recovering various components of recyclable waste from the incoming waste materials for resale to intermediaries who supply bulk material to the recycling industries.

Bundling & Storage of Sorted Waste:

- Bale and pack the sorted waste in large bags or keep it bundled in the waste storage area
- MRF operating staff are responsible for managing large storage spaces to temporarily store sorted recyclables, which can be made available to recyclers in bulk for improved resale value

Weighing of Waste

- Weigh the bundled or packed waste daily and record it
- The sorted waste should be weighed at the MRF only

Maintain Safety and Personal Hygiene

- Wear personal protective equipment before starting the work
- Maintain personal hygiene. Wash your hands and legs with soap before and after your daily work
- Regular maintenance of personal protective equipment
- Proper storage of PPE

Regular Cleaning of Waste Sorting Area

- Clean the MRF area daily

1.3.5. Sound Practices in operating the MRF

Do's

1. A regular check on the working, performance and maintenance etc, of the processing machinery shall be done once in a month.

2. Indoor air quality and adequate lighting shall be monitored continuously for healthy working environment
3. Provision of suitable exhausts/vents/scrubbers, etc.
4. Adequate fire protection measures
5. All workers covered under social security and insurance scheme's
6. Compulsory use of Protection gears
7. Good Hygiene and Sanitation practices including safe drinking water
8. MRF kept Clean and Tidy
9. Ensure Proper Segregation and Low Rejects
10. Periodic Meetings of workers for drills, training
11. Keeping detailed logbook of MRF
12. Good housekeeping and cleaning all machinery after use
13. First Aid

Don'ts

1. No Inflammable objects in premise
2. No Smoking
3. No Child Labor
4. Pregnant women to avoid operating machinery
5. Avoid Water and Electricity Wastage
6. No Discrimination
7. No Littering
8. No animals allowed
9. Do not Burn Waste
10. No explosives or firearms in MRF
11. Keep hands away from moving parts of machinery
12. Do not wear loose clothing around machinery
13. Avoid long term storage of RDF

- **Safety Practices adopted at MRF**

The process of collection, segregation, transportation and recycling involves exposure to contaminants and hazardous waste. The safety aspects to be considered are mentioned below:

Table 4 Safety Practices

Sr.No	Hazard	Precaution	Cure
1.	Cuts and injuries due to presence of broken glass, sharps, needles which may lead to septic wounds and tetanus	Use of Safety Gloves	Medical help should be immediately sought in case of injury
2.	Exposure to fumes causing irritation of nose, throat and lungs.	Suitable masks should be used by the Safaii Mitra while working at Swachhta	Medical help should be immediately sought
3.	Contact with faecal matter and the risk of contracting gastrointestinal diseases and worm infestations	Along with wearing gloves, sanitizers should always be carried and used	Medical help should be immediately sought
4.	Vulnerable to blood borne diseases if hospital waste is collected	Gloves should be worn and direct contact with any waste (especially faecal matter and hospital waste should be avoided)	Medical help should be immediately sought
5.	Exposure to sun, radiation and rain	Areas with radiation should be avoided.	In case of contact with any radioactive waste, they should immediately contact a doctor
6.	Callosities on the fingers observed		Should immediately contact a doctor
7.	Health problems like body ache, leg ache due to long distances travelled	Can be provided with a garbage truck to pick up waste	

- **Hygiene Practices**

It is mandatory to provide a safe working environment for staff, working personnel and any other occupants or visitor at the MRF.

- Keep the MRF dry & clean always
- Keep sorting & storage area dry and free from pest & flies
- Regularly spray disinfection liquid as better prevention practices
- All working personnel and any other occupant at the MRF must use reusable safety gloves, boots and mask. It is advisable to wear uniform while working.
- Use disposable mask & gloves for visitors.
- Make provision for hand wash and disinfectant, hands must be washed with soap before

eating/ leaving the MRF.

- Monthly cleaning & Pest-Control Treatment routine has to be fixed within the MRF and should be followed without ignorance.

➢ **First Aid Box**

This is only for designing a basic first aid kit and its components and should not be taken as a first aid procedure or training. It is important to have a well- stocked first aid kit at the MRF to deal with minor accidents and injuries. The first aid kit should be kept in a cool and dry place out of the reach of children.

A basic first aid kit should contain:

Emergency telephone numbers for emergency medical services 1092/102/108

- Bandages in a variety of different sizes and shapes
- Small, medium and large sterile gauze dressings
- A box of adhesive bandages
- Crêpe rolled bandages
- Safety pins
- Disposable sterile gloves
- Tweezers, scissors
- Micro-porous, sticky tape
- Thermometer (preferably digital)
- Cream or spray to relieve insect bites and stings
- Antiseptic cream
- Directions for requesting emergency assistance.

➢ **Safety Photo Illustration for MRF**

The following photos provide specific comment on safety issues related to those operations.

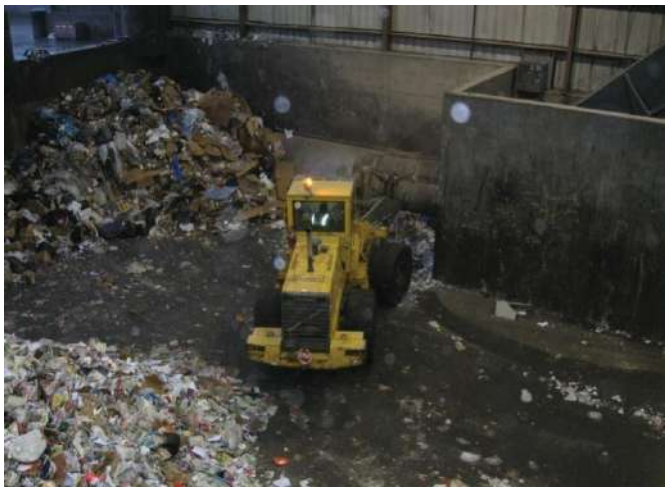
	*Photo 1* Hand sorting operations may require additional safety attention to include high visibility clothing, training on ergonomics and possibly job rotation.
	*Photo 2* An example of safety signage indicating required personal protective equipment.
	*Photo 3* Safe operation of heavy equipment requires constant attention to avoid contact with fixed objects and minimizing personnel foot traffic.

	*Photo 4* An illustration of labeling on an electrical disconnect identifying the affected equipment.
	*Photo 5* Fire extinguishers should be located throughout the facility with clear access paths maintained. The proper type of fire extinguisher should be evaluated based on fire exposures.

Figure 3 Safety Photo Illustration for MRF

1.4. Other Important Guidelines

- The entrance and exit should be kept clear always
- The emergency exits should be kept clear always and should never be used for any temporary/ permanent activity
- A minimum safe distance between two machineries as advised by the manufacturer.
- From maintenance perspective, min 1-metre clearance around each equipment.
- Shed should be constructed with the stipulated structural stability and always keep out rains
- The MRF should be certified by a structural engineer/local ULB engineer and the fire department as per rules.

Awareness Posters

Chapter-2
Plastic Waste

2.1. Introduction

The rapid rate of urbanization and development has led to increase in consumption of plastic products vis-à-vis plastic waste generation. It is a fact that plastics waste constitutes a significant portion of the total municipal solid waste (MSW) generated in India. Plastics are non-biodegradable and remains on earth for thousands of years. The burning of plastics waste under uncontrolled conditions lead to generation of different hazardous air pollutants (HAPs), depending upon the type of polymers and additives used. However, the end-of-life plastics can be recycled into a second life application but after every thermal treatment/recycling deterioration in quality of recycled plastic products. Thus, plastic waste can be recycled only 3-4 times. The visibility of huge quantity of plastic waste has been perceived as a serious problem and made plastics a target in the management of solid waste. Different types of plastics and their uses are given in figure 4.

Plastics are generally categorized into two types:

- **Thermoplastics**: Thermoplastics or Thermosoftening plastics are the plastics which soften on heating and can be molded into desired shape such as PET, HDPE, LDPE, PP, PVC, PS, etc.
- **Thermosets**: Thermoset or thermosetting plastics on heating, but cannot be remolded or recycled such as Sheet Molding Compounds (SMC), Fiber Reinforced Plastic (FRP), Bakelite etc. are the examples of the same.

  For efficient management of plastic waste, the Government of India has superseded with the earlier Plastic Waste (Management & Handling) Rules, 2011 and notified Plastic Waste Management (PWM) Rules, 2016 on 18th March, 2016. These rules shall apply to every Waste Generator, Local Body, Gram Panchayat, Manufacturer, Importer, Producer and Brand Owner throughout India.

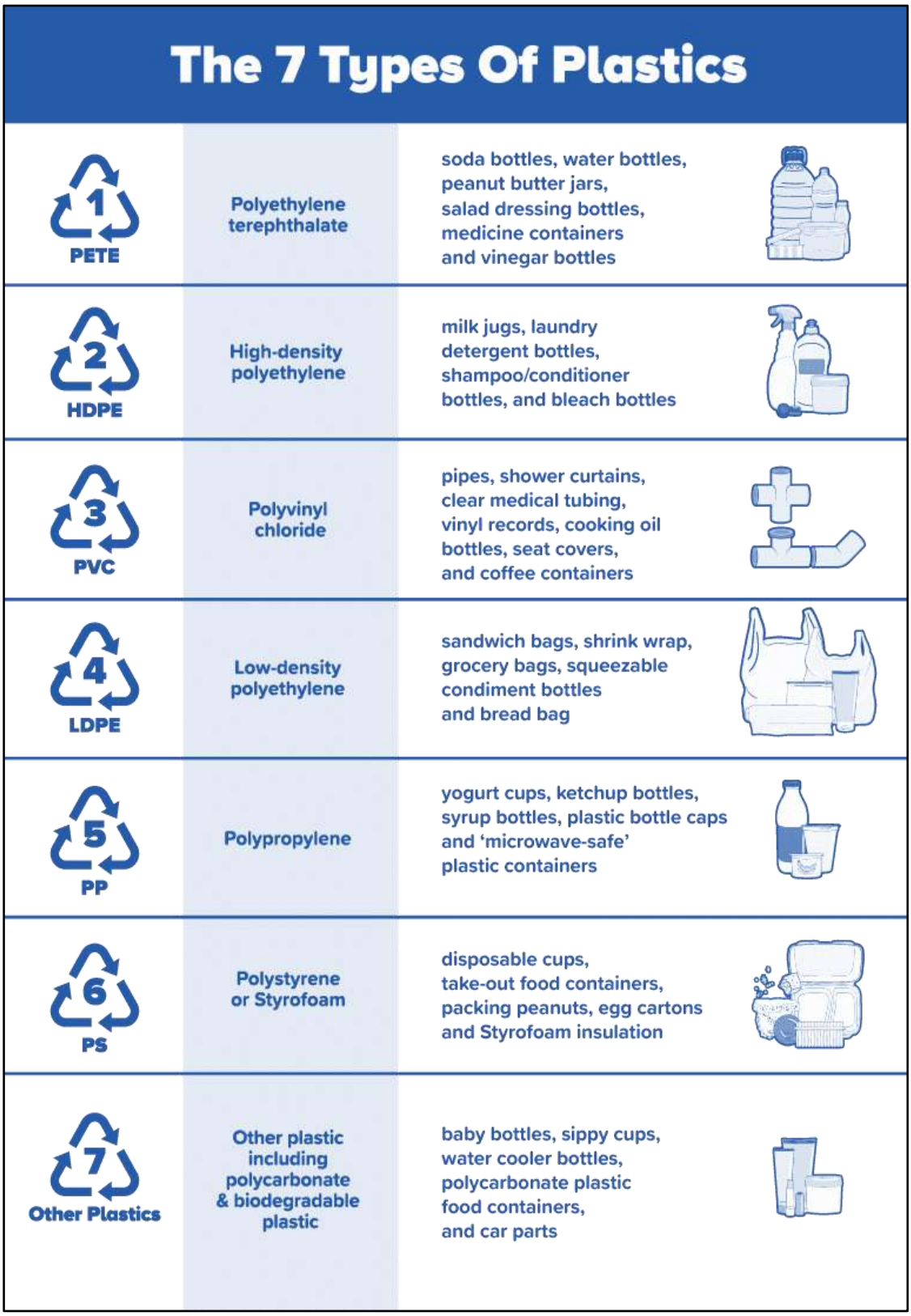


Figure 4 Type of Plastics and its Uses

Figure 5 Types of Plastic

2.2. Environmental impacts of plastic waste

- Littering of plastic waste is a major environmental issue. It makes the land infertile, choke the drains, causes death of cattle when ingested, and gives an ugly look to the area. Open burning of plastic waste is a major health and environmental issue, as it emits toxic gases such as dioxin, furan and phthalates
- Leaching impact on soil, underground water, etc. due to improper dumping of plastic waste (contains metals and phthalates).
- Release of harmful gases such as carbon monoxide, formaldehyde, etc. during product manufacturing.
- Leaching of toxic metals into underground water such as lead and cadmium pigments due to indiscriminate dumping of plastic waste on land.
- Sub-standard plastic carry bags, thin packaging films, etc. pose problem in collection, recycling and reuse.

2.3. Responsibility of waste generator (as per PWM Rules, 2022)

- Take steps to minimize generation of plastic waste and segregate plastic waste at source

in accordance with the Solid Waste Management Rules, 2000 or as amended from time to time.

- Not litter the plastic waste and ensure segregated storage of waste at source and handover segregated waste to urban local body or gram panchayat or agencies appointed by them or registered waste pickers', registered recyclers or waste collection agencies.
- All institutional generators of plastic waste, shall segregate and store the waste generated by them in accordance with the Municipal Solid Waste (Management and Handling) Rules, 2000 notified vide S.O 908(E) dated the 25th September, 2000 under the Act or amendments and handover segregated wastes to authorized waste processing or disposal facilities.
- All waste generators shall pay such user fee or charge as may be specified in the bye-laws of the local bodies for plastic waste management such as waste collection or operation of the facility thereof, etc.

2.4. Banned Single Use Plastic (SUP) Items:

The following identified single use plastic items, which have low utility and high littering potential, have been prohibited, with effect from 1st July, 2022, vide Plastic Waste Management Amendment Rules, 2021:

- Ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene [Thermocol] for decoration;
- Plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners less than 100 micron, stirrers.
- Carry bags or recycled bags with thickness less than 120 microns. Below table 5 provides list of SUP items banned and their alternatives

Table 5 Banned SUPs items and its alternatives

Sr. no.	SUPs	Banned SUPs	Alternate to SUPs
1	Polystyrene [thermocol] for decoration		

2	Packing films around sweet boxes, invitation cards, and cigarette packets		
3	Ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice - cream sticks	 	
4	Plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping, stirrers		 
5	Plastic or PVC banners less than 100 micron		
6	Carry bags or recycled bags with thickness less than 120 microns		

2.5. The 3R principle for Plastic Waste

3 Rs- Refuse, Reduce and Reuse should be practiced for plastic waste minimization. It is responsibility of the individuals in colonies and offices of DPA to practice this by limiting the use of plastics in day to day lives like carrying a cloth bag to markets, making use of stainless steel/earthen water bottles, making use of recyclable goods used in day to day lives etc. General Do's and Don'ts regarding plastic usage are as below:

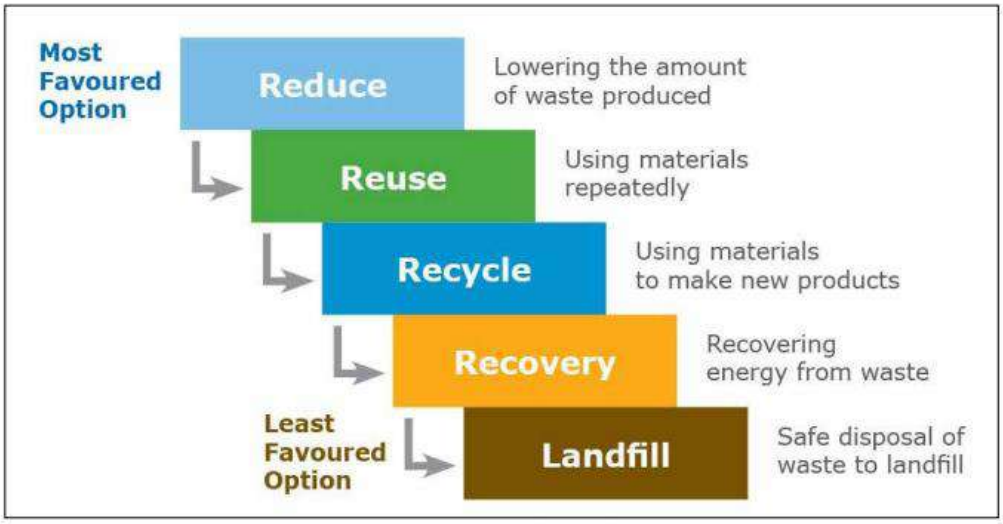


Figure 6 3 R's- Refuse, Reduce and Reuse

2.6. Compostable Plastic

2.6.1. Background and legal provisions

As per the Rule 3(e)(Definitions) of PWM Rules, 2018 "compostable plastics" mean plastic that undergoes degradation by biological processes during composting to yield CO_2, water, inorganic compounds and biomass at a rate consistent with other known compostable materials, excluding conventional Petro-based plastics, and does not leave visible, distinguishable or toxic residue.

As per the Rule 4(h) (Conditions) of PWM Rules, 2018, the manufacturers or sellers of compostable plastic carry bags/products shall obtain a certificate from the CPCB before marketing or selling compostable carry bags/products. Every compostable plastic carry bag manufacturer/seller shall comply following provisions under PWM Rules, 2018:

- **Rule 4(h) (Conditions):** The provision of minimum thickness of 50 micron shall not be applicable to carry bags made up of compostable plastic. Carry bags made from compostable material or plastics shall conform to the Indian Standard: 1S:17088 (as amended from time to time) titled as 'Specifications for Compostable Plastics'.
- **Rule 10 (Protocols for compostable plastic material):** Determination of the degree of

degradability and degree of disintegration of plastic material shall be as per the protocols of the Indian Standards 1S/ISO: 17088 (as amended time to time).

- **Rule 11 (Marking or labelling):1(c):** shall have the following information printed in

English and local **languages** namely; name and certificate number in case of carry bags made from compostable plastic. Each carry bag made from compostable plastics shall bear a label **"compostable"** and shall conform to the Indian Standard: 1S/ISO-17088 (as amended from time to time) titled as "Specifications for Compostable Plastics".

2.6.2. How to identify compostable plastic?

- Plastic products or materials meeting all the requirements specified in 1S/1S0:17088 may be labeled as "compostable" or "biodegradable during composting ".
- The labelling shall conform to international, national, regional or local regulations.
- The name of the country where the plastic product or material is to be marketed or recycled by composting shall be indicated.
- Each carry bag made from compostable material or plastic shall bear a label **"COMPOSTABLE" IS/1SO:17088** titled as Specifications for "Compostable Plastic" in English & regional language. Each carry bag shall also have printed code: …… and Certificate Number of **"MANUFACTURER/SELLER"**.

Figure 7 Compostable Plastic Bags

2.7. Information, Education and Communication (IEC)

- DPA should organize awareness campaigns for residents and office staff to educate them about environmental pollution, its health effects caused due to littering plastics and solutions to these problems. The residents and office staff shall be made aware of Single Use Plastics (SUPs), banned SUPs and environmental damage caused by use of SUPs.
- Segregation of PW from MSW at household and office level could substantially streamline the implementation of PW management system. Residents and office staff should make an effort at bringing a behavioral change in dumping wet and dry (plastic) waste separately at its source of generation itself.
- Efforts should be made for use of plastic free day to day items like earthen wares, cotton bags, steel bottles etc.
- Community awareness is the best means to reduce and manage plastic waste. DPA should organize activities and competitions in its school and community gatherings to engage its residents especially children to create "Best out of Waste" items.
- **Recyclable plastics:** The staff involved with segregation of PW at MRF shed shall be educated and trained about the plastics that are recyclable and non-recyclable. The image given below shows the various types of recyclable plastics and day to day items made from these plastics.

UNDERSTANDING DIFFERENT TYPES OF PLASTIC AND THEIR USES

1 PETE

Converted back to polymer and used for making apparel

2 HDPE

Converted to pellets and used to produce new HDPE

3 PVC

These are used to produce new PVC or as feed for other manufacturing processes or as fuel for energy recovery

4 LDPE

Converted to pellets and used to produce new LDPE

5 PP

Converted to pellets and used to produce new PP

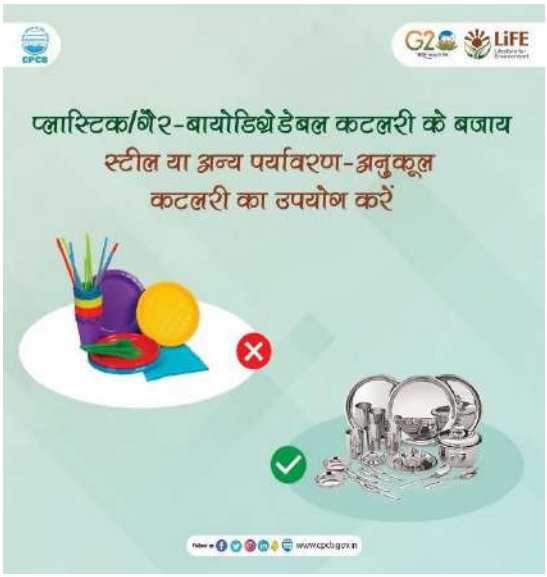
6 PS

Not recyclable

OTHERS

Not recyclable – However, multilayer packaging could be crushed and turned into sheets and boards for roofing, using adhesives

Awareness posters




SAY A
BIG NO
TO
SINGLE
USE PLASTIC
CARRY BAGS!
Note : Plastic carry bags with less than thickness of 120 microns are banned w.e.f 31st December 2022


Say No To
Single Use Plastics
कहीं भी आप पतली पॉलीथिन बैग (120 माइक्रोन से कम) का उत्पादन, भंडारण, बिक्री अथवा प्रयोग होते हुए देखे तो तुरंत SUP Grievance App पर शिकायत दर्ज करें
ऐप डाउनलोड करने के लिए QR कोड को स्कैन करें


Switch To
Sustainable
Lifestyle
Reduce
Plastic Pollution
Bring Your
Own Bags
For
Shopping


Repurpose Glass, Plastic
and Cardboard Containers
Give Them A New Life


CARRY YOUR
OWN CLOTH BAG
FOR SHOPPING
INSTEAD OF USING
PLASTIC BAGS


Turn 'Single Use'
Into 'No-Use'
Lower the environmental impact of Single Use Plastics
by avoiding products made of SUPs.


DO YOU KNOW
WHAT THESE PLASTIC SYMBOLS MEAN?
PET
Polyethylene Terephthalate
HDPE
High-Density Polyethylene
PVC
Polyvinyl chloride
LDPE
Low-Density Polyethylene
PP
Polypropylene
PS
Polystyrene
OTHER
Other


EASY WAYS TO REDUCE
PLASTIC POLLUTION
Prefer metal/ glass bottle bottles instead of plastic bottles
Use cotton/paper/jute bags in place of plastic bags
Refuse plastic decorative items for family gatherings/parties
Choose eco-friendly alternatives over single-use-plastics made products
#SolutionsTo
PlasticPollution

Chapter-3
E-Waste

3.1 Introduction

3.1.1 What is E- Waste?

The E-Waste (Management) Rules, 2022 defines E-waste as any electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes.

'Bulk consumer' means bulk users of electrical and electronic equipment such as Central Government or State Government Departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies, partnership and public or private companies that are registered under the Factories Act, 1948 (63 of 1948) and the Companies Act, 2013 (18 of 2013) and health care facilities which have turnover of more than one crore or have more than twenty employees. As per this definition, AO offices and Gopalpuri colony come under bulk e-waste consumers.

This manual covers topic on environmentally sound management of the e-waste at administration, consumer and waste handling levels.

3.1.2 Characteristics of E-Waste

- Electronic waste or e -waste is any broken or unwanted electrical or electronicappliance.
- E-waste includes computers, consumer electronics, phones, medical equipments,toys and other.
- Items that have been discarded by their original users.
- E-Waste also includes waste which is generated during manufacturing or assemblingof such equipments.

3.1.3 Objective of Module

Creating awareness: People residing in colonies and working staff at offices shall be made aware regarding types of e-wastes and the nuisances created by e-waste. Efforts shall be made to educate people about e-waste potential to create positive impact if collected and attended in environmentally sound manner. This will encourage public participation in collection of e-wastes.

3.2 Background of E-Waste

3.2.1 Categories of E-waste according to E-Waste (Management) Rules, 2022

Categories of electrical and electronic equipment including their components, consumables, parts and spares covered under the rules

Figure 8 E-Waste Categories

Table 6 Categories and products of electrical and electronic equipment

Sr. No.	Categories of electrical and electronic equipment	Electrical and electronic equipment code
i.	**Information technology and telecommunication equipment**:	
	Centralized data processing: Mainframes, Minicomputers	ITEW1
	Personal Computing: Personal Computers (Central Processing unit with input and output devices)	ITEW2
	Personal Computing: Laptop Computers (Central Processing unit with input and output devices)	ITEW3
	Personal Computing: Notebook Computers	ITEW4
	Personal Computing: Notepad Computers	ITEW5
	Printers including cartridges	ITEW6
	Copying Equipment	ITEW7

	Electrical and Electronic Typewriters	ITEW8
	User terminal and Systems	ITEW9
	Facsimile	ITEW10
	Telex	ITEW11
	Telephones	ITEW12
	Pay telephones	ITEW13
	Cordless telephones	ITEW14
	Cellular telephones	ITEW15
	Answering System	ITEW16
	Products or equipment of transmitting sound, images or other information by telecommunications	ITEW17
	BTS (all components excluding structure of tower)	ITEW18
	Tablets, I-PAD	ITEW19
	Phablets	ITEW20
	Scanners	ITEW21
	Routers	ITEW22
	GPS	ITEW23
	UPS	ITEW24
	Inverter	ITEW25
	Modems	ITEW26
	Electronic data storage devices	ITEW27
ii.	Consumer Electrical and Electronics and Photovoltaic Panels:	
	Television sets (including sets based on Liquid Crystal Display and light Emitting Diode Technology)	CEEW1
	Refrigerator	CEEW2
	Washing Machine	CEEW3
	Air- Conditioners excluding centralised air conditioning plants	CEEW4
	Fluorescent and other Mercury containing lamps	CEEW5
	Screen, Electronic Photo frames, Electronic Display Panel, Monitors	CEEW6
	Radio sets	CEEW7
	Set top Boxes	CEEW8
	Video Cameras	CEEW9
	Video Recorders	CEEW10
	Hi-Fi Recorders	CEEW11
	Audio Amplifiers	CEEW12

	Other products or equipment for the purpose of recording or reproducing sound or images including signals and other technologies for the distribution of sound and image by telecommunications	CEEW13
	Solar panels/cells, solar Photovoltaic panels/cells/modules.	CEEW14
	Luminaires for fluorescent lamps with the exception of luminaires in households	CEEW15
	High intensity discharge lamps, including pressure sodium lamps and metal halide lamps	CEEW16
	Low pressure sodium lamps	CEEW17
	Other lighting or equipment for the purpose of spreading or controlling light excluding filament bulbs	CEEW18
	Digital camera	CEEW19
iii.	**Large and Small Electrical and Electronic Equipment**	
	Large cooling appliances	LSEEW1
	Freezers	LSEEW2
	Other large appliances used for refrigeration, conservation and storage of food	LSEEW3
	Clothes dryers	LSEEW4
	Dish Washing Machines	LSEEW5
	Electric cookers	LSEEW6
	Electric stoves	LSEEW7
	Electric hot plates	LSEEW8
	Microwaves, Microwave Oven	LSEEW9
	Other large appliances used for cooking and other processing of food	LSEEW10
	Electric heating appliances	LSEEW11
	Electric radiators	LSEEW12
	Other large appliances for heating rooms, beds, seating furniture	LSEEW13
	Electric fans	LSEEW14
	Other fanning, exhaust ventilation and conditioning equipment	LSEEW15
	Vacuum cleaners	LSEEW16
	Carpet sweepers	LSEEW17
	Other appliances for cleaning	LSEEW18
	Appliances used for sewing, knitting, weaving and other processing for textiles	LSEEW19
	Iron and other appliances for ironing, mangling and other care of clothing	LSEEW20

	Grinders, coffee machines and equipment for opening or sealing containers or packages	LSEEW21
	Smoke detector	LSEEW22
	Heating Regulators	LSEEW23
	Thermostats	LSEEW24
	Automatic dispensers for hot drinks	LSEEW25
	Automatic dispensers for hot or cold bottles or cans	LSEEW26
	Automatic dispensers for solid products	LSEEW27
	Automatic dispensers for money	LSEEW28
	All appliances which deliver automatically all kinds of products	LSEEW29
	Indoor air purifier	LSEEW30
	Hair dryer	LSEEW31
	Electric shaver	LSEEW32
	Electric kettle	LSEEW33
	Electronic display panels/board/visual display unit	LSEEW34
iv.	**Electrical and Electronic Tools (With the exception of large-Scale Stationary Industrial Tools)**	
	Drills	EETW1
	Saws	EETW2
	Sewing Machines	EETW3
	Equipment for turning, milling, sanding, grinding, sawing, cutting, shearing, drilling, making holes, punching, folding, bending or similar processing of wood, metal and other materials	EETW4
	Tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses	EETW5
	Tools for welding, soldering, or similar use	EETW6
	Equipment for spraying, spreading, dispersing or other treatment of liquid or gaseous substance by other means	EETW7
	Tools for mowing or other gardening activities	EETW8
v.	**Toys, Leisure and Sports Equipment**	
	Electrical trains or car racing sets	TLSEW1
	Hand-held video games consoles	TLSEW2
	Video games	TLSEW3
	Computers for biking, diving, running, rowing, etc.	TLSEW4
	Sports equipment with electric or electronic components	TLSEW5
	Coin slot machines	TLSEW6

vi.	**Medical Devices (With the Exception of All Implanted and Infected Products)**	
	Radiotherapy equipment and accessories	MDW1
	Cardiology equipment and accessories	MDW2
	Dialysis equipment and accessories	MDW3
	Pulmonary ventilators and accessories	MDW4
	Nuclear Medicine Equipment and accessories	MDW5
	Laboratory equipment for in vitro diagnosis and accessories	MDW6
	Analysers and accessories	MDW7
	Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) Scanner, Computed Tomography (CT) Scanner, & Ultrasound Equipment along with accessories	MDW8
	Fertilization tests equipment and accessories	MDW9
	Other electric appliances/equipment/kits used for preventing, screening, detecting, monitoring, evaluating, reviewing, examining, investigating, probing, treating illness sickness, disease, disorder, affliction, infection, injury, trauma, abuse or disability including the Mobiles, Tablets or any other device with the features having the potential of sex selection and their accessories	MDW10
vii.	**Laboratory Instruments**	
	Gas analyser	LIW1
	Equipment having electrical and electronic components	LIW2

3.2.2 Resources embedded in e-waste

The electronic and electrical item consists of more than 1000 different substances which can fall under hazardous and non-hazardous categories. The resources embedded in e-waste are very diverse and contains products across different categories. As shown in the below picture, the major constituents are ferrous and non-ferrous metals, plastics, glass and plywood, printed circuit boards, concrete and ceramics, rubber and other items.

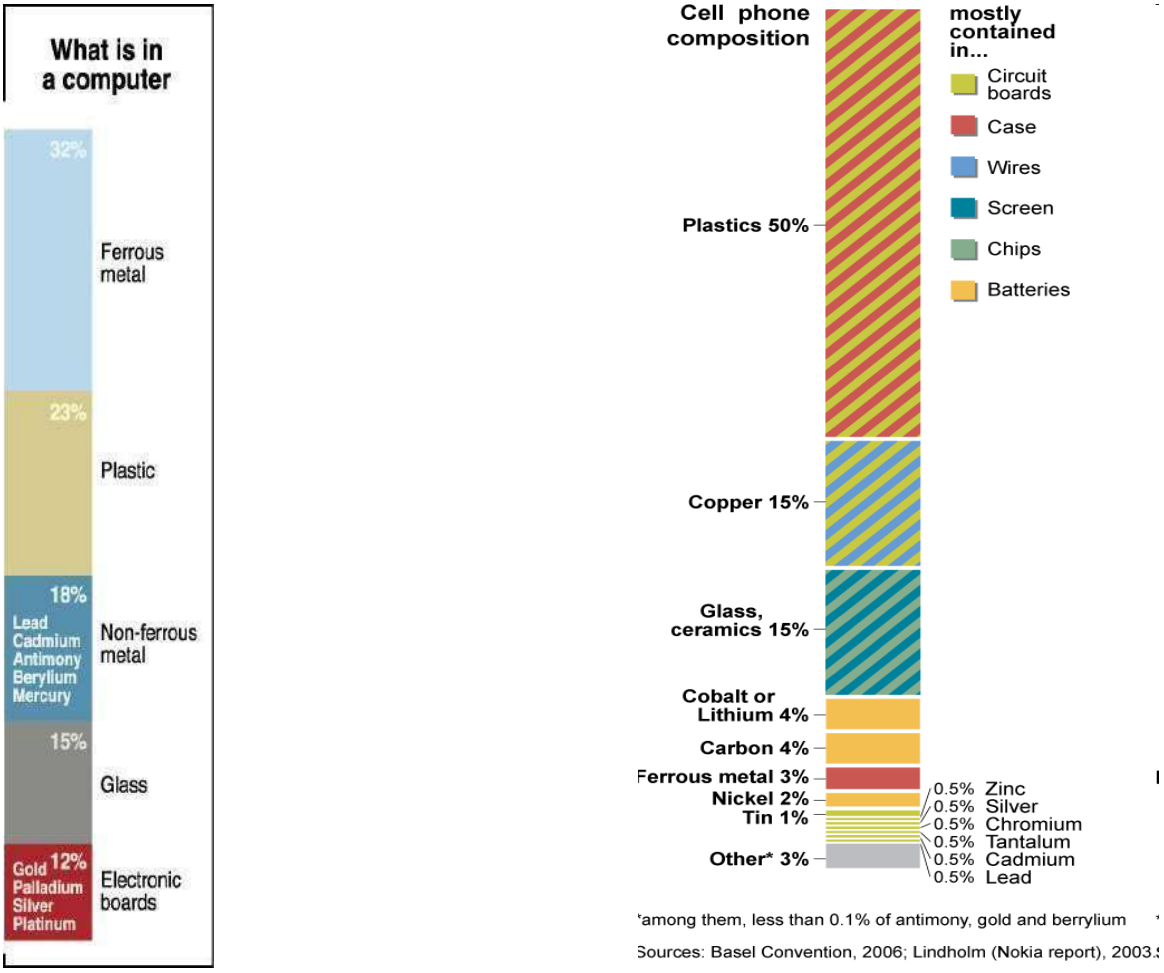


Figure 9 Resources embedded in e-waste

Source: UNEP

3.2.3 Hazards Substances in E-waste

Electronic waste is filled with a variety of toxic materials, which creates a serious risk for human health and the environment if they are released during processing, recycling or disposal. The major constituents are ferrous and non- ferrous metals, plastics, glass and plywood, printed circuit boards, concrete and ceramics, rubber and other items. Iron and steel constitute about 50% of the WEEE followed by plastics (21%), non-ferrous metals (13%) and other constituents. Non-ferrous metals consist of metals like copper, aluminium and precious metals like silver, gold, platinum, palladium etc. Other than these resources heavy metals and organic compounds are also found which contains in e-waste such as lead, cadmium, mercury, arsenic, beryllium, polyvinyl chloride (PVC), Brominated Flame Retardants (BFRs) and phthalates.

Table 7 Possible hazardous substances in WEEE/E-waste components

Component	Possible Hazardous Content
Metal	-
Motor/compressor	-
Cooling	ODS
Plastic	Phthalate plasticize, BFR
Insulation	Insulation ODS in foam, Asbestos, refractory ceramic fiber
Glass	-
CRT	Lead, antimony, mercury, phosphors
LCD	Mercury
Rubber	Phthalate plasticizer, BFR
Winning/electrical	Phthalate plasticizer, lead, BFR
Concrete	-
Transformer	-
Circuit Board	Lead Beryllium, antimony, BFR
Fluorescent Lamp	Mercury, Phosphorus, Flame retardants
Incandescent Lamp	-
Healing element	-
Thermostat	Mercury
BFR – containing plastic	BFRs
Batteries	Lead, lithium, Cadmium, Mercury
CFC, HCFC, HFC, HC	Ozone depleting substances
External electric cables	BFRs, plasticizers
Electrolyte capacitors (over L/D 25mm)	Glycol, other unknown substances

Source: Central Pollution Control Board

Among the substances mentioned in the table 7, of most concern are the heavy metals such as lead, mercury, cadmium and chromium (VI), halogenated substances (e.g. CFCs), polychlorinated biphenyls, plastics and circuit boards that contain brominated flame retardants (BFRs). BFR can give rise to dioxins and furans during incineration. Other materials and substances that can be present are arsenic, asbestos, nickel and copper. These substances may act as a catalyst to increase the formation of dioxins during incineration.

Many of these pollutants are embedded in e-waste and are the constituents of complex materials, e.g. flame retardants in plastics, or are hidden inside electrical components, such as

mercury in switches, therefore these materials are difficult to isolate and separate from the other components. The material fusions with equipment's make the recycling of e-waste complicated and costly. Pollutants or toxins in E-waste are concentrated in circuit boards, plastics, batteries and LCDs (Liquid

crystal displays). To avoid serious environmental pollution and human exposure, adequate treatment of e-waste is crucial; particularly considering the huge amounts of e-waste we are producing globally.

Table 8 Pollutants and their occurrence in WEEE

Pollutant	Occurrence
Arsenic	Semiconductors, diodes, microwaves, LEDs (light emitting diodes), solar cells
Barium	Electron tubes, filler for plastic and rubber, lubricant additives
Brominated flame –proofing agent	Casing, circuit boards (plastic), cables and PVC cables
Cadmium	Batteries, pigments solder, alloys, circuit boards, computer batteries, monitor cathode ray tubes (CRTs)
Chrome	Dyes/pigments, switches, solar
Cobalt	Insulators
Copper	Conducted in cables, copper ribbons, coils, circuitry, pigment
Lead	Lead rechargeable batteries, solar, transistors, lithium batteries PVC (polyvinyl chloride) Stabilizers, lasers,LEDs, thermoelectric elements, circuit boards
Liquid crystal	Displays
Lithium	Mobile telephones, photographic equipment, video equipment (batteries)
Mercury	Components in copper machines and steam irons; batteries in clocks and pocket calculators, switches, LCDs
Nickel	Alloys, batteries, relays, semiconductors, pigments
PCBs (Polychlorinated biphenyls)	Transformers, capacitors, softening agent for paint, glue plastic
Selenium	Photoelectric cells, pigments, photocopiers, fax machine
Silver	Capacitors, switches (contacts), batteries, resistors
Zinc	Steel, brass, alloys, disposable and rechargeable batteries, luminous substances.

Source: Raiya Sabha Secretariat 2011

The major hazards associated with the harmful elements in the composition of WEEE are listed in the table 9. As shown in the table 9, toxic substances are found in components of the electronic or electrical products, which release highly toxic dioxins, furans and acid when burned to retrieve metals from the product. Many of these substances are toxic and carcinogenic. The materials are complex and have been found to be difficult to recycle in an environmentally sustainable manner even in developed countries.

Table 9 Hazards from E-waste substances

Metal	Danger
Lead	A neurotoxin that affects the kidneys and the reproductive system, high quantities can be fatal. It affects mental development in children. Mechanical breaking of CRTs (cathode ray tubes) and removing solder form microchips release lead as powder and fumes.
Plastic	Found in circuit boards, cabinets and cables, they contain carcinogens. BFRs or Brominated flame retardants give out carcinogenic Brominated dioxins andfurans Dioxins can harm reproductive and immune systems. Burning PVC, a component of plastics, also produces dioxins BFR can leach into landfills Even the dust on computer cabinets contains BFR.
Chromium	Used to protect metal housings and plates in a computer from corrosion, inhaling Hexavalent chromium or chromium 6 can damage liver and kidney and cause bronchial maladies including asthmatic bronchitis and lung cancer.
Mercury	Affect the central nervous system, kidneys and immune system. It impairs fetus growth and harms infants through mother's milk. It is released while breaking and burning of circuit boards and switches mercury in water bodies can form methylated mercury through microbial activity. Methylated mercury is toxic and can enter the human food chain through aquatic.
Beryllium	Found in switch boards and printed circuit boards. It is carcinogenic and causes lung diseases.
Cadmium	A carcinogen. Long-term exposure causes Itai-Itai disease, which causes severe pain in the joints and spine. It affects the kidneys and softens bones. Cadmium is released into the environment as powder while crushing and milling of plastics, CRTs and circuit boards. Cadmium may be released with dust, entering surface water and groundwater.
Acid	Sulphuric and hydrochloric acids are used to separate metals from circuit board's furnes contain chlorine and Sulphur dioxide, which cause respiratory problems. They are corrosive to the eye and skin.

E-waste typically contains complex combinations of materials and components down to microscopic levels. The wastes are broken down not just for recycling but for the recoverable materials such as plastic, iron, aluminum, copper and gold. However, since e waste also contains significant concentration of substances that are hazardous to human health and the environment, even a small amount of E-waste entering the residual waste will introduce relatively high number of heavy metals and halogenated substances. Such harmful substances leach into the surrounding soil, water and air during waste treatment or when they are dumped in landfills or left to lie around near it. Sooner or later, they would adversely affect human health and ecology.

Table 10 Typical pathways for the release of pollutants from e-waste

Heavy metals	Dioxins and Furans	Acids
• Dust generated during mechanical treatment, for example, the dismantling and crushing of WEEE. • Flue gas released during thermal treatment, for example, the release of metals from compounds during the incineration of plastic. • Vaporization where in metals are released from compounds in an acid bath	• Dioxins and furans are emitted during the thermal treatment of WEEE, for example during- • The combustion of cable insulation containing PVC in order to recycle copper wiring • The incineration of epoxy resin containing flame retardant from circuit boards in order to recycle the metal they contain	• Released in the form of vapor when metals are released from compounds. May also get disturbed throughout the surrounding area in the following ways • Factory air and dust being blown into the vicinity • Leaching through waste water and seepage • Release of flue gas into the atmosphere as a result of open incineration of furnace combustion

Table 11 Constituents of E-Waste

E-Waste Source	E-Waste Component	Environmental Hazard	Effects on Human
CRTs (used in TVs, Monitors, ATM, Video Camera, etc.) Batteries, PBC cables, Paints	Lead, barium & other heavy metals	These metals leaching into the ground water and release of toxic phosphorus	Anemia, Renal Toxicity, Insomnia
Batteries, Housing & Medical Equipment	Mercury	Air emissions as well as discharge into rivers of glass dust	Renal Toxicity, Muscle tumors, Mental retardation, Cerebral palsy
Plastic from printers, keyboard, monitors, etc.	Plasticizer bisphenol-A (or BPA), as well DEHP and DBA, plastic compounds known as phthalates	Chlorinated plastics release harmful chemical into the surrounding water resources which cause serious harm to the species that drink this water.	Risk in developing heart problems, obesity, reproductive disease
PVC & polymer, Paints inks, Electrical transformers & capacitors	Polychlorinated Biphenyls (PCBs)	Include extreme pollution from production, toxic chemical exposure during use, hazards from fires	Suppression of immune system; Damage to the liver, nervous and reproductive systems

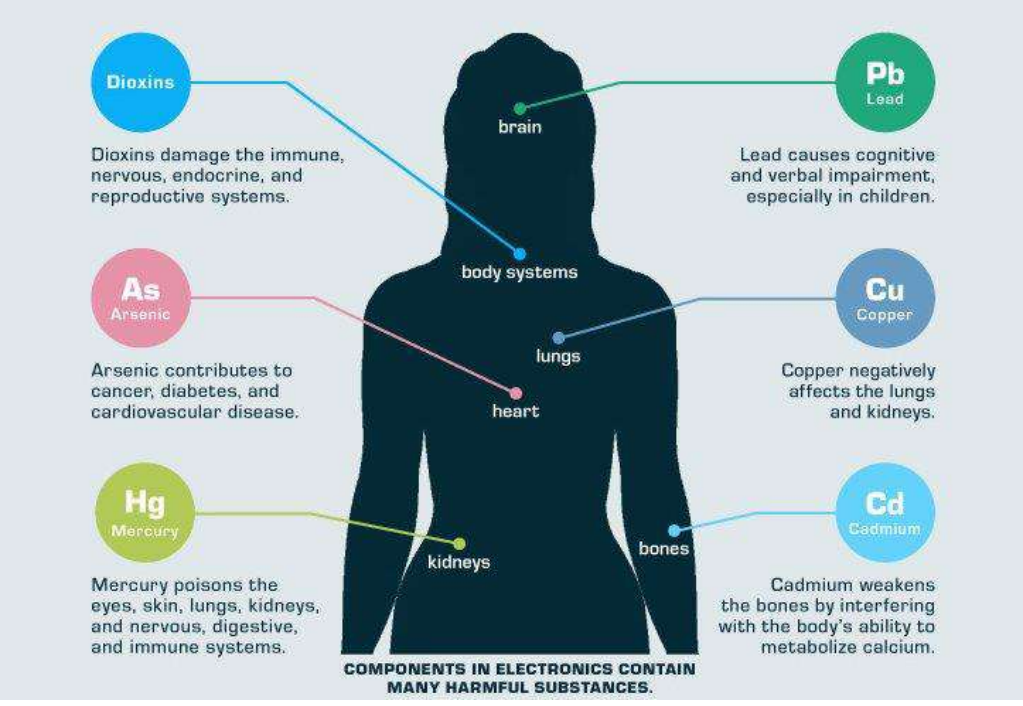


Figure 10 Adverse Impact of e-waste

3.3 Policies for E-Waste Management

3.3.1. Responsibilities of bulk consumer

Bulk consumers of electrical and electronic equipment listed in **Table 12** shall ensure that e-waste generated by them shall be handed over only to the registered producer, refurbished or recycler.

3.3.2. Formulation of a system

For channelization of e-waste from generation source to storage area until collected by authorized agency or GPCB registered e-waste recyclers/refurbishers or dismantlers. DPA shall organize e-waste collection drive once in a year at office and residencies by setting up e-waste collection booths.

The collection points/bins can be at designated places where e-waste can be collected from residential areas, office complexes, commercial complexes and educational institutions.

Mobile collection vans can be used for door-to-door collection of e-waste from and such vans shall be linked to collection booths

During the e-waste collection drive following information shall be communicated to the residents in colonies and office staff:

- Share information pertaining to e-waste collection booths like booth location, timings, etc.
- Toll free number for query resolution to be available during working hours (10 A.M. to 6 P.M.)
- Details of dealers, retailers, collection points/bins/pick up vans linked to collection booths for depositing of e-waste, if they are part of the take-back system.
- Details of any incentive scheme for consumers for returning of e- waste

Collection booth should have weighing equipment for weighing each delivery received by it and maintain a record in this regard.

Collection booths shall store e-waste products category wise.

3.3.3. Record keeping

Since the e-waste generated at Vadinar port and offices is sent to EDP store at AO, Gandhidham office, the concerned official at AO Gandhidham shall keep a record of below listed information to be furnished in Form 2 as per E-waste Management Rules, 2016.

- Name & Address: Producer /Collection Centre/Dismantler/Recycler/ Bulk consumer
- Date of Issue and Validity of Authorization

- Category, description & Quantity of e- waste handled/generated
- Category, description & Quantity of e- waste stored in storage area
- Category, description & Quantity of e- waste handed over to authorized collection center/registered recycler/ dismantler etc.
    - **If e-waste is sent to refurbished:** Name, address and contact details of the destination of refurbished materials
    - **If e-waste is sent to dismantler/recycler or for disposal:** Name, address and contact details of the destination (dismantler/recycler/ dismantling/ recycling or disposal facility)
- Category, description & Quantity of e- waste treated & disposed

3.3.4. Guideline for storage of e-waste

Every manufacturer, producer, refurbisher and recycler may store the e-waste for a period not exceeding **one hundred and eighty days (180)** and shall maintain a record of sale, transfer and storage of e-wastes and make these records available for inspection and the storage of the e-waste shall be done as per the applicable rules or guidelines for the time being in force:

Provided that the Central Pollution Control Board may extend the said period up to **three hundred and sixty-five days (365)** in case the e-waste needs to be specifically stored for development of a process for its recycling or reuse.

Storage of end-of-life products may be done in a manner which does not lead to breakage of these products and safe to workers handling such products.

The storage where refrigerator and air conditioners are also stored should have adequate facilities for managing leakage of compressor oils, coolant/refrigerant gases such as CFCs/HCFCs and mercury from end of life fluorescent and other mercury containing lamp etc. Spills involving broken fluorescent lamps, Oils spills should first be contained to prevent spread of the material to other areas. This may involve the use of dry sand, proprietary booms/absorbent pads, stabilizing chemicals etc. for subsequent transfer of hazardous waste to TSDFs.

During storage of e-waste care may be taken:

- To avoid damage to refrigerators and air-conditioner so as to prevent release of refrigerant gases such as CFC, HFS, HCFC etc. and to prevent spillage of oils (mineral or synthetic oil) and other emissions.

- To avoid damage to Cathode Ray Tube
- To avoid damage to fluorescent and other mercury containing lamps
- To avoid damage to equipment containing asbestos or ceramic fibers to avoid release of asbestos or ceramic fibers in the environment.

After collection of fluorescent and other mercury containing lamps, it should be sent only to a recycler or to a TSDF in case no recycler is available.

Loading, transportation, unloading and storage of E-Waste/ end of life products should be carried out in such a way that its end use such as re-use after refurbishing or recycling or recovery is unaffected.

The storage area should have fire protection system in place.

The storage capacity of the collection/storage area should be in accordance with volume of operations (weight and numbers) and category of E-waste. Space needed for storage of different category of e-waste is given in table 12 below:

Table 12 Space needed for storage

Sr. no	Categories of electrical and electronic equipment	EEE Code	Storage area requirement in m^3/tonne
1.	**Centralized data processing:** Mainframe Minicomputer Personal Computing: Personal Computers (Central Processing Unit with input and output devices) Laptop Computers (Central Processing Unit with input and output devices) Notebook Personal/Notepad Computers Printers including cartridges	ITEW1 to ITEW6	4.0
2.	Monitors (CRT)	Monitors (CRT)	5.0
3.	Copying equipment Electrical and electronic type writers, User terminals and systems, Facsimile	ITEW7 to ITEW10	5.0
4.	Telex Telephones Pay telephones Cordless telephones	ITEW11 to ITEW14	3.0
5.	Cellular telephones Feature phones Smart phones	ITEW15	1.0
6.	Answering systems	ITEW16	3.0
7.	Television sets (including sets based on (Liquid Crystal Display and Light Emitting Diodetechnology)	CEEW1	6.5
8.	Refrigerator	CEEW2-	10.0

9.	Washing Machine	CEEW3	7.5
10.	Air-conditioners excluding centralized air conditioning plants	CEEW4	6.0
11.	Fluorescent and other Mercury containing lamps	CEEW5	1.0

3.3.5. Questions to Ask

What questions should you ask the manufacturers when you do bulk procurement of electrical and electronic goods? What conditions can you introduce in your tender specification to enable easy disposal of e- waste?

The questions that can be asked from the manufacturers and conditions that can be introduced in tender are:

1. Ask whether 'Extended Producer Responsibility - Authorization' is available with the manufacturer. It means a permission given by Central Pollution Control Board to a producer, for managing Extended Producer Responsibility with implementation plans and targets outlined in such authorization including detail of Producer Responsibility Organization and e-waste exchange, if applicable. This can be a mandatory condition in tender.
2. Ask if manufacturer has submitted the 'Extended Producer Responsibility Plan' means a plan submitted by a producer to Central Pollution Control Board, at the time of applying for Extended Producer Responsibility - Authorization in which a producer shall provide details of e-waste channelization system for targeted collection including detail of Producer Responsibility Organization and e-waste exchange, if applicable. This can be a mandatory condition in tender.
3. Ask if manufacturer has 'facility' or any location wherein the process incidental to the collection, reception, storage, segregation, refurbishing, dismantling, recycling, treatment and disposal of e-waste are carried out. This can be a mandatory condition in tender.
4. Ask if the manufacturer has set up 'deposit refund scheme' means a scheme whereby the producer charges an additional amount as a deposit at the time of sale of the electrical and electronic equipment and returns it to the consumer along with interest when the end-of life electrical and electronic equipment is returned. This can be a mandatory condition in tender.
5. Ask regarding tie up with dismantlers and recyclers. This can be a mandatory condition

in tender.

What questions should you ask the e-waste collector/ dismantler/ recycler when you dispose of your e-waste?

The following questions can be asked from the e-waste collector/ dismantler/ recycler:

1. Does the organization have authorization from the CPCB or SPCB for collecting, dismantling or recycling the e-waste.
2. Does it have safe working conditions, tools and equipment to ensure safe treatment and disposal of e-waste.

How can you organize a collection drive for e- waste in your organization? Which agencies can support you in organizing such a collection and awareness drive? How to set up a collection centre?

A collection drive for e-waste can be organized by contacting manufacturer or dealers who would then refer to the authorized collector, dismantler and recycler of e-waste. A record of each item collected in the drive should be maintained and provided to the collector, dismantler and recycler. The local pollution control board officer can be informed about the drive and the e-waste collected during the drive so that they can audit if safe recycling of the collected e-waste has been conducted.

All manufacturers, dealers and government's environment department could support collection and awareness drive. In addition, national, international and local environmental NGOs can be partners for such a drive.

Setting up a collection centre for e-waste:

As per the e-waste management and handling rules to set up a collection center there is a need to apply for authorization from the State Pollution Control Board or Pollution Control Committee as per FORM – 1(a). There is a need to have agreements with producers who are willing to get the e-waste covered under their EPR collected at your center as well as with dismantlers and recyclers who will be taking the e-waste from the collection center for further processing. It should be ensured that systems for record keeping and training for safe handling and storage of e-waste is provided to the people who will be managing the collection center.

Responsibilities of Collection Centres include:

1. Ensure that the facilities are in accordance with the standards or guidelines prescribed by the Central Pollution Control Board from time to time;

2. The e-waste collected by them is stored in a secured manner till it is sent to registered dismantler or recycler as the case may be;
3. Ensure that no damage is caused to the environment during storage and transportation of ewaste;
4. Maintain records of the e-waste handled in Form 2 and make such records available for scrutiny by the State Pollution Control Board or the Pollution Control Committee concerned.

3.4. Battery waste

3.4.1. What is a Battery?

Battery Waste Management Rules, 2022 defines Battery as a new or refurbished cell and/or Battery and/or their component, including accumulator, which is any source of electrical energy generated by direct conversion of chemical energy and includes disposable primary and/or secondary battery.

Many different types and shapes of batteries can occur in IT appliances. Small batteries (i.e. button cells) are used to cover the permanent low energy supply for alarm and computer system (clock, memory backup, etc.). In contrast, bigger batteries (e.g. laptop batteries) allow to run the whole device. Most modern devices do not need the small batteries anymore because the permanent energy demand for the system is reduced on the one hand. On the other hand, the remaining energy demand can be covered by the capacitors.

3.4.2. Responsibilities of User

Under Battery Waste Management Rules, 2022, DPA shall be responsible for the following:

- Ensure that the Waste Battery is collected separately from other waste streams especially from mixed waste and domestic waste streams
- Ensure the disposal of waste batteries in an environment friendly manner by handing it over to an entity engaged in its collection or refurbishment or recycling or under EPR to the entity from which batteries are purchased.

3.4.3. Toxic substances in Batteries

Heavy metals such as cadmium (Cd), nickel, (Ni), and to some extent zinc (Zn). Organic solvents, etc. are some toxins present in batteries.

3.4.4. Localization in appliance

Batteries are very diverse in terms of characteristics, composition, form, size, colour, etc. Almost every IT-equipment contain at least one battery. Rechargeable accumulators can be

found in mobile phones, laptops, toothbrush or electrical razors. Appliances like torches, portable CD players, etc. can be operated using rechargeable and non-rechargeable batteries. Small (button) cell batteries are often used as a backup battery to the main battery; it provides an independent energy supply for processors, timers, security backup, etc. in computers. It is commonly located on the PWB.

3.4.5. Handling Aspect

Caution during dismantling

NEVER CRUSH OR OPEN A BATTERY

There is usually no difficulty or risk to separate the batteries from their support if they are in good condition. Use gloves, and wash hands and throw the gloves away after contact with substances from defective and leaking batteries.

3.4.6. Requirement for storage and transport

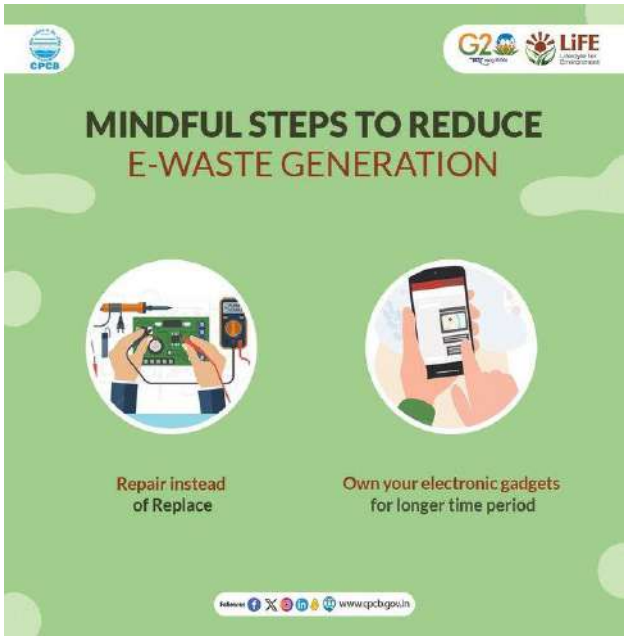
Avoid long time storing. Batteries are subject to corrosion and cell rupture, which could release reactive hazardous substances (heavy metal oxide, organic solvents, sulphuric acid).

Lithium-ion batteries can easily rupture, ignite, or explode when exposed to high temperatures, or direct sunlight.

Avoid fire risk and contact with heat sources. All batteries must be stored in acid-resistant barrels. They should be stored in a dry and sheltered place.

Batteries should be treated in an adequate plant for recovery or disposal. In any case, they should not be incinerated in an open fire or with municipal waste.

Awareness Posters



Chapter-4
Bio-Medical Waste

4.1. Introduction

The term 'Bio-medical waste' includes any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereon, or in the production or testing of biologicals or in health camps, including the categories mentioned in Schedule 1 of the Biomedical Waste Management Rules, 2016. In addition, biomedical waste includes similar kind of waste that are generated at household level, due to health care offered at household level e.g., dialysis at home, self-administration of insulin injections and restorative care.

General waste or non-hazardous waste constitutes to 75 to 90% of waste generated at health care facilities. Administrative, housekeeping, packaging, kitchen and maintenance activities of the facilities contribute to the general waste or non-hazardous waste. The remaining 10 - 25% of waste is considered hazardous and can pose threat to human and environmental health.

Figure 11 Showing Proportion of Infectious and Hazardous Waste

Bio-medical waste and its management is a comprehensive issue, encompassing occupational health and safety, environmental health and safety, and injury and incident prevention.

Training healthcare personnel to adopt 'Good Work Practices' will go a long way in Promoting the safe management of bio-medical waste so that the environment is protected

4.2. Classification of Bio-Medical Waste

Table 13 Classification of Bio-Medical Waste as Per BMW Rules 2016

Colour Coding	Type Of Waste	Examples
Yellow	. Human anatomical waste	Human tissues, organs, body parts, fetus
	. Animal anatomical waste	Experimental animal carcasses
	. Soiled waste	Cotton contaminated with blood and other body fluids, plaster casts
	. Expired or discarded medicines	Discarded tablets and capsules
	. Chemical waste	Used or discarded disinfectants, chemicals used in biologicals
	Chemical liquid waste	Laboratory reagents, X ray film developer, disinfectants, floor washings, formalin
	. Discarded linen, mattresses, beddings contaminated with blood or body fluid	Bedsheets, blankets, mattresses contaminated with blood or body fluids
	Microbiology, biotechnology and other clinical laboratory waste	Culture plates, blood bags, vaccines
Red	Contaminated waste (recyclable)	Plastic tubing, urine bags, vacutainers, gloves,catheters, Ryle's tube
White	Waste sharps including metals	Hypodermic needles, auto-disabled syringes, syringes with fixed needles, scalpels, knives, blades, lumbar puncture needles and intravenous needles.
Blue	Glassware	Used glass bottles
	Metallic body implants	Body implants, Plates and screws

4.3. Hazards of Improper Bio-Medical Waste Management

Who are at risk?

Individuals who would be at risk would include anyone working in proximity with biomedical waste, that would be,

Generators - all individuals working in health care facilities who generate biomedical waste

Handlers - who handle biomedical waste at health care facilities or at treatment and disposal facilities

Exposed group - who are exposed to hazardous biomedical waste due to consequence of careless actions of generators and handlers.

Main groups at risk are:

- Nurses, doctors, allied health care personnel (laboratory technicians)
- Patients receiving care either at hospital or at home

- visitors to health care facilities
- General public if biomedical waste is managed improperly
- Personnel in support services like; cleaners, laundry services,
- Personnel working in waste treatment/management or disposal facilities
- Personnel involved in transporting biomedical waste.

Table 14 Hazards From Various Categories of Bio-Medical Waste

Sr. No	Type Of Waste	Hazard from the Waste	Impact from the Waste
1.	Infectious waste and sharps	• Cuts • Abrasions • Infections	• Percutaneous infections with Hepatitis B, Hepatitis C, HIV
2.	Chemical and pharmaceutical waste	• Intoxication by acute or Chronic exposure • Physical injury • Chemical burns • Injury to skin • Injury to eye • Injury to mucous • membrane of airways • Respiratory disease • Skin disease	• Harmful to wildlife Evolution of antibiotic resistance in bacterial. • The chemicals can also cause contamination of water bodies and soil. When large quantities of Disinfectant are released into sewers, they can bring down the efficiency of the sewage treatment plant.
3.	Genotoxic waste	• Irritant • Dizziness • Nausea • Headache • Dermatitis	• Spontaneous abortions
4.	Radioactive waste	• Headache • Dizziness • Vomiting • Fatal	• Can expose the public as well as healthcare workers to the risk of loss of fetus in the first three months of pregnancy death
5.	Healthcare waste-treatment methods	• Flue gases from improperly • functioning waste incinerators • Physical injuries • Leachate release into water • Burning leads to heavy metal release	• Flue gases released • Water pollution • Air pollution • Release of pathogens and toxic pollutants into the environment.
6.	Public sensitivity	Sensitivity to vision of anatomical parts	• Disposal of anatomical waste inappropriately such as dumping in a landfill is unacceptable.

Figure 12 Hazards of Healthcare Waste

4.4. Training Manual for Bio-Medical Waste (BMW)

First five steps: Segregation, Collection, Pre-treatment, Intramural Transportation and Storage is the exclusive responsibility of Health Care Facility. To ascertain a systematic implementation of these steps following is recommended for identified target audiences.

4.4.1. Target audience: Nursing and BMW handling staff

- **Mandatory use of PPEs**: The Nursing and BMW staff at DPA HCFs shall make use of below listed PPEs while dealing with or handling BMW.

Personal Protective Equipment (PPE)includes:

- Heavy Duty Gloves (Workman's Gloves)
- Gum Boots or safety shoes for waste collectors
- Face mask
- Head Cap
- Splash Proof Gowns or aprons etc.
- Disposal gloves for waste handlers

Follow Good practices for Segregation of BMW:

Bio- medical waste generated from a HCF is required to be segregated at the point of generation as per the color coding stipulated under Schedule-I of BMWM Rules, 2016 presented in Table 15.

Collection of BMW:

- Bio-medical waste should be collected on daily basis from each ward of the hospital at a fixed interval of time depending upon the waste quantum generated in each ward.
- In an IPD ward where the morning routine begins with the changing of dressings, infectious waste could be collected mid-morning to prevent soiled bandages remaining in the area for longer than necessary
- General waste collection, must be done immediately after the visiting hours of the HCFs, as visitors coming to facility generate a lot of general waste and in order to avoid accumulation of such general waste in the HCF. The collection timings must enable the HCF to minimize or nullify the use of interim storage of waste in the departments

- The collection timeline should be such that the disposal of human anatomical waste, animal anatomical waste, soiled waste and biotechnology waste is done within 48 hours of its generation.

Packaging:

- Bio-medical waste bags and sharps containers should be filled to no more than three quarters full.
- Plastic bags should be tied or sealed with a plastic tag or tie and not stapled.
- Replacement bags or containers should be readily available at each waste-collection location so that full ones could immediately be replaced.

Table 15 Color coding and type of containers for BMW

Sr. No.	Category	Type of waste	Colour & Type of storage container
1.	Yellow	Human Anatomical Waste Animal Anatomical Waste Soiled Waste Discarded or Expired Medicine Microbiology, Biotechnology and other clinical laboratory waste Chemical Waste Chemical Liquid Waste	Yellow coloured non-chlorinated Plastic Bags   Note: Chemical waste (yellow-e)comprising of un-used, residual or expired liquid chemicals including spent hypo of X-Ray, should be stored in yellow container
2.	Red	Contaminated Waste (Recyclable)	Red Colored Non-Chlorinated Plastic Bags (having thickness equal to more than 50 µ) and Containers 
3.	White	Waste Sharps including metals	White Coloured translucent, puncture proof, leak proof, Temper Proof containers

			
4.	Blue	Glassware Metallic Body Implants	Puncture proof, leak proof boxes or containers with blue colored marking  

Labelling

All the bags/ containers/ bins used for collection and storage of bio-medical waste, must be labelled with the Symbol of Bio Hazard or Cytotoxic Hazard as the case may be in accordance with the BMWM Rules, 2016.

Bio-Hazard Label

Cyto-Toxic Label

Bio-medical waste bags / containers are required to be provided with bar code labels in accordance with CPCB guidelines for "Guidelines for barcode System for Effective Management of Biomedical Waste".

Sl No. 000xxxxxxxxxx  **ALLIN110029DHBH00578**	**OR**	**Sl No. 000xxxxxxxxxx**  **ALLIN110029DHBH00578**
QR Code		**Bar Code**

Intramural transportation:

In house transportation of BMW from wards to central waste collection room, within the premises of the hospital must be done in closed trolleys / containers preferably fitted with wheels for easy maneuverability.

- Patient trolleys must not be used for BMW transportation.
- Size of such waste transport trolleys should be as per the volume of waste generated from the HCFs.

The route selection for intramural transportation should be in accordance with the below listed points:

- Transportation does not occur through high-risk areas.
- Supplies and waste are transported through separate routes.
- Waste is not transported through areas having high traffic of patients and visitors.
- Central Waste collection area can be easy accessed through this route.
- Safe transportation of waste is undertaken to avoid spillage and scattering of waste.

Storage:

- Exhaust fans should be provided in the waste collection room for ventilation.
- It is to be ensured by the health care facility that such central storage room is safety inspected for potential fire hazard and based on such inspection preventive measure has to be taken by the health care facility like installation of fire extinguisher, smoke detector etc.
- There should also be provision for water supply adjacent to central waste storage area for cleaning and washing of this station and the containers. The drainage from the storage and washing area should be routed to the Effluent Treatment Plant.
- Sign boards indicating relevant details such as contact person and the telephone number should be provided.
- The entrance of this station must be labelled with “Entry for Authorized Personal Only”.

4.5. Training manual for HCF Administration

Following criteria pertaining to BMW management shall be put in place by the administration of HCFs at Gopalpuri, Gandhidham, Port area, clinic in Adipur and HCF in Vadinar. The nursing and other BMW management staff shall be educated and trained in systematic implementation of BMW management system.

Training of BMW staff and its record keeping:

As per Bio Medical Waste Management Rules, 2016, it is mandatory for all the employee of the healthcare facility to be trained on handling of biomedical waste management and handling.

- The HCF administration shall formulate a Training Plan and a Training calendar comprising of two parts:
- Induction training to new joinees
- Annual training to Nursing and BMW management staff.
- The 'Guidelines for Management of Healthcare Waste as per Biomedical Waste Management Rules, 2016'', can be used as a training manual. The guidelines have been attached at Annexure X
- The HCF administration shall maintain training records and furnish them to GPCB on or before 30th June, every FY. The Training records shall mandatorily include following details.
- Total Number of trainings conducted along with the date of imparting the training
- Total number of participants of each training
- Attendance Record
- Total Number of staff trained on BMW Handling
- Total number of staff trained on BMW handling at the time of Induction
- Total number of staff, not undergone any sought of training on BMW Handling

Regulatory requirements

i. Authorization as mandated under BMW rules, 2016 and its timely renewal

The DPA HCFs at Kandla and Vadinar have obtained the authorization from GPCB for operation of HCFs at Kandla, Vadinar and Adipur. Its amendment and renewal from time to time is to be taken under consideration. Also, if any Hospital is converted to a dispensary, its amendment is to be done as per defined procedure under BMW rules.

ii. Information requirements for making a fresh application for amendment

- Particulars of Health Care Facility: Name, Address, Contact Details etc.
- Validity of Consents under Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 (in case of bedded HCFs)
- Detail of HCF: Number of beds, Average number of patients treated per month
- Category wise Quantity of Waste Generated or disposed by the health care facility

- Detail of any treatment facility available in the premises of health care facility

iii. Information requirements for making a renewal application

- Name of the Applicant
- Name of the health care facility (HCF)
- Address for correspondence
- Activity for which authorization is sought (Generation, segregation, Collection, Storage packaging Reception Transportation Treatment or processing or conversion Recycling Disposal or destruction use offering for sale, transfer Any other form of handling)
- Previous authorization number and date:
- Address of the health care facility (HCF) mentioning GPS coordinates of the facility
- Number of beds of HCF
- Number of patients treated per month by HCF
- Quantity of Biomedical waste handled, treated or disposed as per below format

Table 16 Details of waste

Category	Type of Waste	Quantity Generated kg/day	Method of Treatment and Disposal
Yellow	(a) Human Anatomical Waste:		
	(b)Animal Anatomical Waste:		
	(c) Soiled Waste:		
	(d) Expired or Discarded Medicines:		
	(e) Chemical Solid Waste:		
	(f) Chemical Liquid Waste:		
	(g) Discarded linen, mattresses, beddings contaminated with blood or body fluid.		
	(h) Microbiology, Biotechnology and Other clinical laboratory waste:		
Red	Contaminated Waste (Recyclable)		
White (Translucent)	Waste sharps including Metals:		
Blue	Glassware:		
	Metallic Body Implants		

- Brief description of arrangements for handling of biomedical waste

i. Mode of transportation (if any) of bio-medical waste:

ii. Details of treatment equipment as per table 17

Table 17 Details of treatment equipment

Treatment equipment	No. of units	Capacity of unit
Incinerators		
Needle tip cutter		
Plasma pyrolysis		
Microwave:		
Autoclaves:		
Hydroclave:		
Shredder:		
Sharps encapsulation or concrete pit:		
Deep burial pits:		
Chemical disinfection		
Any other treatment equipment		

- Details of directions or notices or legal actions if any during the period of earlier authorization

iv. Reporting to Gujarat Pollution Control Board

Annual Reporting as per the Form IV, BMWM, Rules, 2016

HCF is required to submit the Annual Report to the GPCB on or before 30th June every year, for the period from January to December of the preceding calendar year.

- The information list for filling Annual return is detailed below:
- Particulars of HCF
- Quantity of waste generated in kg/annum
- Details of storage, treatment, transportation, processing and disposal facility
- Details of training conducted on Bio Medical Waste Management
- Details of accident Occurred
- Details Emission and Effluent testing
- Training imparted to the Health Care Workers involved in handling of bio-medical waste
- Minutes of Meeting of BMW Management Committee
- Details of Accident Occurred during one year, along with the remedial steps taken
- Records of testing of Emission of DG Sets / boilers
- Records of Effluent generated and its characteristics from health care facility

- Records of pre-treatment of specified waste categories Record of recyclable waste handed over to the authorized recycler in kg/annum (where captive treatment facility is allowed by the GP)
- Records of health status of the Health Care Workers involved in handling of bio- medical waste
- Records of immunization of Health Care Workers involved in handling of bio- medical waste
- Each healthcare facility must also ensure that the annual report submitted to the GPCB is also published in its website

Table 18 Format for Bio Medical Waste Register/Record

NAME & ADDRESS OF HEALTH CARE FACILITY BIO MEDICAL WASTE REGISTER/ RECORD FORMAT										
Sr.no.	**Date of Generation**	**Quantity of BMW Generated (in KG) Color Coding and Category**					**Date of collection by Waste Collection Agency**	**Time (in AM/ PM)**	**Name & Signature of Waste Collector**	**Name & Signature of HCF Staff**
		Yellow (1)	**Red (2)**	**White (3)**	**Blue (4)**	**Total**				
1.										
2.										
3.										
4.										
5.										

Format for Accident reporting as per Form I BMWM, Rules, 2016

HCF shall report major accidents including accidents caused by fire hazards, blasts during handling of biomedical waste and the remedial action taken and the records relevant thereto. In the manner described below

The list of information required for filing Accident reporting form is as below:

1. Date and time of accident

2. Type of Accident

3. Sequence of events leading to accident

4. Has the Authority been informed immediately

5. The type of waste involved in accident

6. Assessment of the effects of the accidents on human health and the environment:

7. Emergency measures taken

8. Steps taken to alleviate the effects of accidents

9. Steps taken to prevent the recurrence of such an accident

10. Does facility have an Emergency Control policy? If yes give details:

Awareness Posters


CPCB
G20
Segregate the hospital waste in
designated colored dustbins
Grey bin
Metal sharps
Blue bin
Recyclable
General waste
Red bin
Contaminated
plastic waste
Black bin
Hazardous and
Other waste
Green bin
Biodegradable
General waste
Blue bin
Glass waste and
metallic implants
Yellow bin
Anatomical waste, chemical waste,
soiled waste, chemotherapy waste,
discarded linen & medicines
and laboratory waste
#Biomedical
Waste Management
Follow us
www.cpcb.gov.in

Chapter-5
Construction and Demolition (C&D) Waste

5.1. Introduction

5.1.1 Objective

The objective of the training manual is to educate and inform the DPA on the severity of problem caused by Construction and Demolition (C&D) waste on the environment and serve as a reference manual providing detailed information towards management of C&D waste in an environmentally sustainable manner. It is intended that the manual be used for the purpose of training various DPA staff involved with civil construction and management of C&D waste. The sections of the training manual can be formed as training modules for providing necessary knowledge that an individual DPA staff will require to effectively and efficiently perform their respective duties with regards to implementation of C & D waste management rules (2016).

5.2. Background on Construction and Demolition (C&D) waste

5.2.1 Objective of the section

Management of Construction and Demolition waste is a relatively new term in India and so is the need for it. The urbanizing trend leading to lack of availability of land and resource shortage in construction sector has led to the notice, importance of C&D waste management in India which has brought about policy changes which specifies that all local governing bodies manage their C&D waste and also all polluters are responsible for the waste they generate.

Upon successful completion of the session, the participants should:

- Have an insight on what is C&D waste and what is it composed of
- Knowledge on estimation of C&D waste quantities in Indian cities
- Understanding on the flow of C&D waste in India
- What C&D waste can be recycled / reused for?
- Be familiar with the process of collection and transport of C&D waste

5.2.2 What is C&D waste?

Construction and demolition (C&D) waste is generated from construction, renovation, repair, and demolition of houses, large building structures, roads, bridges and dams.

C&D waste is made up of:

- Concrete
- Soil
- Steel, Wood and Plastics

- Other materials – bricks and mortar

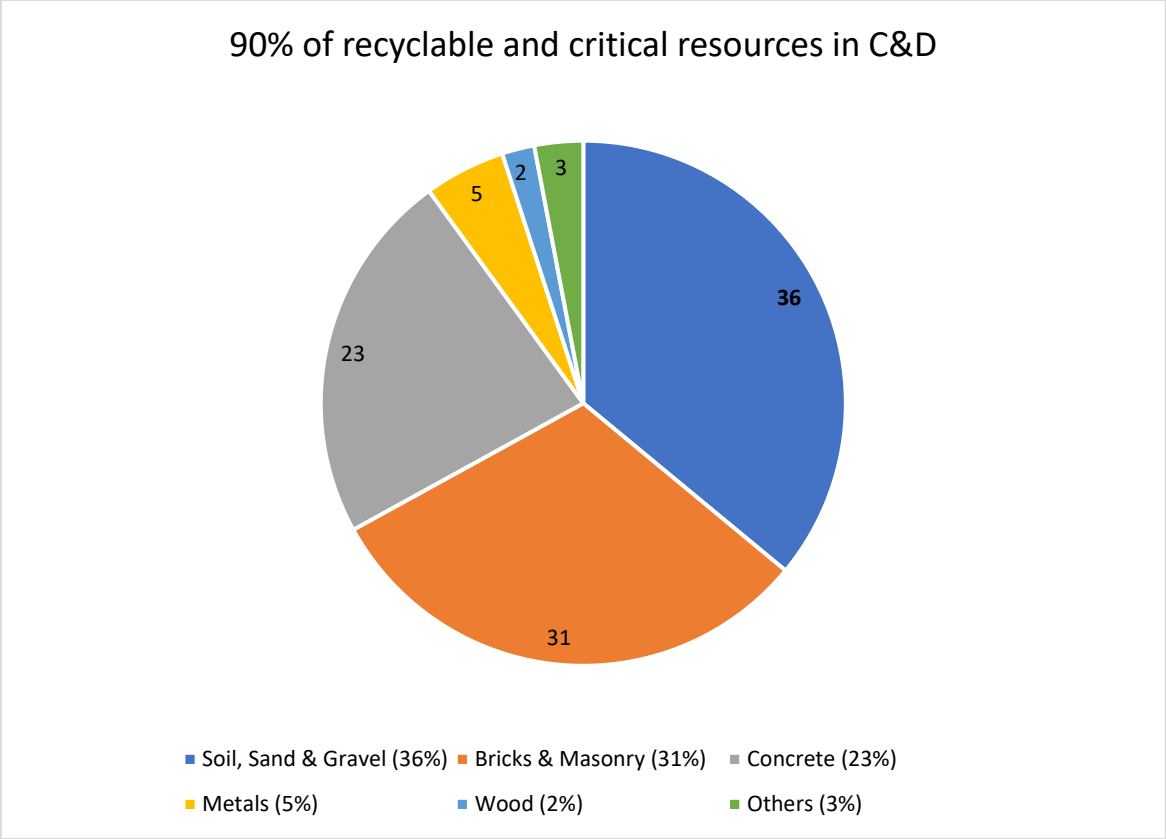


Figure 13 Typical composition of C&D waste (Source: TIFAC,2001)

Figure 14 Components of C&D waste

5.2.3 Why does C&D waste need to be managed?

The importance of C&D waste management is not lost among the stakeholders especially in large cities, where impacts have already been felt. But still effective management of C&D waste is hampered by several challenges and implementation is far from ideal.

The improperly managed and waste heaps impact the system and the environment in multiple aspects which could broadly be classified into the following aspects

Social

- Huge heaps of C&D waste on footpaths, carriage ways, alleys is a common scene in Indian cities turning the surrounding unaesthetic.
- The C&D debris usually could not be removed by normal street sweeping or household waste collection staff as they usually do not carry the equipment neither enough capacity in the collection vehicle nor enough manpower.
- Usually, the polluters tend to dump other municipal solid waste on the heap making it a mix of waste further creating an unsanitary situation.
- The C&D waste is also stealthily dumped in open drains, water channels, and even riverbeds. The debris clog the drains and create water logging. Reports of water logging of drains turning to source for spread of epidemics is common in India
- Clearing drain silts is a major challenging activity for local governing bodies and a major percentage is consisted of by C&D.
- The C&D waste also consists of several kinds of materials which include sharps, broken glasses, boulders, broken wooden logs, rusted metal, broken ceramics etc. which create a hazardous environment when dumped on unfenced open places.

Figure 15 Unauthorized Dumping

Environmental

- C&D waste is also a source of environmental pollution: The C&D debris over course of time forms fine dust creating air pollution, and reducing visibility.
- The leachate and fine chemical particles degrade the soil leading to land pollution and in addition materials like paints, oil and asbestos sheets are common components of C&D waste which are bio-hazardous in nature having potential to endanger health of workers handling the waste, civilians and any living organism
- Formation of silt deposits when dumped in wetlands and water bodies damaging the water ecosystem

Economic

- C&D waste usually gets mixed up with other municipal solid waste also during the process of transfer or at the collection site.
- C&D waste is very difficult to segregate. Separate labor has to be employed for manual segregation or it has to be performed using earth moving machine, in addition the processing efficiency also get reduced due to the presence of C&D waste which is mostly inert.
- The huge mass and volume of C&D waste results in occupying a large volume oflandfills and dump-yards resulting in governing bodies to find alternate space and creation of more landfills, again leading to economic inefficiency in the system.

Figure 16 Mixing with municipal solid waste

Resource shortage - India is witnessing a boom in construction industry due to the urbanization which leadsto over exploitation of primary resource to match the demands. For instance, almost 100% in case of cement and bricks, 40-60% of steel, 85% of paint and 70% ofglass produced in India goes into the construction sector. The anticipated growth of the sector in the near future exerts added pressure on limited stocks of resources especially sand, soil, stone and limestone which have been identified as most critical resources. Therefore, use of secondary materials needs to be promoted to supplement the use of primary materials and recycled C&D waste is one of the best available option available as secondary raw material.

Secondary Raw Material

A secondary raw material can be raw material waste from another industry or an alternate building material available in nature that can be used in place of critical primary resources. The material could partially or completely be replaced in a product

5.2.4 C&D waste management Rules in India

The Ministry for Environment and Forests notified Construction & Demolition waste management rules in 2016 to regulate the handling of C&D waste being generated. According to the new rules, the various stakeholders involved in C&D waste management have been assigned a specific role to be played in the process. Salient features of Construction & Demolition Waste Management Rules, 2016 are covered in detail as separate chapters.

5.2.5 How to implement a proper C&D waste management system?

A cradle to grave approach has to be adopted for proper management of C&D waste according to the national standards (C&D Waste Management Rules, 2016) where a properly implemented system exists. The system should contain proper collection of segregated C&D waste from the polluter, proper transportation of waste, storage of waste occurs at designated transfer stations or collection points followed by proper processing of waste into recycled or reusable products that have market value and where minimal rejects are produced which get deposited in designated landfills. A properly implemented management system also needs to contain proper quantification and classification system for C&D waste at different stages of handling and a properly implemented monitoring system with a neat documentation process.

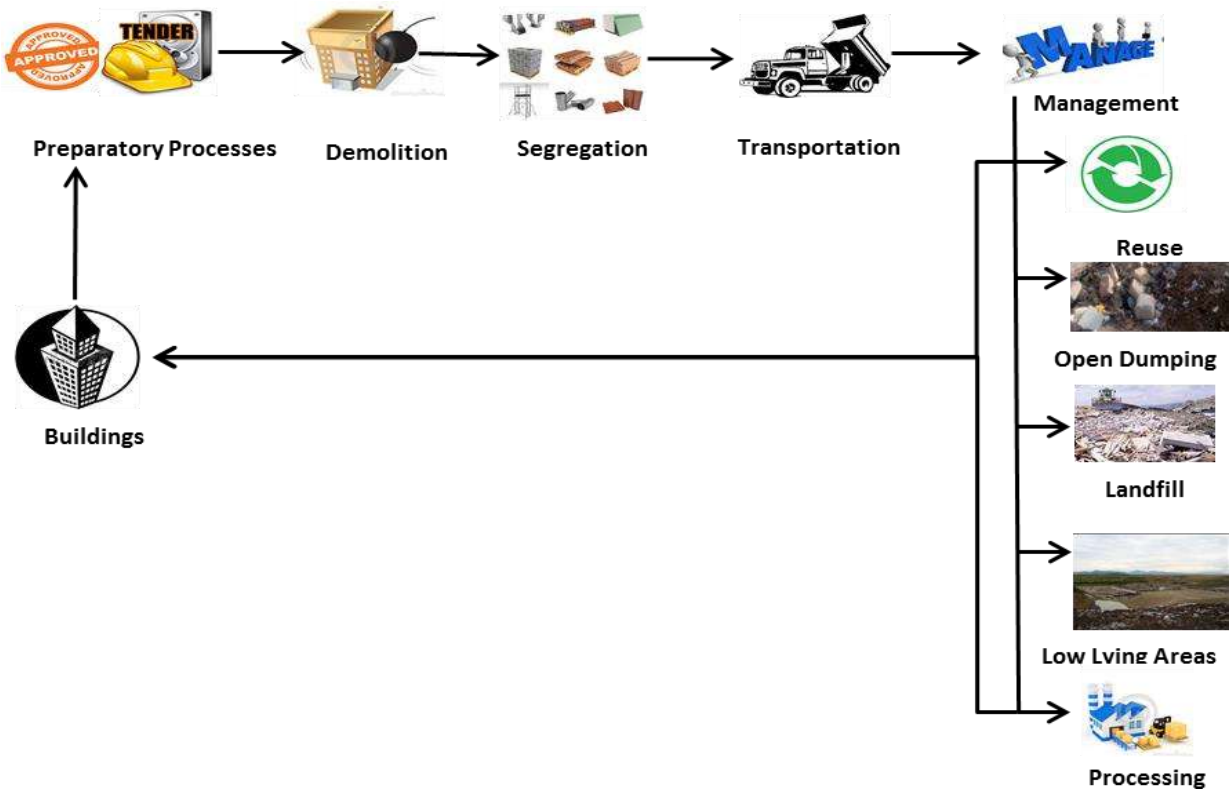


Figure 17 Schematic of current C&D Waste Management Processes in India

5.2.6 What can C&D waste be recycled / reused for?

C&D waste could be recycled and reused for multiple purposes depending on the composition and characteristics of the waste. The major applications of C&D waste which is practiced is listed below:

- **Granular Sub Base (GSB) –** Crushed C&D waste could be used as GSB layer for road constructions, regardless of the type of construction. The granular sub-base layer is formed by piling and compacting C&D aggregates of different sizes one over the other directly below the pavement surface. This acts as the load bearing and strengthening component of the pavement structure, in addition it provides drainage for the pavement structure and protects the structure from frost.
- **Recycled Concrete Aggregates (RCA)** – Concrete waste could be recycled to make aggregates of different standard sizes to replace natural aggregates in construction processes. According to Indian standards RCA could be used in any kind of structural and non-structural applications
- **Recycled Aggregates (RA)** – Crushed aggregates of standard size made from a mix of different C&D waste materials is termed as Recycled Aggregates. RA could be used for partial replacement of natural aggregates for construction of non-load bearing structures.

According to Indian standards, it could replace 20% in plain cement concrete and upto 30% replacement in road construction but only if backed up by proven laboratory test results. RA could also be used for construction of prefabricated molded structures like paver blocks, kerb stones, concrete pots and RCC Sculptures.

Table 19 C&D waste and its potential use

Material	Process	End Use
Plain Concrete	Crushed	Aggregate
Fresh Concrete	Washed to removecement & recover aggregate	Aggregate
Reinforced Concrete	Crushed & Steel bars removed Steel recycled	Crushed Concrete reused as aggregate
Brick	Cleaned & crushed	Aggregate & Filling material

- **Manufactured Sand (M-Sand)** – Manufactured sand is also produced by crushing of C&D waste, but is much finer materials which could replace natural sand in construction activities of non-load bearing structures. According to Indian standards only materials of sieve size between 0.075mm – 4.750mm is considered classified as M-sand and much finer particles are classified as dust particles, suitable only for daily cover for MSW.
- **Backfilling** – The most common reuse practice for C&D waste in India is as a backfilling material. The C&D was as such can be dumped in pits, trenches etc and compacted for backfilling or used to increase elevation or to make top layer of surface even for construction
- **Reusing** – Materials of reuse value like wood, unbroken bricks and ceramics are being used and could be used in secondary market for construction of temporary structures or if treated properly could be used for permanent structures as well
- **Other applications** – C&D waste is also applicable in other minor applications like carrier material in preparing fertilizers, filler material in roofing constructions, wall decorative chips etc.

Table 20 Demand for soil and sand and potential generation from C&D waste

Soil	Stone (Aggregates)
Demand for soil in brick making - **884** million tons/annum	Demand for stone as coarse aggregates in concrete – **1.1 billion** tons/annum Demand for stone as coarse aggregates inroads – **5 million** tons/annum
Soil waste generated from C&D waste - **213** million tons/annum	Aggregates generated from C&D waste - **254** million tons

5.2.7 Importance of Recycling of C&D Waste

a. Re-use and recycling 'wastes' has been promoted in all the waste rules.

b. With the increasing demand for built spaces and scarcity of land, a trend of re-development projects is expected. With increased urbanization and increased housing demands, there will be a shortage of aggregates to the extent of 55,000 million cu.m in housing sector, whereas the road sector requires an additional 750 million cu.m. of aggregates. This emphasizes the need of C & D waste management in India. The cost of construction materials is increasing enormously. In India, the cost of cement during 1995 was Rs. 125/kg and in 2012 the price increased to Rs. 330/bag. In case of bricks, the price was Rs. 0.66 per brick in 1995 and the present rate is Rs. 6 per brick in 2012. With the environmental hazards caused by excessive and illegal extraction of river sand, the mining of river sand was banned since April 1, 2012 (Ref. Report (May 2008) report on practices in C & D waste management in some Asian (includes India) by AIT Thailand).

c. Recycling of C & D waste is important as it helps to reduce the dependence on natural resources and eliminates adverse environmental impacts ex. mining which is energy intensive activity. Recycling of C & D wastes has the additional advantage of controlling the quantum of C & D waste destined for disposal at landfills besides reducing transportation costs.

d. When opportunities for reuse or salvage are exhausted, recycling is the next level. C & D waste materials that can be recycled include acoustical ceiling tiles, asphalt, asphalt shingles, carpets, concrete, drywall, fluorescent lights, land clearing debris (vegetation, stumpage, dirt), metals and metal alloys, structural steel, plastic film (sheeting, packaging), glass, wood etc.

e. The list of reuse and salvage materials include appliances, bathroom fixtures, bricks, blocks, masonry stone, structural steel, cabinets, carpeting, ceiling tiles, timber and

timber based boards, door and window frames and shutters, flooring tiles, stone tiles/platforms, insulation, landscaping materials, lighting fixtures, metal framing including for partitions and ceiling, paneling, pipes, antique moldings, accessories and hardware of furniture, PVC water tanks, roofing sheets used for garages, outdoor areas, fabric of tensile structures etc.

f. From recyclability, building materials can be specified which will encourage recycling of building materials. The list of recycled content building materials include carpet, floor mats, flooring, cellulose insulation, ceiling tile, ceramic/porcelain tile, concrete masonry units, countertop, ductwork, fences/posts, fibre board, fiberglass, insulation, pilings, roofing, structural steel, wallboard, asphalt, concrete, drainage or backfill aggregate.

g. C & D and other inert waste may be utilized for making bricks, pavement blocks, construction materials such as aggregates etc. There are several plants of various capacities in India to make bricks, paver blocks, aggregates, etc. out of such waste material.

h. The Hon'ble Court's intervention on the controversy over sand mining in some states has focused the need to explore options for recycle, reuse and substitute naturally sourced building material (example sand) hence the spotlight on C & D waste management.

i. See **ANNEXURE I**: Potential uses of C & D wastes

5.3. C & D Waste Management Rules, 2016

5.3.1 Why separate rules for Construction and Demolition (C&D)

Government of India in the erstwhile Ministry of Environment and Forest published Municipal Solid Wastes (Management and Handling) rules, 2000 which was amended from time to time. However, the central government after reviewing the existing rules considered it necessary to make separate rules for management of construction and demolition waste due following reasons,

- To give thrust to segregation, recovery, reuse and recycle
- To emphasis roles and accountability of waste generators and other stakeholdersrelated to waste management

5.3.2 Definitions in the Rules

The rules specifically define terms relevant to implementation of its implementation. The important elements of the definitions are highlighted for better understanding of the reader.

Construction

Process of erecting or alternation of building or built facility or other structure, or building of infrastructure

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Construction and Demolition Waste

Waste comprising of building materials, debris and rubble resulting from construction, remodeling, repair and demolition of any civil structure

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De-construction

Planned selective demolition in which salvage, re-use and recycling of the demolished structure is maximized.

Demolition

Breaking down or tearing down building and other structures either manually or using mechanical force (by various equipment) or by implosion using explosives

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Local Authority

Urban local authority such as municipal corporation, municipality, nagar palika, nagar Nigam, nagar panchayat, municipal council including notified area committee, gram panchayat

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Waste Generator

Person or association of persons or institution, residential and commercial establishments including Indian Railway, Airport, Port and Harbour and Defence establishments who undertakes construction or demolition

5.3.3 The Rules promote C & D waste utilization

The Construction and Demolition (C & D) Waste Management Rules, 2016 promotes C & D waste utilization.

Under Rule (6) under Duties of Local Authority, the following sub-rules states:

i. sub-rule (9) 'shall device appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner';

ii. sub-rule (10) 'shall create a sustained system of information, education and communication (IEC) for construction and demolition waste through collaboration with

expert institutions and civil societies and also disseminate through their own website';

iii. sub-rule (11) 'shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

Under Rule (7) mentions the 'Criteria for storage, processing or recycling facilities for construction and demolition (C & D) waste and application of construction and demolition waste and its products'.

Under Schedule I (Rule (7) (1)): 'Construction and demolition waste shall be utilized in sanitary landfill for municipal solid waste of the city or region as mentioned under Schedule I'.

a. The Rule (7) sub-rule (3) gives Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in Schedule II.

b. The Rule (9) sub-rule (4) mentions that the 'Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control'.

c. Rule (11) under Duties of Bureau of Indian Standards (BIS) and Indian Roads Congress (IRC) 'The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities and the role of Indian Road Congress shall be specific to the standards and practices pertaining to construction of roads.

5.3.4 Type of C & D wastes products proposed under Rules

The C & D wastes products suggested under the Construction and Demolition (C & D) Waste Management Rules, 2016 are as follows:

i. Under Rule (6) under Duties of Local Authority: sub-rule (11) 'shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

ii. Under Schedule I (Rule (7) (1)): 'Construction and demolition waste shall be utilized in sanitary landfill for municipal solid waste of the city or region as mentioned under Schedule I'. The Rule (7) sub-rule (3) gives Application of materials made from

construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in Schedule II.

iii. The Rule (9) sub-rule (4) mentions that the 'Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control'.

5.3.5 Duties of stakeholders

Stakeholders mentioned and defined in the rules are,

- Waste Generator
- Service providers and their contractors
- Local authority

The rules define duties each of the above-mentioned stakeholders.

Duties of waste generator

- Waste generators as defined in the rules are responsible for,
  - Collection
  - Storage of C&D waste generated within their premises
- Ensure Solid waste does not get mixed with C&D waste
- **Deposit C&D waste to collection centers OR processing facilities** as designatedand authorized by local body.
- Ensure that there is **no littering or deposition of C&D waste** to prevent obstruction of traffic, public and the drains





1. Concrete **2. Soil** **3. Steel** **4. Wood and Plastics** **5. Bricks & Mortar**

Figure18 Segregate waste into 5 streams

- Waste generators who generate **more than 20 tons per day** OR **300 tons per project in a month** shall,
  - Submit **waste management plan and approval from local authority** beforestarting construction, demolition or remodeling work.
  - **Pay relevant charges** for collection transportation, processing and disposal asnotified by local authority.

Duties of service providers and their contractors

- Prepare **comprehensive C&D waste management plan** for area within their jurisdiction
- **Clean C&D waste** in the work area every day in a reasonable timeframe depending on the duration of work and quantity and type of waste generated. This should be done in consultation with local authority.
- **Tie up with authorized agencies** for cleaning of C&D waste if logistics support is not available.

Duties of local authority

- **Issue direction for management of C&D waste** as per the rules within their jurisdiction and seek detailed plan or undertaking as applicable from generator of C&D waste.
- **Chalk out stages, methodology, equipment required, material** involved in the activities required after Construction and Demolition.
- **Safely dispose C&D waste contaminated with hazardous, toxic or nuclear material**
- after consultation with concerned authority.
- **Make arrangement for collection of C&D waste** and ensure that clean-up is done at regular intervals.
- Get the collected C&D waste transported to appropriate sites for disposal or processing.
- **Give incentives to generator** for salvaging, processing and or recycling C&D waste preferably in-situ.
- **Examine and sanction waste management plan of generators** within one month or within date of submission and approval of building plan, whichever is earlier.
- **Establish C&D waste generation database** and update once a year.
- **Device appropriate measures for management of C&D waste and use of recycled products** in best possible manner.in consultation with expert institutions,
- **Create sustained system of IEC activities for C&D waste management** through collaboration with expert institutes and civil society organizations and also disseminate through their own website.
- **Give incentive for use of products made with recycled C&D waste** in construction activities

5.4. Inventorization of C&D waste in the DPA

5.4.1 Why to do Inventorization of C&D waste?

Inventorization of C&D waste is crucial for following purposes:

- Decision making on capacity and technology of C&D waste processing plant that should be installed.
- Decision making on products that can be made from C&D waste
- Decision making on amount of funds that need to allocated for management of C&D waste
- Decision making on management practices to be adopted for C&D waste

5.4.2 How to estimate the generation of C&D waste in the DPA

The first step towards management of Construction and Demolition (C&D) waste is to determine and quantify the amount of C&D waste generated. Waste quantification models which have been utilized all over the world and other models available from literature review are presented here for better understanding and implementation for quantifying C&D waste. However, the accurate estimation of C&D waste depends on the availability and accessibility of data.

Site visit method

This methodology requires investigators to visit the construction or demolition sites for a realistic survey. Measurements are conducted through weighing C&D waste directly on site where onsite interviews are conducted with professionals for fine tuning the estimated generation. Although this method is very practical and suitable for measuring waste produced from all of the waste generation activities, it not appropriates for estimating the C&D waste generation at a regional level because of the high requirement of time, labor and money.

Per-capita multiplier

Per-capita multiplier is one of the earliest methodologies developed from methodologies that were used to quantify municipal solid waste (MSW). Per-capita multiplier is an easy way to quantify C&D waste as this method is based on population statistics of the region. This type of estimation is less reliable as it often leads to more than 10 folds' variation in the quantity estimated.

Waste Generation rate model

Waste generation rate model is widely used by researchers around the world to estimate the quantity of waste generated in the city. In this method, the amount of construction and

demolition activity happening in the sector has to be estimated and an appropriate activity specific waste generation rate has to be multiplied with the quantum of activity to get the total estimate. Statistical data such as number and the area of waste generation has to be collected for estimation in this model.

Estimation based on waste generation model

$$Q = \sum_{K=1}^{m} \sum_{j=1}^{l} \sum_{i=1} A_i * q_{jk} * p_k$$

Where,

Q is the total quantity of demolition waste generated in a region (in kg);

$\mathbf{A_i}$ refers to the total amount of demolition activity in the i^{th} part of the region;

l is the number of parts or zones in the region;

$\mathbf{q_{jk}}$ is the waste generation rate of j^{th} type of major material from K^{th} type of building;

m is the number of major materials

$\mathbf{p_k}$ refers to the proportion of the k^{th} type of building in the region; and

n is the number of different types of building in the region

Quantification of Construction and Demolition waste is regarded as a pre-requisite for successful implementation of C&D waste management in a city. The selection of most appropriate method is recommended based on the quantification objectives and region-specific conditions.

According to the Technology Information, Forecasting and Assessment Council's, or TIFAC's, thumb rule, a new construction generates 40-60 kg of C&D waste per sq m, then taking an average of 50 kg per sq m. The waste produced per sq m of demolition is 10 times that generated during construction and for building repair/renovation TIFAC estimated that it produces 40-50 kg per sq m of waste. Therefore, the estimates of waste generation can be calculated depending on the type of activity such as Construction, Demolition and renovation.

5.5. Collection, Transportation and Disposal of C&D waste

5.5.1 How to Collect and transport C&D waste?

Collection

Existing Practices – C&D waste in most ULBs is not collected or transported in an orderly manner. The waste is either collected by a random transportation contractor and used for backfilling elsewhere or dumped on unfenced land which is mostly illegal. Some municipalities have designated landfills for disposal, where the polluter has to dump waste at his own arrangements which in most cases isnot practiced since it is either far away on outskirts of city or the designated area is not known to the polluter due to improper communication by the ULB. Among the ULBs which have a collection yard a few have a proper tracking system by means of weigh bridges.

Weighbridge

Weighbridge is a device in form of a platform used to weigh very heavy objects like trucks. The weight of trucks is mostly weighed on a loaded and unloaded situation in order to measure the load it carried

Changes to be adopted - As per the national standards C&D waste need to be kept in the generator's compound and then transported to designated disposal site prescribed by the local governing body.

Transportation

The C&D waste need to be stored in a segregated manner and transported to the designated location on self-arrangements or through local governing bodies system, which ever exist in the ULB. Either way both the generator and the transporting body needs to maintain records of the quantum of waste transported to the dumping area. The local governing body could also provide fenced transfer stations as designated dumping units to facilitate easy transport of waste for the generator. The waste reaching the designated transfer stations of the ULB needs to be recorded and from transfer stations, the waste needs to be transported by the governing body to the dumping site or processing site.

C&D waste is transported from the site by trucks or tractors to disposal sites by paying a minimal fee to the transporters. These transporters can be private or empaneled with the ULB. The ULB transports the waste to the disposal site from these points or contracts with private contractors to do so. The transport of C&D waste needs to be in a covered truck (or any vehicle) to avoid dust, air pollution and spilling of debris on roads. Large scale waste quantum (more than 2 Tons) should be transported only by empaneled trucks which to be registered with the ULB and the registered trucks need to be available to the public to utilize. The trucks empaneled for transportation of generated waste can be enabled with GPS devices for tracking of waste flow from the collection points or demolishing site to the waste processing facilities. The waste needs to be quantified at disposal or processing site also by

proper weighing of trucks.

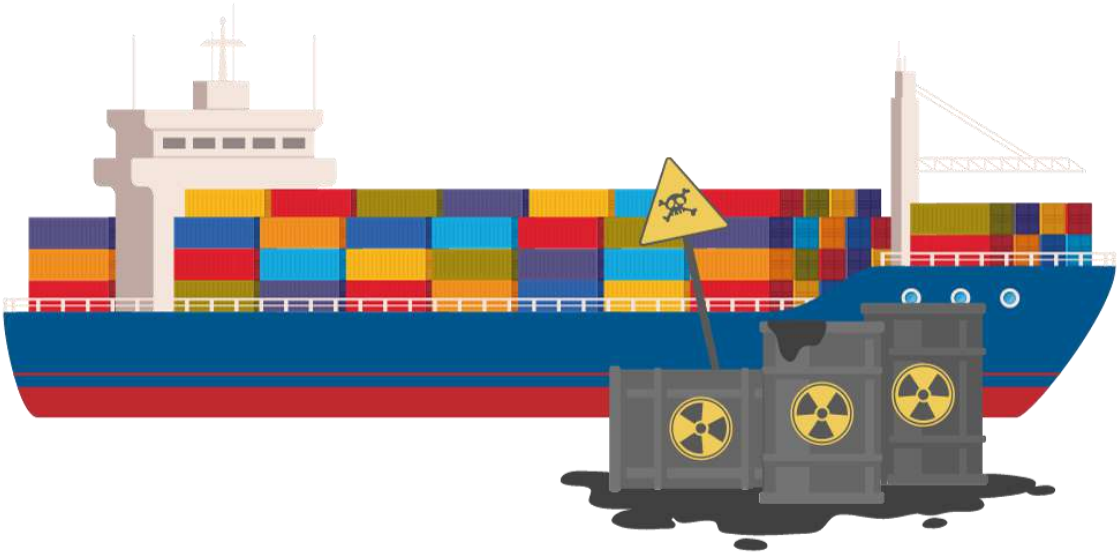
Disposal

Existing practices – C&D waste is mostly being disposed in on plain land, but it is also used as daily cover in MSW landfills. In many Municipalities it is also filled inside MSW landfill, in which case it occupies huge spaces and reduces capacity of the landfill.

Changes to be adopted – The C&D waste that comes out as a waste product after processing need to dumped into a separate sanitary landfill and should not be mixed with other MSW. The hazardous C&D waste need to be dumped in a hazardous waste landfill.

C&D waste should not be allowed to be dumped in the landfills before recovering useful materials from the waste stream.

Even for cities which do not have dedicated recycling facilities, the C&D waste debris should be disposed at designated dumping sites which provides an opportunity for recycling them in the future.



Chapter-6
Shipping Waste

6.1 Introduction of Shipping waste

6.1.1 What is shipping waste

Shipping waste means all types of waste, including sewage, and residues other than cargo residues, which are generated during the service of a ship, and fall under the scope of Annexes I, IV and V to MARPOL 73/78, and cargo associated waste, which is (not limited to): spillage during loading/ unloading, separation materials, fastening pallets, packing and casing materials, plywood, paper, cardboard, wires and steel bands (as defined in the Guidelines for the implementation of Annex V to MARPOL 73/78);

6.1.2 Objective of Manual

Target audience: Deputy Conservator Office and Marine Department, DPA

1. Creating awareness on Ocean pollution

The awareness shall be made amongst all stakeholders regarding the adverse impacts of oil spills and dumping of other wastes into the ocean. Below image in brief states the type of wastes that pollute oceans and adversely impacts Ocean ecosystems.

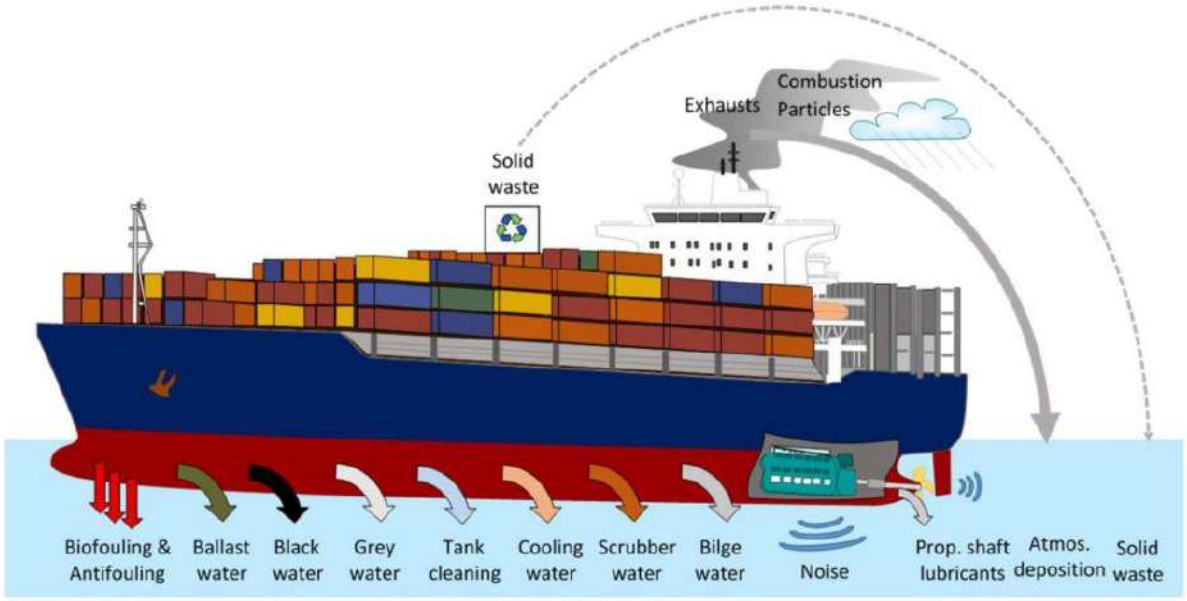


Figure 19 Effect of shipping waste on Ocean

6.2 Legal requirement

As per **Hazardous and Other Wastes (Management and Transboundary) Rules, 2016** DPA shall adhere to the provisions made for waste received from ships calling at the DPA ports as per MARPOL and Hazardous Waste Handling and Management Rules, 2016.

6.2.1 Maintaining records

The standard format for maintaining records of Hazardous and other wastes received at the ports from various ships as per Form 3

List of details required for filling up this format are:

- Name and address of the facility
- Date of issuance of Authorization from GPCB and its reference number
- Description of hazardous and other wastes handled (Generated or Received)

Record keeping format tabulated in Table 21 could be followed for systematic compilation of Waste generated and received from ships calling at the ports.

Table 21 Inventory of waste generated/received at Port

Waste reception date	Received from	Received at (Berth no.)	Waste category as per HWM rules	Waste category as per MARPOL	Total quantity (Metric Tons)	Method of Storage	Destined to
dd/mm/ yy	Name of the ship generating waste	Give details of berth receiving the shipping waste	As specified under HWM rules	Whether waste falls under purview of Annex I, II, IV or V		Details of any on-site waste storage if applicable	Details of agency assigned for waste collection

6.2.2 Annual return

Annual return is to be submitted to Gujarat Pollution Control Board by 30th June every year for the preceding period April to March

List of information required for filling the annual return are:

- Name and address of the facility:
- GPCB Authorization No. and Date of issue:
- Name of the authorized person and full address with telephone, fax number and e-mail
- Total quantity of waste generated category wise to be maintained as per format indicated in Table 22
- Date wise description of management of hazardous and other wastes including products sent and to whom in case of recyclers or pre-processor or utilizer. The record keeping of the movement of waste from port to Waste Managing Agency (WMA) either for processing/reuse or disposal shall be facilitated by the record keeping format shown in Table 22

Quantity dispatched

1. To disposal facility
2. To recycler or co-processors or pre-processor
3. Others

based on frequency of collection of waste by the agency

Table 12 Details of waste collection by agency

Date	Type of waste	Total quantity (Metric Tons)	Details of Agency	Method of disposal
Date of waste collection by agency	Details of waste collected: Name of waste Category of waste	Quantity collected by agency	Name, address and contact details of agency collecting the waste	Mention if waste is Recycled or Reused or Reprocessed and used as raw material or Disposed if disposed; mention the method of disposal i.e Landfilled, incinerated etc.

Quantity in storage at the end of the year

Waste quantity if not collected by agencies due to any circumstances has to be placed in a designated storage area that is protected from sunlight, wind or rain and in an environmentally sound manner. The record keeping of wastes under storage could be done as per format tabulated below in Table 23.

Table 23 Format for waste under storage

Name and type of waste	Quantum of waste (per year)	Reason for non-disposal	Method of storage
		Give brief detail on the reason for non-arrangement of disposal of the stated waste	Mention whether stored in storage room or shed or any other provision ensuring environmentally sound conditions

6.3 Adequacy of Port Reception Facilities

Through its Annexes MARPOL states the requirement for a Port Reception Facility (PRF) to be adequate to meet the needs of ships normally visiting the port and cause not any undue delay.

In the Guidelines for ensuring the adequacy of port waste reception facilities (resolution MEPC.83(44)) "adequate" is described as: "To achieve adequacy the port should have regard to the operational needs of users and provide reception facilities for the types and quantities of wastes from ships normally visiting the port".

"Adequate facilities" are described as those which:

- Mariner's use;
- Fully meet the need of ships regularly using them;
- Do not provide mariners with a disincentive to use them; and
- Contribute to the improvement of the marine environment.

The provided PRF must meet the needs of the ships normally using the port and allow for the ultimate disposal of ship-generated wastes and residues to take place in an environmentally appropriate way.

According to the 2017 Guidelines for the implementation of MARPOL Annex V (resolution MEPC.295(71)) the methodology for determining the adequacy of a reception facility should be based on:

- The number and types of ship calling at the port,
- The waste management requirements of each type of ship
- As well as the size and location of a port.

When selecting the most appropriate type of reception facility for a particular port, attention should be given to alternative methods available:

- Mobile facilities, such as trucks, can enhance a cost-efficient way of collecting ships' wastes.
- Floating facilities, such as barges, might be considered more effective, in particular where access by road is not practicable.

Timely assessment of the need for updating the Port Waste Management Plan (PWMP) shall be done by following:

- Assessing the demand for expanding Port Reception facility, based on waste categories and its quantities being received and requested by users
- Ensure whether information regarding waste categories for which reception facilities like Name of contact person/contractors/fees to be charged on port web-site/ Swachh Sagar Portal or by any other means are readily available to visiting ships prior their arrival
- Address the complaints registered on IMO GISIS Web-site
- Ensuring that the reception facilities provided fully meet the need of ships visiting the ports
- Ensuring that a fee charged to avail the port reception facilities does not act as a dis-incentive to use the facilities
- Ensure whether categorization and separation of ship waste into hazardous and non-

hazardous waste in accordance with hazardous and other waste rules, 2016 is practiced.

- Ensuring whether disposal of hazardous and non-hazardous waste is in accordance with hazardous waste Rules 2016 and port procedures. Also ensure whether waste not defined under hazardous waste rules is disposed in accordance with relevant rules like Plastic Waste in accordance with Plastic Waste Management Rules, e-waste in accordance with E-waste Management Rules and likewise.

6.4 Segregation of wastes on the ship

Target audience: Staff handling waste

PRF and/or port authorities might promote or (financially) incentivize the onboard separation of wastes for its environmentally sound management. The captain of the ship could be educated for waste segregation of ship generated wastes on the ship itself to avoid undue delay.

Table 24 Components of waste

Waste components	
Non-recyclable plastics and plastics mixed with non-plastic garbage	Wood
Rags	Metal
Recyclable wastes	Plastics (including extruded polystyrene or other similar plastic material)
Cooking oil	E-wastes such as electronic cards, equipment, computers, printer cartridges, etc.
Glass	Garbage that might present a hazard to the ship or crew (e.g. Oily rags, light bulbs, acids, chemicals, batteries, etc.)
Aluminum cans	Damaged/unwanted fishing gear
Paper, cardboard, corrugated board	

6.4.1 Segregation of ship generated waste

Segregation of waste generated or received at the ports from the ships calling at ports shall be encouraged as segregation is the building block of waste management system. The wastes shall be segregated into below listed components.

Table 25 Components of waste to be segregated

Waste components	Waste items
Food wastes	E.g. Animal-derived products and by-products because of risk of animal diseases
Cooking oil	Animal-derived products and by-products because of risk of animal diseases
Plastics	All typed of day-to day plastics in use like cutlery, bottles etc.
Domestic waste, operational waste and recyclable or reusable material	Paper, cardboards etc.
Special items like medical waste, outdated pyrotechnics and fumigation remnants	Medicines, drugs etc.
Animal wastes, including used bedding from the transport of live animals (due to risk of disease) but excluding drainage from spaces containing living animals	Animal-derived wastes
Cargo residues	Packaging etc.
E-waste	Such as electronic cards, gadgets, equipment, computers, printer cartridges, etc.

Chapter-7
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Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

“An ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 Certified Institute”

Head Office

"GEMI Bhavan", Plot No. B: 246-247, Electronic Estate,
GIDC, Sector 25, Gandhinagar - 382024 (Gujarat)

Laboratory

GEMI's Laboratory
Plot No. B-64, Electronic Estate GIDC, Sector-25
Gandhinagar - 382024 (Gujarat)

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We Provide Environmental Solutions

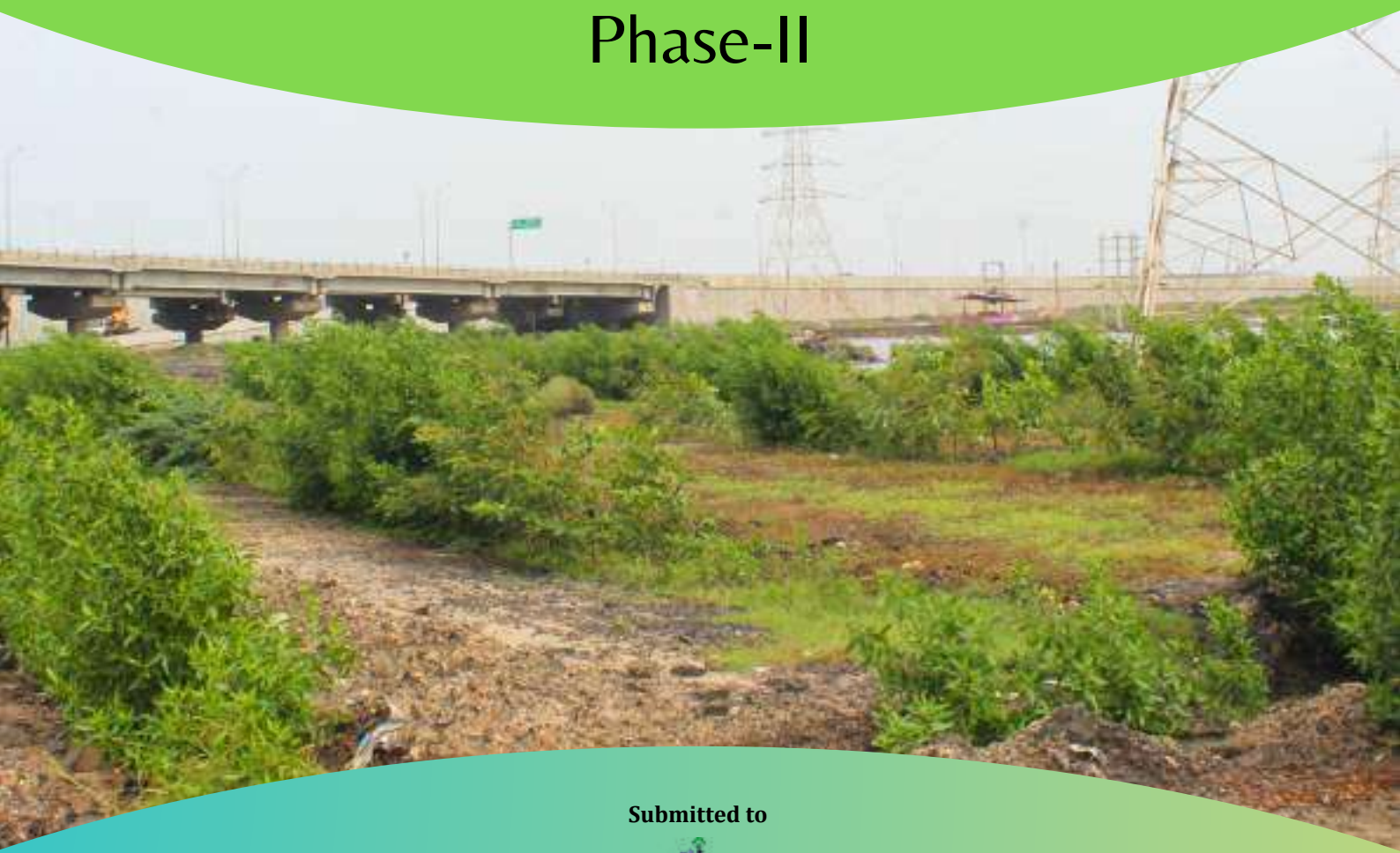
ANNEXURE F
Final Report Green belt development - II

Final Report

on

Greenbelt Development in Deendayal Port Authority and its surrounding areas, Kandla Port

Phase-II



Submitted to

Deendayal Port Authority
Administrative Office Building
Post Box No.50, Gandhidham (Kachchh)
Gujarat-370201

Submitted by

Gujarat Institute of Desert Ecology
Opp. Changleshwar Temple,
Mundra Road, Bhuj-370 001,
Kachchh, Gujarat
www.gujaratdesertecology.com

Final Report

on

Greenbelt Development in Deendayal Port Authority and its surrounding areas (Phase-II) Kandla Port

Co-ordinator
Dr. V. Vijay Kumar, *Director*

Principal Investigator
Dr. Jayesh B. Bhatt, *Scientist*

Co-Principal Investigator
Mr. Bhagirath Paradva, *Project Fellow*
Mr. Rakesh Popatani, *Project Fellow*

Team Member
Mr. Vivek Chauhan, *Project Assistant-I*
Mr. Ajay Gohel, *Project Fellow*

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Content

Introduction

The Greenbelt cover/forest has been the utmost necessity for the survival of human as well as for the wildlife with the current scenario of human explosion, industrial development and climate change. The greenbelt cover provides ecological services such as purifying air, reduce soil erosion, improving ground water table, reduce salinity. In addition, it also caters the services such as food, fodder and medicine, etc. along with playing a very vital role in providing habitats for wildlife and maintaining ecological balance, climate regulation, biodiversity conservation and maintaining pleasant micro climate of the region. Thus, green belt offers a number of benefits for population. Moreover, vegetation absorbs various pollutants from the environment and thus helps in effective pollution control. However, due to the various types and extent of economic development like industrialization, mining, infrastructural development, etc. has exerted pressure in reducing and fragmenting natural vegetation cover day-by day all over the world.

The infrastructural and industrial development leads to influence the life of all the living organisms in two directions: either upwards or downwards. In the upward mode, human being gets opportunities for luxuriant life with easy accessibility to the resources while in downward, the quality of ecosystem services gets affected. Most of the industrial and infra-structural developmental activities generate pollution of one or other types with varying magnitudes, which makes susceptible to all the organisms, nevertheless, the pre-eminence of resistance of each of the organisms helps themselves to overcome the hazards caused by such pollutants.

Therefore, the general concept of green belt has evolved in recent years to develop vegetations or green spaces alongside of industries, mines, thermal power station, roadsides, and other development units is an effective mechanism to rejuvenate the environment through vital vegetation cover that safeguard the health of human and other living organisms. Green belts in and around urban and industrial areas are important to the ecological health of any given region. Greenbelt is the plantation of trees along the industrial units, mines, roadside for reducing the pollution originating from these operations (Flemming, 1967; Hanson and Throne, 1970; Warren, 1973; Ganguly, 1976). Greenbelt has been developed in view of the following factors; (i) physical characteristics

of the green belt eg. Distance from the source, width, and height and leaf surface area density (ii) aerodynamic properties eg. Wind speed through greenbelt and effective height of the incident air stream (iii) deposition velocity of the pollutant and (iv) atmospheric stability conditions (CPCB, 2000).

As per the National Forest Policy (NFP-1988), it is necessary to encourage the planting of trees alongside of roads, railway lines, rivers and streams and canals, and on other unutilized lands under state/corporate, institutional or private ownership. NFP give emphasis on the green belt developments. It says – Green belts should be raised in urban/industrial areas as well as in arid tracts. Such a programme will help to check erosion and desertification as well as improve the microclimate.

Green infrastructure serves to provide on ecological framework for social, economic and environmental health of the surroundings. The main components of this approach include storm water management, climate adaptation, less heat stress, more biodiversity, food production, better air quality, sustainable energy production, clean water and healthy soils, as well as the more anthropocentric functions such as increased quality of life through recreation and providing shade and shelter in and around infrastructure and industrial areas. Green infrastructure is thought to be effective in such scenarios, where green plants from a surface capable of absorbing air pollutants and act as a sink for pollutants. Leaves with their vast leaf area in the tree canopy, absorbs pollutants on their surface. Thus, effectively reduce their concentrations in the ambient air. Often the absorbed pollutants are incorporated in metallic streams and thus the air is purified. Plants grown in such a way as to function as pollutant sinks are collectively referred to as green infrastructure or green belts. Apart from functioning as a pollutant sink, green belts would also provide other benefits like aesthetic improvement and providing possible habitats for birds and animals along with maintain the soil moisture regime with the soil microorganisms and improve the Soil quality and ground water recharge. The greenbelts have helps in improving the ecology, maintenance of biodiversity, mitigation of dust pollution and fugitive emission, control of noise pollution, provide fresh air, increasing aesthetic values of an area and overall improvement of the landscape.

Rationale

Deendayal Port in Kachchh District of Gujarat State (formerly Kandla Port Trust), operated by Deendayal Port Authority (DPA), is a gateway Port to the hinterland in the western and northern states of India. It is one of the 11 major Ports of India situated at 22°59'39.77'' N latitude and; 70°13'20.14'' E longitude on Kandla creek at Gulf of Kachchh. The inclusion of Karachi Port in Pakistan after India's partition and heavy traffic congestion at the then Bombay Port gave impetus for promoting Deendayal Port during the year 1950s. In 1955, Deendayal Port acquired the status of a major Port in India. Because of its proximity to the Gulf countries, large quantities of crude petroleum and other assorted cargo are imported through Deendayal Port. The Port presently has 14 jetties, six oil terminals, and several allied facilities for handling dry and liquid cargo. Regular expansion/developmental activities such as the addition of jetties, allied Special Economic Zones (SEZ hereafter), industrial parks and ship bunkering facilities are underway to cope with the increasing cargo handling demands. Shri Mansukh Mandaviya, Minister of State for Ports, Shipping and Waterways (I/C) appreciated the efforts taken by Deendayal Port and added that it is indeed the major achievements in the challenging (COVID) times and it is significant indication that economy is bouncing back to achieve pre-COVID times.

Major commodities handled by the Deendayal Port are Crude Oil, Petroleum product, Coal, Salt, Edible Oil, Fertilizer, Sugar, Timber, Soya bean, Wheat. This major achievement can be attributed to the user-friendly approach of port with the Shipping fraternity / stakeholders and constant consultations with them to improve ease of doing business. An assortment of liquid and dry cargo is being handled at Deendayal Port. The dry cargo includes fertilizers, iron crap, steel, food grain, metal products, ores, cement, coal, machinery, sugar, wooden logs, salt extractions, etc. The liquid cargo includes edible oil, crude oil and other petroleum products. DPA created a new record by handling 127.10 million metric tons of cargo during FY 2021-22 compared to 117.566 MMT in FY 2020-21, with a growth of 8.11%. Incidentally, DPA is the only major Indian Port to handle more than 127 MMT cargo throughput, and it has also registered as the highest cargo throughput in its history. The Port has handled 3151 vessels during FY 2021-22 compared to 3095 vessels in FY 2019-20. While the Port has flagged off several projects related to infrastructure creation, DPA has successfully awarded the work of

augmentation of Liquid cargo handling capacity by revamping the existing pipeline network at the oil jetty area in September 2021. Deendayal Port is a natural harbour located on the eastern bank of North-South trending Kandla creek at an aerial distance of 145 km from the Gulf's mouth.

Being located at the inner end of the Gulf of Kachchh (GoK), Deendayal Port has a marine ecosystem with a vast expanse of mangroves, creek systems and allied biota. The Port location is marked by a network of major and minor mangrove-lined creek systems. The coastal belt in and around the Port has an irregular and dissected configuration.

There are no perennial or seasonal rivers in Gandhidham taluka where the part is located. Total rainy days during the monsoon season is limited to only 15-20 days and used to be erratic. Freshwater input into the near coastal waters is relatively meagre and appears to have less influence on the ambient coastal water quality except during monsoon months, during which freshwater through flash floods get discharged in the near coastal waters. The annual average humidity is 60%, which increases to 80% during the southwest monsoon (June to September) and decreases to 50% during the months of November and December. The drought phenomenon is common with two drought years in a cycle of 5 years.

The coastal belt in and around the Kandla region is characterized by a network of creek systems and covered by sparse halophytic vegetation, creek water and salt-encrusted land mass, which forms the major land forms. The surrounding environment in a radius of 10 km from the Port is mostly built-up areas consisting of salt works, human habitations and Port related structures on the west and north, creek system, mangrove formations on the east and south. The Deendayal Port and its surroundings have mangroves and creek systems as major ecological entities.

DPA is committed towards environment protection since its establishment and has taken many initiatives towards increasing green cover and greenbelt development in various areas under DPA through intensive plantation activities and developing greenbelt around its established port and jetty areas and human habitations.

In order to enhance and strengthen Greenbelt Development, the DPA has approached GUIDE to develop the greenbelt area within the port area in phase wise manner and raised 5000 plants at a suitable site during the first phase (2022-23). In continuation,

10,000 plants have been finalized during the 2nd phase 2023-24 and 800 plants as a deficient of first phase.

GUIDE team has visited the proposed Greenbelt development site at Kandla port with the officials from Kandla Port as part of selection of suitable and available locations for green belt development. Based on the observation of the project site and its landscape, environment and ecology of the area, suitable plant species for such area was worked out in order to improve the local environment and for the Greenbelt development at the port area.

Project Site

Based on observation made by the GUIDE Team and Officials from Deendayal Port Authority, a site at RoB and another site opposite to 15-16th Birth along the wall have been selected on the peripheral boundary of two sites.

Fig. 1 Map of Plantation Area RoB

The area proposed for green development of Deendayal Port is barren land without any vegetation. The soil of the area is black muddy and is high saline soil and with saline ground water. The area is very dry and hot during the summer. The highest temperature in Kandla is used to be recorded in this area.

Fig. 2 Map of Plantation Area 15-16 Birth Opp: Wall

Fig. 3 Map of Plantation Area 15-16 Birth Opp: Wall

Scope of Works

The overall objective is to Development Greenbelt at Deendayal Port. The following activities of the Greenbelt development have been carried out:

1. To make an inventory of suitable sites for greenbelt development in and around the Deendayal Port at Kandla.
2. To carryout Soil and Moisture Conservation (SMC) of the selected sites.
3. Identification of suitable species of plants as per site scenario for the greenbelt plantation.
4. Adopting plantation technique and soil/manure amendments.
5. Regular monitoring (survival and growth) of the plantation.
6. Suggest measures for management and improvement of the greenbelt.

Approach and Methodology for Greenbelt Development

Following steps have been adopted for greenbelt development:

- Removal of exotic/unwanted plants plant species from the entire area demarcated for green belt development: The entire selected site has been cleared by removing unwanted weeds and material such as stones, plastics etc.by JCB and also with the help of labor forces.
- Landscaping of the area and land preparation Trench line of 2.5x 2.5 ft. have been dig out through JCB at RoB site and another site opposite to 15-16th Birth along the wall.
- Soil and moisture conservation work since the port area is highly saline, SMC work was very much essential for better survival of the plants. Agriculture fertile soil have been added in appropriate quantity.
- Identification of native species of plants for plantation in greenbelt as per the site suitability the site was very challenging for greenbelt development since the water and soil is highly saline with the extreme climatic condition, the selection of plant species for plantation has been made very carefully. 40 % of plants have been selected as native species for plantation where as 60% species of *Conocarpus* depends on high salinity level of the soil of the area.

- Procurement of sapling of identified species or Nursery management or seeding of tree/shrub species all the saplings were procured where of 3-4 ft. in height from reliable nursery. All saplings were of tree species.

- Installation of drip irrigation facilities was not feasible therefore activity was planned preferably through tankers. The watering of the plantation has been scheduled as per the seasons which is given in table. Regular watering as per the scheduled have been provided by the water tanker under the supervision of team expert

- Use of Manure, preferably organic fertilizer for enhancing soil fertility best quality organic manure have been provided to the saplings for better growth and survival. Weed management and trench repairing have been carried out periodically also as and when it required.

- Regular monitoring and management of the saplings by a qualified team from GUIDE the selected. The regular visit to the site has been made for monitoring and clearing the road for water tanker for irrigation. Gap fillings was also made during the period.

Plantation Techniques:

- Site development for a plantation includes clearance for weeds and it involves, bush cutting, soil and moisture conservation works and marking of pits for planting of saplings etc.

- After clearing the land sites for digging of pits, plantation have been marked on ground using a measuring tape to ensure the desired spacing.

- Pits of the size 45 cm x 45 cm and 45 cm depth have been dug for tree plantation. Pits have been deep enough to ensure that the roots of the plants do not curl up once the planting material is placed in it.

- Since the soil is highly saline, a fertile soil around 10 dumpers have been added for better survival of plants

- Organic manure has been added for better growth and survival.

- The pit has been filled a little above the ground level so that after the earth settles the upper surface of the pit is level to the ground thus avoiding any water logging.

- The plantation has been carried out in two phases

- Around 4000 saplings have been planted during the first phase at available plantation area at RoB site.
- Around 4500 saplings have been planted during the first phase at available plantation area at opposite 15-16th Birth along the wall.
- The remaining 2500 saplings have been planted at opposite 15-16th Birth along the wall. Thus, a total of 11000 plantations have been completed at the end of the project.
- Along with the above, gap filling of 2500 plants were carried out in both the sites, thus covering a total of 13,500 plants have been planted to achieve the target of 11,000 plants.
- The assessment on survival of plants have been carried out during the 2nd week of August 2024 which shows the deficient of around 1000 plants hence the gap filling of 1200 plants have been made during 3rd to 7th September 2024.
- The verification of plantation has been made with the officials of Deendayal Port Authority on 22nd October 2024 and it has been verified and confirmed that 90% survival of plants for the plantation carried out during the 2nd Phase under the project.

Selection of Plant Species for Plantation:

Various indigenous tree species suitable for the area have been identified and selected for plantation in suitable areas based on the assessment of soil quality, available water facility, and other environmental parameters.

Number of Sapling:

Approximate numbers of saplings to be required for the greenbelt are as follows;
Total plantations of 11,000 saplings were planted at RoB & 15-16 Birth (Opposite wall both sides) along with additional gap filling in the areas.

Management and Monitoring of Greenbelt:

The plantation within the identified site have been managed and monitored for a minimum period of one year from June 2023 to September 2024. The management of

plantation includes appropriate irrigation of the plantation in regular intervals, during summer and winter periods along with dry spells during the monsoon.

The plants are growing very well and reached more than 4-6 ft. height. The survival of plants has been noted very high as 90% during September 2024. Watering have been made through tanker service at given schedule during the different seasons. (Table. 1)

Table-1 Time Schedule for Watering

Sr. No.	Month & Year	Number of Time
1	October 2023	7 times/ month
2	November 2023	7 times/ month
3	December 2023	7 times/ month
4	January 2024	7 times/ month
5	February 2024	7 times/ month
6	March 2024	9 times/ month
7	April 2024	10 times/ month
8	May 2024	10 times/ month
9	June 2024	8 times/ month
10	July 2024	8 times/ month
11	August 2024	3 times/ month
12	September 2024	5 times/ month

Annexure I
List of Plants for Plantation at site for Greenbelt Development
Site: Road Over Bridge

Sr. No.	Scientific Name	Local Name	No. of Plants
1	*Conocarpus*	Conocarpus	2500
2	*Peltophorum pterocarpum*	Peltofoum	200
3	*Millettia pinnata*	Karanj	100
4	*Delonix regia*	Gulmahor	200
5	*Alstromia schollaris*	Saptparni	100
6	*Terminalia catapa*	Badam	100
7	*Plumaria obtusa*	Chmapo	100
8	*Ceaslpinia pulcherima*	Galtoro	100
9	*Bauhinia racemosa*	Kachnar	200
10	*Tabubia rosea*	tabubia	100
11	*Terminalia arjuna*	Arjun	100
12	*Cassia fistula*	Garmalo	200
	Gap Fillings		2050

Site: Opposite 15-16th Berth

Sr. No.	Scientific Name	Local Name	No. of Plants
1	*Conocarpus*	Conocarpus	4000
2	*Peltophorum pterocarpum*	Peltofoum	450
3	*Millettia pinnata*	Karanj	400
4	*Delonix regia*	Gulmahor	400
5	*Mimusops elengi*	Borssalii	300
6	*Ceaslpinia pulcherima*	Galtoro	450
7	*Tabubia rosea*	tabubia	400
8	*Cassia fistula*	Garmalo	300
9	*Bauhinia racemosa*	Kachnar	300
	Gap fillings		1650

Fig. 4 Digging Out Trench for Plantation

Fig. 5 Transportation of Plants to Site

Fig. 6 Fertile Soil for Better Survival of Plants

Fig. 7 Soil Filling in Plantation Pits

Fig. 8 Organic Manure for Better Growth and Survival

Fig. 9 Regular Watering of the Plants by Tanker

Gap Filling (September 2024)

Current Status of plantation at RoB site

Current Status of plantation opp: 15-16 Berth

ANNEXURE G
Environment Audit Report

ENVIRONMENTAL AUDIT REPORT

(Period of Audit from Aug 2023 – July 2024)

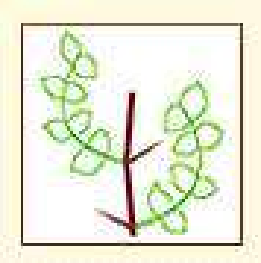
CLIENT

M/S DEENDAYAL PORT AUTHORITY

A.O Building Gandhidham,

Tal: Gandhidham, Dist: Kutch - 370201

AUDITOR



GUJARAT INSTITUTE OF DESERT ECOLOGY
P.B. No. 83, Opp. Changleshwar Temple, Mundra Road
Bhuj-Kachchh, Gujarat – 370001

July 2024

Dr. V. Vijay Kumar
Director

Gujarat Institute of Desert Ecology

Certificate

This is to state that the **Final Report** of the work entitled, **"Environmental Audit of Deendayal Port, Kandla"** has been prepared in line with the Work order issued by DPT vide No. Civil Engineering /EMC/522/Env Audit /2023/336.Dt 19.07.2023 as per the EC & CRZ Clearance accorded by the MoEF & CC, GoI dated 20th November 2020, Standard Condition No. B. X. iv.

This Final Report is for the period from August 2023 – July 2024.

Authorized Signatory **Institute Seal**

P.O. Box No. 83, Opp. Changleshwar Temple, Mundra Road, Bhuj (Kachchh) - 370 001, Gujarat (India)
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INDEX

List of Appendix

EXECUTIVE SUMMARY

DPA has assigned the work to "Carry out the work of Environment Audit" to GUIDE, Bhuj vide work order dated 19/07/2023 (Period August 2023 to July 2024) for the compliance of

1) Stipulated condition of the Consolidated consent and authorization (CCA) issued by the GPCB to DPA for whole Port area, vide letter no. GPCB/CCA-Kutch-812(5)/ID-28494/581914 dated 22/01/2021 General Condition no. 7.6 i.e. "The Environment Audit shall be carried out yearly
2) Compliance of the condition stipulated in EC & CRZ Clearance accorded by the MoEF &CC, GoI dated 20/11/2020 ", condition no. iv of the Environmental Responsibility i.e. "Self-Environment Audit shall be conducted annually. Every three years third party environment audit shall be carried out
3) Implementation of Harit Sagar Guidelines, Para 4.12 ENVIRONMENT MANAGEMENT, All Ports to carry out an Independent Annual Environment Audit by a credible agency and report of the same shall be uploaded on the Port's website annually before 30th April of every year.

OBJECTIVES:

- To check the efficiency and efficacy of the gaseous emissions, solid waste, ambient air, noise, health and safety systems of **M/s Deendayal Port Authority.**
- To check whether **M/s Deendayal Port Authority** meets with all the required norms of state regulatory agency that is Gujarat Pollution Control Board regarding environmental pollution control.
- To check various records of Environmental Management System.

OPERATIONAL BRIEFINGS:

- The team of auditors from Environmental Audit Cell of Gujarat Institute of Desert Ecology led by Dr. K Karthikeyan (Assistant Director) Mr. Ratansi Chaudhary (Chemical engineer), Mr. Ruturajsinh Sarvaiya (Environmental engineer), Ms. Hirji Dangar (Analytical Chemist) did the environmental audit work of **M/s Deendayal Port Authority** by making two visits and also did survey and inspection of Stacks and Ambient and its units. Technical information was also sought. Visual observations of the units and machinery were also carried out.

- Most representative grab effluent samples, ambient air samples, were taken analyzed and have been reported in this report. Noise pollution level was also measured.
- The findings reported in this audit report are entirely based on data furnished by the industry and data collected by the audit team during the audit surveys in the client factory, all the EMS were at normal conditions. The auditors shall not be in a position to comment on the EMS and its performance for the period other than the period of audit surveys. Thus, the findings reported in this audit report are strictly limited to the period when the audit team conducted the surveys.
- Thus the information collected by GUIDE from M/s Deendayal Port Authority and various analyses of effluent, and air samples proved useful in judging the efficiency and efficacy of the Environment Pollution Control measures.

ENVIRONMENTAL AUDIT REPORT 2023 – 24:

This Environmental Audit Report contains **26 Annexures** and **5 Appendix** wherein all the data required as per Environmental Audit Format has been included and analyzed critically.

In summary, it can be said that the Environmental Management System provided by **M/s Deendayal Port Authority** as stated in this report is **adequate** and **efficacious** to achieve the quality of effluents (Air + Waste Water + Solid Waste) as specified / required consent by GPCB, Gandhinagar for liquid effluent, Air Emissions and Hazardous Wastes.

We extend our sincere thanks to all the members of M/s Deendayal Port Authority for their co-operation and help extended to us in data collection and fieldwork to complete the Environmental audit.

We are pleased to submit this environmental audit report for further necessary action.

PERFORMA 1: FORMAT FOR THE ENVIRONMENTAL AUDIT

(Period of Audit from Aug 2023 – July 2024)

[A]	**GENERAL**	
1	Name of Industry	M/s Deendayal Port Authority, Kandla
2	Location	Deendayal Port Authority, A.O. Building Gandhidham, Dist - Kutch 370201.
3	Registered Office Address	Deendayal Port Authority, A.O. Building Gandhidham, Dist - Kutch 370201.
4	Month and year of Establishment.	Kandla Port Operation: April 8, 1955 (Declared a Major Port)
5	Nos. of Workers Employed Male/ Female & Total	Total 1206
6	Nos. of Electric connection with service number. Total connected load. Electric consumption/ton(s) of product manufactured. Percentage enhancement in energy: Saving as compared to previous year	DPA is availing double circuit power supply from GETCO. Having 66 kV network for port operations. As per **Annexure – 1.**
7	Nos. of DG sets and their capacity	2 Nos. : 1010 KVA each
8	Name & Residential Address of all Directors/partners.	As per **Annexure – 2.**

<table>
<tr><td>9</td><td>Telephone nos. Residential & industrial, Fax no. & E-mail of industry & Partners/Directors.</td><td>As per Annexure – 2.</td></tr>
<tr><td>10</td><td>Nos. of Shifts & Timings.</td><td><table><tr><th>Nos. of shifts</th><th>Timings – Port operation</th></tr><tr><td>First Shift</td><td>6:00 to 14:00</td></tr><tr><td>Second Shift</td><td>14:00 to 22:00</td></tr><tr><td>Third Shift</td><td>22:00 to 6:00</td></tr><tr><td>General Shift</td><td>10:00 to 17:30</td></tr></table></td></tr>
<tr><td>11</td><td>Name & Address of the In charge of Environment Safety: Division / Cell/Unit.</td><td>Shri. B. Rajendra Prasad
Dy. Chief Engineer and EMC (I/c) Administrative Office Building, Gandhidham Kutch – 370201, Gujarat India.</td></tr>
<tr><td>12</td><td>Nos. of days during which production activities were in operation during the period covered for it. (For Audit).</td><td>The Port is operated throughout the year.</td></tr>
<tr><td>13</td><td>Has the industry obtained ISO 9000/ISO 14000/OSHAS 18000/Any other EM accreditation/Certification recognition?</td><td>DPA is ISO 14000:2015 certified for providing port facility and related maritime services for vessels and Cargo Handling including storage of Deendayal Port Authority.</td></tr>
<tr><td>14</td><td>Whether the industry has adopted cleaner production/cleaner Technology /CDM?</td><td>Not applicable. As Production activity not involved.</td></tr>
<tr><td>[B]</td><td colspan="2">PRODUCT DETAILS.</td></tr>
<tr><td>1</td><td>Name of Products & Capacity with yield/purity per day</td><td>Not Applicable. As this is Port and Production does not take place. However The quantity of cargo handled per month is attached in Annexure – 5.</td></tr>
</table>

2	Name of all by – products and its quantity per day	Not Applicable
3	Date of commencement of production for each product. Whether production is as per consented quantity:	Kandla Port Operation: April 8, 1955 (Declared a Major Port).
4	All Raw materials required for one kg. of the product.	Not Applicable
5	Whether the manufacturing process is continuous or batch wise. Indicate the batch size. If the process is batch wise, no. of batches/month along with the duration of the completion of each batch.	Port operation is continuous.
6	Detailed manufacturing process with flow diagram:- -List of unit operations & processes & with all chemical reactions, along with the time required (in hrs) for completion of each unit operation /process and the total time for completion of entire batch. -Mass balance in respect of the quantity of water, input of raw materials and waste water generation.	Not Applicable

(C)	**WATER**	
1	The quantity of water consumed per day as well as per ton of product manufactured. (Please also enclose the water balance diagram). over the last three year.	Total water consumed during April – 2023 to March – 2024 is 574086.12 KL. Please refer to **Annexure – 6.**
2	The quantity of waste water (trade effluent) generated per ton of each product per day, as well as per batch. over the last three year.	Total Waste water generated during April – 2023 to March – 2024 is 2690 KL. Please refer to **Annexure – 6.**
3	The particulars of effluent treatments, i.e. -Name and size of each unit. -The capacity of the ETP. -Flow diagram & Hydraulic diagram. -Whether lighting arrangement around ETP is provided. -Whether the separate energy meter for effluent treatment plant area is installed. If provided reading of the meter for consumption every month. -Whether flow meter is provided at the inlet and outlet of ETP. Please indicate the type of the flow meter.	Not Applicable
4	The method of disposal of final treated effluent and the point of disposal (Please attach sketch)	Not Applicable
5	The quality of trade effluent at the inlet and outlet of ETP and various stages of treatment	Not Applicable

6	The quantity and quality of sewage and its method of treatment and disposal (Attach separate sheets) a) As per norms b) Total pollution load*	STP treatment procedure is attached in **Annexure – 7.** Analysis report of STP water & marine water is attached in **Annexure – 8 & 9.**
7	The open area available for disposal of the effluent.	Not Applicable
8	Whether the quality of treated effluent meets the specified norms. If no: the extent of deviation and reasons thereof:	Not Applicable
9	Improvement in effluent quality and quantity since previous environmental audit based on performance evaluation of effluent management systems. If yes, provide details (Attach separate sheets)	None.
10	Retrofitting undertaken to improve performance of ETP. If yes, provide details.	Not Applicable
11	Major problems encountered during operation of effluent treatment facilities, if any and reasons thereof.	Not Applicable

12	The details about the operator/ chemist responsible for operation & maintenance of ETP. - Name of the operators/employee -Qualification & Experience of each operator/employee. - Salary of operators/employee.	Not Applicable
13	The current status of consent under the water act-1974.	Valid upto 21/07/2025 vide Consolidated Consent &Authorisation (CCA) No. AWH-110594.
[D]	**AIR**	
1	Nos. of the flue gas stacks, their height (from ground level), nature & consumption of fuel.	2 Stacks attached to D.G. Sets. Fuel: Diesel, 500 lit/hr.
2	The details pertaining to the stack monitoring facilities.	Necessary monitoring facilities are available.
3	Nos. of process stacks, their height (from ground level), source, expected pollutants & the details pertaining to the provision of stack monitoring facilities.	Not Applicable
4	The quality of emission from each flue gas stack and the process stack and the extent of deviation from them.	Not Applicable
5	The ambient air quality within the factory premises, along with the number of ambient air quality monitoring stations outside the factory.	Please refer to **Annexure – 11.**

6	The status of consent under the air act-1981	Valid upto 21/07/2025 vide Consolidated Consent & Authorisation (CCA) No. AWH-110594.
7	The details of air pollution control measures for all process and flue gas stacks.	Not Applicable
8	Improvement in emission quality since previous environmental audit based on performance evaluation of air pollution management system If yes, provide details.	No
9	Retrofitting undertaken to improve emission quality. If yes, provide details:	Not Applicable
10	Major problems encountered during operation of control device, if any and reasons thereof.	Not Applicable
[E]	**HAZARDOUS (SOLID) WASTE**	
1	The quantity sources and composition of hazardous waste, solid waste from each process/source over the last three year (The total generation of the sludge per ton of product manufactured.) -whether it is as per the consented quantity:	Yes, Hazardous waste disposal from vessel at kandla port is attached in **Annexure – 13.**

2	The method of storage, treatment and disposal of hazardous/solid waste. - The details should include area of storage and disposal and whether storage and disposal system is covered made impervious (Pucca). - Quantity of Hazardous waste sent to TSDF. - Please also indicate how the quantity of hazardous / solid shall be reduced in next three months. - The data/information about leachate generation, quantity & characteristics and treatment facility.	DPA is having port reception facility for the collection of ship generated waste as per Marpol Guidelines. Vessels intimated the port authorities regarding the ship generated effluent prior to their arrival. Accordingly, wastes received from the ships is being collected at the reception facility and is being handed over to the authorized recycler. DPA issues grant of license/permission only to the GPCB authorised vendors to carry out the work of collection and disposal of "Hazardous waste/Sludge Waste oil" from vessel calling at Deendayal port after following the due procedures of DPA.
3	The status of Authorization under the EPA-86 for solid waste.	Valid upto 21/07/2025 vide Consolidated Consent & Authorisation (CCA) No. AWH-110594.
4	Plan, if any to reduce hazardous waste generation or its recycling.	None
[F]	**SITE PLAN**	
1.	The site plan showing the location of effluent treatment plant, final point of disposal of effluent, sampling point, drainage line, stacks, solid waste storage / disposal area and green belt (its width).	Please refer to **Annexure – 14.**

[G]	**RESOURCE RECOVERY**	
1	1) The details regarding resource recovery including treated effluent for recycle/reuse from environmental pollution control system including effluent treatment plant. 2) The details regarding resource recovery/by product recovery from manufacturing process by using cleaner production technology	None.
[H]	**HEALTH**	
1	Whether any hazard is involved in the manufacturing or from the work environment if yes, the details thereof.	Yes, Please refer to **Annexure – 15.**
2	Whether industry has pre-employment & periodical medical examination facilities.	Yes, The medical examinations conducted at DPA, Kandla Hospital. The work has been awarded to M/s Accord Multispecialty Hospital for conducting medical examinations of employees and workers working inside port.
3	Whether health records are maintained regarding adverse effect on health of workers. If yes, details thereof.	Yes, Regular periodic health check-up & monitoring is done.
4	Whether industry has appointed a factory medical officer, if yes/no; full time or part time. Please also include the details about the name, address and qualification of the factory medical officer.	Yes. DPA has appointed Chief Medical Officer (Shri Anil Chellani)

<table>
<tr><td>5</td><td>Details of medical facilities available. Please tick correct column

First Aid Box /Dispensary/Ambulance/Hospital.</td><td>✓ First Aid Box
✓ Ambulance
✓ Hospital</td></tr>
<tr><td>6</td><td>Whether sanitary facilities like latrine, urinals, bathrooms are provided and satisfactory.</td><td>Yes.</td></tr>
<tr><td>[I]</td><td colspan="2">ACCIDENTS</td></tr>
<tr><td>1.</td><td>The details of accidents in the factory and remedial measures taken.</td><td>During the audit period of Aug – 23 to July – 24 total 8 Nos. of accidents has been recorded. Usage of PPE’s and job training are being conducted with help of Asst. Director Safety. By initiating these methods in the system it is presumed that the dock workers mistakes will be minimized and the accidental rate will be decreased. The Unsafe activities by dock workers will be reduced.</td></tr>
<tr><td>[J]</td><td colspan="2">SAFETY MEASURES</td></tr>
<tr><td>1</td><td>General Environment of the factory.
Please tick (√) the appropriate column.
<table><tr><td>(a) House Keeping.</td></tr><tr><td>(b) Dustiness.</td></tr><tr><td>(c) Lighting.</td></tr><tr><td>(d) Ventilation</td></tr></table></td><td><table><tr><td>Good</td><td>Fair</td><td>Poor</td></tr><tr><td>High</td><td>Medium</td><td>Low</td></tr><tr><td>Good</td><td>Fair</td><td>Poor</td></tr><tr><td>Good</td><td>Fair</td><td>Poor</td></tr></table></td></tr>
<tr><td>2</td><td>Whether the following protective appliances are provided to all the persons.</td><td>Yes/No If Yes How Many</td></tr>
</table>

	Goggle Gloves Gumboot Helmet Skin cream Soap Ear plug Face masks (gas mask) Clothing Respirator	Necessary PPEs are provided when required.
3	The details of facilities for disaster management / gas leakage.	The copy of disaster management plan is attached in **Annexure – 16.**
4	Whether on site /off site emergency plans are prepared and are being implemented / upgraded; please give details.	The copy of disaster management plan is attached in **Annexure – 16.**
5	Whether records of occupational hazards are maintained?	Yes
6	Preventive measures adopted to minimize occupational hazard.	Yes, Job training are being conducted with help of Asst. Director Safety related to workplace safety.

[K]	REMEDIAL MEASURES	
1	The details of sources; Monitoring and measures taken for control of noise pollution in and around the industrial premises.	Noise Monitoring report is attached in **Annexure – 19.** DPA has issued Circular No. TF/SH/Circulars/2022/1341 dated 04/11/2022 considering the safety norms provided for smooth and continuous operation. For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest Environmental Monitoring report submitted by GEMI is enclosed with the EC compliance. Further, routine maintenance is being carried out to keep check on the efficiency and noise.
2	The measures taken for prevention treatment and control of odor nuisance in and around the industrial premises.	No Odor problem observed at the port area.
3	The details in respect of cases / complaints under the water act 1974, the air act-1981 and EPA-1986.	No cases and complaints were received during the audit period.
4	The compliance report with respect to all the conditions of NOC/ Consent (under all the acts)	Please refer to **Annexure – 22.**

5	Incidents of spillages, leakages etc. and remedial measures thereof	No incident of leakage and spillage observed during the audit period.
6	Whether insurance policy obtained under PLI Act? If yes, give details	Yes, Please refer to **Appendix – 4.**
(L)	**WATER CESS**	
1	The details regarding payment of the water cess for the previous & the current year.	Water Cess has been ablolished after the introduction of GST.
(M)	**The name and address of the consultant engaged by the company /industry.**	M/s Precitech Laboratories Pvt. Ltd, Vapi Gujarat Institute of Desert Ecology, Bhuj Gujarat Environment Management Institute, Gandhinagar The Energy Research Institute, New Delhi International Management System, Ahmedabad

DECLARATION

It is declared that all the information submitted in and with respect to this format is correct and for any lapse regarding incorrect information or not giving complete information we are responsible for that.

(A) Name & signature of the recognized person of the Industry / Organization / Institute with stamp.	
For M/s Deendayal Port Authority	
Name	**Signature**
Shri V. Raveendra Reddy (Chief Engineer)	
Shri Rajendra Prasad (Dy. Chief Engineer & EMC (I/C)	
Shri B. Ratna Sekhar Rao (Traffic Manager)	
Capt. Pradeep Mohanty (Dy Conservator)	
Shri Sushil Chandra Nahak (Chief Mechanical Engineer)	
Shri Anil Chellani (Chief Medical Officer)	
Dr. Utkarsh Mukkannawar (Manager – Environment)	

(B) Name and signature of all the members of the Audit team	
For Gujarat Institute of Desert Ecology (GUIDE)	
Name	Signature
Dr. K. Karthikeyan (Assistant Director)	
Er. Ratansi Chaudhary (Chemical Engineer)	
Er. Ruturajsinh Sarvaiya (Environmental Engineer)	
Mr. Hirji Dangar (Analytical Chemist)	

ANNEXURE –1

ELECTRICITY CONSUMPTION MONTH WISE

Sr. No.	Month	Electricity consumption at Port area (kWh)
1	April – 23	3,152,742
2	May – 23	3,450,628
3	June – 23	2,021,264
4	July – 23	3,280,396
5	August – 23	3,042,768
6	September – 23	2,813,334
7	October – 23	3,133,070
8	November – 23	2,985,746
9	December – 23	2,736,174
10	January – 24	2,978,244
11	February – 24	2,732,644
12	March – 24	2,766,034
Total		35,093,044

ANNEXURE - 2

NAME AND ADDRESS OF All DIRECTORS/PARTNERS

BOARD OF DEENDAYAL PORT AUTHORITY

Updated On: 21-11-2023 05:00 PM

Name & Designation	Office address	Contact details
Members of Board of Deendayal port Authority		
Shri Sushil Kumar Singh, IRSME Chairman, Deendayal Port Authority, Gandhidham	Office of Chairman, A.O.Building, Post Box No. 50,Gandhidham - Kutch	Phone : (02836) 233001/234601 email : chairman@deendayalport.gov.in
Shri Nandeesh Shukla, IRTS Deputy Chairman, Deendayal Port Authority, Gandhidham	Office of DY. Chairman, A.O.Building, Post Box No. 50,Gandhidham-Kutch	Phone :(02836) 234121 (o) fax: 236323 email: dychairman@deendayalport.gov.in

Name & Designation	Office address	Contact details
Members of Board of Deendayal port Authority		
Shri Sushil Kumar singh Ex-officio member of the board of Deendayal port Authority, nominated by central government	Joint secretary (ports), Ministry of ports, shipping & waterways, Room no.407/5407,Transport bhavan, Ports wing,1, Sansad marg,New Delhi – 110 001	Phone +91 97176 47609 email : js-ports@nic.in
Shri Narender Panwar, IRTS, Chief Freight Transportation Manager, Mumbai	Chief freight transportation manager, office of CFTM, western railway H.Q.Churchgate, Mumbai – 400 020	Phone : (022) 22023660 fax : (022)22014597 email : cftm@wr.railnet.gov.in, cftmwr@gmail.com
Cande, Sudip Malik Naval Officer- Incharge-Porbandar	3DNaval Officer-In-Charge, INS Sardar Patel, C/o Navy Office, Post Box No:66, Porbandar Pin Code-360575.	Phone : (02839)271488,(02839)271480,(02839)271487 email : comcenpdr@navy.gov.in, dwarka2-navy@nic.in
Shri Rajkumar Banwal, I.A.S. Gujarat Maritime board Vice Chairman & Executive officer, Gandhinagar	Chief executive officer & vice chairman, Gujarat maritime board, opp. Air force station,sector-10-A, Gandhinagar-382 010.	Phone : (079) 23236985 email : vc-gmb@Gujarat.gov.in info@gmbports.in

Name & Designation	Office address	Contact details
Members of Board of Deendayal port Authority		
Shri M.Rammohan Rao, IRS Commissioner of Customs, Kandla	Commissioner of Customs, "Custom House" New Kandla	email : commr.cuskandla@nic.in

ANNEXURE - 3

NUMBER OF SHIFTS & TIMINGS

Shifts	Time
First Shift	6:00 to 14:00
Second Shift	14:00 to 22:00
Third Shift	22:00 to 6:00
General Shift	10:00 to 18:00

No. of Days during port in Operation

Sr. No.	Month	No. Of Working Days
1	Aug – 23	31
2	Sept – 23	30
3	Oct – 23	31
4	Nov – 23	30
5	Dec – 23	31
6	Jan – 24	31
7	Feb – 24	29
8	March – 24	31
9	April – 24	30
10	May – 24	31
11	June – 24	30
12	July – 24	31
Total		366

Name and address of the In-Charge of Environment/Safety Division/Cell

Name	Designation	Address
Shri Rajendra Prasad	Dy. Chief Engineer & EMC (I/C)	Administrative Office Building, Gandhidham Kutch – 370201, Gujarat India
Dr. Utkarsh Mukkannawar	Manager – Environment	Administrative Office Building, Gandhidham Kutch – 370201, Gujarat India
Shri. Bhavesh Madhavi	Safety Officer	Administrative Office Building, Gandhidham Kutch – 370201, Gujarat India

ANNEXURE – 4

ISO CERTIFICATION DETAILS

Your Quality Partner

JOVIAL

Certificate of Registration

This is to certify that

Environmental Management System

of

Deendayal Port Authority

Administrative Office Building,
Post Box No.50,
Gandhidham (Kutch)-370 201.
Gujarat State, INDIA.

complies with the requirements of

ISO 14001 : 2015

This certificate is valid concering all activities related to

"Providing Port Facility and Related Maritime Services for Vessels and Cargo Handling Including Storage."

Jan. 01, 2020
Date of Initial Registration

Jan. 02 2023	Jan. 02, 2026	E:201051	Managinig Director
Date of Issue	Valid untill*	Certificate No.	

JOVIAL CERTIFICATION SERVICES PVT. LTD.

website : www.jovialcertification.com Email : info@jovialcertification.com

Accreditation by Global Accreditation body for Certification and Training: GABCT Ltd, UK
48 Cheyneys Avenue, Edgware, Middlesex, London HA8 6SF

https://globalaccreditation.co.uk/certifiedorganizations

This Certificate is only valid if it is available / Valid on Jovial Website at https://jovialcertification.com/clientregister
The Certificate of Registration remains the property of Jovial Certification Services Pvt. Ltd.
and Shall be returned immidiatly upon suspension request.

*In Case if Surveillance Audit is not allowed to be conducted as per schedule, the certificate shall be suspended or withdrawn.

Version 1.2

GLOBAL

ISO

ANNEXURE – 5

QUANTITY OF MATERIAL HANDLED MONTH WISE

Sr. No.	Month	Total Quantity Handled (Dry Cargo) MT/Month	Total Quantity Handled (Liquid Cargo) MT/Month
1	Aug – 23	2631516	1728148
2	Sept – 23	3079378	1575894
3	Oct – 23	2815253	1449593
4	Nov – 23	3486905	1341715
5	Dec – 23	2944539	1434609
6	Jan – 24	3462512	1334782
7	Feb – 24	2539736	1033403
8	Mar – 24	3769787	1195486
9	April – 24	4045012	1312254
10	May – 24	3863749	1548850
11	June – 24	4142886	1388578
12	July – 24	3266099	1499693
Total		**40047372**	**16843005**

ANNEXURE - 6

WATER CONSUMPTION AND WASTE WATER GENERATION

Water Consumption Details

Sr.No.	Month	Total Quantity Consumed in KL
1.	April 2023	47342.47
2.	May 2023	48920.55
3.	June 2023	47342.00
4.	July 2023	48920.55
5.	August 2023	48920.55
6.	September 2023	59980.00
7.	October 2023	48680.00
8.	November 2023	57820.00
9.	December 2023	52100.00
10.	January 2024	45566.00
11.	February 2024	30884.00
12.	March 2024	37610.00
Total		**574086.12**

Waste Water Generation

Sr. No.	Month	Average Quantity of Domestic Waste Water Generation (KLD)
1.	April 2023	225
2.	May 2023	200
3.	June 2023	210
4.	July 2023	220
5.	August 2023	230
6.	September 2023	225
7.	October 2023	230
8.	November 2023	210
9.	December 2023	235
10.	January 2024	255
11.	February 2024	230
12.	March 2024	220
Average	**224.16**	

ANNEXURE – 7

PARTICULARS OF STP

Sewerage Treatment Plant Units

i. Screen Chamber

The flow from the Inlet chamber shall then enter the RCC fine screen channels for removal of fine floating materials. Manual fine screens with 40 mm clear openings shall be provided and each shall be designed for Peak Flow. The flow then shall be taken to the de-gritting units.

ii. Collection tank

In actual practice, flow of domestic wastewater is never constant but exhibits diurnal and seasonal variations, both in volume and strength. Dampening of flow and loading normally improve the performance of reactors, more particularly the biological reactors. Therefore, when it is required to collection the strength of waste water and to provide a uniform flow, a collection tank is employed in the waste water treatment system, after the screen chamber.

iii. Oil & Grease Trap

As domestic waste water mainly generates from colony it has contain high oil and grease for the removal of the same it is proposed to install oil and grease separator prior to Flocculation tank.

iv. Flocculation Tank

Flocculation is important processes in water treatment with coagulation to destabilize particles through chemical reaction between coagulant and colloids, and flocculation to transport the destabilized particles that will cause collisions with flocculation.

v. Primary Tube Settler

The Primary Settlement tanks are designed to reduce the velocity of the wastewater flow, allowing heavier organic solids (called raw sludge) to settle. They are the first stage of treatment after the removal of rags and grit in the inlet works. Scrapers present in the tank move continuously along the floor of the tank to deposit the raw sludge in hoppers for removal. The scum which floats to the surface is directed by water jets or scum boards to the sludge sump. The raw, settled sludge is removed by pump or gravity feed to a sludge treatment process, either on site or via tanker to an arger processing centre. Approximately 60% of suspended solids and 35% of BOD removal efficiency can be achieved at this stage.

vi. Aeration tank – (FMR Based)

In this reactor, the filled packing material expands and gets fluidized when the wastewater to be treated moves upward in the reactor. Air is also introduced along with the influent flow from the inlet. The density of the media is less and thus the media floats on the surface. The air is blown into the reactor at a pressure of 0.5 kg/ m2 which leads to the suspension of media. MLSS is maintained at 8000 mg/l to 10000 mg/l and the film is formed.

vii. Secondary Tube Settler

The secondary settling tank (SST) or is an integral part of the Fluidized media reactor (FMR). The main purpose of providing the secondary settling tank is to separate the large volume of suspended solids (MLSS) coming from biological reactor and to obtain a very clear and stable effluent. The settled solids form the sludge blanket throughout the entire depth in SST. The settled sludge is usually removed from the bottom of tank though drain valves to Sludge Sump.

viii. Slow Sand Filter

Sand filters are used in the treatment of sewage as a final polishing stage. In these filters, the sand traps residual suspended material and bacteria and provides a physical matrix for bacterial decomposition of nitrogenous material, including ammonia and nitrates, into nitrogen gas. Slow sand filters are used in water purification for treating raw water to produce a potable product. They are 2 meters deep, can be rectangular in cross section and are used primarily to treat surface water. The length (18 mtr.) and breadth (14 mtr.) of the tanks are determined by the flow rate desired by the filters

ix. Chlorine Contact Tank

The over flow from the Slow Sand Filter shall finally be feed to chlorine contact tank for disinfection and control of fecal coli form bacteria. Disinfected sewage shall be discharge to treated water tank.

x. Treated Water tank

After the tertiary treatment, the final treated effluent collected into the final collection tank and can be further utilized for flushing purpose or gardening and plantation purpose. Presently it is discharged in drains.

xi. Sludge Drying Bed

From the sludge sump, water is fed to filter press for dewatering and to reduce the water content up to 50%. Removed sludge shall be stored on a natural sludge drying bed for further drying and stabilizing.

TREATMENT PROCEDURE

A. Physical Treatment:

The domestic sewage wastewater shall enter into the screen chamber to remove the large size particle. The equalization tank will be provided with adequate detention times considering peak How and will be equipped with high volume low pressure air purging system to maintain adequate DO level in the wastewater and also keep the Particulate Matter in suspended forms. The equalize wastewater shall be transferred from equalization tank with the help of submersible effluent transfer pumps of adequate capacity to the Fluidized Media Reactor (FMR).

B. Biological Treatment:

The FMR media significantly increase the surface area for bacterial growth. Air is supplied through fine bubble diffuser. Bacteria oxidize the organic matter present in sewage. Suspended particles in the treated wastewater settle in lamella. Treated water overflows in to a chlorination tank, wherein the treated wastewater is disinfected by dosing hypochlorite solution through dosing system. Sludge from PST & SST tank shall be withdraw from the bottom of the tank and transferred to the Sludge Drying Beds. Leachate wastewater generated from the Sludge Drying Beds return back to the equalization tank.

C. Tertiary Treatment:

Supernatant of the secondary lamella transferred to the intermediate collection tank and to multi grade sand filter through high pressure pump for removing the micro suspended particles and give polishing treatment to treated effluent. Further it will be transferred to Activated Carbon Filter for further treatment through adsorption process. From the Activated Carbon Filter, treated wastewater will be collected into treated water tank and may be disposed off in the nearest drain or supplied for Gardening/Plantation purposes.

Technical Specification of units

i. Screen Chamber

Sr. No.	No of screen	1 Nos.
1	Type	Manual
2	Total Avg. flow	1.5 MLD
3	Peak factor	2.25
4	Design Peak Flow	3.75 MLD
5	Velocity through channel at avg. flow	0.3 m/s
6	Maximum Velocity thro' screen	0.6 m/s at peak flow
7	Angle of inclination	60 °
8	Clear opening between bars	30 mm
9	Thickness of bar	6 mm
10	SWD of channel	0.3 m
11	FB	2.35 m
12	Width of channel	1.5 m
13	Length of channel	1.5 m
14	Size of Inlet gate	Dia 300 mm
15	MOC	RCC (M-30)

ii. Collection Tank

Sr. No.	Description	Unit	Size/ Number/ Specification
1	Average Flow	m^3/hr	93.75
2	Peak Factor	-	2.25
3	Peak Flow	m^3/hr	210.93
4	Detention Time	hr	0.5
5	Effective Storage Volume of Tank	m^3	104
6	Depth of Tank	m	4.60
7	Dimension of Tank	m	9.0 m dia x 4.6m
5	MOC	-	RCC (M-30)

iii. Oil & Grease Trap

Sr. No.	Description	Unit	Size/ Number/ Specification
1	Average Flow	m^3/hr	93.75
2	Peak Factor	-	2.25
3	Peak Flow	m^3/hr	210.93
4	Surface Loading Rate	$m^3/m^2/day$	1300
5	Liquid Density		[illegible]
6	Require Area	m^2	0.46
7	Depth of Tank	m	4.60
8	Dimension of Tank	m	9.0 m x 2.0 m x 2.0m (2 SWD + 0.3FB)
9	MOC	-	RCC (M-30)

iv. Flocculation Tank

Sr. No.	Description	Unit	Size/ Number/ Specification
1	No. of Unit	Nos.	1
2	Type	-	Passing throw baffle wall
3	Average Flow	m^3/hr	93.75
4	HRT	Min	20
5	Volume of Tank	M3	36
6	Dimension of Tank	m	9.0 m x 2.0 m x 2.0m (2 SWD + 0.3FB)
7	MOC	-	RCC (M-30)

v. Primary settling tank

SR. No.	Description	Unit	Size/ Number / Specification
1	No of Units	No.	1
2	Flow through Units	Cu. M /d	1500
3	Total Area Required	Sq. m	21
4	SWD	m	3.7
5	Hopper Bottom	m	0.7
6	Sludge Box	m	0.3
7	Free Board	m	0.3
8	Total Depth	m	4.2
9	Size of each PST	m	7.2 x 3.0 x 4.2 + 0.5 m Depth
10	MOC	m	RCC (M –30)

vi. Bioreactor (FMR)

SR. No.	Description	Unit	Size/ Number/ Specification
1	No of Units	No	1
2	Flow In Unit	Cu. M /d	1500
3	BOD Load in unit	kg/d	450
4	BOD in Out let	mg/l	< 25
6	Efficiency Of BOD removal	%	90
7	MLSS	mg/l	8000
8	MLVSS	mg/l	6400
9	Minimum DO Aeration tank	Mg/lit	1.5
10	Require Reactor Volume	Cu. M	675
11	Provided Volume	Cu. M	704
11a.	HRT	Hours	10.8
12	F/M	-	0.15
13	Dimension of tank	-	28 X 14 X(4 SWD + 0.3FB)
14	MOC	-	Hdpe lining with RCC
15	Type		Lagoon Type

vii. Secondary settling tank

SR. No.	Description	Unit	Size/ Number / Specification
1	No of Units	No.	1
2	Flow through Units	Cu. M /d	1500
3	Surface Loading Rate	$m^3/m^2/day$	25
4	Total Area Required	Sq. m	63.75
5	SWD	m	2.5
6	Hopper Bottom	m	0.7
7	Sludge Box	m	0.5
8	Free Board	m	0.3
9	Total Depth	m	2.8
10	Size of each SST	m	8.5 x 7.5 x 2.5 + 0.3 m Depth
11	MOC	m	RCC (M – 30)

viii. Sludge Collection Sump

SR.No.	Description	Unit	Size/ Number/ Specification
1	Total Sludge generated	kg	815
2	Sludge Consistency	%	2
3	Volume of Sludge Generation	lit	39970
4	Total Volume	m^3	5
5	Dimension of Tank	m	3.0 x 1.5 x 1.0

ix. Slow Sand filter

SR.No.	Description	Unit	Size/ Number/ Specification
1	No of Units	No.	1
2	Flow through Units	Cu. M /d	1500
3	Surface Area	Sq. m	252
4	SWD	m	2.0
5	Free Board	m	0.3
6	Dimension of Tank	m	18 x 14 x 2.0
7	MOC	–	RCC (M – 30)

x. Chlorine Contact Tank

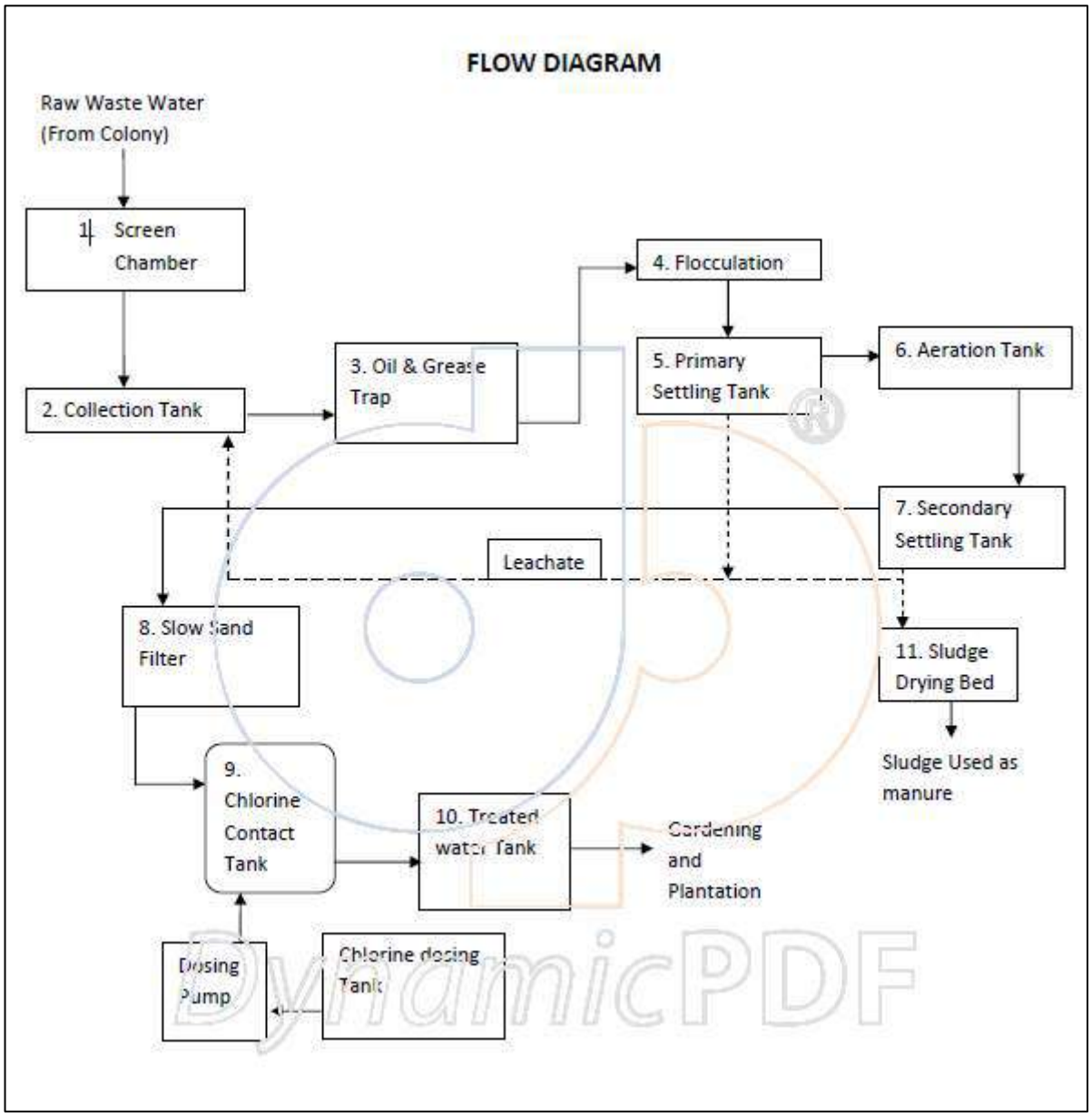
Sr. No.	Description	Unit	Size/ Number/ Specification
1	No of unit	:	1 No.
2	Design Flow	:	1.5 MLD
3	HRT at average flow	:	60 min
4	FB	:	0.3 m
5	SWD	:	2.0 m
6	Width	:	1.5 m
7	Length	:	6.2 m
8	MOC	:	RCC M30
9	Dose of Hypo Chlorite (Chlorine)	:	5 PPM

xi. Final Collection Tank

SR. No.	Description	Unit	Size/ Number/ Specification
1	No of Units	No.	1
2	Detention time in Tank	Hr.	5
3	Volume of Tank	Cu. M	280
4	SWD	m	4.0
5	Free Board	m	0.3
6	Dimension of Tank	m	18 x 9 x 4
7	MOC	:	Hdpe lining -Lagoon Type

xii. Sludge Drying bed

SR.No.	Description	Unit	Size/ Number/ Specification
1	No of Units	No	4
2	Sludge Application depth	m	0.3
3	Free Board	m	0.3
4	Total Depth	m	1.5
5	Water % in Sludge	%	60
6	MOC	-	Brick work
7	Size of Sludge Drying Bed	m	3 X 3 X 1.5


FLOW DIAGRAM
Raw Waste Water
(From Colony)
1. Screen Chamber
2. Collection Tank
3. Oil & Grease Trap
4. Flocculation
5. Primary Settling Tank
6. Aeration Tank
7. Secondary Settling Tank
Leachate
8. Slow Sand Filter
9. Chlorine Contact Tank
10. Treated water Tank
11. Sludge Drying Bed
Sludge Used as manure
Gardening and Plantation
Dosing Pump
Chlorine dosing Tank

ANNEXURE – 8

ANALYSIS REPORT OF STP

1st Monitoring: 16.04.2024 to 20.04.2024

Sr. No.	Tests	Units	Test Methods	STP Outlet	Limits
1	Biochemical Oxygen Demand	mg/L	IS 3025: Part 44 (RA 2014)	0.2	30
2	Total Suspended Solids	mg/L	IS 3025: Part 17:1984 RA 2017	37	100
3	Free available Chlorine	ppm	GPCB manual	0.2	-
4	Fecal Coliforms	MPN Index/100ml	GPCB manual	<1.8	<1000 MPN/ 100ml
5	pH	-	IS 3025: Part 11:1983 RA 2017	7.16	6.5 – 8.5

2nd Monitoring: 01.07.2024 to 05.07.2024

Sr. No.	Tests	Units	Test Methods	STP Outlet	Limits
1	Biochemical Oxygen Demand	mg/L	IS 3025: Part 44 (RA 2014)	0.2	30
2	Suspended Solids	mg/L	IS 3025: Part 17:1984 RA 2017	42	100
3	Free available Chlorine	ppm	GPCB manual	0.2	-
4	Fecal Coliforms	MPN Index/100ml	GPCB manual	<1.8	<1000 MPN/ 100ml
5	pH	-	IS 3025: Part 11:1983 RA 2017	7.15	6.5 – 8.5

ANNEXURE – 9

ANALYSIS REPORT OF MARINE WATER

1st Monitoring: 16.04.2024 to 20.04.2024

Marine water samples			
Parameters (all units in mg/L except *marked)	**EAD – 1 Oil Jetty 7**	**EAD – 2 Oil Jetty 2**	**EAD – 3 Craft Jetty 2**
pH*	7.66	7.74	7.69
Temperature	31.3	31	30.8
Salinity* (ppt)	42	43	40
Total Dissolved Solids	61979	50454	62031
Oil & Grease	1.2	0.8	0.8
Chemical Oxygen Demand	56.0	62.0	48.0
Phenolic Compound	0.021	BDL	BDL
Turbidity (NTU)	234	77	19
Dissolved Oxygen	5	4.8	5.1
BOD	2.5	2.7	2.5
Petroleum Hydrocarbons (µg/L)	10.5	9.8	11.2
Chloride	24009.57	25070.24	22659.64
Sulphate	3900	3950	3600
Total Chromium	BDL	BDL	BDL
Nickel	1	BDL	BDL
Lead	BDL	BDL	BDL
Cadmium	BDL	BDL	BDL
Zinc	0.425	BDL	BDL
Copper	BDL	BDL	BDL
Manganese	BDL	BDL	BDL

2nd Monitoring: 01.07.2024 to 05.07.2024

Parameters (all units in mg/L except *marked)	EAD – 5 Oil Jetty 7	EAD – 6 Craft Jetty 2
pH*	7.82	7.74
Temperature	30	29.4
Salinity* (ppt)	40	41
Total Dissolved Solids	41559	45332
Oil & Grease	12	13.2
Chemical Oxygen Demand	55	68
Phenolic Compound	BDL	BDL
Turbidity (NTU)	431	339
Dissolved Oxygen	6.3	6.2
BOD	2.4	2.8
Petroleum Hydrocarbon (µg/L)	15.5	12.6
Chloride	25746.6	24321.5
Sulphates	3900	3600
Total Chromium	BDL	BDL
Nickel	BDL	BDL
Lead	BDL	BDL
Cadmium	1.865	1.605
Zinc	BDL	BDL
Copper	BDL	BDL
Manganese	BDL	BDL

ANNEXURE – 10

D.G. STACK DETAILS

Sr. No.	Stack attached to	Stack height in meter	Parameter	Permissible Limits	Fuel used
1	D.G. Sets 2 Nos. (1010 KVA)	15 each	PM SOx NOx	150 mg/Nm^3 100 ppm 50 ppm	HSD 500 L/Hr.

Fuel Used per month

Sr. No	Month	Diesel Consumed for DG set (Litre)
1.	May 2023	600
2.	June 2023	900
3.	October 2023	650
4.	May 2024	380

ANNEXURE – 11

AMBIENT AIR QUALITY MONITORING REPORT

1st Monitoring: 16.04.2024 to 20.04.2024

Parameters	Study locations			Limits
	Nr. 66/11 KV substation EADA-1	Nirman Bhavan EADA-2	Near truck parking area EADA-3	
$PM_{2.5}$ (µg/m^3)	47.1	32.95	16	60
SO_2 (µg/m^3)	3.64	9.27	12.17	80
NO_x (µg/m^3)	39.72	18	14.74	80
PM_{10} (µg/m^3)	133.58	146.98	77.11	100

2nd Monitoring: 01.07.2024 to 05.07.2024

Parameters	Study locations			Limits
	Nr. 66/11 KV substation EADA-4	Nirman Bhavan EADA-5	Near truck parking area EADA-6	
$PM_{2.5}$ (µg/m^3)	34	18	25	60
SO_2 (µg/m^3)	6.40	4.68	7.21	80
NO_x (µg/m^3)	13.56	14.06	8.73	80
PM_{10} (µg/m^3)	197.04	48	104.75	100

ANNEXURE - 12

AIR POLLUTION CONTROL MEASURES

DPA already installed Sprinkling system inside Cargo Jetty area for Coal Dust Suppression in Coal Yard (40 Ha. area) at the cost of Rs. 14.44 crores. Continues water sprinkling is being carried out on the heap of coal, at regular intervals to prevent dusting, fire and smoke

DPA has undertaken the project of dust supersession sprinkling system for the 34 hectare coal storage yard. SITC has been completed on 03.04.2023 and O&M has been commenced w.e.f. 04.04.2023.Two Road sweeper machines with compressor have been deployed along with two mist cannon machines for a contract period of 3 years, which are being operated continuously

Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done

Regular sweeping of spilled cargo from roads is done by parties on regular basis

Protection wall along the periphery of coal storage yard is made.

Most of the roads and plots inside Port area are paved in order to prevent dusting

The directions have already been issued from time to time to all the traders in order to ensure that all trucks before leaving the storage yards will be covered with tarpaulin, no overloading of trucks are allowed and there should not be spillage of cargo during transportation.

ANNEXURE- 13

DETAILS OF HAZARDOUS WASTE

Deendayal Port Authority
Marine Department

Statement of Hazardous and Non hazardous Waste disposal from the Vessels at Kandla Port for the Period April 2023 to March 2024 – For the Whole Port Area

(PCB ID 28494)

Sr.No.	Month	Year	Hazardous Waste Generation in MT			Solid Waste Generated in MT
			Total Quantity	Used Oil	Waste Residue Containing Oil	
1.	April	2023	484.45	121.11	363.34	169.57
2.	May	2023	1065.92	266.48	799.44	307.83
3.	June	2023	671.82	167.96	503.87	155.03
4.	July	2023	743.45	185.86	557.59	207.71
5.	August	2023	814.63	203.66	610.97	221.78
6.	September	2023	758.07	189.52	568.55	318.76
7.	October	2023	1002.51	250.63	751.89	144.20
8.	November	2023	982.88	245.72	737.16	198.54
9.	December	2023	802.58	200.65	601.94	254.75
10.	January	2024	825.89	206.47	619.41	207.61
11.	February	2024	549.50	137.38	412.13	200.38
12.	March	2024	1023.87	255.97	767.90	186.79
Total			**9725.56**	**2431.39**	**7294.17**	**2572.94**

Deputy Conservator
Deendayal Port Authorit

Marine Department

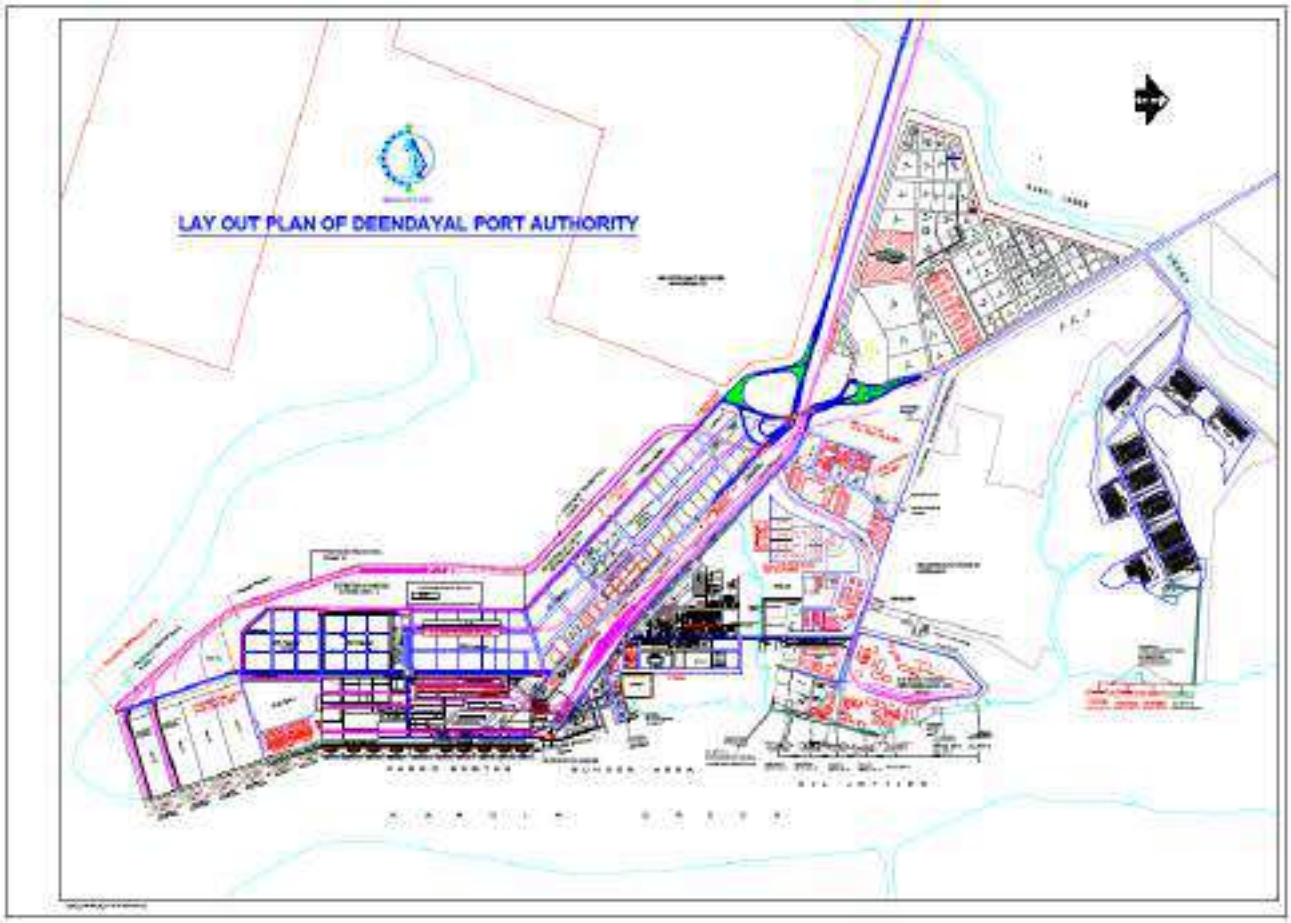
Statement showing the Collection and disposal of Hazardous and Non-Hazardous Wastes carried out by

	Name of Party	Type of Licence	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Total
1	[illegible] Organic Industries Limited	Hazardous									36.76				36.76
2	Amar Hydrocarbon Pvt Ltd	Hazardous								15.41				37.48	59.20
3	Atlas Organics Pvt Ltd	Hazardous				19.24	7.00								26.24
4	Avalon Corporation	Hazardous	5.50	18.45	23.67										52.12
5	Mahalaxmi Asphalt Pvt Ltd	Hazardous	102.96			138.98	-	25.23	67.34		73.93	50.49	14.85	43.57	517.55
6	Priyans Corporation	Hazardous	16.25	91.36	87.35	-	-	29.89	-	35.27	61.60		-	-	327.43
7	Revolution Petrochem LLP	Hazardous	379.86	597.26	594.69	827.90	524.20	450.78	599.26	890.93	423.96	381.95	442.62	645.60	6,345.11
8	Shana Oil Process	Hazardous	-	-	-	-	-	-	-	-	-	-	-	-	-
9	United Shipping Company	Hazardous	-	418.14	-	-	314.16	287.97	366.84	398.10	241.83	432.58	119.51	344.01	2,846.59
10	Chitrakut Trading & Industries	Non-Hazardous	7.24	28.39	14.70	14.98	10.70	6.35	4.78	-	-	5.83	-	-	87.97
11	Golden Shipping Services	Non-Hazardous	7.03	61.82	-	56.87	43.26	77.20	36.10	23.64	75.26	41.55	37.39	49.00	504.66
12	Green Earth Marine Solutions	Non-Hazardous	18.30	37.68	4.42	18.90	27.60	5.00	-	20.24		3.77	6.73		142.66
13	Harish A. Pandya	Non-Hazardous	12.00	7.18	1.85	-	5.02	-	6.42	-	12.58	7.39		-	52.45
14	K M Enterprise	Non-Hazardous	62.00	99.18	74.30	54.40	84.00	48.37	36.34	56.74	73.23	64.17	57.94	117.62	828.73
15	Naaz Shipping Services Ent	Non-Hazardous	-	-	-	7.56	-	12.40	6.35	5.47	6.38	5.38	-	-	44.45
16	New India Marine Works	Non-Hazardous	4.00	-	-	10.50	22.70	45.15	7.00	11.00	17.88	9.30		-	159.15
17	Omega Marine Services	Non-Hazardous	23.81	31.42	30.66	-	-	68.44	20.51	47.35	46.70	20.11	58.65		356.45
18	V K Enterprise	Non-Hazardous	24.06	30.00	-	15.00	18.00	18.00	18.00	15.00	15.00	15.00	9.93		177.96
19	Vighnesh Trade-link Inc	Non-Hazardous	36.98	72.16	29.90	10.90	29.50	37.85	5.70	18.00	11.37	25.04	21.45	34.17	259.13
		Hazardous - Total	508.87	1,199.21	705.41	980.62	856.36	795.97	1,052.04	1,422.62	842.71	867.18	576.88	1,076.06	10,291.83
		Non-Hazardous - Total	189.57	307.83	155.63	197.71	221.13	318.36	130.20	198.54	254.75	201.67	200.38	186.79	2,572.34

Copy to : GPCB, Gandhidham / Harbour Master

ANNEXURE - 14

SITE PLAN



ANNEXURE – 15

TYPES OF HAZARDS INVOLVED IN WORKING ENVIRONMENT

Hazards during Sea Port Operations:

- **Mechanical Hazards:**
  - Crane and heavy machinery operations: Risk of collisions, tipping, and equipment failure.
  - Conveyor belts and cargo handling equipment: Risk of entanglement, crushing, and pinch points.

- **Physical Hazards:**
  - Slips, trips, and falls: Due to uneven surfaces, spills, and debris.
  - Noise and vibration: From machinery, vehicles, and vessel operations.
  - Extreme weather conditions: Such as high winds, heavy rain, and lightning.

- **Chemical Hazards:**
  - Handling hazardous materials: Such as fuels, chemicals, and toxic substances.
  - Spills and leaks: Risk of fire, explosion, and environmental contamination.

- **Biological Hazards:**
  - Contamination: From cargo, waste materials, and pests.
  - Infectious diseases: Risk from exposure to contaminated materials or persons.

- **Ergonomic Hazards:**
  - Manual handling: Risk of musculoskeletal injuries from lifting and moving heavy objects.
  - Repetitive tasks: Leading to strain and fatigue.

- **Environmental Hazards:**
  - Marine environment: Risk of drowning, hypothermia, and exposure to hazardous marine life.
  - Pollution: From vessel emissions, waste discharge, and runoff.

- **Security Hazards:**
  - Unauthorized access: Risk of theft, vandalism, and terrorist activities.
  - Smuggling and illegal activities: Including drug trafficking and human trafficking.

- **Fire and Explosion Hazards:**
  - Storage and handling of flammable materials: Risk of ignition and explosion.
  - Hot work activities: Such as welding and cutting.

Hazards during Maintenance Activities:

- **Mechanical Hazards:**
  - Moving parts of machinery
  - Sharp edges and pinch points
  - Unexpected startup of equipment

- **Electrical Hazards:**
  - Electrical shock and arc flash
  - Faulty or exposed wiring
  - Improper use of electrical equipment

- **Chemical Hazards:**
  - Exposure to hazardous substances (e.g., lubricants, cleaning agents)
  - Inhalation of fumes and vapors
  - Chemical spills and leaks

- **Physical Hazards:**
  - Slips, trips, and falls
  - Working at heights
  - Noise and vibration

- **Ergonomic Hazards:**
  - Repetitive motions
  - Manual handling of heavy objects
  - Awkward postures and overexertion

- **Environmental Hazards:**
  - Adverse weather conditions (e.g., rain, wind, extreme temperatures)
  - Poor lighting
  - Confined spaces

- **Fire and Explosion Hazards:**
  - Flammable materials and gases
  - Hot work activities (e.g., welding, cutting)
  - Combustible dust

- **Biological Hazards:**
  - Contact with contaminated surfaces or materials
  - Pests and vermin

- **Security Hazards**:
  - Unauthorized access to maintenance areas
  - Theft and vandalism

Hazards during Construction Activities:

- **Physical Hazards**:
  - Slips, Trips, and fall: Uneven surfaces, debris, and wet conditions can lead to falls.

- Working at Heights: Risk of falls from ladders, scaffolding, and elevated platforms.
- Noise and Vibration: From construction machinery and equipment.
- Manual Handling: Lifting and moving heavy materials can cause musculoskeletal injuries.

- **Mechanical Hazards:**
  - Moving Machinery: Cranes, excavators, and other heavy equipment pose risks of collision, entanglement, and crushing.
  - Power Tools and Equipment: Risk of cuts, abrasions, and amputations from improper use.

- **Electrical Hazards:**
  - Contact with Live Wires: Risk of electrical shock and arc flash.
  - Faulty Equipment: Damaged or poorly maintained electrical tools and equipment.

- **Chemical Hazards:**
  - Exposure to Hazardous Substances: Paints, solvents, adhesives, and other chemicals.
  - Dust and Fumes: From cutting, grinding, and welding activities.

- **Environmental Hazards:**
  - Weather Conditions: Extreme heat, cold, rain, and wind can affect safety.
  - Marine Environment: Risk of drowning and hypothermia when working near or over water.

- **Ergonomic Hazards:**
  - Repetitive Movements: Risk of strain injuries from repetitive tasks.
  - Awkward Postures: Bending, reaching, and twisting can cause musculoskeletal problems.

- **Fire and Explosion Hazards:**
  - Flammable Materials: Handling of fuels, gases, and other combustible substances.
  - Hot Work Activities: Welding, cutting, and grinding can ignite flammable materials.

- **Security Hazards:**
  - Unauthorized Access: Risk of theft, vandalism, and security breaches.
  - Safety of Workers: Threats from unauthorized individuals or activities.

- **Details of pre-employment and periodical medical examination facilities**

  The medical examinations conducted at DPA, Kandla Hospital. The work has been awarded to M/s Accord Multispecialty Hospital for conducting medical examinations of employees and workers working inside port.

ANNEXURE – 16

DISASTER MANAGEMENT PLAN

Disaster Management Plan

(UPDATED MAY 2019)

for

DEENDAYAL PORT TRUST

ISO 9001:2008 & ISO 14001:2004 Certified Port

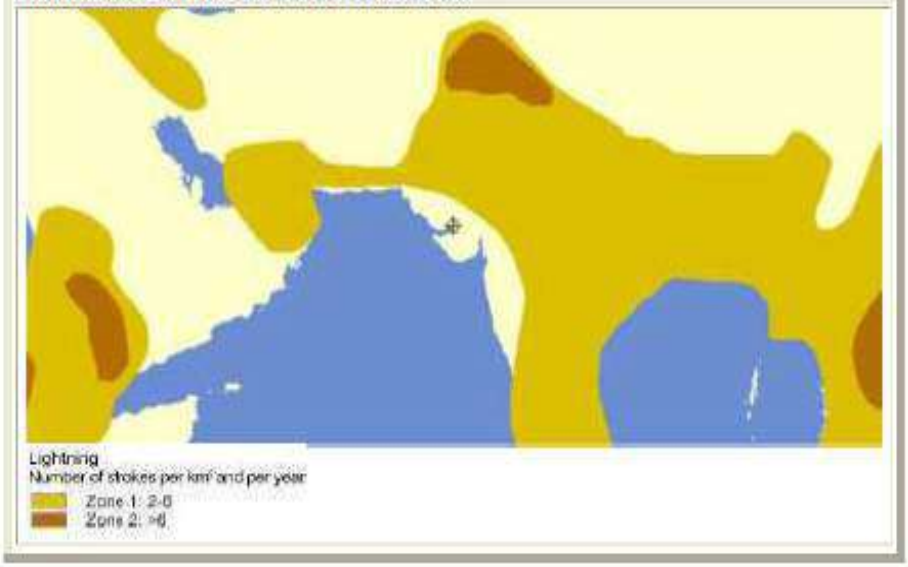
Post Box No: 50

Gandhidham (Kutch) – 370201

Contents

As per Munich Re World Map for Natural hazards, Gandhidham region is in Zone – I which means on an average there are 2 - 6 lightning strikes per km area per year which signifies moderate risk exposure.

Thus risk exposure can be considered as moderate.



2 INTRODUCTION

The important aspect in emergency management is to prevent by Technical & Organizational measures, the unintentional escape of hazardous materials out of the facility and minimize accidents and losses.

Emergency planning also demonstrates the organizations commitment to the safety of employees and public and increases the organizations safety awareness.

The format and contents of the Disaster Management Plan (DMP) have been developed taking into consideration the guidelines of National Disaster Management Authority & Plan, and other accepted industry good practice principles formulated as a result of lessons learned in actual emergencies requiring extensive emergency response.

This master document is to be studied in advance and used for training purpose also. This master document will be upgraded once in every three years by reviewed annually.

2.1 Objectives of DMP

The objective of DMP is to describe the facility emergency response organization, the resources available and response actions applicable to deal with various types of emergencies that could occur at the facility with the response organization structure being developed in the shortest time possible during an emergency. Thus, the objectives of emergency response plan can be summarized

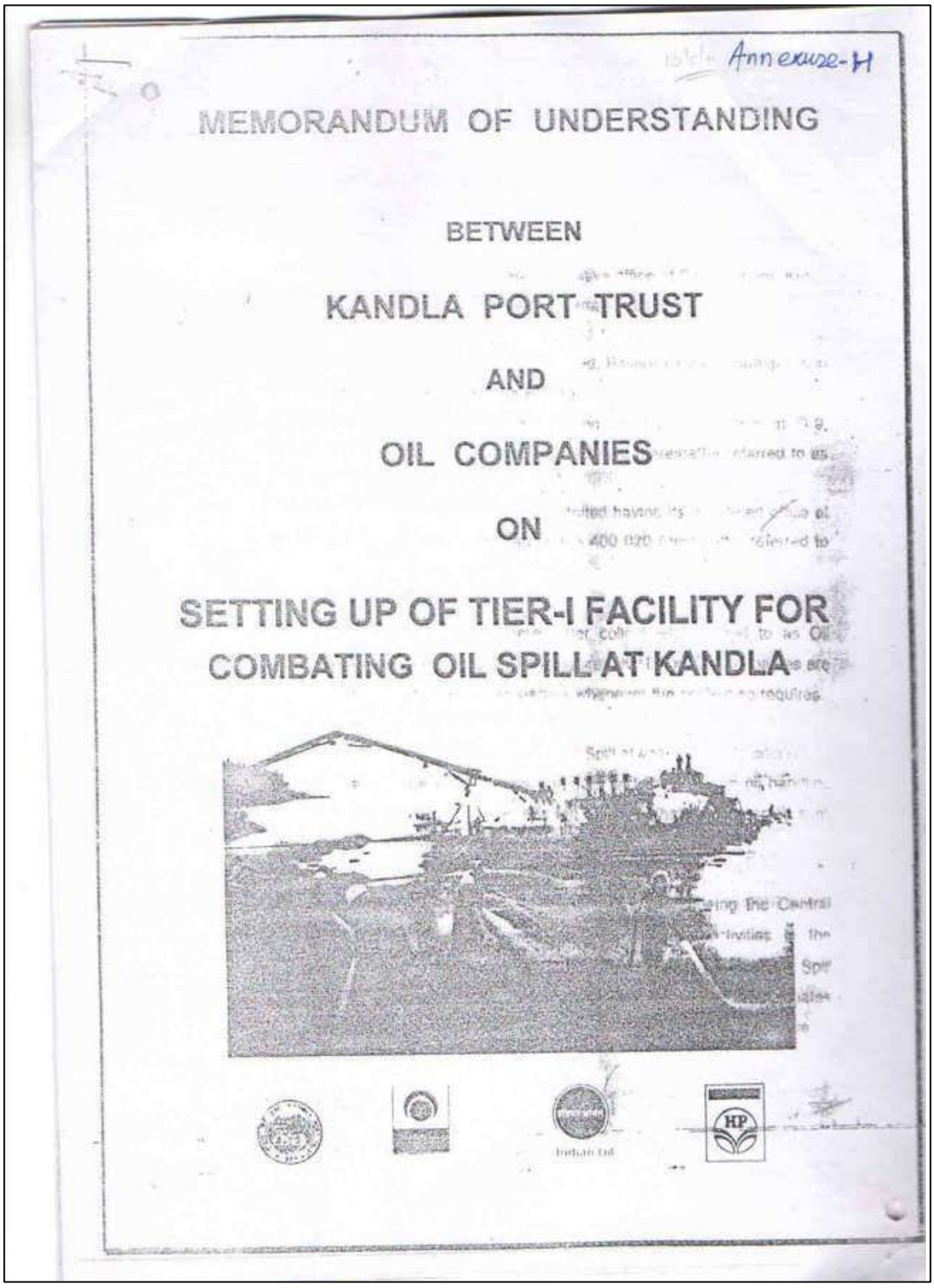
- Rapid control and containment of the hazardous situation.
- Minimizing the risk and impact of event / accident.
- Effective rehabilitation of the affected persons and preventing of damage to property.

In order to effectively achieve the objectives of the emergency planning, the critical elements that form the backbone of the DMP are

- Reliable and early detection of an emergency and careful planning.
- The command co – ordination and response organization structure along with efficient trained personnel.
- The availability of resources for handling emergencies.
- Appropriate emergency response actions.
- Effective notification and communication facilities ③ Regular review and updating of the DMP ③ Proper training of the concerned personnel.

ANNEXURE – 17

OIL SPILLAGE CONTINGENCY PLAN



Annexure-H

MEMORANDUM OF UNDERSTANDING

BETWEEN

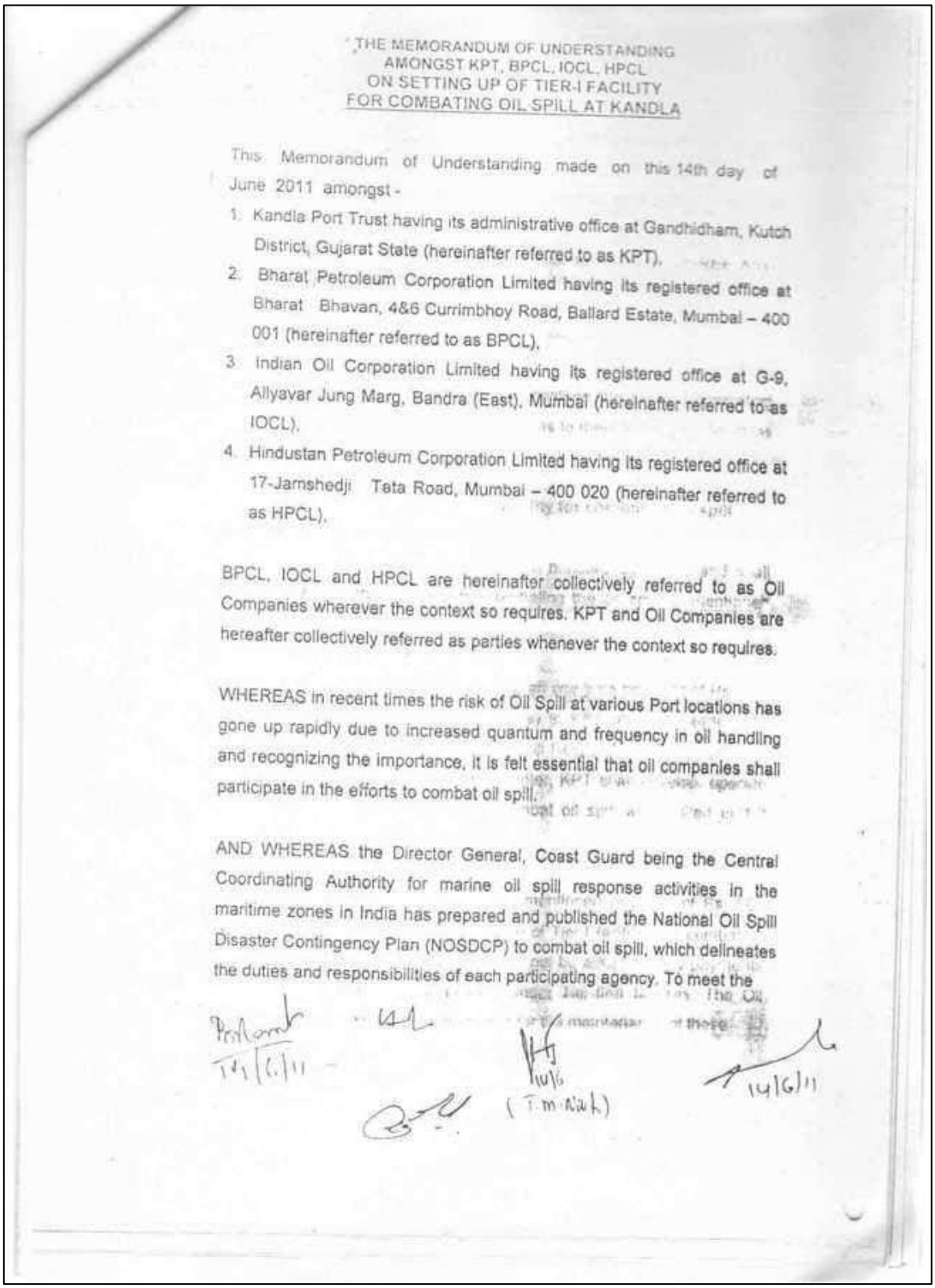
KANDLA PORT TRUST

AND

OIL COMPANIES

ON

SETTING UP OF TIER-I FACILITY FOR COMBATING OIL SPILL AT KANDLA



THE MEMORANDUM OF UNDERSTANDING
AMONGST KPT, BPCL, IOCL, HPCL
ON SETTING UP OF TIER-I FACILITY
FOR COMBATING OIL SPILL AT KANDLA

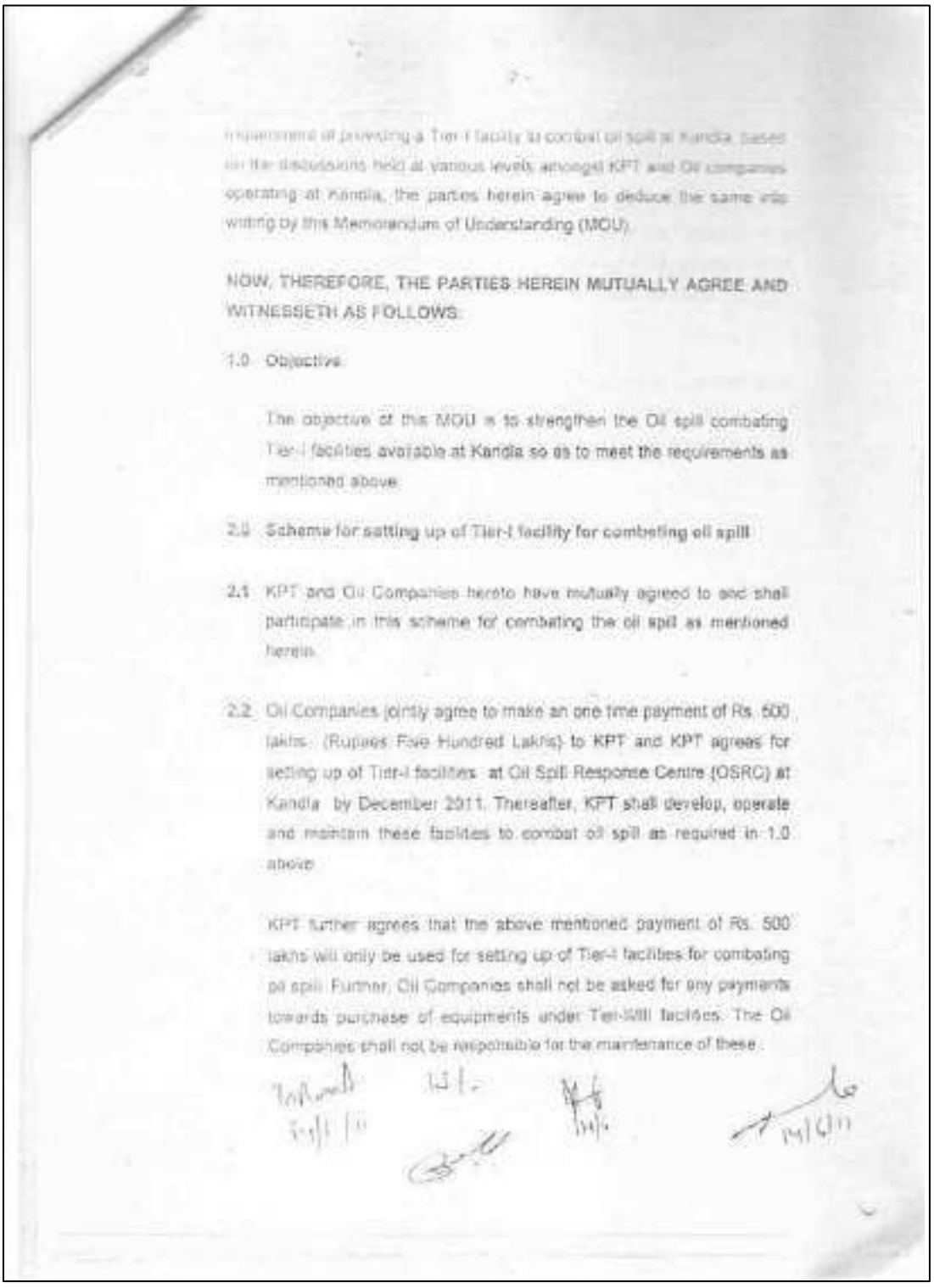
This Memorandum of Understanding made on this 14th day of June 2011 amongst -

1. Kandla Port Trust having its administrative office at Gandhidham, Kutch District, Gujarat State (hereinafter referred to as KPT),
2. Bharat Petroleum Corporation Limited having its registered office at Bharat Bhavan, 4&6 Currimbhoy Road, Ballard Estate, Mumbai – 400 001 (hereinafter referred to as BPCL),
3. Indian Oil Corporation Limited having its registered office at G-9, Allyavar Jung Marg, Bandra (East), Mumbai (hereinafter referred to as IOCL),
4. Hindustan Petroleum Corporation Limited having its registered office at 17-Jamshedji Tata Road, Mumbai – 400 020 (hereinafter referred to as HPCL),

BPCL, IOCL and HPCL are hereinafter collectively referred to as Oil Companies wherever the context so requires. KPT and Oil Companies are hereafter collectively referred as parties whenever the context so requires.

WHEREAS in recent times the risk of Oil Spill at various Port locations has gone up rapidly due to increased quantum and frequency in oil handling and recognizing the importance, it is felt essential that oil companies shall participate in the efforts to combat oil spill.

AND WHEREAS the Director General, Coast Guard being the Central Coordinating Authority for marine oil spill response activities in the maritime zones in India has prepared and published the National Oil Spill Disaster Contingency Plan (NOSDCP) to combat oil spill, which delineates the duties and responsibilities of each participating agency. To meet the



requirement of providing a Tier-I facility to combat oil spill at Kandla, based on the discussions held at various levels amongst KPT and Oil companies operating at Kandla, the parties herein agree to deduce the same into writing by this Memorandum of Understanding (MOU).

NOW, THEREFORE, THE PARTIES HEREIN MUTUALLY AGREE AND WITNESSETH AS FOLLOWS:

1.0 Objective:

The objective of this MOU is to strengthen the Oil spill combating Tier-I facilities available at Kandla so as to meet the requirements as mentioned above.

2.0 Scheme for setting up of Tier-I facility for combating oil spill

2.1 KPT and Oil Companies hereto have mutually agreed to and shall participate in this scheme for combating the oil spill as mentioned herein.

2.2 Oil Companies jointly agree to make an one time payment of Rs. 500 lakhs. (Rupees Five Hundred Lakhs) to KPT and KPT agrees for setting up of Tier-I facilities at Oil Spill Response Centre (OSRC) at Kandla by December 2011. Thereafter, KPT shall develop, operate and maintain these facilities to combat oil spill as required in 1.0 above.

KPT further agrees that the above mentioned payment of Rs. 500 lakhs will only be used for setting up of Tier-I facilities for combating oil spill. Further, Oil Companies shall not be asked for any payments towards purchase of equipments under Tier-I/II facilities. The Oil Companies shall not be responsible for the maintenance of these.

CONTENTS

KANDLA PORT TRUST

LOCAL OIL SPILL – DISASTER CONTINGENCY PLAN.

(LOS-DCP)

INTRODUCTION

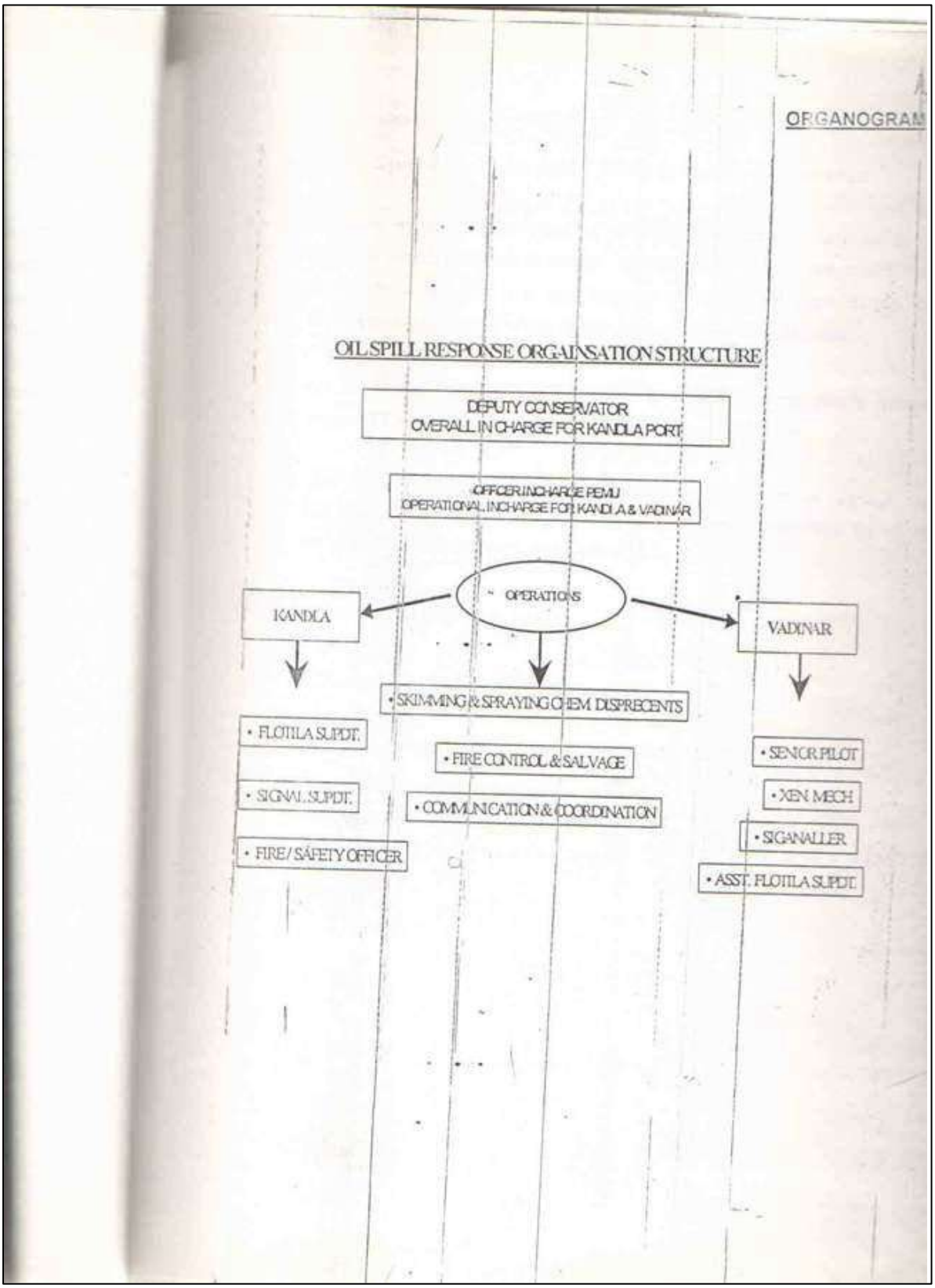
The Indian Coast Guard (ICG) has been designated as the nodal agency to deal with all contingencies associated with OIL SPILL DISASTERS in the coastal and marine environs of the Nation. The ICG in this regard had prepared a NATIONAL OIL SPILL – DISASTER CONTINGENCY PLAN popularly known as the NOS-DCP. The NOS-DCP identifies the Major Ports as among the RESOURCE AGENCIES of ICG. Further the plan details co-ordination procedures for the resource agencies to inter act with the nodal agency.

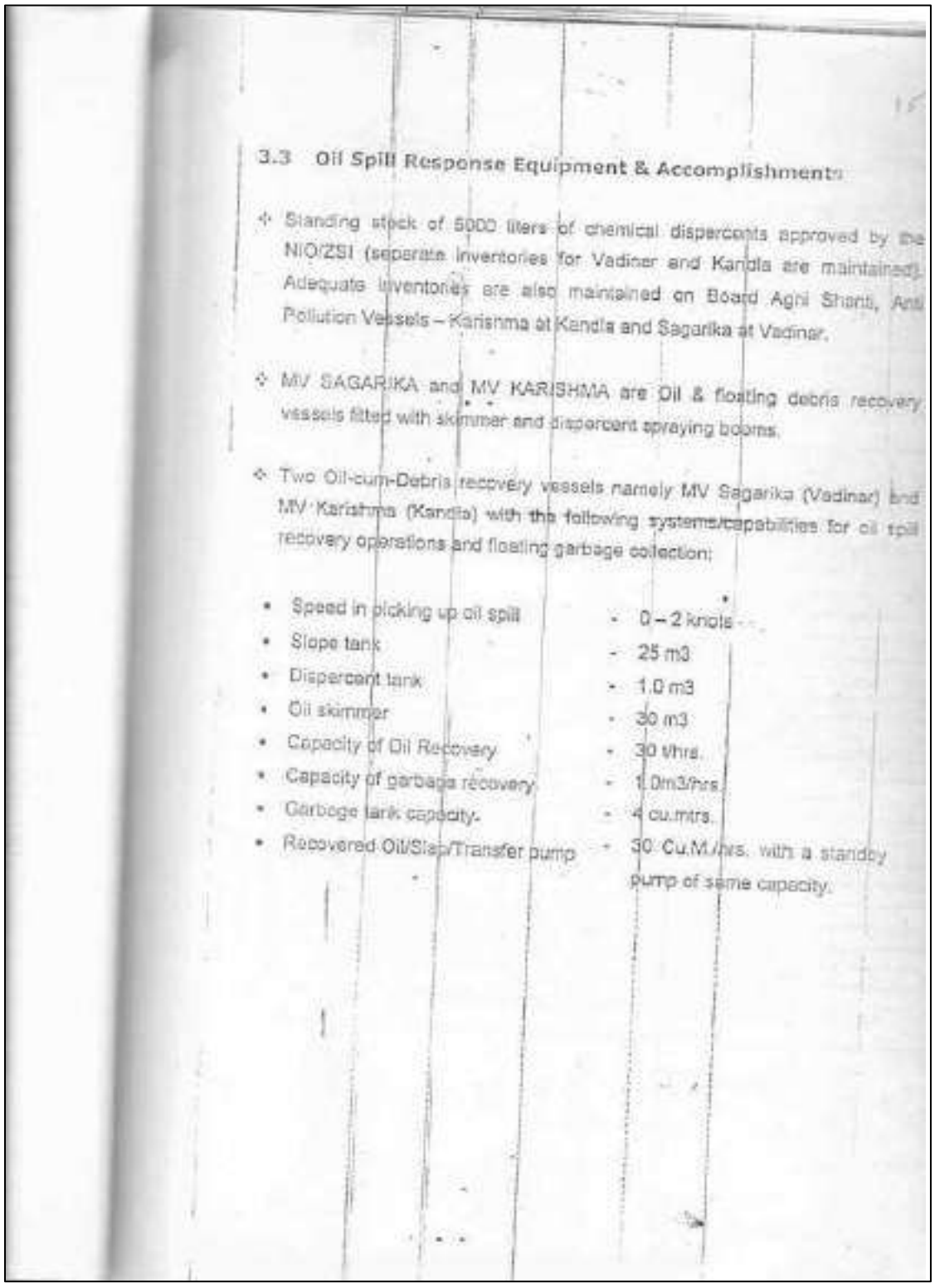
Under the guidelines of the NOS-DCP it is obligatory for the resource agencies to develop a local oil spill disaster contingency plan and link it up with the NOS-DCP. This plan is an effort of KANDLA PORT TRUST to link up its updated LOS-DCP with the NOS-DCP.

Kandla Port is located towards the extreme eastern margin of the GULF OF KUTCH (GOK). Ships calling at Kandla port therefore have to traverse across the GOK, which had been identified as a highly sensitive coastal zone of the maritime state of GUJARAT, owing to the rich bio-diversity persisting all along its southern coast line. The GOK is also significant in maritime culture with the existence of three port complexes viz. KANDLA – VADINAR Major port complex, RELAINCE PETRO-CHEMICALS Ltd.- Marine Terminal complex and the up coming GUJARAT ADANI PORT Ltd. complex. In view of the above ships plying in the GOK and the maritime community associated with them are required to exercise utmost caution particularly with regard to prevention of oil pollution by ships.

KPT - LOS - DCP, jurisdiction and description of the plan area

The plan jurisdiction encompasses the Port limits in general. Fig.1 illustrates the Port limits as defined by the Govt. of India Notification no: 255(E), published in the gazette of India, part II section 5, subsection (i) dated 1st May 1975.


ORGANOGRAM
OIL SPILL RESPONSE ORGANISATION STRUCTURE
DEPUTY CONSERVATOR
OVERALL IN CHARGE FOR KANDLA PORT
OFFICER INCHARGE PEMJ
OPERATIONAL INCHARGE FOR KANDLA & VADINAR
OPERATIONS
KANDLA
VADINAR
• SKIMMING & SPRAYING CHEM. DISPRECENTS
• FIRE CONTROL & SALVAGE
• COMMUNICATION & COORDINATION
• FLOTILA SUPDT.
• SIGNAL SUPDT.
• FIRE / SAFETY OFFICER
• SENIOR PILOT
• XEN. MECH
• SIGANALLER
• ASST. FLOTILA SUPDT.



3.3 Oil Spill Response Equipment & Accomplishments

- Standing stock of 5000 liters of chemical dispersants approved by the NIO/ZSI (separate inventories for Vadinar and Kandla are maintained). Adequate inventories are also maintained on Board Agni Shanti, Anti Pollution Vessels – Karishma at Kandla and Sagarika at Vadinar.

- MV SAGARIKA and MV KARISHMA are Oil & floating debris recovery vessels fitted with skimmer and dispersant spraying booms.

- Two Oil-cum-Debris recovery vessels namely MV Sagarika (Vadinar) and MV Karishma (Kandla) with the following systems/capabilities for oil spill recovery operations and floating garbage collection:

• Speed in picking up oil spill	- 0 – 2 knots
• Slope tank	- 25 m3
• Dispercent tank	- 1.0 m3
• Oil skimmer	- 30 m3
• Capacity of Oil Recovery	- 30 t/hrs.
• Capacity of garbage recovery	- 1.0m3/hrs.
• Garbage tank capacity.	- 4 cu.mtrs.
• Recovered Oil/Slop/Transfer pump	- 30 Cu.M./hrs. with a standby pump of same capacity.

ANNEXURE – 18

LIST OF TERMINALS

Liquid plot allottee's details

Sr. No.	Plot. No.	Name of Plot Allottee	Email ID	Contact details
1	3	M/s. Aegis Logistics	anil.shayal@aegisvopak.com	Mr. Anil - 9824759510
2	4	M/s. Aegis Logistics	anil.shayal@aegisvopak.com	Mr. Anil - 9824759510
3	5	M/s. Aegis Logistics	anil.shayal@aegisvopak.com	Mr. Anil - 9824759510
4	6	M/s. Aegis Logistics	anil.shayal@aegisvopak.com	Mr. Anil - 9824759510
5	7	M/s. Shreeji Liquid Storage Pvt. Ltd.	safety.kandla@shreeji-group.com	Mr. Brijesh - 8758258666, 9737216008
6	10	M/s. Aegis Vopak Terminals Ltd. (Unit-3)	suraj.masavada@aegisvopak.com	Mr. Suraj - 9327615829, 7383376306
7	12	M/s. Aegis Vopak Terminals Ltd. (Unit-4)	anil.shayal@aegisvopak.com	Mr. Anil - 9824759510
8	13	M/s. Gokul Agro Resources Limited	garl@gokulagro.com	Mr. Dharam - 9879112882, 7226927175
9	14	M/s. Kutch Oil and Soap Industry	bhimani_gdm@rediffmail.com, kutchppl@rediffmail.com	02836222314, 228014
10	15	M/s. Seabridge Terminal Pvt. Ltd.	arao@seabridge.co.in	Mr. Chitesh - 7043431354
11	17	M/s. Emperius Infralogistic Pvt. Ltd.	surojit.chakraborty@liladharpasoo.com, admin@emperiusindia.com	Mr. Rudrasinh Zala - 9712579999
12	18	M/s. Sunshine Liquid Storage Pvt. Ltd.	sunshineliquid1@gmail.com	Mr. Prabhat - 9662551957
13	19	M/s. Ambaji Import Pvt. Ltd.	ambaji.import@gmail.com	Mr. Prabhat - 9662551957

Godown Plot Allottee's Details

Sr. No	Plot No	Name of Plot Allottee	Email ID	Contact Details
1	17	M/s Shreeji Exports	shreejiexports@shreeji-group.com	(02836) 225210 / 225211
2	18	M/S Gokul Refoils & solvent Ltd.	grsl@gokulgroup.com	02836-247075/247076/247077, Mr. Ghanshyam - 9879112590
3	19	M/S Gokul Refoils & solvent Ltd.	grsl@gokulgroup.com	02836-247075/247076/247077, Mr. Ghanshyam - 9879112590
4	26	M/s Gokul Agro Resources Ltd.	garl@gokulagro.com	Mr. Dharam - 9879112882, 7226927175
5	31	M/s Friends Salt Works and Allied Industries	vijaysoni@friendsgroupindia.com	Mr Vijay Soni - 8980018334
6	33	M/s Friends Salt Works and Allied Industries	vijaysoni@friendsgroupindia.com	Mr Vijay Soni - 8980018334
7	34	M/s Friends Salt Works and Allied Industries	vijaysoni@friendsgroupindia.com	Mr Vijay Soni - 8980018334
8	35	M/s Friends Salt Works and Allied Industries	vijaysoni@friendsgroupindia.com	Mr Vijay Soni - 8980018334
9	39	M/s Friends Salt Works and Allied Industries	vijaysoni@friendsgroupindia.com	Mr Vijay Soni - 8980018334
10	38	M/s Shreeji Exports	shreejiexports@shreeji-group.com	9016039996, Mr. Rajesh - 7567868145
11	49	M/S ACT Infraport Ltd.	pr@actship.com	9408731943
12	52	M/s Shiv Shipping Services	info@shivshipping.com	Mr. Vijay Chauhan - 9427767411
13	53	M/s Siddhivinayak Warehousing	tejmalbhaico@yahoo.in	
14	65	M/S A&I Hospitality Pvt. Ltd.		

ANNEXURE – 19

NOISE MONITORING REPORT

1st Monitoring: 16.04.2024 to 20.04.2024

Sr. No.	Location	dB(A)
Permissible limit		**75**
1	Nr. Nirman Bhavan	65
2	Nr. Craft Jetty – 2	70
3	Nr. Oil Jetty – 7	72
4	Nr. Berth No. 16	73
5	Nr. Truck Parking area	66
6	Nr. North Main Gate	74

2nd Monitoring: 01.07.2024 to 05.07.2024

Sr. No.	Location	dB(A)
Permissible limit		**75**
1	Nr. Nirman Bhavan	68
2	Nr. Craft Jetty – 2	73
3	Nr. Oil Jetty – 7	70
4	Nr. Berth No. 16	75
5	Nr. Truck Parking area	69
6	Nr. North Main Gate	71

ANNEXURE – 20

COAL HANDLING PROCEDURE

DEENDAYAL PORT TRUST

(AN ISO 9001:2008 & ISO 14001:2004 CERTIFIED PORT)
(आईएसओ9001:2008 एवंआईएसओ14001:2004प्रमाणितपोर्ट)

SAGARMALA

SIPC KANDLA

Telegram : PORT TRUST
तार : पोर्टट्रस्ट
टेलीफोन : 02836-270625
फैक्स : 02836-270475

यातायात प्रबंधक का कार्यालय
कंडलापोर्टट्रस्ट
पीएंडसीबिल्डिंग
नयाकंडला (कच्छ) 370210

TF/SH/Circulars/2019/1256 Date: 10/10/2019

CIRCULAR

In supersession of earlier Circulars notably No.TF/SH/2019/5362 dtd.23-24/01/2019 and No.TF/SH/Circulars/2019/1004 dtd. 18/09/2019 issued with regard to controlling the dust pollution arising out of coal handling as also ensuring safety in cargo handling so as to avoid damage to port infrastructure, in consultation with Port Users the following Standard Operating Procedures (SOPs) is formulated for due compliance :

1. During the course of discharging coal from the vessels at berth, the grab should invariably be opened at a lower height at Wharf.
2. Trucks/Dumpers are transporting coal from wharf to storage yard, storage yard to railway siding/for final delivery by road, as the case may be, should load coal below the brim/body level to avoid spillage enroute.Trucks, dumpers loaded for delivery of coal while moving from plot to weighbridge or weighbridge to plot and moving out should be covered by tarpaulin.
3. Storage of coal at yard shall not exceed above 5Mtrs height.
4. Water sprinkling on Indonesian coal heaps at plots at regular intervals to be undertaken by respective Port Users.
5. Sweeping machines should be deployed by the Port Users for their respective vessels at wharf and on roads during Coal handling operations.Spillage cargo on road/s should be cleaned immediately.
6. The residual cargo at wharf should be swept immediately on completion of dischargeof vessel to ensure the wharf is clean for next incoming vessel.
7. The internal roads at coal storage yard should be cleaned by the respective Port Users adjacent to their plots.

Further, damages are reportedly being caused to Port properties due to deployment of chain mounted heavy equipments by port users. To avoid such damages and adhering to safety norms, it has been decided not to permit deployment of such chain mounted heavy equipments / vehicles to come into direct contact with the surface on following areas:

1. Chain mounted equipments shall not be allowed to come into direct contact with the surface at wharfs neither for cargo loading nor barge unloading including Bunder area.Such equipments are permittedto be used/moved at Wharfs only on rubber mats/Steel plate and/or on cargo heaps of one meter height and above.
2. At no point of time,the Chain/ Crawler mounted equipments are allowed tocome into direct contact with Concrete/Bitumen surfaceeither whilemoving, loading, unloadingof such equipments, except on rubber mats/steel plates or directly on to cargo heaps of minimum one meter height and above.
3. While cleaning coal spillage on Railway Tracks, equipments like Pay Loaders/Escavators (Hitachis) are not to be used.

4. Dumping and/or Storage of cargo within three meters distance from Cable Ducts, Highmast Light Towers, Drainages, Railway Lines, Waterspringling system, Fire fighting installations is not permitted / allowed.

5. While handling of coal and other bulk cargoes, especially with Ship's Cranes, a temporary precautionary barrier should be made available to avoid spillage of cargo into the sea.

6. Plying of Vehicles, Equipments other than at designated places/areas is not permitted.

All Port Users/stake holders are requested to take note of the above and strictly adhere to the aforestated SOPs. CHA's are requested to inform their respective transporters of these SOP's and give wide publicity amongst them.

Any violation of above circular with regard to non adherence of precautions to be taken whilst deploying chain mounted equipment/s, a penalty of Rs. 25000/- and for any other violationsa penalty of Rs 10000/- shall be imposed for each violation of above rules. If the violation is repeated thrice, it could lead to suspension of licence/authorization for a period 10 days. Repeated and habitual violations could lead to cancellation of licence/ authorization. Road Trafffic, parking, covering of coal by Tarpauling and other safety related violations will be delt with as per Circular of life saving Rules and other Safety Rules DPT and procedure for traffic Safety Management in DPT. Any damage to port property by port user a penality of two times of assessed cost will be recorved from the port users.

This will come into effect from 10/10/2019. The same will be reviewed after three months.

The stakeholder's kind co-operation is solicited.

The Circular is issued with approval of competent authority.

Traffic Manager (I/c)
Deendayal Port Trust

To:

All Port Users/Trade Associations

Copy to :

1. **Sr.PS to Chairman – for kind information of Chairman**
2. **PS to Dy.Chairman – for kind information of Dy.Chairman**
3. **Chief Engineer**
4. **Chief Mechanical Engineer**
5. **ALL Officers of Traffic Department - for implementation**
6. **Sr.DD(EDP) - for uploading on website**

ANNEXURE – 21

COAL COMPLIANCE REPORT

Sr. No.	Conditions	Compliances
A	**Location Criteria**	
1	Coal handling unit / Agency shall not use any agriculture land and shall be located at a minimum distance of 250 meters away from the surrounding agriculture land.	Complied
2	Government waste land not suitable for any agriculture purpose meeting with the requisite siting / distance criteria shall be preferred for establishing coal handling units.	Complied
3	Coal Handling unit / Agency shall be minimum 500 meters away from the residential area, school / collages, Historical Monuments, Religious Places, Ecological Sensitive area as well as forests area.	Complied
4	Coal Handling unit / Agency shall be located at a minimum 500 meters away from the Railway line, Express ways, National Highways, State ways and District Roads and from water bodies like River, Nala, Canal, Pond etc.	Complied
5	In case of Coal handling activities at the Port and Jetties or extension thereof, the distance and land use criteria may be relaxed and compensated by advanced / sophisticated pollution control measures and mechanization & thick plantation, however all such port and jetties, where coal handling is carried out, shall provide closed conveyor belt and mechanization for handling of coal.	Complied
B	**Storage and handling Criteria**	
6	Coal Handling Unit / Agency shall store coal in such a way that coal heap should not be higher than 5 meter and clear distance between two adjoining heaps at	Complied

	G.L. should be 5 meters, so that in case of fire, approach is available.	
7	There should be mechanized loading / unloading system from the loading / unloading area to the staking yards and in to the vehicles.	Complied
8	Coal Handling unit / Agency shall take all corrective steps to resolve the issue of air pollution at permitted coal storage / handling area where coal is being stored.	Complied
C	**Transport Criteria**	
9	Coal Handling Unit / Agency shall ensure that all trucks before leaving the storage yard shall be showered with water with adequate system, shall be covered with tarpaulin or any other effective measure / device completely and also that trucks are not over loaded as well as there is no spillage during transportation.	Complied
10	The vehicle carrying the coal should not be overloaded by raising the height of carriage. Weigh scale shall be provided within the loading area only and port / coal park authority shall ensure that no overloading is done.	Complied
11	The top of the vehicle should be covered with fixed cover instead of tarpaulin cover to avoid spillages or dusting of coal.	Point Noted
12	Coal handling unit / Agency shall obtain transport permission from the local Administration under the relevant rules.	Complied
D	**Pollution Prevention Criteria**	
13	Coal Handling unit / Agency shall provide paved approach with adequate traffic carrying capacity.	Complied
14	Coal handling unit / Agency shall construct compound wall all along periphery of the premises with minimum 9 meters height.	Partially Complied
15	Continuous water sprinkling shall be carried out on the top of the heap at regular intervals to prevent dusting, fire & smoke. To prevent fugitive emission during	Complied

	loading / unloading, fixed pipe network with sufficient water storage and pump shall be installed. Water sprinkling shall be carried out at each and every stage of handling to avoid generation of coal dust or other dust within premises.	
16	Coal handling unit / Agency shall ensure regular sweeping of coal dust from internal and main road and also ensure that there is adequate space for free movement of vehicles.	Complied
17	The following adequate Air Pollution Control Measures shall be installed and to be operated efficiently.	Point Noted
(a)	Dust containment cum suppression system for the coal stack, loading and unloading.	Complied
(b)	Construction of effective wind breaking wall suitable to local condition to prevent the suspension of particles from heap.	Complied
(c)	Construction of metal road & RCC Pucca flooring in the plot area / godown etc.	Complied
(d)	System for regular cleaning and wetting of the floor area within the premises.	Complied
(e)	Entire coal storage area / godown should be covered with permanent whether shed roofing and side walls i.e. in closed shed, in case crushing / sieving / grading activity is carried out (i.e. G. I. Sheet) along with adequate additional APCM should be installed.	Partially Complied
18	Coal handling unit / Agency shall carry out three rows plantation with tall growing tress all along the periphery of the coal handling premises, inside & outside of the premises along with road.	Partially Complied
19	Proper drainage system shall be provided in all coal storage area so that water drained from sprinkling & runoff is collected at a common tank and can be reused after screening through the coal slit or any other effective treatment system.	Partially Complied
20	All the engineering control measures and state of art technology including covered	Point Noted.

	conveyer belts, mechanized loading and unloading, provision of silo etc. shall be provided in addition to the measures recommended in the environmental guidelines for curbing the pollution.	
E	**Safety Requirement**	
21	Coal handling unit / Agency shall provide adequate fire fighting measure to avoid any fire or related hazards including adequate water storage facility and the premises shall be exclusively used for storage of the coal.	Complied
22	An onsite emergency plan shall be prepared and implemented by coal handling unit.	Complied.
F	**Legal criteria**	
23	Necessary permission from all the applicable regulatory authorities and adequate steps under the provision of applicable environmental acts/rules shall be taken.	Complied.
24	Coal handling unit / Agency shall prepare EMP (Environment Management Plan) and implement the same in true spirit and thus maintain overall environment of that area.	Complied.
25	Coal handling unit / Agency shall not carry out the operation of loading / unloading of coal / coal dust at any place, till adequate air pollution control equipment for dust control / suppression are installed and efficiently operated and the consent under the provisions of Air (prevention & Control of Pollution) , Act 1981 is obtained by the coal yard owners / Coal handling unit / Agency/ coal importers.	Complied.
26	Coal handling unit / Agency shall operate continuous Ambient Air Quality Monitoring Stations as per CPCB guideline. The results of parameters like SPM, RSPM and SO_2 and NOx shall be submitted to the SPCB every month.	Complied.

<table>
<tr><td>27</td><td>In case of Port which provides the facility to individual developers an agreement / MoUC shall be made between port authority and developer for curtailment of pollution. Port authority shall be responsible for supervising and controlling the pollution control related activities and implementation of the environmental guidelines.</td><td>Point Noted</td></tr>
<tr><td>28</td><td>The concentration of the following parameters in the ambient air within the premises and a distance of 10 meters from the source (other than the stack vent) shall not exceed the following levels.
<table>
<tr><td rowspan="2">Parameters</td><td colspan="2">Permissible Limit</td></tr>
<tr><td>Annual</td><td>24 hrs Average</td></tr>
<tr><td>Particulate Mater – 10 (PM10)</td><td>60 µg/M^3</td><td>100 µg/M^3</td></tr>
<tr><td>Particulate Mater – 2.5 (PM2.5)</td><td>40 µg/M^3</td><td>60 µg/M^3</td></tr>
<tr><td>SO_2</td><td>50 µg/M^3</td><td>80 µg/M^3</td></tr>
<tr><td>NOx</td><td>40 µg/M^3</td><td>80 µg/M^3</td></tr>
</table></td><td>Partially Complied.</td></tr>
</table>

ANNEXURE – 22

CCA COMPLIANCE REPORT

Sr. No.	Conditions	Compliance Status
1	**Specific Condition**	
1	Unit shall strictly adhere to compliance ministry in its letter file no. 11-82/2011-IA-III, dated 2016	Complied
2	Unit shall strictly adhere to all conditions of Environment and CRZ clearance issued by MoEF vide letter no. F.No. 11-70/2006-IA-III	Complied
3	Applicant shall comply with Manufacture, storage and import of Hazardous Chemicals Rules-1989 (MSIHC) as amended time to time.	As per the Lease deed all the statutory clearance and its compliance needs to be done by the plot allotee/BOT operator. All plot allotees/BOT operators are complying with the said rules.
4	Applicant shall ensure that all storage terminal located within DPT area shall strictly comply with MSIHC rules including site notification & submit details periodically to board with relevant details.	As per the Lease deed all the statutory clearance and its compliance needs to be done by the plot allotee/BOT operator. All plot allotees/BOT operators are complying with the said rules.
5	Applicant shall renew Public Liability Insurance time to time & submit a copy to this Board.	Complied
6	Unit shall notify site under MSIHC Rule – 1989 from component authority as mentioned in Schedule – 5 of MSIHC notification.	As per the Lease deed all the statutory clearance and its compliance needs to be done by the plot allotee/BOT operator. All plot allotees/BOT operators are complying with the said rules.
7.	Industry shall not withdraw groundwater without prior NOC from CGWA as per Hon. National Green tribunal order.	Point noted. The Water requirement is being met through GWSSB (Narmada Pipeline) & through private tankers.
8.	Industry shall manage Solid waste generated from Industrial activities as per Solid Waste Management Rules-2016 (Solid waste as defined in Rule -3 (46))	Complied
9.	Industry shall comply with Plastic Waste Management Rules – 2016 and amendments made therein	Complied
10.	Industry shall strictly comply with coal handling guidelines of this board	Complied
11.	Industry shall provide dedicated storage facility for dry cargo and ensure to take adequate measure to prevent dusting.	Partially Complied
12.	The applicant shall ensure that there shall be no damage to the existing mangrove patches near site and also ensure the free flow of water to avoid damage to the mangroves.	Partially Complied

<table>
<tr><td>13.</td><td>Applicant shall ensure as per EC condition that no creeks or rivers are blocked due to any activities at the site and free flow of water is maintained.</td><td>Complied</td></tr>
<tr><td>14.</td><td>Applicant shall provide proper system for collection, storage and treatment and disposal of waste water generated by vessel as per MARPOL & maintain records.</td><td>Complied</td></tr>
<tr><td>15.</td><td>Applicant shall install storm drainage catch basin to avoid directly discharge into surface water.</td><td>Complied</td></tr>
<tr><td>16.</td><td>Waste effluent accumulated with port activities including storm water & sewage from port operation including sewage ballast water, bilge water & clean waste from ships shall be as per MARPOL norms.</td><td>Complied</td></tr>
<tr><td>17.</td><td>Applicant shall make separate records regarding generation, collection, transportation and disposal of waste generation from ship & maintain its records.</td><td>Point Noted</td></tr>
<tr><td>18.</td><td>Applicant shall made necessary arrangement for plastic waste, solid waste or other waste generation due to port activities & for facilitation of reception facilities under MARPOL & Environment (Protection) Act – 1986 rules etc.</td><td>Complied</td></tr>
<tr><td>19.</td><td>Ports shall obtain approval of their oil spill contingency plan (OSCP) as required under national oil spill disaster contingency plan (NOS-DCP) of coast guard. Ministry of defense, govt. of India.</td><td>Complied.</td></tr>
<tr><td>20.</td><td>Best environmental practices by ports may be uploaded on “Indian ports Association” as well as the same may be linked to websites of CPCB and respective SPCBs.</td><td>Complied</td></tr>
<tr><td>21.</td><td>Manually handling of cargo should be converted into mechanized system, in time bound manner.</td><td>Complied</td></tr>
<tr><td>3.</td><td colspan="2">Conditions Under Water Act – 1974</td></tr>
<tr><td>3.1</td><td>Source of Water – GWIL</td><td>Point noted</td></tr>
<tr><td>3.2</td><td>There shall be no industrial water consumption and waste water generation from manufacturing process and other ancillary operations.</td><td>Complied</td></tr>
<tr><td>3.3</td><td>The quantity of the fresh water consumption for domestic purpose shall not exceed 1300 KLD</td><td>Complied</td></tr>
<tr><td>3.4</td><td>The quantity of domestic waste water shall not exceed 800 KLD.</td><td>Complied</td></tr>
<tr><td>3.5</td><td>Domestic effluent shall be treated effluent conforming to following norms shall be discharged on land within premises strictly for gardening and plantation & no sewage shall be disposed outside premises in any manner.
<table>
<tr><td>Parameters</td><td>Permissible limits</td></tr>
<tr><td>pH</td><td>6.5 to 8.5</td></tr>
<tr><td>BOD (5 days at 20 °C</td><td>30 mg/ L</td></tr>
<tr><td>Suspended solids</td><td>100 mg/L</td></tr>
<tr><td>Fecal Coliform</td><td>< 1000 MPN/100 ml</td></tr>
</table></td><td>Complied</td></tr>
</table>

<table>
<tr><td>3.6</td><td>Treated domestic effluent confirming to above norms shall be discharged on land only for gardening & plantation within premises.</td><td>Partially Complied</td></tr>
<tr><td>3.7</td><td>Unit shall provide flow meter at inlet & outlet of STP & maintain its record.</td><td>Not Complied</td></tr>
<tr><td>3.8</td><td>Disposal system for storm water shall be provided separately, in no case storm water and sewage from port facilities shall not be discharged into surface water.</td><td>Point Noted</td></tr>
<tr><td>4.</td><td colspan="2">Conditions under air act 1981:</td></tr>
<tr><td>4.1</td><td>The following shall be used as a fuel in D.G sets
<table><tr><td>Sr. No.</td><td>Utility</td><td>Fuel</td><td>Quantity</td></tr><tr><td>1</td><td>D.G. Set</td><td>HSD</td><td>500 L/Hr.</td></tr></table></td><td>Complied</td></tr>
<tr><td>4.2</td><td>The applicant shall install & operate air pollution control system efficiently in order to achieve prescribed norms.</td><td>Point Noted</td></tr>
<tr><td>4.3</td><td>The flue gas emission through stack attached to D.G sets shall confirm to the following standards
<table><tr><td>Sr. No.</td><td>Stack attached to</td><td>Stack height in meter</td><td>APCM</td><td>Parameter</td><td>Permissible limit</td></tr><tr><td>1.</td><td>D.G sets (2 No.s) (1010 KVA)</td><td>15 each</td><td>--</td><td>PM
SO2
NOx</td><td>150 mg/NM3
100 ppm
50 ppm</td></tr></table></td><td>Complied</td></tr>
<tr><td>4.4</td><td>There shall be no process gas emission from manufacturing in the ambient air within the premises of the industry and a distance of 10 meters form the source other than the stack/vent shall not exceed the following levels.</td><td>Not applicable.
No manufacturing process is involved.</td></tr>
<tr><td>4.5</td><td>The concentration of the following parameters in the ambient air within the premises of the industry and a distance of 10 meters from the source other than the stack/vent shall not exceed the following levels.
<table><tr><td rowspan="2">Parameters</td><td colspan="2">Permissible Limit</td></tr><tr><td>Annual</td><td>24 hrs. Average</td></tr><tr><td>Particulate Matter – 10 (PM10)</td><td>60 µg/M^3</td><td>100 µg/M^3</td></tr><tr><td>Particulate Matter – 2.5 (PM2.5)</td><td>40 µg/M^3</td><td>60 µg/M^3</td></tr><tr><td>SO_2</td><td>50 µg/M^3</td><td>80 µg/M^3</td></tr><tr><td>NOx</td><td>40 µg/M^3</td><td>80 µg/M^3</td></tr></table></td><td>Complied</td></tr>
<tr><td>4.6</td><td>The applicant shall provide portholes, ladder, platform etc at chimney (s) for monitoring the air emissions and the same shall be open for inspection to/and for use of Board’s staff. The chimney(s) vents attached to various sources of emission shall</td><td>Complied</td></tr>
</table>

<table>
<tr><td></td><td>be designated by number such as S-1, S-2, etc and these shall be painted/displayed to facilitate identification</td><td></td></tr>
<tr><td>4.7</td><td>The industry shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standards in respect of noise to less than 75 dB(A) during day time and 70 dB(A) during night time. Daytime is reckoned in between 6:00 am and 10:00 pm and night time is reckoned between 10:00 pm and 6:00 am</td><td>Complied</td></tr>
<tr><td>5.</td><td colspan="2">Authorization as per Hazardous And Other Waste (Management and Transboundary) Rules, 2016 form -2 [see rule 6 (2)]</td></tr>
<tr><td>5.1</td><td>Authorization order no. AWH-110594 date of issue: 08/12/2020</td><td>-</td></tr>
<tr><td>5.2</td><td>M/s. Kandla Port Trust is hereby granted an authorization to operate facilities for following hazardous waste on the premises situated at Kandla, A.O building Gandhidham Tal.: Gandhidham, Dist: Kutch
<table>
<tr><th>Sr. No.</th><th>Waste</th><th>Quantity /Year</th><th>Schedule & Category</th><th>Facility</th></tr>
<tr><td>1</td><td>Used Spent Oil</td><td>4250 MT</td><td>I – 5.1</td><td>Collection, Storage, Transportation and disposal by selling to authorized recyclers.</td></tr>
<tr><td>2</td><td>Waste residue containing oil</td><td>8500 MT</td><td>I – 5.2</td><td>Collection, Storage, Transportation and disposal by selling to authorized recyclers.</td></tr>
</table></td><td>Complied</td></tr>
<tr><td>5.3</td><td>The authorization shall be valid up to 21/07/2025</td><td>Point Noted</td></tr>
<tr><td>5.4</td><td>The authorization is subject to the conditions stated below and such other conditions as may be specified in the rules from time to time under the Environment (Protection) Act – 1986.</td><td>Point Noted</td></tr>
</table>

5.5	The authorization is granted to operate a facility for collection, storage within factory premises transportation and ultimate disposal of hazardous wastes as per conditions no. 5.2 to the industry having valid CCA of this board.	Point Noted
5.6	**Terms and Condition of Authorization**	
1.	The applicant shall comply with the provision of the Environment (Protection) Act-1986 and the rules made there under	Point Noted
2.	The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the Gujarat pollution Control Board.	Point Noted
3.	The person authorized shall not rent, lend, sell, and transfer or otherwise transport the hazardous wastes without obtaining prior permission of the Gujarat Pollution Control Board.	Point Noted
4.	Any unauthorized change in personnel, equipment or working conditions as mentioned in the authorized order by the persons authorized shall constitute a beach of this authorization	Point Noted
5.	The person authorized shall implement Emergency Response Procedure (ERP) for which this authorization is being granted considering all site-specific possible scenarios such as spillages, leakages, fire etc, and their possible impact and also carry out mock drill in this regard at regular interval of time.	Complied
6.	The person authorized shall comply with the provisions outlined in the Central Pollution Control Board guidelines on "Implementing Liabilities for Environmental damages due to handling and disposal of Hazardous waste and penalty."	Point Noted
7.	It is the duty of the authorized person to take prior permission of the Gujarat Pollution Control Board to close down the facility.	Point Noted
8.	An application for the renewal of an authorization shall be made as laid down in rules 6 (2) under Hazardous and other wastes rules, 2016	Point Noted
9.	The imported hazardous and other wastes shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation.	Not applicable. DPA is not involved in import of any kind of hazardous waste.
10.	The record of consumption and fate of the imported hazardous and other wastes shall be maintained.	Not applicable. DPA is not involved in import of any kind of hazardous waste.
11.	The hazardous and other wastes which gets generated during recycling or reuse or recovery or pre-processing or utilization of imported hazardous or other wastes shall be treated and disposed of as per specific conditions of authorization	Not Applicable
12.	The importer or exporter shall bear the cost of import or export and mitigation of damage if any.	Point Noted
13.	Any other conditions for compliance as per the guidelines issued by the ministry of Environment, Forest and climate change or Central Pollution Control Board from time to time.	Point Noted
14.	The waste generator shall be totally responsible for (i.e collection, storage, transportation and ultimate disposal) the wastes generated.	Point Noted
15.	Record of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control board in form -4	Complied

	by 30th day of June of every year for the preceding period April to March	
16.	In case of any accidents, details of the same shall be submitted on Form-11 to Gujarat Pollution Control Board.	Point Noted
17.	As per "Public Liability Insurance Act – 91" company shall get Insurance policy, if applicable.	Complied
18.	Empty drums and containers of toxic and hazardous material shall be treated as per guidelines published for "Management and Handling of discharged containers" records of the same shall be maintained and forwarded to Gujarat Pollution Control Board regularly.	Point Noted
19.	In case of transport of hazardous waste to a facility for (i.e treatment, storage and disposal) existing in a state other than the state where hazardous wastes generated, the occupier shall obtain "No Objection Certificate" from the State Pollution Control Board or Committee of the concerned state of Union Territory Administration where facility exists.	Not Applicable. DPA has appointed GPCB approved vendors for collection and disposal of "Hazardous Waste/Sludge/ Waste Oil". A copy of Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port" is attached
20.	Unit shall all concrete measures to show tangible results in waste generation, reduction, avoidance, reuse and recycle. Actions taken in this regard shall be submitted within three months and also along with form -4	Point Noted
21.	Industry shall have to display the relevant information with regards to hazardous waste as indicated in the Hon. Supreme Court's Order in WP No. 657 of 1995 dated 14th October 2003.	Agreed
22.	Industry shall have to display on-line data outside the main factory gate with regard to quantity and nature of hazardous chemicals being handled in the plant, including wastewater and air emissions and solid hazardous wastes generated within the factory premises.	Agreed
6.	**Specific Conditions: -**	
6.1	The authorized actual user of hazardous and other waste shall maintain records of hazardous and other wastes purchased in a passbook issued by the State Pollution Control Board along with the authorization.	Point Noted
6.2	Handling over of the hazardous and other wastes to the authorized actual user shall be only after making the entry in the passbook of the actual user.	DPA is keeping the details of hazardous waste handed over to the authorized recycler.
6.3	In case of renewal of authorization, a self-certified compliance report in respect of effluent, emission standards and the conditions specified in the authorization for hazardous and other wastes shall be submitted SPCB.	Point Noted
6.4	The occupier of the facility shall comply standard operating procedure/guidelines published by MoEF&CC or CPCB or GPCB from time to time.	Agreed
6.5	Unit shall comply provisions of E-waste management Rules - 2016	Point Noted

6.6	The disposal of hazardous waste shall be carried out as per the waste management hierarchy.	Complied
6.7	The occupier of facilities shall not store the hazardous and other wastes for a period not exceeding ninety days. Prior permission of the board shall be obtained for extension of the storage period.	Complied
6.8	The occupier shall maintain the records of generation, sale, storage, transport, recycling, co-processing and disposal of hazardous waste and make available during the inspection.	Complied
6.9	The transportation of the hazardous waste shall be carried out in GPS mounted dedicated vehicles.	Complied
7.	**General Conditions: -**	
7.1	Any change in personnel, equipment or working conditions as mentioned in the consents from order should immediately be intimated to this Board.	Point Noted
7.2	Applicant shall also comply with the general conditions given in Annexure 1	Point Noted
7.3	Wherever due to accident or other unforeseen act or ever, such emissions occur or apprehend to occur in excess of standards laid down such information shall the forthwith reported to board, concerned police station office of Directorate of Health Service, Department of explosive, Inspectorate of Factories and local body.	Agreed
7.4	In case failure of pollution control equipment's, the production process connected to it shall be stopped. Remedial actions/measures shall be implemented immediately to bring entire situation normal.	Not applicable. No production activity is involved.
7.5	The Environment management Unit/cell shall be setup to ensure implementation on and monitoring of Environmental safeguards and other conditions stipulated by statutory authorities. The Environment management Cell/Unit shall directly report to the Chief executive of the organization and shall work as a focal point for internalizing environmental issues. These cells/units also coordinate the exercise of environmental audit and preparation of environmental statements.	Complied
7.6	The environmental audit shall be carried out yearly and the environmental statements pertaining to the previous year shall be submitted to this State Board latest by 30th September every year.	Not applicable. As per Environment Audit Scheme, DPA is not covered under Schedule 1 or Schedule 2 industry.
7.7	The Board reserves the right to review and/or revoke the consent and/or make variation in the conditions, which the Board deems, fit in accordance with section 27 of the Act.	Point Noted
7.8	In case of change of ownership/management the name and address of the new owners/partners/directors/proprietor should immediately be intimated to the Board.	Point Noted
7.9	Industry shall have to display relevant information with regard to hazardous waste as indicated in the Hon. Supreme order in w.p no. 657 of 1995 dated 14th October 8	Point Noted

ANNEXURE – 23

CRZ COMPLIANCE

Annexure1

Compliance Report for the Period up to May 2024.

Name of Work: Construction of 13th to 16th Cargo Berth at Kandla, District Kachchh.

CRZ Recommendations: Letter No. ENV-I0-2006-138-P dated 14/02/2008 of Director (Environment), Forest & Environment Department, GoG. Further, the Ministry of Environment & Forest–New Delhi, Govt. of India accorded the Environmental/ CRZ clearance vide letter no. 11-70/2006-IA.III dated Sep 2008 & the validity of the same had been extended by MoEF, GoI vide letter No.F.NO.11–70/2006–IA.III dated 7th February, 2014 for a further period of 5 years.

STATUS OF Berths:

13th Cargo Berth: Under operation since 18/2/2013. 15th Cargo Berth: Under Operation since 16/11/2013.14th Cargo Berth: Under Operation since 8/4/2019.
16th Cargo Berth: Under Operation since 10/3/2019.

CONSENT TO OPERATE:

DPA obtained Consolidated Consent & Authorisation (CC&A) for whole port area including 13th to 16th Cargo Berth from the GPCB vide Consent Order no-AWH-110594 dated of issue-8/12/2020, with a validity period upto 21/7/2025. Detailed Order issued by the GPCB vide outward no. 581914 dated 22/1/2021 & subsequently, issued Correction in CC&A order vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/588116 dated 9/4/2021. Further an amendment has issued by GPCB vide letter no. PC/CCA-KUTCH-812(6)/GPCB ID-28494/781072 dated 11/01/2024.

Sr. No.	Conditions in CRZ Recommendation Letter	Compliance
Specific Conditions		
1	The provisions of the CRZ notification of 1991 and subsequent amendments issued from time to time shall be strictly adhered to by the KPT. No activity in contradiction to the Provisions of the CRZ Notification shall be carried out by the KPT.	All the 4 berths are under operation. The provisions of the CRZ notification of 1991 and subsequent amendments issued from time to time are being strictly followed by Deendayal Port Authority (Erstwhile Deendayal Port Trust).
2	The KPT shall participate financially for installing and operating the Vessel Traffic Management System in the Gulf of Kachchh and shall also take lead in preparing and operationalizing and updating regularly after getting it vetted by the Indian Coast Guard.	DPA had already contributed an amount of Rs. 41.25 Crores for installing and operating the VTMS in the Gulf of Kachchh. VTMS has been handed over to the Directorate General of Lighthouse and Lightships, Ministry of Shipping, and GoI for operating and updating regularly to statutory authorities.
3	The KPT shall strictly ensure that no creeks or rivers are blocked dueto any activity at Kandla.	All the four berths are under operation
4	Mangrove plantation in an area of 1000 ha. Shall be carried out by the KPT within 5 years in time bound manner on Gujarat coastline either within or outside the Kandla port Trust area at an appropriate place in consultation with the Forest and Environment Department. A six-monthly compliance report along with the satellite images shall be submitted to the Ministry of Environment and Forest as well as to this Department without fail.	As per the directions of the GCZMA and MoEF&CC, GoI, to date, DPA has undertaken a Mangrove Plantation in an area of 1600 Hectares since the year 2005. The details have already been communicated with the earlier compliance reports submitted. It is also relevant to submit here that, as per the direction of the Gujarat Coastal Zone Management Authority, DPA had already prepared & submitted a report on mangrove conservation and management plan formulated by Gujarat Institute of Desert Ecology during the study period of Jan-April, 2015 (Report already submitted along with earlier compliance reports submitted). For regular monitoring, DPA vide work order dated 3/5/2021 has assigned work to M/s GUIDE, Bhuj, for Monitoring of mangrove plantation carried out by DPA (Period from 24/5/2021 to 23/5/2022). The final report submitted by GUIDE, Bhuj has already been communicated with the last compliance report submitted. Further DPA has assigned work to M/s

		GUIDE, Bhuj vide work order dated 10/06/2024 for "Monitoring of Mangrove Plantation 1600 Ha carried out by DPA" for the Period of 10/06/2024 to 09/06/2025.
5	No activities other than those permitted by the competent authority under the CRZ Notification shall be carried out in the CRZ area.	All the four berths are under operation
6	No groundwater shall be tapped for any purpose during the proposed expansion modernizationactivities.	All the four berths are under operation
7	All necessary permissions from different Government Departments / agencies shall be obtained by the KPT before commencing the expansion activities.	DPA obtained Consolidated Consent & Authorization (CC&A) from the GPCB vide Consent Order no AWH-110594 date of issue-8/12/2020, with a validity period up to 21/7/2025– Detailed Order issued by the GPCB vide outward no. 581914 dated 22/1/2021 & subsequently, issued Correction in CC&A order vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/588116 dated 9/4/2021 (The copy of the Order has already been communicated with the last compliance report submitted).
8	No effluent or sewage shall be discharged into the sea/creek or in the CRZ area and It shall be treated to conform to the Norms prescribed by Gujarat Pollution Control Board and would be reused/recycled within the plant premises to the extent possible.	Generated sewage is treated in DPA's existing STP (1.5 MLD capacity). In addition to that, it also has septic tanks at places where STP is inaccessible. The treated sewage is being used for gardening and plantation purposes. DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the Annual report (2023-24) of environmental monitoring submitted by GEMI, Gandhinagar, is attached herewith as **Annexure A**
9	All the recommendations and suggestion given by the NIOT in their Comprehensive Environment Impact Assessment report for conservation / protection and betterment of environment shall be implemented strictly by the	Currently, all the four berths are under operation. As per the directions of the GCZMA and MoEF&CC, GoI, to date, DPA has undertaken a Mangrove Plantation in an area of 1600 Hectares since the year

	KPT.	2005. The details have already been communicated with the earlier compliance reports submitted. For regular monitoring, DPA vide work order dated 3/5/2021 has assigned work to M/s GUIDE, Bhuj for "Monitoring of mangrove plantation" carried out by DPA (Period from 24/5/2021 to 23/5/2022). The final report submitted by GUIDE, Bhuj, has already been communicated with the last compliance report submitted. Further DPA has assigned work to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Monitoring of Mangrove Plantation 1600 Ha carried out by DPA" for the Period of 10/06/2024 to 09/06/2025. The Work Order is attached herewith as **Annexure B.** DPA assigned work to M/s GUIDE, Bhuj for "Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs" since 2017. The reports are being submitted time to time along with compliance reports submitted. The final report for the period 2023-2024 is attached herewith as **Annexure C.** In continuation of same, DPA had issued work order to GUIDE, Bhuj for "Regular Monitoring of Marine Ecology in and around Deendayal Port Authority" for the year 2024-2027. The work is in progress. The work order is attached herewith as **Annexure D.** To control fugitive emissions, DPA has installed Mist Canon in the Port area. Further, regular sprinkling through tankers on roads and other staking yards is being done to control dust pollution in other areas. it is relevant to mention that Pollution under Control (PUC) Certificates have been made mandatory for vehicles in the port area. For waste generated from ships, DPA

		issued a Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" and for removal of "Dry Solid Waste (Non- Hazardous)" from Vessels calling at Deendayal Port through DPA contractors. Further, all ships are required to follow DG Shipping circulars regarding the reception facilities at the Swachch Sagar portal. Further, DPA vide work order dated 24/01/2023 has appointed GEMI, Gandhinagar, for "Preparation of Plan for Management of Plastic Wastes, Solid Waste including C&D waste, Hazardous wastes including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority area". The work is in progress. DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the Annual report (2023-24) of environmental monitoring submitted by GEMI, Gandhinagar, is attached herewith as **Annexure A**
10	The construction activities and dredging shall be carried out only under the constant supervision and guidelines of the NIOT.	All the four berths are currently under operation.
11	The KPT shall contribute financially for any common study or project that may be proposed by this Department for environmental management/conservation/improvement for the Gulf of Kachchh.	Point noted
12	The construction debris and/or any other of waste shall not be disposed of into the sea, creek or the CRZ areas. The debris shall be removed from the construction site immediately after the construction is over.	All the 4 berths are currently under operation.
General Conditions		
13	The construction camps shall be located outside the CRZ area and the construction labour shall be	All the 4 berths are currently under operation.

	provided with the necessary amenities, including sanitation, water supply and fuel and it shall be ensured that the environmental conditions are not deteriorated by the construction labours.	
14	The KPT shall bear the cost of the external agency that may be appointed by this Department for supervision / monitoring of proposed activities and the environmental impacts of the proposed activities.	Point noted
15	The KPT shall take up massive greenbelt development activities in and around Kandla and also within the KPT limits.	Deendayal Port Authority had taken up massive greenbelt development activities in and around Kandla, Residential colony, administrative building, etc. DPA had entrusted the work to the Forest Department, Gujarat, in August 2019 for developing a green belt in and around the Port area at a cost of Rs. 352 lakhs in an area of about 32 hectares, and the work is completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-I) (5,000 plants)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The work is completed. Further, DPA assigned work to GUIDE, Bhuj, via a work order dated 23/06/2023 for "Green belt development in Deendayal Port Authority and its Surrounding Areas (Phase II) (10,000 plants). The work is in progress and the latest Progress report submitted by GUIDE is attached as **Annexure E**
16	The KPT shall have to contribute financially for talking up the socio- economic upliftment activities in this region in construction with the Forest and Environment Department and the District Collector / District Development Officer.	The details of CSR activities undertaken /to be undertaken by DPA are placed at **Annexure F**
17	A separate budget shall be earmarked for environmental management and socioeconomic	The allocation made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" during

	activities and details there of shall be furnished to this Department as well as the MoEF, GOI. The details with respect to the expenditure from this budget head shall also befurnished.	BE 2024-25 is Rs. 657 Lakhs. The expenditure made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" is Rs. 330 Lakhs from December, 2023 to May, 2024.
18	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during construction and operational phases of the project.	DPA already has an Environment Management Cell. Further, the DPA has also appointed an expert agency to provide Environmental Experts from time to time. DPA appointed M/s Precitech Laboratories, Vapi, to provide Environmental Experts via a work order dated 5/2/2021. In addition, it is relevant to submit here that DPA has appointed a Manager (Environment) on a contractual basis for a period of 3 years, further extendable to 2 years (A copy of the details has already been communicated with the last compliance report submitted).
19	An Environmental report indicating the changes, if any, with respect to the baseline environmental quality in the coastal and marine environment shall be submitted every year by the KPT to this Department as well as to the MoEF, GOI.	DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the Annual report (2023-24) of environmental monitoring submitted by GEMI, Gandhinagar, is attached herewith as **Annexure A**
20	The KPT shall have to contribute financially to support the National Green Corps Scheme being implemented in Gujarat by the GEER Foundation, Gandhinagar, in construction with Forests andEnvironment Department	Point noted
21	Six monthly reports on compliance of the conditions mentioned in this letter shall have to be furnished by the KPT on regular basis to this department/ MoEF, GOI.	DPA has regularly submitted the compliance reports to GCZMA, Gandhinagar, MoEF&CC, and GOI. The last compliance report of the conditions stipulated in CRZ recommendations issued by GCZMA was submitted on 19/03/2024.
22	Any other condition that may be stipulated by this department from time to time for environmental protection/management purpose	Point noted

Annexure 1

Compliance Report (For the period up to May, 2024)

Subject: Point-wise Compliance of conditions stipulated in CRZ Recommendations for project "Creation of water front facilities (oil jetties 8,9,10 and 11) and development of land (1432 acres – revised area 554 acres) for associated facilities for storage at old Kandla, Tal: Gandhidham Dist. Kutch, Gujarat by Deendayal Port Authority (Erstwhile Deendayal Port Trust)" -reg.

Ref No: - CRZ recommendation issued by GCZMA vide Letter No- ENV-10-2018-24- T Cell dated 30.07.2020

S. No	CRZ Conditions	Compliance Status
	SPECIFIC CONDITIONS	
1.	The DPA shall strictly adhere to the provisions of the CRZ Notification, 2011 issued by the Ministry of Environment, Forests and Climate Change, Government of India	It is assured that, the provisions of the CRZ Notification, 2011 shall be strictly adhere to by the DPA.
2.	Necessary permissions from different departments/ agencies under different laws/ acts shall be obtained before commencing any activity (including the construction)	The Consent to Establish (CTE) from the GPCB had already been obtained vide CTE No. 94118 granted by the GPCB vide letter no. PC/CCA-KUTCH 1524/GPCB ID 56985 dated 23/7/2018 with a validity period 3/4/2023. DPA also obtained validity extension vide GPCB order no. PC/CCA-KUTCH 1524/GPCB ID 56985 dated 30/09/2023 valid up to 19/11/2030. Further, Construction activity of Oil Jetty 08 is completed, accordingly DPA had applied for the CCA – fresh application vide inward no. 310134 dated 23/04/2024. A copy of forwarding letter is attached herewith as **Annexure A**
3.	The DPA shall ensure that the all the provisions of CRZ Notification 2011 shall be complied with and storage facilities in CRZ areas shall be in compliance with Annexure-II of the above said Notification	It is assured that all the provisions of CRZ Notification, 2011 will be complied with and only storage of permissible cargo as per CRZ Notification, 2011, Annexure II will be allowed to store in storage facilities to be developed.
4.	There shall not be any blockage of creek due to laying of pipeline. and free flow of water shall be maintained.	Due care is being taken while carrying out construction activity (Construction of Oil Jetty No. 8 and partial development of embankment for road network along with reclamation of Land) on Project site so that there is no blockage of the creek due to lying of pipeline
5.	There shall not be any mangrove destruction/ damage due to proposed activities and adequate buffer zone of 70 metres shall be maintained from mangrove areas	It is assured that all the proposed activities shall be carried out strictly as per the EC & CRZ Clearance accorded by the MoEF&CC, GoI dated 20/11/2020.
6.	The DPA shall effectively implement the Mangrove Development, Protection & Management plan for control of indirect impact on mangrove habitat	As per the directions of the GCZMA and MoEF&CC, GoI, DPA had already undertaken Mangrove Plantation in an area of 1600 Ha. till date since the year 2005. A statement showing details of mangrove plantation at various locations with cost incurred is placed at **Annexure B** It is also relevant to submit here that, as per the direction of the Gujarat Coastal Zone Management Authority, DPA had already prepared & submitted a report on mangrove

		conservation and management plan formulated by Gujarat Institute of Desert Ecology during the study period of Jan-April, 2015 (Report already submitted along with earlier compliance reports submitted). In addition to the above, DPA appointed M/s GUIDE, Bhuj for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). The final report for the year 2021 to 2022 is attached herewith as **Annexure Copy submitted along with the compliance report submitted with 05/05/2023** Further DPA has assigned work to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Monitoring of Mangrove Plantation 1600 Ha carried out by DPA" for the Period of 10/06/2024 to 09/06/2025. The work order is attached herewith as **Annexure C**
7.	The DPA shall have to make a provision that mangrove areas get proper flushing water and free flow of water shall not be obstructed	Due care is being taken while carrying out construction activity (Construction of Oil Jetty No. 8 and partial development of embankment for road network along with reclamation of Land) on Project site mangrove area get proper flushing of water and to maintain free flow of water.
8.	The DPA shall have to dispose of the dredged material at the designated dredged material disposal point based on scientific study and approved by the MOEF&CC, GOI	No dredging activity has been started yet. However, it is assured that dredging activity will be carried out strictly as per the requirement of the condition and the same shall be disposed at designated dumping ground (25° 51' 00" N & 70°10' 00" E).
9.	The DPA shall have to maintain the record for generation and disposal of capital dredging and maintenance dredging	No dredging activity has been started yet. However, it is assured that necessary record will be maintained as per the requirement of the condition.
10.	No dredging, reclamation or any other project related activities shall be carried out in the CRZ area categorized as CRZ I (i) (A) and it shall have to be ensured that the mangrove habitat and other ecologically important and significant areas, if any, in the region are not affected due to any of the project activities.	It is assured that all the project related activities will be strictly carried out as per the EC & CRZ Clearance accorded by the MoEF&CC, GoI dated 20/11/2020.
11.	The DPA shall ensure that construction activities like dredging etc. shall be carried out in confined manner to reduce the impact on marine environment.	No dredging activities have been started yet. However, it is assured that construction activities like dredging will be carried out as per the requirement of the condition.
12.	The DPA shall ensure that the dredging shall not be carried out during the fish breeding season.	No dredging activities have been started yet. Point Noted for compliance.
13.	Construction waste including debris and dredged material shall be disposed safely in the designed areas as approved by MoEF&CC, GoI and it shall be ensured that there shall be no impact on flora and fauna	DPA had already issued general circular vide dated 3/9/2019 regarding Construction and Demolition Waste Management for strict implementation in DPA. **Copy submitted along with the compliance report submitted with 05/05/2023**

14.	No effluent or sewage shall be discharged into the sea / creek or in the CRZ area and shall be treated to conform the norms prescribed by the Gujarat Pollution Control Board and would be reused / recycled as per the approval of the Board.	It is assured that No effluent or sewage will be discharged into the Sea/creek or in the CRZ area. Further, Generated waste water from the oil jetty no. 8 will be treated in septic tank/soak pit. However, after completion of entire project facility (Oil Jetties 8 to 11 & associated area for storage), possibility may be explored to treat the waste water generation (about 16 KLD) through existing STP of DPA
15.	All the recommendations and suggestions given by the Cholamandalam MS Risk Services Limited in their Environment Impact Assessment report shall be implemented strictly by DPA	The compliance of the recommendations and suggestions is given by the EIA Consultant, M/s SV Enviro, Vizag in EIA Report is attached herewith as **Annexure D**
16.	The DPA shall exercise extra precautions to ensure the navigation safety and mitigation of the risk associated with the project activities especially due to collision, sinking or accidents of the vessels and would deploy the latest communication and navigation aids for this purpose. The proposed facilities shall also be covered under the VTMS being developed by the GMB	In this regard, it is to state that, Deendayal Port Authority had already contributed Rs. 41.25 crores for installing and operating the VTMS in the Gulf of Kachchh.
17.	The cost of the external agency that may be appointed by this department for supervision / monitoring of the project activities during construction/ operational phases shall be paid by DPA	Point Noted.
18.	The DPA shall contribute financially for any common study or project that may be proposed by this Department for environmental management / conservation / improvement for the Gulf Kutch	Point noted for compliance.
19.	The piling activities debris and any other type of waste shall not be discharged into the sea or creek or in the CRZ areas. The debris shall be removed from the site immediately after the piling activities are over.	DPA has included clause in the tender for the Contractor to undertake precautions for safeguarding the environment during the course of the construction work.
20.	The camps shall be located outside the CRZ area and the labour shall be provided with the necessary amenities, including sanitation, water supply and fuel and it shall be ensured that the environmental conditions are not deteriorated by the labours.	DPA has included clause in the tender for the Contractor to undertake precautions for safeguarding the environment during the course of the construction work.
21.	The DPA shall prepare and regularly update their Local Oil Spill Contingency and Disaster Management Plan in consonance with the National Oil Spill and Disaster Contingency Plan	Point Noted for compliance. DPA is already having Local Oil Spill contingency plan and updated DMP.
22.	The DPA shall bear the cost of the external agency that may be appointed by this Department for supervision / monitoring of proposed activities and the environmental impacts of the proposed activities	Point noted for compliance.
23.	The groundwater shall not be tapped to meet with the water requirements in any case	Water requirements will be met through procurement from GWSSB or private tankers. It is hereby assured that no groundwater shall be tapped.
24.	DPA shall take up greenbelt development activities in consultation with the Gujarat institute of Desert Ecology / Forest Department / Gujarat Ecology Commission	DPA has already developed Green belt in and around the Port area. Further, DPA assigned work for Green belt development in an area of about 32 hectares to the Forest Department, Govt. of Gujarat during August, 2019 at the cost of Rs. 352.32 lakhs. The work is completed. Further, DPA also undertook massive green belt

		development in and around the Port area and at Gandhidham area. Further, DPA also assigned the work of ***"Greenbelt Development in Deendayal Port Authority and its surrounding areas Charcoal Site (Phase I)"*** vide Work Order dated 31/05/2022 at the cost of Rs. 33.22 lakhs . The work is completed. The final report is submitted along with the compliance submitted on 18/09/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The same is in process
25.	The DPA shall have to contribute financially for taking up the socio-economic upliftment activities in this region in consultation with the Forests and Environment Department and the District Collector / District Development Officer	As per the CSR Guidelines issued by the Ministry of Ports, Shipping & Waterways, Government of India, from time to time, DPA had undertaken CSR activities since the year 2011-12. The details of CSR Activities undertaken & planned is attached herewith as **Annexure E**
26.	A six-monthly report on compliance of the conditions mentioned in this letter shall have to be furnished by DPA on a regular basis to this Department and MoEF&CC, GoI.	DPA has been regularly submitting the six-monthly report on compliance of the conditions mentioned in the CRZ Recommendation letter dated 30/7/2020 to the CRZ Authority and to the MoEF&CC, GoI. Last compliance submitted on 27/03/2024.
27.	The DPA shall ensure that the numbers of the Vessels and machinery deployed during marine construction, which are a source of low level organic and PHC pollution will be optimized to minimize risks of accidents involving these vessels.	Point Noted for compliance.
28.	The noise level during transport and construction of marine facilities shall be kept minimum.	DPA appointed NABL Accredited laboratory for regular Monitoring of environmental parameters since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted. The latest Environmental Monitoring Reports are attached herewith as **Annexure F**
29.	The DPA shall regularly conduct the surveys to identify changes in the channel bathymetry to minimize navigation hazards. Proper navigational aids and guidance should be provided to ships navigating the channel and there should be a properly structured vessels traffic management strategy to avoid accidents.	Point noted for compliance. Further, it is to state that, Deendayal Port Authority had already contributed Rs. 41.25 crores for installing and operating the VTMS in the Gulf of Kachchh.
30.	The DPA shall carry out separate study for further erosion and deposition pattern in the area after dredging through a reputed agency and shall follow the suggestions of the study done by reputed agency, for maintenance dredging,the recommendations/ suggestions of the reputed agency shall be follow by the DPA.	No dredging activity has been started yet. However, it is assured that necessary will be conducted as per the requirement of the condition.

31.	Any other condition that may be stipulated by this Department and MoEF&CC, GoI from time to time for environmental protection / management purpose shall also have to be complied with by DPA.	Point noted.

ANNEXURE – 24

PLASTIC AND E-WASTE DETAILS AND MANAGEMENT

- Companies authorized by Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) have been awarded the work of collection, transporting and disposal of solid waste by the Deendayal Port Authority.

- In additional to the above, DPA has awarded work for "Preparation of Plan for Management of Plastic Wastes, Solid waste including C&D wastes, E-wastes, Hazardous wastes including Biomedical", to Gujarat Environment Management Institute (GEMI), Gandhinagar vide work order dated 24/01/2023. The work is completed.

ANNEXURE – 25

GREEN BELT DETAILS

DPA has accorded the work of Afforestation project in Deendayal Port Area to Forest Department, GoG which includes plantation and maintenance work of 1100 plants per ha. The said work is completed.

DPA has planted 4000 trees at A.O building, Gopalpuri residential colony and along the road side at Kandla. Further, approximately 885 no. of trees have been planted since September 2015 onwards.

DPA has planted 7500 trees in Deendayal port trust area during the year 2014-15 6000 trees during financial year 2016-17 and the same has been regularly maintained.

DPA entrusted work to Forest Department, GoG (Social Forestry Division, Bhuj) during August, 2019 for green belt development in and around port area 31.942 hectares (approx. 35200 plants at various locations) at a cost of Rs. 352.32 lakhs.

DPA has accorded the work of green belt development in Deendayal port Authority and its Surrounding areas (Phase I) to GUIDE for the plantation of 5000 saplings of suitable species. The said work is completed.

DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023.

Deendayal Port Authority had carried out mangrove plantation in an area of 1600 ha. through various government agencies like Gujarat Ecology Commission, State Forest Department.

ANNEXURE – 26

Observation and Recommendations based on the Audit visits

- The online display data board was not at the main gate. As per the authority's information, it is under tendering process. A total number of three display boards were proposed.
- Minor fugitive dust was observed near the dry cargo handling area and wood storage area. Control measures like water sprinklers and sprinkling by tractors to suppress the dust should be adopted.
- It was observed that the coal storage area's barricades were broken. The chances of dispersion of coal due to wind is possible. Hence, it is recommended to provide adequate maintenance to the barricades and repair as soon as possible.
- Minor oil spillage was observed near Craft Jetty 2 and hence it was recommended to take adequate measures to trap oil spillage.
- All the drainage lines near coal storage area were blocked due to dust generated from the construction activity and hence it was recommended to carry out proper drainage cleaning work on a regular basis.
- The port authority shall depute a designated representative having qualification in Environmental Engineering to supervise the Environment related activities and to understand the operations related to the Environmental perspectives of the Port.
- Continuous air quality monitoring shall be installed at the coal handling and storage area as per CPCB Guidelines.
- At the port area, the workers were not using proper PPE's. Authority have to ensure that all the workers must use proper PPE's while working to prevent any accidents.
- It was observed during the Audit visit that there is no specific primary hazardous waste storage area.
- At the coal handling area, three row plantation shall be done as per CPCB guidelines and try to maintain a closed system while handling the coal.
- Authority shall implement certain preventive measures to reduce fugitive emissions during loading and unloading operations.
- Water logging issue due to rain water was observed at the coal storage area. Proper drainage system arrangements shall be provided to prevent water stagnation.
- An LED display board having guidelines regarding port operations and safety measures shall be kept.

- The construction of Jetty No. 8 and 9 are under process.
- The waste or debris which generated during construction activity was lying at the site near material storage area and hence it was recommended to dispose the waste through proper channel to recyclers.
- The oil spillage contingency plan shall be updated regularly.

STP Observation

- The Environmental Cell of Deendayal Port Authority shall have STP inlet and outlet meter reading data, Marpol compliance report and health records during audit visit.
- There were no records or data registers found at the site. Plant operators were not maintaining proper records of inlet and outlet meter readings in the log book, chemical consumption etc.
- The inlet meter of STP was not in working condition and it was recommended to replace it with a new one.
- It was observed that the outlet water of STP is being discharged in the creek.
- The STP workers were directly discharging water from the aeration tank to the plantation without complete treatment. The authority should ensure that proper treatment of water shall be done and only after that discharging of treated water should be made.
- STP operator's qualification does not meet the requirements. So, the authority shall look into it and designate qualified personnel.
- All the pipes used to carry the sewage were corroded which should be checked.
- The overall plant was not in operation which is not in line with condition as mentioned in the CC&A which is a Major non-compliance which should be rectified.
- Major foaming issues were observed at the oil and grease trap and after the aeration tank. Necessary measures shall be taken to reduce foaming using anti-foaming agents.

APPENDIX – 1

CONSOLIDATED CONSENT & AUTHORIZATION WITH AMMENDMENT COPY

GPCB

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN
Sector-10-A, Gandhinagar-382 010
Phone (079) 23226295
Fax (079) 23232156
Website www.gpcb.gov.in

By R.P.A.D

In exercise of the power conferred under section-25 of the Water (Prevention and Control of Pollution) Act 1974 under section-21 of the Air (Prevention and Control of Pollution)-1981 and Authorization under rule 6(2) of the Hazardous and Other Waste (Management and Trans boundary) Rules 2016 framed under the Environmental (Protection) Act-1986

And whereas Board has received consolidated consent application **Inward No.176457** dated 22/09/2020 for the **Renewal of Consolidated Consent and Authorization (CC&A)** of this Board under the provisions / rules of the aforesaid Acts. Consents & Authorization are hereby granted as under

CONSENTS AND AUTHORISATION
(Under the provisions /rules of the aforesaid environmental acts)

To,
M/s. Deendayal Port Trust, (New name) (ID-28494)
M/s. Kandla Port Trust, (Old name),
Kandla, A O Building Gandhidham,
Tal: Gandhidham, Dist: Kutch - 370201

1. **Consent Order No. AWH-110594 Date of issue: 08/12/2020.**
2. The consents shall be valid upto **31/07/2025** for the use of outlet for the discharge of trade effluent and emission due to operation of industrial plant for manufacturing of the following items/products

Sr No	Product/Services	Quantity
1	Dry Cargo Handling	26,54,00,000 MT/Month
2	Liquid Cargo Handling	54,64,00,200 MT/Month
3	Loading and unloading operation at 13 Berth	2 MMTPA
4	Loading and unloading operation at 15 Berth	2 MMTPA

Subject to specific condition:

1. Unit shall strictly adhere to compliance mintsry in its Clearance letter file no. 11-02/2011-IA-III, dated 19/12/2016
2. Unit shall also strictly adhere to all conditions of Environment and CRZ Clearance issued by MoEF vide letter no. F. no. 11-76/2006-IA-III dated 01/10/2008
3. Applicant shall comply with Manufacture, Storage and Import of Hazardous Chemicals Rules-1989 (MSIHC) as amended time to time
4. Applicant shall ensure that all storage terminal located within DPT area shall strictly comply with MSIHC Rules including site notification & submit details periodically to board with relevant details
5. Applicant shall renew Public Liability Insurance time to time & submit copy to this Board

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6 Unit shall notify any accident under MSIHC Rule 1989 from competent authority as mentioned in schedule-5 of MSIHC Notifications.

7 Industry shall not withdraw groundwater without prior NOC from CGWA as per Hon National Green Tribunal order

8 Industry shall manage Solid Wastes generated from industrial activities as per Solid Waste Management Rules-2016 (solid waste as defined in Rule-3(48))

9 Industry shall comply with Plastic Waste Management Rules– 2016 and amendments made therein

10. Industry shall strictly comply with coal handling guideline of this board

11. Industry shall provide dedicated storage facility for dry cargos & ensure to have adequate measures to prevent dusting

12. Applicant shall ensure that there shall be no damage to the existing mangrove patches near site and also ensure the free flow of water to avoid damage to the mangroves

13. Applicant shall ensure as per EC condition that no creeks or rivers are blocked due to any activities at the site and free flow of water is maintained

14 Applicant shall provide proper system for collection, storage & treatment & disposal of waste water generated by vessel as per MARPOL & maintain records

15 Applicant shall install storm drainage catch basin to avoid directly discharge into surface water

16 Waste effluent accumulated with port activities including storm water & sewage from port operation including sewage ballast water bilge water & clean waste water from ships shall be as per MARPOL norms

17 Applicant shall make separate records regarding generation, collection, transportation & disposal of waste generation from ship & maintain its records

18. Applicant shall made necessary arrangement for the plastic Waste Solid Waste or other waste generation due to port activities & for facilitation of reception facilities under MARPOL & Environment (Protection) Act 1986 rules etc

19 Ports shall obtain approval of their oil spill contingency plan (OSCP) as required under national oil spill disaster contingency plan (NOS-DCP) of coast guard Ministry of defence govt of India

20 Best environmental practices by ports maybe uploaded on Indian ports Association as well as the same maybe linked to websites of CPCB and respective SPCBs

21 Manually handling of cargo should be converted into mechanized system in time bound manner

3 **Conditions under the Water act-1974:**

3.1 Source of Water: - GWIL

3.2 There shall be no industrial water consumption and waste water generation from manufacturing process and other ancillary operations

3.3 The quantity of the fresh water consumption for domestic purpose shall not exceed 1300 KLD

3.4 The quantity of domestic waste water shall not exceed 800 KLD

Page 2 of 7

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3.5 Domestic effluent shall be treated in existing STP & treated effluent conforming to following norms shall be discharged on land within premises strictly for gardening and plantation purpose & no sewage shall be disposed outside premises in any manner

PARAMETERS	PRESCRIBED LIMITS
pH	5.5 to 8.5
BOD (3 days at 27° C)	30 mg/L
Suspended Solid	100 mg/L
Fecal Coli form	< 1000 MPN/ 100 ml

3.6 Treated domestic effluent confirming to above norms shall be discharge on land only for gardening & plantation within premises.

3.7 Unit shall provide flow meter at inlet & outlet of STP & maintain its record.

3.8 Disposal system for storm water shall be provided separately. In no case storm water & sewage from port facility shall not be discharge into surface water

4. **Conditions under the Air Act 1981:**

4.1 The following shall be used as a fuel in D.G. Sets

Sr. No.	Utility	Fuel	Quantity
1	D.G. Sets	HSD	500 Liter

4.2 The applicant shall install & operate air pollution control system efficiency in order to achieve prescribed norms

4.3 The flue gas emission through stack attached to D.G. Sets shall conform to the following standards

Sr. No.	Stack attached to	Stack height in Meter	APCM	Parameter	Permissible Limit
1 & 2	DG sets (2 nos ; (1010 KVA)	15 each	--	PM	150 mg/NM³
				SO_2	100 ppm
				NO_x	50 ppm

4.4 There shall be no process gas emission from manufacturing process and other ancilary operations

4.5 The concentration of the following parameters in the ambient air within the premises of the industry and a distance of 10meters from the source(other than the stack/vent) shall not exceed the following levels.

Sr No.	Pollutant	Time Weighted Average	Concentration in Ambient air in µg/M³
1.	Sulphur Dioxide (SO_2)	Annual	50
		24 Hours	80
2.	Nitrogen Dioxide (NO_2)	Annual	40
		24 Hours	80
3	Particulate Matter (Size less than 10 µm) or PM_{10}	Annual	60
		24 Hours	100
4	Particulate Matter (Size less than 2.5 µm) or PM 2.5	Annual	40
		24 Hours	60

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4.6 The applicant shall provide portholes ladder, platform etc at chimney(s) for monitoring the air emissions and the same shall be open for inspection by/and for use of Board's staff. The chimney(s) vents attached to various sources of emission shall be designed by numbers such as S-1 S-2 etc and these shall be painted/displayed to facilitate identification

4.7 The industry shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standards in respect of noise to less than 75dB(A) during day time and 70 dB (A) during night time. Daytime is reckoned in between 6a.m. and 9 p.m. and nighttime is reckoned between 10 p.m. and 6 a.m.

5. AUTHORIZATION as per HAZARDOUS AND OTHER WASTE (MANAGEMENT AND TRANSBOUNDARY) RULES, 2016 Form-2 [See rule 6 (2)]

Form for grant of authorization for occupier or operator handling Hazardous waste

5.1 Authorization order no :**AWH-110594**Date of issue :06/12/2020.

5.2 **M/s Kandla Port Trust** is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated at Kandla A.O. Building Gandhidham, Ta : Gandhidham, Dist : Kutch

Sr No.	Waste	Quantity/ Year	Schedule &Category	Facility
1	Used Spent Oil	1125 MT	5.1	Collection Storage, Transportation and disposal by selling to authorized recycler
2	Waste Residue Containing Oil	3344.43 MT	5.2	Collection Storage, Transportation and disposal by selling to authorized recycler

5.3 The authorization shall be valid up to **21/07/2025.**

5.4 The authorization is subject to the conditions stated below and such other conditions as may be specified in the rules from time to time under the Environment (Protection) Act 1986

5.5 The authorization is granted to operate a facility for collection storage within factory premises transportation and ultimate disposal of Hazardous wastes as per condition no 5.2 to the industry having valid CCA of the Board

5.6 **TERMS AND CONDITIONS OF AUTHORISATION**

1 The applicant shall comply with the provisions of the Environment (Protection) Act 1986 and the rules made there under

2 The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the Gujarat Pollution Control Board

3 The persons authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous wastes without obtaining prior permission of the Gujarat Pollution Control Board

Page 4 of 7

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GUJARAT POLLUTION CONTROL BOARD

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4 Any unauthorized change in personnel, equipment or working conditions as mentioned in this authorization order by the persons authorized shall constitute a breach of this authorization

5 The person authorized shall implement Emergency Response Procedure (ERP) for which this authorization is being granted considering all site specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time

6 The person authorized shall comply with the provisions outlined in the Central Pollution Control Board guidelines on "Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Wastes and Penalty"

7 It is the duty of the authorized person to take prior permission of the Gujarat Pollution Control Board to close down the facility

8 An application for the renewal of an authorization shall be made as laid down in rules 6(2) under Hazardous and Other Waste Rules, 2016

9 The imported hazardous and other wastes shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation

10 The record of consumption and fate of the imported hazardous and other wastes shall be maintained

11 The hazardous and other wastes which gets generated during recycling or reuse or recovery or pre-processing or utilization of imported hazardous or other wastes shall be treated and disposed of as per specific conditions of authorization

12 The importer or exporter shall bear the cost of import or export and mitigation of damages if any.

13. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time

14 The waste generator shall be totally responsible for the collection, storage transportation and ultimate disposal of the wastes generated.

15 Records of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control Board in Form-4 by 30th day of June of every year for the preceding period April to March

16 In case of any accident, details of the same shall be submitted on Form-11 to Gujarat Pollution Control Board

17 As per "Public Liability Insurance Act-91" company shall get Insurance Policy, if applicable

18. Empty drums and containers of toxic and hazard material shall be treated as per guideline published for "Management & Handling of discarded containers" Records of the same shall be maintained and forwarded to Gujarat Pollution Contro Board regularly

19 In case of transport of hazardous wastes to a facility for the treatment, storage and disposal existing in a State other than the State where hazardous wastes are generated, the occupier shall obtain 'No Objection Certificate' from the State Pollution Control Board or Committee of the concerned State of Union Territory Administration where the facility exists

20 Unit shall take all concrete measures to show tangible results in waste generation, reduction, avoidance, reuse and recycle. Actions taken in this regard shall be submitted within three months and also along with Form-4

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7*. Industry shall have to display the relevant information with regards to hazardous waste as indicated in the Hon. Supreme Court's Order in W.P. No.657 of 1995 dated 14th October 2003

7.2 Industry shall have to display on-line data outside the main factory gate with regard to quantity and nature of hazardous chemicals being handled in the plant including wastewater and air emissions and solid hazardous wastes generated within the factory premises

6. **SPECIFIC CONDITIONS:-**

6.1 The authorized actual user of hazardous and other wastes shall maintain records of hazardous and other wastes purchases in a passbook issued by the State Pollution Control Board along with the authorization

6.2 Handing over of the hazardous and other wastes to the authorized actual user shall be only after making the entry in the passbook of the actual user.

6.3 In case of renewal of authorization, a self-certified compliance report in respect of effluent, emission standards and the conditions specified in the authorization for hazardous and other wastes shall be submitted to GPCB

6.4 The occupier of the factory shall comply Standard operating procedure/guidelines published by MOEF&CC or CPCB or GPCB from time to time

6.5 Unit shall comply provisions of E-Waste Management Rules-2016

6.6 The disposal of Hazardous Waste shall be carried out as per the Waste Management hierarchy.

6.7 The occupiers of facilities shall not store the hazardous and other wastes for a period not exceeding **ninety days**. Prior permission of the Board shall be obtained for extension of the storage period

6.8 The occupier shall maintain the records of generation, sale, storage, transport, recycling, co-processing and disposal of hazardous waste and make available during the inspection

6.9 The transportation of the hazardous waste shall be carried out in GPS mounted dedicated vehicles

7. **GENERAL CONDITIONS:-**

7.1 Any change in personnel, equipment or working conditions as mentioned in the consents application should immediately be intimated to this Board

7.2 Applicant shall also comply with the general conditions given in annexure I

7.3 Whenever due to accident or other unforeseen act or event such emissions occur or is apprehended to occur in excess of standards laid down such information shall be forthwith reported to Board, concerned Police Station, Office of Directorate of Health Service, Department of Explosives, Inspectorate of Factories and local body

7.4 In case of failure of pollution control equipments the production process connected to it shall be stopped. Remedial actions/measures shall be implemented immediately to bring entire situation normal

GPCB

GUJARAT POLLUTION CONTROL BOARD

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7.5 The Environmental Management Unit/Cell shall be setup to ensure implementation on and monitoring of environmental safeguards and other conditions stipulated by statutory authorities. The Environmental Management Cell/Unit shall directly report to the Chief Executive of the organization and shall work as a focal point for internalizing environmental issues. These cells/units also coordinate the exercise of environmental audit and preparation of environmental statements.

7.6 The Environmental audit shall be carried out yearly and the environmental statements pertaining to the previous year shall be submitting to this State Board latest by 30th September every year.

7.7 The Board reserves the right to review and/or revoke the consent and/or make variations in the conditions, which the Board deems, fit in accordance with Section 27 of the Act.

7.8 In case of change of ownership/management the name and address of the new owner/ partners/directors/proprietor should immediately be intimated to the Board.

7.9 Industry shall have to display the relevant information with regard to hazardous waste as indicated in the Hon. Supreme order in W.P. no. 657 of 1995 dated 14th October 2003.

For and on behalf of
GUJARAT POLLUTION CONTROL BOARD

(Smt. U.K. Upadhyay)
Environment Engineer

NO: GPCB/CCA-Kutch-812(5)/ID 28494/ **Date:-**
Issued to.
M/s. Deendayal Port Trust, (New name),
M/s. Kandla Port Trust, (Old name),
Kandla, A.O Building Gandhidham,
Tal: Gandhidham, Dist: Kutch - 370 201

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AMENDMENT COPY

GPCB

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN, SECTOR 10-A,
GANDHINAGAR - 382010,
(T) 079-23232152

CCA-Amendment
(WH-130995)

No. PC/CCA-KUTCH- 812(6)/ GPCB ID-28494/ **Date: /01/2024**

To,
M/s. Kandla Port Trust,
At Kandla, A.O Building Gandhidham,
Tal: Gandhidham,
Dist: Kutch – 370 201.

SUB: Amendment in the consolidated consent & Authorization of the Board.

REF: 1) CCA issued by this office vide order no- **AWH- 110594** dated 22/01/2021 valid up to 21/07/2025.
2) Your CCA Amendment Application Inward ID No **277270** dated **23/05/2023.**

In exercise of the power conferred under section-25 of the Water (Prevention and Control of Pollution) Act-1974, under section-21 of the Air (Prevention and Control of Pollution)-1981 and Authorization under rule 6(2) of the Hazardous And Other Waste (Management and Transboundary) Rules, 2016 & framed under the Environment (Protection) Act-1986, The Board has granted CCA vide order No. **AWH- 110594** issued vide order dated 22/01/2021 valid up to 21/07/2025.

The Board has right to review and amend the conditions of the said CCA and its amendment orders. Now, considering your application for CCA amendment inward ID No.**277270** dated 23/05/2023, **the said CCA order is amended as below:**

1. **The order shall be read as CCA amendment Order No.: WH- 130995 Date of Issue: 14/12/2023, valid up to 21/07/2025.**

SUBJECT TO THE FOLLOWING SPECIFIC CONDITIONS:

1. There shall be no change in existing production and its capacity, raw materials consumption, fuel consumption, flue gas emission & process gas emission, due to CCA Amendment.
2. Industry shall not carry out any activity which may attract the applicability of EIA notification-2006 & its amendment.
3. No ground water shall be withdrawal without prior permission from CGWA as per Hon'ble NGT order.
4. Unit shall obtain fresh water from valid source have permission of the competent authority.
5. Industry shall manage Solid Wastes generated from industrial activities as per Solid Waste Management Rules-2016 (solid waste as defined in Rule-3(46)).
6. Industry shall renew Public Liability Insurance Policy time to time & submit a copy of the same to this office.
7. Industry shall comply with circular of the Board dated 27/08/2021 regarding retrofitting of emission control equipment in D.G. Set of capacity 125 KVA and above as per system & procedure for emission compliance testing of Retrofit Emission Control Devices (RECD) for D.G. Set issued by CPCB dated 01/02/2022 at the earliest and submit compliance.

Page 1 of 3

Clean Gujarat Green Gujarat
Website : https://gpcb.gujarat.gov.in

2. **The condition no. 3 of the said CCA is amended as below:**

3. CONDITION UNDER THE WATER ACT:

3.1 Water Source: - GWIL.

3.2 There shall be no industrial water consumption & waste water generation from manufacturing process & other ancillary operation.

3.3 The quantity of domestic water consumption shall be decreased from 1300 KL/Day to 3000 KL/Day, due to CCA-Amendment.

3.4 The quantity of domestic waste water shall not exceed 800 KL/Day.

3.5 Sewage shall be treated separately to conform to the following standards as per Hon.ble NGT order in the matter of OA No.1069/2018 dated 30/04/2019

PARAMETERS	GPCB NORMS
pH	5.5-9.0
Biochemical Oxygen Demand (BOD)	10 mg/L
Total suspended solids (TSS)	20 mg/L
Chemical Oxygen Demand (COD)	50 mg/L
Nitrogen –Total	10 mg/L
Phosphorous-Total (for discharge into Ponds, Lakes)	1.0 mg/L
Fecal Coliform	Desirable-100 MPN/100ml Permissible -230 MPN/100 ml

3.6 Treated domestic effluent conforming to above standard shall be discharged on land for gardening and plantation purpose within premises.

3.7 Industry shall provide fixed pipeline network with flow meter for even distribution of treated domestic effluent and maintain its record.

3.8 Disposal system for storm water shall be provided separately. In no circumstances storm water shall be mixed with the industrial effluent.

3. **The condition no. 5.1 & 5.2 of the said CCA is amended as below:**

5.1 Authorization order no. **WH-130995** Date of issue: 14/12/2023.

5.2 **M/s. Kandla Port Trust** is hereby granted an authorization based on the enclosed signed inspection report for generation, collection, treatment, storage, transport of hazardous waste on the premises situated at Kandla, A.O Building Gandhidham, Tal: Gandhidham, Dist: Kutch;

Sr. No.	Waste	Quantity per Annum		Schedule &Category	Facility
		Existing	After CCA-Amendment		
1.	Used or Spent Oil	1125 MT	4250 MT	I-5.1	Collection, storage, transportation and disposal by selling out to registered recycler.

Page 2 of 3

GPCB

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN, SECTOR 10-A,
GANDHINAGAR - 382010,
(T) 079-23232152

2.	Residue Containing Oil	3444.43 MT	8500 MT	I-5.2	Collection, storage, transportation and disposal by selling out to registered recycler.

4. Rest of conditions of Consolidated Consent & Authorization (CC&A) order No: AWH-110594 issued vide this office letter no. GPCB/CCA-KUTCH-812(5)/ID: 28494/581914 dated 22/01/2021 shall remain unchanged and industry shall comply with the same judicially.

For and on behalf of
GUJARAT POLLUTION CONTROL BOARD

(T. C. Patel)
Unit Head

Page 3 of 3

Clean Gujarat Green Gujarat
Website : https://gpcb.gujarat.gov.in

CORRECTED CCA COPY

GPCB

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN
Sector-10-A, Gandhinagar-382 010
Phone : (079) 23226295
Fax : (079) 23232156
Website : www.gpcb.gov.in

By R.P.A.D.

NO: PC/ CCA- KUTCH-812(5)/ GPCB ID: 28494/ Date: -

Correction in Consolidated Consent & Authorization order no AWH-110594 date of issue 22/01/2021 (Under the provisions/rules of Environmental acts)

To,
M/s. Deendayal Port Trust, (New name)
M/s. Kandla Port Trust, (old name),
Kandla, A.O Building Gandhidham,
Tal: Gandhidham,
Dist: Kutch – 370 201.

Subject : Correction of Consolidated Consent and Authorization (CC& A) of this Board
Reference : 1) CCA issued vide order no. PC/ CCA- KUTCH-812(5)/ GPCB ID: 28494/ 581914 dated 22/01/2021.
2) Your letter dated 25/01/2021

In exercise of the power conferred under section-27 of the Water (Prevention and Control of Pollution) Act-1974, under section-21 of the Air (Prevention and Control of Pollution)-1981 and Authorization under rule 6(2) of the Hazardous & Other Waste (Management &Transboundary Movement) Rules-2016 & as amended framed under the Environmental (Protection) Act-1986 and without reducing your responsibility under the said Acts/Rules in anyway The Board had granted CCA vide order no AWH-110594 dated 22/01/2021

AND WHEREAS the Board is empowered to amend CCA conditions. Accordingly, considering your request for corrected & after care full consideration, the CCA order no AWH-110594 is hereby corrected/ amended as below:

1. The condition no. 2 of the said CCA order shall be corrected as below
   2 The consent shall be **valid upto 21/07/2025** for the use of outlet for the discharge of trade effluent and emission due to operation of industrial plant for manufacturing of the following items/ products.

Sr No.	Product	Quantity
1.	Dry Cargo Handling	26,54,00,000 MT/Month
2	Liquid Cargo Handling	54,64,00,000 MT/Month
3	Loading and unloading operation of 13th and 15th berth	2 MMTPA(Each)
4	Loading and unloading operation of 14th and 16th berth	4.5 MMTPA (Each)

2 All other terms and condition mentioned in AWH – 110594 issued vide CCA letter PC/ CCA- KUTCH-812(5)/ GPCB ID: 28494/581914 dated 22/01/2021 shall remain unchanged.

For and on behalf of
Gujarat Pollution Control Board

(Smt. U. K. Upadhyay)
Environment Engineer

Clean Gujarat Green Gujarat

ISO - 9001 - 2008 & ISO - 14001 - 2004 Certified Organisation Page 1 of 1

APPENDIX – 2

FORM-4

"FORM-IV"

[(See rule 6(%), 13(8), 16(6) and 20(21)
(To be submitted to State Pollution Control Board by 30th day of June of every year for the preceding period April 23 to March 24)

Sr. No.	Particulars	Details
1.	Name and Address of the Facility	**Deendayal Port Authority** Administrative Office Building Post Box No. 50 Gandhidham Dist.: Kutch- 370201 Gujarat State Tel. No.: 02836-233192 Fax No.: 02836-220050
2.	Authorization No. and Date of issue	Consent order no. AWH – 110594 granted by the GPCB dated 22/01/2021, correction in consent order issued by the GPCB dated 09/04/2021 and CCA amendment issued by the GPCB dated 11/01/2024.
3.	Name of Authorized Person and full address with telephone, Fax number and E-Mail	**Mr. Raveendra Reddy** **Chief Engineer** **Deendayal Port Authority** Administrative Office Building Post Box No. 50 Gandhidham Dist.: Kutch- 370201 Gujarat State Tel. No.: 02836-233192 Fax No.: 02836-220050
4.	Production during the year (product wise) wherever applicable	NA Deendayal Port Authority has only loading & unloading activities for dry cargo and liquid cargo. During FY 2023-24 Total Cargo Handled is **132.37 MMTPA**

PART A. To be filled by Hazardous Waste Generator

1.	Total quantity of waste generated category wise	Used oil/Waste residue containing oil 1. **Used Spent Oil:** 2431.39 MT 2. **Waste residue containing oil:** 7294.16 MT
2.	Quantity Dispatched a. To disposal Facility b. To recycler or co-processor or pre-processor c. Others	Used Oil/Waste residue containing oil has been disposed of through CPCB/GPCB authorized vendor **(Annexure-A)**
3.	Quantity utilized inhouse -if any	NA
4.	Quantity in storage at the end of the year	NA

PART B To be filled Treatment, Storage and Disposal Facility Operator

1.	Total Quantity Received 1. Direct Landfill 2. Incineration 3. Land fill after treatment	NA
2.	Quantity at stock at the beginning of the year 1. Direct Landfill 2. Incineration 3. Land fill after treatment	
3.	Quantity treated (Landfill) Land fill after Treatment	
4.	Quantity disposed in landfill as such and after treatment 1. Direct Landfill 2. Land fill after treatment 3. Incineration Ash 4. Salts from Spray Dryer 5. Total	
5.	Quantity incinerated (if applicable)	
6.	Quantity processed other than specified above	
7.	Quantity in storage at the end of the year 1. Incineration 2. Landfill after treatment	

PART C To be filled by recyclers or co-processor or other users

1.	Quantity of the waste received during the year 1. Domestic sources 2. Imported (if applicable)	NA
2.	Quantity in stock at the beginning of the year	
3.	Quantity recycled or co processed or used	
4.	Quantity of products dispatched (wherever applicable)	
5.	Quantity of waste generated	
6.	Quantity of waste disposed	
7.	Quantity re-exported (wherever Applicable)	
8.	Quantity in storage at the end of the year	

Date: 19/7/2024

Place: Gandhidham

Dy. Chief Engineer & EMC (I/C)
Deendayal Port Authority

APPENDIX – 3

Form - 5

"FORM-V"
(See rule -14)

From:
Deendayal Port Authority,
Administrative Office Building,
Post Box No.: 50, Gandhidham,
Dist.: Kutch – 370 207. Gujarat State.
Tel No.: O: 02836-220038
Fax No.: 02836-220050

To,
The Member Secretary,
Gujarat Pollution Control Board,
Paryavaran Bhavan, Sector - 10A,
Gandhinagar – 382043

Environmental statement for the financial year ending the 31st March, 2024

"PART-A"

1) Name and Address of the owner/occupier of the industry or process		
➢ NAME	:	Shree V Raveendra Reddy Chief Engineer
➢ ADDRESS	:	**Deendayal Port Authority** Administrative Office Building, Post Box No.: 50, Gandhidham, Dist.: Kutch – 370 207. Gujarat State. Tel No.: O: 02836-220038 Fax No.: 02836-220050
➢ Industry Category Primary – (STC code) Secondary – (STC code)	:	Major port Authority under the administrative control of Ministry of Ministry of Ports, Shipping and waterways, GOI
➢ Year of Establishment	:	8th April 1955
➢ Date of the last Environment audit report submitted	:	27th June, 2016

"PART-B"

WATER AND RAW MATERIAL CONSUMPTION

Sr.No.	WATER CONSUMPTION	KLD
1.	Process	1573
2.	Cooling	
3.	Domestic Purpose	
Total water consumption for the period from April 2023 to March 2024 was **574086 KL** hence, average water consumption for per day – **1573 KLD**		

I. Water Consumption

Sr. No.	Name of Products	Process Water Consumption per unit of products output	
		During the current financial year 2022-23	During the current financial year 2023-24
01.	Dry Cargo Handling	**137.5 MT**	**132.37 MT**
02.	Liquid Cargo Handling		
Deendayal Port Authority has only loading & unloading activities for dry cargo and liquid cargo. Hence consumption of process water consumption per unit of output with respective to production is not applicable. During FY 2023-24 Total Cargo Handled is **132.37** MMTPA However, Details of the Domestic water consumption for the financial year 2023-24 please refer **Annexure-A**			

II. Raw material Consumption

Sr.No.	Name of Raw Material	Name of Products	Consumption of Raw material per unit of output	
			During the current financial year 2022-23	During the current financial year 2023-24
1.	Deendayal Port Authority has only loading & unloading activities for dry cargo and liquid cargo. Hence consumption of raw material per unit of output with respective to production is not applicable			

"PART-C"

POLLUTION DISCHARGED TO ENVIRONMENT/UNIT OF OUTPUT (PARAMETERS AS SPECIFIED IN THE CONSENT)

Pollutant	Quantity of Pollutant Discharged (mass/day)	Concentration of Pollution in Discharge (mass/volume)	% of Variation from prescribed standard with reasons
Please Refer **Annexure -B** for Environmental Monitoring Reports of • Ambient Air Quality Monitoring • Drinking Water Quality Monitoring • Marine Water Monitoring • Noise Level Monitoring			

"PART-D"
HAZARDOUS WASTE
[AS SPECIFIED UNDER HAZARDOUS WASTE (MANAGEMNET AND HANDLING) RULES -1989 & AMENDMENT RULES -2008]

Sr.No.	Hazardous Waste	Total Quantity in MT/Year	
		During the current financial year 2022-23	During the current financial year 2023-24
1.	5.1- Used Spent Oil	4578.79	2431.39
2.	5.2- Waste Residue Containing Oil	9157.58	7294.17
• Details of Hazardous Waste generated during the financial year 2022-23 please refer **Annexure-C**			
a. From Process: NA b. From Pollution Control facility: NA			

"PART-E"
SOLID WASTE

Sr.No.	Solid Waste	Total Quantity in MT/year	
		During the current financial year 2022-23	During the current financial year 2023-24
1.	From Process	Nil	Nil
2.	From pollution Control Facility	Nil	Nil
a.	Quantity Recycled or Reutilized within the unit	Nil	Nil
b.	Sold	Nil	Nil
c.	Disposed Off	**2473.19 MT**	**2572.94**
Details of Solid Waste (Non-Hazardous Waste) generated during the financial year 2023-24 please refer **Annexure-C**			

"PART-F"

PLEASE SPECIFY THE CHARACTERISTICS (IN TERMS OF CONCENTRATION AND QUANTUM) OF HAZARDOUS AS WELL AS SOLID WASTES AND INDICATE DISPOSAL PRACTICE ADOPTED FOR BOTH THESE CATEGORIES OF WASTES.

Hazardous Waste:

Companies authorized by Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) have been awarded the work of collection, transporting and disposal of hazardous Waste by the Deendayal Port Authority. The same will be hand over to authorize parties for further Treatment & disposal.

Solid Waste:

Garbage facility is provided as per MARPOL Act 73/78 to the vessel berthed at Deendayal Port Authority. Companies authorized by Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) have been awarded the work of collection, transporting and disposal of solid waste by the Deendayal Port Authority. The same will be hand over to authorize parties for further treatment and disposal.

"PART-G"

IMPACT OF THE POLLUTION ABATEMENT MEASURES TAKEN ON CONSERVATION OF NATURAL RESOURCES AND ON THE COST OF PRODUCTION.

DPA has awarded the work of "Preparing and Monitoring of Environmental monitoring and management plan for Deendayal Port Authority Kandla and Vadinar to Gujarat Environment Management Institute (GEMI), Gandhinagar (An autonomous Institute of Government of Gujarat).

Further for Pollution Abatement measures taken for Conservation of Natural Resources DPA appointed renowned agency i.e M/s. GUIDE, Bhuj for the following work.

1. Regular Monitoring of Mangrove Plantation.

2. Preparation of detailed marine Biodiversity management plan for the impact of the project activities as per the requirement of EC & CRZ Clearance accorded by the MoEF&CC, GOI for the project "Creation of water front facilities (Oil jetties 8,9,10,11) and development of land of area 554 acres for associated facilities for storage at old Kandla, Gandhidham, kutch, Gujarat by M/s Deendayal Port Authority"

3. Regular monitoring of marine ecology in and around the Deendayal Port Authority area and continuous monitoring programme covering all season on various aspects of the coastal environ covering physico-chemical parameters of marine sediments samples coupled with biological indices, as per the requirement of EC & CRZ clearance accorded by the MoEF&CC,GOI to the various projects of the Deendayal port Authority.

4. Study on dredged material for presence of contaminant as per EC and CRZ clearance accorded by the MoEF&CC, GOI dated 19/12/2016 – specific condition vii

"PART-H"

ADDITIONAL MEASURES / INVESTMENT PROPOSAL FOR ENVIRONMENTAL PROTECTION INCLUDING ABATEMENT OF POLLUTION, PREVENTION OF POLLUTION

The allocation made under the scheme of "Environmental Services & Clearance there of other related Expenditure" during BE 2024-2025 is Rs. 657 Lakhs

"PART-I"

ANY OTHER PARTICULAR FOR IMPROVING THE QUALITY OF THE ENVIRONMENT

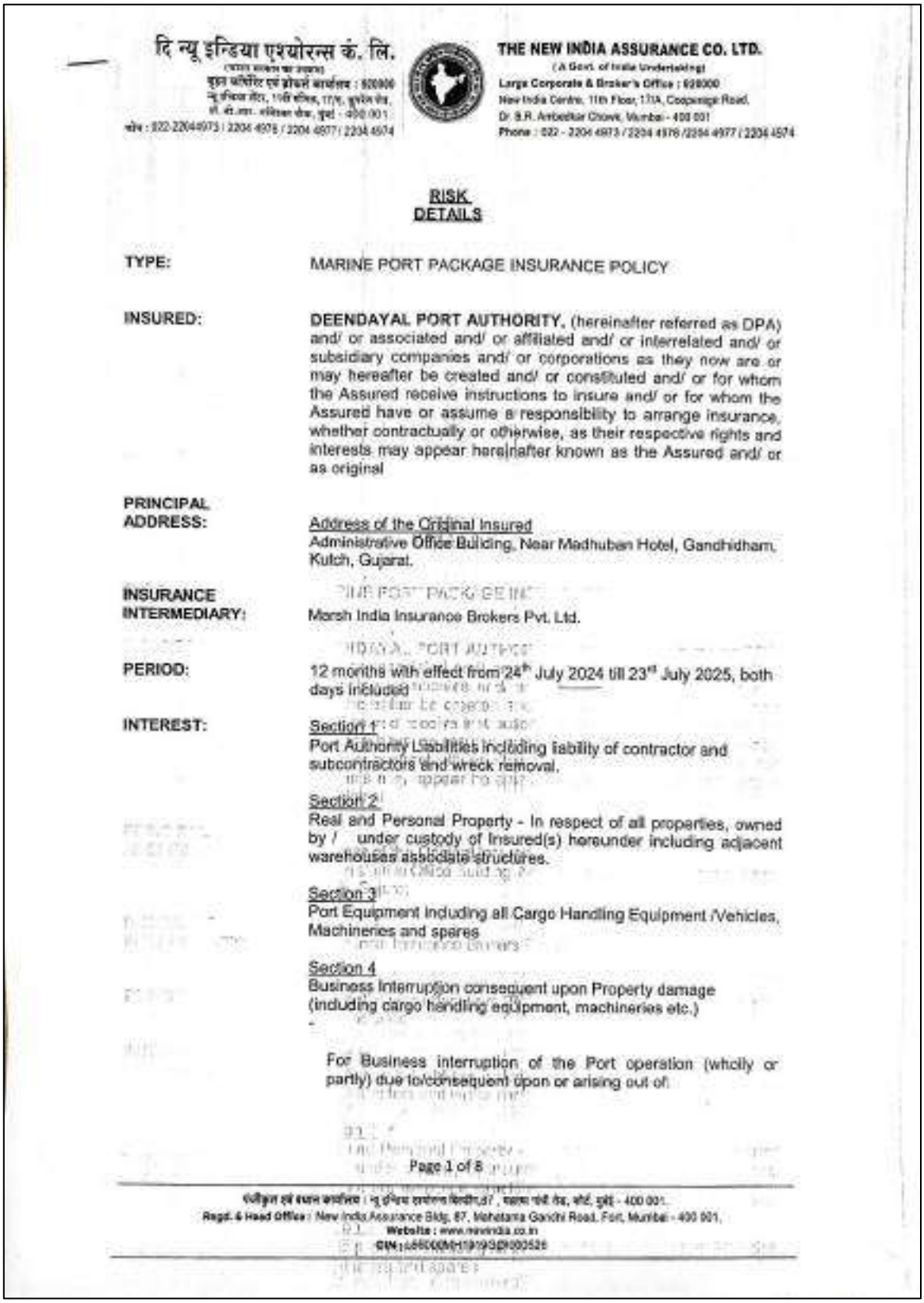
1. DPA is ISO 14001:2015 certified port for "Providing port facility and related maritime services for vessel and Cargo handling including storage
2. DPA has appointed M/s GEMI, Gandhinagar for the work "Making Deendayal Port a Green Port– Intended Sustainable Development under the Green Port Initiatives". M/s GEMI, Gandhinagar had submitted the Final Report on 10/03/2021
3. DPA has accorded the work of Afforestation project in Deendayal Port Area to Forest Department, GoG which includes plantation and maintenance work of 1100 plants per ha.
4. DPA has accorded the work of green belt development in Deendayal port Authority and its Surrounding areas charcoal site to GUIDE for the plantation of 5000 saplings of suitable species.
5. DPA has planted 7500 trees in Deendayal port trust area during the year 2014-15 6000 trees during financial year 2016-17 and the same has been regularly maintained.
6. DPA has planted 4000 trees at A.O building, Gopalpuri residential colony and along the road side at Kandla. Further, approximately 885 no. of trees have been planted since September 2015 onwards.
7. Continuous water sprinkling has been carried out on the top of the heap of coal, at regular intervals to prevent dusting, fire and smoke. DPA already installed sprinkling system inside Cargo Jetty area for coal dust suppression in coal yard (40 Ha. Area) at the cost of Rs. 14.44 crores.
8. DPA has installed Mist Canon at the Port area to minimize the coal dust.
9. Deendayal port Authority (traffic department) issued a Circular (SOP) to the trade with regard to control of dust pollution arising out of coal handling and ensuring safety in coal handling. In case of any violations of SOP, provision of impose of penalty of Rs. 10000/- has been made and if violation is repeated thrice, the same will lead to ban of concerned party into port area. The DPA is taking all the measures to reduce coal dust by implementing the coal handling guidelines through port users.
10. All trucks before leaving the storage yard have been covered with tarpaulin and also trucks are also not over loaded as well as there is no spillage during transportation and there is adequate space for movement of vehicles at the surrounding area.
11. DPA has constantly improving the house keeping in the dry cargo storage yard and nearby approved areas leading to roads. Adequate steps under the

provisions of air prevention and control of pollution Act 1981, Environmental Protection Act 1986 are taken.

12. DPA commissioned STP of capacity 1.5 MLD for treatment of domestic waste water for entire DPA area. (Details of domestic waste water generation is attached herewith as **Annexure D**)
13. Deendayal Port Authority had carried out mangrove plantation in an area of 1600 ha. through various government agencies like Gujarat Ecology Commission, State Forest Department.
14. It is also relevant to mention here that, DPA entrusted work to Forest Department, GoG (Social Forestry Division, Bhuj) during August, 2019 for green belt development in and around port area 31.942 hectares (approx. 35200 plants at various locations) at a cost of Rs. 352.32 lakhs.
15. DPA is involved in various CER activities like providing the proper sanitation and development of better roads for connectivity
16. DPA is managing its plastic waste as per Plastic Waste Management Rules – 2016 and amendments made therein. In order to strictly implement the said rules, DPT had issued a circular regarding plastic waste minimization, source segregation, recycling etc. vide its Circular no. EG/WK/4751/Part 243(A) dated 03/09/2021
17. DPA has entrusted the work to GEMI, Gandhinagar for "Preparation of Plan for Management of Plastic Waste, Solid Waste, C&D Waste, E-waste, Hazardous Waste including Bio-medical Waste and Non-hazardous waste in the Deendayal Port Authority Area
18. DPA has assigned the work to TERI, New Delhi for "Transition of Business Operations to Water Neutrality – Water Neutrality of Deendayal Port, Kandla (Phase I- Study and assessment)
19. Recently, DPA has entrusted the work to GEMI, Gandhinagar for "Study of CO_2 Emission Estimation and Reduction Strategy under Maritime India Vision 2030.
20. Initiative for Installation of Continuous Ambient Air Quality Monitoring System (CAAQMS) for monitoring of Air quality is under process.

APPENDIX – 4

PLI COPY



दि न्यू इन्डिया एश्योरन्स कं. लि.
कॉर्पोरेट एवं ब्रोकर्स कार्यालय : 620000
न्यू इण्डिया सेंटर, 11वी मंजिल, 17/ए, कूपरेज रोड,
डॉ. बी.आर. आंबेडकर चौक, मुंबई - 400 001.
फोन : 022-22044973 / 2204 4976 / 2204 4977 / 2204 4574

THE NEW INDIA ASSURANCE CO. LTD.
(A Govt. of India Undertaking)
Large Corporate & Broker's Office : 620000
New India Centre, 11th Floor, 17/A, Cooperage Road,
Dr. B.R. Ambedkar Chowk, Mumbai - 400 001
Phone : 022 - 2204 4973 / 2204 4976 /2204 4977 / 2204 4574

RISK DETAILS

TYPE: MARINE PORT PACKAGE INSURANCE POLICY

INSURED: **DEENDAYAL PORT AUTHORITY**, (hereinafter referred as DPA) and/ or associated and/ or affiliated and/ or interrelated and/ or subsidiary companies and/ or corporations as they now are or may hereafter be created and/ or constituted and/ or for whom the Assured receive instructions to insure and/ or for whom the Assured have or assume a responsibility to arrange insurance, whether contractually or otherwise, as their respective rights and interests may appear hereinafter known as the Assured and/ or as original

PRINCIPAL ADDRESS: Address of the Original Insured
Administrative Office Building, Near Madhuban Hotel, Gandhidham, Kutch, Gujarat.

INSURANCE INTERMEDIARY: Marsh India Insurance Brokers Pvt. Ltd.

PERIOD: 12 months with effect from 24th July 2024 till 23rd July 2025, both days included

INTEREST:

Section 1
Port Authority Liabilities including liability of contractor and subcontractors and wreck removal.

Section 2
Real and Personal Property - In respect of all properties, owned by / under custody of Insured(s) hereunder including adjacent warehouses associate structures.

Section 3
Port Equipment including all Cargo Handling Equipment /Vehicles, Machineries and spares

Section 4
Business Interruption consequent upon Property damage (including cargo handling equipment, machineries etc.)

For Business interruption of the Port operation (wholly or partly) due to/consequent upon or arising out of:

Page 1 of 8

पंजीकृत एवं प्रधान कार्यालय : न्यू इण्डिया एश्योरन्स बिल्डिंग, 87, महात्मा गांधी रोड, फोर्ट, मुंबई - 400 001.
Regd. & Head Office : New India Assurance Bldg, 87, Mahatma Gandhi Road, Fort, Mumbai - 400 001.
Website : www.newindia.co.in
CIN:L66000MH1919GI000526

दि न्यू इन्डिया एश्योरन्स कं. लि.
THE NEW INDIA ASSURANCE CO. LTD.
[A Govt. of India Undertaking]
Large Corporate & Broker's Office : 520000
New India Centre, 11th Floor, 17/A, Cooperage Road,
Dr. B.R. Ambedkar Chowk, Mumbai - 400 001.
Phone : 022 - 2204 4973 / 2204 4976 /2204 4977 / 2204 4974

(a) Interruption of electric supply to insured properties Or insured handling equipment, which is beyond the control of the assured.

(b) Blockage of Channel/ Waterways due to any cause

(c)Blockage of any land access within the immediate Vicinity* of the Port/ Terminals.
*(Immediate vicinity will mean at least 8 km radii from main entrance of Port's operational area applicable for both Kandla as well as for Vadinar)

LIMIT OF LIABILITY

Section 1
Overall Limit of Liability: INR 40,00,00,000 any one accident or occurrence and in the aggregate
Sublimit for liability arising out of wreck removal: INR 5,00,00,000

Sections 2, 3 & 4

Loss Limit: INR 760,00,00,000 any one accident or occurrence and in the aggregate

TOTAL SUM INSURED FOR PROPERTIES (excludes owned vessels): **INR 66,018,944,786.**

Sections 4

Indemnity Period: 2 Months
Annual Revenue – INR 27,107,385,666
Annual Gross Profit – INR 25,759,485,666
Loss limit – INR 100,00,00,000

Combined Single Limit for PD /BI / Liability across all sections is INR 800,00,00,000

LOCATION:

Insured Location addresses as under:

1. Administrative Office Building, Near Madhuban Hotel, Gandhidham, Kutch, Gujarat -370201
2. Custom Bounded Area Port of Kandla – 370210.
3. Port Colony, KDLB colony, FCI colony, Residential quarters-400 quarters, Gopalpuri, Gandhidham -370201
4. Office Buildings and Residential Quarters outside port area, Kandla – 370210
5. Dispensary at Adipur-370205
6. Baba Saheb Ambedkar Convention Centre Gandhidham

Regd. & Head Office : New India Assurance Bldg. 87, Mahatma Gandhi Road, Fort, Mumbai - 400 001.
Website : www.newindia.co.in
CIN : L66000MH1919GOI000526

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THE NEW INDIA ASSURANCE CO. LTD.
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Dr. B.R. Ambedkar Chowk, Mumbai - 400 001
Phone : 022 - 2204 4973 / 2204 4976 /2204 4977 / 2204 4974

7. Jetty Area, Vadinar-361010 – Latitude : 220 44' N ; Longitude : 690 67' E
8. Port Colony, Vadinar-361010 – Latitude : 230 01' N ; Longitude : 700 13' E

POLICY CONDITIONS:

Section 1
Ports and Terminals Consortium Section 1 – Liability Wording Amended.
Clause 2.3 (Insuring Clause) amended.

Ports and Terminals Consortium Fire Extension (Liability).
Ports and Terminals Consortium Advice and Information Extension
(Liability).

Ports and Terminals Consortium Fines and Duty Extension (Liability).
Ports and Terminals Consortium Infringement of Personal Rights Extension (Liability).
Ports and Terminals Consortium Wrongful Delivery of Cargo Extension (Liability).

Subject to Joint Liability Committee War and Terrorism Exclusion Clause JL2002/02 17/01/02 plus Joint Liability Committee

Deductible:
For Liability (including environmental pollution): Flat: INR 5,00,000

Section 2
Ports and Terminals Consortium Section 2 – Property Damage Wording Amended.
Clause 2.1 (Insuring Clause) amended to include electrical and machinery breakdown.
Exclusion 4.8 (Safe working load) amended.
Exclusion 5.2 (Road) deleted.
Exclusion 5.4 (Stock) does not apply to stock of spare parts.
Exclusion 4.9 (Communication Equipment) deleted.
Clause 5.1 amended to include land development cost
Clause 8.1 (Automatic Acquisition) amended to 90 days. Clause 8.2 (Automatic Acquisition) amended to 10%.

Ports and Terminals Consortium Earthquake Extension Clause (Property) Amended. 1/04 LSW1517.
Clause A amended to include Tsunami. Clause B amended to include Tsunami.
48 hours amended to 72 hours.

Regd. & Head Office : New India Assurance Bldg, 87, Mahatama Gandhi Road, Fort, Mumbai - 400 001.
Website : www.newindia.co.in
CIN : U93000MH1919GOI000526

दि न्यू इन्डिया एश्योरन्स कं. लि.
THE NEW INDIA ASSURANCE CO. LTD.
(A Govt. of India Undertaking)
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फोन : 022-22044973 / 2204 4976 / 2204 4977 / 2204 4974

Clause CL.370 10/11/03, and Marine Cyber Exclusion LMA5402 and Marine Cyber Endorsement LMA5403.

Subject to Sanction Limitation and Exclusion Clause LMA3100 15th September 2010.

Subject to Unintentional Errors and Omission Clause.

Notwithstanding anything contained elsewhere, insurance shall be governed by and construed in accordance with the laws of India and the exclusive jurisdiction of India.

Payment on account clause - Payment on account of any loss recoverable under this insurance will be promptly made by the insurers to the insured if so desired, provided that such payment are deducted from the finally agreed claim settlement figures.

Paneled surveyor clause: In the event of a claim, the surveyors shall be appointed only from the panel of agreed surveyors as mentioned below:

a) Proclaim Insurance Surveyors and Loss Assessors Private Limited

b) McLarens Insurance Surveyors And Loss Assessors India Pvt. Ltd

c) Alex Stewart International (India) Private Limited

In case above surveyors are not available, the appointment of alternate surveyor by insurance company will be done in agreement and after consent of the assured.

EXPRESS WARRANTIES:	None
CONDITIONS PRECEDENT:	None
SUBJECTIVITIES:	None
PREMIUM:	Total Premium inclusive of sections 1,2,3 &4: **INR 14,30,39,825 plus 18% GST of INR 2,57,47,168.50** **Total premium of INR 16,87,86,993.50**

Paid in full prior to inception

Regd. & Head Office : New India Assurance Bldg. 87, Mahatma Gandhi Road, Fort, Mumbai - 400 001.
Website : www.newindia.co.in
CIN : L66000MH1919GOI000526

दि न्यू इन्डिया एश्योरन्स कं. लि.
(भारत सरकार का उपक्रम)
बृहत कॉर्पोरेट एवं ब्रोकर्स कार्यालय : 920000
न्यू इण्डिया सेंटर, 11वीं मंजिल, 17/20, कुपरेज रोड,
डॉ. बी. आर. अंबेडकर चौक, मुंबई - 400 001.
फोन : 022-22044973 / 2204 4976 / 2204 4977 / 2204 4974

THE NEW INDIA ASSURANCE CO. LTD.
(A Govt. of India Undertaking)
Large Corporate & Broker's Office : 920000
New India Centre, 11th Floor, 17/20, Cooperage Road,
Dr. B.R. Ambedkar Chowk, Mumbai - 400 001
Phone : 022 - 2204 4973 / 2204 4976 /2204 4977 / 2204 4974

Terrorism Cover

Insured:	**DEENDAYAL PORT AUTHORITY,** (hereinafter referred as MPT) and/ or associated and/ or affiliated and/ or interrelated and/ or subsidiary companies and/ orcorporations as they now are or may hereafter be created and/ or constituted and/ or for whom the Assured receive instructions to insure and/ or for whom the Assured have or assume a responsibility to arrange insurance, whether contractually or otherwise, as their respective rights and interests may appear hereinafter known as the Assured and/ or as original
Insurance Intermediary:	Marsh India Insurance Brokers Pvt. Ltd.
Risk Location:	Insured Location addresses as under: 1. Administrative Office Buildng, Near Madhuban Hotel, Gandhidham, Kutch, Gujarat -370201 2. Custom Bounded Area Port of Kandla – 370210. 3. Port Colony, Gopalpuri, Gandhidham -370201. 4. Office Buildings and Residential Quarters outside port area, Kandla – 370210 5. Dispensary at Adipur-370205 6. Baba Saheb Ambedkar Convention Centre Gandhidham 7. Jetty Area, Vadinar-361010 – Latitude : 220 44' N ; Longitude : 690 67' E 8. Port Colony, Vadinar-361010 – Latitude : 230 01' N ; Longitude : 700 13' E
Occupancy:	**Marine Port**
Cover:	Terrorism and Sabotage with third party liability limit
Period:	24th July 2024 to 23rd July 2025
Total Insured Values:	Property Damage and handling equipment- INR 66,018,944,766. Sections 4 Indemnity Period: 2 Months Annual Revenue – INR 27,107,385,666 Annual Gross Profit – INR 25,759,485,666 Loss limit – INR 100,00,00,000

Page 7 of 8

पंजीकृत एवं प्रधान कार्यालय : न्यू इण्डिया एश्योरन्स बिल्डींग 87, महात्मा गांधी रोड, फोर्ट, मुंबई - 400 001.
Regd. & Head Office : New India Assurance Bldg. 87, Mahatma Gandhi Road, Fort, Mumbai - 400 001.
Website : www.newindia.co.in
CIN : L66000MH1919GOI000520

दि न्यू इन्डिया एश्योरन्स कं. लि.

THE NEW INDIA ASSURANCE CO. LTD.
(A Govt. of India Undertaking)
Large Corporate & Broker's Office : 920000
New India Centre, 11th Floor, 17/A, Cooperage Road,
Dr. B.R. Ambedkar Chowk, Mumbai - 400 001
Phone : 022 - 2204 4973 / 2204 4976 /2204 4977 / 2204 4974

फोन : 022-22044973 / 2204 4976 / 2204 4977 / 2204 4974

Limit: Combined Single Limit for Property Damage, handling equipment and Business Interruption – INR 760,00,00,000

Third party liability limit of INR 40,00,00,000

Combined Single Limit for Property Damage, handling equipment and Business Interruption and liability – INR 800,00,00,000

Deductibles: Material damage – 2% claim amount subject to minimum of INR 300,000

Business Interruption – 7 days

Third Party Liability – INR 500,000 any one accident / occurrence

Total Premium: **INR 21,92,181 plus 18% GST of INR 3,94,592.58 totaling to**

INR 25,86,773.58

For The New India Assurance Co. Ltd.

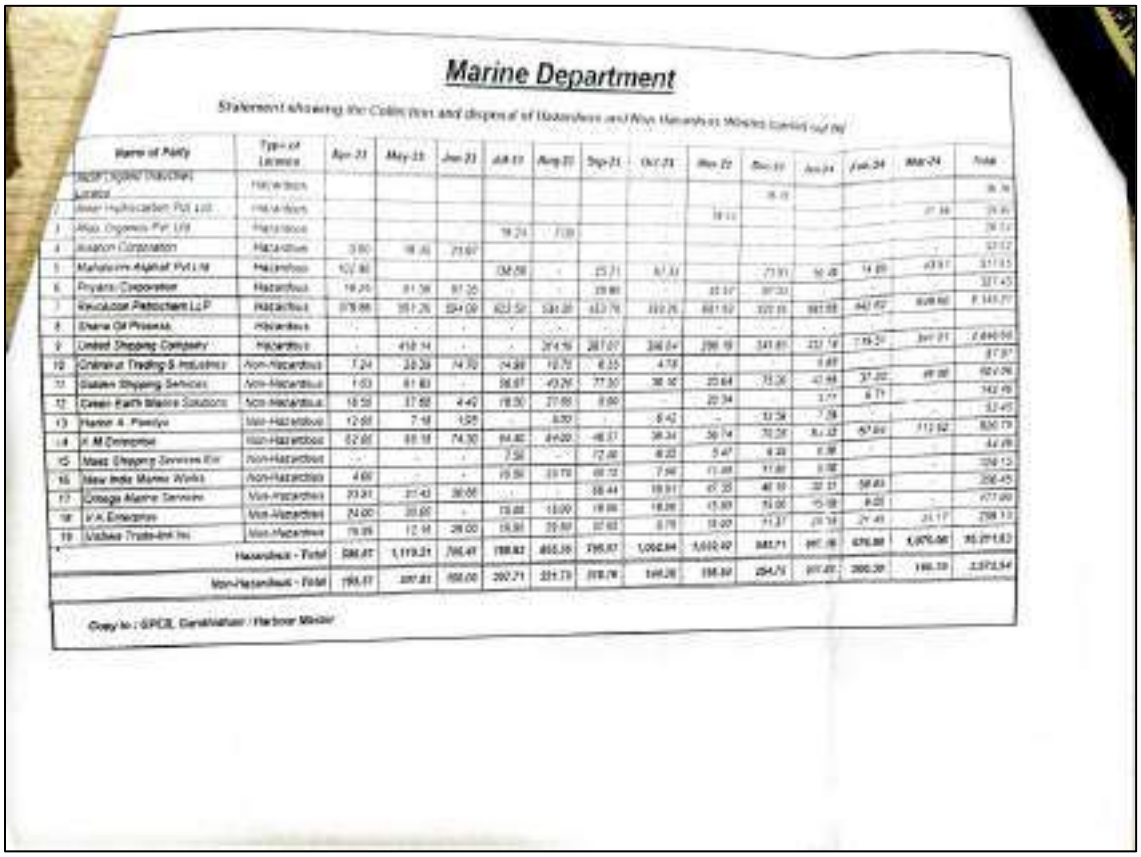
Authorized Signatory

Page 8 of 8

Regd. & Head Office : New India Assurance Bldg. 87, Mahatma Gandhi Road, Fort, Mumbai - 400 001.
Website : www.newindia.co.in
CIN : L66000MH1919GOI000526

APPENDIX – 5

RECYCLER DETAILS



Marine Department

Statement showing the Collection and disposal of Hazardous and Non Hazardous Wastes carried out by

Sr. No.	Name of Party	Type of Licence	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Total
1	[illegible] Limited	Hazardous													
2	Amar Hydrocarbon Pvt Ltd	Hazardous													
3	Alfa Organic Pvt Ltd	Hazardous													
4	Avalon Corporation	Hazardous													
5	Mahalaxmi Asphalt Pvt Ltd	Hazardous													
6	Priyanka Corporation	Hazardous													
7	Revalcon Petrochem LLP	Hazardous													
8	Shama Oil Products	Hazardous													
9	United Shipping Company	Hazardous													
10	Gokarnur Trading & Industries	Non-Hazardous													
11	Sabarn Shipping Services	Non-Hazardous													
12	Green Earth Waste Solutions	Non-Hazardous													
13	Harish A. Pandya	Non-Hazardous													
14	K M Enterprise	Non-Hazardous													
15	Maaz Shipping Services Pvt	Non-Hazardous													
16	New India Marine Works	Non-Hazardous													
17	Omega Marine Services	Non-Hazardous													
18	P.K. Enterprise	Non-Hazardous													
19	Vishwa Trade-link Inc	Non-Hazardous													
	Hazardous - Total														
	Non-Hazardous - Total														

Copy to : GPCB, Gandhidham / Harbour Master

PERFORMA: 2 ADEQUACY CERTIFICATE OF ENVIRONMENTAL MANAGEMENT SYSTEM

The Environmental Audit Scheme was introduced by the Gujarat High Court Vide its orders dated 20/12/96 & 13/3/97 and modified vide order dated 16/9/99. We, Gujarat Institute of Desert Ecology, Bhuj, are recognized by the G.P.C.B. Gandhinagar as Schedule – I Environmental Auditor for compliance of the directions of Hon. High Court in this matter and have carried out environmental audit of;

- **M/s Deendayal Port Authority**
- **Located at:** A.O. Building Gandhidham, Tal: Gandhidham, Dist: Kutch - 370201
- **Manufacturing Products:**

Sr. No.	**Product / Services**	**Quantity**
1	Dry Cargo Handling	26,54,00,000 MT/Month
2	Liquid Cargo Handling	54,64,00,000 MT/Month
3	Loading and Unloading operation of 13th and 15th berth	2 MMTPA (each)
4	Loading and Unloading operation of 14th and 16th berth	4.5 MMTPA (each)

Having Completed the environmental audit based on personal monitoring and audit report, prepared as per the direction of the Hon'ble High Court in Environmental Audit scheme, it is certified that the environmental management system provided by this industry for the products manufactured and capacity as stated above is **adequate** and **efficacious** to achieve the quality of effluents (air + waste water + solid waste) as specified in consent / notifications by GPCB, Gandhinagar for the following quantity of waste generation:

Sr. No.	**Waste**	**Quantity/Year**	**Schedule & Category**	**Facility**
1	Used Spent Oil	4250 MT	I – 5.1	Collection, Storage, Transportation and disposal by selling to authorized recyclers.

2	Waste residue containing oil	8500 MT	1 – 5.2	Collection, Storage, Transportation and disposal by selling to authorized recyclers.

This certificate is valid for the audit period of Aug 2023 to July 2024 only. However, it is subject to automatic cancellation in case of any change in product profile/ capacity, quality and quantity of effluent emission (air + waste water + solid/hazardous) and efficiency of EMS equipment.

This certificate forms part of the environmental audit report.

Date:

Place: Bhuj

Mr. Ratansi Chaudhary

Coordinator of Environmental Audit

PERFORMA: 3 CERTIFICATE FOR SAMPLING AND ANALYSIS

This is to certify that the following samples of emissions (air, water, waste water, solid and hazardous wastes) have been collected and analyzed as per the following details:

Monitoring	Sample Details	Sampling Location	Collected By	Date of Sample Collection
Monitoring – 01, 02	Water & Waste Water Stack Emissions Ambient Air Monitoring	Details as mentioned in relevant monitoring Report	Env. Audit Team Members GUIDE	16.04.2024, 01.07.2024.

1	Parameters analyzed on site	Noise level, pH and Temperature of water sample
2	Parameters analyzed off site	Ambient air,
3	Whether samples were preserved as per standard procedure for offsite analysis	**YES** / ~~NO~~
4	Parameters analysed by auditors team	PM, SO_2, NO_x, PM2.5, PM10 and water parameters as per CCA
5	Parameters analyzed by third party	None
	- Name & Address of the laboratory	-
	- Whether the laboratory is classified under	-
6	Method followed for analysis	As per Indian Standards IS 5182 and GPCB guidelines volume 1 for ambient air IS 11255 for stack IS 3025 for water samples
	- Air emission :	
	- Water / Waste Water	
	- Solid Waste	
	- Hazardous Waste	

Date:	
Place: Bhuj	**Name and address of the Environmental Auditor** Dr. K. Karthikeyan Assistant Director Gujarat Institute of Desert Ecology Bhuj – Kachchh 370001

ANNEXURE 2
Monitoring data sheet

Monitoring the Implementation of Environmental Safeguards
Ministry of Environment, Forest & Climate Change
Regional Office, Gandhinagar
(for the period up to September, 2024)

DATA SHEET

1.	Project type: –River-valley/ Mining / Industry / Thermal / Nuclear / Other (specify)		:	Infra I
2.	Name of the project		:	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernisation of Existing Pipeline Network at Oil Jetty Area, Deendayal Port Trust, Kandla
3.	Clearance letter (s) / OM No. and Date		:	Environment and CRZ clearance by MoEF&CC vide file no. 10-26/2018-IA.III dated 01/01/2024
4.	Location		:	
	a.	District (s)	:	Kutch
	b.	State (s)	:	Gujarat
	c.	Latitude/ Longitude	:	Latitude: 23°01'31.8"N to 23°02'32.2"N Longitude: 70°13'02.7"E to 70°13'23.4"E
5.	Address for correspondence			
	a.	Address of Concerned Project Chief Engineer (with pin code & Telephone/telex/fax numbers	:	Chief Engineer, Deendayal Port Authority, P.O. Box no. 50. A.O. Building, Annex Bldg. Gandhidham- 370 201. Phone: 02836 233192 Fax.: 02836 220050
	b.	Address of Project: Engineer/Manager (with pin code/ Fax numbers)	:	Dy.Chief Engineer (PL) Deendayal Port Authority, P.O. Box no. 50. A.O. Building, Annex Bldg. Gandhidham- 370 201.
6.	Salient features			
	a.	of the project		

Current Proposal	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernisation of Existing Pipeline Network at Oil Jetty Area
Location of Project	Oil Jetty Area of Deendayal Port, Kandla located on the western bank of Kandla Creek in the northeastern part of Gulf of Kutch, under village Kandla in Gandhidham Taluk of Kachchh District of Gujarat
Latitude	Deendayal Port: 22o58'15.5"N to 23o12'30"N Proposed Project: 23°01'31.8"N to 23°02'32.2"N
Longitude	Deendayal Port: 70o13'02.7"E to 70o38'00"E.

				Proposed Project: 70°13'02.7"E to 70°13'23.4"E
				Land Requirement: No Additional Land required.
				Capacity: Existing Cargo throughput is 8 MMTPA after revamping it will be 23.8 MMTPA.
				Dredging Requirement: None
				Construction: Only replacement & revamping of existing Pipeline network at Oil jetty area out of total of 167 pipelines 125 will be scrapped and the remaining 42 will be retained after final revamping there will be total 126 pipelines
				Proposed Investment: Rs.171.32 Crores
	b.	Of the environmental management plans	:	The Environment Management Plan of the Project is attached herewith as **Annexure A**
7.	Production details during the compliance period and (or) during the previous financial year		:	It is under Infrastructure & miscellaneous projects so production is not involved
8.	The breakup of the project area		:	
	a.	submergence area forest &non-forest	:	NIL
	b.	Others	:	NIL
9.	The breakup of the project affected the Population with an enumeration of Those losing houses/dwelling units Only agricultural land only, both Dwelling units & agricultural Land &landless labours/artisan		:	The activities are well within designated port limits.
	a.	SC, ST/Adivasis	:	Nil
10.	Financial details		:	
	a.	Project cost as originally planned and subsequently revised estimates and the year of price reference:		
	1.	Estimated Cost of the Project	:	Estimated Cost : Rs.171.32 Crores, Revised Estimated Project Cost: Rs. 211.61 Crore
	b.	The allocation made for environmental management plans with item-wise and year-wise Break-up.	:	a) The allocation made by DPA under the scheme of "Environmental Services & Clearance thereof other related Expenditure" during BE 2024-25 is Rs. 657 Lakhs.
	c.	Benefit-cost ratio / Internal rate of Return and the year of assessment	:	IRR – 18.15%
	d.	Whether (c) includes the Cost of environmental management as shown in above.	:	Yes
	e.	Actual expenditure incurred on the project so far	:	129.15 Cr

	f.	Actual expenditure incurred on the environmental management plans so far		a) The expenditure made by DPA under the scheme of "Environmental Services & Clearance thereof other related Expenditure" is Rs 172 Lakhs upto September 2024.
11.	Forest land requirement		:	
	a.	The status of approval for the diversion of forest land for non-forestry use	:	NIL
	b.	The status of clearing felling	:	NIL
	c.	The status of compensatory afforestation it any	:	NIL
	d.	Comments on the viability & sustainability of the compensatory afforestation program in light of actual field experience so far	:	NIL
12.	The status of clear felling in non-forest areas (such as the submergence area of the reservoir and approach roads) is any with quantitative information.		:	NIL
13.	Status of construction		:	Work in progress
	a.	Date of commencement (Actual and/or planned)	:	--
	b.	Date of completion (Actual and/or planned)	:	--
14.	Reasons for the delay if the Project is yet to start			--
15.	Date of the site visit			
	a)	The dates on which the regional office monitored the project on pervious occasion. if any		**06/09/2022**
	b)	The date site visit for this monitoring report.		