



DEENDAYAL PORT AUTHORITY
(Erstwhile : Deendayal Port Trust)

Administrative Office Building
Post Box NO. 50
GANDHIDHAM (Kutch).
Gujarat: 370 201.
Fax: (02836) 220050
Ph.: (02836) 220038.

www.deendayalport.gov.in

EG/WK/4751/Part (Stage II) /34

Dated 15/03/2024

Shri T C Patel
Unit Head, Kachchh,
Gujarat Pollution Control Board,
Paryavaran Bhavan,
Sector 10A, Gandhinagar- 382 010.

Sub: Consolidated Consent & Authorization order no AWH-123831 date of issue 20/01/2023 (GPCB ID 48573 - "Oil Jetty no. 7")- **Submission of compliance report of stipulated conditions mentioned in the CCA Order issued by the GPCB reg.**

Ref.: 1. CCA issued by the GPCB vide Letter No.: GPCB/CCA·Kutch·1319/ID 48573/701442, Dated: 20/01/2023 Valid upto 01/01/2028.
2. Correction in CCA order no. AWH-123831 issued by GPCB vide letter no. GPCB/CCA·Kutch·1319/ID 48573/756086 dated 13/10/2023.

Sir,

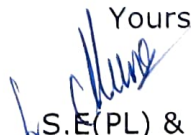
It is requested to kindly refer above cited references for the said subject.

This is in connection with the CCA (Fresh) order issued by the GPCB vide reference cited at Sr no. 1 and further correction in the CCA order issued by the GPCB vide letter no. GPCB/CCA·Kutch·1319/ID 48573/756086 dated 13/10/2023.

Please find enclosed herewith compliance report of conditions stipulated in CCA Order (period up to September - 2023) along with necessary enclosures as **Annexure I (soft copy will be sent through email)**, for kind information & record please.

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

Encl.: As above

Yours faithfully,

S.E(PL) & EMC (I/C)

Deendayal Port Authority

----Cont----

Copy to: 1) Dr. Yogesh Kumar, Deputy Director (S)/Scientist C,
Integrated Regional Office, MoEF&CC,
Office : A - 407 & A-409 , "ARANYA BHAWAN",
Near CH- 3 Circle, Sector - 10 A,
Gandhinagar - 382 010.
Email ID : iro.gandhingr-mefcc@gov.in

2) The Regional Officer,
Gujarat Pollution Control Board,
Regional office,
East Kutch, Gandhidham-370201.
Email Id. ro-gpcb-kute@gujarat.gov.in

ANNEXURE – I

Point Wise compliance to Stipulated conditions in CCA

Subject: Point wise compliance report of stipulated conditions mentioned in the Consolidated Consent & Authorization order no AWH-123831 dated 20/01/2023 to Developing integrated facilities – Stage II (**7th Oil Jetty at Old Kandla**) PCB ID -48573.

Reference: CCA issued vide consent order no. GPCB/CCA-Kutch-1319/701442 GPCB ID-48573 dated 20/01/2023.

Sr. No	Conditions	Compliance Status
1	Specific Conditions	
1	Industry shall not carry out any activities which attract provision of EIA notification 2006 as amended thereafter	Point Noted. For development of Integrated facilities (Stage II- 5 projects), DPA had already obtained the required EC and CRZ clearance issued by the MoEFCC,GoI vide File no. . F.No.11-13/2015-IA III dated 19/02/2020 under the provisions of applicable EIA & CRZ Notification. Copy of EC & CRZ Clearance dated 19/2/2020 is attached as Annexure A .
2	Industry shall comply with all conditions of Environment & CRZ Clearance issued by MoEF&CC vide order no. F.No.11-13/2015-IA III dated 19/02/2020	The compliance reports of stipulated conditions mentioned in the EC & CRZ Clearance accorded by the MoEFCC,GoI vide File no. . F.No.11-13/2015-IA III dated 19/02/2020, are being submitted regularly, to the concerned authorities viz. Regional Office, MoEF&CC,GoI, Gandhinagar with a copy to the MoEF&CC,GoI, New Delhi, RO,CPCB, Vadodara, GPCB, Gandhinagar as well as GPCB Regional Office, Gandhidham.
3.	DPT shall have to comply with all conditions stipulated in the order of Environmental and CRZ Clearance issued by Ministry of Environment, Forest & Climate Change (IA III Section), New Delhi vide letter no. F.No.11-13/2015-IA III dated 19/02/2020	Last compliance report submitted on 03/10/2023 is attached herewith as Annexure B
4	In no case Industry shall damage/affect the mangrove development	Point noted for compliance. Further, as per the directions of the GCZMA and MoEF&CC,GoI, till date, 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 C .
5.	Industry shall obtain fresh water from valid source having permission of the competent authority.	Point noted. The Water requirement is being met through GWSSB (Narmada Pipeline) & through private tankers.
6.	Industry shall comply with Manufacture, Storage and Import of Hazardous Chemicals Rules-1989 (MSIHC) as amended time to time.	Point noted for compliance.
7.	Applicant shall renew Public Liability Insurance time to time & submit a copy to this Board.	The copy of Public Liability Insurance is kept at Annexure D which is valid till 23/07/2024.
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 with the condition. A copy of "Grant of Permission/License for removal of Dry Solid Waste (Non Hazardous) from vessels calling at Deendayal Port is attached herewith as Annexure E Further DPA has accorded work for the " Preparation of Plan for Management of Plastic waste, Solid Waste including C&D waste, E-Waste, Hazardous

		waste including biomedical and non-hazardous waste in the Deendayal Port Authority are” to GEMI, Gandhinagar vide work order dated 24/01/2023.								
9.	Industry 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	<p>It is assured that necessary steps are being taken , to protect existing mangrove patches and for maintaining free flow of water to avoid damage to the mangroves.</p> <p>Further, as per the directions of the GCZMA and MoEF&CC,GoI, till date, 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 C.</p> <p>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 attached as Annexure F).</p> <p>In addition to the above, DPA appointed M/s GUIDE,Bhuj vide work order dated 1/9/2017 & subsequently, vide work order dated 3/5/2021, for “Monitoring of Mangrove Plantation carried out by DPA”. A copy of report prepared by M/s GUIDE, Bhuj (period May, 2021 to May, 2022) is attached herewith as Annexure G.</p>								
3.	Conditions Under Water Act – 1974									
3.1	Source of Water – GWSSB	Point noted								
3.2	There shall be no industrial water consumption and waste water generation from manufacturing process and other ancillary operations.	Not applicable. No manufacturing process or any other ancillary operations involved. Only loading & unloading operations of Liquid cargo is envisaged.								
3.3	The quantity of the fresh water consumption for domestic purpose shall not exceed 23 KL/Day	Point Noted for compliance.								
3.4	The quantity of domestic waste water shall not exceed 18 KL/Day	Point noted for compliance.								
3.5	Domestic effluent shall be disposed off through septic tank/soak pit system	Point noted for compliance.								
3.6	Disposal system for storm water shall be provided separately in no circumstances storm water shall be mixed with the industrial effluent in any case.	Point noted for compliance.								
4.	Conditions under air act 1981:									
4.1	<p>The following shall be used as a fuel in D.G sets</p> <table border="1"> <thead> <tr> <th>Sr.No.</th> <th>Utility</th> <th>Fuel</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>D.G Set</td> <td>Diesel</td> <td>50 Ltr/Hr</td> </tr> </tbody> </table>	Sr.No.	Utility	Fuel	Quantity	1.	D.G Set	Diesel	50 Ltr/Hr	Noted for compliance.
Sr.No.	Utility	Fuel	Quantity							
1.	D.G Set	Diesel	50 Ltr/Hr							
4.2	The applicant shall install & operate air pollution control system efficiently in order to achieve prescribed norms.	Point noted for compliance.								

4.3	<p>The flue gas emission through stack attached to D.G sets shall confirm to the following standards</p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Stack attached to</th> <th>Stack height in meter</th> <th>APCM</th> <th>Parameter</th> <th>Permissible limit</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>D.G set (50 KVA)</td> <td>11 each</td> <td>Adequate stack height</td> <td>PM SO2 NOx</td> <td>150 mg/NM 3 100 ppm 50 ppm</td> </tr> </tbody> </table>	Sr. No.	Stack attached to	Stack height in meter	APCM	Parameter	Permissible limit	1.	D.G set (50 KVA)	11 each	Adequate stack height	PM SO2 NOx	150 mg/NM 3 100 ppm 50 ppm	<p>DPA has been conducting regular monitoring of Environmental parameters through NABL Accredited laboratory 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.</p> <p>Monitoring report is attached herewith as Annexure H</p>								
Sr. No.	Stack attached to	Stack height in meter	APCM	Parameter	Permissible limit																	
1.	D.G set (50 KVA)	11 each	Adequate stack height	PM SO2 NOx	150 mg/NM 3 100 ppm 50 ppm																	
4.4	<p>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 from the source other than the stack/vent shall not exceed the following levels.</p>	<p>Not applicable.</p> <p>No manufacturing process is involved.</p>																				
4.5	<p>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.</p> <table border="1"> <thead> <tr> <th>Sr no</th> <th>Pollutant</th> <th>Time weighted Average</th> <th>Concentration in ambient air in $\mu\text{g}/\text{m}^3$</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Sulphur Dioxide (SO₂)</td> <td>Annual 24 Hour</td> <td>50 80</td> </tr> <tr> <td>2.</td> <td>Nitrogen Dioxide (NO₂)</td> <td>Annual 24 Hour</td> <td>40 80</td> </tr> <tr> <td>3.</td> <td>Particulate matter (size less than 10 μm) or PM₁₀</td> <td>Annual 24 Hour</td> <td>60 100</td> </tr> <tr> <td>4.</td> <td>Particulate matter (size less than 2.5 μm) or PM_{2.5}</td> <td>Annual 24 Hour</td> <td>40 60</td> </tr> </tbody> </table>	Sr no	Pollutant	Time weighted Average	Concentration in ambient air in $\mu\text{g}/\text{m}^3$	1.	Sulphur Dioxide (SO ₂)	Annual 24 Hour	50 80	2.	Nitrogen Dioxide (NO ₂)	Annual 24 Hour	40 80	3.	Particulate matter (size less than 10 μm) or PM ₁₀	Annual 24 Hour	60 100	4.	Particulate matter (size less than 2.5 μm) or PM _{2.5}	Annual 24 Hour	40 60	<p>Point noted for compliance.</p> <p>DPA has been conducting regular monitoring of Environmental parameters through NABL Accredited laboratory 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.</p> <p>Monitoring report is attached herewith as Annexure H</p>
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4.6	<p>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 be designated by number such as S-1, S-2, etc and these shall be painted/displayed to facilitate identification.</p>	<p>Point noted for compliance.</p>																				
4.7	<p>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</p>	<p>Point noted for compliance.</p> <p>DPA has been conducting regular monitoring of Environmental parameters through NABL Accredited laboratory 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</p>																				

		regularly to all the concerned authorities along with compliance reports submitted. Monitoring report is attached herewith as Annexure H
4.8	D.G Sets Conditions	
	The D.G set shall have acoustic enclosure and shall comply with the standards specified at Sr no. 95 of Schedule -1 of the rule-3 of E.P Rules 1986 and Noise pollution level as per the Air Act-1981	Point noted for compliance.
	D.G Set standards: -	
	The flue gas emission through stack attached to D.G sets shall confirm to the following standards	Point noted for compliance.
a)	The minimum height of stack to be provided with each of the generator set shall be $H=h+0.2(KVA)^{1/2}$, where H=total stack height in meter h=height of the building in meters where or by the side of which the generator set is installed.	Point noted for compliance.
b)	Noise from D.G set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the user end.	Point noted for compliance.
c)	The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Such circumstances the performance may be checked for noise reduction up to actual ambient noise level, preferably, in the night time). The measurement for insertion loss may be done at different points 0.5 m from the acoustic enclosure/room and the averaged.	Point noted for compliance.
d)	The D.G set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A)	Point noted for compliance.
e)	All efforts shall be made to bring down the noise level due to the D.G set, outside the premises, within the ambient noise requirement by proper siting and control measures. Installation of a D.G sets must be strictly in compliance with the recommendations of the D.G set manufacturer	Point noted for compliance.
f)	A proper routine and preventive maintenance procedure for the D.G set should be set and followed in consultation with the D.G set manufacturer which would help prevent noise levels of the D.G set from deteriorating with use	Point noted for compliance.
5.	Authorization as per Hazardous And Other Waste (Management and Transboundary) Rules, 2016 form -2 [see rule 6 (2)]	
5.1	Authorization order no. AWH-123831 date of issue: 16/01/2023	--

5.2	<p>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 within existing Kandla Port Trust limit at Kandla. Administrative office building, Post Box no. 50 Tal Gandhidham, Dist : Kutch</p> <table border="1"> <thead> <tr> <th>Sr. No</th> <th>Waste</th> <th>Quantity/annum</th> <th>Schedule & Category</th> <th>Facility</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Used Oil/spent oil</td> <td>900 MT</td> <td>1-5.1</td> <td>Collection, Storage, and reuse as lubricant in plant premises</td> </tr> </tbody> </table>	Sr. No	Waste	Quantity/annum	Schedule & Category	Facility	1.	Used Oil/spent oil	900 MT	1-5.1	Collection, Storage, and reuse as lubricant in plant premises	Point noted for compliance.
Sr. No	Waste	Quantity/annum	Schedule & Category	Facility								
1.	Used Oil/spent oil	900 MT	1-5.1	Collection, Storage, and reuse as lubricant in plant premises								
5.3	The authorization shall be valid up to 01/01/2028	Point noted.										
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.	Point noted.										
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	Agreed with the condition.										
2.	The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the Gujarat pollution Control Board.	Agreed with the condition.										
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.	Agreed with the condition.										
4.	Any unauthorized change in personnel, equipment or working conditions as mentioned in the authorized order by the persons authorized shall constitute a breach of this authorization	Agreed with the condition.										
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.	<p>DPA is already having Disaster management plan Attached as Annexure I considering all site-specific possible scenarios such as spillages, leakages, fire etc., and their possible impact.</p> <p>In addition to the above mock drills are also carried out regularly for effective implementation of the same.</p>										
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."	Agreed with the condition.										
7.	It is the duty of the authorized person to take prior permission of the Gujarat Pollution Control Board to close down the facility.	Agreed with the condition.										
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	Agreed with the condition.										

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. However, 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 herewith as Annexure J
10.	The record of consumption and fate of the imported hazardous and other wastes shall be maintained.	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 herewith as
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.	Agreed with the condition.
15.	Record of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control board in form -4 by 30 th day of June of every year for the preceding period April to March.	Point noted.
16.	In case of any accidents, details of the same shall be submitted on Form-11 to Gujarat Pollution Control Board.	Agreed with the condition.
17.	As per "Public Liability Insurance Act - 91" company shall get Insurance policy, if applicable.	Public Liability Insurance is renewed time to time as required. The Public Liability Insurance was last renewed on 22/07/2023 and is valid till 23/07/2024 The same is attached herewith as Annexure D
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 herewith as

		Annexure J
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 14 th October 2003.	Agreed with the condition.
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 with the condition.
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.	Not Applicable. To be complied by the Authorized recycler.
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.	Point noted.
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 for compliance.
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 with the condition.
6.5	Unit shall comply provisions of E-waste management Rules - 2016	Point noted for compliance. It is relevant to mention here, that DPA has Appointed GEMI, Gandhinagar for the "Preparation of Plan for Management of Plastic Wastes, Solid waste including C&D wastes, E-wastes, Hazardous wastes including Biomedical". The work is in process.
6.6	The disposal of hazardous waste shall be carried out as per the waste management hierarchy.	Waste Management Hierarchy i.e. Prevent, Reduce, Reuse, Recycle, Recover and Disposal is being strictly followed in order by the CPCB approved vendors appointed for the collection of hazardous waste.
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.	DPA appointed GPCB approved vendors for collection of hazardous waste and they are collecting it regularly.
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.	Point noted.
6.9	The transportation of the hazardous waste shall be carried out in GPS mounted dedicated vehicles.	DPA has appointed GPCB authorized vendors for collection, transportation and recycling of Hazardous waste.
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 for compliance.
7.2	Applicant shall also comply with the general conditions given in Annexure 1	Agreed with the condition.
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 with the condition.
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.	DPA is already having Environment Management cell. Further, DPA has also appointed expert agency for providing Environmental Experts from time to time. DPA appointed M/s Precitech Laboratories, Vapi for providing Environmental Experts vide work order dated 5/2/2021. A copy of Work order is attached herewith as Annexure K Further, DPA has appointed manager Environment on contractual basis for the period of 3+2 years. A copy of office order is attached herewith as Annexure L
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 30 th September every year.	Not applicable. As per Environment Audit Scheme, DPA is not covered under Schedule 1 or Schedule 2 industry there fore GPCB has not allotted any auditor to the DPA. However, that in order to fulfill requirement of EC & CRZ Clearance dated 20/11/2020, CCA issued by the GPCB dated 22/1/2021 and Harit Sagar – Green Port Guidelines issued by the MoPSW,GoI, DPA appointed GUIDE,Bhuj vide order dated 19/07/2023 for carrying out Environmental audit of DPA for the period from August 2023 to August 2024. The work is in progress.
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 14 th October 8	Point Noted

ANNEXURE – A

EC Clearance dated 19/02/2020

F.No.11-13/2015-IA-III
Government of India
Ministry of Environment, Forest and Climate Change
(IA.III Section)

Indira Paryavaran Bhawan,
Jor Bagh Road, New Delhi - 3

Date: 19th February, 2020

To,

The Chief Engineer,
M/s Deendayal Port Trust (Erstwhile Kandla Port Trust)
Kandla, Kutch - 370201, Gujarat
E Mail: kptemc@gmail.com

Subject: Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust) - Environmental & CRZ Clearance - reg.

Sir,

This has reference to your online Proposal No. IA/GJ/MIS/27227/2015 dated 1st July, 2016, submitted to this Ministry for grant of Environmental and CRZ Clearance in terms of the provisions of the Environment Impact Assessment (EIA) Notification, 2006 and Coastal Regulation Zone (CRZ) Notification, 2011, under the Environment (Protection), Act, 1986.

2. The proposal for 'Development of integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate promoted by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust) was considered by the Expert Appraisal Committee (Infra-2) in the Ministry in its 8th meeting held on 28-29 July, 2016, 19th meeting held on 27-29 June, 2017, 25th meeting held on 29-30 November, 2017, 27th Meeting held on 25th January, 2018 and 28th meeting held on 5th March, 2018 (correction in the minutes).

3. The details of the project, as per the documents submitted by the project proponent, and also as informed during the above said EAC meeting, are reported to be as under:-

- (i) The proposal is for Development of integrated facilities (Stage-II) within the existing Deendayal Port Trust Limit at Kutchh district of Gujarat by Deendayal Port Trust (1. Setting up of Oil Jetty No.7.; 2. Setting up of Barge jetty at Jafarwadi; 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; and 5. Road connecting from Veera barge jetty to Tuna gate) by M/s Deendayal Port Trust (Deendayal Port Trust).
- (ii) Kandla Port is situated at Latitude 23°01'N and Longitude 70°13'E on the shores of the Kandla Creek. It is in the district of Kutch and is located on the west bank of Kandla creek which runs into the Gulf of Kutch at a distance of 90 nautical miles from the Arabian Sea. Total area of the project is 61.75 Ha.
- (iii) The *Project Components* are as follows:
 - Setting up of Oil Jetty No.7 (Capacity - 2MMTPA, Size - 110m x 12.40m, Approach - 210m - Back up area 1 Ha, Capital dredging - 72000 m³. Maintenance dredging - @15% per annum i.e. 10800 m³/year, Cost - 72 Crores), Site location: 23°02'37.49" N & 70°13'08" E.

J. Kame

- Setting up of Barge jetty at Jafarwadi (On BOT Basis) (Capacity - 3.00 MMTPA, Size - 180 x 20 m, Back up area - 20 Ha., Capital Dredging - 80000 m³, Maintenance dredging - 15% per annum i.e. 12000 m³/year, Cost - 105 Crores).
 - Setting up of Barge port at Veera (On BOT Basis) (Capacity - 6.29 MMTPA, Size - 160 x 60 m, Back up area - 20 Ha., Cost 160 Crores).
 - Construction of Administrative office (Port Operational) building at Tuna Tekra (Build up area - 1600m², Plot Area - 15,000m², Cost - 10 Crores).
 - Road connecting from Veera barge jetty to Tuna Gate (Length - 15500 m, Width - 7.30m, with both sides 1.50m shoulders, Cost - 48.82 Crores).
- (iv) Water will be received from high service reservoir near Bhachau and Narmada Canal through 18" pipeline of Gujarat Water supply and Sewerage Board. 34 KLD water will be used for construction purpose and about 23 KLD water will be used for domestic purposes.
- (v) Wastewater (18 KLD) will be treated in the modern septic tanks. Treated wastewater will be used for gardening and green belt development activities.
- (vi) Solid wastes generated from the colony will be taken care by the waste disposal plan. The construction waste may pose impacts on land environment by contamination of soil and hence the wastes shall be utilized for PCC works, Road construction, and other filling requirement etc the accidental spillage of fuels and lubricants oils will be minimized by proper care. The proposed project does not envisage production of any hazardous waste material.
- (vii) Deendayal Port Trust has endeavored in maintaining eco-balance by way of tree plantation in and around port area. Extensive plantation is carried out every year. The survival rate of plants is very low due to saline soil and adverse weather conditions. Ongoing efforts are taken to increase the area under plantation. Additionally, green belt development is undertaken at, roadside and near residential and office buildings at Kandla, Gandhidham town and surrounding villages. The Greenbelt development plan is given in Section 9.8 of Chapter 09 in the EIA report.
- (viii) Dredging quantity to be conducted by Deendayal Port Trust (capital as well as maintenance) that will be required to maintain the port initially and throughout the year is as follows: Capital Dredging: 152000 m³; Maintenance Dredging: 22800 m³/year. Reclamation is required for backup area i.e 61.75 ha.
- (ix) The fugitive dust emission will be controlled by water spraying. Precautions will be taken to use the covered storage area for cargos.
- (x) Total cost of the project is 395.82 Crores.
- (xi) Terms of Reference was granted by MoEF&CC vide letter No. F.No. 11-13/2015-IA-III dated 23.06.2015. Public Hearing was exempted for the project.
- (xii) GCZMA has recommended all these five projects vide Letter No. ENV-10-2015-231-E (T Cell) dated 29.06.2016.
- (xiii) Project Benefit: Improvement in the social and physical infrastructure, Employment and other benefits.
- (xiv) Employment Potential: 100 people per day.

4. The project/activity is covered under category A of item 7 (e) i.e. Ports, harbours, break waters, dredging' of the schedule to the EIA Notification, 2006 and its subsequent amendments, and requires appraisal at Central level by sectoral EAC.

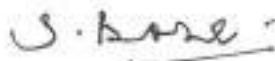
5. The Expert Appraisal Committee (Infra-2) in its 27th meeting held on 25th January, 2018, after detailed deliberations on the project, has recommended the project for grant of Environmental and CRZ Clearance. As per recommendations of the EAC, the Ministry of

J. Bose

Environment, Forest and Climate Change hereby accords Environmental and CRZ Clearance for the project 'Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate promoted by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust)', under the provisions of the EIA Notification, 2006 and CRZ Notification, 2011 and amendments thereto and circulars issued thereon and subject to the compliance of the following specific and general conditions as under:-

A. SPECIFIC CONDITIONS:

- (i) Construction activity shall be carried out strictly according to the provisions of the CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.
- (ii) All the recommendations and conditions specified by the Gujarat Coastal Zone Management Authority vide letter No. ENV-10-2015-231-E (T Cell) dated 29.06.2016 shall be complied with.
- (iii) The project proponent shall ensure that the project is in consonance with the new CZMP prepared by the State Government under the provisions of the CRZ Notification, 2011.
- (iv) The Project proponent would submit a certificate from Gujarat Water Supply and Sewerage Board (GWSSB) for providing required water. This should be submitted with the first compliance report.
- (v) 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.
- (vi) Dredging shall not be carried out during the fish breeding season.
- (vii) Dredging, etc shall be carried out in the confined manner to reduce the impacts on marine environment.
- (viii) Dredged material shall be disposed safely in the designated areas.
- (ix) 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.
- (x) The ground water shall not be tapped within the CRZ areas by the PP to meet with the water requirement in any case.
- (xi) While carrying out dredging, an independent monitoring shall be carried out by Government Agency/Institute to check the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.
- (xii) Mitigative measures as given in the Marine Bio-diversity Management Plan prepared by CSIR-NIO for protection of marine environment shall be complied with in letter and spirit.
- (xiii) A copy of the Marine and riparian biodiversity management plan duly validated by the State Biodiversity Board shall be submitted before commencement of implementation.
- (xiv) A continuous monitoring programme covering all the seasons on various aspects of the coastal environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes/renowned Universities with rich experiences in marine science aspects. The monitoring should cover various physico-chemical parameters coupled with biological indices such as microbes, plankton, benthos and fishes on a periodic basis during construction and operation



phase of the project. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources.

- (xv) Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity.
- (xvi) The project proponents would also draw up and implement a management plan for the prevention of fires due to handling of coal.
- (xvii) 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.
- (xviii) 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.
- (xix) All the recommendations mentioned in the rapid risk assessment report, disaster management plan and safety guidelines shall be implemented.
- (xx) Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.
- (xxi) Necessary arrangement for general safety and occupational health of people should be done in letter and spirit.
- (xxii) The commitments made during the Public Hearing conducted in 2013 for earlier project and recorded in the Minutes shall be complied with letter and spirit. A hard copy of the action taken shall be submitted to the Ministry.
- (xxiii) All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to the RO, MoEF&CC along with half yearly compliance report.
- (xxiv) As per the Ministry's Office Memorandum F.No. 22-65/2017-IA.III dated 1st May, 2018, the project proponent has proposed that an amount of Rs. 2.97 Crore (@ 0.75% of project Cost) shall be earmarked under Corporate Environment Responsibility (CER) for the activities such as Drinking water, Sanitation, Health, Education, Skill Development Roads, Electrification including Solar Power, Scientific support and awareness to local farmers to increase yield of crop and fodder, Rain water harvesting, Soil Moisture Conservation work and Avenue plantation and plantation in community areas. The activities proposed under CER shall be restricted to the affected area around the project. The entire activities proposed under the CER shall be treated as project and shall be monitored. The monitoring report shall be submitted to the Regional Office as a part of half yearly compliance report, and to the District Collector. It should be posted on the website of the project proponent.

B. GENERAL CONDITIONS:

- (i) Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.
- (ii) Full support shall be extended to the officers of this Ministry/ Regional Office at Bhopal by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.

J. Bose

- (iii) A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bhopal regarding the implementation of the stipulated conditions.
- (iv) Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.
- (v) The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry.
- (vi) In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change.
- (vii) The project proponents 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 and the date of start of land development work.
- (viii) A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/ representation has been made received while processing the proposal.
- (ix) A copy of this clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The Clearance letter shall also be displayed at the Regional Office, District Industries centre and Collector's Office/ Tehsildar's office for 30 days.

6. 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.

7. All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.

8. The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental and CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest and Climate Change at <http://www.envfor.nic.in>. The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal.

9. This clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.

10. Any appeal against this clearance 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.

11. Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website.

12. A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the

J. K. Singh

proposal. The clearance letter shall also be put on the website of the company by the proponent.

13. The proponent shall upload the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB.

14. The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB.

15. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of Clearance conditions and shall also be sent to the respective Regional Office of MoEF&CC by e-mail.

16. The above stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter.


(Dr. Subrata Bose)
Scientist F

Copy to:

- 1) The Secretary to Government (Environment and Ecology), Forests & Environment Department, Government of Gujarat Block 14, 8th floor, Sachivalaya, Gandhinagar - 382 010, Gujarat.
- 2) The Addl. Principal Chief Conservator of Forests (Central) Ministry of Environment, Forest and Climate Change, Regional Office (WZ) E-5, Kendriya Paryavaran Bhawan, E-5 Arera Colony, Link Road-3 Ravishankar Nagar, Bhopal - 462016.
- 3) The Chairman, Central Pollution Control Board Parvesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, New Delhi - 110 032.
- 4) The Member Secretary, Gujarat Pollution Control Board, Paryavaran Bhavan, Sector-10A, Gandhinagar-382010, Gujarat.
- 5) Monitoring Cell, MoEF&CC, Indira Paryavaran Bhavan, New Delhi.
- 6) Guard File/ Record File/ Notice Board.
- 7) Website of MoEF&CC.


(Dr. Subrata Bose)
Scientist F

ANNEXURE – B

Compliance Report Submitted on 03/10/2023



DEENDAYAL PORT AUTHORITY (Erstwhile Deendayal Port Trust)

Administrative Office Building
Post Box NO. 50
GANDHIDHAM (Kutch).
Gujarat: 370 201.
Fax: (02836) 220050
Ph.: (02836) 220038.

www.deendayalport.gov.in

No: - EG/WK/4712/Part II / 370

Date: 3/10/2023

To,
The Regional Officer
Ministry of Environment, Forest & Climate Change
Integrated Regional Office,
Gandhinagar, A wing-407 & 409
Aranya Bhavan Near CH-3 Circle
Sector 10A, Gandhinagar - 382010
Email : rows.bpl-mef@nic.in , eccomplaine-guj@gov.in

Sub: Development of Integrated facilities (Stage II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat (1. Setting up of Oil Jetty No. 7 2. Setting up of Barge Jetty at Jafrabadi 3. Setting up of Barge port at Veera 4. Administrative office building at Tuna Tekra 5. Road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Authority (Erstwhile Deendayal Port Trust)- **Six Monthly compliance Report of conditions stipulated in Environmental & CRZ Clearance & Monitoring Report in Data Sheet reg**

Ref.:

- 1) MoEF&CC, GOI vide letter No. F. No. 11-13/2015-IA-III dated 19/02/2020
- 2) Regional Office, Western Zone MoEF&CC, GOI Bhopal Letter dated 30/05/2020
- 3) DPT letter EG/WK/4751/Part/988 dated 29/08/2020 – Submission of Detail asked by Regional Office, Western Zone MoEF &CC, GOI Bhopal Letter date 30/05/2020
- 4) DPT letter No. EG/WK/4712/EC/Part II/52 dated 29/07/2021- Submission of compliance report of stipulated conditions of EC & CRZ clearance.
- 5) DPT letter No. EG/WK/4712/EC/Part II/143 dated 08/02/2022 - Submission of compliance report of stipulated conditions of EC & CRZ clearance
- 6) DPT letter No. EG/WK/4751/(EC-Stage II)/139 dated 11/07/2022 –Submission of compliance report of stipulated conditions of EC & CRZ Clearance
- 7) DPA letter No. EG/WK/4751/(EC-Stage II)/291 dated 03/05/2023 –Submission of compliance report of stipulated conditions of EC & CRZ clearance

Sir,

Kindly refer above cited references for the said subject.

In this connection, it is to state that MoEF&CC, GOI vide above referred letter dated 19/02/2020 has accorded Environmental/CRZ Clearances for the subject project.

Subsequently, DPA vide above mentioned letters had submitted the compliance report of the stipulated conditions mentioned in MoEF&CC, GOI vide letter No. F. No. 11-13/2015-IA-III dated 19/02/2020

In this regard, it is to state that the Point wise compliance status for the period of December 2022 to May 2023 to various stipulations (as per applicability) of the EC & CRZ Clearance accorded by the MoEF&CC, GoI, New Delhi vide no. 11-13/2015-IA-III dated


19/02/2020 with supporting documents and reports is being hereby submitted for your kind information and records.

In addition to above, soft copy of above information is also enclosed herewith in CD & soft copy has also been sent through e-mail.

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

Thanking You.

Yours faithfully,


Manager (Environment)

Deendayal Port Authority

Copy along with point wise compliance of stipulated conditions.

Copy to:

Shri Amardeep Raju,
Scientist E,
Ministry of Environment
Forests & Climate change, GoI,
Indira Paryavaran Bhavan,
3rd floor, Vayu wing,
Jor Bagh Road, Aliganj,
New Delhi – 110 003.
Email Id.
adraju@gmail.com, ad.raju@nic.in

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

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

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

Subject: Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust)

CURRENT STATUS OF WORK

Sr.No.	Name of Project	Status
1.	Setting up of Oil Jetty No.7	Under operation w.e.f January 2023.
2.	Setting up of Barge jetty at Jafarwadi	No construction activity started yet.
3.	Setting up of Barge port at Veera	No construction activity started yet.
4.	Administrative office building at Tuna Tekra;	No construction activity started yet.
5.	Road connecting from Veera barge jetty to Tuna gate	No construction activity started yet.

Subject: Point wise compliance of stipulated conditions of EC & CRZ Clearance for "Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust) - Environmental & CRZ Clearance - reg.". **(For the period of December 2022 to May 2023)**

Sr. No.	Stipulated Conditions	Compliance
i	Construction activity shall be carried out strictly according to the provisions of the CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is completed and it is under operation w.e.f January 2023. The Consent to Operate (CCA) from the Gujarat Pollution Control Board has already been obtained dated 20/1/2023 (Copy – Annexure I).</p> <p>However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that, construction activities will be carried out strictly as per the provisions of the CRZ notification, 2011 and also no activity other than those permissible in Coastal Regulation Notification will be carried out in CRZ area.</p>
ii	All the recommendations and conditions specified by the Gujarat Coastal Zone Management Authority vide letter No. ENV-10-2015-231-E (T Cell) dated 29.06.2016 shall be complied with	The compliance report of CRZ Recommendation issued by the GCZMA dated 29/06/2016 is attached herewith as Annexure II .
iii	The project proponent shall ensure that the project is in consonance with the new CZMP prepared by the State Government under the provisions of the CRZ Notification, 2011	The MoEF&CC, GoI accorded EC & CRZ Clearance for the subject proposal of DPT dated 19/2/2020. Accordingly, implementation of the remaining projects (Project at Sr.no. 2 to 5 – No construction activity started yet) will be carried out as per the EC & CRZ Clearance accorded by the MoEF&CC,GoI.
iv	The Project proponent would submit a certificate from Gujarat Water Supply and Sewerage Board (GWSSB) for providing required water. This should be submitted with the first compliance report.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. The required water supply is purchased from GWSSB.</p> <p>However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.</p>
v	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.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023.</p> <p>However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.</p>
vi	Dredging shall not be carried out during the fish breeding season.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. While carrying out capital dredging work. In the report submitted by IIT, Mumbai , it is mentioned that, "Dredging work not carried out during the fish breeding season". (IIT, Mumbai report is attached as Annexure III).</p> <p>However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.</p>

vii	Dredging, etc shall be carried out in the confined manner to reduce the impacts on marine environment.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. While carrying out capital dredging work. In the report submitted by IIT, Mumbai , it is mentioned that ,"Dredging work carried out in a confined manner to reduce the impacts on the marine environment" (IIT, Mumbai report is attached as Annexure III).</p> <p>However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.</p>
viii	Dredged material shall be disposed safely in the designated areas.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. While carrying out capital dredging work. In the report submitted by IIT, Mumbai , it is mentioned that, "Dredged Material are safely disposed of in the designated area/dumping ground" (IIT, Mumbai report is attached as Annexure III).</p> <p>However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.</p>
ix	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.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023.</p> <p>DPA issued work order vide no. EG/WK/4751/Part (EC- Shoreline study) Dated: 12/10/2021 to NCSCM, Chennai for Shoreline Change Study for Deendayal Port Trust, Kandla, Kachchh District, Gujarat, to Study the Effect of Dumping, if any reg. Final Report submitted by the NCSCM, Chennai has already been submitted with the last six-monthly compliance report communicated vide letter dated 11/07/2022.</p> <p>In the report submitted by IIT,Mumbai, it is mentioned that, During the environmental monitoring the shoreline during execution of dredging activity is not disturbed due to dumping of dredged materials and During the dredging activity , no impact on the existing shoreline or creek is observed (IIT, Mumbai report is attached as Annexure III).</p>
x	The ground water shall not be tapped within the CRZ areas by the PP to meet with the water requirement in any case.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023 required water supply is purchased from GWSSB.</p> <p>However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.</p>
xi	While carrying out dredging, an independent monitoring shall be carried out by Government Agency/Institute to check the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.	<p>The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. DPA appointed IIT-Mumbai as an Independent agent for monitoring the same vide DPA work order no. HD/WK/1078/2022/OJ7/dredging/ENV610 dated 21/12/2022 and submitted the report IITB/DPA/EM/OJ7/RO dated 01/03/2023 (IIT, Mumbai report is attached as Annexure III).</p>

		However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.
xii	Mitigative measures as given in the Marine Biodiversity Management Plan prepared by CSIR-NIO for protection of marine environment shall be complied with in letter and spirit.	Point noted for the compliance.
xiii	A copy of the Marine and riparian biodiversity management plan duly validated by the State Biodiversity Board shall be submitted before commencement of implementation.	A copy of Report entitled "Holistic Marine Ecological Monitoring of Deendayal Port Environment with Special Reference to Biodiversity and Preparation of Management Plan" prepared by M/s GUIDE, Bhuj and validated by Gujarat State Biodiversity Board vide letter dated 24/12/2019 had already been submitted vide DPA letter dated 29/8/2020 - Submission of Detail asked by Regional Office, Western Zone MoEF&CC, GOI Bhopal vide letter dated 30/05/2020.
xiv	A continuous monitoring programme covering all the seasons on various aspects of the coastal environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes/renowned Universities with rich experiences in marine science aspects. The monitoring should cover various physico-chemical parameters coupled with biological indices such as microbes, plankton, benthos and fishes on a periodic basis during construction and operation phase of the project. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources	DPA has entrusted the work to M/s GUIDE, Bhuj for continuous monitoring of Marine Ecology since the year 2017 and the reports in this regard have already been submitted to the Regional Office, MoEF&CC, GoI, Bhopal/Gandhinagar & to the MoEF&CC, GoI, New Delhi along with six monthly compliance reports submitted. Further, DPA assigned work to M/s GUIDE, Bhuj, vide work order dated 3/5/2021 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 water and Marine sediment samples coupled with biological indices, as per the requirements of EC & CRZ Clearances reg. (for three years (2021-2024)). The copy of the final report has already been submitted with the last six-monthly compliance report communicated vide letter dated 11/07/2022. The second season report for the year 2022-2023 submitted is attached herewith as Annexure IV .
xv	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity.	The copy of the final report has already been submitted with the last six-monthly compliance report communicated vide letter dated 11/07/2022. The second season report for the year 2022-2023 submitted is attached herewith as Annexure IV .
xvi	The project proponents would also draw up and implement a management plan for the prevention of fires due to handling of coal.	Deendayal Port Authority 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 (circular no. TF/SH/Circulars/2019/1256 dated 10/10/2019). A copy of circular is attached herewith as Annexure-V 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
xvii	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	DPA is already having Oil Spill contingency plan & accordingly, necessary precautions will be taken to prevent spillage of Fuel/Engine oil and lubricants

	precautions and also by providing necessary mechanisms to trap the spillage.	
xviii	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.	<p>No industrial effluent is generated in the port area. The domestic sewage generated is treated in the STP (1.5 MLD) at Kandla. The treated wastewater from STP is utilized for gardening purpose. Moreover, DPA has been conducting regular Monitoring of environmental parameters including STP monitoring since the year 2016 through NABL Accredited laboratories. The latest Environmental Monitoring Report is enclosed herewith as Annexure VI.</p> <p>DPA appointed GPCB approved vendors for collection of solid waste and they are collecting it regularly</p> <p>DPA has Appointed GEMI, Gandhinagar for the "Preparation of Plan for Management of Plastic Wastes, Solid waste including C&D wastes, E-wastes, Hazardous wastes including Biomedical". The work is in process</p> <p>Further, for projects at Sr. No. 2 to 5, construction activity not yet started. However, the stipulated condition will be complied with</p>
xix	All the recommendations mentioned in the rapid risk assessment report, disaster management plan and safety guidelines shall be implemented	All the recommendations mentioned in the Rapid Risk Assessment Report, Disaster Management Plan & safety Guidelines will be implemented
xx	Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.	DPA already has an Oil Spill Contingency Plan. The copy of the same has already been communicated with earlier compliance reports. In addition to it, DPA also has equipment for Oil Spill Response System
xxi	Necessary arrangement for general safety and occupational health of people should be done in letter and spirit.	DPA has included tender clause regarding the safety of all activities on the site.
xxii	The commitments made during the Public Hearing conducted in 2013 for earlier project and recorded in the Minutes shall be complied with letter and spirit. A hard copy of the action taken shall be submitted to the Ministry	The commitments made during the Public Hearing will be complied with letter & spirit. In this regard, the details of CSR Activities implemented as well as proposed are enclosed herewith as Annexure VII .
xxiii	All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to the RO, MoEF&CC along with half yearly compliance report.	Compliance of the mitigation measures suggested in the EIA report in the matrix format is attached herewith as Annexure VIII
xxiv	As per the Ministry's Office Memorandum F.No. 22-65/2017-IA.III dated 1 st May, 2018, the project proponent has proposed that an amount of Rs. 2.97 Crore (@ 0.75% of project Cost) shall be earmarked under Corporate Environment Responsibility (CER) for the activities such as Drinking water, Sanitation, Health, Education, Skill Development Roads, Electrification including Solar Power, Scientific support and awareness to local farmers to increase yield of crop and fodder, Rain water harvesting, Soil Moisture Conservation work and Avenue plantation and plantation in community areas. The activities proposed under CER shall be restricted to the affected area around the project. The entire activities proposed under the CER shall be treated as	<p>Out of 5 projects, only work of Oil Jetty no. 7 is completed and it is under operation w.e.f January 2023.</p> <p>DPA is in process of appointing expert agency for "Planning and Implementation of the activities to be undertaken under Corporate Environment Responsibility by the Deendayal Port Authority in consonance with EMP". It is assured that, as per condition stipulated, the activities under CER will be implemented in consonance with EMP activities.</p>

	project and shall be monitored. The monitoring report shall be submitted to the Regional Office as a part of half yearly compliance report, and to the District Collector. It should be posted on the website of the project proponent	
B. GENERAL CONDITIONS:		
i.	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	Point noted
ii	Full support shall be extended to the officers of this Ministry/Regional Office at Bhopal by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.	It is assured that full support will be extended to the officers of this Ministry/Regional Office at Gandhinagar by the project proponent during inspection of the project for monitoring purposes.
iii	A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bhopal regarding the implementation of the stipulated conditions.	DPA has been regularly submitting six monthly monitoring report to the Regional Office at Bhopal/Gandhinagar regarding implementation of the stipulated conditions.
iv	Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary, in the interest of environment and the same shall be complied with.	Point noted
v	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry	Point noted
vi	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change.	Point Noted.
vii	The project proponents 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 and the date of start of land development work	For one of the project out of 5 projects i.e. Construction of Oil Jetty No. 7, the Board of Trustees of DPA vide Resolution No. 25 in its meeting held on 08/06/2015 approved the project (Block estimate - 72 Crores). Accordingly, the work for construction of the Oil Jetty No. 7 started on 24/03/2020 now, it is under operation w.e.f January 2023.
viii	A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/ representation has been made received while processing the proposal.	No such representations have been received. Hence, not applicable.
ix	A copy of this clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The Clearance letter shall also be displayed at the Regional Office, District Industries centre and Collector's Office/ Tehsildar's office for 30 days.	--
6.	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 No. 74134 granted by the GPCB vide letter no. PC/CCA-KUTCH 1319/GPCB ID 48573 dated 27/11/2015. Subsequently, DPA obtained EC to CTE (PCB ID 48573) vide GPCB Order dated 13/10/2020 after obtaining Environmental and CRZ Clearance from

		<p>MoEF&CC, GoI vide F. No. 11-13/2015-IA-III dated 19/02/2020. The copy of EC to CTE also obtained from the GPCB</p> <p>In addition to this as the construction work for the project at Sr 1 is completed and it is under operation w.e.f January 2023 therefore CCA has obtained from the Gujarat Pollution Control Board vide GPCB/CCA-Kutch-1319/ID-48573/701442 dated 20/01/2023. (Copy Annexure I)</p>
7.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	Point Noted for the compliance.
8.	The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental and CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest and Climate Change at http://www.envfor.nic.in . The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the regional office of this Ministry at Bhopal.	DPA has already given advertisement in two local news papers viz. KUTCHMITRA (In Gujarati) dated 23/2/2020 and in the Indian Express (In English) dated 23/02/2020 and also forwarded to the Regional Office , MoEF&CC,Bhopal vide letter dated 28/2/2020 (Submitted along with the compliance report submitted on 03/05/2023)
9.	This clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.	Point noted.
10.	Any appeal against this clearance 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.	Point noted.
11.	Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website	DPA regularly uploads the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website www.deendayalport.gov.in
12.	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parishad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	No suggestions/representation received. Public Hearing exempted. Copy of the EC letter has been uploaded in the website of DPA www.deendayalport.gov.in .
13.	The proponent shall upload the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website and shall update`e the same periodically. It shall simultaneously be sent to the Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB	DPA regularly uploads the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website www.deendayalport.gov.in .

14.	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB.	DPA is regularly submitting the report of compliance of the stipulated Clearance conditions including results of monitored data to the IRO Gandhinagar and copy to Office of MoEF&CC, GPCB, CPCB. Last compliance submitted on 03/05/2023.
15.	The environmental statement for each financial year ending 31 st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of Clearance conditions and shall also be sent to the respective Regional Office of MoEF&CC by e-mail.	Point Noted.
16.	The above stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter.	Point Noted.

ANNEXURE – C

Statement of Mangrove Plantation

DEENDAYAL PORT TRUST

DETAILS OF MANGROVE PLANTATION ALREDY CARRIED OUT & Proposed To be Carried Out:

Sr. No	Name of the Organization	Total Mangrove Plantation carried out in Hectares till date and place of plantation and agency	Cost incurred
(A)MANGROVE PLANTATION ALREDY CARRIED OUT			
1	DEENDAYAL PORT TRUST (CRZ Recommendation 13 th to 16 th CB issued by the GCZMA) (Total 1000 ha.)	20 Hectares – 2005-06 Satsida Bet,Kandla, by GUIDE,Bhuj 50 Hectares – 2008-09 Nakti Creek,Kandla by Patel Construction 100 Hectares – 2010-11 Nakti Creek ,Kandla by GEC. (Board 29/1/2010) 200 Hectares – 2011-12 by Forest Department, GoG at Satsaida Bet	Rs. 8.8 lakhs Rs. 27.4 lakhs Rs.24.5 lakhs Rs. 66.5 lakh Rs. 157.5 lakhs (total 630 hectares)
2	Creation of Berthing & allied Facilities off- tekra near Tuna (Outside Kandla Creek) – EC & CRZ Clearance. (Total 500 ha. – 250Ha. by DPT & 250 ha by Adani (concessionaire) MOU signed with GEC during Vibrant Gujarat	300 Hectares – 2015-17 by GEC at Kantiyajal, Bharuch District	Rs. 90.0 lakhs
3.	EC & CRZ Clearance dated 19/12/2016 for Developing 7 integrated facilities (Condition 100 Ha)	100 Ha. –2018- 20 by GEC	Rs. 45 lakhs
4.	EC and CRZ Clearance dated 18/02/2020 (Dev of 3 remaining facility) and EC and CRZ Clearance dated 19/02/2020(Development of Integrated facilities 5 projects (Stage II) Ref : CRZ recommendation GCZMA 100 ha (50+50 Ha)	100 ha by GEC 2021-22 (Kantiyajal, Bharuch)	Rs 45 Lakhs
TOTAL MANGROVE Plantation till date by DPT 1500 Ha.		– Total 464.7 lakhs	

(A) Proposed Mangrove Plantation

1.	CRZ recommendation outfitting jetty & floating dry Dock at Vadinar by DPA	100 Ha by GEC (work in progress)work order dated 02/06/2022	Rs 50 Lakhs
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ANNEXURE – D

Copy of Public Liability Insurance

दि न्यू इन्डिया एश्योरन्स कं. लि.

(भारत सरकार का उद्यम)

बृहत कॉर्पोरेट एवं ब्रोकर्स कार्यालय : 920000
न्यू इन्डिया सेंटर, 11वीं मंजिल, 17/ए, कोपरगेज 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/A, Cooperage Road,
Dr. B.R. Ambedkar Chowk, Mumbai - 400 001

Phone : 022 - 2204 4973 / 2204 4976 / 2204 4977 / 2204 4974



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 2023 till 23rd July 2024, 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:

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(भारत सरकार का उद्योग)

बृहत कॉर्पोरेट एवं ब्रोकर्स कार्यालय : 920000

न्यू इन्डिया सेंटर, 11वीं मंजिल, 17/ए, कोपरगेज रोड,
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(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 673,00,00,000 any one accident or occurrence and in the aggregate

TOTAL SUM INSURED FOR PROPERTIES (excludes owned vessels): **INR 57,304,306,727.**

Sections 4

Indemnity Period: 2 Months

Annual Revenue – INR 23,478,594,000

Annual Gross Profit – INR 22,159,394,000

Loss limit – INR 100,00,00,000

Combined Single Limit for PD /BI / Liability across all sections is INR 713,00,00,000

LOCATION:

Insured Location addresses as under:

1. Administrative Office Bldng, 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.

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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

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

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(Property) Amended, 1/04 LSW1517.
Clause A amended to include Tsunami.
Clause B amended to include Tsunami.
48 hours amended to 72 hours.

Deductible:

(A) Other than AOG peril & Vessel Impact: 2% of claim amount subject to Minimum **INR 3,00,000 each and every claim**

(B) AOG Peril: 2% of claim amount subject to **Minimum INR 20,00,000 each and every claim (including losses affecting breakwater)**

(C) Vessel impact: 2% of claim amount subject to **Minimum INR 20,00,000 each and every claim (including losses affecting breakwater)**

Section 3

Ports and Terminals Consortium Section 3 – Handling Equipment Wording Amended.

Clause 2.1 (Insuring Clause) amended to include electrical and machinery breakdown.

Clause 2.4 (Removal of Wreck/Debris) included

Exclusion 4.7 (Communication Equipment) deleted.

Exclusion 4.9 (Safe working load) amended.

Exclusion 4.15 (Mechanical or Electrical Breakdown) deleted.

Clause 8 (Protective Maintenance) amended.

Clause 9.1 (Automatic Acquisition) amended to 90 days Clause

9.2 (Automatic Acquisition) amended to 10%

Ports and Terminals Consortium Earthquake Extension Clause (Handling Equipment) Amended 1/04 LSW1520. Clause A amended to include Tsunami.

Clause B amended to include Tsunami.

48 hours amended to 72 hours.

Deductible: 2% of claim subject to **Minimum INR 3,00,000**

Section 4

Ports and Terminals Consortium Section 4 Business Interruption Wording Amended 1/04 LSW1522.

Clause 2.3 (Interruption to Utility Supply) amended to include gas, fuel or water supply.

Additional Clause 2.4 interruption due to damage and/or blockage of pipeline.

पंजीकृत एवं प्रधान कार्यालय : न्यू इन्डिया 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 : L66000MH1919GOI000526

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Deductible: 7days

Applicable to Sections 2, 3 & 4

Subject to Expediting Expenses Clause

Subject to Architects, Surveyors', Legal and Consulting Engineers' Fees Clause

Subject to Minor Works Clause

Subject to Public Authority Clause

Subject to Reinstatement Clause

Subject to Temporary Removal Clause

Subject to Additional Increased Cost of Working Clause.

Subject to Prevention of Ingress/Egress Clause.

Subject to Professional Accountants Fees Clause

Subject to Average Clause (85%)

Pollution Clean-up Costs Clause

Claims Preparation Costs Clause

Minimization of Loss Clause

Designation of Property Clause

Listed Perils resulting from seepage and/or pollution and/or contamination clause

Limited seepage &/or pollution &/or contamination resulting from physical damage caused by listed perils clause

Waiver of under-insurance upto 15% of Sum Insured under property damage and BI Sum Insured

Marine Impact Insurance Clause

Specialized / Heavy Lift/ Oversize Lifting clause

Toxic Mould Exclusion Clause

Claims Control Clause

NMA 2919 War and Civil War and Terrorism Exclusion Clause

Applicable to All Sections

General Policy Provisions LSW1524 01/04 Amended.

पंजीकृत एवं प्रधान कार्यालय : न्यू इन्डिया एश्योरन्स बिल्डींग, 87, महात्मा गांधी रोड, फोर्ट, मुंबई - 400 001.

Regd. & Head Office : New India Assurance Bldg, 87, Mahatama Gandhi Road, Fort, Mumbai - 400 001.

Website : www.newindia.co.in

CIN : L66000MH1919GOI000526

दि न्यू इन्डिया एश्योरन्स कं. लि.

(भारत सरकार का उद्योग)

बृहत कॉर्पोरेट एवं ब्रोकरिंग कार्यालय : 920000
न्यू इन्डिया सेंटर, 11वीं मंजिल, 17/ए, कोपरगेज 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/A, Cooperage Road,
Dr. B.R. Ambedkar Chowk, Mumbai - 400 001

Phone : 022 - 2204 4973 / 2204 4976 / 2204 4977 / 2204 4974



Clause 5 (Radioactive Contamination, etc) deleted
Clause 6.1 B. amended to delete 'strike, lock-out, labour disturbance, riot, civil commotion'.
Clause 11 (Notice of Potential Claims) amended.
Clause 18 (Premium Payment Clause) deleted.
Clause 21 (Governing Law) amended to India.
Clause 10 (Electronic Exclusion Clause) deleted.
Employment Practices Clause
Simultaneous Payment Clause (Losses)
Waiver of Subrogation and Additional Assured Clause
Special Termination Clause.
Continuity Clause

Subject to Institute Radioactive Contamination, Chemical, Biological, Bio-chemical and Electromagnetic Weapons Exclusion

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:

- Proclaim Insurance Surveyors and Loss Assessors Private Limited
- McLarens Insurance Surveyors And Loss Assessors India Pvt. Ltd
- 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

दि न्यू इन्डिया एश्योरन्स कं. लि.

(भारत सरकार का उद्यम)

बृहत कॉर्पोरेट एवं ब्रोकर्स कार्यालय : 920000
न्यू इन्डिया सेंटर, 11वीं मंजिल, 17/ए, कोपरगेज रोड,
डॉ. बी.आर. आंबेडकर चौक, मुंबई - 400 001.

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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 119,589,903/- plus GST of INR 21,526,183/-

Total premium of INR 141,116,086/-

Paid in full prior to inception

Terrorism Cover

Insured: **DEENDAYAL PORT AUTHORITY**, (hereinafter referred as MPT) 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

**Insurance
Intermediary:** Marsh India Insurance Brokers Pvt. Ltd.

Risk Location: Insured Location addresses as under:

1. Administrative Office Building, Near Madhuban Hotel, Gandhidham, Kutch, Gujarat -370201

दि न्यू इन्डिया एश्योरन्स कं. लि.

(भारत सरकार का उद्यम)

बृहत कॉर्पोरेट एवं ब्रोकर्स कार्यालय : 920000

न्यू इन्डिया सेंटर, 11वीं मंजिल, 17/ए, कोपरगेज रोड,
डॉ. बी.आर. आंबेडकर चौक, मुंबई - 400 001.

फोन : 022-22044973 / 2204 4976 / 2204 4977 / 2204 4974



THE NEW INDIA ASSURANCE CO. LTD.

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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



370210.

2. Custom Bounded Area Port of Kandla –

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 : 22° 44' N ; Longitude
: 69° 67' E

8. Port Colony, Vadinar-361010 – Latitude : 23° 01' N ;
Longitude : 70° 13' E

Occupancy:

Marine Port

Cover:

Terrorism and Sabotage with third party liability limit

Period:

24th July 2023 to 23rd July 2024

Total Insured Values:

Property Damage and handling equipment-
INR 57,304,306,727.

Sections 4

Indemnity Period: 2 Months

Annual Revenue – INR 23,478,594,000

Annual Gross Profit – INR 22,159,394,000

Loss limit – INR 100,00,00,000

Limit:

Combined Single Limit for Property Damage, handling equipment
and Business Interruption – INR 673,00,00,000

Third party liability limit of INR 40,00,00,000

Combined Single Limit for Property Damage, handling equipment
and Business Interruption and liability – INR 713,00,00,000

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

पंजीकृत एवं प्रधान कार्यालय : न्यू इन्डिया एश्योरन्स बिल्डींग, 87, महात्मा गांधी रोड, फोर्ट, मुंबई - 400 001.

Regd. & Head Office : New India Assurance Bldg, 87, Mahatama Gandhi Road, Fort, Mumbai - 400 001.

Website : www.newindia.co.in

CIN : L66000MH1919GOI000526

दि न्यू इन्डिया एश्योरन्स कं. लि.

(भारत सरकार का उद्यम)

बृहत कॉर्पोरेट एवं ब्रोकर्स कार्यालय : 920000

न्यू इन्डिया सेंटर, 11वीं मंजिल, 17/ए, कोपरगेज रोड,
डॉ. बी.आर. अंबेडकर चौक, मुंबई - 400 001.

फोन : 022-22044973 / 2204 4976 / 2204 4977 / 2204 4974



THE NEW INDIA ASSURANCE CO. LTD.

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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



Total Premium: INR 1,720,634/- plus GST of INR 309,714/- totaling to
INR 2,030,348/-

Thanking you,

The New India Assurance Co. Ltd.

K. Chavan



Authorized Signatory

ANNEXURE – E

**Grant of Permission of Non Hazardous waste (Authorized
Recycler)**



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

One Time Authorization as importer for importing Non-Hazardous waste under Part - D of Schedule - III on behalf of actual users.

(See Rule-13)(2)(C)

The authorization is hereby granted to **V. K. Enterprise** having IEC No. **ACAPN6790N** Located at **2, Plot No.16, Sector 1/A, Shakti Nagar Road, Gandhidham, Kutch-370201** for import of the following waste listed in part D of schedule III of Hazardous and Other Waste (M&TM) Rules-2016.

Sr.No.	Description of Non Hazardous waste to be imported.
1.	Iron and Steel Scrap, Brass Scrap, Aluminium Scrap, Copper Scrap, Zinc Scrap-500MTPA(Under B-1010, Part-D of Schedule - III of Hazardous and Other Waste (M&TM) Rules-2016)

Specific condition;

1. Unit shall strictly comply with all the conditions mentioned in Memorandum of Understanding No.KC0000733176 dated 01/04/2021.
2. The Applicant / Importer shall have to submit Performa Invoice within 30 days from the date of issue of this letter.

The authorization is subjected to following conditions:

- 1 The import is permitted only for sale to actual users/manufactures who are registered & have valid consent & Authorization of the State Pollution Control Board/Pollution Control Committee
- 2 In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous and Other Waste (M&TM) Rules-2016, the waste has to be **re-exported by the importer** at his own cost within a period of 90 days from the date of its arrival in India.
- 3 The importer of the hazardous and other wastes shall maintain records of the hazardous and other waste imported by him in Form 3 and the record so maintained shall be made available for inspection.
- 4 The importer of the hazardous and other wastes shall file an annual return in **Form 4** to the State Pollution Control Board on or before the **30th day of June** following the financial year to which that return relates.

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5. The Board reserves right to cancel/amend/Revoke the authorization at any point of time as per the provision of Hazardous and Other Waste (M&TM) Rules-2016 and subsequent amendment thereof.
6. The importers shall have to comply with the provisions of the Environment protection Act, 1986 and the Rules made therein.
7. The importers shall comply with the provisions of Hazardous and Other Waste (M&TM) Rules-2016 in line with EPA-1986.

For and on behalf of
Gujarat Pollution Control Board

D. M. Thaker
18/9/2021

Environment Engineer
Unit Head Hazardous Waste Cell

No. GPCB/HAZ-R-Kutch-332/ 60/158/

18 SEP 2021

Issued to:

V. K. Enterprise

2, Plot No. 16, Sector 1/A,

Shakti Nagar Road, Gandhidham,

Kutch-370725



GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN

Sector-10-A, Gandhinagar-382 010

Phone : (079) 23226295

Fax : (079) 23232156

Website : www.gpcb.gov.in

TRUE COPY

By R.P.A.D

One Time Authorization as importer for importing Non-Hazardous waste under Part - D of Schedule - III on behalf of actual users.

(See Rule-13)(2)(C)

The authorization is hereby granted to **Green Earth Marine Solutions** having IEC No. **CIOPS1894Q** Located at **Office No.202, Plot No.578, Ward 12/c, Second Floor, Shakti Avenue, Gandhidham, Kutch-370201** for import of the following waste listed in part D of schedule III of Hazardous and Other Waste (M&TM) Rules-2016.

Sr. No.	Name and Basel No. of Other Waste as per the SCHEDULE-III, Part-D of Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016	Quantity (Ton/Annum)	List and detailed address of actual or prospective users
1.	Iron and Steel Scrap [B-1010]	600 MTPA	V M Industries (GPCB ID 13236) Plot No.210/3, Shramjivi Vasahat, Opp. Rajendra Park, Rakhiyal, Ahmedabad
2.	Copper Scrap [B-1010]	1000 MTPA	Jayshree Agro Industries (GPCB ID 11910), Plot No.1211, GIDC Dholka, Ahmedabad

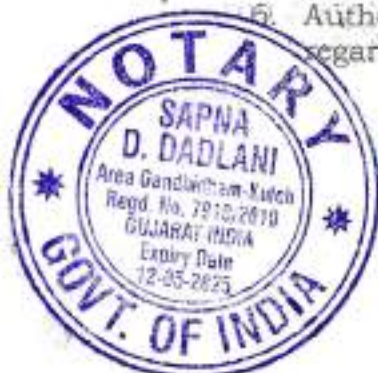
This authorization is granted as per the provisions of clause (c) of sub-rule (2) of rule 13, of Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.

This authorization is subject to the following general and specific conditions:-

1. Unit shall strictly comply with all the conditions mentioned in Memorandum of Understanding No.KC0031050896-897 dated 25/01/2022.
2. The Applicant / Importer shall have to submit Performa Invoice within 30 days from the date of issue of this letter.
3. The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986 (29 of 1986), and the rules made there under.
4. This authorization shall be produced for inspection at the request of an officer authorized by the State Pollution Control Board.
5. The person authorized shall not import, store and trade in the imported other wastes other than those wastes permitted through this authorization.
6. Authorized person shall intimate the State Pollution Control Board regarding change in the storage location or closure of storage facility.

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7. The waste which gets generated during storage and trading of imported other wastes shall be treated and disposed of as per prevailing regulations.
8. The importer shall bear the cost of import and mitigation of damages if any caused during the process of import, storage and trading.
9. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or the Central Pollution Control Board, as the case may be, from time to time.
10. Annual return as per FORM 4 shall be filed by June 30th for the period ensuring 31st March of the year.
11. The Authorized Trader shall be responsible to obtain other statutory permissions as may be required.
12. The import is permitted only for sale to actual users/manufactures who are registered & have valid consent & Authorization of the State Pollution Control Board/Pollution Control Committee.
13. In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous and Other Waste (M&TM) Rules-2016, the waste has to be re-exported by the importer at his own cost within a period of 90 days from the date of its arrival in India.
14. The importer of the hazardous and other wastes shall maintain records of the hazardous and other waste imported by him in Form 3 and the record so maintained shall be made available for inspection.
15. The Board reserves right to cancel/amend/Revoke the authorization at any point of time as per the provision of Hazardous and Other Waste (M&TM) Rules-2016 and subsequent amendment thereof.

For and on behalf of
Gujarat Pollution Control Board

D. M. Thaker
2/2/2022
(D. M. Thaker)

Environment Engineer
Unit Head Hazardous Waste Cell

02 FEB 2022

COLOUR XEROX

- 9 FEB 2022

TRUE COPY

Sapna B. Dadlani
(SAPNA B. DADLANI)
ADVOCATE & NOTARY
Gandhidham-Kutch

No.GPCB/HAZ-R-Kutch-366/ 622139

Issued to:

Green Earth Marine Solutions

Office No.202, Plot No.578, Ward 12/c,
Second Floor, Shakti Avenue, Gandhidham,
Kutch-370201





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

One Time Registration as importer for importing Non-Hazardous waste under Part - D of Schedule - III on behalf of actual users.

(See Rule-16)

The registration is hereby granted to **Chitrakut Trading and Industries** having **IEC No. 3714001654** Located at **Ranko, Ward-29, Navawas, Madhapar, Bhuj, Kutch-370020** for import of the following waste listed in part D of schedule III of Hazardous waste (Management, Handling & Transboundary Movement) Rules-2008 read with third amendment dated 30/3/2010.

Sr. No.	Description of Non Hazardous waste to be imported.
1.	Aluminum Scrap, Iron & Steel Scrap, Copper Scrap, Zinc Scrap, Brass Scrap @ 80000 MTPA Under B-1010, Part-D of Schedule - III

The registration is subjected to following conditions:

- 1 The import is permitted only for sale to actual users/manufactures who are registered & have valid consent & Authorization of the State Pollution Control Board/Pollution Control Committee.
- 2 The registered trader shall have to submit the details of such import and particulars of actual users along with quantities to this Board on a **quarterly basis** as per prescribed format enclosed herewith as Annexure - A and registration would be liable for cancellation on failure to furnish these details/quarterly report to this Board.
- 3 In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous waste (Management, Handling & Transboundary Movement), Third Amendment Rules 2010, the waste has to be **re-exported by the importer** at his own cost within a period of 90 days from the date of its arrival in India.
- 4 The Board reserves right to cancel/amend/Revoke the registration at any point of time as per the provision of Hazardous waste (M,H&TM) Rules - 2008 and subsequent amendment thereof.

28 OCT 2022

TRUE COPY

MLJ

(MADHUKANT J. SHAH)
B.Com., LL.B.(Sp.)
ADVOCATE & NOTARY
Gandhidham (Kutch) 370201, India

Clean Gujarat Green Gujarat

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5. The importers shall have to comply with the provisions of the Environment protection Act, 1986 and the Rules made therein.
6. The Importer shall strictly adhere with Environmental stipulation of Hazardous Waste (Management & Handling) Rules, 2008 in line with EPA-1986.

For and on behalf of
Gujarat Pollution Control Board


(V. R. Ghadge)

Senior Environmental Engineer

No.GPCB/HAZ-R-Kutch-171/ 230610

14 NOV 2014

Issued to:

✓ Chitrakut Trading and Industries
Ranko, Ward-29, Navawas,
Madhapar, Bhuj,
Kutch-370020

TRUE COPY

28 OCT 2012


(MADHUKANT J. SHAH)
B.Com., LL.B.(Sp.)
ADVOCATE & NOTARY
Gandhidham (Kutch) 370201, India



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

One Time Authorization as importer for importing Non-Hazardous waste under Part - D of Schedule - III on behalf of actual users.

(Sec Rule-13)(2)(C)

The authorization is hereby granted to **Golden Shipping Services** having IEC No. **3716500208** Located at **Kidana Nirmal Nagar, Survey No.133, Plot No.83, Kidana, Kutch-370205** for import of the following waste listed in part D of schedule III of Hazardous and Other Waste (M&TM) Rules-2016.

Sr. No.	Name and Basel No. of Other Waste as per the SCHEDULE-III, Part-D of Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016	Quantity (Ton/ Annüm)	List and detailed address of actual or prospective users
1.	Iron and Steel Scrap [B-1010]	600 MTPA	Vega Alloys (GPCB ID 44804) S.No.22/1 & 2, Maglana-364240, Tal: Sihor, Dist: Bhavnagar

This authorization is granted as per the provisions of clause (c) of sub-rule (2) of rule 13, of Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.

This authorization is subject to the following general and specific conditions:-

1. Unit shall strictly comply with all the conditions mentioned in Memorandum of Understanding No.KC0033840599 dated 07/05/2022.
2. The Applicant / Importer shall have to submit Performa Invoice within 30 days from the date of issue of this letter.
3. The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986 (29 of 1986), and the rules made there under.
4. This authorization shall be produced for inspection at the request of an officer authorized by the State Pollution Control Board.
5. The person authorized shall not import, store and trade in the imported other wastes other than those wastes permitted through this authorization.
6. Authorized person shall intimate the State Pollution Control Board regarding change in the storage location or closure of storage facility.
7. The waste which gets generated during storage and trading of imported other wastes shall be treated and disposed of as per prevailing regulations.
8. The importer shall bear the cost of import and mitigation of damages if any caused during the process of import, storage and trading.



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30 MAY 2022

(MADHUKANT J. SHAH)
B.Com., LL.B.(Sp.)
ADVOCATE & NOTARY
Gandhidham (Kutch) 370201, India.

9. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or the Central Pollution Control Board, as the case may be, from time to time.
10. Annual return as per FORM 4 shall be filed by June 30th for the period ensuring 31st March of the year.
11. The Authorized Trader shall be responsible to obtain other statutory permissions as may be required.
12. The import is permitted only for sale to actual users/manufactures who are registered & have valid consent & Authorization of the State Pollution Control Board/Pollution Control Committee.
13. In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous and Other Waste (M&TM) Rules-2016, the waste has to be re-exported by the importer at his own cost within a period of 90 days from the date of its arrival in India.
14. The importer of the hazardous and other wastes shall maintain records of the hazardous and other waste imported by him in Form 3 and the record so maintained shall be made available for inspection.
15. The Board reserves right to cancel/amend/Revoke the authorization at any point of time as per the provision of Hazardous and Other Waste (M&TM) Rules-2016 and subsequent amendment thereof.

For and on behalf of
Gujarat Pollution Control Board

D. M. Thaker
17/5/2022

(D. M. Thaker)
Environment Engineer
Unit Head Hazardous Waste Cell

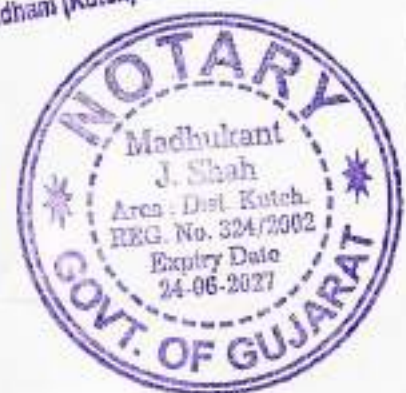
No.GPCB/HAZ-R-Kutch-374/ 672663

Issued to:
Golden Shipping Services
Kidana Nirmal Nagar, Survey No.133,
Plot No.83, Kidana,
Kutch-370205

18 MAY 2022

TRUE COPY
30 MAY 2022

MADHUKANT J. SHAH
B.Com., LL.B.(Sp.)
ADVOCATE & NOTARY
Gandhidham (Kutch) 370201, India.





GUJARAT POLLUTION CONTROL BOARD

Paryavaran Bhavan

Sector-10-A, Gandhinagar-382 010.

Phone : (079) 23226295

Fax : (079) 23232156

Website : www.gpcb.gov.in

RPAD

Registration as importer for importing on behalf of actual users.

(See Rule-16)

The registration is hereby granted to M/s. **Harish A. Pandya** having IEC No.3700000260 Located at Office No.15, Brahm Samaj Building, Plot No.106, Sector-08, B/H-Oslo Cinema, Gandhidham For import of the following waste listed in part-B of Schedule III of Hazardous waste (Management, Handling & Transboundary Movement) Rules, 2008.

Description of waste	Quantity of Waste to be Imported
All kind of ferrous & non ferrous scrap under B-1010 Of Schedule-III Alluminium Scrap Stainless steel scrap Copper scrap - Zink scrap - Brass Scrap	80,000MT/Annum

The registration is subjected to following conditions:

- 1 The import is permitted only on behalf of actual users, registered traders who have valid consent & Authorization of the Gujarat Pollution Control Board.
- 2 The importer shall submit the quarterly report stating the details of import including the names of actual users and quantity of waste to the Board.
- 3 In case of illegal import or import other than mentioned in Part-B of Schedule-III of the Hazardous waste (Management, Handling & Tran boundary Movement) Rules, 2008, the waste has to be re-exported by the importer at his own cost within a period of 90 days from the date of its arrival in India.



TRUE COPY
11 JAN 2023
(MADHUKANT J. SHAH)
B.Com., LL.B.(Sp.)
ADVOCATE & NOTARY
Gandhidham (Kutch) 370201, India.



GUJARAT POLLUTION CONTROL BOARD

Paryavaran Bhavan

Sector-10-A, Gandhinagar-382 010.

Phone : (079) 23226295

Fax : (079) 23232156

Website : www.gpub.gov.in

- 4 The Board reserves right to cancel/amend/Revoke the registration/Authorization at any time as per the policy of the Board/ Government
- 5 The importers shall comply with the provisions of the Environment protection Act, 1986 and the Rules made there under.

For and on behalf of
Gujarat Pollution Control Board

(R. C. Tamboli)
Environment Engineer

GPCB/Haz/R/Kutch-39/ 68612 /2010

Issued to:

M/s **Harish A. Pandya**
Office No.15,Brahm Samaj Building,
Plot No.106, Sector-08,
B/H-Oslo Cinema,
Gandhidham

1 APR 2010



TRUE COPY
11 JAN 2023
(MADHUKANT J. SHAH)
B.Com., LL.B.(Sp.)
ADVOCATE & NOTARY
Gandhidham (Kutch) 370201, India



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

One Time Authorization as importer for importing Non-Hazardous waste under Part - D of Schedule - III on behalf of actual users.

(See Rule-13)(2)(C)

The authorization is hereby granted to **New India Marine Works** having IEC No. **3712001673** Located at **Plot No.378, Ward 11-A, Bharat Nagar, Gandhidham, Kutch-370201** for import of the following waste listed in part D of schedule III of Hazardous and Other Waste (M&TM) Rules-2016.

Sr.No.	Name and Basel No. of Other Waste as per the SCHEDULE-III, Part-D of Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016	List 'and detailed address of actual or prospective users	Quantity (Ton/Annum)
1.	Aluminium Scrap [B-1010]	Pyramid Industries,	3000MTPA
2.	Zinc Scrap [B-1010]	Survey No.322 paiki 1, NR B.V. Oil Mill, Chhatral Kadi Road, Vill:Indrad, Tal: Kadi, Dist: Mehsana	3000MTPA
3.	Brass Scrap [B-1010]	Indu Extrusion &	1000MTPA
4.	Copper Scrap [B-1010]	Alloys Pvt Ltd, Plot No.3657/58, GIDC Phase-III, Dared, Jamnagar	1000MTPA
5.	Iron and Steel Scrap [B-1010]	Sardar Casting Pvt Ltd, 15, Plot No.6,7,8, Kangasiyali Road, Gondal Road, Vavdi, Rajkot	1000MTPA

This authorization is granted as per the provisions of clause (c) of sub-rule (2) of rule 13, of Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.

This authorization is subject to the following general and specific conditions:-

1. Unit shall strictly comply with all the conditions mentioned in Memorandum of Understanding No.KC0019531774, KC0017892708-709 dated 05/01/2022, 17/01/2022.
2. The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986 (29 of 1986), and the rules made there under.
3. This authorization shall be produced for inspection at the request of an officer authorized by the State Pollution Control Board.

4. The person authorized shall not import, store and trade in the imported other wastes other than those wastes permitted through this authorization.
5. Authorized person shall intimate the State Pollution Control Board regarding change in the storage location or closure of storage facility.
6. The waste which gets generated during storage and trading of imported other wastes shall be treated and disposed of as per prevailing regulations.
7. The importer shall bear the cost of import and mitigation of damages if any caused during the process of import, storage and trading.
8. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or the Central Pollution Control Board, as the case may be, from time to time.
9. Annual return as per FORM 4 shall be filed by June 30th for the period ensuring 31st March of the year.
10. The Authorized Trader shall be responsible to obtain other statutory permissions as may be required.
11. The import is permitted only for sale to actual users/manufactures who are registered & have valid consent & Authorization of the State Pollution Control Board/Pollution Control Committee.
12. In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous and Other Waste (M&TM) Rules-2016, the waste has to be re-exported by the importer at his own cost within a period of 90 days from the date of its arrival in India.
13. The importer of the hazardous and other wastes shall maintain records of the hazardous and other waste imported by him in Form 3 and the record so maintained shall be made available for inspection.
14. The Board reserves right to cancel/amend/Revoke the authorization at any point of time as per the provision of Hazardous and Other Waste (M&TM) Rules-2016 and subsequent amendment thereof.

For and on behalf of
Gujarat Pollution Control Board

D. M. Thaker
19/01/2022

(D. M. Thaker)
Environment Engineer
Unit Head Hazardous Waste Cell

No. GPCB/HAZ-R-Kutch-363/21336

Issued to:

New India Marine Works
Plot No.378, Ward 11-A, Bharat Nagar,
Gandhidham. Kutch-370201

19 JAN 2022



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

One Time Authorization as importer for importing Non-Hazardous waste under Part - D of Schedule - III on behalf of actual users.

(See Rule-13(2)(C))

The authorization is hereby granted to **K M Enterprise** having IEC No. **BGJPH6692D** Located at **Plot No.63, Ward-3B, Adipur, Gandhidham, Kutch-370201** for import of the following waste listed in part D of schedule III of Hazardous and Other Waste (M&TM) Rules-2016.

Sr.No.	Description of Non Hazardous waste to be imported.
1.	Iron and Steel Scrap, Brass Scrap, Aluminium Scrap, Copper Scrap, Zinc Scrap-200MTPA (Under B-1010, Part-D of Schedule-III of Hazardous and Other Waste (M&TM) Rules-2016)

Specific condition:

1. Unit shall strictly comply with all the conditions mentioned in Memorandum of Understanding No.KC0001032237 dated 06/03/2021.
2. The Applicant / Importer shall have to submit Performa Invoice within 30 days from the date of issue of this letter.

The authorization is subjected to following conditions:

- 1 The import is permitted only for sale to actual users/manufactures who are registered & have valid consent & Authorization of the State Pollution Control Board/Pollution Control Committee.
- 2 In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous and Other Waste (M&TM) Rules-2016, the waste has to be **re-exported by the importer** at his own cost within a period of 90 days from the date of its arrival in India.

3 The importer of the hazardous and other wastes shall maintain records of the hazardous and other waste imported by him in Form 3 and the record so maintained shall be made available for inspection.

4 The importer of the hazardous and other wastes shall file an annual return in **Form 4** to the State Pollution Control Board on or before **30th day of June** following the financial year to which the return relates.

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(U. K. JOSHI)
NOTARY
DIST. KUTCH- (GUJARAT)
Reg. No 5848

Clean Gujarat Green Gujarat

ISO - 9001 - 2008 & ISO - 14001 - 2004 Certified Organization



- 5 The Board reserves right to cancel/amend/Revoke the authorization at any point of time as per the provision of Hazardous and Other Waste (M&TM) Rules-2016 and subsequent amendment thereof.
- 6 The importers shall have to comply with the provisions of the Environment protection Act, 1986 and the Rules made therein.
- 7 The Importer shall strictly adhere with Environmental stipulation of Hazardous and Other Waste (M&TM) Rules-2016 in line with EPA-1986.

For and on behalf of
Gujarat Pollution Control Board

D. M. Thaker
10/3/2021

(D. M. Thaker)

Environment Engineer
Unit Head Hazardous Waste Cell

No.GPCB/HAZ-R-Kutch-327/58557

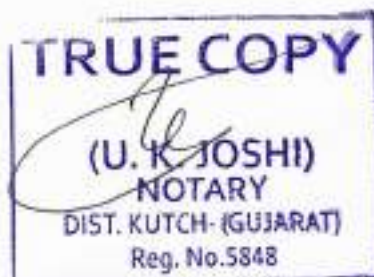
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K M Enterprise
Plot No.63, Ward-3B,
Adipur, Gandhidham,
Kutch-370201

Copy to:

i. Regional Officer,
Kutch (East)



GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN

Sector 10-A, Gandhinagar 382010

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website : www.gpcb.gov.in

By R.P.A.D

One Time Registration as importer for importing Non-Hazardous waste under Part - D of Schedule -III on behalf of actual users.

(See Rule-16)

The registration is hereby granted to **Naaz Shipping Services Enterprise** having IEC No. **3707001466** Located at **Off.No-35, 1st Floor, Grain Merchant Assn. Building, Plot No-297, Ward 12/B, Gandhidham Kutch 370201** for import of the following waste listed in part D of schedule III of Hazardous waste (Management, Handling & Trans boundary Movement) Rules-2008 read with third amendment dated 30/3/2010.

Sr.No.	Description of Non Hazardous waste to be imported.
1.	Iron & Steel Scrap @ 50,000 MTA Under B-1010, Part-D of Schedule - III

Specific condition;

The Applicant / Importer shall have to submit the following details within 7(seven) days or else registration shall be treated as cancelled without prior intimation.

1. Copy of ID proof of the Proprietor of the Company, Pancard etc.

The registration is subjected to following conditions:

- 1 The import is permitted only for sale to actual users/manufacturers who are registered & have valid consent & Authorization of the Gujarat Pollution Control Board.
- 2 The registered trader shall have to submit the details of such import and particulars of actual users along with quantities to this Board on a **quarterly basis** as per prescribed format enclosed herewith as Annexure - A and registration would be liable for cancellation on failure to furnish these details/quarterly report to this Board.
- 3 In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous waste (Management, Handling &

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R.L.GADHI
ADVOCATE & NOTARY
Gandhidham-Kutch

Transboundary Movement), Third Amendment Rules 2010, the waste has to be **re-exported by the importer** at his own cost within a period of 90 days from the date of its arrival in India.

4. The Board reserves right to cancel/amend/Revoke the registration at any point of time as per the provision of Hazardous waste (M,H&TM) Rules – 2008 and subsequent amendment thereof.
5. The importers shall have to comply with the provisions of the Environment protection Act, 1986 and the Rules made therein.
6. The Importer shall strictly adhere with Environmental stipulation of Hazardous Waste (Management & Handling) Rules, 2008 in line with EPA-1986.

For and on behalf of
Gujarat Pollution Control Board

W. R. Patel
(V. R. Patel)
Senior Environment Engineer

GPCB/HAZ-R-KUTCH-124/130332

17 NOV 2012

Issued to:

Naaz Shipping Services Enterprise

Off.No-35, 1st Floor, Grain Merchant Assn. Building,

Plot No-297, Ward 12/B, Gandhidham

Kutch-370201

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R.L.GADHVI
ADVOCATE & NOTARY
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By R.P.A.D

One Time Authorization as importer for importing Non-Hazardous waste under Part - D of Schedule - III on behalf of actual users.

(See Rule-13)(2)(C)

The authorization is hereby granted to **Omega Marine Services** having **IEC No. 3713001812** Located at **Office No.2, Bhraham Samaj Building, Plot No.106, Sector-8, Gandhidham, Kutch-370201** for import of the following waste listed in part D of schedule III of Hazardous and Other Waste (M&TM) Rules-2016.

Sr.No.	Description of Non Hazardous waste to be imported.
1.	Iron and Steel Scrap-50000MTFA [Under B-1010, Part-D of Schedule - III of Hazardous and Other Waste (M&TM) Rules-2016]

Specific condition:

1. Unit shall strictly comply with all the conditions mentioned in Memorandum of Understanding No.86029169441 dated 06/08/2020.
2. The Applicant / Importer shall have to submit Performa Invoice within 30 days from the date of issue of this letter.

The authorization is subjected to following conditions:

- 1 The import is permitted only for sale to actual users/manufactures who are registered & have valid consent & Authorization of the State Pollution Control Board/Pollution Control Committee.
- 2 In case of illegal import or import other than mentioned in Part-D of Schedule-III of the Hazardous and Other Waste (M&TM) Rules-2016, the waste has to be **re-exported by the importer** at his own cost within a period of 90 days from the date of its arrival in India.

The importer of the hazardous and other wastes shall maintain records of the hazardous and other waste imported by him in Form 3 and the record so maintained shall be made available for inspection.

The importer of the hazardous and other wastes shall file an annual return in **Form 4** to the State Pollution Control Board on or before the **30th day of June** following the financial year to which that return relates.

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(PANKAJ J. JOSHI)
MUTUAL (Gandhinagar-6-20-20)



[Handwritten signature]

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- 5 The Board reserves right to cancel/amend/Revoke the authorization at any point of time as per the provision of Hazardous and Other Waste (M&TM) Rules-2016 and subsequent amendment thereof.
- 6 The importers shall have to comply with the provisions of the Environment protection Act, 1986 and the Rules made therein.
- 7 The Importer shall strictly adhere with Environmental stipulation of Hazardous and Other Waste (M&TM) Rules-2016 in line with EPA-1986.

For and on behalf of
Gujarat Pollution Control Board

D. M. Thaker
13/8/2020

(D. M. Thaker)
Environment Engineer
Unit Head Hazardous Waste Cell

No.GPCB/HAZ-R-Kutch-305/ 565808

13 AUG 2020

Issued to:

Omega Marine Services

Office No.2, Bhraham Samaj Building,
Plot No.106, Sector-8, Gandhidham,
Kutch-370201

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Shri
(PANKAJ J. JISHI)
HEADY (Gandhidham-Kutch)



Shri

ANNEXURE – F

Mangrove Conservation Plan

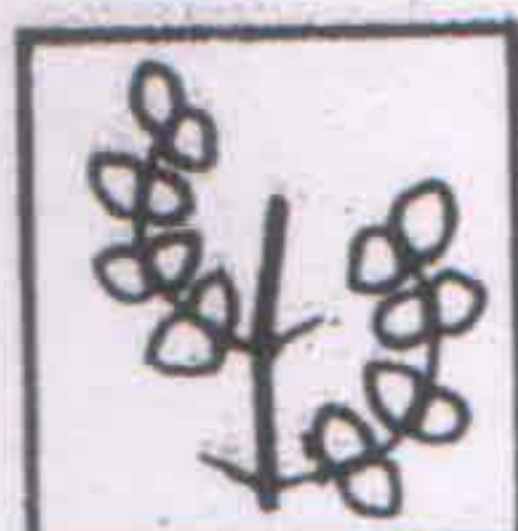
Study on present status, Conservation and Management Plan for mangroves of Kandla Port Region



GUJARAT INSTITUTE OF DESERT ECOLOGY

**Post Box # 83, Opp. Changleshwar Temple,
Mundra Road
Bhuj – Kachchh, Gujarat**

R.V. Asari, IFS (Rtd.)
Director



Gujarat Institute of Desert Ecology

17.08.2015

Certificate

Kandla Port Trust has extensive mangrove formations within its port limits. In order to study different ecological characters of these mangroves and to draw a scientific conservation and management plan, Kandla Port Trust approached Gujarat Institute of Desert Ecology, Bhuj for undertaking an environmental assessment of the mangrove formations with regard to its ecological status, which included baseline documentation, forest structure and a detailed conservation and management plan. Thus, GUIDE undertook this study and carried out field surveys, and sampling in representative mangrove stands in order to prepare this report.

This report presents various ecological status of mangrove formations within Kandla Port area and suggest a detailed conservation and management plan to be considered by the port authorities for execution. This project report forms a baseline document indicating the baseline status and conservation plan for the mangroves which could be used to ensure long term conservation and management of Kandla Port mangroves.

R.V. Asari
Director, GUIDE

Project Personnel

Principal Investigator

Dr. G. A. Thivakaran – Senior Principal Scientist

Co-Investigators

Dr. G. Thirumaran

Dr. Rachna Chandra

Research Scholars

Mr. Dayesh Parmer

Mr. NithulLal

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1. INTRODUCTION:

Kandla Port is located in the Gulf of Kachchh on the northwest coast of India about 430 nautical miles northwest of the Port of Mumbai (Bombay) at the Latitude of 23° 01' N and Longitude of 70° 13' E on the shoreline of the Kandla Creek. The Kandla creek runs into the Gulf of Kachchh, approximately at a distance of 90 nautical miles from the Arabian Sea. The width of the channel varied between 200 meters to 1,000 meters. It is a leading port of India by capacity of cargo handled. Kandla Port as one of India's busiest major port, is gearing to add substantial cargo handling capacity with private sector participation. It handled 72.225 million tonnes of cargo in 2008-09, over 11% more than 64.9 million tonnes handled in 2007-08. At present, Kandla Port handled 87.005 MMTPA Cargo during 2013-2014 and 92.5 MMTPA during the financial year of 2014-2015. Against this capacity, a total of 87.005 MMTPA was handled at Kandla Port resulting in berth occupancy exceeding 80% at general cargo berths in 2013-14. Consecutively, to reduce the pressure on the existing berths and increase the capacity of dry and liquid cargo handling, Kandla Port Trust has developed new Barge Jetty at Tuna, Khori Creek and a new Oil Jetty at old Kandla. Other project for strengthening and upgrading existing facilities at Kandla Port is on the anvil.

Mangroves are a conspicuous ecological entity within Kandla Port area. Similar to other forest ecosystem they discharge multiple ecological services such as production of woody trees; provision of habitat, food, and nursery/spawning grounds for fin-fish and shellfish; provision of habitat for birds and other valuable fauna; protection of coastlines and accretion of sediment to form new land. There are also many economic benefits from mangrove resources; like as a source of firewood, self-replenishing area of fishery resources, for collecting honey and for tourism.

1.1 Origin of the Study:

Due to the major port activities and accompanying development, mangroves within the premises of KPT have possible for its vegetation structure modification over the years. Consequently, conservation and management of this mangrove formation has become imperative and an environmental responsibility of the Kandla

port authority. In view of the continued port expansion and development, Department of Forest and Environment, Government of Gujarat (GOG), Gandhinagar has mandated KPT to investigate the current ecological status of mangroves in the KPT premises through proper scientific assessment and formulate long term conservation and management plan. Kandla Port authorities assigned the task of investigating the mangrove ecology within the port jurisdiction to Gujarat Institute of Desert Ecology (GUIDE), Bhuj. The present study aims to come out with a sound conservation and management plan for mangroves of Kandla Port based on intensive field visits, analyzing the existing management practices of the port *vis-à-vis* mangroves and plantation and other conservation activities carried out by port authorities under different projects of the port.

1.2 Objective of the Present Study:

Suggesting management different management options with a view to conserve mangrove ecosystem within Kandla Port premises on a long term basis is the major objective of the present study. The present investigation is instituted with the following objectives.

1. This study aims to investigate thoroughly the present status of mangroves in terms of vegetation structure such as density, diversity, height, canopy dimensions and younger classes along with governing physical and chemical features of mangroves formations falling within the legal boundary of Kandla Port at Kandla, Gandhidham taluka of Kachchh.
2. Suggest a detailed plan for a holistic and long term management and conservation in order to ensure the long term wellbeing of mangroves of Kandla Port.
3. Review the mangrove plantation carried out so far by the port authorities, future mangrove plantation/rehabilitation plan, monitoring actions to be initiated in order to conserve/preserve the mangrove stands which will ward-off stand degradation in future.

4. Quantify the mangrove extent in terms of dense, sparse and other allied land cover such as mudflats, salt works, water etc by the application of GIS and RS technique.

2. STUDY AREA DESCRIPTION:

2.1 Location:

Kandla port is located in the northern coast of gulf of Kachchh (GoK) almost at its tail end (Map 2.1). Being in the arid zone, annual rainfall within the geographical range of Kandla Port is poor ranging from 250-350 mm which is often irregular. Mean rainfall (1932 to 2001) was 387 and 378 mm in the Gandhidham taluka where Kandla is located. Rain during monsoon is confined to only 15-20 days and occurs as an instant downpour. The weak monsoonal rainfall and high rate of evaporation not only make the area arid but also causes elevation in seawater salinity. Freshwater input into the near coastal waters is quite meagre and appears to have least influence on the ambient coastal water quality except during monsoon months, during which flash floods are discharged in the near coastal waters. Throughout the year, the winds are light to moderate in the Gulf except during late summer and southwest monsoon periods. Stronger winds are also encountered with the disturbances such as depressions and cyclones. Winter and summer temperatures range from 7- 48°C with a yearly average humidity of 60% which increases to 80% during south-west monsoon and decreases to 50% during November-December. Average wind speed is 4.65 m/s with a maximum wind speed of 10.61 m/s during June. Tides in the port environment are mixed, predominantly semidiurnal type with Mean High Water Spring (MHWS) of 6.66 m and Mean High Water Neap (MHWN) of 5.17 m. Mangroves within the port limits are predominantly composed of *Avicennia marina*, a species known for its high tolerance of water salinity and other environmental stresses with sporadic distribution of *Ceriops tagal*.

Kandla is a seaport in Kachchh district of Gujarat state in western India which runs into the Gulf of Kachchh at a point about 90 nautical miles from the Arabian Sea. One the major ports on west coast, Kandla was constructed in the 1950 as the chief seaport serving western India. The total length of the Kandla Port approach channel is

about 23 Km High tidal influences with low turnover time characterize Kandla creek. Kandla creek ($22^{\circ} 55'$ - $23^{\circ} 5'$ N and $70^{\circ} 05'$ - $70^{\circ} 02'$ E) is one of the major creeks along the NW coast of India supplying water to the inner GoK which is an east- west oriented indentation. GoK is 75km wide at the mouth and after running about 170km away from the Arabian sea towards east, narrows down into a constriction at $70^{\circ} 20'$ E at Sathsaida Bet and then bifurcates into a creek system called the Little Rann. The Little Rann has a network of so many small and large creeks, intermingled with marshy tidal flats rich in fine clays. Kandla creek is one of the major tributaries of this creek system, which empties into the inner GoK. Two large creeks , Sara and Phang creeks join the Kandla creek and act as its tributaries. Nakti creek also joins the confluence of Sara and Phang creeks. All these creeks bring water from the Little Rann into Kandla creek, which has a fairly good depth and stable banks. The width of the creek channel varies from 200 m in the upstream to 1000m at the mouth and the depth varies from 8 to 12 m, while the tidal height ranges from 0.83 to 7.2m, with tidal currents varying from 0.08 to 2 m/s (Sinha *et al.* 2006)

Kandla port is located along the western bank of Kandla creek. The protruding Indus River brings heavy sediment load into the creek lowering its primary productivity. Sampling site at Kandla is located around 100 m away from the oil jetty of the port. Ongoing expansive drive of the port and establishment of many SEZs in and around the nearby Gandhidham Township has provided renewed impetus for this coastal town to proliferate further. Various industrial- chemical manufacturing units, fertilizer- manufacturing industry (IFFCO), salt manufacturing units with salt pans rich in brines occur around the Kandla creek. There are a total of six jetties in the creek used by the KPT, Indian Oil and IFFCO for handling liquid bulks, POL, fertilizers, raw materials, industrial chemicals, iron and steel, food grains, metal and its products, mineral ore and other dry cargo, etc. The port facilitates extensive traffic of oil tankers, freighters, passenger cargo vessels, ore carriers, fishing boats and container vessels in Kandla creek. Presence of a major port with heavy vessel traffic activities are temporarily disturb the creek water quality. These activities generate different types of waste , which act as potential sources of contamination. Irrespective

of their source of contribution, these contaminants from natural as well as human activities are ultimately disturb the creek water quality.



Figure 2.1: Shows the location map of the study area

2.2 Study Period:

The present field study for KPT mangrove monitoring was carried out in January 2015 to April 2015.

3. VEGETATION STRUCTURE OF MANGROVES:

Mangroves are the most important salt tolerant trees of the intertidal areas (Kathiresan and Bingham, 2001). It is one of the most productive and bio-diverse wetlands on earth. Inhabiting the inter-tidal areas and estuary mouths between land and sea, mangroves provide critical habitat for a diverse marine and terrestrial flora and fauna. They normally grow poorly in stagnant waters and have luxuriant growth in the alluvial soil substrates with fine textured loose mud or silt. The diversity variability features of mangroves that occur within the inundated areas such as creeks, mudflats, salt-flats, or partially forested areas with dwarfed or sparsely distributed trees.

Vegetation structure is determined by the species diversity, relative densities of constituent species, overall density of the stand, basal area that represents the size of the plant girth and height. The vegetation structure of mangroves provides an indication of its functional capacity which has a bearing on fisheries, forestry and global climate due to its high carbon sequestration potential (Ong et al., 1993).

3.1 Methodology:

The vegetation structure of the present investigation was carried out at diverse representative sites of mangrove formations within the legal boundary of Kandla Port. Generally, KPT mangrove formations can be classified dense and sparse mangroves. Vegetation structure assessment was carried out during low tides by quadrat method by laying plots of 10 × 10m (Figure 3.1). For assessing the mangrove formations along the creeks systems, a fishing boat was used. In total, twenty one random sampling was carried out in the mangrove formations of the port premises representing different landscapes like dense mangroves and sparse mangroves in order to render the sampling truly representative. In each plot, the total numbers of mature trees along with the corresponding height (Figure 3.2), canopy dimension and tree girth-GBH (Figure 3.3) were recorded. At few places, Point Centre Quarter method was also used for the density assessment (Cottam et al. 1953).



Figure 3.1: Analysis of density by using 10 x 10 m quadrat



Figure 3.2: Measurement of tree height



Figure 3.3: Measurement of tree girth

To enumerate younger classes such as regeneration and recruitment classes, subplots of 1×1 m and 2×2 m were laid randomly in all the bigger plots of 10 × 10m. Younger plants less than 50 cm are considered as regeneration class and recruitment class represents the well established saplings which are more than 50cm but less than 1m tall. Density of mature trees, regeneration and recruitment class for each station was expressed as number per hectare (No/ha) extrapolating the data obtained for lesser units. Frequency class was analyzed in order to distinguish the location wise distribution, diversity, structure and composition of different age classes like tree height, GBH, canopy length and canopy width.

3.2 Result:

Overall vegetative structural characteristics of mangroves such as density, height, GBH and regeneration class, recruitment class and frequency classes (in order to distinguish the location wise common vegetation structure, composition of different age and growth classes) recorded in the Kandla Port premises are presented in table 3.1 and 3.2, respectively.

3.2.1 Mangrove Diversity:

During the entire study period (January to April 2015) *Avicenna marina* was the most predominant species with the sporadic occurrence of *Cereops tagal* and *Rhizophora mucronata*. In only one study site *Aegiceros corniculatum* was observed out of the study quadrat. Mangrove diversity of KPT region is comparatively higher than any other mangroves patches of Kachchh coast.

3.2.2 Mangrove Density:

The cumulative average mature tree density of 4124/ha was recorded from 21 sampling locations (Table 3.1). The occurrence of highest density of 7800tree/ha was recorded at 23°10'41.6"N; 70°35'35.4"E. as, the site is located near the water front receiving good tidal waters. Least mature tree density of 1500 trees/ha was estimated at 23° 08' 13.2" N; 70° 18' 19.8" E. Generally, recorded mature tree density is comparable with other healthy mangrove formations of Gulf of Kachchh (Thivakaran *et al.*, 2003).

3.2.3 Tree Height:

Mangrove stands of Kandla port showed significant variation in tree height. The overall average height of the mangroves at 21 sampled locations was 254 cm with the highest plant height of 391 cm recorded at the location 23° 02' 24.9 N; 70° 13' 45.4 E (Table 3.1). The overall height frequency of the mangrove stands from 21 sampling locations, revealed that the majority of the mangrove stands fall in the height class of 51-150 cm (Figure 3.4).

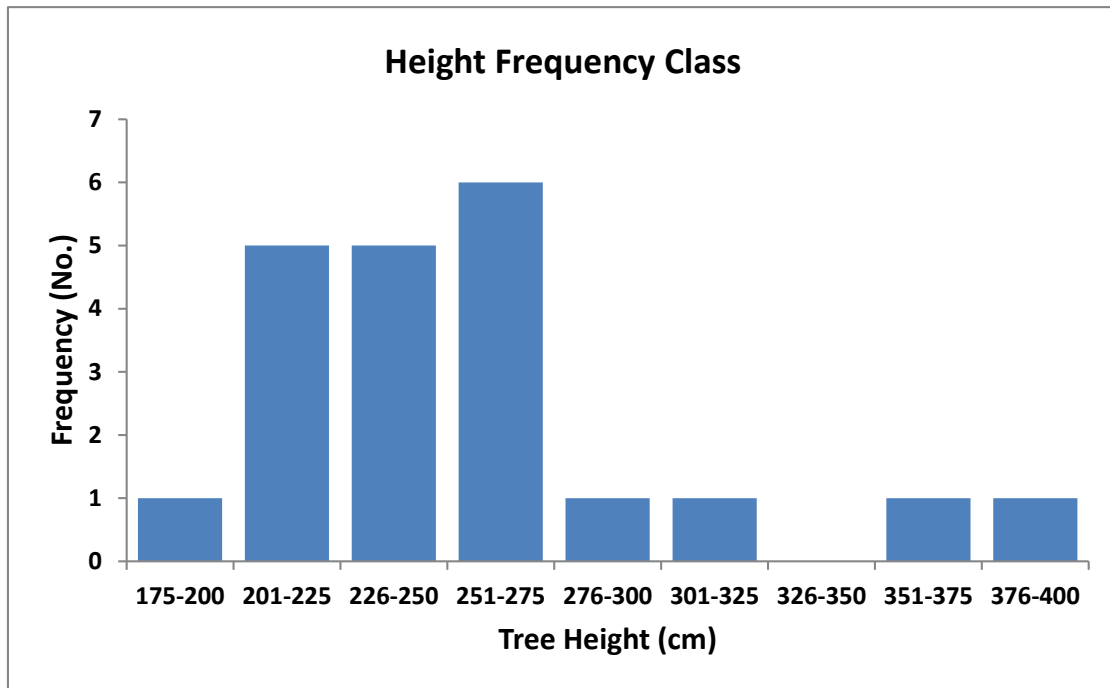


Figure 3.4: Height frequency class of sampled mangrove stands at KPT

3.2.4 Tree Girth (Girth at Breast Height-GBH):

Average tree girth (circumference) of mature trees at 21 sites ranged from 33.5 cm to 53 cm. The overall average girth based on the mean of all the 21 plots was 40.4cm (Table 3.1). During the present study very few transect showed the girth ranges of 34 and 39 cm at $23^{\circ} 03' 41.1''$ N; $70^{\circ} 15' 27.5''$ E; $23^{\circ} 02' 48.3''$ N; $70^{\circ} 13' 34.0''$ E, respectively. Majority of the mangrove girth were in the frequency class of 5.1 to 10cm (Figure 3.5).

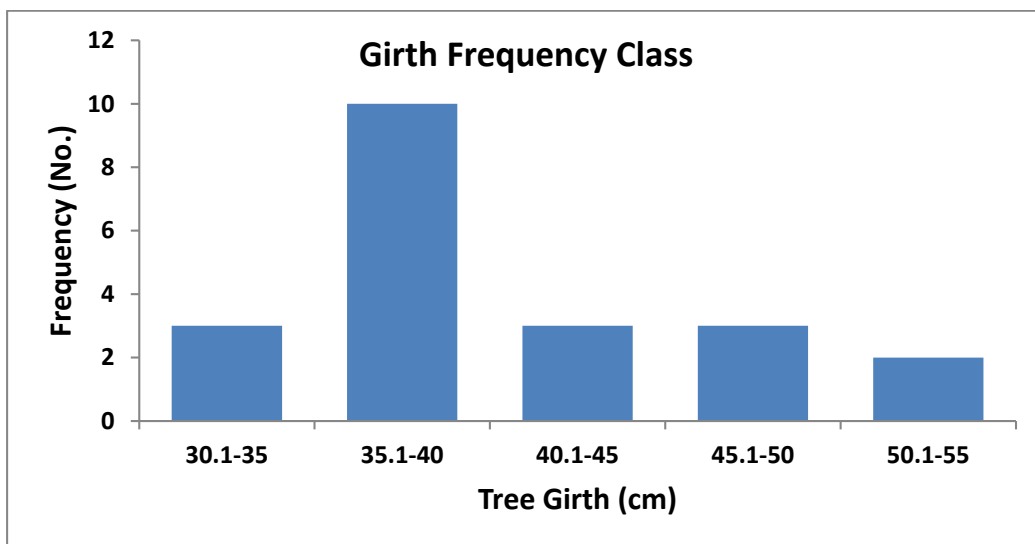


Figure 3.5: GBH frequency class of sampled mangrove stands at KPT

3.2.5 Canopy Length (cm):

Average canopy length of mangrove was assessed at 21 sampled plots which varied from 159.5 cm to 325 cm. Cumulative average value canopy length based on the mean value of all the plots was 222.9 cm (Table 3.1). The coordinates of KPT at 23° 05'07.1N;70° 16' 25.2 E showed few trees with highest canopy length. The overall canopy length frequency class of all the mangrove formations exhibited that majority of the mangrove stands fall in the ranges of 51-100 cm (Figure 3.6).

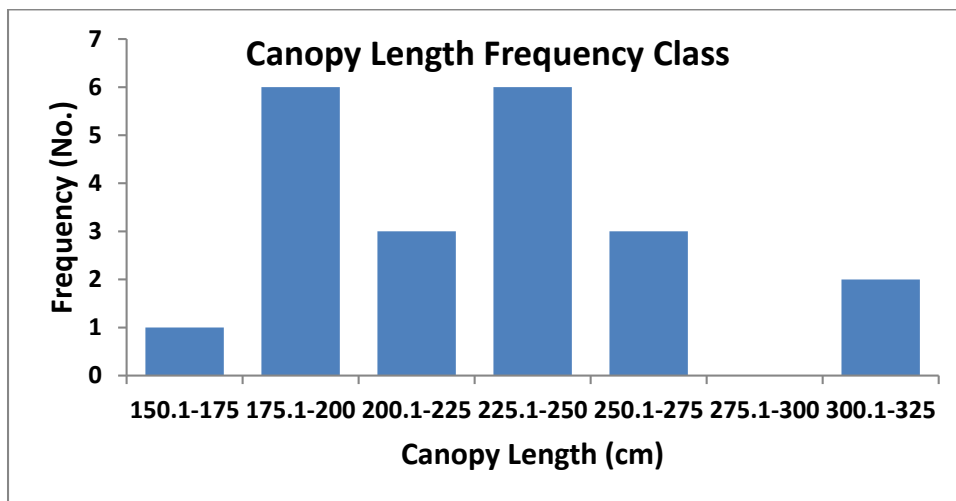


Figure 3.6: Canopy length frequency class of sampled mangrove stands at KPT

3.2.6 Canopy Width (cm):

Average canopy width of the mangrove studied at various plots ranged from 154 cm to 289.5 cm. The overall average canopy width of all the studied sampling plots was 208.4cm (Table 3.1). Mangroves at the coordinates 23° 05' 10.4 N; 70° 16' 25.2 E showed highest canopy width. The cumulative canopy width frequency of all the plots fall in the range of 51 to 100 cm (Figure 3.7).

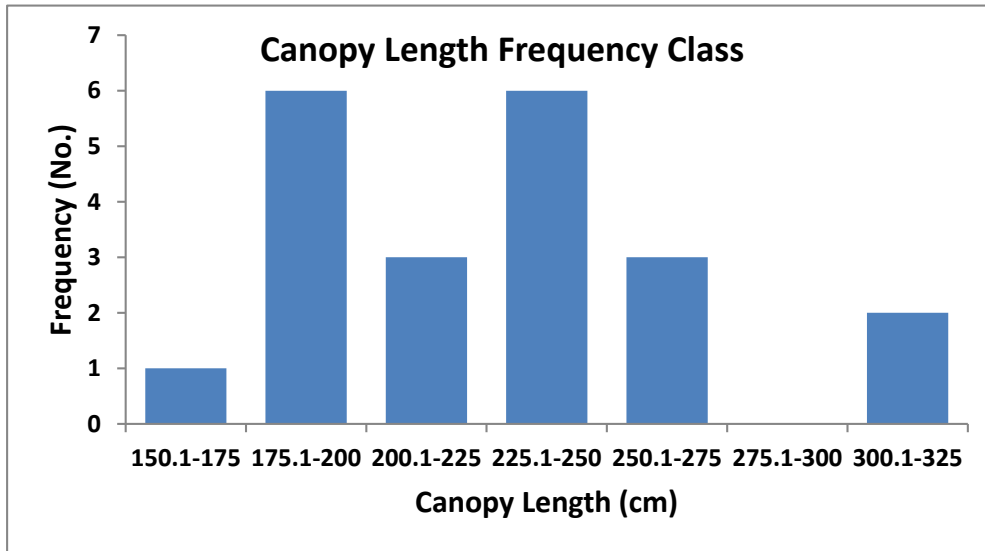


Figure 3.7: Canopy width frequency class of sampled mangrove stands at KPT

Table 3.1: Mangrove vegetation structure and classification carried out during the study

S. NO	GPS Coordinates	Density/ha	Height (cm)			Girth (cm)			Canopy Length (cm)			Canopy Width (cm)		
			Min	Max	Ave.	Min	Max	Ave.	Min	Max	Ave.	Min	Max	Ave.
1	23° 03' 41.1" N;70° 15' 27.5" E	3300	193	537	365	40	66	53	168	443	305.5	146	417	281.5
2	23° 02' 48.3" N ;70° 13' 34.0" E	2200	167	328	247.5	38	53	45.5	147	327	237	125	319	222
3	23° 02' 24.9" N; 70° 13' 45.4" E	3800	208	574	391	41	61	51	193	457	325	168	411	289.5
4	23° 01' 58.8" N ;70° 15' 27.5" E	3400	196	326	261	31.8	41.3	36.55	185	345	265	157	328	242.5
5	23° 01' 52.5" N; 70° 15' 29.1" E	2400	210	293	251.5	29	44	36.5	132	223	177.5	127	211	169
6	23° 02' 5.9" N ; 70° 16' 00.7" E	6800	157	274	215.5	30	47	38.5	98	263	180.5	89	243	166
7	23° 03' 45.3" N; 70° 13'37.21" E	3200	197	335	266	40	51	45.5	165	290	227.5	149	273	211
8	23° 06' 55.6" N ;70° 16' 36.7" E	7500	157	375	266	29	50	39.5	132	187	159.5	127	181	154
9	23° 06' 55.0" N; 70° 16'25.5" E	3500	154	261	207.5	28	53	40.5	130	233	181.5	119	239	179
10	23° 06' 52.5" N; 70° 16' 25.5" E	2100	159	335	247	28	49	38.5	138	307	222.5	126	293	209.5
11	23° 08'13.2" N ;70° 18'19.8" E	1500	183	302	206	31	44	37.5	156	295	225.5	143	282	212.5
12	23° 08' 20.9" N; 70° 18' 16.6" E	2100	165	247	213.5	28	39	33.5	139	218	178.5	127	203	165
13	23° 08' 29.7" N ;70° 18' 17.8" E	3500	157	270	192.5	29	40	34.5	134	242	188	122	219	170.5
14	23° 05' 03.5" N; 70° 16' 18.0" E	2800	155	230	272	28	40	34	136	215	175.5	124	209	166.5
15	23° 05'07.1" N ;70° 16'23.8" E	3400	154	390	280.5	28	48	38	128	375	251.5	111	347	229
16	23° 05' 10.4" N; 70° 16' 25.2" E	6800	166	395	243	28.5	65	46.75	132	383	257.5	124	369	246.5
17	23° 10' 35.9" N ;70° 35' 28.2" E	5900	159	330	238.5	29	50	39.5	142	327	234.5	131	314	222.5
18	23° 10' 38.6" N; 70° 35' 31.3" E	5700	162	324	269.5	30	48	39	145	294	219.5	128	281	204.5
19	23° 10' 30.6" N; 70° 35' 28.3" E	6200	163	314	254.5	30	50	40	142	311	226.5	135	303	219
20	23° 10' 36.5" N ;70° 35' 39.0" E	2700	165	374	229.5	33	55	44	151	257	204	139	244	191.5
21	23° 10' 41.6" N; 70° 35' 35.4" E	7800	160	349	214.5	28	46	37	148	332	240	129	324	226.5
Overall mean		4124	171	341	254	31	49.5	40.4	144.8	301.1	222.9	130.7	286.1	208.4

3.2.7 Regeneration Class:

The cumulative average density of regenerating mangroves from 21 sampled locations exhibited 24286 plants/ha (Table 3.2), which ranged from 3300 plants/ha to 100000 plants/ha. The present investigation showed that regeneration potential of mangroves in the KPT premises is good. This regeneration result indicated that the study site is healthy environment for potential mangrove growth and further succession. The co-ordinates are closure to the water front (23° 06' 55.6" N; 70° 16' 36.7) shows maximum number of regenerating mangroves.

3.2.8. Recruitment Class:

The overall average of recruitment class in the study area was 8888 plants/ha which varied from 1000 to 56600 plants/ha (Table 3.2). The recruitment class of present study was lower than mature tree density at KPT premises due to canopy covering and the resulting low exposure to sunlight. The mature tree density and younger classes (recruitment and regeneration) at Kandla port surroundings show higher regeneration potential of the mangroves. Density Investigation of younger classes like regeneration and recruitment classes are generally indicate that future vegetation structure of the mangrove will be extended. At the coordinate 23° 06' 55.6" N; 70° 16' 36.7 mature tree to regeneration and recruitment classes ratio is high which indicating the healthiness of the stand and its ability to perpetuate the stand characteristics in future.

In general, majority of the sampled plots shows less floral associates. Only at few plots the floral associates like *Sueda*, *Salicornia* sp. and *Salvadora* sp. are present.

Table 3.2: Regeneration and Recruitment details of the sampling points.

S. No.	GPS	Species	Regeneration/ha	Recruitment Class/ha
1	23° 03' 41.1" N; 70° 15' 27.5" E	<i>A. marina</i>	17000	9000
2	23° 02' 48.3" N 70° 13' 34.0" E	<i>A. marina</i>	11000	7500
3	23° 02' 24.9" N 70° 13' 45.4" E	<i>A. marina</i>	38000	13000
4	23° 01' 58.8" N 70° 15' 27.5" E	<i>A. marina</i>	13300	5000
5	23° 01' 52.5" N 70° 15' 29.1" E	<i>A. marina</i>	6600	8350
6	23° 02' 5.9" N 70° 16' 00.7" E	<i>A. marina</i>	40000	5000
7	23° 03' 45.3" N 70° 13' 37.21" E	<i>A. marina</i>	86600	10000
8	23° 06' 55.6" N 70° 16' 36.7" E	<i>A. marina</i>	100000	8300
9	23° 06' 55.0" N ; 70° 16' 25.5" E	<i>A. marina</i>	6600	5000
10	23° 06' 52.5" N ;70° 16' 25.5" E	<i>A. marina</i>	6600	1600
11	23° 08' 13.2" N ;70° 18' 19.8" E	<i>A. marina</i>	3300	1600
12	23° 08' 20.9" N ;70° 18' 16.6" E	<i>A. marina</i>	3300	1000
13	23° 08' 29.7" N ;70° 18' 17.8" E	<i>A. marina</i>	6600	1600
14	23° 05' 03.5" N ;70° 16' 18.0" E	<i>A. marina</i>	6600	3300
15	23° 05' 07.1" N ;70° 16' 23.8" E	<i>A. marina</i>	6600	1600
16	23° 05' 10.4" N ;70° 16' 25.2" E	<i>A. marina</i>	16600	3300
17	23° 10' 35.9" N ;70° 35' 28.2" E	<i>A. marina</i>	60000	5000
18	23° 10' 38.6" N ;70° 35' 31.3" E	<i>A. marina</i>	55000	6600
19	23° 10' 30.6" N ;70° 35' 28.3" E	<i>A. marina</i>	10000	3300
20	23° 10' 36.5" N ;70° 35' 39.0" E	<i>A. marina</i>	8300	30000
21	23° 10' 41.6" N ;70° 35' 35.4" E	<i>A. marina</i>	8000	56600
Cumulative Average			23423.81	8888

4. PHYSICO-CHEMICAL PARAMETERS:

4.1 Introduction:

Range of physico-chemical parameters determines the creek water quality and assessing these parameters are essential in order to understand the governing factors of mangrove environment (Reddi et al., 1993). The mangrove system plays a major role in the global cycle of carbon, nitrogen and sulphur and acts as reservoirs of waste materials (Kathiresan and Bingham 2001; Kathiresan, 2000). Many works are available on the physical and chemical characters of some Indian estuaries and mangroves (Satpathy, 1996; Govindasamy et al., 2000; Rajasekar et al., 2003 and Asha and Diwakar 2007). Salinity, redox potential, pH and sulphide concentration in pore-water parameters play key roles in the development of mangroves and their spatial distributions. To cope with the variation of these properties, mangroves have developed many adaptations that give them wide ranges of tolerance. Additionally, climate, tidal flooding, vegetation evolution, bioturbation and organic matter content are parameters that also contribute to the complexity of the geochemistry of mangrove soil. The physico-chemical parameters like pH, pore-water salinity, sediment texture and Total Organic carbon (TOC) are direct indicators for the healthiness of mangrove stands and also influence vegetation structure of mangroves. In the present attempt some vital parameters that influence the mangrove vegetation structure have been studied and presented below.

4.2 Methodology:

4.2.1 Water Analysis:

Standard protocols (APHA, 1995) were followed for the sample collection and analysis. Water samples were collected using sterile polyethylene containers. Salinity (ppt- ‰) was estimated using a pre-calibrated Refractometer (Aatago–Japan). Collected pore water was analyzed for pH and Salinity.

4.2.2 Sediment Analysis:

Sediment samples of 1 kg weight were collected from random locations; two from each transect to cover the entire study area. The sediment texture was determined by the *Sand- Silt- Clay method* which is based on the particle size distribution after sieving the soil using grading sieves. The sediment texture results are expressed in percentage.

4.2.3 Pore-Water Analysis:

The pore water samples were collected from the random locations of the study site. About 20 cm pit was dug using a spade and water was allowed to seep inside the pit. The clean water in the pit was collected using a syringe from the surface to avoid sediment deposition (Figure 4.1).



Figure 4.1: Collection of Pore-water samples in the sampled locations of KPT

pH was measured in situ using a pre-calibrated handheld pH meter (Hanna make) and the salinity was determined by a Refractometer (Fisher Scientific). The basic nutrients (Nitrate, Nitrite and Phosphate) were determined within 6 hours of sampling. For all analysis protocol given in *Standard methods for the examination of*

water and wastewater, 17th Ed. by American Public Health Association (APHA, 1995) was followed.

4.3 Result:

4.3.1 Salinity:

Seawater salinity is the most important factor that determines many life processes of mangrove ecosystem. The surface water salinity concentration of the 21 sampled mangrove stands varied from 35 to 43‰ with an overall average value of 38.95‰ (Table 4.1). The surface salinity was maximum (43 ‰) at 23° 01' 58.8" N 70° 15' 27.5" E. The recorded values of surface salinity are very common in the mangrove ecosystem of Kachchh.

The pore water salinity of the present investigation ranged from 47 to 62‰ with an overall average value of 53.71 ‰. Pore-water salinity is uneven in all the 21 sampled locations of KPT. The pore water salinity was found to be maximum at 23° 05' 10.4" N 70° 16' 25.2" E. Pore-water salinity in general is influenced by tidal pattern.

4.3.2 Hydrogen Ion Concentration:

The water pH value was varied from 7.1 to 7.8 with a cumulative average value of 7.4. The pH concentration of the present study was maximum at 23° 06' 52.5" N 70° 16' 25.5" E. The pore-water pH ranged from 7.9 to 8.7 with a cumulative average value of 8.21 (Table 4.1). The pore-water pH concentration is always higher than surface water pH which is very common in the mangrove environment.

Table 4.1: Physico-Chemical parameters of water in the sampled locations of KPT

Sample No	Sampling Co-Ordinates	Temperature-°C		Salinity		pH	
		Surface Water	Porewater	Surface Water	Porewater	Surface Water	Porewater
S1	23° 03' 41.1" N; 70° 15' 27.5" E	29	22	38	54	7.4	8.3
S2	23° 02' 48.3" N; 70° 13' 34.0" E	28.5	23.8	37	52	7.2	8.1
S3	23° 02' 24.9" N; 70° 13' 45.4" E	31.3	23.6	42	58	7.7	8.5
S4	23° 01' 58.8" N; 70° 15' 27.5" E	28	25.2	40	55	7.3	8.2
S5	23° 01' 52.5" N; 70° 15' 29.1" E	30.8	25.5	43	60	7.6	8.5
S6	23° 02' 5.9" N; 70° 16' 00.7" E	29	25.3	36	51	7.2	8.0
S7	23° 03' 45.3" N; 70° 13' 37.21" E	31.2	28.2	35	47	7.6	8.5
S8	23° 06' 55.6" N; 70° 16' 36.7" E	28.2	25.5	37	49	7.3	8.1
S9	23° 06' 55.0" N; 70° 16' 25.5" E	30.8	23.8	41	54	7.5	8.2
S10	23° 06' 52.5" N; 70° 16' 25.5" E	29.5	25.5	40	53	7.8	8.7
S11	23° 08' 13.2" N; 70° 18' 19.8" E	27.8	25.7	40	51	7.4	8.1
S12	23° 08' 20.9" N; 70° 18' 16.6" E	30	25	38	48	7.1	7.9
S13	23° 08' 29.7" N; 70° 18' 17.8" E	29.5	23	39	54	7.5	8.3
S14	23° 05' 03.5" N; 70° 16' 18.0" E	28.5	23.6	36	55	7.2	8.0
S15	23° 05' 07.1" N; 70° 16' 23.8" E	28.6	23	38	54	7.4	8.1
S16	23° 05' 10.4" N; 70° 16' 25.2" E	28.9	25.7	42	62	7.7	8.5
S17	23° 10' 35.9" N; 70° 35' 28.2" E	29.8	28.9	40	57	7.3	8.1
S18	23° 10' 38.6" N; 70° 35' 31.3" E	30.9	26.8	41	54	7.4	8.0
S19	23° 10' 30.6" N; 70° 35' 28.3" E	29.2	23	38	52	7.6	8.4
S20	23° 10' 36.5" N; 70° 35' 39.0" E	28	23.2	39	53	7.2	7.9
S21	23° 10' 41.6" N; 70° 35' 35.4" E	29.5	24.3	38	55	7.1	8.0
Cumulative Average		29.38	24.79	38.95	53.71	7.4	8.21

4.3.3 Nutrient Concentration:

During the present study, nutrient concentration was determined by estimating the nitrite, nitrate and phosphate. Nitrite concentration ranged from 0.1 to 0.9 mg/L with an overall average of 0.635 mg/L. The nitrite concentration recorded maximum at 23° 05' 07.1" N 70° 16' 25.2" E, while the lower concentration was recorded at 23° 03' 45.3" N 70° 13' 37.21" E. Nitrate content of the present study varied from 0.9 to 1.9 mg/L with a cumulative average of 1.45 mg/L. The nitrate content at 23° 01' 52.5" N 70° 15' 29.1 shows highest level (1.9 mg/L) than that of all other sampled locations. Phosphate concentration ranged from 0.1 – 1.8 mg/L with an average of 0.75 mg/L with maximum at 23° 03' 45.3" N 70° 13' 37.21" E and minimum at 23° 08' 29.7" N 70° 18' 17.8" E. The recorded nutrient contents are sufficient to support the growth and vegetation structure of the KPT mangroves (Table 4.2).

Table 4.2: Pore-water nutrient concentration of in the KPT sampled locations

Sample ID	Location Coordinates	Nitrite (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)
S1	23° 03' 41.1" N; 70° 15' 27.5" E	0.4	1.4	0.8
S2	23° 02' 48.3" N; 70° 13' 34.0" E	0.2	1.5	0.6
S3	23° 02' 24.9" N; 70° 13' 45.4" E	0.6	1.2	1.3
S4	23° 01' 58.8" N; 70° 15' 27.5" E	0.3	1.0	1.1
S5	23° 01' 52.5" N; 70° 15' 29.1" E	0.2	0.9	0.9
S6	23° 02' 5.9" N; 70° 16' 00.7" E	0.2	1.4	1.1
S7	23° 03' 45.3" N; 70° 13' 37.21" E	0.1	1.2	1.8
S8	23° 06' 55.6" N; 70° 16' 36.7" E	0.8	1.9	1
S9	23° 06' 55.0" N; 70° 16' 25.5" E	0.1	1.6	0.8
S10	23° 06' 52.5" N; 70° 16' 25.5" E	0.6	1.2	0.6
S11	23° 08' 13.2" N; 70° 18' 19.8" E	0.8	1.0	0.4
S12	23° 08' 20.9" N; 70° 18' 16.6" E	0.7	1.4	0.2
S13	23° 08' 29.7" N; 70° 18' 17.8" E	0.7	1.4	0.1
S14	23° 05' 03.5" N; 70° 16' 18.0" E	0.8	1.8	0.8
S15	23° 05' 07.1" N; 70° 16' 23.8" E	0.9	1.6	1.3
S16	23° 05' 10.4" N; 70° 16' 25.2" E	0.2	1.2	1.5
S17	23° 10' 35.9" N; 70° 35' 28.2" E	0.5	1.4	0.8
S18	23° 10' 38.6" N; 70° 35' 31.3" E	0.4	1.5	1.1
S19	23° 10' 30.6" N; 70° 35' 28.3" E	0.8	1.8	1.0
S20	23° 10' 36.5" N; 70° 35' 39.0" E	0.8	1.3	0.8
9S21	23° 10' 41.6" N; 70° 35' 35.4" E	0.8	1.2	0.2
Cumulative Average		0.635	1.45	0.757

4.3.4. Sediment Quality:

4.3.4.1 Sediment Texture:

During the present investigation, sediment texture varied widely among all the 21 sampled stations. Sediment texture typically represents the percentage composition of sand, silt and clay. Percentage composition of sand was maximum 38.1% and minimum 20.5% at the coordinates of 23° 06' 55.0" N, 70° 16' 25.5" E; 23° 01' 52.5"

N, 70° 15'29.1" E; respectively (Table 4.3). Overall average of all the 21 study sites sand constituted 30.09%. The silt composition was maximum at the study site 23° 06' 55.6" N, 70° 16' 36.7" E (16.5%) followed by the site at of 23° 09' 5.9" N, 70° 16' 00.7" E (16.1%) and minimum at 23° 03' 41.1" N, 70° 15'27.5" E(7.6%) with a cumulative mean value of 11.89%. Percentage composition of clay varied from 47.3% to 64.6% with an average value of 58.02%. Higher composition of clay was recorded at 23° 01' 52.5" N, 70° 15'29.1" E. The cumulative average of the sediment indicated that in all the 21 sampled locations clay was the dominant fraction followed by silt and sand.

4.3.4.2 Total Organic Carbon:

The total organic carbon in the sediment ranged from 0.51% to 0.8% with a cumulative mean value of 0.644% (Table 4.3). The higher TOC value was recorded at the site at 23° 10' 41.6" N, 70° 35' 35.4" E (0.8%) followed by the site at 23° 10' 30.6" N, 70° 35' 35.4" E (0.75%) and it was lower at 23° 02' 5.9" N, 70° 16' 00.7" E (0.51%).

Table: Percentage of Sediment texture and TOC in the sampled locations of KPT

Sampling Point No.	Sampling Coordinates	Post-Monsoon Texture (%)			Total Organic Carbon (%)
		Sand	Silt	Clay	
S1	23° 03' 41.1" N; 70° 15' 27.5" E	31.1	7.6	61.3	0.6
S2	23° 02' 48.3" N; 70° 13' 34.0" E	35.5	11.6	52.9	0.525
S3	23° 02' 24.9" N; 70° 13' 45.4" E	33.1	10.9	56	0.6
S4	23° 01' 58.8" N; 70° 15' 27.5" E	29	15.8	55.2	0.712
S5	23° 01' 52.5" N; 70° 15' 29.1" E	20.5	15	64.5	0.675
S6	23° 02' 5.9" N; 70° 16' 00.7" E	26.9	16.1	57	0.51
S7	23° 03' 45.3" N; 70° 13' 37.21" E	23.2	12.2	64.6	0.6
S8	23° 06' 55.6" N; 70° 16' 36.7" E	28.9	16.5	54.6	0.58
S9	23° 06' 55.0" N; 70° 16' 25.5" E	38.1	10	51.9	0.8
S10	23° 06' 52.5" N; 70° 16' 25.5" E	32.3	15	52.7	0.721
S11	23° 08' 13.2" N; 70° 18' 19.8" E	37.5	15.2	47.3	0.628
S12	23° 08' 20.9" N; 70° 18' 16.6" E	22.6	14.1	63.3	0.538
S13	23° 08' 29.7" N; 70° 18' 17.8" E	30.1	8.7	61.2	0.6
S14	23° 05' 03.5" N; 70° 16' 18.0" E	33.2	9.8	57	0.712
S15	23° 05' 07.1" N; 70° 16' 23.8" E	29.2	9.5	61.3	0.52
S16	23° 05' 10.4" N; 70° 16' 25.2" E	31.0	11.2	57.8	0.6
S17	23° 10' 35.9" N; 70° 35' 28.2" E	26.5	11.5	62	0.728
S18	23° 10' 38.6" N; 70° 35' 31.3" E	29.2	9.5	61.3	0.73
S19	23° 10' 30.6" N; 70° 35' 28.3" E	28.6	10.6	60.8	0.75
S20	23° 10' 36.5" N; 70° 35' 39.0" E	32.2	9.3	58.5	0.61
S21	23° 10' 41.6" N; 70° 35' 35.4" E	33.1	9.5	57.4	0.8
Cumulative Average		30.09	11.89	58.02	0.644

4.3.5 Conclusion

Assessment of mangrove health through vegetation structure and its status and water and sediment quality in 21 sampling locations within the boundary of Kandla Port indicated that most of the governing physio-chemical parameters of mangrove formations are within the prescribed limits. Essential parameters like surface water and pore-water salinity of the present study are comparable with other mangrove environment are within the prescribed limits. The high level of salinity is mainly due to the arid condition of the zone and resulting high evapo-transpiration rates prevailing in Gulf of Kachchh waters.

The status of mangrove within Kandla Port premises were characterized by evaluating their vegetation structures such as stand density, diversity, Girth at Breast Height (GBH), Canopy length and canopy width cover in 21 sampled locations. During the present study, mangrove stand at $23^{\circ} 10' 41.6''$ N, $70^{\circ} 35' 35.4''$ E is structurally better than other stands. The cumulative average mature tree density of 4124 trees/ha recorded in all the 21 sampled stands indicated that this mangrove formations is structurally dense than other mangrove formations of Kachchh. Tree height in all the 21 sampled stands showed noticeable variation which ranged from 171 cm to 341 cm with an cumulative average of 254cm. Mangrove trees were considerably taller at $23^{\circ} 05' 07.1''$ N, $70^{\circ} 16' 23.8''$ E, which is higher than all other samplings stands of KPT. Mangroves had highest GBH of 26.5 at $23^{\circ} 02' 24.9''$ N, $70^{\circ} 13' 45.4''$ E. The canopy cover in mangroves of Kandla port is rather small and comparatively lesser than other formations of Kachchh. This is solely attributable to the prevailing ambience like high pore-water salinity and other natural factors. Overall average density of regeneration class from 21 sampling locations is 23423.81 plants/ha, which indicate that the regeneration potential of mangroves of Kandla Port is good. Similarly, overall average density of the next younger class namely recruitment class was equally good establishing the high regeneration potential of the mangrove formation. Density Investigation of younger classes like regeneration and recruitment classes of the present study generally indicated that vegetation structure of the mangroves has high potential to sustain its structural integrity in future.

5. MANGROVE LAND COVER STUDIES IN KPT AREA

5.1 Introduction:

Kachchh mangroves are the largest single stand in the west coast with the extent of 789sq.Km (FSI, 2009). An increase of 11 sq. km was reported from the earlier estimates (FSI, 2013). Harsh environmental settings like arid hinter land minimal rainfall (458mm/year) and extreme evapo-transpiration rate have rendered these mangrove formations to a single species stand comprising hardy *Avicennia marina*, though sporadic occurrence of other species such as *R. mucronata*, *C. tagal* and *A. corniculatum* has been reported in very few coastal stretches.

Gandhidham taluka of Kachchh district where Kandla port is located is estimated to have 61.97sq.km of mangroves (GEC&BISAG, 2009). In the present study dense and sparse mangrove formations within the jurisdiction of Kandla Port have been estimated to be around 13841.4ha (13234.2 ha area located in Kandla region). In the present GIS study, land-cover estimation of within the boundary of Kandla port was carried out to understand mangrove distribution.

Kandla Port Jurisdiction includes mainly Kandla port, Tuna port, Sat Saida bet and surrounding area of the port. Kandla creek on whose bank the port is located runs into the Gulf of Kachchh at a distance of 90 nautical miles from the port. The width of the channel varies from 200 meters to 1,000 meters. The contour depth along the shipping channel is around 10 meters. The study site falls under the coordinates of latitude between 23°12' 20.49"N to 23°53' 35.64"N and Longitude between 69°59' 35.64"E to 70°37' 51.40"E as given in Figure 5.1 (Annexure). It encompasses an approximate area of 120206.1 ha (1202.06 sq. km). This includes terrestrial and part of Gulf systems which fall within the port boundary.

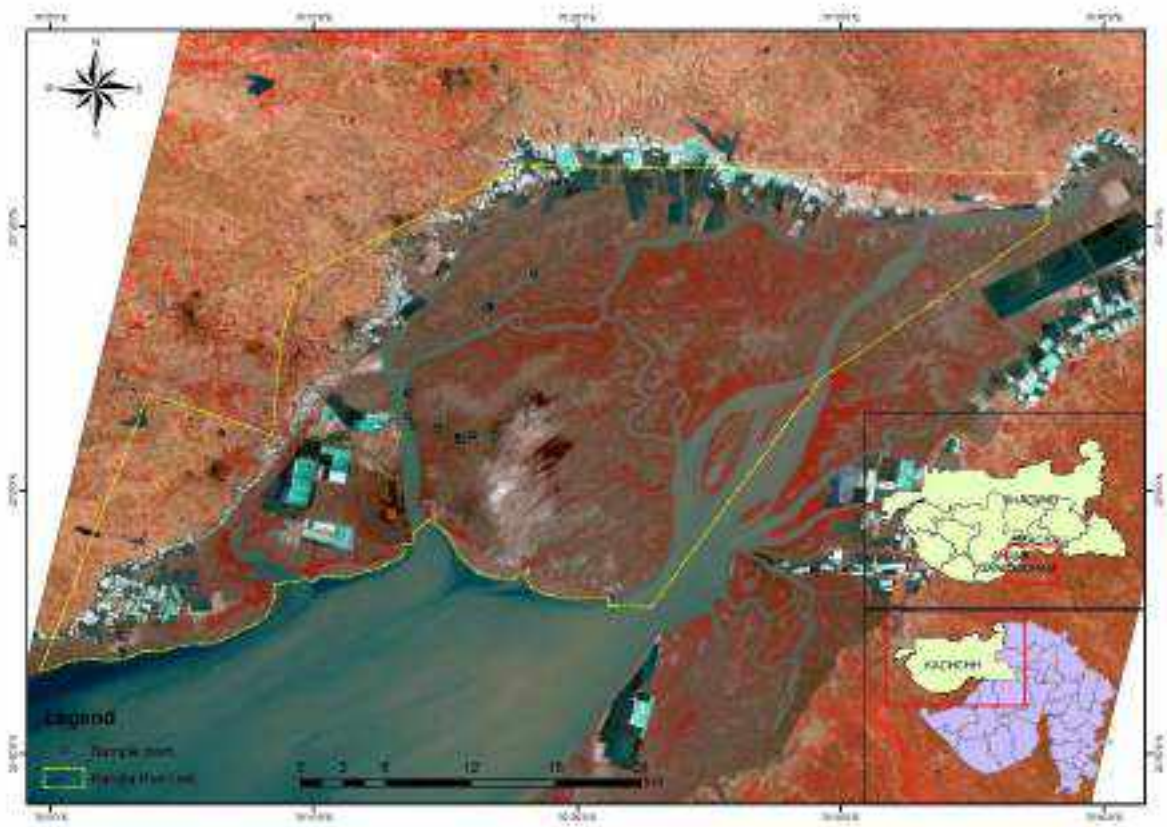


Figure 5.1: Sampling Points of Kandla Port Jurisdiction

5.2 GIS and Remote Sensing:

LISS 4 Satellite imagery of pre-monsoon season procured from NRSC, Hyderabad was used for the present study. The procured imagery has a resolution of 5.8 m with UTM projection with spheroid and datum named WGS 84 in UTM zone 42 north, which will meet the requirement of estimating the areal extent of mangroves within marked port limit area and its current status. Supervised Classification Method is applied to delineate the mangrove area and other natural areas. The details of the satellite imagery used are given below.

Satellite	Year	Month	Sensor	Bands	Pixel Resolution
IRS P6	2014	14,Dec	LISS 4	3	5.8 m

5.3 Pre-Processing:

Pre-processing of satellite data including geometric correction, atmospheric correction and radiometric correction and clipping of the area has been carried out. The rectification operation aims to correct distorted images to create a more faithful representation of the original scene. It typically involves the initial processing of raw image data to correct for geometric distortions.

5.3.1 Radiometric correction:

Radiometric correction addresses variations in the pixel intensities (DNs) that are not caused by the object or scene being scanned. These variations include differing sensitivities or malfunctioning of the detectors, topographic effects and atmospheric effects.

5.3.2 Geometric correction:

Geometric correction addresses errors in the relative positions of pixels. These errors are induced by sensor viewing geometry or terrain variations. Geometric correction was done based on Ground Control Points (GCPs) and the image was re-sampled using nearest neighborhood interpolation method.

5.3.3 Supervised classification:

Supervised classification can be defined normally as the process of sample of known identity to classify pixels of unknown identity. Samples of known identity are those pixels located within training areas. Pixels located within these areas term the training samples used to guide the classification algorithm to assigning specific spectral values to appropriate information class.

Preliminary surveys were conducted on the ground to collect training samples for different Land cover using Garmin GPS with the help of training sample, classification map was generated based on Maximum Likelihood Supervised Classification model using ERDAS Software.

5.4 Land Cover classification for 2014:

Land Cover as observed in the imagery of December 2014 was classified in 10 classes namely Dense mangrove, sparse mangrove, Saltpan, mudflat, other vegetation,

settlement, water, agriculture, fallow land and barren land. This imagery classification was supported by ground truthing through fieldwork as it is a very important to check and collect most of the ground information required for mapping.

Reconnaissance field survey was undertaken to get acquainted with the general land cover pattern of the area. Different patches of mangrove area characteristics were recorded. The variation and tonal patterns observed in the ground truthing was recorded on the existing images. Traverses along Kandla main creek and subordinates creek of Kandla, mangrove area, saline area, saltpan and other vegetation was made for ground truthing the patterns and characters recorded in the image. Various features identified in the ground truthing were correlated with the image element and GPS observations was obtained for various land cover by superimposing on the satellite image.

5.5 Result:

5.5.1 Land Cover Mapping:

The land cover map based on supervised classification of LISS IV December 2014 is given in Fig.5.2 and the area analysis of land cover is given in hectares.

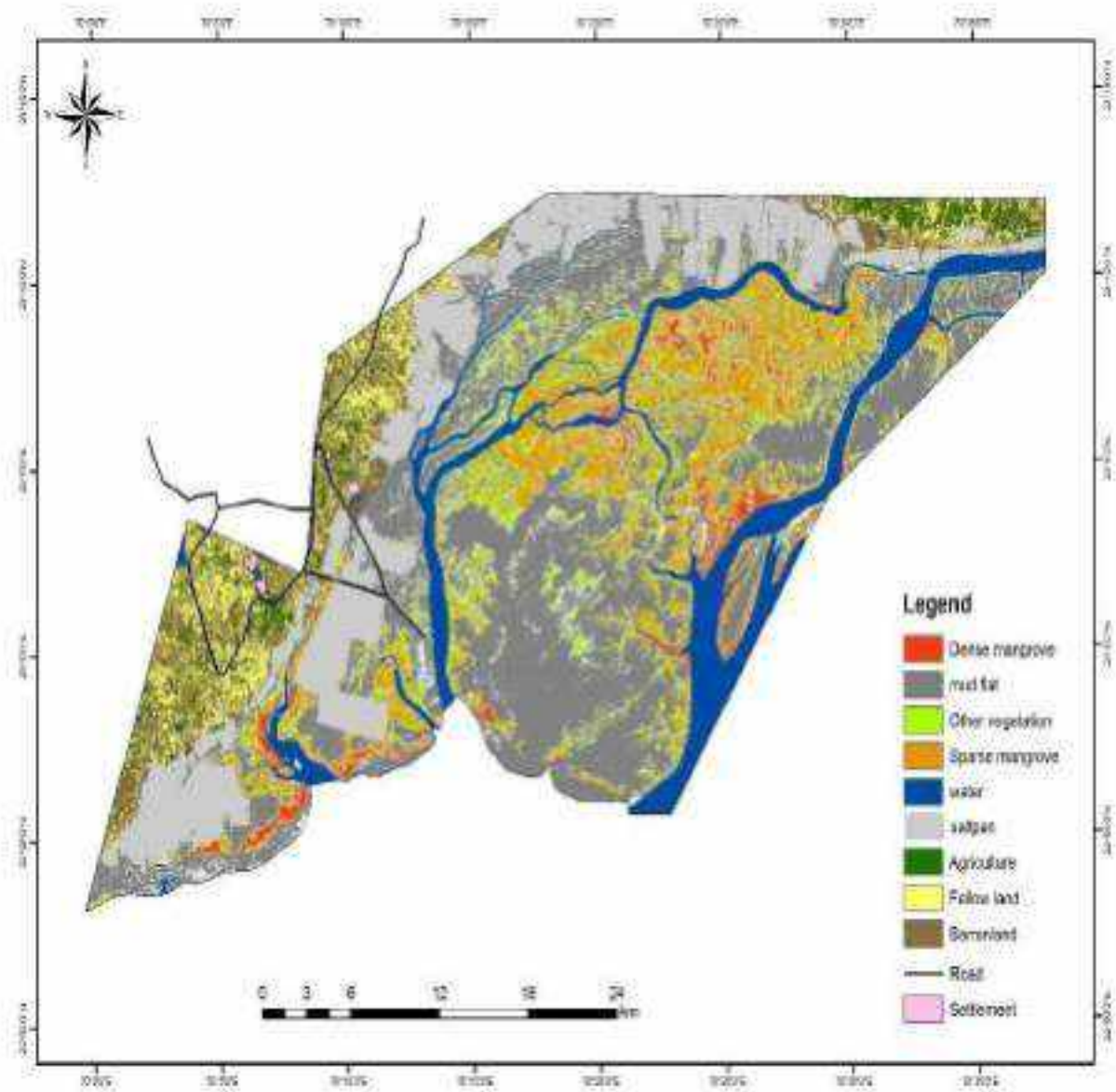


Fig.5.2: Land cover classification map of the study area -December2014

As per this classification different land cover category has been estimated in hectares (Figure 5.3). Total mangrove cover constitutes 15.3% with dense mangroves constituting 3.8% and sparse mangrove 11.5 %. Highest land cover is occupied by mudflats to the tune of 36.9% followed by water spread (11.5%) whereas cover of settlement (01%) and agriculture (1.7%) was lowest (Table 5.1).

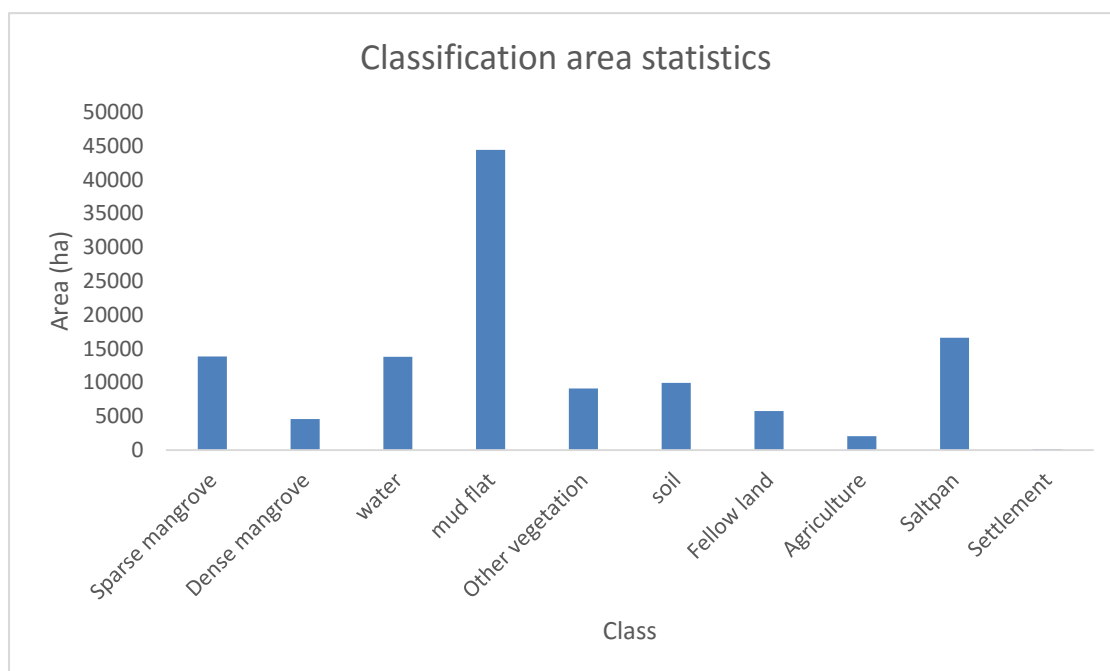


Fig. 5.3: Total Land Cover Classification Statistics in Hectares

Table 5.1: Percentage of Land Cover Classification in Kandla Port Area

Sr. No.	Class	Kandla Area (ha)	Tuna Tekra Area (ha)	Total Area (ha)	Total Area Percentage (%)
1	Sparse mangrove	13234.2	607.03	13841.2	11.5
2	Dense mangrove	4025.1	565.38	4590.4	3.8
3	Water	13117.3	671.54	13788.8	11.5
4	mud flat	41310.4	3080.69	44391.1	36.9
5	Other vegetation	8655.2	439.76	9095.0	7.6
6	Soil	5097.1	4840.60	9937.7	8.3
7	Fellow land	2582.7	3177.75	5760.4	4.8
8	Agriculture	1241.2	817.48	2058.7	1.7
9	Saltpan	12843.6	3754.50	16598.10	13.8
10	Settlement	49.7	94.96	144.7	0.1
	Total	102156.5	18049.68	120206.18	100.0

6. MANGROVE MANAGEMENT PLAN FOR KPT

6.1 Background:

The Kandla Port Trust envisages several facilities to be built at the location. The establishment of facilities over the years, buildings, etc. involves notable changes in the landscapes including natural environment as a result of intensive activities. Doubtlessly, this will alter the local ecological makeup of the area. Any long term human centered activity in any coastal belt will have serious repercussions on all its natural resources and ecosystems in the vicinity. Thus, measures should be taken to conserve and preserve KPT mangroves, thus retaining several visible and invisible ecological services of mangrove. As a first and foremost step it is imperative that no mangroves in the region are to be cleared for any activities and more mangrove plantation/ restoration work should be undertaken. Dumping of any materials such as cement, rubble, sand, steel, spilling of materials, etc. should be strictly avoided.

Regular monitoring programmes at fixed intervals are crucial to assess any change in mangrove diversity during different developmental activities. Therefore, KPT would be explored the possibility to engage an experts for monitoring the area regularly as ecological perspective. Emphasis on growth with respect to survival percentage, height, density, regeneration and recruitment classes, frequency class, etc. should be given during regular monitoring. Other phyto-sociological parameters should also be addressed during regular monitoring programme. Mangroves being a dynamic ecosystem such changes may be studied annually. Nevertheless, in areas with new mangrove growths/restoration the monitoring may be more frequent in order to arrest any adverse impact. Regular monitoring of these factors will facilitate the KPT authorities to understand the impact of the ongoing activities, if any. This would, inturn, help in mangrove conservation and management of the region. The data generated as an outcome of regular monitoring should be collected from predetermined/identified locations to avoid any sampling error. A team of expert groups should be engaged by KPT, in order to assess/evaluate the mangrove growth and vegetation structure.

The expert team may also help to conducting appropriate awareness programmes to the workers, supervisory staff and contract labours of KPT. Thus, environmental training and awareness creation should be undertaken for all jetty staff and contractors during their initial induction period. The training should involve both ecological and environmental importance of mangroves and measures to be taken in order to protect and preserve them during their activities in the areas contiguous to mangroves. Signboards and hoardings at appropriate places should be placed reflecting mangroves importance. These hoardings should be in easily understandable languages and in pictorial forms. Restricted entry/no entry boards may also be placed at appropriate places to regulate/monitor the frequency of visiting labours. This way, any illegal cutting, etc. can be immediately reported to KPT Environment Cell. This must involve a routine system of reporting such incidences. Similarly, KPT should hold an active Environment Cell to handle such problems cases. The consultancy peoples may also help in conducting awareness programs to the workers, supervisory staff and contract labours of KPT.

6.2 Other Activities:

Immense care should be taken to avoid any oil spillage from calling ships and other machineries in the vicinity of mangroves. Any unauthorized entry, cattle grazing and collection of mangrove forest products should be timely reported and entered in the register. Utmost care is required for any chemical/hydrocarbon spillage in the vicinity. Environment Division of KPT should investigate such incidences and take measures to arrest these activities. Further strengthening of this Division is essential as indicated in chapter 7.

No clearance and disturbance to soil surface in the areas close to mangrove formations should be done which would otherwise lead to increased turbidity of runoff. For such purpose it is suggested to earmark the area into buffer zone and core zone and no activity should take place in core zone including the earthmoving machineries. In some places scrub-rolling should be followed to allow resprouting/germination. No oil, loitering, rubbles, etc. should disposed off. In buffer

zone, these items are to be managed, collected, transported and disposed following GPCB norms.

Kachchh being arid zone, encounters dust storms. Thus, to minimize/avoid dust spreading into these ecologically important areas sprinklers should be used to arrest air borne dust and this frequency should be increased based on wind and weather conditions.

6.3 Significant Ecological Parameter:

Pore-water properties in mangroves ecosystem play a major role in determining the health of the mangrove forest. Alteration in the pore-water chemical and physical characteristics, especially salinity is a reliable indicator of changing physical condition in the mangrove. If any alteration in pore-water salinity and conductivity beyond the limit is reported during monitoring, immediate investigation should be carried out to identify the reason and appropriate remedial measures should be taken. For such purposes, constructing canal system to ensure increased flushing, groundwater recovery bores and interceptor channels which would facilitate increased water flushing to mangroves in the event of changed tidal pattern may be included. The construction of such a canal system should be in a well planned manner using the expertise of civil engineers. Since *Avicennia marina*, takes several years to respond to any of these changes, a long term sustained monitoring as mentioned earlier is vital.

6.4 Mangrove Rehabilitation:

At the same time KPT has carried out mangrove plantation and rehabilitation in 1000 ha (excluding 200 ha of IFFCO plantation site and 250 ha by M/S AKBTPPL), the efforts are restricted to the tidal flats of Sat Saida Bet and Nakti creek (Refer Table 7.1). Thus, it is recommended to extend mangrove plantation and rehabilitation activities at Sat Saida Bet region. Such activities should be carried out through mangrove experts of consultancy.

6.5 Biodiversity Monitoring Committee:

Macrofauna is an integral part of mangrove ecosystem. Macrofaunal diversity in mangrove ecosystem reflects its health. It is well known that a steady mangrove

system supports rich faunal diversity/density. The faunal diversity in mangrove ecosystem is very sensitive to alterations in the habitat. Thus, monitoring faunal diversity would directly alert the KPT authorities about at any changes happened/happening in the area. Thus, it is suggested to carry out regular monitoring of macrofauna in the mangrove area.

6.6 Mangrove Plantation and Restoration Activities:

It is known that mudflats experiencing favourable tidal amplitude are suitable for mangrove plantation. Sat Saida Bet area has widespread mudflats and suitable environmental conditions, Therefore, Sat Saida Bet area is recommended to carry out the future mangrove plantation and restoration activities. Being at the tail end of Gulf, the vicinity of Kandla port abounds with networks of creek systems, mudflats and tidal swamps with pronounced tidal amplitude of 6.66 m (Mean High Water Spring-MHWS) that inundates a vast intertidal belt rendering it suitable for plantation. It is noticed that the substrate nature is silty-clay which favours mangrove growth. The areas at Sat Saida Bet can be explored for mangrove plantation in available mudflats. However, this should be carried out in consultation with experts and should also involve long-term monitoring to ensure the growth of mangroves. Any impacts on mangrove health should be studied and measures should be taken to revive the growth. Such impact can be understood by studying faunal diversity as mentioned above.

KPT should undertake restoration activities to replenish the growth of mangroves in areas with stunted growth. This may be based on existence of creeks, removal of blockages in the natural minor creeks, and creation of new tidal regimes through fish bone canals. To undertake such activities, it is suggested to study the area characteristics and relate it with existing scientific knowledge. Thus, this should be carried out in consultation with the experts. It is envisaged that correlating long-term mangrove conservation and preservation with KPT's foreseen expansion would improve its greener outlook and enable KPT to get environmental clearance of its future projects/activities.

Desiltation of natural canals, increased frequency of tidal flushing, should be carried out in areas with natural stunted growth areas in order to improve mangroves

health, and ecological functions and services. Thus, for all such activities, and mangrove plantation and restoration activities creation of a Separate Mangrove Monitoring Cell under the Environmental Division is suggested. For any plantation activity the in site selection is foremost. Nevertheless, protocol involved during site identification as well as selection will play an important role in long term survival of mangroves areas and their well being. Thus, it is recommended to select the future plantation sites in consultation with experts. Experts ought to have a thorough knowledge and experience on ecology, faunal diversity, sediment quality assessment, pore-water quality assessment and impact of other factor on mangrove formations / growth.

It is suggested that other candidate species of mangroves *viz.*, *Aegiceros corniculatum*, *Ceriops tagal* and *Rhizophora mucronata*, should also be attempted in natural areas. These species area likely to improve/increase the diversity of the area and thus improving mangrove health.

For any plantation activity, improved techniques as elaborated in earlier sections should be followed. Raised bed (*Otla*) method should be followed in sites experiencing high tidal currents. However, such plantation technique should be carried out in previous existing mangroves stands and new areas should be completely avoided. Also, sediment erosion monitors and in plantation areas following *Otla* method should be carried out. Kandla port premises especially Sat Saida Bet receives gentle tidal currents, therefore, open mudflats here should have nursery raised sapling or direct dibbling of seeds in a pit.

In order to ensure any negative impact on the health of mangrove ecosystem in Kandla Port region, long term planning and conservation strategies should be attempted and most vulnerable mangrove stand should be identified and exposed to conservation efforts. Thus, special efforts should be taken to conserve these stands.

7. MANGROVE PLANTATION AND REHABILITATION EFFORTS

7.1 Background:

Among Kachchh mangroves with a spread of 789 sq.km, Gandhidham taluka, where Kandla Port is located, has a mangrove formation of 61.97 sq. km. Extent of dense mangrove within this taluka is only around 2.89 sq.km whereas sparse mangroves are 59.07 sq. km (GEC & BISAC, 2009). Potential mudflat area within the taluka is estimated to be 55.47 sq.km presenting a vast scope for mangrove plantation and rehabilitation. Kandla Port Trust within its jurisdiction encompasses a total land area (excluding water) of 893.03 sq. km rendering it the largest land holder in Kachchh district. Extent of mangroves within the Jurisdiction of Kandla Port is estimated to be 18831.64ha with the inclusion of 4990.4 and 13841.2 sq.km sparse and dense mangroves, respectively; a largest patch outside the administrative jurisdiction of forest department. During early 1960s mangrove cover in Kandla-Surajbari belt was reported to be 506 sq.km which ultimately shrank to 49 sq.km during 2002 due to various human and natural factors.

Cargo handling in Kandla Port consistently recorded an increasing growth trend; the total cargo traffic handled by the port has increased from 24.5 million tons in 1993-94 to 82.5 million tons in 2011-12. Moreover, KPT handled 87.005 MMT cargo during the year of 2013-2014 and 92.5 MMT in the financial year of 2014-2015. Additionally, it is planned to construct four dry cargo berths within the Kandla creek; it is also planned to develop two Multi-Product Special Economic Zones (MPSEZ) at Kandla (3400 ha) and at Tuna Tekra (1400 ha). Out of 12 existing cargo berths, six berths have already served their lifespan of 50 years. In addition, existing vessel traffic, congestion in the main port and draft restrictions demand expansion of the port facility to adjacent creek systems.

Due to these commercial, operational and economic reasons and to meet the demands of the expanding trade, KPT has to increase its cargo handling capacity in the future while simultaneously caring for the ecological wellbeing of mangroves in its port vicinity. As expected, these developments will have their own repercussions on the surrounding port environ. Mangrove being a major ecological entity within the

port premise, it is imperative that a well planned, long term conservation measure in terms of aggressive mangrove plantation and rehabilitation has to be initiated in order to bring back the mangrove cover to the pre-port era of pristine nature and also to conserve the existing mangrove formations intact in a sustained long term basis. This calls for consistent effort both for preserving and improving the mangrove formation. This chapter narrates the ongoing mangrove plantation activities by the port authorities and recommend future plan of action for long term conservation. Recommendations on the monitoring programmes to be initiated in order to keep track of the ecosystem health and to initiate course corrections and remedies, if any impacts are felt is also narrated.

7.2 KPT-Present Mangrove Plantation/Rehabilitation Efforts:

Three different terminologies namely Rehabilitation, Restoration and Plantation are interchangeably used to denote human interventions to improve mangrove condition. Field (1999) defines 'Rehabilitation' as 'return of degraded mangrove land to a fully functional mangrove ecosystem'; the term 'Restoration' is defined by him as 'returning the degraded mangrove land to something like its presumed original state'. The term, 'Plantation' could be considered as raising mangroves in a technically suitable coastal belt where mangroves were absent earlier. Going by this definition most of the activities undertaken by Kandla port or any other stake holder agencies until now is only plantation with restoration and rehabilitation activities seldom attempted.

With a vast wide mudflat area extending up to 44391 ha and numerous network of creek systems enabling a rich and conducive environment for mangrove growth, Kandla port environ is an ideal location for mangrove plantation and restoration efforts. These possible mudflats for mangrove plantation are available along the creek systems of Sat Saida Bet. Similarly, many earlier pristine mangrove stands that are now degraded within Kandla port offers equally high opportunity to restore them.

Mangrove plantation activity by Kandla Port was initiated during 2002 as mandated by the Ministry of Environment Forests and Climate Change (MoEF). The first mangrove plantation activity was during 2002 with the development of 20 ha at

Sat Saida Bet, a vast tidally flushed area along the northern bank of Kandla creek opposite to Kandla port. Subsequently, 1200 ha of mangrove plantation has been completed till the end of 2014 in order to meet the legal mandate of Ministry of Environment, Forests and Climate Change (Table 7.1).

Table 7.1: Details of implemented Mangrove Plantation by Kandla Port Trust

Sr. no.	Year of Plantation & Site	Area-ha.	Species	Survival -%	Agency
1	2005-2006 (Sat Saida Bed)	20	<i>A.marina</i>	98	M/s Gujarat Ecology Commission
2	2008-09 (Nakti Creek)	50	<i>A.marina</i>	71	M/s Gujarat Ecology Commission
3	2010-11 (Nakti Creek)	100	<i>A.marina,</i> <i>R. mucronata,</i> <i>C. tagal</i>	68	M/s Gujarat Ecology Commission
4	2011-12 (Sat Saida Bed)	200	<i>A.marina</i>	74	Forest & Environment Department, GoG
5	2012-13 (Sat Saida Bed)	300	<i>A.marina</i>	71	Forest & Environment Department, GoG
6	2013-14 (Sat Saida Bed)	330	<i>A.marina</i>	69	Forest & Environment Department, GoG
Total Mangrove Plantation carried out by KPT – 1000 ha					
7	2013-14 (Sat Saida Bed)	250	<i>A.marina</i>	70	M/s AKBTPL
8	2013-15 (Sat Saida Bed)	200	<i>A.marina</i>	74	IFFCO through GUIDE
9	2015-17	300	-	-	MoU signed with Gujarat Ecology Commission (GEC), Government of Gujarat

In all these plantations the following three different methods were followed.

1. Raised Bed Method (Otila method)
2. Transplantation of nursery raised saplings (Nursery method)
3. Direct Seed Sowing Method

7.2.1 Otla Method:

In majority of the plantation sites raised bed method (*Otla* method) was followed as it is believed to give better results than other methods. Further, this method is perceived to be less cost and labour intensive. This method is especially suitable for sites with high tidal currents. In this method, square earthen mounts of 10-15 cm height were raised and propagules numbering 50-60 were dibbled on the surface of the mount. Generally, number of raised beds per hectare is around 1000 with a spacing of less than 1 × 1 m. In case of plantation among gaps of natural mangroves, clusters of *Otlas* mostly exceeding the density of 1500/ha were made closely.

7.2.2 Direct Propagule Dibbling:

Next to raised bed method, direct propagule dibbling (locally called '*Sing*' Plantation) was attempted in many sites. This method is less labour and cost intensive, though repeated dibbling was often required in order to obtain desirable survival rate. In this method, mature propagules are dibbled in open empty mudflats or among gaps of natural stands. Spacing maintained between each dibbled propagule varied differently and in some sites it was as close as 75×50 cm, especially in plantation raised among gaps of natural mangroves. Propagules used were collected freshly from the nearby mangrove formations which are thought to give better results and no pre-dibbling seed treatments were used. Often propagules were dibbled repeatedly in order to increase survival rates and in raised (*Otla*) bed and nursery plantation sites, dibbling propagules was resorted to increase survival.

7.2.3. Nursery Methods (Polybag Method):

Transplantation of nursery raised saplings was also followed as its success rate is much higher than any other method. Unlike raised bed and direct dibbling methods, this method is labour and cost intensive and time consuming. Nursery raised saplings are transplanted as individual plants either in open intertidal mudflats or along the banks of the creek systems. Saplings in the polythene bags were allowed to attain a height of 40-50 cm before transplantation in a period of 3-4 months. This method was found to be promising and yield better survival rate wherever it was attempted. While

transplanting, varying density, ranging from 3000 to 6000 saplings/ha as dictated by the site condition were followed.

7.3 Mangrove Plantation Targets Achieved:

The targeted plantation area of 1000 ha, Kandla Port Trust has been carried out plantation in two sites namely Sat Saida Bet on the banks of Kandla creek opposite to Kandla Port and along the Nakti creek till the end of 2013-14. Year-wise target achieved and other details of plantation are given in table 7.1. Sat Saida Bet opposite to the port bank of Kandla was chosen to implement the mangrove plantation at Sat Saida Bet, it is a vast mudflat area receiving adequate tidal flushing to support a healthy plantation. Numerous minor tidal creeks criss-cross the mudflat producing very conducive conditions for undertaking plantation activity. Out of the 1000 ha completed till 2013-14, 850 ha of plantation were carried out in Sat Saida Bet which yielded better results with high survival rate of more than 80%.

In all plantation years, except 2008-09, the candidate species was *Avicennia marina*. This is the dominant species occurring in the mangrove formations of Kachchh, though sporadic occurrence of other two species, *Rhizophora mucronata* and *Ceriops tagal* has been reported. *Avicennia marina* is known to survive in very high water and soil salinity due to its extreme tolerance to different environmental conditions. Kachchh coastal region experiences elevated water and soil salinity levels due to aridity and very high evaporation rate. In this prevailing ambiance of high salinity, growth of *A. marina* is fairly good comparing other mangrove species since it is due to its high tolerance to higher salinity ranges. Obviously, *A. marina* is the candidate species in the whole of Kachchh and Gujarat coast due to these reasons. Earlier attempts during 2008-09 to plant *Rhizophora mucronata* and *Ceriops tagal* at Sat Saida Bet yielded only very limited success rates in terms of survival.

7.4 Potential for Plantation and Restoration Activities in Kandla Port Area:

Scope for successful mangrove plantation and restoration activities in Kandla Port area is plenty as basic environmental requirements and conditions are quite conducive. Presence of extensive mudflats, favourable tidal amplitude and conducive

substrate nature favours mangrove plantation in vast areas. The vast mudflat area is around 44391 ha located in the Kandla port premises, around 20000 ha receives good tidal flushing rates which exactly located in Sat Saida Bet region. Being at the tail end of Gulf, the vicinity of Kandla port abounds with networks of creek systems mudflats and tidal swamps with pronounced tidal amplitude of 6.66 m (Mean High Water Spring-MHWS) that inundates vast intertidal belt, rendering it suitable for plantation. Substrate nature is silty-clay which favours luxuriant mangrove growth. Despite factors like high aridity, water salinity and poor rainfall (340 mm/year), growth of mangrove species, especially *A. marina* is favoured by other positive factors. It is estimated that out of available extent of 44391.1 ha of mudflats, nearly 20000 ha has high potential for mangrove plantation. About 830 ha out 1000 ha of plantation executed so far by Kandla port has been carried out at Sat Saida Bet, since it has vast extent of mudflats and tidal swamps. Network of creek systems at Sat Saida Bet and adjacent mudflats in the creek system on its northern extent has vast potential mudflats for mangrove plantation. Other than this, creek systems like Nakti and Khori has extensive mudflats along their banks which are suitable for mangrove plantation.

Similar to plantation potential, potential for mangrove restoration activities are equally high in and around Kandla port. It is estimated that out of total mangrove extent of 18431.6 ha within the port jurisdiction, 4590.4 ha are dense and 13841.2 ha are sparse. Potential for developing the sparse mangroves into a healthy and dense mangrove habitat is plenty by undertaking restoration activities such as deepening the existing minor creek systems, creating new tidal regimes through fish bone canals and removing blockages in the natural minor creeks. Most of these sparse mangroves were once reported to be dense and healthy (ICMAM, 2004) and they were rendered sparse due to micro-level changes in the topography and geomorphology due to various natural and anthropogenic factors.

Majority of the mudflat area in the Tuna region do not support mangrove growth in spite of adequate tidal flushing solely due to lack of geomorphic and tidal factors which prevent effective mangrove seed dispersal. Potential mangrove

plantation sites at Sat Saida Bet is enabling by broadcasting or by other means of most likely convert these mudflats into mangrove formations.

7.5 Recommendation for Future Mangrove Plantation:

Given the vast extent of natural mangroves within the port environ and the ecological sensitivity of mangroves, it will be in the long term commercial interest of Kandla port to ensure that a committed management plan encompassing conservation of natural stand and further areal expansion through plantation and restoration is in place with appropriate budgetary allotment. Since Kandla port is poised for further growth in the future, linking long term mangrove conservation and preservation with its entire future expansion plan will manifold enhance its greener outlook and enable easy environmental clearance of its future project activities. Sustained and planned effort with a strong will and determination will render Kandla Port a truly green port surrounded by thick, dense and luxuriant mangroves. Recommendations to this effect are presented below.

7.6 Long term Plan for Mangrove Plantation or Restoration:

Creation of a separate mangrove cell manned by scientific manpower with clearly defined timely goal could be the first step towards mangrove conservation. Kandla port may create its own cell or it could be assigned to a competent organization with adequate experience in mangrove conservation such as forest department and Gujarat Ecology Commission (GEC). With parallel planning and execution for plantation and restoration, yearly target of plantation and restoration are fixed and met with adequate fund support from port authorities. A long term plan with yearly target of plantation/restoration irrespective of ministry mandate could be drawn by this cell. This plan, to begin with, will identify and demarcate potential mangrove sites separately for plantation and restoration activities through application of GIS and RS tools. Similarly, patches that are likely to face impact due to different anthropogenic activities could be identified and appropriate mitigation measures initiated.

7.6.1 Restoration along with Plantation:

Until now, outright plantation is the sole measure of mangrove conservation while restoration of degraded stand has never been attempted. It is recommended that restoration by bio-physical amendments along with plantation could be attempted in future conservation activities; especially in identified scrubby/stunted stands facing inadequate tidal flushing this restoration effort will yield better results rather than direct plantation. Desiltation of natural canals and enhancing tidal flushing rates through canal systems and increasing number of tidal days in such natural stunted stands by physical amendments will render the scrubby formation healthy, viable and a functional mangrove ecosystem. This could be done in a cost effective manner yielding better results than direct plantation. A thorough and detailed surveillance and categorizing the sites requiring different approaches/treatments could be undertaken in future mangrove conservation efforts. Through application of GIS tools, this task could be done in a scientific manner. These restoration activities could be delinked from ministry mandated conditional plantation for different project setting/expansion and are to be carried out as per the yearly targets set out by Kandla port itself. This will be a time saving and proactive measure to meet conservation mandate that will be imposed by the ministry in future for different project implementation.

7.6.2 Improved Plantation Techniques:

As narrated in section 7.2 three basic techniques for plantation is followed namely, raised bed (Otla) method, Plantation of nursery raised saplings and direct seed dibbling. While raised (Otla) method is predominantly followed, other two methods are supplementary. Raised bed (*Otla*) method is more suitable for sites which experiences heavy tidal currents. Since raised beds control the velocity of receding tidal waters, germinating seedlings do not get dislodged. Though raised bed method initially results in high survival rate, in due course of time, sediment in the bed gets eroded in the receding tidal currents and saplings gets uprooted when their root system are exposed to the currents. In majority of the sites where raised bed method was attempted initial high survival rates is followed by heavy mortality and survival becomes poor after six months. However, this method is satisfactory if the plantation

is carried out among existing mangrove stands which effectively checks and slow down the receding tidal currents. Hence, caution is to be exercised while adapting raised bed method of plantation. It is suggested that this method could be used as a last resort and only in sites facing heavy tidal currents. For the mudflats of Kandla port region, where tidal currents are mostly gentle due to gradual intertidal gradient raised bed method may not be suitable. Either plantation of nursery raised sapling or direct dibbling of seeds in a pit will be more appropriate method.

7.6.3 Site Selection:

By far, suitable site selection in the intertidal belt is foremost criterion determining success of mangrove plantation. A list of bio-physical parameters like gradient of the chosen intertidal belt, soil nature, number of days of tidal flushing, presence/absence of natural mangroves in the vicinity and availability of adequate intertidal extent are to be carefully considered for choosing plantation site. More emphasis is to be given to tidal flushing; only sites that receive good tidal flushing for 15-20 days in a month are to be chosen for plantation activities. A suite of 12 parameters indicated in the table 7.2 are to be meticulously considered before choosing a site. In earlier plantation attempts by Kandla Port, sites among existing natural mangrove formation with good tidal flushing and regeneration potential were taken up. In other cases, plantation was raised along the banks of natural creeks or in the gaps among scrubby mangrove formations and open mudflats close to the coastal belt after ascertaining adequate tidal inundation. In short all bio-physical characters (Table 7.2) are to be carefully considered before choosing plantation sites. Based on bio-physical characteristics of sites, few areas at Sat Saida bet was suggested here for future mangrove plantation activities (Figure 7.1).

Table 7.2: Criteria Adapted by Forest Staff for site selection

Priority Order	Criteria	Preferred Conditions
1	Site Nature- Open coast/creek/Natural Mangrove formations	Creek systems and estuaries with freshwater input is preferable- In open coast sites gentle gradient preferred. In natural mangroves, adequate gaps with good tidal flushing considered.
2	Intertidal Gradient	Intertidal extent with gentle slope preferred-Steep intertidal gradient and those with convex morphology avoided to prevent water logging.
3	Tidal inundation	Only sites with gentle gradient with minimum 15 days

		tidal flushing per month mostly preferred
4	Soil Texture	Silty-clay or muddy soil preferred
5	Water Salinity	Sites close to discharge points of run-off preferred which controls salinity fluctuations -Based on this candidate species are selected.
6	Intertidal Extent/Width	Sites with minimum 150-200 m width and gentle gradient close to the waterfront preferred
7	Tidal Currents	Sites with gentle and low velocity currents preferred
8	Mangrove Presence/ Absence in the Vicinity	Presence of natural mangroves in the vicinity is a reliable indication that the site can support good mangroves.
9	Accessibility of the site	Mostly considered in site where plantation was implemented in EDC mode.
10	Labor Availability	Availability of good labour in nearby villages was considered as a major factor
11	Seed Source	Seed source was from nearby mangroves-If new species were attempted seeds/propagules were acclimatized to higher salinity
12	Pressure-Grazing, Cattle visit, resource gathering etc.	Avoided through constant vigil- EDC village partners were educated not to send their cattle to the natural or planted mangroves.



Figure 7.1: Suggested plantation sites at Sat Saida Bet

7.6.4 Biodiversity Enrichment:

In most of the plantation sites, *A. marina* was the natural candidate species as they are the most predominant in all natural mangrove stands indicating nature's preference to this species. Environmental plasticity of *A. marina* to tolerate extremes of salinity, temperature and light intensity and its adaptation to different soil conditions is scientifically well proven. In addition, easy seed availability, faster

germination in high saline water, tolerance to prolonged drought situation and higher growth rates enables good success rates with *A. marina*. Nevertheless, other candidate species such as *R. mucronata*, *C. tagal* and *Aegiceras corniculatum* could be planted in small areas following their natural zonation pattern. *C. tagal* and *A. corniculatum* occur sporadically in Kandla port region. Though these species are less salinity tolerant, planting them close to the water front where they will get inundated daily will enhance diversity of true mangroves in Kandla port to ensure better ecosystem function.

7.6.5 Monitoring and Arresting Stand Degradation:

In the last five decades since inception of port activities during 1960s mangrove formation in and around Kandla port seems to have undergone degradation due to various human and natural factors. The stand with an extent of 506 sq.km at the tail end of GoK during 1960s has reduced to 49 sq.km during 2002 (ICMAM, 2004). This calls for immediate measures by port authorities to arrest further stand degradation by appropriate action oriented management measures. Following measures are suggested in this line.

Exhaustive GIS mapping with corresponding ground truthing to record and document different stand characteristics such as dense, sparse, moderate stands and identifying stands that are prone to immediate stand degradation.

Earmarking core pristine stands at Kandla and Tuna areas within port limits as reserve forests that are to be protected where further port activities are not to be taken up in future. This earmarked core mangrove formation deserves total protection and preservation against all developmental activities and disturbances.

Rapid and short mangrove monitoring programs at a spatial interval of one year is to be instituted in order to keep track of changes that may happen due to further construction and operation of jetties and other port related structures. Kandla port has already generated considerable primary data on its mangrove formation through various project reports. Consolidating this data and filling the lacunae in the data through further monitoring is suffice to generate up to date baseline data on mangrove

vegetation stand of Kandla port; special attention could be paid to document segment wise data on density, tree canopy, tree diameter classes, stand dynamics, pore-water chemistry, etc. This baseline creation and further yearly monitoring will enable the port authorities on the time series changes happening in the vegetation. Table 7.3 presents different components of the monitoring program, time schedule and other details. Regular monitoring of the chosen parameters in the mangroves of port environment will enable the port authorities to gain knowledge about the impact of the ongoing activities as it is the primary step to device management options to ensure mangrove preservation and health in a holistic manner.

Table 7.3: Mangrove Monitoring Program Components and other Details

Component	Details	Inference to be derived
GIS & RS Mapping	GIS maps for Port limit procured from NRSC and mangrove distribution to be studied-Delineation of different density classes such as dense, moderately dense and sparse mangroves, potential mudflats for plantation, sparse patches for restoration could be earmarked on the map	Changes in the physical extent could be traced by overlaying the subsequent maps on the baseline maps. Changes in areal extent to be gleaned- Potential sites for plantation and restoration identified
Vegetation Structure	Mostly vegetation characters like density, Canopy cover, health in terms of regeneration potential to be established as baseline	General regeneration potential of mangrove stand inferred. This data is to be considered along with pore water parameter like salinity, pH and conductivity in subsequent monitoring to glean information on changes.
Sedimentation Process	To monitor potential changes in sedimentation rate in the mangrove proper due to port activities	To be considered in conjunction with dredging and other civil engineering activities of the port to derive possible correlation
Porewater Chemistry- Salinity, pH, conductivity	Representative samples in a gradient to be collected for better comparison with the baseline data	Produced structural and physiognomic zones to be compared for changes with the baseline data
Photographs	Photographs to be taken from a reference standard points fixed during baseline studies	Visual comparison with the earlier baseline photos establishes changes.

For gathering monitoring data, reference points fixed during baseline collection is to be strictly maintained in order to avoid ambiguous and misleading results during the monitoring activities.

For all the above mentioned parameters a threshold limit of 20% could be kept as standard margin and deviation more than this from the baseline data could be treated as the signs of degradation that calls for appropriate management plan and options to be exercised to control the impact. Some of the options are as follows.

Analyzing the causative factor(s) for the degradation such as physical, geomorphological, biological and exploring the possibility of remedial measures to mitigate the problem that cause stand degradation is the first step. Increased sedimentation due to port activity and resultant micro-level change in geomorphology is often the major cause for mangrove degradation. Other natural causative factors such as cattle grazing and mangrove resource collection is negligible in Kandla though natural coastal erosion is noticed in certain pockets.

In the event of excessive sedimentation in mangrove proper, causative factors like source of sediment load reaching mangroves is to be investigated thoroughly. Measures to ameliorate the impact like reducing the sediment load through changes in operational procedure may be considered.

Efforts to trap run-off slurry and sediment plume from the dredging area by means of silt traps may be attempted and the trapped sediments will be responsibly disposed in pre-designated sites.

Similarly, a safety exclusion zone will be required around the dredging vessel whose size will depend on the final dredging plan and will range from 150 m to 500 m in accordance with the international standards and best practices.

Altered tidal flushing due to various reasons in and around the creek system is a possibility which may affect mangroves on the creek banks leading to erosion. Tidal water flow in small intertidal canals that feed isolated mangrove stands generally get disrupted due to sedimentation with the possibility of complete filling. This could be best managed through micro-level study of the degrading patch and ensuring adequate

and proper tidal flushing through measures narrated in section 7.6. Majority of the problem of stand degradation could be addressed by ensuring adequate tidal flushing, which is the single most important factor for stand degradation.

7.6.6 Erosion:

Fringes of Sat Saida Bet as well as parts Tuna are directly exposed to high tidal currents and erosion. This ongoing natural process is taking a heavy toll of many fully grown and healthy mangrove trees on the mudflat periphery. Following actions are recommended for controlling erosion and check further uprooting of mangroves.

- ♣ Initial earmarking of erosion prone sites along all the creek system.
- ♣ Since the process of erosion is highest along Sat Saida bet, it could be controlled only by physical means by constructing appropriate civil engineering structures. Erosion control structures or constructing embankment of stones or any suitable material along the erosion site is strongly recommended if the problem is too heavy. The proposed embankment should be eco-engineering design with a gentle slope of appropriate angle to the tidal action that will allow natural flushing while totally controlling erosion.
- ♣ Oceanographic factors that cause erosion in the immediate port vicinity need to be understood. Whether the erosion is caused due to ongoing port activities and other port structures or natural cause needs to be ascertained. Coastal stretch of Kandla is stated to fall either under a low or medium erosion category (National Assessment of Shoreline changes, 2011). The erosion map prepared by Ministry of Environment and Forests (MoEF, 2011) marks certain parts of Kandla region and nearby stretches as stable or high accretion coast. Contrarily, erosion of high intensity has been witnessed during this study indicating that this might be due to ongoing port activity.
- ♣ A rapid survey through the survey department of Kandla Port could be undertaken at regular time intervals to identify coastal stretches within the port limit which are prone to high erosion. These high erosion coastal stretches could be provided with gentle slopes with stone pitching and other civil

engineering works which will reduce the rate of erosion. These measures are required only if mangroves are present in vast areas in this stretch.

8 SUMMARY:

Kandla Port is one of the biggest port of India situated in the northwestern part of Gujarat. Mangrove forest is a conspicuous ecological entity within Kandla Port area. Due to the major port activities and accompanying development, mangroves within the premises of KPT have become vulnerable, susceptible and fragile over the years. Consequently, conservation and management of this mangrove formation has become imperative and an environmental responsibility of the Kandla port authority. In view of the continued port expansion and development, Department of Forest and Environment, Government of Gujarat, Gandhinagar has mandated KPT to investigate the current ecological status of mangroves in the KPT premises through proper scientific assessment and formulate long term conservation and management plan. Kandla Port authorities assigned the task of investigating the mangrove ecology within the port jurisdiction to Gujarat Institute of Desert Ecology (GUIDE), Bhuj.

In the present study conservation and management measures for the long term wellbeing of mangroves of Kandla Port is suggested based on intensive field visits, analyzing the existing management practices of the port *vis-à-vis* mangroves and plantation and other conservation activities carried out by port authorities under different projects of the port.

In order to understand the present status in terms of overall mangrove forest structure, stand health and governing physio-chemical factors a detailed field based investigation was carried out. For delineating mangrove characteristics, 21 transects were sampled covering various patches of Kandla port premises. Parameters like density, tree height, GBH, canopy length, canopy width, vegetation frequency and regeneration and recruitment potential were investigated. The mangrove vegetation structure of 21 sampled locations shows an average tree density of 4124/ha and tree height of 254cm and GBH of 40.4 cm. During the present study, mangrove tree density in all the 21 sampled locations ranged between 1500/ha and 7800/ha. Mangrove tree height ranged from 171 cm to 431 cm with average value of 254cm. The Girth at Breast Height (GBH) of at different patches was from 31 cm to 49.5 cm with an average value of 40.4 cm. Regeneration class density ranged between 3300 to

100000/ha whereas recruitment class density were ranged from 1000 and 56600/ha. In general, mangrove vegetation structure at KPT premises demonstrated that mangrove patches are healthy with very moderate density and with good regeneration potential as evidenced by the ratio between mature trees and younger classes (recruitment and regeneration).

Water and sediment health status of KPT premises examined indicated that majority of the parameters are well within the prescribed limits and no pollution could be distinguished showing that the water and sediment at KPT premises is clean. Important parameters like salinity and pH of both surface water and pore-water are within expected level of any mangrove formation. Observed average pore-water salinity was 53.7 ppt and pH was 8.21. Nitrite concentration ranged from 0.1 to 0.9 mg/L with an overall average of 0.63 mg/L. Nitrate content of the present study varied from 0.9 to 1.9 mg/L with a cumulative average of 1.45 mg/L. Phosphate concentration ranged from 0.1 – 1.8 mg/L with an average of 0.75 mg/L. The recorded nutrient concentrations of the present investigation are good enough to support the growth and vegetation structure of the KPT mangroves.

Land cover category of KPT jurisdictions has been estimated in hectares and area contribution are expressed in percentage. Total mangrove cover constitutes 15.3% with dense mangroves constituting 3.8% and sparse mangrove 11.5%. Highest land cover is occupied by mudflats to the tune of 36.9% followed by water spread (11.5%) whereas cover of settlement (01%) and agriculture (1.7%) was lowest.

During the present study, following impacts were recorded due to coastal modification, tidal regime and water currents.

1. Erosion of the creek banks in the immediate vicinity of water front.
2. Reduced tidal flushing and decrease in the tidal flat in and around the construction points.

Following the forecast of impacts, effective mangrove management plan for the preservation of KPT mangroves, suggestions which covers the following three important aspects.

- Creation of Baseline Information to track subsequent changes in mangrove vegetation structure due to port activities and related development activities.
- Periodic monitoring programs are to be organized whose results in comparison with baseline data will assist to formulate appropriate management options to check any stand degradation.
- Preservation measures to be undertaken in the event of signs of impact

Mangrove monitoring programs at a regular interval of one year for gathering all baseline parameters in the same GPS referenced points is suggested. Overlaying the data generated during monitoring program with those of baseline data will help the port authorities to track changes happening in KPT mangroves. Regular monitoring of the chosen parameters in KPT mangroves will highlight the impact of the ongoing activities. Management alternatives to preserve mangroves could be contemplated based on this changes detected during monitoring phases.

Suggested mangrove preservation measures include the following. These preservation measures are parallel and consequent to monitoring programs.

Incidences that are detrimental to mangroves like Oil/fuel and other hydrocarbon spillage from earthwork machineries, fire, unauthorized entry of personnel, trespassing and grazing by cattle and collecting forest produce from mangroves are to be reported which will be investigated and appropriate follow-up action taken.

Washing frontline mangrove foliage through pressure hosing if dust deposition is noticed in frontline mangroves along with a thorough review of dust control measures.

Since developmental activities in the intertidal and near intertidal regions are perceived to cause impact to a large extent, various measures to preserve mangroves from port development impact are suggested. Undertaking mangrove rehabilitation activities in the KPT premises is also recommended in technically suitable sites.

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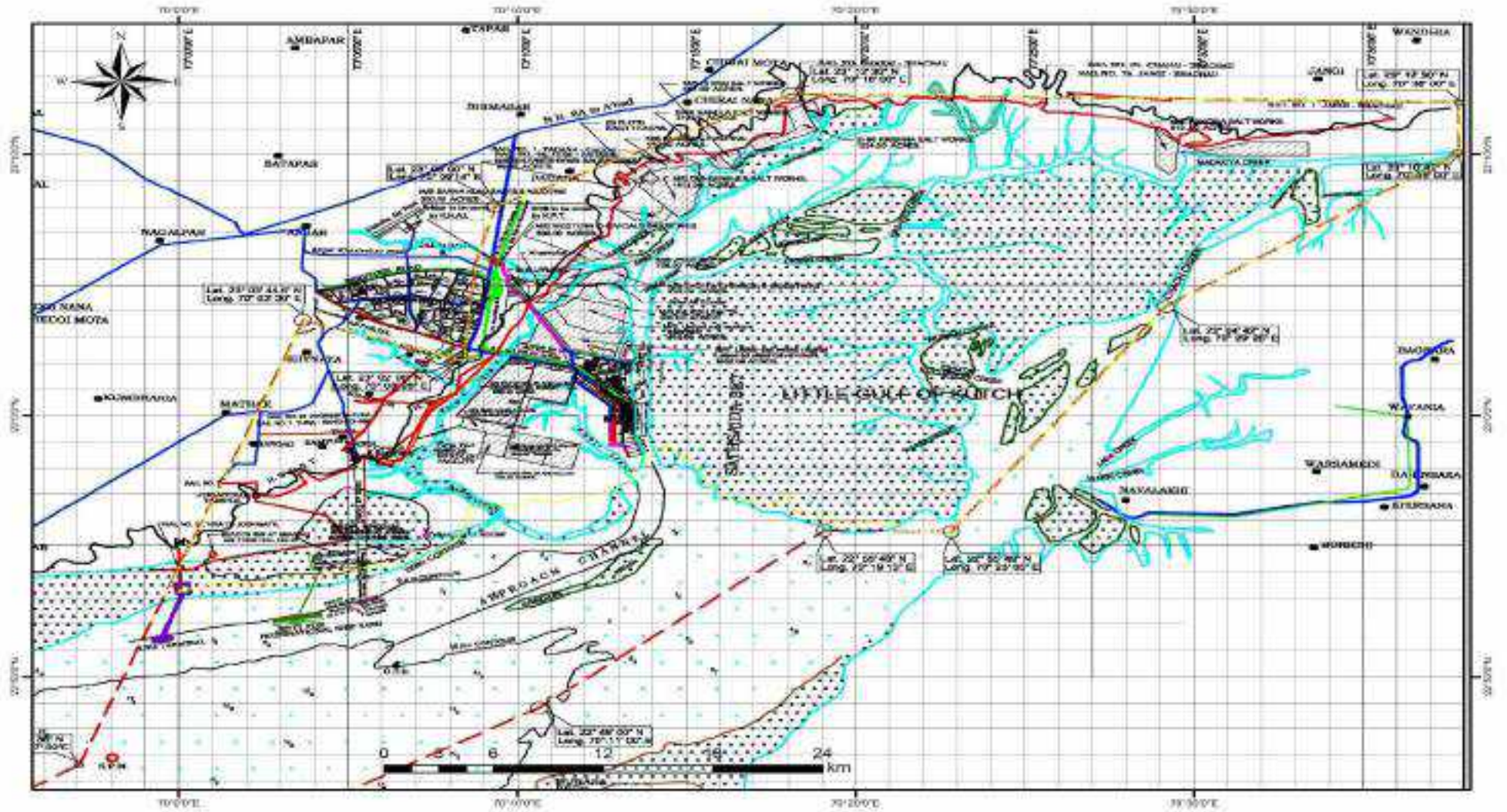
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Annexure I. Location Map of the Kandla Port Premises



ANNEXURE – G

Monitoring of Mangrove Plantation

**Assessment and Monitoring of
Mangrove Plantation (1300 Ha) carried
out by Deendayal Port Trust, Kandla**

Final report submitted to

**Deendayal Port Trust
Gandhidham**

Submitted by



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**Snapshot of the Project," Assessment and Monitoring of Mangrove Plantation
(1300 Ha) carried out by Deendayal Port Trust, Kandla"**

S.No	Components of the Study	Remarks
1	Deendayal Port letter sanctioning the project	NO.EG/WK/4751/CRZ II Letter dated : 01/09/2017
2	Duration of the project	One year-from 15.09.2017 to 15.09.2018
3	Period of survey carried out for various components	November 2017 – August 2018
4	Survey area within the port limit	Sat Saida Bet, Nakti creek and Kantiyajal mangrove plantation sites
5	No of locations sampled within the port limits	04 blocks in Sat Saida Bet, 02 blocks each in Nakti creek and Kantiyajal
6	Components of the report	
7a	Mangrove density	<i>Sat Saida Bet:</i> average density of <i>A. marina</i> varied from 2031 to 5387 individuals/ha with average height ranging from 39 - 113 cm <i>Nakti creek:</i> average density of <i>A. marina</i> varied from 2340 – 2370 individuals/ha with average height from 53 - 84 cm. <i>Kantiyajal:</i> average density of <i>A. marina</i> varied from 1460 - 2220 individuals/ha with average height from 32 -37 cm. Average density of <i>R. mucronata</i> at Kantiyajal was 1280 individuals/ha with an average height of 30 cm
7b	Mangrove survival	Highest survival rate (88.8%) for <i>A. marina</i> plantation in 150 ha at Kantiyajal followed by <i>A. marina</i> plantation in 20 ha at Sat Saida bet (81.6%).
7c	Carbon sequestration potential	The carbon biomass of <i>A. marina</i> plantation varied from 0.041 to 0.202 Mg/ha. The highest Carbon sequestration potential was of Nakti creek.
7d	Management Suggestions	The sparse mangrove patches need to be made dense through restoration efforts following multi-species plantation, more restoration efforts, bio-physical amendments to promote natural regeneration and long term voluntary restoration and plantation efforts.

1. INTRODUCTION

1.1. Background

Mangroves are complex ecosystems that provide coastal bioshield to habitats and societies from natural disasters. Mangrove ecosystems, making up less than 0.4% of the world's forests (Spalding *et al.*, 2010), are being lost at the rate of 1% per year (FAO, 2007). In some areas the rate of mangrove loss is between 2 and 8% per year (Miththapala, 2008). By 1970's decline in mangrove ecosystem was drastic due to both natural and anthropogenic activities. Since 1980, around 20% to 35% of the world's mangrove areas were lost. The mangrove loss has been higher in most of the developing countries for want of space to accommodate various coastal and maritime development activities. Over the years the ecological role of mangroves and the services they provide have been widely realized by the global scientific fraternity. Thus, several researchers eventually targeted mangrove restoration in order to restore their ecological and economical values. The state of Gujarat is no exception to this.

India is lined with a 7516.6 km coastline distributed among nine coastal states and four Union Territories (Anon 2001). Gujarat possesses the longest coastline extending to 1650 km among all the maritime states in India. Mangrove ecosystem in Gujarat is important and is the second largest after Sundarbans in West Bengal. Though contentious, around 15 mangrove species are reported from 13 coastal districts of Gujarat. Of these, the Southern coast of Gulf of Kachchh and South Gujarat are the important districts for mangrove diversity. In Gujarat, the coastal stretch of Gulf of Kutch (GoK) has the largest mangrove extent of 986 km² out of 1140 km². Kachchh district, constituting the northern coast (northern shore) of GoK alone has 798 km² of mangroves constituting 70% of the whole Gujarat mangroves.

True mangroves are taxonomically diverse group, majority of which fall under four genera: *Avicennia*, *Rhizophora*, *Sonneratia* and *Bruguiera*. Though mangrove restoration activities in Gujarat are one of the best examples of habitat restoration

in the world, the mangrove formation / restoration in GoK is largely single species, comprising of *Avicennia marina*. Majority of the mangrove species require fresh water inundation at certain time intervals for propagation. Given the topography of Gujarat state and in particular Kachchh region, finding continuous fresh water sources is atypical. Aridity is the most striking feature of the coastal belt of GoK which often renders plantation of mangrove species other than *A. marina* least promising. This, in turn, makes mangroves restoration / plantation work more challenging and uncertain in semi-arid regions such as Kachchh.

1.2. Rationale

Deendayal Port Trust (DPT) is one of the largest ports of India in terms of volume of cargo handled. Among Indian ports, this port also has the largest coastal habitats such as mangroves (193.1 km²) and mudflats (312.9 km²). Due to this vast coastal resources under its jurisdiction, the port authorities besides legal mandate, desire to conserve, protect and enhance these coastal habitats. The establishment of facilities over the years, buildings, etc. involve notable movement of materials and people in the area. Doubtlessly, this will alter the local ecological makeup of the area. Any long-term activity in the adjacent place will have serious repercussions. Thus, measures should be taken to conserve and preserve KPT mangrove area, thus retaining several unsung ecological services of mangroves. Accordingly, DPT has implemented mangrove plantation in 1300 ha during 2005 - 2017 through various implementing agencies at Sat Saida Bet, Nakti creek and Kantiyajal. The Deendayal Port Trust has entrusted the task of evaluating 1300 ha of mangrove plantation in these three locations to Gujarat Institute of Desert Ecology (GUIDE), Bhuj.

1.3. Objectives of the Study

The overall goal of this study is to assess the mangrove plantation, associated factors affecting mangrove health and suggest tools and techniques of conserving them. The specific objectives are as below:

- i. To evaluate 1300 ha of mangrove plantation at Sat Saida Bet, Nakti creek and Kantiyajal in Kachchh coast carried out by Gujarat Ecology Commission (GEC), Forest & Environment Department and GUIDE.
- ii. To assess the extent of plantation, health status, sapling survival, mortality rate and growth of the planted mangroves.
- iii. To provide a comprehensive overview of both the composition and distribution of the planted mangroves following Phyto-sociological methods.
- iv. To assess the Carbon sequestration potential of the mangrove plantation in view of Climate Change.

2. STUDY AREA

2.1. DPT Environ

Deendayal Port in Kachchh District of Gujarat State (formerly Kandla Port) operated by Deendayal Port Trust (DPT) is a gateway Port to the hinterland in western and northern states of India. It is one of the 11 major Ports of India situated at latitude 23°1' N; longitude 70° 13' E on Kandla creek at the inner end of Gulf of Kachchh. Inclusion of Karachi Port in Pakistan after India's partition and heavy traffic congestion at the then Bombay Port gave impetus for the promotion of Deendayal Port during 1950s. During 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.

An assortment of liquid and dry cargo is being handled at Deendayal Port. Dry cargo includes fertilizers, iron scrap, steel, food grain, metal products, ores, cement, coal, machineries, sugar, wooden logs, salt extractions, etc. Liquid cargo includes edible oil, crude oil and other petroleum products. Total cargo handling was 105 MMTPA during 2016-2017 and 110 MMTPA during 2017-2018. The Port has presently 14 jetties and 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, industrial parks and ship bunkering facilities are underway in order to cope with the increasing cargo handling demands.

Developmental initiatives of this magnitude going on in the past six decades will have its own environmental repercussions. Being located at the inner end of Gulf of Kachchh (GoK), Deendayal Port has a fragile marine ecosystem that includes a vast expanse of mangroves, mudflats, creek systems and allied biota. 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. The Port location is marked by a network of major and minor mangrove lined creek systems

with the vast extent of mudflats. Coastal belt in and around the Port has an irregular and dissected configuration. Due to its location, tidal amplitude is elevated, experiencing 6.66 m during Mean High Water Spring (MHWS) and 0.78 m during Mean Low Water Spring (MLWS) with an MSL of 3.88 m. Commensurate with the increasing tidal amplitude, vast intertidal expanses are present in and around the port environ. This, along with the occurrence of mudflats enables mangrove formations at the intertidal belts. Annual rainfall during 2015 was 398 mm, which is often irregular (India Meteorological Office, Ahmedabad). Mean rainfall at Gandhidham taluka where Deendayal Port is located, during 1985 to 2014 was 398 mm (Table 1). There are no perennial or seasonal rivers in Gandhidham taluka. Rain during monsoon is confined to only 15-20 days and occurs as an instant downpour. Freshwater input into the near coastal waters is quite meagre and appears to have less influence on the ambient coastal water quality except during monsoon months during which flash floods are discharged in the near coastal waters. Annual average humidity is 60%, which increases to 80% during south-west monsoon and decreases to 50% during November-December. Average wind speed is 4.65 m/s with a maximum wind speed of 10.61 m/s during June. The phenomenon of drought is common with 2 drought year in a cycle of 5 years. Annual mean maximum and minimum temperature of the area are 41.8°C and 22.9°C, respectively.

Coastal belt in and around Kandla region is characterized by a network of creek systems and mudflats which are covered by sparse halophytic vegetation like scrubby to dense mangroves, creek water and salt encrusted land mass which forms the major land component. The surrounding environment in a radius of 10 km from the Port is mostly built up areas consisting salt works, human habitations and Port related structures on west and north, creek system, mangrove formations and mudflats in the east and south. Deendayal Port and its surroundings have mangroves, mudflats and creek systems as major ecological entities.

Table 1. Environmental setting of the Deendayal Port region.

Sl. No.	Particulars	Details
1	Deendayal Port Co-ordinates	23° 1' N, 70° 13' E
2	Elevation above Mean Sea level	~20 ft
3	Climatic Conditions	As per Meteorological Station, Deendayal Port Annual Mean Max Temp: 41.8°C Annual Mean Min Temp: 22.9°C Rainfall: 398 mm (2015)
4	Land Use of nearby areas	Comparatively flat marshy land with stunted and dense mangrove formation, mudflats, creek systems, coastal halophytes, saltpans and salt swamps
5	Nearest Highway	National Highway 8A
6	Nearest Railway Station	Gandhidham RS
7	Nearest major airport	Bhuj (~60 km, NW)
8	Nearest Village habitation	Tuna (~12 km, North)
9	Nearest Major Town	Gandhidham (12 km, Northwest)
10	Reserved Forest	Nil
11	Historically Important Places	Nil
12	Rivers/streams around the project environs	Nil
13	Major Dams and barrages	Nil
14	Survey of India Topo sheet covering the proposed site and surroundings	F42K1
15	Seismic Zone	Zone -V

2.2. Mangrove Plantation Activities undertaken by DPT

Mangrove plantation activity by DPT was initiated during the monsoon months of 2005 as mandated by the Ministry of Environment Forests (MoEF). Subsequently, 1300 ha of mangrove plantation has been completed till the end of 2017 in different years in order to meet the legal mandate of Ministry of Environment, Forests and Climate Change (MoEF & CC). The mangrove plantation activities by DPT were carried out at Sat Saida Bet, Nakti creek and Kantiyajal of Bharuch district in South Gujarat. At Sat Saida Bet, plantation activities were carried out in phased out manner i.e. 20 ha during 2005-2006, 200 ha during 2011-2012, 300 ha during 2012-2013, and 330 ha during 2013-2014 (Plate1). At Nakti creek plantation was carried out during 2008-2009 and 2010-2011 in 50 ha and 100 ha,

respectively. At Kantiyajal, mangrove plantation activities were carried out in two phases i.e. 150 ha during 2015-2016 and 150 ha during 2016-2017. The details of implemented mangrove plantation by DPT are given in Table 2. *A. marina* was the preferred species for plantation activities in all the three locations due to prevailing high salinity and high success rate of this species. At Nakti creek *Rhizophora mucronata* and *Ceriops tagal* were also planted in small numbers along with *A. marina*. Likewise, at Kantiyajal attempts were made for planting *R. mucronata* along with *A. marina*. All these mangrove plantations in different years since 2005 were carried out to meet MoEF & CC imposed conditions for different port expansion projects and construction of jetties.

Table 2. Details of implemented mangrove plantation activities by DPT

Location	Year of Plantation	Area (ha)	Species planted	Implementing Agency
Sat Saida Bet, Kachchh district	2005-2006	20	<i>A. marina</i>	M/s Gujarat Institute of Desert Ecology, Bhuj
	2011-2012	200	<i>A. marina</i>	Forest & Environment Department, GoG
	2012-2013	300	<i>A. marina</i>	Forest & Environment Department, GoG
	2013-2014	330	<i>A. marina</i>	Forest & Environment Department, GoG
Nakti Creek, Kachchh district	2008-2009	50	<i>A. marina</i>	M/s Patel Construction Co, Gandhidham
	2010-2011	100	<i>A. marina</i> <i>R. mucronata</i> <i>C. tagal</i>	M/s Gujarat Ecology Commission
Kantiyajal, Bharuch District	2015-2016	150	<i>A. marina</i>	M/s Gujarat Ecology Commission
	2016-2017	150	<i>A. marina</i> <i>R. mucronata</i>	M/s Gujarat Ecology Commission

2.3. Plantation Techniques

For mangrove plantation the following three methods were chosen i) Raised bed method (*Otla* method), ii) Direct propagule dibbling (Seed sowing method), and iii) Transplantation of nursery raised saplings (Polybag method). However, raised

bed and propagules dibbling methods were predominately followed in the majority of the plantation efforts while transplantation of nursery raised saplings were followed in few instances.

2.3.1. Raised Bed Method (*Otla* Methods)

In majority of the plantation sites raised bed method (*Otla* method) was followed, as it is believed to give better results than other methods. Further, this method is perceived to be less costly and labour intensive. This method is especially suitable for sites with high tidal currents since the raised beds resist uprooting of sown seeds in the receding tidal current. In this method, circular earthen mounts of 10-15 cm height and 1 m radius were raised and around 20 seeds/propagules were dibbled on the surface of each bed. Generally, number of raised beds of *A. marina* per ha at Sat Saida bet and Nakti creek was around 3300 with a spacing of 1 x 1 m. *A. marina* survival percentage was calculated based on 6600 saplings/ha for *A. marina* i.e. assuming each *Otla* to has a minimum of two surviving seeds/saplings (3300 *Otla*/ha x 2 surviving saplings = 6600 saplings/ha). In case of plantation where already natural mangroves existed, clusters of *Otlas* mostly exceeding the density of 1500/ha were made closely. In the case of Kantiyajal mangroves 2500 saplings/ha of *A. marina* were considered for calculating survival percentage as per GEC (2015-2017).

2.3.2. Direct Propagule Dibbling (Seed Sowing Method)

Next to raised bed method, direct propagule dibbling (locally called '*Sing*' plantation) was attempted in many sites. This method is less labour and cost intensive, though repeated dibbling is often required in order to obtain desirable survival rate. In this method, mature propagules were dibbled in open empty mudflats or among gaps of natural mangrove stands. Spacing maintained between each dibbled propagule varied and at some sites it was as close as 0.75×0.5 m, especially in plantation raised among gaps of natural mangroves. Propagules used were collected freshly from the nearby mangrove formations, which are thought to give better results, and no pre-dibbling seed treatments were used. Often

propagules were dibbled repeatedly in order to increase survival rates and in raised (*Otla*) bed and nursery plantation sites, dibbling propagules was resorted to increase survival.

2.3.3. Translation of Nursery Raised Saplings (Polybag Method)

Transplantation of nursery raised saplings was also followed as its success rate is higher than other methods. Unlike raised bed and direct dibbling methods, this method is labour and cost intensive, and time consuming. Nursery raised saplings were transplanted as individual plants in the open intertidal mudflats. Saplings in the polythene bags were allowed to attain a height of 40-50 cm before transplantation over a period of 4-5 months. Based on site specific conditions, the number of saplings transplanted varied from 3000 to 6000 per ha. In certain instances, nursery raised saplings were used to gap filling in the seed dibbled plantation in order to raise the survival rate.

2.3.4. Mangrove Plantation at Sat Saida Bet

Sat Saida on the eastern bank of Kandla creek is a unique Island of 253.8 km² opposite to Deendayal port. As one of the major Islands of Gulf of Kachchh, the Island has sparse mangroves (32.8 km²) dense mangroves (7.74 km²) and mudflats (144.73 km²) and halophytic vegetation other than mangroves (49.6 km²). Surrounded by Kandla creek and its branches in the west, Navlakhi creek and its branches on the east and Sara and Pang creek on its north, Sat Saida bet is a highly potential site for mangrove plantation with its vast mudflat. Many major, medium and minor creek systems of Kandla and Navlakhi creeks ramify into this Island in varying length and dimension, supplying tidal water to the interior regions. Southern border of the Island represents the innermost end of Gulf of Kachchh with very few minor creek systems. It is known that mudflats experiencing favourable tidal amplitude are suitable for mangrove plantation. Therefore, Sat Saida Bet area was chosen by DPT to carry out the mangrove plantation and restoration activities. The plantation work in this Island was done in four phases

i.e. 2005-2006, 2011-2012, 2012-2013, and 2013-2014, details of which are given in subsequent sections.

2.3.4.1. 2005-2006 Plantation in 20 ha

During 2005-2006, the mangrove plantation work at Sat Saida Bet was carried out at Dharkadia creek banks in 20 ha. Two sites on both the banks of Dharkadia creek were planted with *A. marina* by M/s. Gujarat Institute of Desert Ecology. Transplanting nursery grown seedlings and direct seed sowing for gap filling were followed during mangrove plantation work. Nevertheless, majority of mangrove plantation was through direct seed dibbing.

2.3.4.2. 2011-2012 Plantation in 200 ha

Mangrove plantation in 200 ha was initiated by Forest Department, Kachchh circle during 2011-2012 on DPT's request. Forest Department (Anjar circle) initiated the plantation activities at Sat Saida Bet during the rainy season of June 2011. The plantation site is opposite to Deendayal port oil jetty and is ~2 km from the bank of Sat Saida bet. A buffer zone of nearly 2 km was allowed between waterfront from the banks of Sat Saida bet and the plantation site. The seeds of *A. marina* were used for plantation activities due to prevailing high salinity in the area. Raised bed method (*Otla*) was followed as the plantation technique and *A. marina* seeds were mostly collected from Kandla mangroves for plantation work.

2.3.4.3. 2012-2013 Plantation in 300 ha

The mangrove plantation carried out during 2012-2013 in 300 ha was covered by Range office of Forest Department at Anjar. *A. marina* was the candidate species for plantation activities at this site. Initially, raised bed method was followed for mangrove plantation but was eventually replaced by direct seed sowing.

2.3.4.4. 2013-2014 Plantation in 330 ha

In continuation of previous year activities, mangrove plantation in 330 ha was carried out by Range Forest Office at Anjar of Kachchh Circle. The plantation site

is located at Sat Saida bet northeast of Kandla port where the main Kandla creek bifurcates east and further north. The plantation site is around 5 km from the bank of Sat Saida bet. Akin to other sites, *A. marina* was the preferred species for plantation activities. Raised bed method was largely followed as the plantation technique at this site. In few spaces, direct seed dibbling was also done.

2.3.5. Mangrove Plantation at Nakti Creek

2.3.5.1. 2008-2009 Plantation in 50 ha

The 50 ha mangrove plantation was carried out at Nakti creek in one block by M/s. Patel Construction Co, Gandhidham. Nursery raised saplings, *Otla* bed, and direct dibbling methods were followed for planting *A. marina*.

2.3.5.2. 2010-2011 Plantation in 100 ha

This mangrove plantation work was executed by M/s. Gujarat Ecology Commission at different blocks at Nakti creek following raised bed method (*Otla*), direct dibbling, and transplantation of nursery raised saplings. The first block was along the Nakti creek and *A. marina* was the candidate species for plantation. In the second block (other side of Nakti creek) *Ceriops tagal* were also sown. In the third block, located on the eastern side of the second block, seeds of *A. marina* were sown. The fourth block plantation was along the minor creek system along the bund and road where propagules of *Rhizophora mucronata* and *C. tagal* were planted. In this 100 ha, *R. mucronata* and *C. tagal* were sown in 5 ha each, and remaining area was planted with *A. marina*. Around 6 lakh seeds involving three species of true mangroves are estimated to be planted in four different blocks. One lakh saplings each of *R mucronata* and *C tagal* were planted in Nakti creek. Accordingly, 20,000 saplings per hectare were transplanted.

2.3.6. Mangrove Plantation at Kantiyajal

Unlike other plantation sites, which are located in and around Deendayal port, this 300 ha, plantation was carried out at Katpor village of Bharuch district near Kantiyajal in South Gujarat by Gujarat Ecology Commission, Gandhinagar. The

plantation was done in two blocks each with 150 ha during 2015-16 and 2016-17 at the coastal stretch of Katpor, Hansot taluka, Bharuch District. *Koteshwar Paryavaran Vikas Vyavasthapan Samiti*, a Community based Organization was entrusted with the task of executing this plantation. Table 3 gives details about the methods followed, candidate species and the target achieved in each method. The seeds of both *A. marina* and *R. mucronata* were collected from the nearby natural mangrove areas. Village level CBO in association with GEC maintain the plantation by gap-filling activities and protection through social fencing. Saplings of *A. marina* were transplanted at the distance of 2.5 x 2.5 m i.e. 2500 saplings/ha. A total of 4,62,500 plants were transplanted in all plantation years. Further, due to large intertidal region as compared to other costal districts of South Gujarat, human habitations are far off from the mangrove habitats.

In total, 70000 propagules of *R. mucronata* were planted to cover 35 ha of area at intertidal belt. The *R. mucronata* propagules were imported from Sindhudurg district of Maharashtra State and each propagule was planted at the distance of 2.5 x 2 m at the banks of small and medium creeks.

Table 3. Mangrove plantation details of Katpor, South Gujarat

Sl. No.	Year of Plantation	Method	Species	Area (ha)
1	2015-2016	Nursery Method	<i>A. marina</i>	70
2	2015-2016	Raised Beds	<i>A. marina</i>	80
3	2016-2017	Nursery Method	<i>A. marina</i>	115
4	2016-2017	Direct dibbling	<i>R. mucronata</i>	35
Total				300

2.3.6.1. 2015-2016 Plantation in 150 ha

This site has naturally growing *A. marina* extending from lower littoral to the mid-littoral. The plantation site is near to this luxuriantly growing mangrove patch. The site is behind the naturally growing plants away from the waterline; however, every day flushing keeps this site quite healthy. The 150 ha mangrove plantation

during 2015-2016 at Kantiyajal was carried out in two blocks. Of this 150 ha, 70 ha plantation activities were carried out following nursery method and remaining area following *Otla* bed. The *Otla* beds of 1 x 1 x 1 m were prepared to improve mangrove density. *A. marina* saplings were transplanted at a distance of 2.5 x 2 m. Around 32,000 such beds were prepared in 80 ha. All plantation activities were taken care by M/s. Gujarat Ecology Commission. *A. marina* was the preferred species for plantation in both the blocks.

2.3.6.2. 2016-2017 Plantation in 150 ha

The plantation site is locally called as “Lalavi area of Alia Bet”. The site is little far away from the approach road and is close to water front. The plantation site is near the aquaculture ponds and a small creek passes through the plantation site. The 150 ha mangrove plantation during 2016-2017 at Kantiyajal was carried out in two blocks. Of this 150 ha, 115 ha plantation activities were carried out following nursery method and in the remaining area direct dibbling method was followed. All plantation activities were taken care by M/s. Gujarat Ecology Commission. *A. marina* was transplanted in 115 ha and *R. mucronata* was planted in 35 ha.

3. METHODOLOGY

3.1. Evaluation of mangrove plantation

The field surveys were undertaken during November 2017 to August 2018 to assess the overall plantation success in these eight blocks. To evaluate the *A. marina* plantation success at Sat Saida bet and Nakti creek i.e. survival percentage and growth rate, initial plantation density of 6600 saplings/ha as a baseline density was considered. Since in most of the plantation method a density 1x1.5 m was used this was considered as initial density at Sat Saida bet and Nakti creek. This contention of implementing agencies that 6600 saplings/ha as equivalent to 1 ha of physical extent, irrespective of the area covered was ascertained through estimating density of the *Otla* beds or saplings per unit area which was then extrapolated to 1 ha in order to ensure notional or physical coverage. Often, raised beds or planted saplings were closely made and compacted at different densities in order to use the available suitable sites.

To assess the survival percentage of the mangrove plantation, the area was divided into uniform grids. Sampling grids were randomly chosen and all surviving saplings in that grid were counted to evaluate the survival status, density of transplanted saplings. The assessment was carried out during low tides by quadrature method by laying plots of 10 × 10 m. In each quadrature, number of planted saplings and their corresponding height were recorded. For assessing the mangrove formations along the creeks systems, a fishing boat was used.

Sat Saida bet, where there are four plantation sites, were taken up first for assessment followed by Nakti creek where two plantation sites exist. Later Kantiyajal mangrove plantation sites were assessed. Based on the GIS co-ordinates all plantation sites were plotted on google map (for the details of satellite imageries procurement, please refer to Annexure 1). Detailed discussion was held with the officials of implementing agencies, i.e. Kachchh forest division and the field supervisor and all relevant information and documents such as plantation registers, local maps, address and personnel involved was gathered. The

implementing agencies were requested to intimate the respective range forest office to extend assistance to the study team.

At Sat Saida bet a total of 72 quadrates were laid, which include, 15 quadrates in 20 ha, 17 quadrates in 200 ha, 16 quadrates in 300 ha, and 24 quadrates in 330 ha. At Nakti creek, 10 quadrates each at 50 and 100 ha plantation sites were laid. At Kantiyajal, 20 quadrates at first block and 10 quadrates in second block were laid. Thus, in total 122 quadrates were laid covering Sat Saida bet, Nakti creek, and Kantiyajal plantation sites.

Of the eight plantation sites, four are located in Sat Saida and Nakti sites where approach and labour mobilization has proved extremely difficult. Though a massive plantation effort has been made which was physically inspected and assessed in the present survey, physical, ecological and environmental changes arising out of the created resources will be visible only after ten years when the raised forest matures into a functional ecosystem discharging all its ecological services.

3.2. Carbon Sequestration Potential of Planted Mangroves

The annual per capita emission of CO₂ from India is 1.67 metric ton and the population of India in 2016 was ~1324 million. According to Kaladharan et al. (2009), the total annual CO₂ emission from India is ~ 2211 million tons. Thus, any intervention proposed must aim at balancing this emission. Mangroves are the first defender during any natural disasters and also a sink of 'Blue carbon' (Donato et al. 2011; Alongi et al. 2016). But unlike other terrestrial ecosystems, mangrove carbon is stored mostly below-ground (Alongi *et al.* 2016). Past researches indicate that mangroves are among the most carbon-rich forests in the tropics, containing an average of 1,023Mg carbon per hectare (Donato *et al.* 2011). In view of above specific, the present study attempted to assess the carbon sequestration potential of planted mangroves at all the sites.

3.2.1. Sampling of Soil and Plant Biomass

Sampling sites for soil/sediment and mangroves were identified through reconnaissance survey. The survey and sampling involved (i) identification of sites for sampling in and around the study area, (ii) collection of soil/sediment and mangrove in and around the study area, and (iii) processing the samples for TOC (%), bulk density and plant biomass. Selection of sampling sites was based on different age/height classes of mangroves.

Based on the above criteria one time sampling was carried out following random sampling protocol for all the samples. At Sat Saida Bet and Nakti creek three pits of 100 cm in each block were made. At Kantiyajal, 2 such pits at each block were made. Samples were collected across the layers i.e. 0-30 cm and 30- 100 cm from each pedon/pit using a plastic scoop. The sampling involved packing of soil samples in pre-cleaned airtight plastic bags, labeling with appropriate code numbers, and subsequent transfer to the laboratory for further processing and analysis (Plate 2). The field collected soil samples were air-dried at normal room temperature (Jackson, 1958), homogenized using an agate mortar and pestle, and sieved through a standard sieve of 2-mm mesh (Tandon, 2005). The particles with size less than 2mm were retained in pre-cleaned plastic bottles for bulk density and Total Organic Carbon (%).

Against each pit/pedon, two mangrove plants were collected. Mangrove samples were collected by complete uprooting of the individual at each site. Individual plants were then packed and labeled. The plant samples were washed thoroughly under tap water several times followed by rinsing with deionized water, drained, and then chopped and separated into root and shoot using a plant cutter. Fresh weight of the samples was taken and subsequently oven dried till constant weight. Mangrove biomass and associated carbon stock calculations were done as follows:

3.2.2. Carbon content in Mangrove Biomass

The mangrove girth is generally measured at 1.3 m height for achieving tree diameter. However, since the present stands were young the whole plant was uprooted for assessing biomass. Total biomass was directly estimated by summing the dry weight of above ground and below ground biomass.

3.2.2.1. Carbon biomass

The biomass was then converted into carbon biomass by multiplying by a factor of 0.42, i.e. $Carbon\ biomass = Total\ biomass \times 0.42$

3.2.2.2. Carbon biomass per hectare

Carbon biomass was calculated per hectare by multiplying the carbon biomass with tree density per hectare, i.e.

$Carbon\ biomass\ (kg/ha) = carbon\ biomass \times density\ of\ plants\ per\ hectare.$

$Carbon\ biomass\ (Mg/ha) = (carbon\ biomass \times density\ of\ plants\ per\ hectare) / 1000$

3.2.2.3. Calculation of CO₂ equivalent

Carbon biomass value is converted into carbon dioxide equivalent by multiplying carbon biomass with 3.67 i.e. $CO_2\ equivalent\ (\%) = carbon\ biomass \times 3.67$

3.2.3. Analysis of soil bulk density, particle density, and air space

Volume of known amount (20 g) of dry soil sample was noted and to this a known volume of water (50 ml) was added. At least 5 ml of water above the soil surface was kept in an undisturbed condition for 30 min. The final volume of soil plus water was noted and bulk density was calculated as follows:

$Bulk\ density = weight\ of\ soil\ (g) / Volume\ of\ soil\ (g/ml)$

3.2.4. Total organic carbon in mangrove soil (El Wakeel and Riley, 1956)

TOC (%) was estimated following the chromic acid digestion and phenanthroline indicator method (El Wakeel and Riley, 1956), wherein the organic matter was oxidized with a mixture of potassium dichromate and concentrated sulphuric acid,

utilizing the heat of dilution of the acid to speed up the process. The unspent potassium dichromate was back titrated against ferrous sulphate solution. The total carbon calculation was as follows:

Ferrous ammonium sulphate (ml) (T) = Titre for Blank – Titre for sample

Total organic carbon (TOC) in sediment soil (mgC/g) (X) = $1.14 \times 0.6 \times T$

Total organic carbon (TOC) in sediment soil (%) = $X / 10$

Total carbon in sediment soil (%) = $TOC \div 2$

3.2.5. Calculation of carbon stock in sediment soil

Carbon stock in sediment soil upto 100 cm was calculated as follows:

Carbon stock in sediment (%) = Bulk density (g.cm^{-3}) \times Total carbon (%) \times Soil depth interval (cm)

3.2.6. Calculation of CO₂ equivalent

CO₂ equivalent was calculated as follows:

CO₂ equivalent (%) = carbon stock \times 3.67

4. RESULTS

Evaluated mangrove survival percentage at Sat Saida bet, Nakti creek and Kantiyajal are detailed in Table 4 to Table 11. In total, four blocks at Sat Saida bet, two blocks at Nakti creek and two blocks at Kantiyajal were visited and assessed. The findings based on site visits and subsequent data analyses are given below:

4.1. Mangrove Plantation Evaluation at Sat Saida bet

4.1.1. 2005-2006 *A. marina* Plantation in 20 ha

This was the first plantation carried out by DPT and executed by Gujarat Institute of Desert Ecology, Bhuj. In total 15 quadrates were laid at this site to assess the *A. marina* status and survival percentage. An average density of 5387 individuals/ha was recorded against the planted 6600 individuals/ha. Thus, a total survival percentage of *A. marina* in this block was 81.6%, which was categorized as successful. Average height of *A. marina* plantation at this site was 113 cm (Table 4, Plate 3 – Plate 7). Minimum and maximum GBH recorded for *A. marina* plantation was 5 cm and 7.5 cm with an average value of 5.7 cm. The minimum and maximum canopy in this plantation stand ranged between 0.49 and 1.19 m² with a mean value of 0.92 m². Generally, canopy cover was more for plants near the waterline. Average density of regeneration class in the quadrates was 1400 plants/ha with a range of 800 to 2100 plants/ha. Generally, density of recruitment class is expected to increase in the future as the phenological cycle of the plant has started in the last 4 years. Density of recruitment class ranged from 300 to 450 plants/ha with an average density of 375 plants/ha.

Around 17 species of associated mangrove fauna were recorded during the survey. Based on current high survival percentage, it is evident that nursery bed and direct seed sowing methods are better suited than raised bed (*Otla*) method. Plantation raised through *Otla* method eventually undergoes high mortality rate even when initial survival rates are high.

Table 4. *A. marina* plantation (2005-2006) in 20 ha at Sat Saida bet

Sl. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	23° 04'' 43.38N	70° 16''47.88E	4400	109	28.34
Q2	23° 04'' 48.18N	70° 16''48.18E	4900	115	24.7
Q3	23° 04'' 43.77N	70° 16''48.41E	5600	110	26.2
Q4	23° 04'' 44.38N	70° 16''47.99E	5700	110	27.7
Q5	23° 04'' 44.10N	70° 16''48.18E	5100	124	29.2
Q6	23° 04'' 48.17N	70° 16''48.17E	4900	135	30.7
Q7	23° 04'' 44.37N	70° 16''48.99E	5300	103	32.2
Q8	23° 04'' 43.49N	70° 16''48.69E	5300	100	34.44
Q9	23° 04'' 44.14N	70° 16''48.93E	6100	121	35.2
Q10	23° 04'' 44.99N	70° 16''47.63E	5200	104	36.7
Q11	23° 04'' 43.07N	70° 16''49.06E	4900	136	29.2
Q12	23° 04'' 43.85N	70° 16''49.88E	5200	105	28.22
Q13	23° 04'' 44.61N	70° 16''48.75E	6100	102	32.15
Q14	23° 04'' 43.53N	70° 16''49.25E	6300	110	33.22
Q15	23° 04'' 44.04N	70° 16''50.02E	5800	110	31.2
Average			5387	113	--

4.1.2. 2011-2012 *A. marina* Plantation in 200 ha

At this site, 17 quadrates were laid to evaluate survival percentage. Average density recorded was 2647 individuals/ha against the planted density of 6600 individuals/ha, which projects poor survival i.e. 40.1%. The average height of plantation was 45 cm only (Table 5, Plate 8 - Plate 12). Minimum and maximum girth of the planted saplings at this site was 4.5 cm and 6.5 cm, respectively with an average value of 5.1 cm. The minimum and maximum canopy Index in *A. marina* plantation stands ranged between 0.67 and 1.1 m² with a mean value of 0.72 m². Only regeneration class (<50 cm) was recorded whereas the recruitment (>50 cm but <100 cm) class was absent. Average density of regeneration class was less to the tune of 400 plants/ha.

Survival of planted mangroves is dependent on several factors, amongst which inundation is a major one. Most of the blocks at Sat Saida bet are inundated only during spring and neap tide i.e. for 6-7 days. Given the scenario, it was apparent that saplings growth and height at Sat Saida bet would be less. Additionally,

Kachchh being an arid zone, rainfall is scanty (340 mm) which adversely affects the growth rate and height of mangroves.

Table 5. *A. marina* plantation (2011-2012) in 200 ha at Sat Saida bet

Sl. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	23° 00'' 48.4N	70° 15'' 49.5E	3000	33.6	9.6
Q2	23° 00'' 50.5° N	70° 15'' 50.0 E	0	0	0
Q3	23° 00'' 53.1° N	70° 15'' 49.2 E	2700	55.9	9.5
Q4	23° 00'' 50.9° N	70° 15'' 47.2 E	3300	31.8	14.9
Q5	23° 00'' 50.1° N	70° 15'' 45.4 E	3500	43.7	14
Q6	23° 00'' 49° N	70° 15'' 43.5 E	3500	53.5	16.6
Q7	23° 00'' 49.3° N	70° 15'' 41.3 E	3500	58.8	26.5
Q8	23° 00'' 51.4° N	70° 15'' 42E	1700	47.9	18.7
Q9	23° 00'' 76.9° N	70° 13'' .50 E	4000	52.7	18.9
Q10	23° 00'' 52.2° N	70° 15'' 37.9E	4600	53.6	24
Q11	23° 00'' 51.7° N	70° 15'' 35.6E	2100	69.9	22.1
Q12	23° 00'' 52.4N	70° 15'' 34.4E	2600	52.7	19.6
Q13	23° 00'' 53.2° N	70° 15'' 33.3E	3500	63.4	19.2
Q14	23° 00'' 55.1° N	70° 15'' 32.4 E	4000	57.6	18.9
Q15	23° 00'' 57.2° N	70° 15'' 33.4 E	2500	40.8	15.7
Q16	23° 00'' 57.9° N	70° 15'' 35.6 E	0	0	0
Q17	23° 00'' 3.6° N	70° 15'' 35.6 E	500	46.6	14.9
Average			2647	45	--

4.1.3. 2012-2013 *A. marina* Plantation in 300 ha

To assess the plantation success, 16 quadrates were laid at this site. Average density of 2031 individuals/ha and average height of 39 cm were recorded (Table 6, Plate 13 - Plate 17) at the site during the survey. Thus, survival percentage of *A. marina* in this block was poor and was to a tune of only 30.8%. Sapling stem girth measured at this plantation ranged from 4.1 to 8 cm with an average of 5.1 cm. Plants with maximum girth of 8 cm were few and recorded sporadically. The canopy Index in this block ranged between 0.69 and 1.28 m² with a mean value of 0.82 m². Canopy cover varied widely among the quadrates in accordance with the growth of the plant. In very few plants, canopy cover was exceptionally high whereas in others it was poor. Similar to earlier stands density of younger classes in this 300 ha plantation was low since this plantation carried out during 2012-13

has yet to attain its full phonological cycle. Average density of regeneration class was less to the tune of 550 plants/ha whereas the recruitment class plants were almost absent. Average height of the saplings in this block was 89 cm with a GBH value of <4 cm showing that these plants are still very young and the phonological cycle is yet to start in the whole plantation. The minimum and maximum canopy Index in this 330 ha mangrove plantation stands planted during 2013-14 was low and ranged between 0.32 and 0.93 m² with a mean value of 0.42 m². Plants are still in recruitment and regeneration stage recording a poor growth rate explaining the low canopy cover recorded presently.

Growth of planted and natural mangroves in this region was slow which could be attributed to higher soil and water salinity. Further, given the low survival percentage of planted *A. marina* in this block, it is quintessential to check the grazing by camels and other livestock. Low survival of planted mangroves could also be due to wrong selection of plantation site, plantation technique i.e. *Otla* bed method which would have affected survival percentage when compared to direct seed sowing. Thus, it is suggested to follow the direct seed sowing or nursery bed techniques for plantation of this species.

Scientifically poor survival in the mangrove plantation could be attributed to inadequate tidal inundation and wrong plantation method. When a planted mangrove fail to get adequate tidal water either it fails to germinate or its growth becomes stunted. Hence, selection of site plays a crucial role in the mangrove plantation success.

Table 6. *A. marina* plantation (2012-2013) in 300 ha at Sat Saida bet

Sl. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	23°02.06604 N	70° 13.25285 E	3600	68.1	25.9
Q2	23°01.93788 N	70°13.244884 E	3700	46.1	19.7
Q3	23° 1.507972 N	70°13 23.2248E	1500	40.9	10.8
Q4	23° 14.5986N	70°15.2648E	1100	35.5	15.6
Q5	23°15.948N	70°15.28626 E	0	0	0
Q6	23°17.128 N	70°15. 30816 E	0	0	0

Q7	23°19.636 N	70°15.29886 E	0	0	0
Q8	23°18.814N	70°15.27636 E	1000	31.4	13.4
Q9	23°18.838N	70°15.27648 E	4200	44.5	20.5
Q10	23°19.768N	70°15.26198 E	1400	31.6	13.8
Q11	23°11.3704N	70°15.231 E	2800	59	20.3
Q12	23°11.3644N	70°15.231 E	3600	56	22.1
Q13	23°11.7004N	70°15.2334 E	2500	70.2	23.5
Q14	23°16.61N	70°15.25192 E	2900	59.4	21
Q15	23°11.4514 N	70°15.27484 E	500	22.2	6.4
Q16	23°11.4418 N	70°15.27336 E	3700	57.2	22.7
Average			2031	39	--

4.1.4. 2013-2014 *A. marina* Plantation in 330 ha

This plantation site is located northwest of the Deendayal Port and in the northern extent of Sat Saida Bet. The plantation site is tidally fed by branches of Pang creek, which is the northern bifurcation of main Kandla creek. We laid 24 quadrates at this site to assess the *A. marina* survival percentage. An average density of 4133 individuals/ha was recorded against the planted 6600 individuals/ha. The average height of *A. marina* plantation at this site was 89 cm with a survival percentage of 62.6% (Table 7, Plate 18 – Plate 22). Both raised bed method and direct seed dibbling were followed at this site. Since poor tidal flushing was identified as a major issue, care was exercised during plantation to choose sites with good tidal flushing to target good survival percentage.

Table 7. *A. marina* plantation (2013-2014) in 330 ha at Sat Saida bet

S. No.	Sampling Locations		Density (Ha)	Height (cm)	St. Dev
Q1	23°04'48.34" N	70° 17' 10.05" E	4400	109	28.34
Q2	23°04'46.55" N	70° 17' 13.94" E	4900	115	24.7
Q3	23°04'45.14" N	70° 17' 18.65" E	4100	110	26.2
Q4	23°04'41.97" N	70° 17' 16.66" E	5600	110	27.7
Q5	23°04'50.58" N	70° 17' 16.68" E	2900	124	29.2
Q6	23°04'44.43" N	70° 17' 16.54" E	4900	135	30.7
Q7	23°04'49.39" N	70° 17' 15.54" E	2800	103	32.2
Q8	23°04'45.35" N	70° 17' 06.79" E	5300	100	34.44
Q9	23°04'42.94" N	70° 17' 09.32" E	5200	121	35.2
Q10	23°04'40.49" N	70° 17' 13.53" E	2900	86	36.7
Q11	23°04'46.46" N	70° 17' 12.37" E	4900	73	29.2

Q12	23°04'44.26" N	70° 17' 15.86" E	5200	105	28.22
Q13	23°04'48.25" N	70° 17' 12.93" E	6100	102	32.15
Q14	23°04'44.174" N	70° 17' 16.32" E	6300	70	33.22
Q15	23°04'38.25" N	70° 17' 10.33" E	5800	110	31.2
Q16	23°04'40.41" N	70° 17' 12.07" E	3500	62	16.1
Q17	23°04'40.76" N	70° 17' 12.89" E	2600	51	14.7
Q18	23°04'38.16" N	70° 17' 20.60" E	3600	43	12.2
Q19	23°04'38.76" N	70° 17' 10.60" E	3300	45	11.1
Q20	23°04'40.69" N	70° 17' 06.48" E	2300	66	23.7
Q21	23°04'49.68" N	70° 17' 14.62" E	3600	72	9.3
Q22	23°04'47.10" N	70° 17' 03.65" E	3100	78	17.6
Q23	23°04'49.42" N	70° 17' 07.81" E	3300	85	19.2
Q24	23°04'49.87" N	70° 17' 10.23" E	2600	64	17.2
Average			4133	89	--

4.2. Mangrove Plantation Evaluation at Nakti creek

Two mangrove plantation sites of 50 ha and 100 ha were developed at the north-eastern bank of Nakti creek, a major creek system west of Kandla creek. The main creek and its branches are getting inundated by 3-4 m of tidal water during high tide. Two mangrove plantation sites developed in this site are adjacent to each other with good tidal flooding.

4.2.1. 2008-2009 *A. marina* Plantation in 50 ha

At this block, 10 quadrates were laid to evaluate the *A. marina* survival. The results revealed that *A. marina* survival in this block was poor with only 35.5% i.e. average density of 2340 individuals/ha. The average height of this plantation was 53 cm (Table 8, Plate 23 - Plate 27). Stem girth of the saplings in this 50 ha stand at Nakti creek ranged from 3.5 cm to 6 cm with an average value of 4.4 cm. Minimum and maximum canopy cover in this stand ranged between 0.42 and 1.1 m² with a mean value of 0.71 m². Average density of regeneration class was 2900 plants/ha with a minimum and maximum range of 4900 to 8000 plants/ha showing good regeneration potential of the site. Similarly, recruitment class density ranged from 900 to 1800 plants/ha with an average density of 1100 plants/ha. It is known that direct dibbling and nursery raised transplantation are superior to *Otla* bed technique. Poor survival of planted *A. marina* could be ascribed to mixed

plantation techniques as more than two species, namely *Rhizophora mucronata* and *Ceriops tagal* were planted at this site.

Table 8. *A. marina* plantation (2008-2009) in 50 ha at Nakti creek

Sl. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	22° 57' 12.9N	70° 09' 04.9 E	3000	53.8	19.6
Q2	22°57' 11.6 N	70° 09'04.5 E	3000	64.8	18.4
Q3	22°57'10.9 N	70°09' 04.7 E	2400	70.5	24.0
Q4	22°57'10.3 N	70°09' 05.4 E	2800	65.8	19.2
Q5	22°57'09.6 N	70°09'06.2 E	2500	63.0	15.9
Q6	22°57'09.1 N	70°09'07.2 E	2700	60.2	15.2
Q7	22°57'09.1 N	70°09'08.2 E	2500	40.9	15.6
Q8	22°57'09.2 N	70°09'08.4 E	0	0.0	0.0
Q9	22°57'08.1 N	70°09'10.0 E	2700	54.1	15.6
Q10	22°57'07.7 N	70°09'10.3 E	1800	60.9	24.6
Average			2340	53	--

4.2.2. 2010-2011 *A. marina* Plantation in 100 ha

4.2.2.1. *A. marina* Plantation in 90 ha

In total, 10 quadrates were laid at this site to assess the *A. marina* survival percentage. Akin to *A. marina* plantation in 50 ha of Nakti creek block, this site also showed poor survival of only 35.9%. The average density of 2370 individuals/ha in this block with average height of 84 cm was recorded (Table 9, Plate 28 – Plate 32). Even though the plantation activities were carried out near the creek system, poor survival of planted mangroves could be due to mixed plantation techniques. The GBH in this plantation varied from 2.8 - 5.2 cm with an average value of 3.7 cm. The minimum and maximum canopy Index in this plantation stand ranged from 0.82 to 1.28 m² with a mean value of 0.96 m². Younger classes were recorded in low density in this block. While regeneration recorded an average density of 2700 plants/ha, the recruitment classes showed a poor density of only 400 plants/ha.

Table 9. *A. marina* plantation (2010-2011) in 100 ha at Nakti creek

S. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	22° 57 50.0 N	70° 09 40.8 E	1200	55.3	14.7

Q2	22 °57 47.8 N	70° 09 42.4 E	2000	67.1	21.04
Q3	22 °57 46.1N	70 °09 42.8E	1200	70.1	29.3
Q4	22° 57 42.4N	70 °09 44.3E	2000	80.1	41.4
Q5	22° 57 41.6N	70° 09 46.2E	3200	90.9	28.3
Q6	22°57 31.1N	70° 09 49.6E	2700	90.9	23.4
Q7	22°57 39.8 N	70° 09 48.8E	3400	82.8	19.9
Q8	22°57 38.6 N	70 °09 51.2E	3500	88.9	20.6
Q9	22°57 38.2N	70 09 54.5 E	2500	115.9	28.2
Q10	22°57 37.5 N	70 09 52.9 E	2000	99.5	17.8
Average			2370	84	--

4.2.2.2. *R. mucronata* Plantation in 5 ha

During the surveys, we did not record any individual inside the quadrates laid. Nevertheless, *R. mucronata* saplings were recorded outside the quadrates with height varying from 50-60 cm. Around 10 individuals were seen during the entire survey. Thus, it was apparent that plantation of *R. mucronata* in 5 ha was a failure. Unlike *A. marina*, *R. mucronata* needs 20 - 25 days of tidal flushing in a month and can tolerate only moderate salinity. During the field surveys, it was recorded that the saplings were invaded by the alga *Enteromorpha* sp. and regular tidal flushing was lacking. All these factors could be attributed to plantation failure.

4.2.2.3. *C. tagal* Plantation in 5 ha

Similar to *R. mucronata* plantation in 5 ha at Nakti creek, no individuals of *C. tagal* could be recorded inside the laid quadrates. Nevertheless, around 20 individuals *C. tagal* with 40-45 cm height were noticed outside the quadrates. Since, nearly 1 lakh propagules of *C. tagal* were planted in 5 ha, presence of only 20 individuals indicates plantation failure. Similar to *R. mucronata*, plantation site of *C. tagal* was also invaded by algae and lacked regular flushing. *C. tagal* and *R. mucronata* are frontline mangroves and thus regular tidal flushing is essential. Algal infestation on mangroves needs regular monitoring and manual removal to help the plant survive. Physical protection and regular monitoring of mangrove plantation stand are the best conservation efforts that will yield positive results.

4.3. Mangrove Plantation Evaluation at Kantiyajal

4.3.1. 2015-2016 *A. marina* and *R. mucronata* Plantation in 150 ha

The 300 ha plantation was carried out at the coastal stretch of Katpor village near Kantiyajal at Bharuch district. This plantation was carried out in two blocks of 150 ha each during 2015-16 and 2016-17. Gujarat Ecology Commission (GEC), Gandhinagar executed this plantation with the community participation of a formed *Samiti* at the Katpor village.

A total of 30 quadrates were laid in this block for assessing mangrove survival success. As per earlier report by GEC (2015-2017), at this site only *A. marina* individuals were planted. However, our field surveys revealed that this block had *R. mucronata* saplings in addition to *A. marina*. An average density of 1460 individuals/ha was recorded for *A. marina* against 2500 saplings/ha. Similarly, average density of *R. mucronata* was 1280 individuals/ha (Table 10, Plate 33 - Plate 34) against the targeted 2000 individuals/ha. The survival percentage of *A. marina* and *R. mucronata* were 58.4% and 64.0%, respectively. The average height of *A. marina* was 32 cm and that of *R. mucronata* was 30 cm at this block. *R. mucronata* being a frontline mangrove, its plantation was carried out towards the lower intertidal region. Continuous tidal flushing and following appropriate zonation pattern during plantation could be attributed to higher survival percentage of *R. mucronata*.

Table 10. Mangrove plantation (2015-2016) in 150 ha at Kantiyajal

<i>A. marina</i>					
Sl. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	21° 28' 5.2" N	72° 38' 57.0" E	2000	29.8	9.0
Q2	21° 28' 22.19" N	72° 38' 12. 43"	2200	42.4	10.9
Q3	21 °28'14.73"N	72°38'52. 97"	1900	41.1	13.9
Q4	21°28'05.00"N	72° 38'58. 66"	1000	38.1	7.1
Q5	21°28'56.68"N	72° 38'50.88"	0	0.0	0.0
Q6	21°28'59. 18" N	72°38'28.70"	1600	40.9	11.6
Q7	21°28'15.05"N	72°38'32.30"	1900	36.0	11.3
Q8	21°28'17.86"N	72°38'39. 86"	0	0.0	0.0
Q9	21°28'18.73"N	72°38'50.30"	2200	44.2	12.0

Q10	21°28'00.43"N	72°38' 08.02"	1800	45.8	9.7
Average			1460	32	--
<i>R. mucronata</i>					
Sl. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	21° 28' 20.93" N	72° 38' 22.20"E	1700	32.5	7.4
Q2	21° 28' 16.56" N	72° 38' 27.88"E	1400	41.4	4.5
Q3	21° 28' 19.69" N	72° 38' 11.96"E	0	0.0	0.0
Q4	21° 28' 9.32" N	72° 38' 7.73" E	700	39.4	7.4
Q5	21° 28' 19.73" N	72° 38' 57.43"E	0	0.0	0.0
Q6	21° 28' 11.18" N	72° 38' 5.68"E	400	36.0	2.0
Q7	21° 28' 5.26" N	72° 38' 4.07"E	300	26.0	1.8
Q8	21° 28' 8.12" N	72° 38' 57.79"E	0	0.0	0.0
Q9	21° 28' 23.34" N	72° 38' 48.32"E	800	45.6	8.6
Q10	21° 28' 17.6" N	72° 38' 40.84"E	800	48.4	13.0
Q11	21°31'7.25"N	72°38'44.82"E	2800	40.6	11.5
Q12	21°31'6.76"N	72°38'52.51"E	2300	43.4	10.4
Q13	21°31'3.83"N	72°38'49.30"E	0	0.0	0.0
Q14	21°31'0.54"N	72°38'45.11"E	2200	35.9	6.8
Q15	21°31'0.58"N	72°38'39.17"E	2600	42.4	8.7
Q16	21°31'1.28"N	72°38'33.98"E	0	0.0	0.0
Q17	21°31'5.42"N	72°38'33.96"E	2300	44.9	9.8
Q18	21°31'7.28"N	72°38'38.40"E	2800	39.4	11.5
Q19	21°31'7.10"N	72°38'42.80"E	2400	42.7	12.7
Q20	21°31'3.75"N	72°38'44.30"E	2100	44.8	12.9
Average			1280.0	30	--

4.3.2. 2016-2017 *A. marina* Plantation in 150 ha at Kantiyajal

At this block, 10 quadrates were laid (Table 11, Plate 35 – Plate 36) for evaluating mangrove plantation success. During field surveys, we did not record *R. mucronata* plantation in this block as mentioned by GEC (2015-2017). Thus, from field data it was evident that single species plantation i.e. *A. marina* was only carried out at this block. Average density of *A. marina* at this site was 2220 individual/ha against 2500 individual/ha which contributes to 88.8% plantation success. Proper site selection, regular inundation and monitoring, etc. are few factors, which affect survival percentage. It was apparent from the field data that this site is good for *A. marina* plantation.

For both the blocks at Kantiyajal, the girth plantation varied from 3.5 - 5 cm with an average of 3.9 cm. Similarly, the canopy cover for both the blocks ranged between 0.42 and 81m² with a mean value of 0.67 m². In both the blocks of this plantation, younger classes such as regeneration and recruitment were absent as the planted saplings have not yet started their flowering and fruiting cycles.

Table 11. *A. marina* (2016-2017) in 150 ha at Kantiyajal

Sl. No.	Sampling Location		Density (Ha)	Height (cm)	St. Dev
Q1	21° 30 58.13" N	72° 38 59.38" E	2600	44.4	13.9
Q2	21° 31 0.49" N	72° 38 48.24" E	2200	41.9	12.7
Q3	21° 31 11.8" N	72° 38 41.61" E	2300	42.9	14.7
Q4	21° 31 15.00" N	72° 38 49.07" E	3000	44.0	9.2
Q5	21° 31 26.22" N	72° 38 46.59" E	2800	37.3	11.8
Q6	21° 31 25.92" N	72° 38 53.85" E	0	0.0	0.0
Q7	21° 31 35.09" N	72° 38 5.04" E	2100	42.1	12.2
Q8	21° 31 13.63" N	72° 38 58.43" E	2400	40.5	12.0
Q9	21° 31 5.94" N	72° 38 53.41" E	2500	41.2	10.4
Q10	21° 31 41.71" N	72° 38 34.34" E	2300	40.0	10.9
Average			2220.0	37	--

4.4. Carbon sequestration potential at Sat Saida Bet

The carbon biomass (Mg/ha) of *A. marina* plantation at Sat Saida bet was 0.076 Mg/ha for plantation with less than 20 cm m height and 0.087 Mg/ha for 60 cm height. The average CO₂ equivalent (dry weight and soil) of *A. marina* plantation at Sat Saida bet was 1.56%.

4.5. Carbon sequestration potential at Nakti creek

At Nakti creek the carbon biomass of *A. marina* plantation varied from 0.041 to 0.202 Mg/ha. Irrespective of the height, the Carbon sequestration potential was more in 100 ha plantation when compared with 50 ha plantation at Nakti creek. The CO₂ equivalent (dry weight and soil) of *A. marina* plantation at Nakti creek was 2.17%. Among the three locations, i.e. Sat Saida bet, Nakti creek and Kantiyajal, the highest Carbon sequestration potential was recorded for Nakti creek.

4.6. Carbon sequestration potential at Kantiyajal

At Kantiyajal carbon biomass of *A. marina* plantation was only carried out which ranged from 0.095 to 0.132 Mg/ha. The CO₂ equivalent (dry weight and soil) for *A. marina* plantation at this site was 1.18%.

5. SUGGESTIONS AND RECOMMENDATIONS

Deendayal port with an area of 999.19 km² including 193.19 km² of mangroves and 312.9 km² of tidal mudflats presents enormous scope for mangrove plantation, restoration and rehabilitation. Based on the present and earlier field surveys and data analysis the following recommendations are suggested for current and future plantation activities.

5.1. Site Selection

By far, site selection within the broader landscape for plantation is the foremost criterion that determines the plantation success. For successful plantation, it is essential that the existing bio-physical conditions of the coastal landscape in a broader and general manner are to be thoroughly understood. Consideration of a set of criteria as given in the Table 12 will enable the planter to conclude the site suitability reliably.

A list of bio-physical parameters such as gradient of the intertidal belt, soil nature, number of days of tidal flushing, presence/absence of natural mangroves in the vicinity and availability of adequate intertidal extent are to be considered and grades should be assigned in a scale of 1 to 10. One major parameter that deserves careful consideration is number of days of tidal flushing which in turn is influenced by the gradient of the intertidal extent; only sites with gentle gradient receiving good tidal flushing for >15 days in a month are to be chosen for plantation activities. The suite of criteria indicated in Table 12 is applicable even for plantation among gaps of natural mangroves, along creek banks and mudflats. Involving local people and fishermen living nearby will render the site selection easier since they are well versed with the local conditions, especially tidal flushing rate. In addition, short term and small-scale feasibility trials could be conducted in order to ascertain the suitability of the site. Several plantation attempts in Kachchh coast and elsewhere have failed due to unsuitable site selection. Hence, it is important that great care be exercised while choosing the plantation site.

Table 12. Criteria for Technically suitable site for Mangrove Plantation

Priority Order	Criteria	Preferred Conditions
1	Site Nature - Open coast/creek/Natural Mangrove formations	Creek systems and river mouths with freshwater input is preferable- In open coast sites gentle gradient is preferred. In enrichment plantation among natural mangroves, adequate gaps with good tidal flushing are to be considered.
2	Intertidal Gradient	Intertidal extent with gentle slope preferred-Steep intertidal gradient and those with convex morphology are to be avoided to prevent water logging.
3	Tidal inundation	Only sites with gentle gradient with minimum of 15 days tidal flushing per month mostly preferred
4	Sediment Texture	Silty-clay or muddy substrate preferred. Though sandy substrate supports some mangrove species such as <i>A. marina</i> it has its own drawbacks like shifting sand, sediment deposition on pneumatophores, etc.
5	Water Salinity	Sites close to discharge points of run-off preferred which controls salinity fluctuations -Based on this candidate species are to be selected.
6	Intertidal Extent/Width	Sites with minimum 150-200 m width and gentle gradient close to the waterfront preferred
7	Tidal Currents	Sites with gentle and low velocity currents preferred
8	Mangrove Presence/ Absence in the Vicinity	Presence of natural mangroves in the vicinity is a reliable indication that the site can support good mangroves.
9	Accessibility of the site	Easy accessibility enables increased working hours for labours and easy labour transport
10	Labour Availability	Availability of good labour in nearby villages is a major factor
11	Seed Source	Seed source from nearby mangroves preferable-If new species are to be attempted seeds/propagules are to be acclimatized to higher salinity
12	Pressure-Grazing, Cattle visit, resource gathering etc.	To be avoided through constant vigil- Social fencing by educating villagers and implementing plantation in a community mode and sensitizing villagers not to send their cattle to the plantation.

5.2. Plantation Efforts

In all future plantation activities, the candidate species should be other than *A. marina*. It is suggested to prefer plantation of *R. mucronata*, *C. tagal* and *A.*

corniculatum, they being locally present in DPT environ though in very small numbers as individual plants at Sat Saida bet.

Based on the findings of current evaluation, it is evident that *Otla* bed plantation technique did not yield good survival percentage. Thus, it is recommended that in future plantation activities transplantation of nursery raised saplings and direct seed dibbling should be preferred to raised bed method.

There are several approaches to restore mangroves such as direct planting of saplings, seedlings, and propagules from adjacent mangrove trees; natural recruitment of propagules; hydrologic manipulation resulting in efforts to re-establish hydrologic regimes; and the combination of the aforementioned methods. However, these techniques may benefit single species plantation such as *A. marina*. Thus, for plantation of multi-species, a thorough understanding of several crucial factors is quintessential. Certain mangrove species require more precise site conditions unlike others, which may in turn have implications on site selection and species association; *R. mucronata* may prefer seaward side than *A. marina*, which thrives well both in seaward and landward side. Thus, mangrove species may tend to confine themselves to a specific coastal stretch following a zonation pattern. Therefore, it is advised to consider integration of several factors during site selection, which are crucial for the success of mangrove plantation.

Of 193.19 km² mangrove formation within the port, dense mangroves are 53.55 km² (27.7%) and remaining are sparse/stunted mangroves. Through appropriate restoration measures, these sparse mangroves could be converted into dense patches. Thus, it is suggested to carry out restoration activities along with direct plantation to improve mangrove vegetation cover in Deendayal port area.

Sat Saida Bet could be an ideal site for all future mangrove plantation, restoration and rehabilitation activities with bio-physical amendments such as de-silting existing creeks, joining all the existing minor creeks with one another through new

creek systems. To improve the flow of tidal water in the existing creek systems, the areas with uneven water depths are to be demarcated where de-silting and deepening the creeks will lead to better tidal flushing to mangrove formations gradually converting them to dense and healthy. Increased tidal flooding and hydroperiod will extend the mangrove formation in this location besides converting sparse into dense mangroves in due course of time. This creek reconstruction, desilting existing minor creek systems and removing blocks in the natural creeks may be taken up in a phased manner with due budgetary allocation.

5.3. Promoting Natural Regeneration

In the GUIDE (2018) report on the holistic and integrated management of creeks and mangroves, a detailed account is provided on how creek systems and mangroves complement each other. In general, creeks as a bio-physical entity influences natural mangrove formation, regeneration and assist mangroves as a fully functional ecosystem. An elaborate account on how creek systems of Deendayal port promote the process of natural regeneration is given. Physical features of creek systems influence natural regeneration potential of the mangrove formation through their tidal inundation, spreading propagules and assist mangroves in colonizing new intertidal belts. Earlier mangrove vegetation analysis studies at Kandla and Tuna mangroves (GUIDE, 2012 and 2015) have clearly indicated that density and entrance of younger classes is good enough to become mature trees. This also indicates that the recruitment process in the mangrove ecosystem is normal and there is good transformation of younger classes into mature category. Nevertheless, GIS studies carried out on Deendayal port mangroves indicates that out of 193.19 km² of mangroves, 72.27% (139.64 km²) of mangroves are sparse mostly due to inadequate inundation and tidal flushing. Earlier reports (GUIDE, 2012, 2015, and 2018) have clearly outlined the management approaches to promote natural regeneration and conversion of sparse mangroves into dense formation through bio-physical amendments such as desilting natural canals, connecting existing natural canals with each other in order to enhance tidal reach and creation of new canals at micro-levels. It is emphasized

that adapting this bio-physical amendments will enhance natural regeneration process many fold besides converting sparse mangroves into dense formations. To sum up, these measures adapted through sustainable long term management practices will render the Deendayal port mangroves a fully grown and functional ecosystem with enhanced ecological services.

5.4. Assisting Natural Regeneration

In mangrove formations such as Sat Saida Island and in Sara and Pang creeks, extensive mudflats are present which are suitable for plantation activities. In addition to initiating plantation in such mudflats, mangrove formation in Sat Saida Island, Tuna region and Navlakhi creek regions could be classified as sparse, dense, mudflats and salt marshes and appropriate conservation initiatives could be taken for each zone.

Sparse mangroves constitute 72.3% of the total mangroves of the port. This could be restored to dense formation through physical amendment measures *viz.*, canal digging, removing blockage in natural canal systems, and by other physical means. Thus, future mangrove plantation efforts could be focused on restoring sparse mangroves into dense formations through biophysical measures.

5.5. Comparison with Earlier Studies

From earlier studies (GUIDE, 2015) and present findings it is apparent that *Otla* bed plantation technique is inapt for good survival percentage. Thus, as recommended in earlier sections, nursery raised transplantation and/or direct seed dibbling techniques may be chosen over *Otla* bed.

Extensive mudflats are an indication of enormous potential the area may hold for restoration and conservation of mangrove ecosystem. According to GUIDE (2018), mudflats and creek systems in Deendayal Port and its surroundings are major ecological entities, with mudflats extending to 312.9 km². Therefore, management and conservation measures for mudflats are requisite in Deendayal

port and its environ. Hence, mangrove restoration efforts in DPT should continue even in the absence of any orders/instructions from MoEF & CC. In view of these specifics, it is recommended that DPT should prepare a long term mangrove restoration, management and monitoring plan in consultation with the experts.

5.6. Mangrove Biodiversity Enhancement

Though mangrove restoration activities in Gujarat are one of the best examples of habitat restoration in the world, the mangrove restoration in Gulf of Kachchh (GoK) is largely single species, comprising of *A. marina*. Given the topography of Gujarat state and in particular Kachchh region, finding continuous fresh water source is atypical. Mangroves require fresh water inundation at certain time intervals for propagation. This, in turn, makes mangroves restoration / plantation work more challenging and uncertain in semi-arid regions. Thus, these factors have contributed to the selection of single hardy species of mangrove i.e. *A. marina* during mangrove plantation in Kachchh coast.

Deendayal port is undertaking mangrove plantation in a massive manner since 2005 and 1300 ha of mangroves have already been planted in Sat Saida Island, Nakti creek and Kantiyajal. However, only *A. marina* is preferred during all the plantation activities due to its environmental plasticity and high salinity tolerance. Nevertheless, within DPT limits, three more mangrove species viz., *R. mucronata*, *C. tagal* and *A. corniculatum* have been sporadically recorded by GUIDE team. Thus, it is recommended that in future mangrove plantation efforts, these additional species which are naturally occurring in this region could be planted extensively. Plantation of these species is expected to create a seed bank in due course of time which would eventually convert single species stand of *A. marina* into multi-species formation.

5.7. Co-Management with the Community

Ideally, mangroves within the DPT jurisdiction should be the object of intense management program with a specific aim to protect them. Such intense

management program is quite feasible in the case of DPT since all the mangrove formations are under its legal control and hence any management program could be implemented without any sectoral conflicts with forest or any other government departments. It was proven in many instances that involving the stakeholder communities in the surrounding villagers will yield better results in mangrove plantation and restoration activities. Though the population in the port surroundings has different livelihood activities, fishermen community could be targeted to involve them in community based mangrove management.

The fishermen communities living in Vera, Khari Rohar and Tuna villages close to the port could be involved in mangrove conservation by forming *Samithies*. The community based organization i.e. *Samithi* roles and responsibilities w.r.t. mangrove conservation in their vicinity should be well defined that would play a seminal role in conserving these mangrove patches. Nevertheless, their resource dependency, perception towards mangroves, level of involvement in such resource management activities, etc. need to be assessed before forming the *Samithi*. It is advised that the *Samithi* may be assigned the task of mangrove plantation/restoration activities, physical protection and other conservation measures. Sustained awareness programs about tangible and intangible benefits the community accrues by conserving mangroves should be strongly conveyed to them. Social structure of the villages in the vicinity could be better understood to see how they could participate in any mangrove centered management programs, preferably a community based resource management.

5.8. Physical Protection

The most common method of conserving mangrove ecosystem is by creation of protected areas. Mangroves of Deendayal port warrant intensive protection as a major means of conservation. Presently, the whole port limit is under the protection of Central Industrial Security Force (CISF). Thus, CISF personnel could be imparted with the ecological significance of mangroves through special awareness program and mangrove patrolling by them can be instituted to enhance

the level of physical protection to mangroves. This could be done by appointing special squads for protecting this patch from incidents like cattle grazing, leaf and wood and other resource collection. Physical protection of natural stand is often the best conservation measure that will fetch positive results.

Employees of Deendayal port need to be made aware with the environmental and ecological significance of mangroves and other coastal resources within the port limits. Licenses for salt works and other port allied industries are awarded by port authorities without understanding the ecological and environmental rules and regulations governing them which often lead to legal and environmental bottleneck at a later stage. Short-term awareness programs to port employees could be conducted by seasoned marine/mangrove ecologists.

5.9. Identification of Stress Factors

It is important that in any conservation efforts, stressors acting on the mangroves are to be identified and removed in order to maintain the ecosystem balance. Mangrove environment will continue to be stable and balanced if there are no external stressors such as change in hydrology, elevation and slope, soil and water salinity and pH, soil texture and wave energy. In addition, human centered stress factors such as resource collection, tree felling and other habitat modification activities will act as major stressors. It would be necessary to find the factors causing stand degradation and scientifically addressing it would remove the stressors allowing mangroves to flourish.

5.10. Change in Hydrology

The most important factors in conserving any mangrove formation include maintaining the original hydrology, original tidal flow including depth, duration of tidal flooding, and frequency of tidal flooding. Understanding the existing mangrove hydrology at micro-level, applying the knowledge to protect mangroves, cost-effective restoration and regeneration, etc. are important. In majority of mangrove degradation instances, it is the modified hydrology and the resultant

reduced tidal flushing and subsequently the critical period of dryness and flushing that determine health of a mangrove forest. Mostly, micro-topography controls the distribution and well-being of mangroves, and physical processes play a dominant role in the formation and functioning of mangrove ecosystem. Even disturbed by human impact, mangrove forest has the ability to self-repair over a period of time provided that the normal tidal hydrology is not disrupted and the availability of water borne seeds are not blocked. Regular monitoring of mangrove hydrology through simple scientific methods will go a long way in maintaining ecosystem balance.

5.11. Regular Mapping through GIS & RS

Mangrove plantation in 1300 ha should be regularly monitored / mapped using GIS and RS facilities as a part of conservation and management efforts. Based on mangrove density, interpolative maps using GIS tools could be prepared which will help in identifying the pockets, which require immediate attention for mangrove restoration. Thus, through a GIS software (Arc-GIS / ERDAS), these layers on yearly basis could be super imposed / overlaid to obtain the difference in mangrove density. This will bridge the gap between decision-making and interventions required for restoring sparse mangrove plantations into dense plantation in due course of time. It could also be used to check mangrove health in terms of canopy cover changes, regeneration potential, and general dynamic nature of mangrove forests. Apart from density, similar interpolative maps for porewater quality could also be prepared.

6. SUMMARY

Mangrove formations in Kachchh coast is predominated by a single species i.e. *A. marina*, with sporadic occurrence of *R. mucronata* and *C. tagal*. The present study was carried out at Sat Saida bet, Nakti creek and Kantiyajal in Kandla vicinity covering eight blocks to evaluate mangrove plantation in 1300 ha during 2005-2017. The major goal of this study was to assess the mangrove plantation survival percentage, assess carbon sequestration potential of planted mangroves, understand the ecological issues, and suggest conservation measures. The mangrove plantation work was carried out in phased out manner i.e. at i) Sat Saida bet: 20 ha during 2005-2006, 200 ha during 2011-2012, 300 ha during 2012-2013, and 330 ha during 2013-2014, ii) Nakti creek: 50 ha during 2008-2009 and 100 ha during 2010-2011, and iii) Kantiyajal: 150 ha during 2015-2016 and another 150 ha during 2016-2017. Due to the prevalence of high salinity in the region, *A. marina* was the preferred species for plantation. Nevertheless, *R. mucronata* and *C. tagal* were also planted in small pockets at Nakti creek. Similarly, *R. mucronata* was attempted at Kantiyajal along with *A. marina*.

The project envisaged three major aspects, i) evaluation of mangrove plantation activities carried out by GEC, and Forest & Environment Department of GoG, ii) investigation of threats being faced by the planted mangroves, iii) assessment of carbon sequestration potential of planted mangroves in the study environ, and iv) suggested conservation and management measures for planted mangroves.

Average density of planted *A. marina* at Sat Saida bet blocks varied from 2031 - 5387 individuals/ha with average height ranging from 39 - 113 cm. In the case of Nakti creek, block-wise average density of *A. marina* varied from 2340 – 2370 individuals/ha with average height from 53 - 84 cm. Nevertheless, the plantation of *R. mucronata* and *C. tagal* at Nakti creek was a failure with very few individuals' existence. *A. marina* average density at two blocks at Kantiyajal was between 1460 and 2220 individuals/ha with an average height between 32 -37 cm. Average density of *R. mucronata* at Kantiyajal was 1280 individuals/ha with an average

height of 30 cm. *R. mucronata* was found mostly as frontline vegetation along the fringes of the block.

Among the locations, maximum density and height was observed at Sat Saida bet. However, of the eight blocks assessed, the survival rate was highest (88.8%) for *A. marina* plantation in 150 ha during 2016-2017 at Kantiyajal followed by *A. marina* plantation in 20 ha at Sat Saida bet (81.6%) during 2005-2006. In rest of the blocks, irrespective of the mangrove species planted, the survival percentage did not reach the minimum expected percentage of 67%. Based on field monitoring and evaluation data it is advised to prefer nursery bed and direct seed sowing methods to *Otla* method since mangrove areas raised through *Otla* method undergo high mortality rate even when initial survival rates are high.

The carbon biomass of *A. marina* plantation varied from 0.041 to 0.202 Mg/ha. The average CO₂ equivalent for all the sites was 1.64%. Among the three locations, i.e. Sat Saida bet, Nakti creek and Kantiyajal, the highest Carbon sequestration potential was recorded for Nakti creek.

The present study indicates that six blocks are most viable for further promotion of mangrove plantation activities, as they have already shown survival failure. Thus, the following conservation measures are suggested for the planted mangroves in order to improve their survival make them a mature mangrove formation over due course of time:

- Appropriate site selection
- Opting for appropriate plantation technique to avoid high mortality
- Regular (in intervals) watering of nursery beds with fresh water
- Regular tidal flushing and inundation
- Manual removal of algal infestation on mangrove recruitment and regeneration classes.
- Monitoring of existing mangrove plantation
- Regular checking of grazing by camels and other livestock

- Containing human activities
- Mangrove plantation involving seed source from nearest area possible
- Restoration of mangroves in sparse areas instead of new plantation sites

Though the mangrove cover in Kachchh coast has reportedly been increasing, the dense mangrove cover has decreased in the region. Thus, to make the mangrove system provide the desired ecosystems services to its fullest, the sparse mangrove patches also need to be made dense through restoration efforts. Appropriate restoration efforts such as deepening and desilting natural canals, removing blocks, etc. are suggested.

Of the several mangrove restoration techniques available, at times they may be suitable for only a single species plantation. Thus, during plantation of multi-species, a thorough understanding of several factors should be considered for the success of mangrove plantation. Involvement of stakeholder communities from the nearby villagers will improve mangrove plantation and restoration activities.

GIS and RS facilities need to be used as a part of mangrove monitoring, conservation and management efforts. Interpolative maps w.r.t. mangrove density, etc. could come handy in identifying the areas that require mangrove restoration.

Above all appropriate awareness and outreach programmes for DPT staff and other stakeholders would strengthen the plantation efforts. The native denizens need to be made aware of the importance of mangroves, the need for their conservation, and the role of relevant authorities. Thus, accordingly these attempts will help in reducing the pressures and/or disturbances on the mangrove plantation efforts in the study area.

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Plate 1. Mangrove Plantation sites in DPT environ



Plate 3. Satellite imageries of 20 ha mangrove plantation at Sat Saida Bet during 2007

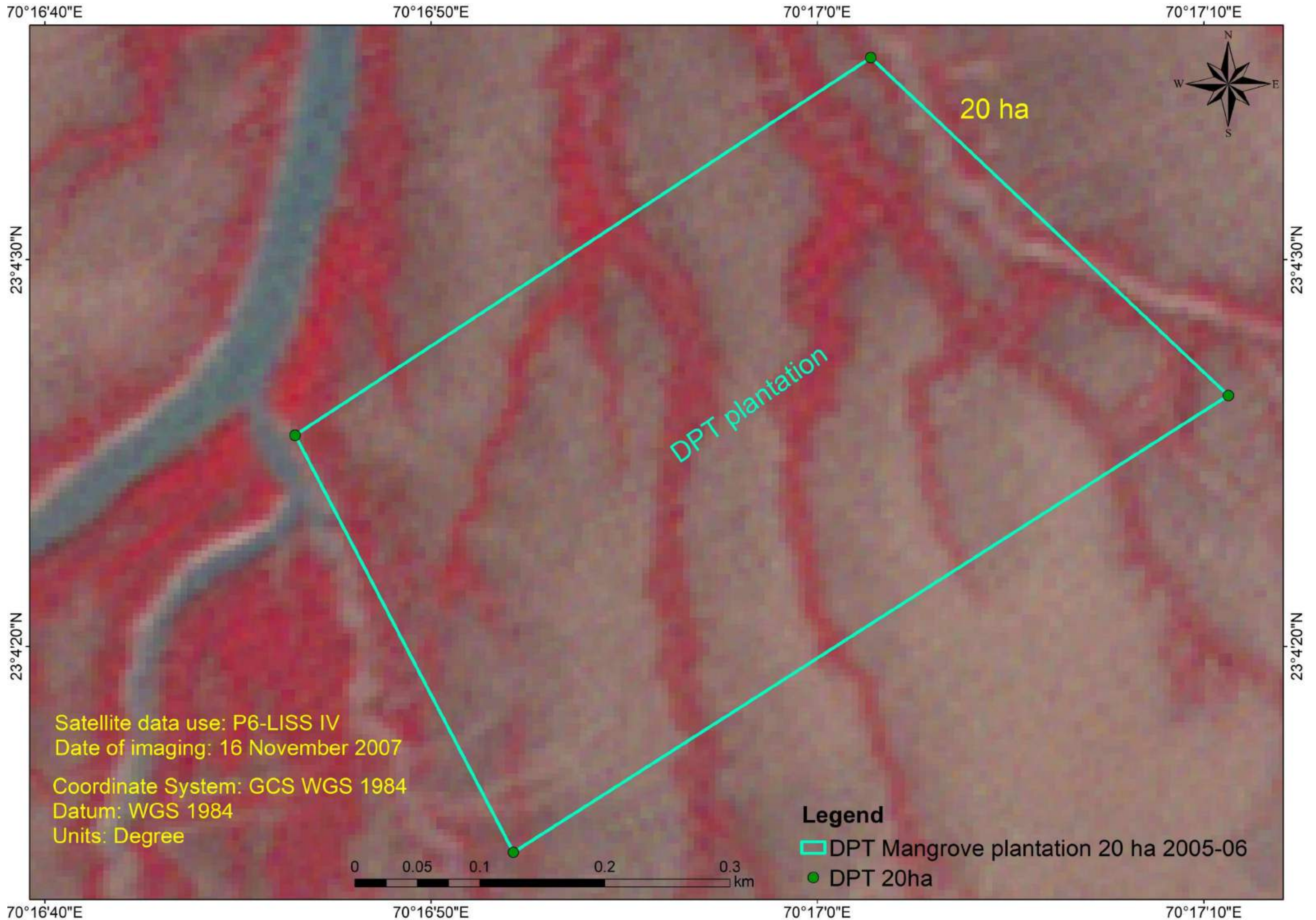


Plate 4. Satellite imageries of 20 ha mangrove plantation at Sat Saida Bet during 2014

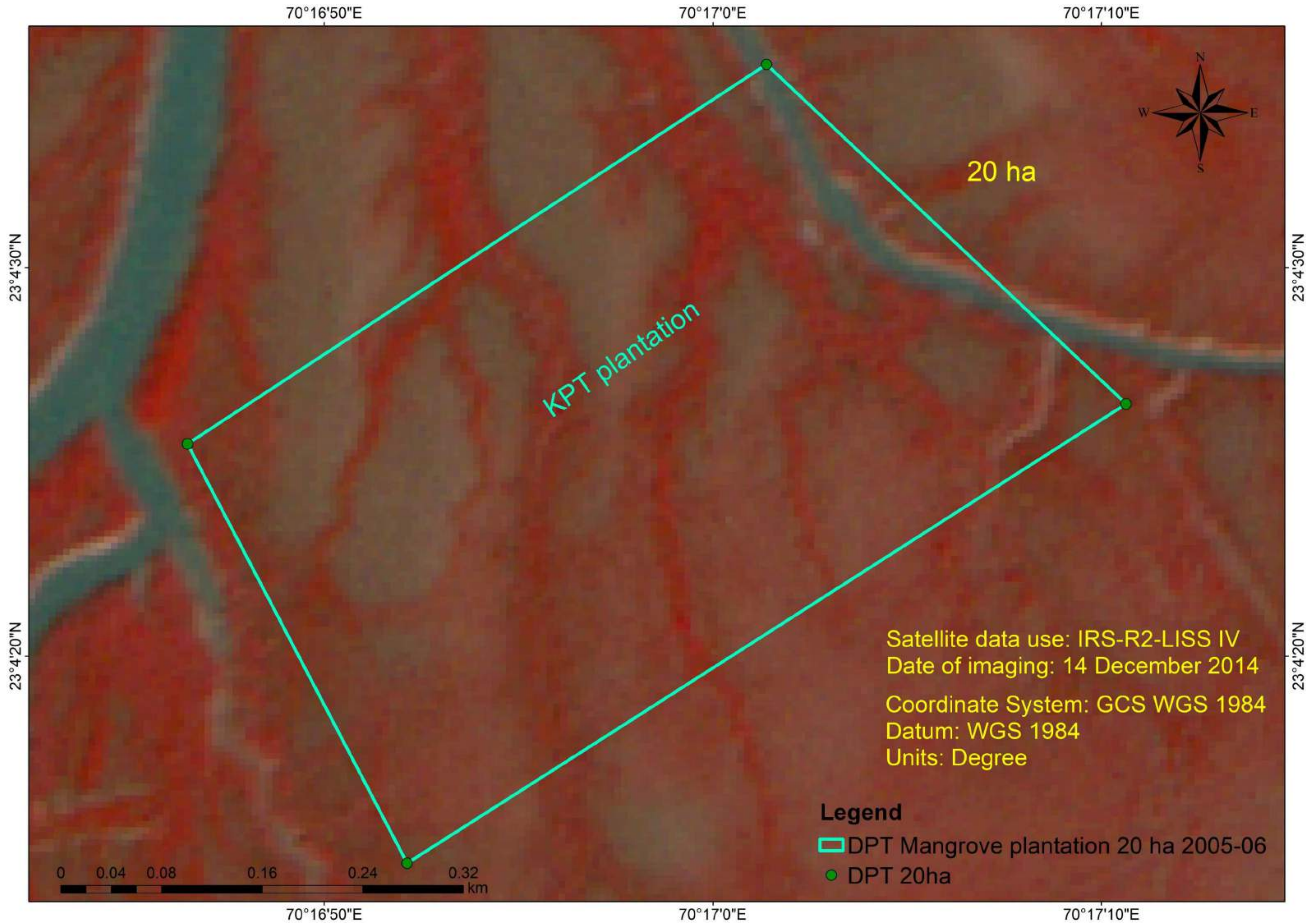


Plate 5. Satellite imageries of 20 ha mangrove plantation at Sat Saida Bet during 2017

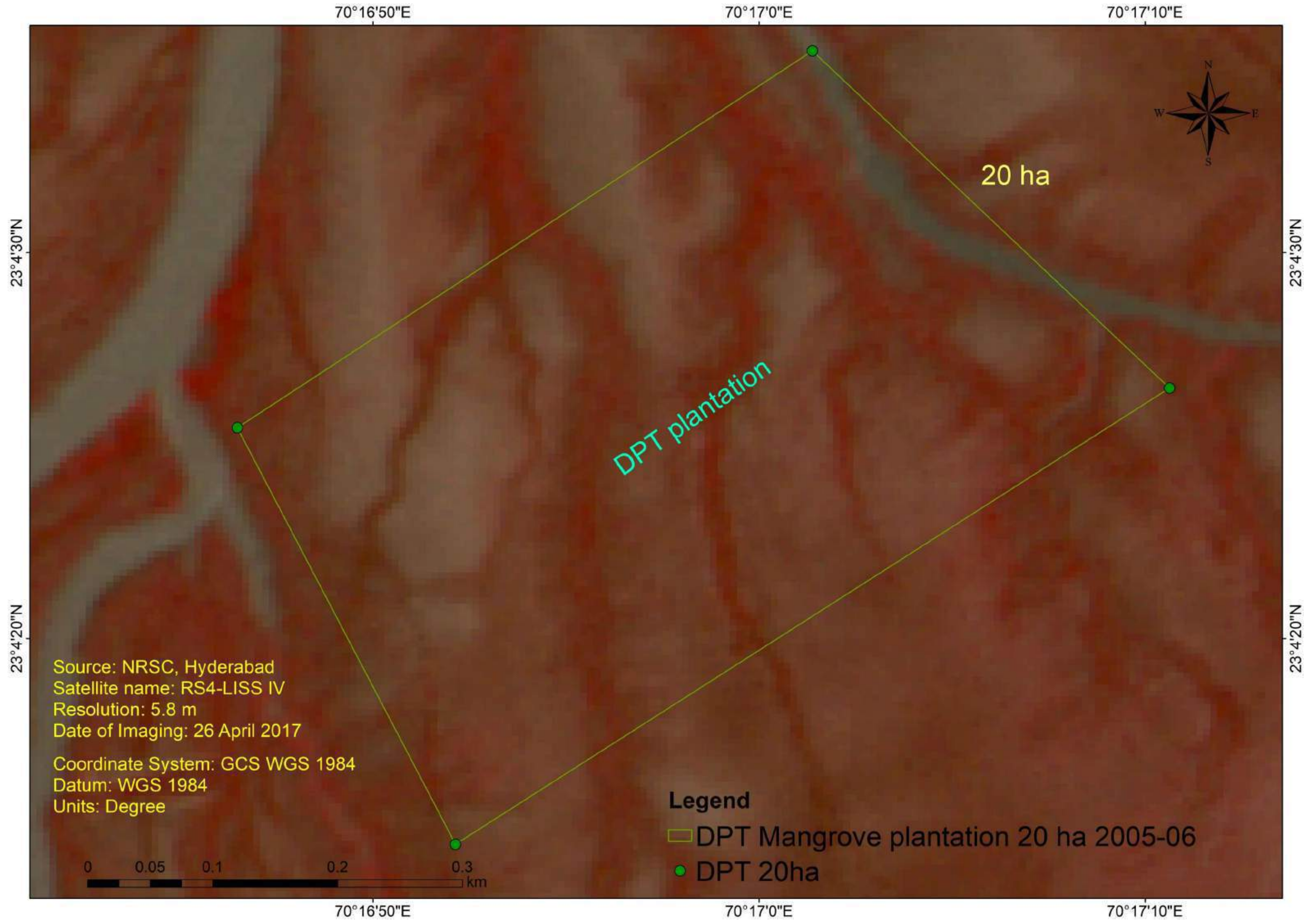


Plate 8. Satellite imageries of 200 ha mangrove plantation at Sat Saida Bet during 2007

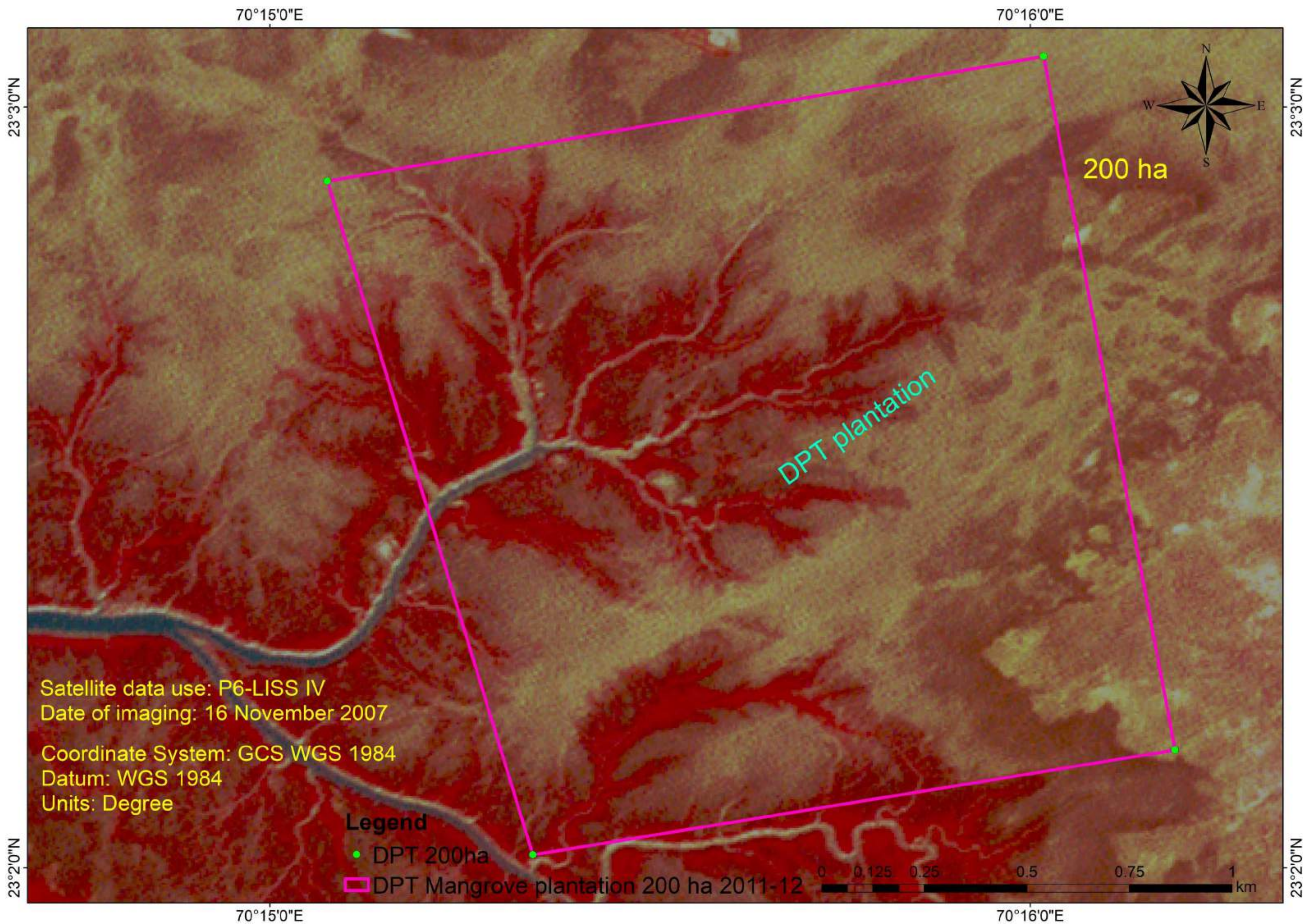


Plate 9. Satellite imageries of 200 ha mangrove plantation at Sat Saida Bet during 2014

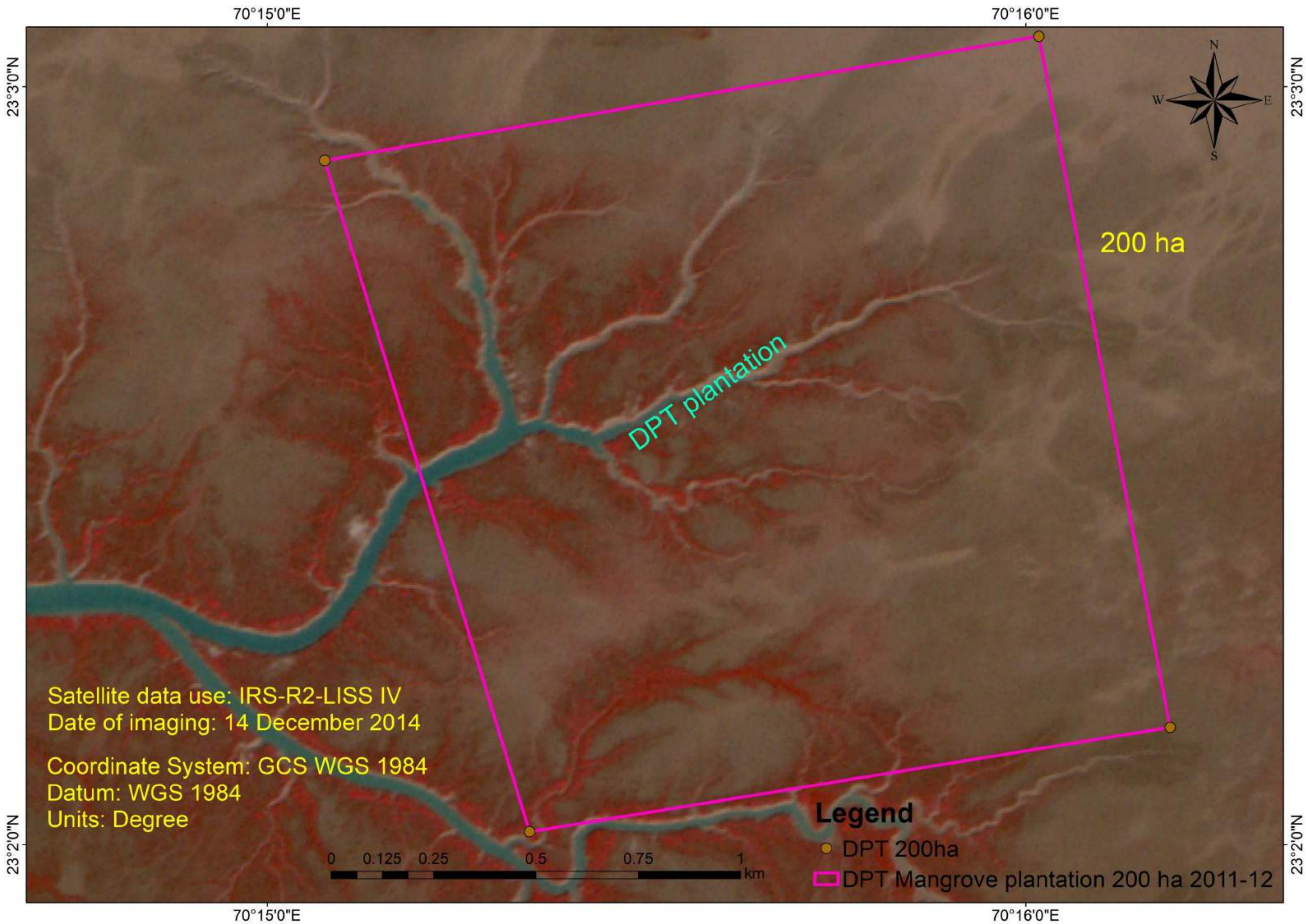


Plate 10. Satellite imageries of 200 ha mangrove plantation at Sat Saida Bet during 2017

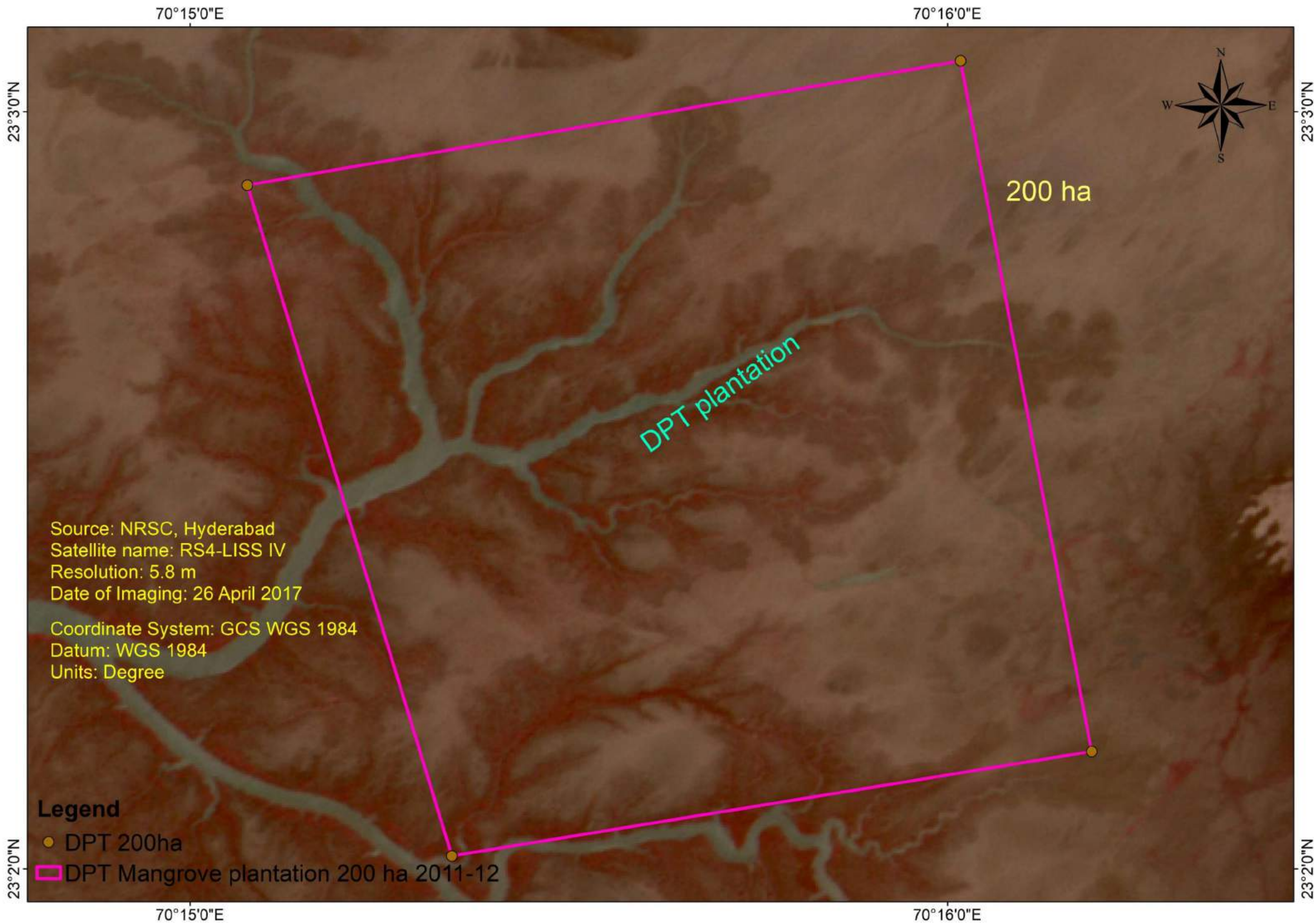


Plate 13. Satellite imageries of 300 ha mangrove plantation at Sat Saida Bet during 2007

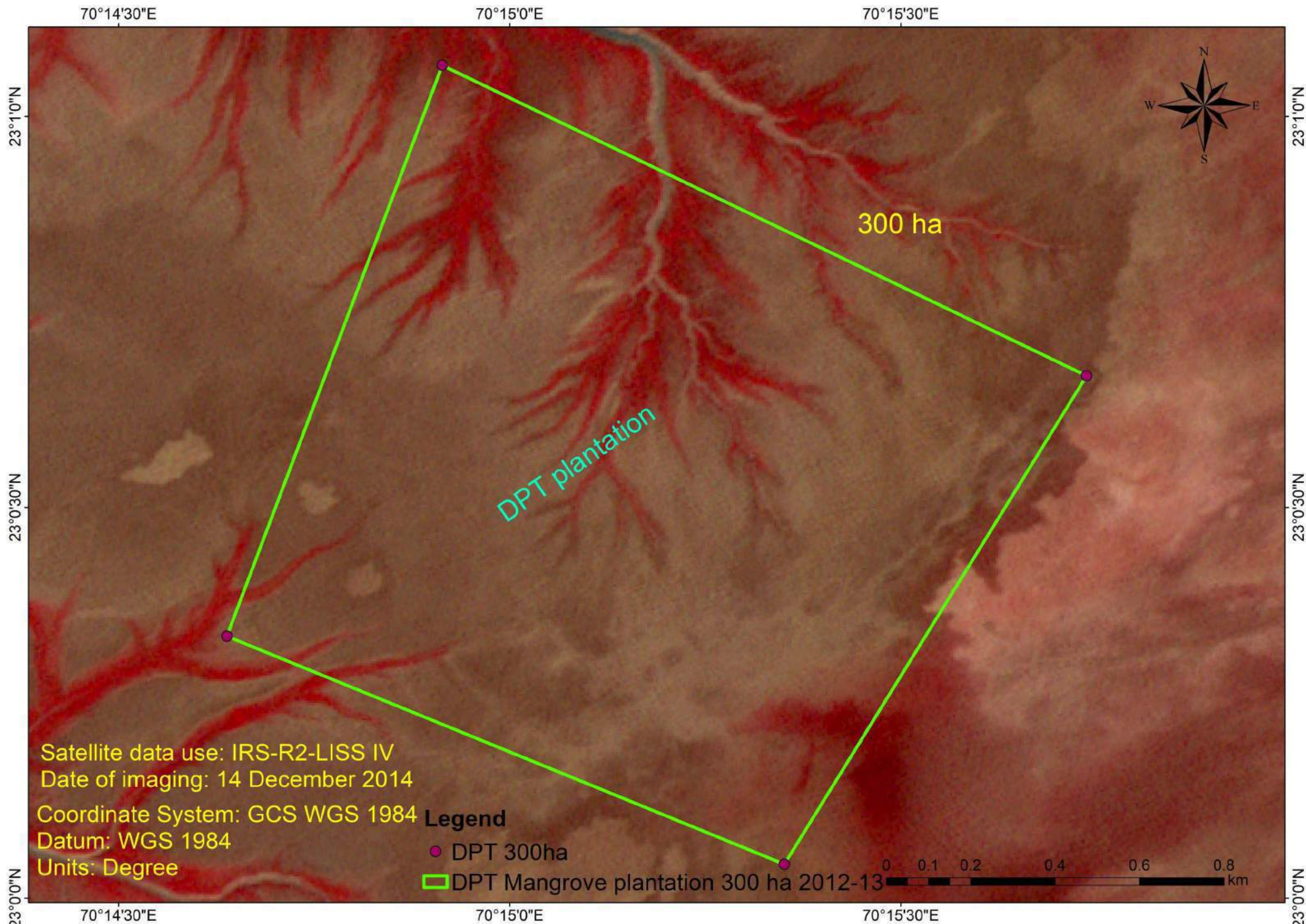


Plate 14. Satellite imageries of 300 ha mangrove plantation at Sat Saida Bet during 2014

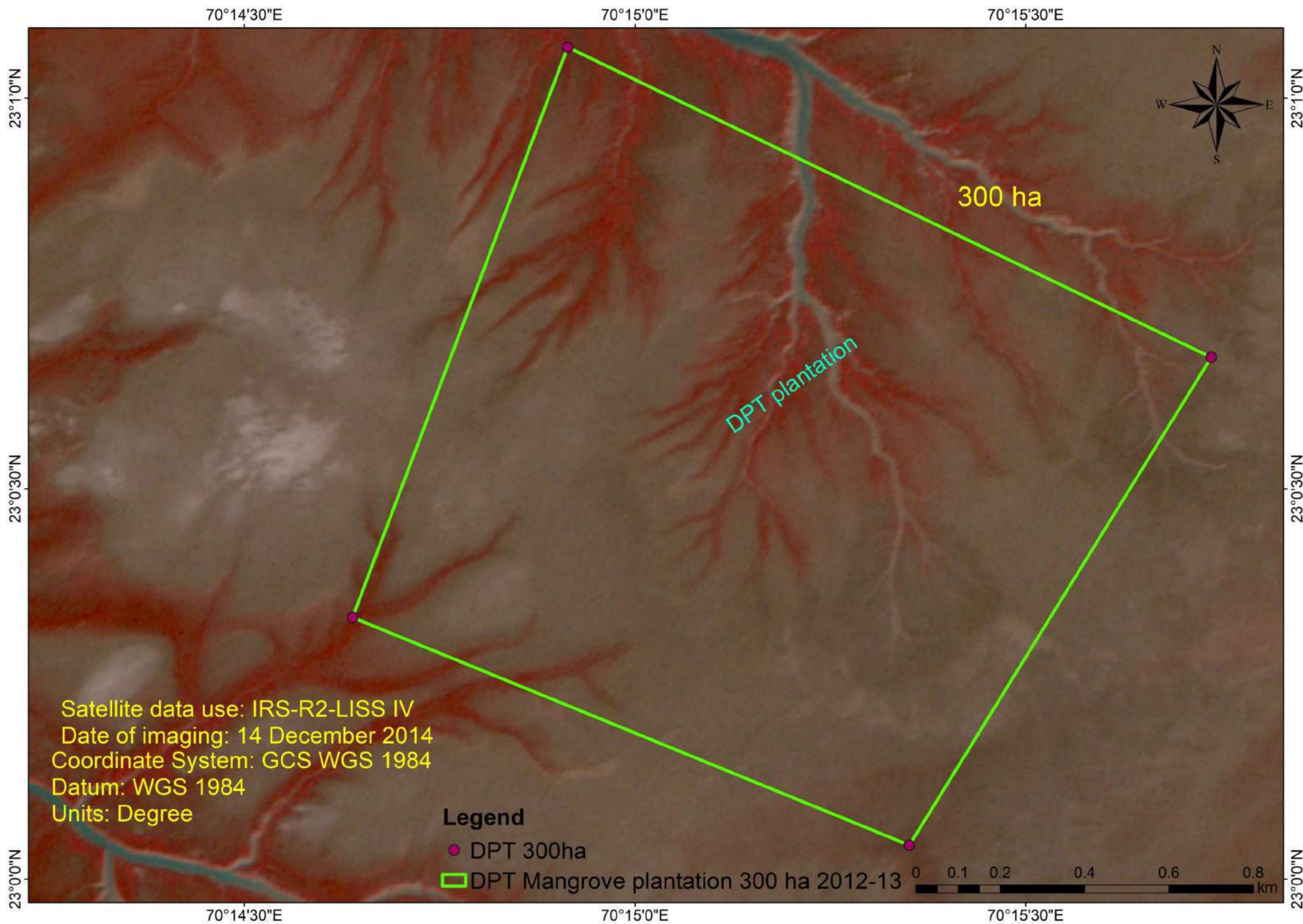


Plate 15. Satellite imageries of 300 ha mangrove plantation at Sat Saida Bet during 2017

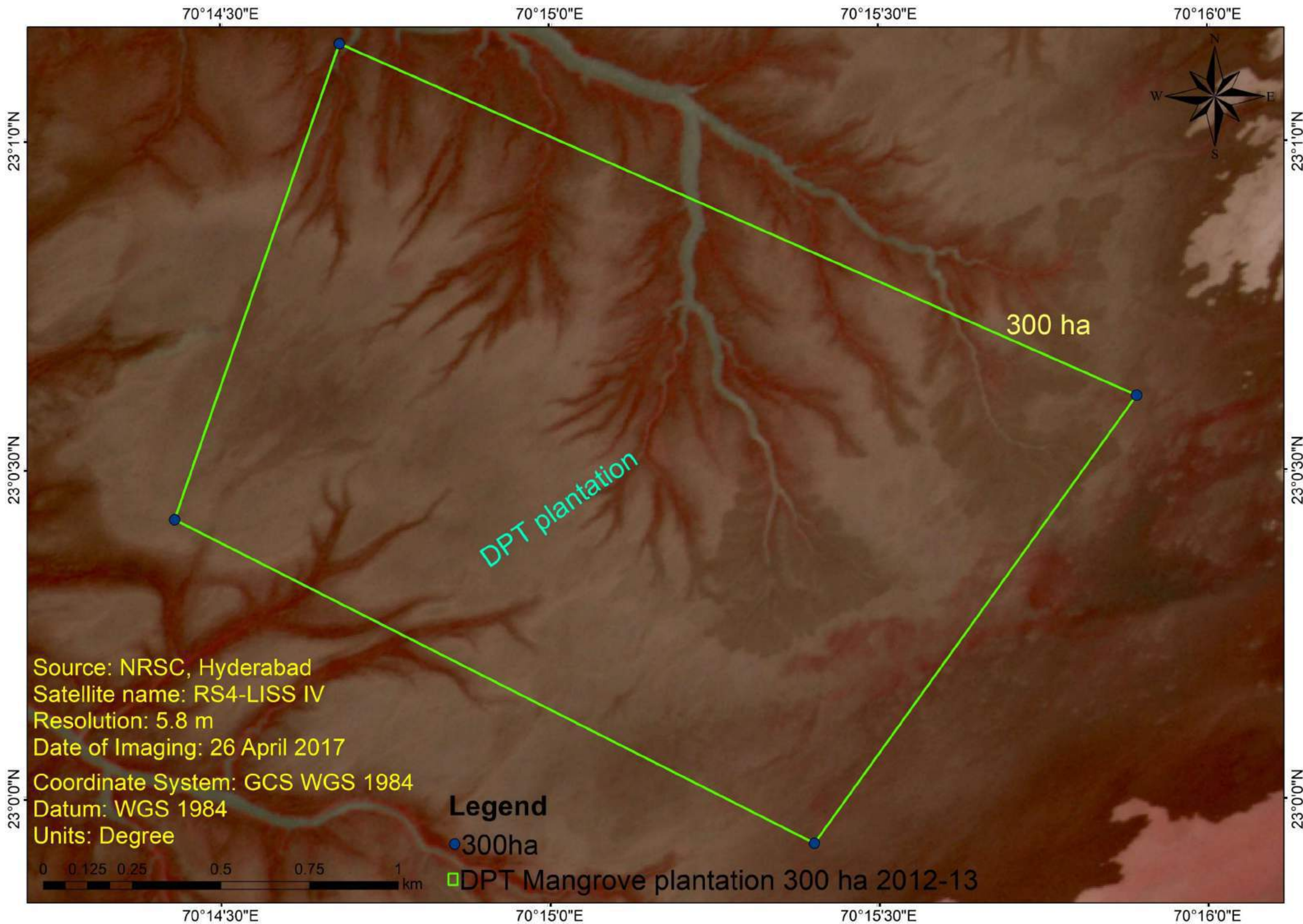


Plate 18. Satellite imageries of 330 ha mangrove plantation at Sat Saida Bet during 2007

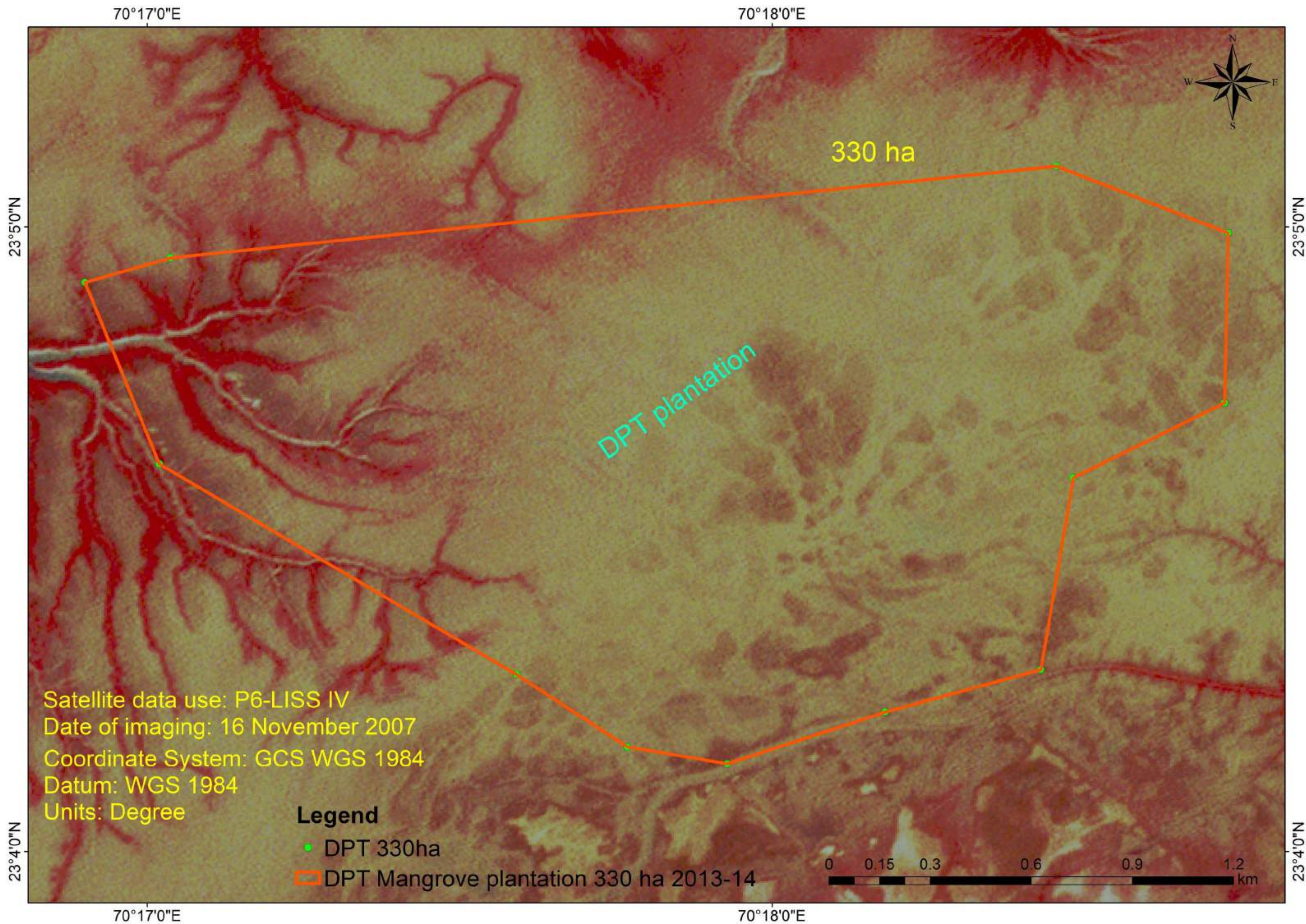


Plate 19. Satellite imageries of 330 ha mangrove plantation at Sat Saida Bet during 2014

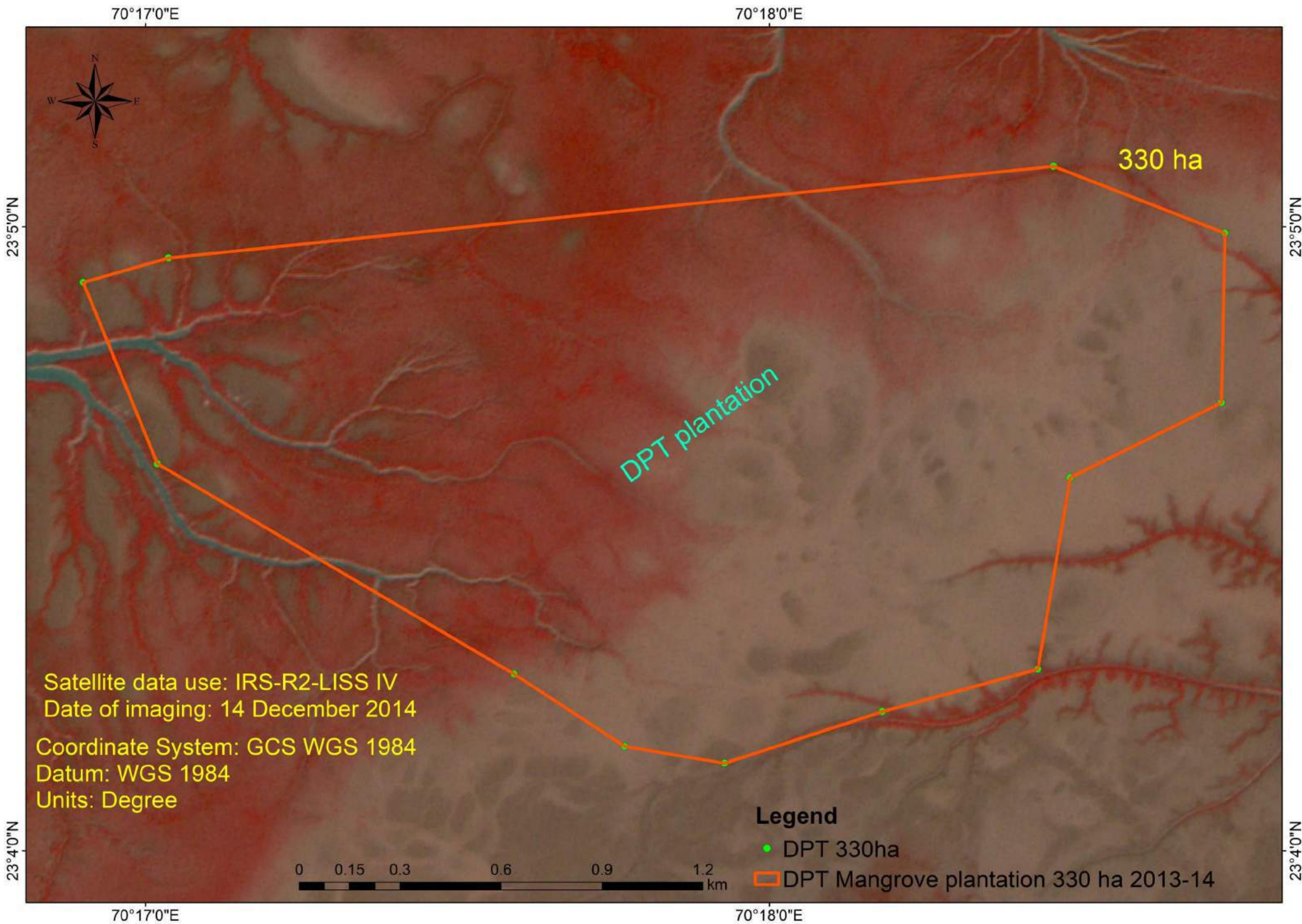


Plate 20. Satellite imageries of 330 ha mangrove plantation at Sat Saida Bet during 2017

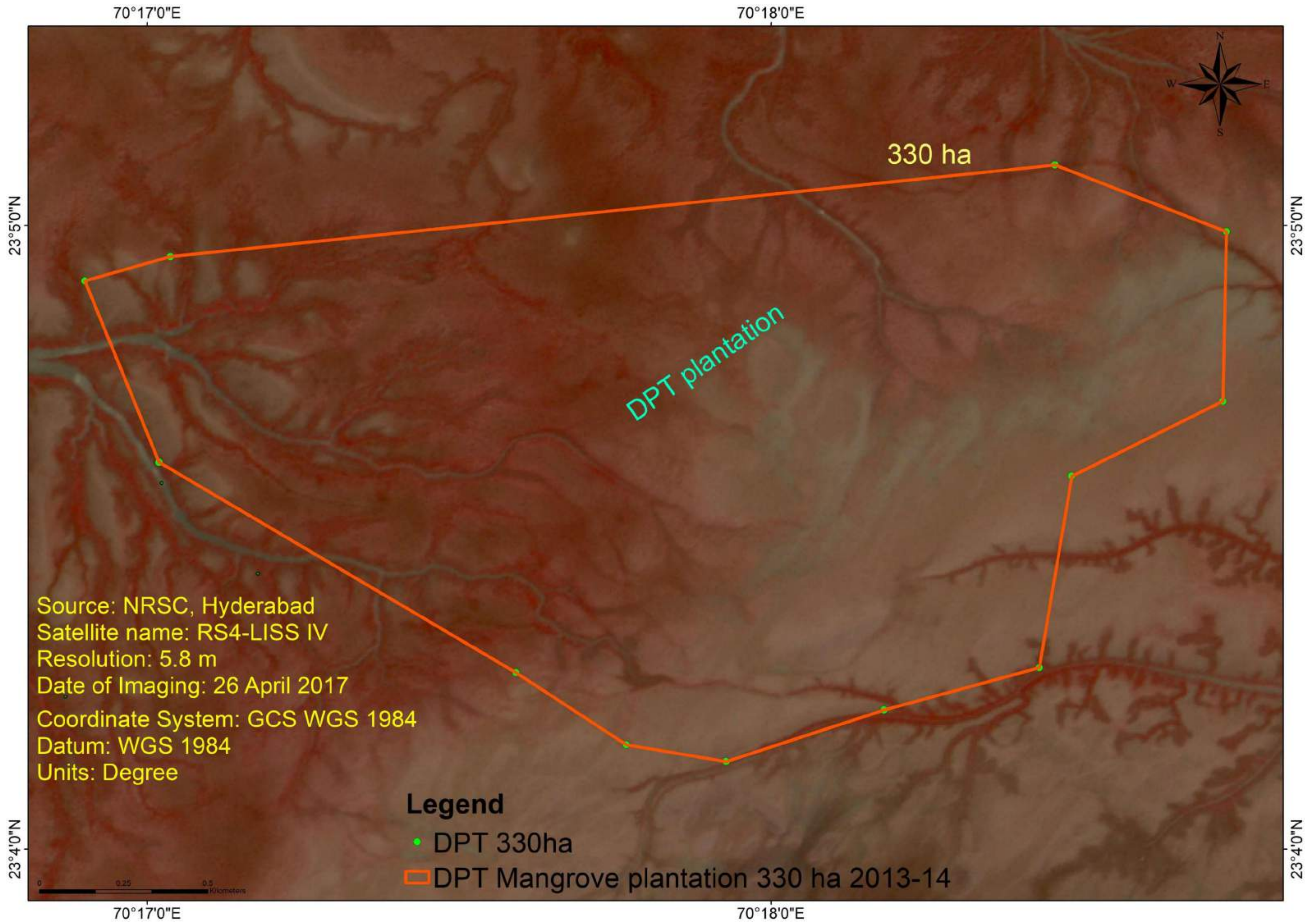


Plate 23. Satellite imageries of 50 ha mangrove plantation at Nakti creek during 2007

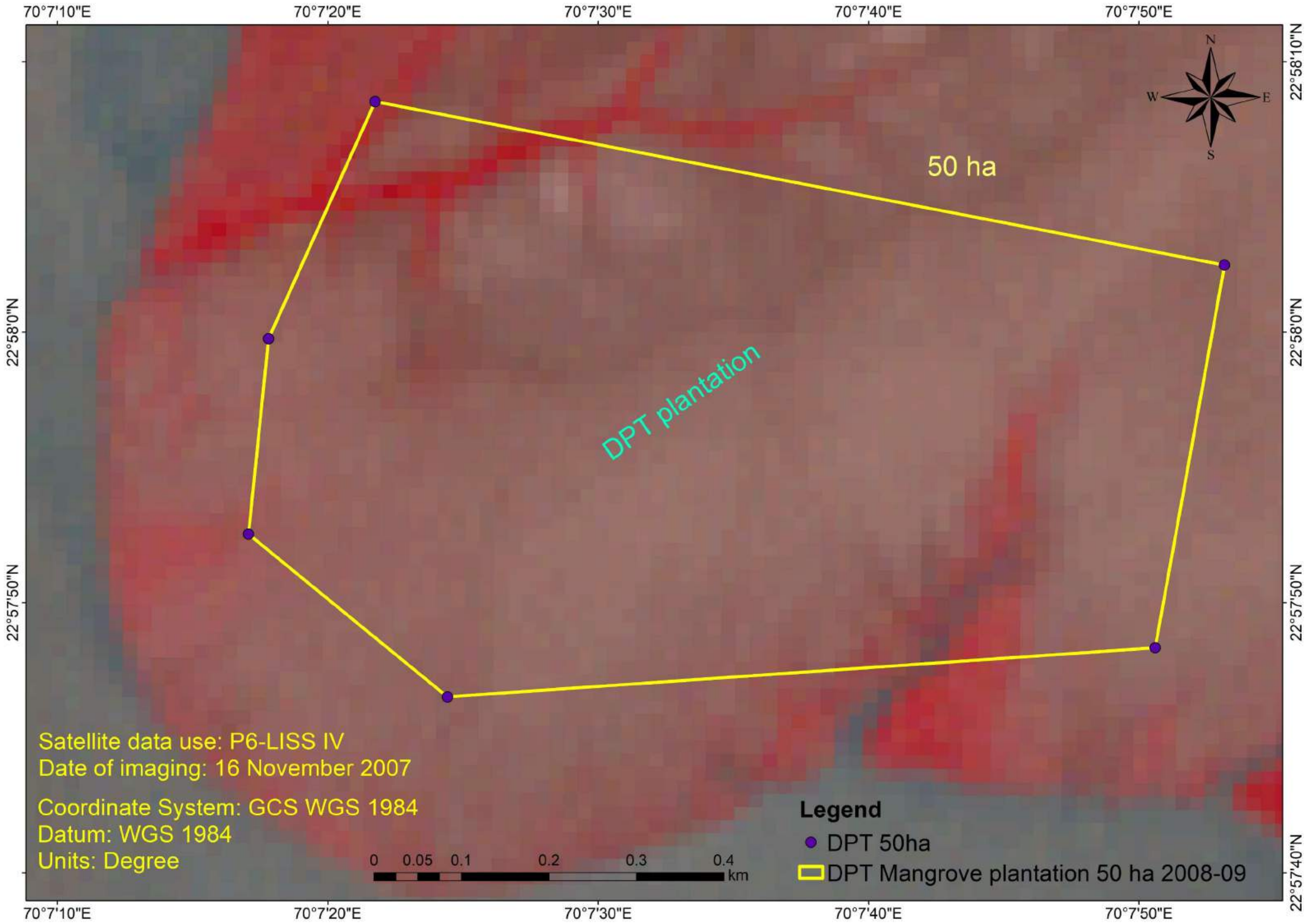


Plate 24. Satellite imageries of 50 ha mangrove plantation at Nakti creek during 2014

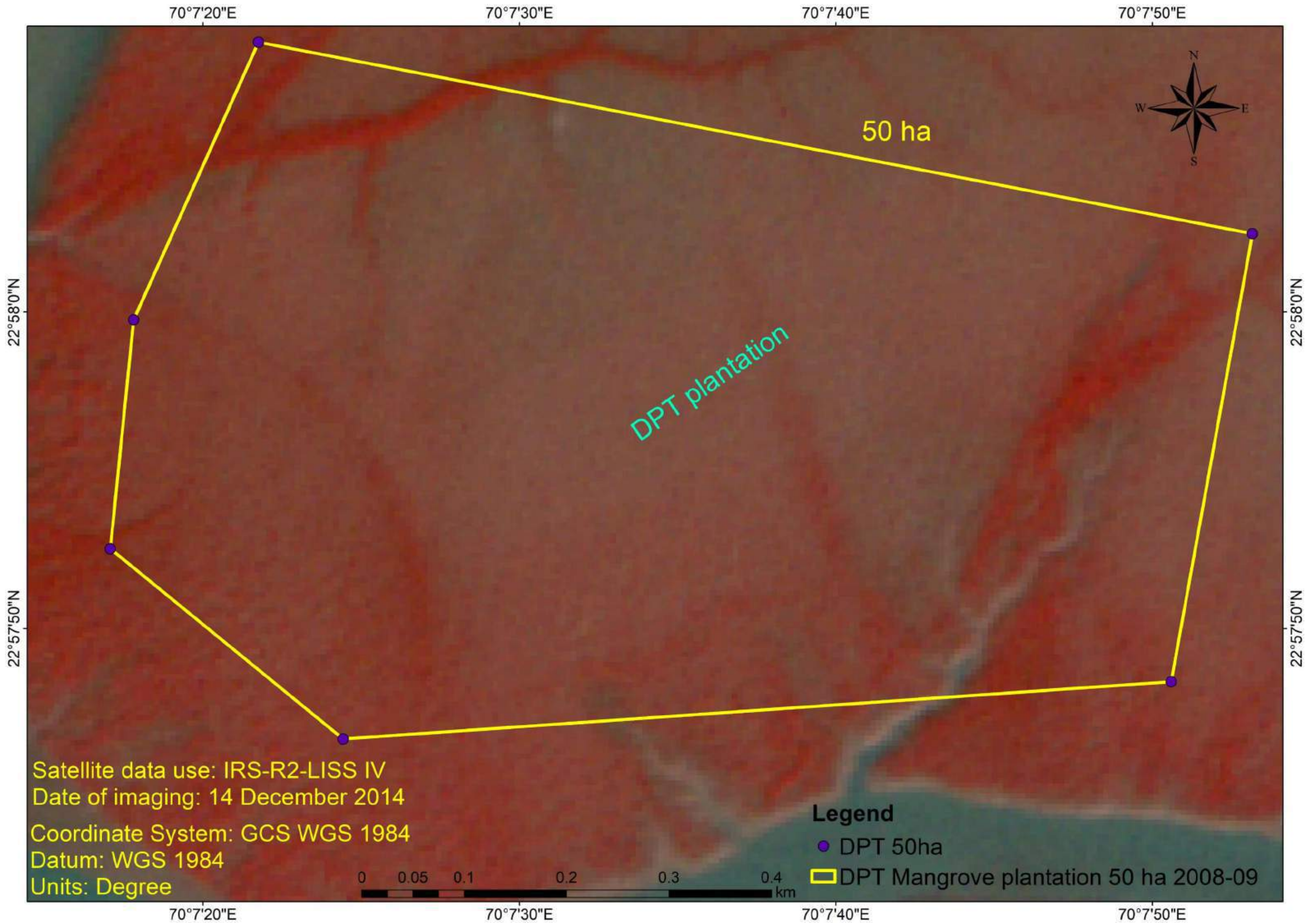


Plate 25. Satellite imageries of 50 ha mangrove plantation at Nakti creek during 2017

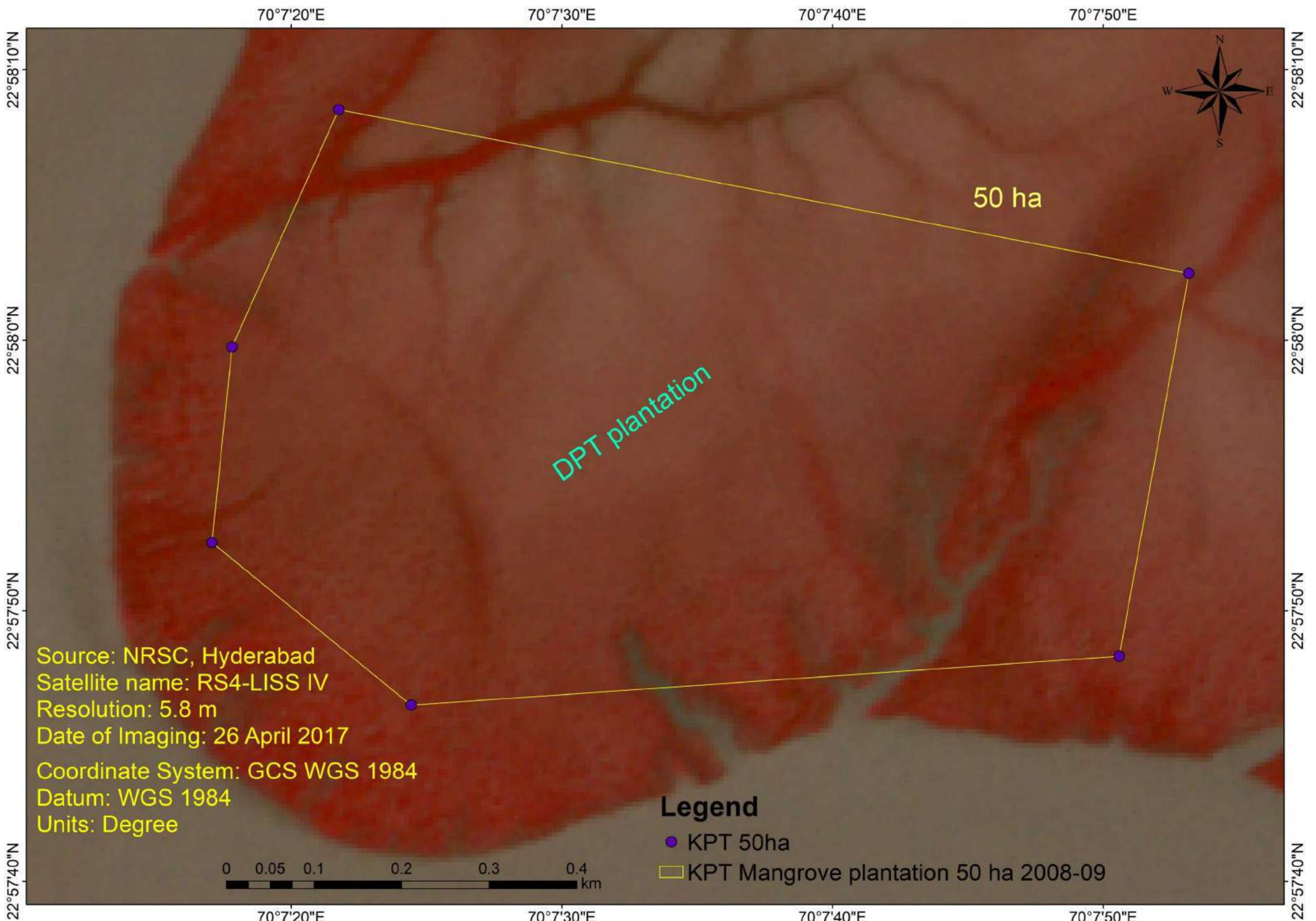


Plate 28. Satellite imageries of 100 ha mangrove plantation at Nakti creek during 2007

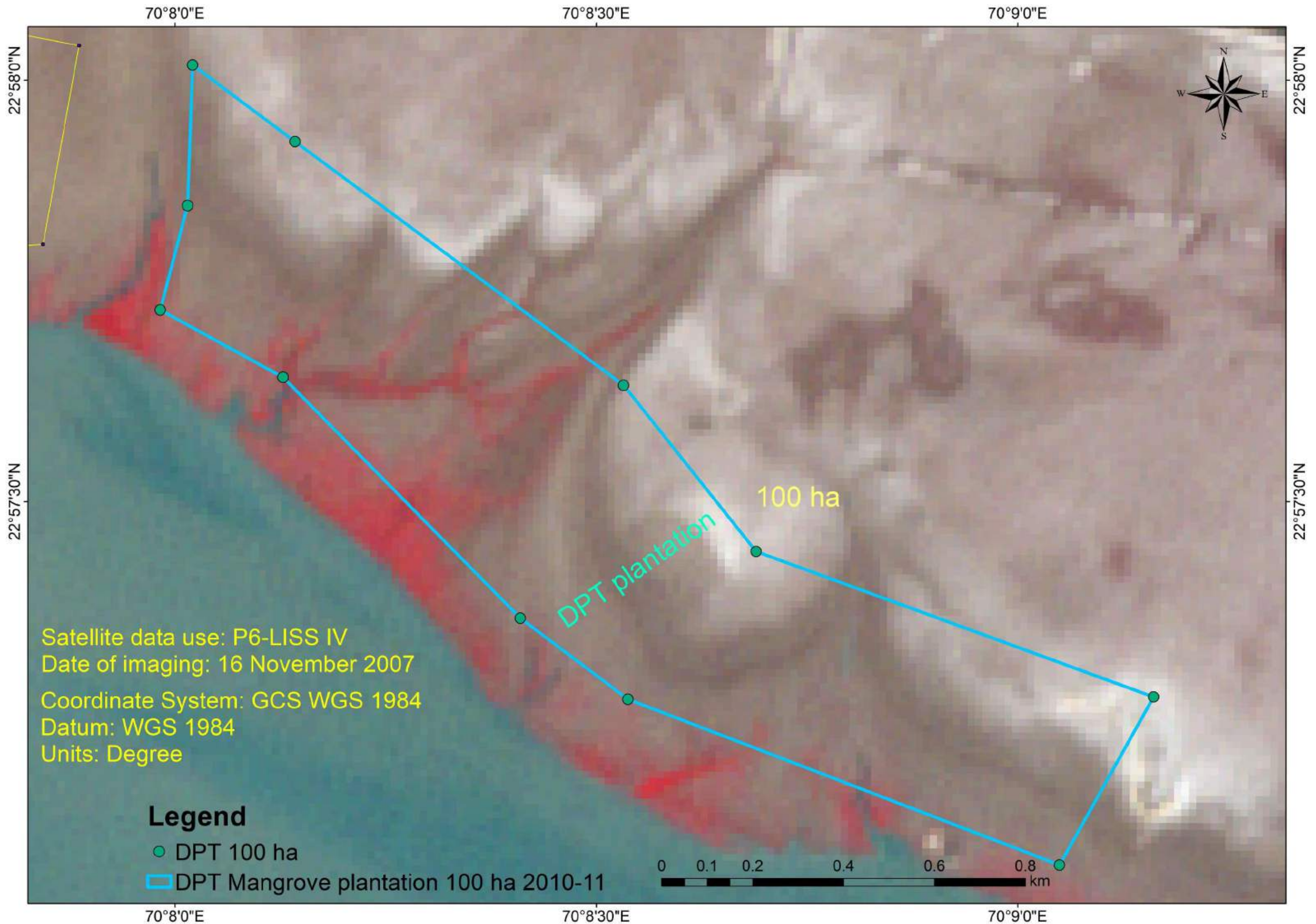


Plate 29. Satellite imageries of 100 ha mangrove plantation at Nakti creek during 2014

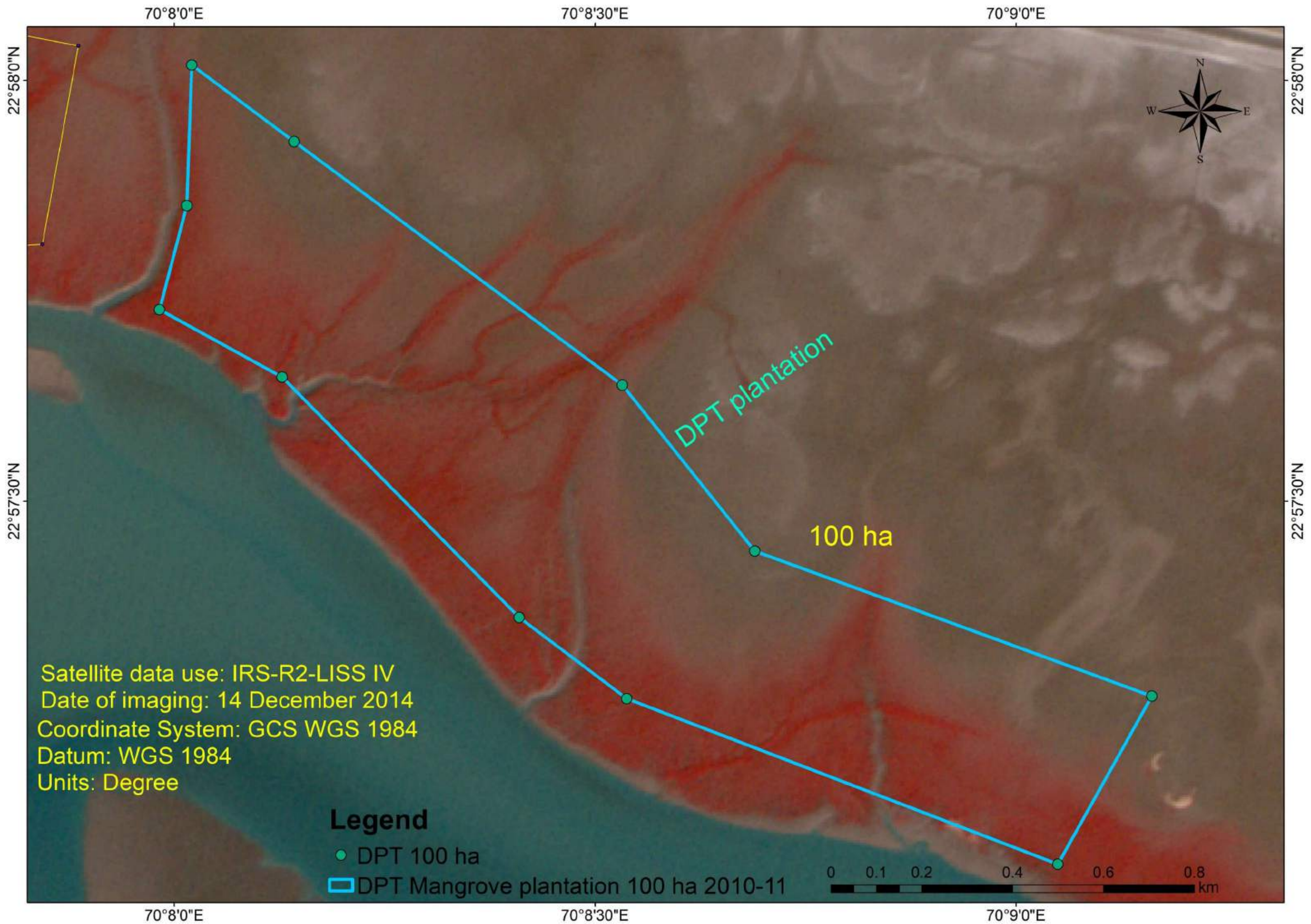


Plate 30. Satellite imageries of 100 ha mangrove plantation at Nakti creek during 2017

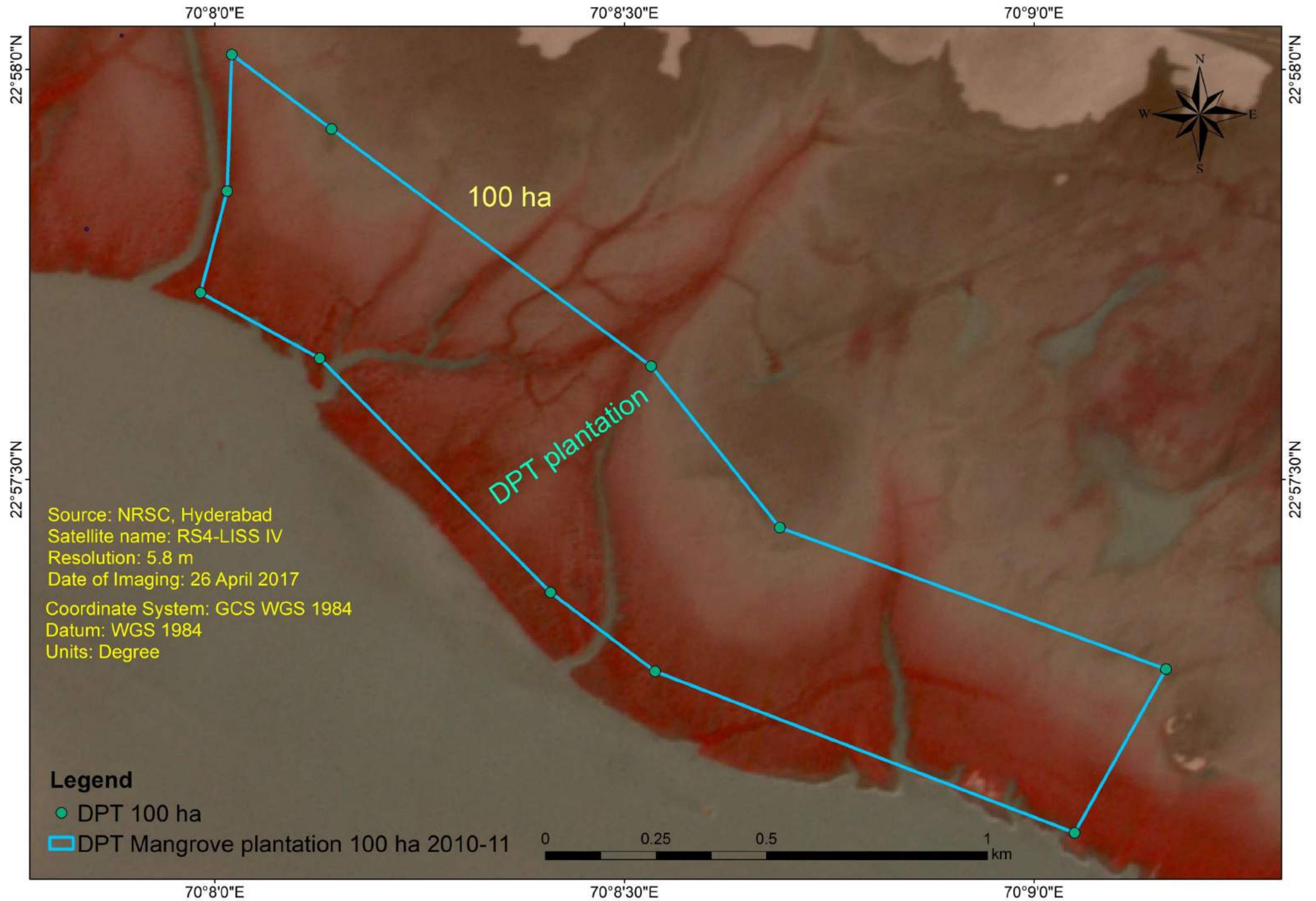


Plate 33. Satellite imageries of 150 ha mangrove plantation at Kantiyajal-block 1 during 2018

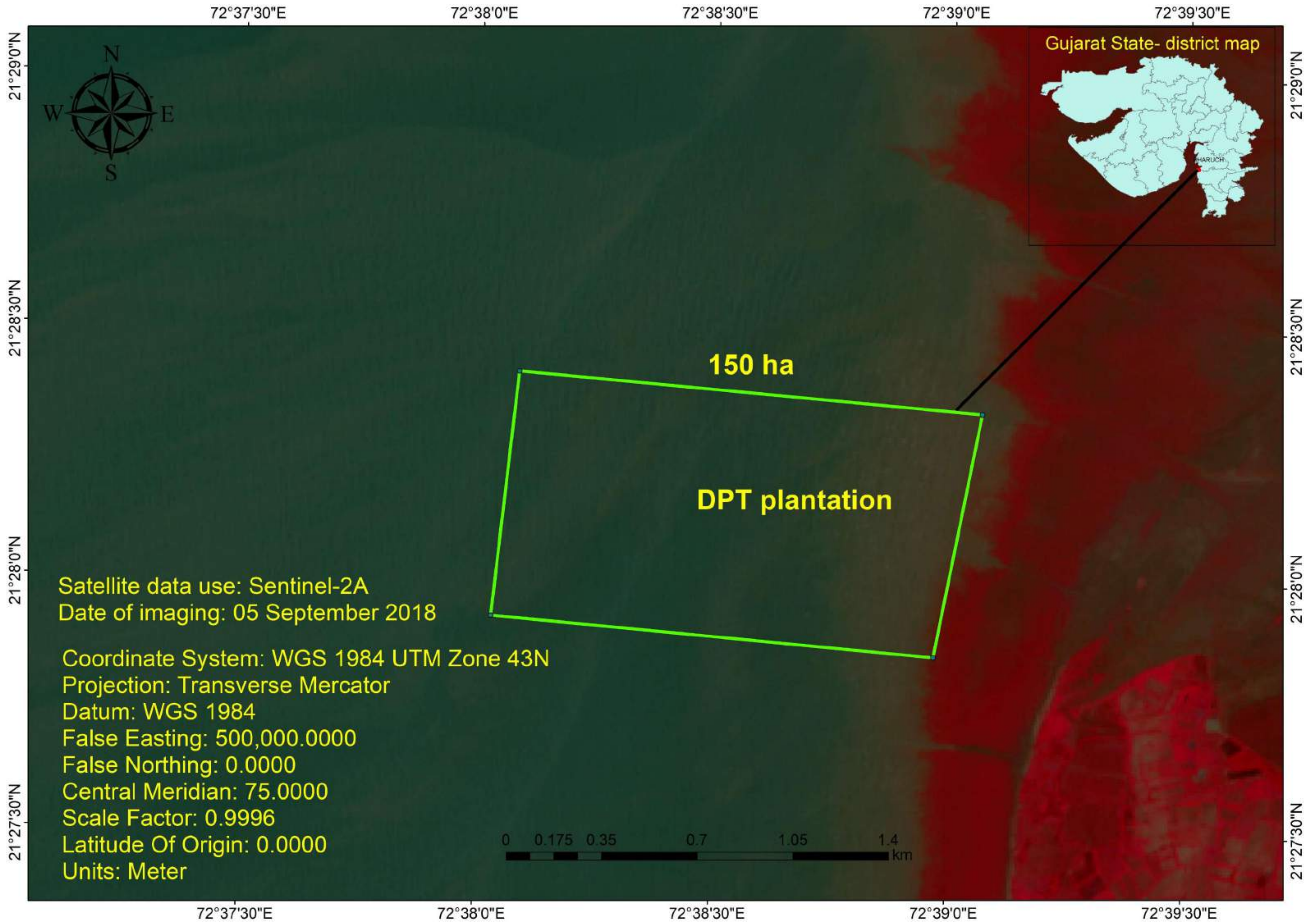


Plate 35. Satellite imageries of 150 ha mangrove plantation at Kantiyajal-block 2 during 2018

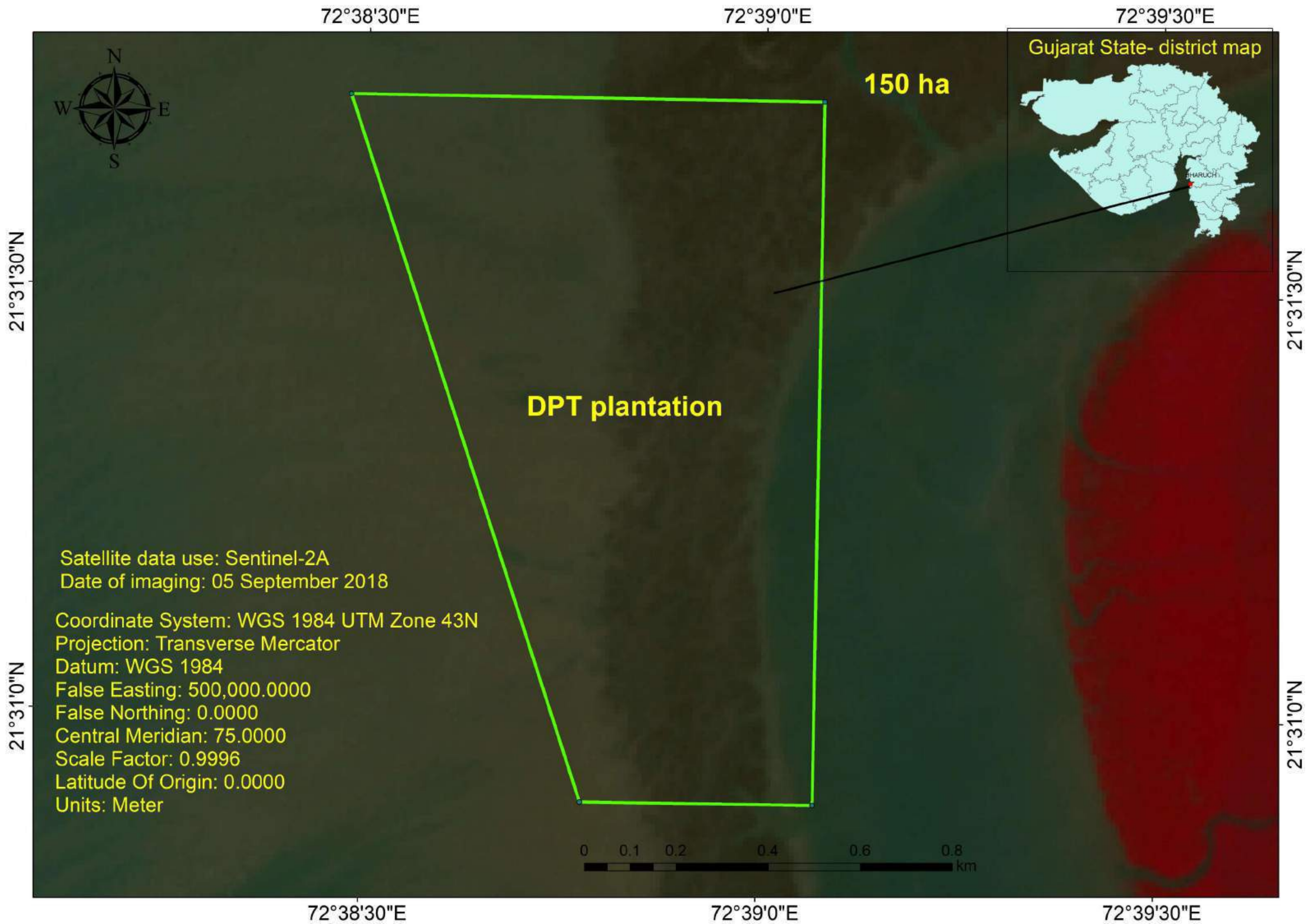




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Plate 16. 300 ha mangrove plantation at Sat Saida bet during 2012-2013



Plate 17. 300 ha mangrove plantation at Sat Saida bet during 2017-2018

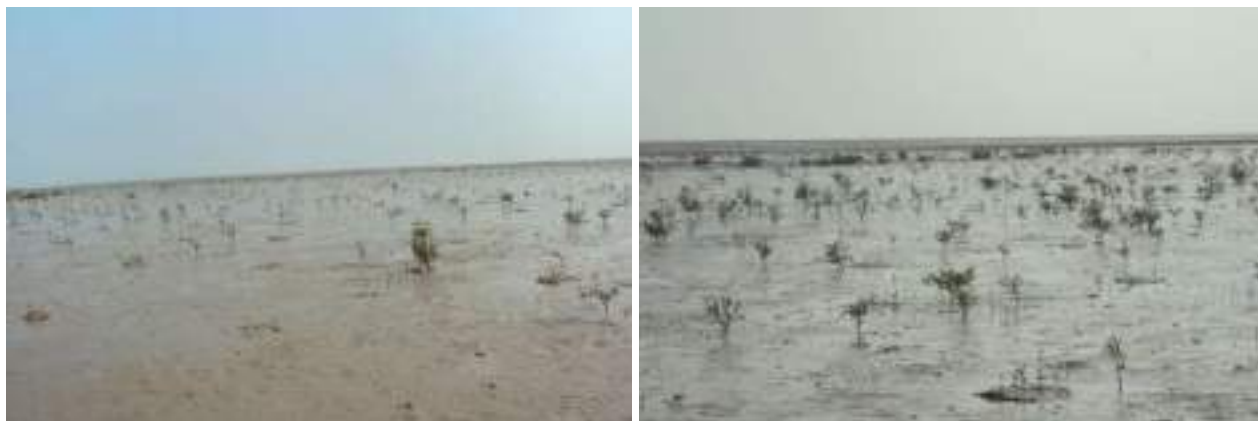


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Plate 34. 150 ha mangrove plantation at Kantiyajal-Block 1 during 2018



Plate 36. 150 ha mangrove plantation at Kantiyajal-Block 2 during 2018

ANNEXURE – H

Latest monitoring report submitted by GEMI, Gandhinagar

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: August-September, 2023)



Document Ref No.: GEMI/DPA/782(2)(2)/2023-24/40

Submitted to:
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Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

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



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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 (August-September, 2023)*” is prepared.

- **Name of the Report:** *Environment Monitoring Report (August-September, 2023)*
- **Date of Issue:** 20/09/2023
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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 monitoring period of 17th August-16th September, 2023.

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, NH₄, PO₄, 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.



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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 transshipment), 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 **Figure 1** as follows:

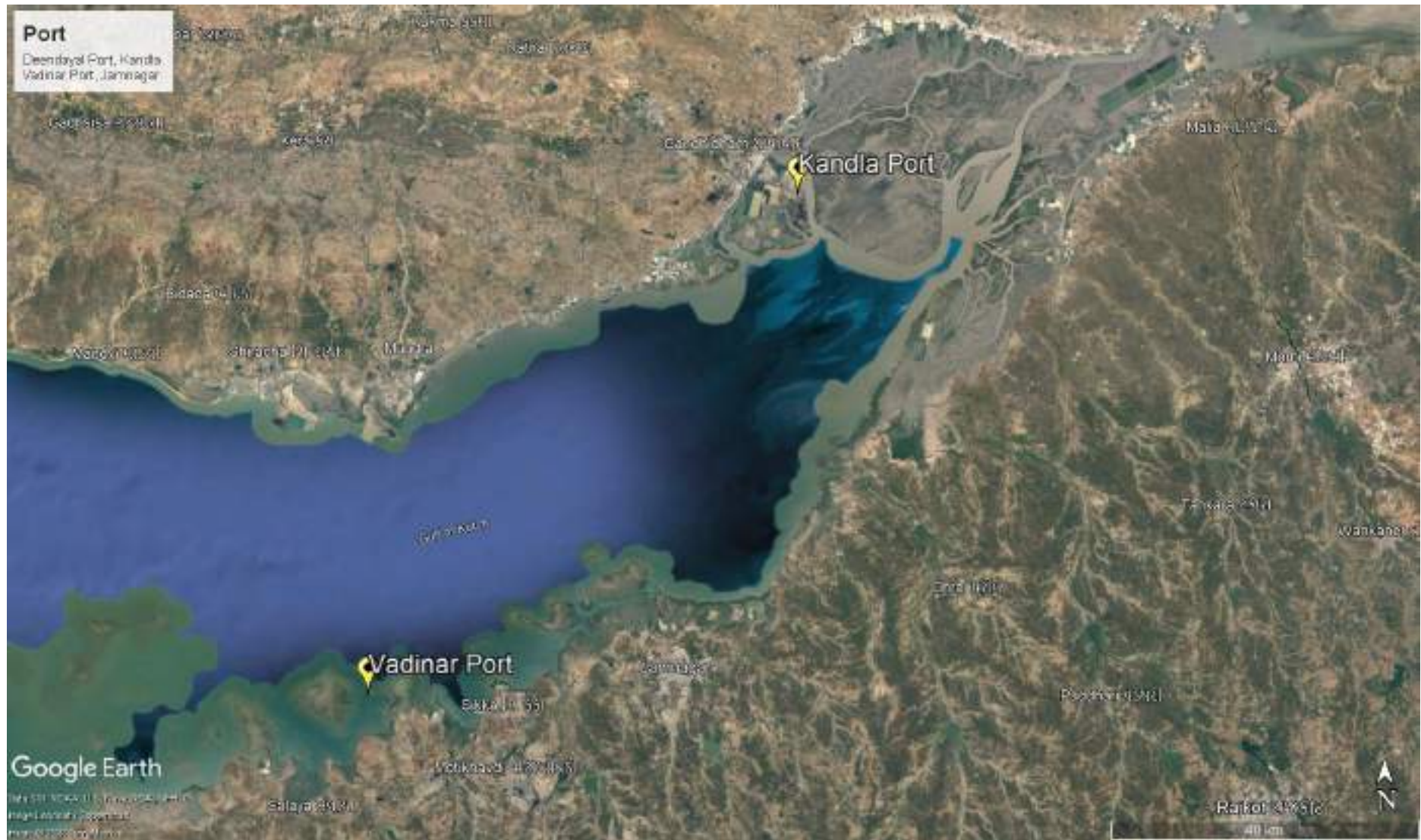


Figure 1: Locations Map of Kandla and Vadinar



Figure 2: Map of Kandla Port



Figure 3: Map 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 4** as given below:

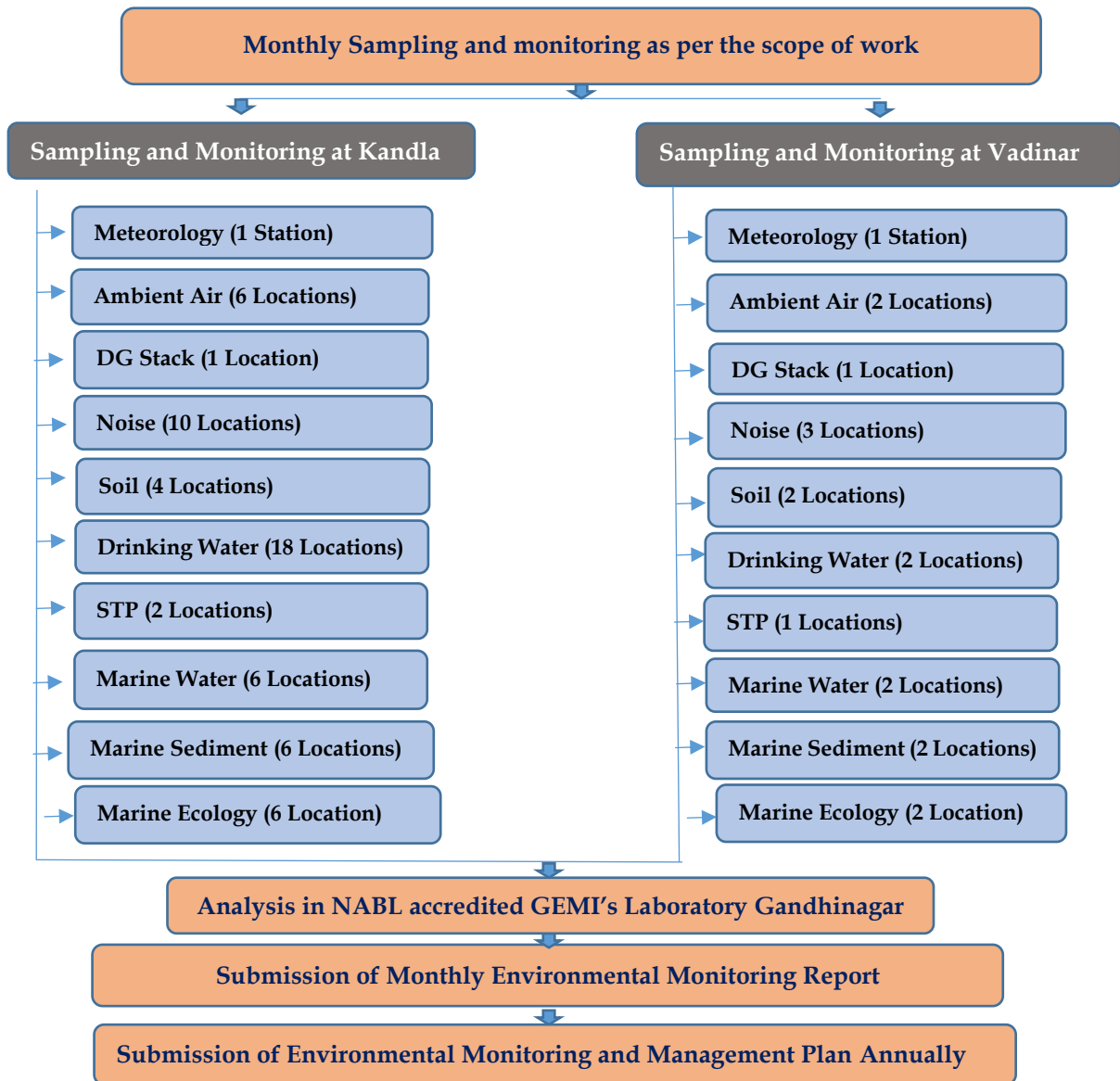


Figure 4: Methodology flow chart

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



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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	°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.

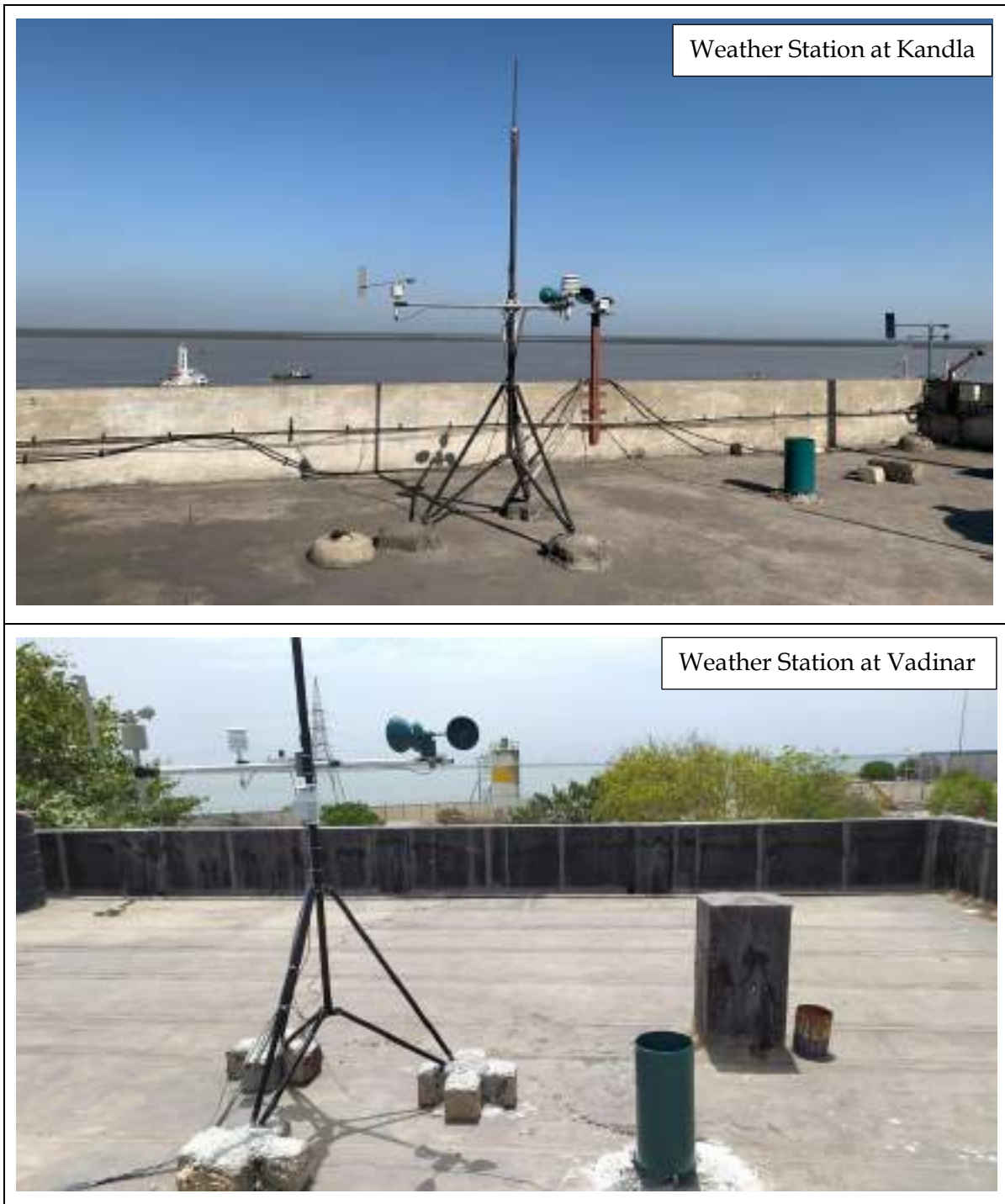


Figure 5: Photographs of Automatic Weather Monitoring Station at Kandla and Vadinar



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/m ²)	Wind Direction (°)	Rainfall (mm)
Stat.	Mean	Max.	Min	Mean	Max	Min	Mean	Max	Min			
August-September 2023	6.55	37.52	0.63	30.33	48.44	38.43	75.59	84.57	69.18	73.28	West-south-west	21.89
Details of micro-meteorological data at Vadinar Observatory												
Monitoring Period	Wind Speed (Km/h)			Temperature (°C)			Relative humidity (%)			Solar Radiation (W/m ²)	Wind Direction (°)	Rainfall (mm)
Stat.	Mean	Max.	Min	Mean	Max	Min	Mean	Max.	Min			
August-September 2023	12.96	28.07	5.20	27.22	27.75	27.18	73.42	75.13	72.87	88.14	South	0.00

3.3 Data Interpretation and Conclusion

- **Temperature**

- a. **Kandla:** The ambient temperature for the monitoring period varies between the range of 38.43-48.44°C for Kandla, with average temperature of 30.33°C.
- b. **Vadinar:** The ambient temperature for the monitoring period varies between the range of 27.18-27.75°C for Vadinar, with average temperature of 27.22°C.

- **Relative Humidity**

- a. **Kandla:** The Relative Humidity recorded between the range of 69.18-84.57%, with average Humidity of 75.59%.
- b. **Vadinar:** During the study period, the Relative Humidity varies between 72.87-75.13%, with average Humidity of 73.42%.

- **Rainfall**

- a. **Kandla:** The average Rainfall during the monitoring period was found to be 21.89 mm.
- b. **Vadinar:** No Rainfall observed during the monitoring period at Vadinar.

- **Wind Speed**

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

- a. **Kandla:** Wind speed recorded ranges between 0.63-37.52 Km/hr.
- b. **Vadinar:** During the monitoring period, the Wind speed recorded, ranges between 5.20-28.07 Km/hr.

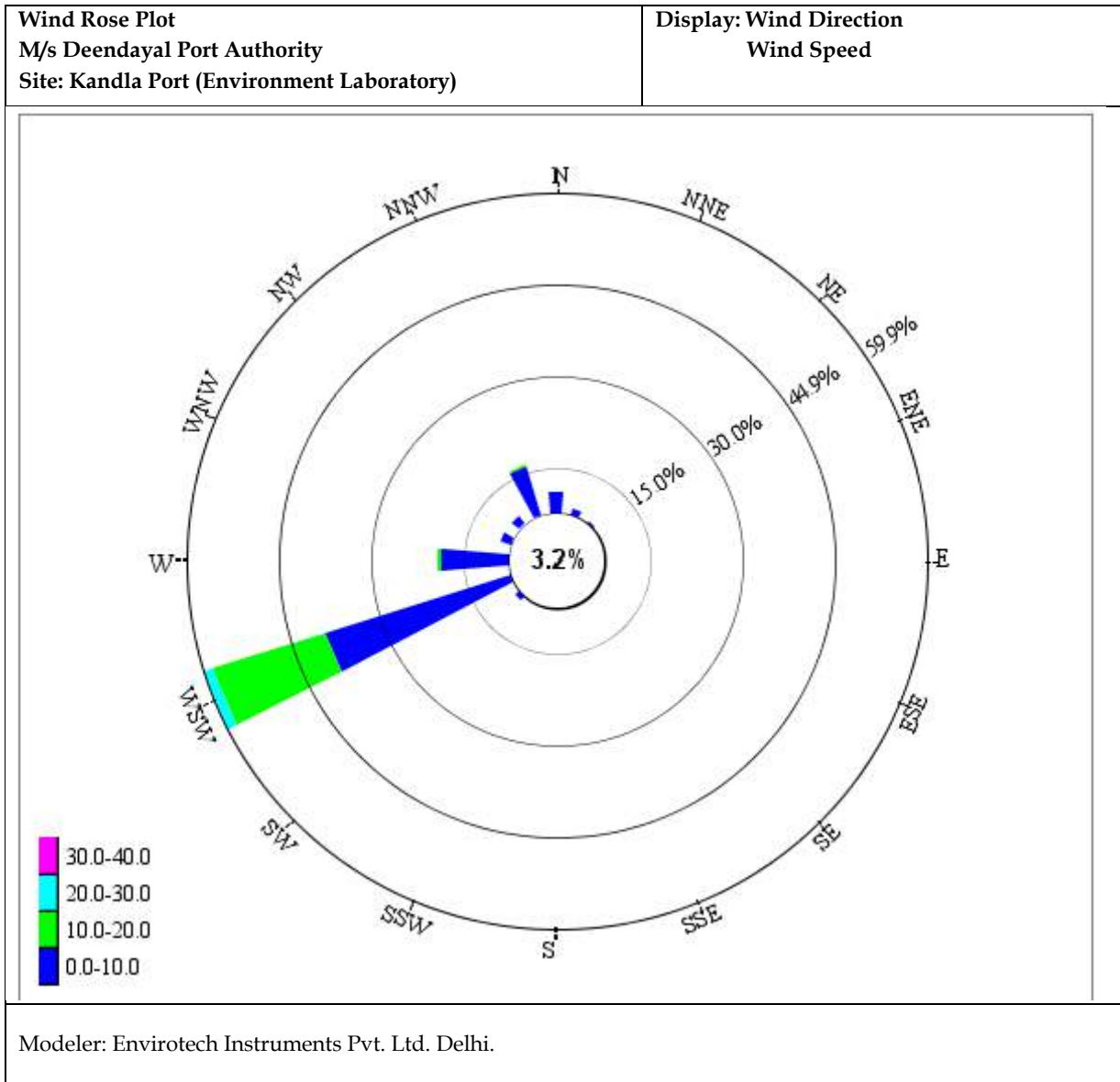
- **Solar Radiation:**

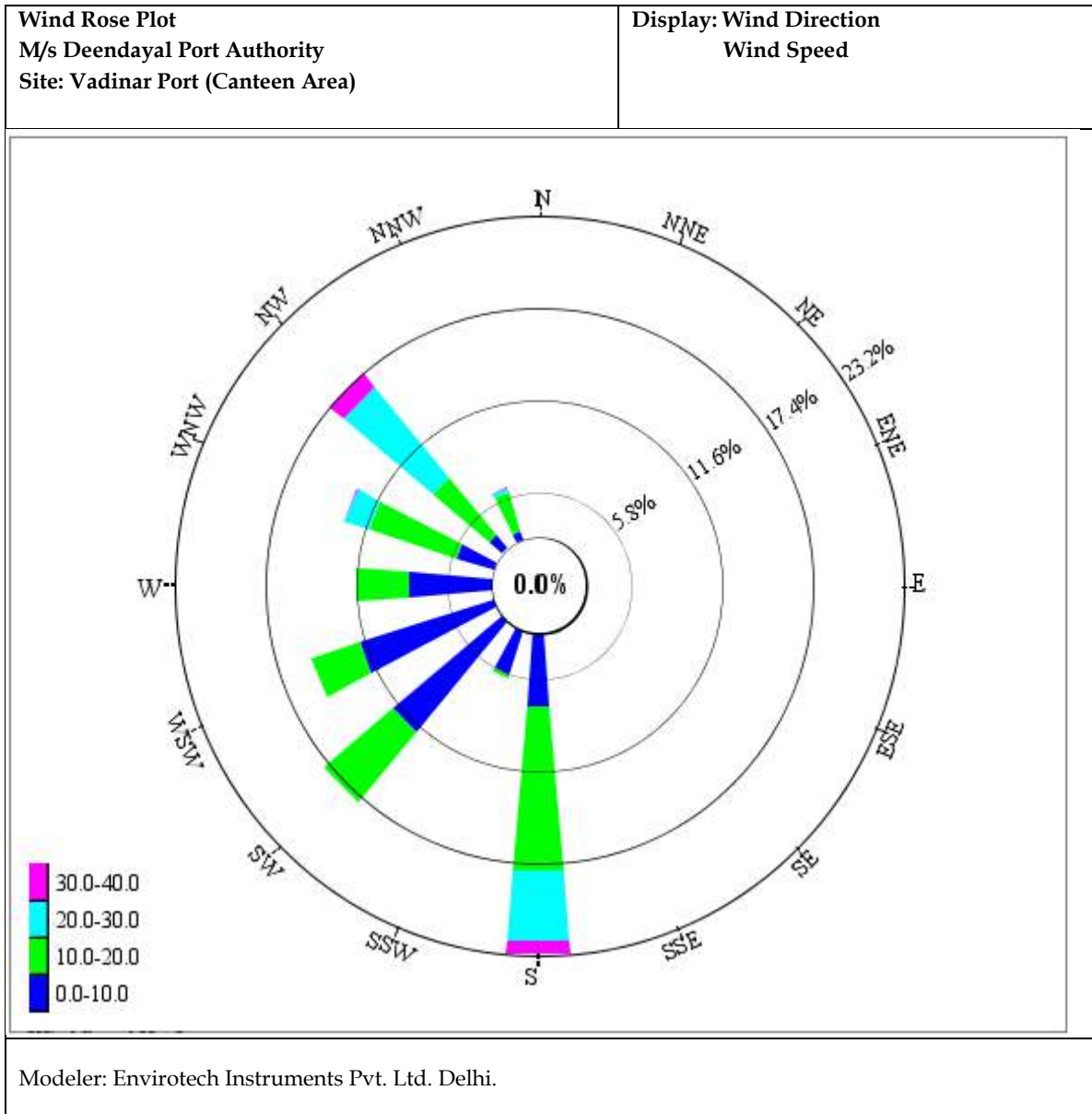
- a. **Kandla:** The average Solar Radiation for the monitoring period was recorded as 73.28 W/m².
- b. **Vadinar:** The average Solar Radiation was recorded as 88.14 W/m².

- **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, during the period the prevailing winds predominantly blow from the West-south-west direction. Whereas the winds at Vadinar were observed to blow mainly from South.







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 August to 16th September, 2023.

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 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	Liquid containers and emission from ship
2.		A-2	Oil Jetty No. 7	
3.		A-3	Kandla Port Colony	Vehicular activity, dust emission, Traffic
4.		A-4	Marine Bhavan	Construction and vehicular activity, road dust emission,
5.		A-5	Coal Storage Area	Coal Dust, Vehicular activity
6.		A-6	Gopalpuri Hospital	Residential area, dust emission, vehicular activity
7.	Vadinar	A-7	Admin Building	Vehicular activity
8.		A-8	Vadinar Colony	Residential Area, burning waste, vehicular activity

The monitoring locations at Kandla and Vadinar have been depicted in map in **Figure 6 and 7** respectively:

Ambient Air monitoring and sampling photographs

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



Figure 6: Location Map for Ambient Air Monitoring at Kandla

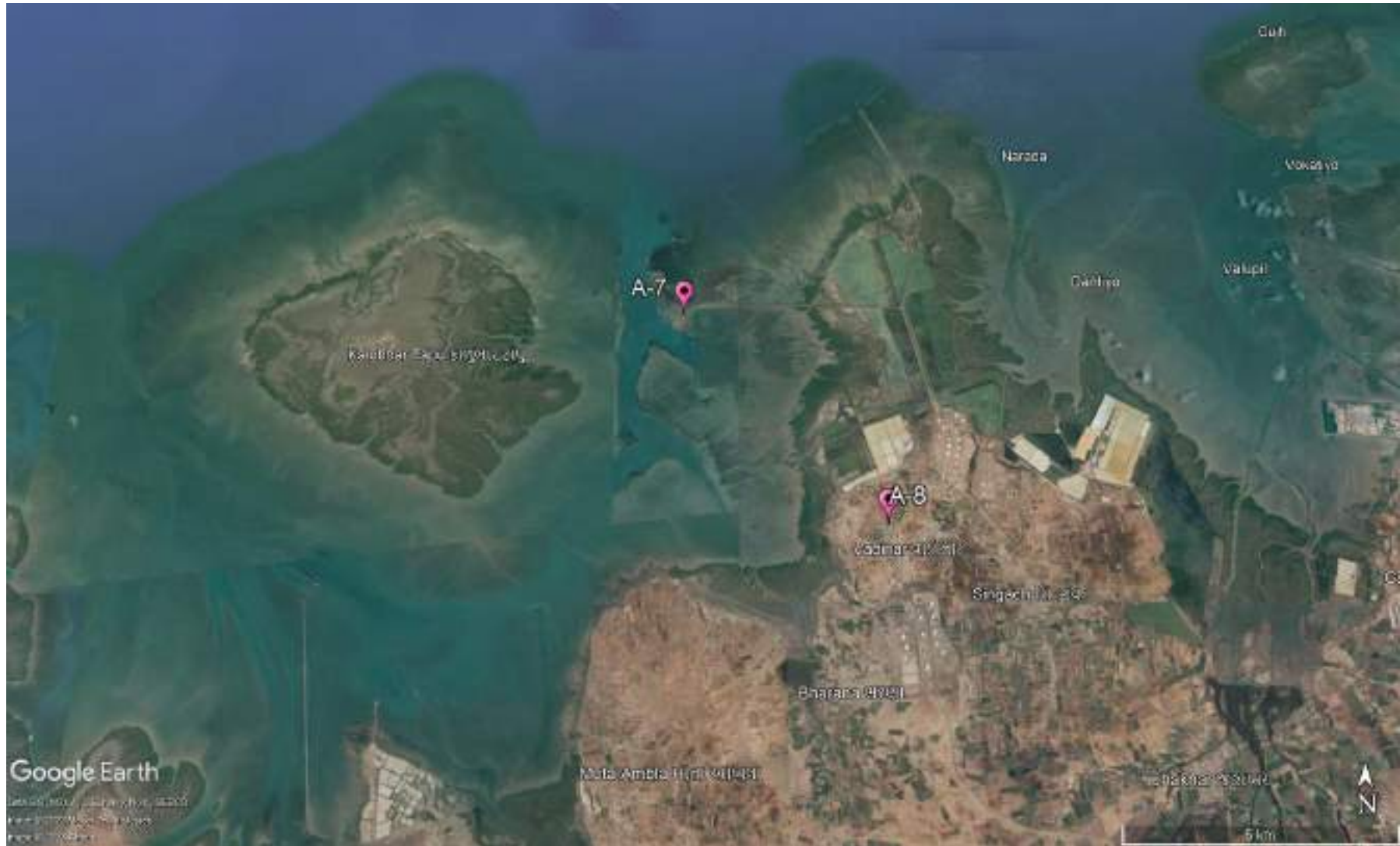


Figure 7: Location Map for Ambient Air Monitoring at Vadinar



Frequency

The sampling for Particulate matter i.e. PM₁₀ 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 PM₁₀, 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 SO₂ 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 PM₁₀, 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/m ³	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/m ³	IS:5182 (Part:24):2019	Fine Particulate Sampler (FPS) conforming to IS:5182 (Part-24): 2019	
3.	Sulphur Dioxide (SO _x)	µg/m ³	IS 5182 (Part:2): 2001	Gaseous Attachment conforming to IS:5182 Part-2	
4.	Oxides of Nitrogen (NO _x)	µg/m ³	IS:5182 (Part-6): 2006	Gaseous Attachment conforming to IS:5182 Part-6	
5.	Carbon Monoxide	mg/m ³	GEMI/SOP/AAQM /11; Issue no 01, Issue date 17.01.2019: 2019	Sensor based Instrument (Make: Vaibhav Instruments)	
6.	VOC	µg/m ³	IS 5182 (Part 17): 2004	Low Flow Air Sampler	
8.	PAH	µg/m ³	IS: 5182 (Part 12): 2004	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-12): 2004	Monthly
7.	Benzene	µg/m ³	IS 5182 (Part 11): 2006 RA: 2017	Low Flow Air Sampler	
9.	Non-methane VOC	µg/m ³	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 PM₁₀, PM_{2.5}, SO₂, NO_x, VOC and CO for Ambient Air quality monitoring at Kandla and Vadinar

Station Code & Name	Unit of Average Concentration	Average Pollutant Concentration $\mu\text{g}/\text{m}^3$ except for CO in mg/m^3					
	Pollutants	PM ₁₀ $\mu\text{g}/\text{m}^3$	PM _{2.5} $\mu\text{g}/\text{m}^3$	SO ₂ $\mu\text{g}/\text{m}^3$	NO _x $\mu\text{g}/\text{m}^3$	VOC $\mu\text{g}/\text{m}^3$	CO mg/m^3
	Duration	(24 hr)				(2 hr)	(1 hr)
NAAQS by CPCB		100	60	80	80	-	2
A-1: Oil Jetty No.1, Kandla	22-Aug-23	28.68	11.11	2.39	8.54	2.2	0.79
	26-Aug-23	51.35	17.54	2.54	<6	3.4	0.82
	28-Aug-23	55.52	28.13	3.12	<6	1.39	<0.3
	31-Aug-23	62.82	19.47	4.25	<6	2.65	0.83
	04-Sep-23	61.67	13.90	3.59	16.38	3.64	0.84
	09-Sep-23	66.68	13.26	2.78	<6	4.85	0.82
	11-Sep-23	87.70	13.21	2.14	<6	2.16	0.83
	14-Sep-23	137.54	21.61	2.01	<6	3.41	0.85
	Minimum	28.68	11.11	2.01	8.54	1.39	0.79
	Maximum	137.54	28.13	4.25	16.38	4.85	0.85
	Average	69.00	17.28	2.85	12.46	2.96	0.83
Std. Deviation	32.21	5.65	0.77	5.54	1.08	0.02	
A-2: Oil Jetty No.7, Kandla	22-Aug-23	37.20	19.08	3.15	16.76	2.05	0.62
	26-Aug-23	34.39	19.67	2.09	29.38	3.25	0.72
	28-Aug-23	54.58	30.69	2.47	8.22	1.24	0.72
	31-Aug-23	112.04	29.61	5.31	11.91	2.50	0.78
	04-Sep-23	87.63	31.46	4.12	7.39	3.49	0.76
	09-Sep-23	68.42	35.63	4.98	9.73	4.70	0.79
	11-Sep-23	73.14	34.11	6.05	6.89	2.01	0.76
	14-Sep-23	91.36	26.70	19.57	14.12	3.26	0.81
	Minimum	34.39	19.08	2.09	6.89	1.24	0.62
	Maximum	112.04	35.63	19.57	29.38	4.70	0.81
	Average	69.85	28.37	5.97	13.05	2.82	0.75
Std. Deviation	27.07	6.17	5.67	7.44	1.08	0.06	
A-3: Kandla Port Colony, Kandla	22-Aug-23	295.27	20.39	2.36	10.41	1.91	0.81
	26-Aug-23	163.45	22.12	3.09	<6	3.11	0.81
	28-Aug-23	150.27	39.14	3.14	10.75	1.10	0.80
	31-Aug-23	175.86	26.04	2.74	15.21	2.36	0.88
	04-Sep-23	165.10	18.61	3.74	18.87	3.35	0.83
	09-Sep-23	105.32	16.45	4.64	<6	2.56	0.85
	11-Sep-23	163.45	17.81	4.12	9.14	1.87	0.86
	14-Sep-23	191.35	21.69	5.37	10.40	3.12	0.89
	Minimum	105.32	16.45	2.36	9.14	1.10	0.80
	Maximum	295.27	39.14	5.37	18.87	3.35	0.89
	Average	176.26	23.29	3.65	12.46	2.42	0.84
Std. Deviation	54.18	8.49	1.02	3.77	0.77	0.03	
A-4: Marine Bhavan, Kandla	22-Aug-23	223.42	28.56	10.21	19.04	1.76	0.80
	26-Aug-23	232.23	29.32	4.02	14.06	2.96	0.88
	28-Aug-23	221.67	27.28	3.58	20.08	0.95	0.90
	31-Aug-23	225.03	28.67	2.16	18.41	2.21	0.89
	04-Sep-23	264.56	19.90	3.94	11.55	3.20	0.85
09-Sep-23	198.13	22.44	3.26	10.23	4.41	0.82	



Station Code & Name	Unit of Average Concentration	Average Pollutant Concentration $\mu\text{g}/\text{m}^3$ except for CO in mg/m^3					
	Pollutants	PM ₁₀ $\mu\text{g}/\text{m}^3$	PM _{2.5} $\mu\text{g}/\text{m}^3$	SO ₂ $\mu\text{g}/\text{m}^3$	NO _x $\mu\text{g}/\text{m}^3$	VOC $\mu\text{g}/\text{m}^3$	CO mg/m^3
	Duration	(24 hr)				(2 hr)	(1 hr)
NAAQS by CPCB		100	60	80	80	-	2
	11-Sep-23	226.12	22.99	11.23	15.72	1.72	0.88
	14-Sep-23	201.45	25.49	16.05	11.09	2.97	0.87
	Minimum	198.13	19.90	2.16	10.23	0.95	0.80
	Maximum	264.56	29.32	16.05	20.08	4.41	0.90
	Average	224.08	25.58	6.81	15.02	2.52	0.86
	Std. Deviation	20.36	3.47	5.03	3.87	1.08	0.04
A-5: Coal Storage Area, Kandla	22-Aug-23	166.20	22.45	4.13	19.58	1.62	0.97
	26-Aug-23	184.13	22.77	3.2	20.13	2.82	1.02
	28-Aug-23	172.73	24.81	4.16	16.79	0.81	0.98
	31-Aug-23	172.01	25.25	7.32	29.02	2.07	0.96
	04-Sep-23	310.36	22.39	2.97	33.16	3.06	0.94
	09-Sep-23	247.34	23.32	3.29	21.84	1.27	0.97
	11-Sep-23	123.40	21.74	4.11	25.67	1.58	0.96
	14-Sep-23	402.44	44.23	9.18	28.54	2.83	0.93
	Minimum	166.20	22.39	2.97	16.79	0.81	0.93
	Maximum	402.44	44.23	9.18	33.16	3.06	1.02
	Average	236.46	26.46	4.89	24.15	2.00	0.97
Std. Deviation	90.39	7.92	2.40	6.07	0.82	0.03	
A-6: Gopalpuri Hospital, Kandla	22-Aug-23	78.68	19.53	3.67	8.85	2.47	0.72
	26-Aug-23	108.18	20.85	3.54	10.19	2.67	0.68
	28-Aug-23	83.67	24.12	21.31	25.12	1.66	0.89
	31-Aug-23	76.37	21.38	2.19	20.22	1.92	0.67
	04-Sep-23	52.96	14.78	4.25	17.67	2.91	0.93
	09-Sep-23	38.13	13.35	3.17	<6	4.12	0.90
	11-Sep-23	30.30	13.46	3.55	7.03	1.43	0.64
	14-Sep-23	50.56	23.69	4.28	<6	1.68	0.64
	Minimum	30.30	13.35	2.19	7.03	1.43	0.64
	Maximum	108.18	24.12	21.31	25.12	4.12	0.93
	Average	64.86	18.90	5.75	14.85	2.36	0.76
Std. Deviation	26.21	4.44	6.32	7.23	0.89	0.13	
A-7: Admin Building, Vadinar	19-Aug-23	44.45	25.43	2.31	20.63	1.32	0.71
	21-Aug-23	49.51	20.83	2.69	43.97	2.52	0.68
	23-Aug-23	85.97	22.03	4.37	10.62	0.51	0.72
	28-Aug-23	56.53	20.02	4.21	<6	1.77	0.73
	30-Aug-23	39.20	15.01	4.6	12.78	2.76	0.70
	03-Sep-23	62.78	14.05	3.9	20.65	1.97	0.68
	11-Sep-23	26.33	11.67	30.34	6.32	1.28	0.72
	13-Sep-23	25.28	11.68	29.21	18.72	2.53	0.67
	Minimum	25.28	11.67	2.31	6.32	0.51	0.67
	Maximum	85.97	25.43	30.34	106.20	2.76	0.73
	Average	48.76	17.59	10.20	31.32	1.84	0.70
Std. Deviation	20.02	5.17	12.11	35.21	0.77	0.02	

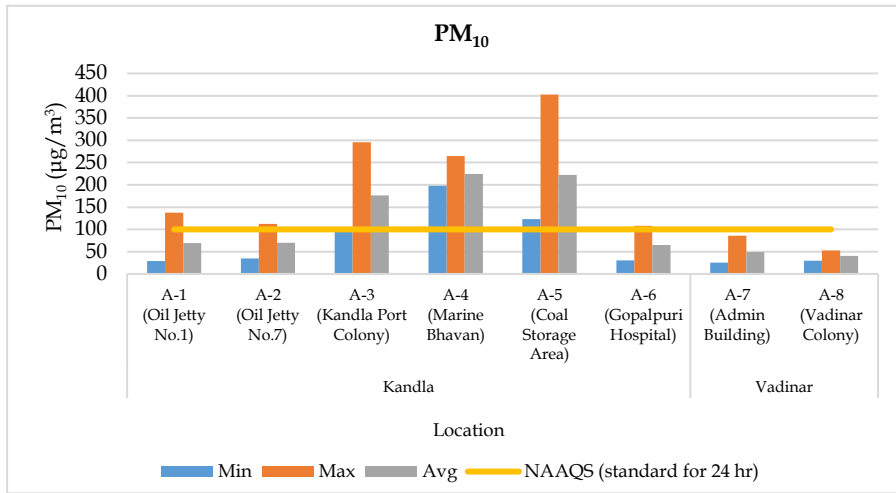


Station Code & Name	Unit of Average Concentration	Average Pollutant Concentration $\mu\text{g}/\text{m}^3$ except for CO in mg/m^3					
	Pollutants	PM ₁₀ $\mu\text{g}/\text{m}^3$	PM _{2.5} $\mu\text{g}/\text{m}^3$	SO ₂ $\mu\text{g}/\text{m}^3$	NO _x $\mu\text{g}/\text{m}^3$	VOC $\mu\text{g}/\text{m}^3$	CO mg/m^3
	Duration	(24 hr)				(2 hr)	(1 hr)
NAAQS by CPCB		100	60	80	80	-	2
A-8: Vadinar Colony, Vadinar	19-Aug-23	38.41	22.49	4.26	33.79	1.18	0.98
	21-Aug-23	39.58	13.77	4.25	24.69	2.38	1.02
	23-Aug-23	33.94	11.48	3.64	<6	0.37	0.98
	28-Aug-23	43.86	16.67	2.15	<6	1.63	1.02
	30-Aug-23	50.16	17.08	3.11	7.28	2.62	1.01
	03-Sep-23	52.59	12.09	3.58	6.24	3.83	0.99
	11-Sep-23	34.34	11.25	30.60	<6	1.14	0.98
	13-Sep-23	30.07	19.60	28.48	17.28	2.39	0.98
	Minimum	30.07	11.25	2.15	6.24	0.37	0.98
	Maximum	52.59	22.49	30.60	33.79	3.83	1.02
	Average	40.37	16.14	10.01	17.86	1.94	1.00
Std. Deviation	7.98	4.07	12.09	11.70	1.08	0.02	

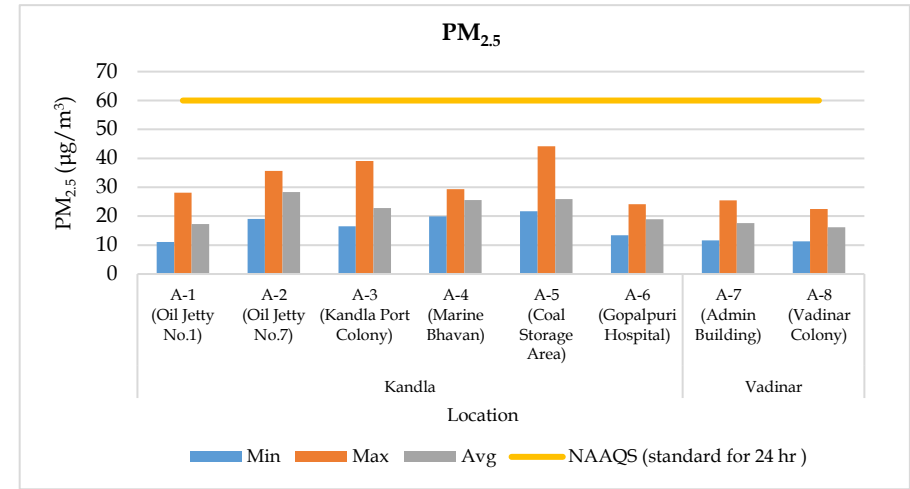
Graphs 1-6 shows spatial trend of ambient air parameter at all the eight-monitoring location (six at Kandla and 2 at Vadinar)



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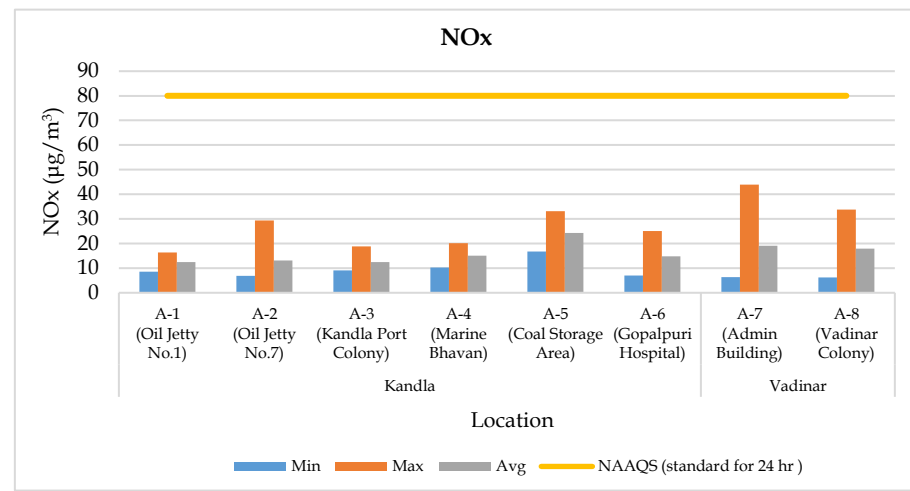
Graph 1: Spatial trend in PM₁₀ Concentration



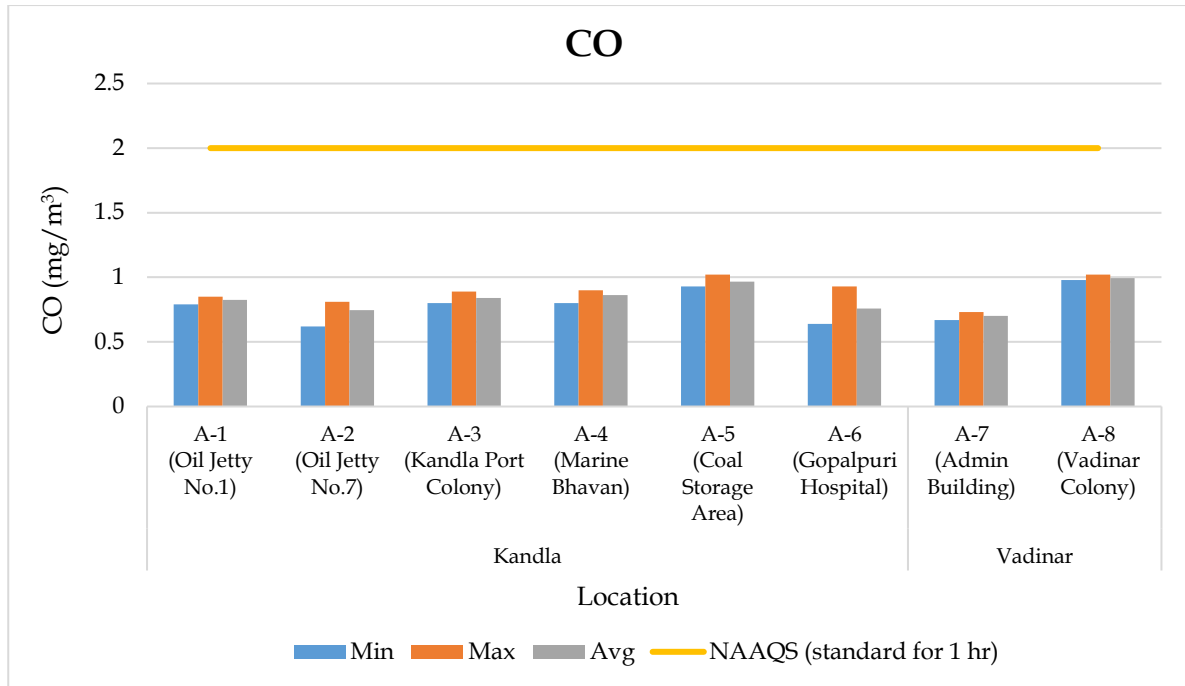
Graph 2: Spatial trend in PM_{2.5} Concentration



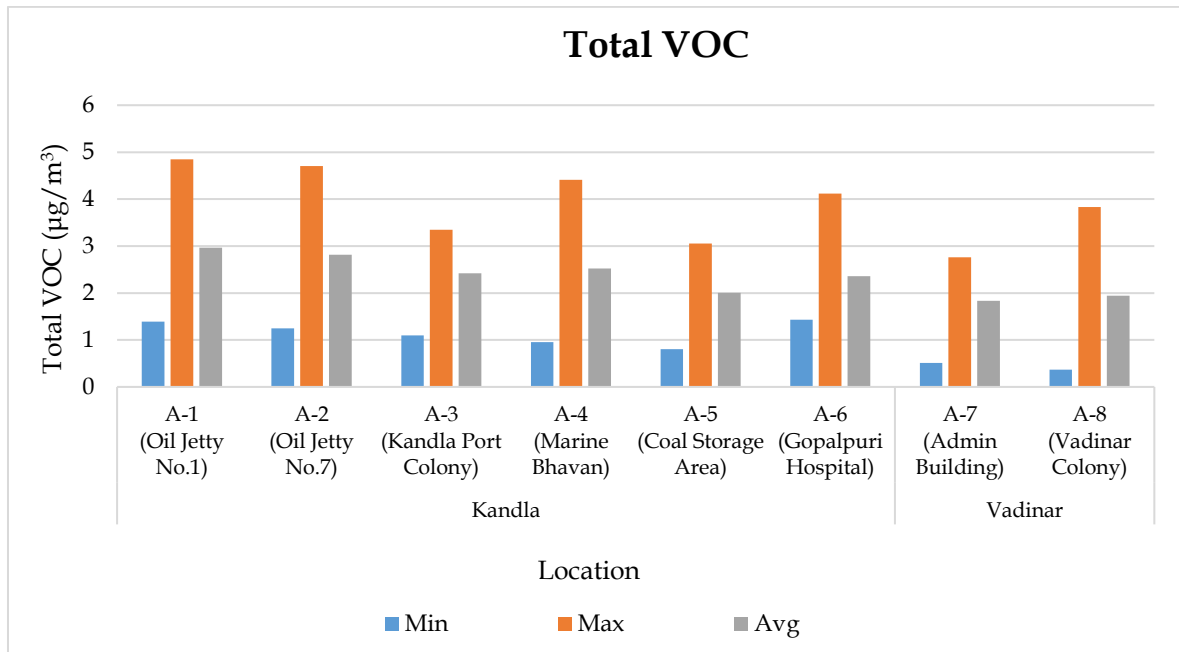
Graph 3: Spatial trend in SO_x Concentration



Graph 4: Spatial trend in NO_x Concentration



Graph 5: Spatial trend in CO Concentration



Graph 6: Spatial trend in Total VOCs

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

Benzene ($\mu\text{g}/\text{m}^3$)									
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	0.33	0.21	0.59	0.68	0.60	0.57	0.02	0.01	5 $\mu\text{g}/\text{m}^3$

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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Acenaphthylene	0.02	0.07	0.04	0.03	0.07	0.00	0.01	0.01
3	Acenaphthene	0.01	0.02	0.01	0.04	0.11	0.00	0.01	0.01
4	Fluorene	0.03	0.07	0.04	0.11	0.30	0.00	0.01	0.01
5	Anthracene	0.23	0.64	0.36	0.73	1.85	0.01	0.00	0.00
6	Phenanthrene	0.30	0.82	0.46	0.00	0.00	0.01	0.00	0.00
7	Fluoranthene	0.17	0.55	0.30	0.33	0.76	0.01	0.01	0.01
8	Pyrene	0.18	0.61	0.39	0.64	1.09	0.01	0.00	0.00
9	Chrycene	0.25	0.59	0.44	0.68	1.15	0.06	0.05	0.05
10	Banz(a)anthracene	0.39	1.19	0.92	2.18	1.67	0.06	0.01	0.01
11	Benzo[k]fluoranthene	0.15	0.78	0.31	0.62	1.05	0.06	0.03	0.04
12	Benzo[b]fluoranthene	0.87	1.59	0.70	1.23	2.31	0.11	0.11	0.10
13	Benzopyrene	0.84	1.99	2.18	3.19	1.79	0.04	0.09	0.10
14	Indeno [1,2,3-cd] fluoranthene	0.40	0.59	0.92	0.26	0.58	0.09	0.13	0.14
15	Dibenz(ah)anthracene	0.31	0.66	0.46	1.25	2.24	0.04	0.16	0.16
16	Benzo[ghi]perylene	0.66	1.21	1.95	2.38	3.37	0.17	0.12	0.13

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	0.22	0.38	0.10	0.24	1.15	1.03	0.17	0.19

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 28.68-402.44 $\mu\text{g}/\text{m}^3$. PM_{10} exceeded NAAQS at locations A-3 (Kandla Port), A-4 (Marine Bhavan) and A-5 (Coal storage area). Whereas, at Vadinar, the concentration varies 25.28-85.97 $\mu\text{g}/\text{m}^3$ which complies with the stipulated norm (100 $\mu\text{g}/\text{m}^3$) for both monitoring locations.

- The highest concentration of PM₁₀ at locations A-3 i.e. Kandla Port Colony 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 PM₁₀ in and around the Coal storage area and Marine bhavan.
- The PM_{2.5} concentrations at Kandla monitoring location varies from 11.11-44.23 µg/m³. Whereas, its concentration varies from 11.25-25.43 µg/m³ at Vadinar. Both Kandla and Vadinar reported PM_{2.5} concentration within the limits of NAAQS i.e. 60 µg/m³.
- The concentration of SO_x varies from 2.09-21.31 µg/m³ at Kandla and 2.15-30.60 µg/m³ at Vadinar. The range falls within the prescribed limit of NAAQS of 80 µg/m³ for both the monitoring site.
- The concentration of NO_x varies from 6.24-33.16 µg/m³ at Kandla and 6.24-106.20 µg/m³ at Vadinar. The range falls within the prescribed limit of NAAQS i.e. 80 µg/m³ at both the monitoring site Kandla and Vadinar except for location A-7 (Admin Building).
- The concentration of CO for the monitoring locations of Kandla and Vadinar falls within the norm of 2 mg/m³ specified by NAAQS.
- The concentration of Total VOCs levels was recorded in range of 0.81-4.85 µg/m³ at Kandla and 0.37-3.83 µg/m³ at Vadinar. The main source of VOCs in the ambient air may be attribute to the burning of Gasoline and Natural gas in Vehicle exhaust and burning fossil fuels, wood, and garbage all release VOCs into the atmosphere. During the monitoring period, the wind flows towards West-south-west 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.
- The concentration of **Benzene** for the Ambient Air Monitoring locations of Kandla, falls within the range of 0.21-0.68 µg/m³, whereas at Vadinar the Benzene concentration falls within the range of 0.01-0.02 µg/m³. The said concentration complies with the specified limit of 5 µg/m³ for both the study areas.
- **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. Comparative higher concentration of PAH was detected at location A-4 i.e. Marine Bhavan and A-5 i.e. Coal Storage area, which is a commercial area. PAHs are a class of chemicals that occur naturally in coal, crude oil, and gasoline. They the higher concentration which result from burning coal, oil, gas, road dust, etc might be attributed to higher traffic density in the area.

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 0.10-1.15 $\mu\text{g}/\text{m}^3$. While at Vadinar, the NM VOC concentration falls in the range of 0.17-0.19 $\mu\text{g}/\text{m}^3$.

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 location A-3, A-4 and A-5 while $\text{PM}_{2.5}$ falls within the prescribed limit. The gaseous pollutants (NO_x , SO_x , CO, VOCs etc.) falls within the permissible limit. The probable reason 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.



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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, SO₂, 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 8 and 9** as follows:



Figure 8: Location Map for DG Stack monitoring at Kandla

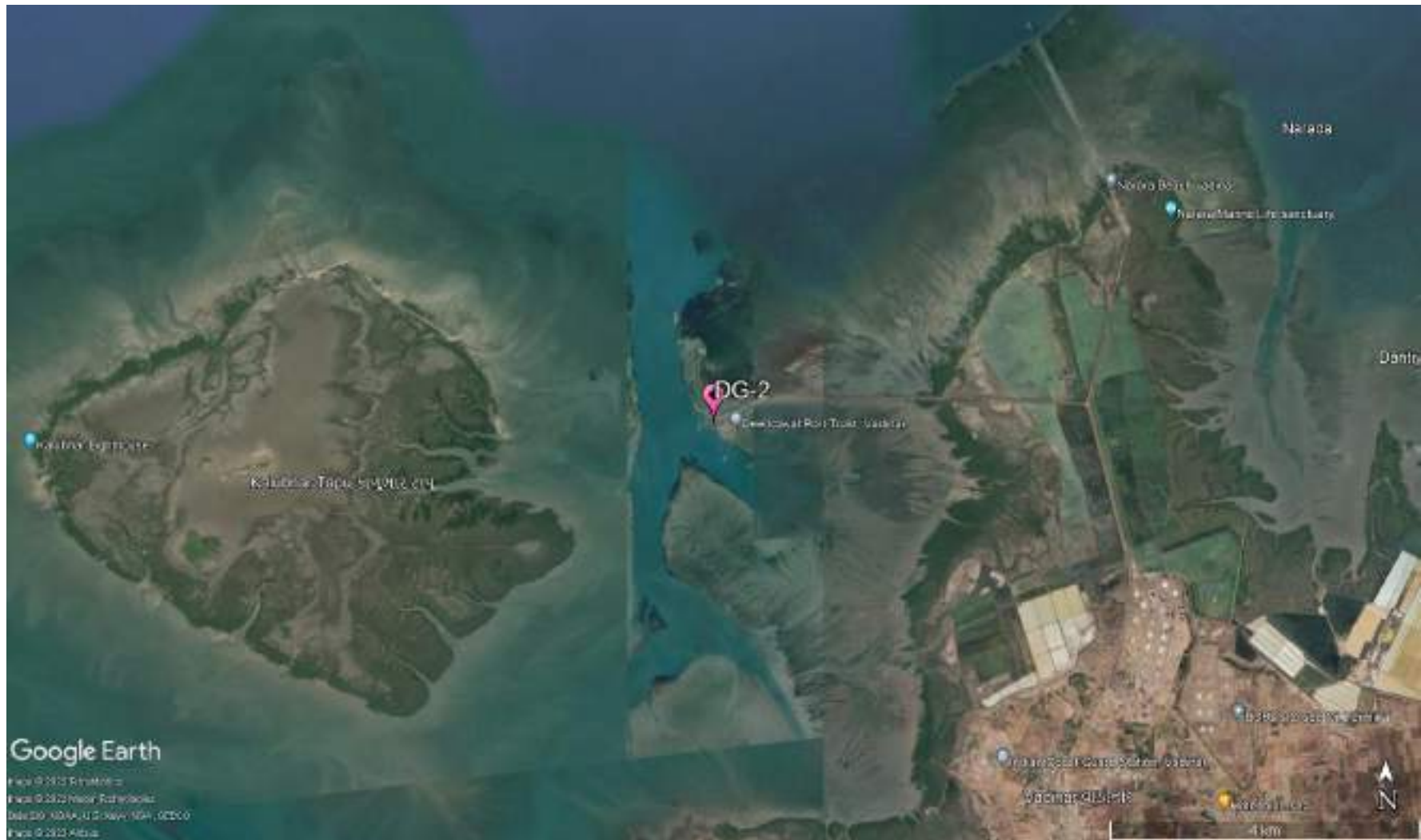


Figure 9: Location Map for DG Stack monitoring at Vadinar

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: Parameters to be monitored under the study

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: The results of DG Sets for Kandla and Vadinar

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	53.97	41.27
2.	Sulphur Dioxide (SO ₂) (PPM)	100	N.D.	N.D.
3.	Oxides of Nitrogen (NO _x) (PPM)	50	39.4	32.1
4.	Carbon Monoxide (%)	1	0.08	0.005
5.	Carbon Dioxide (%)	-	1.67	1.28



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 SPM, SO₂, NO_x and CO.



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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 **Figure 10 and 11** as follow:

Table 13: Details of noise monitoring locations

Sr. No.	Location Code	Location Name	Latitude/ Longitude
1.	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.	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



Figure 10: Location Map for Noise Monitoring at Kandla



Figure 11: Location Map 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 that carried out at Kandla and Vadinar

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	55.2	40	48.4	70	38.7	33.6	36.2
2	N-2	West Gate No.1	A	75	68.2	51.2	63.8	70	54.2	45.9	50
3	N-3	Canteen Area	B	65	58.9	38.9	54.4	55	52.1	34.9	48.3
4	N-4	Main Gate	A	75	58.9	44.3	55	70	46.2	36.1	42
5	N-5	Main Road	A	75	62.6	40.9	57.5	70	42.6	38.9	43.6
6	N-6	Marin Bhavan	B	65	59.1	41.9	53.3	55	41.6	34.2	38.9
7	N-7	Port & Custom Building	B	65	57.8	42.6	53.9	55	41.6	34.1	39
8	N-8	Nirman Building	B	65	56.9	40.9	53.1	55	45.1	35.9	42
9	N-9	ATM Building	B	65	55.6	41.2	51	55	47	34.5	43.1
10	N-10	Wharf Area/ Jetty	A	75	66.2	49.5	60.2	70	49.1	40.8	46.7
11	N-11	Near Main Gate	A	75	69.8	51.2	54.1	70	71.2	52.5	55.7
12	N-12	Near Vadinar Jetty	A	75	64.9	52.5	54	70	68.5	51.6	53.8
13	N-13	Port Colony Vadinar	C	55	60.7	49.5	51.9	45	65.9	47.2	50.1



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. The Day Time noise level at all 10 locations at Kandla ranged from 48.4 dB(A) to 63.8 dB(A). While at Vadinar, the noise levels for the three-location ranged from 51.9 dB(A) to 54.1 dB(A). Whereas, during Night Time the average Noise Level ranged from 36.2 dB(A) to 50 dB(A) at Kandla and 50.1 dB(A) to 55.7 dB(A) at Vadinar which was within the permissible limits for the industrial, residential and commercial area for both day and night time.

6.4 Remedial Measures

As per the noise level found within the norms thus no need to bring it down from the existing level however, the noise could be considerably reduced by adoption of low noise equipment or installation of sound insulation fences. Green belt of plants can be a good barrier. 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 locations

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: List of parameters to be monitored for Soil Quality

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, 6 th 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 12 and 13** as follows:



Figure 12: Location Map for Soil Quality Monitoring at Kandla

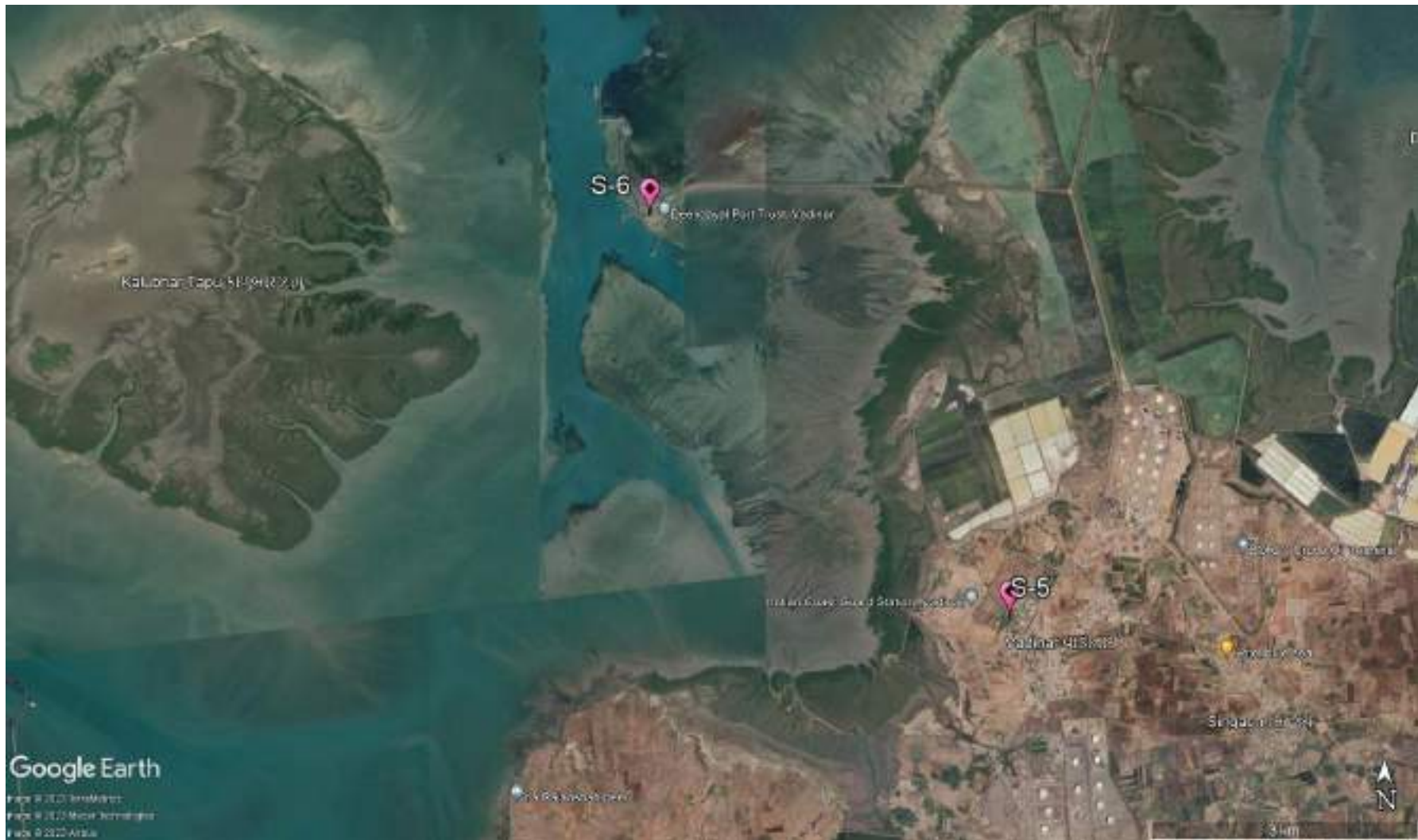


Figure 13: Location Map for Soil Quality Monitoring at Vadinar

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 (Khor Creek)	S-4 (Nakti Creek)	S-5 (Near SPM)	S-6 (Near Vadinar Jetty)
1	pH		9.53	7.89	8.34	9.03	8.69	9.36
2	Conductivity	μS/cm	2790	30700	15810	513	80.8	172
3	Inorganic Phosphate	Kg/ha	2.41	1.21	3.93	2.35	2.45	1.73
4	Organic Carbon	%	0.22	0.19	0.16	0.32	0.25	0.60
5	Organic Matter	%	0.38	0.33	0.28	0.55	0.42	1.04
6	SAR	meq/L	4.7	11.42	12.88	0.41	0.08	0.45
7	Aluminium	mg/Kg	1163.97	1321.18	1373.44	1410.12	2717.01	2746.14
8	Chromium	mg/Kg	92.23	53.45	64.76	42.06	97.22	63.34
9	Nickel	mg/Kg	16.16	14.74	32.03	17.16	41.425	30.68
10	Copper	mg/Kg	25.72	81.15	65.35	25.49	119.68	60.57
11	Zinc	mg/Kg	16.46	BQL	BQL	BQL	88.14	45.23
12	Cadmium	mg/Kg	BQL	BQL	BQL	BQL	3	BQL
13	Lead	mg/Kg	23.748	3.93	13.15	7.242	BQL	BQL
14	Arsenic	mg/Kg	2.562	BQL	4.251	2.182	BQL	BQL
15	Mercury	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL
16	Water Holding Capacity	%	35.8	35.88	49.41	37.25	51.99	59.72
17	Sand	%	77.61	59.7	53.78	79.64	46.09	57.99
18	Silt	%	15.93	37.83	23.87	13.92	39.58	29.67
19	Clay	%	6.45	2.47	22.35	6.44	14.33	12.34
20	Texture		Loamy Sand	Sandy Loam	Sandy clay loam	Loamy Sand	Loam	Sandy Loam

7.3 Data Interpretation and Conclusion

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

- The value of **pH** ranges from 7.89-9.53, highest at location S-1 (Oil Jetty 7) and lowest at S-2 (IFFCO Plant); while the average pH for Kandla was observed to be 8.69. Whereas, at Vadinar the pH value observed at S-5 i.e., Near SPM (8.69) and at S-6 i.e., Near Jetty Area (9.36). As per the observation the pH was found to be **strongly alkaline** both the monitoring station of Kandla and Vadinar.
- At the monitoring locations of Kandla the value of **Electrical Conductivity** ranges from 513-30700 $\mu\text{s}/\text{cm}$, highest at location S-2 (IFFCO plant) with the average electrical conductivity as 12453.25 $\mu\text{s}/\text{cm}$. Whereas, at Vadinar the range of conductivity was between the range of 80.8 to 172 $\mu\text{s}/\text{cm}$ with an average value of 126.4 $\mu\text{s}/\text{cm}$.
- At Kandla the concentration of **Inorganic Phosphate** varied from 1.21-3.93 Kg/ha, with average 2.47 Kg/ha. Whereas, at the locations of Vadinar, the Inorganic Phosphate was observed at S-5 i.e., Near SPM (2.45 Kg/ha) and detected at S-6 i.e., near Jetty Area (1.73 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 0.16-0.32% while the average TOC at Kandla was detected as 0.22%. Whereas, at Vadinar the average TOC was found to be 0.42% where the observed TOC value found at S-5 and S-6 to be 0.25 and 0.60% respectively.
- The concentration of **Water Holding Capacity** in the soil samples of DPA Kandla varies from 37.25-35.8% and 51.99-59.72% at Vadinar.
- The concentration of **Sodium Adsorption Ratio** ranges from 0.41-12.88 meq/L with an average value 7.35 meq/L at Kandla. Whereas, at Vadinar the average SAR was found to be 55.86 meq/L where the observed TOC value found at S-5 and S-6 to be 0.08 and 0.45 meq/L respectively.
- The **Soil Texture** observed at all the locations of Kandla and Vadinar were loam to Sandy Loam.

Heavy Metals

For the sampling period, the concentration of **Aluminium** varied from 1163.97 to 1410.12 mg/kg at Kandla and 2717.01 to 2746.14 mg/kg at Vadinar and the average value was observed to be 1317.17 and 2731.57 mg/kg at Kandla and Vadinar monitoring station, respectively.



The concentration of **Chromium** varied from 42.06 to 92.23 mg/kg at Kandla and 63.34 to 97.22 mg/kg at Vadinar and the average value was observed to be 63.13 and 80.28 mg/kg at Kandla and Vadinar monitoring station, respectively.

The concentration of **Nickel** varied from 14.74 to 32.03 mg/kg at Kandla and 30.68 to 41.43 mg/kg at Vadinar and the average value was observed to be 20.02 and 36.05 mg/kg at Kandla and Vadinar monitoring station, respectively.

The concentration of **Zinc** was found below the detection limit except for S-1 i.e. 16.45 mg/kg at Kandla, while its concentration varies from 45.23 to 88.14 mg/kg at Vadinar with an average value 66.68 mg/kg.

The concentration of **Copper** varied from 25.49 to 81.15 mg/kg at Kandla and 60.57 to 119.68 mg/kg at Vadinar and the average value was observed to be 49.43 and 90.13 mg/kg at Kandla and Vadinar monitoring station, respectively.

The concentration of **lead** varied from 3.93 to 23.74 mg/kg at Kandla with average value 12.02 mg/Kg, whereas for Vadinar, the value of Pb found below detection limit.

The concentration of **Arsenic** varied from 2.18 to 4.25 mg/kg at Kandla and "Below the detection limit" mg/kg at Vadinar and the average value was observed to be 2.99 mg/kg at Kandla monitoring station.

While other heavy metals in the Soil i.e., Mercury and Cadmium were observed "Below detection limit" for majority the soil samples collected at Kandla and Vadinar.



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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 **Figure 14 and 15**.

Table 20: Details of Drinking Water Sampling Locations

Sr. No.	Location Code	Location Name	Latitude/ Longitude
1.	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.	DW-19	Near Vadinar Jetty	22.440759N 69.675210E
20.	DW-20	Near Port Colony	22.401619N 69.716822E



Figure 14: Location Map for Drinking Water Monitoring at Kandla



Figure 15: Location Map 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, 23 rd Edition (Section-4500-H+B):2017	pH Meter
2.	Colour	Hazen	APHA, 23 rd Edition, 2120 B:2017	Color Comparator
3.	EC	µS/cm	APHA, 23 rd Edition (Section-2510 B):2017	Conductivity Meter
4.	Turbidity	NTU	APHA, 23 rd Edition (Section -2130 B):2017	Nephlo Turbidity Meter
5.	TDS	mg/L	APHA, 23 rd Edition (Section-2540 C):2017	Vaccum Pump with filtration assembly and Oven
6.	TSS	mg/L	APHA, 23 rd Edition, 2540 D: 2017	
7.	Chloride	mg/L	APHA, 23 rd Edition (Section-4500-Cl-B):2017	Titration Apparatus
8.	Total Hardness	mg/L	APHA, 23 rd Edition (Section-2340 C):2017	
9.	Ca Hardness	mg/L	APHA, 23 rd Edition (Section-3500-Ca B):2017	
10.	Mg Hardness	mg/L	APHA, 23 rd Edition (Section-3500-Mg B):2017	
11.	Free Residual Chlorine	mg/L	APHA 23 rd Edition, 4500	UV- Visible Spectrophotometer
12.	Fluoride	mg/L	APHA, 23 rd Edition (Section-4500-F-D):2017	
13.	Sulphate	mg/L	APHA, 23 rd Edition (Section 4500-SO4-2-E):2017	
14.	Sodium	mg/L	APHA, 23 rd Edition (Section-3500-Na-B):2017	Flame Photometer
15.	Potassium	mg/L	APHA, 23 rd Edition, 3500 K-B: 2017	
16.	Salinity	mg/L	APHA, 23 rd Edition (section 2520 B, E.C. Method)	Salinity /TDS Meter
17.	Nitrate	mg/L	APHA, 23 rd Edition, 4500 NO3- B: 2017	UV- Visible Spectrophotometer



Sr. No.	Parameters	Units	Reference method	Instrument
18.	Nitrite	mg/L	APHA, 23 rd Edition, 4500 NO ₂ -B: 2017	
19.	Hexavalent Chromium	mg/L	APHA, 23 rd Edition, 3500 Cr B: 2017	
20.	Manganese	mg/L	APHA, 23 rd Edition, ICP Method 3120 B: 2017	ICP-OES
21.	Mercury	mg/L	EPA 200.7	
22.	Lead	mg/L	APHA ICP 23 rd Edition (Section-3120 B):2017	
23.	Cadmium	mg/L	APHA ICP 23 rd Edition (Section-3120 B):2017	
24.	Iron	mg/L	APHA ICP 23 rd Edition (Section-3120 B):2017	
25.	Total Chromium	mg/L	APHA ICP 23 rd Edition (Section-3120 B):2017	
26.	Copper	mg/L	APHA, 23 rd Edition, ICP Method 3120 B: 2017	
27.	Zinc	mg/L	APHA ICP 23 rd Edition (Section-3120 B):2017	
28.	Arsenic	mg/L	APHA ICP 23 rd 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	-	7.33	7.09	7.24	7.20	8.03	8.27	7.26	8.04	7.40	7.64	7.07	7.61	8.13	7.29	7.18	7.16	8.06	7.26	7.82	8.07
2.	Colour	Hazen	5	15	1	1	1	1	5	5	1	5	1	5	1	1	5	1	1	1	5	1	5	5
3.	EC	µS/cm	-	-	291	118	223	141	1823	1470	94	2000	108	2060	296	47.0	1412	191	34.3	112	1337	30.2	403	1736
4.	Salinity	mg/L	-	-	0.14	0.09	0.11	0.07	0.92	0.74	0.05	1.02	0.06	1.05	0.14	0.03	0.71	0.09	0.02	0.06	0.67	0.02	0.19	0.87
5.	Turbidity	NTU	1	5	BQL	BQL	BQL	BQL	2.0	1.5	BQL	1.08	BQL	0.95	BQL	BQL	2.03	BQL	0.63	BQL	1.92	0.7	1.2	1.0
6.	Chloride	mg/L	250	1000	63.98	44.99	53.98	37.49	437.36	329.90	25.99	499.85	26.99	504.84	74.48	13.50	307.40	42.49	10.50	30.49	287.41	9.0	36.49	407.37
7.	Total Hardness	mg/L	200	600	12	10	9	4	260	220	3	280	8	290	22	3	240	12	2	6	230	4	28	240
8.	Ca Hardness	mg/L	-	-	6	6	5	3	150	120	2	140	5	150	12	2	120	6	1.5	4	120	2.5	16	140
9.	Mg Hardness	mg/L	-	-	6	4	4	1	110	100	1	140	3	140	10	1	120	6	BQL	2	110	1.5	12	100
10.	Free Residual Chlorine	mg/L	0.2	1	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
11.	TDS	mg/L	500	2000	148	92	116	72	928	752	48	1012	56	1064	152	24	718	98	18	56	682	16	204	882
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	0.69	0.72	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	1.06
14.	Sulphate	mg/L	200	400	BQL	BQL	BQL	BQL	103.90	97.33	BQL	100.84	BQL	115.62	BQL	BQL	108.77	11.55	BQL	BQL	104.64	BQL	36.54	102.92
15.	Nitrate	mg/L	45	-	21.21	BQL	7.35	BQL	8.77	3.84	BQL	2.24	BQL	1.92	BQL	1.42	2.97	BQL	BQL	BQL	3.23	BQL	4.01	8.68
16.	Nitrite	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	0.15	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	1.89
17.	Sodium	mg/L	-	-	32.59	7.04	18.59	BQL	220.24	197.48	BQL	92.07	BQL	92.67	21.18	BQL	83.91	8.09	BQL	BQL	82.61	BQL	6.08	204.04



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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	
18	Potassium	mg/L	-	-	BQL	BQL	BQL	BQL	5.82	BQL	BQL	BQL	BQL	7	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	5.85
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	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	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	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	BQL
23	Copper	mg/L	0.05	1.5	BQL	BQL	6.19	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	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	0.52	BQL	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	BQL
26	Manganese	mg/L	0.1	0.3	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	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	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	BQL
29	Zinc	mg/L	5	15	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
30	Total Coliform*	MPN/100ml	Shall not be detected		10	BQL	55	20	75	20	15	10	35	35	25	30	35	85	15	50	40	65	BQL	50	

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 NO₃ (QL=1 mg/L), Nitrite as NO₂ (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 methods; 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 at 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 7.07-8.27, with an average pH of 7.5. In Vadinar, the pH values ranged from 7.82 to 8.07, with an average pH of 7.95. Notably, the pH levels at both project sites fall within the acceptable range of 6.5 to 8.5, as specified under IS:10500:2012.
- **Turbidity:** At the drinking water locations of Kandla, the turbidity was found in range from 0.63 to 2.03 NTU with average value 1.35 NTU. Whereas, in Vadinar the turbidity was observed in DW-19 (1.2 NTU) and at DW-19 the value recorded 1 NTU.
- **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 between 16 to 1064 mg/L, with an average TDS concentration of 336.22 mg/L. In Vadinar, the TDS concentrations ranged from 204 to 882 mg/L, and the average TDS concentration was measured at 543 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 except for location DW-5, DW-6, DW-8, DW-10, DW-13, DW-17 and DW-20.
- **Electrical Conductivity:** 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 30.2 to 2060 $\mu\text{S}/\text{cm}$, with an average EC value of 654.86 $\mu\text{S}/\text{cm}$. In Vadinar, the EC values showed variation from 403 to 1736 $\mu\text{S}/\text{cm}$, with an average EC value of 1069.5 $\mu\text{S}/\text{cm}$. 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.
- **Chlorides:** The concentrations in the drinking water samples collected from Kandla and Vadinar were within acceptable limits, as specified by the BIS. The chloride in Kandla varied from 9 to 504.84 mg/L, with an average value of 155.59 mg/L. In Vadinar, the chloride concentrations ranged from 36.49 to 407.37 mg/L, with an average value of 221.93 mg/L. It's important to note that all the recorded chloride concentrations in both Kandla and Vadinar were well below the acceptable limit of 250 mg/L.
- **Total Hardness:** Total Hardness varied from 2 to 290 mg/L, with the average value as 89.72 mg/L. While at Vadinar, the variation in TH was observed from 28 to 240 mg/L; with the average Hardness as 134 mg/L. TH was found to have concentration within the acceptable norm of 200 mg/L as specified by IS:10500:2012 and is not harmful for local inhabitants.
- **Sulphate:** During monitoring period in Kandla and Vadinar, the sulphate concentrations were found to be within the acceptable limits as per the specified

norms. In Kandla, the sulphate concentrations varied from 11.55 to 115.62 mg/L, with an average value of 91.81 mg/L. In Vadinar, the sulphate concentration was observed at DW-19 is 36.54 mg/L and at DW-20 it values 102.92 mg/L.

- **Sodium:** During the monitoring period, at Kandla variation in the concentration of sulphate was observed to be in the range of 7.04 to 220.24 mg/L, with the average concentration of 77.86 mg/L. While at Vadinar, the concentration recorded 6.08 mg/L at DW-19 and 204.04 mg/L at DW-20.
- **Nitrate:** During the monitoring period, at Kandla variation in the concentration of Nitrate was observed to be in the range of 1.41 to 21.22 mg/L, with the average concentration of 5.88 mg/L also majority of the location recorded as “BQL”. While at Vadinar, the concentration recorded 4.01 mg/L at DW-19 and 8.68 mg/L at DW-20.
- **Fluoride:** The concentration was found to be below detection limit in majority of the monitoring location except for location DW-5 (Canteen Area), DW-6 (West Gate 1) at Kandla and DW-20 (Near Port Colony) at Vadinar.
- **Potassium:** The concentration was found to be below detection limit in majority of the monitoring location except for location DW-5 (Canteen Area), DW-10 (Port Colony Kandla) at Kandla and DW-20 (Near Port Colony) at Vadinar.
- The parameters such as **Free Residual Chlorine, Total Suspended Solids, Nitrite, Hexavalent Chromium, and the metals Arsenic, Cadmium, Copper, Iron, Lead, Manganese, 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 a significant number of Total Coliforms were detected at monitoring locations of Kandla and Vadinar. Reporting such concentration of Coliforms indicates certain external influx may contaminate the source. Hence, it should be checked at every distribution point.

This shows that drinking water samples are unfit for human consumption, and hence adequate disinfection is required to make the water potable for drinking purpose.

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.

Furthermore, a regular monitoring 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.



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: Norms of treated effluent 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 16 and 17** as follows:

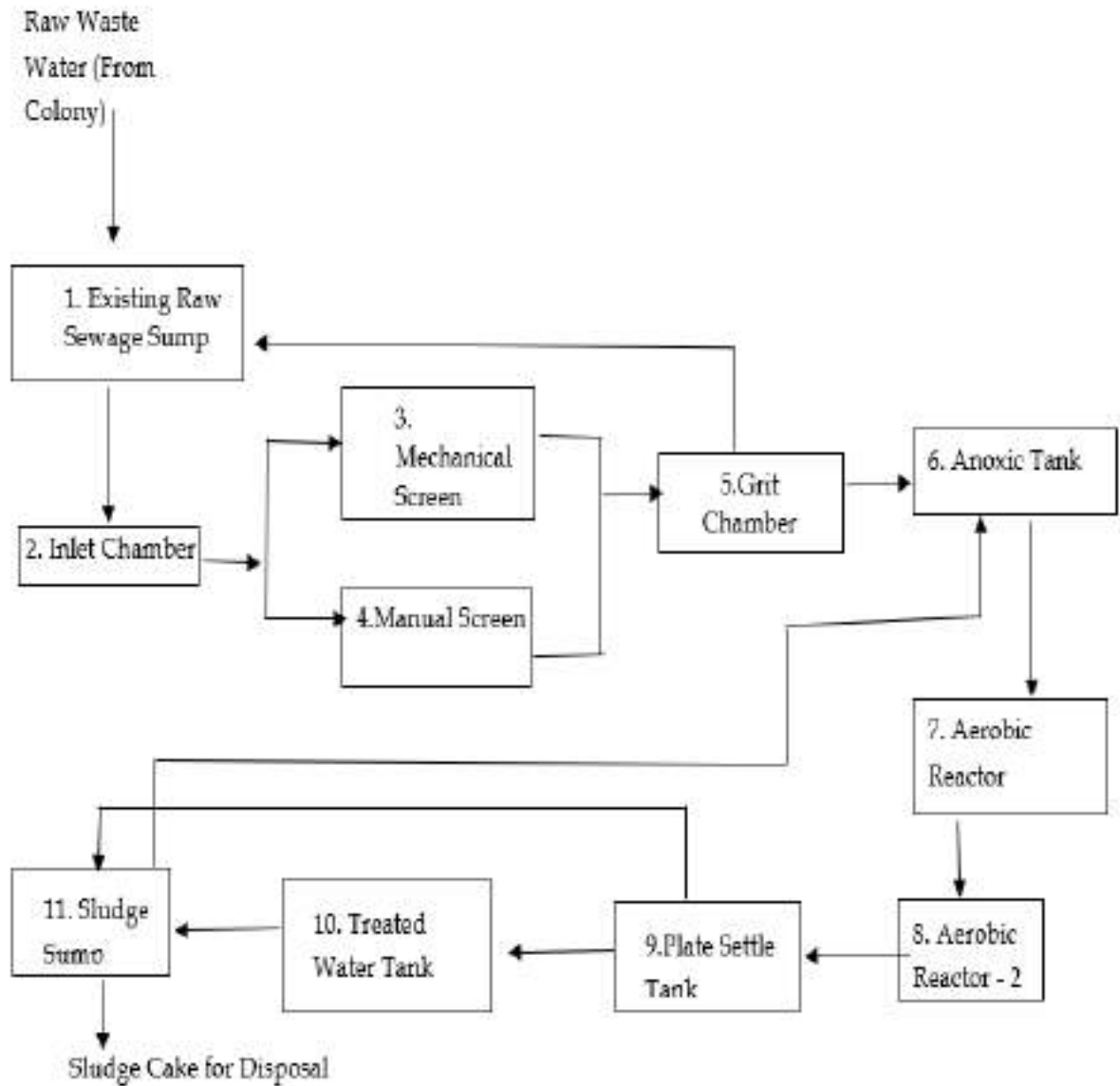


Figure 17: Process flow diagram of Gopalpuri STP

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 18** as follows:

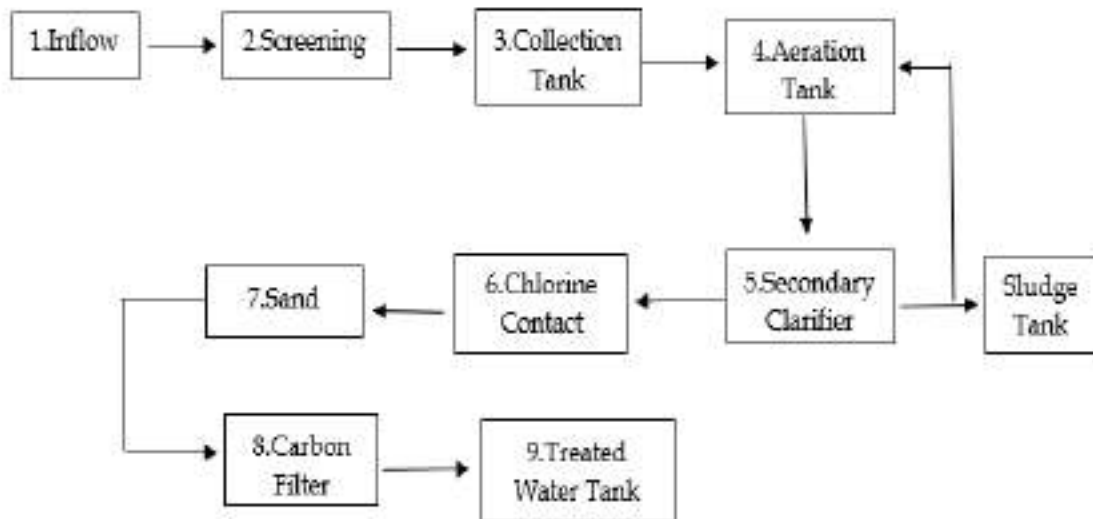


Figure 18: Process flowchart for the Vadinar STP

The map depicting the locations of STP to be monitored in Kandla and Vadinar have been shown in **Figure 19 and 20** as follows:



Figure 19: Location Map for STP Monitoring at Kandla



Figure 20: Location Map 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, 23 rd edition, 4500- H ⁺ B, 2017	pH Meter
2.	TDS	mg/L	APHA, 23 rd Edition, 2540 C: 2017	Vacuum Pump with filtration assembly and Oven
3.	TSS	mg/L		
4.	DO	mg/L	APHA, 23 rd Edition, 4500 C: 2017	Titration Apparatus
5.	COD	mg/L	APHA, 23 rd 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

The quality of the water samples collected from the inlet and the outlet of the STP's of Kandla and Vadinar has been summarized in **Table 27 & 28**. The said water quality has been represented in comparison with the standard values 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 August				Week 4 of August				Week 1 of September				Week 2 of September			
				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	7.12	7.26	7.32	8.18	7.15	7.65	7.35	7.81	7.28	7.55	7.43	7.73	7.34	7.46	7.41	7.65
2.	TDS	mg/L	-	1102	864	1842	1764	1237	847	1896	1584	1453	976	1602	1552	1385	1174	1197	856.1
3.	TSS	mg/L	100	37	5	50	BQL	39	6	44	6	31	BQL	48	4	28	BQL	37	2
4.	DO	mg/L	-	1.5	7.2	BQL	5.37	BQL	5.1	BQL	3.8	BQL	6.3	BQL	0.7	BQL	4.8	0.9	5.5
5.	COD	mg/L	-	108.9	15.6	115.54	15.94	113.4	9.54	108.87	20.16	141.8	10.9	150.79	11.9	103.8	12.47	112.8	11.7
6.	BOD	mg/L	30	36.5	BQL	28.89	BQL	27.9	BQL	20.41	3.78	21.8	2.1	37.7	3.72	32.2	1.7	28.01	BQL
7.	SAR	meq/L	-	5.3	4.9	7.9	7.31	6.7	6.3	7.55	8.49	6.1	5.7	6.52	7.81	6.9	6.2	5.2	4.7
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)	Vadinar							
				Week 3 of August		Week 4 of August		Week 1 of September		Week 2 of September	
				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	7.4	8.09	7.37	7.77	7.41	7.56	7.22	7.64
2.	TDS	mg/L	-	412	378	432	372	442	358	446	342
3.	TSS	mg/L	20	34	BQL	18	BQL	40	6	28	BQL
4.	DO	mg/L	-	BQL	5.2	0.8	5.8	BQL	2.9	BQL	6.5
5.	COD	mg/L	50	174.59	23.81	131.47	7.97	150.41	24.10	199.23	7.66
6.	BOD	mg/L	10	43.65	4.46	41.08	BQL	47.00	4.52	49.81	BQL
7.	SAR	meq/L	-	2.14	1.60	2.06	1.57	0.22	0.91	2.87	1.98
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 conform to the standard of 6.5-8.5. Whereas, pH for STP-3 at Vadinar conforms the norm of 5.5-9 as specified in the CCA.
- The **TSS** for the STP-1 and STP-2 of Kandla and STP-3 of Vadinar falls within the stipulated norms of 100 and 20 mg/L for outlet of Kandla and Vadinar, respectively and hence conforms to the norms specified.
- As per the norms, the **Chemical Oxygen Demand** falls within the 50 mg/L for the STP-3 of Vadinar.
- The **BOD** of the outlet for the STPs of Kandla and Vadinar falls within the stipulated norms.
- The **Total Coliforms** were exceeding the norms at the locations of the STP-1 & STP-2 outlets of Kandla and STP-3 of 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 of 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 treatment parameters such as retention time, Mixed Liquor Suspended Solids (MLSS), Mixed liquor volatile suspended solids (MLVSS), Recirculation rate, sludge generation, etc should be monitored timely.
- During the treatment, the required retention time and rate of aeration should be maintained, so that the efficiency of the treatment plant is maintained.
- The dosage of chemicals administered during the treatment should be reviewed and alterations in the dosage should be done.
- 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/H₂O₂ 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.
- Enhanced biological treatment processes, such as Moving Bed Biofilm Reactors (MBBR), Integrated Fixed-film Activated Sludge (IFAS) systems, and Membrane Bio-Reactors (MBRs) are utilised to improve the efficiency of organic matter and nutrient removal from wastewater.



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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.	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.	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 21 and 22** as follows:



Figure 21: Location Map for Marine Water Monitoring at Kandla



Figure 22: Location Map for Marine Water Monitoring at Vadinar

Methodology

Similar to the methodology adopted for the sampling and monitoring of Drinking water under the study, the sampling 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 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, 23 rd Edition (Section-2510 B):2017	Conductivity Meter
2.	Dissolved Oxygen (DO)	mg/L	APHA, 23 rd Edition, 4500 O C, 2017	Titration Apparatus
3.	pH	-	APHA, 23 rd Edition (Section-4500-H*B):2017	pH meter
4.	Color	Hazen	APHA, 23 rd 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, 23 rd Edition (Section-2540 C):2017	Vaccum Pump with Filtration Assembly and Oven
8.	Total Suspended Solids (TSS)	mg/L	APHA, 23 rd Edition, 2540 D: 2017	
9.	Particulate Organic Carbon	mg/L	APHA, 23 rd 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, 23 rd Edition, 4500 C, 2017	UV- Visible Spectrophotometer
13.	Phosphate	mg/L	APHA,23 rd Edition, 4500 P-D: 2017	
14.	Sulphate	mg/L	APHA, 23 rd Edition, 4500 SO4-2 E: 2017	

Sr. No	Parameters	Units	Reference method	Instrument
15.	Nitrate	mg/L	APHA, 23rd Edition, 4500 NO3-B: 2017	
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	UV- Visible Spectrophotometer
22.	Hexavalent Chromium	µg/L		
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/m ³	-	1.022	1.021	1.020	1.021	1.021	1.022	1.021	1.022
2.	pH	-	6.5-9.0	8.32	8.29	8.33	8.31	8.28	8.31	7.98	8.12
3.	Color	Hazen	No Noticeable	5	5	5	5	5	5	5	5
4.	EC	µS/cm	-	51,600	51,500	51,600	51,800	51,800	51,400	56,900	56,300
5.	Turbidity	NTU	-	190	230	210	200	173	199	6.4	5.8
6.	TDS	mg/L	-	33,884	33,940	33,862	33,976	34,128	33,718	35,890	41,790
7.	TSS	mg/L	-	436	456	476	428	400	414	341	287
8.	COD	mg/L	-	32.6	30.39	25.41	34.25	33.15	29.28	25.6	19.4
9.	DO	mg/L	3.0 mg/L	6.0	6.2	6	5.9	6.1	6.4	4.3	5.1
10.	BOD	mg/L	5.0 mg/L	BQL	BQL	BQL	BQL	BQL	BQL	7.5	6.03
11.	Oil & Grease	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
12.	Sulphate	mg/L	-	2615.4	2692.9	2631.7	2714.9	2547.3	2804.3	2317.4	3236.8
13.	Nitrate	mg/L	-	3.57	3.54	3.64	3.49	3.35	3.5	5.17	4.69
14.	Nitrite	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
15.	Phosphate	mg/L	-	0.839	BQL	BQL	0.760	0.733	0.797	BQL	BQL
16.	Silica	mg/L	-	3.24	2.65	3.73	2.99	3.13	2.89	0.14	0.33
17.	Sodium	mg/L	-	>10,000	>10,000	8950	9101	>10,000	8655	2149.6	3547.20
18.	Potassium	mg/L	-	392.80	366	262.90	360	363.80	370.30	74.25	76.31
19.	Hexavalent Chromium	µg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
20.	Odour	-	-	1	1	1	1	1	1	1	1
21.	Arsenic	µg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
22.	Cadmium	µg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
23.	Copper	µg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
24.	Iron	mg/L	-	0.69	1.03	0.58	1.02	1.16	1.14	0.01	0.08
25.	Lead	µg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL



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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
26.	Manganese	µg/L	-	77.97	62.27	40.67	54.31	64.19	88.25	BQL	BQL
27.	Total Chromium	µg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
28.	Zinc	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
29.	Mercury	µg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
30.	Particulate Organic Carbon	mg/L	-	2.12	2.24	3.02	3.47	2.15	2.05	1.09	1.58
31.	Total Coliforms	MPN/ 100ml	500/100 ml	22	50	26	33	170	30	8	15
32.	Floating Material (Oil grease scum, petroleum products)	mg/L	10 mg/L	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

BQL- Below Quantification Limit; Turbidity (DL=50 NTU), Biochemical Oxygen Demand (QL=3 mg/L), Oil & Grease (QL=1 mg/L), Nitrate as NO₃ (QL=1 mg/L), Nitrite as No₂ (QL=0.1 mg/L), Phosphorous (QL=0.5 mg/L), Silica (QL=0.05 mg/L), Sodium as Na (QL=10,000 mg/L), Hexavalent Chromium (QL=0.01 µg/L), Arsenic (QL=5 µg/L), Cadmium (QL=2 µg/L), Copper (QL=5 µg/L), Iron (QL=0.1 mg/L), Lead (QL=2 µg/L), Manganese (QL=40 µg/L), Total Chromium (QL=5 µg/L), Zinc (QL=0.5 mg/L), Mercury (QL=0.5 µg/L)

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 2023 at high tide. The detailed interpretation of the parameters in comparison to the Class SW-IV for Harbour Waters is as follows:

- **pH** Kandla was observed in the range of 8.28 to 8.33, with the average pH as 8.31. Whereas for the locations of Vadinar, pH was observed in the range of 7.98-8.12, with the average pH as 8.05. For the monitoring location of both the study areas, pH was found to comply with the norms of 6.5-9.0.
- **Color** was observed in the range of 5 Hazen at all the eight-monitoring location of Kandla and Vadinar.
- **Turbidity** for all locations of Kandla was observed in range of 173 to 230 NTU and for Vadinar it ranges from 5.8 to 6.4 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.
- **Electrical conductivity (EC)** was observed in the range of 51,400 to 51,800 $\mu\text{S}/\text{cm}$, with the average EC as 51,616.67 $\mu\text{S}/\text{cm}$ for the locations of Kandla, whereas for the locations of Vadinar, EC was observed in the range of 56,900-56,300 $\mu\text{S}/\text{cm}$, with the average EC as 56,600 $\mu\text{S}/\text{cm}$.
- **Total Dissolved Solids (TDS)** for the monitoring locations at Kandla ranged from 33,718 to 34,128 mg/L, with an average value of 33,9178 mg/L. Similarly, at Vadinar, the TDS values ranged from 35,890 to 41,790 mg/L, with an average value of 38,840 mg/L.
- **TSS** values in the studied area during high Tide varied between 400 to 476 mg/L at Kandla and 287 to 341 mg/L at Vadinar, with the average value of 435 mg/L and 314 mg/L respectively for Kandla and Vadinar.
- **COD** varied between 25.41 to 34.25 mg/L at Kandla and 19.4 to 25.6 mg/L at Vadinar, with the average value as 30.84 mg/L and 22.5 mg/L respectively for Kandla and Vadinar.
- **DO** level in the studied area varied between 5.9 to 6.4 mg/L at Kandla and 4.3 to 5.1 mg/L at Vadinar, which represents that the marine water is suitable for marine life.
- **BOD** observed "below the detection limit" in the studied area, whereas it varies from 6.03 to 7.5 mg/L with average 6.03 mg/L.
- **Sulphate** concentration in the studied area during high Tide varied between 2547.3 to 2804.3 mg/L at Kandla and 2317.4 to 3236.8 mg/L at Vadinar. A high variation in the sulphate concentration is observed at Kandla. Sulphate is naturally formed in inland waters by mineral weathering or the decomposition and combustion of organic matter.
- **Phosphate** in the studied area varied between 0.63 to 0.84 mg/L at Kandla, while at Vadinar, the concentration of Phosphate was observed to be below the detection norm.



- **Potassium** in the studied area during high Tide varied between 262.9 to 392.8 mg/L at Kandla and 74.25 to 76.31 mg/L at Vadinar, with the average value as 352.63 mg/L and 75.28 mg/L respectively for Kandla and Vadinar.
- **Sodium** in the studied area varied between 8655 to >10,000 mg/L at Kandla and 2149.6 to 3547.2 mg/L at Vadinar.
- **Silica** in the studied area varied between 2.65 to 3.73 mg/L at Kandla and 0.14 to 0.33 mg/L for Vadinar.
- **Oil & Grease, Arsenic, Copper, Nitrite, Hexavalent Chromium, Cadmium, Zinc, Total Chromium and Mercury, Floating Material (Oil grease scum, petroleum products)** were observed to have concentrations “**Below the Quantification Limits (BQL)**” for all the locations of Kandla and Vadinar.
- **Coliforms** were detected complying with the specified norm of 500 MPN/100ml for all the locations of Kandla and Vadinar.

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).

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 **Figure 23 and 24** as follows:



Figure 23: Location Map of Marine Sediment Monitoring at Kandla

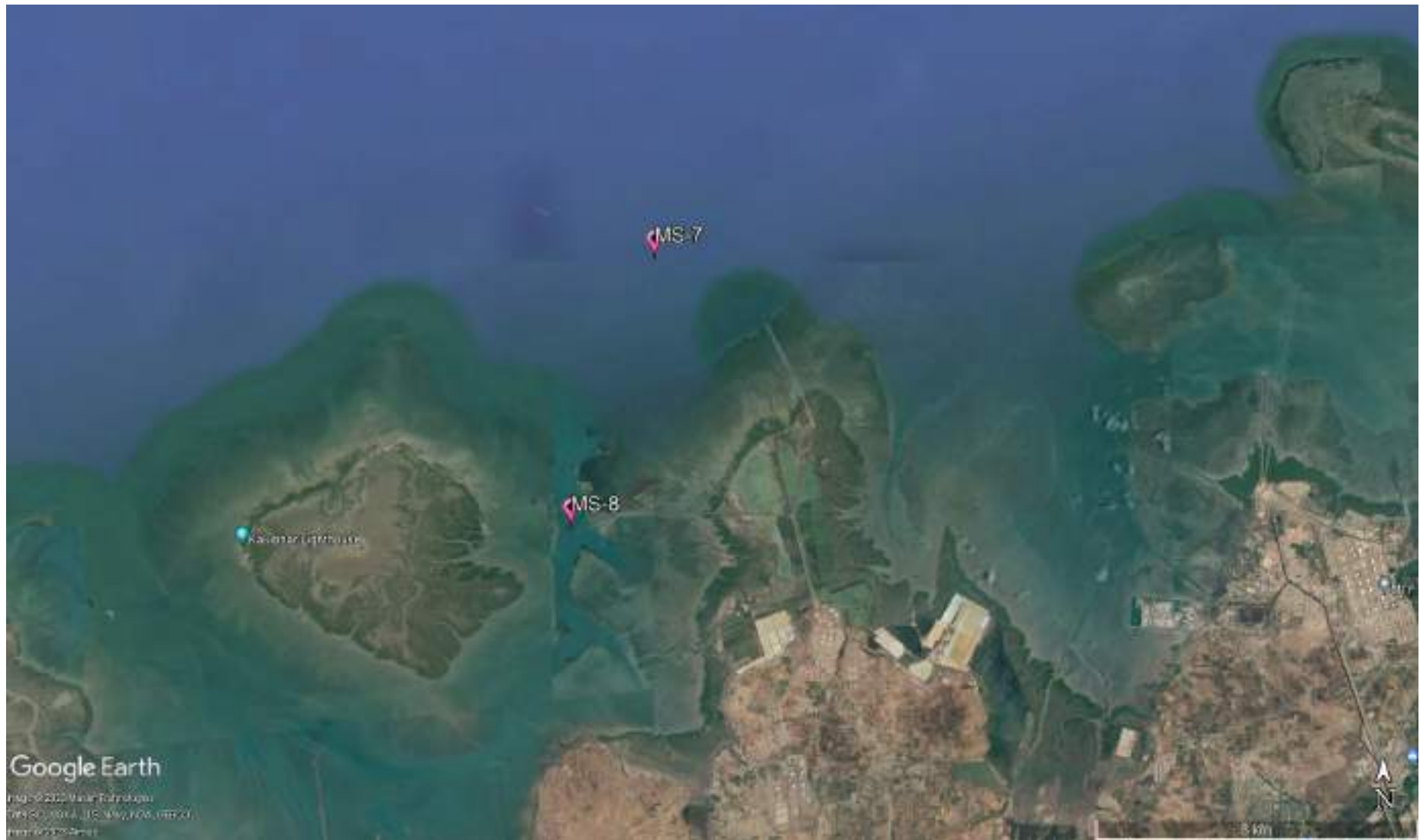


Figure 24: Locations Map of Marine Sediment Monitoring at Vadinar

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	4.71	10.74	41.29	6.44	15.21	34.69	4.12	3.74
2.	Phosphate	mg/Kg	1096.1	1393.54	746.31	459.12	746.28	947.51	396.4	512.87
3.	Organic Matter	mg/Kg	0.63	0.56	0.28	0.76	0.94	BQL	BQL	BQL
4.	Sulphate as SO ⁴⁻	mg/Kg	204.06	156.99	312	97.45	99.64	123.74	201.36	213.40
5.	Calcium as Ca	mg/Kg	2174	3100	2100	3400	1700	2500	3512	3974.20
6.	Magnesium as Mg	mg/Kg	1579	1952	2136	1496	1478	1534	1216.20	1769.24
7.	Silica	g/Kg	547.32	612.51	329.14	246.18	239.74	245.3	231.85	479.2
8.	Nitrite	mg/Kg	0.24	0.74	0.13	0.09	0.12	0.07	0.07	0.15
9.	Nitrate	mg/Kg	20.13	10.02	15.62	14.03	14.08	16.22	11.13	8.09
10.	Sodium	mg/Kg	3975	2733	2563	3496	5479	3458	3971.54	2719.42
11.	Potassium	mg/Kg	1076.2	11580	2697.25	3456.28	2794.52	3479.14	805.64	1549.72
12.	Aluminium	mg/Kg	2761.56	1237.13	1395.42	2874.39	1264.58	1587.36	358.3	479.16
13.	Chromium	mg/Kg	64.12	50.75	53.84	46.79	41.87	56.71	45.28	52.16
14.	Copper	mg/Kg	2.13	5.2	4.9	5.36	6.97	4.12	2.19	5.2
15.	Nickel	mg/Kg	47.25	21.56	36.41	27.59	24.11	23.17	31.96	12.47
16.	Zinc	mg/Kg	59.63	65.69	48.27	69.71	45.13	57.14	11.47	16.97
17.	Cadmium	mg/Kg	1.08	BQL	BQL	1.12	BQL	BQL	BQL	BQL
18.	Lead	mg/Kg	6.28	5.639	4.13	5.22	4.34	3.69	6.12	4.33
19.	Arsenic	mg/Kg	3.27	3.36	3.49	2.85	3.14	2.9	3.74	5.02
20.	Mercury	mg/Kg	4.71	10.74	41.29	6.44	15.21	34.69	BQL	BQL
21.	Texture	-	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy 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 2023. The detailed interpretation of the parameters is given below:

- **Inorganic Phosphate** for the sampling period was observed in range of 4.71 to 41.29 Kg/ha for Kandla and 3.74 to 4.12 Kg/ha for Vadinar. Whereas for Vadinar the value observed at location MS-7 i.e., Nakti creek (4.12 Kg/ha) and MS-8, i.e., Near Vadinar Jetty (3.74 Kg/ha). For Kandla and Vadinar the average value of Phosphate was observed 18.84 and 3.93 Kg/ha respectively.

- The value of **Phosphate** was observed in range of 459.12 to 1393.54 mg/Kg for Kandla and for Vadinar the value observed at location MS-7 i.e., Nakti creek (396.4 mg/Kg) and MS-8, i.e., Near Vadinar Jetty (512.87 mg/Kg). For Kandla and Vadinar the average value of Phosphate was observed 898.143 and 454.63 mg/Kg respectively.
- The value of **Organic Matter** for the sampling period was observed in the range of 0.28 to 0.94% for Kandla with the average value of 0.63% and for Vadinar the value recorded at location MS-7 and MS-8, to be “below the quantification limit”.
- The value of **Sulphate** was observed in the range of 97.45 to 312 mg/Kg for Kandla and for Vadinar the value observed at MS-7 is 201.36 mg/Kg and at MS-8, is 213.4 mg/Kg. For Kandla and Vadinar the average value of Sulphate was observed 165.64 and 207.38 mg/Kg respectively.
- The value of **Calcium** was observed in the range of 1700 to 3400 mg/Kg for Kandla and for Vadinar the value observed at MS-7 is 3512 mg/Kg and at MS-8, is 3974.2 mg/Kg. The average value of Calcium for the monitoring period was observed 2495.66 mg/Kg and 3743.1 mg/Kg at Kandla and Vadinar, respectively.
- The value of **Magnesium** for the sampling period was observed in the range of 1478 to 2136 mg/Kg for Kandla and for Vadinar the value observed at MS-7 is 1216.2 mg/Kg and at MS-8, is 1769.24 mg/Kg. For Kandla and Vadinar the average value of Magnesium was observed 1695.83 mg/Kg and 1492 mg/Kg respectively.
- The value of **Nitrate** was observed in the range of 10.02 to 20.13 mg/Kg for Kandla with average value 15.02 mg/Kg and for Vadinar the value observed to be 11.13 and 8.09 mg/Kg at MS-7 and MS-8, respectively with average 9.61 mg/Kg.
- The value of **Nitrite** was observed in the range of 0.07 to 0.74 mg/Kg for Kandla with average value 0.23 mg/Kg and for Vadinar the value observed to be 0.07 and 0.15 mg/Kg at MS-7 and MS-8, respectively with average 0.11 mg/Kg.
- The value of **Sodium** was observed in the range of 2563 to 5479 mg/Kg for Kandla with average value 3617.33 mg/Kg and for Vadinar the value observed to be 3971.54 and 2719.42 mg/Kg at MS-7 and MS-8, respectively with average 3345.48 mg/Kg.
- For the sampling period **Silica** was observed in the range of 239.74 to 612.51 mg/Kg for Kandla with average value 370.03 mg/Kg and for Vadinar the value observed to be 231.85 and 479.2 mg/Kg at MS-7 and MS-8, respectively with average 355.52 mg/Kg
- The value of **Potassium** was observed in the range of 1076.2 to 11580 mg/Kg for Kandla with average value 4180.56 mg/Kg and for Vadinar the value observed to be 805.64 and 1549.72 mg/Kg at MS-7 and MS-8, respectively with average 1177.68 mg/Kg.
- The value of **Aluminium**, was observed in the range of 1237.13 to 2874.39 mg/Kg for Kandla with average value 1853.40 mg/Kg and for Vadinar the value observed to be 358.3 and 479.16 mg/Kg at MS-7 and MS-8, respectively with average 418.73 mg/Kg.
- The value of **Mercury** was observed “BQL” at all the eight-monitoring location of Kandla and Vadinar.

- Texture was observed to be “**Sandy Loamy**” in both Kandla and Vadinar the 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	3.27	3.36	3.49	2.85	3.14	2.9	3.74	5.02
2.	Copper	mg/Kg	2.13	5.2	4.9	5.36	6.97	4.12	2.19	5.2
3.	Chromium	mg/Kg	64.12	50.75	53.84	46.79	41.87	56.71	45.28	52.16
4.	Nickel	mg/Kg	47.25	21.56	36.41	27.59	24.11	23.17	31.96	12.47
5.	Lead	mg/Kg	6.28	5.639	4.13	5.22	4.34	3.69	6.12	4.33
6.	Zinc	mg/Kg	59.63	65.69	48.27	69.71	45.13	57.14	11.47	16.97
7.	Cadmium	mg/Kg	1.08	BQL	BQL	1.12	BQL	BQL	BQL	BQL

- **Arsenic** was observed in the range of 2.85 to 3.49 mg/Kg for Kandla with average value 3.16 mg/Kg and for Vadinar the value observed to be 3.74 and 5.02 mg/Kg at MS-7 and MS-8, respectively with average 4.38 mg/Kg.
- **Copper** was observed in the range of 2.13 to 6.97 mg/Kg for Kandla with average value 4.78 mg/Kg and for Vadinar the value observed to be 2.19 and 5.2 mg/Kg at MS-7 and MS-8, respectively with average 3.69 mg/Kg.
- **Chromium** was observed in the range of 41.87 to 64.12 mg/Kg for Kandla with average value 52.34 mg/Kg and for Vadinar the value observed to be 45.28 and 52.16 mg/Kg at MS-7 and MS-8, respectively with average 48.72 mg/Kg.
- **Nickel** was observed in the range of 21.56 to 47.25 mg/Kg for Kandla with average value 30.01 mg/Kg and for Vadinar the value observed to be 31.96 and 12.47 mg/Kg at MS-7 and MS-8, respectively with average 22.21 mg/Kg.



- **Lead** was observed in the range of 3.69 to 6.28 mg/Kg for Kandla with average value 3.16 mg/Kg and for Vadinar the value observed “below the detection limit for both the location i.e., MS-7 and MS-8.
- **Zinc** was observed in the range of 45.13 to 69.71 mg/Kg for Kandla with average value 57.59 mg/Kg and for Vadinar the value observed to be 11.47 and 16.97 mg/Kg at MS-7 and MS-8, respectively with average 14.22 mg/Kg.
- **Cadmium** was observed BQL for Kandla and Vadinar during sampling period except for location MS-1 (1.08 mg/Kg) and MS-4 (1.12 mg/Kg).

Analysis of the sediments does not indicate any 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.



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 **Figure 25 and 26** as follows:



Figure 25: Locations Map of Marine Ecological Monitoring at Kandla



Figure 26: Locations Map 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.

- **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, \sum = Summation symbol,

p_i = 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:

$$D = 1 - \sum (p_i^2)$$

Where, \sum = Summation symbol, p_i = 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:

$$D_{Mg} = \frac{S-1}{\ln N}$$

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.

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

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	136	254	141	206	167	145	98	74
2.	Net Primary Productivity	mg/L/hr	0.12	BQL	1.07	BQL	BQL	0.17	1	1.07
3.	Gross Primary Productivity	mg/L/hr	1.23	BQL	2.31	0.16	0.55	1.21	1.22	2.13
4.	Pheophytin	mg/m ³	1.15	0.93	BQL	0.17	BQL	0.34	0.87	BQL
5.	Chlorophyll-a	mg/m ³	3.17	1	1.28	2.13	1.97	2.22	3.15	1.09
6.	Particulate Oxidisable Organic Carbon	mg/L	2.12	2.24	3.02	3.47	2.15	2.05	1.09	1.58
7.	Secchi Depth	ft	0.39	0.35	0.37	0.38	0.42	0.38	3.41	3.63

- Biomass:**

With reference to the **Table 40**, the value of **Biomass** reported from location ME-1 to ME-6 in range between 136-254 mg/L where highest biomass presents in ME-2 (Kandla Creek, near to KPT Colony) and lowest biomass present in ME-1 (Near Passenger Jetty 1) during sampling period. In Vadinar, the value of biomass was observed 98 mg/L at ME-7 (Near SPM), monitoring station and 74 mg/L in ME-8 (Near Vadinar Jetty).

- **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 0.16 to 2.31 mg/L/48 Hr where the highest value recorded for Near Coal Berth (ME-3) and lowest recorded at Kandla creek, Near KPT colony i.e. ME-2. In Vadinar, the value of GPP was observed 1.22 mg/L/48 Hr at ME-7 (Near SPM) monitoring station and ME-8 (Near Vadinar Jetty) recorded 2.13 mg/L/48 Hr.

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 0.12 to 1.07 mg/L/48 Hr. In Vadinar, the value of NPP was observed 1 mg/L/48 Hr at ME-7 (Near SPM) monitoring station and ME-8 (Near Vadinar Jetty) recorded 1.07 mg/L/48 Hr.

- **Pheophytin**

The level of Pheophytin was detected in the range from 0.17 to 1.15 mg/m³ where the highest value observed at ME-1 (Near Passenger Jetty 1) and the lowest or below detection limit observed at ME-3 and ME-5 (Near Coal Bearth and Nakti creek). For Vadinar it was observed 0.87 mg/m³ at ME-7 (Near SPM) and BQL at ME-8 (Near Vadinar Jetty).

- **Chlorophyll-a**

In the sub surface water, the value of Chlorophyll-a reported in range from 2.09-5.15 (mg/m³). The highest value observed at ME-5 while the lowest value observed at ME-6 (Nakti creek). In Vadinar, the value of chlorophyll-a was observed 2.04 mg/m³ at ME-7 (Near SPM), monitoring station and 13.1 mg/m³ in ME-8 (Near Vadinar Jetty).

- **Particulate Oxidisable Organic Carbon**

During the sampling period, the particulate oxidisable organic carbon falls within the range of 2.05 to 3.47 mg/L from monitoring location ME-1 to ME-6 at Kandla, whereas for Vadinar it recorded 1.09 mg/L at ME-7 and 1.38 mg/L at ME-8.

- **Secchi Depth**

In monitoring station of Kandla from ME-1 to ME-6 the level of Secchi Depth was observed between 0.35 to 0.42 ft whereas the value recorded in Near SPM (ME-7) is 3.41 ft and in Near Vadinar Jetty is 3.63 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.e. 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
<i>Bacillaria sp.</i>	410	500	650	350	-	685	200	--
<i>Biddulphia sp.</i>	-	385	-	480	-	700	455	350
<i>Chaetoceros sp.</i>	300	250	440	85	670		150	425
<i>Chlamydomonas sp.</i>	260	100	180	750	660	850	-	700
<i>Cyclotella sp.</i>	150	510	-	150	-	-	255	350
<i>Ditylum sp</i>	80	95	78	77	45	25	165	-
<i>Coscinodiscus sp.</i>	75	-	165	43	75	130	70	228
<i>Fragilaria sp.</i>	-	-	-	105	-	-	-	60
<i>Bacteriastrum sp.</i>	150	55	-	94	80	-	45	-
<i>Pleurosigma sp.</i>	-	145	175	-	205	-	250	88
<i>Navicula sp.</i>	150	220	175	95	209	213	110	114
<i>Nitzschia sp.</i>	140	285	-	125		108	110	-
<i>Synedra sp.</i>	-	220	314	-	129	185	95	-
<i>Planktothrix sp.</i>	111	120	-	240	-	300	-	130
<i>Oscillatoria sp.</i>	140	-	120	150	250	395	145	252
<i>Thalassiosira</i>	-	96	60	20	-	-	120	-
Density-Units/L	1966	2981	2357	2764	2323	3591	2170	2697
No. of genera	11	13	10	14	9	10	13	10

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 13 genera; green algae were represented by 1 genera and filamentous Cynobacteria were represented by 2 genera during the sampling period.

The density of phytoplankton of the sampling stations from ME-1 to ME-6 (Kandla) varying from 1966 to 3591 units/L, while for Vadinar its density of phytoplankton observed 2170 units/L at ME-7 and 2697 units/L at ME-8. During the sampling, phytoplankton communities were dominated by *B Chlamydomonas sp. and. Bacillaria sp.* in Kandla, while *Biddulphia 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	12	12	14	13	16	13	12	14
Individuals	7450	8745	9155	9100	10310	7990	8025	9650
Shannon diversity	2.07	1.93	1.72	2.25	1.40	1.80	1.97	1.17
Simpson 1-D	0.88	0.90	0.85	0.86	0.82	0.90	0.91	0.85
Species Evenness	0.86	0.75	0.75	0.85	0.64	0.78	0.77	0.51
Margalef richness	1.32	1.50	1.16	1.64	1.03	1.10	1.56	1.14
Berger-Parker	0.21	0.17	0.28	0.27	0.29	0.24	0.21	0.26
Relative abundance	0.56	0.44	0.42	0.51	0.39	0.28	0.60	0.37

- Shannon- Wiener's Index (H)** of phytoplankton communities was in the range of 1.40-2.25 between selected sampling stations from ME-1 to ME-6 with an average value of 1.86 at Kandla creek and its nearby creeks. While for Vadinar, Shannon Wiener's index of phytoplankton communities recorded to be 1.97 at ME-7 and 1.17 at ME-8 with an average value of 1.57. 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 0.82-0.90 at all sampling stations in the Kandla creek and nearby creeks, with an average of 0.87. Similarly, for Vadinar Simpson diversity index (1-D) of phytoplankton communities was 0.91 at ME-7 and 0.85 at ME-8 with an average of 0.88.
- Margalef's diversity index (Species Richness)** of phytoplankton communities in Kandla and nearby creeks sampling stations was varying from 1.03-1.64 with an average of 1.29 during the sampling period. While for Vadinar, Margalef's diversity index (Species Richness) of phytoplankton communities observed 1.56 at ME-7 and 1.14 at ME-8 with an average value of 1.42.
- Berger-Parker Index (d)** of phytoplankton communities was in the range of 0.17-0.29 between selected sampling stations from ME-1 to ME-6 with an average value of 0.24 at Kandla creek and nearby creeks. Berger-Parker Index (d) of phytoplankton communities in the sampling stations of Vadinar, was in the range of 0.21 to 0.26 with an average value of 0.24. 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 0.51-0.86 for all the eight-monitoring station of Kandla and Vadinar for the monitoring month, indicate varying degrees of evenness or unevenness in the distribution of individuals among the studied species.
- During the sampling period, **Relative Abundance** of phytoplankton communities was in range of 0.28-0.56 between selected sampling stations from ME-1 to ME-6 with an average value of 0.43 at Kandla creek and nearby creeks. Whereas for Vadinar the Index value 0.6

at ME-7 and 0.37 at ME-8 with an average value 0.48, 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
<i>Acartia sp.</i>	2	-	1	1	3	2	-	1
<i>Acrocalanus</i>	1	2	-	2	1	-	2	3
<i>Amoeba</i>	3	-	1	1	1	1	3	4
<i>Brachionus sp.</i>	2	1	1	2	-	2	-	2
<i>Calanus sp.</i>	4	-	-	-	1	-	-	-
<i>Cladocera sp.</i>	-	2	3	-	1	1	-	3
<i>Cyclopoid sp.</i>	2	1	1	1	2	-	2	1
<i>Copepod larvae</i>	2	2	3	-	-	1	1	-
<i>Diaptomus sp.</i>	-	5	-	4	-	2	5	1
<i>Eucalanus sp.</i>	1	-	3	-	1	-	1	-
<i>Mysis sp.</i>	-	12	9	10	-	11	-	10
<i>Paracalanus sp.</i>	2		1	1	2	1	3	1
Density Unit/L	19	25	23	22	12	21	17	26
No. of genera	9	7	9	8	8	8	7	9

A total of 12 groups/taxa of zooplankton were recorded in Kandla and Vadinar during the study period which mainly constituted by copepods, branchiopoda, monogononata, fish and shrimp larval forms. *Mysis sp.* 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 12 to 25 units/L, while for Vadinar its density of zooplankton observed 17 units/L at ME-7 and 26 units/L at ME-8. During the sampling, zooplankton communities were dominated by *Mysis sp.* in Kandla, while *Amoeba* in both the monitoring location of Kandla and 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	9	7	9	8	8	8	7	9
Individuals	19	25	23	22	12	21	17	26
Shannon diversity	1.88	1.54	1.85	1.53	1.98	1.59	1.56	1.85
Simpson (1-D)	0.92	0.74	0.82	0.77	0.92	0.72	0.88	0.82
Species Evenness	0.86	0.79	0.84	0.74	0.95	0.76	0.8	0.84
Margalef	2.72	1.86	2.55	2.26	2.82	2.3	2.12	2.46
Berger-Parker	0.21	0.48	0.39	0.45	0.25	0.52	0.29	0.38
Relative abundance	47.37	28	39.13	36.36	66.67	38.1	41.18	34.62

- **Shannon- Wiener's Index (H)** of zooplankton communities was in the range of 1.53-1.98 between selected sampling stations from ME-1 to ME-6 with an average value of 1.72 at Kandla creek and its nearby creeks. While for Vadinar, Shannon Wiener's index of zooplankton communities recorded to be 1.56 at ME-7 and 1.85 at ME-8 with an average value of 1.71. 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 0.74-0.92 at all sampling stations in the Kandla creek and nearby creeks, with an average of 0.82. Similarly, for Vadinar Simpson diversity index (1-D) of zooplankton communities was 0.88 at ME-7 and 0.82 at ME-8 with an average of 0.85.
- **Margalef's diversity index (Species Richness)** of zooplankton communities in Kandla and nearby creeks sampling stations was varying from 1.86-2.82 with an average of 2.42 during the sampling period. While for Vadinar, Margalef's diversity index (Species Richness) of zooplankton communities observed 2.12 at ME-7 and 2.46 at ME-8 with an average value of 2.29.
- **Berger-Parker Index (d)** of zooplankton communities was in the range of 0.21-0.52 between selected sampling stations from ME-1 to ME-6 with an average value of 0.38 at Kandla creek and nearby creeks. Berger-Parker Index (d) of zooplankton communities in the sampling stations of Vadinar, was in the range of 0.29-0.38 with an average value of 0.33. 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 0.74-0.95 for all the eight-monitoring station of Kandla and Vadinar for the monitoring month, indicate varying degrees of evenness or unevenness in the distribution of individuals among the studied species.
- During the sampling period, **Relative Abundance** of zooplankton communities was in range of 28-66.67 between selected sampling stations from ME-1 to ME-6 with an average value of 42.61 at Kandla creek and nearby creeks. Whereas for Vadinar the Index value 41.18 at ME-7 and 34.62 at ME-8 with an average value 37.9, 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 **Benthic organism** is mentioned in **Table 44**.

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

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
<i>Hydrobidae</i>	-	2	-	2	1	1	-	3
<i>Mollusca sp.</i>	2	-	1	-	3	-	2	2
<i>Odonata sp.</i>	1	-	2	-	1	-	1	1
<i>Viviparidae</i>	3	-	-	1	-	2	-	-
<i>Atydae</i>	-	2	1	1	1	-	2	1
<i>Gammaridae</i>	2	1	-	2	-	1	4	-
<i>Neridae</i>	1	1	2	-	4	2	1	3
Density-m²	9	6	6	6	10	6	10	10
No of genera	5	4	4	4	5	4	5	5

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 *Mollusca sp.*, *Crustacea sp.*, *Polychaete sp.* etc. The density of benthic fauna was varying from 6 to 10 m². The dominating benthic communities at Kandla Creek and nearby creek (Nakti and Khori creek) were represented *Neridae sp.* While lowest number of benthic species was represented by *Viviparidae sp.*

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	4	4	5	4	5	5
Individuals	9	6	6	6	10	6	10	10
Shannon diversity	0.94	1.33	0.66	1.33	0.83	1.33	0.92	0.95
Simpson 1-D	0.89	0.87	0.93	0.87	0.87	0.87	0.84	0.87
Species Evenness	0.58	0.96	0.48	0.96	0.52	0.96	0.57	0.59
Margalef	1.82	1.67	1.67	1.67	1.74	1.67	1.74	1.74
Berger-Parker	0.33	0.33	0.33	0.33	0.4	0.33	0.4	0.3
Relative abundance	55.56	66.67	66.67	66.67	50	66.67	50	50

- Shannon- Wiener's Index (H)** of benthic organism was in the range of 0.66-1.33 between selected sampling stations from ME-1 to ME-6 with an average value of 1.07 at Kandla creek and its nearby creeks. While for Vadinar, Shannon Wiener's index of benthic organism recorded to be 0.92 at ME-7 and 0.95 at ME-8 with an average value of 0.94. 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 benthic organism was ranged between 0.87-0.93 at all sampling stations in the Kandla creek and nearby creeks, with an average of 0.88.



Similarly, for Vadinar Simpson diversity index (1-D) of benthic organism was 0.84 at ME-7 and 0.87 at ME-8 with an average of 0.85.

- **Margalef's diversity index** (Species Richness) of benthic organism in Kandla and nearby creeks sampling stations was varying from 1.67-1.82 with an average of 1.71 during the sampling period. While for Vadinar, Margalef's diversity index (Species Richness) of benthic organism observed to be 1.74 at both the location ME-7 and ME-8.
- **Berger-Parker Index (d)** of benthic organism was in the range of 0.33-0.4 between selected sampling stations from ME-1 to ME-6 with an average value of 0.34 at Kandla creek and nearby creeks. Berger-Parker Index (d) of benthic organism in the sampling stations of Vadinar, was in the range of 0.3-0.4 with an average value of 0.356. 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 0.48-0.96 for all the eight-monitoring station of Kandla and Vadinar for the monitoring month, indicate varying degrees of evenness or unevenness in the distribution of individuals among the studied species.
- During the sampling period, **Relative Abundance** of zooplankton communities was in range of 50-66.67 between selected sampling stations from ME-1 to ME-6 with an average value of 62.04 at Kandla creek and nearby creeks. Whereas for Vadinar the Index value 50 at both the location (ME-7 and ME-8) with an average value 50, 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)

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"We Provide Environmental Solutions"

ANNEXURE – I

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



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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.

2

Thus risk exposure can be considered as moderate.



Lightning
Number of strikes per km² area per year
Zone 1: 2-6
Zone 2: >6

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1 PREFACE

The Disaster Management Plan (DMP) for Kandla Port has been developed to provide procedures for the implementation and continual development of the Internal Action Plan.

The Internal Action Plan is an interactive document which will be continuously refined and updated every year.

This plan has been formulated to fulfil the requirements of the relevant standards and guidelines set forth by the National Disaster Plan 2016.

It should be noted that the findings and recommendations of the study are based on the data provided and discussions held during the site visit with the port personnel at the time of the site visit on 18th & 19th August 2010 and updated in the Month of July 2016. FOLLOWED BY MAY 2019

National Disaster Management Plan, 2016. A publication of the National Disaster Management Authority, Government of India. May 2016, New Delhi

Documents provided by DEENDAYAL PORT TRUST for reference are:-

1. DEENDAYAL PORT TRUST– Internal action plan up dated July 2018.
2. DMP – DEENDAYAL PORT TRUST– Originally Prepared by Tata AIG Risk Management in the year 1999. Updated by A R Jadeja, Signal Supdt. KPT 2016
3. Copies of DMP of chemical / POL Terminals on Kandla Port Property.
 - a) JRE tank terminal (P) Ltd.
 - b) CRL
 - c) BPCL

- d) United storage and tank terminals Ltd – Liquid Terminal
 - e) United storage and tank terminals Ltd – Liquefied Gas Storage and handling terminals.
 - f) Indo Nippon chemical Company Ltd.
 - g) Rishi Kiran Logistics (P) Ltd,
 - h) INEOS ABS (India) Ltd
 - i) Friends oil and chemical terminals (P) Ltd
 - j) Indian oil (LPG)
 - k) Indian Oil
 - l) IOC Marketing Division
 - m) HPCL
 - n) Friends salt works and allied industries
 - o) IFFCO
4. Layout Map of DEENDAYAL PORT TRUST– DRG. NO: KPH/09
 5. Layout of Fire fighting line at DEENDAYAL PORT TRUST
 6. Layout of proposed oil pipe line at oil jetty DEENDAYAL PORT TRUST

We have exercised all reasonable skill, care and diligence in carrying out the study. This report / document is

not deemed to be any undertaking, warranty or certificate.

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

- ③ Rapid control and containment of the hazardous situation.
- ③ Minimizing the risk and impact of event / accident.
- ③ 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

- ③ Reliable and early detection of an emergency and careful planning.
- ③ The command co – ordination and response organization structure along with efficient trained personnel.
- ③ The availability of resources for handling emergencies.
- ③ Appropriate emergency response actions.
- ③ Effective notification and communication facilities ③ Regular review and updating of the DMP ③ Proper training of the concerned personnel.

FOREWORD

"The document On-site Disaster Management Plan is prepared with the objective of defining the functions and responsibilities of all concerned managerial, operational and supporting services department personnel with respect to detection and effective implementation of action plan. The ultimate goal is the effective containment of the emergency situation by proper mitigative action at the place of occurrence, cautioning people in adjoining affected locations, prompt rescue and medical aid to affected persons and communication to civil authorities for rushing in help from outside. All concerned are hereby requested to carefully study and thoroughly familiarize themselves with it in order to ensure its effectiveness in times of emergency"

Chairman

DEENDAYAL PORT TRUST

Date: ___/___/2019

2.2 Responsibility Nodal officer

Responsibility for establishing and maintaining a state of emergency preparedness belongs to the DC. He is responsible for maintaining distribution control of the plan, and for ensuring that the plan and applicable implementing procedures are reviewed annually. The Fire Safety In charge is responsible for the training of personnel to ensure that adequate emergency response capabilities are maintained in accordance with the plan. He is also responsible for ensuring the adequacy of the conduct of drills, as outlined in the On-site Disaster Management Plan. All employees of various departments are responsible for carrying out their responsibilities, as defined in this Plan.

Contact details of Deputy Conservator as a NODAL OFFICER for any port related contingencies/ incidents are as under

Name Capt T Srinivas

Phone : 02836-233585

Fax : 02836-233585

Cell : 9825232982

E mails : dyconservator@deendayalport.gov.in , srini_takes@yahoo.com , signalkpt@gmail.com

3 FACILITY DESCRIPTION PORT PROFILE

3.1 Introduction

3.1.1 Unique Location

The Major Port of Kandla situated about 90 km off the mouth of Gulf of Kachchh in the Kandla Creek at Latitude 23 degree 1minute North and Longitude 70 degree 13 minutes east, is the lone Major Port on the Gujarat coast line along the West Coast of the country. Amongst the 12 Major Ports in the country, Kandla occupies an enviable position, both in terms of international maritime trade tonnage handled and financial stability and self-sufficiency attained year after year. A gateway to the north-western part of India consisting of a vast hinterland of 1 million sq. km stretched throughout 9 states from Gujarat to Jammu & Kashmir, the Port has a unique location advantage. The Port's hinterland is well connected with infrastructural network of broad gauge and railway system as well as State and National Highways

3.1.2 The Evolution

January 20, 1952, Pandit Jawaharlal Nehru, the then Prime Minister of India, laid the foundation stone at Kandla for the new port on the western coast of India. It was declared as a Major Port on April 8, 1955 by Late Lal Bahadur Shastri, the then Union Minister for Transport. The DEENDAYAL PORT TRUST was constituted in 1964 under the Major Port Trusts Act, 1963. Since then, this Major Port of Kandla has come a long way in becoming the 'Port of the New Millennium'.

3.1.3 The Strengths to Anchor On

Excellent infrastructural facilities, well-connectivity with the rest of the country by road and rail networks, all-round services provided with efficiency and transparency, lowest port tariff and the envious cost-effectiveness are the major strengths of Kandla Port.

3.1.4 Vision

"To be Asia's Supreme Global Logistic Hub"

3.1.5 Mission

To transform the Port of Kandla into a most globally competitive logistics hub with international excellence leaving imprints in the international maritime arena by exploring its fathomless growth potentialities.

HAZARD RISK VULERNABILITIES

3.2 Business Horizon

As the portal to the West and North India and due to its unique location advantage, a vast hinterland of 1 million sq. km can be assured for from Kandla.

The hinterland of the Kandla Port consists of the states of J &K, Punjab, Himachal Pradesh, Haryana, Rajasthan, Delhi, Gujarat and parts of Madhya Pradesh, Uttaranchal and Uttar Pradesh.

Kandla Port is the gateway port for the vast granaries of Punjab and Haryana and the rich industrial belt of West and North India.



3.2.1 Advantage Deendayal Port

ISO 9001 – 2008& ISO 14001:2004 Certified Port.

All weather port – 365 days, 24 hours.

Protected and safe harbor.

16 berths stretching 2.55 km in a straight line

Facilities for liquid cargo, POL products, chemicals and edible oil.

Storage facility for LPG to the tune of 30,000 cu.m.

Port with highest liquid storage capacity in the country.

Excellent road and rail connectivity.

High capacity cranes for dry cargo.


Transparent and notified tariff.


13 meter draught.

Security by CISF. ISPS Compliant

3.3 Port Logistics


3.3.1 Navigation Facilities

 Round-the-clock navigation.


 Permissible draught 13 meters.

Ships with 330 meters length overall and 75,000 DWT are accommodated presently.

 Safe, protected and vast anchorage at outer harbour for waiting and lighter age purpose.

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

 VTS PMS & Pilot Personal Unit as an aid for night navigation.

 Fully equipped signal stations operational round-the-clock. With VTS GOK Port Monitoring Stations

3.3.2 Flotilla

10 Harbor tugs of various sizes. (inclusive Vadinar

2 high speed pilot launches.

One state of the art fully computerized survey launch

FRP mooring launches.

Four general service launches.

One heave up barge for maintenance of navigational aids.

3.4 Strategic & Climatic Advantage

- ✚ All-weather port.
- ✚ Tropical and dry climatic conditions to handle any type of cargo throughout the year.
- ✚ Temperature varying from 25 degree Celsius to 47 degree Celsius.
- ✚ Scanty rainfall facilitates round-the-year operations.
- ✚ Uninterrupted and smooth port operations on 365 days a year.
- ✚ No adverse wave effect, being a protected and sheltered harbour situated in the Creek.
- ✚ The only Indian Major Port nearest to the Middle East and Europe.

3.5 Port Location

- ✚ Latitude: 23°01"N
- ✚ Longitude: 70°13"E

Kandla Port is situated in the Kandla Creek and is 90km from the mouth of the Gulf of Kutch.

3.5.1 Location - Latitude : 23° 1' N, Longitude : 70° 13' E

Figure 1 – Over view of DEENDAYAL PORT TRUST



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3.6 Future Vision of KPT as per Business Plan






KANOLA PORT TRUST
 MASTER PLAN OF KANOLA PORT TRUST (FUTURE VISION OF APT HQ FOR BUSINESS PLAN)

3.7 Steel Floating Dry Dock








The existing steel floating dry dock caters to the need of Port crafts as well as outside organizations and has capacity to accommodate vessels of following parameters.

-  LOA maximum up to 95 meters.
 -  Breadth maximum up to 20 meters.
 -  Draught maximum up to 4.5 meters.
- Lift displacement maximum up to 2700 tones.

3.8 Infrastructure Advantages at Kandla Port



-  16 dry cargo berths are available, with quay length of 2532 meter.
 -  Six oil jetties.
 -  Total custom bonded port area inside the custom fencing is 253 hectares.
- THREE cargo moorings in the inner harbor area for stream handling.

3.8.1 Chemical & Liquid handling Complex



-  Total storage capacity : 21.89 Lakh KL
 - Private sector storage terminals – 9.81 Lakh KL.
 - Public sector and cooperative undertaking – 12.08 Lakh KL.
-  Loading arms for simultaneous loading and unloading.
-  Near zero waiting period for vessels.
-  Capacity utilization at international levels ensuring demurrage free handling.
-  Excellent discharge rates and faster turnaround.
-  Lowest vessel related charges and wharfage charges.
-  Suitable for A, B, C, LG, NH, EO classes of liquid and chemicals.

Chemical storage tank farms in the vicinity of liquid jetties.

Tanks for storage of all categories of liquid cargoes like chemicals LPG, cryogenic cargoes, ammonia, acids, petroleum products, edible oils. Etc.

-  Efficient handling ensuring minimum losses.
-  Sophisticated pipeline network (including stainless steel pipes) Sufficient parking space inside and outside the storage facilities.

3.9 Road Network

-  Four lane National Highway No: 8-A extended right up to the Ports main gates.
-  Fully developed road network, both in and around the Port area to facilitate faster movement of cargo.
 - Inside Cargo Jetty Area – 30 km. ○ Outside Cargo Jetty Area – 31 km. ○ Railway Inside Cargo Jetty Area – 13 km.

3.10 Storage Facilities

Kandla Port offers excellent and vast dry cargo storage facilities inside the custom bonded area for storage of import and export cargoes.

The existing storage facilities at the dry cargo jetty area are:

Sr No	Description	No	Area (Sq MTRS)	Capacity in (Tones)
01	Warehouses	35	2.03 Lakhs	6.47 Lakh
02	Open storage space	67	16.63 Lakhs	36.27 Lakh

3.10.1 Private Sector Liquid Storage Facilities

Sr No	Name of the Terminal Operator	No of Tanks	Capacity in (KL)
-------	-------------------------------	-------------	------------------

01	CRL (Chemicals & Resins Ltd)	112	247000
02	FSWAI (Friend Salt Works & Allied Industries)	132	271650
03	Kesar Enterprise	44	90081
04	N P Patel Pvt Ltd	09	38497
05	FOCT (Friend Oil & Chemicals Terminal	21	39263
06	USTTL – Liquid Terminal	22	63038
07	Agencies & Cargo Care Limited	27	50000
08	J K Synthetics	14	25176
09	IMC Limited	04	25288
10	J R Enterprises	15	25320
11	Indo Nippon Chemicals Ltd	10	17200
12	Liberty Investment	06	16016
13	Bayer ABS Ltd	11	13310
14	Deepak Estate Agency	09	13212
15	Tejmalbhai & Company	08	12577
16	Avean International Care Ltd	11	12160
17	USTTL Gas Terminal	04	5720
18	Parker Agrochem Export Ltd	06	15000
Total Capacity		465	980508

3.10.2 Public Sector Liquid Storage Facilities


Sr No	Name of the Terminal Operator	No of Tanks	Capacity in (KL)
01	Indian Oil Corporation	38	575838
02	Bharat Petroleum Corporation	21	230000
03	Hindustan Petroleum Corporation	28	204000
04	IOC – LPG	02	30000
05	IFFCO	11	110000
06	NDDB	09	58530
Total Capacity		109	1208360

3.11 Container Handling Facilities HAS BEEN AWARDED TO KANDLA INTERNATIONAL CONTAINER TERMINAL : OPERATIONAL

Fully operational Container Terminal Operated by KICT

3.12 Port Equipments

3.12.1 Wharf Cranes

 12 wharf cranes of the following capacities:

- Two of 12 tones.
- Four of 16 tones.
- Six of 25 tones.

- 2 MOBILE CRANES OF 63 TONNES EACH
- ✚ The rated capacity of the 16 ton crane is 400 tones / hour.
- ✚ The rated capacity of the 25 ton crane is 400 tones / hour.

3.12.2 Weighbridges

- ✚ Nine weighbridges inside the port, which includes:
 - Two Weighbridge of 40 MT capacities.
 - One Weighbridge of 50 MT capacity
 - Two Weighbridge of 60 MT capacity
 - Two Weighbridge of 80 MT capacity
 - Three Weighbridge of 100 MT capacities.

3.12.3 Other Support Equipment

- ✚ Easy availability of other support loading equipments such as Forklifts, Tractor - Trailers, Pay-loaders of various capacities.
- ✚ Private handling, equipments like Mobile Cranes, Top lifters, pay-loaders, Forklifts, Heavy-duty Trailers etc. available on hire at competitive rates.

3.13 Berths at Kandla Port

3.13.1 Details of Draught

Sr No	Name of Berth	Draught (in Meters)	DWT (In Metric Tons)
1	Cargo Berth No.1	10.0	45000

2	Cargo Berth No.2	9.80	45000
3	Cargo Berth No.3	9.80	45000
4	Cargo Berth No.4	9.80	45000
5	Cargo Berth No.5	10.0	35000
6	Cargo Berth No.6	12.0	35000
7	Cargo Berth No.7	12.00	55000
8	Cargo Berth No.8	12.00	55000
9	Cargo Berth No.9	12.00	55000
10	Cargo Berth No.10	12.00	55000
11	Cargo Berth No.11	13.00	65000
12	Cargo Berth No.12	13.0	65000
13	Cargo Berth No.13	13.0	75000
14	Cargo Berth No. 14	13.0	75000
15	Cargo Berth No.15	13.0	75000
16	Cargo Berth No. 16	13	75000
15	Oil Jetty No. 1 (Nehru Jetty)	10.0	40000
16	Oil Jetty No. 2 (Shastri Jetty)	09.00	52000
17	Oil Jetty No. 3 (Indira Jetty)	09.80	40000
18	Oil Jetty No. 4 (Rajiv Jetty)	10.70	56000
19	Oil Jetty No. 5 (IFFCO)	10.10	45000
18	Oil Jetty No. 6 (IOCL)	10.10	45000

3.13.2 Details of Berths

No of Berth	No of Bollard		No of Panels	Length of Each Panel	Length of Berth (m)	Draught (in Meters)	DWT (In Metric Tons)
1	1 to 8	08	08	22.866	182.93	9.80	45000
2	8 to 16	08	08	22.866	182.93	9.80	45000
3	17 to 24	08	08	22.866	182.93	9.80	45000
4	25 to 32	08	08	22.866	182.93	9.80	45000
5	33 to 41	09	09	22.866	205.79	9.10	35000
6	42 to 50	09	09	22.866	205.79	9.10	35000
7	51 to 58	08	08	(30.440 x 7) + 22.56 + (3.00)	238.64	12.00	55000
8	59 to 68	10	06	(45.72 x 3) + 30.44 + 27.44 + (18.00)	213.04	12.00	55000
9	69 to 76	08	05	(45.72 x 3) + 25.72 + (18.05)	182.93	12.00	55000
10	77 to 85	09	05	(59.10 x 2) + (43.20 x 2) + (4.81)	209.41	12.00	55000
11	86 to 98	13	05	(59.00 x 4) + (45.00)	281.00	12.50	65000
12	-----	---	---		264.00	12.50	65000
13						13.0	75000
14						13.0	75000
15						13.0	75000
16						13.0	75000







3.13.3 Details of Existing Godown

Sr No	Godown No	Size of Godown (in M)	Area in Sq Meters	Capacity in (Tons)
1	Godown – 1 (WH-A)	152.44 x 36.59	5578	9817
2	Godown – 2 (WH-B)	152.44 x 36.59	5578	10500
3	Godown – 3 (W.H -C)	152.44 x 36.59	5578	10500
4	Godown – 4 (W.H.D)	152.44 x 36.59	5578	10500
5	Godown – 6 (C.F.S. - II)	90.00 x 36.00	3240	12400
6	Godown – 7 (C.F.S. – I)	90.00 x 36.00	3240	12400
7	Godown – 8 (F.B.S.S)	236.00 x 30.00	7080	13300
8	Godown – 9 (Bagging Plant)	287.00 x 19.20	5510	10400
9	Godown – 10	132.00 x 22.50	2970	11400
10	Godown – 11	186.00 x 22.50	4185	7900
11	Godown – 12	170.00 x 22.50	3825	7200
12	Godown – 13	162.00 x 22.50	3645	6900
13	Godown – 14	192.00 x 22.50	4320	8100
14	Godown – 15	162.00 x 22.50	3645	6900
15	Godown – 16	192.00 x 22.50	4320	9100
16	Godown – 17	174.00 x 22.50	3915	15000
17	Godown – 18	138.00 x 45.00	6210	23800
18	Godown – 19	192.00 x 22.50	4320	8100
19	Godown – 20	192.00 x 22.50	4320	8100
20	Godown – 21	192.00 x 22.50	4320	8100





















21	Godown – 22	192.00 x 22.50	4320	8100
22	Godown – 23	174.00 x 22.50	3915	7400
23	Godown – 24	156.00 x 45.00	7020	26900
24	Godown – 25	132.00 x 22.50	2970	5600
25	Godown – 26	99.06 x 36.55	3621	13900
26	Godown – 27		1943	6995
27	Godown – 28	173.88 x 30.50	5503	19092
28	Godown – 29	137.55 x 50.00	6888	24797
29	Godown – 30	126.00 x 49.00	6174	22226
30	Godown – 31	140.00 x 50.00	7000	25200
31	Godown – 32	307.45 x 40.00	12298	44273
32	Godown – 33	133.00 x 40.00	5320	19152
	Total Available Presently		158349	434052

3.14 Various Private Terminal Storages at Kandla & the chemicals POL products handled.




3.14.1 Bharat Petroleum Corporation Ltd

-  Motor Spirit (MS)
-  HSD – High Speed Diesel
-  SKO – Superior Kerosene Oil
-  Ethanol (Ethyl Alcohol)
-  Naphtha
-  LDO – Light Diesel Oil

3.14.2 CRL

-  Benzene
-  Toluene
-  Aniline
-  Butanol (Butyl Alcohol)
-  H Phenol
-  CTC – Carbon Tetra Chloride
-  Caster Oil
-  CPS
-  Phenol
-  De Alcohol (Denatured Alcohol)
-  IPA – Iso Propyl Alcohol
-  Butyl Acetate
-  MEK (Methyl Ethyl Ketone)
-  Methyl Alcohol / Methanol
-  Hexane
-  Vinyl Acetate
-  MIBK
-  BAM
-  Propylene
-  Cyclo Hexane
-  Caustic Soda (Sodium Hydroxide)
-  Acetic Acid
-  Nonene
-  EDC (Ethylene Di Chloride)








3.14.3 United Storage & Tank Terminals Ltd

-  LPG – Liquefied Gas Storage & Handling terminal
-  1:3 Butadiene
-  Crude C 4 Mix
- Butane – 1

3.14.4 Indo Nippon Chemicals Co Ltd




-  ISO Butanol
-  A – Olefin
-  Waksol (Parafin)
-  VAM – Vinyl Acetate Monomer
-  MDC – (Methyle Metacrylate)
- Toluene
- Naphtha
- IPA

3.14.5 Rishi Kiran Logistics (P) Ltd




















-  Butyl Cellsolve
-  Chloroform
-  DO Wanol
-  HNP
-  N – Parafin
-  Methanol
-  Polyether Polyol
- Papi 27 Polymeric
- Tri chloric ethylene Vinyl
chloride monomer.

3.14.6 Ineos ABS (India) Ltd

Chemicals Stored

-  Styrene
-  ACN
-  Chloroform
- Parafin

Chemicals Proposed

-  Methyl Ethyl Ketone (MEK)
-  Benzene
-  Methanol
-  HNP
-  Acetone
-  Butyl Acrylate
-  Butanol
-  1 – Butanol
-  CTC (Carbon Tetra Chloride)
-  Cyclo Hexanol
-  Cyclo Hexanone
-  Cumene
-  Di Octylphthalate
-  Ethanol – IPA (Mix)
-  Ethanol
-  Ethyl Hexanol
-  Ethyl Benzene
-  Hexane
-  Heptane
- Iso Propanol

P – Xylene

Propylene Trimer

C – 9 – Hydrocarbons

Toluene










Vinyl Acetate

Mixed xylene

N – Tetra Decane

Polvoal




3.14.7 Friends Oil & Chemical Terminal (P) Ltd

-  Furnace Oil
-  Styrene
-  C – Palm Oil
-  Mix – HSD & Naphtha
-  CPO (NEG) – Crude Palm Oil
-  Acrylate Bam
-  Butyle Glycol
-  Mosstanoll
-  Butyl Glycol
- Cubutol
- Methyl Methacr
- ISO Nanano
- CDSBO

3.14.8 Indian Oil (LPG)






 LPG

3.14.9 Indian Oil FST












-  Motor Spirit (MS)
-  High Speed Diesel (HSD)
-  SKO (Superior Kerosene Oil)

LAN

3.14.10 Hindustan Petroleum Company Limited

-  Furnace Oil (FO)
-  High Speed Diesel (HSD)
-  Light Diesel Oil (LDO)
-  SKO (Superior Kerosene Oil)
-  Motor Spirit (MS)

3.14.11 Friends Salt Works & Allied Industries

-  Naptha
-  Toluene
-  N – Proanol
-  HNP
-  Mixed Parafin
-  Solvent – CS
-  Iso Propyl Alcohol (IPA)
-  Methenol
-  N – Parafin C9 – C
-  M – xylene
-  High Speed Diesel (HSD)

Mosstanol

Methylene Chloride

Ethyl Acetate

Vinyl Acetate

HA – 100

MEK

Acetone

Crude Benzene

Heavy Aromatics

Butyl Acrylate

Shell Sarasol – 4

Carbon Tetra Chloride (CTC)

HA – 170

MBK

De Natured Spirit

Nonene


Condensate


Caradol SC- 56 – 0

N – Parafin


Butyl Acetate

 LAB

 Naptha

 Hexane

 ISO – Decyl Alcohol

 Sodium Hydroxide (Caustic Soda)

 Methyl Met

 Butyl Arylate







 MIBK

DHSO – But

Crude PEG

CPKO Crude
PNEG

3.14.12 IFFCO

-  Anhydrous Liquid Ammonia
-  Phosphoric Acid
-  Potash
-  Urea
-  Hydrochloric Acid
-  Sulphuric Acid
- LSHS Furnace Oil

3.14.13 IOC (Marketing)

No list of chemicals is provided

3.14.14 JRE Tank Terminal (P) Ltd (Liquid Storage Terminal)

No list of chemicals is provided

3.14.15 United Storage & Tank Terminals Ltd (Liquid Terminal)

No list of chemicals is provided

3.15 Offshore Oil Terminal (OOT) Vadinar

KPT had commissioned off shore oil terminal facilities at Vadinar in 1978, jointly with Indian Oil Corporation, by providing single bouy mooring (SBM) system having capacity of 54 MMTPA, which was the first of its kind in India. A significant quantum of infrastructural up gradation has since been effected and excellent maritime infrastructure created for the 32 MMTPA Essar Oil Refinery at Vadinar.

- A draught of up to 33 meters at SBMs and lighterage point operations (LPO) Three SBMs available.
- 2 Oil Handling Berths of 1,00,000 DWT draft of 20 mtrs
- Handling VLCCs of 300000 DWT and more.

Providing crude oil for the refineries of Koyali (Gujarat), Mathura (UttarPradesh), Panipat (Haryana) and Essar Refinery, Jamnagar (Gujarat) • 2nd SBM was commissioned in the year 1998.

- 3rd SBM at Vadinar is for importing crude for the oil refinery of Essar Oil.
- Simultaneous handling of three VLCCs possible at the SBMs. 3 SBMs interconnected by sub-sea pipeline
- Vast crude tankage facility.

Two 35 tone and four 50 tone state of art BP SRP pull back tugs are available for smooth and simultaneous shipping operations on the SBMs and product jetty.

- Excellent infrastructure and tranquil waters facilitate transshipment operations even during the monsoon.

4 IDENTIFICATION OF EMERGENCIES

4.1 Overall Methodology

In order to undertake this study DPT has used ALOHA (Aerial Locations of Hazardous Atmospheres) a computer program designed especially for use by people responding to chemical releases, as well as for emergency planning and training. ALOHA models key hazards — toxicity, flammability, thermal radiation (heat), and overpressure (explosion blast force) — related to chemical releases that result in toxic gas dispersions, fires, and /or explosions.

4.1.1 Dispersion Modeling

ALOHA air dispersion model is intended to be used to estimate the areas near a short-duration chemical release where key hazards—toxicity, flammability, thermal radiation, or overpressure—may exceed user-specified Levels of Concern (LOCs).

(Note: If the released chemical is not flammable, toxicity is the only air dispersion hazard modeled in ALOHA.)

ALOHA is not intended for use with radioactive chemical releases, nor is ALOHA intended to be used for permitting of stack gas or modeling chronic, low-level ("fugitive") emissions. Other models are designed to address larger scale and/or air quality issues (Turner and Bender 1986). Since most first responders do not have dispersion modeling backgrounds, ALOHA has been designed to require input data that are either easily obtained or estimated at the scene of an accident. ALOHA's on-screen help can assist you in choosing inputs.

4.1.1.1 What is Dispersion

Dispersion is a term used by modelers to include advection (moving) and diffusion (spreading). A dispersing vapor cloud will generally move (advent) in a downwind direction and spread (diffuse) in a crosswind and vertical direction (crosswind is the direction perpendicular to the wind). A cloud of gas that is denser or heavier than air (called a heavy gas) can also spread upwind to a small extent.

ALOHA can model the dispersion of a cloud of pollutant gas in the atmosphere and display a diagram that shows an overhead view of the regions, or threat zones, in which it predicts that key hazard levels (LOCs) will be exceeded. This diagram is called a threat zone plot. To obtain a threat zone estimate, you must first choose at least one LOC. (ALOHA will suggest default LOCs, and you may keep those or choose up to three other LOCs.) For toxic gas dispersion scenarios, an LOC is a threshold concentration of the gas at ground level—usually the concentration above which a hazard is believed to exist. The type of LOC will depend on the scenario. For each LOC you choose, ALOHA estimates a threat zone where the hazard is predicted to exceed that LOC at some time after a release begins. These zones are displayed on a single threat zone plot. If three LOCs are chosen, ALOHA will display the threat zones in red, orange, and yellow. When you

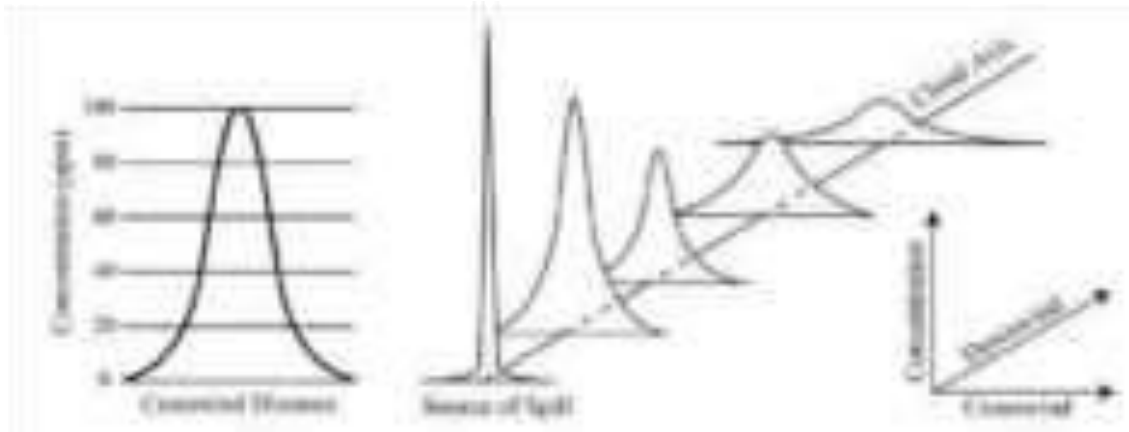
use ALOHA's default LOCs, the red zone represents the worst hazard.

There are two separate dispersion models in ALOHA: Gaussian & Heavy Gas.

4.1.1.2 Gaussian Model:

ALOHA uses the Gaussian model to predict how gases that are about as buoyant as air will disperse in the atmosphere. Such neutrally buoyant gases have about the same density as air. According to this model, wind and atmospheric turbulence are the forces that move the molecules of a released gas through the air, so as an escaped cloud is blown downwind, "turbulent mixing" causes it to spread out in the crosswind and upward directions. According to the Gaussian model, a graph of gas concentration within any crosswind slice of a moving pollutant cloud looks like a bell-shaped curve, high in the center (where concentration is highest) and lower on the sides (where concentration is lower). At the point of a release, the pollutant gas concentration is very high, and the gas has not diffused very far in the crosswind and upward directions, so a graph of concentration in a crosswind slice of the cloud close to the source looks like a spike. As the pollutant cloud drifts farther downwind, it spreads out and the "bell shape" becomes wider and flatter.

Gaussian distribution (left) & Gaussian Spread (right)



4.1.1.3 Heavy gases:

When a gas that is heavier than air is released, it initially behaves very differently from a neutrally buoyant gas. The heavy gas will first "slump," or sink, because it is heavier than the surrounding air. As the gas cloud moves downwind, gravity makes it spread; this can cause some of the vapor to travel upwind of its release point. Farther downwind, as the cloud becomes more diluted and its density approaches that of air, it begins behaving like a neutrally buoyant gas. This takes place when the concentration of heavy gas in the surrounding air drops below about 1 percent (10,000 parts per million). For many small releases, this will occur in the first few yards (meters). For large releases, this may happen much further downwind.

Cloud spread as a result of gravity.



The heavy gas dispersion calculations that are used in ALOHA are based on those used in the DEGADIS model (Spicer and Havens 1989), one of several well-known heavy gas models. This model was selected because of its general acceptance and the extensive testing that was carried out by its authors.

4.1.1.4 Classification of Heavy Gases:

A gas that has a molecular weight greater than that of air (the average molecular weight of air is about 29 kilograms per kilomole) will form a heavy gas cloud if enough gas is released. Gases that are lighter than air at room temperature, but that are stored in a cryogenic (low temperature) state, can also form heavy gas clouds. If the density of a gas cloud is substantially greater than the density of the air (the density of air is about 1.1 kilograms per cubic meter), ALOHA considers the gas to be heavy.

4.1.2 Fires & Explosions

ALOHA version 5.4, can model fire and explosion scenarios as well as toxic gas dispersion scenarios. This section provides information about fires and explosions, and then explains how to model fires and explosions in ALOHA.

ALOHA allows to model chemical releases from four types of sources: Direct, Puddle, Tank, and Gas Pipeline.

- ③ Direct: chemical release directly into the atmosphere (bypassing ALOHA's source calculations).

- ③ Puddle: chemical has formed a liquid pool.

- ③ Tank: chemical is escaping from a storage tank.

- ③ Gas Pipeline: chemical is escaping from a ruptured gas pipeline.

ALOHA Sources & Scenarios

Scenario	Vapor Generation	Fire Generation	Explosion Generation
Process			
Process Disturbance	Vapor/Vapor Cloud	Flammable Area (Flash Point)	Vapor Cloud Explosion
Pipeline			
Evaporation	Vapor/Vapor Cloud	Flammable Area (Flash Point)	Vapor Cloud Explosion
Roaming (Pool Fire)		Pool Fire	
Tank			
Hot Roaming	Vapor/Vapor Cloud	Flammable Area (Flash Point)	Vapor Cloud Explosion
Roaming		Jet Fire or Pool Fire	
BLEVE		BLEVE (Fireball) and Pool Fire	
Gas Pipeline			
Hot Roaming	Vapor/Vapor Cloud	Flammable Area (Flash Point)	Vapor Cloud Explosion
Roaming (Jet Fire)		Jet Fire	

4.1.2.1 Fire

A fire is a complex chain reaction where a fuel combines with oxygen to generate heat, smoke, and light. Most chemical fires will be triggered by one of the following ignition sources: sparks, static electricity, heat, or flames from another fire. Additionally, if a chemical is above its auto ignition temperature it will spontaneously catch on fire without an external ignition source.

There are several properties that measure how readily—that is, how easily—a chemical will catch on fire. Here we'll discuss three of these properties: volatility, flash point, and flammability limits. Volatility is a measure of how easily a chemical evaporates. A flammable liquid must begin to evaporate—forming a vapor above the liquid—before it can burn. The more volatile a chemical, the faster it evaporates and the quicker a flammable vapor cloud is formed. The flash point is the lowest temperature where a flammable liquid will evaporate enough to catch on fire if an ignition source is present. The lower the flash point, the easier it is for a fire to start. Flammability limits, called the Lower Explosive Limit (LEL) and the Upper Explosive Limit (UEL), are the boundaries of the flammable region of a vapor cloud. These limits are percentages that represent the concentration of the fuel—that is, the chemical—vapor in the air. If the chemical vapor comes into contact with an ignition source, it will burn only if its fuel-air concentration is between the LEL and the UEL. To some extent, these properties are interrelated—chemicals that are highly volatile and have a low flash point will usually also have a low LEL.

Once the chemical catches on fire, three things need to be present to keep the fire going: fuel (the chemical), oxygen, and heat. This is often referred to as the fuel triangle. If any one of those components is eliminated, then the fire will stop burning.

Like other reactions, a fire can also generate byproducts—smoke, soot, ash, and new chemicals formed in the reaction. Some of these reaction byproducts can be hazardous themselves. While ALOHA cannot model all the complex processes that happen in a fire (like the generation and distribution of byproducts), it can predict the area where the heat radiated by the fire—called thermal radiation—could be harmful.

Thermal radiation is the primary hazard associated with fires. However, it is also important to consider the hazards associated with any secondary fires and explosions that may occur.

4.1.2.2 Thermal Radiation Levels of Concern:

A Thermal Radiation Level of Concern (LOC) is a threshold level of thermal radiation, usually the level above which a hazard may exist. When you run a fire scenario, ALOHA will suggest three default LOC values. ALOHA uses three threshold values (measured in kilowatts per square meter and denoted as kW/m²) to create the default threat zones:

- ③ Red: 10 kW/m² (potentially lethal within 60 sec);

- ③ Orange: 5 kW/m² (second-degree burns within 60 sec); and

- ③ Yellow: 2 kW/m² (pain within 60 sec).

The thermal radiation effects that people experience depend upon the length of time they are exposed to a specific thermal radiation level. Longer exposure durations, even at a lower thermal radiation level, can produce serious physiological effects. The threat zones displayed by ALOHA represent thermal radiation levels; the accompanying text indicates the effects on people who are exposed to those thermal radiation levels but are able to seek shelter within one minute.

ALOHA's default thermal radiation values are based on a review of several widely accepted sources for this topic (e.g., American Institute of Chemical Engineers 1994, Federal Emergency Management Agency et al. 1988, and Lees 2001).

Thermal Radiation Burn Injury Criteria.

Radiation (kW/m ²)	Intensity	Time for Severe Pain (S)	Time for 2 nd Degree Burns (S)
1		115	663
2		45	187
3		27	92
4		18	57
5		13	40
6		11	30
8		7	20
10		5	14
12		4	11

Note: The durations that correspond to effects like pain or second-degree burns can vary considerably, depending on circumstances. The effects above were observed on bare skin that was exposed directly to the thermal radiation. Some types of clothing can serve as a protective barrier against thermal radiation and can affect the exposure duration. However, exposure duration should be kept to a minimum, even at low levels of thermal radiation.

4.1.3 Overpressure

A major hazard associated with any explosion is overpressure. Overpressure, also called a blast wave, refers to the sudden onset of a pressure wave after an explosion. This pressure wave is caused by the energy released in the initial explosion—the bigger the initial explosion, the more damaging the pressure wave. Pressure waves are nearly instantaneous, traveling at the speed of sound.

Although a pressure wave may sound less dangerous than a fire or hazardous fragments, it can be just as damaging and just as deadly. The pressure wave radiates outward like a giant burst of air, crashing into anything in its path (generating hazardous fragments). If the pressure wave has enough power behind it, it can lift people off the ground and throw them up against nearby buildings or trees. Additionally, blast waves can damage buildings or even knock them flat— often injuring or killing the people inside them. The sudden change in pressure can also affect pressure-sensitive organs like the ears and lungs. The damaging effects of the overpressure will be greatest near the source of the explosion and lessen as you move farther from the source.

ALOHA predicts an explosion's effects, assess the surroundings at the explosion site as you interpret ALOHA's threat zone plot. Large objects (like trees and buildings) in the path of the pressure wave can affect its strength and direction of travel. For example, if many buildings surround the explosion site, expect the actual overpressure threat zone to be somewhat smaller than ALOHA predicts. But at the same time, more hazardous fragments could be generated as the blast causes structural damage to those buildings.

4.1.3.1 Overpressure Levels of Concern

An Overpressure Level of Concern (LOC) is a threshold level of pressure from a blast wave, usually the pressure above which a hazard may exist. When you run a vapor cloud explosion scenario, ALOHA will suggest three default LOC values. ALOHA uses three threshold values to create the default threat zones:

- ③ Red: 8.0 psi (destruction of buildings);

- ③ Orange: 3.5 psi (serious injury likely); and

- ③ Yellow: 1.0 psi (shatters glass).

ALOHA's default overpressure values are based on a review of several widely accepted sources for this topic (e.g., American Institute of Chemical Engineers 1994, Federal Emergency Management Agency et al. 1988, and Lees 2001).

Explosion Overpressure Damage Estimates

Overpressure* (psig)	Expected Damage
0.04	Local noise (145 dB); some loose glass broken
0.11	Typical pressure for glass failure
0.40	Localized noise; cracks of damage
0.70-1.0	Windows severely shattered; some window frame damage
0.70	Minor damage to frame structures
1.0	Partial destruction of frames; much uncollectible
1.0-2.0	Cracked metal panels fall and buckle. Heavy metal panels blow up
1.0-0.9	Range for slight to serious laceration injuries from flying glass and other objects
2.0	Partial collapse of walls and roofs of houses
2.0-3.0	Non-reinforced concrete or masonry block walls shattered
2.4-2.2	Range for 1-80% reduction in severe among exposed populations
2.5	70% destruction of house structures
3.0	Steel frame building distorted and pulled away from foundations
3.0	Wooden window panes shatter
5.0-7.0	Nearly complete destruction of houses
7.0	Loaded truck cars overturned
8.0	Loaded tank truck cars derailed
10.0	Probable steel building destruction
14.5-20.0	Range for the 1-80% reduction among exposed populations due to direct blast effects

* These are peak pressures found in terms of actual overpressure pressure by blast and shock waves

4.2 Effect at different Heat Radiations & Overpressure

4.2.1 Emergency Response Planning Guidelines (ERPGs)

ERPGs were developed as planning guidelines, to anticipate human adverse health effects caused by exposure to toxic chemicals.

The ERPGs are three-tiered guidelines with one common denominator: a 1-hour exposure period. The tiers are defined as follows:



Interpreting ERPG:

The ERPG guidelines do not protect everyone. Hypersensitive individuals would suffer adverse reactions to concentrations far below those suggested in the guidelines.

The guidelines are focused on one period of time: 1 hour. Exposure in the field may be longer or shorter. However, the ERPG committee strongly advises against trying to extrapolate ERPG values to longer periods of time.

ERPGs do not contain safety factors usually incorporated into exposure guidelines such as the TLV. Rather, they estimate how the general public would react to chemical exposure. Just below the ERPG-1, for example, most people would detect the chemical and may experience temporary mild effects. Just below the ERPG-3, on the other hand, it is estimated that the effects would be severe, although not lifethreatening. The TLV, on the other hand, incorporates a safety factor to prevent ill effects to exposed workers.







4.2.2 Temporary Emergency Exposure Limit (TEEL)

TEELs are temporary levels of concern designed to be used as toxic exposure limits for chemicals for which Acute Exposure Guideline Levels (AEGs) or Emergency Response Planning Guidelines (ERPGs) have not yet been defined. Like AEGs and ERPGs, they are designed to represent the predicted response of members of the general public to different concentrations of a chemical during an incident.

Each TEEL includes four tiers, defined as follows:



4.3 Various emergencies that may be expected at the port area

-  Leak / Spill and fire and explosion at the chemical jetties of hazardous chemicals. Fire at Berth/Storage area/warehouse/goodowns
-  Medical Injury
-  Terrorism/Sabotage
-  Civil disturbance
-  Hostage situation
-  Severe Weather
- Earthquake
- Tsunami
- Ships Accidents in the channel.

4.4 Leak / Spill and Fire & Explosion of Hazardous Chemicals at the Jetties

✚ Consequence analysis of impact distances for selected maximum credible loss scenarios of some selected chemicals handled at the chemical berths. ✚ The distance worked are indicative and to be used as a guide line.

4.5 Important assumptions considered for the Study

1. Representative chemicals have been chosen at each jetty. The distance shown in the table / map are applicable to any jetty (1 to 6) where the same chemical could be handled.

If the port is ready to handle the indicated distances for the chosen chemicals, then it can handle any other chemical emergency also under any weather conditions except storm / cyclone etc.

2. Wind speed 10m/sec from SW at 3 meter height.
3. Ground roughness – Open / Concrete
4. Cloud cover – Partial (5 Tenths)
5. Ambient Temperature – 40 degree C Average
6. Atmospheric stability Class “C”
7. Relative Humidity – 50%
8. Leak of 1000 litres of chemical
9. State of chemical at the time of leak – Liquid
10. Source: Direct Source
11. Source: Evaporating Puddle
 - Downwind toxic effects
 - Vapour cloud flash fire
 - Overpressure from vapour cloud explosion
12. Source: Burning Puddle
 - Thermal Radiation

13. Puddle diameter Average – 10 M

14. Puddle volume 1000 Litres.

4.6 Maximum Credible Loss Scenarios

The Maximum Credible Loss Scenarios (MCLS) give the possible failure scenarios, which takes into account the maximum inventory that can get released at the time of such a failure considering the intervention time based on safety systems provided at the facility.

The most hazardous chemicals taken into consideration for the study are:

Berth No: 1 – LPG & Toluene

Berth No: 2 – Benzene, ACN & Aniline

Berth No: 3 – Methanol, 1,3 Butadiene & Acetone

Berth No: 4 – VCM & Propylene

Berth No: 5 – Ammonia & HSD

Berth No: 6 – Motor Spirit & SKO

4.7 Impact Distances for MCLS under study

4.7.1 Jetty No – 1 Instantaneous Release / Evaporation Puddle / Burning Puddle for LPG

Chemical		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance for		
		TEEL - 3 33000 ppm	TEEL - 2 17000 ppm	TEEL - 1 5500 ppm	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		m	m	m	m	m	m	m	m	m	m	m
Jetty One	LPG (Instantaneous Release)	31	46	88	68	204	LOC not exceeded	48	61	-----	-----	-----
	LPG (Evaporation Puddle)	13	24	54	35	130	LOC not exceeded	21	42	-----	-----	-----
	LPG (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	34	42	57

Jet ty On e	TOLUENE (Instantaneous Release)	208	395	1.0Km	71	233	LOC not exceeded	52	72	-----	-----	-----
	TOLUENE (Evaporation Puddle)	< 10	21	73	< 10	< 10	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	-----	-----	-----
	TOLUENE (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	29	35	47

- All emergency equipment should be placed more than 72 meters away from the source of leak.
- Fire fighting should be carried out from a distance of more than 47 meter unless fire suits / fire proximity suits are worn by the fire fighting personnel.
- All persons not directly connected with the emergency operation should be moved more than 1 km away from the source of leak.
- All other fire fighting precautions should be adhered to.

4.7.3 ACRYLONITRILE (ACN)

Chemical		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance For		
		ERPG - 3 75 ppm	ERPG - 2 35 ppm	ERPG - 1 10 ppm	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		m	m	m	m	m	m	m	m	m	m	m
Jet ty Two	ACN (Instantaneous Release)	1.0 Km	1.5 Km	2.8 Km	62	211	LOC not exceeded	41	61	-----	-----	-----
	ACN (Evaporation Puddle)	49	76	148	< 10	< 10	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	-----	-----	-----
	ACN (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	19	23	30

- In case of an emergency involving Acrylonitrile in the form of a major leak with or without a fire, all fire fighters handling the emergency must wear Breathing apparatus, in addition to the usual fire suits.
- All persons not connected with the emergency operation should move beyond 2.8Km distance.

- All supporting personnel must be ready with BA sets.
- The nearby shanty should be evacuated.
- All security staff must have respiratory protection.
- All persons handling the emergency should be sent to the Kandla Port Hospital for checking for CAN poisoning.

4.7.4 ANILINE

Chemical		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance For		
		TEEL	TEEL	TEEL	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		- 3 20 ppm m	- 2 12 ppm m	- 1 8 ppm m	m	m	m	m	m	m	m	m
Jet ty Two	ANILINE (Instantaneous Release)	1.8 Km	2.3 Km	2.7 Km	72	237	LOC not exceeded	53	73	-----	-----	-----
	ANILINE (Evaporation Puddle)	12	20	29	< 10	< 10	No part of the cloud was above the LEL	No part of the cloud was above the	No part of the cloud was above the	-----	-----	-----

							LEL	LEL			
ANILINE (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	20	23	31

- All persons handling the emergency must wear full protection suits to avoid skin contact. BA should be worn by the persons handling the emergency.
- The adjoining shanty should be evacuated.
- Persons handling the emergency should check up if their nails, lips, earlobes have turned blue. If so, immediately move them to Kandla Port hospital.

4.7.5 BENZENE

Chemical	Dispersion Distances	LEL Distances	Overpressure Distances	Pool Fire Heat Radiation Distance For
----------	----------------------	---------------	------------------------	--

		ERPG - 3 1000 ppm m	ERPG - 2 150 ppm m	ERPG -1 50 ppm m	60% m	10% m	8 psi m	3.5 psi m	1.0 psi m	10.0kW/m ² m	5.0kW/m ² m	2.0kW/m ² m
Jet ty Tw o	BENZENE (Instantaneous Release)	228	625	1.1 Km	80	265	LOC not exceeded	61	76	-----	-----	-----
	BENZENE (Evaporation Puddle)	23	81	145	< 10	20	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	-----	-----	-----
	BENZENE (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	29	35	47

- A Benzene fire gives out dense black smoke which could reduce the visibility. All fire fighters must wear a chemical protection suit while handling the emergency, wear BA.

- All those not connected with the emergency handling should move beyond 1.1 km up wind.
- Initial fire fighting should be from a distance of 47 meter, unless fire suits, proximity suits are worn. All security staff must have respiratory protection.
- All persons handling the emergency should be sent to the Kandla Port hospital for urine test to check for Benzene poisoning.

4.7.6 1:3, BUTADIENE

Chemical		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance For		
		ERPG - 3 5000 ppm	ERPG - 2 200 ppm	ERPG - 1 10 ppm	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		m	m	m	m	m	m	m	m	m	m	m
Jetty Thre e	1:3, BUTADIENE (Instantaneous Release)	92	524	2.4 Km	62	206	LOC not exceeded	48	63	-----	-----	-----

1:3, BUTADIENE (Evaporation Puddle)	22	157	736	13	53	LOC not exceeded	< 10	21	----	-----	----
1:3, BUTADIENE (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	34	42	57

- Initial fire fighting should be from a distance of more than 57 meters. The fire fighters should wear BA sets and chemical protection suits.
- The shanty should be evacuated beyond 2.4 Km distance.

4.7.7 ACETONE

Chemical		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance For		
		TEEL - 3	TEEL - 2	TEEL - 1	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		5700 ppm	3200 ppm	200 ppm	m	m	m	m	m	m	m	m
Jet ty Th re e	ACETONE (Instantaneous Release)	97	134	591	56	190	LOC not exceeded	40	56	-----	-----	-----
	ACETONE (Evaporation Puddle)	10	17	111	< 10	22	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	-----	-----	-----

		m	m	m	m	m	m	m	m	m	m	m
Jet ty Th re e	METHANOL (Instantaneous Release)	178	431	1.0 Km	49	190	LOC not exceeded	LOC not exceeded	33	----	-----	----
	METHANOL (Evaporation Puddle)	< 10	33	89	< 10	< 10	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	----	-----	----
	METHANOL (Burning Puddle)	----	-----	----	----	-----	----	----	-----	11	12	15

- Fire fighters should note that acetone and methanol fires are non luminescent and there could be a tendency to go nearer to the puddle /pool on fire. This should be done by fire fighters fully equipped with fire suits / proximity suits. Acetone / Methanol are water soluble, which is advantageous for fire fighting.

4.7.9 Jetty No – 4 Instantaneous Release / Ev PROPYLENE

Chemical		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance For		
		TEEL	TEEL-	TEEL	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		- 3 20000 ppm m	2 10000 ppm m	-1 1500 ppm m	m	m	m	m	m	m	m	m
Jetty Four	PROPYLENE (Instantaneous Release)	51	80	233	74	253	LOC not exceeded	52	66	-----	-----	-----
	PROPYLENE (Evaporation Puddle)	30	53	163	51	194	LOC not exceeded	29	52	-----	-----	-----
	PROPYLENE (Burning)	-----	-----	-----	-----	-----	-----	-----	-----	33	41	55

Puddle)											
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- All emergency handling should be from a distance of more than 66 meters unless full fire suits / proximity suit is worn.
- **All personnel not directly connected with the emergency should be moved beyond 233 meters from the leak area.**

4.7.10 Jetty No – 4 Instantaneous Release / Ev VINYL CHLORIDE (VCM)

Chemical		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance		
		ERPG - 3	ERPG - 2	ERPG - 1	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		5000 ppm	1000 ppm	200 ppm								
		m	m	m	m	m	m	m	m	m	m	m
Jetty Four	VCM (Instantaneous Release)	47	108	376	45	152	LOC not exceeded	30	48	-----	-----	-----
	VCM (Evaporation Puddle)	< 10	15	52	< 10	23	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	-----	-----	-----

		m	m	m	m	m	m	m	m	m	m	m
Jet ty Fiv e	AMMONIA (Instantaneous Release)	219	589	1.4 Km	33	80	LOC not exceeded	LOC not exceeded	26	-----	-----	-----
	AMMONIA (Evaporation Puddle)	96	260	617	< 10	16	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	-----	-----	-----
	AMMONIA (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	< 10	11	13

- Emergencies involving Ammonia will be mostly leakage / spillage.
- Ammonia is flammable with difficulty.
- Ammonia emergencies should be handled by wearing BA sets.
- Ammonia is soluble in water, which will make it easier to handle the emergency.
- Do not direct water jet onto the liquid ammonia puddle, this could cause spurting of the liquid. Let the ammonia vapours come into the water spray / fog.

AEGLs represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. AEGL-2 and AEGL-3, and AEGL-1 values as appropriate will be developed for each of five exposure periods (10 and 30 minutes, 1 hour, 4 hours, and 8 hours) and will be distinguished by varying degrees of severity of toxic effects. It is believed that the recommended exposure levels are applicable to the general population including infants and children, and other individuals who may be susceptible.

The three AEGLs have been defined as follows:

AEGL-1 is the airborne concentration, expressed as parts per million or milligrams per cubic meter (ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Airborne concentrations below the AEGL-1 represent exposure levels that can produce mild and progressively increasing but transient and nondisabling odor, taste, and sensory irritation or certain asymptomatic, nonsensory effects. With increasing airborne concentrations above each AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each corresponding AEGL. Although the AEGL values represent threshold levels for the general public, including susceptible subpopulations, such as infants, children, the elderly, persons with asthma, and those with other illnesses, it is recognized that individuals, subject to unique or idiosyncratic responses, could experience the effects described at concentrations below the corresponding AEGL.

4.7.12 Jetty No – 5 Instantaneous Release / Evaporation Puddle / Burning Puddle for HSD

		Dispersion Distances			LEL Distances		Overpressure Distances			Pool Fire Heat Radiation Distance For		
		TEEL 8600 ppm	TEEL 3300 ppm	TEEL 400 ppm	60%	10%	8 psi	3.5 psi	1.0 psi	10.0kW/m ²	5.0kW/m ²	2.0kW/m ²
		3	2	1								
		m	m	m	m	m	m	m	m	m	m	m
Jetty Five	HSD (Instantaneous Release)	59	112	370	73	240	LOC not exceeded	53	71	-----	-----	-----
	HSD (Evaporation Puddle)	<10	15	85	14	48	LOC not exceeded	10	19	-----	-----	-----

HSD (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	35	42	58
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- High Speed Diesel fires should be handled with care, by wearing fire suits / proximity suits.
- Foam should be used for fire fighting.

4.7.13 Jetty No – 6 Instantaneous Release / Evaporation Puddle / Burning Puddle for MOTOR SPIRIT

Chemical	Dispersion Distances	LEL Distances	Overpressure Distances	Pool Fire Heat Radiation Distance
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		TEEL - 3 1500 ppm m	TEEL - 2 610 ppm m	TEEL - 1 610 ppm m	60% m	10% m	8 psi m	3.5 psi m	1.0 psi m	10.0kW/m ² m	5.0kW/m ² m	2.0kW/m ² m
Jet ty Six	MOTOR SPIRIT (Instantaneous Release)	159	258	258	68	227	LOC not exceeded	51	66	----	-----	----
	MOTOR SPIRIT (Evaporation Puddle)	51	85	85	16	70	LOC not exceeded	11	24	----	-----	----
	MOTOR SPIRIT (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	37	45	61

- Motor spirit fires should be handled with care, by wearing fire suits / proximity suits.
- Foam should be used for fire fighting.

Jet ty Six	SKO (Instantaneous Release)	141	159	209	74	239	LOC not exceeded	54	73	-----	-----	-----
	SKO (Evaporation Puddle)	< 10	< 10	< 10	< 10	< 10	No part of the cloud was above the LEL	No part of the cloud was above the LEL	No part of the cloud was above the LEL	-----	-----	-----
	SKO (Burning Puddle)	-----	-----	-----	-----	-----	-----	-----	-----	28	35	48

- SKO fires should be handled with care, by wearing fire suits / proximity suits.
- Foam should be used for fire fighting.

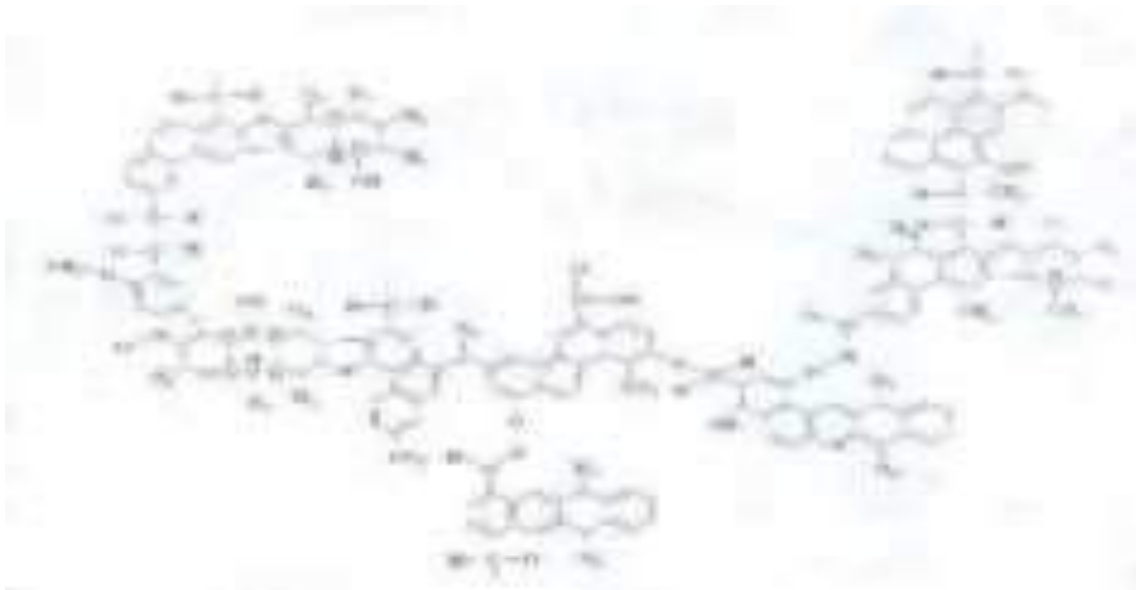
4.8 Coal Storage at Open Yard

4.8.1 General Characteristics of Coal

Coal is a fossil fuel extracted from the ground by underground mining or open pit mining. It is a readily combustible, black or brownish – black sedimentary rock. It is composed primarily of carbon along with assorted other elements.

Carbon forms more than 50% by weight and more than 70% by volume of coal.

Coal usually contains a considerable amount of incidental moisture, which is the water trapped within the coal in between the coal particles. The structure of a coal molecule is represented as follows:



Methane gas is another component of coal. Methane in coal is dangerous as it can cause explosion and may cause the coal to spontaneously combust.

4.8.2 Effects of Coal Burning

Combustion of coal, like any other compound containing carbon, produces CO_2 , along with minor amount of SO_2 .

Coal can be set on fire by spontaneous combustion

4.8.3 Spontaneous Combustion in Coal

The risk from fire exists where significant amounts of coal are in use or storage. Coal is a combustible material, making it susceptible to a variety of ignition scenarios. One of the most frequent and serious causes of coal fires is spontaneous combustion, which has been responsible for a number of incidents within the department in recent years.

Preventing spontaneous combustion coal fires involves attention to many different factors. Among the most critical are the type, age and composition of coal, how it is stored and how it is used. Given the right kind of coal, oxygen, and a certain temperature and moisture content, coal will burn by itself.

Spontaneous combustion has long been recognized as a fire hazard in stored coal. Spontaneous combustion fires usually begin as “hot spots” deep within the reserve of coal. The hot spots appear when coal absorbs oxygen from the air. Heat generated by the oxidation can initiate the fire.

Such fires can be very stubborn to extinguish because of the amount of coal involved (often hundreds of tons) and the difficulty of getting to the seat of the problem. Moreover, coal in either the smouldering or flaming stage may produce copious amounts of methane and carbon monoxide gases. In addition to their toxicity, these gases are highly explosive in certain concentrations, and can further complicate efforts to fight this type of coal fire.

Even the most universal fire fighting substance, water, cannot be used indiscriminately, because of the remote possibility of a steam explosion; it is advisable that water be applied carefully and from a safe distance. Certain chemicals such as carbon dioxide or nitrogen may mitigate fire effects, but their use has had mixed success from a DOE (Department of Energy) perspective. The above information suggests that coal fires require awareness and prior planning to extinguish efficiently, completely, and safely.

4.8.4 Causes of Spontaneous Coal Fires

The following general factors have been mentioned as contributing causes:

- ③ Coal handling procedures allowed for long-time retention of coal, which increases the possibility of heating

- ③ New coal added on top of old coal created segregation of particle sizes, which is a major cause of heating
- ③ Too few temperature probes installed in the coal bunker resulted in an excessive period of time before the fire was detected.
- ③ Failure of equipment needed to fight the fire
- ③ Ineffective capability and use of carbon dioxide fire suppression system
- ③ Delay in the application of water

4.8.4.1 Preventing Spontaneous Combustion in Stored Coal

High quantities of coal are stored in bunkers, silos, hoppers and open air stockpiles. How susceptible such stocks of coal are to fire from spontaneous combustion depends on a number of factors, from how new the coal is to how it is piled.

4.8.5 Recommendations for Coal Storage

- ③ Storing coal with low sulphur content is helpful. Sulphur compounds in coal liberate considerable heat as they oxidize.
- ③ Air circulating within a coal pile should be restricted as it contributes to heating; compacting helps seal air out.
- ③ Moisture in coal contributes to spontaneous heating because it assists the oxidation process. Moisture content should be limited to 3 %; sulphur content should be limited to 1 %, “as mined.” Coal having high moisture content should be segregated and used as quickly as possible. Efforts should be made to keep stored coal from being exposed to moisture.
- ③ Following the “First in, First out” rule of using stock reduces the chance for hot spots by helping preclude heat build up for portions of stock which remain undisturbed for a long term. The design of coal storage bins is important in this regard.

- ③ A high ambient temperature aids the spontaneous heating process. Remove coal as quickly as possible. The longer large coal piles are allowed to sit, the more time the spontaneous process has, to work.

- ③ The shape and composition of open stock piles can help prevent fires. Dumping coal into a big pile can lead to problems. Rather, coal should be packed in horizontal layers (opinions range from 1 ½' to 3' high) which are then levelled by scraping and compacted by rolling. This method helps distribute the coal evenly and thus avoids breakage and segregation of fine coal. Segregation of coal particles by size should be avoided, as it may allow more air to enter the pile and subsequent heating of finer sizes.

- ③ The height of the coal pile/stock is also important; limit un - layered, un - compacted high grade coal to a height of 15' maximum height.

- ③ Properly inspect, test and maintain installed fire protection equipment.

- ③ Maintain an updated pre-fire plan and encourage regular visits to coal facilities by the site or local emergency response force.

4.8.6 Roll Packing

Roll packing helps to exclude O₂ and thus to prevent fires by discouraging spontaneous combustion. Coal is distributed by a grab bucket or by other means in a uniform layer. The layer is then levelled by scraping and compacted by rolling. Distributing the coal evenly avoids breakage and segregation of the coal. The firm packing helps shed water.

4.8.7 Checking Temperature

Steam rising from a pile or the odour of burning coal is an indication of spontaneous heating, but an earlier or more reliable indication is obtained by checking the temperature/ hot spots/CO detection.

Rise of temperature can be noted by use of thermocouples. Hot spots can be detected by use of IR coal fire monitors. CO detectors can indicate that coal combustion has started.

4.9 Risk Analysis for Coal Fires in Storage Yard Berth 14

Data used for calculation of impact distance for coal fires. Type of coal – Bituminous (Medium Volatile)

Emissivity Constant (ϵ)	=	0.9 for Bituminous Coal
Stefan Boatmen constant	=	$5.6 \times 10^{-8} \text{ kW/m}^2 \text{ K}^4$

FQ 47K 4.9.1 Formula used for Calculation of Impact Distance (D) ✓ /

Where D	=	Distance from flame centre to receiving point.
Where F	=	Fraction of heat radiation = 0.15 (Conservative)
Where Q	=	Total Heat Generated /Emitted by Coal
Where K	=	Thermal Radiation level

Maximum temperature attained by flame of Coal $T_f = 900\text{DegC} = 1173\text{K}$

Ambient surrounding temperature $T_a = 27\text{DegC}$ to $35\text{DegC} = 300\text{K} - 308\text{K}$

$$Q = \sigma A \epsilon (T_f^4 - T_a^4)$$

$$\sigma = 5.68 \times 10^{-8} \text{ kW/m}^2 \text{ K}^4$$

$$T_f^4 = (1173)^4 \text{ K}$$

$$T_a^4 = (300)^4 \text{ K}$$

For active coal burning area = 10m^2

$$Q = 5.6 \times 10^{-8} \times 0.9 \times 10 (1173^4 - 300^4)$$

$$Q = 950 \text{ kW}$$

For Heat radiation 4 kW/m^2 impact distance D

$$D = \sqrt{(950 \times 0.15) / (4 \times 3.14 \times 4)} = 1.68 = 1.7\text{m}$$

For Heat radiation 12.5 kW/m^2 impact distance D

$$D = \sqrt{(950 \times 0.15) / (4 \times 3.14 \times 12.5)} = 0.9527 = 1 \text{ m}$$

For Heat radiation 37.5 kW/m^2 impact distance D

$$D = \sqrt{(950 \times 0.15) / (4 \times 3.14 \times 37.5)} = 0.55\text{m}$$

For active coal burning area – 100 m^2

$$Q = 5.6 \times 10^{-8} \times 0.9 \times 100 (1173^4 - 300^4)$$

$$= 9500 \text{ kW/m}^2$$

For Heat radiation 4 kW/m^2 impact distance D

$$D = \sqrt{(9500 \times 0.15) / (4 \times 3.14 \times 4)} = 5.32 \text{ m}$$

For Heat radiation 12.5 KW/m^2 impact distance D

$$D = \sqrt{(9500 \times 0.15) / (4 \times 3.14 \times 12.5)} = 3.012 \text{ m}$$

For Heat radiations 37.5 KW/m² impact distance D

$$D = \sqrt{(9500 \times 0.15) / (4 \times 3.14 \times 37.5)} = 1.74 \text{ m}$$

The Damage Effects Due to Thermal Radiation of Varying Intensity

Incident Radiation Intensity (kW/m ²)	Type of Damage
37.5	Sufficient to cause damage to process equipment unless the equipment is fully thermally fire protected (Insulation, fire proofing, sprinkler protection etc)
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing, etc.
4.5	Sufficient to cause pain to personnel if unable to reach within 20 seconds, blistering of skin (1st degree burns) is likely.

4.9.2 Summary:

Heat Radiation Impact distance for	Active Burning Coal Area	
	10 m ²	100 m ²
4 kW/m ²	1.7 m	5.3 m
12.5 kW/m ²	1.0 m	3.0 m

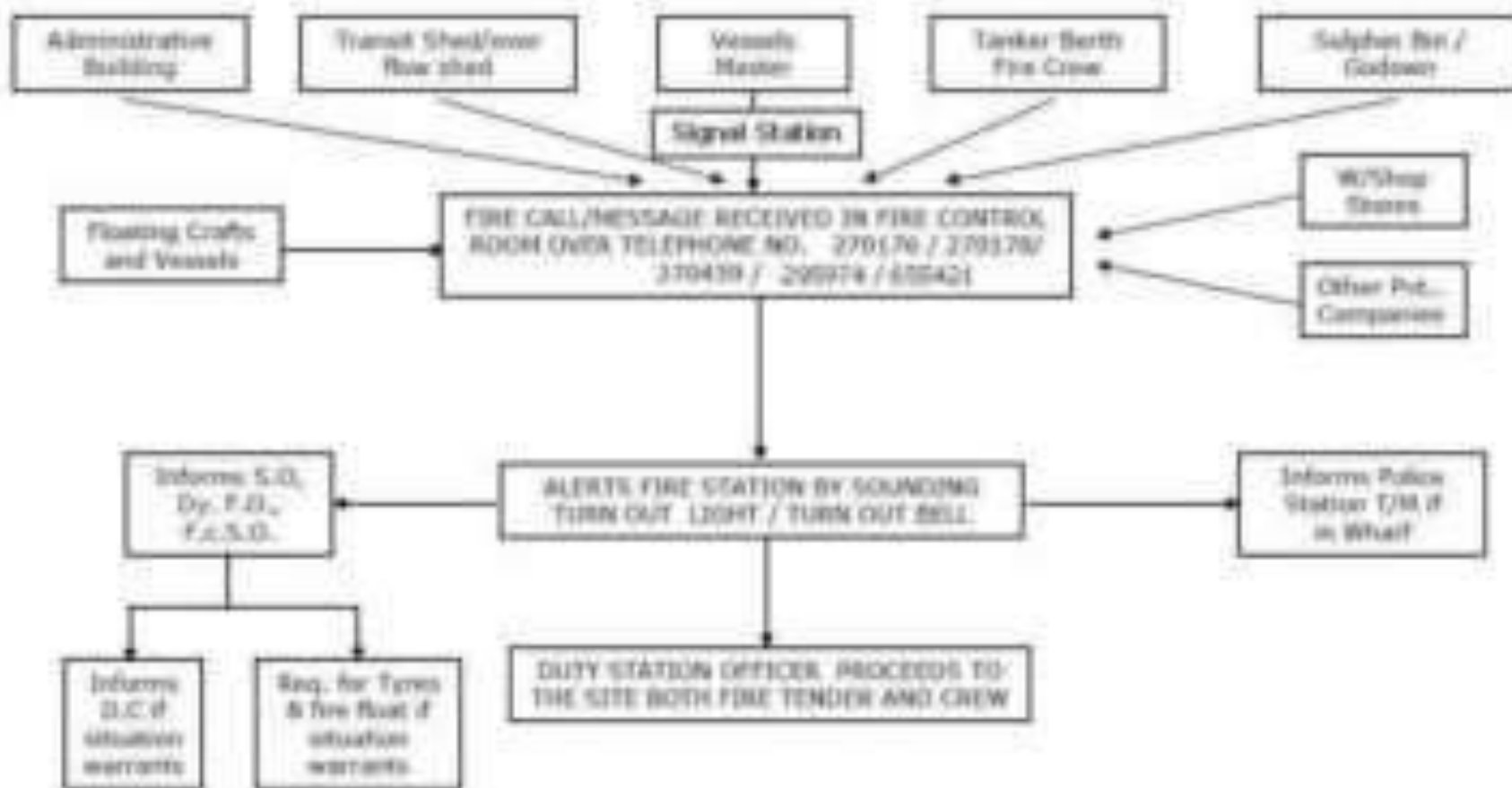
37.5 kW/m ²	0.5 m	1.74 m

Assuming that 100m² surface area of the coal stack is smouldering no person should approach the stock within 6 m distance.

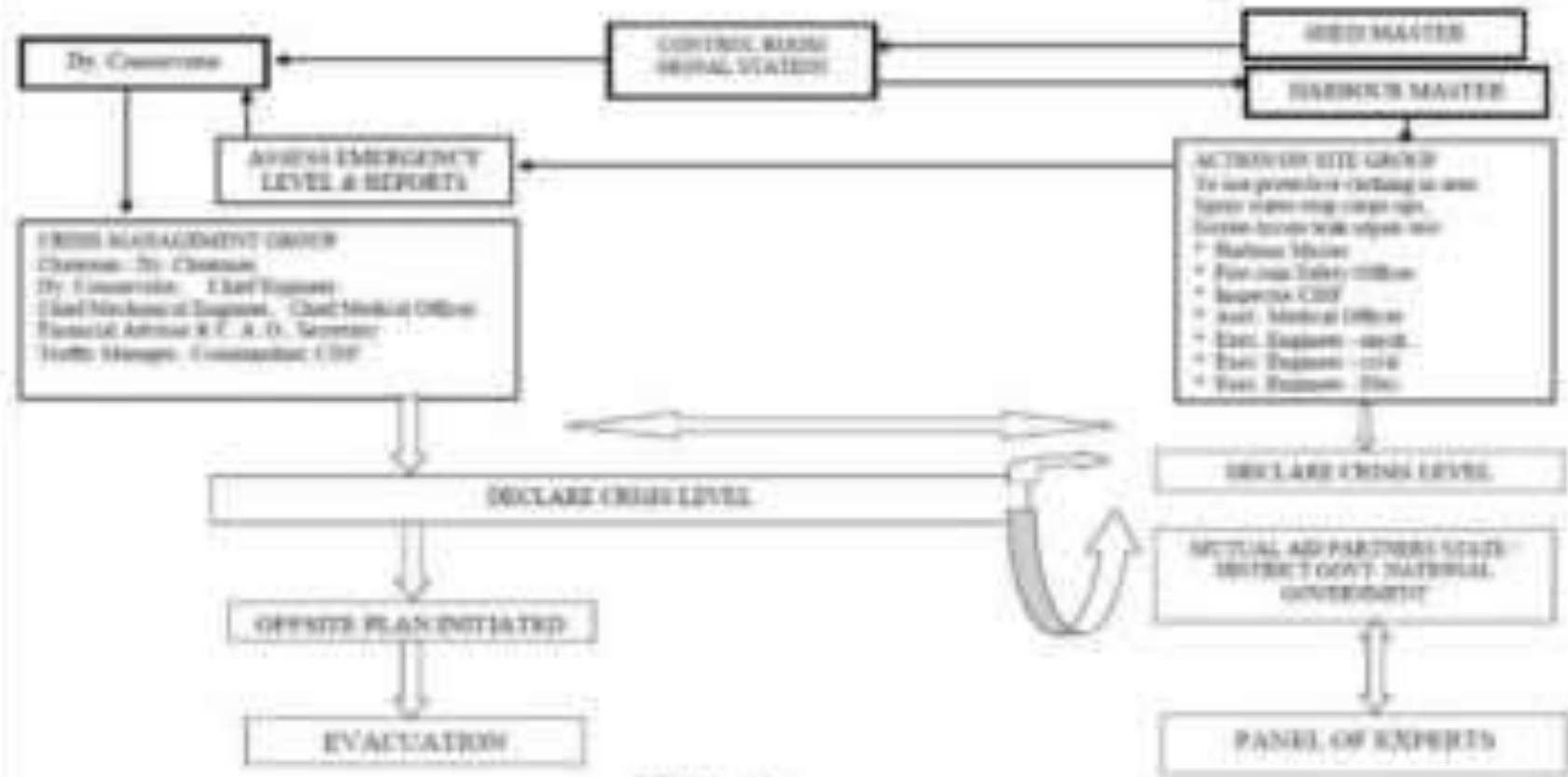
All fire fighting should be done from more than 5.3 m away from the affected coal stack unless the fire fighter is fully clothed with fire protective clothing and respiratory protection

Please note that CO could also be emitted during a coal fire due to incomplete combustion. Hence adequate respiratory protection should be used like canister gas mask or Self Contained Breathing Apparatus –SCBA

4.10 Fire & Explosion Response Plan



4.11 Fire & Toxic Leakage



PROCESS

- | | |
|--|---|
| (1) Meet on infirmity cases when | (7) Inform control room of the Fire Alarm |
| (2) Advise D.C. and H.M. and Action Group | (8) Action group commences to use protective clothing as area spray zone - stop engine, isolate - assess leak repair and screen down with other air |
| (3) Declare crisis level | (9) Crisis level maintained by crisis management group |
| (4) If crisis level declared in green | (10) Mutual aid partners contacted and district emergency plan activated |
| (5) If necessary evacuate concerned parcel of fuel | |

4.12 Details of Fire Fighting Equipment available at Kandla Port

4.12.1 Fire Water Tender – 6 Nos

Water Tank Capacity: 6000 liters. (Discharge Capacity 2250 liters/PER MIN at 7.5kg/cm² & 300 liters at 40kg/cm²).

Fire Monitor Discharge capacity 2750 lpm at 7kg/cm² with effective throw/Jet of minimum 45 meters.

Fire Fighting Equipments:

- RRL Hose 15mtrs X 63mm (ID)
- Foam AFFF 3%
- Various type of Branches
- Hose Fittings
- Small Gears
- Personnel Protective equipment (PPE)
- Additional Foam Fighting System
- Communication System
- Public Address system
- Extension Ladder

4.12.2 Foam Fire Tender – 3 Nos

Water Tank Capacity: 5000 liters. (Discharge Capacity 2250 liters at 7.5kg/cm² & 300 liters at 3.5kg/cm²).

Foam Tank Capacity: 1000 liters.

Fire Monitor Discharge capacity 2750 lpm at 7kg/cm² with effective throw/Jet of minimum 45 meters.

Additional CO₂ Extinguishing System.

Fire Fighting Equipments:

- RRL Hose 15mtrs X 63mm (ID)
- Foam AFFF 3%
- Various type of Branches
- Hose Fittings
- Small Gears
- Personnel Protective equipment (PPE)
- Additional Foam Fighting System
- Communication System
- Public Address system
- Extension Ladder

4.12.3 Multi Purpose Fire Tender – 1 No

Water Tank Capacity: 5000 liters. (Discharge Capacity 2000 liters at 10kg/cm² & 300 liters at 3.5kg/cm²).

Foam Tank Capacity: 1000 liters.

Fire Monitor Discharge capacity 2750 lpm at 7kg/cm² with effective throw /Jet of minimum 45 meters.

Additional CO₂ Extinguishing System.

Additional Dry Chemical Powder Extinguishing System.

Fire Equipments:

- RRL Hose 15mtrs X 63mm (ID)
- Foam AFFF 3%
- Various type Branches
- Hose Fittings
- Small Gears
- Personnel Protective equipment (PPE)
- Addition Foam Fighting System
- Communication System
- Public Address system
- Extension Ladder

4.12.4 SURVEYED OFF NEW PROCUREMENT IN PROCESS

4.12.5 Tank Lorry - 01 No.

- Tank Capacity 12,000 liters.
- Anti Pollution Scheme.

4.12.6 Fire Jeep – 01 No.

Pump Discharge Capacity 1800 liters at 7kg/cm².

Fire Fighting Equipments:

- RRL Hose 15mtrs X 63mm (ID)
- Various type of Branches
- Hose Fittings
- Small Gears
- Personnel Protective equipment (PPE)
- Communication System
- Public Address system
- Extension Ladder

4.12.7 Safety Jeep – 01 No.

For proper Coordination, Inspection, in around the Port (Oil & Chemical Tank Farm & Administrative Works).

Fire Fighting Equipments:

- Small Gears
- Personnel Protective equipment (PPE)
- Communication System
- Public Address system

4.12.8 Ambulance – 01 No.

For Transportation of Injured Ship Official, Ship Crews and Victims.

4.13 Station wise Manpower Break Up (Manned Round The Clock)

4.13.1 Emergency Response Centre / Old Kandla Fire Station (Liquid Cargo Jetty)

- Fire cum Safety Officer – 01
- Deputy Fire Officer – 01
- Station Officers – 02 Nos
- Leading Fireman– 02 Nos
- Pump Operator cum Driver – 03 Nos
- Fireman – 08 Nos

Oil Jetty No. 1 (LPG Jetty)

- Leading Fireman – 01
- Pump Operator cum Driver – 01
- Fireman– 04 Nos

Oil Jetty No. 2

- Leading Fireman– 01
- Fireman– 04 Nos
- Pump Operator cum Driver – 01

Oil Jetty No. 3

- Leading Fireman – 01
- Fireman– 04 Nos

Oil Jetty No. 4

- Leading Fireman – 01

- Pump Operator cum Driver – 01
- Fireman– 04 Nos

Oil Jetty No. 5 (IFFCO Jetty)

- Leading Fireman – 01
- Pump Operator cum Driver – 01
- Fireman– 04 Nos

While LPG Tanker is discharging the LPG at Oil Jetty No.1, a Station Officer shall be in charge till the unberthing of LPG Vessel.

Above Fire Crews will be posted at Oil Jetties depending upon the Nature of Risk Cargo Handled.

4.13.2 Tilak Fire Station (Dry Cargo Jetty).

- Station Officers– 01 No
- Leading Fireman– 01 No
- Pump Operator cum Driver– 02 Nos
- Fireman – 04 Nos

For Running & Maintenance of First Aid, Fire Equipments installed at various work places of Kandla Port.

- Leading Fireman– 01 No
- Fireman – 02 Nos

4.13.3 Azad Fire Station (Dry Cargo Jetty).

- Station Officers– 01 Nos

- Leading Fireman– 01 No
- Pump Operator cum Driver– 02 Nos
- Fireman – 04 Nos

4.14 Fire fighting facility at Chemical / Oil Handling Berths

4.14.1 Oil Jetty No: 1

Fixed 2 nos water/foam monitors mounted on towers at each end of each berth.

There are three vertical turbine pumps each of 500m³/hr capacity. One each of Electrical Fire Water Pumps, Diesel Engine Fire water pumps, Electrical flushing pumps.

Jetty one LPG side – 12 DCP – 5Kg Fire Extinguishers, 2 DCP – 150 Kg Trolley mounted fire extinguishers.

4 Fire suits, 2 BA sets with 2 spare respirable air cylinders.

Fire equipment Room:

- Foam / DCP – 15 Nos fire extinguishers
- Helmets – 6 Nos
- Hose length (15 meters) 10 Nos
- Manual Siren – 1No
- Gum Boots – 6 Pairs
- Ropes
- Foam compound 1000 Liters
- Hose fittings
- Branch Pipes
- Fire Axe

- Safety shower – 1 No
- Water curtains
- Fire suits – 2 Nos
- Canister gas mask – 1 No
- Telephone
- Mobile foam trolley – 100 Liters

4.14.2 Oil Jetty No: 2

Fixed foam / water remote controlled monitors mounted on towers at each end of each berth.

There are two vertical turbine pumps each of 800m³/hr capacity, two jockey pumps of 25m³/hr capacity, two foam pumps each of 22m³/hr capacity, two foam /water remote controlled tower monitors, and six jumbo curtains installed at the jetty face.

Fire equipment Room:

- Foam /DCP – 10 Nos each fire extinguishers
- Helmets – 6 Nos
- Fire Hoses - 10 Nos
- BA set – 1No
- Gum Boots – 6 Pairs
- Foam making branch pipes – 2 Nos
- Female coupling –8 Nos
- Jet branch pipes –5 Nos
- Fire suits -2 Nos
- Foam compound - 50 x 30 Liters
- Chemical Suits- 2 Nos
- Fire Axe- 1No
- DCP Fire extinguishers – 10 Nos

- Foam Fire extinguishers – 10 Nos
- Fire Buckets – 10 Nos
- Oil Dispersant – 10 x 20 Liters
- Rubber hand gloves – 6 Nos
- Hose length – 15 meters (10 Nos)

4.14.3 Oil Jetty No: 3, 4 & 5

In Oil Jetty No: 3, there are two foam pumps, with foam tank, 2 remote controlled tower monitors for foam / water spray, 2 sets of jumbo curtains at jetty face, one flame detection system, one 50KW DG set and control console.

Oil Jetty No: 4, there are three vertical turbine pumps each of 500m³/hr capacity, 2 foam pumps with foam tank, 2 remote control tower monitors of capacity 3000 liters per minute of water, 3 jumbo curtains at jetty face, 50 KW DG set and control console.

Oil Jetty No: 5, there are two fire water pumps each of 270m³/hr capacity, (One electrical driven pump, and one diesel engine pump each).

Fire equipment Room:

- Fire buckets – 8 Nos
- Manual Fire Sirens – 1 No
- Foam branch pipes – 4 Nos
- Mechanical foam generator – 2Nos
- Foam compound – 1000 Liters
- BA set – 1 No
- Gum Boots – 6 Pairs
- Helmets – 6 Nos
- Hose length (15 Meters) – 10 Nos
- DCP fire extinguishers – 10 Nos

- Foam fire extinguishers – 5 Nos
- Fire suits – 2 Nos
- Dispersant chemicals - 6 x 20 Lets
- Double female couplings – 8 Nos
- Male coupling – 2 Nos
- Diffuser – 2 Nos
- Water Curtain – 1 No
- Jet Branch Pipe – 2Nos
- Canister Gas Masks – 1 No
- Portable foam / water monitor – 1 No
- Mobile foam generator
- Safety Shower – 1No

4.14.4 Oil Jetty No: 6

- 2 – Nos Diesel engine fire water pumps 820m³/hour each.
- 1 – HP Jockey pump electrical 80m³/hour
- Fire blankets (water jel)
- Smoke detectors in fire pump house
- Hand tool set
- Water curtains nozzles – 2 Nos • AFFF foam
- DCP fire extinguishers – 6 Nos
- Trolley mounted DCP fire extinguishers – 4 Nos
- CO₂ fire extinguishers – 6 Nos
- Foam fire extinguishers – 6 Nos

4.15 General Fire fighting guidelines at the Oil Jetty

1. Stop all loading / unloading operations and close valves.
2. All fire fighters will be apprised of the chemicals and POL products normally handled at the jetties. A set of MSDS is available at the fire station.
3. As a general rule all fire fighting will be carried out from a distance of 60 meter (Average heat radiation experience of $2\text{kw}/\text{m}^2$). If the fire fighters are required to go closer to the fire then fire suits / close proximity suit must be worn. If necessary, water cover could be provided to the fire fighters going closer to the fire.
4. The water curtain along the edge of the berth will be activated for fire / leak / spill emergency at the berth.

and any available tug should be immediately put on s/by.
5. All emergency equipment should be placed beyond the over pressure distance of about 60 meters (Average overpressure distance for 1.0 psi experience) to avoid damage to them.
6. The remote water / foam monitor should be operated to control the fire at the jetty. If properly used the fire will be immediately controlled.
7. All persons not connected with handling the emergency should be moved beyond the TEEL – 1 / ERPG – 1 level distance which is an average distance of 1 Km. But if toxic chemical release takes place then the people from the shanty should be moved beyond 3 Km distance of the fire.
8. All security staff (CISF) should also have access to respiratory protection as they may not be able to leave their post.
9. External help should be obtained as soon as it is felt that the emergency is grave.

10. CISF guards will keep note of all incoming aid equipment.

11. After the emergency is over the Deputy Conservator / Harbour Master will assign a senior management team to verify that there is no longer a threat of further fire / leak / spill, to assess damage and initiate repairs

as needed.

12. Any emergency at the chemical jetties or at the dry cargo berths will be informed to the Deputy Conservator / Harbour Master, who will activate the DMP if necessary.

4.16 General guidelines in case of Toxic Chemical spill / leak

1. Stop all loading / unloading operations and close valves.

2. All emergency operation should be carried out from up wind direction. This may always not be possible. All persons handling a chemical leak / spill should wear chemical protection suit and respiratory protection like gas mask / BA sets.

3. any available tug should be put on alert or pressed into operation.

4. Deputy Conservator / Harbour Master should be informed of a chemical spill however small it may be.

5. CISF should have access to respiratory protection as they may not be able to leave their post.

6. In case of a major chemical leak / spill the neighbouring shanty should be evacuated especially if chemicals like, Acrylonitrile, Benzene, Aniline, 1:3 Butadiene, Vinyl Chloride, Styrene has spilled.

7. Attempts could be made to salvage the spilled chemical or dispersant could be applied to the spill.

8. The chief fire officer should be kept informed of the chemicals being loaded / unloaded at the port chemical berths on a daily basis.

Important fire fighting methods and spill handling methods of the concerned chemicals should be then informed to the fire fighters. They should also be apprised of the health effects and water solubility of the concerned chemicals.

IDENTIFICATION OF EMERGENCIES AT THE OIL & CHEMICAL FACILITIES AROUND THE KANDLA PORT

5.1 Impact Distances

Under the Risk Assessment Study for the DEENDAYAL PORT TRUST carried out by Tata AIG Risk Management Services Ltd in the year 1999, various failure scenarios have been identified for different facilities around the port and these have been simulated using Phast / Safeti software. These failure scenarios have been categorized into Maximum Credible Loss Scenarios (MCLS) and Worst Case Scenarios (WCS).

These failures can be due to number of reasons like material failure, human error. The failures could also be on account of natural disasters like earthquake, flood etc or they could be due to external factors like missile attack or terrorist attack. On failure due to any account mentioned above and depending on the extent of damage, there can be partial or total loss of confinement of hazardous materials handled in the port.

5.2 Maximum Credible Loss Scenarios (MCLS) considered for the study

5.2.1 Scenario 1 – Butadiene Sphere of United Storage and Tank Terminals Ltd.

There are 4 Butadiene Spheres in the terminal. We have considered the 1000 M.T. sphere for the study. Butadiene is stored at 3 to 4 Degree C and pressure in the sphere is maintained at 0.8 bar. The temperature of Butadiene is controlled by brine chillers cooled by Freon refrigeration system. The probability of BLEVE is very remote, considering there are two compressors and DG set is provided to take care of full power load of terminal in case of power failure. However, for Consequence Analysis study, we have considered BLEVE of 1000 M.T. Butadiene Sphere. It is assumed that the catastrophic rupture of the sphere takes place at a pressure of 25 bar.

Initial temperature (K) : 395. Initial pressure (bar (g))
 : 25.0

5.2.1.1 Radiation Effects: Bleeve / Fire Ball

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5m/s C	2m/s D
1.	4	1558	1558
2.	12.5	919	919
3.	37.5	526	526

5.2.1.2 Explosion Effects

Sr. No.	Over pressure		Distance in meters	
	BAR(g)	PSI (g)	5.0m/s;C	2.0m/s; D
1.	0.0207	0.3	3246	3246
2.	0.1379	2	841	841
3.	0.2068	3	650	650

Comments:

1. In case of BLEVE a radius of 526 m. could be subjected to heat radiation, intensity of 37.5 kw/m². This would affect the facilities of Synthetics and chemicals, Indo Nippon, Kesar Enterprises, Bayer ABS & Chemicals and Resins. A portion of IFFCO facility (boundary) would also be subject to 37.5 KW per m² radiation intensity. This could cause fires in the neighbouring areas and this is likely to lead to domino effect. Employees within a radius of 1.5 km. from the sphere would suffer burn injuries.
2. Structural damage is likely within a radius of 650 m. from the sphere. This would damage nearby tanks, buildings and is likely to lead to domino effect which could aggravate the emergency. Upto a distance of 3.2 k.m there would be window glass breakage.

3. The possibility of BLEVE is less likely as the Horton spheres are maintained at low temperatures and at low temperature. There is also a standby DG set to take care of 100% electrical load of the terminal. The spheres are protected by water spray ring system along with a hydrant system.

5.2.2 Scenario 2 - Phenol storage of United Storage and Tank Terminals Ltd.

In the United storage terminal there is a phenol storage tank. In the event of bottom nozzle rupture or a large overflow from the tank, phenol would spill out and the contents would be within the dyke.

5.2.2.1 Dispersion Distance for PHe nol

Sr. No.	Concentration of interest ppm	Dispersion Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	100	103	90

5.2.2.2 Radiation Effects – Pool Fire

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	32	32
2.	12.5	25	22
3.	37.5	12	12

Comments:

Phenol has IDLH of 100 ppm concentration and the vapours are toxic. Toxic vapour of 100 ppm. Concentration would disperse upto 90 to 103 meters in the downward direction. This scenario may have a moderate off site implication due to toxic vapours.

5.2.3 Scenario 3 - Toluene storage of United Storage and Tank Terminals Ltd.

It is assumed that the tank has a diameter of 15 m. and dyke dia of 30 meters. In case of bottom nozzle failure of large overflow toluene would accumulate in the dyke. In case, the pool encounters the source of ignition, a pool fire would result.

5.2.3.1 Dispersion Distance for Toluene

Sr. No.	Concentration of interest Vol %	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	1.2 (LEL)	63	72

5.2.3.2 Radiation Effects – Pool Fire

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	59	44
2.	12.5	25	22
3.	37.5	20	19

5.2.3.3 Flash Fire

Sr. No.	Distance (m)	Distance in meters (1/2 LEL Distance)	
		5.0m/s;C	2.0m/s; D

1.	Furthest extent (m) for flash fire	111	121
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Comments:

In case of a pool fire, the radiation effect is likely to be contained within the site. A flash fire distance is approximately 120 m. This means that a flammable cloud could cause a flash fire due to source of ignition within 120 m. in the downward direction. The flash fire would result in a pool fire.

The terminal has its own independent fire protection and fire fighting system which can reduce the affected distance by immediate actions like spray of foam compound over the pool formed in the dyke to prevent ignition and reduce the rate of evaporation.

5.2.4 Scenario 4 – Acrylonitrile storage of Bayer ABS

Acrylonitrile polymerises in the presence of light and at high temperature. If polymerization takes place in the tank, it could explode resulting in large release of Acrylonitrile. Acrylonitrile could also be released in the event of bottom nozzle failure of tank or overflow into the dyke.

5.2.4.1 Dispersion Distance for Acrylonitrile

Sr. No.	Concentration of interest ppm	Dispersion distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4 (IDLH)	4026	12000

5.2.4.2 Radiation Effects – Pool Fire

Sr. No.	Radiation levels (kW/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	80	85

2.	12.5	57	53
3.	37.5	42	32

5.2.4.3 Flash Fire

Sr. No.	Distance (m)	Distance in meters (1/2 LEL Distance)	
		5.0m/s; C	2.0m/s; D
1.	Furthest extent (m) for flash fire	118	125

Comments:

1. Acrylonitrile has boiling point of 77Degree C and IDLH 4 ppm concentration. However, it should be noted that on polymerization and in fire condition, Acrylonitrile would decompose to release hydrogen cyanide and NOx.
2. The dispersion distance for 4 ppm concentration of Acrylonitrile vapours could be 12 kms if the wind speed is 2 m/sec and atmospheric stability D. However, this distance could be reduced if timely action is taken.
3. Bayer ABS maintains a good safety code of practice. They have conducted various safety studies and have a good maintenance system. Moreover the emergency management plan is well prepared and rehearsed in house. The standard of housekeeping in the terminal is good. The personnel working in the terminal have a good knowledge of the actions to be taken in the event of an emergency.

5.2.5 Scenario 5 - Styrene storage of Bayer ABS

Bayer ABS has a 1210 KL styrene tank. Styrene can undergo violent polymerization above 65 degree C, which could be explosive. It is assumed that the tank diameter is 12.5 m. and bund is 22.5 x 22.5 m². In case of bottom nozzle failure, overflow, shell rupture, the material would accumulate in the dyke and if it would encounter the source of ignition, a pool fire would result.

5.2.5.1 Radiation Effects

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	52	43
2.	12.5	26	21
3.	37.5	23	17

Comments:

1. The radiation effect would be restricted to the site and is not likely to have off site implication. However, on polymerization and fire condition, styrene generates enormous quantity of soot and splinter could fly off. This could affect neighboring areas.
2. The high safety standards maintained and observed at site would go a long way in preventing catastrophic scenarios.

5.2.6 Scenario 6 - Benzene storage of Indo Nippon

In Indo Nippon terminal Benzene is stored in an 1800 KL tank. Pool fire scenario has been considered for the tank assuming tank diameter as 12 m. and dyke dia as 25 m.

5.2.6.1 Dispersion Distance for Benzene

Sr. No.	Concentration of interest Vol%	Dispersion Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	1.3	119	120

5.2.6.2 Radiation Effects: Pool Fire

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D

1.	4	55	42
2.	12.5	23	20
3.	37.5	20	16

5.2.6.3 Flash Fire

Sr. No.	Distance (m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	Furthest extent (m) for flash fire	175	175

Comments

In case of pool fire radiation effect would be restricted to site.

5.2.7 Scenario 7 - Methanol storage of Indo Nippon

Methanol is stored in 2500 KL tank, dyke dia is assumed as 30 m. And tank dia as 15 m.

5.2.7.1 Dispersion Distance for Methanol

Sr. No.	Concentration of interest Vol%	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	6	36	47

5.2.7.2 Radiation Effects: Pool Fire

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	66	73

2.	12.5	48	48
3.	37.5	37	34

5.2.7.3 Flash Fire

Sr. No.	Dispersion (m)	Dispersion Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	Furthest extent (m) for flash fire	172	83

5.2.7.4 Explosion Effects – Late Ignition

Sr. No.	Over pressure		Distance in meters	
	BAR(g)	PSI (g)	5.0m/s;C	2.0m/s; D
1.	0.0207	0.3	110	137
2.	0.1379	2	80	95
3.	0.2068	3	78	91

Comments:

1. In case of pool fire, the radiation effect would be restricted to the site.
2. Methanol has a low boiling point i.e. (65oC.), hence if timely action is not taken, a large amount of Methanol would vaporize and unconfined vapour cloud would be formed which if it encounters a source of ignition would explode.
3. In case of unconfined vapour cloud explosion there may be a moderate implication on the surrounding facilities (Synthetics & chemicals and J R Enterprises).

5.2.8 Scenario 8 - Refrigerated Butadiene storage tank of Synthetics and chemicals

There are two atmospheric storage tanks of Butadiene having capacity of 2000 MT each. The storage temperature is maintained at minimum 8oC. Ammonia is used as refrigerant. The tank is double walled

tank, catastrophic rupture of the tank is improbable. It is assumed that if the roof of the tank fails and a pool fire has taken place whose diameter equals the diameter of the tank.

5.2.8.1 Radiation Effects: Pool Fire

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	46	74
2.	12.5	41	41
3.	37.5	33	19

5.2.8.2 Flash Fire

Sr. No.	Distance (m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	Furthest extent (m) for flash fire	97	4

Comments:

The radiation distance would be contained within the site.

5.2.9 Scenario 9 - IFFCO Ammonia Sphere

IFFCO has refrigerant ammonia storage tanks. There are two 1500 m/tons Horton Spheres. In case of external fire, the sphere would be heated up. The external fire would cause the shell above the liquid level to get weakened.

5.2.9.1 Dispersion Distance for Ammonia

Sr. No.	Concentration of interest ppm	Distance in meters	
		5.0m/s;C	2.0m/s; D

1.	500 (IDLH)	10440	9908
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Comments:

1. A toxic ammonia cloud of IDLH concentration (500 ppm) would disperse up to 10 km. in the downward direction.
2. Considering that ammonia is highly soluble in water and it is a light gas, the severity of the scenario could be greatly reduced by timely action. I.e. application of water spray to ammonia cloud.
3. The ammonia storages are well protected. The company has its own fire and safety department with fire engines and fire fighting personnel on duty round the clock. The company has a good preventive maintenance programme. Safety training is given to all employees.

5.2.10 Scenario 10- Phenol storage of Kesar Enterprises

Kesar Enterprises terminal phenol is stored in a 566 KL steam jacketed tank. In case of overflow or bottom nozzle failure, phenol would accumulate in the dyke.

5.2.10.1 Dispersion Distance for Phenol

Sr. No.	Concentration of interest ppm.	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	100 (IDLH)	103	90

5.2.10.2 Radiation Effects: Pool Fire

Sr. No.	Radiation levels (kW/sq m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	32	32
2.	12.5	25	22
3.	37.5	12	12

Comments:

1. Phenol vapour of IDLH 100 ppm would disburse upto 131 to 197 m. in downward direction. This may have a moderate off-site implication.

5.2.11 Scenario 11 - Acrylonitrile storage of Kesar enterprises.

In Kesar terminal, Acrylonitrile is stored in a 2526 KL tank. Acrylonitrile polymerises in the presence of light and at high temperature. In case of polymerization, the distances affected could be as follows.

5.2.11.1 Dispersion Distance for Acrylonitrile

Sr. No.	Concentration of interest ppm	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	4	4075	12150

5.2.11.2 Radiation Effects: Pool Fire

Sr. No.	Radiation levels (kW/sq m)	Distance in me ters	
		5.0m/s;C	2.0m/s; D
1.	4	91	96
2.	12.5	65	58
3.	37.5	46	35

5.2.11.3 Flash Fire

Sr. No.	Distance (m)	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	Furthest extent (m) for flash fire	119	126

Comments

1. The dispersion distance for Acrylonitrile for a cloud of 4 ppm concentration is approximately 12 km in the downwind direction, if the wind speed is 2 m/s at atmospheric stability is D. However, this would be greatly reduced if timely action is taken.
2. The polymerization products include Hydrogen Cyanide and Nox.

5.2.12 Scenario 12 - Aniline storage - JK Synthetics Terminal

Aniline is stored in the JK Terminal. The tank diameter is considered 12m and dyke diameter as 25m.

5.2.12.1 Dispersion Distance for Aniline

Sr. No.	Concentration of interest ppm	Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	100	92	177

Comments:

1. In case of overflow of tank or bottom nozzle rupture aniline would accumulate in the dyke.
2. Aniline has an IDLH value of 100 ppm. Toxic vapour of aniline would disperse upto 177 m. in the downwind direction, if the wind speed is 2m/sec.
an atmospheric stability D.
3. The rate of evaporation could be reduced by blanketing with water.

5.2.13 Scenario 13 - BLEVE of LPG road tanker

LPG Road Tankers are filled up at the IOCL terminal. In case of over pressurization of the bullets a BLEVE could take place. Over pressurization could take place because of external fire. In case of an accident of the road tanker on the road, LPG would spill out and could result in an unconfined vapour cloud explosion. One 10 ton LPG road tanker has been considered for the study.

5.2.13.1 Radiation Effects – Bleeve / Fireball

Sr. No.	Radiation levels (Kw/sq m)	Distance in meters	
		5m/sC	2m/s D
1.	4	345	345
2.	12.5	196	196
3.	37.5	108	108

5.2.13.2 Explosion Effects

Sr. No.	Over pressure		Distance in meters	
	BAR(g)	PSI (g)	5.0m/s;C	2.0m/s; D
1.	0.0207	0.3	707	707
2.	0.1379	2	183	183
3.	0.2068	3	141	141

5.2.14 Scenario 14 - Naphtha storage of BPCL

In case of a dyke fire or tank roof fire of a naphtha storage tank in BPCL terminal the damage distances would be as follows.

Sr No	Commodity	Scenario	Wind Speed (M/S)	Damage Distance for Pool fire(Meters)		
				4 kW/m ²	12.5 kW/m ²	37.5 kW/m ²
1.	Naphtha	Dyke fire	3	205	71	31
2.	Naphtha	Tank Roof	3	188	65	29

		Fire				
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5.2.15 Scenario 15 - Catastrophic rupture of 15000 MT cryogenic LPG tank of IOCL

The possibility of catastrophic rupture of the cryogenic LPG tank is very remote. However in case of such a scenario the damage distances would be as follows.

5.2.15.1 Explosion Effects

Sr. No.	Over pressure		Distance in meters	
	BAR(g)	PSI (g)	5.0m/s;C	2.0m/s; D
1.	0.0207	0.3	316	302
2.	0.1379	2	169	176
3.	0.2068	3	157	166

5.2.16 Scenario 16 - Catastrophic rupture of ammonia road tanker

In case of catastrophic rupture of ammonia road tanker the damage distances would be as follows.

5.2.16.1 Dispersion Distance for Ammonia

Sr. No.	Concentration of interest ppm	Dispersion Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	500	1866	1592

5.2.17 Scenario 17 - Leak from Acrylonitrile road tanker

In case of leak from one compartment (Capacity 3 tons) from an Acrylonitrile road tanker, the affected distances would be as follows.

5.2.17.1 Dispersion Distance for Acrylonitrile

Sr. No.	Concentration of interest ppm	Dispersion Distance in meters	
		5.0m/s;C	2.0m/s; D
1.	400	574	1508

6 TOXIC HAZARD RANKING FOR HAZARDOUS CHEMICALS HANDLED AT PORT PREMISES

6.1 Hazard Ranking

6.1.1 Propane



6.1.2 Butane



6.1.3 Toluene

CHEMICAL PROFILES(Hazard Rankings)

Chemical: TOLENE

CAS Number: 100-99-5



6.1.4 Acrylonitrile



6.1.5 Aniline

CHEMICAL PROFILES | Hazard Rankings

Chemical: ANILINE
 CAS Number: 62-53-8



Human Health Rankings

Acute only



Toxicity and persistence



Toxicity and exposure potential



Ecological Health Rankings

Toxicity only



Toxicity and persistence



Integrated Environmental Rankings

Combined human and ecological toxicity



6.1.6 Benzene



6.1.7 1: 3, Butadiene

CHEMICAL PROFILES | Hazard Rankings

Chemical: **1,3-BUTADIENE**

CAS Number: 106-99-0



Human Health Rankings

Toxicity only

Quantitative Toxicity Weight (QTW)

Qualitative Toxicity Weight (QTTW)

Human Health Effects Score (HHE)

Toxicity and exposure potential

Cancer Risk Score - Air Release (CRS)

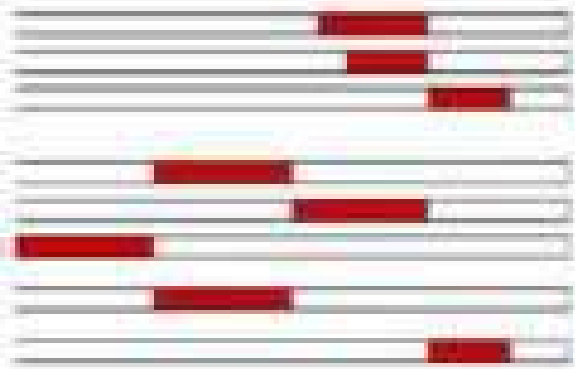
Cancer Risk Score - Water Release (CRS)

Noncancer Risk Score - Air Release (NCRS)

Noncancer Risk Score - Water Release (NCRS)

USEPA

Water Exposure Hazard Score (WEHS)



Ecological Health Rankings

Toxicity only

Ecological Effects Score (EES)

Toxicity and persistence

Environmental Hazard Index Score (EHIS)



Integrated Environmental Rankings

Combined Human and Ecological scores

Total Hazard Index Score (THIS)

Total Hazard Index Score (THIS)



6.1.8 Acetone

CHEMICAL PROFILE/Hazard Rankings

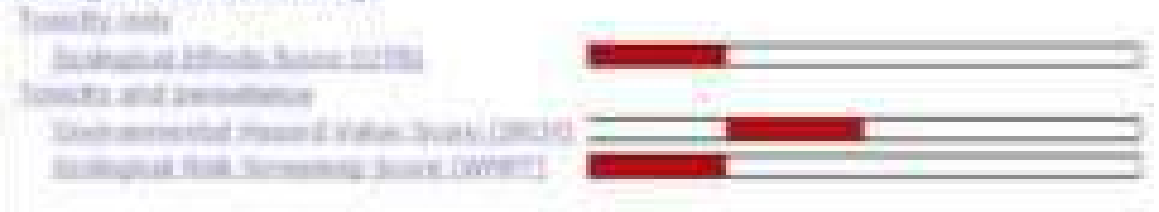
Chemical: **ACETONE**
 CAS Number: 67-64-1



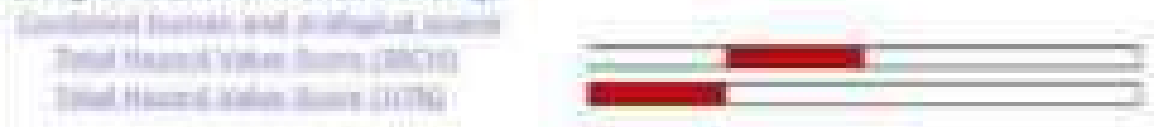
Human Health Rankings



Biological Health Rankings



Integrated Environmental Rankings



6.1.9 Methanol

CHEMICAL PROFILE Hazard Rankings

Chemical: **METHANOL**

CAS Number: 67-56-1



Human Health Rankings

Results only

Acute Toxicity, Weight Weight (100%)



Acute Toxicity, Weight Weight (100%)



Human Health Effect Score (100%)



Scoring and assessment method

Standard Risk Score - No Reference (100%)



Standard Risk Score - Water Reference (100%)



Water Exposure Hazard Score (100%)



Ecological Health Rankings

Results only

Ecological Effect Score (100%)



Scoring and assessment

Environmental Hazard Value Score (100%)



Integrated Environmental Rankings

Combined human and ecological scores

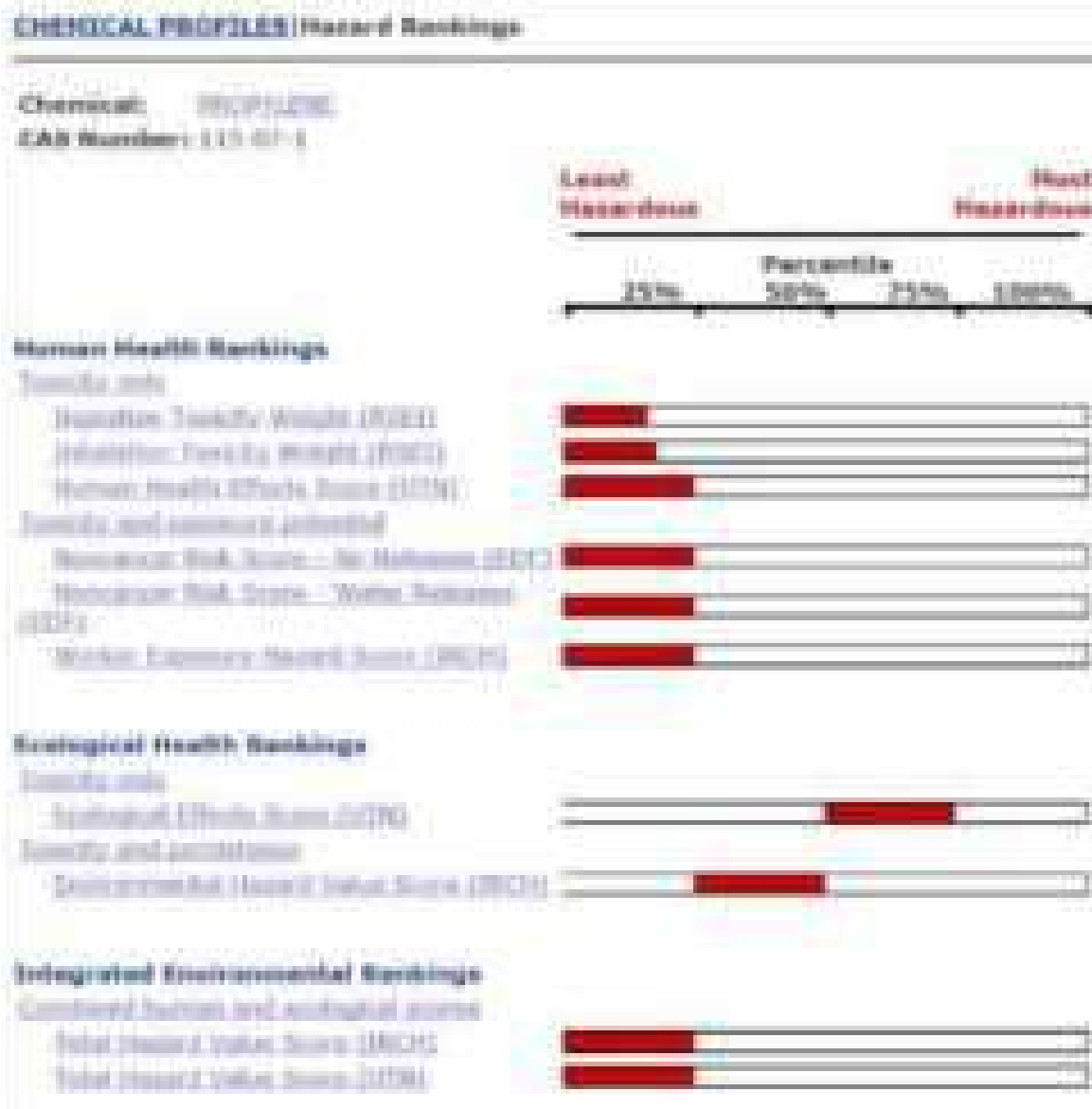
Total Hazard Value Score (100%)



Total Hazard Value Score (100%)



6.1.10 Propylene



6.1.11 Vinyl Chloride

CHEMICAL PROFILES/Hazard Rankings

Chemical: [DPPH, CHLORIDE](#)

EPA Number: 75-13-0



Human Health Rankings

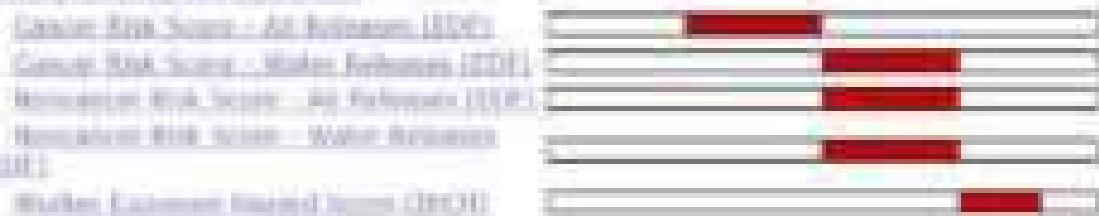
Toxicity only



Toxicity and persistence



Toxicity and exposure potential



Ecological Health Rankings

Toxicity only



Toxicity and persistence

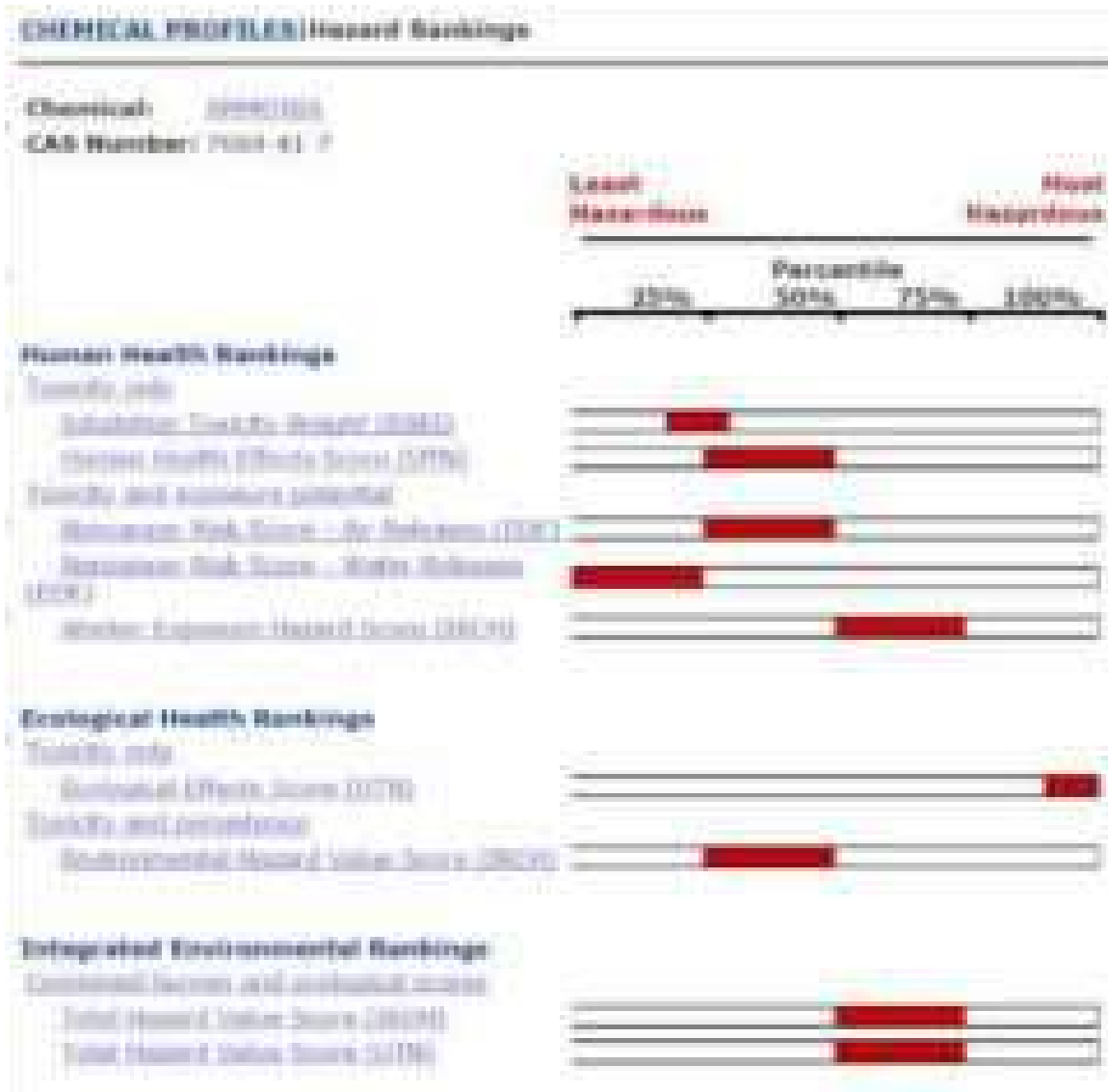


Integrated Environmental Rankings

Combined human and ecological scores



6.1.12 Ammonia



6.1.13 Ethanol



6.1.14 Phenol

CHEMICAL PROFILES: Hazard Rankings

Chemical: [PCP](#)

CAS Number: 109-91-2



Human Health Rankings

Toxicity only

Toxicity Score: Acute (0001)

Toxicity Score: Chronic (0002)

Human Health Effects Score (0000)

Health and environment

Human Health Risk Screening Score (0001)

Toxicity and common interest

Screening Risk Score - All Subsets (000)

Screening Risk Score - Water Subsets (000)

(000)

Water Exposure Point Score (0000)

Ecological Health Rankings

Toxicity only

Ecological Effects Score (0000)

Health and environment

Environmental Stress Value Score (0000)

Ecological Risk Screening Score (0000)

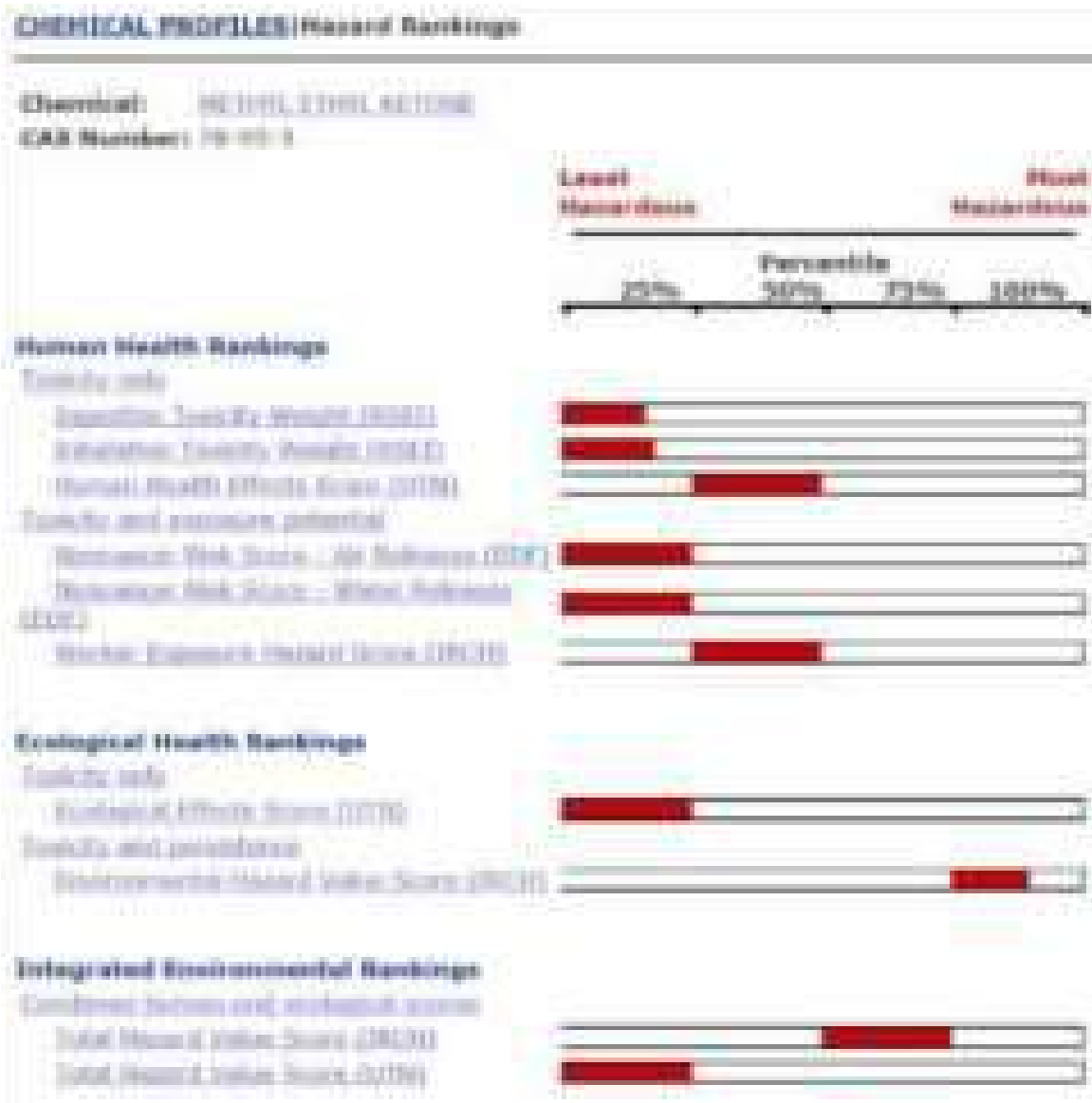
Integrated Environmental Rankings

Combined human and ecological scores

Total Hazard Value Score (0000)

Total Hazard Value Score (0000)

6.1.15 Methyl Ethyl Ketone



6.1.16 Vinyl Acetate

CHEMICAL PROFILES | Hazard Rankings

Chemical: **CHLORACETONE**

CAS Number: 108-05-9



Human Health Rankings

Toxicity: 0/10



Toxicity and exposure potential



Ecological Health Rankings

Toxicity: 0/10



Toxicity and persistence



Integrated Environmental Rankings

Combined human and ecological scores



6.1.17 Caustic Soda



6.1.18 Acetic Acid

CHEMICAL PROFILE Hazard Rankings

Chemical: **ACETALANIL**

CAS Number: 24-19-2



Human Health Rankings

Health and chemical-related

Worker Exposure Hazard Score (WEHS)



Ecological Health Rankings

Health and chemicals

Environmental Hazard Index Score (EHIS)



Integrated Environmental Rankings

Ecological, human, and biological scores

Total Hazard Index Score (THIS)

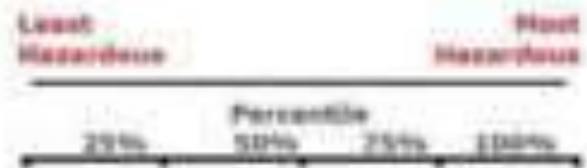


6.1.19 Nonene

CHEMICAL PROFILE Hazard Rankings

Chemical: **NONENE**

CAS Number: 27115-05-8



Ecological Health Rankings

Health and chemicals

Ecological Risk Screening Score (ERSS)



6.1.20 Ethyl Di Chloride (EDC)



Reference: <http://www.scorecard.org/chemical-profiles/hazard-indicators>

7 SABOTAGE & CIVIL DISTURBANCE

Access to the Kandla Port is controlled by walls / fence. The entrances are manned by CISF guards.

If a civil disturbance or sabotage threatens or actually damages the port property – the Harbour Master will communicate with local civil authorities or will request immediate assistance from police, coast guard, navy / air force.

7.1 Bomb Emergency Management

In the event of receiving a bomb threat by telephone call, the following should be asked and noted for relaying it to the army/air force/navy:

In view of the high priority given to Ports, they have high risk of becoming targets of the terrorist groups. Therefore the possibility of receiving bomb threats cannot be ruled out. The golden rule is consider all bomb threats as genuine and act accordingly keeping in mind the safety of the people in the Port and the property.

The objective is:

- a) To avoid/minimize any loss or damage to lives and property
- b) To eliminate panic and build up confidence.
- c) To be prepared for proper handling of any critical situation.

7.2 Immediate actions:

- a) Bomb threats may be received in writing email, SMS or may be received on phone.
- b) When the call is received on phone, keep the caller on the line as long as possible. Request him to repeat the message, listen carefully as every word spoken by the person has to be recorded mentally and penned down.

- c) If the caller does not indicate the location of the bomb or the time of possible detonation, it is advisable to try to ask him for this information.
- d) Inform the caller that the port area is occupied and the detonation of a bomb would result in death or serious injury to many innocent persons.
- e) Pay particular attention to peculiar background noises such as motors running, background music and any other noise which may give a clue as to from where the call is being made.
- f) Listen closely to the voice (male, female), voice quality (calm, excited), accents and speech impediments. Immediately after the caller hangs up report should be made to the security officer on duty about all the above details.
- g) Fill up the bomb threat call details in the format as given below.
- h) Call all identified personnel (As indicated for any emergency)
- i) As soon as an emergency is envisaged /occurs the Emergency chief or his alternate shall promptly communicate the information by a telephone or any other quickest mode of communication to the Inspector of Police, highest administrative officer, fire brigade and the nearby installations. The

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information should include the location of the installation and the degree of emergency (anticipated, eminent or actual).

7.3 Bomb Threat Report Form

7.3.1 Actions on Receiving Bomb Threat Call

1. Do not put down receiver or cut off caller
2. Put on tape-recorder /USE CELL PHONE RECORDING
3. Alert nearest colleague
4. Keep Form and pen ready to fill
5. Note time and duration correctly
6. Obtain as much information as possible
7. Keep caller engaged in conversation as long as possible

(Apologise for bad line, ask him to speak up etc.)

Time of call..... Date..... Exact words of caller.....

Was any one called for by name or designation () Yes () No. If so, who?

7.3.2 Questions to Ask Caller

1. Who is calling from where?
2. When is the bomb set to go off?
3. Where is the bomb placed?
4. What kind of bomb is it?
5. How does it look like?
6. Why are you doing this?
7. Whom do you represent?
8. How do you know so much about the bomb?
9. How can we get rid of the bomb?
10. Do you know that the bomb will kill innocent people?

7.3.3 Details of Caller

- Sex: () Male () Female Approximate age:years.
- Origin of call: () inside plant, () outside local, () outside long distance.
- Voice characteristic: () fast, () slow, () stutter, () distinct, () disguised, () educated, () uneducated, () loud, () soft.
- Language used, accent, manner: ()calm, ()angry, ()emotional, ()laughing, ()deliberate, ()normal, ()abnormal, ()other
- Is voice familiar? () yes, () no.
- Background sound: ()street, ()telephone booth, ()airport, () railway station, ()residence, ()cannot identify, ()others

CISF Commandant/Officer informed at: Name of the person receiving call signature.....

(Keep these forms with all Telephone Operators/All designations having direct line?)

7.4 Responsibility of the CISF Commandant / Officer of Kandla port

- a) Advise the Emergency chief (Chairman/Dy. Chairman/Dy. Conservator/Harbour Master) and keep him apprised of the actions being taken.
- b) Immediately make elaborate preparations near the threatened area for
 - ③ Fire fighting
 - ③ Casualty handling
 - ③ Rescue operations
 - ③ Search operations
- c) Prepare for partial/total evacuation if required. Emergency chief or his alternate will authorize these activities.
- d) Designate the team for bomb search. Initiate search operations with Fire and safety/security officers if time is available.

7.5 Action Plan

Two situations are possible.

- a) When no time limit is given.
- b) When bomb threat call has time limit specified.

As soon as the call is received the concerned area-in-charge will make fire fighting/first aid preparations immediately.

1. In the first case if there is no time limit specified for bomb explosion, as soon as the Emergency chief gives a clearance the following action should be initiated.
 - ③ Emergency shutdown of the Port sections likely to be affected.
 - ③ Evacuation of the employees and visitors to safer locations.
 - ③ Bomb search taking all the precautions.

7.5.1 Action plan when time limit is specified:

In such case the concerned officers should search the area along with safety and security officers.

7.5.2 Search procedures:

- Search must be conducted by employees of the concerned department since they are familiar with the area and would be in a better position to notice a foreign object faster.
- Two teams could be formed to search various parts of the area. Stand quietly for some moments to listen for any clockwork device before starting the search.
- As far as practical do not cause any disturbance in the environment till the search is over.
- Do not go into dark rooms and turn on lights. Use a flashlight instead.
- If any foreign or suspicious object is located, do not move or touch it. The removal/disarming of a bomb must be left to professionals. Report the location and description of the object immediately to the emergency control centre/Security gate.
- If possible place sand bags or mattresses around the bomb. Do not cover it.
- Identify the danger area and block it off with clear zone of at least 100 meter.

7.6 Important Telephone Nos of Police Authorities

Name and Designation of Officer	Fax	Telephone Nos. (Office)	Telephone Nos. (Residence)
District Collector, Bhuj. 9978406212	250430	(02832) 250020	02832- 250350
Resident Add. Collector, Bhuj Mob.9978405099	250430	250650	
Parixita Rathore (IPS) S. P.-(East),9978405690		280233	
Mr. Dy. SP (Anjar)9825304239	243254		
Mr. Dy. SP(HQ)9825225071			
Mr.) Dy. SP.9824543004	0837- 224040		
Control Room(DC-5)Purab	280287		

Mr. Vinod Chawda, M.P.,Kachchh		(m)	
Dy.Collector, Anjar Mob. 9825228049		243345	243363
Mamlatdar, Anjar Mob. 9879278174		242588	243362
Mamlatdar, Gandhidham 7567003975		250475 250270	222875 250475
Collector, Jamnagar		2555869	2554059
Collector's Control Room, Bhuj.		2252347 2231733	-
Dy. Mamlatdar, Gandhidham		250475 250270	9427719800
Civil Defence, Gandhidham		220221	
PGVCL, Gandhidham		221728 222809	
GW&SB, Gandhidham		220975	
GSRTC, Gandhidham		220198	
Duty Officer, All India Radio, Bhuj		221412	
State Information Dept. (Shri Sony) (m) 9879012714		224859 250954	253034 252855
Air Force,Duty Officer, Bhuj		252501 252502	
Air Force, Bhuj		223450	
Air Port, Bhuj		254550	
Aerodrome Officer, Kandla		238370	223247
Indian Navy, Jamnagar		550263 to 5	550825
Airforce, Jamnagar		550245 to 7	550247

S. No	Designation	Present incumbent	Contact Telephone Numbers
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			Office	Res	Mobile
01	CISF Commandant		271037	229140	9825227282
02	CISF Dy. Commandant		271036	220192	9825227045
03	Asst. Commandant		270440	271041	8000954482
04	Control Room		271040		
05	North Gate		270440		
06.	West Gate – I		271039		
07.	West Gate II		270876		

7.6 Contact Telephone Nos of Bomb Detection & Disposal Squad

Sr. No	Area	Telephone
01	GNADHIDHAM	9979928800
02	Rajkot	0281 – 245777
03	Ahmadabad	079 – 2210019

8 HOSTAGE SITUATION



8.1 Commandant CISF Responsibilities

- Apprise - Chairman, Deputy Chairman, Deputy Conservator, Harbour Master of contemplated action.
- Prepare threatened area for fire fighting, casualty handling, search and rescue operations
- Inform Police and requisition help with regard to negotiators/snipers, etc.
- CISF to cordon off area and deny access to persons hampering operations especially media and onlookers.
- Buy time for negotiators to arrive or for formalizing proper plan of action.
- Police/CISF shall assess the situation and based on the assessment, Chairman may permit operation deemed fit to free hostages.

9 SEVERE WEATHER SITUATION

9.1 Act of God Perils (Cyclones Tsunami)


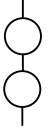














9.1.1 Storms / Cyclone







Even though Kandla is within the cyclone area of storms originating in the Arabian Sea and those that enter across the Indian Peninsula from the Bay of Bengal, cyclones are not as severe or frequent as in the Bay of Bengal. Historically, there has been major cyclone in the region in the year 1998. Hence the exposure to this peril is High.



9.1.1.1

Signal No.	Symbol Day	Symbol Night	Type of Warning	Description

I			Cautionary	There is a region of squally weather in which a storm may be forming.
II			Warning	A storm has formed.
III			Cautionary	Port is threatened by squally weather.
IV			Warning	The Port is threatened by storm, but it does not appear that the danger is as yet sufficiently great justifying extreme measures of precautions.
V			Danger	The Port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the south of the port.
VI			Danger	The Port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the north of the port.
VII			Danger	The Port will experience severe weather from a storm of slight or moderate intensity that is expected to cross over or near to the port.
VIII			Greatest danger	The Port will experience severe weather from a storm of great intensity that is expected to cross to the south of the port.

IX			Great danger	The Port will experience severe weather from a storm of great intensity that is expected to cross the coast to the north of the port.
X			Great danger	The Port will experience severe weather from a storm of great intensity that is expected to cross over or near to the port.
XI			Failure of communication	Failure of Communication with Meteorological head quarters has broken down and the local officer considers that there is danger of bad weather.

-  Red Light.
-  White Light.

9.1.2 Earthquake

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.

2

Thus risk exposure can be considered as moderate.



9.1.4 Tsunami

Tsunami is large submarine earthquake or large submarine landslides, which are often triggered by earthquakes, and volcanic eruption in the sea or on the coast. The waves spread out in all directions and at great speed, which increases with the depth of water. In great ocean basins the average speed is about 700km/h.

Thus risk exposure can be considered as moderate.



Gujarat is prone to tsunami risk due to its long coastline and probability of occurrence of near and offshore submarine earthquakes in the Arabian Sea. Makran Subduction Zone (MSZ) - South West of Karachi is an active fault area which may cause a high magnitude earthquake under the sea leading to a tsunami. In past, Kandla coast was hit by a Tsunami of 12 mtrs height in 1945, due to an earthquake in the Makran fault line. Tsunami prone areas in the State include coastal villages of Kutch, Jamnagar, Rajkot, Porbandar, Bhavnagar, Anand, Ahmedabad, Bharuch, Surat, Navsari and Valsad districts.

When severe weather is predicated or threatened preparation is made by site personnel.

The most probable severe weather events at the Kandla Port will involve High winds, Heavy rains, Cyclone, Storm, Tsunami, and Lightning & Earthquake.

There is a possibility of surface water accumulation and ingress into buildings and equipment. In addition the above severe hazard conditions can create significant personnel hazards loss of power.

PREPAREDNESS & RESPONSE

9.2 Internal Action Plan in case of Cyclone / Flood & Any other Natural Calamity

As soon as the message on anticipated cyclone/flood/natural calamity is received from the State Government Authority/Indian Meteorological Department/Cyclone Warning Centre/Indian Navy, etc. by any official of the Port Trust, the same shall immediately be informed to the Deputy Conservator (Nodal Officer), who in turn shall get such message confirmed from the above sources and apprise the Chairman and Dy. Chairman accordingly. On approval of Chairman, the Action Plan as stipulated hereunder shall be put into operation for which the Deputy Conservator shall inform all the officers-in-charge of the Control Rooms as well as the Heads of Departments, including Chief Operation Manager, OOT, and Vadinar about the decision of the Chairman as per Point No: 9.2.1.

9.2.1 Particulars of the Action Plan Committee Members

Sl No	Name	Designation	Telephone Nos.			
			Office	Residence.	Fax	Mobile
1	Mr. SANJAY MEHTA, IFS	Chairman	02836-233001 234601	02836-233002	235982	
2	Mr.	Dy. Chairman	234121 236323	234218 236346	236323	

3	Capt. T Srinivas	Deputy Conservator	233585 220235	232806	233585	9825232982
4	Mr. A Krishnan	Deputy FA&CAO	220214	223854		9825227036
5	Mr. Ajay Gupta	Sr. DD(EDP)	239623	234116		9825227095
6	Mr Bimal Kumar Jha	Secretary	220167	231939	233172	8141084794
7	Mr. Suresh Balan	Sr.Dy. Secy (G)	221375	236086		9825227044
8	Mr. Rajendra Singh	Dy. Secy	220033			9422056830
9	Mr. Deepak Rane	Sr. Asst. Secy	221679	234691		8238057380
10	Mr. N M Parmar	SE(C-I)		252624		9825227046
11	Mr. Y K Singh	PO.	223828	228584		9825227079
12	Mr.	Traffic Manager	270625 270246	263006	270475	
13	Mr. Krupananda Swami	Sr. Dy Traffic Manager	270270	235100		9825227049
14	Mr. D N Sondhi	FA&CAO	233174		220047	9825214726
15	Capt. S K Pathak	Harbour Master I/C	270201	231310		9825503499
16	Mr	Dy.Hydl. Engr	270277	225389		9825227201
17	Mr. Sunil Kumar	Flotilla Supdt.	270280	226121		7874627756
18	Mr. K Varughese	FCSO	270176 270178	227512	270176	9825227041

19	Mr. SSP PATIL	Chief Engineer	233192	228777	220050	9825227243
20	Mr. MANOJ MISHRA	Dy. CE	233569			7420027171
21	Mr. K J Todarmal	Exe Eng (R)	236165	220670		8980049099
22	Mr. N M Parmar	SE (PL)	222535	252624		9825227046
23	Mr. V R Reddy	DY.CE (G)	270429	228869		9825227038
24	Mr.B. Rajendra Prasad	Exe Eng (D), ENVIRONMENT	220038	232880		9725338260
25	Mr.	CME	270632 270184	231043	270184	9825226944
26	Shri S C NAHAK	Dy CME	270426	226067		9825235196
27	Mr. P Srinivasu	SE (E)	271010			9825204316
28	Mr. B J Solanki	SE (M)	270352			9726188222
29	Dr. Kalindi Gandhi	CMO	225767 220072	234598		9825505795
30	Dr CHELLANI	Sr Dy CMO	236346	220558		9825505796
31	Dr S B Suryavanshi	AMO	220072	233099		9687606995
32	Dr. Mahesh Bapat	A.M.O	220072	228167		9687607528
33	Mr.	Comdt. CISF	271037	229140		9825227282

Based on the past experience, after detailed discussions and experience sharing process, the actions suggested in the plan have to be taken immediately by the concerned staff members/officials as shown against their names/Designations as soon as the warning of cyclone or any other natural calamity is issued. All staff members/officials should know that they shall come into action on their own as soon as the warning is issued, without waiting for any further instructions. Failure on the part of any employees/officials to carry out the earmarked action plan shall attract severe consequences, which all must note.

9.3 Control Room

There shall be three control rooms, one at Kandla at Signal Station Seva-Sadan-III, and second one at AO Building, Gandhidham and third at A O Building Off Shore Oil Terminal, and Vadinar. The Control Room at Kandla shall be under the direct supervision Harbour Master, whereas Dy. Secy. (G) will be the overall in charge of the control room at A O Building, Gandhidham. XEN (M&E) will be the overall in charge of control room at Vadinar. They shall rush to the respective control rooms as soon as the action plan is put into force. The officials named in the duty roster of various departments elsewhere in this Action Plan shall also report to the respective HODs for coordination and to perform duties as may be assigned by the higher authorities. The overall in charge should draw up roster of the said employees and assign duties for the coming five days. The staff should report to the respective control rooms. The Radio Radar Technician will remain in control room to attend all communication equipments.

9.3.1 Duty Roster for Staff of General Administrative Department

01	Mr. Kamalesh S Bajaj, Senior Clerk	220416		
02	Assistant	220010		
03	Assistant	220010		
04	Senior Clerk	220010		
05	Sr. Clerk	220010		
06	Junior Clerk	220010		
07	Messenger	220010		
08	. Junior Clerk	220010		
09	, LWA	270872		

List of Duty Roster of Marine Department (Ministerial Staff)

Sr No	Name	Office	Residence / Mobile
01	PA to DC	220235	9428032483
02	Mr. AR Jadeja, Signal Supdt	270549	9825427400
03	Office Supdt.	221971	
04	Assistant	221971	
05	Sr. Clerk	221971	
06	Messenger	221971	

9.3.2 Pilots

Sr No	Name	Residence	Mobile
01	Shri. S. K. Pathak	231310	9825803499
02	Capt V Tyagi		7065965924
03	Capt. A K Sharma	238154	9879603642
04	Capt. Vipul M. Madaan	221478	9879603643

9.3.3 List of Telephone Nos & Address of DC, HM & Pilots

Sr No	Name of Officer / Pilots	Address of Gandhidham Res	Tel Nos: Cell / Landline
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01	Capt T Srinivas DC	A – 7, Gopalpuri	9825232982 232806
02	Shri S K Pathak HM	C – 32, Gopalpuri	9825803499 231310
03	Capt S K Pathak Pilot		
04	Capt D C Bhatt. Pilot	C – 38, Gopalpuri	9879603641 235653
05	Capt A K Sharma Pilot	C – 40, Gopalpuri	9879603642 238154
06	Capt V Madaan, Pilot	C – 31, Gopalpuri	9879603643 221478
07	AVAILABLE CONTRACT PILOTS WILL BE CONTACTED BY THE SIGNAL STATION.		
08			
09			
10			

9.3.4 Contract / Empanelled Pilots

Sr No	Name	Mobile
01	AVAILABLE CONTRACT PILOTS WILL BE CONTACTED BY SIGNAL STATION	

9.3.5 List of Duty Roster of Mechanical Engineering Department

Designation	Office
CME	270632

Addl. CME	270426
PA to CME	270184
SE(Electrical)	270209
SE (M)	270354
Dy M M	234114
XEN(E)	270469
XEN(DD) I/C	270285
AXEN(M)	270285
Asstt. Engr (M)	234199
AXEN	270165
AXEN (E)	
AE(E)	270322
Office Supdt	270245
Div. Accountant	270245
Div. Accountant	270342
Steno	270184
Junior Clerk	270245
AE(E)	270469
AE(E)	270458
AE(M)	270010
AE(M)	270370
JE(M)	270127
Head Clerk	270342
Head Clerk	270498

Div. Accountant	270498
Head Clerk	270484
Div. Accountant	270484

9.3.6 List of Duty Roster of Civil Engineering Department

Designation	Office	Mobile
Chief Engr	233192	9825227243
Supdt. Engr.(P)	233569	9825325390
Supdt. Engr.(C)	270787	9825227038
Supdt. Engineer (Const)	270419	9825227203
PA To CE (T)	220016	--
P.A. To CE	220050	9426737553
Supdt Engineer (Harbour)	270429	9825227046
Exe. Engr (R)	236165	9825706255
Exe. Engineer (Design)	220038	9725338260
Ex.Engr (TD)	223912	9427205610
Dy.Secretary(E)	221758	9825227044

Asst.Estate Manager	221598	
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9.4Kandla Control Room

Designation	Office	Residence	Fax No	Mobile
Harbour Master	270201	231310	270624	9825232982
Signal Supdt	270549, 270194	232551	270624	9825427400
Signalman at Signal Station	270549, 270194		270624	9825227246

9.5 A.O. Building, Control Room (Gandhidham)

Designation	Office	Residence	Fax No	Mobile
Dy. Secretary (G)	221375	236990	-----	9825505969
Accounts Officer	220908	226199	-----	-----
DMM	231362			

9.4 Vadinar Control Room

Designation	Office	Residence	Fax No	Mobile
Signalman	0288- 2573026			9825212359
Exe. Engineer	0288-			

(E&M)	2573005			
A. F. S.	0288			9712824782
Pilot in Station				

The overall in charge of the Control Rooms shall ensure the presence of the staff, to which various duties have been assigned. They should attend the meetings as and when called. In case of absence of the staff, the matter should be informed to the disciplinary authority, who shall take disciplinary action against the erring employees.

9.5 The Control Room shall have the following Facilities

Control Room	Telephone Nos	Fax No	VHF
Kandla	02836 – 270549/270194, Cell 9825227246	02836- 270624	8,10,12,16
Gandhidham	02836 – 238055/239055	02836- 239055	-----
Vadinar	0288-2573026, 9825212359		12, 16, 8, 10

The above facilities will remain as permanent assets of the Control Rooms. The overall in charge for setting up of Control Room at Kandla will be Dy. Conservator and Secretary for A. O. Building, Gandhidham. They should ensure setting up the Control Rooms at the respective places within two hours of warning and the matter reported to Chairman/Deputy Chairman.

Commandant, CISF to remain in contact with In charge of Control Room at Kandla regarding the positions of the Cyclone.

9.6 Functions of the Control Room

1. It shall remain in touch with the Indian Meteorological Department (Telephone numbers given at Point No: 11.8.1) and also offices and officials as at Point No: 9.8.2, 9.8.3, 9.8.4, 9.8.5 & 9.8.6 on need basis.

9.8.1 Important Telephone Numbers of Indian Meteorological Department

Designation	Address	Office	Resi.	Fax
Director (ACWC)	-do-	022- 22150405	022- 22150452	
Director (I/c)	Met Center Ahmadabad	07922865012 22865165		07922865449 22865012 22861413
Met I/C	MET Centre, Ahmadabad	22861413		
Duty Officer		22865012		
Meteorologist	Ahmadabad	22861413		

Websites

www.imd.gov.in

9.8.2 The Telephone Numbers of Some of the VIP S

Sr. No.	Name and Designation	Fax	Telephone (Office)	Telephone (Resi)
1	District Collector, Bhuj	02832-250430	250020	250350
2	Dy. Collector, Mob. Bhuj 9825300729	02832-252704	250650	
3	Add. Collector, Bhuj Mob. 9825049360	02832-252704	252704	251348
4	Superintendent Police, of Gandhidham,	9978405690	227934	
5	Asstt. Supdt. Of Police		253405	250850
6	Dy. Collector, Anjar		243345	243363
7	Dy. S. P., Anjar		243254	242596
8	Mamlatdar, Gandhidham	9879278174	242588	243362
9	Mamlatdar, Gandhidham		250475 250270	222875 250475
10	Port Co-coordinator, OCC		234313	232808
11	Terminal Manager, IOC	234396	231871	236442
12	Air Force Commander, Jamnagar		2550245	-
13	Collector, Jamnagar		555869	554059
14	Station Commander, Air Force, Bhuj		244005 to 244010	
15	Commandant, Gandhidham	B	223845	

9.8.6 Gujarat State Disaster Management Authority Telephone Numbers of Senior Officials

24 hrs 079- 23251900 - 20

Sr.No	Name of Officers	Designation	Contact No
1	Anuradha Mall, IAS	CEO	079-23259502
2	Shri L.G.Ambujakshan	PS to CEO	079-23259276
3	Shri G. C. Brahmhatt, IAS	Addl. CEO	079-23259451
4	Shri P.B.Thakar, IAS	Addl. CEO	079-23259292
5	Shri G B Mungalpura, GAS	Director (Admin)	079-23259292
6	Shri J. J. Shelat	Director Finance	079-23259278
7	Shri H.K.Chauhan	Controller of Account	079-23259219
8	Shri Nisarg Dave	Deputy Director	079-23259501
9	Shri Sumedh Patil	Deputy Director	079-23259279
10	Shri Piyush Ramteke	Sector Manager	079-23259283
11	Shri Santosh Kumar	Sector Manager	079-23259220
12	Shri Ankit Jaiswal	Sector Manager	079-23259246
13	Shri Anil Kumar	Sector Manager	079-23259220
14	Ms. Akanksha Jain	Sector Manager	079-23259306
15	Ms. Ambika Dabral	Sector Manager	079-23259246
16	Mr. Bhushan Rauisinghani	Sector Manager	079-23259283
17	Ms. Disha Dwivedi	Sector Manager	079-23259283
18	Shri Nehal Desai	Asst. Manager (Admin)& Asst. Director- H & L (i/c)	079-23259286

2. Information from the above Offices/Officers will be collected and transmitted to the overall in charge of Control Rooms/ Dy. Conservator/Harbour Master/ Traffic Manager/Senior Commandant, CISF/Chief Mechanical Engineer on hourly basis. The information should also be passed on to Secretary/Dy. Chairman/Chairman on every 03 hours.
3. Two telephones should be kept in the Control Rooms, one for receiving and the other for outward calls.

4. Each control room will enter messages in Log Books continuously and simultaneously report to the overall in charge after every one-hour. The information shall be passed on to Chairman/Deputy Chairman directly depending upon the importance. It shall be the responsibility of the Control Room Staff to ensure that timely information is passed on and timely proper monitoring done.

9.9 Continuous Monitoring Process

Immediately after the initial signal for Cyclone storm is received, the following officials shall continuously monitor the movement of Cyclone on hourly basis.

Sr. No.	Designation	Office	Mobile
1	Dy. Conservator	233585 / 220235	9825232982
2	Harbour Master	270201	9825803499
3	Pilot	270549	
4	Signal Supdt	270194, 9825227246	9825427400

These officials shall obtain the information from the following sources and The Telephone Numbers of I.M.D. is given in (Point No: 9.8.1)

1. State Meteorological Control Room, Ahmadabad,.
2. Meteorological Control Room, Delhi.

The information so collected shall be maintained by making hourly log entry in a register.

9.10 Monitoring Through Internet

1. As soon as the cyclone warning Signal No. 5 or above is hoisted, the HM nd Pilot should monitor it through internet and give two hourly print out to Dy. Conservator, Secretary, Chief Engineer, FA & CAO, Dy. Chairman and Chairman. Dy. Director (EDP) along with Junior Engineer (PMC) and Mr. B. Rajendra Prasad Exe. Engineer (Design) will monitor the website in the A. O. Building, Gandhidham.

The following are the website codes, through which the required information regarding the position of the Cyclone can be ascertained:

1. www.imd.gov.in

9.11 Inmarsat Mini – M – Terminal Kandla - 00873762092789

9.11.1 Control Room, Gandhidham

1	IDS No	762092789	-	VOICE
		762092790	-	FAX
		762092791	-	DATA

9.11.2 Control Room, Vadinar

1	IDS No	762092777	-	VOICE
		762092778	-	FAX
		762092779	-	DATA

9.12 Plotting of Information on Map

The following officers shall be deputed in the Control Room immediately on starting of the control room with relevant charts.

Sr. No.	Designation	Office	Residence	Mobile
1	Harbour Master	270201	231310	9825803499
2	Pilot			
4	Signal Supdt.	270549 / 270194	232551	9825427400 / 9825227246

The above persons shall immediately reach the Control Room and stay there till the emergency is called off. They shall plot the movement of cyclone on hourly basis and bring the position to the notice of Traffic Manager, Chief Mechanical Engineer, Dy. Conservator and Dy. Chairman/Chairman.

After scrutinizing the movement of Cyclone on the Charts, Dy. Conservator shall, in consultation with Chairman / Dy. Chairman, if required, take a decision for evacuation of ships immediately as soon as the Cyclone is in close proximity to the danger line as defined above.

All pilots should remain stand by as soon as the warning of Cyclone No. 5 level and above is received. All pilots shall be stationed at Kandla and shall not leave the port without prior permission.

Dy. Conservator shall station himself at Control Room at Kandla and remain continuously in touch with the pilots. The pilots should be in a position to mobilize themselves for evacuation of vessels and securing all Port crafts at shortest possible time.

All Class-I & Class-II Officers, the Technical Staff, the essential staff and other persons assigned with specific functions under this plan who want to avail leave in the month of May, June and July should invariably submit their leave program in April every year. Secretary shall issue a circular in the first week of April every year to all the Class-I and Class-II Officers and ascertain the period for which officers would like to proceed on leave during the months of May, June and July of that year.

9.13.2 Immediate stopping of operations at the Port

All the Pilots of the Port should reach Kandla immediately in case of emergency. Any Pilot not traceable in emergency shall be liable for disciplinary action.

Dy. Conservator/Harbour Master/Pilots should be available at Kandla during emergency. (i) Removal of vessels whenever the Cyclone is located in close proximity to the danger line plotted between 65 degree E Longitude 18.2 degree N Longitude and 73 degree E Longitude 18.2 degree N Longitude. Map showing the above position is given at (Annexure XXX (to be inserted by KPT)).

- i. Under such a situation, the ships shall be removed during the first/next available tide. It will be the duty of Harbour Master and Dy. Conservator to ensure that the ships are removed during the first/next available tide as soon as the storm approaches in the close proximity to the danger line as defined above without seeking any further instructions from higher authorities. This action shall be taken automatically and suo-motto without any confusion and for this purpose Traffic Manager shall stop all loading and unloading operations immediately upon instructions from Dy. Conservator so as to enable him to remove the vessels in time. The removal shall be done with the help of all the available pilots plus all contract/empanelled pilots together at one go in the shortest possible time so as to ensure that all the vessels cross the bar before

the tide restriction sets in.
- ii. Dy. Conservator shall ensure that all ships are moved out of the Harbour at the earliest. All pilots shall immediately report at Kandla and stay there till the Action Plan is in operation. Dy. Conservator/Harbour Master shall immediately plan removal of vessels to the OTB as soon as the Action Plan is put into operation irrespective of the signal number, which must be hoisted. If it is impossible to remove them, then all other steps should be taken to ensure safety of the vessels at the Port, as also it would not cause any damage to the Port.
- iii. S E (M) shall enlist the Engine side staff of the Floating crafts to be kept stand by for shifting of crafts to safer places. He will be the in charge of manning these crafts as per the requirement.

For shipping tugs, Marine Engineer / Engineer In charge (Tugs) / will be the in charge for manning the engine side staff for operation of the shipping tugs as per the requirement. Assistant Engineer (DT) and, Assistant Executive Engineer (FC) shall co-ordinate with Marine Engineer / Engineer In charge (Tugs).

- iv. After the Cyclone warning Signal No. 5 or above is hoisted at the Port Traffic Manager shall ensure that the loading/unloading operations at the Port are stopped immediately, hatches closed, ships' derricks properly secured and all labourers evacuated from the port area. Public address system shall be installed at the cargo jetty area, which shall be under the charge of TM. He shall use it for necessary arrangements relating to the evacuation. Senior Commandant, CISF shall ensure that Public Address System is fitted on jeeps provided to CISF.

Traffic Manager should ensure that responsible persons make announcements in a proper way so as not to create any misunderstanding / panic.

9.14 Securing of Cranes

Chief Mechanical Engineer shall ensure that immediately the cranes are secured and properly locked after closing of loading and unloading operations from ships as per procedure and report submitted to Chairman/Dy. Chairman after the operation of this action plan.

The following officers shall constantly monitor the safety of Cranes:

Sr. No.	Designation	Office	Residence	Mobile
1	S E (M)	270354	222771	9825227255
2	S E (E)	271010	229038	9427205563

The above officials and, Assistant Engineer (Elec.) shall arrange to secure all the cranes and keep them properly locked as per the procedure and send a report to the Chief Mechanical Engineer.

Executive Engineer (Dry Dock) and, AE (Mech) shall arrange to secure the cranes at maintenance Jetty as well as Bunder Area.

9.14.1 Securing of all Crafts

Dy. Conservator/Harbour Master shall immediately arrange for securing all the Port Crafts at safer places so that there is no loss to the port and send a report to the Chairman/Dy. Chairman as early as possible after operation of this action plan. Flotilla Superintendent shall be overall in charge of each craft for ensuring their safety.

For parking of crafts in emergency, there places are mainly identified, viz. Bunder Basin, Launch Jetty and maintenance Jetty (As per):

1. Maximum number of crafts such as Mooring Launches, G. S. Launches, and Pilot Launches will be placed in Bunder Basin.
2. In the inner side of Passenger Jetty, one Pilot Launch and one G.S. Launch will be kept.
3. Three Tugs will be kept in the inner side of Maintenance Jetty.

Priority will be given to the Port Crafts for parking in the Bunder Basin and other areas. Rest of the places available in the northern side of Bunder basin area will be allotted to the self propelled barges and private crafts. Dumb barges will be allowed on the beach between maintenance jetty and oil jetty area.

Berthing Supervisor will render all possible assistance to FS, being the overall in charge of the crafts. The following flotilla staff will take care of;

1	Mr. T. Sunil Kumar	F.S
2	Mr JAYDEEPSINH GOHIL	B.S
3	Mr. R B Chauhan	AFS
4	Mr. KENIYA	AFS

9.15 Private Barges / Crafts

The parties who have been given license by the Dy. Conservator to keep their barges and crafts inside the Port limit are given below:

9.15.1 **ALL** HARBOUR CRAFT License Holders to keep their Crafts inside the Port Area

Necessary instructions shall be issued to all those people have valid license immediately. The work of informing these parties will be carried out by Office Superintendent of Dy. Conservator's Office and will personally ensure that the instructions are carried out and report to HM within two hours of the Action Plan coming into operation. The representatives of the above parties shall reach Kandla at once, failing which Dy. Conservator shall cancel the license granted to them and take over the barges/crafts of the party who violate the instructions.

9.16 Evacuation of People from Kandla Area during Emergency – Action Plan

In Kandla Area, there is Residential Habitation in the following areas:

9.16.1 Places of Habitation

9.16.1.1 Saltpan Units

Considerable numbers of Salt Workers are engaged in the following Salt Manufacturing Units.

1. Kutch Salt Works.
2. New Kandla Salt Works.
3. Vijay Salt Works.
4. Friends Salt Works.

5. United Salt Works on KPT Land.
6. United Salt Works on State Government Land.
7. Small Salt Works of State Government, Near Nakti Creek.

The approximate number of Salt Workers that are being engaged/ residing in these Salt Works will be around 2575.

9.16.1.2 Sirva Labour Camp

Plots in Shirva Labour Camps (Near Mosque) have been allotted by DEENDAYAL PORT TRUST on L&L Basis. Population: 450 (approx). There are also some un-authorized hutments in the area.

9.16.1.3 Sirva Railway Hutments

The Shirva Railway Hutments (alongside Main Road) is a cluster of un-authorized Hutments erected on the Railway Land: Population 700 (approx).

9.16.1.4 G – Type Quarters & Housing Societies

The G-Type Quarters are constructed by DEENDAYAL PORT TRUST in early 1950s and were allotted to some persons who were engaged in Port related activities in those days.

DEENDAYAL PORT TRUST has allotted land to Two Housing Societies known as Kandla Port Workers Co-operative Society and Dr. Jaynat Khatri Co-operative Housing Society in Kandla area. Population: 1000 (approx).

9.16.1.5 New Kandla Port Colony P & T & Customs Colonies

The KPT employees, Customs employees etc are residing in these areas.

9.16.1.6 Hutments in the Land of PGVCL

There is a cluster of unauthorized Hutments to the Northern side of wahiya creek and southern side of M/s ABS Bayers Limited and this land belongs to PGVCL. Population: 100 (approx).

9.16.1.7 Banna Fishermen Hutments

There are unauthorized Fisherman hutments situated on the Bank of Kandla Creek towards Southern side of NDDDB Colony. Population: 800 (approx).

9.16.1.8 Hutments near IFFCO Plant

There is a cluster of unauthorized hutments near IFFCO Plant. Population: 500 (approx).

9.17 Population of Kandla

The population of Kandla Area is basically a mixture of people from various places and they can be generally divided in the following three groups;

People belonging to nearby villages like (i) Tuna (ii) Kharirohar (iii) Mithirohar (iv) Chirai and (v) Gandhidham City.

People belonging to other States like (i) Andhra Pradesh (ii) Rajasthan (iii) Uttar Pradesh and (iv) Bihar.

People working in Government establishments residing in the colonies of their organizations.

Most of the people residing in Shirva Labour Camp, Shirva Railway Hutments and Thermal Hutments etc are engaged as Private Labours in the Port and Port related ancillary activities and petty business.

9.17.1 People of Nearby Villages

People of the Port and nearby lease areas belonging to nearby villages like (i) Tuna (ii) Kharirohar (iii) Mithirohar (iv) Chirai and (v) Gandhidham City will have to be sent back to their respective village by providing them Trucks and/or ST Bus facilities in consultation with State Govt. Agencies.

9.17.2 People of Other States

People belonging to other States like (i) Andhra Pradesh (ii) Rajasthan (iii) Uttar Pradesh and (iv) Bihar may not have any relatives or other accommodations facilities in the nearby places like Gandhidham, Adipur.

Hence, they will have to be provided Temporary Shelter in the Schools/community centres as may declared as Temporary Rehabilitation Centre/ Temporary shelters by the State Govt. Authorities.

9.17.3 Action Plan for Evacuation of People from Kandla

On Hoisting of No. 5 Signal or above in Kandla Port, immediately action shall have to be initiated for evacuation of people in the following areas by the persons responsible as mentioned hereunder:-

The evacuation of the inhabitants of the following areas at Kandla is to be done as these areas are sensitive and prone to natural calamities like cyclone, high-tide and other disaster like Gas Leak, etc.

OSD(Estate) and Mr. Bhatia, Asst. Engineer (C) shall ring up all salt lease holders directing them to evacuate their people from their Kandla sites and a report thereof submitted to the Chairman/ Dy Chairman. The Dy Secretary (Estate) will be overall in-charge of the proposed action.

9.17.3.1 List of Salt Lessees

Sr. No	Name of Salt Works	Contact Person	Tel. No. Office	Tel. No. Residence
1	Asstt. Salt Commissioner, Gandhidham	Mr. Jagdish Tripathi	233670	263690
2	M/s. Kanoria Chemicals and Ind. Ltd., Plot No.220, Sector -4, Gandhidham	Mr. B. N. Singh, Mr. J. Singh Factory -	229470	283325 9825225841
3	Shree Krishna Salt Industries, Central Bank	Mr. Kantibhai Thakkar Mr. Vikash Patel	234727 233990	235315 234089

	Compound, Gandhidham	Mb: 9825206214		
4	M/s. Chirai Salt Works, DBZ-S-46, Jawahar Chock, Gandhidham.	Mr.Sureshbhai Mr.Parasbhai Mb: 9825225181 Mr.Mayajar	221109 221267 9826214709	234386 233081
5	M/s. Bhuvneshwari Salt Works, TCX-S-62, Gandhidham	Mr.Sreechandji Jain 9825222269	237114 235203	233605 236860
6	M/s. Dungershee Salt Works, Shop No. D-93, P.B.No.9, Gandhidham	Mr.Hiralal Parekh Mb: 9825019661 Mr. R.B.Agrawal Mb: 9825019662 Mr. Bhikhabhai (Salt Area)	222765 223440 9825225667	232767
7	M/s. Shree Laxmi Salt Allied Ind., "Shree Sadan", 207 / 12-B, Gandhidham	Mr. Rajubhai Rathi Mr. Rameshbhai Rathi Mob.: 9824214901	232167	232167 235482
8	M/s. Jyoti Salt Industries, "Sukh Sadan", Opp. Hotel President, Gandhidham	Mr.Acharya Sukhdevbhai Mr. Sukhdevbhai Acharya Mb: 9825226075	223776 221082 221089 223094	221876

9	M/s. New Kandla Salt and Chemical Co., "Maitri Bhavan", Plot No.18, Sector 8, Gandhidham	Mr. Babulalji Sanghvi 9825226091 Mr. Sukhrajbhai 98252 26011	232227 231588 234087	234325 231814 232122
10	M/s. Kutch Salt Works, New Kandla	Mr. Mitenbhai Mb: 9825225990 Mr. S.P.Giria, Works Manager, Mb: 9825228085	234659 02222040561 22041598 270371	238633

11	M/s. Vijay Salt Works and Allied Industries, "Friends House", P.No. 50, Sector -1A, P.B.No.106, Gandhidham	Mr. Harishbhai Chaturani Mb: 9825064241 Mr. Babulal Nahata	231119 252247 223743	234856 9825228398
12	M/s. Rajesh Salt Works, "Chandan Chambers" National Highway, Plot No.18, 12/A, Gandhidham.	Mr. Kishorbhai Thakkar Mob: 9825177081 Mr. Rameshbhai Mb: 9825226026	220586 221048 222301	234387
13	M/s. Western Chemical, DBZ-S-151, Gandhidham	Mr. Naranbhai Mb: 9825226092	233185 230913	230141
14	M/s. Urvakunj Nicotine Ltd., Central Bank Compound, Plot No.31, Sector No.9, Gandhidham	Mr. Mahendrabhai Patel 9825206214	234727	234480

		Mr. Vikash Patel Mb: 9825226214		
15	M/. Friends Salt Works, "Maitri Bhavan", Plot No.18, Sector No.8, Gandhidham	Mr. Babulalji Mb: 9825226015 Mr. Ashokbhai Mb: 9825226091 Mr. Sukhrajbhai Mb: 9825226011	232227 231588 234087	231646 231814
16	Smt. Savitri H.Pandya, DBZ-N-21/A, GIM	Mr. Jagdihbhai	220212 238112	255612
17	Smt. Vimlaben.H. Pandya, DBZ-N-21/A, Gandhidham	Mr. Jadishbhai Mr.Amritlal Pandya Mb: 9825225212	220212/238 112 238212 255612	-
18	M/s. Rajendra Salt Works, D-125, Jawahar Chowk, Gandhidham	Mr. Tarachand	-	-
19	Mr. Natwarlal Agrawal, TCX-S-75, Gandhidham	Mr. Natwarlal Mb: 9825393555	222672	231564
20	Mr. Indrumal Khubchand, C/o Gulab Salt Works, D-125, Jawahar Chowk, Gandhidham.	Mr. Tarachand	233041 234388	234937
21	Mr. Virji Khimji C/o Ajit Salt works, D-75, Gandhidham	Mr. Kirtibhai	220310	-

22	Mr. Girdharilal.S. Agrawal, Plot No.126, Ward – 12/B, Gandhidham	Mr. Girdharilal	232862	234755
23	Mr. Vijay Kumar.D. Palan & Mri Jagdish Kumar.D.	Mr. Navrotambhai Palan	220310	-
24	M/s. Satya Salt Works, DBZ-S-183, Gandhidham	Mr. Candubhai Mb: 9825225911	224055 221445	234739 234469
25	Shri Premji Gangji Soni, DBZ-S-183, Gandhidham	Mr. Mahes Soni	221263	-
26	Smt. Geetadevi Chaturani Plot No.13, Sector 1, Gandhidham	Mr. Romesh / Ashwin Mr. Dayalbhai Chaturani, Mb:9825064245	221048 256713 220586 256706 Fax: 222930	-
27	Shri Rashmin A.Pandya DBZ-N-21/A, Gandhidham	Mr. Jagdish Pandya	220212 238112 238212	-
28	M/s. Neelkant Enterprise, DBZ-S-60, Gandhidham	Mr. Shamjibhai Mb: 9825 25711	220421 220103 Fax: 223560	231485
29	Dayalal G.Chaturani Shop No.1 to 4, "Chandan Chamber" Plot No.18, Ward No.12, Gandhidham	Mr. Dayal	221048 220588	-

30	Shri Punamchand, DBZ-N-197, Gandhidham	Chaganla	Mr. Chaganlal	220545	-
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Safety Officer & Librarian shall inform the Public/Private Sector Tank Farms in Kandla about the situation and advise them to shift their people out of the respective areas to safe places.

9.17.3.2 List of Private / Public Tank Farm Owners

Sr. No.	Tank Farm Owners	Persons to be contacted in case of emergency		
		Name and Position	Telephone No.	Mobile No.
1	Kesar Enterprises Ltd., Near Oil Jetty, Old Kandla (Kutch)- 370210	Mr. R.K. Gupta Gen. Manager	270435 (O) 295676 (R)	9375349181
2	Kessar Enterprises Ltd, Terminal II, Plot No. 5 &6 Old Kandla	Mr. R.K. Gupta G.M	270435 (O) 270177 (O)	9375349181

3	Chemical & Resins Pvt. Ltd Terminal –I, Near Oil Jetty, Old Kandla, Kutch Terminal – II, Near West Gate, New Kandla – Kutch	Lt. Col. Pramod Kumar (Retd), GM,	270505(O) 236831(R) 270916 (O)	9825225676
4	Indo-Nippon Co. Ltd., Plot No.2, K.K.Road, Old Kandla,	Mr. R.N. Pathak Asst. Terminal Manager	270795(O) 235818(R) 270295(O)	9879571295
5	J. R. Enterprise, Plot No.3, Old Kandla,	Mr. Devendra Dadhich, Terminal In-charge	653528 (O) 257152 ®	9898238380
6	Friends Oil & Chemical Terminals Pvt. Ltd., Near Booster Pump Station, Old Kandla, Kutch	Mr.S.Ramakrishnan Terminal Manager	270987 (O) 257249 ®	9879572107

7	<p>Indian Oil Corporation Ltd.,</p> <p>Main Terminal, GIM</p> <p>Foreshore Terminal, Kandla</p> <p>KBPL</p> <p>LPG Import Plant</p>	<p>Mr. AK. Khanna</p> <p>Sr. Term. Manager</p> <p>Mr. KS Rao, Sr.TM</p> <p>Mr. PS Negi</p> <p>Plant Manager</p>	<p>233274</p> <p>(O)</p> <p>229002 (R)</p> <p>270394</p> <p>(O)</p> <p>270628</p> <p>(O)</p> <p>270477</p> <p>(O)</p> <p>233359[®]</p> <p>270978</p> <p>(O)</p> <p>236944</p>	<p>9427216637</p> <p>9426416108</p> <p>9426725342</p>
8	<p>United Storage & Tank Ltd</p> <p>Near IOC Foreshore Terminals, New Kandla</p> <p>Gas Terminal, Plot No. 4</p> <p>Old Kandla</p>	<p>Mr. Manoj Gor</p> <p>Terminal Manager</p> <p>Mr. G. Chudasama</p>	<p>270609</p> <p>(O)</p> <p>653525</p> <p>(O)</p> <p>651238[®]</p> <p>653529</p> <p>(O)</p>	<p>989850029</p> <p>9904366855</p>
9	<p>IFFCO Kandla Unit, Kandla, Kutch</p>	<p>Mr. L. Murugappan,</p> <p>G.M.(NPK-I)</p> <p>Mr. Brahmbatt</p> <p>Manager (F & S)</p>	<p>270711</p> <p>270352(O)</p> <p>270381</p> <p>(O)</p>	<p>982506922</p> <p>9099019861</p>

10	BPCL, KK Road, GIM	Mr. RG. Dekate Sr. Manager Operations	234313 (O) 223235 (R)	9099929634
11	HPCL KK Road, GIM	Mr. Murthy Manager (Installation)	230936 (O) 220084 (O) 233078 Ext	
12	INEOS ABS (I) Ltd Plot No. 8 Old Kandla	Mr. Vineeth Nair Dy. Manager	270087 (O) 234409 (R)	9825237029

13	Liberty Investments Pvt. Ltd., Plot No. 1 & 2, Block 'H', New Kandla	Mr. Jitendra Vaidya Terminal Manager	270151 (O) 270464 (O) 270468 (R)	9825025645
14	Avean International Pvt. Ltd., Liquid Storage Tank Terminal, Plot No. B-1, New Kandla	Mr. Bharat Rathod Terminal Manager	270537 (O)	9375310260

15	Rishi Kiran Logistics Pvt Limited, Plot No. 7, Link Road Old Kandla	Mr. RH. Pandya GM (Terminal)	270223 (O) 270443 (O)	9879104556
16	N.P.P. Pvt. Ltd., Old Kandla	Mr. MD.Nagvekar	270347 (O) 257807 ®	9825227649
17	Friends Salt Works and Allied Industries, KK Road, Old Kandla	Mr. NJ.Zinduwadia Sr. Manager Mr. HA. Mehta,S.M	270814 (O) 262698 (R) 271260 (O)	9825506361 9825506360
18	IMC Ltd, Cargo Jetty New Kandla	Mr. Anil Brahmhat	270369(O) 653524 (O) 296079 (R)	9898126243
19	Agencies & Cargo Care Ltd., Plot No.3, New Kandla.	Mr.Shivkumar Menon, Terminal Manager	270714 (O)	9825226765

20	Dipak Estate Agency Plot No. 5-6, Block – A New Kandla	Mr. Narendra Thacker	270375 (O)	9879611243
21	Parker Agrochem Exports Ltd, Plot No. 3 –4,Block- H New Kandla	Mr. Bharat Thacker	270486 (O) 270528 (O) 231876 (R)	9825238260
22	Tejmalbhai & Co New Kandla	Mr. Ankitbhai Chandan	271330 (O) 230090 (R)	9825225101
23	Parker Agrochem Product Pvt. Ltd, Plot 7-9/A,N.Kandla	Mr. Raja Babu Dy Manager	270528 (O) 231876 (R)	9979158543
24	Mother Dairy Fruit & Vegetable Pvt. Ltd, Near Oil Jetty, Old Kandla	Mr. Saju Therattu	270654 (O) 270655 (O) 230979(R)	9974022681

Traffic Manager/ Additional Traffic Manager shall arrange to inform all the Stevedores / Agents and other Stakeholders to remove their workers from the operational areas at Kandla.

9.17.3.3 List of Stevedores in the Port

Sr. No.	Name	Address	Fax No.	Telephone Nos.	
				Office	Resi.

1	M/s. Cargo Movers	"Cargo House" BBZS-32A, Gandhidham	231687	220453 231365	261280
2	M/s. DBC & Sons (P) Ltd.	Seva Sadan-II, Room No. 303 / 304, New Kandla	270631	270503 270263 270348	-
3	M/s. A.V.Joshi & Co.	Plot No. 18, Sector-8, Maitry Bhavan, Nr. Post Office, Gandhidham – Kutch	233924	231070 232227 231588	234909
4	M/s. ACT Shipping P. Ltd	Seva Sadan-II, Room No. 206/207, New Kandla	232175	270111 270112 270015 229967	261308 231416
5	M/s. Cargo Carriers	214/215, Rishab Corner, Plot 93, Sector- 8, GIM	230030	220816 231649 230030	231694
6	M/s. Cargo Clearing Agency (Gujarat)	Plot No. 271, Ward 12- B, Gandhidham	233034	221721 220655	231452
7	M/s. Chotalal Premji Stevedores Pvt. Ltd	C-8, Shaktinagar, GIM	231509	270009	-
8	M/s. Hiralal Maganlal & Co.	C-11, GIDC Area, Gandhidham – Kutch	223914	223914 231832	223878 232430

9	M/s. New Dholera Shipping Company	Goyal Commerce Centre Building - 1, Plot No.259, Ward 12B, Gandhidham - Kutch	-	222637 232267	237284
10	M/s. J.M. Baxi & Co.	Seva Sadan – II, Room No. 301 / 306, New Kandla	270646	270630 270550 270448	260427
11	M/s. Pestonjee Bhicajee (Kutch)	Seva Sadan-II, 203, New Kandla	270650 270556	270257 270367	262914
12	M/s. OTA Kandla Pvt. Ltd.	BBZ-N-324, Gandhidham	223241	220145 270560	223241
13	M/s. Purshotamdas Jeramdas & Co.	5, Vaswani Chamber, 16, Sector-8, GIM	222850	238242 222598	220598
14	M/s. R. Tulsidas & Co.	Ahit Building , Plot No.323, Gandhidham - Kutch	232308	222717 221943	-
15	Rishi Shipping	Plot 50, Sector 1/A GIM	238943	229830 229831	
16	M/s. Vinsons	BBZ-S-25, Gandhidham - Kutch	231948	220466	222395 239460
17	Sical Logistics Ltd	403, 4th Floor, Madhuban Compex, OSLO, GIM	234416	234646 234194	

18	Parekh Marine Agency	C-8, Shaktinagar GIM	231509	229297 221158	
19	Krishna Shipping and Allied Services	Transport Nagar, NH GIM	233135	230501 223814 229085	
20	Kevar Handling & Transport	Carrier & Shop 24, Tolani Chamber, Sector -8, GIM	228298	228298	
21	Trinity Shipping & Allied Industries	Trinity House, Plot 46 Sec 1/A, GIM	232060	230911 230910	
22	Velji P & Sons(P)Ltd	2nd Floor, Deepak Compex, 315, 12/B GIM	236168	231545 231546 225466	
23	Asean Marine Services	Ashit Bldg, Plot 33 Sector 1/A, GIM	232308	222717 221943 222145	
24	Rishikiran Roadlines	Kiran House, Plot 8 Sector 8, GIM	231422	231894 234108	
25	Universal Shipping Services	Hotel Sea Bird, Plot 173, Sector 1/A, GIM	235251	230663 226050 226037	
26	Seaways Shipping (P) Ltd	2nd Floor, Plot 351 Ward 12/B, GIM		226183 237147	

27	Seacrest Shipping Services Pvt. Ltd	216, 2nd Floor Om Corner, Plot 336 Ward 12/B, GIM	227028	233325	
28	Shree Maruti Shipping Services	18/21, Swaminarayan Bldg, Sector 9, GIM	234107 250690	233245 237247 250690	
29	Liladhar Pasoo Forwarders P.Ltd	Plot 4, Sector -1 KASEZ, GIM	252383 253506	252286 252297 252612	
30	Shree Radhey Shipping Company	14-16/C, GF Green Park, GIM	232967	222919 228919 238883	
31	Pearl Shipping	220, Rishab Corner, Plot 93, Sector 8 GIM	235570	225283 225284	
32	Patel Shipping Agency	Patel Avenue, Floor 2,Plot 170, Sector 1/A, GIM	231143	224024	
33	Ashirvad Shipping	18-21, Swaminarayan Bldg, Sector- 9, GIM	250690	233245 237247 222822	
34	M/s. Swaminarayan Vijay Trade	1st Floor, H-6, Op. Tejas Society, Ghatlodia,	079- 231983	231981, 231982	

	Carriar	Ahmadabad			
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9.17.3.4 List of Liner & Steamer Agents at Kandla Port

Sr. No.	Name	Fax No.	Tele. No.	Mobile
01	M/s ACT Shipping Ltd Mr. Harshad Gandhi	232175/ 270597	270111 270115-6 229967 231734	9825226141
02	M/s Admiral Shipping Ltd	233596	230552 232823	
03	M/s Areadia Shipping Ltd	232542	234254 223486	
04	M/s Ambica Maritime Ltd Mr. Amit Vyas	252447	252479 252349	9825225210
05	M/s APL (India) Pvt Ltd., Mr. Murli Krishnan	236361	224601/2 236357 236355	9825225753
06	M/s Arebee Star Maritime Agencies Pvt Ltd. Mr. Anil Talwar	235831	220465 235832	9824229109
07	M/s Ashit Shipping Ser. Pvt Ltd. Mr. Sanjay Thakkar	232308	221943 222717 222145	9825225698
08	M/s Atlantic Shipping Pvt Ltd	223372	230552	
09	M/s Asia Shipping Services. Mr. Mohan Karia239326	231285	234526 230954	

10	M/s Bayland Freight Systems Pvt Ltd., Mr. Danendran Gopalan	239326	225522/ 23	9825230880
11	M/s B D Vitlani Shipping Services Pvt Ltd.	234104	232220 221081	
12	M/s Cargo Conveyors Mr. Shekhar Ayachi Mob. 9825226102	233034	221460 220655	
13	M/s CCA Shipping Services Mr. K C Varghese	233034	221721 220655	9825225217
14	M/s Chowgule Brothers Mr. C R Soman	229227	278521 225051 232365	9825361782
15	M/s Coastline Services (India) Pvt Ltd.	221137	232095 222853	
16	M/s Container Marine Agency Pvt Ltd	234541	230026 220416	
17	M/s Conftreight Shipping Agency (India) Pvt Ltd. Mr. K T R Nair	-	233615 236157	
18	M/s Cresent Shipping Agency (India) Pvt Ltd Mr. Sanjay Salve.	224506	221290 221957	9825227311
19	M/s DBC Freight International	230832	230832 230639	

20	M/s DBC Sons (Gujarat) Pvt Ltd. Mr. R C Vazirani	270631	270263 270503	
21	M/s Depe Global Shipping Agency Pvt Ltd. Mr. Jaydeep Roy	232079	231528 233608 234582	9825228121

22	M/s Evershine Shipping Services. Mr. Kishan Motwani	234083	221588 237408	
23	M/s Forbes Gokak Ltd	231464	222634 235004	
24	M/s Freight Connection (India) Pvt Ltd	231357 270726	222247 222545 270727	
25	M/s GAC Shipping (India) Pvt Ltd. Mr. V C Rao	231429	231427 237244	9825225136
26	M/s Ganges Liners Pvt Ltd	233437	231608 233436	
27	M/s German Exp. Shipping Agency Pvt Ltd	236040	223269 236040	
28	M/s Goodrich Maritime Pvt Ltd	222875	222882 222883	
29	M/s G P Dave & Sons (Shipping)	234382	234288 234382	
30	M/s Greenways Shipping Agencies Pvt Ltd	232079	233608 234585	
31	M/s K. Shipping Services Pvt Ltd	233632	231933	
32	M/s Halar Ship & Freight Forwarders. Mr. Tejas Shrma	270224	270192 270568	9825212646
33	M/s Hind Shipping Agencies. Mr. Mahesh Vyas	234795	232710 235375	
34	M/s Hindustan Shipping Services. Mr. M D Sorathiya	239110	239110 222821	9824214994

35	M/s Interocean Shipping India Pvt Ltd. Mr. Suresh Tripathy	232579	235201 230589	9825225583
36	M/s Intra Trade Pvt Ltd. Mr. B P Vasavda	233295	233313 231255	9825226129
37	M/s Trades Shipping Pvt Ltd	231463	235572 233606	
38	M/s James Mackintosh Marine (A) Pvt Ltd. Mr. Satish Nair	270793	270792 270846	9825226077

39	M/s J MBaxi & Co. Mr. D P Mitra	270646	270630 270635 270525	9825225107
40	M/s Kutch Shipping Agency Pvt Ltd. Mr. Azad Khan	233339	221148 250226/ 7/8	
41	M/s Liladhar Passop Forwarders Pvt Ltd. Mr. S. Chakraborty	252383	252297 252402 252288	9825020523
42	M/s Maersk (India) Ltd. Mr. Dinesh Joshi	231388	231387 236192 233963	9825270419
43	M/s Maheshwari Handling Agency Pvt Ltd. Mr. Chaggan Maheshwary	230575 234633	223228 230393	9825227111
44	M/s Maltrans Shipping Agencies India Pv Ltd.	230606	220147 230336 235022	
45	M/s Mathurdas N. & Sons Forwarders Ltd.	252221	252224 252350	

46	M/s Meridian Shipping Agency Pvt Ltd	230212	220305 230220	
47	M/s Mitsutor Shipping Agency Pvt Ltd	230411	220110	
48	M/s M M Shipping Services	235255	231385 238385	
49	M/s Modest Shipping Agency Pvt Ltd	-	230576	
50	M/s NLS Agency India Pvt Ltd. Mr. Sanjay Salve	232413	231318 220305	9825237311
51	M/s Orient Express Lines Ltd	230359	232186 232805	
52	M/s Orient Ship Agency Pvt Ltd. Mr. H G Digrani	233518	223430 223487	9824214801
53	M/s Oscar Shipping Agencies.	231812	226959/6 0 232123	
54	M/s Parekh Marine Agencies Pvt Ltd. Mr. Mitesh Dharamshi	231509	221409 235341	9825226557
55	M/s Patel Handling Agency (Capt. Kalra)- 9825062912	231143	224024 231004 221718	
56	M/s Patvolk (Mr. Shreekumar Nair)	231464	222624 235004	

57	M/s Pearl Shipping Agency. Capt. Kalra	231143	224024 221718	9825062912
58	M/s Penguin Shipping Agencies Pvt Ltd.	230606	230336 220147	

59	M/s Pestonjee Bhieajee (Kutch) Mr. R K Kewalramani	270650 270556	270221 270257 270367	9825226962
60	M/s Prudential Shipping Agencies Pvt Ltd. Mr. Siddharth Mishra	232911	230479 233982	9825226477
61	M/s P&R Nedlloyed India Pvt Ltd	232207	224906/7 232128	
62	M/s R T Bhojwani & Sons Mr. Gopichand Bhijwani	232423	223831 220839	9825225639
63	M/s Sahasu Shipping Services Pvt Ltd	236358	225224 237854	
64	M/s Sai Shipping Co. (P) Ltd Mr. S T Hingorani	231972	221369 231739	9825228681
65	M/s Samrat Shipping Co Pvt Ltd	232890	231983 222939	
66	M/s Samsara Shipping Pvt Ltd. Mr. Pranesh Rathod	233165	228602	9825225755
67	M/s Scorpio Shipping Agency	-	223085	
68	M/s SDS Shipping Pvt Ltd	231542	221326 221087	
69	M/s Seanay Shipping Pvt Ltd	270026	270788	
70	M/s Seabridge Maritime Agencies Pvt Ltd	231509	221409 221158	
71	M/s Seafreight Pvt Ltd	222850	233530 222393	

72	M/s Sealand Agencies India Pvt Ltd	230584	231179 230584	
73	M/s Seamar Shipping India	255563	-	
74	M/s Seatrade Shipping	234171	233810	
75	M/s Sentrans Maritime Pvt Ltd	236129	230002 220702	
76	M/s South India Corporation (Agencies) Ltd Mr. Antony	234416	221276 234646 231494	9825226256
77	M/s Spoonbill Maritime Agencies Pvt Ltd	234167	221049 222058 234454	
78	M/s Star International	231395	233948 232402	
79	M/s Taipan Shipping Pvt Ltd	236040	223269 227010	
80	M/s Taurus Shipping Services. Mr. Sukhveersingh	231266	221334 223074	9825227325
81	M/s Oceanic Shipping Agency Pvt Ltd	270631	270263 270503	
82	M/s TICC Container Line (Kandla) Pvt Ltd	237854	237854	
83	M/s Total Transport Systems Pvt Ltd	231463	222634	
84	M/s Transocean Shipping Agency Pvt Ltd	-	230832	
85	M/s Transworld Shipping Services India Pvt Ltd Mr. Sandeep Rajvanshi	231913	229824 221290	9825225733
86	M/s Trinity Shipping & All. Services Pvt Ltd Mr. Soly	222060	230911 223703	9825225245

87	M/s Unimarine Agencies (Gujarat). Mr. Jaikumar Ramdasani	224633	224631/ 32 223113	9825225216
88	M/s Unique Shipping Services Pvt Ltd	-	232729 232730	
89	M/s United Liner Agencies of India Pvt Ltd Capt Rakesh Kumar	236040	227779 223269	9825225741
90	M/s Universal Freight Systems	252383	252288 252297	
91	M/s Universal Shipping Services Mr. Anil Pillai	235251	230663 231708	9824215168
92	M/s Velhi P. Sons (Agencies) Pvt Ltd	255328	255327 231545	
93	M/s Vibhuti Shipping Pvt Ltd Mr. Vinod	236219	236719 230035 232424	9825226536
94	M/s Worldwide Cargo Care Pvt Ltd	231913	221290 221479	

9.18 Core Team

Asstt. Commandant-CISF, OSD (Estate), Ex. Engineer (Roads)-KPT, Executive Magistrate of State Govt. of Gujarat i.e. the Mamlatdar, Gandhidham and Police Inspector, Kandla shall jointly ensure evacuation of people from Kandla areas. The persons entrusted with the evacuation programme as indicated here below will have to report the progress in evacuation to the Dy. Secretary (E) who shall appraise all developments in this regard to Chairman and Dy. Chairman, KPT over telephone from time to time.

The Evacuation of People from different areas at Kandla shall be looked after by the officers named below.

9.18.1 Banna Fishermen Hutments

ACTION BY, Junior Engineer, and CISF

9.18.2 Saltpans (Including Major & Minor)

ACTION BY: Asstt. Estate Manager, Mr. AB Pradhan, Labour Officer and CISF.

9.18.3 Sirva Camp & Sirva Railway Hutments

ACTION BY: OSD (Estate), Estate Inspector and CISF

9.18.4 G Type Quarters of DEENDAYAL PORT TRUST

ACTION BY: Assistant Engineer and CISF

9.18.5 New Kandla KPT Colonies, Customs & Hutments in PGVCL Land

ACTION BY: Assistant Engineer/InspectorVigilance with CISF

9.18.6 Hutments near IFFCO Plant

ACTION BY: Junior Engineer and CISF

9.18.7 Cargo Jetty & Oil Jetty Areas

ACTION BY: Traffic Manager – Private Workers/ Shore Workers

AAO, CHD - CHD Workers

HOD/Dos - The Employees of their respective deptt.

The Traffic Manager/ Commandant CISF shall ensure that the Cargo/ Oil Jetties are completely evacuated and there is no fresh entry into the operational areas.

9.19 Public Announcement

The Public Announcement for faster evacuation is to be made by (a) CISF on behalf of DEENDAYAL PORT TRUST and (b) Police Inspector, Kandla Police Station in consultation with KPT officials.

9.20 Temporary Shelters

The Temporary Evacuation Centres (TEC) will be set up in the Gandhidham area in places like Schools/ Community centres etc as may be decided in consultation with the State Govt. Officials.

Executive Engineer (TD) will have to ensure the following;

Opening cleaning and providing water facility in the Temporary Shelters at Gandhidham in premises coming under the administrative jurisdiction of Kandla Port that may be identified for the purpose by the Collector/Mamalatdar/concerned state govt. authority. The toilet blocks attached to these buildings are to be kept in usable condition.

Executive Engineer (Electrical) shall ensure providing of lights and continuous electric supply in the Temporary Shelters as mentioned above.

Mr. A B Pradhan, Labour Officer and the Head Master of BVM School will have to ensure opening of the School and shifting of school furniture as may be directed.

The requirement of amenities/ medical aid etc in the Temporary Evacuation Centres will be taken care of by the Executive Engineer(TD)/ (R), Senior Engineer (PL), updt Engineer (E) and Doctors of Medical Department.

9.21 Transport Facility

The Traffic Manager shall provide sufficient number of Trucks and Dumpers as may be requested by Dy. Secretary (E) for evacuation purpose.

The hired buses of KPT shall be deployed for evacuation. In case of additional requirement the Dy. Secretary (G) will co-ordinate with Mamlatdar, Gandhidham for obtaining sufficient number of ST Buses for evacuation purpose.

Secretary shall co-ordinate the above activities.

Ensuring the functioning of TELEPHONES

The name and telephone No. of the Officer Telephone Department to be contacted in case of any problem:

1. General Manager, Bhuj(O) 231201/231648 (R)

2. District Engineer, Bhuj(O) 525410

3. SDO (P), Gandhidham(O) 232453/229666 (R)

Dy. Secretary (Personnel) shall ensure that the telephone of all the Head of Departments and other responsible officers of different Departments are functioning properly by ringing personally. In case any of the telephones does not function or give satisfactory service, he shall take up the matter with the higher authorities immediately.

9.22 Traffic Movement

Commandant, CISF with the help of Police shall ensure that all incoming traffic to the Port is stopped except those which are coming for rescue operations and essential services at three places i.e. KASEZ Junction, Railway crossing and Kharirohar Road. He shall immediately erect two temporary tents and post sufficient number of personnel of CISF in coordination with Police, who shall identify which person has to be allowed. Commandant, CISF shall also ensure that those allowed do not cause any hindrance for those who are supposed to function as per the Internal Action Plan.

Staff Attendance

From experience it is observed that several times many officials do not turn up for work under one or the other pretext. This would be viewed very seriously. Immediately on operationalising this Action Plan, even if, it is a Public Holiday, the following staff shall report for duty.

All Operational Staff particularly those of Floating craft Section and Power Supply Section.

All Head of Departments and all Class-I & Class-II Officers shall be present in their office timings. Besides, a list of very essential officers, who will be required to be present even beyond the normal duty hours, as and when required, shall be prepared.

All P.A.s/Stenographers/Peons of Head of Departments and Deputies.

All Office Superintendents/Superintendents (Accounts)

All Head Clerks and Divisional Accountants.

The above officials shall be present in the office, unless otherwise directed.

The Staff attendance on days when the Action Plan is in the operation shall be collected from P.A. to HODs and compiled by Asstt. Secretary (G). The daily position will be reported to Chairman/Dy. Chairman every day with separate list of absentees. Assistant Secretary (G) should ensure presence of staff by following the required action.

All Head of Departments may hold a meeting with Class-I, & Class-II and staffs and explain their functions as per the provisions of Action Plan during the Natural Calamity and submit a Compliance Report to Chairman/Dy. Chairman on priority basis.

The following officers will ensure timely supply of Drinking Water/Food Packets to the staff during the operation of the Action PLAN:

Asstt. Executive Engineer- For the staff of Traffic/Mech./Civil

Engineering Department

AFS- For the Flotilla Staff /SIGNAL STATION

Company Commander, CISF- CISF

FcSO- For Fire Brigade Staff

The above officers shall be responsible for placing order for procurement of Food Packets. They should ensure that there is no shortage on this account. They shall come in to action on their own. They are also responsible for placing advance order, preparation of food packets, transportation, and distribution in time and report compliance to Secretary for the previous day.

9.24 Sanction of Advance

All Head of Departments would make a judicious assessment regarding the requirement of funds by them to meet the different exigencies, which they may have to handle on account of the Natural Calamity situation. The HoDs would inform the FA&CAO on telephone or in writing or through a messenger regarding their requirement of advances. The FA&CAO in turn would examine the advances sought by the Head of Departments and sanction the advances early without any delay. The FA&CAO would keep the Chairman and Dy. Chairman informed about the amount released by him and seeks approval.

9.25 Vehicle Pool

As soon as this Action Plan comes into force, the vehicle pool stands formed; the vehicle pool shall be controlled by Senior Engineer (Pipeline) and Senior Labour Officer. The following vehicles will be there in the Pool:

All Ambulances Under CMO

9.26 Private Vehicles Buses { To be arranged by Labour Section}

9.26.1

List of Civil, Electrical & Mechanical Contractors

Sr. No	Name & Address of Contractor			
		Office	Resi	
1	Mr. Dilip Bhandbe, M/ Mukund Ltd.	223412		
2	M/s. Maheshwari Const. Co., SDX-N-5, Gandhidham-Kutch Mr. Rameshbhai	232134		
3	M/s. Apex Engineers, Bajaj Chambers, 12/B, Gandhidham – Kutch (Mr. Vishal)	222002 222223	—	9898226666
4	M/s. Gadhvi Constructions, Plot No.524, Sector – 5, Gandhidham – Kutch	235772	—	9426215258
5	M/s. Advance Builders Contractors, B-23, Apanagar, Gandhidham – Kutch.		232864 234242	9825255934
6	M/s. Mohan Construction Co., 415, 2/B, Adipur (Mr. Mohan)	—	264140	9825174351
7	M/s. Star Decorators, 17, Plot No.5, 12/A, National Highway, Gandhidham – Kutch (Mr. Vinod Bajaj)	221450	—	—

8	M/s. Kamal P. Chellani, DBZ-S-81-A, GandhidhamKutch (Mr. Kamal)	_____	_____	9825221542
9	M/s. K.K.Construction, E-71, Gujarat Housing Society, Devi Krupa, Sector –5, Gandhidham (Mr. Milanbhai)			230064
10	M/s. Mepabhai Madan, Plot No. 21/22, Sector-9, Opp. KPT Office, Gandhidham Mr. Rajubhai	222209 222210		233627
11	M/s. S. B. Singh, B-110, Sapna Naga Gandhidham – Kutch	239351	_____	_____
12	M/s. Dipesh Construction Co., 11, Apurva Chambers, Ganga Gate, Anjar – Kutch. (Mr. Parth) (Mr. Sukhdevbhai)	242997	243319	9824294260 9825179040
13	M/s. Raj Construction Co., Deepak Complex, Plot No.315, Ward 12/B, Gandhidham-Kutch Mr. Rajesh Makhijani	220911		
14	M/s. M. V. Rajani,444, 2/B, Matruchhaya,Rambaugh Road, Adipur – Kutch (Mr. Narayan)	260800 262920	_____	9825225690

15	M/s. Bhimji Velji Sorathia, 21, Nilesh Park, Plot No.80, Sector – 8, Near New Court Building, Gandhidham – Kutch (Mr. Bhimji Velji)	231383	_____	9825225948
16	M/s. Sollone & Parco Engg. Co., CCX-165, Adipur – Kutch (Mr. Ravi Solanki)	261298 263248		9825222919
17	M/s. Mahesh Construction, Plot No. 415, 2/B, Adipur- Kutch (Mr. Mahesh)	_____	264140	9825091599
18	M/s. Patel Construction Co. Zanda Chowk, Gandhidham (Mr. Tejabhai Kangad)	220421	_____	9825227199
19	M/s. M. G. Bhavnani, Plot No.102, Sector 1/A, Gandhidham – Kutch	_____	_____	9825191636
20	M/s. Patel Engineering Works, Gandhidham	231832		
21	M/s. H.M.G. Gandhidham	235710 234609		
22	M/s. Mukund Limited Mumbai	022- 25347373		
23	M/s. Bajaj Electric Mumbai	022- 23724192		
24	M/s. Mishra Brothers Gandhidham			

		221172		
25	M/s. Sonu Electricals 18, K.P.Shopping Centre, Near Jivan Bharati School, Karelibaug, Vadodara-390018 Shri Jayendrasingh.B. Thakker	02652464108	2647886	
26	M/s. Ravi Electronics, "Prashant", 20, New Jagnath Rajkot – 360 001 Mr. G.K.Patel	465256 460 253		
27	M/s Megha Technicals, CCX - 165, Adipur - Kutch (Mr. Ravi Solanki)	261298 263248	—	9375320232
28	M/s Maruti Construction, Gandhidham – Kutch	—	—	9824893851
29	M/s Ramesh Meghji Sorathia, Anjar – Kutch	—	—	9825225948
30	M/s Mohit Construction, B-168, Shaktinagar, Gandhidham - Kutch	—	—	9825227072

Senior Engineer (Pipeline) should ensure the availability of the Drivers and the Vehicles and report to the Secretary. All Vehicles whether it is of KPT or hired should be parked in the location as decided by the Senior Engineer (PL) and Senior Labour Officer(PO), from where it can be taken for immediate use as soon as the people move into action. The list of travel agencies is given below:

9.26.2 The list of Travel Agencies

Sr. No.	Name of Agency	Phone No.	
01	M/s. Rathod Tours and Travels, Gandhidham	222444	222959
02	M/s. Gayatri Tourist, plot No. 720/721, Valmikinagar, Bharatnagar, Gandhidham.		231715 230252
03	M/s. Panch Tirth Tours, BBZ-S12, Gandhidham	232215 230760	9825234455
04	M/s. Maheshwari Travels, Plaza Centre, Shop No. 110, 1st floor, Plot No. 110, Sector No.8, Gandhidham	232211 234455	252120 253433
05	M/s. Titan Travels, Behind Shyam Electric Stores, Jhanda Chowk, Gandhidham	222832	236911
06	M/s. Rohit Enterprises, Plot No. 99, Sector No. 4, Near IOB, Gandhidham	228550 237538 237547	234140 9825225121
07	M/s. Jai Somnath Travels, Mr. Mishra		9727304414
08	M/s. Agrawal Tourists, Gandhidham	221311 220068	
09	M/s. Ashirwad Travels Gandhidham. Shri Laxma Singh	225608 225609	9825225608
10	M/s. Krishna Travels Gandhidham	220683 234838	
11	M/s. Shiv Tourists, Gandhidham	221454	

12	M/s. Thakker Gandhidham Travels,	225097	9825271072
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9.27 Contact with Railway & GSRTC

Secretary, Dy. Secretary (G) & Dy. Secretary (P) should ensure for the smooth movement of workers/employees for which he may get in touch with the following officers of Western Railway/GSRTC and apprise them about the situation so that the movement of Staff is not suffered.

Transport	Contact Person	Telephone Nos.	
		Office	Residence
Western Railway	Area Manager	221340	236237
	Control Room	232578	
	Enquiry	131/220011	
GSRTC, Anjar	Depot Manager	241192	243746
GSRTC, Bhuj	Depot Manager	220002/220102	
GSRTC, G'dham	Depot Manager	220198	

9.28 Generator Sets

Generators of following capacities have been installed at Kandla, Gandhidham, and Gopalpuri to supply power to various installations in case of power failure:

1. Cargo Jetty Area - 2 Nos of 1000 KVA EACH:

These Generators can cater power inside Cargo Jetty Area, Seva Sadan-III, Nirman Building, and Old C.D.C. Building restricted up to 2000 KVA.

2. Kandla Hospital - 25 KVA
3. A O Building- 200 KVA
4. Gopalpuri Hospital- 45 KVA
5. Guest House- 25 KVA
6. Old Kandla Fire Brigade- 5 KVA

In addition to above, if any additional Generator Sets are required at Kandla or Gopalpuri, the following officers shall be contacted who shall immediately hire/procure or provide in whatever manner the D.G. Sets giving preference to the operational area.

- (i) Deputy Chief Mechanical Engineer
- (ii) S E (Electrical)
- (iii) Executive Engineer (Mechanical)
- (iv) Asstt. Executive Engineer (Electrical) Shri AK Sharma

The above officers shall also be responsible for operation and maintenance of Generators provided at various locations and submits daily report to the Chief Mechanical Engineer about the working of Generators.

Additional requirement will be assessed by Dy CME/S.E (Electrical) and submitted to Chief Mechanical Engineer for approval. Necessary Fuel (POL) shall be procured and stored in advance by the concerned officials of Mechanical Engineering department.

9.29 Fire Dewatering Pumps

There are 10 Nos. of Dewatering Fire Pumps available with Fire-Cum-Safety Officer at various points. The details of which are as under:-

Dewatering Pump	Old Kandla Fire Station	Tilak Fire Station (West Gate-I)	Azad Fire Station (West Gate -II)
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Portable Fire Pump Capacity:270 LPM	04	01	01
Trailer Fire Pump Capacity:1800 LPM	-	01	01
Trailer Fire Pump Capacity:2250 LPM	02	-	-

The Portable Fire Pump single delivery having capacity of 270 litre per minute are useful for dewatering the congested places like ship holds, barges and other intricate areas.

All the above Fire Pumps will be operated by the Fire-Cum-Safety-Officer. The maintenance of major nature and breakdown will be attended by Executive Engineer (Mechanical).

Fire cum Safety Officer(O) 270176 Mob: 98252-27041

Dy. Fire Officer (O) 270176/270178 (R) 226478

9.30 Shipping Navigational Aid Section

Executive Engineer (Dry -dock) shall ensure that heave-up barge "Bhimsen" is shifted to Bunder area and secured properly; Assistant Engineer (Mechanical) shall attend the above work.

Steel Floating Dry Dock

Executive Engineer (Dry Dock) and AE(DD) shall ensure that the Steel Floating Dry Dock and the Electric Wharf Cranes at the maintenance jetty are properly secured as per procedure and compliance reported to Chief Mechanical Engineer and Dy. Chief Mechanical Engineer shall monitor the safety of the Steel Floating Dry Dock.

9.31 Periodical Reporting by all HODS

All Head of Departments shall have to send Action Taken Report to the Secretary / Control Rooms in writing by Fax or through telephone with regard to the action taken by them as per the Action Plan. If the report is not received from the Head of Departments, the Officer In-charge, Control Room shall obtain the

information, compile it and submit the same to the Chairman / Dy. Chairman on 12 hourly basis i.e. twice a day.

9.31.1 Chief Engineer

The Chief Engineer shall ensure through Superintending Engineers that all Road Blockades are not cleared as also he should ensure that blockades caused in Port quarters due to the falling of trees, walls, sheds, etc. are got removed immediately. He will ensure that the colonies are got cleared and wherever logging of water is found, the water is pumped out and disinfected. A report shall be submitted to the Chairman / Dy. Chairman every day.

9.31.2 Chief Mechanical Engineer

Chief Mechanical Engineer, Dy. CME/S.E (E) shall ensure that all Generator Sets are properly functioning at A.O. Building, Seva Sadan-III, P&C Building, Hospitals, and Guest House. They will ensure quick restoration of Power supply arrangements by keeping close liaison with the officials of Pachim Gujarat Vija Co. Ltd. They will report to the Chairman / Dy. Chairman every day.

9.31.3 Action Plan – Land Fire Station

The Port Fire Brigade has its Head Quarter at Old Kandla Oil Jetty area with two Sub- Stations at Dry Cargo Jetty at New Kandla.

The contact Numbers are as under:

Main Station (Emergency Response Centre) - 270176, 270178, 271377

Cargo Jetty – West Gate No. 1- 270439

Cargo Jetty – West Gate No. II - 295974

Fire cum Safety Officer - 270176 (O))/ 98252 27041(M)

Dy. FcSO- 270178(O) / 226478 (R)

9.31.4 Resources Available

Refer 4.12 to 4.14.4

In case of any fire, or other crisis an information is received through telephone - or VHF channel - Fire Station Control Room, the Duty telephone attendant raises the fire alarm bell and lights the vehicle indicating light (turn-out bell and Turn out light)

The Duty Station Officer proceeds to the scene of fire with fire Tenders and crew. Station Telephone Attendant should inform other officers like Fire-cum-Safety Officer, Dy. Conservator and Port Control. Telephone Attendant should inform hospital and if fire is in wharf should inform Traffic Manager. Fire cum Safety Officer after apprising the situation should inform Deputy Conservator directly or through the Telephone Attendant immediately.

9.31.5 Ensuring the Functioning of Telephones

The name and telephone No. of the Officer Telephone Department to be contacted in case of any problem:

1. General Manager, Bhuj(O) 231201/231648 (R)
2. District Engineer, Bhuj(O) 525410
3. SDO(P), Gandhidham(O) 232453/229666 (R)

Dy. Secretary (Personnel) shall ensure that the telephone of all the Head of Departments and other responsible officers of different Departments are functioning properly by ringing personally. In case any of the telephones does not function or give satisfactory service, he shall take up the matter with the higher authorities immediately.

9.32 Accidents in the Channel

9.32.1 Fire on Board Tanker / Anchor / OTB

The Ship Master - Pilot should raise & alarm and inform Kandla Tower/SIGNAL STATION on VHF Channel 8 or 16 about the intensity and location of fire.

Kandla Tower will inform the Dy. Conservator, Harbour Master and FCSO. & TM

Master should immediately ensure that the loading/discharging operation is suspended and all the connected valves are closed.

Master of the vessel should immediately gear up his firefighting equipment and post his staff for extinguishing the fire. CO₂ should be injected in the affected compartments.

Dy. Conservator after contacting the ship will inform Chairman and Dy. Chairman about the situation.

Harbour Master, will arrange for availability of chemical dispersant and its equipments and keep them in readiness in case of any oil spillage.

TUGS, with personnel and equipments should immediately start for tanker. Harbour Master on board Tug also to reach the tanker.

Dy. Conservator to remain in constant touch with the Master/Pilot of the Tanker to assess the situation.

In case no power is available on deck, the floating hoses connected on board can be disconnected by means of mechanical puller. Hose can be heated up slightly and the weight can be taken off. The Special Clamps on the flange can be removed. This operation takes about 20 Meters for each hose.

If it found necessary to safeguard jetty and the tanker is required to be removed from the jetty, one tug should remain near to tow the tanker and when given orders should pick up the fire spring and take the weight off the moorings. Master and the Pilot should take due precautions and safety measures and by using Fireman's suits to send the personnel to forward of the vessel for unmooring the tanker. Two lines to be

passed on to the Tug for towing to a safe anchorage. In case, the magnitude of fire is more and beyond the control, other agencies such as Indian Coast Guard, ONGC to be called for assistance.

9.32.2 Grounding of a Tanker

Master or Pilot of the vessel should immediately contact Kandla Tower on VHF Channel 8 or 16 and give the detailed information and the seriousness of grounding. Kandla Tower Signal Station will in turn inform Traffic Manager, Dy. Conservator and Harbour Master, Kandla Port Trust. Dy. Conservator will inform Chairman/Dy. Chairman.

Harbour Master will immediately proceed to site and will immediately board the vessel and after assessing the situation will inform Dy. Conservator about the seriousness of the crisis.

Dy. Conservator in the meantime will remain at Kandla Tower and will be in constant touch with the vessel and if required give necessary guidance to Master/Pilot.

Dy. Conservator to direct Sr. Hydrographic Surveyor to proceed to grounded vessel and check the exact position of the ship and also the grounding around.

Tugs and Launches available at Kandla should remain in readiness and wait for the order of action from Dy. Conservator /Harbour Master.

Fire-Cum-Safety-Officer along with staff and equipment salvage pumps etc to remain on board fire float.

Master of vessel to obtain soundings of all the tanks and to maintain a record of the same to ensure any leakage. He should also take hand lead surroundings around the ship and plot them on the chart.

Master should inform his Chief Engineer to change over to high sea suction for cooling water.

If found necessary, Dy. Conservator can decide and ask for a small tanker/salvage tug which can be brought alongside of the grounded ship and part of cargo can be discharged to this daughter ship. This will help to lighten the grounded ship.

Master should instruct his staff to prepare all her ropes including insurance wire for towing, pulling operation.

Tug to immediately to proceed to grounded vessel and take towlines and start pulling the vessel under the instruction of Harbour Master. If required, Dy. Conservator can decide and send more than one Tug also to the grounded ship for assistance. In case the vessel cannot be re-floated within a day, a navigational warning should be sent to the Chief Hydrographer, Dehradun and the same will be transmitted through Mumbai Radio and Navtex.

9.32.3 Breaking / Ground of a Ship outside Kandla Port Limit

Kandla Port has not had any major incident of grounding/sinking or breaking of a ship in recent past. However, minor incidence of grounding could be tackled by Port's own personnel and equipments.

If there is any major breaking or grounding of a ship outside the limits of Kandla Port, the Port can activate its own crisis management plan to deal with the situation. On receiving message from the Master of the Vessel/ or from Principal Officer, MMD or Coast Guard, Mumbai, Dy. Conservator/Harbour Master, KPT will immediately inform Chairman/Dy. Chairman, Kandla Port Trust.

Harbour Master will instruct Flotilla Superintendent/Tug Master, Fire-Cum-Safety Officer to keep the tugs, launches in readiness. Crafts with chemical dispersant spraying system at Kandla and Vadinar should rig the booms etc, Store enough stock of chemical dispersant and stay in readiness. In case, there is any major oil spillage port to activate its oil spill crisis management plan.

Port Signal Station to be made Control Room and to remain in constant touch with the Ship. Master should immediately send messages and inform nearest Port or Coast Guard about the latest situation of the Ship.

Port command team headed by Dy. Conservator will mobilize the resources available with Port to help the Ship.

Indian Coast Guard, to utilize the services of Helicopter and indicate the location and magnitude of the oil spill. They should keep the nearest port informed about the oil spill/sleek.

If the oil slick is dangerous/approaching the limits of Kandla Port Trust, the Harbour Master along with one Senior Pilot and Safety Inspector (antipollution Scheme) to proceed on chemical dispersant Spraying craft and to reach oil slick and under his guidance all available port crafts can spray chemical dispersant. They can go up & down and try to stop/minimize the oil slick danger to port, Harbour Master to keep Dy. Conservator informed about the situation.

Indian Coast Guard, IOC, ONGC and other agencies who have the system to recover the floating oil should be directed with oil recovery vessel to the area.

If it is necessary, Dy. Conservator can requisition a privately owned small tanker or tank barge, which can recover the oil, store it for eventual disposal ashore. If the oil slick is very large and beyond the control of the Port, the Chairman should inform the Ministry and seek their guidance for mobilizing equipments from outside Parties.

STRENGTHENING DISASTER RISK GOVERNANCE

9.33 Contingency plans in grave situation

Immediately on the occurrence of a crisis, the local Internal Action Plan under the Disaster Management Act, 2005 would be put into effect by the local/District and the state authorities. If the situation has wider ramifications and warrants response at the State/National level, the Chairman/ Deputy Chairman will contact the Nodal Ministry of the State / Central Government and seek the required help. The concerned authorities would activate its control room, call for a meeting of the Crisis Management Group and put into operation its contingency Plan.

9.33.1 First Information

As and when a critical crisis situation develops, the first information would be sent by the Chairman/Deputy Chairman to the State/Central Nodal Ministry through Wireless/Cellular Mobile Phone/Fax/e-mail or any other quickest possible means.

Security measures at Vital Installations are inspected by I.B. periodically. The Deputy Conservator and Traffic Manager shall implement the recommendations of I.B. with the help of CISF, made from time to time for beefing up/strengthening the security at important vital installations.

9.33.2 Authorities responsible for sending of First Information

Crisis	Authorities responsible for reporting	Remarks
Natural Disasters	District Magistrate or District Collector Indian Meteorological Department State/Central Water Commission	Information relating to forecasting/warning of the natural calamity will be sent by the IMD, State/Central Water Commission to the Relief Commissioner as laid down in the contingency Action Plan of the State/Central Ministry.
Chemical/Biological/RADIO ACTIVE Disasters	Chairman / Deputy Chairman	The Chief of the Public Sector/Undertakings would be equally responsible to send the first information through his channel to the Nodal Ministry.
Major Disaster having off-site implications	Chairman/Deputy Chairman	
Break-down in Power Generation/Supply	Chief Mechanical Engineer and Executive Engineer (Electrical) through Gujarat Electricity Board Authority.	

An Installation	Oil	Chief or In-charge of the Oil Installation through his channel to the Nodal Ministry.	
Hijack of an Indian Merchant ship or Indian Crew in a Foreign ship		Chairman/Deputy Chairman	Commandant of CISF, Traffic Manager, Deputy Conservator would inform to Chairman/Deputy Chairman immediately.

9.33.3 List of Members NDMA

Contact Details of NDMA Officers

Name	Office	Fax	Mob.	E.mail id
Shri R K Jain, IAS (Retd), Member	011-26701710	011-26701716		secretary@ndma.gov.in

Sh. S K Gulati, PPS	011-26701711,	011-26701716		
Mr. D S Butola PA	011-26701713			-
Lt Gen (Retd) N C Marwah, PVSM, AVSM, Member	011-26701775	011-26701783		marwahnc.ndma@nic.in
Smt Seetha Mahesh, PS to Member	011-26701721	011-26701783		seetham.ndma@nic.in
Shri Vijaya Kumaran, PA to Member	011-26701782	011-26701783		
Dr. D N Sharma, Member	011-26701738	011-26701767		dnsharma@ndma.gov.in
Smt. Shashi A Kumar PSO to Member	011-26701761	011-26701767		
Shri Kamal Kishore, Member	011-26701740	011-26701754	9818143429	kkishore@ndma.gov.in
Shri Harish Kumar Arora PPS to Member	011-26701751	011-26701754	9910226153	
Shri Basudev Rajbhar PA to Member	011-26701753		8285642447	

JOINT SECRETARIES

Name	Office	Fax	Mob.	E.mail id
Shri B Pradhan, IAS, JS (Admin & Capacity Building and Training)	011-26701780	011-26701795		jsadm@ndma.gov.in b.pradhan@nic.in
M.Mushtaq, PPS	011-26701876			
Shri A.K.Sanghi,ITS JS (Mitigation, IT& Comn)	011-26701718	011-26701864		mitigation@ndma.gov.in
Shri Munendar Kumar, PA	011-26701720			
Maj Gen Anurag Gupta, Advisor (Ops)	011-26701886	011-26701742	8527892258	advopscomn@ndma.gov.in

Ms Archana, PA	011-26701267			
Ms. Mamta Kundra, Joint Secretary (Policy & Plan)(Additional Charge)	011-26701777	011- 26701816	09599946299	jspp@ndma.gov.in
Ms Indira, PA	011-26701747			
M.Sanjay Singh, PA	011-26701816		9899403773	

FINANCIAL ADVISOR

Name	Office	Fax	Mob.	E.mail id
Smt. Aastha S Khatwani, FA,	011-26701709	011-26701715		fa@ndma.gov.in
Sh. Bharat Bhushan, PPS	011-26701712			

JOINT ADVISORS

Name	Office	Resi	Mob.	E.mail id
Lt Col Vikrant Lakhanpal, JA (IT & Comn)	011- 26701743			jaitcomn@ndma.gov.in , vikrant.lakhanpal@ndma.gov.in
Col Ranbir Singh, JA (CBT)	011- 26701823			ranbir@ndma.gov.in
Vinay Kajla, JA (RR & NDRF)	011- 26701815			vinay.kajla@ndma.gov.in ,
Dhirendra Singh Sindhu, JA (OPS)	011- 26701218			dssindhu@ndma.gov.in
Sachida Nand Singh, JA(MP & P)	011- 26701798			jampp@ndma.gov.in
Alice Kujur, DIR (PP)	011- 26701722			-
S K Singh, Dir (Finance)	011- 26701778			
Yogeshwar Lal,	011- 26701833			

DS (Admin)				
Bhupinder Singh, DS (PR & AG)	011-26701878			

NCRMP

Name	Office	Fax	Mob.	E.mail id
Ms. Mamta Kundra Project Director	011-26701777 011-26714321			pd.ncrmp@gov.in
Shri S.S. Jain Dy. Project Director	011-26701792			dpd.ncrmp@gov.in
Shri Ashok Kumar Sarkar, Project Accountant cum Admn. Officer	011-26701744			adm.ncrmp@gov.in

NDMA CONTROL ROOM

Name	Office	Fax	Mob.	E.mail id
Control Room	011-26701728 011-1078	011-26701729	9868891801 9868101885	controlroom@ndma.gov.in , ndmacontrolroom@gmail.com ,

Librarian shall ring up all the private/public sector companies of the area and inform them about their situation and tell them to evacuate their people and take necessary steps. List of private/public sector companies is as shown in Point No:

9.17.3.2

Senior Labour Officer, Labour Officer along with Executive Engineer (R) and Headmasters of BVM School shall ensure that temporary evacuation centers are established in the school/community center of Gandhidham-Kandla area.

11.1.1 List of Schools in Gandhidham – Kandla Complex

Sr. No.	Name of School	Contact Person	Telephone No.
1	Dr. C. G. High School	Principal	220271
2	SVP Gujarat Vidhyalaya	Principal	220242
3	M.P. Patel Kanya Vidhyalaya	Principal	220705
4	Adarsh Maha Vidhyalaya	Principal	234172
5	Adarsh Kanya Vidhyalaya	Principal	220175
6	Bhartiya Vidhya Mandir, Kandla Bhartiya Vidhya Mandir, Gopalpuri	Head Master Head Master	271049 233684
7	Central School, (IFFCO)	Principal	221288
8	Central School (Railway)	Principal	220657
9	Modern School	Principal	220284
10	Mount Carmel School	Principal	234262
11	Aum Vidhyalaya, IFFCO	Principal	221104
12	Saint Xavier's School, Adipur	Principal	260265
13	Maitri Maha Vidhyala, Adipur	Principal	260445
14	Maitri Kanya Vidhyalaya, Adipur	Principal	260612

15	Model Excelsior High School, Adipur	Principal	260707
16	Gujarat Vidhyalaya, Adipur	Principal	261312
17	Nagarpalika High School, Anjar	Principal	242510
18	Adarsh Nivasi School, Gandhidham	Principal	223246
19	P.N.Amersey School	Principal	223646
20	Shree Gurunanak English School	Principal	238421
21	Swaminarayan Gurukul	Principal	228098
22	Kairali English School	Principal	221050
23	Sarvodaya Pradhamic Shala Near Oslo Cinema, Gandhidham	Mr. Kangodia	227958
24	Ganeshnagar Pr.Shala, G'nagar	Mr. Kangodia	
25	Jagjivan Pra. Shala, Sapnanagar, Gandhidham	Mr. Kangodia	
26	Cargo Pra. Shala, Sapnanagar, Gandhidham	Mr. Kangodia	
27	Old & New Sunderpuri Schools	Mr. Srimali, HM	224867
28	G'dham Pr. Shala, Near Shivaji Park, Gandhidham	Mrs. Arunaben.	229255
29	Adipur Prathmic Shala, Adipur	Mr.C.M.Rami	264525 264181
30	Kandla Pr. Shala, Shirva Camp & Thermal Colony & United Salt Works	Mrs. Shantaben	253198

Dy. Secretary (P) shall ensure that the telephone of all the Head of Departments and other responsible officers of different Department are functioning properly by ringing personally. In case of any of the telephone does not function or gives satisfactory service; he shall take up the matter with the Higher Authority of Telephone Department.

The staff attendance on days when the Action Plan is in operation shall be collected from PA to HoDs and complied by Asstt. Secretary and reported to Chairman/Dy. Chairman every day with separate list of

absentees. Secretary will do the overall supervision of the work and report compliance to the Chairman/Dy. Chairman within two hours of the warning received.

Secretary will be the overall in charge for liaison work with central/state government officials/IMD, Ahmadabad/Pune Laboratory/ Delhi Laboratory in which he can take the help of Dy. Secretary (P) and Dy. Hydraulic Engineer and report the matter to the Chairman/Dy. Chairman immediately. They shall remain present in all the meetings relating to the Action Plan and report the proceedings of the meetings to the Chairman/Dy. Chairman. They shall also communicate the action to be taken to the concerned Head of Departments. List of IMD telephone numbers is shown below:

11.1.2 List of Important Telephone Nos of Indian Meteorological Department

Websites – www.imd.gov.in, <http://www.imdahm.gov.in/index.html>

All Head of Department shall have to send Action taken report to the Secretary/Control rooms in writing by fax or on telephone with regard to the action required of them as per the Action Plan. If the report is not received from any of the HoDs, the Officer In charge, Control Room shall obtain the information, compile it and submit the same to the Chairman/Dy. Chairman on 12 hourly bases i.e. twice a day.

11.2 Contacts of Officials of GAD following nodal officer will form a team

Sr. No.	Designation	Present incumbent	Contact Telephone Numbers		
	Mr Bimal Kumar Jha	Secretary	220167	231939	233172
01	Mr. Suresh Balan	Dy. Secy (G)	221375	236086	
02	Mr. DEEPAK RANE	Sr. Dy. Secy	220033	234730	

11.3 Duty Roster for Staff of General Administrative Department

AS ABOVE

11.4 Central Industrial Security Force (CIF)

The Sr. Commandant shall remain in contact with in charge of control room at Kandla (HARBOUR Master) regarding the position of the cyclone / calamity.

The Sr. Commandant shall ensure that Public Address System is fitted on Jeeps provided to CISF. He will make arrangements for announcements, with the coordination of police through Public Address System mounted on at least 03 vehicles. The CISF personnel will procure truck with the help of TM. The list of fleet owners and major lift operators are given below:

11.4.1 List of Major Heavy Lift Operators at KPT

Name of Party	Name of Contact Person	Phone Number
Swastik Heavy Lifters	Mr. Jigneshbhai Mr. Aslambhai	9825758151 9825228421
Kutch Carrier Transport Co	Mr. C. R. Thacker	9825225591
Agarwal Handling Agency	Mr. Rakesh Thacker	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

11.4.1.1 Additional list of firms for pay loaders / cranes

M/s Mahalaxmi Transport Co., Plot No. 35, Sector No. 8, Behind Hotel Fun & Food, Gandhidham	Mr. H K Rathod	(O)222387 (R)233500
M/s Kandla Earth Mover, DBZ-S-151, Gandhidham	Mr. Sanjay Goyal	(O)221759 (R)222338 (M) 9825020550

Mr. Lalji Bhavanji Sathwara, Laljibhai Sathwara, Plot No. 27, Shop No.5, Sector9/A, Gandhidham	(O)234118 (R)232566 (M) 9825225957
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11.4.1.2 Equipments available with ABGKCTL TABE REMOVED

11.4.2 List of Fleet Owners at KPT

Sl. No.	Name of Company	Contact Person	Tel. Office	Tel. Resi.	Mobile
01	M/s A V Joshi & Company	Mr. Ramesh Singhvi Mr. Thacker MR. Harshandhu	231386 232605 233147	234176 221451 234325	98251 91325 98252 26105 98252 26013
02	M/s Rishi Shipping	Mr. B. K. Manshukhani Mr. Manoj Manshukhani	220843 229830 238943	234889 235587	98252 25170
03	M/s Maheshwari Handling Agency	Mr. C. P. Maheshwari Mr. Chandan Maheshwari	223228 230393	222339	98252 27111
04	M/s ABC	Mr. Latif Mr. Mithu Mr. Kasam	220483 221390 270190	234163 231477 251684	98252 26707
05	M/s Ganesh Transport	Mr. Hira Rabari Mr. Visa Rabari	223638 223915	260425	
06	M/s Kewar Carrier		220483 227553	234163	

07	M/s Krishna	Mr. K. M. Thakker	223814	220998	98250 19699
	Transport Service	Mr. Pankaj Thacker	224938	234988	98252 25228
08	M/s Gautam Freight Ltd	Mr. Ramesh Singhvi	220163	230328	98251 91325
			230345	234176	

11.5 Contact Nos of CISF Officials

S. No	Designation	Contact Telephone Numbers		
		Office	Res	Mobile
01	Commandant	271037	229140	9825227282
02	Dy. Commandant	271036	220192	9825227045
03	INSPECTORS			8500495813, 9045696584
04	Control Room	271040		
05	North Gate	270440		
06.	West Gate – I	271039		
07.	West Gate II	270876		

11.6 Finance Department

As soon as the Calamity/Cyclone warning Signal No. 5 is hoisted the Dy. Director (EDP) should monitor it through Internet and give two hourly printouts to Dy. Conservator, Secretary, Chief Engineer, FA&CAO, Dy. Chairman and Chairman. And Dy. Director (EDP) will monitor the website in the A O Building, Gandhidham.

All Head of Departments would make a judicious assessment regarding the requirement of funds by them to meet with the different exigencies, which they may have to handle on account of the Cyclone/Calamity situation. The Head of Departments would inform the FA&CAO on telephone or in writing or through a Messenger regarding the requirement of advances. The FA&CAO in turn would examine the advances

sought by the Head of Departments and sanction the advances early without any further delay. The FA&CAO would keep the Chairman and Dy. Chairman informed about the amount released by him and seeks approval.

11.7 Medical Department

Two Casualty Emergency Wards, one at Gopalpuri and other at Kandla Hospital shall start functioning as soon as warning of Cyclone is received. Chief Medical Officer will ensure that no Doctor is given leave during the emergency period. These casualty emergency wards will function round the clock with posting of Doctors and Staff round the clock. Chief Medical Officer will ensure the functioning of casualty emergency wards at Gopalpuri and Kandla. A Register shall be maintained at both the places where in the record of patients attended would be maintained. Adequate number of chlorine pills should be distributed after Cyclone to avoid epidemic from spreading. Chief Medical Officer shall submit a report every evening to Chairman/Dy. Chairman.

11.8 During Disaster

1. Maximum alertness of staff members for their safety.
2. Ambulances/vehicles with Drivers to be kept standby awaiting further orders.
3. Liaison with: - Control Room, Disaster Site/Spot, P.A.s to all HoDs, New Kandla Hospital.

(Action: P.A. to CMO)

11.9 Post Disaster Phase

11.9.1 Tackling of Patients

1. Use of ambulance will be purely on priority basis. The A.C. Ambulance can be used as an Emergency Mobile Van for carrying medicines along with a doctor and other essential Para-medical staff, to the site of crisis.

(Action: Dr. Sunil Suryavanshi)

2. Line of treatment to be decided by attending Doctors, such as Indoor/Outdoor/Under observation etc.

(Action: All Doctors)

3. Cases will be attended depending upon the gravity of injury/condition of case, i.e. very serious, stable. (Action: All Doctors)
4. To ensure supply of adequate medicines and any other items. (Action: AMO Stores / S P S K)
5. Dead bodies to be shifted to Govt. Hospital, Rambaug promptly for identification, disposal, and issue of death certificate etc.

(Action: Mamlatdar/PSI/Medical Supdt. Rambaug Hospital/PA to CMO)

6. If needed be, liaison with local Medical Practitioners, Local Hospitals, etc. (Action: P. A. to CMO.)
7. If need be, to arrange for outside ambulance, in consultation with FA&CAO to whom details have been submitted earlier.

(Action: P. A. to CMO.)

8. Transfer of serious patients to Govt. Hospital/Private hospitals , Bhuj/ Rajkot/ Jamnagar be made but such transfer to be restricted.

(Action: All Doctors on approval by CMO)

9. To mobilize additional nursing /Para-medical staff to cope with additional workload.

(Action: CMO PA tto CMO)

10. Re-deployment of Manpower from Gopalpuri Port Hospital to Kandla Hospital and vice versa.

(Action: C.M.O.)

11.10 Prevention of Epidemics

1. Chlorination of drinking water at source. (Action: Sr. Engr. (P/L) & Estate office In-charge)
2. Mass Survey of residents of Port Colonies at Kandla and adjoining areas. (Action: Dr. Malik & Volunteers)

3. To get chlorine tablets from DHO-Bhuj and arrange for distribution thereof. (Action: Dr. S. B. Suryavanshi and Volunteers)

4. To educate residents/public to promote hygienic condition in and around their dwelling place, use boiled water

(Action: C.M.O. and Volunteers)

5. To shift cases afflicted by contagious or infectious diseases to Govt. Hospital / Private hospitals and notify such cases to the notice of State Authorities.

(Action: C.M.O.)

6. To ensure hygienic condition/cleanliness in both hospitals and colony in coordination with concerned staff of respective Estate Office.

(Action: Dr. Suryavanshi & Dr. Malik with in charges of respective Estate Officers)

7. In Rehabilitation Centre, Medical care will be looked after by Dr. Mahesh P Bapat & AMO besides supply of Chlorine Tablets.

8. To provide on the spot medical-aid at New/Old Kandla Port colonies. (Action: SMO In

9. Antidotes of all the poisonous gases to be kept ready. (M.O. (P)/Safety Officers/AMO)

10. Any further actions depending upon the conditions and restoration in the matter being decided by Administration.

11. Re-deployment on services as mentioned before.

12. In life threatening condition of Staff members - their evacuation.

11.11 Marine Department

As soon as warning of Cyclone Signal No. 5 or above is received, following measures shall be taken:

- Setting up of Control Room at Signal Station.
- Pilots and other Supervisory personnel in Flotilla Section should reach Kandla even if they are on leave, to tackle emergency, if any.
- Evacuation of Ships and securing all Port Crafts at Shortest possible time.
- Essential Staff (Fire Brigade) will not be given any kind of leave.
- The following personnel of Marine Department will not be granted any leave and they shall report for duty including holidays, during such time when Action Plan is put into operation.

⇒ All Operational Staff in Flotilla Section and Signal Station.

⇒ Ministerial Personnel at Point No: 11.11.1

11.11.1 Particulars of the Action Plan Committee Members

- For dewatering, if required, Fire-Cum-Safety-Officer will make arrangements by operating the dewatering Fire Pumps available with him.

11.12 Ships

- All the Pilots of the Port should reach Kandla immediately in case of emergency.
- Dy. Conservator/Harbour Master/Pilots should be available at Kandla during emergency.
- Removal of vessels whenever the cyclone is located in close proximity to the danger line plotted between 65 degree E longitude 18.2 degree N latitude and 73 degree E longitude 18.2 degree N latitude. Map showing the above position is given at Annexure-XXX.

Under such a situation the ships shall be removed during 1st/next available tide. It will be the duty of Harbour Master and DC to ensure that the ships are removed during 1st/next available tide as soon as the storm reaches to close proximity to the danger line as defined above without seeking any further instruction from the higher authorities. This action shall be taken automatically and suo-moto without any confusion and for which purpose Traffic Manager shall stop all loading and unloading operations immediately upon instructions from Dy. Conservator, so as to enable him to remove the vessels in time. The removal shall be done with the help of all the available Pilots plus all empanelled Pilots together at one go in the shortest possible time, so as to ensure that all the vessels cross the bar before the tide restriction sets in.

Dy. Conservator shall ensure that all ships are moved out of the Harbour at the earliest. All pilots shall immediately report at Kandla and stay there till the Action Plan is in operation. Dy. Conservator/Harbour Master shall immediately plan removal of vessels to the OTB as soon as the Action Plan is put into operation irrespective of the Single number, which must be hoisted. If, it is impossible to remove them, all other steps should be taken to ensure safety of the vessels at the Port as also it would not cause any damage to the Port. Dy. Conservator shall also ensure adequate stock of fuel for all crafts.

11.13 Securing of all Crafts

Dy. Conservator /Harbour Master shall immediately arrange for securing all the Port Crafts at safer places, so that there is no loss to the Port and send a report to the Chairman/Dy. Chairman as early as possible after operation of this Action Plan. Flotilla Supdt. (Mr. I. D. Bhagchandani) shall be overall in charge of each craft for ensuring their safety.

For parking of crafts in emergency, three places are mainly identified, viz. Bunder Basin, Launch Jetty and Maintenance Jetty as per:

11.13.1 Placement of Port Crafts on Cyclone Warning

(A)	Shipping Tugs	All 35 BP tugs and Hired tugs	Bunder Area
			Maintenance Jetty (West side)
(B)	Pilot Launches & Survey Launches	All Launches	Floating Crafts Jetty Inside area
			Bunder Basin
			Inside Bunder Area North

			Side.
(C)	G.S. Launches & Mooring Launches	M. L. Mrinal	Inside Bunder Area North Side on Pilot Launches
		M.L. Vaishali M L Alli M L Thamrai	Inner Side of Floating Craft Jetty
		M. L. Vijay M. L. Priyadashani PL Prahari, Rakshak	Inside Bunder Area North on G. S. and Pilot Launches.

Maximum number of crafts such as mooring launches, GS launches and pilot launches will be placed in Bunder Basin.

In the inner side of Passenger Jetty, one pilot launch and one G S launch will be kept.

Three tugs will be kept in the inner side of maintenance jetty.

Priority will be given to the Port crafts for parking in the bunder basin and other areas. Rest of the places available in the Northern side of bunder basin area will be allowed to the self propelled barges and private crafts. Dumb barges will be allowed on the beach between maintenance jetty and oil jetty area.

BS will render all possible assistance to FS, being the overall in charge of the crafts. The following flotilla staff will take care of the crafts.

11.13.2 Flotilla Staff Will be decided by FS as per available team with mooring crew

11.14 Private Barges / Crafts

The parties who have been Harbour Crafts License by the DC have to keep their barges and crafts inside the port limits being earmarked for the purpose.

Necessary instructions shall be issued to all these people having valid license immediately. The work of informing these parties will be carried out by the Office Supdt. of Dy. Conservator's office and will personally ensure that the instructions are carried out and reported to Harbour Master within two hours of the Action Plan coming into operation. The representatives of the above parties shall reach Kandla at once, failing which the Dy. Conservator will cancel the license granted to them and take over the barges/crafts of the party who violates the instructions.

The position shall be appraised to Chairman / Dy. Chairman within two hours of the receipt of warning and at frequent intervals.

11.14.1 List of Duty Roster of Marine Department (Ministerial Staff)

Sr No	Name	Office	Residence / Mobile
01	PA to DC	220235	9428032483
02	Mr. AR Jadeja, Signal Supdt	270549	9825427400
03	Office Supdt.	221971	
04	Assistant	221971	
05	Sr. Clerk	221971	
06	Messenger	221971	

11.14.2 List of Telephone Nos & Addresses of DC, HM & Pilots

Sr No	Name of Officer / Pilots	Address of Gandhidham Res	Tel Nos: Cell / Landline
01	Capt T Srinivas DC	A – 7, Gopalpuri	9825232982 232806
02	Shri S K Pathak HM	C – 32, Gopalpuri	9825803499 231310
04			
05	Capt A K Sharma Pilot	C – 40, Gopalpuri	9879603642 238154
06	Capt V Madaan, Pilot	C – 31, Gopalpuri	9879603643 221478
07	ALL AVAILABLE CONTRACT PILOTS WILL BE CONTACTED THROUGH SIGNAL STATION		
08			
09			
10			
11			
12			
13			
14			
15			
16			

11.14.3 Contract / Empanelled Pilots WILL BE CONTACTED BY SIGNAL STATION

11.14.4 Sections

1. Flotilla Section 270280

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Mr. Sunil Kumar	Flotilla Supdt.	270280	226121		7874627756
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2. Signal Station 270549/270194/9825227246 Fax 270624

3. Fire Station 270176/270178/270439/550421/271244/271377

In case of Natural Calamity, first start with rescue operations, restoration activities on war footing on the advice of Chairman/Dy. Chairman, Dy. Conservator/ Harbour Master/Fire-Cum-Safety-Officer/Flotilla Supdt as the case may be.

11.15 Traffic Department

After, the warning of Cyclone or any other Natural calamity is issued at the Port, Traffic Manager shall ensure that the loading/unloading operations at the Port are stopped immediately, hatches closed, ships derricks properly secured and all labourers evacuated from the Port Area. Public Address System shall be installed at the Cargo Jetty Area, which shall be under the charge of Traffic Manager. He shall use it for necessary arrangements relating to evacuation. Traffic Manager should also ensure that responsible persons make announcements in a proper way, so as not to create any misunderstanding/panic.

Notwithstanding above, Traffic Manager shall stop all loading and unloading operations immediately upon instructions from Dy. Conservator, so as to enable the latter to remove the vessels in time.

The responsibility of evacuating the Port Shore Workers and Private Shore Labourers rest with Traffic Manager. He along with, Dy. Traffic Manager, Mr. Gulrajani, Safety Officer and Dy. Commandant, CISF should ensure that the Port is completely evacuated and there is no fresh entry in the Custom bounded area. Dy. Traffic Manager should get in touch with the Main Contractors in the regard.

Traffic Manager shall render necessary help to procure requisite number of Trucks for Public Announcement and evacuation.

Traffic Manager shall inform all the Stevedores List given below:

11.15.1 List of Stevedores

Sr. No.	Name	Address	Fax No.	Telephone Nos.	
				Office	Resi.
1	M/s. Cargo Movers	"Cargo House" BBZS-32A, Gandhidham	231687	220453 231365	261280
2	M/s. DBC & Sons (P) Ltd.	Seva Sadan-II, Room No. 303 / 304, New Kandla	270631	270503 270263 270348	-
3	M/s. A.V.Joshi & Co.	Plot No. 18, Sector-8, Maitry Bhavan, Nr. Post Office, Gandhidham – Kutch	233924	231070 232227 231588	234909
4	M/s. Agarwal Handling Agencies	DBZ-N-47, Gandhidham – Kutch	232749	220282 233187	232749
5	M/s. ACT Shipping P. Ltd	Seva Sadan-II, Room No. 206/207, New	232175	270111 270112 270015 229967	261308 231416

		Kandla			
6	M/s. Cargo Carriers	214/215, Rishab Corner, Plot 93, Sector- 8, GIM	230030	220816 231649 230030	231694
7	M/s. Cargo Clearing Agency (Gujarat)	Plot No. 271, Ward 12-B, Gandhidham	233034	221721 220655	231452
8	M/s. Chotalal Premji Stevedores Pvt. Ltd	C-8, Shaktinagar, GIM	231509	270009	-
9	M/s. Hiralal Maganlal & Co.	C-11, GIDC Area, Gandhidham – Kutch	223914	223914 231832	223878 232430
10	M/s. New Dholera Shipping Company	Goyal Commerce Centre Building - 1, Plot No.259, Ward 12B, Gandhidham - Kutch	-	222637 232267	237284
11	M/s. J.M. Baxi & Co.	Seva Sadan – II, Room No. 301 / 306, New Kandla	270646	270630 270550 270448	260427
12	M/s. Pestonjee Bhicajee (Kutch)	Seva Sadan-II, 203, New Kandla	270650 270556	270257 270367	262914

13	M/s. OTA Kandla Pvt. Ltd.	BBZ-N-324, Gandhidham	223241	220145 270560	223241
14	M/s. Purshotam das Jeramdas & Co.	5, Vaswani Chamber, 16, Sector-8, GIM	222850	238242 222598	220598
15	M/s. R. Tulsidas & Co.	Ahit Building , Plot No.323, Gandhidham – Kutch	232308	222717 221943	-
16	M/s. Robinsons	101 / 102, Maritime House, Plot No.45, Sector – 9A, Gandhidham – Kutch	234394	221578 223836	231767
17	Rishi Shipping	Plot 50, Sector 1/A GIM	238943	229830 229831	
18	M/s. Vinsons	BBZ-S-25, Gandhidham – Kutch	231948	220466	222395 239460
19.	Sical Logistics Ltd	403, 4th Floor, Madhuban Compex, OSLO, GIM	234416	234646 234194	
20	Parekh Marine Agency	C-8, Shaktinagar GIM	231509	229297 221158	

21	Krishna Shipping and Allied Services	Transport Nagar, NH GIM	233135	230501 223814 229085	
22	Kevar Carrier Handling & Transport	Shop 24, Tolani Chamber, Sector -8, GIM	228298	228298	
23	Trinity Shipping & Allied Industries	Trinity House, Plot 46 Sec 1/A, GIM	232060	230911 230910	

24	Velji P & Sons(P) Ltd	2nd Floor, Deepak Complex, 315, 12/B GIM	236168	231545 231546 225466	
25	Asean Marine Services	Ashit Bldg, Plot 33 Sector 1/A, GIM	232308	222717 221943 222145	
26	Rishikiran Roadlines	Kiran House, Plot 8 Sector 8, GIM	231422	231894 234108	
27	Universal Shipping Services	Hotel Sea Bird, Plot 173, Sector 1/A, GIM	235251	230663 226050 226037	
28	R.T.Bhojwani & Sons	DBZ -S- 146, GIM	232423	222211 221831	
29	Logistic Enterprises (P) Ltd	C-8, Shaktinagar, GIM	231509	235341 230587	

30	Seaways Shipping (P) Ltd	2nd Floor, Plot 351 Ward 12/B, GIM		226183 237147	
31	Seacrest Shipping Services Pvt. Ltd	216, 2nd Floor Om Corner, Plot 336 Ward 12/B, GIM	227028	233325	
32	Shree Maruti Shipping Services	18/21, Swaminarayan Bldg, Sector 9, GIM	234107 250690	233245 237247 250690	
33	Liladhar Pasoo Forwarders P.Ltd	Plot 4, Sector -1 KASEZ, GIM	252383 253506	252286 252297 252612	
34	Shree Radhey Shipping Company	14-16/C, GF Green Park, GIM	232967	222919 228919 238883	
35	Pearl Shipping	220, Rishab Corner, Plot 93, Sector 8 GIM	235570	225283 225284	
36	Patel Shipping Agency	Patel Avenue, Floor 2, Plot 170, Sector 1/A, GIM	231143	224024	
37	Ashirvad Shipping	18-21, Swaminarayan Bldg, Sector- 9, GIM	250690	233245 237247 222822	

38.	M/s. Swaminara yan Vijay Trade Carriar	1st Floor, H-6, Op. Tejas Society, Ghatlodia, Ahmadabad	079- 231983	231981, 231982	
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11.16 Mechanical Engineering Department

- Marine Engineer/Engineer In charge should be available in emergency cell and remain in constant touch with Chief Mechanical Engineer/Signal Station and Assistant Engineers posted on Shipping Tugs.
- All Assistant Engineers (D/T &F/C) should be available on operational tugs irrespective of their duties. They should keep main engines and associated equipment in readiness all the times.
- Assistant Engineers posted in tugs should contact Superintending Engineer (Mech)/ Engineer In-charge for all technical & personal problems.
- Assistant Engineer (F/C) will be responsible for timely supply of food packets and drinking water to officers and staff of tugs.
- SE (Electrical) will be responsible for Securing Cranes at Cargo Jetty. He may, if need be inform about requirement of advance and to draw accordingly. He will be responsible to run 2 X 1000 KVA Generator Sets at Cargo Jetty Area in case of Power failure and also maintain additional Generator sets required at Kandla/Gopalpuri and Attending work of maintenance of major nature and breakdown.
- Asstt. Executive Engineer (Mech.) and JE (Mech) will be responsible for timely supply of Drinking Water/Food Packets to the staff of Mechanical Engineering Department during operation of the action plan.
- Assistant Engineer (Mech.) will be responsible to attend breakdown of Fire Fighting Pumps and DG Sets of 2 X 1000 KVA at Kandla.
- Steel Floating Dry Dock and one Electric Wharf Crane at maintenance jetty and one crane at bunder area are to be properly secured by Executive Engineer (Dry Dock) with help of his team mentioned below, as per prescribed procedure and concerned officers shall constantly monitor the safety of the

Steel Floating Dry Dock and Electric Wharf Cranes in side Bunder Area. He shall ensure all the required wedges, wire ropes, shackles etc.. and other fixtures as required to be kept ready so that the same can be fixed without loss of time & to check the site for the requirement, from time to time.

Action: XEN (DD) and Asstt. Engineer (FC) will lead the team of JE(Mech) and will be in contact with Executive Engineer (Mech) and Chief Mechanical Engineer/Deputy Chief Mechanical Engineer.

- All the V.H.F. and other Wireless Sets, and other required equipments of VHF Unit, including the sets kept at S.F.D.D. should be kept in perfectly working condition and the batteries are fully charged and to be kept in ready position and staff will remain in touch with control room till the emergency is called off to attend all communication equipments. It shall be responsibility of the Control Room Staff to ensure that timely information is passed on and timely and proper monitoring is done.

Action:, Assistant Engineer (DD) and R./R. Technician will render all possible assistance to Ex. Engineer(DD) during the course of calamity period.

- All the vehicles belonging to the Mechanical Engineering Department to be kept in perfectly working condition and sufficient stock of fuel and lubricant to be kept in ready position.

Action: Assistant Engineer (Mech.) with the help of Junior Engineer (Mech.) Garage

- During the course of calamity all the vehicles lying inside the premises of Auto Workshop should be kept in the parking ways meant for parking the individual vehicles and inside the shed. No vehicle is to be parked under any tree or under any such structure where there is possibility of falling such structure or tree over the vehicles. All the concerned drivers to be informed accordingly well advance to avoid such possible damage to vehicles and to remain present at duty place in consultation, Vehicle –in-charge of Pipeline Division.

Action: Assistant Engineer (Mech) with the help of Junior Engineer (Mech) Garage.

- Record of attendance of the employees during these periods to be kept ready and to be fed to the Control Room or any official responsible for such duties.

Action: Assistant Executive Engineer (Mech), Assistant Engineer (Mech) with the help of Head Clerk (Mechanical Division) and Divisional Accountant for all sections.

- Assistant Engineer (DD) to remain in Control Room at New Kandla to attend the communications with help of R/R Technician.

- Assistant Executive Engineer (Mech) and, Assistant Engineer (Mech) are to be associated with Executive Engineer (M) to constantly monitor the safety of the Port Crafts.
- The heave up water barge "BHIMSEN" is shifted to Bunder Area and secured properly in Naval Aid Salvage Section and Floating Craft. Absent/Present report of the above staff will be reported to the concerned section immediately on

starting of each shift and maintenance of major and breakdown etc... Action: Mr. Manohar Dana, Assistant Engineer (Mech)

- All the telephones and intercom telephones and their allied communication systems and equipments should be kept in perfect working condition to ensure that timely information is passed on and timely and proper monitoring done till the emergency is called off. He will ensure quick restoration of telephones by keeping close liaison with the concerned personnel. He will report to the Executive Engineer (Electrical) every day and to carry out all work assigned by the Executive Engineer (E) in case of emergency.

Action: Assistant Engineer (Instru).

- SE (E) and Executive Engineer (E) shall be responsible for liaison with the PGVCL for receiving power in case of power failure. In the event of disturbance in the distribution network necessary arrangements shall be made by them as per the requirement depending upon the situation.
- If any additional Generator Sets are required at Kandla or Gopalpuri, the following officers shall be contacted who shall immediately hire/procure or provide in whatever manner the DG Sets giving preference to the operational area.

1. Superintending Engineer(E)

2. Executive Engineer (Electrical)

3. Executive Engineer (Mechanical)

4. AXEN(E)

The above officers shall also be responsible for operation and maintenance of Generators provided at various locations and submits daily report to the Chief Mechanical Engineer about the working of Generators.

Additional requirements, if any, will be assessed by Dy. CME and the same shall be submitted to Chief Mechanical Engineer for hiring, well in advance so that XEN (E) can take necessary action for hiring, installation etc...

- After the warning of Cyclone or any other Natural Calamity is issued at the Port, Chief Mechanical Engineer shall ensure immediately that the cranes are secured and properly locked as per procedure and report submitted to the Chairman/Deputy Chairman after the operation of the Action Plan.

The following officers shall constantly monitor the safety of the cranes;

1. Executive Engineer (Electrical)

2. Executive Engineer (Mechanical)

The responsibility of evacuating all Mechanical/Electrical and Civil workers rests with Chief Mechanical Engineer with the assistance of respective Executive Engineers.

The maintenance of major nature and de-watering fire pumps operated by FireCum-Safety-Officer will be attended by Executive Engineer (Mech).

Executive Engineer (Dry Dock) and, AE(DD) shall ensure that the Steel Floating Dry Dock and Electric Wharf Cranes at the maintenance jetty are properly secured as per the procedure and compliance reported to the Chief Mechanical Engineer immediately. SE (Mech) shall monitor the safety of Steel Floating Dry Dock.

The following staffs have to report for duty even if it is a public holiday to actively participate in the Action Plan and they shall be responsible for record keeping of attendance, preparation, and submission of reports etc.

1. P A to CME

2. Office Superintendent

3. Superintendent Accounts

4. Sr. Clerk

5. Junior Clerk

11.16.1 List of Duty Roster of Mechanical Engineering Department As formed by CME on available officers

Name of Officer	Designation	Office	Resi.	Fax
Mr. SAROJ DAS	CME	270632 270184	231043	270184
Shri A Ramaswami	Dy CME	270426	226067	
Mr. P Srinivasu	SE (E)	271010		
Mr. B J Solanki	SE (M)	270352		
ABOVE OFFICERS WILL BE FORMULATING A TEAM				

11.17 Civil Department

Based on the practical experience and seriousness of the two Natural Calamities - the devastating Cyclone in 9th June 1998 and the Earthquake on 26th January 2001, the following Action Plan for Civil Engineering Department, is proposed to be implemented.

As soon as the message on anticipated Cyclone/Natural Calamity is received from concerned authorities, the same will be intimated to all the concerned under the Civil Engineering Department and will be instructed to be alert. All the staff members/officers should note that they will come into action on their

own as soon as the Warning is issued without waiting for any further instructions. Failure on the part of any employee/officer to carry out the earmarked Action Plan shall attract severe consequences.

Immediately after receiving the information on the Natural Calamity, nobody will be granted any kind of leave and the persons who are already on leave will be called back after canceling the leave.

Absent/Present report of the staff and the officers will be reported to the concerned Section immediately on starting of each shift for this purpose, Sectional Heads of all Divisions will be responsible to report the matter to P. A. to Chief Engineer for compilation of the information and onward transmission to General Administration Department.

The Engineering Department will assist in shifting of the persons to safe places in the event of such action is required.

Water Supply arrangements will be made to various colonies/sites of work/camps where the workers are shifted, etc. The Senior Engineer (Pipeline) will be the in charge for supply of water to various destinations.

Sufficient number of vehicles will be arranged for transportation workers/staff/officers. This arrangement will also be made by the Senior Engineer (Pipeline).

The Engineering Department will ensure that all Road blockades are got cleared as also blockades caused in Port Quarters due to failing of trees, walls, shed, etc. are got removed immediately. Further, it will be ensured that the colonies are got cleared and whatever logging of water is found is pumped out and disinfected. A report will also be submitted to Chairman/Dy. Chairman.

11.17.1 The following officers are to be contacted in the event of any such problems

Area	Designation	Office	Resi.	Mobile
New Kandla	XEN(R)	236165	222056	9913949700
Gopalpuri	XEN (TD)	223912	235683	9427205610
Old Kandla	Senior Engineer (Pipe Line)	220013	232880	9825225962

Cargo Jetty	Executive Engineer (Harbour)	270429	252624	9825227046
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11.17.2 List of Duty Roster of Civil Engineering Department CE will form a team as per

Mr. SSP PATIL	Chief Engineer	233192	228777	220050	9825227243
Mr. . V R Reddy	Dy. CE	270429	228869		9825227038
Mr. K J Todarmal	Exe Eng (R)	236165	220670		8980049099
Mr.	SE (PL)	220013	229164		9825225962
Mr	SE (H)				
Mr.B. Rajendra Prasad	Exe Eng (D)	220038	232880		9725338260

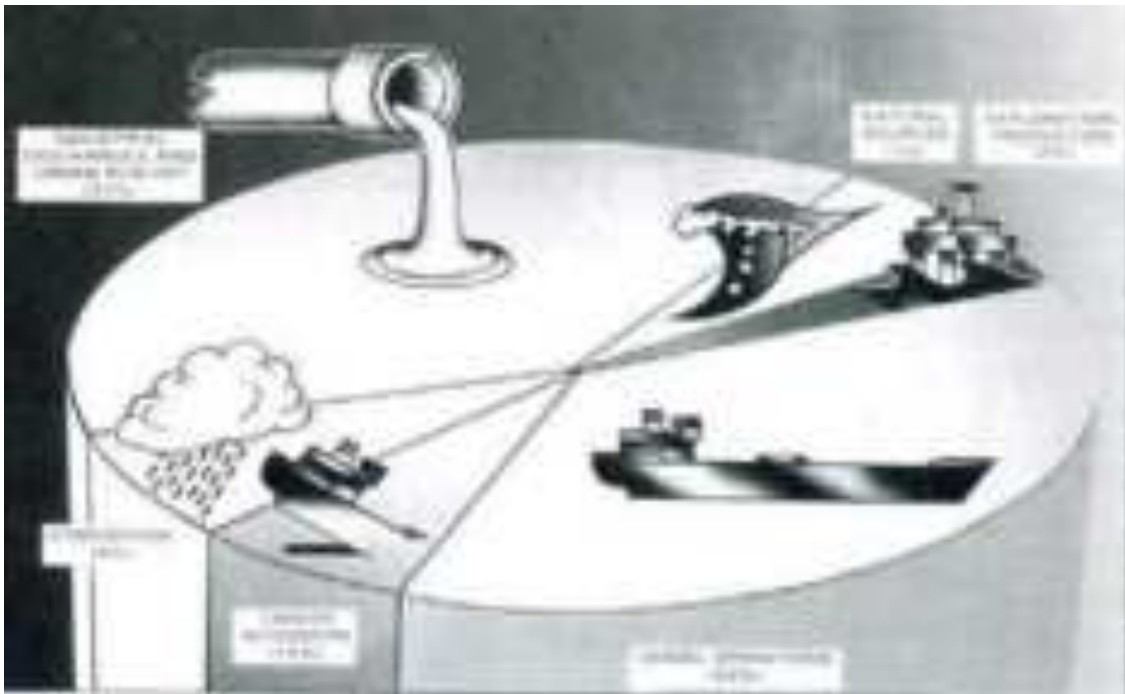
Periodical Meetings will be conducted with the Executive Engineer's/ DSOs/Staff Member to assess the progress made during the day and to instruct further course of action in the matter.

12 RESPONSE TO MARINE OIL SPILLS

12.1 Sources of Petroleum Hydrocarbons

The best estimate for the total input of petroleum to marine environment from all sources is some 3.2 million metric tons per year. By far the biggest contribution comes from terrestrial sources, mainly in the form of municipal and industrial wastes. Accidental spills from ships, together with offshore exploration and production activities, account for about 0.47 million metric tons which is a relatively small amount considering the worlds current production of three million metric tons, half of which is transported by sea.

Major Inputs of Petroleum to the Marine Environment. (Figure)



12.1.1 Accident Spills from Tankers

Accidental spills from tankers contribute an estimated 4,00,000 tones annually. Analysis of tanker spills occurring throughout the world shows that the majority (some 75%) occur in port during routine ship operations such as loading, discharging and bunkering. Most of these spills are, however, relatively small: over 92% are less than 7 tones given in the table below and probably, in total, contribute less than 20,000 tons annually. In comparison, accidents such as collisions and groundings give rise to less than 10% of all spills from tankers, but a quarter of these are larger than 700 tones given in the table below. In fact, a few large accidents give rise to the majority of the oil spilt and hence there is considerable annual variation in this figure below:

Comparison of Incidence of World Oil Spills from Tankers, 1974 – 1985, resulting from Routine Operations & Major Accidents

	< 7 Tones)	7 – 700 (Tones)	> 700 (Tones)	Total
Loading / Discharging	2236 (90%)	227 (9%)	11 (1%)	2474 (100%)
Bunkering	442 (95%)	22 (5%)	-----	464 (100%)
Collision	39 (17%)	134 (59%)	54 (24%)	227 (100%)
Grounding	69 (25%)	134 (49%)	70 (26%)	273 (100%)
Total	2786 (81%)	517 (15%)	135 (4%)	3438 (100%)

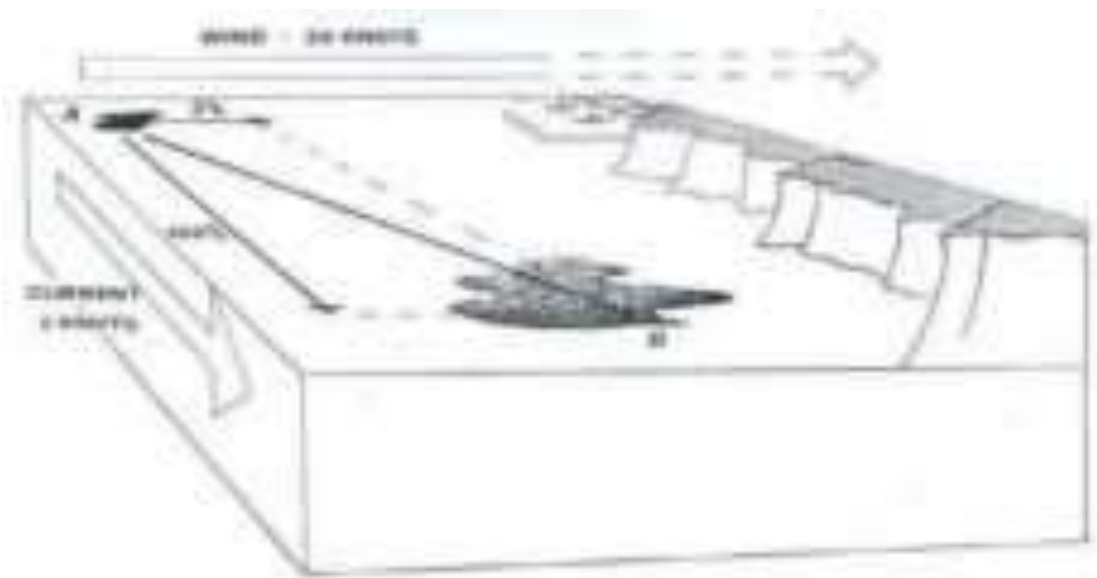
12.2 Forecasting Slick Movement

It is equally important to be able to forecast the probable movement of a slick as well as the likely changes in the properties of oil after it has been spilled. This allows sensitive resources in the path of the slick to be identified and, if appropriate, response measures to be put into effect. The task of forecasting the position of the oil can only be accomplished if data on winds and currents are available since both contribute to the movement of floating oil.

12.2.1 Effect of wind, Tidal currents

It has been found empirically that floating oil will move downwind at about 3% of the wind speed. In the presence of surface water currents, an additional movement of the oil equivalent to the current strength will be superimposed on any winddriven motion. Close to land, the strength and direction of any tidal currents must be taken into account but further out to sea their contribution is usually less significant because they are cyclic and so tend to cancel out over time. Thus, with knowledge of the prevailing winds and currents, it is possible to predict the rate and direction of movement of floating oil from a known position, as shown in Figure given below, overleaf.

The influence of 3% of the wind speed combined with 100% of the current speed results in the movement of oil from A to B



12.2.1.1 Computer Models

This simple calculation can be easily done by hand but becomes very timeconsuming if tidal currents have to be taken into account since it must be recalculated at regular intervals as currents change. Computers can be used to speed up such calculations by storing information on water movement and coastal outline for a specific geographic area. Wind data and the spill location are then the only additional information required at the time of a spill. The reliability of such models depends upon the accuracy of water movement and wind data. Often they are combined with mathematical models simulating weathering processes to provide a forecast of the overall fate of a spill.

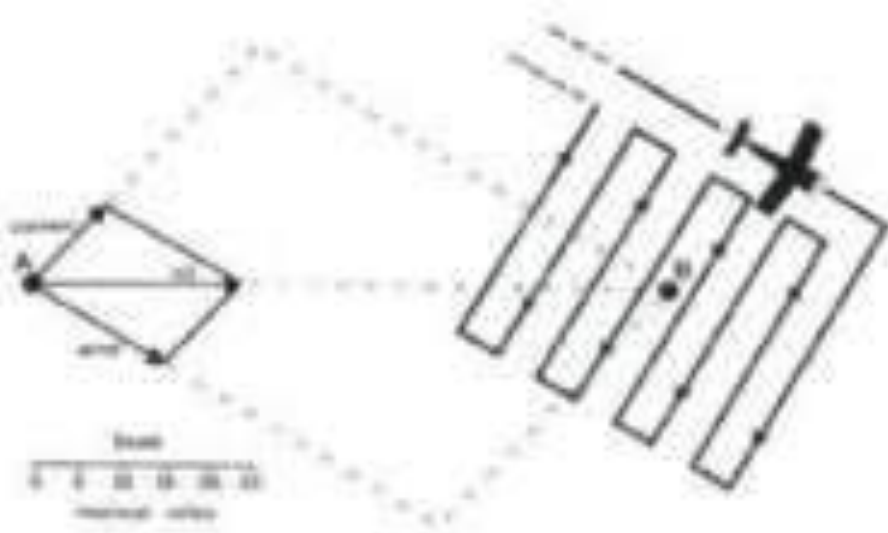
12.3 Aerial Surveillance at Sea

However reliable an oil spill model may be predictions of the fate and movement of oil slicks at sea should be verified through regular surveillance of the oil. This should be conducted from the air since observation from a vessel is highly inefficient.

12.3.1 Search Pattern

12.3.1.1 Ladder Search

A 'ladder search' is frequently the most economical method of surveying a large sea area. Since floating oil has a tendency to become aligned in long narrow windrows parallel to the direction of the wind, a ladder search across the wind will increase the chances of oil detection.



Movement of oil from A to position B three days later, predicted by combining 100% of the current speed and 3% of the wind speed as shown. The arrows from A represent current, wind and oil movement for one day. A cross-wind ladder search pattern is shown over position B.

12.4 Effect of Sunlight, Search Altitude

Haze and dazzle off the sea often affects visibility and the position of the sun may dictate the best direction to fly a search pattern. Sun glasses can give some relief from eye strain caused by strong light. Polarizing lenses can assist the detection of oil at sea under certain light conditions due to the differences in light reflected from oil and water. The search altitude is generally determined by the visibility. In clear weather 500 meters (1600 feet) frequently proves to be optimum for maximizing the scanning area without losing detail.

12.4.1 Navigation

However, it is necessary to drop to half this height or lower in order to confirm any sightings of floating oil or to examine its appearance. Over the open sea, away from any obvious reference points, it is easy to become disoriented. Ideally an observer will be able to consult the aircraft instrumentation for speed, direction and position, but it is worth ensuring beforehand that the instruments can be read without difficulty. In the absence of such aids, an observer with a suitable chart can keep track of course changes and positions by communicating with the pilot using the aircraft intercom.

12.5 Visual Quantification of Floating Oil

It is important that the port personnel estimate the amount of release for planning mitigating measures and allocating resources effectively. An accurate assessment of the quantity of floating oil is virtually impossible due to the difficulty of gauging its thickness. At best, the correct order of magnitude can be estimated by considering certain factors. Oil spreads rapidly and most liquid oils will soon reach an average thickness of about 0.1 mm, characterized by a black or dark brown appearance. Similarly, the color of sheen roughly indicates its thickness.

12.5.1 Appearance versus thickness, Cold water effects

A reliable estimate of water content in a 'mousse' is not possible without laboratory analysis but accepting that figures of 50% to 80% are typical, approximate calculations of oil quantities can be made, given that most typical floating 'mousses' are 1 mm or more thick. However, it should be emphasized that the thickness of 'mousse' and other viscous oils is particularly difficult to gauge because of their limited spreading. Indeed in cold waters some oils with high pour points will solidify into unpredictable shapes and the appearance of the floating portions will belie the total volume of oil present.

12.5.1.1 A Guide to the Relation between Appearance, Thickness and Volume of Floating Oil

Oil Type	Appearance	Approximate Thickness (mm)	Approximate Volume (m ³ /km ²)
Oil sheen	Silvery	0.0001	0.1
Oil sheen	Irridescent	0.0003	0.3
Crude and fuel oil	Black/dark brown	0.1	100
Water-in-oil emulsions ('mousse')	Brown/orange	>1	>1000

12.5.2 Surface area, Percentage cover

In order to estimate the amount of floating oil it is necessary not only to gauge thickness, but also to determine the percentage area of the sea surface covered by oil, water-in-oil emulsion and sheen. Again, accurate estimates are complicated by the patchy incidence of floating oil. To avoid distorted views, it is necessary to look vertically down on the oil when assessing its distribution. By estimating the percentage coverage of each form of oil, the area covered relative to the total sea area affected can be calculated from timed overflights at constant speed or from position fixing equipment.

12.6 Spill Control Management

12.6.1 Contingency Planning

12.6.1.1 Tankers

Plans covering areas where a wide range of oil types are handled or where tankers pass in transit, cannot anticipate the impact of a spill. It is therefore important that the type of oil spilled is established at the earliest opportunity so that its fate can be predicted and the appropriate clean-up techniques employed.

12.6.2 Fixed Installations

For oil terminals where a limited number of oil types are involved, an appreciation of the likely fate of potential spills is valuable when drawing up contingency plans. Information on the prevailing winds and currents throughout the year will indicate the resources where oil spill impact is most likely. Data on the types of oil handled can enable predictions to be made regarding the lifetime of slicks and the quantity and nature of the residue, which may require a clean-up response. It will also assist in the selection of appropriate clean-up equipment to be held in readiness for spills.

12.6.3 Priorities for protection, Sensitivity maps

Because of the difficult decisions that will be required during an oil spill in order to mitigate damage and to resolve conflicts of interest, much can be done at the contingency planning stage to identify sensitive areas and to determine priorities for protection. The mapping of sensitive areas can be a useful starting point. Detailed consideration should be given to the likely impact that a spill would have on each habitat or activity, taking into account any seasonal variability. Attention should then be given to identifying areas to be protected and their order of priority. This will never be easy since the value of each resource to the community will depend upon the weight given to environmental, recreational, economic and political considerations. This may require a wide range of data to be gathered and evaluated.

If properly conducted, such studies of the resources at risk in an area can also form a basis for quantifying any damage caused by a spill at risk in an area can also form a basis for quantifying any damage caused by a spill.

12.6.4 Response decisions

Having determined priorities for protection, attention can be given to designating appropriate clean-up measures. It is necessary to make a realistic assessment of the feasibility of employing various techniques since a recommendation to avoid the more ecologically damaging response options may result in the adoption of ineffective techniques and greater damage to other habitats or activities.

12.6.5 Containment

The containment of floating oil for subsequent recovery or its diversion away from sensitive areas calls for the use of some form of barrier. Many different types of oil barriers have been developed. These include commercially available floating booms, netting systems, sorbent booms, improvised booms and barriers, bubble barriers and chemical barriers. Selection of the most appropriate barrier will depend upon the particular conditions as well as availability. Since commercially available booms are the most common form of barrier used in oil spill control they are described in greatest detail in this section.

12.7 Commercially Available Booms

Design features

Designs vary considerably but all normally incorporate the following features:

1. Freeboard to prevent or reduce splash over;
2. Sub-surface portion (skirt) to prevent or reduce escape of oil under the boom;
3. Floatation by air or some buoyant material;
4. Longitudinal tension component (chain, wire or boom fabric itself) to withstand effects of winds, waves and currents.

Boom designs fall into two broad categories:

12.7.1 Curtain Booms

Curtain Booms provide a continuous sub-surface skirt or flexible screen supported by a solid or air floatation chamber usually of circular cross-section. Air floatation booms take up only a small storage area when deflated, whereas solid floatation booms, although more resistant to damage, are bulky in storage. Curtain booms generally have good wave-following capabilities, moderate escape velocities and are reasonably easy to clean.



12.7.2 Fence Booms

Fence Booms with a flatter cross-section are held vertically in the water by integral or external buoyancy. Solid floatation is most frequently used for fence booms but if external floats are used, turbulence may be generated leading to escape of oil at low water velocities. Such designs are bulky in storage and difficult to clean. In general, fence booms are more suitable for calmer waters where current velocities are low.



12.7.2.1 Common features

Many curtain and fence booms have similar features including bracing struts and/or integral ballast to keep them upright in the water, connectors for joining sections together as well as towing and anchoring points.

12.7.3 Performance/Limitations

12.7.3.1 Currents, Wind, Waves, Turbulence

The most important characteristic of a boom is its oil containment or deflection capability, determined by its behavior in relation to water movement. It should be flexible to conform to waves yet be sufficiently rigid to retain as much oil as possible. No boom can contain oil against water velocities much above 1 knot (0.5 meters per second) acting at right angles to it. The way in which oil escapes, and its relation with water velocity is as much a function of oil type as boom design. Low viscosity oils escape at lower velocities than more viscous materials. With the latter, the oil tends to accumulate at the boom face and to flow vertically down and under the skirt whereas low viscosity oils are carried under the boom as droplets sheared from the underside of the oil layer. Besides river and tidal currents, wind and waves can generate water velocities in excess of the escape velocity as well as causing splash over of contained oil. Oil escape can also result from turbulence along a boom and therefore a uniform profile without projections is desirable.



Escape of oil from a boom:

1. Splash over by wave action
2. Flow down the face of the boom
3. Droplets sheared from the underside of the contained slick

12.7.3.2 Boom size

The size and length of boom sections are also important considerations. The optimum size of a boom is largely related to the sea state in which it is to be used. As a general rule, the minimum freeboard to prevent oil splash over should be selected. The depth of skirt should be of similar dimensions to the freeboard. While short section lengths can make booms easier to handle and can protect the integrity of the boom as a whole should one section fail, these advantages must be weighed against the difficulty and time taken to connect sections effectively. Connections interrupt the boom profile and, wherever possible, should not coincide with the point of heaviest oil concentrations. The design of connectors should allow easy fastening and unfastening during deployment and whilst the boom is in the water.

12.7.3.3 Strength, Ease of deployment

Other important characteristics are strength, ease and speed of deployment, reliability, weight and cost. A boom must be sufficiently robust for its intended purpose and it must tolerate inexperienced handling, since

trained personnel are not always available. Structural strength and durability are required particularly to withstand the forces of water and wind on a boom when it is either towed or moored. Ease and speed of deployment combined with reliability are clearly very important in a rapidly changing situation and may strongly influence the choice made.

12.8 Netting Systems

12.8.1 Advantages

The use of nets to recover solid tar balls is an obvious application and the extension of their use to contain viscous oils theoretically presents a number of advantages over the use of conventional booms. In particular, the open structure should offer less resistance to water movement so that light but strong sections could be manufactured which might realistically be long enough to enclose oil scattered over a wide area of sea. As a result of the lower resistance of nets to movement through the water, it should also be possible to operate in faster currents or to sweep or trawl the sea surface at higher speeds than can be achieved with conventional booms.

12.8.2 Designs

Two basic designs of net have so far been developed which draw on experience from the fishing industry a long double net based on the purse seine method of fishing which can be used to corral or collect floating oil or which can be moored to protect sensitive areas; and a trawl net with a detachable 'cod-end' which can be towed along the sea surface.

12.8.3 Experience

Although neither design has yet been fully evaluated during an actual oil spill, large scale field trials show some promise, especially in the case of the purse seine type when used to corral and retain floating oil. However, once oil has been adsorbed onto the net the mesh becomes blocked and the oil retention capabilities are similar to conventional booms.



Netting system of the purse seine type for oil containment and recovery using two vessels to corral floating oil.



Oil trawl for collecting floating solid oil into a detachable cod-end.

12.9 Sorbent Booms

12.9.1 Construction, Uses

Sorbent booms usually consist of a tube of netting or some other fabric filled with a synthetic or natural sorbent material. Booms constructed of sorbent material have little inherent strength and, in some application, may require additional support. Some also need extra floatation to prevent them sinking when they become saturated with oil and water. They are normally only used in areas of low current velocity to collect thin films of oil, since their recovery efficiency decreases rapidly once the outer layers of the sorbent material become saturated with oil. The handling and disposal of oil-soaked sorbent booms can also cause considerable problems. The use of sorbents is further discussed in the section on Recovery.

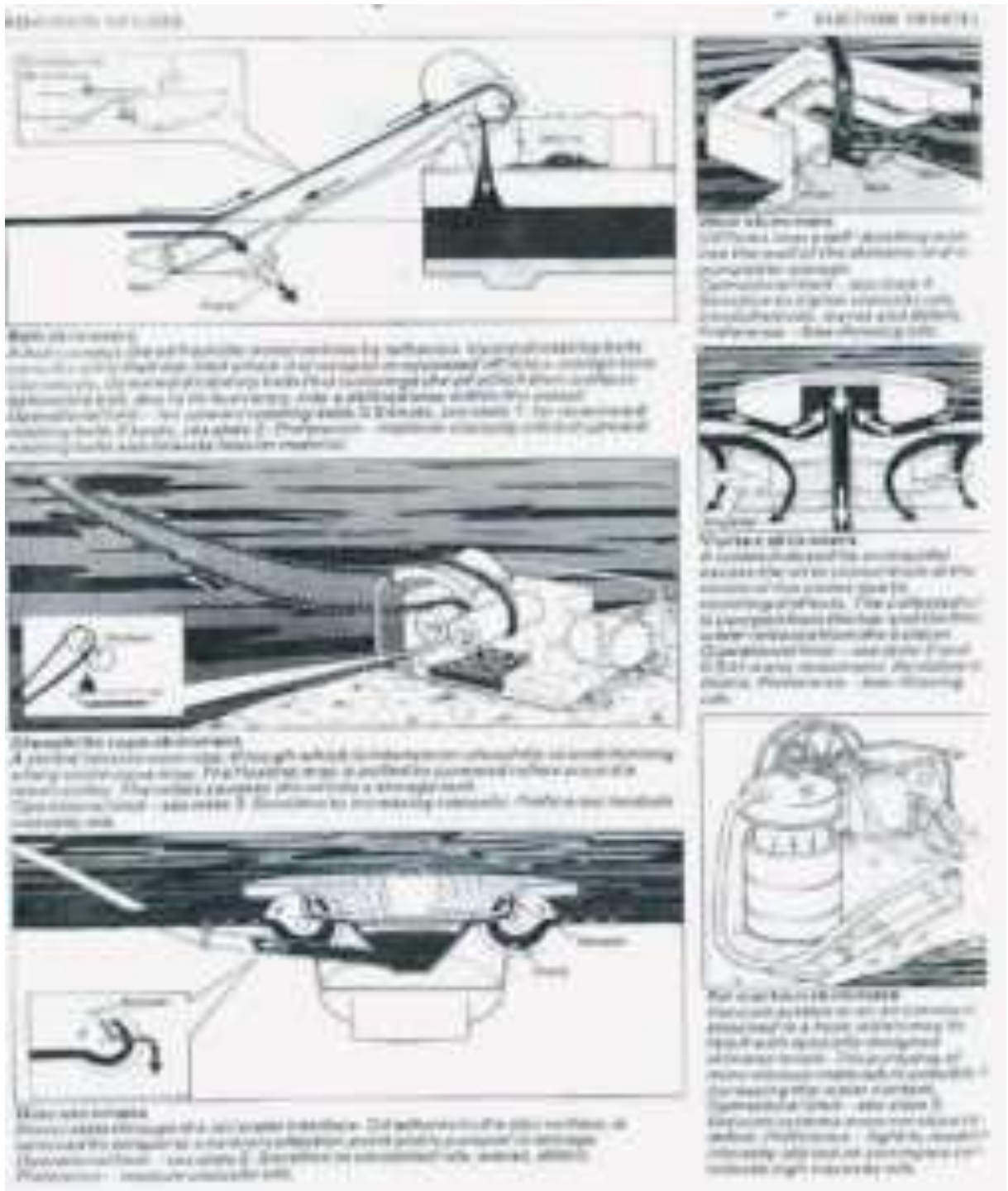


Fixed oil barrier constructed with straw bales and wire netting nailed to wooden stakes.

12.9.1.1 Recovery

The rapid recovery of contained oil is vital to prevent its escape and the contamination of other areas. Recovery can be achieved using skimmers, pumps, sorbents, manual techniques and non-specialized mechanical equipment, such as vacuum trucks.

12.10 Skimmers



12.10.1 Design features

All skimmers incorporate an oil recovery element, some form of floatation or support arrangement and a pump to transfer collected material to storage. More complicated designs may be self-propelled and may have several recovery elements, integral storage tanks or oil/water separation facilities.



12.10.2 Suction skimmers

Two basic approaches can be recognized: SUCTION and ADHESION. The simplest concept is a suction device whereby oil is collected by a pump or air suction system from the water surface directly or via a weir. These designs tend to collect large volumes of water together with the oil. This can be an advantage when recovering viscous oils since the presence of excess water helps to maintain the flow of oils which would otherwise tend to block hoses and pipe work. Large storage is required to receive and separate the water which frequently represents more than 90% of the collected material. For oil spill control purposes, simple gravity separation in settling tanks is adequate.

12.10.3 Adhesion skimmers, Oil types

In contrast, skimmers which incorporate oleophilic materials into belts, drums, discs or synthetic ropes often achieve a higher ratio of recovered oil in relation to water. In general, they work best with medium viscosity oils between 100 and 2000 centistokes although skimmers with toothed discs or chain link belts have been designed specifically for the recovery of heavy oils. These high viscosity oils, such as heavy bunker oil, are extremely sticky and can prove difficult to remove from the adhesion surfaces, whereas, in contrast, viscous water-in-oil emulsions can be almost non-adhesive. Although low viscosity oils like diesel and kerosene can be collected, they do not accumulate on the oleophilic surfaces of skimmers in sufficiently thick layers for high recovery rates to be obtained.

12.10.4 Waves /swell, Currents

Skimmers are designed so that the oil recovery element is positioned at the oil/water interface. This is usually achieved by a self-levelling arrangement and although swell alone does not generally affect performance, none is effective in steep waves.

Small units are easily swamped and pitched around, whilst larger skimmers have greater inertia and cannot follow the wave profiles. The performance of skimmers is also adversely affected by currents in much the same way as for booms. This limitation is partly overcome in some self-propelled skimmers where a

sorbent mop array or belt is rotated so that its velocity relative to the floating oil effectively reduced when the vessel is underway.

12.10.5 Self-propelled skimmers

Other designs of self-propelled skimmers can be effective in the calmer waters of ports and harbours. Because they are comparatively expensive they often combine some secondary function such as debris or waste oil collection. Such vessels are often an integral part of response arrangements for oil terminals and refineries where the pollution risk is more predictable.

12.10.6 Power source

Skimmers require power for the recovery element or for transferring the collected oil to a storage tank. Many systems are designed with an integral power pack. Diesel power can be used directly or to drive electric, hydraulic or pneumatic systems. All except petrol engines can be built to conform with safety regulations imposed in refineries, tank farms and other restricted areas where there may be a risk of fire and explosion. When used in potentially dangerous atmospheres, regular tests should be carried out with explosion meters to ensure safe operating conditions, since spark sources can never be completely eliminated.

13 ROLE OF INDUSTRIAL TERMINALS ON KPT LAND

13.1 Roles & Responsibility

Sr. No.	Tank Farm Owners	Persons to be contacted in case of emergency		
		Name and Position	Telephone No.	Mobile No.
1	Kesar Enterprises Ltd., Near Oil Jetty, Old Kandla (Kutch)370210	Mr. R.K. Gupta Gen. Manager	270435 (O) 295676 (R)	9375349181
2	Kessar Enterprises Ltd, Terminal II, Plot No. 5 &6 Old Kandla	Mr. R.K. Gupta G.M	270435 (O) 270177 (O)	9375349181
3	Chemical & Resins Pvt.Ltd Terminal –I, Near Oil Jetty, Old Kandla, Kutch Terminal – II, Near West Gate, New Kandla – Kutch	Lt. Col. Pramod Kumar (Retd), GM,	270505(O) 236831(R) 270916 (O)	9825225676
4	Indo-Nippon Co. Ltd., Plot No.2, K.K.Road, Old Kandla,	Mr. R.N. Pathak Asst. Terminal Manager	270795(O) 235818(R) 270295(O)	9879571295
5	J. R. Enterprise, Plot No.3, Old	Mr. Devendra Dadhich,	653528 (O) 257152 ®	9898238380

	Kandla,	Terminal In-charge		
6	Friends Oil & Chemical Terminals Pvt. Ltd., Near Booster Pump Station, Kandla, Kutch	Mr.S.Ramakrishnan Terminal Manager	270987 (O) 257249 ®	9879572107

7	Indian Oil Corporation Ltd., Main Terminal, GIM	Mr. AK. Khanna Sr. Term. Manager Mr. KS Rao, Sr.TM	233274 (O) 229002 (R) 270394 (O)	9427216637 9426416108
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Upgraded Emergency Plan / DMP for Kandla Port Gandhidham (Kutch)

	Foreshore Terminal, Kandla KBPL LPG Import Plant	Mr. PS Negi Plant Manager	270628 (O) 270477 (O) 233359 ® 270978 (O) 236944 ®	9426725342
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8	United Storage & Tank Ltd Near IOC Foreshore Terminals, New Kandla	Mr. Manoj Gor Terminal Manager	270609 (O) 653525 (O) 651238 ®	989850029
	Gas Terminal, Plot No. 4 Old Kandla	Mr. G. Chudasama	653529 (O)	9904366855
9	IFFCO Kandla Unit, Kandla, Kutch	Mr. L. Murugappan, G.M.(NPK-I) Mr. Brahmbatt Manager (F & S)	270711 270352(O) 270381 (O)	982506922 9099019861
10	BPCL, KK Road, GIM	Mr. RG. Dekate Sr. Manager Operations	234313 (O) 223235 (R)	9099929634
11	HPCL KK Road, GIM	Mr. Murthy Manager (Installation)	230936 (O) 220084 (O) 233078 Ext	
12	INEOS ABS (I) Ltd Plot No. 8 Old Kandla	Mr. Vineeth Nair Dy. Manager	270087 (O) 234409 (R)	9825237029
13	Liberty Investments Pvt. Ltd., Plot No. 1 & 2, Block 'H', New Kandla	Mr. Jitendra Vaidya Terminal Manager	270151 (O) 270464 (O) 270468 (R)	9825025645

14	Avean International Pvt. Ltd., Liquid Storage Tank Terminal, Plot No. B-1, New Kandla	Mr. Bharat Rathod Terminal Manager	270537 (O)	9375310260
15	Rishi Kiran Logistics Pvt Limited, Plot No. 7, Link Road Old Kandla	Mr. RH. Pandya GM (Terminal)	270223 (O) 270443 (O)	9879104556
16	N.P.P. Pvt. Ltd., Old Kandla	Mr. MD.Nagvekar	270347 (O) 257807 ®	9825227649
17	Friends Salt Works and Allied Industries, KK Road, Old Kandla	Mr. NJ.Zinduwadia Sr. Manager Mr. HA. Mehta,S.M	270814 (O) 262698 (R) 271260 (O)	9825506361 9825506360
18	IMC Ltd, Cargo Jetty New Kandla	Mr. Anil Brahmbhat	270369(O) 653524 (O) 296079 (R)	9898126243
19	Agencies & Cargo Care Ltd., Plot No.3, New Kandla.	Mr.Shivkumar Menon, Terminal Manager	270714 (O)	9825226765
20	Dipak Estate Agency Plot No. 5-6, Block – A New Kandla	Mr. Narendra Thacker	270375 (O)	9879611243

21	Parker Agrochem Exports Ltd, Plot No. 3 –4,Block- H New Kandla	Mr. Bharat Thacker	270486 (O) 270528 (O) 231876 (R)	9825238260
22	Tejmalbhai & Co New Kandla	Mr. Ankitbhai Chandan	271330 (O) 230090 (R)	9825225101
23	Parker Agrochem Product Pvt. Ltd, Plot 7-9/A,N.Kandla	Mr. Raja Babu Dy Manager	270528 (O) 231876 (R)	9979158543
24	Mother Dairy Fruit & Vegetable Pvt. Ltd, Near Oil Jetty, Old Kandla	Mr. Saju Therattu	270654 (O) 270655 (O) 230979(R)	9974022681

The individual terminal will have to ensure the following in the event of emergencies arising out of:

- a) Natural disaster
- b) Toxic release
- c) Flammable vapour release
- d) Road tanker / Rail tank truck transportation accident
- e) Fire
- f) Flooding

13.1.1 Natural Disasters

- Ensure that adequate staff are posted at the terminal to meet any eventuality
- Ensure all operations are shut down
- If possible, ensure disconnecting pipelines
- Provide 48 hours food supply as well as portable water supply at the terminal

13.1.2 Toxic Release

- Ensure that the staff is evacuated in the direction opposite or as far as possible at 90 degree to the direction of the wind
- The staff located at the site to ensure safe operation, should be provided with gas masks
- Do's and Don'ts should be posted outside the control room to ensure minimum loss to life

13.1.3 Flammable Vapour Release

- It should be ensured that all possible help is rendered to the affected site / terminal
- The fire and safety officer at Kandla Port fire station should be informed
- Information pertaining to fire should be relayed to Main Emergency Control room at Gandhidham
- Information regarding fire incident should also be relayed to Kandla Free Trade Zone fire station
- Security personnel of the individual terminals should also be on standby to assist in fire fighting if the need be
- Mutual Aid Agreement should be signed between all the terminals as well as the KPT
- IOC LPG terminal should assist the affected terminal by way of sharing their experience in terms of plugging a chemical/gas leak
- The terminal Manager of the terminal next to the affected terminal should also inform the CISF

13.1.4 Road Tanker / Rail Tank truck transportation accident

- The dispatch terminal to whom the cargo belongs is responsible for attending to the mishap
- The dispatcher has to inform the exact location of the accident to the Main Emergency Control Centre as well as to the local emergency control room at Kandla
- CISF Commandant has to be informed by the dispatcher of the site of accident
- The Fire and Safety Officer stationed at Kandla Port should also be informed with specific name of the chemical
- In case the road tanker involved happens to be containing POL products then HPCL, BPCL and IOCL should be contacted immediately
- Accident involving rail tank truck i.e. LPG should be informed to the IOCL LPG Terminal Manager immediately
- In case of any leakage reported from LPG road tanker or rail tank truck the same should be arrested by the IOCL team

13.1.5 Fire

- Inform the Kandla Port Fire and Safety Officer
- Ensure that information pertaining to the Chemical involved in fire is passed to the Main Emergency Control Centre at Gandhidham as well as Kandla
- Information should be relayed to CISF regarding the fire
- In case it is a fire related to POL product then the oil majors i.e. HPCL, BPCL and IOCL should be contacted
- In the event of chemical fire it would be the collective responsibility of the DEENDAYAL PORT TRUST as well as the dispatcher to ensure that the spill is controlled and collected

13.1.6 Flooding

- Terminal should have trolley mounted pumps preferably of flame proof type to ensure dewatering of the site
- Gum boots should be supplied to the staff at the terminal
- The electricity supply to the terminals should be shut off to avoid short circuit
- The trolley mounted pump should have DC supply in order to ensure continuous operation
- It should be ensured that all the drains should be cemented and free of any debris which could hamper the flow of water

The following occupiers shall be a part of the emergency team for rendering expert advice. (This composition may be changed once in three years on rotation basis.)

13.2 Toxic Team

- IFFCO
- Chemical & Resins Ltd.
- United Storage & Tank Terminals Ltd.
- Bayer ABS

13.3 Fire Team

- Kesar Terminal I
- Indo Nippon

- Friends Oil & Chemicals Ltd. (FOCL)
- Friends Salt Works & Allied Industries Ltd. (FSWAI)

13.4 Transportation Team

- IOCL POL TERMINAL
- HPCL
- BPCL

13.5 Natural Disaster Team

- J. R. Enterprise
- J. K. Synthetics
- Synthetic Chemicals

Individual terminals shall be responsible for ensuring that safe shut down has been affected aftermath of a disaster in the neighborhood.

In case of dry docks KPT shall assume the charge of the emergency controller along with P&O to ensure that all the staff is evacuated from the area barring the security and the emergency team.

The emergency team would be drawn essentially from CISF and Marine Department i.e. at the behest of Harbour Master as well as P&O. In the event of an impending natural disaster like cyclone only CISF personnel to be stationed at the wharf. For the ships berth at the dock please refer to the cyclone disaster plan as annexed.

The emergency team should have the following:

- a) Chemical data sheet
- b) Protective clothing
- c) Breathing Apparatus
- d) Safety Harness

- e) General tools and flash light
- f) Leak plugging equipment like wood plugs
- g) Analytical equipment like explosivemeter
- h) Flood light with generator
- i) First Aid kit
- j) Portable diesel operated fire water pump

The responsibility of the various teams mentioned above would be to follow the following procedure:

- a) Keep people away
- b) Inform incident Controller i.e. at Main Control Room
- c) Contain the chemicals
- d) Avoid igniting the chemicals by ensuring muffler on the exhaust
- e) Obtain chemical data sheet

The communication parameters which need to be relayed to the Emergency Control Centre

- a) Place and time of the incident
- b) Chemicals involved
- c) Condition of the container
- d) Injuries or deaths
- e) Area surrounding (open country, town)
- f) Weather conditions
- g) Assistance available (police, fire services)
- h) Means of maintaining contact

Logistic Team

The function of Logistic Team is to ensure necessary supplies are available to Response Team during the emergency. In addition to above mentioned, the function is also responsible for organising and maintaining the staging area where emergency material and equipment is to be temporarily stored and assembled

before rapid deployment. The Logistic Coordinator will be reporting to the Emergency Chief Incident Controller and keep him updated on the availability of supplies and equipment or of any anticipated need.

Typical list of emergency equipment and material is given below:

- Fire extinguishers
- Fire fighting agents
- Fire hoses and nozzles
- Personal protection apparatus like fire suit (proximity suit)
- Chemical resistance protective clothing
- Self contained breathing apparatus
- Respirators
- Emergency lights
- Power generators
- Portable radios and cellular mobile phones
- Spill control agents for decontamination of toxic spills
- Plastic containers and lining material for diking and damming
- Earth moving machinery
- Fuel and gasoline for operation of vehicles and machinery

14 LINKS BETWEEN THE ARMY, COAST GUARD & AIR FORCE

Aftermath of any disaster the recovery and relief operations are conducted on a war footing.

The task involved usually demands rough and tough and dedicated personnel who are trained professionals to meet any challenge be it evacuating people marooned due to flood or making shelters or transporting relief to inaccessible areas. It is for this purpose that the army, air force and the coast guard would be required to assist the Kandla Port Administration.

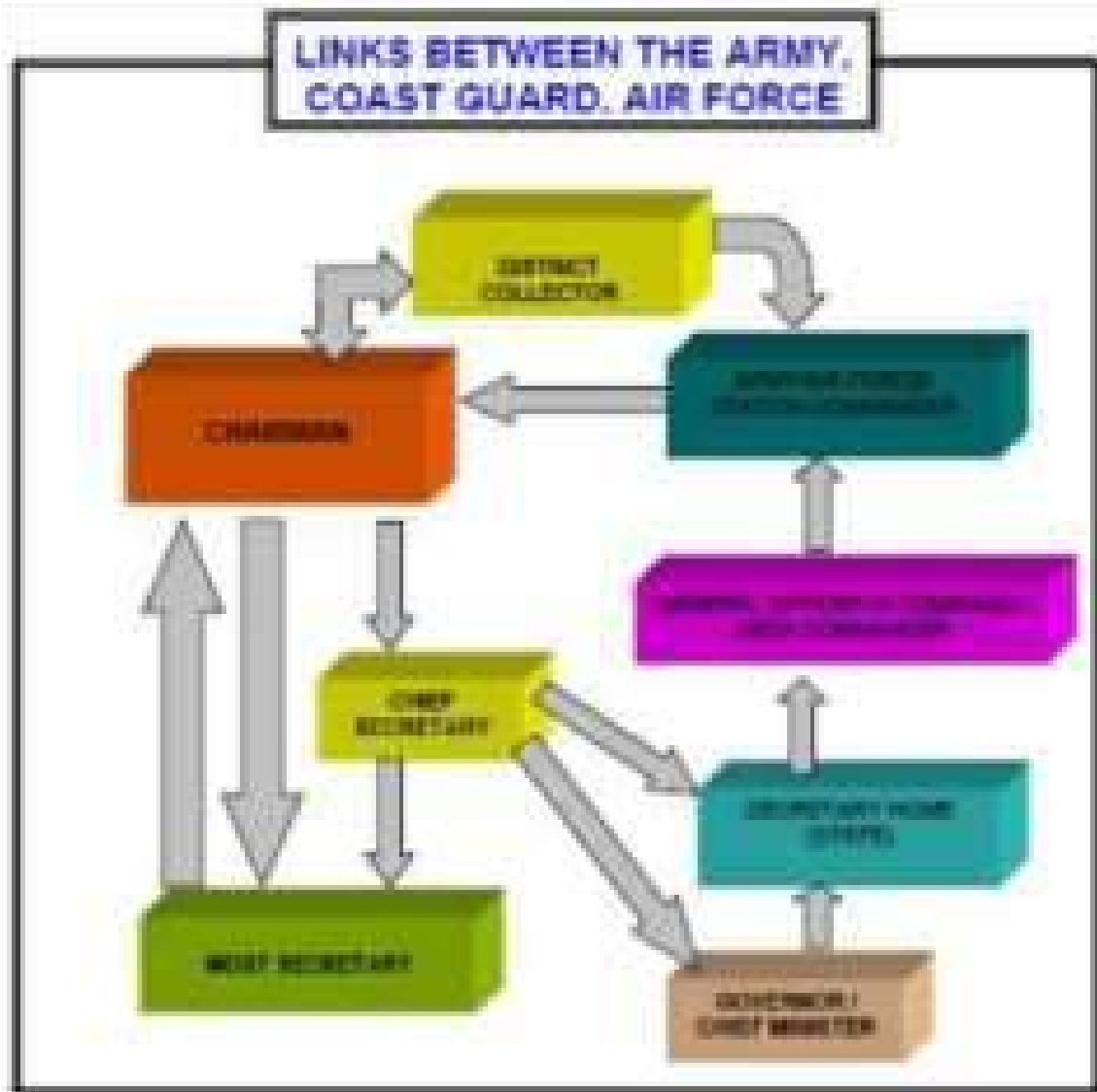
The Chairman / Deputy Chairman would be the coordinating officials for liaising with the Station Commander (army, navy as well as air force) after consulting the District Administration.

While seeking assistance from the army, air force or the coast guard the following documents should be kept ready for reference:

- ③ Overall plot plan of the Kandla Port
- ③ Clear demarcation of the affected area on the plot plan
- ③ VHF link frequency for establishing contacts with the signal room as well as CISF commandant.
- ③ List of all the important telephone numbers.
- ③ In the event of Cyclone, keep the task force updated on the weather condition.
- ③ Ensure that the emergency team is extending their full co-ordination to the task force.
- ③ For ready reference the Secretary should nominate a person who should be made responsible to taking notes on what is happening and what sequence.
- ③ The areas, which could be used as temporary shelters should be indicated to them.
- ③ Open space which can be used as staging area should be indicated to them.
- ③ All the medical staff should be kept on standby and they should be asked to act after consulting the Army or the Air force teams.
- ③ In the event of air evacuation requirement it should be ensured that the people being evacuated are listed and the number of sorties required is noted.
- ③ In the event of a cyclone and an resultant Ammonia Gas leak it should be noted that the Army and the Air force should be provided with gas mask (if the need be).
- ③ Data pertaining to the number people in the affected areas (an approximate) should be made available to the Army / Air force.

The flow of information for co-ordination:

Chairman District Collector Chief Secretary Secretary - Ministry of Surface Transport Governor / Chief Minister of the state ARMY/AIRFORCE.



15 PROCEDURE FOR CO-ORDINATION

The overall responsibility of the Emergency management lies with the Chairman, Kandla Port. He assumes the responsibility of Chief Site Controller on receipt of the information of an emergency or an impending emergency.

Some of the critical functions are:

- ③ Activation of the emergency response organization
- ③ An ongoing emergency assessment, including upgrading or downgrading of the emergency alarm level
- ③ Notification of outside governmental agencies
- ③ The decision to ask for outside help and resources
- ③ The decision to evacuate the people
- ③ Decisions involving the safety of off-site vulnerable points (e.g. recommendations to evacuate or take shelter, in the case of a toxic vapour release).
- ③ Decisions to shut down/restart the Port.

The Chairman i.e. the Chief Site Controller shall be responsible for designating the Incident Controller, the Field Controller as well as the Liaison Officer as well as Public Relations Officer.

Functions like

- ③ Communication
- ③ Fire, Safety and Rescue
- ③ Special hazard
- ③ Utilities
- ③ Engineering / technical function
- ③ Medical function
- ③ Logistic function
- ③ Security function

③ Administrative function

EMERGENCY NOTIFICATION SHEET	
1.	Plant / Location Name _____ Unit _____ Address of Plant / Site _____
2.	Date _____ Time of Call _____
3.	Caller's Name _____ Caller's Position _____ Caller's Telephone Number _____
4.	Time (or Anticipated Time) of Accident / Emission _____ Projected Duration of Accident / Emission _____

5.	Type of Accident / Emission _____
6.	Emergency Alert Level (EAL) : Check One ALERT <input type="checkbox"/> [] SITE EMERGENCY <input type="checkbox"/> [] GENERAL EMERGENCY <input type="checkbox"/> []
7.	In case of Toxic Release :
	Chemical Name of Substance Released _____ Amount and/or Rate of Release _____ Estimated Duration of Release _____ Type of Release (Gas, Liquid or Solid) _____ Toxicity / Flammability _____ Potential Impact on Offsite Area _____ Estimated Area Affected by the Release _____

8.	Weather Condition _____ Wind Speed _____
9.	Casualties / Damages _____
10.	Brief Description of the Accident _____ _____ _____
11.	Assistance Requested _____ _____ _____ _____
12.	Signature _____ Date _____ Time _____

15.1 Procedure for Co – ordination





16 ASSEMBLY POINTS & ESCAPE ROUTES

1. There are two main escape routes from the port side i.e. by land:



Kharirohar road.

Main NH 8 i.e. leading to Gandhidham.

2. The sea route would be the Kandla creek and other creeks i.e. Phang creek, Sara Creek or Rohar Creek or Nakti Creek connecting the same.

3. Air evacuation can be undertaken by Helicopter or from Kandla Aerodrome.

4. KPT to prepare list of all the personnel in their port colony and have it posted at the assembly area.

5. The assembly points in the Cargo Dock for the workers in the area between the North Gate and the plot number five would be the area in front of the Railway Station.

6. The assembly point for the port township could be between block E&D and at the intersection of Block 'B'.

7. The assembly point for each of the adjoining berth would be on the road i.e. used for moving between the warehouse A,B,C,D and the berthing area.

8. However for the workers working in the warehouses as mentioned above the assembly point would be the central road between the two streams of warehouses.

9. The workers working in the bins i.e. open storage the assembly point would be the area in front of the West Gate # 2.

10. For bins closer to the West Gate #2 fire brigade station the staging area for the fire station would be used as assembly point.

11. Computer should be installed in the rooms next to the assembly point connected to the time office for a list of people inside the port and the same should be made available at the railway station.
12. Railway station should have emergency evacuation counter all the personnel being evacuated from the area should be asked to check-in at the counter before they board the train.
13. The PA system at the assembly area should be used to announce “do not carry any luggage or belongings just carry as much as is bare essential in clothing”.
14. The point of departure from the Dry cargo area would be West Gate 1 & 2 as well as North Gate and in an extreme case one would have to use the jetty being used by the pilots for evacuation by sea.

RECOVERY AND BUILDING BACK

17 RECOVERY FACILITY RE-ENTRY RESTORATION OF SERVICES

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The recovery and re-entry phase will begin after the declaration of termination of emergency situation. This determination would be made by the Chief Incident Controller. The recovery plan would be flexible enough to adapt to existing conditions. All of the conditions that may be encountered in an emergency situation cannot be anticipated in advance. Detailed plans and procedures for recovery operations would be prepared at the time they are needed.

Re-entry operations would be performed by the Re-entry Team, which would be same as that of green team under the leadership of the Chief Incident Controller.

The team shall consist of personnel knowledgeable in procedures and facility layout. In the Re-entry planning process, the team will gather available information on the nature of the emergency and its present status by methods such as discussions with the operations personnel on-shift. Necessary protective clothing and equipment would be available for the team before re-entry is authorized.

Specific procedures for recovering from an emergency and re-entering the facility can hardly be provided, since they will have to be determined on a case by case basis, depending on the type of accident and the severity of the damage suffered. However, provision would be made for the following:

- Organising a re-entry team
- Inspecting the damaged area
- Declaring the emergency concluded and making the "all clear" known to the facility employees and the community
- Deciding which employees would report to work and notifying them
- Beginning an investigation into the causes of the emergency
- Assessing the damage to the facility
- Transferring necessary operations to alternative locations
- Decontaminating the damaged area
- Restoring services to the damaged area
- Clearing up the debris
- Salvaging material and equipment affected by the emergency
- Restoring the parts of the facility affected by the emergency
- Determining responsibilities and instituting possible insurance and damage claims

In case of an aftermath of a toxic release, it should be ensured that Chief Incident Controller and the party carrying out the re-entries to ascertain the termination of emergency, should be carrying self-contained breathing apparatus as well respiratory masks.

Please note in the event of a natural disaster the recovery team would involve the usage of ARMY or other paramilitary forces the same would be under the control of the station commander and the overall Controller shall be the District Collector.

CAPACITY DEVELOPMENT

18 MAINTAINING

CAPABILITIES

EMERGENCY

RESPONSE

In order to ensure a prompt and professional emergency response capability, port personnel are required to be knowledgeable of the possibility of various emergencies and emergency actions. General safety training should be provided to all employees to familiarize them with alarms, evacuation routes, safe assembly points, etc. In addition, personnel who are a part of the Emergency Response Organization are required to have additional training and should participate in periodic drills and exercises.

18.1 Training & Education

Regular training should be provided to all personnel who have a role in planning and operational response to an emergency. The main goal of training for emergencies is to enable the participants to understand their roles in the response organization, the tasks associated with each position and the procedures for maintaining effective communications with other response functions and individuals.

The training objectives are:

1. To familiarize personnel with the contents and manner of implementation of the Plan and its procedures.
2. To train personnel in the performance of the specific duties assigned to them in the plan and in the applicable implementing procedures.
3. To keep personnel informed of any changes in the plan and the implementing procedures.
4. To maintain a high degree of preparedness at all levels of the Emergency Response Organization.
5. Train new personnel who may have moved within the organization.

6. Test the validity, effectiveness, timing and content of the plan.

7. Update and modify the plan on the basis of experience acquired through exercises and drills.

Selected port personnel should receive instruction in the use of the fire fighting and emergency equipment available at the site. All personnel working at the site should receive instructions in fire prevention and in basic fire fighting techniques. Periodic refresher training should be provided and supplemented by fire drills.

Crews of tugs, which can be used for fire fighting, should receive instruction and training in fighting petroleum fires in co-operation with land based fire-fighting services. In order to utilize fully the tugs firefighting equipment and capability during an emergency, it may be necessary to supplement the crew with trained shore personnel. Opportunities should be provided at frequent intervals for combined practices involving the tugs and shore fire fighting services. Opportunities may arise whereby a combined fire practice or conference can be arranged between shore personnel and crew members of tanker at berth without imposing an operational delay on either the berth or the tanker. This should help make the tanker personnel familiar with the firefighting equipment ashore. Shore personnel should also have the opportunity of becoming familiar with the types and locations of firefighting equipment on and of being instructed in any design features on tankers which may require special attention in case of fire.

18.2 Drills & Exercises

Emergency drills and integrated exercises have the following objectives. These constitute another important component of emergency preparedness. They refer to the re-enactment, under the assumption of a mock scenario, of the implementation of response actions to be taken during an emergency.

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

The frequency of the drills should vary depending on the severity of the hazard. However, drills should be conducted once in a year. Scenarios may be developed in such a manner as to accomplish more than one event objective.

Drills and exercises will be conducted as realistically as is reasonably practicable.

Planning for drills and exercises should include:

- ③ The basic objectives
- ③ The dates, times and places
- ③ The participating organizations
- ③ The events to be simulated
- ③ An approximate schedule of event
- ③ Arrangements for qualified observers
- ③ An appropriate critique of drills/exercises with participants

Evaluation of drills and exercises should be carried out which should include comments from the participants and observers. Discrepancies noted by the drill observers during the drill shall be pointed out during the drill. A written evaluation of the drill or exercise should be prepared by the individual responsible for conducting the drill or exercise. The evaluation should include assessments and recommendations on:

- ③ Areas that require immediate correction.
- ③ Areas where additional training is needed.
- ③ Suggested modifications to the plan or procedures.
- ③ Deficiencies in equipment, training, and facilities.

The evaluation of a drill or exercise shall be submitted to the Main Controller for review and acceptance who shall then determine the corrective actions to be taken and assign the responsibility to appropriate personnel.

The Chief Fire Officer should track all approved drill and exercise corrective actions as a means of assuring that corrections are made in a reasonable amount of time, and shall advise Main Controller of the status of implementation of corrective actions.

Records of drills, exercises, evaluations, and corrective actions should be duly maintained.

18.3 Review of the plan

The Plan and associated implementing procedures should be reviewed to ensure compliance with relevant regulations and applicable state and local emergency plans and written agreements with mutual aid companies also.

The plan should be reviewed under the direction of the Chairman who should encompass the plan, response procedures, equipment, training, drills and interfaces with local emergency management agencies. The need for changes is based upon the following aspects:

- ③ Written evaluations of drills and exercises which identify deficiencies or more desirable methods, procedures, or organizations.

- ③ Changes in key personnel involved in the organization.

- ③ Changes in the facility organization structure.

- ③ Changes in state regulations.

- ③ Modifications to the facility which could affect emergency planning.

- ③ Recommendations received from other organizations and state agencies.

18.4 Emergency Control Center

The Emergency Control Centre is located in the Board Room of Administrative Office Annexure Building at First Floor.

This room will have seating arrangements for all members of Disaster Management Group.

It will have the following:

1. Adequate number of telephones. One of these telephones shall be used for outgoing telephone calls only.
2. Internal telephones, telex, fax.
3. VHF transceiver having marine band capable of being operated by mains or battery.
4. Hot line linking deputy commissioner of the district.
5. Internal and external telephone directories.
6. Emergency manuals.
7. Emergency light.
8. Wind direction and speed indicator.
9. Plan of the port showing:
 - ③ Berths/Areas where hazardous materials are handled
 - ③ Sources of safety equipment's
 - ③ Personal protective equipment such as aprons, gloves, gum boots, etc. ③ The fire fighting system
 - ③ Stocks of other fire-extinguishing materials
 - ③ Site entrance and roadways, updated at the time of the emergency to indicate roads which are to be used and which are not to be used.
 - ③ Assembly points and routing ③ Medical centers.
 - ③ Layout of pipelines in the Port area

③ Lorry parks and rail sidings

③ Port location in relation to the surrounding community (5 km map)

19 DEENDAYAL PORT TRUST OFF SHORE OIL TERMINAL – VADINAR PORT

19.1 Vadinar Port Information

Vadinar Port is an important port in DEENDAYAL PORT TRUST Group of ports under the control of Kandla Port Trust, Kandla. The port is just 55 Kms from Jamnagar city.

Latitude: 22 Degree 26'25' North

Longitude: 69 Degree 40' 15' East

Charts – Gulf of Kutch Chart No: 203

19.1.1 Metrological Data

1. Temperature: Summer Maximum 38Degree C, Minimum 19Degree C
2. Temperature: Winter Maximum 36Degree C, Minimum 14Degree C
3. Annual rainfall: Average 241.2 mm
4. Average Wave Height: 30 Centimeter (Summer)
5. Average Wave Height: 25 Centimeter (Winter)
6. Maximum Wave Height: 45 Centimeter
7. Maximum Tide – 6.12 Meter
8. Minimum Tide – 0.02 Meter
9. Wind Speed – Average Wind Speed – 16 knots/hour
 - Summer – 25 knots / hour
 - Winter – 18 knots /hour

10. Anchorage: Anchorage areas are about 4.5 miles from shore.

19.1.2 Off Shore Oil Terminal (O O T) Vadinar

The DEENDAYAL PORT TRUST has commissioned the off shore oil terminal facilities in 1978 jointly with Indian Oil Corporation by providing Single Buoy Mooring (SBM) system having a capacity of 10MMTPA was first of its kind in India. The following are the salient features of the operations at OOT Vadinar.

- A draft of upto 30 meters at SBMs and Lighterage Point Operations (LPO) • The Single Buoy Moorings can handle vessels having length of 335 meters. 2 NOS OF OIL BERTHS OF NAYRA(EX ESSAR)
- Handling VLCCs upto 3,00,000 DWT
- Providing crude oil intake for the refineries of M/s. IOCL at Koyali (Gujarat), Mathura (UttraPradesh), and Panipat (Haryana). & VADINAR OIL REFINERY OF NAYRA (EX ESSAR)
- Commissioned the first SBM on 27th August 1978.
- M/s. IOCL Commissioned the second SBM on 25th October 1997.
- Commissioned the third SBM (Essar) on 29th December 2006.
- Simultaneous handling of 3 vessels at three of SBMs
- Vast crude tankage facility of M/s. IOCL having capacity of 11, 44,000 KL.
- 4 High powered Tug of 50 Ton BP.
- Two Tugs of 35 ton BP &
- Two 50 Ton BP tugs for smooth operation is being acquired.

19.1.3 Export Jetty (Essar)

- One Ro - Ro / Lo - Lo Jetty for handling of project cargo / construction material / spare parts.
- Product Jetties (Private Berths at the Port)
- Essar Jetties are used for tankers Loading of POL product cargo by alongside.
- The Jetty No 1 – commissioned on 6th December 2006.
- The Jetty No 2 – commissioned on 29th December 2009.

19.2 Control Room –Vadinar Port

There is one control room at A.O. Building, Vadinar Jetty under the direct supervision of Pilot, stationed at Vadinar. In absence of Pilot, the other Pilot posted at Vadinar and XEN (M&E) shall be responsible for the direct supervision of the Control room at Vadinar, in association with Marine Engineers Grade - II. They shall rush to the Control room as soon as the Action plan is put into force. Two persons viz. one Assistant, Flotilla Supervisor and one Signaller shall report for duty to the In-Charge of Control Room immediately, as soon as the Control room comes into operation. The In-Charge should draw-up rosters of the said employees shift-wise and assign duties to them. The In-Charge shall ensure the presence of the staff as to whom various duties have been assigned. They should attend the meetings as and when called. In case of absence of the staff, the matter should be informed to the C.O.M. (OOT), who shall take disciplinary action against the erring employees.

The Control room has the following assets

Telephone	Fax	VHF Signal
0288-2573026		Marine Channel 12,16,8,10
Mobile Phone Nos. 9825212359 / 9825212360 /		
Xerox Machine / STD telephone		

Inmarsat Mini M. Terminal and / or V.Sat Terminal Antenna are required to be set up and installed at Vadinar.

Manning at Vadinar Control Room Jetty

Any one of the AVAILABLE Contract Pilots is available at Vadinar

Designation
XEN(M&E)
M.E. Grade-II
Office Supdt
A.F.S

A.F.S
Signalman
Signalman
Signalman
Signalman

19.2.1 Obtain Information from following Sources

1. State Meteorological Control Room, Ahmadabad
2. Control Room, KPT, Kandla / Gandhidham 9. Meteorological Section, New Kandla,
3. signal station, New Kandla.

The information so collected shall be maintained by making hourly log entry in a register.

19.2.3 Control Room Assets

1. Xerox machine
2. STD telephone
3. Fax machine
4. Inmarsat Mini M. Terminal / and or V. Sat Terminal antenna, are required to be set up at Vadinar jetty

The In-Charge of Control room should ensure setting up of the Control room at Vadinar jetty immediately on receiving warning and matter be reported to C.O.M. who in turn apprise the Dy. Chairman and Chairman, KPT.

The control room shall remain in touch with various authorities / agencies like State Govt. / Distt. Authorities / and local authorities. Besides, Naval Authority OkhaPorbandar should also be contacted on VHF/UHF frequency, round the clock. In the prevailing set up of CISF Security control staff at Vadinar, Officer-in-charge of C.I.S.F. Unit of KPT Vadinar along with his entire CISF Security Personnel will remain in contact with In-charge of Control Room for posting of CISF Security Personnel at various locations as per the requirements and they will carry out the duties and responsibilities as required & assigned under this Action Plan.

In case the Marine Signal No.8 is issued, the Vadinar jetty area will be evacuated including the Control Room, which shall be shifted to Room No.5 of Port Guest house at Vadinar colony. In this regard, XEN (E&M) shall pre-plan installation of VHF Antenna and drawing extension line of there available Telephone Nos. (02833)-256533 / 256714 at Port Guest House at Colony and ensure laying of cable with suitable connectors with the Wireless Sets duly tested and thereafter to be set up there at Guest House.

19.3 Functions of Control Room –Vadinar Port

Control room shall remain in touch with State level / District level Meteorological Department / Masters of ships at Vadinar, Navy / Coast Guard at Porbandar / Vadinar and also with the Control Room of KPT at Kandla/Gandhidham.

Telephone numbers of concerned contact persons are as under:

STD code: Jamnagar (0288), Vadinar (0288)

Sr. No	Name of Organization / Contact person	Office	Residence
01	Chairman, Mutual Aid District Collector, Jamnagar	2555869	2554059
02	Joint Chair Person, Mutual Aid Commissioner, JMC, Jamnagar	Fax No.2554454 2552321	2552372
03	Distt. Supdt. of Police, Jamnagar	2554203	2555868
04	Police Control Room, Jamnagar	2550200	
05	Police Control Room, Sikka	2344249	
06	The Dy. Chief Controller, Civil Defense, Jamnagar	2540371 2674758	2671828
07	Control Room, Collector Office Jamnagar	2553404	
08	Port Officer, GMB, Jamnagar.	2712815 Mobile:9426239289	2554942

09	Commandant, Home Guard, Jamnagar	2553862	
10	Mamlatdar, Khambhalia	234788	234736
11	Dy. Collector, Khambhalia	234577	
12	Police Station, Khambhalia	234735	
13	Fire Officer, Fire Station, Jamnagar	2662690 Mobile:9879531101	2550340
14	DEAN, Irwin Group Hospital, Jamnagar (Now Guru Gobind Singh Hospital)	2553515	2553676
15	Indian Air Force, Jamnagar Extension: 222/257 Wing Commander	2720003 to 009 2720004-2720005	
16	Duty Officer, INS, Valsura Jamnagar	2550263-222 extn.	
17	CISF, Coast Guard, Vadinar		
18	DGM, IOC, Vadinar	02833-256527	02833- 256567
19	Chief Operation Manager, IOC, Vadinar	02833-256984	02833- 256559
20	Dy. Manager (operation), IOC, Vadinar	02833-256545	02833- 256530
21	Fire Brigade, IOC, Vadinar	02833-256542	02833- 256559
22	Main Board of M/s Essar Oil Limited, Vadinar	02833-241444	
23	Security Control Room, Essar, Vadinar.	02833-241917	02833- 241191

24	Vice President, (P&Admr ESSAR Vadinar Refinery.	02833-241107 02833-241167	028332550976 028332662856
25	M/s. Reliance Petro. Ltd., Moti Khavdi	0288-6610101	

Information from the above officers will be collected and transmitted to the C.O.M. (OOT) on hourly basis between 0800 to 2000 hours & 2000 hours to 0800 hours respectively. The said information shall be passed on to Dy. Chairman / Chairman on three hourly basis.

The Vadinar control room shall maintain logbook of messages received from and to Control Room at Gandhidham continuously and report to the COM (OOT) every hour. The information shall be passed on to Dy. Chairman / Chairman depending upon the importance. It shall be the responsibility of the Control Room staff to ensure that the information is passed on timely and proper monitoring is done.

The following are the Website addresses through which the required information regarding the position of the Cyclone can be ascertained.

<http://www.imd.gov.in/> <http://www.supertyphoon.com/indian.html>

<http://www.npmoc.navy.mil/products>

<http://www.solar.ifa.hawaii.edu/tropical/tropical.html>

<http://www.wunderground.com/tropical>

19.4 Stopping of Port Operations

In case of emergency situation, local port authorities like COM (OOT) will decide about the stoppage of the port operations which will be stopped after consulting DGM, IOC / Essar, and ordered by Dy. Chairman / Chairman. In case COM (OOT) is not available in the emergency situation, senior most Executive Engineer is authorized to take such decisions in consultation with Gandhidham officials. Under such situation COM (OOT) in co-ordination with officials of Indian Oil Corporation Ltd. and M/s. Essar, shall get the operation at all three SBMs stopped and also get the hoses dis-connected from the tanker berthed at SBMs and un-berth tanker from Product jetty of Essar. Pilot of KPT on board the tankers will immediately take action to castoff the tanker from SBMs/Product berths and tankers will be directed to go to suitable safer place in that situation. All the ships waiting at own anchorage or working at anchorage will be asked by Vadinar control to go off in open sea at least 5 Nautical miles away from SBM. The tankers carrying out transshipment operation at LPO (Lighterage point), will be asked to stop the operation immediately and be on their own power to be away from other ships in the vicinity.

19.5 Securing of Ships / Crafts / Tugs etc

Pilot / M.E. Grade-II / both the AFS, should be available at Vadinar in case of Action Plan is in operation and situation like emergency. Immediate action for stopping the shipping operation should be taken by informing concerned agencies like IOC, ESSAR, and Shipping Agencies and also to KPT Tug / Craft working for the shipping operations at SBMs / LPO point and Product berth of Essar at Vadinar.

Both the AFS and AXEN (Mech.) should ensure that all the big crafts are moved out of Pathfinder Creek and all Port crafts & small crafts of private parties are placed at inner and outer side of the Vadinar Berthing Jetty or any other suitable location pre-decided and notified. If it is impossible to remove them, then all other steps should be taken to ensure safety of vessel / crafts at the Vadinar port, as also it would not cause any damage to the port. For the purpose of securing of ships / all crafts, pilots assisted by Marine Engineers Grade-II and XEN (E&M) will jointly assess the situation and get the crafts/tugs secured accordingly. The Pull Back tugs shall be secured safely at the Berthing Jetty and Crafts/dumb barge of outside agencies will be placed at safer places in this area. Both AFSs, will ensure while directing all the flotilla staff to take care of the safety of Floatilla. They will look after Pull back tugs and all other Masters will look after the Port flotilla with the help of team of Lascars, Serangs, Quarter Masters and Engine staff. The private Tugs & dump barges engaged by M/s. Essar and M/s. IOC and placed at approach jetty or RO-RO LO-LO jetty shall be ensured to secure at a place decided well in advance by XEN (E&M) and AFS after consulting authority of M/s. Essar and M/s. IOC. A compliance report of securing all crafts at safe places should be furnished to Control Room immediately on issuance of Cyclone Signal No.5.

Both the AFS should ensure the sufficient stock of mooring ropes and heaving lines, etc. to meet operational requirements during the emergent situation and sufficient number of life buoy, life jackets, etc. kept in easily accessible places in each crafts and at various other places on shore too.

19.6 Communication

XEN(E&M) and XEN (Civil-II) shall ensure on hourly basis by ringing personally that the telephones of signal station, AO Building, Estate Office, Hospital, Electric and Water supply are functioning, failing which they shall take up the matter with concerned BSNL authorities. In case of any difficulty in communication system, COM (OOT) should be contacted.

The satellite phone or V-Sat communication network should be established and put into operation at the earliest, by the following Signalmen:

1. Shri P.C. Kothari.
2. Shri Krishna Prajapati.

They will ensure the charging of walkie-talkie, Mobile telephones, as well as satellite phone available at the Signal Station, Vadinar.

The staff at Jamnagar Liaison office shall remain present on 12 hourly shift basis round the clock; to carry out the liaison work during the Action Plan is in operation and any other work as may be assigned during the period of Calamity. S/Shri V.M. Mehta, Assistant shall communicate with the Gandhidham/Kandla officials in case Vadinar communication is cut off from that of Gandhidham/Kandla

Traffic Movement & Security

XEN(C-II) and In-charge of CISF (KPT) Vadinar unit shall ensure that all incoming traffic to the Port jetty of Vadinar is stopped except those which are coming for rescue operations and essential services. They shall ensure posting of adequate security personnel, at various security points in co-ordination with the local police authority. XEN (Civil-II) and S.I. (W&W) should ensure safety of essential service premises like water overhead tanks / Main Store / Electric Station at colony. In addition, the in-charge of CISF Unit (KPT) Vadinar in co-ordination with XEN (Civil-II) shall ensure the posting of Security personnel with arms at all strategic locations, such as Control Station room at Jetty & Port Colony, Water supply tower, etc.

Medical Aid at Vadinar Port Health Center

Medical Officer (O.O.T.) being Officer in-charge at Health Center, Vadinar & other complete Health Center staff will remain in state of readiness to deal with any casualty by setting up a Casualty Emergency Room at the Health center, Port Colony, Vadinar. The Casualty Emergency Room shall start functioning as soon as Action Plan is put in operation and warning of the calamity is received. No staff of the Health center will be given leave during the period and Casualty Emergency room will function round the clock with posting of Doctor and staff round the clock. Medical Officer shall remain present and, apart from attending the patients, will allocate various duties to the available medical & Para-medical staff, such as maintaining records of patients attended and preparing a report thereof. Adequate number of chlorine pills should be distributed after the calamity is over, to avoid epidemic from spreading. M.O. (OOT), being Officer in-charge shall pre-plan for assessment & urgent requirements of all kind of the medicines to meet with the situation which may arise in case of any Natural Calamity. He should arrange to obtain the advance approval for immediate procuring of such medicines and the same should be procured & stocked readily available in advance.

Action to be taken by Pilots

In case of receiving cyclonic weather warning i.e. on declaration Weather Warning signal No.5 at Port, Pilot on the Board at SBM should un-moor the tankers and direct the Master of vessel to move the vessels to safer places i.e. away from the SBM. While returning to the Jetty by the Port craft, the Pilot should ensure that all the Port crafts are secured properly and safely at both inner and outer sides of the jetty. He should also ensure that ropes are doubled up and the tugs are manned at all times and engines are kept in readiness to move out in case of emergency.

Meanwhile, till the time the Pilot returns to the Jetty, the AFS on duty will not waste time and initiate action to secure the smaller crafts, which will further be inspected by the Pilots. Masters of all the smaller crafts should also be directed to ensure proper fendering arrangements are provided and if required extra fendering to the crafts may be provided. AFS shall ensure that the proper fendering arrangements are provided to all crafts before on set of inclement weather. Port crafts will get the priority over the private crafts to come alongside jetty. If any space is available, the private crafts can be allowed to come alongside the jetty.

After observing/monitoring weather conditions, intensity, speed and direction of propagation of Cyclone, necessary arrangement for abandoning the crafts may be made and on declaration of weather warning Signal No.8, the Vadinar jetty area will be evacuated including jetty Control Room, which shall be shifted to Room No.5 at Port Guest House at Vadinar Colony. In the month of April every year, Signalmen under guidance of XEN (M&E), shall inspect & ensure working of all the equipments meant for Control Room of Jetty as also readiness of all the electric connections / charging points at the above alternate location of Control Room at Colony.

Generator Set

Wherever Generator sets are required due to power failure at Port Jetty and colony, AXEN (Electrical), JE (Electrical) shall be contacted who shall immediately arrange to provide the DG set already procured & available with Electrical section, giving preference to the operational area. However COM (OOT) shall be free to hire additionally required DG sets for a suitable period, if the same is not found adequate available in store.

AXEN (E), JE (Elect.) shall prepare a roster of staff of Electrical section for putting the D.G. sets installed & commissioned at the following destinations in operation and attending faults, if any occurs, during the operation of Action Plan and ensure readiness for meeting with emergency situation in case of power failure. Diesel oil drums, connecting cables with lugs etc. and any other such materials are to be kept readily available/accessible for use.

1. Jetty
2. Colony
3. Guest House
4. Health Center
5. Water supply complex at colony

Provision of sufficient emergency spares and cables, terminals, portable lights (Handle torch, emergency lights), tools, tackles, etc. should be ensured well in advance in planned manner to combat the situation. All precautionary measures should be taken to protect the D.G. sets from detrimental effect of thunderstorm, heavy rain showers and such cyclonic conditions. Sufficient stock of waterproof spread sheets, tarpaulins, canvas, etc. to protect the electrical gear from water showers/moistures, etc. should be planned, procured and kept at easily accessible place for instant use.

Power supply staff should be well equipped with jigs and fixtures, such as portable tower ladders, insulated axe, gumboots, hand gloves, shockproof accessories. All the above urgent items should be got procured & kept readily available, well in advance in association with Assistant Executive Engineer (Mech), to cater for emergent situations. XEN (E&M) shall take advance action for procurement of one No. DeWatering Pump (Diesel Driven) and the same should be kept stand-by along with its suction & discharge hoses connected for use

Vehicle Pool

As soon as the Action plan comes into force, the vehicle pool shall be formed and vehicles as allocated as per ([List of Vehicles available with Chief Operations Manager \(OOT\) Vadinar](#)) shall remain stationed at the said places along with operating staff. The pool shall be controlled by Assistant Executive Engineer (M) / AXEN (E) to be assisted by Junior Engineer (Mech) / (Elect), and following staff will render their services for posting of drivers and allocating of vehicles as per ([List of Vehicles available with Chief Operations Manager \(OOT\) Vadinar](#))

Apart from the above, XEN (E&M) / XEN (Civil-II), shall hire vehicles, if needed for emergency work, from the private vehicle contractors. The list of private vehicles contractors is shown as Annexure – VII. Assistant Executive Engineer (M) / AXEN (E) should ensure the availability of drivers and vehicles and submit compliance report to the COM (OOT). All hired vehicles should be stationed at the location as decided by XEN (E&M) / AXEN (M), from where it can be taken for immediate use at the required places.

Temporary Evacuation Centre

The temporary evacuation center shall be looked after by XEN (Civil-II) and Assistant Executive Engineer (Civil) who will be assisted by the Principal of St. Ann's School & his staff and the following KPT staff members assisted by the volunteer's employees as mentioned in the Annexure-III, for setting up temporary evacuation centers and rendering required services for the same. They shall ensure that temporary evacuation centers are established immediately, in the school and staff club of Vadinar Port colony. Port vehicles such as Trucks, Buses, Ambulances, etc. will be put into operation for immediate evacuation of people from Port Jetty as well as colony, as the need be.

1. Sr. Clerk
2. Assistant
3. Junior Clerk
4. Junior Engineer (Civil)
5. Junior Engineer (Civil)
6. Junior Engineer (Civil)
7. Junior Engineer (Civil)

Assistant Engineer (Water Supply sub division, Vadinar) shall ensure for providing adequate quantity of water supply at all the temporary evacuation centers.

Medical Officer (O.O.T) with the help of internees and staff of Health Centre shall ensure to provide necessary medicines / medical assistance to affected persons and ensure about the hygienic conditions at the temporary evacuation centers.

XEN(Civil-II) being Officer-in-Charge of Temporary Evacuation Centre, with the assistance of following staff members and volunteers employees mentioned in the Annexure-III, shall take care of the requirements of food/water etc. and supply the same for the evacuees in the temporary evacuation centers.

1. Senior Clerk.
2. Electrician.
3. Junior Clerk.

4. Lascar.
5. Chowkidar.

The Officer-in-charge of C.I.S.F. Unit of O.O.T. Vadinar and SI(W/W) should arrange to make announcements regarding cyclone warnings with the co-ordination of local police, by vehicles mounted with public address systems and also should arrange for requisitioning and providing trucks for shifting peoples, as soon as Internal Action Plan comes in action.

Spray of Dis-infecticides / BHC powder etc will be looked after by Assistant Engineer (Civil) Building Sub. Division along with staff of Estate office i.e. Jr. Engineers and other staff.

19.13 Press & Media Management

There will be a Press cell headed by C.O.M. (OOT). The following officers/employees shall remain in the Press cell.

1	XEN (M&E), as Officer-in-Charge
2	PA to COM
	Signalman

The press cell shall come into operation in the chamber of COM (OOT). The press cell shall issue daily press note with the knowledge and approval of Chairman / Dy. Chairman. If needed, a photographer be engaged, who will take photograph / video shooting everyday, which will depict the situation as well as the relief work undertaken by the officers. All media people of press, journalist etc. shall be taken care of by XEN (Civil-II).

As regards to their transportation, lodging / boarding and other hospitality, he shall take required advance amount from Accounts Officer (O.O.T.) and submit the bills thereof subsequently. Accounts Officer (O.O.T.) along with Superintendent of Accounts / D.A. will be the custodian of cash drawn and kept in their custody for the disbursement for various emergency payments to the designated Officers and the record of such advances to such individual Officers.

XEN (Civil-II), Vadinar and Pilot posted at Vadinar, shall remain present in all KPT meetings relating to the Action Plan. XEN (Civil-II) and Pilot in-charge shall remain in touch with State Governments / District Authority and Mutual aid scheme members, on daily basis, for sorting out the difficulty / problems of cyclone/calamity relief work in consultation with COM (OOT).

19.14 Action to be taken by Accounts Officer (OOT)

As soon as the Cyclonic Weather warning Signal No. 5 is declared, Accounts Officer (OOT) shall arrange for the cash amount to be disbursed as advances to various officers. All Officers-in-charge, should make a judicious assessment regarding requirement of funds by them to meet with different exigencies which they may have to handle on account of the situation arises due to Cyclone / natural calamity. A.O. (OOT) in turn, would examine the advances sought by the officers and disburse the advances immediately without delay and intimate C.O.M (OOT) and F.A & C.A.O about amount released by him and obtain sanction thereof.

19.15 Advance Planning

19.15.1 For stocking required equipments / machinery / material & medicines

Assistant Engineer (Civil) in association with Store Keeper, should ensure the advance stocking of Diesel, Petrol, Kerosene, Lubricant Oil, Emergency lights as well as Torches & Cell, required tools & tackles, jigs and fixtures etc. in sufficient quantity to meet with the emergency requirements of Vehicles, Generators as stipulated under action at Sr. No.8 & 10 above and all such other services. All the Officers-in-Charge, must list out the materials required well in advance, to facilitate procurement & stocking in, sufficient quantity of the same by Assistant Engineer

(Civil).

19.15.2 For securing of ships / crafts / tugs etc

A safe place to secure ships/crafts/tugs etc. on issuance of Cyclone Signal No. 5, should be decided & notified well in advance (By April end) by XEN (E&M), in association with both Assistant Flotilla Supervisors. The sequences of operations for shifting of all crafts shall be planned in advance by all the Masters along with related Marine staff, under the guidance & instructions of above officials.

19.15.3 Post Calamity Operations

19.15.3.1.1 Marine Operations

Immediately after the Calamity subsides, Marine Engineers Grade-II along with both the Assistant Flotilla Supervisors & related Marine staff shall carry out the inspection of all the Floating Crafts and check if the crafts can be put into operation for checking the condition of SBMs and hoses. Accordingly, a report to that effect, shall be submitted by both Marine Engineers Grade-II, to the Control Room at Vadinar, who in turn, after taking approval of C.O.M., will transmit the same to the Dy. Chairman/Chairman at Gandhidham/Kandla. C.O.M. shall co-ordinate with officials of M/s. IOC/Essar Vadinar, for their all Okey reports or otherwise, as regard to SBMs/Product Berth, Pipelines and their clearance for resumption of shipping operation & project works at Vadinar.

19.15.3.1.2 Other than Marine Operations

XEN (Civil-II), after taking the stock of situations, arrange for all relief/restoration measures for the damages caused during the Calamity. An advance planning of work-force (Work team/Volunteers by name), list of materials required and the arrangement of effecting the relief/restoration, shall be checked out & notified to all the connected persons in this operations.

For coping up with the immediate restoration work in Post-calamity period, an advance approval of Chairman, KPT, shall be obtained by XEN (Civil-II) by processing the case file, for authorizing the Chief Operations Manager (OOT) to engage Daily rated labour of various discipline in Un-Skilled, Semi-Skilled and Skilled category, at the fixed daily wage for each category personnel.

Further, to hire equipments such as Vehicles/Mobile cranes / Dumpers / JCBs / Pay Loaders etc. for immediate relief/restoration work at the required places at Vadinar, XEN (Civil-II) shall also process case file in advance, for obtaining approval of Chairman, KPT, to hire such equipments, for immediate restoration work in PostCalamity period at Vadinar.

19.16 Action Plan – Land Fire Station

In case of any fire, the Control Room shall immediately establish a communication with C.I.S.F., Fire Brigade of M/s. IOCL and M/s. Essar Oil Ltd., Vadinar and immediately summon CISF In-charge of OOT to directly reach the site of the fire along with his Security Personnel & co-ordinate with fire fighters, for cordoning the site of fire and take actions to provide rescue and containment of fire.

CISF In-charge of KPT (OOT) Dept., Vadinar should keep informing the Control Room and C.O.M (OOT) from time to time about the gravity of situation and extent of control over the situation.

19.16.1 List of all the officers in charge & designated officers & employees covered

Sr. No.	Name & Designation	Tele. No. at Office	Tele. No. Residence
1.	C.O.M.	0288-2573001 0288-2573031 FAX	
2.	, XEN(M&E)	0288-2573005	
3.			
4.	XEN(Civil)	0288-257006	
5.	AXEN(E)	0288-2573011	
6.	Shri NAYAK, M.E. Gr.II	0288-2573007	
7.	A.O.(OOT)	0288-257008	
8.	Dr Medical Officer.	256313 (Vadinar)	
9.	AXEN (Civil)		
10.	A.E.©		
11.	A.E.©		-----
12.	Shri A.XEN.(Mech)		2915231 (Jamnagar)
13.	PA to COM		
14.	O.Supt.		256483 (Vadinar)

15.	Supdt. A/cs.		
16.	(Store Keeper)		
17.	A.F.S.		256517 (Vadinar)
18.	, AFS		256817 (Vadinar)
19	Signalman		
20.			
21.	Signalman		
22.	Signalman		
23.	J.E.©		
24.	J.E. © Gr-1.		
25.	J.E.©		
26.	KPT Guest House at colony.		
27.	Shed Master		
28.	Assistant,KPT Liaison office at Jamnagar		
29.	Time Keeper		
30.	(Clerkcum-Time keeper).		
31.	, Maistry		

19.16.2 List of Press Reporters & News Services at Jamnagar

Sr.No	News Service	Name and address	Telephone nos.
01	District Information Officer, Jamnagar.	Shri K. A. Karamata, District Information Center, Jamnagar.	2556827 2672939
02	Times of India, PTI	Shri Darshan Thakar, Journalist society, Jamnagar	2555731 9824232632
03	Indian Express, Jansatta & Financial Express	Shri Bipin Sukhpariya Limda lane, Jamnagar	2553717
04	Phulchaab	Shri Dinesh Vora, Nr. Old Railway station, Jamnagar	2550320
05	Sandesh	Smt. Bhavnaben Soni, Opp. Apsara Talkies, Jamnagar	2553106 9825280456
06	Jay Hind	Shri Bharatbhai Raval, Nr. Old Railway station, Jamnagar	2557447
07	Sanj Samachar	Shri Mukeshbhai Joiser, Near Old Rly. Station, Jamnagar	2554109 9824219999
08	Bhoomi	Shri Dolarbhai Raval, Limda lane, Jamnagar	2679080
09	Nobat	Shri Pradeep Madhwani, Pancheshwar tower road, Jamnagar	2555924 2670924 2553752 (Fax)

10	Gujarat Samachar	Shri Vipul Hindocha Opp. Madras hotel, Teen batti Jamnagar	2670634
11	Ajkal	Shri Praful Tankaria, City Point, Near Town Hall, Jamnagar	2665602 2665603
12	Lokvat	Shri Jay C. Chauhan, New Super Market, Jamnagar	3092114
13	Sahara Samay	Shri Darshan Thakar, Journalist Society, Jamnagar	2555731
14.	Divya Bhaskar	Shri Mukesh Joiser, Near Old Rly. station, Jamnagar	9824219999

19.16.3 List of School & Buildings available at Vadinar for Shelter purpose

1. St. Ann's School, Vadinar Port colony Telephone No. 256568 / 256514
2. Staff club, Vadinar Port Colony.

19.16.4 List of volunteers employees at Vadinar (Dist Jamnagar) To be formed by COM

19.16.5 List of Vehicles available with Chief Operations Manager (OOT) Vadinar : To be arranged by XEN (M&E) as per availability

Name of Driver (Motor) & their Residence Telephone No : To be arranged by XEN (M&E) as per availability

19.16.6 Names of local contractors working at OOT Vadinar

1. Rajlaxmi Construction, P.O. Vadinar. Phone No. 02833-256789/256505 - Contact person: Shri C.R. Jadeja.
2. Shree Shakti Construction, P.O. Meghpar (Padana) Ph. No. 246314 / 246411 Contact Person: Shri Pradumansinh G. Zala.
3. M/s Jai Chamunda Enterprises, Vadinar 361010 Contact person: Ranmal Vira, Ph. No. 02833-256719
4. Shri Kama Mala, Vadinar 361010.
5. Shri M. B. Jadeja, Vadinar 361010.
6. Shri Ganesh Construction, Village-Kajurda, Tal. Khambhalia Contact person: Shri Kherajbhai
7. Shri Hira Punja Rathod, Vadinar 361010
8. M/s. Shiraji Construction, Vadinar.
9. Shree Ashapura & Co Vadinar 361010 Ph No. 02833-256711
10. M/s. Bariya & Co., Near KPT colony, Vadinar.


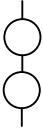
19.16.7 Important Telephone Nos of IMD <http://www.imdahm.gov.in/index.html>


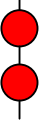
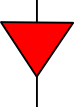
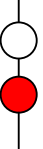
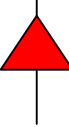

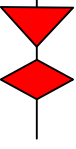

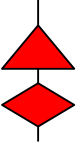
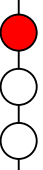
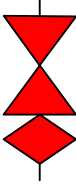

19.16.8 List of Vehicle Hire / Transport Travel Contractors at Jamnagar

Sr.No	Name and address of Transport / traveler	Telephone
1	Pavan Travels, Pancheshwar tower, Jamnagar	2552002
2	Patel Travels, Pancheshwar tower. Jamnagar	2552419 /

		2660243
3	Ashwamegh Travels, Jamnagar	2670613
4	Sheenath Travels, Jamnagar	2663315 / 2662215
5	Royal Travels, Opp. Town Hall, Jamnagar	2553333 / 2553636
6	Pruthvi Travels, Sikka Patia, SIKKA (Jamnagar.)	244466
7	Shree Divya Travels, Jamnagar	2677601
8	Payal Travels, Jamnagar	2551514 / 2551415
9	Gujarat Travels, Jamnagar	2664315
10	Abhishek Travels, Jamnagar	2564380
11	Shiv Shakti Travels, Jamnagar	2566611
12	Sapan Travels, Jamnagar	2558558
13	Tulshi Travels, Jamnagar	2541054
14	Samay Travels, Jamnagar	2551925

19.16.9 Chart of Weather Warnings

Signal No.	Symbol Day	Symbol Night	Type of Warning	Description
I			Cautionary	There is a region of squally weather in which a storm may be forming.

II			Warning	A storm has formed.
III			Cautionary	Port is threatened by squally weather.
IV			Warning	The Port is threatened by storm, but it does not appear that the danger is as yet sufficiently great justifying extreme measures of precautions.
V			Danger	The Port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the south of the port.
VI			Danger	The Port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the north of the port.
VII			Danger	The Port will experience severe weather from a storm of slight or moderate intensity that is expected to cross over or near to the port.

- Receiving product from the refinery into a product tank farm, also located inside the Refinery fence-line for loading into tankers at the marine terminal jetty;
- Receiving seawater from the intake well that is pumped via pipeline to the EOL refinery, and then discharging seawater via the seawater outfall located near the location of the SPM.

The crude oil tank and product tank farms, which are located inside the fence - line of the EOL refinery, while owned by VOTL, are actually operated and maintained by the Refinery, and were not covered by this HAZID or the ERA. (These tanks farms have been risk assessed separately).

The areas where the Marine Terminal and the SPM are located in the Gulf of Kutch are part of a designated and controlled marine park and represent a sensitive marine environment. The on-land pipelines pass through low lying areas which consist of some farming land and are adjacent to several villages.

The VOTL marine terminal facility consists of the following systems for supporting the aforementioned functions:

- A Single Point Mooring (SPM) and Subsea Line for loading crude:

The SPM buoy is the gateway for crude oil input to the EOL refinery. The SPM is anchored to the seabed in the Gulf of Kutch, in around 35 m of water. Tankers are secured to the buoy via mooring hawsers. The tanker is held off the SPM by a pull-back tug. The offloaded crude oil is pumped by the crude tanker pumps through the floating hose(s), through the SPM, and then via flexible catenary hoses into the 48" rigid subsea pipeline, through a PLEM and then flows directly to the crude oil tank farm located within the EOL refinery. The SPM is located roughly 4Km from the Marine Terminal and 8Km from the crude oil pipeline landfall.

- Seawater Intake Unit and Outfall system:

Seawater is pumped from the seawater intake facility (located at pathfinder Creek, adjacent to the jetty) and delivered to meet the water needs of the refinery. Seawater flows through two filter packages in the seawater intake well and is then pumped to a seawater storage reservoir located in the Refinery via a 48" GRP pipeline. Chlorine is added to the seawater downstream of the pumps at the intake facility for prevention of marine growth in the pipeline and the Refinery seawater reservoir.

The seawater outfall dispose of waste brine (high salinity water) generated from different Refinery units through a diffuser located on the seabed close to the location of SPM. The seawater outfall flow is pumped from a seawater return reservoir at the Refinery through an on-land 48" GRP pipeline and then via an 8Km subsea pipeline.

- A jetty including three (3) Loading Arms:

The jetty is located at the inlet to pathfinder Creek, and is situated between two coral reefs which are part of a declared "Marine National Park". The jetty is used for shipping of refined white and black products to vessels. The jetty is connected with the refinery through 3 x 32" diameter pipelines which bifurcate into 7 x 24" lines on the trestle and finally culminate into three (3) loading arms. Each of the 7 x 24" lines are allocated to each of the seven (7) products handled at the jetty, namely: ATF (aviation turbine fuel), kerosene, MS 87 (motor spirit), MS 95 (motor spirit), naphtha, diesel and VGO / FO (vacuum gas oil and fuel oil). Tanker at the jetty is located via pipelines connected through three sets of loading arms with Quick Connector Disconnecting Coupling.

- A pig station with three (3) Pig Receivers / Launchers and Terminal Area Slop Tank:

Pigging is carried out for clearing any previous pipeline content, separation of cargoes, cleaning inside pipeline coating and assessing any leak- buckle or damage- deformation in the internal section of pipelines (intelligent pigging). Products for export are pumped from the refinery to the jetty through 3 x 32" diameter cross- country pipelines. There are two (2) pipelines for white products (naphtha, MS, ATF, Kerosene, and diesel), and other is for black products (VGO / FO). To enable the flexibility of these pipelines to carry different products, pigging is carried out between the Refinery and the Marine Terminal Pigging station, where each line has its own pig receiving and launching facilities (total of 3 pig receivers / Launchers).

A slop tank is also provided for the pig stations to contain / collect liquid product drained from the pig station, and it is also used for transfer of products drained into the jetty Slop Tank (which are transferred by pump). Products drained into the slop tank are removed as required by an educator truck and taken back to the EOL Refinery where they are reprocessed.

- Pipelines between Terminal and Refinery (including crude oil and seawater lines) include the following:
 - 3x 32" diameter cross- country pipelines (two (2) pipelines for white products, and one for black products) between refinery and marine terminal (around 18 km in length)
 - Crude oil pipeline (48") between refinery and landfall (13 Km), and then a further 8Km of 48" subsea pipeline to the PLEM on the seabed below the SPM
 - Seawater intake (48") between marine terminal and refinery (17Km), and seawater outfall (48") between refinery and landfall (13 Km) plus 8Km of subsea line to the outfall diffuser.

All pipelines are buried on land within an earthen berm. Steel lines are wrapped and cathodic protected (crude / product lines). The seawater lines are GRP. There are no flanges or connections on crude / product lines on –land (other than at marine terminal for product), and only air vents are provided along the seawater lines. The subsea crude oil pipeline is concrete encased, with the only flanges at the point of landfall and at the subsea PLEM.

- Buildings including the Main Terminal Control Building (MTCB) and two substations (main substation located near the seawater intake station, and jetty substation).

The response strategy for the VOTL 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 facilities 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.

SPM	:	690 39' 35'' E
		220 30' 14''N
LFP	:	690 43' 26''E
		220 27' 59''N
Berth B (North End)	:	690 40' 10.26''E
		220 27' 15.25''N
Berth A (South End)	:	690 40' 11''E
		220 26' 54''N
Sea Water Intake	:	690 40' 32''E
		220 26' 11'' N

19.17.2 Oil Spill Risks

19.17.2.1 Identification of activities and risks

Oil spills will be categorized in accordance with the internationally recognized three tier classification system

Tier One	100 - 700 T
Operational spillages which can be dealt with using the resources immediately available	
Tier Two	700 – 10000 T
Medium size spillages which exceed VOTL resources and which require District and/or Regional assistance	
Tier Three	10000 > T
Large spillages which exceed the full resources of the District/Region and which may require National assistance and/or the implementation of the NOS - DCP	

19.17.2.2 Types of Oil likely to be spilled

No.	Oil Type	Strategy Figure	Specific Gravity	Genre	Characteristics	Examples
1	Light Oil	5.1	< 0.84	White oils	Non-persistent, Volatile	Aviation fuel, Kerosene, Motor spirit, Naphtha, HSD
2	Crude Oil	5.2	> 0.84	Black oils	Persistent, Viscous, Emulsion. Fresh oil amenable to dispersants	Arabian Light, Arabian Heavy, etc.
3	Heavy Oil	5.3	> 0.95	Black oils	Persistent, Viscous, Emulsion. Generally not amenable to dispersants	Fuel Oils, LSWR

Probable fate of spilled Oil

19.17.3 Preliminary Assessment

The ICG Coordinator will make a preliminary assessment of the incident by contacting the person reporting the spill, governmental officials, and the responsible party.

- Evaluating the magnitude and impact of the discharge or threat of discharge on the public health, welfare, and the environment;
- Determining in which jurisdiction the incident occurred;
- Determining or confirming the responsible party;
- Determining or confirming the source of the spill;
- Determining whether the spill has been stopped or is ongoing, and if ongoing, how quickly it can be controlled;
- Assessing the need for state assistance; and
- Assessing the feasibility of removal and determining the equipment needed to remove the oil.

19.17.4 Containment & Control

Clean-up actions must begin as soon as possible to minimize the effect on natural and economic resources. These actions may include locating the source of the discharge and preventing any further spillage, placement of containment boom to control the spread of oil and to protect sensitive areas, measuring and sampling, physical removal of the oil from water and land, the use of chemicals to herd or disperse the oil, and in situ burning.

19.17.5 Development of Oil Spill scenarios

VOTL is operating 02 Nos. Berths (A & B) for product evacuation & 01 No SPM for crude intake.

The VOTL is capable of accepting vessels ranging from 25000 to 100,000 DWT each at berth A & B and Vessels ranging from 87,000 to 325,000 DWT at SPM.

The 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 jetty.

19.17.6 Port Operations

19.17.6.1 Pilotage

Pilotage is compulsory for all vessels. Pilotage and auxiliary support craft services are provided by Kandla Port Trust (KTP).

19.17.6.2 Main Approach Channel

The least depth in the main approach channel to the tanker jetty is 13 meters; the maximum acceptable draft alongside jetty berths is 15 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 wholly 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/of 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.

19.17.6.3 Approach to SPM Berth

Tankers bound for SPM will follow the deep water route. Berthing and un-berthing of the Tankers on the SPM will be done by KPT Pilots. Charted depth at SPM location is 34.5 meters. Grounding of Tankers in the SPM area is considered as very remote.

19.17.7 Oil Spill scenarios

19.17.7.1 Collision between Vessels Underway

The control which will be imposed on ship movements within terminal are designed to ensure that any risk or collision is minimized. For example, inward / outward bound ships will have sole occupancy of the approach channel to the jetty berth; additionally all departing vessels will remain under Pilotage up to the western limit of the terminal area. It is thus considered that the likelihood of collision between vessels underway within the terminal is remote. There is perhaps a greater risk of collision between vessels maneuvering to the SPM and the jetty anchorage position without Pilotage assistance.

19.17.7.2 Berthing incident (Jetty)

Oil spills can occur as a result of hull contact with the corners of breasting dolphins during ship berthing or un-berthing maneuvers. Such incidents are generally due to failure of a vessel's main propulsion or steering systems, loss of control onboard an attendant tug or pilot error or misjudgment. The potential spill quantities involved depend on the vessel type and the location and extent of the impact damage.

19.17.7.3 Tug impact

There are well documented incidents where cargo or bunker oil has been released as a result of hull impact damage by tugs. This can occur when tugs are approaching a vessel underway prior to berthing, or when coming alongside a moored vessel prior to un-berthing. The potential spill quantities again depend on the location and the extent of the impact.

Adequate fenders shall reduce the level of risk.

19.17.7.4 Cargo Transfer Operations (SPM Berth)

This section considers the potential sources of oil spills during the discharge of crude oil cargoes and is based on oil industry data and ITOPF statistics. It should be noted that the ITOPF statistics demonstrate that most oil spill incidents occur during routine cargo handling operations and that some 91% of these incidents resulted in spillages of less than 7 tones.

19.17.7.5 Connection of Floating Hose String

After the floating hoses have been lifted on board, blank flanges are unbolted from the ends of the hoses prior to connecting them to the ship's presentation flanges. Small spillages frequently occur during the removal of the blank flanges; these are caused by surging of the line contents as the floating hose sections

follow the wave pattern. While in most cases such spillages are contained within the ship's manifold drip tray, there are recorded incidents where oil has escaped overboard via scuppers, which have not been effectively plugged. Spillages of this nature should not exceed 1 m3.

19.17.7.6 Snapping of 24'' diameter Floating Hose

Spillage of crude oil due to snapping of a floating hose, during crude oil unloading operations @ 10000 m3/hr. estimated time taken for response is two minutes. Snapping of hose may occur due to accidental drifting of tanker, collision with SPM, the hose getting entangled due to movement of a tug boat very near to the SPM / Tanker, due to rough weather condition. Theoretically the quantity spilled would be 142 tons. Chances of a full bore snapping of the hose are classified as a rare phenomenon.

19.17.7.7 Sea and Overboard Discharge Valves

Oil can escape to the sea via sea or overboard discharge valves which are directly connected to the cargo pipeline system due to either incorrect line setting or defective valves. The likelihood of this occurring is considerably less on SBT vessels.

19.17.7.8 Slop Tank Overflow

Crude Oil Washing (COW) of cargo tanks will be undertaken during bulk cargo discharge; this operation entails the transfer of tank bottoms and washing oil back to back to the vessel's slop tank(s). The overflow of slop tanks as a result of instrumentation failure or operator error during this process is not uncommon. Checks on the system and operation, pre, during and post COW will considerably lower the associated risk.

19.17.7.9 Vessel Breakout

Other than a sudden and catastrophic failure of the mooring hawser leading to rupture of the floating hose string, it can be reasonably assumed that cargo discharge will have been suspended in weather conditions which approach the established environmental limits. It would also be normal practice to station a crewmember on the forecastle head to maintain a mooring watch. Under most circumstances, therefore, early warning of a potential breakout situation can be anticipated.

In any event, an emergency stop button for the main cargo pumps will be located at the ship's manifold and the deck watch keeper would initiate an ESD immediately the hose string parts.

A vessel breakout and loss of integrity of the floating hose string could result in a spill quantity of some 142 m³. This quantity is based on the following assumptions:

- Bulk flow rate
- Reaction time
- ESD activation time
- Hose contents

In case of undue stresses experienced by the floating hose string, the breakaway couplings will get activated. These are designed to seal both ends on activation.

19.17.7.10 Hull Failure

The incidence of oil pollution due to hull failure is low and some 84% of the incidents attributed to this cause by ITOPF involved spill quantities of less than 7 tones; these spills were caused mainly by minor hull fractures and weld failures. The potential for more serious incidents with spill quantities in excess of 700 tones must, however, be acknowledged.

19.17.7.11 Fire and Explosion

Fires and explosions onboard ship represent a safety hazard with the risk of oil pollution as a secondary impact. All tankers engaged for trading to the SPM facility will be equipped with inert gas systems; gives the control which will be imposed and enforced by VOTL in respect of the oxygen content of cargo tanks, the risk of fire and / or explosion in the cargo spaces must be regarded as minimal.

Strict monitoring and control of the main cargo pump room atmosphere will minimize the fire and explosion risks associated with this space.

Fires resulting from uncontrolled smoking in the accommodation, organization hot work such as welding and engine room fires can spread rapidly if not dealt with swiftly and give rise to incidents of a very serious nature.

While the likelihood of fire or explosion occurring onboard vessels berthed at the SPMs is low, the risk is nevertheless acknowledged. Such an incident could give rise to a spillage of 700 tons or more.

19.17.7.12 Spillages of Fuel Oil

Fuel oil bunkers will not be supplied to tankers moored to the SPM. It may, therefore, be necessary for vessels to undertake the internal transfer of fuel oil for trim or other operational reasons. A bunker tank overflow during such operations could result in spillages of < 1 ton.

Cargo Transfer Operation (Jetty Berth)

19.17.7.13 Ballast Discharge

Only fully SBT (Segregated Ballast Tank) vessels shall be chartered for trading to the Marine terminal; those ships which load refined products will also discharge their segregated ballast water concurrent with the loading operation.

Under fair weather and operational conditions, tankers at SPM will not engage in de-ballasting activity.

On some older designs of SBT tankers, the ballast pipelines pass through the cargo tanks and vice versa, any loss of ballast line integrity can result in the entrainment of cargo oil in the ballast water discharge. Industry records indicate that the spill quantity from this cause on board product carriers should not exceed 25 tones.

19.17.7.14 Loading Arms

The operation of loading arms can lead to minor releases of oil. Common sources are vent valves, swivel joints and hydraulic lines. Loading lines are equipped with PERC (Powered Emergency Release Coupling) and with DDV (Double Disk Valve)

19.17.7.15 Cargo Tank Overflow

Cargo tank overflows can occur on board loading vessels; spills of this nature can be due to instrumentation failure or human error. The spill quantity is a function of the flow rate and also the number of tanks being loaded at the time of the incident. Some of the oil will be retained on deck but in a worst case scenario, some oil could go overboard.

19.17.7.16 Hull Failure - Fire and Explosion

The risks of hull failure - fire and explosion are also similar to those for SPM vessels with the attendant spill quantities being proportional to the tanker size.

19.17.7.17 Effluent Discharges

Treated effluent from the refinery is discharged into the sea area. The discharge consent levels are set and monitored by the State Pollution Control Board and VOTL regularly tests for effluent quality.

Instrumentation malfunction, failure of in-line samplers or operator error can result in the entrainment of oil in the final discharge to harbor waters. Most spillages of this nature are not substantial, and based on industry experience elsewhere, are unlikely to exceed 5m³ in volume.

19.17.7.18 Special Equipment which may be used

- Workboats
- Trucks / cars (four wheel drive)
- Radio transmitter / receivers
- Workshop / repair facilities
- Bulldozers, mechanical scrapers and similar earthmoving equipment
- Vacuum trucks
- Tank trailers
- Life vests
- Explosive meters

19.18 Fire Fighting Facilities at Vadinar Oil Terminal Limited (VOTL) of Essar

19.18.1 Fire water supply pumps at Sea Water Intake

Fire pumps are vertical turbine type as per IS 1710

Dedicated fire pumps are provided for:

1. Fire Tower monitor system
2. Fire Hydrant System (There is no interconnection between two header)

19.18.2 Fire water Pump for Tower Monitor – 4 Nos

- a. Main Motor Driven Pump – 1 No (Discharge capacity 792m³/hr at 15 kg/cm²).
- b. Engine driven – 1 No (Discharge capacity 822m³/hr (standby)).
- c. Jockey Pump (Discharge capacity 33m³/hr at 10.5 kg/cm²).

19.18.3 Fire water Pump for Hydrant System – 4 Nos

- a. Main Motor Driven Pump – 1 No (Discharge capacity 792m³/hr at 15 kg/cm²).
- b. Engine driven – 1 No (Discharge capacity 822m³/hr (standby)).
- c. Jockey Pump (Discharge capacity 33m³/hr at 10.5 kg/cm²).

19.18.4 Fire Hydrant & Jumbo Curtain

Fire Hydrants is located at different section of premises to be protected depending upon nature of fire hazard, fire hydrants are double outlet type.

Each outlet capacity is 900 lpm at 7.5 kg/cm²

The flow rate of hydrant is 1800 lpm at 7.5 kg/cm²

19.18.5 Fire Hydrant Point – 31 Nos

- a. Berth A - 4 Nos
- b. Berth B – 4 Nos
- c. Pig area / cross country / MTCB – 16 Nos
- d. SWI – 03 Nos
- e. Between Berth A & B – 4 Nos

19.18.6 Jumbo Curtain at Berth A

The Jumbo curtains nozzle shall have discharge capacity of 3000 lpm of sea water at 7.5 kg/cm².

Total – 6 Nos of Jumbo Water Curtain

The nozzle shall be able to produce 14 meters. Vertical plane & 20 meters horizontal radius dense water curtain through 160 degree angle – 04Nos at jetty to protect loading arms and – 2 Nos one each at the breasting dolphin to protect tower monitors from the radiant heat in case of fire on tankers.

19.18.7 Jumbo Curtain at Berth B

The Jumbo curtains nozzle shall have discharge capacity of 3000 lpm of sea water at 7.5 kg/cm².

Total – 02 Nos of Jumbo Water Curtain

The nozzle shall be able to produce 13.5 meters. Vertical plane & 22 meters horizontal radius dense water curtain through 180 degree angle – 02Nos at jetty to protect loading arms.

19.18.8 Water / Foam Tower Monitor at Berth A

The monitor shall be suitable for both sea water and foam, each monitor shall be capable of discharging 6000 lpm of sea water and 36000 lpm of expanded foam at 10 Kg.cm² over a range of 100 meters in horizontal direction and 40 meters range in vertical direction. The monitor shall be capable of producing good quality of finished foam.

Horizontal range with water – 100 meters Horizontal
range with foam - 90 meters

The monitor shall be capable of 360 degree rotation in either direction in horizontal plane and 60 degree elevation 70 degree depressions in vertical plane. The monitors shall be achieved by remote control from control room.

Two nos of positive displacement pump have been provided. At a time one pump will be running and other will be acting as stand by. The Capacity of each pump 21.6 m³/hr at 16kg/cm²

19.18.9 Foam Compound Induction

Foam compound induction system is in line with balanced pressure proportioning type to ensure proper mixing of foam concentrate and right proportion and supply the same to the monitor line depending upon the water flow rate necessary automatic valve, spool valve and duplex pressure gauge have been provided to ensure 0 to 6% of foam compound induction.

Induction rate is set at 3% foam compound induction.

19.18.10 Water / Foam Tower Monitor at Berth B

The monitor shall be suitable for both sea water and foam, each monitor shall be capable of discharging 6000 lpm of sea water and 36000 lpm of expanded foam at 7 Kg.cm² over a range of 75 meters in horizontal direction and 35 meters range in vertical direction. The monitor shall be capable of producing good quality of finished foam.

Horizontal range of monitor – 75 meters

The monitor shall be capable of 360 degree rotation in either direction in horizontal plane Elevation – (+) 85 and (-) 45. The monitors shall be achieved by remote control panel near pantry in open area.

19.18.11 Foam supply system at Berth B

Foam supply system shall be operated by manually, located near Foam Tank, Foam supply system located at approximately 50 meters away from Berth B central platform. Since the pipeline will always be under pressure for throwing water / foam through the monitor:

One No foam solution storage tank is provided at south side of berth B with capacity of 16KL.

Foam pumps – 2 Nos (01 No stand by)
Each pump discharge capacity is – 37m³/hr

Two nos of positive displacement pump have been provided. At a time one pump will be running and other will be acting as stand by. The Capacity of each pump 37 m³/hr at 16kg/cm²

19.18.12 Foam Compound Induction

Foam compound induction system is in line with balanced pressure proportioning type to ensure proper mixing of foam concentrate and right proportion and supply the same to the monitor line depending upon the water flow rate necessary automatic valve, spool valve and duplex pressure gauge have been provided to ensure 0 to 6% of foam compound induction.

Induction rate is set at 3% foam compound induction.

19.18.13 Foam Trolley

Foam trolley is firefighting equipment ready to use initial level in case of fire, oil spillage in dyke.

Foam trolley capacity – 200 liters Discharge capacity – 225 lpm

Total – 8Nos of foam trolley available in field.

- Berth A – 2 Nos
- Berth B – 2 Nos
- Pig Area – 3 Nos
- SWI - 1 No

19.18.14 Ground Fixed Water cum Foam Monitors

Fixed foam monitors are ready for instant use in case of emergency and are able to discharge dense foam from orifice type foam nozzle. The discharge capacity of monitor is 2850 lpm

Monitor having facility to discharge water for cooling purpose, all fixed foam monitors are having 200 liters foam drum ready to use by monitor pick up tube.

Total – 4 Nos

- Pig Area – 2 Nos
- Berth B – 2 Nos

19.18.15 Fire Extinguisher

Portable Fire Extinguishers are the first aid of fire fighting equipments. All fire extinguishers installed in the jetty premises are clearly visible and accessible.

At Berth A

- DCP 75 Kg –4 Nos • DCP 50 Kg –2 Nos • DCP 10 Kg –6 Nos

At Berth B

- DCP 75 Kg –4 Nos
- DCP 10 Kg –6 Nos
- CO2 6.5 Kg –2 Nos

Other jetty area locations are also equipped with fire extinguishers

19.18.16 Innergen Total Flooding System

Innergen Total Flooding System has been designed for protection of MTCB floor underneath cabling and DCS instrument panels. It is automatic fire extinguishing flooding system. The contents of gas are (52% nitrogen gas, 40% argon gas, 8% CO₂ gas)

The system is kept in both auto / manual mode operation. There are 12 Innergen gas cylinders which are pressurized to 200 bar at 20 Degree Centigrade for fire protection system.

Innergen Total Flooding system is divided in five different Zones.

Zone 01 & 02: is instrumentation room, Ground Floor MTCB (There are 6 Nos discharge nozzle of Innergen System)

Zone 3: is panel room right side (There is 1 No discharge nozzle of Innergen System)

Zone 4: is panel room left side (There is 1 No discharge nozzle of Innergen System)

Zone 5: is Battery Room Ground Floor MTCB (There is 1 No discharge nozzle of Innergen System)

The system has been put in manual mode.

19.18.17 Manual Call Point (MCP)

MCPs have been installed in premises in different accessible & visible locations like:

- Berth A
- Pig Station
- Around MTCB Building
- SIW & Berth
- All MCP are indentified with Zebra cross red and yellow

In case of Emergency Alarm to be raised MCP glass should be used.

Total 69 Nos of MCPs are in premises connected to DCS panel. On activation of any one MCP alarm will be blow on DCS

- Berth A – 13 Nos
- Berth B – 6 Nos
- Pig Area – 7 Nos
- MTCB – 6 Nos
- SWI / SS – 12 Nos
- Road / Tresle / KPT – 25 Nos

19.18.18 Smoke Detectors

Smoke detectors have been provided inside building (MTCB) cable cellar room, electrical panel room, instrument panel room.

Due to availability smoke particles detector will get activated. Fed Red Becon & hooter will start and on DCS alarm will be sounded repeatedly.

Total No of Smoke Detectors – 68 Nos

19.18.19 Fixed Gas Detectors

Fixed gas detectors have been installed in the jetty premises where most critical hazardous zone is identified.

Fixed hydrocarbon detector detects the hydrocarbon vapours available in the atmosphere and it gives pre explosion alarm. The alarm is set at 10% of LEL.

Total No of Gas detectors – 25 Nos

- Berth A – 6 Nos
- Berth B – 6 Nos
- Pig Area – 5 Nos
- SWI / (H₂) / MTCB – 8 Nos

19.18.20 Life Saving Appliances

1. Life Buoy Ring – Life buoy ring with 30 meters 8 Inch Nylon rope have been installed in entire jetty premises. Total No of Life Buoy – 29 Nos
2. Life Work Vest – Life work vest have been installed in emergency almirah at berth A and Berth B and also installed at central platform of berth and SWI. Total No of Life Work Vest – 18 Nos
3. Life Jacket – Life jacket is available with the terminal whenever persons go to the SPM / Sea shore side life jacket has to be worn. Total No of Life jacket – 12 Nos

19.18.21 Emergency Escape Breathing Device (EEBD)

Emergency Escape Breathing Device is used to escape from place where emergency arises and it is difficult to reach a muster point / safe place, same shall be used in such emergency.

EEBD is ready to use for 15 minutes to see the person can be reached to safest place with normal breath.

Total Nos of EEBD – 5 Nos

- Berth A – 1 No
- Berth B – 1 No
- Pig Area – 1 No
- SWI – 1 No
- Store – 1 No

19.18.22 Breathing Apparatus Set (BA Set)

B A set is to be used in such emergency where it is difficult to breath during rescue operation. Fire Fighting, Toxic gas release, and Flammable gas in atmosphere.

B A set has been installed in jetty premises where it is most hazardous so it can be used immediately whenever necessary.

Total No of B A set – 6 Nos & 2 Nos Spare Air Cylinder

Emergency Almirah Berth A – 2 Nos

- SWI – 2 Nos
- MTCB – 1 No
- Store – 1 No

19.18.23 First Aid Box

First Aid Box is distinctively marked with a red cross on a white background. First aid box is kept in prominent place. Custodians of the first aid boxes are qualified first abiders only.

The names of the first aiders are displayed at the notice board of the control room.

The first aiders are available in each shift.

First aid box available at site – 8 Nos

First box location available in jetty premises and their locations are:

- MTCB – 1 No
- Berth A – 1 No
- Berth B – 2 Nos
- SWI – 1 No
- Security Gate – 1 No
- 70 – 1 – 1 No • 76 – 2 – 1 No

19.18.24 Portable Safety Instrument

1. Area Monitor – Area monitor is available in control room. It is used for continuous monitoring of hydrocarbon vapors in atmosphere. The area monitor lowest alarm is set at 5% of LEL on reaching this range area monitor will be sounding with high volume.

Area monitor is used in hot work area where the most critical hazardous area are identified such as Berth A / Berth B

2. Portable Multi Gas Detector – Multi gas detector is always available in control room and in the field with the fire men. Whenever any hot work permit is issued by SIC, Safety team checks the area and residual hazardous of concerned location and ensures that no hydrocarbon vapor is in the atmosphere. Stand by fire man continuously monitors and makes sure that the LEL always is 0%.
3. Chlorine Meter – The device is widely used for check the work environment before entering the chlorination room / area.
4. H₂S Meter – Very useful device for working crew for confined space work. I.e. Vessel, Tank & nearby hazardous area for continuous monitoring work environment.
5. Oxygen Resuscitator – It is a medical equipment and to give oxygen to casualty by trained person.

19.18.25 Chlorination System at SWI

Chlorine gas is most toxic and corrosive gas. In case of leak and in coming in contact with the skin irritation starts, inhalation is most dangerous if more than 15ppm it will be IDLH (Immediate Danger Life & Health)

Chlorine tonners have been laid down at chlorination system for chlorine injection in sea water line which is going to refinery.

3 Nos of fixed chlorine detectors have been provided at three different locations.

1 No Caustic Soda Tank capacity 8000 Liters with blower and hood

Hood provided on running cylinder, the detector laid would sense 0.5ppm in case of a leak. The blower starts automatically.

Chlorine containment kit & 2 Nos BA set is available in the SWI store.

19.18.26 Chlorine Kit

It is used for containment of chlorine gas in case chlorine leakage from the tonner valve assembly, plug or from body.

Work Permit System

Any routine work, testing of equipment, inspection, schedule maintenance, concern has to take work permit for particular job. SIC will make sure that before issuing work permit receiver must have completed TBRA & TBEA and also tool box talk.

- Hot work permit
- Cold work permit
- Electrical Isolation & restoration
- Confined space entry permit
- Vehicle entry check sheet
- Photography permit check sheet
- Isolation of fire fighting network
- Radiography check sheet.

19.19 Off Shore DMP of Indian Oil Corporation (Vadinar)

19.19.1 Introduction of Facility

Indian Oil Corporation (IOC) Ltd (Pipelines Division) owns and operates two offshore oil terminals in the Gulf of Kutch at Vadinar. The terminals are intended to handle the combined throughput requirement of its three refineries at Koyali, Mathura and Panipat. The oil terminal facilities comprise of two nos. Single Point Mooring (SPM) systems for moorings of tankers, off-shore /on-shore pipelines, the shore terminal comprising of 13 nos. of floating roof tanks with the total storage capacity of about one million tone and originating pumping station through which crude is pumped to the refineries at Koyali, Mathura and Panipat through the Salaya -Virangam, Virangam - Koyali, Virangam-Chaksu, Chaksu-Mathura and Chaksu-Panipat pipeline system.

The offshore oil facilities are connected to the shore tanks by means of 1067 mm (42") dia. submarine pipeline of about 5.3 KM for SPM-I and 6.3 Km for SPM-II followed by twin 1067 mm (42") dia. onshore pipelines of 5.7 KM length each. Another 2.1 Km loop line of 1067 mm (42") dia. is also laid to interconnect the Pipe Line End Manifolds (PLEM) of both SPMs to facilitate shore based pigging operation of both offshore and onshore pipeline. A sketch showing the above is enclosed as Annexure-I. For operational flexibility, sub-sea isolation valves are provided at suitable locations. The tankers berthed at SPMs discharge the crude oil through two strings of floating hoses connected between the tanker manifold and SPMs, and two strings of submarine hoses connected between SPMs and the PLEM located at the end of the submarine pipeline at the seabed.

This off shore oil terminal in Gulf of Kutch near Vadinar together with its cross-country pipeline system to the refineries can be termed as a vital energy artery of the Western Region catering to the energy requirement of the entire Northwest region of the country.

19.19.2 Location of the SPM Terminal

The SPM facilities are situated within the territorial water of DEENDAYAL PORT TRUST(KPT). SPM-I is situated at Latitude 20o 30' 34" N and Longitude 69o 42' 04" E and SPM-II is situated at Latitude 22o 30' 14.36" N and longitude 69o 40' 53.60" E.

The drafts available at SPMs are 34.9 meters and 32.5 meters for SPM-I & SPM-II respectively. The KPT provides the infra structure as well as Pilotage facility for operating this terminal. The entry channel of approximately 126 km (70 Nautical miles) in the Gulf of Kutch is identified for the navigation of vessels by KPT.

A zone of 3.6 Km (2 nautical miles) around each SPM has been declared as the "No Anchorage Zone" and no vessel is allowed to anchor in this area to prevent fouling of their anchors with our SPM anchor chains or sub-sea hoses and the pipeline.

Hardware Details of SPM System at Vadinar

Sr No	Parameters	SPM - 1	SPM - 1
1	Capacity of Tankers to be handled	3,00,000 DWT	3,15,000 DWT
2	Mean Sea Level	34.9 MTR	32.5 MTR
3	Geographical Co - ordinates	LAT: 20° 30' 34 " N LONG: 69° 42' 04 " E	LAT: 22° 30' 14.36 " N LONG: 69° 40' 53.6 " E
4	Year of Commissioning	August - 1978	March - 1997
5	Off - Shore Line	5.3 KM	6.3 KM
	Loop Line Between SPM-I & SPM-II Is 2.1 Kms		
Hose Configuration			
(A) Floating Hose			
1	24" X 40' Half Float Hose	01 No in each String	01 No in each String
2	24" X 40' Decreasing Stiffness Hose	01 No in each String	01 No in each String
3	24" X 40' Standard Full Float Hose	21 Nos in STBD String & 22 Nos in Port String	20 Nos in STBD String & 21 Nos in Port String
4	Metallic Reducer	01 No in each String	01 No in each String
5	20" X 40' Full Float Hose	01 No in each String	01 No in each String
6	20"-16" X 40' Tapered Hose	01 No in each String	01 No in each String
7	16" X 35' Full Float Hose	02 Nos in each String	02 Nos in each String
8	16" X 30' Tanker Rail Hose	01 No in each String	01 No in each String

	Total Length in Meters in each string	Port STR: 331.83 STBD STR: 324.11	Port STR: 336.32 STBD STR: 324.13
(B) Submarine Hoses			
1	20" X 40' Carcass Double Submarine Hose	-----	04 Nos in each String
2	20" X 37.5' Carcass Double Submarine Hose	04 Nos in each String	-----
3	20" X 35' Carcass Double Submarine Hose	04 Nos in each String	04 Nos in each String
	Total Length in Meters in each String	OFF.SH : 44.20 ON. SH : 44.20	OFF.SH : 45.72 ON. SH : 45.72
	Type of Plem Valve Actuator	Rotary Vane	Spring Loaded

19.19.3 Tanker Operation

Tankers can be unloaded simultaneously from both the SPMs and any one SPM. The details of tanker operation are described below:

Pilots of KPT bring the tanker near SPM. There are two strings of floating hoses of 610 mm (24") dia for each SPM which are lifted by the crane of the tanker for connecting to tanker manifold. When the tankers are not there, these floating hoses are floating on sea and at the ends of the strings, butterfly valves are used to close/ blind the line and additionally blinds are fitted to avoid spillage of oil. Once the floating hose strings are connected to the tanker, the system is ready for discharge of cargo through SPM system.

Before commencement of discharge of the tankers, ullaging of the tanker is done and in the meanwhile shore tanks are also aligned and tank valves are operated for receipt of cargo into shore tanks. The inlet and outlet valves of the shore tanks are motor operated and can be closed within five minutes in case of any emergency or after the discharge of the tanker is over. KPT provides the tug for pull back operation to avoid tankers overriding the SPM buoy, under buoy hoses etc. to prevent damage to the buoy and oil pollution.

Further during the operation of the tanker, there is a constant watch on the SPM system and the hoses for any leakage or burst and the operating parameters are kept well within the designed limits besides observing all safety aspects for the safety of the tanker, buoy and its accessories. The work of connecting and disconnecting hoses and repair of lines has been given on contract. During discharge operations technical personnel from following agencies are always available:

- DEENDAYAL PORT TRUST
- IOC Salaya Mathura Pipeline (SMPL), Vadinar.

- M/S Underwater Services, Mumbai
- Crude Oil Tanker

There are isolating valves provided for isolation of the floating strings and under buoy hose strings for use in any emergency arising out of failure of hose or burst of hose during operation to prevent oil loss, pollution and to sustain operation through the other string. Thus by meticulously following the international marine standards of operations and maintenance the entire tanker discharge operation is kept totally spill proof.

Further the entire off-shore facilities are subjected to stringent inspection checks as per Oil Companies International Marine Forum (OCIMF) guidelines and rigorous preventive and schedule maintenance for the upkeep of the facilities/ equipment is done in order to avoid any unforeseen instances of hose burst, leaks or any other eventualities which may result in either small or large scale oil spills in the ocean.

19.19.4 Definition of Oil Spill Management

Accidental and unwanted discharge of crude oil in the sea during the operation of SPM system including accidental spillage, if any, from the oil tankers may be termed as an oil spill resulting into pollution of marine environment.

The oil spill may be minor, intermediate or major in nature depending upon the source and duration of the oil spill.

19.19.5 Oil Spill Classification

Oil spill can be broadly categorized into three categories depending upon the volume and area of oil spill, which has taken place. These three categories of oil spill are generally classified as Tier one, two and three and each Tier will require response strategies to suit its magnitude and manifestations as mentioned below:

TIER ONE

This would be a spill of a magnitude the local resources could respond to, successfully without assistance from other agencies.

TIER TWO

This would be a spill of a magnitude that would outstrip the local resources and would require assistance on a regional basis. This would either come from local/central Government or Local Industries Mutual Aid arrangement.

TIER THREE

This would be a spill of a magnitude that would surpass the capabilities of Tier one and Tier two. Additional resources would be required on a national and international level.

Clearly Tier one and Tier two levels of response equipment and manpower resources are governed by a number of criteria. These criteria are such as location, logistics for national and international assistance, nearby sensitivities and many others.

The following classification has been made as per OISD norms:

Tier Level	Volume
Tier –1	Up to 100 MT
Tier – 2	100 MT – 1000 MT
Tier – 3	More than 1000 MT

19.19.6 Risk Analysis & Causes of Spill

Accidental spill from tankers contribute an estimated 0.4 million tons annually globally. Analysis of tanker spills occurring throughout world shows that the majority occurs in port during routine ship operations such as loading, discharge and bunkering. The most of these spills are, however, relatively small. Over 92% are less than 7 tones and probably in total, contribute less than 20000 ton annually. In comparison, accidents, such as collisions and grounding give rise to less than 10% of oil spills from tankers, but a quarter of these are larger than 700 tons.

19.19.7 Spills Due to Collision

The statistical data shows that as a percentage of the total no. of incident, collision account for 5% of oil spill regardless of the quantity of oil released. The classification based on size of the spill shows more alarming statistics with 29% of all large spills (> 700 tons) being due to a collision. Almost 21% of the sizable spills involving the release of between 7 and 700 tons are due to collisions. Small spills of less than 50 barrel (7 tons) from a collision account for less than 2% of total.

19.19.8 Spills Due to Grounding

A similar analysis of statistical data shows that although as a percentage of the total incidence spills due to grounding are rather small, accounting for only 5.2 %. A different picture emerges when the quantities involved are scrutinized. Large spills of more than 700 tones caused by grounding account for 33% of all releases of that magnitude. Off the sizable spill between 7 - 700 tones about 18 % are a direct result of grounding. The small spills of up to 7 tones are fairly insignificant and are 2.7 % of the total spills in that category.

It is prudent to assume that in any collision or grounding, spill quantity may be more than 700 tones.

19.19.9 Most Likely Spills

The most likely maximum spill can result from a central compartment of a tanker being ruptured at the bottom of the hull releasing most of its contents. Quantities in the order of 7000 tones are therefore more probable due to the release of an assumed 90 % of the contents of a center tank of a typical 175,000 DWT single skin fully laden tanker ruptured due to grounding.

19.19.10 Collision with another Vessel

A collision with another vessel causing a tank to rupture will release only the contents of the tank above the water line. The ensuing spill caused by a gash in the tank resulting from a surface collision will release near about 1750 tones. Therefore the spill quantities in both the above scenarios pertaining to rupture due to collision and a bottom gash resulting from grounding are to be 1750 - 7000 tones when a single tank has been damaged.

19.19.11 Oil Spilled into Sea

Oil spilled into the sea undergoes a number of physical and chemical changes, some of which lead to its disappearances from the sea surface whilst others cause it to persist. The time taken depends primarily upon the physical and chemical characteristics of the oil, as well as the quantity involved, the prevailing climate and sea conditions and whether the oil remains at sea or is washed ashore.

In considering the fate of spilled oil at sea, a distinction is frequently made between nonpersistent oil, which tend to disappear rapidly from the sea surface, and persistent oil, which in contrast, dissipates more slowly and usually requires a clean-up response. Most crude oils and refined residual oils have varying degree of persistent depending upon their physical properties and size of the spill. The main physical properties, which affect the behavior of oil spilled at sea, are specific gravity, distillation characteristics, viscosity and pour point.

19.19.12 Most Small Oil Spills

Most spills will in fact be small, involving less than two tones and will occur mostly when the hose system failed at the terminal. This can usually be dealt with swiftly and efficiently by the terminal operator. Major spills are fortunately considered rare with estimated probabilities between one in 100 years to One in 220 years. In the event of such a large spill at the Gulf of Kutch efforts can be made either to contain and collect the oil using booms and skimmers, or to disperse it using chemical dispersant which are spread either from marine craft using side booms or aircraft (similar to crop spraying).

If oil is washed ashore on a hard sand beach, for instance, it can be quickly and effectively cleared by manual labour with the aid of trucks and bulldozers.

In some cases, bio-degradation method may be applied using bacteria to digest the oil which can halve the time that natural forces would take to achieve the same result. However, natural forces usually degrade any oil, which cannot be cleaned up, and such forces are exceptionally strong at the Gulf of Kutch and the effects of a pollution incident are rarely long term.

19.19.13 Impact of Second SPM at Vadinar

The second SPM was commissioned during March'97 at Vadinar location. Obviously this has an impact on the requirement for pollution preparedness.

It is felt that there will be an increase in the likelihood of a spill rather than the possible volume of oil spill. This position comes from the facts mentioned below:

Increase in vessel traffic.

Doubling of hoses, joints and other possible points of failure and Increases in connections and disconnection of hoses etc.

19.20 Responsibility during Emergency

The basic responsibility of combating oil spill disaster and marine pollution lies with the local port authority within its port jurisdiction and the defaulter companies/ organizations.

19.21 Chief Coordinator (Location Head, WRPL Vadinar)

- a. On getting information of oil spill, he will report to KPT authority and other resource agencies.
- b. He will co-ordinate all activities through Chief Operation Manager and Maintenance Manager (Marine).
- c. He will ensure that appropriate response and techniques are in action to clean up pollutants.
- d. He will ensure that all the resource agencies have been duly reported about incident.
- e. He will apprise Head of WRPL about the incident and actions undertaken.

- f. He will make arrangements for disposal of oil as per the directive of Regional Commander (West).
- g. He will be responsible for the resumption of Operations at SPM terminal.
- h. He will contact IOC (Shipping) and seek assistance required to meet the emergency.

19.22 Roles of IOC in Controlling Oil Spill Disaster

19.22.1 IOC Vadinar

- a. To assist KPT off shore oil terminal, and Coast Guard Vadinar action group, in implementation of local action plan.
- b. To assist KPT, Vadinar and Coast Guard Vadinar in obtaining additional available equipment and chemicals from identified resources if and when required.
- c. To assist in chartering/hiring of tankers to undertake transportation/ transshipment operation if so required by KPT.
- d. To arrange for storage of oil transshipped as above.
- e. To make assessment of the value of the oil transshipped.

19.22.2 IOC Shipping New Delhi

- a. To arrange for chartering tankers for Vadinar as required.

19.22.3 Indian Coast Guard – Central Coordinating Authority

- a. To receive the report of significant spillage of oil at sea.
- b. To keep the Ministry of Defense apprised of the development on receipt of information about oil spill.
- c. To decide upon the nature and extent of actions required and to advise the Regional Headquarters/Local Action Groups/authorities concerned regarding the action to be taken by the latter in consultation with Apex Committee on Control of Marine Pollution/Task Force on oil spills.

- d. To arrange for chartering of any tankers for oil transshipment operations, if required.
- e. If the resources available with the Regional Headquarters / Port authorities/other agencies, Local Action Group/authorities are inadequate, to mobilize all available and necessary resources and direct the same towards the concerned Regional Headquarters/Local Action Groups/authorities.

Regional Coast Guard Commanders (RCC)

- a. Receiving reports of oil pollution at sea.
- b. Coordinating the activities of RCC when activated.
- c. Keeping the Director General, Coast Guard apprised of developments.
- d. Processing and coordinating claims of the affected parties and participating agencies with a view to compilation for processing by Director General Shipping.
- e. Mobilizing Coast Guard resources to support On Scene Commander (OSC) action at spill area.
- f. Maintaining the Regional Contingency Plan (RCP) and forward revised plans to members as may be required by RCC.
- g. Receiving periodic reports from resource agencies on account of Pollution Equipment and material with a view to have an upto date inventory list in the Coast Guard western Region, Eastern Region and Andaman and Nicobar Region.
- h. Providing the administrative infrastructure to the RCC for conduct of routine and operational tasks.
- i. Providing additional sampling effort during spills when requested by OSC.
- j. Maintaining a list of national and international agencies that may be called upon to assist for pollution response at the discretion of RCC.
- k. Arranging for periodical exercise in pollution response.
- l. Providing sensor data to RCC/OSC as required.
- m. Pre-designating a Coast Guard OSC.

19.22.4 Responsibility of Port Authority

The port authorities will be responsible for response to accident / oil spill within Port Limits keeping the coast guard regional commander informed and request for any additional assistance through the Regional Communication/Operations Centers. The detailed responsibilities are as follows:

- a. To arrange for the preparation of a local contingency plan in consultation with Regional Head Quarter/Central Coordinating Authority.
- b. To identify a suitable sea going tug when required for operations
- c. To identify surface crafts
 - On which dispersant spraying equipment can be mounted and
 - Which can be used for rigging the booms
- d. To ensure that the purpose of part-XIII of Merchant Shipping Act, 1958, actions are taken by the various authorities under the overall legal receiver of the wrecks and dock concerned.
- e. To ensure that at least following minimum equipment is kept available locally at all time:

Inflatable booms

Dispersant spraying equipments capable of being mounted on surface craft.

Suitable dispersant chemicals of the nature and quantity estimated as requirement of Local Action Group as part of the local contingency plan.

Oil skimmer equipment

- a. Surface crafts on which above dispersant equipment can be mounted and which can be used for rigging booms etc.
- b. To arrange for training of personnel expected to be engaged in above operation.
- c. To arrange for periodic exercise under the guidance of the RCC to keep equipment and personnel on continuous readiness for oil spill response operation.
- d. To consult the Coast Guard or Director General Shipping or any other authority, when further advice/assistance is required.

- e. To keep the Coast Guard apprised of actions being taken.

19.22.5 Responsibility of Boarding Officer

- a. Inform Chief Crisis Coordinator / Alternate Chief Crisis Coordinator, Maintenance Manager (Marine), IOC Control room, Marine Department about the oil spill incident.
- b. Stop the cargo or slow down the cargo as may be the case and accordingly isolate the affected portion causing the oil spill.
- c. Instruct the O&M contractor to fight the oil spill & locate the source of oil spill and coordinate with various agencies for oil spill containment.
- d. To carry out the water flushing of the SPM system as per the requirement in coordination with IOC control room.

19.22.6 Reporting & Alerting Procedure

After knowing major oil spill, Chief Coordinator, IOCL is to report the same immediately to KPT authority who in turn will inform Commander Coast Guard Region (West). Besides informing KPT, Chief Coordinator, IOCL should inform DC, Jamnagar, Forest Department Jamnagar and Gujarat Pollution Control Board Jamnagar, Gandhinagar regarding the incident.

19.22.7 Handling SPM Emergency

In case of any burst or leakage in floating / under buoy hoses or in any system of SPM, is noticed by the master or Deputy Officer or Our Boarding officer or any other person, the above incident should be immediately brought to the notice of Master/ Deputy Officer of the Ship. On getting the information, the discharging operation should be immediately stopped and the IOC control room at Vadinar should be informed through VHF channel 12 and 07 (US) about the stoppage of oil discharge. The master of the ship/ IOC Boarding officer with the help of crew members of ship and supporting contract vessel of IOC should try to assess where the spill is coming from and try to contain the spill by means of deploying booms available with the ship/contract vessels of IOC. Procedure to be adopted in case of leakage from following is as detailed below:

19.22.8 Floating Hose

- Stop discharge.
- Close the butterfly valve near tanker manifold and isolation valve near SPM.
- Contain the leak
- Further operation can be done only after replacement of burst/leaked hose or hoses

19.22.9 Under Bouy Hose

- Stop discharge.
- Close the PLEM valve of the leaking line.
- Contain the leak
- Further operation can be done only after replacement of burst/leaked hose or hoses.

19.22.10 Central Swivel Leak

If the leak is not controllable then

- Cast-off the vessel.
- Contain the leak.
- Arrest the leak.
- Re-berth the vessel.
- Restart operation.

19.22.11 Central Swivel Leak

The officer on board of the vessel can decide in consultation with pilot/master of the vessel whether the ship can continue at berth. If necessary, arrangement should be made to replace the damaged mooring rope.

19.22.12 Damage to Buoy

It is due to overriding of tanker. The officer on board of the vessel can decide in consultation with the pilot/master of the vessel whether the ship can continue at berth.

19.22.13 Pollution Control near SPM

- a. The master of the vessel will be informed about the oil spillage by boarding officer. The master in turn will contact the port signal station, which is provided with VHF channels 16, 12, 10 and 07 (US) and give a detailed report of the incidence to KPT.
- b. The signal station in turn will inform the Chief Operation Manager (COM) Offshore Oil Terminal (OOT) KPT.
- c. Boarding officer will also inform IOC shore control room/ marine department through VHF and IOC control room in turn will inform the incident to CMNM / Chief Coordinator, IOCL, Vadinar.

- d. Upon receipt of information from port signal station, COM, KPT will direct all the crafts presently posted at Vadinar to combat the oil spill within port limit.
- e. The tug / launches of KPT should carry sufficient quantity of dispersant before leaving Vadinar jetty.
- f. Since the flow of underwater current around Vadinar coast is very high, usage of oil skimmer to recover oil from any leakage from SPM and other floating hoses is not much effective, hence the pollution control near SPM done presently is limited to spray of dispersant.

19.22.14 Typical Case of Oil Spill Combating at Vadinar

In case of any accidental oil spill in and around SPM following action plan is to be brought to effect immediately in line with the disaster plan in association with KPT.

1. Reporting:

- a. On getting any information about oil spill noticed by the Master or the Duty Officer of the vessel, or Boarding Officer of IOC on board, working SPM Maintenance Contractor, Coast Guard patrol party, KPT pilot or any other person, the above incident should be brought to the notice of the Master / Duty Officer of the ship. On getting any such information, the discharging operation should immediately be suspended and the IOC tank farm which is also available on VHF channel 12 and 07 (US) should be immediately informed about the stoppage of discharge.
- b. On getting such information from Boarding Officers, the shift in charge in IOC shore control room shall inform the incident to Chief Coordinator, IOCL, Vadinar and the necessary line isolation from ship to shore tank farm should be ensured by closing necessary valves.
- c. The master or the Boarding Officer of the vessel should contact the Port Signal Station which is provided with VHF channel 16,12,10 and 07 (US) and give a detailed first hand information report of the incident.
- d. The Signal Station, in turn, should inform the COM, KPT. COM, KPT may in turn pass on the information to their authorities and Coast Guard etc.
- e. IOC officer on board should also pass on the information to location head Vadinar through IOC control room on VHF channel and check back with COM, KPT for confirmation of the message receipt through Port Signal Station.
- f. Chief Coordinator, IOCL, Vadinar will immediately establish contact with ED WRPL Gauridad and pass on the first hand information report besides informing the incident to statutory bodies like Gujarat Pollution Control Board (GPCB) and Forest Department / National Marine Park authorities.

2. Alerting: 1

- a. COM, KPT will direct the crafts posted at Vadinar to proceed to SPM and during the passage rig-up the dispersant spraying booms.
- b. IOC, Vadinar should ask its maintenance contract vessel to be ready for deployment of spill combating facilities on board at short notice on demand from COM, KPT.
- c. Small tug available with SPM maintenance contractor should also be put on alert for deployment, if so demanded by KPT for replenishment of oil dispersant and other support services.

3. Operational Requirements:

- a. In view of the strong current experienced at Vadinar only dispersant may be sprayed by 3 tugs of KPT while the fourth craft would be busy in replenishing her stock of dispersant chemicals from the storage provided at Vadinar jetty.
- b. The Master of harbour tugs / launches should ensure that sufficient quantity of dispersant chemical is carried out on board prior to leaving the jetty.
- c. In view of the strong currents experienced at Vadinar and the location of the SPM, Commander TMS Hayes, Advisor on Marine Pollution, International Maritime Organization in his Mission Report has indicated that it will not be possible to contain the oil spill and use a skimmer to collect oil. He therefore has recommended that the KPT should equip at least three crafts with dispersant spraying units. Accordingly, the Port had provided only the dispersant spraying equipments for use at Vadinar.

4. Execution:

The craft should move downstream of the oil spill and then start streaming up against the current while carrying out spray of dispersant chemicals with a systematic run over the oil spill, till the total spill gets dispersed.

5. Support Services:

IOC shall assist KPT and Coast Guard in

- a. Implementing the local action plan.
- b. In obtaining additional equipments and chemicals from HQs of KPT and Coast Guard, if and when required.
- c. Chartering of tankers to undertake transportation / transshipment operation if so required by KPT.
- d. Arranging for the storage of oil transported at shore and
- e. Making assessment of the value of the oil transshipped.

6. Claims:

In case the oil spill in and around SPM terminal is due to any problem of tanker or any negligence from tanker operation crew, following steps should be taken for claim, which will be done by DC / COM, KPT.

COM, KPT should inform the Master of the Vessel holding him responsible for the spillage/pollution and also steps taken by the Port to combat the oil spill and for cleaning operations and the charges thereof as per rules.

Record of all expenditures towards the use of port craft / tugs / dispersant chemicals / port vehicles and any other material should be maintained by the DC / COM, KPT for subsequent recovery from the Master/Agent of the ship, prior to her departure.

7. Final Report :

The detailed report of the oil spill in chronological order supported with available data/records will be prepared by KPT and sent to respective Organizations including IOC. However necessary reports for informing IOC official should be prepared by Chief Coordinator, IOCL, and Vadinar. He will also submit necessary reports to statutory bodies like Gujarat Pollution Control Board, Forest Department/National Marine Park authorities.

19.22.15 Relationship with Coast Guard & Port Trust

The Indian Coast Guard and Port Trust along with IOC would be among the main organization involved in the more practical aspects of oil spill response at Vadinar terminal.

It has been therefore, the endeavor of KPT / IOCL / ESSAR / Indian coast Guard to ensure that good working relationship, understanding of individuals, operating procedure are developed and understood before the high pressure environment of spill response prevents the building of such ties.

All relationship with the Indian Coast Guard has been undertaken with the knowledge that in the National Disaster Plan it states that ICG is the controlling body for all oil spill response activities.

19.23 Oil Spill Equipment Available with IOCL Vadinar

Sr.No	Item Description	Qty
01	Inter Tidal Boom	600 mm
02	Coastal Boom	600 mm
03	Disc Skimmer	1No
04	Mop Skimmer	1No

05	Dispersant Spray Sets	2 Sets
06	On Shore Cleaning System	1 No
07	Floating Tank 25m ³	2 Nos
08	Floating Tank 12.5m ³	4 Nos
09	Off Loading Pump	1 No

19.24 Oil Spill Consumables Available with IOCL Vadinar

Sr.No	Item Description	Qty
01	Oil Spill Dispersant	9800 Liter
02	Oil absorbent pillow (1.5'x1'x5")	72 Nos
03	Oil absorbent boom (length-10'x dia-7")	120 Nos
04	Oil absorbent sheet (1.5'x1.5')	760 Nos

19.25 Imp Telephone Nos of Govt Officials related to Oil Spill Combating

Sr No	Description	Telephone No		Fax Number
		Office	Residence	
1	District Collector Jamnagar (0288)	2555869	2554059 09427306210	
2	Collector Office Jamnagar (0288)	2557601 – 5	-----	2555899
3	Superintendent of Police Jamnagar (0288)	2554203	2555868 09427305071	2556382
4	Municipal Fire Station Jamnagar (0288)	2550101	-----	-----
5	Regional Officer Gujarat Pollution Control Board Jamnagar (0288)	2752366	2540741	2753540
6	Conservator of Forest Jamnagar (0288)	2552077	2553327 09425049064	2679371

7	Police outpost Vadinar (02833)	256541	-----	-----
8	KPT Control Tower Vadinar (02833)		-----	-----
9	Deputy Superintendent of Police, Khambalia (02833)	234262	234726	234262
10	Deputy Collector, Khambalia (02833)	234577	234714	234577
11	Commander Coast Guard, Porbandar (0286)	2241794 /2240958	2244234	2244056
12	Gujarat Pollution Control Board, Gandhinagar, (079)	23222756 /23222095	-----	23232156
13	Chief Conservator of Forest Gandhinagar, (079)	23254123	-----	23229917
14	Director Environment, Govt. of Gujarat. Gandhinagar, (079)	23251062	-----	23252156
15	CG, Station Vadinar	256560 /256579	256534	256560
16	COM, KPT, Vadinar	256749	256522	256540
17	Head (Environment), RIL, (Mr. Kannan)	95288- 3012152		952833- 3012199
18	RPL, Port Operation Center			
19	Mundra (Port operation Center)	0283828820 1 to 288207, 0283822003 3		95288- 288270

19.26 Important Telephone Nos of VOTL Marine Operations

Sr No	NAME	DESIG	TEL (OFF)	MOBILE NO.
1.	Capt Deepak Sachdeva	Chief Operations Officer	02833-241777	9925153618
2.	Capt. Alok Kumar	Port Captain		9909908611
3.	Commandt. Raghuvanam	Head- Port Facility Security	02833-241780	9909021183
4.	V. Gopalakrishnan	Admin Officer	02833-241779	9979891335
5.	Control room	Shift -in charge	02833-241775	9979868460
6.	Control room fax		02833-241779	

19.27 Emergency Telephone Nos of outside agencies including District Authorities

19.27.1 Fire Station

SL No	Dept. Name / Officer's Name	Office	Resident
1	Inspector CISF (02833)	256542	-

2	Municipal Jamnagar (0288)	2550340	2550340
		2550101	
		2675091	
		101	

19.27.2 SHO (Police)

SL No	Dept. Name / Officer's Name	Office	Resident
1	District Superintendant of Police	2554203	2555868
2	Deputy Superintendant of Police	2552940	2542970
3	Police Control Room	100 2550200	-
4	Police Inspector, City 'A' Division	2550243	2676667
5	Police Inspector, City 'B' Division	2550244	2550315
6	Police Inspector, Panchkoshi 'A' Division	2550359	-
7	Police Inspector, Panchkoshi 'B' Division	2676556	-
8	Dhrol	02897- 222033	-
7	Dy. SP Khambhaliya Police Inspector Circle	234726	
8	Office, Khambhaliya	234744	

19.27.3 Collectorate

SL No	Dept. Name / Officer's Name	Office	Resident
1	Collector Shree & District Magistrate Shree	2555869	2554059
2	Additional Collector Shree	2550284	2672131
3	Resident Deputy Collector Shree	2553183	2556102

4	Sub divisional Magistrate Shree	2552130	2552807
5	Mamlatdar Shree (City)	2674575	2660950
6	Collector Control Room	2553404	-
7	Circuit House, Lal Bungalow	2550237-38	-
8	Deputy Collector, Khambhaliya	234577	

19.27.4 District Authority

SL No	Dept. Name / Officer's Name	Office	Resident
1	District Development Officer	2553901	2552402
2	Deputy District Development Officer	2550221	2755070
3	District Health Officer	2671097	2756252

19.27.5 Forest Department

SL No	Dept. Name / Officer's Name	Office	Resident
1	Conservator of Forest Marine National Park	2552077	2552327
2	Deputy Conservator of Forest Marine National Park	2552077	2679374
3	Deputy Conservator of Forest (Distribution)	2553664	2559787
4	Deputy Conservator of Forest (Common)	2553026	2554387

19.27.6 Port Department

SL No	Dept. Name / Officer's Name	Office	Resident
1	Port Officer - Bedi Port	2670207	2556106
2	Port Office - Okha	262001	262010

19.27.7 Railway Station

SL No	Dept. Name / Officer's Name	Office	Resident
1	Railway Inquiry - Jamnagar	2755222	-
2	Railway Inquiry - Hapa	2570410	-
3	Officer, Railway Station - Jamnagar	2755169	-
4	Officer, Railway Station - Hapa	2570410	-

19.27.8 Airport Office

SL No	Dept. Name / Officer's Name	Office	Resident
1	Airport Officer	2712187	2560252
		2712413	2560262
2	Indian Airlines - Jamnagar	2550211	2554768

19.27.9 Station Transport

SL No	Dept. Name / Officer's Name	Office	Resident
1	S.T.Inquiry	2550270	-
2	Manager, S.T.Depo	2676904	-
3	Divisional Director - Jamnagar	2570608	2570486

19.27.10 Hospitals, Ambulance Sevas, Blood Banks & NGO's

Sr No	Dept. Name / Officer's Name	Telephone No
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		Office	Residence
Hospital			
1	Guru Govindsinh Hospital (Emergency)	2661087 2550204-06	-----
2	Samarpan Hospital	25566423 2712728	-----
3	Mental Hospital	2712728	-----
4	Dental Hospital	2750218	-----
5	Ayurvedic Hospital	2550368	-----
6	City Dispensary – Ranjit Road	2676456	-----
7	Oswal Hospital	2562705 2566833 2676521	-----
8	Adarsh Hospital	2665566	-----
9	Jivandep Healthcare Pvt Ltd	2558176 2558275	-----
10	KPT Primary Health Centre, Vadinar	256539	-----
Ambulance Seva			
1	Fire Branch, Jamnagar Mahan agar Palikir	102	-----
2	Aaryasamaj	2550220	-----
3	Guru Govindsinh Hospital	2541081	-----
4	Jilla Panchayat, Jamnagar	2550221	-----
5	Taxi Association, Jamnagar	2560547	-----
6	Mahavir Samaj Sevak Dal	2550225	-----
Blood Bank			
1	Guru Govindsinh Hospital	2550227	-----
2	J.H.M. Blood Bank	2550208	-----

3	Deepchand Gardy Memorial Blood Bank	2672529	-----
4	Omkar Charitable Trust Blood Bank	2673339	-----
NGO			
1	Aandabawa Seva Sanstha	2540155	-----
2	Kabir Ashram	2558049	-----
3	Shree Pranami Seva Sanstha	2551353	-----
4	Nawanagar Chamber of Commerce	2550250	-----
5	Youth Hostel Association of India	2558040	-----
6	Jamnagar Factory Owners Association	2560002	-----
7	Jamnagar Brass Foundry Association	2730271	-----
8	M.P.Shah Udyognagar Association	2550960	-----
9	Kasturba Stree Vikasgruh	2751730	-----
10	Indian Road Cross Society	2553583	-----
11	Rotary Club	2550348	-----
12	Lions Club	2673193	-----
13	Jamnagar Vepari Mahamandal	2533185	-----

19.28 Mutual Aid Members

Sr.No	Name of Mutal-Aid-Scheme Member	Telephone No. Office	Residence/ Mobile Nos.
1	Chairman - Collector	2555869 9978406210	2554059
2	Addl. Collector	2550284 99784 05182	2672131
3	Jt.Chairman Commissioner,JMC	2552321	2552372

4	MR Prajapati - Secretary, MAS, GSFC	2432216	2712768/ 9979853306
5	RN Shah - Treasurer-MAS, GSFC	2432242	9979862520

6	MAS OFFICE	2542764	
7	Office of Supdt. of Police	2554203	2555868
8	Police Control Room - Jamnagar	2550200	2344249(Sikka) 2846125(Padana)
9	District Disaster Control Room	2553404 / 2541485/ 1077 (Toll Free)	9426950783 (DDMO) Mr.Yaswant Sinh Parmar
10	PB Shah ,Asst. DISH - Jamnagar	2678206	9824583767
11	Mr. Desai -Home Guard Jamnagar	2553862	
12	Dr. Gosai RMO - GG Hospital	2550240 /2541081	2551689 / 9824258885
13	Control Room GMB - Jamnagar	2711805 / 2756909	
14	KK Bisnoi - JMC CFO	2550340/101 (2662691)	9879531101
15	Indian Coast Guard - Vadinar	02833 - 256579	1090 (Terror Helpline Toll free)
16	Sanjay Goyal -IOCL Vadinar	02833 - 256330	9909909016
17	P Palanivelu- Jt. Secretary MAS,EOL	02833 - 241892	9825210517
18	PK Prasad - IOCL Theba	2570712	9426911475
19	HS Modha - Fire Officer	2344116	9925214054
20	Chetansinh Jadeja - Fire	2344272 -75/	9099038083

	Officer, SDCC	2439322 (Fire)	
21	V.Koti, VP(Fire) RIL	6611193	9998972008
22	D K Thakur Jt. Secretary- MAS-TCL	02892 - 665247	9227676113
23	Mr. Dipak Roy, Mgr.(O&M) - K Kumar AM - GSPL	9925013159 9879599464	
24	MJ Sunaria - Digjam Ltd.	2712972/73/74	
25	PB Sakharkar -GAIL	6611437	9624089696
26	Indian Navy- Valsura	2550263-357	
27	Indian Air Force, Jamnagar	2720007, Extn.4222(fire)	2550245
28	PR Thatte, VP Bharat Oman Refinery	02833 -256450	9427206501
29	MU Khan - Cairn India		966253945
30	For any Emergency Ambulance / Fire		108

19.29 Details of Fire Fighting Equipment at Vadinar

Sr.No	Description of system	Quantity
1	Water Cum Foam Monitors	
	Fixed Monitors	05 Nos.
	(1200/1500/1800/2580/3840) LPM	2138 lpm (475 gpm)
	Portable Monitors	02 Nos. (Fire Station)
	(1200/1500/2580/3840) LPM	1000 gpm (4500 lpm)
	Foam trolley tank capacity and Qty of AFFF in it.	3 No. of trolleys with 200 liters each.
2	Hoses /Nozzles /Accessories	
	Hose	152 No.

	Type	Type B
	Nozzles	
	Universal (Triple purpose) nozzle	33 No. Diffuser branches
	Jet nozzle (Standard branch)	60 Nos. of Aluminium and 6 no. of Gunmetal
	Fog nozzle	11 Nos.
	Foam branch (FB-5X)	07 Nos.
	Water curtain nozzle	01, Good
	Hose Boxes	64 Nos.
	Foam Concentrate (AFFF)	28000Ltrs(Min)
FIRE SIREN		
	Hand operated	02 Nos
	Electrical	03 Nos.
	Sand buckets with cover	30 Nos.
	Manual fire call points	13 Nos.
3	Safety Equipment	
	Explosimeter (make)	02 Nos (ENDEE GP200L)
	Fire proximity suit	11 Nos.
	Water gel blanket (expiry date)	01 No. (Expiry date Feb. 2010)
	Safety torch	10 Nos.
	Safety goggles	30 Nos.
	Red and Green Flags for drill	01 No each
	Breathing Apparatus Set (Indicate make)	07 Nos make DRAGER
	Spare Breathing Apparatus cylinder	06 Nos
4	Fire Extinguishers	
	CO ₂ Type	66 Nos.
	2.0 Kg	28 Nos

	3.2Kg	10 Nos.
	4.5 Kg.	23 Nos.
	6.8 Kg.	05 Nos.
	DCP Type	148 Nos.
	5.0 Kg	28 Nos.
	10.0 Kg	116 Nos.
	75 Kg	04 Nos.
5	Fixed Fire Fighting Facilities	
	Fire water pond/tank (no. and capacity)	3 no. ponds 6000 KL each.
	Foam tender with accessories	3 Nos
6	Fire Fighting Engines	
	Engine driven FF pump a) 385KL/Hr @ 88m b) 350 KL/Hr @ 88m	4 Nos 2 Nos
	Motor Driven FF pump a) 385 KL/Hr @ 91m b) 350 KL/Hr @ 91m	1 No 2 Nos
	Jockey Pump 60 KL/Hr @ 120m	2 Nos

19.30 Details of Fire Fighting Equipment at Jamnagar

Sr.No	Description of system	Quantity
1	Water Cum Foam Monitors	
	Fixed Water Monitors	03 Nos.
	(1200/1500/1800/2580/3840) LPM	3500 lpm
	Fixed Water Cum Foam Monitors	03 Nos.
	(1200/1500/2580/3840) LPM	1200 lpm
2	Hoses /Nozzles /Accessories	

	Hose	15 Nos.
	Type	Type B
	NOZZLES	
	Universal (Triple purpose) nozzle	04 Nos. Diffuser branches
	Jet nozzle (Standard branch)	03 Nos.
	Fog nozzle	03 Nos.
	Foam branch (FB-5X)	03 Nos.
	Water curtain nozzle	02 Nos
	Hose Boxes	10 Nos.
	Foam Concentrate (AFFF)	5100 Liters
	Fire Siren	
	Hand operated	01 No.
	Electrical	01 No.
	Sand buckets with cover	24 No.
	Manual fire call points	06 Nos.
3	Safety Equipment	
	Explosimeter (make)	01 No. (ENDEE GP200L)
	Fire proximity suit	1 No.
	Water gel blanket (Expiry date)	01 No. (Expiry date Feb. 2010)
	Safety torch	02 Nos.
	Safety goggles	1 No.
	Red and Green Flags for drill	01 no. each
	Sand scoops	04 Nos.
	Stretcher	01 No.
	Breathing Apparatus Set (Indicate make)	01 No., make DRAGER
	Spare Breathing Apparatus cylinder	01 No.
4	Fire Extinguishers	

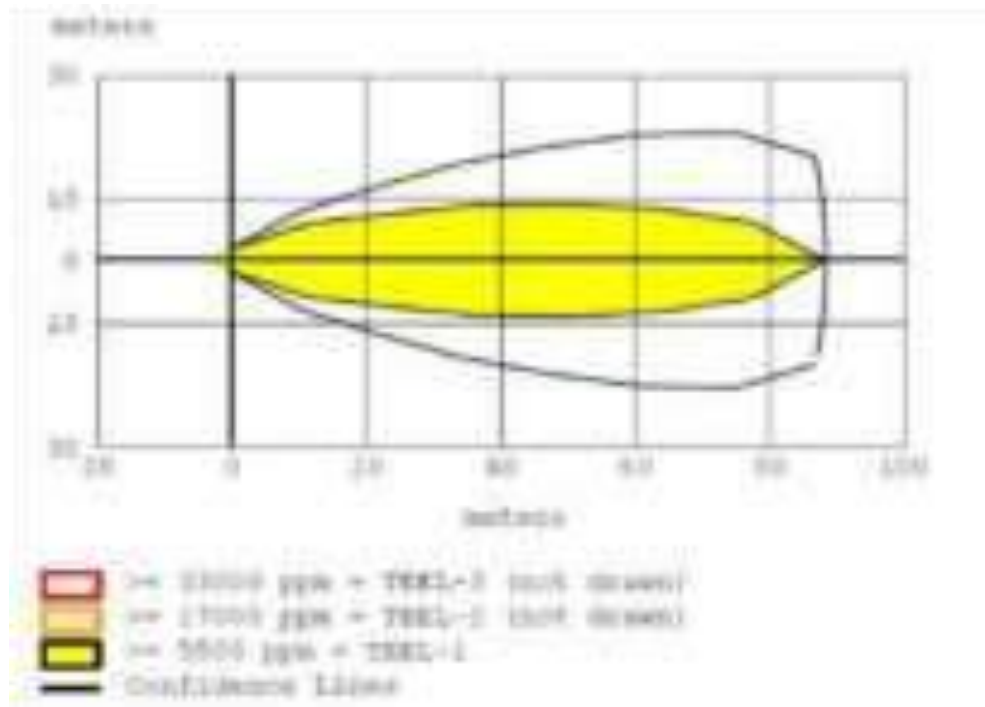
	CO ₂ Type	33 Nos.
	2.0 Kg	13 Nos.
	3.2Kg	Nil
	4.5 Kg.	15 Nos.
	6.8 Kg.	05 Nos.
	DCP Type	27 Nos.
	5 Kg	01 No
	10 Kg	20 Nos.
	75 Kg	06 Nos.
5	Fixed Fire Fighting Facilities	
	Fire Water Mains (size) and date of Pressure Testing	8" Dia tested on July'10
	Fire water pond/tank (no. and capacity)	2 nos above ground tanks of 700 KL each.
	Mainline pump shed fixed foam flooding system (Manual/auto)	Auto with UV/IR detectors
6	Fire Fighting Engines	
	Engine driven FF pumps (150 kl/hr @ 100M)	2 Nos
	Motor Driven FF pump (150 kl/hr @ 100M)	1 No
	Jockey Pump(10 kl/hr @ 100M)	1 No

20 ANNEXURES - GRAPHS

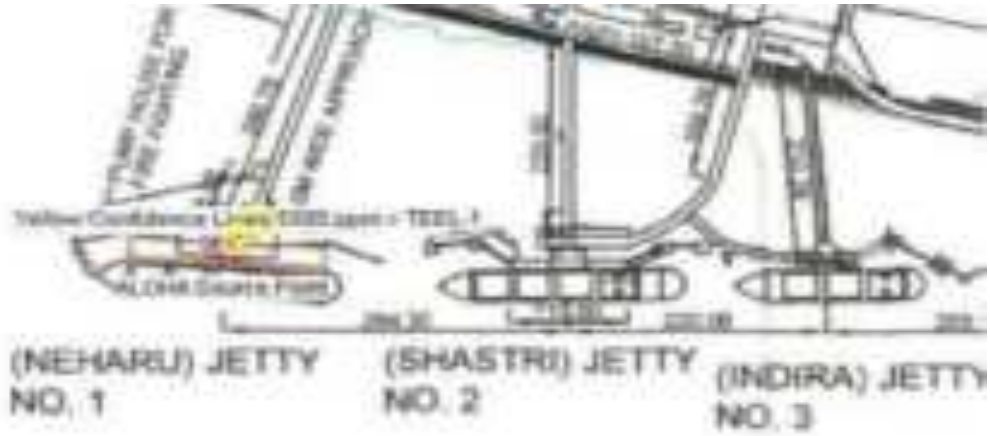
20.1 Graphs & Contours of various MCLS worked out at Jetty (Refer Chapter 4.7)

20.1.1 Jetty One – LPG

20.1.1.1 Instantaneous Release – Toxic Threat Zone (Graph)



20.1.1.2 Instantaneous Release – Toxic Threat Zone (Contour)



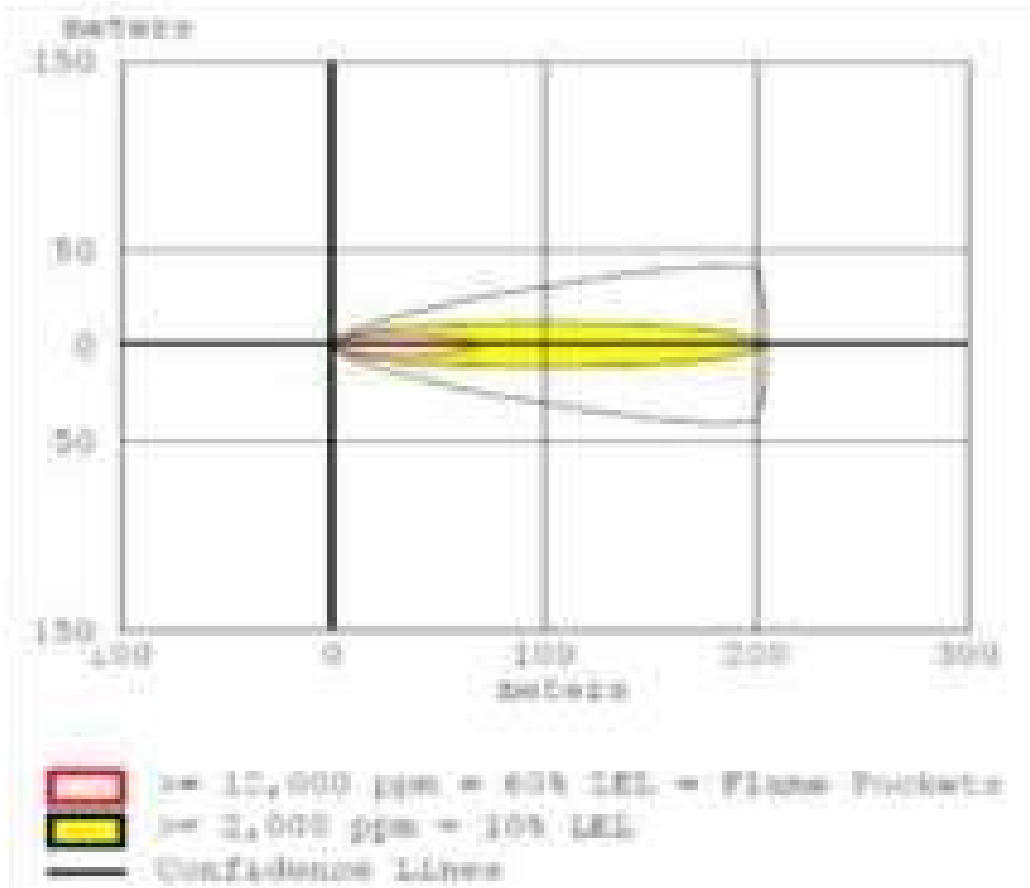
August 25, 2019
2:23 PM
Kandla Jetty Plan

OIL JETTY

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Upgraded Emergency Plan / DMP for Kandla Port Gandhidham (Kutch)

20.1.1.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



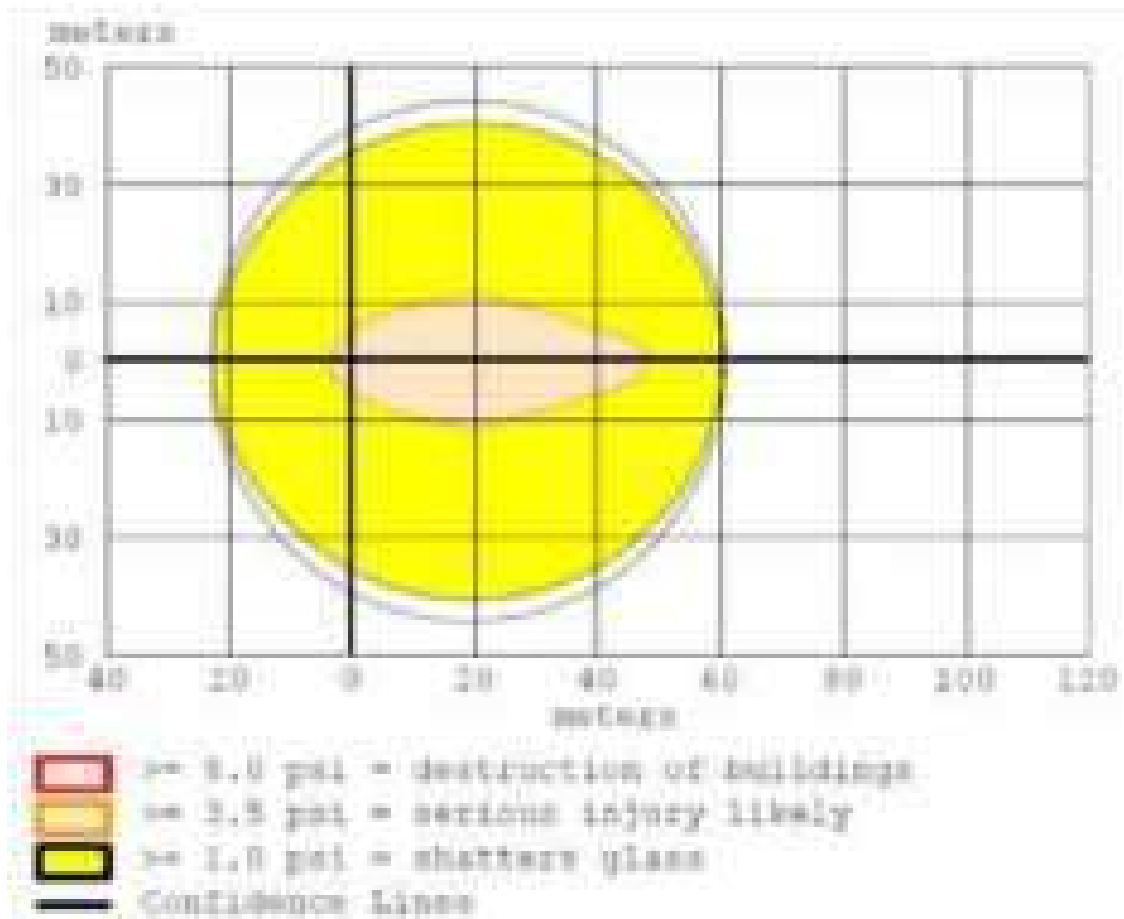
20.1.1.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



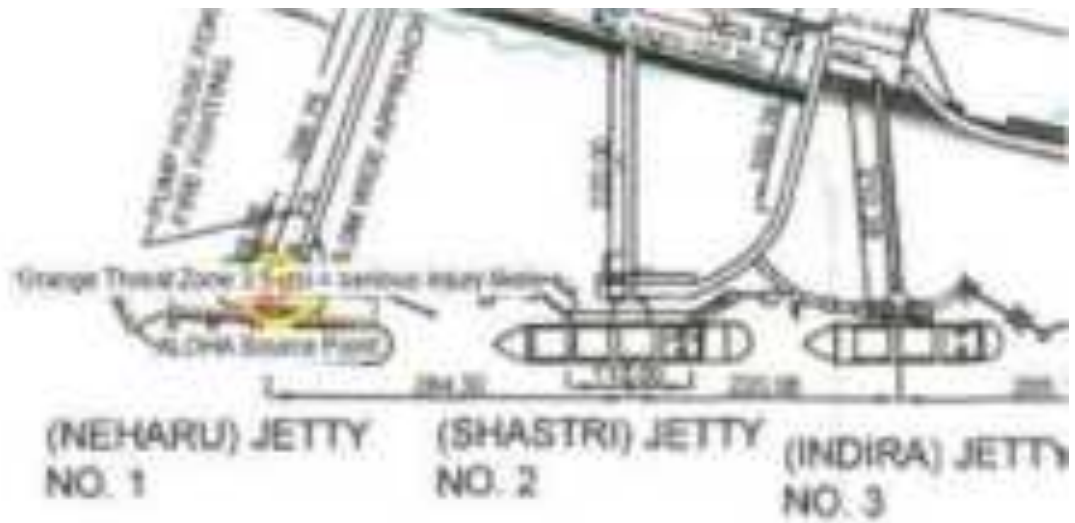
August 25, 2009
2:20 PM
Indira Jetty Map

OIL JETTY

20.1.1.5 Instantaneous Release – Overpressure (Graph)



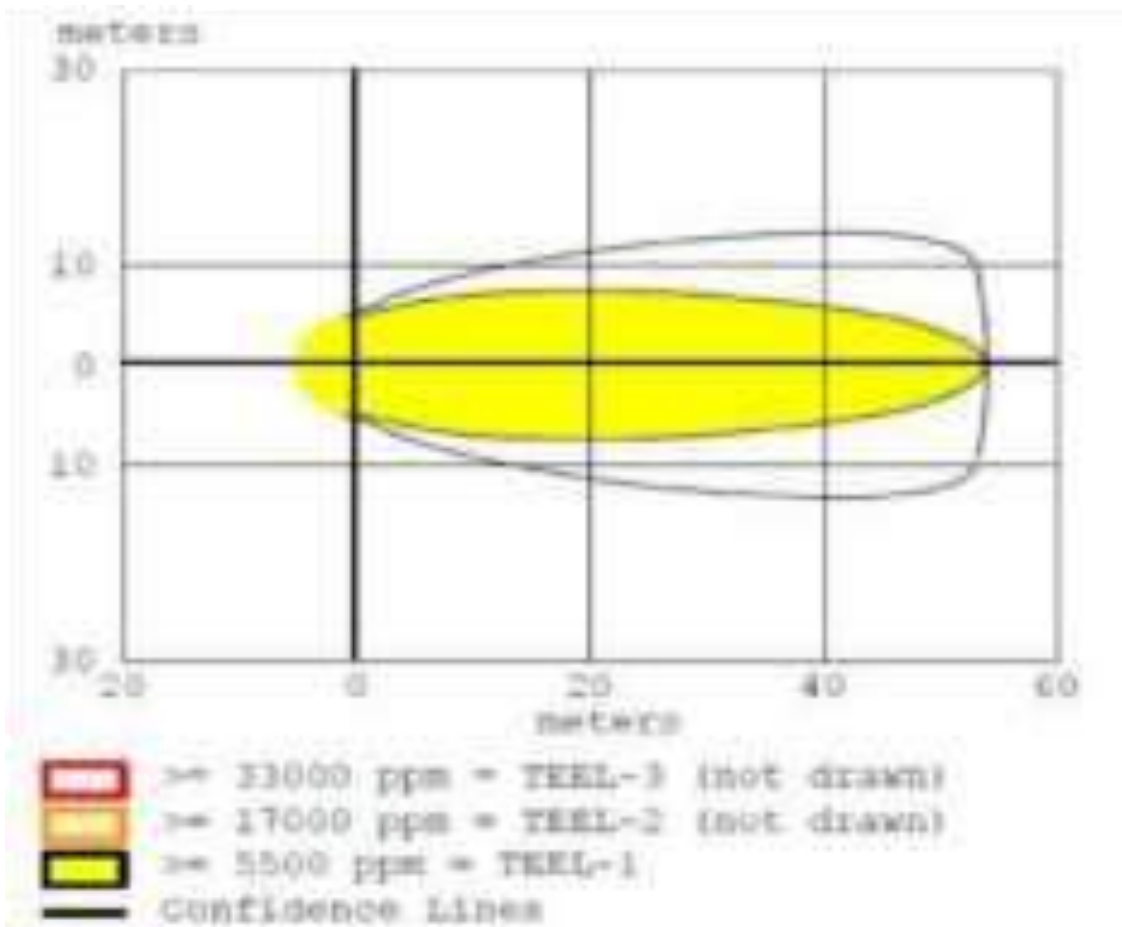
20.1.1.6 Instantaneous Release – Overpressure (Contour)



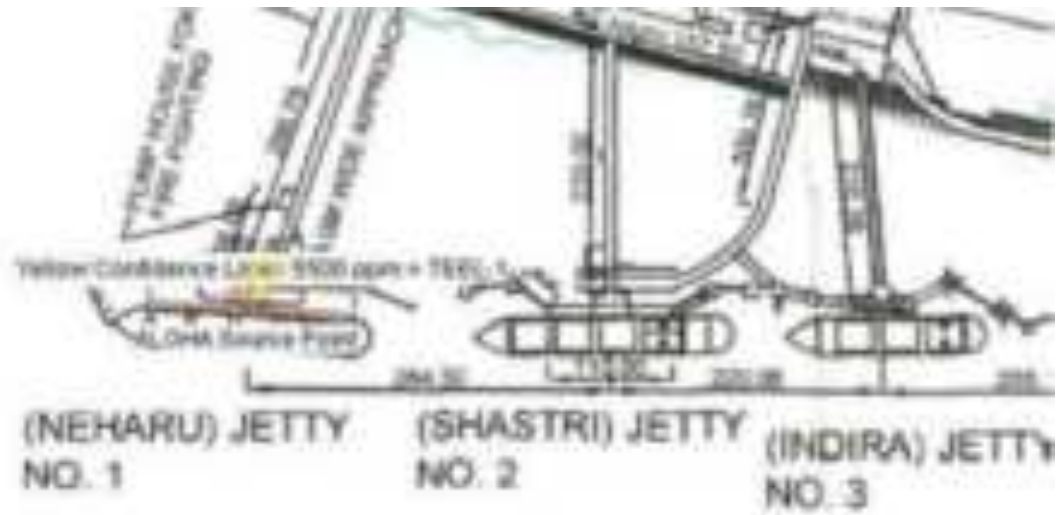
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Kanda Jetty Map

OIL JETTY

20.1.1.7 Evaporating Puddle – Toxic Threat Zone (Graph)



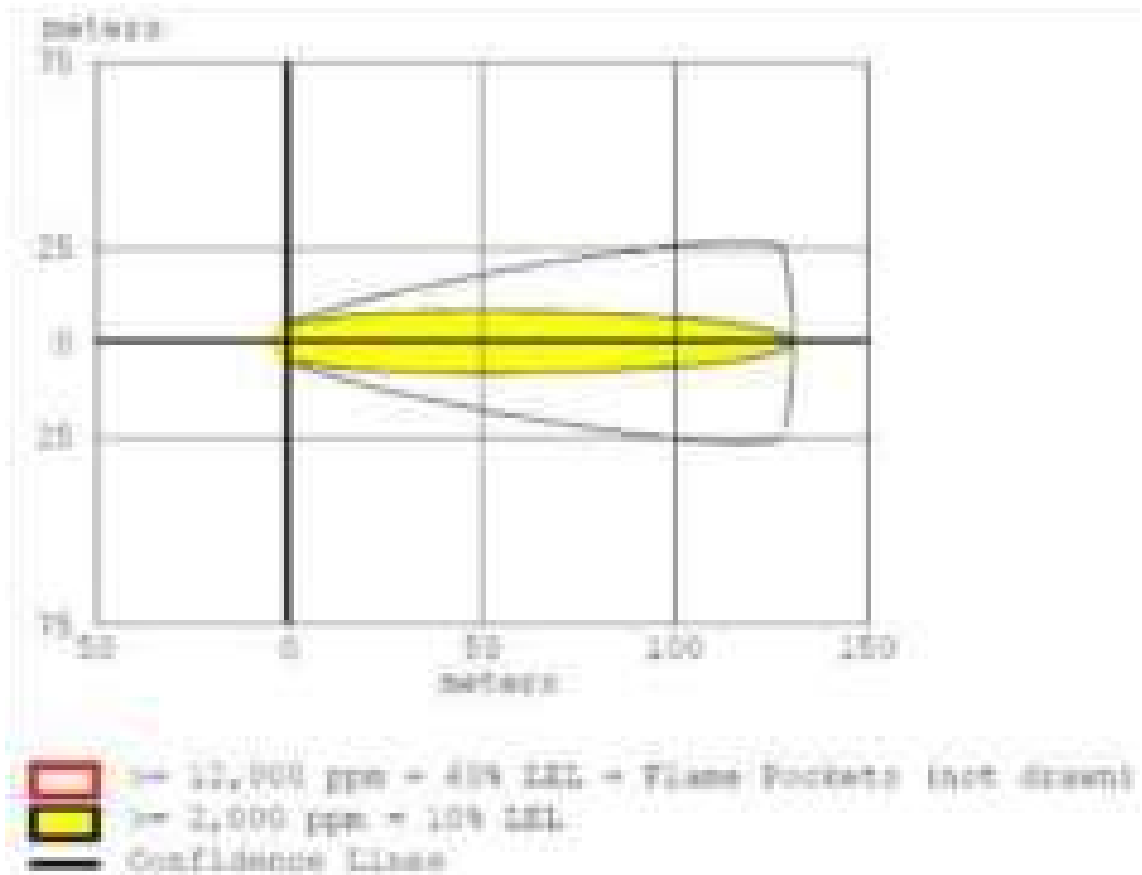
20.1.1.8 Evaporating Puddle – Toxic Threat Zone (Contour)



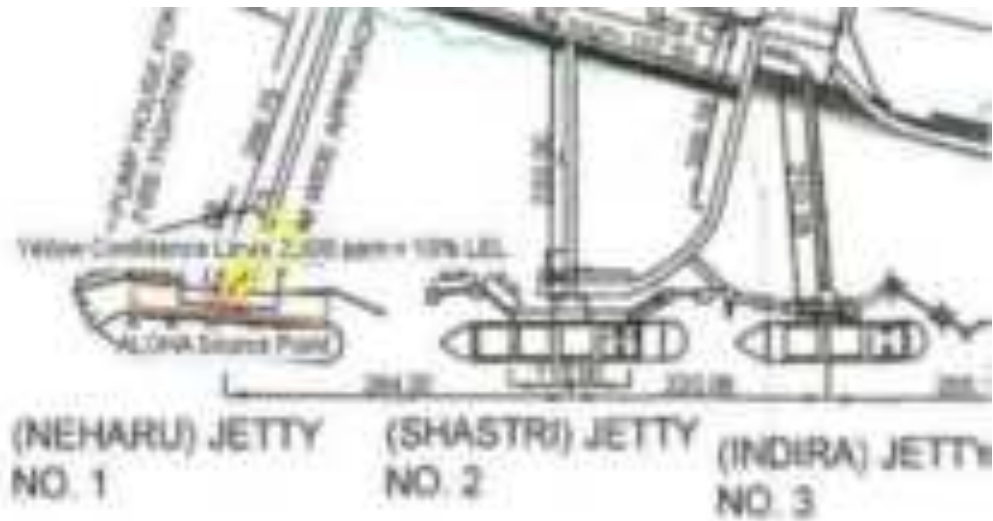
August 28, 2013
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 Gandhi Jetty Map

OIL JETTY

20.1.1.9 Evaporating Puddle – Flammable Area of Vapor Cloud (Graph)



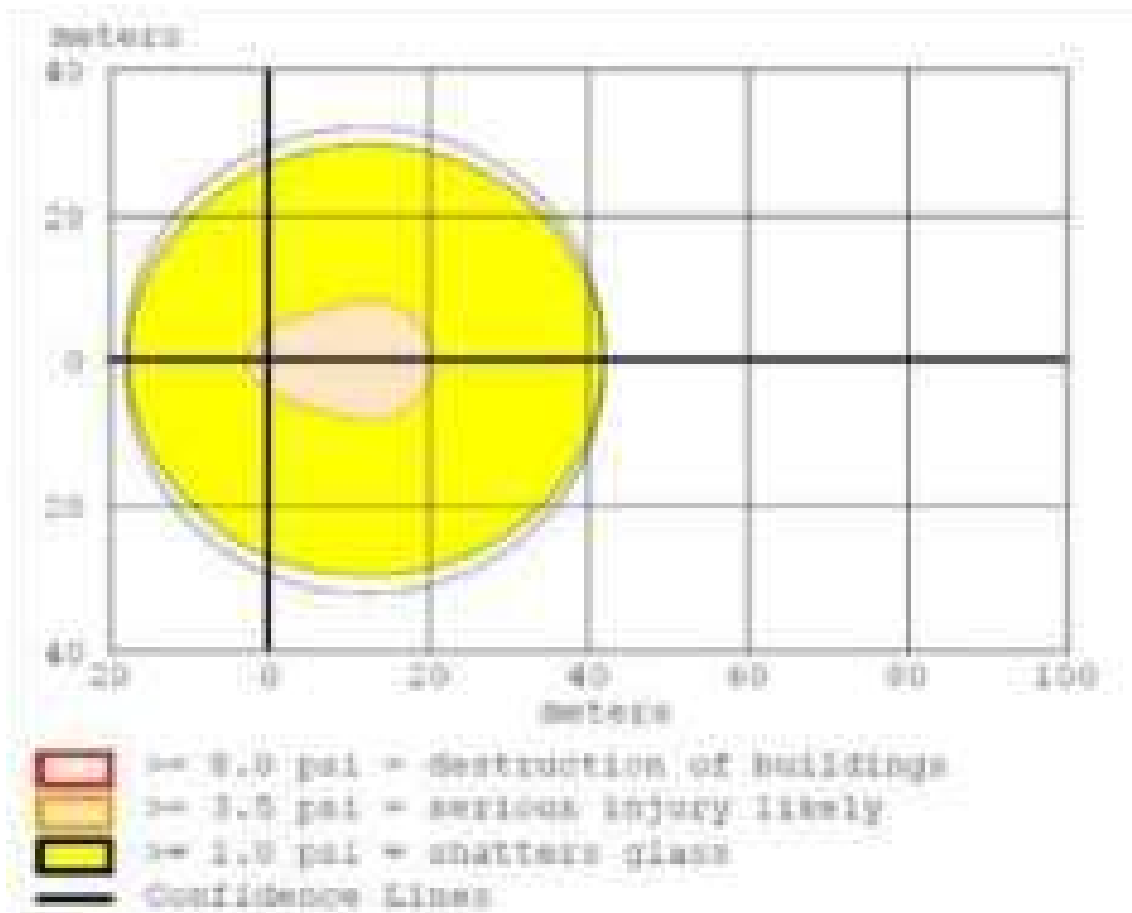
20.1.1.10 Evaporating Puddle – Flammable Area of Vapor Cloud (Contour)



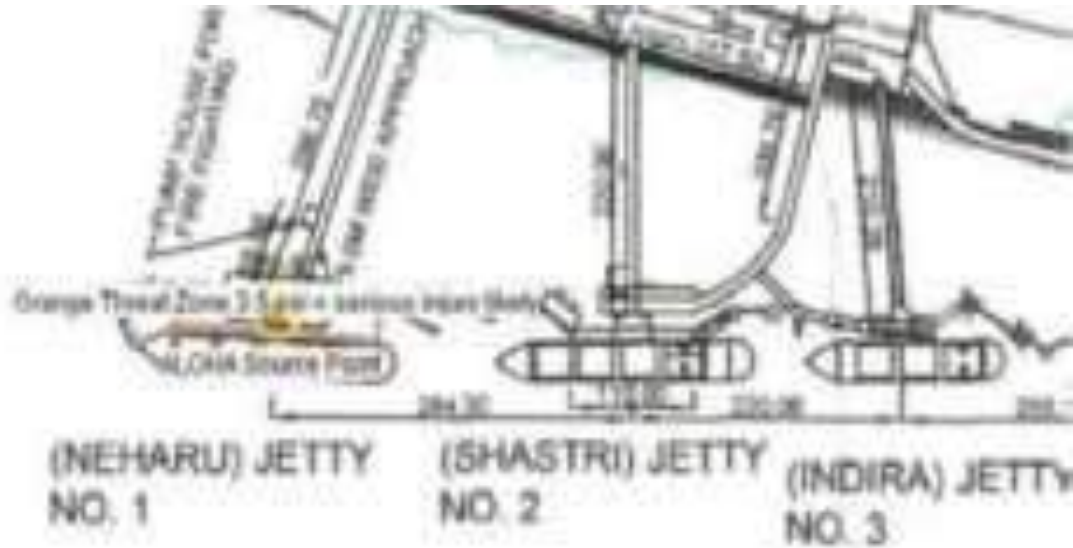
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Kishida Jetty Map

OIL JETTY

20.1.1.11 Evaporating Puddle – Overpressure (Graph)



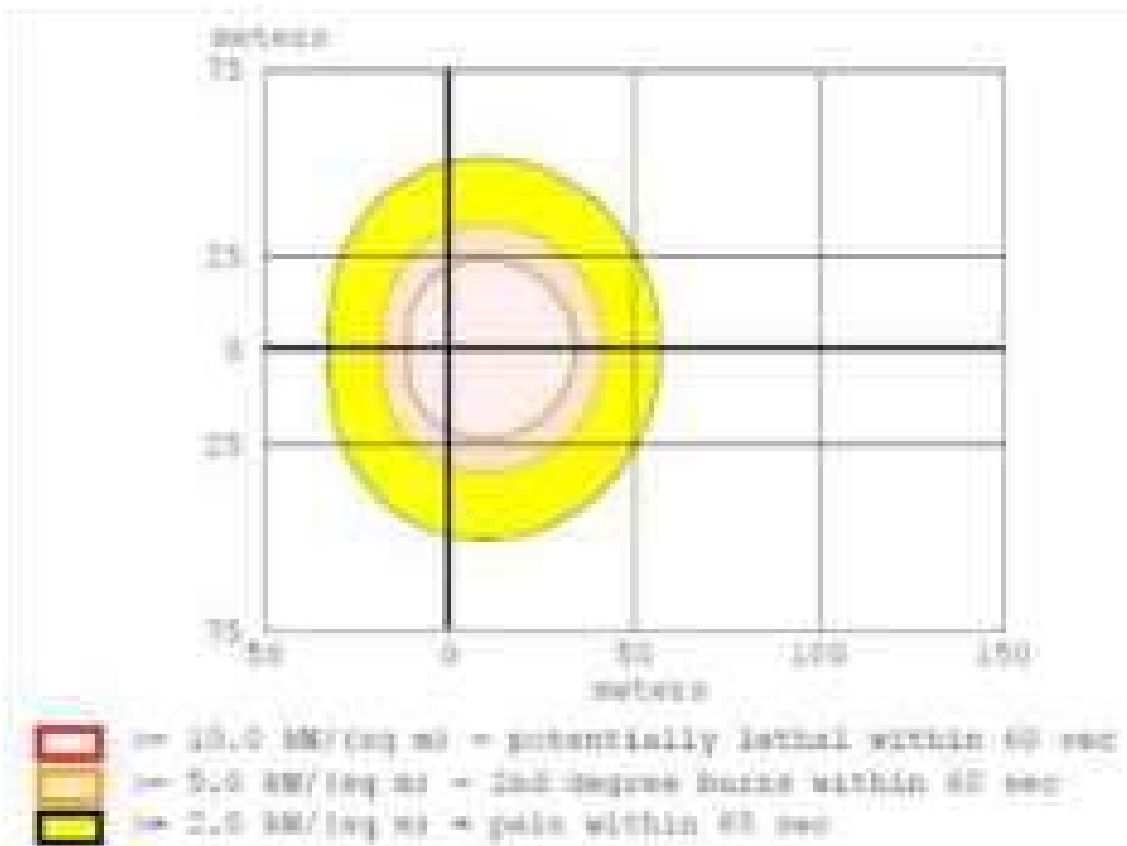
20.1.1.12 Evaporating Puddle – Overpressure (Contour)



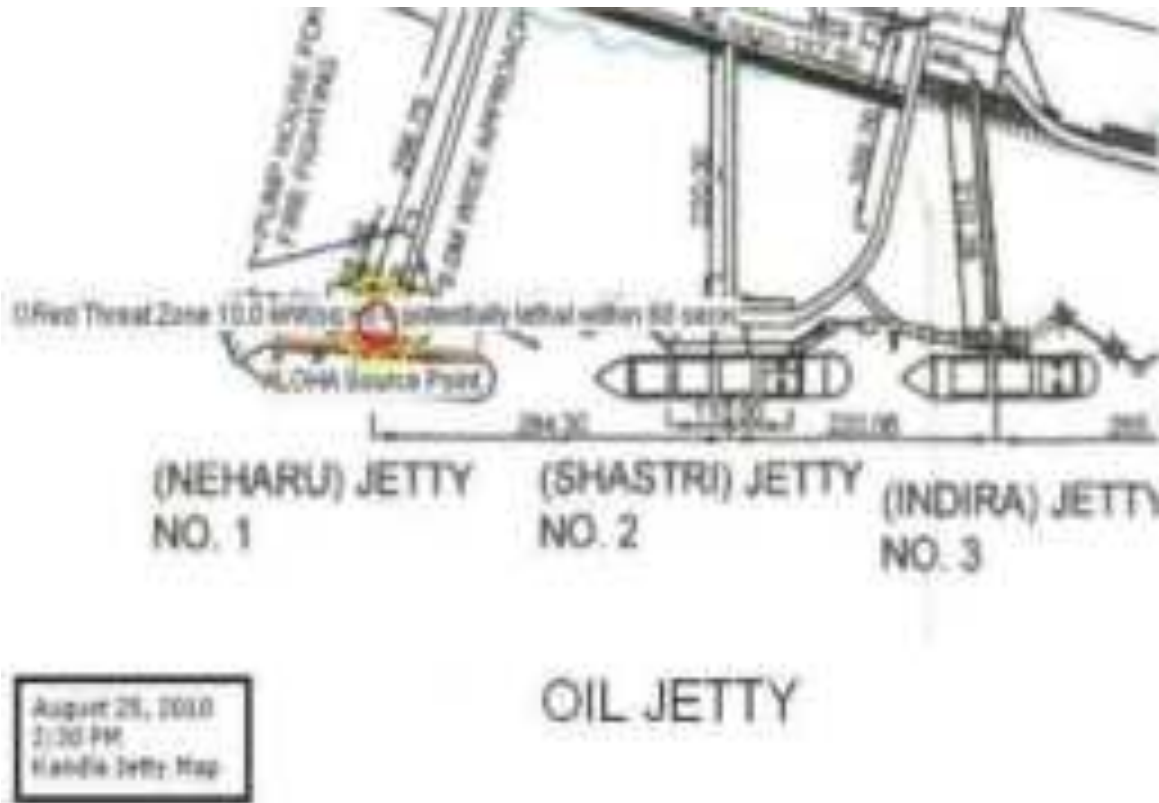
August 25, 2018
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Kandla Jetty Map

OIL JETTY

20.1.1.13 Burning Puddle – Thermal Radiation (Graph)

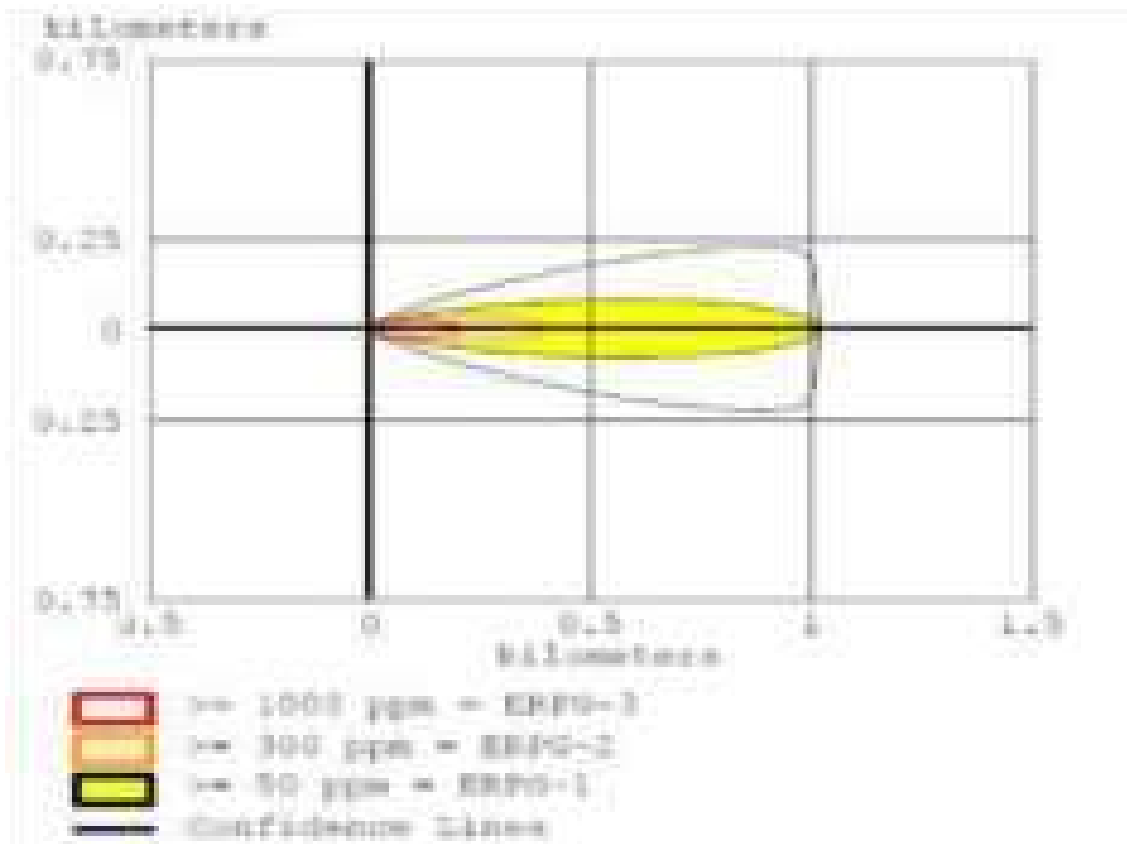


20.1.1.14 Burning Puddle – Thermal Radiation (Contour)

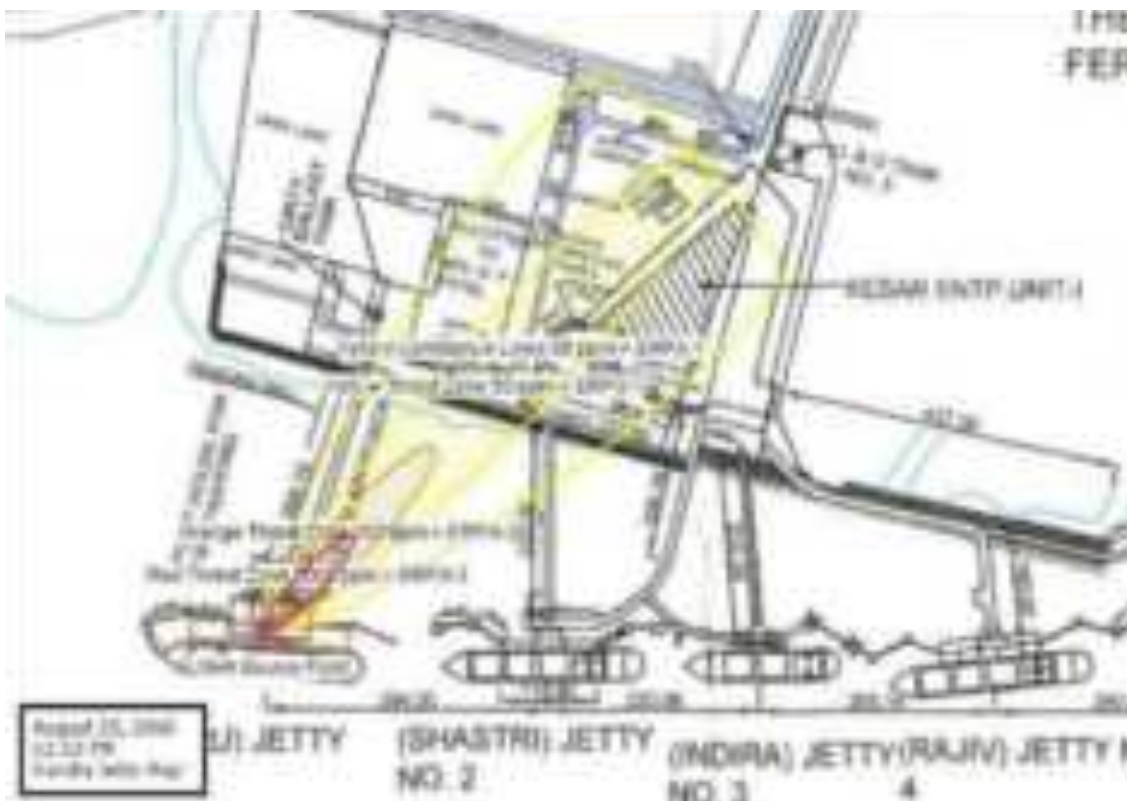


20.1.2 Jetty One – Toluene

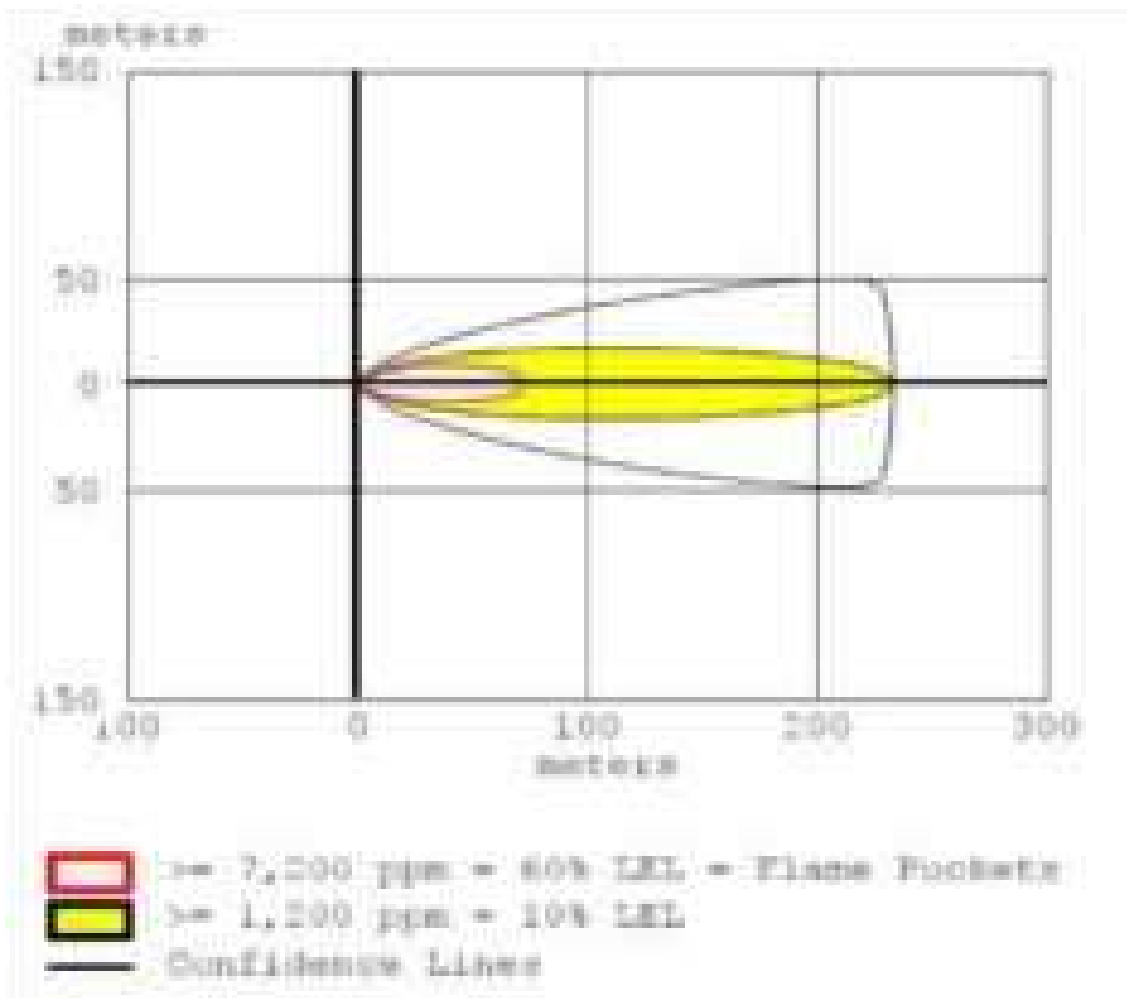
20.1.2.1 Instantaneous Release – Toxic Threat Zone (Graph)



20.1.2.2 Instantaneous Release – Toxic Threat Zone (Contour)



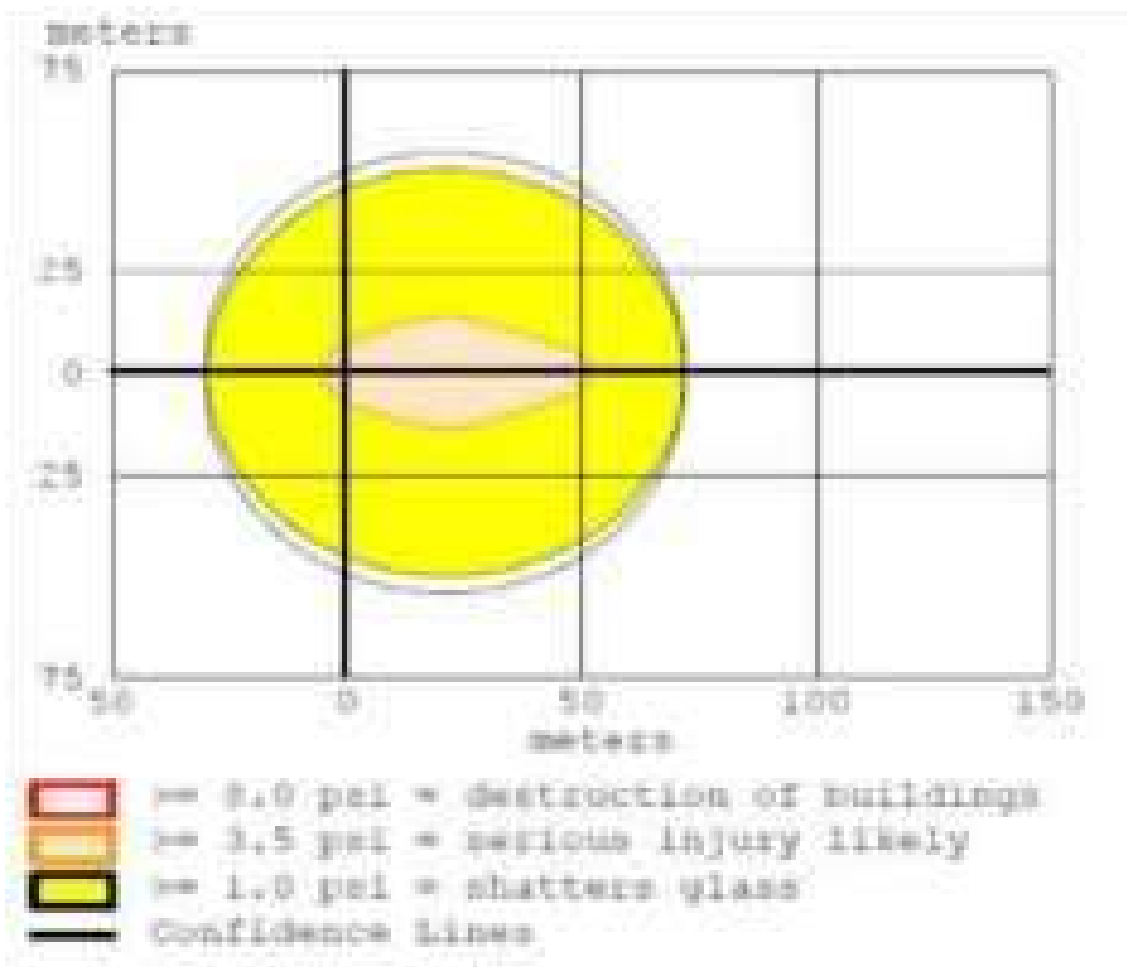
20.1.2.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



20.1.2.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



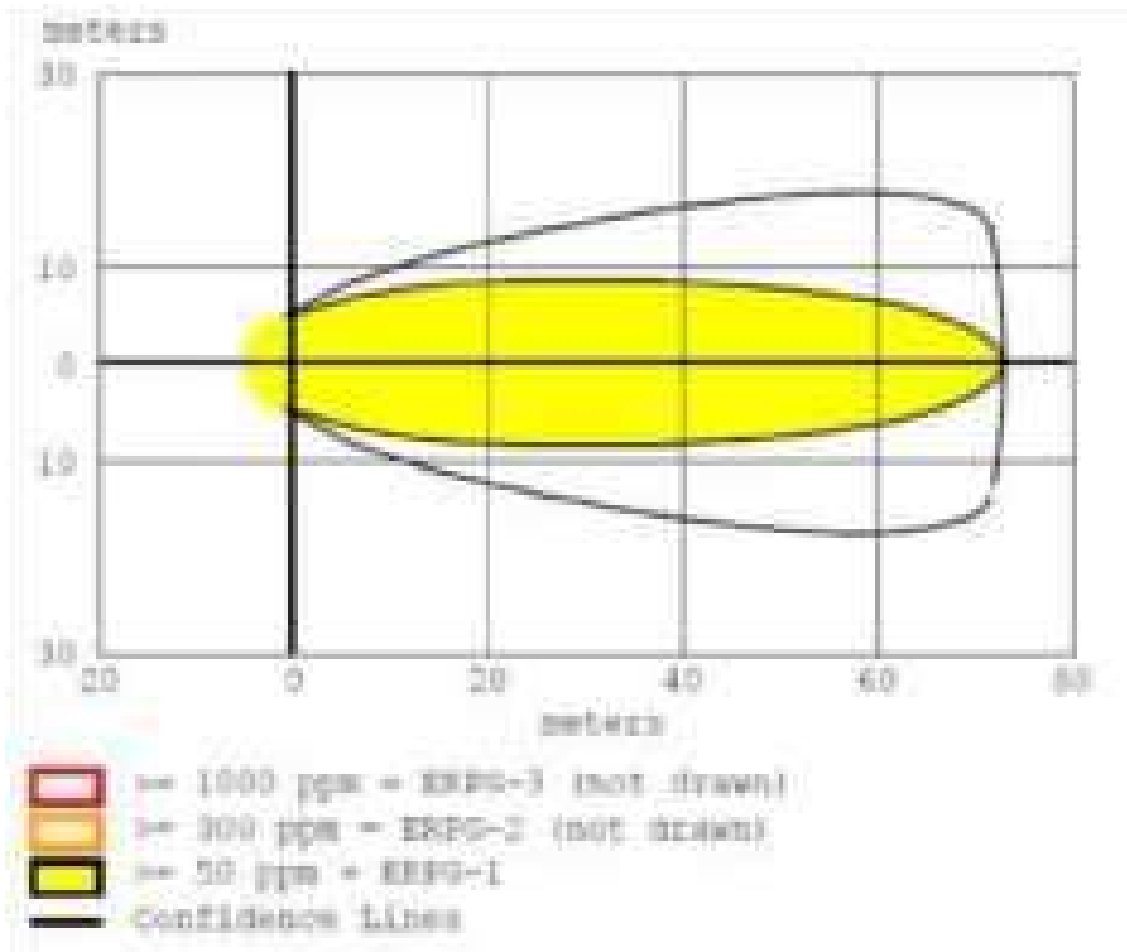
20.1.2.5 Instantaneous Release – Overpressure (Graph)



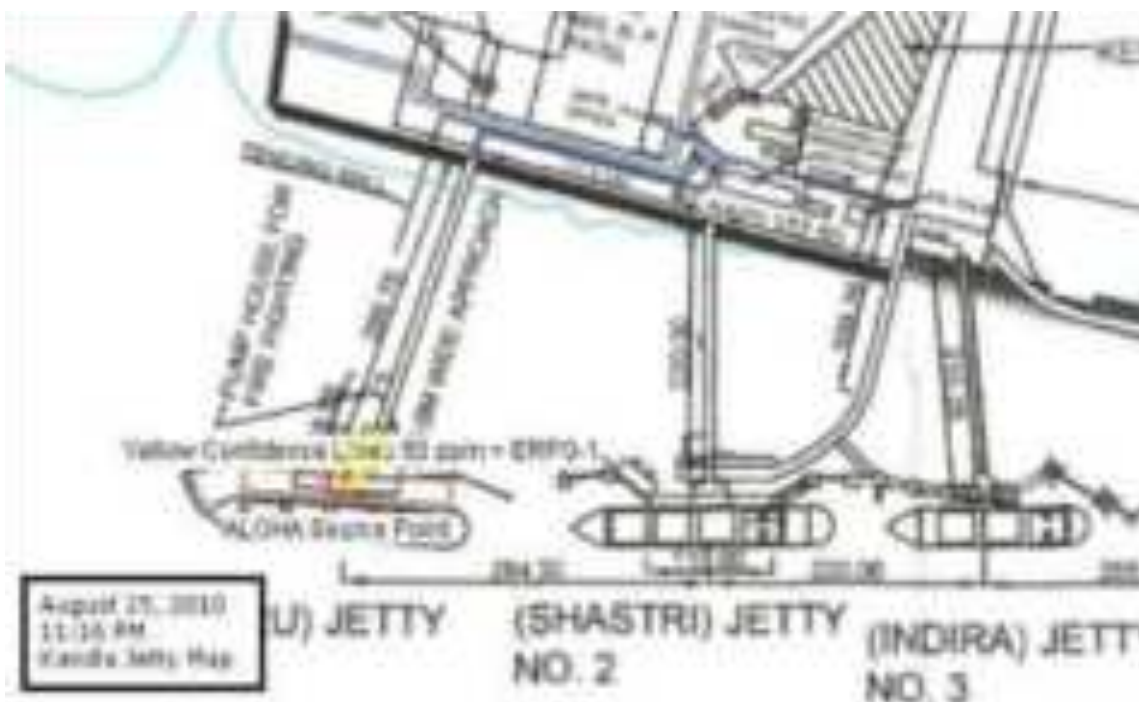
20.1.2.6 Instantaneous Release – Overpressure (Contour)



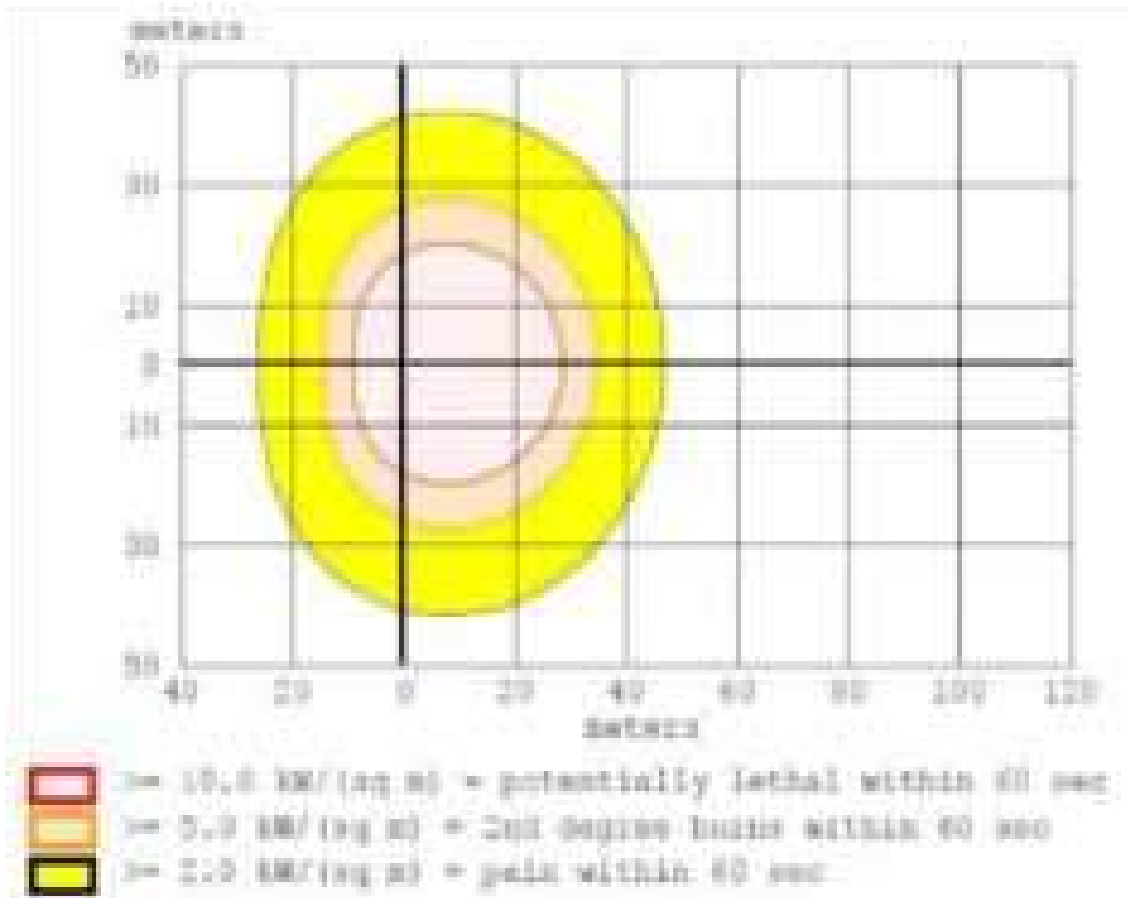
20.1.2.7 Evaporating Puddle – Toxic Threat Zone (Graph)



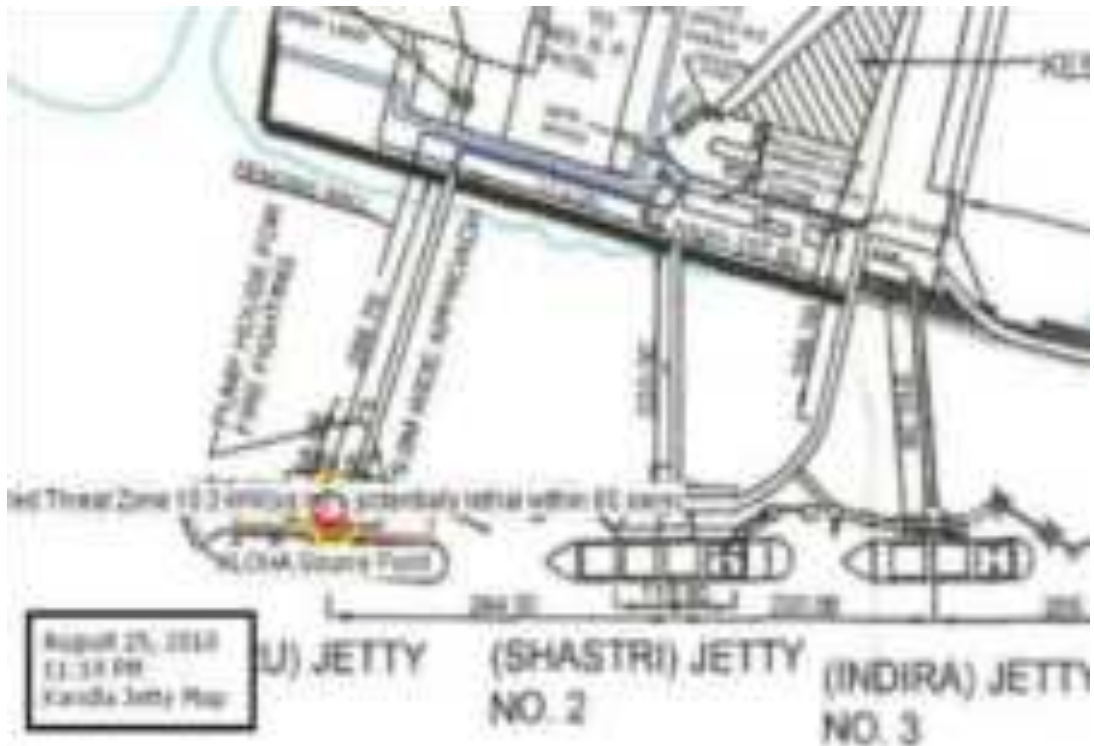
20.1.2.8 Evaporating Puddle – Toxic Threat Zone (Contour)



20.1.2.9 Burning Puddle – Thermal Radiation (Graph)

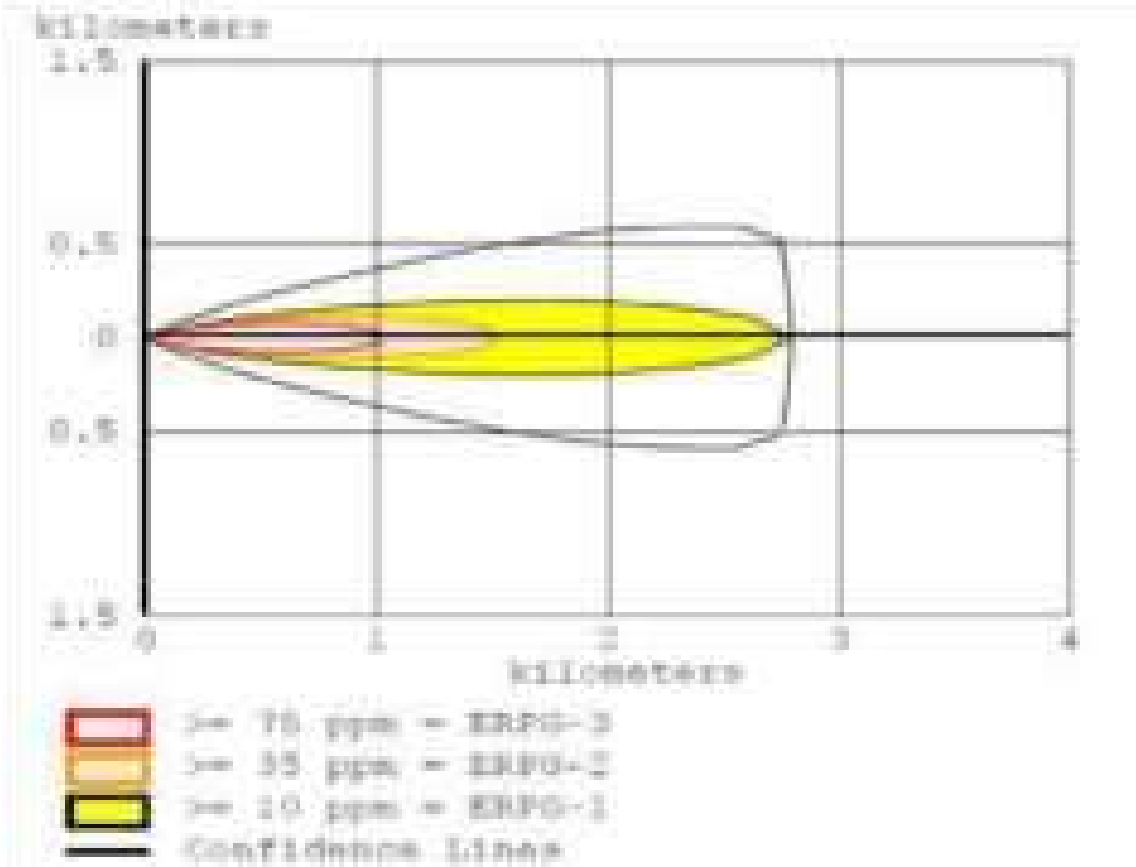


20.1.2.10 Burning Puddle – Thermal Radiation (Contour)

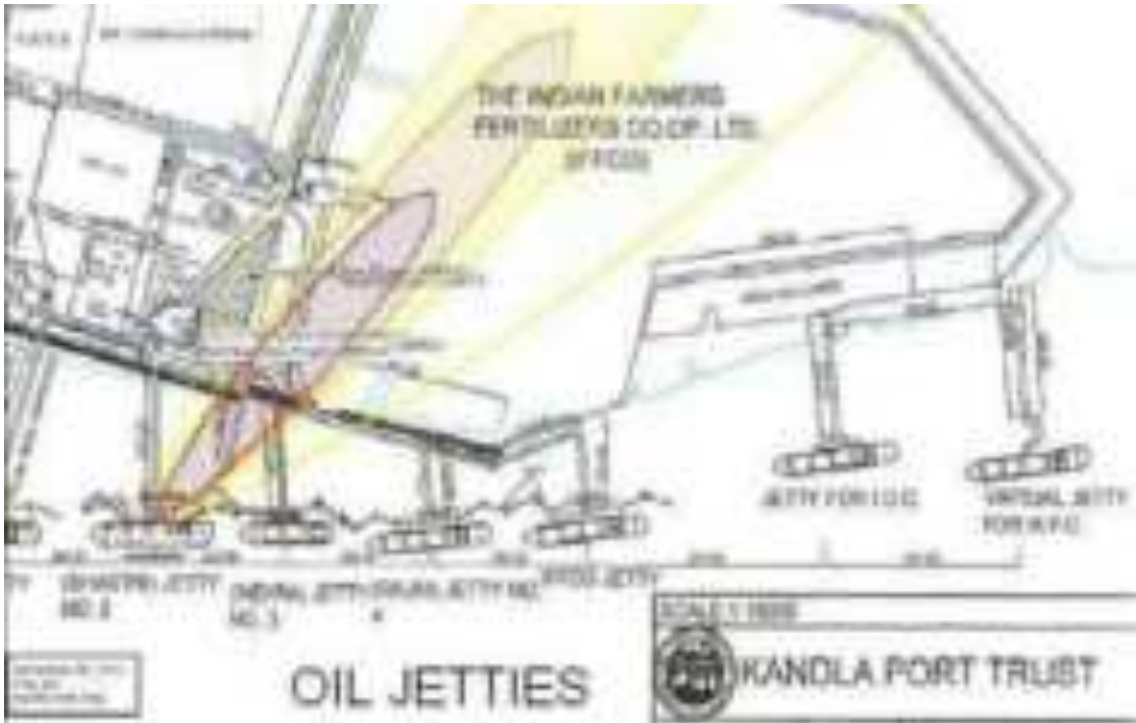


20.1.3 Jetty Two – Acrylonitrile

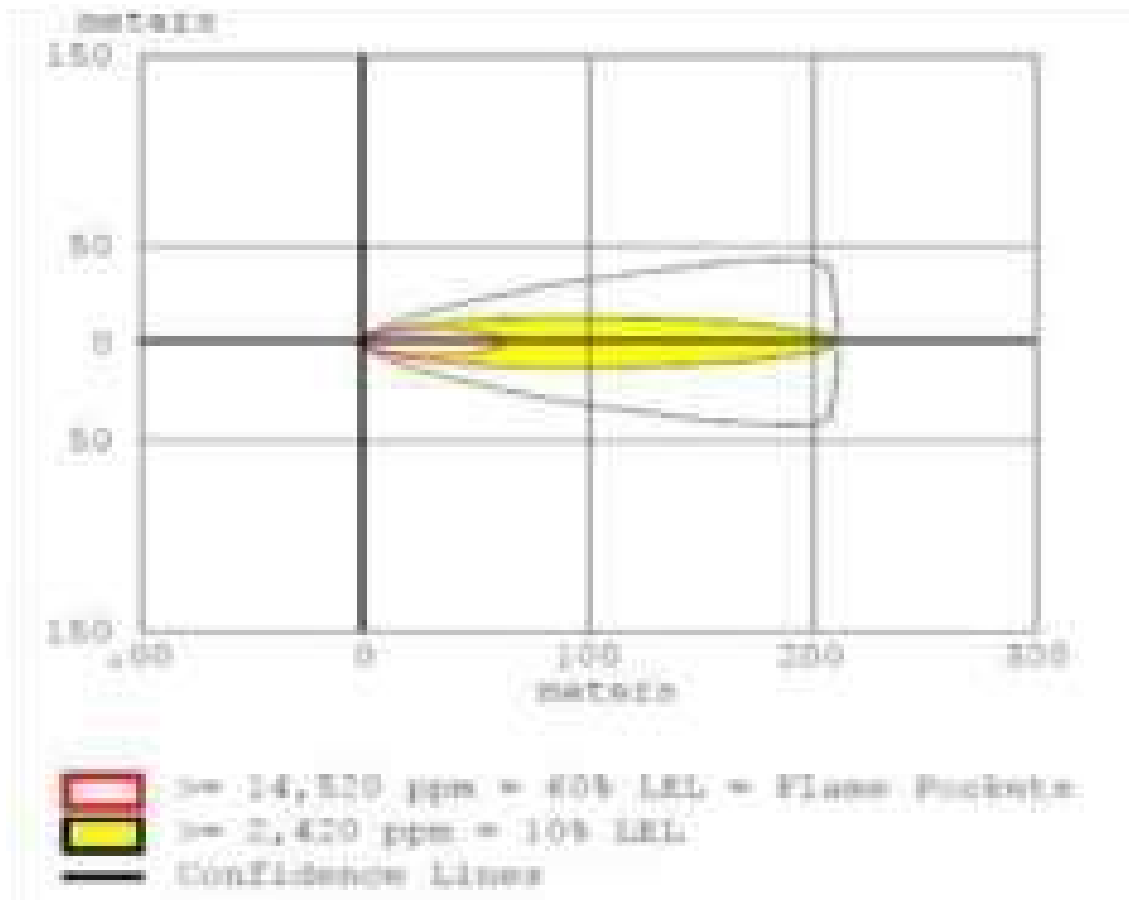
20.1.3.1 Instantaneous Release – Toxic Threat Zone (Graph)



20.1.3.2 Instantaneous Release – Toxic Threat Zone (Contour)



20.1.3.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



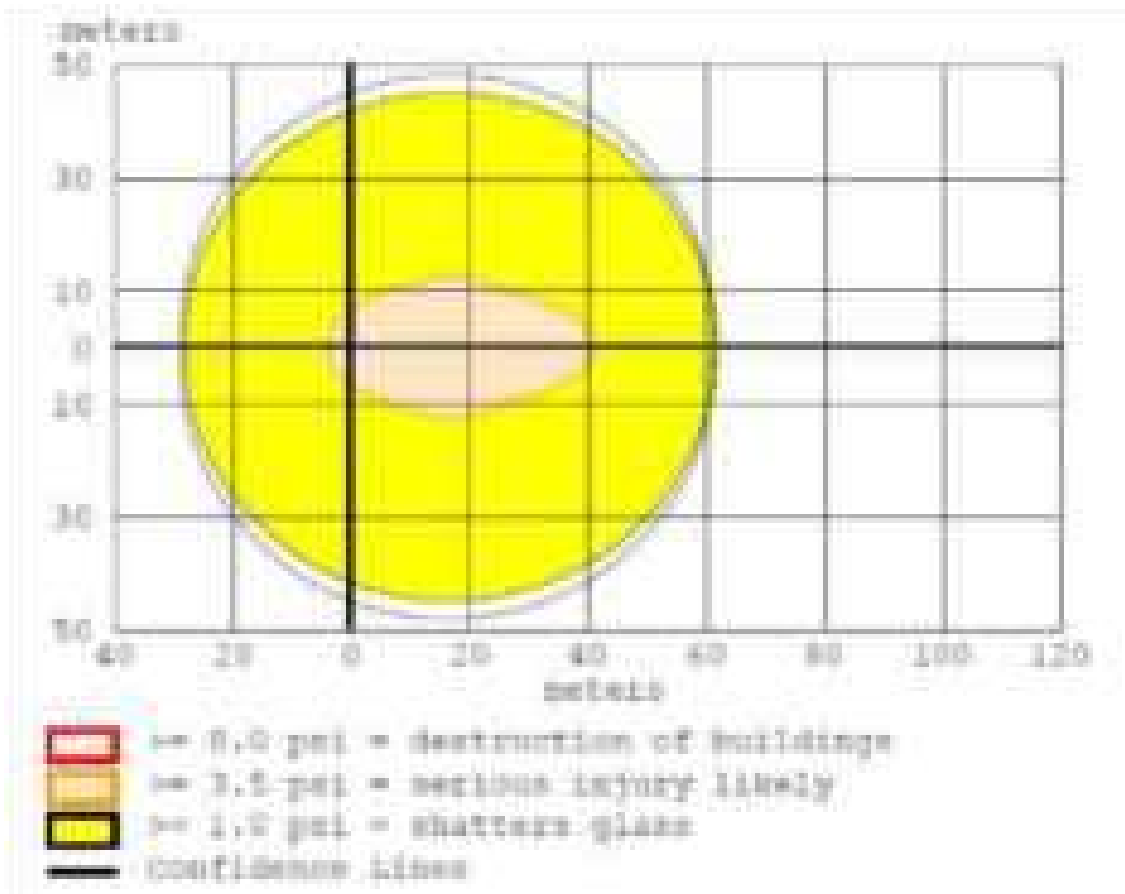
20.1.3.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



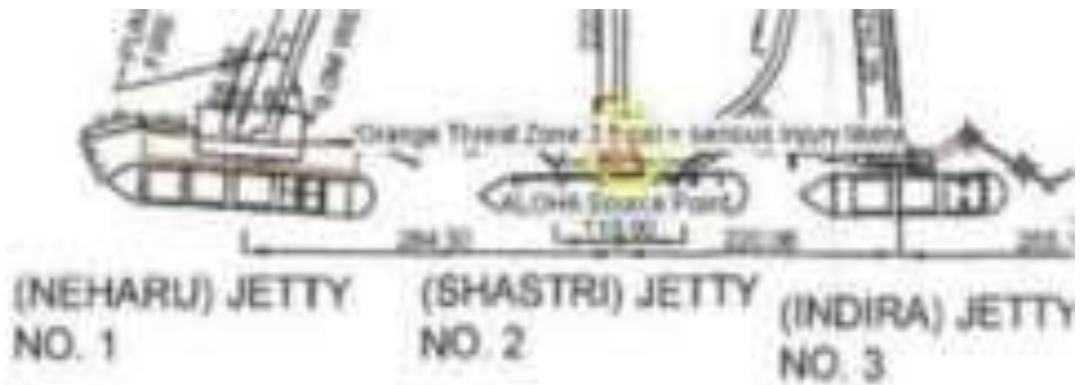
August 25, 2010
1:42 PM
Indira Jetty Map

OIL JETTIES

20.1.3.5 Instantaneous Release – Overpressure (Graph)



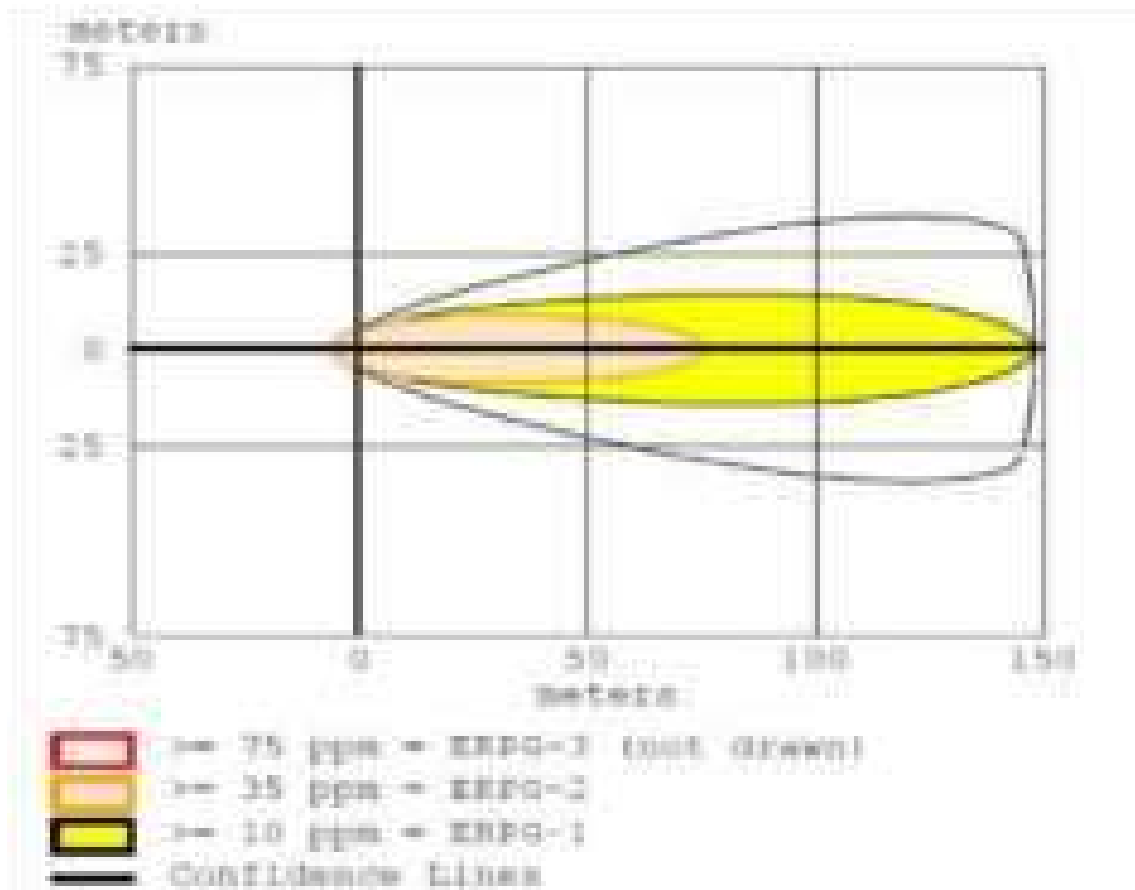
20.1.3.6 Instantaneous Release – Overpressure (Contour)



OIL JETTIES

August 25, 2010
 2:43 PM
 Kandla Jetty Map

20.1.3.7 Evaporating Puddle – Toxic Threat Zone (Graph)



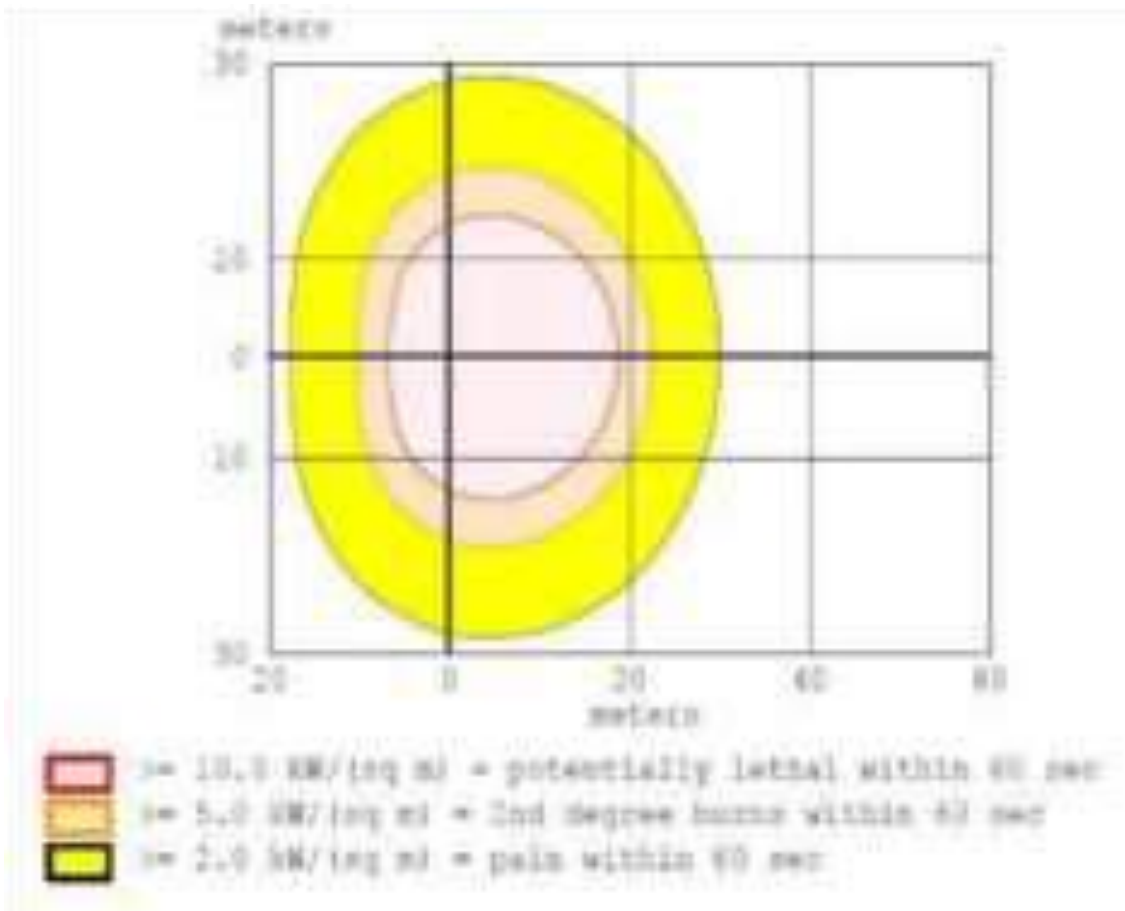
20.1.3.8 Evaporating Puddle – Toxic Threat Zone (Contour)



August 26, 2003
 2:47 PM
 HazMat Jetty Map

OIL JETTIES

20.1.3.9 Burning Puddle – Thermal Radiation (Graph)



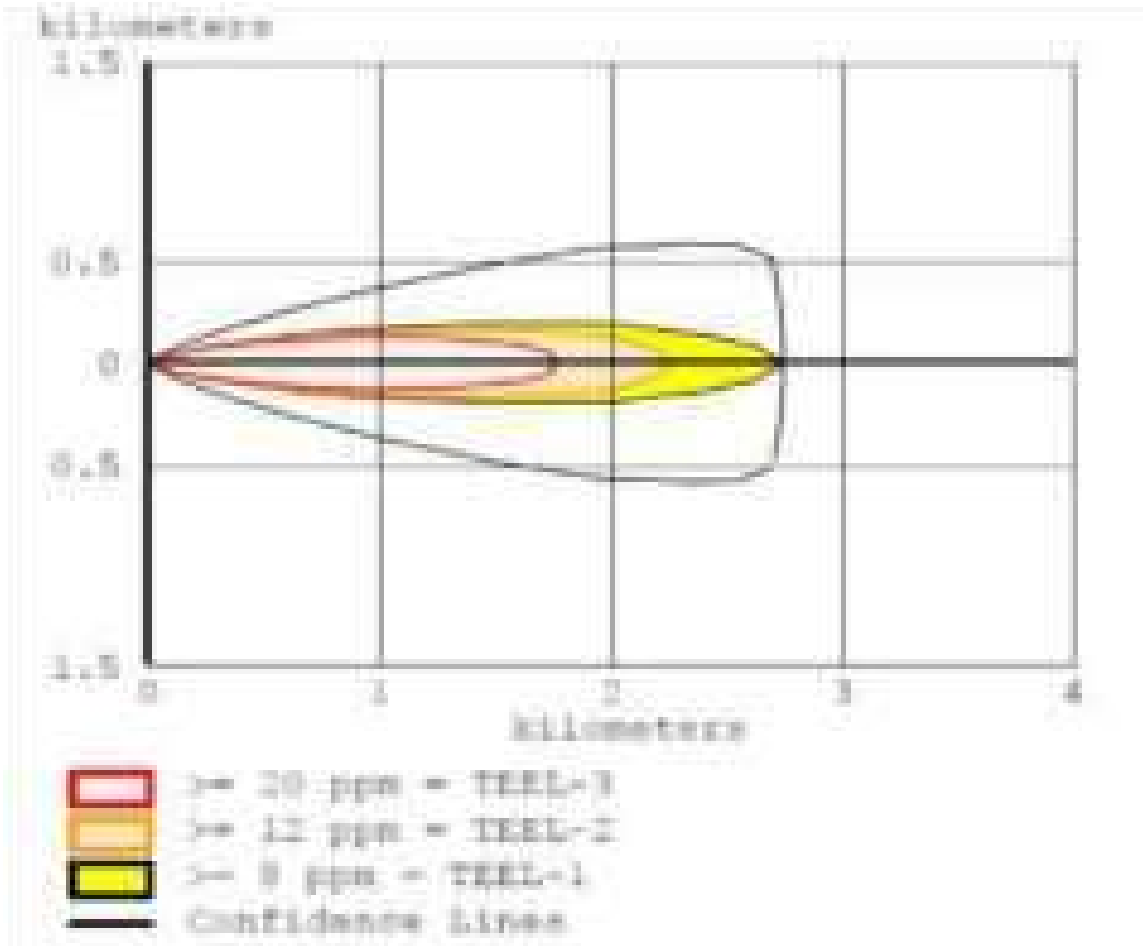
20.1.3.10 Burning Puddle – Thermal Radiation (Contour)



August 25, 1998
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 Kandla Jetty Map

OIL JETTIES

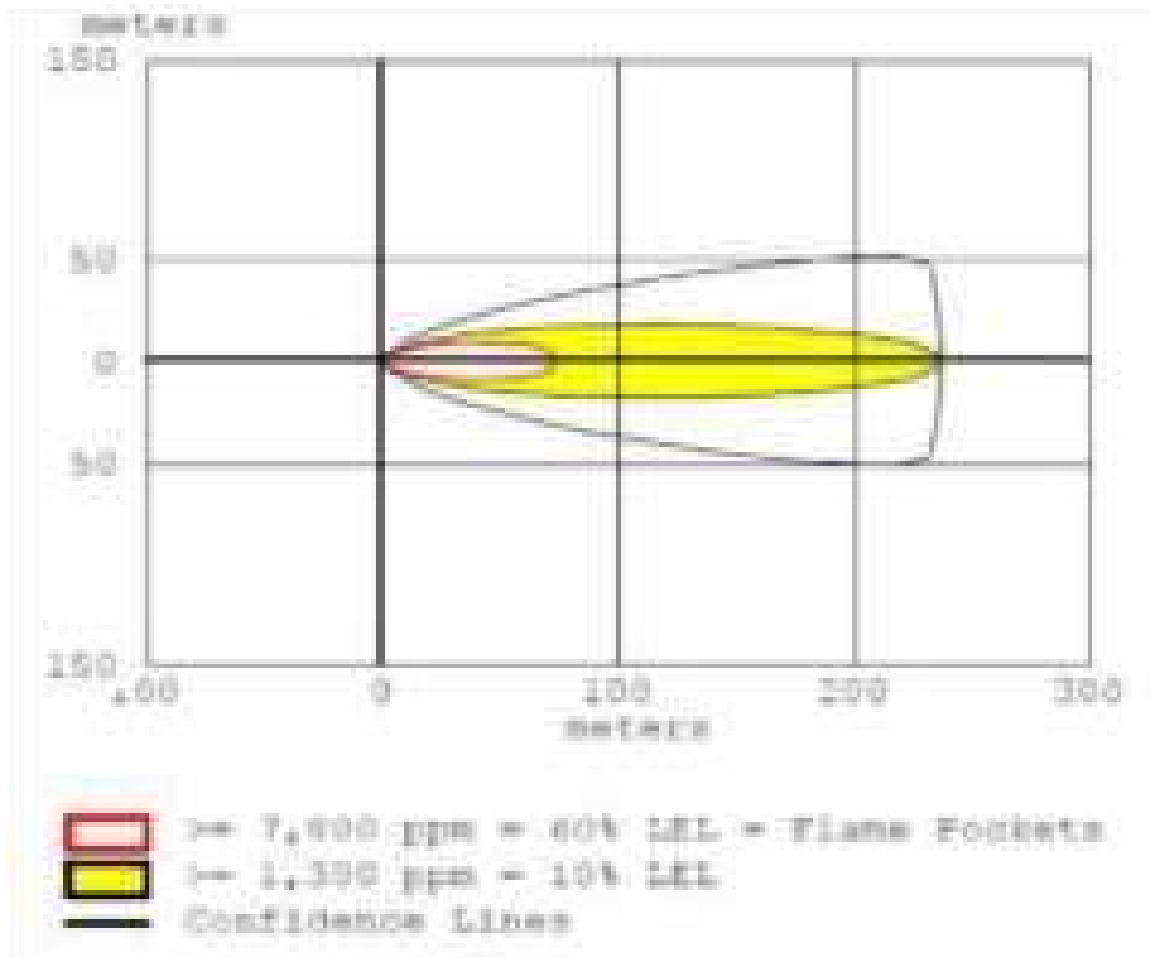
20.1.4.1 Instantaneous Release – Toxic Threat Zone (Graph)



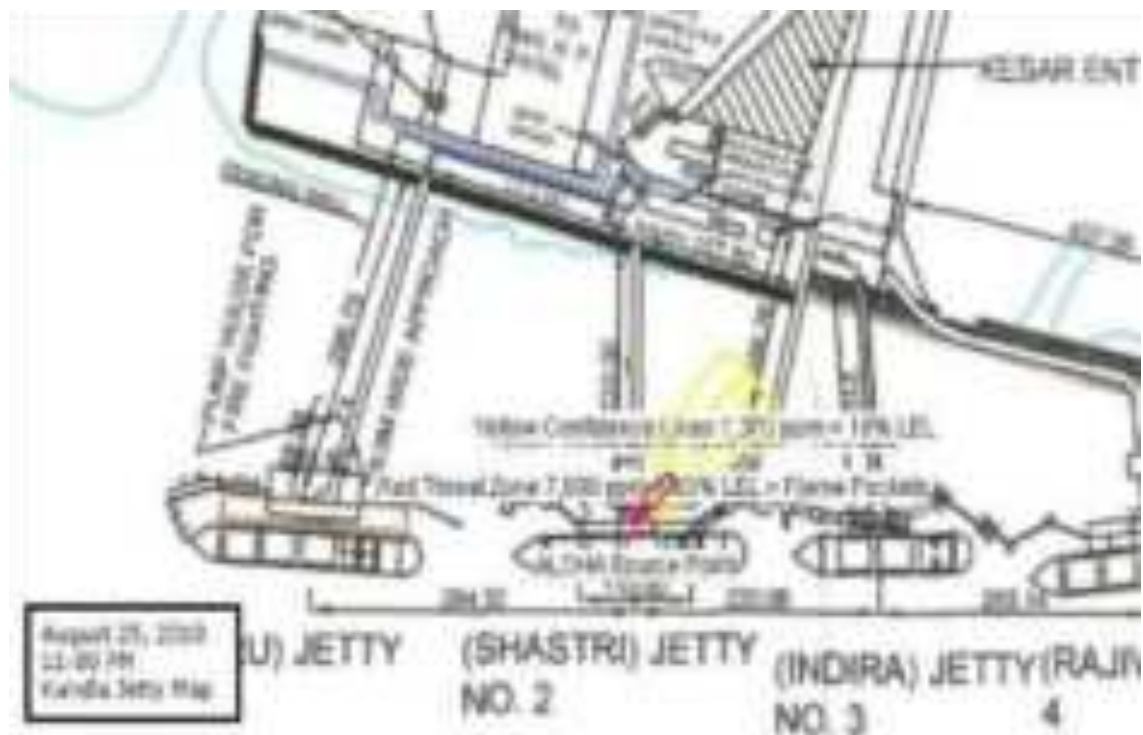
20.1.4.2 Instantaneous Release – Toxic Threat Zone (Contour)



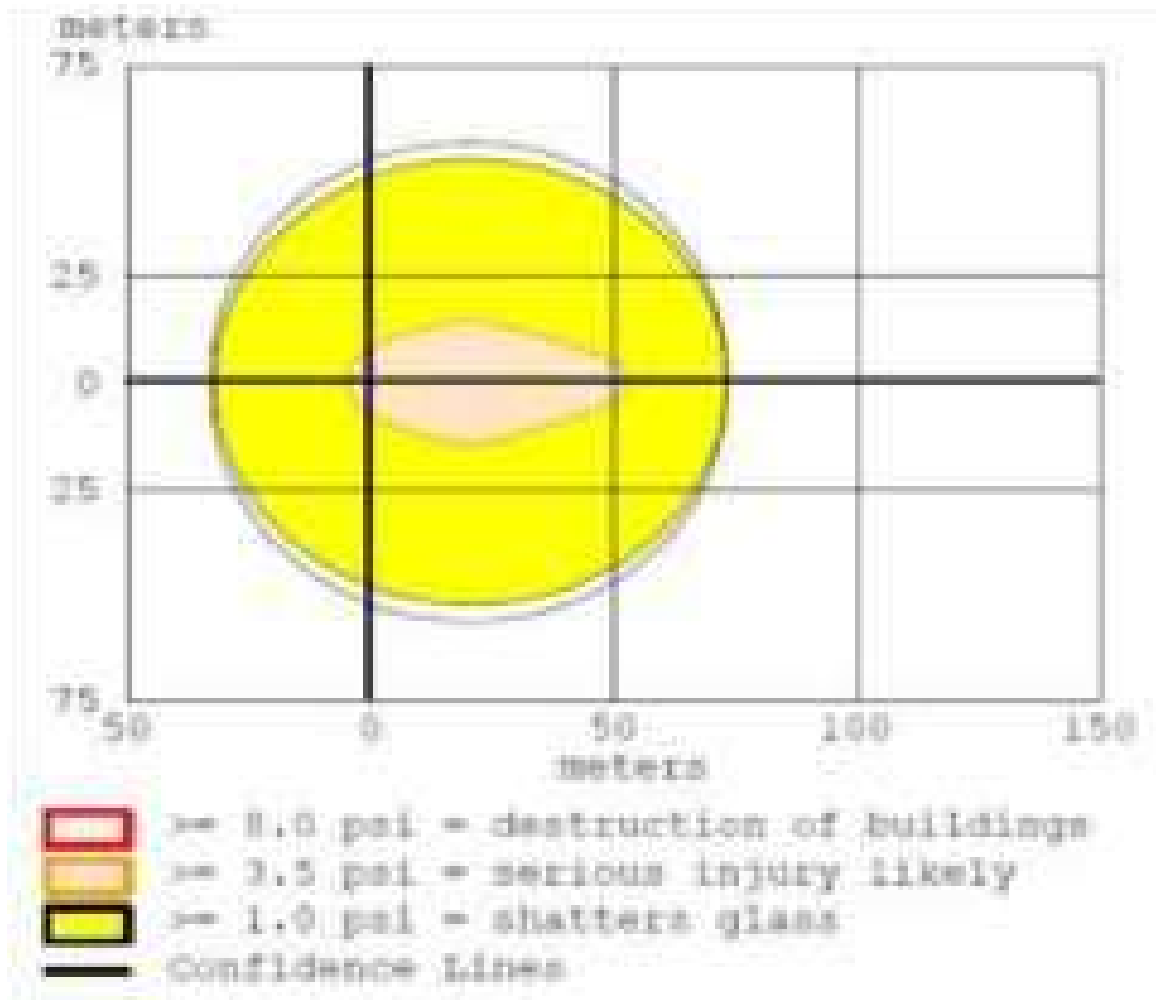
20.1.4.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



20.1.4.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



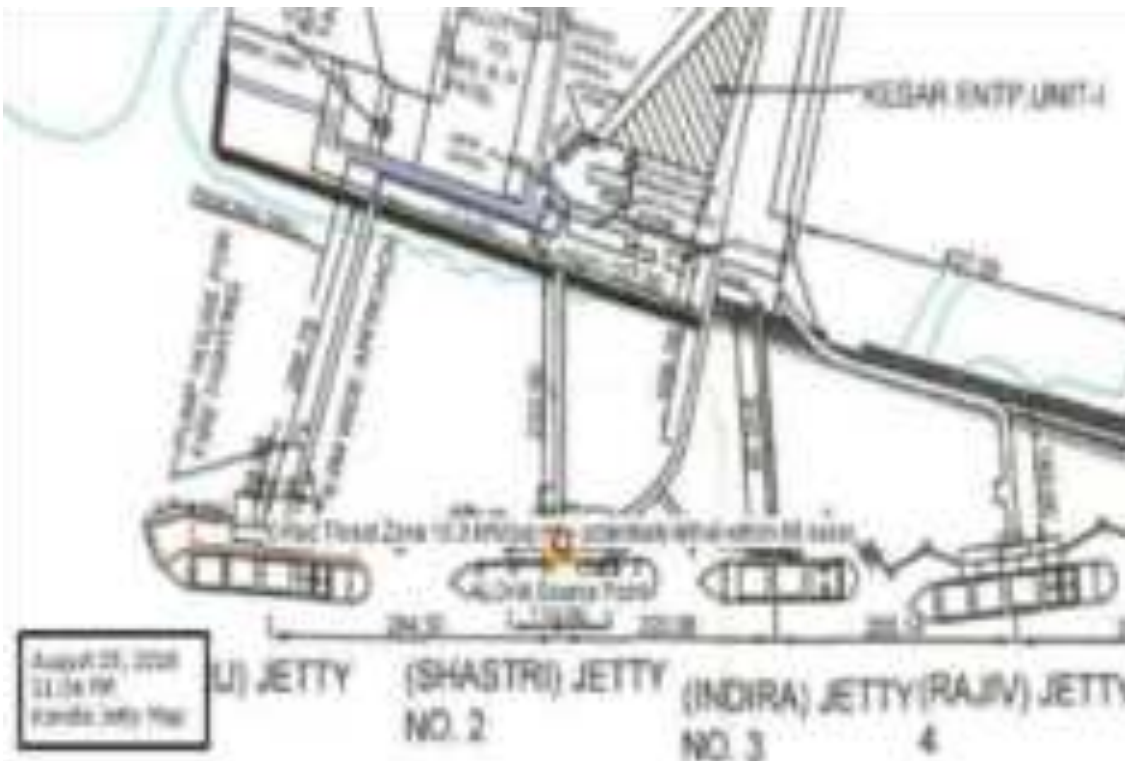
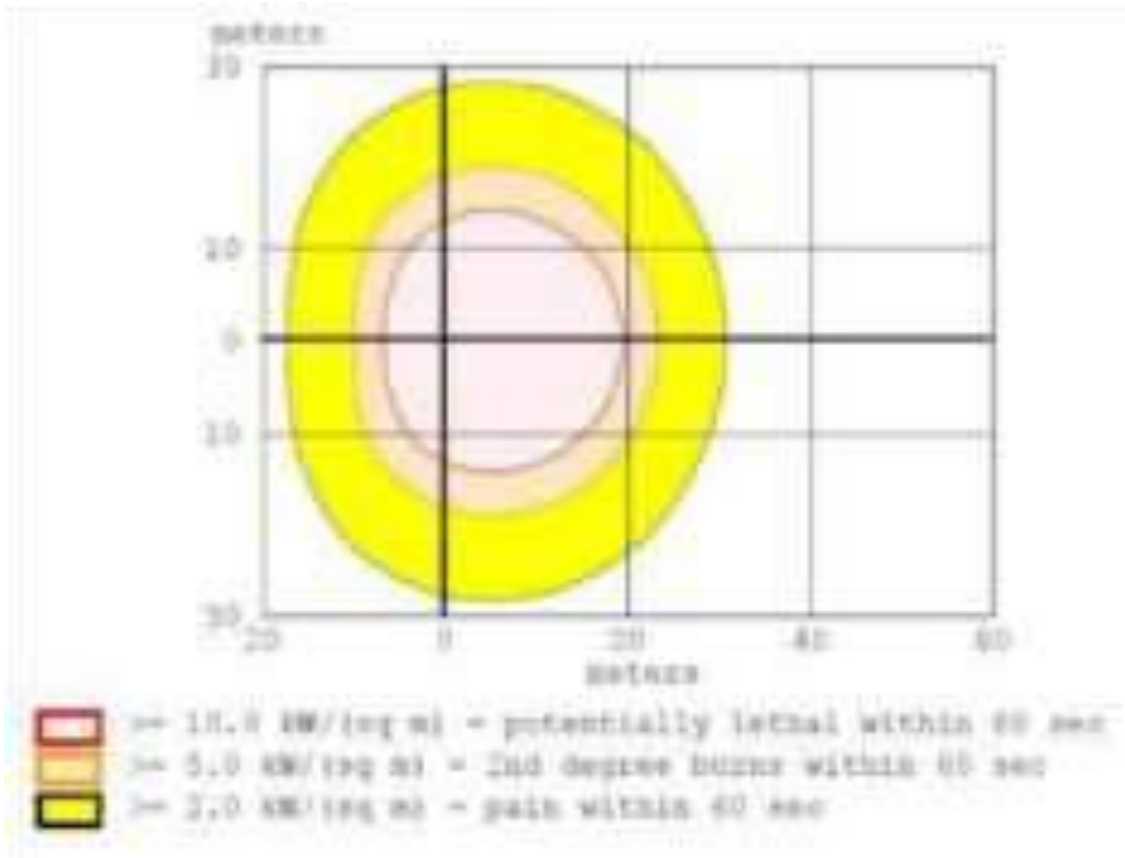
20.1.4.5 Instantaneous Release – Overpressure (Graph)



20.1.4.6 Instantaneous Release – Overpressure (Contour)

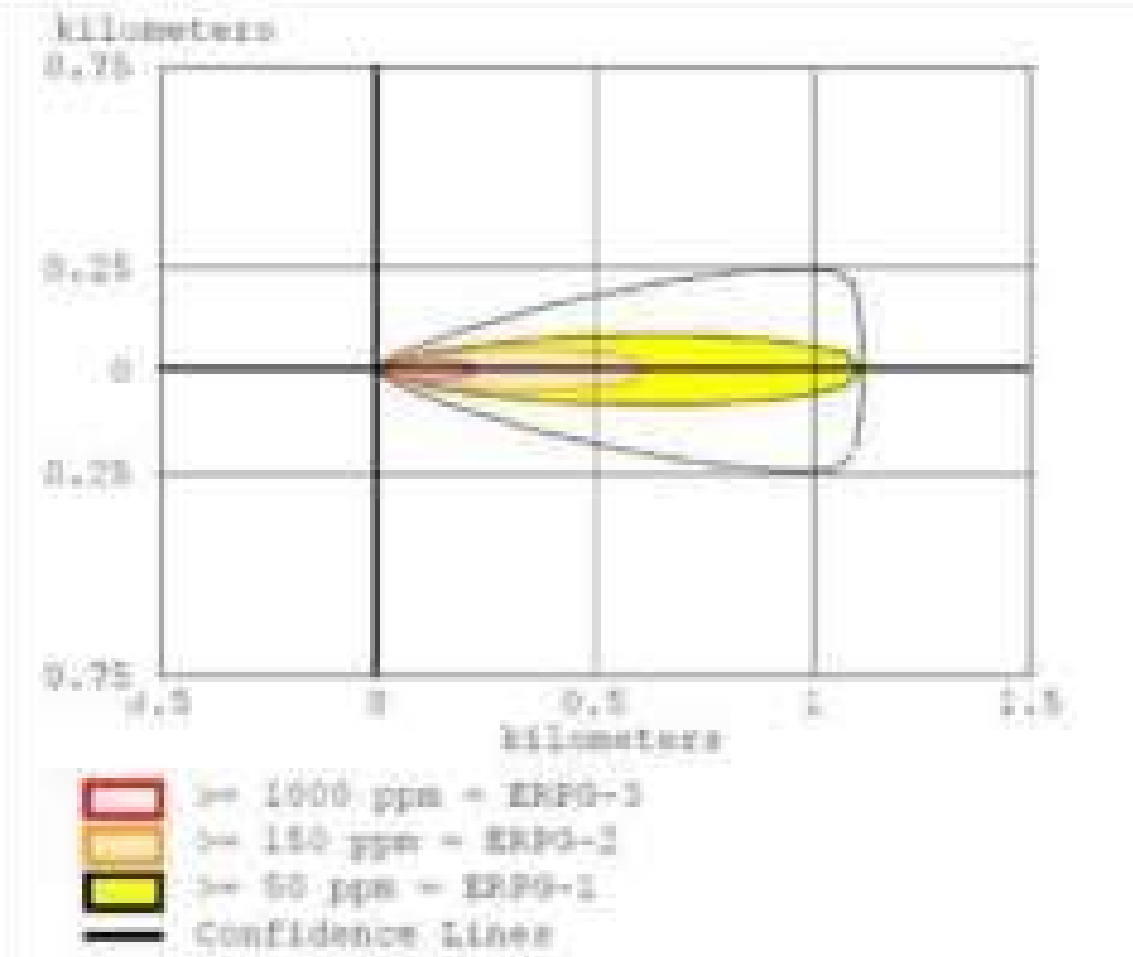


20.1.4.7 Burning Puddle – Thermal Radiation (Graph)



20.1.5 Jetty Two – Benzene

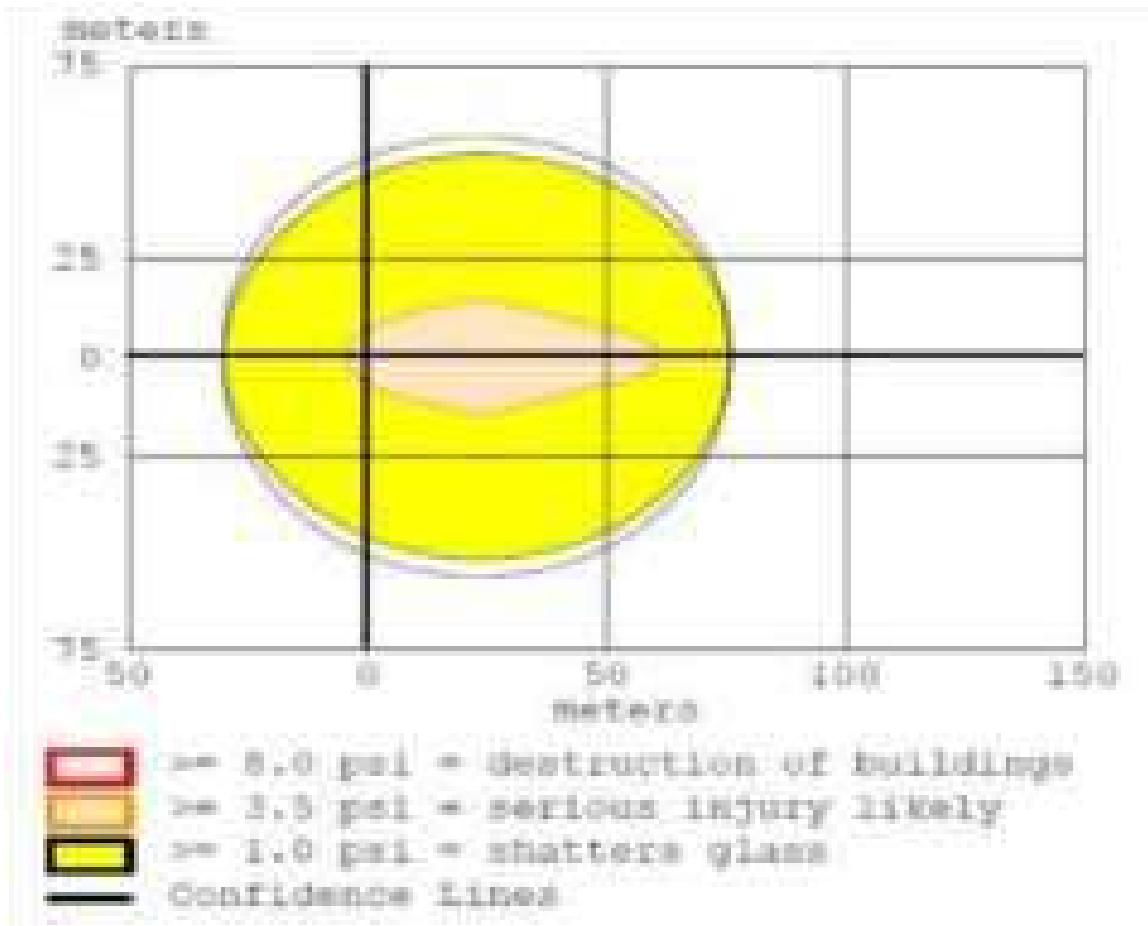
20.1.5.1 Instantaneous Release – Toxic Threat Zone (Graph)



20.1.5.2 Instantaneous Release – Toxic Threat Zone (Contour)



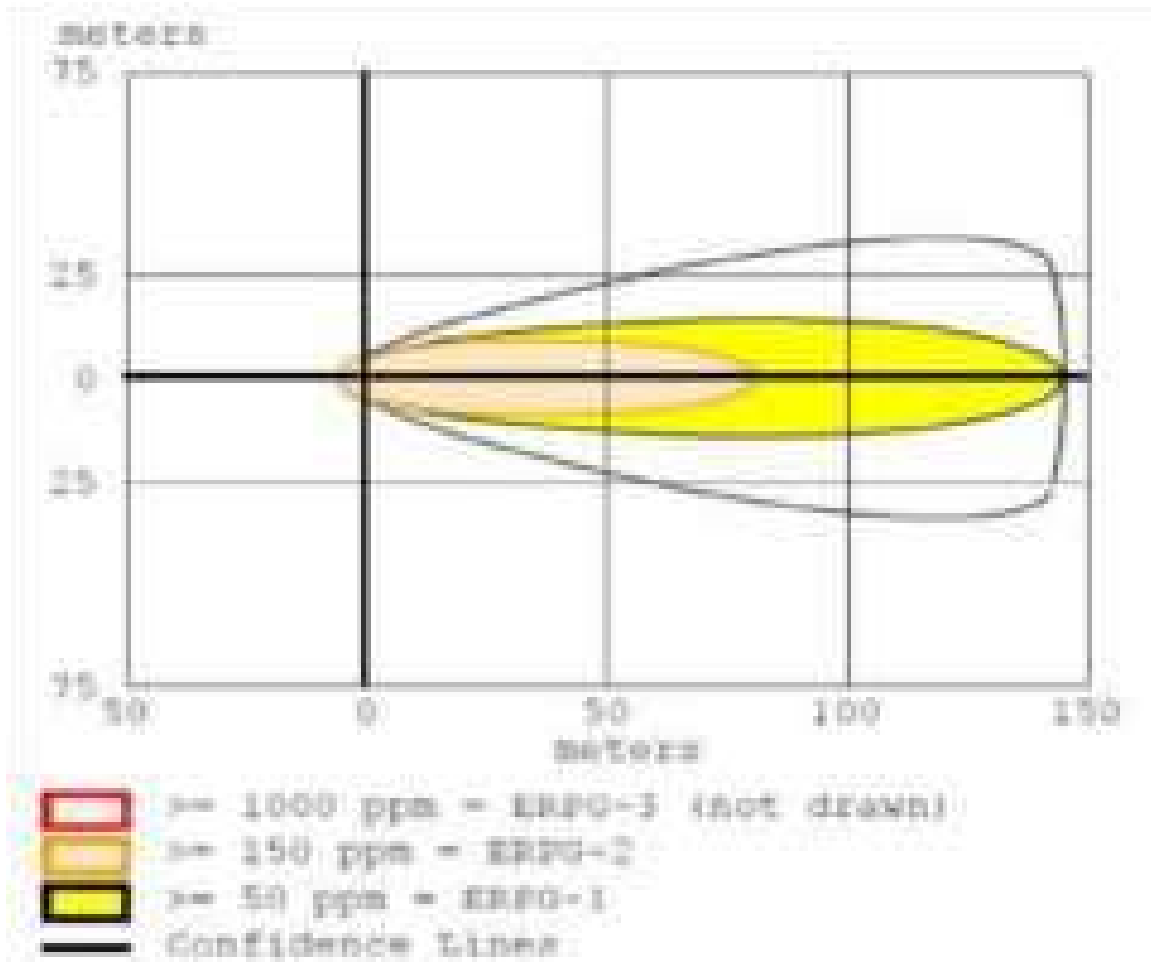
20.1.5.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



20.1.5.6 Instantaneous Release – Overpressure (Contour)



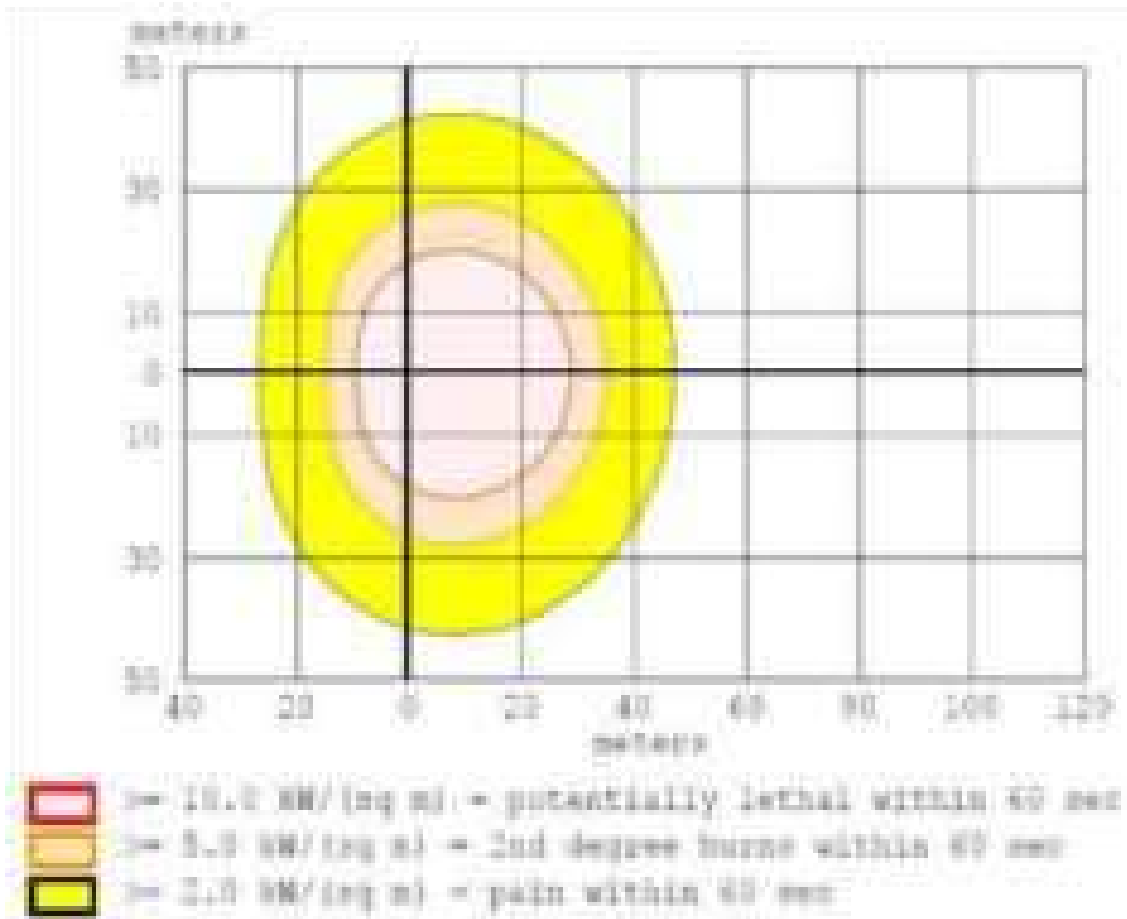
20.1.5.7 Evaporating Puddle – Toxic Threat Zone (Graph)



20.1.5.8 Evaporating Puddle – Toxic Threat Zone (Contour)



20.1.5.9 Burning Puddle – Thermal Radiation (Graph)

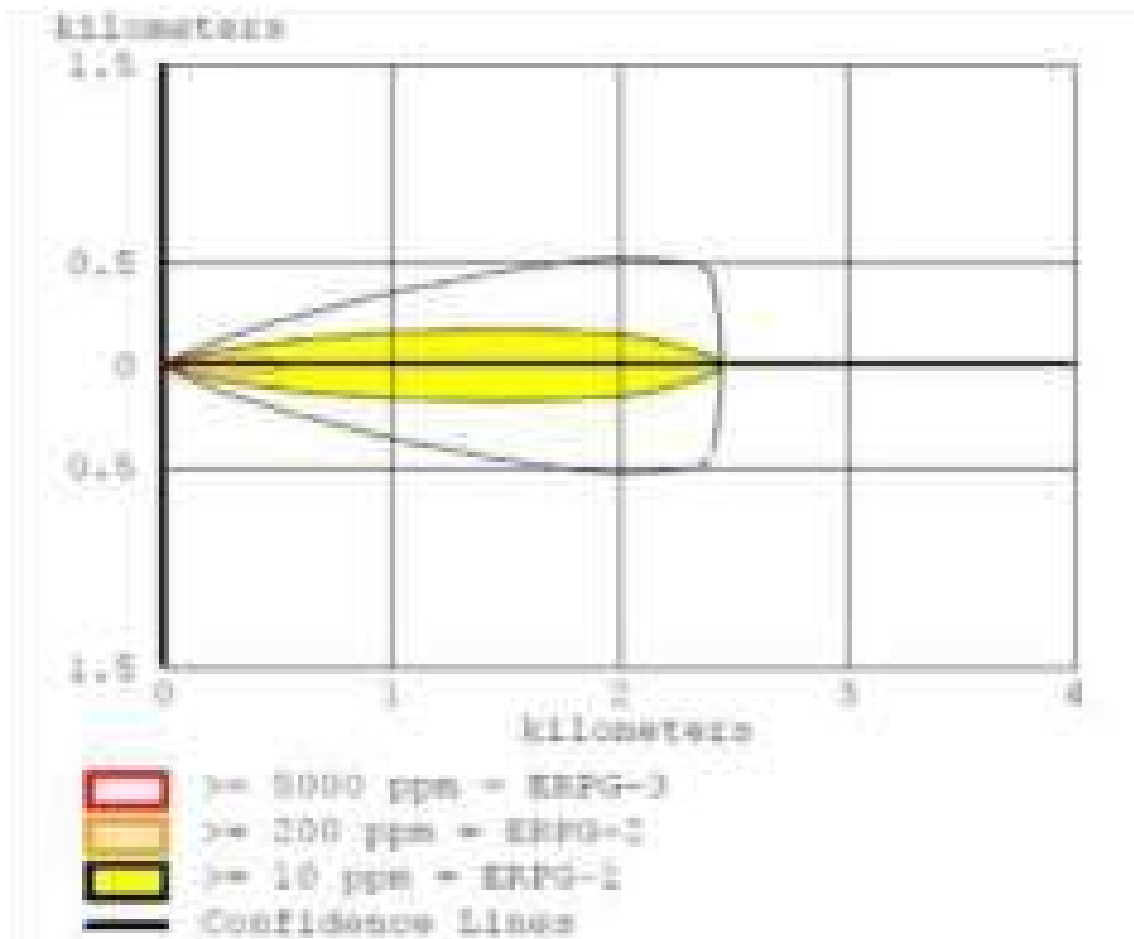


20.1.5.10 Burning Puddle – Thermal Radiation (Contour)



20.1.6 Jetty Three – 1:3, Butadiene

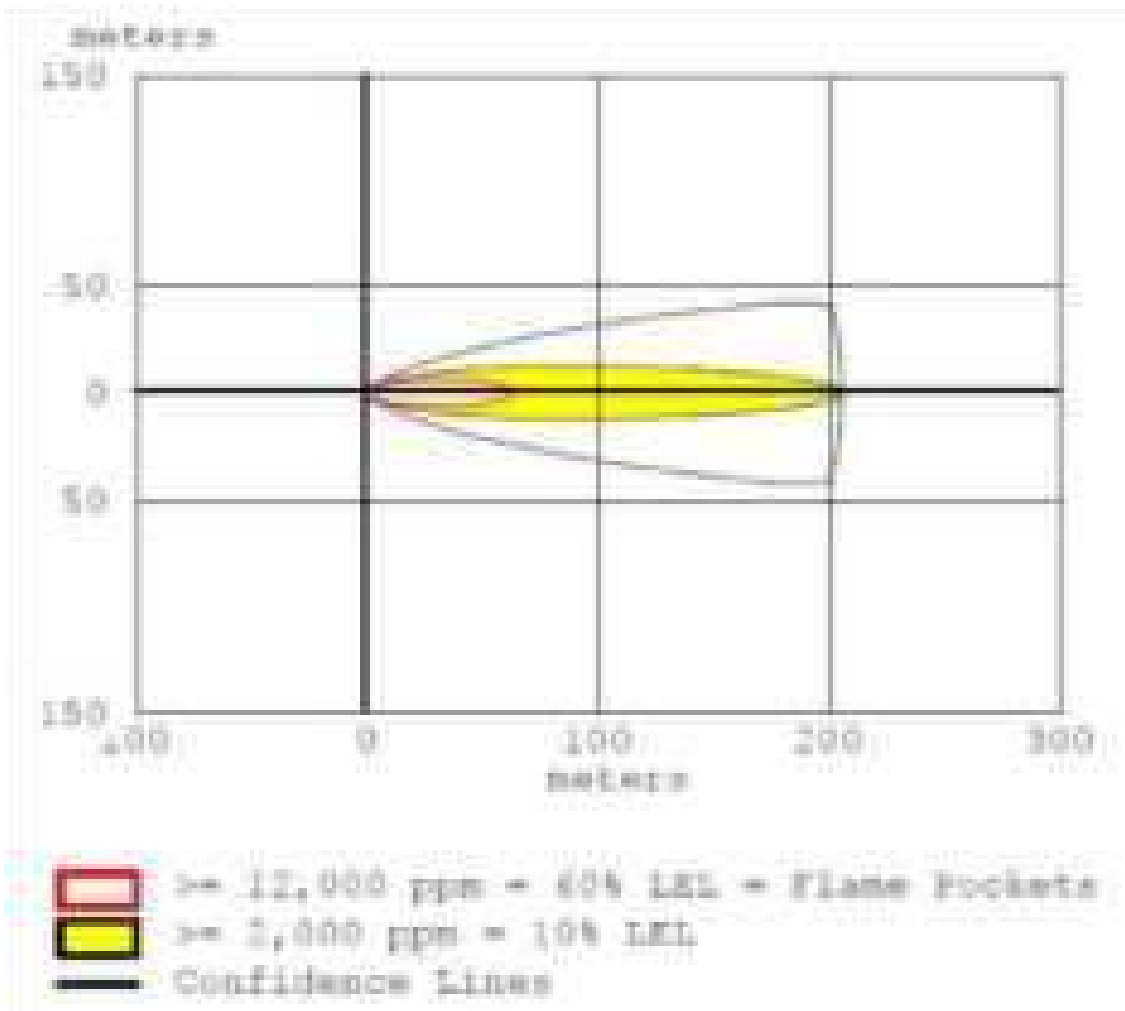
20.1.6.1 Instantaneous Release – Toxic Threat Zone (Graph)



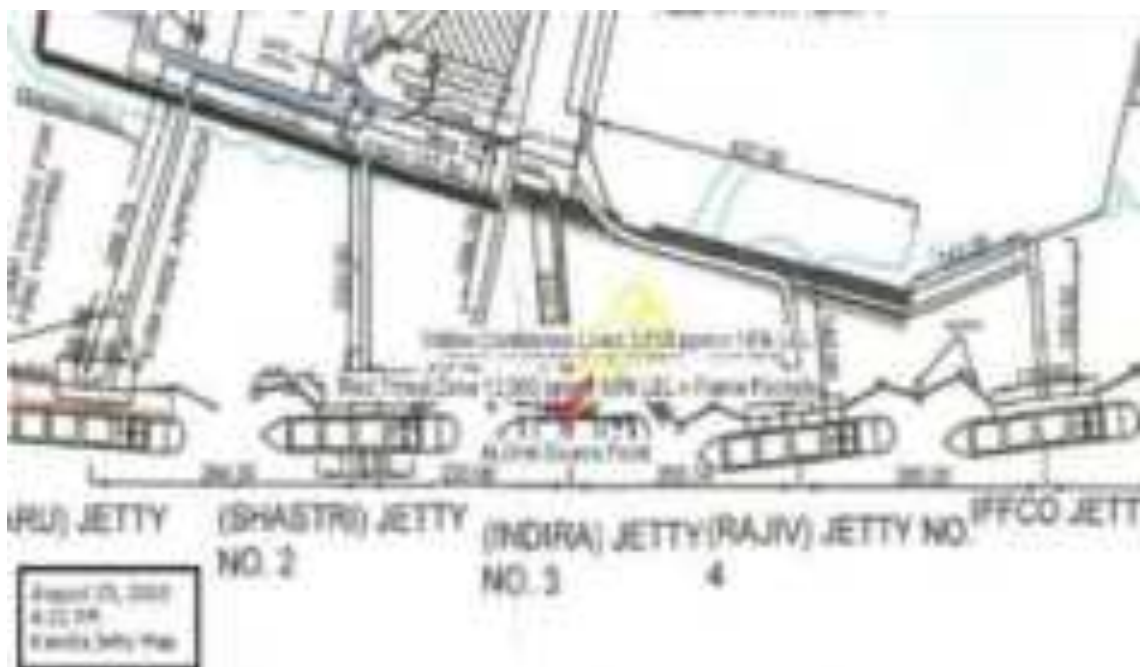
20.1.6.2 Instantaneous Release – Toxic Threat Zone (Contour)



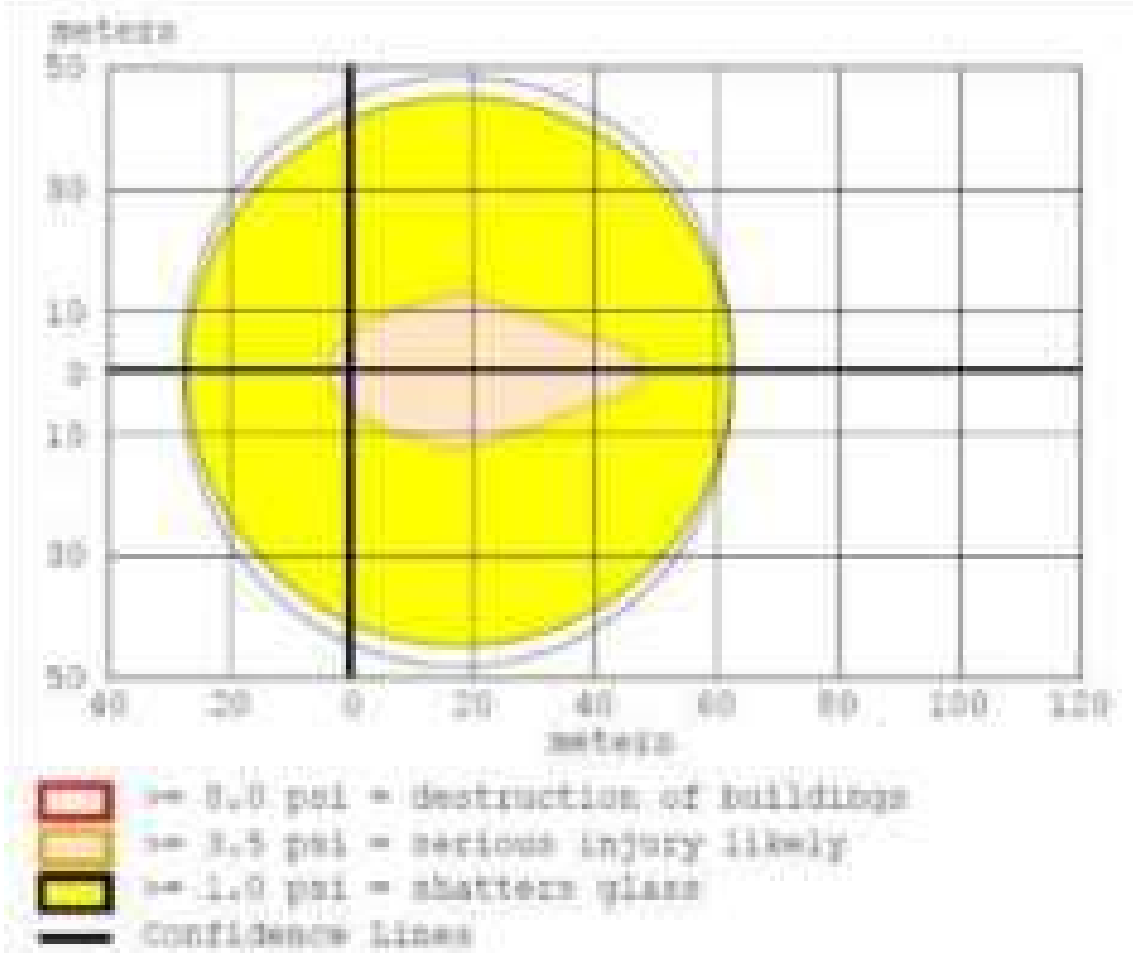
20.1.6.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



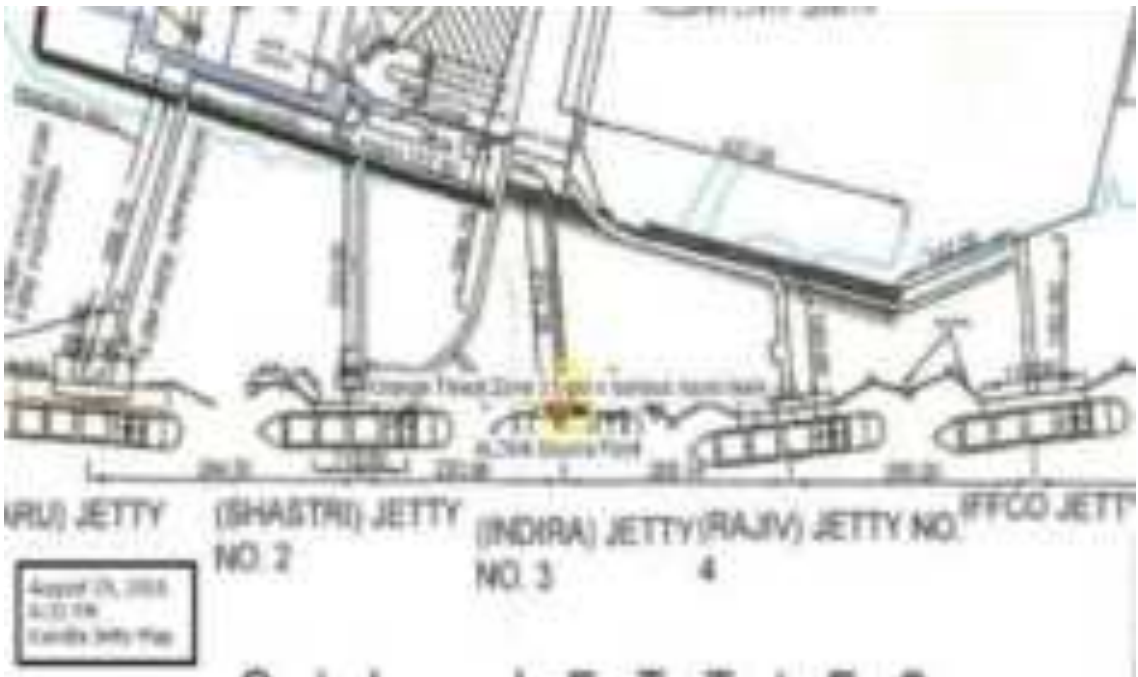
20.1.6.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



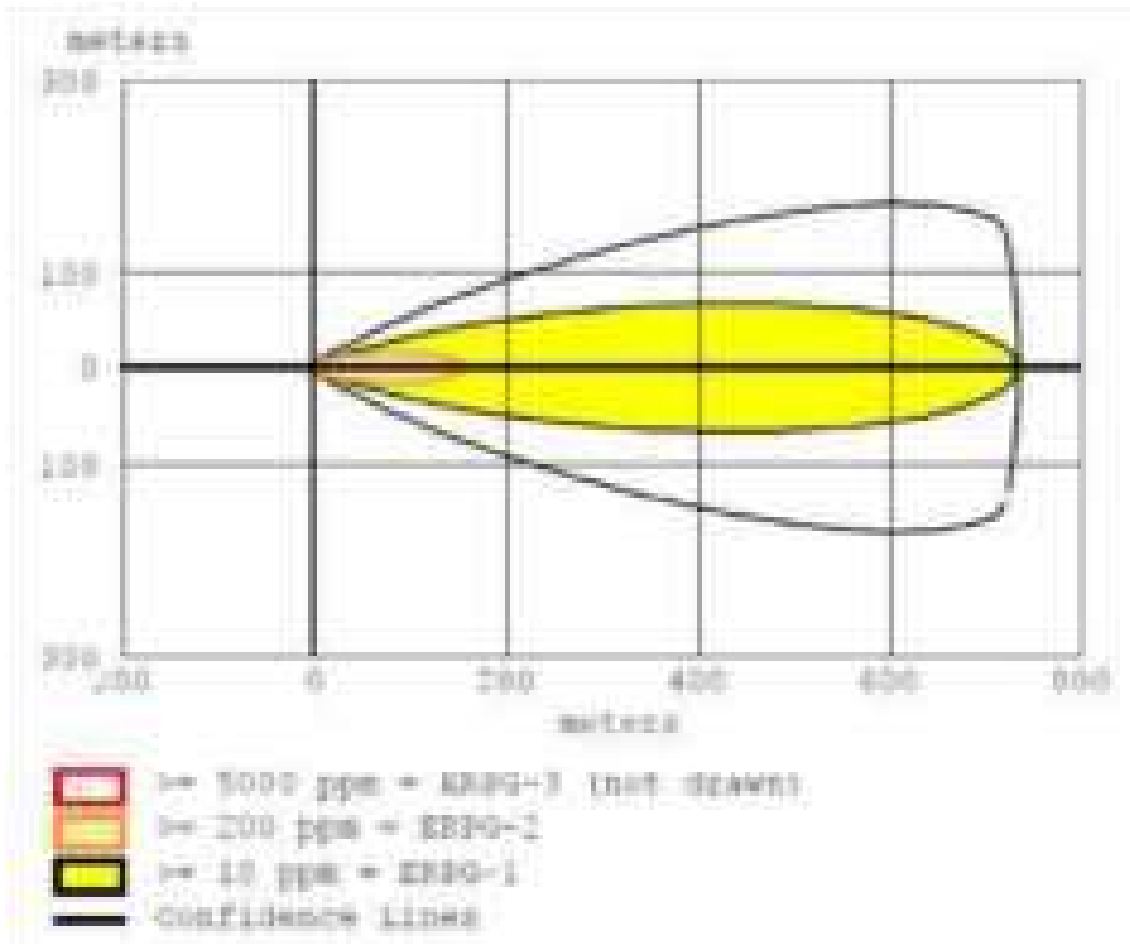
20.1.6.5 Instantaneous Release – Overpressure (Graph)



20.1.6.6 Instantaneous Release – Overpressure (Contour)



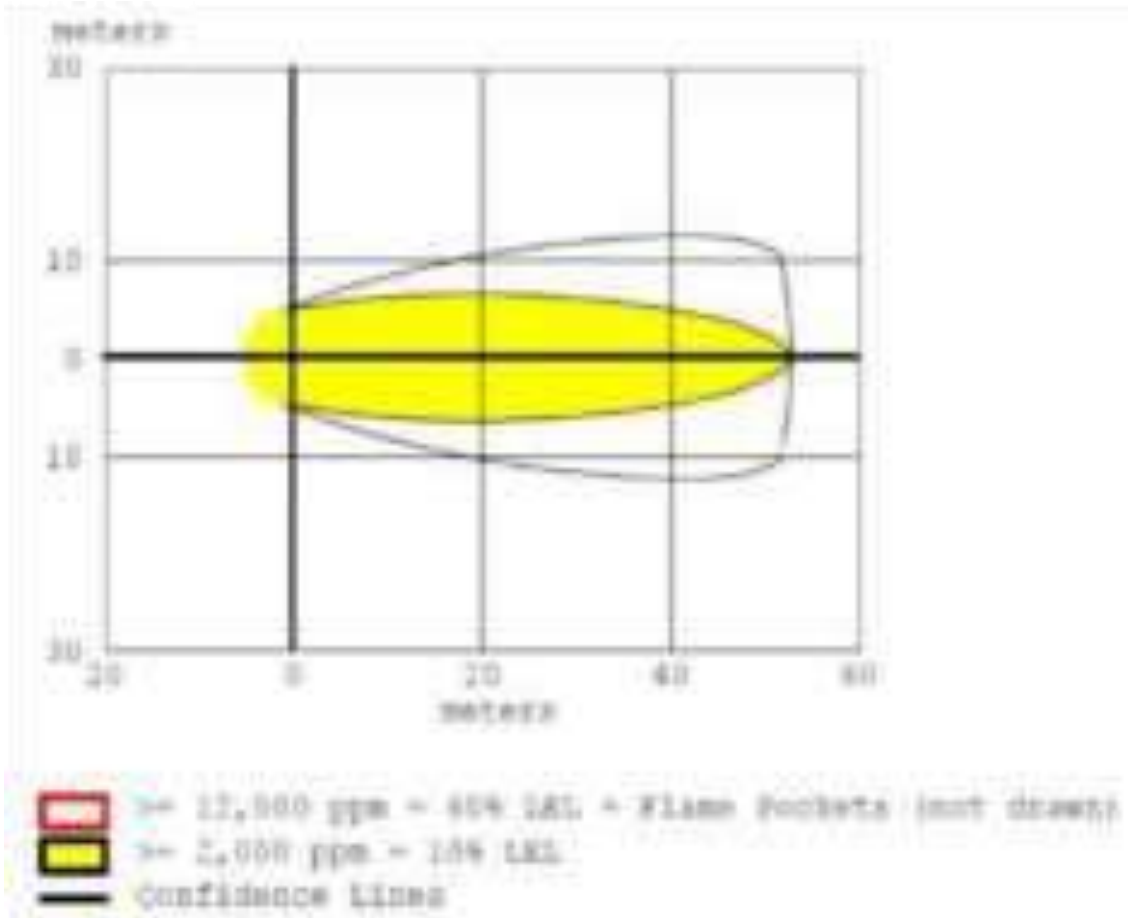
20.1.6.7 Evaporating Puddle – Toxic Threat Zone (Graph)



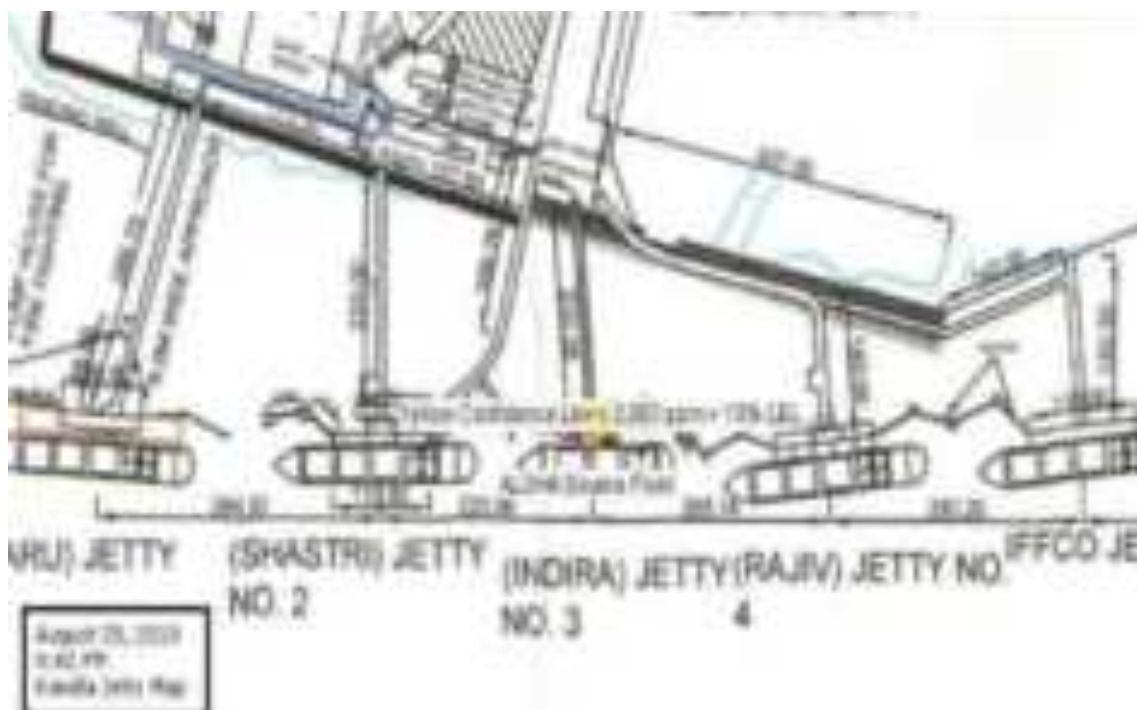
20.1.6.8 Evaporating Puddle – Toxic Threat Zone (Contour)



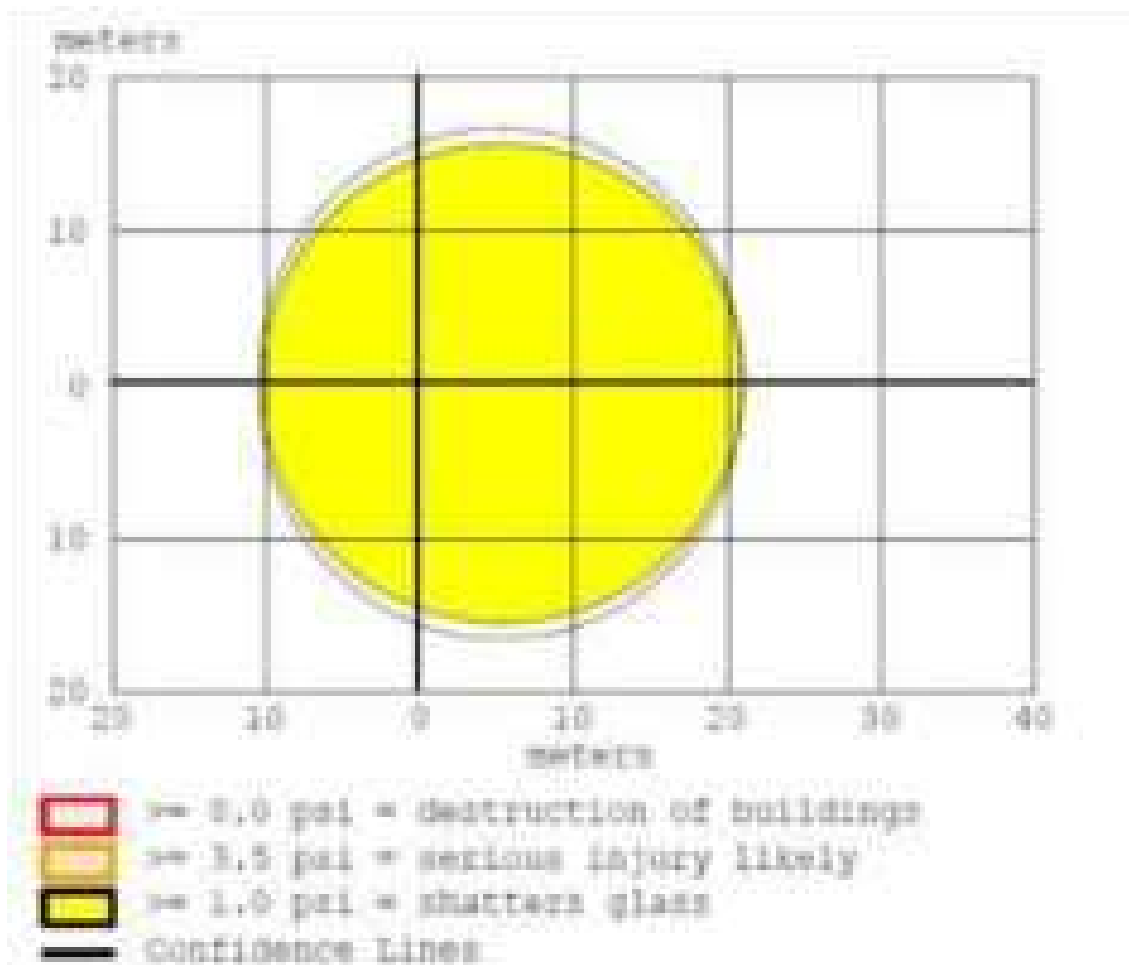
20.1.6.9 Evaporating Puddle – Flammable Area of Vapor Cloud (Graph)



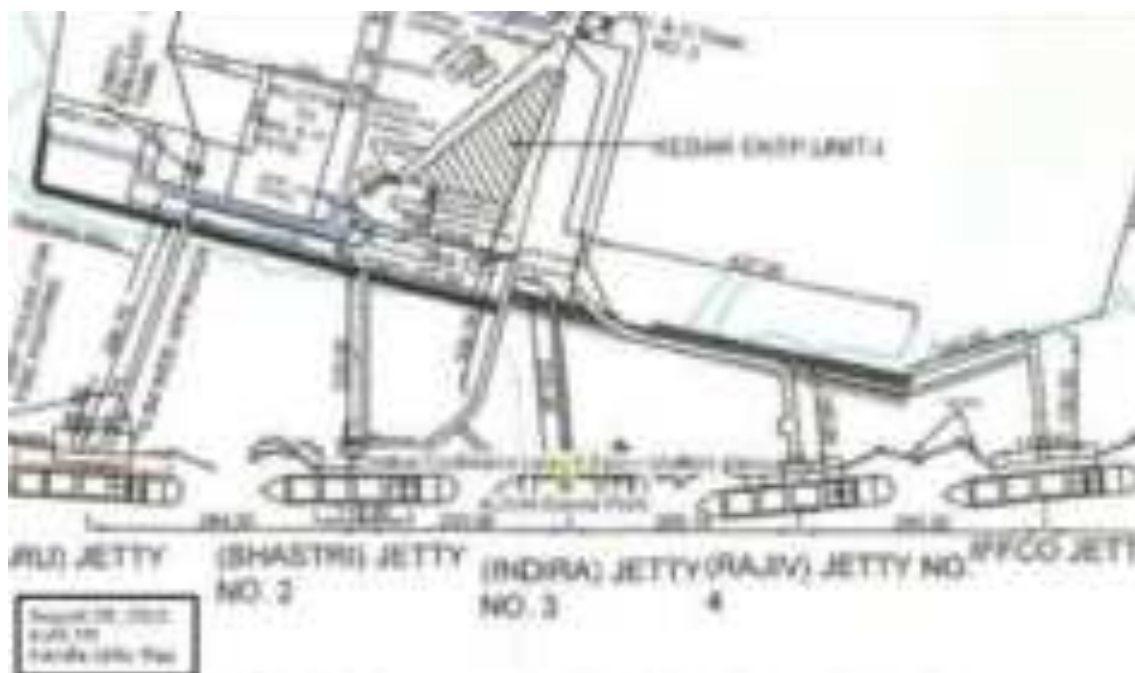
20.1.6.10 Evaporating Puddle – Flammable Area of Vapor Cloud (Contour)



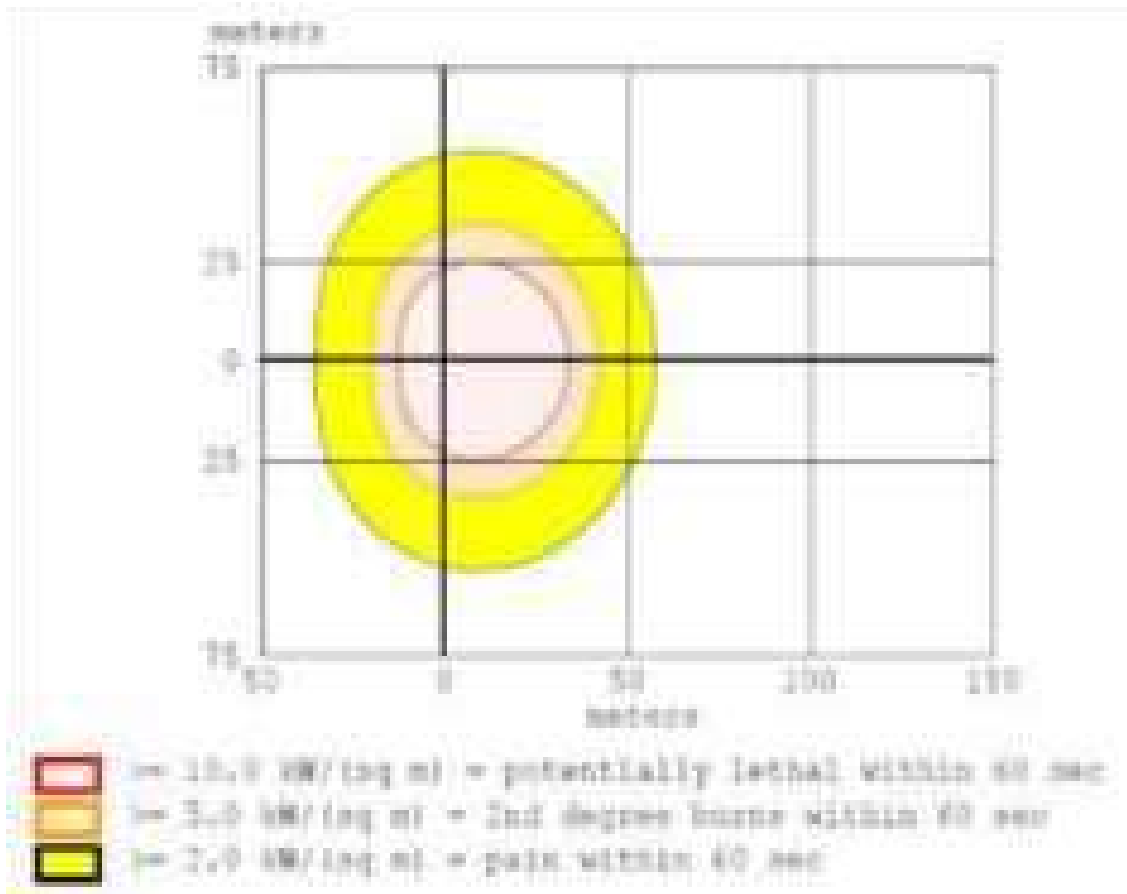
20.1.6.11 Evaporating Puddle – Overpressure (Graph)



20.1.6.12 Evaporating Puddle – Overpressure (Contour)



20.1.6.13 Burning Puddle – Thermal Radiation (Graph)

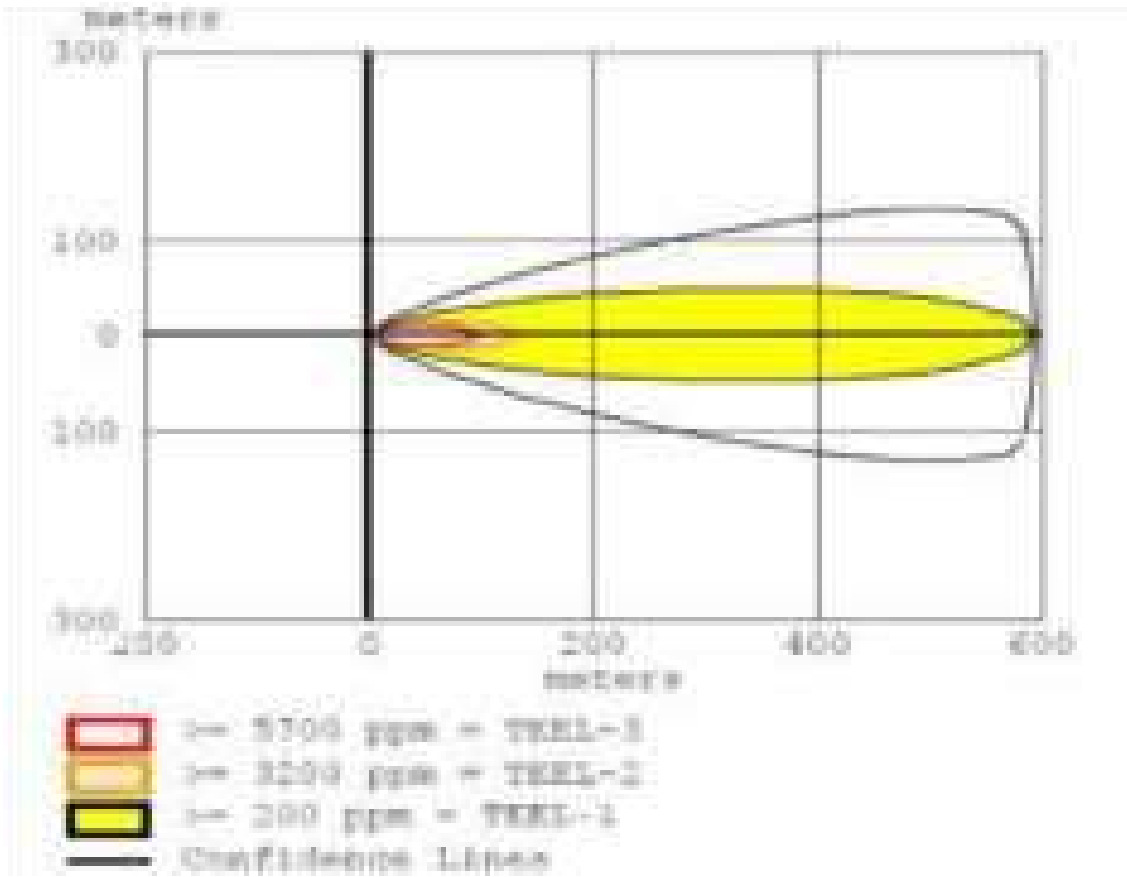


20.1.6.14 Burning Puddle – Thermal Radiation (Contour)



20.1.7 Jetty Three – Acetone

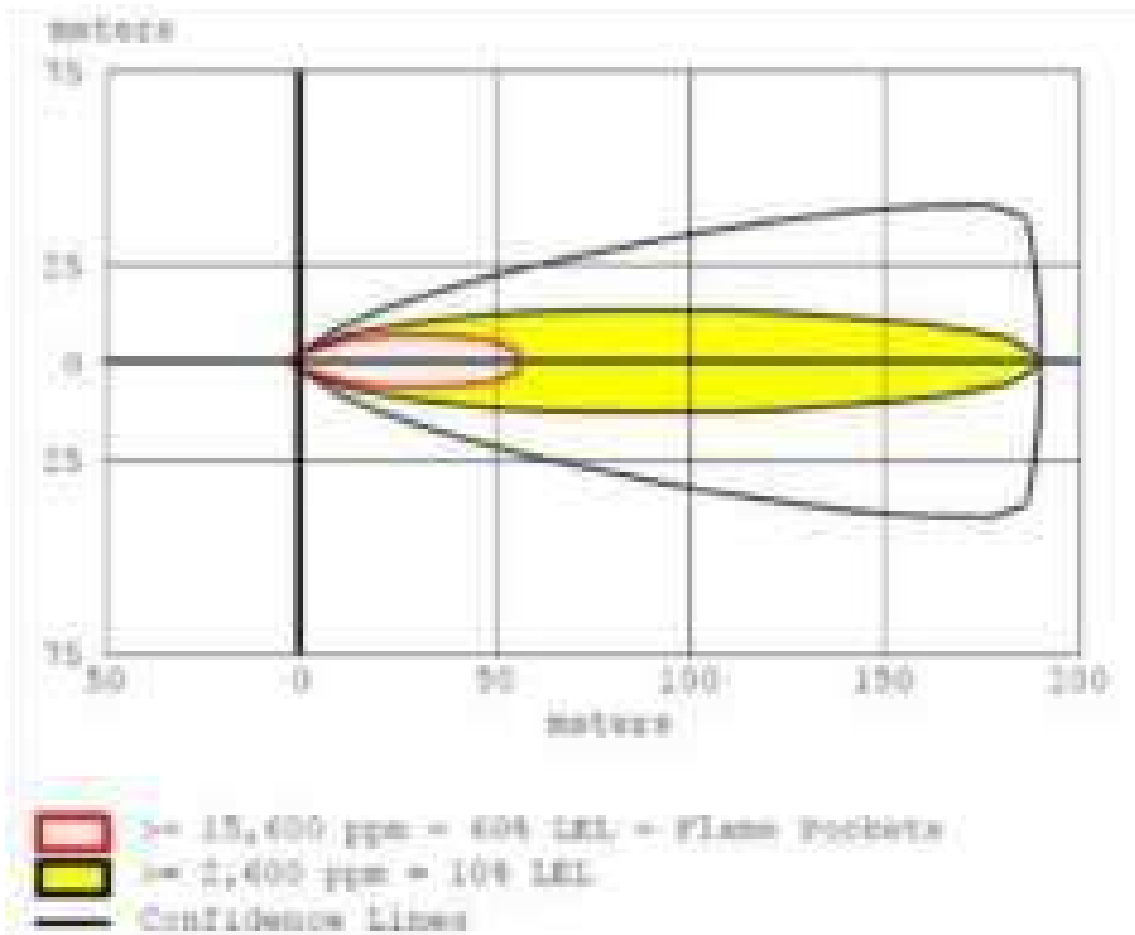
20.1.7.1 Instantaneous Release – Toxic Threat Zone (Graph)



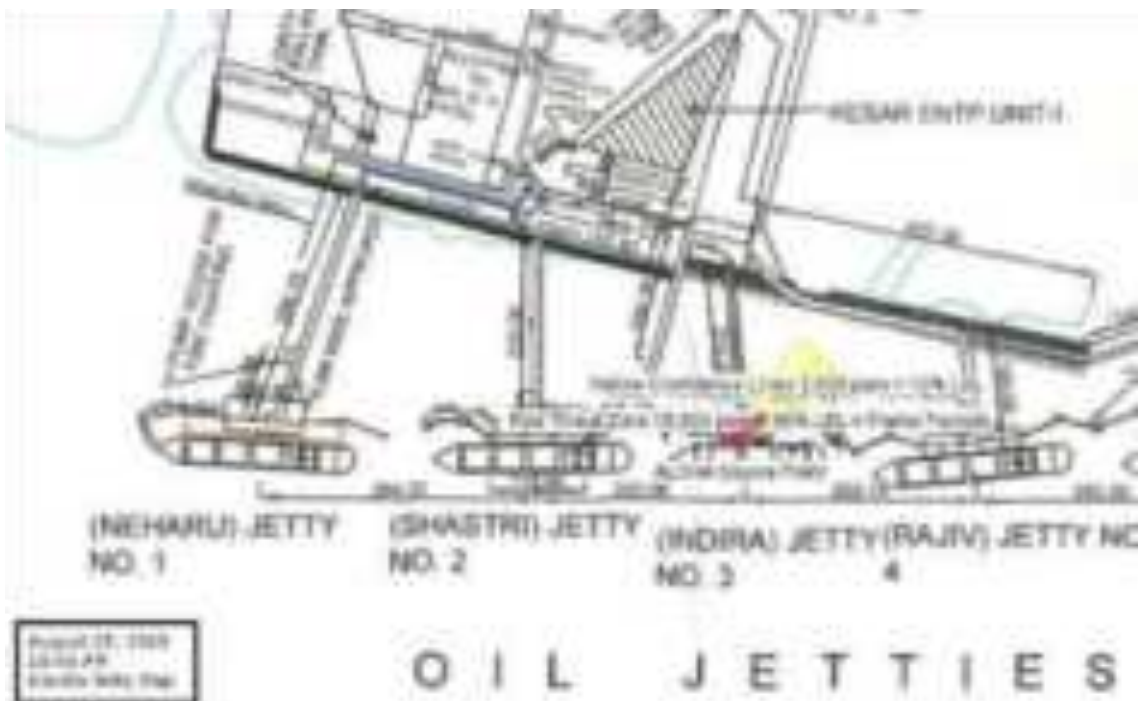
20.1.7.2 Instantaneous Release – Toxic Threat Zone (Contour)



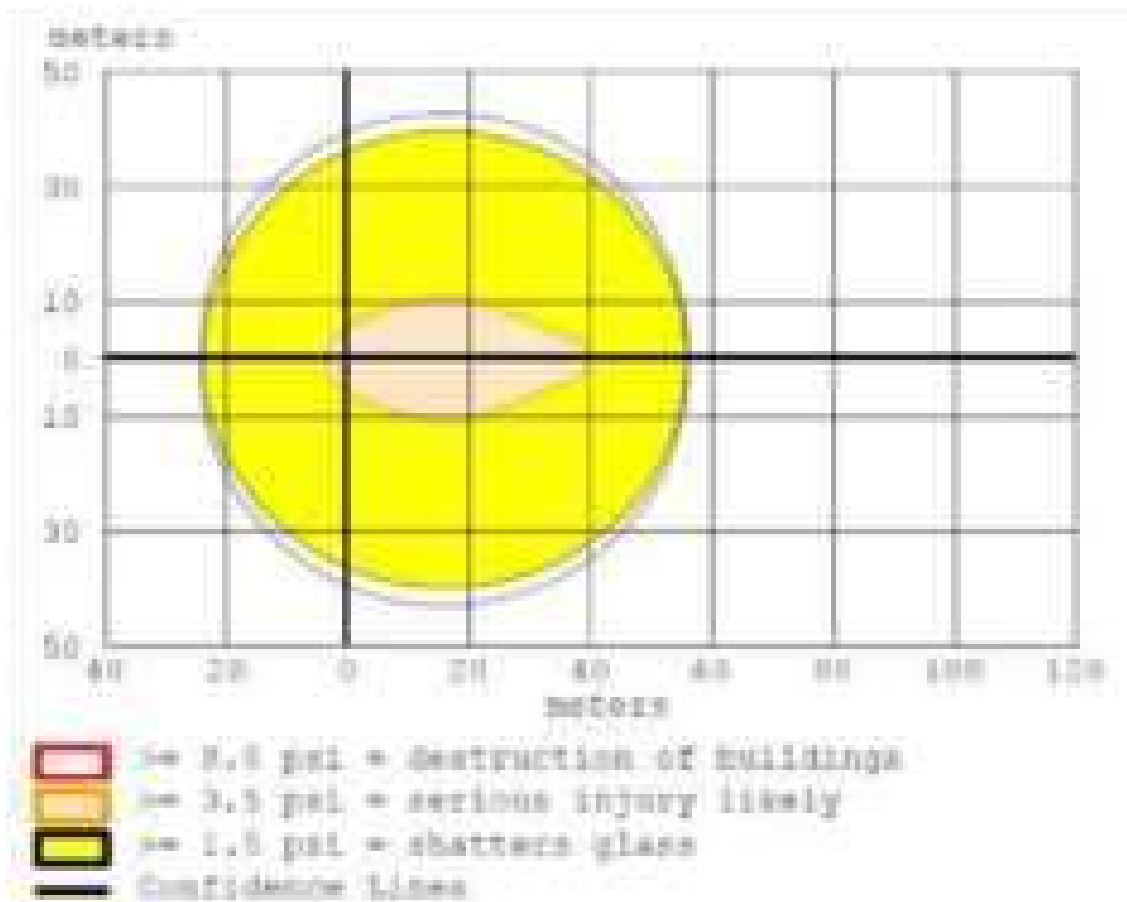
20.1.7.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



20.1.7.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



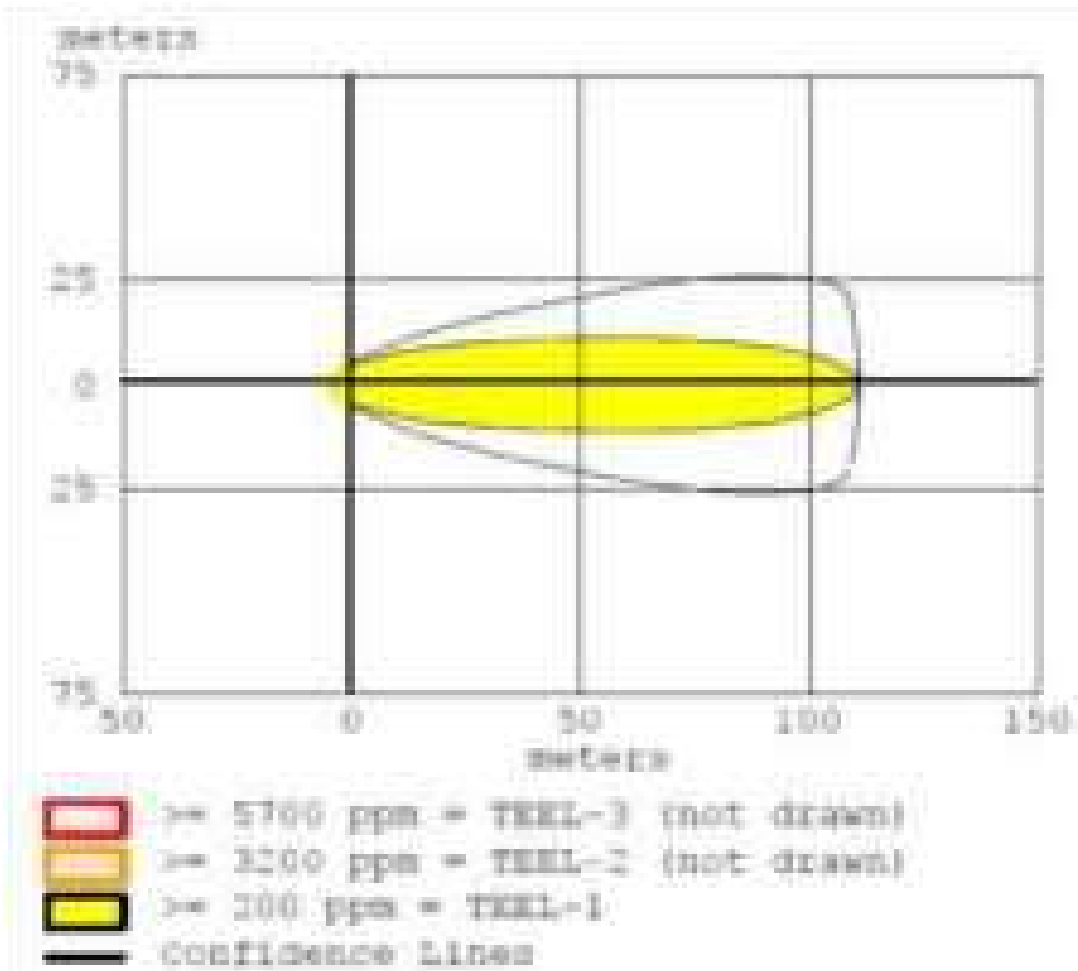
20.1.7.5 Instantaneous Release – Overpressure (Graph)



20.1.7.6 Instantaneous Release – Overpressure (Contour)



20.1.7.7 Evaporating Puddle – Toxic Threat Zone (Graph)

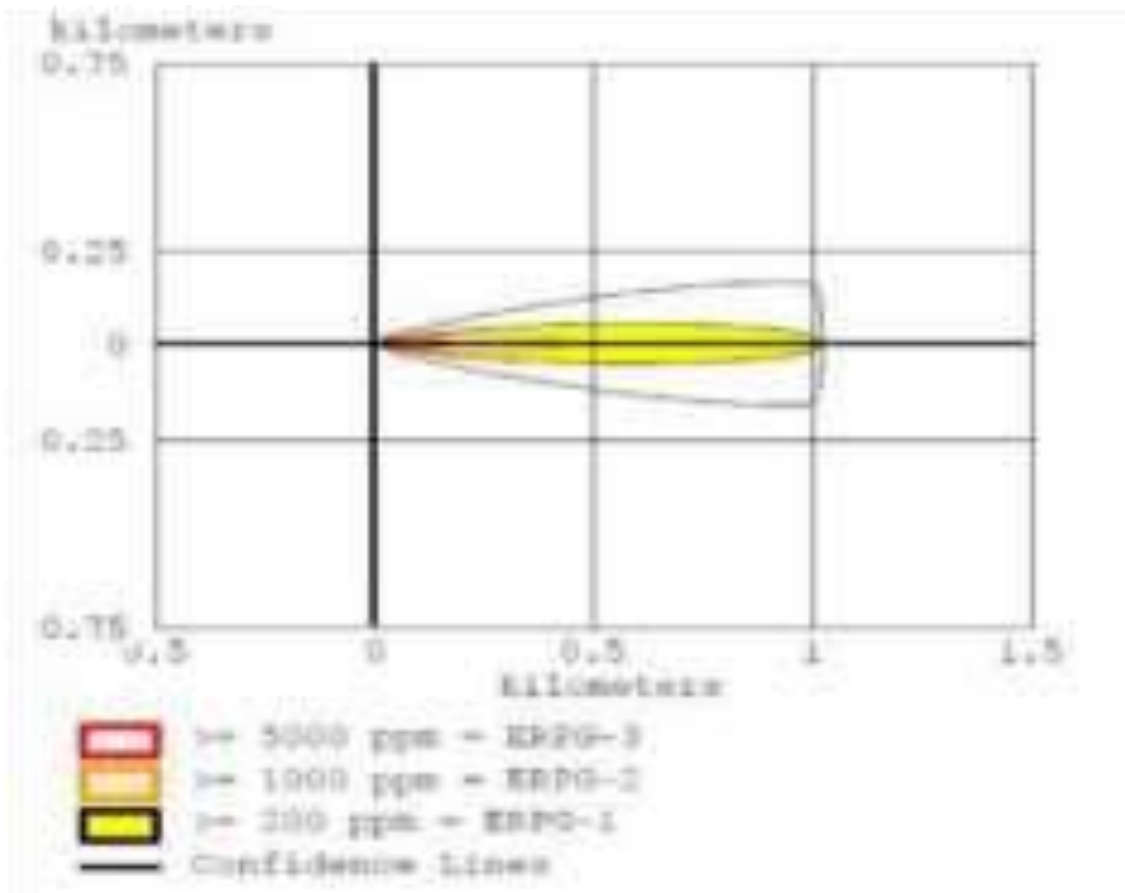


20.1.7.8 Evaporating Puddle – Toxic Threat Zone (Contour)



20.1.7.9 Burning Puddle – Thermal Radiation (Graph)

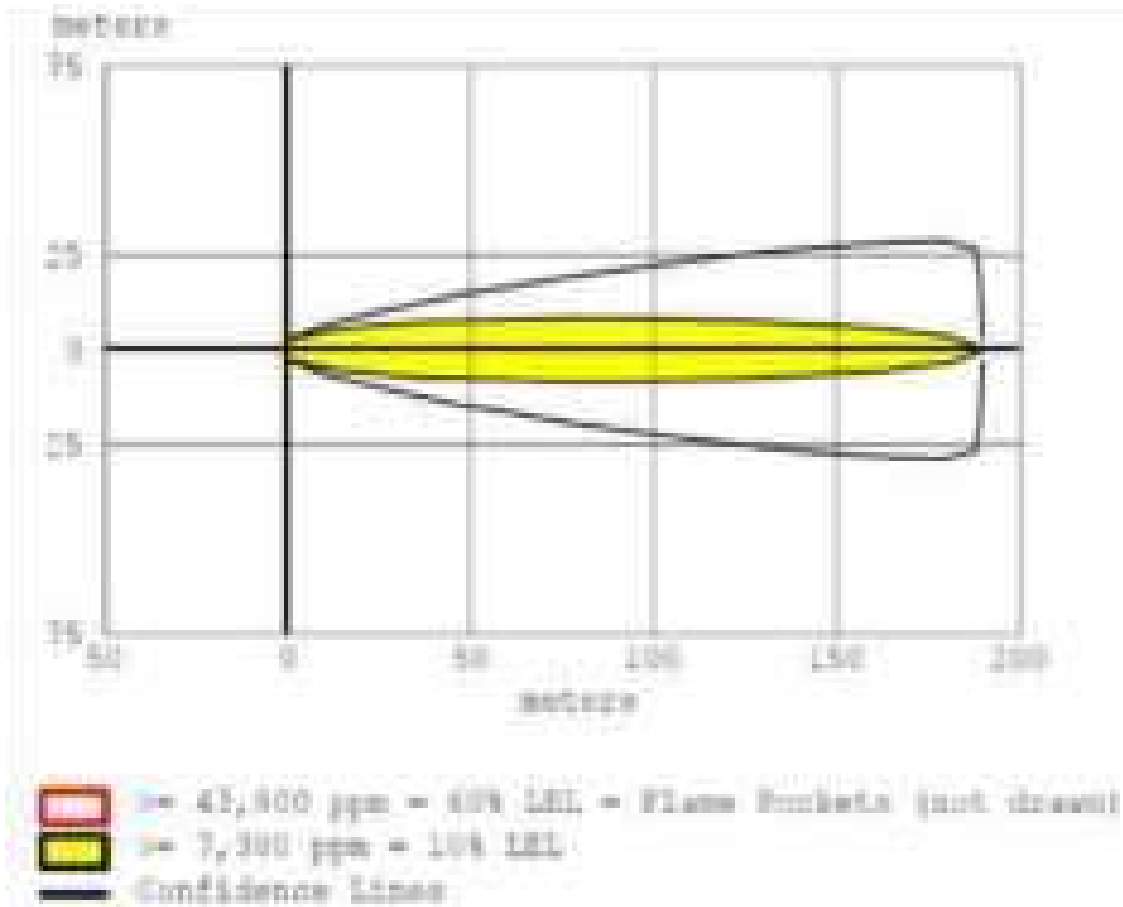
20.1.8.1 Instantaneous Release – Toxic Threat Zone (Graph)



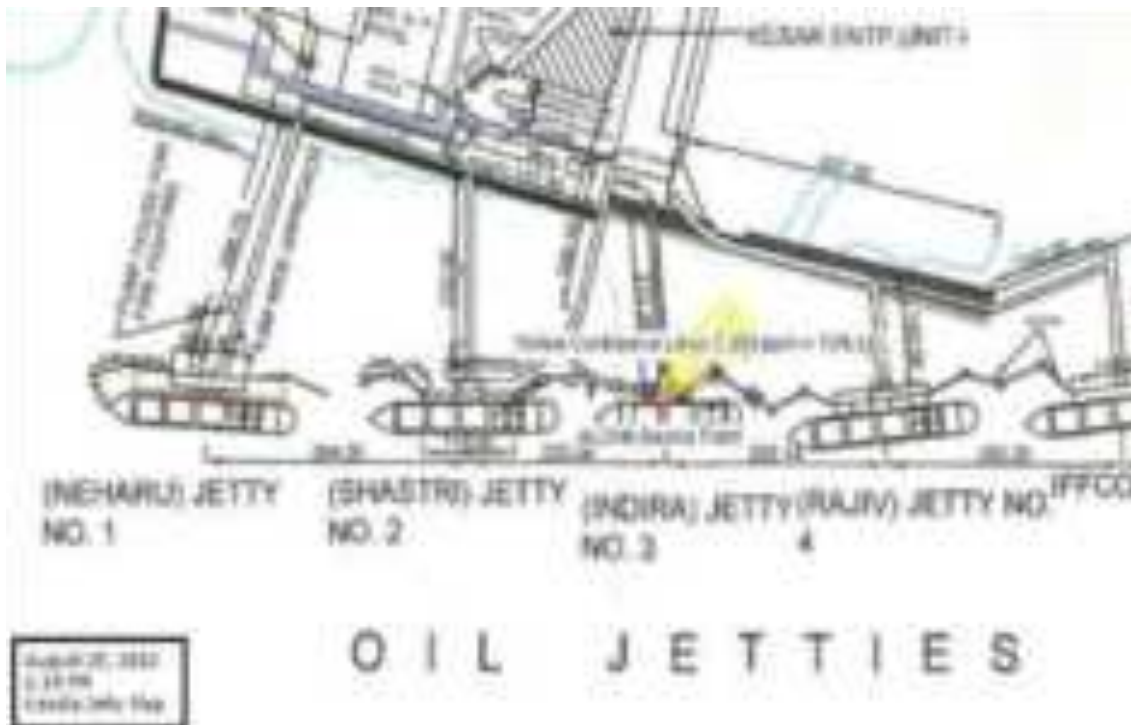
20.1.8.2 Instantaneous Release – Toxic Threat Zone (Contour)



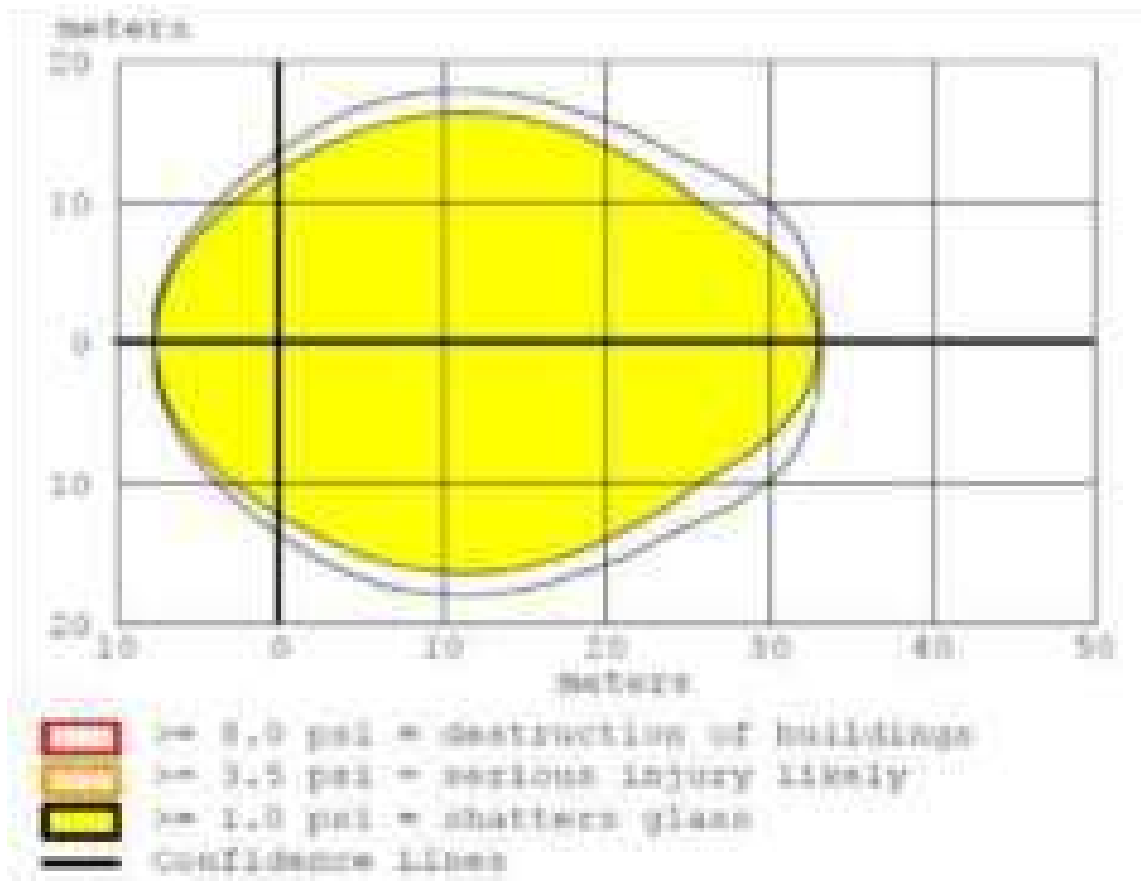
20.1.8.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



20.1.8.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



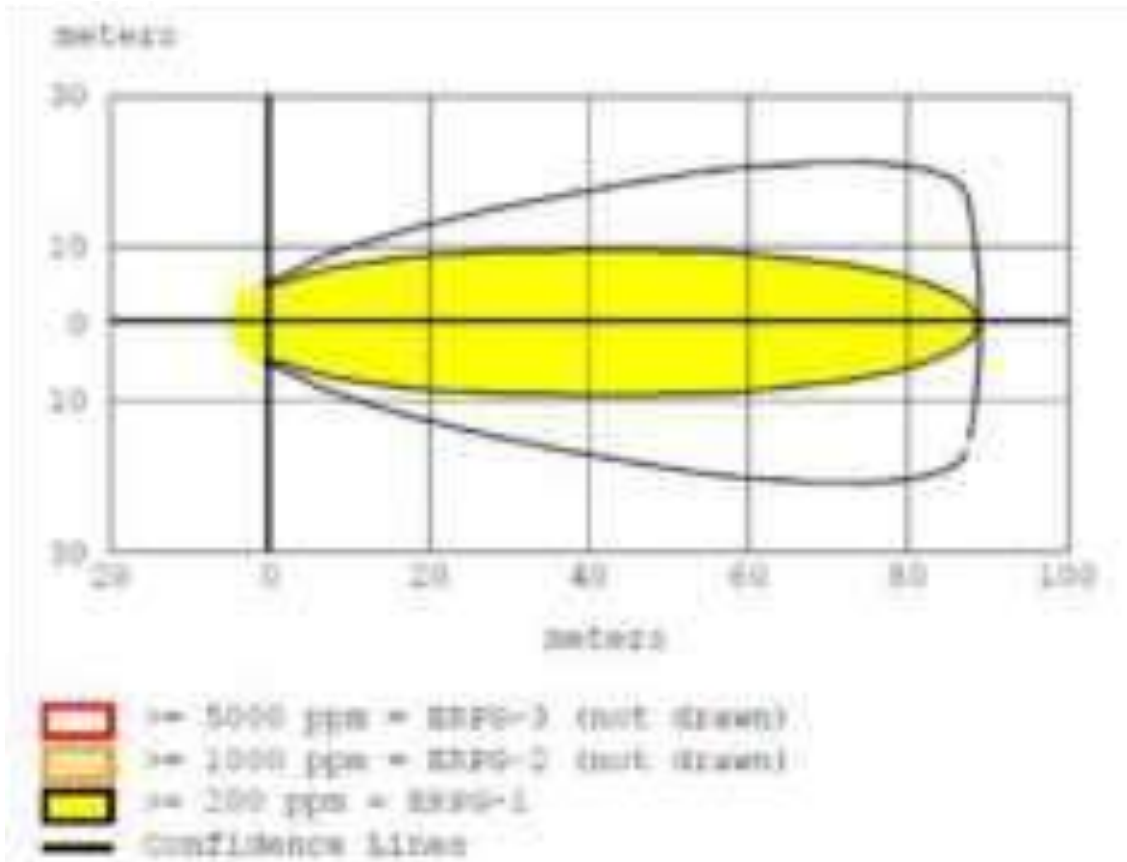
20.1.8.5 Instantaneous Release – Overpressure (Graph)



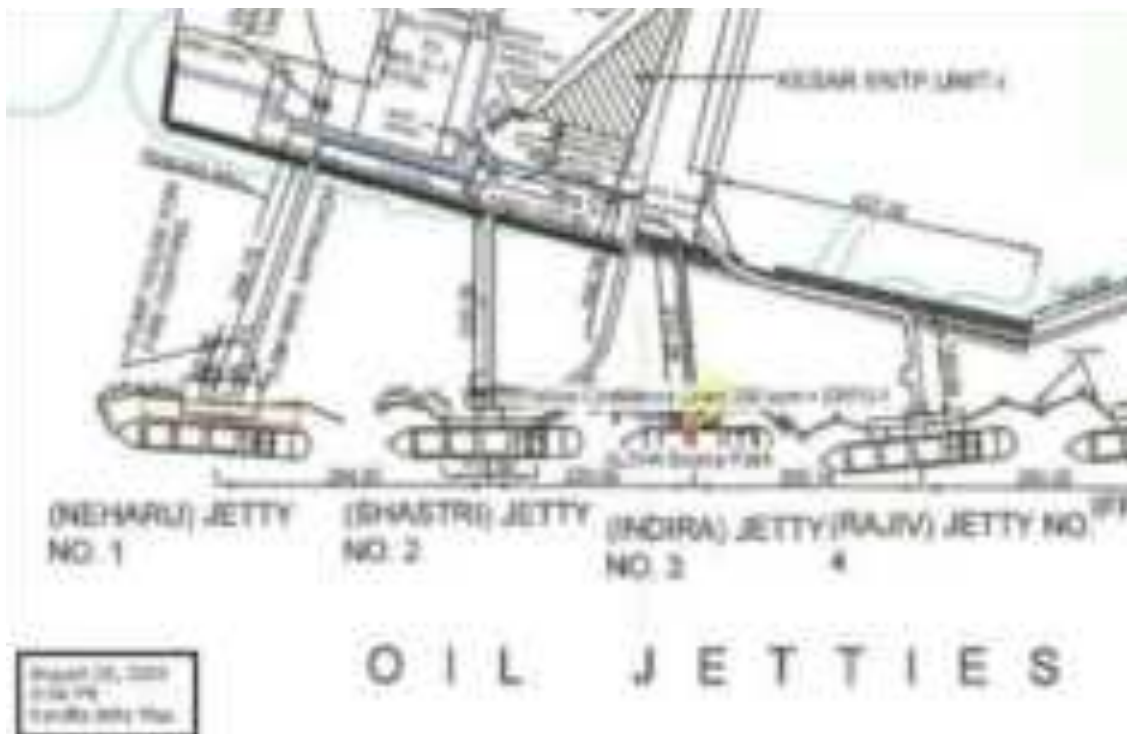
20.1.8.6 Instantaneous Release – Overpressure (Contour)



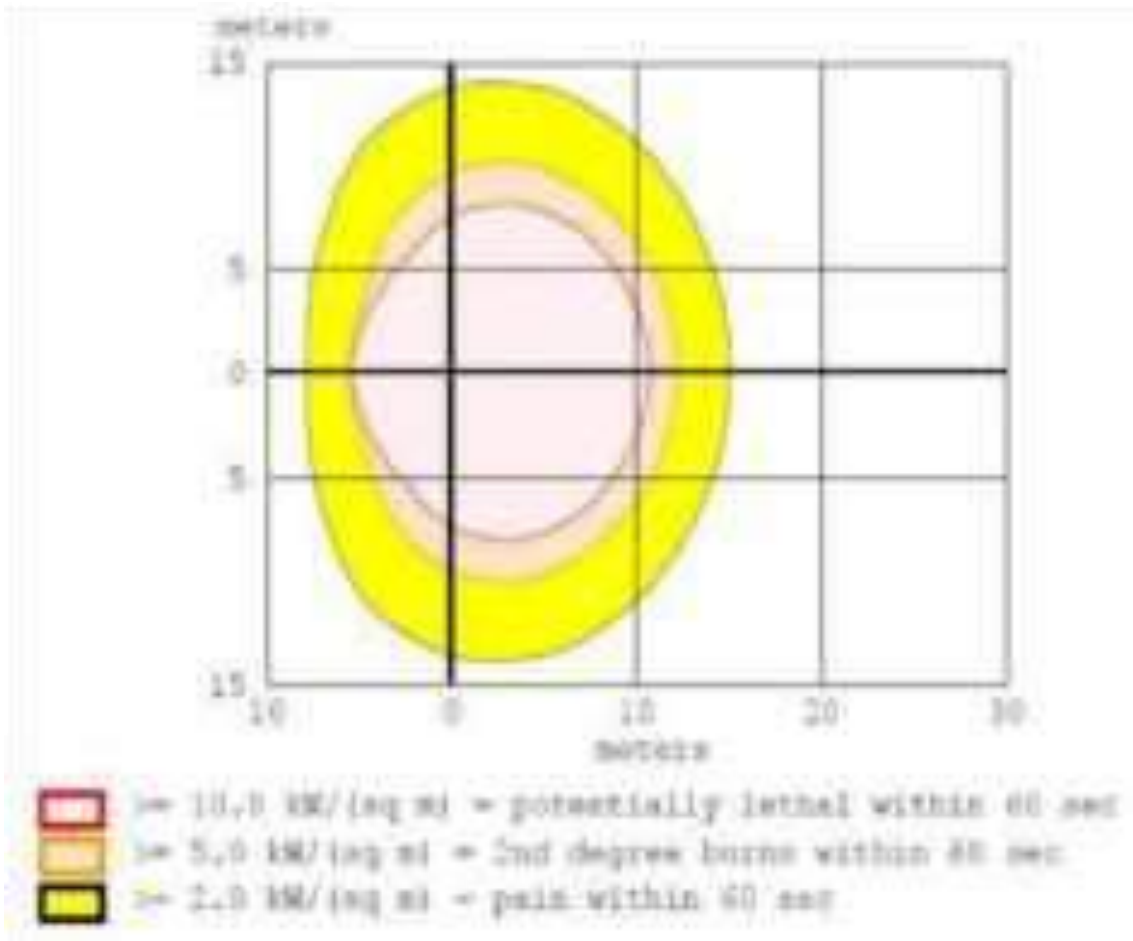
20.1.8.7 Evaporating Puddle – Toxic Threat Zone (Graph)



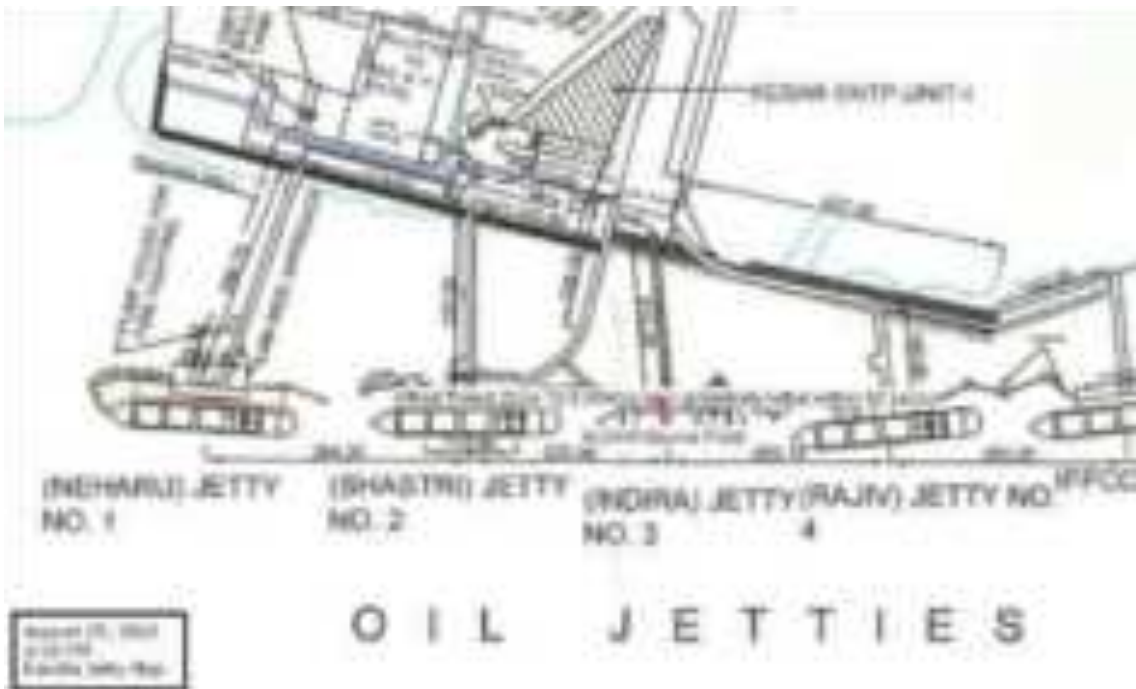
20.1.8.8 Evaporating Puddle – Toxic Threat Zone (Contour)



20.1.8.9 Burning Puddle – Thermal Radiation (Graph)

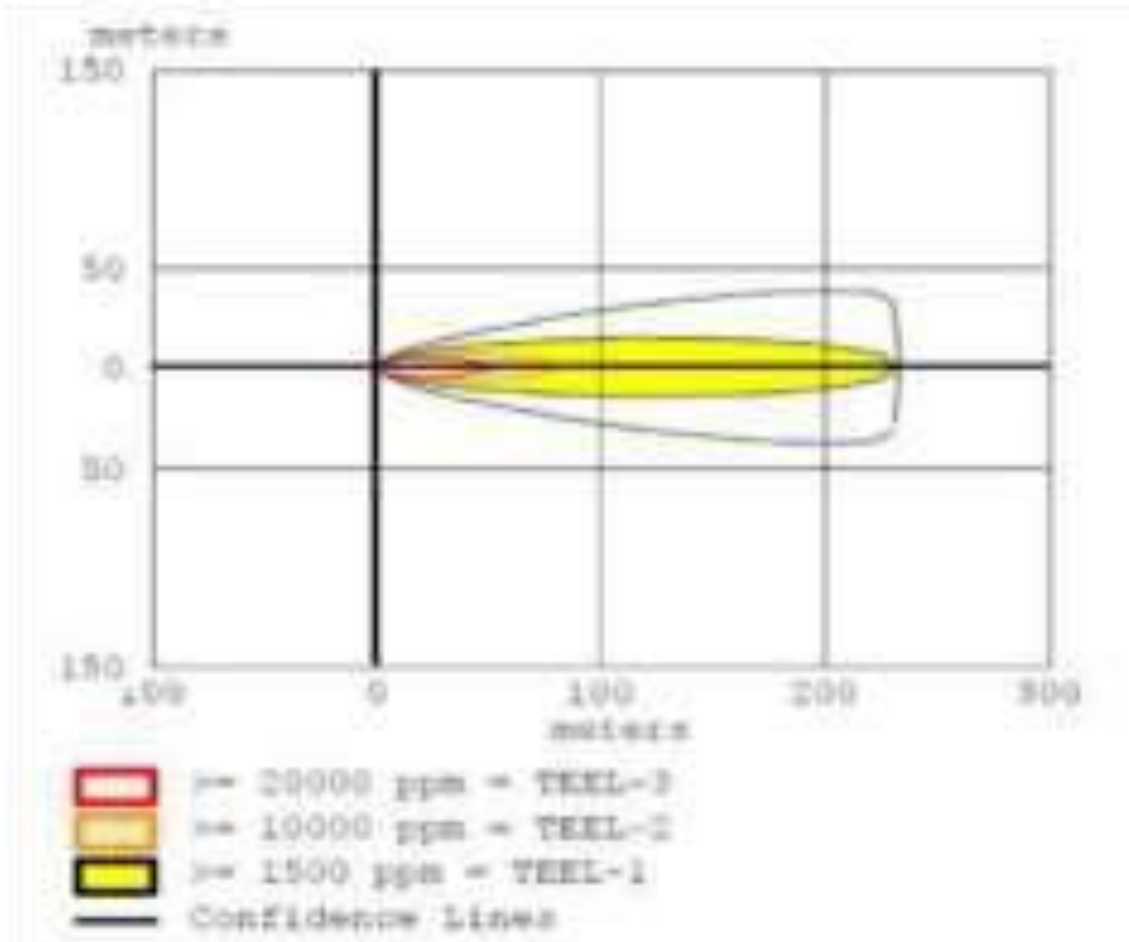


20.1.8.10 Burning Puddle – Thermal Radiation (Contour)

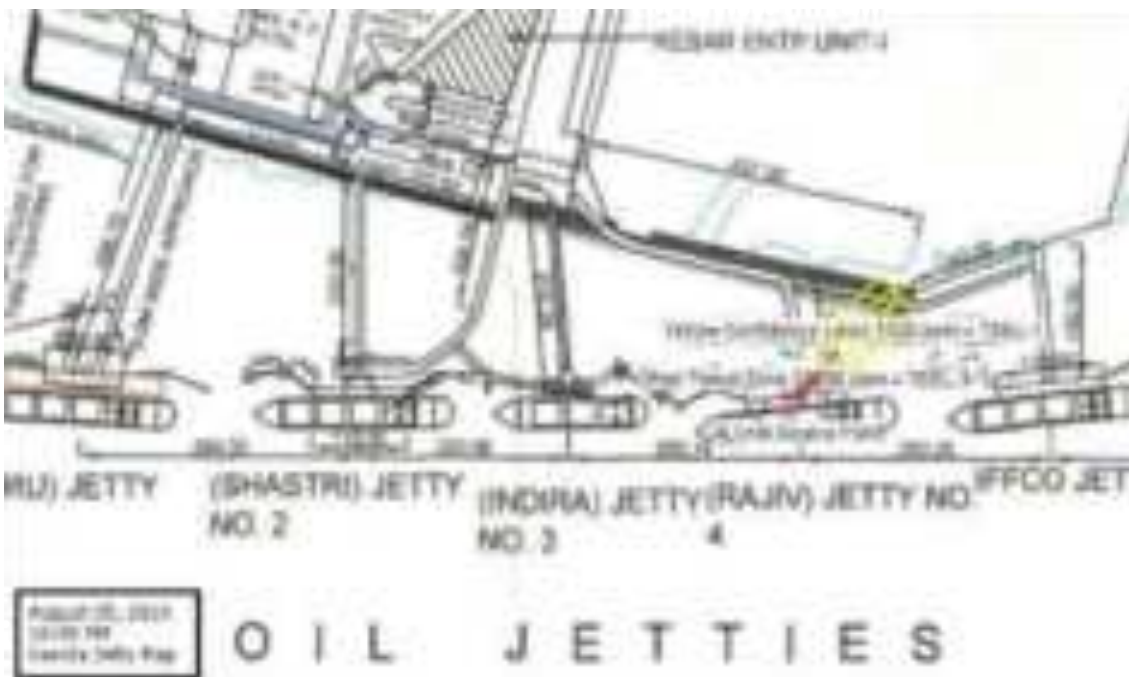


20.1.9 Jetty Four – Propylene

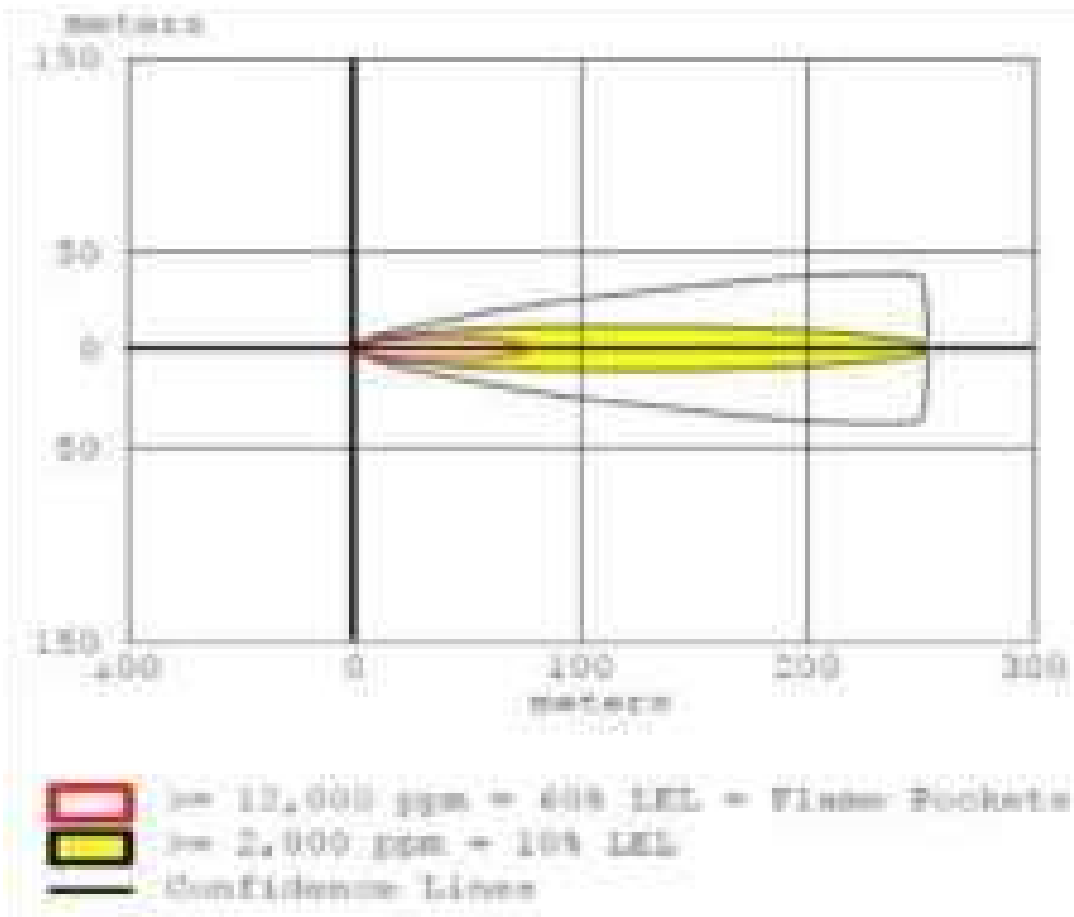
20.1.9.1 Instantaneous Release – Toxic Threat Zone (Graph)



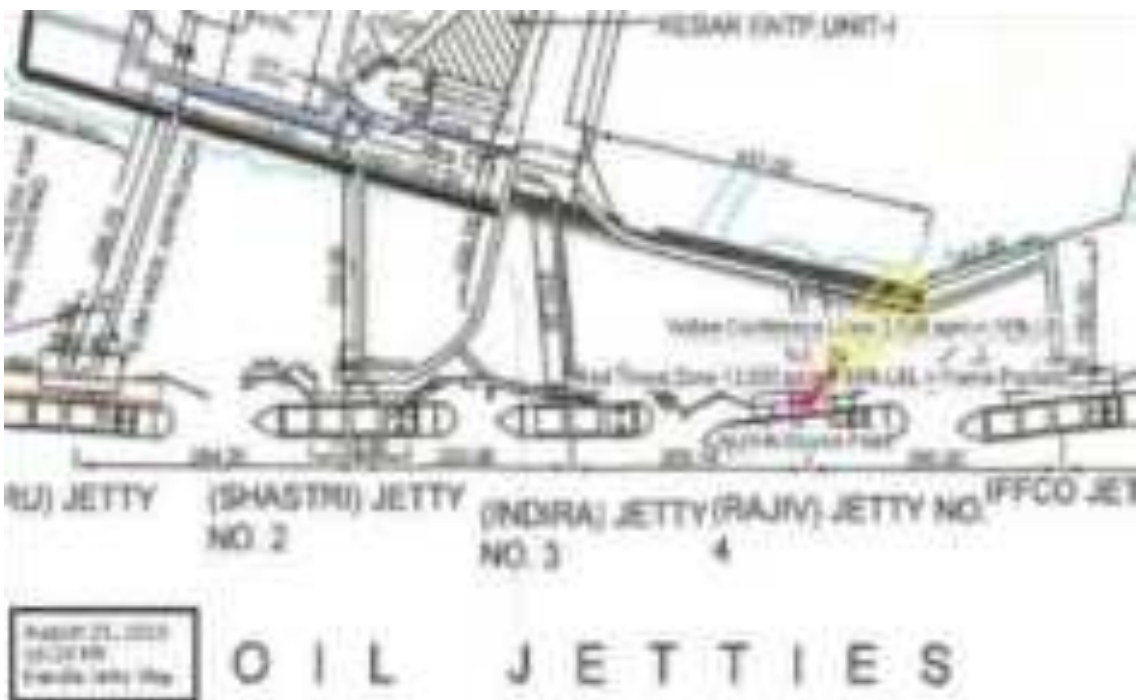
20.1.9.2 Instantaneous Release – Toxic Threat Zone (Contour)



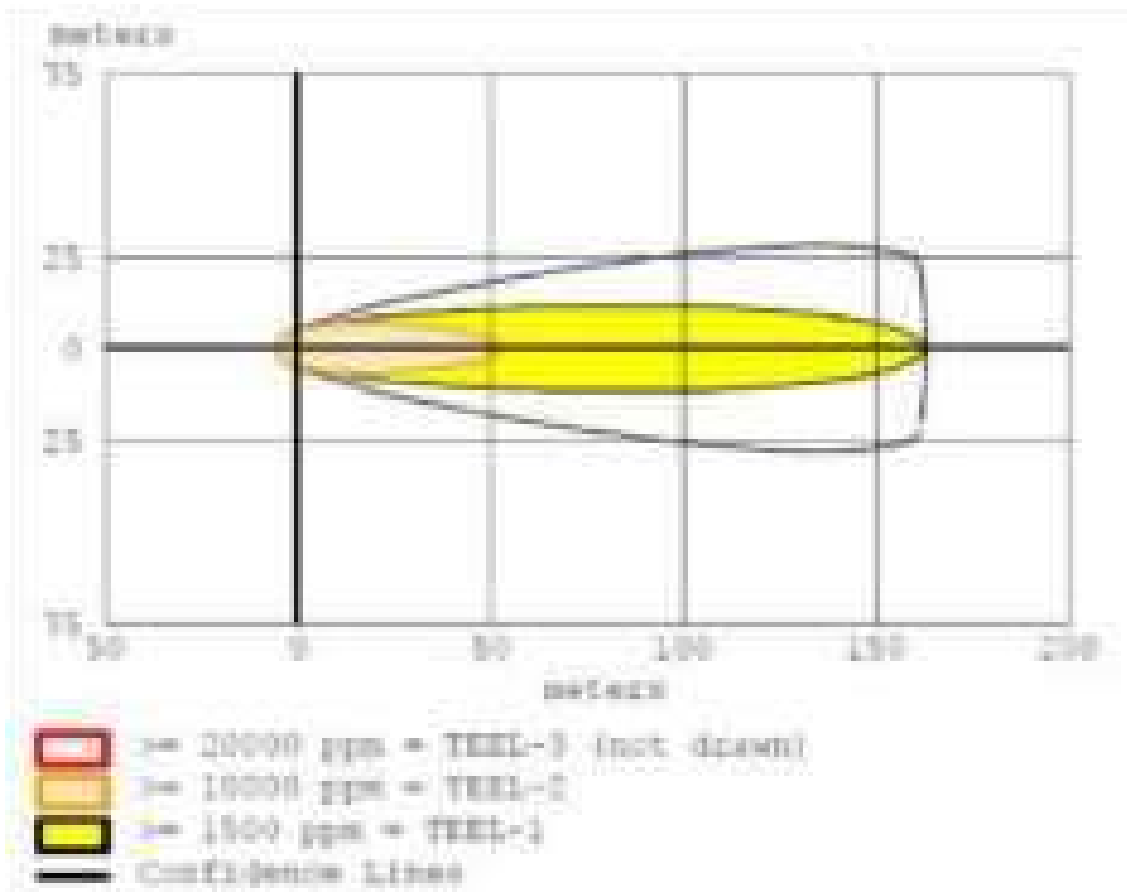
20.1.9.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



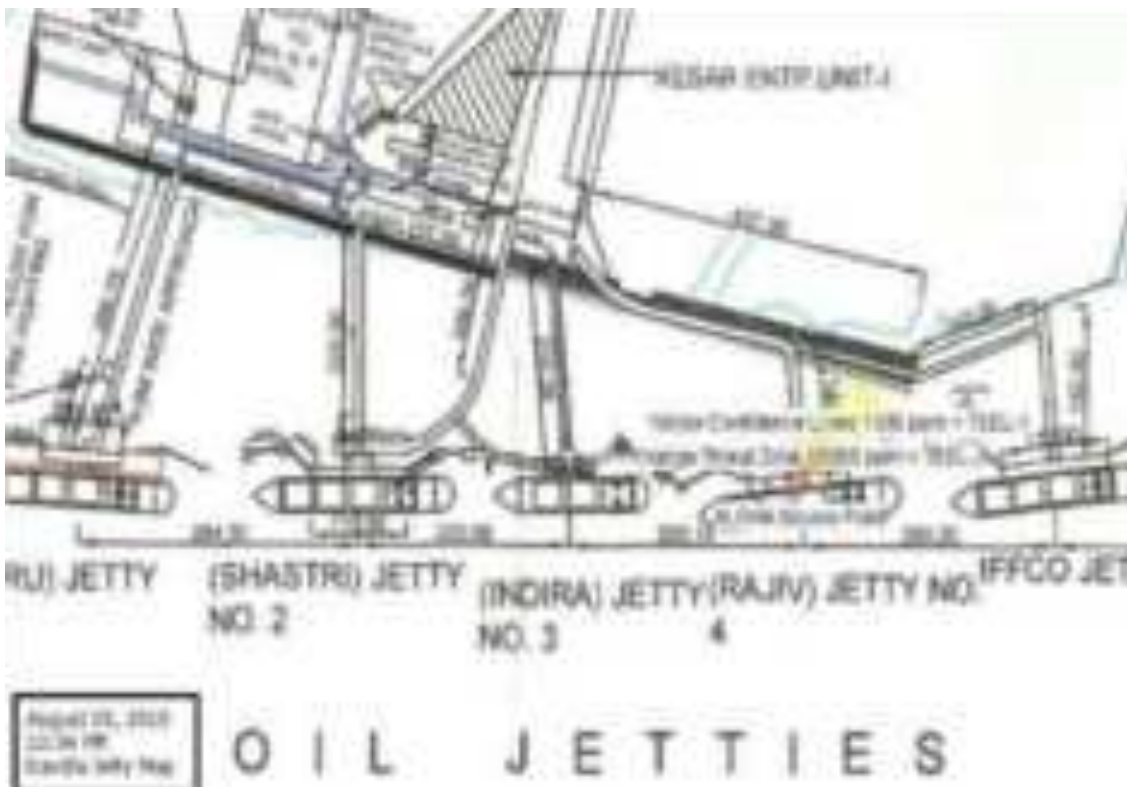
20.1.9.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



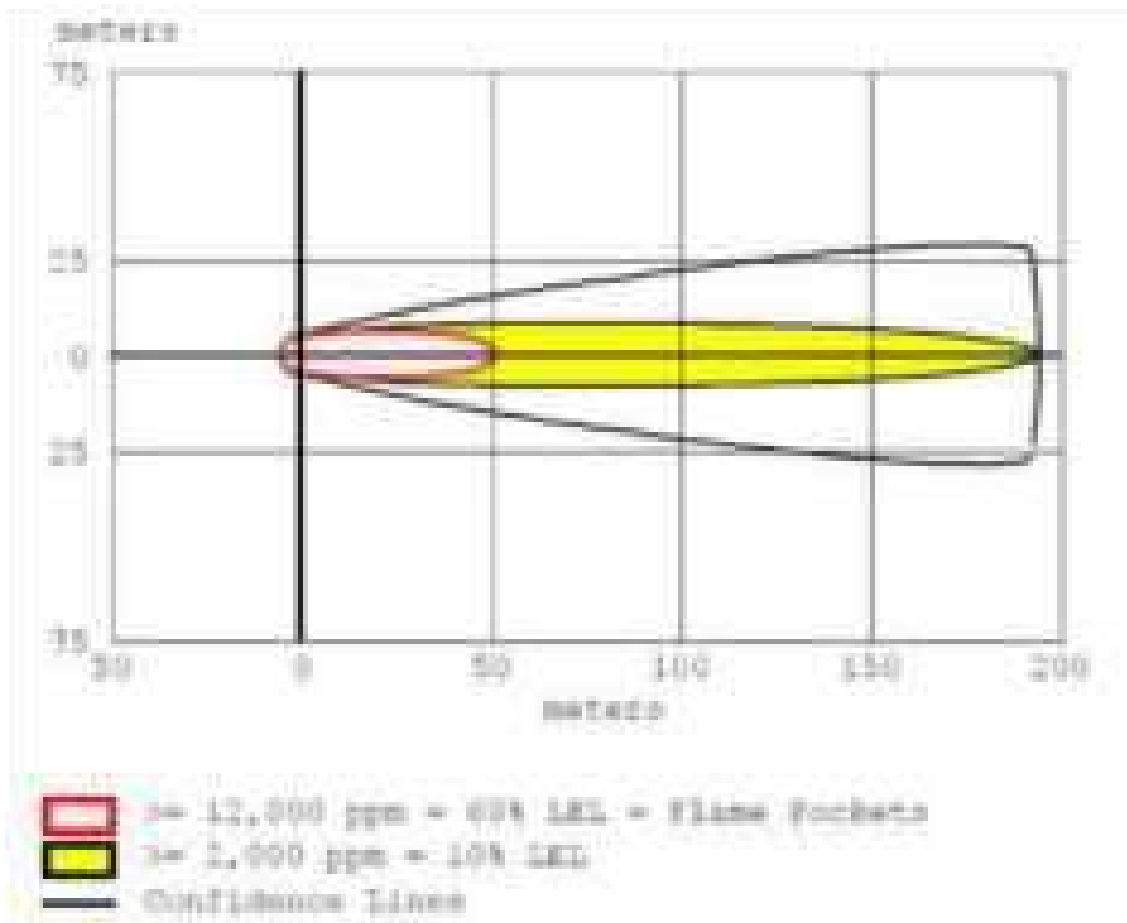
20.1.9.5 Instantaneous Release – Overpressure (Graph)



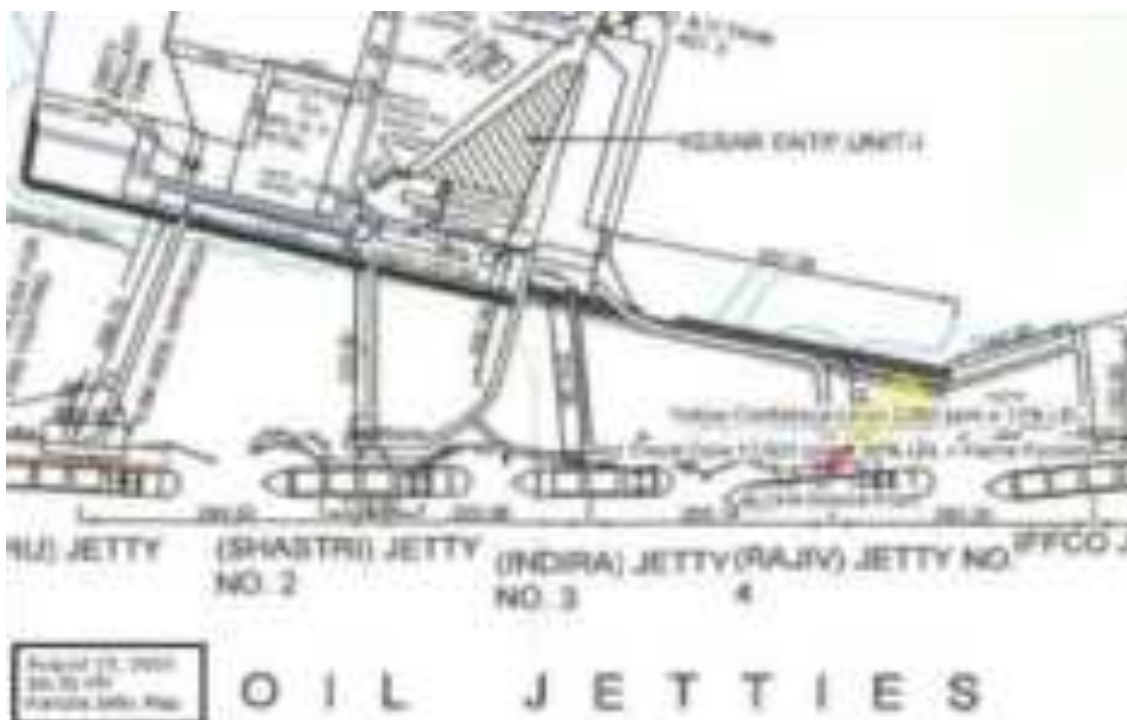
20.1.9.8 Evaporating Puddle – Toxic Threat Zone (Contour)



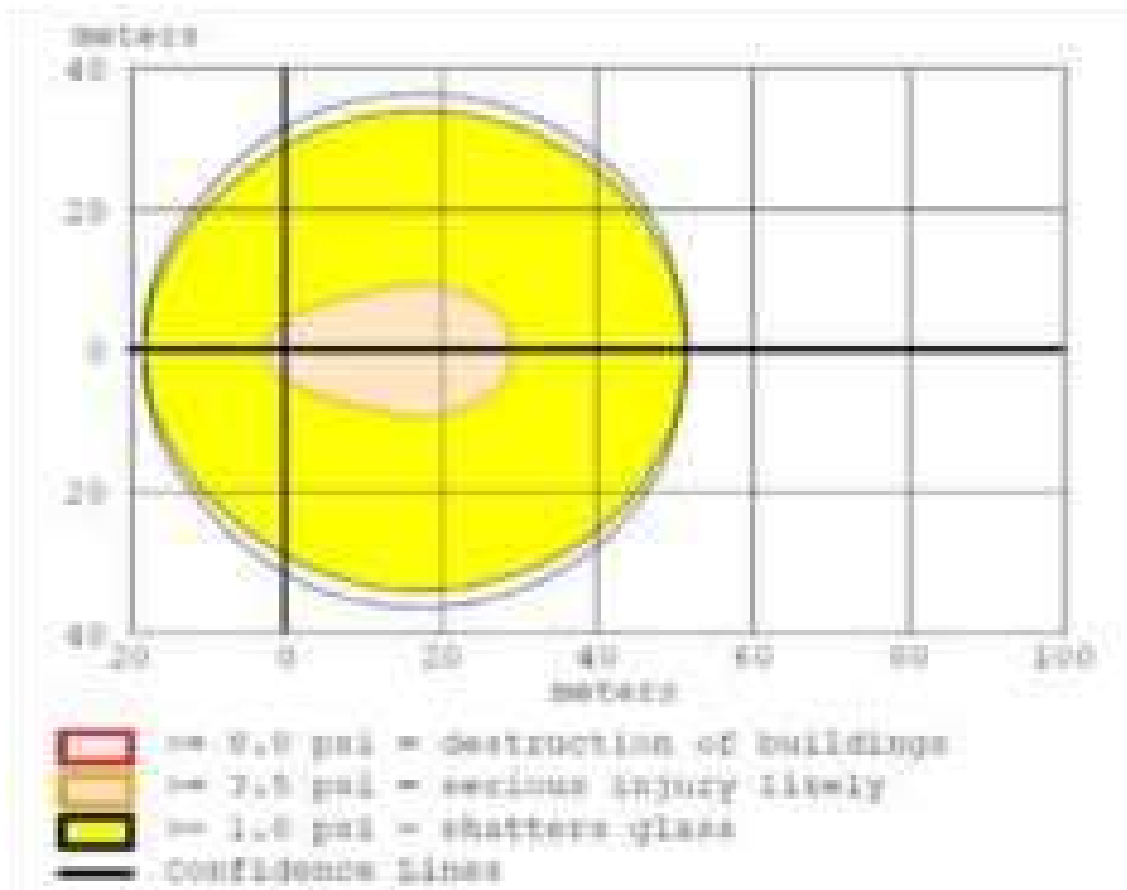
20.1.9.9 Evaporating Puddle – Flammable Area of Vapor Cloud (Graph)



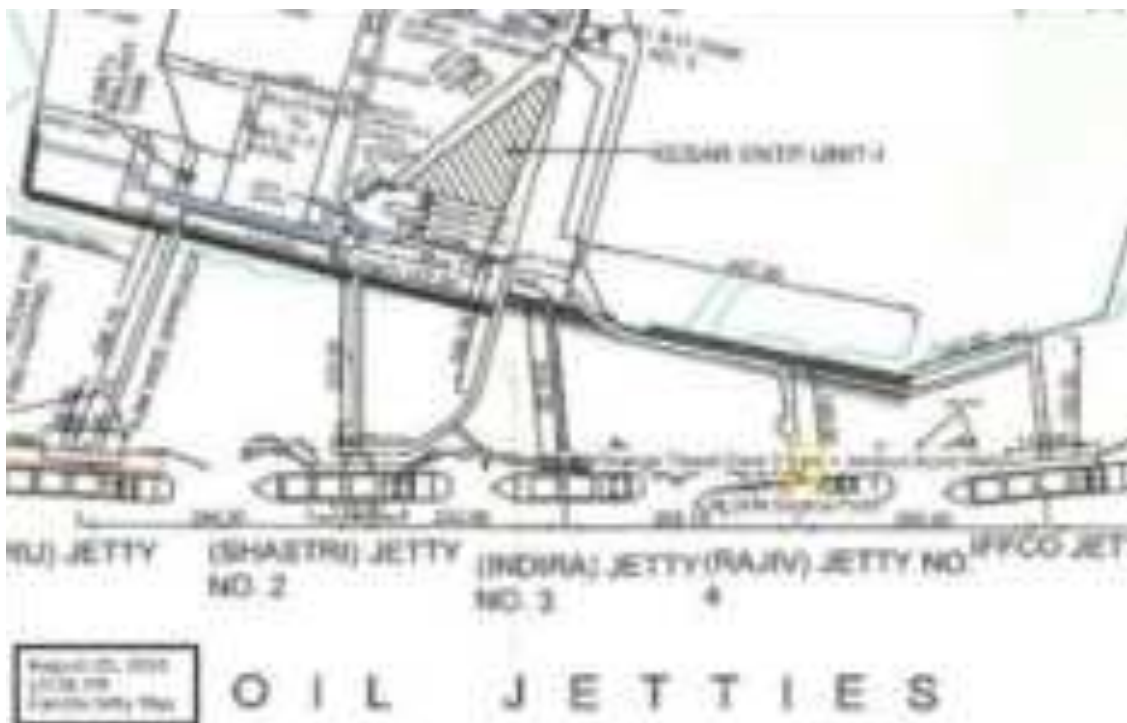
20.1.9.10 Evaporating Puddle – Flammable Area of Vapor Cloud (Contour)



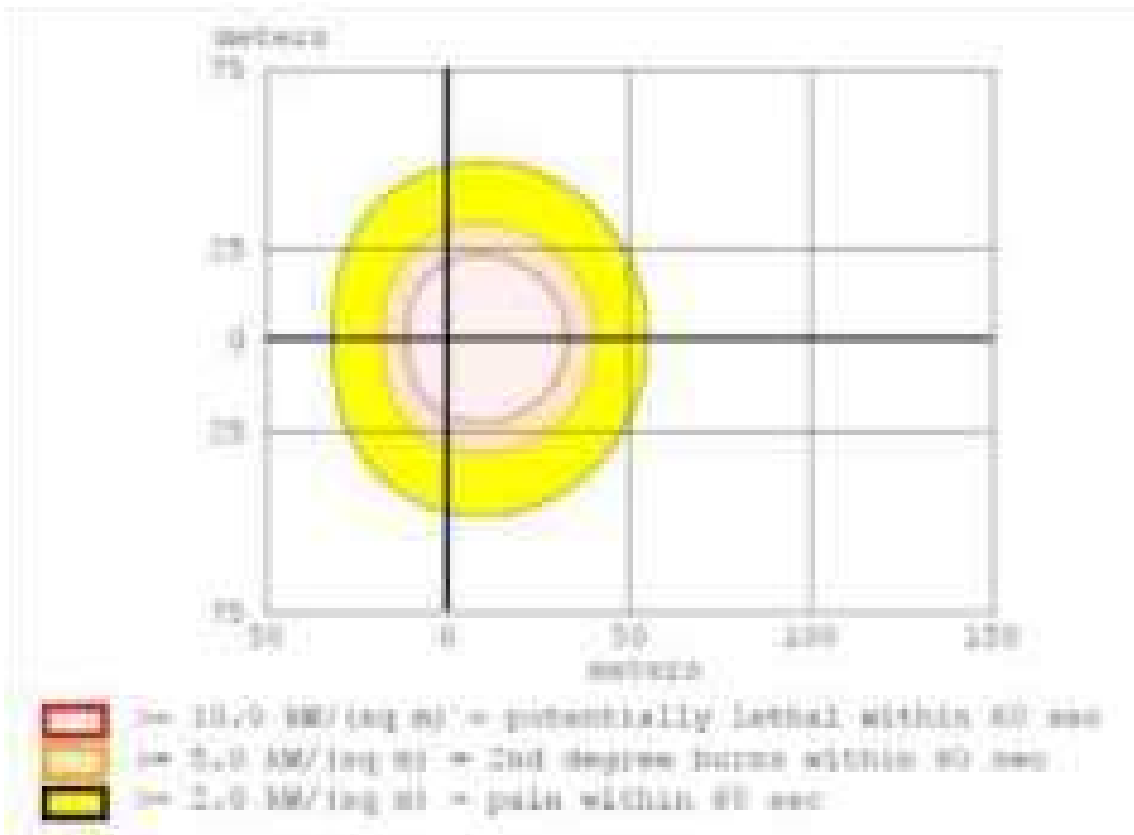
20.1.9.11 Evaporating Puddle – Overpressure (Graph)



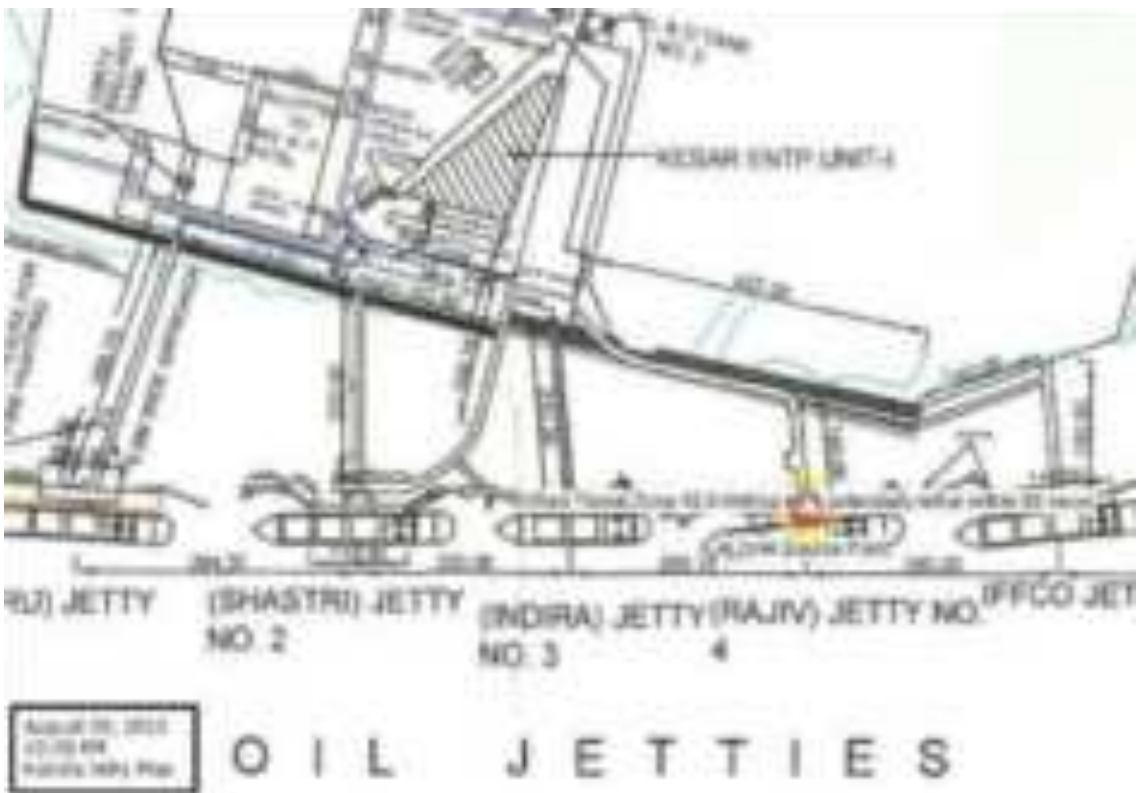
20.1.9.12 Evaporating Puddle – Overpressure (Contour)



20.1.9.13 Burning Puddle – Thermal Radiation (Graph)

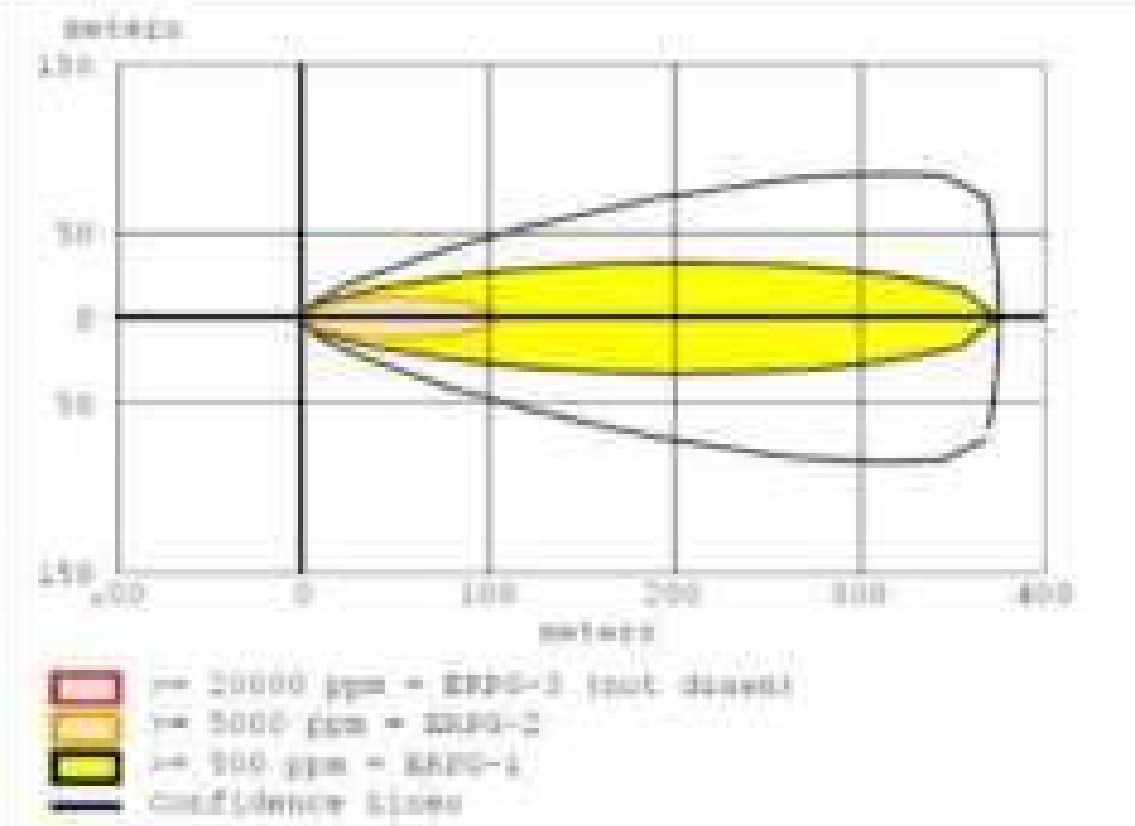


20.1.9.14 Burning Puddle – Thermal Radiation (Contour)

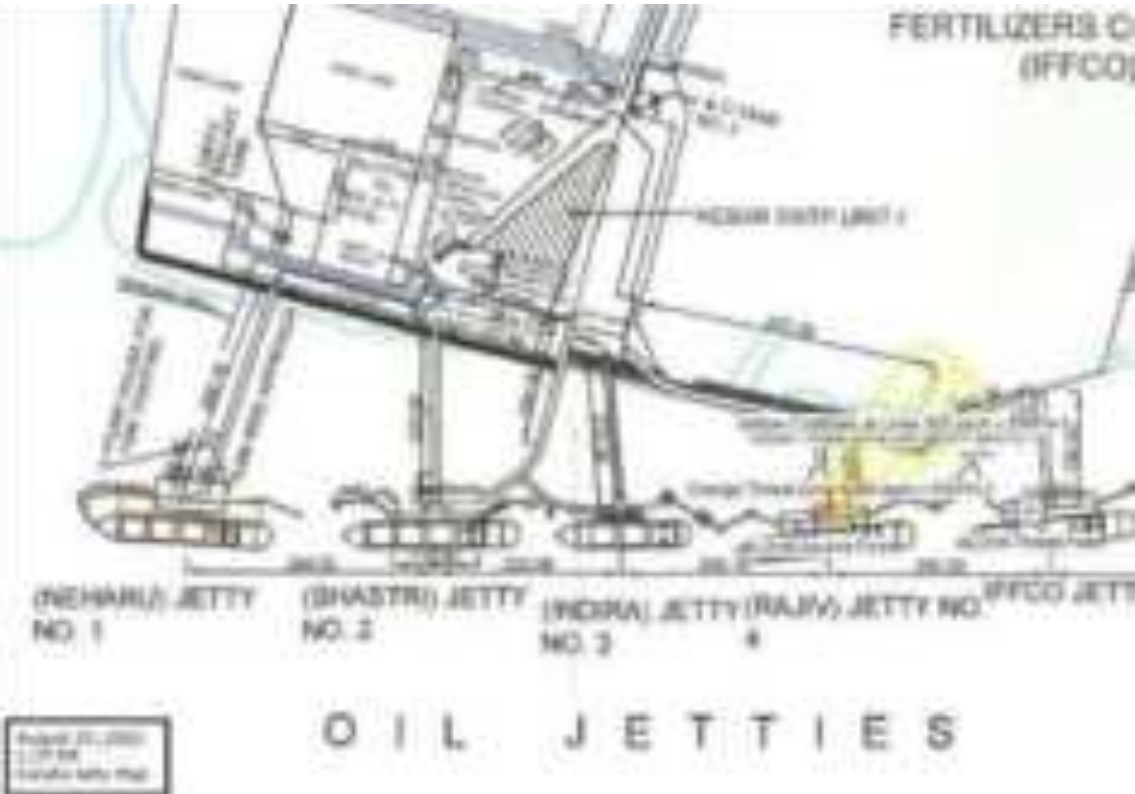


20.1.10 Jetty Four – Vinyl Chloride

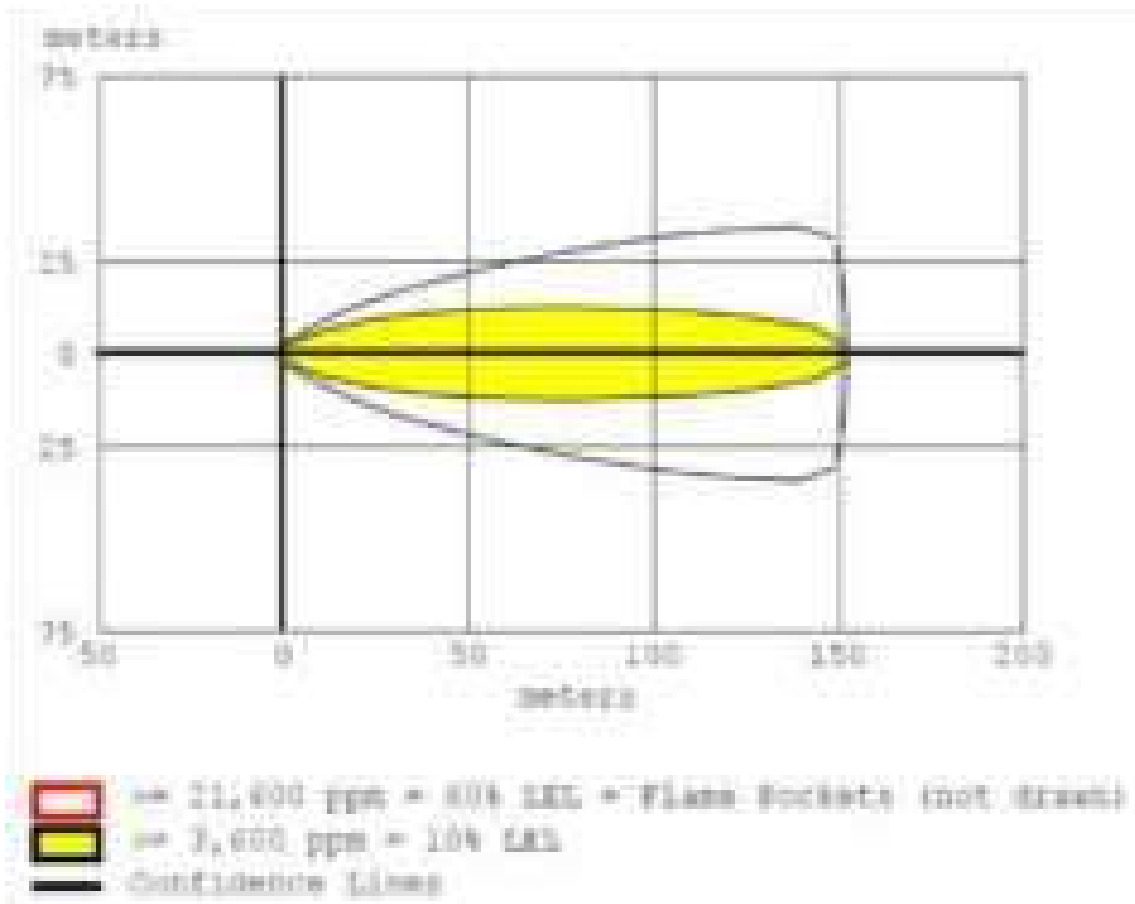
20.1.10.1 Instantaneous Release – Toxic Threat Zone (Graph)



20.1.10.2 Instantaneous Release – Toxic Threat Zone (Contour)



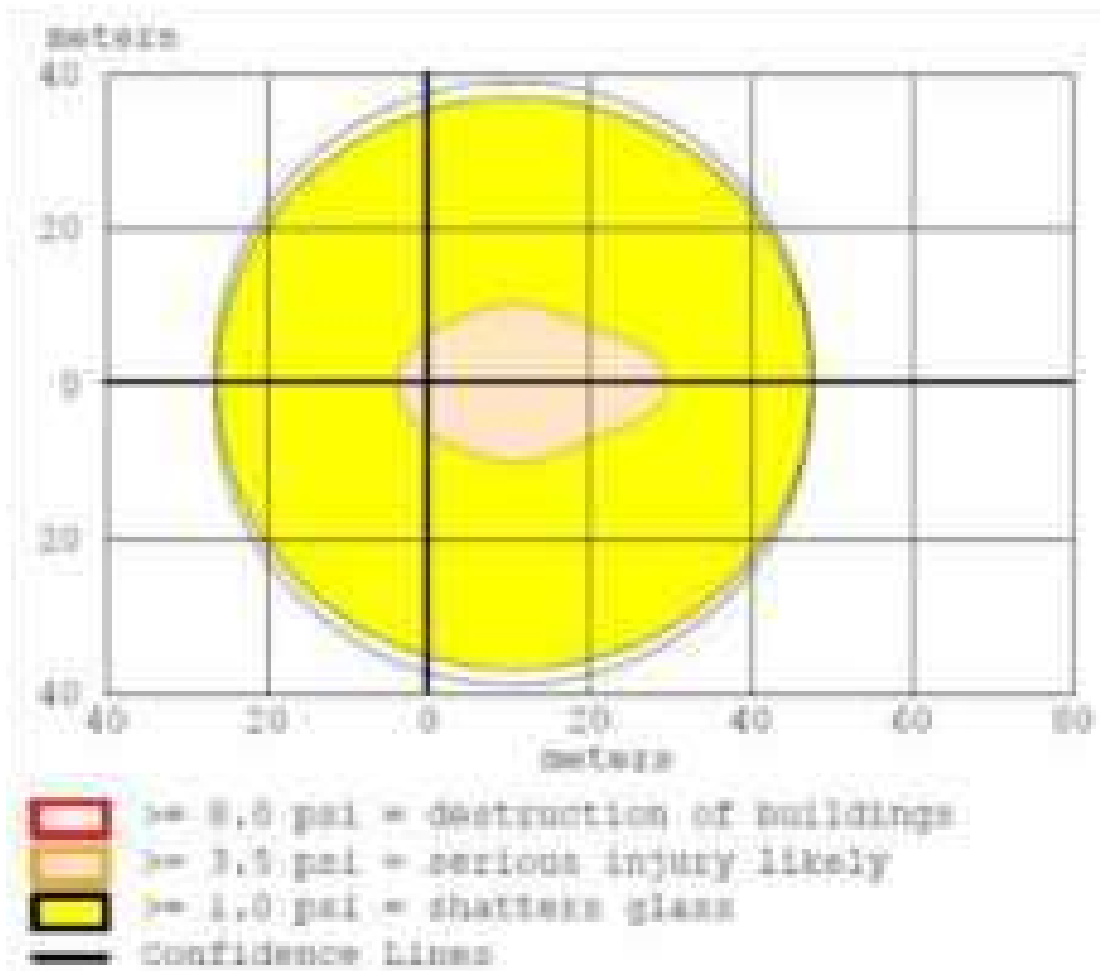
20.1.10.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



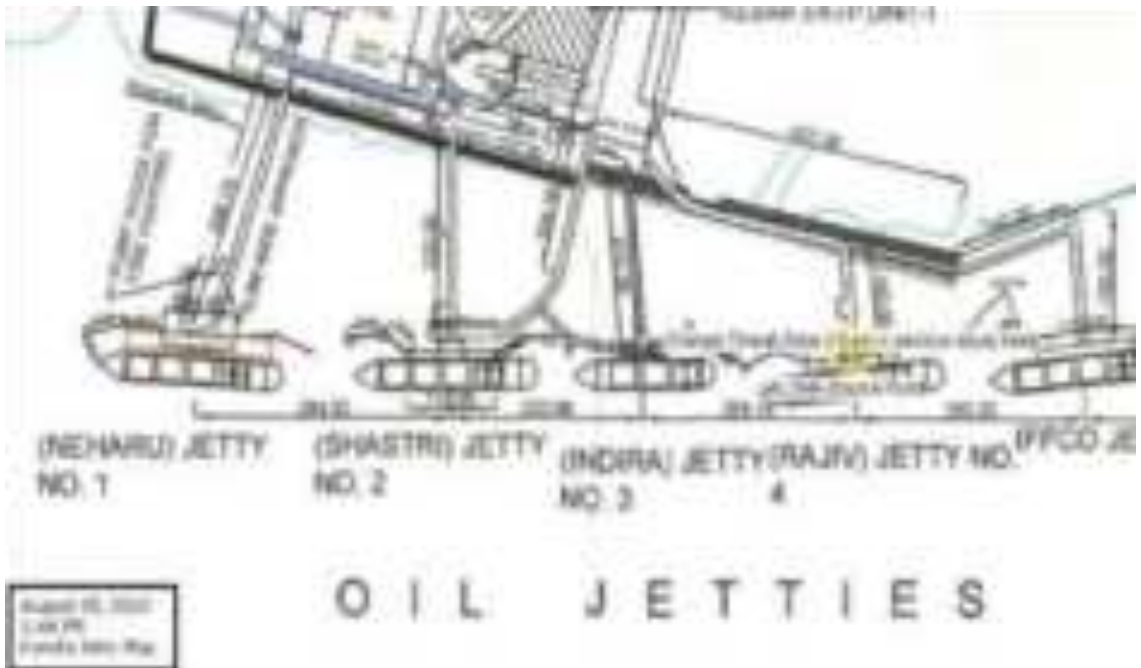
20.1.10.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



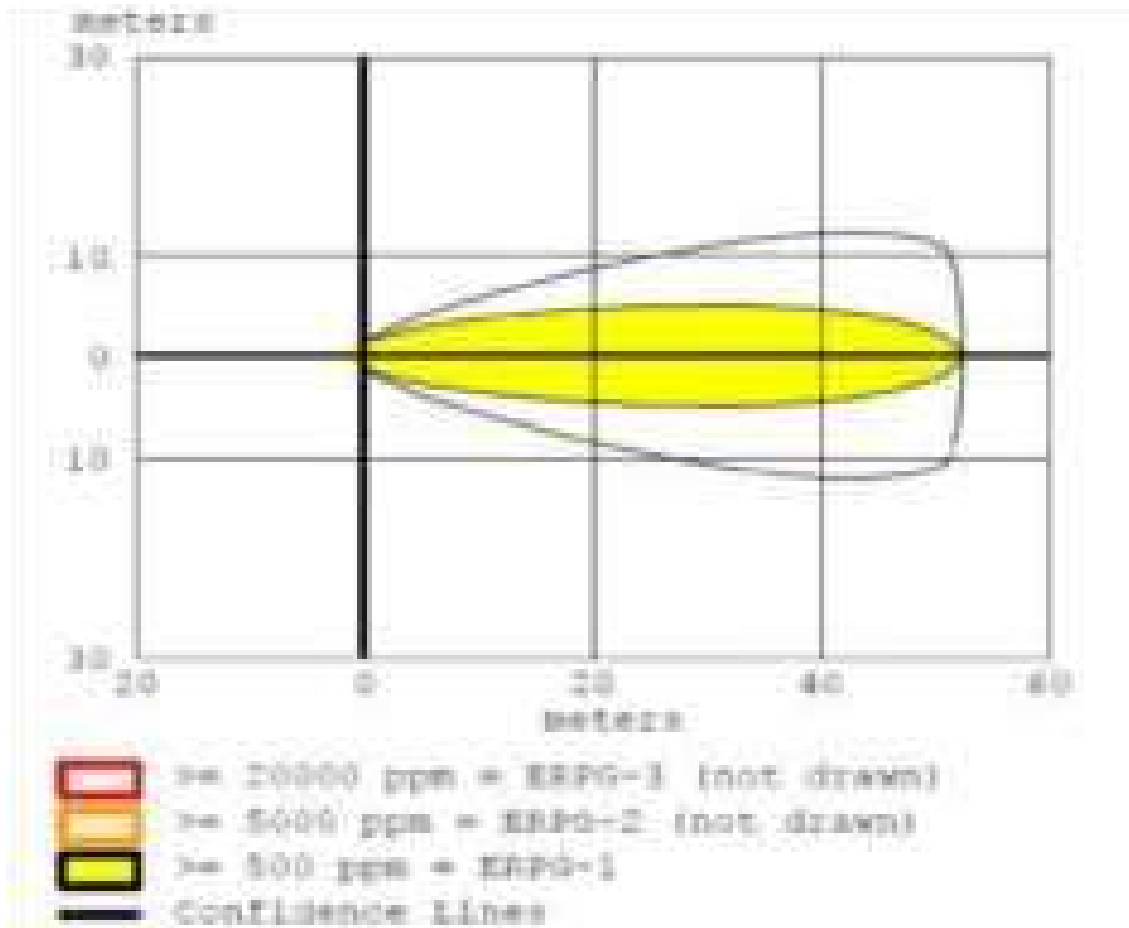
20.1.10.5 Instantaneous Release – Overpressure (Graph)



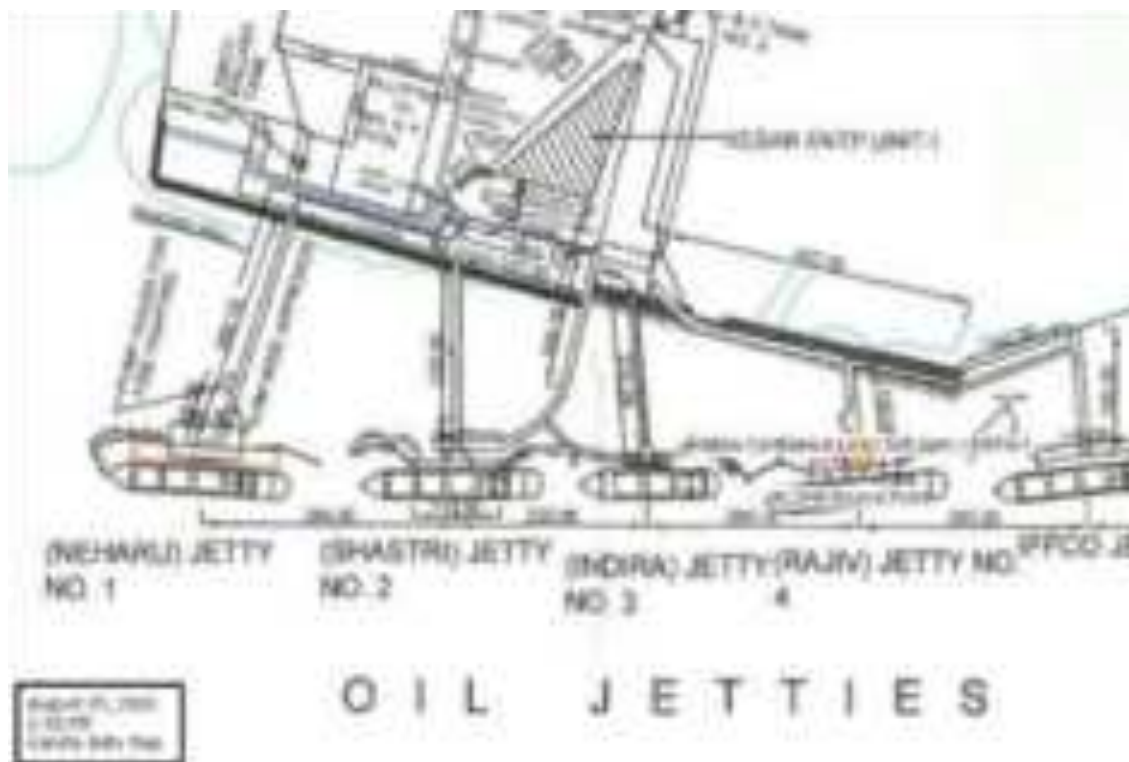
20.1.10.6 Instantaneous Release – Overpressure (Contour)



20.1.10.7 Evaporating Puddle – Toxic Threat Zone (Graph)

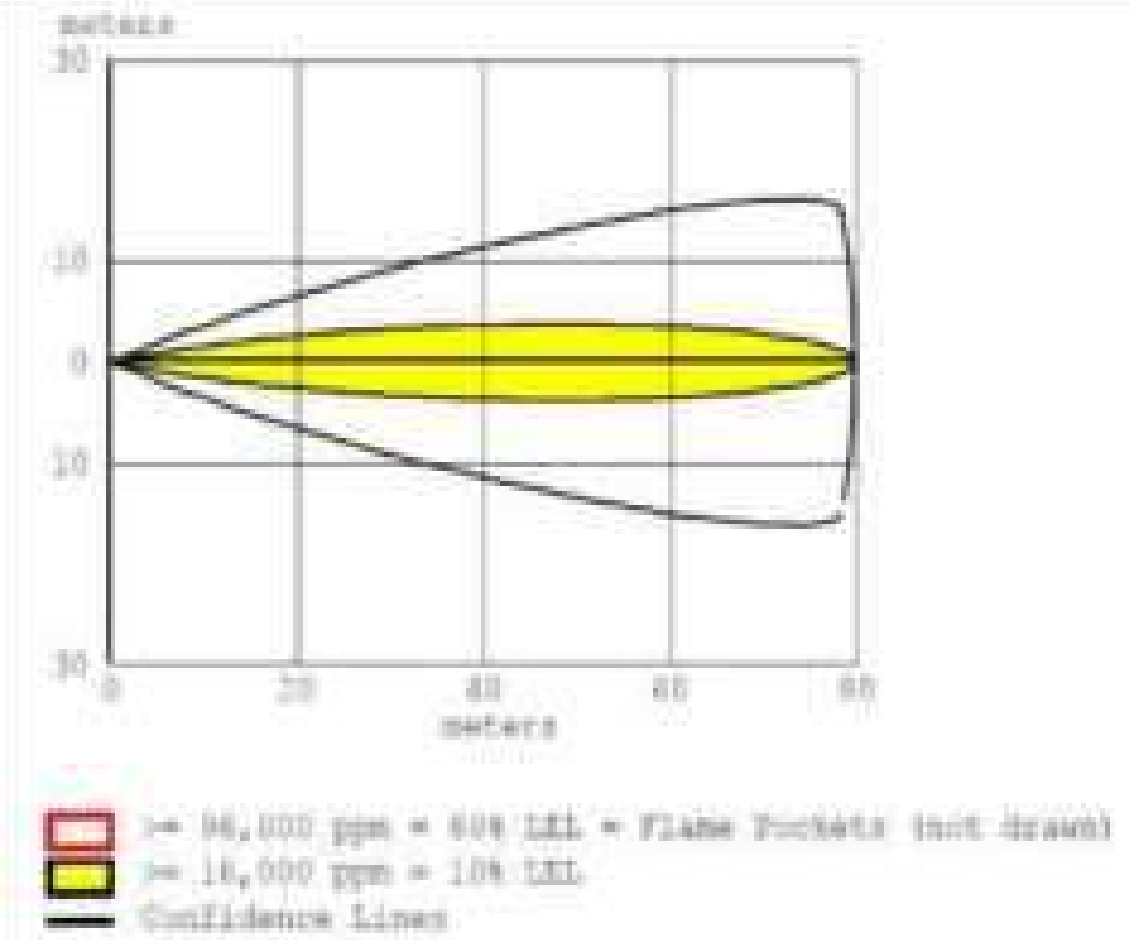


20.1.10.8 Evaporating Puddle – Toxic Threat Zone (Contour)



20.1.11 Jetty Five – Ammonia

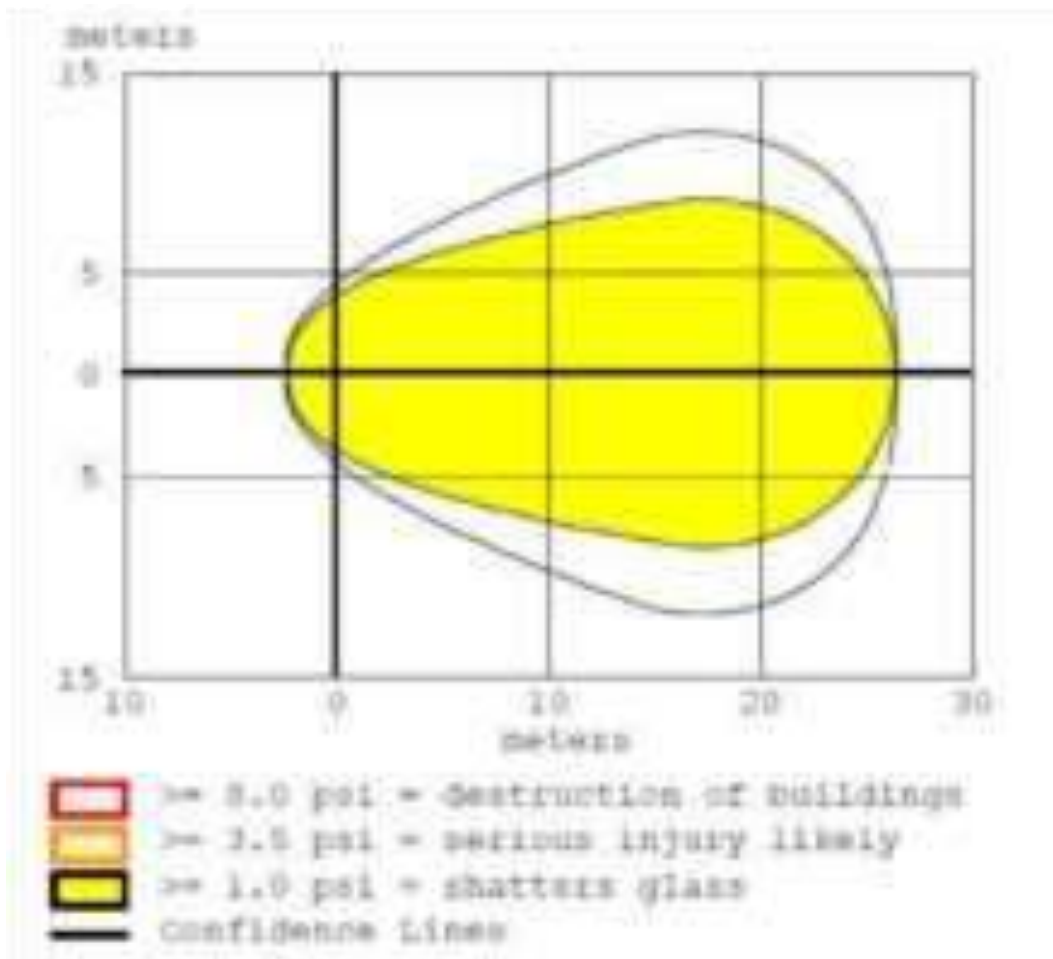
20.1.11.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



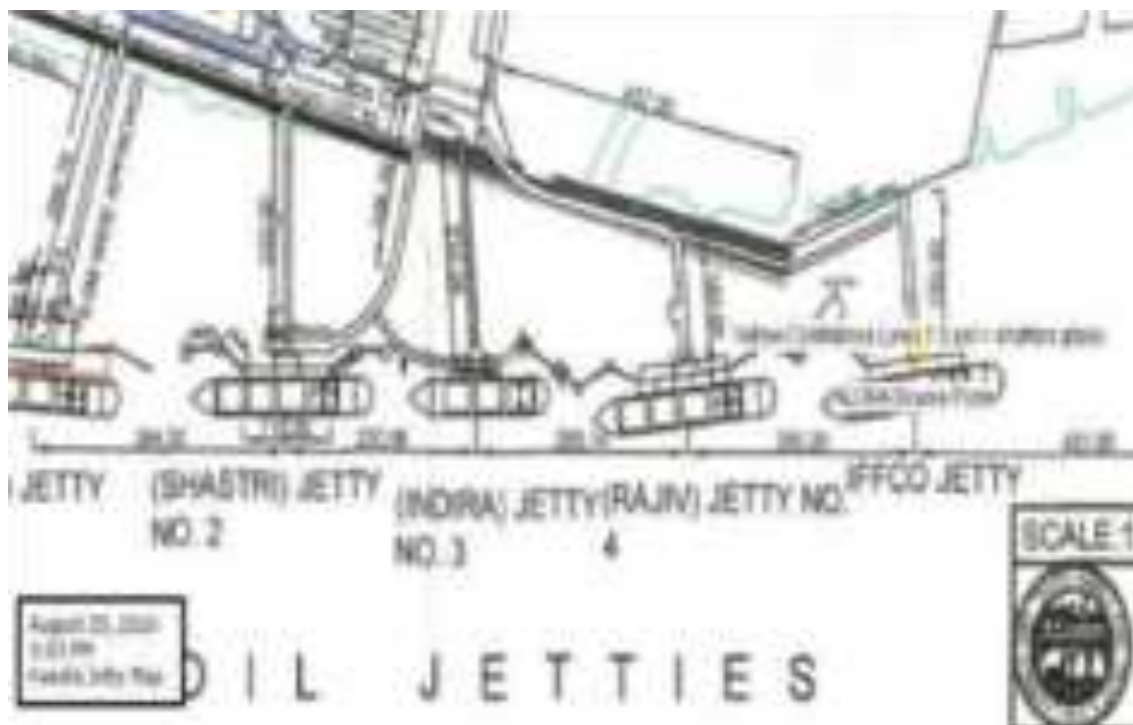
20.1.11.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



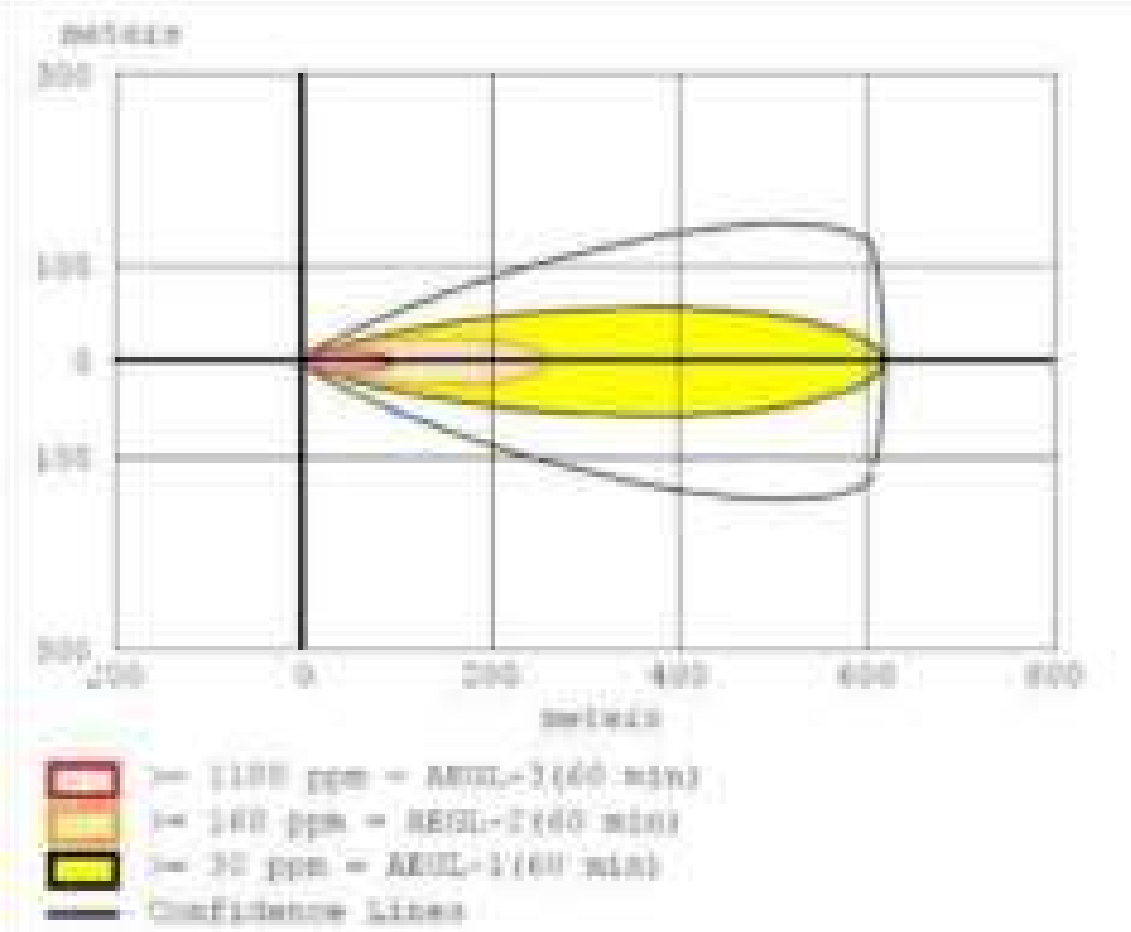
20.1.11.5 Instantaneous Release – Overpressure (Graph)



20.1.11.6 Instantaneous Release – Overpressure (Contour)



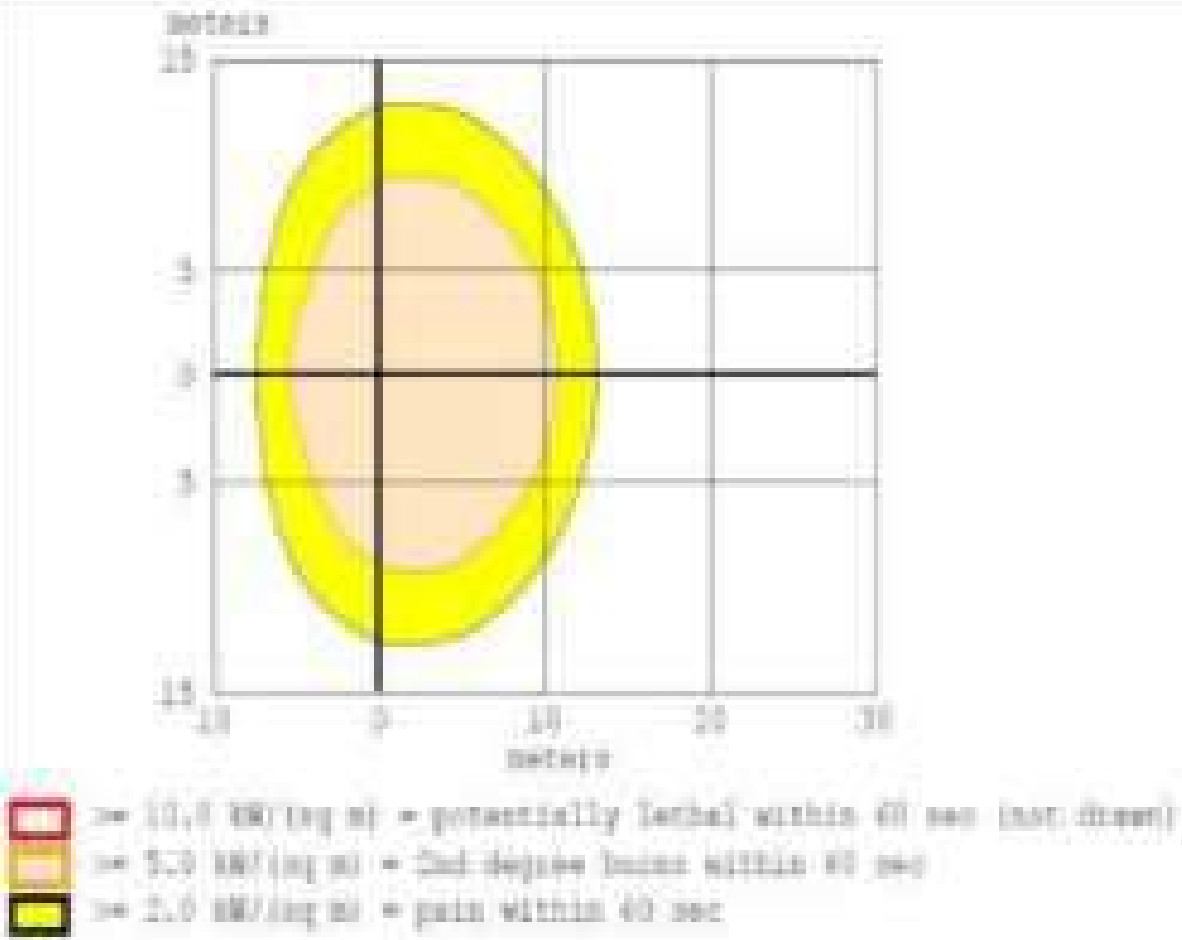
20.1.11.7 Evaporating Puddle – Toxic Threat Zone (Graph)



20.1.11.8 Evaporating Puddle – Toxic Threat Zone (Contour)



20.1.11.9 Burning Puddle – Thermal Radiation (Graph)

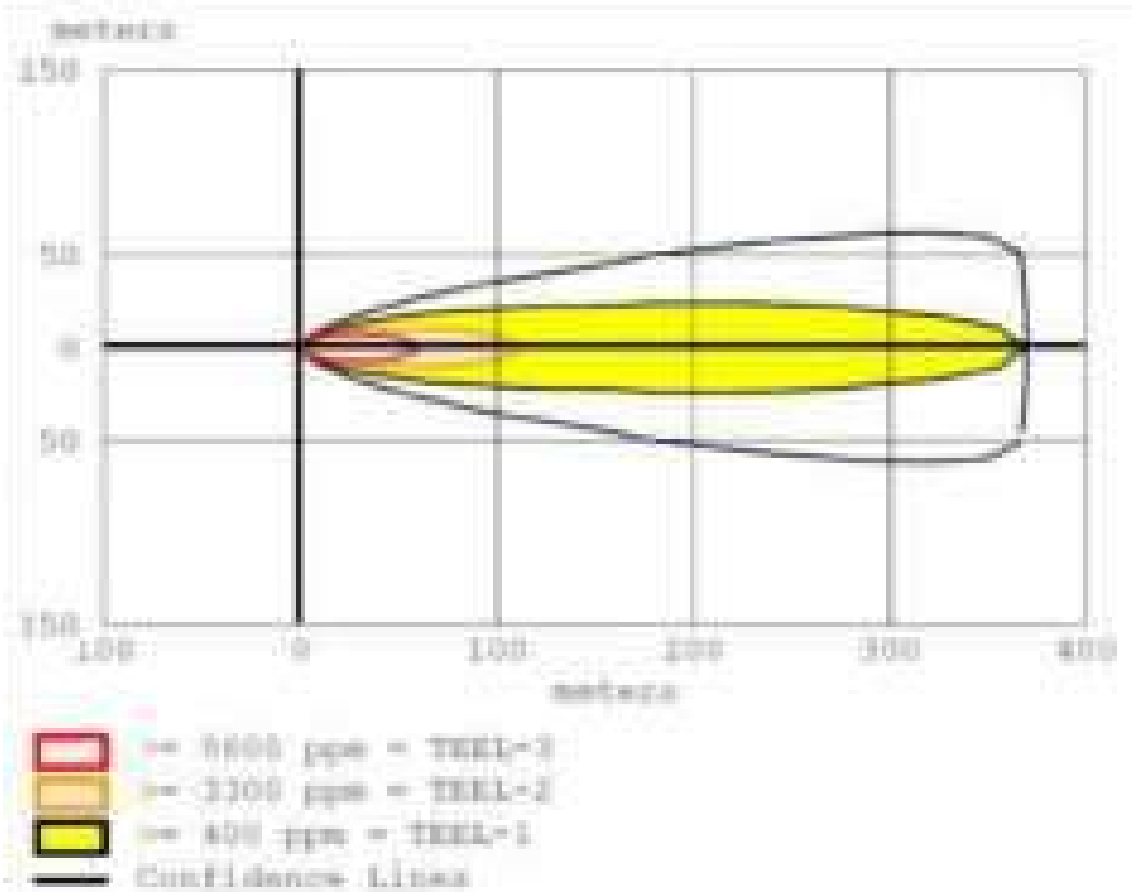


20.1.11.10 Burning Puddle – Thermal Radiation (Contour)

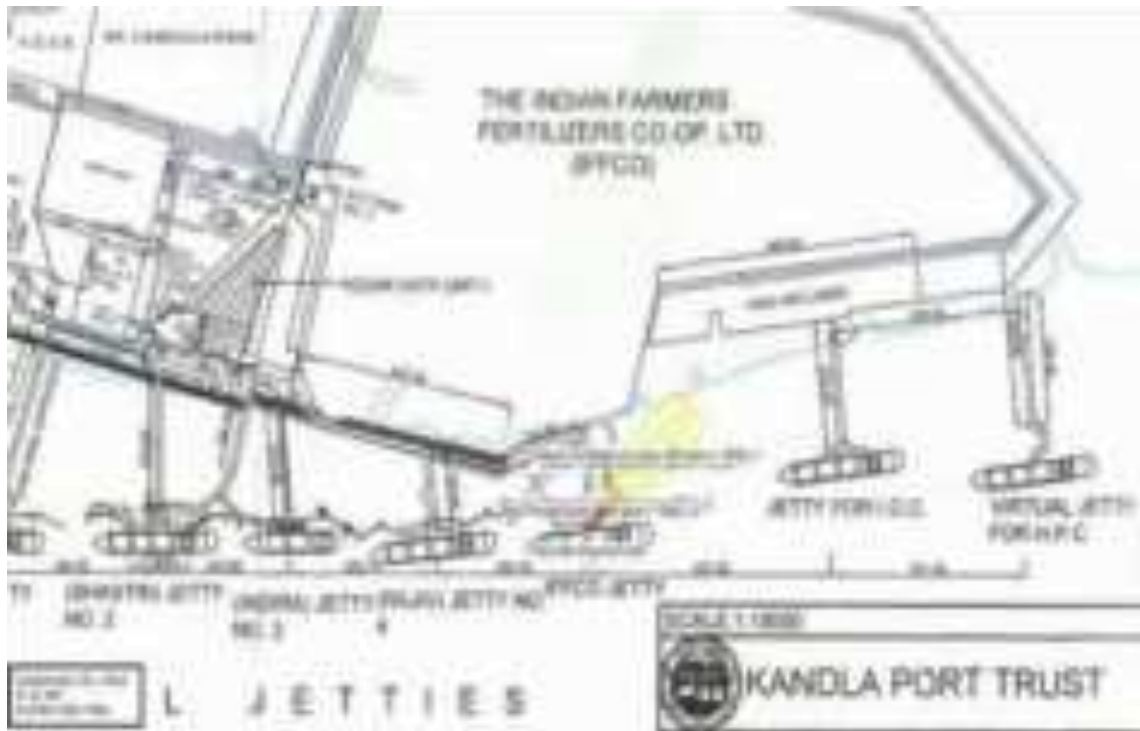


20.1.12 Jetty Five – HSD

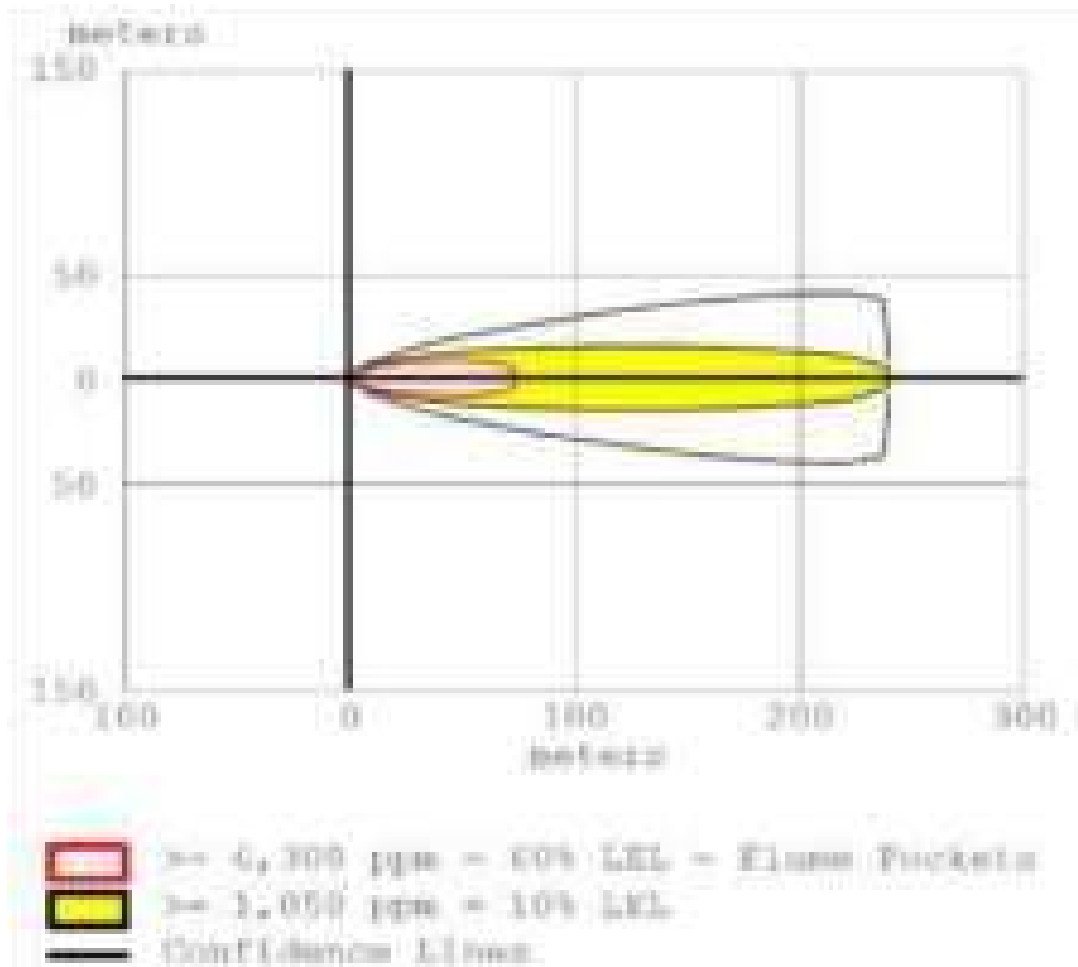
20.1.12.1 Instantaneous Release – Toxic Threat Zone (Graph)



20.1.12.2 Instantaneous Release – Toxic Threat Zone (Contour)



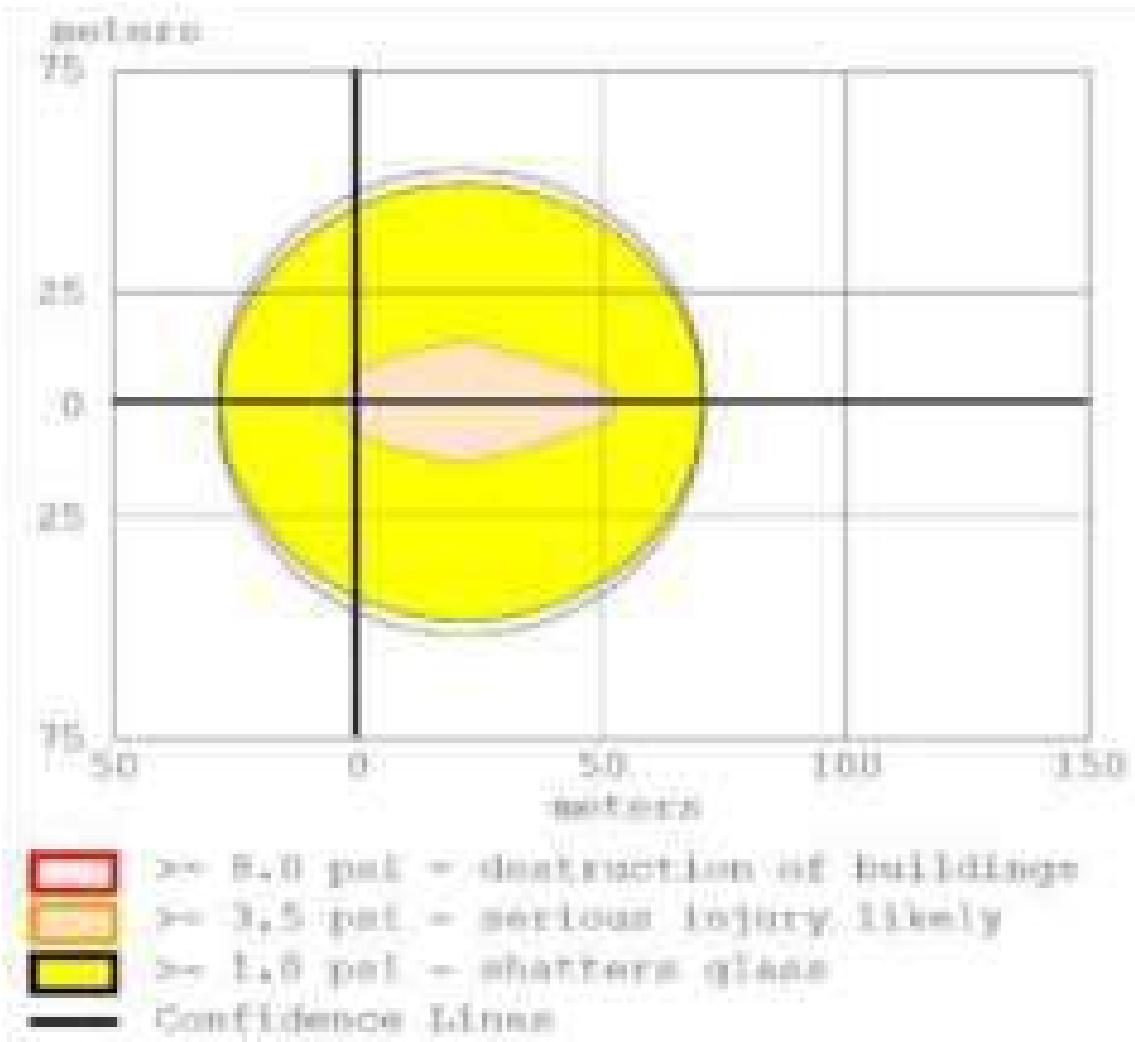
20.1.12.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



20.1.12.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



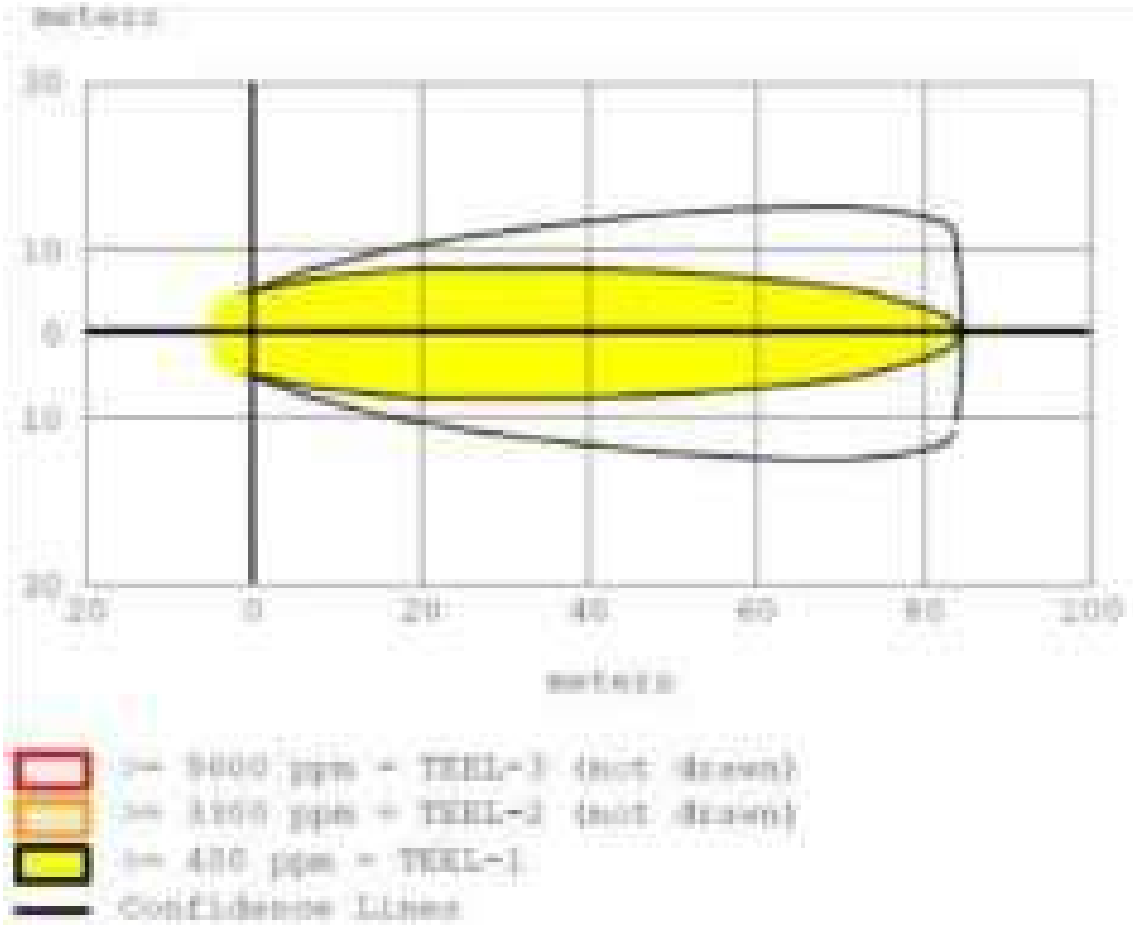
20.1.12.5 Instantaneous Release – Overpressure (Graph)



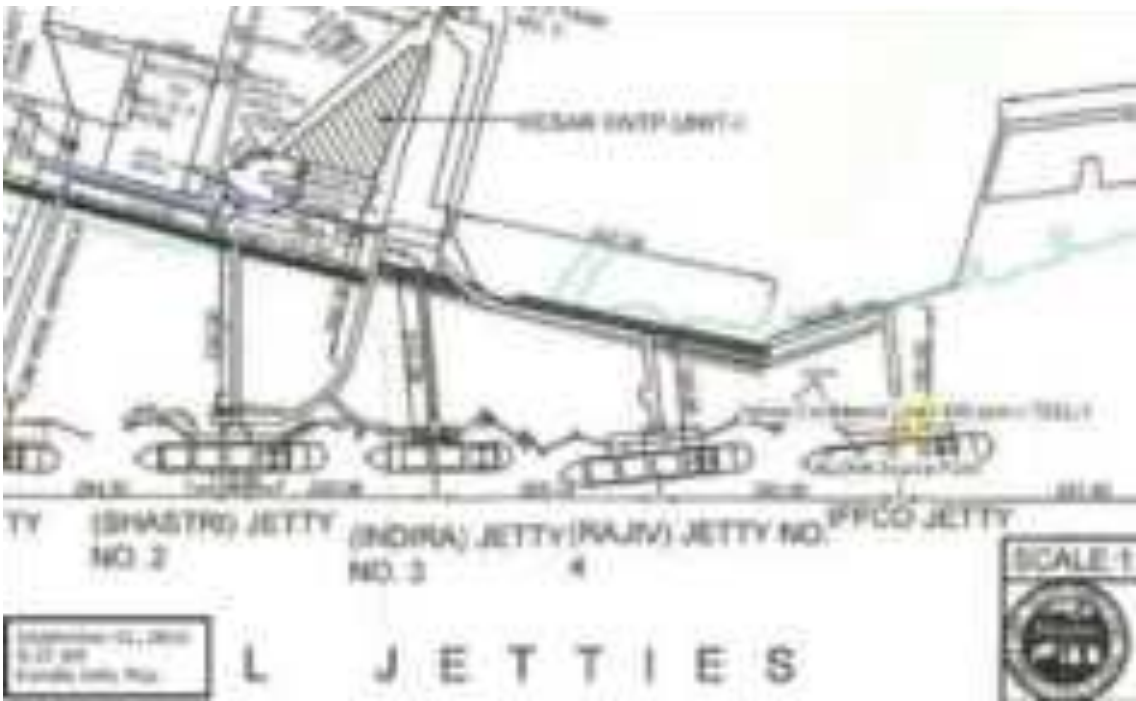
20.1.12.6 Instantaneous Release – Overpressure (Contour)



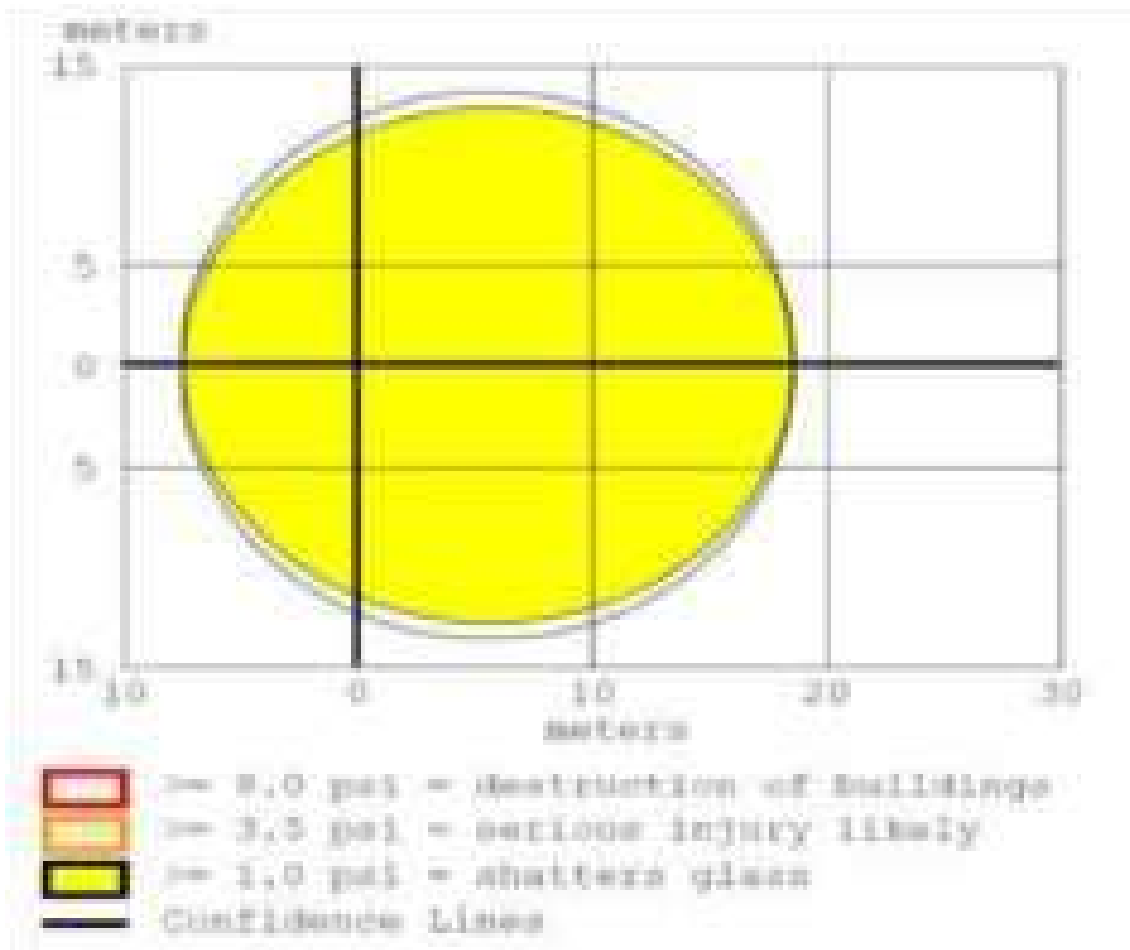
20.1.12.7 Evaporating Puddle – Toxic Threat Zone (Graph)



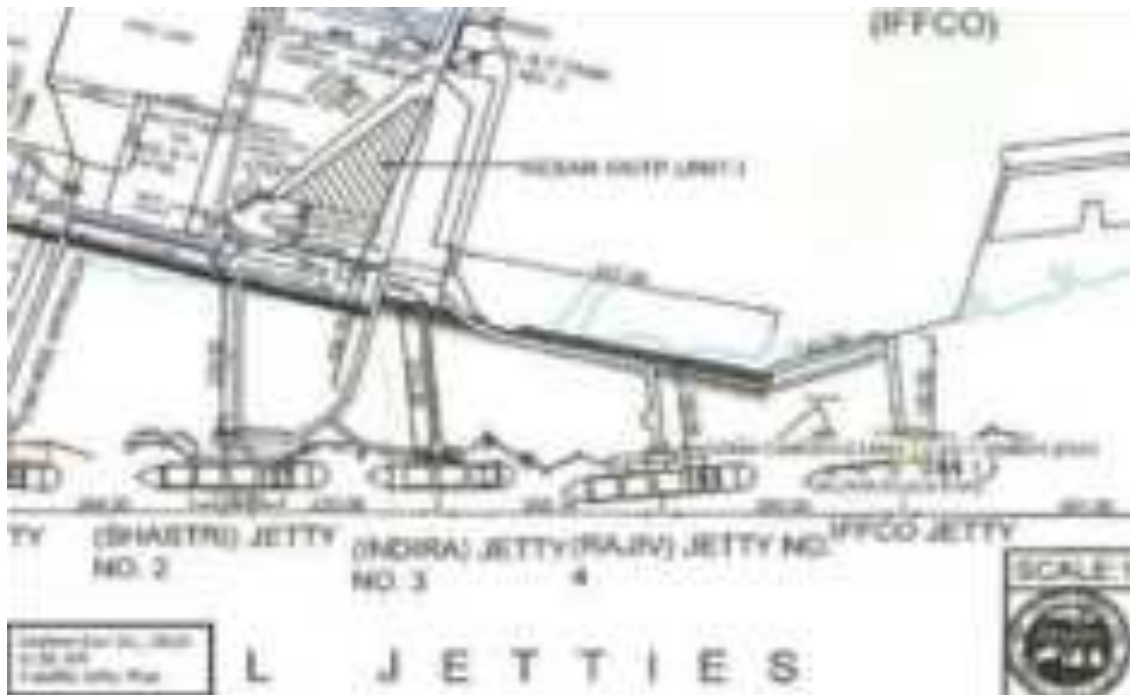
20.1.12.8 Evaporating Puddle – Toxic Threat Zone (Contour)



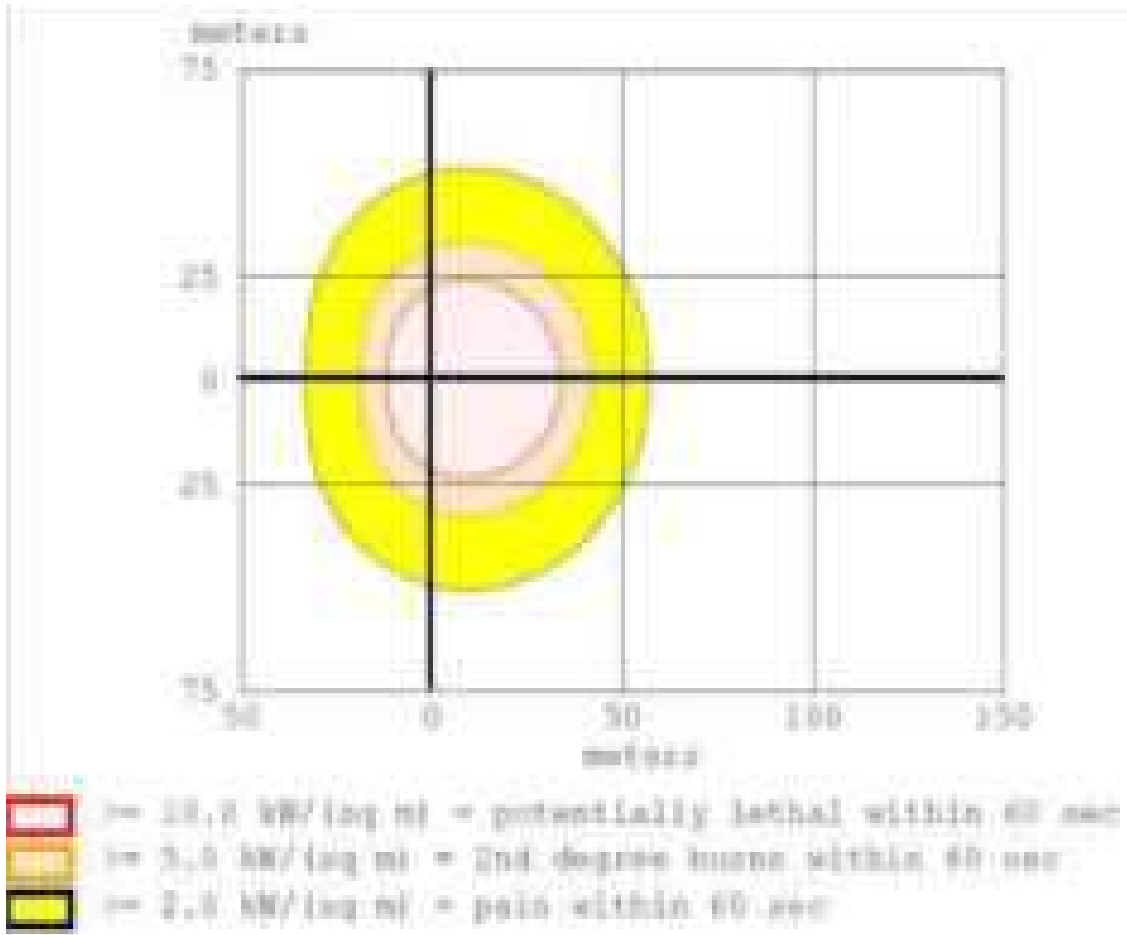
20.1.12.9 Evaporating Puddle – Overpressure (Graph)



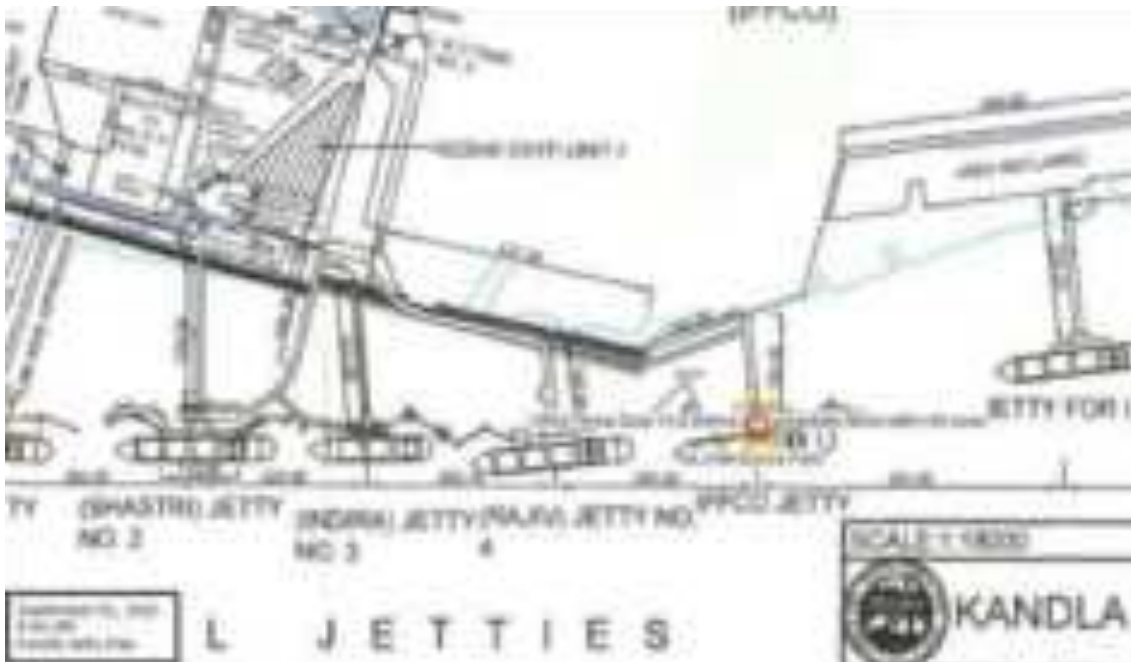
20.1.12.10 Evaporating Puddle – Overpressure (Contour)



20.1.12.11 Burning Puddle – Thermal Radiation (Graph)

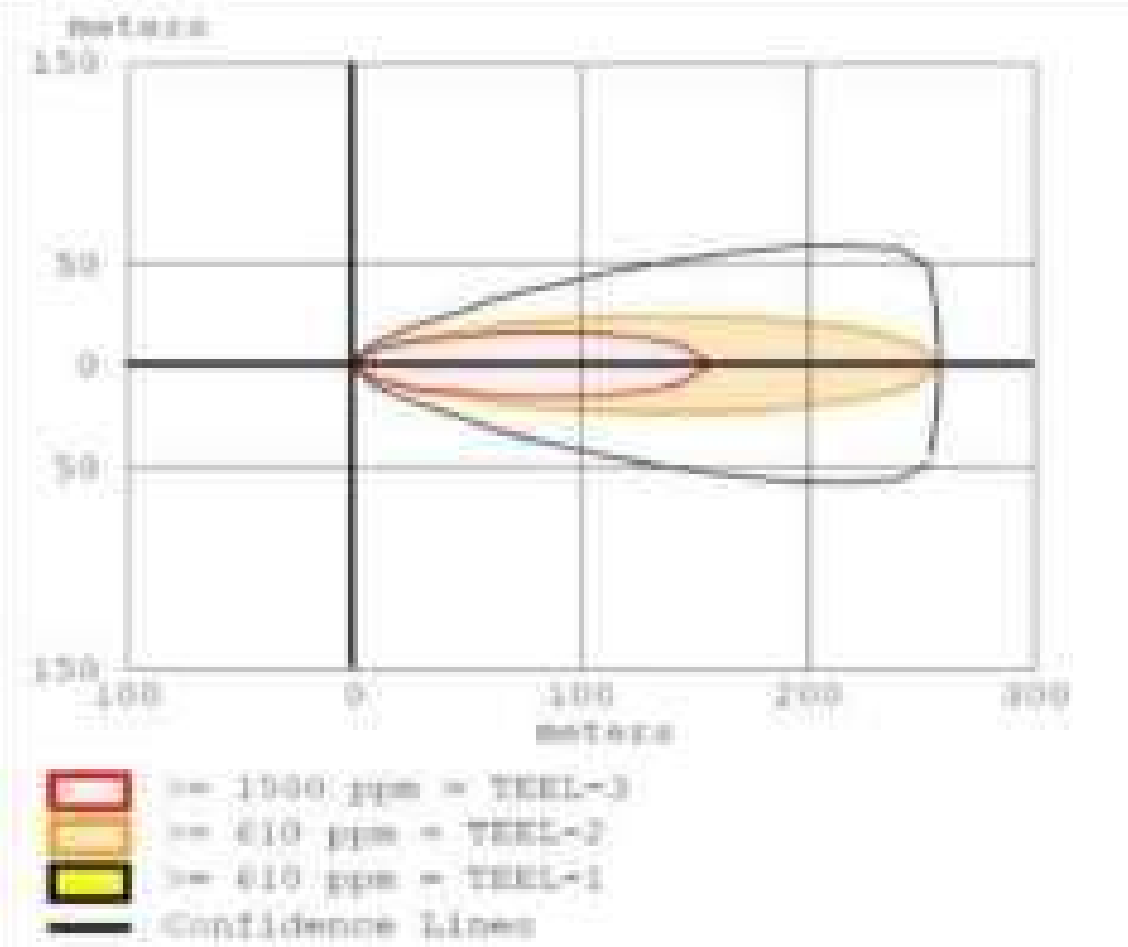


20.1.12.12 Burning Puddle – Thermal Radiation (Contour)



20.1.13 Jetty Six – Motor Spirit

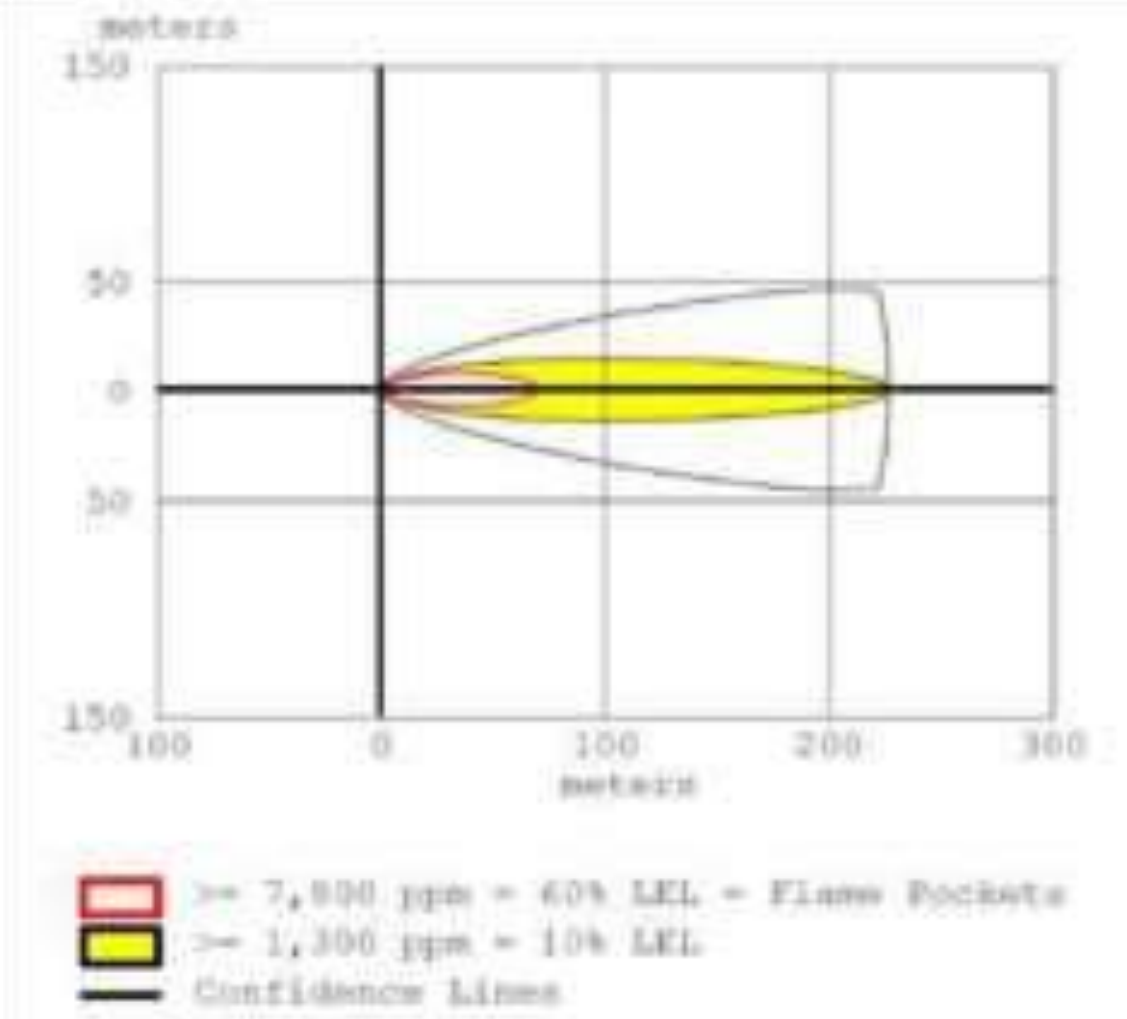
20.1.13.1 Instantaneous Release – Toxic Threat Zone (Graph)



20.1.13.2 Instantaneous Release – Toxic Threat Zone (Contour)



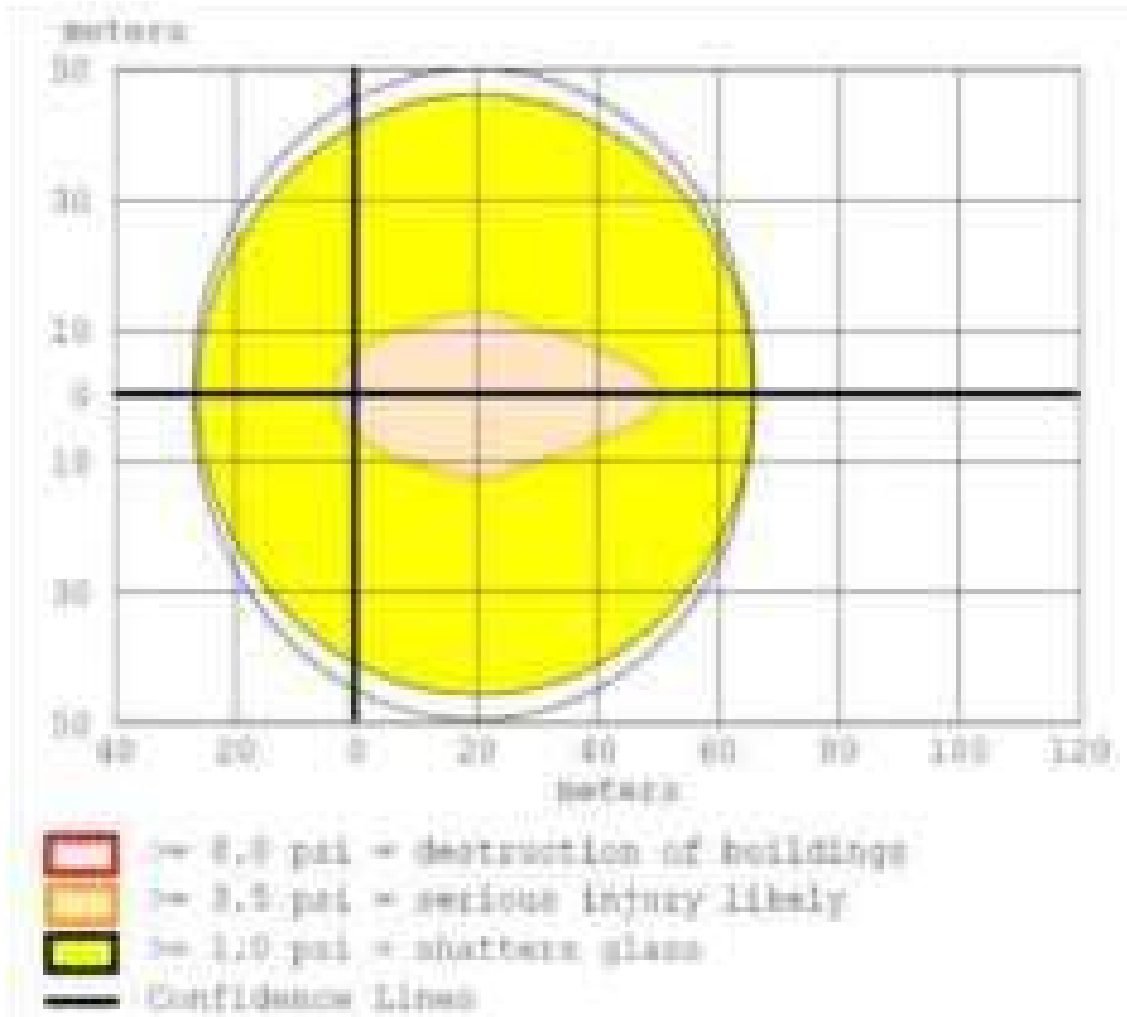
20.1.13.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



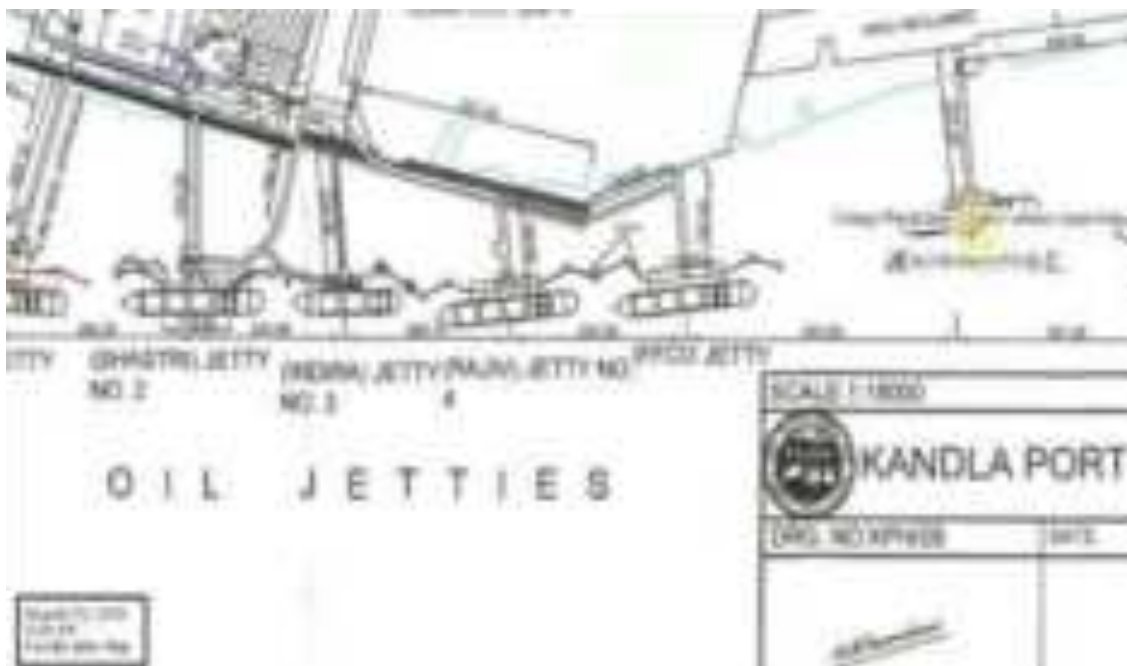
20.1.13.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



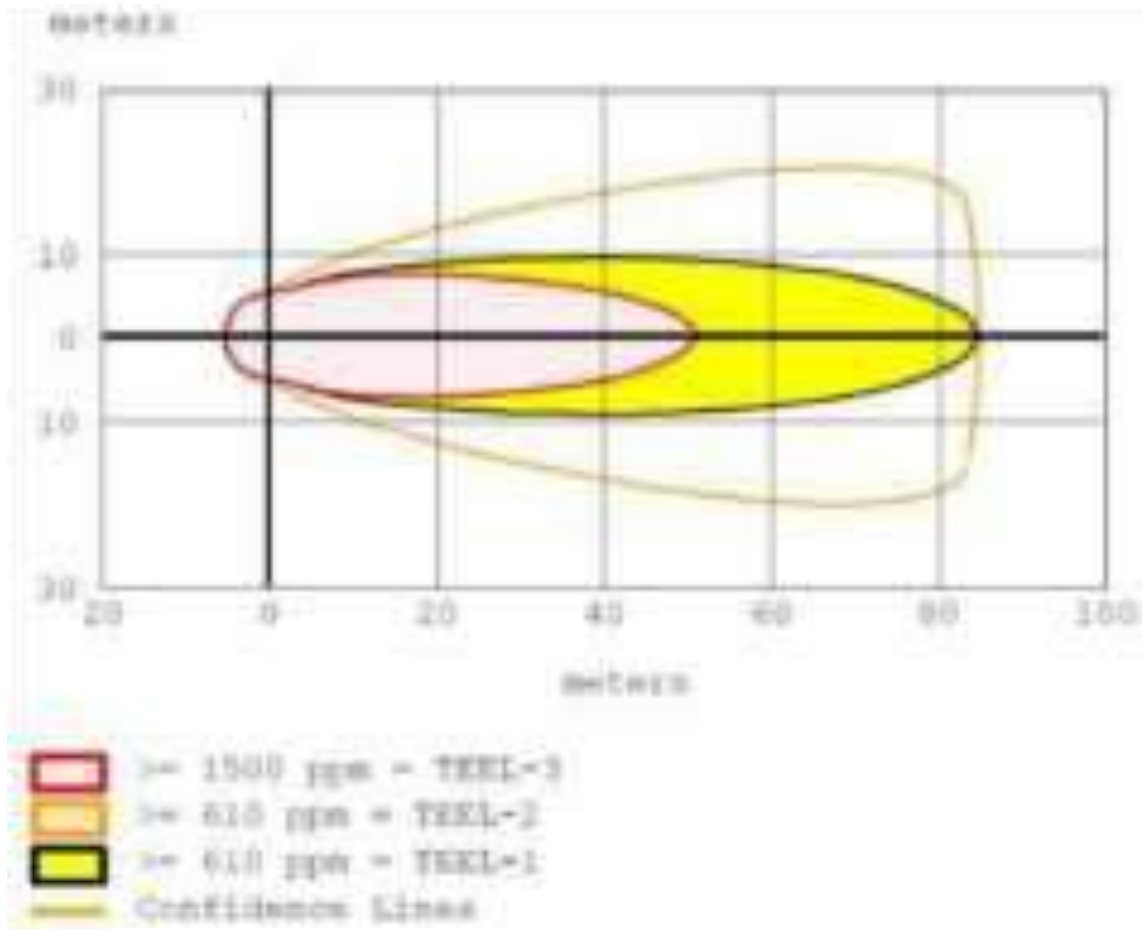
20.1.13.5 Instantaneous Release – Overpressure (Graph)



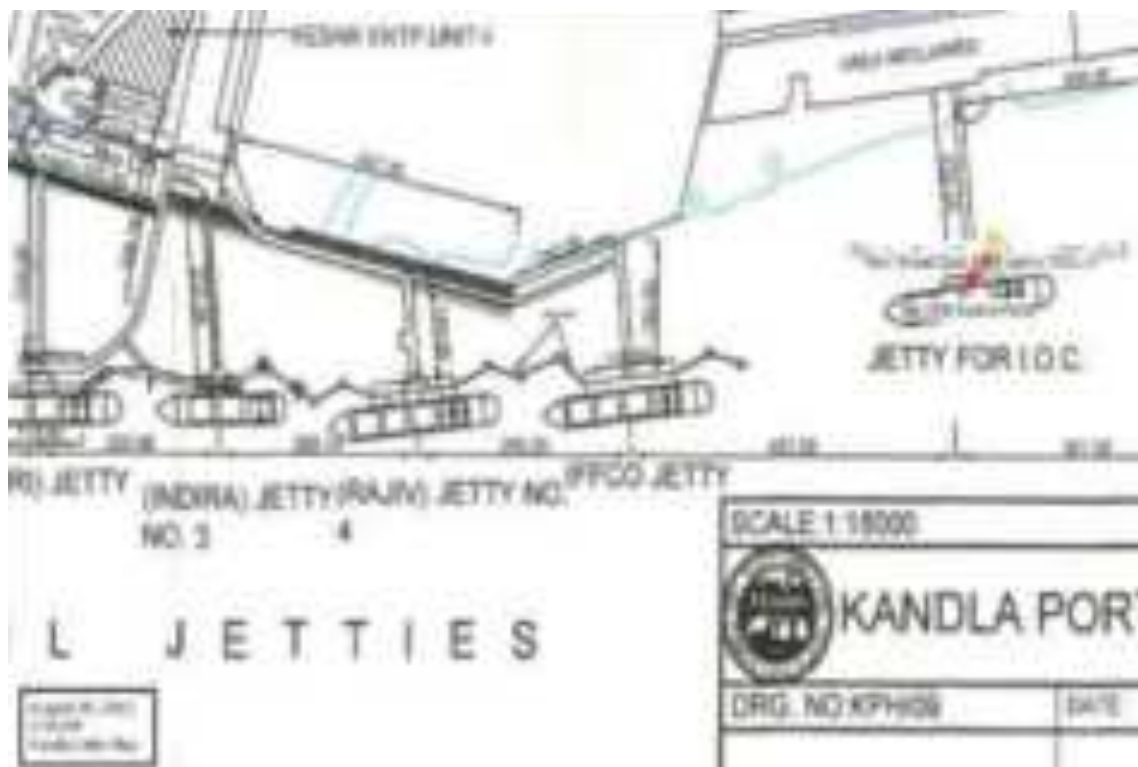
20.1.13.6 Instantaneous Release – Overpressure (Contour)



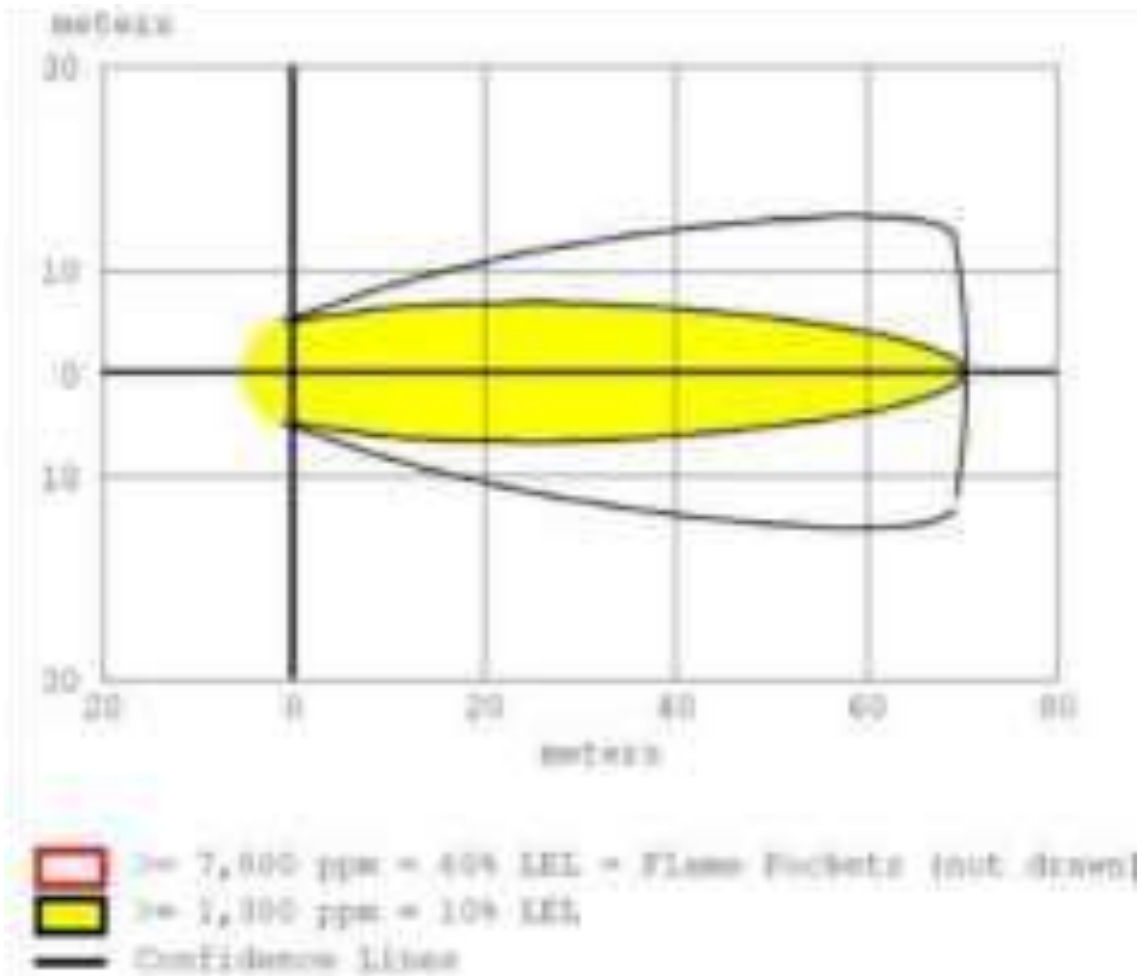
20.1.13.7 Evaporating Puddle – Toxic Threat Zone (Graph)



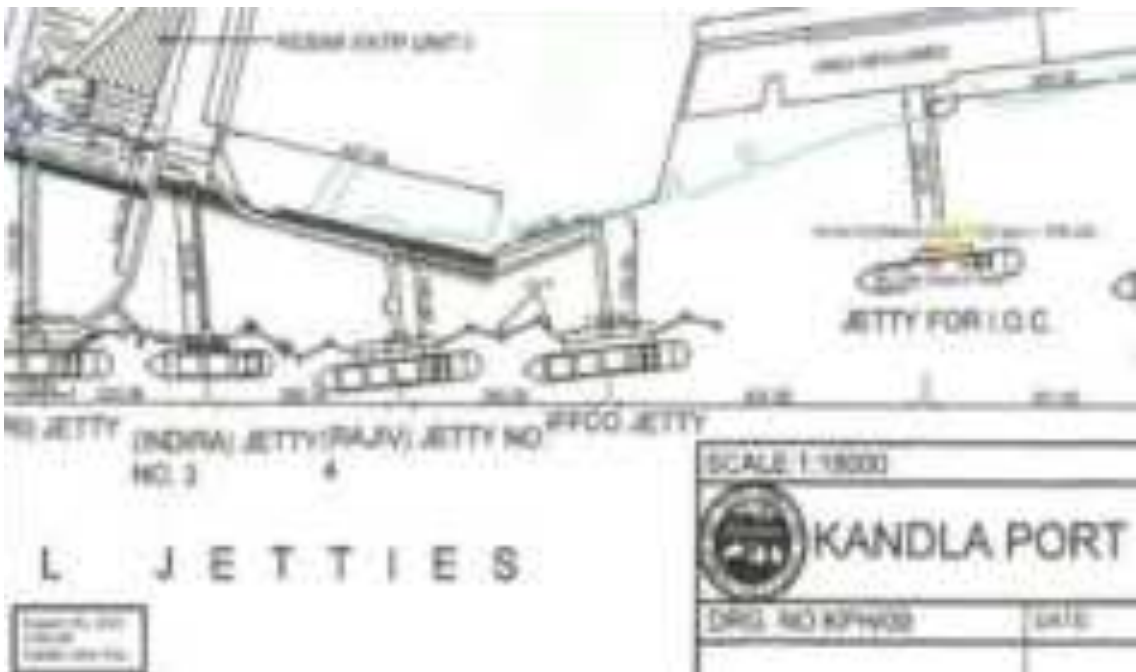
20.1.13.8 Evaporating Puddle – Toxic Threat Zone (Contour)



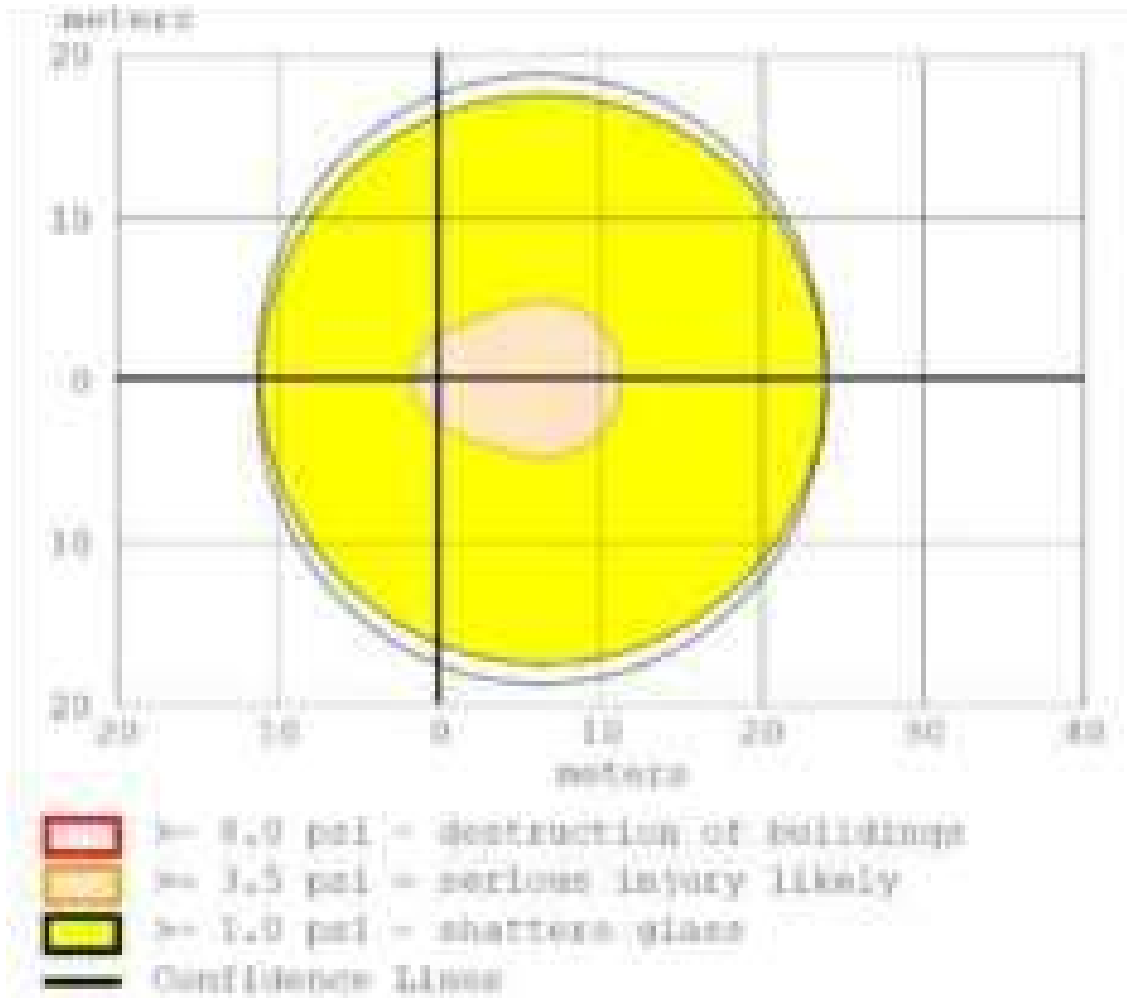
20.1.13.9 Evaporating Puddle – Flammable Area of Vapor Cloud (Graph)



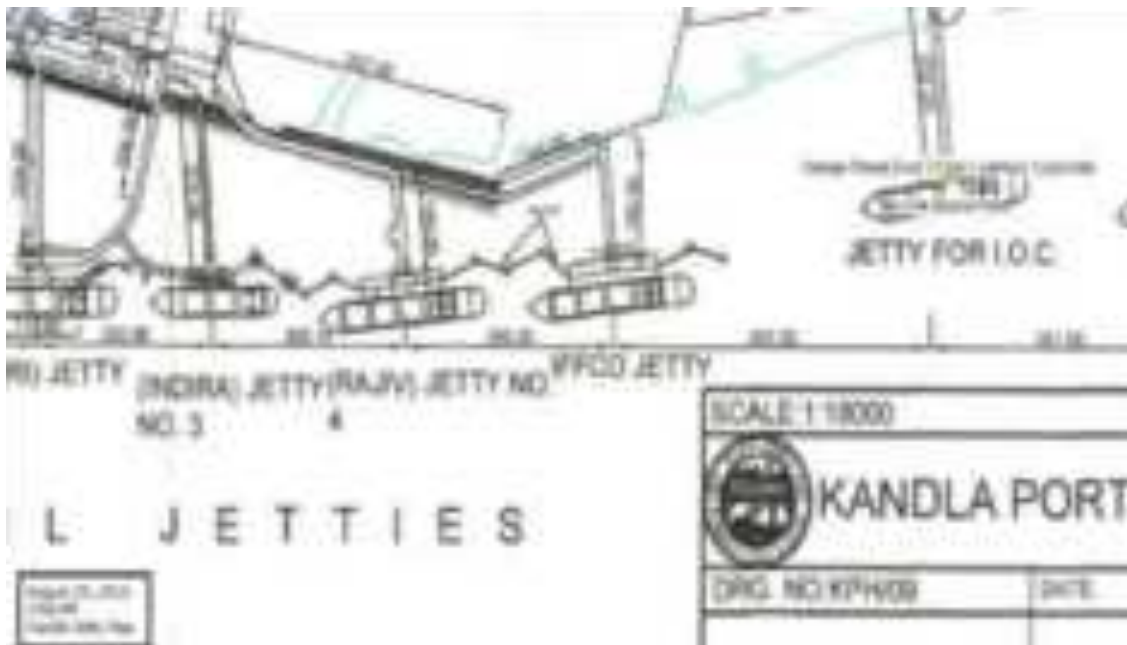
20.1.13.10 Evaporating Puddle – Flammable Area of Vapor Cloud (Contour)



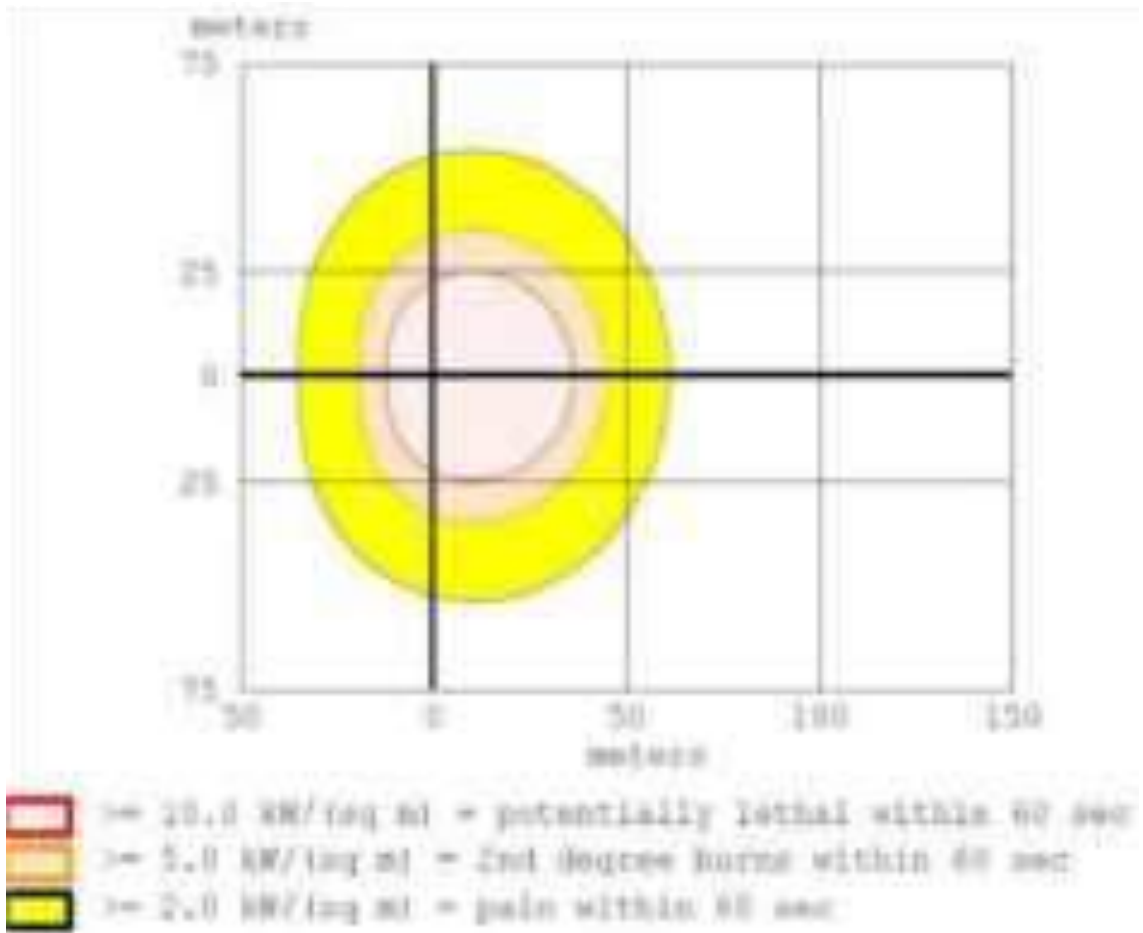
20.1.13.11 Evaporating Puddle – Overpressure (Graph)



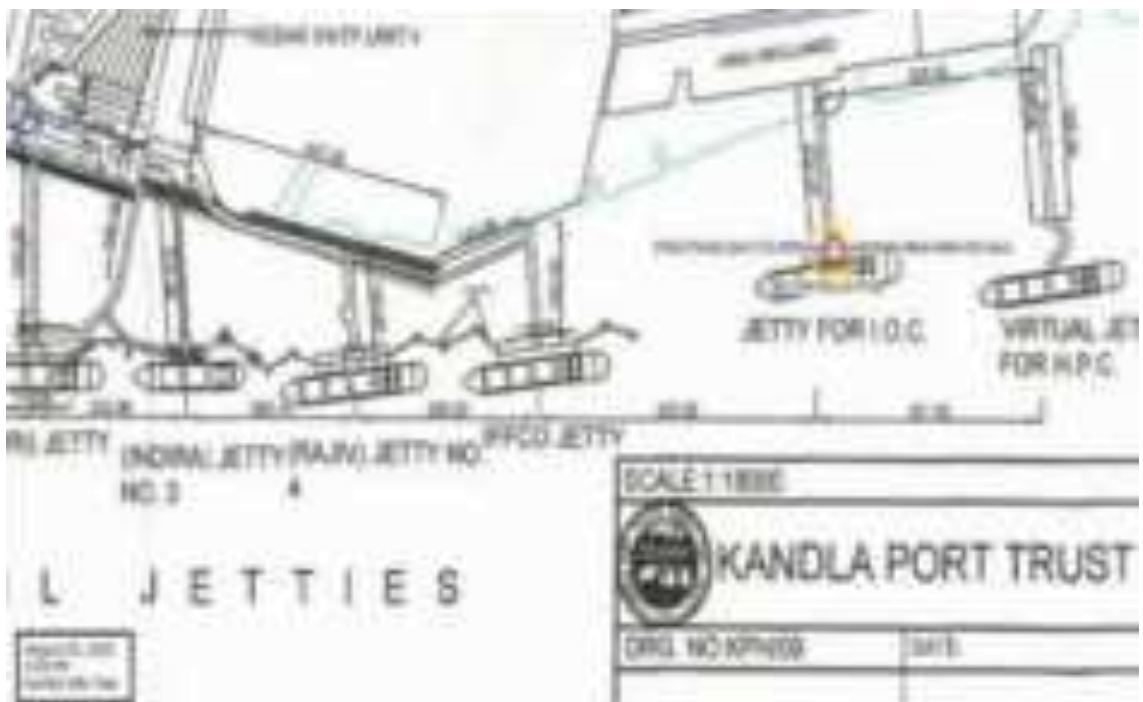
20.1.13.12 Evaporating Puddle – Overpressure (Contour)



20.1.13.13 Burning Puddle – Thermal Radiation (Graph)

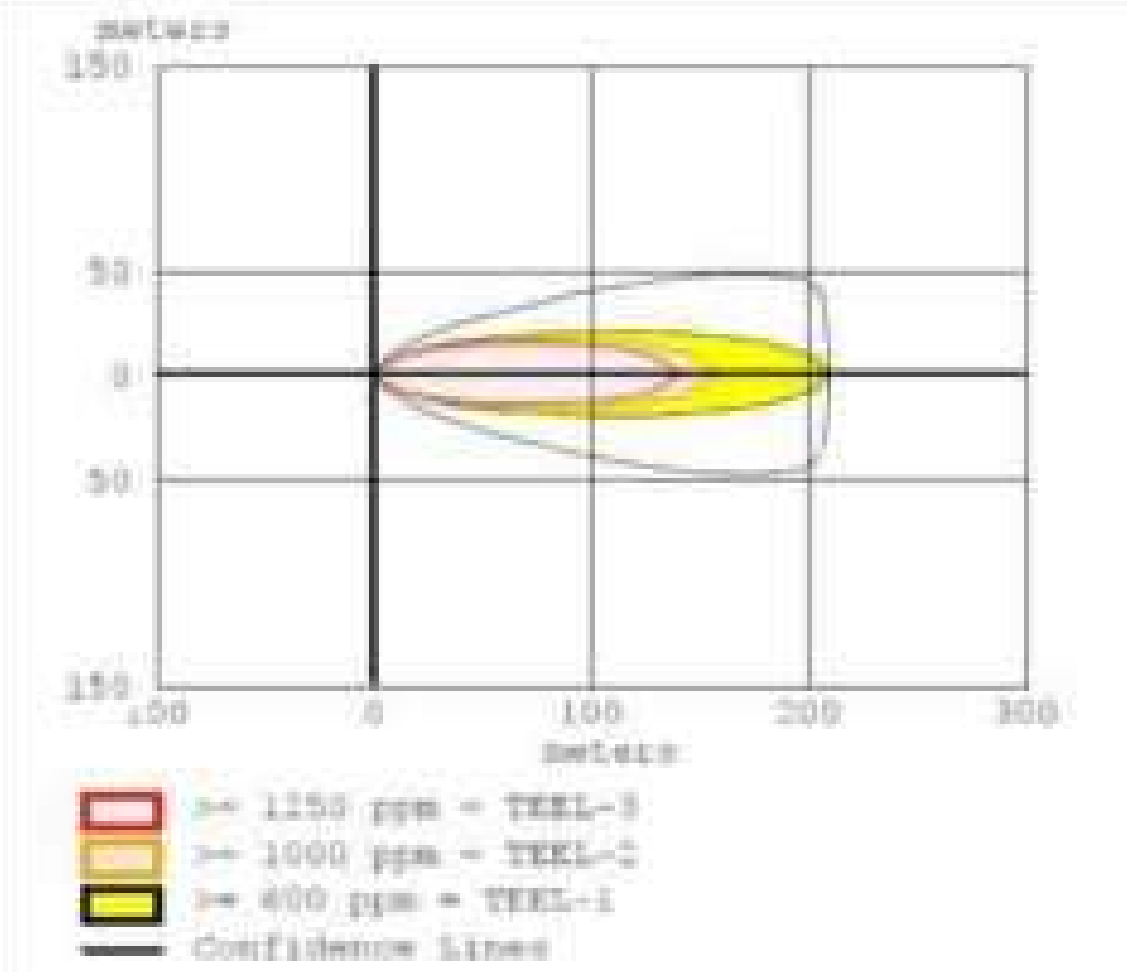


20.1.13.14 Burning Puddle – Thermal Radiation (Contour)



20.1.14 Jetty Six – Motor Spirit

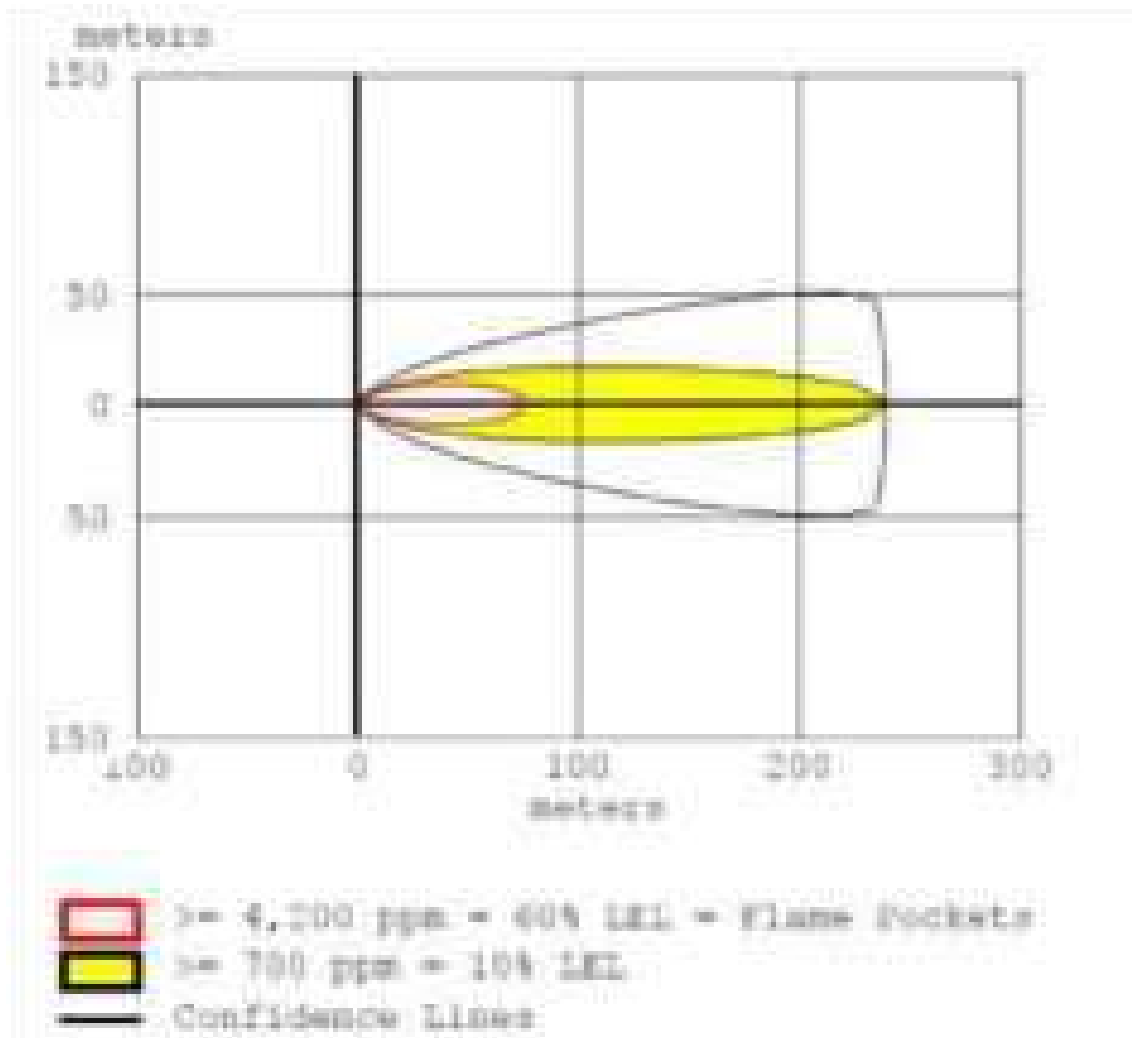
20.1.14.1 Instantaneous Release – Toxic Threat Zone (Graph)



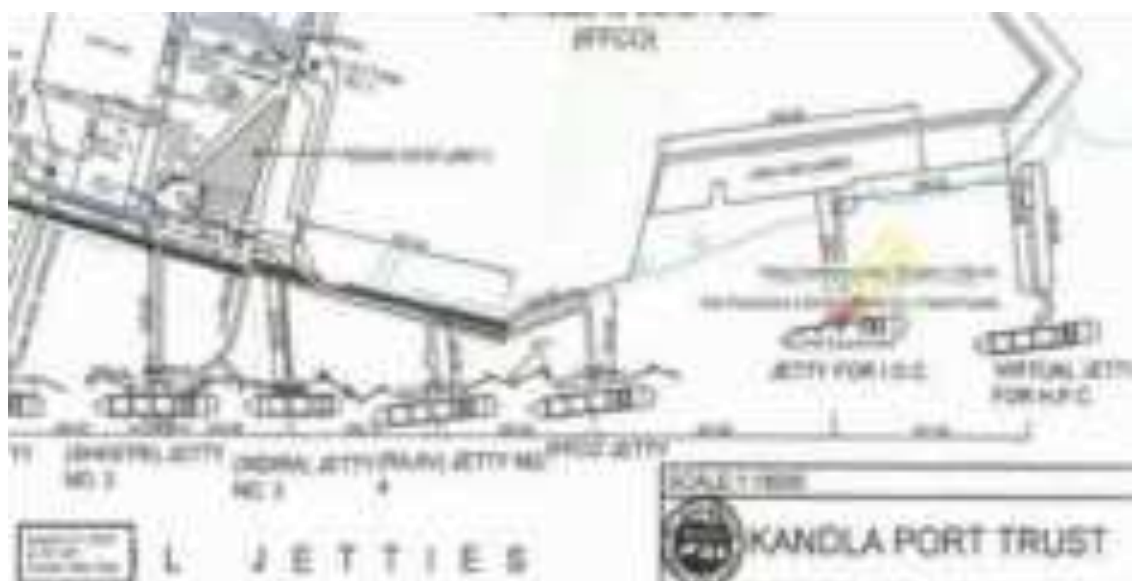
20.1.14.2 Instantaneous Release – Toxic Threat Zone (Contour)



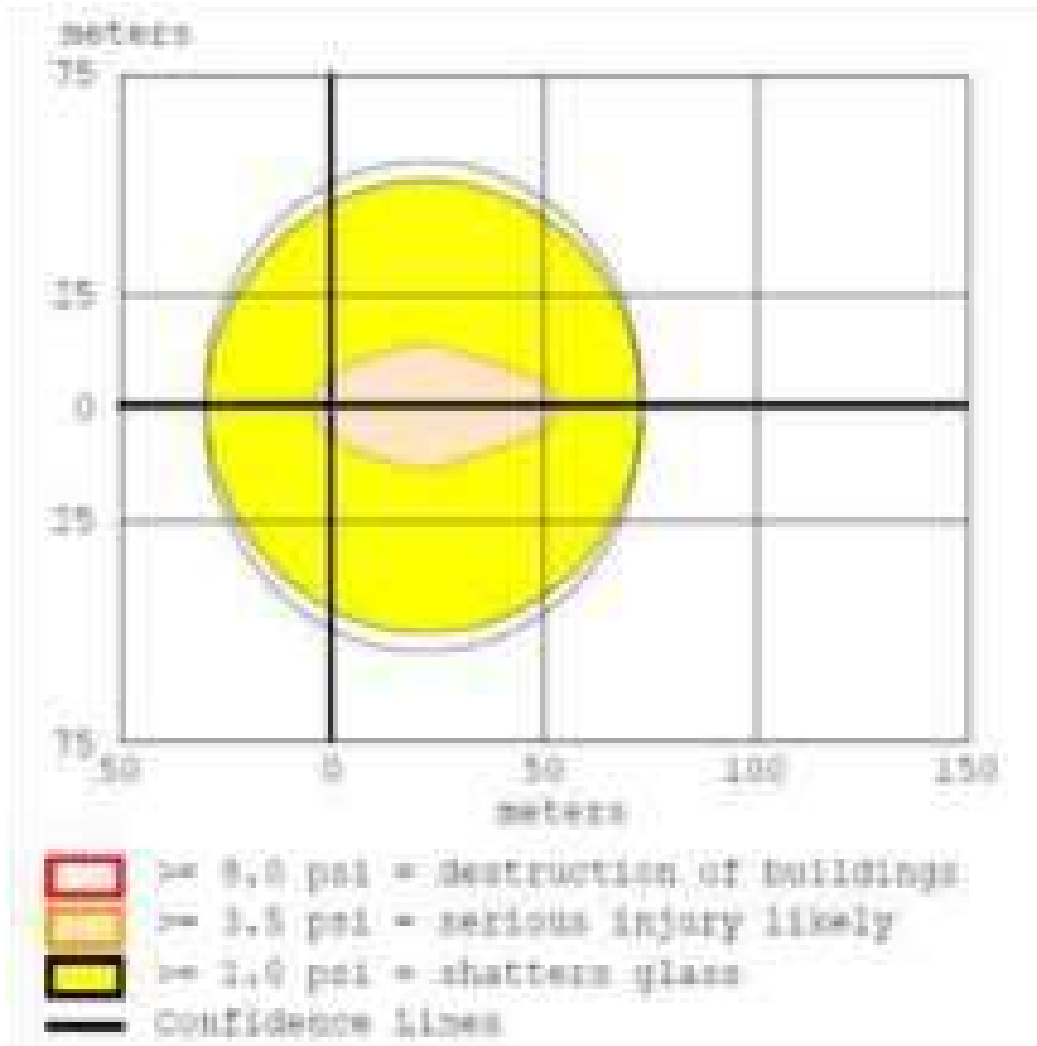
20.1.14.3 Instantaneous Release – Flammable Area of Vapor Cloud (Graph)



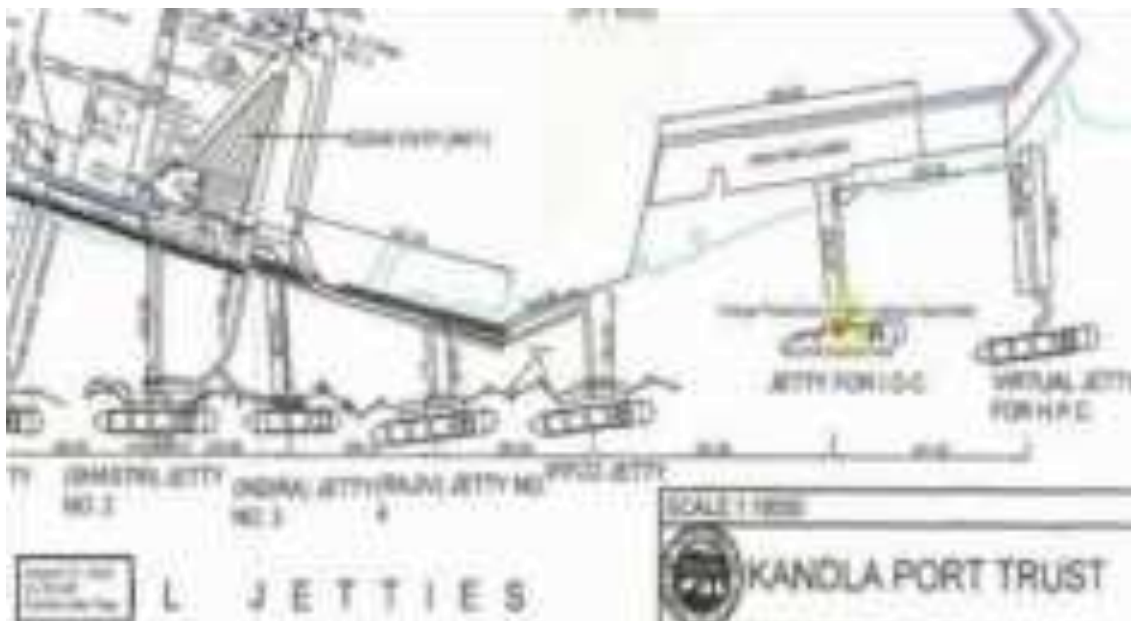
20.1.14.4 Instantaneous Release – Flammable Area of Vapor Cloud (Contour)



20.1.14.5 Instantaneous Release – Overpressure (Graph)



20.1.14.6 Instantaneous Release – Overpressure (Contour)



20.1.14.7 Burning Puddle – Thermal Radiation (Graph)

CBRN: Chemical Biological Radio Activity Nuclear related contingencies Dos & Donts

20 ANNEXURE Very useful telephone
numbers

NDMA CONTACT DETAILS

**NDMA Bhawan,
A-1, Safdarjung Enclave,
New Delhi - 110029**
Telephones:
+91-11-26701700
Control Room: +91-11-26701728
Fax: +91-11-26701729
E-mail: controlroom@ndma.gov.in

NDMA CONTROL ROOM

Name	Office	Fax	Mob.	E.mail id
Control Room	011-26701728 011-1078	011-26701729	9868891801 9868101885	controlroom@ndma.gov.in , ndmacontrolroom@gmail.com ,

GSDMA

- **Block No.11 , 5thFloor, Udyog Bhavan , Sector-11 , Gandhinagar,
Gujarat.**
- ***Email***

info@gsdma.org
- ***PHONE* +91-79-23259283**

21.1 Telephone Nos of Gujarat State District Collectors

No.	District	Collector Name	Phone	Fax
1	Ahmedabad (079)	Dr. Vikrant Pandey	(O)079-27551681	7927552144
2	Amreli (02792)	Shri Oak Aayush Sanjeev	(O)02792-222307	2792222710
3	Anand (02692)	Shri Dilip Kumar Rana	(O)02692-261575	2692261575
4	Arvalli (02774)	Shri Nagarajan M.	(O)02774-250200	2774250202
5	Banaskantha (02742)	Shri Sagale Sandip J.	(O)02742-257171	2742252740
6	Bharuch (02642)	Shri Ravi Kumar Arora	(O)02642-240600	2642240602
7	Bhavnagar (0278)	Shri Harshadkumar Ratilal Patel	(O)02782428822	2782427941
8	Botad (02849)	Shri Sujeet Kumar	(O)02849271301	2849271304
9	Chhotaudepur (02669)	Shri Sujal Jayantibhai Mayatra	(O)02669-233003	2669233002
10	Dahod (02673)	Shri Vijaykumar Lalubhai Kharadi	(O)02673-239001	2673239005
11	Dangs-Ahwa (02631)	Shri N.K. Damor	(O)02631220201	2631220294

12	Devbhumi Dwarka- Khambhaliya	Dr. Narander Kumar Meena	(O)02833232804	2833232102
13	Gandhinagar (079)	Shri S. K. Langa	(O)079-23220630	7923259040
14	Gir-Somnath- Veraval (02876)	Shri Ajay Prakash	(O)02876240001	2876243300
15	Jamnagar (0288)	Shri Ravi Shanakar	(O)02882555869	2882555899
16	Junagadh (0285)	Dr. Pardhi Sourabh Zamsingh	(O)0285-2630100	2852635599
17	Kachchh (02832)	Ms. Remya Mohan Moothadath	(O)02832250020	2832250430
18	Kheda (0268)	Shri S.B. Patel	(O)0268-2553334	2682553358
19	Mahisagar- Lunavada (02674)	Shri R.B. Barad	(O)02674-250664	2674250655
20	Mehsana (02762)	Shri H K Patel	(O)02762222211	2762222202
21	Morbi (02822)	Shri R. J. Makadia	(O)02822-240701	2822240701

22	Narmada-Rajpipla (02640)	Shri I.K. Patel	(O)02640222161	2640222171
23	Navsari (02637)	Dr. M. D. Modia	(O)02637-244999	2637281540
24	Panchmahal (02672)	Shri Udit Agrwal	(O)02672-242800	2672242899
25	Patan (02766)	Shri Anand Babulal Patel	(O)02766233301	2766233055
26	Porabandar (0286)	Shri M. A. Pandya	(O)0286-2221800	2862222527
27	Rajkot (0281)	Dr. Rahul Babubhai Gupta	(O)0281-2473900	2812453621
28	Sabarkantha (02772)	Ms Praveena D.K.	(O)02772-241001	2772241611
29	Surat (0261)	Dr. Dhaval Kumar Patel	(O)0261-2652525	2612655757
30	Surendranagar (02752)	Shri Kankipati Rajesh	(O)02752-282200	2752283862
31	Tapi-Vyara (02626)	Shri R.S. Ninama	(O)02626224460	2626221281
32	Vadodara (0265)	Ms. Shalini Agarwal	(O)0265-2433000	2652431093
33	Valsad (02632)	Shri C.R. Kharsan	(O)02632253613	2632243417

21.2 District Level Authorities

District Collector Office
Near Circuit House, Mandvi Road,
Nr. Mota Bandh,
Bhuj,
Gujarat - 370001

- +91 2832 250650
- +91 2832 250430
- collector-kut@gujarat.gov.in

Emergencies

District Helpline
Call : +91 2832 1077
District EOCs Helpline No.
Call : +91 2832 250650

Commissioner of Rescue & Relief
Call : 1070

Shri R. M. Thakkar

Dy. Mamlatdar Disaster

+91 2832 250923

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Upgraded Emergency Plan/ DMP for Kandla Port Gandhidham (Kutch)

MP Bhuj		252595	251177
Dy. Collector, Anjar Mob. 9825228049		243345	243363
Shri N. C. Rajgor Mamlatdar, Anjar +91 2836 242588 mam-anjar@gujarat.gov.in		242588	243362
Shri J. S. Sindhi (I/C) Mamlatdar, Gandhidham +91 2836 250270 mam-gandhidham@gujarat.gov.in		250475 250270	222875 250475

Collector, Jamnagar		2555869	2554059
Collector's Control Room, Bhuj. Mehul Padharia Kutch District Project Officer Officer 02832- 252347 09557920767 02832- 224150 mehul.nitb04@gmail.com District Project Officer Disaster Risk Management Program, District Emergency Operation Center(DEOC) , Emergency Operation Branch, Collector Office, Kutch		2252347 2231733 02832- 252347 09557920767 02832- 224150	-
Doordarshan, Bhuj		2251107	
Dy. Mamlatdar, Gandhidham		250475 250270	
Civil Defense, Gandhidham		220221	
PGVCL, Gandhidham		221728 222809	
GW&SB, Gandhidham		220975	
GSRTC, Gandhidham		220198	
Duty Officer, All India Radio, Bhuj		222503	
State Information Dept. (Shri Antani)		224859 250954	253034 252855
Air Force Duty Officer, Bhuj		252501 252502	
Air Force, Bhuj		223450	
Air Port, Bhuj		254550	
Aerodrome Officer, Kandla		238370	223247
Indian Navy, Jamnagar		550263 to 5	550825
Air force, Jamnagar		550245 to 7	550247

21.3 List of Telephone Numbers of Gujarat Maritime Board

Sr. No.	Name, Designation and place of Office	Tele. No. (Office)	Tele. No. (Residence)	Fax No.
1	Chairman, G'nagar	23250508 23250506		079-23250589
2	VC&CEO,Gandhinagar	23238363	23262280	23234703
3	Chief Nautical Officer, Gandhinagar	23238346-47		-do-
4	Chief Engineer(C), Gandhinagar	23238346		-do-
5	Officer on Special Duty, Gandhinagar	23238346	079- 2323232	-do-
6	Exe. Asst. to VC&CEO, Gandhinagar	3238363	7451465	-
7	Head Office, G'nagar	3238346 to 8	-	34703/04
8	Port Officer, Magdalla	0261- 2470533	-	2475645
9	Port Officer, Bharuch	02642- 241772	229082	220377
10	Port Officer, Bhavnagar	0278- 2519221	2568580	2211026
11	Port Officer, Jafrabad	02794- 245165		245152
12	Port Officer, Porbandar	0286- 2242408	2242412	2244013
13	Port Officer, Veraval	02876- 220001	242956	243138
14	Port Officer, Okha	02892-	262010	262002

		262001		
15	Port Officer, Jamnagar	0288- 2755106	2557163	2756909
16	Port Officer, Navlakhi Main Gate	02822- 220435		232470
17	Port Officer, Mandvi	02834- 220033	220040	230033
18	Traffic Inspector, Mundra	02838- 222136	222136	-
19	Executive Engineer(C), Jakhau	02831- 287261	222996	-
20	Gujarat Pipavav Port Ltd., Chief Operating Officer, Duty Office	02794286314 86001/92	286070	-
21	Gujarat Adani Port Ltd., Mundra.	02838- 288201 to 8	287241	-

21.4 For supply of Food Packets etc. following agencies to be contacted.

Sr. No.	Name of Agency	Contact Person	Telephone No.
1	Arya Samaj Mandal	Mr.Vachanidhi	231223 Mob. 9824221332
2	Agrawal Samaj	Mr.Dinanath	231638
3	RSS	Mr. Sunil Kothari	222560 / 232909
4	Lions Club, Gandhidham	Mr. Naresh Bulchandani	220212 Mb: 982428470

5	Rotary Club, Gandhidham	Mr. Rajabhai / P.K. Mukherjee	228213 / 232035
6	Red Cross Society	Dr. Bhavesh Acharya	234854, 232736
7	Lohana Mahajan, Gandhidham	Mr. Premji Bhai Thakker	220925
8	Rajasthan Yuva Mandal	Mr. Sunil Bajaj (President) Mr. Dilip Jain	221459 / 230902 234525 / 9825168170
9	Swaminarain Mandir	Mr.Lavjibhai Thackker	231555, 233666
10	Sindhi Youth Circle	Mr.Vijay Khubchandani & Mr.Kundabhai	220490
11	Satwara Samaj	Mr.Agavjibhai	235659
12	Sitaram Parivar	Mr.Mohanbhai Dharsi	222373, 234603
13	Gurudwara, Gandhidham		220643
14	Swaminarayan Gurukul	Swamimukta Prasadji	228098, 226555

21.5 Apart from the above, if required, the following hotels may be contacted for the supply of food packets:-

Sr. No.	Name of Hotel	Contact Person	Telephone No.
1	Shiv	Mr. Nagendra Singh / Mr. Bharat Singh	237712-13-14-15, 221297
2	Sharma Resorts	Mr. Madan Mohta / Mr. J. Gonasaives	31824/231823/231825/ 224885-86-87-88-89

3	Satkar	Mr. Babu Bhai Agrawal	234100/222597 234101 (R)
4	Natraj	Mr. Maulinbhai Acharya	221749/221956/221955 221954/238002
5	President	Mr. Rameshbhai	220053/229364/238002
6	K.K.Caterers	Kaniyalal Rajwani	(O) 227419, (R) 224995, (Mob) 9825226998
7	Bhawani Caterers	Mr. Hukamsinh Purohit	230366(PP)
8	Hotel Mid-Town, Adipur	Mr. Nagendra Singh	9825226568 260237/260080
9	Hotel Sea-Rock, New Kandla	Mr. Vithal Shetty	270490

21.6 List of Labour contractors operating at Kandla Port

Sr. No.	Name of the Company	Contact person	Address	Contact Nos
1	Neelkant Handling A/c Shree Radhey Shipping	Haresh Bupendra	Tenament B Plot 290, Ward 10/A, G'dham	237040 9825001743
2	Ratnakar Handling A/c Aditya Marine	Radhakishan Parida	83-84, GIDC G'dham	9879123371
3	Tirupati Handling Co.	Dayalal B. Rabari	6-8, Goyal Chamber, GIM	235504 9825056599

4	Al Pirani Al Sailani	Akbar Yakub	CS-10, Port Colony, Kandla	22053,232174 9979331100 9825787808
5	Shree Ravechi Handling A/c Trinity Shipping	Mahadeva Agaria	11,2nd Floor, Plot.343, Ward 12- B, GIM	250286 9825361347
6	Shree Ramdev Handling	Nimbaram Gulabji	377, Sector-7 GIM	9825348935 9979898564
7	AVB & Co	Mukesh Gujjar	15, GF, Gokul Park, GIM	232967
8	Ashapura Labour Supply	Khimji Jallabhai Rathod	48, GIDC, Near Ambika Weigh Bridge, GIM	9979053378 9898128069
9	Shree Krishna Handling	Harinder Yadav	E – 108, GHB ,Sec- 5,GIM	9879549803
10	Naasmin & Co	Umar Osman Chamadia	Plot – 14, Sector- 7, GIM	9898333397
11	M.S. Logistics	Asgar Haji Mungrani	Shop No. 5, Opp.CISF Gate,Kandla	9825241065 9913620407
12	Shree Majeesa Handling	Jugal Kishor Joshi	Block 24, MIG, Kidana, GIM	9879373992 9979898564
13	Shree Kailash Handling Co.	Mohanbhai Heera	Plot No. 7, Sector- 8, GIM	9825228555 9879288875
14	Javed Abu Saicha	Javed Abu Saicha Gani Patel	Shop – 13, Port Colony, Kandla	9825092748 9825563094
			Kandla	

15	Shree Ganesh Handling	Dayabhai Rabari	6-8, Goyal Chamber, GIM	9825056599
16	Bhupendra & Co	Mayur M Ahir	Plot 253, Ward 12/C, GIM	9727762191 9825225239

21.7 List of Doctors in Gandhidham Complex

Sr No	Name of Doctor	Telephone	Telephone	Mobile No
Consulting Physician (MD Medicine)				
1	Dr. Babita	261802	322111	
2	Dr. Gandhi C. K.	234561	230111	
3	Dr. Gonsair R. M.	230333	239944	
4	Dr. Johnson Samuel	222344	232244	
5	Dr. Morkahia V. L.	222008	232161	
6	Dr. Raiyani V. R.	230022	234214	9824241220
7	Dr. Sakaria S. B.	230114	230947	
8	Dr. Siju	230160	223852	
Dentist				
1	Dr. Asha Y. Parekh	234295	234451	
2	Dr. Ajay Bhimjiani	233347	260256	982544118
3	Dr. Chadotra M.	220142	237909	
4	Dr. Hitesh Sheth	226763	220965	
5	Dr. Kela B.V.	222094	231181	
6	Dr. Sanghvi V.K.	234979	223343	
7	Dr. Sharma R.	229211	227627	
8	Dr. Singh N.	230769	261343	

9	Dr. Soneta S.	236319	229172	
Dermatologist				
1	Dr. Jhala J.J.	223568	235567	
2	Dr. Deepak Sorathia	242882		9426909822
E.N.T. Surgeon				
1	Dr. Dave A.B.	221931 260394	260461	
2	Dr. Harani D.D.	222096	239121	9825227322
3	Dr. Khatri R.S.	222701	235959	9879195798
4	Dr. Maheswari S.K.	231874	250940	
M.B.B.S				
1	Dr. Acharya B.F.	220715	232736	9825210157
2	Dr. Acharya C.M.	220263		
3	Dr. (Mrs.) Acharya S.C	232606		
4	Dr. Agarwal B.B.	227767	570212	9825225599
5	Dr. Asher G.K.	239139	233765	
6	Dr. Bhadra D.M.		230259	
7	Dr. (Mrs.) Bhatia K.	260255		
8	Dr. C. Jonwal	220263	263987	
9	Dr. (Mrs.) Chellani	220099	270441	
10	Dr. Chudasama V.K.		240952	
11	Dr. Dasani M.G.	260001	261495	
12	Dr. Goswami S.K.	261399		
13	Dr. Guptabhaya D.N.	221305	231777	
14	Dr. Gurdasani V.S.	260674		
15	Dr. Harani H.C.	235369	239327	

16	Dr. (Mrs.) HitemathU.S.	261844	260097	
17	Dr.Joshi N.L.	260666	261661	
18	Dr. Kela H.V.	232069	232071	
19	Dr. Khushlani A.	260562	260738	
20	Dr. Leon A.	261802	262188	
21	Dr. Makwana	220263	263406	
22	Dr. Minocha Ravi	236306	232127	
23	Dr.Mehta H.K.	231590	235021	
24	Dr. Mehta J.R.	220164	220834	
25	Dr. Morbia V.M.	230011		
26	Dr. Parekh S.K.	260608	261123	
27	Dr. Puri R.P.	223355		
28	Dr.Rawal S.	235119		
29	Dr. Singh D.P.	221990		9825359928
30	Dr. Thakkar A. D.	220582	222829	
31	Dr. Thakkar H. M.	223506	222350	
32	Dr. Thakkar M. C.	260577		
33	Dr. Thakkar S. B.	221046 228267 221177	238467	
34	Dr. Vaccharajani N. D.	220088		
35	Dr. Vasudev Jethani	260577	261650	
36	Dr. Vora C. B.	223084		
37	Dr. Vadhwani Vjay	262076	262843	
38	Dr. Zola Mithubhai	260608		
39	Dr. (Mrs.) Raiyani P.V.	230022	234214	

40	Dr. (Mrs.) Singh R. D.	221990		
General Surgeon				
1	Dr. Ahir J. K.	237744		
2	Dr. Dasani D. G.	229231 227505	223346	
3	Dr. Gandhi R. G.	236700	229156	

4	Dr. Girdhani R. C.	233300	231219	
5	Dr. Jiladiya A.	220263	244844	
6	Dr. Joshi Y. V.	221557 230013	233324	
7	Dr. Naik S. K.	234333	231332	
8	Dr. Patel J .K.	230007		
9	Dr. Vora Chetan	224787	229369	9825225942

Obstetrician & Gynecologist

1	Dr. (Mrs.) Acharya N.B.	220715	232736	9825226700
2	Dr. Alpa D. Mehta	262599	265266	
3	Dr. Chandrakant Thacker	224488	225588	
4	Dr. Darshak Mehta	220263	265266	9824211534
5	Dr. (Mrs.) Gor A. A.	235135	239635	
6	Dr. Khanchandani	260833	260839	
7	Dr. (Mrs.) Kaur J. P.	229655	220673	
8	Dr. (Mrs.) Naik P. S.	234333	231332	
9	Dr. (Mrs.) Patel M. H.	230202	230353	

Ophthalmic Surgeon

1	Dr. Gor A.	235135	239635	
2	Dr. Masand S. N.	220139	234187	9825196989

3	Dr. Parikh Y. B.	234295	234451	
Orthopedic Surgeon				
1	Dr. Hotchandani	220039	261530	
2	Dr. Patel H. A.	230202	230353	
3	Dr. Sailesh Ramawat	230160		
4	Dr. Vachhani P. S.	230400	222400	
Pediatrician				
1	Dr. Dubal J. A.	232591	233777	
2	Dr. Jeswani R. M.	255689		9825229249
3	Dr. Majithiya M. S.	222413 222406	227134	
4	Dr. Rupesh Seth	260836	222397	
5	Dr. Naveen Thacker	230195	230894	
6	Dr. Nitin Thacker	221046	220615	
Pathologist				
1	Dr. Sukla K. L.	221611	234062	
2	Dr. (Mrs.) Pawde S. V.	230370	231352	
3	Dr. (Mrs.) Verma G. H.	229168	238386	
Psychiatrist				
1	Dr. Barot S.	221041	234885	
Radiologist				
1	Dr. Shah R. M.	222878 234215	222868 235868	
2	Dr. Bhupendra Shah	572824	227724	

21.8 List of Essential Services

HOSPITALS	OFFICE	RESIDENT
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1	General Hospital, Bhuj Civil Surgeon, Bhuj	222850	250554
2	Referral Hospital, Anjar	232455	
3	Rambaugh Hospital Gandhidham	220263	
4	Divine Life, Adipur	261802	
5	Railway Hospital Gandhidham	231874	
6	Government Dispensary dipur	260608	
TELECOMMUNICATION			
1	General Manager, BSNL, Bhuj	253000	252322
2	Dy. Manager, Bhuj	252505	251505
3	Area Manager, Gandhidham	238000	235000
4	SDO, Gandhidham	236250	236251
ELECTRICITY			
1	S.E., PGVCL, Bhuj	222550	250189
2	Jr. S.E., Anjar	243008	242656
3	XEN, Anjar	242845	242446
4	Dy. Engineer, Gandhidham	222809	--
5	Line Office, Gandhidham	221728	
WATER SUPPLY			
1	S.E., GWS&SB, Bhuj	221806	250601
2	XEN, Bhuj	250685	253016
3	SE, Anjar	242416	242421
4	XEN, Gandhidham	220717	223273
5	Control Room, Gandhidham	221252	

6	Water Tank, Sunderpuri	231313	
7	Water Tank, NU-4	654564	
8	Gandhidham Municipality	231610	
9	Chief Officer, Gandhidham Municipality	234967	

21.9 List of Vehicle Suppliers

Sl. No	Name of Institution	Contact Person	Parking Place	Name and Phone No.	Availability
				Phone No.	of Driver Vehicle.
(A) Vehicle Hire Contractors					
2	M/s Rohit Enterprise /RISHABH ENTERPRISE	Mr. Rohit Shah 228550/237538 237547 (O) 234140 (R) Mob.982522512 1			
3	M/s Jai Somnath Travels (GIM)	Mr. Mishra Mob.982538673 9			
(B) Ambulance Pool					
01	St. Joseph Hospital, Gandhidham	Administrator 230160/229336	Hospital Premises	Driver available round the clock	First come first serve

02	IFFCO-Kandla on contract, Dispensary No. 20164 Dr. Mehta (R) 220832 Plant. Dispt. 270832	Mr. Mukesh Agrawal Hotel Gokul 221311			First come first serve
03	Kandla Salt Mfg. Ass. Neelkanth Bldg.	Mr. Shamji Ahir 231485 (R) 222765/220421 (O)	Zanda Chowk	Driver available round the clock	First come first serve
04	Zhulelal Mandir Trust	Mr. Kundan Guwalani 221760 (R) 229800 (O) Kundan Stores 221533/227800 229580	Mandir Premises	255580	
05	Red Cross Society	Dr. B F Acharya 225636/230345	Red Cross	Driver available round the clock	
06	Western Railway, Gandhidham	Medical Supdt. 231874 (R)	Hospital		
07	Rambaugh Government Hospital	220263	Hospital Premises	Driver available round the clock	
				clock	

08	Gautam Frei Pvt Ltd.		Mr. Ramesh Proprietor 232605/220163, 230345 (O)	GIDC Work shop Sector10C, Plot No. 24.		First Come First Serve
09	Sindhu Sewa Trust, Samiti Adipur		Mr. Jotwar (R) 260836, 260698 TBX-45, Adipur	Hospital Premises	Driver round the clock residence in hospital (Break duty at present)	
10	Tolani Eye Hospital		1. Supd (O) 260497 (R) 260773 2. Vic Chairman (C 260373 Mr. N Chandnani (R) 260456, Prabhu Chaya, Behind Prabhu Darshan	Hospital Premises	One driver in absence of compounde r residi ng in hospital	First Come first Serve
11	Divine Life Society, Adip		261802	Hospital Premises	Round the clock	
12	Atmaram Severam Charitable Trust		237759 9825225294	Mok Gandhid ham	Round the clock	
13	Dev Smru Trust		222096/231073			

14	Mobile Morgue	229430/239965	Lions Club		
15	Shav Vahini/Mobile Mrogue	239965			

21.10 List of Clearing & Forwarding Agents at Kandla

A V Joshi & Co Tel. 232605, 232227, 230345	C. Jivram Joshi & Sons (Gujarat) Tel. 220621 Fax. 231141
Fax. 233924 Mr. Harshandu Mr. Vaidya (Mob.) 9825226013	Mr. Sunil Chowdhari (Mob) 9825225400
ACT Shipping Ltd Tel. 270111/12/13, 270530, 220407 Fax. 270579, 232175	Cargo Movers Tel. 220453, 230883, 270563 Fax.231687
A. Jaswantrai & Co. Tel. 222630, 222717, 222145, 221943 Fax. 232308, 270385	Cargo Clearing Agency (Gujarat) Tel. 221721, 221674, 220655, 270542 Fax. 233034
Asia Shipping Services Tel. 230954. Fax. 231285	Chinubhai Kalidas & Brothers Tel. 232284 Fax. 231881
Airol Shipping Services Tel. 230080, 220180. Fax. 236131	CAP Shipping Pvt Ltd Tel. 221460, 232081 Fax. 233734
Aarpee Clearing Agency Tel. 222614. Fax. 255252	Centrans Shipping Agency (I) Pvt Ltd Tel. 256854 Fax. 234074
Ashirwad Clearing Agencies Tel. 232426, 233245 Fax. 234107	Cargo Shipping Tel. 270802, 270803 Fax. 270802
Ambalika Enterprises Tel. 255382. Fax. 255577	C. Joshi & Sons Tel. 221094

Ashmka Shipping (Tel. 222481)	Dilip A Goplani Tel. 224082, 255423 Fax. 224082
Ashis Enterprise (Tel. 234722)	D.B.C. & sons Gujarat Pvt Ltd Tel. 270263, 270348, 270503 Fax. 270631
Anchor Shipping Tel. 235781 Fax. 235781	Damjidhiroo & Sons Tel. 222329, 221328 Fax. 230139
B N Thakkar & Co., Tel. 222293, 222285, 270239 Fax. 230556	Dvji Premji Punara & Sons Tel. 222057, 221338 Fax. 230139
B. Devchand & Sons Pvt Ltd Tel. 232220 Fax. 234014	Express Transport Pvt Ltd Tel. 220193, 220179, 270591, 222565 Fax: 220193
Benits Forwarders Pvt Ltd Tel. 221707, 222086 Fax. 223151	Friends & Friends Shipping Pvt Ltd Tel. 232227, 231588 Fax. 233924
Blue Sea Shipping Agencies Tel. 235317 Fax. 255221	Fast & Fair Company Tel. 255254, 238175 Fax. 255254
Bhanu Clearing Agency Tel. 256861 Fax. 256861	Flamingo Shipping & Forwarding Pvt Ltd Tel. 256755, 257756 Fax. 256755
Global Marine Agencies Tel. 222928, 223196, 223252 Fax.255418	Liladhar Passoo Forwarders Pvt Ltd Tel. 252288, 252297, 252402, 252617 Fax. 252383
Gayatri Shippers Tel. 230692, 223292 Fax. 230818	Lalbahi Trading Company Tel. 222139
Hiral Enterprise Te. 255644	Leap Forwarders Pvt Ltd Tel. 255530, 255509 Fax. 252383
Hindustan Shipping services Tel. 255644, 222821 Fax. 256618	Link International Tel. 255206/07 Fax. 255530

Hardip Shipping Logistics Pvt Ltd Tel. 232909, 222560 Fax. 232909	Lexicon Shipping Agencies Pvt Ltd Tel. 229951- 53 Fax. 229949/50
Hansraj Pragji & Sons Tel. 221650, 255228 Fax. 255228	Logistics Enterprise Pvt Ltd Tel. 255157, 255458 Fax. 255520
H K Dave Pvt Ltd Tel. 221504, 2333632 Fax. 230411	Mathuradas Narndas & Sons Forwards Pvt Ltd, Tel. 252224, 252350, 252115 Fax.252221
Intralink Clearing & Forwarding Tel. 255188 Fax. 23148	Magal Singh & Company Tel. 224030, 255253, 234688
J M Baxi & Co. Tel. 270630/35, 270148/50, 270525 Fax. 270616	Meridian Shipping Services Tel. 233981, 255362 Fax. 230701
Jesia Mistry Agencies Pvt Ltd Tel. 222317, 223317	Megha Shipping Agency Tel. 222671, 255304 Fax. 230937
Jaisu Shipping Company Pvt Ltd Tel. 270428, 270128/538 Fax.270556	Mayur Forwarders Pvt Ltd Tel. 222671, 255304 Fax. 230937
Jivanlal Laloobhai Tel. 220308, 230530 Fax. 231640, 233803	Maritime service Pvt Ltd Tel. 222671, 255304 Fax. 255304
Krishna Clearing Agency Tel. 223813, 230501 Fax. 233135	Marathon Shipping Combine Tel. 222202, 230106 Fax. 255220
Kiran Roadlines Tel. 232297, 231984, 234108 Fax.231422	Shiv Shipping Service Tel. 255568 Fax. 22256
Kandla Clearing Agency Pvt L td Tel. 232337, 223211, 223210 Fax.230402	Narendra Forwarders Pvt Ltd Tel. 232504, 231795 Fax. 256678
Kamat & Co. Tel. 223471, 232730, 232729 Fax. 255243, 270779	Natwar Parikh Industries Ltd Tel. 232628 Fax. 232628

K S Chaya & Co Tel. 256604 Fax. 230693	New Dholera Shipping & Trading Company Limited. Tel. 222637 Fax. 255329
Kashyap Shipping Ltd Tel. 220816 Fax. 230030	National Shipping Tel. 232319 Fax. 232319
Kanak Shipping & Transport Tel. 231314, 230543, 222059 Fax.221702	Navjeevan Enterprise Tel. 252611, 252360 Fax. 252515
IEE & Muirhead Pvt Ltd Tel. 231535/36 Fax. 231018.	N. G. Bhanushali & Company Tel. 233648, 256791 Fax. 256879
OTA Kandla Pvt Limited	Shivji Kanji & Company

Tel. 220145, 223241, 270450 Fax.223241	Tel. 230127, 223728, 223729 Fax.220308
Pravin Bhatt & Sons Tel. 224032, 230079 Fax. 230079	South India Corp. (Agencies) Limited Tel. 234646, 231494, 221276, 255209 Fax.234416
Prime Forwarders Tel. 234047, 232505 Fax. 231345	S J Thacker & Company Tel.255678,221745 Fax.230659
Purshotam Ramjee & Company Tel. 220354, 222287 Fax. 231754	Star Shipping Services Tel.255424,255425,235326(F)255426
Patel Handling Agency Tel. 221718, 224024, 231004, 270017 Fax. 231143	Shivani Shipping, Tel. & Fax.256836
P S Bedi & Company Tel. 223201, 222841 Fax. 255494	Sea Trans Shipping Agency Tel. 255564 Fax. 233228, 233517
Purshotam Chtrabhuj Thacker Tel. 222720	Seaster Shipping Services Tel. 255349 Fax. 232719
Prashant Shipping Tel. 255306, 223927 Fax. 223927	Seaway Shipping Services Tel. 234272 Fax. 232719

Pramukh Forwarders Tel. 255400 Fax. 232602	Star Clearing Agencies Tel. 230273, 255529, 222983 Fax.232719
P M Agency Pvt Ltd Tel. 232553, 233973, 236414 Fax.255413	S S Shipping Agencies Tel. 236605, 238283 Fax. 236605
Raj Shipping Service Tel. 233948, 232402 Fax. 231395	SPN Shipping Services Tel. 222453, 270733 Fax. 236605
Rajesh Shipping Service Tel. 255444, 255450/52, Fax.255151	Sierra Shipping Pvt Limited Tel. 255395 Fax. 232771
Rudra Shipping Service Tel. 220429, 255317 Fax.255317	Sonal Enterprises Tel. 252666, 252053
Rishi Shipping Tel. 220813, 229830, 2555661/2/3 Fax. 238943, 255522 Mr. B K Mansukhani (M)9825225170	S R Clearing Agency Tel. 232974, 255494 Fax. 255494
Rudraksh Shipping Service Tel. 235937 Fax. 255582	St. John Freight System Limited Tel. 235414, 236444 Fax.235414
Sanghvi Freight Forwarders Pvt Ltd Tel. 234993, 234995, 222401 Fax.230508	Siddi Shipping Services Tel. 232356, 230268 Fax.256712
Sri R K Shipping Pvt Ltd Tel. 232028, 231940, 231936 Fax. 232740	Spalsh Shipping Pvt Limited Tel. 255562, Fax. 220710
Shakti Enterprises Tel. 223531, 221591 Fax. 233898	Thakarshi Madhavji & Sons Tel. 255457, 255458 Fax. 221770
Shree Ambica Commercial Company Tel. 220213, 221253	Trinity Shipping & Allied Services Pvt Ltd Tel. 223703, 230911 Fax. 232060

Shri Maruti Shipping Services. Tel. 270760, 256853, 233245 Fax.220308	Tokto Shipping Services Tel. 234040
Unity Shipping Tel. 255271	Vinson Tel. 220466 Fax. 231948
Umiya Shipping Agency Tel. 255640 Fax. 233625	Vaz Forwarders Ltd Tel. 235317 Fax. 255221
Unique Forwarders Tel. 230080, 255417 Fax. 236131	Varsh Shipping & Travels Tel. 222386, 255300 Fax. 255300
V. Arjoon Tel. 221049, 221335, 222058, 223307 Fax. 234167	Venus Clearing Agency Tel. 233960 Fax. 233362
Velji Dosabhai & Sons Tel. 270220, 270025, 221818, 231423 Fax. 270164, 232363	Vishal Shipping & Handling Tel. 223960 Fax. 233362
Vishvajyoti Enterprises Tel. 252381, 252318 Fax. 253091	Worldwide Cargo Care Pvt Ltd Tel. 221290, 221479, 220307, 230217 Fax. 231913
Velji P & Sons Tel. 255327, 231545, 231546, 270976 Fax. 255328	Zenith Trade Link Tel. 223193 Fax. 255522
Vailash Transport Co. Tel. 233579, 223580	

21.11 Surveyors at Kandla

Adnuralty Marine Services Tel. 235412, 256813 Fax. 256813	Marine Consultants & Surveyors Pvt Ltd Tel. 255293 Fax. 234416
Capt. S. Kochar & co. Tel. 222247, 221084 Fax. 231357	Murray Fenton (India) Surveyors Limited Tel. 235960, 236238 Fax. 233335

Dr. Amin Superintendents & Surveyors Pvt Limited, Tel. 221520, 235636 Fax. 226527	M. M. Cargo Gear & Marine Surveyors Tel. 231385 Fax. 235255
Det Norske Veritas (DNV) Tel. 232712	M.B.S. Surveyors Tel. 256782
Geo-Chem Laboratories Pvt Limited Tel. 221841, 222179 Fax. 233743	Navark & Mareng Surveyors & Consultants Tel. 232123, 233270
G. P. Dave & Sons Tel. 234288 Fax. 234382	S.G.S. India Limited Tel. 221857, 238047, 231869 Fax.232883
Gupta & Associates Tel. 222542 Fax. 222542	S. K. S. Surveyors Assessors Tel. 220555
Inspectorate (India) Consulting	Seascan Surveyors Pvt Limited
Engineering Pvt Limited Tel. 221520, 235636 Fax. 255217	Tel. 221833, 233639, 221627 Fax. 233639
Indian Register of Shipping & Indian Register Quality System Tel. 238623, 233695 Fax. 233695	Sterling Surveyors Tel. 230216 Fax. 230216
Iteng Engineering Tel. 221520, 255429 Fax. 255247	Technomar Surveyors Pvt Limited Tel. 221966
J B Boda Surveyors Pvt Limited Tel. 231801, 231946 Fax. 231693	TCRC Surveyors Tel. 220862, 230050 Fax. 230050
Lloyds Register of Shipping Tel. 234068	Uni Lab (India) Surveyors and Superintendents Tel. 255503
Mitra S K Pvt Limited Tel. 222648	Universal Cargo Inspection Agencies Tel. 222542

Metcalfe Hodgkinsons Pvt Limited Tel. 220940, 221740, 233707, 221845 Fax. 231629	U Marine (India) surveyors Tel. 220070 Fax. 233228
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ANNEXURE-I**PARTICULARS OF THE ACTION PLAN COMMITTEE MEMBERS**

Sr. No	Name	Desgn.	Telephone Nos.			
			Office	Resi.	Fax	Mobile
1	Mr SANJAY MEHTA, IFS	Chairman	233001 234601	233002	235982	
2	Mr.	Deputy Chairman	234121	234218	236323	
3	Capt. T. Srivnivas	Dy. Conservator	233585	232806	233585	98252 32982
4	Mr. A. Krishnan	Dy. FA & CAO	220214	223854	-	98252 27036
5	Mr. R. V. Rajwani	Dy. FA & CAO	221648	226112	-	98793 70975
6	Mr. AJAY GUPTA	Sr. DD (EDP)	239623	234116	-	98252 27095
7	Mr. Bimal Kumar Jha	Secretary	220167	231939	233172	81410 84794
8	Mr.	Sr. Dy. Secy	220033	234730	-	98252 27480
9	Mr. Suresh Balan	Dy. Secretary	221375	236086	-	98252 27044
10	Mr.	Sr. Astt. Secy	221679	-	-	82380 37207
11	Mr.	SE(H) and OSD(Estate)	270429	235683		98252 25963
12	Mr. Y. K Singh	Personnel Officer	223828	228584		98252 27079
13	Mr.	Traffic Manager				
14	Mr. S. Krupanand Swamy	Sr. Dy.TM	270270	235100		98252 27049
15	Mr. Shankar Jivaji	Deputy TM	270324	234918		94264 51554
16	Mr. D. N. Sondhi	FA & CAO	233174	-	233174	98252 14726
17	Capt. S. K. Pathak	Harbour Master	270201	231310		98258 03499
18						
19	Mr. Sunil Kumar	Flotilla Supdt.	270280	226121		78746 27756
20	Mr. K. Varughese	FCSO	270176/ 78	227512	270176	98252 27041

21	Mr. SSP PATIL	Chief Engineer	233192	228777	220050	98252 27243
22	Mr	C.M.E.	270632	231043		
23	Mr.	Dy. CME	270426	226067	270184	98252 35196
24	Mr. N M Parmar	DY CHIEF ENGINEER	270787	252624		98252 27046
25	Dr. Kalindi Gandhi	Chief Medical Officer	225767 220072	225555	232288	98256 11208
26	Dr. Mahesh Bapat	Sr. MO	234598	228167		96876 07528
27	Shri CHAUDHRI	Sr. Commandant CISF	271037	229140	271037	98252 27282

THE TELEPHONE NUMBERS OF SOME OF THE VIPS

Sr. No.	Name and Designation	Fax / Mobile	Telephone (Office)	Telephone (Resi)
1	District Collector, Bhuj	02832-250430	250020	250350
2	Resident Add. Collector, Bhuj	250430 9978405099	250650	
3	Superintends of Police, Bhuj,	99784 05073	250444 250250	250850
4	Asstt. Supdt. Of Police, Bhuj		253405	250850
5	Dy. Collector, Anjar	99784 05079	243345	243345
6	Mamlatdar, Anjar		242588	243362
7	Mamlatdar, Gandhidham.	75670 03975	250475 250270	222875 250475
8	Traffic Manager, IOC	234396	231871	236442
9	Air Force Commander, Jamnagar		2550245	-
10	Collector, Jamnagar		2555869	2554059
11	Commandant, BSF, Gandhidham		223845	
12	Mrs. Vinod Chawda, MP, Kachchh	02832 - 225466 9825905467		
13	Mr. Vasan Ahir, MLA, Anjar	9825025148		
14	Dr. Nimaben Acharya, MLA, Bhuj	9825226700	220715	
15	Mr. Rameshbhai Maheshwari, Gandhidham	9909910619		
16	Mr. Tarachand Chedda, MLA, Mandvi	9825225394		
17	Mr. Pankaj Mehta, MLA, Rapar	9825227883		
18	Mr. Shaktisinh Gohil,	95865 58120		

	MLA, Abdasa,			
19	Kum. Tulsi P. Anandani, SRC	260401	260404 260811	260631
20	Civil Surgeon, GK Gen. Hospital, Bhuj		222850	

ANNEXURE -III**IMPORTANT TELEPHONE NUMBERS OF
INDIAN METEOROLOGICAL DEPARTMENT**

Designation	Address	Office	Resi.	Fax
Director General	Mausam Bhavan, Lodi Road, New Delhi.	011- 24611842	011- 24633692	011- 24611792
		011-		011- 24619167

D.D.G.M. (C.W)	-do -	24611068		
D.D.G.M. (WF)	Met Office, Simla Office, Pune	020- 25535886	020- 25884104	020- 24623210 25893330 25535201
D.D.G.M.	RC Colaba, Mumbai	022- 22150517	22150417	
Director (ACWC)	-do-	022- 22150405	022- 22150452	
Director (I/c)	Met Center Ahmedabad	079- 22865012 22867206		079- 22865449
Met I/C	MET Centre, Ahmedabad	22861413		
Dr. Jayanta Sarkar,	Director I/C.	22865165, 22867657		

Websites

www.imd.emet.in

www.imdmumbai.gov.in

DISASTER MANAGEMENT CELL

Chief Executive Officer,
 9978407002(M), 079-3259276(O)
 079-23254900(R)
 079-3259248(FAX)

ANNEXURE-IV**TELEPHONE NOS. OF STATE MINISTERS**

Sr. No.	Name and Designation	<u>Telephone Numbers</u>		
		Office	Residence	Mobile / Fax
1	Mrs. Anandiben Patel, Hon'ble Chief Minister, Block No.1, 5th Floor, Sachivalaya, Gandhinagar	O) 079 - 23232611- 19	(R) 079 - 23222020	(F) 079 - 23222101
2	Mr Babubhai B. Bokhiriya, Minister for Agri., Animal husbandary. Fisheries	079 - 23238109		079 - 23250133
3	Shri Sankarbai Chaudhry Min. for Health & Family Welfare and Transport	079 - 23250193		079 - 23250145
4	Shri Ramanlal Vora Min. for Social Justice and Empower	079 - 23238078		079 - 23257973

	Department			
5	Shri Mangubhai C. Patel Forest and Environment, Tribal Development.	079 - 23250113		079 - 23250306
6	Shri Bhupendrasinh Manubha Chudasma, Education, Food and Civil Supplied.	079 - 23243389		079 - 23250120
7	Mr Saurabhai Patel, (Finance, Energy and Petrochemicals, Salt Industries, Tourism)	079 - 23238152	23250625	079- 23250215

OFFICIALS

Sr. No.	Designation	office		Fax
01	Chief Secretary, GAD	23220372		23250305
02	Principal Secretary, GAD	23250016		23222101
03	Addl. Chief Secretary, Port & Road Transport	23250506		23252132
04	Principal Secretary (Industries & Mines)	23250701		23250844
05	Principal Secretary (Labour & Employment)	23250871		
06	Addl. Chief Secretary (Home)	23250701		23250844
07	Principal Secretary (Energy & Petro-chemicals)	23250771		23250797
08	Principal Secretary (Finance)	23220286		
09	Principal Secretary (Revenue)	23251603		23251325

10	Principal Secretary (Education)	23251301		23251325
11	Chairman, GMB	23238346	23249356	

ANNEXURE - V**TELEPHONE NOS. OF GUJARAT STATE DISTRICT COLLECTORS**

Sr. No.	District	Office	Residence
1	Ahmedabad	27551681	22863595
2	Amreli	222307	222301
3	Anand	242871	261000
4	Banaskantha	257171	257007
5	Bharuch	240600	223701
6	Bhavnagar	2428822	2568866
7	Dahod	221999	221888
8	Dang	220201	220202
9	Gandhinagar	23220330	23254884
10	Jamnagar	2555869	2554059
11	Junagadh	2651202	2650203
12	Kachchh	250020	250350
13	Kheda	2550856	2556700
14	Mehsana	222200	253565
15	Narmada	222162	222161
16	Navsari	244999	246000
17	Panchmahal	242800	242900
18	Patan	233301	233300

19	Porbandhar	2243800	2243801
20	Rajkot	2463900	2172900
21	Sabarkantha	241001	223001
22	Surat	2471121	2471416
23	Surendranagar	282200	282201
24	Vadodara	2433000	2313131
25	Valsad	253613	253060
26	Vapi	224400	220221

Control Room (Earthquake, Gandhinagar):

3251914 / 3251910 / 3240339 / 3240303 (Fax)

ANNEXURE – VI

GUJARAT STATE DISASTER MANAGEMENT AUTHORITY
TEL. NOS OF SENIOR OFFICIALS

Sr. No.	Name and Designation	Office	Residence	Mobile
1	Dr.Ranjit Banerjee, IAS, Chief Executive Officer, GSDMA	079-3259276 Fax.0793259248		9978407002
2	Mr V.Thirupuzzah,IAS, Addl. CEO, GSDMA	079-3259502 Fax.0793259275	079- 6309273	9825095148
3.	Mr. H.N. Gamit,IAS, Director(Admn.)	079-3259278		9978407005

ANNEXURE –VII

DISTRICT LEVEL AUTHORITIES (EAST)

Name and Designation of Officer	Fax	Telephone Nos. (Office)	Telephone Nos. (Residence)
District Collector, Bhuj. 9978406212	250430	(02832) 250020	02832- 250350
Resident Add. Collector, Bhuj Mob.9978405099	250430	250650	
Mr. Deepakkumar Menghani (IPS) S. P.-(Purab),9978405690		280233	
Mr. C.R. Kotad, GPS Dy. SP (Anjar)9825304239	243254		
Mr. D.R. Agrawat(GPS) Dy. SP(HQ)9825225071			
Mr. Chirag Patel,(GPS) Dy. SP.9824543004	0837- 224040		
Control Room(DC-5)Purab	280287		
Mr. Vinod Chawda, M.P.,Kachchh		(m)	
Dy.Collector, Anjar Mob. 9825228049		243345	243363
Mamlatdar, Anjar Mob. 9879278174		242588	243362
Mamlatdar, Gandhidham 7567003975		250475 250270	222875 250475
Collector, Jamnagar		2555869	2554059
Collector's Control Room, Bhuj.		2252347 2231733	-
Dy. Mamlatdar, Gandhidham		250475 250270	9427719800
Civil Defence, Gandhidham		220221	

PGVCL, Gandhidham		221728 222809	
GW&SB, Gandhidham		220975	
GSRTC, Gandhidham		220198	
Duty Officer, All India Radio, Bhuj		221412	
State Information Dept. (Shri Sony) (m) 9879012714		224859 250954	253034 252855
Air Force, Duty Officer, Bhuj		252501 252502	
Air Force, Bhuj		223450	
Air Port, Bhuj		254550	
Aerodrome Officer, Kandla		238370	223247
Indian Navy, Jamnagar		550263 to 5	550825
Airforce, Jamnagar		550245 to 7	550247

ANNEXURE - VIII**List of Telephone Numbers of Gujarat Maritime Board**

Sr. No.	Name, Designation and place of Office	Tele. No. (Office)	Tele. No. (Residence)	Fax No.
1	Mr. Rajgopal, Chairman, Gandhinagar.	23250508 23250506		079-23250589

2	Mr. A. K. Rakesh VC & CEO,Gandhinagar	23238363	23262280	23234703
3	Chief Nautical Officer, Gandhinagar	23238346-47		-do-
4	Chief EngineerI, Gandhinagar	23238347		-do-
5	Officer on Special Duty, Gandhinagar	23238346	079- 2323232	-do-
6	Exe. Asst. to VC&CEO, Gandhinagar	3238363	7451465	-
7	Head Office, Gandhinagar	3238346 to 48	-	34703/04
8	Port Officer, Magdalla	0261-2470533	-	2475645
9	Port Officer, Bharuch	02642-241772	229082	220377
10	Port Officer, Bhavnagar	0278-2519221	2568580	2211026
11	Port Officer, Jafrabad	02794-245165		245152
12	Port Officer, Porbandar	0286-2242408	2242412	2244013
13	Port Officer, Veraval	02876-220001	242956	243138
14	Port Officer, Okha	02892-262001	262010	262002
15	Port Officer, Jamnagar	0288-2755106	2557163	2756909
16	Port Officer, Navlakhi Main Gate	02822-220435		232470
17	Port Officer, Mandvi	02834-220033	220040	230033
18	Traffic Inspector, Mundra	02838-222136	222136	-
19	Executive EngineerI, Jakhau	02831-287261	222996	-
20	Gujarat Pipavav Port Ltd., Chief Operating Officer, Duty Office	02794-286314 86001/92	286070	-
21	Gujarat Adani Port Ltd.,	02838-	287241	-

	Mundra.	288201 to 208		
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ANNEXURE – IX**POLICE AUTHORITIES**

Name and Designation of Officer	Telephone Nos. (Office)	Telephone Nos. (Residence)
PARIXITA RATHORE S. P. (Purab), 99784 05690	280233	
Dy. SP (Anjar)9825304239	243254	
Dy. SP(HQ)9825225071	243254	
Dy. SP.9824543004	224040	
Police Control Room,DC-5,Poorab, Gandhidham	280287	
Police Control Room, Bhuj	253593 / 250960	Fax – 250427

Dy. Supdt. Of Police, Anjar	02836-243254	242596
Dy. Supdt. Of Police – Bhachau	02837-224040	224020
Bhachau Police Station	02837-224036	
Anjar Police Station	02836 – 242517	242517
Gandhidham Police Station	A. 100/232500/ 229513 B. 233752	
Kandla Police Station	270527	
Adipur Police Station	260615	
Air Commander, Jamnagar	0288-2720003 -009	
Commandant, BSF, GIM	223845	
Air Force Commander, Bhuj	(02832)244005-10	
Army, Bhuj, C.O 128 AD Regmt	229239,229942	

ANNEXURE – X**For the supply of food packets etc., the following Agencies will be contacted:**

Sr. No.	Name of Agency	Contact Person	Telephone No.
1	Arya Samaj Mandal	Mr.Vachanidhi	231223 / 9824221332
2	Agrawal Samaj	Mr. Sunil Sharma	234977
3	RSS	Mr. Sunil Kothari	222560
4	Rotary Club, Gandhidham	Mr. Samir shah	9825093732
5	Red Cross Society	Dr. Bhavesh Acharya	234854 / 232736
6	Lohana Mahajan, Gandhidham	Mr. J.P. Thakkar	9879109826
7	Marvaari Yuva Manch	Mr.Sunil Bajaj (President) Mr. Prashant Agarwal	9879015408
8	Swaminarain Mandir	Mr.Lavjibhai Thackker	231555, 233666
9	Gandhidham Sindhi Youth Circle	Mr.Vijay Khubchandani & Mr.Kundabhai	220490
10	Satwara Samaj	Mr.agavjibhai	235659
11	Sitaram Parivar	Mr.Mohanbhai Dharsi	222373, 234603
12	Gurudwara, Gandhidham		220643
13	Swaminarayan Gurukul	Swamimukta Prasadji	228098, 226555

Apart from the above, if required, the following hotels may be contacted for the supply of food packets:-

Sr. No.	Name of Hotel	Contact Person	Telephone No.
1	Grand Shiv	Mr Nagendra Singh	221297, 9825226568
2	Sharma Resorts	Mr Madan Mohta	31824/231823/231825/ 224885-86-87-88-89
3	Satkar	Mr Babu Bhai Agrawal	234100/222597
4	Natraj	Mr. Acharya	221749/221956/221955 221954/238002
5	President	Mr. Romesh	220053
6	K.K.Caterers	Mr. Kaniyalal Rajwani	(M) 98252 26998 (M) 98983 74896
7	Hotel Mid-Town, Adipur	Mr. Nagendra Singh	98252 26568 260237/260080
8	Hotel Sea-Rock, New Kandla	Mr. Devidas Shetty	270490

LIST OF LABOUR CONTRACTORS OPERATING AT KANDLA PORT

Sr. No.	Name of the Company	Contact person	Address	Contact Nos
1	Neelkant Handling A/c Shree Radhey Shipping	Haresh Bupendra	Tenament B Plot 290,Ward 10/A, G'dham	237040 98250 01743
2	Ratnakar Handling A/c Aditya Marine	Radhakishan Parida	83-84, GIDC G'dham	98791 23371
3	Ganesh Handling Co.	Dayalal B. Rabari	6-8, Goyal Chamber, GIM	235504
4	Al Pirani Al Sailani	Akbar Yakub	CS-10, Port Colony, Kandla	22053 / 232174 99793 31100 98257 87808
5	Shree Ravechi Handling A/c Trinity Shipping	Mahadeva Agaria	11, Second Floor, Plot.343, Ward 12- B, GIM	250286 9825361347
6	Shree Ramdev Handling	Nimbaram Gulabji	377, Sector-7 GIM	9825348935 9979898564
7	AVB & Co	Mukesh Gujjar	15, GF, Gokul Park, GIM	232967
8	Ashapura Labour Supply	Khimji Jallabhai Rathod	48, GIDC, Near Ambika Weigh Bridge, GIM	9979053378 9898128069
9	Shree Krishna Handling	Harinder Yadav	Plot E – 108, Guj Housing Soceity,Sec- 5,GIM	9879549803
10	Naasmin & Co	Umar Osman Chamadia	Plot – 14, Sector- 7, GIM	9898333397
11	M.S. Logistics	Asgar Haji Mungrani	Shop No. 5, Opp. CISF Gate,	9825241065 9913620407

			Kandla	
12	Shree Majeesa Handling	Jugal Kishor Joshi	Block 24, MIG, Kidana, GIM	9879373992 9979898564
13	Shree Kailash Handling Co.	Mohanbhai Heera	Plot No. 7, Sector- 8, GIM	9825228555 9879288875
14	Javed Abu Saicha	Javed Abu Saicha Gani Patel	Shop - 13, Port Colony, Kandla	9825092748 9825563094
15	Shree Ganesh Handling	Dayabhai Rabari	6-8, Goyal Chamber, GIM	9825056599
16	Bhupendra & Co	Mayur M Ahir	Plot 253, Ward 12/C, GIM	9727762191 9825225239

**ANNEXURE –
XII**

LIST OF CIVIL ELECTRICAL AND MECHANICAL CONTRACTORS

Sr. No.	Name & Address of Contractor	Office	Resi	Mobile
1	Mr. Dilip Bhandbe, M/s Mukund Ltd.	223412		
2	M/s. Maheshwari Const. Co., SDX-N-5, Gandhidham-Kutch Mr Rameshbhai	232134		
3	M/s. Apex Engineers, Bajaj Chambers, 12/B, Gandhidham – Kutch (Mr. Vishal)	222002 222223		9898226666
4	M/s. Gadhvi Constructions, Plot No.524, Sector – 5, Gandhidham – Kutch	235772		9426215258
5	M/s. Advance Builders & Contractors, B-23, Apnanagar, Gandhidham – Kutch.		232864 234242	9825255934
6	M/s. Mohan Construction Co., 415, 2/B, Adipur (Mr.Mohan)		264140	9825174351
7	M/s. Star Decorators, 17, Plot No.5, 12/A, National Highway, Gandhidham – Kutch (Mr. Vinod Bajaj)	221450		
8	M/s. Kamal P. Chellani, DBZ-S-81-A, Gandhidham-Kutch (Mr.Kamal)			9825221542
9	M/s. K.K.Construction, E-71, Gujarat Housing Society,			230064

	Devi Krupa, Sector -5, Gandhidham (Mr Milanbhai)			
10	M/s. Mepabhai Madan, Plot No. 21/22, Sector-9, Opp. KPT Office, Gandhidham Mr Rajubhai	222209 222210		233627
11	M/s. S. B. Singh, B-110, Sapna Nagar, Gandhidham - Kutch	239351		
12	M/s. Dipesh Construction Co., 11, Apurva Chambers, Ganga Gate, Anjar - Kutch. (Mr. Parth) (Mr. Sukhdevbhai)	242997	243319	9824294260 9825179040
13	M/s. Raj Construction Co., Deepak Complex, Plot No.315, Ward 12/B, Gandhidham-Kutch Mr Rajesh Makhijani	220911		
14	M/s. M. V. Rajani,444, 2/B, Matruchhaya,Rambaugh Road, Adipur - Kutch (Mr. Narayan)	260800 262920		9825225690
15	M/s. Bhimji Velji Sorathia, 21, Nilesh Park, Plot No.80, Sector - 8, Near New Court Building, Gandhidham - Kutch (Mr. Bhimji Velji)	231383		9825225948
16	M/s. Sollone & Parco Engg. Co., CCX-165, Adipur - Kutch (Mr Ravi Solanki)	261298 263248		9825222919
17	M/s. Mahesh Construction,			

	Plot No. 415, 2/B, Adipur- Kutch (Mr. Mahesh)		264140	9825091599
18	M/s. Patel Construction Co. Zanda Chowk, Gandhidham (Mr. Tejabhai Kangad)	220421		9825227199
19	M/s. M. G. Bhavnani, Plot No.102, Sector 1/A, Gandhidham – Kutch			9825191636
20	M/s. Patel Engineering Works, Gandhidham	231832		
21	M/s. H.M.G. Gandhidham	235710 234609		
22	M/s. Mukund Limited Mumbai	022- 25347373		
23	M/s. Bajaj Electric Mumbai	022- 23724192		
24	M/s. Mishra Brothers Gandhidham	221172		
25	M/s. Sonu Electricals 18, K.P.Shopping Centre, Near Jivan Bharati School, Karelibaug, Vadodara-390018 Shri Jayendrasingh.B. Thakker	0265- 2464108	2647886	
26	M/s. Ravi Electronics, "Prashant", 20, New Jagnath Rajkot – 360 001 Mr. G.K.Patel	465256 460 253		
27	M/s Megha Technicals, CCX – 165, Adipur – Kutch (Mr. Ravi Solanki)	261298 263248		9375320232

28	M/s Maruti Construction, Gandhidham – Kutch			9824893851
29	M/s Ramesh Meghji Sorathia, Anjar – Kutch			9825225948
30	M/s Mohit Construction, B-168, Shaktinagar, Gandhidham – Kutch			9825227072

ANNEXURE – XIII**LIST OF SALT LAND LESSEES**

Sr. No.	Name of Salt Works	Contact Person	Tel. No. Office	Tel. No. Residence
1	Asstt. Salt Commissioner, Gandhidham	Mr. Jagdish Tripathi	233670	263690
2	M/s. Kanoria Chemicals and Ind. Ltd., Plot No.220,	Mr. B. N. Singh, Mr. J. Singh	229470 0237-74433	283325 9825225841

	Sector -4, Gandhidham	Factory -		
3	Shree Krishna Salt Industries, Central Bank Compound, Gandhidham	Mr. Kantibhai Thakkar Mr. Vikash Patel Mb: 9825206214	234727 233990	235315 234089
4	M/s. Chirai Salt Works, DBZ-S-46, Jawahar Chock, Gandhidham.	Mr.Sureshbhai Mr.Parasbhai Mb: 9825225181 Mr.Mayajar	221109 221267 9826214709	234386 233081
5	M/s. Bhuvneshwari Salt Works, TCX-S-62, Gandhidham	Mr.Sreechandji Jain Mob: 9825222269	237114 235203	233605 236860
6	M/s. Dungershee Salt Works, Shop No. D-93, P.B.No.9, Gandhidham	Mr.Hiralal Parekh Mb: 9825019661 Mr. R.B.Agrawal Mb: 9825019662 Mr. Bhikhabhai (Salt Area)	222765 223440 9825225667	232767
7	M/s. Shree Laxmi Salt Allied Ind., "Shree Sadan", 207 / 12-B, Gandhidham	Mr. Rajubhai Rathi Mr. Rameshbhai Rathi Mob.: 9824214901	232167	232167 235482
8	M/s. Jyoti Salt Industries, "Sukh Sadan", Opp. Hotel President, Gandhidham	Mr.Acharya Sukhdevbhai Mr. Sukhdevbhai Acharya Mb: 9825226075	223776 221082 221089 223094	221876
9	M/s. New Kandla Salt and Chemical Co., "Maitri Bhavan", Plot No.18, Sector 8,	Mr. Ashokbhai Sanghvi Mr. Babulalji Sanghvi	232227 231588 234087	234325 231814 232122

	Gandhidham	Mb: 9825226091 Mr. Sukhrajbhai Mb: 98252 26011		
10	M/s. Kutch Salt Works, New Kandla	Mr. Mitenbhai Mb: 9825225990 Mr. S.P.Giria, Works Manager, Mb: 9825228085	234659 022- 22040561 22041598 270371	238633

11	M/s. Vijay Salt Works and Allied Industries, "Friends House", P.No. 50, Sector -1A, P.B.No.106, Gandhidham	Mr. Harishbhai Chaturani Mb: 9825064241 Mr. Babulal Nahata Mr. Lalchandji Nahata	231119 252247 223743	234856 9825228398
12	M/s. Rajesh Salt Works, "Chandan Chambers" National Highway, Plot No.18, 12/A, Gandhidham.	Mr. Kishorbhai Thakkar Mob: 9825177081 Mr. Rameshbhai Mb: 9825226026	220586 221048 222301	234387
13	M/s. Western Chemical, DBZ-S-151, Gandhidham	Mr. Naranbhai Mb: 9825226092	233185 230913	230141
14	M/s. Urvakunj Nicotine Ltd., Central Bank Compound, Plot No.31, Sector No.9, Gandhidham	Mr. Mahendrabhai Patel - 9825206214 Mr. Vikash Patel Mb: 9825226214	234727	234480
15	M/. Friends Salt Works, "Maitri Bhavan", Plot No.18, Sector No.8, Gandhidham	Mr. Babulalji Mb: 9825226015 Mr. Ashokbhai Mb: 9825226091 Mr. Sukhrajbhai Mb: 9825226011	232227 231588 234087	231646 231814
16	Smt. Savitri H.Pandya, DBZ-N-21/A, Gandhidham	Mr. Jagdihbhai	220212 238112	255612

17	Smt. Vimlaben.H. Pandya, DBZ-N-21/A, Gandhidham	Mr. Jadishbhai Mr.Amritlal Pandya Mb: 9825225212	220212/ 238112/ 238212/ 255612 Fax: 222930	
18	M/s. Rajendra Salt Works, D-125, Jawahar Chowk, Gandhidham	Mr. Tarachand	-	-
19	Mr Natwarlal Agrawal, TCX-S-75, Gandhidham	Mr. Natwarlal Mb: 9825393555	222672	231564
20	Mr Indrumal Khubchand, C/o Gulab Salt Works, D-125, Jawahar Chowk, Gandhidham	Mr. Tarachand	233041 234388	234937
21	Mr Virji Khimji C/o Ajit Salt works, D-75, Gandhidham	Mr. Kirtibhai	220310	-
22	Mr Girdharilal.S. Agrawal, Plot No.126, Ward – 12/B, Gandhidham	Mr. Girdharilal	232862	234755
23	Mr Vijay Kumar.D. Palan & Mri Jagdish Kumar.D.	Mr. Navrotambhai Palan	220310	-
24	M/s. Satya Salt Works, DBZ-S-183, Gandhidham	Mr. Candubhai Mb: 9825225911	224055 221445	234739 234469
25	Shri Premji Gangji Soni,	Mr. Mahesh Soni	221263	-

	DBZ-S-183, Gandhidham			
26	Smt. Geetadevi P. Chaturani Plot No.13, Sector 1, Gandhidham	Mr. Romesh / Ashwin Mr. Dayalbhai Chaturani, Mb:9825064245	221048 256713 220586 256706 Fax: 222930	-
27	Shri Rashmin A.Pandya DBZ-N-21/A, Gandhidham	Mr. Jagdish Pandya	220212 238112 238212 Fax: 222930	-
28	M/s. Neelkanth Enterprise, DBZ-S-60, Gandhidham	Mr. Shamjibhai Mb: 9825 25711	220421 220103 Fax: 223560	231485
29	Dayalal G.Chaturani Shop No.1 to 4, "Chandan Chamber" Plot No.18, Ward No.12, Gandhidham	Mr.Dayal	221048 220588	-
30	Shri Chaganlal Punamchand, DBZ-N-197, Gandhidham	Mr. Chaganlal	220545	-

Annexure -XIV**LIST OF STEVEDORES AT THE PORT**

Sr. No.	Name	Address	Fax No.	Telephone Nos.	
				Office	Resi.
1	M/s. Cargo Movers	"Cargo House" BBZS-32A, Gandhidham	231687	220453 231365	261280
2	M/s. DBC & Sons (P) Ltd.	Seva Sadan-II, Room No. 303 / 304, New Kandla	270631	270503 270263 270348	-
3	M/s. A.V.Joshi & Co.	Plot No. 18, Sector-8, Maitry Bhavan, Nr. Post Office, Gandhidham -Kutch	233924	231070 232227 231588	234909

4	M/s. Agarwal Handling Agencies	DBZ-N-47, Gandhidham – Kutch	232749	220282 233187	232749
5	M/s. ACT Shipping P. Ltd	Seva Sadan-II, Room No. 206/207, New Kandla	232175	270111 270112 270015 229967 231734	261308 231416
6	M/s. Cargo Carriers	214/215, Rishab Corner, Plot 93, Sector- 8, GIM	230030	220816 231649 230030	231694
7	M/s. Cargo Clearing Agency (Gujarat)	Plot No. 271, Ward 12-B, Gandhidham	233034	221721 220655	231452
8	M/s. Chotalal Premji Stevedores Pvt. Ltd	C-8, Shaktinagar, GIM	231509	270009	-
9	M/s. Hiralal Maganlal & Co.	C-11, GIDC Area, Gandhidham – Kutch	223914	223914 231832	223878 232430
10	M/s. New Dholera Shipping Company	Goyal Commerce Centre Building – 1, Plot No.259, Ward 12B, Gandhidham – Kutch	-	222637 232267	237284
11	M/s. J.M. Baxi & Co.	Seva Sadan – II, Room No. 301 / 306, New Kandla	270646	270630 270550 270448	260427
12	M/s. Pestonjee	Seva Sadan-II, Room	270650	270257	262914

	Bhicajee (Kutch)	No.203, New Kandla	270556	270367 270221	
13	M/s. OTA Kandla Pvt. Ltd.	BBZ-N-324, Gandhidham	223241	220145 270560	223241
14	M/s. Purshotamdas Jeramdas & Co.	5, Vaswani Chamber, Plot 16, Sector-8, GIM	222850	238242 222598	220598
15	M/s. R. Tulsidas & Co.	Ahit Building , Plot No.323, Gandhidham – Kutch	232308	222717 221943	-
16	M/s. Robinsons	101 / 102, Maritime House, Plot No.45, Sector – 9A, Gandhidham – Kutch	234394	221578 223836	231767
17	Rishi Shipping	Plot 50, Sector 1/A GIM	238943	229830 229831	
18	M/s. Vinsons	BBZ-S-25, Gandhidham – Kutch	231948	220466	222395 239460
19.	Sical Logistics Ltd	403, 4 th Floor, Madhuban Compex, OSLO, GIM	234416	234646 234194	
20	Parekh Marine Agency	C-8, Shaktinagar GIM	231509	229297 221158 230587	
21	Krishna Shipping and	Transport Nagar, NH	233135	230501	

	Allied Services	GIM		223814 229085	
22	Kevar Carrier Handling & Transport	Shop 24, Tolani Chamber, Sector -8 GIM	228298	228298	
23	Trinity Shipping & Allied Industries	Trinity House, Plot 46 Sec 1/A, GIM	232060	230911 230910	
24	Velji P & Sons(P) Ltd	2 nd Floor, Deepak Compex, 315, 12/B GIM	236168	231545 231546 225466	
25	Asean Marine Services	Ashit Bldg, Plot 33 Sector 1/A, GIM	232308	222717 221943 222145	
26	Rishikiran Roadlines	Kiran House, Plot 8 Sector 8, GIM	231422	231894 234108	
27	Universal Shipping Services	Hotel Sea Bird, Plot 173, Sector 1/A GIM	235251	230663 226050 226037	
28	R.T.Bhojwani & Sons	DBZ -S- 146, GIM	232423	222211 221831	
29	Logistic Enterprises(P) Ltd	C-8, Shaktinagar, GIM	231509	235341 230587	

30	Seaways Shipping (P) Ltd	2 nd Floor, Plot 351 Ward 12/B, GIM		226183 237147	
31	Seacrest Shipping Services Pvt. Ltd	216, 2 nd Floor Om Corner, Plot 336 Ward 12/B, GIM	227028	233325	
32	Shree Maruti Shipping Services	18/21, Swaminarayan Bldg, Sector 9, GIM	234107 250690	233245 237247 250690	
33	Liladhar Pasoo Forwarders P.Ltd	Plot 4, Sector -1 KASEZ, GIM	252383 253506	252286 252297 252612	
34	Shree Radhey Shipping Company	14-16/C, GF Green Park, GIM	232967	222919 228919 238883	
35	Pearl Shipping	220, Rishab Corner, Plot 93, Sector 8 GIM	235570	225283 225284	
36	Patel Shipping Agency	Patel Avenue, Floor 2, Plot 170, Sector 1/A GIM	231143	224024	
37	Ashirvad Shipping	18-21, Swaminarayan Bldg, Sector- 9, GIM	250690	233245 237247 222822	
38.	M/s. Swaminarayan	1 st Floor, H-6, Op. Tejas Society,	079-	231981,	

	Vijay Trade Carriar	Ghatlodia, Ahmedabad	231983	231982	
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LIST OF TANK FARM OWNERS

Sr. No.	Tank Farm Owners	Persons to be contacted in case of emergency		
		Name and Position	Telephone No.	Mobile No.
1	Kesar Enterprises Ltd., Near Oil Jetty, Old Kandla (Kutch)-370210	Mr. R.K. Gupta Gen. Manager	270435 (O) 295676 I	9375349181
2	Kessar Enterprises Ltd, Terminal II, Plot No. 5 &6 Old Kandla	Mr. R.K. Gupta G.M	270435 (O) 270177 (O)	9375349181
2	Chemical & Resins Pvt.Ltd Terminal -I, Near Oil Jetty, Old Kandla, Kutch Terminal - II, Near West Gate, New Kandla - Kutch	Mr. Manoj Kumar Gupta, Terminal Manager	270505(O) 270916 (O)	99240 44424
3	Indo-Nippon Co. Ltd., Plot No.2, K.K.Road, Old Kandla,	Mr. R.N. Pathak Asst. Terminal Manager	270795(O) 235818I 270295 (O)	9879571295
4	J. R. Enterprise, Plot No.3, Old Kandla,	Mr. Devendra Dadhich, Terminal In-charge	653528 (O) 257152 ®	9898238380
5	Friends Oil & Chemical Terminals Pvt. Ltd., Near Booster Pump Station, Old Kandla, Kutch	Mr.S.Ramakrishnan Terminal Manager	270987 (O) 257249 ®	9879572107
6	Indian Oil Corporation Ltd., Main Terminal, GIM	Mr. AK. Khanna Sr. Term. Manager	233274 (O) 229002 I	9427216637

	Foreshore Terminal, Kandla KBPL LPG Import Plant	Mr. KS Rao, Sr.TM Mr. PS Negi Plant Manager	270394 (O) 270628 (O) 270477 (O) 233359 ® 270978 (O) 236944 ®	9426416108 9426725342
7	United Storage & Tank Ltd Near IOC Foreshore Terminals, New Kandla Gas Terminal, Plot No. 4 Old Kandla	Mr. Manoj Gor Terminal Manager Mr. G. Chudasama	270609 (O) 653525 (O) 651238 ® 653529 (O)	989850029 9904366855
8	IFFCO Kandla Unit, Kandla, Kutch	Mr. M.R. Patel. Execut. Director, Mr. N.C. Patel, Sr. Manager	270711 270352(O) 270381 (O)	9687666888 9979026415
9	BPCL, KK Road, GIM	Mr.Vineet Bhudhai Sr. Manager Operations	234313 (O) 257808 ®	9409305433
10	HPCL KK Road, GIM	Mr. Murthy Manager (Installation)	230936 (O) 220084 (O) 233078 Ext 109(R)	
11	INEOS ABS (I) Ltd Plot No. 8 Old Kandla	Mr. Vineeth Nair Dy. Manager	270087 (O) 234409 I	9825237029
12	Liberty Investments Pvt. Ltd., Plot No. 1 & 2, Block 'H', New Kandla	Mr. Jitendra Vaidya Terminal Manager	270151 (O) 270464 (O) 270468 I	9825025645

13	Avean International Pvt. Ltd., Liquid Storage Tank Terminal, Plot No. B-1, New Kandla	Mr. Bharat Rathod Terminal Manager	270537 (O)	9375310260
14	Rishi Kiran Logistics Pvt Limited, Plot No. 7, Link Road Old Kandla	Mr. RH. Pandya GM (Terminal)	270223 (O) 270443 (O)	9879104556
15	N.P.P. Pvt. Ltd., Old Kandla	Mr. Jud Sequeira, GM(Terminal)	270347 (O) 257807 (R)	9099944900
16	Friends Salt Works and Allied Industries, KK Road, Old Kandla	Mr. NJ.Zinduwadia Sr. Manager Mr. HA. Mehta Sr. Manager	270814 (O) 262698 I 271260 (O) 235072 I	9825506361 9825506360
17	IMC Ltd, Cargo Jetty New Kandla	Mr. Anil Brahmbhat	270369(O) 653524 (O) 657963	9898126243
18	Agencies & Cargo Care Ltd., Plot No.3,New Kandla	Mr.Shivkumar Menon, Term. Mgr.	270714 (O)	9825226765
19	Dipak Estate Agency Plot No. 5-6, Block -A Behind Petrol Pump New Kandla	Mr. Narendra Thacker	270375 (O)	9879611243
20	Parker Agrochem Exports Ltd, Plot No. 3 -4,Block- H New Kandla	Mr. Bharat Thacker	270486 (O) 270528 (O) 231876 I	9825238260
21	Tejmalbhai & Co Plot 10, Block- A New Kandla	Mr. Ankitbhai Chandan	271330 (O) 230090 I	9825225101 9825222101
22	Parker Agrochem	Mr. P.Raja Babu	270528 (O)	9979158543

	Product P Ltd, Plot 7-9, Block-A, New Kandla	Dy Manager	231876 I	
23	Mother Dairy Fruit & Vegetable Pvt. Ltd, Near Oil Jetty, Old Kandla	Mr. Saju Therattu	270654 (O) 270655 (O) 230979(R)	9974022681
24	Mother Dairy Fruit & Vegetable Pvt. Ltd., Nr. Oil Jetty, Old Kandla	Mr. Saju Therattu	270654(O) 270655(O) 230979(R)	9974022681

ANNEXURE – XVI**LIST OF SCHOOLS IN GANDHIDHAM – KANDLA COMPLEX**

Sr. No.	Name of School	Contact Person	Telephone No.
1	Dr. C. G. High School	Principal	220271
2	SVP Gujarat Vidhyalaya	Principal	220242
3	M.P. Patel Kanya Vidhyalaya	Principal	220705
4	Adarsh Maha Vidhyalaya	Principal	234172
5	Adarsh Kanya Vidhyalaya	Principal	220175
6	Bhartiya Vidhya Mandir, Kandla Bhartiya Vidhya Mandir, Gopalpuri	Head Master Head Master	271049 233684
7	Central School, (IFFCO)	Principal	221288
8	Central School (Railway)	Principal	220657

9	Modern School	Principal	220284
10	Mount Carmel School	Principal	234262
11	Aum Vidhyalaya, IFFCO	Principal	221104
12	Saint Xavier's School, Adipur	Principal	260265
13	Maitri Maha Vidhyala, Adipur	Principal	260445
14	Maitri Kanya Vidhyalaya, Adipur	Principal	260612
15	Model Excelsior High School, Adipur	Principal	260707
16	Gujarat Vidhyalaya, Adipur	Principal	261312
17	Nagarpalika High School, Anjar	Principal	242510
18	Adarsh Nivasi School, Gandhidham	Principal	223246
19	P.N.Amersey School	Principal	223646
20	Shree Gurunanak English School	Principal	238421
21	Swaminarayan Gurukul	Principal	228098
22	Kairali English School	Principal	221050
23	Sarvodaya Pradhamic Shala Near Oslo Cinema, Gandhidham		227958
24	Ganeshnagar Pr.Shala, G'nagar		
25	Jagjivan Pra. Shala, Sapnanagar, Gandhidham		
26	Cargo Pra. Shala, Sapnanagar, Gandhidham		
27	Old & New Sunderpuri Schools	Head Master	224867
28	G'dham Pr. Shala, Near Shivaji Park, Gandhidham	Head Master	229255
29	Adipur Prathmic Shala, Adipur	Head Master	264525 264181
30	Kandla Pr. Shala, Shirva Camp & Thermal Colony & United Salt Works	Head Master	253198

ANNEXURE – XVII**LIST OF DOCTORS IN GANDHIDHAM COMPLEX**

Sl. No.	Name of Doctor	Telephone Numbers	
		Office	Residential
ANAESTHETIST			
1	Dr. (Mrs.) Dubal	232591	233555
2	Dr. (Mrs.) S.R.Gandhi	236700	229156
3	Dr. P. P. Kour	229655	220673

PHYSICIAN			
1	Dr. (Mrs) Gandhi	234561	230111
2	Dr. Johnson	222344	232244
3	Dr. Morakhiya	222008	232161
4	Dr. Sakaria	230114	230947
5	Dr. Siju Jacob (St. Joseph Hospital)	230160	223852
6	Dr. Acharya	220715	232736
7	Dr. D. P. Singh	221990	221990

SURGEONS			
1	Dr. D.G.Dasani	229231	223346
2	Dr. Girdhani	233300	231219
3	Dr. Y.V.Joshi	221557	233324

4	Dr. Hotchandani	230039	261530
5	Dr. Hemang Patel	230202	230353
6	Dr. Vachani	230400	222400
7	Dr. J.K.Ahir	237744	--
8	Dr. Harani	222096	222096

GYNAECOLOGISTS			
1	Dr. (Mrs.) N.B.Acharya	220715	232736
2	Dr. Chandrakant Thakker	224488	225588
3	Dr. (Mrs.) Rekha Singh	221990	221990
4	Dr. (Mrs.) Naik P.S.	234333	231332

PAEDIATRICIANS			
1	Dr. J. A. Dubal	232591	233777
2	Dr. Navin Thakker	230195	230894
3	Dr. Nitin Thakker	221046	220615

PATHOLOGISTS			
1	Dr. K. L. Shukla	221611	234062
2	Dr. (Mrs.) Seema Pavde	230370	231352
3	Dr. (Mrs.) Verma G.H.	229168	238386

ANNEXURE – XVIII*LIST OF ESSENTIAL SERVICES*

HOSPITALS	OFFICE	RESIDENT
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1	General Hospital, Bhuj Civil Surgeon, Bhuj	222850	250554
2	Referral Hospital, Anjar	232455	
3	Rambaugh Hospital, Gandhidham	220263	
4	Divine Life, Adipur	261802	
5	Railway Hospital, Gandhidham	231874	
6	Government Dispensary, Adipur	260608	

TELECOMMUNICATION			
1	General Manager, BSNL, Bhuj	253000	252322
2	Dy. Manager, Bhuj	252505	251505
3	Area Manager, Gandhidham	238000	235000
4	SDO, Gandhidham	236250	236251

ELECTRICITY			
1	S.E., PGVCL, Bhuj	222550	250189
2	Jr. S.E., Anjar	243008	242656
3	XEN, Anjar	242845	242446
4	Dy. Engineer, Gandhidham	222809	--
5	Line Office, Gandhidham	221728	

WATER SUPPLY			
1	S.E., GWS&SB, Bhuj	221806	250601
2	XEN, Bhuj	250685	253016

3	SE, Anjar	242416	242421
4	XEN, Gandhidham	220717	223273
5	Control Room, Gandhidham	221252	
6	Water Tank, Sunderpuri	231313	
7	Water Tank, NU-4	654564	
8	Gandhidham Municipality	231610	
9	Chief Officer, Gandhidham Municipality	234967	

ANNEXURE – XIX***LIST OF VEHICLES SUPPLIER***

Sl. No	Name of Institution	Contact Person	Parking Place Phone No.	Name and Phone No. of Driver	Availabil ity of Vehicle.
(A) Vehicle Hire Contractors					
1	M/s Rohit Enterprise	Mr Rohit Shah 228550/237538 237547 (O) 234140 I Mob.9825225121			
(B) Ambulance Pool					
01	St. Joseph Hospital, Gandhidham	Administrator 230160/229336	Hospital Premises	Driver available round the clock	First come first serve
02	Red Cross Society, Gandhidham.	230269	Red Cross	Driver available round the	

				clock	
03	Western Railway, Gandhidham	238891, 231874	Hospital		
04	Rambaugh Government Hospital, Adipur	261625	Hospital Premises	Driver available round the clock	
05	Gautam Freight Pvt Ltd.	Mr Ramesh, Proprietor 232605/220163, 230345 (O)	GIDC Work shop Sector- 10C, Plot No. 24.		First Come First Serve
06	Tolani Eye Hospital	Supdt.(O)260497 - 260773	Hospital Premises	One driver in absence of compounde r residing in hospital	First Come first Serve
07	Sterling Divine Life Hospital, Adipur	260577, 7698166555	Hospital Premises	Round the clock	
08	Dev Smruti Trust Dr. Harani	222096, 9825227322			
09	Mobile Morgue	229430/239965	Lions Club		
10	Shav Vahini/Mobile Mrogue	239965			
11	Varsha Cheritable Trust C/o Hareshkumar Tulsidas	9909829555			
12	Hari Om Trust Mr. K. Parmar	260833			

PLACEMENT OF PORT CRAFTS ON CYCLONE WARNING.

(A)	SHIPPING TUGS	Heera Mehul	Bunder
		Kalinga	Maintenance Jetty (West side)
(B)	PILOT LAUNCHES AND SURVEY LAUNCHES	M. L. BHARINI, M.L. NIHARIKA M. T. SWATI	Floating Crafts Jetty
		ML Karishma	Bunder Basin
		ML Nirishak	Inside Bunder Area North Side.
I	G.S. LAUNCHES AND MOORING LAUNCHES	M. L. Mrinal	Inside Bunder Area North Side on Pilot Launches
		M. L. Unnati M.L. Vaishali	Inner Side of Floating Craft Jetty
		M. L. Vijay M. L. Priyadashani PL Rakshak	Inside Bunder Area North on G. S. and Pilot Launches.

ANNEXURE -XXI**LIST OF LICENSE HOLDERS TO KEEP THEIR CRAFTS INSIDE THE PORT AREA.**

Sl. No.	Name of Party	Name of Nodal Officer	Tele. (Office)	Tele. (Resi)
01	M/s Jaisu Shipping Co. P Ltd., Kewalramani House, Dinshaw, Bldg. Road, New Kandla	Mr.Preetam, Director, Mob. 9825226114	270538 270128 270428	260235 260224
02	M/s Gautam Freight Pvt Ltd., Plot No. 24, Sector, 10/C, GIDC Area, Gandhidham	Mr. Ramesh Singhvi, CMD	231386 232605 230345 220163	234176 230328
03	M/s Babu's Shipping, Plot No. 32, Sec - 9 GIM	Mr. Vishalsinh Jadeja	222002	
04	M/s Blue Ocean Sea Transport, Manali Chamber, Plot No.306, Sec 1/A GIM	Mr. Hukumat T. Bhojwani & Mr. Dushyant Patel	239143 222518 230488 239058	
05	M/s Rishi Shipping, Rishi House, Sec 1/A, Plot No. 50 Gandhidham	Mr. Manoj Mansukhani Proprietor	220843 229830 229831 223913 229517 Fax. No. 238943	
06	M/s Velji P & Sons, Deepak Complex, 2 nd Floor, Plot No. 315,	Mr. Sureshchandra	231545 231546	232247

	Ward 12/B, GIM			
07	M/s A.S. Moloobhoy & Sons, Anchor House Shivkripa Bldg, Plot No. 135, Sec 1/A, GIM	Mr. Adil Sheth M- 9375312077	326543 225060 225061 225060	
08	M/s Gudani International Pvt. Ltd, C/o Chemoil Adani Mithakali Circle, Ahmedabad.		079- 25555765 25555266	

LIST OF TRAVEL AGENCIES

Sr. No.	Name of Agency	Phone No.	Mobile
01	M/s. Rathod Tours and Travels, Gandhidham	222444	222959
02	M/s. Rishabh Enterprises, M/s. Rishabh Tours and Travels, 30-31, Tolani Chamber, Plot no. 2, Sector No. 8, Nr. B.M. Petrol Pump, Gandhidham	228550 237538 237547	234140 9825225121
03	M/s. Jai Somnath Travels, Mr. Mishra		9727304414
04	M/s. Agrawal Tourists, Gandhidham	221311 220068	
05	M/s. Krishna Travels, Gandhidham	220683 234838	
06	M/s. Shiv Tourists, Gandhidham	221454	
07	M/s. Thakker Travels, Gandhidham	225097	9825271072

LIST OF MAJOR HEAVY LIFT OPERATORS AT K P T

NAME OF PARTY	NAME OF CONTACT PERSON	Phone Number
Swastik Heavy Lifters	Mr. Jigneshbhai	9825758151
	Mr. Aslambhai	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

ADDITIONAL LIST OF FIRMS FOR PAY-LOADERS/CRANES

M/s Mahalaxmi Transport Co., Plot No. 35, Sector No. 8, Behind Hotel Fun & Food, Gandhidham	Mr H K Rathod	(O)222387 I233500
M/s Kandla Earth Mover, DBZ-S-151, Gandhidham	Mr Sanjay Goyal	(O)221759 I222338 (M) 9825020550
Mr Lalji Bhavanji Sathwara, Laljibhai Sathwara, Plot No. 27, Shop No.5, Sector-9/A, Gandhidham		(O)234118 I232566 (M) 9825225957

LINER AND STEAMER AGENTS AT KANDLA

Sl. No.	Name	Fax No.	Tele. No.	Mobile
01	M/s ACT Shipping Ltd Mr. Harshad Gandhi	232175/ 270597	270111 270115-6 229967 231734	9825226141
02	M/s Admiral Shipping Ltd	233596	230552 232823	
03	M/s Areadia Shipping Ltd	232542	234254 223486	
04	M/s Ambica Maritime Ltd Mr. Amit Vyas	252447	252479 252349	9825225210
05	M/s APL (India) Pvt Ltd., Mr. Murli Krishnan	236361	224601/2 236357 236355	9825225753
06	M/s Arebee Star Maritime Agencies Pvt Ltd. Mr. anil Talwar	235831	220465 235832	9824229109
07	M/s Ashit Shipping Ser. Pvt Ltd. Mr. Sanjay Thakkar	232308	221943 222717 222145	9825225698
08	M/s Atlantic Shipping Pvt Ltd	223372	230552	
09	M/a Asia Shipping Services. Mr. Mohan Karia239326	231285	234526 230954	
10	M/s Bayland Freight Systems Pvt Ltd., Mr. Danendran Gopalan	239326	225522/23	9825230880
11	M/s B D Vithlani Shipping Services Pvt Ltd.	234104	232220 221081	
12	M/s Cargo Conveyors Mr. Shekhar Ayachi Mob. 9825226102	233034	221460 220655	
13	M/s CCA Shipping Services Mr. K C Varghese	233034	221721 220655	9825225217
14	M/s Chowgule Brothers	229227	278521	9825361782

	Mr. C R Soman		225051 232365	
15	M/s Coastline Services (India) Pvt Ltd.	221137	232095 222853	
16	M/s Container Marine Agency Pvt Ltd	234541	230026 220416	
17	M/s Conftreight Shipping Agency (India) Pvt Ltd. Mr. K T R Nair	-	233615 236157	
18	M/s Cresent Shipping Agency (India) Pvt Ltd Mr. Sanjay Salve.	224506	221290 221957	9825227311
19	M/s DBC Freight International	230832	230832 230639	
20	M/s DBC Sons (Gujarat) Pvt Ltd. Mr. R C Vazirani	270631	270263 270503	
21	M/s Depe Global Shipping Agency Pvt Ltd. Mr. Jaydeep Roy	232079	231528 233608 234582	9825228121
22	M/s Evershine Shipping Services. Mr. Kishan Motwani	234083	221588 237408	
23	M/s Forbes Gokak Ltd	231464	222634 235004	
24	M/s Freight Connection (India) Pvt Ltd	231357 270726	222247 222545 270727	
25	M/s GAC Shipping (India) Pvt Ltd. Mr. V C Rao	231429	231427 237244	9825225136
26	M/s Ganges Liners Pvt Ltd	233437	231608 233436	
27	M/s German Exp. Shipping Agency Pvt Ltd	236040	223269 236040	
28	M/s Goodrich Maritime Pvt Ltd	222875	222882 222883	
29	M/s G P Dave & Sons (Shipping)	234382	234288 234382	
30	M/s Greenways Shipping Agencies Pvt Ltd	232079	233608 234585	
31	M/s K. Shipping Services Pvt Ltd	233632	231933	

32	M/s Halar Ship & Freight Forwarders. Mr. Tejas Shrma	270224	270192 270568	9825212646
33	M/s Hind Shipping Agencies. Mr. Mahesh Vyas	234795	232710 235375	
34	M/s Hindustan Shipping Services. Mr. M D Sorathiya	239110	239110 222821	9824214994
35	M/s Interocean Shipping India Pvt Ltd. Mr. Suresh Tripathy	232579	235201 230589	9825225583
36	M/s Intra Trade Pvt Ltd. Mr. B P Vasavda	233295	233313 231255	9825226129
37	M/s Trades Shipping Pvt Ltd	231463	235572 233606	
38	M/s James Mackintosh Marine (A) Pvt Ltd. Mr. Satish Nair	270793	270792 270846	9825226077
39	M/s. J.M. Baxi & Co.	270646	270630 270635 270525	9825225107
40	M/s Kutch Shipping Agency Pvt Ltd.	233339	221148 250226/ 7/8	
41	M/s Liladhar Passop Forwarders Pvt Ltd. Mr. S. Chakraborty	252383	252297 252402 252288	9825020523
42	M/s Maersk (India) Ltd. Mr. Dinesh Joshi	231388	231387 236192 233963	9825270419
43	M/s Maheshwari Handling Agency Pvt Ltd. MR. Chaggan Maheshwary	230575 234633	223228 230393	9825227111

44	M/s Maltrans Shipping Agencies India Pv Ltd.	230606	220147 230336 235022	
45	M/s Mathurdas N. & Sons	252221	252224	

	Forwarders Ltd.		252350	
46	M/s Meridian Shipping Agency Pvt Ltd	230212	220305 230220	
47	M/s Mitsutor Shipping Agency Pvt Ltd	230411	220110	
48	M/s M M Shipping Services	235255	231385 238385	
49	M/s Modest Shipping Agency Pvt Ltd	-	230576	
50	M/s NLS Agency India Pvt Ltd. Mr. Sanjay Salve	232413	231318 220305	9825237311
51	M/s Orient Express Lines Ltd	230359	232186 232805	
52	M/s Orient Ship Agency Pvt Ltd. Mr. H G Digrani	233518	223430 223487	9824214801
53	M/s Oscar Shipping Agencies.	231812	226959/60 232123	
54	M/s Parekh Marine Agencies Pvt Ltd. Mr. Mitesh Dharamshi	231509	221409 235341	9825226557
55	M/s Patel Handling Agency (Capt. Kalra)- 9825062912	231143	224024 231004 221718	
56	M/s Patvolk (Mr. Shreekumar Nair)	231464	222624 235004	
57	M/s Pearl Shipping Agency. Capt. Kalra	231143	224024 221718	9825062912
58	M/s Penguin Shipping Agencies Pvt Ltd.	230606	230336 220147	
59	M/s Pestonjee Bhieajee (Kutch)	270650 270556	270221 270257 270367	9825226962
60	M/s Prudential Shipping Agencies Pvt Ltd. Mr. Siddharth Mishra	232911	230479 233982	9825226477
61	M/s P&R Nedlloyed India Pvt Ltd	232207	224906/7 232128	

62	M/s R T Bhojwani & Sons Mr. Gopichand Bhijwani	232423	223831 220839	9825225639
63	M/s Sahasu Shipping Services Pvt Ltd	236358	225224 237854	
64	M/s Sai Shipping Co. (P) Ltd Mr. S T Hingorani	231972	221369 231739	9825228681
65	M/s Samrat Shipping Co Pvt Ltd	232890	231983 222939	
66	M/s Samsara Shipping Pvt Ltd. Mr. Pranesh Rathod	233165	228602	9825225755
67	M/s Scorpio Shipping Agency	-	223085	
68	M/s SDS Shipping Pvt Ltd	231542	221326 221087	
69	M/s Seanay Shipping Pvt Ltd	270026	270788	
70	M/s Seabridge Maritime Agencies Pvt Ltd	231509	221409 221158	
71	M/s Seafreight Pvt Ltd	222850	233530 222393	
72	M/s Sealand Agencies India Pvt Ltd	230584	231179 230584	
73	M/s Scamar Shipping India	255563	-	
74	M/s Scatrade Shipping	234171	233810	
75	M/s Sentrans Maritime Pvt Ltd	236129	230002 220702	
76	M/s South India Corporation (Agencies) Ltd Mr. Antony	234416	221276 234646 231494	9825226256
77	M/s Spoonbill Maritime Agencies Pvt Ltd	234167	221049 222058 234454	
78	M/s Star International	231395	233948 232402	

79	M/s Taipan Shipping Pvt Ltd	236040	223269 227010	
80	M/s Taurus Shipping Services. Mr. Sukhveersingh	231266	221334 223074	9825227325
81	M/s Oceanic Shipping Agency Pvt Ltd	270631	270263 270503	
82	M/s TICC Container Line (Kandla) Pvt Ltd	237854	237854	
83	M/s Total Transport Systems Pvt Ltd	231463	222634	
84	M/s Transocean Shipping Agency Pvt Ltd	-	230832	
85	M/s Transworld Shipping Services India Pvt Ltd Mr. Sandeep Rajvanshi	231913	229824 221290	9825225733
86	M/s Trinity Shipping & All. Services Pvt Ltd Mr. Soly	222060	230911 223703	9825225245
87	M/s Unimarine Agencies (Gujarat). Mr. Jaikumar Ramdasani	224633	224631/ 32 223113	9825225216
88	M/s Unique Shipping Services Pvt Ltd	-	232729 232730	
89	M/s United Liner Agencies of India Pvt Ltd, Capt Rakesj Kumar	236040	227779 223269	9825225741
90	M/s Universal Freight Systems	252383	252288 252297	
91	M/s Universal Shipping Services Mr. Anil Pillai	235251	230663 231708	9824215168
92	M/s Velhi P. Sons (Agencies) Pvt Ltd	255328	255327 231545	
93	M/s Vibhuti Shipping Pvt Ltd Mr. Vinod	236219	236719 230035 232424	9825226536

ANNEXURE-XXV**LIST OF CLEARING & FORWARDING AGENTS AT KANDLA**

A V Joshi & Co Tel. 232605, 232227, 230345 Fax. 233924 Mr. Harshandu Mr. Vaidya (Mob.) 9825226013	C. Jivram Joshi & Sons (Gujarat) Tel. 220621 Fax. 231141 Mr. Sunil Chowdhari (Mob) 9825225400
ACT Shipping Ltd Tel. 270111/12/13, 270530, 220407 Fax. 270579, 232175	Cargo Movers Tel. 220453, 230883, 270563 Fax.231687
Jaswantrai & Co. Tel. 222630, 222717, 222145, 221943 Fax. 232308, 270385	Cargo Clearing Agency (Gujarat) Tel. 221721, 221674, 220655, 270542 Fax. 233034
Asia Shipping Services Tel. 230954. Fax. 231285	Chinubhai Kalidas & Brothers Tel. 232284 Fax. 231881
Airol Shipping Services Tel. 230080, 220180. Fax. 236131	CAP Shipping Pvt Ltd Tel. 221460, 232081 Fax. 233734
Aarpee Clearing Agency Tel. 222614. Fax. 255252	Centrans Shipping Agency (I) Pvt Ltd Tel. 256854 Fax. 234074
Ashirwad Clearing Agencies Tel. 232426, 233245 Fax. 234107	Cargo Shipping Tel. 270802, 270803 Fax. 270802
Ambalika Enterprises Tel. 255382. Fax. 255577	C. Joshi & Sons Tel. 221094
Ashmka Shipping (Tel. 222481)	Dilip A Goplani Tel. 224082, 255423 Fax. 224082
Ashis Enterprise (Tel. 234722)	D.B.C. & sons Gujarat Pvt Ltd Tel. 270263, 270348, 270503 Fax. 270631
Anchor Shipping Tel. 235781 Fax. 235781	Damjidhiroo & Sons Tel. 222329, 221328 Fax. 230139
B N Thakkar & Co., Tel. 222293, 222285, 270239	Dvji Premji Punara & Sons Tel. 222057, 221338 Fax. 230139

Fax. 230556	
B. Devchand & Sons Pvt Ltd Tel. 232220 Fax. 234014	Express Transport Pvt Ltd Tel. 220193, 220179, 270591, 222565, Fax. 220193
Benits Forwarders Pvt Ltd Tel. 221707, 222086 Fax. 223151	Friends & Friends Shipping Pvt Ltd Tel. 232227, 231588 Fax. 233924
Blue Sea Shipping Agencies Tel. 235317 Fax. 255221	Fast & Fair Company Tel. 255254, 238175 Fax. 255254
Bhanu Clearing Agency Tel. 256861 Fax. 256861	Flamingo Shipping & Forwarding Pvt Ltd Tel. 256755, 257756 Fax. 256755
Global Marine Agencies Tel. 222928, 223196, 223252 Fax.255418	Liladhar Passoo Forwarders Pvt Ltd Tel. 252288, 252297, 252402, 252617 Fax. 252383
Gayatri Shippers Tel. 230692, 223292 Fax. 230818	Lalbahi Trading Company Tel. 222139
Hiral Enterprise Te. 255644	Leap Forwarders Pvt Ltd Tel. 255530, 255509 Fax. 252383
Hindustan Shipping services Tel. 255644, 222821 Fax. 256618	Link International Tel. 255206/07 Fax. 255530
Hardip Shipping Logistics Pvt Ltd Tel. 232909, 222560 Fax. 232909	Lexicon Shipping Agencies Pvt Ltd Tel. 229951-53 Fax. 229949/50
Hansraj Pragji & Sons Tel. 221650, 255228 Fax. 255228	Logistics Enterprise Pvt Ltd Tel. 255157, 255458 Fax. 255520
H K Dave Pvt Ltd Tel. 221504, 2333632 Fax. 230411	Mathuradas Narndas & Sons Forwards Pvt Ltd, Tel. 252224, 252350, 252115 Fax.252221
Intralink Clearing & Forwarding Tel. 255188 Fax. 23148	Magal Singh & Company Tel. 224030, 255253, 234688
J M Baxi & Co. Tel. 270630/35, 270148/50, 270525 Fax. 270616	Meridian Shipping Services Tel. 233981, 255362 Fax. 230701

Jesia Mistry Agencies Pvt Ltd Tel. 222317, 223317	Megha Shipping Agency Tel. 222671, 255304 Fax. 230937
Jaisu Shipping Company Pvt Ltd Tel. 270428, 270128/538 Fax.270556	Mayur Forwarders Pvt Ltd Tel. 222671, 255304 Fax. 230937
Jivanlal Laloobhai Tel. 220308, 230530 Fax. 231640, 233803	Maritime service Pvt Ltd Tel. 222671, 255304 Fax. 255304
Krishna Clearing Agency Tel. 223813, 230501 Fax. 233135	Marathon Shipping Combine Tel. 222202, 230106 Fax. 255220
Kiran Roadlines Tel. 232297, 231984, 234108 Fax.231422	Shiv Shipping Service Tel. 255568 Fax. 22256
Kandla Clearing Agency Pvt Ltd Tel. 232337, 223211, 223210 Fax.230402	Narendra Forwarders Pvt Ltd Tel. 232504, 231795 Fax. 256678
Kamat & Co. Tel. 223471, 232730, 232729 Fax. 255243, 270779	Natwar Parikh Industries Ltd Tel. 232628 Fax. 232628
K S Chaya & Co Tel. 256604 Fax. 230693	New Dholera Shipping & Trading Company Limited. Tel. 222637 Fax. 255329
Kashyap Shipping Ltd Tel. 220816 Fax. 230030	National Shipping Tel. 232319 Fax. 232319
Kanak Shipping & Transport Tel. 231314, 230543, 222059 Fax.221702	Navjeevan Enterprise Tel. 252611, 252360 Fax. 252515
IEE & Muirhead Pvt Ltd Tel. 231535/36 Fax. 231018.	N. G. Bhanushali & Company Tel. 233648, 256791 Fax. 256879
OTA Kandla Pvt Limited Tel. 220145, 223241, 270450 Fax.223241	Shivji Kanji & Company Tel. 230127, 223728, 223729 Fax.220308
Pravin Bhatt & Sons Tel. 224032, 230079 Fax. 230079	South India Corp. (Agencies) Limited Tel. 234646, 231494, 221276, 255209 Fax.234416
Prime Forwarders	S J Thacker & Company

Tel. 234047, 232505 Fax. 231345	Tel.255678,221745 Fax.230659
Purshotam Ramjee & Compnay Tel. 220354, 222287 Fax. 231754	Star Shipping Services Tel.255424,255425,235326(F)255426
Patel Handling Agency Tel. 221718, 224024, 231004, 270017 Fax. 231143	Shivani Shipping, Tel. & Fax.256836
P S Bedi & Company Tel. 223201, 222841 Fax. 255494	Sea Trans Shipping Agency Tel. 255564 Fax. 233228, 233517
Purshotam Chtrabhuj Thacker Tel. 222720	Seaster Shipping Services Tel. 255349 Fax. 232719
Prashant Shipping Tel. 255306, 223927 Fax. 223927	Seaway Shipping Services Tel. 234272 Fax. 232719
Pramukh Forwarders Tel. 255400 Fax. 232602	Star Clearing Agencies Tel. 230273, 255529, 222983 Fax.232719
P M Agency Pvt Ltd Tel. 232553, 233973, 236414 Fax.255413	S S Shipping Agencies Tel. 236605, 238283 Fax. 236605
Raj Shipping Servie Tel. 233948, 232402 Fax. 231395	SPN Shipping Services Tel. 222453, 270733 Fax. 236605
Rajesh Shipping Service Tel. 255444, 255450/52, Fax.255151	Sierra Shipping Pvt Limited Tel. 255395 Fax. 232771
Rudra Shipping Service Tel. 220429, 255317 Fax.255317	Sonal Enterprises Tel. 252666, 252053
Rishi Shipping Tel. 220813, 229830, 2555661/2/3 Fax. 238943, 255522 Mr. B K Mansukhani (M)9825225170	S R Clearing Agency Tel. 232974, 255494 Fax. 255494
Rudraksh Shipping Servie Tel. 235937 Fax. 255582	St. John Freight System Limited Tel. 235414, 236444 Fax.235414
Sanghvi Freight Forwarders Pvt Ltd	Siddi Shipping Services

Tel. 234993, 234995, 222401 Fax.230508	Tel. 232356, 230268 Fax.256712
Sri R K Shipping Pvt Ltd Tel. 232028, 231940, 231936 Fax. 232740	Spalsh Shipping Pvt Limited Tel. 255562, Fax. 220710
Shakti Enterprises Tel. 223531, 221591 Fax. 233898	Thakarshi Madhavji & Sons Tel. 255457, 255458 Fax. 221770
Shree Ambica Commercial Company Tel. 220213, 221253	Trinity Shipping & Allied Services Pvt Ltd Tel. 223703, 230911 Fax. 232060
Shri Maruti Shipping Services. Tel. 270760, 256853, 233245 Fax.220308	Tokto Shipping Services Tel. 234040
Unity Shipping Tel. 255271	Vinson Tel. 220466 Fax. 231948
Umiya Shipping Agency Tel. 255640 Fax. 233625	Vaz Forwarders Ltd Tel. 235317 Fax. 255221
Unique Forwarders Tel. 230080, 255417 Fax. 236131	Varsh Shipping & Travels Tel. 222386, 255300 Fax. 255300
V. Arjoon Tel. 221049, 221335, 222058, 223307 Fax. 234167	Venus Clearing Agency Tel. 233960 Fax. 233362
Velji Dosabhai & Sons Tel. 270220, 270025, 221818, 231423 Fax. 270164, 232363	Vishal Shipping & Handling Tel. 223960 Fax. 233362
Vishvajyoti Enterprises Tel. 252381, 252318 Fax. 253091	Worldwide Cargo Care Pvt Ltd Tel. 221290, 221479, 220307, 230217 Fax. 231913
Velji P & Sons Tel. 255327, 231545, 231546, 270976 Fax. 255328	Zenith Trade Link Tel. 223193 Fax. 255522
Vailash Transport Co. Tel. 233579, 223580	

ANNEXURE-XXVI**SURVEYORS AT KANDLA**

Adnuralty Marine Services Tel. 235412, 256813 Fax. 256813	Marine Consultants & Surveyors Pvt Ltd Tel. 255293 Fax. 234416
Capt. S. Kochar & co. Tel. 222247, 221084 Fax. 231357	Murray Fenton (India) Surveyors Limited Tel. 235960, 236238 Fax. 233335
Dr. Amin Superintendents & Surveyors Pvt Limited, Tel. 221520, 235636 Fax. 226527	M. M. Cargo Gear & Marine Surveyors Tel. 231385 Fax. 235255
Det Norske Veritas (DNV) Tel. 232712	M.BS. Surveyors Tel. 256782
Geo-Chem Laboratories Pvt Limited Tel. 221841, 222179 Fax. 233743	Navark & Mareng Surveyors & Consultants Tel. 232123, 233270
G. P. Dave & Sons Tel. 234288 Fax. 234382	S.G.S. India Limited Tel. 221857, 238047, 231869 Fax.232883
Gupta & Associates Tel. 222542 Fax. 222542	S. K. S. Surveyors Assessors Tel. 220555
Inspectorate (India) Consulting Engineering Pvt Limited Tel. 221520, 235636 Fax. 255217	Seascan Surveyors Pvt Limited Tel. 221833, 233639, 221627 Fax. 233639
Indian Register of Shipping & Indian Register Quality System Tel. 238623, 233695 Fax. 233695	Sterling Surveyors Tel. 230216 Fax. 230216
Iteng Engineering Tel. 221520, 255429 Fax. 255247	Technomar Surveyors Pvt Limited Tel. 221966
J B Boda Surveyors Pvt Limited Tel. 231801, 231946 Fax. 231693	TCRC Surveyors Tel. 220862, 230050 Fax. 230050
Metcalfe Hodgkinsons Pvt Limited Tel. 220940, 221740, 233707, 221845 Fax. 231629	U. . Marine (India) surveyors

	Tel. 220070 Fax. 233228
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ANNEXURE – XXVII**LIST OF JOURNALISTS****PRINT MEDIA**

Sr. No.	Name of Newspaper	Correspondent & Address	Tel. No.	Fax
1	Kutchmitra Neewspaper	Mr. Adwait Anjaria Bureau Chief Gandhidham	222930	222930
2.	Kutch Uday,	Mr. Gangaram Bhanushali Editor, Plot.No.287, Sector- 1/A, Nr.Gayatri Mandir, Gandhidham	235851 231213 9825226987	231267 239887
3	Pandya News Agency	Mr. Jagdish Pandya, Main Bazaar, Gandhidham	220212 238112 238212	221412
4.	AAjkal	Mr. Nidhiresh Raval Bureau Chief Gandhidham	9825517030	229834
5.	Chanchal	Mr. Satish Upadhyay Bureau Chief, Shardha Appartment, Hinglaj Vadi,Bhuj	02832- 252942	02832- 252945
6.	Sandesh	Ms. Kulsumben Yusuf,	02832- 229200	255601

	Bhuj	Editor, Bhuj		228797
7.	Sandesh - Gandhidham	Mr. Jaydeep Purohit Bureau Chief Office No.: 108, Golden Point, Plot No. 31, Sector - 8, Gandhidham	222411	233211
	Sandesh Ahmedabad	Sandesh Sandesh Bhavan, Lad Society Road, Behind Vastrapur Gam, Ahmedabad-380015	079- 6762952, 6765480, 6765481, 6765482,	
8.	Gujarat Samachar Gandhidham	Mr. Awesh Malviya, B-ureau Chief, Gandhidham	9825425978	228222
	Gujarat Samachar Ahmedabad	Lok Prakashan Ltd. Gujarat Samachar Bhavan, Khanpur, AHMEDABAD	30410000	
9.	Jansatta - Loksatta	Ms Jayshreeben Mehta, Bureau Chief,Gim	9825225453 228797	---
10.	Indian Express Rajkot	216, Dhan Rajni Complex, Dr. Yagnik Road,Rakot	0281- 22481156	0281- 2481158
11.	The Times of India	Sterling Apartments,	9879324200	---

	Rajkot	1st floor, Jawahar Road, Rajkot – 360001	0281- 2226995 2227490	
	The Times of India Ahmedabad	SAKAR-1, 2nd Floor, Opp. Gandhigram Rly. Station, AHMEDABAD–380 009	079- 26554430, 26554431	079- 26587741 26554458
9.	DNA	Mr. D. V. Maheshwari Bureau Chief, Bhuj	02832- 251689	
10.	Mumbai Samachar, Chaupal	Mr. Tridev Vaidya Bureau Chief , Bhuj	02832- 231200	
11.	UNI	Mr. Mahesh Gadhvi Bureau Chief , Bhuj	9428294194	
12.	Exim Newsletter	Mr. P. G.,Nair, Bureau Chief Gandhidham	234194 9898573833	
13.	Daily Shipping Times	Mr. Haresh Manji Bureau Chief Gandhidham	222665 9925744679	
14.	Divya Bhaskar	Mr. Jayesh Shah Bureau Chief Gandhidham	9909944054	
15.	ETV	Mr. Rakesh Kotwal Bureau Chief Gandhidham	9909944080	
16.	Bhandarkar Shipping	Mr. Mehul Raval Bureau Chief Gandhidham	231455 / 9724307499	
17.	Hindustan Times, Ahmedabad	50, 5th Floor, Srikrishna Centre,	079- 6560049	079- 6560037

		Mithakali, Ahmedabad	6560061	
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PRINT MEDIA

18.	Mr. Kishore Ahir	Dy. Director	9427974892
19.	Shri Soni	Assistant Director	9879012714
20.	Mr. Shailesh Vyas	Chief News, All India Radio	9426802510

ANNEXURE-XXVIII**LIST OF FLEET OWNERS**

Sl. No.	Name of Company	Contact Person	Tel. Office	Tel. Resi.	Mobile
01	M/s A V Joshi & Company	Mr. Ramesh Singhvi Mr. Thacker MR. Harshandhu	231386 232605 233147	234176 221451 234325	98251 91325 98252 26105 98252 26013
02	M/s Rishi Shipping	Mr. B. K. Manshukhani Mr. Manoj Manshukhani	220843 229830 238943	234889 235587	98252 25170
03	M/s Maheshwari Handling Agency	Mr. C. P. Maheshwari Mr. Chandan Maheshwari	223228 230393	222339	98252 27111
04	M/s ABC	Mr. Latif Mr. Mithu Mr. Kasam	220483 221390 270190	234163 231477 251684	98252 26707
05	M/s Ganesh Transport	Mr. Hira Rabari Mr. Visa Rabari	223638 223915	260425	
06	M/s Kewar Carrier		220483 227553	234163	
07	M/s Krishna Transport Service	Mr. K. M. Thakker Mr. Pankaj Thacker	223814 224938	220998 234988	98250 19699 98252 25228
08	M/s Gautam Freight Ltd	Mr. Ramesh Singhvi	220163 230345	230328 234176	98251 91325

VTS GOK OFFICERS OF MASTER CONTROL CENTER (MCC) KANDLA

Sr. No.	Name	Designation	Mobile number
01	Shir B. Mishra	Deputy Director	7383576832
02	Shri Hansraj	Deputy Director	9428863924
03	Shri Mukesh Parmar	Asstt. Executive Engineer	9016106566
04	Shri M. Nimare	Asstt. Executive Engineer	9408553192

RADIO ACTIVE DISASTERS DOs AND DONTs

NUCLEAR EMERGENCIES - HOW TO RESPOND:

Nuclear facilities in India adopt internationally accepted guidelines for ensuring their safe operations and safety to the public and the environment. An independent regulatory authority oversees their safe operations. While the limits for radiation release/exposure have been set at a fraction of what can cause any significant harm, emergency procedures get implemented even when these very low limits are exceeded. As a result, it is extremely unlikely that the public near a nuclear facility will be exposed to any radiation beyond the permissible limits. However, to reassure the public, contingency plans are put in place even to handle such unlikely scenarios.

Keeping these facts in mind, if you still feel concerned on hearing any news or rumour about an incident at a nearby nuclear facility, follow these simple guidelines. These guidelines could also be followed in the event of any other nuclear emergency in your area, which does not even involve any nuclear facility.

- **DO THE FOLLOWING:**

1. Go indoors. Stay inside.

2. Switch on Radio/TV and look out for public announcements from your local authority.
3. Close doors/windows.
4. Cover all food, water and consume only such covered items.
5. If in the open, cover your face and body with a wet handkerchief, towel, dhoti or saree. Return home, change/remove clothes. Have a complete wash and use fresh clothing.
6. Extend full co-operation to local authorities and obey their instructions completely - be it for taking medication, evacuation, etc.

- **DO NOT DO THE FOLLOWING:**

1. Do not panic.
2. Do not believe in rumours passed on by word of mouth from one person to another.
3. Do not stay outside or go outside.
4. As far as possible, AVOID - water from open wells/ponds, exposed crops and vegetables, food, water or milk from outside.
5. Do not disobey any instruction of the District or Civil Defence Authorities who would be doing their best to ensure the safety of yourself, your family and your property.

AN OVERVIEW OF THE EMERGENCY RESPONSE PLANS IN THE DEPARTMENT OF ATOMIC ENERGY:

1. The Department of Atomic Energy (DAE) has been identified as the nodal agency in the country in respect of man made radiological emergencies in the public domain.
2. For this purpose, a Crisis Management Group (CMG) has been functioning since 1987 in DAE. In the event of any radiological or nuclear emergency in the public domain, the CMG is immediately activated and will co-ordinate between the local authority in the affected area and the National Crisis Management Committee (NCMC). The CMG comprises of senior officials drawn from various units of DAE like the Nuclear Power Corporation of India Ltd (NPCIL), Bhabha Atomic Research Centre (BARC), Heavy Water Board (HWB) and the Directorate of Purchase and Stores (DP&S). It also includes a senior official from the regulatory authority, the Atomic Energy Regulatory Board (AERB). Each member is backed by an alternate member, so that the CMG can be activated at a very short notice. Several Resource Agencies from BARC also backup the CMG. They can provide advice and assistance in the areas of radiation measurement and protection and medical assistance to radiation affected personnel.
3. As regards major nuclear facilities of DAE like the nuclear power stations, they have an Exclusion Zone of 1.6 km surrounding the power station in which no habitation is permitted. The entire area is fenced or walled off and defines the boundary of the site. Beyond this is the public domain and an area of 16 km radius around the plant site is called the Off Site Emergency Planning Zone (EPZ).
4. As a general practice, elaborate and comprehensive safety systems are in place for the operation of any nuclear facility. These are in turn overseen by the AERB who have powers to license and even shutdown any facility which violates their guidelines. However, as a matter of abundant caution, even some "beyond design basis" accidents are postulated for the nuclear power stations. It is only under such highly unlikely scenarios, that there is a possibility of a radiological emergency in the public domain. Therefore, in addition to the other types of emergency response plans in place within the facility to handle local emergencies, response plans have also been drawn up for handling such emergencies in the public domain, which are called as "Off Site Emergencies". These plans - drawn up separately in detail for each site - which are under the jurisdiction of the local District Administration, cover an area of about 16 km radius around the plant or the Off Site Emergency Planning Zone.
5. The first three types of Emergencies which are foreseen and for which detailed plant specific emergency response plans have been drawn up are Emergency Standby, Personnel Emergency and Plant Emergency. In all these, the consequences of the accident are expected to be limited to the plant facility only. The next type of Emergency which is foreseen is the Site Emergency, wherein the consequences of an accident are not expected to cross the site boundary, that is, the Exclusion Zone - which means that even under this condition, there is no radiological emergency in the public domain. The last type of Emergency which assumes the highly unlikely possibility of radiological releases in the public domain is the "Off Site Emergency" and detailed response plans have been drawn up even for this hypothetical scenario at each site. **The local District Administration, the Crisis Management**

Group, DAE and the National Crisis Management Committee (NCCM) get involved in this last type of Emergency.

6. It is mandatory for NPCIL to have comprehensive and well laid out plans to deal with all the above types of Emergencies. Barring the last one, all the others fall within the domain of responsibility of NPCIL, and the AERB as the Regulatory Authority approves these plans. It is also mandatory for the NPCIL to periodically test out these plans by way of Exercises and Drills and take corrective measures as stipulated by the Safety Committees and AERB. As the first stage of the trigger mechanism, the Crisis Management Group, DAE and its resource agencies are automatically alerted even when a Plant or Site Emergency/Exercise takes place.
7. In accordance with statutory requirements, it is the local District Administration which is responsible for drawing up and testing the Off Site Emergency Plans. NPCIL has co-ordinated with all concerned District Administration to enable them to draw up comprehensive Off Site Emergency Plans for each power station. It may be mentioned that the AERB does not permit any nuclear power station to be commissioned unless and until, such plans for all types of Emergencies are in place well before the commissioning date.
8. The Off Site Emergency Plans are also periodically tested and all power stations have ensured that this is being done atleast once in about two years. During these exercises, all the Members and Alternate Members of the Crisis Management Group, DAE, the Resource Agencies and Key Officials in Mumbai and Delhi are alerted. In these Exercises, the district administration is fully involved and the reports of the independent observers (from AERB, NPCIL and CMG) are used as a feedback to further improve the Emergency Response System.
9. Recognising the importance of communications in the handling of any Emergency, **Emergency Control Rooms (ECRs) are maintained at Mumbai at two different locations. These manned and operated on a round-the-clock and on all days of the year and maintain continuous contact with all the critical facilities of DAE.** The ECRs are equipped with Wireless, Telephone, Facsimile, VSAT and Electronic Mail facilities. These are tested practically on a daily basis to ensure their continuous availability. Further, each major site also carries out fortnightly or monthly communication exercises to test all the links in the entire communication chain.
10. In addition to about 165 communication exercises, about 110 emergency exercises are carried out every year. During the period from 1987 to 2000, 34 Off Site Emergency exercises have been conducted by the respective district administrations at various locations in the country. These involve direct participation by local district officials like police, health, transport, etc. At the end of each of these exercises, the District Collector/Magistrate chairs a "critique or feedback" session at which the deficiencies are recorded for taking corrective actions.
11. As regards transport of nuclear material, mandatory design specifications for the packaging, systems and procedures for handling and transport are in place to ensure that there is no release of radioactivity in the public domain in the unlikely event of such an accident. However, even if such an event were to occur, the procedures are such that the Emergency Control Room at the DAE Secretariat gets an alert which in turn would immediately activate the Crisis Management Group, DAE.
12. In the event of any other type of nuclear emergency in the public domain arising from the unauthorized presence or suspected presence of nuclear materials, a booklet giving the essential guidelines to be followed has been circulated to State Governments and Union Territories. Among other steps, the guidelines require that the nearest listed DAE facility as well as the DAE Emergency Control Room be also contacted immediately, who would then advise on the further necessary steps to be taken to attend to the emergency.

This short write up is primarily meant to educate the public and instill confidence about the Emergency Response System of DAE to handle radiation emergencies. As regards nuclear facilities of DAE, the regulatory and safety systems ensure that equipment are designed to operate safely and even in the unlikely event of any failure or accident, mechanisms like plant and site emergency response plans are in place to ensure that the public is not affected in any manner. In addition, detailed plans which involve the local public authorities, are also in place to respond if the consequences were to spill into the public domain. The System is also in a position to respond to any other radiation emergency in the public domain that may occur at locations which do not even have any DAE facility.

ANNEXURE – J

**License to carry out work of collection of Hazardous waste
(Authorized recycler)**



By R.P.A.D.

CONSOLIDATED CONSENT AND AUTHORIZATION (CC & A)

CCA NO: AWH-64725 Appl. Type: CCA-Renewal

NO: GPCB/KUT/RO/CCA-Renewal/ID-38470/

In exercise of the power conferred under Section-25 of the Water (Prevention and Control of Pollution) Act-1974, under Section-31 of the Air (Prevention and Control of Pollution) Act-1981 and Authorization under rule 6(2) of the Hazardous & Other Wastes (Management and Transboundary Movement) Rules-2016, framed under the E(P)Act-1986.

And whereas Board has received consolidated application dated 13/03/2023 and inward no. 274885 for the Renewal of consolidated consent and authorization (CC & A) of this Board under the provisions / rules of the aforesaid Acts. Consolidated Consent & Authorization is hereby granted as under.

CONSOLIDATED CONSENT AND AUTHORISATION:

(Under the provisions / rules of the aforesaid Environmental Acts)

To,
M/s. United Shipping Company,
Plot NO: 46, Mithrohar-GGDC,
Vill: Mithrohar -370240,
Tal: Gandhidham, Dist: Kutch East.

1. Consent Order No.: AWH-64725, date of Issue 30/06/2023.
2. The consent under Water Act -1974, Air Act - 1981 and Authorization under Environment (Protection) Act, 1986 shall be valid up to 13/03/2033 to operate Industrial plant to manufacture following product:

Sr. No.	List of Product	Quantity	Unit Per Month	Remarks
1.	Re-Refined Used Oil/ Waste Oil	525.00	MT	--

SPECIFIC CONDITIONS:-

- a. No ground water shall be used for the project coming under dark zone without permission of competent authority.
- b. Industry shall comply with fresh water from valid source having permission of the competent authority.
- c. Industry shall not carry out any activity which may attract the applicability of EIA Notification-2006 & its amendment.
- d. Management of Solid Waste generated from industrial activities shall be as per Solid Waste Management Rules-2016 (solid waste as defined in Rule-3(46)).
- e. As per provision of Rule-1B of Solid Waste Management Rules-2016 all industrial units using fuel and located within 100 km from the refused derived fuel (RDF) plant shall made an arrangement to replace at least five percent of their fuel requirement by refused derived fuel so produced.
- f. You shall not receive/ reprocess the used/ spent oil without obtain necessary amendment to authorization under rule-9 of Hazardous and Other Wastes (Management and Transboundary Movement) Rules-2016 from competent Authority.

3. CONDITION UNDER THE WATER ACT:

- 3.1 Source of water: Tankers.
- 3.2 The quantity of total water consumption shall not exceed 13 KL/Day as per below break up as mentioned in form D submitted for consent application under Water Act- 1974.
- a) Industrial: 12 KL/Day.
 - b) Domestic: 1 KL/Day.
- 3.3 The quantity of total waste water generation shall not exceed 01 KL/Day as per below break up as mentioned in form D submitted for consent application under Water Act- 1974.
- a) Industrial: 0.5 KL/Day
 - b) Domestic: 0.5 KL/Day
- 3.4 Industrial effluent management:
- a) Mode of disposal of treated industrial effluent: ETP.
 - b) Description for treated industrial effluent disposal: There shall be no discharge of industrial effluent. The effluent generated from the manufacturing process and other ancillary industrial operation shall be treated in Effluent Treatment Plant, giving primary treatment and shall be reused back in cooling process, in order to achieve zero liquid discharge.
- 3.5 Domestic sewage management:
- a) Mode of disposal of treated domestic sewage: Soak Pit/ Septic Tank.
 - b) Description for treated domestic sewage disposal: Generated domestic waste water shall be disposed into Soak Pit/ Septic Tank.
- 3.6 Industry shall provide fixed pipeline with flow meter for reuse of treated effluent in cooling process and maintain its record at site.
- 3.7 There shall be no discharge of the Industrial effluent which will be generated from the manufacturing process and other ancillary Industrial operations, Hence the Industry shall strictly adhere to zero liquid discharge (ZLD).
- 3.8 Disposal system for storm water shall be provided separately. In no circumstances storm water shall be mixed with industrial effluent.
- 3.9 The Board reserves the right to review and/or revoke the consent and / or make modifications in the conditions which it seems fit in accordance with provisions of Water Act-1974.

4. CONDITIONS UNDER THE AIR ACT:

- 4.1. Industry shall use fuel as specified in this order and the flue gas emission through stack shall conform to the following standards:

Sr. No.	Stack attached to	Capacity	Name of fuel	Quantity of Fuel	Air Pollution Control Measure (APCM)	Stack Height in Meter (From G.L.)	Parameter & Permissible limit
1.	Thermic Fluid Heater	10 Lac Kcal	Diesel	15 Lit/Hr.	Cyclone Separator	30	PM 150mg/Nm ³ SO ₂ 100 PPM NOX 50 PPM

- 4.2. There shall be no process gas emission from the manufacturing process and any other ancillary industrial operation through various stacks/ vent of reactors, process, and vessel from plant premises.
- 4.3. The concentration of the following parameters in the ambient air within the premises of the Industry shall not exceed the limits specified hereunder as per National Ambient Air Quality Standards issued by MoEF & CC dated 16th November-2009.



Sr. No.	Parameters	Permissible Limit (microgram / m ³)	
		Annual	24 Hours Average
1.	Particulate Matter (PM ₁₀)	60	100
2.	Particulate Matter (PM _{2.5})	40	60
3.	Oxides of Sulphur (SO _x)	50	80
4.	Oxides of Nitrogen (NO _x)	40	80

- Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.
- 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

- 4.4 Industry 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 be designed by numbers such as S-1, S-2, etc. and these shall be painted/displayed to facilitate identification.
- 4.5 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 a.m. and 10 p.m. and nighttime is reckoned between 10 p.m. and 6 a.m.

5. AUTHORISATION FOR THE MANAGEMENT & HANDLING OF HAZARDOUS WASTES Form-2 (See rule 6(2)).

- 5.1. Number of authorization: AWH-64725, date of Issue 30/06/2023.
- 5.2. M/s. United Shipping Company, is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated at Plot NO: 46, Mithirohar-GGDC, Vill: Mithirohar -370240, Tal: Gandhidham, Dist: Kutch East.

Sr. No.	Name of Haz. Waste	Category Number	Quantity in MT/Yr.	Facility and Mode of Disposal
1.	Used or Spent Oil	5.1	7200.00	Collection, storage, Transportation and disposal by reuse as lubricant in plant machineries within plant premises.
2.	Discarded Containers/ Barrels/ Liners	33.3	15.00 Nos./Yr.	Collection, storage, Transportation and disposal by giving it to registered recycler.
3.	Oily Sludge/ Emulsion	4.1	30.00	Collection, storage, Transportation and disposal by giving it to registered recycler.
4.	Organic Process Residue	4.4	20.00	Collection, storage, Transportation and disposal to CHWIF.
5.	ETP Sludge	34.3	0.50	Collection, storage, Transportation and disposal to TSDF.
6.	Spent Clay	4.5	30.00	Collection, storage, Transportation and disposal to CHWIF or to actual reuser or for Co-incineration.

- 5.3. The authorization is granted to operate a facility for collection, storage within factory premises, transportation and ultimate disposal of Hazardous wastes as mentioned above.
- 5.4. The authorization shall be in force for a period as mentioned above.
- 5.5. 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.
- 5.6. **Terms and conditions of authorization:**
- The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.
 - The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the Gujarat Pollution Control Board.
 - The person authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.
 - Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorization.
 - 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;
 - 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"
 - It is the duty of the authorized person to take prior permission of the Gujarat Pollution Control Board to close down the facility.
 - The imported hazardous and other wastes shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation.
 - The record of consumption and fate of the imported hazardous and other wastes shall be maintained.
 - The hazardous and other waste 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.
 - The importer or exporter shall bear the cost of import or export and mitigation of damages if any.
 - An application for the renewal of an authorization shall be made as laid down under these Rules.
 - 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.
 - Annual return (Form - 4) shall be filed by June 30th for the period ensuring 31st March of the year.
- 5.7. The industry shall have to manage used or spent oil; empty or discarded barrels / containers / liners contaminated with hazardous chemicals / wastes, process waste as per Hazardous & Other Wastes (Management and Transboundary Movement) Rules-2016, framed under the E(P)Act-1986 and shall apply Authorization for all applicable waste.
- 5.8. The waste generator shall be totally responsible for (i.e. collection, storage, transportation and ultimate disposal) of the wastes generated.
- 5.9. In case of any accident, details of the same shall be submitted in Form - 11 to Gujarat Pollution Control Board.


6. GENERAL CONDITION

- 6.1 In case of change of ownership/ management the name and address of the new ownership/ partners/ directors/ proprietor should immediately be intimate to the Board. Also any change in equipment or working conditions as mentioned in the consent form/ order should immediately be intimated to this Board.



- 6.2 Industry shall put up at the entrance a board displaying the name of the Industry, particulars of the products/ process and the name of proprietor/partners /directors of the Industry and the electricity consumer number as on the record of PGVCL.
- 6.3 The environmental statements pertaining to the previous year shall be submitting to this State Board latest by 30th June every year.
- 6.4 Adequate plantation shall be carried out all along the periphery of the industrial premises in such a way that the density of plantation is at least 1000 trees per acre of land and a green belt of 5 meters width is developed.
- 6.5 The industry shall have to display the relevant information with regard to hazardous waste, waste water & air pollutants as indicated in the Courts Order in W.P. No.657 of 1995 dated 14th October-2003.
- 6.6 As per "Public Liability Insurance Act - 1991", Industry shall get Insurance Policy, if applicable.
- 6.7 Applicant shall also comply with the general conditions given in annexure I.
- 6.8 The waste generator shall be totally responsible for (I.E. Collection, storage, transportation and ultimate disposal) of the wastes generated.
- 6.9 Records of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control Board in Form - 4 by 31st January of every year
- 6.10 In case of any accident, details of the same shall be submitted in Form - 5 to Gujarat Pollution Control Board.
- 6.11 Empty drums and containers of toxic and hazards 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 Control Board regularly.
- 6.12 In no case any kind of hazardous waste shall be imported without prior approval of appropriate authority.
- 6.13 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 waste are generated, the occupier shall obtain "No Objection certificate" from the state pollution Control Board, the Committee of the concerned state or Union territory Administration where the facility exists.
- 6.14 Unit shall take all concrete measures to show tangible results in waste generation reduction, avoidance, reuse and recycle. Action taken in this regards shall be submitted within 03 months and also along with Form 4.
- 6.15 Industry shall have to display online 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 waste generated within the factory premises.

For and on behalf of
GUJARAT POLLUTION CONTROL BOARD


(Rajesh Kumar Parmar)
Regional Officer, Kutch (East)

ISSUED TO,
M/s. United Shipping Company,
Plot NO: 46, Mithirohar-GGDC,
Vill: Mithirohar -370240,
Tal: Gandhidham, Dist: Kutch East.

GPCB ID: 38470, Inward ID: 274885.



Gujarat Pollution Control Board

REGIONAL OFFICE : MEHSANA

Plot No.. H/3-A, GIDC Estate, Phase-1, Nr FCI Godown, Modhera Road, Mehsana-384 002
Phone No.: (02762) 258284, 258106, Web: <http://gpcb.gujarat.gov.in>

By **R.P.A.D**

NO: GPCB / MEH / CEA- 46(4)/ ID-18126/ 5403 / **17805**

Date: 08/05/2023

In exercise of power conferred under Section -25 of the Water (Prevention & Control of Pollution) Act - 1974, under Section - 21 of the Air (Prevention & Control of Pollution) Act - 1981 and Authorization under rule 3 (c) & 5 (5) of the Hazardous Waste (Management & Handling & Trans boundary movement) Rules 2008 framed under the Environmental (Protection) Act - 1986.

And Whereas Board has received Consolidated Consent Application letter No. **273092** dated **29/01/2023** for the **Consolidated Consent and Authorization (C C & A)** of this Board under the provision / rules of the aforesaid Acts. Consent & Authorization are hereby granted as under

CONSENT AND AUTHORIZATION:

(Under the provision / rules of the aforesaid Environmental Acts.)

To,
M/s. **ALICID ORGANIC INDUSTRIES LTD**
Plot No. 207, 208,
Village: Hanumant Heduva,
Ta & Dist: Mehsana - 384-002.

1. Consent Order No: **AWH-62807**, Date of issue: **19/04/2023**.
2. The consent shall be valid up to **31/03/2028** for use outlet for the discharge of trade effluent & emission due to operation of industrial plant for manufacture of the following items / products.

Sr. No	Product	Quantity
1.	Re-cycled Waste Oil (Industrial fuel)	1500 KL/Monch
2.	Re-refine used oil	225 KL/Month

SPECIFIC CONDITION:

- The passbook for Re-Refining of Hazarders waste for "Waste oil @ 18000 KLPD & used oil @ 2700 KLPD" shall be valid up to **31/03/2023**.
- The unit shall not import any waste without obtaining the clearance as specified in Sch-VII of Haz. Waste Rules-2016.
- The unit shall quarterly and annually submit the details of waste procured and processed to the Board.

3. CONDITION UNDER THE WATER ACT

- 3.1 There shall be no discharge of the industrial effluent from the manufacturing process and other ancillary industrial operations
- 3.2 The quantity of the industrial discharge shall be NIL.
- 3.3 The quantity of the domestic waste water (sewage) shall not exceed **800 Lits/day**.
- 3.4 Sewage shall be disposed of through **Septic tank/soak pit** system.

4. CONDITIONS UNDER AIR ACT 1981:

- 4.1 The following shall be used as fuel.

Sr. No	Fuel	Quantity
1.	LDO	65 lit/ Hr.
2.	Wood	100 Kg/ Hr.
3.	Imported Coal	75 Kg/ Hr.
4.	CNG	175 SCM/ Hr

Page 1 of 3

Clean Gujarat Green Gujarat

ISO - 9001 - 2008 & ISO - 14001 - 2004 Certified Organisation

Gujarat Pollution Control Board

Gujarat Pollution Control Board
MEDICAL OFFICE, MEDICAL COLLEGE, RAIPUR, RAJCOVA, RAJCOVA, RAJCOVA



- 4.2 The applicant shall install & operate air pollution control system in order to achieve norms prescribed below.
 4.3 The flue gas emission through stacks attached to boiler shall conform to the following standards:-

Stack No.	Stack Attached to	Stack Height in Meter	APCM	Parameter	Permissible Limit
1.	Thermal Fluid Heater (02 Lakh Kcal)	30	--	PM SO ₂ NO _x	150 mg/NM ³ 100 ppm 50 ppm
	Thermal Fluid Heater (02 Lakh Kcal)		--		
2.	Thermal Fluid Heater (01 No's) (06 Lakh Kcal)	30	--		
3.	Thermal Fluid Heater (01 No's) (10 Lakh Kcal)		Dust collector + Bag Filter		

- 4.4 There shall be no process emission from the manufacturing process and other ancillary operations.
 4.5 Ambient air quality within the premises of the industry shall conform to the following standards:-

PARAMETERS	PERMISSIBLE LIMIT	
	Annual	24 Hrs Average
Particulate Matter- 2.5 (PM 2.5)	40 Microgram/M ³	60 Microgram/M ³
Particulate Matter- 10 (PM 10)	60 Microgram/M ³	100 Microgram/M ³
Sulphur Dioxide (SO ₂)	50 Microgram/M ³	80 Microgram/M ³
Nitrogen Dioxide (NO _x)	40 Microgram/M ³	80 Microgram/M ³

- 4.6 The applicant shall install & operate following Air pollution control equipment very efficiently & continuously so that the emission of particulate matter shall not exceed the concentration mentioned at 4.5 above.
 4.7 The consent to operate the industrial plant shall lapse if at any time the parameters of the emission are not within the tolerance limits specified in the condition no-4.5.
 4.8 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. Day time is reckoned in between 6 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.

5. AUTHORIZATION FOR THE MANAGEMENT & HANDLING OF HAZARDOUS WASTES FORM-2 (See rule 5 (4))

- 5.1 Form for grant of authorisation for occupier or operator handling hazardous waste.
 5.2 M/S. **ALICID ORGANIC INDUSTRIES LTD** is hereby granted an authorisation to operate facility for following hazardous wastes on the premises situated at Plot No. 207, 208, Village: Hanumant Heduva, Ta & Dist: Mehsana - 384 002.

Sr. No.	Type of Waste	Quantity	Category Schedule-1	Facility
1.	Used Oil (Cat. No. 5.1)	2700 KL/Year	5.1	Reception, Collection, Storage & Re-Refining in the premises.
2.	Waste Oil (Cat. No. 5.2)	18000 KL/Year	5.2	Reception, Collection, Storage & Re-cycling in the premises.
3.	Distillation Residues (Cat. No. 20.3)	444 KL/Year	20.3	Collection, Storage, transportation, disposal at Authorized CHWIF
4.	Spent Clay Containing Oil (Cat. No. 4.5)	117 MT/Year	4.5	Collection, Storage, transportation, disposal at Authorized CHWIF
5.	Filter and filtering materials (Cat. No. 36.2)	12 MT/Year	36.3	Collection, Storage, Transportation, disposal at Authorized TSDF site



Gujarat Pollution Control Board

REGIONAL OFFICE : MEHSANA

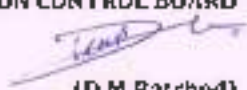
Plot No. H/3-A, GIDC Estate Phase-1, Nr FCI Godown, Modhera Road, Mehsana 384 002
Phone No.: (02762) 258294, 258106, Web: <http://gpcb.gujarat.gov.in>

- 5.3 The authorisation is granted to operate a facility for Collection, Storage, and return back to supplier/ sale to authorized recycler.
- 5.4 The authorisation shall be valid up to 31/03/2028.
- 5.5 The authorisation 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.

6 GENERAL CONDITION:

- 6.1 Adequate plantation shall be carried out all along the periphery of the industrial premises in such a way that the density of plantation is at least 1000 trees per acre of land and a green belt of 05 meters width is developed.
- 6.2 The applicant shall have to submit the returns in prescribed form regarding water consumption and shall have to make payment of water cess to the board under the Water Cess Act-1977
- 6.3 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
- 6.4 The applicant shall however, not without the prior consent of the Board bring into use any new or altered outlet for the discharge of effluent or gaseous emission or sewage waste from the proposed industrial plant. The applicant is required to make applications to this Board for this purpose in the prescribed forms under the provisions of the Water Act-1974, the Air Act-1981 and the Environment (Protection) Act-1986
- 6.5 Any change in personnel, equipment or working conditions as mentioned in the consents form/ order should immediately be intimated to this Board. 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.
- 6.6 If it is established by any competent authority that the damage is caused due to their industrial activities to any person or his property. In that case they are obliged to pay the compensation as determined by the competent authority.
- 6.7 Management of Solid Waste generated from industrial activities shall be as per Solid Waste Management Rules-2016 (solid waste as defined in Rule-3(46)).
- 6.8 As per provision of Rule 18 of Solid Waste Management Rules-2016 all industrial units using fuel and located within 100 km from the refused derived fuel (RDF) plant shall make an arrangement to replace at least five percent of their fuel requirement by refused derived fuel so produced.

For and on behalf of
GUJARAT POLLUTION CONTROL BOARD


(D.M. Rathod)
Regional Officer



GUJARAT POLLUTION CONTROL BOARD

REGIONAL OFFICE : AHMEDABAD (RURAL)
1, Daffodils Avenue,
Nr. Zydus Research Center,
Sarkhej-Bavlā N.H No-8A, Moraiya-382213
Ta: Sanand, Dist: Ahmedabad.
Website : www.gpcb.gov.in
Email: ID : ~~gpcbrural@gmail.com~~
Ph. No. : ~~(079) 332-22006~~

NO: GPCB/RO-ABD(RURAL)

DATE:

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) Act-1981 and Authorization under rule 6(2) of the Hazardous and other Waste (Management and Transboundary Movement) Rules, 2016, framed under the Environment (Protection) Act-1986.

And whereas Board has received on line consolidated application Inward No. 159558 dated 19/07/2019 for the Consolidated Consent and Authorization (CC&A) of this Board under the provisions / rules of the aforesaid Acts Consent & Authorization is hereby granted as under.

CONSENT AND AUTHORISATION:

(Under the provisions / rules of the aforesaid environmental acts)

To,
M/s. Amar Hydrocarbon Pvt Ltd,
Plot no: 36, S. No. 165/1 to 180, 1+2,
Lyava - 382170,
Tal: Sanand, Dist: Ahmedabad.



1.0 Consent Order No. : AWH-38235, Date of Issue - 04/09/2019.

1.1 The consents shall be valid up to 30/06/2024 for the use of outlet for the discharge of trade effluent & emission due to operation of industrial plant for manufacturing of following items/products:

Sr. No	Product	Quantity
1.	Re-Cycled Waste Oil	1500 KL/Month
2.	Re-Refined Used Oil	250 KL/Month
3.	Industrial Fuel Oil	500 KL/Month
4.	Industrial Soft Oil	250 KL/Month
5.	Industrial Specialty Oil	125 KL/Month
6.	Industrial Bottom Oil	125 KL/Month

SUBJECT TO THE FOLLOWING CONDITION:

1. Unit shall have to obtain the Environmental Clearance from the relevant authority if at any stage project activity is covered under the EIA notification dated 14-09-2006, if applicable.
2. Unit shall strictly maintain zero liquid discharge.
3. Unit shall comply with guidelines/SOP prescribed by GPCB/CPG for used oil/waste oil.
4. Unit shall not extract ground water without getting prior permission from CGWA.



2.0 CONDITIONS UNDER THE WATER ACT, 1974:

- 2.1 The total water consumption shall not exceed **5.5 KL/day**.
- 2.2 The quantity of the industrial effluent to be generated from the manufacturing process and other ancillary industrial operation shall not exceed **3.7 KL/Day**.
- 2.3 The generated industrial effluent shall be treated in Effluent Treatment Plant and after treatment treated waste water shall be used **2.7 KL/Day** water in cooling tower and 1 KL/Day evaporated in heat quencher. Thus, unit shall maintain zero liquid discharge.
- 2.4 The quantity of domestic waste water (sewage) shall not exceed **1.6 KL/day**.
- 2.5 Domestic effluent shall be disposed off through **Septic tank/Soak pit system**.

3.0 CONDITIONS UNDER THE AIR ACT, 1981:

- 3.1 The following shall be used as fuel:

Sr. No.	Fuel	Quantity
1	Wood	2 MT/Day
2	LDO/light cut oil	200 lit/day

- 3.2 The applicant shall install and operate air pollution control system in order to achieve following norms prescribed below:

- 3.3 The flue gas emission through stack shall conform to the following standards:

Sr. No.	Stack attached to	Stack height in Meter	APCM Details	Parameter	Permissible Limit
1.	Wood fired Furnace	33 Common Stack	Waste Heat Quencher	Particulate matter	150 mg/Nm ³
2.	Thermic Fluid Heater			SO ₂	100 ppm
				NO _x	50 ppm

- 3.4 There shall be no process gas emission from the manufacturing process and other ancillary industrial operations.
- 3.5 The concentration of the following parameters in the ambient air within the premises of the industry shall not exceed the limits specified hereunder:

Parameters	Permissible Limit Annual	Permissible Limit 24 Hrs Average
Particulate Matter-10 (PM ₁₀)	60 Microgram/m ³	100 Microgram/m ³
PM 2.5 (PM _{2.5})	40 Microgram/m ³	60 Microgram/m ³
SO ₂	50 Microgram/m ³	80 Microgram/m ³
NO _x	40 Microgram/m ³	80 Microgram/m ³

- 3.6 The applicant shall provide portholes, ladder, platform etc at chimney(s) for monitoring the air emissions and the same shall be open for inspection to/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.
- 3.7 The applicant shall operate industrial plant/air pollution control equipment very efficiently and continuously so that the gaseous emission always conforms to the standards specified in condition no. 3.3 and 3.5 above.
- 3.8 The consent to operate the industrial plant shall lapse if at any time the parameters of gaseous emission are not within the tolerance limits specified in the condition no. 3.3 & 3.5.
- 3.9 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 a.m. and 10 p.m. and night-time is reckoned between 10 p.m. and 6 a.m.
- 3.10 The applicant shall at his own cost get samples of ambient air quality collected & analyzed from an approved laboratory once in for the parameters indicated in condition No. 3.3 & 3.5 and shall submit in duplicate the report there of to the Board by the 10th of the succeeding month.



GENERAL CONDITIONS:

- Any change in personnel, equipment or working conditions as mentioned in the consents form/order should immediately be intimated to this Board.
- Whenever due to accident or other unforeseen act or ever, 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. 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.
- 4.3 The Environmental Management unit/cell shall be set up to ensure implementation 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 shall also coordinate the exercise of environmental audit of environmental statements.
- 4.4 The environmental audit shall be carried out yearly, if the unit fall under Schedule-I and Schedule-II of Environment Audit Scheme and the environmental statements pertaining to the activities for the year ending on 31st March shall be submitted to the State Board latest by 30th September every year.
- 4.5 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.
- 4.6 In case of change of ownership/management the name and address of the new owners/ partners/directors/proprietor should be immediately be intimated to the Board.

5.0. AUTHORISATION FOR THE MANAGEMENT & HANDLING OF HAZARDOUS WASTES Form-2 (See rule 6 (2)).

- 5.1 **M/s. Amar Hydrocarbon Pvt Ltd**, is hereby granted an Authorization to operate facility for following hazardous and other wastes on the premises situated at **Plote no: 36, S. No. 165/1 to 180, 1+2, Iyava - 382170, Tal: Sanand, Dist: Ahmedabad.**

Sr. No.	Waste	Category	Quantity	Facility
1.	Waste Oil	5.2	18000 KL/Year	Reception, Collection, Storage and Recycling.
2.	Used Oil	5.1	3600 KL/Year	Reception, Collection, Storage and Recycling.
3.	Distillation residue	20.3	540 KL/Year	Collection, Storage, Transportation, Disposal by incineration at SEPI Kutch.
4.	Spent clay containing oil	4.5	70 MT/Year	Collection, Storage, Transportation, Disposal by incineration at SEPI Kutch.
5.	ETP Waste	34.3	240 Kg/Year	Collection, Storage, Transportation, Disposal at TSD of SEPI Kutch.
6.	Filters & Filtering materials	35.1	240 Kg/Year	Collection, Storage, Transportation, Disposal at TSD of SEPI Kutch.
7.	Discarded barrels	33.3	2400 Nos./Year	Collection, Storage, Transportation, and Sale to registered de-contamination facility.

- 5.2 The authorization is granted to operate a facility for collection, storage at factory premises and transportation and disposal of hazardous waste as above.
- 5.3 The **Authorization No. AWH-38235** shall be in force for a period up to **30/06/2024**.
- 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 applicant shall have to comply with the provisions of E-Waste (Management) Rules-2016.

be specified in the rules from time to time under the Environment (Protection) Act-1986.

5.5 The applicant shall have to comply with the provisions of E-Waste (Management) Rules-2016

6.0 TERMS AND CONDITIONS OF AUTHORISATION:

- 6.1 The applicant shall comply with the provisions of the Environment (Protection) Act -1986 and the rules made there under
- 6.2 The authorization shall be produced for inspection at the request of an officer authorized by the Gujarat Pollution Control Board.
- 6.3 The persons authorized shall not rent, lend, sell, and transfer or otherwise transport the hazardous wastes without obtaining prior permission of the Gujarat Pollution Control Board.
- 6.4 Any unauthorized change in personnel, equipment or working conditions as mentioned in the authorization order by the persons authorized shall constitute a breach of this authorization.
- 6.5 It is the duty of the authorized person to take prior permission of the Gujarat Pollution Control Board to close down the facility.
- 6.6 An application for the renewal of an authorization shall be made as laid down in rule 6 (1).
- 6.7 Industry shall submit annual report within 15 days and sub squinty by 30th June every year
- 6.8 Industry shall have to manage waste oil; discarded containers etc as per the Rules 2016 and shall apply Authorization/submit details for all the applicable waste as per the Rules 2016 within 15 days.

7.0 GENERAL CONDITIONS:

- 7.1 The waste generator shall be totally responsible for (i.e. collection, storage, encapsulation, incineration, treatment, transportation and ultimate disposal) of the wastes generated.
- 7.2 Records of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control Board in Form - 4 by 30th June of every year.
- 7.3 In case of any accident, details of the same shall be submitted in Form-11 to Gujarat Pollution Control Board.
- 7.4 As per "Public Liability Insurance Act - 91" company shall get insurance Policy, if applicable.
- 7.5 Empty drums and containers of toxic and hazards 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 Control Board regularly.
- 7.6 In no case any kind of hazardous waste shall be imported without prior approval of appropriate authority.
- 7.7 In case of transport of hazardous wastes to a facility for (i.e. 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 or Union territory Administration where the facility exists.
- 7.8 Unit shall take all concrete measures to show tangible results in waste generation, reduction, avoidance, reuse and recycle. Action taken in this regards shall be submitted within three months and also along with Form-4.
- 7.9 Industry shall have to display the relevant information with regard to hazardous waste as indicated in the Courts Order in W.P. No.657 of 1995-dated 14th October-2003.
- 7.10 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 waste water and air emissions and solid hazardous wastes generated within the factory premises.

For and on behalf of
Gujarat Pollution Control Board

C.A. Shah
Regional Officer

NO: GPCB/RO-A'bad (Rural)/GEN-1201/ID-11702/ 15730 Date: 16/01/2020

issued To:

M/s. Amar Hydrocarbon Pvt Ltd,
Plote no: 36, S. No. 165/1 to 180, 1+2,
iyava - 382170, Tal: Sanand, Dist: Ahmedabad.



TRUE COPY

A. S. TALAT
NOTARY
GOVT. OF INDIA

Copy to: (1) The Member Secretary, GPCB, Gandhinagar..... For information please.

TRUE COPY



Gujarat Pollution Control Board

REGIONAL OFFICE : MEHSANA

Plot No. H/3-A, GIDC Estate, Phase-1, Nr. FCI Godown, Modhera Road, Mehsana-384 002
Phone No.: (02762) 258294, Fax No.: (02762-258106) Web: gpcb.gov.in

In exercise of power conferred under Section -25 of the Water (Prevention & Control of Pollution) Act - 1974, under Section - 21 of the Air (Prevention & Control of Pollution) Act - 1981 and Authorization under rule 3 (c) & 5 (5) of the Hazardous Waste (Management & Handling & Transboundary movement) Rules 2008 framed under the Environmental (Protection) Act - 1986. And Whereas Board has received Consolidated Consent Application letter No. 159886 dated 26/06/2019 for the Consolidated Consent and Authorization (C C & A) of this Board under the provision / rules of the aforesaid Acts. Consent & Authorization are hereby granted as under:

CONSENT AND AUTHORIZATION:

(Under the provision / rules of the aforesaid Environmental Acts.)

TO,
M/s. ATLAS ORGANICS P. LTD
Plot No. 14602,
Village: Rajpur-382740,
Tal: Kadi, Dist: Mehsana.

- Consent Order No: AWII-37547, Date of issue: 29/07/2019.
- The consent shall be valid up to 31/03/2024 for use outlet for the discharge of trade effluent & emission due to operation of industrial plant for manufacture of the following items / products.

Sr. No	Product	Quantity
1	Re-cycled Waste Oil	700 KL/Month
2	Re-refined used Oil	250 KL/Month

SPECIFIC CONDITION:

- Unit shall obtain necessary CGWA permission in case of ground water withdrawal.

3. CONDITION UNDER THE WATER ACT

- The quantity of the industrial effluent to be generated from the manufacturing process and other ancillary industrial operations shall be 10.50 KLPD as generated industrial effluent shall be treated in proposed ETP. Treated waste water shall be reuse back in process.
- The quantity of domestic sewage effluent from the factory shall not exceed 0.2 KLPD.
- The effluent treatment plant consisting of the following units shall be provided.

Sr.No.	Name of Unit
1.	Collection Tank
2.	Oil & Grease removal Tank
3.	Neutralization Tank
4.	Settling Tank
5.	Holding Tank
6.	Sludge Drying Beds

- Domestic effluent shall be disposed of through Septic tank/soak pit system.

4. CONDITIONS UNDER AIR ACT 1981:

- The following shall be use as fuel in boiler/furnace/heater respectively.

Sr. No	Fuel	Quantity
1	LDO(for furnace)	500 Lit/ Day
2	LDO	750 Lit/Day
3	Coul	02 MT/Day

- The applicant shall install & operate air pollution control system in order to achieve norms prescribed below.

- The flue gas emission through stacks attached to boiler/furnace/heater shall conform to the following standards:-

Stack No.	Stack Attached to	Stack Height in Meter	APCM	Parameter	Permissible Limit
1	Thermic Fluid Heater & Non Hot Boiler	21	--	PM SO ₂ NO _x	150 mg/NM ³ 100 ppn 50 ppn
2	Furnace	15	Bag Filter		



Clean Gujarat Green Gujarat

ISO - 9001 - 2008 & ISO - 14001 - 2004 Certified Organisation

26 JUL 2022
TRUE COPY

(SHWETA N. RAMNANI)
ADVOCATE & NOTARY
Gandhinagar - Kachchh

TRUE COPY



Gujarat Pollution Control Board

REGIONAL OFFICE : MEHSANA

Plot No.: H/3-A, GIDC Estate, Phase-1, Nr. FCI Godown, Modhera Road, Mehsana-384 002
Phone No.: (02762) 258294, Fax No.: (02762-258106) Web: gpcb.gov.in

4.4 There shall be no process emission from the manufacturing process and other ancillary operations.

4.5 Ambient air quality within the premises of the industry shall conform to the following standards: -

PARAMETERS	PERMISSIBLE LIMIT	
	Annual	24 Hrs Average
Particulate Matter- 2.5 (PM _{2.5})	40 Microgram/M ³	60 Microgram/M ³
Particulate Matter-10 (PM ₁₀)	60 Microgram/M ³	100 Microgram/M ³

4.6 The applicant shall install & operate Air pollution control equipment very efficiently & continuously so that the gaseous emission always conforms to the standards specified in condition no.3.3 above.

4.7 The consent to operate the industrial plant shall lapse if at any time the parameters of the emission are not within the tolerance limits specified in the condition no.3.3 & 3.5 above.

4.8 The applicant shall provide portholes, ladder, platform etc at Chimney(s) for monitoring the air emission 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 be designed by numbers such as S-1,S-2, etc. And these shall be painted/displayed to facilitate identification.

4.9 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. Day time is reckoned in between 6 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.

5. **AUTHORISATION FOR THE MANAGEMENT & HANDLING OF HAZARDOUS WASTES FORM-2 (See rule 5 (4))**

5.1 Form for grant of authorisation for occupier or operator handling hazardous waste.

5.2 M/s. ATLAS ORGANICS P. LTD is hereby granted an authorisation to operate facility for following hazardous wastes on the premises situated at Plot No. 1460/2, Village:Rajpur-382740, Ta: Kadi, Dist: Mehsana.

Sr. No.	Type of Waste	Quantity	Category Schedule-1	Facility
1	Waste Oil	10080 KL/Year	5.2	Collection, transportation, Storage & Re-cycling
2	Used Oil/Spent Oil	3600 KL/Year	5.1	Collection, transportation, Storage & Re-cycling
3	Empty Barrels/Containers barrels.	500 Nos./year	33.1	Collection, Storage, transportation, & sale to register recycler
4	ETP Sludge	1 MT/Year	34.3	Collection, decontamination & Storage & disposal at TSDF
5	Spent clay containing oil	200 MT/Year	4.5	Collection, decontamination & Storage & send to co-processor
6	Oil sludge/ Bottom residue	180 KL/Year	4.4	Collection, decontamination & Storage & send to co-processor

5.3 The authorisation is granted to operate a facility for Collection, Storage, encapsulation, incineration treatment within the factory premises transportation and ultimate disposal of hazardous waste at NEPL.

5.4 The authorisation 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 authorisation shall be in force for a period up to 31/03/2024.

6 TERMS AND CONDITIONS OF AUTHORISATION

- The applicant shall comply with the provisions of the Environment (Protection) Act - 1986 and the rules made there under.
- The authorisation shall be produced for inspection at the request of an officer authorized by the Gujarat Pollution Control Board.
- 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.
- Any unauthorized change in personnel, equipment or working conditions as mentioned in the authorisation granted by the persons authorized shall constitute a breach of this authorisation.
- It is the duty of the authorised person to take prior permission of the Gujarat Pollution Control Board to close down the facility.

Clean Gujarat Green Gujarat

ISO - 9001 - 2008 & ISO - 14001 - 2004 Certified Organisation



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Gujarat Pollution Control Board

REGIONAL OFFICE : MEHSANA

Plot No.: H/3-A, GIDC Estate, Phase-1, Nr. FCI Godown, Modhera Road, Mehsana-384 002
Phone No.: (02762) 258294, Fax No.: (02762-258106) Web: gpcb.gov.in

- 1) An application for the renewal of an authorisation shall be made as laid down in rule 5(6)(i).
- 2) Industry shall have to manage waste oil, discarded containers etc as per Amended Rules - 2003 and Shall apply authorization/submit details for all applicable waste as per Amended Rules -2003 with 15 days.
- 3) Industry shall submit annual report within 15 days and subsequently by 31st January every year

GENERAL CONDITION:

- 1 Adequate plantation shall be carried out all along the periphery of the industrial premises in such a way that the density of plantation is at least 1000 trees per acre of land and a green belt of 05 meters width is developed.
- 2 The applicant shall have to submit the returns in prescribed form regarding water consumption and shall have to make payment of water cess to the board under the Water Cess Act-1977.
- 3 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.
- 4 The applicant shall however, not without the prior consent of the Board bring into use any new or altered outlet for the discharge of effluent or gaseous emission or sewage waste from the proposed industrial plant. The applicant is required to make applications to this Board for this purpose in the prescribed forms under the provisions of the Water Act-1974, the Air Act-1981 and the Environment (Protection) Act-1986.
- 5 Any change in personnel, equipment or working conditions as mentioned in the consents form/ order should immediately be intimated to this Board. 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.
- 6 If it is established by any competent authority that the damage is caused due to their industrial activities to any person or his property. In that case they are obliged to pay the compensation as determined by the competent authority.
- 7 Management of Solid Waste generated from industrial activities shall be as per Solid Waste Management Rules-2016 (solid waste as defined in Rule-3(46)).
- 8 As per provision of Rule-18 of Solid Waste Management Rules-2016 all industrial units using fuel and located within 100 km from the refused derived fuel (RDF) plant shall made an arrangement to replace at least five percent of their fuel requirement by refused derived fuel so produced.

NO:GPCB/CCA-MH-155(3)/ID: 18145/ 1767/15925

Date: 05 AUG 2019

Issued to:
M/s. ATLAS ORGANICS P. LTD
Plot No. 1460/2,
Village:Rajpur-382740,
Ta: Kadi, Dist: Mehsana.

For and on behalf of
GUJARAT POLLUTION CONTROL BOARD


(J.D. Priyadarshi)
Regional Officer

22 JUL 2022

TRUE COPY


(SHWETA N. RAMNANI)
ADVOCATE & NOTARY
Gandhidham - Kachchh



Regional Office - Kutch (East)
Gujarat Pollution Control Board
Room No. 215-216-217, 2nd Floor,
Kandla Port Trust Administrative Building,
Gandhidham - 370201, Kutch.
Email:- ro-gpcb-kute@gujarat.gov.in

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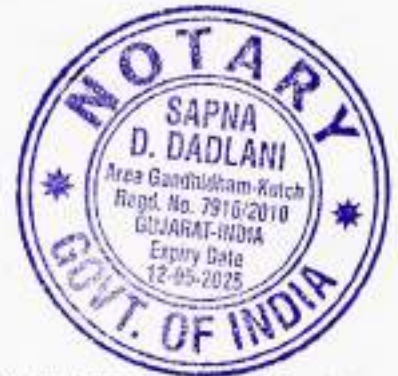
In exercise of the power conferred under section-25 of the Waster (Prevention and Control of Pollution) Act-1974, under section-21 of the Air (Prevention and Control of Pollution) Act-1981 and Authorization under rule 6(2) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 framed under the E (P) Act-1986.

And whereas Board has received consolidated application no: 176383, dated 28/06/2020 for the fresh consolidated consent and authorization (CC & A) of this Board under the provision / rules of the aforesaid acts-rules. Consent & Authorization is hereby granted as under.

CONSOLIDATED CONSENT AND AUTHORISATION:

(Under the provision / rules of the aforesaid environmental acts)

To,
Aviation Corporation (PCB ID -63724),
PLOT NO: S. No. 67/2/P1,
Shikarpur- 370150
TAL: Bhachau, DIST: Kutch.



1. Consent Order No: AWH -43501; Date of Issue: 21/10/2020.

2. The consent shall be valid up to 27/06/2025 for the use of outlet for the discharge of trade effluent and emission due to operation of industrial plant for manufacture of following items/products at an above-mentioned address.

Sr No	Product	Quantity
1	Used Oil/ Waste Oil Reprocessing	300 MT/Month (Used Oil- 150 MT/Month & Waste Oil- 150 MT/Month)
2	Sodium Silicate	1500 MT/Month

Specific Condition

1. No ground water shall be withdrawn without prior approval from competent authority.
2. You shall not carry out any activity which may attract the applicability of EIA notification-2006 and its amendments.
3. Management of Solid Waste generated from industrial activities shall be as per Solid Waste Management Rules-2016 (solid waste as defined in Rule-3(46)).
4. As per provision of Rule-18 of Solid Waste Management Rules-2016 all industrial units using fuel and located within 100 km from the refused derived fuel (ROF) plant shall made an arrangement to replace at least five percent of their fuel requirement by refused derived fuel so produced.
5. Industry shall manage Solid Waste generated from industrial activities as per Solid Waste Management Rules- 2016 (Solid Waste as defined in Rule- 3(46)).
6. Industry shall comply with Plastic Waste Management Rules- 2018 & amended therefore. (if applicable)
7. You shall have to comply with Coal Handling guideline.



8. You shall have to comply with Fly Ash Notification- 1999 and its amendments.

3 Condition under the Water Act

3.1 Source of Water: Tankers

3.2 The quantity of industrial water consumption shall not exceed 07 KL/Day.

3.3 The quantity of Domestic water consumption shall not exceed 02 KL/Day.

3.4 The quantity of industrial waste water generated from manufacturing process & other ancillary operation shall not exceed 2.2 KL/Day.

3.5 The quantity the Domestic waste water (sewage) shall not exceed 1.2 KL/Day.

3.6 Industrial effluent from process plant, washing etc. shall be collected separately & treated into ETP adequately so that treated industrial effluent shall comply with following norms:

PARAMETER	PERMISSIBLE LIMIT
pH	6.5 to 8.5
Temperature	40°C
Color	100 Units
Suspended Solids	100 mg/l
Oil & Grease	10 mg/l
Phenolic Compound	01 mg/l
Amonical Nitrogen	50 mg/l
BOD (03 days At 27° C)	30 mg/l
COD	100 mg/l
Chloride	600 mg/l
Sulphates	1000 mg/l
Total Dissolved Solids	2100 mg/l
Sulphides	02 mg/l
Percent Sodium	60%
Sodium Adsorption Ratio	26

Treated effluent conforming to the above standards shall be reuse in within plant only.
 3.7 Industry shall provide fixed pipeline with flow meter for reuse of treated effluent to achieve Zero Liquid Discharge.

3.5 Sewage shall be disposed of through septic tank / soak pit system.

4 Conditions under the Air Act

4.1 The following shall be used as fuel.

Sr No	Fuel	Quantity
1	HSD	20 Lit/Hr.
2	LDQ	290 Lit/Day
3	Fire Wood	08 MT/Day
4	Coal	05 MT/Day

4.2 The flue gas emission through stack shall confirm to the following standards.

Stack No	Stack attached to	Stack height in meter	APCM	Parameter	Permissible Limit
1	Boiler (01 TPD)	12	Water Scrubber	PM	150 mg/Nm3





2	Vessel (12 TPD)	11	with Cyclone Separator	SO2 NOx	100 PPM 50 PPM
3	Furnace	30	Alkali Scrubber		
4	DG Set (80 kVA) Stand by	11	--		

4.3 There shall be no process gas emission from manufacturing activities and other ancillary operations.

4.4 The concentration of the following 11 parameters in the ambient air within the premises of the industry shall not exceed the limits specified hereunder as per National Ambient Air Quality Standards issued by MoEF & CC dated 16th November-2009.

Sr. No.	Pollutant	Time Weighted Average	Concentration in Ambient air in microgram/cum
1	Sulphur Dioxide (SO ₂)	Annual	50
		24 Hours	80
2	Nitrogen Dioxide (NO ₂)	Annual	40
		24 Hours	80
3	Particulate Matter (PM ₁₀)	Annual	60
		24 Hours	100
4	Particulate Matter (PM _{2.5})	Annual	40
		24 Hours	60

5 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 be designed by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.

4.6 The industry shall make 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 6 AM to 10 PM and nighttime is reckoned between 10 PM to 6 AM.

4.7 **DG Sets Conditions:**

The D.G. Set shall have acoustic enclosure and shall comply with the standards specified at Sr. no. 95 of Schedule-I of the rule-3 of E.P. Rules -1986 and Noise pollution level as per the Air Act, 1981.

D.G. Sets standards:

The flue gas emission through stack attached to D.G. Sets shall conform to the following standards.

- The minimum height of stack to be provided with each of the generator set shall be $H=h+0.2(KVA)^{1/2}$ where H=Total stack height in meter, h=height of the building in meters where or by the side of which the generator set is installed.
- Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the user's end
- The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side [if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/ acoustic treatment. Such circumstances the performance may be checked for noise reduction up to actual ambient noise level.





- preferably, in the night time). The measurement for insertion loss may be done at different points at 0.5 m from the acoustic enclosure/room, and the averaged.
- The D.G. Set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).
 - All efforts shall be made to bring down the noise level due to the D.G. Set, outside the premises, within the ambient noise requirements by proper siting and control measures.
 - Installation of a D.G. Sets must be strictly in compliance with the recommendations of the D.G. Set manufacturer.
 - A proper routine and preventive maintenance procedure for the D G. Set should be set and followed in consultation with the DG Set manufacture which would help prevent noise levels of the DG Set from deteriorating with use.

5 **Authorization under the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 & amended.**

5.1 Authorization Number: AWH -43501 Date of Issue: 21/10/2020 and shall valid up to 27/06/2025.

5.2 M/s. Aviation Corporation (PCB ID -63724), is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated PLOT NO: S. No. 67/2/P1, Shikarpur- 370150, TAL: Bhachau, DIST: Kutch.

Sr. No	Waste	Quantity	Schedule- I	Facility
1	Used or spent Oil	1800 MT/yr.	5.1	Receipt, Collection, Storage, Transportation & reused in process.
2	Oil waste	1800 MT/yr.	5.2	Receipt, Collection, Storage, Transportation & reused in process.
2	Sludge from Wet Scrubber	05.0 MT/yr.	37.1	Collection, Storage, Transportation & Disposed to TSDF site.
3	Sludge and filter contaminated with Oil	20.0 MT/yr.	3.3	Collection, Storage, Transportation & Disposed to TSDF site.
4	Empty barrels/ containers/ liners contaminated with hazardous chemicals / wastes	04.00 M/yr.	33.1	Collection, Storage, Transportation & disposed by selling it to registered recycler.

5.3 The authorization is granted to operate a facility for collection, storage within factory premises, transportation and ultimate disposal of Hazardous waste by selling it to registered recyclers.

5.4 Unit shall apply for authorization for other types of hazardous waste referring to the amended Rules.

5.5 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.

5.6 **Terms and conditions of authorization:-**

1. The authorized person 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 State Pollution Control Board.
3.	The person authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.
4.	Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his 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 Waste and Penalty".
7.	It is the duty of the authorized person to take prior permission of the State Pollution Control Board to close down the facility.
8.	The imported hazardous and other wastes shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation.
9.	The record of consumption and fate of the imported hazardous and other wastes shall be maintained.
10.	The hazardous and other waste 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.
11.	The importer or exporter shall bear the cost of import or export and mitigation of damages if any.
12.	An application for the renewal of an authorization shall be made as laid down under these Rules.
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.	Annual return shall be filed by June 30th for the period ensuring 31st March of the year.
5.7	General Conditions
1	Any change in personnel, equipment or working conditions as mentioned in the consents form/order should immediately be intimated to this Board.
2	Applicant shall also comply with the general conditions given in annexure I.
3	The waste generator shall be totally responsible for (I.E. Collection, storage, transportation and ultimate disposal) of the wastes generated.
4	Records of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control Board in Form - 4 by 31st January of every year.
5	In case of any accident, details of the same shall be submitted in Form - 5 to Gujarat Pollution Control Board.
6	As per "Public liability Insurance Act - 91" company shall get Insurance policy, if applicable
7	Empty drums and containers of toxic and hazards 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 Control Board regularly.
8	In no case any kind of hazardous waste shall be imported without prior approval of appropriate authority.
9	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 waste are generated, the occupier shall obtain "No Objection certificate" from the state pollution Control Board, the Committee of the





Regional Office - Kutch (East)
Gujarat Pollution Control Board
Room No. 215-216-217, 2nd Floor,
Kandla Port Trust Administrative Building,
Gandhidham - 370201, Kutch.
Email:- ro-gpcb-kute@gujarat.gov.in

TRUE COPY

	concerned state or Union territory Administration where the facility exists.
10	Unit shall take a) concrete measures to show tangible results in waste generation reduction, avoidance, reuse and recycle. Action taken in this regards shall be submitted within 03 months and also along with Form 4.
11	Industry shall have to display the relevant information with regard to hazardous waste as indicated in the Hon Supreme Court's order in W.P. NO.65 of 1995 dated 14th October 2003.
12	Industry shall have to display online 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 waste generated within the factory premises.

For and behalf of
Gujarat Pollution Control Board

Regional Officer, Kutch(East)



1 JUN 2022

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(SAPNA D. DADLANI)
ADVOCATE & NOTARY
Gandhidham-Kutch

REGIONAL OFFICE
GUJARAT POLLUTION CONTROL BOARD

PLOT NO: 1616-1617, 1st FLOOR, SWASTIC COMPLEX,
NEAR VEER MOKHADAJI CIRCLE, GHOGHA ROAD
BHAVNAGAR- 364001 PHONE: 2566108



No. GPCB/RO-BHV/BHV-1001/ID-15970/17394 Dt: 15 OCT 2022

To,
M/s. Fine Refiners Pvt. Ltd. (ID: 15970)
Plot No: 40,
Village-Vartej, GIDC, Vartej
Vartej-364001
Tal: Bhavnagar, Dist: Bhavnagar.

Sub: Extension of validity of Consolidated Consent & Authorization under the Water Act-1974, the Air Act-1981 & the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

Ref: 1. Issued Consent order no. AWH-52604, Dated: 05/03/2022.
2. Consent issued vide letter No. GPCB/RO-BHV/BHV-1001/ID- 15970/ 17255, Dated: 31/03/2022.

Sir,

In exercise of 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 3(3) & 6(2) of The Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016 and as amended from time to time, framed under The Environmental (Protection) Act-1986, Consent is granted with respect of following condition as under.

- The Validity period of the above referred CCA order is extended up to 30/09/2026, with following specific condition:
 - Unit shall obtain CTE & CCA Amendment for additional plot.
- All other condition of CCA issued vide letter No. GPCB/RO-BHV/BHV-1001/ID-15970/17255, Dated: 31/03/2022. shall remain unchanged.

FOR AND BEHALF OF
GUJARAT POLLUTION CONTROL BOARD

(A.J. Rathod)
Regional Officer

FOR, FINE REFINERS PVT. LTD.

DIRECTOR

01.05.2023



GUJARAT POLLUTION CONTROL BOARD REGIONAL OFFICE

Swastik Complex, First Floor, Plot No. 1616/1617,

Near Vir Mokhdaji Circle, Ghogha Road, Bhavnagar - 364 001.

Phone (0278) 2566108 E-mail : ro-gpcb-bhav@gujarat.gov.in XGN site : www.gpcb.gujarat.gov.in

In exercise of the power conferred under section-25 of The Water (Prevention and Control of Pollution) Act-1974, Section-21 of The Air (Prevention and Control of Pollution) Act-1981, and authorization under Rule 3(3) & 6(2) of The Hazardous and Other Solid Wastes (Management & Transboundary Movement) Rules, 2016 and as amended from time to time, framed under The Environmental (Protection) Act-1986,

And whereas Board has received application vide **Inward ID No: 200555 & Inward Dt: 02/09/2021**, for The Consolidated Consent and Authorization (CC&A) of this Board under the provisions/rules of the aforesaid act. Consents & Authorization are hereby grant as under:

CONSENTS & AUTHORISATION

(Under the provisions/rules of aforesaid environmental acts)

TO,

MEs Fine Refiners Pvt Ltd. (ID: 15970)

Plot No. 40,

GIDC-Vartej,

TAL: Bhavnagar, DIST: Bhavnagar

- 1 Consolidated Consent and Authorization Order No: AWH-52604, Date of Issue 05/03/2022.
- 2 The validity period of the order shall be up to 30/09/2022
- 3 The list of the proposed product to manufacture is as below:

Sr. No	PRODUCT	QUANTITY
1.	Re refined of Used oil	200KL/Month
2.	Re refined of Waste oil	1000KL/Month

Special Condition:

- Unit shall submit the revised presentation including the material mass balance including quantity of raw material including activated clay requirement, product and waste generated, separate corrected flow diagram for used oil and waste oil.
- Unit shall improve the housekeeping and shall carry out plant retrofitting along with painting wherever required and shall submit the photograph.
- Unit shall submit the MOU as per hazardous waste generation of distillation residue and membership certificate for other waste disposal as per material balance quantity.
- Unit shall submit hazardous waste annual returns regularly.
- Unit shall adopt and regularly use the online manifest system for procurement & disposal of hazardous waste.

4 CONDITIONS UNDER THE WATER ACT:

- 4.1 The quantity of trade effluent from the manufacturing process and other ancillary operations shall not exceed **0.3 KL/Day**.
- 4.2 The applicant shall provide adequate effluent treatment system in order to achieve the quality of the treated effluent as per GPCB norms mentioned below:

Parameter	Permissible Limit
pH	6.5-8.5
Temperature	40 °C

FOR, FINE REFINERS PVT. LTD.

DIRECTOR

DT. 05/05/2023

Color (Pt. Co Scale)	100 units
Suspended Solids	100 mg/l
Oil & Grease	10 mg/L
Ammonical Nitrogen	50 mg/L
BOD (5 days at 20 deg C)	30 mg/L
COD	100 mg/L
Chlorides	600 mg/L
Sulphates	1000 mg/L
TDS	2100 mg/L
% Na	60%
Sodium Absorption Ratio	26

(All efforts shall be made to remove color and Unpleasant odor as far as practicable)

- 4.3 The Final treated effluent conforming to above shall be utilized on land within the factory premises and on land of farmer with whom agreement is made, for gardening & plantation purpose.
- 4.4 The quantity of sewage effluent from the factory shall not exceed **0.8 KL/Day**.
- 4.5 Domestic effluent shall be disposed off through septic tank/soak pit system.

5 CONDITIONS UNDER THE AIR ACT:

- 5.1 The following shall be used as fuel in the Boiler (Hot Water Generation):

Sr No.	Fuel	Quantity
1	Wood	50 Kg/Hr
2	LDO	15 Lit/Hr

- 5.2 The flue gas emission through stack shall conform to the following standards:

Sr.	Stack attached to	Stack height in meters	APCM	Parameters	Permissible Limit
1	Dehydration Furnace	Common Stack 33	Water Scrubber	Particulate Matter SO ₂ NO _x	150 mg/NM ³ 100 ppm 50 ppm
2	Distillation Furnace				
3	Bleaching Furnace				
4	Incinerator				

- 5.3 There shall be no any process emission from the manufacturing process and other ancillary industrial operations.
- 5.4 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:

Sr. No.	Pollution Parameters	Time weighted Average	Concentration Ambient Air
1	Sulphur dioxide (SO ₂), µg/M ³	Annual 24 Hours	50 80
2	Nitrogen dioxide (NO ₂), µg/M ³	Annual 24 Hours	40 80
3	Particulate Matter (Size less than 10µm) OR PM 10 µg/M ³	Annual 24 Hours	60 100
4	Particulate Matter (Size less than 2.5µm) OR PM2.5 µg/M ³	Annual 24 Hours	40 60

FOR, FINE REFINERS PVT. LTD.

Aarjya

DIRECTOR

ASD

01.05/05/2023

- 5.5 Stack monitoring facilities like port hole, platform/ladder etc shall be provided with stack/vents chimney in order to facilitate sampling of gases being emitted in to the atmosphere.
- 5.6 The applicant shall provide proper ventilation and exhaust facilities to maintain healthy working atmosphere within the factory premises.

6 CONDITIONS UNDER HAZARDOUS WASTE:

- 6.1 Number of Authorization: AWH-52604, Date of issue: 05/03/2022
- 6.2 M/s Fine Refiners Pvt. Ltd. is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated at Plot No. 40,GIDC-Vartej, TAL: Bhavnagar, DIST: Bhavnagar.

Sr. No.	Waste	Quantity	Category	Facility
1	Wastes or residues containing oil	9000 (MT/Year)	1-5.2	Collection, Storage, Recycle, Transport
2	Chemical sludge from waste water treatment	0.600 (MT/Year)	1-35.3	Collection, Storage, Reuse as lubricant within plant
3	Used or Spent Oil	1800 (MT/Year)	1-5.1	Collection, Storage, Recycle, Transport
4	Ash from incineration and flue gas cleaning residue	294.00 (MT/Year)	1-37.2	Collection, Storage, Reuse as lubricant within plant
5	Spent Clay Containing Oil	300.0 (MT/Year)	1-4.5	Collection, Storage, Transportation Disposal at TSDI site
6	Empty barrels/containers/liners contaminated with hazardous chemicals/wastes	12.00 (MT/Year)	1-33.1	Collection, Storage, Reuse
7	Organic Residues From Process	130.600 (MT/Year)	1-4.4	Collection, Storage, Disposal at Incinerator.
8	Contaminated cotton rags or other cleaning materials	0.600 (MT/Year)	1-33.2	Collection, Storage, Disposal at Incinerator.

- 6.3 The authorization shall be valid up to 30/09/2022.
- 6.4 The applicant shall obtain membership of common Hazardous Waste incinerator for disposal of incinerable waste, whenever applicable.
- 6.5 The applicant shall provide temporary storage facilities for each type of Hazardous Waste as per Hazardous and other solid waste (Management & Transboundary Movement) Rules-2016 as amended from time to time.

7 GENERAL CONDITION:

- 7.1 Unit shall develop green belt within premise as per the CPCB guidelines. However, if the adequate land is not available within premises, the unit shall tie up with local agencies like gram panchayat, school, and social forestry office etc. for the plantation at suitable open land in nearby locality and submit an action plan of plantation for next three years to GPCB.
- 7.2 Adequate plantation shall be carried out all along the periphery of premises in such a way that the density of plantation is at least 1000 tree per acre of land and a green belt of 10 meters width is developed.
- 7.3 The applicant shall have to submit the returns in prescribe form regarding water consumption and shall have to make payment of water cess to the Board under The Water Act-1977.
- 7.4 In case of change of ownership/management, the name and address of the new Owners/partners/directors/proprietor shall immediately intimate to the Board.

FOR, FINE REFINERS PVT. LTD.

[Signature]
DIRECTOR

05.05.2023

- 7.5 The applicant shall however, not without the prior consent of the Board bring into use any new or altered outlet for the discharge of effluent or gaseous emission or swage waste from the proposed industrial plant. The applicant is required to make application to this Board for this purpose in the prescribed forms under the provisions of the Water Act-1974, the Air Act-1981 and the Environment (Protection) Act-1986.
- 7.6 The overall noise level in and around the plant area shall be kept well within the standard by providing noise control measure including engineering control like acoustic insulation hood, silencers, enclosures etc on all source of noise generation. The ambient noise level shall conform to the standards prescribed under the Environment (Protection) Act-1986 & Rules.
- 7.7 The concentration of noise in ambient air within the premises of industrial unit shall not exceed following levels:
- Between 6A.M. and 10P.M.: 75dB (A)**
Between 10P.M. and 6A.M.: 70dB (A)
- 7.8 Applicant is required to comply with the manufacturing, Storage and Import of Hazardous Chemicals Rules-1989 Framed under the Environment (Protection) Act-1986.
- 7.9 If it is, establish by any competent authority that the damage is caused due to their industrial activities to any Person or his property; in that case they are obliged to pay the compensation as determined by the competent authority.
- 7.10 Applicant shall have to comply with the guidelines/directive issued/being issued by MoEF & CC/CPCB/DoEF from Time to time.
- 7.11 Applicant shall not use/withdraw ground water either during construction and/or operation phase.
- 7.12 Environmental cell shall be step and shall be responsible for the total Environmental management.
- 7.13 Monitoring in respect to Air, Water, and Noise level shall carry out regularly and results shall submit to this Board.

FOR AND BEHALF OF
GUJARAT POLLUTION CONTROL BOARD

A.G. Oza
31-3-2022

(A.G. Oza)

Regional Officer, Bhavnagar

No. GPCB/RO/BHV-1001/ID-15970/17255

Dt: 31 MAR 2022

M/s Fine Refiners Pvt. Ltd. (ID: 15970)
Plot No. 40,
GIDC-Vartej,
TAL: Bhavnagar, DIST: Bhavnagar

submit to this Board.

FOR, FINE REFINERS PVT. LTD.

A. S. V.
DIRECTOR

Dt. 05/05/2023



GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN
Sector-10-A, Gandhinagar-382 010
Phone : (079) 23226295
Fax : (079) 23232156
Website : www.gpcb.gov.in

"Consent to Establish"

(CTE-110273)

NO: GPCB/CCA-KUTCH-1742/ID-78079 15744 22

Date: 05-12-2020

To,
M/s. Mahalaxmi Asphalt Pvt. Ltd.,
Survey no.: 343,
Village: Bandhadi,
Tal: Bhachau
Dist: Kutch - 370 140,

Sub: Consent to Establish (NOC)-Amendment under Section 25 of Water Act 1974 and Section 21 of Air Act 1981
Ref: Your application for CTE no. 179791 received dated 22/09/2020.

Without prejudice to the powers of this Board under the Water (Prevention and Control of Pollution) Act-1974, the Air Act-1981 and the Environment (Protection) Act-1986 and without reducing your responsibilities under the said Acts in any way, this is to inform you that this Board grants Consent to Establish to set up an industrial plant located at Survey 343, Village: Bandhadi Tal Bhachau, Dist: Kutch

1. The validity of this order will be up to 21/09/2027.
2. The list of the products to be manufacture is as below:

Sr. No.	Product	Quantity
1.	Re-refined waste oil	500 KL/Month
2	Bitumen Melting	200 MT/Month

SUBJECT TO THE FOLLOWING CONDITIONS:

1. Industry shall not carry out any activity which attracts provision of EIA notification 2016 & its amendment.
 2. Industry shall not withdrawal ground water without prior NOC of CGWA as per order of Hon National Green Tribunal.
 3. Unit shall obtain Rule 9 permission as per Hazardous & Other Waste Management Rule-2016 for refining of waste oil.
 4. Industry shall use environmentally sound technologies for refining of used oil/ waste oil as per Hazardous Rules.
 5. Industry shall carry out only melting of solid bitumen in bitumen melting plant.
 6. Unit shall obtain fresh water from valid source have permission of the complete authority
- Industry shall take adequate measures to control fugitive emission due to storage, handling and transportation of raw materials and products.

3. CONDITIONS UNDER WATER ACT 1974:

- 3.1 Water Source: - Tankers

Page 1 of 5



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(U.K. JOSHI)
NOTARY
DIST. KUTCH. (GUJARAT)
Reg. No. 5848

Clean Gujarat Green Gujarat For MAHALAXMI ASPHALT PVT. LTD

ISO - 9001 - 2008 & ISO - 14001 - 2004 Certified Organisation



AUTHORISED SIGNATORY

- 3.2 The quantity of fresh water consumption for Industrial purpose shall not exceed 4 KL/Day.
- 3.3 The quantity of fresh water consumption for Domestic purpose shall not exceed 2 KL/Day.
- 3.4 There shall be no generation of effluent asphalt mixer plant industrial waste water from waste oil refine plant after necessary treatment, shall be reused in cooling tower. In order to achieve ZLD.
- 3.5 Industry shall provide fixed pipeline with flow meter for reuse of treated industrial waste water & maintain its record.
- 3.6 The quantity of Domestic waste water generation shall not exceed 1.6 KL/Day.
- 3.7 The sewage shall be disposed through septic tank / soak pit system.
- 3.8 Disposal system for storm water shall be provided separately. In no circumstances storm water shall be mixed with the industrial effluent.

4. CONDITIONS UNDER AIR ACT 1981:

4.1 The following shall be used as fuel in the Furnaces, TFH & D.G Set respectively.

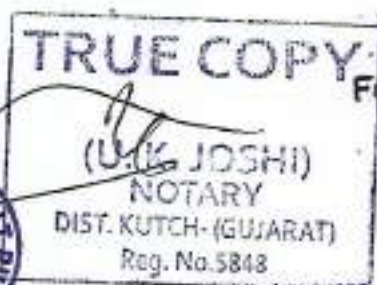
Sr. No.	Utility	Fuel	Quantity
1.	Furnaces (2 nos.)	Diesel	40 liter/hr
2.	TFH	Diesel	45 liter/hr
3.	D.G set	Diesel	05 liter/hr

4.2 The applicant shall install & operate comprehensive air pollution control system in order to achieve flue gas emission norms as prescribed below.

4.3 The flue gases emission from stack attached to Furnaces, THF & D.G Set respectively:

Sr. No	Stack attached to	Stack height In Meters	APCM	Parameter	Permissible limit
1.	Furnaces (2 nos.) (waste oil plant)	33	Heat Quencher	PM SO ₂ NO _x	150 mg/NM ³ 100 ppm 50 ppm
2.	TFH (6 lakh K cal) (Bitumen melting plant)	11	-	PM SO ₂ NO _x	150 mg/NM ³ 100 ppm 50 ppm
3.	D.G. set (cap -165 KVA) Standby facility	-	-	PM SO ₂ NO _x	150 mg/NM ³ 100 ppm 50 ppm

4.4 There shall be no process gas emission from manufacturing process and other ancillary operations



Page 2 of 5
For, MAHALAXMI ASPHALT PVT. LTD.

A. Patel
AUTHORISED SIGNATORY

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN

Sector-10-A, Gandhinagar-382 010

Phone : (079) 23226295

Fax : (079) 23232156

Website : www.gpcb.gov.in

GPCB

4.5 The concentration of the following parameters in the ambient air within the premises of the industry and a distance of 10 meters from the sources (other than the stack/vent) shall not exceed the following levels.

Sr. NO.	Pollutant	Time Weighted Average	Concentration in Ambient air in $\mu\text{g}/\text{m}^3$
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 $10 \mu\text{m}$) or PM_{10}	Annual	60
		24 Hours	100
4.	Particulate Matter (Size less than $2.5 \mu\text{m}$) or $\text{PM}_{2.5}$	Annual	40
		24 Hours	60

4.6 The level of Noise in ambient air within the premises of industrial unit shall not exceed following levels:

Between 6 am to 10 pm : 75 dB(A)
Between 10 pm to 6 am : 70 dB(A)

4.7 D.G. Sets Conditions

The D.G. Set shall have acoustic enclosure and shall comply with the standards specified at Sr. no. 95 of Schedule-I of the rule-3 of E.P. Rules -1986 and Noise pollution level as per the Air Act-1981.

D.G. Sets standards: -

The flue gas emission through stack attached to D.G. Sets shall conform to the following standards.

- The minimum height of stack to be provided with each of the generator set shall be $H=h + 0.2 (\text{KVA})^{1/2}$, where H= Total stack height in meter, h= height of the building in meters where or by the side of which the generator set is installed.
- Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.
- The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/ acoustic treatment. Such circumstances the performance may be checked for noise reduction up to actual ambient noise level, preferably, in the night time). The measurement for insertion loss may be done at different points at 0.5 m from the acoustic enclosure/room, and the averaged.
- The D.G. Set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

Page 3 of 5



Clean Gujarat Green Gujarat
ISO - 9001 - 2008 & ISO - 14001 - 2004 Certified Organisation



AUTHORISED SIGNATURE

- e) All efforts shall be made to bring down the noise level due to the D.G. Set, outside the premises, within the ambient noise requirements by proper siting and control measures. Installation of a D.G. Sets must be strictly in compliance with the recommendations of the D.G. Set manufacturer.
- f) A proper routine and preventive maintenance procedure for the D.G. Set should be set and followed in consultation with the DG Set manufacture which would help prevent noise levels of the DG Set from deteriorating with use

5. CONDITIONS UNDER HAZARDOUS & OTHER WASTE RULES 2016:

- 5.1 The applicant shall have to comply with provisions of Hazardous and other Waste (Management and Trans Boundary Movement) Rules 2016.
- 5.2 The applicant shall obtain membership of common TSDF site for disposal of Hazardous waste as categorized in Hazardous and other Waste (Management and Trans Boundary Movement) Rules 2016.
- 5.3 The applicant shall obtain membership of common Hazardous Waste incinerator for disposal of incinerable waste.
- 5.4 The applicant shall provide temporary storage facilities for each type of Hazardous Waste as per Hazardous and other Waste (Management and Trans Boundary Movement) Rules 2016.
- 5.5 The applicant shall obtain registration/authorization for recycling/reprocessing any hazardous waste before procuring material/starting production as per HW Rules 2016.
- 5.6 The applicant shall obtain authorization for recovery/reuses of any hazardous waste material as per HW Rules 2016.

6. GENERAL CONDITION:

- 6.1 Adequate plantation shall be carried out all along the periphery of the industrial premises in such a way that the density of plantation is atleast 1000 trees per acre of land and a green belt of 03 meters' width is developed.
- 6.2 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.
- 6.3 The applicant shall however, not without the prior consent of the Board bring into use any new or altered outlet for the discharge of effluent or gaseous emission or sewage waste from the proposed industrial plant. The applicant is required to make applications to this Board for this purpose in the prescribed forms under the provisions of the Water Act-1974, the Air Act-1981 and the Environment (Protection) Act-1986.
- 6.4 The concentration of Noise in ambient air within the premises of Industrial unit shall not exceed following levels:

Between 6 A.M. and 10 P M : 75 dB(A)
Between 10 P M and 6 A.M. : 70 dB(A)

Page 4 of 5

For, MAHALAXMI ASPHALT PVT. LTD.

Apal
AUTHORISED SIGNATORY





GPCB

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN

Sector-10-A, Gandhinagar-382 010

Phone : (079) 23226295

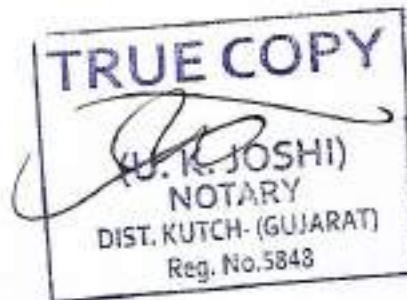
Fax : (079) 23232156

Website : www.gpcb.gov.in

- 6.5 Applicant is required to comply with the manufacturing, Storage and Import of Hazardous Chemicals Rules-1989 framed under the Environment (Protection) Act-1986.
- 6.6 If it is established by any competent authority that the damage is caused due to their industrial activities to any person or his property .in that case, they are obliged to pay the compensation as determined by the competent authority.

For and on behalf of
GUJARAT POLLUTION CONTROL BOARD

(Smt U.K. Upadhyay)
Environment Engineer



For, MAHALAXMI ASPHALT PVT. LTD.

AUTHORISED SIGNATORY

Page 5 of 5

Clean Gujarat Green Gujarat

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GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN

Sector-10-A, Gandhinagar-382 010

Phone : (079) 23226295

Fax : (079) 23232156

Website : www.gpcb.gov.in

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) Act-1981 and Authorization under rule 6(2) of the Hazardous & other Waste (Management, Handling and Tran boundary Movement) Rules, 2016 framed under the E (P) Act-1986.

And whereas Board has received consolidated application Inward ID No.154661, dated 01/04/2019 for the consolidated consent and authorization (CC&A) of this Board under the provisions / rules of the aforesaid acts, Consent & Authorization is hereby granted as under.

CONSENTS AND AUTHORISATION:

(Under the provisions /rules of the aforesaid environmental acts)

TO,
M/S. PRIYANSI CORPORATION,
SHED NO.,CI-804 TO 808,
GIDC,BAMANBORE-363520,
TA:CHOTILA, DIST: SURENDRANAGAR



- Consent Order No.: AWH – 101211 date of issue: 22/04/2019.
- The consents shall be valid up to 21/04/2024 for operation of industrial plant for manufacture of the following items/products:

Sr. No.	Product	Quantity
1	Recycle Waste Oil	150 Kl/Month
2	Re Refine Used Oil	200 Kl/Month

Specific Condition: Unit shall have to comply with all the conditions stipulated in registration certificate for re-refining /recycling of Hazardous waste.

3. CONDITIONS UNDER THE WATER ACT:

- There shall be no generation of industrial effluent from the manufacturing process and other ancillary industrial operations. But waste water generated from Dehydration process , unit has provided collection cum Neutralization Tank for the same.
- The quantity of sewage wastewater from the factory shall not exceed 1000 Lit/day.
- Unit shall provide flow meter on water intake line of raw water and maintain record of use of water & made available for inspection.
- Sewage wastewater shall be disposed off through septic tank / soak pit system.

4. CONDITIONS UNDER THE AIR ACT:

- 4.1 The following shall be used as fuel.

Sr. No.	Fuel	Quantity
1	Wood	1.5 MT/Day
2	Light out Oil	10 Lit/Hrs

- 4.2 The applicant shall install & operate air pollution control system in order to achieve norms prescribed below.

- 4.2.1 The flue gas emission through stack attached shall conform to the following standards:

Stack No.	Stack attached	Stack height in Meter	Air Pollution Control Measures	Parameter	Permissible Limit
1.	Furnace-3 Nos (Heating vessel)	33	---	Particulate Matter SO ₂ NO _x	150 mg/NM ³ 100 ppm 50 Ppm

- 4.2.2 The process emission through various stack/vent of reactors, process, vessel shall conform to the following standards.

Outward No: 50842/1906

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- 4.2.3 The concentration of the following parameters in the ambient air within the premises of the industry shall not exceed the limits specified hereunder.

PARAMETER	PERMISSIBLE LIMIT ANNUAL	PERMISSIBLE LIMIT 24 HRS. AVERAGE
Particulate matter ₁₀ (PM10)	60 Microgram /NM ³	100 Microgram /NM ³
Particulate matter _{2.5} (PM2.5)	40 Microgram /NM ³	60 Microgram /NM ³
Oxides of Sulphur	50 Microgram /NM ³	80 Microgram /NM ³
Oxides of Nitrogen	40 Microgram /NM ³	80 Microgram /NM ³

- 4.3. 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 be designed by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.

- 4.4. 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 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.

Authorization for the Management & Handling of Hazardous Wastes Form-2 (See rule 6(2) Form for grant of authorization for occupier or operator handling hazardous waste.

M/s PRIYANSI CORPORATION, is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated at SHED NO., CI-804 TO 808, GIDC, BAMANBORE-363520, TA:CHOTILA, DIST: SURENDRANAGAR.

No.	Waste	Quantity	Schedule / I	Facility
1.	Used oil	2880 Kl/Year	IV-20	Reception, Storage, Transportation & disposal by used as raw material.
2	Waste Oil	2400 KL/Year	IV-20	Reception, Storage, Transportation & disposal by used as raw material.
3	Organic Residue from process	300 Kl/year	4.4	Collection, Storage, Transportation & disposal by incineration at CHWIF of SEPL, Kutch.
4	Spent Clay containing Oil	78 MT/Year	4.5	Collection, Storage, Transportation & disposal by incineration at CHWIF of SEPL, Kutch.
5	ETP Waste	600 KG/Year	35.3	Collection, Storage, Transportation & disposal by incineration at CHWIF of SEPL, Kutch.
6	Discarded drums /Barrels	12,000 Nos/Year	33.1	Collection, Storage, Transportation & disposal by sale to registered recyclers.

- 5.2 The authorization shall be in force up to ~~21/04/2024~~.

- 5.3 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.



Outward No: 508942, 01/06/2019

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GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN

Sector-10-A, Gandhinagar-382 010

Phone : (079) 23226295

Fax : (079) 23232156

Website : www.gpcb.gov.in

5.4 TERMS AND CONDITIONS OF AUTHORISATION:

- a) The applicant shall comply with the provisions of the Environment (Protection) Act - 1986 and the rules made there under.
- b) The authorisation shall be produced for inspection at the request of an officer authorized by the Gujarat Pollution Control Board.
- c) The persons authorized shall not rent, lend, sell, and transfer or otherwise transport the hazardous wastes without obtaining prior permission of the Gujarat Pollution Control Board.
- d) Any unauthorized change in personnel, equipment or working conditions as mentioned in the authorisation order by the persons authorized shall constitute a breach of this authorisation.
- e) It is the duty of the authorised person to take prior permission of the Gujarat Pollution Control Board to close down the facility.
- f) An application for the renewal of an authorisation shall be made as laid down in rule 5 (6) (ii).
- g) Industry shall submit annual report within 15 days and subsequently by 30th June of every year.

6. GENERAL CONDITIONS: -

- 6.1 Any change in personnel, equipment or working conditions as mentioned in the consents form/order should immediately be intimated to this Board.
- 6.2 Applicant shall also comply with the general conditions given in annexure I.
- 6.3 The waste generator shall be totally responsible for (i.e. Collection, storage, transportation and ultimate disposal) of the wastes generated.
- 6.4 Records of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control Board in Form - 4 by 30th June of every year.
- 6.5 In case of any accident, details of the same shall be submitted in Form - 5 to Gujarat Pollution Control Board.
- 6.6 As per "Public liability Insurance Act - 91" company shall get Insurance policy, if applicable.
- 6.7 Empty drums and containers of toxic and hazards 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 Control Board regularly.
- 6.8 In no case any kind of hazardous waste shall be imported without prior approval of appropriate authority.
- 6.9 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 waste are generated, the occupier shall obtain "No Objection certificate" from the state pollution Control Board, the Committee of the concerned state or Union territory Administration where the facility exists.
- 6.10 Unit shall take all concrete measures to show tangible results in waste generation reduction, avoidance, reuse and recycle. Action taken in this regards shall be submitted within three months and also along with Form - 4.
- 6.11 Industry shall have to display the relevant information with regard to hazardous waste as indicated in the Hon Supreme Court's order in W.P. No.657 of 1995 dated 14th October 2003.
- 6.12 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 waste generated within the factory premises.

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Outward No: 508942, 03/07/2018

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6.13 The applicant shall provide proper collection system for storage of solid waste generated from plant and Effluent treatment plant & disposed of the same in environmentally mentally sound manner.

For and on behalf of
Gujarat Pollution Control Board

D.M. THAKER
21/5/19
(D.M. THAKER)

Environmental Engineer

NO: GPCB/ CCA/SN-199/ ID- 34506/

ISSUED TO:
M/S. PRIYANSI CORPORATION,
SHED NO., CI-804 TO 808,
GIDC, BAMANBORE-363520,
TA: CHOTILA, DIST: SURENDRANAGAR

- 3 DEC 2022

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Sapna
(SAPNA D. DADLANI)
ADVOCATE & NOTARY
Gandhidham-Kutch



Outward No: 508942, 03/06/2019



Regional Office - Kutch (East)
Gujarat Pollution Control Board
Room No. 215-216-217, 2nd Floor,
Kandla Port Trust Administrative Building,
Gandhidham - 370201, Kutch.
Email:- rogpcb.eastkutch@gmail.com

In exercise of the power conferred under section-25 of the Waster (Prevention and Control of Pollution) Act-1974, under section-21 of the Air (Prevention and Control of Pollution) Act-1981 and Authorization under rule 6(2) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 framed under the E (P) Act-1986.

And whereas Board has received consolidated application no: 168422, dated 17/12/2019 for the fresh consolidated consent and authorization (CC & A) of this Board under the provision / rules of the aforesaid acts-rules. Consent & Authorization is hereby granted as under.

CONSOLIDATED CONSENT AND AUTHORISATION:

(Under the provision / rules of the aforesaid environmental acts)

To,
Revolution Petrochem LLP. (PCB ID -59793),
PLOT NO: 187, Mithi Rohar (GGDC) Industrial Estate,
Mithi Rohar-370201
TAL: Gandhidham, DIST: Kutch.

1. Consent Order No.: AWH -40354; Date of Issue: 24/01/2020

2. The consent shall be valid up to 16/12/2024 for the use of outlet for the discharge of trade effluent and emission due to operation of industrial plant for manufacture of following items/products at an above-mentioned address.

Sr No	Product	Quantity
1	Recycled Waste Oil (Industrial Fuel)	1200 KL/Month
2	Re-Refined Used Oil	300 KL/Month

Specific Condition

1. No ground water shall be withdrawn without prior approval from competent authority.
2. You shall not carry out any activity which may attract the applicability of EIA notification-2006 and its amendments.
3. Management of Solid Waste generated from industrial activities shall be as per Solid Waste Management Rules-2016 (solid waste as defined in Rule-3(46).
4. As per provision of Rule-18 of Solid Waste Management Rules-2016 all industrial units using fuel and located within 100 km from the refused derived fuel (ROF) plant shall made an arrangement to replace at least five percent of their fuel requirement by refused derived fuel so produced.

3 Condition under the Water Act

- 3.1 The quantity of industrial effluent shall not exceed 5.4 KL/Day.
- 3.2 The quantity the Domestic waste water (sewage) shall not exceed 1.0 KL/Day.
- 3.3 The quality of industrial effluent shall confirm to following standards.

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(U. K. JOSHI)
NOTARY
DIST. KUTCH- (GUJARAT)
Reg. No.5848





	PARAMETER	PERMISSIBLE LIMIT																																							
	pH	6.5 to 8.5																																							
	Temperature	40°C																																							
	Color	100 Units																																							
	Suspended Solids	100 mg/l																																							
	Oil & Grease	10 mg/l																																							
	Phenolic Compound	01 mg/l																																							
	Ammoniacal Nitrogen	50 mg/l																																							
	BOD (03 days At 27° C)	30 mg/l																																							
	COD	100 mg/l																																							
	Chloride	600 mg/l																																							
	Sulphates	1000 mg/l																																							
	Total Dissolved Solids	2100 mg/l																																							
	Sulphides	02 mg/l																																							
	All efforts shall be made to remove color & unpleasant odor as far as practicable.																																								
3.4	The treated waste water conforming to the above standards, where 4.2 KL/Day treated waste water shall be recirculated in cooling tower & remaining 1.2 KL/Day shall be evaporated in heat quencher & evaporation.																																								
3.5	Sewage shall be disposed of through septic tank / soak pit system.																																								
4	Conditions under the Air Act																																								
4.1	The following shall be used as fuel.																																								
	<table border="1"> <thead> <tr> <th>Sr No</th> <th>Fuel</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Diesel</td> <td>125 L/Hr.</td> </tr> </tbody> </table>	Sr No	Fuel	Quantity	1	Diesel	125 L/Hr.																																		
Sr No	Fuel	Quantity																																							
1	Diesel	125 L/Hr.																																							
4.2	The flue gas emission through stack shall confirm to the following standards.																																								
	<table border="1"> <thead> <tr> <th>Stack No</th> <th>Stack attached to</th> <th>Stack height in meter</th> <th>Parameter</th> <th>Permissible Limit</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Boiler + TFH (06 L K Cal/Hr.)</td> <td>11</td> <td>PM</td> <td>150 mg/Nm³</td> </tr> <tr> <td>2</td> <td>Furnace</td> <td>33</td> <td>SO₂</td> <td>100 PPM</td> </tr> <tr> <td>3</td> <td>Furnace</td> <td>33</td> <td>NO_x</td> <td>50 PPM</td> </tr> <tr> <td>4</td> <td>DG Set (165 kVA)</td> <td>11</td> <td>NO_x+ HC</td> <td>≤ 7.5 g/kW-hr</td> </tr> <tr> <td></td> <td></td> <td></td> <td>CO</td> <td>≤ 3.5 g/kW-hr</td> </tr> <tr> <td></td> <td></td> <td></td> <td>PM</td> <td>≤ 0.3 g/kW-hr</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Smoke Limit (Light Absorption Co-efficient)</td> <td>≤ 0.7 m⁻¹</td> </tr> </tbody> </table>	Stack No	Stack attached to	Stack height in meter	Parameter	Permissible Limit	1	Boiler + TFH (06 L K Cal/Hr.)	11	PM	150 mg/Nm ³	2	Furnace	33	SO ₂	100 PPM	3	Furnace	33	NO _x	50 PPM	4	DG Set (165 kVA)	11	NO _x + HC	≤ 7.5 g/kW-hr				CO	≤ 3.5 g/kW-hr				PM	≤ 0.3 g/kW-hr				Smoke Limit (Light Absorption Co-efficient)	≤ 0.7 m ⁻¹
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4.3	There shall be no process gas emission from manufacturing activities and other ancillary operations.																																								
4.4	The concentration of the following 11 parameters in the ambient air within the premises of the industry shall not exceed the limits specified hereunder as per National Ambient Air Quality Standards issued by MoEF & CC dated 16th November-2009.																																								

2/ Page
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(U. K. JOSHI)
NOTARY
DIST. KUTCH - (GUJARAT)
Reg. No. 5848





Regional Office - Kutch (East)
Gujarat Pollution Control Board
Room No. 215-216-217, 2nd Floor,
Kandla Port Trust Administrative Building,
Gandhidham - 370201, Kutch.
Email:- rogpcb.eastkutch@gmail.com

Sr. No.	Pollutant	Time Weighted Average	Concentration in Ambient air in microgram/cum
1	Sulphur Dioxide (SO ₂)	Annual 24 Hours	50 80
2	Nitrogen Dioxide (NO ₂)	Annual 24 Hours	40 80
3	Particulate Matter (PM10)	Annual 24 Hours	60 100
4	Particulate Matter (PM2.5)	Annual 24 Hours	40 60

4.5 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 be designed by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.

4.6 The industry shall make 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 6 AM to 10 PM and nighttime is reckoned between 10 PM to 6 AM.

5 **Authorization under the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 & amended.**

5.1 Authorization Number: AWH -40354 Date of Issue: 21/01/2020 and shall valid up to 16/12/2024.

5.2 Revolution Petrochem LLP. (PCB ID -59793), is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated PLOT NO: 187, Mithi Rohar (GGDC) Industrial Estate, Mithi Rohar- 370201, TAL: Gandhidham, DIST: Kutch.

Sr. No	Waste	Quantity	Schedule-1	Facility
1	Used or spent Oil	4321.0 MT/yr.	5.1	Receipt, Collection, Storage, Transportation & reused in process.
2	Distillation Residues	170.0 MT/yr.	20.3	Collection, Storage, Transportation & Disposed to TSDF site.
3	Chemical sludge from waste water treatment	2.40 MT/yr.	35.3	Collection, Storage, Transportation & Disposed to TSDF site.
4	Empty barrels/containers/liners contaminated with hazardous chemicals/wastes	5.00 M/yr.	33.1	Collection, Storage, Transportation & disposed by selling it to registered recycler.
5	Spent clay containing oil	105.0 MT/yr.	4.5	Collection, Storage, Transportation & Disposed to TSDF site.

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(U. K. JOSHI)
NOTARY
DIST. KUTCH- (GUJARAT)
Reg. No.5848





Regional Office - Kutch (East)
Gujarat Pollution Control Board
Room No. 215-216-217, 2nd Floor,
Kandla Port Trust Administrative Building,
Gandhidham - 370201, Kutch.
Email:- rogpcb.eastkutch@gmail.com

6	Wastes as residues containing oil	17280.0 MT/yr.	5.2	Collection, Storage, Transportation & disposed by selling it to registered recycler.
5.3	The authorization is granted to operate a facility for collection, storage within factory premises, transportation and ultimate disposal of Hazardous waste by selling it to registered recyclers.			
5.4	Unit shall apply for authorization for other types of hazardous waste referring to the amended Rules.			
5.5	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.			
5.6	Terms and conditions of authorization:-			
1.	The authorized person 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 State Pollution Control Board.			
3.	The person authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.			
4.	Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his 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 Waste and Penalty".			
7.	It is the duty of the authorized person to take prior permission of the State Pollution Control Board to close down the facility.			
8.	The imported hazardous and other wastes shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation.			
9.	The record of consumption and fate of the imported hazardous and other wastes shall be maintained.			
10.	The hazardous and other waste 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.			
11.	The importer or exporter shall bear the cost of import or export and mitigation of damages if any.			
12.	An application for the renewal of an authorization shall be made as laid down under these Rules.			
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.	Annual return shall be filed by June 30th for the period ensuring 31st March of the year.			
5.7	General Conditions			
1	Any change in personnel, equipment or working conditions as mentioned in the consents form/order should immediately be intimated to this Board.			
2	Applicant shall also comply with the general conditions given in annexure I.			
3	The waste generator shall be totally responsible for (I.E. Collection, storage, transportation and ultimate disposal) of the wastes generated.			

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(U.K. JOSHI)
NOTARY
DIST. KUTCH - (GUJARAT)
Reg. No. 5848





Regional Office - Kutch (East)
Gujarat Pollution Control Board
Room No. 215-216-217, 2nd Floor,
Kandla Port Trust Administrative Building,
Gandhidham - 370201, Kutch.
Email:- rogpcb.eastkutch@gmail.com

4	Records of waste generation, its management and annual return shall be submitted to Gujarat Pollution Control Board in Form - 4 by 31st January of every year.
5	In case of any accident, details of the same shall be submitted in Form - 5 to Gujarat Pollution Control Board.
6	As per "Public liability Insurance Act - 91" company shall get Insurance policy, if applicable.
7	Empty drums and containers of toxic and hazardous 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 Control Board regularly.
8	In no case any kind of hazardous waste shall be imported without prior approval of appropriate authority.
9	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 waste are generated, the occupier shall obtain "No Objection certificate" from the state pollution Control Board, the Committee of the concerned state or Union territory Administration where the facility exists.
10	Unit shall take a)) concrete measures to show tangible results in waste generation reduction, avoidance, reuse and recycle. Action taken in this regards shall be submitted within 03 months and also along with Form 4.
11	Industry shall have to display the relevant information with regard to hazardous waste as indicated in the Hon Supreme Court's order in W.P. NO.65 of 1995 dated 14th October 2003.
12	Industry shall have to display online 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 waste generated within the factory premises.

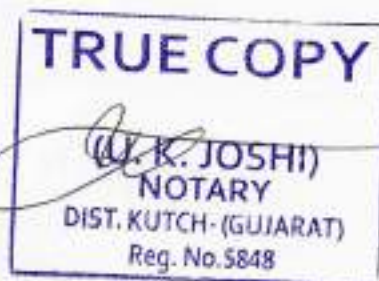
NO. GPCB/RO- Kutch (East)/CCA-Fresh/Kutch-/PCB ID: 59793/

Date: -

For and behalf of
Gujarat Pollution Control Board

Regional Officer, Kutch(East)

Outward No: 15594, 22/04/2020



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GUJARAT POLLUTION CONTROL BOARD REGIONAL OFFICE-AHMEDABAD (CITY)

2nd floor, Gujarat Pollution Control Board (Old Building), Paryavaran Bhavan, Sector-10-A,
Gandhinagar-382010, Phone: 079-23222096 E-Mail - ID: ro-gpcb-ahmc@gujarat.gov.in



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) Act-1981 and Authorization under rule 5(4) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, framed under the Environment (Protection) Act-1986.

And whereas Board has received consolidated consent application NO. 164983 dated 16/10/2019 for the 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. Shana Oil Process
Nr Good Luck Market,
Chandola Lake,
Ahmedabad-380028



1. Consent Order No.: AWH-39520, Date of issue: 27/11/2019.
2. The consents shall be valid up to 30/09/2024 for use of outlet for the discharge of trade effluent & emission due to operation of industrial plant for following products.

Sr. No	Product	Quantity
1	Re-Refining of Used Oil	24.25 KL/Month
2	Recycled Waste Oil (Industrial Fuel)	40 KL/Month

SPECIFIC CONDITIONS

- Unit shall obtain CTE/CCA Amendment on receipt of CCA Renewal.
- Unit shall not to procure waste oil or used oil more than consented quantity and comply with undertaking dated 10/10/2019.
- Unit shall not operate plant in night hours during winter season and comply with the winter action plan and air action plan of Ahmedabad city.
- The applicant shall receive/transport/sell any hazardous waste in global Positioning system enabled (GPS enabled) dedicated tankers/trucks only and shall have to adopt online manifest system of GPCB-Extended green node (XGN) invariably.

3. CONDITIONS UNDER WATER ACT 1974

- 3.1 Domestic water consumption shall not exceed 1.0 KLPD and the quantity of the domestic waste water (sewage) shall not exceed 0.8 KLPD. Sewage shall be discharge in to AMC drain.
- 3.2 Industrial water consumption shall not exceed 3.25 KLPD which shall be treated in ETP and partly reuse in cooling tower make up & partly evaporated in evaporator, so there shall be no discharge of any kind of industrial effluent from the manufacturing process and other ancillary operations.

NY

- 3.3 The directives issued by the board from time to time in view of direction issued by the Honorable High Court of Gujarat in the matter of S.C.A. 770/95 and any other shall have to be complies with.

4. **CONDITIONS UNDER THE AIR ACT :**

TRUE COPY

- 4.1 The following shall be used as fuel in furnaces.

Sr. No.	Fuel	Quantity
1	LDO	0.03 KL/Hr

- 4.2 The applicant shall install & operate the Air pollution control system in order to achieve norms prescribed below.

Stack No.	Stack attached to	Stack height in Meter	Parameter	Permissible Limit
1	Furnaces (2 nos)	11	Particulate Matter SO ₂ NO _x	150 mg/NM ³ 100 PPM 50 PPM

- 4.3 Stack monitoring facility like port hole, platform / ladder, etc. shall be provided with stack/vents chimney in order to facilitate sampling of gases being emitted into the atmosphere.
- 4.4 There shall be no process gas emission.
- 4.4 Ambient air quality within the premises of the industry shall conform to the following standards:

Pollutant	PERMISSIBLE LIMIT Annual	PERMISSIBLE LIMIT 24 Hrs Average
Particulate Matter 10 (PM10)	80 Microgram/M ³	100 Microgram/M ³
PM 2.5 (PM 2.5)	40 Microgram/M ³	60 Microgram/M ³
SO ₂	50 Microgram/M ³	80 Microgram/M ³
NO _x	40 Microgram/M ³	80 Microgram/M ³

The industry shall take adequate measures for control of noise levels from its own sources within the permission 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 a.m. and 10 a.m. and nighttime is reckoned between 10 p.m. and 6 a.m.

- 4.6 The applicant shall provide proper ventilation and exhaust facilities so as to maintain healthy working atmosphere within the factory premises.

5. **Authorization for the Management & Handling of Hazardous Wastes Form-2 (See rule 3 (c) & 5 (4) Form for grant of authorization for occupier or operator handling hazardous waste.**

5.1 **Number of authorization: AWH-39520, Date of issue: 27/11/2019.**

Shana Oil Process is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated at Nr Good Luck Market, Chandola Lake, Ahmedabad-380028.

Sr. No	Waste	Quantity per year	Schedule category	Facility
1	Used or Spent Oil	300 MT	5.1	Collection, Storage, Reception, Reprocess within premises



TRUE COPY

- g) Industry shall manage waste as per amended rules 2016 and shall applied authorization for all applicable waste as per amended rules 2016 within 15 days.
h) Industry shall submit annual report within 15 days and subsequently by 30 June every year.

6. **GENERAL CONDITIONS: -**

- 6.1 Any change in personnel, equipment or working conditions as mentioned in the consents form/order should immediately be intimated to this Board.
6.2 In case of any accident, details of the same shall be submitted in Form - 14 to Gujarat Pollution Control Board.
6.3 In no case any kind of hazardous waste shall be imported without prior approval of appropriate authority.
6.4 Unit shall take all concrete measures to show tangible results in waste generation reduction, avoidance, reuse and recycle. Action taken in this regards shall be submitted within three months and also along with Form - 4.
6.5 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 waste are generated, the occupier shall obtain 'No Objection certificate' from the state pollution Control Board, the Committee of the concerned state or Union territory Administration where the facility exists.
6.6 Industry shall have to display the relevant information with regard to hazardous waste as indicated in the Hon Supreme Court's order in W.P. No.657 of 1995 dated 14th October 2003.
6.7 As per "Public liability Insurance Act - 91" company shall get insurance policy, if applicable.
6.8 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 waste generated within the factory premises.

For and on behalf of
Gujarat Pollution Control Board

N.D. Ajmera

N.D. Ajmera
I/C Regional Officer



NO: GPCB/RO-ABD/AM/13711/ 18670

ISSUED TO:

M/s. Shans Oil Process
Nr Good Luck Market,
Chandola Lake,
Ahmedabad-380028

COPY TO:

1. THE MEMBER SECRETARY, G.P.C.BOARD. GANDHINAGAR.
2. OFFICE COPY CONCERNED INDUSTRIES FILE.

5 DEC 2019

30 MAY 2022

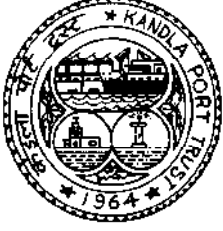
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Shweta
(SHWETA N. RAMNANI)
ADVOCATE & NOTARY
Gandhidham - Kachchh

ANNEXURE – K

Work order of M/s Precitech Laboratories Pvt Ltd.

DEENDAYAL PORT TRUST



Administrative Office Building
Post Box NO. 50
GANDHIDHAM (Kutch).
Gujarat: 370 201.
Fax: (02836) 220050
Ph.: (02836) 220038

www.deendayalport.gov.in

NO.EG/WK/4783/V/131

Dated : 05/02/2021

To,
M/s Precitech Laboratories Pvt Ltd,
1st Floor, Bhanujyot Complex,
Plot No C5/27, B/h Panchratna Complex,
Nr. GIDC Char Rasta,
VAPI-396195.

Sub: Work order for "STRENGTHENING OF EXISTING ENVIRONMENTAL MANAGEMENT CELL AT DEENDAYAL PORT TRUST: Appointment of environment experts for two years further extendable for one year"-**reg.**

Ref: 1) Tender dated 21.06.2019 submitted by M/s Precitech Laboratories Pvt.Ltd, Vapi.
2) Letter of Acceptance vide no-EG/WK/4783/V/100 dtd 01(04).01.2021
3) Letter from DPT no E/WK/4783/V/103 dtd 06.01.2021
4) Performance Guarantee submitted by M/s Precitech Laboratories Pvt Ltd in the form of Bank Guarantee of Rs. 3,60,000.00 vide Bank Guarantee no. 1102921BG0000016 dated 19.01.2021 issued by State Bank of India, Vapi.

Sir,

Kindly refer above cited Letter of Acceptance dtd 01(04).01.2021.

- 2) You shall have to provide Key Experts as per tender requirement during the entire contract period. Accordingly, you shall have to submit the qualification and experience certificates of the Key experts to be appointed at DPT, as per tender conditions for verification & approval.
- 3) Please submit the Agreement of contract as per tender conditions no 1.29.
- 4) Kindly commence the work on or before 15.02.2021.


.....Cont.....

- 2 -

Please note that the time period for providing Consultancy services for the subject work will be initially for two years and further extendable for one year on mutual consent as per tender conditions.

Thanking you.

Yours faithfully,


Superintending Engineer (Design & EMC (i/c))
Deendayal Port Trust

ANNEXURE – L


Office order of Manager Environment

दीनदयाल पोर्ट ट्रस्ट
अभियांत्रिकी विभाग
(स्थापना अनुभाग)

Sub: Duty Report of Shri Mukkannawar Utkarsh Suresh
appointed as Manager (Env.) - req.

With reference to above cited subject, as Shri Mukkannawar Utkarsh Suresh has been appointed as Manager (Environment) on contract basis, accordingly Duty Report already forwarded to SE (EMC) under Pipeline Division. The establishment/salary may please be process In the Pipeline Division.

संलग्नक : यथोक्त।


मुख्य अभियंता के निजी सहायक
दीनदयाल पोर्ट ट्रस्ट

SE (PL)

No. EG/PS/4729/ 539

Date : 11/02/2022

DAE(PL) / Shri Pankaj


दीनदयाल पोर्ट ट्रस्ट
अभियांत्रिकी विभाग
(स्थापना अनुभाग)

Sub: Duty Report of Shri Mukkannawar Utkarsh Suresh
appointed as Manager (Env.) - reg.

With reference to above cited subject, Shri Mukkannawar Utkarsh Suresh has been appointed as Manager (Environment) on contract basis, accordingly Duty Report dated 07/02/2022 received from Shri Mukkannawar, is forwarded in original alongwith Fitness certificate vide No. MH/GNU/1112 dated 04/02/2022 issued by the CMO and Offer letter for engagement issued by the Secretary vide No. GA/PS/4292/HE(PF)/2017/304 dated 17/01/2022, read with remarks of Chief Engineer below the Duty report, posting of Shri Mukkannawar in EMC Cell, for information and further necessary action in accordance with the relevant rules please.

संलग्नक : यथोक्त ।

प्रमुख अभियंता के निजी सहायक
दीनदयाल पोर्ट ट्रस्ट

मुख्य अभियंता के निजी सहायक
दीनदयाल पोर्ट ट्रस्ट

SE(EMC)

EMC CELL

No. EG/PS/4729/526

Date : 9/02/2022

Copy to:

199
व्यक्तिगत

Sr. AS (P)

W.r. to his note no. GA/PS/4292/HE/DA/2017/496 dt. 07/01/2022, for further necessary action, please.

Shri. Anoop Dave
Shri. Padma

9/2/22

Utkarsh Suresh

Date : 07.02.2022

To
The Secretary,
Deendayal Port Trust,
Gandhidham

Sub : Duty Report.


Sir,

I have been offered the appointment to the post of Manager(Environment) vide your offer letter No. GA/PS/4292/HE(PF)/2017/304 dated 17.01.2022.

Therefore, I hereby submit my duty report today i.e. 07.02.2022(FN).

Thanking you,

Yours faithfully,


(Dr. Mukannawar Utkarsh Suresh)

EMC-Cell


6 Feb/2022
CE

DS(E)
2/2
7/2/22

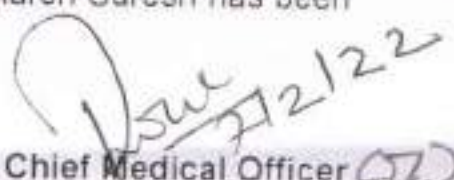
DEENDAYAL PORT TRUST

Medical Department

Sub: Certificate of Fitness – Shri Mukkanwar Utkarsh Suresh
Manager-Environment

Ref: GA/PS/4292/HE/PF/2017/304 dated 17.01.2022

With reference to the above, Shri Mukkanwar Utkarsh Suresh has been
examined on 07.02.2022 and he is found medically fit.


Chief Medical Officer

Secretary

No: MH/GN/1112/

Date: 07.02.2022

GENERAL ADMINISTRATION DEPARTMENT

ESTABLISHMENT SECTION

Sub : Duty Report of Shri Mukkannawar Utkarsh Suresh as Manager
(Environment)

Shri Mukkannawar Utkarsh Suresh was offered the post of Manager(Environment) vide this office's offer letter No.GA/PS/4292/HE(PF)/2017/304 dated 17.01.2022 with last date of joining as 27.01.2022. On his request vide email dated 19.01.2022, he was granted extension of 11 days for joining, after approval of the Competent Authority.

A copy of the duty report and extension letter for joining is enclosed herewith for further necessary action please.

Encl : As above. (plus medically fitness certificate)

Sr.Asstt. Secretary
Deendayal Port Trust

VPA to Chief Engineer

No.GA/PS/4292/HE(PF)2017/ 496

Date : 07/02/2022



DEENDAYAL PORT TRUST

ISO 9001 : 2008 : ISO 14001 : 2004

Ph. : 02836-220167

Fax: 02836-233172

website: deendayalport.gov.in

e-mail : secretary@deendayalportgov.in



General Administration Deptt.
Administrative Office Building,
Post Box No. 50,
Gandhidham (Kutch) 370 201

By Speed Post / E-mail

No. GA/PS/4292/HE(PF)/2017/ 304

Dated, 17 January, 2022

OFFER OF CONTRACTUAL ENGAGEMENT AS MANAGER(ENVIRONMENT), IN DEENDAYAL PORT TRUST.

With Reference to your application for contractual engagement as Manager - Environment, in response to the advertisement, inviting applications for the subject position, on assessment and interview before the Services Selection Committee on 06.01.2022, the Competent authority has been pleased to offer the contractual engagement as Manager (Environment) in Deendayal Port Trust, purely on contractual basis, subject to the following terms and conditions :

a) Roles & Responsibilities

- Develop, implement and manage long term port environmental programmes such as the Green Marine Programme, sustainability plan, air strategies, tenant environment plan and tenant lease management.
- Represent the Port in local, state and federal agency meetings.
- Assist in the development and updating of the Port's comprehensive scheme of Harbour improvements and strategic plan.
- Monitor and conduct regular mock drills to train the employees at different levels.

b) Remuneration :-

Your consolidated remuneration per month will be Rs.1,00,000/- (Rupees One Lakh Only). Suitable increase depending upon the performance and variation in the AICP index may be given after successful completion of yearly service. Applicable taxes will be deducted at the time of payment.

c) Period of Contract :

The contract will be for a period of 3 years, extendable by another two years, subject to satisfactory performance.

d) Duty Hours :

You may be posted at/under any department/authority of Deendayal Port Trust, as per requirement, Duty Hours are from 10.00 AM to 06.00 PM or as may be decided by the Administration from time to time. In case of requirement, you may have to work beyond the normal duty hours, for which no other compensation, monetary or otherwise will be considered.

.....
(Mukkannawar Utkarsh Suresh)

Contd....

You will normally be entitled to a weekly off on Sunday. If situation warrants, the weekly day of rest may be changed with prior intimation. For work on any weekly day off / declared national holiday in exigencies of work, a compensatory day of rest as per the convenience of the Administration, in lieu thereof, will be granted and for which no other compensation, monetary or otherwise will be considered.


Failure to report for duty will entail deduction of wages on pro-rata basis.

- e) Medical facility : Only Outdoor Medical treatment facility for self and your spouse will be provided in the Port Trust Hospital. No other medical facilities will be provided to you/ your family.
- f) Leave entitlement : 10 days leave in a year and National Holidays will be given. No other leave will be admissible and for any absence beyond the said leave, pro-rata deduction will be made from the consolidated remuneration.
- g) Accommodation : Suitable accommodation, if available, may be provided, subject to recovery of charges under FR-45A, and the element of HRA excluded from the lumpsum remuneration.
- h) Your engagement on contractual basis is subject to strict adherence to the norms and conduct.
- i) The engagement can be terminated by giving one month's notice in writing from either side. However, in case of unsatisfactory performance or for any act considered derogatory/ detrimental to the interest of Deendayal Port Trust, this contractual engagement will be terminated forthwith.
- j) If you leave without notice or without acceptance of notice of termination, the amount due i.e., consolidated remuneration payable will be forfeited.
- k) You shall not claim any right/title/interest on par with the regular employees of the Port or otherwise.
- l) You shall not have any claim/right whatsoever for regular appointment / absorption in Deendayal Port Trust under any circumstances.
- m) Your contractual engagement is subject to verification of antecedents by the police. If any adverse report is received from the Police, your contractual services are liable to be terminated forthwith.
- n) You will not be permitted to take any other assignment during the period of contract with Deendayal Port Trust.

- l) On official tour outside Head Quarters, you will be entitled to TA/DA as admissible under the rules.
- m) The terms and conditions shall be amended / modified depending upon the requirement of the Port. Any dispute(s)/difference(s) shall be decided solely by the Chairman, Deendayal Port Trust, which shall be final and binding.
- n) You are required to submit discharge letter / relieving letter from your present employer at the time of joining Deendayal Port Trust, without you may not be allowed to join.
- o) The contractual engagement is subject to your being found medically fit as per the requirements of Deendayal Port Trust.

2. You have to report for medical examination before the Medical Board of DPT at Gopalpuri Hospital on any working day between 10.00 hrs to 12.00 hrs.

3. If you agree to the above terms and conditions, you may convey acceptance by signing the duplicate of the letter in token of your acceptance and submit the same to this office and call at this office with all certificates and two copies of passport size photographs latest by 27th January, 2022 failing which the offer of contractual engagement stands automatically cancelled.


Secretary
Deendayal Port Trust

To
Shri. Mukkanawar Utkarsh Suresh,
21/1, Madhukunj Housing Society,
Near Canara Bank, Panchavati,
Pashan, Pune, Maharashtra - 411008.
Email : utkaish@gmail.com

I accept the above terms and conditions and will report for duty on _____.

Name :

Date :

Copy to: CMO – for conducting Medical Examination.

DEENDAYAL PORT TRUST

Certified under ISO 9001 : 2008 & ISO 14001 : 2004

Ph. : 02836-220167
Fax : 02836-233172
e-mail : sras@deendayalport.gov.in
Website : www.deendayalport.gov.in

General Administration Deptt.
Administration Office Building,
Post Box No. 50,
Gandhidham (Kutch) 370 201

No. GA/PS/4292/HE(PF)/2017/ 419

Dated, the 31 January, 2022

To
Shri Mukkannawar Utkarsh Surosh,
21/1, Madhukunj Housing Society,
Near Canara Bank,
Panchvati, Pashan, Pune,
Maharashtra - 411008

Sub:- Offer of engagement for the post of Manager(Environment) on contract basis in DPT [extension] – Reg.

Sir,

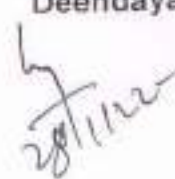
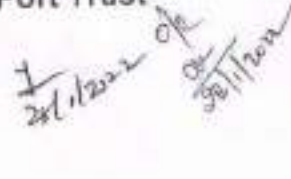
Reference this Offer Letter No.GA/PS/4292/HE(PF)/2017/304 dated 17th January, 2022 and your e-mail dated 19 January, 2022, on the above subject.

2. In this context, it is informed that the Competent Authority has acceded your request and accorded approval for extension of time of 11 days i.e., from 28.01.2022 to 07.02.2022 to take up your assignment at DPT, as 'Manager (Environment)'.

3. You are, therefore, requested to report to DPT latest by 08th February 2022 as 'Manager(Environment)' on the terms & conditions as mentioned in our offer letter dated 17/01/2022 on due observance of formalities as mentioned therein. However, no further extension will be granted, which may please be noted.

Yours Sincerely,


Secretary
Deendayal Port Trust

 28/1/2022
 31/1/2022

Date : 07.02.2022

To
The Secretary,
Deendayal Port Trust,
Gandhidham

Sub : Duty Report.


Sir,

I have been offered the appointment to the post of Manager(Environment) vide your offer letter No. GA/PS/4292/HE(PF)/2017/304 dated 17.01.2022.

Therefore, I hereby submit my duty report today i.e. 07.02.2022(FN).

Thanking you,

Yours faithfully,


(Dr. Muktapawar Utkarsh Suresh)

