

**Fw: Half Yearly EC Compliance Report Submission - APSEZ, Mundra - SMP & COT 2004 (Oct'19 to Mar'20)**

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Wed 5/20/2020 12:09 PM

To: Dilip Kumar Moolchandani <Dilip.Moolchandani@adani.com>

1 attachments (11 MB)

3. EC Compliance Report\_SPM-2004\_Oct'19 to Mar'20.pdf;

20/5/20  
कायालय/ऑफिस  
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय  
Ministry of Environment, Forests & Climate Change  
भारत सरकार (केंद्रीय क्षेत्र)/Regional Office/Western Zone  
भोपाल (म.प्र.)/Bhopal-462016

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**Sent:** Tuesday, May 19, 2020 5:18 PM

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**Subject:** Half Yearly EC Compliance Report Submission - APSEZ, Mundra - SMP & COT 2004 (Oct'19 to Mar'20)

**adani**

Ports and  
Logistics

**APSEZL/EnvCell/2020-21/020**

**Date:** 19.05.2020

To

**Additional Principal Chief Conservator of Forests (C),**

Ministry of Environment, Forest and Climate Change,

Regional Office (WZ), E-5, Kendriya

Paryavaran Bhawan, Arera Colony,

Link Road No. - 3, Bhopal - 462 016.

E-mail: [rowz.bpl-mef@nic.in](mailto:rowz.bpl-mef@nic.in)

**Sub :** Half yearly Compliance report of Environment Clearance of "Single Point Mooring (SPM), Crude Oil Terminal (COT) and connecting pipes at Mundra Port, District Kachchh by M/s. Adani Ports & SEZ Limited"

**Ref :** Environment clearance granted to M/s Adani Ports & SEZ Ltd. vide letter dated 21<sup>st</sup> July, 2004 bearing no. J-16011/30/2003-IA-III.

**Dear Sir,**

Please refer to the above cited reference for the said subject matter. In connection to the same, it is to state that copy of the compliance report for the Environmental and CRZ Clearance for the period of October - 2019 to March - 2020 is being submitted through soft copy (e-mail communication).

Kindly consider above submission and acknowledge.

Thank you,

Yours Faithfully,

For, **M/s Adani Ports and Special Economic Zone Limited**

  
**Avinash Rai**

To

**Additional Principal Chief Conservator of Forests (C),**  
Ministry of Environment, Forest and Climate Change,  
Regional Office (WZ), E-5, Kendriya  
Paryavaran Bhawan, Arera Colony,  
Link Road No. – 3, Bhopal – 462 016.  
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Kindly consider above submission and acknowledge.

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Yours Faithfully,

For, **M/s Adani Ports and Special Economic Zone Limited**



**Avinash Rai**  
**Chief Executive Officer**  
**Mundra & Tuna Port**

**Encl: As above**

**Copy to:**

- 1) The Director (IA Division), Ministry of Environment, Forests & Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi-110003
- 2) Zonal Officer, Regional Office, CPCB – Western Region, Parivesh Bhawan, Opp. VMC Ward Office No. 10, Subhanpura, Vadodara – 390 023
- 3) Member Secretary, GPCB – Head Office, Paryavaran Bhawan, Sector 10 A, Gandhi Nagar – 382 010
- 4) The Director, Forests & Environment Department, Block – 14, 8<sup>th</sup> floor, Sachivalaya, Gandhi Nagar – 382 010
- 5) Regional Officer, Regional Office GPCB (Kutch-East), Gandhidham, 370201



# Environmental Clearance Compliance Report

of



SPM, Crude Oil Terminal and  
Connecting Pipes

at

Mundra Port,  
Dist. Kutch, Gujarat

of

Adani Ports and SEZ Limited

Period:

October-20 19 to March-20 20


	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

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# **EC Compliance Report**

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated in Environment Clearance</b>		

**Half yearly Compliance report of Environment and CRZ Clearance of “Single Point Mooring (SPM), Crude Oil Terminal (COT) and connecting pipes at Mundra Port, District Kutch issued by MoEF vide letter no. J-160 11/30/2003-IA.III dated 21<sup>st</sup> July 2004.**

<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>
<b>A. Specific Condition</b>		
1.	Mangrove afforestation in 25 ha of area, suitably identified in consultation with State Forest Department. The GAPL shall bear the cost of the said land as well as the cost of the plantation of mangroves and its sustenance and implant within 6 months from the date of clearance of this letter. Further, it shall be ensured that mangroves in the vicinity of the salt works are not affected due to the project.	<p>Complied.</p> <p>25 hectare of mangrove plantation with a cost of 10 Lakh is already completed near railway yard in consultation with Dr. Maity, Mangrove consultant of India.</p> <p>There are no salt works within the project area.</p> <p>It may be noted that to enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in 2890 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 832 lakh. Details on mangroves afforestation &amp; Green belt development carried out by APSEZ till date is annexed as <b>Annexure – 1</b>.</p>
2.	In addition to the mangrove plantation, GAPL should also take up massive green belt developments in 30 acres of land in and around the project in consultation with the Forest Department. Detailed plan indicating the area identified for the mangrove plantation as indicated at (i) above and for green belt development along with the financial outlay shall be provided to this ministry within 6 months from the date of receipt of this letter.	<p>Complied.</p> <p>During the course of development of the project, green belt was developed in 6.18 Hectares of land. Total 7607 trees were planted with the density of 1230 trees per hectare at a cost of Rs. 25.00 Lakh. This plantation was done in consultation with Gujarat Ecological Commission (as they are one of the authorized agencies of Dept. of Forest &amp; Env. Dept., Govt. of Gujarat).</p> <p>In addition to this, various activities on green belt development and mangrove plantation are being carried out on regular basis by horticulture department. Total expenditures of the horticulture dept. for the financial year of 20 19-20 have been INR 728 lakh.</p> <p>It may be noted that, APSEZ has developed more than 467 ha. area as greenbelt with plantation of more than 8.7 Lacs saplings within the APSEZ area. Details on mangroves afforestation &amp; Green belt development carried out by APSEZ till date is annexed as <b>Annexure – 1</b>.</p>

**Status of the conditions stipulated in Environment Clearance**

Sr. No.	Conditions	Compliance Status as on 31-03-2020																						
3.	No dredging activity shall be carried out.	Complied. Construction activities are completed & project is in operation stage. SPM is approximately 8.6 km inside the open sea from the shore where 30 m of draft is naturally available. Hence no dredging is required.																						
4.	No ground water should be tapped at the project site / within CRZ area.	Complied. No ground water is tapped at the project site. Water requirement is not on regular basis. However during operation and maintenance activity, approximately 100 liters per day water is being consumed for drinking purpose only.																						
5.	Adequate facilities as listed in National Oil spill Disaster Contingency Plan for the Mundra Port which includes firefighting equipment of 1200 cum/hr. spray capacity with 2 monitor fitted with the dolphin 2, 3, 4 and 5 oil spill dispersant foam liquid etc. should be maintained and put into operation immediately in case of oil spills.	Complied.  Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared.  The OSCRP updated on 01.10.2019 is in place and implemented. The updated copy of Oil Spill Contingency Response Plan is attached as <b>Annexure – 2</b> .  Based on the oil spill modeling study, it has been observed that crude oil spill of 700 tons (Tier-I) will spread over an area having radius of around 400 m within 4hr. APSEZ already has facilities for combating a Tier-1 spill. Shoreline Resources available with APSEZ, for deployment during shoreline cleanup/ emergent situation: <table><tr><th>Item</th><th>Quantity</th></tr><tr><td>Oil Spill Dispersants</td><td>5000 ltr.</td></tr><tr><td>Absorbent pads</td><td>2000 Nos.</td></tr><tr><td>Portable dispersant storage tank: 1000 ltr. Capacity</td><td>1 no.</td></tr><tr><td>Portable pumps</td><td>2 nos.</td></tr><tr><td>Oil Containment Boom-Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm</td><td>2000 m</td></tr><tr><td>Skimmer-KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.</td><td>4 Nos.</td></tr><tr><td>12.5T Flexible Floating Storage Tank (PUA).</td><td>3 Nos.</td></tr><tr><td>Lamor Minimax 12 m³ skimmer</td><td>2 sets</td></tr><tr><td>Lamor Side Collector system (Recovery Capacity 123 m³/ hr)</td><td>2 Nos.</td></tr><tr><td>Canadyne Fence Boom (Reel model 7296/8496</td><td>1 No.</td></tr></table>	Item	Quantity	Oil Spill Dispersants	5000 ltr.	Absorbent pads	2000 Nos.	Portable dispersant storage tank: 1000 ltr. Capacity	1 no.	Portable pumps	2 nos.	Oil Containment Boom-Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm	2000 m	Skimmer-KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.	4 Nos.	12.5T Flexible Floating Storage Tank (PUA).	3 Nos.	Lamor Minimax 12 m³ skimmer	2 sets	Lamor Side Collector system (Recovery Capacity 123 m³/ hr)	2 Nos.	Canadyne Fence Boom (Reel model 7296/8496	1 No.
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	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated in Environment Clearance</b>		

<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>					
		with Power Pack, Towing bridles and Tow lines - 235 meter					
		<ul style="list-style-type: none"> <li>• 10 Tugs are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required.</li> <li>• 9 Tugs are fitted with a fire curtain and remote controlled fire monitors.</li> <li>• Dolphin 11 has firefighting system of 1200 m<sup>3</sup>/hr. along with 20 ton lifting "A" frame and diving support facility.</li> <li>• The equipment are being kept in working condition. Routine inspection, maintenance and testing is performed as per the stipulated requirements.</li> <li>• Detail of resource available at APSEZL is provided in annexure 3 of Oil Spill Contingency Plan.</li> </ul>					
6.	The duration of construction phase of the project should be kept to a maximum of 8 months to avoid impact on marine environment and birds as suggested by NIO.	<p>Already complied. Not applicable at present.</p> <p>Construction activity is already completed and the project is in operation.</p>					
7.	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.	<p>Not Applicable</p> <p>Location of SPM is unmanned (approximately 8.6 km inside the open sea from the shore) hence; there is no displacement of people, houses or fishing activity as a result of the project.</p>					
8.	The project proponents must make necessary arrangements for disposal of solid wastes and for the treatment of effluents / liquid wastes. It must be ensured that the effluents / liquid wastes are not discharged into the seawater.	<p>Complied.</p> <p>Used oil / Spent oil generated is being sold to registered recyclers time to time.</p> <p>No other type of solid waste as well as no effluent or liquid waste are generated from operation of SPM or discharged into the sea water.</p> <p>In order to analyzed marine water quality, marine sampling is being carried out at a location nearby SPM by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'19 to Mar'20 is mentioned below.</p> <p><b>Sampling Locations &amp; Frequency: 9 Nos. (Monthly)</b></p> <table border="1"> <thead> <tr> <th>Parameter</th><th>Unit</th><th>Surface</th><th>Bottom</th></tr> </thead> </table>		Parameter	Unit	Surface	Bottom
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	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated in Environment Clearance</b>		


Sr. No.	Conditions	Compliance Status as on 31-03-2020					
				Max	Min	Max	Min
		pH	--	8.34	8.02	8.28	7.88
		TSS	mg/L	364	124	381	127
		BOD (3 Days @ 27 °C)	mg/L	5.3	2.2	3.0	ND*
		DO	mg/L	8.8	5.5	6.2	5.2
		Salinity	ppt	37.5	34.1	38.2	34.2
		TDS	mg/L	38496	35602	38796	35112
		*ND = Not Detectable					
		<p>The results depict that there is no damage to the marine ecology. Please refer <b>Annexure – 3</b> for detailed analysis reports. Approx. INR 21.74 Lakh is spent for all environmental monitoring activities during the FY 2019-20.</p> <p>The environmental monitoring within Adani Ports &amp; SEZ Limited has been stopped since 23<sup>rd</sup> March, 2020 considering COVID-19 Pandemic lockdown and the same has already been intimated to the regulatory authorities vide our e-mail dated 06.04.2020. Details of the same is attached as <b>Annexure – 4</b>.</p>					
9.	The camps of labor shall be kept outside the Coastal Regulation Zone area. Proper arrangements for cooking fuel shall be made for the labor during construction phase so as to ensure that mangroves are not cut / destroyed for this purpose.	<p>Complied. Not applicable at present.</p> <p>Construction activities are completed and project is in operational phase.</p>					
10.	Regular drills should be conducted to check the effectiveness of the on-site Disaster Management Plan. The recommendations made in the Environmental Management Plan and Disaster Management Plan, as contained in the Environmental Impact	<p>Complied.</p> <p>Disaster Management plan is in place and implemented. Updated DMP was submitted to the MoEF &amp; CC along with half yearly compliance report for the period from Apr – 2016 to Sep – 2016 and there is no further change.</p> <p>Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared. The updated oil spill contingency response plan is</p>					

**Status of the conditions stipulated in Environment Clearance**

Sr. No.	Conditions	Compliance Status as on 31-03-2020						
	Assessment and Risk analysis reports of the project, shall be effectively implemented.	<p>attached as <b>Annexure – 2</b>.</p> <p>Oil spill mock drills are conducted regularly. Latest mock drill was conducted on 23.10.2019 for crude oil spillage from SPM. Mock drill report is attached as <b>Annexure – 5</b>.</p> <p>All the recommendations given in the report of NIO and Tata AIG Risk Management Services are implemented. Few examples are provided below.</p> <p><b>Few Marine EIA recommendations:</b></p> <table><tr><td>Temporary colonies of workforce should be located sufficiently away from the HTL with proper sanitation. Adequate arrangement of fuel supply to the workers should be made to discourage them from using mangroves for firewood.</td><td>Construction activity is already completed. Most of the construction labours were residing in the nearby villages where all basic facilities are easily available. However, for those residing near the construction site, infrastructure facilities such as water supply, fuel, sanitation, first aid, ambulance etc. were provided by APSEZL.</td></tr><tr><td>As a step towards improvement in marine environment quality, mangrove afforestation of intertidal mudflats should be encouraged through adequate institutional support.</td><td>25 hectare of mangrove plantation with a cost of 10 Lakh is already completed near railway yard in consultation with Dr. Maity, Mangrove consultant of India.  Details on mangroves afforestation &amp; Green belt development carried out by APSEZ till date is annexed as Annexure – 1.</td></tr><tr><td>The prevailing traffic control management of deep-sea ships navigating through the gulf needs thorough review and introduction of state of the art VTS should be considered.</td><td>APSEZ is practicing well defined traffic control procedure.  A VTS service for Gulf of Kutch is provided by the VTS Gulf of Kutch, operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India.  Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77. Arrival and departure information before arrival and departure respectively in Gulf of Kutch is provided to VTS information cell</td></tr></table>	Temporary colonies of workforce should be located sufficiently away from the HTL with proper sanitation. Adequate arrangement of fuel supply to the workers should be made to discourage them from using mangroves for firewood.	Construction activity is already completed. Most of the construction labours were residing in the nearby villages where all basic facilities are easily available. However, for those residing near the construction site, infrastructure facilities such as water supply, fuel, sanitation, first aid, ambulance etc. were provided by APSEZL.	As a step towards improvement in marine environment quality, mangrove afforestation of intertidal mudflats should be encouraged through adequate institutional support.	25 hectare of mangrove plantation with a cost of 10 Lakh is already completed near railway yard in consultation with Dr. Maity, Mangrove consultant of India.  Details on mangroves afforestation & Green belt development carried out by APSEZ till date is annexed as Annexure – 1.	The prevailing traffic control management of deep-sea ships navigating through the gulf needs thorough review and introduction of state of the art VTS should be considered.	APSEZ is practicing well defined traffic control procedure.  A VTS service for Gulf of Kutch is provided by the VTS Gulf of Kutch, operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India.  Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77. Arrival and departure information before arrival and departure respectively in Gulf of Kutch is provided to VTS information cell
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	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated in Environment Clearance</b>		

<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>	
			through agent or by directly sending mail to vtsmanagergulfofkutch@yahoo.com and vtsgok@yahoo.com
		<b>Few Tata AIG Risk Assessment Recommendations:</b>	
		There should be facilities of boom, skimmer, dispersant, diving suits, firefighting equipment and excellent communication facilities.	10 Dolphin tugs fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 9 Dolphin Tugs are fitted with a fire curtain and remote controlled fire monitors.
		In the event of oil spillage the oil slick normally will be carried away by water current and wind. It is very difficult to identify oil slick patches by boats/vessels, hence it is suggested that GAPL may take help from coast guard/Navy for aerial surveillance in order to identify and monitor oil slick movement.	Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared. Oil spill contingency plan updated & approved by coast guard is attached as Annexure – 2.
11.	The entire stretch of the pipelines shall be buried underground except at the booster pumping station, which will be properly fenced and the station would be manned round the clock. The buried lines will be protected with anticorrosive coal tar based coating. The coating will be tested by high voltage detector in accordance with prescribed standards.	<p>Complied.</p> <p>Entire SPM pipeline is buried underground. Total pipeline length is 15.4 km including 8.6 km inside the open sea and 6.8 km on landward side.</p> <p>Booster pump is not provided throughout the pipeline. However the material is transferred by using pumping system of respective vessels berthed at SPM.</p> <p>Anticorrosive 3 LPE coating is provided to the portion of onshore pipeline while offshore pipeline is also protected by concrete coating.</p> <p>For offshore pipeline, Cathodic Potential (CP) survey is being done once in five years. Last CP inspection of offshore pipeline done in Oct'2017 and report for the same was provided along with EC compliance report submission for the period of Apr'17 to Sep'17.</p> <p>For onshore pipeline also CP survey is being done by APSEZ</p>	

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated in Environment Clearance</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2020								
		on monthly bases. Report of monitoring done within this compliance period is enclosed as <b>Annexure – 6</b> .								
12.	Markers shall be installed at every 30 m to indicate the position of the line. Regular patrolling of the pipelines needs to be done. This will help in identifying any activity that have the potential to cause pipeline damage or to identify small leaks whose effects are too small to be detected by instrument.	<p>Complied.</p> <p>Markers are installed at every 30 m to indicate position of pipeline. Details of the same were submitted during half yearly EC Compliance report for the period Oct'18 to Mar'19.</p> <p>Pressure at vessel and reception points of transfer line is being monitoring during operation to ensure no leakage in pipeline.</p> <p>Regular patrolling of pipeline is being done by APSEZL Security Department. Following mitigation plan is followed in case of small leaks leading to spills.</p> <table><tr><th>Activity</th><th>Adequacy of Measures</th></tr><tr><td>Hose Connection / Disconnection (liquid operation)</td><td>It is collected in deep tray in case of leakage. Stop the supply of liquid discharge.</td></tr><tr><td>Hose Connection / Disconnection (liquid operation)</td><td>Immediately stop the supply of liquid discharge. Marine break away coupling available for control of load.</td></tr><tr><td>Tanker discharge operation (SPM operation)</td><td>Emergency operation shut off (stopping the discharge)</td></tr></table>	Activity	Adequacy of Measures	Hose Connection / Disconnection (liquid operation)	It is collected in deep tray in case of leakage. Stop the supply of liquid discharge.	Hose Connection / Disconnection (liquid operation)	Immediately stop the supply of liquid discharge. Marine break away coupling available for control of load.	Tanker discharge operation (SPM operation)	Emergency operation shut off (stopping the discharge)
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Tanker discharge operation (SPM operation)	Emergency operation shut off (stopping the discharge)									
13.	There should be display boards at critical locations along the pipeline viz. road / rail /river crossings giving emergency instructions as well as contact details of GAPL. This will ensure prompt information regarding location of accident during any emergency. Emergency Information board should contain emergency instructions in addition to contact details.	<p>Complied.</p> <p>Display boards with emergency contact detail are provided at critical locations.</p> <p>Photographs of the same were submitted as part of the compliance report for the period from Oct'16 to March'17 and there is no farther change.</p>								
14.	During operation phase, proper precautions should be taken to avoid	<p>Complied</p> <p>During operation, SPM team takes responsibility and actively supervises the operation. Inspection and maintenance</p>								



	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated in Environment Clearance</b>		

<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>
	any oil spills and no oily wastes shall be discharged into the water bodies.	activities are carried out regularly for prevention of any kind of oil spill at SPM. No liquid waste are generated / discharged from the project activity. In order to analyze marine water quality, marine sampling is being carried out at a location near SPM. Please refer condition no 8 for further details.
15.	All conditions stipulated by the Forest and Environment Department, Government of Gujarat should be strictly implemented.	Complied  All the conditions stipulated by Forest and Environment Department are being complied. Point wise compliance report of CRZ recommendations issued vide letter No. <b>ENV-10-2002-124-P (Part1)</b> dated <b>8<sup>th</sup> October 2003</b> is enclosed as <b>Annexure- A</b> .
16.	All conditions stipulated in Gujarat Pollution Control Board vide their letter No. PC/NOC/381/1039 dated 8 <sup>th</sup> January, 2002 should be implemented.	Complied.  Consent to Operate (CC&A) was granted by GPCB based on the compliance of conditions of the No Objection Certificate (CtE). This CC&A is renewed from time to time based on its validity. The last renewal was obtained vide GPCB consent no. WH 86980 valid till 26 <sup>th</sup> April, 2022. Copy of the same was submitted as part of compliance report for the duration of Apr'17 to Sep'17 and there is no further change.
<b>B. General Condition</b>		
1	Construction of the proposed structures should be undertaken meticulously confirming to the existing Central / local rules and regulations. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned State Government Department / Agencies.	Complied. Not applicable at present.  Construction activities are completed & project is in operation stage. Entire SPM pipeline is buried underground. Total pipeline length is 15.4 km including 8.6 km inside the open sea and 6.8 Km on landward side.  Construction activities are carried out based on the approvals of the concerned state government department and prevailing laws.
2	The project authorities should take appropriate community development and welfare measures for the villagers in the vicinity of the project	Complied. APSEZ is actively working with local community around the project area and provides required support for their livelihood and other concerns through the CSR arm – Adani Foundation. Brief information about activities in the main four persuasions is mentioned below. Please refer <b>Annexure</b>

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
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	site, including drinking water facilities. A separate fund should be allocated for this purpose.	<p>– 7 for full details of CSR activities carried out by Adani Foundation in the Mundra region.</p> <table><tr><th>Area</th><th>Activity</th></tr><tr><td>Community Health</td><td><p><b>Community Health – Mundra</b></p><ul style="list-style-type: none"><li>• 11 Rural Clinic-8 from Mundra &amp; 3 from Anjar block treated; <b>25142</b> patients.</li><li>• <b>31 villages</b> covered through Mobile healthcare unit <b>20399</b> patients benefited during the year.</li><li>• The mobile health care unit cover <b>25 villages</b> and <b>07 fishermen settlements</b>. Around <b>90 types of general life saving medicines</b> are available in these units.</li><li>• During the year 2019-20, total <b>9860 transactions</b> were done by <b>8672</b> card holders of <b>68 villages</b> of Mundra Taluka. They received cash less medical services under the senior citizen project.</li><li>• In the year of 2019-20, Total <b>3137 people</b> had been benefitted by various kind of camp and needy and screened patients are treated in Adani Hospital.</li></ul><p><b>Community Health – Bhuj</b></p><ul style="list-style-type: none"><li>• <b>5398</b> Patients taken Care and Coordination</li><li>• <b>609</b> Dead body referred by carry van</li><li>• <b>3557</b> Ayushman Gold Card facilitation through Enrollment camp and Mahiti Setu</li><li>• <b>549</b> support for Implants and Needy Patients</li><li>• <b>9896</b> People helped through Mahiti Setu for various government schemes</li><li>• <b>816</b> people benefitted in 6 health awareness camps</li><li>• Adani Foundation organized <b>52 General Health Camps and Speciality Camps</b> in various interior villages of Kutch in coordination with GKGH which created magical impact and benefitted <b>4779 patients</b>. Adani Foundation Bhuj Health team has also organized more than six awareness camps.</li><li>• Adani foundation, Adani Hospital and GAIMS have Jointly Celebrated "<b>Arogya Saptah</b>" 8<sup>th</sup> to 14<sup>th</sup> August &amp; 20<sup>th</sup> to 26<sup>th</sup> January in Respect of Independence and Republic of our country. Celebration included multi-specialty camps, Workshops, truckers health check-up, surgical camp on foundation day and adolescent fair at different part of district. 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This year total <b>78</b> students are being facilitated by Adani foundation.</li><li>• <b>Book Support</b> - <b>49 Fisherman Students</b> from Higher Secondary Standard (9 to 12) has been benefitted from various of Juna Bandar, Zarpara, Navinal, Bhadreshwar.</li><li>• <b>Cycle Support</b> - Fishermen who are at fishermen hamlets</li></ul></td></tr></table>	Area	Activity	Community Health	<p><b>Community Health – Mundra</b></p> <ul style="list-style-type: none"><li>• 11 Rural Clinic-8 from Mundra &amp; 3 from Anjar block treated; <b>25142</b> patients.</li><li>• <b>31 villages</b> covered through Mobile healthcare unit <b>20399</b> patients benefited during the year.</li><li>• The mobile health care unit cover <b>25 villages</b> and <b>07 fishermen settlements</b>. 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			<p>are migrated with whole family for 8 month fishing season. During that time to continue higher education of their children at Mundra, Adani foundation provide cycle support every year to 9th standard students This year cycle support has been given to 7 students</p> <ul style="list-style-type: none"> <li>• <b>28</b> fishermen has been facilitated by fishing materials under Machhimar Ajivika Uparjan Yojana</li> <li>• The Foundation provided fishermen with employment equivalent to <b>6261 man-days</b>. In addition to this, employment worth of <b>42048 man-days</b> has been provided till date. The Foundation has also supported Pagadiya fishermen as painting laborers by providing them with employment and job in various field.</li> </ul>
		Education	<ul style="list-style-type: none"> <li>• Under <b>Project UTTHAN 25 primary government schools</b> of Mundra and Nakhtrana Taluka of Kutch district have been adopted to take up various initiatives aimed at improving quality in these schools. <b>3417</b> children are benefiting from a meaningful education in these schools.</li> <li>• One teacher–One school + Sports teacher + IT teacher</li> <li>• 'IT on Wheel 'Van with <b>35 laptops and computer</b> instructor make students more tech savvy and spreading the digital and technology knowledge amongst the younger generation.</li> <li>• Use of Reading Corner by students of Std. 3 to 8 of Utthan School Every Saturday Library activity with the Book issue were planned and executed in a meaningful manner. 7113 Book issued in academic year 2019-20.</li> <li>• With the intervene of our Sports teacher in all Utthan Schools successfully enrolled <b>500+ students</b> in Khel Mahakumbh.</li> <li>• Utthan Sahayak +<b>1222 students</b> from High school &amp; Higher secondary of 6 villages celebrate Fifth International Yoga Day.</li> <li>• Adani Vidya Mandir: provide “cost-free” education to meritorious students coming from challenging economic background, who have priceless treasures but have been under achievers due to situation. In year 2019-20 <b>443 students</b> are studying.</li> <li>• <b>568 institutes</b> and <b>33,030 beneficiaries</b> have made inspirational visit up to March 2020 under <b>Project UDAAN</b>.</li> </ul>
		Rural Infrastructure	<p><b><u>WORK COMPLETED</u></b></p> <ul style="list-style-type: none"> <li>• Adani foundation carries out the construction of prayer shade name “PRATHNA SHADHNA” at AVMB.</li> <li>• Painting &amp; Branding Old Strcture at Old Bandar and Luni Bandar</li> <li>• Upgradation of Balwadi at Zarpa</li> <li>• Waiting place for Pgadiya at Navinal</li> <li>• Garden Development work</li> <li>• Road Side Beautification at Mundra.</li> <li>• S &amp; F Benches In Various Location in Various Village</li> <li>• Construction of R.O. Plant Room at Primary School sadau Village</li> <li>• Construction of Shed at BRC Bhavan</li> <li>• Renovation Balwadi at Bavdi Banadar</li> <li>• Fixing of LED street light at Bhopawandh, Mundra &amp; Bhorara)</li> </ul>

**Status of the conditions stipulated in Environment Clearance**

Sr. No.	Conditions	Compliance Status as on 31-03-2020	
			<p><b><u>SUJLAM SUFLAM JAL ABHIYAN</u></b></p> <ul style="list-style-type: none"> <li>• A large number of water harvesting structure (<b>18 Nos. of check dams</b> in coordination with salinity department) and</li> <li>• Ground recharge activities (pond deepening work for <b>more than 52 ponds</b>) individually and <b>26 ponds</b> under <b>Sujlam Suflam Jal Abhiyan</b> were built leading to a significant increase in water table and higher returns to the farmers.</li> <li>• Roof Top Rain Water Harvesting <b>54 Nos.</b> and Recharge Bore well <b>75 Nos.</b></li> <li>• Drip Irrigation <b>823 Farmers</b> benefitted in coordination with Gujrat Green Revolution Company</li> <li>• Participatory Ground Water Management in ten villages with holistic approach for Kankavati Sandstone Aquifer Programme.</li> </ul> <p>Skill Development</p> <ul style="list-style-type: none"> <li>• Adani Skill Development Centre (ASDC) is playing a pivotal role in implementing sustainable development in the state. The objective of this Centre is to impart different kinds of training to the students of 10<sup>th</sup>, 12<sup>th</sup>, college or ITI from surrounding areas.</li> <li>• During this year Total <b>2664 people</b> trained in various trainings to enhance socio economic development.</li> <li><b>In the year 2019-20, ASDC-Bhuj trained 1699 candidates.</b></li> <li>• Soft skill training – 756 Nos.</li> <li>• Technical Training – 943 Nos.</li> <li><b>In the year 2019-20, ASDC-Mundra trained 965 candidates.</b></li> <li>• Soft skill training – 552 Nos.</li> <li>• Technical Training – 413 Nos.</li> </ul>
3	To meet any emergency situation, appropriate fire – fighting system should be installed. Appropriate arrangements for uninterrupted power supply to the environment protection equipment and continuous water supply for the firefighting system should be made.	<p>Complied.</p> <p>Tug (Dolphin-11) has firefighting system of 1200 m3/hr. along with 20 ton lifting “A” frame and diving support facility for support at offshore.</p> <p>With respect to onshore facilities valve station, pumping station and transportation pipeline, foam base fire tender is available.</p> <p>With respect to onshore facilities valve station , pumping station and transportation pipeline, foam base fire tender, fire water network is available Fire-fighting system has been installed and maintained to meet emergency situations. Additionally for emergency, DG Set is provided for fire water pumps to ensure continuous water supply for firefighting purpose. Detail information on firefighting facility available at APSEZL was submitted as part of the compliance report for the period from Oct'16 to March'17 and there is no</p>	



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		farther change.
4	A separate Environment Management Cell with suitably qualified staff to carry out various environment related functions should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the Company.	<p>Complied.</p> <p>APSEZL has a well structured Environment Management Cell, staffed with qualified manpower for implementation of the Environment Management Plan at site. Site team report to General Manager (Environment) at Corporate, who heads the Environment Management Cell who directly reports to the top management.</p> <p>Environment Management Cell Organogram is attached as <b>Annexure – 8</b>.</p>
5	The funds earmarked for environment protection measures should be maintained in a separate account and there should be no diversion of these funds for any other purpose. A year wise expenditure on environmental safeguards should be reported to this Ministry's Regional Office at Bhopal.	<p>Complied.</p> <p>Separate budget for the Environment Protection measures is earmarked every year. All environmental and horticulture activities are considered at group level and budget allocation is also done accordingly. No separate bank account is maintained for the same however, all the expenses are recorded in advanced accounting system of the organization.</p> <p>Budget for environmental management measures (including horticulture) for the FY 2019-20 is to the tune of INR 1146 lakh. Out of which, Approx. INR 1084 lakh are spent during this year. Detailed breakup of the expenditures for the past 3 years is attached as <b>Annexure – 9</b>.</p>
6	Full support should be extended to the officers of this Ministry's Regional Office at Bhopal and the officers of the Central and State Pollution Control Board by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures	<p>Complied</p> <p>APSEZL is always extending full support to the regulatory authorities during their visit to the project site.</p> <p>Last visit of Regional Office, GPCB was done on 20.07.2017 for Main port. APSEZL has submitted the reply to the site visit report vide letter dated 04.08.2017 incorporating details of action taken in respect of the observations of the GPCB representative. Details were submitted during half yearly EC Compliance report for the period Apr'17 to Sep'17.</p> <p>There was no visit carried out by any SPCB during the compliance period of Oct'19 to Mar'20 with respect to SPM project.</p>

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	and other environmental protection activities.	Inline to the compliance certification process of Environment Clearance condition of Waterfront Development Plan, RO, MoEF&CC Bhopal had visited the site on 27 <sup>th</sup> & 28 <sup>th</sup> January, 2020 for compliance verification. APSEZ provided all requisite information and documents required by the Regional Officer MoEF&CC). During the said compliance verification visit, there was no major non-compliance observed.
7	In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance conditions or imposition of new one for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures.	Point noted. There is no change in the approved project proposal.
8	This Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	Point noted.
9	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which should be complied with.	Point noted.
10	A copy of the clearance letter should be marked to the concerned	Not applicable at present

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	Panchayat / local NGO, if any, from whom any suggestion / representation has been received while processing the proposal.	
11	State Pollution Control Board / Committee should display a copy of the clearance letter at the District Industries Center and Collector's Office/ Tehsildar's Office for 30 days from the date of receipt of this letter.	Not Applicable This condition does not belong to project proponent.
12	The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letter are available with the Gujarat Pollution Control Board and may also be seen at the website of the Ministry of Environment & Forests at <a href="http://www.envfor.nic.in/">http://www.envfor.nic.in/</a>	Already Complied.
13	The project proponents should inform regional Office Bhopal as well as the Ministry, the date of financial closure and final approval of the project by the concerned	Already Complied

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	authority and the date of start of work.	
14	The project proponent will obtain Forest clearance for any stretch of land if it passes through the forest land.	Not Applicable No forest land was involved in the project.
15	So as to maintain ecological features and avoid damage to the ecosystem, movement of vehicles in the Inter Tidal Zone shall be restricted to minimum.	Complied. All activities are carried out as per the permissions obtained from competent authorities. No unauthorized movement of vehicles is allowed in the intertidal zone.
16	Since the pipeline passes along mangrove areas and the mud flats of Mundra area, the project proponents will ensure adequate protection to mangroves.	Complied. Not applicable at present Construction activities are completed & project is in operation stage. Please refer to specific condition no 1 for detailed reply regarding mangrove plantation activity.
17	Budgetary break up for Environmental Management Plan for the project to be mentioned.	Complied.  Please refer to general condition no 5 for detailed reply regarding budgetary break up.



# **Compliance Report of CRZ Recommendations**

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

**Half yearly Compliance report of CRZ recommendation for “SPM,COT and connecting pipeline at Mundra Port, Dist. Kutch in Gujarat” issued by DoEF, GOG vide letter no. ENV-10-2002-124-P (Part 1) dated 8<sup>th</sup> October 2003.**

<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>
1	The provision of the CRZ notification of 1991 and its amendments issued from time to time shall be strictly complied with by the GAPL.	Complied. Construction activities are completed and the project is in operation phase. All stipulations with respect to the CRZ notification and its subsequent amendments are complied with.
2	This recommendation is only for those activities proposed to be commissioned before the end of the year 2008 as mentioned in the bar chart submitted by GAPL.	Point noted. Construction activities are completed and the project is in operation phase.
3	A separate clearance shall be obtained by the GAPL for construction of the SPM No. 3 and 4, corresponding pipelines and COTs after demonstrating the compliance of the conditions, ecological upliftment activities undertaken successfully and mitigative measures implemented while developing the SPM no.1 and corresponding COT. A regional EIA shall also be commissioned immediately by the GAPL and all future development should be based on the outcome of the said regional EIA only.	Point Noted. APSEZL has only developed SPM no. 1 so far. SPM no. 3 and 4 are not developed yet and required permissions for the same will be obtained by following procedures mentioned in respective notifications.
4	Before commissioning of the construction activities, the construction design and pipeline alignment shall be validated/ approved by National Institute Oceanography to ensure that there is no negative	Complied. Construction activities are completed and the project is in operation phase.  The EIA report was prepared by NIO and specific design considerations were taken into account for carrying out various studies for preparation of the same. Findings of the studies were considered before commissioning of the

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
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<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>
	impact on the coastal morphology, hydrodynamics and ecological systems including the corals, if any. The mitigative measures as may be suggested by the NIO for this purpose shall be implemented by the GAPL.	<p>construction activities.</p> <p>There are no corals present at the project site.</p>
5	A comprehensive EIA shall be prepared and submitted to this Department by the GAPL, before commissioning of the SPM. All the suggestions for environmental protection /management that may be given in the comprehensive EIA shall be implemented by the GAPL.	<p>Complied.</p> <p>EIA study has been completed and report is already submitted to MoEF&amp;CC and other concerned authorities. Based on the same, Environment and CRZ clearance was granted by MoEF&amp;CC.</p> <p>However, APSEZ had appointed a NABET accredited consultant M/s. Cholamandalam MS Risk Services Limited to prepare a cumulative impact assessment report for the entire Mundra region. The study has been concluded and the final report was submitted vide our letter dated 30.04.2018 to GCZMA and MoEF&amp;CC for their consideration. Details of the same were submitted along with half yearly EC Compliance report for the period Apr'18 to Sep'18. Presentation on the findings of the report was made to GCZMA committee on 4<sup>th</sup> October 2019 and after detailed discussion, authority has decided to constitute committee to discuss the details of the report further.</p> <p>However, APSEZ is already complying with the Environment Management Plan (applicable to APSEZ) suggested in Cumulative Impact Assessment report. The detailed compliance, applicable to APSEZ is attached as <b>Annexure – 10</b>.</p>
6	The ground water shall not be tapped in any case to meet with the water requirements during construction and/or operation phases.	<p>Complied.</p> <p>APSEZ does not draw any ground water for the water requirement. Present source of water for entire port and SEZ is desalination plant and/or Narmada water through Gujarat Water Infrastructure Limited.</p> <p>Location of SPM is unmanned (approximately 8.6 km inside the open sea from the shore) hence no operation or maintenance activities require use of water on regular</p>

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
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<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>
		basis.
7	The GAPL shall ensure that the free flow of water in the intertidal area is not hampered due to proposed construction activities for pipeline corridor as well as other activities including the COT. Further, it shall be ensured by the GAPL that the nearby mangroves are not at all affected due to proposed development activities specifically the COT.	<p>Complied.</p> <p>Construction activity is already completed and the project is in operation phase.</p> <p>Free flow of water in the intertidal area is not hampered due to any operational activities. There are no filling or reclamation activities done at any of the creeks or mangrove areas in the vicinity of the project. As per the bathymetry study carried out by NCSCM in 2017-18, it can be concluded that there are sufficient depths at the creek mouths and all creek mouths are open allowing flushing of water.</p> <p>Details regarding NCSCM final report on comprehensive and integrated plan for preservation and conservation of mangroves and associated creeks in and around were submitted along with last half yearly EC Compliance report for the period Apr'19 to Sep'19. The action plan for conservation of creeks and mangrove areas is prepared by NCSCM and the same was submitted to GCZMA and MoEF&amp;CC for their examination and recommendation. Presentation on the findings of the report was made to GCZMA committee on 4<sup>th</sup> October 2019 and same has been approved vide MOM published by GCZMA.</p> <p>Inline towards the compliance of the action plan "Monitoring of mangrove cover in Jan/Mar, 2020 using latest satellite images and validation with field observations", Work has already been assigned to NSCSM, for amount of INR. 23,56,000/- vide PO no 4800050718, dtd. 31<sup>st</sup> December 2019 and same is under progress.</p>
8	The GAPL shall take up massive mangroves plantation activities in addition 25 Ha. of area suitably identified in consultation with the office of the Principal Chief Conservator of Forests, GoG, as well as this Department. The GAPL shall bear the cost of the said land as well	<p>Complied.</p> <p>Construction activities are completed &amp; project is in operation stage. Please refer to specific condition no 1 of the compliance of EC and CRZ clearance for detailed reply regarding mangrove plantation activity.</p>


	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

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	as the cost of the plantation of mangroves & its sustenance for a reasonable period of time.	
9	In addition to the mangroves plantation, the GAPL shall also take up massive greenbelt development in and around the project site in consultation with the Forest Department.	Complied. Construction activities are completed & project is in operation stage. Please refer to specific condition no 2 of the compliance of EC and CRZ clearance for detailed reply regarding greenbelt development activity.
10	The GAPL shall provide financial contribution as many as decided by this department for any common study like carrying capacity for the Gulf of Kachchh as well as for any common facilities including Vessel Traffic Management System in the Gulf of Kachchh, for the purpose of the environment protection/management.	Complied.  Necessary financial support will be provided on hearing from MOEF&CC.  APSEZ is practicing well defined traffic control procedure.  A VTS service for Gulf of Kutch is provided by the VTS Gulf of Kutch, operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India.  Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77.  Arrival and departure information before arrival and departure respectively in Gulf of Kutch is provided to VTS information cell through agent or by directly sending mail to <a href="mailto:vtzmanagergulfofkutch@yahoo.com">vtzmanagergulfofkutch@yahoo.com</a> and <a href="mailto:vtsgok@yahoo.com">vtsgok@yahoo.com</a>
11	The GAPL shall provide financial support in implementation of National Green Corps scheme (being implemented in Gujarat by the GEER Foundation) in Kachchh district in consultation with Forests & Environment Department.	Complied Necessary support will be provided on hearing from GEER foundation to support NGC scheme.
12	The GAPL shall bear the cost of the external agency that may be appointed by	Point noted.  APSEZ will provide full support for supervision and

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	the Forests and Environment Department, GoG for supervision/monitoring of their activities during construction and/or operational phases.	monitoring of the project operations after due discussion with the concerned agency and Forests & Environment Department, GoG. No such agency was appointed during the compliance period.
13	The dredged material that may be generated, if any, shall be disposed of at location suitably identified in consultation with the institute of repute like NEERI/NIO after due consideration of various environmental aspects and ensuring no significant negative impacts due to the same.	Complied. Construction activities are completed & project is in operation stage. SPM is approximately 8.6 km inside the open sea from the shore where 30 m of draft is naturally available. Hence no dredging is required.
14	No waste including the construction debris, oily waste from construction equipment's, untreated sewage, etc. would be disposed of in to sea/ river/ creek or in the CRZ areas. The treated sewage meeting with the norms fixed by the Gujarat Pollution Control Board and the reject water from RO plant if any, shall be disposed of at a point in the deep sea as may be suggested by the institute of repute like the NEERI/NIO.	Complied.  Construction activities are completed and the project is in operation phase. There is no disposal of any waste including civil debris in CRZ area.  No Sewage or RO Reject water is being generated by SPM activity.
15	The Gujarat Maritime Board shall ensure that the Vessel Traffic Management System for safe navigation in the Gulf of Kachchh shall be established and commissioned before	Complied.  Kandla, GMB & DGLL are the agencies who financially support to VTMS. For SPM, APSEZ is mutual partner to support in case of Oil spill & vice versa. For further details regarding traffic management, please refer condition no. 10 of CRZ recommendations above.



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	commissioning of the SPM No. 1 by the GAPL. The GAPL shall follow up for this with various stakeholders and provide financial and technical inputs for the same.	
16	A mutual aid system for the Mundra Port region shall be developed to meet with any unforeseen circumstances or to meet with any accidental condition. The GAPL shall take a lead for this by involving other stakeholders including HPCL.	<p>Complied.</p> <p>APSEZ has signed an MoU with HPCL, Mittal Pipeline Ltd., Mundra in the region of Gulf of Kutch to assist each other within stipulated time frame with best combination of resources.</p> <p><b>Interface with ROSDCP and NOSDCP</b> For responding to oil spill, the Indian Coast Guard has developed the National Oil Spill Disaster Contingency Plan NOSDCP which has the approval of the Committee of Secretaries and has been in operation since 1996. The NOSDCP brings together the combined resources of the various organizations and departments, Coast Guard, Ports and Oil handling Agencies, and related industries, to provide a level of preparedness to the threat posed to the marine environment by oil spills.</p>
17	A detailed Risk Assessment and Disaster Management Plan shall be worked out before commissioning of the SPM by the GAPL and the mitigative measures shall be identified and implemented. The local Oil Spill Contingency Plan in lines with the National Oil Spill Disaster Contingency Plan for the Mundra Port shall be put in to operation immediately.	<p>Complied.</p> <p>Detailed Risk Assessment and Disaster Management Plan were prepaid By Tata AIG risk assessment services and few mitigation measures are addressed in compliance of specific condition no 10 of EC &amp; CRZ clearance above. These studies were carried out before the start of the development activity and were considered by MoEF&amp;CC before grant of the EC and CRZ clearance.</p> <p>For responding to oil spill, the Indian Coast Guard has developed the National Oil Spill Disaster Contingency Plan NOSDCP which has the approval of the Committee of Secretaries and has been in operation since 1996. Oil Spill Contingency Response Plan (OSCRP) is prepared in accordance with the NOSDCP.</p> <p>OSCRP is updated regularly. The updated OSCRCP is attached as <b>Annexure – 2</b>.</p>
18	Proper rehabilitation scheme shall be worked out	Not applicable

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
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	for local fisherman communities in consultation with the District Collector/the Commissioner of Fisheries, Government of Gujarat, before commissioning of the SPM and report shall be furnished to the Forests and Environment Department.	<p>Location of SPM is unmanned (approximately 8.64 km inside the open sea from the shore) hence, there is no displacement of people, houses or fishing activity as a result of the project. However, APSEZ performs large scale socio-economic upliftment program and shares the details with FOKIA (Federation of Kutch Industries Association) chaired by District Collector quarterly.</p> <p>For further information related to CSR activities carried out by Adani Foundation in the Mundra region, please refer to compliance of General condition no. 2 of the EC and CRZ clearance above.</p>
19	The construction labour shall be provided with adequate amenities/facilities including the water supply, sanitation and fuel to ensure that the existing environmental condition is not deteriorated by them. The camps for the construction labour shall be kept outside the CRZ area. The GAPL shall ensure that there is no confrontation amongst the local villagers and construction labour.	<p>Complied.</p> <p>Construction activity is already completed, project is in operation phase.</p> <p>No construction camps were located in CRZ area. Most workers came from nearby villages however, for others; construction camps were located outside CRZ area.</p> <p>All necessary infrastructure and facilities like mobile toilets, safe drinking water, medical health care etc. were provided.</p>
20	All possible social and health impacts due to the proposed development at Mundra Port shall be assessed in detail in the comprehensive EIA and a detailed management plan shall be developed to mitigate the same.	<p>Complied.</p> <p>Aspects of social and health impact were studied as part of EIA report prepared by NIO and mitigation measures have been implemented.</p> <p>APSEZ performs large scale socio-economic upliftment program and shares the details with FOKIA (Federation of Kutch Industries Association) chaired by District Collector quarterly.</p>
21	The GAPL shall work out a detailed socio-economic upliftment programme in consultation with the District Collector and District Development Officer and shall implement	<p>For further information related to CSR activities carried out by Adani Foundation in the Mundra region, please refer to compliance of General condition no. 2 of the EC and CRZ clearance above.</p>

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
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Sr. No.	Conditions	Compliance Status as on 31-03-2020																																								
	the same. Separate budgetary provisions shall be kept for this purpose.																																									
22	An Environmental Management Cell with person having proper background shall be constituted. A separate budgetary provision shall have to be made for implementation of the Environmental Management Plan.	<p>Complied.</p> <p>APSEZL has a well structured Environment Cell, staffed with qualified manpower for implementation of the Environmental Management Plan. For further details on the same, please refer to compliance of general condition no. 4 of the EC and CRZ clearance above.</p> <p>Separate budget for the Environment Protection measures is earmarked every year. For further details on the same, please refer to compliance of general condition no. 5 of the EC and CRZ clearance above.</p>																																								
23	Post project environmental monitoring shall be carried out regularly through a reputed institute like NEERI/NIO and report shall be submitted to the Forests and Environment Department, GoG every year.	<p>Being complied.</p> <p>Monitoring of various environmental parameters for Ambient Air, Noise, marine water and sediments is being carried out by NABL accredited and MoEF&amp;CC approved agency namely M/s. Pollucon Laboratory Pvt. Ltd.</p> <p>Ambient Air Quality (twice in a week) and Noise (once in a month) monitoring are being carried out by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'19 to Mar'20 is mentioned below.</p> <p><b>Total Ambient Air &amp; Noise Sampling Locations: 4 Nos.</b></p> <table><tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit<sup>§</sup></th></tr><tr><td>PM<sub>10</sub></td><td>µg/m<sup>3</sup></td><td>96.23</td><td>50.53</td><td>100</td></tr><tr><td>PM<sub>2.5</sub></td><td>µg/m<sup>3</sup></td><td>54.39</td><td>18.68</td><td>60</td></tr><tr><td>SO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>28.47</td><td>6.41</td><td>80</td></tr><tr><td>NO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>45.56</td><td>14.52</td><td>80</td></tr><tr><th>Noise</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit</th></tr><tr><td>Day Time</td><td>dB(A)</td><td>74.2</td><td>58.3</td><td>75</td></tr><tr><td>Night Time</td><td>dB(A)</td><td>69.8</td><td>50.2</td><td>70</td></tr></table> <p><sup>§</sup> as per NAAQ standards, 2009 Values recorded confirms to the stipulated standards</p> <p>Marine water monitoring is carried out on monthly frequency In order to analyzed marine water quality,</p>	Parameter	Unit	Max	Min	Perm. Limit <sup>§</sup>	PM <sub>10</sub>	µg/m <sup>3</sup>	96.23	50.53	100	PM <sub>2.5</sub>	µg/m <sup>3</sup>	54.39	18.68	60	SO <sub>2</sub>	µg/m <sup>3</sup>	28.47	6.41	80	NO <sub>2</sub>	µg/m <sup>3</sup>	45.56	14.52	80	Noise	Unit	Max	Min	Perm. Limit	Day Time	dB(A)	74.2	58.3	75	Night Time	dB(A)	69.8	50.2	70
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	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
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		marine sampling is being carried out at a location nearby SPM. Please refer specific condition No. 8 of EC & CRZ clearance above.  Environmental monitoring reports for the period from Oct'19 to Mar'20 are enclosed as <b>Annexure – 3</b> .																					
24	No construction activities shall be carried out by the GAPL in any of the Forest areas.	Already Complied. Not applicable at present.  The construction work is completed and project is in operation phase. No construction activity at any of the forest area is carried out for project of SPM, COT and connecting pipeline.																					
25	All necessary clearances from different Government Department/Agencies shall be obtained before commissioning any construction activities.	Complied. All necessary clearances as per prevailing laws have been already obtained. Construction activity is already completed, project is in operation phase.																					
26	A half yearly compliance report with respect to above mentioned conditions as well as the implementation of the suggestions/ recommendations of the EIA and Risk Assessment reports shall be furnished to the Forest and Environment Department, GoG, without fail at regular interval.	Complied.  Compliance report of EC conditions is uploaded regularly. Last compliance report including results of monitoring data for the period of Apr'19 to Sep'19 was submitted to Regional Office of MoEF&CC @ Bhopal, Zonal Office of CPCB @ Baroda, GPCB @ Gandhinagar & Gandhidham and Dept. of Forests & Env., Gandhinagar vide our letter dated 26.11.2019. Copy of the same is also available on our web site <a href="https://www.adaniports.com/ports-downloads">https://www.adaniports.com/ports-downloads</a> . A soft copy of the same was also submitted through e-mail on 26.11.2019 to all the concern authorities. Please refer below for the details regarding past six compliance submissions. <table border="1"> <thead> <tr> <th>Sr. no.</th><th>Compliance period</th><th>Date of submission</th></tr> </thead> <tbody> <tr> <td>1</td><td>Oct'16 to Mar'17</td><td>30.05.2017</td></tr> <tr> <td>2</td><td>Apr'17 to Sep'17</td><td>01.12.2017</td></tr> <tr> <td>3</td><td>Oct'17 to Mar'18</td><td>29.05.2018</td></tr> <tr> <td>4</td><td>Apr'18 to Sep'18</td><td>30.11.2018</td></tr> <tr> <td>5</td><td>Oct'18 to Mar'19</td><td>31.05.2019</td></tr> <tr> <td>6</td><td>Apr'19 to Sep'19</td><td>28.11.2019</td></tr> </tbody> </table> All the recommendations given in the report of Tata AIG Risk Management Services are implemented. For further information related to the same, please refer to compliance of specific condition no. 10 of the EC and CRZ clearance above.	Sr. no.	Compliance period	Date of submission	1	Oct'16 to Mar'17	30.05.2017	2	Apr'17 to Sep'17	01.12.2017	3	Oct'17 to Mar'18	29.05.2018	4	Apr'18 to Sep'18	30.11.2018	5	Oct'18 to Mar'19	31.05.2019	6	Apr'19 to Sep'19	28.11.2019
Sr. no.	Compliance period	Date of submission																					
1	Oct'16 to Mar'17	30.05.2017																					
2	Apr'17 to Sep'17	01.12.2017																					
3	Oct'17 to Mar'18	29.05.2018																					
4	Apr'18 to Sep'18	30.11.2018																					
5	Oct'18 to Mar'19	31.05.2019																					
6	Apr'19 to Sep'19	28.11.2019																					

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'19 To : Mar'20</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

<b>Sr. No.</b>	<b>Conditions</b>	<b>Compliance Status as on 31-03-2020</b>
27	The GAPL shall also have to comply with any other condition as may be stipulated by the Forests and Environment Department, GoG, from time to time.	Point noted.

# **Annexure – 1**



## Details of Greenbelt Development at APSEZ, Mundra

LOCATION	Total Green Zone Detail Till Up to March - 20 20				
	Area (In Ha.)	Trees (Nos.)	Palm (Nos.)	Shrubs (SQM)	Lawn (SQM)
SV COLONY	66.40	29592	7072	67187.00	92019.00
PORT & NON SEZ	81.38	146692	19220	75061.78	61982.38
SEZ	116.60	227120	20489	220583.60	28162.03
MITAP	2.48	8168	33	3340.00	4036.00
WEST PORT	94.35	206772	63331	24112.00	22854.15
AGRI PARK	8.94	17244	1332	5400.00	2121.44
SOUTH PORT	14.45	27530	3470	3882.00	3327.26
Samudra Township	56.03	53922	11834	20908.89	47520.07
Productive Farming (Vadala Farm)	23.79	27976	--	--	--
<b>TOTAL (APSEZL)</b>	<b>464.40</b>	<b>745016</b>	<b>126781.00</b>	<b>420475.27</b>	<b>262022.33</b>
	<b>Total Saplings</b>	<b>871797</b>			

## **Details of Mangrove Afforestation done by APSEZ**

Sl. no.	Location	Area (ha)	Duration	Species	Implementation agency
1	Mundra Port	24.0	-	Avicennia marina	Dr. Maity, Mangrove consultant of India
2	Mundra Port	25.0	-	Avicennia marina	Dr. Maity, Mangrove consultant of India
3	Luni/Hamirmora (Mundra, Kutch)	160.8	2007 - 2015	Avicennia marina, Rhizophora mucronata, Ceriops tagal	GUIDE, Bhuj
4	Kukadsar (Mundra, Kutch)	66.5	2012 - 2014	Avicennia marina	GUIDE, Bhuj
5	Forest Area (Mundra)	298.0	2011 - 2013	Avicennia marina	-
6	Jangi Village (Bhachau, Kutch)	50.0	2012 - 2014	Avicennia marina	GUIDE, Bhuj
7	Jakhau Village (Abdasa, Kutch)	310.6	2007-08 & 2011-13	Avicennia marina, Rhizophora mucronata, Ceriops tagal	GUIDE, Bhuj
8	Sat Saida Bet (Kutch)	255.0	2014-15 & 2016-17	Avicennia marina & Bio diversity	GUIDE, Bhuj
9	Dandi Village (Navsari)	800.0	2006 - 2011	Avicennia marina, Rhizophora mucronata, Ceriops tagal	SAVE, Ahmedabad
10	Talaza Village (Bhavnagar)	50.0	2011-12	Avicennia marina	SAVE, Ahmedabad
11	Narmada Village (Bhavnagar)	250.0	2014 - 2015	Avicennia marina	SAVE, Ahmedabad
12	Malpur Village (Bharuch)	200.0	2012-14	Avicennia marina	SAVE, Ahmedabad
13	Kantiyajal Village (Bharuch)	50.0	2014-15	Avicennia marina	SAVE, Ahmedabad
14	Devla Village (Bharuch)	150.0	210-16	Avicennia marina	SAVE, Ahmedabad
15	Village Tala Talav (Khambhat, Anand)	100.0	2015 - 2016	Avicennia marina	SAVE, Ahmedabad
16	Village Tala Talav (Khambhat, Anand)	38.0	2015 - 2016	Avicennia marina	GEC, Gandhinagar
17	Aliya Bet, Village Katpor (Hansot, Bharuch)	62.0	2017-18	Avicennia marina & Rhizophora spp.	GEC, Gandhinagar
<b>Total Mangrove Plantation:</b>		<b>2889.90 Ha</b>			

# **Annexure – 2**



# **OIL SPILL CONTINGENCY RESPONSE PLAN TIER 1**

(To be used in conjunction with OSRA Vol-1 and Vol-2)

**ADANI PORTS AND SPECIAL  
ECONOMIC ZONE LIMITED**

**POST BAG NO. 1**

**NAVINAL ISLAND**

**MUNDRA 370 421**

**PH. : (02838) 289221 / 289371**

**FAX : (02838) 289170 / 289270**

Reviewed By : Capt. Pankaj Sinha	Issue No. : 01	Issued On : 01.10.2019
Approved By : Capt. Anubhav Jain	Revision No. : 04	Page 1 of 98

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

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This document is distributed as per Oil Spill Contingency Response plan. In addition, documents on a "need based" basis will be distributed.

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Reviewed By : Capt Pankaj Sinha	Issue No. : 01	Issued On : 01.10.2019
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# OIL SPILL CONTINGENCY RESPONSE PLAN

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

## Section 03: Strategy

### 1 Introduction

- 1.1 Authorities and responsibilities
- 1.2 Coordinating committee
- 1.3 Statutory requirements
- 1.4 Mutual aid agreements
- 1.5 Geographical limits of plan
- 1.6 Interfaces with ROSDCP and NOSDCP

### 2 Risk assessment

- 2.1 Identification of activities and risks
- 2.2 Types of oil likely to be spilled
- 2.3 Probable fate of spilled oil
- 2.4 Development of oil spill scenarios including worst case discharge
- 2.5 Shoreline sensitivity mapping
- 2.6 Shoreline resources, priorities for protection
- 2.7 Special local considerations

### 3 Response strategy

- 3.1 Philosophy and objectives
- 3.2 Limiting and adverse conditions
- 3.3 Oil spill response in offshore zones
- 3.4 Oil spill response in coastal zones
- 3.5 Shoreline oil spill response
- 3.6 Storage and disposal of oil and oily waste

### 4 Equipment

- 4.1 Marine oil spill response equipment
- 4.2 Inspection, maintenance and testing
- 4.3 Shoreline equipment, supplies and services

### 5 Management

- 5.1 Crisis manager and financial authorities
- 5.2 Incident organization chart
- 5.3 Manpower availability (on-site, on call)
- 5.4 Availability of additional manpower
- 5.5 Advisors and experts – spill response, wildlife and marine environment
- 5.6 Training / safety schedules and drill / exercise programme

### 6 Communications

- 6.1 Incident control room and facilities
- 6.2 Field communications equipment
- 6.3 Reports, manuals, maps, charts and incident logs

Reviewed By : Capt Pankaj Sinha	Issue No. : 01	Issued On : 01.10.2019
Approved By : Capt. Anubhav Jain	Revision No. : 04	Page 5 of 98

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

## Action and operations

### 7 Initial procedures

- 7.1 Notification of oil spill to concerned authorities,
- 7.2 Preliminary estimate of response tier
- 7.3 Notifying key team members and authorities
- 7.4 Manning Control Room
- 7.5 Collecting information (oil type, sea / wind forecasts, aerial surveillance, beach reports)
- 7.6 Estimating fate of slick (24, 48, 72 hours)
- 7.7 Identifying resources immediately at risk, informing parties

### 8 Operations planning

- 8.1 Assembling full response team
- 8.2 Identifying immediate response priorities
- 8.3 Mobilizing immediate response
- 8.4 Media briefing
- 8.5 Planning medium-term operations (24, 48 and 72 hour)
- 8.6 Deciding to escalate response to higher tier
- 8.7 Mobilizing or placing on standby resources required
- 8.8 Establishing field command post communications

### 9 Control of operations

- 9.1 Establishing a Management team with experts and advisors
- 9.2 Updating information (sea, wind, weather forecasts, aerial surveillance, beach reports)
- 9.3 Reviewing and planning operations
- 9.4 Obtaining additional equipment, supplies, manpower
- 9.5 Preparing daily incident log and management reports
- 9.6 Preparing operations accounting and financial reports
- 9.7 Preparing releases for public and press conferences
- 9.8 Briefing local and government officials

### 10 Termination of operations

- 10.1 Deciding final and optimal levels of beach clean-up
- 10.2 Standing down equipment, cleaning, maintaining, replacing
- 10.3 Preparing formal detailed report
- 10.4 Reviewing plans and procedures from lessons learnt

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## Data Directory

### Maps / Charts

1. Coastal facilities, access roads, telephones, hotels etc.
2. Coastal charts, currents, tidal information (ranges and streams), prevailing winds
3. Risk locations and probable fate of oil
4. Shoreline resources for priority protection
5. Shoreline types
6. Sea zones and response strategies
7. Coastal zones and response strategies
8. Shoreline zones and clean up strategies
9. Oil and waste storage / disposal sites
10. Sensitivity Maps/ Atlas

### Lists

1. **Primary Oil spill Equipment:** booms, skimmers, spray equipment, dispersant, absorbents, oil storage, Radio communications etc. (Manufacturer, type, size, location, transport, contact, delivery time, cost and conditions)
2. **Auxiliary Equipment:** Tugs and work boats, aircraft, vacuum trucks, tanks and barges, loaders and graders, plastic bags, tools, protective clothing, communication equipment etc. (Manufacturer, type, size, location, transport, contact, delivery time, cost and conditions)
3. **Support Equipment:** Aircraft, communications, catering, housing, transport, field sanitation and shelter etc. (Availability, contact, cost and conditions)
4. **Sources of Manpower:** Contractors, local authorities, caterers, security firms (Availability, numbers, skills, contact, cost and conditions)
5. **Experts and Advisors:** Environment, safety, auditing (Availability, contact, cost and conditions)
6. **Local and National Government contacts:** Name, rank and responsibility, address, telephone, fax, telex.

### Data

1. Specifications of oils commonly traded
2. Wind and weather
3. Information sources

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**Annexures**

Annexure 1	Initial Oil Spill Report
Annexure 2	POLREP Report
Annexure 3	List of resources available
Annexure 4	List of Telephone numbers of Expert and advisors
Annexure 5	Responsibilities: Marine Officer / SPM Officer
Annexure 6	Responsibilities: Marine Manager / On Scene Commander
Annexure 7	Responsibilities: SPM Pilot
Annexure 8	Responsibilities: HOD – Marine
Annexure 9	Oil Spill Progress report
Annexure 10	Emergency response Log
Annexure 11	Classification of oils
Annexure 12	Response Guidelines
Annexure 13	Site Specific Health and Safety Plan.
Annexure 14	Indian Chart 2079
Annexure 15	List of recycler approved by state of Gujarat
Annexure 16	List of agency for support & guidance for rescue & rehabilitation of oiled bird & mangroves management during oil spill

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## **Strategy**

### **1. Introduction**

The movement of Petroleum/ Petroleum-products from the production centre in middle east to Adani Ports and SEZ Ltd and various other ports in Gulf of Kutch is handled through ships at sea and to refineries using pipe lines on ground. Like any other port, Adani Port is very much vulnerable to oil spill disaster arising due to collision, leakage or grounding of vessels in sea and damage to pipelines on ground.

This action plan prepared by Adani Ports and SEZ Ltd, Mundra is to combat the oil spill (LOS-DCP) is in accordance with the NOS-DCP, International Petroleum Industry Environmental Conservation Association (IPIECA).

#### **1.1 Authorities and responsibilities**

##### **Adani Ports and SEZ Limited**

APSEZL has responsibility for dealing with oil spillages which occur within port limit if the estimated quantity of product lost is 700 tons or less.

Should the spill migrate to other areas, the Coast Guard Monitor will assume the position of On Scene Commander and will direct the response effort. In both cases, APSEZL will act and deploy their resources as required by the relevant On Scene Commander.

This operational version of Oil Spill Contingency Response Plan for the Adani Ports and SEZ Ltd, Mundra is intended for use by all such personnel like Marine Personnel, Tug Masters and all others as indicated in the Spill Response Organization who may be involved in the response to oil spills which may occur within Adani Port Limits.

This plan has been prepared as per the stipulation of Ministry of Environment and Forest Clearance (MoEF) and Coast Guard Requirements.

##### **Gujarat Maritime Board**

While responsibility for oil spill contingency remains with conservator of the port – Gujarat Maritime Board Port Officer, this plan (Tier 1) demonstrates the readiness of Adani Port for mitigating oil spill incidents.

Port Conservator will monitor and provide the necessary assistance required for administering the oil spill operation within the port limit.

##### **Indian Coast Guard**

The Indian Coast Guard has a statutory duty to protect the maritime and other national interests of India in the Maritime Zones of India and to prevent and control marine pollution. Coast Guard is also the Central Co-ordinating Authority for marine pollution control in the country. The Indian Coast Guard is responsible for implementation and enforcement of the relevant marine pollution laws.

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The National Oil Spill Disaster Contingency Plan stipulates the organizational and operational details to effectively combat a national oil spill contingency. The plan promotes the development of Regional and Local Contingency Plans in the three Coast Guard Regions.

The Coast Guard Monitor will assume the role of On Scene Commander in the event that any oil spill involving PLL operations exceeds 700 tons.

**Gujarat Pollution Control Board**

The Gujarat Pollution Control Board is responsible for, and control, waters up to 5 km from the shoreline. They require to be advised of all pollution incidents.

**Ministry of Environment, Gujarat**

The Ministry requires to be informed of all pollution incidents.

**Emergency Response Team**

Emergency Response Team (ERT) is the nomenclature used to describe the command and control team established for an oil spill incident at the jetty or in the jetty approaches, with representatives of organisations attending as described in section 2.4.

The ERT will convene at the Terminal Control Room, under the chairmanship of the Terminal Manager, and will consist of a Management Team and a Support Team as noted in section 2.3.

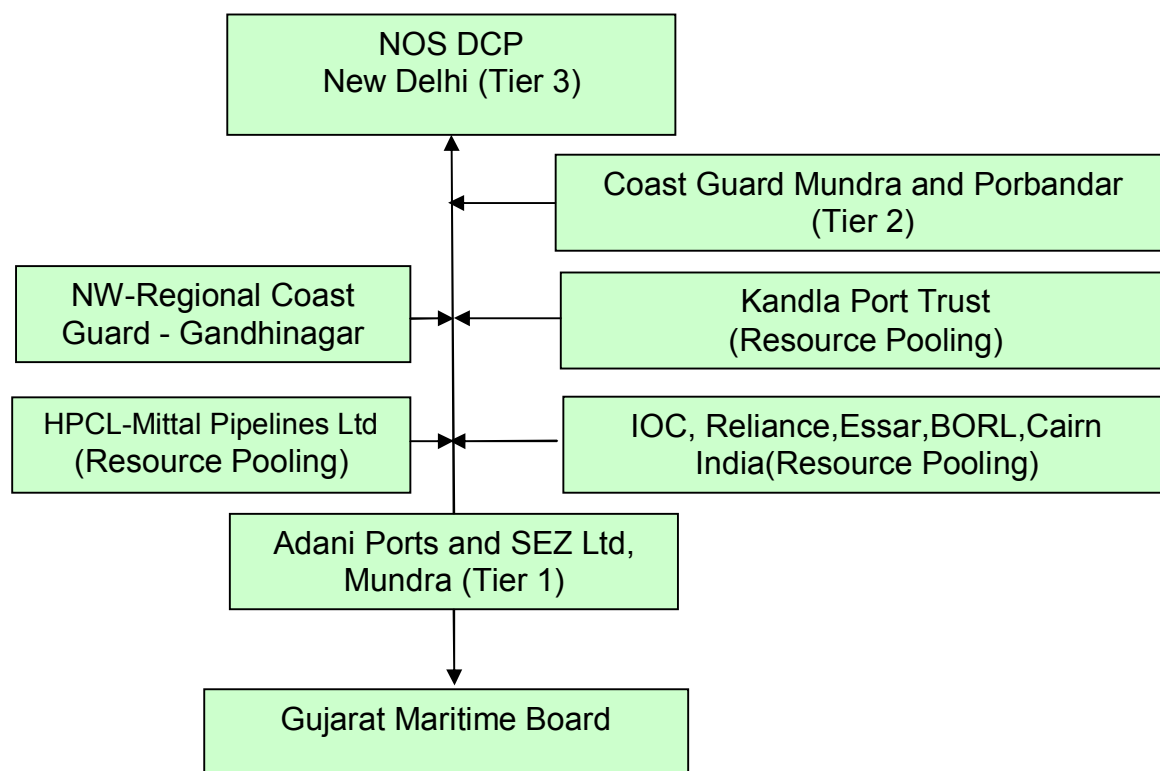
It is a strategic plan to quickly call on additional resources in a systematic manner firstly from Adani port and subsequently from other ports.

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**1.2 Coordinating Committee**



**1.3 Statutory requirements**

The Indian Government is a signatory to the International Convention on Oil Pollution Preparedness, Response and Co-operation which came into force in May 94. Under the NOSDCP, it is obligatory for a port to have a Local Oil Spill Contingency Plan to combat oil spills within port limits.

This oil spill contingency response plan (Tier 1) is the response plan in accordance with the facilities available at Adani Port only.

This plan is prepared in accordance with:

- a) Marine Environmental Impact Assessment of SPMs, COTs and connecting pipelines of APSEZL at Mundra dated February 2001, prepared by National Institute of Oceanography, Mumbai.
- b) Report on Risk assessment study and On-site disaster management Plan for SPMs, COTs and connecting Pipelines of Adani Ports and Special Economic Zone Limited, by TATA AIG Risk Management Services Limited, dated February 2001.
- c) HAZOP study report of SPM Terminal pipeline project by Intec Engineering, dated 26/02/2004.
- d) IPIECA guide to Contingency planning for oil spills on water.
- e) Oil spill risk assessment and contingency plan study done by M/s Environ Software Pvt. Ltd. (Copy enclosed)

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#### **1.4 Mutual aid agreements**

APSEZL signed MOU with HPCL Mittal Pipelines Limited, Mundra operating in the region of Gulf of Kutch to have mutual aid agreement for the purpose of assisting each other within stipulated time frame with best combination of resources to combat and overcome any large and worst spill with the intent of maximizing the availability of the private, public and government sector response resources during oil spills where assistance is requested by another member.

As per agreement, the member agencies of the affected member state or province may directly request cascable response resources located in oil handling agencies operating in the region of Gulf of Kutch.

#### **1.5 Geographical limits of plan**

Adani Ports and SEZ Ltd, Mundra is situated at the North head of Gulf of Kutch which is at the west coast of India. Ships calling Adani Port therefore have to traverse across the GOK. This oil spill contingency response plan (Tier 1) is applicable for the following:

- 1) Loading and Unloading of liquid cargo at the Multi-purpose terminal jetty at the Adani Port.
- 2) Unloading of the crude oil the vessels at the single point mooring (SPM) to offload 70,000 to 3,00,000 DWT.
- 3) Bunkering operations carried out within the port limits.
- 4) Any spill that occurs from any source within port limit (including West Basin, South Basin and LNG Terminal) whether at berths, anchorages or in the channel.

APSEZL falls within the area jurisdiction of The Commander, No.1 Coast Guard District (Gujarat), located at Porbandar. Mundra has a full-fledged Indian Coast Guard Station. The Port limit of APSEZL, Mundra is shown in enclosed chart in annexure 14.

#### **1.6 Interface with ROSDCP and NOSDCP**

For responding to oil spill, the Indian Coast Guard has developed the National Oil Spill Disaster Contingency Plan NOSDCP which has the approval of the Committee of Secretaries and has been in operation since 1996. The NOSDCP brings together the combined resources of the various organizations and departments, Coast Guard, Ports and Oil handling Agencies, and related industries, to provide a level of preparedness to the threat posed to the marine environment by oil spills.

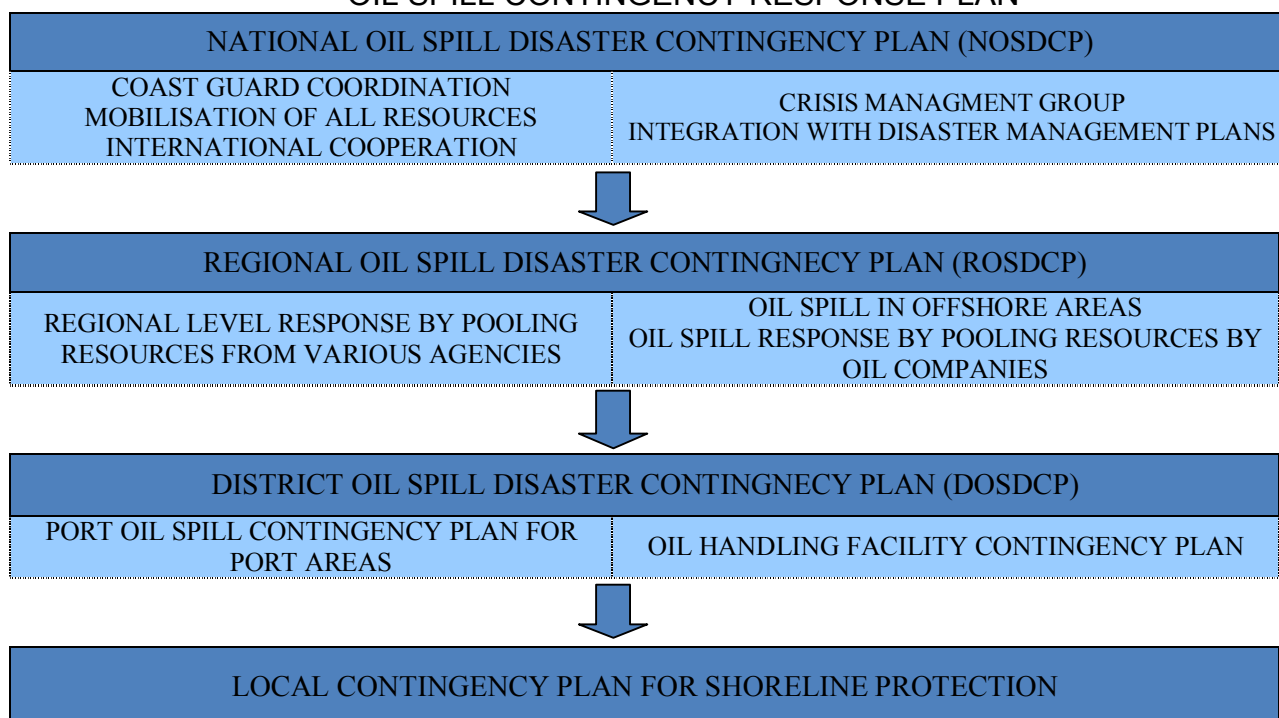
The NOSDCP sets out a clear definition of the responsibilities of the major participants, such as the Coast Guard, various ministries and departments, ports and oil industry.

The national oil spill contingency plan hierarchy outlined in Figure 1 consists of NOSDCP at the apex level to coordinate significant or disaster type spills, the Regional Oil Spill Disaster Contingency plan (ROSDCP) to coordinate spill in the Gulf of Kutch, utilizing the resources available within the region.

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**Figure 1 - Contingency Plan hierarchy**

The aim of Local Contingency Plan - for the Mundra Port, is to outline arrangements for responding to oil spills in the coastal and shoreline areas, with the aim of protecting against environmental pollution as a result of oil spill or, where this is not possible, minimise the effect and respond the oil spill in an environment friendly manner and dispose the collected oil/debris in according to the existing laws/regulations/orders in force. CONTINGENCY PLAN FOR SHORELINE PROTECTION

## **2 Risk Assessment**

The number of vessels calling annually at APSEZL is more than 3000 including Chemical, Gas and oil tankers. The threat of oil spill is much high in Gulf of Kutch and is very oil spill sensitive area. A marine national park is located in the Southern shore of GOK. There is a popular beach spot on the Northern shore namely Mandvi. Lastly, as GOK is a closed system, any oil spilled will arrive to the shores.

### **2.1 Identification of activities and risks**

The scenario of the spill are classified under two categories :

- Oil Spill at Mundra Port Multi-Purpose Terminals
- Oil Spill at SPM

The oil spill could occur due to various reasons at any of the APSEZL's marine facilities (SPMs, Basins/ berths, anchorage or approach channel) within the new Mundra Port limit. The spills beyond these areas are not covered in this plan. Both the categories are discussed in detail

Accidental oil spill at Multipurpose terminals/ Basins/ berths, anchorage or approach channel is possible from overflow of slop tanks, bunker tanks, reception facility and road tankers (generally a low pressure operation).

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Accidental oil spill at the SPM may be due to hose puncture while unloading, failure of swivel joint of SPM or Leakage of Crude Oil at PLEM or from the submarine pipeline.

Following risks are being addressed to mitigate incident of oil pollution:

- Connection of hoses with established work instructions for use of blank flanges, drip trays etc.
- Thorough understanding of use of OSD and limitations of vessel surging due to slack mooring ropes in given weather conditions.
- Monitoring of ships pump room atmosphere, display of fire notices and acknowledging accidental explosion through the use of IMO ship / shore check list.
- Spillage of F.O. during bunkering operations by using bunkering check list
- Ballast discharge contamination or malfunction of ship's sea side valves by prohibiting such operations without written permission of the port.
- Non use of reception facility of the port by ships on cost plus basis.

**Operational leakage**

**Spill due to floating hose failure at SPM: (183 t, at pumping rate of 10000 m<sup>3</sup>/h of crude oil for 75 sec): (Spill points - S1 at HMEL SPM & S2 at Mundra SPM)**

Crude oil pumping rate from the tanker to the shore tanks will be varying between 5000 m<sup>3</sup>/hr and 10000 m<sup>3</sup>/hr. In the present study, the maximum pumping rate of 10000m<sup>3</sup>/hr has been considered to assess the risk on a higher side. The Safety Break Away Coupling in the crude oil transfer hose will be activated within a few seconds in the event of hose rupture or hose failure. Again for the sake of assessing higher risk, a response time of 60 sec – 75 sec (worst case scenario) is considered to estimate the amount of oil that would spill at the SPM. Thus the quantity of crude oil spill has been estimated to be a maximum of 183 tons in the event of hose failure or rupture.

**Spill due to rupture of sub-sea crude oil pipeline from SPM to shore tanks: (384 tons of crude oil, at pumping rate of 10000 m<sup>3</sup>/hr for 60 sec): Spill point S3 taken at midpoint of the pipeline from HMEL SPM to LFP)**

Crude oil pumping rate from the tanker will be in the range of 5000 m<sup>3</sup>/hr to 10000 m<sup>3</sup>/hr. In the present study, to assess the maximum risk, pumping rate of 10000 m<sup>3</sup>/hr has been considered. The minimum wall thickness of sub-sea crude oil pipeline is 15.6 mm and the maximum thickness is 24 mm. Moreover all along, 5 inches concrete cladding (weight coating) is provided on the surface of the pipeline. Crude oil pipelines designed, constructed and laid as per the international norms are safe and leakages are extremely rare during their designed life. However, a rupture of size 1 cm x 12.7 cm has been assumed for assessing the quantum of oil spill through sub-sea pipeline.

The maximum manifold pressure will be 12 kg/cm<sup>2</sup> and crude oil will be pumped to the shore tanks without any boosting device in-between. As the level in the tanker depletes, discharge pressure would also be reduced. Moreover, with the flow distance the crude oil pressure inside the pipe drops. For the sake of assessing the amount of oil spill in case of rupture of sub-sea pipeline, an average pressure of 10 kg/cm<sup>2</sup> and a water column height of 35 m have been considered.

Accordingly the quantity of Crude oil spill has been estimated using the formula given by

$$Q = C_d A (2gH)^{1/2}$$

Where,

Q = quantity of spill (m<sup>3</sup>/s)

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$C_d$  = coefficient of discharge (0.9)

$A$  = Area of rupture ( $m^2$ ) (1 cm x 12.7 cm)

$H$  = Net head (m) ( $6.5 \text{ kg/cm}^2 = 65 \text{ m}$ )

This would give a value of  $0.04 \text{ m}^3$  of crude oil per sec spilling out of the pipeline through the rupture as the pump will be in operation.

The availability of solenoid operated hydraulic shutoff valves in the sub-sea pipeline, which will get activated in less than 15 seconds time as soon as the pressure falls, will limit the amount of oil leaked in case of pipe rupture and consequent drop inside the pipeline. However 60 sec response time has been considered for quantification of oil spill. Accordingly the quantity of Crude oil spill has been estimated to be  $2.4 \text{ m}^3$  before the pump discharge valve closes. However, there will be high pressure inside the pipeline initially and the oil inside the pipeline will start leaking into the waters through the hole as the pressure inside the pipe line is higher than the outside pressure, even after the valve is closed and pumping is stopped. Even after the pipeline inside pressure equalises the outside static pressure acting on the rupture, oil continues to start leaking as the density difference between the oil and water; oil being lighter and LFP is higher in elevation compared to the pipeline elevation. Two factors need to be considered here; the specific gravity of the crude oil inside the pipeline is less than 1 whereas the sea water specific gravity is more than 1. Also depending on the location of the hole/leak, there will always be a static head of sea water acting on the leak when the oil tries to flow out and sea water trying to flow in to occupy the place vacated by the leaked oil. Hence all the oil in the pipeline will not leak and there would be an equilibrium point reached when there would be no more oil leaking from the hole as the sea water pressures effectively blocks the oil leak. Also, the leak would be attended to within the stipulated time as per the standard maintenance procedures followed by the organisation. For the purpose of this study and as a worst case scenario before the leak is repaired by the established maintenance procedures, it is assumed that a maximum of 5% of the pipeline oil volume would leak and though it would be a continuous leak, this total quantity is taken to be instantaneous for the purpose of the study.

The pipeline length is approximately 10 km (from SPM to LFP) and the pipeline size is 42" NB. The pipeline volume works out to be approximately  $8662 \text{ m}^3$  or 7622 t.

Hence the total oil leaked due to rupture in sub-sea pipeline will be  $2.15 \text{ t} + 5\%$  of pipeline volume of oil in t ( $0.05 \times 7622 = 381 \text{ t}$ ) which works out to be a maximum of 383.45 t, say 384 t of crude oil.

For the purpose of simulation studies, this spill on the pipeline is assumed to have taken place at the midway point from HMEL SPM to LFP (designated as spill point **S3** in the report) and is taken on the sub-sea pipeline from HMEL SPM to LFP. As the pipeline from HMEL SPM to LFP and the Mundra SPM to LFP run very close only one leak point in the pipeline is studied as it gives a representative oil spill study for the pipeline leakage scenario.

**Spill due to collision at SPM: (Spill points S1 & S2)**

Crude Oil is received at SPM by ocean tankers having capacity between 90,000-360,000 metric tons. Crude Oil is pumped to shore tanks through pipeline/s from the SPM. In the present scenario, collision of the vessel at the SPM or tanker route with another vessel enroute to other terminals can cause partial damage to the vessels cargo tanks (not more than 3 nos. of cargo tanks) leading to a maximum oil spill of about 700 tons to 25,000 tons of crude oil. In the present study, the probable quantity of crude oil spill due collision at SPM is considered as 700 tons at the minimum and as 25,000 tons at the maximum.

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**Spill due to collision or grounding in the tanker route: (Spill point S4)**

Tankers are expected to call at the SPMs frequently depending upon the demand for the refineries for the crude oil. These tankers may meet accidents like collision with other vessels or grounding in the vicinity of the SPM. In case of such accidents, the spillage may vary depending on the size of the tanker and the extent of damage and number of cargo tanks ruptured etc. In the present study the probable quantity of spill in the tanker route considered for modelling is 25000 tons at a point which lies on the tanker route to SPM not exactly within Mundra port limit; but a spill point is taken along the tanker route in the Gulf but close to the Mundra port limit.

**Spills at the berths (applicable to berths at West Basin, South Basin, East Basin, North Basin, LNG berth and existing cargo berths of Mundra port.)**

Oil spills can take place at the berths in the basins during the loading / unloading as well as berthing and traversing operations. The likely spill scenarios are discussed below:

**a) Spills during the navigation of the vessel along the approach channel: (Spill point S7 for West Basin)**

The spill location can be anywhere in the path. One location along the approach path has been selected for carrying out for model runs.

**b) Spills around the jetty (in the maneuvering basin / turning circle): (Spill point S6 for West Basin and Spill point S10 for South Basin)**

This can occur due to tug boat impacting the vessel and grounding of the vessel. One location around the jetty at the turning circle has been considered for the computational runs

**c) Spills at the berths: (Spill point S5 for West Basin, Spill point S9 for South Basin, Spill point S13 for East Basin, Spill point S14 for North Basin, Spill point S8 for LNG jetty, Spill point S11 for MMPT 1 and Spill point S12 for MICT / AMCT berth locations)**

During the loading/unloading operations spills may take place due to one or more of the following: –

Hose/ loading arm leakage (liquid products handled at the liquid berth), overflow on the vessel deck, vessel grounding at the jetty, vessel colliding with jetty, fire and explosion on the vessel or at the jetty, during bunkering operations etc.

**Spills along approach Channel / Route**

Vessels to the port berths follow the Deep Water route in Gulf of Kutch and Pilot boards at Pilot Boarding Ground “A” or “B”, subject to tide and the berth allotted to the tanker.

While the risk of grounding is low, it cannot be wholly eliminated; the most likely causes are steering or propulsion system failure or navigational error, any of which could result in grounding on the channel margins. Given that the bed of the Gulf is rocky at some places the likelihood of any significant hull damage cannot be ruled out. In a general case scenario, weld fractures in the forward bunker tanks could give rise to a release of approximately 10 Tons of diesel oil and in a worst case scenario extensive damage to the bunker tanks may occur which would cause a spill of 500 to 700 t of FO spill.

**Collision**

The risk of collision while transiting the channel is negligible given the reason that port authorities use sophisticated ship tracking and navigational systems as the Gulf traffic has increased. These systems would ensure that the chances of any collision are remote or non-existent when ships / marine craft traverses / transits through the channel. However, even if any collision occurs, it is beyond reasonable

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doubt that such an incident would result in the fore part rather than the parallel mid-body of the vessel and the loss of integrity of hull plating of a cargo tank is most unlikely. A spill quantity of 700 t can be the maximum in such a scenario.

**Berthing Incident**

Oil and/ or liquid chemical spill can occur as a result of hull coming in contact with the corners of the jetty structure 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 on support tug in attendance or Master error or wrong judgment.

The potential spill quantities involved depend on the vessel type and the location and extent of the impact damage; hull damage to a 20000 DWT – 80000 DWT tanker / vessel in way of a forward or aft wing tank, for example, could give rise to a release of some 500 Tons of product. The potential spill quantity, should hull plating be ruptured in way of an aft wing diesel oil bunker tank can, historically, be up to 100 Tons.

**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 extent of the impact damage but can be over 20 tons for Diesel oil and 100 Tons for cargo (FO) oil. Spills from this cause are considered to be of low likelihood but the risk is acknowledged.

**Loading Arms / Flexible hoses**

The operation of loading arms / flexible hoses can lead to minor releases of oil. Common sources are vent valves, swivel joints and hydraulic lines. Such spillage seldom exceeds 0.1 Tons.

**Cargo Tank Overflow**

Cargo tank overflows can occur on board loading vessels; spills of this nature can be due to instrumentation failure, tank valve mismanagement or operator 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 and/or chemical will be retained on deck but, in a worst case scenario, up to 3 tons could escape overboard.

**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 tons; 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 tons must however be acknowledged.

**Fire and Explosion**

Fires and explosions on board ship represent a safety hazard with the risk of pollution as a secondary impact. Most tankers engaged for trading will be equipped with inert gas systems. Given the controls, which are imposed and enforced by APSEZL authorities 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, insofar as cargo transfer operations are concerned.

Strict monitoring and control of the main cargo pump room atmosphere will minimize the fire and explosion risks associated with this space.

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Fires resulting from uncontrolled smoking in the accommodation, unauthorized hot work such as welding, and engine room fires can spread rapidly if not dealt with swiftly and can give rise to incidents of a very serious nature.

While the likelihood of fire or explosion occurring on board vessels berthed at the Mundra port berths is low, the risk is nevertheless acknowledged. Such an incident could give rise to a spillage of 700 tons or more.

**Bunkering – spillage of fuel oil**

Bunkering at the port may sometimes give rise to spills due to hose failure and / or bunker tank overflow etc. in spite of the strict regulatory supervision of the port operations. These spills could be as small as a few kgs to a maximum of 500 t of FO.

As can be seen from the spill scenarios mentioned above, the spills range from extremely negligible quantities to enormous quantities in rare catastrophic events. The simulation of oil spills does not vary significantly in various scenarios except for the magnitude of impact zone and the quantity involved in such impacts. Though the software is intended to be used for specific scenarios so as to get the trajectory and other weathering information; in this study, a few hypothetical scenarios have been simulated and computations carried out considering the worst-case scenarios of oil spills at the different likely locations in the domain.

Based on the above deliberations, the following scenarios for computations have been selected for carrying out modeling studies for the oil spill trajectory and weathering processes.

**Computational Scenarios:**

<b>Spill Locations</b>	<b>Pre-monsoon (Jan)</b>	<b>Monsoon (July)</b>	<b>Post monsoon (Nov)</b>
<b>SPM</b>			
Crude oil spill of 183 t at the pumping rate of 10000 m <sup>3</sup> /hr (for 75 sec release) at the SPMs (due to Hose failure) Spill points: <b>S1</b> and <b>S2</b> During spring and neap tide conditions (tide conditions : PF and PE)	▪	▪	•
Instantaneous crude oil spill of 700t at the SPMs Spill points: <b>S1</b> and <b>S2</b>	▪	▪	•
Instantaneous crude oil spill of 25000t at the SPMs -- Spill points: <b>S1</b> and <b>S2</b>	▪	▪	•
<b>Pipeline Leakage</b>			
Crude oil spill of 384 t at the pumping rate of 10000 m <sup>3</sup> /hr (for 60 sec release) along the pipeline corridor at a select (midway) point of subsea pipeline in the pipeline routes. -- Spill point: <b>S3</b>	▪	▪	•
<b>Tanker route</b>			
Instantaneous crude oil spill of 25000t along the tanker route at select location. Spill point: <b>S4</b>	▪	▪	•

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<b>West Basin (berths)</b>			
100 tons (due to Berthing incident/ collision) at the West Basin berths (FO) Spill point: <b>S5</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the West Basin berths (HSD) Spill point: <b>S5</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berths -- Spill point: <b>S5</b>	■	■	●
In the maneuvering basin: <ul style="list-style-type: none"> <li>○ 20 Tons of HSD oil due to Tug Impact (HSD)</li> <li>○ 100 Tons of FO due to Tug Impact</li> </ul> Spill point: <b>S6</b>	■	■	●
Along the vessel route at one location: Instantaneous oil spill of 700t along the tanker route at a select location.(FO): Spill point: <b>S7</b>	■	■	●
<b>LNG Berth</b>			
100 tons (due to Berthing incident/ collision) at the LNG berth (FO) -- Spill point: <b>S8</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the LNG berth (HSD) – Spill point: <b>S8</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth-- Spill point: <b>S8</b>	■	■	●
<b>South Basin (Berths)</b>			
100 tons (due to Berthing incident/ collision) at the South Basin berths (FO) -- Spill point: <b>S9</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the South Basin berths(HSD) – Spill point: <b>S9</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth -- Spill point: <b>S9</b>	■	■	●
At the turning circle: <ul style="list-style-type: none"> <li>○ 20 Tons of HSD oil due to Tug Impact</li> <li>○ 100 Tons of FO due to Tug Impact</li> </ul> Spill point: <b>S10</b>	■	■	●
<b>At the existing MMPT 1 Berth: : Spill Point S11</b>			
100 tons (due to Berthing incident/ collision) at the berth(FO) -- Spill point: <b>S11</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the berth (HSD) – Spill point: <b>S11</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth	■	■	●

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<b>At the existing MICT / AMCT Berths:</b> <b>: Spill point S12</b>			
100 tons (due to Berthing incident/ collision) at the (FO) - Spill point <b>S12</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth - Spill point <b>S12</b>	■	■	●
<b>At the East Basin:</b> <b>Spill point S13</b>			
100 tons (due to Berthing incident/ collision) at the East Basin berth (FO) - Spill point <b>S13</b>	■	■	●
<b>At the North Basin:</b> <b>Spill point S14</b>			
100 tons (due to Berthing incident/ collision) at the North Basin berth (FO) - Spill point <b>S14</b>	■	■	●

## 2.2 Types of oil likely to be spilled

Mundra Port mainly deals with Vegetable oils, Furnace oil, Naphtha, Methanol, High Speed Diesel, Super Kerosene Oil and other light oils at its Multi-Purpose terminal. The vessels calling at the port (or the designated anchorage areas) may spill fuel, diesel or a minimal quantity of lubricating oils. The SPM is being used to discharge crude oils from tankers.

At Berths:

- Vegetable oils,
- Furnace oil,
- Naphtha,
- Methanol,
- High Speed Diesel,
- Super Kerosene Oil,
- Carbon Black Feed Stock (CBFS),
- Motor Spirit,
- Other light oils
- Other HNS Substances

At SPM:

- Crude oil

At anchorages or within port limits:

- Fuel oil,
- Diesel oil,
- Minimal quantity of lubricating oil.

## 2.3 Probable fate of spilled oil

APSEZL is all weather, commercial port with geographical and hydrological advantages on the West Coast of India, in the Gulf of Kutch. Tidal range is between +0.37 m during Neaps and + 6.40 m during springs. Tidal streams flow 070<sup>0</sup> – 250<sup>0</sup> at an average rate of 3 kts and 4-5 kts during spring tides.

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It has been observed from the modeling study that during pre-monsoon season, the spills occurring at the APSEZL marine facilities move towards the southern / southwestern part of the Gulf of Kutch nearer to the facilities depending on tide phase.

The spills taking place at the APSEZL marine facilities move towards northern coast of Gulf of Kutch during monsoon season and affect the coast near Mundra, Kandla etc.

During post - monsoon season, the spills taking place at the APSEZL marine facilities move towards south / southwest and affect the islands /coast on southern side of the Gulf of Kutch.

The surface or subsurface oil spill consists of slick floating on the water surface, which partially dissolves in the water and partially evaporates into the atmosphere. There is a continuous exchange between the suspended and surface oil (floating oil). The assumption made in deriving the governing equations is that the thickness of the oil layer is negligible in comparison with the water depth.

In addition to the location, size and physico-chemical properties of the spill, other major factors affect the fate of the oil slick are governed by complex interrelated transport (turbulence) and weathering processes (evaporation, emulsification and dissolution). The spilled oil spreads and moves by the forces of winds and currents. A small portion of hydrocarbons begin to go into solution in the underlying water column, but most of the oil is lost through evaporation into the atmosphere. In the present model, all these processes are considered in the transport of Oil Slick.

Out of the above mentioned oils the vegetable or light oils do not pose any significant threat to the environment.

The spilled 'persistent' crude oil (or fuel oil) undergoes a number of physical and chemical changes known as "weathering". The major weathering processes are spreading, evaporation, dispersion, emulsification, dissolution, oxidation sedimentation and biodegradation.

*The term persistent is used to describe those oils which, because of their chemical composition, are usually slow to dissipate naturally when spilled into the marine environment and are therefore likely to spread and require cleaning up. Non-persistent oils tend to evaporate quickly when spilled and do not require cleaning up. Neither persistence nor non-persistence is defined in the Conventions. However, under guidelines developed by the 1971 Fund, an oil is considered non-persistent if at the time of shipment at least 50% of the hydrocarbon fractions, by volume, distill at a temperature of 340°C (645°F), and at least 95% of the hydrocarbon fractions, by volume, distill at a temperature of 370°C (700°F) when tested in accordance with the American Society for Testing and Materials Method D86/78 or any subsequent revision thereof."*

- a) **Spreading:** is one of the most significant processes during early stages of a spill is initially due to gravity. The oil spreads as a coherent slick and the rate is influenced by its activity. After a few hours, the slick begins to break-up and after this stage, spreading is primarily due to turbulence. Wind and wave actions also tend to fragment the slick, breaking it up into islands and windrows.
- b) **Evaporation:** The rate and extent of evaporation depends primarily on the volatility of the oil. In general, oil components with a boiling point below 200 D C evaporate within 4 to 16 hours in tropical conditions. Spills of refined products such as kerosene and gasoline evaporate completely and light crude lose up to 40 % of its volume within a few hours. In contrast, heavy crude and fuel oils undergo little evaporation.
- c) **Dispersion:** Waves and turbulence act on the slick to produce droplets of oil of different sizes. Small droplets remain in suspension while the larges ones rise to the surface. The rate of dispersion mainly depends on the nature of the oil and the sea state. Oils which remain fluid can spread unhindered by other weathering processes can disperse completely in moderate sea conditions within a few days. Viscous oils tend to form thick lenses on the water surface with slow

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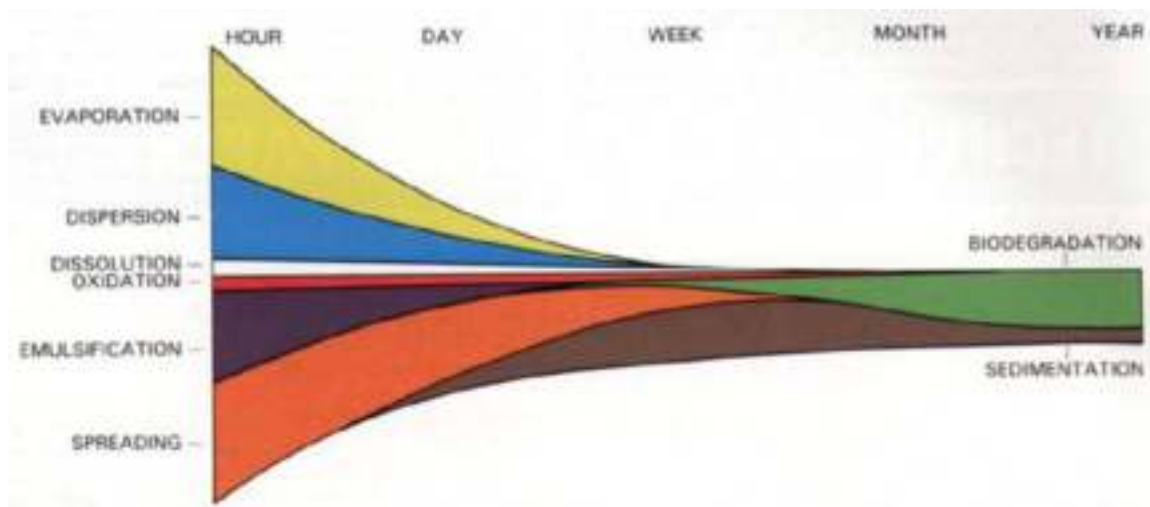
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tendency to disperse, which can persist for several weeks.

- d) **Emulsification:** Several oils have tendency to absorb water to form water-in-oil emulsions thereby increasing the volumes of the emulsified mass by a factor of 3 to 4. The rate at which the oil is emulsified is largely a function of sea state though viscous oils absorb water slowly. In turbulent sea conditions, low viscosity oils can incorporate as high as 80 % water by volume within 2 to 3 hours.
- e) **Dissolution:** The heavy components of crude oil are virtually insoluble in sea water while lighter compounds are slightly soluble. Hence levels of dissolved PHC rarely exceed 1 mg/l following a spill. Therefore, dissolution, does not make a significant contribution to the removal of oil from the sea surface.
- f) **Sedimentation:** Very few oils are sufficiently heavy to sink in sea water. However, the weathered residue gets mixed up with the suspended substances in water and may sink. This process becomes significant when water-in-oil emulsions attain specific gravity near to one and therefore need very little suspended substances to exceed the specific gravity of sea water (1.025).
- g) **Oxidation:** Hydrocarbon molecules react with oxygen and either breaks down into soluble products or combine to form persistent tars. Many of these oxidation reactions are promoted by sunlight and their effect on overall dissipation is minor in relation to other weathering processes.
- h) **Biodegradation :** Sea water contains a range of marine bacteria, moulds and yeasts which can use oil as source of carbon and energy. The main factors affecting the rate of biodegradation are temperature and the availability of oxygen and nutrient, principally compounds of nitrogen and phosphorous. Each type of micro-organism tends to degrade a specific group of hydrocarbons and whilst a range of bacteria exists between them which are capable of degrading most of the wide variety of compounds in crude oil, some components are resistant to attack.

Because the micro-organisms live in sea water, biodegradation can only take place at an oil/water interface. At sea, the creation of oil droplets, either through natural or chemical dispersion, increases the interfacial area available for biological activity and so enhances degradation.

The processes of spreading, evaporation, dispersion, emulsification and dissolution are most important during the early stages of a spill whilst oxidation, sedimentation and biodegradation are long-term processes, which determine the ultimate fate of oil. Fig.3.1 shows schematic diagram of weathering processes with time.



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**Schematic diagram of weathering processes with time**

It should be appreciated that throughout the lifetime of an oil slick, it continues to drift on the sea surface, independent of these processes. The actual mechanism governing movement is complex but experience shows that oil drift can be predicted by taking into account wind-induced effects and surface water currents. These can be calculated using mathematical modeling to determine the oil spill trajectory. The wind-induced effect is normally taken as 1-3% of the wind velocity, and the current effect as 110% of the current velocity. Reliable prediction of slick movement is clearly dependent upon the availability of good wind, tide and current data.

An understanding of the way in which weathering processes interact is important in forecasting their combined effect in changing the characteristics of different oils and the lifetime of slicks at sea. In order to predict such interactions, numerical models have been developed, based on theoretical and empirical considerations.

Accidental oil spills as indicated in 'Oil Spill Scenario' in section 2.1 of this plan might occur in the area of SPM. On the basis of the data modeled, the results indicate that

- a) about 38 % of hydrocarbons are lost by evaporation, 2.8 % by emulsification and 0.75 % by dissolution within 5 hours;
- b) the quantum of dissolved oil increases up to initial 5 hours and thereafter decreases as lighter (more soluble) hydrocarbons evaporate;
- c) after 50 hour, no oil dissolves;
- d) the trend of emulsified oil is similar to that of evaporated oil but emulsification occurs at a slow rate;
- e) the radius of oil slicks increases to nearly 1400 m at the end of 148 hours; and
- f) the maximum PHC concentration in water is about 39 µg/l.

The spill trajectories clearly reveal the dominance of wind in deciding the location of landfall of the weathered oil. Thus during June-August, the spill will be preferentially transported in the north east direction under the influence of south west winds while during October-November, and possible up-to February, the oil will be predominantly carried to the southern shore. It is also evident that under the influence of the southwest winds, the oil will be deposited on the northern shore within 60 hours, while it might take about 80 hours to reach the southern shore during north east winds.

#### **2.4 Development of oil spill scenarios including worst case discharge**

The scenario of the spill are classified under two categories:

1. Oil Spill at Mundra Port Multi-Purpose Terminals/ Basins
2. Oil Spill at SPM

Oil Spill at Mundra Port Multi-Purpose Terminals/ Basins

- a) Leak during cargo transfer operations Minor (250 liters)

This can occur at the start of cargo operations, during operation due to leakage in pipes, expansion joints, and at the time of disconnection of hose at manifold. However, such instances are remote on implementation of International Safety Management by Ships and Quality Management systems by Port.

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b) Slop tank / bunker tank overflow at, Jetty / Ship Minor (250 - 1000 ltrs.)

This source of pollution is purely of an accidental nature. The ship is expected to be ship shape with good trained crew and this has been emphasized to the Master of the vessel at the time of cargo transfer / bunkering. Based on a rate of 20 cbm/hr. and reaction time of 1 min, and hose content of 150 ltrs., likely spill is only 250 litres. A ship shore check list for cargo operations and bunkering is employed. A joint declaration is made by Marine Staff and Chief Officer / Master and enforced by Marine Manager. This results in good ship / shore co-ordination.

c) Spill during berthing (tug impact) Moderate (3000 liters)

Accidental contact with tugs or another marine structure is a possibility but quantum is not going to be significant because of Fendering system employed and training given to tug crews. Also with concept of double hull tanker the entire cargo compartments are protected by another hull, thus cargo spillage due to impact of tug is remote.

d) Grounding / Hull Damage :

APSEZL operates dry cargo & liquid cargo berths. Tankers mainly carry Furnace oil, Naphtha, Methanol, High Speed Diesel, Super Kerosene Oil and Vegetable oil. Oil transfer operations at the jetty are supervised by Liquid terminal staff. Manifold area has receptacle facilities to prevent accidental spills at connection / disconnection time. Berthing is done under controlled conditions and spill due to contact damage to underwater oil tanks is very remote. Radio officer controls movement of vessels in and around the berth and traffic presently is insignificant to pose any collision damage risk. Under water sea bed characteristic is soft sand. The berth area of about 500<sup>2</sup> m is surveyed monthly for any changes and underwater obstructions; hence grounding resulting into oil spill is very remote.

**Oil Spill at SPM**

a) Hose Puncture while unloading:

In such an event, crude oil, about 10670 Kgs may spill onto water. On spillage the oil slick will be carried away at a distant location depending upon water current and wind direction. The trained crew of the maintenance vessel patrolling the area during unloading, would control the oil slick movement by using booms and subsequently, the oil will be collected by the skimmer.

b) Failure of Swivel joint of SPM:

In this event about 17780 Kgs of crude oil may spill onto water. In this case the leakage may be detected visually by the personnel monitoring the operation from the ship tanker or by the detectors provided on the SPM.

c) Leakage of Crude oil at PLEM or from the submarine pipeline:

This case will occur at least 20 m below the water surface, oil being lighter than water will travel upward and float on to water. By the time oil water reaches the sea water surface, the oil droplets may start undergoing "weathering process" and it may form emulsion along with water.

d) Ship Collision Frequency :

Based on the statistical data and its analysis carried out by National Institute of Oceanography, the probability of this type of accident is about one in every seven years for the traffic projection and hence, this case is ignored.

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e) Ship Grounding Frequency :

Based on the statistical data and its analysis carried out by National Institute of Oceanography, the probability of this type of accident is about one in eleven years for the traffic projection and hence, this case is also ignored. Also with concept of double hull tanker the entire cargo compartments are protected by another hull, thus cargo spillage due to grounding is remote.

## 2.5 Shoreline sensitivity mapping

Gulf of Kutch is a typical semi-enclosed basin where the tidal forces interact with the open ocean waters of the sea, across its western open boundary at Okha. The currents of the region are tidal-driven and the water column is vertically well mixed. These features make the numerical modeling task easier, as a 2-D hydrodynamic model is sufficient to accurately reproduce the tides and currents for the study region in the Gulf of Kutch at Mundra.

The model domain of longitudes of 68° 50' 56.7" E and 70° 27' 36.9" E and the latitudes of 22°14' 58.8" N and 23° 01' 49.1" N is selected for carrying out sensitivity analysis and predicting the fate and transport of oil spill that may take place at APSEZL's SPMs, Basins, berths and tanker route near Mundra coast in Gulf of Kutch.

The bottom roughness in the Gulf of Kutch varies due to the variation of bed sediment grain sizes. The bed consists of various sizes of clay, sand, silt and rocky soils. In the present study a uniform Manning's roughness coefficient has been used for numerical runs of hydrodynamic processes. The filled contours of Chezy's roughness coefficient are shown in Fig. A.1.4. The same roughness coefficient has been used to predict tides and tidal velocities in the Mundra area for prediction of oil spill trajectory.

The interpolated Chezy's coefficient calculated based on Manning's roughness and total water depth is shown in Fig.A1.4. The sensitivity analysis has been carried out with various Manning's value, which is the combined effect of  $d_{50}$  sediment size and bed configuration, to calibrate the model with respect to the tide data of March and October 1994, at Sikka. The computational runs were continued with various sets of various bed roughness values till computed and measured tide levels are within the acceptable limit.

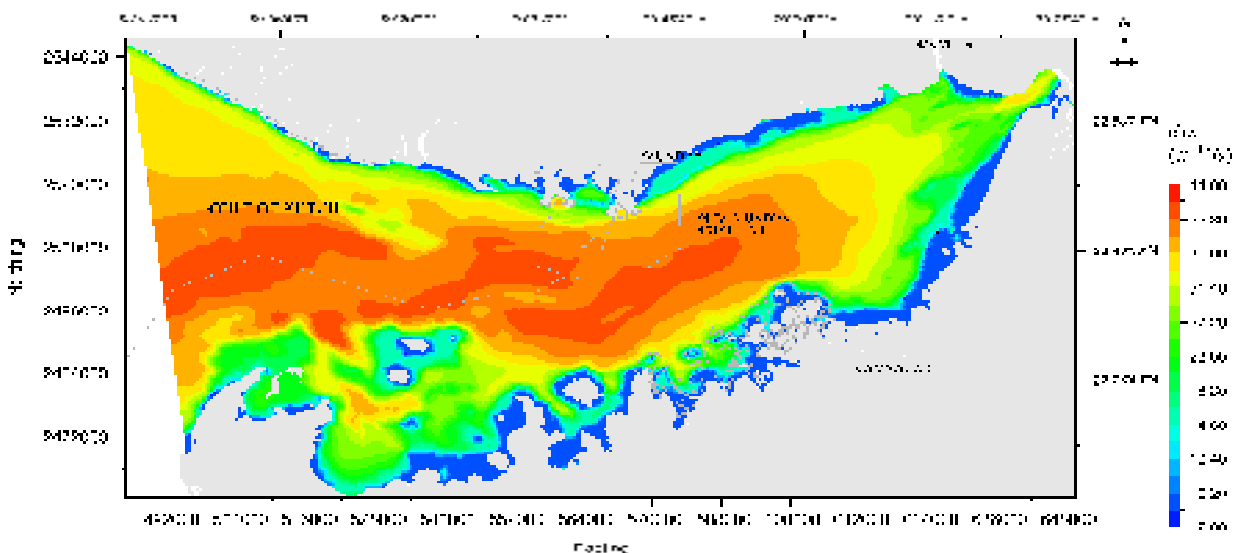


Fig.A1.4 Chezy's coefficient

For Shoreline sensitivity mapping refer Volume 2 (Annexure-V, VI and VII) of Oil Spill Risk Assessment.

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**2.6 Shoreline resources, priorities for protection**

The SPMs and the Marine facilities (Existing Berths, South Basin, West Basin, North Basin, East Basin and LNG Berth etc.) are located in the Northern side of Gulf of Kutch at Mundra. VLCCs bring Crude oil and unload at the two SPMs which are connected to the Shore tanks by means of Submarine pipelines. The Crude unloaded at these SPMs is pumped through Submarine pipeline to Shore tank farm area.

Various Marine craft / solid cargo/ liquid cargo vessels traverse through the Gulf waters to berth at the various Terminals / Berths located in the new Mundra port limit. The general layout of the various facilities like SPMs, terminals etc. within the Mundra port limit area are shown in Fig.1.1 to Fig.1.4 in chapter 1. There is a probability of spillage at SPMs, along the sub-sea pipelines and tanker route during unloading operations and transportation. Apart from these operations at the SPMs, loading / unloading operations at the different berths of the Mundra port – South Basin, West Basin, North Basin, East Basin, LNG jetty and existing berths also may give rise to accidental spills at the berth locations. The spills at these locations may affect the shore and other facilities along the coast of Gulf of Kutch. The coast of Mundra has tidal flats, sand bars and not much in the way of mangroves. The mangroves, Marine Park / Marine Sanctuary etc. are on the Southern side of Gulf of Kutch. As it was observed that the spills occurring at the various locations of the APSEZL Marine facilities may reach the Coast on the Northern side as well as on the Southern side of the Gulf depending upon the season, there is a need to protect the environment in the event of an oil spill at any of the APSEZL Marine facilities.

**Shoreline Resources available with APSEZL, Mundra for deployment during shoreline cleanup/emergent situation:**

Item	Quantity
Oil Spill Dispersants	15000 liters
Sorbent pads	2000 nos.
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Oil discharge hose, 3", 2 x 10 m	1 set
Tanker Trucks	04 nos.
Mini Vacuum Pump (30 m <sup>3</sup> / hr)	05 nos.
Sorbent Boom Pack( 12.5cm x 4 M)	500 mtr
Slurry Pump (60 m <sup>3</sup> / hr)	01 no.
Start Tank with capacity 10000 liter(10 m <sup>3</sup> )	02 nos.
OSD Applicator- Oil Dispersant Spry Unit(20 ltr) for use on beach and inter tidal zones	02 nos.

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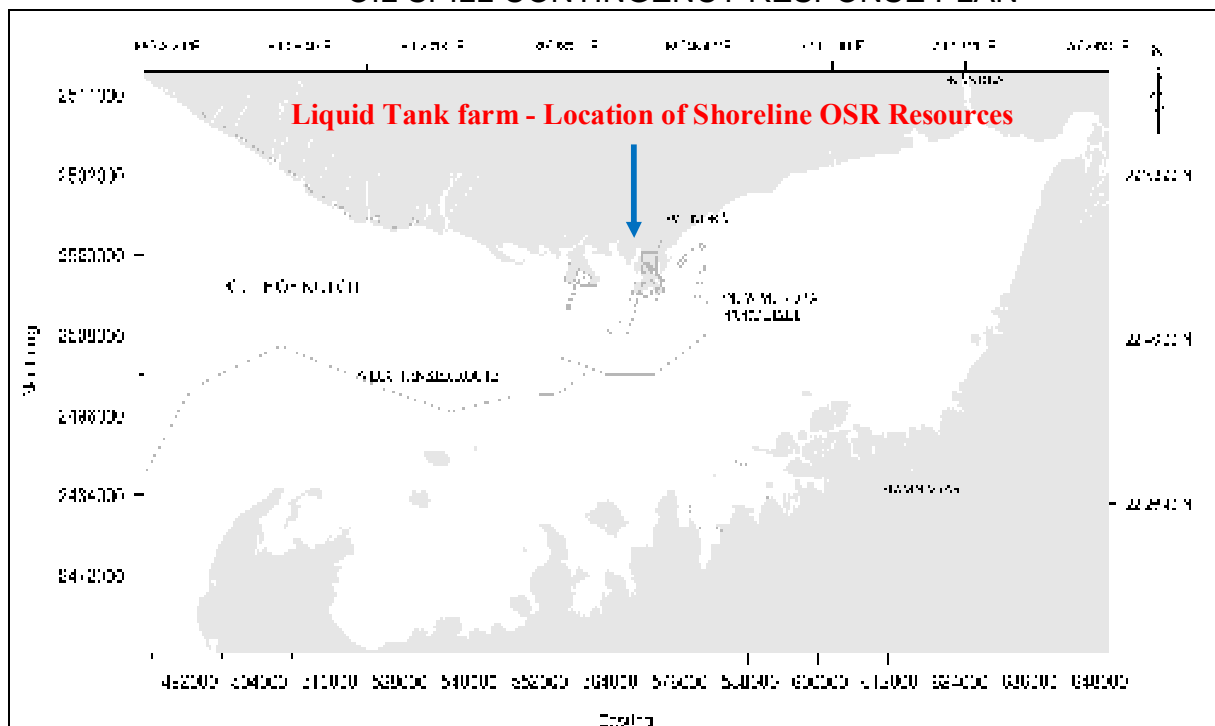


Fig.1.1 :General Arrangement of the marine facilities at Mundra port showing the VLCC route and facilities within the new Mundra port limit considered for carrying out the oil spill risk assessment studies.

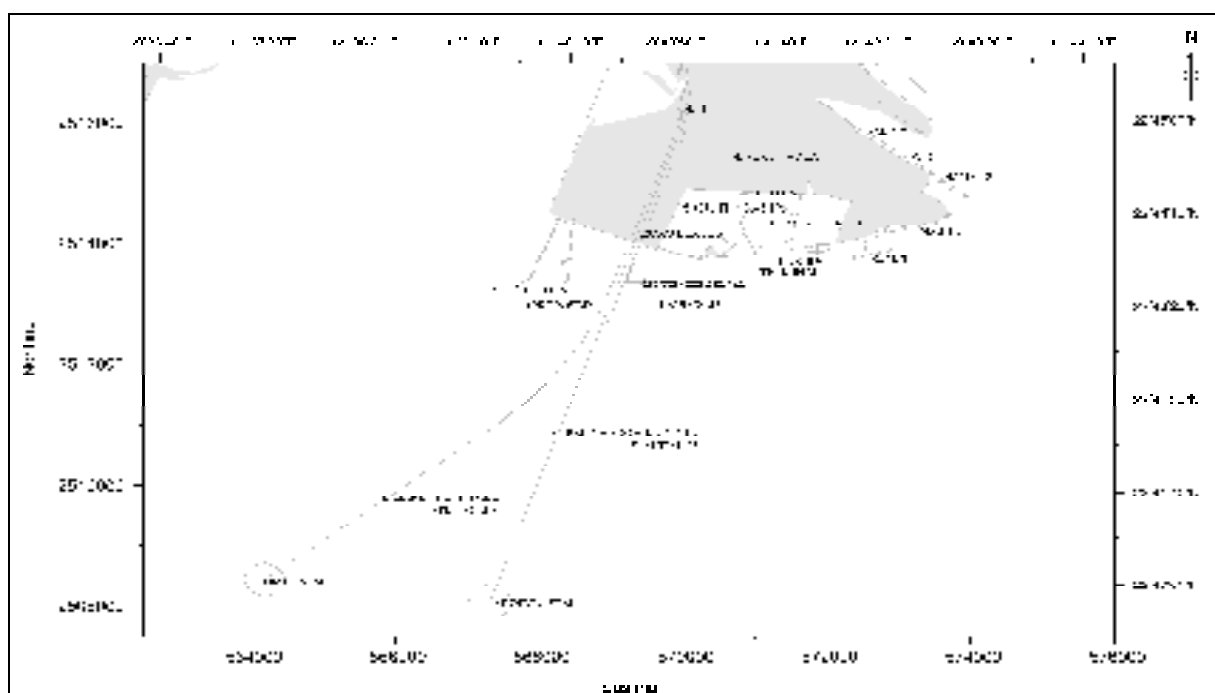


Fig1.2: Zoomed up portion of the South Basin showing the berths, turning circle, LNG jetty and existing berths as well as SPMs.

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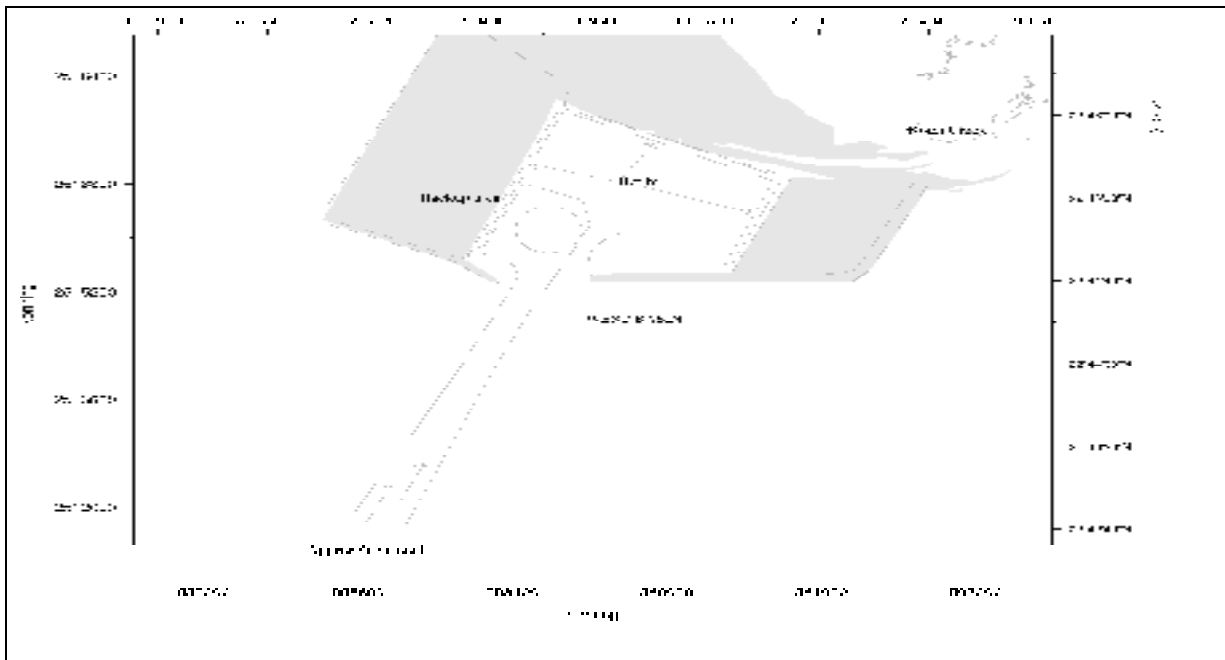


Fig.1.3 Zoomed up portion of the West Basin showing the berth locations and the approach channel for the vessels

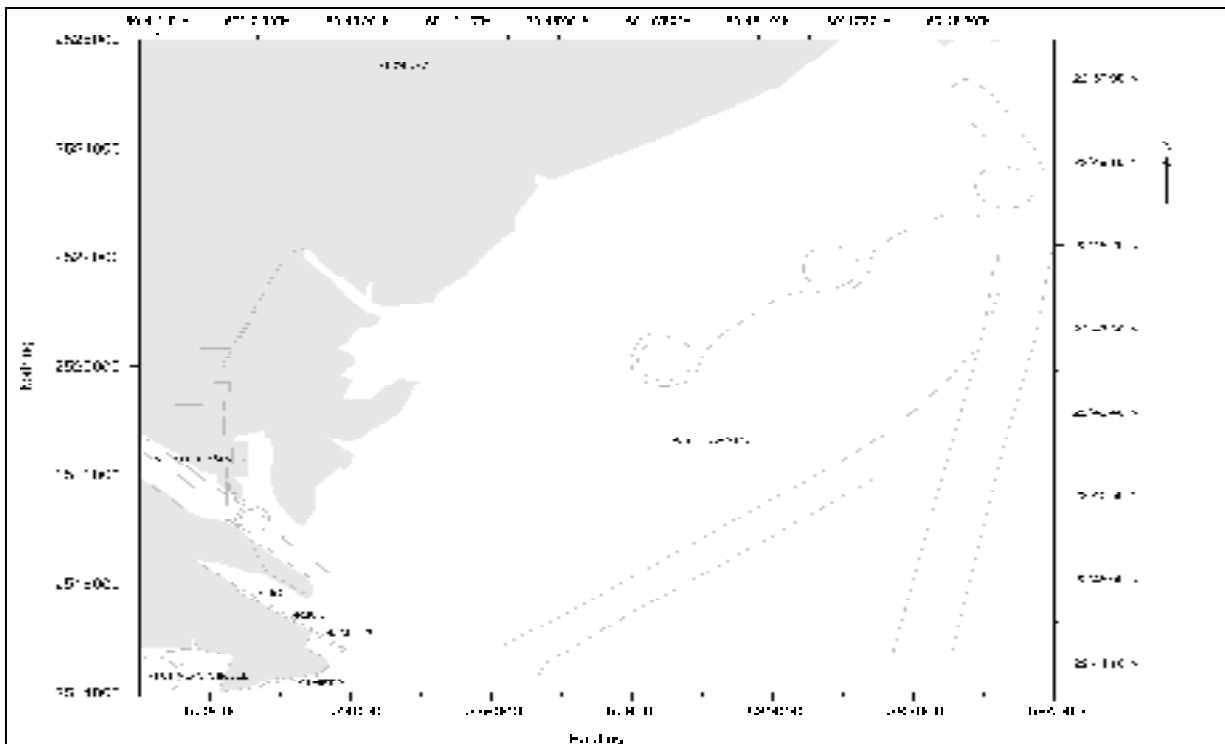


Fig.1.4 Zoomed up portion showing the East Basin & North Basin

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**Marine resources in Gulf of Kutch**

**Phytoplankton**

Phytoplanktons are vast array of minute and microscopic plants passively drifting in natural waters and mostly confined to the illuminated zone. In an ecosystem these organisms constitute primary producers forming the first link in the food chain. Phytoplankton long has been used as indicators of water quality. Some species flourish in highly eutrophic waters while others are very sensitive to organic and/or chemical wastes. Some species develop noxious blooms, sometimes creating offensive tastes and odours or anoxic or toxic conditions resulting in animal death or human illness. Because of their short life cycles, plankton responds quickly to environmental changes. Hence their standing crop in terms of biomass, cell counts and species composition are more likely to indicate the quality of the water mass in which they are found. Generally, phytoplankton standing crop is studied in terms of biomass by estimating chlorophyll and primary productivity, while in terms of population by counting total number of cells and their generic composition. When under stress or at the end of their life cycle, chlorophyll in phytoplankton decomposes to phaeophytin as one of the major products.

**Phytopigments**

During April 2010, the phytoplankton pigments viz. chlorophyll a (1.7 – 2.4 mg/m<sup>3</sup>; av 1.9 mg/m<sup>3</sup>) and phaeophytin (0.3 – 1.2 mg/m<sup>3</sup>; av 0.7 mg/m<sup>3</sup>) varied considerably. In October 2010, chlorophyll a ranged from 2.0 – 4.2 mg/m<sup>3</sup> (av 3.1 mg/m<sup>3</sup>) and phaeophytin from 0.7 - 1.1 mg/m<sup>3</sup> (av 0.7 mg/m<sup>3</sup>) (Tables 8.1 and 8.2). The average concentration (mg/m<sup>3</sup>) of chlorophyll a off Vadinar during different sampling events (2010) is listed in Table 8.1:

**Table 8.1: Average chlorophyll a (mg/m<sup>3</sup>) off Vadinar (April 2010 to October 2010)**

Area	Pathfinder	Nearshore	ESSAR DP	IOC SPM	ESSAR SPM	Salaya Creek	Gulf
April 2010	2.4	2.1	1.9	1.4	2.0	2.0	1.7
Oct 2010	2.1	4.2	2.8	4.1	2.0	-	3.7

The values of phaeophytin during the present monitoring period are given in Tables 8.2, while, the average concentrations (mg/m<sup>3</sup>) between different sampling events (April 2010 and October 2010) are listed in Table 8.2.

**Table 8.2: Average phaeophytin (mg/m<sup>3</sup>) off Vadinar (April 2010 to October 2010)**

Month	Pathfinder	Nearshore	ESSAR DP	IOC SPM	Essar SPM	Salaya Creek	Gulf
April 2010	1.2	0.6	0.8	0.3	0.6	0.8	0.6
Oct 2010	1.1	0.9	1.1	0.9	0.7	-	0.8

**Phytoplankton population**

As is generally the case with Coastal waters, the phytoplankton population density (68-332 nox10<sup>3</sup>/l; av 186 no x 10<sup>3</sup>/l) and generic diversity (11-30 no; av 18 no) varied over a wide range and in a random manner during April 2010 (Table 8.3). In October 2010 the phytoplankton population density ranged from 100-789.6 nox10<sup>3</sup>/l (av 329.4 no x 10<sup>3</sup>/l) and generic diversity ranged from 12-25 no (av 19 no) (Table 8.4) off Vadinar.

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**Table 8.3: Average phytoplankton population density (no x 10<sup>3</sup>/l) and total genera (no) off Vadinar (April 2010 to October 2010)**

Month	Pathfinder		Nearshore		ESSAR DP		IOC SPM	
	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)
Apr-10	216.2	19	200.5	17	192.7	15	127.7	18
Oct 2010	203.1	19	446.6	20	323.6	23	360.4	18

Month	Essar SPM		Salaya Creek		Gulf	
	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)
Apr-10	124	16	198.5	18	211	15
Oct 2010	260	16	-	-	487.6	14

The above results indicated wide temporal and spatial fluctuations in the standing stock of phytoplankton between April 2010 and October 2010 off Vadinar. In general, the coastal waters revealed high average cell counts during October 2010 as compared to previous data. The generic diversity of phytoplankton during April 2010 widely varied with the dominance of genera such as Nitzschia (17.7%), Guinardia (16.7%), Skeletonema (9.1%), Thalassiosira (7.4%), Hemiaulus (7.2%), Navicula (6.1%), Rhizosolenia (4.5%), Biddulphia (3.4%) and Leptocylindrus (3.4%). In October 2010, the dominant phytoplankton genera were Leptocylindrus (57.6%), Guinardia (13.9%), Nitzschia (8.1%) and Chaetoceros (7.2%)

### Mangroves

According to one estimate the dense mangrove cover of Narara Bet is spread over an area of 5.5 km<sup>2</sup>. The mangrove area has increased in recent years due to extensive plantations made by the Forest Department. Mangrove cover and mudflat areas (km<sup>2</sup>) in Jamnagar, Lalpur, Khambalia and Kalyanpur Talukas estimated based on satellite data are given in Table 8.4 below:

**Table 8.4: Mangrove areas (km<sup>2</sup>) along Jamnagar coast**

Taluka	Mangroves (Dense)	Mangroves (Sparse)	Tidal mudflats
Jamnagar	12.03	23.91	83.53
Lalpur	1.96	3.95	50.50
Khambalia	3.86	11.48	101.94
Kalyanpur	0.04	0.01	0.78

\*Singh H.S., 2000. Mangrove in Gujarat, GEER foundation

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**Mangroves at Vadinar**

The intertidal expanse in the vicinity of Dargah ranged in 1 – 1.2 km. Lower intertidal zone was muddy with dense algal growth. The mid and upper intertidal zone sustained mangrove vegetation of ~ 500 m width. The zone around HTL was dominated by a sandy beach with ~ 5 m width and a narrow beam at the backshore. The distribution of mangroves at Vadinar during the present monitoring (April 2010) is given in Table 8.5 below:

**Table 8.5: Distribution of mangroves at Vadinar (Dargah - North side)**

	Location	Species	% FQ	Density	Height (m)	DBH (cm)	Seedling (no/m <sup>2</sup> )
D1	22° 26' 42.6''N 69° 42' 07.8''E	<i>A. marina</i>	100	Sep-67 -38	0.5 - 3.5	<2.6 - 6	0 - 2
D2	22° 26' 50.5''N 69° 41' 52.9''E	<i>A. marina</i>	40	0 - 5 -2	0.5 - 1.5	<2.5 - 4	0 - 1
<b>Vadinar (Dargah - south side; afforested area)</b>							
D3	22° 26' 30.8''N 69° 42' 05.6''E	<i>A. marina</i>	100	(20 - 75) -50	1.0 - 2.3	<1.5 - 5	0 - 15

As evident from above data, the stand density of *A. marina* at two locations (D1 and D2) along North-east of Vadinar Dargah varied from nil to 67 plants/100 m<sup>2</sup> with higher density of plants noticed at location D1. Frequency of occurrence ranged from 40 - 100% in the mid and upper intertidal zones. The height varied from 0.5 to 3.5 m. Mostly the plants were dwarf (av 1 m) with occasional tall plants of 3.5 m. Diameter at Breadth Height (DBH) varied from <2.5 to 6 cm. The seedling density was poor and varied from 0 - 2 no/m<sup>2</sup>. The mid intertidal segment was the popular feeding site for flocks of flamingos.

The upper intertidal expanse along South-west of Vadinar Dargah (D3) showed good growth of afforested mangroves (Table 8.5). The density of mangroves ranged from 20 - 75 plants/100 m<sup>2</sup> with an average of 50 plants/100 m<sup>2</sup>. The plant height varied from 1.0 to 2.3 m and the DBH ranged from <1.5 to 5 cm. The seedling density was low (0-15 no/m<sup>2</sup>), however, better than that noticed along North-east of Vadinar - Dargah (D1 & D2). Present results are comparable with earlier monitoring studies (2007 - 2009).

**Mangroves at Narara**

The intertidal expanse along the IOCL pipeline corridor varied from 2000 - 2200 m. The mangroves vegetation from upper intertidal region was observed to be healthy, dominated by *A. marina* on both sides of the pipeline corridor. Four locations (N1 to N4) were selected for monitoring of mangroves at Narara as detailed in below given Table 7.6.

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**Table 8.6: Distribution of mangroves at Narara**

	Location	Species	% FQ	Density	Height (m)	DBH (cm)	Seedling (no/m <sup>2</sup> )
N1	22° 27' 56.8''N 69° 43' 43.2''E	<i>A.marina</i>	100	20-45 (38)	2-3	3-8	0-85
		<i>C.tagal</i>	10	0.7*	-	-	-
		<i>R.mucronata</i>	5	0.2*	-	-	-
N2	22° 27' 59.1''N 69° 43' 21.3''E	<i>A.marina</i>	100	60-90 (85)	2-4	25-12	0-7
N3	22° 28' 03.5''N 69° 43' 27.4''E	<i>A.marina</i>	100	28-85 (50)	0.5-2.5	<15-7	0-55
		<i>R.mucronata</i>	3	-	-	-	-
N4	22° 28' 07.2''N 69° 43' 24.6''E	<i>A.marina</i>	100	30-130 (80)	0.5-3.5	<2.0-3.5	0-10

\* no/500 m<sup>2</sup>

As can be noticed in the above table, the plant density of *A.marina* varied from 20 - 130 plants/100 m<sup>2</sup> with a frequency of occurrence of 100% at Narara. The species like *Cerriops tagal* (7 plants/500 m<sup>2</sup>) and *Rhizophora mucronata* (2 plants/500 m<sup>2</sup> - 3 plants/100 m<sup>2</sup>) were rarely noticed. The locations N2 (85 plants/100 m<sup>2</sup>) and N4 (80 plants/100 m<sup>2</sup>) revealed better average density of *A.marina* as compared to the rest. The height of *A.marina* varied from 0.5 to 4 m with N2 and N4 locations indicating better plant height than the rest. The DBH varied from <1.5 to 12 cm at the monitoring locations. The seedling density ranged from 0 - 85 no/m<sup>2</sup> with N1 and N3 locations sustained better seedling density than the rest. Few new plants (30 - 45 cm in height) of *C.tagal* and *R.mucronata* were noticed at the EOL pipeline corridor during the present monitoring.

#### Sand dune vegetation

The narrow beach of ~ 5 m width around HTL along Narara Bet is marked with berm of ~ 1.5-2 m width, followed by back shore sandy zone. Occasional shrubs of *Salicornia brachiata* and *Suaeda maritima* are observed on the backshore sandy zone. The sand dune flora is more predominant on berm and immediate back shore zone of ~5 m width. Sand dune flora is represented by seven species viz; *Crassa sp*, *Cyperus arenarius*, *Launea sp*, *Suaeda maritima*, *Salicornia brachiata*, unidentified *Poaceae* member and unidentified *Fabaceae* member.

#### Seaweeds and Seagrasses

Seaweeds, which are known as a source of food, fodder and manure, are mostly found attached to various substrata like sandy, muddy and coralline sediments as well as rocky areas and play a significant role in enriching the sea by adding dissolved organic matter, nutrients and detritus besides serving as nursery areas for the larvae and juveniles of innumerable marine organisms. Some green Seaweeds are edible, red algae are the important source of agar and some of the brown algae are used for manufacturing algin and alginic acid. Seaweeds are also used to produce some bioactive compounds.

The algal zone of Narara Bet is confined to 1.2-2.5 km width. A total of 62 species of algae and 3 species of sea grasses are recorded from this region. Among them *Lyngbya*, *Caulerpa*, *Cladophora*, *Ulva*, *Cystoceira*, *Dictyota*, *Hydroclathrus*, *Padina*, *Sargassum*, *Acanthopora*, *Amphiroa*, *Champia*, *Centraceros*, *Gracilaria*, *Hypnea* and *Polysiphonia* were common with the dominance of *Padina* and *Gracilaria* at the lower reef flat. The open mudflats of Narara Bet are dominated by algae like *Enteromorpha*, *Ulva*, *Lyngbya* and *Polysiphonia*, while, the upper sandy shore and mangrove areas are associated with *Enteromorpha* and *Ulva*. Seagrasses such as *Halophila ovata* and *Halodule uninervis* are common in patches on sandy regions of the reef, while, *Halophila beccarii* occasionally occurred on mudflats along the tidal channels.

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*Open mudflats near Dargah and Narara pipeline corridor supported growth of twelve marine algae dominated by Enteromorpha spp (Table 8.7). The biomass of Enteromorpha estimated at ~ 4 kg/m<sup>2</sup>.*

**Table 8.7: Marine algal flora along Narara/Vadinar**

Sr. No.	Species	% FO*	ES*
1	<i>Enteromorpha clathrata</i>	100	D
2	<i>Enteromorpha intestinalis</i>	100	D
3	<i>Caulerpa racemosa</i>	50	C
4	<i>Ulva fasciata</i>	100	D
5	<i>Ulva lactuta</i>	100	D
6	<i>Ulva reticulate</i>	90	D
7	<i>Codium elongatum</i>	30	O
8	<i>Sargassum ilicifolium</i>	45	C
9	<i>Sargassum tenerimum</i>	60	CD
10	<i>Gracilaria corticata</i>	55	C
11	<i>Gracillaria verrucosa</i>	85	C
12	<i>Polysiphonia platycarpa</i>	20	O

\*%FO: Percentage Frequency Occurrence, ES: Ecological Status, D: Dominant (% FO = 80-100), CD: Co-dominant (% FO = 60-79), C: Common (% FO = 40-59), O: Occasional (% FO = 20-39).

The intertidal zone of Kalubhar Tapu harbours 47 species of marine algae and three species of seagrasses. The reef areas of this island are dominated by *Dictyota*, *Gracilaria*, *Padina*, *Hydroclathrus*, *Ulva* and *Hypnea*. The open mudflats and sandy areas at the upper intertidal are preferred by *Enteromorpha*, *Ulva*, *Lyngbya* and *Polysiphonia*. The sandy region of the reef flat supported seagrasses like *Halophila* and *Halodule*.

### **Zooplankton**

The zooplankton standing stock in terms of biomass and population density during April 2010 (Table 8.8) varied from 0.2 to 121.2 ml/100m<sup>3</sup> (av 3.3 ml/100m<sup>3</sup>) and 2.2-722.7 x 10<sup>3</sup>/100m<sup>3</sup> (av 39 x 10<sup>3</sup>/100m<sup>3</sup>), respectively while during October 2010 the zooplankton biomass and abundance ranged from 0.2 to 12.0 ml/100m<sup>3</sup> (av 3.5 ml/100m<sup>3</sup>) and 2.5-157.8 x 10<sup>3</sup>/100m<sup>3</sup> (av 48.4 x 10<sup>3</sup>/100m<sup>3</sup>) respectively suggesting normal secondary production off Vadinar during the monitoring period.

The average zooplankton biomass (ml/100m<sup>3</sup>), population density (nox10<sup>3</sup>/100m<sup>3</sup>) and total groups (no) off Vadinar during the monitoring period varied in accordance with the data presented in Table 8.8.

**Table 8.8: Average values of zooplankton (A) biomass (ml/100m<sup>3</sup>) (B) Population density (nox10<sup>3</sup>/100m<sup>3</sup>) and (c) total groups (no) off Vadinar (April 2010 – October 2010)**

Area		Pathfinder	Nearshore	ESSAR DP	IOC SPM	Essar SPM	Salaya Creek	Gulf
April 2010	A	8.3	1.1	1.1	0.9	1.4	2.5	3.5
	B	89.9	24.6	14.4	22.7	12.7	20.4	37.4
	C	17	15	12	16	13	16	17
Oct 2010	A	4	3.9	1.5	3	5.7	-	2.1
	B	57.4	55.9	23.5	30.5	83.1	-	32.8
	C	13	11	10	10	9	-	7

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The overall zooplankton standing stock was low and highly variable off Vadinar which could be due to high patchiness and seasonal variability in their distribution apart from high grazing pressure at higher trophic levels.

During April 2010, 24 faunal groups were identified in the coastal waters off Vadinar during the monitoring period while 17 faunal groups were present in the samples of October 2010. The most common faunal groups were copepods (40.5%), decapod larvae (19%), gastropods (22.5%), lamellibranchs (10.7%), and foraminiferans (2.1%) in April 2010. In addition to the above, groups like chaetognaths, siphonophores, *Lucifer* sp, polychaetes, ctenophores, medusae, amphipods, ostracods, mysids, heteropods, isopods, stomatopod larvae, appendicularians and fish larvae were also frequently noticed but in less numbers during April 2010. During October 2010, the dominant groups were copepods (93.6%) and decapod larvae (4.8%). In general, the coastal waters off Vadinar revealed a moderate production of zooplankton associated with random fluctuations and seasonal changes.

**Macro benthos**

The organisms inhabiting the sediment are referred as benthos. Depending upon their size, benthic animals are divided into three categories, macrofauna, microfauna and meiofauna and macrofauna. Benthic community responses to environmental perturbations are useful in assessing the impact of anthropogenic perturbations on environmental quality. Macrobenthic organisms which are considered for the present study are animals with body size larger than 0.5 mm. The presence of benthic species in a given assemblage and its population density depend on numerous factors, both biotic and abiotic.

**Intertidal macrofauna**

During April 2010, Intertidal macrofauna was studied along 5 transects viz. 1 transect (Transect I) at Kalubhar Island and 4 transects at Narara Bet. Several locations were sampled along each transect between the HTL and the LTL viz; High Water (HW), Mid Water (MW) and Low Water (LW). The intertidal macrofaunal standing stock in terms of population density (50-7800 no/m<sup>2</sup>, av 2292 no/m<sup>2</sup>) and biomass (0.1-37.2 g/m<sup>2</sup>; wet wt, av. 9.2 g/m<sup>2</sup>; wet wt) varied widely During the post monsoon, only the first three transects were sampled. In October 2010, the intertidal macrofaunal standing stock in terms of population density ranged from 0-3625 no/m<sup>2</sup> (av 1185 no/m<sup>2</sup>) and biomass from 0-67.8 g/m<sup>2</sup>; wet wt (av. 14.6 g/m<sup>2</sup>; wet wt). These results are compared with historical data in Table 8.9.

**Table 8.9 Average of intertidal macro benthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m<sup>2</sup>) (B) Population density (no/m<sup>2</sup>) and (C) Total groups**

Transect		I	II	III	IV	V
April 2010	A	11.2	4.2	13.7	10.7	6.1
	B	3983	1172	1292	2401	2614
	C	5	3	6	6	3
Oct 2010	A	11.9	16.8	15.1	-	-
	B	1495	904	1156	-	-
	C	5	7	5	-	-

Overall, the intertidal region sustained good faunal standing stock and diversity and the contribution of major faunal components are comparable over the past many years at Narara Bet/Kalubhar.

**Subtidal macrofauna**

Subtidal macrofauna was studied at 13 stations in the coastal system off Vadinar during April 2010 and at 10 stations during October 2010. The distribution of subtidal faunal standing stock in terms of biomass (0.3 - 41.0 g/m<sup>2</sup>; av 8.0 g/m<sup>2</sup> wet wt) and population density (150-8925 no/m<sup>2</sup>; av 1902 no/m<sup>2</sup>) during April 2010. In October 2010 the biomass ranged from 0.3 – 23.9 g/m<sup>2</sup> (av 7.1 g/m<sup>2</sup>; wet wt) and population density ranged from 125-14975 no/m<sup>2</sup> (av 2282 no/m<sup>2</sup>) The current data is listed (April 2010 – Oct 2010) in Table 8.10.

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**Table 8.10 Average of subtidal macrobenthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m<sup>2</sup>) (B) Population density (no/m<sup>2</sup>) and (C) Total groups**

Area		Pathfinder	Nearshore	ESSAR DP	IOC SPM	ESSAR SPM	Salaya Creek	Gulf
April 2010	A	11.2	2.9	2.0	6.1	1.3	15.5	6.4
	B	3833	338	388	694	2375	1553	1865.5
	C	7	3	4	6	5	6	4
Oct 2010	A	12.1	7.7	1.9	4.9	1.8	-	10.6
	B	5019	2967	400	1169	181	-	1652
	C	8	5	4	4	2	-	7

The macrobenthic population was dominated by polychaetes (50.1%), amphipods (18.5%), pelecypods (8.2%), decapod larvae (7.4%), tanaids (3.6%) and foraminiferans (3.2%) during April and by polychaetes (76.3%), amphipods (12.3%) and pelecypods (5%) during October 2010.

### Corals and associated biota

Live corals at the Narara and Kalubhar reefs are mainly confined to the lower littoral (reef flat) and shallow subtidal zones (< 8 m). They are absent at the upper reef flat probably because of high rate of sedimentation and long exposure during low tide.

### Narara Bet

The eastern segment of Narara Bet represents a formation of vast mud flat, which resulted in significant negative influence on the live coral population. Many regions along the reef flat on the western side are exposed during low tide for prolonged periods because of which the distribution of live corals was poor. In all 30 and 22 Scleractinian species have been identified in the intertidal and subtidal zones respectively of Narara Bet with *Montipora*, *Goniopora*, *Porites*, *Favia*, *Favites*, *Goniastrea*, *Platygyra*, *Cyphastrea*, *Pseudosiderastrea*, *Turbinaria*, *Leptastrea* and *Symphyllia* as the dominant genera.

In general, the live coral density decreased with depth. The live corals were absent beyond 8 m (CD). However, the subtidal area at Narara sustained good coral populations within 5 m (CD). Distance-wise corals were rich within 250 m towards the sea from the LTL. The corals of the genera *Montipora*, *Porites*, *Favites*, *Goniastrea*, *Goniopora*, *Cyphastrea*, *Leptastrea*, *Favia* and *Turbinaria* dominated the subtidal area.

### Kalubhar

In general, Kalubhar reef sustained relatively healthy live corals at the lower intertidal and subtidal (<7 m depth) zones as compared to the population at the Narara reef. The north and north-west regions of Kalubhar had better coral density and diversity as compared to the east and south-east regions because of high sedimentation of the reef flat and the subtidal zones. Overall, 30 and 7 species of Scleractinians in the intertidal and subtidal zones respectively at Kalubhar have been identified. The corals at Kalubhar were mainly represented by genera *Montipora*, *Favia*, *Favites*, *Porites*, *Goniastrea*, *Goniopora*, *Cyphastrea*, *Platygyra*, and *Symphyllia* and *Turbinaria*. The live corals were absent at the reef edge of 50 m width due to total exposure for longer period whereas their coverage increased (90 to 100%) at the reef slope below 1 m depth.

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A rich reef associated flora and fauna was noticed at Kalubhar. The common and dominant seaweed genera were *Sargassum*, *Gelidiella*, *Acanthophora*, *Ulva*, *Caulerpa*, *Codium*, *Dictyota*, *Padina*, *Halymenia*, *Enteromorpha*, and *Gracillaria*. Varieties of sponges were associated with coral boulders. The fauna consisted of coelenterates (*Zoanthus* sp., *Discosoma* sp., *Stoichactis*, *giganteum*, *Cerianthus* sp. and variety of corals), annelids (various polychaetes), echiuroid (*Ikedella misakiensis*), crustaceans (amphipods, isopods, *Acetes* sp., shrimps and crabs), molluscs (*Octopus* sp., *Sepia* sp., *Loligo* sp., gastropods, bivalves, nudibranchs etc.) echinoderms and variety of reef fishes.

### **Fishery**

Gujarat ranks number one position in marine fish production in India. The Gulf contributes about 22% to the fish production of the state. The share of the Jamnagar District is between 5 and 14% (av 10%) to the State's total marine fish landings. The important fish landing centres in the vicinity of IOCL SPM area which falls under Khambalia zone are Vadinar, Bharana, Nana Amla and Salaya which together contributed about 6823 t, 8253 t and 5330 t of fish landings in 2006-07, 2007-08 and 2008-09 respectively to the total landings of the Jamnagar District. Similarly, the important fish landing centres in the vicinity of Sikka which falls under Jamnagar zone are Sachana, Baid, Sarmat, Bedi and Sikka which together contributed about 4768 t, 5122 t and 5848 t of fish landings in 2006-07, 2007-08 and 2008-09 respectively. Within the Jamnagar zone, the major landings (98%) were from Sachana (32%), Baid (27%), Sikka (19.7%) and Bedi (18.9%) during the last 3 years. Within the Khambalia zone, the major landings (81-89%) were at Salaya during the period 2006-09. On an average the Khambalia zone (56.5%) contributed to about 13% higher fish landings than Jamnagar zone (43.5%) for the last 3 years. However, the landings at Sikka (1.3%) and Vadinar (0.5%) to the total landings of the district were negligible during the period 2006-2009.

### **Reptiles and mammals**

The reptiles are mainly represented by marine turtles *Chelonia mydas* and *Lepidochelys olivacea* which breed and spawn on the sandy beach along the Sikka-Vadinar coast as well as on the islands.

Dolphin (*Dolphinus delphis*) and whale (*Balanoptera* sp) are common in the Gulf. Though occurrence of Dugong (*Dugong dugon*) in the Gulf particularly along the Jamnagar coast has been reported, there are no recent sightings.

The resources discussed above likely to be threatened are tidal flats, Phytoplankton, Phytopigments, Mangroves, seaweeds and seagrasses, Zooplankton, Macrobenthos, Corals and associated biota, salt works fishing activities and other vocational related to marine sensitive areas in the coast of Vadinar and Sikka.

It has been observed from the modeling study that during pre-monsoon season, the spills occurring at the APSEZL marine facilities move towards the southern / southwestern part of the Gulf of Kutch nearer to the facilities depending on tide phase.

The spills taking place at the APSEZL marine facilities move towards northern coast of Gulf of Kutch during monsoon season and affect the coast near Mundra, Kandla etc.

During post - monsoon season, the spills taking place at the APSEZL marine facilities move towards south / southwest and affect the islands /coast on southern side of the Gulf of Kutch.

### **2.7 Special local considerations**

Considering the distant proximity of various other installations with the port of Mundra, in case of a tier 1 spill, no other special considerations are deemed to be required apart from an active spill response close to the port facility itself.

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### 3 Response strategy

#### 3.1 Philosophy and objectives

This plan is intended to assist APSEZL in dealing with an accidental release or discharge of oil. Its primary purpose is to set in motion the necessary actions to stop or minimize the discharge and to mitigate its effects. Effective planning ensures that the necessary actions are taken in a structured, logical and timely manner.

This plan guides the HOD– Marine and his Duty Staff through the decisions which will be required in an incident response. The tables, figures and checklists provide a visible form of information, thus reducing the chance of oversight or error during the early stages of dealing with an emergency situation.

For this plan to be effective, it must be:

- familiar to those APSEZL staff with key response functions;
- regularly exercised; and,
- Reviewed and updated on a regular basis.

This plan uses a tiered response to oil and chemical pollution incidents. The plan is designed to deal with Tier One spillage. The products handled are likely to pose a greater fire and safety, rather than an environmental risk; there may thus be additional factors involving the safety of personnel, which will take precedence over the pollution response. In this case, reference must be made to the APSEZL Emergency Procedures Manual. The salvage and casualty management of any vessel that poses a threat of pollution is priority considerations.

During oil spill response activities, account must be taken of the following:

- site hazard information
- adherence to permit procedures
- spill site pre-entry briefing
- boat safety
- APSEZL safety manual and material safety data sheets
- Personal protective equipment needs
- heat stress
- decontamination

#### 3.2 Limiting and adverse conditions

APSEZL is situated in natural protected Gulf of Kutch and there are less incidences of heavy wind or any other factor affecting operation.

#### 3.3 Oil spill response in offshore zones

SPM handles (unloading) crude oil and pumps it to shore tank farm area through sub-sea pipeline. The impact of such spills on marine environment is on the higher side. Hence, oil spill equipments are required for combating oil in case of such spills at the marine facilities at Mundra.

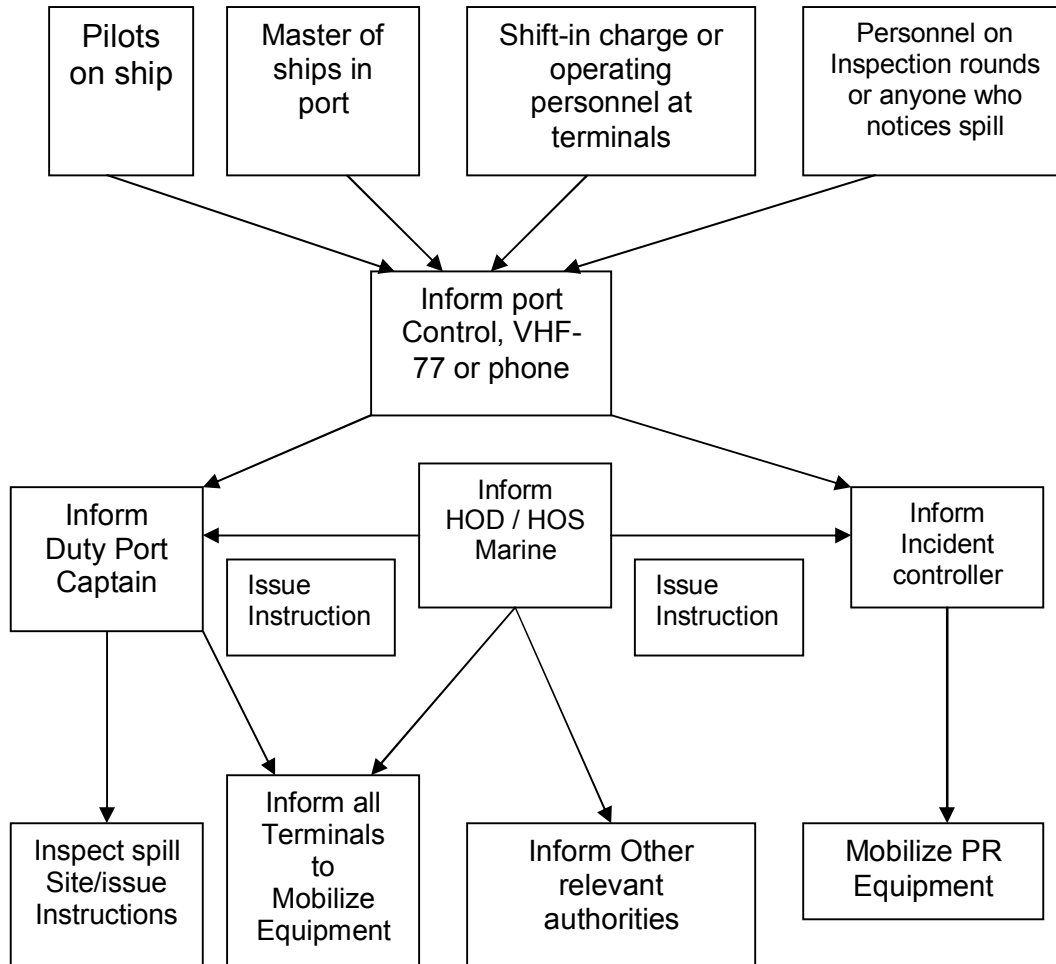
Based on the oil spill modeling study, it has been observed that crude oil spill of 700 tons (Tier-I) will spread over an area having radius of around 400 m within 4hr. APSEZL has already having facilities for combating a Tier-1 spill.

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3.4 Oil spill response in coastal zones

Contingency Chart to deal with Oil Spill



**On-site Crisis Management Group – Action Group**

In an emergency, the personnel available at or near the incident site play vital role. This concept is made use of in nominating the Key Persons. It is necessary to nominate a functionary as the Incident Controller who is invariably a shift-in-charge of the facility. The Incident Controller tackling the emergency in real times requires the support from various other services i.e. Fire & Safety, Medical Services covering communication, transport and personal functions etc. A key person for each of these services therefore, is nominated.

Overall in charge of these activities is **Chief Operating Officer – Mundra Port**. The different functional coordinators, designated, will co-ordinate with Chief Controller in their respective functional areas. It is suggested that key personal chart be developed, giving the names, designation, telephone nos. of top level personnel who will act as coordinators in different disciplines/services. The duties and the responsibilities of various Key Persons and Coordinators need to be written down on a chart and should be made available across the organization at the site / location.

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**Roles & Responsibilities**

**Incident Control Officer – (HOS – Marine / Duty Port Captain)**

- Directs and co-ordinates all field operations at the scene of the accident
- Assess incident/crisis at site, nature, location, severity, casualties, resource requirement
- Classifies incident - Advises Exe. Controller, Civil Defence, Dy. Conservator, Traffic Manager - regarding crisis severity status and emergency level, wind direction, temperature, casualties and resource requirements.
- **Conducts initial briefing to Chairman**
- Activates elements of the terminal emergency plan/ site response actions
- Protect port personnel and the public
- Directs security/fire fighting/oil spillage/gas leakage/vessel accidents/natural calamities, cargo operations shutdown
- Search for casualties and arrange first aid and hospitalization
- Brief or designate a person to brief, personnel at the incident scene
- Determine information needs and inform Crisis Management Group
- Coordinates all functional heads in field operations group to take action
- Manages incident operations to mitigate for re-entry and recovery
- Coordinate search and rescue operations
- Arrange evacuation of non-essential workers to assembly points –outside port
- Arranges tugs, mooring boats and pilot(s) for sailing vessel(s)
- Co-ordinates actions, requests for additional resources and periodic tactical and logistical briefings with Site Emergency Coordinator
- Coordinate incident termination and cleanup activities
- Instructs various emergency squads as necessary

**Site Emergency Coordinator – (Senior Pilot and Duty Radio Officer)**

- Direct operations from the emergency control center with assistance from Crisis Management Group
- Take over central responsibility from the Site incident controller (SIC)
- Decide level of crisis and whether to activate off site emergency plan
- Instruct SIC to sound appropriate alarm
- Direct the shutting down, evacuation and other operations at the port
- Monitor on site and off site personal protection, safety and accountability
- Monitor that casualties if any are given medical aid and relatives informed
- Exercise direct operational control of the works outside the affected works
- Monitor control of traffic movements within the port
- Coordinate with the senior operating staff of the fire, police and statutory authorities
- Issue authorized statements to the news media
- Review and assess possible developments to determine the most probable course of events
- Authorize the termination of the emergency situation by sounding the all clear siren-continuous long single tone siren for one minute
- Control rehabilitation of affected areas after emergency
- Arrange for a log of the emergency

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**Fire Coordinator – (HOS - Fire / HOS -Safety)**

(Under the direction of the Incident Control Officer)

- Announces fire incident point over the public address system and evacuates workers to the assembly points
- Informs fire station immediately and leads fire fighting team to the incident location
- Informs SIC if external fire tender / fire-fighting equipment / materials/mutual aid is required
- If necessary, arranges and activates other fire-fighting equipment
- Arranges safety equipment e.g. fire suits, protective gloves and goggles, breathing apparatus
- In liaison with Civil Engineering Department, ensures that adequate water pressure is maintained in the fire hydrant system/at the area supply
- Maintains adequate records

**HOS - Security / Duty Security Officer**

- Directs, gate security and facilitates evacuation, transport, first aid, rescue
- Controls the entry of unauthorized persons and vehicles-disperses crowd
- Permits the entry of authorized personnel and outside agencies for rescues operations without delay. Liaises with State police
- Allows the entry of emergency vehicles such as ambulances without hindrances
- Ensures that residents within port area are notified about disaster and instructs to evacuate if necessary
- Ensure that all people are aware of the assembly points, where the transportation vehicles are available
- Ensure that the people are as per the head count available with the assembly point section of that area
- Liaise with the Chief Medical Officer to ensure first aid is available at the assembly points
- Carry out a reconnaissance of the evacuated area before declaring the same as evacuated and report to SIC.

**Medical Superintendent**

- Direct medical team
- Set up casualty collection centre arrange first aid posts
- Arrange for adequate medicine, antidotes, oxygen, stretchers etc
- Contact and cooperate with local hospitals and ensure that the most likely injuries can be adequately treated at these facilities e.g. burns
- Advise Chief Emergency Controller on industrial hygiene and make sure that the facility personnel are not exposed to unacceptable levels of toxic compounds
- Make arrangements for transporting and treating the injured
- Inform the hospitals of the situation in case of a toxic release and appraise them of the antidotes necessary for the treatment
- Maintain a list of blood groups of each employee with special reference to rare blood groups
- Liaise with Govt. Hospitals/Red Cross

**Marine Pollution Coordinator – Manager (Marine / pollution control)**

- Minimizes the impact of an accident on the environment for which it would develop methodologies to control hazardous spills
- Monitors cooperation with emergency response squads to conduct the actual cleanup work during and after the emergency.

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- In case of fire and specially if the fire involves toxic/flammable materials, to ensure responsible actions for containing the run off fire water and other water from the damaged units
- Determines the level of contamination of the site as a result of the accident
- During cyclones/floods arranges sand bags and transfers important plans and documents to higher levels

**Traffic Coordinator – Duty Port Captain**

- Directs operation staff
- Prepares vessels to vacate from berth
- Arranges to protect cargo in vicinity from damage
- Arranges to segregate and shift cargo in sheds
- Submits consolidated list of dangerous goods in port including tankers in port and tank farms in port area
- Coordinates with ship owners / agents/C & F agents/stevedores

**Communications Officer – (Duty Port Captain / Duty Marine Control officer)**

- Ensure telephone operator/signal room advises entire emergency team
- On receipt of instructions from the chief Incident controller, notifies the fire brigade/police/hospitals/district collector/mutual aid partners
- Keep the switchboard open for emergency calls and transmit the same to the concerned personnel effectively
- Refrain from exchanging any information with authorized persons unless authorized to do so by the Chief Incident Controller
- Maintains contact with other vessels through VTMS

**Chief Emergency Controller – (Head - HSE)**

- Inform district emergency authorities-District Collector, Medical officer-Coast Guard Pollution control -Inspector of factories-Inspector of Dock Safety & Health,
- Activate the off site plan if necessary
- Liaise with Jt. Secy./Director MOST (Ministry of Shipping) or relevant Govt. authority
- Inform the media

**Civil Coordinator – (HOS – Environment cell / HOS - Estate)**

- Inform Gujarat Pollution Control Board and other environmental agencies about the incident for getting necessary guidance
- Instruct the contractors to carry out urgent civil works if required
- Hire the barges for collecting the spilled oil, if required

**Marine Engineering Coordinator – (HOS – SPM / Diving Team in-charge)**

- Organise the tugs for combating the pollution
- Start the rigging of pollution combating equipment on tugs/launches
- Hire additional crafts if required

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**HOD- Corporate affairs:**

- Collect detailed information periodically and liaise with press about the incident
- Arrange transport facilities, if required
- Inform local authorities/District Collector about the incident (as per EAP)

**HOS - Legal & HOD - Estate:**

- Issue notice under Major Port Trusts Act, Indian Ports Act(Prevention & Control of Pollution) Rules, etc; to the defaulting master/owner/agent
- Arrange for settlement of claims related to the pollution(as per EAP)

**3.5 Shoreline oil spill response**

Most oil spills reach the shorelines and cause visible oil pollution which is particularly sensitive to public opinion. The selection and correct application of clean up techniques are therefore essential. When an oil spill occurs on open water the optimal solution is to intercept and recover the oil before it reaches the shoreline. This is because:-

- The environmental damage is normally less critical in the open water environment
- The logistics of oil removal becomes more complex in the varied natural environment of coastlines compared with the open sea.
- The costs of oil recovery increases dramatically when oil reaches sensitive shorelines compared with open water operations.

Experience has shown that it is very difficult to avoid some oil reaching the shorelines. Mechanical equipment and chemical treatment at sea are often insufficient to recover all oil spilled at sea. When the oil reaches the shoreline, a number of different parameters specific for this particular situation have to be taken into consideration:-

- Quantity of oil
- Characteristics of the oil (for instance, toxicity and viscosity)
- Prevailing on-site conditions (weather, season, tides, temperature)
- Shoreline type or combination of types (cliffs, pebble, sand, marsh)
- Special Considerations

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

**Step 1: Assessment**

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

**Step 2: Select Clean-up Method**

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

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**Step 3: Clean-up Operations**

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

**Step 4: Termination / Monitoring**

- Ongoing assessment of clean-up operations
- Determine when clean-up objectives have been met
- Post-spill monitoring to confirm recovery of shoreline features, biota

**The four main methods for shoreline clean-up are as follows:-**

**A. Pumping and Skimming Techniques**

- Applicable to shorelines that are heavily oiled.
- Often the first step in cleaning a heavily contaminated shoreline.
- Preferred option because it results in fluid wastes that are relatively free of sediments and debris, which are more easily dealt with in disposal.
- Pumping and skimming techniques can also be used in conjunction with flushing techniques.

**B. Flushing Techniques**

- Use water or steam to flush oil from the beach, and direct it to a recovery location.
- Applicable to heavily contaminated beaches, and substrates that are relatively impermeable (e.g., mud and saturated beaches, boulders, and man-made structures) that will not allow the flushed oil to penetrate the beach surface.
- Typically carried out in conjunction with a skimming operation. The flushed oil is directed down-slope to skimmers positioned at the water's edge, with booms deployed around the skimmers to prevent any loss of the water.
- Options of using low or high pressure water, and of using ambient temperature water versus warm water or steam.
- Low pressure, cold water is generally the least effective, particularly with sticky oils and emulsions, but is least harmful on the environment.
- High pressure water and heated water and steam are more effective, but may remove and/or kill beach-dwelling organisms.

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C. Sediment Removal Techniques

- Applicable to a variety of shoreline types, and in particular, when the shoreline is heavily contaminated, though likely to cause the greatest environmental impact
- The requirements are access for the heavy equipment required for transporting away oily debris and sediments for disposal and a surface which is able to support heavy equipment
- An important factor to consider is the depth of oil penetration
- Important to limit the depth of material removed in order to minimise disturbance to the beach, and to minimise disposal requirements
- The best option is to use manual labour to pick up the oily sediment and mechanical means to transport it away

D. Biodegradation Techniques

- Generally refers to "active" bioremediation, where nutrients and/or microorganisms are applied to enhance natural degradation
- Generally suitable for areas that are lightly oiled, especially lightly oiled salt marshes and tidal flats where the use of equipment could increase the environmental effects by forcing oil into the substrate
- It can also be used as a final clean-up step following more active efforts

The shoreline clean-up operation is normally not an emergency operation as is the case with an oil spill on open water. A clean-up project can last many weeks or months depending on the amount of oil spilled. Many wrong decisions can be made in planning and carrying out a shoreline clean-up operation. The contingency plan must be used in combination with consulting experts with experience of shoreline clean up. The agencies such as NIO, NEERI, Ports and Oil companies have experts with experience which is relevant for the specific oil spill situation and they should be consulted prior undertaking shoreline clean-up.

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### 3.6 Storage and disposal of oil and oily waste

After the natural degradation by coagulation and evaporation of oil on water, residual oil and waste material collected during a Tier 1 response will be disposed off by in-situ or terrestrial burning.

	Type of material	Separation methods	Disposal methods
LIQUIDS	Non-emulsified oils	Gravity separation of free water	Use of recovered oil as fuel or refinery feedstock
	Emulsified oils	Emulsion broken to release water by ; - Heat treatment - Emulsion breaking chemicals - Mixing with sand	Use of recovered oil as fuel or refinery feedstock. Burning Return of separated sand to source.
SOLIDS	Oil mixed with sand	Collection of liquid oil leaching from sand during temporary storage Extraction of oil from sand by washing with water or solvent Removal of solid oil by sieving	Use of recovered oil as fuel or refinery feedstock. Direct disposal Stabilization with inorganic material. Degradation through land farming or composting. Burning
	Oil mixed with cobbles, pebbles or shingle	Collection of liquid oil leaching from beach material during temporary storage Extraction of oil from beach material by washing with water or solvents	Direct disposal. Burning
	Oil mixed with wood, plastics, sea weeds, sorbents	Collection of liquids leaching from debris during temporary storage Flushing of oil from debris with water	Direct disposal. Burning. Degradation through land farming or composting for oil mixed with sea weeds or natural sorbents.
	Tar balls	Separation from sand by sieving	Direct disposal Burning

#### Location for Dug Pond for temporary storage of oily water:

To store the contaminated oily water, temporary dug pond will be excavated for storage of oily water. It is expected that 20 times volume of oil & water mixture will be generated if oil spill happen in the sea. Storage capacity of dug pond of volume 14000 m<sup>3</sup> considering spill of level 1 (Tier-1) is required.

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Location Identified for Dug Pond behind Maruti Yard (Lat. 22° 45.252'N , Long. 69° 41.093'E) is roposed.



- Size of Dug Pond to be provided : 100 mtr X 100mtr X 1.5mtr
- Total storage capacity (m3) : considering 20 times oily water @ 700 m3 = 14000 m3

Once the contaminated mixture of oil and water is stored, the same will be transferred via tanker to following location. Following are the steps require to be followed.

1. Oil Water Separator: Capacity 25 m3/hr.
2. Effluent Treatment Plant: Capacity 120 KLD
3. Parallely oil recyclers will be approached for the collection and transportation of the oily water.
4. Contaminated Soil / Sediments will be directly sent to the Treatment Storage and Disposal Facility (TSDF) site. List of Oil recyclers and TSDF sites are shown in Annexure – 15
5. Different types of equipment & manpower require for creating dug pond:

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Name of Equipment	Quantity	Primary Responsibility of Equipment & Material	Secondary Responsibility
Excavator	10 Nos.	Marine Dept.	MHS section (Dry Cargo) / Asset Department / Procurement
JCB Machines	10 Nos.	Marine Dept.	ES Civil / Asset Department / Procurement
<b>Material</b>			
HDPE Liners for dug pond	10600 Sq. mtr.	Marine Dept.	Stores & Procurement

In phase wise manner stored oily water will be treated at both the above facility to separate oil from water to the possible extent. Whereas, after recovery of oil from water, water confirming to the effluent discharge limit of oil (< 10 ppm) will be discharged in to sea.

Whereas in case oily water will not capable of treat at OWS & ETP will be dispose through sending it to registered recyclers, for which APSEZL have already done tie up with the registered recyclers as mentioned in **Annexure – 15**.

APSEZL have also done necessary tie up with various institutes/agency/NGO as mentioned in **Annexure – 16** for providing service for rescue & rehabilitation of oil soaked birds as well as restoration of mangroves, when oil reaches to the sea shore and mangrove areas during oil spill. Mobile van / vehicle require for rescue of oil soaked birds to transfer from affected area to treatment facility center.

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## 4 Equipment

### 4.1 Marine oil spill response equipment

Detailed in Annexure 3

### 4.2 Inspection, maintenance and testing

The equipments are being kept in working condition. Routine inspection, maintenance and testing performed as per the stipulated requirements.

### 4.3 Shoreline equipment, supplies and services

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

- Protective clothing for everybody (including boots and gloves), spare clothing.
- Cleaning material, rags, soap, detergents, and brushes.
- Equipment to clean clothes, machinery, etc., with jets of hot water.
- Plastic bags (heavy duty) for collecting oily debris.
- Heavy duty plastic sheets for storage areas especially for the lining of temporary storage pits.
- Spades, shovels, scrapers, buckets, rakes
- Ropes and lines
- Anchors, buoys
- Lamps and portable generators
- Whistles
- First Aid material.

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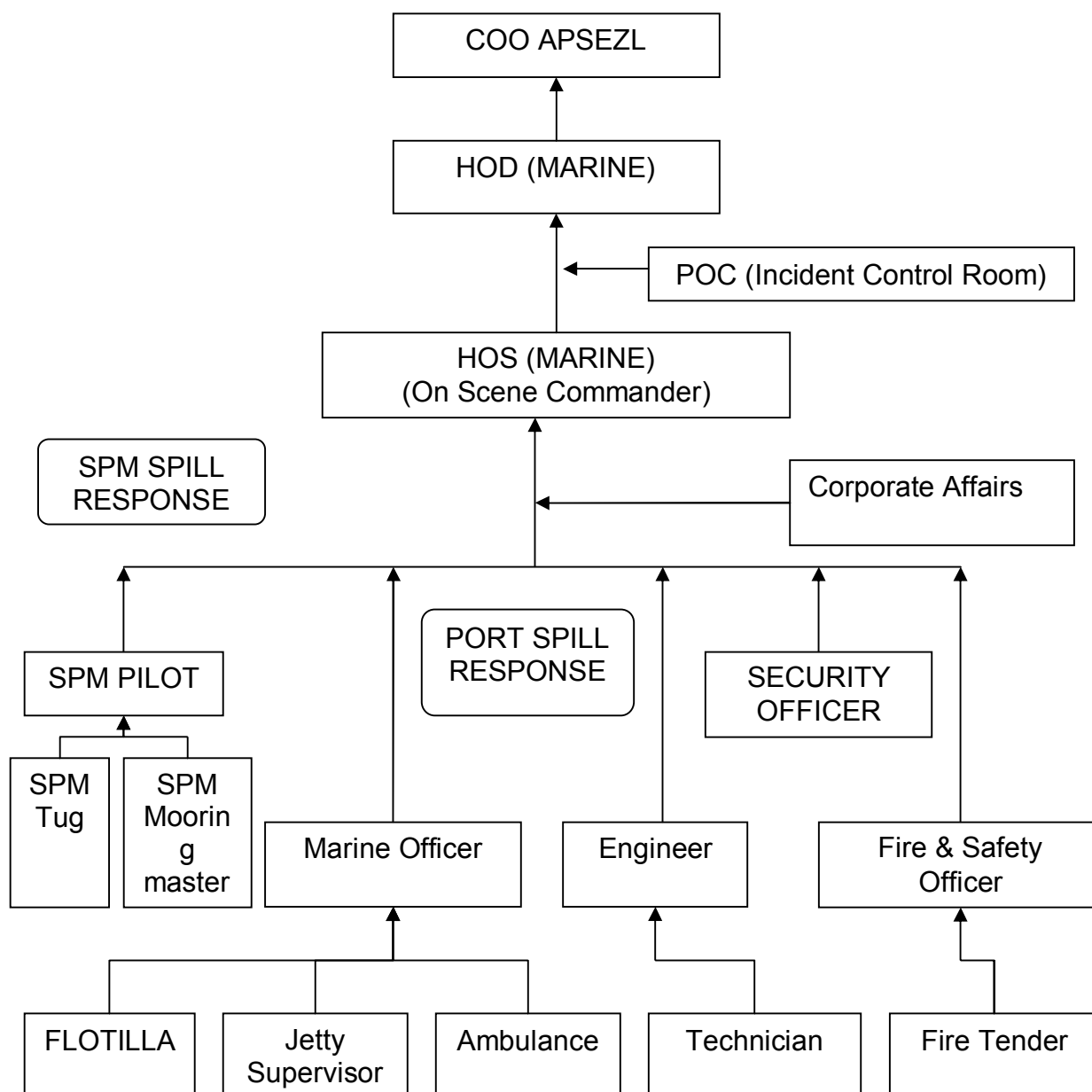
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## 5 Management

### 5.1 Crisis manager and financial authorities

The COO of APSEZL is the final authority of the oil spill response in case of a Tier 1 scenario. He is responsible for raising the level of the response if required and summoning additional help. The authority of all financial decisions rest with him.

### 5.2 Incident organization chart



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### **5.3 Manpower availability (on-site, on call)**

In an event of incident Kandla Port Trust, Gujarat Maritime Board, Gulf of Kutch Ports, District and Regional plans are deemed to have been implemented. Adani Ports and Special Economic Zone Limited (APSEZL) manpower and resources will be put at the disposal and will be deployed as required, provided APSEZL is the polluter and spill is within the Port Limits.

In the event of APSEZL not being the polluter and any event outside the port limit of Adani Port, APSEZL equipment will be subject to mutual assistance plan and it will be the responsibility of the above forum.

### **5.4 Availability of additional manpower**

Similarly in the event of APSEZL being the polluter, additional manpower and supplies can be requested from the resources which are part of this forum.

A numbers of private parties have their labor force working round the clock in the port and on call these can be available.

### **5.5 Advisors and experts – spill response, wildlife and marine environment**

APSEZL, being the nodal agency in this LOS-DCP, will function as the main agency. In the event of the emergency getting raised to higher tier, i.e. in case the incidence becomes a national disaster, the help and advice of Indian Coast Guard will be taken.

### **5.6 Training / safety schedules and drill / exercise programme**

Training of all APSEZL staff who may get involved in implementing this plan is acknowledged. In house and external facilities (of ICG) are used periodically to impart training as per matrix below. Marine Manager has been appointed as training coordinator and custodian of oil pollution equipment. He shall organize training, drills and inspection of equipment as per the plan in force.

<b>Training Module</b>	<b>Duration</b>	<b>Frequency</b>	<b>Participants</b>	<b>Remarks</b>
IMO Model Course	2-5 days	Once	Key persons	By Maritime Training Institute
Oil Spill	1-5 days	Once every 5 years	Key persons	Coast Guard
Oil spill equipment	1-5 days	Once every Year	Managers	In house
Oil spillManagement course	1 day	Once every year	Managers & junior staff	In house for in-depth knowledge
Notification exercise	1-2 hours	6 months	Operational staff	Check systems & communication
Table top	2-6 hours	12 months	Managers	Interactive discussions
Incident	6-8 hours	12 months with others	All	Mock drill

**Number of IMO Level-1 and IMO Level-2 qualified staff available with Adani Ports and SEZ Ltd, Mundra:**

**IMO Level-1 - 28**

**IMO Level-2 - 04**

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## 6 Communications

### 6.1 Incident control room facilities

Detailed in Annexure 3

### 6.2 Field communication equipment

Detailed in Annexure 3

### 6.3 Reports, manuals, maps, charts and incident logs

A copy of the relevant manual is kept with HOD – Marine. Maps/ Charts of APSEZL are kept in Marine Control Tower and attached in Annexures

## Action and operations

## 7 Initial procedures

### 7.1 Notification of oil spill to concerned authorities

The emergency (due to spill) should be initiated by the first person noticing it by activating the fire alarm from the nearest call-point or by contacting the fire control room immediately on the internal telephone or through mobile phone or through VHF Channel.

The SPM Pilot or On Scene Commander will report the spill to the Marine Control Room.

### 7.2 Preliminary estimate of response tier

The first few minutes after the incident / accident are invariably the most critical period in prevention of escalation. Therefore the person available at or near the incident site (and often responsible for carrying out that particular activity) on round the clock basis play a vital role in an emergency. The SPM Pilot or On Scene Commander will report the spill to the control room along with his estimate of the response tier.

### 7.3 Notifying key team members and authorities

Statutory First Information Report (FIR - given in annexure 1) is to be communicated by fastest means possible to President, GMB port and CG at Porbandar followed by full Pollution Report (POLREP – given in annexure 2). The report is to be updated, should the oil spill not be contained and likely to increase to Tier 2

### 7.4 Manning Control Room

Auxiliary control center is located at Port Operation Centre. Escalation of emergency if any is monitored here. Statutory reporting procedures of FIR and POLREP of developing situation and action taken are also sent from this center. The detail of the contacts to whom the information is to be given is placed at Annexure 4.

### 7.5 Collecting information (oil type, sea / wind forecasts, aerial surveillance, beach reports)

Marine Manager has the responsibility of arranging the collection of the relevant information which will help in mitigating the emergency

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#### **7.6 Estimating fate of slick (24, 48, 72 hours)**

Considering the prevalent tidal stream, wind and weather conditions, section 8.3 is to be used in estimating the fate of the slick

#### **7.7 Identifying resources immediately at risk, informing parties**

Depending on the quantity of fluid spilled and the prevalent wind & weather conditions, the resources / facilities immediately at risk have to be identified by the On scene commander and the concerned parties informed.

### **8 Operations planning**

#### **8.1 Assembling full response team**

On being appraised of the spill, the duty marine officer will inform the marine manager, who will, in turn initiate the assembly of the complete response team which essentially involves relaying information to all relevant personnel, parties and authorities and informing them of the initial response requirements.

#### **8.2 Identifying immediate response priorities**

Depending on the initial estimated response tier and the prevalent weather conditions, the marine manager, in consultation with the on scene SPM pilot / marine officer will identify the immediate resources at risk and the response priorities.

#### **8.3 Mobilizing immediate response**

The Manager - Marine will initiate the mobilization procedure of the spill equipment, resources and personnel depending on the scale of emergency at hand.

#### **8.4 Media briefing**

No other person is authorized to communicate with any external party by any means whatsoever unless expressly permitted by the HOD – Marine or COO, APSEZL.

#### **8.5 Planning medium-term operations (24, 48 and 72 hour)**

The HOD – Marine will plan the subsequent action to be taken in response to the tier 1 spill after the initial response is well under way and its consequences / effectiveness are duly evaluated.

#### **8.6 Deciding to escalate response to higher tier**

After carefully assessing the scenario and appraising the efficiency of the initial response in the prevalent conditions, the HOD – Marine will decide whether or not to escalate the response.

#### **8.7 Mobilizing or placing on standby resources required**

It is recommended that in case of a doubt (as the exact estimate of the quantity of oil spilled is quite difficult and the boundaries between the tiers will inevitably be blurred) it is important to be prepared to involve the next higher tier from the earliest moments. It is easier to stand down an alerted system than to try to escalate a response by calling up unprepared reserves at a late stage.

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### **8.8 Establishing field command post communications**

Communications between the Emergency Response Center/ Marine Control room and marine personnel during the response to any oil spillage will be primarily by VHF marine band radio on Channel 73 or 77

Communications between the Marine Control Room and other vessels will be established on VHF radio Channel 16 and will thereafter be conducted on Channel 73 / 77.

Use of cellular telephones will be minimized.

Communications between the Emergency Response Center/ Marine Control Room and external authorities and organizations will be undertaken by telephone and facsimile.

## **9 Control of operations**

### **9.1 Establishing a Management team with experts and advisors**

Detailed in Annexure 4

### **9.2 Updating information (sea, wind, weather forecasts, aerial surveillance, beach reports)**

The Marine Control Room is well equipped in assimilating data on weather and its forecasts. In case of a Tier 1 response, aerial surveillance and beach reports are not deemed to be essential

### **9.3 Reviewing and planning operations**

Ongoing response and its influence in mitigating the situation will have to be constantly under review in order to contain the spill at the earliest.

### **9.4 Obtaining additional equipment, supplies, manpower**

While deciding not to elevate the tier of the response the HOD- marine may still request additional resources from nearby port facilities which are essentially members of the common forum and are obliged to assist.

### **9.5 Preparing daily incident log and management reports**

A complete report will be submitted by the Marine Manager to the HOD (Marine) every morning (in case the response extends to more than 1 day).

Format for the above report in Annexure 9

### **9.6 Preparing operations accounting and financial reports**

The Port's accounting department will assess the expenditure incurred in the ongoing operation and submit a report to the President's office.

### **9.7 Preparing releases for public and press conferences**

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite press releases from time to time and hold press conferences.

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**9.8 Briefing local and government officials**

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite reports to brief local and government officials..

**10 Termination of operations**

**10.1 Deciding final and optimal levels of beach clean-up**

If at all a distant beach is affected, the COO APSEZL office will decide the optimal levels of cleanup in consultation with the conservator of the port – Gujarat Maritime Board Port Officer.

**10.2 Standing down equipment, cleaning, maintaining, replacing**

Considering the natural disintegration of the residual oil on water after the cleanup of the bulk amount, The HOD – Marine will decide when to stand down the response. The resources which have been used will have to be re-instated to the original condition by elaborate cleanup or replacement.

**10.3 Preparing formal detailed report**

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite reports to brief local and government officials and media.

**10.4 Reviewing plans and procedures from lessons learnt**

A complete spill response report will be produced by the Marine manager providing comprehensive and all-inclusive details of the circumstances leading to the spill, initial response and consequent affect of the same, subsequent follow up, effect of prevailing weather, adverse situations, safety issues, difficulties faced and lessons learnt.

Requisite changes will be affected to this plan on basis of such report.

Such a report will also be prepared by the marine manager after each drill or training session and requisite modification(s) incorporated to the plan in order to enhance the overall efficacy of the same.

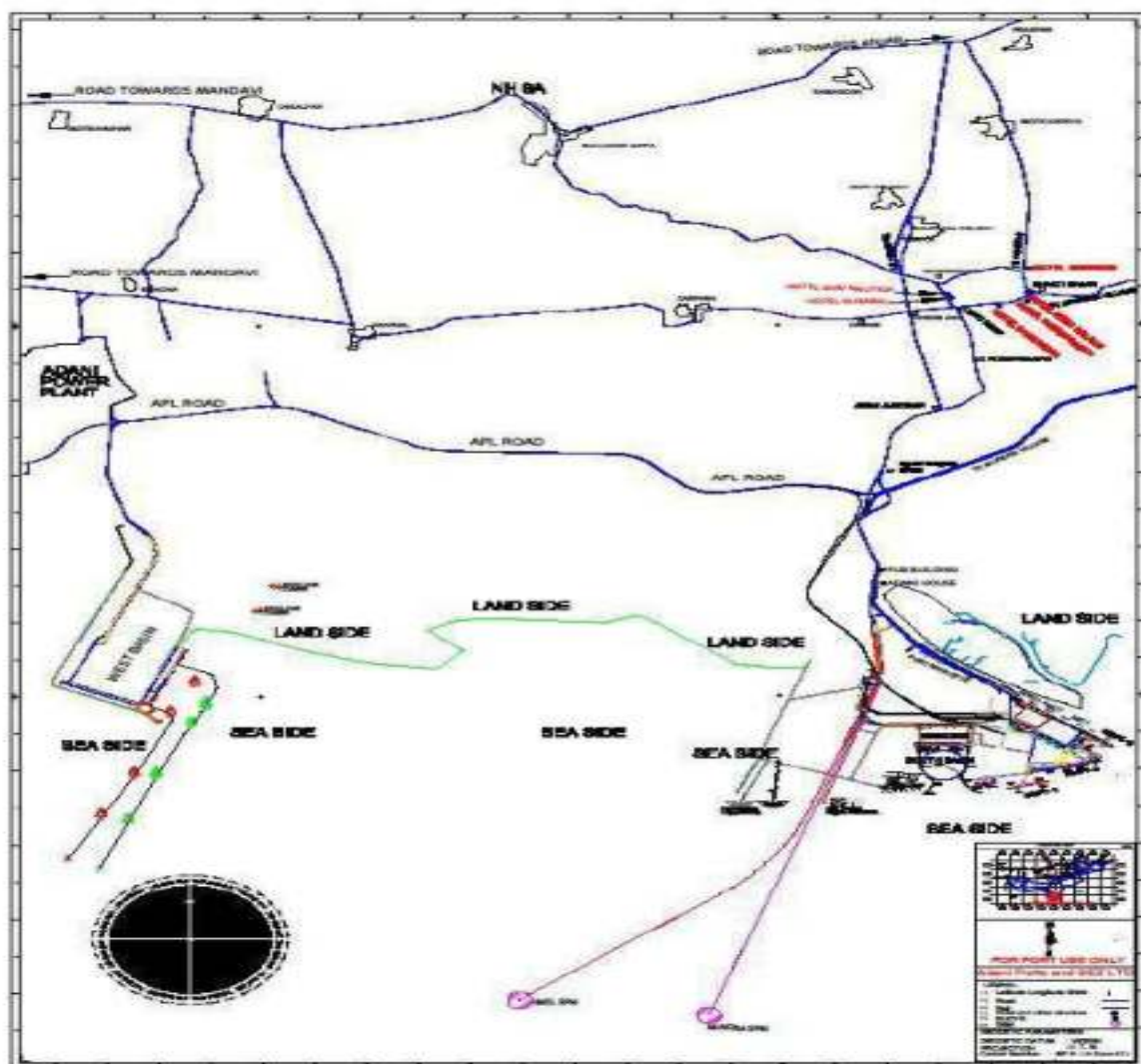
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**Data Directory**

**Maps / Charts**

**1. Coastal facilities, access roads, hotels etc.**



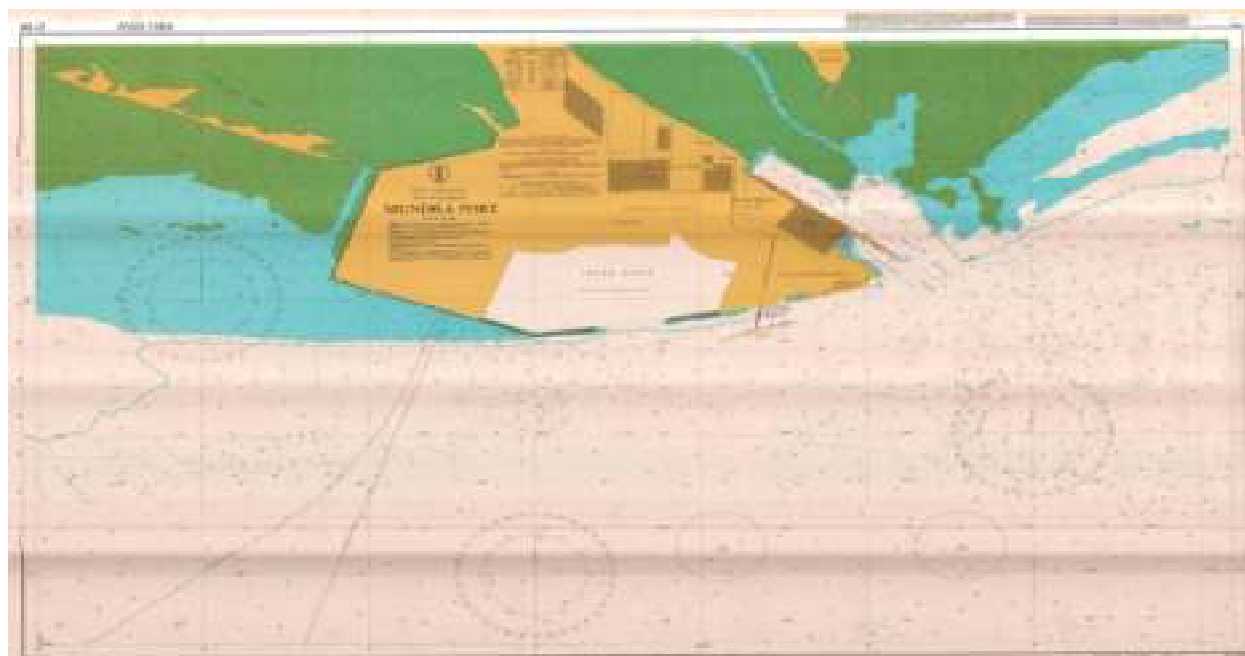
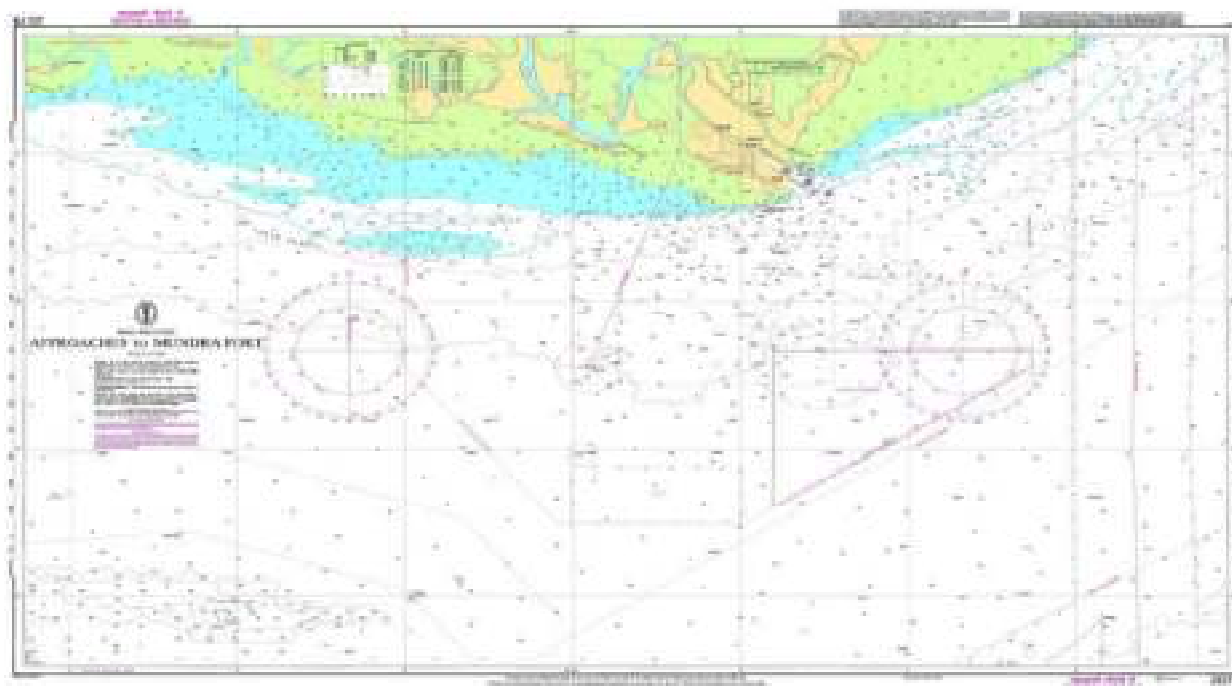
**Telephones:** Detailed in Annexure 4

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**2. Coastal charts, currents, tidal information (ranges and streams), prevailing winds**

Currents, tidal information (ranges and streams) : Detailed in Annexure- II, Annexure- III and Annexure- IV (Volume 2) of Oil Spill Risk Assessment



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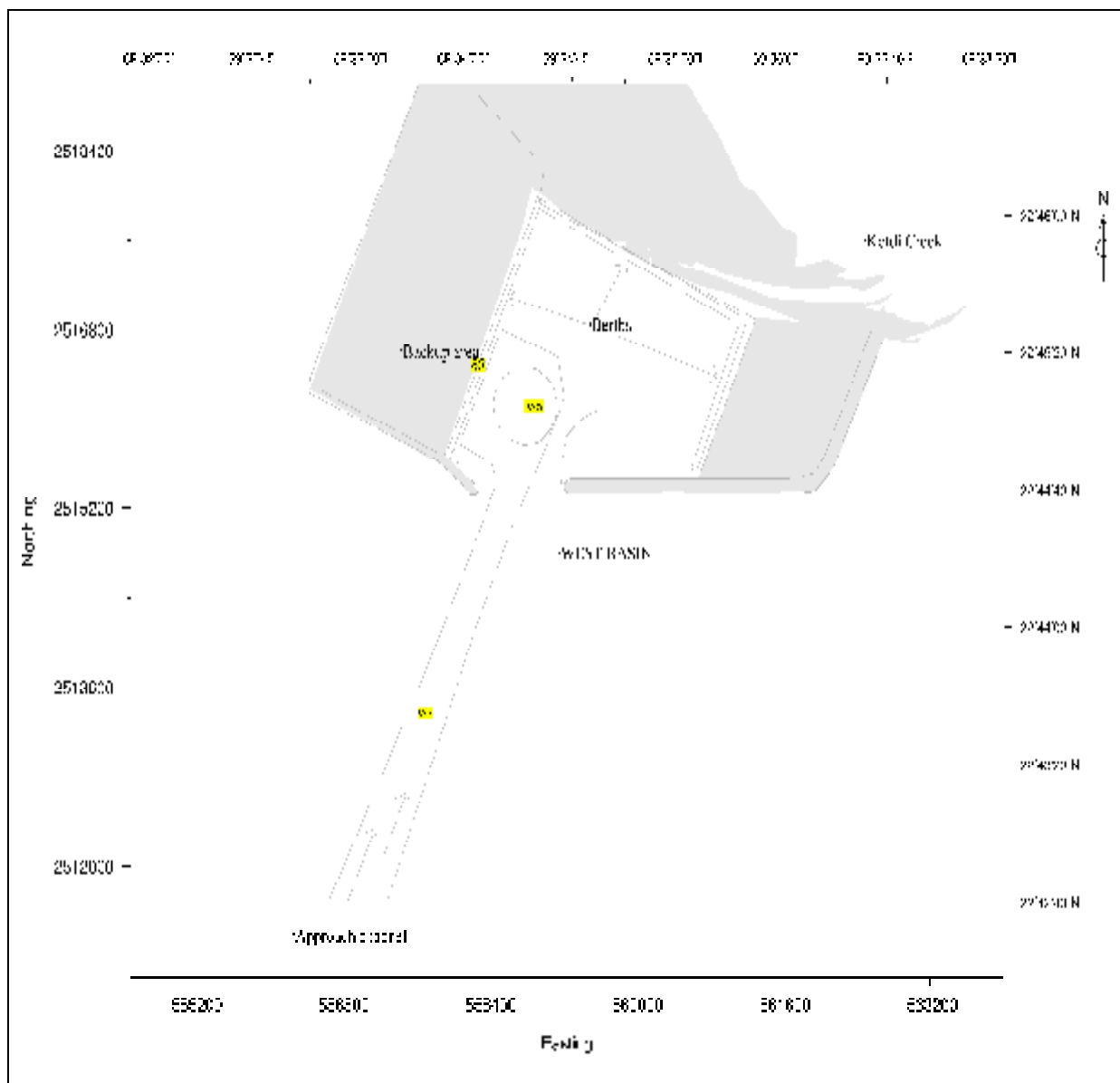


Fig.2: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for West Basin

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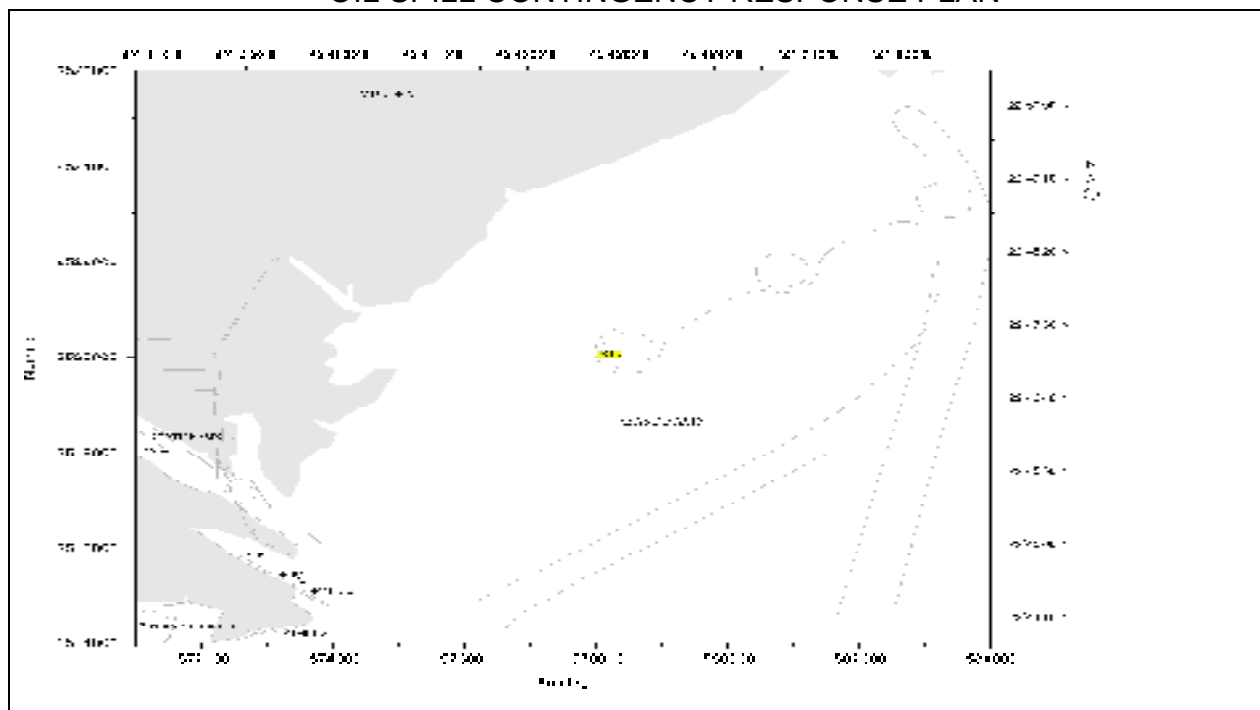
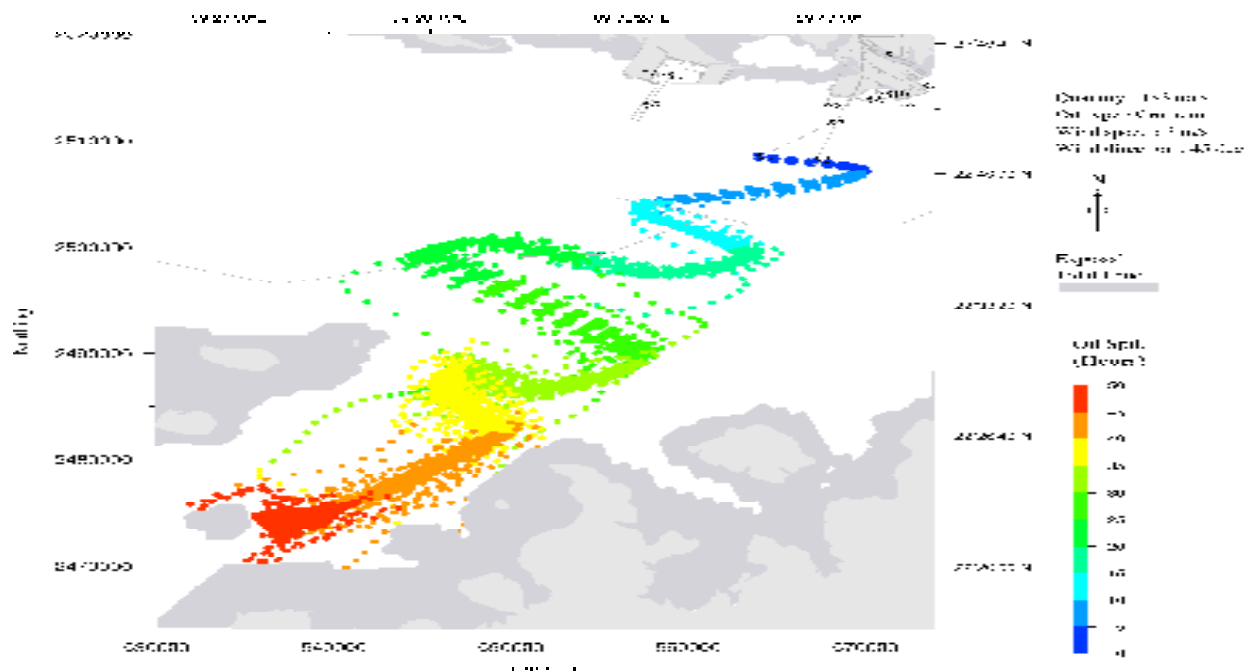


Fig.3: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for North Basin & East Basin

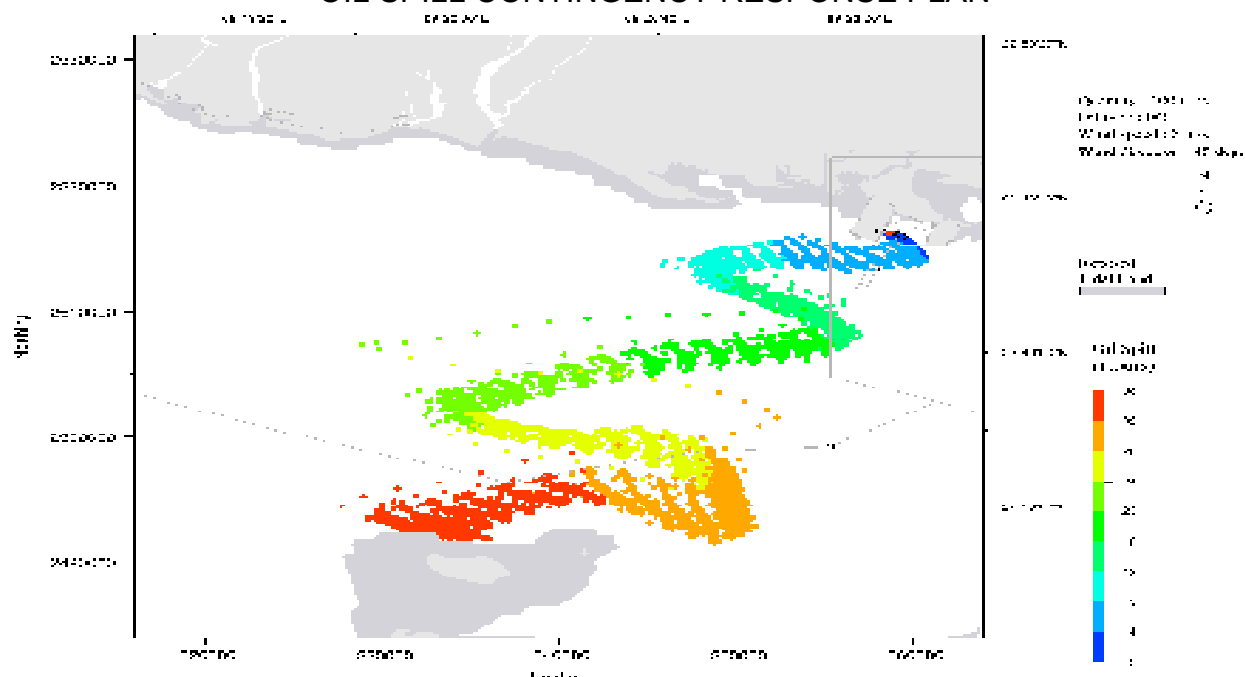


Oil Spill trajectory due to instantaneous crude oil leakage of 700 t (due to collision) at spill point S1 (HMEL SPM) after 50 hours during flood condition of the neap tide

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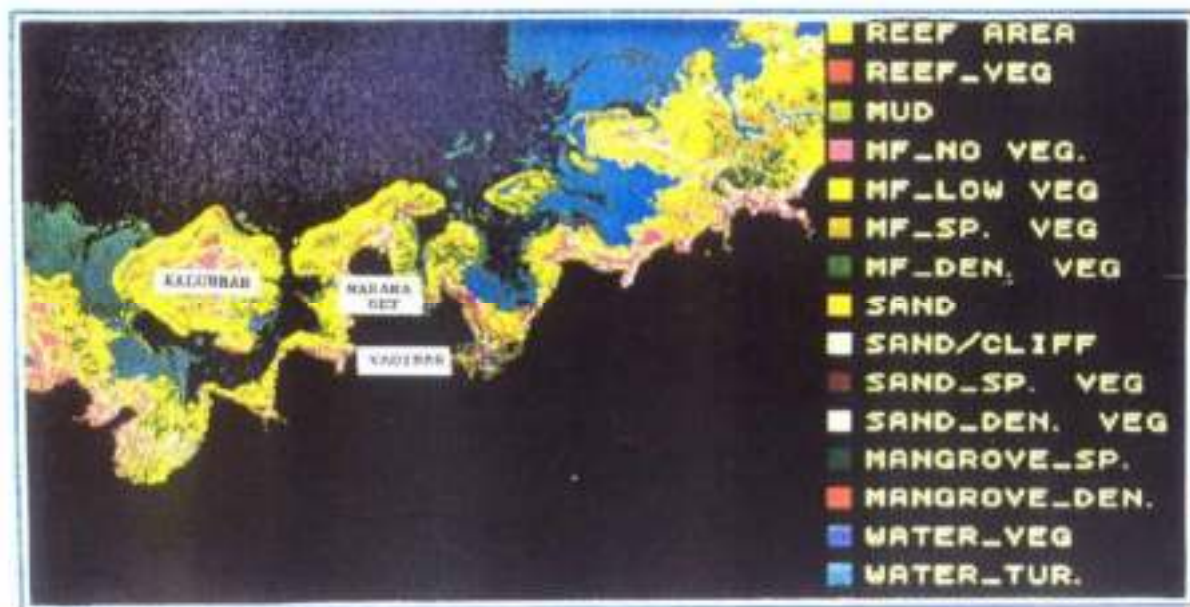
## OIL SPILL CONTINGENCY RESPONSE PLAN



Oil Spill trajectory due to instantaneous FO leakage of 700 t (due to hull failure/ fire / explosion) at typical berth location in the West Basin

For Risk locations and probable fate of oil refer Annexure- V (Volume 2) of Oil Spill Risk Assessment.

### Shoreline resources for priority protection



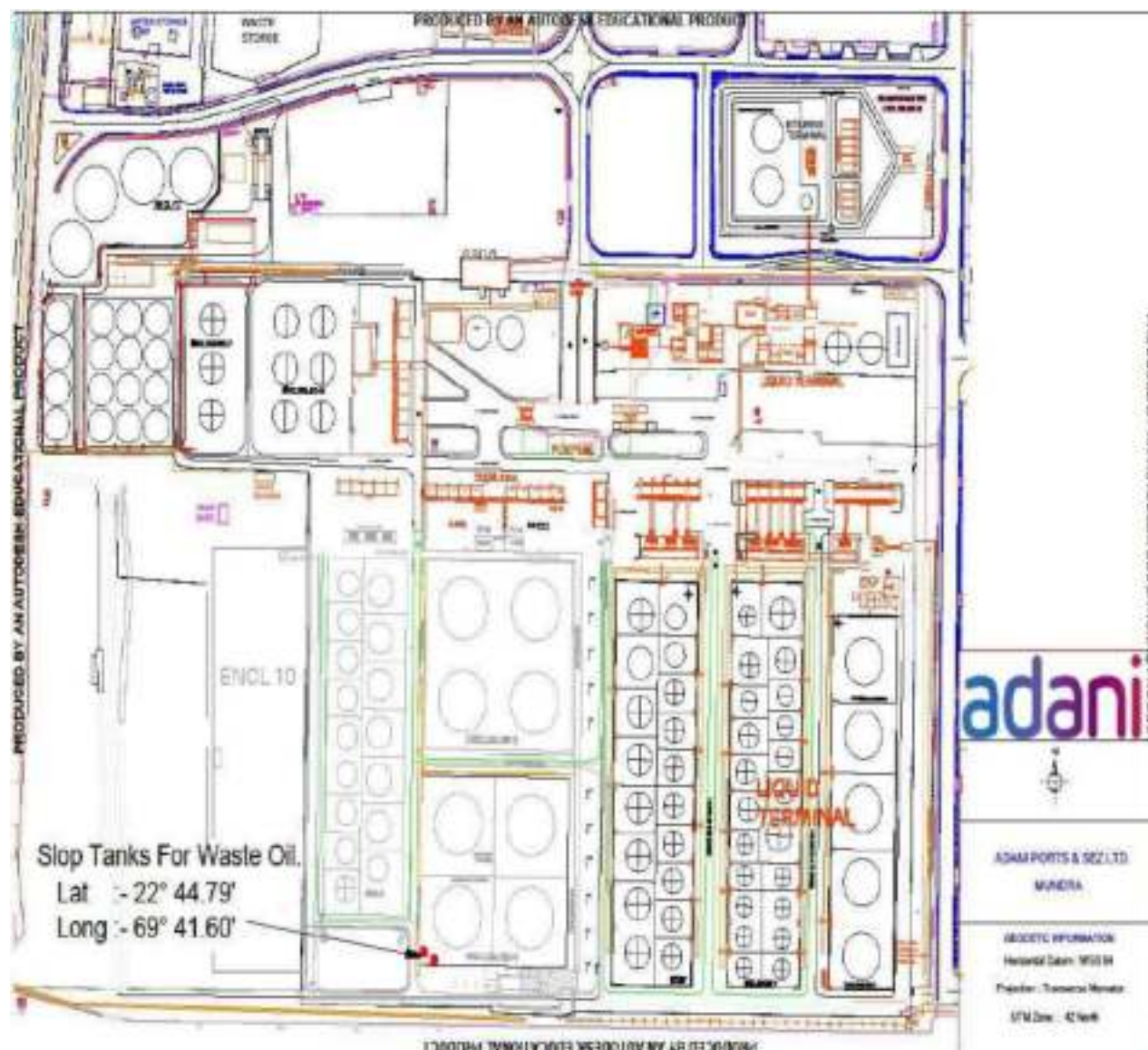
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Oil and Waste Storage / Disposal sites

Oil and Waste storage / Disposal tank No. 46, 109 and 110 are available within Liquid Tank farm.



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**Sensitivity Maps/ Atlas**

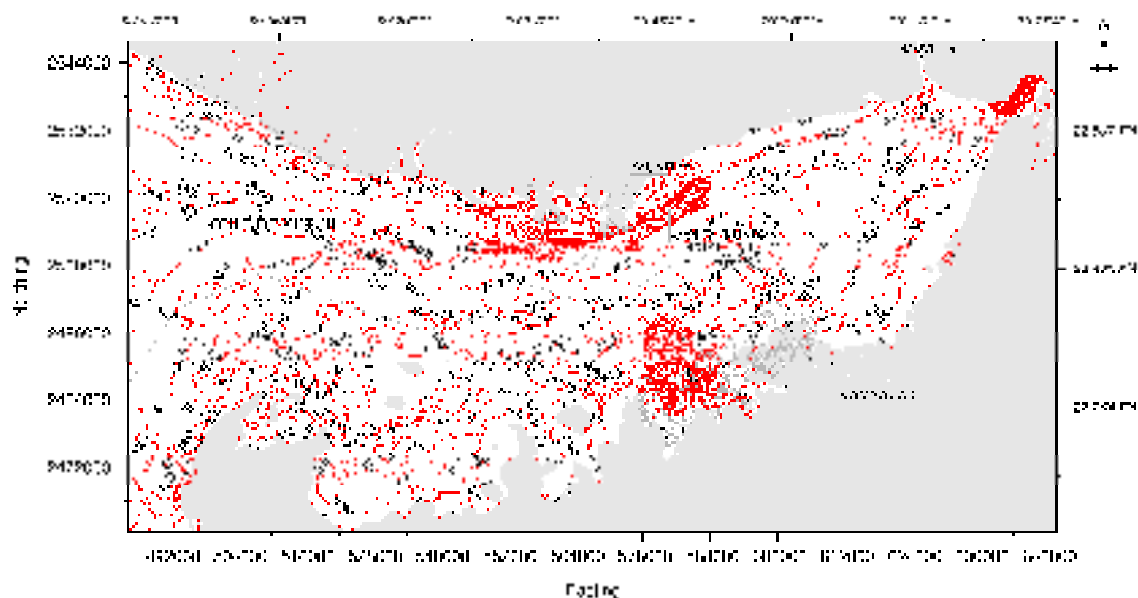


Fig.A1.1 Terrain features of study domain.

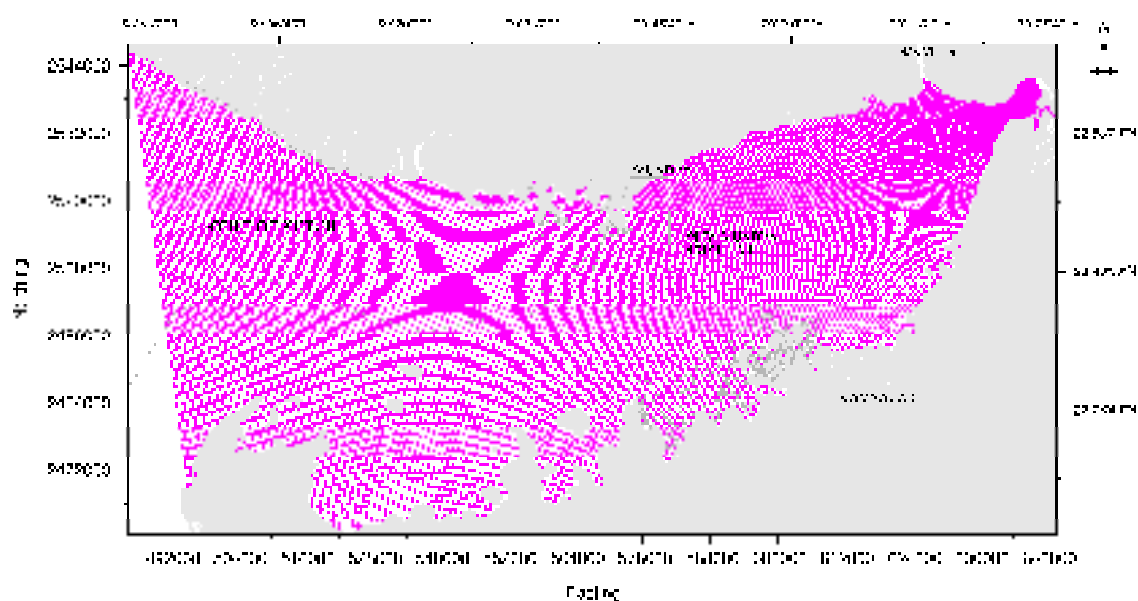


Fig.A1.2 Computational grid

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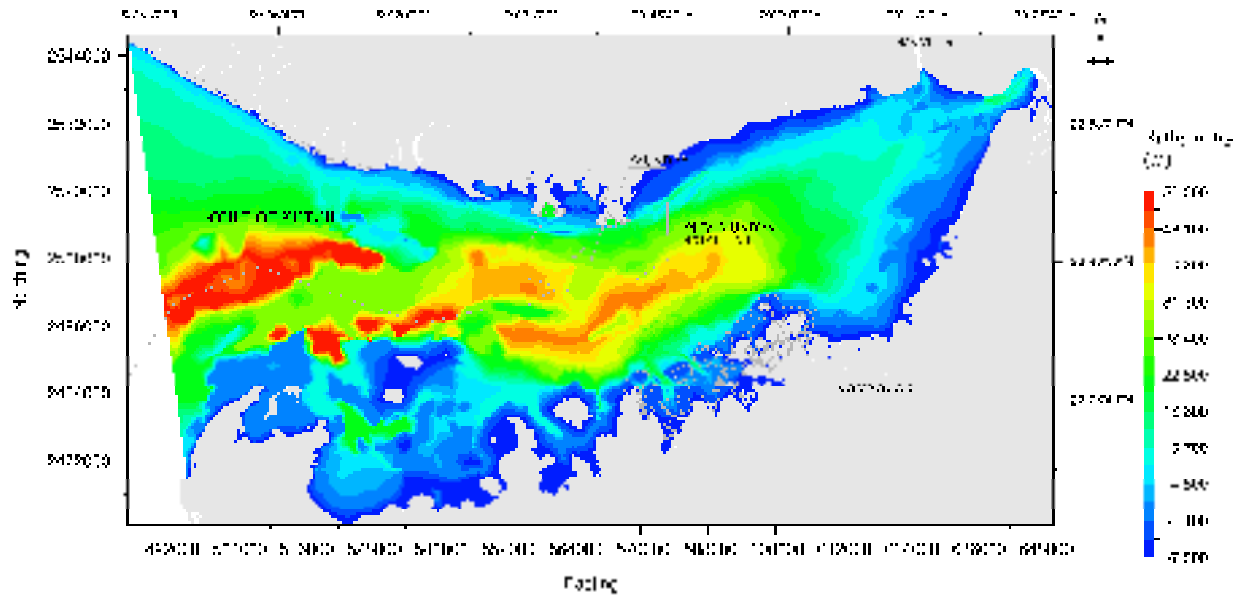


Fig.A1.3 Interpolated depth contours

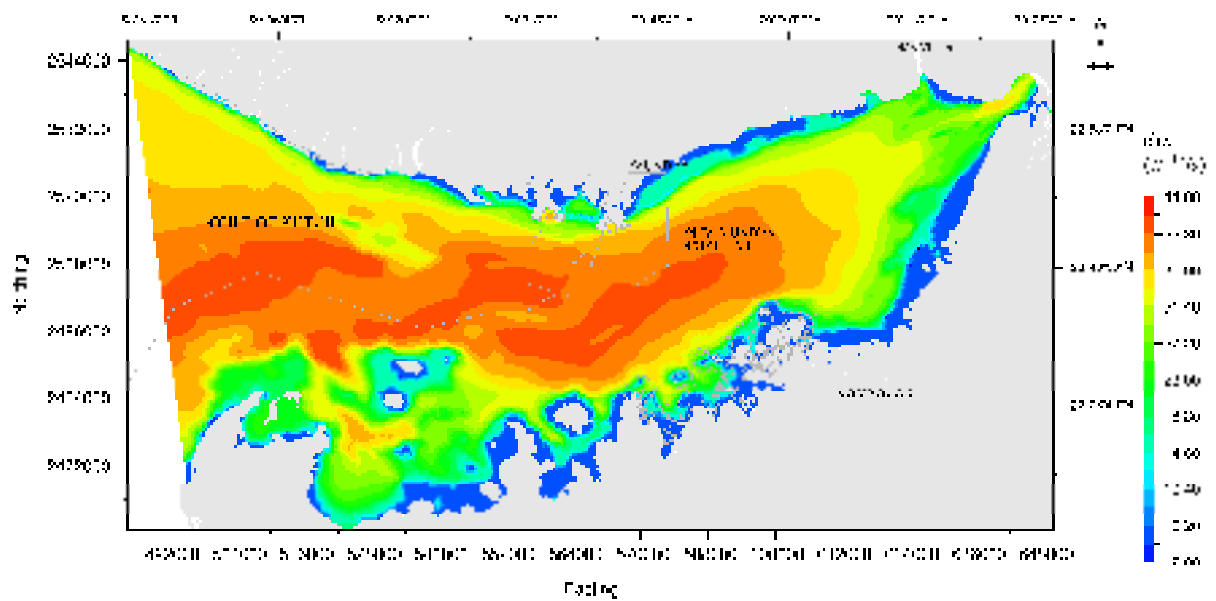


Fig.A1.4 Chezy's coefficient

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**Lists**

1. **Primary Oil spill Equipment:** booms, skimmers, spray equipment, dispersant, absorbents, oil storage, Radio communications etc.

Detailed in Annexure 3

2. **Auxiliary Equipment:** Tugs and work boats, aircraft, vacuum trucks, tanks and barges, loaders and graders, plastic bags, tools, protective clothing, communication equipment etc.

Detailed in Annexure 3

3. **Support Equipment:** Aircraft, communications, catering, housing, transport, field sanitation and shelter etc. (Availability, contact, cost and conditions)

Not applicable

4. **Sources of Manpower:** Contractors, local authorities, caterers, security firms (Availability, numbers, skills, contact, cost and conditions)

Refer Para 5.3

5. **Experts and Advisors:** Environment, safety, auditing (Availability, contact, cost and conditions)

Detailed in Annexure 4

6. **Local and National Government contacts:** Name, rank and responsibility, address, telephone, fax, telex.

Detailed in Annexure 4

**Data**

**1. Specification of Oils commonly traded**

At the liquid berth, the representative products that would be handled are petroleum products like FO/ HSD / SKO / MS / CBFS / CPO / Naphtha etc. Vessels calling at the port will be having FO and HSD for their propulsion requirements.. The products like MS, Naphtha etc are oils of non – persistent nature; they tend to evaporate fast and will not stay long on the surface of the sea waters. Hence spill studies have been carried out for FO and HSD spills at the berths.

At the SPMs, Crude oil unloading takes place.

Physical and Chemical Properties of products handled at the SPMs, Berths and of the propulsion fuels of the ships / tankers

Data on the properties for the hydrocarbons / products handled at the jetty is required for quantitative hazard identification and consequence calculations. The properties of the FO and HSD, the petroleum hydrocarbons likely to be spilled due to the operations at the jetty are given in Table-3.1.

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**Table-3.1: Properties of Crude Oil, FO and Diesel**

Sl. No	Chemical	Boiling Range (°C)	Specific Heat of Liquid (J/Kg °K)	Heat of Evaporation (x 10 <sup>5</sup> J/Kg)	Heat of Combustion (x 10 <sup>5</sup> J/Kg)
1	Crude Oil	IBP - 700+	2385	3.4	425
2	HSD	200 - 350	2889	4.65	448
3	Fuel Oil	180 - 450	2500	3.4	452

The following characteristics of oil are used for modelling study:

**(a) Crude Oil**

Sp. Gr = 0.82 to 0.88

Surface Tension = 3.0 e-03

Molar Volume = 0.002

Viscosity: 275 CST at 37.8 deg C

Wax content: 12 – 19 %

Pour point of untreated crude: 30 deg C

Pour point of treated crude: 18 deg C

**(b) FO**

Sp. Gr = 0.92

Boiling point = > 260° C

Vapor pressure = < 0.1 psia at 21° C

**(c) HSD**

Sp. Gr = 0.86

Pour point = 6° C - 18° C

Vapor pressure = 2.12 to 26 mm Hg at 21° C

## **2. Wind and weather**

### **Meteorological and Oceanographic Conditions**

The met-ocean conditions have been previously ascertained at several stages in the course of various studies conducted in past in respect of Mundra port projects. Flow modeling for the Mundra port location has been covered in the model developed by Environ, India, who have developed the model for whole of Gulf as relevant to Mundra region. It has been observed during model studies that flow regime does not have significant changes due to the proposed developments. The following are the main hydro-meteorological parameters for planning and designing of the marine facilities described below.

### **Rainfall and Temperature**

The Kutch is a semi-arid region with weak and erratic rainfall confined largely to June-October period. With a few rainfall days, the climate is hot and humid from April till October and pleasant during brief winter from December to February. Although the monthly mean maximum temperature recorded is 37°C during 2005, it occasionally exceeds 40°C. Rainfall alone forms the ultimate source of freshwater resource to the region. The average rainfall at Mundra is about 400 mm/year.

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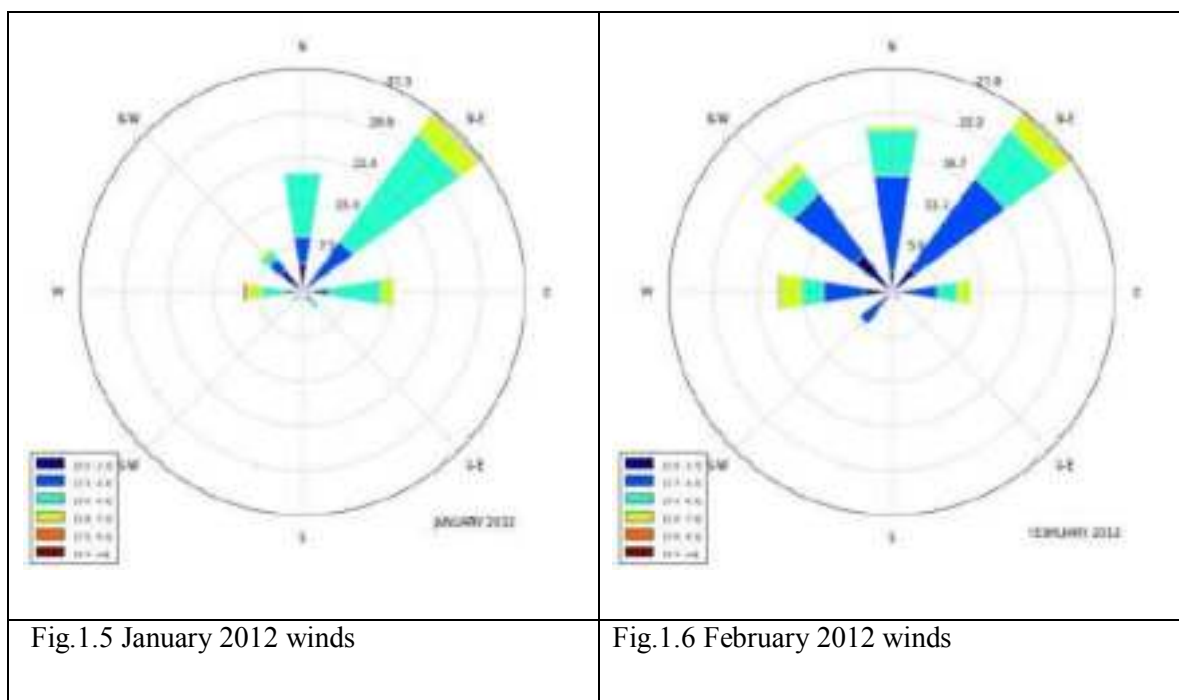
**OIL SPILL CONTINGENCY RESPONSE PLAN**

**Cyclones**

Cyclonic disturbances strike North-Gujarat, particularly the Kachchh and Saurashtra regions, periodically. These disturbances generally originate over the Arabian Sea and sometimes the Bay of Bengal. Generally during June, the storms are confined to the area North of 15°N and East of 65°E. In August, the initial stages, they move along the northwest course and show a large latitudinal scatter. West of 80°E, the tracks tend to curve towards North. During October the direction of movement of a storm is to the West in the Arabian Sea. However, East of 70°E some of the storms move North-Northwest and later recurves North East to strike Gujarat-North Mekran coast.

**Wind**

There are strong winds at times at Mundra Port. The month wise wind rose diagrams for the year 2012 and for the months of January and February of the year 2013 are given below. In the period lasting over months March to May the wind direction is generally SWW (225° - 250°) and velocity varies from 20 to 25 Knots. From June through August, the wind direction is predominantly SW and velocity varies from 25 to 30 Knots with short gusts going up to 35 to 40 Knots. Towards end of September and through October wind direction changes to NE with velocities ranging from 7 to 10 Knots. Direction remaining same the velocity varies 10 knots to 25 Knots in the period November to January. February is the calm period when wind direction is Southerly with velocity in the range of 7 Knots. Stormy weather may generate winds having velocity up to 100 Knots which should be taken as the worst case scenario for design of tall structures and heavy duty cranes.



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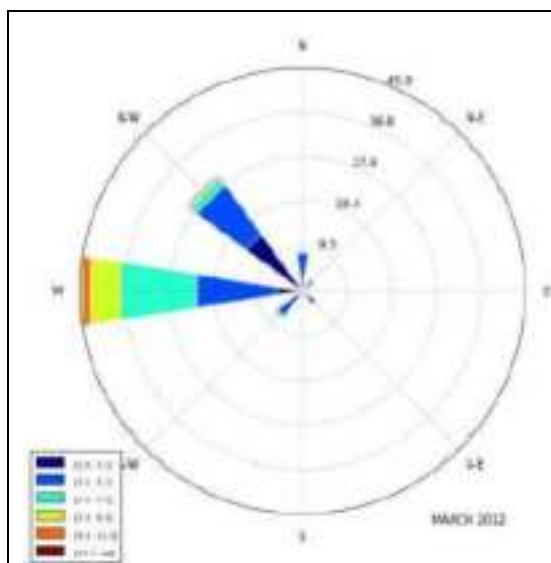


Fig.1.7 March 2012 winds

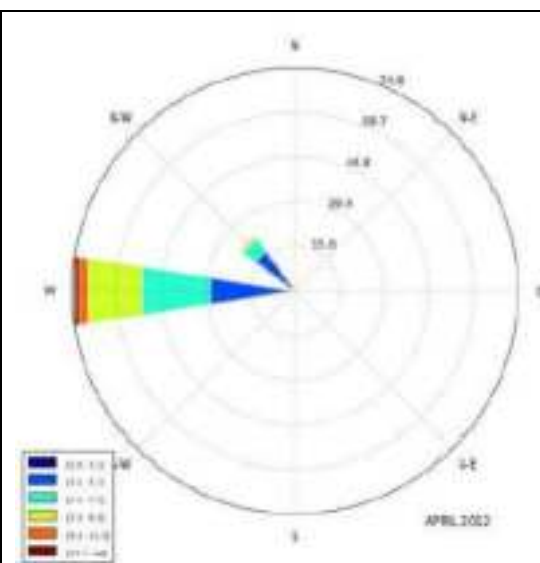


Fig.1.8 April 2012 winds

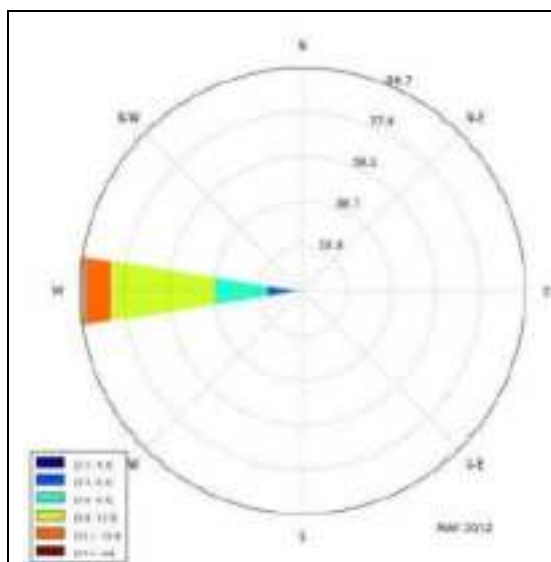


Fig.1.9 May 2012 winds

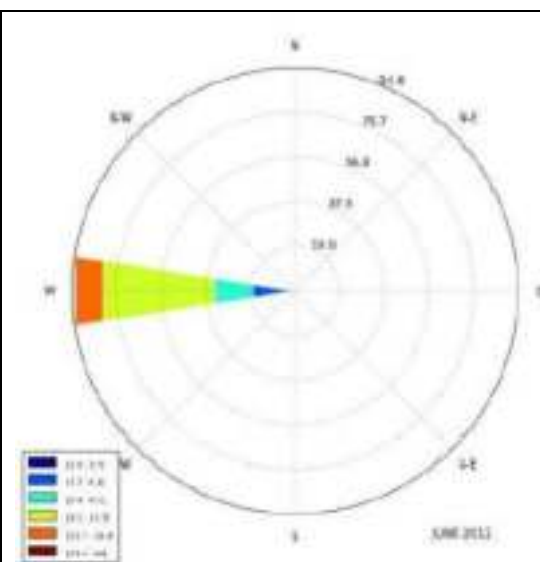


Fig.1.10 June 2012 winds

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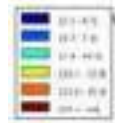


Fig.1.11 July 2012 winds

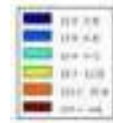


Fig.1.12 August 2012 winds

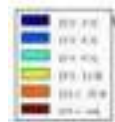


Fig.1.13 September 2012 winds

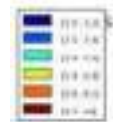
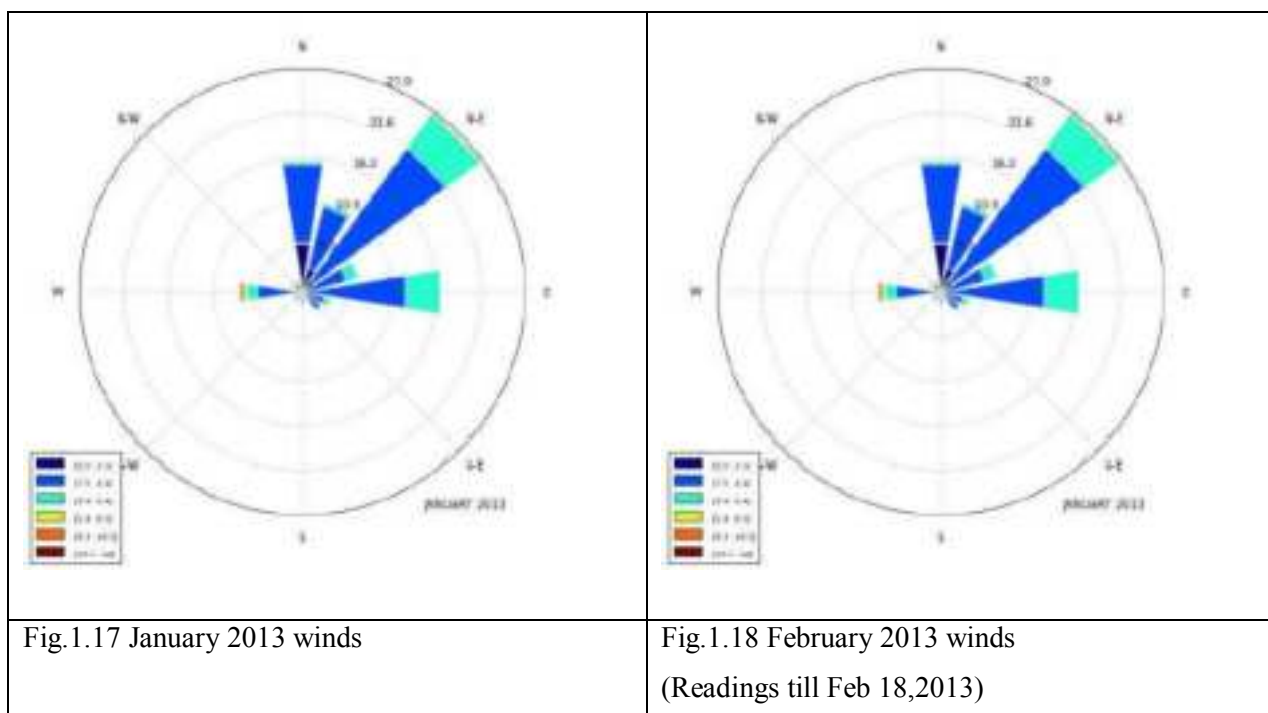
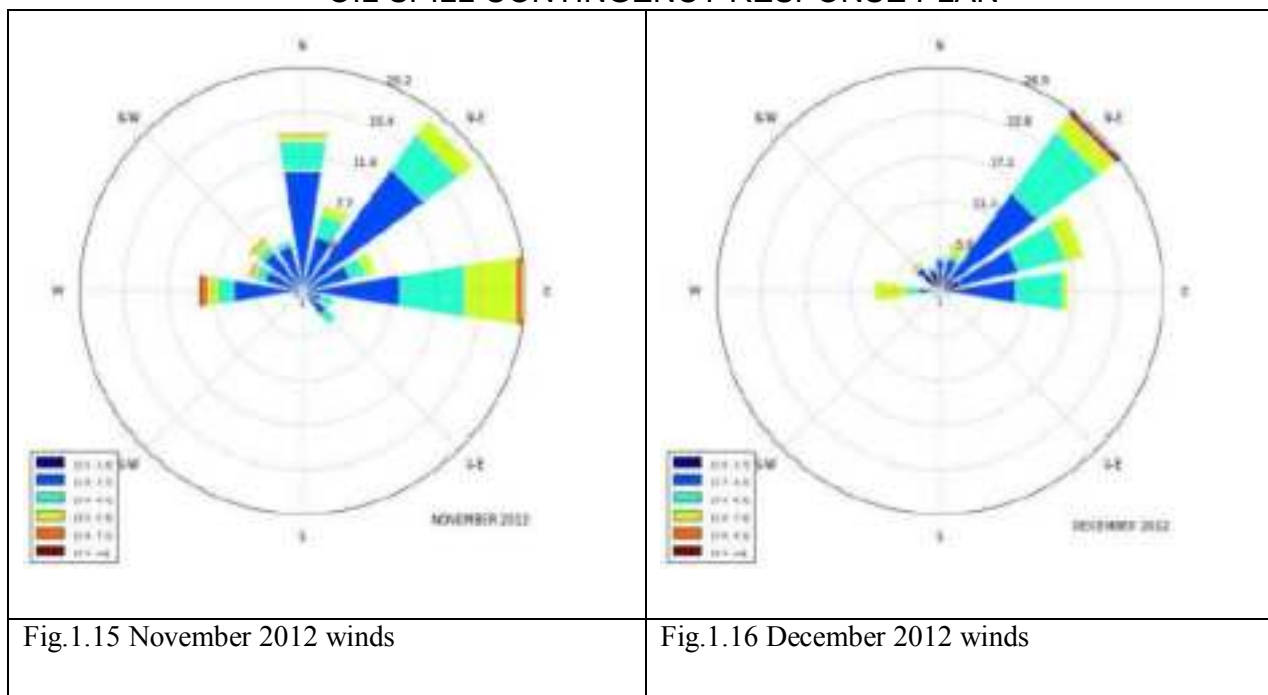


Fig.1.14 October 2012 winds

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**Tides**

The tidal planes were assessed in 1998 and are as shown in Table below.

The Highest Astronomical Tide (HAT) is estimated to be about +6.4 m above chart datum (CD), and the Lowest Astronomical Tide (LAT) to be at 0.0 m CD.

Tide	Height (m) above CD
Mean High Water Springs	5.8
Mean High Water Neaps	4.6
Mean Low Water Neaps	2.1
Mean Low Water Springs	1.0

**Currents**

Currents in the approaches to the port are dominated by the tidal flows, with predictable variations over diurnal, monthly and annual time scales. Currents in this part of the Gulf flow parallel to the natural sea-bed contours. Currents can be relatively strong, with speeds in excess of 3.0 Knots reported at sometimes of the year. The Admiralty Chart shows currents off Navinal point to be 3.0 Knots East & West bound. It is observed that the currents are usually aligned with the bed contours and are stronger in deeper waters off the coast. The impact of future development over the existing coast-line can be determined by the change in current speed resulting from the proposed developments.

**Waves**

In past HR Wallingford (HRW) has studied the wave climate considering wave energy from locally generated waves and swell propagating in to the Gulf of Kutch from the Arabian Sea. The results of the study carried out by HRW are presented in the Table below.

**Design Waves at Mundra**

Direction Sector (°N)	Return Period (years)	Inshore Direction (°N)	Hs (m)	T2 (sec)
210	1	222	1.2	5.0
	5	222	1.4	5.3
	20	221	1.6	5.8
	100	221	1.8	6.1
240	1	226	1.5	5.4
	5	226	1.7	5.8
	20	225	1.8	6.1
	100	225	2.0	6.5
270	1	239	1.4	5.5
	5	236	1.7	6.3
	20	236	1.8	6.7
	100	235	2.0	7.4
300	1	240	0.8	5.2
	5	240	0.9	5.6
	20	239	1.0	6.2
	100	238	1.2	6.7

Atmospheric stability is an important factor for predicting the dispersion characteristics of gases/vapours into the surrounding environment. Change in atmospheric stability is a direct consequence of the vertical

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temperature structure. The stability effects are mathematically represented through Pasqual parameters. The following stability classification is employed:

<b>Stability Class</b>	<b>Atmospheric Condition</b>
A	Very Unstable
B	Unstable
C	Slightly Unstable
D	Neutral
E	Stable
F	Very Stable

Condition of atmospheric stability is estimated by a suitable method that uses dispersion parameters viz., vertical temperature gradient, profile of the winds and roughness factor. The roughness factor for the Mundra area is small since it mainly comprises of plain land.

The following meteorological information has been taken in the calculations for the Mundra area (GMB-2010):

Average ambient temperature : 30°C  
Average wind speed : Wind data for the whole year 2012 is available and is used  
Stability condition : F (Very Stable)

### **3 Information sources**

This plan is prepared in accordance with:

- a) Marine Environmental Impact Assessment of SPMs, COTs and connecting pipelines of APSEZL at Mundra dated February 2001, prepared by National Institute of Oceanography, Mumbai.
- b) Report on Risk assessment study and On-site disaster management Plan for SPMs, COTs and connecting Pipelines of Adani Ports and Special Economic Zone Limited, by TATA AIG Risk Management Services Limited, dated February 2001.
- c) HAZOP study report of SPM Terminal pipeline project by Intec Engineering, dated 26/02/2004.
- d) IPIECA guide to Contingency planning for oil spills on water.
- e) Oil spill risk assessment and contingency plan study done by M/s Environ Software Pvt. Ltd. (Copy enclosed)

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**ANNEXURES**

INITIAL OIL SPILL REPORT		ANNEXURE 1
Particulars of person, office reporting		
Tel No.		
Date & time of incident		
Spill location		
Likely cause of spill		Witness
Initial response action		By
Any other information		
<p>This FIR is to be sent to Marine Manager by fastest means of communication possible. It is an offence not to report oil pollution incident.</p> <p>This FIR is to be followed by company's incident report also.</p> <p>Following POLREP report to the Government through nearest CG information will also be required:</p>		
Identity of informant		
Time of FIR		
Source of spill		
Cause of spill		
Type of spill		
Colour code information (from CG)		
Radius of slick		
Tail		
Volume		
Quantity		
Weather		
Tide / current		
Density		
Layer thickness		
Air / Sea temp.		
Predicted slick movement		
Size of spill classification (Tier 1, 2 or 3)		

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POLREP		ANNEXURE 2
In case of an oil spill, APSEZ will provide information to Commandant Coast Guard District 1 Porbandar COMDIS 1 and Coast Guard Station Mundra in the following format:		
SN.	Parameter	Data
1.	Identity of the informant	
2.	Time of information receipt	
3.	Source of Spill	
4.	Cause of Spill	
5.	Type of oil	
6.	Colour code information	
7.	Configuration	
8.	Radius	
9.	Tail	
10.	Volume	
11.	Quantity	
12.	Weathered or Fresh	
13.	Density	
14.	Viscosity	
15.	Wind	
16.	Wave Height	
17.	Current	
18.	Layer Thickness	
19.	Ambient air temperature	
20.	Ambient sea temperature	
21.	Predicted slick movement	
22.	Confirm Classification of spill size	
<b>Additional Information :</b>		

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LIST OF RESOURCES AVAILABLE						ANNEXURE 3
Tugs Available for Oil Spill Containment						
Name of Tug	Type	BHP	OSD	AFFF	Capacity (cubm/Hr)	BP
Dolphin No. 3	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 4	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 7	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 10	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 11	ASD (DSV)	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 14	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 15	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 16	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 17	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 18	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Khushboo	Fixed screw	401 X 2	-	-	-	10
<p>Dolphin No. 3, 4, 7, 10, 11, 14, 15, 16, 17 &amp; 18 are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required. Dolphin No.3, 4, 7, 11, 14, 15, 16, 17 &amp; 18 are fitted with a fire curtain and remote controlled fire monitors.</p> <p><b>All above eleven Tugs have class notation as Harbour Tugs and are certified to work within the Harbour limits only.</b></p> <p>Reception Facility : 12" pipe line, connected to a slop tank at chemical tank farm.</p> <p>Dolphin 11 has fire fighting system of 1200 m<sup>3</sup>/hr along with 20 ton lifting "A" frame and diving support facility.</p> <p><b>Location of Oil Spill Equipment:</b> The Oil Spill Equipments are stored in SPM Store.</p> <p><b>Resources / Equipment Available with APSEZL, Mundra</b></p>						

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Item	Quantity
<b>Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 235 meter</b>	1 no
Power pack with boom reel with hydraulic hoses	2 nos.
Power pack - 20 KV with boom reel with hydraulic hoses	2 nos.
<b>Lamor Side Collector system (Recovery Capacity 123 m<sup>3</sup>/ hr)</b> (Side collector LSC-3C/2300 (01CO2-P536). Oil transfer pump OT A 50 with oil transfer hose set	2 nos. 2 sets
<b>Lamor Minimax 12 m<sup>3</sup> skimmer</b>	2 sets
Power pack for skimmers with hydraulic hoses	4 nos.
Power pack - 20 KV for skimmers with hydraulic hoses	1 no.
<b>Floating tank (25 m<sup>3</sup> )</b>	1 nos.
Foot pumps for floating tank	6 nos
Oil Spill Dispersants	5000 ltr
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Two – way hydraulic maneuvering panel	2 nos
<b>Oil Containment Boom</b> -Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm	2000 mtr
<b>Current Buster Boom</b> -Fasflo -75 (for response in fast current)	2 Nos
<b>Skimmer</b> -KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.	4 Nos
<b>12.5T Flexible Floating Storage Tank (PUA).</b>	3 Nos
Diesel Driven Transfer Pump for Flex Barge	2 Nos
Site Hose Kit for the transfer Pump for the Flex Barge	2 Nos
3" & 2"Hose Adaptor for Transfer Pump and Hose	2 Nos
<b>Shoreline Cleanup Equipment</b>	
Mini Vac System	5 Nos
<b>OSD Applicator</b> - Oil Dispersant Spry Unit(20 Ltr) for use on Beach and Inter Tidal Zones	2 Nos
Startank with Capacity 10000 liter(10m <sup>3</sup> )	2 Nos
Sorbent Boom Pack(12.5cm x4 M)	500 mtr
Sorbent pad	2000 Nos

**Facilities in the Marine Control room:**

1. Tidal stream gauge: This can accurately read the prevalent rate of flow and direction of current.
2. Tide gauge: For accurately calculating the height of tide at any given time.
3. Wind gauge: For direction and speed of wind.
4. VHF sets (fixed and portable) with complete range of marine frequencies to be used for field operations.

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**OIL SPILL CONTINGENCY RESPONSE PLAN**

<b>LIST OF TELEPHONE NUMBERS OF EXPERT ADVISORS ANNEXURE 4</b>			
<b>List of Important Telephone Numbers of Govt. Officials and other neighboring Organisations (Expert and Advisors) related to Spill Combating Plan</b>			
<b>SN.</b>	<b>Company</b>	<b>Name and Designation</b>	<b>Telephone Numbers</b>
1.	APSEZL, Mundra	Chief Operating Officer Head Marine Pollution Response Officer Port Control	02838-6272602838-255727 02838-255727 02838-255761 / 289170 (Fax) 02838-255739
2.	Kandla Port Trust	Chairman Dy. Conservator Harbor Master Signal Station	02836-233001 / 234601 02836-223585 / 220235 02836-270201 02836-270194 / 549
3	Indian Oil Corporation, Mundra	CM (Ops) Manager (Ops) Control Room	02838- 222194 02838- 222197 02838- 224444
4	Indian Oil Corporation, Vadinar	DGM (Ops) Manager Tech Services Port Control	02833-256527 02833-256464 02833-256555
5	Reliance Petroleum Ltd Jamnagar	Marine Chief Senior Port Captain Port Control	0288-4013607 0288-4013750 0288-4012600 / 4012610
6	The Commanding Officer Indian Coast Guard Station, Mundra	ICGS, Mundra Station Ops Officer	02838 - 271402 & 03 (Tel) 02838 – 271404 (Fax)
7	The Commander Coast Guard Region (North West), Gandhinagar	COMCG (NW) Regional Ops & Plans Officer	079-23243241 (Tel) 079-23243283 (Fax)
8	The Commander No.1 Coast Guard District (Guj), Porbandar	COMDIS-1 District Ops & Plans Officer	0286-2214422 (Tel) 0286-2210559 (Fax)
9	The Commander Coast Guard Region (West) Mumbai	COMCG (W) Regional Ops & Plans Officer	022-24376133 (Tel) 022-24333727 (Fax)
10	The Officer-in-Charge Coast Guard Pollution Response Team (West), Mumbai	PRT (W) Officer-in-Charge	022-23722438 (Tel) 022-23728867 (Fax)
11	Gujarat Maritime Board	Vice Chairman & CEO Chief Nautical Officer	079-23238346 / 23238363 079-23234716

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12	Ministry of Environment Govt. of Gujarat	Director (Environment)	079-23252154 / 23251062 079-23252156 ( Fax )
13	Gujarat Pollution Control Board	Environmental Engineer	079-232 22756 079-232 22784 (Fax)

**List Of Important Telephone Numbers Of Adani Group Personnel**

S.No.	Description / contact person / designation	Telephone Nos.	
		Landline	Mobile
01	Capt. Anubhav Jain, Head – Marine & PFSO, APSEZL	02838 - 255727	91 9925223674
02	Mr.–Jagdish Patel Head CT-3	91-2838 - 255998	91 9979855979
03	Capt. Kumar Paritosh, Head CT-4	02838 – 255733	91 9879104839
04	Mr. Hari Govindan V , Dy.PFSO, MICT	91-2838 - 285072	91 9879104805
05	Marine control, APSEZL	02838 – 255333 / 255761	91 9825228673
06	Port Operation center, APSEZL	02838 –255762	91 9825000949
07	Port security Control, APSEZL	02838 – 289322	91 9825000933
08	Head - Security, APSEZL	02838 – 255999	91 9099991093
09	Head - Health, safety & Environment, APSEZL	02838 - 255777	91 7574894383
10	Head - Fire Dept. APSEZL	02838 – 255857	91 7069083035
11	Occupational Health Centre	02838 - 255710	91 8980015070

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Marine Officer/ SPM Mooring master ANNEXURE 5		
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>• Observe or receive report of oil or chemical spill incident</li> <li>• Initiate measures to prevent/ reduce further spillage</li> <li>• Maintain communication with other all vessels</li> </ul>	
Step	Actions	Additional Information
<b>Alert</b>	<input type="checkbox"/> (Marine Manager / On Scene Commander / SPM Pilot <input type="checkbox"/> Tugs and other support/ response craft	<i>VHF Channel 73 / 77</i>
<b>Initial Actions</b>	<input type="checkbox"/> Stop all cargo operations <input type="checkbox"/> Ensure all safety precautions taken/observed <input type="checkbox"/> Verify incident details <input type="checkbox"/> Advise all relevant information to (Marine Manager / On Scene Commander / or SPM Pilot <input type="checkbox"/> Initiate personal log <input type="checkbox"/> Place tugs/other response craft on stand-by	<i>Liaise with Terminal Shift Engineer</i>
<b>Further Actions</b>	<input type="checkbox"/> Brief (Marine Manager / On Scene Commander / SPM Pilot as necessary <input type="checkbox"/> Mobilize response equipment/ personnel as directed by (Marine Manager / On Scene Commander / <input type="checkbox"/> Maintain personal log of communications and events <input type="checkbox"/> Act as instructed by (Marine Manager / On Scene Commander / SPM Pilot	
<b>Final Actions</b>	<input type="checkbox"/> Submit personal log to HOD – Marine <input type="checkbox"/> Attend debrief	

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<b>MARINE MANAGER / On Scene Commander ANNEXURE 6</b>		
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>Initially assess situation</li> <li>Verify classification</li> <li>Verify fate of spill</li> <li>Verify resources immediately at risk, inform parties</li> <li>Provide accurate situation reports to Radio Room/ HOD – Marine</li> <li>Collect evidence and/ or statements</li> <li>Liaise with HOD-Health, Safety, Environment &amp; Fire</li> <li>Liaise with incident vessel regarding status of oil spill (if applicable)</li> </ul>	
<b>Step</b>	<b>Actions</b>	<b>Additional Information</b>
<b>Alert</b>	HOD – Marine	
<b>Initial Actions</b>	<input type="checkbox"/> Proceed to incident location, assume role of On-Scene Coordinator <input type="checkbox"/> Ensure all safety precautions have been taken <input type="checkbox"/> Initiate response / <input type="checkbox"/> Investigate cause/ source of spill <input type="checkbox"/> Communicate all information to HOD – Marine <input type="checkbox"/> Ensure samples of spilled oil taken <input type="checkbox"/> Initiate personal log <input type="checkbox"/> Take photographic evidence <input type="checkbox"/> Collect evidence and take statements	<i>Stopped or ongoing</i>
<b>Further Actions</b>	<input type="checkbox"/> Ensure resources are being deployed as required <input type="checkbox"/> Provide co-ordination at-sea response <input type="checkbox"/> Provide detailed situation reports to HOD- Marine <input type="checkbox"/> Liaise with -Health, Safety Environment & Fire Department.	
<b>Final Actions</b>	<input type="checkbox"/> Submit personal log to HOD – Marine <input type="checkbox"/> Attend debrief	

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SPM Pilot			ANNEXURE 7
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>Initially assess situation</li> <li>Verify classification</li> <li>Provide accurate situation reports to Radio Room/ OSC</li> <li>Collect evidence and/ or statements</li> <li>Liaise with incident vessel regarding status of oil spill (if applicable)</li> </ul>		
Step	Actions	Additional Information	
<b>Alert</b>	<input type="checkbox"/> Marine Control Room <input type="checkbox"/> OSC <input type="checkbox"/> Tugs and other support / response crafts	<i>VHF Channel 73 / 77</i>	
<b>Initial Actions</b>	<input type="checkbox"/> Assume role of On-Scene Coordinator <input type="checkbox"/> Investigate cause/ source of spill <input type="checkbox"/> Communicate all information to Marine Control Room <input type="checkbox"/> Ensure samples of spilled oil taken <input type="checkbox"/> Initiate personal log <input type="checkbox"/> Take photographic evidence <input type="checkbox"/> Collect evidence and take statements	<i>Stopped or ongoing</i>	
<b>Further Actions</b>	<input type="checkbox"/> Ensure resources are being deployed as required <input type="checkbox"/> Provide co-ordination of the at-sea response <input type="checkbox"/> Provide detailed situation reports to HOD – Marine		
<b>Final Actions</b>	<input type="checkbox"/> Submit personal log to HOD – Marine <input type="checkbox"/> Attend debrief		

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HOD – Marine ANNEXURE 8		
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>• Confirm/ amend initial classification</li> <li>• Manage the APSEZL response</li> <li>• Authorize expenditure after consultation with COO APSEZL</li> <li>• Brief COO, APSEZL</li> <li>• Liaise with Coast Guard</li> <li>• Approve press statements for release</li> </ul>	
Step	Actions	Additional Information
<b>Alert</b>	<input type="checkbox"/> Coast Guard <input type="checkbox"/> External organizations	
<b>Initial Actions</b>	<input type="checkbox"/> Verify/ amend spill classification <input type="checkbox"/> Ensure all safety precaution have been taken <input type="checkbox"/> Confirm external organizations have been alerted <input type="checkbox"/> Convene Emergency Response Team <input type="checkbox"/> Predict slick movement <input type="checkbox"/> Liaise with vessel Agents/ Owners as appropriate	
<b>Further Actions</b>	<input type="checkbox"/> Chair the Emergency Response Team meetings <input type="checkbox"/> Constantly review the strategy being employed and advise of changes where necessary <input type="checkbox"/> Approve all expenditure commitments <input type="checkbox"/> Brief President APSEZ <input type="checkbox"/> Agree press statements with Corporate Relations Chief <input type="checkbox"/> Confirm formal samples have been taken <input type="checkbox"/> Advise Coast Guard if oil migrates outside of Local Area	
<b>Final Actions</b>  <b>Final Actions (contd.)</b>	<input type="checkbox"/> Terminate the clean-up <input type="checkbox"/> Collate personal logs. <input type="checkbox"/> Prepare the incident report. <input type="checkbox"/> Hold full de-brief involving all members. <input type="checkbox"/> Amend contingency plan as required. <input type="checkbox"/> General Report to President	

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# OIL SPILL CONTINGENCY RESPONSE PLAN

OIL SPILL PROGRESS REPORT						ANNEXURE 9	
<b>Incident Name:</b>							
<b>Updated by:</b>							
<b>Date:</b>				<b>Time (local):</b>			
<b>Summary of Incident Response Operations:</b>							
<b>Summary of Incident Response Resource Utilization:</b>							
Number of Aircraft:				Number of Vessels:			
Dispersant Used:    Liters				Length of Booms in Use:    m			
Number of Recovery Devices:				Number of Storage Devices:			
Sorbent Used:    kg				Bio-remediation Used:    kg			
Number of Personnel:				Number of Vehicles:			
<b>Specialist Equipment:</b>							
<b>Oil Spill Balance Sheet:</b>							
Total amount of oil spilled:				Tons			
Total amount of oil recovered:				Tons			
Outstanding amount of spilled oil:				Tons			
<b>Mass balance:</b>							
Estimated Natural Weathering:				Tons			
Mechanically agitated:				Tons			
Chemically dispersed:				Tons			
Skimmer recovered:				Tons			
Sorbent recovered:				Tons			
Manually recovered:				Tons			
Bio-remediated:				Tons			
Other:				Tons			

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# OIL SPILL CONTINGENCY RESPONSE PLAN

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## Control Room Officer

**HOD – Marine**

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## Classification of Oil

## ANNEXURE 11

### Group 1 oils

A: \*API > 45 (Specific gravity < 0.8)

B: Pour point °C

C: Viscosity @ 10–20°C: less than 3 Cst

D: % boiling below 200°C: greater than 50%

E: % boiling above 370°C: between 20 and 0%

	A	B	C	D	E
Asgard	49	-28	2 @ 10°C	58	14
Arabian Super Light	51	-39	2 @ 20°C		
Cossack	48	-18	2 @ 20°C	51	18
Curlew	47	-13	2 @ 20°C	57	17
F3 Condensate	54	-46	1 @ 10°C	81	0
Gopleni	52	-43	1.5 @ 20°C	63	8
Hedra	52	-42	2.5 @ 10°C	60	11
Terengganu condensate	73	-34	0.5 @ 20°C	>95	0
Wahyunt	49	-53	2 @ 20°C	55	4
Gasoline	58		0.5 @ 15°C	100	0
Kerosene	45	-55	2 @ 15°C	50	0
Naphtha	55		0.5 @ 15°C	100	0

### Group 3 oils

A: \*API 17.5–35 (Specific gravity 0.85–0.95)

B: Pour point °C

C: Viscosity @ 10–20°C: between 8 CSt and semi solid

D: % boiling below 200°C: between 10 and 35%

E: % boiling above 370°C: between 30 and 65%

Low pour point <6°C

	A	B	C	D	E
Alaska North Slope	28	-18	32 @ 15°C	32	41
Arabian Heavy	28	-40	55 @ 15°C	21	56
Arabian Medium	30	-21	25 @ 15°C	22	51
Arabian Light	33	-40	14 @ 15°C	25	45
Bonny Light	35	-11	25 @ 15°C	26	30
Iranian Heavy	31	-36	25 @ 15°C	24	48
Iranian Light	34	-32	15 @ 15°C	26	43
Khatji	28	-57	80 @ 15°C	21	55
Sirri	33	-12	18 @ 10°C	32	38
Thunder Horse	35	-27	10 @ 10°C	32	39
Tia Juana Light	32	-42	300 @ 15°C	24	45
Troll	33	-9	14 @ 10°C	24	35
IFO 180	18–20	10–30	1,500–3,000 @ 15°C		-

High pour point >5°C

	A	B	C	D	E
Cabinda	33	12	Semi-solid	18	56
Coco	32	21	Semi-solid	21	46
Garnbra	31	23	Semi-solid	11	54
Mandji	30	9	70 @ 15°C	21	53
Minas	35	18	Semi-solid	15	58

### Group 2 oils

A: \*API 35–45 (Specific gravity 0.8–0.85)

B: Pour point °C

C: Viscosity @ 10–20°C: between 4 Cst and semi-solid

D: % boiling below 200°C: between 20 and 50%

E: % boiling above 370°C: between 15 and 50%

Low pour point <6°C

	A	B	C	D
Arabian Extra Light	38	-30	3 @ 15°C	26
Azeri	37	-3	8 @ 20°C	29
Brent	38	-3	7 @ 10°C	37
Draugen	40	-15	4 @ 20°C	37
Dukhan	41	-49	9 @ 15°C	36
Liverpool Bay	45	-21	4 @ 20°C	42
Sokol (Sakhalin)	37	-27	4 @ 20°C	45
Rio Negro	35	-5	23 @ 10°C	29
Umm Shaif	37	-24	10 @ 10°C	34
Zakum	40	-24	6 @ 10°C	36
Marine Gas oil (MGO)	37	-3	5 @ 15°C	

High pour point >5°C

	A	B	C	D
Amna	36	19	Semi-solid	25
Beatrice	38	18	32 @ 15°C	25
Bintulu	37	19	Semi-solid	24
Escravos	34	10	9 @ 15°C	35
Sarir	38	24	Semi-solid	24
Statfjord	40	6	7 @ 10°C	38

### Group 4 oils

A: \*API <17.5 (Specific gravity >0.95) or

B: Pour point >30°C

C: Viscosity @ 10–20°C: between 1500 CSt and semi-solid

D: % boiling below 200°C: less than 25%

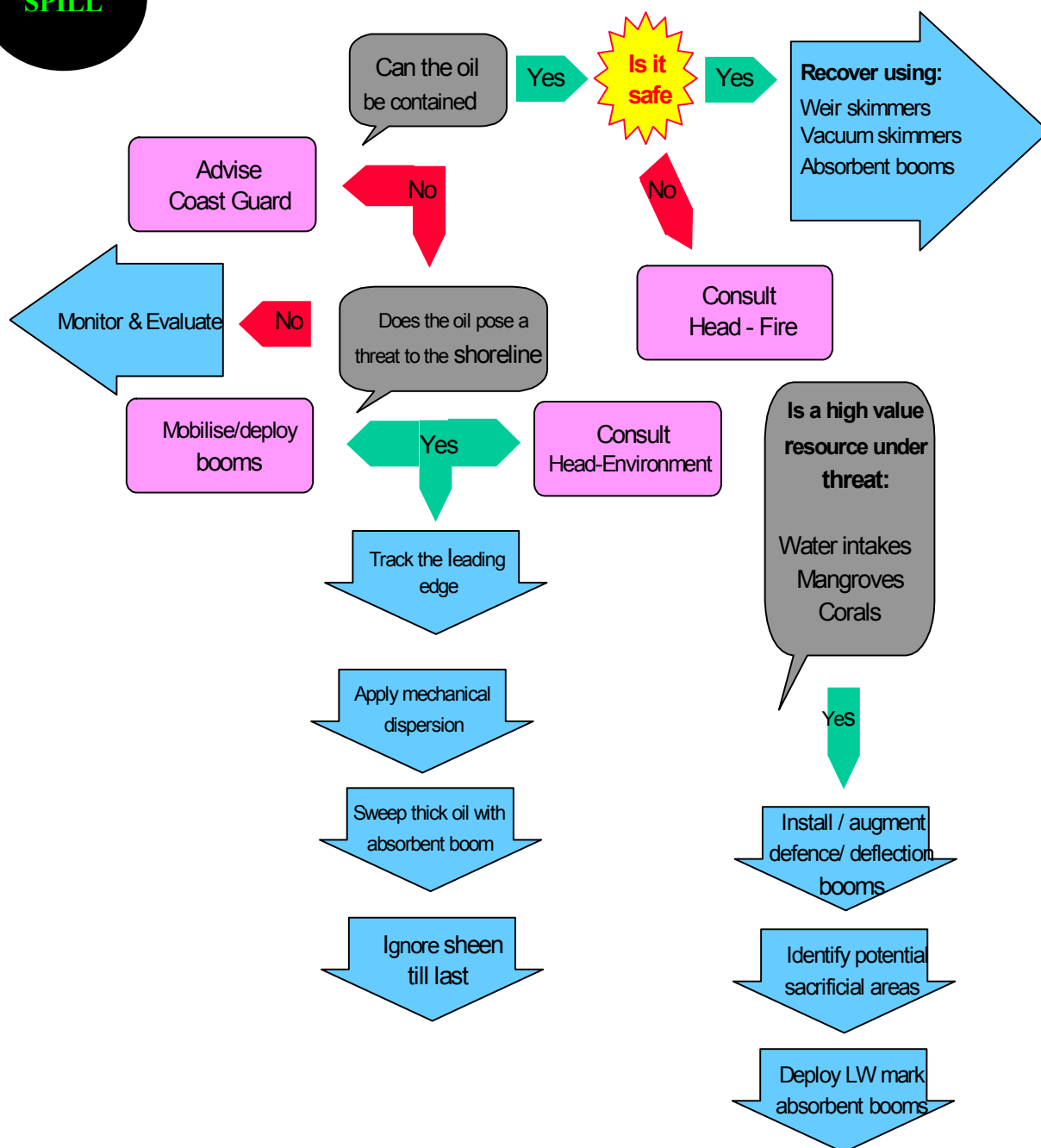
E: % boiling above 370°C: greater than 30%

	A	B	C	D	E
Bachaquero 17	16	-29	5,000 @ 15°C	10	60
Boscan	10	15	Semi-solid	4	80
Cinta	33	43	Semi-solid	10	54
Handi	33	35	Semi-solid	23	33
Merey	17	-21	7,000 @ 15°C	7	70
Nile Blend	34	33	Semi-solid	13	59
Pilon	14	-3	Semi-solid	2	92
Shengli	24	21	Semi-solid	9	70
Taching	31	35	Semi-solid	12	49
Tia Juana Pesado	12	-1	Semi-solid	3	78
Widai	33	46	Semi-solid	7	70
IFO 380	11–15	10–30	5,000–30,000 @ 15°C		

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**OIL  
SPILL**

### Light Oil Response Guidelines



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### Heavy Oil Response Guidelines



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<b>Site Specific Health and Safety Plan</b> <span style="float: right;"><b>ANNEXURE 13</b></span>											
<b>Assessment Form</b>											
<b>1. APPLIES TO SITE :</b>											
<b>2. DATE :</b>				<b>3. TIME :</b>				<b>4. INCIDENT :</b>			
<b>5. PRODUCT(S) :</b>								(Attach MSDS)			
<b>6. Site Characterization</b>											
<b>6a. Area</b>		<input type="checkbox"/> Open water		<input type="checkbox"/> Inshore water		<input type="checkbox"/> River / Creek		<input type="checkbox"/> Salt marsh		<input type="checkbox"/> Mudflats	
		<input type="checkbox"/> Shoreline		<input type="checkbox"/> Sand		<input type="checkbox"/> Shingle		<input type="checkbox"/> Intake Channel			
<b>6b. Use</b>		<input type="checkbox"/> Commercial		<input type="checkbox"/> Industrial		<input type="checkbox"/> Public		<input type="checkbox"/> Government		<input type="checkbox"/> Recreational	
		<input type="checkbox"/> Residential		<input type="checkbox"/> Other							
<b>7. Site Hazards</b>											
		<input type="checkbox"/> Boat safety			<input type="checkbox"/> Fire, explosion, in-situ burn			<input type="checkbox"/> Slips, trips and falls			
		<input type="checkbox"/> Chemical hazards			<input type="checkbox"/> Heat stress			<input type="checkbox"/> Steam and hot water			
		<input type="checkbox"/> Drum handling			<input type="checkbox"/> Helicopter operations			<input type="checkbox"/> Tides			
		<input type="checkbox"/> Equipment operations			<input type="checkbox"/> Lifting			<input type="checkbox"/> Trenches, excavations			
		<input type="checkbox"/> Electrical hazards			<input type="checkbox"/> Motor vehicles			<input type="checkbox"/> Visibility			
		<input type="checkbox"/> Fatigue			<input type="checkbox"/> Noise			<input type="checkbox"/> Weather			
		<input type="checkbox"/> Others			<input type="checkbox"/> Overhead/buried utilities			<input type="checkbox"/> Work near water			
		<input type="checkbox"/>			<input type="checkbox"/> Pumps and hoses						
<b>8. Air Monitoring</b>											
		<input type="checkbox"/> O <sub>2</sub>				<input type="checkbox"/> LEL				<input type="checkbox"/> Benzene	
								<input type="checkbox"/> H <sub>2</sub> S			
								<input type="checkbox"/> Other			
<b>9. Personal Protective Equipment</b>											
<input type="checkbox"/> Foot Protection						<input type="checkbox"/> Coveralls					
<input type="checkbox"/> Head Protection						<input type="checkbox"/> Impervious suits					
<input type="checkbox"/> Eye Protection						<input type="checkbox"/> Personal Floatation					
<input type="checkbox"/> Ear Protection						<input type="checkbox"/> Respirators					
<input type="checkbox"/> Hand Protection						<input type="checkbox"/> Other					
<b>10. Site Facilities</b>											
<input type="checkbox"/> Sanitation				<input type="checkbox"/> First Aid				<input type="checkbox"/> Decontamination			
<b>11. Contact details :</b>											
<input type="checkbox"/> Doctor					Phone						
<input type="checkbox"/> Hospital					Phone						
<input type="checkbox"/> Fire					Phone						
<input type="checkbox"/> Police					Phone						
<input type="checkbox"/> Other					Phone						
<b>12. Date Plan Completed</b>											
<b>13. Plan Completed by</b>											

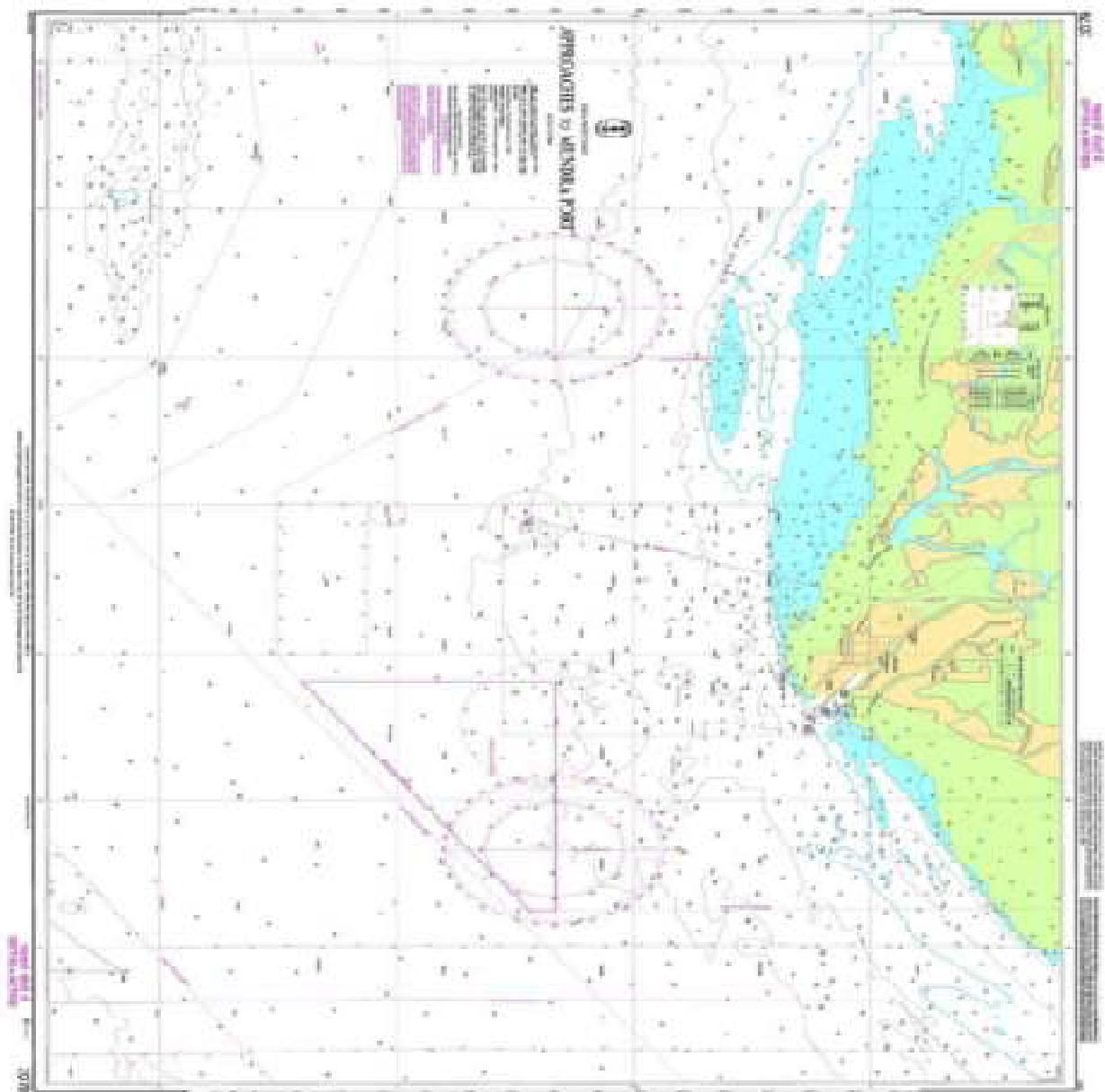
Reviewed By : Capt Pankaj Sinha	Issue No. : 01	Issued On : 01.10.2019
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Indian Chart 2079

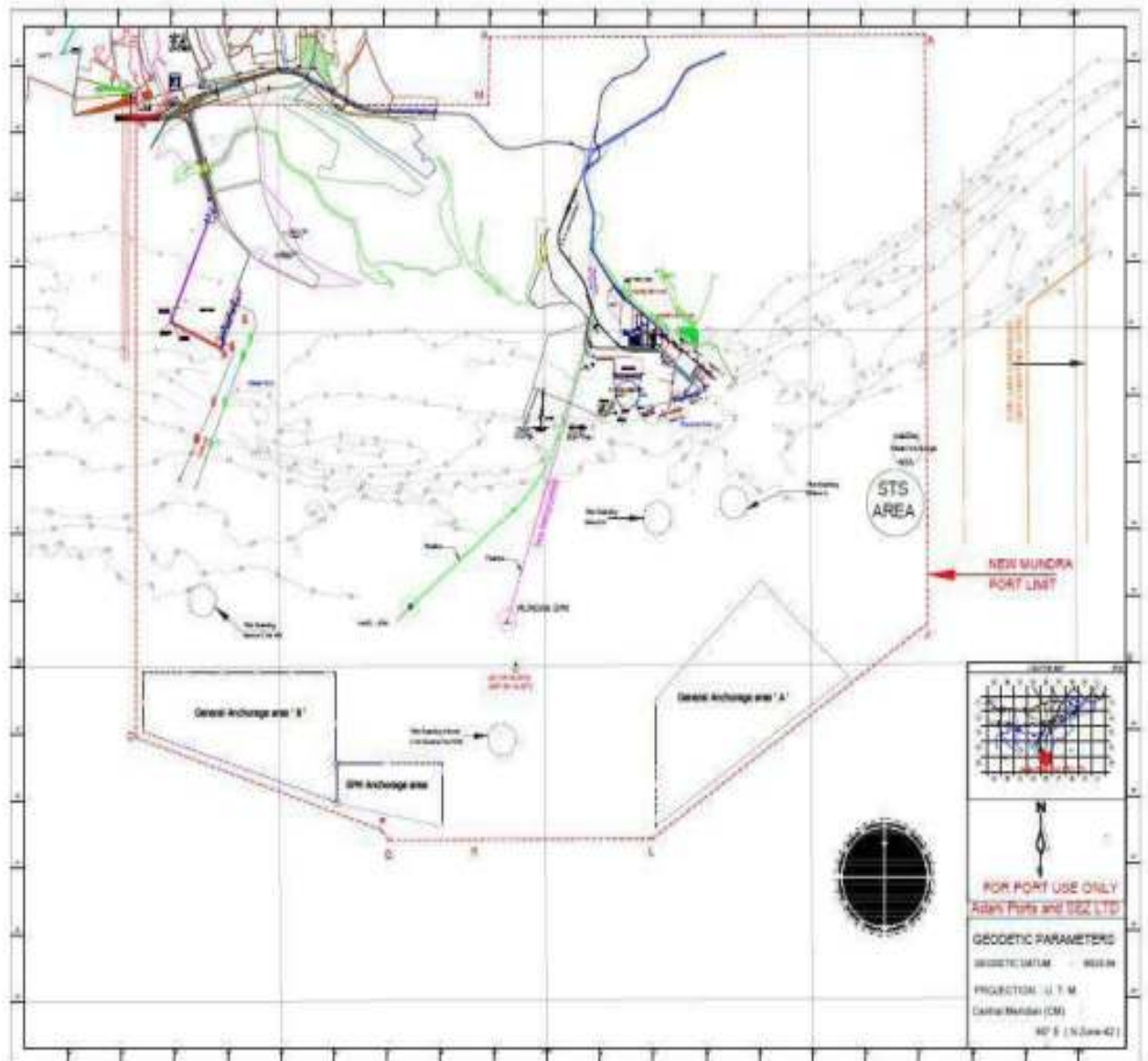
ANNEXURE 14



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<b>List of recycler approved by state of Gujarat</b>	<b>ANNEXURE 15</b>
--	--------------------

**LIST OF APPROVED VENDOR FOR COLLECTION & DISPOSAL OF OIL SPILL WASTE WATER  
AND OILY SOIL**

<b>Sr No.</b>	<b>Name of the party &amp; Contact Detail</b>	<b>Date of Issue of Passbook alongwith validity</b>	<b>Capacity</b>
1	M/s Jawrawala Petroleum, Plot No: 200/33, B/H Kashiram Textile Mill, Narol, Ahmedabad – 382405 Contact Detail - (079) - 25358099 (M) +91 9824045726	18/09/2012 to 17/09/2017	1. 4800 KLPA - Used Oil 2. 9000 KLPA – Waste Oil
2	M/s Reliance Barrel Supply co., 200/34, B/H- Kashiram Mill, Narol, Ahmedabad-382405 Contact Detail - (079) - 25356629 (M) +91 9824090021	03/09/2014 to 02/09/2019	1. 8280 KLA - Used Oil 2. 9000 KLA – Waste Oil
3	M/s Western India Petrochem Industry, Plot No-50, 51, GIDC Estate, Village Gozaria, Dist-Mehsana. Contact Detail - Tel:+91- 278- 420941 Fax:+91- 278- 429503	25/07/2014 to 24/07/2019	1. 3660 KLPA – Used oil 2. 11100 KLPA – waste oil
4	M/s Saurashtra Enviro Projects Pvt. Ltd.(SEPPL) 3rd Floor,K.G.Chambers, Udhana Darwaja, Ring Road, Surat, Gujarat, India-395002 Contact Detail - +91 261 2351248	TSDf Site	3,95,000 MT (Landfilling) + 7.50 Million Kcal/Hr. (Incineration)
5	M/s Bharuch Enviro Infrastructure Ltd, Ankleshwar Contact Detail - Phone 91-2646-253135 Fax 91-2646-222849	TSDf Site	23,00,000 MT (Landfilling) + 120 MT/Day (Incineration)
6	M/s Nandesari Environment Control Ltd. Nandesari, Vadodara, Contact Detail – Phone 265 – 2840818 Fax 265 – 2841017	TSDf Site	3,00,000 MT (Landfilling) + 700 Kg/Hr. (Incineration)

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**LIST OF AGENCY FOR SUPPORT & GUIDANCE FOR RESCUE & REHABILITATION OF OILED BIRD & MANGROVES MANAGEMENT DURING OIL SPILL**

**ANNEXURE 16**

Sr No.	Name of the party & Contact Detail	Contact Person	Contact Detail	Activity
1	Gujarat Institute of Desert Ecology P.O Box No. #83, Opp. Changleshwar Temple, Mundra Road Bhuj - 370001 Gujarat – India.	Dr. Thivakaran	EMAIL: desert_ecology@yahoo.com FAX: 02832-235027  02832-235025	Restoration of Mangroves
2	Kalapooranasuri Karunadham Karunadham Hospital, At – Shedata, Bhuj, Kutch		(M) 9925020776	Rescue of oil soaked birds / animals and medical treatment facility
3	Anchorwala Ahinshadham Bhagwan Mahavir Pashu Raksha Kendra, Pragpar, Mundra, Kutch.		Phone (02838) 22352	Rescue of oil soaked birds / animals and medical treatment facility
4	<b>ASHA Foundation</b> C/182, Ashoknagar, Opposite ISRO Satellite, Ahmedabad – 380015, Gujrat, India.	Lalubhai	Phone: 09824037521 ,09879877281 Email: ashahmedabad@yahoo.co.in Website: www.ashafoundationindia.org	Rescue of oil soaked birds / animals and medical treatment facility

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**Terms, definitions and abbreviations used in this plan**

APSEZL	Adani Ports and Special Economic Zone Ltd.
COO	Chief Operating Officer
DGM	Deputy General Manager
DGS	Directorate General of Shipping
ENGR.	Engineer
ESD	Emergency Shut Down
FIR	First Information Report
FO	Furnace Oil
GMB	Gujarat Maritime Board
GPCB	Gujarat Pollution Control Board
HOD	Head Of Department
HQ	Head Quarters
HSD	High Speed Diesel
ICG	Indian Coast Guard
IMO	International Maritime Organization
IPMS	Integrated Port Management System
KPT	Kandla Port Trust
LWS	Low Water State
MCLS	Maximum Credible loss scenario
MMD	Mercantile Maritime Deptt.
MOEF	Ministry of Environment & Forest
MSDS	Material Safety Data Sheets
NOS DCP	National Oil Spill Disaster Contingency Plan
OSC	On Scene Commander
PLEM	Pipe line end manifold
POLREP	Pollution Report
PPE	Personal Protective Equipment
PR	Public Relations Officer
R/O	Radio Officer
SKO	Super Kerosene Oil

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**ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.**  
**MUNDRA**  
**OIL SPILL CONTINGENCY RESPONSE PLAN**  
**Certificate of Endorsement**

(To be certified personally by an officer not below the post of Deputy Conservator of a port facility or the Installation Manager of an oil installation, or offshore installation, or equivalent legally responsible authority)

**I hereby certify that:**

1. The oil spill contingency plan for the facility under my charge has been prepared with due regard to the relevant international best practices, international conventions, and domestic legislation.
2. The nature and size of the possible threat including the worst case scenario, and the resources consequently at risk have been realistically assessed bearing in mind the probable movement of any oil spill and clearly stated.
3. The priorities for protection have been agreed, taking into account the viability of the various protection and clean-up options and clearly spelt out.
4. The strategy for protecting and cleaning the various areas have been agreed and clearly explained.
5. The necessary organization has been outlined, the responsibilities of all those involved have been clearly stated, and all those who have a task to perform are aware of what is expected of them.
6. The levels of equipment, materials and manpower are sufficient to deal with the anticipated size of spill. If not, back-up resources been identified and, where necessary, mechanisms for obtaining their release and entry to the country have been established.
7. Temporary storage sites and final disposal routes for collected oil and debris have been identified.
8. The alerting and initial evaluation procedures are fully explained as well as arrangement for continual review of the progress and effectiveness of the clean-up operation.
9. The arrangements for ensuring effective communication between shore, sea and air have been described.
10. All aspects of plan have been tested and nothing significant found lacking.
11. The plan is compatible with plans for adjacent areas and other activities.
12. The above is true to the best of my knowledge and belief.
13. I undertake to keep the plan updated at all times and keep the Indian Coast Guard informed of any changes through submission of a fresh certificate of endorsement.

Seal:

**Capt. Anubhav Jain**  
**AGM - Marine & PFSO**  
**Adani Ports & SEZ Ltd.**  
**Mundra - Kutch - Gujarat**

Signature:

Name: Capt. Anubhav Jain  
Designation: Head - Marine

Organisation: Adani Ports and SEZ Ltd, Mundra

Place: Mundra

Date: 01 Oct 2019

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## Contingency Planning Compliance Checklist

Name of the Port/ Oil Handling Agency		Adani Ports and SEZ Limited, Mundra	
DESCRIPTION		Complied Yes/No	Remarks
<b>Risk Assessment</b>			
1.	Whether the facility produces / handles / uses / imports / stores any type of petroleum product.	Yes	(Ref. OSCRP 2.2)
2.	Whether risk assessment is done	Yes	(Ref. OSCRP 2.0)
3.	Who did the risk assessment	Yes	Environ Software (P) Ltd. & APSEZ
4.	Whether maximum volume of oil spill that can occur in the worst case scenario is considered.	Yes	(Ref. OSCRP 2.4)
5.	Whether relative measures of the probability and consequences of various oil spills including worst case scenario are taken into account.	Yes	(Ref. OSCRP 2.4)
6.	Whether all types of spills possible in the facility are considered including grounding, collision, fire, explosion, Rupture of hoses.	Yes	(Ref. OSCRP 2.3 & 2.4)
7.	Please specify the list of oils considered for risk assessment	Yes	(Ref. OSCRP 2.2)
8.	Whether the vulnerable areas are estimated by considering maximum loss scenario and weather condition	Yes	(Ref OSCRP 2.1 Computational Scenarios)
9.	Whether impacts on the vulnerable areas are made after considering the marine protected areas ,population, fishermen ,salt pans ,mangroves ,corals, and other resources within that area	Yes	(Ref. OSCRP 2.6)
10.	Whether measures for reduction of identified high risk are included by reducing the consequences through spill mitigation measures	Yes	(Ref. OSCRP 1.4, 2.3, 2.6. 3 & 5)
11.	Whether steps have been considered to reduce risks to the exposed population by increasing safe distances by acquiring property around the facility ,if possible	NA	All facilities developed within SEZ keeping safe distances from the exposed population.
12.	Whether risk levels are established for each month after considering the probability with tide and current and consequences of each such spill	Yes	(Ref. OSCRP 2.1 computational scenarios & 2.3)
13.	Whether prevention and mitigation measures are included in the plan	YES	(Ref. OSCRP 4.0, 7.0, 8.0 & 9.0)
14.	Whether the spill may affect the shoreline.(length of the shoreline with coordinated)	Yes	Ref. OSCRP 2.3 & 2.6)
15.	Whether time taken the oil spill to reach ashore in each quantity of spill in various month are mentioned in the plan	Yes	(Ref. OSCRP 2.3)
16.	Whether sensitivity mapping has been carried out	Yes	(Ref. OSCRP 2.5)
17.	Does the sensitivity mapping clearly identify the vulnerable areas along with MPAs, corals fishermen community, salt pans, mangroves and other socio-economic elements in the area	Yes	(Ref. OSCRP 2.5 & 2.6)
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## ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.

## MUNDRA

## OIL SPILL CONTINGENCY RESPONSE PLAN

18	Do the sensitivity maps indicate area to be protected on priority	Yes	(Ref. OSCRP 2.6)
19	Does the maps indicate boom deployment locations	NA	Booms not deployed permanently
20	Whether any marine protected area will be affected	YES	(Ref. OSCRP 2.5 & 2.6)
21	Whether total number of fishermen likely to affected is mentioned in the plan	Yes	(Ref. OSCRP 2.6)
22	Whether any saltpan in the area is going to be affected	Yes	(Ref. OSCRP 2.6)
23	Whether any mangroves in the area will be affected by a spill	Yes	(Ref. OSCRP 2.6)
<b>Preparedness</b>			
24	whether any containment equipment is available	Yes	(Ref. OSCRP Annex 3)
25	Whether any recovery equipment is available	Yes	(Ref. OSCRP Annex 3)
26	Whether the facility is having any temporary storage capacity	Yes	(Ref. OSCRP Annex 3)
27	Whether location of the oil spill response equipment is mentioned in the plan	Yes	Has been included in Annex 3
28	Whether suitable vessels available for deploying the boom skimmer etc.	Yes	(Ref. OSCRP Annex 3)
29	Whether OSD held with facility	Yes	(Ref. OSCRP Annex 3)
30	Whether the OSD held with the facility is approved for use in Indian waters	Yes	
31	Whether the facility has MoU with other operator for tier -1 preparedness	Yes	(Ref. OSCRP 1.4)
32	Whether the list of oil spill response equipment available with each agency in deliberation	Yes	MoU document
33	Whether the facility has any MoU with private OSRO	NA	Port itself is equipped to deal with oil spill emergencies
34	Whether the procedure for evoking the mutual aid is clearly described in the plan	Yes	(Ref. OSCRP 1.4)
35	Whether additional manpower is available	Yes	(Ref. OSCRP 5.4)
36	Whether list of approved recyclers is mentioned in the plan	Yes	List of recycler approved by state of Gujarat is included in Annexure 15.
37	Whether NEBA (net environmental Benefit Analysis) has been undertaken	Yes	Before commissioning of any new project, various environmental aspects with their positive or adverse impact is considered under EIA Environment Impact Assessment stage.
38	Whether the areas from priority protection have identify in the plan	YES	(Ref. OSCRP 2.5 & 2.6)
39	Whether relevant authorities and stakeholder were consulted for NEBA and during the areas for property protection	Yes	Before commissioning of any new project Environment Impact Assessment & Public consultation is carried out, in which relevant authorities & stakeholders

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			were consulted.
40	Whether district administration has been appraised of the risk impact of oil spills?	Yes	District Level Disaster Management Plan is prepared and regularly updated at district level by District Collector of Kutchh. Under DMP Oil spillage contingency is identified as risk. During preparation & updating of disaster management plan, District Level Authority organises & compiles information from various industries of kutchh. APSEZL is regularly participating in the same & providing necessary information to district level administration.
<b>Action Plan</b>			
41	Whether the plan outlines procedure for reporting of oil spill to coast guard	Yes	(Ref. OSCRP 7.3)
42	Whether the oil spill response action is clearly mentioned	Yes	(Ref. OSCRP 3.1 to 3.6)
43	Whether the action plan include all duties to be attended in connection with an oil spill	Yes	(Ref. OSCRP 3.4)
44	Whether the action plan includes key personnel by their name and designation viz. C/C, S/C	Yes	Ref. OSCRP Annexure-4
45	Whether alternate coverage is planned to take care of the absence of a particular person [in cases where action plan is developed basic names]	Yes	(Ref. OSCRP 5)
46	Whether the plan includes assignment of all key coordinators viz. the communication controller, safety coordinator, Emergency management team, Administration and communication coordinator and safety coordinator	Yes	(Ref. OSCRP 3.4)
47	Whether contact directory containing numbers of key response and management personnel is intimated in the plan	Yes	Ref. OSCRP Annexure-4
48	Whether approved recyclers are identified for processing recovered oil and oily debris	Yes	List of approved recycler of Gujarat state is included in annexure 15.  Membership of common disposal facility for disposal of oily debris is also attached annexure 15.
49	Whether the shoreline likely to be affected is identified	Yes	(Ref. OSCRP 2.5 & 2.6)
50	Whether final report on the incident is submitted to CGHQ as per NOS-DCP 2014	NA	<b>No incident</b>
51	Whether the spill incident and its consequences	NA	<b>No incident</b>

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	are informed to fishermen and other NGOs for environment protection through media		
	<b>Training and exercises</b>		
52	Whether mock fire /emergency response drills are specified in the plan	Yes	(Ref. OSCRP 5.6)
53	Whether the mock drills cover all types of probable oil spill	Yes	
54	Whether the plan mentions list of trained manpower	Yes	(Ref. OSCRP 5.6)
55	Whether record for periodic mock drill are maintained in a well-defined format	Yes	
56	Whether the plan updated according to the finding in mock-drills and exercises	Yes	
	<b>DESCRIPTION</b>		
57	What is the frequency of updation /review of contingency plan?	Yes	As Per NOSDCP 2015
58	Periodicity of joint exercises with mutual aid partner	Yes	
59	Frequency of mock-drills for practice	Yes	(Ref. OSCRP 5.6)
60	Whether the records for periodic mock drills are maintained in a well-defined format	Yes	(Ref. OSCRP 5.6)
61	Whether the plan is updated according to the finding of mock-drills and exercises	Yes	
62	Frequency of updation /review of contingency plan	Yes	As Per NOSDCP 2015
<p>I, hereby, declare that the all information appended above and true and correct to my knowledge of belief.</p> <p style="text-align: center;"> <b>Capt. Anubhav Jain</b>  <b>AGM - Marine &amp; PFSO</b>  <b>Adani Ports &amp; SEZ Ltd.</b>  <b>Mundra - Kutch - Gujarat</b> </p> <p>Date: 01 Oct 2019</p> <p style="text-align: right;">   Chief conservator /Installation manager </p>			
<b>VERIFIED</b>			
<p>Date: _____ (District commander ICG ) or his representative</p>			
<p>Date: _____ (Regional commander ICG) or his representative</p>			

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# **Annexure – 3**



**POLLUCON**

LABORATORIES PVT. LTD.

Environmental Auditors, Consultants & Analysts  
Cleaner Production / Waste Minimisation Facilitators

Recognised by MoEF New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

# **"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"**

**FOR**



**ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED  
TAL: MUNDRA, KUTCH, MUNDRA – 370 421**

**MONITORING PERIOD: OCTOBER 2019 TO MARCH 2020**

**PREPARED BY:**



**POLLUCON LABORATORIES PVT.LTD.**

**PLOT NO.5/6 "POLLUCON HOUSE", OPP. BALAJI INDUSTRIAL SOCIETY,  
OLD SHANTINATH SILK MILL LANE, NEAR GAYTRI FARSAN MART,  
NAVJIVAN CIRCLE, UDHANA MAGDALLA ROAD, SURAT-395007.  
PHONE/FAX – (+91 261) 2455 751, 2601 106, 2601 224.  
E-mail: [pollucon@gmail.com](mailto:pollucon@gmail.com) web: [www.polluconlab.com](http://www.polluconlab.com)**

**TC - 5945**

**ISO 9001:2015**

**ISO 14001:2015**

**OHSAS 18001:2007**

## MARINE WATER MONITORING SUMMARY REPORT

### RESULTS OF MARINE WATER [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.29	8.17	8.21	8.16	8.14	8.05	8.17	8.06	8.15	8.09	8.2	8.04	IS3025(P11)83Re.02
2	Temperature	oC	30.4	30.0	30.2	29.8	29.9	29.6	29.8	29.6	30	29.8	30.3	30.2	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	276	296	196	127	136	164	149	164	129	146	216	250	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4.8	Not Detected	5.3	Not Detected	4.2	Not Detected	3.6	Not Detected	3.8	Not Detected	4.0	2.0	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.9	6.0	5.9	6.1	5.5	5.9	5.7	5.9	5.6	5.4	8.8	6	IS3025(P38)89Re.99
6	Salinity	ppt	34.9	35.3	35.1	35.3	34.8	35.5	36.5	37.4	37.1	37.6	34.6	34.4	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)5520 D
8	Nitrate as NO <sub>3</sub>	µmol/L	3.98	4.15	5.26	5.68	4.9	4.57	6.78	7.29	4.18	4.20	10.8	8.2	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	µmol/L	0.2	0.16	1.38	0.99	0.72	0.52	0.75	0.97	0.63	0.57	1.1	0.9	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	µmol/L	1.90	2.10	3.29	3.47	3.12	2.93	2.69	2.52	1.79	1.86	6.24	5.54	IS3025(P34)88Cla.2.3
11	Phosphates as PO <sub>4</sub>	µmol/L	1.1	1.3	2.15	2.56	1.87	1.63	1.52	1.6	1.34	1.41	1.6	1.3	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	µmol/L	7.08	7.14	9.93	10.14	8.78	8.02	10.22	10.78	6.60	6.63	8.5	8.2	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	Not Detected	Not Detected	10	Not Detected	13.6	Not Detected	12	Not Detected	17.6	10.2	18	4	PLPL-TPH
14	Total Dissolved Solids	mg/L	36258	36890.0	36710	36989	35874	36526	37468	38270	37998	38456	36218	36080	IS3025(P16)84Re.02
15	COD	mg/L	18	7.5	19	Not Detected	25	Not Detected	28	20.0	25	17.6	10	8.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Flora and Fauna</b>															
16	Primary productivity	mgC/L /day	8.77	7.6	10	9.3	13.5	10.8	18.9	15.3	19.8	16.2	2.13	0.76	APHA (22 <sup>nd</sup> Edi) 10200-J
<b>B Phytoplankton</b>															
17.1	Chlorophyll	mg/m <sup>3</sup>	3.57	2.45	2.93	2.72	3.25	2.83	2.93	2.67	3.15	2.83	1.11	0.929	APHA (22 <sup>nd</sup> Edi) 10200-H

H. T. Shah

Lab Manager



Dr. ArunBajpai

Lab Manager (Q)

Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

17.2	Phaeophytin	mg/m <sup>3</sup>	0.2	1.2	1.1	1.1	1.3	1.3	2	2.26	1.63	1.73	3.2	2.90	APHA (22 <sup>nd</sup> Edi) 10200-H
17.3	Cell Count	No. x 10 <sup>3</sup> /L	180	72	196	88	204	102	182	104	166	94	228	76	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Pinnularia sp.</i> <i>Oscillatoria sp.</i> <i>Biddulphia sp.</i> <i>Rhizosolenia sp.</i>	<i>Navicula sp.</i> <i>Thallasiosira sp.</i> <i>Thalassionema sp.</i> --	<i>Biddulphia sp.</i> <i>Rhizosolenia sp.</i> <i>Coscinodiscus sp.</i> <i>Navicula sp.</i> --	<i>Cheatoceus sp.</i> <i>Navicula sp.</i> <i>Gyrosigma sp.</i> --	<i>Amphiproira sp.</i> <i>Gyrosigma sp.</i> <i>Biddulphia sp.</i> <i>Nitzschia sp.</i> --	<i>Thallasiosira sp.</i> <i>Navicula sp.</i> <i>Rhizosolenia sp.</i> --	<i>Synedra sp.</i> <i>Rhizosolenia sp.</i> <i>Biddulphia sp.</i> <i>Skeletonema sp.</i> --	<i>Navicula sp.</i> <i>Pleurosigma sp.</i> <i>Thalassiotrix sp.</i> --	<i>Melosira sp.</i> <i>Cheatoceus sp.</i> <i>peridinium sp.</i> <i>Rhizosolenia sp.</i> <i>Thalassionema sp.</i>	<i>Fragillaria sp.</i> <i>Biddulphia sp.</i> <i>Pleurosigma sp.</i>	<i>Biddulphia sp.</i> <i>Melosira sp.</i> <i>Navicula sp.</i> <i>Nitzschia sp.</i> <i>Skeletonema sp.</i>	<i>Melosira sp.</i> <i>Navicula sp.</i> <i>Nitzschia sp.</i> <i>Fragillaria sp.</i> --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	56		53		59		39		44		20		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Mysids Gastropods Copepods Polychaetes		Bivalves Crustaceans Mysids		Decapods Crustaceans Bivalves Polychaetes		Ostracods Decapods Ctenophores Gastropods		Decapods Polychaetes Mysids		Copepods Decapods Foraminiferans Ostracodes		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	3.9		3.8		4.1		2.1		3.45		4.58		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2480		1720		2320		2450		2460		1770		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2.4 (2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

H. T. Shah

Lab Manager



Dr. ArunBajpai

Lab Manager (Q)

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**RESULTS OF SEDIMENT ANALYSIS [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019	NOVEMBER 2019	DECEMBER 2019	JANUARY 2020	FEBRUARY 2020	MARCH 2020	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.76	0.82	0.65	0.7	0.83	0.82	FCO:2007
2	Phosphorus as P	µg/g	504	576	612	743	712	170	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	5.2	4.86	5.2	4.96	4.72	5.6	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	118	214	170	136	191	218	AAS 3111B
5.3	Manganese as Mn	µg/g	1236	969	934	905	938	1680	AAS APHA 3111 B
5.4	Iron as Fe	%	5.25	5.1	4.98	5.01	4.82	5.2	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	21.4	37.4	43	37	27	80.6	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	34.7	58.6	39	28	35	70.8	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	175	224	120	139	158	240	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	2.13	3.76	2.49	2.12	1.73	8.2	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	0.07	Not Detected	Not Detected	Not Detected	Not Detected	0.12	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	amphipods Polychaetes --	Polychaetes Copepods amphipods	Polychaetes Echinoderms Crustaceans	Crustaceans Polychaetes Bivalves	Crustaceans Polychaetes	Decapods Amphipods --	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	Turbellarians	Foraminiferans	--	Foraminiferans	Nematodes	Copepods Hydrozoa	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m2	618	559	706	765	676	370	APHA (22 <sup>nd</sup> Edi) 10500-C



**H. T. Shah**  
**Lab Manager**




**Dr. Arun Bajpai**  
**Lab Manager (Q)**

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**RESULTS OF MARINE WATER [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.26	8.17	8.13	8.08	8.10	8.01	8.02	7.95	8.16	8.07	8.24	8.06	IS3025(P11)83 Re.02
2	Temperature	oC	30.5	30.1	30.1	29.7	29.9	29.4	29.9	29.7	30	29.9	30.3	30.1	IS3025(P9)84R e.02
3	Total Suspended Solids	mg/L	290	312	231	267	134	152	124	149	154	168	260	280	IS3025(P17)84 Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4.3	Not Detected	3.3	Not Detected	3.6	Not Detected	3.0	Not Detected	3.2	Not Detected	4.0	3.0	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	6.0	6.1	5.8	6.0	5.6	5.9	5.7	5.9	5.7	5.4	6.6	6	IS3025(P38)89 Re.99
6	Salinity	ppt	35.1	35.3	35.5	35.9	34.7	36.4	36.9	37.6	36.8	37.5	34.9	34.6	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)5 520D
8	Nitrate as NO <sub>3</sub>	μmol/L	4.18	4.85	5.3	5.41	4.8	4.3	7.12	7.6	6.14	6.30	14.2	10.2	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	1.3	1.14	1.37	0.92	0.68	0.5	0.376	0.79	0.43	0.59	1.5	1.1	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	1.50	2.10	3.26	3.51	3.14	2.91	2.74	2.68	1.90	1.82	5.9	5.5	IS3025(P34)88 Cla.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	1.9	1.5	2.4	2.58	1.98	1.73	1.63	1.42	1.38	1.53	1.5	1.3	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	4.50	5.30	9.92	9.84	8.60	7.71	10.23	11.07	8.47	8.71	7.6	7.4	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	Not Detected	Not Detected	9.3	Not Detected	11.4	Not Detected	15	Not Detected	14.9	13.2	17	7.0	PLPL-TPH
14	Total Dissolved Solids	mg/L	36610	37394	36890	37014	36186	37894	37812	38450	37616	38370	37128	36726	IS3025(P16)84 Re.02
15	COD	mg/L	16.2	7.0	24.0	Not Detected	23.0	Not Detected	25.0	19.0	28	21	12.0	10.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Flora and Fauna</b>															
16	Primary productivity	mgC/L/day	8.73	7.29	9.72	9.36	14.4	11.7	20.7	17.1	21.6	18	1.35	0.67	APHA (22 <sup>nd</sup> Edi) 10200-J
<b>B Phytoplankton</b>															
17.1	Chlorophyll	mg/m <sup>3</sup>	3.04	2.34	2.83	2.4	2.99	2.72	3.2	3.04	3.25	2.93	2.2	0.97	APHA (22 <sup>nd</sup> Edi) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	1.0	1.3	1.1	1.6	1.2	0.9	1.4	0.99	1.34	1.17	3.5	4.4	APHA (22 <sup>nd</sup> Edi) 10200-H

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Lab Manager



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17.3	Cell Count	No. x 10 <sup>3</sup> /L	136	61	141	64	160	89	184	90	172	84	285	140	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>ceratium p</i> <i>Coscinodiscus sp.</i> <i>Pinnularia sp.</i> --	<i>Nitzschia sp.</i> <i>Surirella sp.</i> <i>Biddulphia sp.</i> --	<i>Thalassionema sp.</i> <i>Coscinodiscus sp.</i> <i>Biddulphia sp.</i> <i>ceratium sp.</i> --	<i>Navicula sp.</i> <i>Rhizosolenia sp.</i> -- --	<i>Surirella sp.</i> <i>Biddulphia sp.</i> <i>Coscinodiscus sp.</i> <i>Thalassionema sp.</i> <i>Navicula sp.</i>	<i>Melosira sp.</i> <i>Nitzschia sp.</i> <i>Cyclotella sp.</i> -- --	<i>Nitzschia sp.</i> <i>Coscinodiscus sp.</i> <i>Pleurosigma sp.</i> <i>Rhizosolenia sp.</i> --	<i>Navicula sp.</i> <i>Stauroneis sp.</i> <i>Synedra sp.</i> -- --	<i>Skeletonema sp.</i> <i>Cyclotella sp.</i> <i>Biddulphia sp.</i> <i>a sp.</i> <i>Melosira sp.</i> <i>Rhizosolenia sp.</i>	<i>Fragillaria sp.</i> <i>Nitzschia sp.</i> <i>Ceratium sp.</i>	<i>Biddulphia sp.</i> <i>Cyclotella sp.</i> <i>Nitzschia sp.</i> <i>Peridinium</i> <i>Coscinodiscus sp.</i>	<i>Thalassionema sp.</i> <i>Skeletonema sp.</i> <i>Navicula sp.</i> -- --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> / 100 m <sup>3</sup>	44		47		42		52		45		32		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Ostracods lamellibranchs Chaetognathes		molluscan Crustaceans Bivalves		Chaetognathes Polychaetes Foraminiferans		Gastropods Decapods Amphipods Chaetognaths		Foraminiferans Chaetognathes Polychaetes		Gastrotriches Copepods Polychaete worms Bivalves		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	2.25		2.55		3.1		2.9		3.75		4.2		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2200		1840		2350		2210		2280		1640		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)9 221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Ed i.2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



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## RESULTS OF SEDIMENT ANALYSIS [M2 MOUTH OF BOCHA & NAVINAL CREEK – N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019	NOVEMBER 2019	DECEMBER 2019	JANUARY 2020	FEBRUARY 2020	MARCH 2020	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.69	0.7	0.54	0.73	0.65	0.72	FCO:2007
2	Phosphorus as P	µg/g	470	554	590	714	632	206	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	5.1	4.36	4.92	4.83	4.85	5.2	AAS APHA 3111 B
5.2	Total Chromium as Cr+3	µg/g	141	270	158	140	203	130	AAS 3111B
5.3	Manganese as Mn	µg/g	903	963	910	932	924	1940	AAS APHA 3111 B
5.4	Iron as Fe	%	5.22	4.9	4.86	4.98	4.98	5.1	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	37.8	53.2	40	48	32	94.6	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	39.1	28.4	35	32	27	62.8	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	183	170	154	156	143	256	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	2	3.16	2.68	2.36	1.69	10.7	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Polychaetes Gastropods --	Polychaetes Crustaceans --	Polychaetes Gastropods Branchayrans	Polychaetes Gastropods Crustaceans	Polychaetes Crustaceans Bivalves	Polychaete worms Amphipods Gastropods	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	Nematodes	Nematodes	--	Nematodes	--	Hydrozoa	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m <sup>2</sup>	706	647	676	733	616	296	APHA (22 <sup>nd</sup> Edi) 10500-C



H. T. Shah

Lab Manager





Dr. Arun Bajpai

Lab Manager (Q)


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### RESULTS OF MARINE WATER [M3 EAST OF BOCHAISLAND - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.23	8.15	8.20	8.12	8.15	8.03	8.24	8.16	8.19	8.10	8.3	8.15	IS3025(P11)83Re.02
2	Temperature	oC	30.4	30.0	30.1	29.9	29.9	29.5	29.9	29.7	30	29.9	30.2	30.3	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	283	326	192	211	208	216	183	174	144	152	248	224	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	4.5	Not Detected	4.0	Not Detected	4.2	Not Detected	3.3	Not Detected	3.7	Not Detected	4.0	3.0	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.9	6.0	5.8	5.9	5.7	5.9	5.6	5.9	5.6	5.4	6.2	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	34.6	34.9	35.6	35.8	35.9	36.6	37.1	37.6	37.5	37.8	35	34.6	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)552 OD
8	Nitrate as NO <sub>3</sub>	μmol/L	3.91	4.28	5.1	5.29	5.36	5.57	6.28	6	5.18	5.0	13.8	8.0	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.16	0.11	1.36	1.14	1.1	1	0.65	0.75	0.61	0.48	1.2	0.6	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	3.27	3.90	3.57	3.81	3.40	3.62	2.42	2.16	1.92	1.73	2.7	2.2	IS3025(P34)88Cla.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.83	3.16	3.7	3.21	3.12	3.26	1.64	1.39	1.50	1.29	1.6	1.40	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	7.34	8.3	10.03	10.2	9.86	10.2	9.35	8.91	7.71	7.21	3.8	2.7	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	12.0	Not Detected	11.3	Not Detected	15.0	Not Detected	12	Not Detected	19	Not Detected	18	12	PLPL-TPH
14	Total Dissolved Solids	mg/L	36024	36184	37010	37554	36410	37116	37810	38450	38370	38694	36210	35714	IS3025(P16)84Re.02
15	COD	mg/L	15.6	8.2	24.0	Not Detected	27.0	Not Detected	25.0	19.0	23	17	10	8.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Flora and Fauna</b>															
16	Primary productivity	mgC/L/day	8.5	6.97	9.18	8.28	15.12	12.24	18.9	15.3	21.42	18	1.71	0.47	APHA (22 <sup>nd</sup> Edi) 10200-J
<b>B Phytoplankton</b>															
17.1	Chlorophyll	mg/m <sup>3</sup>	3.2	2.24	2.83	2.72	2.93	2.88	3.09	2.67	3.31	3.09	2.5	0.65	APHA (22 <sup>nd</sup> Edi) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	1.0	1.9	1.3	1.1	2.7	0.9	1.91	2.3	1.47	1.54	2.4	1.8	APHA (22 <sup>nd</sup> Edi) 10200-H

  
**H. T. Shah**  
Lab Manager



  
**Dr. Arun Bajpai**  
Lab Manager (Q)

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17.3	Cell Count	No. x 10 <sup>3</sup> /L	146	70	184	78	196	86	178	94	164	84	264	96	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Amphipro ra sp.</i> <i>Nitzschia sp.</i> <i>Thalassiosira sp.</i> <i>Ceratium sp.</i>	<i>Navicula sp.</i> <i>Coscinodiscus sp.</i> <i>Biddulphia sp.</i> --	<i>Navicula sp.</i> <i>Coscinodiscus sp.</i> <i>Cheatoceous sp.</i> <i>Rhizosolenia sp.</i>	<i>Nitzschia sp.</i> <i>Biddulphia sp.</i> <i>Pleurosigma sp.</i> --	<i>Navicula sp.</i> <i>Fragillaria sp.</i> <i>Thalassionema sp.</i> <i>Coscinodiscus sp.</i>	<i>Nitzschia sp.</i> <i>Biddulphia sp.</i> <i>Amphipro ra sp.</i> --	<i>Cheatoceous sp.</i> <i>Navicula sp.</i> <i>Biddulphia sp.</i> <i>Skeletonema sp.</i> --	<i>Thalassionema sp.</i> <i>Nitzschia sp.</i> <i>Navicula sp.</i> --	<i>Cyclotella sp.</i> <i>Rhizosolenia sp.</i> <i>Coscinodiscus sp.</i> <i>Ceratium sp.</i>	<i>Biddulphia sp.</i> <i>Fragillaria sp.</i> <i>Cheatoceous sp.</i>	<i>Nitzschia sp.</i> <i>Navicula sp.</i> <i>Coscinodiscus sp.</i> <i>Rhizosolenia sp.</i> <i>Biddulphia sp.</i>	<i>Fragillaria sp.</i> <i>Navicula sp.</i> <i>Melosira sp.</i> --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	41		46		44		47		42		20		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Foraminiferans Polychaetes Gastropods --		Gastropods Crustaceans Polychaetes		Copepods Mysids Decapods Chaetognathes		Lamellibranches Gastropods Decapods Polychaetes		Polychaetes Ostracods Gastropods		Copepods Nematodes Polychaete worms --		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	2.3		2.6		2.95		2.9		3.15		5.28		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2310		1780		2150		2240		2210		1690		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)922 1-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2 .4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

H. T. Shah

Lab Manager



Dr. ArunBajpai

Lab Manager (Q)

### RESULTS OF SEDIMENT ANALYSIS [M3 RIGHT SIDE OF BOCHA CREEK - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019	NOVEMBER 2019	DECEMBER 2019	JANUARY 2020	FEBRUARY 2020	MARCH 2020	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.7	0.74	0.73	0.65	0.55	0.63	FCO:2007
2	Phosphorus as P	µg/g	461	560	658	698	672	150	APHA(22 <sup>nd</sup> Eti) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	5.07	4.46	5.12	4.76	4.89	5.43	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	163	276	172	152	169	150	AAS 3111B
5.3	Manganese as Mn	µg/g	970	1010	953	917	960	1570	AAS APHA 3111 B
5.4	Iron as Fe	%	5.18	4.69	4.6	4.86	4.9	5.12	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.5	Nickel as Ni	µg/g	41.3	59.4	37	30	39	50.2	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.6	Copper as Cu	µg/g	35.7	47.3	43	28	32	40.6	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.7	Zinc as Zn	µg/g	201	251	165	198	183	218	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.8	Lead as Pb	µg/g	2.84	2.6	1.9	2	1.78	11.6	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Polychaetes Gastropods --	Crustaceans Gastropods --	Branchayrans amphipods Gastropods	Polychaetes Ostracods amphipods	Polychaetes Crustaceans	Polychaete worms Isopods Decapods	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	Nematodes	Foraminiferans	--	Nematodes	Nematodes	Nematodes	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m <sup>2</sup>	676	588	704	735	618	340	APHA (22 <sup>nd</sup> Edi) 10500-C



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

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## RESULTS OF MARINE WATER [M4 JUNA BANDAR N 22°47'57" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.25	8.17	8.18	8.12	8.17	8.03	8.21	8.15	8.27	8.21	8.11	8.07	IS3025(P11)83R e.02
2	Temperature	oC	30.6	30.2	30.1	29.8	29.9	29.5	29.9	29.7	30	29.9	30.2	30	IS3025(P9)84Re .02
3	Total Suspended Solids	mg/L	264	289	237	249	210	226	236	252	184	201	285	219	IS3025(P17)84R e.02
4	BOD (3 Days @ 27 °C)	mg/L	4.9	Not Detected	3.2	Not Detected	3.8	Not Detected	3.5	Not Detected	4.1	Not Detected	2.5	1.8	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	6.0	6.2	5.7	5.9	5.6	5.7	5.7	5.9	5.6	5.4	5.8	5.2	IS3025(P38)89R e.99
6	Salinity	ppt	35.2	35.7	37	37.3	35.8	36.5	37.0	37.7	37.3	37.9	35	34.2	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)5 520D
8	Nitrate as NO <sub>3</sub>	µmol/L	3.57	3.81	4.98	5.16	5.2	5.36	6.40	5.97	4.79	4.58	20.6	17.4	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	µmol/L	0.23	0.17	1.3	1.18	1.19	0.9	0.85	0.68	0.72	0.60	1.2	0.8	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	µmol/L	2.91	3.24	3.68	3.34	3.76	3.52	1.92	1.76	1.83	2.14	2.2	1.8	IS3025(P34)88C la.2.3
11	Phosphates as PO <sub>4</sub>	µmol/L	2.16	2.39	3.49	2.56	3.64	3.13	1.84	1.45	1.56	1.83	1.7	1.4	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	µmol/L	6.71	7.22	9.96	9.68	10.15	9.78	9.17	8.41	7.34	7.32	7	6	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	15	Not Detected	17	Not Detected	13	Not Detected	15.2	Not Detected	19	Not Detected	14	8.0	PLPL-TPH
14	Total Dissolved Solids	mg/L	36818	37260	37162	37428	36280	37771	37910	38540	38185	38726	36840	36320	IS3025(P16)84R e.02
15	COD	mg/L	21.0	8.6	25	Not Detected	28	Not Detected	29	17	25	16.3	8.0	6.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
A	Flora and Fauna														
16	Primary productivity	mgC/L/d ay	8.07	6.16	9.45	8.46	13.95	12.15	19.8	16.2	21.5	17.82	2.56	0.67	APHA (22 <sup>nd</sup> Edi) 10200-J
B	Phytoplankton														
17.1	Chlorophyll	mg/m <sup>3</sup>	2.93	2.67	2.88	2.72	3.2	2.93	3.04	2.72	3.09	2.88	3.1	0.7	APHA (22 <sup>nd</sup> Edi) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	1.7	1.1	2.1	1.9	2.6	1.7	1.78	2.32	1.54	1.6	2.4	1.7	APHA (22 <sup>nd</sup> Edi) 10200-H

H. T. Shah  
Lab Manager



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17.3	Cell Count	No. x 10 <sup>3</sup> /L	156	76	178	90	204	98	180	107	164	90	310	80	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Oscillatoria</i> sp. <i>Navicula</i> sp. <i>Gyrosigma</i> sp. --	<i>Navicula</i> sp. <i>Fragillaria</i> sp. <i>Ditylimum</i> sp. --	<i>Coscinodiscus</i> sp. <i>Cyclotella</i> sp. <i>Nitzschia</i> sp. <i>Thalassionema</i> sp.	<i>Navicula</i> sp. <i>Rhizosolenia</i> sp. <i>Biddulphia</i> sp. --	<i>Thalassionema</i> sp. <i>Pleurosigma</i> sp. <i>Biddulphia</i> sp. <i>Ceratium</i> sp.	<i>Amphiprora</i> sp. <i>Navicula</i> sp. <i>Cyclotella</i> sp. --	<i>Nitzschia</i> sp. <i>Rhizosolenia</i> sp. <i>Cheatecerous</i> sp. <i>Pleurosigma</i> sp. --	<i>Navicula</i> sp. <i>Biddulphia</i> sp. <i>Synedra</i> sp. --	<i>Melosira</i> sp. <i>Coscinodiscus</i> sp. <i>Thalassionema</i> sp. <i>Pleurosigma</i> sp. <i>Nitzschia</i> sp.	<i>Ceratium</i> sp. <i>Cheatecerous</i> sp. <i>Navicula</i> sp. <i>Nitzschia</i> sp.	<i>Fragillaria</i> sp. <i>Melosira</i> sp. <i>Pinnularia</i> sp. <i>Rhizosolenia</i> sp. <i>Skeletonema</i> sp.	<i>Nitzschia</i> sp. <i>Amphora</i> sp. <i>Biddulphia</i> sp. --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	45		50		47		53		43		17		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Ctenophores Polychaetes Crustaceans --		Polychaetes Gastropods Nematodes		Polychaetes Copepods Ostracods Chaetognathes		Amphipods Decapods Lamellibranches Polychaetes		Polychaetes Chaetognathes Ctenophores		Copepods Ostracods Molluscans Ostracods		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	2.6		3.2		3		3.25		3.35		10.2		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2540		1540		2230		2180		2320		1540		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)9 221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi .2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



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## RESULTS OF SEDIMENT ANALYSIS [M4 JUNA BANDAR N 22°47'57" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019	NOVEMBER 2019	DECEMBER 2019	JANUARY 2020	FEBRUARY 2020	MARCH 2020	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.71	0.78	0.65	0.69	0.69	0.96	FCO:2007
2	Phosphorus as P	µg/g	503	546	624	684	658	190	APHA(22 <sup>nd</sup> Eti) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.85	4.28	5.23	4.8	4.79	5.5	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	195	253	163	176	181	190	AAS 3111B
5.3	Manganese as Mn	µg/g	987	1034	926	902	956	1940	AAS APHA 3111 B
5.4	Iron as Fe	%	5.11	4.86	4.5	5.12	4.83	5.35	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.5	Nickel as Ni	µg/g	48.3	50.8	39	18	28	38.6	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.6	Copper as Cu	µg/g	54.8	33.2	54	26	32	72.2	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.7	Zinc as Zn	µg/g	211	180	116	175	192	222	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.8	Lead as Pb	µg/g	2.73	2.14	1.9	2.1	1.86	10.2	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Crustaceans Gastropods --	Copepods Polychaetes --	Gastropods Polychaetes Crustaceans	Polychaetes Gastropods Mysids	Copepods Polychaetes Crustaceans	Polychaete worms Isopods Decapods	APHA (22 <sup>nd</sup> Eti) 10500-C
6.2	MeioBenthos	--	Nematodes Foraminiferans	Nematodes	Foraminiferans	Nematodes	--	Bryozoans	APHA (22 <sup>nd</sup> Eti) 10500-C
6.3	Population	no/m <sup>2</sup>	706	618	645	794	676	296	APHA (22 <sup>nd</sup> Eti) 10500-C



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Lab Manager




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Lab Manager (Q)

**RESULTS OF MARINE WATER [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.25	8.21	8.21	8.17	8.15	8.06	8.21	8.10	8.26	8.20	8.16	8.12	IS3025(P11)83Re.02
2	Temperature	oC	30.4	30.1	30.0	29.8	29.9	29.6	29.9	29.7	30.1	29.9	30.6	30.2	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	279	296	172	190	184	201	198	185	181	203	209	170	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4.5	Not Detected	3.2	Not Detected	4.0	Not Detected	3.6	Not Detected	4.2	Not Detected	4.0	3.0	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.8	6.0	5.7	5.9	5.6	5.9	5.7	5.9	5.7	5.3	6.2	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	34.1	38.2	36.3	37.2	35.8	36.6	37	37.8	375	37.7	34.8	34.5	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)55 20D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.7	3.9	4.72	5.16	4.95	5.12	6.79	7.30	4.96	4.70	14.2	12.4	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.26	0.3	1.13	1.38	1	0.9	0.92	1.26	0.84	0.67	1.3	1.1	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	3.57	4.00	3.16	3.47	3.54	3.18	2.74	2.58	1.96	1.72	1.9	1.5	IS3025(P34)88Cl a.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.17	2.35	2.48	3.12	2.69	2.8	1.90	1.73	1.70	1.56	1.7	1.4	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	7.53	8.20	9.01	10.01	9.49	9.20	10.45	11.14	7.76	7.09	2.8	2.4	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	14.0	Not Detected	12.0	Not Detected	15.3	Not Detected	12.6	Not Detected	15.8	Not Detected	18	7	PLPL-TPH
14	Total Dissolved Solids	mg/L	36898	36920	37242	37671	36310	37612	37912	38634	38496	38630	35720	35230	IS3025(P16)84Re.02
15	COD	mg/L	17.4	7.2	21.0	Not Detected	20.0	Not Detected	23	16	24.8	17.4	12.0	10.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Flora and Fauna</b>															
16	Primary productivity	mgC/L /day	7.96	6.41	9	8.46	13.68	11.97	19.35	16.2	19.62	16.56	1.84	0.83	APHA (22 <sup>nd</sup> Edi) 10200-J
<b>B Phytoplankton</b>															
17.1	Chlorophyll	mg/m <sup>3</sup>	2.93	2.34	2.88	2.5	3.25	3.04	3.20	2.72	3.31	2.93	1.16	0.97	APHA (22 <sup>nd</sup> Edi) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	1.3	2.0	1.9	1.8	1.8	1.9	0.98	1.69	2.0	1.96	2.2	1.6	APHA (22 <sup>nd</sup> Edi) 10200-H

H. T. Shah  
Lab Manager



Dr. ArunBajpai  
Lab Manager (Q)



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17.3	Cell Count	No. x 10 <sup>3</sup> /L	138	50	168	82	190	102	204	102	172	94	340	90	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Cheatoceus sp.</i> <i>Cyclotella sp.</i> <i>Rhizosolenia sp.</i> <i>Skeletonema sp.</i>	<i>Rhizosolenia sp.</i> <i>Melosira sp.</i> <i>Gyrodinium sp.</i> --	<i>Rhizosolenia sp.</i> <i>Cyclotella sp.</i> <i>Cheatoceus sp.</i> <i>Skeletonema sp.</i>	<i>Biddulphia sp.</i> <i>Rhizosolenia sp.</i> <i>Pleurosigma sp.</i> --	<i>Navicula sp.</i> <i>Rhizosolenia sp.</i> <i>Thalassionema sp.</i> <i>Biddulphia sp.</i>	<i>Nitzschia sp.</i> <i>Melosira sp.</i> <i>Rhizosolenia sp.</i> --	<i>Synedra sp.</i> <i>Biddulphia sp.</i> <i>Coscinodiscus sp.</i> <i>Navicula sp.</i> --	<i>Nitzschia sp.</i> <i>Pleurosigma sp.</i> <i>Rhizosolenia sp.</i> --	<i>Navicula sp.</i> <i>Melosira sp.</i> <i>Thalassionema sp.</i> <i>Coscinodiscus sp.</i> <i>Ceratium sp.</i>	<i>Ceratium sp.</i> <i>Nitzschia sp.</i> <i>Biddulphia sp.</i> <i>Skeletonema sp.</i>	<i>Amphora sp.</i> <i>Fragillaria sp.</i> <i>Melosira sp.</i> <i>Rhizosolenia sp.</i> <i>Coscinodiscus sp.</i>	<i>Fragillaria sp.</i> <i>Melosira sp.</i> <i>Nitzschia sp.</i> --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	53		60		55		46		50		15		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Polychaetes Gastropods Crustaceans		Crustaceans Copepods --		Copepods Polychaetes Gastropods		Polychaetes Ostracods Ctenophores Amphipods		Chaetognathes Polychaetes Decapods		Polychaete worms Amphipods Gastrotriches Copepods		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	2.8		4.45		3.7		2.45		3.4		5.69		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2380		2120		2180		2250		2240		1820		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)92 21-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
Lab Manager (Q)

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## RESULTS OF SEDIMENT ANALYSIS [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019	NOVEMBER 2019	DECEMBER 2019	JANUARY 2020	FEBRUARY 2020	MARCH 2020	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.75	0.71	0.53	0.7	0.75	0.8	FCO:2007
2	Phosphorus as P	µg/g	469	518	590	638	672	270	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.63	4.23	4.98	4.7	4.82	5.33	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	189	263	156	168	153	170	AAS 3111B
5.3	Manganese as Mn	µg/g	1137	974	928	940	968	1380	AAS APHA 3111 B
5.4	Iron as Fe	%	3.83	4.65	5.1	4.82	4.9	5.4	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	39.5	23.9	31	42	32	21.8	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	47.3	41.4	35	30	28	60.6	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	187	237	174	158	162	172	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	2.64	2.19	1.96	2.14	1.76	17.2	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	0.18	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Polychaetes amphipods --	Copepods Isopods Crustaceans	Polychaetes Crustaceans amphipods	Hydrozoans Polychaetes Isopods Crustaceans	Polychaetes Gastropods	Polychaete worms Isopods Mysids	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	Turbellarians Nematodes	--	--	--	Foraminiferans	Hydrozoa	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m2	765	676	735	762	645	364	APHA (22 <sup>nd</sup> Edi) 10500-C



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
Lab Manager (Q)

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## RESULTS OF MARINE WATER [M7 EAST PORT N 22°47'120" E 069°47'110"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.21	8.13	8.19	8.10	8.17	8.09	8.21	8.14	8.24	8.19	8.05	8.09	IS3025(P11)83Re.02
2	Temperature	oC	30.3	30.1	30.0	29.8	29.9	29.7	29.9	29.6	30	29.5	30.1	29.6	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	298	312	239	261	206	218	170	182	168	187	186	156	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	4.5	Not Detected	3.6	Not Detected	4.1	Not Detected	4.2	Not Detected	4.0	Not Detected	2.2	1.6	IS 3025 (P44)1993Re.03 Edition 2.1
5	Dissolved Oxygen	mg/L	5.9	6.1	5.8	6.0	5.6	5.9	5.7	5.9	5.6	5.3	6.2	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	35.2	35.7	36.4	37.3	35.9	36.6	36.7	37.5	37.1	37.8	34.8	34.5	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)5520D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.64	3.83	4.7	4.97	4.98	5.12	6.24	6.47	4.76	4.56	7.8	5.2	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.31	0.24	1.23	1.42	1.14	1.28	0.93	1.40	0.57	0.69	1.1	0.8	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	3.69	3.81	3.83	4.10	3.26	3.17	2.50	2.37	1.92	1.72	3.1	1.9	IS3025(P34)88Cla 2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.41	2.62	1.76	2	1.89	2.3	1.62	1.48	1.36	1.58	1.43	2.24	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	7.64	7.88	9.76	10.49	9.38	9.57	9.67	10.24	7.25	6.97	4.3	2.8	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	15.0	Not Detected	13.0	Not Detected	15.0	Not Detected	17	Not Detected	19.8	Not Detected	15	10.0	PLPL-TPH
14	Total Dissolved Solids	mg/L	36624	37260	36928	37742	36371	37123	37638	38634	37994	38696	35602	35112	IS3025(P16)84Re.02
15	COD	mg/L	16.3	7.9	25	Not Detected	21	Not Detected	27	18	25.2	19	7	6.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Flora and Fauna</b>															
16	Primary productivity	mgC/L /day	7.31	6.25	9.18	8.46	12.96	10	19.62	15.48	20.25	16.47	1.6	1.3	APHA (22 <sup>nd</sup> Edi) 10200-J
<b>B Phytoplankton</b>															
17.1	Chlorophyll	mg/m <sup>3</sup>	2.67	2.45	2.83	2.5	3.04	2.77	3.20	2.9	3.36	2.7	1.15	0.97	APHA (22 <sup>nd</sup> Edi) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	1.1	1.9	1.5	1.3	1.8	1.8	1.21	1.12	1.16	2.11	2.4	1.9	APHA (22 <sup>nd</sup> Edi) 10200-H

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Lab Manager



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17.3	Cell Count	No. x 10 <sup>3</sup> /L	156	62	172	64	192	84	204	106	164	90	270	65	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Coscinodiscus</i> sp. <i>Rhizosolenia</i> sp. <i>Biddulphia</i> sp. <i>Thalassiosira</i> sp.	<i>Ceratium</i> sp. <i>Nitzschia</i> sp. <i>Fragillaria</i> sp. --	<i>Navicula</i> sp. <i>Coscinodiscus</i> sp. <i>Biddulphia</i> sp. <i>ceratium</i> sp. --	<i>Navicula</i> sp. <i>Rhizosolenia</i> sp. <i>Fragillaria</i> sp. --	<i>Navicula</i> sp. <i>Pleurosigma</i> sp. <i>Coscinodiscus</i> sp. <i>Fragillaria</i> sp. <i>Thalassionema</i> sp.	<i>Nitzschia</i> sp. <i>Melosira</i> sp. <i>Rhizosolenia</i> sp. <i>Biddulphia</i> sp. --	<i>Biddulphia</i> sp. <i>Coscinodiscus</i> sp. <i>Rhizosolenia</i> sp. <i>Cheatecerous</i> sp. --	<i>Nitzschia</i> sp. <i>Pleurosigma</i> sp. <i>Biddulphia</i> sp. --	<i>Melosira</i> sp. <i>cymbella</i> sp. <i>Thalassiosira</i> sp. <i>Coscinodiscus</i> sp.	<i>Nitzschia</i> sp. <i>Rhizosolenia</i> sp. <i>Biddulphia</i> sp. <i>cymbella</i> sp.	<i>Amphora</i> sp. <i>Cyclotella</i> sp. <i>Rhizosolenia</i> sp. <i>Navicula</i> sp. <i>Thalassionema</i> sp. <i>Coscinodiscus</i> sp.	<i>Biddulphia</i> sp. <i>Melosira</i> sp. <i>Rhizosolenia</i> sp. --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	55		59		53		43		47		18		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Polychaetes Copepods Mysids Decapods		Gastropods Copepods Crustaceans		Foraminiferans Copepods Polychaetes --		Foraminiferans Amphipods Decapods Gastropods		Polychaetes Decapods Chaetognathes		Polychaete worms Amphipods Gastrotriches Ostracods		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	2.8		3.4		3		3.1		3.75		8.2		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2420		1740		2280		2140		2250		1940		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)922 1-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2 .4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

H. T. Shah

Lab Manager



Dr. ArunBajpai

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**RESULTS OF MARINE WATER [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.28	8.20	8.23	8.16	8.17	8.09	8.20	8.15	8.26	8.10	8.34	8.28	IS3025(P11)83Re.02
2	Temperature	oC	30.3	30.9	30.0	29.8	29.8	29.3	29.9	29.6	30	29.7	29.8	29.4	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	272	312	182	203	190	212	246	271	201	219	206	178	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4	Not Detected	3.6	Not Detected	4.2	Not Detected	4.5	Not Detected	4.2	Not Detected	3.4	2.8	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.8	6.0	5.7	6.0	5.7	5.9	5.7	5.8	5.6	5.4	6	5.6	IS3025(P38)89Re.99
6	Salinity	ppt	35.3	35.7	36.4	37.3	35.3	36.5	36.8	37.6	37.2	37.9	35.1	34.8	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)552 0D
8	Nitrate as NO <sub>3</sub>	µmol/L	3.24	3.6	4.73	4.9	4.58	4.24	6.57	6.72	4.83	4.70	9.6	7.4	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	µmol/L	0.19	0.11	1.64	1.37	1.32	1.1	1.28	0.96	1.56	1.31	1.5	0.7	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	µmol/L	3.74	3.98	3.90	4.18	3.85	4.00	2.50	2.74	1.94	1.72	3.8	3.2	IS3025(P34)88Cla 2.3
11	Phosphates as PO <sub>4</sub>	µmol/L	2.89	3.1	2.2	3.87	2.9	3.12	2.0	1.93	1.80	1.56	2.1	0.612	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	µmol/L	7.17	7.69	10.27	10.45	9.75	9.34	10.35	10.42	8.33	7.73	4.9	3.7	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	Not Detected	Not Detected	10.0	Not Detected	9.6	Not Detected	14	Not Detected	17	Not Detected	16	11.0	PLPL-TPH
14	Total Dissolved Solids	mg/L	36170	36902	37920	38756	36316	37908	37720	38450	38170	38724	35710	35470	IS3025(P16)84Re.02
15	COD	mg/L	18.0	7.6	24.0	Not Detected	21.0	Not Detected	25	17	27.2	18	14	10	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
A	Flora and Fauna														
16	Primary productivity	mgC/L /day	8.43	6.4	9.72	8.5	13.68	12.0	18.90	15.75	19.89	16.38	2.43	0.74	APHA (22 <sup>nd</sup> Edi) 10200-J
B	Phytoplankton														
17.1	Chlorophyll	mg/m <sup>3</sup>	2.83	2.61	2.67	2.5	3	2.67	3.25	2.88	3.20	2.93	1.2	0.93	APHA (22 <sup>nd</sup> Edi) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	1.7	1.2	1.6	1.3	2.0	2.0	1.0	1.49	1.09	1.40	1.5	0.4	APHA (22 <sup>nd</sup> Edi) 10200-H

H. T. Shah  
Lab Manager



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Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

17.3	Cell Count	No. x 10 <sup>3</sup> /L	174	68	190	78	204	84	198	102	172	86	290	90	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Melosira sp.</i> <i>Coscinodiscus sp.</i> <i>Biddulphia sp.</i> <i>Thalassiosira sp.</i>	<i>Nitzschia sp.</i> <i>Rhizosolenia sp.</i> <i>Cyclotella sp.</i> --	<i>Navicula sp.</i> <i>Biddulphia sp.</i> <i>Cyclotella sp.</i> <i>Fragillaria sp.</i>	<i>Nitzschia sp.</i> <i>Rhizosolenia sp.</i> <i>Thalassiosira sp.</i> --	<i>Nitzschia sp.</i> <i>Thalassiosira sp.</i> <i>Coscinodiscus sp.</i> <i>Melosira sp.</i>	<i>Navicula sp.</i> <i>Pleurosigma sp.</i> <i>Rhizosolenia sp.</i> --	<i>Rhizosolenia sp.</i> <i>Cheatoceus sp.</i> <i>Coscinodiscus sp.</i> <i>Nitzschia sp.</i> --	<i>Nitzschia sp.</i> <i>Navicula sp.</i> <i>Thalassiosira sp.</i> --	<i>Melosira sp.</i> <i>Thalassiosira sp.</i> <i>Pleurosigma sp.</i> <i>Rhizosolenia sp.</i> <i>Ceratium sp.</i>	<i>Nitzschia sp.</i> <i>Biddulphia sp.</i> <i>Coscinodiscus sp.</i>	<i>Synedra sp.</i> <i>Skeletonema sp.</i> <i>Biddulphia sp.</i> <i>Navicula sp.</i> <i>Nitzschia sp.</i>	<i>Fragillaria sp.</i> <i>Nitzschia sp.</i> <i>Thalassiosira sp.</i> --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	61		59		53		42		47		21		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Chaetognathes Gastropods Polychaetes		Gastropods Crustaceans Copepods		Polychaetes Mysids Gastropods		Gastropods Polychaetes Amphipods Foraminiferans		Polychaetes Mysids Gastropods		Gastropods Polychaetes Bivalves Copepods		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	3.7		3.35		3.1		3.0		3.9		7.5		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2500		1920		2480		2320		2350		1650		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)922 1-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
Lab Manager (Q)



Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

### RESULTS OF SEDIMENT ANALYSIS [M8 RIGHT SIDE OF BOCHA CREEK – N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019	NOVEMBER 2019	DECEMBER 2019	JANUARY 2020	FEBRUARY 2020	MARCH 2020	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.73	0.76	0.69	0.71	0.57	0.7	FCO:2007
2	Phosphorus as P	µg/g	497	534	648	620	672	408	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.81	4.92	4.98	4.72	4.87	5.4	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	167	253	163	158	172	240	AAS 3111B
5.3	Manganese as Mn	µg/g	953	1026	916	930	963	1890	AAS APHA 3111 B
5.4	Iron as Fe	%	5.2	5.08	5.14	4.9	5.02	5.3	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	43.6	19.9	28	38	31	56.1	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	57.5	46.2	30	47	28	78.8	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	191	224	152	195	164	282	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	3.27	2.9	1.83	1.98	1.7	14.8	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Polychaetes Sipunculids	Crustaceans Gastropods	Polychaetes Gastropods	Polychaetes Ostracods Branchyurans	Polychaetes Gastropods Crustaceans	Bivalves Mysids	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	Nematodes Foraminiferans	Nematodes	Ostracods	Nematodes	--	Nematodes Copepods	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m <sup>2</sup>	762	733	645	794	676	294	APHA (22 <sup>nd</sup> Edi) 10500-C



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
Lab Manager (Q)

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### RESULTS OF MARINE WATER [M11 MPT T1 JETTY N 22°42'278" E 069°43'450"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.22	8.16	8.17	8.10	8.14	8.02	8.26	8.16	8.25	8.21	8.15	8.1	IS3025(P11)83Re.02
2	Temperature	oC	30.3	30.7	30.1	29.9	29.8	29.2	29.9	29.5	30.1	29.8	30.3	29.8	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	364	381	210	248	224	239	182	170	194	216	310	238	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4.7	Not Detected	3.6	Not Detected	4.8	Not Detected	4.2	Not Detected	4.6	Not Detected	3.4	3.0	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.9	6.1	5.7	5.9	5.7	5.9	5.6	5.9	5.6	5.3	6.2	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	35.4	35.8	36.8	37.3	35.4	36.1	36.9	37.8	37.3	37.9	35.7	35.2	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)552 0D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.57	3.85	4.29	4.56	4.64	4.3	6.27	6.48	5.16	4.87	15.7	10.2	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.23	0.31	1.12	1.9	1.29	1.1	0.84	0.72	0.69	0.60	2.2	1.6	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	3.70	3.91	3.84	3.97	3.90	3.85	2.57	2.40	1.98	1.74	1.7	1.4	IS3025(P34)88Cla.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.23	2.64	2.72	3.81	2.83	3.12	1.83	1.71	1.67	1.48	1.2	0.9	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	7.50	8.07	9.25	10.43	9.83	9.25	9.68	9.60	7.83	7.21	2.38	2.25	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	15.0	Not Detected	11.0	Not Detected	15.0	Not Detected	13.2	Not Detected	15.2	Not Detected	20	8.0	PLPL-TPH
14	Total Dissolved Solids	mg/L	36916	37390	38280	38742	36151	36744	37820	38630	38184	38796	36792	36168	IS3025(P16)84Re.02
15	COD	mg/L	19.0	Not Detected	27	Not Detected	23	Not Detected	25	17	24	18	11	8.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Flora and Fauna</b>															
16	Primary productivity	mgC/L /day	8.64	6.36	9.18	8.28	14.58	12.42	19.62	14.85	19.98	15.48	1.93	1.01	APHA (22 <sup>nd</sup> Edi) 10200-J
<b>B Phytoplankton</b>															
17.1	Chlorophyll	mg/m <sup>3</sup>	3	2.72	2.67	2.45	3.26	3.04	3.15	2.88	3.20	2.99	2.1	0.50	APHA (22 <sup>nd</sup> Edi) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	1.5	1.7	1.7	1.4	3.0	1.1	2.49	2.16	2.10	1.83	2.5	2.1	APHA (22 <sup>nd</sup> Edi) 10200-H

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17.3	Cell Count	No. x 10 <sup>3</sup> /L	157	64	182	97	198	101	210	104	178	86	290	86	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Navicula</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Coscinodiscus</i> <i>sp.</i>	<i>Nitzschia</i> <i>sp.</i> <i>Thalassiosira</i> <i>sp.</i> <i>Skeletonema</i> <i>sp.</i> --	<i>Nitzschia</i> <i>sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Ceratium</i> <i>sp.</i> <i>Cheateoceros</i> <i>sp.</i> <i>Gyrosigma</i> <i>sp.</i>	<i>Fragillaria</i> <i>sp.</i> <i>Navicula</i> <i>sp.</i> <i>Synedra</i> <i>sp.</i> <i>Cyclotella</i> <i>sp.</i> --	<i>Skeletonema</i> <i>sp.</i> <i>Thalassiosira</i> <i>sp.</i> <i>Coscinodiscus</i> <i>sp.</i> <i>Biddulphia</i> <i>sp.</i> <i>Navicula</i> <i>sp.</i>	<i>Navicula</i> <i>sp.</i> <i>Melosira</i> <i>sp.</i> <i>Amphiproteron</i> <i>sp.</i> --	<i>Skeletonema</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Cheateoceros</i> <i>sp.</i> --	<i>Biddulphia</i> <i>sp.</i> <i>Pleurosigma</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> --	<i>Nitzschia</i> <i>sp.</i> <i>Skeletonema</i> <i>sp.</i> <i>Cymbella</i> <i>sp.</i> <i>Biddulphia</i> <i>sp.</i> <i>Fragillaria</i> <i>sp.</i>	<i>Nitzschia</i> <i>sp.</i> <i>Thalassiosira</i> <i>sp.</i> <i>Coscinodiscus</i> <i>sp.</i> <i>Cheateoceros</i> <i>sp.</i> --	<i>Navicula</i> <i>sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Thalassiosira</i> <i>sp.</i> <i>Coscinodiscus</i> <i>sp.</i> <i>Skeletonema</i> <i>sp.</i>	<i>Navicula</i> <i>sp.</i> <i>Thalassiosira</i> <i>sp.</i> <i>Biddulphia</i> <i>sp.</i> --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	62		58		54		50		47		22		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Gastropods Polychaetes Ostracods		Crustaceans Gastropods Polychaetes		Gastropods Polychaetes Ctenophores		Polychaetes Foraminiferans Amphipods Gastropods		Ostracods Gastropods Polychaetes		Copepods Foraminiferans Ostracods Gastropods		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	3.1		3.45		3.10		2.85		3.6		8.8		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2640		2140		2480		2320		2370		1760		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)922 1-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



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### RESULTS OF MARINE WATER [M12 SPM N 22°40'938" E 069°39'191"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2019		NOVEMBER 2019		DECEMBER 2019		JANUARY 2020		FEBRUARY 2020		MARCH 2020		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.25	8.18	8.19	8.12	8.20	8.13	8.25	8.12	8.24	8.2	8.02	7.88	IS3025(P11)83Re.02
2	Temperature	oC	30.3	30.7	30.2	29.9	29.9	29.5	29.9	29.7	30	29.7	29.4	29.1	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	348	365	268	287	216	240	172	197	183	209	290	256	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	4	Not Detected	3.5	Not Detected	4.0	Not Detected	4.3	Not Detected	4.0	Not Detected	4.0	3.0	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.9	6.1	5.7	5.9	5.7	5.9	5.6	5.9	5.6	5.4	5.8	5.4	IS3025(P38)89Re.99
6	Salinity	ppt	35.5	35.6	36.7	37.2	36.5	36.9	36.9	37.8	37.2	37.9	36.1	35.7	APHA (22 <sup>nd</sup> E di) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> E di)552 0D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.81	4.12	4.1	4.32	3.68	3.42	6.12	6.35	5.26	5.13	21.8	14.6	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.2	0.28	1.59	1.93	1.3	1.16	0.89	0.82	0.65	0.52	1.7	1.2	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	3.59	3.72	3.42	3.67	3.32	3.70	2.41	2.68	2.14	2.36	3.4	2.8	IS3025(P34)88Cla .2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.17	2.36	2.39	2.73	2.16	2.4	1.87	1.70	1.63	1.52	1.5	1.4	APHA(22 <sup>nd</sup> E di) 4500 C
12	Total Nitrogen	μmol/L	7.60	8.12	9.11	9.92	8.30	8.28	9.42	9.85	8.05	8.01	5.1	3.8	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	16.0	Not Detected	12.0	Not Detected	13.0	Not Detected	16	Not Detected	19	Not Detected	12	7	PLPL-TPH
14	Total Dissolved Solids	mg/L	36718	37098	38184	38654	37119	38132	37824	38647	37980	38728	36772	35986	IS3025(P16)84Re .02
15	COD	mg/L	18.0	Not Detected	23	Not Detected	26	Not Detected	25	19	27	18.3	12	10	APHA(22 <sup>nd</sup> E di) 5520-D Open Reflux
<b>A Flora and Fauna</b>															
16	Primary productivity	mgC/L /day	8	6.79	9.72	8.28	14.85	13.59	18.72	16.02	19.35	15.30	2.47	0.74	APHA (22 <sup>nd</sup> E di) 10200-J
<b>B Phytoplankton</b>															
17.1	Chlorophyll	mg/m <sup>3</sup>	2.99	2.50	2.61	2.56	3.09	2.93	3.20	2.99	3.25	3.09	2.2	1.02	APHA (22 <sup>nd</sup> E di) 10200-H
17.2	Phaeophytin	mg/m <sup>3</sup>	2.2	2.0	1.1	2.0	1.5	1.1	1.84	1.91	1.27	1.72	1.6	1.2	APHA (22 <sup>nd</sup> E di) 10200-H

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17.3	Cell Count	No. x 10 <sup>3</sup> /L	196	78	190	82	206	94	210	116	172	98	224	75	APHA (22 <sup>nd</sup> Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	<i>Navicula sp.</i> <i>Pleurosigma sp.</i> <i>Amphiprotra sp.</i> <i>Rhizosolenia sp.</i>	<i>Cyclotella sp.</i> <i>Cheatoceous sp.</i> <i>Nitzschia sp.</i> --	<i>Rhizosolenia sp.</i> <i>ceratium sp.</i> <i>Coscinodiscus sp.</i> <i>Pleurosigma sp.</i> --	<i>Navicula sp.</i> <i>Biddulphia sp.</i> <i>Synedra sp.</i> <i>Bacteriastum sp.</i> --	<i>Navicula sp.</i> <i>Rhizosolenia sp.</i> <i>Thalassioema sp.</i> <i>Pleurosigma sp.</i> <i>Ceratium sp.</i>	<i>Nitzschia sp.</i> <i>Melosira sp.</i> <i>Thalassiosira sp.</i> -- --	<i>Closterium sp.</i> <i>Skeletonema sp.</i> <i>Melosira sp.</i> <i>Biddulphia sp.</i> <i>Rhizosolenia sp.</i>	<i>Navicula sp.</i> <i>Thalassiosira sp.</i> <i>Fragillaria sp.</i> -- --	<i>Melosira sp.</i> <i>Biddulphia sp.</i> <i>Thalassiosira sp.</i> <i>Rhizosolenia sp.</i> <i>Coscinodiscus sp.</i>	<i>Nitzschia sp.</i> <i>Pleurosigma sp.</i> <i>Cheatoceous sp.</i> <i>Navicula sp.</i>	<i>Fragillaria sp.</i> <i>Peridinium</i> <i>Melosira sp.</i> <i>Thalassiosira sp.</i> <i>Skeletonema sp.</i>	<i>Melosira sp.</i> <i>Navicula sp.</i> <i>Nitzschia sp.</i> -- --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>C Zooplanktons</b>															
18.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	57		62		58		47		51		12		APHA (22 <sup>nd</sup> Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Polychaetes Gastropods Mysids		Gastropods Nematodes Crustaceans		Copepods Chaetognathes Polychaetes		Amphipods Polychaetes Gastropods --		Ostracods Polychaetes Copepods		Foraminiferans Ctenophores Polychaetes Copepods		APHA (22 <sup>nd</sup> Edi) 10200-G
18.3	Total Biomass	ml/100 m <sup>3</sup>	2.9		3.5		3.15		2.75		3.75		10.0		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>D Microbiological Parameters</b>															
19.1	Total Bacterial Count	CFU/ml	2350		1950		2180		2250		2250		1420		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22 <sup>nd</sup> Edi)922 1-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

### RESULTS OF ETP WATER OUTLET

SR. NO.	PARAMETERS	UNIT	RESULTS OF ETP WATER OUTLET						GPCB Limit	TEST METHOD
			08/10/2019	11/05/2019	06/12/2019	--	--	--		
1	Colour	Co-pt	40	30	40	--	--	--	<b>100</b>	IS3025(P4)83Re.02
2	pH	--	6.91	8.05	7.21	--	--	--	<b>6.5 TO 8.5</b>	IS3025(P11)83Re.02
3	Temperature	°C	31.2	30.8	30.1	--	--	--	<b>40</b>	IS3025(P9)84Re.02
4	Total Suspended Solids	mg/L	59	82	68	--	--	--	<b>100</b>	IS3025(P17)84Re.02
5	Total Dissolved Solids	mg/L	1960	1681	2034	--	--	--	<b>2100</b>	IS3025(P16)84Re.02
6	COD	mg/L	98	88	84	--	--	--	<b>100</b>	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
7	BOD (3 Days @ 27 °C)	mg/L	25	23	26	--	--	--	<b>30</b>	IS 3025 (P44)1993Re.03Edition2.1
8	Chloride as Cl	mg/L	579	419	570	--	--	--	<b>600</b>	IS3025(P32)88Re.99
9	Oil & Grease	mg/L	2.8	2.2	3.1	--	--	--	<b>10</b>	APHA(22 <sup>nd</sup> Edi)5520D
10	Sulphate as SO <sub>4</sub>	mg/L	448	411	536	--	--	--	<b>1000</b>	APHA(22 <sup>nd</sup> Edi)4500 SO <sub>4</sub> E
11	Ammonical Nitrogen as NH <sub>3</sub>	mg/L	6.24	7.5	5.18	--	--	--	<b>50</b>	IS3025(P34)88Cla.2.3
12	Phenolic Compound	mg/L	Not Detected	Not Detected	Not Detected	--	--	--	<b>1</b>	IS3025(P43)92Re.03
13	Copper as Cu	mg/L	Not Detected	Not Detected	Not Detected	--	--	--	<b>3</b>	AAS APHA(22 <sup>nd</sup> Edi)3111 B
14	Lead as Pb	mg/L	Not Detected	Not Detected	Not Detected	--	--	--	<b>0.1</b>	AAS APHA(22 <sup>nd</sup> Edi)3111 B
15	Sulphide as S	mg/L	1.3	1.28	1.2	--	--	--	<b>2</b>	APHA(22 <sup>nd</sup> Edi) 4500-S
16	Cadmium as Cd	mg/L	Not Detected	Not Detected	Not Detected	--	--	--	<b>2</b>	AAS APHA(22 <sup>nd</sup> Edi)3111 B
17	Fluoride as F	mg/L	0.6	0.52	0.46	--	--	--	<b>2</b>	APHA(22 <sup>nd</sup> Edi) 4500 F D SPANDS

\*Below detection limit



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**RESULT OF AMBIENT AIR QUALITY MONITORING**

ADANI PORT – TUG BERTH 600 KL PUMP HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM10) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM 2.5) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO2) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO2) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2019	63.44	38.64	15.38	35.28	0.55	BDL*	BDL*
2	07/10/2019	82.62	50.26	22.45	30.36	0.72	BDL*	BDL*
3	09/10/2019	79.45	35.84	20.50	33.54	0.44	BDL*	BDL*
4	14/10/2019	84.30	33.41	16.56	36.51	0.66	BDL*	BDL*
5	16/10/2019	75.41	39.47	13.52	26.88	0.74	BDL*	BDL*
6	21/10/2019	61.44	34.65	17.56	23.46	0.42	BDL*	BDL*
7	23/10/2019	87.72	48.37	9.37	37.59	0.57	BDL*	BDL*
8	30/10/2019	71.55	43.55	21.45	40.26	0.33	BDL*	BDL*
9	31/10/2019	89.28	51.25	12.69	34.52	0.85	BDL*	BDL*
10	04/11/2019	90.58	48.37	14.34	29.57	0.74	BDL*	BDL*
11	06/11/2019	65.67	34.59	19.33	39.26	0.44	BDL*	BDL*
12	11/11/2019	82.37	43.29	16.16	36.21	0.77	BDL*	BDL*
13	13/11/2019	68.23	41.58	25.14	32.51	0.57	BDL*	BDL*
14	18/11/2019	79.34	38.50	20.22	24.62	0.81	BDL*	BDL*
15	20/11/2019	84.35	45.37	15.66	38.30	0.53	BDL*	BDL*
16	25/11/2019	76.31	36.26	17.55	42.62	0.36	BDL*	BDL*
17	27/11/2019	95.37	53.24	10.34	33.44	0.64	BDL*	BDL*
18	02/12/2019	88.61	46.58	16.55	35.68	0.52	BDL*	BDL*
19	04/12/2019	67.29	35.42	28.47	42.68	0.64	BDL*	BDL*
20	09/12/2019	71.53	31.22	19.36	39.48	0.39	BDL*	BDL*
21	11/12/2019	90.27	47.33	11.57	36.42	0.87	BDL*	BDL*
22	16/12/2019	76.64	36.34	13.49	32.47	0.68	BDL*	BDL*
23	18/12/2019	80.36	44.25	17.52	34.50	0.74	BDL*	BDL*
24	23/12/2019	75.49	39.25	20.53	43.57	0.48	BDL*	BDL*
25	25/12/2019	69.42	32.43	22.37	26.57	0.92	BDL*	BDL*
26	30/12/2019	82.32	42.33	18.56	37.51	0.78	BDL*	BDL*
27	01/01/2020	79.53	45.37	22.45	29.55	0.87	BDL*	BDL*
28	06/01/2020	90.55	53.49	18.62	34.61	1.01	BDL*	BDL*
29	08/01/2020	83.63	49.24	13.58	31.51	0.66	BDL*	BDL*
30	13/01/2020	73.47	40.25	17.37	42.31	0.53	BDL*	BDL*

Continue ...



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

### RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI PORT – TUG BERTH 600 KL PUMP HOUSE								
Sr.No.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
31	15/01/2020	67.25	37.55	25.42	38.22	0.72	BDL*	BDL*
32	20/01/2020	92.44	52.70	10.26	32.44	0.94	BDL*	BDL*
33	22/01/2020	86.69	46.37	19.58	21.53	1.02	BDL*	BDL*
34	27/01/2020	78.37	41.33	23.50	27.21	0.76	BDL*	BDL*
35	29/01/2020	69.49	36.21	21.58	35.66	0.42	BDL*	BDL*
36	03/02/2020	63.54	28.47	20.23	37.57	0.93	BDL*	BDL*
37	05/02/2020	78.63	32.55	11.25	27.55	0.72	BDL*	BDL*
38	10/02/2020	86.50	47.58	23.51	38.35	0.44	BDL*	BDL*
39	12/02/2020	71.22	35.46	18.25	31.26	0.46	BDL*	BDL*
40	17/02/2020	90.36	41.87	21.24	34.56	0.84	BDL*	BDL*
41	19/02/2020	82.41	44.50	16.24	23.32	0.76	BDL*	BDL*
42	24/02/2020	75.36	39.59	8.45	29.34	0.62	BDL*	BDL*
43	26/02/2020	66.39	34.30	15.37	32.45	0.66	BDL*	BDL*
44	02/03/2020	90.29	48.66	23.49	41.32	0.52	BDL*	BDL*
45	04/03/2020	70.66	29.30	17.55	43.52	1.01	BDL*	BDL*
46	09/03/2020	83.62	43.54	22.29	29.36	0.82	BDL*	BDL*
47	11/03/2020	68.51	34.22	25.33	42.56	0.77	BDL*	BDL*
48	16/03/2020	80.65	44.33	18.30	28.57	0.96	BDL*	BDL*
49	18/03/2020	79.56	40.25	14.53	36.58	0.55	BDL*	BDL*
	<b>TEST METHOD</b>	IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob &Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Below detection limit



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)



## RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR FIRE STATION								
Sr. No.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2019	89.36	42.82	10.36	20.86	0.47	BDL*	BDL*
2	07/10/2019	58.49	23.47	8.64	26.38	0.64	BDL*	BDL*
3	09/10/2019	69.29	46.24	17.44	29.39	0.31	BDL*	BDL*
4	14/10/2019	74.38	36.86	20.55	33.58	0.41	BDL*	BDL*
5	16/10/2019	60.55	24.30	9.51	18.91	0.19	BDL*	BDL*
6	21/10/2019	71.61	38.51	14.65	35.68	0.25	BDL*	BDL*
7	23/10/2019	64.31	20.25	11.69	23.43	0.44	BDL*	BDL*
8	30/10/2019	53.81	27.77	6.53	30.56	0.53	BDL*	BDL*
9	31/10/2019	62.48	40.08	15.40	28.48	0.62	BDL*	BDL*
10	04/11/2019	80.31	43.52	8.23	22.46	0.54	BDL*	BDL*
11	06/11/2019	91.56	50.36	22.78	36.46	0.27	BDL*	BDL*
12	11/11/2019	62.56	24.55	19.51	24.52	0.70	BDL*	BDL*
13	13/11/2019	81.23	44.61	9.42	28.42	0.50	BDL*	BDL*
14	18/11/2019	65.69	26.64	15.40	38.46	0.41	BDL*	BDL*
15	20/11/2019	73.59	39.39	11.22	21.96	0.65	BDL*	BDL*
16	25/11/2019	83.40	29.43	7.63	32.33	0.52	BDL*	BDL*
17	27/11/2019	67.32	21.68	14.53	25.70	0.48	BDL*	BDL*
18	02/12/2019	76.56	32.68	12.69	24.50	0.72	BDL*	BDL*
19	04/12/2019	61.36	28.39	10.64	37.27	0.55	BDL*	BDL*
20	09/12/2019	54.26	25.64	8.66	33.54	0.22	BDL*	BDL*
21	11/12/2019	83.44	38.48	15.61	30.53	0.49	BDL*	BDL*
22	16/12/2019	57.70	21.51	21.21	27.57	0.77	BDL*	BDL*
23	18/12/2019	75.24	37.52	9.54	24.21	0.47	BDL*	BDL*
24	23/12/2019	68.59	34.60	6.58	36.58	0.32	BDL*	BDL*
25	25/12/2019	59.35	23.64	16.63	42.13	0.61	BDL*	BDL*
26	30/12/2019	64.26	39.27	13.30	32.40	0.66	BDL*	BDL*
27	01/01/2020	74.31	39.23	8.61	20.56	0.63	BDL*	BDL*
28	06/01/2020	86.39	46.40	15.70	27.31	0.86	BDL*	BDL*
29	08/01/2020	71.53	34.23	11.62	22.41	0.80	BDL*	BDL*
30	13/01/2020	65.43	30.43	6.49	36.27	0.36	BDL*	BDL*

Continue ...



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

## RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR FIRE STATION								
Sr.N o.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
31	15/01/2020	59.35	25.47	10.21	31.54	0.61	BDL*	BDL*
32	20/01/2020	80.40	33.48	12.36	25.73	0.56	BDL*	BDL*
33	22/01/2020	78.35	42.31	17.50	35.69	0.71	BDL*	BDL*
34	27/01/2020	68.63	24.35	19.31	23.65	0.85	BDL*	BDL*
35	29/01/2020	53.63	27.64	7.50	17.37	0.24	BDL*	BDL*
36	03/02/2020	50.53	21.55	6.86	32.50	0.73	BDL*	BDL*
37	05/02/2020	63.47	27.51	9.66	19.59	0.53	BDL*	BDL*
38	10/02/2020	75.64	33.43	12.66	35.69	0.29	BDL*	BDL*
39	12/02/2020	62.48	29.26	7.65	15.50	0.68	BDL*	BDL*
40	17/02/2020	73.62	38.06	11.23	27.59	0.57	BDL*	BDL*
41	19/02/2020	65.88	41.23	14.19	20.37	0.39	BDL*	BDL*
42	24/02/2020	59.34	28.47	10.41	23.58	0.50	BDL*	BDL*
43	26/02/2020	71.59	25.47	13.52	26.52	0.70	BDL*	BDL*
44	02/03/2020	78.50	35.68	16.52	30.58	0.32	BDL*	BDL*
45	04/03/2020	65.54	21.34	13.57	24.42	0.85	BDL*	BDL*
46	09/03/2020	72.52	28.68	10.53	19.36	0.61	BDL*	BDL*
47	11/03/2020	84.36	45.65	12.69	17.56	0.80	BDL*	BDL*
48	16/03/2020	74.96	39.27	21.59	23.72	0.66	BDL*	BDL*
49	18/03/2020	66.04	36.56	6.59	32.57	0.76	BDL*	BDL*
	<b>TEST METHOD</b>	IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob &Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Below detection limit



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)



### RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2019	70.65	51.38	16.51	30.48	0.48	BDL*	BDL*
2	07/10/2019	51.32	18.68	13.59	17.51	0.45	BDL*	BDL*
3	09/10/2019	62.61	24.52	15.37	27.52	0.52	BDL*	BDL*
4	14/10/2019	58.72	30.28	10.69	21.54	0.27	BDL*	BDL*
5	16/10/2019	71.38	32.43	17.40	33.42	0.40	BDL*	BDL*
6	21/10/2019	67.70	26.42	7.65	26.37	0.22	BDL*	BDL*
7	23/10/2019	74.41	37.65	19.34	32.46	0.34	BDL*	BDL*
8	30/10/2019	59.47	33.48	8.61	24.60	0.39	BDL*	BDL*
9	31/10/2019	68.58	23.68	11.23	31.55	0.37	BDL*	BDL*
10	04/11/2019	60.78	33.61	19.22	37.54	0.32	BDL*	BDL*
11	06/11/2019	71.22	29.95	11.27	23.58	0.23	BDL*	BDL*
12	11/11/2019	54.61	25.66	13.39	32.47	0.49	BDL*	BDL*
13	13/11/2019	75.36	31.57	16.27	20.22	0.61	BDL*	BDL*
14	18/11/2019	86.32	35.44	8.59	16.65	0.37	BDL*	BDL*
15	20/11/2019	65.61	30.24	18.43	34.30	0.58	BDL*	BDL*
16	25/11/2019	70.67	34.57	9.60	26.50	0.42	BDL*	BDL*
17	27/11/2019	82.60	40.23	20.54	36.35	0.71	BDL*	BDL*
18	02/12/2019	81.66	42.61	21.29	38.32	0.63	BDL*	BDL*
19	04/12/2019	78.20	39.61	19.44	22.40	0.71	BDL*	BDL*
20	09/12/2019	68.46	29.32	12.69	28.43	0.57	BDL*	BDL*
21	11/12/2019	77.36	34.57	7.87	24.37	0.80	BDL*	BDL*
22	16/12/2019	64.51	26.41	15.69	35.45	0.54	BDL*	BDL*
23	18/12/2019	55.78	32.53	22.57	41.51	0.37	BDL*	BDL*
24	23/12/2019	62.47	28.49	14.52	23.54	0.25	BDL*	BDL*
25	25/12/2019	83.41	38.48	9.64	18.62	0.41	BDL*	BDL*
26	30/12/2019	70.69	31.57	11.52	30.45	0.50	BDL*	BDL*
27	01/01/2020	58.22	35.61	20.22	35.67	0.41	BDL*	BDL*
28	06/01/2020	60.54	38.53	10.66	31.69	0.57	BDL*	BDL*
29	08/01/2020	77.53	45.32	18.48	33.51	0.71	BDL*	BDL*
30	13/01/2020	61.55	27.66	13.58	20.55	0.27	BDL*	BDL*

Continue ...



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

## RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM10) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM 2.5) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO2) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO2) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
31	15/01/2020	53.46	31.53	16.63	19.60	0.81	BDL*	BDL*
32	20/01/2020	72.61	34.53	7.61	23.42	0.88	BDL*	BDL*
33	22/01/2020	69.35	37.49	9.58	15.30	0.46	BDL*	BDL*
34	27/01/2020	56.40	28.53	15.65	30.36	0.60	BDL*	BDL*
35	29/01/2020	64.20	32.53	12.41	21.55	0.64	BDL*	BDL*
36	03/02/2020	57.64	25.41	15.67	25.30	0.33	BDL*	BDL*
37	05/02/2020	71.68	24.53	18.22	30.39	0.48	BDL*	BDL*
38	10/02/2020	64.31	30.28	8.68	15.62	0.24	BDL*	BDL*
39	12/02/2020	56.27	26.41	10.36	18.32	0.61	BDL*	BDL*
40	17/02/2020	61.57	33.57	14.16	23.41	0.40	BDL*	BDL*
41	19/02/2020	58.48	35.36	11.61	31.60	0.55	BDL*	BDL*
42	24/02/2020	70.27	31.53	6.86	20.43	0.71	BDL*	BDL*
43	26/02/2020	52.65	22.57	9.49	28.36	0.42	BDL*	BDL*
44	02/03/2020	70.22	32.20	21.22	26.44	0.47	BDL*	BDL*
45	04/03/2020	57.63	26.82	8.64	17.47	0.39	BDL*	BDL*
46	09/03/2020	77.00	35.69	19.32	38.32	0.56	BDL*	BDL*
47	11/03/2020	54.24	24.16	17.48	31.64	0.50	BDL*	BDL*
48	16/03/2020	66.18	31.53	12.67	35.63	0.34	BDL*	BDL*
49	18/03/2020	59.37	27.57	10.30	28.73	0.62	BDL*	BDL*
	<b>TEST METHOD</b>	IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob &Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Below detection limit



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

### RESULT OF AMBIENT AIR QUALITY MONITORING

CT-3 RMU-2								
Sr.N o.	Date of Sampling	Particulate Matter (PM10) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM 2.5) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO2) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO2) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2019	76.32	45.31	19.40	27.69	0.36	BDL*	BDL*
2	07/10/2019	69.38	36.29	14.57	33.47	0.61	BDL*	BDL*
3	09/10/2019	74.38	39.27	6.41	36.56	0.71	BDL*	BDL*
4	14/10/2019	87.56	42.66	12.61	26.22	0.54	BDL*	BDL*
5	16/10/2019	91.33	50.32	15.66	21.69	0.29	BDL*	BDL*
6	21/10/2019	77.86	24.66	10.34	30.66	0.82	BDL*	BDL*
7	23/10/2019	82.40	44.65	17.61	39.58	0.48	BDL*	BDL*
8	30/10/2019	78.35	40.26	13.57	29.36	0.21	BDL*	BDL*
9	31/10/2019	92.49	47.22	22.42	40.22	0.73	BDL*	BDL*
10	04/11/2019	95.37	53.65	17.55	25.63	0.62	BDL*	BDL*
11	06/11/2019	83.66	46.19	13.52	28.58	0.93	BDL*	BDL*
12	11/11/2019	76.33	38.23	24.34	44.58	0.66	BDL*	BDL*
13	13/11/2019	86.27	49.23	18.73	36.45	0.40	BDL*	BDL*
14	18/11/2019	96.23	54.31	11.21	33.54	0.31	BDL*	BDL*
15	20/11/2019	79.31	41.28	21.28	40.28	0.78	BDL*	BDL*
16	25/11/2019	87.67	45.36	14.39	31.59	0.24	BDL*	BDL*
17	27/11/2019	93.29	48.61	16.56	43.49	0.55	BDL*	BDL*
18	02/12/2019	90.33	54.31	24.34	45.56	0.86	BDL*	BDL*
19	04/12/2019	82.33	44.52	21.26	40.60	0.44	BDL*	BDL*
20	09/12/2019	77.67	40.28	16.36	36.49	0.26	BDL*	BDL*
21	11/12/2019	95.44	50.27	20.59	39.58	0.60	BDL*	BDL*
22	16/12/2019	79.63	32.45	25.38	41.50	0.94	BDL*	BDL*
23	18/12/2019	86.93	47.27	19.60	28.62	0.69	BDL*	BDL*
24	23/12/2019	92.40	51.56	15.26	32.43	1.01	BDL*	BDL*
25	25/12/2019	88.42	45.36	12.52	37.51	0.34	BDL*	BDL*
26	30/12/2019	75.61	35.32	9.54	24.56	0.65	BDL*	BDL*
27	01/01/2020	85.62	48.36	17.60	24.70	0.77	BDL*	BDL*
28	06/01/2020	76.39	42.65	8.67	19.21	0.70	BDL*	BDL*
29	08/01/2020	90.30	54.39	21.54	39.27	0.97	BDL*	BDL*
30	13/01/2020	86.24	46.31	16.39	27.46	0.90	BDL*	BDL*



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

### RESULT OF AMBIENT AIR QUALITY MONITORING

CT-3 RMU-2								
Sr.N o.	Date of Sampling	Particulate Matter (PM10) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM 2.5) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO2) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO2) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
31	15/01/2020	77.85	41.53	19.50	34.54	0.49	BDL*	BDL*
32	20/01/2020	87.67	49.56	14.58	38.50	0.58	BDL*	BDL*
33	22/01/2020	91.54	52.35	12.37	31.22	0.38	BDL*	BDL*
34	27/01/2020	73.68	35.32	22.33	35.36	0.52	BDL*	BDL*
35	29/01/2020	80.63	44.65	15.29	29.63	0.29	BDL*	BDL*
36	03/02/2020	74.52	36.53	14.55	23.70	0.58	BDL*	BDL*
37	05/02/2020	91.53	52.52	20.17	33.64	0.81	BDL*	BDL*
38	10/02/2020	80.37	42.52	10.33	27.56	0.63	BDL*	BDL*
39	12/02/2020	77.64	39.53	12.40	25.41	0.78	BDL*	BDL*
40	17/02/2020	83.49	45.36	16.32	30.32	0.32	BDL*	BDL*
41	19/02/2020	70.36	37.49	18.44	28.44	0.25	BDL*	BDL*
42	24/02/2020	82.46	49.27	11.99	34.50	0.45	BDL*	BDL*
43	26/02/2020	76.30	38.23	7.63	17.58	0.64	BDL*	BDL*
44	02/03/2020	85.34	43.52	19.52	33.74	0.73	BDL*	BDL*
45	04/03/2020	76.27	38.61	11.25	28.32	0.63	BDL*	BDL*
46	09/03/2020	69.57	32.65	13.54	21.31	0.95	BDL*	BDL*
47	11/03/2020	79.44	42.57	16.46	26.36	0.69	BDL*	BDL*
48	16/03/2020	88.68	47.19	20.35	31.60	0.53	BDL*	BDL*
49	18/03/2020	72.68	31.53	8.61	14.52	0.86	BDL*	BDL*
	<b>TEST METHOD</b>	IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob & Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Below detection limit



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

## RESULTS OF NOISE LEVEL MONITORING

### Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	ADANI PORT – TUG BERTH 600 KL PUPM HOUSE					
		Result [Leq dB(A)]					
	Sampling Date & Time	24/10/2019	25/11/2019	06/12/2019	17/01/2020	24/02/2020	13/03/2020
1	6:00-7:00	67.2	65.9	66.4	60.8	63.2	62.1
2	7:00-8:00	73.2	68.3	62.2	67.3	67.2	68.4
3	8:00-9:00	70.2	62.7	61.3	64.2	69.3	72.1
4	9:00-10:00	68.9	67.0	64.3	61.2	66.1	74.1
5	10:00-11:00	66.4	72.2	67.2	67.3	69.8	68.4
6	11:00-12:00	70.1	71.6	63.1	70.3	65.3	65.4
7	12:00-13:00	65.5	68.3	65.6	68.4	67.4	68.3
8	13:00-14:00	62.1	63.5	63.2	67.3	62.9	63.1
9	14:00-15:00	67.7	65.8	67.3	63.2	64.1	61.3
10	15:00-16:00	63.3	68.8	63.2	66.6	61.6	67.3
11	16:00-17:00	60.3	62.1	66.1	68.3	66.5	65.3
12	17:00-18:00	68.2	62.9	69.4	65.3	69.5	68.1
13	18:00-19:00	62.1	69.3	66.2	61.9	65.2	65.5
14	19:00-20:00	66.2	63.2	65.9	65.3	62.4	63.2
15	20:00-21:00	62.5	67.5	65.3	68.9	66.3	67.7
16	21:00-22:00	67.3	65.5	62.1	65.3	63.2	64.2
Day Time Limit*		75 Leq dB(A)					

### Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	ADANI PORT – TUG BERTH 600 KL PUPM HOUSE					
		Result [Leq dB(A)]					
	Sampling Date & Time	24/10/2019	25/11/2019	06/12/2019	17/01/2020	24/02/2020	13/03/2020
1	22:00-23:00	68.2	64.2	63.9	65.5	60.5	66.3
2	23:00-00:00	65.3	62.1	68.4	66.5	66.3	64.2
3	00:00-01:00	62.4	67.7	64.2	64.1	63.4	60.2
4	01:00-02:00	69.3	69.4	62.8	63.4	67.5	60.7
5	02:00-03:00	66.3	68.4	67.8	65.1	67.0	64.2
6	03:00-04:00	67.5	66.8	64.8	61.8	66.3	62.1
7	04:00-05:00	69.3	64.7	67.4	62.4	62.3	65.3
8	05:00-06:00	68.4	67.3	65.3	61.4	67.4	62.5
Night Time Limit*		70 Leq dB(A)					



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

## RESULTS OF NOISE LEVEL MONITORING

### Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	NEAR FIRE STATION					
		Result [Leq dB(A)]					
	Sampling Date & Time	18/10/2019	20/11/2019	18/12/2019	10/01/2020	12/02/2020	--
1	6:00-7:00	67.4	67.3	63.2	63.2	65.3	--
2	7:00-8:00	68.1	64.2	67.3	68.5	68.3	--
3	8:00-9:00	62.3	62.1	69.5	70.3	71.2	--
4	9:00-10:00	66.1	65.9	71.5	64.2	63.2	--
5	10:00-11:00	61.3	73.2	65.6	63.9	62.1	--
6	11:00-12:00	66.8	70.4	67.3	69.5	66.5	--
7	12:00-13:00	64.4	66.4	63.7	67.3	69.3	--
8	13:00-14:00	69.4	69.4	67.4	64.2	65.3	--
9	14:00-15:00	67.2	64.1	72.9	63.8	71.4	--
10	15:00-16:00	68.4	69.7	71.3	69.4	67.5	--
11	16:00-17:00	65.5	65.3	64.8	67.3	66.3	--
12	17:00-18:00	62.1	63.8	69.5	63.5	65.1	--
13	18:00-19:00	68.3	67.4	65.6	65.5	68.5	--
14	19:00-20:00	65.2	66.9	67.3	69.4	66.2	--
15	20:00-21:00	68.1	69.4	63.2	65.3	62.4	--
16	21:00-22:00	69.3	64.9	62.3	64.2	65.7	--
Day Time Limit*		75 Leq dB(A)					

### Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	NEAR FIRE STATION					
		Result [Leq dB(A)]					
	Sampling Date & Time	18/10/2019	20/11/2019	18/12/2019	13/01/2020	12/02/2020	--
1	22:00-23:00	66.3	66.8	68.3	53.4	65.3	--
2	23:00-00:00	62.2	62.1	66.4	56.1	62.8	--
3	00:00-01:00	65.9	68.4	62.9	50.2	60.4	--
4	01:00-02:00	69.4	64.2	68.4	52.7	66.4	--
5	02:00-03:00	69.8	62.5	68.9	57.4	68.4	--
6	03:00-04:00	66.1	65.5	69.2	60.4	64.2	--
7	04:00-05:00	61.5	68.8	61.9	60.8	68.6	--
8	05:00-06:00	65.3	62.2	66.9	61.8	65.4	--
Night Time Limit*		70 Leq dB(A)					



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)



## RESULTS OF NOISE LEVEL MONITORING

### Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	ADANI HOUSE					
		Result [Leq dB(A)]					
		02/10/2019	22/11/2019	02/12/2019	22/01/2020	05/02/2020	04/03/2020
1	6:00-7:00	64.2	64.2	65.3	66.3	65.3	64.8
2	7:00-8:00	68.4	67.9	64.8	68.3	67.8	67.4
3	8:00-9:00	74.2	70.3	68.2	69.2	62.1	70.2
4	9:00-10:00	67.3	64.1	70.2	65.2	68.3	68.2
5	10:00-11:00	70.2	66.8	69.5	63.6	65.3	65.2
6	11:00-12:00	71.3	69.4	67.3	66.2	68.3	62.3
7	12:00-13:00	65.3	71.3	63.2	61.3	67.6	67.4
8	13:00-14:00	68.2	65.3	66.7	67.4	70.4	63.2
9	14:00-15:00	63.1	63.8	67.2	64.6	65.3	61.3
10	15:00-16:00	61.4	68.5	71.2	70.3	64.1	67.3
11	16:00-17:00	64.2	68.8	69.2	65.3	62.9	69.4
12	17:00-18:00	68.4	64.3	64.2	63.5	66.3	72.2
13	18:00-19:00	68.1	63.2	62.4	68.3	64.2	67.3
14	19:00-20:00	66.4	62.7	65.3	70.2	67.4	65.3
15	20:00-21:00	69.8	65.5	68.3	67.5	64.3	63.1
16	21:00-22:00	63.2	67.5	64.2	66.9	65.7	65.3
Day Time Limit*		75 Leq dB(A)					

### Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	ADANI HOUSE					
		Result [Leq dB(A)]					
		02/10/2019	22/11/2019	02/12/2019	22/01/2020	05/02/2020	04/03/2020
1	22:00-23:00	69.4	67.4	65.3	66.2	68.3	67.4
2	23:00-00:00	64.2	64.3	68.3	63.4	65.3	64.2
3	00:00-01:00	62.1	65.4	63.9	63.2	67.2	60.3
4	01:00-02:00	60.4	64.1	68.5	62.2	60.3	65.3
5	02:00-03:00	65.5	61.6	64.3	65.3	62.6	66.1
6	03:00-04:00	68.5	66.9	62.1	60.3	58.4	63.2
7	04:00-05:00	67.4	64.7	64.3	58.3	60.3	61.5
8	05:00-06:00	63.2	65.1	62.6	60.2	63.1	64.3
Night Time Limit*		70 Leq dB(A)					



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

## RESULTS OF NOISE LEVEL MONITORING

### Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	CT-3 RMU-2					
		Result [Leq dB(A)]					
	Sampling Date & Time	14/10/2019	27/11/2019	20/12/2019	22/01/2020	07/02/2020	20/03/2020
1	6:00-7:00	64.2	67.4	60.4	58.3	62.4	61.2
2	7:00-8:00	68.4	64.3	67.3	60.4	67.4	65.2
3	8:00-9:00	73.2	71.7	63.2	64.2	60.3	67.4
4	9:00-10:00	69.3	67.9	62.3	68.3	63.4	69.6
5	10:00-11:00	66.2	69.4	69.5	64.4	68.2	66.4
6	11:00-12:00	62.9	63.5	65.2	69.5	66.3	63.1
7	12:00-13:00	69.5	65.3	63.7	66.2	63.2	61.8
8	13:00-14:00	65.5	63.2	70.2	62.4	65.2	68.4
9	14:00-15:00	62.2	61.8	68.3	69.4	68.5	64.2
10	15:00-16:00	65.8	67.4	67.1	65.3	64.2	66.9
11	16:00-17:00	68.2	64.3	62.8	64.5	67.3	68.5
12	17:00-18:00	68.9	66.7	67.7	68.4	62.1	63.2
13	18:00-19:00	64.2	65.4	63.3	65.2	65.7	69.5
14	19:00-20:00	62.1	69.8	64.2	62.5	69.3	65.2
15	20:00-21:00	67.1	65.1	62.8	67.4	67.7	62.1
16	21:00-22:00	69.3	62.4	67.8	64.5	62.3	65.8
Day Time Limit*		75 Leq dB(A)					

### Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	CT-3 RMU-2					
		Result [Leq dB(A)]					
	Sampling Date & Time	14/10/2019	27/11/2019	20/12/2019	22/01/2020	07/02/2020	20/03/2020
1	22:00-23:00	62.1	67.2	65.9	65.2	64.3	65.3
2	23:00-00:00	65.3	62.1	68.4	60.4	68.6	63.1
3	00:00-01:00	68.3	68.3	64.7	61.4	60.3	60.4
4	01:00-02:00	68.3	63.2	67.5	60.8	58.8	58.2
5	02:00-03:00	60.2	66.9	62.9	60.7	59.3	62.3
6	03:00-04:00	62.2	62.3	69.5	58.4	62.4	60.3
7	04:00-05:00	65.1	68.9	65.7	62.4	61.7	62.2
8	05:00-06:00	61.3	62.9	62.8	60.3	64.4	60.4
Night Time Limit*		70 Leq dB(A)					



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)



## RESULT OF STACK MONITORING

SR NO	TEST PARAMETERS	UNIT	STD. LIMIT	THERMIC FLUID HEATER (BITUMEN-01)	THERMIC FLUID HEATER (BITUMEN-02)	HOT WATER SYSTEM-1	HOT WATER SYSTEM-2	TEST METHOD
<b>OCTOBER 2019</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	15.51	--	--	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	5.63	--	--	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	30.65	--	--	--	IS:11255 (Part-VII):2005
<b>NOVEMBER 2019</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	21.53	--	--	25.75	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	4.09	--	--	5.64	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	32.41	--	--	37.46	IS:11255 (Part-VII):2005
<b>DECEMBER 2019</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	--	14.80	--	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	--	3.62	--	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	--	31.70	--	--	IS:11255 (Part-VII):2005
<b>JANUARY 2020</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	23.74	--	25.61	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	3.57	--	5.82	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	35.33	--	36.72	--	IS:11255 (Part-VII):2005
<b>FEBRUARY 2020</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	--	18.72	--	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	--	2.64	--	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	--	28.33	--	--	IS:11255 (Part-VII):2005
<b>MARCH 2020</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	--	24.34	--	18.61	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	--	2.89	--	5.47	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	--	23.64	--	30.63	IS:11255 (Part-VII):2005

\*Below detection limit

Results on 11 % O<sub>2</sub> Correction when Oxygen is greater than 11 %. And 12% CO<sub>2</sub> correction when CO<sub>2</sub> is less than 12%



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

## RESULTS OF D.G. STACK MONITORING

07/10/2019 07/10/2019 07/10/2019							
SR. NO.	TEST PARAMETERS	Unit	Adani Port			GPCB Limit	Test Method
			D.G. Set-1 (500 KVA)	D.G. Set-2 (500 KVA)	D.G. Set-3 (500 KVA)		
1	Particulate Matter	mg/Nm <sup>3</sup>	16.82	14.38	12.56	150	IS:11255 (Part-I):1985
2	Sulphur Dioxide	ppm	5.49	3.92	7.44	100	IS:11255 (Part-II):1985
3	Oxide of Nitrogen	ppm	34.34	31.84	35.74	50	IS:11255 (Part-VII):2005
4	Carbon Monoxide	mg/m <sup>3</sup>	8.7	8.6	6.3	Not Specified	Digital Gas Analyzer
5	Hydro Carbon NMHC	ppm	Not Detected	Not Detected	Not Detected	Not Specified	Gas Chromatography

\*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O<sub>2</sub> Correction when Oxygen is greater than 15 %

07/10/2019 07/10/2019 11/02/2020							
SR. NO.	TEST PARAMETERS	Unit	Adani Port			GPCB Limit	Test Method
			D.G. Set-4 (500 KVA)	D.G. Set-5 (500 KVA)	D.G. Set -6, 7 & 8 (1250 KVA, each)		
1	Particulate Matter	mg/Nm <sup>3</sup>	10.51	13.84	14.25	150	IS:11255 (Part-I):1985
2	Sulphur Dioxide	ppm	4.41	5.51	6.41	100	IS:11255 (Part-II):1985
3	Oxide of Nitrogen	ppm	36.81	30.52	35.86	50	IS:11255 (Part-VII):2005
4	Carbon Monoxide	mg/m <sup>3</sup>	5.2	5.1	--	Not Specified	Digital Gas Analyzer
5	Hydro Carbon NMHC	ppm	Not Detected	Not Detected	--	Not Specified	Gas Chromatography

\*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O<sub>2</sub> Correction when Oxygen is greater than 15 %



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

**POLLUCON** LABORATORIES PVT. LTD.Environmental Auditors, Consultants & Analysts.  
Cleaner Production / Waste Minimization Facilitator

Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

26/02/2020 26/02/2020 26/02/2020							
SR. NO.	TEST PARAMETERS	Unit	CT-4			GPCB Limit	Test Method
			D.G. Set-1 (1500 KVA)	D.G. Set-2 (1500 KVA)	D.G. Set-3 (1500 KVA)		
1	Particulate Matter	mg/Nm <sup>3</sup>	28.41	19.82	23.27	150	IS:11255 (Part-I):1985
2	Sulphur Dioxide	ppm	6.55	5.36	7.69	100	IS:11255 (Part-II):1985
3	Oxide of Nitrogen	ppm	32.88	30.78	36.72	50	IS:11255 (Part-VII):2005
4	Carbon Monoxide	mg/m <sup>3</sup>	--	--	--	Not Specified	Digital Gas Analyzer
5	Hydro Carbon NMHC	ppm	--	--	--	Not Specified	Gas Chromatography

\*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O<sub>2</sub> Correction when Oxygen is greater than 15 %

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)

### Minimum Detection Limit [MDL]

Ambient Air Parameters		
Sr. No.	Test Parameter	MDL
1	Particulate Matter (PM <sub>10</sub> ) (µg/m <sup>3</sup> )	10
2	Particulate Matter (PM 2.5) (µg/m <sup>3</sup> )	10
3	Sulphur Dioxide (SO <sub>2</sub> ) (µg/m <sup>3</sup> )	5
4	Oxides of Nitrogen (µg/m <sup>3</sup> )	5
5	Hydrogen Sulphide as H <sub>2</sub> S (µg/m <sup>3</sup> )	6

Stack Parameters		
Sr.No.	Test Parameter	MDL
1	Particulate Matter (mg/Nm <sup>3</sup> )	10
2	Sulphur Dioxide (ppm)	1.52
3	Oxides of Nitrogen (ppm)	2.65
4	Carbon Monoxide (mg/Nm <sup>3</sup> )	0.1
5	Hydro Carbon NMHC (ppm)	1.0

Sea Water Parameters			
SR. NO.	TEST PARAMETERS	UNIT	MDL
1	pH	--	2
2	Temperature	°C	2
3	Total Suspended Solids	mg/L	2
4	BOD (3 Days @ 27 °C)	mg/L	1
5	Dissolved Oxygen	mg/L	0.1
6	Salinity	ppt	1
7	Oil & Grease	mg/L	2
8	Nitrate as NO <sub>3</sub>	µmol/L	0.5
9	Nitrite as NO <sub>2</sub>	µmol/L	0.01
10	Ammonical Nitrogen as NH <sub>3</sub>	µmol/L	0.2
11	Phosphates as PO <sub>4</sub>	µmol/L	0.5
12	Petroleum Hydrocarbon	µg/L	1
13	Total Dissolved Solids	mg/L	10
14	COD	mg/L	3
15	Primary productivity	mgC/L/day	0.1
16	Chlorophyll	mg/m <sup>3</sup>	0.1
17	Phaeophytin	mg/m <sup>3</sup>	0.1
18	Cell Count	No. x 10 <sup>3</sup> /L	1

Sea Sediment Parameters			
SR. NO.	TEST PARAMETERS	UNIT	MDL
1	Organic Matter	%	0.1
2	Phosphorus as P	µg/g	1
3	Petroleum Hydrocarbon	µg/g	1
4	Aluminum as Al	%	0.1
5	Manganese as Mn	µg/g	1
6	Mercury as Hg	µg/g	0.1



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

STP Water parameter(mg/L)		
Sr. No.	Test parameter	MDL
1	pH	2
2	Total Suspended Solids (mg/L)	2
3	BOD (3 days @ 270 C) (mg/L)	1
4	Residual Chlorine (mg/L)	0.2
5	Fecal Coliform (MPN INDEX/100 mL)	1.8

ETP Water Parameters			
SR. NO.	TEST PARAMETERS	UNIT	MDL
1	Colour	Co-pt	2
2	pH	--	2
3	Temperature	°C	2
4	Total Suspended Solids	mg/L	2
5	Total Dissolved Solids	mg/L	10
6	COD	mg/L	3
7	BOD (3 Days @ 27 °C)	mg/L	1
8	Chloride as Cl	mg/L	1
9	Oil & Grease	mg/L	2
10	Sulphate as SO <sub>4</sub>	mg/L	1
11	Ammonical Nitrogen as NH <sub>3</sub>	mg/L	0.2
12	Phenolic Compound	mg/L	0.005
13	Copper as Cu	mg/L	0.01
14	Lead as Pb	mg/L	0.01
15	Sulphide as S	mg/L	0.1
16	Cadmium as Cd	mg/L	0.002
17	Fluoride as F	mg/L	0.05



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

# **"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"**

**FOR**



**BORE HOLE WATER  
ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED  
TAL: MUNDRA, KUTCH, MUNDRA – 370 421**

**MONITORING PERIOD:  
OCTOBER 2019 TO MARCH 2020**

**PREPARED BY:**



**POLLUCON LABORATORIES PVT.LTD.**

**PLOT NO.5/6 "POLLUCON HOUSE", OPP. BALAJI INDUSTRIAL SOCIETY,  
OLD SHANTINATH SILK MILL LANE, NEAR GAYTRI FARSAN MART,  
NAVJIVAN CIRCLE, UDHANA MAGDALLA ROAD, SURAT-395007.  
PHONE/FAX – (+91 261) 2455 751, 2601 106, 2601 224.  
E-mail: [pollucon@gmail.com](mailto:pollucon@gmail.com) Web: [www.polluconlab.com](http://www.polluconlab.com)**

**TC - 5945**

**ISO 9001:2015**

**ISO 14001:2015**

**OHSAS 18001:2007**

## RESULTS OF BORE HOLE WATER

SR. NO	TEST PARAMETERS	UNIT	RESULTS			TEST METHOD
			PUMP HOUSE-1	PUMP HOUSE-2	PUMP HOUSE-3	
	Sampling Date		06/12/2019	06/12/2019	06/12/2019	
1	pH	--	7.84	7.78	7.87	IS3025(P11)83Re.02
2	Salinity	ppt	5.60	1.72	1.8	APHA 2520B
3	Oil & Grease	mg/L	Not Detected	Not Detected	1.8	APHA(22ndEdi)5520D
4	Hydrocarbon	mg/L	Not Detected	Not Detected	Not Detected	GC/GC-MS
5	Lead as Pb	mg/L	0.058	0.062	0.072	AAS APHA(22ndEdi)3111 B
6	Arsenic as As	mg/L	Not Detected	Not Detected	Not Detected	AAS APHA 3114 B
7	Nickel as Ni	mg/L	Not Detected	Not Detected	Not Detected	AAS APHA(22ndEdi)3111 B
8	Total Chromium as Cr	mg/L	Not Detected	Not Detected	Not Detected	AAS 3111B
9	Cadmium as Cd	mg/L	Not Detected	0.036	0.038	AAS APHA(22ndEdi)3111 B
10	Mercury as Hg	mg/L	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
11	Zinc as Zn	mg/L	Not Detected	2.31	0.42	AAS APHA(22ndEdi)3111 B
12	Copper as Cu	mg/L	Not Detected	Not Detected	Not Detected	AAS APHA(22ndEdi)3111 B
13	Iron as Fe	mg/L	4.28	5.44	2.70	AAS APHA(22ndEdi)3111 B
14	Insecticides/Pesticides	mg/L	Absent	Absent	Absent	GC/GC-MS
15	Depth of Water Level from Ground Level	meter	1.9	2.05	1.8	--

\*BDL: Below Detection Limit



**H. T. Shah**

**Lab Manager**




**Dr. Arun Bajpai**

**Lab Manager (Q)**



SR. NO	TEST PARAMETERS	UNIT	RESULTS		TEST METHOD
			NEAR ETP OFFICE	NEAR CONTROL ROOM	
	Sampling Date		06/12/2019	06/12/2019	
1	pH	--	7.89	7.81	IS3025(P11)83Re.02
2	Salinity	ppt	14	6.4	APHA 2520B
3	Oil & Grease	mg/L	2.83	Not Detected	APHA(22ndEdi)5520D
4	Hydrocarbon	mg/L	Not Detected	Not Detected	GC/GC-MS
5	Lead as Pb	mg/L	0.052	0.062	AAS APHA(22ndEdi)3111 B
6	Arsenic as As	mg/L	Not Detected	Not Detected	AAS APHA 3114 B
7	Nickel as Ni	mg/L	Not Detected	Not Detected	AAS APHA(22ndEdi)3111 B
8	Total Chromium as Cr	mg/L	Not Detected	Not Detected	AAS 3111B
9	Cadmium as Cd	mg/L	Not Detected	Not Detected	AAS APHA(22ndEdi)3111 B
10	Mercury as Hg	mg/L	Not Detected	Not Detected	AAS APHA- 3112 B
11	Zinc as Zn	mg/L	0.087	3.26	AAS APHA(22ndEdi)3111 B
12	Copper as Cu	mg/L	Not Detected	Not Detected	AAS APHA(22ndEdi)3111 B
13	Iron as Fe	mg/L	0.32	5.7	AAS APHA(22ndEdi)3111 B
14	Insecticides/Pesticides	mg/L	Absent	Absent	GC/GC-MS
15	Depth of Water Level from Ground Level	meter	2.1	2.1	--

\*BDL: Below Detection Limit



**H. T. Shah**

**Lab Manager**




**Dr. Arun Bajpai**

**Lab Manager (Q)**



Borehole Water Parameters			
SR. NO.	TEST PARAMETERS	UNIT	MDL
1	pH	--	2
2	Salinity	mg/L	0.5
3	Oil & Grease	mg/L	2
4	Hydrocarbon	mg/L	0.01
5	Lead as Pb	mg/L	0.01
6	Arsenic as As	mg/L	0.001
7	Nickel as Ni	mg/L	0.02
8	Total Chromium as Cr	mg/L	0.025
9	Cadmium as Cd	mg/L	0.002
10	Mercury as Hg	mg/L	0.005
11	Zinc as Zn	mg/L	0.06
12	Copper as Cu	mg/L	0.01
13	Iron as Fe	mg/L	0.1
14	Insecticides/Pesticides	mg/L	0.1



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

# **Annexure – 4**

## Chiragsing Rajput

---

**From:** Chiragsing Rajput  
**Sent:** Monday, April 6, 2020 6:14 PM  
**To:** 'ro-gpcb-kute@gujarat.gov.in'; rowz.bpl-mef@nic.in; mefcc.ia3@gmail.com; monitoring-ec@nic.in; 'ms-gpcb@gujarat.gov.in'  
**Cc:** Shalin Shah; Azharuddin Kazi; Vivek Gundraniya; Kripa Shah; Mahendra Kumar Ghritlahre (Mahendra.Ghritlahare@adani.com); Ashvin Kumar Patni; Dhanesh Tank  
**Subject:** Intimation Letter\_Stoppage of Environment Monitoring due to COVID-19\_APSEZ, Mundra  
**Attachments:** Letter\_Stoppage of Envionmental Monitoring due to COVID-19.pdf

Dear Sir,

Please find attached intimation letter w.r.t. stoppage of environmental monitoring within Adani Ports & SEZ Limited, Mundra, Kutch (Gujarat) since 23<sup>rd</sup> March, 2020 considering COVID-19 Pandemic lockdown.

So kindly consider this submission and oblige.

**Thanks & Regards,**  
**Chiragsing Rajput**  
**Environment Cell | Adani Ports & Special Economic Zone Ltd.**  
**Mob +91 9687678443 | Ext: 52132 | [chiragsing.rajput@adani.com](mailto:chiragsing.rajput@adani.com) | [www.adani.com](http://www.adani.com)**  
**Adani House, 1<sup>st</sup> Floor, P.O. Box 1, Mundra 370 421, Gujarat, India.**



APSEZL/EnvCell/2020-21/001

Date: 06.04.2020

To,

**Regional Officer,**

**Regional Office – East Kutch**

Gujarat Pollution Control Board,

Gandhidham – 370201.

**Subject:** Intimation for stoppage of environmental monitoring within APSEZ, Mundra (Kutch, Gujarat) during COVID – 19 Pandemic lockdown.

**Ref.:** Regulatory Permission obtained by APSEZ, Mundra (Kutch, Gujarat) as per attached **Annexure – 1.**

Dear Sir,

With reference to above stated subject, we would like intimate you that, in compliance to various regulatory permissions granted by MoEF&CC / SEIAA as well as SPCB for various project, M/s. Adani Ports and SEZ Limited, Mundra (Kutch, Gujarat) has been regularly carrying out post environment clearance, monitoring (environmental attributes viz. Air, Water, Noise, Soil, Marine etc.) through NABL accredited / MoEF recognized laboratory and same is being reported/submitted to regulatory body periodically.

However, considering the current scenario of COVID – 19 Pandemic lockdown, we were forced to stop the Environmental Monitoring from 23<sup>rd</sup> March, 2020 and same shall be restarted after completion of this lockdown period and/or when the condition is normalized (as directed by district administration/State/Central Govt.). The date of restart of Environment Monitoring, shall be communicated to your good office.

Kindly consider our above submission and oblige.

Thanks & Regards

**For, Adani Ports and Special Economic Zone Limited**



**Shalin Shah**

**(Head – Environment)**

**CC To:**

1. Member Secretary, GPCB – Head Office, Paryavaran Bhavan, Sector 10 A, Gandhi Nagar – 382 010
2. APCCF, Regional Office (WZ), MoEF&CC, Regional Office (WZ), E-5, Kendriya Paryavaran Bhawan, Arera Colony, Link Road No. – 3, Bhopal – 462 016
3. The Director (IA Division), Ministry of Environment, Forests & Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi-110003

Adani Ports and Special Economic Zone Ltd  
Adani House,  
PO Box No. 1  
Mundra, Kutch 370 421  
Gujarat, India

Tel +91 2838 25 5000  
Fax +91 2838 25 51110  
info@adani.com  
www.adani.com

## ANNEXURE – 1

### REGULATORY PERMISSIONS

Sr. No.	Permission for	Ref. No. & Dated
<b>Environmental / CRZ clearance from MoEF&amp;CC/ SEIAA</b>		
1.	Handling facility of General Cargo / LPG /Chemicals and their storage terminal	F. No. J-16011/13/95-IA.III, 25 <sup>th</sup> August, 1995
2.	Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities	F. No. J-16011/40/99-IA.III, 20 <sup>th</sup> September, 2000
3.	Single Point Mooring (SPM), Crude Oil Terminal (COT) and connecting pipes	F. No. J-16011/30/2003-IA-III, 21 <sup>st</sup> July, 2004
4.	Development of Multipurpose berth (Terminal- 2)	F. No. 11-84/2006- IA.III, 5 <sup>th</sup> February, 2007
5.	Water Front Development Project	F. No. 10-47/2008- IA.III, 12 <sup>th</sup> & 19 <sup>th</sup> January, 2009, 7 <sup>th</sup> October, 2015
6.	Township and area development project	Letter No. SEIAA/GUJ/EC/8(b)/44 /2010, 20 <sup>th</sup> February, 2010
7.	Establishment of Common Effluent Treatment Plant (CETP) of 17 MLD	Letter no. SEIAA/GUJ/EC/7(h)/43/2010, 20 <sup>th</sup> February, 2010
8.	Multi Product SEZ, Desalination, Sea Water Intake, Outfall Facility and Pipeline	F. No. 10-138/2008-IA.III, 15 <sup>th</sup> July, 2014
<b>Consent to Operate from SPCB</b>		
1.	Mundra Port Terminal ( <b>PCB ID: 17739</b> ) for handling, storage and distribution of Dry, Liquid and Containerized Cargo	Order No. AWH-83561, Dated 09.02.2017
2.	WFDP – West Port ( <b>PCB ID: 35427</b> ) for Dry cargo handling	Order No. AWH-79241, Dated 28.07.2016
3.	SPM and Pipeline for Crude Oil Terminal ( <b>PCB ID: 37436</b> )	Order No. WH-86980, Dated 30.08.2017
4.	Multi Product SEZ ( <b>PCB ID: 31463</b> )	Order No. AWH-88998, Dated 23.11.2017
5.	MUPL – CETP ( <b>PCB ID: 10605</b> ) for 2.5 MLD Capacity	Order No. AWH-79311, Dated 29.07.2016
6.	AMSIPL ( <b>PCB ID: 10602</b> ) for township and area development	Order No. AWH-89533, Dated 05.12.2017
7.	APSEZ, Residential colony ( <b>PCB ID: 17738</b> ) for STPs (350 + 250 KLD) & RO Plant (10 KLPH)	Order No. AWH-81075, Dated 12.09.2016
8.	MLPTPL ( <b>PCB ID: 53331</b> ) for handling, storage and distribution of LPG	Order No. AWH-103906, Dated 09.11.2019

# **Annexure – 5**

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

## ANNEXURES

INITIAL OIL SPILL REPORT		ANNEXURE 1
Particulars of person, office reporting	Capt. Anubhav Jain, HOD Marine, APSEZ Mundra,	
Tel No.	8980015245	
Date & time of incident	23.10.2019 / 10:05 hrs	
Spill location	Near SPM	
Likely cause of spill	SPM camlock coupling leak	Witness – Boat Arcadia Krishna
Initial response action	Informed Port Control	By- Boat Arcadia Krishna
Any other information	OSR action plan initiated	
Identity of informant	Boat Arcadia Krishna (Hired by APSEZ)	
Time of FIR	10:05 HRS	
Source of spill	SPM camlock coupling leak	
Cause of spill	SPM camlock coupling leak	
Type of spill	Crude Oil	
Color code information (from CG)	Black	
Radius of slick	8 to 10 m	
Tail	12 m	
Volume	0.3 to 0.5 cubic meter approx.	
Quantity	550 to 700 L	
Weather	NE' Ly x 10 - 12 knts.	
Tide / current	Flooding / 0.2 to 0.5 knts.	
Density	0.7 to 0.8 specific gravity	
Layer thickness	0.7 to 0.8 mm approx.	
Air / Sea temp.	32 deg C / 28 deg C	
Predicted slick movement	Towards T-1	
Size of spill classification (Tier 1, 2 or 3)	Tier 1	

Reviewed By : Capt. Rahul Agarwal	Issue No. : 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No. : 03	Page 71 of 100

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

POLREP		ANNEXURE 2
In case of an oil spill, MPSEZ will provide information to Commandant Coast Guard District 1 Porbandar COMDIS 1 and Coast Guard Station Vadinar CGS Vadinar in the following format:		
SN.	Parameter	Data
1.	Identity of the informant	Boat Arcadia Krishna
2.	Time of information receipt	10:05 hrs
3.	Source of Spill	SPM camlock coupling leak
4.	Cause of Spill	SPM camlock blind flange loosened
5.	Type of oil	Crude oil
6.	Colour code information	black
7.	Configuration	-
8.	Radius	8 to 10 m
9.	Tail	12 m
10.	Volume	0.3 to 0.5 cubic meter approx.
11.	Quantity	550 to 700 L
12.	Weathered or Fresh	Weathered
13.	Density	0.7 to 0.8 specific gravity
14.	Viscosity	-
15.	Wind	NE' Ly x 20 - 22 knts.
16.	Wave Height	0.2 to 0.3 m
17.	Current	0.2 to 0.5 knts.
18.	Layer Thickness	0.7 to 0.8 mm approx.
19.	Ambient air temperature	32 deg C
20.	Ambient sea temperature	28 deg C
21.	Predicted slick movement	Towards T-1
22.	Confirm Classification of spill size	Tier 1

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 72 of 100		



ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

<b>Page Number:</b> 1 of 1		<b>Date:</b> 23.10.2019	
<b>Name:</b> Saket Kumar		<b>Position:</b> Radio Officer	
<b>Contact Number:</b> 9825228673		<b>Signature:</b>	
<b>Time</b>	<b>Activity Completed:</b>		
10:05	Information received from Boat Arcadia Krishna that there is slightly oil leaking from SPM floating hose camlock coupling		
10:07	Information given to HOD, HOS, SPM Manager		
10:09	Instructed Dolphin 11 to cast off from SPM mooring buoy and proceed to SPM for Oil Spill Response.		
10:27	Dolphin 11 reported at SPM and deployment of Oil Spill Response started.		
11:19	Dolphin 11 confirmed Boom layout of 250 m completed and skimmer deployed and Oil Recovery commenced.		
12:55	Oil spillage recovery drill completed. Boom and other equipment recovered onboard. Mock Drill Called Off.		

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 82 of 100		

PHOTOS TAKEN DURING THE DRILL



PHOTOS TAKEN DURING THE DRILL



## Personnel & Boats Participated in Drill

- 01 Capt. Anubhav Jain
- 02 Mr. Sanjay Kewalramani
- 03 Mr. M P Choudhary
- 04 Mr. Ramdas Pawale
- 05 Mr. Bharmal Bishnoi
- 06 Mr. Y K Sharma
- 07 Mr. Sashikant Padave
- 08 Mr. Santosh Rasam
- 09 Mr. Vishwanath Chavan
- 10 Mr. Upinder Samkaria
- 11 Mr. Sudhakar Singh
- 12 Mr. Ashish Kadiyan
- 13 Mr. Narayan Tamhankar
- 14 Mr. Manoj
- 15 Mr. Jimish Patel
- 16 Crew of Dolphin 11
- 17 Crew of Boat Arcadia Krishna

# **Annexure – 6**



# ADANI Ports And Special Economic Zone Ltd

Mundra -Kutchh

## P.S.P. MONITORING REPORT OF ICCP SYSTEM

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 25/10/2019

Criteria for PSP as per OISD 226 / 12.3.5 A or NACE SP0169-2013/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	PSP (-ve volt)	Casing PSP(-V)	AC V	Un Protected PSP(- V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.180		0.015	0.82	
2	2	D	After Railway Crossing	0.425	1.270	0.66	0.017		
3	3	A	field	1.400	1.250		0.016		
4	4	A	field	2.400	1.250		0.007		
5	5	A	field	3.000	1.240		0.001		
6	6	D	Road crossing	3.440	1.230	0.36	0.001		
7	7	A	field	4.300	1.210		0.005		
8	8	A	field	5.2	1.210		0.001		
9	9	A	IOCL Boundry wall	5.900	1.200		0.011		
10	10	E	Inside IOCL	6.200	1.200		0.029	0.58	

B)

Feeding TRUnit/ CPPSM Locations >>	TP2		
Feed Voltage (DC volt) :	4.22		
Feed Current (DC amp) :	2.1		
AC voltage (50Hz) at input of TRU/CPPSM:	230V		

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy :

**Pipeline is well protected**

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by N R ENTERPRISE

Signature :

Name :

Designation :



# ADANI Ports And Special Economic Zone Ltd

Mundra -Kutchh

## P.S.P. MONITORING REPORT OF ICCP SYSTEM

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 24/11/2019

Criteria for PSP as per OISD 226 / 12.3.5 A or NACE SP0169-2013/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	PSP (-ve volt)	Casing PSP(-V)	AC V	Un Protected PSP(- V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.280		0.014	0.74	
2	2	D	After Railway Crossing	0.425	1.260	0.66	0.016		
3	3	A	field	1.400	1.250		0.017		
4	4	A	field	2.400	1.240		0.008		
5	5	A	field	3.000	1.240		0.003		
6	6	D	Road crossing	3.440	1.230	0.36	0.002		
7	7	A	field	4.300	1.220		0.008		
8	8	A	field	5.2	1.210		0.002		
9	9	A	IOCL Boundry wall	5.900	1.190		0.001		
10	10	E	Inside IOCL	6.200	1.200		0.009	0.65	

B)

Feeding TRUnit/ CPPSM Locations >>	TP2		
Feed Voltage (DC volt) :	4.56		
Feed Current (DC amp) :	2.2		
AC voltage (50Hz) at input of TRU/CPPSM:	230V		

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy :

**Pipeline is well protected**

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by N R ENTERPRISE

Signature :

Name :

Designation :



# ADANI Ports And Special Economic Zone Ltd

Mundra -Kutchh

## P.S.P. MONITORING REPORT OF ICCP SYSTEM

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 26/12/2019

Criteria for PSP as per OISD 226 / 12.3.5 A or NACE SP0169-2013/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	PSP (-ve volt)	Casing PSP(-V)	AC V	Un Protected PSP(- V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.290		0.015	0.65	
2	2	D	After Railway Crossing	0.425	1.280	0.62	0.018		
3	3	A	field	1.400	1.260		0.019		
4	4	A	field	2.400	1.240		0.005		
5	5	A	field	3.000	1.230		0.012		
6	6	D	Road crossing	3.440	1.220	0.52	0.012		
7	7	A	field	4.300	1.210		0.008		
8	8	A	field	5.2	1.210		0.017		
9	9	A	IOCL Boundry wall	5.900	1.190		0.012		
10	10	E	Inside IOCL	6.200	1.210		0.014	0.54	

B)

Feeding TRUnit/ CPPSM Locations >>	TP2		
Feed Voltage (DC volt) :	4.63		
Feed Current (DC amp) :	2.3		
AC voltage (50Hz) at input of TRU/CPPSM:	230V		

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy :

**Pipeline is well protected**

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by N R ENTERPRISE

Signature :

Name :

Designation :



MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 27/01/2020

Criteria for PSP as per ISIRI 228 / 12.3.5 A or NACE SP0189-2013/ 6.2 uncoated/protected level (-0.81 volt), Overprotected level (-1.2 volt) with Cu-CuSO4 reference Electrode

SL. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	PSP (vs vol)	Caving PSP(-V)	AC V	Un Protected PSP(- V)	Remarks
1	1	E	W. Insulating Joint	0.000	1.170		0.015	0.82	
2	2	D	After Railway Crossing	0.425	1.270	0.60	0.017		
3	3	A	Field	1.400	1.270		0.018		
4	4	A	Field	2.400	1.230		0.007		
5	5	A	Field	3.000	1.190		0.001		
6	6	D	Road crossing	3.440	1.210	0.36	0.021		
7	7	A	Field	4.300	1.210		0.025		
8	8	A	Field	5.2	0.030		0		TLP NO.1321MS
9	9	A	IOCL Boundary wall	5.800	1.200		0.021		
10	10	E	Inside IOCL	6.300	1.200		0.029	0.58	

(B)

Feeding TRUnit/ CPPSM Locations >>

TP1

Feed Voltage (DC volt) :

4.25

Feed Current (DC amp) :

2.1

AC voltage (SCHz) at input of TRU/CPPSM:

230V

Graphical Representation (Annexure) : Included

Any other observation/ discrepancy :

Pipeline is well protected

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by

Signature :

Name :

Designation :



MAINT. BASE : Mundra

PIPELINE SECTION : AHC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 28/02/2020

Criteria for PSP as per Q100-226 / 11.1.5 A or NACE SP0169-2011/ E.2 unprotected level (-0.85 volt), Overprotected level (-1.1 volt) wrt Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (m)	ON -PSP (+ve volt)	OFF -PSP (-ve volt)	ACV	Un Protected -PSP (V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.218	1.068			
2	2	D	After Railway Crossing	0.435	1.328	1.108			
3	3	A	field	1.400	1.348	1.118			
4	4	A	field	2.400	1.308	1.098			
5	5	A	field	3.000	1.268	1.048			
6	6	D	Road crossing	3.440	1.298	1.088			
7	7	A	field	4.300	1.288	1.028			
8	8	A	field	5.2	0.000	0.000			TLP MISSING
9	9	A	IOCL Boundary wall	5.900	1.278	1.008			
10	10	E	Inside IOCL	6.200	1.258	0.998			

B)

Feeding TR Unit/ CPPSM Locations &gt;&gt;

TP2

Feed Voltage (DC volt) :

4.27

Feed Current (DC amp) :

5.0

AC voltage (50Hz) at input of TRU/CPPSM:

230V

Graphical Representation (Annexure) : Included

Any other observation/ discrepancy :

Pipeline is well protected.

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by

Signature :

Name :

Designation :





# ADANI Ports And Special Economic Zone Ltd

Mundra -Kutchh

## P.S.P. MONITORING REPORT OF ICCP SYSTEM

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 24/03/2020

Criteria for PSP as per OISD 226 / 12.3.5 A or NACE SP0169-2013/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	PSP (-ve volt)	Casing PSP(-V)	AC V	Un Protected PSP(- V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.200		0.018	0.8	
2	2	D	After Railway Crossing	0.425	1.320	0.63	0.038		
3	3	A	field	1.400	1.330		0.04		
4	4	A	field	2.400	1.310		0.04		
5	5	A	field	3.000	1.250		0.004		
6	6	D	Road crossing	3.440	1.280	0.43	0.001		
7	7	A	field	4.300	1.280		0.005		
8	8	A	field	5.2	0.000		0		TLP MISSING
9	9	A	IOCL Boundry wall	5.900	1.260		0.014		
10	10	E	Inside IOCL	6.200	1.240		0.04	0.55	

B)

Feeding TRUnit/ CPPSM Locations >>	TP2		
Feed Voltage (DC volt) :	4.27		
Feed Current (DC amp) :	5.0		
AC voltage (50Hz) at input of TRU/CPPSM:	230V		

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy :

**Pipeline is well protected**

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by N R ENTERPRISE

Signature :

Name :

Designation :

# **Annexure – 7**

Sustainable Growth

With Goodness





# Our Journey

The year 2019-20 has passed off with motivation through recognition by Ministry of Corporate Affairs and courage to work for the commitment given to the community. It is necessary that sustained growth is achieved at rural level along with the industrial development. This can be made possible by involving more and more people in the rural development programme.

Since beginning, The Adani Foundation Mundra is committed to the cause of the deprived and underprivileged. It has been working relentlessly across 6 Talukas, covering 92 villages, to uplift the lives of more than 60,000 families with a multi-faceted approach.

This year conceded with more streamline projects of Education i.e. Utthan – to enhance primary education of 17 schools of Mundra and 8 Schools of Nakhatrana, milestone achievement in Fisherman Livelihood project, Launched Gram Utthan in seven villages of Mundra , considerable impact created by Mangroves Biodiversity projects and new era defined in agriculture projects i.e. Home biogas and Dragon Fruit Cultivation

Adani Hospital Mundra is come out as a true blessings for the community due to reframed rate structure with more than 90% discount. Current year G K General Hospital recognized by Government for best implementation of Ayushman Yojana and for the best health service provider as well. Two Health Weeks were Celebrated to increase outreach of GKGH.

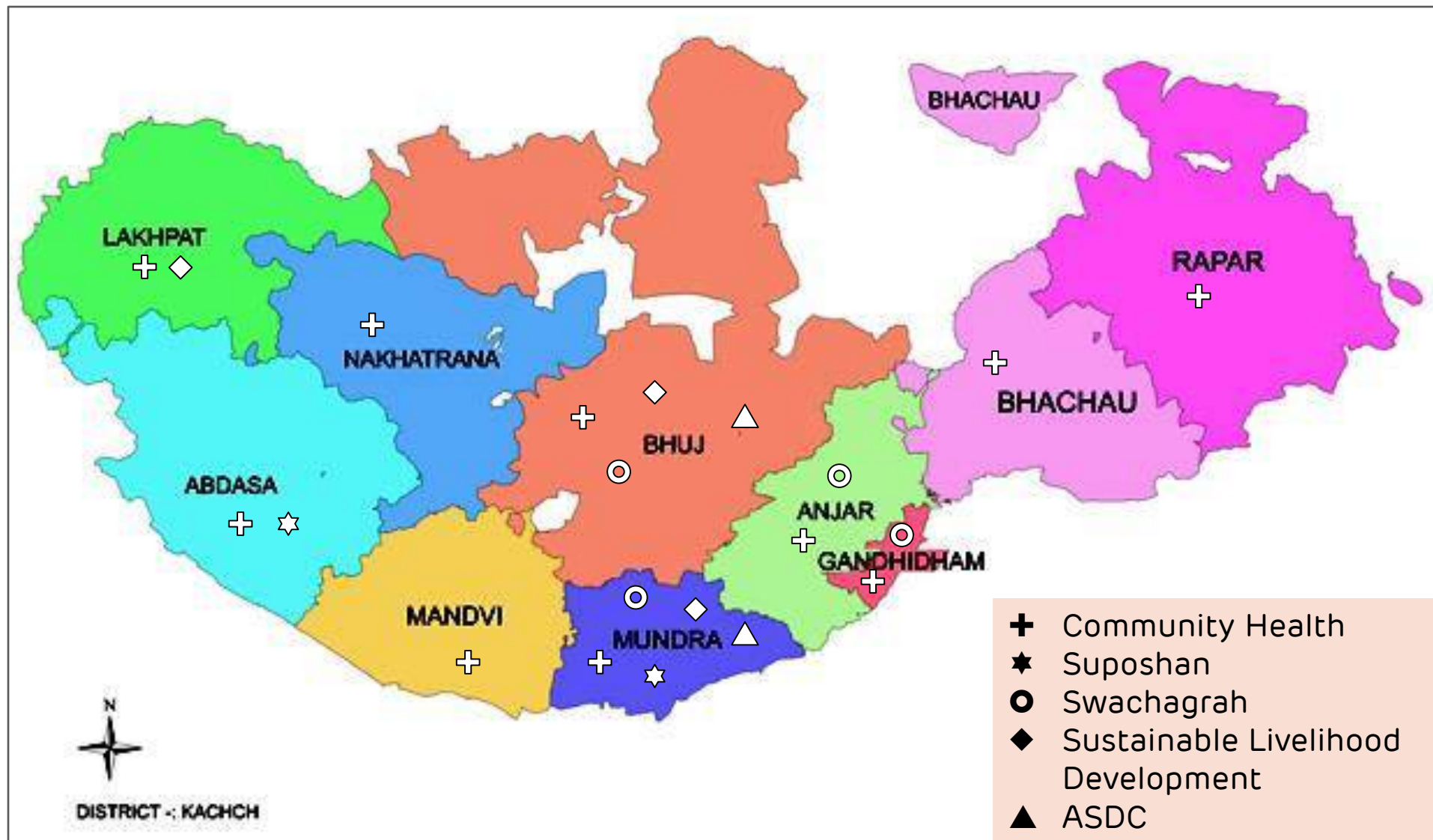
Namda Artisan Karim mansoori was awarded with "Best State Artisan Award" by CM, Gujrat. Live exhibition of different mangroves spices in District Level Krishi Mela by Adani Foundation. " Speaker of Kutchh" organized to motivate and identify youth speaker at District Level.

The people of Kutch have generously supported the activities carried out by the Adani Group or else this wouldn't have been possible. Their determination, understanding and commitment have strengthened the development even more.

Thanks to Mr. Rakshit Shah – Executive Director APSEZ and Mr. Avinash Rai – CEO APSEZ for being mentor of the team Always !

Our Achievement would not be possible without the ultimate support by Mr. P N Roy Chaudhry, Executive Director - AF and generous faith and passionate support by Dr. (Mrs.) Priti G Adani, Chairperson– Adani Foundation

# Our Presence in Kutch



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# Education



🇮🇳 3417 Students	: 25 Schools Utthan
🇮🇳 502 Students	: Khel Mahakumbh
🇮🇳 3100 Enrollment Kit	: 118 Schools
🇮🇳 997 Students	: Dignity of Workforce
🇮🇳 3110 Mothers	: Mother's meet touch
🇮🇳 33030 Students	: Udaan Project
🇮🇳 443 Students	: Adani Vidya Mandir
🇮🇳 552 Teachers	: Guruvandana- I,II



The future of India depends upon the quality of education imparted to our children in primary schools. Primary education is the basic foundation on which a nation builds its future.

In this context with an aim to enhance the quality of primary education in Kutch district, Adani foundation adopted 25 government school located at Mundra and Nakhtrana Taluka under the project 'UTTHAN' a drive of quality education.





Large-scale efforts have been made by the government and non-government sectors, especially in rural government primary schools, but coverage and quality of education are still not satisfactory. Adani Foundation leveraging their experience, to intervene in Government Schools. These interventions will aim to enhance the quality of primary education in Government schools. Under Project UTTHAN 25 primary government schools of Mundra and Nakhtrana Taluka of Kutch district have been adopted to take up various initiatives aimed at improving quality in these schools. 3417 children are benefiting from a meaningful education in these schools.

Academic

Co -curricular

Extra curricular



## Academic

- One teacher – One school + Sports teacher + IT teacher
- 'IT on Wheel' Van with 35 laptops and computer instructor make students more tech savvy and spreading the digital and technology knowledge amongst the younger generation
- To achieve academic excellence of Priya Vidyarthi, Utthan Shikshak implies various alternative method to make their classroom more friendly and interesting.
- English is to be taught to the students from the early classes so that they will be equipped with ample resources during their further studies.
- Training cum Induction Program on various topic like teaching methodology of progressive learner, assessment pattern of slow learner, multiple intelligence etc.







## Library activities

Use of Reading Corner by students  
of Std. 3 to 8 of Utthan School  
Every Saturday Library activity with  
the Book issue were planned and  
executed in a meaningful manner

**7113** Book issued in academic  
year 2019-20



Book mark  
exchange program

Through book mark exchange  
program Received

**32** Partner schools from  
**11 different**  
countries



## Other Activities



## Sports

Sports are a crucial part of a student's growth and development. Through participation in sports and games, a student gains various skills, experience and confidence. With the intervene of our Sports teacher in all Utthan Schools successfully enrolled 500+ students in Khel Mahakumbh

All 17 Utthan school has received FIT INDIA certificate from Government of Gujrat.

36 Students (24 girls, 12 boys) reached on District level in Khelmakakumbh

500+ students enrolled in Khel Mahakumbh



# Achievements

Utthan Sahayaks with the help of customize

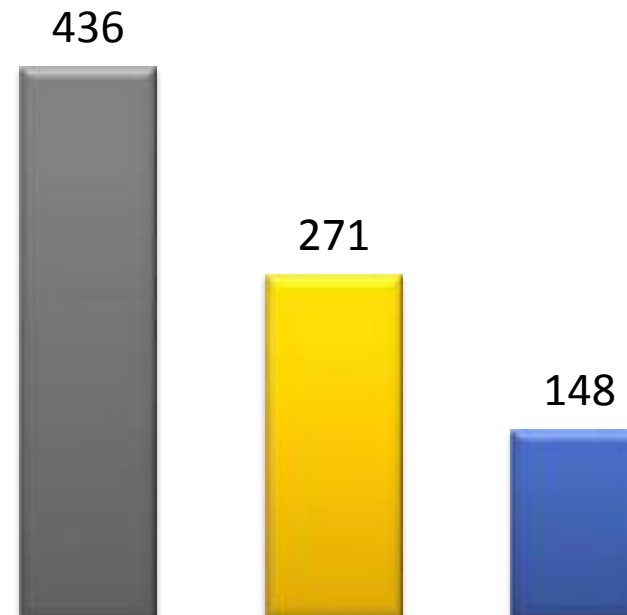
table meet huge success to achieve the main objective of the program

**The No's of priya vidhyarthi in 2019 was 271 which is reduced to 148 in 2020**

Third party assessment by KSKV University Department of Master of Social Work

## Smart Classroom:

### Gradually Reduction in no's of Priya Vidhyarthi



■ No. of Priya Vidyarthi as per the result of Gunotsav - 2017

■ No. of Priya Vidyarthi as per the report of Impact Assessment 2019

■ No. of Priya Vidyarthi as per the Internal assessment 2020

One of the major element of project Utthan is to convert traditional teaching method into technological based learning After the installation of Software classroom become more Interactive and Interesting – Stated in the Impact Assessment report done by KSKV University





## Extra - Curricular

- Utthan Sahayak + 1222 students from High school & Higher secondary of 6 villages celebrate Fifth International Yoga Day
- On International Plastic Bag Free Day, Awareness were spread through Effective speech, Soft board decoration, Video and Newspaper clipping in all Utthan school.
- Celebration of Gurupurnima in all Utthan Schools during morning special.
- 363 students from 17 schools got an opportunity to visit Adani West port. Main port , Willmar, power & power through project Udaan.
- Tree plantation in all the Utthan School. Adani Foundation align with the circular passed by the Government of Gujarat "Ek baal Ek Jhhad" distributed 100 trees in each school. Students not only planted the trees in fact they adopt each tree with giving their own names.





Adani foundation has make out four major criteria for peripheral Development work amongst them “EDUCATION PROGRAMME” is the one of the major area where we work on following objectives.



Render support to gap understanding school Environment.

Efforts for 100% enrollment and retention of eligible children in Govt. primary school.

To fill the gap- understanding the importance and urgency of requirement though material or infrastructure support.

Sr. No.	Activities	Beneficiaries
1	Mothers Meeting	3110
2	Chintan Shibir	1155
3	Praveshotsav	3100
4	Celebrations	3295
5	Other Activities	734
Total		11394

Adani foundation is supporting for improving quality of education To motivate children for schooling as well as inspire peers with create conducive Environment by various activities like Mothers Meeting, Chintan Shibir etc.

# Adani Vidya Mandir Bhadreshwar

In Bhadreshwar, Mundra, the Adani Vidyamandir has completely revolutionized the education scenario. Only the children of families with an income of less than 1.5 lakh are admitted to this school. Along with quality education, the school also focuses on providing nutritious food, uniforms and other services to the children for free.

In year 2019-20 Total strength of students are 443 in Adani Vidya Mandir





# Adani Vidya Mandir Bhadreswar

## Annual Day Celebration



Annual Day was celebrated in Adani Vidya Mandir on 13<sup>th</sup> December 2019 on theme "Mera Bharat Mahan". Chief Guest of the Event was Wing Commander BSF and Mr. Rakshit Shah Executive Director, APSEZ was the chief guest of the Event. All the students participated with great Enthusiasm and Zeal.



## AVMB STD - 10 SECOND BATCH RESULT

Year 2019-2020

SR NO	GRADE	STUDENTS
1	Above 80 %	1
2	Above 70 %	3
3	Above 60 %	5
4	Above 50 %	9
5	Above 40 %	7
6	Fail	2
TOTAL		27

### AVMB Std.-10 Second Batch Result 2018-19

Adani Vidya Mandir Bhadreshwar achievement in Gujrat Board Standard 10th Examination Result 92% (25 students have passed the examination out of 27). Adani Foundation will take all responsibility of further study of students with respect to their interest.





## Project Udaan

With a vision to familiarize, educate and inspire the future generations, Adani Foundation organizes Education Exposure visits to Mundra for High schools and educational institutes in Various parts of Gujrat.

568 institutes and 33,030 beneficiaries have made inspirational visit up to March 2020



# Objective of the program:

The main objective of the project is to encourage and motivate young school students to develop their entrepreneurial skills. The main idea behind this project goes back a long way when Mr. Gautam Adani himself had a life changing experience. Young Mr. Adani had the chance to go and visit Kandla port, Gujarat. Looking at the expanse, the large scale activities being carried out at the port he got extremely inspired and encouraged. From that day onwards he nurtured his entrepreneurial skills only to later become the proud owner of one of the most successful ports in the world. Mr. Adani believes that if that one visit could have such an impact on his life, it could similarly do wonders for hundreds of other young minds if given a chance to dream big.



## Other activities



## Follow up Mechanism:

There is a structured feedback mechanism for the project where the visiting students along with their teachers send back a feedback form to the organization sharing their experience and inputs to

better the overall program. Entering in its 10th year, there are

concentrated efforts in the organization to conduct a full-fledged impact

study of the program to measure its short term and long terms effects.

# Community Health Mundra



Project	Total OPD & IPD
Senior citizen	9860
Medical Supports	2129
Dialysis Supports	6
Medical Mobile van	20399
Rural Clinic	25142
Ayushman Bharat yojna	364
General Health camp	3137
Utthan Health camp	837
Brest & Cervical Cancer Camp	370
Forthnight health celebration	712
<b>Total</b>	<b>62956</b>

"ॐ सर्वे भवन्तु सुखिनः सर्वे ऽन्तु निरामयाः" is the Arogya Mantra of India – Adani Foundation Mundra is always following this mantra in case of health and well being of the community. Health is the basic need for development of community. Adani Foundation understands this fact and its committed to improve health care facilities in every corner of region.





# Rural Clinic & Mobile healthcare unit

To solve the health issue in interior villages and to cover the marginalized as well as poor people Mobile Van and rural clinic service is being executed by Adani foundation is to reduce travel time, hardships and expenses. The mobile health care unit cover 25 villages and 07 fishermen settlements. Around 90 types of general life saving medicines are available in these units. It has turned out to be a boon for women and children as the service is availed at their door - step. The Adani Foundation operates Rural Dispensaries in 7 villages of Mundra block, 03 villages of Anjar block and 1 clinics in Mandvi Block. Mobile dispensary and rural clinics provide health services with token charge of 10/- rupees per patient daily by a doctor and a volunteer.



## 11 Rural Clinic

8 from mundra 3 from Anjar block treated ;  
**25142 patients.**

**31 villages** covered through Mobile healthcare unit  
**20399** patients benefited during the year





# Health Cards to Senior Citizens

In the Fourth part of life is there is need special care for health and warmth hence Adani foundation has started senior citizen project in Mundra Block since 9 years.

The project is being implemented in three phase wise with key point of Blue and green card according to beneficiaries criteria.

The amount strategy per phase wise – Three year is as below

- |                |           |
|----------------|-----------|
| ❑ First phase  | 75000 INR |
| ❑ Second phase | 50000 INR |
| ❑ Third Phase  | 30000 INR |

During the year 2019-20, total 9860 transactions were done by 8672 card holders of 68 villages of Mundra Taluka. They received cash less medical services under this project.

The third phase of this scheme was started in last year. The limit for the beneficiary was set to 30000/- within a period of 3 years. the senior citizens get emergency medical care at Adani Hospital, Mundra and refer to GKGH, Hospital ,Bhuj in Emergency.

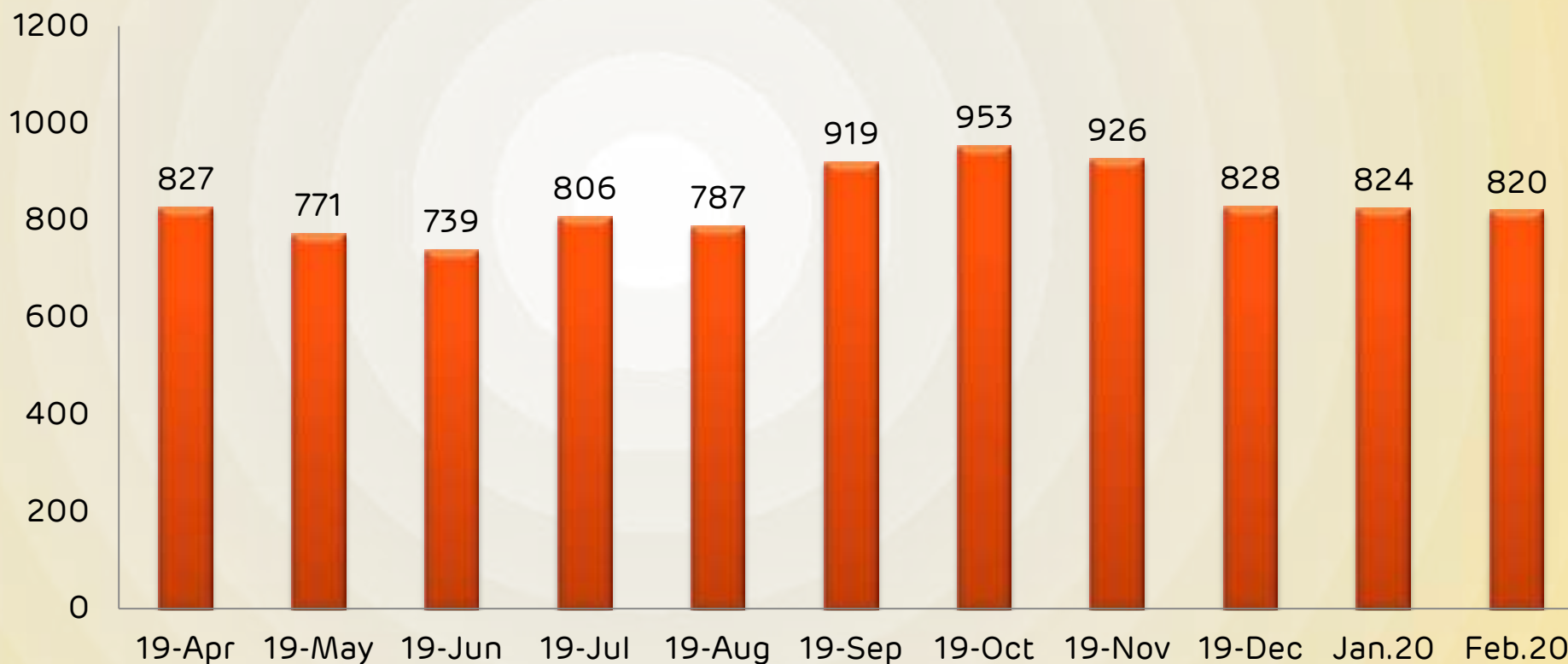


## Sr.Citizen Project – Total village wise Card transection for April-19 to March-20

Sr.Citizen status Year-2011 to 2020

Number of Villages	Total Cards	Total Survey	Pending Renew Cards	EXP	Green cards	Blue Cards	BPL Cards	APL Cards	No Resnig Cards	RSBY Cards	MA Cards
68	8672	7056	901	715	6289	767	2493	4516	47	77	222

Month	OPD
19-Apr	827
19-May	771
19-Jun	739
19-Jul	806
19-Aug	787
19-Sep	919
19-Oct	953
19-Nov	926
19-Dec	828
Jan.20	824
Feb.20	820
Mar 20	660
<b>Total</b>	<b>9860</b>







General health camps, Pediatric Camp, breast and cervical cancer screening camp and surgical health camps was organized at frequently to meet the specific requirements of the community and in disease outbreak season.

In the year of 2020-2021 Total 3137 people had been benefitted by various kind of camp and needy and screened patients are treated in **Adani Hospital**.

As well as linkages and facilitated them with government health Yojna like Ayushman Bharat, RSBY, Maa Amrutam and Maa Vatsalya yojna ,Bal sakha yojna.

Health camp			
Sr. no.	Place	Villages Name	Total Patients
1	Ganesh Mandir Mela_ Health Camp	Luni	40
2	Hajipir Mela provide Medicine	Hajipir mela	100
3	Salimbhai Labour colony Health camp	Dhrub	71
4	Shri Ram Katha Nandi Sarovar Ahinsadham	Pragpar	491
5	Aslambhai Labour colony health camp	Dhrub	175
6	Tatwamsi Keraliyan Samaj	Mundra	64
7	Labour Colony Health camp - AWL	Dhrub	154
8	Labour Colony Health camp - AWL	Dhrub	117
9	Khoja Jamat khana Mundra	Mundra	125
10	Multi Speciality Camp Ramvadi Gundala	Gundala	105
11	Health camp at Uras Darga Sarif Luni	Luni	824
12	Labour Colony Health camp - AWL	Dhrub	161
13	Pra.School Sukhpar Vaas _mundra	Mundra	108
14	Samaj vadi Sukhpar vaas - Mundra	Mundra	160
15	Luni Samuha Sadi	Luni	290
16	Labour Colony Health camp - AWL	Dhrub	152
Total...			3137

## Medical support



While Health emergency create its takes limitless rupees to recover it and it is not possible to economically poor though Adani Foundation provides primary health care and financial assistance for ailments such as kidney related problems, paralysis, cancerous and tumor surgeries, neurological and heart problems, blood pressure, diabetes etc.

Medical Support had been given to 2129 benefitted from Mundra, Mandavi and Anjar Block at adani hospital, Mundra where as In the Critical cases after stable them we refer them to GKGH, BHUJ for further treatment.

## Dialysis support



As the kutchh is arid region and higher saline Drinking water in Mundra, there is urinary stone and kidney failure case is more prominent in Block. A dialysis support project to providing dialysis treatment to help the extremely needy patients to live a healthy life.

**Total 6 Patients are being supported for regular dialysis (twice in a week) during this year.**

# Community Health Bhuj



- **5398 Patients taken Care and Coordination**
- **52 Health Camps 4779 beneficiaries**
- **609 Dead body referred by carry van**
- **3557 Ayushman Gold Card facilitation through Enrollment camp and Mahiti Setu**
- **549 support for Implants and Needy Patients**
- **9896 People helped through Mahiti Setu for various government schemes**
- **816 people benefitted in 6 health awareness camps**





# Gujarat Adani Institute of Medical Science (GAIMS) - Bhuj

Gujarat Adani Institute of Medical Science is the first Medical College of Kutch region. It started in partnership with Adani Group and Government of Gujarat in the year 2009. This college was affiliated by the Medical council of India in the year 2014 for the MBBS with 150 seats per year. Gujarat Adani Institute of Medical Science is affiliated with the first digital university "Krantiguru Shyamji Krishna Verma Kutch University". In GAIMS, currently 750 students are studying. The GAIMS Medical College is situated in heart of Bhuj city on a large plot of 27 acres.



A teaching hospital (G K General Hospital) with 750 beds is established with GAIMS in which patients of Kutch are getting subsidized medical facilities. The Hostel facility is also available for the students in the campus only. The accommodation facility is given to the staff of GAIMS.

## Adani Foundation - Bhuj

- Adani Foundation Team has initiated coordination with GKGH hospital since 2014 and established a reception area for the smooth patient coordination and preparation for the social networking program.
- Adani Foundation organized **52 General Health Camps and Speciality Camps** in various interior villages of Kutch in coordination with GKGH which created magical impact and benefitted **4779 patients**. Adani Foundation Bhuj Health team has also organized more than six awareness camps.
- Dead body medical van – Dignity to death is one of the noble initiatives taken up by the Adani Foundation. If any death occurs in GKGH, dead bodies are shifted to the native village of the concerned in the Kutch District free of cost. Total 609 dead bodies privileged till now to different locations in Kutch.





# Patent Care and coordination



Sr. No.	Month	Total Patient Special Care in OPD and IPD level
1	April to June	1350
2	July to September	1474
3	October to December	1419
4	January to March	1155

In the financial year 2019-20 G K General Hospital Adani Foundation team has coordinated with 5398 patients for proper IPD care from admission stage to up to discharge level.

## Mahiti Setu

Mahiti Setu has created trust and easy access to various government schemes – outreach will increase with time and awareness. 9686 people helped through Mahiti setu for various govt scheme

Sr. No.	Month	Total Beneficiaries
1	April to June	2249
2	July to September	1993
3	October to December	1951
4	January to March	3493





# Arogya Saptah

Adani foundation, Adani Hospital and GAIMS have Jointly Celebrated "Arogya Saptah" 8th to 14th August & 20<sup>th</sup> to 26<sup>th</sup> January in Respect of Independence and Republic of our country. Celebration included multi specialty camps, Workshops, truckers health check up, surgical camp on foundation day and adolescent fair at different part of district. Collector, **7<sup>th</sup> to 14<sup>th</sup> August 2019**

Day	Date	Event Name	Details about the event	Beneficiaries
1	07/08/2019	Health check up at Orphan age, Bhuj	Orphan children's of Yatimkhana ahlesunat primary schools 101 students health checked and referred 24 students for further treatment	101
2	08/08/2019	Blood Donation Camp, Nakhatrana	Blood donation of 16,500 MI was taken from blood donation camp at Nakhatrana.	55
3	09/08/2019	Pregnant Women health check up, Madhapar	ANC mothers HB and health checked by gynaecologist and advised for care and diet during the pregnancy	50
4	10/08/2019	Surgical Mega Camp, Khavda	Mega Surgical Health camp held in Khavda region 223 patient had been treated and more than 35 patients referred for further treatment	223
5	11/08/2019	General Health Camp, Palara Jail	Due to constant complaints about the health of the examiners of the Palara Jail, the camp was organized in the Palara jail and there were an 35 patients referred to gkgh of skin patient.	139
6	12/08/2019	Ayushman Health Card Enrolment, Gorevali	Aushyman bharaat golden card enrolment camp was held at Gorevali PHC there was 39 family covered under the the skim and 52 card was given to beneficiary.	52
7	13/08/2019	Awareness on women health, mukt jivan college, Bhuj	Woman awareness for hostel girl of Muktjivan Swamibapa mahila collage was held 250 Student got aware about Menstrual, HIV, Breast and cervical cancer.	250
8	14/08/2019	Blood Donor Appreciation	More than 50 and 100 times blood donor was appreciated with certificate by Adani foundation and GAIMS.	36

# Arogya Saptah

Objective of the program was to avail health benefits at GKGH and also at Adani Hospital Mundra and Approximately 1539 people were direct beneficiaries of the program.

20<sup>th</sup> – 26<sup>th</sup> January 2020

Day	Date	Event Name		Beneficiaries
1	20/01/2020	Eye diagnosis camp- Khavda	Due to the dry climate eye diseases such as Cataract etc. are more prevalent in Kachchh area. Thus we held speciality camp of eye and 9 operative patient referred to GKGH	42
2	21/01/2020	Woman Health and awareness and HB camp	Adolescent girl, woman HB awareness and check up camp was held at Mota reha village, 3 girls of higher haemoglobin was awarded as Miss Haemoglobin	86
3	22/01/2020	Health check-up camp ugedi	3 <sup>rd</sup> event of Health week 4 was held as Health check-up at Ugedi village of Nakhtrana Taluka. 115 Patient was taken benefits of the camp.	115
4	23/01/2020	Subhaschandra boss Jaynti celebration	Speech and Drawing Competition Held at 'PATVADI NAKA' Primary School on the occasion of the birth anniversary of Freedom Fighter Subhash Chandra Bose	150
5	24/01/2020	Ayushyman Bharat camp-Bhadreshwar	Golden card of central Government's PM-JAY scheme enrolled at Bhadreshwar PHC 32 family and 45 beneficiary taken benefits of this camp.	45
6	25/01/2020	World leprosy day celebration	Organized an awareness program to celebrate World Leprosy Day 160 PCA and Nursing staff got advice about leprosy	160
7	26/01/2020	Appreciation to housekeeping staff	PCA and Security staff who has done excellent work for Public Health was appreciated by adani foundation as part of 4 <sup>th</sup> Health week on the occasion of Republic Day celebrations	35



# Sustainable Livelihood Development

In the villages at Mundra Taluka, several communities are economically side-lined and weaker that depend on a sole income source or are unemployed. Sustainable livelihood projects have been launched to cater financial independence through building local partnerships, providing diverse livelihood avenues, inculcate the attitude to establish savings, equipping to earn and updating local skills by making use of existing resources to encourage self-reliant lifestyles. Participation Is encouraged by launching specific projects for fishermen communities, farmers and cattle owners, youth and women.





# Fisherman Amenities work



- 🏠 939 Students : Education Support
- 🏠 137 Students : Adani Vidya Mandir \*
- 🏠 28 Fisherman : Alternate livelihood
- 🏠 11 Fisherwomen : Linkages for schemes
- 🏠 1295 Fisherman : Community Engagement
- 🏠 4340 Members : Potable water provision
- 🏠 6261 Mandays : Mangroves Plantation \*
- 🏠 12 Members : Sea Weed Culture
- 🏠 6970 Direct Beneficiaries

28 Fisherman are engaged in various contract related jobs and 37 Fisherman are doing job after taken training from Adani Skill Development Center.



To strengthen the standard of pri-primary education, Adani Foundation has constructed 4 BALWADI at different fishermen helmet Which focuses on the development of basic age-appropriate learning concepts, discipline, regularity, awareness of health & hygiene, cleanliness and also provides nutritious food. 140 children are benefiting from this scheme

Balwadi		
Sr.	Village & Bandar	children
1	Juna Bandar	45
2	Luni Bandar	25
3	Bavdi Bandar	40
4	Zarapra	30
	Total	140

# Learning with Joy

Adani foundation came to know that fishermen children are being suffered to continue their study due to migration of their family at different Vasahat so foundation has started vehicle support for transportation from different Bandar to village total 120 students were benefitted.





## Scholarship Support

The Adani Foundation provided scholarship support to motivation and encouragement of fishermen boys and girls for higher education under this program we provide 100% fees support to girls and 80% fees support to boys as a scholarship. this year total 78 students are being facilitated by Adani foundation.



## Book support:

49 Fisherman Students from Higher Secondary Standard ( 9 to 12) has been benefitted from various of Juna Bandar, Zarpara, Navinal, Bhadreshwar.



## Cycle support:

Fishermen who are at fishermen hamlets are migrated with whole family for 8 month fishing season. During that time to continue higher education of their children at Mundra, Adani foundation provide cycle support every year to 9th standard students. This year cycle support has been given to 7 students.



## Awareness Program



To create awareness about health, personal hygiene, child education and nutritional diet in fishermen community, various awareness programs have been organized.

Facilitation of Government's fishermen welfare scheme "Sarkar Apne Dwar" program organize. More than 150 Beneficiaries participated in this events.



## Machhimar Ajivika Uparjan Yojana

Providing fishing materials support like fishing nets, ropes, buoys, anchor, etc. according to fishermen need. Before these Fishermen had to buy this borrowed materials from traders which were very expensive for them

28 fishermen has been facilitated by fishing materials

## Potable Water to Fisher Folk at vasahat-2019-20

Sr.	Vasahat	family	Requirement Per day	Remarks
1	Luni Bandar	116	15000	9 Month
2	Bavdi Bandar	88	15000	9 Month
3	Kutdi Bandar	140	15000	Provide by Adani Solar
4	Virabandar	58	10000	Provide by Tuna port
5	Randh Bandar	350	25000	9 Month
6	Ghavarvaro Banadar	58	7500	Provide by Tuna port
7	Junabandar	134	30000	Connection with Mundra Gram Panchayat
8	Zarapra Vasahat	72		12 Months
9	Chhachh vadi Zarapra	69		12 Months
	Total	1085	117500	



## Machhimar Shudhh Jal Yojana

Pure water play important role for good health hence reduce water scarcity and ultimately reduce load over women , potable water was provided to the fishermen communities at different vasahat through water tanker **A total of 1,17,500 litres of water per day was supplied to 1085 households from different settlements on a daily basis..**





## Cricket Tournament

Adani Foundation, Mundra organized Cricket Tournament, **"Adani Premiere League"** among fishermen community to promote healthy sportsmanship ,and harmonically transparent community relationship among fisher folk of Mundra ,Anjar and Mandvi Taluka.

Total 65 Teams were participated from 13 villages i.e 750 Fisherman youth from various Villages Zarpara, Navinal, Shekhadia, Modhava, Salaya, Mundra, Tragadi, Luni, Gundiyali, Bhadreshwar ,Vandi (Tuna),layja and kathada with great enthusiasm.

## Ramotsav Programme

To Development of physical and mental Development of youth Ramotsav week Program has been organized at various Vasahat. (i.e. Junabandar, Luni, Zarapara, Bavdi Bandar and Navinal & Vira Bandar )

This year Total 545 children of 1st to 10th standerds were participated.





# Environment Sustainability

The Environment Impact Assessment (EIA) Notification, 2006, issued under the Environment (Protection) Act, 1986, as amended from time to time, prescribes the process for granting prior environment clearance (EC) in respect of certain development projects/activities listed out in the Schedule to the Notification.

Sustainable development has many important facets/components like social, economic, environmental, etc. these components are closely interrelated and mutually reinforcing. Under Corporate Environmental responsibility 10 km radius villages from SEZ Boundaries.

To make connections between human actions and the level of biological diversity found within a habitat and/or ecosystem, this year we launch project "Sanrakshan" in coordination with GUIDE. MOU has been signed with Dr. Thivakaran – GUIDE for conservation of five species of mangroves.



# Bio diversity Project

Bio diversity Project has been Continue with three species Rhizophora Mucronata ,Ceripos Tagal, Ceriops Decandra with good growth at Luni Bandar.

The mangrove biodiversity enrichment project in and around Adani ports special economic zone limited (APSEZL) aims to introduce select true mangrove species on a pilot scale in suitable coastal belts and assess their survival. Because this project is the first of its kind, the expected survival rate is between 20-30%.



The project is currently in its initial stages of establishing nurseries and sowing seeds of several different species brought in from multiple locations in and outside of Gujarat state. These nurseries have been developed in tidal flats near the village of Luni, Kutchh, Gujarat.

The mangrove seeds/propagules) for the establishment of the nursery were brought in from various locations in India, namely, Machilipatnam (Andhra Pradesh), Pondicherry (Tamil Nadu), Parangipettai (Pichavaram Mangroves, Tamil Nadu), Kandla (Gujarat) and Jamnagar (Gujarat).

In most of these locations, there is adequate fresh water supply available due to high/substantial rainfall and/or presence of major rivers (also important river confluences and deltas that give rise to a thriving estuarine environment). Consequently, the mangrove species that successfully grow in those regions are adapted to a low-salinity environment (where salinity is approximately 20 ppt) against that of 37-44 ppt prevailing in Kutchh coastal waters. Furthermore, the species selected to establish the biodiversity enrichment project also belong to this group of mangrove species. This subsequently creates a challenge for the team heading this project because the Kachchh region does not provide adequate salinity ranges for survival of most of these species. In fact, it provides an extremely harsh saline environment (salinity can range up to as high as 44 ppt during summer).

Considering the above-mentioned scenario, the site selection criteria, need for species of high salinity tolerance and studying their natural occurrence in Kutchh becomes critical in ensuring a substantial survival rate of the mangrove species selected to potentially successfully establish a diverse and resilient mangrove community in the Kutchh region.

Furthermore, a highly diverse set of mangrove species will ensure resilience in the face of changing climate and could probably provide as a thriving gene pool and seed bank in the future for the Kutchh region.



# Book Launch : Multi- species Mangroves Biodiversity Park by Chairperson, Adani Foundation



# SUJLAM SUFLAM JAL ABHIYAN

## **Global Problem-Local Solution**

**Water Conservation Work** At the turn of millennium, the state watched with growing alarm the steady depletion of its ground water and launched massive drive to achieve water security in Mundra region.

- A large number of water harvesting structure ( 18 Nos. of check dams in coordination with salinity department) and
- Ground recharge activities (pond deepening work for more than 52 ponds) individually and 26 ponds under Sujlam Suflam Jal Abhiyan were built leading to a significant increase in water table and higher returns to the farmers.
- Roof Top Rain Water Harvesting 54 Nos. and Recharge Bore well 75 Nos.
- Drip Irrigation 823 Farmers benefitted in coordination with Gujrat Green Revolution Company
- Participatory Ground Water Management in ten villages with holistic approach for Kankavati Sandstone Aquifer Programme



# Water Harvesting Structures



Dhrub- pond deepening work – work completed



Zarpara – Roof Top Rain Water Harvesting

For Water conservation drive we are having vision for next five years that

- Drinking Water Sustainable Villages by Roof Top Rain Water Harvesting – at least 5 villages
- Agriculture water conservation by 100% Drip, Bore well Recharge
- Farm Bunding and Crop pattern
- Recycling Sewage water from STP
- Awareness for water conservation to community

# Machhimar Ajivika Uparjan Yojana

The 'Ajivika Uparjan Yojana' was implemented to promote and support alternative livelihoods among the Fisher folk communities during the non-fishing months. The Foundation introduced 'Mangrove Nursery Development and Plantation' in the area as an alternate income generating activity for the people of the region. Both men and women received training on Mangrove plantation, moss cleaning, etc. as per requirements. The Foundation provided them with employment equivalent to 6261 man-days. In addition to this, employment worth of 42048 man-days has been provided till date. The Foundation has also supported Pagadiya fishermen as painting laborers by providing them with employment and job in various field.





## Sea Weed Project

The cultivation of seaweed have significant potential for the sequestration of carbon dioxide (CO<sub>2</sub>) and will very fulfill in mitigating the climate change. Seaweeds are macrophysics algae, a primitive type of plants lacking true roots, stems and leaves. They provides valuable source of raw material for industries like health food, medicines, pharmaceuticals, textiles, fertilizers, animal feed etc.

As per study of government of Gujarat, Seaweed culture can be best developed along the coast lines of Amreli and Kutchn districts in Gujarat. Juna bandar has good potential for seaweed farming as it has Calm and less wind action. We started this project as Pilot base at Junabadar with 50Kg Quantity. though there was good growth but due to cyclone it was damaged at present it 600Kg.





# PROJECT "DRIP IRRIGATION"

- **Basis of Requirements of Drip Irrigation**

The main source of livelihood being agriculture, the cultivators tend to use more and more underground water for irrigation. Underground waters have gone very highly saline. The use of such water for irrigation has made the soil also saline and the crop yields have dwindled.

- **Process of Drip Support**

Farmer have to applied in the prescribed form of Adani foundation with photograph. Inspection and verification will be by AF representative.

Ration card, work order of G.G.R.C, 7/12 certificate and all bills must be attached.

Farmer will be informed by telephonic to have form query.

Primary information about farmer land will be received by telephone.

Farm visit within 10 days of after received of application and verified the installation of system as per map and material as per bill will be checked and get farmer feed back.

Verification report submitted to account office.

Payment within 20 days if all document is complete through net banking.

Farmer economic study after our support. – Follow up

- **We have covered 164 farmers and 755 acre drip irrigation area last year. Curret year We have covered 131 farmers and 667 acre drip irrigation which is remarkable for water conservation.**



# Home Biogas



Home biogas is the Israel based company was founded in 2012 manufactures dynamic biogas unit not only for farm waste but for kitchen waste too.

Under Gram Utthan Project, Adani Foundation is supporting home biogas to farmers to Uthhan Villages phase wise. Current year supported 95 home biogas in Dhrub, Zarpara and Navinal Villages.

- Reducing organic waste,
- Transitioning to renewable energy
- Motivation for reduction in use for fertilizer

**And Improving the health and living conditions for the millions of families that are still cooking on charcoal and wood.** Adani Foundation is not only supporting but creating awareness to save environment and health of the community who regularly cooking on Chula. It is proven that one hour cooking on Chula is as dangerous as smoking 40 cigrates.



### **Objective of the Project :**

As a Main Process, Bacteria break down organic waste in a naturally occurring process, and Home Biogas stores and harnesses the energy created so that it can be used for gas.

Earlier we had proceeded for capacity 2 cum but after visit and series of meetings with farmer group – we need to take up plant capacity 6 cum

### **Participation by Community :**

For acceptance of this new biogas - We did awareness programmes, given information about usages of home biogas to farmers. Demonstration and training for smooth operation and also maintenance. Community has given 10 percent participation means 3000 INR per Home biogas.



# SLD Agriculture Initiatives

- The organization has carried out remarkable activities in the agricultural and animal husbandry sectors. We have initiated Programme for Awareness of Farmers in collaboration with KVK. The outreach is approximate 200 farmers of seven villages under Gram Uthhan.
- The purpose of this project is to initiate village wise integrated agricultural & allied development for sustaining agriculture and socio economic situation of farming community of Mundra block.





# Fodder Cultivation

After periodic discussions with Village Development Committee, Gram Panchayat and Gau Seva Samiti of Siracha – Adani Foundation had coordinated for Village Gauchar Development. Total 85 Acre Gauchar Land was approved by GP for Development by decision taken in Gram sabha . Among them 22 Acre land Has been Sowed with Sorghum and Remaining land would be Grow with Wild Grass

## Siracha

22 Acre – 88000Kg Sorghum

63 Acre- 63000Kg Wild Grass

**Total 85 Acre= 151000KG**

Bhadreshwar @ 7 Acre= 28000Kg

Kukadsar @ 15 Acre= 60000Kg

## Implementation Process includes

- Meeting with Village Development Committee
- Meeting with SDM for Gauchar Land Details







# Tissue Culture : Date Palm

## **Brief Description**

Make availability of 4000 tissue cultured plants of Barahi varieties to the farmers of project area. For this, we have selected best offshoots of Barahi plants from Well known Laboratory in coordination with farmers groups, Vice Chancellor (Anand Krishi University), Dr Murlidharan (Scientist, Date Research Center) and Krishi Vigyan Kendra Mundra.

The selected tissues from laboratory will take 3 years period for development and fruit. Hence, whole program is coordinating farmers participation basis having four party i.e. Tissue culture laboratory, Adani Foundation, KVK and farmers committee of project area. Major functions of all parties are as under;

TC Lab: Develop TC plantlets of Yellow varieties

Adani foundation: Financial support

KVK : Technical support to the program

Farmers committee: Provide their support for selection of Tissue plants & contribution in distribution & provide 50% cost of plants.

## **Objective:**

To provide tissue culture plants of local elite varieties of Datepalm to the farmers of project area at affordable price.

## **Expected Outcome**

We have registered Farmer's Producer Company first (Kutchh Kalptaru Farme's Producer Company) in which 140 farmers are registered members of project area. Adani Foundation will support for 25 plants/farmers phase wise. In first phase during Financial Year 2019-20 we will provide support to 70 Farmers.

## **Financial Outcome**

If we will assume 100 kg production of fresh fruits of Datepalm of best varieties per plant. Then total production is 4 lakh Kg. and price Rs. 80 / Kg. Then total gross income will be generated Rs. 3.20 crore. Consultant Fees will be Rs. 60,000 including FPO Registration Charges

Strategy: For 4000 Date tissue plant in 2 phase (per plant cost 3300 INR)

Farmers : 70 Farmers will be supported 25 Plants (1750 Plants in current year)

(50 percent contribution from Farmers (they will get 35% from Government in a form of subsidy after plantation.)



# Tissue Culture : Date Palm





# Women Empowerment Projects



- In Kutch, the situation of women is miserable. Women are totally dependent on male members of family for their needs. Consumption of liquor is one of the main culprits in Kutch. Due to this evil prevalent among men many women are suffering.
- Considering this situation, We have started our training program with two major women's group of Villages near Adani Power and Adani Ports. Both the groups of women (**123 women in total**) successfully completed their training for preparing washing powder, phenyl, liquid for cleaning utensils and hand wash etc.
- We have selected 10 women groups having 123 members total, as per their ability for different work i.e. accounting, banking, leadership, marketing, administration etc.
- As a further step to bring sustainability, we thought to start a shop "Saheli Mahila Gruh Udyog" at Shantivan Colony.

# Women Empowerment Projects

## Step towards socio economic development

No	Name	Members	Work	Avg Income
1	Sonal Saheli Group	11	Washing Powder and Phynayle making	3000
2	Tejasvi Saheli Group	10	Stitching Unit / Bag Making	5000
3	Pragpar Saheli Group	29	Handicraft Suf, Pakko and Jat	7500
4	Shradhha Saheli Group	11	Dry and Fresh Nasta Making Unit	3200
5	Meghdhanush Saheli Group	10	Mud Mirror Work	6000
6	Umang Saheli Group	11	Soft Toys and Dori work	1400
7	Asha Saheli Group	10	Sanitary Pad Making Unit	2500
8	Anjali Saheli Group	10	Paper Bag and Paper Cup Making Unit	-
9	Vishwas Saheli Group	10	Dry Nasta – Chiki, Potato Waffer, Papad	2200
10	Radhe Saheli Group	11	Non Women Bags	1150
		123		

# Women Empowerment Projects

## Step towards socio economic development

Apart from Self help Group, Adani Foundation is motivating and supporting Rural women for appearing SSC/HSC board exams, completing graduations and joining course under Skill Development Center or RSETI.

Also coordinating for Bank Sakhi, Bima Sakhi, Gram Rakshak Dal and Private Companies for full time job. For the same we coordinate with district administration, DRDA and HR Department of Private Company. This Coordination became very fruitful in case of Britannia Company. We have coordinated with approximately 300 women for appearing for interview and filling forms for Britannia. As on date 271 women are doing job in Britannia and getting Rs. 9700 plus PF per Month.

No	Name	Members	Work	Avg Income
1	Bank Sakhi Yojana	9	By State Government – agent work	3000
2	Gram Rakshak Dal	7	Secured job by Government	6000
3	Laundry work at Samudra Township	2	Commercial Complex Samudra	2500
4	Britannia Company	270	By Capacity Building and confidence building	9800
5	Bima Sakhi Yojana	6	By State Government	3000
6	Aggarbatti making Unit	2	Widow Women	1700
		296		





**7** women of village  
Sadau, Mangra and  
Baroi Selected in Gram  
Rakshak Dal by our  
Coordination

# Women Empowerment

Adani Foundation Mundra has received Order of supplying 10,000 sanitary pad per Month to Seven Public Health Centers of Mundra Taluka and 9 KGBV hostels at Kutchh District.



Right now 8 Females are working for the same. In second phase after starting one more unit our capacity will increase approx. 700 pad per day – which will enhance income of them up to 4000 per month.



8 Females



1.50 lac



# Women Empowerment

An initiative under the Sustainable Livelihoods Development Program to encourage women, take control of their own lives and increase their confidence whether they are single, married or widowed.



Total Sale more than Rs.4.50 Lacs and women are getting approximately Rs.8500 per month.

14 Women of Pragpar village are traditionally doing Suf Embroidery. We are on the verge of completion to development of Sahkari Mandali. After getting formal structure we could be able to sale products online with GST.



# Community Infrastructure Development



Community infrastructure primarily refers to small scale basic structures, technical facilities and systems built at the community level that are critical for sustenance of lives and livelihoods of the population living in a community. Adani foundation has designed, planned and built a infrastructure community health, agriculture and living standards, all initiatives were fulfilled according to the needs of people of community.

Adani Foundation supports for infrastructure development on request basis. Adani foundation carries out the construction of prayer shade name "PRATHNA SHADHNA" at AVMB.



Construction of Prayer Shed at AVMB



Painting & Branding Old Strcture at Old Bandar and Luni Bandar



Upgradation of Balwadi at Zarpara



Waiting place for Pgadiya at Navinal





Garden Development work



Road Side Beautification at Mundra.



S & F Benches In Various Location in Various Village



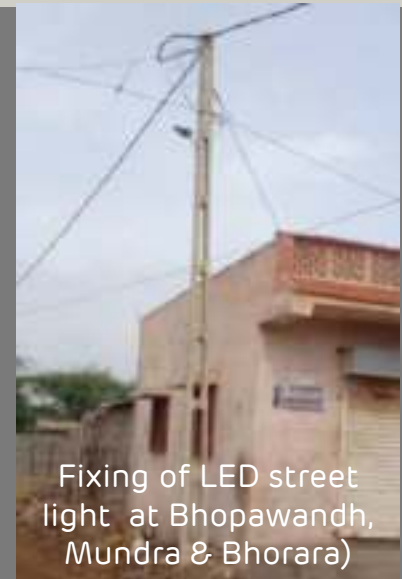
Construction of R.O. Plant Room at Primary School sadau Village



Construction of Shed at BRC Bhavan



Renovation Balwadi at Bavdi Banadar



Fixing of LED street light at Bhopawandh, Mundra & Bhorara)

Adani Skill Development Centre (ASDC) is playing a pivotal role in implementing sustainable development in the state.

Several miscellaneous industries exist in Kutch district. Adani Skill Development Centre has started a center in Mundra block so that the needs of these industries are fulfilled, the local youth is enrolled in various training / skill courses and the distance between the both is minimized.

The objective of this Centre is to impart different kinds of training to the students of 10th, 12th, college or ITI from surrounding areas. Thus, various employment-oriented trainings are organized to optimize the skills, art and knowledge through proper guidance and direction.

**During this year Total 2664 people trained in various trainings to enhance socio economic development.**

Out of which more than 60% people are getting employment or Self Employment and average income up to Rs. 5200 per month. Digital literacy training is very helpful in coordinating with today's Digital world....

# Adani Skill Development Centre





# Adani Skill Development Centre Kutchh



Digital  
Literacy  
1119



Unarmed  
Security  
Guard  
60



General  
Duty  
Assistant  
188



Beauty  
Therapist  
465



Self  
Employee  
Tailor  
262



JOC  
60



Tally with  
GST  
34



RTG  
24



MS Office &  
Excel Training  
26



Hand  
Embroidery  
197



Spoken  
English  
229

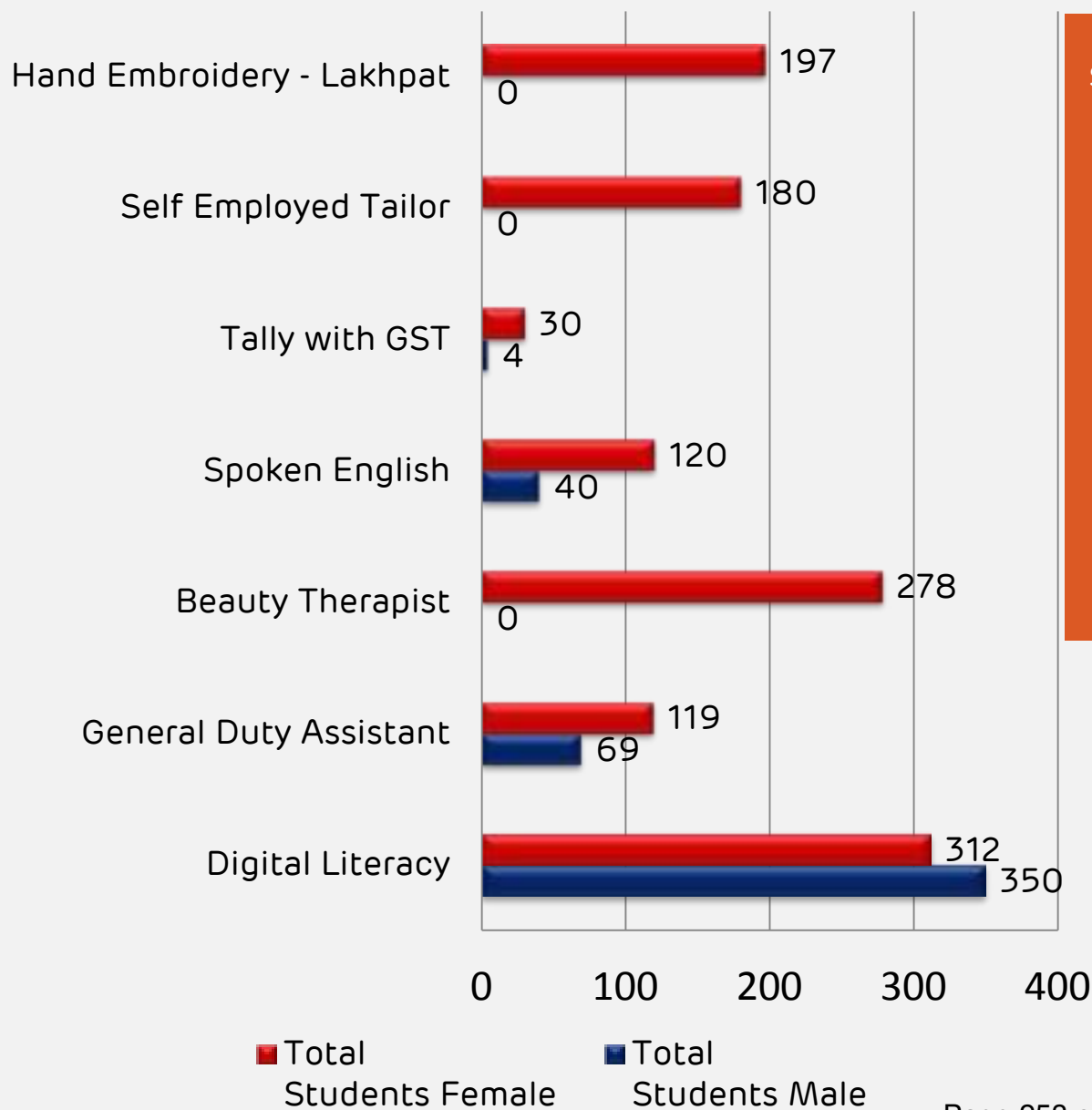
Achievement : 2664

Total Batches: 126

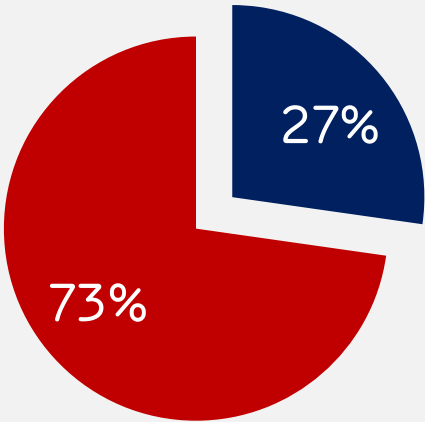




In the year 2019-20,ASDC-Bhuj trained 1699 candidates.



Sr. No.	Name of Trade	Total Students	
		Male	Female
1	Digital Literacy	350	312
2	General Duty Assistant	69	119
3	Beauty Therapist	0	278
4	Spoken English	40	120
5	Tally with GST	4	30
6	Self Employed Tailor	0	180
7	Hand Embroidery - Lakhpat	0	197
Total	(1699)	463	1236



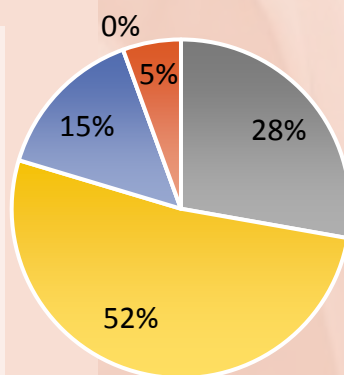


## Adani Skill Development Centre - Bhuj

- Certificate Oriented Training Program: On Successful completion of the course and completion of Assessment organized by the Centre.
- The training methodology ensures a balance between theoretical concept delivery and emphasis on application of concepts through latest training pedagogical processes.

### Placement F.Y. 2019-'20

- Digital Literacy
- General Duty Assistant
- Beauty Therapist
- Spoken English
- Tally with GST



ADANI SKILL DEVELOPMENT CENTRE - BHUJ						
Quarter & Training wise Candidate Detail F.Y.: 2019-20						
Sr. No.	Name of Trade	Q-1_Total	Q-2_Total	Q-3_Total	Q-4_Total	Total
1	Digital Literacy	278	163	138	83	<b>662</b>
2	General Duty Assistant	60	0	68	60	<b>188</b>
3	Beauty Therapist	38	0	0	240	<b>278</b>
4	Spoken English	144	16	0	0	<b>160</b>
5	Tally with GST	12	22	0	0	<b>34</b>
6	SET	0	0	0	180	<b>180</b>
7	HE	0	0	0	197	<b>197</b>
<b>Total</b>		<b>532</b>	<b>201</b>	<b>206</b>	<b>760</b>	<b>1699</b>

- 52% students got the job in PMKVY GDA training.
- 28% students got job in Digital Literacy Course.
- 8 women self employed in Beauty Therapist Course.

## Special Training for Widows

MOU signed between Govt. of Gujarat and Adani Skill Development Centre with an aim to provide quality skill training to widow women to become self-reliant and generate their livelihood.

Total 25 widow women has enrolled for GDA course training.



## Special Training for Divyang

Digital Literacy, Beauty And Wellness And Spoken English Training for Physically Challenged Students under Social Welfare Justice Department at Navchetan Andhjan Mandal, Bhuj.

The trainings conducted by Adani Skill Development Centre, Bhuj for Differently Abled Students - Madhapar. Navchetan Andhjan Mandal has dedicated Computer Lab which consists of 15 computers with NVDA software to facilitate disabled students to learn efficiently.

124 students trained for Digital Literacy, Beauty And Wellness And Spoken English Training.

(Digital Literacy = 62, Spoken English= 40, Beauty & wellness= 22)

5 of them placed during the year.





# Adani Skill Development Centre – Bhuj

One more feather added in cap of ASDC Bhuj Centre is PMKVY GDA Training Project Saksham – Adani Skill Development Centre completed Four PMKVY GDA Batches in Bhuj received with Four Star Rating in PMKVY certification.

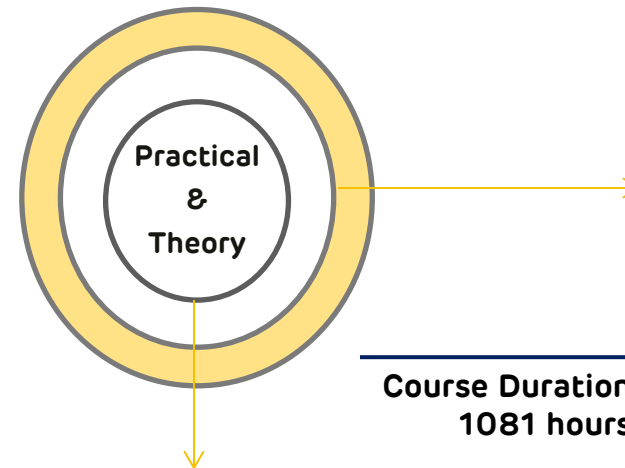
Total 120 Candidates trained till the date (F.Y. 2018-20).

In a year 2019-'20, 28 out of 60 (52%) candidates got the job in various medical departments. 55 candidates passed out of 60 people of PMKVY General Duty Assistant training.

## ASDC Bhuj first ever Centre to implement successfully DDU GKY Project for GDA Training.

Total Hours	Domain (GDA)	Non-Domain (Soft-skill)	Non-Domain (IT)	Non-Domain (English)
1081	780	38	150	113

DDU-GKY is placement linked skill development initiative by ministry of rural development, government of India (MoRD).



**Course Duration  
1081 hours**



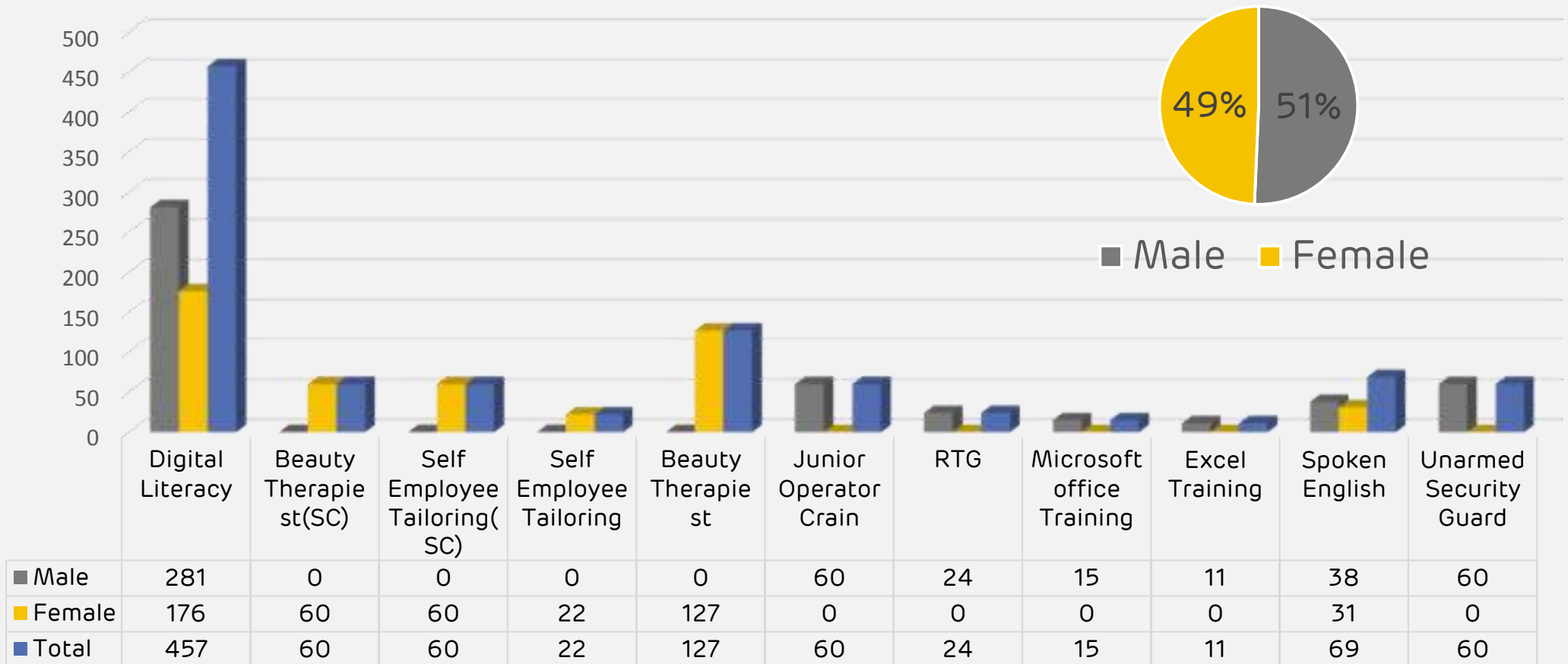
**Total 60 Students have to attended 8 hours class per day.**



In the year 2019-20,ASDC-Mundra trained 965 candidates.

Training Chart 2019-20

Gender Ratio



# Adani Skill Development Centre – Mundra



RPL recognizes the value of learning acquired in a formal setting and provides a government certificate for an individual's skill.

Candidates received an accidental insurance coverage for three years at free of cost.

Certified 27 assessors, 19 Trainers and 08 Assessors.

Started first loader-unloader job role in Port.

Total Candidates registration 2500



- 42 candidates cleared PMKVY Junior Operator Crane exam out of 43.
- 21 candidates working in various companies with 8000-15000 PM.
- 26 students got jobs in various companies.
- More than 30 women working as self-employed.
- Mobilization activities for SC batches in various villages and colleges.



# Adani Skill Development Centre - Mundra

## SC Project

Skill Development trainings to various weaker sections of Community

To deliver and promote employability

In collaboration with Department of social justice & empowerment, Gujarat



More than 100 trainees benefited under Self employed tailor training course at Mundra.

More than 300 candidates have been trained in various courses.

# Swachhagraha



Adani Foundation has launched project "Swachhagraha" Swachhata ka Satyagraha in the year 2015, to support the 'Swachh Bharat Abhiyan'. Falling in line with our Honorable Prime Minister's call for a Clean India, we launched this mass movement towards making our Nation litter free.

On 9<sup>th</sup> October 2019 the Project handed over to all institute with a gentle promise to keep swachhagraha flame lighting. In this ceremony with the blessings of Shilin Adani mam Best Swachhagraha Schools awarded by District Education Officer, Kutchh

Swachhagraha at Kutchh

4 City / town

266 Schools

266 Prerak trained

5000+ Dal members





## Swachhagraha Outreach



Swachhagraha  
Wall



Toilet  
Etiquettes



Large Scale  
community events

Safai  
Ke Sitare



Personal  
Hygiene



# Suposhan

The objective of the Project is to reduce occurrence of malnutrition and anemia.

create awareness about malnutrition and anemia and related factors amongst all stakeholders and role they may play in curbing the issue.

To successful implementation of the project, "Sangini – Village Health Volunteer" plays major role in the Project.

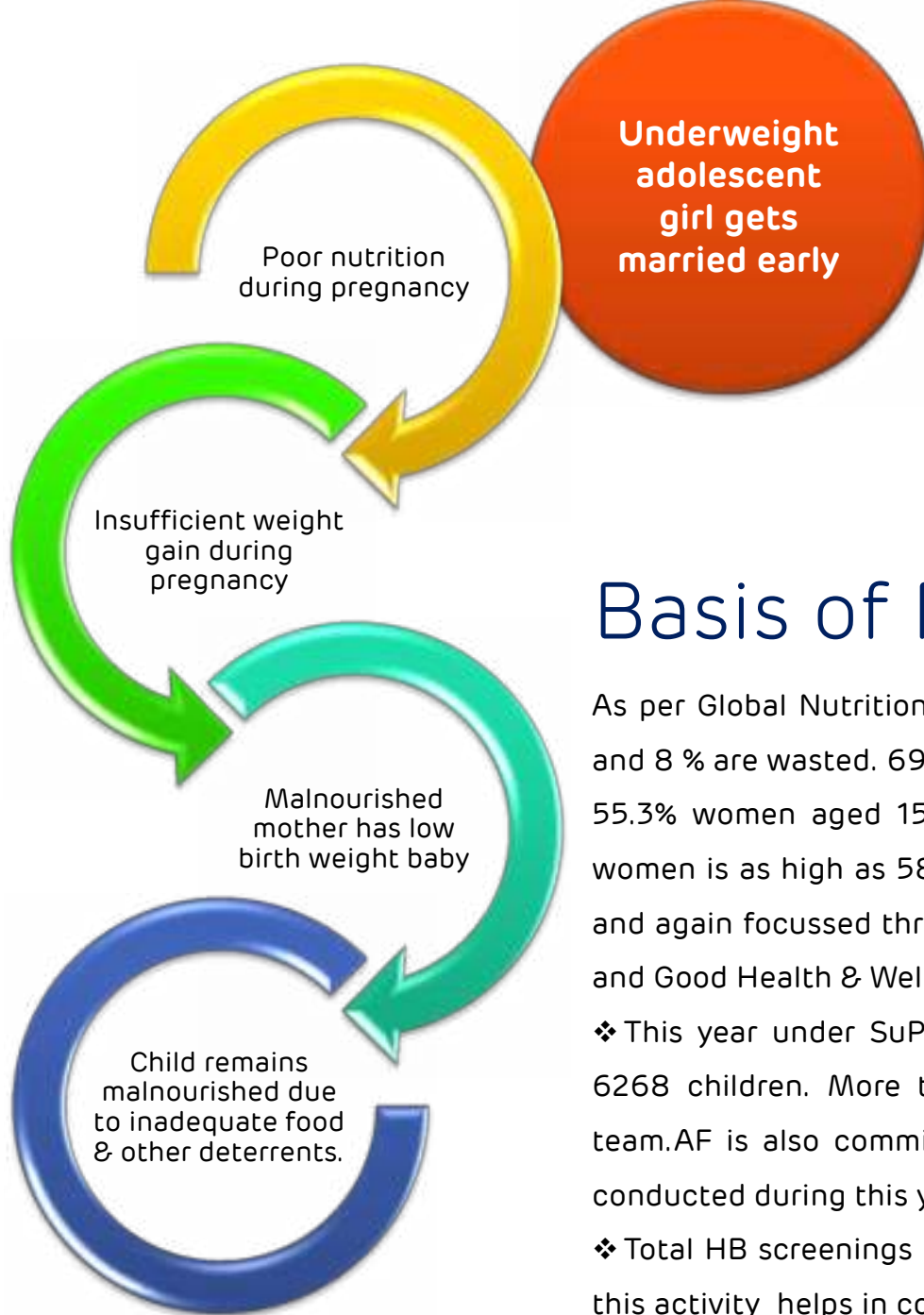






# Suposhan





## Basis of Requirement

As per Global Nutrition Report released recently, Children below five years- 23 % Stunted and 8 % are wasted. 69.5 % children 6-59 months old, 55.8% adolescent girls aged 15-18 years, 55.3% women aged 15-49 years have Anaemia. Moreover anaemia prevalence in pregnant women is as high as 58.7 %) Curbing Malnutrition was part of Millennium Development Goals and again focussed through second and third Sustainable Development Goals on Zero hunger and Good Health & Wellbeing respectively.

❖ This year under SuPoshan project AF has conducted anthropometry study of more than 6268 children. More than 98 children became free of malnutrition due to efforts of AF team. AF is also committed to spread awareness in this regard. More than 2023 FGD were conducted during this year.

❖ Total HB screenings of RPA woman- 6598no and adolescent girls -10645no was this year. this activity helps in controlling anaemia in women and indirectly malnutrition.

Community Engagement and other Activities 19-20		
Sr No	Activity	Progress
1	Total Sangini	25
2	Total Village	45
3	Total Anganwadi Cover	72
4	Total Families	9178
5	Total Children	5736
6	Total Adolescent Girl	5067
7	Total Women (RPA)	9762
8	Focus Group Discussion	2023
9	Family Counselling	431
10	Village level Events	117
11	No of SAM children referred to CMTC	75
12	No of SAM children provided with Energy Dense Food (Only New children)	112
13	No of total HB & BMI screening - Women in reproductive age	6598
14	No of total HB & BMI screening - Adolescent girls	10645
15	Stunting Category (Changing)	18
16	Wasting Category (Changing)	25
17	Underweight Category (Changing)	55
18	Adolescent Girls with Anaemia (10-19 yr.) (Changing)	249
19	Women with Anaemia in reproductive age (14-50 yr.) (Changing)	272
22	Women in RPA provided with IFA Tablets	201
23	Adolescent girls provided with IFA Tablets	102
20	Sangini Meeting	17
21	Sangini Training	5
22	Total Anthropometric screening	6268





## Implementation Strategy

Base line data was provided for Mundra Taluka in initial phase of Project.

- Total Number Aanganwadis in the selected area
- Information on Sub- canters / Primary Health Centres/ Community Health centres/ Referral Hospitals
- Availability of Healthy worker- male & female both, ANMs, LHVs, Doctors, specialists such as Gynaecologist, Paediatricians, Pharmacist, Dietician Lab. Technician, Nursing Staff etc. at above centres (Number & names with contact details)
- Selected areas' Birth rate, Death rate, Infant Mortality Rate, Mother Mortality Rate, Sex ratio, Child Sex ratio against district, state and national average
- Total number of beneficiaries and against that enrolled beneficiaries at Anganwadi/ICDS: 0-6 year children, Adolescent girls, pregnant women and lactating mothers
- Identified malnourished and anaemic children/ adolescent girls and women (numbers, DOB & name as well as current level of malnutrition & anaemia with dates- Base Line data)
- Current Inputs provided through the Government machineries
- Other services available through CBOs, NGOs etc.- Details of inputs and contact details of those organizations
- Understanding & Listing of area specific cultural and behavioural barriers



## Expected Outputs

Community Health vertical at each location would focus on project on "Curbing Malnutrition amongst Children, Adolescent girls and Women "with combined approach of community management of Malnutrition and Anaemia and necessary medical treatment components.

- Each child and especially malnourished will be mapped with growth chart
- Regular inputs of RUTF treatment when necessary.
- FDGs with mothers and adolescent girls.
- Village meeting one in a month at every village
- Health camp every month
- Awareness campaigns.

## Expected Outcomes

To reduce the occurrence of malnutrition amongst Children by 95 % in three years

- To reduce malnutrition and anaemia amongst adolescent girls and pregnant & lactating women by 70% in three years
- To create awareness about the issue of malnutrition and anaemia and related factors amongst all stakeholders and role they may play in curbing the issue
- To create a pool of resources to be utilised for combating the issue of Malnutrition and Anaemia
- To support efforts in reducing IMR and MMR

# Project Swavlamban

Project Swavlamban Launched with blessings of differently abled people of MUNDRA TALUKA.

## Our objective is

- To increase awareness about Government schemes for Divyang people, widows and senior citizens and coordinate them with Social Welfare Department, GoG
- After getting income generation equipment support - Proper training provision to make them self-reliant in true sense!!
- Adani Foundation is playing the role of facilitator in case of tie up with Government Scheme for Widows, Senior Citizens and Handicapped people. The identity cards are issued for the handicapped in coordination with Bhuj Samaj Suraksha Khata which is beneficial for them to get specific kit for their disability type. Uoto date 1094 beneficiaries linked up with pension scheme.
- The financial benefit of the senior citizen Yojana is Rs. 500 per month and the widow scheme is of Rs. 1250 per month. Jilla Samaj Suraksha Officer and team remain present every time.

No	Type	Beneficiaries	Financial benefit
1	Palak Mata Pita	6 x 3000	18,000
2	Widow	74 x 1250	92,500
3	Senior Citizen	79 x 750	59,250
	Total	533	1,69,750





# Project Swavlamban

Government and Adani Foundation both have supported Total 1094 Beneficiaries of Amount Rs. 15,44,100.00

Govt. shemes	Mundra Taluka	Rate	Total Amount
Artificially foots	14	15000	210000
Artificially Hand	1	5000	5000
Blind satick	7	200	1400
Bycycle	9	4500	40500
Crutches	4	200	800
Hand cart	4	5000	20000
Hearing Aid	13	3000	39000
M.R kit	20	500	10000
music	1	500	500
Pension	4		0
RTE Admission	1		0
Sewing Machine	30	5000	150000
Tricycle	33	6500	214500
Walker	3	1000	3000
walking satick	12	200	2400
Wheelchair	26	4000	104000
Bus pass	392		0
Medical certi	401		0
Total	975		801100

AF Support	Mundra Taluka	Rate	Total Amount
wheelchair	30	4000	120000
Cabin	5	15000	75000
Fridge	1	18000	18000
Fruit Shop	2	8000	16000
Grocery Shop Item	4	5000	20000
Hand Cart	2	9000	18000
Harmonium	1	10000	10000
Rikshaw	1	80000	80000
Sewing Machine	16	5500	88000
Tricycle	25	6800	170000
Wheelchair	32	4000	128000
Total	119		743000





## CSR Tuna

Adani Kandla Bulk Terminal Pvt. Ltd. is joint venture of Adani Ports and SEZ Limited as well as Kandla Port. We are going to implement drainage pipeline for Tuna and Wandi with participation of Kandla Port in current year. Survey is done and work will be started soon..

Adani  
Kandla  
Bulk  
Terminal  
Pvt. Ltd.



# CSR Tuna

- In Rampar and Tuna Village We are providing Fodder in summer season. Also guiding farmers for modern farming techniques for Organic Farming and sustainable Agriculture
- Praveshotsav Kit is distributed in 8 schools covering 180 Students in Tuna and Surrounding seven villages.. Our efforts were appreciated by community.
- Adani Foundation is bridging the gap between Government Schemes and Beneficiaries. This year we could able to support 5 widows and 4 differently abled to avail benefits of Government. Tree Plantation and 4 health camp was organized in Tuna and Rampar Village.





## CSR Nakhtrana



Adani Green  
Energy  
Limited  
(Nakhtrana)

## CSR Nakhtrana

Adani Green Energy(MP) Limited (AGEMPL) proposes to setup an integrated wind energy project as Green Energy Works which includes Limestone 750 Mw, Through approx. 1250 windmill at Dayapar to Nakhtrana in District Kutch (Gujarat). Foundation, in cooperation with respective Block Agriculture Departments during the PRAs, regularly conducts various training programmes for the farmers. They have been introduced to various innovative and cost-saving practices in farm cultivation.







**Community Health** - In Coordination with GKGH 2 Specialty Camp, Eye Camp and 3 General Health Camp was organized. Total beneficiaries is 572.

Adani Foundation has initiated **Project Utthan** – at 8 Schools at Nakhatrana by signing MOU with District Education Department. Frame work of the Utthan Project is as per Utthan Mundra.

**Project Svavlamban** – Started Svavlamban Center at Nakhatrana Town to make widow and Divyang Women Sustainable though Stitching work. We have supported 5 stitching machine and material for fund rotation.

In Community Infrastructure Development work we have taken up work of Road Levelling and Culvert Construction at Gadani Village. Main reason to initiate the project is - During Monsoon Period difficult to use road for farmers and School Going Children of Vadi Vistar and Due to water logging excess water enters into farms which affect development of crop. Approximately 80 farmers and 70 School going children will be beneficiaries of the Project.

The work will be resulted into Construction of Pipe Culvert and Road Levelling work at Vadi Vistar at Gadani Village with Outcome to Easy Approach for Farmers and Students of Vadi Vistar School during monsoon Period.





CSR Lakhpāt

Adani  
Cementation  
Private Limited  
(Lakhpāt)



Adani Cementation Limited (ACL) proposes to setup an integrated cement project as Lakhpat Cement Works which includes Limestone Mine in 251.9 ha area, Cement Plant of rated production capacity of 10MMTPA Clinker and 3MMTPA of OPC/ PPC/ PSC/ COMPOSITE CEMENT in three phases, and a berthing jetty of 15MMTPA traffic capacity in phase wise manner in Taluka Lakhpat of District Kutch (Gujarat).

Project Public hearing held in month of May 2019. For Smooth Execution of the Project we have done Participatory Rural Appraisal and Village Development Committee formation at three nearest villages (Koriyani, Kapurashi and Mundhvay) of our upcoming cement plant.

### Linkages with Govt. Scheme

Wheelchair support – 2

Tri cycle support - 3

Divyang Form – 2

### Education Support

Music Kit – 4

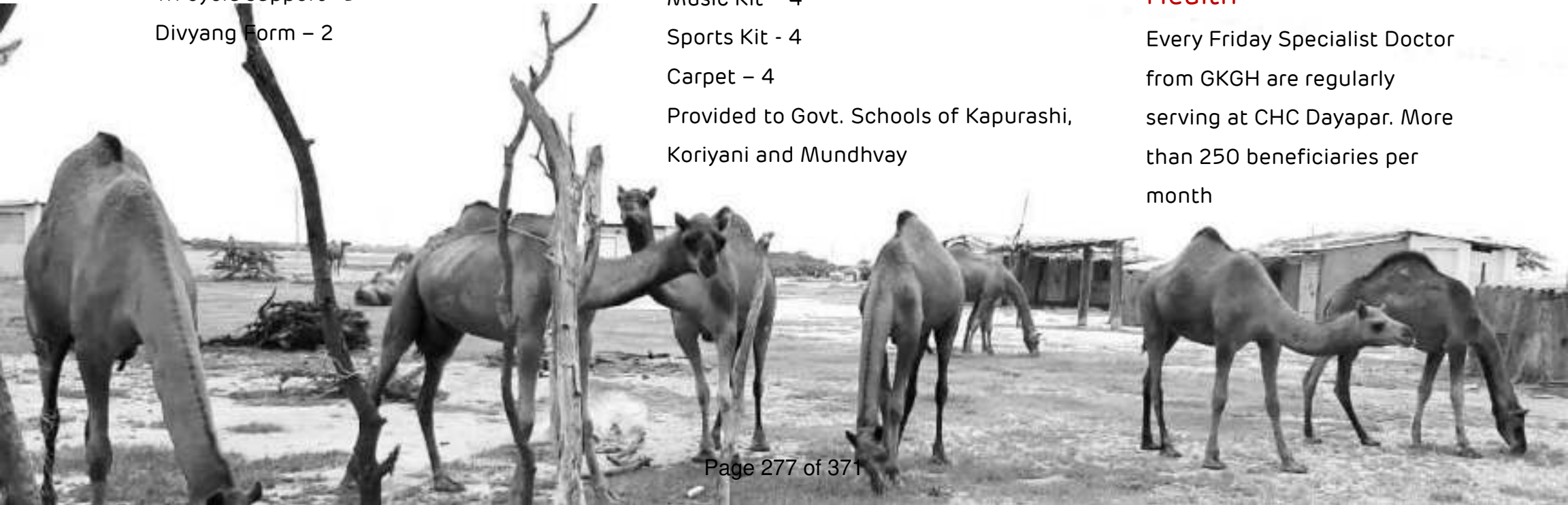
Sports Kit - 4

Carpet – 4

Provided to Govt. Schools of Kapurashi, Koriyani and Mundhvay

### Health

Every Friday Specialist Doctor from GKGH are regularly serving at CHC Dayapar. More than 250 beneficiaries per month



## Fodder Cultivation

Most of the population of Lakhpat Depends upon Livestock for their livelihood. Fodder is the prime requirement of them. Adani Foundation had distributed Jovar seeds after considerable rain to 260 Farmers to motivate them for sustainable Livestock development.

### The Problem

- ❑ Scanty rainfall
- ❑ Deficit of fodder availability
- ❑ Fodder only available on high rates.

### The Solution

- Encourage farmers
  - ❑ To grow grass as fodder
  - ❑ To cultivate jovar as fodder harvest
  - ❑ Village level grassland development



**299 acres**  
under fodder  
cultivation



Expected Yield:  
**747.5**  
**tonnes**







## World Disable Day celebration

Celebrated World Disability Day - Swavlamban center opened at Dayapar for disable and widow women.

Support 10 tricycles and 2 wheelchairs and 9 artificial limps to disables.

# Adani Solar Energy Private Limited (Bitta)

## CSR Bitta

Under Adani Solar Limited – 40 MW Solar Panel Power Unit is Situated at Bitta Village in Abdasa Taluka. We are providing Fodder Support and Health Camp Facilities at Bitta. Our Suposhan Project is running successfully at Bitta..

Adani Foundation has taken Eco Friendly initiative for whole village. Village street lights, School and GP is provided Solar Panel to save electricity. The unit was conceptualized and implemented by Solar Team.

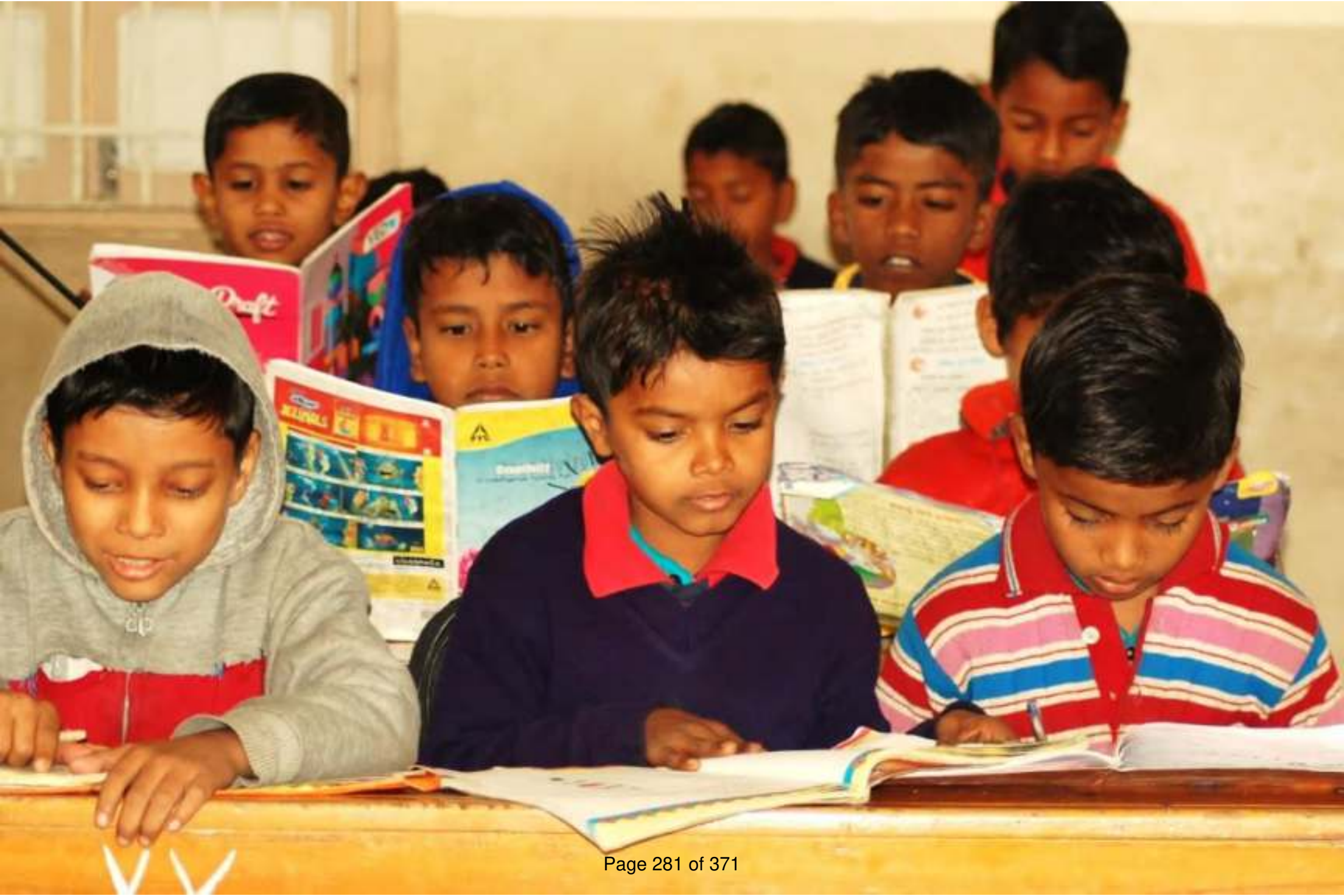
As Abdasa is water scared region and very less rain in past years , as per humble request of villagers Adani Foundation has provided 1,13,750 Kg Fodder to Bitta, Dhrufi and Moti Dhrufi village.

Under "Sujlam Suflam Jal Abhiyan" Two Pond Deepening was carried out and got appreciation letter from District Magistrate.

Praveshotsav Kit is distributed in 8 schools covering 47 Students in Bitta and Surrounding seven villages.. Our efforts were appreciated by community.







# Employee Volunteering Program



704 children in the school are from families of migrant labourers working in various industries in and around Mundra. Children from migrant labourer families in addition to resource constraints at home also bear the disadvantage of unfamiliarity with local language and culture inhibiting participation in school.

Current year 997 students have been adopted – which is matter of proud. To make employees connected with children Vallabh Vidyalaya regularly send progress report twice in a year. Process of cheque handing over ceremony is delayed due to corona virus issues.



# Employee Volunteering Program



International Yoga Day Celebrated at Shantivan Colony ground where 2100 students have participated from different Government School.

More than 500 Employees participated and HR Department has coordinated whole event. Chief Guest of the Event was Mr. Sunil Singhi Chairman, Labour welfare board, GOG

We distributed 250 hooks to employees residing at Shantivan colony. Hook is the thin rod of steel. In this hook all will collect plastic bags. After three months we will collect all bags and give to Suzlon for recycle will made PVC Horse Pipe. I.e **"Waste to Best"**. Employee's family members became determined for not using Plastic bags.

For motivation purpose facilitation of employee was done by Mrs. Vinita Rai (President, Ladies Group –Shantivan Colony)





# Employee Volunteering Program



Periodic Support to Old age home at Gundala where total 105 Senior citizens are living.

Till Date 36 Adani Employee have celebrated Birthdays or any memorable day with senior citizen by sponsoring and servicing for lunch/dinner facility

Dignity of workforce day was organized jointly of APSEZ (Adani ports n SEZ Limited), AWL(Adani Wilmar Limited), MSPVL (Mundra Solar Pvt Limited) Adani Hospital and Adani foundation at labour colony with medical camp and handing over of sanitation. more than 32 employees have volunteered in this event.

**1. Total OPD by Medical camp at Labour colony- 760 (5 Camps)**

**2. Joy of Giving Week Cloth Distribution to 800 workers**

In this event Mr. Sharad Sharna Head-AWL with staff, Bhaktbandhu DGM HR and Admin staff (APSEZ), Mr. Ganesh Sharma Head HR, President - Kutch Labour Union and Adani foundation team remained.





## Our Change Makers

"I have a Disability yes that's true, but all that really means is I may have to take a slightly different path than you."

We always complain to God, for life, for appearance, and for so many others. But today I am talking about Rubina, a young girl from Deshalpar village. Rubina has a unique personality, who, despite being unable to speak or listen, always she faces these physical shortcomings with a smile.

somehow Rubina found about Adani skill development beauty therapist course and she decided to join this course. when she joined the there was question in everyone's mind, is she enabled to do this course, how she will manage, how will learn, ask questions, listen etc. but she proved wrong to everyone. like miracle happens, she completed her training very smoothly. not just completed but she was very active and enthusiastic during training.

today she has started her mahendi studio, the amount of earning is not so much high, but the satisfaction is up to sky.

At the end she smiled and said

**"Don't compare your struggles to anyone else's. Don't get discouraged by the success of others. Make your own path and never give up"**



## Suf Handicraft : Conserving “VIRASAT” of Decades

Parvati Ben's earliest memory of stitching delicate handicrafts is from when she was as little as 5-years-old. Since then, she has followed this art with an immense dedication that shows through her intricate and precise handiwork.

Parvati is a resident of Pragpar-2 village. She lives in a house with 5 other people and is the sole breadwinner. Even so, Parvati is a humble, loving and welcoming individual.

Parvati Ben had been practising her intricate Suf handicraft all along, making scarves, table cloths, garments and more for her fellow villagers and the occasional visitors. Her artwork had consistently been worth more than what she sold it for- her only desire being that her art finds an expression, a space in the world, however small it may be.

One day, Adani Foundation discovered this diligent, rigorous woman. Parvati Ben now works on projects brought to her by Adani Foundation and is hence able to sustain her entire family on her own. She has risen to be an aspirational figure, looked upon as a role model by her fellow village women. Parvati Ben is playing a major role in now setting up a federation for the village women across Mundra district to practise their handicraft work and earn a livelihood.

But more than all the titles and positions, what Parvati Ben deems sacred is the sheer recognition of her art. All she ever wanted was to be known as an artist and now she is the voice of this very own art, inspiring dozens of women like her to become independent.



## When Miracle happened !!

One mentally disabled boy named Gyan was residing in one small village Bihar. During makarsankranti festival Ganga Snan he was going with his family. By mistake he entered in different train n reached to Bhuj.

As for any Train coming in western India Bhuj is last station and that's why many mentally disabled people found out in Bhuj.

27 years old Gyan was alone in Bhuj - he used to beg and eat, too tough life !!

After passing two months anyhow, One day due to small accident he was brought to Adani GKGH. During treatment, one smart para medical staff found out mobile number in tattoo drawn on his hand.

Staff members of GKGH called on this number and ask his family to come Bhuj.

Finally Gyan meet his family n back to his home.



Our Change Makers

## Healthy Children Become Happy Children

Under the initiative of Balwadi at Vasahat (doorstep Early age Education for less Fisher folk), special awareness camps are organized for kids in school in order to imbibe health seeking behavior in the next generation. Various awareness activities based on healthy living are taught to them such as hand-washing steps and healthy eating habits so that they actively participate in adopting methods for personal hygiene in their daily routine.

Yamina is one of the student of Balwadi. She is five years old. Earlier she used to come to Balwadi without taking bath or hair combing. But after regular awareness camps for mother and students now she is coming well dressed and clean – due to maintaining personnel hygiene she remains healthy too..







## Our Change Makers

### Every Dark Cloud has Silver Lining

Ms. Ramila Maheswari belongs to village Dhrub. Her father's occupation is farming. She has completed graduation and was searching job but lacking in computer operation skill.

Ramila says one of my friends suggested me to join digital literacy training at Adani Skill Development Centre, Mundra. I visited the center with my friend and joined class. I sincerely attended all classes of the course and learnt basics of computer operation viz; Typing, Paint, MS Office (word, Excel, power point), shortcut Keys and using internet for web browsing like; Gmail, Paytm, amazon, net banking etc.

She is saying with smiling on face that

"Today, I am working with firm "YASH ENTERPRISE" in Nana Kapaya, Mundra as a customer care executive and earning Rs. 7000 per month. I am really thankful to Adani Skill development Center to make 'SAKSHAM'.





## Our Change Makers

# Pathways towards bright future !!

Kripalsinh Jadeja comes from Hatadi, Mundra with a family of 5 people, four elder brothers and parents. His father is a farmer and mother help him in farming. The brother is working as truck driver. The economic condition of the family was very poor.

Kripalsinh has completed 12th and was searching job. The team of ASDC Mundra had mobilized in the area where he stays and through which he got to know that Adani Skill Development Centre (ASDC) is providing training for checker-cum- RTG crane operator and this was his dream job.

He performed well during the training and understood how this training would help him to grow in future in the field he desires. He was regular to the classes and always eager to know the process well and he performed well during all the activities.

Kripalsinh says he gained back his confidence after starting the training and was motivated by the trainer to participate in all activities and grab any opportunity where he can showcase his skills.

He says that he got more support by getting additional training of soft skills, public speaking, professional manners and facing interviews with confidence.

While undergoing the ASDC training Kripalsinh never imagined that this additional knowledge and skill up gradation would bring him a bright future.



## Our Change Makers

### My Emotional Support

*Adani Foundations' Senior Citizen Health Card is like a cure to our emotional, physical and psychological problem; in the times when we are completely lonely and handicap at age."....Says both of them while weeping.*

Every human being has specific periods of the life wherein the childhood is for fun and the adulthood is spent for the family; remains old age to take care of health Adani Foundation is holded hands of the senior citizens of Mundra Rajendrasinh and his wife stay alone. Their son and daughters stay separately. They earn their living by grazing cattle. he is having severe arthritis and respiratory disorder. The source of income is very meager and that to dependent on rain. He had to borrow money from family friends or at times take on interest for taking basic treatment. His wife Shantaba also has blood sugar and hence she also requires medical assistance at times. The couple took Adani Foundations' Senior Citizen Health Card in 2015 by which they are able to save good amount, which was their medical expense every month.



## Our Change Makers

# Can any other relationship be as beautiful?"

When you grow old, loneliness is sometimes more painful than physical sickness. During routine visits of Dr Deven Goswami – Medical Officer of Rural clinic in Siracha the community as a health volunteer, he met Parma Ba (grandmother in Gujrati) who initially appeared as an introvert. She lives in Siracha Village. According to her neighbors, she confined herself within the four walls after her husband's demise. Despite living with her children, she is often seen sitting alone in the corridor of her house, as the family members are apparently busy with their own lives. Financially strained, she refrained from visiting a doctor due to fear of their exorbitant fee.

Dr. Deven was determined to not only get her to Rural Clinic, but also cultivate a health seeking behavior in her. He would keep on standing outside her house till the time she didn't agree to listen to his request. Do you know something? Ba is his best friend today. They not only share our secrets with each other, but also counsel each other as a mother and a son. Can any other relationship be as beautiful?"





## Our Change Makers

# Good Human Beings are Gods Incarnate

While many people talk about water crisis and drought in Kutchh, Rambhai Gadhavi of Zarpara has practically found and tried a solution to it and that is water conservation. Born into a poor farmer's family, he faced water problems in childhood and used to wake up at wee hours to fetch water, which inspired him to find ways of water conservation. Under Guidance and Support of Adani Foundation He practiced non-irrigation agricultural methods as solutions to water crisis which causes drought, thereby leading to Indian farmer suicides every year.

He did Bore well recharge and Farm Bunding to increase capacity of ground water through rain and to prevent run off. Not only that, he gave guidance to other farmers to accept water conservation practices.

Rambhai and his wife Veerbai's enthusiasm is remarkable in micro irrigation, fodder cultivation and Recharge activities. They are real change makers of "Sustainable Agriculture Projects" of Adani Foundation







## Our Change Makers

### Every drop that matters!

Kutchh district is a dry temperate zone and rainfall is negligible. Water requirement is met through the reservoirs in which the water decreases during summer months when crop is standing in the field. Whatever irrigation was provided resulted in soil erosion leading to loss of huge quantity of soil every year thereby increasing the farmer's problem in producing good quality crop. Therefore, usage of water and land is to be done sensibly by the farmer. Muljibhai The farmer of Navinal Village attended awareness programme of micro irrigation and organic farming organized by the Adani Foundation and showed interest in adopting the same. He was given every suitable help in subsidy and was persuaded into adopting drip irrigation for field crops.

Not only this, with support of DRDA and Adani Foundation he had adopted Bio gas which is utilized for cooking and organic fertilizer as well.

With the help of drip system, the Muljibhai was able to diversify towards different Horticulture crops like Pomegranate, Jamfal, chikoo etc. in addition to traditionally grown crops like Cotton and Caster. As a result, he is able to get 40-45% higher yield as compared to flood irrigated crops. Diversification has helped in improving returns from the same area.



## Our Change Makers

### Reenaben is making patients smile with compassionate care

Reena Amal has literally put his wise words into practice. An ambitious and determined girl, she was pursuing B.A. when tragedy struck. Her husband died of a heart attack leaving her widowed at the age of 24 with two young boys to raise. Unable to get support from her in-laws, she had to move back into her parents' home. In spite of being unsure about the future, her love for her children gives her new hope every single day. Her desire to provide them with a good education and a stable life fuels her to aspire for more. So, she joined ASDC's General Duty Assistant course and hasn't looked back since then.

Reena proved to be a dedicated student throughout the course. She impressed her trainers with her zeal to learn. She soon completed the course and became a successful patient care assistant. Currently, she is working at the G.K. General Hospital and earning salary of Rs. 9900/- pm in the OPD under the guidance of a dietician. She is learning how to prepare diet charts according to the needs of various patients. She is most grateful to ASDC in Bhuj for giving her this opportunity to become self-reliant and care for her children. Reena has truly risen above tragedies and obstacles in life by immersing herself in a life of serving and caring for others!



## Our Change Makers

Dilipbhai says “ Digital Literacy training has given a boost in my life.”

“Change occurs at every turn of the page of life.”

I am providing outsourcing services of Administration in G.K General Hospital, Bhuj. I am 40 plus and I have observed the IT wave and Artificial Intelligence has proved as boon in healthcare industry. Young colleagues at work are using their IT skills to make ease at work but growing Digitalization also brought many challenges for middle aged people like me. I enquired about Digital literacy course to many places but couldn't found the quality training centre. In Adani Skill Development Centre, I have not only improved my Ms office and typing skills but also found effective and time saving techsavy solutions for day to day time consuming activities. Dilip Joshi





## Our Change Makers

### Adani helped me to live with dignity !

Bhadreshwar is a well known village due to Suradas family, the generous donor Jagdusha and Jain temple Vasai Tirth ! Here we want to introduce a couple of this village who are blind ! Yes, Khetshi Chande and his wife Manglaben who live in this village with their daughter Trupti. His only source of income was the government pension. Once when Khetshibhai was with Karshanbhai from Adani at Mundra bus station, he sung few lines describing his own life. "Nach nachavya che ghana ne, aaj hu khud nachi rahyo chu, didha nathi pan devdavya chhe daan ghana ne, aaj khud yaachi rahyo chu; prabhu tari aa lilaa, jem tu ramade em rami rahyo chu !" which means once he was helping others and today he is asking others for help.

When Karshanbhai visited his home, he came to know that once upon a time Khetshibhai was having a small shop but due to less sell he stopped it. At this moment instantly Karshanbhai proposed Khetshibhai that he should start once again his shop and for that Adani would support him. This proposal made Khetshibhai very happy but than he asked if he could get any help from someone who could support him to buy grocery worth 10 thousand. Karshanbhai told him that he would put it in "Self reliance program" by Adani foundation for sure. After few days on the birthday of honorable Mr. Gautambhai Adani, there was a celebration at the school in Bhadreshwar on 24th May, 2018. In this celebration Khetshibhai was handed over a grocery kit which he was in need by Panktiben from Adani foundation in presence of Sarpanch and citizens.

Today Khetshibhai is running his shop at Maheshwarivas of Bhadreshwar village with all dignity ! He is happily earning around 2000 per month and is able to send his daughter to Adani vidhya mandir where she is studying in 7th ! This happy family is always blessing Adani foundation for helping needy people !



## Our Change Makers

# Pathways towards self Dependency!!

Tunda is a small village of Mundra block. Gorighar Goswami is pujari of Lord Shiva temple and he lives with his wife Anitaaben, three children and his mother. Gorighar was doing need based works in various companies for earning purpose and with that income he was fulfilling his family needs ! Ones when Gorighar was returning from other village an accident occurred with him and he died on the spot. When this news came to his family, it was unbelievable to them. Adani foundation respects all the invitation from the village but whenever there is any incident of sad demise, Adani foundation is there for sure to consulate. A staff member of Adani foundation went to their home and gave consolation to Anitaaben and promised her to help her .

In the next visit Devalben recognize the economical condition of the family as after him no one earning member was there in the family

We always believe that if something is there in your luck, no one can take it away from you. Life teaches us that you will get whatever is there in your luck but not without your own efforts ! Anitaaben is a person who was ready for every efforts to help her family ! This keen interest of this woman was noted by Adani foundation ! Anitaaben was allotted a stitching machine in presence of CSR head of Adani Panktiben and Sarpanch of village Abdremanbhai Kumbhar.

As she was having knowledge of stitching, this stitching machine gave her a lift and she started her work with more force ! Today Anitaaben is well known for her traditional cloths stitching and she is getting more and more orders from her village ! When she came to know that TATA power company is in need of lots of cloth bags, she grabbed the opportunity which helped her to earn good amount ! Today she is earning around 8 to 9 thousand which is enough to run her family very well ! She said, "Due to Adani foundation I have started not only earning very well but it has changed my life thoroughly ! On behalf of all women like me I would like to thank Adani Foundation !





# World Environment Day



555+ Tree plantation in  
Bhuj, Mundra & Nakhtrana  
Taluka on world  
Environment day

9000+ cum Augmentation  
and deepening work of  
check dam in Mandvi &  
Lakhpat Taluka

World Environment Day was celebrated in Five Talukas by different activities related to conservation of Environment. These Events were organized in coordination with DDO, TDO, SDM and Village Leaders of all Five Talukas. The activities Tree Plantation, Check dam Augmentation work, Inauguration work of Godhatal Dam Deepening work. 11000+ Tree plantation during year in Bhuj, Mundra, Nakhtrana, Anjar, Lakhpat, and Mandvi Taluka





### International Coastal Clean up Day



Mundra Adani foundation MUNDRA has celebrated swachhagraha related International Coastal Clean up Day celebrated with Coast Guard" with theme swachhagraha.. School students, Coast Guard staff and Adani foundation staff had cleaned Mandvi beach and give a message of swachhagraha.. At the end information given about swachhagraha project

Teachers day celebration in coordination with District Education Office and District Development Office with Adani Foundation - District Level Best teacher Award on this auspicious day.

13 teachers is selected after screening by DEO Office and tofay award will be given in presence of DEO, DPEO and Vasan bhai Ahir Minister Gujarat .

### Teacher's Day : Guru Vandana





## Rethinking about future of plastics

National conference on current status n Rethinking about future of plastics was organized at GUIDE – Adani Foundation was partner of the Event.

We have presented our efforts for changing mindset for No plastic awareness campaign..

Plus We also shared mangroves biodiversity project with GUIDE and given book to all present dignitaries





# International Volunteer Day (IVD)

International Volunteer Day (IVD) on 5 December was designated by the United Nations in 1985 as an international observance day to celebrate the power and potential of volunteerism.

It is an opportunity for volunteers, and volunteer organisations, to raise awareness of, and gain understanding for, the contribution they make to their communities. On 3rd July – Occasion of "International No plastic Day" - AF Team has distributed 250 hooks to employees residing at Shantivan colony.

Hook is the thin rod of steel. In this hook all have collected plastic bag wrapper i.e. Waffer, Biscuit, milk etc @ 8.5 Kg. This Plastic will be given for recycle for making Hose Pipe. I.e "Waste to Best". Employee's family members became determined for not using Plastic bags.

Today On 5th December – We have felicitated the five volunteers who collected highest quantity of plastic bags. Chief Guest of the Event was Ms. Vinita Rai (Head, SVC Ladies Club) and Mr. Avinash Rai (CEO, APSEZ).

Respected Ganesh Sharma Sir (VP – HR, APSEZ) and Respected Patiyal Sir (Head –Admin, APSEZ) had nicely coordinated for the Event.

This will be regular and sustainable event for AF.





### Divine Feelings Towards Mata no Madh

People used to go by foot to Mata no madh in Navaratri. Total 8 camps at different locations is inaugurated today in way towards Mata no Madh by Adani Foundation Bhuj and GKGH Hospital.

Total 34537 Patients were benefitted in this Camp

Mata no Madh is a village in Lakhpat Taluka of Kutch district, Gujarat, India. The village lies surrounded by hills on both banks of a small stream and has a temple dedicated to Ashapura Mata. She is considered patron deity of Kutch. The village is located about 105 km from Bhuj, the headquarters of Kutch district.



### "Ayushman Bharat – Celebrating First Birthday !!"

On the first birth anniversary of "AYUSHMAN ENROLMENT CARD" Adani Foundation Bhuj and Mundra had successfully completed 11 Ayushman card enrollment camps in a single Day.





# Skill Development Training Program for Schedule Cast Beneficiaries

**We could able to fulfil target of training 1440 SC beneficiaries from Eight Talukas from Kutchh for different courses.**

Mr Vinod Chavda (MP, Kutchh and Morabi) Mrs Lata Solanki (Pramukh, Nagar Palika,Bhuj) Mr Rohit (District Social Justice and Empowerment ), Mr Jatin Trivedi (Head, ASDC)and Mr solanki (Chairman, social justice commitee Kutchh) we're present.

courses

1. Hand embroidery
2. Self employed stitching
3. Mobile Repairing
4. Beauty parlor
5. Crane operator







completed 10 years of  
udaan

Education Minister Mr. Bhupendrasinh Chudasama visited Udaan Project and Utthan Project of Adani Foundation. He Appreciated Udaan Project which is truly inspirational and impactful Project. He got information through power point presentation about Utthan Project – Enhancing Primary Education of Government School. He motivated and appreciated joint effort of AF Team and District Primary Education office



## Events



Adani Foundation have arranged a program **“Celebrating The Health Of Women”** at Mundra. The motive was awareness in women about their health and issues. Around 250 women were participated in this event. Doctors were gave information about women health, periods cycle, breast cancer etc. Doctor discussed about breast cancer, its symptoms, precautions, does and don'ts etc., and advised women to go for regular check up after forties. At the end of program health kit distributed to women.



## Republic Day Celebration at ASDC Centre

Bhuj Adani Skill Development Centre witnessed the celebration of the Republic Day on the 25th January, 2020.

Students, Staff and Faculty members filled with a feeling of patriotism and dedication gathered in front of the Guest & Director-Adani Foundation, Vasant Gadhavi. In his speech, the director highlighted the importance of the Constitution and its unique features in the preamble of the constitution. He also gave an insight on the various accomplishments achieved by Centre and motivated the crowd for bringing more laurels for the Centre through their accomplishments.



## Events

### International disability day



Celebration of international disability day - Adani foundations Lakhpat celebrated three different programmes in coordination with District social welfare department and Lokseva trust.

1. Seva setu programme in which information and form fill up for various Govt schemes for Divyang I.e. bus pass, sadhan sahay and pension
2. Sadhan sahay - If beneficiary can not fulfill Govt criteria then of disability percentage or age bar - Adani foundation has supported beneficiaries.
3. Opening of swavlamban center in coordination of merchant association - widow women will stitch non woven bags and merchant association will purchase regularly and mamlatdar saheb will monitor the system.



## Events



Mr. Karim Mansoori – Namda Artist was felicitated at National Artisan Expo Rajkot by Mr. Vijay Rupani along with 13 other artisans from all over Gujarat. the motive of felicitation was, their work towards community and their efforts for revising their art. Karim Mansoori was the only artisan of this art called “NAMDA” in Gujarat state. he was also part of this six-day National Artisan expo, for one week.

# Awards and Accolades



With a great pleasure to share that APSEZ - CSR received such a big recognition as a honourable mention in western recognition under category Challenging circumstances under first National corporate social responsibility 2019.

Chief guest of the ceremony was our President Honble. Ramnath kovind. Ceremony was presided over by smt Nirmala sitaraman - Minister Finance and Guest of honour was Mr Anurag sinh Thakur Minsitry of state for finance and corporate affairs ..

Award received by Respected Dr Malay Mahadeviya and accompanied by Mr Rakshit shah and Mr Avinash Rai.



# Awards and Accolades

## Apex India CSR Innovation Award 2019



Adani Foundation Mundra received "**Gold Award**" under Apex India CSR Innovation Award 2019 Today at Goa.

Chief Guest of the event was Shri Prasad ( Union Minister Goa,GOI) and Guest of Honour Mr Suri (Former Governor Goa).

From Adani Foundation Mundra - Mr Vijay Gosai (Coordinator SLD Projects) and Mr. Karsan Gadhvi ( Sr PO SLD Projects) received the Award.

# Awards and Accolades

## QCFI Best Case Study (State Award)2019



It was an honour for our Mundra team to be presented with the Diamond Category award at the State Case Study Presentation Competition by Quality Circle Forum, for their 'Mangroves afforestation and alternate livelihood' case study. We hope to continue our efforts to #empower people and preserve the #environment for the betterment of all



# Awards and Accolades

## QCFI Best Case Study (National Award)2019



It was an honour for our Mundra team to be presented with the 'Far Excellence' category award at the National Case Study Presentation Competition by Quality Circle Forum, for their 'Mangroves afforestation and alternate livelihood' case study. We hope to continue our efforts to #empower people and preserve the #environment for the betterment of all.

# Awards and Accolades



Sharing with Proud that Adani Foundation got felicitation from Mr Vijay Rupani Honrable Cheif Minister Gujarat for

1. Water Conservation works
  2. More than 7000 Tree Plantation in Mundra, Anjar, Lakhpat and Mandvi Taluka
- Felicitatation of 3 CSR from Kutchh district for remarkable scarcity related work.

From Adani Foundation - Mr Karsanbhai Gadhvi received Award.





# Awards and Accolades



Quality education is all about providing students with the resources & opportunities that open a new window to the outside world. At our Adani Vidya Mandir schools, we're dedicatedly working to facilitate our children and make them future-ready. It's an immensely proud moment for us as Adani Vidya Mandir schools Bhadreswar was recognised at the Samagra Shiksha Empowering India 2020 Awards, by Ministry of Human Resource Development, Government of India, for empowering children with education, ensuring a Brighter Tomorrow for India's future generations. The awards were presented by Dr.Ramesh Pokhriyal Nishank.



Ms. Pankti Shah was invited as a guest of honour for Mission Eco Next "Eco Eureka Training" by ministry of science and technology - Government of India at KSKV Bhuj.

Initiatives of Adani Foundation for Biodiversity and water conservation was shared on this platform.

Mr. Mavajibhai Baraiya was invited as a guest of honor for "Creating Sustainable Farming Villages" by Krushi Research and Development Association by Vagad Visa Oswal Samaj. Initiatives of Adani Foundation for Fodder Sustainability and water conservation was shared by him.





मुख्य अतिथि  
**श्री राम नाथ कोविन्द**  
माननीय राष्ट्रपति, भारत गणराज्य

AWARDS

Chief Guest  
**Shri Ram Nath Kovind**  
Hon'ble President of India

आयोजक  
**श्रीमती निर्मला सीतारमण**  
माननीय वित्त एवं वाणिज्य मंत्री, भारत गणराज्य

विशेष अतिथि  
**श्री अनुराग सिंह ठाकुर**  
माननीय वित्त एवं वाणिज्य मंत्री, भारत गणराज्य

Presided over by  
**Smt Nirmala Sitharaman**  
Hon'ble Minister of Finance and Corporate Affairs

Guest of Honour  
**Shri Anurag Singh Thakur**  
Hon'ble Minister of State for Finance and Corporate Affairs

29 अक्टूबर 2019, विज्ञान भवन, नई दिल्ली

29 October 2019, Vigyan Bhawan, New Delhi

IICA  
Indian Institute of  
Corporate Affairs  
Institution for Corporate Governance



## Awards and Accolades





Adani Foundation Parivar

No	Core Area	Beneficiaries	Remarks
1	Education	7514	Uthhan, Praveshotsav, Labour School Support
2	Adani Vidya Mandir	443	School Students
3	UDAAN	33030	568 Institutes Visited
4	Adani Skill Dev. Center	2664	Mundra and Bhuj
5	Community health Mundra	62956	MHCU, Medical Camps, Senior Citizen
6	Community health Bhuj	25604	Health Camps, Mahiti Setu, patient care
7	SLD Fisherman	6970	Water, Education, Mangroves etc.
8	SLD Agriculture	2907	Drip Irrigation, Bio gas, tissue
9	SLD Women Empowerment	419	Saheli mahila gruh udyog – 12 SHG
10	Community Infra. Development	94206	Pond deepening, AKBTPL, Labours work
11	Suposhan Mundra	20565	Adolescent, Children and RPA
12	Nakhatrana	610	Community Health, Biodiversity and CID
13	Tuna	445	Cattle Owner, Praveshotsav, Svavlamban
14	Lakhpatt	765	Cattle owner for fodder, Divyang and School Support
<b>Total Beneficiaries</b>		<b>259098</b>	

## Financial Overview

Adani Foundation -Mundra				
Executive Summary-Budget Utilization 2019-20				
F.Y. 2019-20 (Rs. In Lacs)				
Sr. No.	Budget Line Item	Budget 2019-20	Budget Utilization	% of utilization
A.	Admin Expense	71.50	64.47	90.17%
B.	Education	57.75	55.46	96.04%
C.	Community Health	220.66	244.89	110.98%
D.	Sustainable Livelihood Development	487.80	451.41	92.54%
E.	Rural Infrastructure Development	321.53	249.36	77.56%
Total AF CSR Budget :		1159.24	1065.60	91.92%
F.	Utthan - Education	108.93	81.21	74.55%
G.	Model Village	197.26	173.65	88.03%
Total Project Utthan Budget		306.19	254.86	83.24%
H.	Adani Vidya Mandir - Bhadreswar	204.35	184.93	90.50%
Total AVMB Budget		204.35	184.93	90.50%
I.	Project Udaan_Mundra	373.14	307.69	82.46%
Total Project Udaan Budget		373.14	307.69	82.46%
Grand Total :		2042.92	1813.08	88.75%





भारत सरकार  
Government of India  
कारपोरेट कार्य मंत्रालय  
Ministry of Corporate Affairs

राष्ट्रीय कारपोरेट सामाजिक दायित्व (सीएसआर) पुरस्कार 2019  
National Corporate Social Responsibility (CSR) Awards 2019

प्रमाण पत्र  
Certificate of

सम्माननीय उल्लेख  
Honourable Mention

चुनौतीपूर्ण परिस्थितियों में सीएसआर  
CSR in Challenging Circumstances

(भारत में)  
(Within India)

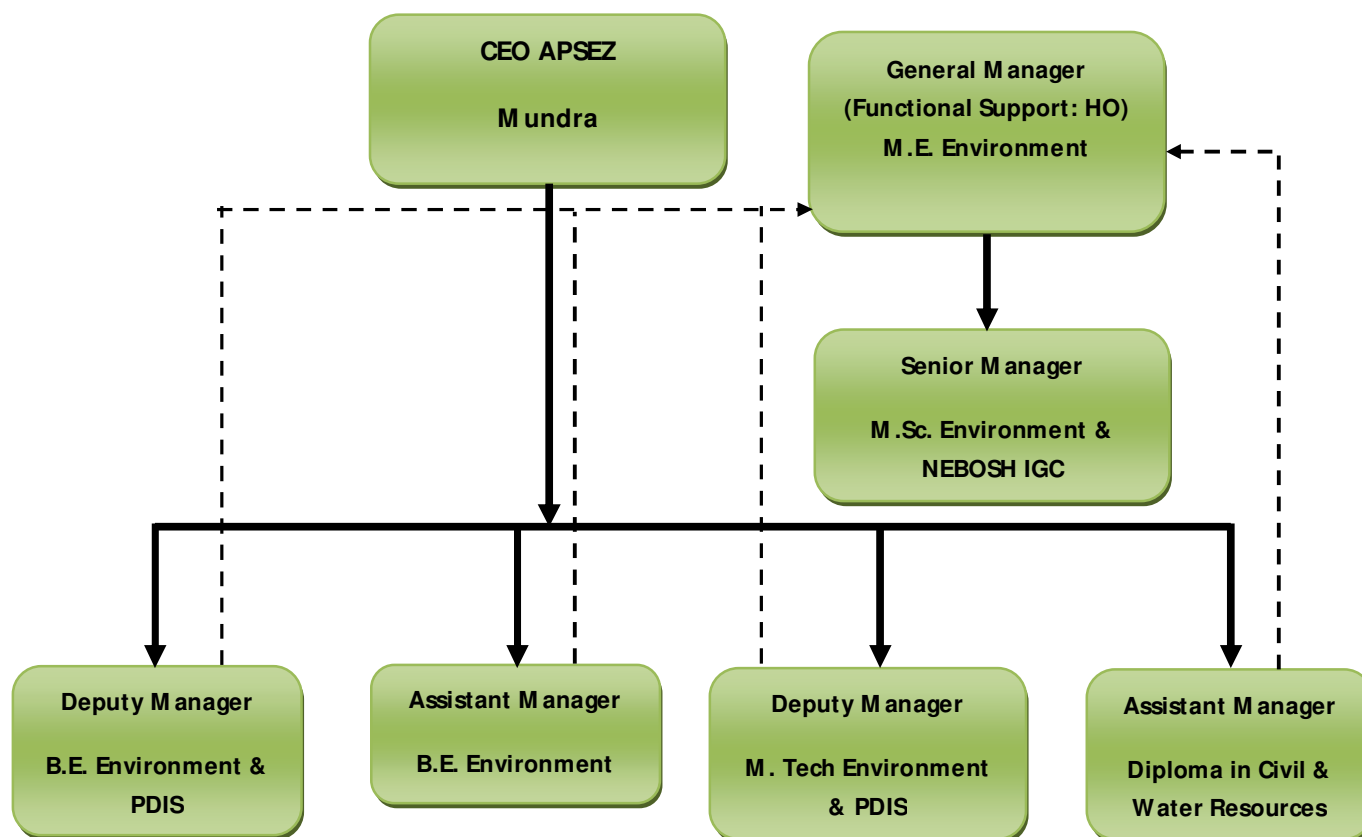
“अडानी पोर्ट्स एंड स्पेशल इकोनॉमिक ज़ोन लिमिटेड”  
“Adani Ports and Special Economic Zone Limited”

नई दिल्ली / New Delhi  
दिनांक / Date: 29-10-2019

सचिव / Secretary  
कारपोरेट कार्य मंत्रालय  
Ministry of Corporate Affairs

# **Annexure – 8**

## Organogram of Environment Management Cell, APSEZ, Mundra



# **Annexure – 9**



### **Cost of Environmental Protection Measures**

Sr. No.	Activity	Cost incurred (INR in Lacs)			Budgeted Cost (INR in Lacs)
		20 17 – 18	20 18 – 19	20 19 – 20	20 19 – 20
1.	Environmental Study / Audit and Consultancy	9.0	6.7	0.33	6.0
2.	Legal & Statutory Expenses	5.07	4.42	0.84	3.0
3.	Environmental Monitoring Services	27.02	20.36	21.74	24.0
4.	Hazardous / Non Hazardous Waste Management & Disposal	65.62	95.72	108.43	120.57
5.	Environment Days Celebration and Advertisement / Business development	2.85	0.28	1.5	10.0
6.	Treatment and Disposal of Bio-Medical Waste	1.13	1.21	1.62	1.56
7.	Mangrove Plantation, Monitoring & Conservation	60.0	47.0	Nil	Nil
8.	Other Horticulture Expenses	547.0	579.32	734.18	727.80
9.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	70.02	144.29	110.18	128.52
10.	Expenditure of Environment Dept. (Apart from above head)	102.15	109.28	105.13	124.38
<b>Total</b>		<b>889.86</b>	<b>1008.58</b>	<b>1083.95</b>	<b>1145.83</b>

# **Annexure–10**

## Compliance Report of CIA Study Environment Management Plan

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
<b>1</b>	<b>Land Use Change</b>						
1.1	<p>It is predicted that the built up land in the rural areas would increase by an order 50% from the baseline 2015.</p> <p>New settlements near the SEZ area might create slums.</p> <p>Unorganized urban development leading to poor sanitation and proliferation of vectors and disease.</p>	Level - 1	<p>APSEZ has developed two townships (Shantivan and Samudra) presently accommodating 1668 households. Necessary permissions from concerned authorities were already obtained for the development of townships and Associated infrastructure facilities.</p>	<p>The existing townships will be expanded to accommodate about 4 lakh people when the APSEZ is fully developed.</p>	APSEZ	As and when Required	<p>APSEZ has developed two townships (Shantivan and Samudra) accommodating 2180 households and associated infrastructure facilities. Accommodation is made available for all interested employees working within Adani group &amp; SEZ industries. Out of which 86% Occupancies are accommodated within the townships and rest are available for employees working within APSEZ.</p> <p>At present 43 nos. of industries are operating within the SEZ. Township facilities are also made by some of SEZ industries within Mundra town for their employees with basic infrastructure facilities and requirements.</p> <p>Most of the employees working in SEZ industries are residing in Mundra township having all basic requirements and associated facilities.</p> <p>The existing social infrastructure facilities are adequate for present development at APSEZ. The existing townships with associated facilities will be expanded as per requirement.</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
							APSEZ has also been granted permission for receiving domestic sewage @ 2.5 MLD from Mundra village (which was earlier discharged in to open area within Mundra region) in to wastewater treatment plant for treatment and disposal. APSEZ has already started receiving of domestic sewage from Mundra, which will abate the poor sanitation and unhygienic condition within Mundra region. Total project cost for laying domestic sewage underground pipeline with other associated facilities from Mundra to APSEZ is <b>362 Lacs</b> .
1.2	Once the project is fully developed, due to increase in built up land in the APSEZ area, there will be an increase in the storm water runoff from the facility.	Level-1	The study area experiences scanty rainfall less than 400 mm/year. Considering the natural gradient, ASPEZ have designed and implemented storm water drains in the existing facility to meet the peak daily rainfall of 440 mm/hr. Hence flooding of	Technical feasibility study can be carried out to explore the possibility of developing storm water collection ponds to utilize maximum possible storm water runoff for dust suppression in the coal yard areas during non-rainy days.	APSEZ	Technical Study - one time, Implementation - Continual process	<p>Presently, 42% of the total SEZ area (8434.5890 Ha) is developed. Based on technical studies, APSEZ has developed adequate storm water facilities that meets with daily demand as per recorded highest rainfall.</p> <p>At present all existing coal yards are designed with drain, for collection of water during water sprinkling and rainfall, which is carried away to dump pond. Supernatant water from dump pond is being collected and used for dust suppression activities or after sedimentation, discharged to sea. Photographs showing the drain and dump pond are attached as <b>Annexure – A</b>.</p> <p>During last year 2019-20, the maximum recorded rain fall was <b>33.2 mm/hr.</b>, which was</p>



S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
			water in the neighboring areas is not envisaged.				much less than the design capacity of existing storm water drainage system. So our existing storm water management facility is adequate to handle the storm water runoff from the area. Hence flooding of water in the neighboring areas is not envisaged.
			As per the directions given in the environmental clearance issued for the proposed Multi-Product SEZ and CRZ clearance for Desalination, sea water intake, outfall facility and pipeline project, the master plan of the project was designed and being implemented without disturbing the natural flow of rainwater in all the seasonal streams.	The channel depth in all the natural streams shall be maintained to accommodate peak flood flow during the monsoon and periodical de-silting activities in the natural streams passing through the APSEZ area	APSEZ, District Administration * and Irrigation department	As and When Required	Presently there is no Desalination plant, sea water intake and outfall facility developed as part of EC & CRZ clearance of Multiproduct SEZ. The project will be designed and implemented without disturbing the natural flow of rainwater in all the seasonal streams.

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
1.3	Due to conservation and protection of mangroves in the designated conservation area, it has been predicted that the current mangrove footprint area would marginally increase in next 15 years due to natural growth. This will enhance the overall biodiversity in the local coastal eco-system.	Positive Impact with ecological benefits	In addition to conservation of the identified 1254 ha mangrove areas around Mundra port and SEZ, APSEZ has taken up large scale mangrove afforestation activities in an area of more than 2800 ha at various locations across the coast of Gujarat state in consultation with various organizations	APSEZ will continue mangrove afforestation as per the commitment made with concerned regulatory authority	APSEZ	Short Term	<p>APSEZ has carried out mangrove afforestation in 2890 ha. area across the coast of Gujarat till date.</p> <p>No further mangrove afforestation is pending w.r.t. commitment made with concerned regulatory authority for APSEZ, Mundra project.</p> <p>As per study conducted by NCSCM in 2017, mangrove cover in and around APSEZ, Mundra has increased from 2094 Ha to 2340 ha (as compared between 2011 to 2017). The analysis has shown an overall growth of 246 ha. The cost for said study was INR 3.15 Cr.</p> <p>Further work has been assigned to NCSCM in March 2020 as part of compliance for the action plan "Monitoring of mangrove cover". The cost of the said work is INR 23.56 Lacs.</p>
1.4	Development activities along the coast might cause certain		Detailed hydro-dynamic modelling and shoreline change	It is recommended to map the coastal morphology (Shoreline) at least once in three years	APSEZ	Continual Process	Shoreline assessment study will be conducted in FY 2020-21.

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
	changes in hydro-dynamic characteristics along the shoreline. Shoreline of any area also can be influenced by storm surges and other natural processes.		prediction for a fully developed APSEZ facility has been studied. The study reveals that the erosion and accretion in the study area at the end of 15th year will be within the designated criteria of $\pm 0.5$ m/year. which reconfirms that the waterfront development activities of APSEZ would pose insignificant impact on the Mundra shoreline.				
<b>2</b>	<b>Regional Traffic Management Plan</b>						
2.1	The projected traffic data as per the EIA Report of Multi-Product	Level-1	As per the master plan of APSEZ, eight artillery roads will be	Additional road as per master plan will be built in future based on the overall progress of the project.	APSEZ	As and When Required	Presently 42% of the total SEZ area (8434.5890 Ha) is developed.  Existing road/rail infrastructure facilities are adequate to evacuate the existing cargo. Further, APSEZ's cargo evacuation through rail

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
	<p>Special Economic Zone, the peak vehicular traffic from the port and SEZ operations (including supporting facilities and colony) could be in the order of 18,300 and 10,400 vehicles per day respectively.</p> <p>There could be a possible increase in traffic congestions on village-highway intersections and road accidents.</p>		<p>connected to either state highway or national highway for evacuating the goods from APSEZ. None of these roads are passing through settlements, thereby avoiding traffic Congestions in the respective villages. The carrying capacity of the eight artillery roads connecting APSEZ is estimated to be about 16,000 PCU/hr as against the envisaged peak traffic volume of 4,500</p>	<p>Currently about 25% of cargo from APSEZ is transported by Rail and the same will be enhanced to 40% when the facility is fully developed in future. This will further reduce the traffic volumes on the regional road network.</p>			<p>has increased to 30 %, thereby reducing the usage of road.</p> <p>Additional road facilities will be built as per master plan considering future development.</p> <p>The facilities for transportation of cargo other than road will be enhanced considering future development, which will reduce the traffic volumes on the regional road Network.</p>



S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
			<p>PCU/hr.</p> <p>Out of eight artillery roads considered in APSEZ master plan, seven roads were already developed and functional.</p>				
			<p>APSEZ has been imparting Driver Training Programs to all their contractors to enhance awareness on road safety.</p>	<p>APSEZ can undertake technical feasibility of implementing Intelligent Transport System (ITS) for the freight carriers associated with their development activities.</p>	APSEZ & GSRDC*	Long Term	<p>APSEZ is being imparting the regular in-house classroom and on-job training to the all drivers and employees on below topics:</p> <ul style="list-style-type: none"> <li>• Basic induction Training for drivers</li> <li>• ITV Driver Training</li> <li>• ITV Driver Induction for Supervisor</li> <li>• Defensive Driving</li> <li>• Defensive Driving &amp; BBS</li> <li>• Traffic Management &amp; Road Signage</li> <li>• Driving safety training</li> <li>• RORO Driver training</li> <li>• Defensive Driving &amp; Emergency Action Plan</li> <li>• Drivers Responsibilities &amp; Safe driving</li> <li>• Emergency Rescue (Vehicle) Training</li> </ul> <p>Approx. 3300 Participants (On roll and contractual manpower) were benefitted from above trainings in FY 2019-20. The same will</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
							<p>be continued in future also.</p> <p>APSEZ has also implemented the Remote traffic management system (RTMS) to manage the traffic movements and capturing the violations to further improve the system.</p> <p>Following steps were taken by APSEZ to reduce the accidents.</p> <ul style="list-style-type: none"> <li>✓ Installation of approx. 100 Nos. of cameras which is being operated at ISCR (Integrated security control room) to monitor &amp; manage the traffic system in APSEZ on real time basis.</li> <li>✓ Installation of 02 Nos. RTMS - Remote traffic management system (having combination of Radar + OCR camera + LED display board - showing speed limit) to recognize the over speeded vehicles, so that timely capture the same and avoid any road accidents.</li> </ul>
<b>3</b>	<b>Water resources Management and sewage treatment &amp; disposal Plan</b>						
3.1	For a fully developed APSEZ facility, water demand will be in the order of 4,30,000 m3/day (430 MLD). APSEZ	No-Impact	APSEZ is meeting the current water demand through Narmada water supply scheme and 47 MLD captive	As per the master plan and permissions granted under EC, APSEZ will be developing progressively 4,50,000 m3/day (450 MLD) of desalination plants to meet the	APSEZ	As and When Required	<p>Currently there are two fresh water sources available with APSEZ.</p> <p><b>Desalination Plant – 47 MLD</b></p> <p><b>Narmada water through GWIL – 11 MLD</b> (sanctioned capacity).</p> <p>Current water demand for APSEZ along with SEZ industries including Adani Power Plant is around 30 MLD.</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
	will be sourcing majority of the water from the captive desalination plants, which will be developed in progressive manner.		desalination plant at site. Necessary water allocation from concerned authorities was obtained and the same will be renewed from time to time as per the directions of state government.	future demand. Hence stress on regional water resources due to these developmental projects will be less significant.			So presently, these sources are adequate to fulfill the current fresh water requirement of APSEZ.  The desalination plant of additional capacities will be installed on modular basis considering future requirement of APSEZ.
3.2	Existing water demand in the Mundra taluk is estimated as 8500 m3/day (@55 lpcd) and the potable and sanitation water needs would increase to 37,000 m3/day (@125 lpcd) in future when the area is	Level-2	Adani Foundation has been contributing to various watershed development projects in the Mundra region to enhance ground water resources in the area. Adani Foundation has contributed about Rs. 300 Lakhs so far for	Adani Foundation is planning to implement the various water resource conservation programs in next ten years under various schemes.	APSEZ and CGWB*	Long Term	Water needs of APSEZ is being met through existing Desalination Plant of APSEZ and Narmada canal supplied by the GWIL which may be further enhanced on modular basis, At present Ground water is not utilized for any activities of APSEZ.  However various works are being carried out continuously under Water Conservation Work to achieve water security in Mundra region by Adani Foundation.. Following works are carried out as a part of water conservation work since April – 2018.  <ul style="list-style-type: none"> <li>Under <b>“Sujlam Suflam Jal Abhiyan campaign”</b> AF Mundra had completed deepening work in 26 pond works as per</li> </ul>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
	fully grown into larger municipality due to induced economic growth. Water demand of the local communities is met through Narmada water supply system to some extent, but largely depending on the ground water in the study area. Mundra block is reported to be a safe ground block as on date. Due to influx of people and rapid urbanization due to the economic		the development of 18 check dams.				<p>given target by District Collector Kutch in 19 villages. Total excavation done 51723 Cum. Total storage capacity created 51.72 million liters. These works done as per government guidelines.</p> <ul style="list-style-type: none"> <li>• Under “<b>Participatory Ground Water Management</b>” work we have created artificial recharge borewell in Borana, Mangara &amp; Dhrub village.</li> <li>• Participatory Ground Water Management in ten villages with holistic approach for Kankavati Sandstone Aquifer Programme. With the objective of to preserve the rain water to reduce the impact of salinity and recharge the ground water (the main source of water) to facilitate the Agricultural activities as well as for drinking water.</li> <li>• Ground recharge activities (pond deepening work for more than 52 ponds) individually were built leading to a significant increase in water table and higher returns to the farmers.</li> <li>• Roof Top Rain Water Harvesting 54 Nos. and Recharge Bore well 75 Nos.</li> <li>• Drip Irrigation 823 Farmers benefitted in coordination with Gujrat Green Revolution Company</li> <li>• Under UTHHAN MODEL VILLAGE PROJECT, Salinity ingress issue is well taken with pond deepening, recharge bore well technique and roof top rain water harvesting. Total ground water recharged</li> </ul>



S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
	development, there could be some stress on the ground water resources in future.						due to this project 1878 ML.  Adani foundation has spent approx. INR 3437 lakhs during last two years (i.e. 2018-19 & 2019-20) for CSR activities which also includes water conservation projects as mentioned above.
3.3	It is estimated that about 60,000 m3/day (60 MLD) of sewage will be generated from the APSEZ facility when the project is fully developed.	No Impact	Seven sewage treatment plants with an aggregate capacity of 3.1 MLD have already built at APSEZ. Treated sewage is utilized for greenbelt development and sewage is not discharged into either seasonal natural streams or marine environment.	APSEZ is permitted to develop decentralized sewage treatment plants of total 62 MLD capacities. Existing sewage treatment facilities will be augmented progressively based on the development at APSEZ in future. Similar to existing practices, treated sewage will be utilized for greenbelt development.	APSEZ	As and When Required	Current installed capacity of wastewater treatment plants is 5.6 MLD (ETP, STPs & CETP) for treatment of effluent & sewage generated at various locations.  Out of 43 only 3 industries within the SEZ are sending their partially treated industrial as well as domestic effluent to the CETP confirming to CETP inlet norms for further treatment and final disposal. Other SEZ industries have their own STPs / ETPs for treatment of wastewater generated from their industrial operation and discharging the treated water on land for horticulture purpose within their premises as per specific permission granted by SPCB.  Presently avg. 1.4 MLD of wastewater (in to ETP, STPs & CETP) is treated and being utilized on land for horticulture purpose within APSEZ premises. Existing wastewater treatment plants are adequate to treat and handle the total effluent / sewage load considering current development.

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030 )	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance					
							Existing wastewater treatment facilities will be augmented or new plants will be developed on modular basis considering future requirement.					
4	Air quality management Plan											
4.1	Although all the regulated activities in the study area will be adopting promulgated emission norms, total air emission mass discharge from the study area would increase.	Level-2	APSEZ and other thermal power plants have obtained valid consent to operate and have been operating the facilities as per the emission norms stipulated in respective consent orders. APSEZ and other two power plants are monitoring the ambient air quality on regular intervals as per GPCB/CPCB guidelines and the data is analyzed and presented to	All existing and new industrial establishments will obtain requisite consents from GPCB and adhere to the stipulated emission norms regulations and guidelines issued by authorities from time to time.	APSEZ And Other Industries	Continual Process	<p>APSEZ has been granted requisite permissions from the concerned authorities with stipulated norms for air emission (flue gas as well as ambient air).</p> <p>Ambient Air Quality monitoring is being carried out by NABL accredited and MoEF&amp;CC authorized agency namely M/s. Pollucon Laboratory Pvt. Ltd. as per NAAQ standards, 2009. Stack emission monitoring is also being carried out on regular basis. Reports of the same are being submitted to the concerned authorities on regular basis.</p> <p>Adani power plant has installed continuous emission and air quality monitoring instruments as per CPCB Directive and submitting the reports also. Another power plant of CGPL is outside APSEZ area.</p> <p>The AAQM summary for last six months (Oct'19 to Mar'20) are as below. Locations: 17 Nos. (APSEZ – 12 + APL – 5 including 3 villages) Frequency: Twice in a week</p> <table><tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit<sup>s</sup></th></tr></table>	Parameter	Unit	Max	Min	Perm. Limit <sup>s</sup>
Parameter	Unit	Max	Min	Perm. Limit <sup>s</sup>								

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance																				
			GPCB on monthly basis. Both the thermal power plants located within the study area have installed continuous emission and air quality monitoring instruments as per CPCB directive.				<table><tr><td>PM<sub>10</sub></td><td>µg/m<sup>3</sup></td><td>96.23</td><td>46.29</td><td>100</td></tr><tr><td>PM<sub>2.5</sub></td><td>µg/m<sup>3</sup></td><td>58.30</td><td>17.65</td><td>60</td></tr><tr><td>SO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>29.44</td><td>6.34</td><td>80</td></tr><tr><td>NO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>45.56</td><td>13.50</td><td>80</td></tr></table> <p>\$ as per NAAQ standards, 2009 Values recorded confirms to the stipulated standards.</p> <p>Approx. INR 21.74 Lakh is spent for environmental monitoring activities during the FY 2019-20 which also includes ambient air quality monitoring.</p> <p>Other industries located within the SEZ have obtained requisite permissions from the competent authorities for their respective plant and they are also carried out environmental monitoring within their premises to comply with the permission granted. The same has been ensured by APSEZ as well as SPCB on regular basis. APSEZ carries out regular visits of member industries within SEZ and last visit was conducted during March &amp; April 2019 for EMS &amp; compliance verification. Same will be continued in future also.</p> <p>The monitoring reports of industries within SEZ are also being submitted to the regulatory authorities as a part of half yearly Compliance</p>	PM <sub>10</sub>	µg/m <sup>3</sup>	96.23	46.29	100	PM <sub>2.5</sub>	µg/m <sup>3</sup>	58.30	17.65	60	SO <sub>2</sub>	µg/m <sup>3</sup>	29.44	6.34	80	NO <sub>2</sub>	µg/m <sup>3</sup>	45.56	13.50	80
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S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
							report of EC for Multi Product SEZ.
				A common air quality management committee may be framed under the guidance of the State Pollution Control Board and district administration to manage regional level emission inventory data that can help to manage regional level air quality management goals.	APSEZ and Other Industries, Stakeholders, District Administration and GPCB*	Long Term And Continual	<p>APSEZ will co-operate and comply with the directions from concerned regulatory authorities for air quality management within APSEZ area. However at present, APSEZ has formed Internal Environment Monitoring Committee, involving Sr. Management from APSEZ and Adani Power Limited, with following role and responsibilities:.</p> <ul style="list-style-type: none"> <li>• Identification of sources of air &amp; noise emission and its dispersion in surrounding villages</li> <li>• Remedial measures to eliminate, control, reduce or capture air &amp; noise emission</li> <li>• Identify available resource to abate the air and noise emission</li> <li>• Required additional resources for control of air and noise emission</li> <li>• Drinking water and its testing of all the available fresh water sources in surrounding villages</li> <li>• Identify any surrounding villages affected by organization's improper waste disposal mechanism.</li> </ul> <p>APSEZ and all the industries within SEZ are in compliance to NAAQS and same is being ensured by APSEZ. The monitoring reports of industries within SEZ are being submitted to the regulatory authorities as part of half yearly Compliance report of EC for Multi Product SEZ.</p>



S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
4.2	Release of particulate emissions from handling and storage of coal at the port and power plants would influence PM10 and PM2.5 concentration in the background air. This could pose some health impacts such as asthma and COPD etc. among the local communities.	Health Impact	APSEZ has been implementing the following management plan to control emissions as per the applicable regulations and similar practices will be adopted in future: Entire bulk material handling facilities are mechanized. Regular water sprinkling on road and other open areas, regular cleaning of roads, dry fog dust suppression systems (DSS) in hoppers, transfer towers and conveyor belts, use of	All industries located in the APSEZ shall adhere to the emissions norms and minimum stack height guidelines issued by CPCB and consent to operate issued by Gujarat Pollution Control Board from time to time.	APSEZ and Other Industries	Continual Process	<p>Following safeguard measures are taken by APSEZ for abatement of dust emissions.</p> <ul style="list-style-type: none"> <li>• Adequate stack heights to the Boilers, D.G. Sets, TFHs &amp; HWGs for proper dispersion of pollutants within APSEZ</li> <li>• Using of liquid &amp; Gaseous fuels instead of solid fuels in Boilers, Thermic fluid heaters and hot water generators.</li> <li>• Regular sprinkling on road and other open area</li> <li>• Regular cleaning of roads</li> <li>• Dry fog Dust Suppression System (DSS) in hopper, transfer towers and conveyor belts</li> <li>• Use of water mist canon</li> <li>• Closed type conveyor belts</li> <li>• Regular sprinkling on coal heaps</li> <li>• Covering other types of dry bulk cargo heaps</li> <li>• Installation of wind breaking wall</li> <li>• Development of greenbelt along the periphery of the storage yards/back up area</li> <li>• Mechanized handling system for coal and other dry bulk cargo</li> <li>• Wagon loading and truck loading through closed silo</li> </ul> <p>Adequate air pollution control measures like ESPs, FGDs, Bag Filters, etc. and adequate stack heights provisions are implemented</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance																				
			water mist canon, covered conveyor belts, regular sprinkling on coal heaps,				<p>within the thermal power plant.</p> <p>The stack monitoring summary for last six months (Oct'19 to Mar'20) are as below. Total Nos. of Stacks: 22 Nos. Frequency: Monthly / Half Yearly</p> <table><tr><th>Parameter</th><th>Unit</th><th>GPCB Limit</th><th>Min</th><th>Max</th></tr><tr><td>PM</td><td>mg/nm<sup>3</sup></td><td>150</td><td>30.81</td><td>10.5</td></tr><tr><td>SO<sub>2</sub></td><td>Ppm</td><td>100</td><td>7.69</td><td>2.64</td></tr><tr><td>NO<sub>x</sub></td><td>ppm</td><td>50</td><td>37.46</td><td>23.6</td></tr></table> <p>Values recorded confirms to the stipulated standards.</p> <p>Approx. INR 21.74 Lakh is spent for all environmental monitoring activities during the FY 2019-20 which includes stack gas monitoring.</p> <p>All other industries located within SEZ are adhere to provide adequate stack height and pollution control measures for proper dispersion of pollutants as per respective permissions granted by the board. The same is being inspected and ensured by APSEZ as well as SPCB officials on regular basis.</p>	Parameter	Unit	GPCB Limit	Min	Max	PM	mg/nm <sup>3</sup>	150	30.81	10.5	SO <sub>2</sub>	Ppm	100	7.69	2.64	NO <sub>x</sub>	ppm	50	37.46	23.6
Parameter		Unit	GPCB Limit	Min	Max																						
PM	mg/nm <sup>3</sup>	150	30.81	10.5																							
SO <sub>2</sub>	Ppm	100	7.69	2.64																							
NO <sub>x</sub>	ppm	50	37.46	23.6																							
			covering of other types of dry bulk cargo heaps by protective	An internal Coal Dust Management Working	APSEZ and Other Industries,		As mentioned above, presently, APSEZ has formed Internal Environment Monitoring Committee, involving Sr. Management of APSEZ and Adani Power Limited, with specific role and responsibilities as defined above.																				

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			materials, installation of wind breaking wall, development of greenbelt along the periphery of the storage yards/back up area and mechanized handling system for coal and other dry bulk cargo and Wagon loading and truck loading through closed silo. Both thermal power plants in the study area have installed electrostatic precipitators on the boilers and are meeting the emission norms as per the respective ECs granted. Due to	Group shall be formed by APSEZ to effectively co-ordinate the approach to coal dust management and monitoring	Concerned Stake holders, District Administration *	Long Term	<p>The dry cargo is being handled by mechanized system and transported by covered conveyer system, trucks and rail wagons.</p> <p>Wind breaking wall is provided around the coal storage yards of APSEZ as well as Adani Power Plant.</p> <p>Adequate air pollution control measures like ESPs, FGDs, Bag Filters, etc. and adequate stack heights provisions within the thermal power plant for proper dispersion of pollutants.</p> <p>Green belt / plantation is provided around the periphery of dry cargo storage area and regular water sprinkling is also being done to abate the dust emission from coal hips.</p>

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			installation of tall stacks as per CPCB guidelines and EC conditions, the relative air pollution impacts due to release of emissions from two power plants is insignificant.				
4.3	Ships are one of the significant sources of SO <sub>2</sub> and NO <sub>x</sub> emissions in the study area. Marine diesel engines on the ships often utilize fuel oils that might contain higher sulphur content. As per the international best practices,	Level-2	A Standard Operating Procedure (SOP) has been developed to be included as a part of APSEZ environment management plan to verify that all ships anchored at the port are adopting the	The current global limit for Sulphur content of ships fuel oil is 3.5 % m/m (mass by mass). According to MARPOL, the new global cap on sulphur in the marine vessel fuels will be 0.50% m/m by the 1st January 2025. APSEZ should explore the possibility of providing shore power to the ships at the port to reduce idling stage ship emissions.	APSEZ and Ship Owners	Long Term	The ships coming to the APSEZ are complying with MARPOL and other shipping rules and regulations.  APSEZ has already started providing shore power supply to the tugs (11 Nos.), dredgers (2 Nos.) and barges (1 No.). The feasibility of shore power will be explored and implemented on large scale for the visiting vessels to reduce idling stage ship emissions.

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	these marine diesel engines are designed to meet MARPOL regulations with NOX emissions less than 14.4 gram/Kwhr of engine. Due to lower stack heights of the marine diesel engine, ship emissions often gets dispersed in the local environment and might pose risk of fumigation during the early morning and evening hours due to atmospheric inversion break-up periods.		MARPOL4 regulations.				



S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
4.4	Road vehicle emissions will be other major contributors to the air pollution in the region when the facility is fully developed.	Level-2	Not Applicable	Due to implementation of Bharat VI fuels (MoEF&CC)6 in near future the vehicular and diesel engine emissions will be reduced by about 50% from the current national levels. APSEZ should develop a robust contractor environmental policy to ensure that Bharat Stage VI emission norms are adopted by all their contractors and sub-contractors.	APSEZ and All Industries	Short Term	<p>Presently, cargo evacuation through rail has increased to 30 %, thereby reducing the usage of road.</p> <p>Vehicles having valid PUC certificate are only being allowed to enter within APSEZ area.</p> <p>In future, APSEZ will also explore the feasibility of using Electric Vehicles for internal cargo movement.</p>
5	<b>Noise emissions</b>						
5.1	Noise emissions are envisaged from port operations, industrial operations and power plants in the study area.	Level-1	Due to adoption of various mechanized operations at the waterfront development, the noise emissions from the port cargo handling will be minimal. An adequate	APSEZ, all the tenant industries and facilities within APSEZ are required to undertake noise monitoring at their facilities to demonstrate the compliance with the Noise level standards. Continuous noise recording units can be	APSEZ	Continual Process	<p>Below Safeguard measures are already taken for abatement of noise emissions.</p> <ul style="list-style-type: none"> <li>• Development of greenbelt along the periphery of the operational area.</li> <li>• D.G. Sets having Acoustic enclosures.</li> <li>• Maintenance of plant machineries and equipments on regular frequency.</li> </ul> <p>Noise monitoring is being carried out by NABL accredited and MoEF&amp;CC authorized agency namely M/s. Pollucon Laboratory Pvt. Ltd. as per permission granted and reports are being</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance															
	Any increase in noise levels beyond three decibels from the background levels would be perceived as noise nuisance (USEPA)7.		greenbelt is being developed by APSEZ to further reduce any residual impacts due to noise emissions from the facility. Periodic noise level monitoring programs were adopted by APSEZ. Predicted noise levels were found to be well within the designated noise standards for Industrial facilities.	installed by APSEZ at facility boundary to address the community grievances, when ever required. To assess the overall site wide compliance and also to address any community grievances related to noise issues due to operation of APSEZ facilities.			<p>submitted to the concerned authorities on regular basis.</p> <p>The noise monitoring summary for last six months (Oct'19 to Mar'20) are as below.</p> <p>Locations: 12 Nos. Frequency: Once in a month (24 hourly)</p> <table><tr><th>Noise</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit<sup>\$</sup></th></tr><tr><td>Day Time</td><td>dB(A)</td><td>74.3</td><td>52.4</td><td>75</td></tr><tr><td>Night Time</td><td>dB(A)</td><td>69.8</td><td>48.3</td><td>70</td></tr></table> <p><sup>\$</sup> as per GPCB standards</p> <p>Approx. INR 21.74 Lakh is spent for all environmental monitoring activities during the FY 20 19-20 which includes noise monitoring.</p> <p>All the results are well within the standards. From this it can be inferred that there no impacts on the surrounding community.</p> <p>All other industries located in the APSEZ are adhere to monitor and control the ambient noise level as per permission granted by SPCB and same has been confirmed by APSEZ as well as SPCB on regular basis.</p> <p>Further, till date APSEZ has not received any grievances/notice for noise issues from any of</p>	Noise	Unit	Max	Min	Perm. Limit <sup>\$</sup>	Day Time	dB(A)	74.3	52.4	75	Night Time	dB(A)	69.8	48.3	70
Noise	Unit	Max	Min	Perm. Limit <sup>\$</sup>																		
Day Time	dB(A)	74.3	52.4	75																		
Night Time	dB(A)	69.8	48.3	70																		

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
							the stakeholders.
				In order to address the public grievances related to noise from the facility, an internal Noise Management Committee can be formed by APSEZ to investigate the root cause and to develop and implement noise mitigation plans in the specific zones.	APSEZ	Continual Process	As mentioned above, presently, APSEZ has formed Internal Environment Monitoring Committee, involving Sr. Management of APSEZ and Adani Power Limited, having role and responsibilities as defined above.  No grievance received for noise related issues and it is observed that ambient noise level are well within the permissible standards.
<b>6</b>	<b>Surface water quality (Terrestrial and Marine )</b>						
6.1	In general, release of untreated wastewater from industrial facilities would pose threat to water quality of streams, estuaries and marine water bodies.	Level -1	As per the master plan of APSEZ, 67 MLD of wastewater is expected to be generated from the fully developed project scenario, for which necessary permissions to set up decentralized CETPs of various	As per the master plan of APSEZ, the existing CETP shall be augmented to 67 MLD in progressive manner based on the future demand. The facility should limit the marine discharge of treated industrial wastewater to 16 MLD as per the permits. Remaining treated wastewater shall be utilized for horticulture purpose.	APSEZ	As and When Required	APSEZ has installed Common Effluent Treatment Plant (CETP) having 2.5 MLD capacities for treatment of partially treated effluent and sewage generated from industries within SEZ.  Currently, CETP receives 350 KLD hydraulic load and considering the current development scenario, existing CETP is adequate to treat and handle the total effluent load coming from industries within SEZ.  Out of 43 only 3 industries within SEZ are sending their partially treated industrial as well as domestic effluent to the CETP confirming CETP inlet norms for further treatment and final disposal. Other industries within SEZ have

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
			capacities are already obtained. Presently a CETP capacity of 2.5 MLD is in place. Presently member units treat their effluents to meet the CETP inlet norms and then send it to CETP. Treated wastewater from CETP meets the stipulated discharge norms for utilization for greenbelt development within the APSEZ areas.				<p>their own STPs / ETPs for treatment of wastewater generated from their industrial operation and discharging the treated water on land for horticulture purpose within their premises as per permission granted by SPCB.</p> <p>The capacities of CETP will be enhanced on modular basis as per future requirement.</p> <p>Presently avg. 1.4 MLD (from CETP, ETP &amp; STPs) of treated water is being utilized on land for horticulture purpose within APSEZ premises and no discharge is made to any other source.</p>
			Online wastewater quality monitoring systems are installed at	Efforts shall be made to recycle complete treated wastewater for port operations and industrial operations of APSEZ	APSEZ	Based on outcome Techno-feasibility Study	<p>Online continuous effluent monitoring system installed at the discharge point of CETP to track any deviation from discharge norms.</p> <p>Presently entire quantity of treated water from CETP is used for gardening / horticulture</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance
			CETP to ensure quality of treated effluent meets the requisite discharge norms. No wastewater from CETP is discharged into natural bodies as on date..	in future based on a detailed techno- economic feasibility study.			purpose within APSEZ premises.
			Runoff during monsoon from coal storage yards is collected in sedimentation ponds (dump pond) to remove any residual dust particulates for further disposal into sea	Storm water runoff from the facility during the first rain shall be sampled and analyzed for the presence of heavy metals or other criteria pollutants to adopt corrective and preventive actions to protect the marine water quality. All red and hazard category industry within APSEZ shall adopt spill prevention and control program and no effluents shall be discharged into	APSEZ	Continual	<p>There are provision of drains around coal stack yard to carry to runoff water to dump ponds. This water is either used for dust suppression or after sedimentation (to remove residual dust), is allowed disposal to sea.</p> <p>Presently Marine monitoring is being carried out once in a month by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. The analysis reports of the same are being submitted to the concerned authorities on regular basis.</p> <p>The marine water quality monitoring summary for last six months (Oct'19 to Mar'20) is as per below.</p> <p>Locations: 14 Nos. (APSEZ – 9 + APL – 5) Frequency: Once in a Month</p>



S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude 1	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ ESMP	Responsible agency	Timeframe for implementation	Compliance																																														
				storm water-drains.			<table><tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Surface</th><th colspan="2">Bottom</th></tr><tr><th>Max</th><th>Min</th><th>Max</th><th>Min</th></tr><tr><td>pH</td><td>--</td><td>8.34</td><td>8.02</td><td>8.28</td><td>7.88</td></tr><tr><td>TSS</td><td>mg/ L</td><td>364</td><td>26</td><td>381</td><td>22</td></tr><tr><td>BOD (3 Days @ 27 °C)</td><td>mg/ L</td><td>5.3</td><td>2.2</td><td>4.3</td><td>ND*</td></tr><tr><td>DO</td><td>mg/ L</td><td>8.8</td><td>5.1</td><td>6.2</td><td>4.9</td></tr><tr><td>Salinity</td><td>ppt</td><td>37.5</td><td>32.85</td><td>38.2</td><td>33.03</td></tr><tr><td>TDS</td><td>mg/ L</td><td>38496</td><td>35602</td><td>38796</td><td>35112</td></tr></table> <p>*ND = Not Detectable</p> <p>Approx. INR 21.74 Lakh is spent for all environmental monitoring activities during the FY 2019-20 which includes marine water monitoring.</p>	Parameter	Unit	Surface		Bottom		Max	Min	Max	Min	pH	--	8.34	8.02	8.28	7.88	TSS	mg/ L	364	26	381	22	BOD (3 Days @ 27 °C)	mg/ L	5.3	2.2	4.3	ND*	DO	mg/ L	8.8	5.1	6.2	4.9	Salinity	ppt	37.5	32.85	38.2	33.03	TDS	mg/ L	38496	35602	38796	35112
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			Detailed marine hydrodynamic modelling studies revealed that the current and proposed dredged soil disposal practices, sea water intake and outfall facilities and desalination	Good dredging practices shall be adopted by APSEZ: (i).Improving the dredging accuracy (ii).Improving onboard automation and monitoring, (iii). Reduce spill and loss, (iv). evaluating the need for installing silt screens near mangrove areas during the dredging phase	APSEZ	Long Term	<p>No capital dredging has been done, since Feb 2019. Dredged material generated during maintenance dredging is being disposed at designated locations within deep sea as identified by NIO.</p> <p>Dredging Management plan is adopted for carrying out dredging and management of dredge material.. Presently there are 3 nos. (2 Nos. Cutter suction + 1 No. Trailer suction) of dredgers are in operation for dredging.</p> <p>Marine monitoring is being carried out once in a month by NABL and MoEF&amp;CC accredited</p>																																														

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			plant outfall etc have shown insignificant impact on the marine eco-system. As part of the comprehensive environmental monitoring program, APSEZ has been adopting marine water and sediment quality monitoring on monthly basis.	operations, (v). Environment friendly dredging activities can be undertaken in such a way that the overall turbidity levels near the mangrove and ecologically sensitive zones shall not exceed 100 NTU or 200 mg/l of TSS (10% lethal level of fish) Existing marine monitoring program shall be continued as per the directions of MoEF&CC and GPCB.			agency namely M/s. Pollucon Laboratory Pvt. Ltd. The analysis reports of the same are being submitted to the concerned authorities on regular basis. Summary of marine water for the last six months is as mentioned above.  The same practice will be continued in future also as per direction by MoEF&CC as well as GPCB.  Monitoring will be focused near ecological sensitive area in case of need to carryout capital dragging near such areas..
<b>7</b>	<b>Groundwater quality and salinity ingress</b>						
7.1	While Mundra block is enjoying safe ground water status as on date (based on the data published by CGWB), due to induced economic and	Level-2	APSEZ is not utilizing ground water for any type of use. APSEZ is meeting the current water demand through Narmada water supply scheme and 47 MLD	A dedicated desalination plant of capacity 4,50,000 m3/day (450 MLD) will be developed in progressive manner to meet the APSEZ requirements.	APSEZ	As and When Required	Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited and same is sufficient to meet the present water demand. APSEZ does not draw any ground water.  The desalination plant of additional capacities will be installed on modular basis considering future development and requirement.

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	population growth, use of ground water resources by the local people might increase in Mundra region. This might increase the TDS and chloride levels in the ground water in future.		captive desalination plant at site.				
7.2	Due to induced growth in the region, pressure on the available ground water source would increase and this could pose some threat to salinity ingress.	Level-2	Ground water is not drawn by APSEZ for its operations. Natural streams (seasonal rivers) passing through the APSEZ area will not be disturbed, the micro-watershed in the area will	The Govt. of Gujarat, Narmada, Water Resources, Water Supply & Kalpsar Dept.,(WRD)12 has prevention projects	District Administration *	Long Term	APSEZ will co-operate and comply with the directions from concerned regulatory authorities.  APSEZ does not draw any ground water for the fresh water requirement.

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			not be disturbed. Due to the above reasons, the possibility of salinity ingress due to APSEZ development is not envisaged. Mundra and Anjar blocks fall under fresh water to medium salinity zones. It can be observed that little variation was observed in the ground water salinity levels from year 2013 to 2016 across the Mundra and Anjar blocks. This aspect confirms that the overall salinity ingress from the shore into the land				

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			due to existing APSEZ facilities and power plant outfalls are less significant.																																												
				While the individual industries in the study area will continue to undertake ground water quality monitoring as per the environmental clearances issued for the respective projects, a regional level ground water conservation action committee can be formed under the guidance of state ground water board and district Administration.	All Concerned Stakeholders, District Administration and CGWB*	Continual Process	<p>APSEZ is carrying out ground water sampling at 8 locations at every six months and reports of the same are being submitted to the regulatory authorities on regular basis. The summary of ground water quality monitoring for last six months (Oct'19 to Mar'20) are as below.</p> <p>Locations: 8 Nos. Frequency: Half Yearly</p> <table><tr><th>Sr. No.</th><th>Parameter</th><th>Unit</th><th>Max. Value</th><th>Min. Value</th></tr><tr><td>1</td><td>pH</td><td>--</td><td>8.1</td><td>7.6</td></tr><tr><td>2</td><td>Salinity</td><td>ppt</td><td>18.9</td><td>1.72</td></tr><tr><td>3</td><td>Oil &amp; Grease</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>4</td><td>Hydrocarbon</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>5</td><td>Lead as Pb</td><td>mg/L</td><td>0.072</td><td>ND*</td></tr><tr><td>6</td><td>Arsenic as As</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>7</td><td>Nickel as Ni</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr></table>	Sr. No.	Parameter	Unit	Max. Value	Min. Value	1	pH	--	8.1	7.6	2	Salinity	ppt	18.9	1.72	3	Oil & Grease	mg/L	ND*	ND*	4	Hydrocarbon	mg/L	ND*	ND*	5	Lead as Pb	mg/L	0.072	ND*	6	Arsenic as As	mg/L	ND*	ND*	7	Nickel as Ni	mg/L	ND*	ND*
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							<table><tr><td>8</td><td>Total Chromium as Cr</td><td>mg/L</td><td>0.072</td><td>0.036</td></tr><tr><td>9</td><td>Cadmium as Cd</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>10</td><td>Mercury as Hg</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>11</td><td>Zinc as Zn</td><td>mg/L</td><td>3.26</td><td>0.068</td></tr><tr><td>12</td><td>Copper as Cu</td><td>mg/L</td><td>ND*</td><td>Not Detected</td></tr><tr><td>13</td><td>Iron as Fe</td><td>mg/L</td><td>5.7</td><td>0.098</td></tr><tr><td>14</td><td>Insecticides/Pesticides</td><td>mg/L</td><td>Absent</td><td>Absent</td></tr><tr><td>15</td><td>Depth of Water Level from Ground Level</td><td>meter</td><td>2.6</td><td>1.8</td></tr></table>	8	Total Chromium as Cr	mg/L	0.072	0.036	9	Cadmium as Cd	mg/L	ND*	ND*	10	Mercury as Hg	mg/L	ND*	ND*	11	Zinc as Zn	mg/L	3.26	0.068	12	Copper as Cu	mg/L	ND*	Not Detected	13	Iron as Fe	mg/L	5.7	0.098	14	Insecticides/Pesticides	mg/L	Absent	Absent	15	Depth of Water Level from Ground Level	meter	2.6	1.8
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							Approx. INR 21.74 Lakh is spent for all environmental monitoring activities during the FY 2019-20 which includes ground water monitoring.																																								
							The fresh water requirement of all the industries within SEZ are being satisfied through APSEZ. All the industries are encouraged to monitor ground water quality as per the permissions granted by competent authorities.																																								
							As mentioned above, presently, APSEZ has																																								

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							<p>formed Internal Environment Monitoring Committee, involving Sr. Management of APSEZ and Adani Power Limited, having role and responsibilities as defined above.</p> <p>APSEZ will co-operate and comply with the directions from concerned regulatory authorities for ground water management.</p>
<b>8</b>	<b>Waste Management</b>						
8.1	Solid waste will be generated from industrial activities of APSEZ and other permitted facilities in the study area including Mundra town. These wastes would contain recyclable material, construction debris, organic waste, inert material and e-waste etc. In the absence of	Level-2	APSEZ has been adopting Zero waste Initiatives and the entire waste generated from existing operations is segregated and disposed to recycling vendors, thereby APSEZ has achieved zero landfill status as on date.	APSEZ will continue to adopt Zero Waste Initiative and wastes will be segregated at source and disposed to various recycling vendors, co-processing in cement plants. This initiative helps not only to reduce the waste to landfill significantly, but also to recycle the materials there by avoiding ecological impacts.	APSEZ	Continual Process	<p>Presently APSEZ has implemented Zero waste Initiatives as per 5R (Reduce, Reuse, Recycle, Recover &amp; Reprocess) principles of waste management. At present, APSEZ has developed material recovery facility for 6.0 TPD capacities. A well-established system for segregation of dry &amp; wet waste is in place. All wet waste (Organic waste) is being segregated &amp; utilized for compost manufacturing and/or biogas generation for cooking purpose. The compost is further used by in house horticulture team for greenbelt development. Whereas dry recyclable waste is being sorted in various categories. Presently manual sorting is being done for sorting of different types of solid waste. Segregated recyclable materials such as Paper, Plastic, Cardboard, PET Bottles, Glass etc. are then sent to respective recycling units, whereas remaining non-recyclable waste is bailed and sent to cement plants for Co-processing as RDF (Refused Derived Fuel). The same practice will be continued in future also. APSEZ has also been recognized for Zero</p>

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	any organized source segregation programs and material recycling strategies and infrastructure facilities, these wastes will enter into environment and would pose long term health impacts.						Waste to Landfill certification from reputed organization. Copy of certificate is attached as <b>Annexure – B</b> .  APSEZ will continue proper solid waste management in his operational area.
8.2	Considering an average solid waste generation of 0.25 Kg/person/day, the estimated solid waste from facilities within APSEZ will be in the order of 100	Level-2	APSEZ has made a provision for central waste management facilities within the existing site based on the future needs. As part of the Zero Waste Initiatives, no landfill facilities will be installed at APSEZ.	The existing waste segregation and material recycling facilities will be augmented to dispose safely the wastes generated from APSEZ areas. Solid Waste Management Program shall be adopted and implemented as per Municipal Solid Waste Management Rules 2016 and Construction Waste	APSEZ	Continual Process	

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	TPD (36,500 TPA).			Management Rules 2016			Industries located within the SEZ area are also complying with the waste management rules stipulated by statutory authorities and same has also been confirmed by APSEZ as well SPCB on regular basis.
8.3	About 35 TPD (13,000 TPA) of solid waste would be generated from the proposed industrial areas located outside the APSEZ area.	Level-2	As per the MSW Rules 2016 all the industrial facilities and SEZs are required to adopt waste segregation facilities at the respective properties and non-recyclable waste shall be disposed to landfill sites.	Solid Waste Management Program shall be adopted and implemented as per Municipal Solid Waste Management Rules 2016 and Construction Waste Management Rules 2016	All Industries	Continual Process	
9	<b>Ecological aspects (terrestrial and marine)</b>						
	About 1576 ha of shrub		It is noted that the designated forest land is free from any	APSEZ has approached concerned authorities for diversion of designated forest land. Suitable compensatory			Stage -1 forest Clearance for about 1576. Ha Forest land has been obtained. Presently APSEZ is in the process of compliance to the stage – 1 Forest Clearance conditions, for further submitting to Govt authorities for issuance of Stage-2 Forest Clearance.

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9.1	forest land contiguous to APSEZ area is applied for land diversion for various developmental activities. This might have certain level of changes in the biodiversity in the study area.	Level -1	<p>native vegetation and comprises of Prosopis juliflora. It is also noted that no endangered species are present at the shrub forests that are applied for land diversion.</p> <p>It is also noted that no forest produce is reported from this designated forest land parcel due to lack of economic importance of plant species reported in the shrub forest.</p> <p>It is also noted that no tribal lands are located in the</p>	<p>afforestation plan shall be adopted based on the recommendations and directions of the concerned authorities. Due to adoption of compensatory afforestation program through a scientific manner, the overall ecological footprint in the district will be increased.</p> <p>Due to plantation of native tree species as part of greenbelt development, the overall biodiversity of the region will increase considerably when the project is fully developed.</p>	APSEZ/State Forest Department*	Long Term	



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			designated forest land parcel. Hence there will not be any change in biodiversity due to the proposed diversion.				
9.2	Mangrove conservation areas are located adjacent to the APSEZ area. Accidental discharges of industrial effluents into the marine environment would pose certain ecological risk.	Level -1	No development activities will be undertaken within mangrove conservation areas. APSEZ has taken up large scale mangrove afforestation activities in an area of more than 2800 ha at various locations across the coast of Gujarat state in consultation with various	Mangrove footprint and health status shall be monitored annually	APSEZ	Continual Process	As per study conducted by NCSCM in 2017, mangrove cover in and around APSEZ, Mundra has increased from 2094 Ha to 2340 ha (as compared between 2011 to 2017). The analysis has shown an overall growth of 246 ha. The cost for said study was INR 3.15 Cr.  Further work has been assigned to NCSCM in March 2020 as part of compliance for the action plan "Monitoring of mangrove cover". The cost of the said work is INR 23.56 Lacs.

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			organizations The Adani Foundation introduced 'Mangrove Nursery Development and Plantation' scheme in the area as an alternative income generating activity for the people of the region.				
9.3	Outfall from the thermal power plants desalination and CETP would pose certain level of impact on the marine environment.	Level-1	A detailed marine hydro-dynamic and dispersion modelling of the study area indicates that the background temperature and salinity at mangrove conservation area will not increase from the prevailing	All approved marine outfalls shall be monitored for salinity, temperature and other designated parameters as per consent to establish issued by GPCB. Existing marine environmental monitoring program shall be continued.	APSEZ and Concerned Industry	Continual Process	<p>Presently marine monitoring is being carried out by the Adani power plant at the marine outfall locations and reports are being submitted to the concerned authorities on regular basis.</p> <p>APSEZ is carrying out Marine monitoring once in a month at 9 locations in deep sea by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. The analysis reports of the same are being submitted to the concerned authorities on regular basis.</p> <p>Adani power plant is also doing marine water quality at 5 locations (2 locations at outfall location) in deep sea by NABL and MoEF&amp;CC</p>

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			background levels as the outfalls are located far away. APSEZ and respective power plants in the study area have been monitoring the marine water quality status on monthly basis for the stipulated environmental and ecological parameters.				<p>accredited agency namely M/s. Unistar Environment &amp; Research Labs Pvt. Ltd. The analysis reports of the same are being submitted to the concerned authorities on regular basis. The summary of marine water quality is shown above.</p> <p>The comparison of marine water results between CIA and current monitoring data are as below.</p> <table><tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Max</th><th colspan="2">Min</th></tr><tr><th>CIA</th><th>Present</th><th>CIA</th><th>Present</th></tr><tr><td>Temp.</td><td>°C</td><td>30.2</td><td>30.4</td><td>28</td><td>29.5</td></tr><tr><td>Salinity</td><td>ppt</td><td>41.8</td><td>37.8</td><td>34.9</td><td>34.6</td></tr></table> <p>As per above results, it can be seen that there is no major deviation in the concentration of parameters and thus indicates that impacts are insignificant.</p> <p>Presently no desalination plant, sea water intake as well as outfall facilities have been developed as a part of EC &amp; CRZ Clearance of Multiproduct SEZ. Hence there is no marine discharge from components approved as part of SEZ.</p>	Parameter	Unit	Max		Min		CIA	Present	CIA	Present	Temp.	°C	30.2	30.4	28	29.5	Salinity	ppt	41.8	37.8	34.9	34.6
Parameter	Unit	Max		Min																									
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Temp.	°C	30.2	30.4	28	29.5																								
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9.4	<b>Terrestrial Ecology:</b> Study area doesn't	Level-1	APSEZ has developed greenbelt in an	The compensatory afforestation area to	APSEZ	Continual Process	APSEZ has developed its own "Dept. of Horticulture" which is taking measures/ steps for terrestrial plantation/greenbelt development. APSEZ, Individual SEZ Industries																						

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	have any notified national parks or ecological sanctuaries. Since the area falls under dry deciduous shrubs. Due to scanty rains in the area, the overall natural green-cover/vegetation in the area is very small.		area of 550ha as against the committed area of 430ha. A dedicated nursery is set up to promote plantation. APSEZ have undertaken a plantation with about 9.6 Lakh fully grown trees.	be monitored annually to check the survival rate of the plantation.			and Adani Power Plant has developed total 623 ha. area as greenbelt with plantation about 11.6 Lacs saplings within the APSEZ area including SEZ industries & Adani Power Plant.  Dedicated horticulture department is maintaining and monitoring the terrestrial green belt development on regular basis to check the survival rate of plantation.  Total expenditures of the horticulture dept. during the FY 2019-20 within APSEZ is INR 728 lakh.
<b>10</b>	<b>Socio-economic aspects</b>						
10.1	Population growth in the Mundra region was reported to be in the order of 85% during the past decade (2001-2011). Further expansion of the urban area could be possible due to	Level-1	Dedicated townships are developed within APSEZ area with necessary community infrastructures such as hospital, school, recreational facilities, sewage treatment and waste collection	The existing townships will be expanded to accommodate about 4lakh people when the project activity is fully developed.	APSEZ	As and When Required	APSEZ has developed two townships (Shantivan and Samudra) accommodating 2180 households and associated infrastructure facilities. Accommodation is made available for all interested employees working within Adani group & SEZ industries. Out of which 86% Occupancies are accommodated within the townships and rest are available for employees working within APSEZ.  At present 43 nos. of industries are operating within the SEZ. Township facilities are also

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	induced economic growth in the region. Increase in population will have a additional need for public infrastructure in the region.		facilities. Adani Foundation has been undertaking various CSR programs under the principal themes such as education, community health, sustainable livelihood and rural infrastructure. About Rs. 97 Cr has been spent on various CSR activities in the Mundra region since 2010. Similar community development programs (based on need based assessment) will be continued in future as well with allocation of appropriate budget.				<p>made by SEZ industries within Mundra town for their employees having basic infrastructure facilities and requirements. Most of the employees working in SEZ industries are residing in Mundra township having all basic requirements and associated facilities.</p> <p>The existing social infrastructure facilities are adequate to accommodate the people considering present APSEZ development. The existing townships with associated facilities will be expanded as per requirement. Other infrastructure facilities have been developed for people are as follows.</p> <ul style="list-style-type: none"> <li>• Multi-Specialty Hospital</li> <li>• School</li> <li>• Commercial complex</li> <li>• Religious place</li> </ul> <p>APSEZ is actively working with local community (including fishermen community) around the project area and provides required support for their livelihood and other concerns through the CSR arm – Adani Foundation in the main five persuasions is mentioned below.</p> <ul style="list-style-type: none"> <li>• Community Health</li> <li>• Sustainability Livelihood – Fisher Folk</li> <li>• Education</li> <li>• Rural Infrastructures</li> <li>• Skill Development</li> </ul> <p>About Rs. 34 Cr has been spent on various CSR activities in the Mundra region since April</p>



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							<p>2018 till March 2020 including cost of rural infrastructure projects development.</p> <p>Major works carried out since April 2018 as a part of CSR activities are as below.</p> <ul style="list-style-type: none"> <li>• Pond Deepening work at Vadala &amp; Mota Bhadiya</li> <li>• Artificial recharge borewell in Borana, Mangara &amp; Dhruv village.</li> <li>• Under Dignity of Drivers Project, Adani Foundation has constructed Resting Shed for Drivers entering in SEZ Premises. Total 50 beds are constructed, drinking water and sanitation plus recreational – TV Facilities.</li> <li>• Construction of 45 Toilet block and proper bathing place for labours.</li> <li>• RO Plant – Samaghogha, Siracha village &amp; Vallabh Vidyalaya at Mundra</li> <li>• Basic sanitation facility (18 Nos) at Balvadi, medical centre and retiring places at labour settlements</li> <li>• Ground recharge activities (pond deepening work for more than 52 ponds) individually and 26 ponds under Sujlam Suflam Jal Abhiyan were built leading to a significant increase in water table and higher returns to the farmers.</li> <li>• Roof Top Rain Water Harvesting 54 Nos. and Recharge Bore well 75 Nos.</li> <li>• Drip Irrigation 823 Farmers benefitted in</li> </ul>

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							<p>coordination with Gujrat Green Revolution Company</p> <ul style="list-style-type: none"> <li>Participatory Ground Water Management in ten villages with holistic approach for Kankavati Sandstone Aquifer Programme.</li> </ul> <p>Similar community development programs (based on need based assessment) will be continued in future as well with allocation of appropriate budget.</p>
10.2	The overall sex ratio was found to reduce by 28% in the Mundra taluk (study area) during the period 2001 - 2011. This could be attributed to increase in influx of working men in the region due to rapid economic development. Similar trend might continue in future due to induced economic growth in the	Level-2	Adani foundation is taking up several girl child education programs as part of CSR activities to create awareness about girl child protection.	Suitable regional level awareness programs on the girl child protection and encouragement programs in line with state and national policies shall be adopted under Corporate Social Responsibility programs in association with district authorities.	APSEZ, Other development projects and District Administration*	Long Term	<p>Major works carried out since April 2018 as a part of CSR activities to create awareness about girl child protection are as below.</p> <ul style="list-style-type: none"> <li>The Adani Foundation provided scholarship support to motivation and encouragement of fishermen boys and girls for higher education under this program. APSEZ provide 100% fees support to girls as a scholarship. This year total 78 students are being facilitated by Adani foundation.</li> <li>Separate sanitation facilities for girl child in schools.</li> <li>Total 8770 haemoglobin screenings of RPA woman and adolescent girls was carried out in year 2017-18. Which helps in controlling anaemia in women and indirectly malnutrition.</li> <li>Beti Vadhavo Programme was organized in 32 Villages in the presence of Village Sarpanch and other leaders in year 2017-</li> </ul>

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	region.						<p>18. We explained people about the various topics i.e. importance of girl child, Sex Ratio, Gender Equality and laws regarding Child abortion. This initiative was well accepted by community and we have observed a visible change in their mindset. We have facilitated 560 daughters with Kit (Small Bed sheet, Mosquito net, Soap and Cream with nutritious food for mother) To create awareness about health, personal hygiene, child education and nutritional diet in fishermen community, various awareness programs have been organized.</p> <ul style="list-style-type: none"> <li>• Project Suposhan is initiated with the Motive ... Curb malnutrition amongst Children, Adolescent girls and Women in our CSR villages.</li> <li>• To reduce malnutrition and anemia amongst Children 95 % &amp; adolescent girls and pregnant &amp; lactating women by 70 % in three years</li> <li>• Reduction IMR and MMR</li> <li>• Support Awareness &amp; Cover 100 % Vaccination taken by Child &amp; women.</li> </ul> <p>About Rs. 34 Cr has been spent on various CSR activities in the Mundra region since April 2018 till March 2020 including cost of community health and education for woman and girl child.</p>

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10.4	Due to economic growth leading to rapid urbanization, which prompts the need for healthcare facilities in the region. For an influx of 6 lakh people from APSEZ operations and additional 3 Lakh from induced growth by the year by 2030 (fully developed scenario), total hospitals facilities with about 540 beds would be required.	Level-2	Adani hospitals, Mundra is setup by Adani group near Samudra township with a goal to provide primary and secondary health care services to Adani group employees and the local populace of Mundra. The existing 100 bed Adani hospital at Mundra has been catering the services ranging from wellness and preventative care.	APSEZ will explore other possibilities to augment the primary and secondary healthcare facilities in future depending on the growth scenario at APSEZ development.	APSEZ	Long Term	<p>Adani hospitals (Multi-specialty), Mundra is having 100 bed facility and same is setup by Adani group near Samudra township.</p> <p>Primary health center and community health center are in place within the Mundra taluka.</p> <p>Other than this Adani foundation is doing various activities as part of community health. The details of last year are as below.</p> <p><b><u>Community Health – Mundra</u></b></p> <ul style="list-style-type: none"> <li>• 11 Rural Clinic-8 from Mundra &amp; 3 from Anjar block treated; 25142 patients.</li> <li>• 31 villages covered through Mobile healthcare unit 20399 patients benefited during the year.</li> <li>• The mobile health care unit cover 25 villages and 07 fishermen settlements. Around 90 types of general life saving medicines are available in these units.</li> <li>• During the year 2019-20, total 9860 transactions were done by 8672 card holders of 68 villages of Mundra Taluka. They received cash less medical services under the senior citizen project.</li> <li>• In the year of 2019-20, Total 3137 people had been benefitted by various kind of camp and needy and screened patients are treated in Adani Hospital.</li> </ul> <p><b><u>Community Health – Bhuj</u></b></p> <ul style="list-style-type: none"> <li>• 5398 Patients taken Care and</li> </ul>

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							<p>Coordination</p> <ul style="list-style-type: none"> <li>• 609 Dead body referred by carry van</li> <li>• 3557 Ayushman Gold Card facilitation through Enrollment camp and Mahiti Setu</li> <li>• 549 support for Implants and Needy Patients</li> <li>• 9896 People helped through Mahiti Setu for various government schemes</li> <li>• 816 people benefitted in 6 health awareness camps</li> <li>• Adani Foundation organized 52 General Health Camps and Speciality Camps in various interior villages of Kutch in coordination with GKGH which created magical impact and benefitted 4779 patients. Adani Foundation Bhuj Health team has also organized more than six awareness camps.</li> <li>• Adani foundation, Adani Hospital and GAIMS have Jointly Celebrated "Arogya Saptah" 8th to 14th August &amp; 20th to 26th January in Respect of Independence and Republic of our country. Celebration included multi-specialty camps, Workshops, truckers health check-up, surgical camp on foundation day and adolescent fair at different part of district. Collector.</li> </ul> <p>About Rs. 34 Cr has been spent on various CSR activities in the Mundra region since April 2018 till March 2020 including cost of community health.</p>



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							<p>Present Hospital facilities are adequate to avail the medical treatment for Mundra region considering present development. Other Occupational Health centres, primary health centers and community health centres are also in place in Mundra to take care the people residing in Mundra. Adani group is also operating high quality health care services to the people of Kutch at G. K. General Hospital, Bhuj having 750 beds facilities on public private partnership (PPP) model, which is 60 km far from Mundra.</p> <p>APSEZ will explore other possibilities to augment the primary and secondary healthcare facilities in future depending on the future development at APSEZ.</p>
10.5	<p>Due to rapid economic development in the region, several employment opportunities can be generated to the local people.</p> <p>When the area is fully developed by the end of</p>		<p>APSEZ has been giving preferences to people from Gujarat for providing employment opportunities based on eligibility and skills. In Mundra, special programmes have been conducted by Adani</p>	<p>APSEZ is committed to provide support for fishermen livelihood activities and has submitted a detailed 5 years plan to MoEF&amp;CC with a total budget of Rs.13.5 Cr.</p>	APSEZ	Short Term	<p>The Adani Foundation has provided employment equivalent to 6261 man-days to fishermen in the year 2019-20. So total employment worth of 42048 man-days has been provided to fishermen till date. The Foundation has also supported Pagadiya fishermen as painting laborers by providing them with employment and job in various fields.</p> <p>Adani Skill Development Centre (ASDC) is playing a pivotal role in implementing sustainable development in the state. The objective of this Centre is to impart different kinds of training to the students of 10<sup>th</sup>, 12<sup>th</sup>, college or ITI from surrounding areas.</p>

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	2030, the working population of the Mundra taluk would increase from current level of 55,000 to as high as 4,00,000, which will be 45% of the total envisaged population in Mundra Taluk by the end of 2030.		Foundation to enhance the employability of youth from fisherfolk communities. Based on the need assessment results, several livelihood options have been introduced by the Adani Skill Development Centre, Mundra. In these centres, youth can join and get vocational training for a number of technical and non-technical skills. An industrial Training Institute is set up at APSEZ, Mundra, to enhance the skill levels of the local youth to maximum possible extent.				<p>During this year Total 2664 people trained in various trainings to enhance socio economic development.</p> <p>APSEZ is carrying out various initiatives specific to the Fisherfolk community which includes:</p> <ul style="list-style-type: none"> <li>• Vidya Deep Yojana</li> <li>• Vidya Sahay Yojana – Scholarship Support</li> <li>• Adani Vidya Mandir</li> <li>• Fisherman Approach in SEZ</li> <li>• Machhimar Arogya Yojana</li> <li>• Machhimar Kaushalya Vardhan Yojana</li> <li>• Machhimar Sadhan Sahay Yojana</li> <li>• Machhimar Awas Yojana</li> <li>• Machhimar Shudhh Jal Yojana</li> <li>• Sughad Yojana</li> <li>• Machhimar Akshay kiran Yojana</li> <li>• Machhimar Suraksha Yojana</li> <li>• Machhimar Ajivika Uparjan Yojana</li> <li>• Bandar Svachhata Yojana</li> </ul> <p>These initiatives are planned for the period 2016 – 2021 with a committed expense of INR 13.5 Cr as submitted earlier in detail in the report namely “Silent Transformation of Fisher folk at Mundra”, .</p> <p>Till, March 2020 (Since 2016-17) approx. 8.13 Cr. INR, has already been spent in support for</p>

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							fishermen livelihood activities.

**ANNEXURE – A**

**Photographs showing Dump Pond and Strom Water Drain near Coal Yard**



ZERO Waste to Landfill Certificate

# Certificate

## LIBEROASSURANCE



This is to certify that the  
Management System of:

**Adani Ports and SEZ Ltd (APSEZ)**

**adani**

Ports and  
Logistics

Mundra, Kutch 370421, India

Has been assessed and registered under the certification and inspection scheme of  
LiberoAssurance for the following standard:

## Zero Waste to Landfill

The Management System is applicable to:

**Handling, Warehousing, Logistics**

Issued 28/03/2019 at PIRAEUS, GREECE  
(Date of issue) (Place of issue of certificate)

Expiry 27/03/2020  
(Expiration date)

For the Issuing Organisation  
Efthymios Liberopoulos

LiberoAssurance is:  
ISO 17021 Accredited Body by IAS  
(USA) & ESYD (GREECE)

This certificate is valid subject to satisfactory  
completion of annual audits.

Certificate ID: **IN28135002192W11**

Please Check Validity of this Certificate at:  
<https://liberoassurance.org/verification/>

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