**APSEZ/EnvCell/2018-19/008** **Date:** 16.05.2018

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

**Sub** : Half yearly Compliance report of Environment Clearance under CRZ notification for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat by M/s. Adani Ports & SEZ Limited."

**Ref** : Environment clearance under CRZ notification granted to M/s Adani Ports & SEZ Limited vide letter dated 20th September, 2000 bearing no. J-16011/40/99-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 – 2017 to March - 2018 is enclosed here for your records. The stated information is also provided in form of a CD (soft copy).

Thank you,
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 Bhavan, Sector 10 A, Gandhi Nagar – 382 010
4) Deputy Secretary, Forests & Environment Department, Block – 14, 8th floor, Sachivalaya, Gandhi Nagar – 382 010
5) Regional Officer, Regional Office GPCB (Kutch-East), Gandhidham, 370201

# Environmental Clearance Compliance Report

Port Expansion Project including Dry/Break Bulk Cargo Container Terminal, Railway Link and related Ancillary and Back-up facilities at Mundra Port, Dist. Kutch, Gujarat

## Adani Ports and SEZ Limited

For the Period of:

October - 2017 to March- 2018

# Index

# Compliance Report

| | | |
|---|---|---|
| adani | **Adani Ports and SEZ Limited** | **From : Oct'17**<br>**To : Mar'18** |

**Status of the conditions stipulated in Environment Clearance under CRZ notification**

**Half yearly Compliance report of Environment Clearance under CRZ notification for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat vide letter no. J-16011/40/99-IA.III dated 20th September, 2000"**

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td colspan="3">A. Specific Condition</td></tr>
<tr><td>i</td><td>All the conditions stipulated by the Gujarat Pollution Control Board vide their NOC No. PC/NOC/Kutch/391/18424 dated 10.6.99 and No. PC/NOC/Kutch/222(2)16880 dated 1.5.99 shall be strictly implemented.</td><td>Complied.<br><br>Consent to Establish (CtE) and Consent to Operate (CtO) is obtained and renewed/amended from time to time as per the progress of the project activity. The present in-force CTE & CtO summaries are as below.
<table>
<tr><th>Permission</th><th>Project</th><th>Ref. No. / Order No.</th><th>Valid till</th></tr>
<tr><td>CtO – Renewal</td><td>Mundra Port Terminal</td><td>AWH-83561</td><td>20.11.2021</td></tr>
<tr><td>CtO - Amendment</td><td>Mundra Port Terminal</td><td>WH-88317</td><td>20.11.2021</td></tr>
</table>
Copy of the updated/amended CC&A was submitted as part of compliance report for the duration of Apr'17 to Sep'17.</td></tr>
<tr><td>ii</td><td>The conditions stipulated in the letter No ENV-1098-6477-PI dated October 28, 1999 and No. ENV-1099-2702-PI dated 27.12.99 of shall be strictly implemented.</td><td>Complied.<br><br>Point wise compliance report of CRZ recommendations issued vide letter No ENV-1098-6477-PI dated October 28, 1999 and No. ENV-1099-2702-PI dated 27.12.99 is enclosed as Annexure- A.</td></tr>
<tr><td>iii</td><td>The turning circle should be increased from 550 m to 600 m.</td><td>Complied.<br>Construction activities are completed and project is in operation phase.</td></tr>
<tr><td>iv</td><td>A girdle canal with settlement tanks shall be provided around the coal storage area.</td><td>Not applicable at present.<br>Coal handling is not practiced at project site.</td></tr>
<tr><td>v</td><td>All efforts shall be made for water conservation and rain water harvesting.<br>Arrangements shall be made for roof top rain water harvesting from various structures.</td><td>Complied.<br><br>Under the Water Conservation and Optimization Drive at APSEZ, various initiatives were taken for conservation of water such as,<br>1. 100% utilization of treated water for horticultural purpose.<br>2. Total 33 Water-free urinals are installed and in</td></tr>
</table>

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | | operation at Adani House & Tug Berth building<br>3. Recirculation of water from fixed firefighting system to reservoir through flexible pipe during testing of firefighting system.<br>4. Conservation of Condensate from Air Conditioner and use for gardening<br>5. Water flow reducers are provided in taps of Adani House, Tug Berth, CT2, CT3 & CT4 buildings to reduce the water consumption and are in use.<br>6. Water Maker machine is installed near Tug Berth jetty which generates drinking water from atmospheric moisture. The capacity of this machine is 250 liters per day.<br>7. Attending leakages and damages of water lines at various locations of APSEZ.<br><br>Above initiative have saved substantial amount of water consumption.<br><br>Groundwater recharge cannot be done at the project site since the entire project is in the intertidal / sub tidal areas. Rain water within project area is managed through storm water drainage. However, APSEZ has carried out pond deepening activity at Mota Bhadiya, Vadala and Bhujpur villages during the compliance period to envisage rainwater harvesting.<br><br>Adani foundation has started participatory ground water management project. The objective of the project was to reduce the salinity ingress in and around the coastal regions of Mundra, Kutchh and mitigate the ill-effects of this manmade problem to improve the livelihoods of the rural people. The Project will help to get water table high, also it will help in agricultural activities. – as part of this initiative, below listed activities are initiated:<br>• Ground Water Recharge activities at Jharpara, Navinal, Siracha, Nana Kapaya and Baroi villages<br>Monitoring of 109 wells by sample collection and analysis of the same (analysis is under progress) to measure the quality of water<br>Please refer **Annexure – 1** of CSR activity report for more details upon participatory ground water management initiatives. |
| vi | To obviate the problem | Complied. |

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>of coastal erosion due to dredging, the setback distance of at least 50 m from the Chart Datum line of Bocha island would be maintained.</td><td>During Maintenance dredging in this area, it is ensured that at least 50 m distance is maintained.</td></tr>
<tr><td>vii</td><td rowspan="2">The dredged material shall be disposed of only in the identified locations outside the CRZ area. While dumping the dredged material, sufficient distance should be ensured from the existing mangroves so that there is no damage to the ecology. During dumping of dredged material the mitigative measures as suggested by NIO shall be implemented. It shall be ensured that there is no dumping of dredged material in the CRZ.</td><td>Complied.<br><br>Capital dredging is completed and only maintenance dredging is being carried out, if required.<br><br>Dredged material generated by maintenance dredging is used for level rising. The measures recommended by NIO are implemented.<br><br>In order to ensure no damage to marine ecology Marine water & sediment monitoring is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below.<br><br>Total Sampling Locations: 09 Nos.
<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>8.47</td><td>7.52</td><td>8.29</td><td>7.28</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>412</td><td>142</td><td>390</td><td>29</td></tr>
<tr><td>BOD (3 Days @ 27 °C)</td><td>mg/L</td><td>5.6</td><td>1.2</td><td>4.6</td><td>1</td></tr>
<tr><td>DO</td><td>mg/L</td><td>6.8</td><td>4.8</td><td>6.6</td><td>4.8</td></tr>
<tr><td>Salinity</td><td>ppt</td><td>40.96</td><td>34.2</td><td>40.8</td><td>34.1</td></tr>
<tr><td>TDS</td><td>mg/L</td><td>41030</td><td>34940</td><td>40760</td><td>34720</td></tr>
<tr><td>COD</td><td>mg/L</td><td>24</td><td>4.8</td><td>18</td><td>4.4</td></tr>
</table>
The results depict that there is no damage to the marine ecology. Monitoring Reports are attached as Annexure – 2 for the same.<br>Approximately INR 27 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18</td></tr>
<tr><td>viii</td><td>The mangrove afforestation shall be undertaken at the identified sites and the progress report in this regard shall be submitted</td><td>Complied.<br><br>All construction activities are completed and project is in operation phase since long time. 24 hectare of mangrove afforestation was carried out at identified sites in consultation with Dr Maity, (Mangrove Consultant of</td></tr>
</table>

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | to this Ministry regularly. All the recommendations suggested in the NIO report for restoration of the coastal habitat by mangrove afforestation at Navinal island shall be strictly implemented. | India).<br><br>To enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in more than 2800 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 782 lakh. So, far APSEZ have developed more than 400 ha. area as greenbelt with plantation more than 8.0 Lacs trees within the APSEZ area.<br><br>Details of mangrove plantation and green belt development carried out by APSEZ till date is annexed as **Annexure – 3.** |
| ix | No ground water shall be withdrawn for this project. | Complied.<br>Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited. Average water consumption for entire APSEZ area is 5.2 MLD. |
| x | The project proponent shall ensure that the construction workers do not cut the Mangroves for fuel wood etc. | Complied.<br><br>All construction activities are completed and project is in operation phase since long time. |
| xi | The project proponent shall ensure that no creeks are blocked and the natural drainage of the area is not affected due to project activities. | Complied.<br>Prominent creek system (main creeks and small branches of creeks) in the study region are: (1) Kotdi (2) Baradimata (3) Navinal (4) Bocha (5) Mundra (Oldest port (Juna Bandar) leading to Bhukhi river)<br><br>All above creeks are in existence allowing free flow of water and there is no filling or reclamation of any creek area. APSEZ has so far constructed 19 culverts having total length of approx. 1100 m with total cost of INR 20 Crores. Apart from that three RCC Bridges have been constructed over Kotdi creek with total length of 230 m at the cost of INR 10 Crores. Photographs of the same were attached as part of compliance report for the duration of Apr'17 to Sep'17. |
| xii | The project proponent shall ensure that there will be no disposal of sullage and sewage generated from | Complied.<br>Project is in operation phase.<br><br>Sewage generated from port is being treated in designated STP and treated sewage is used for |

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>construction camps, surface run-off from construction sites, and oil and grease spillage from the construction equipment's in the creeks.</td><td>horticulture purposes.
<table>
<tr><th>Location</th><th>Capacity</th><th>Quantity of Wastewater</th><th>Type of ETP / STP</th></tr>
<tr><td>LT</td><td>265 KLD</td><td>85 KLD</td><td>Activated Sludge</td></tr>
</table>
<br>Third party analysis of the treated water is being carried out twice in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for the duration from Oct'17 to Apr'18 is mentioned below. The results of the same are attached as Annexure – 2.
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit$</th></tr>
<tr><td>pH</td><td>--</td><td>7.75</td><td>6.19</td><td>6.5 – 8.5</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>90</td><td>22</td><td>100</td></tr>
<tr><td>TDS</td><td>mg/L</td><td>2060</td><td>1032</td><td>2100</td></tr>
<tr><td>COD</td><td>mg/L</td><td>96</td><td>72</td><td>100</td></tr>
<tr><td>BOD (3 Days @ 27 °C)</td><td>mg/L</td><td>27</td><td>19</td><td>30</td></tr>
</table>
$ as per CC&A granted by GPCB
<br>Approximately INR 27 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18</td></tr>
<tr><td>xiii</td><td>The project proponent shall stick to the time bound program submitted to the Department of Environment, Government of Gujarat for the proposed activities including installation of desalination plant for meeting the entire water requirement. They shall coordinate their construction/operations schedule with the installation schedule of desalination plant.</td><td>Complied.<br><br>Desalination plant has already been installed as per time bound program and is in use. Details regarding water consumption are mentioned in Sr. no. ix above.</td></tr>
<tr><td>xiv</td><td>The project proponent shall ensure that the</td><td>Complied.</td></tr>
</table>

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | commercial fisheries are not hampered due to presence of barges, vessels and other activities in the region. Necessary plan in this regard shall be prepared in consultation with the NIO and submitted within 3 months. | No commercial fisheries are prevailing in this area except Pagadia and fishermen with small boats. Unhindered access is provided to the fishing boats.<br><br>During project proposal, APSEZ proposed to provide four (4) dedicated accesses at Juna Bandar, Luni, Bavdi Bandar and Zarpara for the fishermen to approach the sea for fishing activity. However, during construction as well as operation, through fishermen consultative process, APSEZ has provided seven (7) access roads. Total length of all the approach roads is approx. 23 Kms and expenditure involved was Rs. 637 Lacs. There is no hindrance to the movement of fisherman boats. |
| xv | The project proponent shall bear the cost of the external agency that may be appointed by the Department of Environment, Government of Gujarat for carrying out the supervision and/or the monitoring of the construction activities. | Complied.<br><br>Construction activities are completed and project is in operation phase.<br>As part of the directions given by MoEF&CC vides order dated 18th Sep, 2015, following studies were proposed.<br>• Bathymetry & Topography study, preparation of plan for protection of creeks/ mangrove area including buffer zone, mapping of co-ordinates, running length, HTL, CRZ boundary. Cost of the study as per the NCSCM proposal is 315.5 Lakh. The progress report for the same is attached as **Annexure - 4**<br>• A Regional Impact Assessment study to identify impacts of all the existing as well as proposed project activities in Mundra region. Total cost of the study is approx. INR 1.3 cr. which is financed by APSEZ. The study is recently concluded and the final report is submitted vide our letter dated 30.04.2018 to GCZMA and MoEF&CC for their consideration. Copy of the acknowledgement letter is attached as **Annexure – 5**. |
| xvi | The project proponent shall carry out the post-project monitoring of various environmental parameters in consultation with the Department of Environment, Government of Gujarat and Gujarat Pollution | Being complied.<br><br>Monitoring of various environmental parameters for Ambient Air, Noise, Wastewater, ground water, marine water and sediments along with the parameters mentioned in the consent order issued by GPCB is being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd.. Monitoring reports for the period from Oct'17 to Mar'18 are enclosed as **Annexure – 2.** |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | Control Board. | |
| xvii | The project proponent shall prepare the detailed traffic control management plan for the port and shall participate in the VTMS to be developed for the Gulf of Kachchh. | Complied.<br><br>APSEZ is practicing well defined traffic control procedure.<br><br>A VTS service for Gulf of Kutch is operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India.<br><br>APSEZ is practicing well defined traffic control procedure. Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77. Arrival and departure information in Gulf of Kutch is provided to VTS information cell through an agent or directly by sending an e-mail to vtsmanagergulfofkutch @ yahoo.com and vtsgok@yahoo.com. |
| xviii | Action plan shall be prepared by the project proponents to prevent damage to marine life and also to the coastline in case of any oil spillage and the same shall be strictly implemented. Regular mock drills shall be carried out to ensure fitness of the equipment in place. | Complied.<br><br>Oil spill contingency response plan updated on 29.08.2017 is in place and implemented. An acknowledgement letter on updates in OSCRP by coast guard along with a copy of the updated plan was submitted as a part of compliance report for the duration of Apr'17 to Sep'17.<br><br>A Joint Inspection of Port Oil Spill Response (OSR) capability by Indian Coast Guard (ICG), Gujarat Maritime Board (GMB) & Oil Industry Safety Directorate (OISD) was held on 13 Feb 2018 at APSEZ. The final assessment rating was given as "Very Satisfactory." The report on the same is attached as **Annexure – 6.**<br><br>Mock drills are conducted regularly. Report on drill conducted on 19.04.2017 was submitted as a part of compliance report for the duration of Apr'17 to Sep'17. |
| xix | The project proponents shall work out the maximum quantity of spilled material, which can find its way into the coastal waters, under different accident scenarios, and their impact on aquatic life | Complied.<br><br>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. A copy of the updated plan & acknowledgement letter on same by coast guard was submitted as a part of compliance report for the duration of Apr'17 to Sep'17.<br>Based on the oil spill modeling study, it has been observed |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | shall be studied after clearly demarcating the impact zones. On the basis of such studies, the necessary action plan to mitigate the likely impacts shall be prepared before commencement of the operations. Action taken report in this regard shall be submitted to the Ministry. | 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.<br><br>Recommendations of Marine EIA by NIO with respect to pollution emergency contingency plan for Multipurpose Terminal, Container, Dry & Break Bulk Terminal as well as associated facilities are addressed in Oil Spill Response Plan.<br><br>This action plan prepared by APSEZ to combat the oil spill (LOS-DCP) is in accordance with the NOS DCP, International Petroleum Industry Environmental Conservation Association (IPIECA).<br><br>A Joint Inspection of Port Oil Spill Response (OSR) capability by Indian Coast Guard (ICG), Gujarat Maritime Board (GMB) & Oil Industry Safety Directorate (OISD) was held on 13 Feb 2018 at APSEZ. The final assessment rating was given as "Very Satisfactory." The report on the same is attached as **Annexure – 6.** |
| B. General Condition | | |
| i | Construction of the proposed structures should be undertaken meticulously conforming 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 Departments / Agencies. | Already complied. Not applicable at present.<br><br>All construction activities are carried out confirming to the existing rules and regulation and as per the CRZ notification.<br><br>Approval under the preview of GMB, PESO and Factories act were taken prior to start of construction. |
| ii | The proponent shall ensure that as a result of the proposed constructions ingress of the saline water into the ground water does not take place. Piezometers | Complied.<br>To monitor the ground water quality, bore wells are provided at various location in the port and SEZ areas. Third party analysis of the ground water is being carried out twice a year by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 |

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>shall be installed for regular monitoring for this purpose at appropriate locations on the project site.</td><td>is mentioned below. Monitoring Reports are attached as Annexure – 2 for the same.<br>Number of Sampling Locations: 4
<table>
<tr><th>Parameter</th><th>Unit</th><th>Minimum</th><th>Maximum</th></tr>
<tr><td>pH</td><td>-</td><td>7.09</td><td>8.12</td></tr>
<tr><td>Salinity</td><td>ppt</td><td>0.56</td><td>11.3</td></tr>
<tr><td>Oil & Grease</td><td>mg/L</td><td>1.2</td><td>4.4</td></tr>
<tr><td>Hydrocarbon</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>Lead as Pb</td><td>mg/L</td><td>BDL*</td><td>22.2</td></tr>
<tr><td>Arsenic as As</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>Nickel as Ni</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>Total Cromium as Cr</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>Cadmium as Cd</td><td>mg/L</td><td>BDL*</td><td>0.17</td></tr>
<tr><td>Mercury as Hg</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>Zinc as Zn</td><td>mg/L</td><td>BDL*</td><td>2.74</td></tr>
<tr><td>Copper as Cu</td><td>mg/L</td><td>0.08</td><td>50.4</td></tr>
<tr><td>Iron as Fe</td><td>mg/L</td><td>0.99</td><td>16.3</td></tr>
<tr><td>Insecticides/Pesticides</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>Depth of Water Level from GL</td><td>meter</td><td>1.94</td><td>2.66</td></tr>
</table>
*BDL = Below Detectable Limit<br>Approximately INR 27 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18.</td></tr>
<tr><td>iii</td><td>A comprehensive contingency plan in collaboration with the concerned authorities must be formulated to contain in case of any oil spills. Appropriate devices such as oil skimmer, oil monitor, oil water separator must be acquired for strengthening the contingency plan. All the service vessels that required for oil spill operations must be equipped with booms and dispersants. The</td><td>Complied.<br><br>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. A copy of the updated plan & acknowledgement letter on same by coast guard was submitted as a part of compliance report for the duration of Apr'17 to Sep'17.<br>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>40250 ltr.</td></tr>
<tr><td>Absorbent pads</td><td>1000</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 discharge hose, 3", 2 x 10 m</td><td>1 set</td></tr>
<tr><td>Rachet belt (Eco make)</td><td>10 nos.</td></tr>
</table></td></tr>
</table>

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | personal onboard of these vessels must be properly trained in operation of these booms and dispersants. | <table><tr><td>Tool box (Eco)</td><td>6 nos.</td></tr><tr><td>Tanker Trucks</td><td>04 nos.</td></tr><tr><td>Mini Vacuum Pump (30 m3 / hr)</td><td>02 nos.</td></tr><tr><td>Slurry Pump (60 m3 / hr)</td><td>01 no.</td></tr></table><br>11 Dolphin tugs are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 10 Dolphin Tugs are fitted with a fire curtain and remote controlled fire monitors.<br><br>IMO module course organized by Maritime Training Institute is conducted & 36 personnel have achieved IMO level 1 & 4 personnel have achieved IMO Level 2. Different training modules as Oil Spill, Oil Spill Equipment, Notification exercise, Incident are conducted at different frequency.<br><br>Detail of resource available at APSEZL is provided in annexure 3 of Oil Spill Contingency Plan which was submitted as a part of compliance report for the duration of Apr'17 to Sep'17. |
| iv | The operation plan for responding to an oil spill must include clear procedures for notification of a spill, response decision, clean up operations, communications, and termination of cleanup operations, cleanup cost, oil pollution, damage control and disaster management plan. | Complied.<br><br>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. A copy of the updated plan & acknowledgement letter on same by coast guard was submitted as a part of compliance report for the duration of Apr'17 to Sep'17.<br>Oil Spill Contingency Plan includes procedures for notification of a spill as point no 7.1, response strategy as Point no. 3.0, cleanup operations, Cleanup cost and termination of cleanup in point no. 3.5, communications in point no. 6.0. |
| v | A well-equipped laboratory with suitable instruments to monitor the quality of air and water shall be set up so as to ensure that the quality of ambient air and water conforms to the prescribed standards. The laboratory will also | Being complied<br><br>Site is provided with environment monitoring equipment with sufficient & competent staff of Third Party laboratory accredited by NABL & MoEF&CC.<br>Ambient Air Quality (twice in a week) and Noise (once in a month) monitoring are being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below. |

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>be equipped with qualified manpower including a marine biologist so that the marine water quality is regularly monitored in order to ensure that the marine life is not adversely affected as a result of implementation of the said project. The quality of ambient air and water shall be monitored periodically in all the seasons and the results should be properly maintained for inspection of the concerned pollution Control agencies.<br>The periodic monitoring reports at least once in 6 months must be sent to this Ministry as well as its Regional Office at Bhopal.</td><td>
Total Ambient Air Sampling Locations: 4 Nos.
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit$</th></tr>
<tr><td>$PM_{10}$</td><td>$\mu g/m^3$</td><td>95.6</td><td>41.7</td><td>100</td></tr>
<tr><td>$PM_{2.5}$</td><td>$\mu g/m^3$</td><td>55.4</td><td>18.7</td><td>60</td></tr>
<tr><td>$SO_2$</td><td>$\mu g/m^3$</td><td>27.2</td><td>5.0</td><td>80</td></tr>
<tr><td>$NO_2$</td><td>$\mu g/m^3$</td><td>45.8</td><td>15.1</td><td>80</td></tr>
</table>
$ as per NAAQ standards, 2009<br><br>
Total Noise Monitoring Locations: 4 Nos.
<table>
<tr><th>Noise</th><th>Unit</th><th>Min</th><th>Max</th><th>Perm. Limit</th></tr>
<tr><td>Day Time</td><td>dB(A)</td><td>58.1</td><td>73.4</td><td>75</td></tr>
<tr><td>Night Time</td><td>dB(A)</td><td>57.2</td><td>69.4</td><td>70</td></tr>
</table>
Sewage generated from port is being treated in designated STPs and treated sewage is used for horticulture purposes.<br><br>
Third party analysis of the treated water is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is provided above in point No. xii (specific conditions).<br><br>
Marine Monitoring:<br>
Summary of the marine water monitoring for duration from Oct'17 to Mar'18 is provided above in point No. vii (specific conditions)<br><br>
Adani group has appointed a marine biologist Mr Shivanagouda Sanagoudra to monitor marine water quality. Also the third party monitoring of the Marine water is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. who has marine biologist to ensure that the marine water quality do not adversely affects the marine life. Monitoring Reports are attached as Annexure – 2 for the same. Approximately INR 27 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18 .<br><br>
Half yearly compliance reports containing monitoring
</td></tr>
</table>

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | | report is regularly submitted to MoEF&CC, Bhopal and other concerned government agencies / offices. Last compliance report was submitted vide our letter reference No. APSEZL/EnvCell/2017-18/036 dated 22.11.2017 in soft as well as hard copy. |
| vi | Adequate provision for infrastructure facilities such as water supply, fuel for cooking, sanitation etc. must be provided for the laborers during the construction period in order to avoid damage to the environment. Colonies for the laborers should not be located in the CRZ area. It should also be ensured that the construction workers do not cut trees including mangroves for fuel wood purpose. | Already complied. Not Applicable at present.<br><br>Construction Activity is already completed. Adequate infrastructure facilities as mentioned in the condition were provided during construction phase.<br><br>The facility for drinking water, toilet and rest shelter are provided for the dignity of operation labours. Photographs of the same were provided along with the compliance submission for the duration of Oct'16 to Mar'17. |
| vii | To prevent discharge of sewage and other liquid wastes in to the water bodies, adequate system for collection and treatment of the wastes must be provided. No sewage and other liquid wastes without treatment should be allowed to enter into the water bodies. The quality of treated effluents, emissions, solid wastes and noise levels must confirm to the standards laid down by the competent authority including the Central/State Pollution Control Board. | Complied.<br><br>Adequate pipelines are provided to ensure the collection and treatment of effluent. Raw sewage is collected from 30 different collection pits at APSEZ locations through browsers and is transferred to ETP/STPs for treatment.<br><br>Sewage generated from port is being treated in designated ETP/STPs and treated sewage is used for horticulture purposes. No treated water is discharged into the water bodies. Summary of treated effluent for the duration from Oct'17 to Mar'18 is provided in Specific Condition No. xii above.<br>Third party analysis of the treated water, Flue Gas, Ambient Air and Noise is being carried out regularly by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd.<br><br>Summary of six monthly monitoring of Flue gas emission is provided below. |

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Parameter</th><th>Unit</th><th>Limit</th><th>Min</th><th>Max</th></tr>
<tr><td>PM</td><td>mg/Nm$^3$</td><td>150</td><td>10.15</td><td>33.47</td></tr>
<tr><td>$SO_2$</td><td>ppm</td><td>100</td><td>2.07</td><td>8.54</td></tr>
<tr><td>$NO_x$</td><td>ppm</td><td>50</td><td>20.96</td><td>38.92</td></tr>
</table>
<br>Six monthly report of Flue Gas emissions for duration from Oct'17 to Mar'18 is attached as Annexure – 2.<br><br>Summary of Ambient Air and Noise for duration from Oct'17 to Mar'18 is provided in general condition No. v above.<br><br>Waste Management – APSEZ has adopted 5R concept for environmentally sound management of different types of solid & liquid wastes. Please refer below details about management of each type of waste.<br><br><u>Municipal Solid Waste</u>: A well-established system for segregation of dry & wet waste is in place. All wet waste (Organic waste) is being segregated & utilized for compost manufacturing. 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 plant (M/s. Sanghi Industries Ltd.) for Co-processing as RDF (Refused Derived Fuel).<br><br><u>Hazardous Waste</u>:<br>• E – Waste & Used Batteries are being sold to GPCB registered recyclers namely M/s. e-Processing House.<br>• Solid Hazardous Waste is being disposed through common facility i.e. M/s. Recycling Solutions Pvt. Ltd., Panoli and/or co-processing at Sanghi Industries Ltd., Kutch. Used/Waste Oil is being sold to GPCB authorized recyclers / re-processors namely M/s.Western India Petrochem Industry, Bhavnagar.<br>• Downgrade chemicals generated from cleaning of storage tanks / pipelines are being sold to authorized solvent recovery facilities namely M/s. Acquire Chemicals, Ankleshwar however during the compliance
</td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>period, there was no disposal of downgrade chemicals.<br>• Slop Oil received from vessels is treated to separate water and oil particles in Oil Water Separator system. Separated oil from the same is being sold to authorized recycler / reprocessor namely M/s.Western India Petrochem Industry, Bhavnagar and water is sent to ETP for further treatment. However during the compliance period, there was no disposal of Slope Oil.<br><br>The following table summarizes the waste management practice (for Oct'17 to March'18) for different types of wastes at APSEZ:
<table>
<tr><th>Waste</th><th>Quantity in MT</th><th>Disposal method</th></tr>
<tr><td colspan="3">Hazardous Waste</td></tr>
<tr><td>Pig Waste</td><td>5.4</td><td>Co-processing at common fac and/or cement industry</td></tr>
<tr><td>Tank Bottom Sludge</td><td>33.4</td><td>Co-processing at common facility</td></tr>
<tr><td>Oily Cotton waste</td><td>55.2</td><td>Co-processing at Cement Industry</td></tr>
<tr><td>Used / Spent Oil</td><td>86.1</td><td>Sell to GPCB approved recycler</td></tr>
<tr><td>Discarded Containers</td><td>8.7</td><td>Sell to GPCB approved recycler</td></tr>
<tr><td>E-Waste</td><td>2.32</td><td>Sell to GPCB approved recycler</td></tr>
<tr><td colspan="3">Municipal Solid Waste</td></tr>
<tr><td>Dry Waste</td><td>105.6</td><td>After recovery sent for recycling</td></tr>
<tr><td>Wet Waste</td><td>467.4</td><td>Converted to Manure horticultural use</td></tr>
</table></td></tr>
<tr><td>viii</td><td>Appropriate facility should be created for the collection of solid and liquid wastes generated by the barges/vessels and their safe treatment and disposal should be ensured to avoid possible contamination of the water bodies.</td><td>Complied.<br>• Ships berthing at Mundra Port comply with MARPOL regulations.<br>• Waste reception facility provided at port collects Solid waste (i.e. Garbage) from vessels and collected waste is being sorted at Material Recovery Facility & it is sent for recycling.<br>• No discharge such as bilge wastes, sewage or any other liquid wastewater is allowed into marine environment inside port limits and APSEZ does not receive sewage/liquid waste from ship.<br>• Oily sludge (a mixture of oil, water and dirt) is disposed through authorized recycler / re-processor.</td></tr>
</table>

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
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| | | • As a general practice APSEZ provide facility for receiving slop oil from vessels through hose connection with oil tankers. These tankers divert slop oil to Oil water separator system where water and oil particles are separated. Separated oil is being sold to authorized recycler /re-processor. However, no slope oil was received during the compliance period. |
| ix | Necessary navigational aids such as channel markers should be provided to prevent accidents. Internationally recognized safety standards shall be applied in case of barge /vessel movements. | Complied.<br><br>Navigational aids such as buoys and leading lights have been provided. The rules and regulation of the port contributes to the safe, efficient and environmentally responsible handling of shipping traffic. The international rules of IMO, such as SOLAS convention and its amendments and national regulations are in force at APSEZ, Mundra.<br>**APPLICABLE REGULATION**<br>➢ Port Security Law (ISPS)<br>➢ Indian Port Act<br>➢ Gujrat Maritime Board Act 1981<br>➢ Navigational Safety Port Committee (NSPC)<br>➢ All relevant international rules and regulations on MARPOL, Load lines etc. |
| x | During operation phase proper precautions should be taken to avoid any oil spills and no oily wastes shall be discharged into the water bodies. | Complied.<br><br>Proper precautions are taken to avoid any oil spills during operation such as pressure checks of oil transfer lines and manual watch during oil cargo transfer.<br><br>Available mechanisms to avoid oil spills are identified as below<br><u>At liquid terminal:</u><br>• Immediate shut off valve from vessel and shore.<br>• Periodical testing of lines<br>• Immediate suction of material by pump.<br>• Emergency operation shut down.<br><u>At Marine Operations:</u><br>• Scupper plug, dip tray, absorbent pad, saw dust is provided to address confined spillage/leakage.<br><u>At Container Terminals:</u><br>• Leak cart is available for collect spilled chemical.<br>• Spill control materials in place.<br>• Oil drums are stored in covered shed where pellets |

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>are used. Tray provided to collection of spillage/leakage if occurred.<br><br>No oily waste is discharged to water bodies. Oily waste or oil contaminated waste is being disposed as mentioned in General Condition no. vii above.</td></tr>
<tr><td>xi</td><td>The project authorities should take appropriate community development and welfare measures for the villagers in the vicinity of the project site, including drinking water facilities. A separate fund should be allocated for this purpose.</td><td>Complied.<br>Adani Foundation (AF) is the CSR arm of the Adani Group actively working for upliftment of the communities in the surroundings of various project sites of Adani Group.<br><br>Brief information about activities in the main four persuasions are mentioned below:
<table>
<tr><th>Area</th><th>Activity</th></tr>
<tr><td>Community Health</td><td>• The Adani Foundation operates Rural Dispensaries in 8 villages of Mundra block, 03 villages of Anjar block and 2 clinics at SEZ area. Mobile dispensary and rural clinics provide health services with token charge of 10/- rupees per patient daily by a doctor and a volunteer. Total patient was treated under this scheme during the year 2017-18: 53757 Nos.<br>• During the year 2017-18, total 9950 transactions were done by 8518 card holders of 66 villages of Mundra Taluka and they received cash less medical services under this project.<br>• During this year, anthropometry study done for 7202 children. Total 86 children became free of malnutrition due to efforts under "Suposhan" Project. Additionally, 1557 FGD were conducted during this year.<br>• Total 8770 haemoglobin screenings of RPA woman and adolescent girls was carried out, which helps in controlling anaemia in women and indirectly malnutrition.<br>• Total 7732 general health camp was</td></tr>
</table></td></tr>
</table>

| Sr. No. | Conditions | | Compliance Status as on 31-03-2018 |
|---|---|---|---|
| | | | organized during the year across the Mundra Taluka to provide primary medical care during various public events. |
| | | Sustainable Livelihood – Fisher folk | • Average 118 KL of water was supplied to 983 households from different settlements on a daily basis under Machhimar Shudhh Jal Yojana.<br>• Computer Training: 20 Fisherman Youth<br>• Sewing Training: 20 Women<br>• RTG Crane Operator: 02 Fisherman Youth<br>• Dori Work Training: 60 Women<br>• Mangrove Plantation: 4526 Man-days<br>• Painting Labour: 47 Fisherman<br>• AF has started poly culture project with consultancy of GUIDE In this system we stocked 6000 fingerlings fishes of 3 gm weight in six different cages. There was 80% survival with 100 to 150 gm each weight after 5 month culture period.<br>• We have facilitated 560 daughters with Kit (Small Bed sheet, Mosquito net, Soap and Cream with nutritious food for mother) under Beti Vadhavo Programme. |
| | | Education | • Total 2736 Schools and 203309 students have visited Adani Port, Adani Power & Adani Willmar facilities to get an insight upon the large scale business activity carried out at each of them as a part of project UDAAN.<br>• 111 Govt. primary schools in total 62 villages of Mundra Taluka, 3 villages of in Anjar taluka and two villages of Mandvi Taluka every year on an average 2550 to 2700 children gets enrolled in 1st std in Taluka For |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 | |
|---|---|---|---|
| | | | 2017-2018 total 2500 children got enrolled & Adani foundation provided the "Enrollment kit" to all new enrolee in Taluka.<br>• AF provided green board support at Tuna, Taluka shala Mundra, Lalji Sumar Mundra, Teacher's table support to Mota bhadiya vadi school number 2 & 3, fan at Shekhadiya, science equipment at Luni high school, Girls sanitation at Sadau primary school, water tank renovation at Shekhadiya and Mahesh nagar school.<br><br>**Skill Development:**<br>• Soft skill training – 675 Nos.<br>• Technical Training – 278 Nos. |
| | | Rural Infrastructure | • 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 15 ponds) were built leading to a significant increase in water table and higher returns to the farmers.<br>• Adani Foundation has studied impact of Check Dam Strengthening carried out in two villages before two years period.<br>1. Pond Deepening work at Vadala<br>2. Pond Deepening work at Mota Bhadiya<br>• Participatory Ground Water Management. The objective of the project was to reduce the salinity ingress in and around the coastal regions of Mundra, Kutchh and mitigate the ill-effects of this manmade problem to improve the livelihoods of the rural people. The Project will help to get water table |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
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| | | high, also it will help in agricultural activities.<br>• Other works completed<br>1. Prayer Shed - Govt Primary School at Ragha and Bhadreshwar<br>2. Grill work – Kumar Shala Zarpara<br>3. RO Plant – Samaghogha, Siracha village &<br>4. Vallabh Vidyalaya at Mundra<br>5. Basic sanitation facility (18 Nos) at Balvadi, medical centre and retiring places at labour settlements<br><br>Budget for CSR Activity for the FY 2017-18 was to the tune of INR 1565 lakh out of which, INR 1399 lakh are spent.<br><br>Details of CSR activities carried out by Adani Foundation for Mundra and surrounding area is attached as **Annexure – 1.** |
| xii | The quarrying material required for the construction purpose shall be obtained only from the approved quarries / borrow areas. Adequate safeguard measures shall be taken to ensure that the overburden and rocks at the quarry site does not find their way into water bodies. | Not applicable at present.<br><br>Construction activities are completed.<br>No such activity is carried out during the compliance period of Oct'17 to Mar'18Apr'17 to Sep'17. |
| xiii | The dredging operations, if any, to be undertaken with the prior approval of this Ministry, shall be executed with appropriate safeguard measures to prevent turbidity conditions in | Complied<br><br>Capital dredging is completed and only maintenance dredging is being carried out, if required.<br>Dredged material generated by maintenance dredging is used for level rising. The measures recommended by NIO |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
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| | consultation with the expert agencies such as CWPRS / NIO. | are implemented. |
| xiv | For employing unskilled, semi-skilled and skilled workers for the project, preference shall be given to local people. | Complied<br><br>• Adani Skill Development Center (ASDC), Mundra is providing skill development training to the locals for Soft Skill, Technical Training and Carrier Guidance & knowledge based training.<br>Total 953 students were enrolled as per above topics during financial year of 2017-18.. Allocation of fund for education is availed by Adani Foundation. Total INR 534 Lacs are allotted for community education & skill development out of which INR 475 Lacs are spent for the purpose.<br>• Preference is given to local people for employment based on their qualification and experience.<br>• All Mangrove plantations are done in consultation with GUIDE and Local forest dept.<br>• 24 hectare of mangrove afforestation at Mundra was done through active participation of local fishermen at the cost of INR 25.0 Lac<br>Details on skill development training imparted during financial year of 2017-18 by Adani Foundation are enclosed as **Annexure – 1.** |
| xv | To meet any emergency situation, appropriate firefighting system and water pipelines 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. | Complied.<br><br>Tug (Dolphin-11) has firefighting system of 1200 $m^3$/hr. along with 20 ton lifting "A" frame and diving support facility for support at offshore.<br><br>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 APSEZ was submitted as a part of compliance report for the duration of Apr'17 to Sep'17. |
| xvi | Regular drills should be conducted to check the effectiveness of the on- | Complied.<br>.<br>Regular drills are being conducted for effectiveness of the |

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>site Disaster Management Plan.</td><td>system. There were four drills conducted for various scenario during financial year 2017-18 as mentioned below.
<table>
<tr><th>Location</th><th>Date</th><th>Sceario</th></tr>
<tr><td>CT - 3</td><td>07.04.17</td><td>Evacuation Mock Drill for any emergency</td></tr>
<tr><td>Liquid Terminal T-30 (Enclosure 2)</td><td>10.04.17</td><td>Fire in ethyl alcohol Tank -30 with 2 No. casualties.</td></tr>
<tr><td>Liquid Terminal Tanker Parking Area</td><td>12.07.17</td><td>Collision of tanker & Leakage of Ethyl Alcohol</td></tr>
<tr><td>AMCT- STS 01</td><td>24.08.17</td><td>We assumed that One Lasher of M/s Zenith Ent Mr.Rajni fall In Sea while getting down from vessel gangway.</td></tr>
</table>
Report on drills conducted was submitted as a part of compliance report for the duration of Apr'17 to Sep'17.</td></tr>
<tr><td>xvii</td><td>The recommendations made in the Environmental Plan and Disaster Management Plan, as contained in the EIA and Risk Analysis Reports of the project, shall be effectively implemented.</td><td>Complied<br>All the recommendations are being implemented.<br>Few Marine EIA recommendations:
<table>
<tr><td>Operational protocols and safety procedure should be printed and freely available to concerned staff. The employees must be adequately trained to inculcate a high level of competence not only in day to day operations but also during emergency sictuations. Periodic refresher cources must also be organized to maintain the level of</td><td>The company has written the operational protocols and safety procedures as a part of ISO 14001:2008, OHSAS 18001:2008 and ISO 9001:2008certifications.<br>APSEZ has established training department to impart training to its employees.<br><br>IMO module course organized by Maritime Training Institute is conducted & 36 personnel have achieved IMO level 1 & 4 personnel have achieved IMO Level 2. Different training modules as Oil Spill, Oil Spill Equipment, Notification</td></tr>
</table></td></tr>
</table>

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 | |
|---|---|---|---|
| | | their competence. | exercise, Incident are conducted at different frequency. |
| | | Periodic monitoring should be undertaken at the designated sites after the terminals become operational and the results of each monitoring should be carefully evaluated to identify changes if any and to take corrective measures, if warranted. | Monitoring of various environmental parameters for Ambient Air, Noise, Wastewater, ground water, marine water and sediments is being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Monitoring reports for the period from Oct'17 to Mar'18 are enclosed as **Annexure-2**. |
| | | Adequate vigilance is required to adherence of ships to Marpol protocol and related regulations. | During the vessel declaration compliances with respect to Air Pollution and Oil are monitored by the Port Authority. The ships are certified with international certification bodies only after complying with the Marpol protocol. |
| | | Manual Listing Procedure for conducting ship movement operations in the port area must be available to the concerned staff. | Berthing Policy & Tariff Structure is made available for conducting ship movement to the concerned staff and made available on web link www.adaniports.com/pdfs/PIB_06122013.pdf Port Information Booklet is also made available on web link www.adaniports.com/Port_Operations_Port_Tariffs.aspx |
| | | **Few Risk Assessment Recommendations of EIA of Multipurpose Terminal carried out in 1995:** | |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 | |
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| | | There should be a provision for activating a fire alarm at the fire control room from various strategic/hazard prone areas in the factory. In areas where there is high level of Noise, It may be necessary to install more than one audible alarm transmitter or flashing lights. | Provision of activating a fire alarm is available at Control Room. Employees are provided with communication system with which they can communicate about any emergency to Control Room. Emergency alarm systems are installed which is audible from any port location. Alarm testing is carried out at a frequency of once in a month. |
| | | Wind sleeves with adequate lightings around them should be provided at various places to guide personnel to escape in a direction perpendicular to the prevailing wind direction. | Wind sleeves with adequate various lighting system around them are available at various places of Port locations to guide personnel to escape in a direction perpendicular to the prevailing wind direction. |
| | | Succession or second line Coordinators should be named for assuming responsibilities in case disaster occurs in the absence of principal coordinators. | Disaster Management Plan for APSEZ is in place and that includes second line coordinators to assume responsibilities in absence of principal coordinators. |
| xviii | 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. | Complied.<br>M/s APSEZL has a well structured Environment Management Cell, staffed with qualified manpower for implementation of the Environment Management Plan. The Environment Management Cell is headed by Sr. Manager who directly reports to the top management. The organogram of Environment Cell is attached as **Annexure – 8.** | |
| xix | The project affected people, if any, should be | Not applicable.<br>The project was conceptualized in such a way that there are | |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
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| | properly compensated and rehabilitated. | no impacts on the local settlements due to the project proposal. However, the project is already implemented and is in operation phase. |
| xx | 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. | Complied.<br>Separate budget for the Environment protection measures is earmarked every year. All environment and horticulture activities are considered at corporate level and budget allocation is done accordingly. No separate bank account is maintained for the same however, all the expenses are recorded in advanced accounting system of the organization.<br><br>Budget for environmental management measures (including horticulture) for the FY 2017-18 is to the tune of INR 957 lakh. out of which, INR 890 lakh are spent. Detailed breakup of the expenditures is attached as **Annexure – 8**. |
| xxi | 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 Boards by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities. | Complied<br><br>APSEZL is always extending full support to the regulatory authorities during their visit to the project site.<br><br>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. The details of the same were submitted as a part of compliance report for the duration of Apr'17 to Sep'17. |
| xxii | 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 ones | Point Noted. |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
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| | for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures. | |
| xxiii | 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. |
| xxiv | This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with. | Point Noted. |
| xxv | A copy of the clearance letter will be marked to concerned Panchayat / local NGO. If any, from whom any suggestion / representation has been received while processing the proposal. | Not applicable at present |
| xxvi | State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industries centre and Collector's Office/Tehsildar's Office for 30 days | Applicable for State Pollution Control Board. |
| xxvii | The project proponent should advertise at least in two local newspapers widely circulated in the | Already Complied. |

| Sr. No. | Conditions | Compliance Status as on 31-03-2018 |
|---|---|---|
| | 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 letters are available with the State Pollution Control Board and may also be seen at Website of the Ministry of Environment and Forests at http://www.envfor.nic.in/ . | |
| xxviii | The Project Proponents should inform the Regional Office as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work. | Already Complied. |
| xxix | The Project Proponent should make specific arrangements for rainwater harvesting in the project design and the rainwater so harvested should be optimally utilized. | Complied<br><br>Groundwater recharge cannot be done at the project site since the entire project is in the intertidal / sub tidal areas. Rain water within project area is managed through storm water drainage.<br><br>However, APSEZL has carried out pond deepening activity at Mota Bhadiya, Vadala and Bhujpur villages during financial year 2017-18 to envisage rainwater harvesting.<br><br>Please refer specific condition no. v for further details upon participatory ground water management project for Mundra region. |

# Annexure – A

| | | |
|---|---|---|
| adani | Adani Ports and SEZ Limited | From : Oct'17<br>To : March'18 |
| Status of the conditions stipulated under CRZ Recommendation | | |

**Half yearly Compliance report of CRZ recommendation for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat vide DoEF, GOG letter no. ENV-1098-6477-p1 dated 28th October 1999.**

| Sr. No. | Conditions | CRZ Compliance Status as on 31-03-2018 |
|---|---|---|
| A. Specific Condition | | |
| 1 | The company shall submit comprehensive Environmental Impact Assessment Report and Risk Assessment Report containing worst case scenario and detailed oil spill control management plan before carrying out the construction activities and shall implement all the mitigative measures/suggestions/recommendations given in the report of NIO and Tata AIG Risk Management Services. | Already Complied. Not applicable at present<br><br>Environmental Clearance was granted based on the submission of said documents. Rapid EIA was submitted on Feb 29, 2000 & Risk Assessment Report containing worst case scenario and detailed oil spill control management plan was submitted on Dec 28, 1999.<br><br>For more details, please refer to general condition no xvii of the compliance of EC and CRZ clearance |
| 2 | The company in no case tap ground water. | Complied.<br><br>Please refer to Specific Condition no. ix of the compliance of EC and CRZ clearance above for details. |
| 3 | The company shall not cut mangroves for the project activities except for stray mangrove seeding required for the railway line only after detailed assessment through NIO and 25 acre of land shall be planted with mangroves in consultation with NIO. | Already Complied. Not applicable at present<br><br>The company has not cut mangroves. APSEZ has carried out 24 hectare of mangrove plantation near Navinal creek.<br><br>To enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in more than 2800 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 782 lakh. So, far APSEZ have developed more than 400 ha. area as greenbelt with plantation more than 8.0 Lacs saplings within the APSEZ area. Details of mangrove plantation and green belt development carried out by APSEZ till date is annexed as **Annexure – 3.**<br><br>EIA report was prepared by NIO in which all impacts on |
| 4 | The company shall carry out the mangroves plantation programme in addition to 25-acre | |

| Sr. No. | Conditions | CRZ Compliance Status as on 31-03-2018 |
|---|---|---|
| | mangrove plantation to be done with the help of the NIO, in consultation with the forest department. | mangroves and coastal ecology of the region for the proposed design were studied in detail. |
| 5 | The company shall ensure that the construction labors do not cut mangroves for fuel, etc. | Already Complied. Not applicable at present<br><br>Construction activity is already completed.<br>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 APSEZ. |
| 6 | The company shall ensure that no creek are blocked due to the project activities, | Complied.<br><br>Please refer to Specific Condition no. xi of the compliance of EC and CRZ clearance above for details. |
| 7 | The company shall ensure that there will be no disposal of sullage and sewage generated from construction camps, surface run-off from construction sites, and oil and grease spillage from construction equipment in the creeks. | Already complied. Not applicable at present.<br><br>Summary of the sewage sample results for duration from Oct'17 to Mar'18 is mentioned in the condition no. xii of EC Compliance report.<br><br>Project is in operation phase.<br>Sewage and effluent generated from port is being treated in designated ETP and treated water is used for horticulture purposes.<br><br>Third party analysis of the treated water is being carried out twice in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. The results of the same are attached as **Annexure – 2.** |
| 8 | The company shall stick to the time bound programme submitted to this department for the proposed activities including installation of desalination plant for meeting the entire water requirement. | Already complied. Not applicable at present.<br><br>Construction work was completed on time and project is in operation phase. Desalination plant with the capacity of 47 MLD is installed to meet the water requirement.<br><br>For detail on present source of water and quantity of water consumption, Please refer to Specific Condition no. ix of the compliance of EC and CRZ clearance above. |
| 9 | The company shall ensure that the | Complied. |

| Sr. No. | Conditions | CRZ Compliance Status as on 31-03-2018 |
|---|---|---|
| | commercial fisheries are not hampered due to the presence of barges, vessels and other activities in the region. Necessary plan in this regards shall be prepared in consultation with the NIO. | Communication mechanisms have been developed for the smooth movement of fishing boats vis-à-vis shipping activities.<br><br>Please refer to Specific Condition no. xiv of the compliance of EC and CRZ clearance above for details. |
| 10 | The company shall bear the cost of the external agency that may appointed by this department for carrying out the supervision and/or the monitoring of the construction activities. | Complied.<br>Construction activities are completed and project is in operation phase. If at all any study is suggested by Govt. of Gujarat, we will give full co-operation.<br>Please refer to Specific Condition no. xv of the compliance of EC and CRZ clearance above for details. |
| 11 | The company shall carry out the post project monitoring of various environmental parameters in consultation with this department and Gujarat Pollution Control Board. | Being complied.<br>Post project monitoring of various environmental parameters is being carried out regularly.<br>Please refer to Specific Condition no. xvi of the compliance of EC and CRZ clearance above for details. |
| 12 | The company shall prepare the detailed traffic control management plan for the port and shall participate in the VTMS to be developed for the Gulf of Kachchh. | Complied.<br>APSEZ has participated in VTMS.<br>Please refer to Specific Condition no. xvii of the compliance of EC and CRZ clearance above for details. |
| 13 | In order the eliminate adverse impact on the mangroves of Bocha Island and coastal ecology of the region, the company shall carry out construction activities only after the construction design and methodology is | Already complied. Not applicable at present.<br><br>Construction activity is already completed.<br><br>EIA report was prepared by NIO in which all impacts on mangroves and coastal ecology of the region for the proposed design were studied in detail. |

| Sr. No. | Conditions | CRZ Compliance Status as on 31-03-2018 |
|---|---|---|
| | approved by NIO. | |
| 14 | Any other conditions may be stipulated by this department from time to time. | Point noted. |

# Annexure – 1

# ANNUAL REPORT 2017-18

## Adani Foundation, Mundra

**Adani Foundation**
Adani House, Port Road, Mundra – Kutch 370 421
[info@adanifoundation.com] [www.adanifoundation.com]

Your Hard Work and Team Effort Will Speak Louder Than Voice – This has been the core philosophy enlivened by Adani Act over the years, on its path of sustainable community development. Adani Group also firmly believes that growth is possible only by working together with and for the community, and enriching the environment – ecology.

Year 2017-18 witnessed many major milestones achieved by Adani Foundation, Mundra that brought national fame and big laurels to the organization for its high standard CSR projects aiming at sustainable development of the community at large. The unit was crowned with coveted CII Sustainability Recognition, Gold Award for "Ek Kam Desh K Nam" and the First Position in Gujarat CSR Authority Award in "Sustainable and Impactful" CSR category.

Besides, the last fiscal was also a year of new development initiatives for AF, Mundra. In the first quarter, the unit initiated fodder cultivation and individual fodder development projects in five periphery villages along with rejuvenating of check dams and deepening of major ponds. The initiatives were successfully implemented through community participatory approach in the line of sustainable development.

With the greater objective to make our healthcare services more sustainable and value-added, in the second quarter we introduced token charges from the beneficiaries for community medical facilities such as, MHCU and Rural Clinic. Here also the idea of injecting community ownership feeling worked very well for long-term good health of the people-welfare project.

Even as the third quarter was full of achievements, awards and recognitions with independent evaluation teams visiting the site and highly praising our initiatives and objectives post physical verification of the projects, the last quarter was furthermore meaningful with regard to our key infrastructure projects with a long-term vision of nation development.
Dignity of Labour, a project close to the heart of our promoters and the senior management was carried out very efficiently by AF, Mundra team. Apart from creating basic healthcare and hygiene, education infrastructures for large number of labour families in the project surroundings, a Rest-Shed for Drivers in the SEZ area of the port was constructed by the RID. This is remarked as a stand-alone infrastructure project by AF.
Participatory Ground Water Management, which has been a buzz word in all major civil society and CSR conclaves, seminars and workshops in Kutchh district, was taken up as a sustainable project AF, Mundra. With involvement of expert bodies in the field, the project work has kick-started with the objective of ground water recharge in Kankavati Sandstone Aquifer.

All our above achievements were not possible without the valuable inputs and continued support and guidance of Mr. Mukesh Saxena (Site Head, CSR-Mundra), Mr. Rakshit Shah (Executive Director – APSEZ), PNR Sir (ED-AF) and the plentiful faith and passionate support by Dr. (Mrs.) Priti G Adani, Managing Trustee – Adani Foundation.



# Community health

**It is said that "health is wealth". 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 Mundra region. Following motto of "Health for All" the Foundation runs Mobile Dispensaries, Rural Clinics, Special Innovative Projects i.e. Health Card to Senior Citizens, "SuPoshan"- Fighting to Mal nourishment in Mundra and support to dialysis patients projects. Adani Foundation also organizes special medical camps during disease outbreak.**

## Index



## Community health Mobile Van and Rural Clinic

The population of Mundra block is spread over various villages. There is no strong transportation facility available to reach for getting basic medical care. The patients have to spend minimum 200-500 INR for their common ailments like-cough, cold, fever, diarrhea etc.
The medical expenses and zero earning per day add surplus to their hardships.
To help the community in their medical needs, the service of mobile medical van has been started by the Adani Foundation in Mundra block. In big villages, rural dispensaries have been started considering their population and area.
The Main objective of Mobile Van is to reduce travel time, hardships and expenses. one mobile health care unit cover 25 villages and 07 fishermen settlements at Mundra. Another unit cover 8 villages at Bitta. Around 90 types of general and 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. Total OPD for MHCU – Bitta is 6400 for year 2017-18.
The Adani Foundation operates Rural Dispensaries in 8 villages of Mundra block, 03 villages of Anjar block and 2 clinics at SEZ area. Mobile dispensary and rural clinics provide health services with token charge of 10/- rupees per patient daily by a doctor and a volunteer.

| Project name | 17-Apr | 17-May | 17-Jun | 17-Jul | 17-Aug | 17-Sep | 17-Oct | 17-Nov | 17-Dec | 18-Jan | 18-Feb | 18-Mar | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mobile van - Mundra | 2758 | 2460 | 2157 | 1751 | 2024 | 1921 | 1642 | 2291 | 1932 | 2352 | 2213 | 1890 | 25391 |
| Rural clinic | 2999 | 2811 | 3034 | 2275 | 2390 | 2490 | 1929 | 2026 | 2127 | 2363 | 2097 | 1825 | 28366 |
| Total | 5757 | 5271 | 5191 | 4026 | 4414 | 4411 | 3571 | 4317 | 4059 | 4715 | 4310 | 3715 | 53757 |

## Community health Vadil Swasthya Yojana

When people become old, they start living a life of remoteness and isolation. The needs of old people are less looked after. Therefore, the Adani Foundation has started the Adani Health Programme for the aged to look after their health. To address the health care issues related to ageing, AF launched a 3 years long pilot project – 'Adani Vadil Swasthya Yojna' on 20th February 2011 at Mundra and further extended the same for the next three years i.e. up to 2017. Under this Programme, the individuals aged 60 years and above are benefitted. Health Cards are issued to them with the purpose of providing adequate and timely treatment. The families consisting of aged ones with a yearly income of Rs. 2 lacs or more get a Blue Card. The Blue Card holders can avail diagnosis facility and treatment at a subsidized rate in the Adani hospitals, Mundra. The families with a yearly income of less than Rs. 2 lacs are issued a Green Card. Green Card holder aged people get treatment for illness in Adani hospitals, Mundra with an aid up to the limit of Rs. 50,000/- within a period of 3 years.

**During the year 2017-18, total 9950 transactions were done by 8518 card holders of 66 villages of Mundra Taluka.** They received cash less medical services under this project. In Green Card category, 6139 aged people got treated for various illness & diseases at Adani hospitals, Mundra with an aid up to a limit of Rs. 50,000/- within the period of 3 years.

The 763 Blue Card Holders can avail diagnosis facility and treatment at a subsidized rate in the Adani hospitals, Mundra. Scheme is continue since seven years 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 they are referred to GAIMS, Bhuj for further treatment.



## Dialysis Project

Drinking water of Mundra contains high Fluoride (amount of salt). Hence, the proportion of patients with urinary stone and kidney failure is more . A project for patients who need dialysis is thus initiated so that the poor patients can receive the treatment at Adani hospitals. The main objective of providing dialysis treatment is to help the extremely needy patients to live a healthy life.

Total 5 Patients were being supported for regular dialysis (twice in a week) during this year.

## Awareness Sessions

Awareness sessions at various schools conducted to sensitize the future generations and teachers regarding importance of personal hygiene and cleanliness. We had included health issues related with personal hygiene such as worms, skin diseases, various infections etc. to promote awareness among the people.

**During this year more than 1500 students are benefitted by awareness sessions**

**Awareness Session**

| Sr.no. | Month | Place | Villages Name |
|---|---|---|---|
| 1 | May-17 | Sadipani Vidhaylay school - pratappar | Pratapar |
| 2 | Jun-17 | Sukhpar vas Pra school - Maleria | Mundra |
| 3 | Jul-17 | Seth R.D. High School Mundra- Swain Flu | Mundra |
| 4 | Jul-17 | Adani Vidhya mandir-Bhadreshwar- Swain Flu | Bhadreshwar |
| 5 | Dec-17 | Primry School Moti Bhujpur | Moti Bhujpur |
| 6 | Dec-17 | Vanki- Primary School - Gaynec | Vanki |
| 7 | Dec-17 | Dhrub- Primary School - Gaynec | Dhrub |
| 8 | Jan-18 | Nari Samalan - Rotaray Club - Wonam Health | Mundra |
| 9 | Feb-18 | Adani Hospital - Suposhan Sagini Meeting- Gaynec | Mundra |
| 10 | Feb-18 | Samaghogha Kumar Sala | Sama Ghogha |
| 11 | Feb-18 | Dhrub- High School - Gaynec | Dhrub |
| 12 | Feb-18 | Baroi Aganvadi - Gaynec | Baroi |
| 13 | Feb-18 | Patri - Aganvadi - Gaynec | Patri |
| 14 | Feb-18 | Dakhan Faliyu Moti Bhujpur- Gaynec | Moti Bhujpur |



## Adani Vadil Swasthya Yojana : We Seek the blessings!!

This octogenarian will always greet you with an innocent smile no matter how she is physically and mentally. Age-related ailments like hypertension and osteoarthritis couldn't take away her inner happiness and the desire to live young.

Javerben Dayaram Rajgor of Pratappar village in Mundra locality is one important case study for the Senior Citizen Project of Adani Foundation. The elderly lady would teach you how life should be lived and how physical deformities can't be spoilsport for your healthy living in the true sense.

Adani Foundation feels it a great privilege to stand by such jovial and energetic senior citizens in their journey of old-age life and aims to extend all possible medical and emotional care to retain the invaluable smile on their faces. In return to our dedicated services for the elderly ones, we seek their blessings which would take our mission of selfless service to the society and attain sustainable development to greater heights.

As if luck has turned cruel to her, Bhagirathi Ben (72) has a heart-throbbing story of never-ending struggle and misery. Married at 19, she was widowed at just 32 with the challenge of raising her son and making a livelihood for the two. Toiling hard in local factories and working as housemaid for long years, she had harrowing times discharging her responsibility as a true parent. In this long journey of life, countless times she had to starve, but never did she allow a situation when her son would remain empty stomach. Moreover, she educated her son to become a graduate and serve a company in Mumbai.

As she is left behind in the village, again the loneliness and miseries of life haunt this elderly widow. Since she became a part of the senior citizen healthcare project of Adani Foundation since six years, taking care of her health and giving her the emotional support like a member of the family, has become an honor for the organization. Standing by her in the forward journey of life we strive to bring a sigh of relief and smile in the face of Bhagirathi Ben



## Community health Suposhan

Malnutrition amongst Children, Adolescent girls and Women in India is an alarming phenomenon. (In India: 48 % or 54 million children under-five years were stunted. India accounted for 33 %of stunted children in the world. As per Global Nutrition Report released recently, Children below five years- 38.7 % Stunted and 15.1%are wasted. 69.5% children6-59 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.

- **During this year, anthropometry study done for 7202 children. Total 86 children became free of malnutrition due to efforts under "Suposhan" Project. Additionally, 1557 FGD were conducted during this year.**
- **Total 8770 haemoglobin screenings of RPA woman and adolescent girls was carried out. Which helps in controlling anaemia in women and indirectly malnutrition.**

## Worth Results of "SuPoshan"

Standing on her lush green kitchen garden in Zarpara village, Manek Gadhavi smiles herself thinking about her past conversations with a representative of Adani Foundation who was the source behind his motivation for the profitable vegetable farming. When the AF official had suggested her to experiment vegetable farming in some portion of 12-acre land, Manek bai had instantly rejected the idea and laughed at him thinking that he was talking something meaningless and unnecessary.

After repeated motivation and AF support of a 15x15 feet kitchen garden kit containing water tank, drip line, vegetable seed and fertilizer, the villager had ventured into vegetable farming last year. Continued support of AF remained in the form of extending technical support, knowledge sharing on pest control and possible market linkages for the farm produces.

Manek Gadhavi is quite happy that her kitchen garden could cater to all the vegetable and green leaf requirements for her large-size joint family round-the-year.

This is the story of "Veerbai"- 13 years adolescent girl living in vadi Vistar in Zarpara village. She was in the grip of an invisible enemy until she got lucky because her school teacher flagged her condition with help of Hemoglobin check up by Adani Foundation. With the objective to get most feasible solution, We have motivated adolescent girls and their mothers to develop kitchen garden at the back of their house. Total 22 Kitchen garden developed in Zarpara and Navinal villages. Kitchen garden has brought worth results for "Suposhan" in Adolescent girls. All the vegetables grown at the garden are consumed by their own house



## SaHil : Our Ray of Hope!!"

Sahil- a ten month boy, the other name of boundless excitement, vigor and happiness, always smiling and bubbling with enthusiasm

Four months back, the picture was all different. Four months back, when Sahil was six months old, he was extremely thin and weak. He weighed only 4 kg and his M.A.U.C. was 8.5 cm. He appeared to be an extremely malnourished child.

Suposhan- a project run by the Adani foundation for children, adolescent girls, pregnant women and mothers feeding their new born. To spread this project to the innermost and remote areas, there is a team of well trained, dedicated members and they are known as Sangini workers.

One such Sangini worker – Sahemaben works on this activity in Baroi village. She met Sahil and Fatmaben during one health checkup camp for children. While talking to her in detail, Sahemaben came to know that Sahil had not been able to get mother's milk in the initial days. Mother's milk is the most powerful and must food for any child and its absence may cause malnutrition to children.

Later on, Sahemaben went to meet her at her place. There she observed and very mildly drew her attention towards the importance of cleanliness of the household and the utensils used for cooking. She also asked her about the food intake of Sahil. She informed her about 'Balbhog' (ready to eat therapeutic food RUTF by Amul). Convincing Fatemaben about her child's health was a herculean task but after a series of logical arguments, Sahemaben could convince her.

Sahil gradually started consuming the baby food (balbhog) and could show a noticeable improvement in his health.

Along with the improvement in Sahil's health, the household witnessed many positive changes like cleanliness and Fatemaben herself stopped consuming Tobacco.

The household is now surrounded with cleanliness and the small plants of Neem, chilly, pomegranate, lemon etc. embellish the household.

And Sahil is now hale and hearty. He weighs 6 kg and 700 grams. The vibrant smile of health and happiness on his face is the reward of Sahemaben' s dedicated and sincere work.

## 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 and To support efforts in reducing IMR and MMR

## Community health Suposhan

Base line data was provided for Mundra Taluka in initial phase of Project.

•Total Number Anganwadi in the selected area

•Information on Sub-centers/ 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 & 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

**Community Engagement and other Activities -2017-18**

| Sr.No | Activity | Progress |
|---|---|---|
| 1 | No of Sangini | 39 |
| 2 | Total Village Cover | 59 |
| 3 | Total Anghanvadi Cover | 99 |
| 4 | Total PRA | 10 |
| 5 | SAM to MAM Monitoring Progress | 45 |
| 6 | MAM to Normal Monitoring Progress | 86 |
| 7 | SAM/MAM Child Camp | 3 |
| 8 | Focus Group Discussion | 1557 |
| 9 | Family Based Counselling | 287 |
| 10 | Village level Events | 680 |
| 11 | Formation of women's groups | 274 |
| 12 | Formation of adolescent's Groups | 246 |
| 13 | No of SAM children referred to CMTC | 18 |
| 14 | No of SAM children provided with RUTF | 86 |
| 15 | Total HB screening - RPA | 3751 |
| 16 | Total HB screening - Adolescent girls | 5020 |
| 17 | Women in RPA provided with IFA Tablets | 246 |
| 18 | Adolescent girls provided with IFA Tablets | 351 |
| 19 | Anthromatry Study (0 to 5) | 7202 |
| 20 | Sangini Meeting | 24 |
| 21 | Sangini Training | 12 |
| 22 | SuPoshan Workshop | 1 |



## Holistic Intervention to tackle malnutrition!!"

When we talk about Kutch, we get two pictures - Kutch, before the earthquake and after the earthquake. After the earthquake, Kutch has witnessed green revolution along with industrial revolution. The crops which were earlier not possible to be cultivated here are now grown successfully because of the modern agricultural equipment and the methods like drip irrigation. This is one of the reasons why many labourers from outside Kutch come here to work and earn.

One such family is that of Deepika ben and Dinesh Bhai who have come here from Halol to earn their daily bread. They have settled themselves in Nani Bhujpur. The family consists of the couple and their five daughters. The couple in expectation of a baby boy gave birth to five daughters, thanks to the rigid and orthodox mentality of Indians! Probably it would take years to eradicate this mentality.

The family which could barely manage hand to mouth was to welcome one more member in the family. The situation was really crucial for Deepika ben as after delivering five children, her body had lost its ability to bear anymore. She started remaining unwell. Who would take care of this lady in the village which was far from her own village? But it is truly said that every dark night is followed by a bright morn. Deepika ben too got such a warm ray of hope in form of a Sangini worker.

Sangini workers are those workers who are the active harbingers of the good work of Adani Foundation and the Project Suposhan. The Project Suposhan aims at fighting the malnutrition prevalent in many states across India. These female workers are known as 'Sangini Bahen'. One such is Sangini Deval Ben. Deval Ben was once busy surveying the condition of the expecting mothers and how would Deepika Ben's condition stay out of her attention? She met her, talked to her and made her aware about her condition. She brought it to her notice that it would be dangerous for her to have a child in such a frail physical condition. It may be fatal for both- the baby and the mother. She motivated her to attend meetings of the Suposhan Project.

She took her to Bhujpur PHC and got her tests done. To her great shock, she came to know that Deepikaben's hemoglobin level was just 4.2% which was really fatal for a pregnant woman. The doctor prescribed certain injections of Iron and bottles of blood for her body. Deval Ben stood by her in all her testing times.

As a result of Deval ben's efforts, Deepika ben's HB level went up to 10.5%. At the end of the ninth month, she gave birth to a completely normal and healthy baby girl weighing three kg.

Thus, Deval Ben saved not only Deepika Ben's life but also the lives of the whole family.

## Community health "Suposhan" - Bitta

A child's entire life is determined in large measures by the food given to him/her during his/her first five years because childhood is the period of rapid growth and development. Nutrition is one of the most influencing factors in this period.

Project Suposhan is initiated at Bitta also with the objectives to **Curb malnutrition amongst Children and Adolescent girls and Women in our CSR villages**

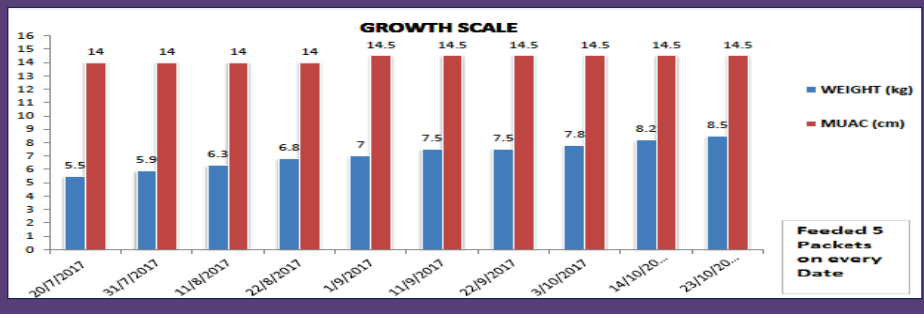
- Total 18 Adolescent and 23 RPA groups are already formed. HB Testing completed for 766 RPA and 612 girls. **During this year, anthropometry study done for 400 children. Total 6 children became free of malnutrition due to efforts under "Suposhan" Project.**



Priyanshi's mother told the Sangini worker that Priyanshi is a pampered child and gets what she wanted. Thus she got into the habit of eating packet food and would eat two packet per day. Due to these packets, she consumed less of homemade nutritious food. She was taken to the doctor at the Adani Foundation and was given the packets of baby Amul food according to her weight.

Every week the Sangini worker would go to measure her height and weight. The parents also started paying proper attention and giving her the baby Amul food regularly. Desired improvement could be noticed within the first week. For three months, every week she was given the baby Amul food and her improvement was constantly monitored. She also started consuming the homemade food. A very constant improvement could be seen in her weight. She was given as many as 50 packets and it was noticed that she had gained 3 kg. She is now 8.5 kg. Her height is now 75 cm. Every month, the Sangini worker goes to visit her and monitor her progress.

Priyanshi's parents thank Adani Foundation and tell the villagers about the good work done by the team of Suposhan worker






## My Daughter is glowing now !!

The village Nani Dhufi is situated in Abdasa taluka on Bhuj- Naliya highway. The village is 20 kilometers from Naliya and 67 kilometer from Bhuj. It is inhabited by many different communities like Darbar, Muslims, Koli, Dalits etc. who all are involved in various professions like driving, agriculture, cattle breeding etc. The population of the village is 800 but the level of education is very low. The reasons for the same may be poor financial conditions and some wrong beliefs. When the Adani Foundation started its SuPoshan Project in this village, a survey was conducted in the primary school and the Anganwadi. Later on, the Sangini surveyed the health condition of 50 children of the village in the age group of 0 to 5 years. Their height, weight and the other health criteria were assessed and based on this assessment, children were divided in the categories 'malnourished', 'less malnourished' and 'healthy'. The workers of Adani Foundation working in the SuPoshan Project had previously informed about the importance of nutritious food, its importance and the diseases caused when such food is not consumed. The people of the village were made aware about the harms caused by eating fast food or packet food readily available in shops. They got to know that the reason behind the malnutrition of their children is lack of nutritious food.

Working of the Project:

During the survey, it came to the notice of the workers that Priyanshi Rajeshbhai Yadav was one such malnourished child. She was 1 year, 7 months old but her weight was 5.5 kg. , her height was 75 cm and her M.U.A.C. was 14 cm. As Priyanshi was an underweight child, the worker talked to her parents, informed them about malnourishment and also the Suposhan project being run by the Adani Foundation.



## Community health : Health Camps

Various health camps are organized at regular intervals to meet the specific requirements of the community. We organize special health camps during the season of disease outbreak. We also organize medical camps to provide primary medical care during various public events. We organized total 21 such health camps during this year.


General Health Camp

| Sr.no. | Month | Villages Name | Total Patients |
|---|---|---|---|
| 1 | Apr-17 | Baroi | 192 |
| 2 | May-17 | Mundra | 139 |
| 3 | May-17 | Mundra | 141 |
| 4 | Jun-17 | Nana Kapaya | 51 |
| 5 | Jun-17 | Mundra | 48 |
| 6 | Jun-17 | Luni | 55 |
| 7 | Aug-17 | Navinal | 71 |
| 8 | Aug-17 | Baroi | 32 |
| 9 | Aug-17 | Luni | 85 |
| 10 | Aug-17 | Mundra | 90 |
| 11 | Aug-17 | Dhrub | 34 |
| 12 | Sep-17 | Nana Kapaya | 1200 |
| 13 | Sep-17 | Nana Kapaya | 110 |
| 14 | Sep-17 | Zarpara | 4000 |
| 15 | Sep-17 | Bhadreshwar | 410 |
| 16 | Oct-17 | Tharad | 155 |
| 17 | Oct-17 | Luni | 519 |
| 18 | Dec-17 | Mundra | 118 |
| 19 | Feb-18 | Mundra | 119 |
| 20 | Mar-18 | Luni | 59 |
| 21 | Mar-18 | Bharapar | 104 |
| Total... | | | 7732 |


## Community Health

It is not a coincidence that the first four letters of health is "Heal". Instilling health pursuing activities and ensuring availability of quality health care services to the remote areas is the objective of this sector. Committed to "Health for All" the Foundation runs Mobile Health Care Units, Rural Clinics, Special Innovative Projects i.e. Senior Citizens priority card for GKGH, School health and Variety of Health Related Camps.



## JEDLE JO JATAN (WOMAN HEALTH)

Adani Foundation organized one district level workshop for creating awareness for breast cancer and survival cancer and preventive measures. Guidance given by five gynecologists doctors. Total 530 women from various villages of Kutch District took active part in this workshop. They also visited GKGH hospital and got knowledge about mammography and pep test.



# Gujarat Adani Institute of Medical Sciences

Gujarat Adani Institute of Medical Science is the first Medical College of Kutch region. It started in partnership with Adani Group and Government of Gujrat 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 affiliate 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.

- Adani Foundation Team has initiated coordination with GKGH hospital since last year and established a reception area for the smooth patient coordination and preparation for the social networking Programme.
- **Adani Foundation organized General Health Camps and Specialty Camps in various interior villages of Kutch in coordination with GKGH which created magical impact and benefitted 3483patients**. Adani Foundation Bhuj Health team has also organized more than ten awareness camps and village level meetings at 293 villages of Kutch regarding services of GKGH.
- **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 625 dead bodies privileged till now to different locations in Kutch**.
- It is not always possible to predict the medical expenses. Moreover, those who are economically not so sound, become indebted for lifetime in case of certain illnesses. Therefore, 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.
- In current year **we have Supported 610 People from all over district - Kutch**



**અદાણી જી કે જનરલ હોસ્પિટલમાંઅદાણી ફાઉન્ડેશનના આર્થિક સહયોથી૧૧૦ વર્ષના માજી પર સફળતા પુર્વક સાથળના ભાગના હાડકાનો ગોળો બદલવાનું ઓપરેશન હાથ ધરાયું.**

થું તમે કયારેય વિચાર્યુ છે કે ૧૧૦ વર્ષની વ્યકિતના હાડકાના ઓપરેશન કરાયું હોય અને તે પણ સફળતા પુર્વક સંભવત સામાન્ય માણસ માટે અચરજ પમાડે તેમ અને મેડિકલમાં પણ અઘરૂ કહી શકાય તેવુ ઓપરેશન તાજેતરમાં અદાણી સ્થિર જી.કે જનરલ હોસ્પિટલમાં મુળ ગાગોદર હાલે મોટી હમીપર કુભારામ આશ્રમના ૧૧૦ વર્ષના લાછીબેન મહાદેવભાઈ પ્રજાપતિ પર સફળતા પુર્વક હાથ ધરવામાં આવ્યું હતુ આ આખી ઘટનાની વિગત કાઈક અમવી છે. પોતાનું કામ જાતે કરવું એવા સિધ્ધાતવાદી ૧૧૦ વર્ષના લાછીબેન થોડાક મહિનાઅગાઉદિવસ અસાનક લપસી પડયા હતા જેને કારણે તેમને થાપાના ભાગમાં ગંભીર ઈજાઓ થઈ હતી સખ્ત દુખ્યાવાના કારણે તેમનાથી સામાન્ય હલન ચલન થઈ શકતી ન હતી એટલે તેમના દિકરા કરશન મહાદેવ પ્રજાપતિ ત્યાના સ્થાનિક દવાખાનામાં લઈ ગયા પરંતુ આખો કેસ તથા દર્દીની ઉમર જોતા તે હોસ્પિટલના તેમજ શહેરના અન્ય ડોકટરોએ તેમની આગવી સારવાર આપવા ઈન્કાર કરી દીધો જો કે અગાઉના સારા અનુંભવો બાદ તેમના દિકરા વધુ સમય ના બગાડતા માજીને હોસ્પિટલથી સીધા ભુજ સ્થિત અદાણી જી.કે જનરલ હોસ્પિટલ સલાહ સારવાર માટે હાડકા વિભાગમાં લઈ આવ્યા.

આ આખા કેસની વાત કરતા હાડકા વિભાગના ડોકટર પારસ મોટવાની ડોકટર સંગીન ભુડીયા એ જણાવ્યું હતુ કે આ આખો કેસ બહુ અઘરો હતો અલ્પત ૧૧૦ વર્ષની ઉમર હોય અને વળી તેમના પર હાડકાનું ઓપરેશન હાથ ધરવાનું હોય એટલે બહુ સાવચેતી રાખવી પડે અસહય પીડા સહન કરતા માજીને થાપાના ભાગમાં ફેકચર થયું હતુ જેના કારણે તેઓ સામાન્ય હલન ચલન પણ કરી કકાતા ન હતા સામાન્ય હલન ચલન કયતે તેમને ખુબ પીડા થતી હતી અલ્પત ઉમરના હીસાબથી તેમના પર ઓપરેશન હાથ ધરવું જોખમી હતું જો કે આ છતાએ હોસ્પિટલના હાડકા વિભાગનાતબિબો ડો.પારસ મોટવાની ડો.સંગીન ભુડીયા.ડો.ગૌરવ કાકરીયા ડો.નવીન ગાગર ડો.સત્યજીત ભારડ ડો.આનંદ ગિરાણી એ અદાણી ફાઉન્ડેશનના આર્થિક સહયોગથી **થાપાનો ગોળો બદલવાનુંઆખુ** ઓપરેશન ખુબ સફળતા પુર્વક હાથ ધર્યું.

આ આખા કેસમા નોધ પાત્ર બાબત તો એ હતી કે ઓપરેશન દરમ્યાન તેમને ન તો લોહી ચડાવવું પડયું કે ન તો તેમને આઈ.સી.યુ મા રાખવા પડયા દર્દી જીજા દિવસથી જ પથારીમાં હલન ચલન કરી શકયા અને વધુમાં ઉમેરતા તેમના દિકરા એ જણાવ્યું હતુ કે મોટા ભાગના ડોકટરોએ ના જ પાડી હતી જો કે અમે લોકો અદાણી ફાઉન્ડેશનના કિશોર ભાઈ ચાવડા સલાહ સુચનથી સમય સુચકતા વાપરીને ભુજ સ્થિર હોસ્પિટલમા આવી ગયા હતા હને મારી માતાજી પેલાની જેમજ સરળતાથી ચાલી શકે છે. ભુજ અદાણી જી.કે જનરલ હોસ્પિટલનો આભાર વ્યકત કરીએ છીએ.

# Community health : Bhuj

## ૮૦૦ ગ્રામ વજન ધરાવતા નવજાત શિશુનેઅદાણી જી.કે.જનરલ હોસ્પિટલ માં મોતના મુખેથી બચાવાયું.

સામાન્ય રીતે બાળકનુ જન્મ થતા તેનુ વજન ૨.૫ થી ૩ કી.ગ્રા હોવુ જોઈએ તેવા બાળકને શારીરિક રીતે સ્વસ્થ માનવા માં આવે છે. ભુજ ની અદાણી જી.કે.જનરલ હોસ્પીટલ મા માત્ર ૮૦૦ ગ્રામ વજન ધરાવતા બાળકનુ બાળ રોગના નિષ્ણાંત ડો. હરદાસ ચાવડા અને એન.આઈ.સી.યુ વિભાગના ઈનચાર્જ ડો. હસમુખ ચૌહાણ અને સ્ટાફ ખુબ જ કાળજી પુર્વક સારવાર આપવામા આવી હતી જેથી બાળક ગંભીર બીમારીઓથી બહાર આવી ગયું

આજથી ૨૭ દિવસ પહેલા મિરઝાપરના નર્સ બહેન જયશ્રીબેન ચાવડા દ્વારાનોરમલ પ્રસુતિ કરવામા આવી હતી આ સમય દરમિયાનજન્મેલ નવજાત બેબી નુ વજન માત્ર ૮૦૦ ગ્રામ હોતા નવજાત શિશુનો જીવજોખમમા હતુ આથી ગભરાયેલામાતા–પિતા ગીતાબેન અરવિંદ કોલી નવજાત શિશુની સારવાર માટેભુજ ની અદાણી જી.કે.જનરલ હોસ્પીટલ મા લઈ આવ્યાજયા તેમને લાબા સમય સુધી વેન્ટીલેટર મશીન પર રાખવામાં આવ્યુ હતુ ત્યારબાદ તેમની તબિયતમાં સુધારો થતા તેમને સી પેપ પર રાખવામાં આવ્યુ ધીરે ધીરે તેમની તબિયતમાં સુધારો થતા લાગ્યો આ બાળકની જીદગી ડોકટર અને નર્સિંગ સ્ટાફના અથાગ પ્રયત્નથી નવજાત શિશુનો જીવ બચાવામા આવ્યો.

૧૪/૦૪/૧૭ ના હોસ્પિટલમા આવેલા નવજાત શિશુને ૧૦/૦૫/૧૭ ના રોજ રજા આપવામા આવી ત્યારેનવજાત શિશુનુ વજન ૮૦૦ ગ્રામ થી વધીને ૧કિલો ને ૩૫ ગ્રામ થયુ મહત્વની બાબતતો એ ગણવામાં આવે છે કે આટલા લાબા સમય સુધી તેમના માતા પિતાએ ધીરજ રાખી તેમને ડોકટર અને સ્ટાફ ની સારવાર ઉપર વિશ્વાસ હતો આ હોસ્પિટલના મેડીકલ ડારેકટર ડો. જ્ઞાનેશ્વર રાવ સાહેબે જણાવ્યું હતુ આટલા દિવસ સારી સારવાર કરાવી અને કરી એ બદલ બાળકના વાલીઓ અને હોસ્પિટલના સ્ટાફ અભિનંદને પાત્ર ગણાવ્યા હતા અને આ ઉપરાત અદાણી જી.કે જનરલ હોસ્પિટલમાં વધારે સારી સારવાર મળી રહેશે એવુ જણાવ્યુ હતું. અદાણી ફાઉન્ડેશનના સહયોગથી ડો. હરદાસ ચાવડા, ડો. હસમુખ ચૌહાણ અન કિશોર ચાવડા ના હસ્તે શુભેચ્છારૂપે નવજાત શિશુને બેબી હેલ્થ કીટ આપવામાં આવી હતી.



## Fisherman : Education Initiatives

**Education** is a strong building block in building a stronger and healthier community. Adani Foundation, through its surveys and assessments with fishermen community came to know that only education can make change in the status of fishermen community so we have started education intervention work from pre primary to college level under various project which are as below

### Fisherman Vidya deep Yojana

Adani foundation has been working restless to strengthen to pre-primary level education as "BALWADI" and to achieve this goal foundation has constructed four balwadi center at different fishermen helmet for 2.5 to 5 years group children. This Programme focuses on the development of basic age-appropriate learning concepts, discipline, regularity, awareness about health, hygiene, cleanliness and also provides nutritious food. Total beneficiaries of Vidya deep Yojana are 138 of four fisherman vasahat

### Fisherman Vidya Sahay Yojana

Adani foundation implement various program to improve higher education level of fishermen children through various support.
Scholarship Support (80%) to 50 students studying in 10th standard in SMJ High School, Luni.
Book Support : Total 57 students benefitted by book support for standard 9th to 12th.
Ramotsav organized at five fisher folk settlement to motivate young children for developing sportsman spirit

# 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.

## Dares to dream of a bright future

The otherwise hopeless eyes of Isak Bhai are today filled with great hopes of prosperity and wellness. Sitting near his wretched house in the Luni fisher folk hamlet, this poor fisherman dares to dream of a bright future for his family surrounding his minor son Samir .

A school-goer of Balwadi run by Adani Foundation, Samir has undergone a varied transformation which has brought in the belief in Isak Bhai that "Future Good" is waiting to happen with his family. The small boy who couldn't even utter his name properly, today speaks clear English lines with much confidence.

Thanks to the Balwadi teaching process, Samir knows lot about basic hygiene, public speaking, table manners and what all. The change in Samir has highly impressed the parents and showed them a ray of hope for better tomorrow.

## A Story of Transformation of Life

A woman is called a divinity of power and lame at the same time. She is called a deity of power because there are many conflicts in life and she fights back to any circumstances and survives. And she is called lame because though society trumpets about the rights and respects for the women but still she suffers and society, may be unintentionally, do not care about her problems.

Even today in remote areas she is stopped from going to school as soon as she becomes literate enough to read and write. Unless this thinking will not change we have no rights to worship the deity of power. It is not responsibility of government only to change the mind-set. Contribution from each one of us can only bring the change and will get good results.

This is a story of such inimitable change. The story of Muslim daughter Husena! Husena is a brilliant girl who was studying in class 7th in Bavadi Vasahat in Bhadreshwar Village in Adani Vidya Mandir Bhadreshwar. Suddenly she stopped going school. Teachers visited her home and tried a lot to convince her parents but they did not agree to give permission. Next day Ishwar Bhai reached to her house. Her father Isak Bhai opposed him in the beginning but after some time his anger calm down with ending the conversation Isak Bhai just spoke ,"if Husena want to study she can go to school".



## 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 4526 man–days. In addition to this, employment worth of 29526 man-days has been provided till date. The Foundation has also supported Pagadiya fishermen as painting labourers by providing them with employment and job in various field.

## Alternate Livelihood for Fisherman

Fishing is only source to earn livelihood. There is uncertainty in fishing business so Adani foundation support them to provide alternate livelihood like contract work and painting work in Adani. due to this intervention we awarded painting job in port as well as colonies and SEZ. In addition, After successful completion of technical training by Adani skill development center, provided job to 19 fishermen and contract work to 28 fishermen.



## Fisherman : Health Initiatives

A person of perfect health does not shirk his duties. He can work properly and leaves nothing undone As a student, he shines in his examinations though the important mobile dispensary has been started by Adani foundation at different vasahat since 2009 to provide medical facilities and primary treatment of diseases , this year its reached to patients At different vasahat.

1. Due lack of health awareness in fishermen community there are some dominant diseases found hence apart dispensary facility we also organized health awareness camps, women meeting at frequent intervals,.
2. Medical Financial Support –Adani Foundation has extended financial assistance to more than 1519 financially challenged patients from the Fisher Folk Community in case of medical urgency during this year.
3. Health Card for Senior Citizen Project – This is one of the major and prominent and the most innovative project of the Adani Foundation. Under this scheme Health Cards were given to the to Senior Poverty Stricken Citizens to provide them financial support to combat with their health related needs. The project for the senior citizens is popularly known as Vadil Swasthya Yojana and till date 219 senior citizens from fisher folk community are enrolled in the scheme. They are getting cash less medical services upto Rs. 30,000 for three years. Besides this, follow up with the card holders is a regular activity. It has been observed that card holders treat the card as an important document. Most of them keep these cards in their wallets with other important documents and cards.



## Machhimar Kausalya Vardhan Yojana

Skill building is a powerful tool to empower individuals and improve their social acceptance hence skill development program has been started by Adani foundation as per fishermen youth need assessment to create employability by ASDC at Mundra and from this year we have started Dori work and sewing training program for fisherwomen at their vasahat to make them self reliant.

| Year | 2017-18 |
|---|---|
| IT Basic Computer | 20 |
| Tailoring Training | 20 |
| RTG Crane Operator | 2 |
| Dori Work Training | 60 |
| Total | 102 |

## 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 (1,18000 Litre/Day) liters of water was supplied to 983 households from different settlements on a daily basis

Potable Water to Fisher Folk at vasahat-2017-18

| Sr. | Vasahat | family | Requirement Per day | Remarks |
|---|---|---|---|---|
| 1 | Luni Bandar | 110 | 15000 | 9th Month |
| 2 | Bavdi Bandar | 88 | 15000 | 9th Month |
| 3 | Kutdi Bandar | 140 | 15000 | 9th Month |
| 4 | Virabandar | 80 | 10000 | 9th Month |
| 5 | Randh Bandar | 250 | 23000 | 9th Month |
| 6 | Ghavarvaro Banadar | 60 | 10000 | 9th Month |
| 7 | Junabandar | 165 | 30000 | 9th Month |
| 8 | Zarapra Vasahat | 35 | | As per requirement |
| 9 | Chhachh vadi Zarapra | 55 | | |
| | Total | 983 | 118000 | |

## Fisherman Cricket League

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 and Anjar Taluka The Adani Premiere League by Adani Foundation started on 13.07.2016 at Shantivan Colony Cricket Ground. Total 58 Teams of 15 villages and 696 Fisherman participated. Teams from Villages Zarpara, Navinal, Shekhadiya, Modhava, Salaya, Mundra, Tragadi, Luni, Sanghad, Gundiyali, Bhadreshwar ,Vandi (Tuna),Layja and kathada participated with great enthusiasm. we took 786Rs registration fees from all participated teams.



## Cage Culture

Fishing occupation and Port business coexists. When we started port operations, condition of Fisherfolk community was deprived. After inception of CSR arm of Adani Group – Adani Foundation in 1996, strategy was planned based on priorities for socio-economic development of Fisher folk community. The fishers of the Shekhadiya fishing village (Juna Bandar) are one of the stakeholders of the Adani Port Ltd., Mundra.

Cage culture mean The production method for raising aquatic species using enclosures made of wire or netting around rigid frames which are placed in water.

Technology change is an important instrument in the continuous process of socio-economic development toward this path Adani foundation has started cage culture project with two beneficiary with consultancy of CMFRI for technical guide line.in this culture system 619 tiny lobster were stocked in to two 6x6 meter square cage. the growth and health of lobster were being monitored after seven month culture period 125 kg lobster and 80 kg native fish were harvested which create 1.10 lakh Rs income over fishermen. we organized grand harvesting inauguration and cage culture awareness program in presence of Mrs. Emleda Joseph (principal scientist of CMFRI).and 6 fishermen were facilitated by CMFRI training certificate.

It was reported that about big numbers of fisher folks are willing to change their occupation; therefore, Cage culture aimed to provide alternative employment and encouraging them to shift from full-time to part-time fishing.



## Journey for career building and shaping a golden future !!

A journey for career building and shaping a golden future in the game of cricket has begun for Fakir Ahmed. An extraordinary talent with astonishing batting and bowling skills, the 21-year old from Luni fishermen community has taken his road to stardom at the right time and age.

Due to the sincere efforts of Adani Foundation, Fakir has been enrolled into the prestigious Yusuf Bamaniya Academy, Rajkot for able mentoring and high standards of coaching. Like few other maestros emerging from the Academy to play for India in the national team, Fakir may become a shining star of Indian cricket tomorrow, bringing laurels to his community and the nation as a whole.

Born to economically poor parents of the fishing community in Kathda village of Mandvi Taluka, the cricket talent of Fakir and his passion for game was well noticed by his father even when the boy was at the tender of 9 years only. With his limited ability and resources, the father would encourage Fakir to take part in village and district level tournaments and appreciate his series of wins and victories.

Till November 2017, Fakir was just another face in the crowd when he had come to Mundra to play among 696 youths of his fishermen community representing 58 different teams for a mega cricket tournament organised by Adani Foundation. Throughout the tournament his consistent performance and unique style of playing was vividly noticed by the audience as well as the organisers.

However, Fakir's one-man show and struggle to save his team from a miserable defeat in the final match was worth viewing. In his sincere efforts for victory he was shining like a lone star in the dark sky. Heart beats fastened and the curiosity kept on rising with Fakir intelligently facing each ball of the deciding match with utmost calmness. With his awesome playing, Fakir literally made all the audience and the organisers his fans and became the star attraction of the entire tournament.

Subsequently, with the intervention and counselling of AF, Fakir has got into the Yusuf Bamani Academy where he will have One year of rigorous training in the game. Realising the fact very well that Fakir was an active member of the family and the residential cricket coaching would cease that running income, AF has facilitated a stipend of Rs. 10,000/- a month to the budding cricketer which would prevent his family from financial crunch.



## Poly Culture

Polyculture is the practice of culturing more than one species of aquatic organisms in the same unit area (marine, pond and rivers). The principle of Polyculture is that production of more organisms in the particular unit area having different food habits in one unit.

The main objectives for promotion of alternative livelihood to raise the economic standard of fisher folk, second is to reduce the pressure on fishing effort.AF has started poly culture project with consultancy of GUIDE In this system we stocked 6000 fingerlings fishes of 3gm weight in six different cages. There was 80% survival with 100 to 150 gm each weight after 5 month culture period

The activities involved i.e. capacity building, expert inputs, machineries, seeds of fish and fish food. We have identified feasible sites for the Polyculture and implement the activities with participation of fisher folk committees who has taken whole responsibilities. These Polyculture will add value to the fishing occupation of the local fisher folk community.

## Thanks AF for Guiding me to Success !!

It's a complete paradigm shift for Altaf Jakub Manjaliya. From a small fisherman to a salaried employee in Airlines company, the college-educated fisher youth has made a noteworthy journey in life.

Altaf Bhai of Luni village was compelled to get into the traditional fishing profession of the family after employment seemed a distance dream for his 12th pass qualification. Frustration had loomed large and he had no hope of ever getting into a salaried profession as had dreamt during studies.

However, Adani Foundation lend him a helping hand and made the dream come true. With necessary guidance and coaching by Adani Foundation, Altaf had appeared an interview in Odisha Airlines against a vacancy in Mundra location. Luck shined, he got selected for the position, and today earns a monthly salary of Rs 8500/- leading a contended life.

Expressing his heartfelt gratitude to Adani Foundation, Altaf reacts, "Now I have got a status in the society and could help my family financially. Today I realized the value of education and sincerely thank Adani Foundation for guiding me to success. "



## SLD Agriculture initiatives

Adani Foundation puts efforts in Mundra block for consistent betterment in livelihood sector. The organization has carried out remarkable activities in the agricultural and animal husbandry sectors.

### Drive for Technology to use in agriculture

We have initiated Programme for Awareness of Farmers in collaboration with KVK. The outreach is approximate 105 farmers of 5 villages

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.

This year Main Focused Activities

- Biogas Support to 10 Nos of farmers (AF, Beneficiaries and Govt support)
- Participatory Fodder Development Programme Individual 105 Farmer 45 Acer 5 Village
- Participatory Fodder Development Programme Group wise 1 Village
- Organic Farming 7 Farmers Wheat and Bajara
- Soil Health cards analysis : 27 individual farmers
- Organic farming Related 15 Demonstration for "Jivamrut" at Zarpara
- Marketing Linkages Work : Dates



### SLD Fodder Cultivation NB21

The organization provides fodder during the time of scarcity and the last 3 months of summer every year. During this period, fodder is regularly sent to every village with the help of the local people. This has given stability to the families who earn their livelihood through animal husbandry. In order to meet the demand of fodder, the Adani Foundation purchases it from the regional farmers. This gives them fair rates in return.

**This year we have given 60,000 man fodder worth Rs. 170.00 Lacs approximately.**

Additionally, to bring sustainable approach in fodder cultivation – two strategies has been work out.

### Participatory approach

1. Fodder cultivation in common land provided by Gram Panchayat

Kutch is famous for animal husbandry business specially for banni buffaloes.as Kutch is a dry and scanty rainfall region so scarcity of fodder is always remain major issue in Kutch and Mundra region. Though to solve this challenge and make village fodder sustainable Adani foundation has begin from FGD approach in different village to run this program in participatory manner. Mr. kalyanji from bareja village had taken lead to start sorghum fodder development in 25 acre land the security and fodder cutting responsibility had done by villagers and after the one cycle of crop total 90 ton fodder was harvested even after low rainfall . The villagers are ready to go with 100 acre land in next year for fodder development.

2. Individual Farmer fodder cultivation NB21

We have promoted cultivation of green fodder in the operational four villages (Siracha, Zarpara under public private partnership mode. Our endeavor is also to improve the production of milk in this area. **Green fodder has its own nutritional values as it helps in the growth of cattle and increases the quality and quantity of milk.** We are promoting green fodder cultivation with the help of Krishi Vigyan Kendra. Beneficiaries : 105 farmers and quantity of 3 Lac Kgs will be cultivated. Upto next year we are planning to increase our outreach upto 200 farmers by participatory approach. AF will provide Cuttings of NB21 and KVK will provide their expertise.



Sustainability is not only about making projects self-reliant, but also about adding value to existing projects or, activities for its long-term viability.

The story of Kamalaben Sheda's encounter with Adani Foundation is something of this sort. The village woman was running a small dairy farm with 11 cows and earned from selling milk in the local market. And, whatever she earned from selling milk, about 40 percent of the amount she had to spent on procuring cattle feed which squeezed the income majorly.

AF in coordination with Krishi Vigyan Kendra has been doing demonstration farming of NB-21 fodder with an idea of minimizing the cost of cattle feed for milk producers in Kutchh district. The linkage of AF helped Kamalaben immensely and her adoption of NB-21 farming technique drastically reduced the fodder expenses. As a result, she has today higher profit margin and a better scope of her business sustainability. She demonstrated the technique in 0.75 acres of land and the harvesting of first year stood above 8000 kgs. While doing a considerable cost-saving on her cattle feed procurement, the association of Kamilaben also made AF proud as she was the first lady farmer to adopt NB-21 technique and succeed.

Kutchh is dried and arid region and there is always shortage of fodder in Kutchh as well as in Mundra region. Abdul Latif Suleman is from Dhrub village however he is mainly depended on dates farming but due to expanding dairy Udyog he is also engaging in animal husbandry business.

Whenever we met him, He always discussed and worry about the fodder as main part of animal husbandry business and requested to find out the technology to solve of fodder scarcity ,so we organize exposure tour for NB20 as well as meetings with parijnya and KVK to make them familiar about NB20.

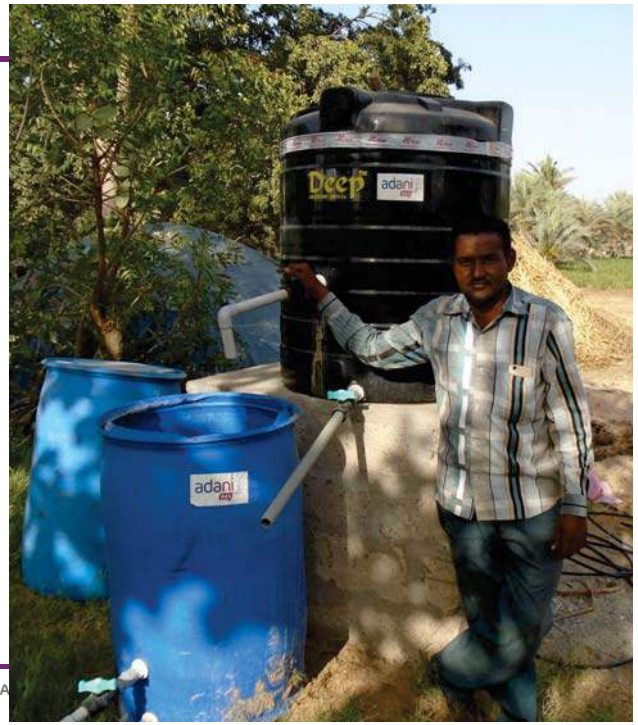
After all this Mr. Abdul Bhai inspired and has started NB 20 farming in his 0.5 acre land with AF financial and technical support. The total production was 4000kg after first cutting and consequently it will be harvested as its multi crop nature.

Abdul Bhai says that He has total 7 animal and now he don't need to purchase fodder. its also nutritive fodder for cattle which make milk more nutritive hence ultimately save his money and increase his income. he also add that NB21 grows up to 12 to 13 feet and as its multi crop effect farmer can reach their fodder requirement even in small area land hence they can be use more land in other crop.

## SLD Bio gas

Biogas is a clean, non-polluting and low cost fuel. It contains about 55 to 75 percent methane, which is inflammable. Bio gas can be produced from cattle dung, human waste and other organic matter by a process called "Anaerobic digestion" which takes place in a biogas plant. The digested effluent, which comes out of the plant, is enriched manure.

The Multiple benefits of the biogas have changed many lives in rural areas. During the last year 11 plants have been constructed and process for 10 more plants is going on. We are providing support addition to Government support to the beneficiary. (Under bio-gas scheme of government, the total cost is Rs.33, 500 out of which Rs.15, 000 will be granted by the government and out of the pending amount of Rs.18, 500 sum of Rs.10, 000 will be contributed by the Adani Foundation. The beneficiary will have to pay only Rs. 8, 500). Beneficiary women use the time, saved from cooking and fuelwood collection, to take up an additional economic activities.






## Self Dependency brings confidence !!

A lady Narmadaben 38 year old from Shekhadiya village. She has started her journey though joining in Sonal Krupa Mandal in which they save Rs.100 per month.

As a part of women empowerment we always remain in touch with all SHG Groups even provide various training for saving, Account and entrepreneurship.

Narmadaben has business oriented mind and she always think about to start business. Though as her strong desire she started to washing powder preparation Gruh Udyog with Saheli Gruh Udyog support. Now a day she and their group Members earns minimum 2000Rs per month as optional livelihood with AF market linkage support.

She says: I get status in my society and I am able to support my Family and I realize that women can do anything. This all come true due to AF support and motivational. she become inspirable for other women .

A lady Dhanbai Ravji chuiya 28 year old from Baroi village. Her husband has been working in private company.

Her empowering journey is started from joining in Adhar Saheli Mandal which is our initiative for women empowerment. Each women saved Rs.100 per month in this saving group than We had organized training program to create entrepreneurship and motivation among them though as a result of it she started khakhara Udyog on small scale with support of Saheli Gruh Udyog (Supported by Adani Foundation) for training and marketing meanwhile we also organized some training as per their need like account and Rasoi, Papad at VRTI and other center. After all they earn well to meet their day end but Dhanbai has burning desire to start her own business hence she has started to sell dresses, cutlery items and sewing work in their rental shop at Mundra. now she earn more than 4000Rs/month. Additionally, She appeared for HSC boar examination and could able to clear 12th standard with support and motivation of Adani Foundation team.

She says: I get status in my society and support my husband to earn this all happened due to AF strong effort



## SLD – Women empowerment

Encouraging women, to take control of their lives and building their confidence whether they are single, married or a widow; is one of the initiatives under the sustainable livelihood development program.

- Considering this situation, We have started our training programme with two major women's group of Villages near Adani Power and Adani Ports. Both the groups of women (90 women in total) successfully completed their training for preparing washing powder, phenyl, liquid for cleaning utensils and hand wash etc.
- We have selected 6 women groups having 15 members each, as per their ability for different work i.e. accounting, banking, leadership, marketing, administration etc.
- Before two years we have started shop "Saheli Mahila Gruh Udyog" at Shantivan Colony and started coordinating with various companies for orders of perishable as well as non perishable items.
- **"Saheli Mahila Gruh Udyog "has annual turn over of Rs.8.00Lacs**.

## SLD – Beti Vadhavo

Beti Vadhavo Programme was organized in 32 Villages in the presence of Village Sarpanch and other leaders. 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)



## Messages of Women's Day !!

International Women's Day has been celebrated by the Adani Foundation, Mundra with Integrated Child Development Scheme. On this momentous occasion the supervisors of ICDS were felicitated and honoured for their noble work including the five women entrepreneurs who were supported by the Adani Foundation, Mundra for income generation. The Head of Sarswatam trust was also honoured for his/er remarkable contribution in the upliftment of women. The Staff of AF, Mundra was also facilitated by the ICDS for their remarkable work in field of women empowerment. The SDM, Mamalatdar and the TDO remained present on the occasion. Total 250 women attended the programme followed with a lunch which was prepared by Saheli Mahila Gruh Udyog.

## Coordination with Government for Widow and Senior Citizen Scheme

- We are 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 to two persons for the handicapped in coordination with Bhuj Samaj Suraksha Khata for regular visit and follow up.
- **Last year, 71 widows and 47 Senior citizens and 733 handicapped - total 853 members got benefitted** from the approval of pension certificate. The financial benefit of the senior citizen Yojana is Rs. 400 per month and the widow scheme is of Rs. 900 per month.

| No | Linkages Detail | Beneficiaries | Source |
|---|---|---|---|
| 1 | Handicap medical certificate | 180 | Under medical camp and G.k -Bhuj |
| 2 | Handicap Buss pass and I card | 196 | Samaj surxa khata at Bhuj |
| 3 | Sadhan sahay munent | 47 | By Jilla samaj surxa khatu at : Bhuj |
| 4 | Physiotherapy – students | 30 | Coordination with B.R.C and Adani hospital |
| 5 | I.G sadhan sahay | 51 | Sewing machine, hand cart, computer kit 1 |
| | I.G sadhan sahay and widow | 48 | By adani foundation |
| 6 | Sadhan sahay | 38 | By adani foundation- tricycle, wheelchair.. |
| 7 | Handicap pension | 3 | Sant surdas Yojana – samaj suraxa - Bhuj |
| 8 | Widows pension | 71 | Mamlatdar Office Mundra |
| 9 | Snr Citizens pension | 47 | Mamlatdar Office Mundra |
| 10 | Centeral govat shadhan shay | 142 | With Taluka health programs |
| | Total benefits | 853 | |



# Rural Infrastructure Development

## Global Problem-Local Solution

### Water Conservation Work : Impact Study

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 15 ponds) were built leading to a significant increase in water table and higher returns to the farmers.

Many of these check dams are now in need of repair. Problems such as silting, damaged gates or broken structures have to be attended to for optimal water harvesting.

Adani Foundation has studied impact of Check Dam Strengthening carried out in two villages before two years period.

1. Pond Deepening work at Vadala
2. Pond Deepening work at Mota Bhadiya

In Both the villages post survey has been carried out and impact on surrounding agriculture is measured.

## Pond Deepening work : Vadala

Sans irrigation facilities and the drastic fall in water level in dug wells as well as bore wells in the non-monsoon seasons, several big farmers of Vadala village in Mundra locality were deprived of a second crop, thereby keeping their large patches of cultivable land barren post the Ravi crop harvest. Apart from ceasing good income possibility, the water-scarcity scenario had frustrated the farmers who remained helpless and hopeless of getting any solution to the crisis.

This was a situation during 2014-15, when Vadala village had irrigation facility for hardly 30 percent of the agricultural land and the rest patches of land were depending on water availability from dug wells and bore wells surrounding the age-old Radhan Peer Pond located on the northern side of the village. But, the poor storage level accompanied by seepage at many points of the pond resulted negligible ground water recharge in the locality.

The then Sarpanch of Vadala gram panchayat, Manjibhai Paradhi, who requested Adani Foundation, Mundra for a permanent solution to the issue, informed that during monsoon season not more than **3 mcft of water could be stored in the pond**, which used to vanish and totally wasted within days due to the prominent seepages. The village with a population of 2871 had around 718 households and majority of them were earning livelihood from cultivation of bajra and castor and animal husbandry. Hence, the poor ground water recharge and faulty pond storage had impacted heavily on the economic condition of the villagers.

### Before

| | |
|---|---|
| Village Name | :Vadala |
| Village Population | : 2871 |
| Village HH | : 718 |
| Pond Storage | : 3 Mcft |
| Study area | : 15 acre – 6 farmers |
| Crop | : Bajra |
| | : Castor |

### After

| | |
|---|---|
| Pond Storage | : 3.25 Mcft |
| Study area | : 15 acre – 6 farmers |
| Total earning | : 2.25 Lacs |
| Crop | : Bajra |
| | : Castor |
| | : Cotton |
| | : Wheat |

Depends on irrigation facility two times summer and winter

### Impact

Annual increase of Rs.15,000 per Acre after Pond Deepening



After carrying out a preliminary survey of the area and identification of the issues, the RID team of AF, Mundra had taken up a project to deepen the pond through silt excavation and close the seepages by erecting RCC protection wall. With a rich experience of working on water recharge in Mundra locality for over a decade benefitting large number of farmers, AF had undertaken the project at Vadala in the year 2015-16 at an expenditure of Rs 8 lakh, and handed over the same to village panchayat for community ownership.

On the very year of project completion itself, good results spoke about the quality of work. While the pond storage level had gone up to 3.25 mcft, the total check in seepage caused water to remain in store for months together allowing the natural recharging of ground water. Again to the excitement of the surrounding farmers, all the dug wells and bore wells remained water-filled for several months facilitating a winter crop to six major farmers in an approximate farming land of 15 acres.

Manjibhai, who is the ex-sarpanch today says, "per acre a farmer makes an additional earning of Rs 15,000/- which comes to a total rise in earning of Rs 2.25 lakh for 15 acres of land belonging to the six major farmers." Apart from improving the socio-economic status of the agricultural farmers, the RID initiative of AF has also benefited large number of other villagers practising animal husbandry due to round-the-year availability of ground water in the locality, added further a local farmer Parbatbhai Vasubhai.

## Pond Deepening work : Mota Bhadiya

Sigh of relief has come to the large number farmers and residents of Mota Bhadia village in Mundra taluka who were struggling with perennial woes of water crisis. Adani Foundation acted as a change-agent to facilitate better storage of rain water, further recharge of ground water and rise in water table of the locality.

Even though a check dam existed in the village, yet the storage of water during monsoon was very negligible due to faulty upstream level and excess deposition of silt on the water storage area. After doing a field survey, Adani Foundation had taken up the project of excavation of silt on the upstream of the check dam about two years back. While in 2016-17 financial year around 8535 CMT of sand was excavated, another about 13278 CMT sand was excavated during 2017-18, which deepened the storage space increasing its capacity substantially.

And the result, water recharging takes place automatically improving the ground water condition and maintain a healthy water table. Above 100 acres of agricultural land today give better yield due to water availability and the quality of drinking water from nearly 12 tube wells sunk in the area for public use has improved considerably. The efforts have resulted in ending up a long-standing worry to the farmers.




## Demonstration of Conversion of Non used bore well into Artificial Recharge Bore well

Program: Participatory Groundwater Management on Kankavati Sandstone Aquifer

Project Area: Adani Foundation CSR Villages of Mundra Taluka

Coastal region of Kutchh has potential aquifer known as Kankavati sandstone speeded over 04 coastal talukas. The aquifer is backbone for entire region and groundwater extracted for this aquifer is being used for various purposes like drinking, domestic use, irrigation and others. The groundwater resource is under threat of water table depletion and quality deterioration. Therefore, it is required to manage the resource for long term sustainability with approach of Participatory Groundwater Management (PGWM). PGWM program is being implemented on Kankavati sandstone aquifer by Arid Communities and Technologies (ACT) with multi partners. With the support of Adani Foundation, the program is being implemented in 10 villages of Mundra Taluka jointly by ACT, Geo Science Services (GSS) and PARAB water management.

It is aim to maintain balance between demand and supply based on groundwater resource characteristics. For supply side management, various techniques designed for groundwater recharge augmentation. As a part of this, demonstration has been designed to convert non used bore well into artificial recharge bore well. This demonstration activity has been implemented at farm level with 06 farmers of Jharpara village.

To set demonstration, series of discussion have been made with farmers, village Sarpanch and PGWM committee. At primary state, 06 farmers have been selected having different farmland situations. Each farm has one none use bore well and another in use for irrigation. By diverting rainwater and recharging aquifer through non used bore well, groundwater condition will get improve and that will increase and secure crop production and successively farmer's economy

*A very positive and active farmer Muljibhai says-'in Jharpara village, there are 2 to 3 bore wells in each farm. If we convert one bore well in recharge bore well, groundwater condition will improve and lush green past of the village can be seen again. This is direct benefit to farmer with low expenditure. I am sure that each farmer will adopt this technology with your guidance and support.'*

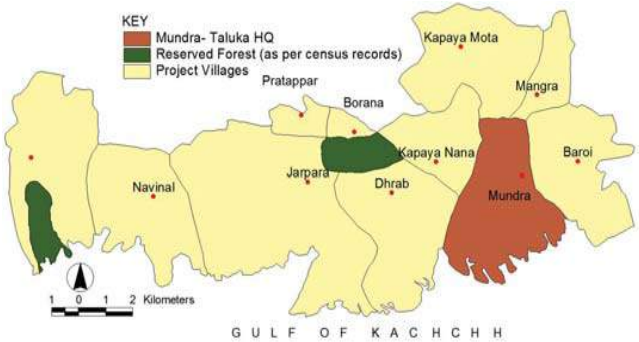


## Participatory Ground Water Management

In Region Kutchh, in many cases, groundwater or surface water may be unavailable for drinking water. The objective of the project was to reduce the salinity ingress in and around the coastal regions of Mundra, Kutchh and mitigate the ill-effects of this manmade problem to improve the livelihoods of the rural people. The Project will help to get water table high, also it will help in agricultural activities.

**MAIN AIM OF THE PROJECT** : Participatory groundwater management of Kankavati sandstone aquifer to create water secure future. Due to problem of Salinity ingress, we received many issues regarding water scarcity during our village meetings, Public hearings and GRI related meetings.

**Expected outcome :** If we will start this initiative the issue can be sorted out upto some extent. This is not a corporate requirement but environment compliances – Eco friendly project for the business. This Project will also help agricultural activities also




- Aquifer level Institution working on resource management
- Multi Stakeholder Engagement for sharing and learning of groundwater management at cluster / block level
- Pilots to demonstrate Participatory Ground Water Management Framework for Use



*Farmer Karsanbhai says- 'Through diversion of rainwater in this non use bore well, groundwater condition will improve in bore well which is in use for irrigation. Overall groundwater quality is poor but through this activity I can secure my one season crop with good production'*

Recharge plan and estimates have been prepared for each farm. Depth of bore well ranges from 380 to 450 feet. While groundwater table stands at 280 feet. Catchment area has been calculated for each bore well to estimate rainwater. Catchment area may be upstream farm land, own farm land or small tributary. Rainwater will get accumulated in low laying area and then diverted through underground pipeline to the bore well. Recharge chamber has been constructed around bore well by arranging filter media to prevent blockage. Through filter chamber, rain water will directly replenish groundwater resource. In this demonstration, farmers have contributed through labor work required at farm level.

Estimated rainwater for each bore well is more than irrigation requirement for one season crop in respective farm. Through this demonstration, balance could be set between recharge and discharge. Such demonstration can be replicate in entire region and that will improve groundwater condition in term of salinity dilution, water quality improvement and increase in water storage.

Basic details of the demonstration activity

| Sr. No. | Farmer's Name | Location | Farm area | Depth of Nonuse bore well Feet | Catchment Area | Received Rainfall Cum |
|---|---|---|---|---|---|---|
| 1 | Karsanbhai Lakhamanbhai Gagiya | N 22° 50' 20.73" E 69° 36' 36.47" | 4 | 380 | 10 acre | 17,600 |
| 2 | Muljibhi Visrambhai Gelva | N 22° 50' 25.3" E 69° 36' 31.1" | 8 | 450 | 8 acre | 14,080 |
| 3 | Lakhamanbhai Manshibhai Gagiya | N 22° 50' 13.2" E 69° 36' 42.7" | 4 | 400 | 8 acre | 14,080 |
| 4 | Joshi Ashariyabhai Ranshibhai | N 22° 50' 37.3" E 69° 36' 35.74" | 5 | 450 | 4 sqkm | 17,60,000 |
| 5 | Kalyanbhai Karsanbhai Sheda | N 22° 51' 4.6" E 69° 37' 3.2" | 18 | 415 | 24 acre | 42,240 |
| 6 | Bharubhai Dada Lakhani | N 22° 50' 20.73" E 69° 36' 36.47" | 7 | 460 | 4 sqkm | 17,60,000 |

Filter chamber around bore well

Mini filter chamber for clay settlement

Site visit by PGWM Team

Excavation for diversion canal

Pipe laying in diversion canal


Google layout of artificial recharge bore well demonstration activity

## Participatory Ground Water Management

PGWM Activity ongoing....

| | | | |
|---|---|---|---|
| Data collection for Demography, livelihood, water resource assessment, land use, drinking water status | Problem identification Site visit | Water demand and supply budgeting | Water Security Plan for each village |
| Activity prioritized for drinking water support | Designing and estimation | Implementation of GWR activity and Monitoring | Groundwater Recharge Augmentation |
| Identification of Rural Youth | Capacity building as BJ | Involvement in data collection and monitoring | BJs cadre development |
| Group identification interest in water | PGWM committee formulation | Meetings, trainings, planning | Village level institution building |
| Awareness and advocacy | Meetings, exposure | Block level workshop | |



## Workshop : Participatory Ground Water Management

Every stage of implementation is initiated by advocacy workshop at block level to share experiences of various partners including farmers, village committees, CSR foundations, researchers, Bhujal Jankars and local experts. One such workshop has been organized on 22 March 2018 by Adani Foundation, (AF) Arid Communities and Technologies, (ACT) Geo Sciences Services (GSS) and Parab Water Management Pvt ltd. at Mundra. The aim of workshop is to inform about PGWM project planned jointly by AF and ACT and to create awareness among various stakeholders about PGWM activities on other part of kankavati Sandstone area by different CSR and community interventions. One of the objectives of the workshop is to sensitize stakeholders about groundwater use by users and educate about kankavati sandstone issues and potential. Considering aim and objectives workshop sessions were planned for sharing of learning and characteristics of Kankavati sandstone by experts of ACT and GSS., experiences sharing by CSR foundations, AF, CGPL and IL&FS, regarding their interventions on PGWM and activities and impact of different activities. In this workshop special focus has given to role of Media on raising awareness and how they can be helpful developing sensitization towards water management with special focus on groundwater management within and outside the project areas.

The workshop has also planned to develop platform for discussions, suggestions by farmers, village committees and Bhujal jankars and to discuss what should be done at village level, cluster level and aquifer levels for developing protocols for demand side and supply management.

The workshop has been attended by 107 participants from 29 villages including 10 village partners of AF project areas, three CSR foundations, KVK, five organizations, four main media i.e. Kachchh Mitra, Divya Bhaskar, Maa News, all India radio and immanent citizens of Mundra town.

**The workshop way forward**

09 village water security plan have given to respective villages

- Village community people have highly appreciated Adani foundations attempts on PGWM and promise to cooperate for PGWM activities and agreed to develop protocols based on PGWM principle.
- KVK should be involved in monitoring of PGWM activities carried out in villages and document changes in agriculture and water conservations due to change in water quality and quality



**Water Conservation Projects**: Scarcity of potable water in Kutch has led to acute problems in its coastal region. In Mundra, people mostly use ground water for drinking. Unfortunately this water has a high level of TDS which causes bone and kidney diseases. To alleviate this situation, the Adani Foundation has taken initiatives for water conservation including construction of check dams and pond deepening

**This year Adani foundation carried out pond deepening in Bhujpur and Mota Bhadiya Village and Canal Repairing work across the river at Zarpara village. Also repaired check dam at kandagara to rejuvenate the same.**

Education Related Projects: Education is the most powerful weapon which you can use to change the world." To improve the quality of education and to improve school environment, the Adani Foundation supports for infrastructure development on request basis. Adani Foundation carries out the construction of assembly hall, classrooms, computer labs, space for midday meal, playground, school walls, washrooms etc. as per the needs and preferences of the school. It is aimed at providing facilities in education sector to the present generation.

**We have constructed Prayer Shed at Govt Primary School at Ragha and Bhadreshwar. Also grill work done in Kumar Shala Zarpara.**

## Rural Infrastructure Development

**Drinking Water Related Projects**: Potable drinking water is basic requirement of any village. For better health and hygiene of village drinking water should be clean and pure. So, this project will create positive and effective social impact. **Adani Foundation has installed RO Plant at Samaghogha and Siracha village. Also RO installation at Vallabh Vidyalaya at Mundra**



## RID – Dignity of Workforce

Present condition of migrated labour community of Adani port, power and Wilmar is really matter of concern. They are living in pathetic condition. It is true that we cannot achieve our goal of development unless and until we support to bring up the lives of this community. Basic needs of this labour force need to be addressed. In labour Vasahats they were not getting even the facility of pure drinking water, proper living condition, sanitation or in one go we can say "NO" proper living conditions.

With the objective to build up trust and transparency in labour community, union Labours and Smooth business operations, **Adani foundation has constructed and provided basic sanitation facility (18 Nos), Balvadi, medical center and retiring places at labour settlements near Adani Wilmar Ltd.** The provided facilities may lead them to live happy, healthy, secure and hygienic conditions and will definitely make them happy and will boost the efficiency and commitment of the people.



- Health Related Projects: The proposed work was related to our major core area – health. Adani Foundation has constructed toilet block at Sadau Primary school. Also two toilets constructed at Tuna Village of Anjar Taluka
- Other Projects: Some Projects we took up to fulfill the demands of communities. We have completed road repair work at Shekhadia, fodder shed at Tuna, water pipeline work at Wandi, garden development at kandagara etc,
- Other Projects: Some Projects we took up to fulfill the demands of communities. We have completed road repair work at Shekhadia, fodder shed at Tuna, water pipeline work at Wandi, garden development at kandagara etc,

## A step towards Swachh Bharat : School Sanitation

Adani Foundation has brought smiles to large number of girl students of Sadau primary school in Mundra locality, who were otherwise unhappy with the poor toilet and sanitation facilities available in their premises. The construction of three new urinals, two toilet blocks and one wash basin exclusively for girls has largely changed the scenario and created much impact on the hygiene conditions as well as psychology of the female students. Even the parents and guardians are a relaxed lot with the improved facility and privacy for toilet use to their children.

Earlier, there were only two toilets each for boys and girls which was insufficient considering the large number of about 243 girl students. Besides, the boys and girls toilets were adjoined, thereby causing psychological impact on the users.

Citing lack of fund, the school authorities had requested Adani Foundation to support the construction of exclusive toilet facilities for girls. As per prescribed designed of government, the toilets, urinals and wash basin for girl students were constructed.

Apart from playing a key role in Swachh Bharat Abhiyan, this RID project of Adani Foundation also contributed towards Girl Child Education.



## RID – Dignity of Drivers

It is very difficult to achieve a healthy lifestyle for truck drivers. It's no secret that truck drivers are strapped to their seats for long periods of time. Poor sleep and busy life style leads to many diseases i.e. blood pressure, diabetic, obesity and this leads to heart attack sometimes. With reference to the above stated issue Adani Foundation decided to provide resting shed with water and sanitation facility for truckers near SEZ parking areas. We can reach upto truckers and help them to be comfortable after long tiring journey, Which will useful to create trust among vendors and union Labours.

With objective to build up trust and transparency in Truckers community and Smooth business operations. In long term it will help us in trust building for the group and necessary for the business relations with stakeholders.

Size of shed is 24.10 Mtr x 12.40 Mtr and total 50 platform is constructed for resting. Other facilities are drinking water, sanitation, LCD for recreation purpose and canteen facility nearby

# Education

Education is a strong building block in building a stronger and healthier community. Adani Foundation, through its surveys and assessments with fishermen community came to know that only education can make change in the status of fishermen community so we have started education intervention work from pre primary to college level under various project which are as below




**Summary of School Visits at Shanti Vihar from December-2010 to March-2018**

| Financial Year | No Of Schools / Institutes | No Of Visitors |
|---|---|---|
| FY 2010-11 (December 2010 to March 2011) | 99 | 4145 |
| FY 2011-12 | 318 | 22652 |
| FY 2012-13 | 364 | 27704 |
| FY 2013-14 | 375 | 36744 |
| FY 2014-15 | 423 | 28310 |
| FY 2015-16 | 343 | 27926 |
| FY 2016-17 | 327 | 23804 |
| FY 2017-18 | 487 | 32024 |
| **Total** | **2736** | **203309** |




**Project UDAAN**

Udaan is a learning based initiative focused on the youth coming from various schools across the state of Gujarat. Under this project, a two day free of cost exposure tour is organized wherein students are given a chance to visit the Adani Port, Adani Power & Adani Willmar facilities to get an insight upon the large scale business activity carried out at each of them.

Specifically students from high school (9th to 11th grade) are encouraged to take part in the exposure tours. It is believed that students of this age would be able to absorb the learning in a better way which could help them shape their lives by aspiring for big. The spread of the schools extends to various districts in Gujarat. There is a specific effort to reach out to schools in the rural areas. Other than schools even colleges where the exposure visit seems to be helping the curriculum are encouraged.

**Till Date Total 2736 Schools and 203309 students have been part of project UDAAN**



## Adani Vidya Mandir

**About School :-**

Adani Vidya mandir (AVM-B), a GSEB affiliated school is the first of its kind initiative, under the support of Adani Foundation.

**Mission :-** To fulfill the quality base education for economically poor family & Fisherman Students, so that no children can drop primary education.

**School Provides "cost-free"** education to meritorious students coming from challenging economic background, who have priceless treasures but have been under achievers due to situation.

The school was established to realize the dreams of those parents who owing to financial constraints are not in a position to provide quality education.

School also provides them free uniform, textbooks, Notebooks, Breakfast, Lunch and refreshments.

**Students strength Year wise (2013-18)**

| Class | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|---|
| 1st | 53 | 40 | 45 | 41 | 38 | 40 |
| 2nd | 26 | 68 | 46 | 41 | 39 | 37 |
| 3rd | 27 | 40 | 73 | 45 | 37 | 39 |
| 4th | - | 39 | 48 | 70 | 44 | 36 |
| 5th | - | - | 37 | 46 | 58 | 39 |
| 6th | - | - | 37 | 36 | 46 | 58 |
| 7th | - | - | 34 | 37 | 35 | 44 |
| 8th | - | - | 39 | 34 | 36 | 34 |
| 9th | - | - | - | 38 | 38 | 30 |
| 10th | - | - | - | - | 23 | 27 |
| Total | 106 | 187 | 359 | 387 | 394 | 384 |

**Key Activities:**

1. Science Fair – Block level
2. Drawing Competition under the P.C.R.A. National level competition
3. Assembly on every Saturday.
4. International Yoga Day Celebration
5. Guru Purnima celebration
6. 71st Independence Day Celebration
7. Teacher's day Celebration
8. Children's Day Celebration
9. Educational Tour for each standard
10. Festival Celebration
11. Awareness Street Play organized at various villages

| ADANI VIDYA MANDIR, BHADRESHWAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ANALYZED GRADE OF THE STUDENTS | | | | | | | | |
| CLASS | A1 90% ABOVE | A 80%-89 | B 65%-79% | C 50%-64% | D 33%-49% | E | ABSENT | TOTAL |
| 1 | 7 | 13 | 9 | 11 | 0 | 0 | 0 | 40 |
| 2 | 2 | 10 | 14 | 8 | 3 | 0 | 0 | 37 |
| 3 | 3 | 11 | 7 | 9 | 9 | 0 | 0 | 39 |
| 4 | 1 | 13 | 10 | 3 | 9 | 0 | 0 | 36 |
| 5 | 0 | 6 | 14 | 13 | 7 | 0 | 1 | 41 |
| 6A | 0 | 1 | 8 | 12 | 8 | 0 | 0 | 29 |
| 6B | 0 | 2 | 4 | 17 | 6 | 0 | 0 | 29 |
| 7 | 0 | 1 | 8 | 17 | 19 | 0 | 0 | 45 |
| 8 | 0 | 1 | 8 | 12 | 12 | 0 | 1 | 34 |
| 9 | 0 | 0 | 3 | 22 | 0 | 5 | 0 | 30 |
| 10 | 0 | 0 | 4 | 12 | 0 | 11 | 0 | 27 |
| TOTAL | 13 | 58 | 89 | 136 | 73 | 16 | 2 | 387 |



## Shala Praveshotsav

To motivated children for schooling by providing the welcome kit / education kit and to create conducive children for **" joyful learning"** Environment for children for Learning during shala Praveshotsav Govt. has wide spread network of 111 Govt. primary schools in total 62 villages of Mundra Taluka, 3 villages of in Anjar taluka and two villages of Mandvi Taluka every year on an average 2550 to 2700 children gets enrolled in 1st std in Taluka For 2017-2018 total 2500 children got enrolled & Adani foundation provided the "Enrollment kit" to all new enrollee in Taluka

## Adani Education Development Center

Kutchh District is very poor in case of Primary Education. Educational Standards of Govt. School is considerably depraved. It continuously destroying our young generation in absence of proper direction and base. keeping this situation in view, We have initiated Coaching center at Zarpara and Sharda Mandir, Mundra. More than 85 students has benefitted by coaching center. (22 students were in D Grade who secured C Grade and rest 63 students were in C Grade among them secured 21 students got B Grade this year.

Key Focus of center:

- Efforts to Improve Quality of Education
- Child Education & Nurturing
- Propagate Child Friendly Environment at schools
- Community Participation
- Maximum [100%] enrollment and retention in Schools



# Vatvruksha : Come, Let Us Walk Together on the Path of Development'


Education has the power to transform the social landscape. With its progressive approach and ideas, the Foundation has been carrying out innovative activities to improve the scenario of primary education in the Mundra taluka for many years. Its unique initiatives are aimed at making education more effective and interesting for the children to ensure that no child remains bereft of primary education. These initiatives target children, teachers as well as schools. With these objectives, education camps are organized regularly.

'Come, Let Us Walk Together on the Path of Development' – With this idea, the Foundation organized a teacher's camp named 'Vatvruksha'. Hon'ble Collector Shri Remya Mohanji, DEO Shri Vaghela, DPEO Shri Suvarnakar, Adani Foundation Advisors Shri Vasant Gadhvi, Shri Rakshit Shah and Shri Mukesh Saxena, TDO Shri Mamlatdar, DPEO Shri Haresh bhai, Mundra Taluka CRC as well as invited teachers attended the camp.

Mohan Vaghela, Nisha Trivedi, Viraj Vohra, Alka Chavda, Sanjay Mehta, Rashida Hussain and other experts also participated. Important topics like teaching methods and evaluation, classroom arrangements, life skills, positive attitude, lesson planning and personality development were covered in the camp.



## Material Support

Adani foundation is supporting for improving quality of education under the teaching learning material schools for teachers and students. Role on infrastructure is must to achieve quality of education. Many studies highlight that lack of infrastructure is also affected the school dropout ratio. Good and proper infrastructure attracting children for school. Adani foundation is also trying to full fill need of infrastructure in schools. Where there is no provision of Govt. grant & school's required support AF is there. During this period AF provided green board support at Tuna, Taluka shala Mundra, Lalji Sumar Mundra, Teacher's table support to Mota bhadiya vadi school number 2 & 3, fan at Shekhadiya, science equipment at Luni high school, Girls sanitation at Sadau primary school, water tank renovation at Shekhadiya and Mahesh nagar school.


# Adani Foundation Launches 'Swachhagraha' to create a culture of cleanliness

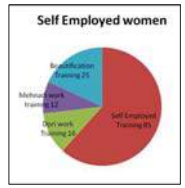
Swachhagraha, a Behavior Change Education Programme, is an initiative of the Adani Foundation. 'Swachhagraha' draws inspiration from 'Satyagraha' led by Mahatma Gandhi during the freedom struggle movement, which catalyzed action through tremendous patience and perseverance, instilling in the Indian mind, dignity and self-respect. It aims at engaging people and bringing about a change, similar in scale to India's freedom movement, where people get involved to take action for 'Creating a culture of Cleanliness'.

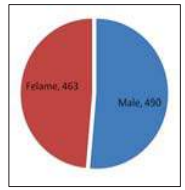
The programme was launched in Mundra, Bhuj District, Gujarat with participation of over 32 schools in Swachhagraha Prerak's training with support of District Education Officer, Bhuj & Taluka Primary Education Officer, Mundra. The programme was launched by Shri Bhupendra Sinh Vaghela, DEO, Bhuj, Shri Haresh bhai Patel, TPEO, Mundra and Jignesh R. Vibhandik, Project Coordinator, Adani Foundation, on 20th January at Adani House, Mundra Port Road, Mundra with full day Swachhagraha training workshop of principals & teachers. Mrs. Pankti Shah, Unit head CSR, Adani Foundation, said, "The Swachhagraha project is perfectly aligned with the 'Swachh Bharat Abhiyan'. At the heart of this project is the idea of 'creating a culture of cleanliness' in the upcoming generations of India."




# Adani Skill Development Center

- ASDC's approach to skill development is holistic and aimed at making each candidate a well-developed individual hence, the team goes to each and every area for making the initiative, a success.
- ASDC reaches out to various communities by leaflet and other advertisements.
- The team holds various meetings with women and youth of the villages to explain them the objective of ASDC.
- ASDC maintains all the records, follow-up with candidates meticulously during the entire training period.



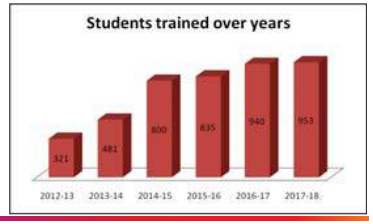




**OUR IMPACT**

Success of a project is defined by the fulfillment of its objectives. And ASDC's succeeds when the trainees get suitable employment.

A total of 378 trained students from ASDC has been suitably placed with an average income minimum of Rs.9000pm

ASDC has proven to be a major catalyst in igniting the fire of self-employment and entrepreneurship amongst women. A total of 138 women are now earning at home after getting trained at ASDC in various exclusive courses.





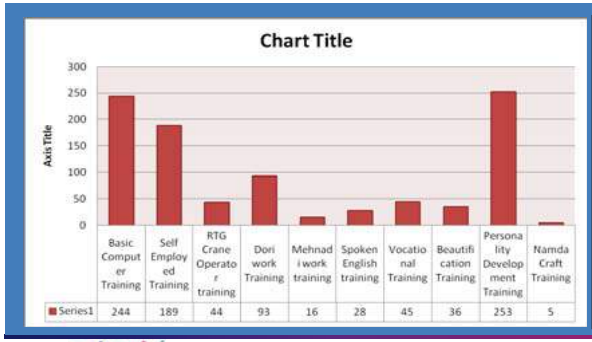

# SAKSHAM

## Adani Skill Development Centre

Adani Skill Development Centre (ASDC) is playing a pivotal role in implementing sustainable development in the state.

Adani Skill Development Centre has initialized in the 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 both is minimized.

- The objective of this center 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.
- Due to social and cultural traditions, various training Programme are organized at school OR village level for youth and women so that they can gain its benefits in the future as well.
- **In the year 2017-18, ASDC trained 953 candidates at Mundra.**
- **Soft skills training was imparted to 675 students in total, while technical training have been given to 278 students**






**Jaru Devabhai Arjanbhai**, an RTG crane operator at GTI Port, Maharashtra is a classic case study of skill development training ensuing employability. Just couple of years back a much stressed Jaru bhai had approached Adani Skill Development Centre (ASDC) Mundra to undertake checker-cum-RTG crane operator training with a hope of getting some employment somewhere to support his economically poor family. After passing ITI post his 12th qualification, Jaru bhai was rendered unemployed like hundreds and thousands of youths of his age and locality. While undergoing the ASDC training he would have never imagined that this additional knowledge and skill upgradation would bring him a bright future and good days for his family in Vaghura village of Mundra. Soon after completion of his 3 months duration course, Jaru bhai got a job in AK Enterprises company doing cargo handling operations at GTI Port, Maharashtra. His current earning per month is Rs 43,000/- with company accommodation.

He is now a big support for his father, who is a local farmer and his two brothers and sisters, who are continuing their studies to follow the steps of Jaru bhai for employability through knowledge and skill development.

Bhand Navin Devjibhai is very fond of financial autonomy and self-sufficiency, a principle of life which he has got by virtue of his skill development training at Adani Skill Development Centre (ASDC), Mundra. A Commerce graduate from Mundra village, in the year 2017 Navin had enrolled himself at ASDC for the IT-Basic Computer training. He was unemployed and lacked the minimum confidence of facing any job interview as per his qualification.

As part of the well-designed training curriculum at ASDC, the 21-year old youth learnt skills of public speaking, professional manners, facing interviews etc. along with core subject of IT basic computer. The training helped he immensely and fetched him a company job with lucrative Rs. 10,000/- per month salary. Happy with his financial autonomy, he is now in a comfortable position to support his parents and three brothers.

## Namda on revival path : Adani Skill Development Centre launches artisan training

Even as a breakthrough is waiting to happen, five trainees were enrolled in Dec 17 by Adani Skill Development Centre (ASDC) for the age-old Namda craft, a dying art form of Kutchh district in Gujarat. First initiative of its kind, the skill development training on Namda is aimed at preparing a future generation of artisans for the historic art form.

Adani Foundation, the CSR wing of Adani Group had vowed to save Namda from extinction and bring back its past glory. Originally innovated by an artisan of Mughal Era in the 11th Century India, Namda craft was primarily practiced by the Pinjara and Mansuri communities and Sama Muslims native to Kutchh. Sans proper encouragement, marketing avenues and promotion, the art suffered a major setback with artisans gradually switching over to other professions for livelihood earning.

Till recently, when the Adani Foundation, Mundra team members approached Mansuri Karimbhai Umarbhai, perhaps the sole survivor of the craft in Kutchh, Namda was dying a natural death. As a good corporate citizen, the Adani Group initiated a move to protect the art form, as well to make it popular and sustainable.

The first step towards the enormous goal of reviving Namda, the training programme kicked started with lots of positivity and enthusiasm among the trainees, who are committed to put best efforts for bringing back the past glory for this craft. And the best part of the initiative is that, the Namda survivor himself would train the future-artisans.

The trainees comprised of two male and three female artisans, who would be given stipend by Adani Foundation during the three-month training duration.

And what sounds quite favourable about the revival-attempt for Namda is that many important people from the related fields of art promotion and marketing attended the inaugural function of the training programme to witness and support the big effort by Adani Foundation.

The assistant director, Handicrafts Marketing and Service Extension Centre, Development Commissioner Handicrafts, Shri Archit Sahare, Manager, Gujarat State Handloom and Handicraft Corporation Shri MK Parmar, Guide and Retired Profession of NID Shri Vinay Kumar, Director of VRTI Shri Mavjibhai Baraiya, Director of Qasab Shri Pankaj Soni and the local marketing head of Amazon Shri Viraj Thaker were among the key persons present on the occasion to support and encourage the initiative.



## Employee Volunteering Programme

Always spreading the warmth of concern and care for members of its community in and around Mundra through its sustainable CSR projects, we made yet another endeavor by taking the warmth to labour habitants in the APSEZ Mundra periphery. **As the part of "Employees Volunteering Programme "JOY OF GIVING WEEK" Warm cloth distribution was arranged at all three residential colonies of Adani group.**

As part of the 2nd phase of Dignity of Labour drive by Adani Group, nearly 350 Labour families were distributed warm clothes by AF, Mundra on Monday. Nearly 150 blankets, 100 sweaters and jackets along with winter caps and shocks were given away to Labour families in view of the already prevalent winter. **The warm clothes were donated by employee families, company associates and residents of Mundra under a drive initiated by the company**

**Swachhata Abhiyan – Village cleaning campaign was organized by Adani ports and SEZ Limited (Baroi, Luni and Sadau), Adani Power Limited (Siracha), Adani Wilmar Limited (Dhrub) and Mundra Solar Private Limited (Tunda Wandh)**




## "AWAZ DE : Voice for the Community"

Small farmers and Fisherfolk remain vulnerable to weather conditions and lack of access to necessary knowledge that enables better decision making related to livelihood activities, health and disaster preparedness.

**Adani Foundation reaches out to the farming and fishing community of Mundra through multiple knowledge dissemination – AWAZ DE (Voice messages) which provides reliable information at the right time from the right source.**

Note : "AWAZ DE" is the software by which AF reaches out to the various target groups by voice messages. AF Mundra is using this software since five years and got a very good result to communicate the same message to more than 5000 people.

**Making Community Partners**

**We do not treat community as a receipt of charity. In fact, people are active partners in development process. The community participates in the work and people own the programs. "Ownership helps make the change Sustainable." It also gives birth to social leaders within the community.**

## Recognition

The Gujrat CSR Authority launched the CSR Awards'18 with an aim to recognize exemplary work in integrating and internalizing CSR. We are honored to receive the "Sustainable and Impactful CSR Project" Award in the presence of Shri O.P.Kohli. Such recognitions inspire us to continue on our journey. Award received by Shri Mukesh Saxena (COO, SEZ) and Pankti Shah (CSR Head, Adani Foundation)

Glad to announce our latest accolade-the Eminent Award 2017 presented at the Ek Kaam Desh Ke Naam award ceremony on 15th January, 2018 at New Delhi. The Award was bestowed upon Adani Ports and SEZ Ltd, Mundra, for outstanding achievement in CSR, specifically for "Sustainable Livhihood for Fisherman Community". Award was presented by Thavar Chand Gehlot, Hon'ble ,minister of social justice and empowerment, GOI and received by shri TT Mehta and Vijay Gosai of CSR Mundra Team.


Pleased to announce a milestone for APSEZ Mundra, as it receives the "CII ITC Excellence in sustainable business" commendation award - CSR for the year 2017. The award was presented by Shri C K Mishra, Secretary Ministry of Environment and Climate to *Capt. Unmesh Abhyankar, Jt. President - APSEZ* and Ms. Pankti Shah, Mundra CSR Head, Adani Foundation. Our endeavor towards sustainability strengthens with every achievement unlocked



| Adani Foundation, CSR Budget - Mundra<br>Budget Utilization F.Y. 2017-18 | | | |
|---|---|---|---|
| | | | Rs. In lacs |
| Sr. No. | Program | Budget 2017-18 Rs. | Budget Utilization Rs. |
| A. | **Admin Expense** | **152.05** | **128.06** |
| | | | |
| B. | **Education** | | |
| (i) | Education Initiative | 59.70 | 50.51 |
| (ii) | Adani Vidya Mandir- Bhadreshwar | 142.08 | 125.35 |
| (iii) | Project Udaan- Mundra | 332.33 | 298.93 |
| | **Sub Total** | **534.11** | **474.79** |
| | | | |
| C. | **Community Health** | **214.49** | **187.26** |
| | | | |
| D. | **Sustainable Livelihood Development** | **289.20** | **285.00** |
| | | | |
| E. | **Rural Infrastructure Development** | **374.70** | **323.40** |
| | | | |
| | GRAND TOTAL | 1564.55 | 1398.51 |

adani™ Act

# Annexure – 2

# "HALF YEARLY ENVIRONMENTAL MONITORING REPORT"

## FOR

adani™

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

## MONITORING PERIOD:
## OCTOBER 2017 TO MARCH 2018

**PREPARED BY:**

Pollucon

**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 web: 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 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 8.4 | 8.23 | 8.39 | 8.13 | 8.29 | 8.19 | 8.35 | 8.28 | 8.17 | 8.09 | 8.27 | 8.17 | IS3025(P11)83Re.02 |
| 2 | Temperature | oC | 28.6 | 28.2 | 28 | 27.6 | 28.5 | 28.7 | 28.6 | 28.4 | 29.8 | 29.2 | 30.4 | 29.7 | IS3025(P9)84Re.02 |
| 3 | Total Suspended Solids | mg/L | 340 | 318 | 340 | 335 | 298 | 272 | 340 | 312 | 220 | 192 | 260 | 242 | IS3025(P17)84Re.02 |
| 4 | BOD (3 Days @ 27 °C) | mg/L | 2.8 | 2.4 | 1.9 | 1.7 | 2.2 | 1.8 | 2.9 | 2 | 4 | 2.8 | 5.6 | 4.6 | IS 3025 (P44)1993Re.03Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 6.4 | 5.8 | 6.2 | 5.6 | 5.9 | 5.5 | 6.3 | 5.7 | 5.8 | 5.5 | 6.2 | 5.7 | IS3025(P38)89Re.99 |
| 6 | Salinity | ppt | 39.76 | 39.3 | 39.8 | 38.5 | 38.4 | 37.9 | 38 | 37.5 | 35.4 | 35.1 | 35.2 | 34.9 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)5520 D |
| 8 | Nitrate as $NO_3$ | µmol/L | 23.2 | 19.6 | 25.4 | 20.3 | 27.8 | 21.4 | 31.6 | 26.2 | 17.8 | 12.2 | 22.6 | 18.8 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 1.8 | 1.34 | 2.6 | 2.2 | 1.3 | 0.9 | 1.5 | 1.2 | 1.4 | 1.1 | 1.6 | 1 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 3.6 | 2.1 | 2.7 | 2.3 | 3.1 | 2.4 | 3.7 | 2.9 | 4.8 | 3.5 | 5.2 | 3.9 | IS3025(P34)88Cla.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 1.71 | 1.66 | 2.3 | 2 | 2.1 | 1.8 | 2.5 | 1.4 | 2.14 | 1.5 | 2.7 | 2.4 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 5.5 | 3.5 | 5.7 | 4.9 | 4.40 | 3.30 | 5.20 | 4.10 | 6.2` | 4.6 | 6.8 | 4.9 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 13 | 11 | 15 | 12 | 19 | 16 | 24 | 17 | 23 | 6 | 18 | 12 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 39480 | 38550 | 38880 | 37660 | 37680 | 37210 | 37782 | 37510 | 36200 | 35990 | 36840 | 36310 | IS3025(P16)84Re.02 |
| 15 | COD | mg/L | 14 | 12 | 20 | 16 | 10.4 | 15 | 17 | 13 | 10 | 6 | 15 | 8 | APHA(22nd Edi) 5520-D Open Reflux |
| A | **Flora and Fauna** | | | | | | | | | | | | | | |
| 16 | Primary productivity | mgC/L /day | 1.6 | 0.4 | 1.45 | 0.34 | 1.3 | 0.5 | 1.7 | 0.8 | 2.15 | 0.56 | 1.78 | 0.7 | APHA (22nd Edi) 10200-J |
| B | **Phytoplankton** | | | | | | | | | | | | | | |
| 17.1 | Chlorophyll | mg/$m^3$ | 1.15 | 0.35 | 1.19 | 0.324 | 1.36 | 3.6 | 1.72 | 0.54 | 2.57 | 0.44 | 2.68 | 0.33 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | mg/$m^3$ | 1.6 | 2 | 2.04 | 1.24 | 1.98 | 1.34 | 4.1 | 2.69 | 3.1 | 2.6 | 2.94 | 2.7 | APHA (22nd Edi) 10200-H |

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

POLLUCON LABORATORIES PVT. LTD. SURAT-3

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**Lab Manager (Q)**

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.3 | Cell Count | No. x $10^3$/L | 190 | 50 | 210 | 72 | 120 | 32 | 190 | 42 | 318 | 90 | 304 | 88 | APHA (22nd Edi) 10200-H |
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Bacillariophyceae Rhizosolenia sp. Dianoflagllates Peridinizem sp. | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- -- -- | Bacillariophyceae Navicula sp. Nitzschia sp. Coscinodiscus sp. Tabellaria sp. Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. -- -- -- -- -- | Naviculle Synedra Gyrosigma Coscinodiscus Asterionella Melrsia Syrirella Skeletonemel Certaium | Nitishia Naviculle -- -- -- -- -- -- | Bacillariophyceae Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. Synedra sp. | Bacillariophyceae Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. -- | Bacillariophyceae Nitzschia sp. Navicula sp. Fragillaria sp. Cyclotella sp. Melosira sp. Synedra sp. Biddulphia sp. -- | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- | Bacillariophyceae Navicula sp. Synedra sp. Coscinodiscus sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Pinnularia sp. Green Algae Pandorina sp. Chlorella sp. | Bacillariophyceae Fragillaria sp. Gyrosigma sp. Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. Navicula sp. -- | APHA (22nd Edi) 10200-H |
| C | **Zooplanktons** | | | | | | | | | | | | | | |
| 18.1 | Abundance (Population) | noX$10^3$/ 100 $m^3$ | 34 | | 38 | | 36 | | 30 | | 16 | | 14 | | APHA (22nd Edi) 10200-G |
| 18.2 | Name of Group Number and name of group species of each group | -- | Polychaete worms Decapods Molluscans -- | | Decapods Gastropods -- -- -- | | Nematodes Cnstaeen -- -- -- | | Isopods Bivalves Polychaete worms Fish egg Brachiopods | | Polychaete worms Decapods Molluscans -- -- | | Gastropods Polychaete worms -- | | APHA (22nd Edi) 10200-G |
| 18.3 | Total Biomass | ml/100 $m^3$ | 2.3 | | 3.8 | | 1.8 | | 2.4 | | 7.5 | | 9.6 | | APHA (22nd Edi) 10200-G |
| D | **Microbiological Parameters** | | | | | | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 1820 | | 1620 | | 1380 | | 2020 | | 1560 | | 1620 | | IS 5402:2002 |
| 19.2 | Total Coliform | /ml | Absent | | Absent | | Absent | | Absent | | Absent | | Absent | | APHA(22nd Edi)9221-D |

**H. T. Shah**
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POLLUCON LABORATORIES PVT. LTD. SURAT-3

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|---|---|---|---|---|---|---|---|---|---|
| 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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**Lab Manager (Q)**

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

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | NOVEMBER 2017 | DECEMBER 2017 | JANUARY 2018 | FEBRUARY 2018 | MARCH 2018 | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|
| | | | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | |
| 1 | Organic Matter | % | 0.72 | 0.672 | 0.82 | 0.65 | 0.68 | 0.55 | FCO:2007 |
| 2 | Phosphorus as P | µg/g | 174 | 184 | 198 | 152 | 172 | 196 | APHA(22nd Edi) 4500 C |
| 3 | Texture | -- | Sandy | Sandy | Sandy | Sandy | Sandy | Sandy | -- |
| 4 | Petroleum Hydrocarbon | µg/g | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | PLPL-TPH |
| 5 | **Heavy Metals** | | | | | | | | |
| 5.1 | Aluminum as Al | % | 5.5 | 5.2 | 5.3 | 4.95 | 5.1 | 5.46 | AAS APHA 3111 B |
| 5.2 | Total Chromium as $Cr^{+3}$ | µg/g | 210 | 242 | 152 | 206 | 240 | 180 | AAS 3111B |
| 5.3 | Manganese as Mn | µg/g | 1870 | 1790 | 1260 | 1510 | 1740 | 1950 | AAS APHA 3111 B |
| 5.4 | Iron as Fe | % | 5.84 | 5.13 | 4.4 | 5.1 | 4.9 | 5.3 | AAS APHA(22nd Edi)3111 B |
| 5.5 | Nickel as Ni | µg/g | 62 | 65 | 49.6 | 56.2 | 72.4 | 56.2 | AAS APHA(22nd Edi)3111 B |
| 5.6 | Copper as Cu | µg/g | 78 | 71 | 86 | 65 | 48.9 | 62.4 | AAS APHA(22nd Edi)3111 B |
| 5.7 | Zinc as Zn | µg/g | 156 | 147 | 172 | 120 | 211 | 190 | AAS APHA(22nd Edi)3111 B |
| 5.8 | Lead as Pb | µg/g | 23 | 27 | 16.8 | 12.6 | 10.4 | 15.2 | AAS APHA(22nd Edi)3111 B |
| 5.9 | Mercury as Hg | µg/g | 0.7 | 0.8 | 0.56 | 0.32 | 0.44 | 0.29 | AAS APHA- 3112 B |
| 6 | **Benthic Organisms** | | | | | | | | |
| 6.1 | Macrobenthos | -- | Isopods<br>Echinoderms<br>Mysids | Echinoderms<br>Foraminiferans<br>-- | Copepods<br>Decapods<br>-- | Polychaete worms<br>Bivalves | Isopods<br>Polychaete worms<br>-- | Crabs<br>Anthozoans<br>Isopodes<br>Decapodes | APHA (22nd Edi) 10500-C |
| 6.2 | MeioBenthos | -- | Nematodes<br>Foraminiferans | Mysids<br>-- | Copepods<br>Foraminiferans | Nematodes | Nematodes<br>Foraminiferans | Foraminiferans<br>Mysids | APHA (22nd Edi) 10500-C |
| 6.3 | Population | no/m2 | 210 | 230 | 250 | 190 | 320 | 290 | APHA (22nd Edi) 10500-C |

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

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**Dr. ArunBajpai**
**Lab Manager (Q)**

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

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 8.4 | 8.1 | 8.3 | 8.2 | 8.35 | 8.15 | 8.27 | 8.12 | 8.16 | 8.06 | 8.20 | 8.18 | IS3025(P11)83 Re.02 |
| 2 | Temperature | oC | 28.5 | 28.2 | 28.4 | 28.3 | 28.7 | 28.1 | 28.9 | 28.5 | 29.8 | 29.2 | 30.1 | 29.7 | IS3025(P9)84Re.02 |
| 3 | Total Suspended Solids | mg/L | 322 | 308 | 290 | 262 | 298 | 326 | 312 | 344 | 290 | 308 | 272 | 293 | IS3025(P17)84 Re.02 |
| 4 | BOD (3 Days @ 27 °C) | mg/L | 2.4 | 2 | 1.8 | 1.6 | 1.5 | 1.2 | 1.4 | 3 | 2.2 | 1.8 | 1.9 | 1.5 | IS 3025 (P44)1993Re.03 Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 6.2 | 5.2 | 5.8 | 5.4 | 6.4 | 5.8 | 6.6 | 5.5 | 6.5 | 5.9 | 6.3 | 5.1 | IS3025(P38)89 Re.99 |
| 6 | Salinity | ppt | 40.96 | 39.4 | 39.6 | 38.6 | 38.8 | 38.1 | 38.3 | 37.9 | 36.2 | 35.8 | 35.9 | 35.7 | APHA (22ndEdi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22ndEdi)5 520D |
| 8 | Nitrate as $NO_3$ | µmol/L | 28.4 | 20 | 29.4 | 24.6 | 26.8 | 21.2 | 31.4 | 30.8 | 18.2 | 15.8 | 21.6 | 19.7 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 1.6 | 1.4 | 2.4 | 2.1 | 2.9 | 1.7 | 2.6 | 1.4 | 2.5 | 2 | 2.4 | 1.8 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 3.5 | 2.1 | 2.8 | 2.2 | 1.8 | 1.5 | 2.3 | 1.9 | 3.2 | 2.9 | 2.5 | 2.1 | IS3025(P34)88 Cla.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 1.64 | 1.59 | 2.8 | 2.1 | 2.3 | 1.6 | 3.1 | 2.7 | 1.75 | 1.7 | 2.1 | 1.8 | APHA(22ndEdi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 5.2 | 3.8 | 5.3 | 4.4 | 4.70 | 3.20 | 4.90 | 3.30 | 5.70 | 4.90 | 5.1 | 4.0 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 12 | 10 | 14 | 13 | 16 | 11 | 18 | 14 | 15.15 | 3.2 | 10 | 8 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 40020 | 39220 | 37670 | 36880 | 37930 | 37122 | 36880 | 36140 | 37210 | 36980 | 37470 | 36912 | IS3025(P16)84 Re.02 |
| 15 | COD | mg/L | 13 | 11 | 10 | 7 | 5.2 | 4.8 | 8.4 | 6.6 | 5.2 | 4.4 | 6.8 | 4.9 | APHA(22ndEdi) 5520-D Open Reflux |
| A | **Flora and Fauna** | | | | | | | | | | | | | | |
| 16 | Primary productivity | mgC/ L/day | 1.55 | 0.338 | 1.63 | 0.33 | 1.8 | 0.45 | 1.57 | 0.338 | 2.35 | 0.7 | 1.9 | 0.52 | APHA (22nd Edi) 10200-J |
| B | **Phytoplankton** | | | | | | | | | | | | | | |
| 17.1 | Chlorophyll | mg/ $m^3$ | 2.24 | 1.3 | 1.16 | 0.381 | 1.36 | 0.16 | 2.72 | 1.22 | 1.98 | 0.25 | 2.1 | 0.52 | APHA (22ndEdi) 10200-H |
| 17.2 | Phaeophytin | mg/ $m^3$ | 1.56 | 0.9 | 1.6 | 2 | 1.34 | 1.98 | 2.69 | 4.1 | 2.8 | 3.1 | 3.2 | 3.8 | APHA (22ndEdi) 10200-H |
| 17.3 | Cell Count | No. x $10^3$/L | 185 | 43 | 175 | 56 | 118 | 23 | 236 | 124 | 312 | 140 | 290 | 130 | APHA (22nd Edi) 10200-H |

**H. T. Shah**
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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Navicula sp. Nitzschia sp. Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. Synedra sp. -- | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- -- -- | Bacillariophyceae Navicula sp. Synedra sp. Coscinodiscus sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Pinnularia sp. Green Algae Pandorina sp. Chlorella sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. -- -- -- -- -- | Bacillariophyceae Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Melosira sp. Navicula sp. Nitzschia sp. Coscinodiscus sp. | Rhizosolenia sp. Nitishia Naviculle -- -- -- -- -- | Bacillariophyceae Amphipro ra sp. Asterionel la sp. Cyclotella sp. Gyrosigm a sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosole nia sp. Dianoflagl lates Peridinize m sp. | Bacillariophyceae Coscinodiscus Asterionel la Melrsia Syrirella Skeletone mel Certaium Naviculle Synedra Gyrosigm a -- | Bacillariophyceae Coscinodiscus sp. Tabellaria sp. Skeletone ma sp. Cyanophyceae Cyclotella sp. Pinnularia sp. Fragillaria sp. | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- | Bacillariophyceae Tabellaria sp. Skeletone ma sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. Amphipro ra sp. Asterionel la sp. Cyclotella sp. -- | Bacillariophyceae Navicula sp. Fragillaria sp. Gyrosigm a sp. Pinnulari a sp. Cyanoph yceae Lyngbya sp. Oscillatori a sp. -- -- | APHA (22nd Edi) 10200-H |
| C | **Zooplanktons** | | | | | | | | | | | | | |
| 18.1 | Abundance (Population) | noX10 3/ 100 $m^3$ | 36 | | 40 | | 42 | | 38 | 37 | | 26 | | APHA (22nd Edi) 10200-G |
| 18.2 | Name of Group Number and name of group species of each group | -- | Isopods Bivalves Polychaete worms Fish eggs Brachiopods Copepods | | Copepods Decapods Polychaetes Gastropods -- -- | | Copepods Nematedoes Polycleate Cnstaeen Foraminiferus -- | | Bivalves Gastropods Nematodes Krill Fish egg -- | Crustaceans Copepods Krill Polychaete worms Decapods | | Krill Decapods Crustaceans Nematodes -- | | APHA (22nd Edi) 10200-G |
| 18.3 | Total Biomass | ml/100 $m^3$ | 2.1 | | 2.9 | | 2.6 | | 2.2 | 3.5 | | 4.6 | | APHA (22nd Edi) 10200-G |
| D | **Microbiological Parameters** | | | | | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 1810 | | 1750 | | 1560 | | 1720 | 1540 | | 1540 | | IS 5402:2002 |
| 19.2 | Total Coliform | /ml | Absent | | Absent | | Absent | | Absent | Absent | | Absent | | APHA(22ndEdi)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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 2017 | NOVEMBER 2017 | DECEMBER 2017 | JANUARY 2018 | FEBRUARY 2018 | MARCH 2018 | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|
| | | | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | |
| 1 | Organic Matter | % | 0.631 | 0.62 | 0.44 | 0.61 | 0.82 | 0.59 | FCO:2007 |
| 2 | Phosphorus as P | µg/g | 306 | 230 | 177 | 210 | 192 | 175 | APHA(22nd Edi) 4500 C |
| 3 | Texture | -- | Sandy | Sandy | Sandy | Sandy | Sandy | Sandy | -- |
| 4 | Petroleum Hydrocarbon | µg/g | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | PLPL-TPH |
| 5 | **Heavy Metals** | | | | | | | | |
| 5.1 | Aluminum as Al | % | 6.4 | 6.1 | 5.65 | 5.2 | 5.32 | 5.6 | AAS APHA 3111 B |
| 5.2 | Total Chromium as Cr+3 | µg/g | 197 | 188 | 122 | 186 | 132 | 164 | AAS 3111B |
| 5.3 | Manganese as Mn | µg/g | 1510 | 1600 | 1440 | 1910 | 1720 | 1590 | AAS APHA 3111 B |
| 5.4 | Iron as Fe | % | 5.22 | 5.1 | 5.15 | 4.76 | 5.4 | 5.6 | AAS APHA(22nd Edi)3111 B |
| 5.5 | Nickel as Ni | µg/g | 64 | 68.2 | 71.4 | 63.2 | 81.6 | 64.2 | AAS APHA(22nd Edi)3111 B |
| 5.6 | Copper as Cu | µg/g | 72 | 66 | 62.7 | 67.9 | 56.8 | 40.6 | AAS APHA(22nd Edi)3111 B |
| 5.7 | Zinc as Zn | µg/g | 144 | 154 | 240 | 268 | 296 | 302 | AAS APHA(22nd Edi)3111 B |
| 5.8 | Lead as Pb | µg/g | 21 | 19 | 17 | 21 | 13.2 | 9.8 | AAS APHA(22nd Edi)3111 B |
| 5.9 | Mercury as Hg | µg/g | 0.9 | 0.6 | 0.55 | 0.72 | BDL* | BDL* | AAS APHA- 3112 B |
| 6 | **Benthic Organisms** | | | | | | | | |
| 6.1 | Macrobenthos | -- | Mysids<br>Echinoderms<br>Isopods | Bivalves<br>Echinoderms | Isopods<br>Decapods | Polychaete worms<br>Bivalves | Mysids<br>Polychaete worms<br>Isopods | Anthozoans<br>Isopodes<br>Decapodes<br>Crabs | APHA (22nd Edi) 10500-C |
| 6.2 | MeioBenthos | -- | Nematodes<br>Foraminiferans | Mysids | Copepods<br>Foraminiferans | Nematodes | Copepods<br>-- | Copepodes<br>Foraminiferans | APHA (22nd Edi) 10500-C |
| 6.3 | Population | no/$m^2$ | 270 | 290 | 360 | 172 | 340 | 310 | APHA (22nd Edi) 10500-C |

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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 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 7.52 | 7.28 | 8.42 | 8.17 | 8.23 | 8.18 | 8.15 | 8.08 | 8.21 | 8.13 | 8.22 | 8.23 | IS3025(P11)83Re.02 |
| 2 | Temperature | oC | 30.1 | 29.6 | 28.3 | 28.1 | 28.9 | 28.5 | 28.7 | 28.6 | 28.5 | 28.2 | 29.7 | 29.4 | IS3025(P9)84Re.02 |
| 3 | Total Suspended Solids | mg/L | 324 | 294 | 334 | 316 | 312 | 292 | 302 | 272 | 290 | 185 | 308 | 296 | IS3025(P17)84Re.02 |
| 4 | BOD (3 Days @ 27°C) | mg/L | 2.9 | 2.4 | 2.6 | 2.2 | 3.3 | 3 | 2.8 | 2.1 | 3.4 | 3 | 2.7 | 2 | IS 3025 (P44)1993Re.03Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 6.3 | 5.9 | 6.4 | 5.6 | 6.5 | 6.2 | 6 | 5.1 | 6.6 | 6 | 5.8 | 5.1 | IS3025(P38)89Re.99 |
| 6 | Salinity | ppt | 40.22 | 39.1 | 39.6 | 38.3 | 38.6 | 38.2 | 38.4 | 38 | 35.1 | 34.9 | 34.7 | 34.2 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)5520D |
| 8 | Nitrate as $NO_3$ | µmol/L | 25.1 | 23.8 | 28.2 | 20.3 | 23.8 | 21.6 | 25.2 | 18.9 | 12.8 | 7.4 | 14.2 | 10.2 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 1.77 | 1.52 | 1.7 | 1.5 | 2.1 | 1.4 | 3.2 | 2.4 | 0.9 | 0.65 | 1.1 | 0.8 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 3.94 | 2.31 | 3.6 | 2.1 | 2.7 | 2.4 | 2.2 | 1.8 | 3.1 | 2.4 | 3.5 | 3.3 | IS3025(P34)88Cla.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 1.73 | 1.42 | 1.65 | 1.58 | 1.9 | 1.56 | 1.4 | 1.2 | 1.85 | 1.4 | 2.1 | 1.87 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 5.84 | 3.91 | 5.44 | 3.72 | 4.80 | 3.80 | 5.40 | 4.20 | 4.00 | 3.05 | 4.6 | 4.1 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 18 | 14 | 12 | 10 | 17 | 11 | 24 | 16 | 14 | 5 | 17 | 10 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 40220 | 39740 | 38770 | 37520 | 37640 | 35810 | 37310 | 36930 | 35870 | 35210 | 35480 | 35310 | IS3025(P16)84Re.02 |
| 15 | COD | mg/L | 18 | 14 | 13 | 11 | 13.8 | 12 | 15.2 | 11.8 | 16 | 14 | 18 | 12 | APHA(22nd Edi) 5520-D Open Reflux |
| A | **Flora and Fauna** | | | | | | | | | | | | | | |
| 16 | Primary productivity | mgC/L /day | 2 | 0.45 | 1.59 | 0.63 | 1.8 | 0.65 | 2.4 | 1.3 | 2.8 | 0.65 | 2.5 | 0.42 | APHA (22nd Edi) 10200-J |
| B | **Phytoplankton** | | | | | | | | | | | | | | |
| 17.1 | Chlorophyll | mg/m$^3$ | 1.159 | 0.354 | 1.671 | 0.35 | 1.56 | 3.6 | 2.92 | 1.44 | 1.95 | 0.38 | 2.2 | 0.6 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | mg/m$^3$ | 2.2 | 2.4 | 2.12 | 2.5 | 2.34 | 2.98 | 3.2 | 4.6 | 2.4 | 2.35 | 2.96 | 2.8 | APHA (22nd Edi) 10200-H |
| 17.3 | Cell Count | No. x $10^3$/L | 194 | 55 | 223 | 114 | 148 | 53 | 266 | 134 | 252 | 60 | 310 | 80 | APHA (22nd Edi) 10200-H |

**H. T. Shah**
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POLLUCON LABORATORIES PVT. LTD. SURAT-3

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**Lab Manager (Q)**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Melosira sp. synendra sp. Tabellaria sp. Cheatoceros sp. Green algae Ulothrix sp. Pediastrum sp. Cyanophyceae Oscillatoria sp. Spirulina sp. | Bacillariophyceae Coscinodiscus sp. Gyrosigma sp. synendra sp. Pinnularia sp. Green algae Ulothrix sp. Pediastrum sp. Cyanophyceae Anabaena sp. -- | Bacillariophyceae Navicula sp. Nitzschia sp. Coscinodiscus sp. Tabellaria sp. Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. -- -- -- -- -- | Gyrosigma Naviculle Synedra Coscinodiscus Asterionella Melrsia Syrirella Skeletonemel Certaium | Coscinodiscus Naviculle Nitishia -- -- -- | Bacillariophyceae Navicula sp. Nitzschia sp. Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. Synedra sp. | Bacillariophyceae Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. -- | Bacillariophyceae Coscinodiscus sp. Navicula sp. Gyrosigma sp. Synedra sp. Asterionella sp. Green Algae Chlorella sp. Pandorina sp. | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- | Bacillariophyceae Navicula sp. Synedra sp. Coscinodiscus sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Pinnularia sp. Green Algae Pandorina sp. -- | Bacillariophyceae Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. Navicula sp. Fragillaria sp. Gyrosigma sp. -- -- -- | APHA (22nd Edi) 10200-H |
| C | **Zooplanktons** | | | | | | | | | | | | |
| 18.1 | Abundance (Population) | noX$10^3$/ 100 $m^3$ | 32 | | 28 | 29 | | 25 | | 22 | | 15 | APHA (22nd Edi) 10200-G |
| 18.2 | Name of Group Number and name of group species of each group | -- | decapods Echinoderms Fish egg Foraminiferans -- -- | | Copepods Decapods Polychaetes Gastropods -- -- | Copepods Nematedoes Polycleate Cnstaeen Foraminiferus -- | | Bivalves Isopods Polychaete worms Fish egg Brachiopods Copepods | | Copepods Krill Decapods Polychaete worms Crustaceans | | Gastropods Decapods Bivalves Copepods -- | APHA (22nd Edi) 10200-G |
| 18.3 | Total Biomass | ml/100 $m^3$ | 2.7 | | 2.9 | 3.2 | | 2.8 | | 10.2 | | 9.5 | APHA (22nd Edi) 10200-G |
| D | **Microbiological Parameters** | | | | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 1910 | | 2030 | 1480 | | 1820 | | 1688 | | 1470 | IS 5402:2002 |
| 19.2 | Total Coliform | /ml | Absent | | Absent | Absent | | Absent | | Absent | | Absent | APHA(22ndEdi)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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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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**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 2017 | NOVEMBER 2017 | DECEMBER 2017 | JANUARY 2018 | FEBRUARY 2018 | MARCH 2018 | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|
| | | | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | |
| 1 | Organic Matter | % | 0.59 | 0.53 | 0.74 | 0.88 | 0.68 | 0.59 | FCO:2007 |
| 2 | Phosphorus as P | µg/g | 710 | 660 | 214 | 186 | 228 | 162 | APHA(22nd Edi) 4500 C |
| 3 | Texture | -- | Sandy | Sandy | Sandy | Sandy | Sandy | Sandy | -- |
| 4 | Petroleum Hydrocarbon | µg/g | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | PLPL-TPH |
| 5 | **Heavy Metals** | | | | | | | | |
| 5.1 | Aluminum as Al | % | 6.25 | 5.45 | 4.7 | 5.4 | 5.36 | 4.9 | AAS APHA 3111 B |
| 5.2 | Total Chromium as $Cr^{+3}$ | µg/g | 220 | 245 | 198 | 172 | 152 | 188 | AAS 3111B |
| 5.3 | Manganese as Mn | µg/g | 1680 | 1820 | 1640 | 1820 | 1140 | 1320 | AAS APHA 3111 B |
| 5.4 | Iron as Fe | % | 5.66 | 5.24 | 5.6 | 5.25 | 4.9 | 4.6 | AAS APHA(22nd Edi)3111 B |
| 5.5 | Nickel as Ni | µg/g | 68 | 62 | 36 | 44 | 35.6 | 44.9 | AAS APHA(22nd Edi)3111 B |
| 5.6 | Copper as Cu | µg/g | 75 | 81 | 65 | 46 | 42.6 | 52.8 | AAS APHA(22nd Edi)3111 B |
| 5.7 | Zinc as Zn | µg/g | 151 | 120 | 156 | 182 | 240 | 252 | AAS APHA(22nd Edi)3111 B |
| 5.8 | Lead as Pb | µg/g | 27 | 21 | 9.8 | 13.2 | 17.3 | 12.6 | AAS APHA(22nd Edi)3111 B |
| 5.9 | Mercury as Hg | µg/g | 0.5 | 0.7 | 0.44 | 0.22 | BDL* | BDL* | AAS APHA- 3112 B |
| 6 | **Benthic Organisms** | | | | | | | | |
| 6.1 | Macrobenthos | -- | Polychaete worms<br>Mysids | Isopods<br>Echinoderms<br>Nematodes | Decapods<br>Isopods | Polychaete worms<br>Bivalves | Isopods<br>Polychaete worms<br>-- | Decapodes<br>Isopodes<br>Anthozoans<br>Crabs | APHA (22nd Edi) 10500-C |
| 6.2 | MeioBenthos | -- | Foraminiferans<br>-- | Foraminiferans<br>-- | Foraminiferans<br>Copepods | Nematodes | Isopods<br>Gastrotriches | Foraminiferans<br>Copepodes | APHA (22nd Edi) 10500-C |
| 6.3 | Population | no/$m^2$ | 236 | 252 | 208 | 232 | 256 | 188 | APHA (22nd Edi) 10500-C |

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

POLLUCON LABORATORIES PVT. LTD. SURAT-3

**Dr. ArunBajpai**
**Lab Manager (Q)**

## RESULTS OF MARINE WATER [M4 JUNA BANDAR N 22°47'577" E 069°43'620"]

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 8.27 | 8.19 | 8.39 | 8.15 | 8.23 | 8.17 | 8.29 | 8.2 | 8.19 | 8.12 | 8.25 | 8.21 | IS3025(P11)83Re.02 |
| 2 | Temperature | oC | 28.4 | 28 | 28.7 | 28.1 | 28.6 | 28.2 | 28.8 | 28.4 | 28.7 | 28.5 | 29.1 | 28.9 | IS3025(P9)84Re.02 |
| 3 | Total Suspended Solids | mg/L | 292 | 260 | 334 | 316 | 298 | 270 | 312 | 29 | 207 | 185 | 227 | 188 | IS3025(P17)84Re.02 |
| 4 | BOD (3 Days @ 27 °C) | mg/L | 1.7 | 1.5 | 2.7 | 2.2 | 3.2 | 2.4 | 2.8 | 2.6 | 3.4 | 3.1 | 2.8 | 2 | IS 3025 (P44)1993Re.03 Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 5.8 | 5.4 | 6.5 | 5.6 | 6.4 | 5.8 | 6.3 | 5.2 | 6.1 | 5.5 | 5.8 | 5 | IS3025(P38)89Re.99 |
| 6 | Salinity | ppt | 39.6 | 39.4 | 38.6 | 37.8 | 38.1 | 37.9 | 38.4 | 38.2 | 35.3 | 35.1 | 34.9 | 34.8 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)5520D |
| 8 | Nitrate as $NO_3$ | µmol/L | 29.5 | 24.7 | 28.3 | 20.3 | 17.8 | 13.2 | 21.9 | 26.4 | 18.6 | 15.2 | 14.7 | 13.8 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 2.4 | 2.1 | 1.68 | 1.5 | 1.80 | 1.5 | 2.30 | 1.7 | 0.98 | 0.6 | 1.4 | 1.3 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 2.9 | 2.3 | 3.5 | 2.1 | 1.70 | 1.1 | 1.50 | 0.9 | 4.40 | 3.8 | 3.1 | 2.8 | IS3025(P34)88Cla.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 2.8 | 2.1 | 1.59 | 1.58 | 2.4 | 2.1 | 1.9 | 1.4 | 2.02 | 1.75 | 1.96 | 1.86 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 5.4 | 4.6 | 5.3 | 3.8 | 3.50 | 2.60 | 3.80 | 2.60 | 5.38 | 4.40 | 4.7 | 4.1 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 15 | 12 | 16 | 10 | 12 | 11 | 17 | 13 | 14 | 7 | 10 | 5 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 39750 | 39430 | 38550 | 37660 | 37612 | 37428 | 37980 | 37520 | 34940 | 34720 | 35080 | 34812 | IS3025(P16)84Re.02 |
| 15 | COD | mg/L | 12 | 10 | 14 | 11 | 15 | 13 | 19 | 14 | 13 | 7 | 16 | 10 | APHA(22nd Edi) 5520-D Open Reflux |
| A | | | | | | | Flora and Fauna | | | | | | | | |
| 16 | Primary productivity | mgC/L/day | 1.53 | 0.32 | 1.61 | 0.61 | 1.8 | 0.65 | 1.63 | 0.54 | 2.8 | 0.9 | 3.1 | 1.1 | APHA (22nd Edi) 10200-J |
| B | | | | | | | Phytoplankton | | | | | | | | |
| 17.1 | Chlorophyll | $mg/m^3$ | 1.15 | 0.31 | 1.72 | 0.33 | 2.56 | 0.28 | 2.72 | 0.44 | 2.95 | 0.48 | 2.65 | 0.22 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | $mg/m^3$ | 1.7 | 1.8 | 2.13 | 1.9 | 1.96 | 1.75 | 2.2 | 1.92 | 3.5 | 3.3 | 3.14 | 2.96 | APHA (22nd Edi) 10200-H |
| 17.3 | Cell Count | No. x $10^3$/L | 174 | 52 | 192 | 112 | 228 | 35 | 206 | 25 | 380 | 92 | 340 | 72 | APHA (22nd Edi) 10200-H |

**H. T. Shah**
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POLLUCON LABORATORIES PVT. LTD. SURAT-3

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Melosira sp. synendra sp. Tabellaria sp. Cheatoceros sp. Green algae Ulothrix sp. Pediastrum sp. Cyanophyceae Oscillatoria sp. Spirulina sp. | Bacillariophyceae Navicullе Fragillaria sp. Nitzschia sp. Melosira sp. | Bacillariophyceae Navicula sp. Nitzschia sp. Coscinodiscus sp. Tabellaria sp. Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. | Naviculle Synedra Gyrosigma Coscinodiscus Asterionella Melrsia Syrirella Skeletonemel Certaium | Naviculle Nitishia -- | Bacillariophyceae Navicula sp. Nitzschia sp. Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. Synedra sp. | Bacillariophyceae Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. | Bacillariophyceae Fragillaria sp. Navicula sp. Pinnularia sp. Cyanophyceae Gyrosigma sp. Oscillatoria sp. Lyngbya sp. -- | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- | Bacillariophyceae Synedra sp. Asterionella sp. Coscinodiscus sp. Cocconeis sp. Gyrosigma sp. Pinnularia sp. Green Algae Chlorella sp. Pandorina sp. | Bacillariophyceae Navicula sp. Fragillaria sp. Gyrosigma sp. Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. -- -- | APHA (22nd Edi) 10200-H |
| C | **Zooplanktons** | | | | | | | | | | | | |
| 18.1 | Abundance (Population) | noX10$^3$/ 100 m$^3$ | 28 | 22 | 29 | 24 | 27 | 25 | APHA (22nd Edi) 10200-G | | | | |
| 18.2 | Name of Group Number and name of group species of each group | -- | Polychaete worms Chaetognaths Copepods Nematodes Nauplius larvae Cyclops | Copepods Decapods Polychaetes Gastropods | Copepods Nematedoes Polycleate Cnstaeen Foraminiferus | Bivalves Gastropods Nematodes Krill Fish egg | Polychaete worms Decapods Molluscans | Foraminiferus Gastropods Decapods | APHA (22nd Edi) 10200-G | | | | |
| 18.3 | Total Biomass | ml/100 m$^3$ | 2.6 | 2.1 | 2.4 | 2.9 | 10.4 | 11.2 | APHA (22nd Edi) 10200-G | | | | |
| D | **Microbiological Parameters** | | | | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 1870 | 1750 | 1810 | 1820 | 1790 | 1650 | IS 5402:2002 | | | | |
| 19.2 | Total Coliform | /ml | Absent | Absent | Absent | Absent | Absent | Absent | APHA(22ndEdi)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 | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| 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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**Lab Manager (Q)**

## RESULTS OF SEDIMENT ANALYSIS [M4 JUNA BANDAR N 22°47'577" E 069°43'620"]

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | NOVEMBER 2017 | DECEMBER 2017 | JANUARY 2018 | FEBRUARY 2018 | MARCH 2018 | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|
| | | | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | |
| 1 | Organic Matter | % | 0.65 | 0.57 | 0.58 | 0.75 | 0.35 | 0.59 | FCO:2007 |
| 2 | Phosphorus as P | µg/g | 710 | 650 | 204 | 167 | 176 | 199 | APHA(22nd Edi) 4500 C |
| 3 | Texture | -- | Sandy | Sandy | Sandy | Sandy | Sandy | Sandy | -- |
| 4 | Petroleum Hydrocarbon | µg/g | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | PLPL-TPH |
| 5 | **Heavy Metals** | | | | | | | | |
| 5.1 | Aluminum as Al | % | 6.4 | 5.9 | 4.6 | 5.8 | 5.1 | 5.7 | AAS APHA 3111 B |
| 5.2 | Total Chromium as $Cr^{+3}$ | µg/g | 200 | 247 | 166 | 198 | 126 | 151 | AAS 3111B |
| 5.3 | Manganese as Mn | µg/g | 1470 | 1610 | 1740 | 1442 | 1372 | 1540 | AAS APHA 3111 B |
| 5.4 | Iron as Fe | % | 4.99 | 4.33 | 5.35 | 4.96 | 4.8 | 5.1 | AAS APHA(22nd Edi)3111 B |
| 5.5 | Nickel as Ni | µg/g | 59 | 62 | 32.4 | 48.9 | 32.6 | 24.9 | AAS APHA(22nd Edi)3111 B |
| 5.6 | Copper as Cu | µg/g | 75 | 61 | 118 | 90 | 65.4 | 56.2 | AAS APHA(22nd Edi)3111 B |
| 5.7 | Zinc as Zn | µg/g | 149 | 172 | 132 | 156 | 172 | 188 | AAS APHA(22nd Edi)3111 B |
| 5.8 | Lead as Pb | µg/g | 21.5 | 23 | 17.8 | 14.2 | 20.2 | 16.8 | AAS APHA(22nd Edi)3111 B |
| 5.9 | Mercury as Hg | µg/g | 0.8 | 0.3 | 0.44 | 0.29 | 0.12 | 0.09 | AAS APHA- 3112 B |
| 6 | **Benthic Organisms** | | | | | | | | |
| 6.1 | Macrobenthos | -- | Isopods<br>Echinoderms<br>Mysids | Anthozoans<br>Echinoderms | Bivalves<br>Decapods | Polychaete worms<br>Bivalves | Bivalves<br>Polychaete worms<br>-- | Crabs<br>Mysids<br>Isopodes<br>Decapodes | APHA (22nd Edi) 10500-C |
| 6.2 | MeioBenthos | -- | Nematodes<br>Foraminiferans | Copepods<br>Foraminiferans | Nematodes | Nematodes | Foraminiferans<br>Decapods | Nematodes<br>Foraminiferans | APHA (22nd Edi) 10500-C |
| 6.3 | Population | no/$m^2$ | 225 | 282 | 198 | 226 | 240 | 175 | APHA (22nd Edi) 10500-C |

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## 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 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 8.18 | 8.22 | 8.4 | 8.25 | 8.22 | 8.16 | 8.09 | 7.98 | 8.14 | 7.98 | 8.15 | 7.95 | IS3025(P11)83Re .02 |
| 2 | Temperature | oC | 30 | 29 | 28.5 | 28.3 | 28.4 | 28.2 | 28.7 | 28.3 | 28.7 | 28 | 28.9 | 28.6 | IS3025(P9)84Re. 02 |
| 3 | Total Suspended Solids | mg/L | 350 | 342 | 325 | 318 | 258 | 242 | 283 | 262 | 170 | 152 | 150 | 128 | IS3025(P17)84Re .02 |
| 4 | BOD (3 Days @ 27 °C) | mg/L | 3.8 | 2.6 | 2.8 | 2.4 | 2.2 | 2 | 2.7 | 2.5 | 1.5 | 1.2 | 1.8 | 1 | IS 3025 (P44)1993Re.03E dition2.1 |
| 5 | Dissolved Oxygen | mg/L | 5.9 | 5.2 | 6.4 | 5.8 | 6.3 | 5.8 | 6.1 | 5.1 | 6.5 | 6.2 | 6.8 | 6.6 | IS3025(P38)89Re .99 |
| 6 | Salinity | ppt | 37.9 | 37.1 | 40.1 | 40.8 | 37.4 | 37.1 | 37.9 | 37.5 | 34.8 | 34.6 | 34.2 | 34.1 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)55 20D |
| 8 | Nitrate as $NO_3$ | µmol/L | 26.7 | 24.3 | 23.2 | 19.6 | 19.5 | 17.1 | 23.9 | 24.7 | 10.4 | 9.8 | 8.2 | 6.4 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 1.66 | 1.53 | 1.8 | 1.3 | 2.1 | 1.6 | 1.8 | 1.1 | 0.8 | 0.6 | 0.44 | 0.28 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 3.8 | 3.1 | 3.6 | 2.1 | 2.9 | 2.5 | 2.2 | 1.9 | 1.5 | 1.2 | 0.98 | 0.72 | IS3025(P34)88Cl a.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 2.9 | 2.5 | 1.71 | 1.66 | 1.78 | 1.52 | 2.11 | 1.98 | 1.4 | 1.1 | 1.72 | 1.52 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 5.68 | 4.71 | 5.55 | 3.57 | 5.00 | 4.10 | 4.00 | 3.00 | 2.3 | 1.8 | 1.42 | 1.2 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 16 | 13 | 15 | 12 | 17 | 13 | 21 | 19 | 8 | 6 | 4 | 2 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 38270 | 37880 | 40120 | 40760 | 38200 | 37190 | 37960 | 37512 | 35890 | 35360 | 35110 | 34950 | IS3025(P16)84Re .02 |
| 15 | COD | mg/L | 18 | 14 | 16 | 12 | 13.4 | 12.2 | 14.3 | 11.9 | 12 | 7 | 9 | 6 | APHA(22nd Edi) 5520-D Open Reflux |
| A | **Flora and Fauna** | | | | | | | | | | | | | | |
| 16 | Primary productivity | mgC/L /day | 1.74 | 0.555 | 1.84 | 0.471 | 1.92 | 0.65 | 2.14 | 0.84 | 3.4 | 1.1 | 3.6 | 1.3 | APHA (22nd Edi) 10200-J |
| B | **Phytoplankton** | | | | | | | | | | | | | | |
| 17.1 | Chlorophyll | mg/$m^3$ | 1.247 | 0.504 | 1.67 | 0.45 | 1.63 | 0.79 | 2.56 | 0.63 | 2.95 | 0.75 | 3.1 | 0.9 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | mg/$m^3$ | 1.72 | 1.93 | 1.15 | 0.35 | 1.96 | 1.75 | 2.4 | 1.79 | 3.7 | 3.1 | 2.5 | 2.4 | APHA (22nd Edi) 10200-H |
| 17.3 | Cell Count | No. x $10^3$/L | 242 | 38 | 192 | 54 | 240 | 50 | 217 | 45 | 310 | 70 | 360 | 110 | APHA (22nd Edi) 10200-H |

**H. T. Shah**
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POLLUCON LABORATORIES PVT. LTD. SURAT-3

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Nitzschia sp. Surirella sp. Rhizosolenia sp. Pinnularia sp. Green algae Ankistrodesmus sp. Hydrodictyon sp. Pandorina sp. Desmids Closterium sp. | Bacillariophyceae synendra sp. Navicula sp. Nitzschia sp. Green algae Chlorella sp. Cyanophyceae Oscillatoria sp. Lyngbya sp. -- -- | Bacillariophyceae Navicula sp. Nitzschia sp. Coscinodiscus sp. Tabellaria sp. Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. -- -- -- -- -- | Melrsia Syrirella Skeletonemel Coscinodiscus Asterionella Naviculle Synedra Gyrosigma Certaium | Naviculle Nitishia -- -- -- -- -- -- | Bacillariophyceae Navicula sp. Nitzschia sp. Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. Synedra sp. | Bacillariophyceae Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. -- | Bacillariophyceae Cyclotella sp. Amphipora sp. Gyrosigma sp. Asterionella sp. Rhizosolenia sp. Pinnularia sp. Navicula sp. Nitzschia sp. | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- | Bacillariophyceae Navicula sp. Synedra sp. Coscinodiscus sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Pinnularia sp. Green Algae Pandorina sp. Chlorella sp. | Bacillariophyceae Navicula sp. Fragillaria sp. Gyrosigma sp. Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. -- -- -- | APHA (22nd Edi) 10200-H |
| C | **Zooplanktons** | | | | | | | | | | | | | |
| 18.1 | Abundance (Population) | noX10$^3$/ 100 m$^3$ | 21 | | 33 | | 23 | | 17 | | 25 | | 30 | APHA (22nd Edi) 10200-G |
| 18.2 | Name of Group Number and name of group species of each group | -- | Echinoderms Snail Brachiopods Copepods -- | | Copepods Decapods Polychaetes Gastropods -- | | Copepods Nematedoes Polycleate Cnstaeen Foraminiferus | | Bivalves Gastropods Nematodes Krill Fish egg | | Decapods Copepods Crustaceans Polychaete worms Krill | | Polychaete worms Decapods Molluscans -- -- | APHA (22nd Edi) 10200-G |
| 18.3 | Total Biomass | ml/100 m$^3$ | 3.1 | | 2.9 | | 2.7 | | 2.4 | | 11.2 | | 10.4 | APHA (22nd Edi) 10200-G |
| D | **Microbiological Parameters** | | | | | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 1790 | | 1970 | | 1540 | | 1820 | | 1950 | | 2020 | IS 5402:2002 |
| 19.2 | Total Coliform | /ml | Absent | | Absent | | Absent | | Absent | | Absent | | Absent | APHA(22ndEdi)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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | NOVEMBER 2017 | DECEMBER 2017 | JANUARY 2018 | FEBRUARY 2018 | MARCH 2018 | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|
| | | | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | |
| 1 | Organic Matter | % | 0.614 | 0.524 | 0.44 | 0.62 | 0.88 | 0.49 | FCO:2007 |
| 2 | Phosphorus as P | µg/g | 318 | 644 | 416 | 512 | 270 | 380 | APHA(22nd Edi) 4500 C |
| 3 | Texture | -- | Sandy | Sandy | Sandy | Sandy | Sandy | Sandy | -- |
| 4 | Petroleum Hydrocarbon | µg/g | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | PLPL-TPH |
| 5 | **Heavy Metals** | | | | | | | | |
| 5.1 | Aluminum as Al | % | 6.82 | 6.49 | 5.1 | 5.35 | 5.55 | 5.3 | AAS APHA 3111 B |
| 5.2 | Total Chromium as $Cr^{+3}$ | µg/g | 250 | 239 | 127 | 179 | 110 | 137 | AAS 3111B |
| 5.3 | Manganese as Mn | µg/g | 1760 | 1599 | 1540 | 1990 | 1012 | 1270 | AAS APHA 3111 B |
| 5.4 | Iron as Fe | % | 6.12 | 6.09 | 5.1 | 5.95 | 4.95 | 5.3 | AAS APHA(22nd Edi)3111 B |
| 5.5 | Nickel as Ni | µg/g | 73 | 69 | 40 | 56 | 32.6 | 47.8 | AAS APHA(22nd Edi)3111 B |
| 5.6 | Copper as Cu | µg/g | 84 | 72 | 95 | 72 | 51.4 | 67.4 | AAS APHA(22nd Edi)3111 B |
| 5.7 | Zinc as Zn | µg/g | 166 | 196 | 185 | 152 | 213 | 244 | AAS APHA(22nd Edi)3111 B |
| 5.8 | Lead as Pb | µg/g | 29 | 21 | 19 | 24 | 21.9 | 27.8 | AAS APHA(22nd Edi)3111 B |
| 5.9 | Mercury as Hg | µg/g | 0.3 | 0.7 | 0.5 | 0.35 | BDL* | BDL* | AAS APHA- 3112 B |
| 6 | **Benthic Organisms** | | | | | | | | |
| 6.1 | Macrobenthos | -- | Ostracods Nematodes Polychaete worms | Mysids Echinoderms | Isopods Decapods | Polychaete worms Bivalves | Isopods Polychaete worms -- | Mysids Anthozoans Decapodes Isopodes | APHA (22nd Edi) 10500-C |
| 6.2 | MeioBenthos | -- | Nematodes Foraminiferans | Copepods Foraminiferans | Foraminiferans | Nematodes | Ostracodes Nematodes | Copepods Foraminiferans | APHA (22nd Edi) 10500-C |
| 6.3 | Population | no/m2 | 230 | 282 | 270 | 292 | 302 | 268 | APHA (22nd Edi) 10500-C |

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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 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 8.04 | 7.79 | 7.52 | 7.28 | 8.15 | 8.09 | 8.27 | 8.25 | 8.05 | 8.03 | 8.19 | 8.13 | IS3025(P11)83Re.02 |
| 2 | Temperature | oC | 30 | 29 | 30.1 | 29.6 | 28.4 | 28 | 28.9 | 28.5 | 28.6 | 28.2 | 29.1 | 29.8 | IS3025(P9)84Re.02 |
| 3 | Total Suspended Solids | mg/L | 372 | 316 | 324 | 294 | 198 | 156 | 232 | 213 | 150 | 145 | 142 | 112 | IS3025(P17)84Re.02 |
| 4 | BOD (3 Days @ 27°C) | mg/L | 3.3 | 3 | 2.9 | 2.4 | 2.8 | 2.5 | 1.8 | 1.4 | 1.8 | 1.6 | 1.5 | 1.2 | IS 3025 (P44)1993Re.03Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 6.4 | 5.7 | 6.3 | 5.9 | 6 | 4.8 | 5.9 | 5.5 | 6.6 | 6.3 | 6.5 | 6.4 | IS3025(P38)89Re.99 |
| 6 | Salinity | ppt | 40.2 | 38.9 | 38.4 | 38.5 | 37.9 | 37.5 | 37.1 | 36.8 | 35 | 34.7 | 34.6 | 34.4 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)5520D |
| 8 | Nitrate as $NO_3$ | µmol/L | 27.7 | 28.9 | 25.1 | 23.8 | 32.4 | 24.2 | 26.8 | 32.2 | 11.8 | 10.6 | 9.8 | 7.5 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 2.31 | 2.54 | 1.77 | 1.52 | 1.85 | 1.44 | 1.56 | 1.34 | 0.6 | 0.5 | 0.48 | 0.39 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 4.94 | 5.27 | 3.94 | 2.31 | 4.52 | 3.9 | 3.38 | 2.22 | 1.4 | 0.8 | 0.88 | 0.65 | IS3025(P34)88Cla.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 1.8 | 1.99 | 1.73 | 1.42 | 2.4 | 2.1 | 1.7 | 1.5 | 1.52 | 1.38 | 1.62 | 1.58 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 7.32 | 7.93 | 5.88 | 4.01 | 6.37 | 5.34 | 4.94 | 3.56 | 2.10 | 1.30 | 1.5 | 1.2 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 15 | 13 | 17 | 12 | 13 | 11 | 17 | 14 | 7.4 | 5.2 | 9 | 7 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 39920 | 38870 | 38090 | 38430 | 37140 | 36920 | 37780 | 37210 | 36100 | 35700 | 35810 | 35470 | IS3025(P16)84Re.02 |
| 15 | COD | mg/L | 24 | 18 | 18 | 14 | 16 | 15 | 12 | 10 | 10 | 8 | 14 | 6 | APHA(22ndEdi) 5520-D Open Reflux |
| A | **Flora and Fauna** | | | | | | | | | | | | | | |
| 16 | Primary productivity | mgC/L /day | 1.72 | 0.41 | 2 | 0.45 | 1.85 | 0.35 | 2.1 | 0.72 | 3.1 | 1.8 | 4 | 1.8 | APHA (22nd Edi) 10200-J |
| B | **Phytoplankton** | | | | | | | | | | | | | | |
| 17.1 | Chlorophyll | $mg/m^3$ | 1.41 | 0.426 | 1.159 | 0.354 | 1.58 | 0.28 | 1.72 | 0.65 | 2.75 | 0.7 | 2.98 | 0.8 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | $mg/m^3$ | 1.51 | 2.04 | 2.2 | 2.4 | 2.1 | 2.8 | 1.5 | 2.6 | 4 | 3.5 | 3.6 | 2.7 | APHA (22nd Edi) 10200-H |
| 17.3 | Cell Count | No. x $10^3$/L | 252 | 64 | 196 | 58 | 217 | 56 | 290 | 72 | 295 | 60 | 305 | 95 | APHA (22nd Edi) 10200-H |

**H. T. Shah**
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|---|---|---|---|---|---|---|---|---|---|---|
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Cocconeis sp. Fragillaria sp. Navicula sp. Green algae Chlorella sp. Pediastrum sp. Cyanophyceae Spirulina sp. | Bacillariophyceae Biddulphia sp. Cymbella sp. Navicula sp. sydra sp. pinnularia sp. Green algae Volvox sp. Pediastrum sp. Ulothrix sp. Cyanophyceae Lyngbya sp. | Bacillariophyceae Navicula sp. Nitzschia sp. Coscinodiscus sp. Tabellaria sp. Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. -- | Skeletonemel Synedra Gyrosigma Coscinodiscus Asterionella Melrsia Syrirella Naviculle Certaium | Naviculle Nitishia -- -- -- | Bacillariophyceae Navicula sp. Nitzschia sp. Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. | Bacillariophyceae Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. Synedra sp. |
| 17.4 | | | Bacillariophyceae Synedra sp. Navicula sp. Coscinodiscus sp. Cocconeis sp. Gyrosigma sp. Green Algae Chlorella sp. -- | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- | Bacillariophyceae Navicula sp. Synedra sp. Coscinodiscus sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Pinnularia sp. Green Algae Pandorina sp. Chlorella sp. | Bacillariophyceae Navicula sp. Synedra sp. Fragillaria sp. Gyrosigma sp. Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. -- -- -- | APHA (22nd Edi) 10200-H | | | |
| C | **Zooplanktons** | | | | | | | | | |
| 18.1 | Abundance (Population) | noX10$^3$/ 100 m$^3$ | 26 | 20 | 23 | 28 | 29 | 22 | APHA (22nd Edi) 10200-G | |
| 18.2 | Name of Group Number and name of group species of each group | -- | Polychaete worms Bivalves Fish eggs Brachiopods Copepods | Gastropods Decapods Decapods Gastropods -- | Nematodes Nematedoes Polycleate Cnstaeen Foraminiferus | Gastropods Nematodes Krill Fish egg Bivalves | Crustaceans Copepods Krill Polychaete worms Decapods | Brachiopods Polychaete worms Nematodes Fish egg Copepods | APHA (22nd Edi) 10200-G | |
| 18.3 | Total Biomass | ml/100 m$^3$ | 2.7 | 1.7 | 1.8 | 2.4 | 10.2 | 11.6 | APHA (22nd Edi) 10200-G | |
| D | **Microbiological Parameters** | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 2110 | 1970 | 1840 | 2120 | 1820 | 2090 | IS 5402:2002 | |
| 19.2 | Total Coliform | /ml | Absent | Absent | Absent | Absent | Absent | Absent | APHA(22ndEdi)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 | |

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|---|---|---|---|---|---|---|---|---|---|
| 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 [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 8.47 | 8.25 | 8.08 | 8.13 | 8.28 | 8.19 | 8.1 | 7.96 | 8.35 | 8.25 | 8.22 | 8.16 | IS3025(P11)83Re.02 |
| 2 | Temperature | oC | 28.5 | 28.3 | 29 | 28.6 | 28.4 | 28 | 28.8 | 28.6 | 28.9 | 28.5 | 29.4 | 29.1 | IS3025(P9)84Re.02 |
| 3 | Total Suspended Solids | mg/L | 325 | 319 | 314 | 298 | 322 | 296 | 280 | 256 | 340 | 280 | 312 | 298 | IS3025(P17)84Re.02 |
| 4 | BOD (3 Days @ 27 °C) | mg/L | 2.8 | 2.4 | 3.1 | 2.9 | 3.5 | 2.8 | 2.4 | 1.6 | 3.4 | 3.2 | 2.4 | 2.1 | IS 3025 (P44)1993Re.03Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 6.4 | 5.8 | 6 | 5.2 | 6.6 | 5.7 | 6.1 | 5.3 | 6.2 | 5.9 | 6.4 | 5.8 | IS3025(P38)89Re.99 |
| 6 | Salinity | ppt | 39.7 | 38.9 | 40.4 | 39.8 | 37.7 | 37.1 | 38.2 | 37.6 | 35.8 | 35.7 | 35.3 | 35.2 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)5520D |
| 8 | Nitrate as $NO_3$ | µmol/L | 23.2 | 19.4 | 23.6 | 24.3 | 19.2 | 17.4 | 21.6 | 16.8 | 14.8 | 13.2 | 16.4 | 11.8 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 1.8 | 1.3 | 1.9 | 2 | 1.8 | 1.5 | 2.4 | 2.1 | 1.6 | 0.8 | 1.3 | 0.4 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 3.6 | 2.2 | 3.5 | 3.6 | 2.2 | 1.8 | 3.1 | 2.5 | 2.3 | 1.9 | 1.6 | 0.8 | IS3025(P34)88Cla.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 1.71 | 1.66 | 1.4 | 1.1 | 1.53 | 1.48 | 2.74 | 2.25 | 1.95 | 1.65 | 1.84 | 1.72 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 3.74 | 3.58 | 5.36 | 5.41 | 4.00 | 3.30 | 5.50 | 4.60 | 3.90 | 2.70 | 3.1 | 1.2 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 15 | 12 | 19 | 14 | 17.7 | 13.2 | 15.9 | 12.7 | 14 | 10 | 18 | 12 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 40040 | 39540 | 41030 | 40370 | 38100 | 37970 | 37840 | 37520 | 36400 | 36210 | 36140 | 35920 | IS3025(P16)84Re.02 |
| 15 | COD | mg/L | 18 | 12 | 17 | 13 | 15 | 10 | 9.6 | 8.2 | 14.4 | 12 | 10 | 8 | APHA(22nd Edi) 5520-D Open Reflux |
| A | | | | | | | Flora and Fauna | | | | | | | | |
| 16 | Primary productivity | mgC/L /day | 1.84 | 0.471 | 1.553 | 0.338 | 2.1 | 0.64 | 1.85 | 0.48 | 2.2 | 0.8 | 2.9 | 1.5 | APHA (22nd Edi) 10200-J |
| B | | | | | | | Phytoplankton | | | | | | | | |
| 17.1 | Chlorophyll | mg/$m^3$ | 1.67 | 0.45 | 1.14 | 0.347 | 2.1 | 0.58 | 2.68 | 0.75 | 2.5 | 0.65 | 3.1 | 0.8 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | mg/$m^3$ | 1.15 | 0.35 | 1.56 | 1.8 | 2.34 | 0.63 | 1.95 | 0.38 | 3.1 | 2.6 | 3.5 | 2.9 | APHA (22nd Edi) 10200-H |
| 17.3 | Cell Count | No. x $10^3$/L | 192 | 54 | 170 | 46 | 230 | 48 | 196 | 52 | 280 | 90 | 320 | 100 | APHA (22nd Edi) 10200-H |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Coscinodiscus sp. Pinnularia sp. synendra sp. Green algae Volvox sp. Chlorella sp. Ulothrix sp. Cyanophyceae Oscillatoria sp. | Bacillariophyceae Fragillaria sp. Navicula sp. Pinnularia sp. Melosira sp. Green algae Spirogyra sp. Spirogyra sp. Cyanophyceae Oscillatoria sp. | Bacillariophyceae Navicula sp. Nitzschia sp. Coscinodiscus sp. Tabellaria sp. Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. -- | Syrirella Gyrosigma Coscinodiscus Asterionella Melrsia Skeletonemel Certaium -- | Naviculle Nitishia -- -- -- | Bacillariophyceae Navicula sp. Nitzschia sp. Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. | Bacillariophyceae Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. Synedra sp. | Bacillariophyceae Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Synedra sp. Cyclotella sp. Melosira sp. Nitzschia sp. | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- | Bacillariophyceae Navicula sp. Synedra sp. Coscinodiscus sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Pinnularia sp. Green Algae Chlorella sp. | Bacillariophyceae Navicula sp. Fragillaria sp. Gyrosigma sp. Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. -- -- | APHA (22nd Edi) 10200-H |
| C | | | | | | | Zooplanktons | | | | | | |
| 18.1 | Abundance (Population) | noX$10^3$/ 100 $m^3$ | 29 | | 33 | 24 | 28 | | 18 | | 24 | | APHA (22nd Edi) 10200-G |
| 18.2 | Name of Group Number and name of group species of each group | -- | Crustaceans Nematodes Nauplius larvae Gastropods | | Copepods Decapods Polychaetes Gastropods | Copepods Nematedoes Polycleate Cnstaeen Foraminiferus Krill | Polychaete worms Brachiopods Fish egg Isopods Bivalves Copepods | | Polychaete worms Decapods Krill Copepods Crustaceans | | Isopods Bivalves Polychaete worms Fish egg Brachiopods | | APHA (22nd Edi) 10200-G |
| 18.3 | Total Biomass | ml/100 $m^3$ | 3.4 | | 2.7 | 3.1 | 2.8 | | 8.8 | | 11.8 | | APHA (22nd Edi) 10200-G |
| D | **Microbiological Parameters** | | | | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 2030 | | 1910 | 1770 | 2012 | | 1520 | | 1710 | | IS 5402:2002 |
| 19.2 | Total Coliform | /ml | Absent | | Absent | Absent | Absent | | Absent | | Absent | | APHA(22ndEdi)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) |

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

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**Dr. ArunBajpai**
**Lab Manager (Q)**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 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 [M8 RIGHT SIDE OF BOCHA CREEK – N 22°45'987" E 069°43'119"]

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | NOVEMBER 2017 | DECEMBER 2017 | JANUARY 2018 | FEBRUARY 2018 | MARCH 2018 | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|
| | | | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | SEDIMENT | |
| 1 | Organic Matter | % | 0.627 | 0.537 | 0.39 | 0.51 | 0.92 | 0.61 | FCO:2007 |
| 2 | Phosphorus as P | µg/g | 813 | 710 | 570 | 495 | 412 | 510 | APHA(22nd Edi) 4500 C |
| 3 | Texture | -- | Sandy | Sandy | Sandy | Sandy | Sandy | Sandy | -- |
| 4 | Petroleum Hydrocarbon | µg/g | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | PLPL-TPH |
| 5 | **Heavy Metals** | | | | | | | | |
| 5.1 | Aluminum as Al | % | 6.08 | 6.12 | 4.96 | 5.28 | 5.39 | 5.05 | AAS APHA 3111 B |
| 5.2 | Total Chromium as $Cr^{+3}$ | µg/g | 224 | 239 | 198 | 185 | 208 | 223 | AAS 3111B |
| 5.3 | Manganese as Mn | µg/g | 1882 | 1756 | 1720 | 1885 | 1420 | 1610 | AAS APHA 3111 B |
| 5.4 | Iron as Fe | % | 5.27 | 6.01 | 5.64 | 5.36 | 4.9 | 5.1 | AAS APHA(22nd Edi)3111 B |
| 5.5 | Nickel as Ni | µg/g | 67 | 72 | 33 | 49 | 23.2 | 37.6 | AAS APHA(22nd Edi)3111 B |
| 5.6 | Copper as Cu | µg/g | 80 | 58 | 56 | 67 | 56.8 | 42.2 | AAS APHA(22nd Edi)3111 B |
| 5.7 | Zinc as Zn | µg/g | 174 | 196 | 132 | 175 | 182 | 206 | AAS APHA(22nd Edi)3111 B |
| 5.8 | Lead as Pb | µg/g | 31 | 28 | 17 | 12 | 10.4 | 13.2 | AAS APHA(22nd Edi)3111 B |
| 5.9 | Mercury as Hg | µg/g | 0.5 | 0.8 | 0.29 | 0.12 | BDL* | BDL* | AAS APHA- 3112 B |
| 6 | **Benthic Organisms** | | | | | | | | |
| 6.1 | Macrobenthos | -- | Nauplius larvae<br>Nematodes | Mysids<br>Echinoderms | Isopods<br>Decapods | Polychaete worms<br>Bivalves | Decapods<br>Polychaete worms<br>-- | Bivalves<br>Mysids<br>Isopodes<br>Nauplius larvae | APHA (22nd Edi) 10500-C |
| 6.2 | MeioBenthos | -- | Daphnia<br>Mysids | Nematodes<br>Foraminiferans | Copepods<br>Foraminiferans | Nematodes | Foraminiferans<br>Daphnia | Daphnia<br>Foraminiferans | APHA (22nd Edi) 10500-C |
| 6.3 | Population | no/$m^2$ | 258 | 234 | 226 | 258 | 290 | 198 | APHA (22nd Edi) 10500-C |

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

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**Lab Manager (Q)**

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

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 8.43 | 8.16 | 8.05 | 7.77 | 8.02 | 7.93 | 8.33 | 8.17 | 8.07 | 8.03 | 8.11 | 8.09 | IS3025(P11)83Re .02 |
| 2 | Temperature | oC | 28.3 | 28.1 | 30.1 | 29.3 | 28.8 | 28.5 | 28.9 | 28.7 | 29 | 28 | 29.8 | 29.1 | IS3025(P9)84Re. 02 |
| 3 | Total Suspended Solids | mg/L | 334 | 320 | 350 | 310 | 293 | 262 | 318 | 281 | 198 | 172 | 230 | 202 | IS3025(P17)84Re .02 |
| 4 | BOD (3 Days @ 27 °C) | mg/L | 2.6 | 2.3 | 3.4 | 2.9 | 4.4 | 2.9 | 3.6 | 3.1 | 3.8 | 3.2 | 2.9 | 2.6 | IS 3025 (P44)1993Re.03Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 6.4 | 5.6 | 6.4 | 5.7 | 6.3 | 5.5 | 5.9 | 4.9 | 6 | 5.8 | 5.9 | 5.3 | IS3025(P38)89Re .99 |
| 6 | Salinity | ppt | 39.6 | 38.3 | 40.2 | 38.9 | 37.7 | 37.3 | 37.4 | 37 | 36.8 | 36.1 | 36.2 | 35.7 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)5520D |
| 8 | Nitrate as $NO_3$ | µmol/L | 28.2 | 20.3 | 27.7 | 28.9 | 17.4 | 15.2 | 21.2 | 18.3 | 14.8 | 12.6 | 17.2 | 14.4 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 1.8 | 1.6 | 2.33 | 2.47 | 1.58 | 1.44 | 2.6 | 2.3 | 1.2 | 0.9 | 1.35 | 1.2 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 3.5 | 2.4 | 4.94 | 5 | 3.8 | 3.6 | 4.5 | 4.1 | 2.8 | 2.3 | 3.1 | 2.7 | IS3025(P34)88Cla .2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 1.65 | 1.58 | 1.8 | 1.99 | 2.15 | 1.82 | 1.74 | 1.56 | 1.68 | 1.59 | 1.98 | 1.82 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 5.44 | 3.72 | 7.32 | 7.93 | 5.38 | 5.04 | 7.10 | 6.40 | 4.00 | 3.20 | 4.45 | 3.9 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 12 | 10 | 15 | 14 | 17 | 11 | 22 | 18 | 19 | 8 | 14 | 6 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 38760 | 37610 | 39770 | 38550 | 37100 | 36820 | 37640 | 37210 | 37110 | 36840 | 37920 | 37580 | IS3025(P16)84Re .02 |
| 15 | COD | mg/L | 15 | 11 | 22 | 18 | 14 | 10 | 17 | 12 | 15 | 10 | 18 | 16 | APHA(22nd Edi) 5520-D Open Reflux |
| A | **Flora and Fauna** | | | | | | | | | | | | | | |
| 16 | Primary productivity | mgC/L /day | 1.57 | 0.63 | 1.72 | 0.41 | 1.84 | 0.69 | 2.1 | 0.58 | 2.52 | 0.72 | 1.98 | 0.52 | APHA (22nd Edi) 10200-J |
| B | **Phytoplankton** | | | | | | | | | | | | | | |
| 17.1 | Chlorophyll | mg/$m^3$ | 1.74 | 0.37 | 1.52 | 0.412 | 2.36 | 0.46 | 2.62 | 0.65 | 2.21 | 0.34 | 2.54 | 0.29 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | mg/$m^3$ | 2.22 | 2.5 | 1.51 | 2.04 | 2.96 | 2.6 | 1.84 | 1.63 | 2.68 | 2.48 | 2.95 | 2.72 | APHA (22nd Edi) 10200-H |

**H. T. Shah**
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**Lab Manager (Q)**

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.3 | Cell Count | No. x $10^3$/L | 202 | 114 | 248 | 64 | 318 | 123 | 256 | 88 | 290 | 78 | 306 | 98 | APHA (22nd Edi) 10200-H |
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Navicula sp. Synedra sp. Coscinodiscus sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Pinnularia sp. Green Algae Pandorina sp. Chlorella sp. | Bacillariophyceae Fragillaria sp. Nitzschia sp. Melosira sp. Synedra sp. -- | Bacillariophyceae Navicula sp. Nitzschia sp. Biddulphia sp. Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. Synedra sp. | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- | Bacillariophyceae Peridinizem sp. Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. | Bacillariophyceae Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Melosira sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. -- | Bacillariophyceae Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. Navicula sp. Nitzschia sp. Coscinodiscus sp. | Bacillariophyceae Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Nitzschia sp. Navicula sp. Pinnularia sp. Rhizosolenia sp. Tabellaria sp. -- | Bacillariophyceae Fragillaria sp. Biddulphia sp. Nitzschia sp. Navicula sp. Asterionella Melrsia Syrirella Skeletonemel | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- | Bacillariophyceae Naviculle Synedra Gyrosigma Coscinodiscus Amphipora sp. Asterionella sp. Cyclotella sp. Gyrosigma sp. Synedra sp. | Bacillariophyceae Gyrosigma sp. Fragillaria sp. Navicula sp. Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. -- -- | APHA (22nd Edi) 10200-H |
| C | **Zooplanktons** | | | | | | | | | | | | | | |
| 18.1 | Abundance (Population) | noX$10^3$/ 100 $m^3$ | 16 | | 18 | | 20 | | 23 | | 19 | | 17 | | APHA (22nd Edi) 10200-G |
| 18.2 | Name of Group Number and name of group species of each group | -- | Bivalves Gastropods Nematodes Krill Fish egg | | Polychaete worms Decapods Molluscans -- | | Krill Polycleate Nematedoes Cnstaeen Foraminiferus Copepods | | Decapods Gastropods -- | | Bivalves Isopods Copepods Polychaete worms Crustaceans | | Nematodes Cnstaeen -- | | APHA (22nd Edi) 10200-G |
| 18.3 | Total Biomass | ml/100 $m^3$ | 8.9 | | 8.3 | | 7.1 | | 9.3 | | 8.4 | | 9.6 | | APHA (22nd Edi) 10200-G |
| D | **Microbiological Parameters** | | | | | | | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 2020 | | 1980 | | 1540 | | 1780 | | 1710 | | 1580 | | IS 5402:2002 |
| 19.2 | Total Coliform | /ml | Absent | | Absent | | Absent | | Absent | | Absent | | Absent | | APHA(22ndEdi)9221-D |
| 19.3 | Ecoli | /ml | Absent | | Absent | | Absent | | Absent | | Absent | | Absent | | IS:1622:1981Edi. |

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**Dr. ArunBajpai**
**Lab Manager (Q)**

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

| SR. NO. | TEST PARAMETERS | UNIT | OCTOBER 2017 | | NOVEMBER 2017 | | DECEMBER 2017 | | JANUARY 2018 | | FEBRUARY 2018 | | MARCH 2018 | | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | SURFACE | BOTTOM | |
| 1 | pH | -- | 7.82 | 7.93 | 8.08 | 8.11 | 8.23 | 8.05 | 8.35 | 8.29 | 8.1 | 7.95 | 7.92 | 7.85 | IS3025(P11)83Re.02 |
| 2 | Temperature | oC | 30.6 | 30.6 | 29.8 | 29.6 | 28.7 | 28.6 | 28.8 | 28.5 | 28.8 | 28.7 | 29.6 | 29.1 | IS3025(P9)84Re.02 |
| 3 | Total Suspended Solids | mg/L | 310 | 336 | 320 | 390 | 372 | 317 | 288 | 262 | 398 | 340 | 412 | 360 | IS3025(P17)84Re.02 |
| 4 | BOD (3 Days @ 27°C) | mg/L | 2 | 2.1 | 2.6 | 2.2 | 3 | 2 | 4 | 3 | 4.4 | 3.8 | 3.2 | 2.8 | IS 3025 (P44)1993Re.03Edition2.1 |
| 5 | Dissolved Oxygen | mg/L | 5.8 | 5.2 | 6 | 5.2 | 6.6 | 5.8 | 5.4 | 4.9 | 6.1 | 5.3 | 5.5 | 5.2 | IS3025(P38)89Re.99 |
| 6 | Salinity | ppt | 36.6 | 37.8 | 40.2 | 39.7 | 37.2 | 36.9 | 37.5 | 37.1 | 36.3 | 36.1 | 36.5 | 35.9 | APHA (22nd Edi) 2550 B |
| 7 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | APHA(22nd Edi)5520D |
| 8 | Nitrate as $NO_3$ | µmol/L | 26.2 | 28.4 | 27.4 | 29.1 | 23.7 | 19.2 | 16.6 | 13.8 | 24.4 | 20.2 | 28.6 | 25.9 | IS3025(P34)88 |
| 9 | Nitrite as $NO_2$ | µmol/L | 2.12 | 2.44 | 2.27 | 2.39 | 1.8 | 1.5 | 2.3 | 1.9 | 1.52 | 1.1 | 1.3 | 0.9 | IS3025(P34)88 NEDA |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 5.2 | 4.94 | 5.71 | 4.13 | 2.8 | 2.4 | 3.5 | 3.2 | 1.95 | 1.2 | 1.73 | 1.35 | IS3025(P34)88Cla.2.3 |
| 11 | Phosphates as $PO_4$ | µmol/L | 1.7 | 1.82 | 1.5 | 1.93 | 1.96 | 1.56 | 1.84 | 1.6 | 1.9 | 1.65 | 2.1 | 1.9 | APHA(22nd Edi) 4500 C |
| 12 | Total Nitrogen | µmol/L | 7.582 | 7.676 | 7.98 | 6.52 | 4.60 | 3.90 | 5.80 | 5.10 | 3.80 | 2.30 | 3 | 2.2 | IS3025(P34)88 |
| 13 | Petroleum Hydrocarbon | µg/L | 16 | 14 | 17 | 12 | 15 | 11 | 17 | 13 | 17 | 14 | 21 | 16 | PLPL-TPH |
| 14 | Total Dissolved Solids | mg/L | 36090 | 35230 | 39350 | 38760 | 37700 | 37100 | 37940 | 37270 | 36940 | 36250 | 37010 | 36570 | IS3025(P16)84Re.02 |
| 15 | COD | mg/L | 20 | 13 | 18 | 11 | 15 | 7 | 20 | 16 | 18 | 14 | 22 | 18 | APHA(22nd Edi) 5520-D Open Reflux |
| A | **Flora and Fauna** | | | | | | | | | | | | | | |
| 16 | Primary productivity | mgC/L /day | 1.66 | 0.369 | 1.553 | 0.338 | 1.85 | 0.58 | 1.48 | 0.35 | 2.9 | 1.4 | 3.4 | 1.8 | APHA (22nd Edi) 10200-J |
| B | **Phytoplankton** | | | | | | | | | | | | | | |
| 17.1 | Chlorophyll | mg/m$^3$ | 1.354 | 0.366 | 1.14 | 0.347 | 1.9 | 0.36 | 1.5 | 0.28 | 3.5 | 0.85 | 2.4 | 0.7 | APHA (22nd Edi) 10200-H |
| 17.2 | Phaeophytin | mg/m$^3$ | 1.48 | 1.99 | 1.56 | 1.8 | 1.6 | 1.4 | 1.7 | 1.35 | 3.2 | 2.4 | 2.1 | 1.8 | APHA (22nd Edi) 10200-H |

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

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**Lab Manager (Q)**

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.3 | Cell Count | No. x $10^3$/L | 210 | 54 | 170 | 46 | 260 | 65 | 310 | 72 | 270 | 50 | 240 | 60 | APHA (22nd Edi) 10200-H |
| 17.4 | Name of Group Number and name of group species of each group | -- | Bacillariophyceae Asterionella Cyclotella sp. Gyrosigma sp. Skeletonemel Certaium Gyrosigma sp. Pinnularia sp. Cyanophyceae -- | Bacillariophyceae Nitishia Naviculle Nitzschia sp. -- | Bacillariophyceae Navicula sp. Nitzschia sp. Navicula sp. Tabellaria sp. Skeletonema sp. Melosira sp. Cyclotella sp. Pinnularia sp. Fragillaria sp. | Bacillariophyceae Cyclotella sp. Nitzschia sp. Melosira sp. Synedra sp. Melosira sp. -- | Bacillariophyceae Peridinizem sp. Gyrosigma Nitzschia sp. Amphipora sp. Asterionella sp. Naviculle Synedra | Bacillariophyceae Fragillaria sp. Melosira sp. Melrsia Syrirella | Bacillariophyceae Navicula sp. Gyrosigma sp. Biddulphia sp. Fragillaria sp. Coscinodiscus sp. Synedra sp. | Bacillariophyceae Pinnularia sp. Asterionella sp. Synedra sp. Gyrosigma sp. Nitzschia sp. Dianoflagllates Pinnularia sp. Rhizosolenia sp. -- | Bacillariophyceae Fragillaria sp. Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Pinnularia sp. Rhizosolenia sp. -- -- | Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. Nitzschia sp. -- -- -- -- | Bacillariophyceae Navicula sp. Amphipora sp. Navicula sp. Asterionella sp. Gyrosigma sp. Cocconeis sp. Nitzschia sp. Green Algae Pandorina sp. Chlorella sp. | Bacillariophyceae Pinnularia sp. Cyanophyceae Lyngbya sp. Oscillatoria sp. Coscinodiscus sp. Navicula sp. Fragillaria sp. Coscinodiscus -- -- | APHA (22nd Edi) 10200-H |

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

POLLUCON LABORATORIES PVT. LTD. SURAT-3

**Dr. ArunBajpai**
**Lab Manager (Q)**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C | **Zooplanktons** | | | | | | | | |
| 18.1 | Abundance (Population) | noX$10^3$/ 100 $m^3$ | 23 | 17 | 28 | 32 | 18 | 15 | APHA (22nd Edi) 10200-G |
| 18.2 | Name of Group Number and name of group species of each group | -- | Molluscans<br>Gastropods<br>Polychaete worms | Gastropods<br>Polychaetes<br>Decapods | Cnstaeen<br>Nematedoes<br>Polycleate<br>Copepods | Isopods<br>Bivalves<br>Polychaete worms<br>Fish egg<br>Brachiopods<br>Copepods | Molluscans<br>Polychaete worms<br>Decapods<br>-- | Fish eggs<br>Cnstaeen<br>Polychaete worms<br>Foraminiferus | APHA (22nd Edi) 10200-G |
| 18.3 | Total Biomass | ml/100 $m^3$ | 5.8 | 6.2 | 6.6 | 5.2 | 9.8 | 11.6 | APHA (22nd Edi) 10200-G |
| D | **Microbiological Parameters** | | | | | | | | |
| 19.1 | Total Bacterial Count | CFU/ml | 2000 | 1640 | 1760 | 1940 | 1530 | 1580 | IS 5402:2002 |
| 19.2 | Total Coliform | /ml | Absent | Absent | Absent | Absent | Absent | Absent | APHA(22ndEdi)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**

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**Dr. ArunBajpai**
**Lab Manager (Q)**

## RESULTS OF ETP WATER OUTLET

| SR. NO. | PARAMETERS | UNIT | RESULTS OF ETP WATER OUTLET | | | | | | GPCB Limit | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 04/09/2017 | 07/11/2017 | 05/12/2017 | 08/01/2018 | 06/02/2018 | 06/03/2018 | | |
| 1 | Colour | Co-pt | 30 | 30 | 20 | 30 | 30 | 40 | **100** | IS3025(P4)83Re.02 |
| 2 | pH | -- | 6.52 | 7.24 | 7.75 | 6.19 | 6.25 | 6.8 | **6.5 TO 8.5** | IS3025(P11)83Re.02 |
| 3 | Temperature | °C | 30 | 30 | 29 | 29 | 29 | 31 | **40** | IS3025(P9)84Re.02 |
| 4 | Total Suspended Solids | mg/L | 34 | 22 | 56 | 90 | 22 | 48 | **100** | IS3025(P17)84Re.02 |
| 5 | Total Dissolved Solids | mg/L | 1564 | 1032 | 1372 | 1608 | 1204 | 1860 | **2100** | IS3025(P16)84Re.02 |
| 6 | COD | mg/L | 96 | 96 | 80 | 94 | 72 | 88 | **100** | APHA(22nd Edi) 5520-D Open Reflux |
| 7 | BOD (3 Days @ 27 °C) | mg/L | 27 | 22 | 19 | 24 | 24 | 24 | **30** | IS 3025 (P44)1993Re.03Edition2.1 |
| 8 | Chloride as Cl | mg/L | 489 | 505 | 499 | 434 | 434 | 580 | **600** | IS3025(P32)88Re.99 |
| 9 | Oil & Grease | mg/L | BDL* | BDL* | BDL* | 1.06 | BDL* | 2.4 | **10** | APHA(22nd Edi)5520D |
| 10 | Sulphate as $SO_4$ | mg/L | 112 | 122 | 342 | 108 | 105 | 146 | **1000** | APHA(22nd Edi)4500 $SO_4$ E |
| 11 | Ammonical Nitrogen as $NH_3$ | mg/L | 4.15 | 5.4 | 2.26 | 3.2 | 2.55 | 2.6 | **50** | IS3025(P34)88Cla.2.3 |
| 12 | Phenolic Compound | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | 0.018 | **1** | IS3025(P43)92Re.03 |
| 13 | Copper as Cu | mg/L | 0.014 | 0.015 | 0.19 | 0.023 | 0.017 | BDL* | **3** | AAS APHA(22nd Edi)3111 B |
| 14 | Lead as Pb | mg/L | BDL* | BDL* | BDL* | BDL* | BDL* | BDL* | **0.1** | AAS APHA(22nd Edi)3111 B |
| 15 | Sulphide as S | mg/L | <0.01 | BDL* | 0.82 | < 0.01 | BDL* | BDL* | **2** | APHA(22nd Edi) 4500-S |
| 16 | Cadmium as Cd | mg/L | BDL* | BDL* | 0.13 | BDL* | BDL* | BDL* | **2** | AAS APHA(22nd Edi)3111 B |
| 17 | Fluoride as F | mg/L | BDL* | BDL* | 0.29 | 0.17 | BDL* | 1.9 | **2** | APHA(22nd Edi) 4500 F D SPANDS |

*Below detection limit

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

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**Dr. ArunBajpai**
**Lab Manager (Q)**

# RESULTS OF STP WATER OUTLET

| SR. NO | TEST PARAMETERS | Unit | ADANI HOUSE STP OUTLET | | | | | | GPCB Permissible Limit | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | October-17 | | November-17 | | December-17 | | | |
| | | | 04/10/ 2017 | 24/10/ 2017 | 06/11/ 2017 | 23/11/ 2017 | 05/12/ 2017 | 21/12/ 2017 | | |
| 1 | pH | -- | 7.17 | 7.03 | 7.28 | 7.20 | 7.02 | 7.25 | -- | IS3025(P11)83Re.02 |
| 2 | Total Suspended Solids | mg/L | 26 | 26 | 24 | 14 | 26 | 16 | 100 | IS3025(P17)84Re.02 |
| 3 | BOD (3 days @ 270 C) | mg/L | 16 | 18 | 18 | 13 | 18 | 19 | 30 | IS 3025 (P44)1993Re.03Edition 2.1 |
| 4 | Fecal Coliform | MPN/ 100 mL | --- | --- | --- | --- | --- | --- | < 1000 | APHA (22ndEdi) 9221 C&E |

| SR. NO | TEST PARAMETERS | Unit | ADANI HOUSE STP OUTLET | | | | | | GPCB Permissible Limit | TEST METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | January-18 | | February-18 | | March-18 | | | |
| | | | 08/01/ 2018 | 22/01/ 2018 | 06/02/ 2018 | 22/02/ 2018 | 06/03/ 2018 | 20/03/ 2018 | | |
| 1 | pH | -- | 7.16 | 7.09 | 7.01 | 7.03 | 6.95 | 6.56 | -- | IS3025(P11)83Re.02 |
| 2 | Total Suspended Solids | mg/L | 18 | 22 | 23 | 26 | 16 | 14 | 100 | IS3025(P17)84Re.02 |
| 3 | BOD (3 days @ 270 C) | mg/L | 20 | 18 | 15 | 12 | 18 | 12 | 30 | IS 3025 (P44)1993Re.03Edition 2.1 |
| 4 | Fecal Coliform | MPN/ 100 mL | 84 | 110 | 430 | 920 | 350 | 920 | < 1000 | APHA (22ndEdi) 9221 C&E |

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## RESULT OF AMBIENT AIR QUALITY MONITORING

**ADANI PORT – T1 TERMINAL NR.MARINE BUILDING**

| Sr. No. | Date of Sampling | Particulate Matter (PM10) µg/m³ | Particulate Matter (PM 2.5) µg/m³ | Sulphur Dioxide (SO2) µg/m³ | Oxides of Nitrogen (NO2) µg/m³ | Carbon Monoxide as CO mg/m³ | Hydrocarbon as $CH_4$ mg/m³ | Benzene as $C_6H_6$ µg/m³ |
|---|---|---|---|---|---|---|---|---|
| 1 | 03/10/2017 | 68.52 | 32.43 | 9.58 | 20.44 | 0.41 | BDL* | BDL* |
| 2 | 06/10/2017 | 57.81 | 28.68 | 11.90 | 26.52 | 0.53 | BDL* | BDL* |
| 3 | 10/10/2017 | 84.65 | 39.49 | 14.47 | 35.36 | 0.69 | BDL* | BDL* |
| 4 | 13/10/2017 | 55.35 | 23.70 | 5.59 | 15.72 | 0.11 | BDL* | BDL* |
| 5 | 17/10/2017 | 91.70 | 53.67 | 25.44 | 31.44 | 0.44 | BDL* | BDL* |
| 6 | 20/10/2017 | 88.41 | 37.41 | 13.02 | 19.34 | 0.17 | BDL* | BDL* |
| 7 | 24/10/2017 | 72.40 | 40.32 | 16.13 | 28.73 | 0.48 | BDL* | BDL* |
| 8 | 27/10/2017 | 53.19 | 26.61 | 12.93 | 34.07 | 0.77 | BDL* | BDL* |
| 9 | 31/10/2017 | 60.58 | 29.52 | 15.86 | 37.33 | 0.61 | BDL* | BDL* |
| 10 | 03/11/2017 | 63.78 | 41.57 | 8.87 | 31.34 | 0.61 | BDL* | BDL* |
| 11 | 07/11/2017 | 46.79 | 20.37 | 15.48 | 37.77 | 0.99 | BDL* | BDL* |
| 12 | 10/11/2017 | 54.61 | 24.53 | 20.41 | 41.38 | 0.79 | BDL* | BDL* |
| 13 | 14/11/2017 | 77.57 | 33.67 | 13.71 | 39.29 | 0.88 | BDL* | BDL* |
| 14 | 17/11/2017 | 68.58 | 40.74 | 10.15 | 17.66 | 0.15 | BDL* | BDL* |
| 15 | 21/11/2017 | 83.42 | 38.66 | 23.47 | 34.21 | 0.58 | BDL* | BDL* |
| 16 | 24/11/2017 | 70.37 | 29.52 | 12.10 | 26.21 | 0.22 | BDL* | BDL* |
| 17 | 28/11/2017 | 62.61 | 32.43 | 7.10 | 22.99 | 0.55 | BDL* | BDL* |
| 18 | 01/12/2017 | 68.59 | 27.83 | 7.03 | 18.28 | 0.40 | BDL* | BDL* |
| 19 | 05/12/2017 | 59.39 | 30.20 | 12.33 | 28.17 | 0.48 | BDL* | BDL* |
| 20 | 08/12/2017 | 63.40 | 23.46 | 9.85 | 15.12 | 0.21 | BDL* | BDL* |
| 21 | 12/12/2017 | 73.40 | 41.35 | 11.64 | 24.21 | 0.23 | BDL* | BDL* |
| 22 | 15/12/2017 | 48.40 | 19.55 | 13.52 | 35.02 | 0.86 | BDL* | BDL* |
| 23 | 19/12/2017 | 57.23 | 26.83 | 20.75 | 38.54 | 0.71 | BDL* | BDL* |
| 24 | 22/12/2017 | 80.62 | 38.32 | 8.87 | 29.88 | 0.45 | BDL* | BDL* |
| 25 | 26/12/2017 | 66.30 | 35.53 | 5.04 | 25.53 | 0.30 | BDL* | BDL* |
| 26 | 29/12/2017 | 78.28 | 43.39 | 14.09 | 34.25 | 0.74 | BDL* | BDL* |
| 27 | 02/01/2018 | 86.80 | 48.64 | 14.25 | 32.58 | 0.27 | BDL* | BDL* |
| 28 | 05/01/2018 | 76.80 | 41.35 | 5.65 | 16.71 | 0.39 | BDL* | BDL* |
| 29 | 09/01/2018 | 81.49 | 36.53 | 11.86 | 26.41 | 0.63 | BDL* | BDL* |
| 30 | 12/01/2018 | 79.33 | 45.43 | 13.07 | 30.61 | 0.95 | BDL* | BDL* |

**Continue …**

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

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**Lab Manager (Q)**

## RESULT OF AMBIENT AIR QUALITY MONITORING

| ADANI PORT – T1 TERMINAL NR. (MARINE BUILDING) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr.No.** | **Date of Sampling** | **Particulate Matter (PM10) µg/m³** | **Particulate Matter (PM 2.5) µg/m³** | **Sulphur Dioxide (SO2) µg/m³** | **Oxides of Nitrogen (NO2) µg/m³** | **Carbon Monoxide as CO mg/m³** | **Hydrocarbon as $CH_4$ mg/m³** | **Benzene as $C_6H_6$ µg/m³** |
| 31 | 16/01/2018 | 84.57 | 32.37 | 6.15 | 19.16 | 0.55 | BDL* | BDL* |
| 32 | 19/01/2018 | 73.40 | 39.40 | 19.23 | 34.49 | 0.93 | BDL* | BDL* |
| 33 | 23/01/2018 | 94.30 | 47.60 | 21.51 | 35.46 | 0.53 | BDL* | BDL* |
| 34 | 26/01/2018 | 82.29 | 46.39 | 10.42 | 22.36 | 0.40 | BDL* | BDL* |
| 35 | 30/01/2018 | 92.41 | 55.38 | 17.75 | 25.44 | 0.87 | BDL* | BDL* |
| 36 | 02/02/2018 | 67.84 | 29.75 | 15.31 | 33.26 | 0.40 | BDL* | BDL* |
| 37 | 06/02/2018 | 82.48 | 47.84 | 12.66 | 29.29 | 0.19 | BDL* | BDL* |
| 38 | 09/02/2018 | 95.62 | 53.42 | 10.71 | 22.24 | 0.48 | BDL* | BDL* |
| 39 | 13/02/2018 | 74.33 | 39.40 | 11.47 | 40.98 | 0.74 | BDL* | BDL* |
| 40 | 16/02/2018 | 93.40 | 50.59 | 18.15 | 30.37 | 0.60 | BDL* | BDL* |
| 41 | 20/02/2018 | 72.41 | 41.52 | 9.98 | 17.84 | 0.42 | BDL* | BDL* |
| 42 | 23/02/2018 | 62.41 | 26.46 | 13.27 | 35.25 | 0.39 | BDL* | BDL* |
| 43 | 27/02/2018 | 83.52 | 44.39 | 16.17 | 31.34 | 0.64 | BDL* | BDL* |
| 44 | 02/03/2018 | 81.43 | 37.86 | 15.25 | 29.83 | 0.54 | BDL* | BDL* |
| 45 | 06/03/2018 | 90.38 | 53.42 | 13.73 | 26.41 | 0.63 | BDL* | BDL* |
| 46 | 09/03/2018 | 84.57 | 35.70 | 20.32 | 32.57 | 0.17 | BDL* | BDL* |
| 47 | 13/03/2018 | 67.78 | 40.48 | 12.64 | 37.41 | 0.38 | BDL* | BDL* |
| 48 | 16/03/2018 | 79.39 | 33.70 | 9.77 | 35.21 | 0.68 | BDL* | BDL* |
| 49 | 20/03/2018 | 62.10 | 29.37 | 7.24 | 16.72 | 0.27 | BDL* | BDL* |
| 50 | 23/03/2018 | 82.41 | 45.35 | 11.95 | 42.36 | 0.37 | BDL* | BDL* |
| 51 | 27/03/2018 | 70.38 | 34.74 | 18.39 | 34.48 | 0.50 | BDL* | BDL* |
| 52 | 30/03/2018 | 88.59 | 48.64 | 10.84 | 31.36 | 0.40 | BDL* | BDL* |
| | **TEST METHOD** | **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-NaAsO2)** | **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**

POLLUCON LABORATORIES PVT. LTD. SURAT-3

**Dr. ArunBajpai**
**Lab Manager (Q)**

## RESULT OF AMBIENT AIR QUALITY MONITORING

| NEAR FIRE STATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr. No. | Date of Sampling | Particulate Matter (PM10) µg/m³ | Particulate Matter (PM 2.5) µg/m³ | Sulphur Dioxide (SO2) µg/m³ | Oxides of Nitrogen (NO2) µg/m³ | Carbon Monoxide as CO mg/m³ | Hydrocarbon as $CH_4$ mg/m³ | Benzene as $C_6H_6$ µg/m³ |
| 1 | 03/10/2017 | 75.41 | 34.57 | 11.27 | 40.33 | 0.65 | BDL* | BDL* |
| 2 | 06/10/2017 | 81.59 | 42.49 | 18.45 | 23.48 | 0.74 | BDL* | BDL* |
| 3 | 10/10/2017 | 92.08 | 51.65 | 21.18 | 33.70 | 0.32 | BDL* | BDL* |
| 4 | 13/10/2017 | 66.20 | 28.32 | 9.80 | 21.18 | 0.19 | BDL* | BDL* |
| 5 | 17/10/2017 | 85.52 | 44.55 | 17.53 | 37.43 | 0.58 | BDL* | BDL* |
| 6 | 20/10/2017 | 76.50 | 30.41 | 23.74 | 42.36 | 0.42 | BDL* | BDL* |
| 7 | 24/10/2017 | 83.41 | 47.49 | 27.18 | 34.62 | 0.38 | BDL* | BDL* |
| 8 | 27/10/2017 | 79.41 | 35.41 | 15.04 | 25.37 | 0.40 | BDL* | BDL* |
| 9 | 31/10/2017 | 68.68 | 26.66 | 20.72 | 41.44 | 0.78 | BDL* | BDL* |
| 10 | 03/11/2017 | 84.62 | 47.49 | 20.12 | 35.31 | 0.50 | BDL* | BDL* |
| 11 | 07/11/2017 | 72.32 | 32.49 | 13.82 | 28.69 | 0.52 | BDL* | BDL* |
| 12 | 10/11/2017 | 64.62 | 39.57 | 18.23 | 45.80 | 1.04 | BDL* | BDL* |
| 13 | 14/11/2017 | 81.23 | 36.66 | 22.21 | 36.78 | 0.42 | BDL* | BDL* |
| 14 | 17/11/2017 | 90.38 | 51.65 | 7.17 | 23.45 | 0.26 | BDL* | BDL* |
| 15 | 21/11/2017 | 78.68 | 35.41 | 16.15 | 40.00 | 0.79 | BDL* | BDL* |
| 16 | 24/11/2017 | 87.47 | 38.74 | 23.41 | 38.42 | 0.55 | BDL* | BDL* |
| 17 | 28/11/2017 | 67.29 | 28.74 | 9.77 | 33.51 | 0.85 | BDL* | BDL* |
| 18 | 01/12/2017 | 74.48 | 31.65 | 9.62 | 28.46 | 0.64 | BDL* | BDL* |
| 19 | 05/12/2017 | 67.60 | 37.22 | 19.81 | 32.24 | 0.37 | BDL* | BDL* |
| 20 | 08/12/2017 | 85.63 | 44.38 | 7.90 | 21.25 | 0.27 | BDL* | BDL* |
| 21 | 12/12/2017 | 92.39 | 53.28 | 17.77 | 35.21 | 0.36 | BDL* | BDL* |
| 22 | 15/12/2017 | 76.49 | 33.56 | 15.21 | 25.33 | 0.53 | BDL* | BDL* |
| 23 | 19/12/2017 | 69.43 | 29.41 | 23.01 | 41.14 | 0.85 | BDL* | BDL* |
| 24 | 22/12/2017 | 72.29 | 35.60 | 14.86 | 37.06 | 0.66 | BDL* | BDL* |
| 25 | 26/12/2017 | 52.07 | 32.40 | 16.59 | 22.24 | 0.48 | BDL* | BDL* |
| 26 | 29/12/2017 | 89.28 | 50.33 | 18.01 | 31.13 | 0.60 | BDL* | BDL* |
| 27 | 02/01/2018 | 68.39 | 32.52 | 10.41 | 19.16 | 0.36 | BDL* | BDL* |
| 28 | 05/01/2018 | 82.40 | 45.88 | 15.86 | 25.33 | 0.65 | BDL* | BDL* |
| 29 | 09/01/2018 | 78.50 | 33.19 | 18.39 | 37.51 | 0.48 | BDL* | BDL* |
| 30 | 12/01/2018 | 85.32 | 41.43 | 16.66 | 42.40 | 0.78 | BDL* | BDL* |

**Continue …**

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

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**Dr. ArunBajpai**
**Lab Manager (Q)**

## RESULT OF AMBIENT AIR QUALITY MONITORING

| NEAR FIRE STATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr.No.** | **Date of Sampling** | **Particulate Matter (PM10) µg/m³** | **Particulate Matter (PM 2.5) µg/m³** | **Sulphur Dioxide (SO2) µg/m³** | **Oxides of Nitrogen (NO2) µg/m³** | **Carbon Monoxide as CO mg/m³** | **Hydrocarbon as $CH_4$ mg/m³** | **Benzene as $C_6H_6$ µg/m³** |
| 31 | 16/01/2018 | 74.73 | 29.53 | 22.51 | 31.74 | 0.85 | BDL* | BDL* |
| 32 | 19/01/2018 | 62.48 | 26.66 | 24.83 | 39.34 | 0.57 | BDL* | BDL* |
| 33 | 23/01/2018 | 76.81 | 34.34 | 14.12 | 26.45 | 0.73 | BDL* | BDL* |
| 34 | 26/01/2018 | 51.58 | 28.82 | 19.26 | 29.46 | 0.50 | BDL* | BDL* |
| 35 | 30/01/2018 | 84.29 | 49.45 | 14.20 | 34.33 | 0.66 | BDL* | BDL* |
| 36 | 02/02/2018 | 61.51 | 26.41 | 13.22 | 21.69 | 0.49 | BDL* | BDL* |
| 37 | 06/02/2018 | 76.49 | 41.26 | 9.77 | 18.68 | 0.26 | BDL* | BDL* |
| 38 | 09/02/2018 | 89.52 | 48.62 | 15.41 | 34.71 | 0.36 | BDL* | BDL* |
| 39 | 13/02/2018 | 79.17 | 46.58 | 19.60 | 37.06 | 0.58 | BDL* | BDL* |
| 40 | 16/02/2018 | 85.63 | 43.63 | 21.56 | 32.54 | 0.44 | BDL* | BDL* |
| 41 | 20/02/2018 | 68.57 | 33.56 | 17.18 | 28.32 | 0.62 | BDL* | BDL* |
| 42 | 23/02/2018 | 67.48 | 29.41 | 10.58 | 23.14 | 0.53 | BDL* | BDL* |
| 43 | 27/02/2018 | 75.21 | 40.34 | 14.19 | 20.89 | 0.46 | BDL* | BDL* |
| 44 | 02/03/2018 | 92.33 | 40.93 | 18.22 | 26.41 | 0.41 | BDL* | BDL* |
| 45 | 06/03/2018 | 85.63 | 47.37 | 11.13 | 23.38 | 0.44 | BDL* | BDL* |
| 46 | 09/03/2018 | 90.80 | 52.61 | 22.53 | 36.97 | 0.25 | BDL* | BDL* |
| 47 | 13/03/2018 | 73.63 | 43.38 | 20.11 | 44.01 | 0.47 | BDL* | BDL* |
| 48 | 16/03/2018 | 86.72 | 37.56 | 16.87 | 29.57 | 0.55 | BDL* | BDL* |
| 49 | 20/03/2018 | 78.38 | 46.83 | 13.77 | 22.69 | 0.39 | BDL* | BDL* |
| 50 | 23/03/2018 | 89.22 | 51.66 | 8.85 | 33.01 | 0.52 | BDL* | BDL* |
| 51 | 27/03/2018 | 79.60 | 39.64 | 12.90 | 31.79 | 0.34 | BDL* | BDL* |
| 52 | 30/03/2018 | 83.37 | 45.38 | 16.04 | 24.45 | 0.58 | BDL* | BDL* |
| | **TEST METHOD** | **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-NaAsO2)** | **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**

POLLUCON LABORATORIES PVT. LTD. SURAT-3

**Dr. ArunBajpai**
**Lab Manager (Q)**

## RESULT OF AMBIENT AIR QUALITY MONITORING

| ADANI HOUSE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr. No. | Date of Sampling | Particulate Matter (PM10) µg/m³ | Particulate Matter (PM 2.5) µg/m³ | Sulphur Dioxide (SO2) µg/m³ | Oxides of Nitrogen (NO2) µg/m³ | Carbon Monoxide as CO mg/m³ | Hydrocarbon as $CH_4$ mg/m³ | Benzene as $C_6H_6$ µg/m³ |
| 1 | 03/10/2017 | 70.29 | 38.73 | 16.62 | 24.86 | 0.33 | BDL* | BDL* |
| 2 | 06/10/2017 | 64.59 | 33.73 | 13.21 | 29.47 | 0.64 | BDL* | BDL* |
| 3 | 10/10/2017 | 76.37 | 36.64 | 8.97 | 30.50 | 0.96 | BDL* | BDL* |
| 4 | 13/10/2017 | 60.13 | 25.40 | 11.77 | 28.29 | 0.23 | BDL* | BDL* |
| 5 | 17/10/2017 | 74.49 | 40.74 | 22.28 | 44.80 | 0.52 | BDL* | BDL* |
| 6 | 20/10/2017 | 85.73 | 35.40 | 15.00 | 32.54 | 0.25 | BDL* | BDL* |
| 7 | 24/10/2017 | 66.89 | 28.73 | 20.59 | 38.46 | 0.62 | BDL* | BDL* |
| 8 | 27/10/2017 | 72.59 | 30.40 | 7.95 | 22.71 | 0.82 | BDL* | BDL* |
| 9 | 31/10/2017 | 53.37 | 23.74 | 18.55 | 26.52 | 0.71 | BDL* | BDL* |
| 10 | 03/11/2017 | 55.48 | 22.49 | 18.29 | 43.59 | 0.81 | BDL* | BDL* |
| 11 | 07/11/2017 | 65.58 | 27.48 | 11.08 | 28.51 | 1.09 | BDL* | BDL* |
| 12 | 10/11/2017 | 71.72 | 18.74 | 13.47 | 35.31 | 0.92 | BDL* | BDL* |
| 13 | 14/11/2017 | 69.61 | 30.40 | 10.97 | 32.37 | 1.26 | BDL* | BDL* |
| 14 | 17/11/2017 | 78.60 | 35.40 | 12.92 | 26.36 | 0.30 | BDL* | BDL* |
| 15 | 21/11/2017 | 62.42 | 28.73 | 17.49 | 37.40 | 0.68 | BDL* | BDL* |
| 16 | 24/11/2017 | 82.63 | 43.72 | 21.79 | 29.57 | 0.33 | BDL* | BDL* |
| 17 | 28/11/2017 | 53.19 | 25.40 | 15.85 | 25.52 | 0.44 | BDL* | BDL* |
| 18 | 01/12/2017 | 57.49 | 21.38 | 9.88 | 22.24 | 0.31 | BDL* | BDL* |
| 19 | 05/12/2017 | 61.12 | 34.30 | 17.21 | 39.84 | 0.62 | BDL* | BDL* |
| 20 | 08/12/2017 | 78.60 | 26.55 | 14.88 | 24.46 | 0.32 | BDL* | BDL* |
| 21 | 12/12/2017 | 88.59 | 48.63 | 8.61 | 17.79 | 0.18 | BDL* | BDL* |
| 22 | 15/12/2017 | 70.37 | 29.63 | 11.89 | 20.15 | 0.94 | BDL* | BDL* |
| 23 | 19/12/2017 | 52.28 | 23.71 | 15.86 | 30.58 | 0.79 | BDL* | BDL* |
| 24 | 22/12/2017 | 63.42 | 31.21 | 18.50 | 33.36 | 0.55 | BDL* | BDL* |
| 25 | 26/12/2017 | 58.57 | 20.59 | 6.15 | 15.57 | 0.63 | BDL* | BDL* |
| 26 | 29/12/2017 | 84.29 | 46.84 | 10.76 | 28.46 | 0.78 | BDL* | BDL* |
| 27 | 02/01/2018 | 83.38 | 38.47 | 13.36 | 24.25 | 0.41 | BDL* | BDL* |
| 28 | 05/01/2018 | 62.69 | 32.46 | 9.58 | 15.27 | 0.82 | BDL* | BDL* |
| 29 | 09/01/2018 | 72.37 | 28.34 | 15.87 | 36.41 | 0.81 | BDL* | BDL* |
| 30 | 12/01/2018 | 65.41 | 35.63 | 11.42 | 26.35 | 0.97 | BDL* | BDL* |

**Continue …**

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

## RESULT OF AMBIENT AIR QUALITY MONITORING

| ADANI HOUSE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Date of Sampling** | **Particulate Matter (PM10) µg/m³** | **Particulate Matter (PM 2.5) µg/m³** | **Sulphur Dioxide (SO2) µg/m³** | **Oxides of Nitrogen (NO2) µg/m³** | **Carbon Monoxide as CO mg/m³** | **Hydrocarbon as $CH_4$ mg/m³** | **Benzene as $C_6H_6$ µg/m³** |
| 31 | 16/01/2018 | 58.39 | 22.46 | 18.97 | 37.19 | 0.40 | BDL* | BDL* |
| 32 | 19/01/2018 | 78.30 | 33.42 | 12.65 | 29.64 | 1.04 | BDL* | BDL* |
| 33 | 23/01/2018 | 64.20 | 26.42 | 19.46 | 38.32 | 0.60 | BDL* | BDL* |
| 34 | 26/01/2018 | 74.49 | 39.42 | 7.91 | 18.19 | 0.24 | BDL* | BDL* |
| 35 | 30/01/2018 | 68.62 | 42.26 | 10.87 | 28.26 | 0.94 | BDL* | BDL* |
| 36 | 02/02/2018 | 57.43 | 24.71 | 8.95 | 15.19 | 0.61 | BDL* | BDL* |
| 37 | 06/02/2018 | 70.50 | 38.30 | 10.51 | 20.97 | 0.31 | BDL* | BDL* |
| 38 | 09/02/2018 | 64.81 | 35.84 | 13.57 | 26.47 | 0.63 | BDL* | BDL* |
| 39 | 13/02/2018 | 59.42 | 30.34 | 9.64 | 18.22 | 0.69 | BDL* | BDL* |
| 40 | 16/02/2018 | 74.49 | 33.59 | 11.32 | 24.71 | 0.82 | BDL* | BDL* |
| 41 | 20/02/2018 | 54.52 | 29.34 | 15.96 | 31.46 | 0.38 | BDL* | BDL* |
| 42 | 23/02/2018 | 82.42 | 40.38 | 17.73 | 29.83 | 0.45 | BDL* | BDL* |
| 43 | 27/02/2018 | 61.48 | 36.76 | 12.77 | 25.08 | 0.73 | BDL* | BDL* |
| 44 | 02/03/2018 | 74.61 | 32.63 | 9.84 | 21.46 | 0.80 | BDL* | BDL* |
| 45 | 06/03/2018 | 66.68 | 40.38 | 10.36 | 29.34 | 0.71 | BDL* | BDL* |
| 46 | 09/03/2018 | 77.58 | 33.26 | 16.76 | 18.04 | 0.29 | BDL* | BDL* |
| 47 | 13/03/2018 | 62.51 | 36.76 | 7.92 | 15.40 | 0.57 | BDL* | BDL* |
| 48 | 16/03/2018 | 72.37 | 30.38 | 14.79 | 22.56 | 0.64 | BDL* | BDL* |
| 49 | 20/03/2018 | 57.61 | 24.84 | 5.61 | 19.26 | 0.18 | BDL* | BDL* |
| 50 | 23/03/2018 | 76.61 | 42.55 | 13.46 | 36.19 | 0.42 | BDL* | BDL* |
| 51 | 27/03/2018 | 65.59 | 28.59 | 8.79 | 20.36 | 0.60 | BDL* | BDL* |
| 52 | 30/03/2018 | 59.30 | 34.34 | 13.03 | 27.51 | 0.36 | BDL* | BDL* |
| | **TEST METHOD** | **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-NaAsO2)** | **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**

POLLUCON LABORATORIES PVT. LTD. SURAT-3

**Dr. ArunBajpai**
**Lab Manager (Q)**

## RESULT OF AMBIENT AIR QUALITY MONITORING

| CT-3 DG HOUSE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr. No. | Date of Sampling | Particulate Matter (PM10) µg/m$^3$ | Particulate Matter (PM 2.5) µg/m$^3$ | Sulphur Dioxide (SO2) µg/m$^3$ | Oxides of Nitrogen (NO2) µg/m$^3$ | Carbon Monoxide as CO mg/m$^3$ | Hydrocarbon as $CH_4$ mg/m$^3$ | Benzene as $C_6H_6$ µg/m$^3$ |
| 1 | 03/10/2017 | 53.62 | 26.63 | 13.96 | 27.63 | 0.63 | BDL* | BDL* |
| 2 | 06/10/2017 | 73.60 | 37.44 | 15.69 | 20.44 | 0.94 | BDL* | BDL* |
| 3 | 10/10/2017 | 68.61 | 32.45 | 18.89 | 36.60 | 0.85 | BDL* | BDL* |
| 4 | 13/10/2017 | 48.50 | 18.72 | 7.85 | 18.65 | 0.15 | BDL* | BDL* |
| 5 | 17/10/2017 | 80.58 | 48.64 | 20.15 | 38.59 | 0.36 | BDL* | BDL* |
| 6 | 20/10/2017 | 69.40 | 29.54 | 17.49 | 23.74 | 0.31 | BDL* | BDL* |
| 7 | 24/10/2017 | 78.48 | 42.44 | 24.68 | 34.99 | 0.26 | BDL* | BDL* |
| 8 | 27/10/2017 | 58.37 | 23.30 | 8.78 | 31.31 | 0.73 | BDL* | BDL* |
| 9 | 31/10/2017 | 46.43 | 20.39 | 10.50 | 28.55 | 0.45 | BDL* | BDL* |
| 10 | 03/11/2017 | 70.62 | 30.37 | 24.25 | 39.73 | 0.35 | BDL* | BDL* |
| 11 | 07/11/2017 | 53.07 | 24.55 | 6.19 | 34.33 | 0.96 | BDL* | BDL* |
| 12 | 10/11/2017 | 41.68 | 27.46 | 8.08 | 31.45 | 0.60 | BDL* | BDL* |
| 13 | 14/11/2017 | 60.50 | 25.38 | 18.49 | 42.49 | 1.11 | BDL* | BDL* |
| 14 | 17/11/2017 | 83.60 | 45.35 | 5.60 | 20.42 | 0.20 | BDL* | BDL* |
| 15 | 21/11/2017 | 72.39 | 32.45 | 20.08 | 25.75 | 0.46 | BDL* | BDL* |
| 16 | 24/11/2017 | 61.60 | 26.63 | 16.96 | 33.11 | 0.40 | BDL* | BDL* |
| 17 | 28/11/2017 | 47.53 | 22.47 | 12.41 | 29.43 | 0.84 | BDL* | BDL* |
| 18 | 01/12/2017 | 62.40 | 24.34 | 11.82 | 25.35 | 0.73 | BDL* | BDL* |
| 19 | 05/12/2017 | 52.40 | 27.52 | 21.22 | 36.07 | 0.22 | BDL* | BDL* |
| 20 | 08/12/2017 | 72.40 | 30.41 | 5.91 | 18.53 | 0.14 | BDL* | BDL* |
| 21 | 12/12/2017 | 68.50 | 39.57 | 14.18 | 29.19 | 0.26 | BDL* | BDL* |
| 22 | 15/12/2017 | 57.28 | 23.38 | 8.90 | 30.58 | 0.80 | BDL* | BDL* |
| 23 | 19/12/2017 | 45.63 | 20.29 | 18.45 | 28.72 | 0.50 | BDL* | BDL* |
| 24 | 22/12/2017 | 66.30 | 28.23 | 10.54 | 22.98 | 0.34 | BDL* | BDL* |
| 25 | 26/12/2017 | 71.18 | 41.28 | 13.88 | 19.46 | 0.70 | BDL* | BDL* |
| 26 | 29/12/2017 | 67.28 | 37.27 | 16.91 | 38.71 | 0.96 | BDL* | BDL* |
| 27 | 02/01/2018 | 76.80 | 44.17 | 5.54 | 16.29 | 0.18 | BDL* | BDL* |
| 28 | 05/01/2018 | 62.40 | 37.43 | 12.35 | 19.40 | 0.89 | BDL* | BDL* |
| 29 | 09/01/2018 | 55.39 | 24.34 | 19.04 | 32.87 | 0.29 | BDL* | BDL* |
| 30 | 12/01/2018 | 70.33 | 32.41 | 15.18 | 36.38 | 0.77 | BDL* | BDL* |

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Lab Manager

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Lab Manager (Q)

## RESULT OF AMBIENT AIR QUALITY MONITORING

| CT-3 DG HOUSE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Date of Sampling** | **Particulate Matter (PM10) µg/m³** | **Particulate Matter (PM 2.5) µg/m³** | **Sulphur Dioxide (SO2) µg/m³** | **Oxides of Nitrogen (NO2) µg/m³** | **Carbon Monoxide as CO mg/m³** | **Hydrocarbon as $CH_4$ mg/m³** | **Benzene as $C_6H_6$ µg/m³** |
| 31 | 16/01/2018 | 64.90 | 25.85 | 10.52 | 23.58 | 0.96 | BDL* | BDL* |
| 32 | 19/01/2018 | 52.40 | 22.17 | 17.29 | 25.55 | 0.64 | BDL* | BDL* |
| 33 | 23/01/2018 | 71.50 | 42.43 | 16.75 | 31.46 | 0.47 | BDL* | BDL* |
| 34 | 26/01/2018 | 60.20 | 35.30 | 15.00 | 26.41 | 0.33 | BDL* | BDL* |
| 35 | 30/01/2018 | 58.31 | 30.37 | 8.88 | 17.96 | 0.74 | BDL* | BDL* |
| 36 | 02/02/2018 | 51.18 | 22.71 | 11.57 | 26.47 | 0.66 | BDL* | BDL* |
| 37 | 06/02/2018 | 66.67 | 35.38 | 5.07 | 15.62 | 0.14 | BDL* | BDL* |
| 38 | 09/02/2018 | 56.30 | 25.85 | 17.25 | 29.29 | 0.21 | BDL* | BDL* |
| 39 | 13/02/2018 | 64.47 | 33.25 | 13.58 | 33.22 | 0.47 | BDL* | BDL* |
| 40 | 16/02/2018 | 78.63 | 36.35 | 15.97 | 25.49 | 0.65 | BDL* | BDL* |
| 41 | 20/02/2018 | 61.42 | 29.32 | 10.42 | 20.79 | 0.71 | BDL* | BDL* |
| 42 | 23/02/2018 | 76.31 | 32.41 | 19.36 | 28.20 | 0.33 | BDL* | BDL* |
| 43 | 27/02/2018 | 69.42 | 39.36 | 9.01 | 16.27 | 0.55 | BDL* | BDL* |
| 44 | 02/03/2018 | 66.49 | 29.36 | 11.88 | 32.28 | 0.65 | BDL* | BDL* |
| 45 | 06/03/2018 | 75.52 | 43.50 | 8.86 | 20.69 | 0.53 | BDL* | BDL* |
| 46 | 09/03/2018 | 62.40 | 26.22 | 14.00 | 15.40 | 0.13 | BDL* | BDL* |
| 47 | 13/03/2018 | 55.63 | 23.38 | 9.90 | 23.23 | 0.62 | BDL* | BDL* |
| 48 | 16/03/2018 | 65.51 | 28.40 | 5.39 | 28.20 | 0.46 | BDL* | BDL* |
| 49 | 20/03/2018 | 51.48 | 32.75 | 10.30 | 26.59 | 0.23 | BDL* | BDL* |
| 50 | 23/03/2018 | 68.50 | 37.81 | 16.63 | 39.43 | 0.32 | BDL* | BDL* |
| 51 | 27/03/2018 | 59.23 | 25.43 | 14.30 | 24.07 | 0.19 | BDL* | BDL* |
| 52 | 30/03/2018 | 70.33 | 41.37 | 6.93 | 18.75 | 0.30 | BDL* | BDL* |
| | **TEST METHOD** | **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-NaAsO2)** | **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**

POLLUCON LABORATORIES PVT. LTD. SURAT-3

**Dr. ArunBajpai**
**Lab Manager (Q)**

# RESULTS OF NOISE LEVEL MONITORING

## Result of Noise level monitoring [Day Time]

| SR. NO. | Name of Location | T1 TERMINAL NR.MARINE BUILDING | | | | | |
|---|---|---|---|---|---|---|---|
| | | Result [Leq dB(A)] | | | | | |
| | Sampling Date & Time | 06/10/2017 | 21/11/2017 | 12/12/2017 | 19/01/2018 | 09/02/2018 | 02/03/2018 |
| 1 | 6:00-7:00 | 63.1 | 62.0 | 64.1 | 65.2 | 69.4 | 62.8 |
| 2 | 7:00-8:00 | 68.4 | 68.9 | 68.8 | 62.7 | 62.4 | 63.4 |
| 3 | 8:00-9:00 | 62.4 | 70.1 | 65.1 | 73.4 | 65.1 | 61.8 |
| 4 | 9:00-10:00 | 69.7 | 71.2 | 72.1 | 73.1 | 71.4 | 69.4 |
| 5 | 10:00-11:00 | 71.8 | 71.0 | 71.4 | 70.6 | 73.4 | 64.7 |
| 6 | 11:00-12:00 | 68.4 | 68.0 | 68.9 | 71.4 | 69.4 | 67.2 |
| 7 | 12:00-13:00 | 63.1 | 68.9 | 66.1 | 68.4 | 65.1 | 60.4 |
| 8 | 13:00-14:00 | 61.8 | 67.2 | 68.8 | 62.8 | 62.8 | 68.0 |
| 9 | 14:00-15:00 | 65.6 | 68.1 | 68.2 | 63.2 | 65.4 | 70.8 |
| 10 | 15:00-16:00 | 62.4 | 65.2 | 66.1 | 66.4 | 69.4 | 72.4 |
| 11 | 16:00-17:00 | 68.4 | 61.6 | 62.4 | 66.9 | 61.4 | 65.9 |
| 12 | 17:00-18:00 | 65.2 | 68.8 | 64.5 | 69.4 | 60.4 | 69.8 |
| 13 | 18:00-19:00 | 63.4 | 65.2 | 65.3 | 65.8 | 63.4 | 62.8 |
| 14 | 19:00-20:00 | 61.4 | 67.8 | 63.8 | 66.4 | 62.8 | 68.7 |
| 15 | 20:00-21:00 | 61.8 | 69.5 | 68.1 | 63.8 | 62.8 | 62.9 |
| 16 | 21:00-22:00 | 63.4 | 60.8 | 62.5 | 67.6 | 68.1 | 69.7 |
| Day Time Limit* | | 75 Leq dB(A) | | | | | |

## Result of Noise level monitoring [Night Time]

| SR. NO. | Name of Location | T1 TERMINAL NR.MARINE BUILDING | | | | | |
|---|---|---|---|---|---|---|---|
| | | Result [Leq dB(A)] | | | | | |
| 1 | Sampling Date & Time | 06/10/2017 & 07/10/2017 | 21/11/2017 & 22/11/2017 | 12/12/2017 & 13/12/2017 | 19/01/2018 & 20/01/2018 | 09/02/2018 & 10/02/2018 | 02/03/2018 & 03/03/2018 |
| 2 | 22:00-23:00 | 69.1 | 60.8 | 63.1 | 65.5 | 65.4 | 68.4 |
| 3 | 23:00-00:00 | 65.6 | 63.9 | 60.4 | 68.4 | 62.8 | 65.5 |
| 4 | 00:00-01:00 | 65.1 | 58.7 | 59.1 | 64.1 | 62.9 | 62.4 |
| 5 | 01:00-02:00 | 62.4 | 62.3 | 65.4 | 63.4 | 65.1 | 63.1 |
| 6 | 02:00-03:00 | 66.2 | 60.0 | 63.1 | 65.1 | 61.3 | 61.4 |
| 7 | 03:00-04:00 | 61.2 | 59.3 | 64.4 | 61.8 | 63.7 | 68.4 |
| 8 | 04:00-05:00 | 68.4 | 57.3 | 64.9 | 62.4 | 65.1 | 64.2 |
| 9 | 05:00-06:00 | 61.8 | 59.0 | 62.8 | 61.4 | 62.9 | 63.1 |
| Night Time Limit* | | 70 Leq dB(A) | | | | | |

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Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

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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 | 13/10/2017 | 10/11/2017 | 05/12/2017 | 12/01/2018 | 16/02/2018 | 20/03/2018 |
| 1 | 6:00-7:00 | 70.8 | 62.8 | 62.4 | 60.1 | 65.1 | 60.3 |
| 2 | 7:00-8:00 | 69.4 | 61.0 | 64.2 | 63.4 | 62.7 | 62.8 |
| 3 | 8:00-9:00 | 69.1 | 68.7 | 62.8 | 62.1 | 68.4 | 68.4 |
| 4 | 9:00-10:00 | 65.4 | 67.5 | 68.2 | 68.4 | 64.1 | 64.1 |
| 5 | 10:00-11:00 | 62.8 | 69.8 | 65.1 | 64.7 | 63.7 | 66.1 |
| 6 | 11:00-12:00 | 66.4 | 65.3 | 66.1 | 67.6 | 65.9 | 72.1 |
| 7 | 12:00-13:00 | 62.8 | 67.9 | 72.1 | 69.1 | 62.4 | 70.4 |
| 8 | 13:00-14:00 | 65.1 | 70.1 | 70.1 | 62.8 | 61.8 | 70.6 |
| 9 | 14:00-15:00 | 66.8 | 71.2 | 69.1 | 68.4 | 63.4 | 68.1 |
| 10 | 15:00-16:00 | 63.4 | 69.7 | 65.1 | 62.5 | 69.4 | 62.7 |
| 11 | 16:00-17:00 | 66.4 | 63.8 | 68.1 | 68.8 | 70.4 | 65.4 |
| 12 | 17:00-18:00 | 59.8 | 63.5 | 62.4 | 68.2 | 63.4 | 61.8 |
| 13 | 18:00-19:00 | 61.8 | 68.2 | 66.3 | 68.1 | 62.8 | 62.8 |
| 14 | 19:00-20:00 | 63.7 | 65.1 | 63.4 | 63.4 | 61.4 | 64.7 |
| 15 | 20:00-21:00 | 61.8 | 65.3 | 61.4 | 65.3 | 62.4 | 63.1 |
| 16 | 21:00-22:00 | 62.8 | 69.1 | 62.8 | 63.7 | 61.8 | 61.5 |
| 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)] | | | | | |
| 1 | Sampling Date & Time | 13/10/2017 & 14/10/2017 | 10/11/2017 & 11/11/2017 | 05/12/2017 & 06/12/2017 | 12/01/2018 & 13/01/2018 | 16/02/2018 & 17/02/2018 | 20/03/2018 & 21/03/2018 |
| 2 | 22:00-23:00 | 68.1 | 64.2 | 68.4 | 68.4 | 68.4 | 65.1 |
| 3 | 23:00-00:00 | 65.2 | 67.9 | 65.5 | 65.1 | 62.4 | 62.4 |
| 4 | 00:00-01:00 | 62.4 | 65.3 | 62.4 | 66.1 | 60.4 | 67.2 |
| 5 | 01:00-02:00 | 67.1 | 57.2 | 63.1 | 62.1 | 61.8 | 63.4 |
| 6 | 02:00-03:00 | 62.4 | 62.2 | 60.4 | 60.4 | 59.4 | 60.5 |
| 7 | 03:00-04:00 | 64.1 | 61.3 | 61.8 | 60.7 | 65.4 | 68.4 |
| 8 | 04:00-05:00 | 65.1 | 64.8 | 63.7 | 63.1 | 61.8 | 65.2 |
| 9 | 05:00-06:00 | 62.8 | 60.4 | 62.8 | 61.1 | 63.4 | 62.1 |
| Night Time Limit* | | 70 Leq dB(A) | | | | | |

H. T. Shah
Lab Manager

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Dr. ArunBajpai
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)] | | | | | |
| | Sampling Date & Time | 10/10/2017 | 07/11/2017 | 08/12/2017 | 23/01/2018 | 13/02/2018 | 13/03/2018 |
| 1 | 6:00-7:00 | 68.4 | 63.9 | 58.1 | 65.1 | 62.4 | 59.4 |
| 2 | 7:00-8:00 | 62.3 | 67.2 | 63.4 | 62.4 | 63.8 | 65.1 |
| 3 | 8:00-9:00 | 63.1 | 70.6 | 62.8 | 64.3 | 68.1 | 62.7 |
| 4 | 9:00-10:00 | 61.8 | 71.2 | 68.4 | 68.8 | 60.1 | 63.8 |
| 5 | 10:00-11:00 | 73.4 | 70.8 | 65.2 | 70.3 | 62.8 | 68.4 |
| 6 | 11:00-12:00 | 65.1 | 68.0 | 71.4 | 70.1 | 65.1 | 64.1 |
| 7 | 12:00-13:00 | 62.8 | 64.3 | 68.8 | 69.1 | 61.4 | 62.1 |
| 8 | 13:00-14:00 | 68.4 | 69.1 | 65.5 | 65.5 | 63.8 | 61.7 |
| 9 | 14:00-15:00 | 68.2 | 68.1 | 63.4 | 63.1 | 69.4 | 69.1 |
| 10 | 15:00-16:00 | 68.4 | 63.1 | 69.1 | 62.8 | 64.7 | 70.5 |
| 11 | 16:00-17:00 | 65.1 | 65.2 | 66.1 | 65.1 | 70.4 | 65.2 |
| 12 | 17:00-18:00 | 61.8 | 69.9 | 62.4 | 61.9 | 70.5 | 62.8 |
| 13 | 18:00-19:00 | 60.4 | 67.2 | 68.4 | 68.4 | 68.1 | 65.6 |
| 14 | 19:00-20:00 | 67.1 | 64.8 | 65.1 | 65.3 | 62.4 | 63.2 |
| 15 | 20:00-21:00 | 63.4 | 58.1 | 62.8 | 62.1 | 65.5 | 61.8 |
| 16 | 21:00-22:00 | 65.1 | 67.9 | 62.1 | 62.9 | 63.4 | 68.4 |
| 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)] | | | | | |
| 1 | Sampling Date & Time | 10/10/2017 & 11/10/2017 | 07/11/2017 & 08/11/2017 | 08/12/2017 & 09/12/2017 | 23/01/2018 & 24/01/2018 | 13/02/2018 & 14/02/2018 | 13/03/2018 & 14/03/2018 |
| 2 | 22:00-23:00 | 60.4 | 63.1 | 65.5 | 65.7 | 63.4 | 68.4 |
| 3 | 23:00-00:00 | 68.4 | 63.9 | 62.1 | 67.1 | 68.1 | 64.2 |
| 4 | 00:00-01:00 | 65.2 | 65.8 | 63.4 | 61.5 | 59.4 | 62.1 |
| 5 | 01:00-02:00 | 63.4 | 58.2 | 68.1 | 60.4 | 60.4 | 62.1 |
| 6 | 02:00-03:00 | 61.4 | 65.3 | 62.7 | 60.3 | 62.4 | 60.4 |
| 7 | 03:00-04:00 | 63.4 | 62.8 | 60.1 | 62.8 | 60.7 | 64.8 |
| 8 | 04:00-05:00 | 68.1 | 64.2 | 60.9 | 64.1 | 61.8 | 63.1 |
| 9 | 05:00-06:00 | 64.1 | 58.3 | 63.1 | 62.9 | 63.7 | 61.7 |
| Night Time Limit* | | 70 Leq dB(A) | | | | | |

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Lab Manager

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Lab Manager (Q)

## RESULTS OF NOISE LEVEL MONITORING

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

| SR. NO. | Name of Location | CT-3 DG HOUSE | | | | | |
|---|---|---|---|---|---|---|---|
| | | Result [Leq dB(A)] | | | | | |
| | Sampling Date & Time | 23/10/2017 | 17/11/2017 | 15/12/2017 | 09/01/2018 | 20/02/2018 | 09/03/2018 |
| 1 | 6:00-7:00 | 58.1 | 63.1 | 62.2 | 61.5 | 59.1 | 58.4 |
| 2 | 7:00-8:00 | 60.2 | 63.8 | 59.1 | 59.4 | 63.4 | 60.4 |
| 3 | 8:00-9:00 | 68.4 | 65.9 | 63.1 | 63.4 | 68.4 | 69.7 |
| 4 | 9:00-10:00 | 62.4 | 64.0 | 62.4 | 65.5 | 65.4 | 64.0 |
| 5 | 10:00-11:00 | 61.9 | 68.8 | 62.8 | 62.3 | 61.4 | 61.5 |
| 6 | 11:00-12:00 | 63.4 | 60.1 | 65.3 | 63.8 | 62.8 | 62.4 |
| 7 | 12:00-13:00 | 68.4 | 65.3 | 63.4 | 64.1 | 62.4 | 61.8 |
| 8 | 13:00-14:00 | 68.1 | 68.5 | 61.1 | 62.8 | 61.8 | 64.7 |
| 9 | 14:00-15:00 | 61.8 | 61.7 | 62.8 | 69.2 | 68.7 | 62.8 |
| 10 | 15:00-16:00 | 59.4 | 62.3 | 68.4 | 67.2 | 65.3 | 61.8 |
| 11 | 16:00-17:00 | 60.7 | 68.9 | 67.1 | 66.1 | 63.4 | 63.4 |
| 12 | 17:00-18:00 | 63.4 | 60.2 | 69.2 | 68.4 | 62.8 | 61.8 |
| 13 | 18:00-19:00 | 61.8 | 65.2 | 69.1 | 68.3 | 62.8 | 67.4 |
| 14 | 19:00-20:00 | 65.7 | 67.9 | 63.1 | 62.4 | 63.4 | 61.9 |
| 15 | 20:00-21:00 | 66.7 | 67.1 | 65.4 | 64.3 | 61.8 | 65.1 |
| 16 | 21:00-22:00 | 65.1 | 65.3 | 62.8 | 63.8 | 65.2 | 62.4 |
| Day Time Limit* | | 75 Leq dB(A) | | | | | |

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

| SR. NO. | Name of Location | CT-3 DG HOUSE | | | | | |
|---|---|---|---|---|---|---|---|
| | | Result [Leq dB(A)] | | | | | |
| 1 | Sampling Date & Time | 23/10/2017 & 24/10/2017 | 17/11/2017 & 18/11/2017 | 15/12/2017 & 16/12/2017 | 09/01/2018 & 10/01/2018 | 20/02/2018 & 21/02/2018 | 09/03/2018 & 10/03/2018 |
| 2 | 22:00-23:00 | 66.1 | 60.8 | 67.5 | 65.2 | 63.4 | 60.4 |
| 3 | 23:00-00:00 | 68.4 | 67.9 | 65.2 | 60.4 | 64.8 | 62.4 |
| 4 | 00:00-01:00 | 62.4 | 62.8 | 63.1 | 61.4 | 60.8 | 60.4 |
| 5 | 01:00-02:00 | 64.7 | 60.1 | 60.4 | 60.8 | 61.8 | 65.2 |
| 6 | 02:00-03:00 | 63.8 | 59.3 | 65.1 | 60.7 | 63.4 | 63.1 |
| 7 | 03:00-04:00 | 69.4 | 64.3 | 62.8 | 58.4 | 61.8 | 64.5 |
| 8 | 04:00-05:00 | 62.7 | 64.8 | 61.2 | 62.4 | 61.7 | 68.4 |
| 9 | 05:00-06:00 | 67.1 | 61.7 | 62.8 | 60.3 | 60.8 | 62.1 |
| Night Time Limit* | | 70 Leq dB(A) | | | | | |

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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 |
|---|---|---|---|---|---|---|---|---|
| | | | | **OCTOBER 2017** | | | | |
| 1 | Particulate Matter | $mg/Nm^3$ | **150** | 10.15 | --- | 15.54 | 19.48 | IS:11255 (Part-I):1985 |
| 2 | Sulfur dioxide | ppm | **100** | 4.20 | --- | 5.62 | 7.51 | IS:11255 (Part-II):1985 |
| 3 | Oxides of Nitrogen | ppm | **50** | 29.29 | --- | 38.67 | 33.67 | IS:11255 (Part-VII):2005 |
| | | | | **NOVEMBER 2017** | | | | |
| 1 | Particulate Matter | $mg/Nm^3$ | **150** | 14.57 | 19.83 | 20.53 | 23.80 | IS:11255 (Part-I):1985 |
| 2 | Sulfur dioxide | ppm | **100** | 3.46 | 4.64 | 7.37 | 6.42 | IS:11255 (Part-II):1985 |
| 3 | Oxides of Nitrogen | ppm | **50** | 25.57 | 27.16 | 36.07 | 30.88 | IS:11255 (Part-VII):2005 |
| | | | | **DECEMBER 2017** | | | | |
| 1 | Particulate Matter | $mg/Nm^3$ | **150** | 17.52 | 12.92 | 27.63 | 20.87 | IS:11255 (Part-I):1985 |
| 2 | Sulfur dioxide | ppm | **100** | 4.91 | 3.56 | 6.62 | 7.91 | IS:11255 (Part-II):1985 |
| 3 | Oxides of Nitrogen | ppm | **50** | 28.26 | 24.43 | 38.90 | 36.30 | IS:11255 (Part-VII):2005 |
| | | | | **JANUARY 2018** | | | | |
| 1 | Particulate Matter | $mg/Nm^3$ | **150** | 14.58 | 11.85 | 19.56 | 24.51 | IS:11255 (Part-I):1985 |
| 2 | Sulfur dioxide | ppm | **100** | 3.55 | 2.45 | 7.51 | 6.81 | IS:11255 (Part-II):1985 |
| 3 | Oxides of Nitrogen | ppm | **50** | 26.11 | 20.96 | 34.02 | 32.70 | IS:11255 (Part-VII):2005 |
| | | | | **FEBRUARY 2018** | | | | |
| 1 | Particulate Matter | $mg/Nm^3$ | **150** | 12.63 | 15.75 | 22.52 | 18.36 | IS:11255 (Part-I):1985 |
| 2 | Sulfur dioxide | ppm | **100** | 2.07 | 3.36 | 6.69 | 8.78 | IS:11255 (Part-II):1985 |
| 3 | Oxides of Nitrogen | ppm | **50** | 23.60 | 26.03 | 35.53 | 32.46 | IS:11255 (Part-VII):2005 |
| | | | | **MARCH 2018** | | | | |
| 1 | Particulate Matter | $mg/Nm^3$ | **150** | 18.67 | 20.82 | 28.45 | 23.72 | IS:11255 (Part-I):1985 |
| 2 | Sulfur dioxide | ppm | **100** | 5.04 | 4.11 | 8.54 | 6.58 | IS:11255 (Part-II):1985 |
| 3 | Oxides of Nitrogen | ppm | **50** | 27.01 | 23.71 | 38.15 | 35.00 | IS:11255 (Part-VII):2005 |

*Below detection limit
Results on 11 % $O_2$ Correction when Oxygen is greater than 11 %. And 12% $CO_2$ correction when $CO_2$ is less thsn 12%

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**Lab Manager (Q)**

# RESULTS OF D.G. STACK MONITORING

**19/02/2018**

| SR. NO. | TEST PARAMETERS | Unit | South Basin CT-3 DG STACK | | | Test Method |
|---|---|---|---|---|---|---|
| | | | D.G. Set-1* (1500 KVA) | D.G. Set-2* (1500 KVA) | D.G. Set-3* (1500 KVA) | |
| 1 | Particulate Matter | $mg/Nm^3$ | 33.47 | 24.38 | 29.53 | IS:11255 (Part-I):1985 |
| 2 | Sulphur Dioxide | ppm | 7.50 | 3.46 | 5.36 | IS:11255 (Part-II):1985 |
| 3 | Oxide of Nitrogen | ppm | 32.53 | 38.92 | 35.57 | IS:11255 (Part-VII):2005 |
| 4 | Carbon Monoxide | mg/m3 | 4.58 | 2.63 | 2.34 | Digital Gas Analyzer |
| 5 | Hydro Carbon NMHC | ppm | BDL* | BDL* | BDL* | Gas Chromatography |

*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O2 Correction when Oxygen is greater than 15 %

**17/02/2018**

| SR. NO. | TEST PARAMETERS | Unit | Adani Port CT-4 DG STACK | | | Test Method |
|---|---|---|---|---|---|---|
| | | | D.G. Set-1* (1500 KVA) | D.G. Set-2* (1500 KVA) | D.G. Set-3* (1500 KVA) | |
| 1 | Particulate Matter | $mg/Nm^3$ | 18.64 | 15.32 | 21.75 | IS:11255 (Part-I):1985 |
| 2 | Sulphur Dioxide | ppm | 7.59 | 6.60 | 5.73 | IS:11255 (Part-II):1985 |
| 3 | Oxide of Nitrogen | ppm | 38.17 | 34.77 | 31.77 | IS:11255 (Part-VII):2005 |
| 4 | Carbon Monoxide | mg/m3 | 5.04 | 5.93 | 5.12 | Digital Gas Analyzer |
| 5 | Hydro Carbon NMHC | ppm | BDL* | BDL* | BDL* | Gas Chromatography |

*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O2 Correction when Oxygen is greater than 15 %

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| | | | 12/02/2018 | | | |
|---|---|---|---|---|---|---|
| SR. NO. | TEST PARAMETERS | Unit | Adani Port CT-2 DG STACK | | | Test Method |
| | | | D.G. Set-3* (500 KVA) | D.G. Set-4* (500 KVA) | D.G. Set-5* (500 KVA) | |
| 1 | Particulate Matter | $mg/Nm^3$ | 22.42 | 19.62 | 20.33 | IS:11255 (Part-I):1985 |
| 2 | Sulphur Dioxide | ppm | 3.45 | 4.51 | 7.47 | IS:11255 (Part-II):1985 |
| 3 | Oxide of Nitrogen | ppm | 27.91 | 38.05 | 31.75 | IS:11255 (Part-VII):2005 |
| 4 | Carbon Monoxide | mg/m3 | 2.94 | 2.43 | 3.14 | Digital Gas Analyzer |
| 5 | Hydro Carbon NMHC | ppm | BDL* | BDL* | BDL* | Gas Chromatography |

*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O2 Correction when Oxygen is greater than 15 %

| | | | 12/02/2018 | | 25/02/2018 | |
|---|---|---|---|---|---|---|
| SR. NO. | TEST PARAMETERS | Unit | Adani Mundra Port | | Adani House | Test Method |
| | | | D.G. Set-1* (500 KVA) | D.G. Set-2* (500 KVA) | D.G. Set* (750 KVA) | |
| 1 | Particulate Matter | $mg/Nm^3$ | 18.71 | 13.86 | 15.62 | IS:11255 (Part-I):1985 |
| 2 | Sulphur Dioxide | ppm | 5.67 | 6.55 | 4.53 | IS:11255 (Part-II):1985 |
| 3 | Oxide of Nitrogen | ppm | 34.56 | 29.81 | 31.72 | IS:11255 (Part-VII):2005 |
| 4 | Carbon Monoxide | mg/m3 | 4.87 | 3.58 | 5.80 | Digital Gas Analyzer |
| 5 | Hydro Carbon NMHC | ppm | BDL* | BDL* | BDL* | Gas Chromatography |

*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O2 Correction when Oxygen is greater than 15 %

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

POLLUCON LABORATORIES PVT. LTD. SURAT-3

**Dr. ArunBajpai**
**Lab Manager (Q)**

# Minimum Detection Limit [MDL]

| Ambient Air Parameters | | |
|---|---|---|
| **Sr. No.** | **Test Parameter** | **MDL** |
| 1 | Particulate Matter (PM10) (µg/$m^3$) | 10 |
| 2 | Particulate Matter (PM 2.5) (µg/$m^3$) | 10 |
| 3 | Sulphur Dioxide ($SO_2$) (µg/$m^3$) | 5 |
| 4 | Oxides of Nitrogen (µg/$m^3$) | 5 |
| 5 | Hydrogen Sulphide as $H_2S$ (µg/$m^3$) | 6 |

| Stack Parameters | | |
|---|---|---|
| **Sr.No.** | **Test Parameter** | **MDL** |
| 1 | Particulate Matter (mg/$Nm^3$) | 10 |
| 2 | Sulphur Dioxide (ppm) | 1.52 |
| 3 | Oxides of Nitrogen (ppm) | 2.65 |
| 4 | Carbon Monoxide (mg/$Nm^3$) | 0.1 |
| 5 | Haydro 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 $NO_3$ | µmol/L | 0.5 |
| 9 | Nitrite as $NO_2$ | µmol/L | 0.01 |
| 10 | Ammonical Nitrogen as $NH_3$ | µmol/L | 0.2 |
| 11 | Phosphates as $PO_4$ | 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/$m^3$ | 0.1 |
| 17 | Phaeophytin | mg/$m^3$ | 0.1 |
| 18 | Cell Count | No. x $10^3$/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 |

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**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 | $^{o}C$ | 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 $^{o}C$) | mg/L | 1 |
| 8 | Chloride as Cl | mg/L | 1 |
| 9 | Oil & Grease | mg/L | 2 |
| 10 | Sulphate as $SO_4$ | mg/L | 1 |
| 11 | Ammonical Nitrogen as $NH_3$ | 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 |

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# Annexure – 3

# Details of Greenbelt development at APSEZ, Mundra

| LOCATION | Total Green Zone Detail | | | | |
|---|---|---|---|---|---|
| | Area (In Ha.) | Trees (Nos.) | Palm (Nos.) | Shrubs (SQM) | Lawn (SQM) |
| SV COLONY | 65.34 | 30051.00 | 6965.00 | 51138.00 | 80069.00 |
| PORT & NON SEZ | 77.52 | 131942.00 | 18613.00 | 68166.78 | 58455.18 |
| SEZ | 99.52 | 227135.00 | 15924.00 | 220449.60 | 27462.03 |
| MITAP | 2.48 | 8168.00 | 33.00 | 1670.00 | 4036.00 |
| WEST PORT | 83.20 | 182118.00 | 50221.00 | 24112.00 | 22854.15 |
| AGRI PARK | 7.63 | 17244.00 | 1332.00 | 5400.00 | 2121.44 |
| SOUTH PORT | 14.08 | 25150.00 | 3430.00 | 3882.00 | 4826.97 |
| Samudra Township | 38.72 | 44872.00 | 11818.00 | 19978.07 | 35071.67 |
| Productive Farming (Vadala Farm) | 23.79 | 27976.00 | 0.00 | 0.00 | 0.00 |
| **TOTAL (APSEZL)** | **412.27** | **694656.00** | **108336.00** | **394796.45** | **234896.44** |
| | | ***802992.00*** | | | |

# Details of Mangrove Afforstation 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 |
| | **Total Mangrove Plantation:** | **2827.90 Ha** | | | |

# Annexure – 4

NCSCM
NATIONAL CENTRE FOR SUSTAINABLE COASTAL MANAGEMENT
*Ministry of Environment, Forest & Climate Change, Government of India*

Prof. Dr. R. Ramesh
*PhD (JNU) PhD (McGill)*
Director

No. NCSCM/APSEZ/1/2017 Date: 21st November 2017

Dear Shri Shalin Shah

Kindly refer to the Service order No PURC/F/012 dt 29.8.2017 awarding consultancy to NCSCM on Preparation of comprehensive and integrated conservation plan for the APSEZ area including detailed bathymetry study and protection of creeks/mangrove area including buffer zone, mapping of co-ordinates, running length, HTL and CRZ boundary.

A progress report indicating status under the above consultancy project up to October, 2017 is enclosed. We have already sent you the hard copies of bathymetry charts of creeks. Kindly acknowledge the receipt of this report.

Best regards,

R. Ramesh 21/11/2017

**R. Ramesh**

Encl: as above

To
Shri Shalin Shah
Head (Environment)
Adani Ports and Special Economic Zone Limited
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# Progress report on APSEZ consultancy on Integrated Management plan for mangroves and creeks in and around the APSEZ Mundra

## 1. Background

The Ministry of Environment and Forests have accorded Environmental Clearance (EC) vide Letter No. F.No.10-138/2008-IA.III dt. 15th July, 2014 to M/s Adani Ports and Special Economic Zone Ltd (APSEZ) to set up a multi-product SEZ at Mundra, Kachchh, Gujarat (Fig.1). The project involves development of SEZ in a notified SEZ area of 6641.2784 ha for which Environmental and CRZ clearance has been given. The activities proposed in the SEZ include:

- Processing zones
- Non-processing zones
- Warehousing zones
- Road network (trunk as well as internal)
- Bridges or culverts over natural drains
- Rail and IT communication networks
- Effluent collection network
- Water supply through freshwater sources and desalination
- Conservation & drainage network
- Effluent collection network
- Social infrastructure
- Existing airstrip
- Municipal solid waste disposal site
- Utilities & supporting infrastructure
- Disposal of treated sewage, effluents and brine from desalination plant

The SEZ covers both inland and water front areas. Industrial plots will be made by APSEZ and shall be given to the firms that would be setting up individual industries of any type who need to obtain EC before initiating their projects. The industries envisage to utilize the services of Adani port for transport of imported and exported goods. While according EC to the project, the MoEFCC have stipulated General and Specific conditions in its letter F.No.10-138/2008-IA.III dt 15 July 2014 in (viii) and (ix) of para 11 A (Specific conditions). The details of the ones relevant to NCSCM are:

- The Project Proponent (PP) shall get detailed bathymetry done for all the creeks and rivers within Port and SEZ areas along with mapping of co-ordinates, running length, HTL, CRZ boundary, mangrove area including buffer zone through NCSCM/NIOT.

- PP shall also get prepared a detailed action plan for conservation and protection of creeks, mangrove area etc. through NCSCM/NIOT and submit the same to GCZMA for their examination and recommendation. GCZMA will submit its recommendations to MoEFCC for approval.

Further in its order F.No.10-47/2008-IA.III dt 18 Sept. 2015, it gave following directions relevant to NCSCM:

*A Comprehensive and integrated conservation plan including detailed bathymetry study and protection of creeks/mangrove area including buffer zone, mapping of co-ordinates, running length, HTL, CRZ boundary will be put in place. The plan will take note of all the conditions of approvals granted to all project proponents in this area, e.g., the reported case of disappearance of mangroves near Navinal creek. The preservation of entire area to maintain fragile ecological condition will be a part of the plan in relation to the creeks, mangrove conservation and conservation of Bocha island up to Baradimata and others.*

*NCSCM will prepare the plan in consultation with NIOT, PP and GCZMA. In recognition of the fact that the existing legal provisions under the E(P) Act 1986 do not provide for any authority to impose ERF by the Government, the plan will be financed by the PP. The implementation will be carried out by GCZMA. The monitoring of the implementation will be carried by NCSCM.*

**2. Compliance to the EC conditions**

Accordingly Adani Ports and Special Economic Zone Limited (APSEZ) has requested the National Centre for Sustainable Coastal Management (NCSCM) to conduct bathymetry survey in creeks that are present in and around APSEZ area and for preparation of an integrated conservation plan for mangroves and creeks. Terms of Reference (ToR) were prepared and agreed upon with the following major components

a. Detailed bathymetry of creeks including the ones distributed on the seawater side, along with mapping of co-ordinates, running length, HTL, CRZ boundary in and around APSEZ area

b. Mapping of mangroves distributed in and around APSEZ area including their seaward side with buffer zones and
c. Preparation of Comprehensive and Integrated plan for preservation and conservation of mangroves and associated creeks

## 3. Description of Methodology

Bathymetry survey involves measurement of depth of creeks and major branch channels originating from the creeks. The method used to measure the depth is based on echosounder for depth > 0.5 m and tide pole for locations < 0.5 m. A dual beam echosounder was used to measure the depth in deeper areas and a graduated tide pole is used in shallow areas (<0.5 m of depth). Bathymetry measurements were made during high tide and tide corrections were made to account for tide induced water depth. For this purpose, tide gauges calibrated tide poles were placed at regular intervals to obtain water levels during different time period of bathymetry measurement. The data collected was processed in HYPACK software which has programmes for tide correction of bathymetry data. In dry channel branches of main creeks, Real Time Kinematic GPS is used to determine bottom levels with respect to adjoining ground to estimate depth. All the bathymetry data collected are presented in a chart with reference to Chart Datum.

## 4. Progress made so far:

### 4.1. Bathymetry of creeks

The area in and around APSEZ has five major creeks namely (i) Kotdi creek originating from Daneshwari River with two branches, (ii) Baradimatha creek originating from Nagavati river with two branches, (iii) Navinal creek adjoining main Adani Port (iv) Bocha creek and (v) Khari creek originating from Phot and Bhuki rivers. The bathymetry survey of above-mentioned 5 creeks (with branches) was initiated in April 2017 in association with M/s Indomer Coastal Hydraulics, Chennai which is specialized in bathymetry measurements. The measurements were carried out using Ceeducer PRO Echosounder/ Garmin Echosounder supported by Trimble DSM 232 DGPS Beacon Receiver (to co-record position for every depth measurement), HYPACK MAX Data collection and processing software.

The survey was carried out using low draft survey vessel equipped with safety gears. The echosounder transducer was mounted by positioning below the water surface. The DGPS receiver antenna was mounted on the mast vertically in line with the transducer, so that it represents the exact coordinates of the location where the depth is simultaneously measured by the transducer. The necessary inputs were given in HYPACK data collection software before the commencement of the survey.

The planned track lines were displayed on the monitor at the wheel for navigation. Watch guards were positioned at bow, transducer/antenna and heave compensator at rear end. The data was continuously collected in the onboard PC along each transect. After each day of data collection, the entire data was downloaded to external hard disc and stored. The recorded data will include: date, time, latitude, longitude, X coordinate, Y coordinate and heave. The depth data was recorded at 0.2 sec interval.

Bathymetry measurements have been completed in all the 5 creeks and the surveyed areas are indicated in Fig.1. In smaller channels with depths <0.5 m and adjoining mud flats, collection of topographic data has been completed. The entire data collected has been processed using HYPACK software with corrections on tidal variation and transducer draught and the depth values will be presented in maps with contour intervals.

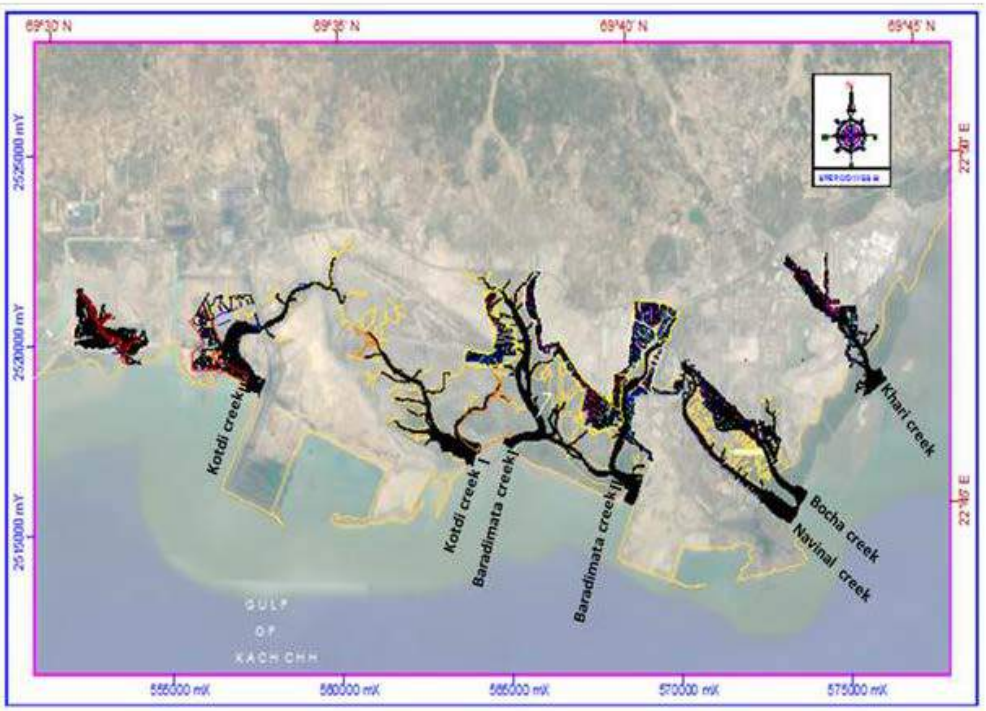



**Fig.1: Bathymetry Survey – Completed areas indicated in black colour**

The bathymetry charts of the creeks are placed in Figs. 2-6. The depth values are indicated with reference to Chart datum (which is presumably Lowest low tide level) and the depth may increase during high tide conditions, depending on the tidal range prevalent at a location Table 1. The green colours in the chart are inter-tidal areas with respect to mean highest high water spring. Areas beyond inter-tidal areas (elevated areas) have been indicated in yellow colour.

NCSCM in association with its consultant M/s Indomer Coastal Hydradulics, Chennai has completed the bathymetry of creeks in and around APSEZ area. The highlight of bathymetry of the creeks and running length of the creeks with water parts are indicated in Table 1.

**Table 1. Depth ranges and running length of creeks in and around APSEZ area**

| Name of the creek | Depth range (m) w.r.t CD* | Running Length of water part of the creek during High Tide (Km)* | Running Length of the Creek (Km) including water and dry parts of the creek* |
|---|---|---|---|
| Kotdi creek I | 0.1-1m | 5.00 | 5.00 |
| Kotdi creek II | 0.1-1.8m | 7.57 | 8.38 |
| Baradimata creek I | 0.1-5.0 m | 6.15 | 6.29 |
| Inter-connecting channel | Inter-tidal | 2.25 | 2.25 |
| Baradimata creek II | 0.1-5.6m | 5.59 | 5.94 |
| Navinal Creek | 0.1-16.8m | 4.69 | 4.80 |
| Bocha creek | 0.1-12.2m | 3.95 | 4.42 |
| Khari Creek | 0.9-8.9 m | 3.80 | 4.22 |

* Source: Bathymetry charts at Figs 2-6.

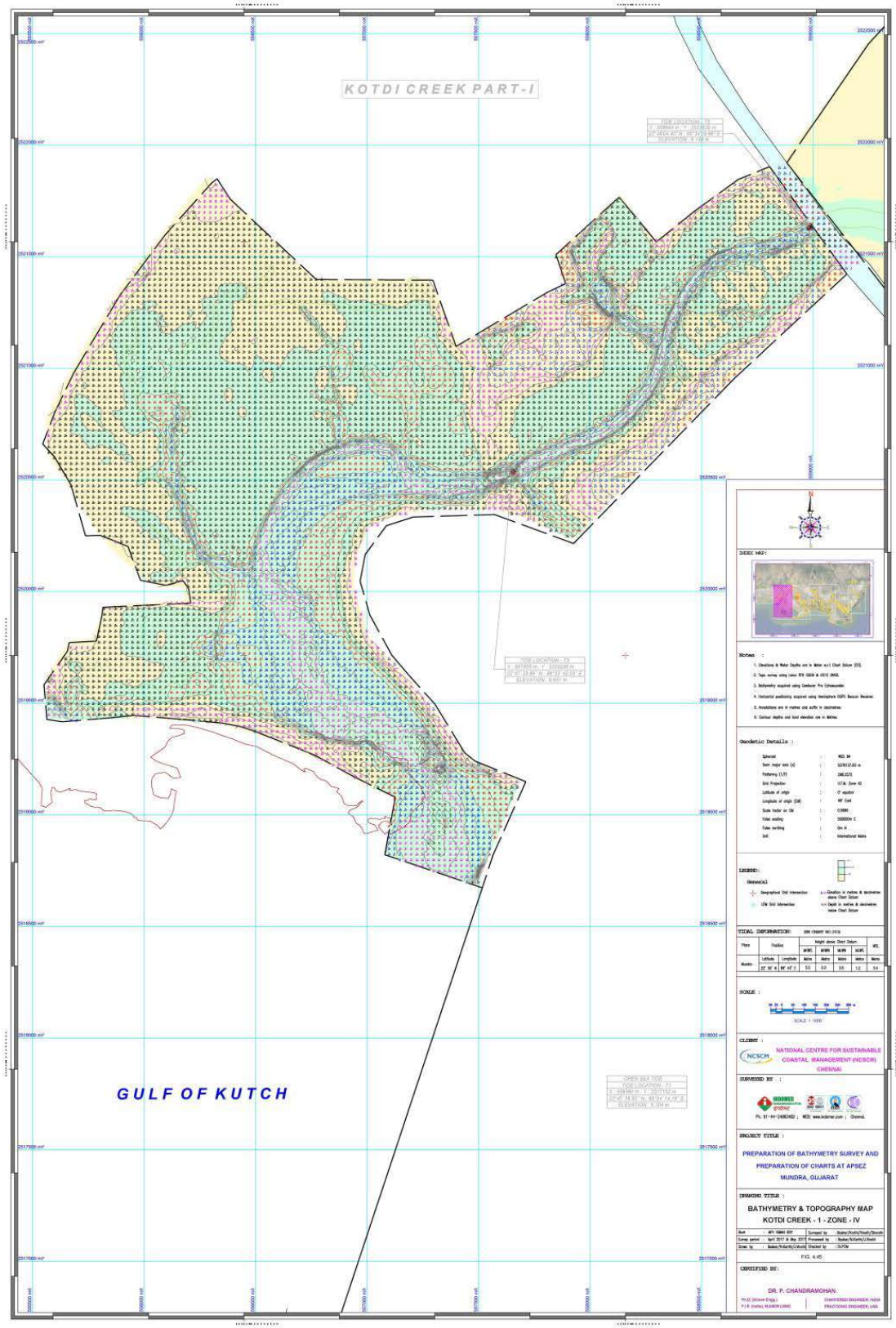



**Fig 2 Bathymetry of Kotdi creek I and elevation (numbers with underscore mark) in adjoining mangrove areas**

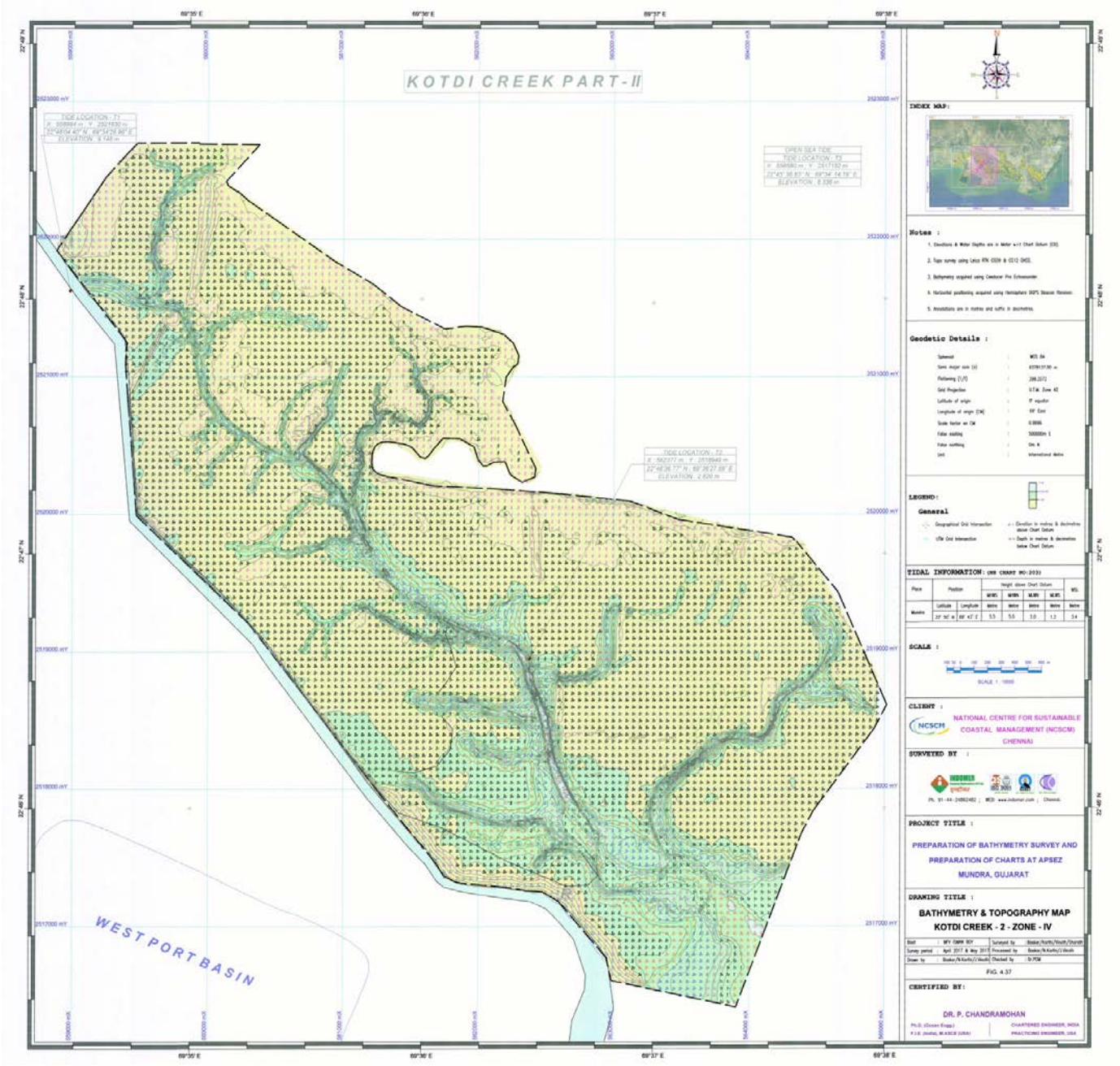



**Fig 3 Bathymetry of Kotdi creek II and elevation (numbers with underscore mark) in adjoining mangrove areas**

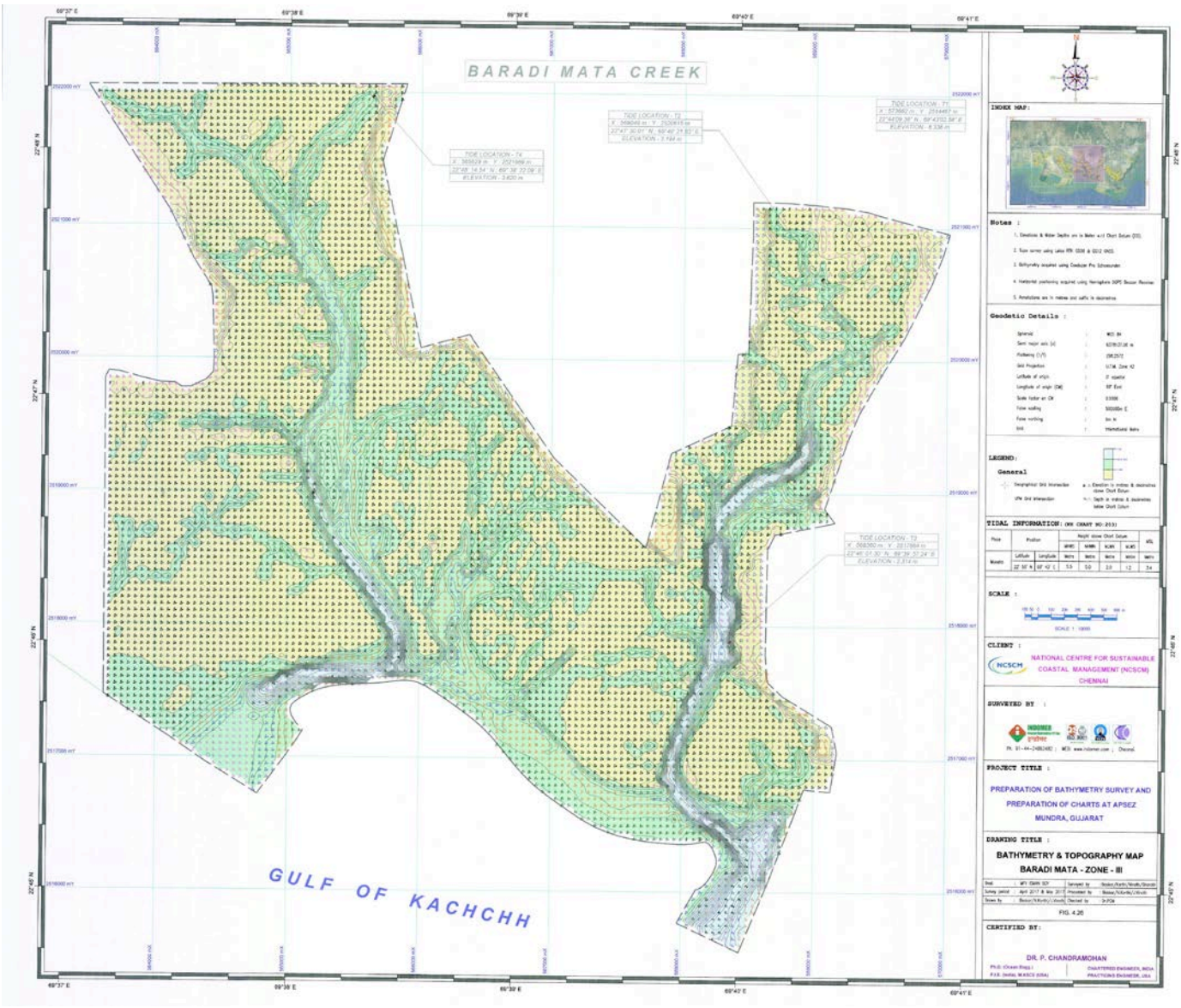



**Fig.4. Bathymetry of Baradimata creeks and elevation (numbers with underscore mark) in adjoining mangrove areas**

**Kotdi and Baradimata creeks:** These creeks are shallow compared to Bocha, Navinal and Khari creeks. While Kotdi creeks exhibited least depths and mostly exposed during the low tide conditions, the mouth regions of Baradimata creek was fairly deeper compared to Kotdi creeks. (Figs.2-4)

**Navinal**: Navinal creek study indicates that at the mouth and port areas were deeper with depths ranging from 0.1-16.8 m. The depth decreases from 16.8m at the mouth to 0.1m beyond the port limit. The depth was shallow, as low as 0.13 m towards interior parts of the creek. most of the branches of main creek, the creeks were totally exposed during the low tide. (Fig.5)

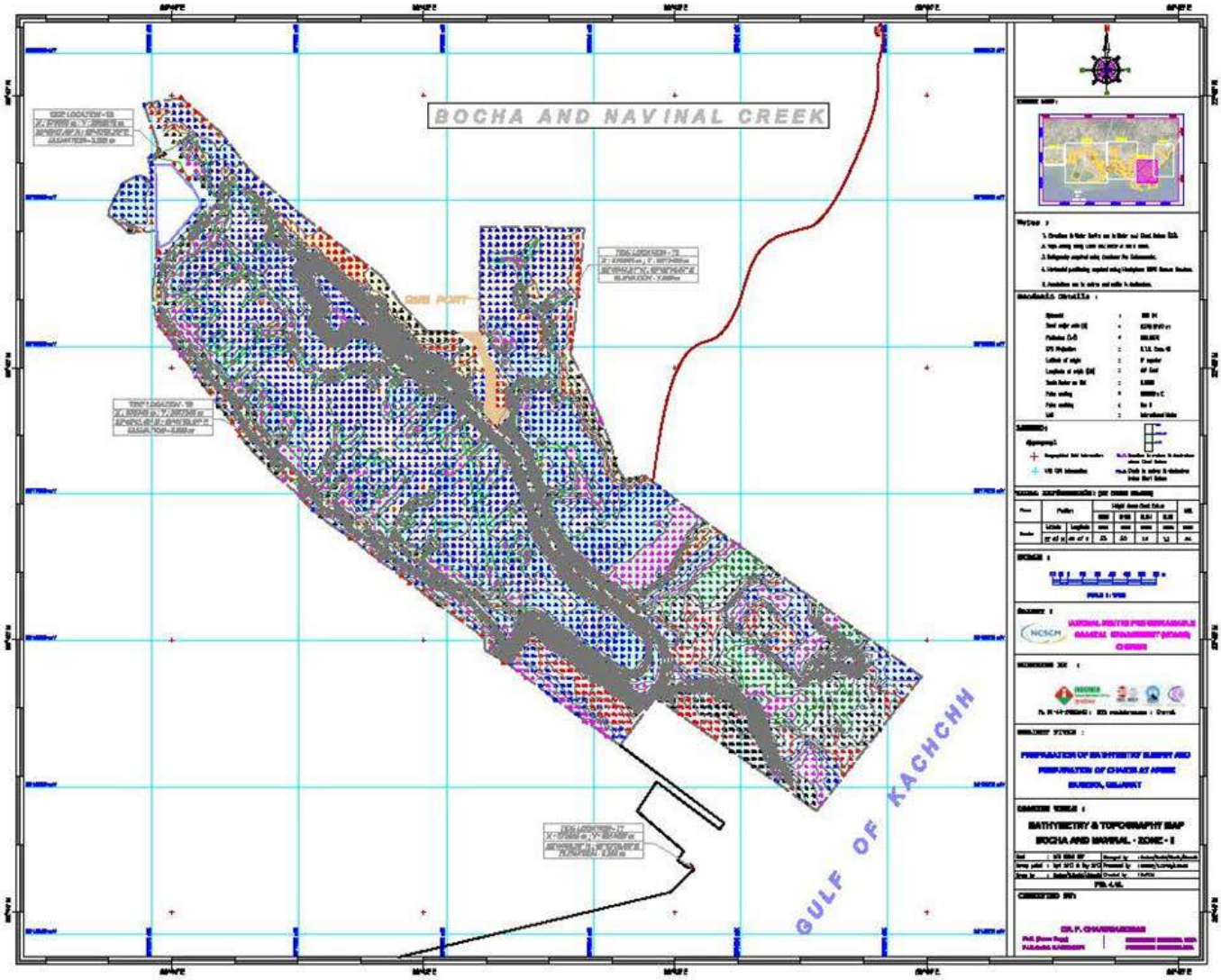



**Fig.5 Bathymetry of Navinal and Bocha creeks and elevation (numbers with underscore mark) in Bocha Island**

- **Bocha**: The water depth ranged from 0.3 to 12.2 m. (Fig.5) and increased from mouth to reach 12.2 m at middle of the creek. There after the depth became shallow and the creek and its branches were exposed during the low tide

- **Khari (Juna Bandar creek):** The shallow water depth of Khari creek at Junabandar with the depths ranging from 0.9 to 8.9 m and the deeper depths were noticed close to mouth areas (Fig.6)

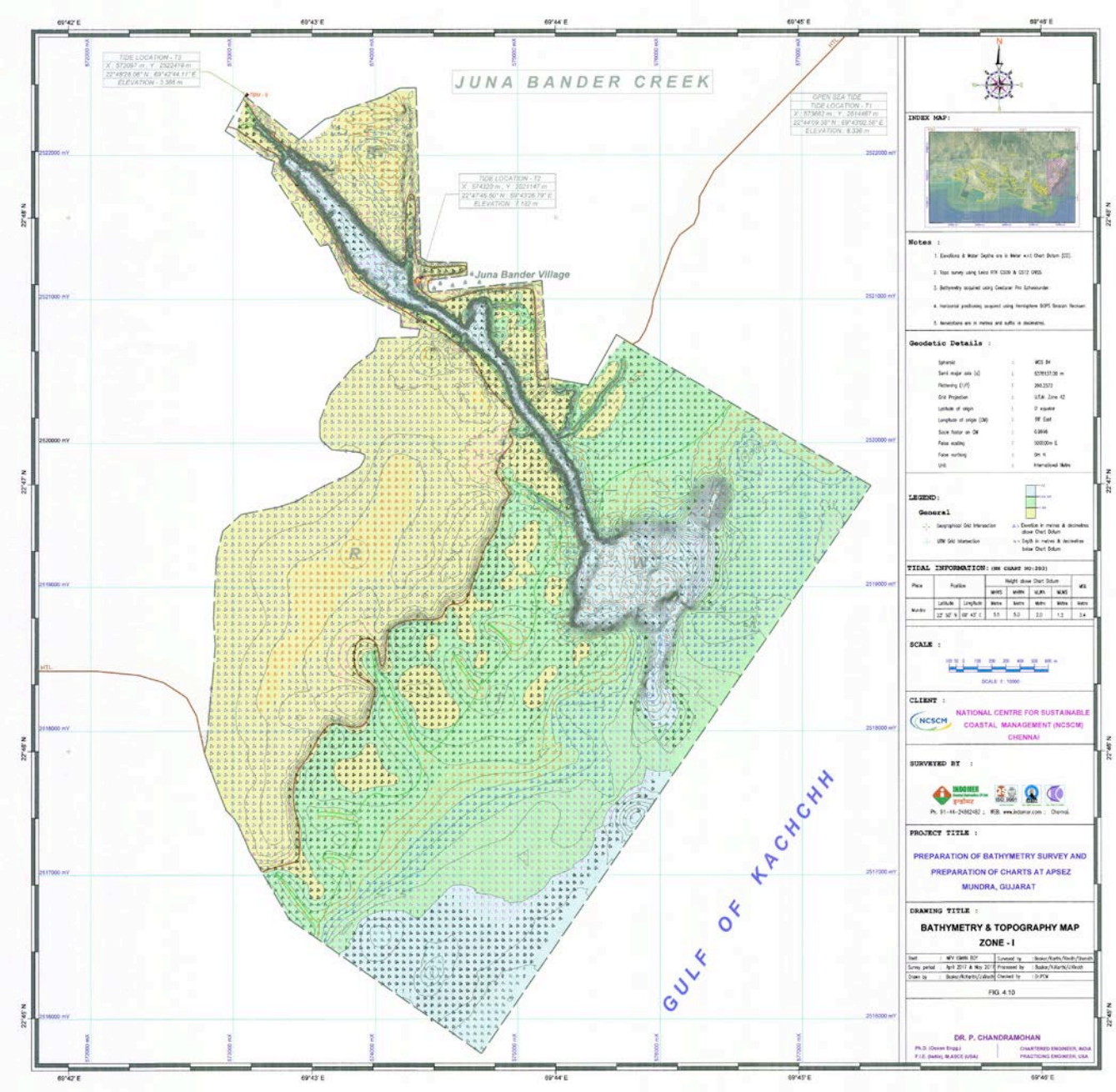



**Fig.6. Bathymetry of Khari (Juna bundar) creek and elevation (numbers with underscore mark) of mangrove and mud flats around the creek**

### 4.2. . Mapping and status of Mangroves

Maps of mangrove areas in and around APSEZ, namely Bocha island, along creeks of Bocha and Navinal, Baradimata creeks and Kotdi creeks using Google Earth pro image of 2016 for Mundra area have been prepared and field rectified. The field survey was conducted along the creeks in and around APSEZ area namely, Bocha (including island), Navinal, Kotdi, Baradimata (land mass also) and Khari between 9$^{th}$ and 14$^{th}$ of May, 2017, using Line Transect (LT) method (100m; triplicate; 50m interval). Quantitative data on mangrove vegetative structures were collected by laying quadrats (10 × 10 m) along the line transects. In each line transect, three quadrats were laid at 0, 50 and 100 m points. Within each plot, all mangroves were identified up to species level and counted according to maturity categories, such as seedling (≤1m) and tree (>1 m). Vegetation measurements such as, tree height (measured by a Distometer (Leica Disto D510)) and diameter at breast height (using a measuring tape) were made and the number of seedlings and saplings were counted species-wise in each quadrat. Further, the associated flora and fauna in each creek were identified and documented. While categorizing mangroves in terms of their density, they have been classified as dense, sparse (low height or shrubs with distance between patches less than 5 m) and scattered (shrubs and distance between patches is more than 5 m). Though the terminology of scattered is not used in mangrove literature, in order to explicitly indicate the mangrove patches are distributed far apart, this terminology has been used.

The status of the mangroves along the creeks and adjoining land/island are given in Table 2. Descriptions related to mangroves of creeks have been given in subsequent sections below.

**Table 2. Summary of the structural characteristics of mangroves distributed along the study sites of APSEZ**

| Site Name | Area of dense mangroves (ha)* | Species Richness (*D*) | Density (No/Ha) | Basal Area ($m^2$/H) | Complexity Index | Diversity Indices | | Recruitment (No/Ha) | Mean Girth (m ±SD) | Mean Height (m ± SD) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *H′* | *S* | | | |
| Bocha island | 332(571) | 3 | 2700 | 39.48 | 22.7 | 0.48 | 0.71 | 5500 | 0.35 ± 0.24 | 1.97 ± 0.009 |
| East side of Navinal Creek | Included in Bocha island | 3 | 1566 | 56.58 | 60.74 | 0.17 | 0.93 | 16633 | 0.62 ± 0.25 | 2.96 ± 0.007 |
| Khari Creek | 190 (288) | 2 | 1266 | 18.92 | 11.11 | 0 | 1 | 8500 | 0.43 ± 0.13 | 4.54 ± 0.002 |
| Baradimata Creek | 216 (1036) | 3 | 1933 | 19 | 18.16 | 0.66 | 0.53 | 12500 | 0.32 ± 0.13 | 4.21 ± 0.018 |
| Kotdi Creek | 17 (370) | 3 | 1733 | 22.72 | 21.90 | 0 | 1 | 13000 | 0.4 ± 0.03 | 5.37 ± 0.005 |

- Value refers only to dense part of the mangroves
- Basal area refers to cross-sectional area of a tree stem measured at breast height (1.4m)
- Complexity index of tree
- Girth indicates circumference or diameter of trunk of a tree

* values in parenthesis indicate total mangrove cover

### 4.2.1. Kotdi creek

Kotdi creek is located close to the West port area and adjacent to the Baradimata creek. This creek has many sub-creeks and it surrounds the West port, opening to the Arabian Sea on east and west sides of the port.

Distribution of mangroves along the creek and nearby land areas are indicated in Fig.7. It may be seen that the total mangrove cover was about 370 ha out of which dense mangroves occurred to the extent of only 17 ha, followed by sparse mangroves distributed in 181 ha. The scattered mangrove had coverage of 172 ha.


**Fig.7. Mangroves of Kotdi – I and Kotdi – II creeks**

**a. Mangrove species composition**

The mangrove species distributed in this creek includes *Avicennia marina*, *Ceriops tagal* and *Rhizophora mucronata*. The western side (northeast of West port) of the creek has dense and tall mangroves from the mouth towards the inside of creek upto≈1 km where *A. marina* dominates followed by a few *R. mucronata*. The mangroves are sparse and stunted, and beyond the *A. marina* zones, natural colonization of *C. tagal* was noticed. The eastern side of the creek is characterized by sparse, stunted, single stretched (2 m width) *A. marina* zonation followed by dense *Prosopis* sp. and sparse salt marsh towards the landward side. Plantation of *A. marina* by Gujarat Forest Department was witnessed here. In the middle of the creek (Opposite to Adani Power plant), dense and stunted (>1 m height) *A. marina* was observed; however, from this point up to the mouth (north side of the West port, where it mixes with Arabian Sea) mangroves are sparse and stunted (Fig. 8a & 8b ).


**Fig. 8 a Google image (2016) indicating location of sparse/stunted mangroves in Kotdi I creek (indicated as 36 - Lat.22$^0$ 46′ 33″ Long 69$^0$ 36′ 33″)**

**Fig. 8b. Photo of Stunted growth of mangrove in Kotdi I creek (Lat.22$^0$ 46′ 33″ Long 69$^0$ 36′ 33″)**

Analysis with image of the 2004 at this location indicates that the sparse and scattered mangroves were earlier habited by mangrove vegetation of different density.

**c. Associated flora and fauna**

Dense distribution of *Arthrocnemum indicum* was found beyond the mangroves on the western side of the creek whereas, the eastern side has sparse vegetation. Mangrove crabs namely *Uca annulipes*, *Uca tetragonum* and *Metapograpsus messor* were observed here. Birds were represented by *Myceterialeuco cephala*, *Ardea purpurea*, *A. cinerea* and *Egretta gularis*.

**d. Mangrove structure**

The overall density of mangrove trees was found to be 1,733 individuals ha$^{-1}$. The basal area and complexity index estimated were 22.72 m$^2$ ha$^{-1}$ and 21.90 respectively (Table 2). The diversity indices were found to be low ($H'$ = 0, $D$ = 1). In the case of recruitment of mangroves, 13,000 individuals ha$^{-1}$were recorded. The mean girth and height of mangrove trees were 0.4 ± 0.03 and 5.37 ± 0.01 respectively.

**e. Issues**

The major issue to the mangroves of both parts of the Kotdi creek include, higher elevation in scattered mangrove area to the extent of 0.1 to 2.4 m from High water level of that location (~5.5m), which prevents penetration of tidal water that is required for propagation of mangroves (Fig.2)

**f. Mitigation measures**

Hydrological correction is required for enhancing the frequency of tidal inundation to the sparse and scattered mangrove areas so that natural colonization can take place. This will be attempted in the Conservation plan of mangroves based on modeling studies which will provide extent of possibilities for increasing tidal flow in to the Kotdi creeks.

### 4.2.2. Baradimata creek

The Baradimata creek is located between the South port and West port and adjacent to the Kotdi creek (Fig.1). This creek is divided into two major creeks and many sub-creeks. Presence of distinct islets are witnessed inside the creek. Major creeks open into the Arabian Sea on the northern side and are interconnected close to the mouth.


**Fig. 9. Mangroves of Baradimata – I and Baradimata – II creeks**

**a. Mangrove species composition**

Mangrove cover of the Baradimata land area was about 1036 ha (Fig.9). Out of this, scattered vegetation was found to be dominating with 45.5% (471 ha), followed by sparse vegetation with 33.7% (349 ha) and the least being dense vegetation with 20.8%.

(216 ha). The species present were *Avicennia marina*, *Ceriops tagal* and *Rhizophora mucronata*. Mangroves along the creek banks (periphery) were dense (≈10 m width) beyond which scanty distribution of salt marsh could be seen. The major creek on the eastern side has all the three species with a good dense patch of *R. mucronata* between the *A. marina*. In the case of the second major creek, the western side had a mono specific distribution of *A. marina* with stunted growth, whereas tall (≈6.5 m) and dense mangroves were distributed on the east side of the creek. The natural colonization of *A. marina* was witnessed along the northern side of the pit near to the mouth and the creeks were connected together. The island found on the seaward side has dense mangroves on the northern side and sparse mangroves on the southern side.

**c. Associated flora and fauna**

Sparse distribution of *Arthrocnemum indicum* was recorded behind the mangrove area towards landward side. Dense colonization by *Prosopis* sp. was observed just behind the mangrove zonation. Mangrove crabs, *Uca annulipes*, *Uca* sp. and *Metapograpsus messor* and swimming crab *Portunus pelagicus* were recorded here. Coastal birds namely *Casmerodius albus*, *Myceterialeuco cephala*, *Ardea purpurea*, *Egretta gularis*, *Platalealeu corodia* were observed in this creek.

**d. Mangrove structure**

The density of mangrove trees in the Baradimata creek is 1,933 individuals per hectare (Table 2). The basal cover of mangrove trees was recorded to be 19 $m^2$ $ha^{-1}$. The estimated complexity index was 18.16 (Table 2). The diversity indices were found to be low ($H'$= 0.66, $D$ = 0.53). The recruitment of juveniles recorded was 12,500 individuals $ha^{-1}$. The mean girth and height is calculated to be 0.32 ± 0.13 and 4.21 ± 0.02 respectively.

**e. Observation and recommendation**

The sparse and scattered mangrove areas have been remaining in the similar conditions over the years as evidenced when Satellite images of 2016 and pre 2005 were compared. Hence it is suggested that the area should remain as per present condition without undertaking any developmental activities. No dredge spoil should be dumped off the mouth which may affect the tidal flow and also may cause erosion of banks of creeks resulting in loss of mangrove vegetation.

### 4.2.3. Bocha island and creek

The Bocha island is situated between Navinal and Bocha creeks. Mouth of the Navinal creek is used as Port basin. The total mangrove cover of the island is about 571 ha including banks of Navinal and Bocha creeks (Fig.10) with dense mangroves contributing to the highest percentage of 58% (332 ha), followed by scattered as 24 % (135 ha) and sparse 18% (104 ha).

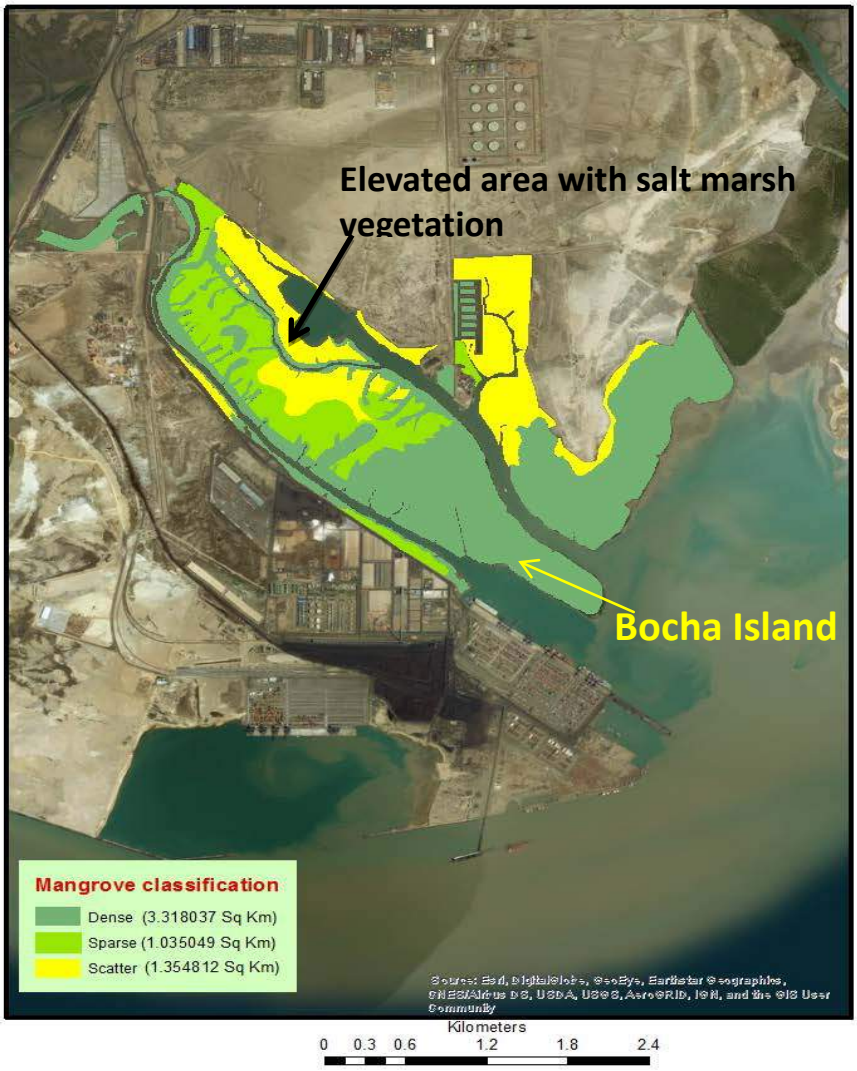
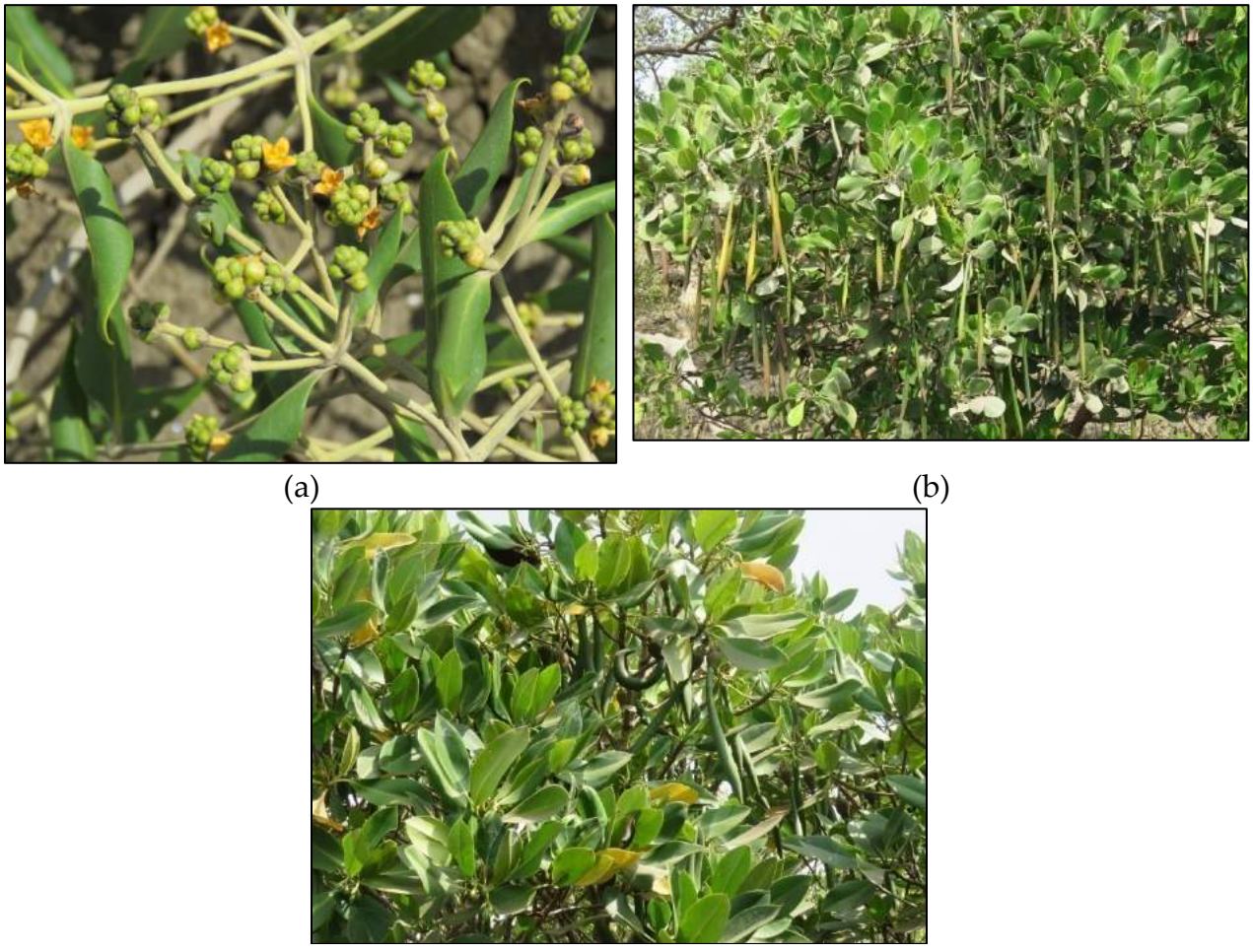



**Fig. 10. Distribution of mangrove vegetation in Bocha island**

### a. Mangrove species composition

There were three mangrove species distributed along the Bocha creek *viz*., *Avicennia marina, Ceriops tagal* and *Rhizophora mucronata* (Figs. 11 a-c ). A major mono specific expansion of *A. marina* was recorded along the creeks except at the mouth where *C. tagal* and *R. mucronata* were found to be mixed. In general, tall mangroves were found either near the creek mouth or along the banks up to the middle. In other places, the mangroves had stunted growth and towards the northen side at elevated locations (~0.1-1.6 from spring high water level = ~5.5m), sparse distribution of salt marsh species was noticed (Fig.10)



(a) (b)

(c)

**Figs 11 a-c. Mangrove species recorded at creeks in and around APSEZ(a)** ***Avicennia marina*** **(b)** ***Ceriops tagal*** **(c)** ***Rhizophora mucronata***

**c. Associated flora and fauna**

Sparse and scattered distribution of salt marsh species, *Arthrocnemum indicum* and *Suaeda fruticosa* were recorded towards the landward side. Mangrove crabs were represented by *Uca annulipes*, *Metapograpsus mesor*, *Grapsusalb olineatus* and *Metaplax indica* (Fig.12). Birds such as *Threskiornis melanocephalus*, *Casmerodius albus*, *Myceteria leucocephala, Sterna aurantia and Vanellus indicus* were observed during the survey. Occurrence of crabs like *Uca* sp indicates that the existing mangrove ecosystem is healthy in terms of associated biodiversity.

*Grapsusalbo lineatus* *Uca sp*

**Fig.12. Associated fauna**

**d. Mangrove structure**

The overall tree density for Bocha creek is 2700 individuals $ha^{-1}$. The basal cover and complexity index was found to be 39.48 $m^2ha^{-1}$ and 22.7 respectively (Table 2). The Shannon-Wiener diversity (*H'*) and Simpson Dominance (*S*) was found to be low (0.48, 0.71). The recruitment of mangrove juveniles was found to be 5500 individuals $ha^{-1}$. The mean girth and height was estimated to be 0.35 ± 0.24 m and 1.97 ± 0.009 m respectively.

**e. Issues**

The major issues observed along the Bocha Island are given below:

(i) Despite the high tidal amplitude, there is less frequency of tidal inundation at north central part of the creek which is due to elevated topography (Example Location indicated in Fig.10 with elevation of 0.5 m more than spring high tide and photo in Fig. 13).

(ii) Erosion along the banks of the creek and tip of the Bocha island causing damage/loss of mangroves and sea facing mud flats (Fig.14).

Fig.13. Elevated north part of the Bocha island with growth of salt marsh vegetation (Lat. 22°46′06.31 N and Long. 69°41′35.06)

Fig. 14. Erosion of banks of Bocha island in the Bocha creek side with mangrove vegetation

**f. Mitigation measures**

The issue of no tidal inundation in elevated part of the island and erosion of banks are being analysed. Mathematical model simulating the existing topographic conditions with prevalent tidal range for such areas in the mangrove region in and around APSEZ is being developed to explore the possibility of reaching the tidal water in the area so that formation of mangrove vegetation will commence after appropriate interventions. Regarding the erosion at the tip of the island facing Gulf of Kachchh which has led to

loss of mangroves and mud flats compared to the previous years, it is understood that the cause of erosion might be alteration of the coastal processes prevailing in the nearshore waters. Therefore it is suggested that no further developmental and other activities that disturb/alter the coastal processes should be undertaken in the sea around the tip of the island and also along both Navinal and Bocha creeks adjoining the Bocha Island. This will avoid further loss of mangroves and mud flats by way of increased erosion. Remedial measures to prevent erosion of tip of island will be suggested after conclusion of modelling studies.

#### 4.2.4. Navinal Creek

**a. Creek location**

This creek is situated on the western side of the Bocha Island and it dissects the Island and the existing Port of APSEZ (Fig.1). Several small sub-creeks/ branches are present, of which one connects the Bocha creek on the northern side.

**b. Mangrove species composition**

Three mangroves species namely *Avicennia marina*, *Ceriops tagal* and *Rhizophora mucronata* were recorded on the Bocha island banks of this creek. Like Bocha creek side of Bocha island, the species richness is heterospecific near the mouth and thereafter monospecific represented by *A. marina* up to the end of the creek on the eastern side. The mangroves along the banks are distinctly tall (≈5.5 m) but occupy only a 10 m wide stretch on the periphery followed by stunted mangroves inwards. The western side of the creek was covered with *A. marina* as a single stretch of ≈7 m width. The creek banks of Bocha island side were highly eroded near the creek mouth (Fig.15). New recruitment of *A. marina* (seedlings and established saplings) was found along the creek banks indicating commencement of natural regeneration of mangroves.

**Fig. 15. Erosion of banks of Bocha island along the Navinal creek**

**c. Mangrove structure**

The density of trees found here is 1566 individuals $ha^{-1}$. The basal cover and complexity index was estimated as 56.58 $m^2ha^{-1}$ and 60.74 respectively (Table 2). Low diversity indices were recorded (*H'*, 0.17; *D*, 0.93). The recruitment of *A. marina* colonizing along the waterfront areas of the creek was calculated as 16,633 juveniles per hectare. The mean girth and height recorded were 0.62 ± 0.25 and 2.96 ± 0.007 respectively.

**c. Associated flora and fauna**

Sparse distribution of *Arthrocnemum indicum* was observed within this creek. The distribution of mangrove crabs such as *Metapograpsus messor*, *Metaplax indica*, *Uca annulipes*, *Grapsusalbo lineatus* were observed. Birds such as *Egretta gularis*, *Himantopus himantopus*, *Vanellus indicus* and *Casmerodius albus* were found foraging on the exposed banks.

**d. Issues**

The major issue was erosion of creek banks of Bocha island near the mouth of Navinal creek resulting in loss of frontline mangrove vegetation of Bocha Island (Fig.16)

**Fig.16. Erosion of banks of Bocha island along Navinal creek**

**e. Mitigation measures**

Recommendations for stabilisaton of banks of Navinal creek through appropriate interventions will be made after conducting mathematical modelling studies.

### 4.2.5. Khari creek

**a. Creek location**

Khari creek is ≈3.5 km in length and branched with two major and many small sub-creeks, located near Juna bander (Fishermen settlement) (Fig.1)

**b. Mangrove species composition**

The mangrove cover of the creek area is about 288 ha. The order of distribution of dense, sparse and scattered mangroves were 190 ha (66%), 40 ha (14%) and 56 ha (20%) as shown in Fig 17. A mono specific expansion of *Avicennia marina* is observed in the Khari creek along with very few *Rhizophora mucronata* species. Stunted and sparse distribution of *A. marina* was observed along the creek banks except the mouth, where

the mangroves are tall (≈4.5 m) and moderately dense. The creek mouth possesses a wide mudflat with the natural colonization of *A. marina*.


**Fig.17 Mangrove cover of Khari creek**

**c. Associated flora and fauna**

Salt marsh *Suaeda* sp. is moderately distributed in this creek. Mangrove crabs *Uca tetragonum*, *Uca* sp and *Metapograpsus messor* were recorded from this creek. Birds were represented by *Egretta gularis*, *Ardea cinerea*, *Platalealeu corodia*, *Myceterialeuco cephala*, *Corvus splendens* and *Himantopus himantopus*.

**d. Mangrove structure**

The tree density of the Khari creek was found to be 1,266 individuals per hectare. The basal cover and complexity index was estimated as 18.92 $m^2$ $ha^{-1}$ and 11.11 respectively (Table 2). Due to the monospecies distribution of *A. marina*, the diversity indices were low (*H'*= 0; *D* = 1). Natural recruitment of *A. marina* was recorded as 8,500 juveniles per hectare. The mean girth and height of *A. marina* is 0.43 ± 0.13 and 4.54 ± 0.002 respectively.

**e. Issues**

The major issue observed in the Khari creek was cutting of Mangrove trees by human as evident from Photo at Fig 18, which may cause erosion of banks of Khari creek posing a threat to existence of mangrove vegetation.

**Fig. 18. Erosion on the banks of Khari creek and cutting of mangrove vegetation**

**f. Mitigation measures**

- The mangrove felling by human needs to be analysed and a suitable solution through stakeholder consultation to prevent such felling is necessary

### 4.3. Mangrove Health

**a. Basal cover**

Basal area is an indicator to measure the forest stand development and to understand species population, biomass and productivity in response to stress factors. The pristine mangrove forests with slight impacts will have a basal area of >25 $m^2$ $ha^{-1}$; secondary forest is found to have around 15 $m^2$ $ha^{-1}$; and disturbed forests havebasal areas of <10 $m^2$ $ha^{-1}$. Thus, results indicate that low stand of basal area recorded at Khari, Baradimata and Kotdi creeks are due to low structural development. In most of the creeks, *Avicennia marina* had better basal area coverage in comparison to other reported species. **The mangroves at Bocha and Navinal creeks can be classified as pristine mangroves.**

**b. Complexity index**

The complexity index is an integrative measure that combines a quantitative description of the floral and structural characteristics of mangrove vegetation. However, the mono species dominance causes the reduction in structural complexity and ecosystem services. Our findings revealed that Bocha island has the largest complexity index (60.74) owing to taller canopy and larger basal areas when compared with the mangroves documented along the other creeks. The low tree density and basal cover is an indication of the reduced structural complexity with disturbed conditions. For example, in Andaman mangrove forests, the complexity index ranged between 87.14-268.74 and 6.69-14.18 in undisturbed and disturbed forests respectively.

**c. Regeneration potential**

The quality of crop and productivity of forest stands determined by population growth, and is thus chiefly determined by seedling recruitment and survivorship. The evaluation of the regeneration potential involves assessment of seedling and sapling density, composition, sizes and the possibility of recruitment into the adult canopy. For adequate natural regeneration potential of a stand, the following criteria are required:

- ✓ a minimum of 2500 well distributed seedlings per hectare
- ✓ the total number of seedlings and saplings are > 50% of the number of mature trees per hectare

Field surveys by NCSCM revealed that all the mangrove stands in the creeks of Port and SEZ have adequate natural regeneration potential either as***'potential regeneration'*** (juvenile measuring <30 cm) or '***established regeneration'*** (30 cm to 1 m). However, erosion along the creek banks makes the seedlings starved, where the juveniles regenerate. Generally, seedling density is high outside the canopy cover since it requires regular inundation and sun light. Field observation exhibited that the regeneration potential was significant in *Avicennia marina* compared to *Rhizophora mucronata* or *Ceriops tagal* due to the monospecific expansion of *A. marina*. In mixed stands, regeneration potential is almost equal.

Due to the deeper depth at the mouth of the Baradimata creek , the natural colonization of mangroves along the front line areas is well established. However, the mouth should

be regularly monitored otherwise there is a chance of closing of mouth due to accretion/ sedimentation.

**d. Species diversity**

There are only three mangrove species *viz.*, *Avicennia marina*, *Rhizophora mucronata* and *Ceriops tagal* present in the creeks. *A. marina* is predominantly present in the creeks. Absence of a clear mangrove zonation pattern is witnessed in the creeks of Port and SEZ.

### 4.4. Associated species

Occurrence of wide range of associated fauna especially *Uca* sp indicates that associated faunal diversity around the dense mangrove environment is healthy.

## 5. Mitigation measures

### 5.1. Hydrology

The mangroves are highly sensitive to minor alterations in the hydrology of an area. Generally, regeneration takes place when the normal tidal hydrology is restored in elevated areas (for e.g., central part of Bocha creek, as indicated in Fig. 7) and the supply of seeds or propagules from adjacent stands is re-established. Mangroves can be established (restored in some areas) through meticulous hydrological corrections which will be suggested after completion of modelling studies.

## 6. Completion of remaining tasks

The tasks remaining are following

1. **Bathymetry maps with HTL and CRZ areas**
   The HTL data from satellite image will be plotted on the bathymetry map and verified with field HTL data collected at the time of bathymetry survey. The CRZ areas will also be mapped.
2. Finalising buffer in mangrove maps
3. **Preparation of integrated plan for conservation of mangroves and the creeks**

Using the mangrove maps prepared and elevation data obtained over sparse and scatter mangroves, based on field observations and mathematical modeling results, measures will be suggested to facilitate inflow of seawater to set a condition for growth of mangroves. The task of modeling is in progress.

As a part of the conservation plan, the extent of dependence on mangrove plants for fuel and fodder will be determined from the communities living around mangrove areas of APSEZ through Focus Group Discussion. The data will be used to suggest use of alternate methods against mangrove vegetation.

# Annexure – 5

adani

30.04.2018

To,
Director (Environment) & Member Secretary,
Gujarat Coastal Zone Management Authority,
Sachivalaya,
Gandhi Nagar

**Subject:** Submission of final report for Cumulative Impact Assessment at Mundra

**Reference:**

(1) Your office letter no. ENV-10-2013-118-E dated 19.12.2014
(2) MoEF&CC order vide F. No. 10-47/2008-IA-III dated 18.09.2015
(3) Our submission of 1st progress report vide letter dated 10.09.2016
(4) Our submission of 2nd progress report vide letter dated 27.07.2017

Dear Sir,

In view of compliance with the directions issued by MoEF&CC, GCZMA in its 21st meeting held on 07.02.2014 has directed APSEZ to submit Terms of Reference (ToR) to undertake a "*Cumulative Impact Assessment study for the projects already granted Environmental Clearance (EC) and CRZ clearance in the region so that future developments can be assessed for providing necessary approvals at a later stage*".

Further to the submission of ToR and subsequent discussions, GCZMA has approved ToR for undertaking Cumulative Impact Assessment (CIA) study vide letter no: ENV-10-2013-118-E dated 19.12.2014.

In view of the above, APSEZ appointed M/s. Cholamandalam MS Risk Services Limited (CMSRSL) for carrying out CIA Study.

Further, an order was issued by MoEF&CC vide F. No. 10-47/2008-IA-III dated 18.09.2015, with specific directions to APSEZ. Below mentioned directions relate to the need of CIA study.

*xi) A regional strategic impact assessment report with a special focus on Mundra region will also be prepared. The cost towards these studies will also be borne by PP.*

*x) In the subject matter of thermal power plant, the proposed regional strategic impact assessment analysis will take in to account salinity aspect along with its potential environmental impact to suggest future corrective actions as well as the guiding tool on extension and additional of the capacities.*

Adani Ports and Special Economic Zone Ltd
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During the course of the study, APSEZ has submitted two progress reports to GCZMA. Also, APSEZ has been submitting the updated status regarding the progress of the CIA study to all concerned authorities as part of the six monthly compliance reports. A joint site visit (MoEF&CC, RO, Bhopal, GCZMA and GPCB, RO, Gandhidham) was carried out during 21 – 22.12.2016 for compliance report verification.

In continuation to our earlier submissions, we would like to inform you that the CIA study is now completed (including baseline data collection, completion of all the technical studies to identify possible impacts on various environmental attributes and drafting a suitable macro level environment management plan) and the final report is enclosed for your consideration.

Thank you
Yours sincerely,

Shalin Shah
Head – Environment

Copy to: Sh. Kushal Vashist, Director, MoEF&CC, Indira Paryavaran Bhavan, Jor bagh road, Aliganj, NewDelhi

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Thank you
Yours sincerely,

Shalin Shah
Head – Environment

Copy to: Sh. Kushal Vashist, Director, MoEF&CC, Indira Paryavaran Bhavan, Jor bagh road, Aliganj, NewDelhi

02/5/18

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Ministry of Environment, Forests & Climate Change
भारत सरकार / Govt. of India
इन्दिरा पर्यावरण भवन/Indira Paryavaran Bhawan
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# Annexure – 6

Tel: 022-23728867
E-mail: prt-west@indiancoastguard.nic.in

Indian Coast Guard
Pollution Response Team (W)
LOCO/Boiler Shed
Narsu Vithoba Nakhwa Marg
Mumbai – 400 010

704

02 Apr 18

The Commander
{for CSO(OPS)/RFEO}
Headquarters
Coast Guard Region(West)
Worli Sea Face
Mumbai – 400 030

**JOINT INSPECTION OF TIER-1 POLLUTION RESPONSE CAPABILITIES: ADANI PORT, MUNDRA**

1. Refer to CGRHQ(W) fax 771/5 dated 06 Feb 18, not addressed to all.

2. Joint inspection of Tier 1 pollution response capabilities of Adani Port, Mundra was undertaken on 13 Feb 18 conjointly by representatives of Coast Guard and Oil Industry Safety Directorate (OISD) under Ministry of Petroleum and Natural Gas (MoP&NG) IAW CGRHQ(W) fax quoted ibid. A detailed report of Joint Inspection is forwarded herewith for information and records.

3. Final assessment of Adani Port, Mundra is **"VERY SATISFACTORY"**.

(Amitava Das)
Commandant
Officer-in-Charge

**Enclosure.** As above

**Copy to:**

The Director General
{for Director(FE)}
Headquarters
Indian Coast Guard
National Stadium Complex
Purana Quila Road
New Delhi – 110 001

**Enclosure to CGPRT(W)**
**Letter 704 dated 02 Apr 18**

## BOARD PROCEEDING ON TIER-1 OIL SPILL RESPONSE CAPABILITIY OF ADANI PORT MUNDRA

| | | | | |
|---|---|---|---|---|
| 1. | Authority for inspection of Adani Port | : | (a) CGHQ fax : | EP/0704/JI/OHA Dated 05 Feb 2018 |
| | | | (b) CGRHQ(W) fax: | 771/5 Dated 06 Feb 2018 |
| 2. | Inspecting Team | : | (a) | Commandant A Das (0376-D) Oi/c PRT(W) Indian Coast Guard Ministry of Defence |
| | | | (b) | Shri MK Dutta, Addl. Director (Process & Engg.), Rep of OISD (Oil Industry Safety Directorate) Ministry of Petroleum & Natural Gas |
| 3. | Date of Inspection | : | 13 Feb 18 | |
| 4. | Place of inspection | : | Adani Port Mundra. | |
| 5. | Aim | : | To check Tier-I Pollution Response capability of Adani Port. | |
| 6. | Adani Port Mundra | : | The Adani Group commenced as a commodity trading firm in 1988, grew quickly and diversified into the import and export of multi-basket commodities. In 1990s, it developed its own port in Mundra to provide a base for its trading operations. In 1995, Adani started construction at Mundra and in 1998, it became the top net foreign exchange earner for India. | |
| 7. | Catergory of Port as per NOSDCP-2017 | : | Category 'A' | |
| 8. | Contingency Plan | : | Oil spill contingency plan of Adani Port approved by CGRHQ(NW) vide letter 7563 dated 07 Nov 16 (**Appendix-'A'**) | |

9. PR Equipment : The details of equipments held by Adani Port vis-à-vis deficiency as per Appendix F 2.1 to NOSDCP 2017 is as mentioned below:

| Sl. | Description | Qty to be held | Actual held | Deficiency | Remarks |
|---|---|---|---|---|---|
| (a) | Inflatable boom | 2000 | 2000 | -- | -- |
| (b) | Skimmer(20TPH) | 04 | 12 TPH : 02<br>123 TPH : 02 | -- | -- |
| (c) | OSD applicator(no.) | 06 | 09 sets | -- | Fitted in Tugs |
| (d) | Oil spill dispersant (Litres) | 10,000 | 20,000 | -- | Valid till Sep 2020 **Appendix-'B'** |
| (e) | 10 Ton Flex Berge(no.) | 04 | 04 | -- | -- |
| (f) | Boom sustainable in strong current if current within 4 knots (meters/no.) | 400/2 | 02 | -- | -- |
| (g) | Sorbant boom (meters) | 500 | 500 | -- | -- |
| (h) | Sorbent Pad | 2000 | 2000 | -- | -- |
| (j) | Mini Vacuum pump | 5 | 5 | -- | -- |
| (k) | Portable Temporary storage facility | 5 | 5 | -- | -- |
| (l) | Shore sealing boom (meters) | 400 | 235 | **165** | -- |
| (m) | Work boat | 2 | 2 | -- | -- |
| (n) | Tugs | 2 | 10 | -- | -- |
| (p) | IMO Level-1 | 10 | Nil | **10** | Validity of Personnel with Adani Port qualified in IMO level has expired as same are more than 05 years from date of issue. |
| (q) | Imo Level-2 | 4 | 3 | **1** | -- |
| (r) | IMO level-3 | -- | 01 | -- | -- |
| (s) | Others | 10 | 12 | -- | -- |

The available equipments have been physically sighted on board OSRV and at storing shed. The demonstration of equipment by personnel was witnessed on 13 Feb 18 and performance was observed to be satisfactory. Additionally the boom sustainable in strong current i.e within 04 knots was also checked.

| | | | |
|---|---|---|---|
| 10. | Equipment Maintenance Log book | : | Maintained and held with Adani Port |
| 11. | Disposal Mechanism of Collected oil | : | Adani Port has listed vendors for disposal of oil spill waste water/oily water (**Appendix 'C'**) |
| 12. | Training | : | Training for personnel for operating OSR equipment is periodically undertaken by Adani Port. Last training by OEM Vikoma was undertaken from 12 Dec 16 to 16 Dec 16, wherein 26 personnel attended the training (**Appendix 'D'**) |
| 13. | Mock Drill/ Training | : | Mock drill by the Adani Port is periodically undertaken and record of same is maintained. Two mock drills have been undertaken in 2017 (19 Apr 17 and 29 Nov 17) |
| 14. | MOU | : | MOU exist between Adani Port and HPCL Mittal Pipe Lines Limited (**Appendix- 'E'**) |
| 15. | Inspection Performa of Coast Guard | : | **Appendix- 'F'** |
| 16. | Inspection performance Of OISD | : | **Appendix- 'G'** |
| 18. | Overall assessment | : | (a) Oil spill contingency plan vetted/ approved by Coast Guard.<br><br>(b) PR equipment as per NOSDCP 2017 Appendix F2.1 held with Adani Port except meagre deficiency of few items.<br><br>(c) Display/demonstration of equipment during inspection was satisfactory. POLREP was initiated by Port on simulation of exercise |

(d) Boom sustainable in current within 04 Knots was also demonstrated at sea.

19. Photographs : **Appendix- 'H'**

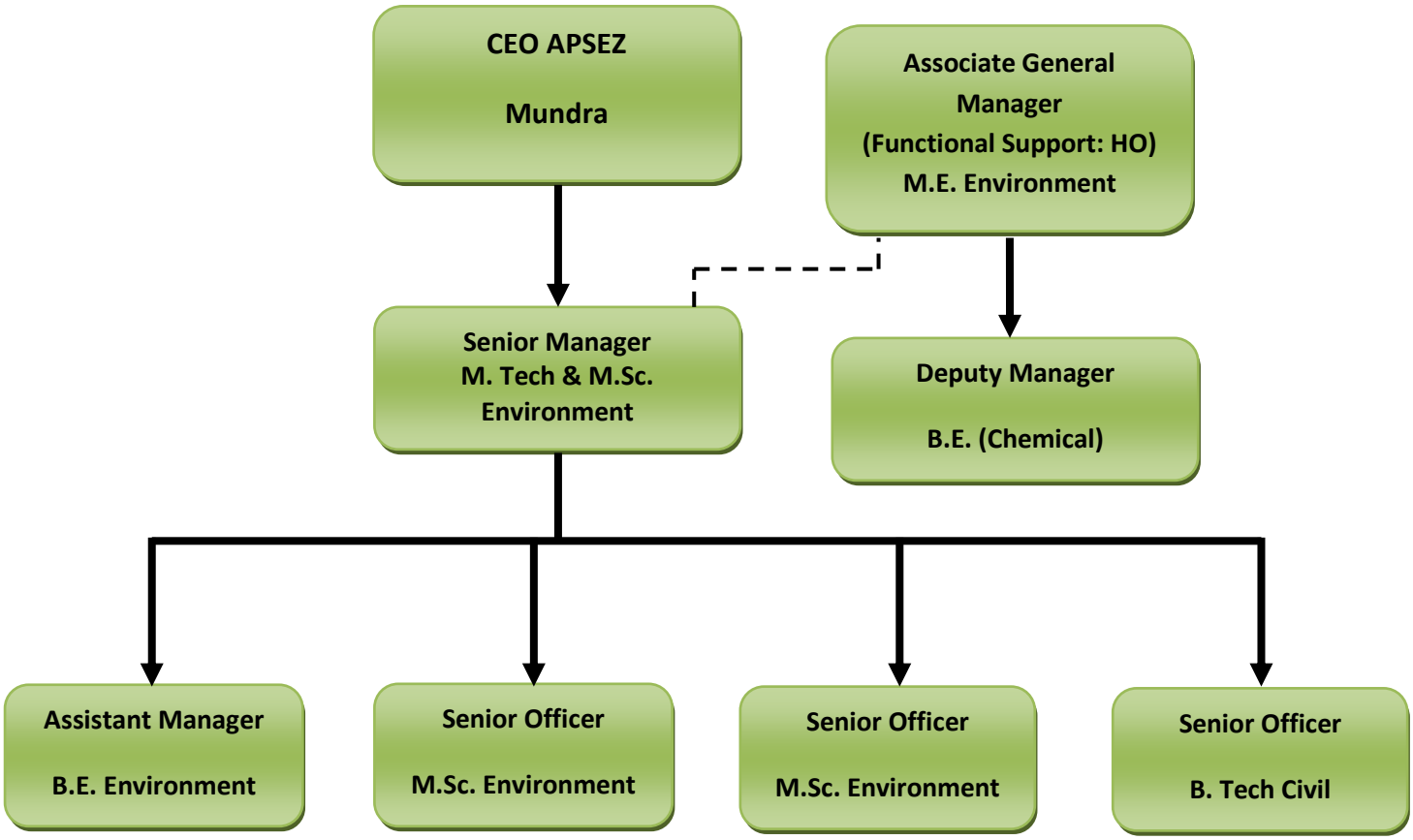
20. Final assessment Comments : **VERY SATISFACTORY**

(MK Dutta)
Addl. Director (Process & Engg.)
Oil Industry Safety Directorate
Ministry of Petroleum & Natural Gas

(Amitava Das)
Commandant
Oi/c PRT (W)
Indian Coast Guard
Ministry of Defence

# Annexure – 7

## Organogram of Environment Management Cell, APSEZ, Mundra



# Annexure – 8

# Cost of Environmental Protection Measures

| Sr. No. | Activity | Cost incurred (INR in Lakh) | | | Budgeted Cost (INR in Lakh) |
|---|---|---|---|---|---|
| | | 2014 – 15 | 2015 – 16 | 2016 – 17 (Till Date) | 2016 – 17 |
| 1. | Environmental Study / Audit and Consultancy | 29.87 | 45.45 | 158.14 | 146.86 |
| 2. | Legal & Statutory Expenses | 11.26 | 3.30 | 7.39 | 7.88 |
| 3. | Environmental Monitoring Services | 23.76 | 26.80 | 15.48 | 32.82 |
| 4. | Hazardous Waste Management & Disposal | 9.56 | 34.56 | 7.50 | 11.04 |
| 5. | Environment Day Celebration | 7.01 | 7.18 | 6.54 | 12.00 |
| 6. | Treatment and Disposal of Bio-Medical Waste | 1.00 | 1.22 | 0.69 | 1.39 |
| 7. | Mangrove Plantation | 127.97 | 53.28 | 30.00 | 30.00 |
| 8. | Mangrove Monitoring & Conservation | 36.75 | 20.36 | 20.26 | 40.00 |
| 9. | Horticulture Expenses | 380.27 | 434.72 | 498.00 | 518.58 |
| 10. | O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant) | 30.78 | 18.18 | 41.43 | 48.38 |
| 11. | Expenditure of Environment Dept. (Apart from above head) | 184.91 | 135.90 | 112.47 | 178.01 |
| | **Total** | **843.14** | **837.73** | **897.90** | **1026.96** |

**Further year wise breakup of the cost is mentioned in table below:**

| Year | Env. | Horticulture | Total |
|---|---|---|---|
| 2012-2013 | 150.00 | 200.00 | 350.00 |
| 2013-2014 | 250.00 | 433.75 | 683.75 |
| 2014-2015 | 462.87 | 380.27 | 843.14 |
| 2015-2016 | 346.23 | 434.72 | 780.95 |
| 2016-2017 | 399.90 | 498.00 | 897.90 |
| **Total** | **1609.00** | **1946.74** | **3555.74** |