

**SIX MONTHLY COMPLIANCE REPORT OF
ENVIRONMENTAL CLEARANCE (EC)**

**4620 (4×330+5×660) MW THERMAL POWER
PLANT PHASE - I, II & III**

At

**MUNDRA TALUKA, KUTCHH DISTRICT
GUJARAT**

Submitted to:

**Western Regional Office
Ministry of Environment, Forests & Climate Change,
Central Pollution Control Board, New Delhi &
Gujarat Pollution Control Board, Gandhinagar**

adani

Submitted By:

**Environment Management Department
Adani Power (Mundra) Limited
Tunda & Wandh Village,
Mundra Taluka, Kutchh District
Gujarat**

PERIOD: October'2019 – March'2020

Contents

Sl. No.	Title	
1.	Introduction	
2.	Compliance status of Environmental Clearance (EC) Phase I, II & III	
<u>List of Annexures</u>		
3.	Environmental Monitoring Reports (October'2019 to March'2020) <ul style="list-style-type: none"> • Micro-meteorological data • Ambient Air Quality • Stack Emission Monitoring • Water Quality (Ground & Surface) • Noise Level • Soil Quality • Continuous Emission Monitoring Report 	Annexure I
4.	Terrestrial Ecology Report	Annexure II
5.	Marine Ecology Report and Physical Oceanography Report	Annexure III
6.	Online Continuous Ambient Air Quality Monitoring (CAAQM) Results	Annexure IV
7.	Differential temperature Report	Annexure V
8.	Green Belt / Plantation Details	Annexure VI
9.	Fly Ash Utilization Details	Annexure VII
10.	Water Quality Near Ash Dyke (Bore Well)	Annexure VIII
11.	Expenditure for Environment protection measure	Annexure IX
12.	CSR Progress Report (October'2019 to March'2020)	Annexure X

Adani Power (Mundra) Limited, Mundra

Introduction:

Adani Power (Mundra) Limited (APMuL) is located at village: Siracha & Tunda, Taluka Mundra, District Kutchh in Gujarat.

APMuL has been granted Environmental Clearances from Ministry of Environment, Forest & Climate Change, Consent to Establish (CTE) and Consent to Operate (CTO) from Gujarat Pollution Control Board for Phase I, II & III and APMuL also obtained all necessary statutory / mandatory clearance.

Adani Power Limited, Mundra (APL Mundra) has been restructured and the Mundra Thermal Power Plant has been demerged and transferred to Adani Power (Mundra) Ltd.

Consequent to this De-Merger of 4620 MW Thermal Power Plant, undertaking now vests with Adani Power (Mundra) Limited from 1st January 2018. Ministry of Environment, Forest & Climate Change (MoEF&CC) has Transferred the Environmental Clearances (EC) to Adani Power (Mundra) Limited on 13.04.2018.

Adani Power (Mundra) Limited has commissioned the first supercritical 660 MW unit in the country. Mundra is also the World's First supercritical technology project to have received 'Clean Development Mechanism (CDM) Project' certification from United Nations Framework Convention on Climate Change (UNFCCC).

We have implemented the Environment Management System (EMS) ISO 14001:2015.

Adani Power (Mundra) Limited, Mundra

Compliance Status on Environment Clearance (EC)

For 660 MW (2x330) TPP Phase - I

Vide letter No.J-13011/7/2007-IA-II (T) dated 13/08/07

Sr. No.	Conditions	Status
3-(i)	No activities in CRZ area will be taken up without prior requisite clearance under the provisions of the CRZ Notification, 1991.	CRZ Clearance obtained from MoEF&CC vide Letter No. 10 - 94 /2007- IA - III dated 29 th May' 2008. However, the facilities for Sea water intake and outfall were not developed. The CRZ Clearance has not been acted upon. NIO suggested to develop integrated intake and outfall facility in place of multiple intakes and outfalls. This integrated intake & outfall has been approved by MoEF&CC under the clearance for Waterfront Development proposed by APSEZL. APMuL is using this integrated intake and outfall facilities.
(ii)	The seawater intake structure shall be so designed to ensure that the continuity of free flow of water in the two arms of Kotdi Creek is not hampered.	The integrated Intake channel developed by APSEZ is away from Kotdi Creek. The outfall crosses Kotdi Creek at one place, for which aqueduct has been provided so that the treated effluent does not mix with water in the Creek and does not Interfere with free flow of water in the two arms of Kotdi Creek.
(iii)	The recommendations made in the NIO report shall be effectively implemented in the project cycle.	Subsequent to NIO's recommendations, integrated intake & outfall facilities are developed by APSEZ and approved from MoEF&CC New Delhi.
(iv)	It shall be ensured that the mangroves are not adversely affected due to the project.	The Thermal Power Plant is located well beyond the CRZ area and there are no mangroves at the plant site.
(v)	The temperature of discharged water shall be continuously monitored to ensure that it does not exceed the prescribed limit of 7°C above the ambient temperature of receiving waters at any point of time.	The temperature of discharge water and the Intake water is monitored on daily basis. Differential temperature is well within the Stipulated limits. Please refer Annexure V
(vi)	Space provision shall be made for installation of FGD of requisite efficiency of removal of SO ₂ , if required at later stage.	Space was provided for FGD for future requirement. FGD installation is in progress in compliance with the CPCB directions vide letter No.: B- 33014/07/2017-18/IPC-II/TPP/

Adani Power (Mundra) Limited, Mundra

		152872, dated 11/12/2017.
(vii)	The total land requirement shall not be exceed 228 Ha for all the activities/facilities relating to the proposed power project.	The project has undergone two expansions. The total area has changed and the same has been approved by MoEF&CC. The total area for all three phases is 452.79 ha.
(viii)	Coal with ash content not exceeding 8% and sulphur content not exceeding 0.69% shall be used as fuel	Being followed. The coal is imported from Indonesia and South Africa. The ash content in Coal is below 8% and sulphur content below 0.3%. The Ash content report is being sent to MoEF&CC, Regional office on quarterly basis. Ash content report is enclosed as Annexure-VII.
(ix)	Rain water harvesting should be adopted. Central Groundwater Authority/Board shall be consulted for finalization of appropriate rain water harvesting structure within a period of three months from the date of clearance	Rain water harvesting (RWH) scheme has been submitted to Regional Office, CGWB, Ahmedabad. We have adopted the scheme and developed rainwater collection & groundwater recharging facilities at three locations within plant premises.
(x)	A bi -flue stack of 220 m height with exit velocity of at least 22 m/s shall be provided with continuous monitoring system.	Complied. A Bi - flue stack of 220 meter height is provided. On line analyzers for PM, SO ₂ , NO _x has been provided & maintained and calibration is being done on regular basis, exit velocity is more than 22 m/s. RTDMS commissioned for gas analyzer.
(xi)	High efficiency Electrostatic precipitator (ESPs) having efficiency of 99.9% shall be installed so as to ensure that particulate emissions do not exceed 100 mg/Nm ³ .	Complied, ESP with efficiency of 99.9% installed in both the units to meet permissible norm for particulate emissions less than 50 mg/Nm ³ . Please refer Annexure - I
(xii)	Fly ash shall be collected in dry form and its 100 % utilization shall be ensured from the day of commissioning of the plant. In case of emergency, the utilized ash may be disposed in the ash pond through High Concentration Slurry Disposal (HCSD) system.	Complied. Ash Generation & Utilization details from October'2019 to March'2020 Please refer Annexure- VII.

Adani Power (Mundra) Limited, Mundra

(xiii)	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke and project area to ascertain the change, if any, in the water quality due to leaching of contaminants from ash disposal area.	Complied Four nos. of Bore well establish around the ash dyke & Ground water quality is being monitored on regular basis. Ground water analyses report enclosed. Please refer Annexure VIII
(xiv)	Noise level shall be limited up to 75 dB (A). For People working in high noise area, protective devices such as earplugs etc. shall be provided.	Noise level monitoring is being carried out on regular basis inside the plant locations & monitoring values are well within stipulated limits. Please refer Annexure I We are providing necessary PPE's like ear muff and ear plug to all employee & workers. Occupational Health & Safety Management System as ISO ISO 45001:2018 implemented.
(xv)	A greenbelt shall be developed all around the plant boundary and ash dyke covering an area of at least 88.2 Ha.	Green belt / plantation being developed in 138.63 Ha (Out of total 452 Ha Land for all three phases). Green belt/plantation details is enclosed as Annexure- VI
(xvi)	First aid and sanitation arrangements shall be made for the drivers and contract labor during construction phase.	Complied. First aid and sanitation was provided for driver and contract labour during construction phase.
(xvii)	Regular monitoring of the air quality shall be carried out in and around the power plant and records shall be maintained. The location of the monitoring stations and frequency of monitoring shall be finalized in consultation with State Pollution Control Board. Six monthly reports shall be submitted to this Ministry.	Being Complied. The regular Environmental Monitoring is being carried out in & around plant premises and reports are being submitted on monthly basis to GPCB regional office, Bhuj. Online continuous AAQ Monitoring systems has been installed in consultation with GPCB and also established five AAQM locations in & around the plant with frequency of twice in a week, monitoring is being carried out by third party. Please refer Annexure I
(xviii)	For controlling fugitive dust, regular sprinkling of water in coal handling area and other vulnerable areas of the plant shall be ensured.	Being Complied. Regular water sprinkling is being done to control the fugitive dust in CHP area and all other areas. In addition mechanical sweeping machine have been deployed for cleaning the road. To control and minimize the fugitive air pollution at coal handling plant, dust extraction system has been provided in all the transfer towers as well as crusher house.

Adani Power (Mundra) Limited, Mundra

		<p>Desalinated water is being used for dust suppression system.</p> <p>Windshield is already provided at coal stack yard area.</p> <p>Close conveyor system for Coal transportation is provided.</p> <p>Integrated Ash silo system (Ash transfer by Numeric system in pipe) is in place for ash handling.</p>
(xix)	<p>The project proponent should advertise within seven day of Environment clearance, in at least two newspapers widely circulated in the region around the project, one of which should be in vernacular language of the locality concerned, informing that the project has been accorded environmental clearance and copies of clearance letter are available with State Pollution Control Board/Committee and may also be seen in the Website of Ministry of Environment and Forest in the - http://envfor.nic.in</p>	<p>Complied</p> <p>Published in Two News paper</p>
(xx)	<p>A separate environment-monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.</p>	<p>Complied.</p> <p>We have established separate environmental management cell with well qualified staff to carry out regular surveillance for implementation of stipulated environmental safeguards and full fledged Environment Lab for Air & Water has been established.</p> <p>Environment Management System as per EMS ISO 14001: 2015 implemented.</p>
(xxi)	<p>Half yearly report on the status of implementation of conditions and environmental safeguards should be submitted to this Ministry, the Regional Office, CPCB and SPCB.</p>	<p>Six monthly compliance report accordance to the Environmental clearance granted by MoEF is being submitted to MoEF, CPCB & GPCB regularly.</p> <p>Compliance status report updated on company's website.</p> <p>Last compliance report was submitted for the period of April'19 to September'19 had been submitted vide letter no. APMuL/EMD/EC/MoEF/161/11/19, Dated: 21.11.2019.</p>

Adani Power (Mundra) Limited, Mundra

(xxii)	Regional Office of the Ministry of Environment & Forests located at Bhopal will monitor the implementation of the stipulated conditions. A complete set of documents including Environmental Impact Assessment report, Environment Management Plan and additional information/ clarifications submitted to this ministry subsequently should be forwarded to the Regional Office for their use during monitoring.	Being followed All necessary information forwarded to the MoEF Regional Office, Bhopal on regular basis.
(xxiii)	Separate funds should be allocated for implementation of environmental protection measures along with item-wise break-up. These cost should be included as part of the project cost. The funds earmarked for the environment protection measures should not be diverted for other purposes and year- wise expenditure should be reported to the Ministry.	Being complied. Separate funds allocated for environmental protection measures. Expenditures details F.Y. 2019-20 is enclosed as Annexure- IX
(xxiv)	Full cooperation should be extended to the Scientists/Officers from the Ministry and its Regional Office at Bhopal/ the CPCB/ the SPCB during monitoring of the project.	Noted Full co-operation shall be extended to the authority

Adani Power (Mundra) Limited, Mundra

**Compliance status on Environment Clearance
For 1980 MW (2x330 + 2x660) TPP Phase – II**

Vide letter No. J-13011/1/2008-IA-II (T) dated 21/10/08)

Sr. No.	Conditions	Status
3-(i)	The changes/ modification made in the scope of phase - I of the project should be get incorporated formally in the environmental clearance already granted.	Noted. Changes in Phase-I communicated to MoEF&CC.
(ii)	Prior CRZ clearance under the provisions of CRZ Notification, 1991 for the activities to be taken up in the CRZ area as applicable to this project, shall be obtained.	CRZ clearance already obtained from MoEFCC New Delhi vide Letter No. 10 - 94 /2007- IA - III dated 29 th May, 2008. However, the facilities for Sea water intake and outfall were not developed. The CRZ Clearance has not been acted upon. Based on NIO suggestion to develop integrated intakes and outfall facility in place of multiple intake and outfall, The integrated intake & outfall has been approved by MoEFCC, New Delhi under the clearance for Waterfront Development proposed by APSEZL. APMuL is using this integrated intake and outfall facilities.
(iii)	Regular monitoring of the thermal discharges into the sea shall be carried out and records maintained. The temperature changes, if any, in the sea water within the impact zone due to the project shall be carried out. Based on the same, necessary safeguard measures as may be required to protect the aquatic flora and fauna shall be taken. It shall be ensured that discharge temperature does not exceed the prescribed limits of 7°C above the ambient temperature of receiving waters at any point of time.	Being complied The temperature of discharge water and the intake water is monitored on daily basis. Differential temperatures are well within the stipulated limits. Please refer Annexure - V . Regular third party marine monitoring also being carried out, monitoring report is enclosed for the period of October'2019 to March'2020, Monitoring report is enclosed as Annexure - III
(iv)	The recommendations made in the report of NIO relating to intake and outfall shall be implemented.	NIO suggested/recommended to develop integrated intake and outfall facility in place of multiple intake and outfall. This integrated intake & outfall has been approved by MoEF&CC under the clearance for Waterfront Development proposed by APSEZL. APMuL is using this

Adani Power (Mundra) Limited, Mundra

		integrated intake and outfall facility.
(v)	The sulphur content in the coal to be used both for Phase-I and Phase-II shall not exceed 0.3 %.	Being followed. The coal is imported from Indonesia and South Africa. It is ensured that sulphur content in coal below 0.3%. The Ash content report is being sent to MoEF&CC, Regional office on quarterly basis. Ash content report is enclosed as Annexure-VII.
(vi)	Appropriate measures shall be adopted to reduce the emissions of SO ₂ . It shall also be ensured that at no point of time the ground level concentration of SO ₂ in the impact zone exceeds the prescribed limit. The proponent shall also provide, additional corrective measures as may be deemed necessary shall be taken.	Being Complied The regular monitoring is being carried out in & around the plant premises. We have already installed online continuous monitoring system in all stacks. At no point of time, the ground level concentration of SO ₂ has exceeded the permissible limits.
(vii)	Continuous meteorological data shall be collected at site for at least three years. Based on the data so collected, air quality modeling prediction shall be carried out. The results so obtained shall be analyzed and based on the same, additional corrective measures as may be deemed necessary shall be taken.	Complied. Continuous meteorological stations installed within plant premises, Details of metrological data/report observation enclosed as Annexure I.
(viii)	Two bi-flue stacks of 275 m height each for 2 X 330MW and 2 X 660 MW units shall be provided with continuous online monitoring equipments for SO ₂ , NO _x and Particulate. Exit velocity of Flue gases shall not be less than 22.27 m/sec for 2 X 330MW stack and 22.97 m/sec for 2 X 660 MW units.	Complied. Two bi-flue stacks 275 meters has been provided in all four boilers (2x330 MW + 2x660 MW) and on line continuous emission monitoring system (CEMS) installed for PM, SO _x & NO _x . Exit velocity is more than 23 m/sec record maintained. Regular stack emission monitoring is also being carried out by third party consultant.
(ix)	High efficiency electrostatic precipitators (ESP's) shall be installed to ensure that particulate emission does not exceed 50 mg/ Nm ³	Complied Highly efficient Electrostatic Precipitator (ESPs) has been provided to each boiler to maintain particulate emission less than 50 mg/Nm ³ . Please refer Annexure I
(x)	The seawater intake structure shall be so designed to ensure that the continuity of free flow of water in the two arms of Kotdi creek is not hampered.	The integrated Intake channel developed by APSEZ is away from Kotdi Creek. The outfall channel Crosses Kotdi Creek at one place, for which aqueduct has been provided so that the treated effluent does not mix with Creek water and does not

Adani Power (Mundra) Limited, Mundra

		Interfere with free flow of water in the two arms of Kotdi Creek.
(xi)	It shall be ensured that the mangroves are not adversely affected due to the project.	The Thermal Power Plant is located well beyond the CRZ area and there are no mangroves at the plant site.
(xii)	Cooling towers with closed cycle system shall be installed COC of at least 1.5 shall be maintained.	Being Complied COC of 1.5 is being maintained
(xiii)	Space provision shall be made for installation of FGD of requisite efficiency of removal of SO ₂ , If required at later stage.	Noted. Space for FGD was provided in the plant layout. As per the guidelines of CPCB vide letter No. B-33014/07/2017/IPC-II/TPP/15872 dated 11.12.2017 "Plant shall install FGD by December 31, 2022 in Unit-1 & 2, September 30, 2022 in Unit-3 & 4, June 30, 2022 in Unit-5 & March'31, 2022 in Unit-6; comply with SO ₂ emission limit by 2022." FGD installation is in progress in compliance with the CPCB direction.
(xiv)	The total land requirement shall not exceed 254.49 ha for all the activities/ facilities relating to Phase - I and Phase - II of the proposed power project.	Noted. The project has undergone two expansions. The total area has changed and the same has been approved by MoEF&CC. The total area for all three Phases is 452.79 ha.
(xv)	Rain water harvesting should be adopted. Central Groundwater Authority/Board shall be consulted for finalization of appropriate rainwater harvesting structures within a period of three months form the date of clearance.	Rainwater Harvesting (RWH) scheme has been submitted to RO, CGWB, Ahmedabad. We have adopted the scheme and developed rainwater collection & groundwater recharging facilities at three locations within plant premises.
(xvi)	Fly ash shall be collected in dry form and its 100 % utilization shall be ensured from the day of the commissioning of the plant. In case of emergency, the utilized ash may be disposed in the ash pond through High Concentration Slurry Disposal (HCSD) system and bottom ash in conventional slurry mode.	Complied. Ash Generation & utilization details from October'2019 to March'2020. Please refer Annexure VII
(xvii)	Adequate safety measures shall be provided in the plant area to check/ minimize spontaneous fires in coal yard, especially during summer season. Copy of the these measures with full details along with plant	Water sprinkler system and Hydrant system in operation to minimize spontaneous fires in coal yard.

Adani Power (Mundra) Limited, Mundra

	layout location shall be submitted to the ministry as well as to the Regional Office of the Ministry of Bhopal.	
(xviii)	Storage facilities for auxiliary liquid fuel such as LDO and HFO/LSHS shall be made in the plant area where risk is minimum to the storage facilities Disaster management Plan shall be prepared to meet any eventuality in case of accident taking place. Mock drills shall be conducted regularly and based on the same, modifications required, if any shall be incorporated in the DMP. Sulphur content in the liquid fuel will not exceed 0.5 %.	<p>The LDO and HFO / LSHS are stored in designated location and minimum risk area.</p> <p>Emergency Management Plan (EMP) has been prepared & Mock Drill is being conducted on regular interval.</p> <p>Occupational Health & Safety Management System as ISO 45001:2018 implemented.</p>
(xix)	Noise levels emanating from turbines shall be limited to 75 dBA. For people working in the high noise area, requisite personal protective equipment like earplugs/ear muffs etc. Shall be provided. Workers engaged in noisy areas such as turbine area, air compressors etc shall be periodically examined to maintain audiometric record and for treatment for any hearing loss including shifting to non - noisy/less noisy areas.	<p>Regular noise level monitoring is being carried out inside the plant locations & monitoring values are well within limits. Please refer Annexure- I.</p> <p>We are providing necessary PPE's like ear muff and ear plug to all employees & workers.</p> <p>Occupational Health & Safety Management System as ISO 45001:2018 implemented.</p>
(xx)	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke and the project area to ascertain the change, if any, in the water quality due to leaching of contaminants from ash disposal area.	<p>Complied</p> <p>Four nos. of Bore well establish around the ash dyke & Ground water quality is being monitored on regular basis. Please refer monitoring report in Annexure-VIII.</p>
(xxi)	A greenbelt shall be developed all around the plant boundary and ash dyke covering and area of at least 98.2 ha.	<p>Complied.</p> <p>Green belt / plantation being developed in 138.63 Ha. (Out of total 452 Ha Land for all three phases), Green belt / plantation is enclosed as Annexure- VI.</p>
(xxii)	First aid and sanitation arrangements shall be made for the drivers and contract labour during construction phase.	<p>Complied.</p> <p>First aid and sanitation was provided for driver and contract labour during construction phase.</p>
(xxiii)	Regular monitoring of ground level concentration of SO ₂ , NO _x , Hg, SPM and RSPM shall be carried out in the impact zone and records maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be provided immediately. The location of the	<p>Being Complied</p> <p>The regular Environmental Monitoring is being carried out in & around plant premises and reports are submitted to MoEF&CC, CPCB & GPCB. Please refer Annexure- I</p> <p>Online continuous monitoring systems</p>

Adani Power (Mundra) Limited, Mundra

	monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports shall be submitted to the Regional Office of this Ministry.	Installed in consultation with GPCB. AAQM monitoring in and around also being done by third party twice in a week. Please refer Annexure - IV
(xxiv)	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Complied. Proper housing and infrastructure facilities were provided to labors during the construction. The temporary facilities have been removed after the completion of project.
(xxv)	The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned within seven days from the date of this clearance letter, informing that the project has been accorded environmental clearance and copies of clearance letter are available with the State Pollution Control Board/ Committee and may also be seen at website of the Ministry of Environment and Forests http://envfor.nic.in	Complied.
(xxvi)	A separate environment management cell with qualified staff shall be set up for implementation of the stipulated environment safe guards.	We have established separate environmental monitoring cell with well-qualified staff to carry out regular surveillance for implementation of stipulated environmental safeguards and full fledged Environment Lab accredited with NABL ISO/IEC 17025:2017 for Air, Water & Noise including marine biology as well as terrestrial ecology regularly. Environment Management System as per EMS ISO 14001: 2015 implemented.
(xxvii)	Half yearly on the status of implementation of stipulated condition and environmental safe guards shall be submitted to this Ministry/Regional office /CPCB/SPCB.	Six monthly compliance report accordance to the Environmental clearance granted by MoEF&CC being submitted to MoEF&CC, CPCB & GPCB. Last compliance report was submitted for the period of April'2019 to September'2019 had been submitted vide letter no. APMuL/EMD/EC/MoEF/161/11/19 Dated: 21.11.2019
(xxviii)	Regional office of the Ministry of	Being followed.

Adani Power (Mundra) Limited, Mundra

	Environment & Forest located at Bhopal will monitor the implementation of the stipulated conditions. A complete set of documents including Environmental Impact Assessment - Report and environment Management Plant along with the additional information submitted from time to time shall be forwarded to the Regional office for their use during monitoring.	All necessary documents already submitted to MoEF&CC, Regional Office Bhopal. Addition information being forwarded time to time MoEF&CC, Regional Office Bhopal.
(xxix)	Separate funds shall be allocated for implementation of environmental protection measures along with item wise break up. These cost shall be included as part of the project cost. The funds earmarked for the environment protection measures shall not be diverted for other purposes and year wise expenditure shall not be diverted for other purposes and year wise expenditure should be reported to the Ministry.	Being followed Separate funds allocated for environmental protection measures. Expenditures details F.Y. 2019-20 is enclosed as Annexure- IX
(xxx)	The project authorities shall inform the Regional office as well as the Ministry regarding the date of financial closure and final approval of the project by the concerned authorities and the dates of start of land development work and commissioning of plant.	Complied.
(xxxi)	Full cooperation shall be extended to the Scientists/Officers from the Ministry /Regional Office of the Ministry at Bhopal/the CPCB/ the SPCB who would be monitoring the compliance of environmental status.	Noted. Full co-operation shall be extended to mentioned authority.

Adani Power (Mundra) Limited, Mundra

Compliance status on Environment Clearance

For 1980 MW (3x660) TPP Phase – III

Vide letter No. J-13012/126/2008-IA.II (T) dated 20.05.10

Sr. No.	Specific Conditions	Status
A -(i)	Phase – I and Phase – II projects shall be run purely on imported coal. Phase- III project shall be run on 70 % domestic and 30 % imported coal.	Phase I & II: Already commissioned being operated on imported coal. Phase-III: Domestic Coal Linkage for 70 % quantity granted by Ministry of Coal. Operational on blended coal.
(ii)	In case source of fuel supply is to be changed for Phase- I and Phase- II at a later stage, the project proponent shall intimate the Ministry well in advance along with necessary requisite documents for its concurrence for allowing the change.	Noted. Change in the source of fuel supply for power plant will be intimated to the Ministry well in advance along with necessary requisite documents for its concurrence for allowing the change.
(iii)	The project proponent shall examine in detail the possibility to adopting NIOT technology for desalination of sea water through Low temperature Thermal Desalination (LTTD) process. In case the same is not feasible detailed explanation shall be submitted.	Complied. The desalination plant is already commissioned. The LTTD process is not feasible at Mundra and report already submitted to RO, MoEF&CC, Bhopal.
(iv)	Marine biology shall not be disturbed in the Kotdi Creek and Gulf of Tunda due to any activity arising from the operation of power plant. Continuous monitoring of the marine biology in the area shall be undertaken and assessed for any changes beyond the natural variability identified and records maintained and submitted to the Ministry from time to time.	Complied. The integrated intake channel developed by APSEZL is away from Kotdi Creek, which is used by APMuL also. The integrated outfall developed by APSEZL and being used by APL, crosses Kotdi Creek, through aqueduct without mixing with Kotdi Creek and without causing any obstruction to free flow. Marine biology is being monitored & maintained on regular basis. Monitoring report is enclosed as Annexure – III .
(v)	A comprehensive marine biological quality monitoring programme and mitigation measures shall be prepared and submitted within six months to the Ministry for immediate implementation.	Being Complied. A comprehensive marine biological quality monitoring report is prepared and implementation. Report being submitted to MoEF&CC. Monitoring report is enclosed as Annexure – III .

Adani Power (Mundra) Limited, Mundra

(vi)	A dedicated Environment Management Cell with suitable qualified personnel constituting of marine Biologist and an ecologist shall be set up under the control of a Senior Executive, who will report directly to the head of the Organization.	A dedicated Environment Management cell has been set up with qualified staff Including marine biologist and an ecologist. The head of the Environment Management Cell reports to the Station Head at Mundra. We have full-fledged Environment Lab accredited with NABL ISO/IEC 17025:2017 to carry out in-house environmental monitoring. Environment Management System as per EMS ISO 14001: 2015 implemented.
(vii)	The project proponent shall not be hamper the vocation of the fishing community in the area and it shall be ensured that local fishing community shall be allowed to carry out their vocation in the creek.	The power plant is located at a site, which is away from the fishing areas. Adani Power (Mundra) Ltd. uses the marine facilities such as intake channel and outfall channel, developed by APSEZ Ltd., which is not hampering the vocation of fishing community. Our CSR activities enhance infrastructure & essential nets to fishermen communities for the betterment of their vocation in the area. Please refer Annexure- X .
(viii)	The project proponent shall adopt the fishing communities displaced/ affected by the power plant and in particular those residing in and around Zarpara, Kotdi, Navinal, and Tragadi for their overall socio economic development.	No fishing community is displaced by the power plant. The fishing community is being supported by the CSR activities of the company, being implemented through Adani Foundation . The CSR report is enclosed as Annexure X
(ix)	An endowment of Fisherman Welfare Fund shall be created not only to enhance their quality of life through creation of facilities for fish landing platforms/ fishing harbour/cold storage, but also to provide relief in case of emergency situations such as missing of fisherman on duty due to rough seas, tropical cyclone and storms etc.	APMuL provided adequate funds for creation, maintenance and support of facilities such as sanitation facilities, support schools, approach roads, cycle to school going children, fish lending sheds etc. as well as support for purchasing various essential materials like nets, cycle, iceboxes, anchors, weighing scales, other fishing equipment's etc. All these activities are undertaken as a part of CSR, being implemented through Adani Foundation. Adani Foundation has also established " Adani Vidya Mandir " a school focusing

Adani Power (Mundra) Limited, Mundra

		on education of fisherman's children. Refer Annexure- X .
(x)	Suitable screens (in stages) shall be placed across intake channel to prevent entrainment of life forms including eggs, larvae, juvenile fish, plankton etc. during extraction of sea water.	Being complied. Suitably designed screen systems have been provided in the intake system.
(xi)	No ground water shall be extracted for use in operation of the power plant even in lean season.	Being Complied. There is no extraction of Ground water for use in operation of the power plant.
(xii)	No water bodies including natural drainage system in the area shall be disturbed due to activities associated with the setting up/operation of the power plant.	Being Complied. No ground water bodies/natural drainage will be disturbed.
(xiii)	FGD shall be provided for Phase- III units.	Complied. Sea water based FGD has been provided.
(xiv)	The system with COC of at least 1.3 shall be designed since the sea water has high TDS.	Being complied. COC of least 1.3 is being maintained.
(xv)	Additional soil for leveling of the proposed site shall be generated within the sites (to the extent possible) so that natural drainage system of the area is protected and improved.	Complied. For leveling the site, the maximum additional soil has been generated within the site itself and maintained natural drainage system of the area.
(xvi)	High Efficiency Electrostatic Precipitator(ESPs) shall be installed to ensure that particulate emission does not exceed 50 mg/Nm ³ .	Complied. High efficient Electrostatic Precipitator (ESPs) has been provided to each boiler to maintain particulate emission less than 50 mg/Nm ³ . Please refer Annexure- I
(xvii)	Adequate dust extraction system such as cyclones/bag filters and water spray system in dusty areas such as in coal handling and ash handling points, transfer areas and other vulnerable dusty areas shall be provided.	Water spraying system is provided in coal handling area and dust extraction system provided in coal transfer & other vulnerable dusty area. Closed conveyor system for Coal transportation is provided. Wind shield around coal stack is provided. Integrated Ash silo system (Ash transfer by pneumatic system through pipeline) is in place for ash handling at single place and frequently water sprinkling is being done in the area.
(xviii)	Utilization of 100 % Fly Ash generated for Phase-III shall be made from day one of operation of the plant. Status of implementation shall be reported to the Regional office of the Ministry from time to	Being complied Ash Generation & utilization details from October'2019 to March'2020. Please refer Annexure- VII

Adani Power (Mundra) Limited, Mundra

	time.	
(xix)	Fly ash shall be collected in dry form and storage facility (silos) shall be provided. Unutilized fly ash shall be disposed off in the ash pond in the form of slurry form. Mercury and other heavy metals (As, Hg, Cr, Pb etc.) will be monitored in the bottom ash as also in the effluents emanating from the existing ash pond. No ash shall be disposed off in low lying area.	Being followed. Fly Ash is collected in dry form and storage silos have been provided. Unutilized ash is wet conditioned for disposal in Ash Dyke. Mercury and heavy metals are periodically monitored in the ash. No ash from Phase III Units is disposed off in low-lying area.
(xx)	Ash pond shall be lined with HDP/LDP lining or any other suitable impermeable media such that no leachate takes place at any point of time. Adequate safety measures shall also be implemented to protect the ash dyke from getting breached.	Ash dyke is provided with LDPE Lining. Safety measures are in place to prevent breaching of the dyke.
(xxi)	For disposal of Bottom Ash in abandoned mines (if proposed to be undertaken) it shall be ensured that the bottom and sides of the mined out areas are adequately lined with clay before Bottom Ash is filled up. The project proponent shall inform the State Pollution Control Board well in advance before undertaking the activity.	No mines in the nearby area.
(xxii)	There should not be any contamination of soil, ground and surface waters (Canals & village pond) with sea water in and around the project sites. In other wards necessary preventive measures for spillage from pipelines, such as lining of guard pond used for the treatment of outfall and intake should be adopted. This is just because the areas around the projects boundaries fertile agriculture and used for paddy cultivation.	Being complied. The Sea water is used within the plant premises only and in closed circuit. There is no contamination of soil, ground and surface water. There are no agricultural lands on sea ward side of the power plant.
(xxiii)	To absorb the ground level pollutants, to act buffer against strong winds arising out of tropical cyclones/ storms, to reduce heat load and ameliorate environment, there is a need for shelterbelts/greenbelts/tree cover along the coastline, bunds around marshy areas, roadsides, around the project protected monuments, forts, waste places, School Campuses and other vacant lots. Coconut plantations can be developed along the coastline and near villages, school and forts. Stands of Casuariana should also be developed on some dunes and along coasts. Bamboos, Neem and other native trees should be planted	Being complied. Green belt / plantation developed in 138.63 Ha (Out of total 452 Ha Land for all three phases). Afforestation has been undertaken by APSEZL and Adani Foundation. Please refer Annexure VI

Adani Power (Mundra) Limited, Mundra

	in and around at the villages.	
(xxiv)	The above suggest Green Belt shall consist of 3 tires of plantation as cited above and largely comprising of native species around the power plant and at least 100 m width shall be raised. Wherever 100 m width is not feasible a 50 m width shall be raised and adequate justification shall be submitted to the Regional office of the Ministry. Tree density shall not less than 2500 per ha with survival rate not less than 70 %.	Being complied. Green belt Being developed in & around plant area. We have well established Horticulture Department which has started large scale plantation/ Green Belt developed in and around the plant.
(xxv)	To meet the expenditure of these plantations and their management, a common Green Endowment fund should be created by the project proponents out of EMP budgets the interest earned out of it should be used for the development and management of green cover of the area.	APMuL has internal department of Horticulture for developing greenbelt/landscaping of our APMuL premises and its surrounding area. APMuL has separate fund for such development.
(xxvi)	No waste water should be discharged onto channel systems, backwaters, marshy areas and seas without treatment. The outfall should be first treated in guard pond and then discharge into deep sea (12 to 15 m depth). Similarly the intake should be from deep sea to avoid aggregation of fish. The brine that comes out from desalinization plants should not be discharged into sea.	The waste water is treated and disposed off through Outfall Channel, as recommended by NIO and approved by MoEF&CC.
(xxvii)	The treated effluents conforming to the prescribed standards only shall be re circulated and reused within the plant (as may be required). Arrangements shall be made that effluent and storm water do not get mixed.	Desalination waste water is treated and utilized for dust suppression, CHP make up, etc. effluent stream and storm water drainage are isolated to prevent any mixing.
(xxviii)	The project proponent shall identify and develop new fodder farm/grazing land (Gaucher land) Firm financial commitment along with details for development of fodder farm/grazing land shall be submitted with in three months to the Regional Office of the Ministry.	Fodder support is provided to various needy villages so as to facilitate the farmers and cattle owners in the time of need when fodder is highly expensive and in short supply, CSR report enclosed as Annexure- X.
(xxix)	The project proponent shall prepare an action plan to be submitted within three months to the Ministry for regeneration of mangroves in the area and shall specify the financial commitments for the same.	Mangrove plantation plan along with regeneration plan submitted to MoEF&CC. To enhance the marine biodiversity, till date Adani group has carried out mangrove afforestation in more than 2800 ha. Area across the coast of Gujarat.
(xxx)	The water containing brine shall be discharged	Being complied.

Adani Power (Mundra) Limited, Mundra

	only after cooling at ambient temperature in a guard pond such that the same meets the average salinity of sea water.	The wastewater is treated and disposed off through Outfall Channel, as recommended by NIO and approved by MoEFCC
(xxxii)	The project proponent shall set up single teacher school in every village in the study area so that village boy and girls do not have to walk long distances. The project proponent shall also explore the feasibility of providing cycles to school going children/students to address school dropouts. Report to this effect shall be submitted to the Regional Office of the Ministry from time to time.	All school of the surrounding villages adopted for development by Adani Foundation, CSR activities being carried out by Adani Foundation. CSR Progress Report for 2019-20 is enclosed as Annexure- X .
(xxxiii)	Action plan for R&R (If applicable) with compensation package of the project affected persons be submitted and implemented as per prevalent R&R policy within three months from the date of issue of this letter.	Not applicable.
(xxxiiii)	An amount of Rs. 36.0 Crores shall be earmarked as one time capital cost for CSR programme. Subsequently a recurring expenditure of Rs. 7.20 Crores per annum shall be earmarked as recurring expenditure for CSR activities. Details of the activities to be undertaken shall be submitted within one month along with road map for implementation.	Complied. A separate budget earmarked for CSR activities. CSR study report already submitted to ministry. CSR activities being carried out by Adani Foundation. Expenditure details F.Y.2019-20 is enclosed as Annexure- X .
(xxxv)	While identifying CSR programme the company shall conduct need based assessment for the nearby villages to study economic measures with action plan which can help in upliftment of poor section of society. Income generating projects consistent with the traditional skills of the people besides development of fodder farm, fruit bearing orchards, vocational training etc, can form a part of such programme. Company shall provide separate budget for community development activities and income generating programmes. This will be in addition to vocational training for individuals imparted to take up self employment and jobs. In addition a special scheme for upliftment of SC/ST's and marginalised population in the study area out of CSR programme shall be formulated and submitted to the Ministry within six months along with firm commitment of implementation. The scheme shall have an in-built monitoring	Need based Assessment Study for development of CSR plan completed by VIKSAT, Ahmedabad. Report already submitted to MoEF&CC. Need based plan implementation is being started nearby villages; individuals who are economically weak to undertake some economic activity that would help them achieve sustainable livelihood and financial independence. Please Refer Annexure X .

Adani Power (Mundra) Limited, Mundra

	mechanism.	
(xxxv)	If shall be ensured that in-built monitoring mechanism for the schemes identified is in place and annual social audit shall be got done from the nearest government institute of repute in the region. The project proponent shall also submit the status of implementation of the scheme from time to time.	Being complied. Indian Institute of Social Welfare and Business Management (IISWBM) of university of Kolkata have done the Social audit. Final Social Audit Report is awaited from IISWBM. Final Social Audit Report has been submitted in Six monthly compliance report for period April '2016 to September'2016.
B	General Conditions:	Status
(i)	A sewage treatment plant shall be provided (as applicable) and the treated sewage shall be used for raising greenbelt/plantation.	Sewage Treatment Plants (STP) installed within the plant and treated water being utilizing/recycle within the plant remises for plantation and green belt development.
(ii)	Rainwater harvesting should be adopted. Central Groundwater Authority/ Board shall be consulted for finalization of appropriate rainwater harvesting technology within a period of three months from the date of clearance and details shall be furnished.	Being Complied Rain water Harvesting (RWH) scheme has been submitted to RO, CGWB, Ahmedabad. We have adopted the scheme and developed rainwater collection & groundwater recharge facilities at three locations within plant premises.
(iii)	Adequate safety measures shall be provided in the plant area to check/minimize spontaneous fires in coal yard, especially during summer season. Copy of these measures with full details along with location plant layout shall be submitted to the Ministry as well as to the Regional Office of the Ministry.	Proper firefighting and fire hydrant system has been provided in the coal stack yard. Occupational Health & Safety Management System as ISO 45001:2018 implemented.
(iv)	Storage facilities for auxiliary liquid fuel such as LDO and /HFO /LSHS shall be made in the plant area in consultation with department of Explosives, Nagpur. Sulphur content in the liquid fuel will not exceed 0.5 %. Disaster Management Plan shall be prepared to meet any eventuality in case of an accident taking place due to storage of oil.	The LDO and HFO/LSHS properly stored in minimum risk area. A Disaster management plan will be prepared covering the all the eventualities in case of accident due to storage of oil. On site plan has already been made and implemented. Disaster management Plan has already been prepared and implemented. Occupational Health & Safety Management system as ISO 45001:2018 implemented.

Adani Power (Mundra) Limited, Mundra

(v)	Regular monitoring of ground water level shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals (Hg, Cr, As, Pb) and records maintained and submitted to the Regional Office of this Ministry. The data so obtained should be compared with the baseline data so as to ensure that the ground water quality is not adversely affected due to the project.	Complied. Four nos. of Bore well establish around the ash dyke & Ground water quality monitored on regular basis by third party and periodic report being submitted to the MoEFCC. Please refer Annexure VIII
(vi)	First aid and Sanitation arrangement shall be made for the drivers and other contract workers during construction phase.	Complied. First aid and sanitation was provided for driver and contract labour during construction.
(vii)	Noise levels emanating from turbines shall be so controlled such that the noise in the work zone shall be limited to 75 dBA. For people working in the high noise area, requisite personal protective equipment like earplugs/earmuffs etc. shall be provided. Workers engaged in noisy areas such as turbine area, air compressors etc shall be periodically examined to maintain audiometric record and for treatment for any hearing loss including shifting to non noisy/less noisy areas.	Being complied. Necessary action has been taken to maintain noise level within 75dB (A). The working personals provided with appropriate personal protective equipment and periodic audiometric check up is being carried out and records are maintained. Regular noise level monitoring is being carried out inside the plant locations & monitoring values are well within limits. Please refer Annexure I Occupational Health & Safety Management System as ISO 45001:2018 implemented.
(viii)	Regular monitoring of ground level concentration of SO ₂ , NO _x , PM _{2.5} & PM ₁₀ and Hg shall be carried out in the impact zone and records maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be provided immediately. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports shall be submitted to the Regional Office of this Ministry. The data shall also be put on the website of the company.	Being complied Regular monitoring of PM ₁₀ , PM _{2.5} , SO ₂ , NO _x and Hg is being carried out by third party consultant as well as in house and records are maintained. Please refer Annexure I Online Continuous Ambient Air Quality Monitoring System has been installed at three various locations within the plant premises. Monitoring result is available & within the permissible limits. Please refer Annexure I Monitoring reports being submitted to regional office of the MoEF&CC, CPCB and GPCB periodically. Please refer Annexure I

Adani Power (Mundra) Limited, Mundra

(ix)	Provision shall be made for the made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Proper temporary housing and infrastructure facilities provided to manpower. The temporary facilities removed after the Completion of project.
(x)	The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned within seven days from the date of this clearance letter, informing that the project has been accorded environmental clearance and copies of clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of Environment and Forests at http://envfor.nic.in	Complied. Advertisement published in the local newspaper.
(xi)	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad /Municipal Corporation, urban local Body and the Local NGO, if any, from whom suggestions/representations, if any, received while processing the proposal: The clearance letter shall also be put on the website of the Company by the proponent.	Complied.
(xii)	A separate Environment Management cell with qualified staff shall be set up for implementation of the stipulated environment safe guards.	We have established separate environmental monitoring cell with well qualified staff to carry out regular surveillance for implementation of stipulated environmental safeguards and full-fledged Environment Lab accredited with NABL ISO/IEC 17025:2017 to carry out in-house monitoring of Air, Water & Noise as well as terrestrial & marine ecology regularly. Environment Management System as per EMS ISO 14001: 2015 implemented.
(xiii)	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional office of MOEF, the respective Zonal Office of CPCB and SPCB. The criteria pollutant levels	Six monthly Environmental Clearance compliance status report is regularly submitted to MoEF&CC, CPCB and SPCB. The same is sent by email also. Compliance status updated on Company's website. Regular monitoring of PM ₁₀ , PM _{2.5} , SO ₂ ,

Adani Power (Mundra) Limited, Mundra

	namely; SPM, RSPM (PM _{2.5} , & PM ₁₀), SO ₂ , NO _x (ambient levels as well as stack emissions) shall be displayed at a convenient location near the main gate of the company in the public domain.	NO _x and Hg is being carried out by third party and records are maintained. Please refer Annexure I Display board is already installed in main gate.
(xiv)	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well by e-mail) to the respective Regional Office of MOEF, the respective Zonal office of CPCB and SPCB.	Being Complied. Six monthly compliance report is regularly submitted to MoEF&CC, CPCB & SPCB. The same is sent by email also. Compliance status updated on Company's website. Last compliance report was submitted for the period of April'19 to September'19 had been submitted vide letter no.- APMuL/EMD/EC/MoEF/161/11/19 Dated: 21.11.2019
(xv)	The environment statement for each financial year ending 31st March in Form V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website, of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of the Ministry by e-mail.	Being complied, Regular environment statement is being submitted to the Gujarat Pollution Control Board (GPCB).
(xvi)	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the ministry of Environment and Forests, its Regional Office, Central Pollution Control Board and State Pollution Control Board. The project proponent shall upload the status of compliance of the environment of the environmental clearance conditions on their website and update the same periodically and simultaneously send the same by e-mail to the Regional Office, Ministry of Environment and Forests.	Six monthly Environmental Clearance compliance status report is regularly submitted to MoEF&CC, CPCB and SPCB. The same is sent by email also. Compliance status updated on Company's website.
(xvii)	Regional Office of Ministry Of Environment and Forest will monitor the implementation of the stipulated conditions. A complete set of documents including Environment Impact Assessment Report and Environment Management Plan along with the additional	Being Complied. Display board already installed in main gate.

Adani Power (Mundra) Limited, Mundra

	information submitted from time to time shall be forwarded to the Regional office for their use during monitoring. Project proponent will upload the compliance status in their website and update the same from time to time at least six monthly basis. Criteria pollutants levels including NOx (from stack & ambient air) shall be displayed at the main gate of the power plant.	
(xviii)	Separate funds allocated for implementation of environmental protection measures along with item wise breakup. These cost shall be included as part of the project cost. The funds earmarked for the environment protection measures shall not be diverted for other purposes and year wise expenditure should be reported to the Ministry.	Being Complied. Separate funds allocated for environmental protection measures. Expenditures details F.Y. 2019-20 is enclosed as Annexure-IX
(xix)	The project authorities shall inform the Regional Office as well as the Ministry regarding the date of financial closure and final approval of the project by the Concerned authorities and the dates of start of land development work and commissioning of plant.	Complied.
(xx)	Full cooperation shall be extended to the scientists/ officers from the Ministry/Regional office of the Ministry at Bangalore/CPCB/ the SPCB who would be monitoring the compliance of environmental status.	Noted. Full co-operation shall be extended to mentioned authority always.

ENVIRONMENTAL MONITORING REPORT

AMBIENT AIR QUALITY, STACK EMISSION, WATER
QUALITY AND NOISE MONITORING

Period: October 2019 - December 2019

For

M/S. ADANI POWER (MUNDRA) LIMITED



At
Tunda & Siracha,
Tal. Mundra, Dist.: Kutch.
KUTCH, GUJARAT – 370 435

Prepared By



This report is released for the use of the Adani Power (Mundra) Limited for Regulators and relevant stakeholders solely as part of the Environmental Clearance and Consent to operate (CTO) compliances. Information provided (unless attributed to referenced third parties) is otherwise copy righted and shall not be used for any other purpose without the written consent of UniStar Environment & Research Labs Pvt. Ltd.

QUALITY CONTROL							
Name of Publication	Environmental Quality Monitoring Report for the Quarter October 2019 - December 2019						
Project Number	03	Report No.	UERL/ENV/OCT/ 10-12 / 2019	Version	1	Released	January- 2020
Project Coordinator	Mr. Bhavin Patel						
Prepared By	Miss. Shweta A. Rana						
Checked By	Mr. Jaivik Tandel						
DISCLAIMER							
UniStar has taken all reasonable precautions in the preparation of this report as per its auditable quality plan. UniStar Environment & Research Labs Pvt. Ltd. also believes that the facts presented in the report are accurate as on the date it was written. However, it is impossible to dismiss absolutely, the possibility of errors or omissions; UniStar therefore specifically disclaims any liability resulting from the use or application of the information contained in this report. The information is not intended to serve as legal advice related to the individual situation.							

FOR
UniStar Environment and
Research Labs Pvt. Ltd.



Mr. Jaivik Tandel
(Authorized By)



CONTENTS

1.0	ENVIRONMENTAL PARAMETERS	06
1.1	Ambient Air Quality.....	07
1.2	Flue gas monitoring	07
1.3	Water Quality monitoring	07
1.4	Ambient Noise Level Monitoring.....	07
1.5	Micrometeorology	08
1.5.1	Wind Rose Diagram	09
2.0	SCOPE & METHODOLOGY ADOPTED FOR ENVIRONMENTAL MONITORING	12
2.1	Introduction	12
2.2	Scope and Methodology for Monitoring of Various Environmental Attributes.....	12
3.0	ENVIRONMENTAL AIR QUALITY AND FLUE GAS MONITORING	13
3.1	Ambient Air Quality Monitoring Data	13
3.1.1	Details of Ambient Air Quality Monitoring Stations	13
3.1.2	Location: Nr. 20 MLD Plant	14
3.1.3	Location: Nr. Shantiniketan.....	15
3.1.4	Location: Kandagara Village	16
3.1.5	Location: Siracha Village	17
3.1.6	Location: Wandh Village	18
3.1.7	Ambient Air Quality Monitoring (Parameters- Mercury & Ozone).....	19
3.2	Flue Gas Monitoring Data	20
3.3	Water Quality Monitoring	21
3.3.1	Location: Tunda Village Water sample	21
3.3.2	Location: Kandagara Village Water sample.....	22
3.3.3	Location: Siracha Village Water sample.....	23
3.3.4	Location: Navinal Village Water sample	24
3.3.5	Location: Desalpur Village Water sample	25
3.4	Water Quality Monitoring – Plant area	26
3.4.1	Location: Outfall Channel	26
3.4.2	Location: STP Outlet	26
3.4.3	Location: ETP Outlet	27
3.4.4	Location: Bore-well Water Sample (Nr. Emergency Ash point).....	28
3.4.5	Location: Cooling Tower Blow down Water Sample.....	29
3.4.6	Location: Condensate Cooling Tower Water Sample.....	30
3.4.7	Location: Boiler Blow Down Water Sample.....	31
4.0	AMBIENT NOISE QUALITY MONITORING	31

[LIST OF GRAPHS](#)

Graph 1 : Particulate Matter Level Nr.20 MLD Plant	14
Graph 2: SO ₂ and NO ₂ Level Nr.20 MLD Plant	14
Graph 3: Particulate Matter Level Nr. Shantiniketan-1	15
Graph 4 : SO ₂ and NO _x Level Nr. Shantiniketan-1.....	15
Graph 5: Particulate Matter Level Kandagara Village.....	16
Graph 6 : SO ₂ and NO ₂ Level Kandagara Village	16
Graph 7 : Particulate Matter Level Siracha Village	17
Graph 8 : SO ₂ and NO ₂ Level Siracha Village.....	17
Graph 9 : Particulate Matter Level Wandh Village	18
Graph 10 : SO ₂ and NO ₂ Level Wandh Village.....	18

EXECUTIVE SUMMARY

Adani Power (Mundra) Limited (APMuL) has total generation capacity of 4620MW in phased manner at Mundra Thermal (coal Based) Power Plant near Village Tunda in Mundra, District Kutch, and Gujarat. The phased wise development being undertaken for ultimate capacity of power plant is shown below.

- First Phase : 2 x 330 MW
- Second Phase : 2 x 330 MW + 2 x 660 MW
- Third Phase : 3 x 660 MW

The Thermal Power Plant is located near Village Tunda, Mundra Taluka in Kutch District. The Site is closed to the sea, making cooling water perennially available for the power plant. The Power Plant is based on supercritical technology using imported coal.

All three phase of the power plant is operational and as the part of the compliance to the statutory requirement, M/s. Adani Power (Mundra) Limited has entrusted the environmental quality monitoring study for the area surrounding the power plant. Adani Power (Mundra) Limited Implemented ISO-14001:2015 Environment Management System (EMS) and Accreditation of NABL in Environmental Laboratory (ISO/IEC 17025:2017) vide Certificate No. TC-5215.

Various environmental parameters have been monitored during the period of October 2019-December 2019. The detail of the environmental parameters along with frequency of monitoring is shown in subsequent sections.

1. ENVIRONMENTAL PARAMETERS

Sr. No.	Environmental Indices	Parameter	No. of Location and Monitoring.	Frequency of Sampling
1.	Ambient Air Quality	PM ₁₀ , PM _{2.5} , Sulphur Dioxide and Nitrogen Dioxide	Three Location	Twice a week
2.	Ambient Air Quality	PM ₁₀ , PM _{2.5} , Sulphur Dioxide, Nitrogen Dioxide, Ozone and Mercury	Two Location	Once in a month
3.	Stack Monitoring	PM, Sulphur Dioxide, Oxide of Nitrogen and Hg	Nine Location	Once in a month
4.	Meteorological Monitoring	Wind rose, Wind speed, Wind direction, Rainfall, Temperature, Relative Humidity	One location	Round the clock
5.	Surrounding Villages Ground Water Analysis	Colour, Odour, Taste, Turbidity, Dissolved Solids, pH value, Total Hardness, Calcium, Boron, Copper, Iron, Manganese, Chloride, Sulphate, Nitrate, Fluoride, Phenolic Compounds, Mercury, Cadmium, Selenium, Arsenic, Cyanide, Lead, Zinc, Anionic Detergents as MBAS, Chromium Cr+6, Mineral Oil, MPN Index for Coliform Bacteria per 100 ml, Residual Free Chlorine, Aluminium, Alkalinity, Magnesium as Mg, Escherichia Coli in 250 ml.	Five Location	Once in Quarter
6.	Effluent Water Sample	pH, Temperature, colour, SS, O & G, BOD ₃ , COD, Chlorides, TDS, Sulphates, Ammonical Nitrogen, % Sodium, Sodium Absorption Ratio, Sulphides, Total Chromium, Hexavalent Chromium, Copper, Lead, Zinc, Free available chlorine, Phosphate, Iron	Four Location	Once in a month / Quarter
7.	STP Water Analysis	pH, Residual Chlorine, SS, BOD, COD, Faecal coliform	Three Location	Once in month/ Quarter
8.	Borwell water Near Ash Dyke Area	pH @ 25 ° C, Conductivity (µS), Chloride as Cl ⁻ Salinity (ppt), Total Dissolved Solids, Carbonate as CaCO ₃ , Bicarbonate as CaCO ₃ , Mercury as Hg, Arsenic as As, Lead as Pb, Chromium as Cr, Cadmium as Cd.	Four Location	Once in a Quarter
9.	Surrounding Villages Soil Analysis	Magnesium as Mg %, Molybdenum as Mo in ppm, Phosphorus as P %, Calcium as Ca %, Zinc as Zn, Manganese as Mn, Potassium as K%, Nitrogen as N%, Iron as Fe%, Copper as Cu, Boron as B, Sulphur in %, Chloride as Cl%.	Five Location	Once in Six Month
10.	Noise Level Monitoring	Noise level monitoring in dB(A)	10 Location	Once in a Quarter
11.	Cooling tower	pH @ 25 ° C, Free available chlorine, Zinc as Zn, Hexavalent Chromium, Total Chromium, Phosphate	09 Location	Once in a Quarter

1.1 AMBIENT AIR QUALITY

The scenario of the Ambient Air Quality in the study region has been assessed through a network of 5 locations of Ambient Air Quality Monitoring. The design of monitoring network in the air quality surveillance program was based on the following considerations.

- Topography / Terrain of the study area.
- Human Settlements
- Wind pattern
- Health status
- Representation of regional Background levels.
- Accessibility of monitoring site.
- Resource availability.

Pre-calibrated Respirable Dust Samplers (PM₁₀) & Fine Dust Samplers (PM_{2.5}) have been used for monitoring the existing AAQM Status. Maximum, Minimum, Average, Standard Deviation and percentile have been computed from the raw data collected at all individual sampling stations to represent the Ambient Air Quality Status.

The significant parameters viz., PM₁₀, PM_{2.5}, Sulphur Dioxide (SO₂) and Nitrogen Dioxides (NO₂) and Mercury were monitored within the study area of 10 km from the site.

1.2 FLUE GAS MONITORING

All three phases of the Thermal Power Plant is in operation. The flue gas emission from stack attached to individual boiler is monitored once in month during the monitoring period.

1.3 WATER QUALITY MONITORING

The water quality parameters as per IS: 10500 for water resource within the study area have been used for describing the water environment and assessing the impacts on it.

Groundwater samples of nearby villages were collected at five locations the parameters of prime importance selected under physicochemical characteristics were estimated to describe the baseline environmental status of the water resources during the monitoring period. Four bore well samples surrounding the ash dyke area were collected during the month of October 2019 along with outfall water sample.

1.4 AMBIENT NOISE LEVEL MONITORING

The Ambient Noise levels within the plant premises were relocated at a different location (10 nos.) For the implementation of effective noise control programs.

METEOROLOGICAL MONITORING REPORT

Period: – October 2019 to December 2019



1.5 MICROMETEOROLOGY

Meteorological parameters are important factors in the study of Air Pollution. The Transport and diffusion of the pollutants in the atmosphere are governed by meteorological factors.

Primary / Basic Meteorological Parameters

- Wind Velocity
- Wind Direction

Since the dispersion and diffusion of pollutants mainly depend on the above factors hence these factors are considered as primary meteorological parameters.

Secondary Meteorological Parameters

- Relative Humidity
- Ambient Temperature

The above-said factors are considered as secondary factors since these factors control the dispersion of the pollutant indirectly by affecting the primary factors.

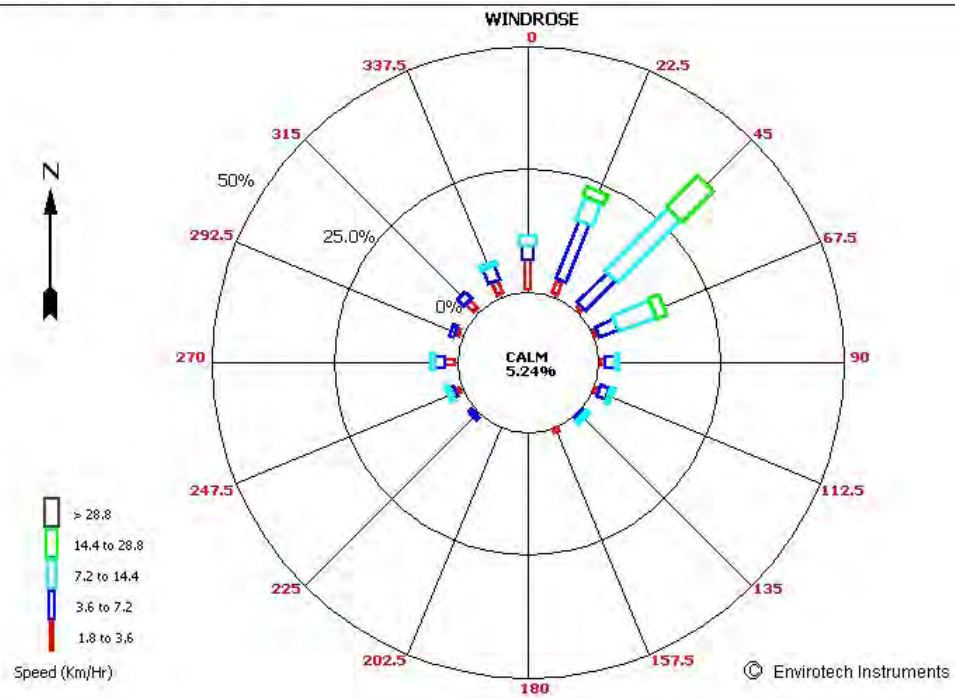
1.5.1 Wind Rose Diagram

Project	:	Adani Power (Mundra) Limited (APMuL)	Period	:	Oct. 2019 to Dec. 2019
Location	:	Village – Tunda, Dist. - Kutch			
October 2019					
Wind Direction			NE		
Average Wind Speed			7.1 km/hr		
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)			10.00 %		
November 2019					
Wind Direction			N		
Average Wind Speed			9.2 km/hr		
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)			1.97 %		
December 2019					
Wind Direction			NNE		
Average Wind Speed			8.8 km/hr		
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)			4.1 %		

ADANI POWER (MUNDRA) LIMITED – MUNDRA WINDROSE FOR THE SEASON OF Oct. to Dec. 2019

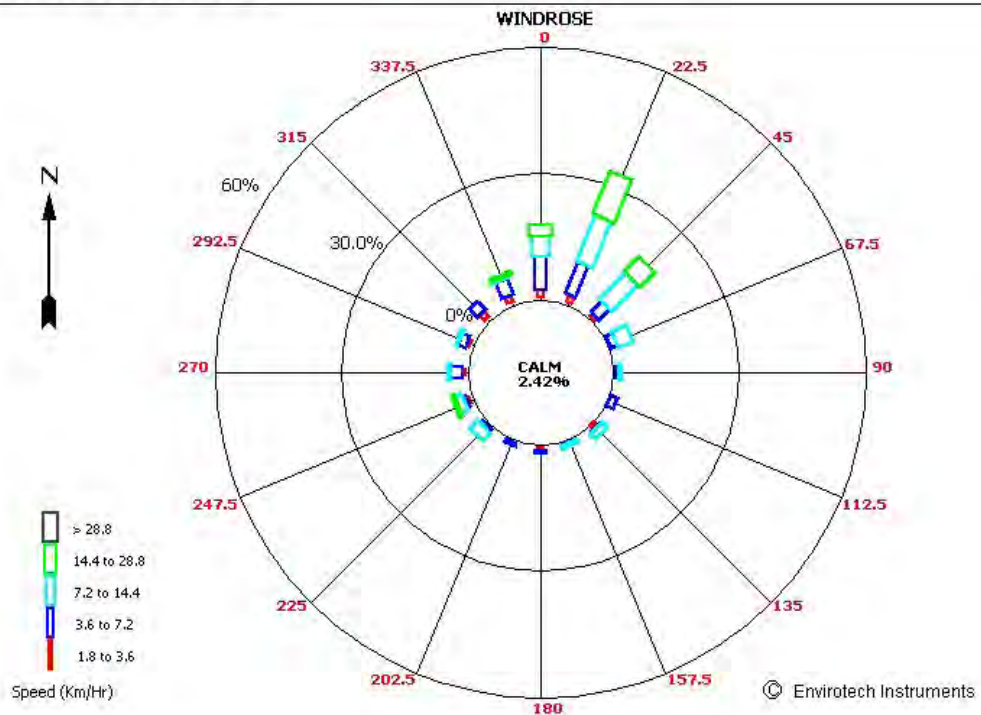
Time : 00:00 - 23:00
Date : 11/10/19 - 31/10/19

ADANI POWER (MUNDRA) LIMITED



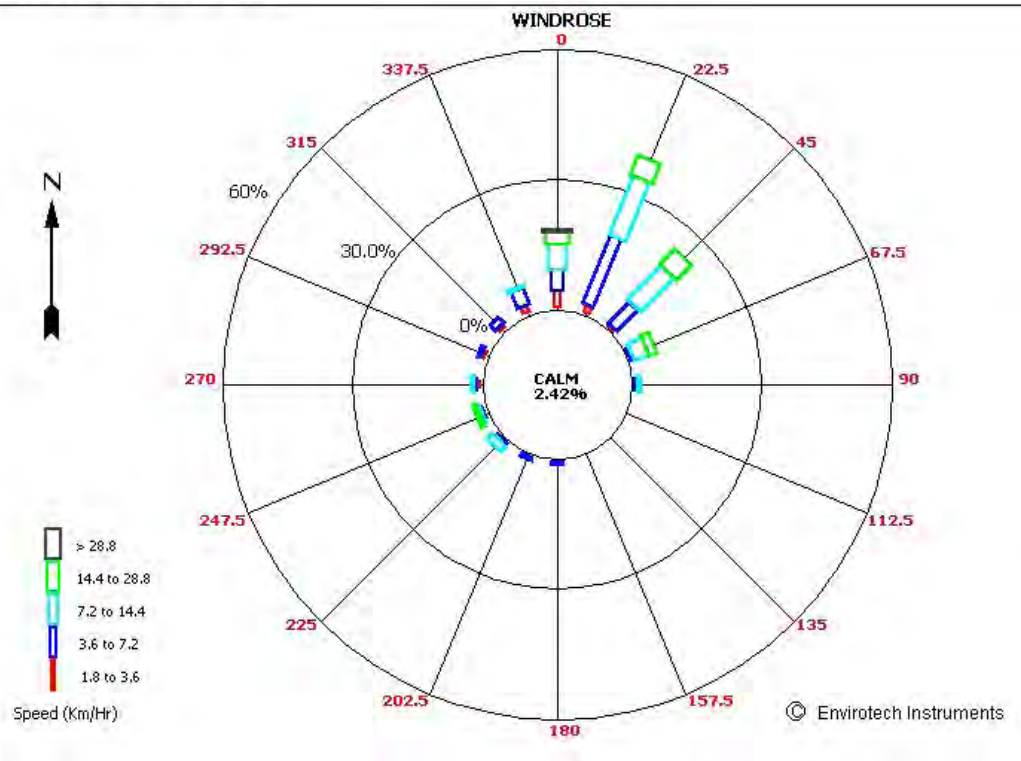
Time : 00:00 - 23:00
Date : 01/11/19 - 30/11/19

ADANI POWER (MUNDRA) LIMITED



Time : 00:00 - 23:00
Date : 02/12/19 - 31/12/19

ADANI POWER (MUNDRA) LIMITED



2 SCOPE & METHODOLOGY ADOPTED FOR ENVIRONMENTAL MONITORING

2.1 Introduction

The scope of the study includes detailed characterization of various environmental like air, water and noise within an area of 10 km radius in and around the power plant area at 20 MLD Plant , Shantiniketan -1 and surrounding villages named as Siracha, Wandh and Kandagara of Dist. Kutch.

The above mentioned environmental components were monitored at the study area and frequency of monitoring, number of samples along with methodology is as shown in below table.

2.2 Scope and Methodology for Monitoring of Various Environmental Attributes

Sr. No	Environmental Attributes	Sampling Locations	Sampling Parameters	Sampling Frequency	Total No of samples	Methodology
1	Ambient Air Quality	3	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	Twice a week (24 hourly Samples)	72	IS : 5182 & Reference APHA(AIR)
2	Ambient Air Quality	5	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , O ₃ , Mercury	Once in month (24 hourly Samples)	15	IS : 5182 & Reference APHA(AIR)
2	Flue Gas Stack Analysis	Unit 1 to 9 Boiler	PM, SO ₂ , NO _x	Once in month	27	As per IS : 11255
3	Surrounding Villages Ground Water Analysis	5 water sample	Test specification as per IS : 10500 - 1991	Once in Quarter	5	AS per APHA Method
4	Water Quality of Outfall for APMuL	1	As per CTO	Once in month	3	As Per APHA Method
5	STP Outlet	1	As per CTO	Once in month	3	As Per APHA Method
6	Bore well water Near Ash Dyke Area	4	Test specification as per IS : 10500 - 1991	Once in Quarter	4	As Per APHA Method
7	Cooling Tower Blow down Water Sample	9	As per CTO	Once in Quarter	9	As Per APHA Method
8	Condensate Cooling Tower Water Sample	9	As per CTO	Once in Quarter	9	As Per APHA Method
9	Boiler Blow down Water Sample	9	As per CTO	Once in Quarter	9	As Per APHA Method

3 ENVIRONMENTAL AIR QUALITY AND FLUE GAS MONITORING

The principle objective of the ambient air quality was to assess the existing levels of the air pollution as well as the regional background concentration in the plant area. Air pollution forms important and critical factors to study the environmental issues in the study areas. Thus, air quality has to be frequently monitored to know the extent of pollution due to power plant activity and other ancillary activities. Details are provided in Section 3.1.1.

Flue gas monitoring analysis has been conducted by UniStar Environment and Research Labs Pvt. Ltd. Details are provided in Section 3.2.

3.1 Ambient Air Monitoring Data

3.1.1 Details of Ambient Air Quality Monitoring Stations

The detail of the ambient air monitoring locations including the distance from the project site with direction is as shown below.

S.No.	Code	Name of sampling location	Distance
1	A - 1	Nr.20 MLD Plant	1.2 Km
2	A - 2	Nr. Shantiniketan-1	0.8 Km
3	A - 3	Kandagara Village	3.2 km (NW)
4	A - 4	Siracha Village	2.6 km (NE)
5	A - 5	Wandh Village	2.0 km (SW)

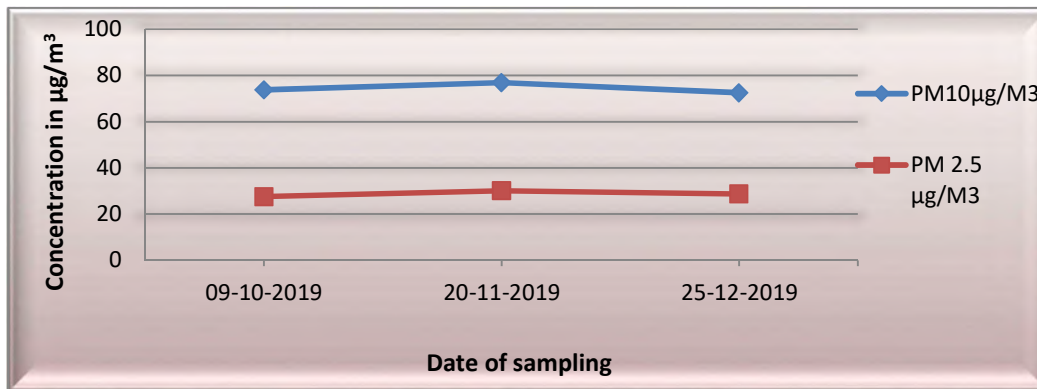
3.1.2 Location: Nr.20 MLD Plant

The Sampling station was located in the core zone in Company premises. The Respirable Dust Sampler (PM₁₀) & (PM_{2.5}) Sampler were placed at a height of 3 m above the ground level. Assess present pollution level the observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during monitoring period (Oct.2019- Dec.2019) are as follows:

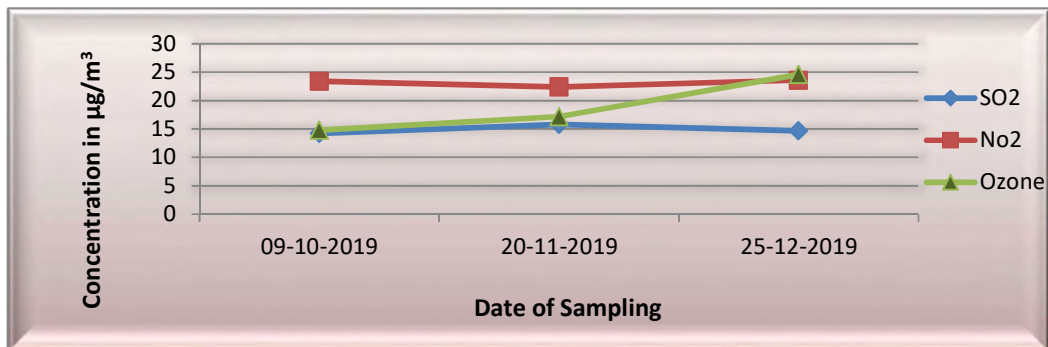
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	76.9	30.1	15.8	23.6	24.6
Minimum Value	72.5	27.6	14.2	22.4	14.8
Average Value	74.4	28.8	14.9	23.1	18.8
Standard Deviation	2.3	1.3	0.8	0.6	5.1
Permissible Limits	100	60	80	80	100

Units: µg/m³

Graph 1 : Particulate Matter Level Nr.20 MLD Plant



Graph 2: SO₂, NO₂ and O₃ Nr.20 MLD Plant



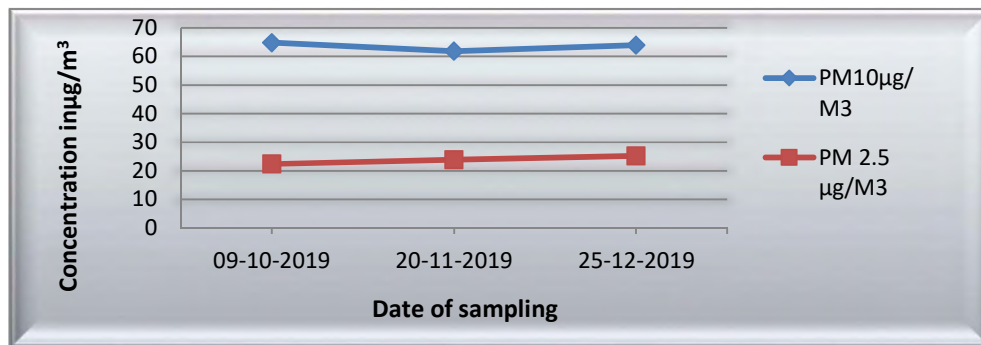
3.1.3 Location: Nr. Shantiniketan-1

The Sampling station was located in the core zone in company premises. The Respirable Dust Sampler PM₁₀ & PM_{2.5} Sampler were placed at a height of 3 m above the ground level. The observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during monitoring period (Oct.2019- Dec.2019) are as follows

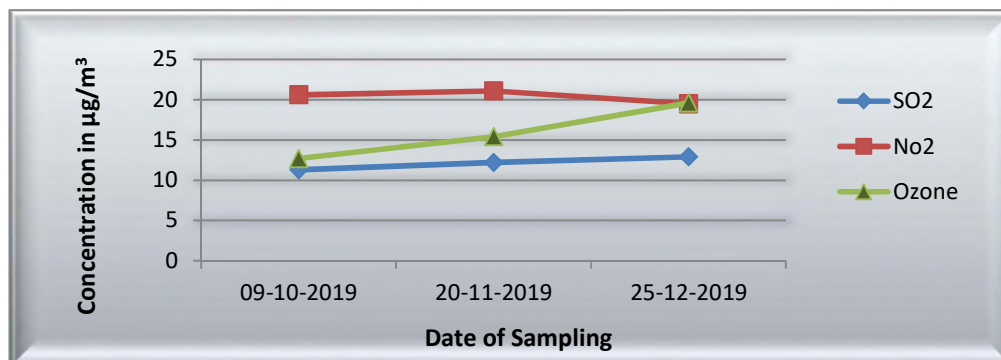
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	64.8	25.2	12.9	21.1	19.6
Minimum Value	61.8	22.4	11.3	19.5	12.7
Average Value	63.5	23.8	12.1	20.4	15.9
Standard Deviation	1.5	1.4	0.8	0.8	3.4
Permissible Limits	100	60	80	80	100

Units: µg/m³

Graph 3: Particulate Matter Level Nr. Shantiniketan-1



Graph 4 : SO₂, NO₂ and O₃ Nr. Shantiniketan-1



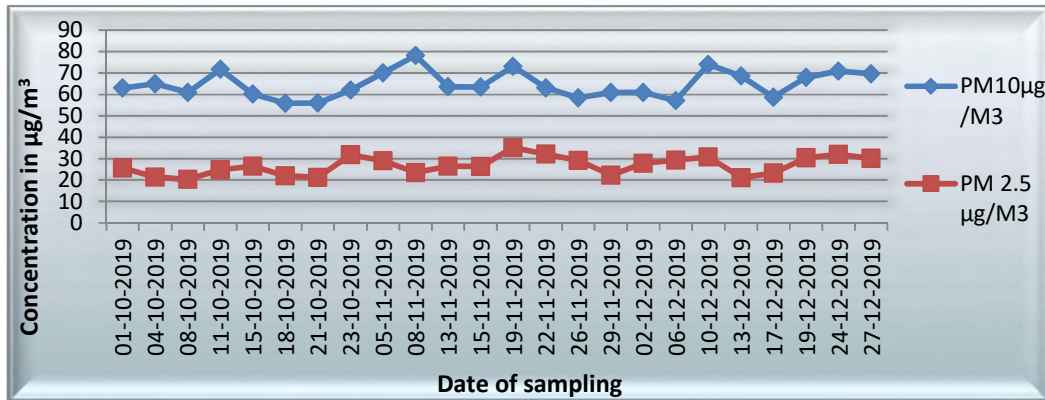
3.1.4 Location: Kandagara Village

The Sampling station was located in the core zone. The Station is located at about 3 km away in Northwest Direction from the Company premises. The Respirable Dust Sampler (PM₁₀) & PM_{2.5} Sampler were placed at a height of 1.5 m above the ground level. The observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during the monitoring period (Oct.2019- Dec.2019) are as follows.

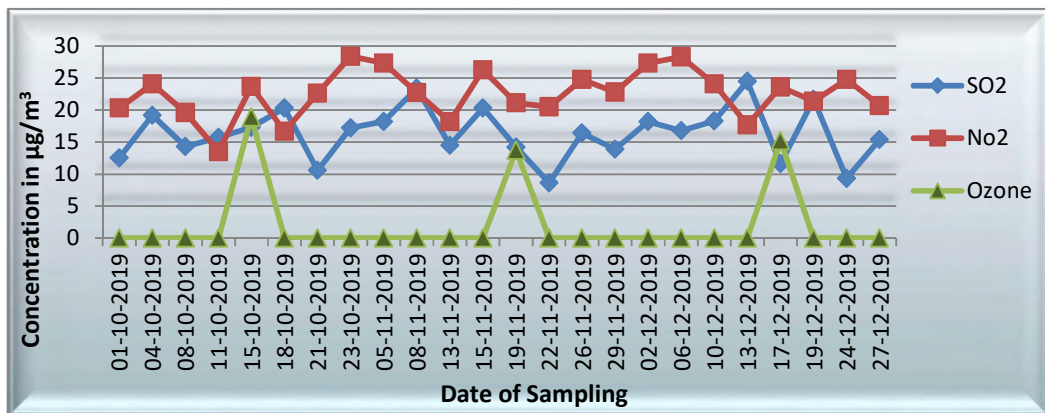
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	78.2	35.2	24.5	28.4	18.9
Minimum Value	55.9	20.3	8.6	13.5	13.7
Average Value	64.7	26.8	16.4	22.5	15.9
Standard Deviation	6.2	4.2	4.2	3.8	2.6
Permissible Limits	100	60	80	80	100

Units: µg/m³

Graph 5: Particulate Matter Level Kandagara Village



Graph 6 : SO₂, NO₂ and O₃ Level Kandagara Village



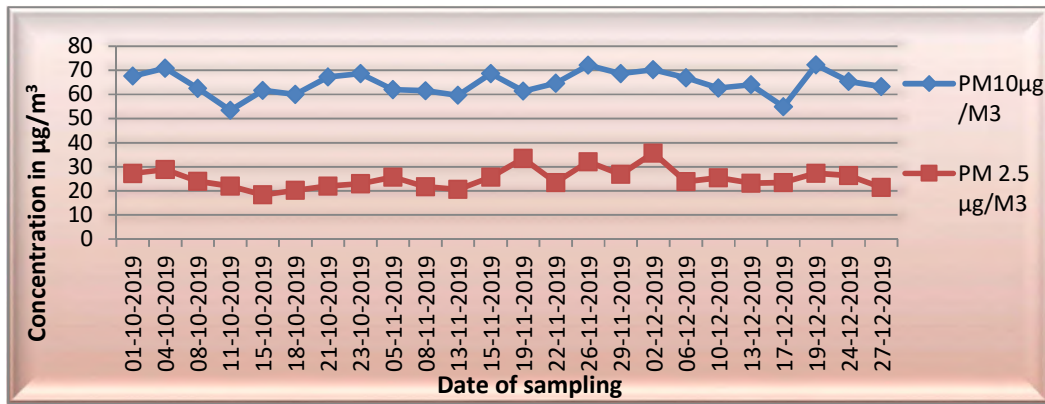
3.1.5 Location: Siracha Village

The Sampling station was located in the Siracha village. The Station is located at about 3.5 km away in Northwest Direction from the core zone area. The Respirable Dust Sampler & PM_{2.5} was placed at a height of 3.0 m above the ground level. The observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during the monitoring period (Oct.2019- Dec.2019) are as follows.

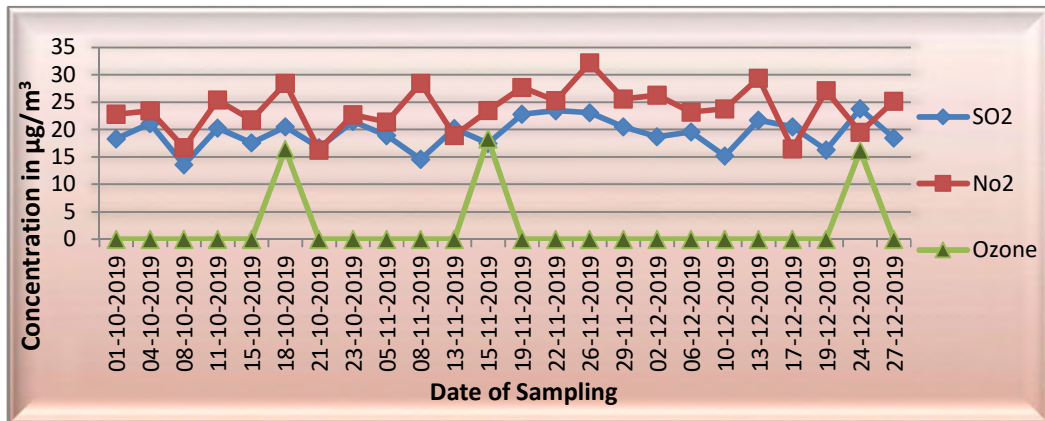
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	72.3	35.7	23.8	32.2	18.3
Minimum Value	53.4	18.3	13.6	16.3	16.2
Average Value	64.6	25.1	19.4	23.8	16.9
Standard Deviation	5.0	4.2	2.8	4.2	1.1
Permissible Limits	100	60	80	80	100

Units:µg/m³

Graph 7 : Particulate Matter Level Siracha Village



Graph 8 : SO₂, NO₂ and O₃ Level Siracha Village



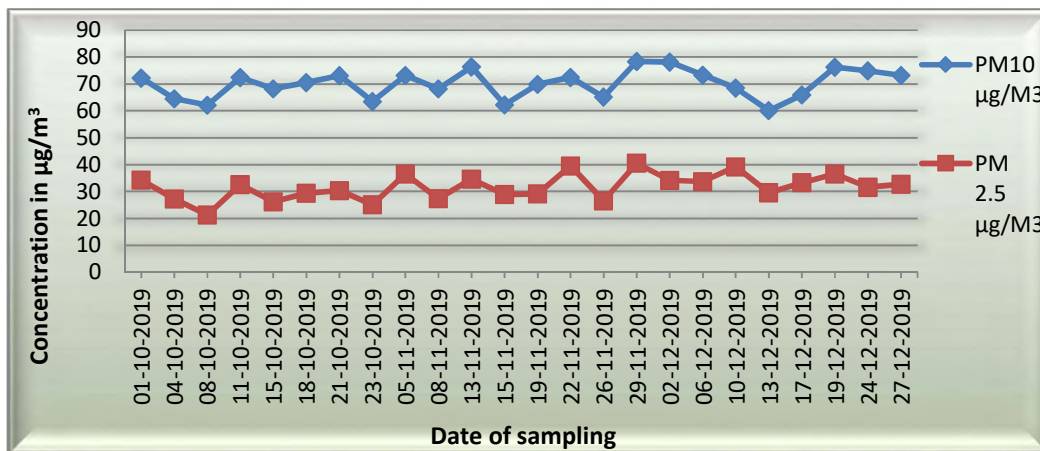
3.1.6 Location: Wandh Village

The Sampling station was located in the core zone in Wandh village. The Station is located at about 3.0 km away in Southwest Direction from the Company premises. The Respirable Dust Sampler Was placed at a height of 3.0 m above the ground level. The observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during the monitoring period (Oct.2019- Dec.2019) are as follows.

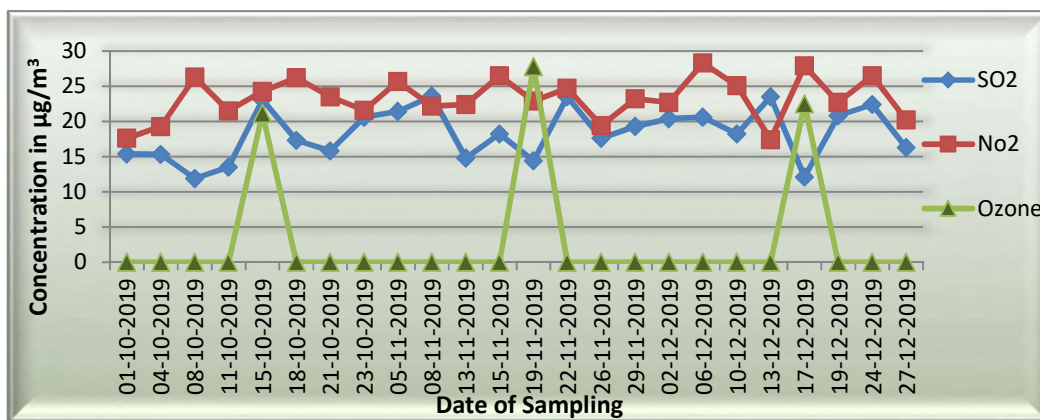
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	78.4	40.5	23.6	28.3	27.8
Minimum Value	60.1	21.3	11.9	17.4	21.1
Average Value	70.1	31.7	18.3	23.3	23.8
Standard Deviation	5.3	4.9	3.7	3.0	3.5
Permissible Limits	100	60	80	80	100

Units: µg/m³

Graph 9 : Particulate Matter Level Wandh Village



Graph 10 : SO₂, NO₂ and O₃ Level Wandh Village



3.1.7 Ambient Air Quality Monitoring (Parameters- Mercury & Ozone)

Location	October - 19			November - 19			December - 19		
	Date	Ozone (O ₃) µg/m ³	Mercury (Hg) µg/m ³	Date	Ozone (O ₃) µg/m ³	Mercury (Hg) µg/m ³	Date	Ozone (O ₃) µg/m ³	Mercury (Hg) µg/m ³
Village Kandagara	15.10.19	18.9	BDL	19.11.19	13.7	BDL	17.12.19	15.2	BDL
Village Wandh	15.10.19	21.1	BDL	19.11.19	27.8	BDL	17.12.19	22.5	BDL
Village Siracha	15.10.19	16.8	BDL	19.11.19	9.3	BDL	17.12.19	15.6	BDL
Nr. 20 MLD Plant	09.10.19	14.8	BDL	20.11.19	17.2	BDL	26.12.19	24.6	BDL
Nr. Shantiniketan-1	09.10.19	12.7	BDL	20.11.19	15.4	BDL	24.12.19	19.6	BDL

Remark: Calibrated equipment & instruments were used during monitoring & analysis of above identified sample.

Analysis Method Reference :

Hg : AAS by VGA Method -3112 B APHA 22 Edition : BDL Limit Hg : 2 ppb

O₃ : IS - 5182 (part 9) 2009 Ozone BDL limit: 5 µg/m³

3.2 Flue Gas Monitoring Data

Stack monitoring has been carried out by UniStar environment & Research Pvt. Ltd.

Date	Location	PM in mg/Nm ³	SO ₂ in mg/Nm ³	NO _x in mg/Nm ³
11-10-2019	Boiler (Unit - 1)	39.6	312.5	296.3
07-11-2019	Boiler (Unit - 1)	40.7	505.9	284.3
09-12-2019	Boiler (Unit - 1)	36.3	575.1	272.3
11-10-2019	Boiler (Unit - 2)	36.2	320.6	289.3
07-11-2019	Boiler (Unit - 2)	39.4	502.7	308.6
09-12-2019	Boiler (Unit - 2)	33.3	602.7	308.6
14-10-2019	Boiler (Unit - 3)	33.1	375	304.5
21-11-2019	Boiler (Unit - 3)	36.8	614.8	298.2
21-12-2019	Boiler (Unit - 3)	38.1	569.3	272.9
14-10-2019	Boiler (Unit - 4)	30.2	366.8	296.1
21-11-2019	Boiler (Unit - 4)	35.7	532.4	281.4
21-12-2019	Boiler (Unit - 4)	32.2	628.7	305.6
12-10-2019	Boiler (Unit - 5)	33.6	464.7	302.5
23-11-2019	Boiler (Unit - 5)	35.8	434.8	302.5
10-12-2019	Boiler (Unit - 5)	32.8	451.1	292.4
12-10-2019	Boiler (Unit - 6)	34.4	459.2	284.3
23-11-2019	Boiler (Unit - 6)	37.6	406	276.8
24-10-2019	Boiler (Unit - 7)	36.5	169.1	260.8
22-11-2019	Boiler (Unit - 7)	34.8	179.3	291.4
17-12-2019	Boiler (Unit - 7)	31.2	158.3	271.4
24-10-2019	Boiler (Unit - 8)	30.8	139.6	297.8
22-11-2019	Boiler (Unit - 8)	39.5	159.6	261.9
17-12-2019	Boiler (Unit - 8)	36	141.1	254.9
24-10-2019	Boiler (Unit - 9)	31	153.1	283.5
22-11-2019	Boiler (Unit - 9)	37.4	142.9	274.4
17-12-2019	Boiler (Unit - 9)	30.5	137.3	264.8
Permissible Limits		50	<500 MWH-600 >500 MWH-200	300

3.3 Water Quality Monitoring

3.3.1 Location: Tunda Village Water Sample

DATE: 15/10/2019

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	8.02	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	20	5	15
3	Odor	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	136.3	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	31.9	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	18	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1696	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	397.4	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	527.2	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	189.8	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	3.1	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.35	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.66	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	12	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.92	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	10	5	15
3	Odor	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	168.9	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	30.7	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	30.2	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1708	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	468.4	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	536.9	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	167.3	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	4.5	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.36	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.67	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	N.D.(MDL:0.001)
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	N.D.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	N.D.(MDL:0.01)
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	N.D.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	N.D.(MDL:0.003)
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	N.D.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	N.D.(MDL:0.1)
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	N.D.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	N.D.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	N.D.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	N.D.(MDL:0.001)
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	8	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.98	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	10	5	15
3	Odour	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	328.4	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	56.8	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	38.8	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1706	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	348.2	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	476.5	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	187.2	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	1.6	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.26	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.68	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	8	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.97	6.5 – 8.5	6.5 – 8.5
2	Colour	Pt-Co	10	5	15
3	Odour	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	203.3	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	29	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	32.4	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1680	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	323.9	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	512.6	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	179.6	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	2.2	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.32	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.62	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	8	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.8	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	10	5	15
3	Odor	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	229.3	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	42.6	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	29.7	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1718	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	477.3	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	541.9	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	208.0	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	3.5	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.41	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.6	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	8	100 CFU/ml	100 CFU/ml

Note: Colour = 1(10) = 10 APHA, BDL= Below Detection Limit. N.D. = Not Detected

3.4 Water Quality Monitoring – Plant area

3.4.1 Location: Outfall Channel

Sr. No.	Parameter	Unit	Date of sampling		
			23/10/2019	23/11/2019	04/12/2019
1	pH @ 25	--	7.51	7.58	7.49
2	Temperature	°C (Intake)	29.0	26.5	26.5
		°C (Outfall)	32.0	30.0	28.5
		°C (Differential)	3.0	3.5	2
3	Color	Pt. CO. Scale	10	10	10
4	Total Suspended Solids	mg/L	18	14	18
5	Oil & Grease	mg/L	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
6	Ammonical Nitrogen	mg/L	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
7	Sulphide as S-2	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
8	Total Chromium	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
9	Hexavalent Chromium as Cr+6	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
10	Phosphate as PO ₄	mg/L	0.33	0.28	0.22
11	Lead as Pb	mg/L	0.021	0.017	0.015
12	Copper as Cu	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
13	Zinc as Zn	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
14	Iron (as Fe)	mg/L	0.152	0.141	0.133
15	Chemical Oxygen Demand(COD)	mg/L	50.1	62.3	49.1
16	Biochemical Oxygen Demand (BOD)	mg/L	16	17	15

Note: BDL= Below Detection Limit. N.D. = Not Detected

3.4.2 Location: STP Outlet Water Sample;

Sr. No.	Parameter	Unit	SPCB Limit	Date of sampling		
				23/10/2019	23/11/2019	04/12/2019
1	pH @ 25 ° C	--	6.5-8.5	7.78	7.59	7.48
2	Total Suspended Solids	mg/L	30	22	18	15
3	Residual Chlorine	mg/L	0.5 Min.	0.65	0.62	0.69
4	Biochemical Oxygen Demand (BOD)	mg/L	20	16	14	12
5	Fecal Coliform	CFU/100ml	<1000	68	62	62

3.4.3 Location: ETP Outlet Water Sample;

S.N	Parameter	Unit	SPCB Limit	Date of sampling		
				23/10/2019	23/11/2019	04/12/2019
1	pH @ 25	--	6.5 – 8.5	7.63	7.47	7.33
2	Temperature	° C	40 Max.	32	33	32
3	Color	Pt. CO. Scale	100 Max.	40	40	40
4	Total Suspended Solids	mg/L	100 Max.	18	20	14
5	Oil & Grease	mg/L	10 Max.	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
6	Chemical Oxygen Demand (COD)	mg/L	100 Max.	50.3	49.5	45.2
7	Biochemical Oxygen Demand (BOD)	mg/L	30 Max.	16	15	13
8	Chloride as Cl ⁻	mg/L	600 Max.	444.1	423.2	396.6
9	Total Dissolved Solids	mg/L	2100 Max.	1618	1596	1404
10	Sulphate as SO ₄	mg/L	1000 Max.	193.6	133.1	120.2
11	Ammonical Nitrogen	mg/L	50 Max.	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
12	% Sodium(Na)	mg/L	60 Max.	53.7	45.6	43.9
13	Sodium Absorption Ratio(SAR)	mg/L	26 Max.	9.1	7.9	7.1
14	Sulphide as S ⁻²	mg/L	02 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
15	Total Chromium	mg/L	02 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
16	Hexavalent Chromium as Cr+6	mg/L	0.1 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
17	Phosphate as PO ₄	mg/L	5.0 Max.	0.66	0.47	0.38
18	Copper as Cu	mg/L	03 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
19	Lead as Pb	mg/L	0.1 Max.	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
20	Zinc as Zn	mg/L	05 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
21	Residual Free Chlorine	mg/L	0.5 Max.	BDL(MDL:0.2)	BDL(MDL:0.2)	BDL(MDL:0.2)
22	Iron (as Fe)	mg/L	1.0 Max.	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)

Note: N.D. = Not Detected, MDL = Minimum Detection Limit

3.4.4 Location: Bore-well – 1 to 4 (Nr. Emergency Ash Pond)
Date: 02/12/2019

Sr.No.	Parameter	Unit	Results			
			Borewell-1	Borewell-2	Borewell-3	Borewell-4
1	pH @ 25 ° C	-	7.41	7.19	7.57	7.96
2	Conductivity (µS)	-	15956.25	17647	15416	16444
3	Chloride as Cl ⁻	mg/L	4682.5	4538.7	4596.3	4624.1
4	Salinity (ppt)	mg/L	8.5	8.2	8.3	8.35
5	Total Dissolved Solids	mg/L	10212	11352.6	9866	10524
6	Carbonate as CaCO ₃	mg/L	23.64	33.2	36.3	28.1
7	Bicarbonate as CaCO ₃	mg/L	192.5	165.2	172.3	182.3
8	Mercury as Hg	mg/L	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)
9	Arsenic as As	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
10	Lead as Pb	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
11	Chromium as Cr	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
12	Cadmium as Cd	mg/L	BDL(MDL:0.03)	BDL(MDL:0.03)	BDL(MDL:0.03)	BDL(MDL:0.03)
13	Iron (as Fe)	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)
14	Zinc (as Zn)	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
15	Total Alkalinity	mg/L	442.2	465.5	420.2	469.3
16	Calcium as Ca	mg/L	352.6	380.205	336.6	365.5
17	Magnesium as Mg	mg/L	239.3	246.3	205.5	239.2
18	Sodium as Na	mg/L	1715	2010	1614	1914
19	Potassium as K	mg/L	102.5	119.3	95.5	105.5
20	Sulphate as SO ₄ -2	mg/L	644	796	647.5	744
21	Nitrate as NO ₃	mg/L	26.6	29.2	23.3	28.6
22	Phosphate as PO ₄	mg/L	2.62	3.1	2.1	2.95
23	Barium as Ba	mg/L	N.D.	N.D.	N.D.	N.D.
24	Fluoride as F	mg/L	2.47	2.85	2.05	2.85
25	Cobalt as Co	mg/L	N.D.	N.D.	N.D.	N.D.
26	Copper as Cu	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
27	Manganese as Mn	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)
28	Nickel as Ni	mg/L	BDL(MDL:0.02)	BDL(MDL:0.02)	BDL(MDL:0.02)	BDL(MDL:0.02)

Note: N.D. = Not Detected, MDL = Minimum Detection Limit

3.4.5 Location: Cooling Tower Blow down Water Sample

S.No.	Parameter	Unit	Limit	Results			
				Unit-1	Unit-2	Unit-3	Unit-4
Date of Sampling →				05/12/2019	05/12/2019	05/12/2019	05/12/2019
1	pH @ 25 ° C	--	-	8.14	8.13	8.16	8.10
2	Free available Chlorine	° C	Min. 0.5	0.74	0.68	0.72	0.77
3	Zinc as Zn	Pt. CO. Scale	1.0	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
4	Hexavalent Chromium as Cr+6	mg/L	0.1	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
5	Total Chromium as Cr	mg/L	0.2	0.056	0.062	0.068	0.069
6	Phosphate as P	mg/L	5.0	0.22	0.52	0.34	0.77

S.No	Parameter	Unit	Limit	Results				
				Unit-5	Unit-6	Unit-7	Unit-8	Unit-9
Date of Sampling →				05/12/2019	05/12/2019	05/12/2019	05/12/2019	05/12/2019
1	pH @ 25 ° C	--	-	8.12	8.16	8.14	8.25	0.65
2	Free available Chlorine	° C	Min. 0.5	0.81	0.71	0.74	0.74	BDL(MDL:0.05)
3	Zinc as Zn	Pt. CO. Scale	1.0	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
4	Hexavalent Chromium as Cr+6	mg/L	0.1	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
5	Total Chromium as Cr	mg/L	0.2	BDL(MDL:0.05)	BDL(MDL:0.05)	0.073	BDL(MDL:0.05)	0.44
6	Phosphate as P	mg/L	5.0	0.54	0.52	0.61	0.63	0.65

3.4.6 Location: Condensate Cooling Tower Water Sample

S.No.	Parameter	Unit	Limit	Results			
				Unit-1	Unit-2	Unit-3	Unit-4
Date of Sampling →				05/12/2019	05/12/2019	05/12/2019	05/12/2019
1	pH @ 25 ° C	--	6.5 to 8.5	8.08	8.11	8.13	8.09
2	Temperature °C (Intake)	°C	--	28.6	28.8	28.8	28.6
	Temperature °C (Outlet)	°C	--	31.5	31.7	31.8	31.4
	Temperature °C (Differential)	°C	7	2.9	2.9	3.0	2.8
3	Free available Chlorine	mg/L	Min 0.5	0.62	0.71	0.72	0.67

S.No.	Parameter	Unit	Limit	Results				
				Unit-5	Unit-6	Unit-7	Unit-8	Unit-9
Date of Sampling →				05/12/2019	05/12/2019	05/12/2019	05/12/2019	05/12/2019
1	pH @ 25 ° C	--	6.5 to 8.5	8.11	8.10	8.05	8.13	8.11
2	Temperature °C (Intake)	°C	--	28.9	28.5	28.6	28.6	29.0
	Temperature °C (Outlet)	°C	--	31.7	31.4	31.4	31.5	31.7
	Temperature °C (Differential)	°C	7	2.8	2.9	2.8	2.9	2.7
3	Free available Chlorine	mg/L	Min 0.5	0.66	0.69	0.68	0.69	0.63

Sr. No.	Parameter	Unit	Limit	Results			
				Unit -1	Unit -2	Unit -3	Unit -4
1	Total Suspended Solids	mg/L	100	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)
2	Oil & Grease	mg/L	10	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
3	Total Copper as Cu	mg/L	1.0	0.08	0.06	0.08	0.09
4	Total Iron (as Fe)	mg/L	1.0	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)

4 AMBIENT NOISE LEVEL MONITORING

The main objective of noise monitoring in the study area is to establish the baseline noise levels and assess the impact of the total noise generated by the operation activities around it. Noise monitoring has been conducted at 10 locations within the periphery of industry premises.

Date of Monitoring: 14-15.10.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A)	Sampling Time	Night Time dB(A)
			06 am - 10 pm		10 pm - 06 am
		Limit 75 dB(A)	Limit 70 dB(A)		
1.	Nr. LDO Pump House	10:10 am - 14:05 pm	61.8	22:05 pm -01:50 am	60.2
2.	Nr. 20 MLD Plant		64.2		62.3
3.	Nr. Pump House		62.9		59.5
4.	Nr. Coal Handling plant		65.8		61.2
5.	Nr. Gate No.4		60.1		55.4
6.	Nr. Integrated Ash Silo		65.2		60.4
7.	Nr. Main Gate		57.2		55.3
8.	Nr. APCH Building		59.3		58.4
9.	Nr. Shantiniketan-I		58.4		57.1
10.	Nr.OHC Building		61.3		59.3

Remark: Calibrated instruments were used during monitoring of above identified sample.

Date of Monitoring: 21-22.11.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A)	Sampling Time	Night Time dB(A)
			06 am - 10 pm		10 pm - 06 am
		Limit 75 dB(A)	Limit 70 dB(A)		
1.	Nr. LDO Pump House	10:40 am - 14:15 pm	63.2	22:05 pm -01:50 am	60.3
2.	Nr. 20 MLD Plant		61.3		60.1
3.	Nr. Pump House		64.6		62.7
4.	Nr. Coal Handling plant		64.2		63.6
5.	Nr. Gate No.4		60.1		59.0
6.	Nr. Integrated Ash Silo		65.7		63.5
7.	Nr. Main Gate		62.2		61.9
8.	Nr. APCH Building		60.6		60.3
9.	Nr. Shantiniketan-I		61.9		59.7
10.	Nr.OHC Building		59.3		58.4

Remark: Calibrated instruments were used during monitoring of above identified sample.

Date of Monitoring: 22-23.12.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A)	Sampling Time	Night Time dB(A)
			06 am - 10 pm		10 pm - 06 am
		Limit 75 dB(A)	Limit 70 dB(A)		
1.	Nr. LDO Pump House	10:15 am - 14:05 pm	64.8	22:15 pm -01:55 am	62.3
2.	Nr. 20 MLD Plant		63.2		60.1
3.	Nr. Pump House		62.8		60.7
4.	Nr. Coal Handling plant		64.9		62.2
5.	Nr. Gate No.4		61.9		59.4
6.	Nr. Integrated Ash Silo		67.1		63.5
7.	Nr. Main Gate		63.2		60.9
8.	Nr. APCH Building		61.2		60.3
9.	Nr. Shantiniketan-I		59.4		57.7
10.	Nr.OHC Building		60.7		58.4

Remark: Calibrated instruments were used during monitoring of above identified sample.

ENVIRONMENTAL MONITORING REPORT

**AMBIENT AIR QUALITY, STACK EMISSION, WATER
QUALITY AND NOISE MONITORING**

Period: January 2020 to March 2020

For

M/S. ADANI POWER (MUNDRA) LIMITED



**At
Tunda & Siracha,
Tal. Mundra, Dist.: Kutch.
KUTCH, GUJARAT – 370 435**

Prepared By



This report is released for the use of the Adani Power (Mundra) Limited for Regulators and relevant stakeholders solely as part of the Environmental Clearance and Consent to operate (CTO) compliances. Information provided (unless attributed to referenced third parties) is otherwise copy righted and shall not be used for any other purpose without the written consent of UniStar Environment & Research Labs Pvt. Ltd.

QUALITY CONTROL							
Name of Publication	Environmental Quality Monitoring Report for the Quarter January 2020 - March 2020						
Project Number	03	Report No.	UERL/ENV/JAN/ 01-03 /2020	Version	1	Released	April- 2020
Project Coordinator	Mr. Bhavin Patel						
Prepared By	Miss. Shweta A. Rana						
Checked By	Mr. Jaivik Tandel						
DISCLAIMER							
UniStar has taken all reasonable precautions in the preparation of this report as per its auditable quality plan. UniStar Environment & Research Labs Pvt. Ltd. also believes that the facts presented in the report are accurate as on the date it was written. However, it is impossible to dismiss absolutely, the possibility of errors or omissions; UniStar therefore specifically disclaims any liability resulting from the use or application of the information contained in this report. The information is not intended to serve as legal advice related to the individual situation.							

FOR
UniStar Environment and
Research Labs Pvt. Ltd.

Mr. Jaivik Tandel
(Authorized By)



CONTENTS

1.0	ENVIRONMENTAL PARAMETERS.....	06
1.1	Ambient Air Quality.....	07
1.2	Flue gas monitoring	07
1.3	Water Quality monitoring	07
1.4	Ambient Noise Level Monitoring.....	07
1.5	Micrometeorology	08
1.5.1	Wind Rose Diagram	09
2.0	SCOPE & METHODOLOGY ADOPTED FOR ENVIRONMENTAL MONITORING.....	12
2.1	Introduction	12
2.2	Scope and Methodology for Monitoring of Various Environmental Attributes.....	12
3.0	ENVIRONMENTAL AIR QUALITY AND FLUE GAS MONITORING.....	13
3.1	Ambient Air Quality Monitoring Data	13
3.1.1	Details of Ambient Air Quality Monitoring Stations	13
3.1.2	Location: Nr. 20 MLD Plant	14
3.1.3	Location: Nr. Shantiniketan.....	15
3.1.4	Location: Kandagara Village	16
3.1.5	Location: Siracha Village	17
3.1.6	Location: Wandh Village	18
3.1.7	Ambient Air Quality Monitoring (Parameters- Mercury & Ozone).....	19
3.2	Flue Gas Monitoring Data	20
3.3	Water Quality Monitoring	21
3.3.1	Location: Tunda Village Water sample	21
3.3.2	Location: Kandagara Village Water sample.....	22
3.3.3	Location: Siracha Village Water sample.....	23
3.3.4	Location: Navinal Village Water sample	24
3.3.5	Location: Desalpur Village Water sample	25
3.4	Water Quality Monitoring – Plant area	26
3.4.1	Location: Outfall Channel	26
3.4.2	Location: STP Outlet	26
3.4.3	Location: ETP Outlet	27
3.4.4	Location: Bore-well Water Sample (Nr. Emergency Ash point).....	28
3.4.5	Location: Cooling Tower Blow down Water Sample.....	29
3.4.6	Location: Condensate Cooling Tower Water Sample.....	30
3.4.7	Location: Boiler Blow Down Water Sample.....	31
4.0	AMBIENT NOISE QUALITY MONITORING.....	31

[LIST OF GRAPHS](#)

Graph 1 : Particulate Matter Level Nr.20 MLD Plant	14
Graph 2: SO ₂ and NO ₂ Level Nr.20 MLD Plant	14
Graph 3: Particulate Matter Level Nr. Shantiniketan-1	15
Graph 4 : SO ₂ and NO _X Level Nr. Shantiniketan-1	15
Graph 5: Particulate Matter Level Kandagara Village	16
Graph 6 : SO ₂ and NO ₂ Level Kandagara Village	16
Graph 7 : Particulate Matter Level Siracha Village	17
Graph 8 : SO ₂ and NO ₂ Level Siracha Village	17
Graph 9 : Particulate Matter Level Wandh Village	18
Graph 10 : SO ₂ and NO ₂ Level Wandh Village	18

EXECUTIVE SUMMARY

Adani Power (Mundra) Limited (APMuL) has total generation capacity of 4620MW in phased manner at Mundra Thermal (coal Based) Power Plant near Village Tunda in Mundra, District Kutch, and Gujarat. The phased wise development being undertaken for ultimate capacity of power plant is shown below.

- First Phase : 2 x 330 MW
- Second Phase : 2 x 330 MW + 2 x 660 MW
- Third Phase : 3 x 660 MW

The Thermal Power Plant is located near Village Tunda, Mundra Taluka in Kutch District. The Site is closed to the sea, making cooling water perennially available for the power plant. The Power Plant is based on supercritical technology using imported coal.

All three phase of the power plant is operational and as the part of the compliance to the statutory requirement, M/s. Adani Power (Mundra) Limited has entrusted the environmental quality monitoring study for the area surrounding the power plant. Adani Power (Mundra) Limited Implemented ISO-14001:2015 Environment Management System (EMS) and Accreditation of NABL in Environmental Laboratory (ISO/IEC 17025:2017) vide Certificate No. TC-5215.

Various environmental parameters have been monitored during the period of January 2020-March 2020. The detail of the environmental parameters along with frequency of monitoring is shown in subsequent sections.

1. ENVIRONMENTAL PARAMETERS

Sr. No.	Environmental Indices	Parameter	No. of Location and Monitoring.	Frequency of Sampling
1.	Ambient Air Quality	PM ₁₀ , PM _{2.5} , Sulphur Dioxide and Nitrogen Dioxide	Three Location	Twice a week
2.	Ambient Air Quality	PM ₁₀ , PM _{2.5} , Sulphur Dioxide, Nitrogen Dioxide, Ozone and Mercury	Two Location	Once in a month
3.	Stack Monitoring	PM, Sulphur Dioxide, Oxide of Nitrogen and Hg	Nine Location	Once in a month
4.	Meteorological Monitoring	Wind rose, Wind speed, Wind direction, Rainfall, Temperature, Relative Humidity	One location	Round the clock
5.	Surrounding Villages Ground Water Analysis	Colour, Odour, Taste, Turbidity, Dissolved Solids, pH value, Total Hardness, Calcium, Boron, Copper, Iron, Manganese, Chloride, Sulphate, Nitrate, Fluoride, Phenolic Compounds, Mercury, Cadmium, Selenium, Arsenic, Cyanide, Lead, Zinc, Anionic Detergents as MBAS, Chromium Cr+6, Mineral Oil, MPN Index for Coliform Bacteria per 100 ml, Residual Free Chlorine, Aluminium, Alkalinity, Magnesium as Mg, Escherichia Coli in 250 ml.	Five Location	Once in Quarter
6.	Effluent Water Sample	pH, Temperature, colour, SS, O & G, BOD ₃ , COD, Chlorides, TDS, Sulphates, Ammonical Nitrogen, % Sodium, Sodium Absorption Ratio, Sulphides, Total Chromium, Hexavalent Chromium, Copper, Lead, Zinc, Free available chlorine, Phosphate, Iron	Four Location	Once in a month / Quarter
7.	STP Water Analysis	pH, Residual Chlorine, SS, BOD, COD, Faecal coliform	Three Location	Once in month/ Quarter
8.	Borwell water Near Ash Dyke Area	pH @ 25 ° C, Conductivity (µS), Chloride as Cl ⁻ Salinity (ppt), Total Dissolved Solids, Carbonate as CaCO ₃ , Bicarbonate as CaCO ₃ , Mercury as Hg, Arsenic as As, Lead as Pb, Chromium as Cr, Cadmium as Cd.	Four Location	Once in a Quarter
9.	Surrounding Villages Soil Analysis	Magnesium as Mg %, Molybdenum as Mo in ppm, Phosphorus as P %, Calcium as Ca %, Zinc as Zn, Manganese as Mn, Potassium as K%, Nitrogen as N%, Iron as Fe%, Copper as Cu, Boron as B, Sulphur in %, Chloride as Cl%.	Five Location	Once in Six Month
10.	Noise Level Monitoring	Noise level monitoring in dB(A)	10 Location	Once in a Quarter
11.	Cooling tower	pH @ 25 ° C, Free available chlorine, Zinc as Zn, Hexavalent Chromium, Total Chromium, Phosphate	09 Location	Once in a Quarter

1.1 AMBIENT AIR QUALITY

The scenario of the Ambient Air Quality in the study region has been assessed through a network of 5 locations of Ambient Air Quality Monitoring. The design of monitoring network in the air quality surveillance program was based on the following considerations.

- Topography / Terrain of the study area.
- Human Settlements
- Wind pattern
- Health status
- Representation of regional Background levels.
- Accessibility of monitoring site.
- Resource availability.

Pre-calibrated Respirable Dust Samplers (PM₁₀) & Fine Dust Samplers (PM_{2.5}) have been used for monitoring the existing AAQM Status. Maximum, Minimum, Average, Standard Deviation and percentile have been computed from the raw data collected at all individual sampling stations to represent the Ambient Air Quality Status.

The significant parameters viz., PM₁₀, PM_{2.5}, Sulphur Dioxide (SO₂) and Nitrogen Dioxides (NO₂) and Mercury were monitored within the study area of 10 km from the site.

1.2 FLUE GAS MONITORING

All three phases of the Thermal Power Plant is in operation. The flue gas emission from stack attached to individual boiler is monitored once in month during the monitoring period.

1.3 WATER QUALITY MONITORING

The water quality parameters as per IS: 10500 for water resource within the study area have been used for describing the water environment and assessing the impacts on it.

Groundwater samples of nearby villages were collected at five locations the parameters of prime importance selected under physicochemical characteristics were estimated to describe the baseline environmental status of the water resources during the monitoring period. Four bore well samples surrounding the ash dyke area were collected during the month of March 2020 along with outfall water sample.

1.4 AMBIENT NOISE LEVEL MONITORING

The Ambient Noise levels within the plant premises were relocated at a different location (10 nos.) For the implementation of effective noise control programs.

METEOROLOGICAL MONITORING REPORT

Period: – January 2020 to March 2020



1.5 MICROMETEOROLOGY

Meteorological parameters are important factors in the study of Air Pollution. The Transport and diffusion of the pollutants in the atmosphere are governed by meteorological factors.

Primary / Basic Meteorological Parameters

- Wind Velocity
- Wind Direction

Since the dispersion and diffusion of pollutants mainly depend on the above factors hence these factors are considered as primary meteorological parameters.

Secondary Meteorological Parameters

- Relative Humidity
- Ambient Temperature

The above-said factors are considered as secondary factors since these factors control the dispersion of the pollutant indirectly by affecting the primary factors.

1.5.1 Wind Rose Diagram

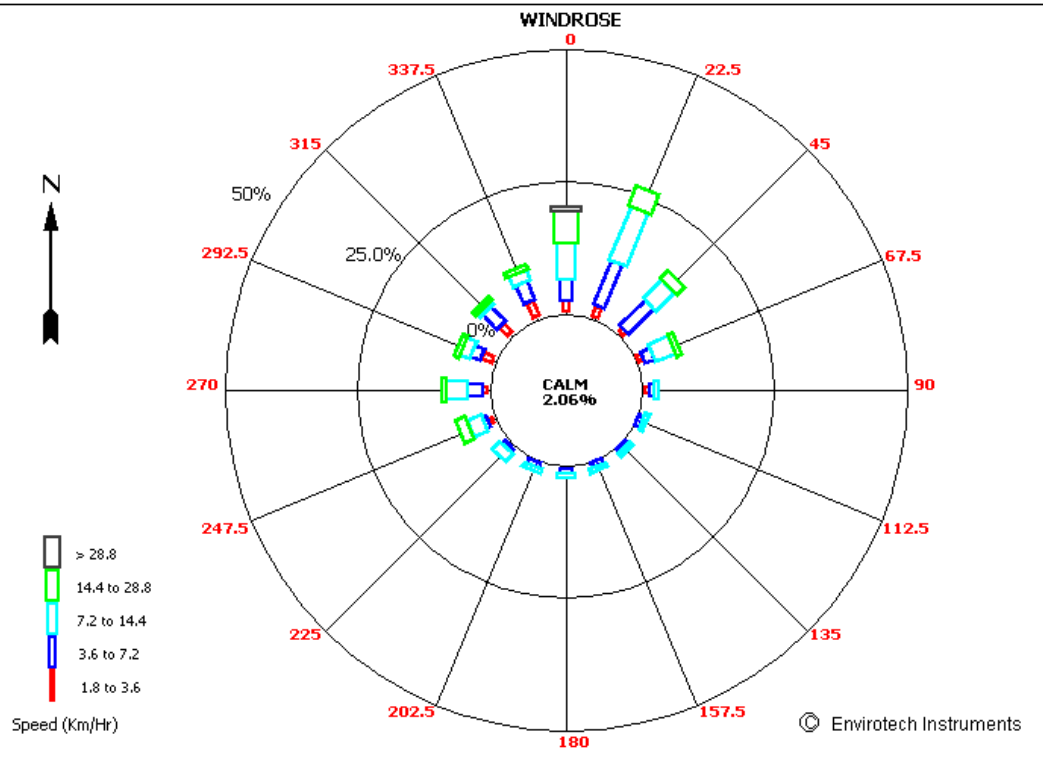
Project	:	Adani Power (Mundra) Limited (APMuL)	Period	:	Jan. 2020 to Mar. 2020
Location	:	Village – Tunda, Dist. - Kutch			
January 2020					
Wind Direction			NNE		
Average Wind Speed			8.8 km/hr		
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)			1.89 %		
February 2020					
Wind Direction			NNE		
Average Wind Speed			7.5 km/hr		
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)			3.17 %		
March 2020					
Wind Direction			W		
Average Wind Speed			9.1 km/hr		
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)			2.87 %		

ADANI POWER (MUNDRA) LIMITED – MUNDRA WINDROSE FOR THE SEASON OF Jan. to March. 2020

Time : 00:00 - 23:00

Date : 01/01/20 - 31/01/20

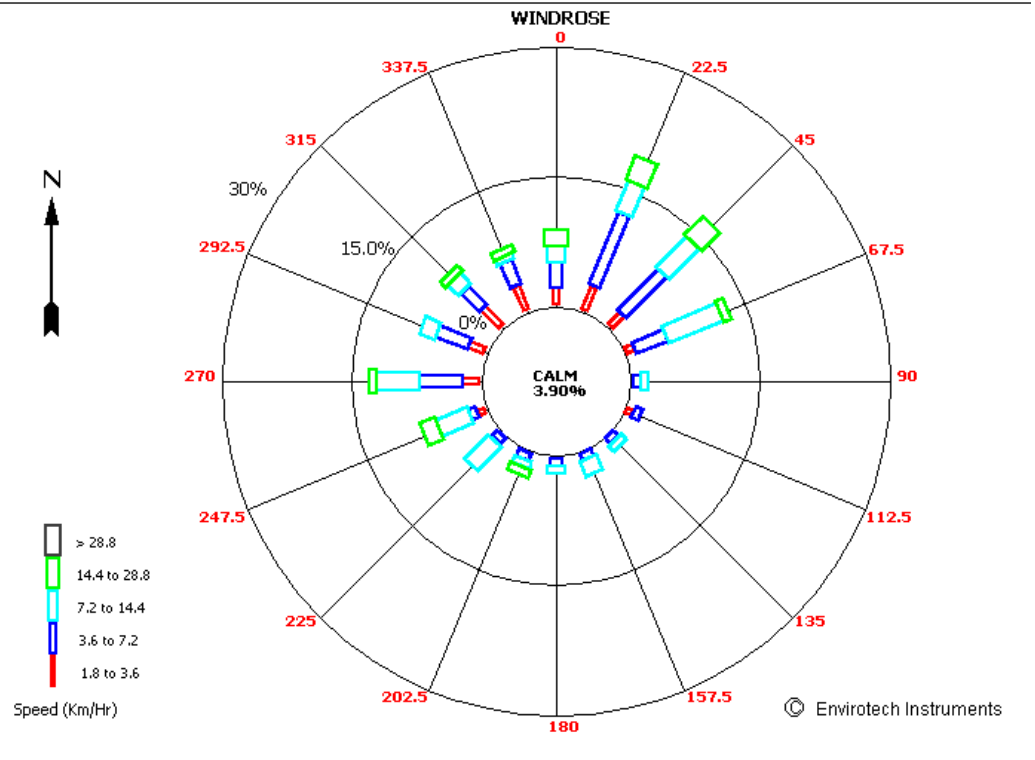
ADANI POWER(MUNDRA) LIMITED



Time : 00:00 - 23:00

Date : 01/02/20 - 29/02/20

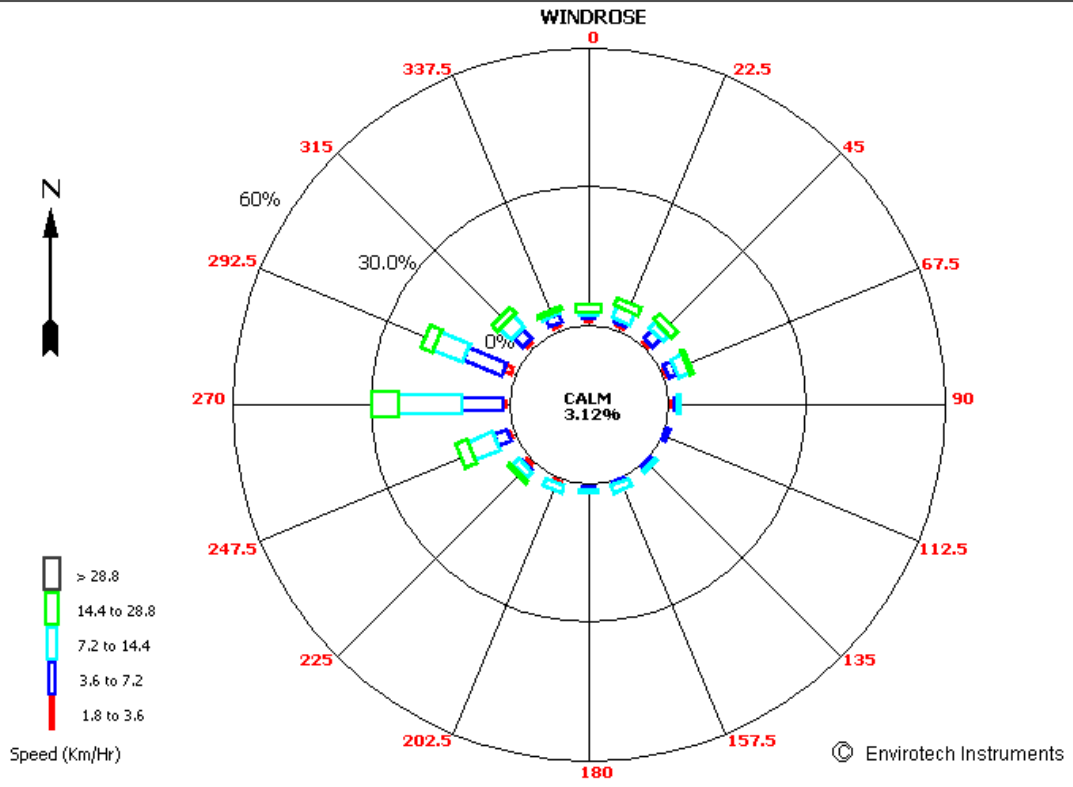
ADANI POWER(MUNDRA) LIMITED



Time : 00:00 - 23:00

Date : 02/03/20 - 31/03/20

ADANI POWER(MUNDRA) LIMITED



2 SCOPE & METHODOLOGY ADOPTED FOR ENVIRONMENTAL MONITORING

2.1 Introduction

The scope of the study includes detailed characterization of various environmental like air, water and noise within an area of 10 km radius in and around the power plant area at 20 MLD Plant , Shantiniketan -1 and surrounding villages named as Siracha, Wandh and Kandagara of Dist. Kutch.

The above mentioned environmental components were monitored at the study area and frequency of monitoring, number of samples along with methodology is as shown in below table.

2.2 Scope and Methodology for Monitoring of Various Environmental Attributes

Sr. No	Environmental Attributes	Sampling Locations	Sampling Parameters	Sampling Frequency	Total No of samples	Methodology
1	Ambient Air Quality	3	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	Twice a week (24 hourly Samples)	72	IS : 5182 & Reference APHA(AIR)
2	Ambient Air Quality	5	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , O ₃ , Mercury	Once in month (24 hourly Samples)	15	IS : 5182 & Reference APHA(AIR)
2	Flue Gas Stack Analysis	Unit 1 to 9 Boiler	PM, SO ₂ , NOx	Once in month	27	As per IS : 11255
3	Surrounding Villages Ground Water Analysis	5 water sample	Test specification as per IS : 10500 - 1991	Once in Quarter	5	AS per APHA Method
4	Water Quality of Outfall for APMuL	1	As per CTO	Once in month	3	As Per APHA Method
5	STP Outlet	1	As per CTO	Once in month	3	As Per APHA Method
6	Bore well water Near Ash Dyke Area	4	Test specification as per IS : 10500 - 1991	Once in Quarter	4	As Per APHA Method
7	Cooling Tower Blow down Water Sample	9	As per CTO	Once in Quarter	9	As Per APHA Method
8	Condensate Cooling Tower Water Sample	9	As per CTO	Once in Quarter	9	As Per APHA Method
9	Boiler Blow down Water Sample	4	As per CTO	Once in Quarter	4	As Per APHA Method

3 ENVIRONMENTAL AIR QUALITY AND FLUE GAS MONITORING

The principle objective of the ambient air quality was to assess the existing levels of the air pollution as well as the regional background concentration in the plant area. Air pollution forms important and critical factors to study the environmental issues in the study areas. Thus, air quality has to be frequently monitored to know the extent of pollution due to power plant activity and other ancillary activities. Details are provided in Section 3.1.1.

Flue gas monitoring analysis has been conducted by UniStar Environment and Research Labs Pvt. Ltd. Details are provided in Section 3.2.

3.1 Ambient Air Monitoring Data

3.1.1 Details of Ambient Air Quality Monitoring Stations

The detail of the ambient air monitoring locations including the distance from the project site with direction is as shown below.

S.No.	Code	Name of sampling location	Distance
1	A - 1	Nr.20 MLD Plant	1.2 Km
2	A - 2	Nr. Shantiniketan-1	0.8 Km
3	A - 3	Kandagara Village	3.2 km (NW)
4	A - 4	Siracha Village	2.6 km (NE)
5	A - 5	Wandh Village	2.0 km (SW)

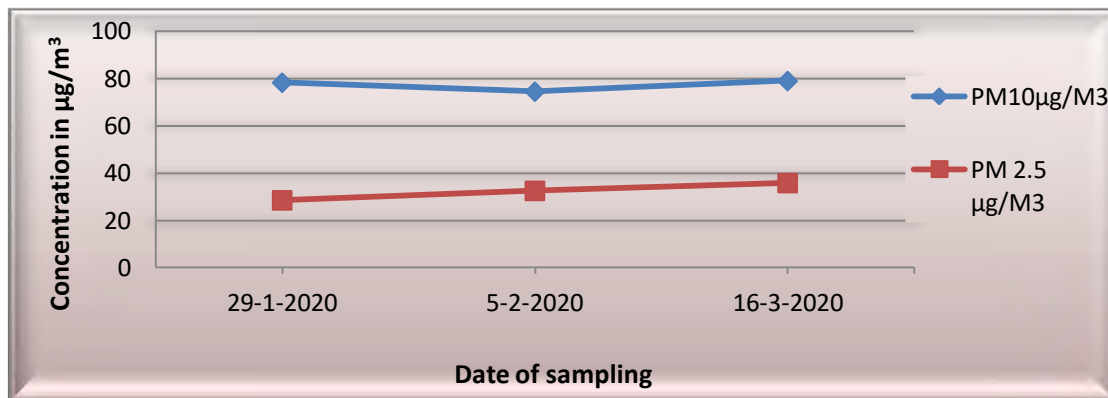
3.1.2 Location: Nr.20 MLD Plant

The Sampling station was located in the core zone in Company premises. The Respirable Dust Sampler (PM_{10}) & ($PM_{2.5}$) Sampler were placed at a height of 3 m above the ground level. Assess present pollution level the observed levels of PM_{10} , $PM_{2.5}$, SO_2 , NO_2 and O_3 collected during monitoring period (Jan.2020- Mar.2020) are as follows:

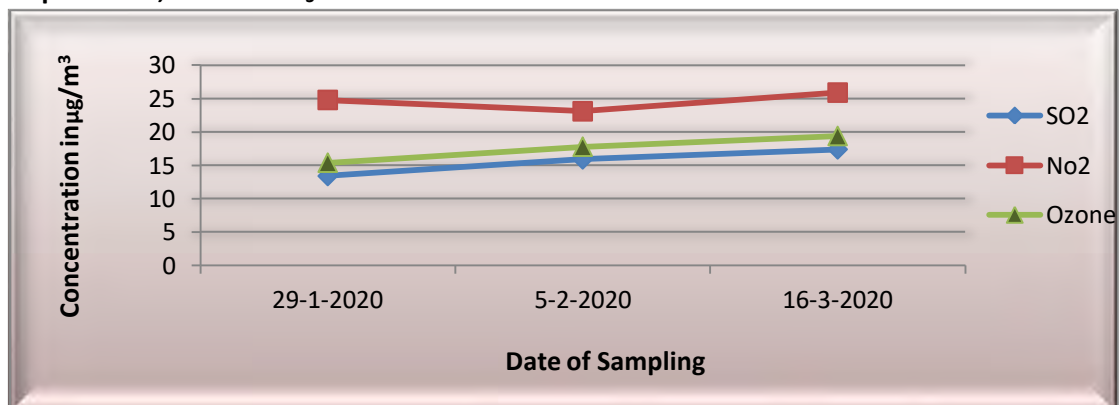
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	78.9	35.8	17.4	25.9	19.4
Minimum Value	74.4	28.5	13.4	23.1	15.4
Average Value	77.2	32.3	15.6	24.6	17.5
Standard Deviation	2.4	3.7	2.0	1.4	2.01
Permissible Limits	100	60	80	80	100

Units: $\mu\text{g}/\text{m}^3$

Graph 1 : Particulate Matter Level Nr.20 MLD Plant



Graph 2: SO_2 , NO_2 and O_3 Nr.20 MLD Plant



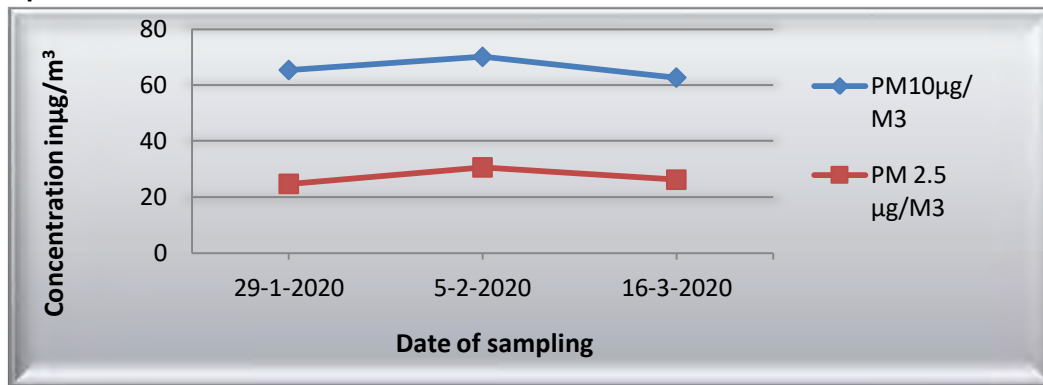
3.1.3 Location: Nr. Shantiniketan-1

The Sampling station was located in the core zone in company premises. The Respirable Dust Sampler PM_{10} & $PM_{2.5}$ Sampler were placed at a height of 3 m above the ground level. The observed levels of PM_{10} , $PM_{2.5}$, SO_2 , NO_2 and O_3 collected during monitoring period (Jan.2020- Mar. 2020) are as follows

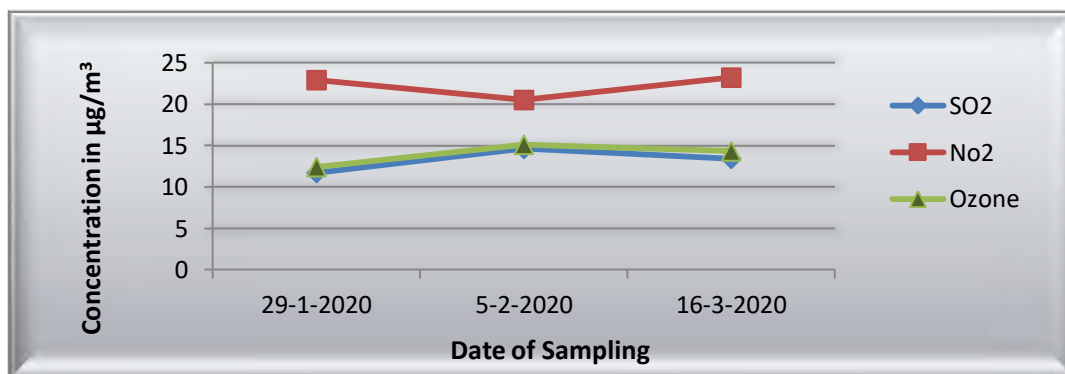
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	70.1	30.6	14.6	23.2	15.1
Minimum Value	62.7	24.7	11.7	20.5	12.4
Average Value	66.1	27.2	13.2	22.2	13.9
Standard Deviation	3.7	3.1	1.5	1.5	1.3
Permissible Limits	100	60	80	80	100

Units: $\mu\text{g}/\text{m}^3$

Graph 3: Particulate Matter Level Nr. Shantiniketan-1



Graph 4 : SO_2 , NO_2 and O_3 Nr. Shantiniketan-1



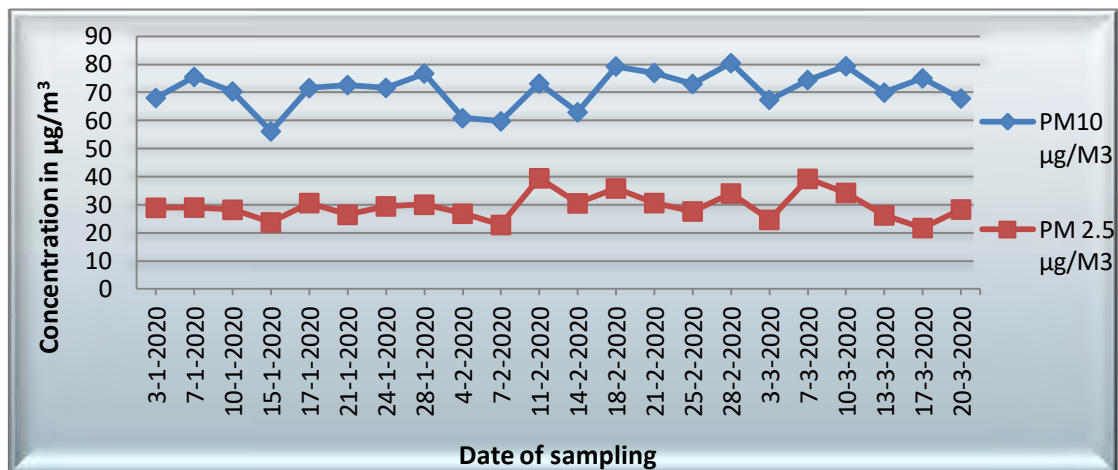
3.1.4 Location: Kandagara Village

The Sampling station was located in the core zone. The Station is located at about 3 km away in Northwest Direction from the Company premises. The Respirable Dust Sampler (PM₁₀) & PM_{2.5} Sampler were placed at a height of 1.5 m above the ground level. The observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during the monitoring period (Jan.2020- Mar.2020) are as follows.

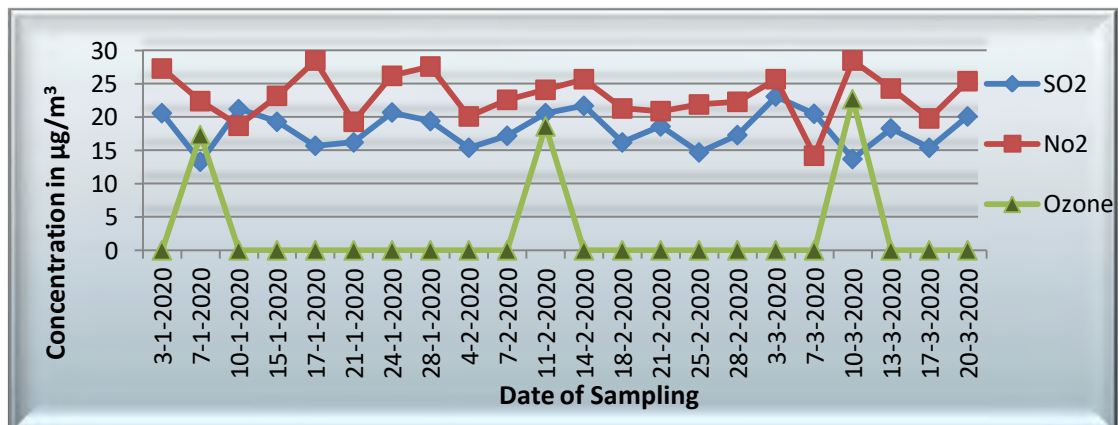
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	80.4	39.4	23.1	28.5	22.7
Minimum Value	56.1	21.7	13.3	14.2	17.3
Average Value	71.0	29.5	18.1	23.2	19.5
Standard Deviation	6.6	4.8	2.8	3.6	2.8
Permissible Limits	100	60	80	80	100

Units: µg/m³

Graph 5: Particulate Matter Level Kandagara Village



Graph 6 : SO₂, NO₂ and O₃ Level Kandagara Village



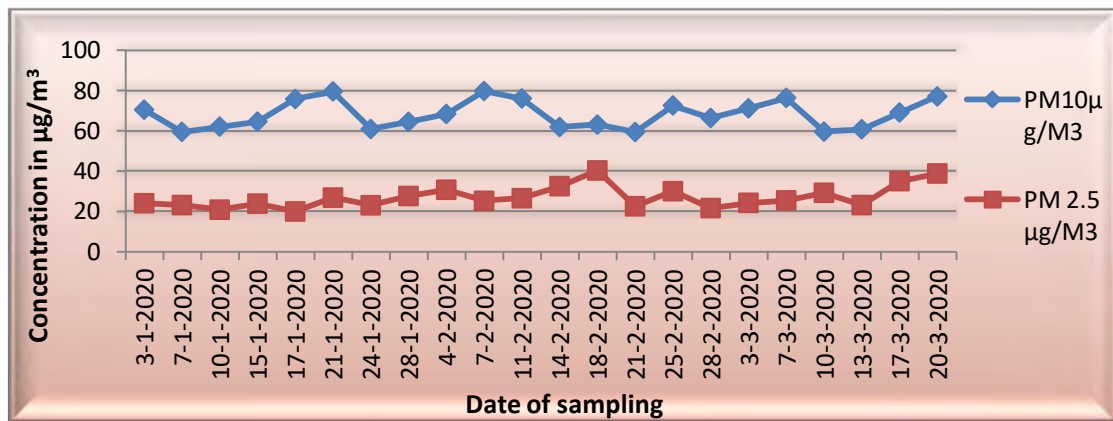
3.1.5 Location: Siracha Village

The Sampling station was located in the Siracha village. The Station is located at about 3.5 km away in Northwest Direction from the core zone area. The Respirable Dust Sampler & PM_{2.5} was placed at a height of 3.0 m above the ground level. The observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during the monitoring period (Jan.2020- March 2020) are as follows.

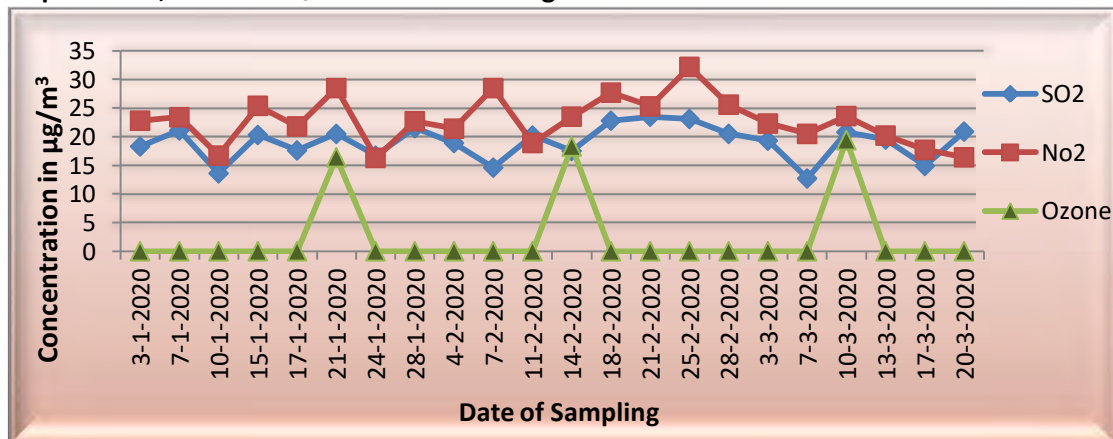
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	79.8	40.3	23.5	32.2	32.2
Minimum Value	59.4	19.9	12.7	16.3	16.4
Average Value	68.2	27.0	19.0	22.8	18.0
Standard Deviation	7.0	5.6	3.0	4.2	1.5
Permissible Limits	100	60	80	80	100

Units:µg/m³

Graph 7 : Particulate Matter Level Siracha Village



Graph 8 : SO₂, NO₂ and O₃ Level Siracha Village



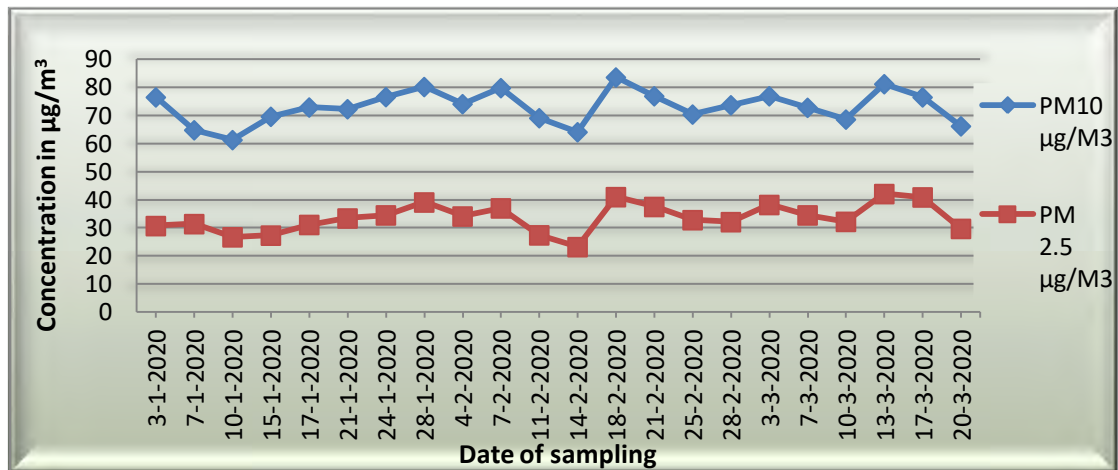
3.1.6 Location: Wandh Village

The Sampling station was located in the core zone in Wandh village. The Station is located at about 3.0 km away in Southwest Direction from the Company premises. The Respirable Dust Sampler Was placed at a height of 3.0 m above the ground level. The observed levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and O₃ collected during the monitoring period (Jan.2020- March 2020) are as follows.

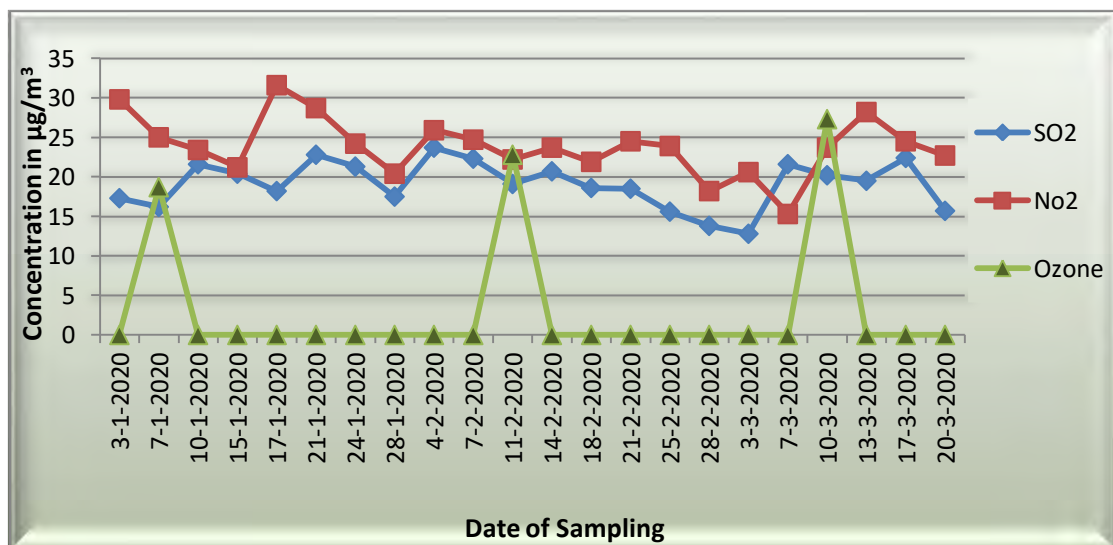
Observations	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	O ₃
Maximum Value	83.5	42.0	23.7	31.6	27.3
Minimum Value	61.2	23.1	12.8	15.3	18.7
Average Value	73.0	33.4	19.1	23.8	22.9
Standard Deviation	5.9	5.0	3.0	3.7	4.3
Permissible Limits	100	60	80	80	100

Units: $\mu\text{g}/\text{m}^3$

Graph 9 : Particulate Matter Level Wandh Village



Graph 10 : SO₂, NO₂ and O₃ Level Wandh Village



3.1.7 Ambient Air Quality Monitoring (Parameters- Mercury & Ozone)

Location	January-20			February-20			March-20		
	Date	Ozone (O ₃) µg/m ³	Mercury (Hg) µg/m ³	Date	Ozone (O ₃) µg/m ³	Mercury (Hg) µg/m ³	Date	Ozone (O ₃) µg/m ³	Mercury (Hg) µg/m ³
Village Kandagara	07.01.20	17.3	BDL	11.02.20	18.6	BDL	10.03.20	22.7	BDL
Village Wandh	07.01.20	18.7	BDL	11.02.20	22.8	BDL	10.03.20	27.3	BDL
Village Siracha	07.01.20	11.3	BDL	11.02.20	15.8	BDL	10.03.20	19.4	BDL
Nr. 20 MLD Plant	29.01.20	15.4	BDL	05.02.20	17.8	BDL	16.03.20	19.4	BDL
Nr. Shantiniketan-1	29.01.20	12.4	BDL	05.02.20	15.1	BDL	16.03.20	14.3	BDL

Remark: Calibrated equipment & instruments were used during monitoring & analysis of above identified sample.

Analysis Method Reference :

Hg : AAS by VGA Method -3112 B APHA 22 Edition : BDL Limit Hg : 2 ppb

O₃ : IS - 5182 (part 9) 2009 Ozone BDL limit: 5 µg/m³

3.2 Flue Gas Monitoring Data

Stack monitoring has been carried out by UniStar environment & Research Pvt. Ltd.

Date	Location	PM in mg/Nm ³	SO ₂ in mg/Nm ³	NO ₂ in mg/Nm ³
02-01-2020	Boiler (Unit - 1)	37.6	609.3	294.1
18-02-2020	Boiler (Unit - 1)	32.3	639.9	281.3
14-03-2020	Boiler (Unit - 1)	31.7	612.9	233.7
02-01-2020	Boiler (Unit - 2)	40.7	587.5	279.5
18-02-2020	Boiler (Unit - 2)	36.3	552.3	309.5
14-03-2020	Boiler (Unit - 2)	33.8	491.9	283.2
30-01-2020	Boiler (Unit - 3)	38.5	571.1	314.4
19-02-2020	Boiler (Unit - 3)	30.2	533.1	264.4
11-03-2020	Boiler (Unit - 3)	31.1	516.8	220.6
30-01-2020	Boiler (Unit - 4)	32.1	622.4	302.4
19-02-2020	Boiler (Unit - 4)	31.5	604.4	311.7
11-03-2020	Boiler (Unit - 4)	33.8	580.4	261.6
23-01-2020	Boiler (Unit - 5)	35.4	448.9	270.7
27-02-2020	Boiler (Unit - 5)	38.7	414.7	240.7
23-03-2020	Boiler (Unit - 5)	29.1	367.3	258.1
23-01-2020	Boiler (Unit - 6)	30.8	465.1	284.5
27-02-2020	Boiler (Unit - 6)	37.3	595.1	308.4
23-03-2020	Boiler (Unit - 6)	35.8	333.5	263.6
04-01-2020	Boiler (Unit - 7)	35.7	170.2	291.6
21-02-2020	Boiler (Unit - 7)	36.1	162.4	261.6
21-03-2020	Boiler (Unit - 7)	36.5	162.4	224.9
04-01-2020	Boiler (Unit - 8)	38.3	158.1	265.5
21-02-2020	Boiler (Unit - 8)	31	128.1	255.5
21-03-2020	Boiler (Unit - 8)	29.3	128.1	269.8
04-01-2020	Boiler (Unit - 9)	33.3	168.5	277.4
Permissible Limits		50	<500 MWH-600 >500 MWH-200	300

3.3 Water Quality Monitoring

3.3.1 Location: Tunda Village Water Sample

DATE: 13/03/2020

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.96	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	10	5	15
3	Odor	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	N.D.(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	138.2	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	33.6	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	19.1	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1768	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	401.3	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	533.3	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	204.1	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	3.4	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.38	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.73	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.01)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	10	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.84	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	10	5	15
3	Odor	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	162.1	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	26.9	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	27.3	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1658	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	454.3	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	504.8	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	154.5	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	4.1	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.32	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.66	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	N.D.(MDL:0.001)
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	N.D.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	N.D.(MDL:0.01)
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	N.D.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	N.D.(MDL:0.003)
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	N.D.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	N.D.(MDL:0.1)
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	N.D.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	N.D.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	N.D.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	N.D.(MDL:0.001)
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	10	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.74	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	10	5	15
3	Odour	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	N.D.(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	314.2	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	51.7	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	37.9	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1615	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	337	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	462.9	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	176.4	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	1.57	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.22	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.64	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	10	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.81	6.5 – 8.5	6.5 – 8.5
2	Colour	Pt-Co	10	5	15
3	Odour	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	188.6	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	27.5	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	28.9	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1553	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	316.3	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	460.3	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	172.1	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	2	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.28	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.61	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.01)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	6	100 CFU/ml	100 CFU/ml

Note: BDL= Below Detection Limit. N.D. = Not Detected

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.86	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	10	5	15
3	Odor	mg/L	Agreeable	Unobjectionable	Unobjectionable
4	Taste	mg/L	Agreeable	Agreeable	Agreeable
5	Turbidity(NTU)	mg/L	BDL(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as CaCO ₃	mg/L	207.6	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	38.3	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	26.5	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1564	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	445.6	200 mg/lit.	600 mg/lit.
11	Chloride as Cl ⁻	mg/L	464.4	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO ₄ ⁻²	mg/L	189.7	200 mg/lit.	400 mg/lit.
13	Nitrate as NO ₃	mg/L	2.9	45 mg/lit.	45 mg/lit.
14	Copper as Cu	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	1.5 mg/lit.
15	Manganese as Mn	mg/L	BDL(MDL:0.1)	0.1 mg/lit.	0.3 mg/lit.
16	Iron as Fe	mg/L	BDL(MDL:0.1)	0.3 mg/lit.	0.3 mg/lit.
17	Residual Free Chlorine	mg/L	0.36	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.52	1.0 mg/lit.	1.5 mg/lit.
19	Zinc as Zn	mg/L	BDL(MDL:0.05)	5 mg/lit.	15 mg/lit.
20	Phenolic Compound	mg/L	BDL(MDL:0.01)	0.001 mg/lit.	0.002 mg/lit.
21	Mercury as Hg	mg/L	BDL(MDL:0.001)	0.001 mg/lit.	0.001 mg/lit.
22	Cadmium as Cd	mg/L	BDL(MDL:0.003)	0.003 mg/lit.	0.003 mg/lit.
23	Selenium as Se	mg/L	N.D.	0.01 mg/lit.	0.01 mg/lit.
24	Arsenic as as	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.05 mg/lit.
25	Cyanide as CN	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
26	Lead as Pb	mg/L	BDL(MDL:0.01)	0.01 mg/lit.	0.01 mg/lit.
27	Anionic Detergent	mg/L	N.D.	0.2 mg/lit.	1.0 mg/lit.
28	Hexavalent Chromium	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
29	Mineral Oil	mg/L	N.D.	0.5 mg/lit.	0.5 mg/lit.
30	Aluminum as Al	mg/L	N.D.	0.03 mg/lit.	0.2 mg/lit.
31	Boron as B	mg/L	N.D.	0.5 mg/lit.	1 mg/lit.
32	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	0.05 mg/lit.	0.05 mg/lit.
33	Total Coliform	(CFU/100 ml)	Absent	Absent	Absent
34	E. coli	(CFU/100 ml)	Absent	Absent	Absent
35	Total Bacterial Count	(CFU/ml)	6	100 CFU/ml	100 CFU/ml

Note: Colour = 1(10) = 10 APHA, BDL= Below Detection Limit. N.D. = Not Detected

3.4 Water Quality Monitoring – Plant area

3.4.1 Location: Outfall Channel

Sr. No.	Parameter	Unit	Date of sampling		
			20/01/2020	10/02/2020	12/03/2020
1	pH @ 25	--	7.37	7.79	7.87
2	Temperature	^o C (Intake)	21.5	25.5	29.0
		^o C (Outfall)	23.5	27.5	32.5
		^o C (Differential)	2	2.0	3.5
3	Color	Pt. CO. Scale	10	10	10
4	Total Suspended Solids	mg/L	14	16	18
5	Oil & Grease	mg/L	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
6	Ammonical Nitrogen	mg/L	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
7	Sulphide as S-2	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
8	Total Chromium	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
9	Hexavalent Chromium as Cr+6	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
10	Phosphate as PO ₄	mg/L	0.27	0.31	0.34
11	Lead as Pb	mg/L	0.019	0.023	0.027
12	Copper as Cu	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
13	Zinc as Zn	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
14	Iron (as Fe)	mg/L	0.141	0.135	0.148
15	Chemical Oxygen Demand(COD)	mg/L	56.2	62.5	61.4
16	Biochemical Oxygen Demand (BOD)	mg/L	17	18	19

Note: BDL= Below Detection Limit. N.D. = Not Detected

3.4.2 Location: STP Outlet Water Sample;

Sr. No.	Parameter	Unit	SPCB Limit	Date of sampling		
				20/01/2020	10/02/2020	12/03/2020
1	pH @ 25 ° C	--	6.5-8.5	7.26	7.35	7.45
2	Total Suspended Solids	mg/L	30	18	20	14
3	Residual Chlorine	mg/L	0.5 Min.	0.64	0.69	0.62
4	Biochemical Oxygen Demand (BOD)	mg/L	20	14	16	12
5	Fecal Coliform	CFU/100ml	<1000	66	62	52

3.4.3 Location: ETP Outlet Water Sample;

S.N	Parameter	Unit	SPCB Limit	Date of sampling		
				20/01/2020	10/02/2020	12/03/2020
1	pH @ 25	--	6.5 – 8.5	7.47	7.36	7.58
2	Temperature	° C	40 Max.	30	29	32
3	Color	Pt. CO. Scale	100 Max.	40	40	20
4	Total Suspended Solids	mg/L	100 Max.	18	16	16
5	Oil & Grease	mg/L	10 Max.	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
6	Chemical Oxygen Demand (COD)	mg/L	100 Max.	50.1	44.5	44.5
7	Biochemical Oxygen Demand (BOD)	mg/L	30 Max.	15	13	13
8	Chloride as Cl ⁻	mg/L	600 Max.	456.3	423.1	418.4
9	Total Dissolved Solids	mg/L	2100 Max.	1678	1692	1521
10	Sulphate as SO ₄	mg/L	1000 Max.	218.3	205.5	201.2
11	Ammonical Nitrogen	mg/L	50 Max.	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
12	% Sodium(Na)	mg/L	60 Max.	55.2	53.9	50.3
13	Sodium Absorption Ratio(SAR)	mg/L	26 Max.	11.1	10.2	10.4
14	Sulphide as S ⁻²	mg/L	02 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
15	Total Chromium	mg/L	02 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
16	Hexavalent Chromium as Cr+6	mg/L	0.1 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
17	Phosphate as PO ₄	mg/L	5.0 Max.	0.71	0.62	0.66
18	Copper as Cu	mg/L	03 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
19	Lead as Pb	mg/L	0.1 Max.	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
20	Zinc as Zn	mg/L	05 Max.	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
21	Residual Free Chlorine	mg/L	0.5 Max.	BDL(MDL:0.2)	BDL(MDL:0.2)	BDL(MDL:0.2)
22	Iron (as Fe)	mg/L	1.0 Max.	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)

Note: N.D. = Not Detected, **MDL** = Minimum Detection Limit

Sr.No.	Parameter	Unit	Results			
			Borewell-1	Borewell-2	Borewell-3	Borewell-4
1	pH @ 25 ° C	-	7.56	7.33	7.72	7.91
2	Conductivity (µS)	-	16275	17890	15724	16673
3	Chloride as Cl ⁻	mg/L	4776	4629.4	4688.2	4716.6
4	Salinity (ppt)	mg/L	8.67	8.34	8.47	8.42
5	Total Dissolved Solids	mg/L	10416	11530	10063	10734.5
6	Carbonate as CaCO ₃	mg/L	24.11	33.9	37.0	29.7
7	Bicarbonate as CaCO ₃	mg/L	196.4	178.5	175.7	185.9
8	Mercury as Hg	mg/L	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)
9	Arsenic as As	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
10	Lead as Pb	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
11	Chromium as Cr	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
12	Cadmium as Cd	mg/L	BDL(MDL:0.03)	BDL(MDL:0.03)	BDL(MDL:0.03)	BDL(MDL:0.03)
13	Iron (as Fe)	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)
14	Zinc (as Zn)	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
15	Total Alkalinity	mg/L	451.0	474.8	428.6	478.7
16	Calcium as Ca	mg/L	359.7	387.8	343.3	375.8
17	Magnesium as Mg	mg/L	244.1	251.2	209.6	244.0
18	Sodium as Na	mg/L	1749.3	2050.2	1646	1952.3
19	Potassium as K	mg/L	104.6	121.7	97.4	107.6
20	Sulphate as SO ₄ -2	mg/L	656.9	811.9	660.5	758.9
21	Nitrate as NO ₃	mg/L	27.13	29.8	23.8	29.2
22	Phosphate as PO ₄	mg/L	2.67	3.2	2.14	3.01
23	Barium as Ba	mg/L	N.D.	N.D.	N.D.	N.D.
24	Fluoride as F	mg/L	2.52	2.91	2.09	2.91
25	Cobalt as Co	mg/L	N.D.	N.D.	N.D.	N.D.
26	Copper as Cu	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
27	Manganese as Mn	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)
28	Nickel as Ni	mg/L	BDL(MDL:0.02)	BDL(MDL:0.02)	BDL(MDL:0.02)	BDL(MDL:0.02)

Note: N.D. = Not Detected, MDL = Minimum Detection Limit

3.4.5 Location: Cooling Tower Blow down Water Sample

S.No.	Parameter	Unit	Limit	Results			
				Unit-1	Unit-2	Unit-3	Unit-4
Date of Sampling →				14/03/2020	14/03/2020	14/03/2020	14/03/2020
1	pH @ 25 ° C	--	-	8.02	8.05	8.15	8.09
2	Free available Chlorine	° C	Min. 0.5	0.62	0.69	0.72	0.66
3	Zinc as Zn	Pt. CO. Scale	1.0	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
4	Hexavalent Chromium as Cr+6	mg/L	0.1	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
5	Total Chromium as Cr	mg/L	0.2	0.069	0.074	0.071	0.055
6	Phosphate as P	mg/L	5.0	0.31	0.52	0.48	0.63

S.No	Parameter	Unit	Limit	Results			
				Unit-5	Unit-6	Unit-7	Unit-8
Date of Sampling →				14/03/2020	14/03/2020	14/03/2020	14/03/2020
1	pH @ 25 ° C	--	-z	8.12	8.06	8.03	8.14
2	Free available Chlorine	° C	Min. 0.5	0.72	0.69	0.72	0.68
3	Zinc as Zn	Pt. CO. Scale	1.0	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
4	Hexavalent Chromium as Cr+6	mg/L	0.1	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
5	Total Chromium as Cr	mg/L	0.2	BDL(MDL:0.05)	BDL(MDL:0.05)	0.072	BDL(MDL:0.05)
6	Phosphate as P	mg/L	5.0	0.41	0.56	0.45	0.47

3.4.6 Location: Condensate Cooling Tower Water Sample

S.No.	Parameter	Unit	Limit	Results			
				Unit-1	Unit-2	Unit-3	Unit-4
Date of Sampling →				14/03/2020	14/03/2020	14/03/2020	14/03/2020
1	pH @ 25 °C	--	6.5 to 8.5	8.09	8.14	8.15	8.09
2	Temperature °C (Intake)	°C	--	28.5	29.0	28.8	28.6
	Temperature °C (Outlet)	°C	--	31.5	31.4	31.8	31.4
	Temperature °C (Differential)	°C	7	3.0	2.4	3.0	2.8
3	Free available Chlorine	mg/L	Min 0.5	0.64	0.72	0.65	0.68

S.No.	Parameter	Unit	Limit	Results			
				Unit-5	Unit-6	Unit-7	Unit-8
Date of Sampling →				14/03/2020	14/03/2020	14/03/2020	14/03/2020
1	pH @ 25 °C	--	6.5 to 8.5	8.10	8.10	8.15	8.14
2	Temperature °C (Intake)	°C	--	28.8	29.0	28.6	28.4
	Temperature °C (Outlet)	°C	--	31.8	31.6	31.4	31.0
	Temperature °C (Differential)	°C	7	3.0	2.6	2.8	2.6
3	Free available Chlorine	mg/L	Min 0.5	0.72	0.70	0.75	0.68

Sr. No.	Parameter	Unit	Limit	Results			
				Unit -1	Unit -2	Unit -3	Unit -4
1	Total Suspended Solids	mg/L	100	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)
2	Oil & Grease	mg/L	10	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
3	Total Copper as Cu	mg/L	1.0	0.06	0.07	0.09	0.06
4	Total Iron (as Fe)	mg/L	1.0	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)

4 AMBIENT NOISE LEVEL MONITORING

The main objective of noise monitoring in the study area is to establish the baseline noise levels and assess the impact of the total noise generated by the operation activities around it. Noise monitoring has been conducted at 10 locations within the periphery of industry premises.

Date of Monitoring: 16-17.01.2020

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A)	Sampling Time	Night Time dB(A)
			06 am - 10 pm		10 pm - 06 am
		Limit 75 dB(A)	Limit 70 dB(A)		
1.	Nr. LDO Pump House	11:00 am - 14:45 pm	64.1	22:20 pm -02:15 am	61.4
2.	Nr. 20 MLD Plant		58.9		56.7
3.	Nr. Pump House		60.3		58.4
4.	Nr. Coal Handling plant		63.2		61.1
5.	Nr. Gate No.4		57.8		56.2
6.	Nr. Integrated Ash Silo		66.5		62.3
7.	Nr. Main Gate		62.2		61.9
8.	Nr. APCH Building		57.3		56.2
9.	Nr. Shantiniketan		59.4		57.2
10.	Nr.OHC Building		62.1		60.1

Remark: Calibrated instruments were used during monitoring of above identified sample.

Date of Monitoring: 04-05.02.2020

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A)	Sampling Time	Night Time dB(A)
			06 am - 10 pm		10 pm - 06 am
		Limit 75 dB(A)	Limit 70 dB(A)		
1.	Nr. LDO Pump House	11:40 am - 14:45 pm	62.7	22:20 pm -01:10 am	61.5
2.	Nr. 20 MLD Plant		61.5		59.9
3.	Nr. Pump House		61.1		58.4
4.	Nr. Coal Handling plant		64.1		61.1
5.	Nr. Gate No.4		58.4		55.7
6.	Nr. Integrated Ash Silo		64.6		61.6
7.	Nr. Main Gate		62.2		59.0
8.	Nr. APCH Building		61.0		58.7
9.	Nr. Shantiniketan		61.2		59.2
10.	Nr.OHC Building		63.1		60.7

Remark: Calibrated instruments were used during monitoring of above identified sample.

Date of Monitoring: 06-07.03.2020

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A)	Sampling Time	Night Time dB(A)
			06 am - 10 pm		10 pm - 06 am
		Limit 75 dB(A)	Limit 70 dB(A)		
1.	Nr. LDO Pump House	10:20 am - 14:05 pm	63.2	22:20 pm -01:20 am	61.2
2.	Nr. 20 MLD Plant		66.0		61.7
3.	Nr. Pump House		64.6		60.9
4.	Nr. Coal Handling plant		63.6		63.6
5.	Nr. Gate No.4		59.3		59.0
6.	Nr. Integrated Ash Silo		64.6		63.3
7.	Nr. Main Gate		62.4		59.8
8.	Nr. APCH Building		61.3		60.4
9.	Nr. Shantiniketan-I		61.0		58.1
10.	Nr.OHC Building		60.2		59.3

Remark: Calibrated instruments were used during monitoring of above identified sample.



ADANI POWER(MUNDRA) LIMITED

Continues Environment Monitoring System (CEMS) -- MONTH: October'2019 TO March'2020

Date	Unit 1			Unit 2			Unit 3		
	PM mg/Nm3 (Avg)	SOx ppm (Avg)	NOx ppm (Avg)	PM mg/Nm3 (Avg)	SOx ppm (Avg)	NOx ppm (Avg)	PM mg/Nm3 (Avg)	SOx ppm (Avg)	NOx ppm (Avg)
1-Oct-19	27.5	445.3	238.9	22.6	668.1	206.8	23.1	271.5	208.7
2-Oct-19	27.3	796.1	247.8	22.5	737.1	209.1	23.0	262.3	206.8
3-Oct-19	27.5	611.1	256.9	22.7	571.8	216.8	24.9	259.0	207.3
4-Oct-19	27.2	502.8	246.1	22.4	501.9	212.0	23.8	278.3	199.8
5-Oct-19	26.9	434.7	251.1	22.3	559.1	209.7	28.3	355.0	190.8
6-Oct-19	26.8	528.5	242.8	22.3	381.6	187.4	31.8	347.3	190.0
7-Oct-19	27.0	491.9	244.1	22.2	505.7	195.5	33.4	342.8	190.3
8-Oct-19	26.6	513.5	226.3	22.2	532.5	209.7	30.6	340.1	189.1
9-Oct-19	26.9	475.6	234.6	22.3	462.4	196.3	31.2	333.8	188.4
10-Oct-19	26.9	380.3	243.1	22.1	305.8	187.9	32.6	336.4	188.2
11-Oct-19	26.9	385.5	246.6	22.1	389.5	202.1	32.7	332.9	187.8
12-Oct-19	26.5	364.5	236.9	21.9	293.5	187.8	32.1	326.2	186.0
13-Oct-19	26.7	415.6	251.6	22.2	406.2	210.5	31.7	331.3	187.6
14-Oct-19	26.9	878.1	248.1	22.3	768.6	217.5	32.4	318.5	185.8
15-Oct-19	26.9	777.5	235.1	22.5	667.7	215.7	31.8	315.7	185.7
16-Oct-19	26.9	854.2	219.7	22.4	839.6	215.0	31.8	308.1	184.3
17-Oct-19	26.8	520.3	184.0	22.6	759.1	185.9	31.7	295.3	183.1
18-Oct-19	26.9	463.0	188.8	22.7	820.6	189.8	31.9	281.4	182.2
19-Oct-19	26.7	576.6	181.9	22.6	776.8	202.1	31.5	265.1	181.9
20-Oct-19	26.7	577.7	171.5	22.1	777.5	201.5	31.0	256.0	181.0
21-Oct-19	26.7	551.6	185.8	22.3	755.9	201.2	29.4	302.8	192.3
22-Oct-19	26.7	750.7	198.3	22.3	701.7	197.8	27.3	419.5	214.8
23-Oct-19	26.9	618.0	211.5	22.5	618.9	191.1	27.0	416.6	215.7
24-Oct-19	26.7	510.7	188.6	23.4	621.8	173.8	26.3	402.2	214.5
25-Oct-19	28.5	541.0	195.0	26.9	597.3	192.3	26.4	392.6	214.5
26-Oct-19	30.5	524.3	172.7	26.7	427.3	104.6	26.0	387.5	215.2
27-Oct-19	30.7	438.3	191.4	27.0	617.4	168.4	26.2	402.9	220.2
28-Oct-19	31.7	460.0	192.0	27.8	534.9	172.1	26.3	425.0	223.6
29-Oct-19	31.5	491.7	213.0	27.0	661.7	184.9	26.9	421.7	224.4
30-Oct-19	31.5	558.7	203.3	26.9	600.2	175.1	26.2	426.3	228.4
31-Oct-19	33.8	665.7	216.2	27.0	562.6	166.6	26.8	443.9	230.1
1-Nov-19	33.8	646.8	205.0	27.3	637.7	183.4	27.0	437.9	227.0
2-Nov-19	32.2	624.1	204.7	27.0	590.1	168.5	27.2	437.6	228.1
3-Nov-19	31.0	610.5	207.6	26.6	493.7	194.6	27.1	427.1	224.5
4-Nov-19	31.3	601.2	218.7	26.9	546.0	190.4	28.0	422.9	226.0
5-Nov-19	30.9	480.2	234.9	26.9	448.6	199.1	27.4	416.0	220.7
6-Nov-19	30.9	503.1	228.5	26.9	448.2	209.4	27.5	416.5	226.2
7-Nov-19	30.6	487.6	217.4	26.5	447.6	204.6	27.6	417.7	228.8
8-Nov-19	30.3	510.8	218.5	26.4	447.3	196.7	27.5	414.7	227.5
9-Nov-19	30.3	394.1	231.9	26.5	411.3	193.5	27.9	415.1	225.5
10-Nov-19	30.3	458.2	240.5	26.6	400.9	202.8	28.3	418.0	225.3
11-Nov-19	30.4	497.7	266.9	26.7	486.8	208.1	28.3	419.2	224.1
12-Nov-19	30.6	490.0	246.3	26.9	501.2	216.2	28.2	419.3	225.8
13-Nov-19	30.8	496.4	241.7	27.0	521.2	210.2	28.9	417.9	226.6
14-Nov-19	30.9	503.9	237.9	26.7	455.4	219.0	28.0	412.0	227.3
15-Nov-19	30.6	553.2	229.7	26.6	485.0	206.9	28.4	415.0	227.3
16-Nov-19	30.6	359.6	231.3	26.5	413.7	194.3	27.7	416.1	229.0
17-Nov-19	30.6	293.6	238.4	26.6	407.2	188.0	27.9	414.4	228.6
18-Nov-19	30.6	341.4	242.3	26.6	448.0	198.0	27.9	415.6	228.7
19-Nov-19	30.8	500.1	238.9	26.7	517.9	210.2	28.7	403.9	224.9
20-Nov-19	30.9	519.5	242.8	26.8	543.0	207.4	28.8	374.2	224.1
21-Nov-19	30.6	577.4	246.0	28.4	567.3	212.7	28.6	381.3	223.1
22-Nov-19	31.1	812.5	237.0	27.8	756.7	197.3	28.5	411.3	208.0
23-Nov-19	31.1	787.3	230.4	27.7	381.2	83.4	28.7	344.6	177.7
24-Nov-19	30.8	494.3	230.3	27.5	236.0	37.4	28.5	741.8	205.9
25-Nov-19	30.9	444.4	227.8	27.5	291.1	75.3	28.5	1164.8	255.5
26-Nov-19	30.7	465.1	227.9	27.8	581.9	173.2	27.4	1517.8	289.4
27-Nov-19	30.3	436.5	197.6	27.4	568.6	169.9	27.4	1298.7	279.4
28-Nov-19	30.5	710.3	182.5	27.4	567.9	169.8	27.9	519.7	313.1
29-Nov-19	30.5	872.8	177.6	27.5	570.5	175.8	28.9	518.2	319.1
30-Nov-19	30.8	923.0	170.5	27.6	463.9	221.4	28.9	534.1	312.7

1-Dec-19	30.6	939.1	168.3	27.4	80.4	250.5	28.8	563.9	294.5
2-Dec-19	30.7	997.5	168.3	27.5	362.8	110.8	28.5	562.3	278.8
3-Dec-19	30.7	1051.5	166.3	27.4	604.3	218.7	28.0	566.9	279.3
4-Dec-19	30.9	1103.8	168.1	27.5	569.3	246.9	27.5	574.5	282.4
5-Dec-19	31.4	1115.3	171.7	27.6	530.6	273.3	27.7	587.5	288.9
6-Dec-19	31.0	1037.9	189.4	27.6	501.1	290.5	28.1	588.6	286.6
7-Dec-19	30.5	783.7	171.4	27.3	454.7	307.5	28.7	591.1	286.3
8-Dec-19	30.6	727.1	171.8	27.4	404.6	332.8	28.8	590.2	278.3
9-Dec-19	30.7	675.3	177.9	27.5	383.1	343.1	28.9	595.8	276.0
10-Dec-19	30.4	372.3	160.6	27.6	457.9	277.4	29.2	606.6	276.3
11-Dec-19	30.5	340.2	147.0	27.7	510.4	201.7	29.4	607.0	283.4
12-Dec-19	30.5	309.1	156.1	27.7	317.8	231.4	29.1	601.6	288.9
13-Dec-19	30.4	243.7	147.3	27.5	312.7	232.5	29.5	595.1	297.0
14-Dec-19	30.5	440.8	177.6	27.5	299.6	237.6	29.3	595.4	299.8
15-Dec-19	30.2	906.7	221.8	27.2	289.1	236.8	29.1	597.1	292.8
16-Dec-19	30.2	941.6	252.5	27.3	290.5	244.4	29.6	602.2	287.6
17-Dec-19	30.1	976.6	236.1	27.4	292.0	244.3	29.8	608.1	283.3
18-Dec-19	30.3	827.1	192.2	27.4	359.8	255.0	30.0	605.9	275.5
19-Dec-19	30.5	656.0	264.6	27.3	408.6	257.2	30.0	580.2	268.8
20-Dec-19	30.5	684.5	267.0	27.5	482.9	257.8	29.9	505.3	253.4
21-Dec-19	30.5	780.3	276.3	27.6	462.5	253.6	29.3	506.8	255.1
22-Dec-19	30.2	544.7	250.0	27.3	344.4	245.4	28.8	506.1	249.7
23-Dec-19	30.2	551.6	250.6	27.3	320.9	235.6	28.9	592.9	285.1
24-Dec-19	30.1	518.0	249.1	27.2	283.6	236.7	29.2	1048.5	334.3
25-Dec-19	30.0	504.2	247.4	27.3	272.4	235.5	29.1	1231.1	332.8
26-Dec-19	30.0	520.5	247.4	27.4	289.6	247.4	30.0	1226.4	302.7
27-Dec-19	29.9	527.9	241.4	27.2	271.4	242.2	29.3	1310.3	304.7
28-Dec-19	29.9	519.7	242.6	27.2	289.8	239.2	29.0	840.9	246.0
29-Dec-19	30.1	533.1	247.0	27.2	303.7	227.0	29.5	281.9	182.2
30-Dec-19	30.0	653.3	247.6	27.5	524.0	229.5	29.9	328.1	174.9
31-Dec-19	30.2	962.0	266.2	27.4	691.7	253.5	30.2	354.6	187.1
1-Jan-20	30.0	555.3	249.2	27.6	404.8	227.5	30.3	354.4	183.3
2-Jan-20	30.2	810.9	261.8	27.7	698.8	226.5	31.2	375.9	180.7
3-Jan-20	30.5	1024.6	277.8	27.6	798.2	260.8	32.9	345.4	115.8
4-Jan-20				27.7	593.2	244.5	29.6	300.0	214.5
5-Jan-20				27.4	757.0	262.0			
6-Jan-20				27.5	903.8	170.1			
7-Jan-20				27.8	860.5	232.9	33.0	254.2	213.0
8-Jan-20				27.8	416.5	154.6	30.4	262.2	212.0
9-Jan-20				27.6	400.1	154.2	30.7	254.1	211.7
10-Jan-20				27.7	433.7	160.8	30.1	235.4	212.0
11-Jan-20				27.6	413.7	168.6	30.4	248.0	205.4
12-Jan-20				27.9	382.8	166.7	30.4	340.7	226.9
13-Jan-20				27.9	434.4	162.5	30.9	444.3	255.0
14-Jan-20				27.7	346.7	145.3	29.7	286.2	150.1
15-Jan-20				27.7	334.8	158.0	29.9	372.3	212.4
16-Jan-20				27.7	543.2	236.1	30.4	366.4	216.8
17-Jan-20				28.3	527.2	247.0	30.7	428.8	227.0
18-Jan-20				27.8	548.8	260.3	30.6	424.7	227.7
19-Jan-20				27.6	582.1	261.2	29.7	426.8	227.4
20-Jan-20				27.7	658.5	274.7	29.9	424.6	228.1
21-Jan-20				27.8	721.2	302.2	30.1	415.2	227.9
22-Jan-20				27.5	677.7	282.8	28.4	404.0	227.3
23-Jan-20				27.5	802.2	312.3	29.4	412.7	227.5
24-Jan-20	30.9	353.8	251.3	27.6	956.8	327.1	29.8	418.4	228.0
25-Jan-20	30.3	537.2	231.3	27.7	852.4	331.1	30.0	424.3	229.0
26-Jan-20	23.7	720.6	251.3	27.6	573.9	297.2	30.1	419.3	228.6
27-Jan-20	27.7	726.6	181.4	27.8	595.3	274.5	30.4	419.7	228.0
28-Jan-20	30.5	832.1	179.4	27.8	599.5	271.1	30.6	417.3	227.4
29-Jan-20	30.3	778.7	157.5	27.7	482.1	218.4	31.0	411.5	226.4
30-Jan-20	30.1	580.4	188.2	27.7	537.2	309.9	31.2	412.8	227.3
31-Jan-20	30.1	542.1	153.32	27.8	554.7	260.3	31.0	417.9	227.1
1-Feb-20	30.0	666.2	161.6	27.65	584.75	273.17	29.70	405.96	226.61
2-Feb-20	30.0	806.6	172.0	27.63	566.68	316.46	29.79	401.81	227.35
3-Feb-20	30.1	834.4	173.4	27.80	550.77	333.51	30.55	402.16	226.66
4-Feb-20	30.1	727.2	173.1	27.91	543.68	315.29	31.31	411.36	227.21
5-Feb-20	30.3	709.4	167.1	27.92	614.74	263.07	31.53	400.96	227.01
6-Feb-20	30.1	558.3	191.4	27.89	605.68	265.35	31.32	404.01	227.47
7-Feb-20	30.2	611.5	185.8	27.81	589.85	276.76	31.49	406.56	227.95
8-Feb-20	30.0	602.9	150.0	27.66	576.20	290.80	30.24	412.03	228.31
9-Feb-20	30.0	604.8	155.4	27.80	552.39	316.06	29.64	398.48	226.65

Date	Unit 4			Unit 5			Unit 6		
	PM mg/Nm ³ (Avg)	SO _x ppm (Avg)	NO _x ppm (Avg)	PM mg/Nm ³ (Avg)	SO _x ppm (Avg)	NO _x ppm (Avg)	PM mg/Nm ³ (Avg)	SO _x ppm (Avg)	NO _x ppm (Avg)
1-Oct-18	33.3	425.3	250.5	32.38	392.9	226.4	31.9	297.1	146.0
2-Oct-18	32.7	429.3	247.9	31.11	384.3	201.4	32.7	493.8	288.5
3-Oct-18	35.5	423.5	275.6	31.38	383.0	207.9	32.8	509.9	286.7
4-Oct-18	22.4	424.7	265.8	31.85	390.5	219.3	32.2	644.5	304.4
5-Oct-18	25.2	420.8	295.7	32.35	390.5	226.1	32.1	606.2	304.0
6-Oct-18	27.4	426.6	270.6	31.69	385.1	211.2	32.1	573.2	310.3
7-Oct-18	27.6	425.1	294.2	33.33	395.2	246.3	32.4	578.1	310.2
8-Oct-18	31.6	418.7	237.0	32.06	390.6	224.1	32.2	537.2	290.5
9-Oct-18	31.2	419.1	243.3	31.28	368.1	219.1	32.7	590.6	293.4
10-Oct-18	28.0	423.9	263.9				33.5	623.9	308.8
11-Oct-18	27.9	423.4	258.9				35.2	646.3	307.8
12-Oct-18	29.5	428.0	247.8	32.74	388.1	233.2	32.9	532.4	306.4
13-Oct-18	30.5	428.0	246.4	33.07	394.0	240.5	31.7	517.3	299.4
14-Oct-18	29.2	429.2	277.5	32.73	394.6	232.9	33.4	515.1	311.8
15-Oct-18	28.7	427.8	257.7	33.51	396.7	246.6	32.9	504.5	303.2
16-Oct-18	28.8	486.3	161.0	33.54	396.8	247.3	33.1	569.3	293.2
17-Oct-18	28.8	468.5	196.8	33.99	398.0	252.2	34.1	578.1	284.2
18-Oct-18	28.4	422.8	237.7	33.46	441.3	262.0	33.2	535.1	290.2
19-Oct-18	28.1	430.5	227.0	33.96	500.2	297.1	33.1	556.7	308.9
20-Oct-18	28.4	477.5	91.4	31.78	388.4	217.7	32.2	494.3	320.1
21-Oct-18	30.4	462.2	147.3	32.44	391.5	225.4	32.4	550.5	322.2
22-Oct-18	28.4	442.5	159.6	31.66	387.6	213.0	32.0	597.3	320.6
23-Oct-18	27.0	467.2	119.4	32.4	391.3	227.2	32.2	555.4	322.7
24-Oct-18	29.3	461.0	123.8	31.55	389.9	213.5	31.8	524.6	308.8
25-Oct-18	28.1	479.4	100.3	30.66	386.5	194.5	31.7	493.8	282.2
26-Oct-18	29.5	447.9	145.0	30.37	437.5	216.3	31.0	427.0	254.4
27-Oct-18	28.3	414.0	177.2	31.36	397.4	214.6	10.2	370.4	216.6
28-Oct-18	27.6	412.3	190.7	29.93	390.5	185.0	30.9	483.5	281.7
29-Oct-18	27.2	411.4	199.8	30.76	399.2	204.3	31.5	475.5	282.0
30-Oct-18	29.4	413.4	195.9	31.55	415.0	225.9	32.4	454.7	282.6
31-Oct-18	28.6	419.5	201.5	33.18	410.7	251.0	31.7	471.7	278.4
1-Nov-18	27.1	415.4	229.2	32.5	414.5	240.4	32.4	426.7	234.5
2-Nov-18	26.8	423.4	238.7	32.3	415.6	238.1	31.8	336.4	195.4
3-Nov-18	29.1	431.6	215.7	31.21	415.2	220.5	31.8	325.8	201.2
4-Nov-18	27.8	431.8	226.7	31.75	410.5	224.8	32.5	357.7	200.3
5-Nov-18	27.1	467.6	93.4	31.81	401.5	221.7	32.5	398.5	198.2
6-Nov-18	26.9	401.1	115.8	31.74	410.2	224.6	33.1	396.8	196.9
7-Nov-18	27.4	96.6	147.6	31.93	389.7	218.4	32.1	361.4	200.1
8-Nov-18	31.2	246.5	125.5	31.38	394.4	211.7	31.8	343.7	180.2
9-Nov-18	29.6	410.3	233.3				32.7	368.4	116.2
10-Nov-18	28.7	399.6	259.7				32.3	315.6	121.5
11-Nov-18	27.9	605.0	282.4	31.49	410.2	224.1	32.2	546.5	138.2
12-Nov-18	27.0	421.1	290.4	32.08	412.9	232.8	31.9	372.1	156.6
13-Nov-18	27.1	458.7	284.3	32.68	393.0	230.2	33.0	315.2	149.3
14-Nov-18	27.5	395.0	285.7	31.76	388.3	214.7	32.5	230.5	147.0
15-Nov-18	28.7	375.5	272.1	32.18	390.8	222.2	32.2	238.1	145.1
16-Nov-18	28.0	409.8	275.2	31.6	385.3	211.1	31.6	259.7	172.5
17-Nov-18	29.3	375.6	255.4	30.29	378.9	185.4	31.5	232.3	169.5
18-Nov-18	29.2	412.3	268.9	32.33	391.6	225.6	32.0	366.7	128.4
19-Nov-18	28.3	554.8	288.4	32.22	390.2	223.4	32.5	693.7	107.4
20-Nov-18	27.6	488.0	292.1	32.67	391.1	229.8	32.9	257.0	146.9
21-Nov-18	27.7	645.4	299.6	33.05	393.5	235.1	32.7	726.1	123.5
22-Nov-18	27.8	693.8	286.8	32.68	392.8	230.8	32.0	478.4	100.4
23-Nov-18	27.6	693.2	295.7	32.05	388.8	219.1	33.0	296.1	141.5
24-Nov-18	27.3	502.8	290.9	31.66	385.7	212.2	20.7	502.5	291.2
25-Nov-18	27.3	446.1	300.2	33.16	395.5	237.6	17.6	499.7	222.1
26-Nov-18	27.4	383.7	268.2	32.21	388.6	220.3	31.9	511.2	311.5
27-Nov-18	29.3	379.1	244.0	31.09	384.0	202.0	31.4	526.2	277.7
28-Nov-18	29.3	384.9	228.6	31.8	385.9	215.6	31.7	543.7	210.1
29-Nov-18	28.3	399.2	256.4	31.6	384.0	210.9	31.4	552.1	179.0
30-Nov-18	27.8	388.3	266.1	31.91	387.2	218.5	31.2	556.4	167.4

1-Dec-18	27.3	383.6	272.2	30.66	381.9	194.4	31.8	559.6	161.9
2-Dec-18	27.7	382.3	256.9	32.57	392.5	229.0			
3-Dec-18	27.6	385.6	265.0	32.75	394.0	230.7			
4-Dec-18	27.4	400.9	285.8	32.72	392.8	229.7			
5-Dec-18	27.2	402.1	283.7	32.41	390.1	226.3			
6-Dec-18	27.2	424.5	286.3	32.42	389.6	225.0			
7-Dec-18	28.2	438.1	260.1	32.26	389.2	221.7			
8-Dec-18	28.2	404.7	259.6	31.67	382.6	209.9			
9-Dec-18	28.1	409.6	279.1	32.57	387.5	226.7			
10-Dec-18	27.2	425.7	286.0	32.49	388.0	225.8			
11-Dec-18	27.2	412.9	275.2	32.71	394.3	232.9			
12-Dec-18	27.4	414.2	276.3	32.41	392.0	227.4			
13-Dec-18	27.5	365.5	255.4	30.17	369.1	180.6			
14-Dec-18	26.8	387.4	112.2	30.5	372.9	188.1			
15-Dec-18	27.6	392.3	111.8	29.76	362.6	170.9			
16-Dec-18	27.6	379.8	112.8	30.7	379.1	193.8			
17-Dec-18	27.5	369.3	112.1	30.46	373.1	187.7			
18-Dec-18	27.8	368.3	113.1	30.51	372.8	188.6			
19-Dec-18	27.2	375.9	113.6	31.95	379.5	217.0			
20-Dec-18	27.3	494.5	193.7	32.26	389.1	223.0			
21-Dec-18	27.3	682.3	268.9	32.23	389.1	222.3			
22-Dec-18	27.6	675.8	250.0	30.17	353.6	177.6			
23-Dec-18	27.2	681.1	253.4	32.08	387.3	219.3			
24-Dec-18	27.6	699.6	246.4	31.91	384.3	216.2			
25-Dec-18	27.5	715.5	263.5	32.35	388.7	222.8			
26-Dec-18	27.3	765.5	268.8	31.52	383.1	211.4			
27-Dec-18	26.9	832.7	260.8	31.43	377.6	207.9			
28-Dec-18	27.0	798.7	277.4	31.44	380.0	209.2			
29-Dec-18	27.4	541.1	193.0	31.68	384.3	213.5			
30-Dec-18	27.6	381.1	136.4	31.81	386.5	215.8			
31-Dec-18	27.6	589.7	270.6	31.9	385.7	216.0			
1-Jan-19	27.7	602.8	272.4	31.79	385.3	215.0			
2-Jan-19	27.5	613.9	288.2	32.56	392.8	229.5			
3-Jan-19	27.5	686.1	305.7	32.66	391.7	228.6			
4-Jan-19	27.4	681.0	289.3	31.93	387.8	217.8			
5-Jan-19	27.1	741.2	285.5	31.64	380.7	210.3			
6-Jan-19	28.0	704.7	288.7	32.31	376.1	203.2			
7-Jan-19	28.2	558.1	285.0	32.1	391.6	229.7			
8-Jan-19	27.9	388.5	254.1	32.08	387.6	217.6			
9-Jan-19	27.2	358.8	237.3	32.15	387.8	222.6			
10-Jan-19	27.5	373.0	233.8	32.01	387.0	219.7			
11-Jan-19	27.5	371.8	252.8	32.28	389.2	222.1			
12-Jan-19	28.2	360.6	261.5	31.16	377.3	200.6			
13-Jan-19	28.4	371.3	248.7	31.78	376.2	210.7			
14-Jan-19	27.3	352.6	216.5	32	381.1	217.0			
15-Jan-19	28.0	293.7	191.5	32.04	380.8	217.2			
16-Jan-19	27.4	239.1	215.5	32.25	389.1	223.9			
17-Jan-19	27.5	381.7	194.8	32.11	388.8	220.2			
18-Jan-19	27.6	466.9	263.6	31.99	388.2	217.6			
19-Jan-19	27.2	525.6	264.2	31.46	386.0	209.1			
20-Jan-19	27.5	524.6	224.2	32.46	390.7	225.5			
21-Jan-19	27.7	468.7	223.6	32.81	391.2	228.8			
22-Jan-19	27.3	424.6	223.5	32.66	387.5	226.5	30.0	479.0	162.1
23-Jan-19	27.6	423.3	223.3	32.5	384.1	224.1	31.6	888.2	129.3
24-Jan-19	27.7	422.9	223.3	32.54	385.4	223.5	32.6	774.4	132.2
25-Jan-19	27.8	421.4	223.4	31.97	385.4	219.2	33.8	385.7	131.5
26-Jan-19	27.5	422.4	222.7	30.76	376.0	193.4	32.3	493.7	139.8
27-Jan-19	27.9	424.4	221.1	32.15	390.6	220.1	33.4	466.4	107.7
28-Jan-19	28.7	422.9	220.6	32.25	387.4	220.2	32.9	493.8	106.8
29-Jan-19	31.3	422.3	220.1	32.35	387.3	222.0	32.9	483.4	104.2
30-Jan-19	30.5	421.2	220.5	32.35	388.1	223.9	32.7	525.4	168.5
31-Jan-19	30.5	420.8	220.5	32.39	388.0	222.7	32.9	738.4	182.4
1-Feb-20	31.20	421.45	220.67	32.15	428.10	220.87	32.46	700.6	217.1
2-Feb-20	30.52	419.83	221.27	30.41	518.63	183.11	31.21	762.2	183.5
3-Feb-20	31.01	418.27	221.31	31.78	570.10	209.89	33.23	734.9	194.1
4-Feb-20	30.39	471.65	197.33	32.26	580.65	220.20	33.36	893.4	204.9
5-Feb-20	30.07	433.92	159.38	32.15	581.70	220.44	33.26	886.1	214.1
6-Feb-20	30.76	386.86	171.94	32.40	592.77	226.17	32.73	857.8	190.8
7-Feb-20	30.61	347.36	178.79	31.92	578.59	215.70	32.88	892.4	211.1
8-Feb-20	30.76	397.21	159.81	32.24	588.94	223.20	32.88	837.7	218.8
9-Feb-20	31.29	380.97	181.20	30.91	580.81	198.64	31.69	888.1	188.8

10-Feb-20	30.83	391.50	145.96	31.58	582.45	210.75	32.84	835.5	191.8
11-Feb-20	30.66	359.06	137.75	32.12	570.20	213.70	32.98	878.5	186.1
12-Feb-20	30.45	282.43	120.65	32.49	586.71	223.58	32.77	853.7	197.5
13-Feb-20	30.34	354.11	179.90	32.87	492.18	231.42	32.87	905.9	199.7
14-Feb-20	30.70	424.89	150.80	31.88	412.89	211.95	32.99	904.0	183.7
15-Feb-20	30.59	474.31	151.83	32.96	489.56	231.07	33.32	1029.6	218.6
16-Feb-20	30.93	445.08	136.70	32.59	461.65	226.20	32.27	1044.0	226.1
17-Feb-20	31.70	427.65	122.23	31.89	432.91	215.92	32.84	1054.1	199.8
18-Feb-20	30.63	450.05	138.69	32.79	435.00	226.08	32.81	755.3	189.1
19-Feb-20	30.88	431.97	151.68	33.30	494.71	235.50	33.11	699.4	224.1
20-Feb-20	31.10	428.17	216.08	33.16	423.39	232.73	33.26	673.9	246.8
21-Feb-20	31.47	613.86	289.01	31.45	498.55	205.43	31.82	670.6	232.5
22-Feb-20	32.10	611.08	289.94	32.29	378.45	216.55	32.26	616.6	224.0
23-Feb-20	31.47	609.46	289.60	31.68	388.62	213.02	31.79	606.3	228.0
24-Feb-20	31.38	611.11	288.92	32.72	511.58	231.76	32.11	707.5	218.7
25-Feb-20	31.11	610.78	288.70	32.42	433.44	226.16	32.66	703.9	257.8
26-Feb-20	31.36	607.85	288.73	30.69	439.99	193.72	31.05	653.8	253.8
27-Feb-20	31.44	619.03	287.96	32.96	393.42	231.12	32.70	701.7	216.3
28-Feb-20	31.08	619.30	287.86	32.26	580.37	220.28	32.71	664.7	215.5
29-Feb-20	31.09	618.00	286.94	31.18	732.57	205.38	31.45	623.9	233.4
1-Mar-18	31.4	619.9	286.7	30.0	692.5	175.2	30.9	608.6	213.9
2-Mar-18	31.7	626.4	286.8	31.0	711.5	196.1	31.7	607.0	260.9
3-Mar-18	31.1	626.5	286.4	30.8	713.3	199.4	31.8	559.5	257.3
4-Mar-18	31.7	625.5	284.8	31.6	735.5	212.3	32.8	441.1	277.1
5-Mar-18	32.9	622.0	285.0	30.6	727.3	194.1	30.9	391.9	238.5
6-Mar-18	32.3	619.4	285.0	30.3	704.7	181.6	30.2	382.3	240.9
7-Mar-18	32.0	614.5	285.2	30.5	714.0	185.5	30.7	556.2	261.3
8-Mar-18	31.7	615.2	285.0	30.2	682.9	175.7	29.9	498.9	212.9
9-Mar-18	32.1	625.2	284.9	29.8	696.9	171.7	32.1	420.7	244.3
10-Mar-18	30.4	637.1	283.6				31.1	360.6	287.6
11-Mar-18	32.7	634.4	283.7				30.9	388.6	257.3
12-Mar-18	31.7	627.7	284.1				31.6	461.2	287.2
13-Mar-18	31.5	628.6	283.6				32.4	504.4	224.3
14-Mar-18	31.2	635.7	284.1				31.8	464.3	252.9
15-Mar-18	32.3	642.3	283.5				31.5	323.9	257.6
16-Mar-18	32.0	653.4	283.6				31.1	413.2	243.0
17-Mar-18	31.7	653.1	283.7				32.1	468.3	210.2
18-Mar-18	32.4	655.0	282.9	32.8	736.2	230.9	32.7	394.3	224.1
19-Mar-18	31.9	627.4	268.3	33.2	562.5	242.6	33.0	330.1	217.1
20-Mar-18	32.7	567.4	242.7	31.3	387.0	208.2	32.1	323.3	191.7
21-Mar-18	32.2	567.0	241.7	30.4	374.1	188.0	31.4	299.9	220.1
22-Mar-18	33.6	572.3	241.2	30.1	382.0	182.5			
23-Mar-18	32.6	583.4	240.6	30.6	382.9	194.0			
24-Mar-18	32.6	587.7	239.8	28.8	333.2	143.9			
25-Mar-18	34.9	591.2	239.9	27.9	298.0	120.2			
26-Mar-18	33.8	589.4	239.6	29.4	354.6	161.3			
27-Mar-18				29.1	347.0	152.8			
28-Mar-18				28.9	337.2	146.8			
29-Mar-18				28.4	312.9	133.1			
30-Mar-18				28.5	319.9	134.8			
31-Mar-18				28.8	333.1	144.8			

Date	Unit 7			Unit 8			Unit 9		
	PM mg/Nm ³ (Avg)	SOx ppm (Avg)	NOx ppm (Avg)	PM mg/Nm ³ (Avg)	SOx ppm (Avg)	NOx ppm (Avg)	PM mg/Nm ³ (Avg)	SOx ppm (Avg)	NOx ppm (Avg)
1-Oct-19	34.4	174.3	272.2	33.2	147.7	239.4	32.0	157.4	234.1
2-Oct-19	32.3	164.4	242.3	31.2	135.6	221.6	30.0	150.7	217.6
3-Oct-19	33.7	172.9	261.2	33.1	150.1	239.7	33.3	166.0	247.8
4-Oct-19	33.0	168.2	250.7	30.4	129.4	214.8	28.7	144.6	206.2
5-Oct-19	33.3	167.6	249.7	30.4	128.5	212.7	29.8	150.0	216.1
6-Oct-19	32.9	168.3	249.4	31.3	137.7	224.0	30.3	151.7	202.2
7-Oct-19	33.9	171.5	258.0	32.9	150.7	243.2	32.3	161.3	244.7
8-Oct-19	31.1	159.6	229.8	30.9	137.7	219.9	29.3	147.3	209.6
9-Oct-19	33.4	171.7	264.9	34.0	159.2	258.4	34.1	165.8	252.3
10-Oct-19	35.4	178.4	285.4	33.3	158.9	246.7	35.7	174.1	271.1
11-Oct-19	37.0	180.8	298.1	33.2	158.8	249.9	36.7	178.2	275.5
12-Oct-19	35.5	172.3	261.6	33.5	153.8	240.0	34.9	170.5	230.0
13-Oct-19	35.5	174.0	262.7	32.1	143.3	225.8	33.3	165.1	232.4
14-Oct-19	36.1	176.7	275.1	32.3	146.1	236.2	34.6	169.7	243.0
15-Oct-19	36.2	177.1	274.1	32.7	150.7	240.9	35.1	170.3	259.6
16-Oct-19	35.5	176.7	274.1	32.5	150.5	239.7	34.1	167.4	252.2
17-Oct-19	35.7	177.9	280.9	32.6	154.0	239.4	34.8	171.7	259.6
18-Oct-19	34.8	173.6	269.9	32.3	150.3	238.7	33.1	164.1	245.5
19-Oct-19	34.5	170.7	261.5	29.6	118.6	202.1	32.4	159.3	237.2
20-Oct-19	31.6	159.5	226.9	30.4	119.3	203.5	28.4	142.8	204.7
21-Oct-19	32.1	159.8	229.8	30.8	120.1	203.1	27.7	139.9	198.9
22-Oct-19	34.2	166.1	244.0	32.1	129.2	211.3	28.5	142.2	198.1
23-Oct-19	34.6	168.9	251.0	31.6	129.8	212.6	30.1	149.7	214.3
24-Oct-19	34.2	168.0	244.9	30.4	116.6	202.8	30.5	151.2	218.7
25-Oct-19	33.4	163.2	235.5	31.4	124.9	209.6	28.9	143.3	206.9
26-Oct-19	32.9	160.8	230.0	31.0	120.9	204.7	28.4	140.7	203.1
27-Oct-19	32.0	159.3	226.6	30.1	117.6	201.2	27.4	137.9	
28-Oct-19	31.3	156.9	223.0	29.1	113.7	198.0	26.6	135.9	
29-Oct-19	33.5	165.9	246.1	31.1	129.4	212.9	27.9	141.3	
30-Oct-19	35.3	174.8	272.6	31.1	141.2	225.5	29.7	147.9	232.9
31-Oct-19	34.3	172.1	258.0	30.7	140.4	223.3	31.6	158.2	229.1
1-Nov-19	34.7	171.6	257.6	31.3	135.9	223.9	33.3	164.7	245.5
2-Nov-19	33.5	167.8	252.5	32.3	149.6	241.5	33.7	165.7	249.7
3-Nov-19	32.5	161.9	233.1	28.4	117.8	202.7	29.8	148.7	213.1
4-Nov-19	33.4	166.6	246.9	30.4	135.6	223.3	31.4	156.0	227.8
5-Nov-19	32.7	165.9	249.0	30.3	135.1	227.6	31.8	158.0	233.6
6-Nov-19	32.6	165.3	245.4	30.5	137.0	227.5	31.0	154.6	224.9
7-Nov-19	32.4	162.1	234.1	30.2	131.1	215.1	30.0	150.7	217.1
8-Nov-19	33.1	164.3	243.5	29.4	126.6	213.1	29.9	149.4	216.5
9-Nov-19	34.0	167.7	249.9	31.3	139.3	225.6	31.3	155.0	227.4
10-Nov-19	32.1	158.7	228.6	29.3	126.8	210.1	28.6	143.1	203.8
11-Nov-19	33.4	166.7	247.0	30.4	132.4	218.1	30.7	154.1	224.0
12-Nov-19	32.9	166.9	245.6	30.9	140.2	225.5	29.9	149.5	216.5
13-Nov-19	33.0	166.7	248.8	30.7	137.2	224.2	31.5	156.0	227.3
14-Nov-19	33.2	166.8	247.3	30.4	135.4	222.4	32.1	157.4	237.9
15-Nov-19	33.5	166.6	248.1	31.4	142.3	227.3	32.6	159.3	239.7
16-Nov-19	33.2	164.4	240.8	31.0	137.3	226.6	30.7	152.2	223.2
17-Nov-19	31.4	156.1	222.7	28.8	118.7	202.5	28.2	140.9	201.4
18-Nov-19	34.5	171.0	263.2	31.4	142.6	231.2	32.2	159.3	191.6
19-Nov-19	34.1	171.0	261.8	31.2	142.8	229.1	30.5	153.5	219.2
20-Nov-19	34.0	170.6	259.6	31.1	143.4	230.1	30.2	151.3	216.0
21-Nov-19	35.0	173.3	268.5	31.8	145.7	235.7	29.7	148.8	212.8
22-Nov-19	34.5	172.9	270.4	32.0	147.0	238.6	28.2	98.6	123.5
23-Nov-19	34.0	170.5	254.9	31.9	145.8	231.9			
24-Nov-19	33.5	166.3	248.0	30.7	135.8	221.3			
25-Nov-19	35.3	174.4	274.7	31.6	144.4	231.8	20.3	82.3	84.5
26-Nov-19	33.8	165.8	243.7	30.2	128.5	212.3	28.9	144.3	207.1
27-Nov-19	33.1	162.3	235.9	30.0	126.3	213.0	28.9	142.5	207.4
28-Nov-19	32.1	159.1	227.3	28.2	115.1	199.2	27.8	138.4	199.4
29-Nov-19	32.2	160.1	230.3	28.5	118.8	203.4	27.7	138.3	198.5
30-Nov-19	33.4	164.1	239.2	31.5	141.1	228.7	29.7	147.5	213.8

1-Dec-19	32.5	160.2	229.8	29.2	125.1	207.7	28.3	141.7	203.8
2-Dec-19	35.6	173.1	269.8	31.6	141.1	225.4	30.9	152.6	223.0
3-Dec-19	36.3	175.4	277.2	32.7	147.0	242.7	31.5	155.0	232.1
4-Dec-19	34.8	170.5	265.2	32.0	144.8	235.0	31.0	153.7	233.0
5-Dec-19	35.2	172.8	269.7	32.1	144.3	235.7	31.2	154.7	233.9
6-Dec-19	34.8	169.9	259.0	31.1	140.7	227.7	31.2	154.3	228.4
7-Dec-19	35.6	173.2	266.9	30.5	135.0	216.8	32.0	156.7	248.4
8-Dec-19	34.5	167.1	248.5	30.8	134.9	218.3	29.7	147.3	
9-Dec-19	35.3	172.2	270.3	31.7	144.3	229.8	32.0	157.6	247.0
10-Dec-19	35.1	174.6	268.6	31.4	144.5	232.1	31.0	152.2	220.3
11-Dec-19	34.6	173.2	268.6	30.9	145.6	235.3			
12-Dec-19	34.5	172.0	264.3	30.8	143.6	236.0			
13-Dec-19	32.8	162.2	234.3	28.9	126.1	208.0	27.0	67.1	206.6
14-Dec-19	33.6	166.0	244.2	30.3	135.5	217.6	28.7	142.3	207.6
15-Dec-19	33.1	161.8	232.2	29.0	117.5	202.4	27.5	137.1	200.4
16-Dec-19	34.8	167.3	243.5	29.5	121.5	205.3	27.9	137.5	207.1
17-Dec-19	34.3	164.7	237.3	31.1	135.0	216.3	29.0	143.0	205.6
18-Dec-19	34.2	165.5	241.3	30.1	132.9	213.9	28.5	141.4	205.5
19-Dec-19	35.1	172.9	273.2	30.7	142.8	229.6	31.1	155.0	219.3
20-Dec-19	34.4	172.9	264.4	31.0	145.2	236.9	31.2	156.0	237.9
21-Dec-19	34.6	172.1	265.1	31.0	141.2	231.6	31.2	154.8	230.2
22-Dec-19	34.4	168.1	252.6	30.6	136.3	221.5	30.2	149.5	202.2
23-Dec-19	35.4	172.8	268.3	31.2	144.8	237.6	31.5	155.3	245.5
24-Dec-19	34.8	171.6	262.9	31.5	147.3	242.4	31.3	155.4	241.4
25-Dec-19	35.1	172.9	270.8	30.7	143.5	239.0	30.4	151.6	233.0
26-Dec-19	34.1	168.7	259.2	29.3	135.4	221.9	29.0	144.7	212.3
27-Dec-19	36.4	178.1	275.1	30.0	135.1	214.9	31.8	156.9	180.5
28-Dec-19	35.2	173.4	266.9	31.1	142.9	234.4	31.2	153.7	248.4
29-Dec-19	35.4	172.3	260.4	31.3	142.2	231.2	31.1	153.8	
30-Dec-19	34.0	168.5	262.0	30.2	137.3	227.3	30.3	151.1	242.7
31-Dec-19	34.3	169.5	258.9	30.5	139.2	227.7	31.1	154.1	240.4
1-Jan-20	34.7	170.2	262.1	30.2	137.6	227.4	31.1	153.3	228.7
2-Jan-20	34.8	171.6	264.4	30.5	141.7	233.2	31.1	154.5	229.2
3-Jan-20	34.4	171.7	267.5	30.5	142.1	231.8	31.7	156.4	232.7
4-Jan-20	34.7	172.8	267.7	30.6	141.4	230.1	31.7	156.8	234.1
5-Jan-20	34.1	168.6	251.8	30.8	137.5	223.8	30.9	152.3	227.0
6-Jan-20	34.6	171.6	265.2	30.7	143.0	233.4	31.7	156.5	234.5
7-Jan-20	34.8	171.7	268.7	31.0	142.0	232.8	31.6	156.2	235.3
8-Jan-20	35.5	171.9	267.7	30.2	138.3	226.3	31.3	154.7	231.9
9-Jan-20	38.1	176.3	270.7	31.5	142.1	230.1	31.7	155.9	235.7
10-Jan-20	38.6	177.1	274.8	31.3	141.5	226.2	31.5	153.5	231.9
11-Jan-20	37.5	175.0	269.8	30.3	140.4	223.1	31.3	153.9	231.8
12-Jan-20	36.1	169.9	255.8	29.2	132.1	215.4	29.0	145.6	
13-Jan-20	36.8	173.8	267.4	29.9	138.1	224.1	30.7	153.9	247.2
14-Jan-20	35.9	173.7	266.3	30.0	141.2	229.2	31.4	156.0	
15-Jan-20	34.2	170.1	255.2	30.1	140.0	226.1	31.3	155.3	237.1
16-Jan-20	33.8	169.9	261.2	29.8	140.8	226.3	31.4	155.4	221.0
17-Jan-20	34.4	172.4	268.9	30.0	140.8	229.4	32.0	157.3	235.3
18-Jan-20	34.9	171.9	262.9	30.6	141.8	228.3	31.8	156.1	232.8
19-Jan-20	34.9	169.7	250.2	30.7	138.5	220.1	30.4	149.0	219.5
20-Jan-20	34.9	172.3	263.3	30.8	143.0	228.0	32.1	157.2	237.7
21-Jan-20	34.8	172.6	264.3	30.5	143.0	227.2	31.1	154.6	226.3
22-Jan-20	35.4	172.4	263.6	31.4	143.6	230.0	31.0	152.8	229.5
23-Jan-20	35.1	170.4	252.1	31.2	140.1	225.8	30.8	151.6	226.0
24-Jan-20	35.8	174.6	275.0	30.9	143.3	227.7	31.8	155.9	234.9
25-Jan-20	34.5	171.6	265.2	30.4	141.7	227.3	31.4	155.7	229.8
26-Jan-20	32.4	163.7	241.2	28.1	123.6	208.8	28.7	144.7	201.4
27-Jan-20	33.4	170.7	264.9	30.6	139.8	234.1	31.5	156.9	236.6
28-Jan-20	33.2	168.9	258.8	30.4	137.7	228.6	30.8	154.0	228.1
29-Jan-20	33.4	169.3	255.7	30.0	139.4	224.8	31.3	155.8	230.6
30-Jan-20	33.7	169.3	256.5	29.9	138.2	222.2	31.3	154.9	229.0
31-Jan-20	34.2	170.7	260.7	30.6	142.2	229.9	31.4	155.9	231.2
1-Feb-20	35.0	172.1	261.0	30.9	140.0	224.4	31.3	153.8	236.3
2-Feb-20	33.9	166.0	245.7	29.9	127.3	211.5	28.9	143.8	
3-Feb-20	34.1	169.2	256.7	30.3	136.0	219.2	31.2	154.5	234.8
4-Feb-20	34.2	172.0	268.2	30.6	142.9	228.8	32.1	158.1	241.6
5-Feb-20	34.1	170.4	254.9	30.3	138.0	221.6			
6-Feb-20	35.1	172.9	265.9	30.7	140.0	223.7			
7-Feb-20	34.7	172.3	265.8	30.9	143.2	229.5			
8-Feb-20	35.1	171.7	258.7	31.1	142.4	225.6			
9-Feb-20	34.0	166.2	245.5	30.3	128.3	212.6			

10-Feb-20	35.0	170.6	256.9	31.3	135.2	219.6			
11-Feb-20	34.7	169.3	257.3	30.5	131.1	215.3			
12-Feb-20	34.9	171.6	261.6	31.0	135.9	219.5			
13-Feb-20	34.7	171.8	264.4	30.9	140.3	226.5			
14-Feb-20	34.7	172.9	264.4	30.7	136.8	223.8			
15-Feb-20	35.3	174.8	275.5	30.6	139.9	224.9			
16-Feb-20	34.0	169.6	259.5	30.5	139.9	225.9			
17-Feb-20	35.3	172.5	272.2	31.1	140.8	226.6			
18-Feb-20	34.5	172.1	262.9	30.3	139.9	224.6			
19-Feb-20	34.2	171.9	265.7	30.2	138.7	222.4			
20-Feb-20	34.2	171.1	263.1	30.8	141.5	227.5			
21-Feb-20	33.9	165.5	240.7	30.8	133.6	216.5			
22-Feb-20	34.4	169.4	254.7	30.6	138.0	222.3			
23-Feb-20	33.3	164.5	241.1	29.3	123.5	208.5			
24-Feb-20	33.5	166.8	250.4	30.4	137.5	222.0			
25-Feb-20	32.8	165.7	240.9	28.4	125.2	204.0			
26-Feb-20	30.0	151.7	218.4	25.1	106.3	172.3			
27-Feb-20	33.6	168.8	258.5	29.4	136.6	219.5			
28-Feb-20	33.9	169.7	260.9	29.9	134.7	223.9			
29-Feb-20	32.2	163.0	241.9	28.9	123.6	209.1			
1-Mar-20	31.7	159.5	229.8	28.1	116.5	200.5			
2-Mar-20	33.4	166.6	245.3	29.8	133.2	217.3			
3-Mar-20	32.1	162.0	239.3	29.7	132.6	216.8			
4-Mar-20	32.7	163.9	240.6	29.4	128.5	210.7			
5-Mar-20	32.3	162.5	236.8	30.8	132.3	218.5			
6-Mar-20	30.7	155.2	223.5	29.2	116.3	200.3			
7-Mar-20	32.1	161.8	234.0	29.8	122.4	207.0			
8-Mar-20	31.6	158.6	230.2	29.3	119.3	201.0			
9-Mar-20	32.2	162.5	237.1	30.7	123.5	206.2			
10-Mar-20	31.1	157.8	226.4	28.5	115.6	195.8			
11-Mar-20	31.3	158.1	228.4	28.1	118.7	202.1			
12-Mar-20	33.6	169.3	253.2	29.5	132.4	214.0			
13-Mar-20	34.4	172.4	265.4	30.6	138.4	222.8			
14-Mar-20	34.0	167.5	249.8	29.8	131.6	214.2			
15-Mar-20	33.0	162.3	233.9	29.3	123.2	206.7			
16-Mar-20	34.8	169.9	257.2	30.5	131.2	216.1			
17-Mar-20	34.6	171.1	265.8	31.4	142.4	230.9			
18-Mar-20	35.3	174.6	277.7	31.9	146.8	234.3			
19-Mar-20	34.6	173.7	277.4	31.7	146.1	239.4			
20-Mar-20	34.1	170.2	256.5	30.7	136.9	221.1			
21-Mar-20	32.2	161.2	231.8	29.7	123.1	208.1			
22-Mar-20	30.3	153.5	220.7	27.9	114.4	196.1			
23-Mar-20	30.9	157.2	224.0	28.3	117.4	200.5	28.5	146.2	177.7
24-Mar-20	30.8	156.4	224.3	28.6	117.4	201.0	27.0	138.6	182.1
25-Mar-20	30.6	154.6	220.9	27.7	111.0	194.7	27.4	140.4	176.4
26-Mar-20	31.3	155.9	223.7	28.4	114.5	197.8	27.5	139.4	175.2
27-Mar-20	30.5	152.9	218.4	27.9	112.7	192.0	26.6	135.2	172.4
28-Mar-20	29.3	148.7	212.7	26.1	108.7	179.7	26.1	133.9	175.6
29-Mar-20	29.9	151.3	216.2	26.9	110.0	191.0	27.4	138.2	181.4
30-Mar-20	30.3	152.7	218.8	27.6	112.4	194.5	26.4	134.1	173.7
31-Mar-20	30.4	153.7	220.7	27.6	113.2	194.9	27.1	136.6	179.1



Terrestrial Ecology Report (October, 2019 to March, 2020)



Environment Department,
Adani Power (Mundra) Limited,
Village Tunda & Siracha, Taluka Mundra,
Mundra Kutch, 370 435
Gujarat, India.

List of Abbreviations

APMuL	: Adani Power (Mundra) Limited, Mundra
CBH	: Circumference at Breast Height
DBH	: Diameter at Breast Height
EIA	: Environmental Impact Assessment
GPS	: Global Positioning System
H'	: Shannon-Wiener Diversity Index
Ha	: Hectare
IUCN	: International Union for Conservation of Nature
IVI	: Importance Value Index
MoEF&CC	: Ministry of Environment, Forest & Climate Change, India
SEZ	: Special Economic Zone

Table of Contents

Chapter No.	Title	Page No.
1	The Study Area	1
2	Sampling Period and Sampling Locations	1
3	Collection of Primary Data	2
	A Vegetation Diversity	2
	B Faunal Diversity	7
	C Avifauna	8
4	Green belt activities	13
5	References	14

List of Plates

Plate No.	Title	Page No.
1	<i>Aerva javanica</i>	3
2	<i>Tamarix dioica</i>	3
3	<i>Prosopis juliflora</i>	3
4	<i>Salvadora persica</i>	3
5	Mammals recorded the Study Area of 10 Km	7
6	Migratory Birds Observed in the Study Area of 10 Km	9
7	Migratory Birds Observed in the Study Area of 10 Km	10
8	Resident Birds Observed in the Study Area of 10 Km	11
9	Resident Birds Observed in the Study Area of 10 Km	12

List of Table

Table No.	Title	Page No.
1	List of Sampling Location	1
2	Study of Diversity Indices for Trees	5
3	Study of Diversity Indices for Shrubs	6
4	Study of Diversity Indices for Herbs	6
5	Fauna Observed in the Study Area of 10 km	7
6	Study of Diversity Indices for Birds (Avi-Fauna)	12

1. The Study Area

The Mundra coast falls in Gulf of Kutch, an ecologically important area, supports variety of fishes and birds and other associated ecosystems and hence it is necessary to monitor the ecological environment to know if any changes are happening or not due to the operation activities of power plant.

The study area has been marked as 10 Km radial distance from the existing thermal power plant boundary near village Tunda, Mundra Taluka of Kutch district of Gujarat. The study area around the plant premises comprises of terrestrial ecosystem (Fallow and barren land) and coastal ecosystem (Sea and Creeks). Topography of the study area is plain. Part of Study area falls in notified industrial zone (SEZ).

2. Sampling Period and Sampling Locations

The study has been carried out during the months of **October, 2019 to March, 2020** in two different seasons comprising Pre-monsoon and Post-monsoon seasons.

Sampling locations were selected on the basis of topography, land use, vegetation pattern, etc. as per the objectives and guidelines of MoEF. All observations were taken in and around sampling locations for quantitative representation of different species. List of sampling location for ecological study are given in **Table 1** and Study area map is presented in **Fig. 1**.

Table 1: List of Sampling Location

Sr. No.	Name of Location	Aerial Distance from Plant (Approx. Km)	GPS Location
1	Near Siracha Village	2.2	N 22° 50' 22.62" E 69° 33' 46.32"
2	Near Tunda Village	1.3	N 22° 50' 13.58" E 69° 32' 2.25"
3	Near Kandagra Village	3.2	N 22° 50' 22.11" E 69° 31' 33.55"
4	Near Navinal Creek	7.5	N 22° 48' 12.76" E 69° 37' 57.47"
5	Near Vandh Village	1.5	N 22° 48' 44.54" E 69° 32' 33.24"
6	Near Desalpar Village	7.2	N 22° 52' 50.21" E 69° 34' 45.56"
7	Common Intake Channel area	3.5	N 22° 47' 31.71" E 69° 32' 10.53"
8	Outfall Channel and Kotdi creek area	3.3	N 22° 48' 4.82" E 69° 34' 33.72"



Fig. 1: Map showing Ecological Sampling Locations around 10 km radial distance

3. Collection of Primary Data

A. Vegetation Diversity

Methodology

The study area is dominated by the vegetation of dry deciduous scrub of small tree, shrub and very few large trees along with agricultural fields towards the northern part. Therefore the observation of vegetation was made by visiting different sampling stations and accordingly among available plants, the dominant plants species were recorded.

Observation

Forest Type: According to Champion and Seth, the vegetation in the study area can be classified as “VI – B Northern Tropical Forest” Sub type C-I Desert Thorn Forest (Kutch, Saurashtra, Gujarat). The forest patches falling under this category have mono-dominant *Prosopis juliflora*. *Acacia spp.*, *Cassia auriculata* *Euphorbia spp.*, *Zyziphus mauritiana* and *Zyziphus nummularis* are also found in these scrubs.

Vegetation Structure and Composition: Trees Composition varies considerably in condition, composition and density with change in location. The vegetation has a very open appearance and is widely spaced with scanty natural growth typical of a saline soil with hot and humid climate mainly composed of co-dominant, thorny trees and shrubs which are xerophytic in nature. The dominant tree species vary from 5-10m in height and tends to be collected in clumps. Regeneration by root suckers is common, especially in *Prosopis* and *Capparis*. The perennial grasses grow in clumps and tussocks (Bunch). There is a thin growth of annual grasses after the rains. They wither after the rainy season.

Vegetation generally occurs near human settlement areas and agricultural bunds. The most dominant species in this region is *Prosopis juliflora* (**Plate-1**). Other tree species observed are namely *Salvadora oleoides*, *Salvadora persica*, *Phoenix sylvestris* and *Ficus religiosa*. Large horticulture crops of Chiku (*Manilkara zapota*),

Coconut (*Cocos nucifera*), Mango (*Mangifera indica*), Guava (*Psidium guajava*) and Date Palm (*Phoenix dactylifera*) are observed near northern part of the study area. Medicinal trees like *Aegle marmelos* (Bel), *Azadirachta indica* (Neem), *Tamarindus indica* (Amla) etc are also commonly observed in the study area.

The vertical structure of the vegetation shows three distinguished layers i.e. Top, Middle and Ground. *Azadirachta indica*, *Borassus flabellifer*, *Ficus bengalensis*, *Ficus racemosa*, *Mangifera indica*, *Tamarindus indica*, *salvadora persica* (Plate-4) etc. comprises top layer of the vegetation.

Salvadora oleoides, *Phoenix sylvestris*, *Cassia auriculata*, *Capparis deciduas*, *Pithecellobium dulce*, *Calotropis procera*, *Euphorbia nebulia*, *Prosopis juliflora*, *Zizyphus mauritiana*, *Zizyphus nummularia*, *Tamarix dioica*, etc. forms middle layer of vegetation.

Ground layer vegetation consists of *Aloe vera*, *Achyranthes aspera*, *Boerhavia repens*, *Citrullus colocynthis* (Plate 1), *Cynodon dactylon*, *Indigofera cordifolia*, *Suaeda fruticosa*, *Suaeda nudiflora*, *Solanum xanthocarpum*, *Tridax procumbens*, *Sporolobus maderaspatenus* etc.



Plate 1: *Aerva javanica*



Plate 2: *Tamarix dioica*



Plate 3: *Prosopis juliflora*



Plate 4: *salvadora persica*

Dominance, Density and Frequency: The floristic composition assessment of the study area has been evaluated. Phytosociological studies were carried out by using least count quadrant method. Trees, shrubs and herbs were sampled by taking randomly distributed 10 quadrates of 100 m², 25 m² and 1 m² respectively. The data obtained was further used to estimate Relative Density, Relative Frequency, Relative Dominance and calculation of Importance Value Index (IVI).

The Importance Value Index (IVI) for trees varies between 20.27 and 50.97. The highest IVI of studied tree recorded in study area is of *Prosopis juliflora* (50.97) and lowest IVI recorded is of *Acacia nilotica* (20.27) during study period. For shrubs, IVI varies between 13.09 and 33.24. The highest IVI of studied shrubs recorded in study area is of *Cassia auriculata* (33.24) and lowest IVI recorded is of *Calotropis gigantea* (13.09) during study period. The undergrowth vegetation (herbs) shows IVI in between 10.40 and 29.85. The highest IVI of studied herbs recorded in study area is of *Salicornia brachiata* (29.85) and lowest IVI recorded is of *Solanum xanthocarpum* (10.40) during study period. The details of IVI are presented in **Table 2 to 4** for tree shrubs and herbs respectively.

Diversity Index: Diversity means variety or variability. Species diversity therefore refers to the variation that exists among the different living forms. Species indicates the extent of biodiversity in the ecosystem. Species diversity is a statistical abstraction with two components. These are the number of species or richness and evenness or equitability. For better understanding of plant diversity, the Shannon-Wiener diversity index was used. The index considers two important characters of vegetation, i.e. floristic richness and proportional abundance of the species. Diversity index increases with floral spectra (more species means that more wide diversity) which represents actual scenario of ecosystem. The index is given as:

$$H' = - \sum_{i=1}^s P_i \ln(P_i)$$

Where H' = Shannon-Wiener diversity index

P_i = Proportional abundance of the ith (individual) species

S = species richness (total number of species present)

ln = natural log (base e)

The species diversity of the study area found to be **2.18, 2.22** and **2.21** for tree, shrub and herbs respectively. The details are presented in **Table 2 to 4** for trees, shrubs and herbs respectively.

Table 2: Study of Diversity Indices for Trees

Scientific Name	IUCN Category	No. of Plots in Sp. Occ.	Total No. Sp.	Total CBH (cm)	Radius (cm)	DBH (cm)	Total Basal Cover (Sq. Meter)	Density/ ha	R-Density	Domin.	R-Domin.	Freq.	R-Freq.	IVI	Pi	In (Pi)	Pi X Ln (Pi)
<i>Acacia nilotica</i>	NE	4	3	12	51	8.12	16.23	0.02	120	10.17	0.21	5.07	0.3	6.12	21.37	0.1017	-2.2858
<i>Azadiracta indica</i>	NE	8	6	12	72	11.46	22.92	0.04	120	10.17	0.41	10.11	0.6	12.24	32.53	0.1017	-2.2858
<i>Borassus flabellifer</i>	NE	2	4	10	90	14.32	28.64	0.06	100	8.47	0.64	15.80	0.4	8.16	32.44	0.0847	-2.4681
<i>Casuarina equisetifolia</i>	NE	4	6	15	25	3.98	7.96	0.00	150	12.71	0.05	1.22	0.6	12.24	26.18	0.1271	-2.0626
<i>Cocos nucifera</i>	NE	5	4	18	110	17.50	35.01	0.10	180	15.25	0.96	23.61	0.4	8.16	47.02	0.1525	-1.8803
<i>Mangifera indica</i>	DD	5	5	12	60	9.55	19.10	0.03	120	10.17	0.29	7.02	0.5	10.20	27.40	0.1017	-2.2858
<i>Phoenix dactylifera</i>	NE	4	6	15	110	17.50	35.01	0.10	150	12.71	0.96	23.61	0.6	12.24	48.56	0.1271	-2.0626
<i>Prosopis juliflora</i>	NE	9	10	12	42	6.68	13.37	0.01	120	10.17	0.14	3.44	1.0	20.41	34.02	0.1017	-2.2858
<i>Salvadora persica</i>	NE	3	5	12	72	11.46	22.92	0.04	120	10.17	0.41	10.11	0.5	10.20	30.49	0.1017	-2.2858
Total			118					1180	100.00	4.08	100.00	4.9	100.00	300.00			2.18
																Shannon-Wiener	2.18

NE: Not Evaluated, **DD:** Data Deficient

Table 3: Study of Diversity Indices for Shrubs

Scientific Name	IUCN Category	No. of Plots in Sp. Occ.	Total No. of Sp.	Density/ ha	Relative Density	Frequency	Relative Frequency	IVI	Pi	ln (Pi)	Pi X Ln (Pi)
<i>Aerva javanica</i>	NE	8	12	30	8.63	0.80	12.90	21.54	0.0863	-2.4496	0.21
<i>Calotropis gigantea</i>	NE	10	9	23	6.47	1.00	16.13	22.60	0.0647	-2.7372	0.18
<i>Calotropis procera</i>	NE	8	16	40	11.51	0.80	12.90	24.41	0.1151	-2.1619	0.25
<i>Capparis deciduas</i>	NE	7	12	30	8.63	0.70	11.29	19.92	0.0863	-2.4496	0.21
<i>Cassia auriculata</i>	NE	8	25	63	17.99	0.80	12.90	30.89	0.1799	-1.7156	0.31
<i>Euphorbia spp.</i>	NE	6	12	30	8.63	0.60	9.68	18.31	0.0863	-2.4496	0.21
<i>Tamarix dioica</i>	NE	4	18	45	12.95	0.40	6.45	19.40	0.1295	-2.0441	0.26
<i>Thevetia peruviana</i>	NE	5	9	23	6.47	0.50	8.06	14.54	0.0647	-2.7372	0.18
<i>Zizyphus mauritiana</i>	NE	3	5	13	3.60	0.30	4.84	8.44	0.0360	-3.3250	0.12
<i>Zizyphus numularia</i>	NE	3	21	53	15.11	0.30	4.84	19.95	0.1511	-1.8900	0.29
		Total	139	348	100.00	6.20	100.00	200.00			2.22
										Shannon-Wiener	2.22

NE: Not Evaluated, DD: Data Deficient

Table 4: Study of Diversity Indices for Herbs

Scientific Name	IUCN Category	No. of Plots in Sp. Occ.	Total No. of Sp.	Density/ ha	Relative Density	Frequency	Relative Frequency	IVI	Pi	ln (Pi)	Pi X Ln (Pi)
<i>Achyranthes aspera</i>	NE	4	16	0.16	8.60	0.4	11.43	20.03	0.0860	-2.4532	0.21
<i>Aloe vera</i>	NE	4	18	0.18	9.68	0.4	11.43	21.11	0.0968	-2.3354	0.23
<i>Boerhavia diffusa</i>	NE	2	11	0.11	5.91	0.2	5.71	11.63	0.0591	-2.8279	0.17
<i>Citrullus colocynthis</i>	NE	4	18	0.18	9.68	0.4	11.43	21.11	0.0968	-2.3354	0.23
<i>Ipomoea biloba</i>	NE	3	16	0.16	8.60	0.3	8.57	17.17	0.0860	-2.4532	0.21
<i>Salicornia brachiata</i>	NE	4	36	0.36	19.35	0.4	11.43	30.78	0.1935	-1.6422	0.32
<i>Solanum xanthocarpum</i>	NE	2	6	0.06	3.23	0.2	5.71	8.94	0.0323	-3.4340	0.11
<i>Indigofera cordifolia</i>	NE	3	18	0.18	9.68	0.3	8.57	18.25	0.0968	-2.3354	0.23
<i>Sporolobus maderaspatenus</i>	NE	4	28	0.28	15.05	0.4	11.43	26.48	0.1505	-1.8935	0.29
<i>Suaeda fruticosa</i>	NE	5	19	0.19	10.22	0.5	14.29	24.50	0.1022	-2.2813	0.23
<i>Tridax procumbens</i>	NE	4	16	0.16	8.60	0.4	11.43	20.03	0.0860	-2.4532	0.21
		Total	186	1.86	100.00	3.5	100.00	200.00			2.21
										Shannon-Wiener	2.21

NE: Not Evaluated, DD: Data Deficient

B. Faunal Diversity

Methodology

For animals, since they are capable of moving from one place to another, this makes their study entirely different. Therefore, specific methods were adopted for counting these animals in the field. The on-site information (observation and interview with local people) collected during survey was further enriched by the information collected from different secondary sources.

Observation

Mammals. The diversity in fauna basically depends upon density and diversity of flora. The richer the diversity among the flora better will be the diversity in fauna. Present conditions (sparse, dry and thorny vegetation) of the area do not support higher mammals, however animals like Fox and Jackal are commonly observed. Vermin animals like Nilgai, Wild Boar and Hare also observed from the study area. **Plate-5** shows the mammals observed during the study.

Reptiles and amphibians. Area is devoid of good agricultural land, however standing orchards of coconut, mango and chiku attracts many rodents and birds, which ultimately attracts many reptiles and amphibians. Lizards such as monitor lizard and garden lizards are observed in the study area. The faunal elements observed in the study area during this period are given in **Table 5**.

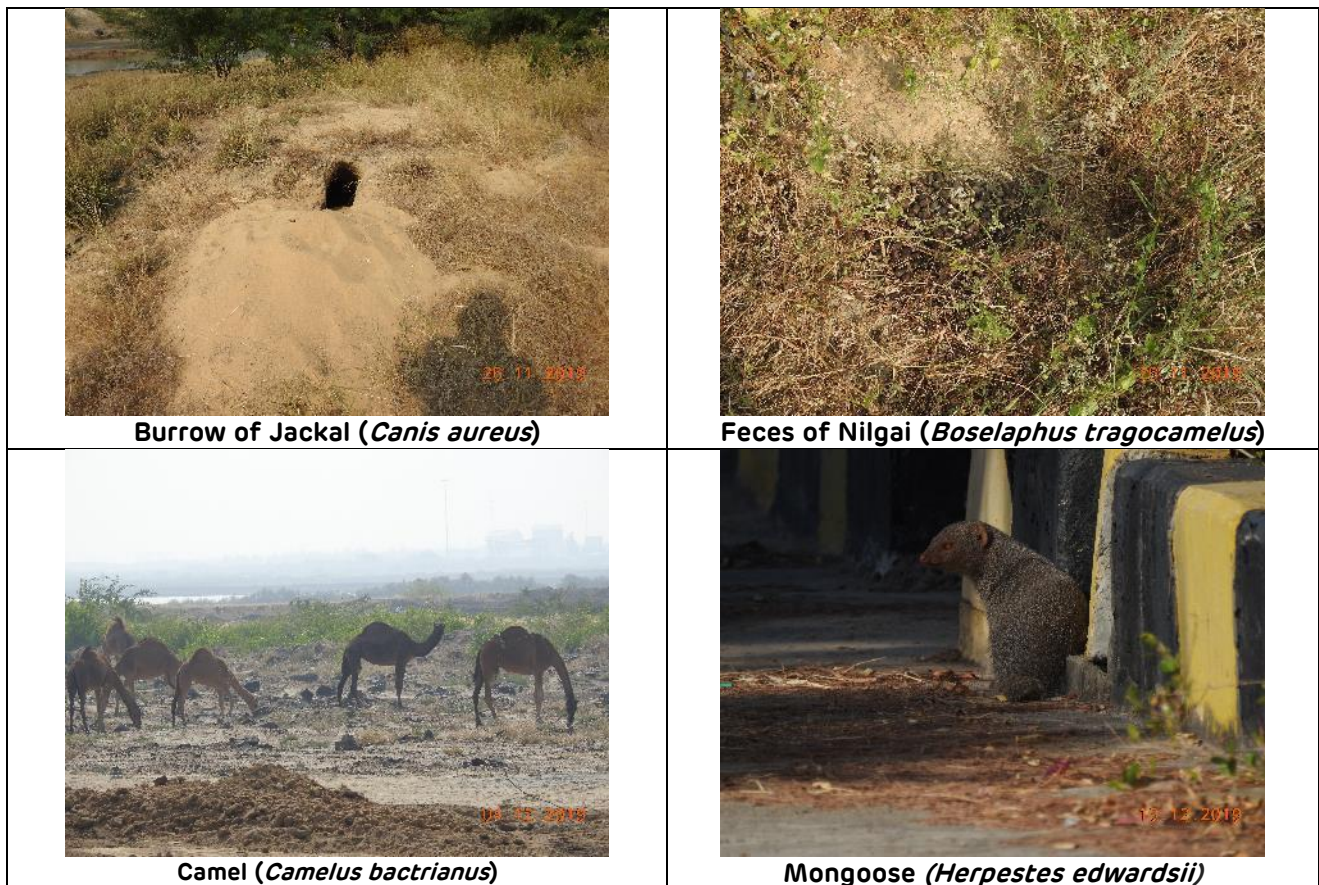


Plate 5: Mammals recorded the Study Area of 10 Km

Table 5: Fauna Observed in the Study Area

Sr. No.	Common Name	Scientific Name	IUCN Category	Wildlife Schedule
Mammals				
1	Nilgai	<i>Boselaphus tragocamelus</i>	LC	Schedule III
2	Jackal	<i>Canis aureus</i>	LC	Schedule II: Part - II
3	Mongoose	<i>Herpestes edwardsii</i>	LC	Schedule II: Part - II
4	Hare	<i>Lepus nigricollis</i>	LC	Schedule IV
5	Wild Boar	<i>Sus scrofa</i>	LC	Schedule III
6	Camel	<i>Camelus bactrianus</i>	LC	Schedule IV
Amphibians				
1	Indian Skipping Frog	<i>Euphlyctis cyanophlyctis</i>	LC	-
2	Indian bullfrog	<i>Hoplobatrachus tigerinus</i>	LC	-
Reptiles				
1	Garden lizard	<i>Calotes versicolor</i>	NE	-
2	Monitor lizard	<i>Varanus spp.</i>	LC	Schedule II: Part - II
3	Fan-throated lizard	<i>Sitana ponticeriana</i>	LC	-
4	Indian cobra	<i>Naja naja</i>	LC	Schedule II: Part - II
5	Python	<i>Python molurus</i>	NT	Schedule I: Part - II

LC: Least Concern, NT: Near Threatened, NE: Not Evaluated.

C. Avifauna

Methodology

For survey of the birds, the area around APMUL power plant and adjacent areas of the study area was carried out from **October, 2019 to March**. Birds were observed once a week. A working day was divided into two parts, viz., morning (0600 to 0800hr) and afternoon (1700 to 1900hr). Existing roads, bridle paths, embankments, cattle trails, plantation areas, shore lines, canal and pond banks, etc., were used to cover the study area. The trail length varied from 500m to 1000m and the visibility of these trails was 50m to 100m width on both sides. All types of habitats were visited weekly. Maximum field visits were carried on foot but sometimes vehicles were also used to cover long distance of the study area. Birds were observed either by a pair of binoculars (**Nikon Action 8x40CF**) or by naked eyes depending on the distance of the object. Long notes were taken on whether the observed birds were singing, feeding or flying over. For identification, external morphology and other modes i.e., colour, size, shape, flight, walk, habitat, call, and sitting postures were considered, followed by the use of Field guide by Ali (1996), Ali and Ripley (1983). A camera camera (**Nikon Coolpix P900**) with **83x zoom** lens was used for photography.

The estimates of the survey provide an index of the various species of birds in the study area and allow species comparison between them. For better understanding of avian diversity, the Shannon-Wiener diversity index was used. The index considers two important characters of birds, i.e. its richness and proportional abundance of the species. Diversity index increases with the avian spectra (more species means that more wide diversity) which represents actual scenario of ecosystem. The index is given as:

$$H' = - \sum_{i=1}^s P_i \ln(P_i)$$

Where H' = Shannon-Wiener diversity index

P_i = Proportional abundance of the ith (individual) species

S = species richness (total number of species present)

\ln = natural log (base e)

Observation

Mundra coast provides very good grounds for roosting and food to the avifauna. The coastal wetlands in Mundra coast with broad intertidal mudflats, mangroves and salt pans offer a great diversity of habitats for birds to utilize for roosting, nesting and breeding.

The study area supports three habitat types of birds namely water birds, grassland birds and coastal birds. The birds like Mynas, Crows, Sparrows, Bulbuls, Babblers and Pigeons were commonly observed in and around villages. Areas with or near the agriculture fields, grain eating herbivorous species were dominant. These species includes Doves, Sparrows, Pigeons, etc. Insectivorous bird species viz. Bee-Eaters, Bulbuls, Wagtails, Desert Wheatears, Drongos, etc. were observed in the study area. Fruit eating birds like Bulbuls, Mynas and Sunbirds usually observed near the village settlements. Water habitat and fish eating birds like Curlews, Kingfishers, Herons, Lapwings, Plovers, Sandpipers, Indian Rollers, and Egrets were observed near the water bodies and in low-lying marshy areas. View of migratory birds (**Plate 6 & 7**) & resident birds observed in the study area are shown in (**Plate 8 & 9**). List of birds observed during the study period in the study area are given in **Table 6**.

The Shannon Weiner Diversity Index for birds in the study area is found to be **3.95** during this period. The Species richness for the study area is found to be **70**. Proportional abundance of the individual species varies between 0.0008 and 0.0663. The highest abundance recorded was of Blue Rock Pigeon (0.1083) and the lowest recorded were of **Osprey** (0.0008). The details are presented in **Table 6**.

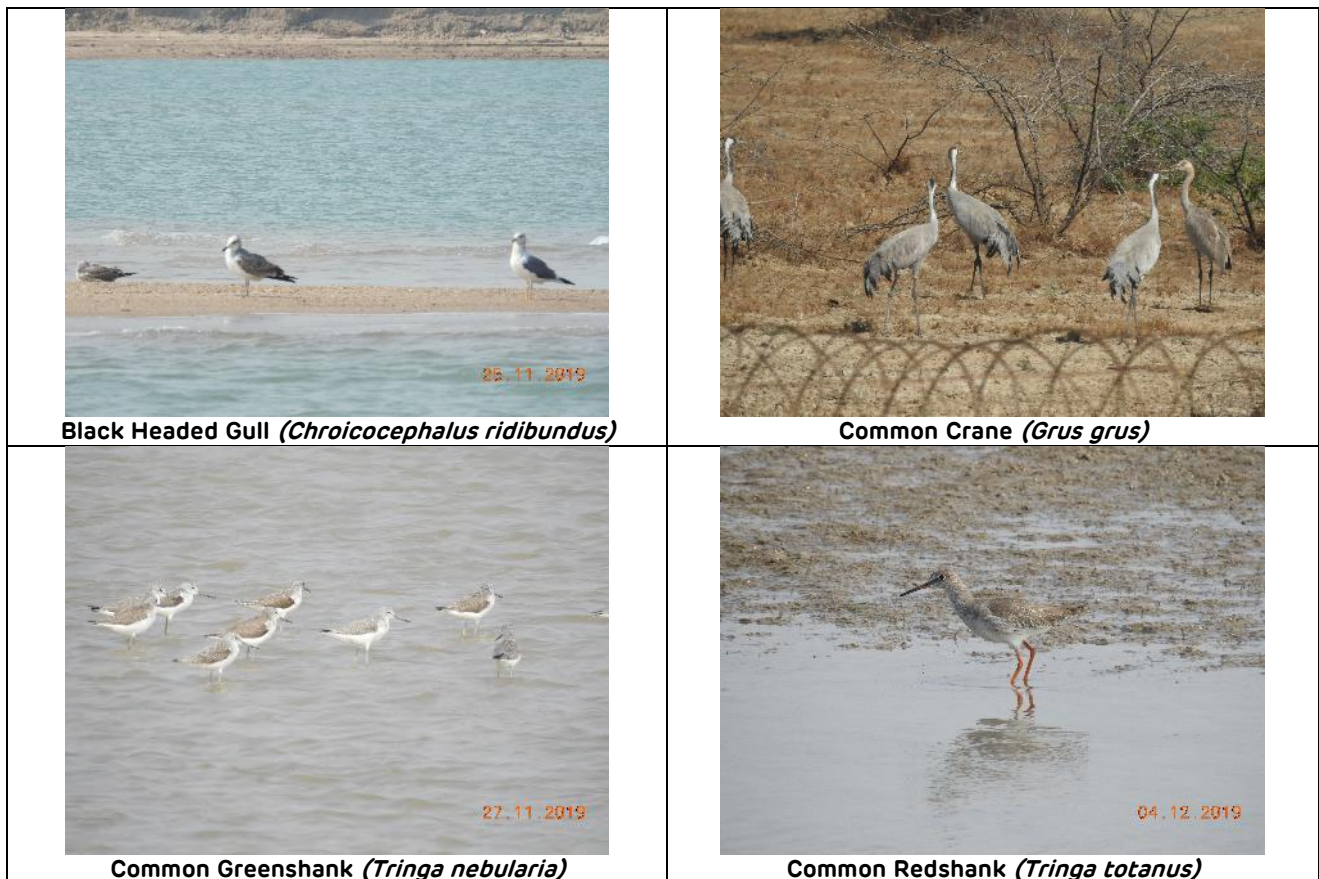


Plate 6: Migratory Birds Observed in the Study Area of 10 Km



Dalmatian Pelican (*Pelecanus crispus*)



Eurasian Curlew (*Numenius arquata*)



Great White Pelican (*Pelecanus onocrotalus*)



Green Sandpiper (*Tringa ochropus*)



Northern shoveller (*Spatula clypeata*)



Osprey (*Pandion haliaetus*)



Kentish Plover (*Charadrius alexandrinus*)



Eurasian Spoonbill (*Platalea leucorodia*)

Plate 7: Migratory Birds Observed in the Study Area of 10 Km



Black-necked Stork (*Ephippiorhynchus asiaticus*)-RM



House sparrow (*Passer domesticus*)-RM



Common crested Lark (*Galerida cristata*)-RM



Common Swallow (*Hirundo rustica*)-RM



Desert Wheatear (*Oenanthe deserti*)



Common coot (*Fulica atra*)



Great Thick-knee (*Esacus recurvirostris*)



Greater short toed-lark (*Calandrella brachydactyla*)

Plate 8: Resident Birds Observed in the Study Area of 10 Km



Indian pond heron (*Ardeola grayii*)



Indian robin (*Saxicoloides fulicatus*)



Indian pond heron (*Ardeola grayii*)



Large Egret (*Ardea alba*)



White Eared Bulbul (*Pycnonotus leucotis*)



Oriental darter (*Anhinga melanogaster*)

Plate 9: Resident Birds Observed in the Study Area of 10 Km

Table 6: Study of Diversity Indices for Birds (Avi-Fauna)

Sr. No.	Common Name	Scientific Name	IUCN Category	Wildlife Schedule	Total	Pi	In Pi	SWI
1	Asian Koel	<i>Eudynamys scolopaceus</i>	LC	Schedule IV	32	0.0066	-5.016	0.0333
2	Black-Tailed Godwit	<i>Limosa limosa</i>	NT	Schedule IV	9	0.0019	-6.285	0.0117
3	Black-crowned sparrow-lark	<i>Eremopterix nigriceps</i>	LC	Schedule IV	60	0.0124	-4.387	0.0545
4	Black Drongo	<i>Dicrurus macrocercus</i>	LC	Schedule IV	64	0.0133	-4.323	0.0573
5	Black Headed Gull	<i>Chroicocephalus ridibundus</i>	LC	Schedule IV	77	0.0160	-4.138	0.0660
6	Black Ibis/Glossy Ibis	<i>Pseudibis papillosa</i>	LC	Schedule IV	70	0.0145	-4.233	0.0614
7	Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	NT	Schedule IV	5	0.0010	-6.872	0.0071
8	Black-Winged Stilt	<i>Himantopus himantopus</i>	LC	Schedule IV	98	0.0203	-3.897	0.0791
9	Black-Shouldered Kite	<i>Elanus caeruleus</i>	LC	Schedule IV	5	0.0010	-6.872	0.0071
10	Blue Cheeked Bee Eater	<i>Merops persicus</i>	LC	Schedule IV	57	0.0118	-4.439	0.0524
11	Blue Rock Pigeon	<i>Columba livia neglecta</i>	NE	Schedule IV	320	0.0663	-2.713	0.1799
12	Brahminy Starling	<i>Sturnia pagodarum</i>	NE	Schedule IV	58	0.0120	-4.421	0.0531
13	Cattle Egret	<i>Bubulcus ibis</i>	LC	Schedule IV	80	0.0166	-4.1	0.0680
14	Common Babbler	<i>Turdoides caudata</i>	LC	Schedule IV	97	0.0201	-3.907	0.0785
15	Common Coot	<i>Fulica atra</i>	LC	Schedule IV	148	0.0307	-3.485	0.1069
16	Common Crane	<i>Grus grus</i>	LC	Schedule IV	117	0.0242	-3.72	0.0902
17	Common Crested Lark	<i>Galerida cristata</i>	LC	Schedule IV	80	0.0166	-4.1	0.0680
18	Common Hoopoe	<i>Upupa epops</i>	LC	Schedule IV	27	0.0056	-5.186	0.0290
19	Common Iora	<i>Aegithina tiphia</i>	LC	Schedule IV	18	0.0037	-5.591	0.0209
20	Common Myna	<i>Acridotheres tristis</i>	LC	Schedule IV	69	0.0143	-4.248	0.0607
21	Common Quail	<i>Coturnix coturnix</i>	LC	Schedule IV	36	0.0075	-4.898	0.0365
22	Common Redshank	<i>Tringa totanus</i>	LC	Schedule IV	69	0.0143	-4.248	0.0607
23	Common Greenshank	<i>Tringa nebularia</i>	LC	Schedule IV	68	0.0141	-4.262	0.0601
24	Common Swallow	<i>Hirundo rustica</i>	LC	Schedule IV	79	0.0164	-4.112	0.0673
25	Common Teal	<i>Anas crecca</i>	LC	Schedule IV	157	0.0325	-3.426	0.1114
26	Dalmatian Pelican	<i>Pelecanus crispus</i>	LC	Schedule IV	101	0.0209	-3.867	0.0809
27	Great White Pelican	<i>Pelecanus onocrotalus</i>	LC	Schedule IV	120	0.0249	-3.694	0.0919
28	Desert Wheatear	<i>Oenanthe deserti</i>	LC	Schedule IV	61	0.0126	-4.371	0.0552
29	Great Stone Plover	<i>Esacus recurvirostris</i>	NT	Schedule IV	52	0.0108	-4.531	0.0488
30	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	LC	Schedule IV	40	0.0083	-4.793	0.0397
32	Eurasian Curlew	<i>Numenius arquata</i>	NT	Schedule IV	5	0.0010	-6.872	0.0071
33	Eurasian Spoonbill	<i>Platalea leucorodia</i>	LC	Schedule IV	47	0.0097	-4.632	0.0451
34	Greater Flamingo	<i>Phoenicopterus roseus</i>	LC	Schedule IV	224	0.0464	-3.07	0.1425
35	Greater Short-toed Lark	<i>Calandrella brachydactyla</i>	LC	Schedule IV	51	0.0106	-4.55	0.0481
36	Green Bee Eater	<i>Merops orientalis</i>	LC	Schedule IV	84	0.0174	-4.051	0.0705
37	Green Sandpiper	<i>Tringa ochropus</i>	LC	Schedule IV	16	0.0033	-5.709	0.0189
38	Grey Heron	<i>Ardea cinerea</i>	LC	Schedule IV	52	0.0108	-4.531	0.0488
39	Grey Francolin	<i>Gelochelidon nilotica</i>	LC	Schedule IV	60	0.0124	-4.387	0.0545
40	House Crow	<i>Corvus splendens</i>	LC	Schedule V	129	0.0267	-3.622	0.0968

41	House Sparrow	<i>Passer domesticus</i>	LC	Schedule IV	308	0.0638	-2.752	0.1756
42	Indian Pond Heron	<i>Ardeola grayii</i>	LC	Schedule IV	53	0.0110	-4.511	0.0495
43	Indian Robin	<i>Saxicoloides fulicatus</i>	LC	Schedule IV	46	0.0095	-4.653	0.0444
44	Indian Roller/ Neelkanth	<i>Coracias benghalensis</i>	LC	Schedule IV	34	0.0070	-4.955	0.0349
45	Large Egret	<i>Ardea alba</i>	LC	Schedule IV	59	0.0122	-4.404	0.0538
46	Laughing Dove	<i>Spilopelia senegalensis</i>	LC	Schedule IV	116	0.0240	-3.728	0.0896
47	Little Cormorant	<i>Microcarbo niger</i>	LC	Schedule IV	29	0.0060	-5.114	0.0307
48	Little Tern	<i>Sternula albifrons</i>	LC	Schedule IV	5	0.0010	-6.872	0.0071
49	Northern Shoveller	<i>Spatula clypeata</i>	LC	Schedule IV	80	0.0166	-4.1	0.0680
50	Oriental White Ibis / Black-Headed ibis	<i>Threskiornis melanocephalus</i>	NT	Schedule IV	57	0.0118	-4.439	0.0524
51	Osprey	<i>Pandion haliaetus</i>	LC	Schedule IV	4	0.0008	-7.095	0.0059
52	Painted Stork	<i>Mycteria leucocephala</i>	NT	Schedule IV	139	0.0288	-3.547	0.1022
53	Pied Avocet	<i>Recurvirostra avosetta</i>	LC	Schedule IV	7	0.0015	-6.536	0.0095
54	Pied Kingfisher	<i>Ceryle rudis</i>	LC	Schedule IV	29	0.0060	-5.114	0.0307
55	Purple Sunbird	<i>Nectarinia asiatica</i>	LC	Schedule IV	91	0.0189	-3.971	0.0749
56	Red Vented Bulbul	<i>Pycnonotus cafer</i>	LC	Schedule IV	121	0.0251	-3.686	0.0924
57	Red Wattled Lapwing	<i>Vanellus indicus</i>	LC	Schedule IV	69	0.0143	-4.248	0.0607
58	Ring Dove	<i>Streptopelia capicola</i>	LC	Schedule IV	57	0.0118	-4.439	0.0524
59	Rose-Ringed Parakeet	<i>Psittacula krameri</i>	LC	Schedule IV	65	0.0135	-4.307	0.0580
60	Shikra	<i>Accipiter badius</i>	LC	Schedule IV	19	0.0039	-5.537	0.0218
61	Small Blue (Common) Kingfisher	<i>Alcedo atthis</i>	LC	Schedule IV	45	0.0093	-4.675	0.0436
62	Snake Bird/ Darter	<i>Anhinga melanogaster</i>	NT	Schedule IV	21	0.0044	-5.437	0.0237
63	Spot billed duck	<i>Anas poecilorhyncha</i>	LC	Schedule IV	54	0.0112	-4.493	0.0503
64	Variable Wheatear	<i>Oenanthe picata</i>	LC	Schedule IV	23	0.0048	-5.346	0.0255
65	Western Reef Heron	<i>Egretta gularis</i>	LC	Schedule IV	47	0.0097	-4.632	0.0451
66	White Breasted Kingfisher	<i>Halcyon smyrnensis</i>	LC	Schedule IV	46	0.0095	-4.653	0.0444
67	White Wagtail	<i>Motacilla alba</i>	LC	Schedule IV	58	0.0120	-4.421	0.0531
68	White-Eared Bulbul	<i>Pycnonotus leucotis</i>	LC	Schedule IV	53	0.0110	-4.511	0.0495
69	White-Throated Munia	<i>Lonchura malabarica</i>	LC	Schedule IV	79	0.0164	-4.112	0.0673
70	Wire-tailed Swallow	<i>Hirundo smithii</i>	LC	Schedule IV	70	0.0145	-4.233	0.0614
Total					482			3.95
Shannon Wiener								3.95

LC: Least Concern, NT: Near Threatened.

4. Green Belt Activities

Horticulture Department of Adani Power (Mundra) Limited, Mundra has taken many steps to develop plantation in and around the power plant premises.

The main objectives are:

- To improve the soil fertility
- To reduce the use of chemical fertilizers,
- To produce organic manure facility by utilizing the fly ash

To achieve the above objectives, APMuL Mundra had constructed Vermicompost which

is useful for growth of plants. From October, 2019 to March, 2020 total 235.24 MT of Vermicompost manure was produced and all are utilized in development of greenbelt in the plant premises. In addition to this Environment department had developed an Eco-Park, which is prepared with waste and reusable material. It spreads in 4.1366 ha of land. Eco-Park is based on Concept 4-R: Reduce, Reuse, Recover and Recycle. Eco-Park has an Organic Waste converter unit which converts kitchen waste into organic compost. From October, 2019 to March, 2020 total 3512 kg of organic manure was produced from kitchen waste.

New nursery is established to cater the needs of new plantation and gap filing activities. Native trees species plantation are carried out to suppress the dust and for maintaining the aesthetic beauty of the region. The tree species include *Azadirachta indica*, *Casuarina equisetifolium*, *Jatropha*, *Salvadora oleoides* and *Cocos nucifera* were recently planted for greenbelt development. Plant species planted for landscaping are mainly evergreen species. These are *Caesalpinia pulcherrima*, *Ficua Panda*, *Hibiscus rosa-sinensis*, *Ixora hybrid* and *Plumeria alba*. Many orchard species are also grown inside the plant premises such as mango, chicku, Sapota and pomegranate.

The greenbelt details regarding area, species, and number of trees, palm & shrubs planted is given in **Annexure: III**.

5. References

- **Champion, H. G., and S. K. Seth. 1968.** A Revised Survey of the Forest Types of India. Manager of Publications, Government of India, New Delhi.
- **Banger, K., Tian, H.Q., and Tao, B. 2013.** Contemporary land cover and land use patterns estimated by different regional and global datasets in India. *Journal of Land Use Science*.
- **Chhabra, A., and Panigrahy, S. 2011.** Analysis of spatio-temporal patterns of leaf area index in different forest types of India using high temporal remote sensing data. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, XXXVIII-8/W20, 119-124.
- **FSI (2013).** State of Forest Report. Forest Survey of India, Dehra Dun.
- **Ali, S. (1996).** The Book of Indian Birds (12th revised and centenary edition). Oxford University Press, New Delhi.
- **Joshi, P.K., Roy, P.S., Singh, S., Agrawal, S., & Yadav, D. (2006).** Vegetation cover mapping in India using multi-temporal IRS Wide Field Sensor (WiFS) data. *Remote Sensing of Environment*, 103(2), 190-202.
- **Ali, S. and S.D. Ripley (1983).** A Pictorial Guides to the Birds of the Indian Subcontinent. Oxford University Press, New Delhi.
- **IAN F. SPELLERBERG and PETER J. FEDOR (2003).** A tribute to Claude Shannon (1916–2001) and a plea for more rigorous use of species richness, species diversity and the 'Shannon–Wiener' Index. *Global Ecology & Biogeography* (2003) 12, 177–179.
- **The Indian Wildlife (Protection) Act, 1972.** Schedule I, II, III, IV, V and VI as amended upto 1993. Ministry of Environment & Forests (MoEF), Government of India. Downloaded from <http://envfor.nic.in/legis/wildlife/wildlife1.html>
- **The IUCN Red List of Threatened Species. Version 2017.2 (2017).** Downloaded from <http://www.iucnredlist.org>

MARINE MONITORING REPORT

December- 2019(Post Monsoon)

FOR

M/s. ADANI POWER (MUNDRA) LIMITED



At
Tunda & Siracha,
Tal. Mundra, Dist.: Kutch.
KUTCH, GUJARAT - 370 435

Prepared by



PREFACE

M/s. Adani Power (Mundra) Limited (APMuL) is a subsidiary company of Adani Group engaged in imported coal based thermal power plant at Mundra near village Tunda&Siracha, Taluka Mundra District Kutch, Gujarat has entrusted the work of carrying out Marine Monitoring to **M/s. UniStar Environment and Research Labs Pvt. Ltd., Vapi.**

Adani Power (Mundra) Limited has commissioned the first supercritical 660 MW unit in the country, engaged in imported coal based thermal power plant with capacity of 4620 MW at Mundra near village Tunda & Siracha, Taluka Mundra District Kutch, Gujarat. Has entrusted the work of carrying out Marine Monitoring to **M/S.UniStar Environment and Research Labs Pvt. Ltd., Vapi.**

The marine monitoring involves Physio-chemical and biological analysis of Marine water. Marine water quality of Sub-tidal and Intertidal regions, Flora and Fauna analysis in marine water area and Benthos in inter-tidal and sub-tidal analysis for the coastal area near Adani Power plant (Mundra) Limited. Water sample are collected from five location (station) and Benthos sample are collected from High water and low water transect area. Samples are brought to the laboratory by field sampling team and the analysis was carried out in our laboratory and the results are presented in this report.

This Marine Monitoring reports provide a data obtained from monitoring and analysis activities undertaken during (Post monsoon) December 2019.

Date: 27/12/2019

**M/S.UniStar Environment and
Research Labs Pvt. Ltd.**

White house, Char Rasta,
Vapi-396 191

Sampling by



(Bhavin Patel)

Report Prepared By



(Shweta Rana)

Approved by



(Jaivik Tandel)

TABLE OF CONTENTS

NO.	Contents	Page no.
Introduction To Project		
1.1	Background	4
1.2	Objectives	5
1.3	Study program	5
1.4	Sampling	7
Water quality		
2.1	Marine Water quality	8
2.2	Physico-chemical Water analysis result	8
Biological characteristics (Biodiversity Studies)		
3.1	Planktonic forms	13
3.2.	Significance of Phytoplankton & Zooplankton	14
3.3	Phytoplankton	14
3.3.1	Microscopic observation	15
3.3.2	Planktonic diversity	15
3.4	Zooplankton	17
3.4.1	Microscopic observation	18
3.4.2	Zooplankton diversity	18
3.5	Benthic fauna	21
3.5.1	Significance of benthic macro invertebrates	22
3.5.2	Methodology	23
3.5.3	Handling and preservation	24
3.5.4	Identification	24
3.5.5	Benthic biodiversity	24
3.6	Chlorophyll and Pheophytin	26
3.6.1	Method	27
3.6.2	Result	28
3.7	Conclusion	29
	Sampling Photographs	30

Figure No.	Contents	Page No.
Map / Photos / Images/Graph		
1.1	Study Marine Station Location Map	6
1.2	Phytoplankton Photographs	17
1.3	Total number of zooplankton	19
1.4	Zooplankton Photographs	21
1.5	Benthos Diversity in Project Site	26
1.6	Degradation Pathways of Chlorophyll	27
	Sampling Photographs	30

Table No.	Contents	Page No.
Tables		
1	Station locations and co ordinates	5
2	Water Sampling Locations, December 2019 (Post Monsoon)	8
3	Physico-Chemical Water Analysis Results	9
4	Test Method For Phytoplankton & Zooplankton Analysis	14
5	Phytoplankton Sampling Station	15
6	Total abundance & groups of phytoplankton observed at the sampling stations	16
7	Zooplankton Sampling Station	17
8	Total abundance, biomass and groups of Zooplankton at the sampling stations	19
9	Density (Nos. m-3) and contribution (% , in parentheses) of various zooplankton groups at station 1 to 5	20
10	Test method for Benthos Analysis	23
11	Sub-tidal Benthos Sampling Sites	23
12	Intertidal Benthos Sampling Sites	23
13	Standing stock and abundance of sub tidal macro benthos	25
14	Standing stock and abundance of Inter tidal macro benthos	25
15	Test Method for Chlorophyll a & Pheophytin Analysis	27
16	Chlorophyll <i>a</i> and Pheophytin	28
17	Names of the Marine Monitoring Team Members	30

INTRODUCTION

1.1 Background

Adani Power (Mundra) Limited (APMuL) is engaged in imported coal based thermal power plant with capacity of 4620 MW at Mundra near village Tunda&Siracha, Taluka Mundra District Kutch, Gujarat.

Adani Power (Mundra) Limited (APMuL) is largest single location private coal based power plant in the world it is created history by synchronizing the first super-critical technology based 660MW generating unit at Mundra. This is not only the first super-critical generating unit in the country but also the fastest project implementation ever by any power developer in the country. The Phase III of the Mundra Project, which is based on supercritical technology, has received 'Clean Development Mechanism (CDM) Project' certification from United Nations Framework Convention on Climate Change (UNFCCC). This is the world's first thermal project based on supercritical technology to be registered as CDM Project under UNFCCC.

Adani Power (Mundra) Limited (APMuL) assessing marine environment it involves Physio-chemical and biological analysis of Marine water. Marine water quality of Sub-tidal and Intertidal regions, Flora Phytoplankton's and Phytopigments and Fauna analysis in marine water area it includes Zooplanktons, Benthos in inter-tidal and sub-tidal analysis for the coastal area near power plant marine outfall water mixing and Sea intake, with special reference to intake channel and seawater discharge.

This report is prepare by the **M/S.UniStar Environment and Research Labs Pvt. Ltd.**, at the instance of APMuL and addresses the marine environmental issues related to the APMuL's operational power plant.

1.2 Objectives:

- a) Physico chemical seawater parameter to be analyzed for understands the water quality in study area.
- b) The prevailing marine biological status of the study area is evaluated based on the quantitative and qualitative data on marine life namely Phytoplankton, zooplankton, Chlorophyll & Pheophytin, Sub-tidal/Intertidal Macro benthos.
- c) To recommend adequate marine environmental management measures

1.3 Study program:

Period:

The field investigation is completed during December 2019 and sampling team was planned in such a manner so as to get a detailed picture of the marine environment characteristics of the study area and Sampling and analysis for marine environment has been carried out by **M/S.UniStar Environment and Research Labs Pvt. Ltd.**

Study Station locations:

A total of five subtidal station and three intertidal transects was selected for the sampling, here we are given exact location and their position were sampled.

Table 1: Station locations and co ordinates

Subtidal Station			
Station	Locations	Co ordinates	
1	Intake point	22°48' 31.'69"N	69°32'57.18"E
2	Mouth of intake point	22°46'54.62"N	69°32'02.89"E
3	West port area	22°45'16.56"N	69°34'45.26"E
4	Outfall area	22°44' 30.23"N	69°36'17.02"E
5	Outfall area	22°44'47.17"N	69°36'35.74"E

Intertidal transect			
I	High Tide water level	22°47'07.55" N	69°32'16.91" E
	Low Tide water level	22°47'06.38" N	69°32'11.62" E
II	High Tide water level	22°45'58.72" N	69°34'35.41" E
	Low Tide water level	22°45'57.74" N	69°34'35.05" E
III	High Tide water level	22°44'52.21" N	69°36'41.64" E
	Low Tide water level	22°44'51.23" N	69°36'39.28" E

Figure 1.1: Study marine stations location map



1.4 Sampling

a) Sampling frequency:

All Sampling subtidal stations were monitored during flood to ebb. Water samples were collected in duplicate (surface and bottom) for assessing water quality and marine biological characteristics.

Intertidal sampling was completed during low tide, for assessed Macro benthic fauna samples were collect in duplicate from each transects.

b) Sampling methodology:

- Niskin (5 litre capacity) with a mechanism for closing at a desired depth using messenger was used for collecting sub–surface water samples. Sampling at the surface was done using a clean polyethylene bucket. Known volume of water sample (1 L) was preserved with 4% Lugol’s iodine solution.
- For the analysis of Benthos, sub tidal sediment samples were collected using Van-veen grab covering an area of 0.04 m². Intertidal samples were collected using metal quadrant. Samples were sieved with 500 μ metal sieve and preserved with Rose Begal-Formalin solution.
- For Zooplankton oblique hauls were made using Heron Tranter net attached with calibrated flow meter. After collection, samples were preserved with 5% formalin.

C) Methods of analysis:

I) Physicochemical Parameter: Samples were analyses by using analytical methods for estimations of Temperature, Turbidity, PH, SS, Salinity, DO, BOD, COD, Phosphate, Total nitrogen, Nitrite, Nitrate, Phenols and PHc.

II) Biological Samples: Phytoplankton, Zooplankton and Macro benthos.

a) Phytoplankton: Sample for cell count was preserved in Lugol’s iodine solution, and identification of phytoplankton was done under a compound microscope using Sedgwick Rafter slide.

b) Chlorophyll: For the estimation of chlorophyll *a* and Pheophytin, the extinction of the acetone extract was measured using Turner Fluometer before and after treatment with dilute acid respectively.

c) **Zooplankton:** Volume (biomass) was obtained by displacement method. A portion (25-50 %) of the sample was analyzed under a microscope for faunal composition and population count.

d) **Benthos:** The total Macro benthos population (sub tidal & intertidal) was estimated as number of 1 m² area and biomass on wet weight basis.

WATER QUALITY

2.1 Marine Water quality:

Sea water samples have been collected during December 2019 (Post Monsoon)

From Five locations, which are listed in Table 2

Table 2: Water sampling locations, December 2019(Post Monsoon)

Station no.	Location	Tide
1	Intake point	Flood
2	Intake point	Ebb to Flood
3	West port area	Flood to Ebb
4	Outfall area	Flood
5	Outfall area	Flood to Ebb

2.2 Physico chemical Water analysis result:

All the water sampled, which is collected by sampling team is brought to the lab for Physico chemical analysis. The marine water quality at different collected stations are measured during this investigation is presented in Table No.3

Table: 3 Physico chemical Water Analysis Result

Sr. No.	Parameters	Station 1		Station 2		Test Method Permissible
		Surface	Bottom	Surface	Bottom	
PHYSICAL QUALITY						
1.	pH @ 25 ° C	8.02	8.02	8.05	8.03	IS 3025(Part 11)1983
2.	Temperature (°C)	24.5	25	25	24.5	IS 3025(Part 9)1984
3.	Turbidity (NTU)	0.1	0.1	0.1	0.1	IS 3025(Part 10)1984
CHEMICAL QUALITY						
1.	Total Suspended Solids (mg/l)	42	48	28	26	(APHA 23 rd Ed.,2017,2540- D)
2.	Biochemical Oxygen Demand (BOD) (mg/l)	2.4	2.2	2.8	3.0	IS 3025(Part 44)1993Amd.01
3.	Sulphate as SO ₄ (mg/l)	2950	2900	2800	2830	(APHA 23 rd Ed.,2017,4500- SO4 E)
4.	Ammonical Nitrogen(μmol/l)	0.6	0.4	1.8	1.2	(APHA 23 rd Ed.,2017,4500- NH3 B)
5.	Salinity (ppt)	33.03	33.29	32.85	33.03	By Calculation
6.	Dissolved Oxygen (mg/l)	5.1	5.3	5.6	4.9	IS 3025(Part 38)1989,
7.	Total Nitrogen (μmol/l)	11.5	12.9	12.6	13.2	(APHA 23 rd Ed.,2017,4500-O,B),
8.	Dissolved Phosphate (μmol/l)	1.6	1.7	1.1	1.8	APHA 23 rd Ed.,2017,4500 NH3 - B
9.	Nitrate (μmol/l)	6.6	12.6	8.4	9.6	(APHA 23 rd Ed.,2017,4500-P,D)
10.	Nitrite (μmol/l)	0.7	0.8	0.9	0.6	(APHA 23 rd Ed.,2017,4500 NO3-B)
11.	Phenol(μg/l)	4.0	6.8	9.8	8.6	APHA 23 rd Ed.,2017,4500NO2B
12.	PHc (ppb)	0.6	0.9	0.8	0.9	IS 3025(Part 43)1992Amd.02

Note: MDL = Minimum Detection Limit (MDL: 0.01) and N.D. = Not detectable

Sr. No	Parameters	Station 3		Station 4		Test Method Permissible
		Surface	Bottom	Surface	Bottom	
PHYSICAL QUALITY						
1.	pH @ 25 ° C	8.12	8.10	8.08	8.02	IS 3025(Part 11)1983
2.	Temperature °C	26.0	26.5	25.5	25.5	IS 3025(Part 9)1984
3.	Turbidity (NTU)	0.1	0.1	0.1	0.1	IS 3025(Part 10)1984
CHEMICAL QUALITY						
1.	Total Suspended Solids (mg/l)	26	22	44	34	(APHA 23 rd Ed.,2017,2540-D)
2.	Biochemical Oxygen Demand (BOD) (mg/l)	3.4	3.6	2.6	3.2	IS 3025(Part 44)1993Amd.01
3.	Sulphate as SO ₄ (mg/l)	2790	2750	2850	2796	(APHA 23 rd Ed.,2017,4500-SO4 E)
4.	Ammonical Nitrogen(μmol/l)	8.2	10.4	7.8	8.5	(APHA 23 rd Ed.,2017,4500-NH3 B)
5.	Salinity (ppt)	33.29	33.63	33.55	33.20	By Calculation
6.	Dissolved Oxygen (mg/l)	5.2	5.5	5.6	5.1	IS 3025(Part 38)1989,
7.	Total Nitrogen (μmol/l)	12.6	13.2	9.5	9.8	(APHA 23 rd Ed.,2017,4500-O,B),
8.	Dissolved Phosphate (μmol/l)	4.4	2.7	3.1	1.9	APHA 23 rd Ed.,2017,4500 NH3 - B
9.	Nitrate (μmol/l)	1.1	6.2	4.4	3.9	(APHA 23 rd Ed.,2017,4500-P,D)
10.	Nitrite (μmol/l)	0.6	0.9	1.1	1.8	(APHA 23 rd Ed.,2017,4500 NO3-B)
11.	Phenol(μg/l)	1.2	1.8	1.1	1.4	APHA 23 rd Ed.,2017,4500NO2B
12.	PHc (ppb)	ND	6.2	4.7	5.3	IS 3025(Part 43)1992Amd.02

Note: MDL = Minimum Detection Limit (MDL: 0.01) and N.D. = Not detectable

Sr. No.	Parameters	Station 5		Test Method Permissible
		Surface	Bottom	
PHYSICAL QUALITY				
1.	pH @ 25 ° C	8.14	8.16	IS 3025(Part 11)1983
2.	Temperature (°C)	26.0	26.5	IS 3025(Part 9)1984
3.	Turbidity (NTU)	0.1	0.1	IS 3025(Part 10)1984
CHEMICAL QUALITY				
1.	Total Suspended Solids	26	28	(APHA 23 rd Ed.,2017,2540- D)
2.	Biochemical Oxygen Demand (BOD) (mg/l)	3.8	4.3	IS 3025(Part 44)1993Amd.01
3.	Sulphate as SO ₄ (mg/l)	2823	2872	(APHA 23 rd Ed.,2017,4500-SO4 E)
4.	Ammonical Nitrogen(μmol/l)	4.4	6.2	(APHA 23 rd Ed.,2017,4500-NH3 B)
5.	Salinity (ppt)	33.63	33.29	By Calculation
6.	Dissolved Oxygen (mg/l)	5.9	5.7	IS 3025(Part 38)1989,
7.	Total Nitrogen (μmol/l)	12.8	12.6	(APHA 23 rd Ed.,2017,4500-O,B),
8.	Dissolved Phosphate (μmol/l)	1.8	3.0	APHA 23 rd Ed.,2017,4500 NH3 - B
9.	Nitrate (μmol/l)	6.6	8.2	(APHA 23 rd Ed.,2017,4500-P,D)
10.	Nitrite (μmol/l)	1.3	0.9	(APHA 23 rd Ed.,2017,4500 NO3-B)
11.	Phenol(μg/l)	N.D.(MDL:0.01)	0.7	APHA 23 rd Ed.,2017,4500NO2B
12.	PHc(ppb)1M Level	0.5.	N.D.	IS 3025(Part 43)1992Amd.02

Note: MDL = Minimum Detection Limit (MDL: 0.01) and N.D. = Not detectable

a) Temperature: Marine water temperature of the study area was checked on site, so surface & bottom water temperature observed in the study area in range between 25°C to 26.5°C. The water temperature generally varied in accordance with the prevailing air temperature, tidal activity and seasonal variation.

b) pH: The pH of the water is generally buffering effect, influenced by the freshwater and anthropogenic discharge from land. The observed pH in the study area in range of 8.02 to 8.14 at surface level and 8.02 to 8.16 at bottom level.

c) Salinity: Salinity which is an indicator of seawater, the standard average salinity of sea water is 32 to 33 ppt, which is variable depending on the riverine flow, any fresh water discharge from landward side, rainy season and temperature in study area. Average salinity (ppt) for monsoon study is 32.85 to 33.63 ppt at surface water as well as 33.03 to 33.63 ppt at bottom water.

d) DO & BOD: High Dissolve oxygen level is measured of good oxidizing conditions in an aquatic environment. In unpolluted waters equilibrium is maintained between its generation through photosynthesis and dissolution from the atmosphere, and consumption by the respiration and decay of organic matter in a manner that Dissolve oxygen levels are close to or above saturation value.

Dissolve oxygen level of the study area is varied from 5.1 mg/l to 5.9 mg/l at water surface level & 4.9 mg/l to 5.7 mg/l at water bottom level. The comparison of average Dissolve oxygen value of post monsoon period is 5.4 mg/l which show the good oxidizing conditions in study area aquatic environment.

BOD was generally indicating effective consumption of oxidisable matter in that water body. BOD of the study area is varied from 2.4 mg/l to 3.8 mg/l at water surface level and 2.2 mg/l to 4.3 mg/l at water bottom level.

e) Nutrients: Dissolved phosphorus and nitrogen compounds serve as the nutrients for phytoplankton which is the primary producer in aquatic food chain. Phosphorous compounds are present predominantly as reactive phosphate while combined nitrogen is present as nitrate, nitrite and ammonium species. So nutrient concentration (phosphate -nitrate - nitrite) in the study area is Phosphate range 1.1 to 4.4 $\mu\text{mol/l}$ in at Surface water and 1.7 to 3.0 $\mu\text{mol/l}$ at Bottom water , Nitrate range 1.1 to 8.4 $\mu\text{mol/l}$ in surface water and 3.9 to 12.6 $\mu\text{mol/l}$ at bottom water, Nitrite range 0.7 to 1.3 $\mu\text{mol/l}$ in surface level and 0.6 to 1.8 $\mu\text{mol/l}$ at bottom level. This nutrient concentration values indicate water healthiness.

f) PHc and phenol: The observed Phenol in the study area in range of 0.7 to 1.2 $\mu\text{g/l}$ at surface level and 0.6 to 1.8 $\mu\text{g/l}$ at bottom level. The level of PHc in the study area in range of 0.0 to 4.7 $\mu\text{g/l}$ at surface level and 0.0 to 6.2 $\mu\text{g/l}$ at bottom level.

g) Total suspended solids: The suspended solids generally constitute clay, silt and sand from the bed sediment and that from the upstream as well as contributed through shore erosion. Anthropogenic discharges also contribute to suspended solids in the form of contaminants such as oil and solid waste in polluted area. Suspended solids in the study area are little variable, surface area range observed 26 to 44mg/l as well as bottom area range is 22 to 48mg/l.

BIOLOGICAL CHARACTERISTICS (BIODIVERSITY STUDIES):

Marine environment is unique ecosystems involve the complex interaction between abiotic and biotic components. Any change in the abiotic factors leads to change in aquatic organisms (biotic factor). The human interventions always compromise the health of marine ecosystem by disturbing the ecological balance. Hence the assessment of the biotic components along with abiotic factors is an integral part of Environmental assessment and monitoring study. During the present study at APMuL the abundance and distribution of marine organisms (plankton and benthos) were studied as part of routine environmental monitoring.

3.1 Planktonic Forms:

The name plankton is derived from the Greek word “planktons”, meaning “wanderer” or “drifter”. While some forms of plankton are capable of independent movement and can swim up to several hundred meters in a single day, their position is primarily determined by currents in the body of water they inhabit. By definition, organisms classified as "plankton" are unable to resist ocean currents. Plankton is primarily divided into broad functional groups:

1. Phytoplankton
2. Zooplankton

This scheme divides the plankton community into broad producer and consumer groups.

a) Phytoplankton:

The organisms responsible for primary production in all aquatic ecosystems are known as “phytoplankton.” These miraculous microscopic organisms not only form the base of life in our oceans, but also produce up to 90% of the oxygen in our atmosphere.

Phytoplankton is microscopic plants that live in the ocean, freshwater and other terrestrial based water systems. There are many species of phytoplankton, each of which has a characteristic shape, size and function. Marine species of phytoplankton grow abundantly in oceans around the world and are the foundation of the marine food chain. Marine Phytoplankton is the producing (autotrophic) component in the ocean. There are fourteen

classes of phytoplankton. Each class of phytoplankton contains unique attributes in size, cell structure, nutrients and function.

b) Zooplankton:

Zooplankton are the consumer organism, incapable of making its own food from light or inorganic compounds, and feeds on organisms or the remains of other organisms to get the energy necessary for survival. They are primarily depends on the phytoplankton and other small organisms groups for their nutritional needs.

3.2 Significance of Phytoplankton and Zooplankton:

Phytoplankton are the major primary producers of organic matter in the aquatic ecosystem. They contribute up to 90% in primary productivity in the Oceanic environment. As part of photosynthesis process they produce organic compounds from carbon dioxide with the help of sunlight and inorganic compound. Collectively, they directly or indirectly support the entire animal population, and thus form the basis of most marine food webs. Phytoplankton also helps in the carbon dioxide sequestration process. The significance of zooplanktons is found in their role in transferring biological production from phytoplankton to large organisms in the marine food web and to the sea floor. A large number of phytoplankton species are grazed upon by the microscopic protozoan, tunicates, copepods and other crustaceans. These in turn become food for other animals further linking the food web. Therefore, variability in the reproduction of copepods would affect the survival of young fish that depend on them.

Table: 4 Test methods for Phytoplankton & Zooplankton analysis

Sr. no.	Test performed	Method
1	Phytoplankton	APHA, Edition 21, Part 10000, 10200 F
2	Zooplankton	APHA, Edition 21, Part 10000, 10200 G

3.3 Phytoplankton:

Phytoplankton sampling was carried out at 5 stations. At each station water samples were collected from surface and bottom waters. The sampling location is given in following table.5

Table 5: Phytoplankton Sampling Station

Station	Location	Co ordinates		Water depth	Tide
1	Intake point	22°48' 31.'69"N	69°32'57.18"E	6 m	Flood
2	Intake point Mouth area	22°46'54.62"N	69°32'02.89"E	6.5 m	Ebb - Flood
3	West port area	22°45'16.56"N	69°34'45.26"E	10 m	Flood - Ebb
4	Outfall area	22°44' 30.23"N	69°36'17.02"E	6 m	Flood
5	Outfall area	22°44'47.17"N	69°36'35.74"E	5 m	Flood - Ebb

A Niskin sampler with a closing mechanism at a desired depth was used for collecting sub surface water samples. Surface samples were collected using a clean polyethylene bucket. Samples were stored in amber colored plastic containers fitted with inert cap liners. Further Lugol's solution was added to preserve the phytoplankton cells for further enumeration. The identification of phytoplankton were carried out under a microscope using Sedgwick Rafter slide.

3.3.1 Microscopic Observations

For phytoplankton enumeration 0.5 ml of the sample was taken on Sedgwick-Rafter counting cells. The identification was done using a microscope under 40X or 100X magnification. The standard keys given by Desikachary, 1959; Sournia, 1974; Tomas 1997; Horner, 2002 were used for the identification of phytoplankton cells. Species were identified to a genus level.

3.3.2 Phytoplankton Diversity

Phytoplankton sampling was carried out at 5 stations throughout the sampling period. A maximum 25 phytoplankton genera, *Navicula*, *Thalassiosira*, *Thalassionema*, *Pleurosigma*, *Pleurosigma*, *Pseudonitzschia*, *Coscinodiscus*, *Protoperidinium*, *Scrippsiella*, *Cylindrotheca*, *Skeletonema*, *Hemialus* and *Melocera* were identified at ST-2 during the study period. At station 3 minimum of 19 phytoplankton genera, *Navicula*, *Thalassiosira*, *Rhizosolenia*, *Thalassionema*, *Pleurosigma*, *Odontella*, *Pseudonitzschia*, *Coscinodiscus*, *Protoperidinium*, *Scrippsiella*, *Skeletonema*, *Hemialus*, *Ditylum*, *Chaetoceros*, *Bacteriastrum*, *Amphidinium*, *Prorocentrum* and *Gunardia* were identified from the preserved samples.

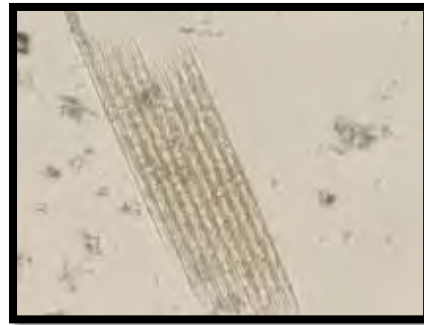
The phytoplankton abundance in the study region was ranged from 12029 to 18906 cells L⁻¹. Highest phytoplankton abundance was observed at the STN-2 water. However, lowest phytoplankton abundance was observed at the STN-3 water (Table: 6)

Table 6: Total abundance & groups of phytoplankton at the sampling stations

Station	Abundance (cells L ⁻¹)	Genera count	Phytoplankton groups observed in study
ST-1	12322	22	<i>Bacteriastrum</i> , <i>Navicula</i> , <i>Thalassiosira</i> , <i>Rhizosolenia</i> , <i>Thalassionema</i> , <i>Odontella</i> , <i>Pleurosigma</i> , <i>Pseudonitzschia</i> , <i>Leptocylindrus</i> , <i>Coscinodiscus</i> , <i>Scrippsiella</i> , <i>Cylindrotheca</i> , <i>Skeletonema</i> , <i>Surirella</i> , <i>Hemialus</i> , <i>Ditylum</i> , <i>Chaetoceros</i> , and <i>Prorocentrum</i> .
ST-2	18906	25	<i>Navicula</i> , <i>Thalassiosira</i> , <i>Thalassionema</i> , <i>Pleurosigma</i> , <i>Pleurosigma</i> , <i>Pseudonitzschia</i> , <i>Coscinodiscus</i> , <i>Protoberidinium</i> , <i>Scrippsiella</i> , <i>Cylindrotheca</i> , <i>Skeletonema</i> , <i>Hemialus</i> and <i>Melocera</i> .
ST-3	12029	19	<i>Navicula</i> , <i>Thalassiosira</i> , <i>Rhizosolenia</i> , <i>Thalassionema</i> , <i>Pleurosigma</i> , <i>Odontella</i> , <i>Pseudonitzschia</i> , <i>Coscinodiscus</i> , <i>Protoberidinium</i> , <i>Scrippsiella</i> , <i>Skeletonema</i> , <i>Hemialus</i> , <i>Ditylum</i> , <i>Chaetoceros</i> , <i>Bacteriastrum</i> , <i>Amphidinium</i> , <i>Prorocentrum</i> and <i>Gunardia</i> .
ST-4	13561	21	<i>Navicula</i> , <i>Thalassiosira</i> , <i>Rhizosolenia</i> , <i>Nitzschia</i> , <i>Thalassionema</i> , <i>Pleurosigma</i> , <i>Odontella</i> , <i>Corethron</i> , <i>Pleurosigma</i> , <i>Pseudonitzschia</i> , <i>Leptocylindrus</i> , <i>Coscinodiscus</i> , <i>Protoberidinium</i> , <i>Scrippsiella</i> , <i>Cylindrotheca</i> , <i>Skeletonema</i> , <i>Surirella</i> , <i>Haslea</i> , <i>Meuneria</i> and <i>Ditylum</i> .
ST-5	12250	23	<i>Navicula</i> , <i>Thalassiosira</i> , <i>Rhizosolenia</i> , <i>Thalassionema</i> , <i>Odontella</i> , <i>Corethron</i> , <i>Pseudonitzschia</i> , <i>Coscinodiscus</i> , <i>Protoberidinium</i> , <i>Scrippsiella</i> , <i>Cylindrotheca</i> , <i>Skeletonema</i> , <i>Hemialus</i> , <i>Ditylum</i> , <i>Chaetoceros</i> , <i>Bacteriastrum</i> , <i>Gunardia</i> and <i>Ceratium</i> .



Coscinodiscus



Thalassionema



Skeletonema



Odontella

1.2 Phytoplankton Photographs

3.4 Zooplankton:

Zooplankton samples were collected at 5 selected locations. The sampling details are given in following table 7.

Table 7: Zooplankton Sampling Station

Station	Location	Co ordinates		Water depth	Tide
1	Intake point	22°48' 31.69"N	69°32'57.18"E	6 m	Flood
2	intake point	22°46'54.62"N	69°32'02.89"E	6.5 m	Ebb - Flood
3	West port area	22°45'16.56"N	69°34'45.26"E	12 m	Flood - Ebb
4	Outfall area	22°44' 30.23"N	69°36'17.02"E	5 m	Flood
5	Outfall area	22°44'47.17"N	69°36'35.74"E	6 m	Flood - Ebb

Oblique hauls for Zooplankton were made using Heron Tranter net with calibrated flow meter. Samples were preserved with formalin and stored in plastic containers with inert cap liners till further analysis.

3.4.1 Microscopic Observations

For quantification of zooplankton, 0.5 ml of the sample was taken in zooplankton counting chamber. The identification was carried out under Stereomicroscope at 45X or 100X magnification. The zooplanktons were identified using standard identification keys given by Kasturirangan 1963; Santhanam and Srinivasan, 1994 and Conway et al., 2003 etc. Species were identified to group level.

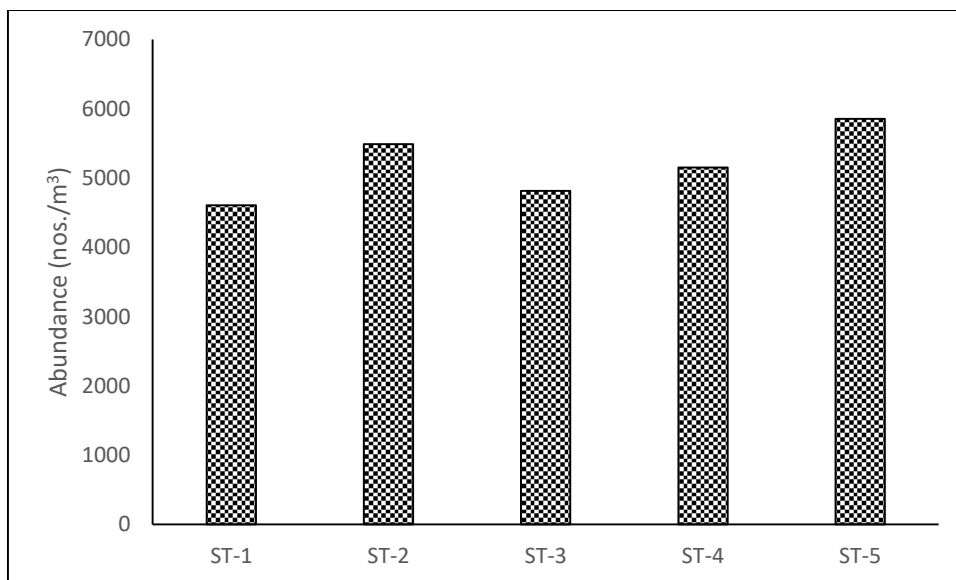
3.4.2 Zooplankton Diversity

A maximum 11 groups of Zooplankton consisting of Copepoda, Copepoda nauplii, Decapoda, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg, Fish larvae, Polychaete larvae, Brachiopoda, and Chaetognatha were recorded from the study area. (Table 8 and 9). Copepods and Decapods, which on an average constituted 55.71% and 24.29% of total zooplankton density respectively in all the stations. Fish and invertebrate eggs are another major group reported from study area contributing 7.04% of total zooplankton density at all stations. Brachiopoda was another group of importance, which contributed 5.15% of the zooplankton density. Copepod nauplii was another major group reported in study area, consist of 3.55% of all zooplankton assemblage. Occurrence of copepods and their nauplii as well as crustacean larvae, decapods and fish larvae/eggs in zooplankton samples suggest that the study area has fair production potentials for live food organism's resources for fish and shellfishes.

Zooplankton standing stock in terms of abundance revealed variation within all stations. Zooplankton biomass (ml/m^3) and density (nos. /m^3) is presented in Table 8. Among all the stations, least zooplankton biomass of 0.106 ml/m^3 was recorded at Station#2 while, maximum biomass was reported at Station#5 (0.189 ml/m^3). Minimum zooplankton population density was reported at Station#1 (4608 nos. /m^3), whereas, maximum density reported at station#5 (5856 nos. /m^3).

Table 8: Total abundance, biomass and groups of zooplankton at the sampling stations

Stations	Biomass (ml/m ³)	Population (no./m ³)	Total groups	Zooplankton groups observed in the study
ST-1	0.179	4608	11	<i>Copepoda, Copepoda nauplii, Decapoda, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg, Fish larvae, Polychaete larvae, Brachiopoda, Chaetognatha</i>
ST-2	0.106	5488	11	<i>Copepoda, Copepoda nauplii, Decapoda, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg, Fish larvae, Polychaete larvae, Brachiopoda, Chaetognatha</i>
ST-3	0.1137	4816	11	<i>Copepoda, Copepoda nauplii, Decapoda, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg, Fish larvae, Polychaete larvae, Brachiopoda, Chaetognatha</i>
ST-4	0.158	5152	11	<i>Copepoda, Copepoda nauplii, Decapoda, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg, Fish larvae, Polychaete larvae, Brachiopoda, Chaetognatha</i>
ST-5	0.189	5856	11	<i>Copepoda, Copepoda nauplii, Decapoda, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg, Fish larvae, Polychaete larvae, Brachiopoda, Chaetognatha</i>



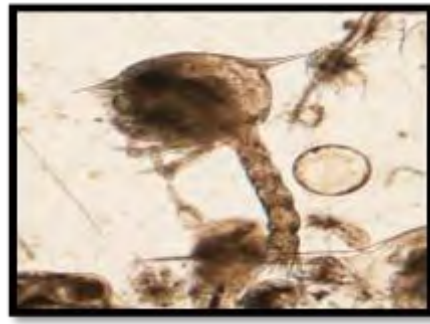
Graph 1.3: Total number of zooplankton (no. m⁻³) at the sampling stations.

Table 9: Density (Nos. m⁻³) and contribution (% in parentheses) of various zooplankton groups at station 1 to 5 in the APMuL marine waters, Mudra during December, 2019

Zooplankton groups	Station 1	Station 2	Station 3	Station 4	Station 5
Calanoid copepod					
<i>Acartia sp.</i>	472	720	720	592	504
<i>Centropages sp.</i>	368	448	560	336	904
<i>Centropages furcatus</i>	152	304	336	304	480
<i>Paracalanus sp.</i>	184	224	472	288	328
<i>Acrocalanus sp.</i>	168	192	0	80	312
<i>Cosmocalanus sp.</i>	144	0	392	0	376
<i>Subeucalanus sp.</i>	56	0	24	0	0
<i>Labidocera sp.</i>	264	0	416	0	360
<i>Unidentified Calanoid copepod</i>	424	632	0	128	176
Cyclopoida					
<i>Oithona sp.</i>	72	24	16	128	16
Harpacticoida	0	0	0	0	0
<i>Microsetella sp.</i>	0	0	8	0	0
<i>Euterpina acutifrons</i>	8	0	0	0	0
Poecilostomatatoida					
<i>Oncaea sp.</i>	0	0	0	0	168
<i>Corycaeus sp.</i>	304	504	224	96	32
Copepod nauplii	96	104	104	448	168
Decapoda					
Decapoda Larvae	568	744	720	448	80
Euphausiacea	48	80	72	288	88
<i>Lucifer sp.</i>	336	592	216	312	504
<i>Lucifer typus</i>	64	96	24	128	0
<i>Lucifer penicillifer</i>	0	0	72	256	0
Brachyurans larvae	112	208	24	64	24
Anomurans larvae	0	32	0	96	0
Fish eggs	304	248	128	136	680
Invertebrates eggs	0	0	0	0	328
Fish Larvae	8	0	0	0	0
Mollusca					
Gastropoda juvenile	0	32	0	0	16
<i>Limacina sp.</i>	16	0	0	0	0
Diacavolinia	0	0	0	96	8
Bivalvia juvenile	32	0	0	0	0
Polychaeta					
Polychaeta larvae	0	24	0	8	0
Brachiopoda					
<i>Penilia avirostris</i>	136	64	48	384	16
<i>Evadne nordmanni</i>	152	152	96	24	160
<i>Cirripedia nauplii</i>	0	0	104	0	0
Chaetognatha					
<i>Sagitta sp.</i>	64	16	16	288	104
<i>Oikopleura sp.</i>	56	32	24	224	24
Total density (Nos/m³)	4608	5472	4816	5152	5856
Total biomass (ml/m³)	0.179	0.106	0.137	0.158	0.189



Copepod



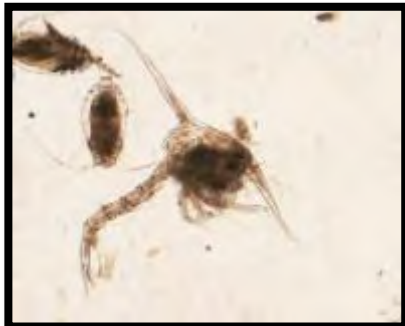
Brachyuran crab larvae



Cumacea



Ostracods



Anomuran crab larvae



Copepod nauplii

1.4 Microphotographs of zooplanktons reported at sampling stations

3.5 Benthic Fauna

The benthic zone is the ecological region at the lowest level of a water (such as an ocean or a lake) which include the sediment surface and some sub-surface layers. The superficial layer of sediment is an integral part of the benthic zone, as it influences greatly the biological activity which takes place there. Organisms living in this zone are called benthos. They generally live in close relationship with the substrate bottom; many such organisms are attached to the bottom. Some benthic organisms are mainly dwelling at the bottom of the substratum but at times may travel upwards in the water column. They may also occupy rock crevices, organic debris and other microhabitat at the bottom. The benthic invertebrates

ranges from microscopic (e.g. micro invertebrates, <10 microns) to a few tens of centimeters or more in length (e.g. macro invertebrates, >50 cm).

Benthic organisms are morphologically different from that planktonic organisms. Many are adapted to live on the substrate (bottom). In benthic habitats they can be considered as dominant creatures. These organisms adapted to deep-water pressure so cannot survive in the upper parts of the water column. Since light does not penetrate very deep ocean-water, the benthic organisms often depends on the organic matter falling from the upper water column as their main energy source. This dead and decaying matter sustains the benthic food chain. The most benthic organisms in are scavengers or detritivores. These organisms by virtue of being relatively stationary, are constantly exposed to changes undergoing in overlying water, and hence, respond very well to aquatic pollution. The macro benthic population is very sensitive to environmental perturbation and is highly influenced by the physicochemical characteristics of water, nature of substratum, food, predation and other factors. The density of benthic invertebrates also fluctuates widely with the changes in the season.

3.5.1 Significance of benthic macro invertebrates

The biomass of benthic organisms in estuaries and coastal embayment is often high. It declines if communities are affected by prolonged periods of poor water quality especially when anoxia and hypoxia are common. Burrowing and tube-building by deposit-feeding benthic organisms (bioturbators) helps to mix the sediment and enhances decomposition of organic matter. Nitrification and denitrification are also enhanced because a range of oxygenated and anoxic micro-habitats are created. For example, the area of oxic-anoxic boundaries and the surface area available for diffusive exchange are increased by tube-building macro invertebrates. Loss of nitrification and denitrification (and increased ammonium efflux from sediment) in coastal and estuarine systems is an important cause of hysteresis, which can cause a shift from clear water to a turbid state.

The loss of benthic suspension-feeders can further enhance turbidity levels because these organisms filter suspended particles including planktonic algae, and they enhance sedimentation rates through bio deposition (*i.e.* voiding of their wastes and unwanted food). Changes in the macro fauna (and flora) cause changes in nutrient storage pools. Macro fauna are also important constituents of fish diets and thus are an important link for transferring

energy and nutrients between trophic levels, also driving pelagic fish and crustacean production. For these reasons the benthic organisms are extremely important indicators of environmental change.

3.5.2 Methodology

To enumerate the macro-benthic population sediment samples were collected from 5 sub-tidal and 3 inter-tidal transects. The details are as mentioned in the table (11 & 12). Sample was collected in the month of December 2019.

Table 10: Test method for Benthos analysis

Sr. No	Test performed	Method
1	Benthos	APHA, Edition 21, Part 10000,10500 A-10500 D

Table 11: Sub-tidal Benthos Sampling Sites

Station	Location	Co ordinates		Sediment quality
1	Intake point	22°48' 31.69"N	69°32'57.18"E	Silty clay
2	intake point	22°46'54.62"N	69°32'02.89"E	Silty clay
3	West port area	22°45'16.56"N	69°34'45.26"E	Silty clay
4	Outfall area	22°44' 30.23"N	69°36'17.02"E	Sandy
5	Outfall area	22°44'47.17"N	69°36'35.74"E	Silty clay

Table 12: Sub-tidal Benthos Sampling Sites

Transect	Location	Co ordinates	Intertidal expose area (m)	Sediment quality
I	High water level	22°47'07.55" N 69°32'16.91" E	42 m	Sandy
	Low water level	22°47'06.38" N 69°32'11.62" E		Silty-sand
II	High water level	22°45'58.72" N 69°34'35.41" E	54 m	Sandy
	Low water level	22°45'57.74" N 69°34'35.05" E		Silty-sand
III	High water level	22°44' 52.21" N 69°36'41.64" E	47m	Sandy
	Low water level	22°44' 51.23" N 69°36'39.28" E		Sandy

For the analysis of Benthos subtidal sediment samples were collected using Van-veen grab as well as intertidal samples were collected using metal quadrant.

The total Macro benthos population (sub tidal & intertidal) was estimated as number of 1 m² area and biomass on wet weight basis.

3.5.3 Handling and Preservation

The samples were first sieved with 500 μ size metal sieve and then washed with sea water. Sieving yields residual mixture of benthic organisms and detritus matter. The organisms were handpicked using forceps and paint brush. After sorting, macro benthic organisms were identified to the group level. Organisms were preserved in 5% formalin.

3.5.4 Identification

Identification of the organisms was done under stereo-microscope. Day, 1967, Fauchald, 1977 were used as standard reference for identification of the macro invertebrates.

3.5.5 Benthic Diversity

The present study revealed comparatively high macrobenthos abundance and biomass reported at sub-tidal stations than inter-tidal stations at APMuL, Mundra.

At the intertidal sampling locations average macrofaunal biomass was measured to be 1.67 mg m^{-2} . Macrobenthic biomass ranges from 1.08 mg m^{-2} at station#2 (IT-2) to 2.15 mg m^{-2} at station#1 (IT-1). Whereas the macrobenthos density ranges from 112.5 nos. m^{-2} at station#2 (IT-2) to 185 nos. m^{-2} at station#3 (IT-3).

At the subtidal stations, average macrobenthos biomass was recorded to be 3.02 mg m^{-2} . Macrobenthic biomass ranges from 2.58 mg m^{-2} at station#4 (ST-4) to 3.64 mg m^{-2} at station#1 (ST-1) at APMuL marine monitoring sites. Whereas, least density of benthic macro organisms was reported as 212.50 nos. m^{-2} at Station#2 (ST-2), whereas, highest density was reported as 395 nos. m^{-2} respectively at Station#1 (ST-1). Polychaetes were the major contributing group in the benthic faunal assemblage, followed by the crustaceans. Polychaetes belongs to family Capitellidae, Cossuridae, Glyceridae, Goniadidae, Nephtyidae, Nereidae, Spionidae, Syllidae were the polychaete families recorded during this study.

Table 13: Standing stock and abundance of sub tidal macro benthos

Station	Biomass (mg. m ⁻²)	Abundance (no. m ⁻²)	Total Group (No.)	Major Group
ST-1	3.64	395	7	<i>Polychaeta, Bivalvia, Gastropoda, Amphipoda, Brachyura, Mysida, Isopoda</i>
ST-2	2.82	285	6	<i>Polychaeta, Bivalvia, Gastropoda, Amphipoda, Isopoda, Sipunculid</i>
ST-3	3.11	277.5	7	<i>Polychaeta, Nematoda, Bivalvia, Gastropoda, Amphipoda, Brachyura, Isopoda</i>
ST-4	2.58	212.5	7	<i>Polychaeta, Sipunculid, Bivalvia, Gastropoda, Amphipoda, Brachyura, Isopoda</i>
ST-5	2.94	260	7	<i>Polychaeta, Bivalvia, Gastropoda, Amphipoda, Brachyura, Mysida, Isopoda</i>

Sub tidal region:

- A maximum seven group of macro benthic organisms were recorded from ST-1, ST-3, ST-3, ST-4, and ST-5, representing Polychaeta, Nematoda, Sipuncula, Bivalvia, Gastropoda, Amphipoda, Brachyura, Mysida, Isopoda identified from. A minimum of six macrobenthic benthic groups were recorded at ST-2, including Polychaeta, Bivalvia, Gastropoda, Amphipoda, Isopoda, Sipunculid.
- In the sub-tidal region, higher macro benthos abundance was recorded at ST-1 (395 no. m⁻²), whereas, lowest abundance was recorded at ST-5 (212.5 no. m⁻²). Higher macrobenthic biomass was recorded at ST-3 (3.11 mg. m⁻²) as compared to other stations (Table: 13).

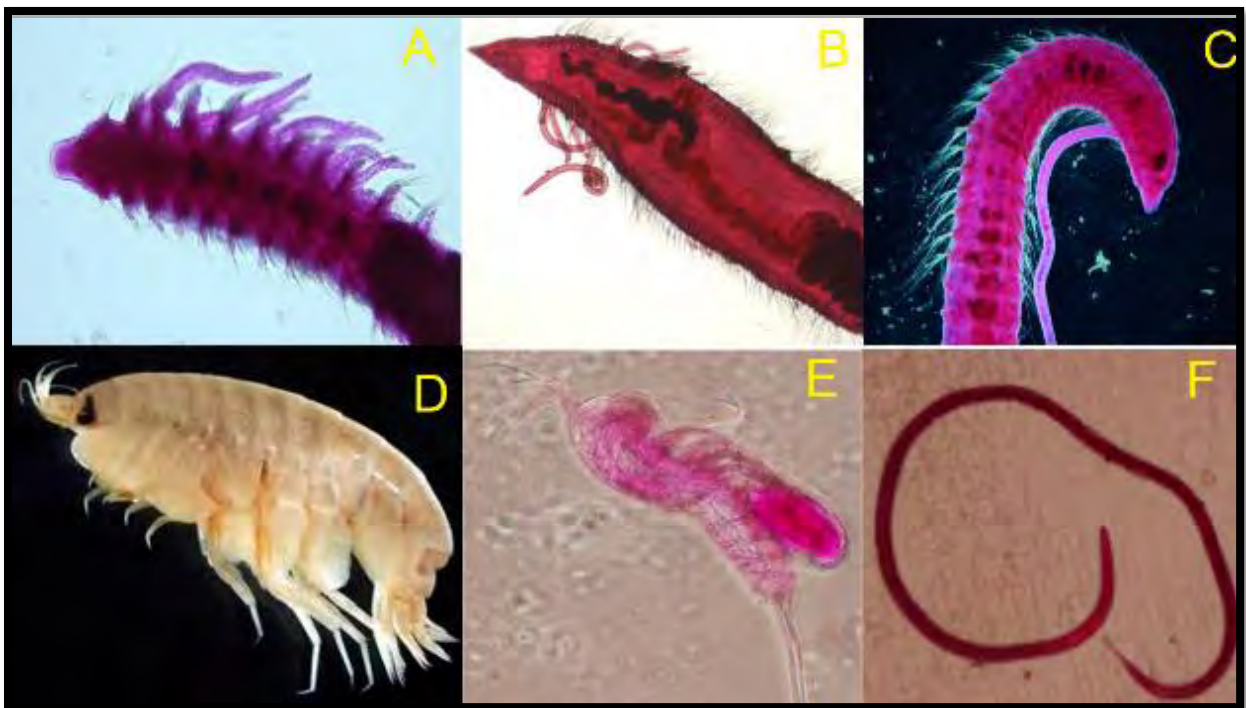
Table 14: Standing stock and abundance of intertidal macro benthos

Station	Biomass (mg. m ⁻²)	Abundance (no. m ⁻²)	Total Group	Macro benthic groups observed in the study
IT-1 (LW)	2.15	185	4	Polychaeta, Nematoda, Bivalvia, Gastropoda
IT-1 (HW)	1.26	135	4	Polychaeta, Nematoda, Bivalvia, Gastropoda
IT-2 (LW)	1.08	112.5	3	Polychaeta, Bivalvia, Gastropoda
IT-2 (HW)	-	-	-	-
IT-3 (LW)	1.79	135	4	Polychaeta, Nematoda, Bivalvia, Gastropoda
IT-3 (HW)	0.92	72.5	2	Polychaeta, Bivalvia

Note: LW-low water during low tide; HW: high water during high tide

Inter tidal region:

- Four macrobenthic groups were identified at stations, IT-1 (LW), IT-1 (HW), IT-3 (LW) and IT-2 (HW), representing to Polychaeta, Nematoda, Bivalvia, Gastropoda. Organisms belongs to benthic group Polychaeta, Bivalvia, Gastropoda were identified from IT-2 (LW), whereas, at station IT-3 (HW) benthic faunal assemblages comprised of Polychaeta, and Bivalvia only.
- The highest macro benthos abundance (185 no. m⁻²) was reported at IT-1 (LW). Highest biomass (2.15 mg. m⁻²) was also recorded at IT-1 (LW) (Table: 14).



1.5 Microphotographs of macro benthic organisms.

Figures: A. *Spionidae*; B. *Cirratulidae*; C. *Cossuridae*; D. *Amphipoda*; E. *Herpeticoida*; F. *Nematoda*

3.6 Phytoplankton pigments (Chlorophyll and Pheophytin)

Chlorophyll and Pheophytin concentration:

Marine phytoplankton contains the essential as well as accessory pigment similar as that of terrestrial plants. Chlorophyll is the essential photosynthetic, green molecule responsible for energy fixation in the process of photosynthesis. The energy fixed by the phytoplankton gets transfer to higher tropic level in the food web through grazing process by the consumers.

Chlorophyll is a measure of algal biomass and it acts as an empirical link between nutrient concentrations.

Algal chlorophyll forms a series of degradation products upon degradation. In addition to Chlorophyll the naturally occurring pigments in algal cells, a filtered water sample will also contain colored degradation products of these pigments. The nature of these degradation products depends on which part of the chlorophyll molecule that is affected. As chlorophyll degrades, the initial step is either the loss of the magnesium from the center of the molecule or the loss of the phytol tail. This results in the formation of the molecule, *phaeophytin*. Depending on the parent molecule a number of distinct molecules like phaeophytins, chlorophyllides, and pheophorbides can be produced. Thus in addition to Chlorophyll *a* filtered sea water contains colored degradation products of phytoplankton pigments.

Figure 1.6: The Degradation Pathways Of Chlorophyll

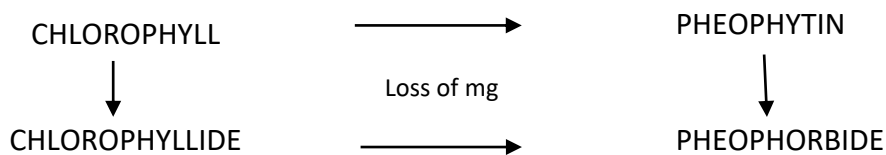


Table 15: Method of analysis for Chlorophyll a and Pheophytin

Sr. no	Test performed	Method
1	Chlorophyll <i>a</i> and Pheophytin	APHA, Edition 21, Part 10000, 10200 H (with some modification)

3.6.1 Estimation of Chlorophyll *a* and Pheophytin:

- Sampling locations were same as that of the plankton samples. Surface water samples were collected in clean plastic dark bottles.
- Water samples were filtered through Whatman glass microfiber filters (GF/F: 47 mm) and paper was macerated in 90% acetone and one night stored in the dark at 4°C.
- The extraction slurry was transferred to 15 ml centrifugation tube and centrifuged at ~2000 rpm for 10 min.
- The extract was decanted into a 15 ml centrifuge tube, volume was adjusted to 10 ml with 90% acetone.
- Clarified extract was transferred to cuvette. Chlorophyll fluorescence was measured using Turner Flurometer.
- The extract was then acidified in the cuvette with 0.1 ml of 0.1 N NH₄Cl. The acidified extract is gently agitated and phaeophytin fluorescence was measured using Turner Flurometer (after acidification).

3.6.2 Results

Distribution of phytoplankton biomass expressed in terms of Chlorophyll a (Chl a) and phaeophytin at sub-tidal and inter-tidal stations in the marine environment of APMUL, Mundra is presented in. In sub-tidal region, concentrations of Chl a ranged from 0.15 to 2.40 mg/m³ at station#3 and station#2, respectively. The content of phaeophytin ranged from 0.80 to 1.40 mg m³ at station#3 and station#2, respectively. The concentration of phaeophytin is a measure of the dead cells and is an indirect indicator of biotic and abiotic stress conditions of the algae leading to deterioration of chlorophyll a. The ratio from concentrations of chlorophyll a and phaeophytin in an aquatic ecosystem suggest balance between the growth and mortality of phytoplankton life. In healthy environments, ratios of chlorophyll a to phaeophytin generally exceed 1.2. Ratios of Chl a to phaeophytin in the sub-tidal study area of APMUL, Mundra ranged from 1.50 to 1.88. The ratios of the concentrations of chl a and phaeophytin in the sampled stations were generally high (>1) except station#5, indicating that the appropriate conditions prevailed for the phytoplankton growth.

Table 16: Chlorophyll *a* and Pheophytin (mg/l)

Sampling locations	Chlorophyll <i>a</i> mg m ⁻³	Phaeophytin mg m ⁻³	Chl <i>a</i> : Pheophytin ratio
ST-1	2.2	1.3	1.69
ST-2	2.4	1.4	1.71
ST-3	1.5	0.8	1.88
ST-4	1.9	1.2	1.58
ST-5	1.8	1.2	1.50

3.7 Conclusion

- The phytoplankton abundance in the study region was ranged from 12029 to 18906 cells L⁻¹. Highest phytoplankton abundance was observed at the STN-2 water. However, lowest phytoplankton abundance was observed at the STN-3 water.
- In general, the concentrations of chlorophyll-a, and phaeophytin in the sampled stations were generally high (>1) except station 3 (phaeophytin: 0.8). Chlorophyll-a and Phaeophytin ratio calculated to be >1.2 at all the stations, indicating that the appropriate conditions prevailed for the phytoplankton growth.
- The lowest zooplankton biomass of 0.106 ml/m³ was recorded at Station 2 while, maximum biomass was reported at Station 5 (0.189 ml/m³). Minimum zooplankton population density was reported at Station 1 (4608 nos. /m³), whereas, maximum density reported at station 5 (5856 nos. /m³).
- The highest macro benthos abundance (185 no. m⁻²) was reported at IT-1 (LW). Highest biomass (2.15 mg. m⁻²) was also recorded at IT-1 (LW). In the sub-tidal region, higher macro benthos abundance was recorded at ST-1 (395 no. m⁻²), whereas, lowest abundance was recorded at ST-5 (212.5 no. m⁻²). Higher macrobenthic biomass was recorded at ST-3 (3.11 mg. m⁻²) as compared to other stations
- Complete sampling data survey reveals that the physicochemical and marine biological parameters of the post monsoon (December 2019) analyses data persisted and not differed from the baseline monitoring data. However, the unstable intertidal benthic dead shells deposit as the effect of natural tidal currents and interchange with sediment carriage activity moves the settlement of the benthic fauna, primarily in the sampling location at station 03 (West Port area) area.
- The biological parameters considered for the present monitoring study are phytoplankton pigments and cell count, zooplankton standing stock and population, macrobenthic biomass and population status is stable and healthy in our sapling sites

Table 17: Names of the Marine Monitoring Team Members

Sr. No.	Name of Person
1.	Dr. Kalyan De (Marine Scientist)
2.	Mr. Vijay Thanki (Env. Chemist)
3.	Mr. Pravin Singh (Env. Chemist)
4.	Miss. Shweta A. Rana (Env. Microbiologist)
5.	Dr. Shivanagouda N. Sanagoudra (Marine Biologist)



DIFFERENT TYPES OF SAMPLING PHOTOGRAPHS



ADANI POWER(MUNDRA) LIMITED

Summary of Continues Ambient Air Quality Monitoring System Reports -- MONTH: October' 2019 TO March' 2020

Parameters		Station: ECO Park				Station: Near Main Gate				Station: Near Ash Pond			
		PM10	PM2.5	SO ₂	NO ₂	PM10	PM2.5	SO ₂	NO ₂	PM10	PM2.5	SO ₂	NO ₂
UNIT		ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³
MONTH	GPCB LIMIT	100	60	80	80	100	60	80	80	100	60	80	80
October'19	Minimum	49.9	30.8	16.5	12.1	49.5	27.3	13.4	11.2	53.1	30.5	13.7	12.3
	Maximum	82.6	39.1	27.5	17.3	81.7	37.1	27.5	20.6	82.7	49.9	26.4	21.2
	Average	66.2	34.8	20.6	14.4	61.4	32.1	18.9	15.4	72.0	41.3	21.1	16.0
November'19	Minimum	52.3	29.3	17.8	11.2	52.5	27.7	12.4	12.1	47.7	28.5	16.9	12.6
	Maximum	86.3	41.8	28.5	18.2	85.7	41.5	31.2	21.7	88.9	53.3	28.7	23.8
	Average	75.4	34.6	22.7	14.7	76.3	35.0	20.1	16.2	71.0	43.5	22.2	18.2
December'19	Minimum	49.5	30.3	10.6	11.6	43.2	28.4	16.7	13.7	42.5	28.4	19.7	25.3
	Maximum	81.7	44.5	26.5	21.4	81.5	38.4	26.1	21.7	82.5	48.8	27.2	31.9
	Average	62.0	34.9	21.1	16.6	60.5	33.3	22.8	16.8	64.3	39.2	23.9	29.1
January' 20	Minimum	44.4	27.6	12.2	12.3	40.5	26.4	10.2	11.6	52.7	27.6	13.5	11.4
	Maximum	83.7	40.0	29.3	21.4	82.4	43.8	27.9	20.4	69.6	37.5	25.4	22.4
	Average	65.8	33.0	21.7	15.7	63.6	34.6	22.2	15.1	63.3	32.7	22.0	17.1
February' 20	Minimum	59.8	30.2	10.8	11.3	49.0	30.2	12.4	12.4	45.2	39.0	20.2	18.3
	Maximum	83.2	40.8	27.8	20.4	83.4	37.1	27.5	21.7	80.5	47.8	26.5	29.5
	Average	70.8	35.1	15.5	16.1	68.5	33.3	18.0	16.4	59.6	43.1	23.7	22.8
March'20	Minimum	49.5	32.5	11.2	9.3	59.5	35.5	10.2	9.8	66.9	42.7	18.3	12.3
	Maximum	86.9	57.7	27.2	18.6	88.6	55.2	26.5	17.9	84.3	49.8	23.4	16.5
	Average	69.5	44.2	18.5	11.9	73.0	43.2	16.5	12.4	71.5	46.3	20.4	13.9

* Unit under Shutdown

Month: October'19			
Date	Intake Reservoir °C	Outfall Channel °C	Temp. Difference °C
01-10-2019	28	31.5	3.5
02-10-2019	28.5	32	3.5
03-10-2019	28	32	4
04-10-2019	29	32.5	3.5
05-10-2019	29.5	32	2.5
06-10-2019	29	32.5	3.5
07-10-2019	28.5	32	3.5
08-10-2019	29.5	32.5	3
09-10-2019	30	33	3
10-10-2019	30.5	33.5	3
11-10-2019	30	32.5	2.5
12-10-2019	30.5	33	2.5
13-10-2019	30.5	33.5	3
14-10-2019	31	32.5	1.5
15-10-2019	30.5	34	3.5
16-10-2019	31	35	4
17-10-2019	30.5	32.5	2
18-10-2019	30.5	33.5	3
19-10-2019	30	32.5	2.5
20-10-2019	31	33.5	2.5
21-10-2019	30.5	33.5	3
22-10-2019	30.5	33	2.5
23-10-2019	31	34.5	3.5
24-10-2019	30.5	34	3.5
25-10-2019	30.5	32.5	2
26-10-2019	30	32	2
27-10-2019	29.5	32.5	3
28-10-2019	30	33.5	3.5
29-10-2019	29.5	32	2.5
30-10-2019	28.5	31.5	3
31-10-2019	28	31	3
Min.	28.0	31.0	1.5
Max.	31.0	35.0	4.0
Average	29.8	32.7	3.0

Month: November'19			
Date	Intake Reservoir °C	Outfall channel °C	Temp. difference °C
01-11-2019	29	32.5	3.5
02-11-2019	28.5	32.0	3.5
03-11-2019	28	31.0	3
04-11-2019	28.5	32.0	3.5
05-11-2019	29	31.0	2
06-11-2019	28.5	31.5	3
07-11-2019	29	32.0	3
08-11-2019	28.5	32.0	3.5
09-11-2019	28.5	31.5	3
10-11-2019	28.5	32.0	3.5
11-11-2019	28	31.5	3.5
12-11-2019	28.5	32.0	3.5
13-11-2019	28.5	31.5	3
14-11-2019	29	31.5	2.5
15-11-2019	28.5	32.0	3.5
16-11-2019	28.5	31.5	3
17-11-2019	28	31.0	3
18-11-2019	27.5	30.5	3
19-11-2019	28	31.5	3.5
20-11-2019	28.5	31.5	3
21-11-2019	27	30.5	3.5
22-11-2019	27.5	30.5	3
23-11-2019	26.5	30.0	3.5
24-11-2019	27	30.5	3.5
25-11-2019	27.5	30.5	3
26-11-2019	27.5	31.0	3.5
27-11-2019	26.5	30.0	3.5
28-11-2019	27.5	30.5	3
29-11-2019	26.5	30.0	3.5
30-11-2019	26	29.5	3.5
Min.	26.0	29.5	2.0
Max.	29.0	32.5	3.5
Average	28.0	31.2	3.2

Month: December'19			
Date	Intake Reservoir °C	Outfall Channel °C	Temp. Difference °C
01-12-2019	28	30.5	2.5
02-12-2019	27.5	30	2.5
03-12-2019	27	28.5	1.5
04-12-2019	26.5	28	1.5
05-12-2019	26	28.5	2.5
06-12-2019	26.5	28.5	2
07-12-2019	25.5	27	1.5
08-12-2019	26.5	28.5	2
09-12-2019	26	27.5	1.5
10-12-2019	26.5	28.5	2
11-12-2019	25.5	27	1.5
12-12-2019	26	28	2
13-12-2019	26	27.5	1.5
14-12-2019	26.5	28.5	2
15-12-2019	25.5	27.5	2
16-12-2019	26	28.5	2.5
17-12-2019	25	27.5	2.5
18-12-2019	24.5	26.5	2
19-12-2019	24	25.5	1.5
20-12-2019	23.5	26.5	3
21-12-2019	24	26	2
22-12-2019	23.5	26.5	3
23-12-2019	23	25.5	2.5
24-12-2019	23.5	26	2.5
25-12-2019	23	25.5	2.5
26-12-2019	*	*	*
27-12-2019	*	*	*
28-12-2019	*	*	*
29-12-2019	22	25.5	3.5
30-12-2019	23	25	2
31-12-2019	24	27.5	3.5
Min.	22.0	25.0	1.5
Max.	28.0	30.5	3.5
Average	25.2	27.4	2.2

Note: * Outfall Channel under Maintenance

Month: January-2020			
Date	Intake Reservoir °C	Outfall Channel °C	Temp. Difference °C
01-01-2020	23.5	25.5	2
02-01-2020	22.5	25	2.5
03-01-2020	22	24.5	2.5
04-01-2020	23	25	2
05-01-2020	23	24.5	1.5
06-01-2020	23.5	25.5	2
07-01-2020	23.5	24.5	1
08-01-2020	24	25.5	1.5
09-01-2020	23.5	24.5	1
10-01-2020	22.5	24	1.5
11-01-2020	23.5	25.5	2
12-01-2020	24.5	26	1.5
13-01-2020	23.5	25.5	2
14-01-2020	22.5	25	2.5
15-01-2020	24.5	26	1.5
16-01-2020	23.5	25.5	2
17-01-2020	24.5	26.5	2
18-01-2020	21.5	24.5	3
19-01-2020	21	24	3
20-01-2020	21.5	23.5	2
21-01-2020	22.5	24	1.5
22-01-2020	23.5	25.5	2
23-01-2020	20.5	24	3.5
24-01-2020	19.5	23	3.5
25-01-2020	21.5	24.5	3
26-01-2020	22	24.5	2.5
27-01-2020	21.5	24	2.5
28-01-2020	23.5	25.5	2
29-01-2020	22	25	3
30-01-2020	23	24.5	1.5
31-01-2020	23.5	25.5	2
Min.	19.5	23.0	1.0
Max.	24.5	26.5	3.5
Average	22.7	24.9	2.1

Month: February-2020			
Date	Intake Reservoir °C	Outfall Channel °C	Temp. Difference °C
01-02-2020	24	25.5	1.5
02-02-2020	23.5	25.5	2
03-02-2020	23	24.5	1.5
04-02-2020	23.5	25	1.5
05-02-2020	23	24.5	1.5
06-02-2020	24	25.5	1.5
07-02-2020	24.5	26.5	2
08-02-2020	24	26	2
09-02-2020	25	26.5	1.5
10-02-2020	*	27	1.5
11-02-2020	*	*	*
12-02-2020	*	*	*
13-02-2020	*	*	*
14-02-2020	*	*	*
15-02-2020	*	*	*
16-02-2020	*	*	*
17-02-2020	26	27.5	1.5
18-02-2020	25.5	27.5	2
19-02-2020	26	28.5	2.5
20-02-2020	26.5	28	1.5
21-02-2020	26	28.5	2.5
22-02-2020	25.5	27.5	2
23-02-2020	25	27	2
24-02-2020	25.5	27	1.5
25-02-2020	26	27.5	1.5
26-02-2020	25.5	27.5	2
27-02-2020	25	28	3
28-02-2020	26	27.5	1.5
29-02-2020	25.5	28	2.5
Min.	23.0	24.5	1.5
Max.	26.5	28.5	3.0
Average	25.0	26.8	1.8

Note: * Outfall Channel under Maintenance

Month: March-2020			
Date	Intake Reservoir °C	Outfall Channel °C	Temp. Difference °C
01-03-2020	25.5	28	2.5
02-03-2020	25	28.5	3.5
03-03-2020	25.5	27.5	2
04-03-2020	26	28.5	2.5
05-03-2020	25.5	27.5	2
06-03-2020	25.5	28	2.5
07-03-2020	26	28.5	2.5
08-03-2020	25.5	27.5	2
09-03-2020	26.5	28	1.5
10-03-2020	25	27.5	2.5
11-03-2020	24.5	28	3.5
12-03-2020	25	28.5	3.5
13-03-2020	26	27.5	1.5
14-03-2020	26.5	28.5	2
15-03-2020	26.5	29	2.5
16-03-2020	26.5	29	2.5
17-03-2020	26	29.5	3.5
18-03-2020	26.5	29.5	3
19-03-2020	25.5	29	3.5
20-03-2020	26.5	29.5	3
21-03-2020	26	29	3
22-03-2020	25	28.5	3.5
23-03-2020	24.5	27.5	3
24-03-2020	25.5	28	2.5
25-03-2020	25.5	28.5	3
26-03-2020	26	29.5	3.5
27-03-2020	27	28.5	1.5
28-03-2020	26.5	29	2.5
29-03-2020	26	29.5	3.5
30-03-2020	27	28.5	1.5
31-03-2020	27.5	29.5	2
Min.	24.5	27.5	1.5
Max.	27.5	29.5	3.5
Average	25.9	28.5	2.6

Adani Power (Mundra) Limited**Greenbelt Details:**

Area (ha)	No. of Trees & Palm Planted	No. of Shrubs Planted
138.63	259314	1395954

Plant species planted at Adani Power Limited, Mundra

Sr. No.	Scientific Name	Common Name
Tress		
1.	<i>Achras sapota</i>	Sapota / Chiku
2.	<i>Areca catechu</i>	Nut Palm tree
3.	<i>Azadirachta indica</i>	Neem
4.	<i>Bismarckia nobilis</i>	Bismarckia Palm
5.	<i>Bauhinia blakeana</i>	Kachnar
6.	<i>Callistemon viminalis</i>	Pink Bottle brush
7.	<i>Callistemon lanceolatus</i>	Red Bottle brush
8.	<i>Casuarina equisetifolia</i>	Saru/Casuarina
9.	<i>Cocos nucifera</i>	Nariyal/Cocconut
10.	<i>Delonix regia</i>	Gulmohar
11.	<i>Ficus benghalensis</i>	Baniyan tree
12.	<i>Ficus religiosa</i>	Peepal Tree
13.	<i>Punica granatum</i>	Pomegranate
14.	<i>Emblica officinalis</i>	Aamla
15.	<i>Ficus infectoria</i>	Pilkhan /White Fig tree
16.	<i>Mangifera indica</i>	Aam/ Mango
17.	<i>Polyalthia longifolia</i>	Ashok/ False Ashok
18.	<i>Psidium guajava</i>	Guava
19.	<i>Salvadora oleoides</i>	Peelu
20.	<i>Citrus limon</i>	Lemon
21.	<i>Syzygium cumini</i>	Jamun
22.	<i>Washingtonia filifera</i>	Washingtonia Palm
23.	<i>Wodyetia bifurcata</i>	Palm
Shrubs		
24.	<i>Allamanda</i>	Yellow Bell
25.	<i>Bougainvillea spectabilis</i>	Bougainvillea/ Booganbel
26.	<i>Catharanthus alba</i>	Vinca
27.	<i>Clerodendrum inerme</i>	Wild Jasmine
28.	<i>Cycas circinalis</i>	Cycas
29.	<i>Euphorbia cotinifolia</i>	Tropical Smoke Bush
30.	<i>Euphorbia milii</i>	Christ Thorn
31.	<i>Ficus panda</i>	-
32.	<i>Hymenocallis caroliniana</i>	Spider Lily
33.	<i>Ixora hybrid</i>	Ixora
34.	<i>Jasminum molle</i>	Jui
35.	<i>Jatropha curcas</i>	Ratanjyot,
36.	<i>Nerium indicum</i>	Kaner
37.	<i>Nerium odoratum</i>	Kaner
38.	<i>Plumeria alba</i>	Champa
39.	<i>Tecoma</i>	Yellow Trumpetbush
40.	<i>Ziziphus mauritiana</i>	Ber/Bor/Indian plum
41.	<i>Furcraea macdougallii</i>	Furcraea
42.	<i>Nicadevia</i>	Nicadevia

Annexure VII

Ash Production & Disposal (Phase I, II, III)
(Period: October 2019 – March 2020)

Month	Ash Production (MT/month)	For Cement manufacturing (MT/Month)	For Brick/ Construction/ Traders (MT/ month)	Reclamation of Low Lying Areas (MT/month)	Ash Dyke (MT/ month)	Dyke Ash lifted for reutilization (MT)	Bottom Ash (Sold/Export) (MT)	Total Ash Utilized (Silo+ Dyke) (MT)	% of Ash Utilization	Previous Month's Stock
										2590
Oct-2019	70740	34753	23727	11803	0	0	0	70283	99.35	3046
Nov-2019	63953	22111	32005	10816	0	0	0	64933	101.53	2066
Dec-2019	52156	28172	14689	8798	0	0	0	51660	99.05	2563
Jan-2020	56888	27319	18311	9029	0	0	386	55045	96.76	4406
Feb-2020	57867	29991	20370	9450	0	0	367	60178	103.99	2095
Mar-2020	43141	15661	16214	10457	0	0	415	42746	99.08	2491
Total	344745	158007	125317	60353	0	0	1168	344844	100.03	

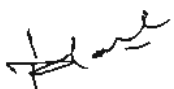
Note: Total 2491 MT Ash filled in bags and will be utilized in upcoming months

TEST REPORT

ULR - TC775319000019255P			
Report No.	URC /19/12/0099	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT - 370 435.		
Sample Details	Bore well Water Sample - 1	Sample Qty.	2 Lit
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0099			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.41
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	15956.25
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl	(APHA 23 rd Ed.,2017,4500-Cl)	4682.5
2.	*Salinity (ppt)	By Calculation	8.5
3.	Total Dissolved Solids	(APHA 23 rd Ed.,2017,2540- C)	10212
4.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	23.64
5.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	192.5
6.	Mercury as Hg	(APHA 23 rd Ed.,2017,3112-B)	BDL(MDL:0.001)
7.	Arsenic as As	APHA 23 rd Ed.,2017,3114-C	BDL(MDL:0.01)
8.	Lead as Pb	(APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.01)
9.	Chromium as Cr	APHA 23 rd Ed.,2017,3125	BDL(MDL:0.05)
10.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.03)
11.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.1)
12.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)
13.	Total Alkalinity	[IS 3025(Part 23)1986, Amd.2]	442.2
14.	Calcium as Ca	(APHA 23rd Ed.,2017,3500 Ca.B)	352.6
15.	Magnesium as Mg	(APHA 23rd Ed.,2017., 3500 Mg.B)	239.3
16.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na,B	1715
17.	Potassium as K	APHA 23 rd Ed.,2017,3500 K,B	102.5
18.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	644
19.	Nitrate as NO ₃	(APHA 23rd Ed.,2017,4500 NO ₃ -B)	26.6
20.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	2.62
21.	Barium as Ba	AAS Method	N.D.
22.	Fluoride as F	(APHA 23rd Ed.,2017,4500 F,D)	2.47



MoEF&CC (GOI) Recognized Environmental Laboratory under the EPA-1986(12.01.2015 to 11.01.2020)

GCINABET Accredited QA Consultant Organization

GPCB Recognized Environmental Auditor (Schedule-II)

CHSAS18001:2007 Certified Company

ISO 9001:2015 Certified Company

TEST REPORT

ULR - TC775319000019255P			
Report No.	URC /19/12/0099	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited, Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT - 370 435.		
Sample Details	Bore well Water Sample - 1	Sample Qty.	2 Lt
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0099			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
23.	Cobalt as Co	AAS Method	N.D.
24.	Copper as Cu	IS 3025(Part 42)1992amd.01, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.05)
25.	Manganese as Mn	APHA 23rd Ed.,2017,3500 Mn B	BDL(MDL:0.1)
26.	Nickel as Ni	IS 3025(Part 54)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.02)

Note. "The parameters marked with an* are not accredited by NABL", BDL= Below Detection Limit, MDL = Minimum Detection Limit, N.D. = Not Detectable,

***** End of Report *****

Tested By
Joesai
(J.P.D.)
(Chemist)
Page 2 of 2

Checked By
Purvi
(P.C.P.)
(Sr. Chemist)

Authorized By
Hari
(H.T.T.)
(Technical Manager)
UERL/CHM/F-2/03

TEST REPORT

ULR - TC775319000019256P			
Report No.	URC /19/12/0100	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT - 370 435.		
Sample Details	Bore well Water Sample - 2	Sample Qty.	2 Lit
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0100			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.19
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	17647
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl ⁻	(APHA 23rd Ed.,2017,4500-Cl)	4538.7
2.	*Salinity (ppt)	By Calculation	8.2
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	11352.6
4.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	33.2
5.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	165.2
6.	Mercury as Hg	(APHA 23rd Ed.,2017,3112-B)	BDL(MDL:0.001)
7.	Arsenic as As	APHA 23rd Ed.,2017,3114-C	BDL(MDL:0.01)
8.	Lead as Pb	(APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.01)
9.	Chromium as Cr	APHA 23rd Ed.,2017,3125	BDL(MDL:0.05)
10.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.03)
11.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.1)
12.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.05)
13.	Total Alkalinity	[IS 3025(Part 23)1986, Amd.2]	465.5
14.	Calcium as Ca	[APHA 23rd Ed.,2017,3500 Ca.B)	380.205
15.	Magnesium as Mg	(APHA 23rd Ed.,2017., 3500 Mg.B)	246.3
16.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na.B	2010
17.	Potassium as K	APHA 23 rd Ed.,2017,3500 K.B	119.3
18.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	796
19.	Nitrate as NO ₃	(APHA 23rd Ed.,2017,4500 NO3-B)	29.2
20.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	3.1
21.	Barium as Ba	AAS Method	N.D.
22.	Fluoride as F	[APHA 23rd Ed.,2017,4500 F,D)	2.85



TEST REPORT

ULR – TC775319000019256P			
Report No.	URC /19/12/0100	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 2	Sample Qty.	2 Lit
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0100			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
23.	Cobalt as Co	AAS Method	N.D.
24.	Copper as Cu	IS 3025(Part 42)1992amd.01, {APHA 23rd Ed.,2017,3111-B}	BDL(MDL:0.05)
25.	Manganese as Mn	APHA 23rd Ed.,2017,3500 Mn B	BDL(MDL:0.1)
26.	Nickel as Ni	IS 3025(Part S4)2003, {APHA 23 rd Ed.,2017,3111-8}	BDL(MDL:0.02)

Note: *The parameters marked with an* are not accredited by NABL*, BDL= Below Detection Limit, MDL = Minimum Detection Limit, N.D. = Not Detectable,

***** End of Report *****

Tested By
Jesal
(J.P.D.)
(Chemist)

Checked By
Pranav
(N.C.P.)
(Sr. Chemist)

Authorized By
Pranav
(M.T.)
(Technical Manager)

Page 2 of 2

UERL/CHM/F-2/03

TEST REPORT

ULR – TC775319000019257P			
Report No.	URC /19/12/0101	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 3	Sample Qty.	2 Lit
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0101			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.57
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	15416
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl ⁻	(APHA 23 rd Ed.,2017,4500-Cl)	4596.3
2.	*Salinity (ppt)	By Calculation	8.3
3.	Total Dissolved Solids	(APHA 23 rd Ed.,2017,2540-C)	9866
4.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	36.3
5.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	172.3
6.	Mercury as Hg	(APHA 23 rd Ed.,2017,3112-B)	BDL(MDL:0.001)
7.	Arsenic as As	APHA 23 rd Ed.,2017,3114-C	BDL(MDL:0.01)
8.	Lead as Pb	(APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.01)
9.	Chromium as Cr	APHA 23 rd Ed.,2017,3125	BDL(MDL:0.05)
10.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.03)
11.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.1)
12.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)
13.	Total Alkalinity	(IS 3025(Part 23)1986, Amd.2)	420.2
14.	Calcium as Ca	(APHA 23 rd Ed.,2017,3500 Ca.8)	336.6
15.	Magnesium as Mg	(APHA 23 rd Ed.,2017,, 3500 Mg.B)	205.5
16.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na,B	1614
17.	Potassium as K	APHA 23 rd Ed.,2017,3500 X,B	95.5
18.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	647.5
19.	Nitrate as NO ₃	(APHA 23 rd Ed.,2017,4500 NO3-B)	23.3
20.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	2.1
21.	Barium as Ba	AAS Method	N.D.
22.	Fluoride as F	(APHA 23 rd Ed.,2017,4500 F,D)	2.05



NIEP&CC (GDI) Recognized Environmental Laboratory under the EPA-1986(12.01.2015 to 1.01.2020)

QC/NABE Accredited EIA Consultant Organization

GPCB Recognized Environmental Auditor (Schedule-II)

OHSAS18001:2007 Certified Company

ISO 9001:2015 Certified Company

TEST REPORT

ULR - TC775319000019257P			
Report No.	URC /19/12/0101	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT - 370 435.		
Sample Details	Bore well Water Sample - 3	Sample Qty.	2 Lit
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0101			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
23.	Cobalt as Co	AAS Method	N.D.
24.	Copper as Cu	IS 3025(Part 42)1992amd.01, (APHA 23rd Ed.,2017,3111-8)	BDL(MDL:0.05)
25.	Manganese as Mn	APHA 23rd Ed.,2017,3500 Mn B	BDL(MDL:0.1)
26.	Nickel as Ni	IS 3025(Part 54)2003, (APHA 23 rd Ed.,2017,3111-8)	BDL(MDL:0.02)

Note: "The parameters marked with an * are not accredited by NABL", BDL= Below Detection Limit, MDL = Minimum Detection Limit, N.D. = Not Detectable.

***** End of Report *****

Tested By

Jesal C.J.P.D.

(Chemist)

Page 2 of 2

Checked By

(N.C.P.)

(Sr. Chemist)

Authorized By

(H.H.)

(Technical Manager)

UERL/CHM/F-2/03

TEST REPORT

ULR – TC775319000019258P			
Report No.	URC /19/12/0102	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 4	Sample Qty.	2 Lt.
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0102			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.96
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	16444
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl ⁻	(APHA 23 rd Ed.,2017,4500-C)	4624.1
2.	*Salinity (ppt)	By Calculation	8.35
3.	Total Dissolved Solids	(APHA 23 rd Ed.,2017,2540- C)	10524
4.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	28.1
5.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	182.3
6.	Mercury as Hg	(APHA 23 rd Ed.,2017,3112-B)	BDL(MDL:0.001)
7.	Arsenic as As	APHA 23 rd Ed.,2017,3114-C	BDL(MDL:0.01)
8.	Lead as Pb	(APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.01)
9.	Chromium as Cr	APHA 23 rd Ed.,2017,3125	BDL(MDL:0.05)
10.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.03)
11.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.1)
12.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)
13.	Total Alkalinity	{IS 3025(Part 23)1986, Amd.2}	469.3
14.	Calcium as Ca	(APHA 23rd Ed.,2017,3500 Ca.B)	965.5
15.	Magnesium as Mg	(APHA 23rd Ed.,2017,, 3500 Mg.B)	239.2
16.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na,B	1914
17.	Potassium as K	APHA 23 rd Ed.,2017,3500 K,B	105.5
18.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	744
19.	Nitrate as NO ₃	(APHA 23rd Ed.,2017,4500 NO3-B)	28.6
20.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	2.95
21.	Barium as Ba	AAS Method	N.O.
22.	Fluoride as F	(APHA 23rd Ed.,2017,4500 F,D)	2.85



TEST REPORT

ULR – TC775319000019258P			
Report No.	URC /19/12/0102	Date Of Report	10/12/2019
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 4	Sample Qty.	2 Lt.
Sampling Date	02/12/2019	Sample Received Date	04/12/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	04/12/2019	Test Completion Date	09/12/2019
UERL Lab Sample ID.No. 19/12/0102			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
23.	Cobalt as Co	AAS Method	N.D.
24.	Copper as Cu	IS 3025(Part 42)1992amd.01, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.05)
25.	Manganese as Mn	APHA 23rd Ed.,2017,3500 Mn B	BDL(MDL:0.1)
26.	Nickel as Ni	IS 3025(Part 54)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.02)

Note: *The parameters marked with an* are not accredited by NABL*, BDL= Below Detection Limit, MDL = Minimum Detection Limit, N.D. = Not Detectable,

***** End of Report *****

Tested By
Jesai
(C.P.D.)
(Chemist)
Page 2 of 2

Checked By
Buney
(N.C.P.)
(Sr. Chemist)

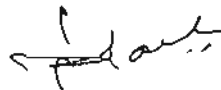
Authorized By
Haul
(F.T.S.)
(Technical Manager)
UERL/CHM/F-2/03

TEST REPORT

Report No.	URC /20/03/APML-0316	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 1	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0316			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.56
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	16270
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl	(APHA 23 rd Ed.,2017,4500-Cl)	4776
2.	Total Dissolved Solids	(APHA 23 rd Ed.,2017,2540- C)	10416
3.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	24.1
4.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	196.3
5.	Mercury as Hg	(APHA 23 rd Ed.,2017,3112-B)	BDL(MDL:0.001)
6.	Arsenic as As	APHA 23 rd Ed.,2017,3114-C	BDL(MDL:0.01)
7.	Lead as Pb	(APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.01)
8.	Chromium as Cr	APHA 23 rd Ed.,2017,3125	BDL(MDL:0.05)
9.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.03)
10.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.1)
11.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)
12.	Total Alkalinity	(IS 3025(Part 23)1986, Amd.2)	451.0
13.	Calcium as Ca	(APHA 23 rd Ed.,2017,3500 Ca.B)	359.6
14.	Magnesium as Mg	(APHA 23 rd Ed.,2017,, 3500 Mg.B)	244.1
15.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na,B	1749.3
16.	Potassium as K	APHA 23 rd Ed.,2017,3500 K,B	104.5
17.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	656.8
18.	Nitrate as NO ₃	(APHA 23 rd Ed.,2017,4500 NO3-B)	27.1
19.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	2.67
20.	Fluoride as F	(APHA 23 rd Ed.,2017,4500 F,D)	2.52
21.	Copper as Cu	IS 3025(Part 42)1992amd.01, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)



TEST REPORT

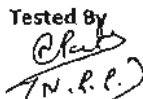
Report No.	URC /20/03/APML-0316	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda & Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT - 370 435.		
Sample Details	Borewell Water Sample - 1	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0316			

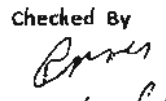
TEST RESULTS

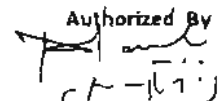
DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
22.	Manganese as Mn	APHA 23rd Ed., 2017, 3500 Mn B	BDL(MDL:0.1)
23.	Nickel as Ni	IS 3025(Part 54)2003. (APHA 23 rd Ed., 2017, 3111-B)	BDL(MDL:0.02)

Note: BDL= Below Detection Limit, MDL = Minimum Detection Limit,

***** End of Report *****

Tested By

(Chemist)

Checked By

(Sr. Chemist)

Authorized By

(Technical Manager)

TEST REPORT

Report No.	URC /20/03/APML-0316	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 1	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs.	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0316			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
1.	*Salinity (ppt)	By Calculation	8.67
2.	*Barium as Ba	AAS Method	N.D.
3.	*Cobalt as Co	AAS Method	N.D.

Note: *The parameters marked with an * are not accredited by NABL*, N.D. = Not Detectable,

***** End of Report *****

Tested By

(Signature)
(N.E.E.)

(Chemist)

Checked By

(Signature)
(V.C.P.)

(Sr. Chemist)

Authorized By

(Signature)
(P.K.)

(Technical Manager)

TEST REPORT

Report No.	URC /20/03/APML-0317	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda & Sracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 2	Sample Qty.	2-lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0317			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.33
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	17890
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl-	(APHA 23rd Ed.,2017,4500-Cl)	4629.4
2.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	11530
3.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	33.9
4.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	178.5
5.	Mercury as Hg	(APHA 23rd Ed.,2017,3112-B)	BDL(MDL:0.001)
6.	Arsenic as As	APHA 23rd Ed.,2017,3114-C	BDL(MDL:0.01)
7.	Lead as Pb	(APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.01)
8.	Chromium as Cr	APHA 23rd Ed.,2017,3125	BDL(MDL:0.05)
9.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.03)
10.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.1)
11.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.05)
12.	Total Alkalinity	[IS 3025(Part 23)1986, Amd. 2]	474.8
13.	Calcium as Ca	(APHA 23rd Ed.,2017,3500 Ca.B)	387.8
14.	Magnesium as Mg	(APHA 23rd Ed.,2017,, 3500 Mg.B)	251.2
15.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na,B	2050.2
16.	Potassium as K	APHA 23 rd Ed.,2017,3500 K,B	121.7
17.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	811.9
18.	Nitrate as NO ₃	(APHA 23rd Ed.,2017,4500 NO3-B)	29.8
19.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	3.2
20.	Fluoride as F	(APHA 23rd Ed.,2017,4500 F,D)	2.91
21.	Copper as Cu	IS 3025(Part 42)1992amd.01, (APHA 23rd Ed.,2017,3111-B)	BDL(MDL:0.05)



TEST REPORT

Report No.	URC /20/03/APM1-0317	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda & Siracha, Tal. Mundra, Dist.: Kutch, GUJARAT - 370 435.		
Sample Details	Bore well Water Sample - 2	Sample Qty.	2 Lt
Sampling Date	08/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APM1-0317			

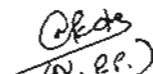
TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (in mg/L)			
22.	Manganese as Mn	APHA 23rd Ed., 2017, 3500 Mn B	BDL (MDL:0.1)
23.	Nickel as Ni	IS 3025 (Part 54) 2003, (APHA 23 rd Ed., 2017, 3111-B)	BDL (MDL:0.02)

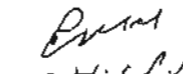
Note: BDL = Below Detection Limit, MDL = Minimum Detection Limit,

***** End of Report *****

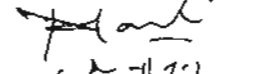
Tested By


(N. R. P.)
(Chemist)

Checked By


(Sr. Chemist)

Authorized By


(P-1170)
(Technical Manager)

TEST REPORT

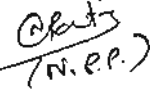
Report No.	URC /20/03/APML-0317	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited, Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 2	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0317			

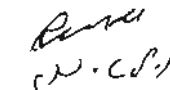
TEST RESULTS

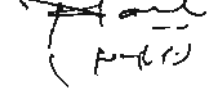
DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
1.	*Salinity (ppt)	By Calculation	8.34
2.	*Barium as Ba	AAS Method	N.D.
3.	*Cobalt as Co	AAS Method	N.D.

Note: "The parameters marked with an* are not accredited by NABL", N.D. = Not Detectable,

***** End of Report *****

Tested By

(N.P.P.)
(Chemist)

Checked By

(N.C.P.)
(Sr. Chemist)

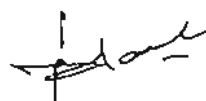
Authorized By

(P.P.P.)
(Technical Manager)

TEST REPORT

Report No.	URC/20/03/APML-0318	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT - 370 435.		
Sample Details	Bore well Water Sample - 3	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0318			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.72
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	15724
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl	(APHA 23 rd Ed.,2017,4500-Cl)	4688.2
2.	Total Dissolved Solids	(APHA 23 rd Ed.,2017,2540- C)	10064
3.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	37.0
4.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	175.7
5.	Mercury as Hg	(APHA 23 rd Ed.,2017,3112-B)	BDL(MDL:0.001)
6.	Arsenic as As	APHA 23 rd Ed.,2017,3114-C	BDL(MDL:0.01)
7.	Lead as Pb	(APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.01)
8.	Chromium as Cr	APHA 23 rd Ed.,2017,3125	BDL(MDL:0.05)
9.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.03)
10.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.1)
11.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)
12.	Total Alkalinity	(IS 3025(Part 23)1986, Amd.2)	428.6
13.	Calcium as Ca	(APHA 23 rd Ed.,2017,3500 Ca,B)	343.3
14.	Magnesium as Mg	(APHA 23 rd Ed.,2017,, 3500 Mg,B)	209.6
15.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na,B	1646
16.	Potassium as K	APHA 23 rd Ed.,2017,3500 K,B	97.4
17.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	660.5
18.	Nitrate as NO ₃	(APHA 23 rd Ed.,2017,4500 NO ₃ -B)	23.8
19.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	2.14
20.	Fluoride as F	(APHA 23 rd Ed.,2017,4500 F,D)	2.09
21.	Copper as Cu	IS 3025(Part 42)1992amd.01, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)



TEST REPORT

Report No.	URC /20/03/APML-0318	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 3	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0318			

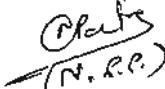
TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
22.	Manganese as Mn	APHA 23rd Ed., 2017, 3500 Mn B IS 3025(Part 54)2003.	BDL(MDL:0.1)
23.	Nickel as Ni	(APHA 23 rd Ed., 2017, 3111-8)	BDL(MDL:0.02)


Note: BDL= Below Detection Limit, MDL = Minimum Detection Limit,

***** End of Report *****

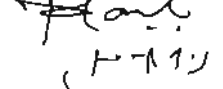
Tested By


(N.R.P.)
(Chemist)

Checked By


(N.C.P.)
(Sr. Chemist)

Authorized By


(H.T.J.)
(Technical Manager)

TEST REPORT

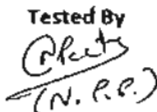
Report No.	URC /20/03/APML-0318	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited, Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT- 370 435.		
Sample Details	Bore well Water Sample - 3	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0318			

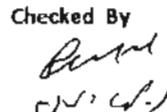
TEST RESULTS

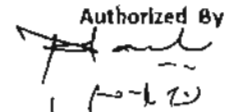
DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
1.	*Salinity (ppt)	By Calculation	8.47
2.	*Barium as Ba.	AAS Method	N.D.
3.	*Cobalt as Co	AAS Method	N.D.

Note: The parameters marked with an * are not accredited by NABL, N.D. = Not Detectable,

***** End of Report *****

Tested By

(N.P.R.)
(Chemist)

Checked By

(Sr. Chemist)

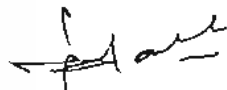
Authorized By

(Technical Manager)

TEST REPORT

Report No.	URC /20/03/APML-0319	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 4	Sample Qty.	2 Lt.
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0319			

TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
PHYSICAL QUALITY			
1.	pH @ 25 °C	IS 3025(Part 11)1983	7.91
2.	Conductivity (uS/cm)	IS 3025(Part 14)1984	16673
CHEMICAL QUALITY (In mg/L)			
1.	Chloride as Cl ⁻	(APHA 23 rd Ed.,2017,4500-Cl)	4716.6
2.	Total Dissolved Solids	(APHA 23 rd Ed.,2017,2540- C)	10734.5
3.	Carbonate as CaCO ₃	IS 3025(Part 51)2001	29.7
4.	Bicarbonate as CaCO ₃	IS 3025(Part 51)2001	185.9
5.	Mercury as Hg	(APHA 23 rd Ed.,2017,3112-B)	BDL(MDL:0.001)
6.	Arsenic as As	APHA 23 rd Ed.,2017,3114-C	BDL(MDL:0.01)
7.	Lead as Pb	(APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.01)
8.	Chromium as Cr	APHA 23 rd Ed.,2017,3125	BDL(MDL:0.05)
9.	Cadmium as Cd	IS 3025(Part 41)1992, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.03)
10.	Iron (as Fe)	IS 3025(Part 53)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.1)
11.	Zinc (as Zn)	IS 3025(Part 49)1994, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)
12.	Total Alkalinity	(IS 3025(Part 23)1986, Amd.2)	478.7
13.	Calcium as Ca	(APHA 23 rd Ed.,2017,3500 Ca-B)	375.8
14.	Magnesium as Mg	(APHA 23 rd Ed.,2017, 3500 Mg-B)	244.0
15.	Sodium as Na	APHA 23 rd Ed.,2017,3500 Na,B	1952.3
16.	Potassium as K	APHA 23 rd Ed.,2017,3500 K,B	107.6
17.	Sulphate as SO ₄ -2	IS 3025(Part 24)1986	758.9
18.	Nitrate as NO ₃	(APHA 23 rd Ed.,2017,4500 NO3-B)	29.2
19.	Phosphate as PO ₄	(APHA 23 rd Ed.,2017,4500-P,D)	3.01
20.	Fluoride as F	(APHA 23 rd Ed.,2017,4500 F,D)	2.91
21.	Copper as Cu	IS 3025(Part 42)1992amd.01, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.05)



TEST REPORT

Report No.	URC /20/03/APML-0319	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch, GUJARAT – 370 435.		
Sample Details	Bore well Water Sample - 4	Sample Qty.	2 Lt.
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0319			


TEST RESULTS

DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
22.	Manganese as Mn	APHA 23rd Ed.,2017,3500 Mn B	BDL(MDL:0.1)
23.	Nickel as Ni	IS 3025(Part 54)2003, (APHA 23 rd Ed.,2017,3111-B)	BDL(MDL:0.02)

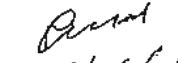
Note: BDL= Below Detection Limit, MDL = Minimum Detection Limit,

***** End of Report *****

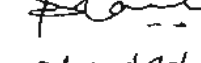
Tested By


(N.R.P.)
(Chemist)

Checked By


(N.C.P.)
(Sr. Chemist)

Authorized By


(Technical Manager)

TEST REPORT

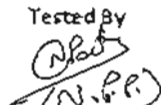
Report No.	URC/20/03/APML-0319	Date Of Report	21/03/2020
Name & Address of Customer	M/s. Adani Power (Mundra) Limited. Village: Tunda&Siracha, Tal. Mundra, Dist.: Kutch. GUJARAT - 370 435.		
Sample Details	Bore well Water Sample - 4	Sample Qty.	2 Lit
Sampling Date	09/03/2020	Sample Received Date	11/03/2020
Sampled By	UniStar Env. & Research Labs.	Appearance Of Sample	Colorless
Test Started Date	13/03/2020	Test Completion Date	20/03/2020
UERL Lab Sample ID.No. 20/03/APML-0319			

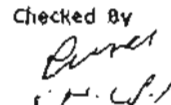
TEST RESULTS

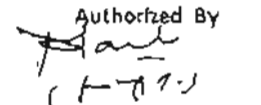
DISCIPLINE : Chemical Testing		NAME OF GROUP: Water	
Sr. No.	Parameters	Test Method Permissible	Results
CHEMICAL QUALITY (In mg/L)			
1.	*Salinity (ppt)	By Calculation	8.42
2.	*Barium as Ba	AAS Method	N.D.
3.	*Cobalt as Co	AAS Method	N.D.


Note: The parameters marked with an * are not accredited by NABL, N.D. = Not Detectable,

***** End of Report *****

Tested By

(N.P.R.)
(Chemist)

Checked By

(Sr. Chemist)

Authorized By

(Technical Manager)

	Adani Power (Mundra) Limited, Mundra	Annexure – IX
	Expenditure for Environmental Protection & CER (Period: October 2019 – March 2020)	

Expenditure for Environmental Protection & CER		
(Fig. in Rs. Lakhs)		
Sr. No.	Particular	Expenditure from October'19 to March' 20
1	Rural Development/CER/CSR Activities	921.77
2	Green belt development	72.00
3	Legal, Consent Fee, GPCB lab bills & Environment Audit	0.29
4	Hazardous waste disposal cost	0.51
5	Treatment and Disposal cost (Waste water & Sewage Treatment)	42.04
6	Maintenance cost of ESP & FGD (Material Cost)	105.29
7	Third party monitoring and Equipment & instruments maintenance, materials, communication cost.	37.33
8	Insurance, training and external environmental management	0.0
Total		1179.23

adani
Foundation

Sustainable Growth

With Goodness



Adani Foundation

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

Our Journey

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

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

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

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

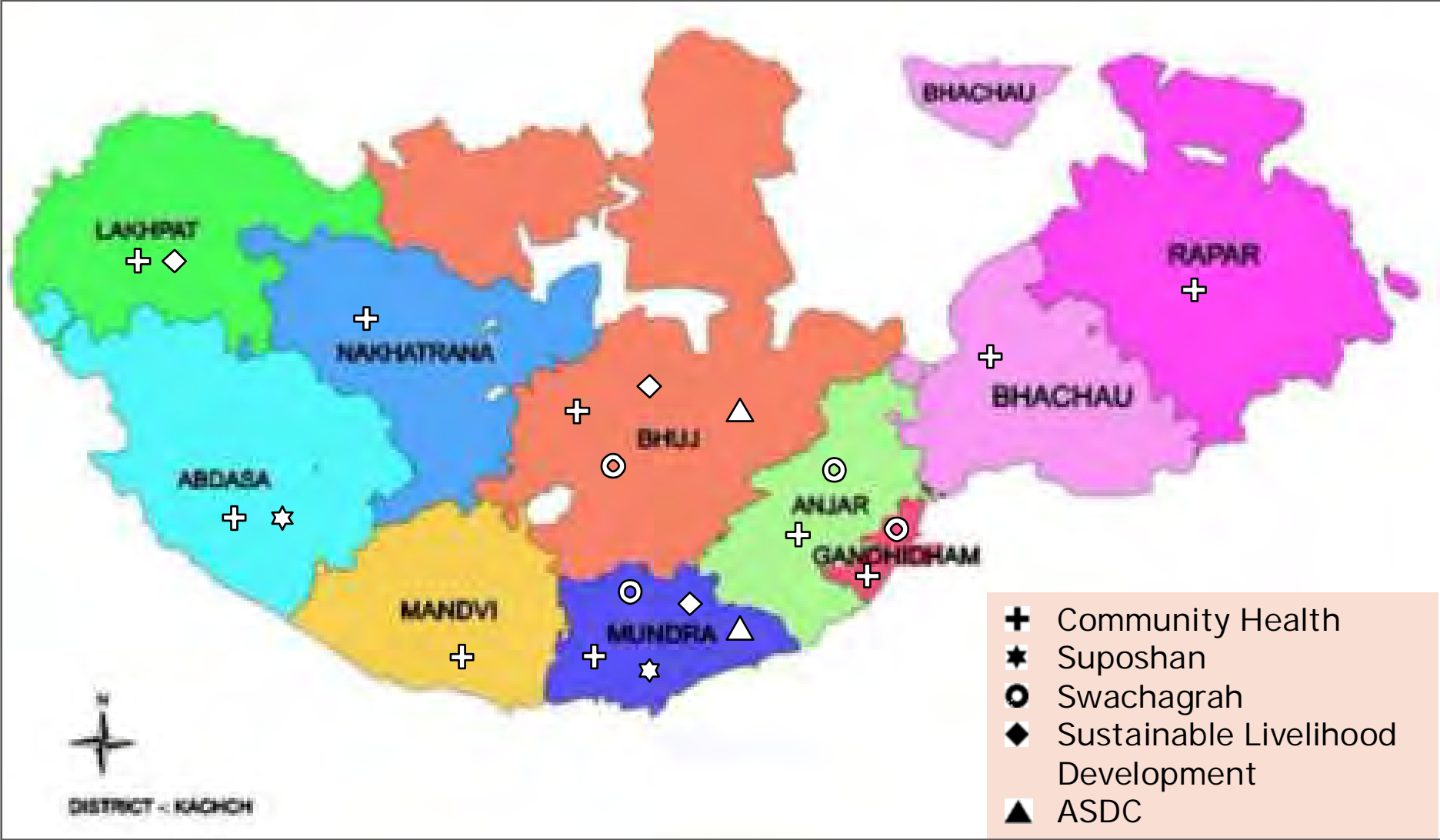
Namda Artisan Karim mansoori was awarded with "Best State Artisan Award" by CM, Gujrat. Live exhibition of different mangroves spices in District Level Krishi Mela by Adani Foundation. " Speaker of Kutchh" organized to motivate and identify youth speaker at District Level.

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

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

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

Our Presence in Kutch



INDEX

5	Education	75	Suposhan
14	Adani Vidya Mandir Bhadreswar	80	Project Swavlamban
17	Udaan	83	Adani Kandla Bulk Terminal Pvt. Ltd. - Tuna
19	Community Health Mundra	85	Adani Green Energy Limited - Nakhtrana
26	Community Health Bhuj	89	Adani Cementation Private Limited - Lakhpat
33	SLD - Fisherman Amenities work	93	Adani Solar Energy Private Limited - Bitta
40	Environment Sustainability	95	Employee Volunteering Program
50	SLD - Agriculture Initiatives	98	Our Change Makers
54	Women Empowerment Projects	113	Events
60	Community Infrastructure Development	122	Awards and Accolades
63	Adani Skill Development: Centre - Bhuj	131	Beneficiary Detail
70	Adani Skill Development: Centre - Mundra	132	Financial Overview
73	Swachhagraha		

Education



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



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

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



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

Academic

Co-curricular

Extra curricular



Academic

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





Library activities

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

7113 Book issued in academic year 2019-20



Book mark exchange program

Through book mark exchange program Received

32 Partner schools from **11 different** countries



Other Activities



Sports

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

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

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

500+ students enrolled in Khel Mahakumbh



Achievements

Utthan Sahayaks with the help of customize

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

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

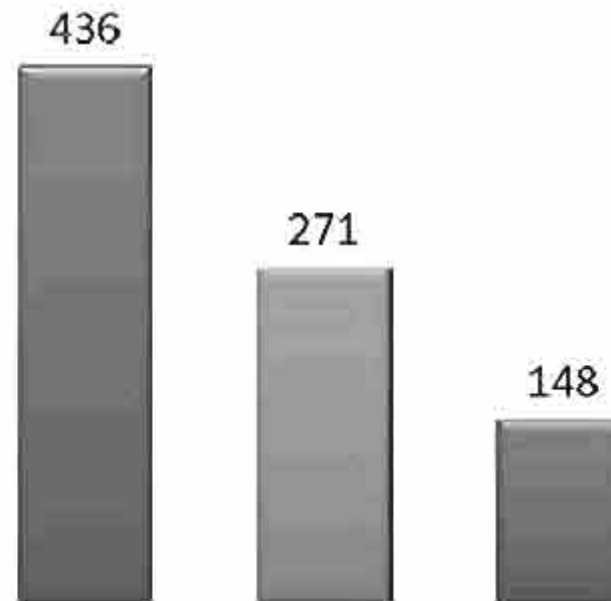
Third party assessment by KSKV University Department of Master of Social Work

Smart Classroom:



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

Gradually Reduction in no's of Priya Vidhyarathi



- No. of Priya Vidyarthi as per the result of Gunotsav - 2017
- No. of Priya Vidyarthi as per the report of Impact Assessment 2019
- No. of Priya Vidyarthi as per the Internal assessment 2020



Extra - Curricular

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



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



Render support to gap understanding school Environment.

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

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

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

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

Adani Vidya Mandir Bhadreshwar

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

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



Adani Vidya Mandir Bhadreshwar

Annual Day Celebration



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





AVMB STD - 10 SECOND BATCH RESULT

Year 2019-2020

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

AVMB Std.-10 Second Batch Result 2018-19

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

Udaan
get inspired



Project Udaan

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

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

Objective of the program:

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



Other activities



Follow up Mechanism:

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

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

concentrated efforts in the organization to conduct a full-fledged impact study of the program to measure its short term and long terms effects.

Community Health Mundra



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

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



Rural Clinic & Mobile healthcare unit

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



11 Rural Clinic

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

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



Health Cards to Senior Citizens

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

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

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

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

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

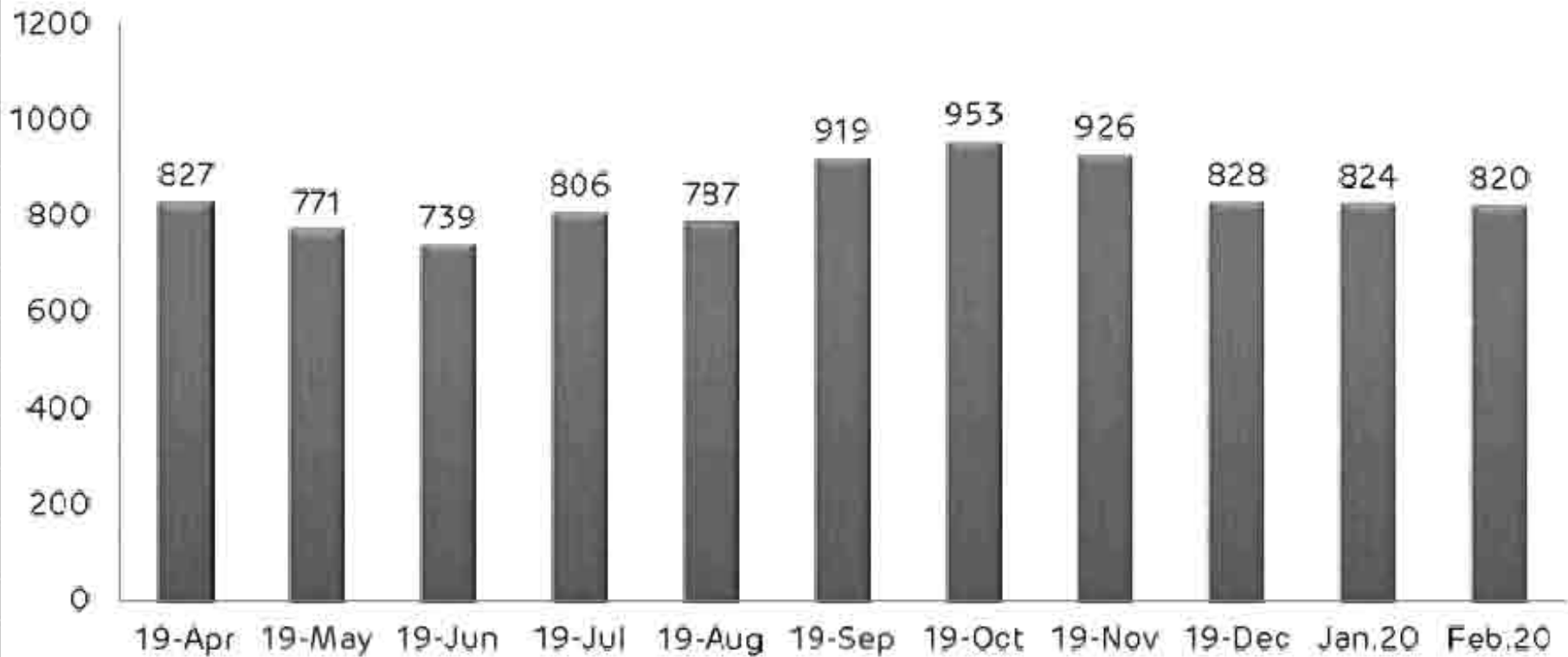
The third phase of this scheme was started in last year. The limit for the beneficiary was set to 30000/- within a period of 3 years. the senior citizens get emergency medical care at Adani Hospital, Mundra and refer to GKGH, Hospital ,Bhuj in Emergency.



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

Sr.Citizen status Year-2011 to 2020											
Number of Villages	Total Cards	Total Survey	Pending Renew Cards	EXP	Green cards	Blue Cards	BPL Cards	APL Cards	No Resnlg Cards	RSBY Cards	MA Cards
68	8672	7056	901	715	6289	767	2493	4516	47	77	222

Month	OPD
19-Apr	827
19-May	771
19-Jun	739
19-Jul	806
19-Aug	787
19-Sep	919
19-Oct	953
19-Nov	926
19-Dec	828
Jan.20	824
Feb.20	820
Mar 20	660
Total	9850





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

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

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

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

Medical support



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

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

સાંસ્યું à D



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

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

Community Health Bhuj



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



Gujarat Adani Institute of Medical Science (GAIMS) - Bhuj

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



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

Adani Foundation - Bhuj

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



Patent Care and coordination



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

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

Mahiti Setu

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

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





Arogya Saptah

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

7th to 14th August 2019

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

Arogya Saptah

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

20th – 26th January 2020

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

Sustainable Livelihood Development

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



Fisherman Amenities work



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

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



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

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

Learning with Joy

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





Scholarship Support

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



Book support:

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



Cycle support:

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

Awareness Program



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

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



Machhimar Ajivika Uparjan Yojana

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

28 fishermen has been facilitated by fishing

Potable Water to Fisher Folk at vasahat-2019-20

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



Machhimar Shudhh Jal Yojana

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



Cricket Tournament

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

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

Ramotsav Programme

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

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



Environment Sustainability

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

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

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



Bio diversity Project

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

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



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

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

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

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

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

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



SUJLAM SUFLAM JAL ABHIYAN

Global Problem-Local Solution

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

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

Water Harvesting Structures



Dhrub- pond deepening work – work completed



Zarpara – Roof Top Rain Water Harvesting

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

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

Machhimar Ajivika Uparjan Yojana

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



Sea Weed Project

The cultivation of seaweed have significant potential for the sequestration of carbon dioxide (CO₂) and will very fulfill in mitigating the climate change. Seaweeds are macrophysics algae, a primitive type of plants lacking true roots, stems and leaves. They provides valuable source of raw material for industries like health food, medicines, pharmaceuticals, textiles, fertilizers, animal feed etc.

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





PROJECT "DRIP IRRIGATION"

- **Basis of Requirements of Drip Irrigation**

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

- **Process of Drip Support**

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

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

Farmer will be informed by telephonic to have form query.

Primary information about farmer land will be received by telephone.

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

Verification report submitted to account office.

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

Farmer economic study after our support. – Follow up

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

Home Biogas



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

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

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

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



Objective of the Project :

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

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

Participation by Community :

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

SLD

Agriculture Initiatives

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



Fodder Cultivation

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

Siracha

22 Acre – 88000Kg Sorghum

63 Acre- 63000Kg Wild Grass

Total 85 Acre= 151000KG

Bhadreshwar @ 7 Acre= 28000Kg

Kukadsar @ 15 Acre= 60000Kg

Implementation Process includes

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





Tissue Culture : Date Palm

Brief Description

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

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

TC Lab: Develop TC plantlets of Yellow varieties

Adani foundation: Financial support

KVK: Technical support to the program

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

Objective:

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

Expected Outcome

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

Financial Outcome

If we will assume 100 kg production of fresh fruits of Datepalm of best varieties per plant. Then total production is 4 lakh Kg. and price Rs. 80 / Kg. Then total gross income will be generated Rs. 3.20 crore. Consultant Fees will be Rs. 60,000 including FPO Registration Charges

Strategy: For 4000 Date tissue plant in 2 phase (per plant cost 3300 INR)

Farmers : 70 Farmers will be supported 25 Plants (1750 Plants in current year)

(50 percent contribution from Farmers (they will get 35% from Government in a form of subsidy after plantation.)

Tissue Culture : Date Palm



Women Empowerment Projects



- In Kutch, the situation of women is miserable. Women are totally dependent on male members of family for their needs. Consumption of liquor is one of the main culprits in Kutch. Due to this evil prevalent among men many women are suffering.
- Considering this situation, We have started our training program with two major women's group of Villages near Adani Power and Adani Ports. Both the groups of women (**123 women in total**) successfully completed their training for preparing washing powder, phenyl, liquid for cleaning utensils and hand wash etc.
- We have selected 10 women groups having 123 members total, as per their ability for different work i.e. accounting, banking, leadership, marketing, administration etc.
- As a further step to bring sustainability, we thought to start a shop "Saheli Mahila Gruh Udyog" at Shantivan Colony.

Women Empowerment Projects

Step towards socio economic development

No	Name	Members	Work	Avg Income
1	Sonal Saheli Group	11	Washing Powder and Phynayle making	3000
2	Tejasvi Saheli Group	10	Stitching Unit / Bag Making	5000
3	Pragpar Saheli Group	29	Handicraft Suf, Pakko and Jat	7500
4	Shradhha Saheli Group	11	Dry and Fresh Nasta Making Unit	3200
5	Meghdhanush Saheli Group	10	Mud Mirror Work	6000
6	Umang Saheli Group	11	Soft Toys and Dori work	1400
7	Asha Saheli Group	10	Sanitary Pad Making Unit	2500
8	Anjali Saheli Group	10	Paper Bag and Paper Cup Making Unit	-
9	Vishwas Saheli Group	10	Dry Nasta - Chiki, Potato Waffer, Papad	2200
10	Radhe Saheli Group	11	Non Women Bags	1150
		123		

Women Empowerment Projects

Step towards socio economic development

Apart from Self help Group, Adani Foundation is motivating and supporting Rural women for appearing SSC/HSC board exams, completing graduations and joining course under Skill Development Center or RSETI.

Also coordinating for Bank Sakhi, Bima Sakhi, Gram Rakshak Dal and Private Companies for full time job. For the same we coordinate with district administration, DRDA and HR Department of Private Company. This Coordination became very fruitful in case of Britannia Company. We have coordinated with approximately 300 women for appearing for interview and filling forms for Britania. As on date 271 women are doing job in Britannia and getting Rs. 9700 plus PF per Month.

No	Name	Members	Work	Avg Income
1	Bank Sakhi Yojana	3	By State Government – agent work	3000
2	Gram Rakshak Dal	7	Secured job by Government	6000
3	Laundry work at Samudra Township	2	Commercial Complex Samudra	2500
4	Britannia Company	270	By Capacity Building and confidence building	9800
5	Bima Sakhi Yojana	6	By State Government	3000
6	Aggarbatti making Unit	2	Widow Women	1700
		296		



7 women of village
Sadau, Mangra and
Baroi Selected in Gram
Rakshak Dal by our
Coordination

Women Empowerment

Adani Foundation Mundra has received Order of supplying 10,000 sanitary pad per Month to Seven Public Health Centers of Mundra Taluka and 9 KGBV hostels at Kutchh District.



Feminism isn't about making women strong. Women are already strong. It's about changing the way the world perceives that strength.

Right now 8 Females are working for the same. In second phase after starting one more unit our capacity will increase approx. 700 pad per day – which will enhance income of them up to 4000 per month.



8 Females



1.50 lac

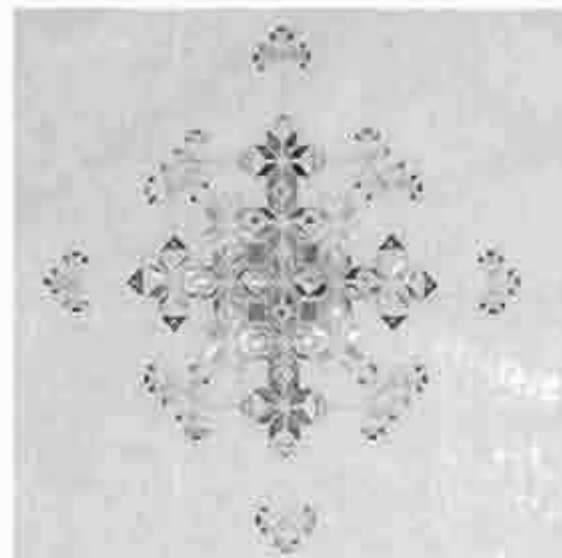
Women Empowerment

An initiative under the Sustainable Livelihoods Development Program to encourage women, take control of their own lives and increase their confidence whether they are single, married or widowed.



Total Sale more than Rs.4.50 Lacs and women are getting approximately Rs.8500 per month.

14 Women of Pragpar village are traditionally doing Suf Embroidery. We are on the verge of completion to development of Sahkari Mandali. After getting formal structure we could be able to sale products online with GST.



Community Infrastructure Development



Community infrastructure primarily refers to small scale basic structures, technical facilities and systems built at the community level that are critical for sustenance of lives and livelihoods of the population living in a community. Adani foundation has designed, planned and built a infrastructure community health, agriculture and living standards, all initiatives were fulfilled according to the needs of people of community.

Adani Foundation supports for infrastructure development on request basis. Adani foundation carries out the construction of prayer shade name "PRATHNA SHADHNA" at AVMB.



Construction of Prayer Shed at AVMB



Painting & Branding Old Structure at Old Bandar and Luni Bandar



Upgradation of Balwadi at Zarpara



Waiting place for Pardiya at Navinal



Garden Development work



**Road Side Beautification at
Mundra**



**S & F Benches In Various Location
in Various Village**



**Construction of R.O.
Plant Room at Primary
School,sadau Village**



**Construction of Shed at BRC
Bhavan**



**Renovation Balwadi at Bavdi
Banadar**



**Fixing of LED street
light at Bhopawandh,
Mundra & Bhorara)**

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

Several miscellaneous industries exist in Kutch district. Adani Skill Development Centre has started a center in Mundra block so that the needs of these industries are fulfilled, the local youth is enrolled in various training / skill courses and the distance between the both is minimized.

The objective of this Centre is to impart different kinds of training to the students of 10th, 12th, college or ITI from surrounding areas. Thus, various employment-oriented trainings are organized to optimize the skills, art and knowledge through proper guidance and direction.

During this year Total 2664 people trained in various trainings to enhance socio economic development.

Out of which more than 60% people are getting employment or Self Employment and average income up to Rs. 5200 per month. Digital literacy training is very helpful in coordinating with today's Digital world....

Adani Skill Development Centre



Adani Skill Development Centre Kutchh



Digital
Literacy
1119



Unarmed
Security
Guard
60



General
Duty
Assistant
188



Beauty
Therapist
465



Self
Employee
Tailor
262



JOC
60

TALLY FOR
GST
Tally with
GST
34



RTG
24



MS Office &
Excel Training
26



Hand
Embroidery
197



Spoken
English
229

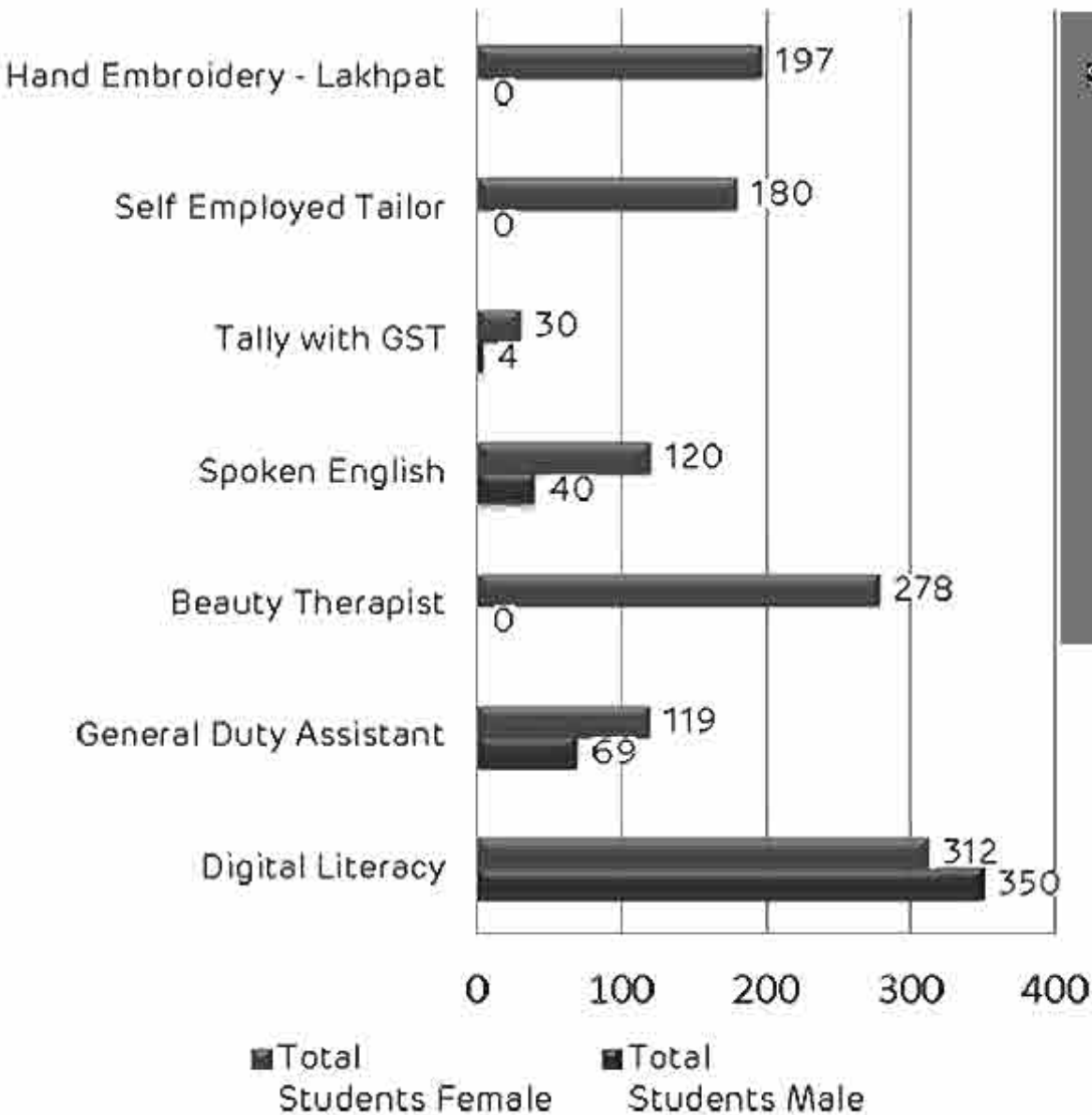
Achievement : 2664

Total Batches: 126
64

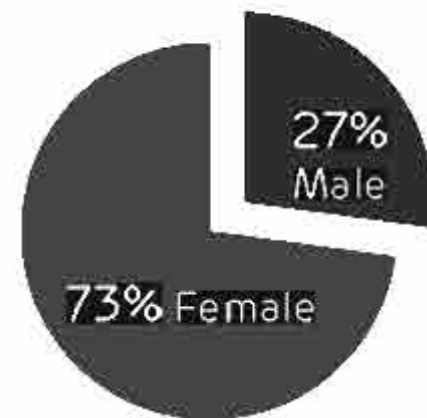




In the year 2019-20,ASDC-Bhuj trained 1699 candidates.



Sr. No.	Name of Trade	Total Students	
		Male	Female
1	Digital Literacy	350	312
2	General Duty Assistant	69	119
3	Beauty Therapist	0	278
4	Spoken English	40	120
5	Tally with GST	4	30
6	Self Employed Tailor	0	180
7	Hand Embroidery - Lakhpat	0	197
Total	(1699)	463	1236

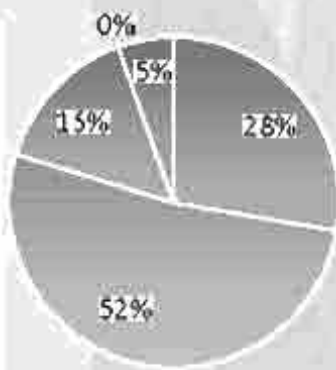


Adani Skill Development Centre - Bhuj

- Certificate Oriented Training Program; On Successful completion of the course and completion of Assessment organized by the Centre.
- The training methodology ensures a balance between theoretical concept delivery and emphasis on application of concepts through latest training pedagogical processes.

Placement F.Y. 2019-'20

- Digital Literacy
- General Duty Assistant
- Beauty Therapist
- Spoken English
- Tally with GST



- 52% students got the job in PMKVY GDA training.
- 28% students got job in Digital Literacy Course.
- 8 women self employed in Beauty Therapist Course,

ADANI SKILL DEVELOPMENT CENTRE - BHUJ
Quarter & Training wise Candidate Detail F.Y.: 2019-20

Sr. No.	Name of Trade	Q-1_Total	Q-2_Total	Q-3_Total	Q-4_Total	Total
1	Digital Literacy	278	163	138	83	662
2	General Duty Assistant	60	0	68	60	188
3	Beauty Therapist	38	0	0	240	278
4	Spoken English	144	16	0	0	160
5	Tally with GST	12	22	0	0	34
6	SET	0	0	0	180	180
7	HE	0	0	0	197	197
Total		532	201	206	760	1699

Special Training for Widows

MOU signed between Govt. of Gujarat and Adani Skill Development Centre with an aim to provide quality skill training to widow women to become self-reliant and generate their livelihood.

Total 25 widow women has enrolled for GDA course training.



Special Training for Divyang

Digital Literacy, Beauty And Wellness And Spoken English Training for Physically Challenged Students under Social Welfare Justice Department at Navchetan Andhjan Mandal, Bhuj.

The trainings conducted by Adani Skill Development Centre, Bhuj for Differently Abled Students - Madhapar. Navchetan Andhjan Mandal has dedicated Computer Lab which consists of 15 computers with NVDA software to facilitate disabled students to learn efficiently.

124 students trained for Digital Literacy, Beauty And Wellness And Spoken English Training.

(Digital Literacy = 62, Spoken English= 40, Beauty & wellness= 22)

5 of them placed during the year.



Adani Skill Development Centre – Bhuj

One more feather added in cap of ASDC Bhuj Centre is PMKVY GDA Training Project Saksham – Adani Skill Development Centre completed Four PMKVY GDA Batches in Bhuj received with Four Star Rating in PMKVY certification.

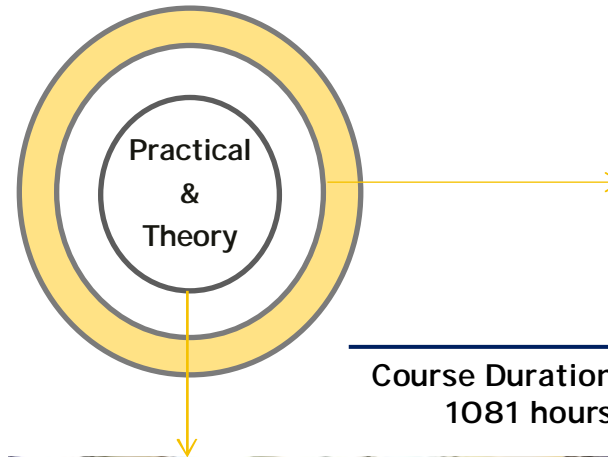
Total 120 Candidates trained till the date (F.Y. 2018-20).

In a year 2019-20, **28 out of 60 (52%) candidates** got the job in various medical departments. 55 candidates passed out of 60 people of PMKVY General Duty Assistant training.

ASDC Bhuj first ever Centre to implement successfully DDU GKY Project for GDA Training.

Total Hours	Domain (GDA)	Non-Domain (Soft-skill)	Non-Domain (IT)	Non-Domain (English)
1081	780	38	150	113

DDU-GKY is placement linked skill development initiative by ministry of rural development, government of India (MoRD).



Course Duration
1081 hours



Total 60 Students have to attended 8 hours class per day.



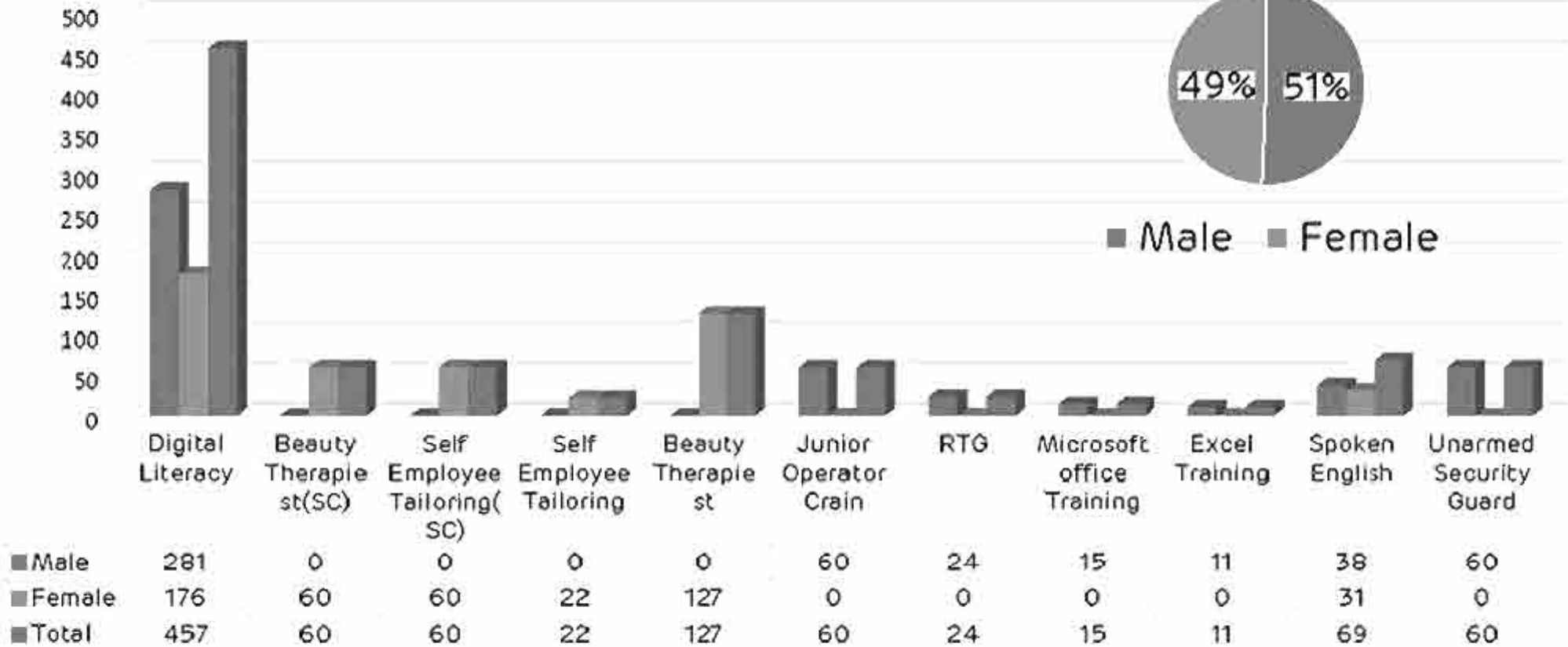
In the year 2019-20,ASDC-Mundra trained 965 candidates.

Training Chart 2019-20

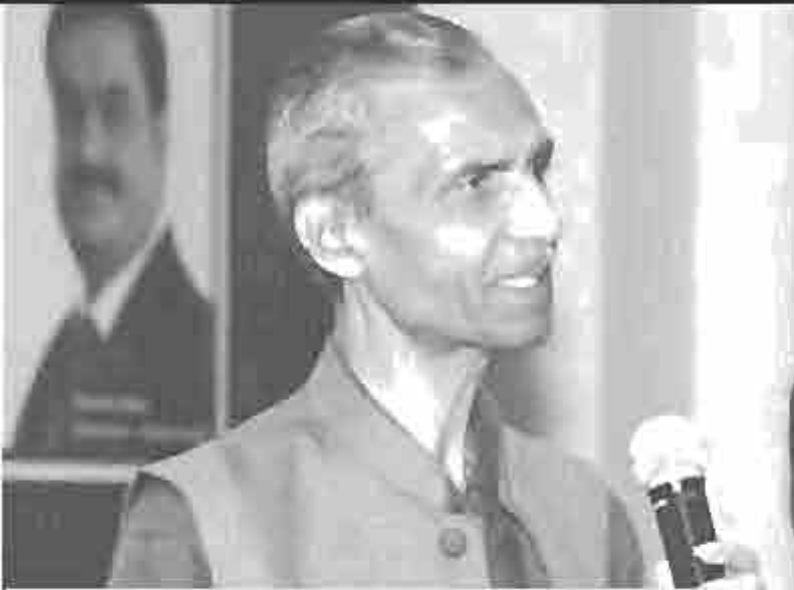
Gender Ratio



■ Male ■ Female



Adani Skill Development Centre – Mundra



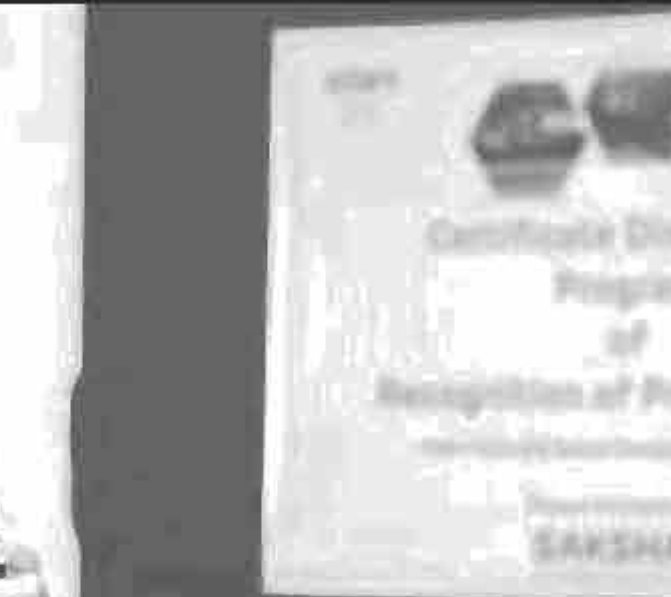
RPL recognizes the value of learning acquired a formal setting and provides a government certificate for an individual's skill.

Candidates received an accidental insurance coverage for three years at free of cost.

Certified 27 assessor, 19 Trainer and 08 Assessor.

Started first loader-Unloader job role in Port.

Total Candidates registration 2500



- 42 candidates cleared PMKVY Junior Operator Crane exam out of 43,
- 21 candidates working in various company with 8000-15000 PM,
- 26 students got job in various company
- More than 30 women working as self employed,
- Mobilization activities for SC batches in various village and collage



Adani Skill Development Centre - Mundra

SC Project

Skill Development trainings to various weaker sections of Community

To deliver and promote employability

In collaboration with Department of social justice & empowerment, Gujarat



More than 100 trainees benefited under Self employed tailor training course at Mundra.

More than 300 candidates have been trained in various courses.

Swachhagraha



Adani Foundation has launched project "Swachhagraha" Swachhata ka Satyagraha in the year 2015, to support the 'Swachh Bharat Abhiyan'. Falling in line with our Honorable Prime Minister's call for a Clean India, we launched this mass movement towards making our Nation litter free.

On 9th October 2019 the Project handed over to all institute with a gentle promise to keep swachhagraha flame lighting. In this ceremony with the blessings of Shilin Adani mam Best Swachhagraha Schools awarded by District Education Officer, Kutchh

Swachhagraha at Kutchh

4 City / town

266 Schools

266 Prerak trained

5000+ Dal members



Swachhagraha Outreach



Swachhagraha
Wall



Toilet
Etiquettes



Large Scale
community events

Safai
Ke Sitare



Personal
Hygiene



Suposhan

The objective of the Project is to reduce occurrence of malnutrition and anemia.

create awareness about malnutrition and anemia and related factors amongst all stakeholders and role they may play in curbing the issue.

To successful implementation of the project, "Sangini – Village Health Volunteer" plays major role in the Project,





Suposhan

**Underweight
adolescent
girl gets
married early**

Poor nutrition
during pregnancy

Insufficient weight
gain during
pregnancy

Malnourished
mother has low
birth weight baby

Child remains
malnourished due
to inadequate food
& other deterrents

Basis of Requirement

As per Global Nutrition Report released recently, Children below five years- 23 % Stunted and 8 % are wasted. 69.5 % children 6-59 months old, 55.8% adolescent girls aged 15-18 years, 55.3% women aged 15-49 years have Anaemia. Moreover anaemia prevalence in pregnant women is as high as 58.7 % Curbing Malnutrition was part of Millennium Development Goals and again focussed through second and third Sustainable Development Goals on Zero hunger and Good Health & Wellbeing respectively.

❖ This year under SuPoshan project AF has conducted anthropometry study of more than 6268 children. More than 98 children became free of malnutrition due to efforts of AF team. AF is also committed to spread awareness in this regard. More than 2023 FGD were conducted during this year.

❖ Total HB screenings of RPA woman- 6598no and adolescent girls -10645no was this year. this activity helps in controlling anaemia in women and indirectly malnutrition.



Community Engagement and other Activities 19-20		
Sr No	Activity	Progress
1	Total Sangini	25
2	Total Village	45
3	Total Anganwadi Cover	72
4	Total Families	9178
5	Total Children	5736
6	Total Adolescent Girl	5067
7	Total Women (RPA)	9762
8	Focus Group Discussion	2023
9	Family Counselling	431
10	Village level Events	117
11	No of SAM children referred to CMTC	75
12	No of SAM children provided with Energy Dense Food (Only New children)	112
13	No of total HB & BMI screening - Women in reproductive age	6598
14	No of total HB & BMI screening - Adolescent girls	10645
15	Stunting Category (Changing)	18
16	Wasting Category (Changing)	25
17	Underweight Category (Changing)	55
18	Adolescent Girls with Anaemia (10-19 yr.) (Changing)	249
19	Women with Anaemia in reproductive age (14-50 yr.) (Changing)	272
22	Women in RPA provided with IFA Tablets	201
23	Adolescent girls provided with IFA Tablets	102
20	Sangini Meeting	17
21	Sangini Training	5
22	Total Anthropometric screening	6268



Implementation Strategy

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

- Total Number Aanganwadis in the selected area
- Information on Sub- canters / Primary Health Centres/ Community Health centres/ Referral Hospitals
- Availability of Healthy worker- male & female both, ANMs, LHVs, Doctors, specialists such as Gynaecologist, Paediatricians, Pharmacist, Dietician Lab. Technician, Nursing Staff etc. at above centres (Number & names with contact details)
- Selected **areas'** Birth rate, Death rate, Infant Mortality Rate, Mother Mortality Rate, Sex ratio, Child Sex ratio against district, state and national average
- Total number of beneficiaries and against that enrolled beneficiaries at Anganwadi/ICDS: 0-6 year children, Adolescent girls, pregnant women and lactating mothers
- Identified malnourished and anaemic children/ adolescent girls and women (numbers, DOB & name as well as current level of malnutrition & anaemia with dates- Base Line data)
- Current Inputs provided through the Government machineries
- Other services available through CBOs, NGOs etc.- Details of inputs and contact details of those organizations
- Understanding & Listing of area specific cultural and behavioural barriers



Expected Outputs

Community Health vertical at each location would focus on project on **"Curbing Malnutrition amongst Children, Adolescent girls and Women** **"with** combined approach of community management of Malnutrition and Anaemia and necessary medical treatment components.

- Each child and especially malnourished will be mapped with growth chart
- Regular inputs of RUTF treatment when necessary.
- FDGs with mothers and adolescent girls.
- Village meeting one in a month at every village
- Health camp every month
- Awareness campaigns.

Expected Outcomes

- To reduce the occurrence of malnutrition amongst Children by 95 % in three years
- To reduce malnutrition and anaemia amongst adolescent girls and pregnant & lactating women by 70% in three years
 - To create awareness about the issue of malnutrition and anaemia and related factors amongst all stakeholders and role they may play in curbing the issue
 - To create a pool of resources to be utilised for combating the issue of Malnutrition and Anaemia
 - To support efforts in reducing IMR and MMR

Project Swavlamban

Project Swavlamban Launched with blessings of differently abled people of MUNDRA TALUKA.

Our objective is

- To increase awareness about Government schemes for Divyang people, widows and senior citizens and coordinate them with Social Welfare Department, GoG
- After getting income generation equipment support - Proper training provision to make them self-reliant in true sense!!
- Adani Foundation is playing the role of facilitator in case of tie up with Government Scheme for Widows, Senior Citizens and Handicapped people. The identity cards are issued for the handicapped in coordination with Bhuj Samaj Suraksha Khata which is beneficial for them to get specific kit for their disability type. Uoto date 1094 beneficiaries linked up with pension scheme.
- The financial benefit of the senior citizen Yojana is Rs. 500 per month and the widow scheme is of Rs. 1250 per month. Jilla Samaj Suraksha Officer and team remain present every time.

No	Type	Beneficiaries	Financial benefit
1	Palak Mata Pita	6 x 3000	18,000
2	Widow	74 x 1250	92,500
3	Senior Citizen	79 x 750	59,250
	Total	533	1,69,750



Project Swavlamban

Government and Adani Foundation both have supported Total 1094 Beneficiaries of Amount Rs. 15,44,100.00

Govt. shemes Mundra Taluka	Rate	Total Amount
Artificially foots	14	210000
Artificially Hand	1	5000
Blind satick	7	1400
Bycycle	9	40500
Crutches	4	800
Hand cart	4	20000
Hearing Aid	13	39000
M.R kit	20	10000
music	1	500
Pension	4	0
RTE Admission	1	0
Sewing Machine	30	150000
Tricycle	33	214500
Walker	3	3000
walking satick	12	2400
Wheelchair	26	104000
Bus pass	392	0
Medical certi	401	0
Total	975	801100

AF Support Mundra Taluka	Rate	Total Amount
wheelchair	30	120000
Cabin	5	75000
Fridge	1	18000
Fruit Shop	2	16000
Grocery Shop Item	4	20000
Hand Cart	2	18000
Harmonium	1	10000
Rikshaw	1	80000
Sewing Machine	16	88000
Tricycle	25	170000
Wheelchair	32	128000
Total	119	743000



CSR Tuna

Adani Kandla Bulk Terminal Pvt. Ltd. is joint venture of Adani Ports and SEZ Limited as well as Kandla Port. We are going to implement drainage pipeline for Tuna and Wandi with participation of Kandla Port in current year. Survey is done and work will be started soon.

Adani
Kandla
Bulk
Terminal
Pvt. Ltd.

CSR Tuna

- In Rampar and Tuna Village We are providing Fodder in summer season. Also guiding farmers for modern farming techniques for Organic Farming and sustainable Agriculture
- Prayeshotsav Kit is distributed in 8 schools covering 180 Students in Tuna and Surrounding seven villages. Our efforts were appreciated by community,
- Adani Foundation is bridging the gap between Government Schemes and Beneficiaries. This year we could able to support 5 widows and 4 differently abled to avail benefits of Government. Tree Plantation and 4 health camp was organized in Tuna and Rampar Village.



CSR Nakhtrana



Adani Green
Energy
Limited
(Nakhtrana)

CSR Nakhtrana

Adani Green Energy(MP) Limited (AGEMPL) proposes to setup an integrated wind energy project as Green Energy Works which includes Limestone 750 Mw, Through approx. 1250 windmill at Dayapar to Nakhtrana in District Kutch (Gujarat). Foundation, in cooperation with respective Block Agriculture Departments during the PRAs, regularly conducts various training programmes for the farmers. They have been introduced to various innovative and cost-saving practices in farm cultivation.





Community Health - In Coordination with GKGH 2 Specialty Camp, Eye Camp and 3 General Health Camp was organized. Total beneficiaries is 572.

Adani Foundation has initiated **Project Utthan** - at 8 Schools at Nakhatrana by signing MOU with District Education Department. Frame work of the Utthan Project is as per Utthan Mundra.

Project Swaylamban - Started Swaylamban Center at Nakhatrana Town to make widow and Divyang Women Sustainable through Stitching work. We have supported 5 stitching machine and material for fund rotation.

In Community Infrastructure Development work we have taken up work of Road Levelling and Culvert Construction at Gadani Village. Main reason to initiate the project is - During Monsoon Period difficult to use road for farmers and School Going Children of Vadi Vistar and Due to water logging excess water enters into farms which affect development of crop. Approximately 80 farmers and 70 School going children will be beneficiaries of the Project.

The work will be resulted into Construction of Pipe Culvert and Road Levelling work at Vadi Vistar at Gadani Village with Outcome to Easy Approach for Farmers and Students of Vadi Vistar School during monsoon Period.



CSR Lakhpat

Adani
Cementation
Private Limited
(Lakhpat)



Adani Cementation Limited (ACL) proposes to setup an integrated cement project as Lakhpat Cement Works which includes Limestone Mine in 251.9 ha area, Cement Plant of rated production capacity of 10MMTPA Clinker and 3MMTPA of OPC/ PPC/ PSC/ COMPOSITE CEMENT in three phases, and a berthing Jetty of 15MMTPA traffic capacity in phase wise manner in Taluka Lakhpat of District Kutch (Gujarat).

Project Public hearing held in month of May 2019. For Smooth Execution of the Project we have done Participatory Rural Appraisal and Village Development Committee formation at three nearest villages (Koriyani, Kapurashi and Mundhvay) of our upcoming cement plant.

Linkages with Govt. Scheme

Wheelchair support – 2

Tri cycle support - 3

Divyang Form – 2

Education Support

Music Kit – 4

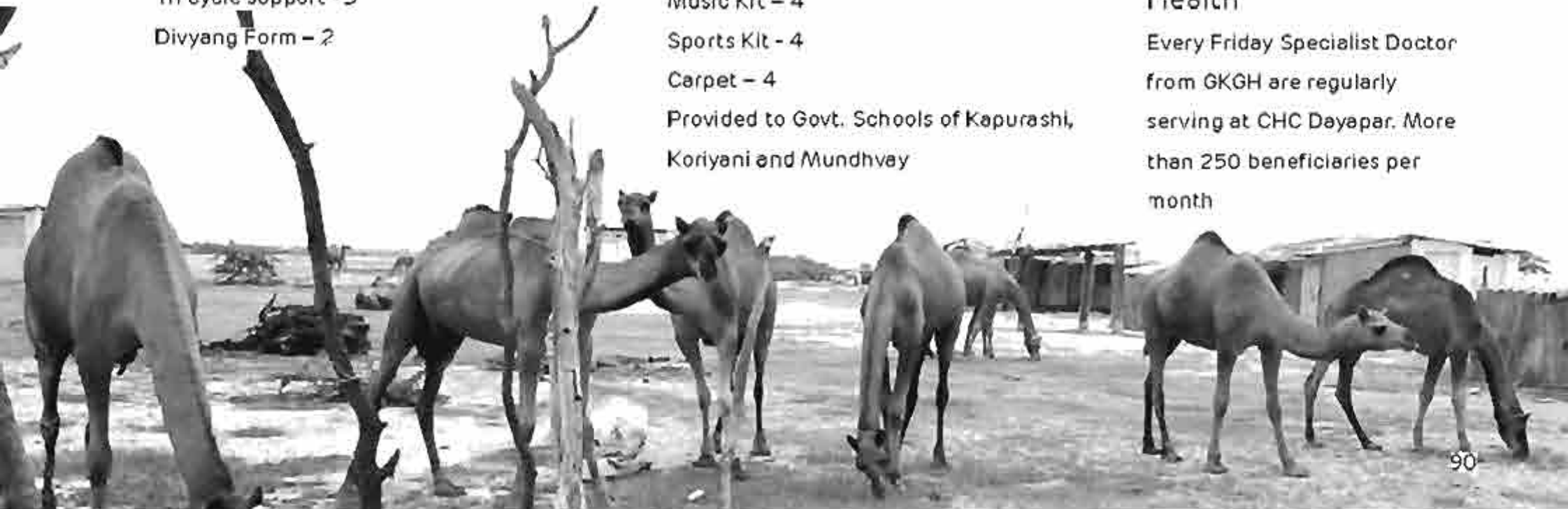
Sports Kit - 4

Carpet – 4

Provided to Govt. Schools of Kapurashi, Koriyani and Mundhvay

Health

Every Friday Specialist Doctor from GKGH are regularly serving at CHC Dayapar. More than 250 beneficiaries per month



Fodder Cultivation

Most of the population of Lakhpat Depends upon Livestock for their livelihood. Fodder is the prime requirement of them. Adani Foundation had distributed Jowar seeds after considerable rain to 260 Farmers to motivate them for sustainable Livestock development.



299 acres
under fodder
cultivation



Expected Yield:
747.5
tonnes

The Problem

- Scanty rainfall
- Deficit of fodder availability
- Fodder only available on high rates.

The Solution

Encourage farmers

- To grow grass as fodder
- To cultivate jowar as fodder harvest
- Village level grassland development



World Disable Day celebration

Celebrated World Disability Day - Swaylamban center opened
at Dayapar for disable and widow women.

Support 10 tricycles and 2 wheelchairs and 9 artificial limbs to disables

Adani Solar Energy Private Limited (Bitta)

CSR Bitta

Under Adani Solar Limited – 40 MW Solar Panel Power Unit is Situated at Bitta Village in Abdasa Taluka. We are providing Fodder Support and Health Camp Facilities at Bitta. Our Suposhan Project is running successfully at Bitta...

Adani Foundation has taken Eco Friendly initiative for whole village. Village street lights, School and GP is provided Solar Panel to save electricity. The unit was conceptualized and implemented by Solar Team.

As Abdasa is water scared region and very less rain in past years , as per humble request of villagers Adani Foundation has provided 1,13,750 Kg Fodder to Bitta, Dhrufi and Moti Dhrufi village.

Under "Sujlam Sufiam Jal Abhiyan" Two Pond Deepening was carried out and got appreciation letter from District Magistrate.

Praveshotsav Kit is distributed in 8 schools covering 47 Students in Bitta and Surrounding seven villages. Our efforts were appreciated by community.





Employee Volunteering Program



Last year Adani group employees has adopted 704 students who are from families of migrant labourers working in various industries in and around Mundra. Children from migrant labourer families in addition to resource constraints at home also bear the disadvantage of unfamiliarity with local language and culture inhibiting participation in school.

Current year 997 students have been adopted – which is matter of proud. To make employees connected with children Vallabh Vidyalaya regularly send progress report twice in a year. Process of cheque handing over ceremony is delayed due to corona virus issues.

Employee Volunteering Program



International Yoga Day Celebrated at Shantivan Colony ground where 2100 students have participated from different Government School.

More than 500 Employees participated and HR Department has coordinated whole event. Chief Guest of the Event was Mr. Sunil Singh Chairman, Labour welfare board, GOG

We distributed 250 hooks to employees residing at Shantivan colony. Hook is the thin rod of steel. In this hook all will collect plastic bags. After three months we will collect all bags and give to Suzlon for recycle will made PVC Horse Pipe. I.e "Waste to Best". Employee's family members became determined for not using Plastic bags.

For motivation purpose facilitation of employee was done by Mrs. Vinita Rai (President, Ladies Group - Shantivan Colony)



Employee Volunteering Program



Periodic Support to Old age home at Gundala where total 105 Senior citizens are living.

Till Date 36 Adani Employee have celebrated Birthdays or any memorable day with senior citizen by sponsoring and servicing for lunch/dinner facility

Dignity of workforce day was organized jointly of APSEZ (Adani ports n SEZ Limited), AWL(Adani Wilmar Limited), MSPVL (Mundra Solar Pvt Limited) Adani Hospital and Adani foundation at labour colony with medical camp and handing over of sanitation, more than 32 employees have volunteered in this event.

1. Total OPD by Medical camp at Labour colony- 760 (5 Camps)

2. Joy of Giving Week Cloth Distribution to 800 workers

In this event Mr. Sharad Sharna Head-AWL with staff, Bhaktbandhu DGM HR and Admin staff (APSEZ), Mr. Ganesh Sharma Head HR, President - Kutch Labour Union and Adani foundation team remained.





Our Change Makers

"I have a Disability yes that's true, but all that really means is I may have to take a slightly different path than you."

We always complain to God, for life, for appearance, and for so many others. But today I am talking about Rubina, a young girl from Deshalpar village. Rubina has a unique personality, who, despite being unable to speak or listen, always she faces these physical shortcomings with a smile,

somehow Rubina found about Adani skill development beauty therapist course and she decided to join this course. when she joined there was question in everyone's mind, is she enabled to do this course, how she will manage, how will learn, ask questions, listen etc. but she proved wrong to everyone. like miracle happens, she completed her training very smoothly. not just completed but she was very active and enthusiastic during training.

today she has started her mahendi studio, the amount of earning is not so much high, but the satisfaction is up to sky.

At the end she smiled and said

"Don't compare your struggles to anyone else's. Don't get discouraged by the success of others. Make your own path and never give up"



Suf Handicraft : Conserving “VIRASAT” of Decades

Parvati Ben's earliest memory of stitching delicate handicrafts is from when she was as little as 5-years-old. Since then, she has followed this art with an immense dedication that shows through her intricate and precise handiwork.

Parvati is a resident of Pragpar-2 village. She lives in a house with 5 other people and is the sole breadwinner. Even so, Parvati is a humble, loving and welcoming individual.

Parvati Ben had been practising her intricate Suf handicraft all along, making scarves, table cloths, garments and more for her fellow villagers and the occasional visitors. Her artwork had consistently been worth more than what she sold it for- her only desire being that her art finds an expression, a space in the world, however small it may be.

One day, Adani Foundation discovered this diligent, rigorous woman. Parvati Ben now works on projects brought to her by Adani Foundation and is hence able to sustain her entire family on her own. She has risen to be an aspirational figure, looked upon as a role model by her fellow village women. Parvati Ben is playing a major role in now setting up a federation for the village women across Mundra district to practise their handicraft work and earn a livelihood.

But more than all the titles and positions, what Parvati Ben deems sacred is the sheer recognition of her art. All she ever wanted was to be known as an artist and now she is the voice of this very own art, inspiring dozens of women like her to become independent.



Our Change Makers

When Miracle happened !!

One mentally disabled boy named Gyan was residing in one small village Bihar. During makarsankranti festival Ganga Snan he was going with his family. By mistake he entered in different train n reached to Bhuj.

As for any Train coming in western India Bhuj is last station and that's why many mentally disabled people found out in Bhuj.

27 years old Gyan was alone in Bhuj - he used to beg and eat, too tough life !

After passing two months anyhow. One day due to small accident he was brought to Adani GKGH. During treatment, one smart para medical staff found out mobile number in tattoo drawn on his hand.

Staff members of GKGH called on this number and ask his family to come Bhuj.

Finally Gyan meet his family n back to his home



Our Change Makers

Healthy Children Become Happy Children

Under the initiative of Balwadi at Vasahat (doorstep Early age Education for less Fisher folk), special awareness camps are organized for kids in school in order to imbibe health seeking behavior in the next generation. Various awareness activities based on healthy living are taught to them such as hand-washing steps and healthy eating habits so that they actively participate in adopting methods for personal hygiene in their daily routine.

Yamina is one of the student of Balwadi. She is five years old. Earlier she used to come to Balwadi without taking bath or hair combing. But after regular awareness camps for mother and students now she is coming well dressed and clean – due to maintaining personal hygiene she remains healthy too.



Our Change Makers

Every Dark Cloud has Silver Lining

Ms. Ramila Maheswari belongs to village Dhrub. Her father's occupation is farming. She has completed graduation and was searching job but lacking in computer operation skill.

Ramila says one of my friends suggested me to join digital literacy training at Adani Skill Development Centre, Mundra. I visited the center with my friend and joined class. I sincerely attended all classes of the course and learnt basics of computer operation viz: Typing, Paint, MS Office (word, Excel, power point), shortcut Keys and using internet for web browsing like: Gmail, Paytm, amazon, net banking etc.

She is saying with smiling on face that

"Today, I am working with firm "YASH ENTERPRISE" in Nana Kapaya, Mundra as a customer care executive and earning Rs. 7000 per month. I am really thankful to Adani Skill development Center to make "SAKSHAM".



Pathways towards bright future !!

Kripalsinh Jadeja comes from Hatadi, Mundra with a family of 5 people, four elder brothers and parents. His father is a farmer and mother help him in farming. The brother is working as truck driver. The economic condition of the family was very poor.

Kripalsinh has completed 12th and was searching job. The team of ASDC Mundra had mobilized in the area where he stays and through which he got to know that Adani Skill Development Centre (ASDC) is providing training for checker-cum RTG crane operator and this was his dream job.

He performed well during the training and understood how this training would help him to grow in future in the field he desires. He was regular to the classes and always eager to know the process well and he performed well during all the activities.

Kripalsinh says he gained back his confidence after starting the training and was motivated by the trainer to participate in all activities and grab any opportunity where he can showcase his skills.

He says that he got more support by getting additional training of soft skills, public speaking, professional manners and facing interviews with confidence.

While undergoing the ASDC training Kripalsinh never imagined that this additional knowledge and skill up gradation would bring him a bright future.



My Emotional Support

Adani Foundations' Senior Citizen Health Card is like a cure to our emotional, physical and psychological problem; in the times when we are completely lonely and handicap at age."...Says both of them while weeping.

Every human being has specific periods of the life wherein the childhood is for fun and the adulthood is spent for the family; remains old age to take care of health Adani Foundation is holded hands of the senior citizens of Mundra Rajendrasinh and his wife stay alone. Their son and daughters stay separately. They earn their living by grazing cattle. he is having severe arthritis and respiratory disorder. The source of income is very meager and that to dependent on rain. He had to borrow money from family friends or at times take on interest for taking basic treatment. His wife Shantaba also has blood sugar and hence she also requires medical assistance at times. The couple took Adani Foundations' Senior Citizen Health Card in 2015 by which they are able to save good amount, which was their medical expense every month.



Our Change Makers

Can any other relationship be as beautiful?"

When you grow old, loneliness is sometimes more painful than physical sickness. During routine visits of Dr Deven Goswami – Medical Officer of Rural clinic in Siracha the community as a health volunteer, he met Parma Ba (grandmother in Gujrati) who initially appeared as an introvert. She lives in Siracha Village. According to her neighbors, she confined herself within the four walls after her husband's demise. Despite living with her children, she is often seen sitting alone in the corridor of her house, as the family members are apparently busy with their own lives. Financially strained, she refrained from visiting a doctor due to fear of their exorbitant fee.

Dr. Deven was determined to not only get her to Rural Clinic, but also cultivate a health seeking behavior in her. He would keep on standing outside her house till the time she didn't agree to listen to his request. Do you know something? Ba is his best friend today. They not only share our secrets with each other, but also counsel each other as a mother and a son. Can any other relationship be as beautiful?*



Our Change Makers

Good Human Beings are Gods Incarnate

While many people talk about water crisis and drought in Kutchh, Rambhai Gadhavi of Zarpara has practically found and tried a solution to it and that is water conservation. Born into a poor farmer's family, he faced water problems in childhood and used to wake up at wee hours to fetch water, which inspired him to find ways of water conservation. Under Guidance and Support of Adani Foundation He practiced non-irrigation agricultural methods as solutions to water crisis which causes drought, thereby leading to Indian farmer suicides every year.

He did Bore well recharge and Farm Bunding to increase capacity of ground water through rain and to prevent run off. Not only that, he gave guidance to other farmers to accept water conservation practices.

Rambhai and his wife Veerbai's enthusiasm is remarkable in micro irrigation, fodder cultivation and Recharge activities. They are real change makers of "Sustainable Agriculture Projects" of Adani Foundation



Our Change Makers

Every drop that matters!

Kutchh district is a dry temperate zone and rainfall is negligible. Water requirement is met through the reservoirs in which the water decreases during summer months when crop is standing in the field. Whatever irrigation was provided resulted in soil erosion leading to loss of huge quantity of soil every year thereby increasing the farmer's problem in producing good quality crop. Therefore, usage of water and land is to be done sensibly by the farmer. Muljibhai The farmer of Navinal Village attended awareness programme of micro irrigation and organic farming organized by the Adani Foundation and showed interest in adopting the same. He was given every suitable help in subsidy and was persuaded into adopting drip irrigation for field crops.

Not only this, with support of DRDA and Adani Foundation he had adopted Bio gas which is utilized for cooking and organic fertilizer as well.

With the help of drip system, the Muljibhai was able to diversify towards different Horticulture crops like Pomegranate, Jamfal, chikoo etc. in addition to traditionally grown crops like Cotton and Caster. As a result, he is able to get 40-45% higher yield as compared to flood irrigated crops. Diversification has helped in improving returns from the same area.



Our Change Makers

Reenaben is making patients smile with compassionate care

Reena Amol has literally put his wise words into practice. An ambitious and determined girl, she was pursuing B.A, when tragedy struck. Her husband died of a heart attack leaving her widowed at the age of 24 with two young boys to raise. Unable to get support from her in-laws, she had to move back into her parents' home. In spite of being unsure about the future, her love for her children gives her new hope every single day. Her desire to provide them with a good education and a stable life fuels her to aspire for more. So, she joined ASDC's General Duty Assistant course and hasn't looked back since then.

Reena proved to be a dedicated student throughout the course. She impressed her trainers with her zeal to learn. She soon completed the course and became a successful patient care assistant. Currently, she is working at the G.K. General Hospital and earning salary of Rs. 9900/- pm in the OPD under the guidance of a dietician. She is learning how to prepare diet charts according to the needs of various patients. She is most grateful to ASDC in Bhuj for giving her this opportunity to become self-reliant and care for her children. Reena has truly risen above tragedies and obstacles in life by immersing herself in a life of serving and caring for others!



Our Change Makers

Dilipbhai says “ Digital Literacy training has given a boost in my life.”

“Change occurs at every turn of the page of life.”

I am providing outsourcing services of Administration in G,K General Hospital, Bhuj, I am 40 plus and I have observed the IT wave and Artificial Intelligence has proved as boon in healthcare industry, Young colleagues at work are using their IT skills to make ease at work but growing Digitalization also brought many challenges for middle aged people like me. I enquired about Digital literacy course to many places but couldn't found the quality training centre. In Adani Skill Development Centre, I have not only improved my Ms office and typing skills but also found effective and time saving techsavy solutions for day to day time consuming activities, Dilip Joshi



Our Change Makers

Adani helped me to live with dignity !

Bhadreshwar is a well known village due to Suradas family, the generous donor Jagdusha and Jain temple Vasai Tirth ! Here we want to introduce a couple of this village who are blind ! Yes, Khetshi Chande and his wife Manglaben who live in this village with their daughter Trupti. His only source of income was the government pension. Once when Khetshibhai was with Karshanbhai from Adani at Mundra bus station, he sung few lines describing his own life. "Nach nachavya che ghana ne, aaj hu khud nachi rahyo chu, didha nathi pan devdavya chhe daan ghana ne, aaj khud yaachi rahyo chu; prabhutar aa lilaa, jem tu ramade em rami rahyo chu !" which means once he was helping others and today he is asking others for help.

When Karshanbhai visited his home, he came to know that once upon a time Khetshibhai was having a small shop but due to less sell he stopped it. At this moment instantly Karshanbhai proposed Khetshibhai that he should start once again his shop and for that Adani would support him. This proposal made Khetshibhai very happy but then he asked if he could get any help from someone who could support him to buy grocery worth 10 thousand. Karshanbhai told him that he would put it in "Self reliance program" by Adani foundation for sure. After few days on the birthday of honorable Mr. Gautambhai Adani, there was a celebration at the school in Bhadreshwar on 24th May, 2018. In this celebration Khetshibhai was handed over a grocery kit which he was in need by Panktiben from Adani foundation in presence of Sarpanch and citizens.

Today Khetshibhai is running his shop at Maheshwarivas of Bhadreshwar village with all dignity ! He is happily earning around 2000 per month and is able to send his daughter to Adani vidhya mandir where she is studying in 7th ! This happy family is always blessing Adani foundation for helping needy people !



Pathways towards self Dependency!!

Tunda is a small village of Mundra block, Gorighar Goswami is pujari of Lord Shiva temple and he lives with his wife Anitaaben, three children and his mother. Gorighar was doing need based works in various companies for earning purpose and with that income he was fulfilling his family needs! Ones when Gorighar was returning from other village an accident occurred with him and he died on the spot. When this news came to his family, it was unbelievable to them. Adani foundation respects all the invitation from the village but whenever there is any incident of sad demise, Adani foundation is there for sure to consulate. A staff member of Adani foundation went to their home and gave consolation to Anitaaben and promised her to help her.

In the next visit Devalben recognize the economical condition of the family as after him no one earning member was there in the family

We always believe that if something is there in your luck, no one can take it away from you. Life teaches us that you will get whatever is there in your luck but not without your own efforts! Anitaaben is a person who was ready for every efforts to help her family! This keen interest of this woman was noted by Adani foundation! Anitaaben was allotted a stitching machine in presence of CSR head of Adani Panktiben and Sarpanch of village Abdremanbhai Kumbhar.

As she was having knowledge of stitching, this stitching machine gave her a lift and she started her work with more force! Today Anitaaben is well known for her traditional cloths stitching and she is getting more and more orders from her village! When she came to know that TATA power company is in need of lots of cloth bags, she grabbed the opportunity which helped her to earn good amount! Today she is earning around 8 to 9 thousand which is enough to run her family very well! She said, "Due to Adani foundation I have started not only earning very well but it has changed my life thoroughly! On behalf of all women like me I would like to thank Adani Foundation!"



World Environment Day



555+ Tree plantation in Bhuj, Mundra & Nakhtrana Taluka on world Environment day

9000+ cum Augmentation and deepening work of check dam in Mandvi & Lakhpat Taluka

World Environment Day was celebrated in Five Talukas by different activities related to conservation of Environment. These Events were organized in coordination with DDO, TDO, SDM and Village Leaders of all Five Talukas. The activities Tree Plantation, Check dam Augmentation work, Inauguration work of Godhatal Dam Deepening work. 11000+ Tree plantation during year in Bhuj, Mundra, Nakhtrana, Anjar, Lakhpat, and Mandvi Taluka



International Coastal Clean up Day



Mundra Adani foundation MUNDRA has celebrated swachhagraha related International Coastal Clean up Day celebrated with Coast Guard" with theme swachhagraha.. School students, Coast Guard staff and Adani foundation staff had cleaned Mandvi beach and give a message of swachhagraha.. At the end information given about swachhagraha project

Teacher's Day : Guru Vandana

Teachers day celebration in coordination with District Education Office and District Development Office with Adani Foundation - District Level Best teacher Award on this auspicious day.

13 teachers is selected after screening by DEO Office and award had given in presence of DEO, DPEO and Vasan bhai Ahir Minister Gujarat .





Rethinking about future of plastics

National conference on current status n Rethinking about future of plastics was organized at GUIDE – Adani Foundation was partner of the Event.

We have presented our efforts for changing mindset for No plastic awareness campaign.

Plus We also shared mangroves biodiversity project with GUIDE and given book to all present dignitaries



International Volunteer Day (IVD)

International Volunteer Day (IVD) on 5 December was designated by the United Nations in 1985 as an international observance day to celebrate the power and potential of volunteerism.

It is an opportunity for volunteers, and volunteer organisations, to raise awareness of, and gain understanding for, the contribution they make to their communities. On 3rd July – Occasion of "International No plastic Day" - AF Team has distributed 250 hooks to employees residing at Shantivan colony.

Hook is the thin rod of steel. In this hook all have collected plastic bag wrapper i.e. Waffer, Biscuit, milk etc @ 8.5 Kg. This Plastic will be given for recycle for making Hose Pipe. I.e "Waste to Best". Employee's family members became determined for not using Plastic bags.

Today On 5th December – We have felicitated the five volunteers who collected highest quantity of plastic bags. Chief Guest of the Event was Ms. Vinita Rai (Head, SVC Ladies Club) and Mr. Avinash Rai (CEO, APSEZ).

Respected Ganesh Sharma Sir (VP – HR, APSEZ) and Respected Patiyal Sir (Head –Admin, APSEZ) had nicely coordinated for the Event.

This will be regular and sustainable event for AF.



Divine Feelings Towards Mata no Madh

People used to go by foot to Mata no madh in Navaratri. Total 8 camps at different locations is inaugurated today in way towards Mata no Madh by Adani Foundation Bhuj and GKGH Hospital.

Total 34537 Patients were benefitted in this Camp

Mata no Madh is a village in Lakhpat Taluka of Kutch district, Gujarat, India. The village lies surrounded by hills on both banks of a small stream and has a temple dedicated to Ashapura Mata. She is considered patron deity of Kutch. The village is located about 105 km from Bhuj, the headquarters of Kutch district.



"Ayushman Bharat – Celebrating First Birthday !!"

On the first birth anniversary of "AYUSHMAN ENROLMENT CARD" Adani Foundation Bhuj and Mundra had successfully completed 11 Ayushman card enrollment camps in a single Day.





Skill Development Training Program for Schedule Cast Beneficiaries

We could able to fulfil target of training 1440 SC beneficiaries from Eight Talukas from Kutchh for different courses.

Mr Vinod Chavda (MP, Kutchh and Morabi) Mrs Lata Solanki (Pramukh, Nagar Palika,Bhuj) Mr Rohit (District Social Justice and Empowerment), Mr Jatin Trivedi (Head, ASDC)and Mr solanki (Chairman, social justice commitee Kutchh) we're present.

courses

1. Hand embroidery
2. Self employed stitching
3. Mobile Repairing
4. Beauty parlor
5. Crane operator





Udaan
get inspired

completed 10 years of
Udaan

Education Minister Mr. Bhupendrasinh Chudasama visited Udaan Project and Utthan Project of Adani Foundation. He Appreciated Udaan Project which is truly inspirational and impactful Project. He got information though power pint presentation about Utthan Project – Enhancing Primary Education of Government School. He motivated and appreciated joint effort of AF Team and District Primary Education office



Events



Adani Foundation have arranged a program **"Celebrating The Health Of Women"** at Mundra. The motive was awareness in women about their health and issues. Around 250 women were participated in this event. Doctors were gave information about women health, periods cycle, breast cancer etc. Doctor discussed about breast cancer, its symptoms, precautions, does and don'ts etc., and advised women to go for regular check up after forties. At the end of program health kit distributed to women.



Republic Day Celebration at ASDC Centre

Bhuj Adani Skill Development Centre witnessed the celebration of the Republic Day on the 25th January, 2020.

Students, Staff and Faculty members filled with a feeling of patriotism and dedication gathered in front of the Guest & Director-Adani Foundation, Vasant Gadhavi. In his speech, the director highlighted the importance of the Constitution and its unique features in the preamble of the constitution. He also gave an insight on the various accomplishments achieved by Centre and motivated the crowd for bringing more laurels for the Centre through their accomplishments.



Events

International disability day



Celebration of international disability day - Adani foundations Lakhpat celebrated three different programmes in coordination with District social welfare department and Lokseva trust.

1. Seva setu programme in which information and form fill up for various Govt schemes for Divyang i.e. bus pass, sadhan sahay and pension
2. Sadhan sahay - If beneficiary can not fulfill Govt criteria then of disability percentage or age bar - Adani foundation has supported beneficiaries.
3. Opening of swavlamban center in coordination of merchant association - widow women will stitch non woven bags and merchant association will purchase regularly and mamlatdar saheb will monitor the system.

Events



Mr. Karim Mansoori – Namda Artist was felicitated at National Artisan Expo Rajkot by Mr. Vijay Rupani along with 13 other artisans from all over Gujarat. the motive of felicitation was, their work towards community and their efforts for revising their art. Karim Mansoori was the only artisan of this art called "**NAMDA**" in Gujarat state. he was also part of this six-day National Artisan expo, for one week.

Awards and Accolades



With a great pleasure to share that APSEZ - CSR received such a big recognition as a honourable mention in western recognition under category Challenging circumstances under first National corporate social responsibility 2019.

Chief guest of the ceremony was our President Honble. Ramnath kovind. Caremony was presided over by smt Nirmala sitaraman - Minister Finance and Guest of honour was Mr Anurag sinh Thakur Minsitry of state for finance end corporate affairs ..

Award received by Respected Dr Malay Mahadaviya and accompanied by Mr Rakshit shah and Mr Avinash Rai.

Awards and Accolades

Apex India CSR Innovation Award 2019



Adani Foundation Mundra received **"Gold Award"** under Apex India CSR Innovation Award 2019 Today at Goa

Chief Guest of the event was Shri Prasad (Union Minister Goa,GOI) and Guest of Honour Mr Suri (Former Governor Goa).

From Adani Foundation Mundra - Mr Vijay Gosal (Coordinator SLD Projects) and Mr. Karsan Gadhvi (Sr PO SLD Projects) received the Award.

Awards and Accolades

QCFI Best Case Study (State Award)2019



It was an honour for our Mundra team to be presented with the Diamond Category award at the State Case Study Presentation Competition by Quality Circle Forum, for their 'Mangroves afforestation and alternate livelihood' case study. We hope to continue our efforts to #empower people and preserve the #environment for the betterment of all.

Awards and Accolades

QCFI Best Case Study (National Award)2019



It was an honour for our Mundra team to be presented with the 'For Excellence' category award at the National Case Study Presentation Competition by Quality Circle Forum, for their 'Mangroves afforestation and alternate livelihood' case study. We hope to continue our efforts to #empower people and preserve the #environment for the betterment of all.

Awards and Accolades



Sharing with Proud that Adani Foundation got felicitation from Mr Vijay Rupani Honorable Cheif Minister Gujarat for

1. Water Conservation works
 2. More than 7000 Tree Plantation in Mundra, Anjar, Lakhpat and Mandvi Taluka
- Felicitation of 3 CSR from Kutchh district for remarkable scarcity related work.

From Adani Foundation - Mr Karsanbhai Gadivi received Award.



Awards and Accolades



Quality education is all about providing students with the resources & opportunities that open a new window to the outside world. At our Adani Vidya Mandir schools, we're dedicatedly working to facilitate our children and make them future-ready. It's an immensely proud moment for us as Adani Vidya Mandir schools Bhadreswar was recognised at the Samagra Shiksha Empowering India 2020 Awards, by Ministry of Human Resource Development, Government of India, for empowering children with education, ensuring a Brighter Tomorrow for India's future generations. The awards were presented by Dr. Ramesh Pokhriyal Nishank.



Ms. Pankti Shah was invited as a guest of honour for Mission Eco Next "Eco Eureka Training" by ministry of science and technology - Government of India at KSKV Bhuj, Initiatives of Adani Foundation for Biodiversity and water conservation was shared on this platform,

Mr. Mavajibhai Baraiya was invited as a guest of honor for "Creating Sustainable Farming Villages" by Krushi Research and Development Association by Vagad Visa Oswal Samaj. Initiatives of Adani Foundation for Fodder Sustainability and water conservation was shared by him.



Recognising Excellence in CSR

मुख्य अतिथि
श्री राम नाथ कोविन्द
भागीम जगदीश, राष्ट्र-पति

Chief Guest

Shri Ram Nath Kovind
Hon'ble President of India

आयोजक
श्रीमती निर्मला सीधरामन
भारतीय उद्योग-व्यापार-विकास-विभाग

सह-आयोजक

श्री अजय कुमार गुप्ता
भारतीय उद्योग-व्यापार-विकास-विभाग

सह-आयोजक

श्री निर्मला सीधरामन
भारतीय उद्योग-व्यापार-विकास-विभाग

सह-आयोजक

श्री अमर सिंह थलार
भारतीय उद्योग-व्यापार-विकास-विभाग

29 October 2019, Vigyan Bhawan, New Delhi

29 October 2019, Vigyan Bhawan, New Delhi

ICCA
Indian Institute of
Corporate Affairs



Awards and Accolades



भारत सरकार
Government of India
कारपोरेट कार्य मंत्रालय
Ministry of Corporate Affairs

राष्ट्रीय कारपोरेट सामाजिक दायित्व (सीएसआर) पुरस्कार 2019
National Corporate Social Responsibility (CSR) Awards 2019

प्रमाण पत्र
Certificate of

सम्माननीय उल्लंख
Honourable Mention

चुनौतीपूर्ण परिस्थितियों में सीएसआर
CSR in Challenging Circumstances

(पश्चिम भारत)
(West India)

“अडानी पोर्ट्स एंड स्पेशल इकोनॉमिक ज़ोन लिमिटेड”
“Adani Ports and Special Economic Zone Limited”

नई दिल्ली / New Delhi
दिनांक / Date: 25-10-2019

सचिव / Secretary
कारपोरेट कार्य मंत्रालय
Ministry of Corporate Affairs

No	Core Area	Beneficiaries	Remarks
1	Education	7514	Uthhan, Praveshotsav, Labour School Support
2	Adani Vidya Mandir	443	School Students
3	UDAAN	33030	568 Institutes Visited
4	Adani Skill Dev. Center	2664	Mundra and Bhuj
5	Community health Mundra	62956	MHCU, Medical Camps, Senior Citizen
6	Community health Bhuj	25604	Health Camps, Mahiti Setu, patient care
7	SLD Fisherman	6970	Water, Education, Mangroves etc.
8	SLD Agriculture	2907	Drip Irrigation, Bio gas, tissue
9	SLD Women Empowerment	419	Saheli mahila gruh udyog – 12 SHG
10	Community Infra. Development	94206	Pond deepening, AKBTPL, Labours work
11	Suposhan Mundra	20565	Adolescent, Children and RPA
12	Nakhatrana	610	Community Health, Biodiversity and CID
13	Tuna	445	Cattle Owner, Praveshotsav, Svavlamban
14	Lakhpat	765	Cattle owner for fodder, Divyang and School Support
Total Beneficiaries		259098	

Financial Overview

Adani Foundation - Mundra Executive Summary Budget Utilization F.Y. 2019-20

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget 2019-20	Budget Utilization 2019-20	% of utilization	Remarks
A	Admin Expense	71.50	70.68	98.85%	
B	Education	57.75	55.27	95.70%	
C	Community Health	220.66	243.81	110.49%	
D	Sustainable Livelihood Development	487.80	480.02	98.41%	
E	Rural Infrastructure Development	321.53	249.36	77.56%	
	Total AF CSR Budget :	1159.24	1099.14	94.82%	
F	Utthan – Education	108.93	78.53	72.09%	
G	Model Village	197.26	174.80	88.62%	
	Total Project Utthan Budget	306.19	253.33	82.74%	
H	Adani Vidya Mandir – Bhadreswar	204.35	183.93	90.01%	
	Total AVMB Budget	204.35	183.93	90.01%	
I	Project Udaan Mundra	373.14	307.14	82.31%	
	Total Project Udaan Budget	373.14	307.14	82.31%	
	GRAND TOTAL	2042.92	1843.54	90.24%	

Note :

- The Above Utilization is considered from utilization upto 30th March 2020 – It is subject to increase after remaining bill of AHMPL submission.
- Due to Corona Effect Tissue plants are not delivered so couldn't processed Store Formalities. However we have considered it in above utilization.

adani
Foundation



Adani Foundation Parivar