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

Submitted By:

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

PERIOD: April'2019 – September'2019

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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 will now vest 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.

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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 29th 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 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	Space was provided for FGD for future requirement. FGD installation is in progress

	SO_2, if required at later stage.	in compliance with the CPCB directions vide letter No.: B- 33014/07/2017-18/IPC-II/TPP/ 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, SO2, NOX 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. (As we have received renewed "Consent to Operate" (CTO). **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 April'2019 to September'2019 Please refer **Annexure- VII.**

(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.	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 138.52 Ha (Out of total 452 Ha Land for all three phases). Green belt/plantation 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.

		Desalinated water is being used for dust suppression system. Windshield is also provided at coal stack yard area. Close conveyor system for Coal transportation is provided. Integrated Ash silo system (Ash transfer by Numeric system in pipe) is in place for ash handling.
(xix)	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 latter are available with State Pollution Control Board/Committee and may also seen in the Website of Ministry of Environment and Forest in the - http://envfor.nic.in	Complied Published in Two News paper
(xx)	A separate environment-monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.	Complied. We have established separate environmental management cell with well qualified staff to carry out regular surveillance for implementation of stipulated environmental safeguards and full fledge Environment Lab for Air & Water has been established. **Environment Management System as per EMS ISO 14001: 2015 implemented.**
(xxi)	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.	Six monthly compliance report accordance to the Environmental clearance granted by MoEF is being submitted to MoEF, CPCB & GPCB regularly. Compliance status report updated on company's website. Last compliance report was submitted for the period of October '18 to March '19 had been submitted vide letter no. APMuL/ EMD/EC/MoEF/170/05/19 Dated: 24.05.2019.

(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

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 29th 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 April '2019 to September'2019, 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 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 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, NOx 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, SOx & NOx. Exit velocity is more than 23 m/sec record maintained. Regular stack emission monitoring is also being carried out by third party, Environmental laboratory.
(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

		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 SO2, If required at later stage.	Noted. Space for FGD was provided in the plant layout for future requirement. 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 SO2 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 April '2019 to September '2019 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.

	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 %.	The LDO and HFO / LSHS are stored in designated location and minimum risk area. Emergency Management Plan (EMP) has been prepared & Mock Drill is being conducted on regular interval. Occupational Health & Safety Management System as ISO 45001:2018 implemented.
(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.	Regular noise level monitoring is being carried out inside the plant locations & monitoring values are well within limits. Please refer **Annexure- I.** We are providing necessary PPE's like ear muff and ear plug to all employees & workers. Occupational Health & Safety Management System as ISO 45001:2018 implemented.
(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.	Being complied 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.**
(xxi)	A greenbelt shall be developed all around the plant boundary and ash dyke covering and area of at least 98.2 ha.	Complied. Green belt / plantation being developed in 138.52 Ha. (Out of total 452 Ha Land for all three phases), Green belt / plantation is enclosed as **Annexure- VI.**
(xxii)	First aid and sanitation arrangements shall be made for the drivers and contract labour during construction phase.	Complied. First aid and sanitation was provided for driver and contract labour during construction phase.
(xxiii)	Regular monitoring of ground level concentration of SO2, NOx, 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	Being Complied 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** Online continuous monitoring systems

	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 form 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 fledge 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 October '2018 to March '2019 had been submitted vide letter no. APMuL/EMD/EC/MoEF/170/05/19 Dated: 24.05.2019
(xxviii)	Regional office of the Ministry of	Being followed.

	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.

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**.

(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

		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/beg 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 April'2019 to September'2019. Please refer **Annexure- VII**

	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) if 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 see 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 138.52 Ha (Out of total 452 Ha Land for all three phases). Afforestation has been undertaken by APSEZL and Adani Foundation. Please refer **Annexure VI**

	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.

	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
(xxxi)	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 done by Adani Foundation. Progress Report for 2019-20 is enclosed as **Annexure- X.**
(xxxii)	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.
(xxxiii)	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.**
(xxxiv)	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 orchrds, 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 mariginalised 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.**

	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.**

(v)	Regular monitoring of ground water level shall be carried out be 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.	Being 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, NOx, $PM_{2.5}$ & 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 PM10, PM2.5, SO2, NOX 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**

(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,

	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. Half yearly 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 October'18 to March'19 had been submitted vide letter no.- APMuL/ EMD/EC/MoEF/170/05/19 Dated: 24.05.2019
(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.

	information submitted from time to time shall be forwarded to the Regional office for their use during monitoring. Project proponent will up load 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.
(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: April 2019 - June 2019

For

M/S. ADANI POWER (MUNDRA) LIMITED

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

Prepared By

UniStar Environment & Research Labs Pvt. Ltd.

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QUALITY CONTROL							
Name of Publication	Environmental Quality Monitoring Report for the Quarter April 2019 - June 2019						
Project Number	03	**Report No.**	UERL/ENV/JAN/ 4-6/2019	**Version**	1	**Released**	July 2019
Project Coordinator	Mr. Bhavin Patel						
Prepared By	Miss. Shweta A. Rana						
Checked By	Mr. Jaivik Tandel						
DISCLAIMER							
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FOR
UniStar Environment and
Research Labs Pvt. Ltd.

Mr. Jaivik Tandel
(Authorized By)

UNISTAR ENVIROMENT & RESEARCH LABS PVT. LTD. GUJARAT VAPI

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LIST OF GRAPHS

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 April 2019-June 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, BOD3, 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 CaCO3, Bicarbonate as CaCO3, 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 %, Molybdenium 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, Sulphurin %, 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 5locations 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 (PM_{10}) & 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 represents the Ambient Air Quality Status.

The significant parameters viz., PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) and Nitrogen Dioxides of (NO_2) 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 May 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.

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.

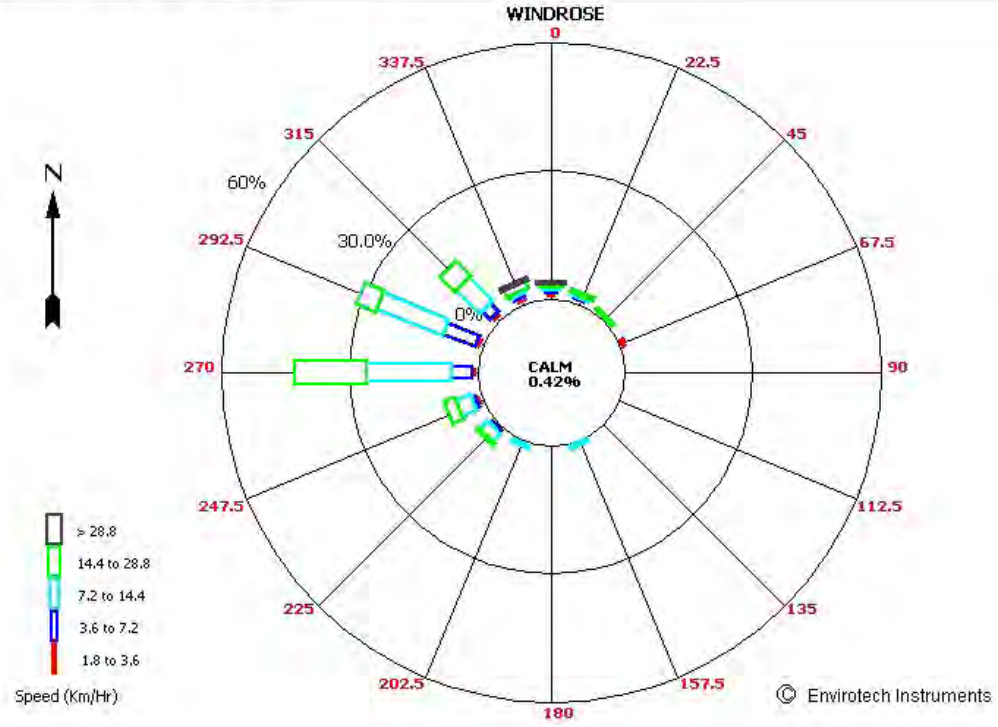
1.5.1 Wind Rose Diagram

Project	:	**Adani Power (Mundra) Limited (APMuL)**	**Period**	**:**	April 2019 to June 2019
Location	:	**Village – Tunda, Dist. - Kutch**			
April 2019					
Wind Direction		W			
Average Wind Speed		12.1 km/hr			
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)		0.70 %			
May 2019					
Wind Direction		W			
Average Wind Speed		14.9 km/hr			
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)		0.0 %			
June 2019					
Wind Direction		W			
Average Wind Speed		15.4 km/hr			
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)		0.41 %			

ADANI POWER (MUNDRA) LIMITED – MUNDRA WINDROSE FOR THE SEASON OF April to June 2019

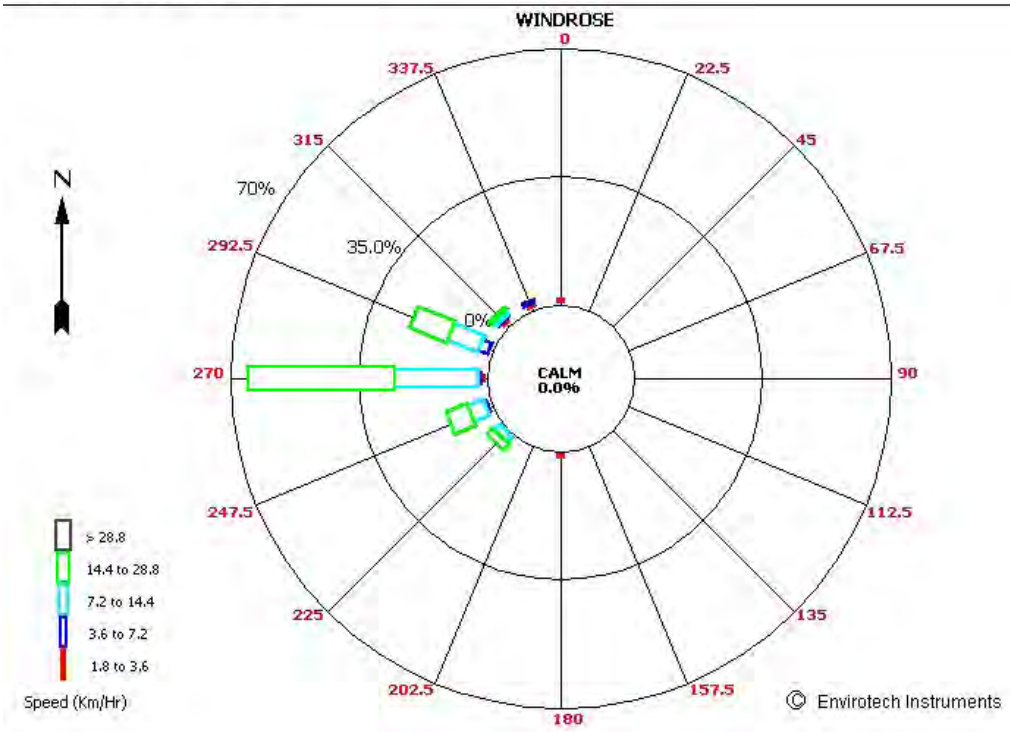
Time : 00:00 - 23:00
Date : 01/04/19 - 30/04/19

ADANI POWER(MUNDRA) LIMITED



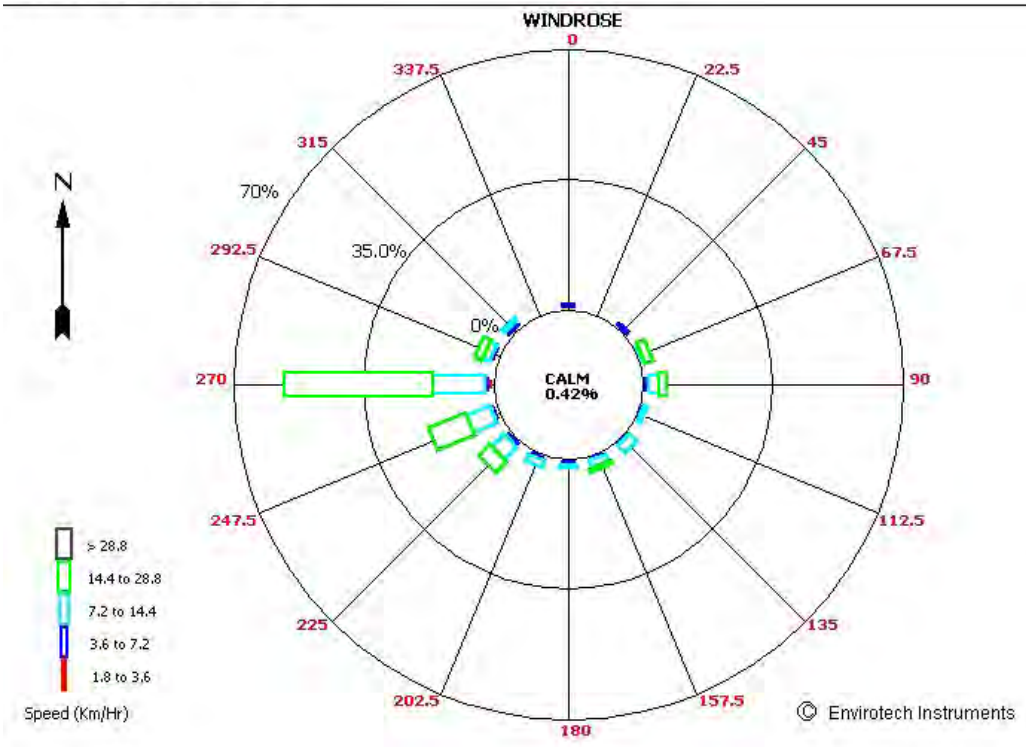
Time : 00:00 - 23:00
Date : 01/05/19 - 31/05/19

ADANI POWER(MUNDRA) LIMITED



Time : 00:00 - 23:00
Date : 01/06/19 - 30/06/19

ADANI POWER (MUNDRA) LTD.



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 pump house, erector house, 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	9	As per CTO	Once in Quarter	9	As Per APHA Method

3 ENVIRONMENAT 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)

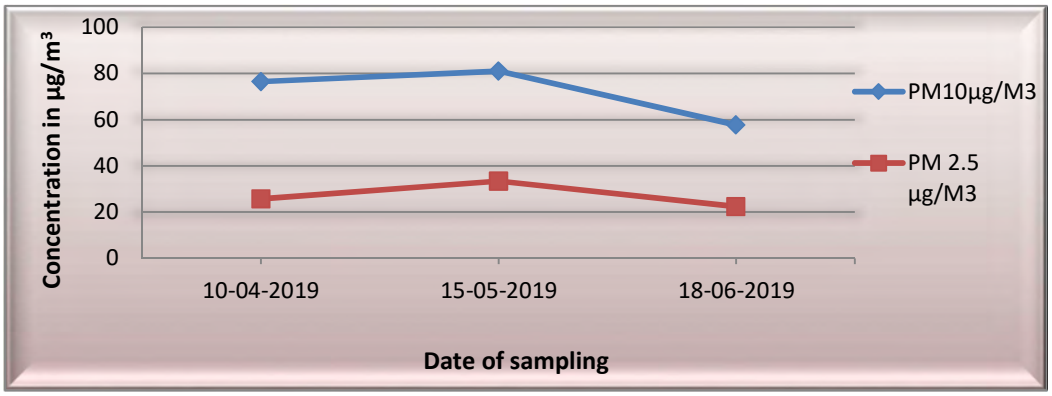
3.1.2 Location: Nr.20 MLD Plant

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 (April 2019 - June 2019) are as follows:

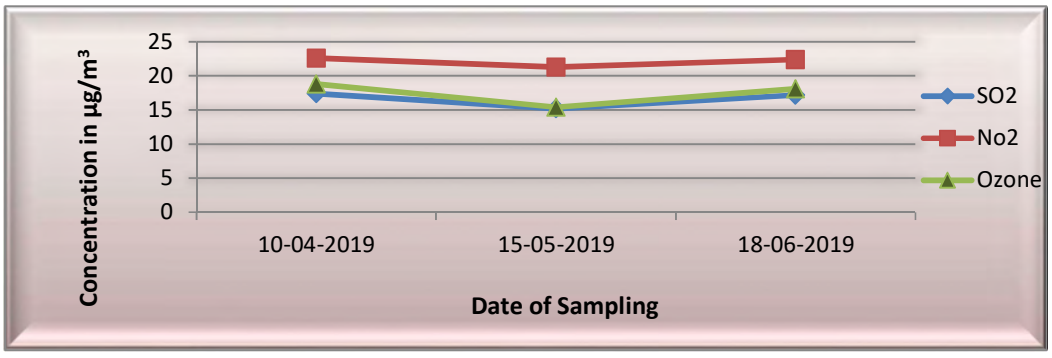
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	81	33.4	17.4	22.6	18.8
Minimum Value	57.7	22.4	15.2	21.3	15.4
Average Value	71.7	27.2	16.6	22.1	17.4
Standard Deviation	12.4	5.6	1.2	0.7	1.7
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: µg/m^3

Graph 1 : Particulate Matter Level Nr.20 MLD Plant



Graph 2: SO2, NO2 and O_3 Nr.20 MLD Plant



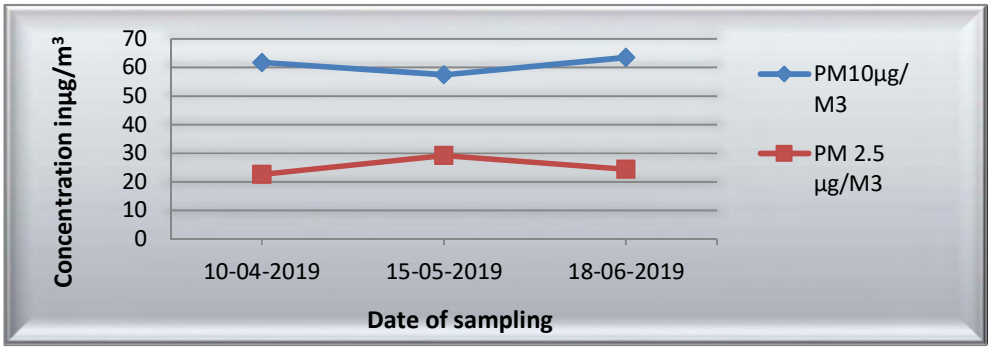
3.1.3 Location: Nr. Shantiniketan-1

The Sampling station was located in the core zone in company premises. The Respirable Dust SamplerPM_{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 (April 2019 - June 2019) are as follows

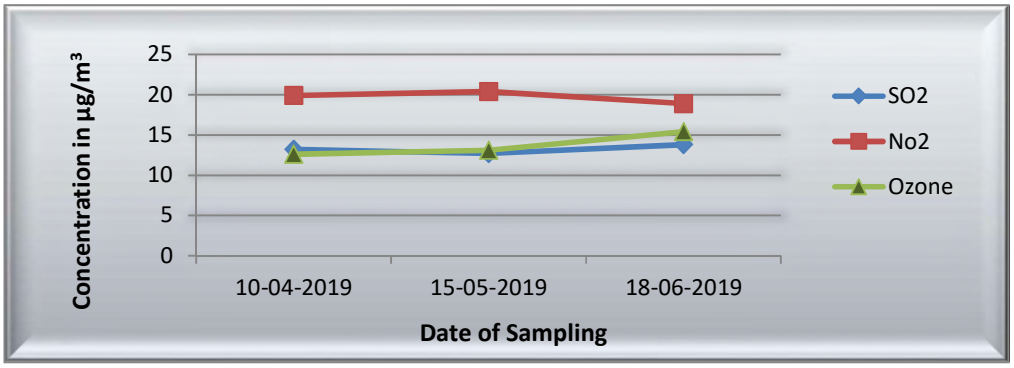
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	63.5	29.2	13.8	20.4	15.4
Minimum Value	57.4	22.6	12.7	18.9	12.6
Average Value	60.9	25.4	13.2	19.7	13.7
Standard Deviation	3.1	3.4	0.6	0.8	1.4
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: $\mu g/m^3$

Graph 3: Particulate Matter Level Nr. Shantiniketan-1



Graph 4 : SO2, NO2 and O_3 Nr. Shantiniketan-1



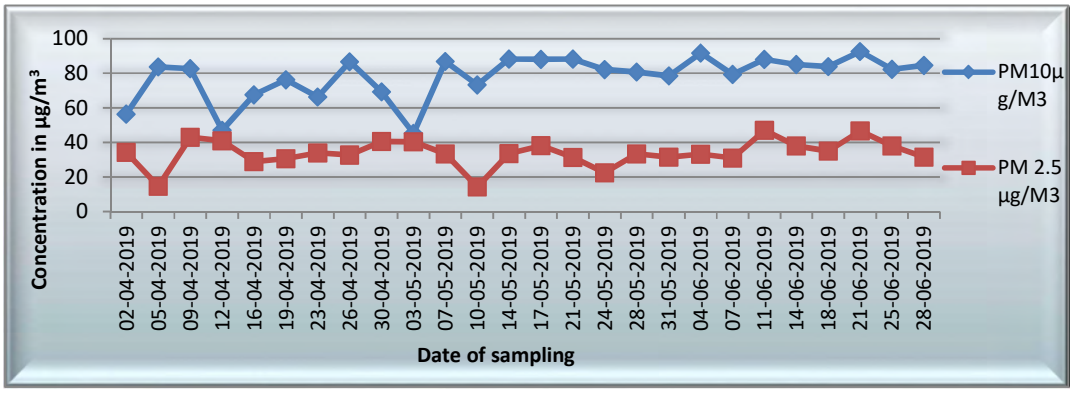
3.1.4 Location: Kandagara Village

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 (PM_{10}) & $PM_{2.5}$Sampler were placed at a height of 1.5 m above the ground level. The observed levels of PM_{10}, $PM_{2.5}$, SO_2, NO_2 and O_3 collected during the monitoring period (April 2019 - June 2019) are as follows.

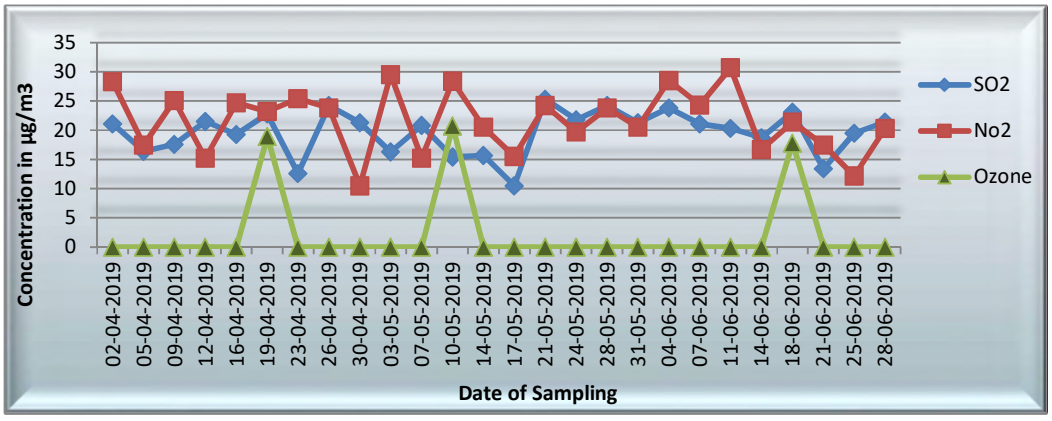
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	81.6	37.3	25.3	30.7	20.7
Minimum Value	51.4	23	10.5	10.5	17.8
Average Value	70.4	31.0	19.6	21.6	19.1
Standard Deviation	7.6	4.5	3.8	5.5	1.4
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: µg/m^3

Graph 5: Particulate Matter Level Kandagara Village



Graph 6 : SO2, NO2 and O_3 Level Kandagara Village



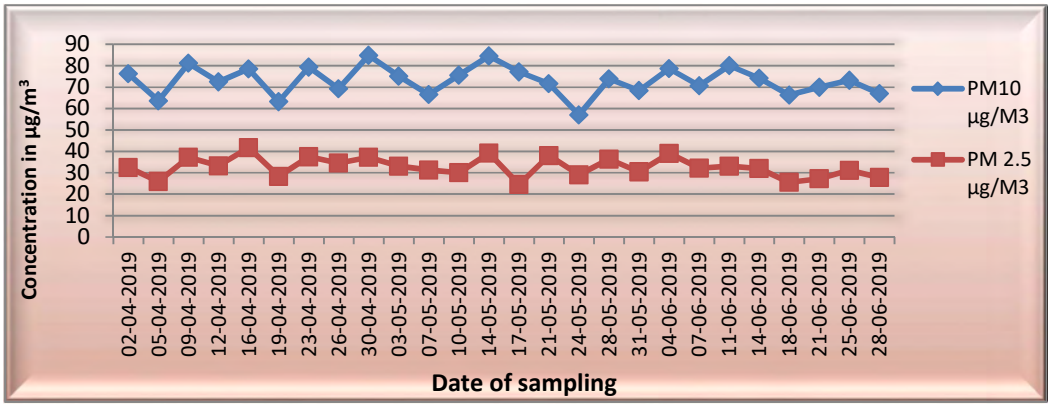
3.1.5 Location: Siracha Village

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 PM_{10}, $PM_{2.5}$, SO_2, NO_2 and O_3 collected during the monitoring period (April 2019 - June 2019) are as follows.

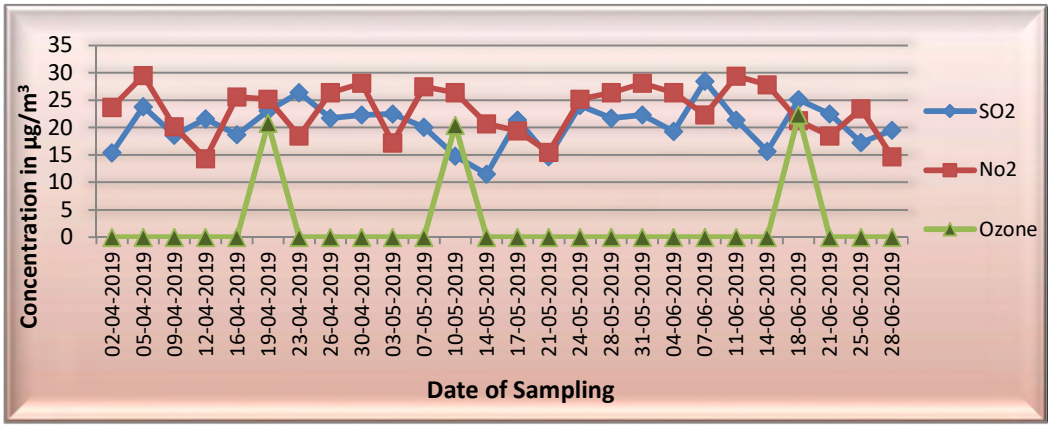
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	84.8	41.7	28.5	29.5	22.3
Minimum Value	57	24.5	11.5	14.3	20.4
Average Value	73.0	32.6	20.5	23.1	21.1
Standard Deviation	6.8	4.7	3.9	4.7	1.0
Permissible Limits	**100**	**60**	**80**	**80**	100

Units:µg/m^3

Graph 7 : Particulate Matter Level Siracha Village



Graph 8 : SO_2, NO_2 and O_3 Level Siracha Village



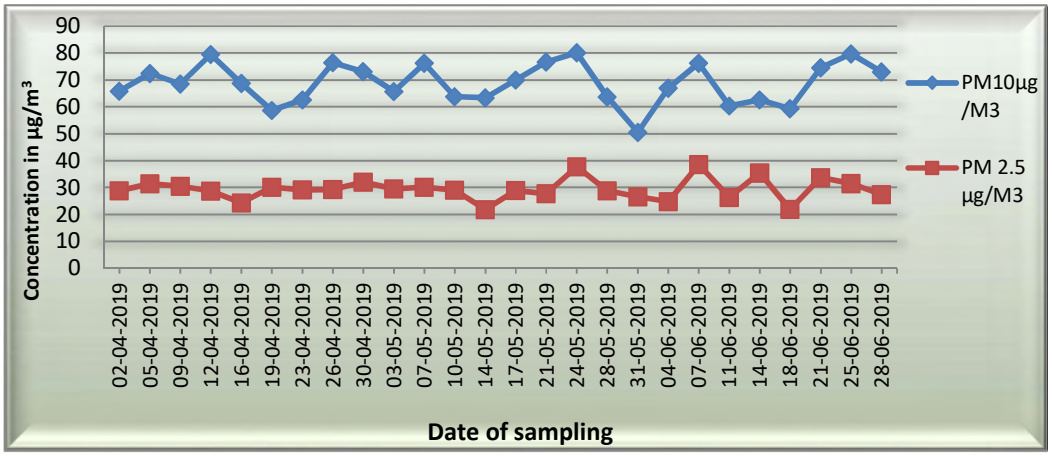
3.1.6 Location: Wandh Village

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 PM_{10}, $PM_{2.5}$, SO_2, NO_2 and O_3 collected during the monitoring period (April 2019 - June 2019) are as follows.

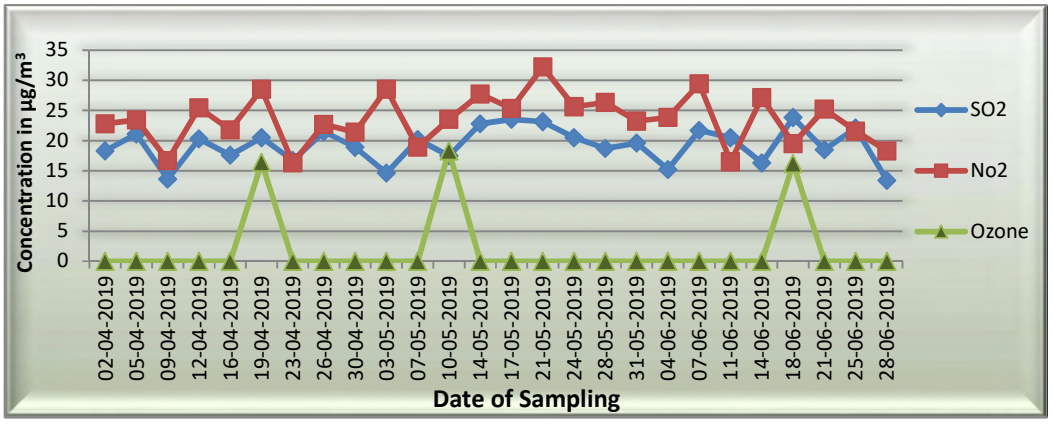
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	80.1	38.5	23.8	32.2	18.3
Minimum Value	50.5	21.8	13.4	16.3	16.2
Average Value	68.8	29.4	19.3	23.5	16.9
Standard Deviation	7.6	4.1	3.0	4.2	1.1
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: $\mu g/m^3$

Graph 9 : Particulate Matter Level Wandh Village



Graph 10 : SO_2, NO_2 and O_3 Level Wandh Village



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

Location	April - 19			May - 19			June - 19		
	Date	Ozone (O_3) µg/m3	Mercury (Hg) µg/m3	Date	Ozone (O_3) µg/m3	Mercury (Hg) µg/m3	Date	Ozone (O_3) µg/m3	Mercury (Hg) µg/m3
Village Kandagara	19.04.19	18.9	BDL	10.05.19	20.7	BDL	18.06.19	17.8	BDL
Village Wandh	19.04.19	16.4	BDL	10.05.19	18.3	BDL	18.06.19	16.2	BDL
Village Siracha	19.04.19	20.8	BDL	10.05.19	20.4	BDL	18.06.19	22.3	BDL
Nr. 20 MLD Plant	10.04.19	18.8	BDL	15.05.19	15.4	BDL	18.06.19	18.1	BDL
Nr. Shantiniketan-1	10.04.19	12.6	BDL	15.05.19	13.1	BDL	18.06.19	15.4	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

O_3 : IS - 5182 (part 9) 2009 Ozone BDL limit: 5 µg/m^3

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
11-04-2019	Boiler (Unit - 1)	33.9	516	290.2
03-05-2019	Boiler (Unit - 1)	38.6	626.4	277.4
10-06-2019	Boiler (Unit - 1)	36.6	526.4	267.4
11-04-2019	Boiler (Unit - 2)	38.6	679.3	312.8
03-05-2019	Boiler (Unit - 2)	43.2	541.6	282.6
10-06-2019	Boiler (Unit - 2)	41.4	491.6	272.4
27-04-2019	Boiler (Unit - 3)	30.8	461	265.3
04-05-2019	Boiler (Unit - 3)	33.6	639.8	311.4
16-06-2019	Boiler (Unit - 3)	38.6	539.8	316.4
27-04-2019	Boiler (Unit - 4)	34.4	681.4	323.4
04-05-2019	Boiler (Unit - 4)	40.8	563.7	259.4
11-06-2019	Boiler (Unit - 4)	39.5	563.7	250.2
30-04-2019	Boiler (Unit - 5)	29.5	448.8	278.7
22-05-2019	Boiler (Unit - 5)	31.6	501.1	312.8
12-06-2019	Boiler (Unit - 5)	30.8	464	312.8
30-04-2019	Boiler (Unit - 6)	28.5	522.2	261.6
22-05-2019	Boiler (Unit - 6)	37.1	433.8	218.5
12-06-2019	Boiler (Unit - 6)	35.2	493.5	268.5
16-04-2019	Boiler (Unit - 7)	36	156.4	292.6
16-05-2019	Boiler (Unit - 7)	31.9	159.6	301.7
25-06-2019	Boiler (Unit - 7)	34.8	152.1	256.8
16-04-2019	Boiler (Unit - 8)	30.5	135.7	311.7
16-05-2019	Boiler (Unit - 8)	30.1	133.1	260.2
25-06-2019	Boiler (Unit -8)	28.8	141.4	266.2
16-04-2019	Boiler (Unit - 9)	35.9	159.6	296.8
16-05-2019	Boiler (Unit - 9)	35.7	160.2	275.0
25-06-2019	Boiler (Unit - 9)	31.6	163.4	273.0
Permissible Limits		**50**	**<500 MWH-600 >500 MWH-200**	**300**

3.3 Water Quality Monitoring

3.3.1 Location: Tunda Village Water Sample **DATE: 21/05/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	8.10	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	134.9	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	26.3	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	18.6	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1724	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	408.7	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	774.9	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	204.6	200 mg/lit.	400 mg/lit.
13	Nitrate as NO_3	mg/L	3.9	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	0.32	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.74	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

3.3.2 Location: Kandagara Village Water Sample **DATE: 21/05/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	8.22	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	185.1	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	30.2	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	31.5	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1936	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	512.3	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	744.8	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	184.5	200 mg/lit.	400 mg/lit.
13	Nitrate as NO_3	mg/L	4.8	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	0.34	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.81	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)	08	100 CFU/ml	100 CFU/ml

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

3.3.3Location: Siracha Village Water Sample **DATE: 21/05/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	8.27	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	5	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	344.2	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	64.7	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	40.9	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1762	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	357	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	712.9	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	226.4	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	0.36	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.74	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

3.3.4 Location: Navinal Village Water Sample **DATE: 21/05/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	8.32	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	N.D.(MDL:0.1)	1 NTU	5 NTU
6	Total Hardness as $CaCO_3$	mg/L	205.4	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	50	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	31.8	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1894	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	357	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	736.9	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	206.5	200 mg/lit.	400 mg/lit.
13	Nitrate as NO_3	mg/L	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	0.37	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.65	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

3.3.5Location: Desalpur Village Water Sample **DATE: 21/05/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	8.17	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	256.6	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	46.2	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	37.3	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1804	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	515.8	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	624.9	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	236.5	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	0.34	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.63	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)	08	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		
			11/04/2019	17/05/2019	15/06/2019
1	pH @ 25	--	8.02	7.96	7.85
2	Temperature	^{0}C (Intake)	30.5	31.0	30.0
		^{0}C (Outfall)	33.5	34.0	33.5
		^{0}C (Differential)	3.0	3.0	3.0
3	Color	Pt. CO. Scale	10	10	10
4	Total Suspended Solids	mg/L	18	14	20
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	0.32	0.39	0.42
11	Lead as Pb	mg/L	0.019	0.013	0.021
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	0.188	0.197	0.178
15	Chemical Oxygen Demand(COD)	mg/L	53.3	46.2	49.3
16	Biochemical Oxygen Demand (BOD)	mg/L	13	12	14

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		
				11/04/2019	17/05/2019	15/06/2019
1	pH @ 25 ° C	--	**6.5-8.5**	7.36	7.57	7.69
2	Total Suspended Solids	mg/L	**30**	22	16	22
3	Residual Chlorine	mg/L	**0.5 Min.**	0.63	0.71	0.83
4	Biochemical Oxygen Demand (BOD)	mg/L	**20**	12	16	14
5	Fecal Coliform	CFU/100ml	**<1000**	78	68	72

3.4.3 Location: IWWT Outlet Water Sample;

S.N	Parameter	Unit	SPCB Limit	Date of sampling		
				11/04/2019	17/05/2019	15/06/2019
1	pH @ 25	--	**6.5 – 8.5**	7.91	7.85	8.06
2	Temperature	° C	**40 Max.**	33	33	32
3	Color	Pt. CO. Scale	**100 Max.**	30	30	40
4	Total Suspended Solids	mg/L	**100 Max.**	30	24	22
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.**	49.3	54.1	39.6
7	Biochemical Oxygen Demand (BOD)	mg/L	**30 Max.**	16	17	12
8	Chloride as Cl^-	mg/L	**600 Max.**	525.1	536.6	467.2
9	Total Dissolved Solids	mg/L	**2100 Max.**	1568	1614	1562
10	Sulphate as SO_4	mg/L	**1000 Max.**	102.2	124.5	156.3
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.**	55.5	56.3	58.6
13	Sodium Absorption Ratio(SAR)	mg/L	**26 Max.**	8.6	8.9	10.8
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.**	0.67	0.83	0.83
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

3.4.4Location: Bore-well – 1(Nr. Emergency Ash Pond) **Date: 17/05/2019**

Sr.No.	Parameter	Unit	Results
1	pH @ 25 ° C	-	8.10
2	Conductivity (µS)	-	17566
3	Chloride as Cl^-	mg/L	4816
4	Salinity (ppt)	mg/L	8.7
5	Total Dissolved Solids	mg/L	11242.0
6	Carbonate as CaCO3	mg/L	30.2
7	Bicarbonate as CaCO3	mg/L	156.4
8	Mercury as Hg	mg/L	BDL(MDL:0.001)
9	Arsenic as As	mg/L	BDL(MDL:0.01)
10	Lead as Pb	mg/L	BDL(MDL:0.01)
11	Chromium as Cr	mg/L	BDL(MDL:0.05)
12	Cadmium as Cd	mg/L	BDL(MDL:0.03)
13	Iron (as Fe)	mg/L	BDL(MDL:0.1)
14	Zinc (as Zn)	mg/L	BDL(MDL:0.05)

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

3.4.5Location: Bore-well – 2(Nr. Emergency Ash Pond) **Date: 17/05/2019**

S.No.	Parameter	Unit	Results
1	pH @ 25 ° C	-	8.14
2	Conductivity (µS)	-	19359
3	Chloride as Cl^-	mg/L	4649
4	Salinity (ppt)	mg/L	8.4
5	Total Dissolved Solids	mg/L	12390
6	Carbonate as CaCO3	mg/L	46.7
7	Bicarbonate as CaCO3	mg/L	144.7
8	Mercury as Hg	mg/L	BDL(MDL:0.001)
9	Arsenic as As	mg/L	BDL(MDL:0.01)
10	Lead as Pb	mg/L	BDL(MDL:0.01)
11	Chromium as Cr	mg/L	BDL(MDL:0.05)
12	Cadmium as Cd	mg/L	BDL(MDL:0.03)
13	Iron (as Fe)	mg/L	BDL(MDL:0.1)
14	Zinc (as Zn)	mg/L	BDL(MDL:0.05)

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

3.4.6Location: Bore-well – 3 (Nr. Emergency Ash Pond) **Date: 17/05/2019**

Sr.No.	Parameter	Unit	Results
1	pH @ 25 ° C	-	8.02
2	Conductivity (µS)	-	16378
3	Chloride as Cl^-	mg/L	4760
4	Salinity (ppt)	mg/L	8.6
5	Total Dissolved Solids	mg/L	10482.0
6	Carbonate as CaCO3	mg/L	32.7
7	Bicarbonate as CaCO3	mg/L	128.4
8	Mercury as Hg	mg/L	BDL(MDL:0.001)
9	Arsenic as As	mg/L	BDL(MDL:0.01)
10	Lead as Pb	mg/L	BDL(MDL:0.01)
11	Chromium as Cr	mg/L	BDL(MDL:0.05)
12	Cadmium as Cd	mg/L	BDL(MDL:0.03)
13	Iron (as Fe)	mg/L	BDL(MDL:0.1)
14	Zinc (as Zn)	mg/L	BDL(MDL:0.05)

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

3.4.7 Location: Bore-well – 4(Nr. Emergency Ash Pond) **Date: 17/05/2019**

Sr.No.	Parameter	Unit	Results
1	pH @ 25 ° C	-	8.15
2	Conductivity (µS)	-	18200
3	Chloride as Cl^-	mg/L	4926
4	Salinity (ppt)	mg/L	8.9
5	Total Dissolved Solids	mg/L	11648
6	Carbonate as CaCO3	mg/L	26.8
7	Bicarbonate as CaCO3	mg/L	168.4
8	Mercury as Hg	mg/L	BDL(MDL:0.001)
9	Arsenic as As	mg/L	BDL(MDL:0.01)
10	Lead as Pb	mg/L	BDL(MDL:0.01)
11	Chromium as Cr	mg/L	BDL(MDL:0.05)
12	Cadmium as Cd	mg/L	BDL(MDL:0.03)
13	Iron (as Fe)	mg/L	BDL(MDL:0.1)
14	Zinc (as Zn)	mg/L	BDL(MDL:0.05)

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

3.4.8 Location: Cooling Tower Blow down Water Sample

S.No.	Parameter	Unit	Limit	Results			
				Unit-1	Unit-2	Unit-3	Unit-4
Date of Sampling ⟹				18/06/2019	18/06/2019	18/06/2019	18/06/2019
1	pH @ 25 ° C	--	-	8.06	8.15	8.06	8.02
2	Free available Chlorine	° C	Min. 0.5	0.72	0.75	0.79	0.81
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	0.062	0.056	0.074	0.069
6	Phosphate as P	mg/L	5.0	0.42	0.63	0.65	0.47

S.No	Parameter	Unit	Limit	Results				
				Unit-5	Unit-6	Unit-7	Unit-8	Unit-9
Date of Sampling ⟹				18/06/2019	25/06/2019	18/06/2019	18/06/2019	18/06/2019
1	pH @ 25 ° C	--	-	8.11	8.09	8.10	8.10	8.08
2	Free available Chlorine	° C	Min. 0.5	0.74	0.78	0.77	0.73	0.71
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	0.054	BDL(MDL:0.05)	0.066	BDL(MDL:0.05)	BDL(MDL:0.05)
6	Phosphate as P	mg/L	5.0	0.44	0.25	0.45	0.55	0.39

3.4.9 Location: Condensate Cooling Tower Water Sample

S.No.	Parameter	Unit	Limit	Results			
				Unit-1	Unit-2	Unit-3	Unit-4
Date of Sampling ⟹				18/06/2019	18/06/2019	18/06/2019	18/06/2019
1	pH @ 25 ° C	--	**6.5 to 8.5**	8.12	8.03	8.14	8.11
2	Temperature ^{0}C (Intake)	^{0}C	--	30.8	30.7	30.7	30.8
	Temperature ^{0}C (Outlet)	^{0}C	--	33.5	33.4	33.8	33.6
	Temperature ^{0}C (Differential)	^{0}C	**7**	2.7	2.7	3.1	2.8
3	Free available Chlorine	mg/L	**Min 0.5**	0.68	0.67	0.78	0.68

S.No.	Parameter	Unit	Limit	Results				
				Unit-5	Unit-6	Unit-7	Unit-8	Unit-9
Date of Sampling ⟹				18/06/2019	25/06/2019	18/06/2019	18/06/2019	18/06/2019
1	pH @ 25 ° C	--	**6.5 to 8.5**	8.13	8.15	8.16	8.05	8.12
2	Temperature ^{0}C (Intake)	^{0}C	--	30.4	30.6	30.8	30.8	30.8
	Temperature ^{0}C (Outlet)	^{0}C	--	33.5	33.7	33.9	33.9	33.8
	Temperature ^{0}C (Differential)	^{0}C	**7**	3.1	3.1	3.1	3.1	3.0
3	Free available Chlorine	mg/L	**Min 0.5**	0.72	0.77	0.71	0.67	0.74

3.4.10 Location: Boiler Blow Down Water Sample **DATE: 18/06/2019**

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**	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
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: 19.05.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A) 06 am - 10 pm	Sampling Time	Night Time dB(A) 10 pm - 06 am
			Limit 75 dB(A)		Limit 70 dB(A)
1.	Nr. LDO Pump House	11:16 am - 12:35 pm	60.7	22:05 pm - 23:15 pm	55.9
2.	Nr. 20 MLD Plant		62.9		56.8
3.	Nr. Pump House		58.8		54.5
4.	Nr. Coal Handling plant		62.4		56.8
5.	Nr. Gate No.4		57.1		53.6
6.	Nr. Integrated Ash Silo		64.0		59.2
7.	Nr. Main Gate		62.4		56.8
8.	Nr. APCH Building		61.4		57.6
9.	Nr. Shantiniketan-I		59.7		53.3
10.	Nr.OHC Building		60.0		56.3

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

Date of Monitoring: 11.06.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A) 06 am - 10 pm	Sampling Time	Night Time dB(A) 10 pm - 06 am
			Limit 75 dB(A)		Limit 70 dB(A)
1.	Nr. LDO Pump House	10:50 am - 12:55 pm	62.1	22:10 pm -23:25 pm	58.7
2.	Nr. 20 MLD Plant		63.8		60.4
3.	Nr. Pump House		61.7		58.4
4.	Nr. Coal Handling plant		64.5		59.7
5.	Nr. Gate No.4		55.4		52.1
6.	Nr. Integrated Ash Silo		65.9		62.4
7.	Nr. Main Gate		61.1		59.7
8.	Nr. APCH Building		59.4		55.7
9.	Nr. Shantiniketan-I		58.4		54.2
10.	Nr.OHC Building		59.7		56.8

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: July 2019 - September 2019

For

M/S. ADANI POWER (MUNDRA) LIMITED

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

Prepared By

UniStar Environment & Research Labs Pvt. Ltd.

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QUALITY CONTROL							
Name of Publication	Environmental Quality Monitoring Report for the Quarter July 2019 - September 2019						
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Prepared By	Miss. Shweta A. Rana						
Checked By	Mr. Jaivik Tandel						
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FOR
UniStar Environment and
Research Labs Pvt. Ltd.

Mr. Jaivik Tandel
(Authorized By)

UNISTAR ENVIROMENT & RESEARCH LABS PVT.LTD. GUJARAT VAPI

adani

CONTENTS

LIST OF GRAPHS

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 July 2019-September 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, BOD3, 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 CaCO3, Bicarbonate as CaCO3, 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 %, Molybdenium 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, Sulphurin %, 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 5locations 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 (PM_{10}) & 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 represents the Ambient Air Quality Status.

The significant parameters viz., PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) and Nitrogen Dioxides (NO_2) 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 August 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.

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

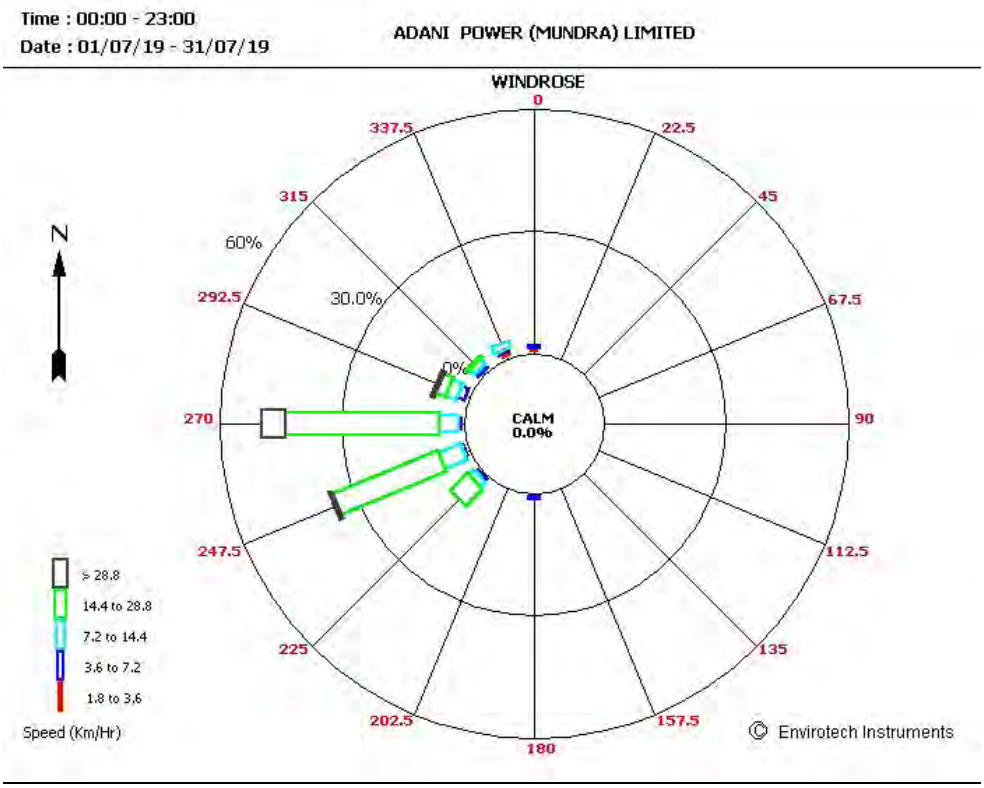
The above-said factors are considered as secondary factors since these factors control the dispersion of the pollutant indirectly by affecting the primary factors.

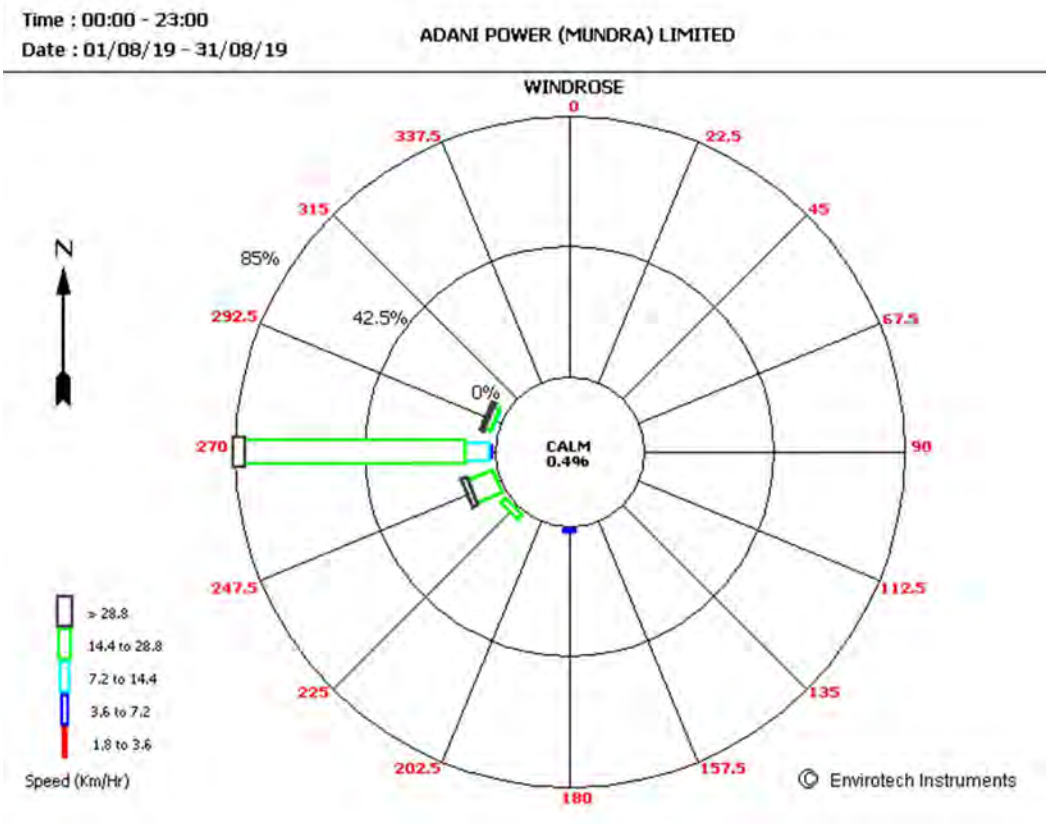
1.5.1 Wind Rose Diagram

Project	:	**Adani Power (Mundra) Limited (APMuL)**	**Period**	**:**	July 2019 to Sep. 2019
Location	:	**Village – Tunda, Dist. - Kutch**			

July 2019	
Wind Direction	W
Average Wind Speed	18.7 km/hr
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)	0.00 %
August 2019	
Wind Direction	W
Average Wind Speed	14.8 km/hr
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)	0.27 %
September 2019	
Wind Direction	W
Average Wind Speed	8.5 km/hr
Percentage Occurrence of Calm Winds (<1.7 Km/Hr)	5.01 %

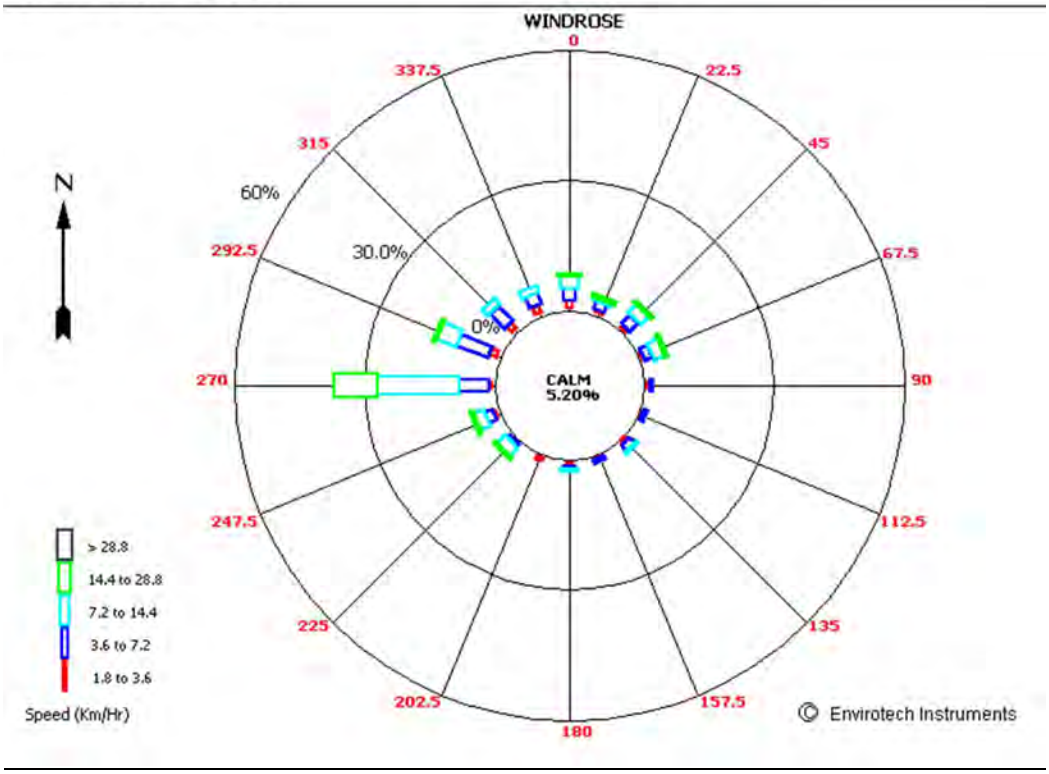
ADANI POWER (MUNDRA) LIMITED – MUNDRA WINDROSE FOR THE SEASON OF July to Sep. 2019





Time : 00:00 - 23:00
Date : 03/09/19 - 30/09/19

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 pump house, erector house, 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	9	As per CTO	Once in Quarter	9	As Per APHA Method

3 ENVIRONMENAT 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)

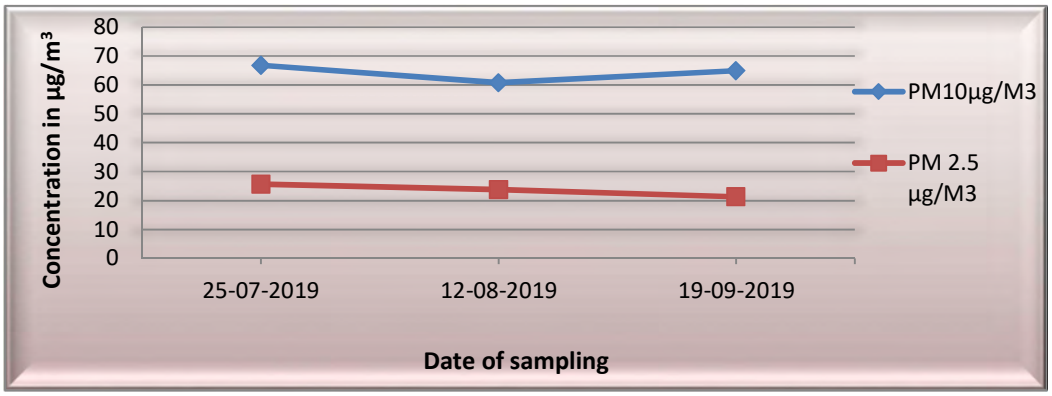
3.1.2 Location: Nr.20 MLD Plant

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 (July 2019 - Sep.2019) are as follows:

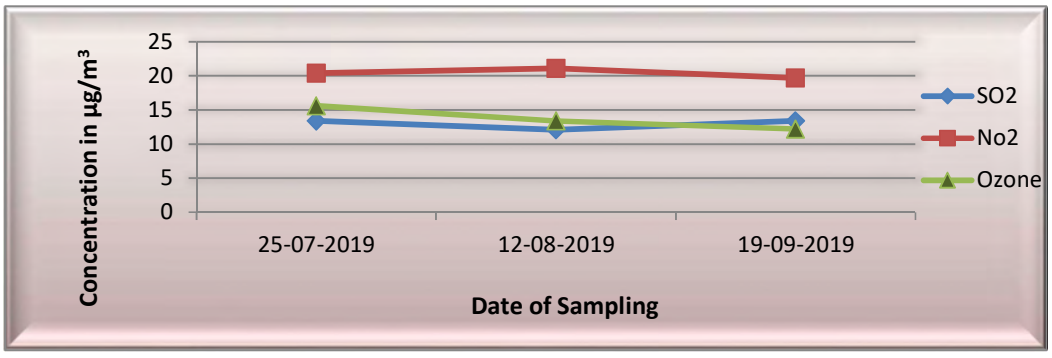
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	66.8	25.7	13.4	21.1	15.6
Minimum Value	60.8	21.3	12.1	19.7	12.2
Average Value	64.2	23.6	13.0	20.4	13.7
Standard Deviation	3.1	2.2	0.8	0.7	1.7
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: µg/m^3

Graph 1 : Particulate Matter Level Nr.20 MLD Plant



Graph 2: SO2, NO2 and O_3 Nr.20 MLD Plant



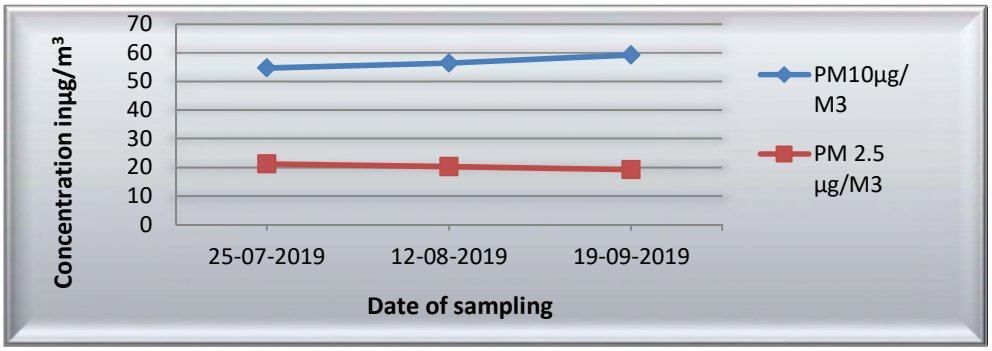
3.1.3 Location: Nr. Shantiniketan-1

The Sampling station was located in the core zone in company premises. The Respirable Dust SamplerPM_{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 (July 2019 - Sep.2019) are as follows

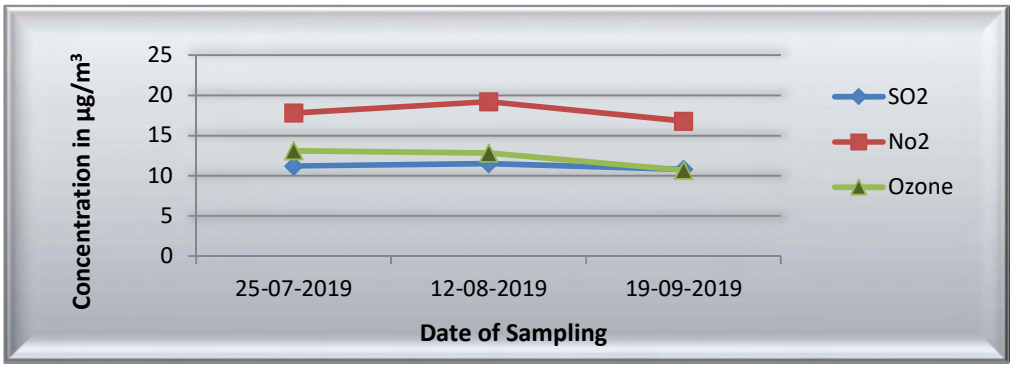
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	59.3	21.2	11.5	19.2	13.1
Minimum Value	54.7	19.2	10.8	16.8	10.7
Average Value	56.8	20.2	11.2	17.9	12.2
Standard Deviation	2.3	1.0	0.4	1.2	1.3
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: $\mu g/m^3$

Graph 3: Particulate Matter Level Nr. Shantiniketan-1



Graph 4 : SO2, NO2 and O_3 Nr. Shantiniketan-1



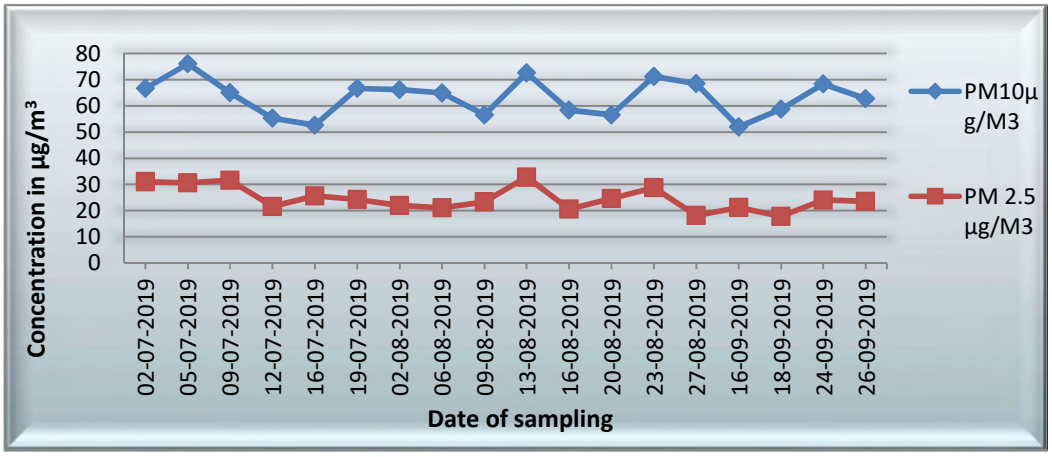
3.1.4 Location: Kandagara Village

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 (PM_{10}) & $PM_{2.5}$Sampler were placed at a height of 1.5 m above the ground level. The observed levels of PM_{10}, $PM_{2.5}$, SO_2, NO_2 and O_3 collected during the monitoring period (July 2019 - Sep.2019) are as follows.

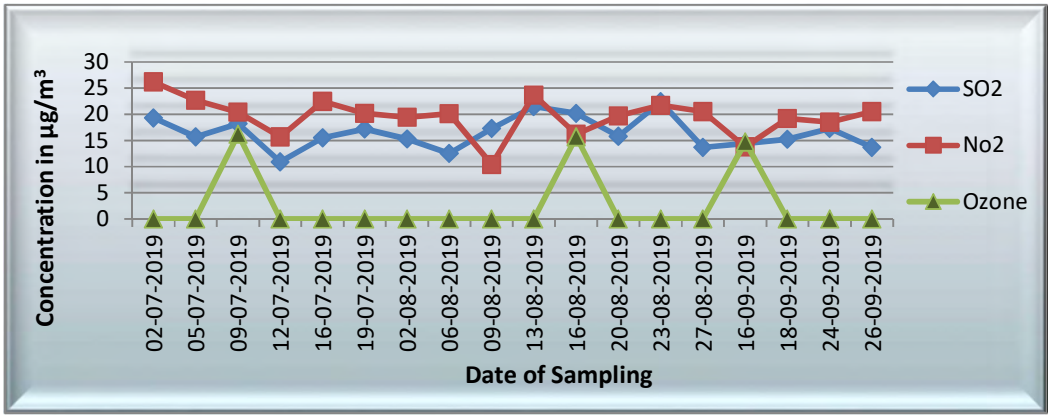
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	76.1	32.8	22.4	26.2	16.2
Minimum Value	52	17.8	10.9	10.4	14.7
Average Value	63.3	24.6	16.5	19.5	15.5
Standard Deviation	7.0	4.6	3.1	3.7	0.7
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: $\mu g/m^3$

Graph 5: Particulate Matter Level Kandagara Village



Graph 6 : SO2, NO2 and O_3 Level Kandagara Village



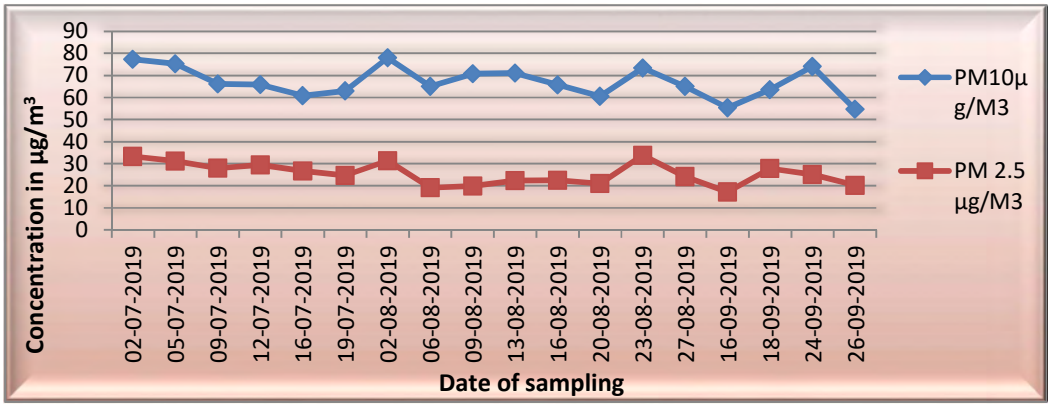
3.1.5 Location: Siracha Village

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 PM_{10}, $PM_{2.5}$, SO_2, NO_2 and O_3 collected during the monitoring period (July 2019 - Sep.2019) are as follows.

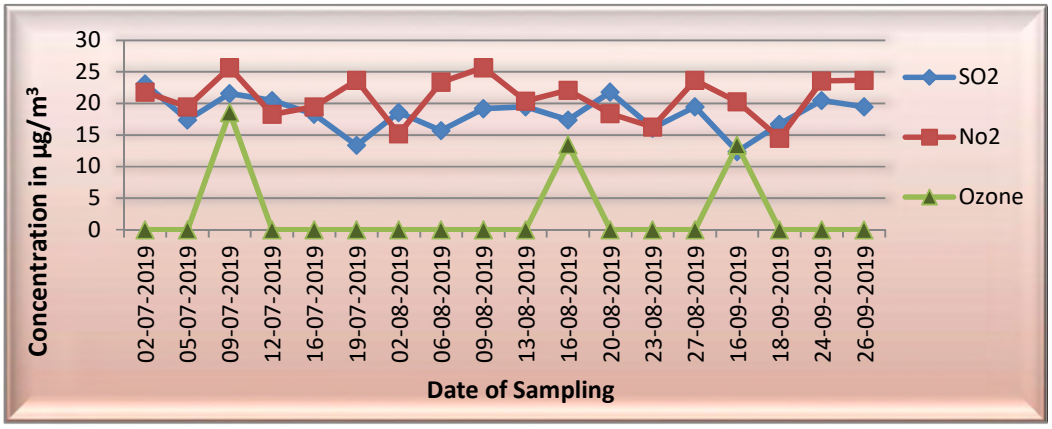
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	78	33.8	23.1	25.7	18.6
Minimum Value	54.7	17.2	12.4	14.5	13.4
Average Value	67.0	25.4	18.4	20.9	15.1
Standard Deviation	7.0	5.1	2.8	3.4	2.9
Permissible Limits	**100**	**60**	**80**	**80**	100

Units:µg/m^3

Graph 7 : Particulate Matter Level Siracha Village



Graph 8 : SO_2, NO_2 and O_3 Level Siracha Village



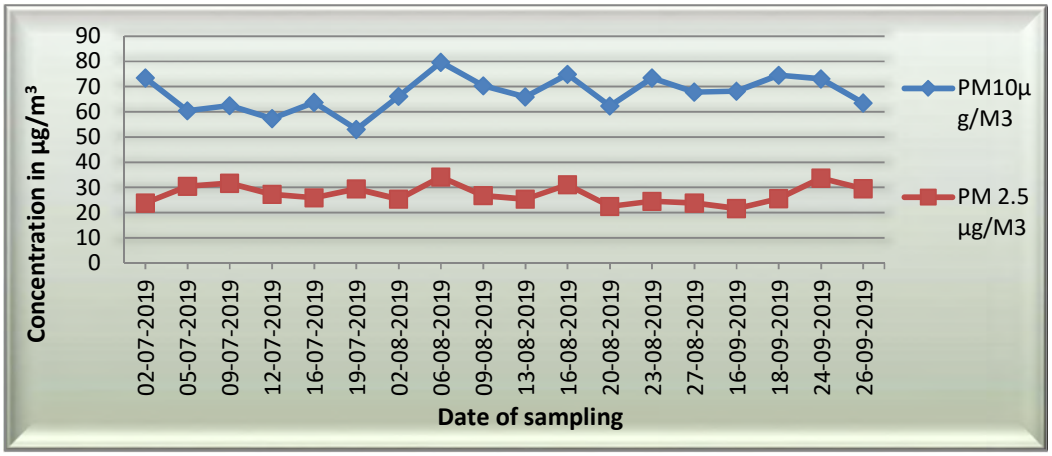
3.1.6 Location: Wandh Village

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 PM_{10}, $PM_{2.5}$, SO_2, NO_2 and O_3 collected during the monitoring period (July 2019 - Sep.2019) are as follows.

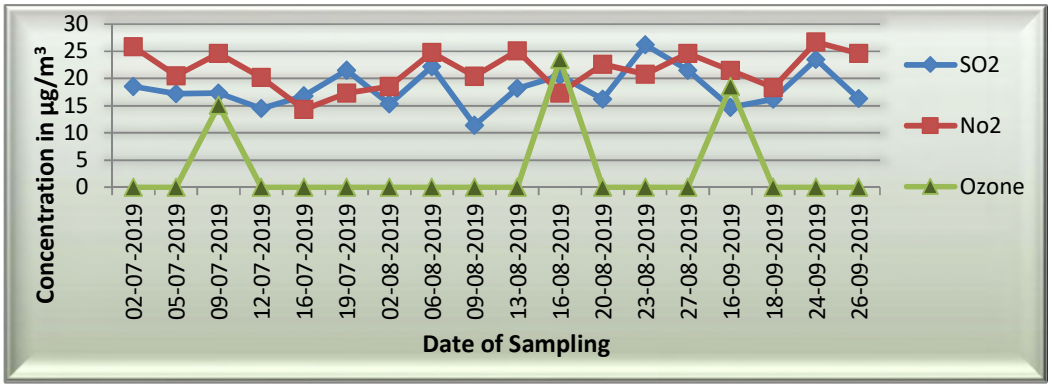
Observations	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3
Maximum Value	79.7	34.2	26.2	26.7	23.5
Minimum Value	53.1	21.7	11.4	14.3	15.1
Average Value	67.3	27.4	18.2	21.6	19.0
Standard Deviation	6.9	3.8	3.7	3.5	4.2
Permissible Limits	**100**	**60**	**80**	**80**	**100**

Units: $\mu g/m^3$

Graph 9 : Particulate Matter Level Wandh Village



Graph 10 : SO_2, NO_2 and O_3 Level Wandh Village



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

Location	July - 19			August - 19			September - 19		
	Date	Ozone (O_3) µg/m3	Mercury (Hg) µg/m3	Date	Ozone (O_3) µg/m3	Mercury (Hg) µg/m3	Date	Ozone (O_3) µg/m3	Mercury (Hg) µg/m3
Village Kandagara	09.07.19	16.2	BDL	16.08.19	15.7	BDL	16.09.19	14.7	BDL
Village Wandh	09.07.19	15.1	BDL	16.08.19	23.5	BDL	18.06.19	18.5	BDL
Village Siracha	09.07.19	18.6	BDL	16.08.19	13.5	BDL	16.09.19	13.4	BDL
Nr. 20 MLD Plant	25.07.19	15.6	BDL	12.08.19	13.4	BDL	19.09.19	12.2	BDL
Nr. Shantiniketan-1	25.07.19	13.1	BDL	12.08.19	12.8	BDL	19.09.19	10.7	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

O_3 : IS - 5182 (part 9) 2009 Ozone BDL limit: 5 µg/m^3

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
15-07-2019	Boiler (Unit - 1)	41.6	564.3	278
09-08-2019	Boiler (Unit - 1)	30.2	642.3	268
11-09-2019	Boiler (Unit - 1)	41.8	513	280.1
15-07-2019	Boiler (Unit - 2)	39.2	511.2	284.1
09-08-2019	Boiler (Unit - 2)	31.6	571.7	311.2
11-09-2019	Boiler (Unit - 2)	39.2	564.7	264.7
19-07-2019	Boiler (Unit - 3)	35.6	568.3	291.4
30-08-2019	Boiler (Unit - 3)	34.9	498.3	281.4
12-09-2019	Boiler (Unit - 3)	32.0	518.5	290.6
19-07-2019	Boiler (Unit - 4)	32.0	511.7	274.1
07-08-2019	Boiler (Unit - 4)	33.9	618.6	324.5
12-09-2019	Boiler (Unit - 4)	35.3	611	305.9
20-07-2019	Boiler (Unit - 5)	35.6	444.2	268.4
10-08-2019	Boiler (Unit - 5)	31.3	406.3	298.6
20-09-2019	Boiler (Unit - 5)	32.8	491.8	326.3
25-07-2019	Boiler (Unit - 6)	36	493.5	277.6
10-08-2019	Boiler (Unit - 6)	33.1	464.5	317.6
20-09-2019	Boiler (Unit - 6)	30.1	421.7	285.8
30-07-2019	Boiler (Unit - 7)	34.7	172.1	287.2
08-08-2019	Boiler (Unit - 7)	32.8	172.2	287.3
28-09-2019	Boiler (Unit - 7)	33.5	134.5	284.4
30-07-2019	Boiler (Unit - 8)	37.5	137.3	290.3
08-08-2019	Boiler (Unit - 8)	30.1	137.5	270.3
28-09-2019	Boiler (Unit -8)	39.1	156.7	304.8
30-07-2019	Boiler (Unit - 9)	36.6	148.6	292.3
08-08-2019	Boiler (Unit - 9)	31.8	158.6	292.1
28-09-2019	Boiler (Unit - 9)	36.6	148.5	283
Permissible Limits		**50**	**<500 MWH-600 >500 MWH-200**	**300**

3.3 Water Quality Monitoring

3.3.1 Location: Tunda Village Water Sample **DATE: 07/08/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.99	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	133.9	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	28.9	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	15.0	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1570	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	371.9	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	494.7	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	181.9	200 mg/lit.	400 mg/lit.
13	Nitrate as NO_3	mg/L	3.0	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	0.6	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)	10	100 CFU/ml	100 CFU/ml

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

3.3.2 Location: Kandagara Village Water Sample **DATE: 07/08/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.72	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	166.6	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	27.18	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	28.4	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1704	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	461.2	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	511.8	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	166.1	200 mg/lit.	400 mg/lit.
13	Nitrate as NO_3	mg/L	4.3	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	0.34	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.72	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)	6	100 CFU/ml	100 CFU/ml

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

3.3.3Location: Siracha Village Water Sample **DATE: 07/08/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.93	6.5 – 8.5	6.5 – 8.5
2	Color	Pt-Co	20	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	304.1	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	52.6	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	36.6	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1580	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	322.4	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	454.3	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	173.3	200 mg/lit.	400 mg/lit.
13	Nitrate as NO_3	mg/L	1.5	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	0.24	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.63	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)	6	100 CFU/ml	100 CFU/ml

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

3.3.4 Location: Navinal Village Water Sample **DATE: 07/08/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.67	6.5 – 8.5	6.5 – 8.5
2	Colour	Pt-Co	20	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	197.5	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	28.7	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	30	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1664	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	318.4	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	502.4	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	172.8	200 mg/lit.	400 mg/lit.
13	Nitrate as NO_3	mg/L	2.0	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	0.30	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.56	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

3.3.5Location: Desalpur Village Water Sample **DATE: 07/08/2019**

Sr. No.	Parameter	Unit	Results	Desirable Limits	Permissible limit in the absence of alternate source
1	pH @ 25	-	7.50	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	216.3	200 mg/lit.	600 mg/lit.
7	Calcium as Ca	mg/L	41.3	75 mg/lit.	200 mg/lit.
8	Magnesium as Mg	mg/L	27.5	30 mg/lit.	100 mg/lit.
9	Total Dissolved Solids	mg/L	1660	500 mg/lit.	2000 mg/lit.
10	Total Alkalinity	mg/L	464.4	200 mg/lit.	600 mg/lit.
11	Chloride as Cl^-	mg/L	501.2	250 mg/lit.	1000 mg/lit.
12	Sulphate as SO_4^{-2}	mg/L	192.6	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	0.38	0.2 mg/lit.	1.0 mg/lit.
18	Fluoride as F	mg/L	0.55	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)	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		
			11/07/2019	17/08/2019	13/09/2019
1	pH @ 25	--	7.81	7.35	7.42
2	Temperature	^{0}C (Intake)	28.3	29.0	28.0
		^{0}C (Outfall)	31.2	32.5	31.0
		^{0}C (Differential)	2.9	3.5	3.0
3	Color	Pt. CO. Scale	10	10	10
4	Total Suspended Solids	mg/L	14	16	12
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	0.35	0.38	0.27
11	Lead as Pb	mg/L	0.016	0.019	0.014
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	0.159	0.156	0.141
15	Chemical Oxygen Demand(COD)	mg/L	33.2	56.9	44.7
16	Biochemical Oxygen Demand (BOD)	mg/L	10	20	14

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		
				20/07/2019	17/08/2019	13/09/2019
1	pH @ 25 ° C	--	**6.5-8.5**	7.58	7.54	7.66
2	Total Suspended Solids	mg/L	**30**	18	26	18
3	Residual Chlorine	mg/L	**0.5 Min.**	0.74	0.75	0.68
4	Biochemical Oxygen Demand (BOD)	mg/L	**20**	11	16	14
5	Fecal Coliform	CFU/100ml	**<1000**	64	66	62

3.4.3 Location: ETP Outlet Water Sample;

S.N	Parameter	Unit	SPCB Limit	Date of sampling		
				11/07/2019	17/08/2019	13/09/2019
1	pH @ 25	--	**6.5 – 8.5**	8.01	7.86	7.72
2	Temperature	° C	**40 Max.**	29	30	30
3	Color	Pt. CO. Scale	**100 Max.**	40	40	40
4	Total Suspended Solids	mg/L	**100 Max.**	26	18	12
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.**	44.5	52.6	46.5
7	Biochemical Oxygen Demand (BOD)	mg/L	**30 Max.**	14	18	14
8	Chloride as Cl^-	mg/L	**600 Max.**	486.3	478.1	425.3
9	Total Dissolved Solids	mg/L	**2100 Max.**	1644	1608	1456
10	Sulphate as SO_4	mg/L	**1000 Max.**	170.0	202.3	178.6
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.**	59.2	54.3	52.5
13	Sodium Absorption Ratio(SAR)	mg/L	**26 Max.**	11.5	9.7	8.3
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.**	0.91	0.65	0.53
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: 06/08/2019**

Sr.No.	Parameter	Unit	Results			
			Borewell-1	Borewell-2	Borewell-3	Borewell-4
1	pH @ 25 ° C	-	7.32	7.11	7.46	7.92
2	Conductivity (µS)	-	15459	16894	14752	15847
3	Chloride as Cl^-	mg/L	4539.6	4312.2	4472.5	4539.1
4	Salinity (ppt)	mg/L	8.2	8.1	8.08	8.2
5	Total Dissolved Solids	mg/L	9894.0	10812	9441.0	10142
6	Carbonate as CaCO3	mg/L	21.92	31.41	34.10	26.8
7	Bicarbonate as CaCO3	mg/L	178.31	148.87	153.54	168.4
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	425.5	456.3	396.2	445.3
16	Calcium as Ca	mg/L	345.2	362.1	321.1	352.3
17	Magnesium as Mg	mg/L	221.3	239.1	198.6	228.6
18	Sodium as Na	mg/L	1644	1905	1562.5	1862
19	Potassium as K	mg/L	95.5	110.2	88.1	98.3
20	Sulphate as SO4-2	mg/L	625	744	604	685
21	Nitrate as NO3	mg/L	25.5	27.1	21.1	26.2
22	Phosphate as PO_4	mg/L	2.45	2.96	1.97	2.82
23	Barium as Ba	mg/L	N.D.	N.D.	N.D.	N.D.
24	Fluoride as F	mg/L	2.35	2.67	1.77	2.6
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

3.4.5Location: Cooling Tower Blow down Water Sample

S.No.	Parameter	Unit	Limit	Results			
				Unit-1	Unit-2	Unit-3	Unit-4
Date of Sampling ⟹				06/08/2019	06/08/2019	06/08/2019	06/08/2019
1	pH @ 25 ° C	--	-	8.14	8.19	8.12	8.09
2	Free available Chlorine	° C	Min. 0.5	0.67	0.69	0.71	0.75
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	0.057	0.052	0.067	0.061
6	Phosphate as P	mg/L	5.0	0.36	0.56	0.56	0.39

S.No	Parameter	Unit	Limit	Results				
				Unit-5	Unit-6	Unit-7	Unit-8	Unit-9
Date of Sampling ⟹				06/08/2019	06/08/2019	06/08/2019	06/08/2019	06/08/2019
1	pH @ 25 ° C	--	-	8.16	8.15	8.05	8.06	8.02
2	Free available Chlorine	° C	Min. 0.5	0.69	0.71	0.68	0.68	0.67
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	0.061	BDL(MDL:0.05)	0.058	BDL(MDL:0.05)	BDL(MDL:0.05)
6	Phosphate as P	mg/L	5.0	0.37	0.31	0.41	0.47	0.32

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 ⟹				06/08/2019	06/08/2019	06/08/2019	06/08/2019
1	pH @ 25 ° C	--	**6.5 to 8.5**	8.06	8.06	8.10	8.05
2	Temperature ^{0}C (Intake)	^{0}C	--	27.6	27.8	27.6	27.8
	Temperature ^{0}C (Outlet)	^{0}C	--	30.2	30.5	30.4	30.5
	Temperature ^{0}C (Differential)	^{0}C	**7**	2.6	2.7	2.8	2.7
3	Free available Chlorine	mg/L	**Min 0.5**	0.61	0.59	0.69	0.62

S.No.	Parameter	Unit	Limit	Results				
				Unit-5	Unit-6	Unit-7	Unit-8	Unit-9
Date of Sampling ⟹				06/08/2019	06/08/2019	06/08/2019	06/08/2019	06/08/2019
1	pH @ 25 ° C	--	**6.5 to 8.5**	8.11	8.11	8.12	8.01	8.09
2	Temperature ^{0}C (Intake)	^{0}C	--	27.5	27.5	27.5	27.7	27.5
	Temperature ^{0}C (Outlet)	^{0}C	--	30.3	30.3	30.4	30.5	30.2
	Temperature ^{0}C (Differential)	^{0}C	**7**	2.8	2.8	2.9	2.8	2.7
3	Free available Chlorine	mg/L	**Min 0.5**	0.68	0.69	0.65	0.61	0.67

3.4.7 Location: Boiler Blow Down Water Sample **DATE: 17/08/2019**

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**	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
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)

3.5 Soil Quality Monitoring: Date: 07/08/2019

Locations of soil sampling ⇨			Kandagara	Tunda	Desalpur	Siracha	Navinal
Sr. No.	Parameter	Unit	Results				
1	Magnesium as Mg	%	0.0059	0.0049	0.0047	0.0046	0.0047
2	Molybdenum as Mo	%	N.D.	N.D.	N.D.	N.D.	N.D.
3	Phosphorous as P	%	0.367	0.374	0.245	0.323	0.256
4	Calcium as Ca	%	0.0088	0.0078	0.0067	0.0083	0.0063
5	Zinc as Zn	%	0.0009	0.0012	0.0018	0.0012	0.0008
6	Manganese as Mn	%	0.0118	0.0144	0.0176	0.0108	0.0117
7	Potassium as K	%	0.0059	0.0096	0.0056	0.0162	0.0063
8	Nitrogen as N	%	0.0089	0.0223	0.0093	0.0126	0.0095
9	Iron as Fe	%	1.896	2.153	1.981	2.530	1.963
10	Copper as Cu	%	0.0006	0.0011	0.0010	0.0009	0.0007
11	Boron as B	%	N.D.	N.D.	N.D.	N.D.	N.D.
12	Sulphur	%	0.0058	0.0084	0.0087	0.0091	0.0057
13	Chlorides as Cl	%	0.0105	0.0178	0.0267	0.0621	0.0396

Note: N.D. = Not Detected,

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: 13.07.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A) 06 am - 10 pm	Sampling Time	Night Time dB(A) 10 pm - 06 am
			Limit 75 dB(A)		Limit 70 dB(A)
1.	Nr. LDO Pump House	11:12am-12:40pm	63.0	22:10pm-23:35 pm	61.0
2.	Nr. 20 MLD Plant		65.7		63.4
3.	Nr. Pump House		64.1		61.8
4.	Nr. Coal Handling plant		65.4		60.9
5.	Nr. Gate No.4		56.8		55.9
6.	Nr. Integrated Ash Silo		66.2		63.2
7.	Nr. Main Gate		62.5		61.5
8.	Nr. APCH Building		58.4		56.1
9.	Nr. Shantiniketan-I		62.0		57.5
10.	Nr.OHC Building		57.5		53.2

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

Date of Monitoring: 05.08.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A) 06 am - 10 pm	Sampling Time	Night Time dB(A) 10 pm - 06 am
			Limit 75 dB(A)		Limit 70 dB(A)
1.	Nr. LDO Pump House	11:19 am - 12:45 pm	62.2	22:14 pm - 23:40 pm	61.7
2.	Nr. 20 MLD Plant		61.2		60.7
3.	Nr. Pump House		62.6		60.2
4.	Nr. Coal Handling plant		63.7		59.3
5.	Nr. Gate No.4		59.0		56.5
6.	Nr. Integrated Ash Silo		67.9		61.0
7.	Nr. Main Gate		63.5		62.0
8.	Nr. APCH Building		58.4		57.2
9.	Nr. Shantiniketan-I		62.0		58.6
10.	Nr.OHC Building		58.5		57.5

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

Date of Monitoring: 11.09.2019

Result

Sr. No.	Location	Noise Level dB(A)			
		Sampling Time	Day Time dB(A) 06 am - 10 pm	Sampling Time	Night Time dB(A) 10 pm - 06 am
			Limit 75 dB(A)		Limit 70 dB(A)
1.	Nr. LDO Pump House	10:59 am - 12:08 pm	64.1	22:10 pm - 23:39 pm	62.6
2.	Nr. 20 MLD Plant		63.8		60.1
3.	Nr. Pump House		65.1		61.5
4.	Nr. Coal Handling plant		64.6		60.1
5.	Nr. Gate No.4		58.5		57.0
6.	Nr. Integrated Ash Silo		66.6		62.2
7.	Nr. Main Gate		58.8		57.1
8.	Nr. APCH Building		60.9		57.0
9.	Nr. Shantiniketan-I		60.7		56.2
10.	Nr.OHC Building		59.4		57.6

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

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ADANI POWER(MUNDRA) LIMITED

Continues Environment Monitoring System (CEMS) -- MONTH: April'2019 TO September'2019

	Unit 1			Unit 2			Unit 3		
Date	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-Apr-19	30.6	1154.3	247.5	28.4	857.9	147.7	24.0	900.3	153.6
2-Apr-19	30.8	790.2	185.3	28.5	868.4	144.2	24.7	1046.8	233.3
3-Apr-19	31.1	829.7	193.4	29.4	912.2	142.4	24.6	1174.5	230.4
4-Apr-19	31.2	1212.4	248.5	29.0	924.6	147.9	24.4	1311.0	243.5
5-Apr-19	30.8	1259.7	269.9	28.8	937.0	144.7	23.8	1323.7	214.4
6-Apr-19	31.4	1273.1	263.0	28.9	908.2	165.5	25.7	1166.2	229.2
7-Apr-19	31.1	1118.7	218.7	29.4	595.4	235.7	25.3	756.4	169.2
8-Apr-19	31.0	1196.2	208.0	44.9	580.7	213.6	25.0	708.3	157.5
9-Apr-19	31.1	1168.4	195.4	38.4	594.2	212.6	25.1	651.7	160.1
10-Apr-19	31.7	1173.9	181.3	24.0	594.3	233.3	24.7	657.0	159.8
11-Apr-19	31.5	1200.4	181.0	23.6	557.6	222.0	24.4	741.7	149.9
12-Apr-19	30.7	1128.7	168.2	23.4	461.2	198.5	24.5	1404.2	217.9
13-Apr-19	30.8	1139.9	188.7	23.2	314.1	166.2	25.0	924.0	208.1
14-Apr-19	30.8	1118.6	181.3	22.7		130.3	25.1	485.9	183.4
15-Apr-19	30.5	1070.3	165.2	22.5	325.1	168.8	25.4	346.5	190.2
16-Apr-19	30.4	836.2	149.3	23.4	727.0	261.9	23.1	405.6	204.6
17-Apr-19	30.4	1033.1	158.8	22.8	668.0	215.4	22.3	435.3	179.9
18-Apr-19	30.6	952.8	150.1	22.7	809.5	220.5	24.0	546.7	202.5
19-Apr-19	30.0	578.2		22.4	665.2	215.5	23.4	554.9	199.6
20-Apr-19	30.3	491.3	107.9	22.6	633.4	209.6	24.1	440.9	122.3
21-Apr-19	30.3	535.0	107.2	22.5	633.9	201.5	23.4	458.7	127.4
22-Apr-19	30.7	914.5	139.0	22.6	861.8	213.4	24.5	421.7	105.5
23-Apr-19	30.5	897.5	146.8	22.8	791.4	205.5	22.8	451.4	133.7
24-Apr-19	30.8	1063.6	150.2	22.6	785.4	210.9	23.8	469.0	149.3
25-Apr-19	31.2	1182.5	174.3	22.6	813.1	173.5	23.1	631.5	191.0
26-Apr-19	31.3	1082.5	150.9	22.5	692.2	156.4	23.9	1179.3	271.1
27-Apr-19	30.6	1029.8	124.2	22.5	611.7	152.3	24.0	1472.1	272.2
28-Apr-19	30.5	984.1	127.8	22.5	571.1	123.3	23.0	1613.1	217.8
29-Apr-19	31.0	1199.1	197.3	22.7	584.9	115.1	24.3	1302.2	173.8
30-Apr-19	30.9	1423.0	226.0	22.6	589.6	111.3	24.1	1173.9	202.7
1-May-19	31.1	1528.9	275.0	22.7	589.4	111.6	23.7	1384.8	219.7
2-May-19	31.1	1315.8	340.3	22.5	589.7	111.2	23.8	1264.7	198.1
3-May-19	31.1	869.8	346.8	22.5	591.6	110.0	23.5	1232.4	178.2
4-May-19	31.3	945.5	352.7	22.5	590.0	111.0	23.7	1327.1	191.5
5-May-19	31.0	1011.2	352.6	22.4	591.0	110.6	22.6	935.7	186.0
6-May-19	31.5	1126.6	369.7	22.4	587.7	112.0	22.3	986.7	176.9
7-May-19	31.4	1319.2	397.2	22.4	585.2	113.5	22.7	865.9	171.7
8-May-19	30.9	1287.5	396.7	22.4	595.3	116.8	21.8	1080.1	162.7
9-May-19	31.1	810.9	215.3	22.1	629.7	169.1	22.4	836.5	170.3
10-May-19	30.8	868.4	182.1	22.2	605.3	197.6	21.5	501.8	172.9
11-May-19	31.1	735.9	171.6	22.3	565.1	210.2	22.4	526.0	161.8
12-May-19	31.2	818.2	192.2	22.6	562.8	210.8	22.8	608.6	174.4
13-May-19	31.1	871.6	202.3	23.1	560.4	212.1	22.4	489.3	159.1
14-May-19	31.2	875.8	214.7	24.5	560.0	211.3	21.2	550.5	141.9
15-May-19	30.9	807.9	182.0	23.0	554.2	214.9	21.9	752.5	166.1
16-May-19	31.2	576.2	186.5	22.8	551.8	216.5	24.1	683.8	159.7
17-May-19	30.7	640.4	186.2	22.4	546.2	220.5	26.0	633.9	158.2
18-May-19	30.7	668.8	192.7	22.4	538.9	225.2	26.2	573.0	127.6
19-May-19	30.9	931.0	237.0	22.7	536.5	226.8	25.8	566.1	138.5
20-May-19	31.5	956.1	249.3	23.6	533.7	227.7	26.6	507.0	139.0
21-May-19	31.3	1113.1	267.6	24.3	533.0	228.1	26.3	668.5	195.9
22-May-19	31.4	1144.3	282.2	25.3	531.3	229.4	26.3	713.2	205.8
23-May-19	31.6	1042.7	288.4	23.9	530.9	229.0	26.2	659.7	210.5
24-May-19	31.6	1061.5	290.1	23.4	539.5	225.2	26.8	569.7	221.4
25-May-19	31.7	1173.0	321.7	23.0	590.6	211.5	27.0	516.3	185.1
26-May-19	31.1	1274.0	353.0	22.5	592.8	212.7	26.1	514.6	125.3
27-May-19	31.5	1220.7	344.4	22.7	591.6	215.1	26.7	574.0	120.1
28-May-19	31.8	923.5	288.3	23.2	590.5	216.0	27.0	607.6	117.7
29-May-19	31.7	705.9	257.9	24.0	591.6	215.9	27.2	635.4	117.0
30-May-19	31.2	791.1	271.3	22.5	586.7	217.9	26.2	703.1	143.7
31-May-19	31.7	897.9	298.9	24.0	585.2	219.4	27.0	660.2	167.1

1-Jun-19	31.3		317.3	22.7	582.4	221.5	26.9	569.0	126.8
2-Jun-19	31.2		345.8	22.7	577.1	224.1	25.8	518.4	128.5
3-Jun-19	31.2	929.4	343.4	22.7	541.0	238.4	25.6	473.8	147.3
4-Jun-19	30.9	558.6	270.4	22.5	501.5	248.8	26.2	524.3	180.8
5-Jun-19	31.4	687.8	281.0	22.7	499.1	248.0	26.4	628.3	181.8
6-Jun-19	31.2	577.7	252.3	22.9	498.0	247.9	26.4	627.4	179.4
7-Jun-19	31.9	506.1	211.2	24.7	495.9	248.6	26.9	700.8	185.0
8-Jun-19	32.0	706.9	245.1	26.1	493.5	249.3	26.1	642.9	198.2
9-Jun-19	31.4	805.1	275.8	23.6	492.9	249.0	26.3	641.0	200.4
10-Jun-19	31.6	735.0	288.4	23.4	493.2	247.5	26.4	684.5	202.0
11-Jun-19	31.7	711.6	318.9	23.0	493.5	246.6	26.2	645.3	197.6
12-Jun-19	31.6		375.6	23.4	483.5	252.3	45.5	590.0	150.5
13-Jun-19	31.1		362.7	22.6	484.2	251.6	27.1	677.2	198.9
14-Jun-19	31.2	823.9	241.3	22.3	491.8	247.8	26.4	611.2	204.2
15-Jun-19	31.3	712.3	168.7	22.4	490.6	248.0	26.5	440.3	167.4
16-Jun-19	31.3		179.6	22.4	492.1	247.5	25.9	467.3	148.1
17-Jun-19	31.5	829.9	164.9	22.6	491.2	247.3	25.0	464.0	134.6
18-Jun-19	31.9	736.7	178.4	22.7	493.1	246.0	25.4	415.5	144.4
19-Jun-19	31.9	708.1	178.9	23.7	497.3	242.9	26.0	314.5	154.9
20-Jun-19	32.1	589.2	176.5	23.9	494.8	244.7	26.4	330.7	179.2
21-Jun-19	32.4	685.9	201.5	27.3	481.6	168.1	26.0		161.3
22-Jun-19	32.3	803.2	212.3	26.2	771.8	136.8	27.3		113.7
23-Jun-19	31.6	702.7	221.1	24.4	689.2	122.3	26.1	465.3	175.4
24-Jun-19	31.8	731.9	214.9	24.5	712.6	101.4	27.1	574.7	191.0
25-Jun-19	31.8	753.0	215.4	26.5	821.0	112.9	27.4	551.3	187.5
26-Jun-19	31.4	570.5	218.4	24.7	653.0	115.8	26.7	407.6	160.7
27-Jun-19	31.1	262.3	210.0	23.5	282.4		26.3	250.4	126.9
28-Jun-19	31.1		203.8	22.6			26.5		
29-Jun-19	31.0		191.2	22.4	269.4	136.7	26.5		
30-Jun-19	31.3		186.7	23.8		171.0	25.5		
1-Jul-19	31.4		187.9	22.3	301.2	166.1	26.8	267.1	152.5
2-Jul-19	31.7	409.5	206.3	22.4	428.9	178.0	27.4	260.4	100.8
3-Jul-19	31.5		194.5	22.4	336.2	168.4	28.3	386.6	178.4
4-Jul-19	31.3	408.5	193.1	22.3	361.6	151.4	25.5	584.7	141.8
5-Jul-19	31.6	718.8	213.1	22.3	606.6	176.4	27.3	588.6	188.5
6-Jul-19	31.4	794.4	197.4	22.7	693.5	162.9	26.6	475.0	180.3
7-Jul-19	31.3	946.1	191.0	22.4	823.5	182.7	26.2	390.5	172.4
8-Jul-19	32.0	1013.7	226.7	22.5	863.8	176.2	27.6	281.7	179.3
9-Jul-19	31.5	958.8	212.0	22.4	803.7	165.1	27.0	253.0	165.9
10-Jul-19	32.1	839.2	227.5	22.5	812.4	170.2	28.4	251.2	172.2
11-Jul-19	31.9	936.6	222.4	22.4	817.9	163.5	28.2	342.0	177.0
12-Jul-19	32.1	701.6	187.2	22.5	811.6	163.3	28.5	451.6	102.7
13-Jul-19	32.1	289.8	118.1	22.4	807.1	153.1	27.7	359.8	165.9
14-Jul-19	31.5		55.6	22.2	572.4	137.1	27.1	389.5	173.4
15-Jul-19	31.6	451.5	145.3	22.2	457.0	86.5	27.6	548.3	181.3
16-Jul-19	31.8	758.6	207.0	22.4	713.6	184.4	28.7	570.4	193.6
17-Jul-19	31.9	640.8	227.2	24.2	1048.5	195.5	29.7	545.7	207.8
18-Jul-19	31.9	1049.5	233.7	23.2	1062.9	197.1	30.0	266.9	231.2
19-Jul-19	31.9	1073.1	234.6	22.7	1041.0	191.6	29.8	725.3	238.6
20-Jul-19	32.0	1035.1	234.3	23.0	1055.0	179.2	30.5	547.0	246.8
21-Jul-19	31.8	948.9	224.3	23.2	1067.8	163.7	30.0	859.8	265.2
22-Jul-19	31.9	986.1	226.9	23.1	1082.5	157.1	30.9	612.1	262.3
23-Jul-19	32.0	1019.8	230.2	22.6	1013.9	154.5	30.6	606.7	269.6
24-Jul-19	31.9	976.9	227.9	22.5	1035.1	148.9	29.7	720.4	287.5
25-Jul-19	32.0	913.5	227.6	22.1	811.8	101.5	28.3	607.6	260.5
26-Jul-19	31.7	890.8	221.3	22.6	863.6	90.1	29.6	628.3	276.2
27-Jul-19	28.9	767.4	207.6	22.4	992.7	101.0	28.9	578.4	299.4
28-Jul-19	26.9	958.4	228.4	22.2	924.2	121.9	28.6	555.1	280.9
29-Jul-19	27.3	812.5	231.2	22.1	430.6	110.3	27.9	533.7	202.3
30-Jul-19	28.0	665.5	220.4	22.9	534.9	113.1	29.6	570.3	297.9
31-Jul-19	31.3	447.9	215.8	24.0	993.3	317.0	SD	SD	SD
1-Aug-19	31.0	885.2	215.0	23.4	1031.3	337.8	SD	SD	SD
2-Aug-19	30.5	948.6	215.0	23.4	1126.5	345.3	SD	SD	SD
3-Aug-19	29.7	733.2	151.2	22.5	1022.1	355.4	SD	SD	SD
4-Aug-19	29.8	723.1	133.2	23.5	1186.2	348.0	SD	SD	SD
5-Aug-19	29.4	1018.6	228.1	23.6	1151.8	342.1	SD	SD	SD
6-Aug-19	29.3	989.7	229.5	24.2	1141.9	343.7	SD	SD	SD
7-Aug-19	28.3	954.9	209.2	25.1	1172.8	348.0	SD	SD	SD

8-Aug-19	28.7	937.5	223.9	23.8	1127.1	348.6	SD	SD	SD
9-Aug-19	27.5	699.2	211.2	22.8	1031.0	363.7	SD	SD	SD
10-Aug-19	28.9	382.4	193.5	22.6	929.7	303.0	SD	SD	SD
11-Aug-19	30.2	760.8	201.6	22.6	690.6		SD	SD	SD
12-Aug-19	32.0	786.7	222.5	24.3	655.7		SD	SD	SD
13-Aug-19	32.5	370.9	205.1	24.0	367.0		SD	SD	SD
14-Aug-19	29.8	298.5	186.3	23.4	404.4		SD	SD	SD
15-Aug-19	29.0		163.5	21.9	277.1	170.0	SD	SD	SD
16-Aug-19	28.9		139.9	22.0	299.6	161.9	SD	SD	SD
17-Aug-19	28.2		129.7	22.2	276.7	152.3	SD	SD	SD
18-Aug-19	28.1		188.8	22.2	281.6	164.7	SD	SD	SD
19-Aug-19	28.7		186.9	22.7	447.6	171.8	SD	SD	SD
20-Aug-19	29.4	262.0	200.7	22.5	748.2	189.0	SD	SD	SD
21-Aug-19	29.1		193.1	22.6	717.1	186.7	SD	SD	SD
22-Aug-19	28.7		177.0	23.3	729.6	191.3	SD	SD	SD
23-Aug-19	28.4	453.2	201.0	23.6	916.4	200.8	SD	SD	SD
24-Aug-19	28.0	345.0	137.1	22.6	927.4	207.6	SD	SD	SD
25-Aug-19	27.9			22.6	961.9	212.1	SD	SD	SD
26-Aug-19	28.0	258.4	136.8	22.5	871.2	212.4	26.1	297.7	197.6
27-Aug-19	27.3	655.2	218.8	22.2	798.1	201.8	25.6	374.3	230.9
28-Aug-19	27.7	480.0	241.4	22.2	682.3	199.7	25.8	598.7	220.6
29-Aug-19	28.2	472.7	242.0	22.3	677.1	195.5	23.7	614.8	231.5
30-Aug-19	28.9	584.0	228.3	22.7	575.1	159.4	19.8	504.2	248.5
31-Aug-19	28.5	446.7	209.8	22.8	459.1	102.2	19.7	422.2	227.2
1-Sep-19	27.4	760.1	230.9	22.2	498.9		17.8	1001.3	278.4
2-Sep-19	28.2	1022.9	252.3	22.8	617.1	120.3	18.0	890.1	278.6
3-Sep-19	28.5	947.2	241.2	22.9	831.8	166.2	20.2	779.6	252.1
4-Sep-19	28.0	914.6	228.2	23.1	1055.0	198.2	23.0	757.9	237.3
5-Sep-19	28.0	918.9	217.4	22.8	1026.4	190.2	22.7		220.2
6-Sep-19	28.5	680.2	238.5	22.3	731.9	178.4	23.7	378.2	242.9
7-Sep-19	28.9	594.2	252.1	22.1	673.3	185.9	22.1		215.1
8-Sep-19	32.8	513.4	255.0	22.0	532.5	162.1	22.1		191.9
9-Sep-19	33.4	476.6	250.5	22.2	546.2	183.9	22.8		208.7
10-Sep-19	31.7	464.9	250.7	22.2	538.5	192.5	22.6	392.2	233.7
11-Sep-19	30.4	427.4	239.4	21.9	466.4	171.4	21.3	350.3	208.1
12-Sep-19	30.1	432.2	247.6	21.9	502.3	202.6	21.6	350.6	211.1
13-Sep-19	30.8	486.4	232.7	21.9	574.5	189.1	22.1	371.5	212.6
14-Sep-19	31.5	466.1	250.2	21.8	449.5	192.1	21.8	369.8	211.5
15-Sep-19	29.5	419.5	233.6	21.7	406.0	194.8	21.9	367.4	210.5
16-Sep-19	30.5	283.6	241.7	21.9	433.2	208.3	22.3	364.9	210.1
17-Sep-19	31.9	456.9	256.5	22.1	575.1	223.3	23.3	365.2	210.4
18-Sep-19	31.3	492.2	253.8	22.2	640.5	225.3	24.6	355.8	209.6
19-Sep-19	31.7	549.0	253.2	22.0	615.9	221.9	25.5	347.5	208.8
20-Sep-19	36.1	403.6	236.7	21.9	562.3	223.8	25.0	340.5	208.8
21-Sep-19	31.7	488.4	252.0	21.9	565.3	217.2	24.2	338.0	209.9
22-Sep-19	30.7	406.6	239.9	21.8	497.4	215.7	22.2	331.2	210.5
23-Sep-19	30.6	446.7	243.7	22.0	524.5	220.3	24.4	327.4	209.6
24-Sep-19	29.3	454.6	250.5	22.3	562.9	220.7	24.4	317.9	208.9
25-Sep-19	28.5	447.7	238.5	22.3	556.1	212.3	22.7	305.5	210.9
26-Sep-19	28.1	421.9	229.7	22.3	477.7	203.9	23.4	313.9	212.2
27-Sep-19	27.4	397.0	219.8	22.1	411.4	201.2	23.3	302.6	210.3
28-Sep-19	27.5	409.5	228.8	22.1	429.0	212.5	22.2	300.9	211.2
29-Sep-19	27.3		261.9	22.4	466.7	221.1	22.0	289.7	208.9
30-Sep-19	27.2		240.3	22.4	512.5	195.1	23.1	276.4	207.5

	Unit 4			Unit 5			Unit 6		
Date	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-Apr-19	35.1	377.6	133.1	34.3	298.2	178.2	32.4	411.9	135.8
2-Apr-19	37.7	378.2	181.5	33.0	318.0	174.8	32.3	458.4	139.7
3-Apr-19	38.8	356.1	202.0	34.6	330.6	174.0	33.6	534.5	157.3
4-Apr-19	37.6	387.4	235.8	35.0	343.3	180.2	32.8	549.9	145.0
5-Apr-19	35.7	370.8	181.7	36.1	361.3	186.1	33.2	586.7	113.9
6-Apr-19	38.8	490.0	248.2	36.0	383.2	183.3	33.3	588.3	137.8
7-Apr-19	35.7	498.8	166.2	33.8	367.6	177.7	32.9	531.9	133.4
8-Apr-19	36.9	417.0	170.2	35.0	363.1	177.8	33.7	483.8	160.9
9-Apr-19	37.4	309.2	183.5	35.3	315.2	176.8	34.3	358.2	174.3
10-Apr-19	36.7	359.4	174.0	35.2	327.0	176.6	33.6	400.3	165.4
11-Apr-19	36.3	670.7	181.5	35.4	320.6	172.9	33.4	386.8	155.3
12-Apr-19	38.2	1258.3	227.8	34.9	462.4	183.8	34.0	998.9	187.4
13-Apr-19	38.0	811.3	208.4	34.8	360.2	174.8	33.8	524.6	115.2
14-Apr-19	37.6	586.9	176.0	35.3	281.2	176.8	34.0		
15-Apr-19	37.1	474.3	144.5	34.4	288.8	178.7	33.0		116.1
16-Apr-19	34.7	423.2	145.9	33.1	360.2	188.3	32.3	412.6	181.3
17-Apr-19	33.3	476.7	136.7	32.1	358.9	182.9	32.0	452.0	156.5
18-Apr-19	35.7	598.0	151.9	32.8	369.5	186.4	32.2	560.9	163.4
19-Apr-19	33.5	504.5	125.5	33.7	349.1	186.6	31.8	473.9	148.7
20-Apr-19	36.3	578.3	153.8	34.0	335.7	184.9	32.1	485.4	155.6
21-Apr-19	36.1	621.0	165.3	32.3	343.0	176.7	32.8	505.6	183.0
22-Apr-19	38.4	681.7	188.3	35.6	358.3	181.9	34.0	609.3	194.6
23-Apr-19	35.3	571.0	142.1	33.3	344.8	181.5	33.1	363.3	106.8
24-Apr-19	39.1	526.1	194.8	34.7	326.5	182.8	32.7		
25-Apr-19	39.1	539.0	216.6	34.1	343.4	180.1	33.2	296.0	199.0
26-Apr-19	39.0	494.5	194.8	34.3	334.8	181.4	32.4	296.4	172.5
27-Apr-19	38.7	543.5	192.2	33.9	309.6	180.8	32.7	271.0	148.3
28-Apr-19	36.7	529.9	167.0	33.2	308.3	180.4	32.6	319.7	151.9
29-Apr-19	38.3	662.5	204.1	34.4	345.9	186.8	33.1	340.5	136.8
30-Apr-19	38.9	642.6	175.9	33.9	403.3	203.9	32.3	299.5	148.6
1-May-19	38.6	578.9	174.7	34.5	311.4	242.1	32.4	324.9	164.1
2-May-19	38.6	632.9	163.8	34.1	451.8	306.1	32.6	645.5	210.3
3-May-19	38.7	632.0	168.4	34.1	437.6	309.3	32.7	619.0	221.8
4-May-19	37.7	730.5	155.8	34.1	522.5	314.4	32.5	714.6	224.6
5-May-19	36.3	691.1	133.3	33.5	661.0	308.8	32.4	862.8	231.3
6-May-19	37.2	765.9	144.4	34.1	715.7	286.6	33.2	936.9	210.3
7-May-19	36.5	755.5	129.4	34.3	824.7	317.7	32.9	1088.6	211.9
8-May-19	35.7	1356.8	150.4	33.9	1378.4	301.5	33.4	1453.5	199.6
9-May-19	36.4	707.9	207.8	33.6	807.8	263.2	33.4	820.9	213.2
10-May-19	34.1	415.6	146.8	33.2	431.8	227.3	33.3	468.7	194.7
11-May-19	36.2	514.9	206.5	33.8	848.9	228.3	33.2	729.8	190.9
12-May-19	38.5	465.8	198.5	33.5	899.9	233.6	33.6	793.0	187.4
13-May-19	37.4	459.4	194.4	33.5	944.8	224.0	33.2	863.2	210.1
14-May-19	34.8	553.3	159.2	33.3	717.7	237.8	32.3	618.2	192.9
15-May-19	35.2	491.9	149.1	33.4	458.9	215.2	32.9	328.9	179.8
16-May-19	37.3	292.6	152.3	33.7	316.5	217.2	32.8		185.7
17-May-19	38.8	279.0	164.8	33.0	300.1	198.5	33.3		174.5
18-May-19	39.1	445.1	203.0	33.6	374.2	193.1	34.0	335.5	190.8
19-May-19	38.6	497.9	179.0	33.1	240.1	156.8	33.2	268.4	173.5
20-May-19	41.1	310.7	187.6	33.9	253.9	148.1	33.8	381.0	172.5
21-May-19	39.6	339.8	166.0	34.1	267.6	154.0	33.7	354.0	167.9
22-May-19	40.3	485.5	184.4	34.3	286.2	161.4	34.0	433.8	160.1
23-May-19	39.8	489.3	168.3	34.1	285.3	156.8	33.7	413.8	168.0
24-May-19	40.5	523.0	178.6	33.9	266.0	147.5	33.8	361.7	187.8
25-May-19	40.4	513.7	176.4	33.6	270.4	169.5	33.6	359.8	171.4
26-May-19	39.5	532.5	169.8	33.0	328.0	160.0	33.2	405.6	178.5
27-May-19	40.4	516.4	190.6	33.5	327.5	168.5	33.2	371.5	177.9
28-May-19	40.7	433.9	177.5	33.8	339.2	163.9	33.1	373.4	177.5
29-May-19	41.0	469.9	184.4	33.5	352.7	160.8	33.8	353.2	167.8
30-May-19	39.4	450.4	162.1	33.4	349.5	167.3	33.3	349.4	201.6
31-May-19	43.1	447.2	196.8	34.3	362.9	170.3	33.3	380.7	209.1

1-Jun-19	37.2	511.5	178.7	34.1	294.7	200.9	33.3	352.5	188.0
2-Jun-19	25.3	455.0	148.0	33.2	289.2	169.8	33.0	310.6	192.0
3-Jun-19	26.4	342.1	145.1	34.0	269.0	170.0	33.0		192.1
4-Jun-19	28.1	530.4	172.1	33.1	311.8	170.0	33.3	261.5	157.5
5-Jun-19	30.2	615.5	192.0	34.2	379.9	175.6	33.7		150.2
6-Jun-19	28.8	339.3	171.3	33.9	341.6	186.2	33.3		139.4
7-Jun-19	28.2	538.5	168.1	34.1	380.4	182.1	33.7	346.1	152.8
8-Jun-19	27.8	506.4	183.8	34.5	262.2	174.0	33.5	250.7	149.0
9-Jun-19	28.4	275.9	170.2	33.4	262.5	181.0	32.7		
10-Jun-19	28.5	578.4	173.8	34.6	326.1	184.8	33.6		111.2
11-Jun-19	28.8	422.5	209.2	34.3	281.8	182.2	33.4	447.4	139.4
12-Jun-19	28.6	356.6	214.0	33.7		178.6	33.0	457.0	116.3
13-Jun-19	26.1	471.8	149.5	32.6	274.3	172.7	32.2	450.2	124.2
14-Jun-19	26.1	465.0	143.6	32.6	317.1	169.3	32.7	462.9	118.8
15-Jun-19	26.9	611.1	167.6	34.1	362.6	167.6	32.9	471.0	120.5
16-Jun-19	26.4	464.4	150.5	32.3	256.2	156.1	31.8	431.7	
17-Jun-19	27.3	464.6	180.3	31.4	295.2	164.4	32.7	389.4	
18-Jun-19	27.5	377.4	196.8	32.1	339.7	162.6	32.3	387.3	
19-Jun-19	27.7	459.0	178.3	34.0	441.3	165.8	33.6	383.6	
20-Jun-19	29.2	500.9	200.3	33.8	531.3	163.2	33.6	362.5	
21-Jun-19	29.6	453.0	188.0	34.4	566.4	155.4	33.9	358.1	
22-Jun-19	30.2	590.1	217.3	34.0	595.4	159.2	33.6	681.6	116.2
23-Jun-19	28.7	695.7	204.9	33.9	618.0	151.1	33.5		193.8
24-Jun-19	29.7	911.0	199.8	34.0	686.4	162.7	33.4		180.5
25-Jun-19	30.0	967.7	229.2	34.3	585.2	193.9	33.7	503.3	198.4
26-Jun-19	28.6	397.0	207.5	30.2	343.2	169.8	33.5	518.6	198.6
27-Jun-19	26.1		153.3	33.2	280.6	182.4	33.2	544.8	200.5
28-Jun-19	26.4		157.2	32.5	289.4	188.7	33.2	554.5	202.4
29-Jun-19	26.7		151.8	32.8	281.3	197.7	33.1	555.4	203.4
30-Jun-19	25.8		149.0	32.8		195.8	32.9	556.7	203.8
1-Jul-19	27.1	287.4	180.4	33.5	276.2	195.2	33.6	562.0	204.1
2-Jul-19	28.1	338.4	194.5	33.8	326.9	201.1	33.3	560.3	203.7
3-Jul-19	28.8	314.4	182.6	34.6	357.0	197.6	33.5	555.4	204.0
4-Jul-19	24.7	310.4	121.0	32.8	340.3	108.0	32.7	553.3	203.1
5-Jul-19	26.0	375.6	157.1	32.7	360.5	189.1	32.6	566.7	203.4
6-Jul-19	25.2	476.2	141.5	32.2	355.1	170.8	33.5	590.7	205.2
7-Jul-19	24.7	395.6	127.6	32.8	322.9	168.3	32.1	598.8	206.9
8-Jul-19	26.7	479.3	156.7	34.0	382.7	180.5	33.5	603.3	207.7
9-Jul-19	25.5	481.8	142.8	32.1	292.7	145.9	32.1	592.4	208.3
10-Jul-19	27.3	576.5	171.7	SD	SD	SD	SD	SD	SD
11-Jul-19	27.1	441.1	166.3	SD	SD	SD	SD	SD	SD
12-Jul-19	27.9	455.2	157.8	SD	SD	SD	SD	SD	SD
13-Jul-19	26.8	400.1	151.1	29.9	714.2	127.1	SD	SD	SD
14-Jul-19	25.0	423.4	130.3	30.2	665.3	154.5	SD	SD	SD
15-Jul-19	25.4	618.8	148.5	30.3	644.5	253.1	SD	SD	SD
16-Jul-19	27.2	628.7	161.6	29.8	621.4	249.9	SD	SD	SD
17-Jul-19	27.9	588.8	168.0	30.6	598.1	246.2	SD	SD	SD
18-Jul-19	28.3	793.8	180.2	30.9	568.7	240.7	SD	SD	SD
19-Jul-19	28.4	793.8	184.3	30.4	538.7	235.1	SD	SD	SD
20-Jul-19	28.2	666.3	175.9	30.5	492.2	226.2	SD	SD	SD
21-Jul-19	27.4	824.2	176.3	30.8	482.2	225.4	SD	SD	SD
22-Jul-19	28.9	348.6	183.2	30.7	465.6	222.7	SD	SD	SD
23-Jul-19	28.9	384.4	176.7	30.4	463.6	222.9	SD	SD	SD
24-Jul-19	30.2	393.1	152.7	30.8	471.9	226.4	SD	SD	SD
25-Jul-19	29.3	370.0	123.8	32.4	478.6	227.6	33.5	403.4	155.3
26-Jul-19	30.9	382.0	157.2	29.8	475.7	227.3	31.8	392.9	200.8
27-Jul-19	29.8	369.9	180.1	29.9	462.0	224.5	26.6	273.2	108.4
28-Jul-19	30.0	371.0	182.0	23.6	437.1	219.4	SD	SD	SD
29-Jul-19	29.7	401.7	184.9	31.7	431.9	219.3	SD	SD	SD
30-Jul-19	35.1	457.9	191.5	30.7	423.6	218.1	32.0	414.3	155.9
31-Jul-19	41.5	460.5	225.0	31.0	422.4	218.0	33.2	407.5	207.4
1-Aug-19	34.1	380.4	203.9	32.0	418.3	217.3	32.1	404.1	207.2
2-Aug-19	32.7	402.6	207.2	30.5	416.7	217.3	32.6	402.2	207.2
3-Aug-19	31.9	481.1	199.7	31.3	422.3	218.6	32.6	402.2	207.4
4-Aug-19	37.6	451.4	194.6	31.4	407.3	215.5	32.2	393.9	207.4
5-Aug-19		407.9	216.0	30.3	417.6	218.3	33.6	395.2	206.9
6-Aug-19	33.0	385.9	213.1	31.4	419.8	218.5	33.4	395.3	207.6
7-Aug-19	32.3	370.9	195.5	31.5	418.1	218.3	33.6	391.9	207.7

8-Aug-19	34.7	292.5	211.7	32.0	395.4	213.4	33.5	379.7	207.1
9-Aug-19	32.8		177.2	30.6	378.6	211.0	32.7	365.9	205.6
10-Aug-19	36.4		191.9	31.0	413.4	219.2	33.1	367.8	205.6
11-Aug-19	35.5		190.3	31.3	422.7	220.1	32.5	371.4	207.3
12-Aug-19	36.5		224.7	31.7	430.8	222.6	32.7	372.4	207.0
13-Aug-19	35.2		218.7	32.8	422.8	220.6	33.9	367.4	207.8
14-Aug-19	34.5		206.0	33.4	418.6	220.0	33.6	361.5	207.5
15-Aug-19	32.4		184.0	30.4	390.4	215.0	32.3	345.9	206.6
16-Aug-19	33.4		182.8	30.6	390.5	218.1	31.6	346.5	206.1
17-Aug-19	33.6		187.2	31.0	390.8	219.5	31.3	346.7	206.0
18-Aug-19	33.8		205.4	31.2	393.6	220.5	31.5	346.4	205.9
19-Aug-19	33.4		188.1	31.7	389.0	219.9	32.6	340.3	205.3
20-Aug-19	34.5		202.8	33.2	372.9	217.0	33.6	328.6	204.3
21-Aug-19	33.8		195.1	33.4	370.4	217.4	33.7	327.0	204.1
22-Aug-19	33.7		197.9	33.6	364.5	217.2	34.4	321.8	203.9
23-Aug-19	34.1		202.5	33.7	350.4	213.4	34.5	312.8	202.9
24-Aug-19	33.9		197.7	31.8	342.7	213.6	33.1	309.4	202.3
25-Aug-19	32.6		186.4	31.3	339.7	211.1	32.4	301.0	201.6
26-Aug-19	33.1		200.2	31.0	357.1	217.6	32.5	309.4	202.3
27-Aug-19	32.2		193.8	33.4	361.0	218.8	33.7	311.8	203.3
28-Aug-19	32.3		203.5	34.2	369.7	219.6	34.6	315.1	204.2
29-Aug-19	35.2	252.7	226.6	34.2	391.4	221.2	34.9	327.5	205.8
30-Aug-19	38.7	258.3	243.4	33.7	437.6	229.0	34.8	333.6	207.5
31-Aug-19	36.1	261.9	238.9	33.9	449.4	230.9	35.2	336.6	209.3
1-Sep-19	30.6	456.7	207.4	31.7	417.8		33.0	319.1	210.1
2-Sep-19	32.2	373.7	220.8	31.3	387.2		32.7	297.3	208.1
3-Sep-19	29.8	457.7	249.3	28.2	415.9		32.7	308.4	207.7
4-Sep-19	29.7	328.8	212.7	29.7	419.7		32.8	309.7	208.3
5-Sep-19	30.0		204.9	31.4	404.8		32.2	298.3	207.8
6-Sep-19	32.2		213.2	30.3	395.2		32.0	291.8	207.6
7-Sep-19	30.3		178.1	30.5	396.6		31.7	294.1	207.7
8-Sep-19				30.6	383.9		32.5	280.6	206.8
9-Sep-19	31.0	253.9		SD	SD	SD	32.5	362.4	179.4
10-Sep-19	30.5		225.2	SD	SD	SD	33.3	418.5	194.8
11-Sep-19	28.8		149.1	SD	SD	SD	33.4	294.1	192.6
12-Sep-19	29.0		174.9	SD	SD	SD	34.3		108.7
13-Sep-19	29.2		166.0	SD	SD	SD	34.1	393.0	114.4
14-Sep-19	30.0		166.8	SD	SD	SD	33.6	409.6	246.7
15-Sep-19	29.6		185.6	SD	SD	SD	32.8	448.4	254.2
16-Sep-19	29.4	261.4	198.0	SD	SD	SD	33.0	441.3	252.5
17-Sep-19	30.6	405.1	268.7	SD	SD	SD	33.6	446.1	248.4
18-Sep-19	32.0	401.8	323.6	32.3		120.4	32.4	445.2	247.7
19-Sep-19	31.6	398.5	283.2	33.2			32.9	312.7	200.3
20-Sep-19	31.8	406.2	302.4	31.7	817.1	177.2	32.1		152.7
21-Sep-19	30.8	408.4	268.0	31.7	388.2	217.1	32.0	334.8	154.4
22-Sep-19	30.3	400.3	222.4	31.5	384.5	210.8	SD	SD	SD
23-Sep-19	31.6	401.7	284.4	32.2	390.2	225.0	20.0	283.8	
24-Sep-19	31.9	405.7	296.1	31.2	666.4	343.9	32.8	282.8	205.5
25-Sep-19	31.5	404.6	269.1	31.2	385.1	203.8	32.6	261.1	200.0
26-Sep-19	31.5	405.2	281.2	31.1	387.8	204.7	32.4	252.9	199.6
27-Sep-19	31.8	405.5	278.7	30.7	381.0	192.1	32.2	256.4	200.3
28-Sep-19	31.3	401.2	274.2	31.8	387.9	216.4			
29-Sep-19	38.0	406.5	237.8	30.9	606.4	308.3		595.0	
30-Sep-19	33.1	412.3	260.1	31.1	381.3	201.4			

	Unit 7			Unit 8			Unit 9		
Date	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-Apr-19	27.8	151.0	333.9	29.0	130.5	353.3	29.1	158.2	
2-Apr-19	28.8	154.3	337.1	30.6	135.3	365.5	32.4	159.9	
3-Apr-19	30.4	158.6	342.7	32.1	139.3	374.9	32.5	159.7	348.1
4-Apr-19	31.3	162.0	347.3	31.4	137.5	367.9	33.1	160.7	335.7
5-Apr-19	31.9	163.4	349.5	32.9	141.7	378.7	35.0	161.8	346.4
6-Apr-19	30.8	159.7	343.7	31.4	136.7	365.3	34.2	161.5	341.1
7-Apr-19	27.2	148.3	315.4	30.7	134.6	359.7	32.5	160.4	328.6
8-Apr-19	30.1	155.5	338.6	31.1	136.0	373.0	31.2	158.3	326.7
9-Apr-19	30.1	157.2	341.0	31.8	138.2	374.2	29.5	157.8	317.6
10-Apr-19	30.3	158.5	342.5	30.8	135.6	367.9	31.1	159.3	327.8
11-Apr-19	30.1	159.1	342.3	30.9	136.4	371.2	33.0	160.3	337.4
12-Apr-19	29.7	157.9	341.6	31.7	139.6	384.2	33.1	160.0	339.4
13-Apr-19	30.0	161.2	345.8	32.5	142.4	295.0	34.9	161.5	375.0
14-Apr-19	29.1	155.5	337.7	30.6	134.9		31.0	158.1	
15-Apr-19	29.2	157.7	340.5	31.5	139.1	206.6	32.0	160.3	335.6
16-Apr-19	29.0	155.1	336.6	30.0	132.8	329.2	30.6	158.4	320.3
17-Apr-19	28.4	149.3	329.8	29.4	128.9	320.8	28.3	156.6	310.5
18-Apr-19	29.4	154.5	336.8	29.5	131.5	329.0	29.1	157.1	312.6
19-Apr-19	29.4	153.8	335.9	29.6	131.8	330.3	30.2	157.6	326.8
20-Apr-19	28.7	153.3	335.3	29.5	132.5	327.5	29.3	157.5	
21-Apr-19	28.3	152.3	333.5	28.3	128.3	320.7	29.6	157.9	
22-Apr-19	30.1	159.5	342.7	31.9	139.4	350.3	33.7	160.7	323.3
23-Apr-19	29.4	156.6	339.3	32.1	138.9	348.0	33.0	160.3	
24-Apr-19	30.6	160.1	343.6	31.7	137.8	346.3	33.2	160.8	348.8
25-Apr-19	30.3	159.5	342.6	31.1	136.8	344.3	32.4	159.3	337.4
26-Apr-19	30.2	160.3	344.3	32.0	139.6	351.2	32.8	159.9	329.8
27-Apr-19	29.5	157.1	340.4	30.0	133.6	335.0	31.1	159.6	322.9
28-Apr-19	29.5	156.3	338.8	30.3	134.1	336.9	30.8	158.4	327.4
29-Apr-19	30.8	159.9	343.9	31.8	137.9	345.0	33.7	159.6	341.9
30-Apr-19	30.3	156.9	340.5	31.7	137.4	343.6	33.9	159.8	342.2
1-May-19	29.6	155.8	338.9	31.8	138.1	345.9	31.8	138.1	345.9
2-May-19	28.8	154.7	336.7	31.3	135.4	338.7	31.3	135.4	338.7
3-May-19	29.0	153.4	335.0	29.5	130.7	325.9	29.5	130.7	325.9
4-May-19	30.2	157.1	340.0	31.7	137.2	343.4	31.7	137.2	343.4
5-May-19	29.4	152.9	334.2	29.9	132.0	328.3	29.9	132.0	328.3
6-May-19	29.8	155.7	338.1	31.5	137.8	342.3	31.5	137.8	342.3
7-May-19	30.3	159.8	343.0	31.9	139.4	350.4	31.9	139.4	350.4
8-May-19	28.9	156.6	338.6	32.1	139.8	344.8	32.1	139.8	344.8
9-May-19	29.1	156.8	339.2	31.8	138.2	343.7	31.8	138.2	343.7
10-May-19	28.5	153.9	335.7	31.3	137.0	337.9	31.3	137.0	337.9
11-May-19	29.9	158.7	341.8	31.4	137.7	339.6	31.4	137.7	339.6
12-May-19	30.0	158.9	341.4	31.7	139.0	346.3	31.7	139.0	346.3
13-May-19	29.8	158.4	340.4	32.6	140.9	355.5	32.6	140.9	355.5
14-May-19	28.4	153.5	335.4	30.2	132.9	328.4	30.2	132.9	328.4
15-May-19	29.2	157.4	339.2	31.0	135.8	334.4	31.0	135.8	334.4
16-May-19	29.5	158.7	341.4	30.9	136.6	338.2	30.9	136.6	338.2
17-May-19	29.4	154.9	337.0	31.0	136.4	338.0	31.0	136.4	338.0
18-May-19	29.2	154.2	336.2	29.2	132.0	329.6	29.2	132.0	329.6
19-May-19	28.3	153.8	335.4	30.5	135.4	338.7	30.5	135.4	338.7
20-May-19	30.1	159.7	342.0	32.3	141.3	351.9	32.3	141.3	351.9
21-May-19	28.3	156.9	335.3	31.6	138.8	340.7	31.6	138.8	340.7
22-May-19	SD	SD	SD	32.2	140.5	346.4	32.2	140.5	346.4
23-May-19	SD	SD	SD	32.2	141.2	351.0	32.2	141.2	351.0
24-May-19	SD	SD	SD	31.7	137.8	346.1	31.7	137.8	346.1
25-May-19	SD	SD	SD	31.7	138.0	341.0	31.7	138.0	341.0
26-May-19	SD	SD	SD	31.3	136.8	340.5	31.3	136.8	340.5
27-May-19	SD	SD	SD	32.6	141.2	350.8	32.6	141.2	350.8
28-May-19	SD	SD	SD	34.0	144.1	358.1	34.0	144.1	358.1
29-May-19	SD	SD	SD	34.2	144.4	355.9	34.2	144.4	355.9
30-May-19	SD	SD	SD	33.0	141.5	345.8	33.0	141.5	345.8
31-May-19	SD	SD	SD	33.9	144.4	356.2	33.9	144.4	356.2

1-Jun-19	SD	SD	SD	33.8	142.4	351.4	36.1	162.5	363.5
2-Jun-19	SD	SD	SD	32.0	137.3	337.2	33.2	161.2	337.7
3-Jun-19	SD	SD	SD	32.6	140.0	345.7	34.0	161.3	341.7
4-Jun-19	SD	SD	SD	31.9	136.5	336.2	34.2	161.2	345.2
5-Jun-19	SD	SD	SD	34.5	146.9	370.2	38.5	163.1	373.4
6-Jun-19	SD	SD	SD	34.5	145.4	366.5	37.1	162.8	364.1
7-Jun-19	SD	SD	SD	34.9	148.4	373.8	37.1	162.9	345.3
8-Jun-19	SD	SD	SD	35.0	149.7	378.7	37.7	163.0	
9-Jun-19	SD	SD	SD	33.1	141.4	352.7	34.1	161.9	
10-Jun-19	SD	SD	SD	35.5	150.2	379.4	38.8	164.3	
11-Jun-19	SD	SD	SD	34.6	147.0	372.3	37.7	162.3	386.5
12-Jun-19	SD	SD	SD	33.6	141.9	354.3	34.8	161.6	332.0
13-Jun-19	SD	SD	SD	32.4	139.3	349.0	34.2	158.6	349.8
14-Jun-19	SD	SD	SD	33.8	143.3	359.8	36.9	160.7	362.6
15-Jun-19	SD	SD	SD	30.5	134.6	336.6	37.8	163.0	375.5
16-Jun-19	SD	SD	SD	28.5	127.2	316.8	32.7	161.6	335.1
17-Jun-19	SD	SD	SD	28.2	126.7	315.5	32.4	160.9	332.3
18-Jun-19	SD	SD	SD	28.3	126.7	315.7	32.2	160.6	319.4
19-Jun-19	SD	SD	SD	28.5	127.5	317.6	40.1	163.6	387.0
20-Jun-19	SD	SD	SD	28.6	127.7	318.4	38.2	162.6	368.3
21-Jun-19	SD	SD	SD	28.5	127.4	317.9	40.8	164.3	384.8
22-Jun-19		171.9	357.7	28.1	126.8	315.7	37.3	162.6	365.5
23-Jun-19		169.8	354.4	31.3	136.8	341.0	33.7	161.1	
24-Jun-19	36.1	172.8	358.9	33.7	144.8	366.0	38.4	162.5	371.9
25-Jun-19	37.4	177.8	367.2	33.8	145.9	371.6	40.0	164.4	381.7
26-Jun-19	37.2	176.4	365.5	33.5	144.8	368.8	38.0	163.2	
27-Jun-19	37.0	166.7	345.4	34.0	143.8	357.3	36.1	161.2	356.8
28-Jun-19	38.0	172.7	357.3	33.7	143.9	357.8	37.0	161.9	363.1
29-Jun-19	36.5	175.0	360.3	34.1	144.7	359.7	37.1	162.2	366.6
30-Jun-19	36.0	171.8	358.9	33.3	141.5	353.4	30.8	158.2	327.4
1-Jul-19	36.8	176.5	368.0	34.8	144.5	356.7	37.6	161.7	366.8
2-Jul-19	34.8	173.1	367.0	33.5	140.6	345.1	35.8	161.4	354.6
3-Jul-19	36.7	181.3	382.6	34.9	145.6	363.5	38.0	161.9	370.1
4-Jul-19	33.5	168.3	353.8	32.3	137.5	339.3	33.0	160.3	337.0
5-Jul-19	34.8	174.0	372.1	33.2	140.1	347.3	32.8	160.2	336.2
6-Jul-19	33.6	169.0	357.0	33.6	141.1	351.8	35.7	160.8	353.7
7-Jul-19	32.9	165.7	349.3	32.4	137.8	339.6	33.2	160.0	345.3
8-Jul-19	35.8	178.4	372.8	33.6	143.0	352.5	37.1	161.4	381.5
9-Jul-19	33.8	169.7	356.6	31.7	137.0	337.1	33.5	160.4	339.9
10-Jul-19	33.7	169.8	359.4	31.4	136.5	338.0	32.3	159.7	333.5
11-Jul-19	35.4	177.3	375.7	32.9	140.6	347.7	35.9	161.4	353.6
12-Jul-19	35.1	176.7	305.6	32.5	138.4	279.7	34.3	161.1	294.5
13-Jul-19	34.7	174.7	181.1	33.3	142.3	176.6	37.3	169.7	192.6
14-Jul-19	33.1	168.3	164.6	30.4	130.7	145.6	31.6	148.7	168.6
15-Jul-19	30.8	160.2	136.8	29.8	127.1	140.8	28.0	134.5	106.0
16-Jul-19	30.6	157.7	168.2	28.6	117.3	147.6	29.3	139.3	142.2
17-Jul-19	32.8	167.8	244.6	30.2	127.4	216.7	31.4	146.9	219.2
18-Jul-19	34.3	172.6	257.3	30.7	130.6	221.5	33.5	155.3	234.6
19-Jul-19	35.9	180.2	281.9	33.4	154.0	252.9	35.5	163.9	252.5
20-Jul-19	36.0	180.0	277.3	31.4	143.4	233.3	36.0	167.8	255.1
21-Jul-19	34.2	173.9	262.2	30.1	133.6	222.3	32.7	153.9	229.0
22-Jul-19	37.0	182.6	293.9	32.7	153.1	259.8	36.8	168.3	N/A
23-Jul-19	37.5	186.9	306.7	33.9	161.2	270.0	39.1	176.1	285.5
24-Jul-19	37.1	184.5	296.9	34.1	159.9	266.2	38.7	175.5	275.8
25-Jul-19	32.3	163.8	232.2	30.4	125.7	209.8	29.8	143.0	204.6
26-Jul-19	31.9	162.9	231.2	30.8	130.0	216.4	28.5	139.8	197.7
27-Jul-19	31.9	162.0	229.0	29.9	123.8	206.5	27.0	137.0	194.9
28-Jul-19	30.9	159.5	223.4	28.7	115.6	200.4	26.8	137.1	194.2
29-Jul-19	32.8	170.9	260.7	31.8	140.9	237.6	32.0	157.2	237.2
30-Jul-19	35.3	179.8	282.3	32.1	143.0	229.4	31.7	156.4	232.8
31-Jul-19	35.7	183.8	286.2	33.9	154.9	250.1	34.0	166.2	245.0
1-Aug-19	36.5	185.8	279.8	34.2	158.4	255.9	34.4	167.1	259.6
2-Aug-19	35.3	180.7	267.6	32.0	144.0	234.1	28.6	145.2	206.7
3-Aug-19	35.2	179.7	265.5	32.9	148.2	240.8	31.8	157.1	234.7
4-Aug-19	33.8	175.6	257.1	31.4	138.8	233.4	30.8	153.7	225.6
5-Aug-19	35.8	184.0	285.3	33.8	154.8	264.2	34.6	168.7	262.6
6-Aug-19	35.6	182.8	272.1	33.0	152.2	242.3	33.1	163.2	240.9
7-Aug-19	34.3	178.0	263.5	33.8	152.5	246.4	32.5	160.4	259.4

8-Aug-19	35.3	182.4	280.2	32.1	147.2	247.9	32.7	162.4	245.3
9-Aug-19	34.0	174.5	257.3	31.3	139.1	228.4	30.8	154.0	224.8
10-Aug-19	33.9	173.3	267.3	32.7	149.1	240.5	28.7	129.6	174.7
11-Aug-19	32.7	165.6	249.4	31.2	132.9	224.1	28.4	142.9	204.2
12-Aug-19	35.2	174.0	268.6	33.4	149.5	243.6	32.9	161.6	241.1
13-Aug-19	35.4	177.0	278.9	34.1	156.8	254.2	33.9	166.5	251.9
14-Aug-19	34.7	174.3	268.1	33.5	146.9	237.0	30.4	151.7	227.3
15-Aug-19	31.6	161.0	231.8	31.3	122.8	207.3	27.5	139.6	199.9
16-Aug-19	31.9	162.5	236.9	29.7	123.8	207.2	27.5	138.7	195.1
17-Aug-19	30.9	157.9	226.5	28.9	118.5	203.0	26.2	134.3	192.2
18-Aug-19	31.5	160.1	236.3	30.3	124.4	216.1	28.2	142.5	187.9
19-Aug-19	34.9	174.7	274.1	33.3	152.7	249.8	32.7	161.0	238.8
20-Aug-19	35.0	176.2	277.1	33.1	155.6	251.6	33.3	165.1	256.9
21-Aug-19	35.0	175.8	276.5	33.2	150.2	243.6	32.4	161.0	238.1
22-Aug-19	36.0	179.6	287.6	33.3	153.2	248.4	33.9	167.1	254.0
23-Aug-19	35.4	178.0	282.7	33.1	156.1	257.7	35.1	172.0	265.7
24-Aug-19	34.6	175.0	272.9	32.0	146.0	234.6	30.8	153.6	225.8
25-Aug-19	32.1	163.6	239.4	29.9	126.4	210.6	28.0	142.4	202.5
26-Aug-19	31.9	163.4	240.7	30.4	127.4	222.2	29.1	146.8	213.0
27-Aug-19	33.7	172.8	263.9	SD	SD	SD	32.8	161.7	206.1
28-Aug-19	34.4	177.6	277.0	SD	SD	SD	34.9	172.3	267.4
29-Aug-19	36.3	178.0	275.8	SD	SD	SD	35.1	171.8	266.2
30-Aug-19	37.4	179.7	278.3	SD	SD	SD	35.1	171.7	267.4
31-Aug-19	36.2	181.5	290.7	SD	SD	SD	35.5	172.3	261.9
1-Sep-19	33.2	168.6	249.9	SD	SD	SD	30.9	153.2	
2-Sep-19	35.3	176.4	274.9	SD	SD	SD	32.6	161.7	
3-Sep-19	35.5	179.1	281.7	SD	SD	SD	34.0	167.3	261.7
4-Sep-19	34.7	175.1	272.6	SD	SD	SD	32.3	160.0	227.2
5-Sep-19	32.0	164.0	239.6	SD	SD	SD	29.0	146.8	212.2
6-Sep-19	31.2	160.3	231.5	SD	SD	SD	28.1	142.6	202.7
7-Sep-19	31.3	162.0	235.1	SD	SD	SD	30.0	150.8	219.3
8-Sep-19	32.3	165.5	244.1	SD	SD	SD	29.7	150.7	215.6
9-Sep-19	34.1	172.4	261.4	29.5	123.4	111.6	31.8	156.9	232.8
10-Sep-19	34.5	173.4	266.0	31.5	140.6	221.3	32.1	159.2	236.1
11-Sep-19	33.6	171.2	263.7	31.6	139.8	221.7	31.8	157.1	232.2
12-Sep-19	33.5	172.8	265.1	31.8	138.9	224.5	32.1	158.4	234.9
13-Sep-19	35.1	175.4	271.8	32.9	147.0	232.4	32.1	158.1	235.3
14-Sep-19	33.7	168.9	253.9	31.2	134.4	218.5	31.2	155.5	232.2
15-Sep-19	32.2	163.1	239.3	30.6	130.4	213.0	29.5	148.1	216.2
16-Sep-19	33.7	169.2	251.3	32.2	141.0	226.2	30.7	152.8	233.1
17-Sep-19	34.1	171.1	256.9	33.0	146.1	233.4	33.4	163.8	249.3
18-Sep-19	34.0	170.8	254.8	31.0	130.2	214.1	30.6	152.9	224.0
19-Sep-19	33.8	168.2	252.6	31.6	137.3	225.1	32.2	158.5	205.5
20-Sep-19	34.3	169.6	251.2	32.5	141.9	226.6	32.5	160.3	
21-Sep-19	34.6	161.6	246.3	32.6	142.4	224.5	28.2	142.6	
22-Sep-19	31.1	123.5	205.4	28.9	114.7	198.0	27.0	137.0	
23-Sep-19	33.4	134.2	229.2	30.4	126.4	214.3	31.0	154.6	245.3
24-Sep-19	32.9	145.4	238.6	30.7	133.2	213.4	29.6	148.4	214.1
25-Sep-19	33.1	169.4	254.5	31.2	133.1	217.7	29.9	149.0	215.6
26-Sep-19	33.9	179.8	255.2	31.8	139.4	215.9	29.6	147.5	211.2
27-Sep-19	32.8	164.4	239.7	30.7	127.2	213.2	29.4	145.6	211.5
28-Sep-19	33.4	166.7	248.7	31.5	132.5	220.4	27.8	139.7	200.2
29-Sep-19	30.7	157.5	225.5	27.4	110.0	192.4	28.1	141.1	
30-Sep-19	31.7	163.9	242.6	29.4	122.6	208.7	29.4	147.5	221.2

Terrestrial Ecology Report (April to September, 2019)

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

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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 **April to September, 2019** 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	2.0	N 22° 50' 22.72" E 69° 33' 46.62"
2	Near Tunda Village	1.5	N 22° 50' 13.50" E 69° 32' 2.45"
3	Near Kandagra Village	3.0	N 22° 50' 22.01" E 69° 31' 33.35"
4	Near Navinal Creek	8.5	N 22° 48' 12.66" E 69° 37' 57.37"
5	Near Vandh Village	0.5	N 22° 48' 44.94" E 69° 32' 33.04"
6	Near Desalpar Village	7.0	N 22° 52' 50.91" E 69° 34' 45.99"
7	Common Intake Channel area	3.8	N 22° 47' 31.21" E 69° 32' 10.63"
8	Outfall Channel and Kotdi creek area	3.5	N 22° 48' 4.62" E 69° 34' 33.98"

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*. *Acasia 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*. 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 (Amli)* 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* etc. comprises top layer of the vegetation.

Salvadora oleoides, Phoenix sylvestris, Cassia auriculata, Capparis deciduas, Pithecellobium dulce, Calotropis procera **(Plate 2)**, *Euphorbia nevulia, Prosopis juliflora, Zizyphus mauritiana, Zizyphus nummularia, Tamarix dioica,* etc. forms middle layer of vegetation.

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

Plate 1: Fruit of *Citrullus colocynthis*

Plate 2: Flowers of *Calotropis procera*

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 m^2, 25 m^2 and 1 m^2 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:

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

Where H' = Shannon-Wiener diversity index

Pi = Proportional abundance of the i th (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 **2.02, 2.23** and **2.33** 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	ln (Pi)	Pi X Ln (Pi)
Acacia nilotica	NE	4	16	43	6.84	13.69	0.01	160	6.64	0.15	4.54	0.4	9.09	20.27	0.0664	-2.7122	0.18
Azadiracta indica	NE	8	25	68	10.82	21.64	0.04	250	10.37	0.37	11.35	0.8	18.18	39.91	0.1037	-2.2659	0.24
Borassus flabellifer	NE	2	9	85	13.53	27.05	0.06	90	3.73	0.57	17.74	0.2	4.55	26.02	0.0373	-3.2876	0.12
Casuarina equisetifolia	NE	4	48	23	3.66	7.32	0.00	480	19.92	0.04	1.30	0.4	9.09	30.31	0.1992	-1.6136	0.32
Cocos nucifera	NE	5	25	88	14.00	28.01	0.06	250	10.37	0.62	19.02	0.5	11.36	40.75	0.1037	-2.2659	0.24
Mangifera indica	DD	5	23	59	9.39	18.78	0.03	230	9.54	0.28	8.55	0.5	11.36	29.45	0.0954	-2.3493	0.22
Phoenix dactylifera	NE	4	18	98	15.60	31.19	0.08	180	7.47	0.76	23.58	0.4	9.09	40.14	0.0747	-2.5944	0.19
Prosopis juliflora	NE	9	65	38	6.05	12.09	0.01	650	26.97	0.11	3.55	0.9	20.45	50.97	0.2697	-1.3104	0.35
Salvadora persica	NE	3	12	65	10.34	20.69	0.03	120	4.98	0.34	10.37	0.3	6.82	22.17	0.0498	-2.9999	0.15
Total			**241**					**2410**	**100**	**3.24**	**100**	**4.4**	**100**	**300**			**2.02**
																Shannon-Wiener	**2.02**

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)
Aerva javanica	NE	3	10	25	6.67	0.30	6.82	13.48	0.0667	-2.7081	0.18
Calotropis gigantea	NE	4	6	15	4.00	0.40	9.09	13.09	0.0400	-3.2189	0.13
Calotropis procera	NE	5	12	30	8.00	0.50	11.36	19.36	0.0800	-2.5257	0.20
Capparis deciduas	NE	4	11	28	7.33	0.40	9.09	16.42	0.0733	-2.6127	0.19
Cassia auriculata	NE	7	26	65	17.33	0.70	15.91	33.24	0.1733	-1.7525	0.30
Euphorbia spp.	NE	5	16	40	10.67	0.50	11.36	22.03	0.1067	-2.2380	0.24
Tamarix dioica	NE	3	23	58	15.33	0.30	6.82	22.15	0.1533	-1.8751	0.29
Thevetia peruviana	NE	5	18	45	12.00	0.50	11.36	23.36	0.1200	-2.1203	0.25
Zizyphus mauritiana	NE	3	13	33	8.67	0.30	6.82	15.48	0.0867	-2.4457	0.21
Zizyphus numularia	NE	5	15	38	10.00	0.50	11.36	21.36	0.1000	-2.3026	0.23
		Total	**150**	**375**	**100.00**	**4.40**	**100.00**	**200.00**			**2.23**
										Shannon-Wiener	**2.23**

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)
Achyranthes aspera	NE	5	18	0.18	7.76	0.5	10.87	18.63	0.0776	-2.5564	0.20
Aloe vera	NE	6	21	0.21	9.05	0.6	13.04	22.10	0.0905	-2.4022	0.22
Boerrhavia diffusa	NE	4	15	0.15	6.47	0.4	8.70	15.16	0.0647	-2.7387	0.18
Citrullus colocynthis	NE	3	21	0.21	9.05	0.3	6.52	15.57	0.0905	-2.4022	0.22
Ipomoea biloba	NE	2	18	0.18	7.76	0.2	4.35	12.11	0.0776	-2.5564	0.20
Salicornia brachiata	NE	6	39	0.39	16.81	0.6	13.04	29.85	0.1681	-1.7832	0.30
Solanum xanthocarpum	NE	3	9	0.09	3.88	0.3	6.52	10.40	0.0388	-3.2495	0.13
Indigofera cordifolia	NE	4	15	0.15	6.47	0.4	8.70	15.16	0.0647	-2.7387	0.18
Sporolobus maderaspatenus	NE	4	21	0.21	9.05	0.4	8.70	17.75	0.0905	-2.4022	0.22
Suaeda fruticosa	NE	5	33	0.33	14.22	0.5	10.87	25.09	0.1422	-1.9502	0.28
Tridax procumbens	NE	4	22	0.22	9.48	0.4	8.70	18.18	0.0948	-2.3557	0.22
		Total	**232**	**2.32**	**100.00**	**4.6**	**100.00**	**200.00**			**2.33**
										Shannon-Wiener	**2.33**

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

B. Faunal Diversity

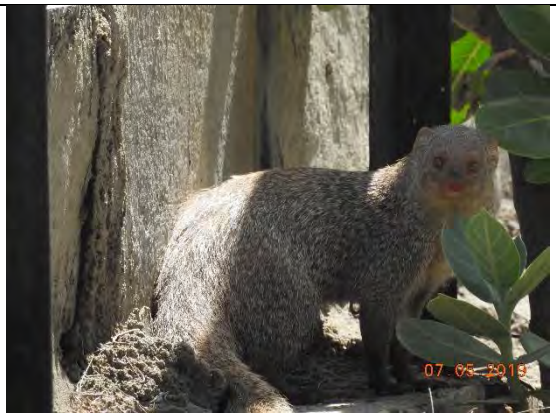
Methodology

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.

***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** and **Plate-3**.



Mongoose *(Herpestes edwardsii)*

Wild Boar *(Sus scrofa)*

Garden Lizard *(Calotes versicolor)*

Paython *(*Python molurus*)*

Plate 3: Reptiles 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	*Boselaphus tragocamelus*	LC	Schedule III
2	Jackal	*Canis aureus*	LC	Schedule II: Part - II
3	Mongoose	*Herpestes edwardsii*	LC	Schedule II: Part - II
4	Hare	*Lepus nigricollis*	LC	Schedule IV
5	Wild Boar	*Sus scrofa*	LC	Schedule III
Amphibians				
1	Indian Skipping Frog	*Euphlyctis cyanophlyctis*	LC	-
2	Indian bullfrog	*Hoplobatrachus tigerinus*	LC	-
Reptiles				
1	Garden lizard	*Calotes versicolor*	NE	-
2	Monitor lizard	*Varanus spp.*	LC	Schedule II: Part – II
3	Fan-throated lizard	*Sitana ponticeriana*	LC	-
4	Indian cobra	*Naja naja*	LC	Schedule II: Part – II
5	Python	*Python molurus*	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 **April to September, 2019**. 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:

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

Where H' = Shannon-Wiener diversity index
Pi = Proportional abundance of the i th (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 3)** & resident birds observed in the study area are shown in **(Plate 4-5)**. 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 **3.52** during this period. The Species richness for the study area is found to be **48**. Proportional abundance of the individual species varies between 0.0017 and 0.1083. The highest abundance recorded was of Blue Rock Pigeon (0.1083) and the lowest recorded were of **Black-necked stork** (0.0017). The details are presented in **Table 6**.

Asiaen koel *(Eudynamys scolopaceus)*

black winged stilt *(Himantopus himantopus)*

Blue Rock Pigeon *(Columba livia)*

brahmani starling *(Sturnia pagodarum)*

Plate 4: Resident Birds Observed in the Study Area of 10 Km


Greater coucal *(Centropus sinensis)*


Greater short toed-lark *(Calandrella brachydactyla)*


Green bee eater (Merops orientalis*)*


Indian robin *(Saxicoloides fulicatus)*


Indian Sparrow *(Passer domesticus)*


Jungle babbler *(Turdoides caudata)*


wire tailed swallow *(Hirundo smithii)*

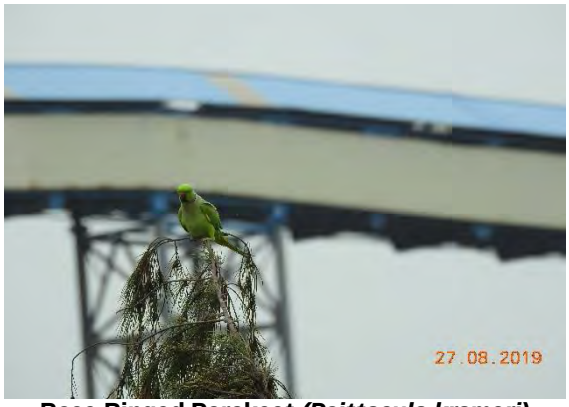

pond heron *(Egretta gularis)*

Plate 5: Resident Birds Observed in the Study Area of 10 Km

Common Coot (*Fulica atra*)

Little Cormorant (*Phalacrocorax niger*)

Red-wattled Lapwing *(Vanellus indicus)*



Rose-Ringed Parakeet *(Psittacula krameri)*

Grey Heron (*Ardea cinerea*)

white breasted kingfisher *(Halcyon smyrnensis)*

White browed wagtail *(Motacilla alba)*

White throated munia *(Lonchura malabarica)*

Plate 6: 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	ln Pi	SWI
1	Black Drongo	*Dicrurus macrocercus*	LC	Schedule IV	51	0.017641	-4.0375	0.07
2	Asian Koel	*Eudynamys scolopaceus*	LC	Schedule IV	32	0.011069	-4.5036	0.05
3	Black Ibis/Glossy Ibis	*Pseudibis papillosa*	LC	Schedule IV	26	0.008993	-4.7113	0.04
4	Black-Winged Stilt	*Himantopus himantopus*	LC	Schedule IV	68	0.023521	-3.7499	0.09
5	Blue Rock Pigeon	*Columba livia*	NE	Schedule IV	313	0.108267	-2.2232	0.24
6	Black-necked stork	*Ephippiorhynchus asiaticus*	NT	Schedule IV	5	0.00173	-6.3599	0.01
7	Black headed Gull	*Chroicocephalus ridibundus*	LC	Schedule IV	8	0.002767	-5.8899	0.02
8	Brahminy Starling	*Sturnia pagodarum*	NE	Schedule IV	20	0.006918	-4.9736	0.03
9	Common Hoopoe	*Upupa epops*	LC	Schedule IV	17	0.00588	-5.1361	0.03
10	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	54	0.018679	-3.9804	0.07
11	Common Babbler	*Turdoides caudata*	LC	Schedule IV	121	0.041854	-3.1736	0.13
12	Common Crested Lark	*Galerida cristata*	LC	Schedule IV	41	0.014182	-4.2558	0.06
13	Common Myna	*Acridotheres tristis*	LC	Schedule IV	37	0.012798	-4.3584	0.06
14	Common Sandpiper	*Actitis hypoleucos*	LC	Schedule IV	206	0.071256	-2.6415	0.19
15	Common Swallow	*Hirundo rustica*	LC	Schedule IV	65	0.022484	-3.7950	0.09
16	Common Quail	*Coturnix coturnix*	LC	Schedule IV	59	0.020408	-3.8918	0.08
17	Common Teal	*Anas crecca*	LC	Schedule IV	18	0.006226	-5.0790	0.03
18	Desert Wheatear	*Oenanthe deserti*	LC	Schedule IV	52	0.017987	-4.0181	0.07
19	Greater Coucal	*Centropus sinensis*	LC	Schedule IV	27	0.009339	-4.6735	0.04
20	Greater Short-toed Lark	*Calandrella brachydactyla*	LC	Schedule IV	45	0.015566	-4.1627	0.06
21	Green Bee Eater	*Merops orientalis*	LC	Schedule IV	120	0.041508	-3.1819	0.13
22	Grey Heron	*Ardea cinerea*	LC	Schedule IV	29	0.010031	-4.6021	0.05
23	Greater flamingoes	*Phoenicopterus roseus*	LC	Schedule IV	32	0.011069	-4.5036	0.05
24	Grey Francolinm	*Francolinus pondicerianus*	LC	Schedule IV	84	0.029056	-3.5385	0.10
25	House Crow	*Corvus splendens*	LC	Schedule V	92	0.031823	-3.4476	0.11
26	House Sparrow	*Passer domesticus*	LC	Schedule IV	247	0.085438	-2.4600	0.21
27	Indian Pond Heron	*Ardeola grayii*	LC	Schedule IV	69	0.023867	-3.7353	0.09
28	Indian Robin	*Saxicoloides fulicatus*	LC	Schedule IV	30	0.010377	-4.5682	0.05
29	Indian Roller	*Coracias benghalensis*	LC	Schedule IV	33	0.011415	-4.4729	0.05
30	Large Egret	*Ardea alba*	LC	Schedule IV	32	0.011069	-4.5036	0.05
31	Laughing Dove	*Spilopelia senegalensis*	LC	Schedule IV	68	0.023521	-3.7499	0.09
32	Little Cormorant	*Microcarbo niger*	LC	Schedule IV	30	0.010377	-4.5682	0.05
33	Little Egret	*Egretta garzetta*	LC	Schedule IV	34	0.011761	-4.4430	0.05
34	Little Ringed Plover	*Charadrius dubius*	LC	Schedule IV	21	0.007264	-4.9248	0.04
35	Painted Stork	*Mycteria leucocephala*	NT	Schedule IV	17	0.00588	-5.1361	0.03
36	Pied Kingfisher	*Ceryle rudis*	LC	Schedule IV	22	0.00761	-4.8783	0.04
37	Purple Sunbird	*Nectarinia asiatica*	LC	Schedule IV	83	0.02871	-3.5505	0.10
38	Red Vented Bulbul	*Pycnonotus cafer*	LC	Schedule IV	146	0.050502	-2.9858	0.15
39	Red Wattled Lapwing	*Vanellus indicus*	LC	Schedule IV	62	0.021446	-3.8422	0.08
40	Rose-Ringed Parakeet	*Psittacula krameri*	LC	Schedule IV	36	0.012452	-4.3858	0.05
41	Spot billed duck	*Anas poecilorhyncha*	LC	Schedule IV	9	0.003113	-5.7721	0.02
42	Small Blue (Common) Kingfisher	*Alcedo atthis*	LC	Schedule IV	33	0.011415	-4.4729	0.05
43	Western Reef Heron	*Egretta gularis*	LC	Schedule IV	69	0.023867	-3.7353	0.09
44	White Breasted Kingfisher	*Halcyon smyrnensis*	LC	Schedule IV	71	0.024559	-3.7067	0.09
45	White-Eared Bulbul	*Pycnonotus leucotis*	LC	Schedule IV	26	0.008993	-4.7113	0.04
46	White-Throated Munia	*Lonchura malabarica*	LC	Schedule IV	67	0.023175	-3.7647	0.09
47	White Wagtail	*Motacilla alba*	LC	Schedule IV	18	0.006226	-5.0790	0.03
48	Wire-tailed Swallow	*Hirundo smithii*	LC	Schedule IV	46	0.015911	-4.1407	0.07
Total					**2891**			**3.52**
Shannon-Wiener								**3.52**

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 April to September, 2019 total **236.44 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 April to September, 2019 total **3703 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**.

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Annex - III

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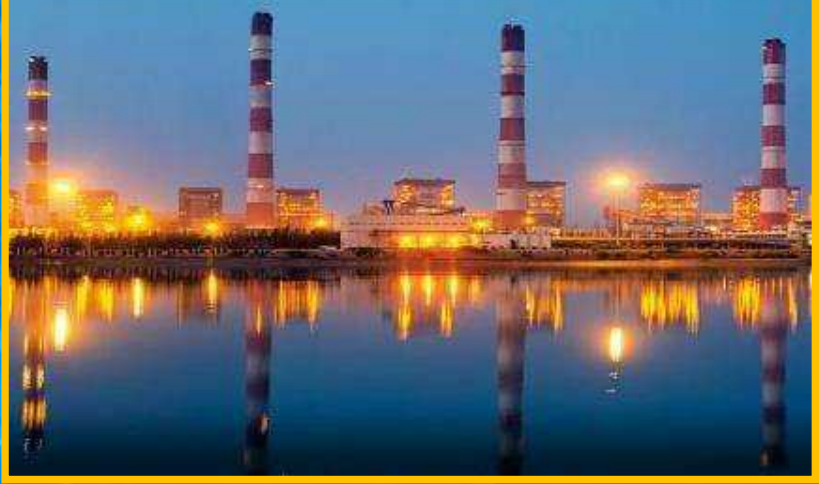
MARINE MONITORING REPORT

September– 2019(Monsoon)

FOR

M/s. ADANI POWER (MUNDRA) LIMITED



At

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

Prepared by

UniStar
Environment & Research Labs Pvt. Ltd.

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.

These Marine Monitoring reports provide a data obtained from monitoring and analysis activities undertaken during (monsoon) September 2019.

Date: 27/09/2019

M/S.UniStar Environment and
Research Labs Pvt. Ltd.
White house, Char Rasta,
Vapi-396 191

Sampling by	Report Prepared By	Approved by
		
(Bhavin Patel)	(Shweta Rana)	(Jaivik Tandel)

adani

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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) Sediment samples will be analyzed for estimate selected trace metals.

c) 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.

d) To recommend adequate marine environmental management measures

1.3 Study program:

Period:

The field investigation is completed during September 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 34.'56"N	69°32'58.95"E
2	Mouth of intake point	22°46'58.26"N	69°32'06.93"E
3	West port area	22°45'23.59"N	69°35'20.61"E
4	Outfall area	22°44' 49.69"N	69°36'29.61"E
5	Outfall area	22°44'44.68"N	69°36'46.64"E

Intertidal transect			
I	High Tide water level	22° 48′ 09.6″ N	69° 34′ 27.8″ E
	Low Tide water level	22°56′42.3″N	69°52′38.5″E
II	High Tide water level	22° 48′ 18.0″ N	69°34′ 03.4″ E
	Low Tide water level	22°52′38.1″N	69°52′20.2″E
III	High Tide water level	22° 45′ 30.0″ N	69°47′34.1″E
	Low Tide water level	22° 45′ 34.0″ N	69°35′ 50.4″ 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 m^2. 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 Flurometer 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 m^2 area and biomass on wet weight basis.

WATER QUALITY

2.1 Marine Water quality:

Sea water samples have been collected during September 2019(Monsoon)

From Five locations, which are listed in Table 2

Table 2: Water sampling locations, September 2019(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	8.18	8.14	8.04	8.10	IS 3025(Part 11)1983
2.	Temperature (^{0}C)	29.5	29.8	30.5	30.8	IS 3025(Part 9)1984
3.	Turbidity (NTU)	1	1	1	1	IS 3025(Part 10)1984
CHEMICAL QUALITY						
1.	Total Suspended Solids (mg/l)	56	54	58	55	(APHA 23rd Ed.,2017,2540-D)
2.	Biochemical Oxygen Demand (BOD) (mg/l)	4.8	4.6	5.6	5.8	IS 3025(Part 44)1993Amd.01
3.	Sulphate as SO_4(mg/l)	2840	2810	2784	2745	(APHA 23rd Ed.,2017,4500-SO4 E)
4.	Ammonical Nitrogen(µmol/l)	0.5	0.7	1.2	0.9	(APHA 23rd Ed.,2017,4500-NH3 B)
5.	Salinity (ppt)	35.8	36.1	34.8	35.0	By Calculation
6.	Dissolved Oxygen (mg/l)	5.1	5.2	5.9	5.6	IS 3025(Part 38)1989,
7.	Total Nitrogen (µmol/l)	9.58	6.28	7.69	8.58	(APHA 23rd Ed.,2017,4500-O,B),
8.	Dissolved Phosphate (µmol/l)	1.28	1.08	1.14	1.68	APHA 23rd Ed.,2017,4500 NH3 - B
9.	Nitrate (µmol/l)	5.06	5.08	6.45	7.15	(APHA 23rd Ed.,2017,4500-P,D)
10.	Nitrite (µmol/l)	1.46	1.28	1.56	1.38	(APHA 23rd Ed.,2017,4500 NO3-B)
11.	Phenol(µg/l)	N.D.(MDL: 0.01)	N.D.(MDL:0.01)	N.D.(MDL:0.01)	N.D.(MDL:0.01)	APHA 23rd Ed.,2017,4500NO2B
12.	PHc (ppb)	N.D.	N.D.	N.D.	N.D.	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	7.98	7.95	8.08	8.02	IS 3025(Part 11)1983
2.	Temperature ^{0}C	29.5	31.0	30.5	30.8	IS 3025(Part 9)1984
3.	Turbidity (NTU)	2	2	3	3	IS 3025(Part 10)1984
CHEMICAL QUALITY						
1.	Total Suspended Solids (mg/l)	58	55	57	56	(APHA 23rd Ed.,2017,2540-D)
2.	Biochemical Oxygen Demand (BOD) (mg/l)	5.3	6.2	5.8	6.0	IS 3025(Part 44)1993Amd.01
3.	Sulphate as SO_4(mg/l)	2899	2812	2685	2756	(APHA 23rd Ed.,2017,4500-SO4 E)
4.	Ammonical Nitrogen(µmol/l)	0.6	1.0	0.9	1.2	(APHA 23rd Ed.,2017,4500-NH3 B)
5.	Salinity (ppt)	34.8	36.2	35.1	36.8	By Calculation
6.	Dissolved Oxygen (mg/l)	5.4	5.2	5.6	5.2	IS 3025(Part 38)1989,
7.	Total Nitrogen (µmol/l)	11.12	9.62	10.28	10.54	(APHA 23rd Ed.,2017,4500-O,B),
8.	Dissolved Phosphate (µmol/l)	1.15	1.08	1.14	1.05	APHA 23rd Ed.,2017,4500 NH3 - B
9.	Nitrate (µmol/l)	7.8	8.2	9.67	9.54	(APHA 23rd Ed.,2017,4500-P,D)
10.	Nitrite (µmol/l)	1.09	1.15	1.23	0.89	(APHA 23rd Ed.,2017,4500 NO3-B)
11.	Phenol(µg/l)	N.D.(MDL:0.01)	N.D.(MDL:0.01)	N.D.(MDL:0.01)	N.D.(MDL:0.01)	APHA 23rd Ed.,2017,4500NO2B
12.	PHc (ppb)	N.D.	N.D.	N.D.	N.D.	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	8.15	8.11	IS 3025(Part 11)1983
2.	Temperature (^{0}C)	31.5	31.2	IS 3025(Part 9)1984
3.	Turbidity (NTU)	3	4	IS 3025(Part 10)1984
CHEMICAL QUALITY				
1.	Total Suspended Solids	62	44	(APHA 23rd Ed.,2017,2540- D)
2.	Biochemical Oxygen Demand (BOD) (mg/l)	3.6	3.8	IS 3025(Part 44)1993Amd.01
3.	Sulphate as SO_4 (mg/l)	2434	2590	(APHA 23rd Ed.,2017,4500-SO4 E)
4.	Ammonical Nitrogen(µmol/l)	0.8	1.2	(APHA 23rd Ed.,2017,4500-NH3 B)
5.	Salinity (ppt)	37.5	37.2	By Calculation
6.	Dissolved Oxygen (mg/l)	5.6	5.5	IS 3025(Part 38)1989,
7.	Total Nitrogen (µmol/l)	14.03	10.97	(APHA 23rd Ed.,2017,4500-O,B),
8.	Dissolved Phosphate (µmol/l)	1.47	1.15	APHA 23rd Ed.,2017,4500 NH3 - B
9.	Nitrate (µmol/l)	12.90	11.56	(APHA 23rd Ed.,2017,4500-P,D)
10.	Nitrite (µmol/l)	1.13	1.30	(APHA 23rd Ed.,2017,4500 NO3-B)
11.	Phenol(µg/l)	N.D.(MDL:0.01)	N.D.(MDL:0.01)	APHA 23rd Ed.,2017,4500NO2B
12.	PHc(ppb)1M Level	N.D.	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 29^{0}C to 31^{0}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 7.98 to 8.18 at surface level and 7.95 to 8.14 at bottom level.

c) Salinity: Salinity which is an indicator of seawater, the standard average salinity of sea water is 34 to 37 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 34.8 to 37.5 ppt at surface water as well as 35.0 to 37.2 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 & 5.2 mg/l to 5.6 mg/l at water bottom level. The comparison of average Dissolve oxygen value of 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 3.6 to 6.2mg/l at water surface level and 3.8 to 6.0mg/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 1.14 to 1.47 µmol/l in at Surface water and 1.05 to 1.68 µmol/l at Bottom water , Nitrate range 5.06 to 12.90 µmol/l in surface water and 5.08 to 11.56 µmol/l at bottom water, Nitrite range 1.09 to 1.56 µmol/l in surface level and 0.89 to 1.38 µmol/l at bottom level. This nutrient concentration values indicate water healthiness.

f) PHc and phenol: The observed Phenol & level of PHc was below detection level which indicates in significant influence of anthropogenic inputs on the water body in study area.

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 contaminates such as oil and solid waste in polluted area. Suspended solids in the study area are little variable, surface area range observed 54 to 62mg/l as well as bottom area range is 44 to 56mg/l.

The Sediment quality at different stations are measured during this investigation is presented in Table No.4 and Table No.5

2.3 Inter tidal & Sub tidal Sediment analysis result

Table 4 : Sub Tidal Sediment Analysis Result

No.	Parameters	SUBTIDAL SEDIMENT QUALITY(µg/g)					Test Method Permissible
		Station 1	Station 2	Station 3	Station 4	Station 5	
1.	Texture	Silty sand	sandy	sandy	Silty sand	Loamy sand	--
2.	Aluminum as Al	1.4	1.6	2.6	2.0	3.4	IS 3025(Part 55)2003
3.	Cobalt as Co	5	4	6	8	N.D.	AAS Method
4.	Copper as Cu	6	8	4	13	12	IS 3025(Part 42)1992amd.01,
5.	Zinc as Zn	0.553	0.534	0.574	0.595	0.423	IS 3025(Part 49)1994
6.	Mercury	N.D.	N.D.	N.D.	N.D.	N.D.	(APHA 22nd Ed.,2012,3112-B)
7.	Phosphorous (Total)	373	325	405	422	391	(APHA22nd Ed.,2012,4500 -P,D)
8.	C(Org.)%	0.9	1.4	1.2	1.5	0.8	Standard method (Walkley and Black, 1934).
9.	Chromium	18	24	16	38	43	IS 3025(Part 52)2003,
10.	Nickel	8	10	12	7	9	IS 3025(Part 54)2003,
11.	Manganese	731	649	773	574	755	APHA 22nd Ed.,2012,3500 Mn B
12.	Iron%	2.3	3.1	1.6	1.4	2.4	IS 3025(Part 53)2003,
13.	PHc	0.1	0.1	0.4	0.1	0.1	G.C.Method
14.	Arsenic	N.D.	N.D.	N.D.	N.D.	N.D.	APHA 22nd Ed.,2012,3114-C

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

Table 5: Inter tidal Sediment Analysis Result

INTER TIDAL SEDIMENT QUALITY (µg/g)						
Sr. No	Parameters	Transect 1		Transect 2		Test Method Permissible
		High Tide	Low Tide	High Tide	Low Tide	
1.	Texture	Sandy	Sandy	Sandy	Sandy	--
2.	Aluminium as Al	1.8	1.6	2.0	2.9	IS 3025(Part 55)2003
3.	Cobalt as Co	3	5	4	2	AAS Method
4.	Copper as Cu	3	6	8	5	IS 3025(Part 42)1992amd.01,
5.	Zinc as Zn	0.486	0.523	0.556	0.495	IS 3025(Part 49)1994
6.	Mercury	N.D.	N.D.	N.D.	N.D.	(APHA 22ndEd.,2012,3112-B)
7.	Phosphorous (Total)	256	355	290	325	(APHA 22ndEd.,2012,4500-P,D)
8.	C(Org.)%	0.8	1.0	0.9	0.9	Standard method (Walkley and Black, 1934).
9.	Chromium	15	12	18	24	IS 3025(Part 52)2003,
10.	Nickel	6	8	10	7	IS 3025(Part 54)2003,
11.	Manganese	653	689	732	660	APHA 22ndEd.,2012,3500 Mn B
12.	Iron%	2.0	2.8	3.4	3.6	IS 3025(Part 53)2003,
13.	PHc	0.1	0.1	0.1	0.1	G.C.Method
14.	Arsenic	N.D.	N.D.	N.D.	N.D.	APHA 22ndEd.,2012,3114-C

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

- The texture of sediment is sandy to sandy loam and sandy clay loam.
- The highest phosphorus content (422µgm/gm) was recorded at ST-4 and lowest phosphorous content (325 µgm/gm) was found at ST-2 in sub tidal region. In the Inter ltidal region highest phosphorus content (355 µgm/gm) was recorded at IT-1(LWL) and lowest phosphorous content (256 µgm/gm) was found at IT-1(HWL)
- The Chromium content of marine sediment was ranged from 16µgm/gm to 43µgm/gm. The highest chromium content was recorded at ST-5 and lowest at ST-3. And in Intertidal region the highest chromium content (24 µgm/gm) was recorded at IT-2(LWL) and lowest chromium content (12 µgm/gm) was found at IT-1(LWL)
- The highest Nickel content (12 µgm/gm) was recorded at ST-3 and lowest Nickel content (7µgm/gm) was recorded at ST-4. In the Inter tidal region highest Nickel content (10µgm/gm) was recorded at IT-2(HWL) and lowest Nickel content (6µgm/gm) was found at IT-1(HWL).
- The highest Copper content (13 µgm/gm) was recorded at ST-4 and lowest copper content (4 µgm/gm) was recorded at ST-3. In the Inter tidal region highest copper content

(8µgm/gm) was recorded at IT-2(HWL) and lowest copper content (3µgm/gm) was found at IT-1(HWL).

- The highest Zinc content (0.595 µgm/gm) was recorded at ST-4 and lowest zinc content (0.423 µgm/gm) was recorded at ST-5. In the Inter tidal region highest Zinc content (0.486 µgm/gm) was recorded at IT-1(HWL) and lowest Zinc content (0.556µgm/gm) was found at IT-2(HWL).
- The highest Organic carbon content (1.5 %) was recorded at ST-4 and lowest Organic carbon content (0.8 %) was recorded at ST-5. In the Inter tidal region highest Organic carbon content (1.0 %) was recorded at IT-1(LWL) and lowest Organic carbon content (0.8 %) was found at IT-1(HWL).
- The highest Iron content (3.1 %) was recorded at ST-2 and lowest Iron content (1.4%) was recorded at ST-4. In the Inter tidal region highest Iron content (3.6%) was recorded at IT-2(LWL) and lowest Iron content (2.0%) was found at IT-1(HWL).
- The highest Manganese content (773µgm/gm) was recorded at ST-3 and lowest Manganese content (574µgm/gm) was recorded at ST-4. In the Inter tidal region highest Manganese content (732µgm/gm) was recorded at IT-2(HWL) and lowest Manganese content (653µgm/gm) was found at IT-1(HWL).
- The highest Aluminium content (3.4µgm/gm) was recorded at ST-5 and lowest Aluminium content (1.4µgm/gm) was recorded at ST-1. In the Inter tidal region highest Aluminium content (2.9µgm/gm) was recorded at IT-1(LWL) and lowest Aluminium content (1.6µgm/gm) was found at IT-1(LWL).
- The highest Cobalt content (8.0µgm/gm) was recorded at ST-4 and lowest Cobalt content (0.0µgm/gm) was recorded at ST-5. In the Inter tidal region highest Cobalt content (5.0µgm/gm) was recorded at IT-1(LWL) and lowest Cobalt content (2.0µgm/gm) was found at IT-2(LWL).
- Arsenic & Mercury was not detected in any station.

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 APL 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: 6 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.7

Table 7: Phytoplankton Sampling Station

Station	Location	Co ordinates		Water depth	Tide
1	Intake point	22°48 34.'56"N	69°32'58.95"E	6 m	Flood
2	Intake point Mouth area	22°46'58.26"N	69°32'06.93"E	6.5 m	Ebb - Flood
3	West port area	22°45'23.59"N	69°35'20.61"E	10 m	Flood - Ebb
4	Outfall area	22°44' 49.69"N	69°36' 29.61"E	6 m	Flood
5	Outfall area	22°44'44.68"N	69°36' 46.64"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

During the sampling period a total of 35 phytoplankton genera (29 diatom genera and 6 dinoflagellate genera) were observed in sampled water (Table 8). Diatom genera includes, Amphora sp., Bacillaria sp., Biddulphia sp., Chaetoceros sp., Cocconeis sp., Coscinodiscus sp., Cylindrotheca sp., Diploneis sp., Ditylum sp., Fragillaria sp., Gramatophora sp., Gyrosigma sp., Lauderia sp., Leptocylindrus sp. Melosira sp., Navicula sp., Nitzschia sp., Odontella sp., Pinnularia sp., Planktoniella sp., Pleurosigma sp., Rhizosolenia sp., Scrippsiella sp., Skeletonema sp., Surirella sp., Thalassionema sp., Thalassiosira sp., Thalassiothrix sp. and Trachyneis sp.. Whereas, dinoflagellate includes Ceratium sp., Dinophysis sp., Noctiluca sp., Peridinium sp.,Prorocentrum sp. and Protoperidinium sp. were identified from sub-tidal and intertidal region. Average phytoplankton abundance recorded in surface waters was

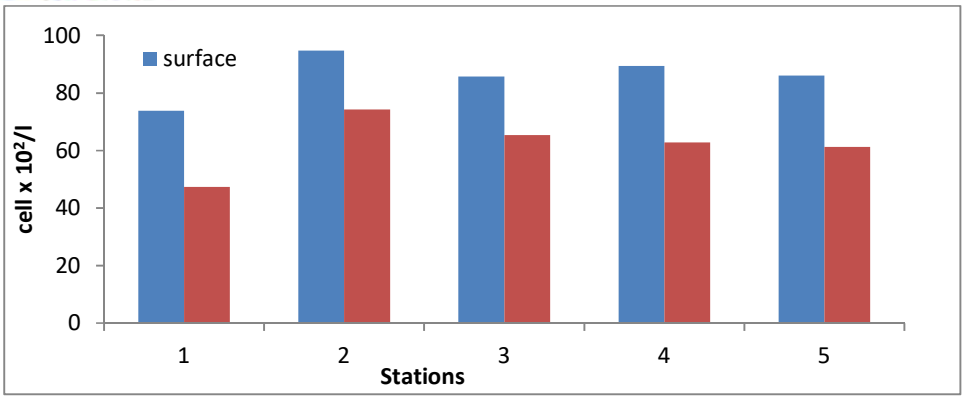
81.91±7.79 cells x 102/l, whereas, in bottom waters phytoplankton abundance was 62.15±9.72 cells x 102/l.

The phytoplankton abundance in the study region was ranged from 73.74 cells x 102/l to 94.69 cells 102/l (Table 8) in surface waters. In surface water samples, highest phytoplankton abundance was observed at surface water of Station 2 (94.69 cells 102/l), whereas in bottom water samples, the highest phytoplankton abundance was recorded at Station 2 (74.22 cells 102/l). The phytoplankton community in the sampling area was dominated by Nitzschia sp. (23.01%), Thalassionema sp. (14.36%), Rhizosolenia sp.(14.96), Navicula sp. (9.25%) and Coscinodiscus sp. (6.50%).

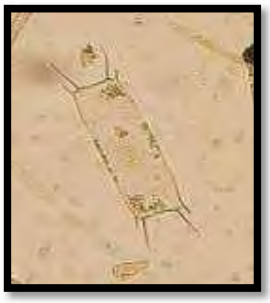
The increase abundance of phytoplanktons at particular station might be due to increase density of single genus for example Nitzschia sp. The study shows that marine water around APL, Mudra are well supported for growth of phytoplankton species.

Table 8: Phytoplankton composition and abundance (Cells x 10^2/l) at sub-tidal and inter-tidal stations in the coastal waters of APMuL, Mundra during September 2019 (S=Surface; B=Bottom).

Phytoplankton genera	Sampling Stations									
	Station 1		Station 2		Station 3		Station 4		Station 5	
	S	B	S	B	S	B	S	B	S	B
Diatoms										
Amphora sp.	0.6	0.5	1.8	0.5	0.24	0.1	0.2	0.5	0.6	0.3
Bacillaria sp.	0.5	0	0.2	0	0	0	0.1	0	0	0.2
Biddulphia sp.	1.4	1.2	0.95	1.3	1.6	1.5	1	0.7	1.65	1.78
Chaetoceros sp.	0.1	0.12	0.2	0	0.35	0.14	0.3	0.1	0.2	0
Cocconeis sp.	0.5	0	0.2	0	0	0.2	0	0.5	0	0.5
Coscinodiscus sp.	1.6	1	4.6	3.1	6.4	4.5	7.3	5.4	8.8	5.4
Cylindrotheca sp.	0	0	0	0	0	0.6	0.5	0.3	0.8	0.6
Diploneis sp.	2.3	0.2	1.7	0.3	0.26	0.3	1.7	0.6	2.1	0.9
Ditylum sp.	0.7	0.2	0.4	0	0.4	0.2	0.4	0.1	0.64	0.2
Fragillaria sp.	1.7	2.4	1.6	0.8	3.65	2.2	5.7	3.5	5.8	4.1
Grammatophora sp.	0.5	0.9	7.9	2.2	0.65	0.2	0.7	0.65	0.9	0.6
Gyrosigma sp.	0	0.6	0	0	0.25	0	0.6	0.7	0.3	0.5
Lauderia sp.	0.23	0.15	0.8	0.34	0.78	0.1	0.3	0.5	0.4	0
Leptocylindrus sp.	0.15	0.16	0.7	0.21	0.34	0.1	0.12	0	0.7	0.2
Melosira sp.	0.5	0	0	0.6	1.32	0.8	0.7	0.3	1.2	0.6
Navicula sp.	4.8	6.5	1.4	6.9	8.8	7.9	10.4	6.8	8.4	6.6
Nitzschia sp.	29.5	15.2	18.6	18.7	16.7	13.6	19.4	11.6	15.4	11.6
Odontella sp.	0.4	1.6	0	1.4	0	0.2	0.6	0.2	0.65	0.2
Pinnularia sp.	0.4	0	0.2	0.15	0	0	0.1	0	0.1	0
Planktoniella sp.	0	0	0.1	0	0.2	0	0.4	0.5	0.3	0.5
Pleurosigma sp.	5.5	3.9	2.7	2.4	3.6	2.5	5.4	3.2	4.4	2.2
Rhizosolenia sp.	12.6	0	27.9	19.4	10.9	8.1	7.7	6.2	6.8	5.2
Scrippsiella sp.	0	0	0	0	0.2	0	0.4	0	0.4	0
Skeletonema sp.	0.3	0.12	0.14	0.1	0.3	0.15	0.6	0.7	0.5	0.2
Surirella sp.	1.7	0.5	0.4	0.6	1.2	1.5	1.5	1.3	1.67	0.8
Thalassionema sp.	1.9	6.8	8.9	6.9	17.1	15.3	12.6	10.6	14.6	11.6
Thalassiosira sp.	0.8	0	2.7	0.7	1.1	0.2	0.6	0.8	0.8	0.4
Thalassiothrix sp.	1.8	4.6	2.7	4.9	2.2	0	3.1	1.62	0.4	0.6
Trachyneis sp.	0	0	0	0	0	0.2	0	0.2	0	0
Dinoflagellates										
Ceratium sp.	2.3	0.3	4.7	1.6	5.2	3.5	4.2	3.5	5.7	4.5
Dinophysis sp.	0.6	0	0.8	0.2	0.7	0.8	0.6	0.5	0.4	0.2
Noctiluca sp.	0	0	0.7	0	0.6	0.1	0.8	0.3	0.7	0
Peridinium sp.	0	0.2	1.2	0.7	0.32	0.2	0.4	0.5	0.4	0.5
Prorocentrum sp.	0.2	0	0.3	0.1	0.1	0	0.7	0.1	0	0.1
Protoperidinium sp.	0.16	0.1	0.2	0.12	0.3	0.15	0.25	0.28	0.32	0.1
Total abundance (cells x 10^2/l)	**73.74**	**47.28**	**94.69**	**74.22**	**85.76**	**65.34**	**89.37**	**62.75**	**86.03**	**61.18**



Graph 1.2: Abundance of phytoplankton (cells L^{-1}) observed in surface and bottom waters at the sampling stations.



Odontella sp.

Ditylum sp.

Pinnularia sp.

Rhizosolenia sp.

Nitzschia sp. **and** ***Navicula sp.***

Pleurosigma sp.

Ceratium sp.

Noctiluca sp.

Coscinodiscus sp.

1.3 Microphotographs of phytoplankton reported at sampling stations

3.4 Zooplankton:

Zooplankton samples were collected at 5 selected locations. The sampling details are given in following table 9.

Table 9: Zooplankton Sampling Station

Station	Location	Co ordinates		Water depth	Tide
1	Intake point	22°48 34.'56"N	69°32'58.95"E	6 m	Flood
2	intake point	22°46'58.26"N	69°32'06.93"E	6.5 m	Ebb - Flood
3	West port area	22°45'23.59"N	69°35'20.61"E	12 m	Flood - Ebb
4	Outfall area	22°44' 49.69"N	69°36' 29.61"E	5 m	Flood
5	Outfall area	22°44'44.68"N	69°36' 46.64"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

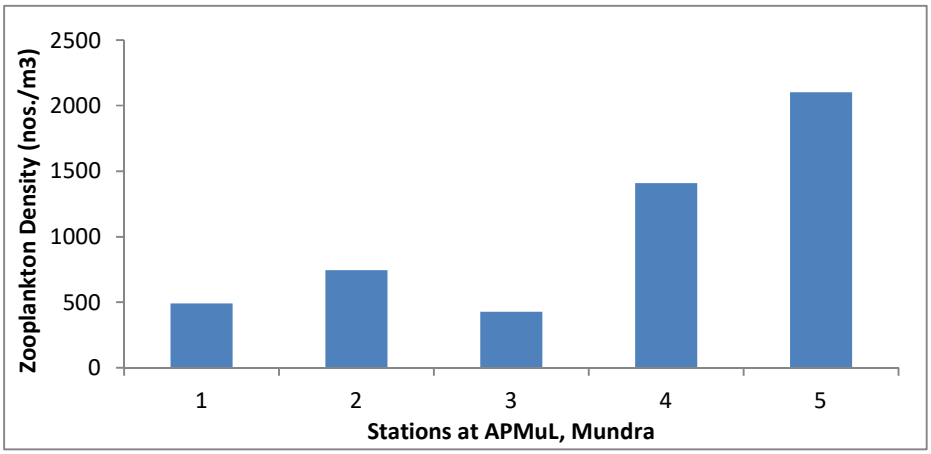
A maximum 11 groups of Zooplankton consisting of Copepods, Copepod nauplii, Decapoda (euphausids and shrimps), Amphipoda, Oikoplura, fish larvae, polychate larvae, Gastropod larvae, Crustacean larvae (brachyuran and anomuran crab larvae), Bivalve larvae, Fish and shrimp eggs were identified from study area. (Table 10). Copepods and copepod nauplii, which on an average constituted 73.35% and 14.36% of total zooplankton density respectively in all the stations. Fish and decapods eggs are another major group reported from study area contributing 6.67% of total zooplankton density at all stations. Crustacean larvae (brachyuran and anomuran crab larvae) is another group of importance which mainly consist of zoea stage larvae contributed 2.01%. Decapods, gastropod larvae and eggs of shrimps and fishes are

another major group reported in study area. 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 substantial spatial variation within all stations. Zooplankton biomass (ml/m3) and density (no.s/m3) is presented in Table 10. Among all the stations, least zooplankton biomass of 0.128 ml/m3 was recorded at Station 1 while, maximum biomass was reported at Station 5 (0.243 ml/m3). Minimum zooplankton population density was reported at Station 1 (491 nos./m3), whereas, maximum density reported at station 5 (2103 nos./m3).

Table 10: 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	0.128	491	8	Copepod, Copepod nauplii, Decapoda (euphausids and shrimps), Okiopleura, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg
ST-2	0.194	745	7	Copepod, Copepod nauplii, Decapoda (euphausids and shrimps), Polychate larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg
ST-3	0.118	429	8	Copepod, Copepod nauplii, Decapoda (euphausids and shrimps), Okiopleura, Polychate larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg
ST-4	0.169	1408	9	Copepod, Copepod nauplii, Decapoda (euphausids and shrimps), Amphipoda, Okiopleura, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg
ST-5	0.243	2103	8	Copepod, Copepod nauplii, Decapoda (euphausids and shrimps), Okiopleura, Gastropod larvae, Crustacean larvae, Bivalve larvae, Fish and decapods egg



Graph 1.4: Total number of zooplankton (no. m^{-3}) at the sampling stations.

Table 11: Density (Nos. m^{-3}) and contribution (%, in parentheses) of various zooplankton groups at station 1 to 5 in the APMuL marine waters, Mudra during September, 2019

Zooplankton group	Station 1	Station 2	Station 3	Station 4	Station 5
Copepods	431 (87.78%)	682 (91.54%)	289 (67.37%)	1025 (72.80%)	1369 (65.10%)
Copepods nauplii	14 (2.85%)	26 (3.49%)	41 (9.56%)	203 (14.42%)	459 (21.83%)
Decapoda (shrimps and euphausiids)	6 (1.22%)	11 (1.48%)	9 (2.10%)	21 (1.49%)	39 (1.85%)
Amphipoda	0	0	0	1 (0.07%)	0
Oikoplura	2 (0.41%)	0	7 (1.63%)	12 (0.85%)	11 (0.52%)
Fish larvae	0	0	0	0	0
Polychate larvae	0	1 (0.13%)	1 (0.23%)	0	0
Gastropod larvae	1 (0.20%)	0	0	3 (0.21%)	11 (0.52%)
Crustacean larvae	10 (2.04%)	8 (1.07%)	5 (1.17%)	13 (0.92%)	68 (3.23%)
Bivalve larvae	11 (2.24%)	6 (0.81%)	1 (0.23%)	15 (1.07%)	19 (0.90%)
Eggs (fish and shrimps)	16 (3.26%)	11 (1.48%)	76 (17.76%)	115 (8.17%)	127 (6.04%)
Total density (nos/m^3)	**0.128**	**0.194**	**0.118**	**0.169**	**0.243**
Total biomass (ml/m^3)	**491**	**745**	**429**	**1408**	**2103**

Copepod

Nauplii

Egg

Gastropod larvae

Anomuran crab larvae

Brachyuran crab larvae

1.5 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 (13 & 14). Sample was collected in the month of September 2019.

Table 12: Test method for Benthos analysis

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

Table 13: Sub-tidal Benthos Sampling Sites

Station	Location	Co ordinates		Sediment quality
1	Intake point	22°48 34.'56"N	69°32'58.95"E	Silty clay
2	intake point	22°46'58.26"N	69°32'06.93"E	Silty clay
3	West port area	22°45'23.59"N	69°35'20.61"E	Silty clay
4	Outfall area	22°44' 49.69"N	69°36' 29.61"E	Sandy
5	Outfall area	22°44'44.68"N	69°36' 46.64"E	Silty clay

Table 14: Sub-tidal Benthos Sampling Sites

Transect	Location	Co ordinates	Intertidal expose area (m)	Sediment quality
I	High water level	22°56'33.4"N 69°46'31.3"E	42 m	Sandy
	Low water level	22°56'42.3"N 69°52'38.5"E		Silty-sand
II	High water level	22° 48' 18.0" N 69° 34' 03.4" E	54 m	Sandy
	Low water level	22°52'38.1"N 69°52'20.2"E		Silty-sand
III	High water level	22°56'41.1"N 69°47'34.1"E	47m	Sandy
	Low water level	22° 45' 30.0" N 69° 35' 50.4" 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 m^2 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 10% formalin.

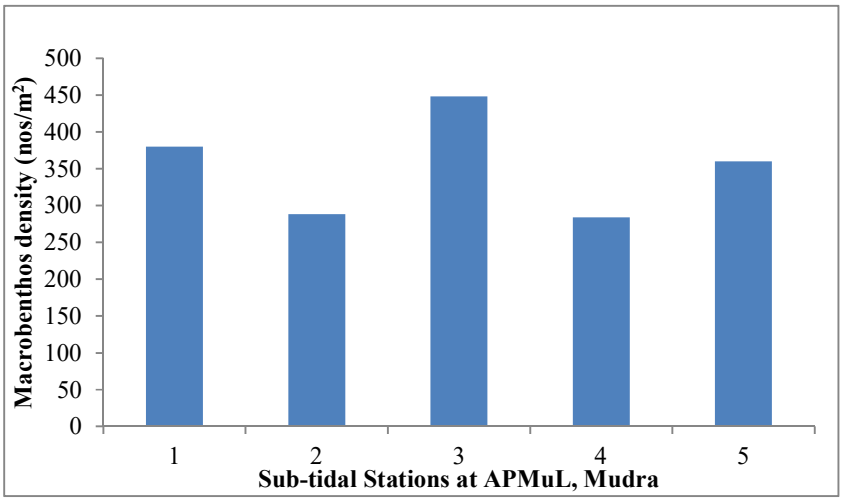
3.5.4 Identification

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

During present study, high macrobenthos abundance and biomass was reported at sub-tidal stations than inter-tidal stations at APL, Mundra. The macrobenthos biomass was measured from 2.98 mg m−2 to 5.1 mg m−2 from all stations at APL marine monitoring area. Whereas, least density of benthic macro organisms was reported as 284 nos. m−2 whereas, highest density was reported as 448 nos. m−2 respectively at Station 4 and Station 3. Polychaete species contributed (65.68%) to the total macrobenthic abundance at these stations followed by crustaceans (18.18%). Polychaetes belongs to family Ampharetidae, Capitellidae, Nereidae and Glyceridae were dominated the macrobenthic population at the sampling region (Table 7). More occurrence of this group could indicate the organic carbon enrichment in the sediment. Overall, the presence of polychate, sipuncula worms and amphipods suggest availability of food organisms for higher predators in the area.

The macrobenthos biomass was measured from 0.45 mg m−2 to 3.2 mg m−2 from all stations at APL marine monitoring area). Whereas, least density of benthic macro organisms was reported as 32 nos. m−2 at station IT-2 (HW) whereas, highest density was reported as 392 nos. m−2 at Station IT-1 (LW). Polychaete species contributed (66.87%) to the total macrobenthic abundance at these stations followed by sipuncula (19.48%).



Graph 1.6: Abundance of subtidal macrobenthos (no. m^{-2}).

Table 15: 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	4.9	380	5	Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids
ST-2	3.7	288	5	Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids
ST-3	5.1	448	5	Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids
ST-4	2.98	284	6	Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids, Pisces
ST-5	3.45	360	5	Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids

Sub tidal region:

- A maximum 6 group of *Polychaeta*, Isopoda , Sipunculids, Bivalvia, Pisces and Amphipoda identified from St-4. A minimum of 5 benthos groups were recorded at ST-1, ST-2, ST-3 and ST-5.
- In the sub-tidal region macro benthos abundance was higher at ST-3 (448 no. m^{-2}), whereas lowest abundance was recorded at ST-2 (288 no. m^{-2}). Higher macrobenthic biomass was recorded at ST-3 (5.1 mg. m^{-2}) as compared to other stations (Table: 15).

Table 16: 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)	3.2	392	5	Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids
IT-1 (HW)	1.56	108	4	Polychaeta, Isopoda, Amphipoda and Sipunculids
IT-2 (LW)	0.77	84	5	Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids
IT-2 (HW)	0.45	32	4	Polychaeta, Isopoda, Amphipoda and Sipunculids
IT-3 (LW)	-	-	-	Dead bivalve and gastropod shells.
IT-3 (HW)	-	-	-	Dead bivalve and gastropod shells.

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

Inter tidal region:

- Three benthic groups were identified at stations, IT-1 (LW), IT-1 (HW), IT-2 (LW) and IT-2 (HW). Organisms belongs to benthic group Bivalvia, Polychaeta, Isopoda, Amphipoda and Sipunculids were identified from IT-1 (LW) and IT-2 (LW), whereas at station IT-1 (HW) & IT-1 (HW) Polychaeta, Isopoda, Amphipoda and Sipunculids were reported.
- The highest macro benthos abundance (392 no. m^{-2}) was reported at IT-1 (LW). Highest biomass (3.2 mg. m^{-2}) was recorded at IT-1 (LW) (Table: 16).

Capitellidae

Glyceridae

Ampharetidae

Nereidae

Amphipods

Isopods

1.7 Microphotographs of macro benthic organisms.

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 1.8 : The Degradation Pathways Of Chlorophyll

Table 17: Method of analysis for Chlorophyll a and Pheophytin

Sr. no	Test performed	Method
1	Chlorophyll *a* 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 Whattman glass microfiber filters (GF/F: 47 mm) and paper was macerated in 90% acetone and one night stored in the dark at 4ºC.
- 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 florescence was measured using Turner Flurometer.
- The extract was then acidified in the cuvette with 0.1 ml of 0.1 N NH_4Cl. The acidified extract is gently agitated and phaeophytin florescence 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 APL, Mundra is presented in. In sub-tidal region, concentrations of Chl a ranged from 0.49 to 2.01 mg m^{-3} at surface (station 5 and station 2, respectively) and from 0.43 to 1.02 mg m-3 at bottom, (station 5 and station 1, respectively). The content of phaeophytin in surface waters ranged from 0.57 to 0.97 mg m^{-3} (station 5 and station 2, respectively) and from 0.55 to 0.76 mg m-3 in the bottom waters (station 5 and station 3, respectively). The measured concentrations of Chl a and Phaeophytin showed a marginally elevated levels in the surface waters as compared to the bottom waters. The small variations observed between the surface and bottom waters could be due to the natural biological variability inherent to such dynamic ecosystems. The

lower Chl a and Phaeophytin values recorded at station 4 & 5 were attributed to the outfall discharge compared to the other stations. 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 and inter-tidal study area of APL, Mundra ranged from 0.78 to 2.07. 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 18: Chlorophyll *a* and Pheophytin (mg/l)

Sampling locations	Chlorophyll *a* mg m^{-3}	Phaeophytin mg m^{-3}	Chl *a*: Phaeophytin ratio
Station-1 Surface	1.43	0.7	2.04
Station-1 Bottom	1.12	0.62	1.81
Station-2 Surface	2.01	0.97	2.07
Station-2 Bottom	1.36	0.75	1.81
Station-3 Surface	1.23	0.64	1.92
Station-3 Bottom	1.09	0.76	1.43
Station-4 Surface	0.87	0.69	1.26
Station-4 Bottom	0.78	0.66	1.18
Station-5 Surface	0.49	0.57	0.86
Station-5 Bottom	0.43	0.55	0.78

3.7 Conclusion

- The phytoplankton abundance in the study region was ranged from 73.74 cells x 102/l to 94.69 cells 102/l. in surface waters. In surface water samples, highest phytoplankton abundance was observed at surface water of Station 2 (94.69 cells 102/l), whereas in bottom water samples, the highest phytoplankton abundance was recorded at Station 2 (74.22 cells 102/l).
- In general, 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.
- Zooplankton biomass of 0.128 ml/m^3 was recorded at Station 1 while, maximum biomass was reported at Station 5 (0.243 ml/m^3). Minimum zooplankton population density was reported at Station 1 (491 nos. /m^3), whereas, maximum density reported at station 5 (2103 nos. /m^3).
- In the sub-tidal region macro benthos abundance was higher at ST-3 (448 no. m^{-2}), whereas lowest abundance was recorded at ST-2 (288 no. m^{-2}). Higher macrobenthic biomass was recorded at ST-3 (5.1 mg. m^{-2}) as compared to other stations
- The highest macro benthos abundance (392 no. m^{-2}) was reported at IT-1 (LW). Highest biomass (3.2 mg. m^{-2}) was recorded at IT-1 (LW)
- Complete sampling data valuation reveals that the physicochemical and marine living parameters of the monsoon analyses data were not deviated from the baseline monitoring data. However, the unsteady benthic sediment as the effect of natural tidal currents and exchange with sediment carriage activity moves the settlement of the benthic fauna, predominantly in the west port area.

Table 19: Names of the Marine Monitoring Team Members

Sr. No.	Name of Person
1.	Dr. Sushant Sanaye (Marine Scientist)
2.	Mr. Vijay Thanki (Env. Chemist)
3.	Mr. Pravin Singh (Env. Chemist)
4.	Miss. Shweta A. Rana (Env. Microbiologist)
5.	Dr. Shivan Gouda (Marine Biologist)

DIFFERENT TYPES OF SAMPLING PHOTOGRAPHS

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ADANI POWER(MUNDRA) LIMITED

Summary of Continues Ambient Air Quality Monitoring System Reports - MONTH: April'2019 TO September'2019

		Station: ECO Park					Station: Near Main Gate					Station: Near Ash Pond			
Parameters		**PM10**	**PM2.5**	**SO_2**	**NO_2**	**O_3**	**PM10**	**PM2.5**	**SO_2**	**NO_2**	**O_3**	**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**	**ug/m^3**	**ug/m^3**
MONTH	**GPCB LIMIT**	**100**	**60**	**80**	**80**	**100**	**100**	**60**	**80**	**80**	**100**	**100**	**60**	**80**	**80**
April'19	Minimum	70.10	10.22	10.19	12.62	10.40	53.60	12.70	16.79	18.19	10.90	*	*	*	*
	Maximum	94.10	32.95	29.76	29.09	47.71	91.45	43.25	27.23	30.41	60.65	*	*	*	*
	Average	83.65	18.03	19.23	20.13	21.09	74.82	18.45	26.25	21.79	24.95	*	*	*	*
May'19	Minimum	53.80	10.84	11.38	9.71	10.83	61.25	9.70	16.71	17.28	13.71	42.12	21.42	11.44	17.26
	Maximum	93.70	28.41	19.94	26.53	25.74	91.46	27.20	28.59	35.56	42.23	78.14	38.59	26.54	44.42
	Average	80.63	16.50	13.73	16.72	15.92	78.40	15.81	24.85	28.08	29.93	61.14	28.42	22.54	31.25
June'19	Minimum	56.60	8.60	19.72	9.66	8.76	61.00	10.00	16.80	5.42	13.18	38.23	26.12	14.54	20.25
	Maximum	97.60	19.98	22.37	15.31	20.30	88.60	26.50	19.14	25.90	32.48	76.44	38.42	23.45	28.44
	Average	83.33	14.70	20.94	12.40	14.78	71.77	17.98	18.03	9.83	23.40	54.12	30.24	20.91	24.11
July' 19	Minimum	40.70	10.17	11.60	22.75	15.29	17.80	10.20	15.13	8.98	18.29	30.20	24.52	14.10	21.60
	Maximum	89.70	28.41	26.07	48.26	42.14	89.56	19.90	26.59	21.28	29.35	70.30	32.54	25.45	26.45
	Average	78.29	16.28	19.91	36.19	32.28	60.80	14.71	19.84	18..59	36.54	56.12	28.58	21.24	23.46
August' 19	Minimum	58.20	10.29	11.60	10.28	12.52	43.63	11.80	19.07	17.96	10.89	21.67	20.14	11.23	16.28
	Maximum	94.21	32.54	25.47	48.26	36.25	91.65	33.24	28.11	54.60	28.54	89.25	41.30	27.54	33.24
	Average	79.37	18.23	18.69	27.94	23.58	75.97	21.55	22.37	36.94	23.04	63.63	32.24	20.28	24.02
September'19	Minimum	55.20	12.65	20.60	9.62	10.17	67.60	17.70	18.54	10.30	22.36	60.57	27.26	14.00	14.12
	Maximum	92.70	29.30	39.90	22.80	25.20	89.50	29.20	29.60	19.91	52.90	81.54	46.12	18.34	29.56
	Average	78.90	23.31	30.68	16.91	17.99	79.34	22.09	23.74	15.47	30.36	69.28	39.41	16.20	19.30

* Unit under Shutdown(Re-installation and commissioning of Station under process at new location due to outfall channel repairing activity near ash pond area

Adani Power (Mundra) Limited, Mundra

Sea Water Differential Temperature – Annexure-V

Month: April'19			
Date	**Ambient Water Temperature ºC**	**Outfall Channel ºC**	**Temp. Difference ºC**
01/04/2019	29.2	*	*
02/04/2019	30	*	*
03/04/2019	29.5	*	*
04/04/2019	30	*	*
05/04/2019	29	*	*
06/04/2019	29.5	*	*
07/04/2019	29.5	*	*
08/04/2019	30	33	3
09/04/2019	30.5	32.5	2
10/04/2019	30.5	33	2.5
11/04/2019	30	33.5	3.5
12/04/2019	29.5	33	3.5
13/04/2019	29.5	32.5	3
14/04/2019	29.5	32.5	3
15/04/2019	30.5	32.5	2
16/04/2019	30	33.5	3.5
17/04/2019	30.5	33.5	3
18/04/2019	30.5	32.5	2
19/04/2019	31	34.5	3.5
20/04/2019	30.5	34.5	4
21/04/2019	30.5	34	3.5
22/04/2019	30	34.5	4.5
23/04/2019	30.5	34.5	4
24/04/2019	30.5	32.5	2
25/04/2019	30.5	32	1.5
26/04/2019	30.5	32.5	2
27/04/2019	30	32.5	2.5
28/04/2019	29.5	33	3.5
29/04/2019	30	33	3
30/04/2019	30	33	3
Min.	**29**	**32**	**1.5**
Max.	**31**	**34.5**	**4.5**
Average	**30.0**	**33.2**	**2.96**

Annexure – V

Note: * Outfall Channel under Maintenance

Adani Power (Mundra) Limited, Mundra

Sea Water Differential Temperature – Annexure-V

Month: May'19			
Date	**Ambient Water Temperature ºC**	**Outfall channel ºC**	**Temp. difference ºC**
01/05/2019	30	33.5	3.5
02/05/2019	30.5	34	3.5
03/05/2019	31	34.5	3.5
04/05/2019	30.5	33.5	3
05/05/2019	30.5	*	*
06/05/2019	29.5	*	*
07/05/2019	29.5	*	*
08/05/2019	30	*	*
09/05/2019	30.5	*	*
10/05/2019	30.5	*	*
11/05/2019	30	*	*
12/05/2019	30.5	*	*
13/05/2019	31.5	34.5	3
14/05/2019	31.5	33.5	2
15/05/2019	30.5	35	4.5
16/05/2019	30.5	34.5	4
17/05/2019	31.5	34.5	3
18/05/2019	31.5	34.5	3
19/05/2019	31	34	3
20/05/2019	31.5	34.5	3
21/05/2019	30.5	35	4.5
22/05/2019	31.5	34.5	3
23/05/2019	30.5	34.5	4
24/05/2019	30.5	33.5	3
25/05/2019	32	34.5	2.5
26/05/2019	31.5	34.5	3
27/05/2019	31.5	34.5	3
28/05/2019	30.5	33.5	3
29/05/2019	31.5	33.5	2
30/05/2019	32	34.5	2.5
31/05/2019	31.5	34.5	3
Min.	**29.5**	**33.5**	**2**
Max.	**32**	**35**	**4.5**
Average	**30.8**	**34.2**	**3.2**

Note: * Outfall Channel under Maintenance

Month: June'19			
Date	**Ambient Water Temperature ºC**	**Outfall channel ºC**	**Temp. difference ºC**
01/06/2019	30	33.5	3.5
02/06/2019	30.5	34	3.5
03/06/2019	31	34.5	3.5
04/06/2019	30.5	33.5	3
05/06/2019	30.5	*	*
06/06/2019	29.5	*	*
07/06/2019	29.5	*	*
08/06/2019	30	*	*
09/06/2019	30.5	*	*
10/06/2019	30.5	*	*
11/06/2019	30	*	*
12/06/2019	30.5	*	*
13/06/2019	31.5	34.5	3
14/06/2019	31.5	33.5	2
15/06/2019	30.5	35	4.5
16/06/2019	30.5	34.5	4
17/06/2019	31.5	34.5	3
18/06/2019	31.5	34.5	3
19/06/2019	31	34	3
20/06/2019	31.5	34.5	3
21/06/2019	30.5	35	4.5
22/06/2019	31.5	34.5	3
23/06/2019	30.5	34.5	4
24/06/2019	30.5	33.5	3
25/06/2019	32	34.5	2.5
26/06/2019	31.5	34.5	3
27/06/2019	31.5	34.5	3
28/06/2019	30.5	33.5	3
29/06/2019	31.5	33.5	2
30/06/2019	32	34.5	2.5
Min.	**30**	**33.5**	**2**
Max.	**31.5**	**35.5**	**4.5**
Average	**30.7**	**34.2**	**3.5**

Note: * Outfall Channel under Maintenance

Month: July'19			
Date	**Ambient Water Temperature ºC**	**Outfall channel ºC**	**Temp. difference ºC**
01/07/2019	30.5	33.5	3
02/07/2019	30	33.5	3.5
03/07/2019	29.5	33	3.5
04/07/2019	29.5	33	3.5
05/07/2019	30	33	3
06/07/2019	30.5	33	2.5
07/07/2019	30	33	3
08/07/2019	30.5	33.5	3
09/07/2019	29.5	32.5	3
10/07/2019	29.5	33	3.5
11/07/2019	30	34	4
12/07/2019	29.5	33	3.5
13/07/2019	29.5	32.5	3
14/07/2019	29.5	32.5	3
15/07/2019	29	32.5	3.5
16/07/2019	29.5	33	3.5
17/07/2019	29.5	32	2.5
18/07/2019	29	32.5	3.5
19/07/2019	28.5	32	3.5
20/07/2019	29.5	32	2.5
21/07/2019	29.5	32	2.5
22/07/2019	30	32.5	2.5
23/07/2019	29.5	33	3.5
24/07/2019	29	32.5	3.5
25/07/2019	29.5	33	3.5
26/07/2019	29	32.5	3.5
27/07/2019	28.5	32	3.5
28/07/2019	28	31.5	3.5
29/07/2019	27	30.5	3.5
30/07/2019	27	30.5	3.5
31/07/2019	27.5	31	3.5
Min.	**27**	**30.5**	**2.5**
Max.	**30.5**	**34.0**	**4.0**
Average	**29.3**	**32.5**	**3.2**

Month: August'19			
Date	**Ambient Water Temperature ºC**	**Outfall channel ºC**	**Temp. difference ºC**
01/08/2019	28.5	32	3.5
02/08/2019	28	32	4
03/08/2019	28.5	32	3.5
04/08/2019	29	32.5	3.5
05/08/2019	29.5	32	2.5
06/08/2019	29.5	32.5	3
07/08/2019	29	32	3
08/08/2019	29.5	33	3.5
09/08/2019	28	31.5	3.5
10/08/2019	27.5	31.5	4
11/08/2019	27	30.5	3.5
12/08/2019	28.5	31	2.5
13/08/2019	28	31.5	3.5
14/08/2019	28.5	31.5	3
15/08/2019	28	31	3
16/08/2019	27.5	31.5	4
17/08/2019	28	31	3
18/08/2019	28.5	32	3.5
19/08/2019	29	32	3
20/08/2019	29	32.5	3.5
21/08/2019	28.5	32	3.5
22/08/2019	28.5	31.5	3
23/08/2019	29.5	33	3.5
24/08/2019	30	33.5	3.5
25/08/2019	28.5	32.5	4
26/08/2019	29	32	3
27/08/2019	28.5	31.5	3
28/08/2019	28	32	4
29/08/2019	28.5	32	3.5
30/08/2019	29	32.5	3.5
31/08/2019	28.5	32.5	4
Min.	**27**	**30.5**	**2.5**
Max.	**30.5**	**33.5**	**4.0**
Average	**28.6**	**32.0**	**3.4**

Adani Power (Mundra) Limited, Mundra

Sea Water Differential Temperature – Annexure-V

Month: September'19			
Date	**Ambient Water Temperature ºC**	**Outfall channel ºC**	**Temp. difference ºC**
01/09/2019	29	32.0	3
02/09/2019	28.5	32.0	3.5
03/09/2019	28	31.5	3.5
04/09/2019	28.5	32.5	4
05/09/2019	29	32.5	3.5
06/09/2019	28.5	31.5	3
07/09/2019	28	32.0	4
08/09/2019	28.5	32.0	3.5
09/09/2019	29	32.5	3.5
10/09/2019	28.5	32.0	3.5
11/09/2019	28	31.5	3.5
12/09/2019	28.5	32.0	3.5
13/09/2019	28.5	31.5	3
14/09/2019	29	32.5	3.5
15/09/2019	28.5	32.0	3.5
16/09/2019	27.5	32.0	4.5
17/09/2019	28	31.5	3.5
18/09/2019	28.5	31.0	2.5
19/09/2019	29	31.5	2.5
20/09/2019	29	32.0	3
21/09/2019	28.5	32.5	4
22/09/2019	28.5	32.0	3.5
23/09/2019	29.5	31.5	2
24/09/2019	30	32.0	2
25/09/2019	28.5	32.0	3.5
26/09/2019	29	32.5	3.5
27/09/2019	28.5	31.5	3
28/09/2019	28	32.0	4
29/09/2019	28.5	32.0	3.5
30/09/2019	29	32.5	3.5
Min.	**27.5**	**31.0**	**2**
Max.	**31.5**	**35.5**	**4.5**
Average	**28.6**	**32.0**	**3.4**

Annexure: VI

Adani Power (Mundra) Limited

Greenbelt Details:

Area (ha)	No. of Trees & Palm Planted	No. of Shrubs Planted
138.52	258935	1395579

Plant species planted at Adani Power (Mundra) Limited, Mundra

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

adani	**Adani Power (Mundra) Limited, Mundra** **Ash Production & Disposal (Phase I, II, III)** **(Period: April 2019 – September 2019)**	**Annexure – VII**

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)	Total Ash Utilized (Silo + Dyke) (MT)	% of Ash Utilization	Previous Month's Stock
									8824
April-19	78612	50603	21300	13059	0	0	84962	108.08	2474
May-19	68058	30397	13851	14699	0	0	58947	86.61	11585
June-19	59914	21584	30588	12621	0	0	64792	108.14	6706
July-19	67320	46164	15419	11248	0	0	72831	108.19	1195
August-19	58865	21818	11278	22131	0	0	55227	93.82	4833
September-19	58225	38393	12410	9665	0	0	60468	103.85	2590
Total	**390995**	**208958**	**104847**	**83424**	**0**	**0**	**397229**	**101.59**	

Note: Total 2590 MT Ash stocked (613 MT Ash in ash silo and 1977 MT Ash filled in bags) and will be utilized in the month of October 2019

ADANI POWER (MUNDRA) LIMITED

Annexure – I

ASH PERCENTAGE IN COAL

(From July'2019 – September'2019)

Sl. No.	Month	Coal Consumption (MT)	Ash Content in Coal (%)	Quarterly Average (%)
1	July'2019	13,74,219	4.90	**4.55**
2	August'2019	14,35,041	4.10	
3	September'2019	12,54,858	4.64	

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TEST REPORT

ULR – TC775319000008444P			
Report No.	URC /19/05/0653	Date Of Report	24/05/2019
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	17/05/2019	Sample Received Date	18/05/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	18/05/2019	Test Completion Date	21/05/2019
UERL Lab Sample ID.No. 19/05/0653			

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	8.10
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	17566
	CHEMICAL QUALITY (In mg/L)		
1.	Chloride as Cl	(APHA 23rd Ed.,2017,4500-Cl)	4816
2.	*Salinity (ppt)	By Calculation	8.7
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	11242.0
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	30.2
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	156.4
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)

Note: "The parameter marked with an* is not accredited by NABL", BDL= Below Detection Limit, MDL= Minimum Detection Limit

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

Tested By
(Chemist)

Checked By
(Sr. Chemist)

Authorized By
(Technical Manager)

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TEST REPORT

ULR – TC775319000008445P			
Report No.	URC /19/05/0654	Date Of Report	24/05/2019
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	17/05/2019	Sample Received Date	18/05/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	18/05/2019	Test Completion Date	21/05/2019
UERL Lab Sample ID.No. 19/05/0654			

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	8.14
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	19359
	CHEMICAL QUALITY (In mg/L)		
1.	Chloride as Cl-	(APHA 23rd Ed.,2017,4500-Cl)	4649
2.	*Salinity (ppt)	By Calculation	8.4
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	12390
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	46.7
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	144.7
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)

Note: "The parameter marked with an* is not accredited by NABL", **BDL**= Below Detection Limit, **MDL** = Minimum Detection Limit

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

Tested By	Checked By	Authorized By
(N.J.M)	(N.B.P.)	(P.J.T)
(Chemist)	(Sr. Chemist)	(Technical Manager)

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TEST REPORT

ULR – TC775319000008446P			
Report No.	URC /19/05/0655	Date Of Report	24/05/2019
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	17/05/2019	Sample Received Date	18/05/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	18/05/2019	Test Completion Date	21/05/2019
UERL Lab Sample ID.No. 19/05/0655			

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	8.02
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	16378
	CHEMICAL QUALITY (In mg/L)		
1.	Chloride as Cl^-	(APHA 23rd Ed.,2017,4500-Cl)	4760
2.	*Salinity (ppt)	By Calculation	8.6
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	10482.0
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	32.7
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	128.4
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)

Note: "The parameter marked with an* is not accredited by NABL", **BDL**= Below Detection Limit, **MDL** = Minimum Detection Limit

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

Tested By	Checked By	Authorized By
(C.S.M)	(N.L.P.)	
(Chemist)	(Sr. Chemist)	(Technical Manager)

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TEST REPORT

ULR – TC775319000008447P			
Report No.	URC /19/05/0656	Date Of Report	24/05/2019
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 Lit.
Sampling Date	17/05/2019	Sample Received Date	18/05/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	18/05/2019	Test Completion Date	21/05/2019
UERL Lab Sample ID.No. 19/05/0656			

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	8.15
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	18200
	CHEMICAL QUALITY (In mg/L)		
1.	Chloride as Cl^-	(APHA 23rd Ed.,2017,4500-Cl)	4926
2.	*Salinity (ppt)	By Calculation	8.9
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	11648
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	26.8
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	168.4
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)

Note: "The parameter marked with an* is not accredited by NABL", **BDL**= Below Detection Limit, **MDL** = Minimum Detection Limit

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

Tested By
(Chemist)

Checked By
(Sr. Chemist)

Authorized By
(Technical Manager)

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Extended Work Office : G.I.D.C., Dahej-II, Bharuch, Gujarat.
CIN:U73100GJ2007PTC051463

UniStar
Environment and Research Labs Pvt. Ltd.

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TEST REPORT

ULR – TC775319000013018P			
Report No.	URC/19/08/0247	Date Of Report	16/08/2019
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	06/08/2019	Sample Received Date	09/08/2019
Sampled By	UniStar Env. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	09/08/2019	Test Completion Date	14/08/2019
UERL Lab Sample ID.No. 19/08/0247			

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	7.32
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	15459
	CHEMICAL QUALITY (In mg/L)		
1.	Chloride as Cl^-	(APHA 23rd Ed.,2017,4500-Cl)	4539.6
2.	*Salinity (ppt)	By Calculation	8.2
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	9894.0
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	21.92
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	178.31
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]	425.5
14	Calcium as Ca	(APHA 23rd Ed.,2017,3500 Ca.B)	345.2
15	Magnesium as Mg	(APHA 23rd Ed.,2017,, 3500 Mg.B)	221.3
16	Sodium as Na	APHA 23rd Ed.,2017,3500 Na,B	1644
17	Potassium as K	APHA 23rd Ed.,2017,3500 K,B	95.5
18	Sulphate as SO4-2	IS 3025(Part 24)1986	625
19	Nitrate as NO3	(APHA 23rd Ed.,2017,4500 NO3-B)	25.5
20	Phosphate as PO_4	(APHA 23rd Ed.,2017,4500-P,D)	2.45
21	Barium as Ba	AAS Method	N.D.
22	Fluoride as F	(APHA 23rd Ed.,2017,4500 F,D)	2.35

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TEST REPORT

ULR – TC775319000013018P			
Report No.	URC /19/08/0247	Date Of Report	16/08/2019
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	06/08/2019	Sample Received Date	09/08/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	09/08/2019	Test Completion Date	14/08/2019
UERL Lab Sample ID.No. 19/08/0247			

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 23rd 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
(N.P.P.)
(Chemist)

Checked By
(Sr. Chemist)

Authorized By
(Technical Manager)

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TEST REPORT

ULR – TC775319000013019P			
Report No.	URC/19/08/0248	Date Of Report	16/08/2019
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	06/08/2019	Sample Received Date	09/08/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	09/08/2019	Test Completion Date	14/08/2019
UERL Lab Sample ID.No. **19/08/0248**			

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	7.11
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	16894
	CHEMICAL QUALITY (In mg/L)		
1.	Chloride as Cl-	(APHA 23rd Ed.,2017,4500-Cl)	4312.2
2.	*Salinity (ppt)	*By Calculation*	8.1
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	10812
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	31.41
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	148.87
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]	456.3
14	Calcium as Ca	(APHA 23rd Ed.,2017,3500 Ca.B)	362.1
15	Magnesium as Mg	(APHA 23rd Ed.,2017,, 3500 Mg.B)	239.1
16	Sodium as Na	APHA 23rd Ed.,2017,3500 Na,B	1905
17	Potassium as K	APHA 23rd Ed.,2017,3500 K,B	110.2
18	Sulphate as SO4-2	IS 3025(Part 24)1986	744
19	Nitrate as NO3	(APHA 23rd Ed.,2017,4500 NO3-B)	27.1
20	Phosphate as PO_4	(APHA 23rd Ed.,2017,4500-P,D)	2.96
21	Barium as Ba	AAS Method	N.D.
22	Fluoride as F	(APHA 23rd Ed.,2017,4500 F,D)	2.67

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TEST REPORT

ULR – TC775319000013019P			
Report No.	URC /19/08/0248	Date Of Report	16/08/2019
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	06/08/2019	Sample Received Date	09/08/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	09/08/2019	Test Completion Date	14/08/2019
UERL Lab Sample ID.No. 19/08/0248			

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 23rd 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
(N.P.L.)
(Chemist)

Checked By
(N.C.L.)
(Sr. Chemist)

Authorized By
(Technical Manager)

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CIN:U73100GJ2007PTC051463

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TEST REPORT

ULR – TC775319000013020P			
Report No.	**URC /19/08/0249**	Date Of Report	**16/08/2019**
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	**06/08/2019**	Sample Received Date	**09/08/2019**
Sampled By	**UniStarEnv. & Research Labs**	Appearance Of Sample	**Colorless**
Test Started Date	**09/08/2019**	Test Completion Date	**14/08/2019**
UERL Lab Sample ID.No. **19/08/0249**			

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	7.46
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	14752
		CHEMICAL QUALITY (In mg/L)	
1.	Chloride as Cl	(APHA 23rd Ed.,2017,4500-Cl)	4472.5
2.	*Salinity (ppt)	By Calculation	8.08
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	9441.0
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	34.10
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	153.54
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]	396.2
14	Calcium as Ca	(APHA 23rd Ed.,2017,3500 Ca.B)	321.1
15	Magnesium as Mg	(APHA 23rd Ed.,2017,, 3500 Mg.B)	198.6
16	Sodium as Na	APHA 23rd Ed.,2017,3500 Na,B	1562.5
17	Potassium as K	APHA 23rd Ed.,2017,3500 K,B	88.1
18	Sulphate as SO4-2	IS 3025(Part 24)1986	604
19	Nitrate as NO3	(APHA 23rd Ed.,2017,4500 NO3-B)	21.1
20	Phosphate as PO_4	(APHA 23rd Ed.,2017,4500-P,D)	1.97
21	Barium as Ba	AAS Method	N.D.
22	Fluoride as F	(APHA 23rd Ed.,2017,4500 F,D)	1.77

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TEST REPORT

ULR – TC775319000013020P			
Report No.	URC /19/08/0249	Date Of Report	16/08/2019
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	06/08/2019	Sample Received Date	09/08/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	09/08/2019	Test Completion Date	14/08/2019
UERL Lab Sample ID.No. 19/08/0249			

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 23rd 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
(N.P.P.)
(Chemist)

Checked By
(Sr. Chemist)

Authorized By
(Technical Manager)

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TEST REPORT

ULR – TC775319000013021P			
Report No.	URC /19/08/0250	Date Of Report	16/08/2019
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 Lit.
Sampling Date	06/08/2019	Sample Received Date	09/08/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	09/08/2019	Test Completion Date	14/08/2019
UERL Lab Sample ID.No. 19/08/0250			

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	7.92
2.	Conductivity (µS/cm)	IS 3025(Part 14)1984	15847
	CHEMICAL QUALITY (In mg/L)		
1.	Chloride as Cl	(APHA 23rd Ed.,2017,4500-Cl)	4539.1
2.	*Salinity (ppt)	By Calculation	8.2
3.	Total Dissolved Solids	(APHA 23rd Ed.,2017,2540- C)	10142
4.	Carbonate as CaCO3	IS 3025(Part 51)2001	26.8
5.	Bicarbonate as CaCO3	IS 3025(Part 51)2001	168.4
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]	445.3
14	Calcium as Ca	(APHA 23rd Ed.,2017,3500 Ca.B)	352.3
15	Magnesium as Mg	(APHA 23rd Ed.,2017,, 3500 Mg.B)	228.6
16	Sodium as Na	APHA 23rd Ed.,2017,3500 Na,B	1862
17	Potassium as K	APHA 23rd Ed.,2017,3500 K,B	98.3
18	Sulphate as SO4-2	IS 3025(Part 24)1986	685
19	Nitrate as NO3	(APHA 23rd Ed.,2017,4500 NO3-B)	26.2
20	Phosphate as PO_4	(APHA 23rd Ed.,2017,4500-P,D)	2.82
21	Barium as Ba	AAS Method	N.D.
22	Fluoride as F	(APHA 23rd Ed.,2017,4500 F,D)	2.6

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TEST REPORT

ULR – TC775319000013021P			
Report No.	URC /19/08/0250	Date Of Report	16/08/2019
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 Lit.
Sampling Date	06/08/2019	Sample Received Date	09/08/2019
Sampled By	UniStarEnv. & Research Labs	Appearance Of Sample	Colorless
Test Started Date	09/08/2019	Test Completion Date	14/08/2019
UERL Lab Sample ID.No. 19/08/0250			

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 23rd 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
(Chemist)

Checked By
(Sr. Chemist)

Authorized By
(Technical Manager)

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Extended Work Office : G.I.D.C., Dahej-II, Bharuch, Gujarat.
CIN:U73100GJ2007PTC051463

adani	Adani Power (Mundra) Limited, Mundra Expenditure for Environmental Protection & CER (Period: April 2019 – September 2019)	Annexure – IX

Expenditure for Environmental Protection & CER		
		(Fig. in Rs. Lakhs)
Sr. No.	**Particular**	**Expenditure from April'19 to September' 19**
1	Rural Development/CER/CSR Activities	744.86
2	Green belt development	53.28
3	Legal, Consent Fee, GPCB lab bills & Environment Audit	25.52
4	Hazardous waste disposal cost	0.0
5	Treatment and Disposal cost (Waste water & Sewage Treatment)	37.03
6	Maintenance cost of ESP & FGD (Material Cost)	338.97
7	Third party monitoring and Equipment & instruments maintenance, materials, communication cost.	30.14
8	Insurance training and external environmental management	0.5
Total		**1230.3**

Annex - X

adani
Foundation

SIX MONTHLY REPORT 2019-20

Education
Community Infrastructure Development
Kutch
Sustainable Livelihood Development
Community Health
CSR

Sustainable Growth With Goodness

Adani Foundation
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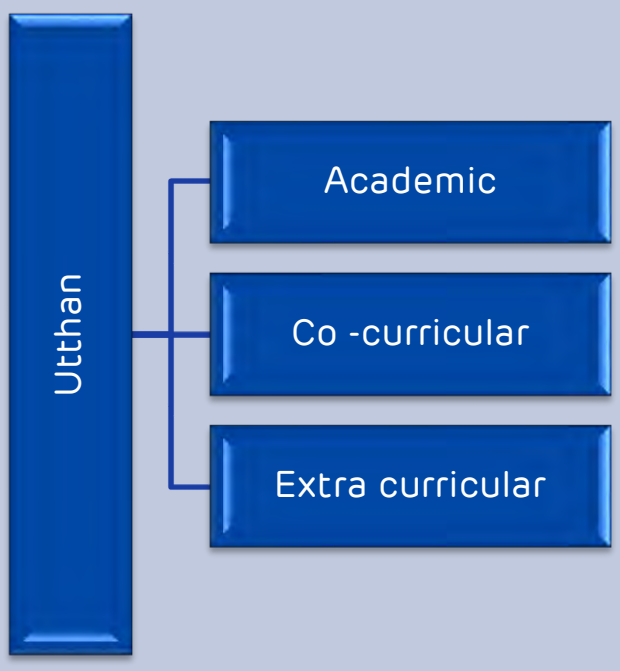
Project: Utthan



Majority of Indians are the products of Government schools. These schools are a linchpin of the Indian educational system, accounting for 70% of Pre-Primary and Primary Schools and Secondary Schools. They have a great penetration into the very interiors of our country. We find them in hilly areas, unreachable islands, tribal areas and everywhere.

For the academic year 2018-19, Adani Foundation leveraging their experience, to intervene in Government Schools. These interventions will aim to enhance the quality of primary education in Government schools and result in around 3000 of children benefiting from a meaningful education. 17 Primary Government schools of Mundra taluka of Kutch district have been adopted to take up various initiatives aimed at improving quality in these schools. The project titled is 'UTTHAN'. In this holistic educational project we are focusing on:

उत्थान

Project: Utthan

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 learnr, multiple intelligence etc.

Co - Curricular

- Every Saturday Library activity with the Book issue were planned and executed in a meaningful manner
- 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

Project: Utthan

Extra - Curricular

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

Adani Vidya Mandir Bhadreshwar

provide "cost-free" education to meritorious students coming from challenging economic background, who have priceless treasures but have been under achievers due to situation. In year 2019-20 450 students are studying.

Activities Covered

- Science Fair – Block level
- Drawing Competition under the P.C.R.A. National level competition
- Assembly on every Saturday.
- International Yoga Day Celebration
- Guru Purnima celebration
- Independence Day Celebration
- Teacher's day Celebration
- Children's Day Celebration
- Educational Tour for each standard
- Festival Celebration
- Awareness Street Play organized at various villages

Adani Vidya Mandir Bhadreshwar

92% - Result SSC Board Exam

Shala Pravestosav of Std.-1 Students

Parents Teachers Meeting

Healthy Food

Festival Celebration

Various Competitions

Project Udaan

Udaan
get inspired

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.

250 institutes and 15,329 beneficiaries have made inspirational visit during this six months

Community Health

Health is the basic need for development of community. Adani Foundation focuses on ensuring good health for batter contribution to growth and progress and improving access to quality healthcare service in remote area.

Rural Clinic & Mobile healthcare unit

11 Rural Clinic

8 from mundra 3 from Anjar block treated ; **10889 patients**.

31 villages covered througfh Mobile healthcare unit

7902 patients benefited during six month

Community Health

19 General Health Camp conducted -

12 General & 7 under Utthan project ;

2873 patients treated

Community Health

206 Dialysis patients

498 Needy patient benefited through Medical support Total amount of support is **Rs.4,02,201/-**

Sr. Citizen project 8672 Card holders of 68 villages get benefit under this project .

4713 sr. citizen patients benefited during six month

30000 limit for three year per patients

Gujarat Adani Institute of Medical Science (GAIMS) - Bhuj

First Medical College of Kutch district based on PPP model. It started from 2009.
Affiliate with "Krantiguru Shyamji Krishna Verma Kutch University"

750 bed – Largest Multi Specialty Hospital in kutch

Adani Foundation Team has initiated coordination with GKGH hospital and established a reception area for the smooth patient coordination and preparation for the social networking Programme.

Community Health

Health - Bhuj

3075 Beneficiaries of 27 General Health camps.

2629 Golden card enrolled in 18 Health camps in Interior villages & Mahiti Setu as well.

322 death bodies Reached at various locations of Kutchh with dignity and respect.

258 Poor patient supported in GKGH(Rs.2,84,321/-)

4242 People helped through Mahiti Setu for various government schemes

37450 Patinets benefitted though 11 camps towards Mata Madh

Celebration of various days like - World No tobacco day, Kargil Vijay divas, Health week on independence day, 5 years completion ceremony of GKGH, Teachers day,

Community Health

Awareness
for Health & hygiene

Mahiti
setu

Support
Poor patient

General
Health camps

Arogya Saptah (7th – 14th August 2019)

Adani foundation, Adani Hospital and GAIMS have Jointly Celebrated "Arogya Saptah" 8th to 14th August-2019 in Respect of 73th Independence 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, DDO, Minister, MLA and other dignitaries from NGOs had remained present. Objective of the program was to avail health benefits at GKGH and also at Adani Hospital Mundra and Approximately 4500 people will be direct beneficiaries of the program.

Day	Date	Event Name	Beneficiaries
1	07/08/2019	Health check up at Orphan age, Bhuj	101
2	08/08/2019	Blood Donation Camp, Nakhatrana	55
3	09/08/2019	Pregnant Women health check up, Madhapar	50
4	10/08/2019	Surgical Mega Camp, Khavda	223
5	11/08/2019	General Health Camp, Palara Jail	139
6	12/08/2019	Ayushman Health Card Enrolment, Gorevali	52
7	13/08/2019	Awareness on women health, mukt jivan college, Bhuj	250
8	14/08/2019	Blood Donor Appreciation	36

Fisherman Education

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.

125 children are benefiting from this scheme

115 students are getting benefit of vehicle transportation support from different Bandar.

100% girls 80% boys

providing **scholarship support** to motivate and encourage fishermen boys and girls for higher education

Book support : 49 Fisherman Students of Higher Secondary Standard
(9 to 12) has been benefitted

Vidya Sahay Yojana

SLD Fishermnan

65 Teams

13 villages

750 Fisherman youth`

“Adani Premiere League”

Cricket Tournament organized among fishermen community to promote healthy sportsmanship ,and harmonically transparent community relationship

Awareness Program

Facilitation of Government Fishermen Welfare

Vessel Approach Related Message Intimation to Fishermen.

4 Fishermen VAsahat

983 Families

70000 ltr water per day`

potable water provided to the fishermen communities at different vasaht through water tanker

SLD Fisherman

Sea Weed Culture

Sea Weed Culture is going on. Seed bank preparation is going on under guidance of VRTI.

4300 Man-days

Mangrove plantation at Hamira mora site .

Bio diversity Project:-

Project started with two spices of mangroves which has good survival rate & Plantation at site – 70 % Survival
Total 4 Hector Plantation.

Sustainable Livelihood Development

- 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 7 villages
- The purpose of this project is to initiate village wise integrated agricultural & allied development for sustaining agriculture and socio economic situation of farming community of Mundra block.

Sustainable Livelihood Development

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

UTTHAN MODEL VILLAGE DEVELOPMENT PROJECT

Implementation Process includes

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

Sustainable Livlihood Development

With the Objective of to Preserve the rain Water to reduce the Impact of salinity and Recharge the Ground Water (the Main Source of water) to facilitate the Agricultural activities as well as For Drinking water.

Under **UTHHAN MODEL VILLAGE PROJECT.** Salinity ingress issue is well taken with Pond Deepening, Recharge Borewell technique and Roof Top Rain Water Harvesting.

RRWHS: 54

Bore Recharge - 75

Well Recharge- 31

Pond Deepning- 2

Total Ground Water Recharge

- 1878140 cum

Sustainable Livelihood Development

Tissue Culture

UTTHAN MODEL VILLAGE DEVELOPMENT PROJECT

Date is the Amrut Fal of Kutchh and Mainly best quality available in some villages in Mundra Taluka. To maintain quality uniformity Adani Foundation is planning for cultivate 4000 tissue cultured plants of elite varieties to the farmers of project area.

Registration is in progress for Farmer's Producer Company with NABARD – 220 Farmers had registered for the same.

Women Empowerment

WOMEN EMPOWERNMENT

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.

Aaarambh SHG "Suf" Handicraft Cluster Seven Women from Pragpar village are doing embroidery and one women from Mundra is looking after design part.

Total Sale more than Rs.3.50 Lacs and women are getting approximately Rs.8500 per month.

Women Empowerment

Tejashvi Saheli

3100 School bags for the Students 300 wall hanging for the project of Swachhagraha and 170 Uniform Pair to the Students of Balwadi.

24 Nos of Women got employment

6 women got Job in Britannia Company (Rs.7500/- per month), 9 women got bank sakhi Yojana, 9 women working in various field in SEZ and other companies

Community Infrastructure Development

Water Conservation Works

- Pond deepening work in Baroi, Luni & Zarpara villages
- Mota Bhadiya Check Dam desilting work
- Lakhpat Godhatal dam desilting work
- Mota Bhadiya artificial bore well recharge - 2 no's

Community Infrastructure Development

Protection Compound wall
at Navinal Village

Garden Development
Hanuman Temple - Baroi

Fixing of street light
30 LED Street light Bhopawandh
20 LED Street light Mundra
50 LED Street Light at Bhorara

Community Infrastructure Development

- Construction of Prayer Shed at AVMB
- Garden Development work at- Bhujpur Village.
- Construction of R.O. Plant Room at Primary School sadau Village
- Drainage maintenance.
- Renovation of ITI at Mundra work in Progress.

Work In progress

- Renovation of Bavadi at Bavadi Bandar
- Development of Community Training Hall at Mundra & Goyarsama
- Fisherman Room at Navinal & Zarpara Vasahat

Adani Skill Development Centre

Adani Skill Development Centre is providing various employment-oriented trainings to the young for become self-reliant, responsible and active citizen.

ASDC is tied up with Pradhan Mantri Kaushalya Vardhan Yojana and Deen Dayal Upadhyaya Grameen Kaushalya Yojana.

Total No of trainee 643

Total No of batch. 33

Digital Literacy 345

Beauty Therapist 100

Self Employed Tailor 22

Junior Operator Crane 60

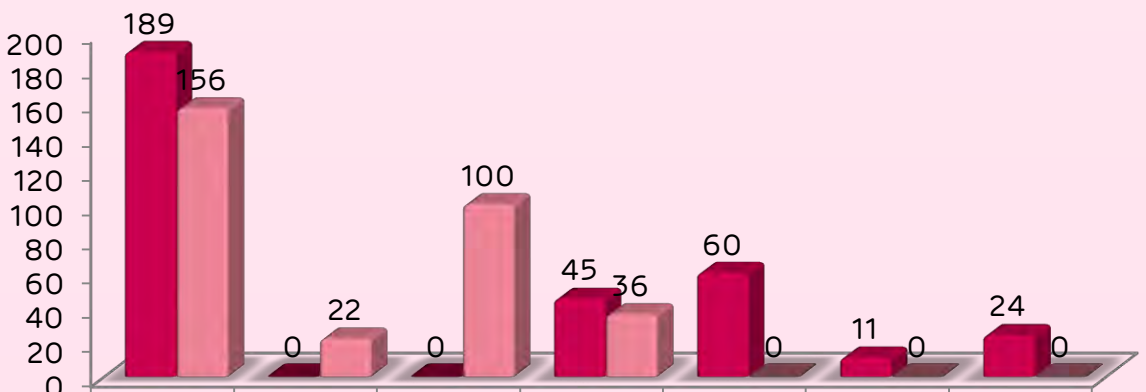
Excel training 11

RTG Crane Operator 24

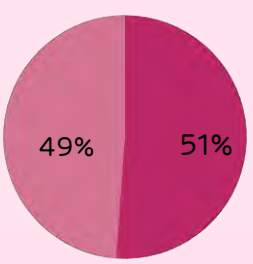
Adani Skill Development Centre

- 42 candidates passed out of 43 people of PMKVY Junior Operator Crane training.
- 21 candidates working in various company with 8000-15000 PM.
- 26 students got job in various company
- 48 women self employed.
- Spoken English class.
- Mobilization activities for SC batch in various village and collage

Completed & Running batch (April to September 2019)



	Digital Literacy	Self Employed Tailor	Beauty Therapist	Spoken English	Junior Operator Crane	Excel Training	RTG Crain Operator
Male	189	0	0	45	60	11	24
Female	156	22	100	36	0	0	0



Adani Skill Development Centre

Recognition of Prior Learning (RPL)


Skill India
कौशल भारत-कुशल भारत

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

CERTIFIED PROVISIONAL TRAINER

This is to certify that
Wilson G Pious (Aadhaar Number - XXXXXXXX7577) with Trainer ID - TR7395
has successfully cleared the assessment as
Provisional Trainer
for the Qualification Pack of **Courier Sorter (LSC/Q3026)- v1.0**
conforming to National Skill Qualification Framework Level - 3
Date of Issue: 28/06/2019 | Valid Upto: 28/12/2019

LSC/Q3026/100719/TR7395

LSC Logistics Skill Council

R.Dinesh
Chairman
Logistics Skill Council


Skill India
कौशल भारत-कुशल भारत

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

CERTIFIED PROVISIONAL ASSESSOR

This is to certify that
Vijay Kumar Kantilal Chavda (Aadhaar Number - XXXXXXXX4778) with Assessor ID - AR4712
has successfully cleared the assessment as
Provisional Assessor
for the Qualification Pack of **Reach Truck Operator (LSC/Q2111)- v1.0**
conforming to National Skill Qualification Framework Level - 4
Date of Issue: 28/06/2019 | Valid Upto: 28/12/2019

LSC/Q2111/280619/AR4712

LSC Logistics Skill Council

R.Dinesh
Chairman
Logistics Skill Council

RPL recognizes the value of learning acquired a formal setting and provides a government certificate for an individuals 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 550

ASDC Mundra team received award for Best Center - Unique Initiatives

Another milestone reached on 12th Sep 2019, ASDC launched its program for schedule caste in the state of Gujarat. This program will train candidates in various vocational training educational course like Self employed tailor and Beauty & Wellness. Total 135 women/Girls participated in this training. This course is sponsored by Department of Social justice and Empowerment .

Adani Skill Development Centre

Skill Development Training Program for Schedule Cast Beneficiaries

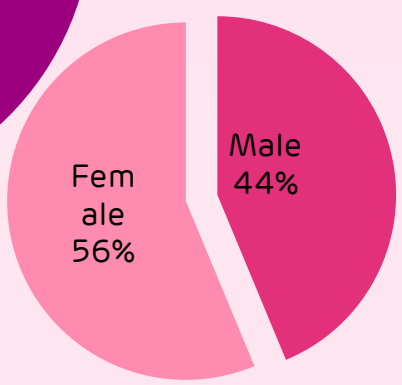
1440 SC beneficiaries from Eight Taluka of Kutchh.

Inauguration in presence of 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

- Hand embroidery
- Self employed stitching
- Mobile Repairing
- Beauty parlor
- Crane operator

460 Training Completed at Centre

441 Training completed outreach



Sr No	Job Role (Write Full Name of Job Role)	Female	Male	Total
1	General Duty Assistant	86	38	124
2	Digital Literacy	239	313	552
3	Spoken English	113	40	153
4	Beauty Therapist	38	0	38
5	Tally erp.9	31	3	34
	Total	507	394	901

Suposhan

Community Engagement and other Activities

1	No of Sangini	25
2	Total Village Cover	45
3	Total Anganwadi Cover	76
4	SAM to MAM Monitoring Progress	9
5	MAM to Normal Monitoring Progress	20
6	Focus Group Discussion	1111
7	Family Based Counselling	310
8	Village level Events	57
9	Formation of women's groups	15
10	Formation of adolescent's Groups	14
11	No of SAM children referred to CMTC	15
12	No of SAM children provided with EDF	10
13	Total HB screening - RPA	1086
14	Total HB screening - Adolescent girls	1161
15	Total Anthropometric screening	6268
16	Total Family Cover	9038
17	"NATIONAL NUTRITION month Celebration"	1551
18	"WORLD BREASTFEEDING WEEK"celebration	500
19	SuPoshan Melawa	140
20	World menstrual Hygiene Day celebration	220

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

create awareness about malnutrition and anaemia 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.

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.

Swachhagraha at Kutchh

4 City / town

266 Schools

266 Prerak trained

5000+ Dal members

Swachhagraha

Swachhagraha
Wall

Toilet
Etiquettes

Safai
Ke Sitare

Personal
Hygiene

Large Scale
community events

Swachhagraha
Oath

Activities of Swachhagraha

CSR
Tuna

Adani Kandla Bulk Terminal Port Limited 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..

- In Rampar and Tuna Village We are providing Fodder in summer season. Also guiding farmers for modern farming techniques for Organic Farming and sustainable Agriculture
- Praveshotsav Kit is distributed in 8 schools covering 180 Students in Tuna and Surrounding seven villages.. Our efforts were appreciated by community.
- Adani Foundation is bridging the gap between Government Schemes and Beneficiaries. In this Six Months 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
Nakhatrana

As a Part of Integrated Development of any Rural area – Education is the most powerful weapon. Keeping in mind, Utthan Education Project will be start after November at 8 Schools of Nakhatrana.

During Primary Information collection, we received warm welcome from Principals and Government Officials. .

Adani Foundation has initiated UTTHAN programme in Government schools. The programme converges the four pillars of education seamlessly: Students, Teachers, Guardians and Infrastructure.

The Project Relates to Adani Green energy Limited – Mainly Windmills project. First phase is completed.

Adani Foundation is also planning to implement Uthhan Model Village Concept and Bio Diversity – Peacock Conservation will be planned in next Budget.

From Current year We are implementing UTHHAN EDUCATION PROJECT in Eight Schools of Nakhatrana

CSR
Lakhpat

Successfully completion of Public Hearting without any hindrances

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

SLD Projects

Total 260 Acre = 200000Kg

Kapurashi @ 130 Acre= 520000Kg

Koriyavi @ 105Acre=480000Kg

Maundhvaiy @25 Acre= 100000Kg

Education Support

Music Kit – 4

Sports Kit - 4

Carpet – 4

Provided to Govt. Schools of Kapurashi, Koriyani and Mundhvay

Linkages with Govt. Scheme

Wheelchair support – 2

Tri cycle support - 3

Divyang Form – 2

Health

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

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.

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

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.

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

Employee volunteering

- Medical Camp – **23**
- Senior Citizen Home – **17**
- Blood Donation Camp – **1174**
- Plastic Free campaign – **251**
- Bio Diversity – **4**
- Joy of Giving – **13**
- Yoga Day - **538**
- Total – **2020**

Adani Group is deeply involved in all round social and economic development of the areas in and around Mundra. Adani EVP is context driven and employees have taken part in teaching, Medical Camps, giving impetus to national Swachhata Mission and blood donation. The journey continues

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

Healthy children become happy children

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

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

Every Dark Cloud has Silver Lining

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

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

She is saying with smiling on face that

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

Our Change Makers

Pathways towards bright future !!

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

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

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

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

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

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

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

Can any other relationship be as beautiful?"

When you grow old, loneliness is sometimes more painful than physical sickness. During routine visits of Dr Mukesh Parmar – Medical Officer of Medical Mobile Unit in the community as a health volunteer, he met Rahomat Ba (grandmother in Gujrati) who initially appeared as an introvert. She lives in Gundala 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.

Mukesh bhai was determined to not only get her to our mobile hospital, 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 my 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?"

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 though 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

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

Giving Back to the Society

Sharad Sharma is Plant head of Adani Wilmar Limited since six years. During Review meetings he came to know about activities of Adani Foundation. He asked Adani Foundation to start health camps near Wilmar Workforce settlements.

Before three years, when Adani Foundation organized first health camp under dignity of workforce – he came during inauguration. He discussed various issues of workforce during camp and being generous and sensitive – he took a decision to do some concrete work for the workforce.

He started visit of labour vasahat once in a month for interacting with them regarding various issues i.e. deaddiction, sanitation, health issues and education of children. Due to his support, We could able to start "Joy of Giving Week" twice in a year.

Not only this, his wife has also extended great support for Education and Joy of giving Week. In spite of being always occupied Sharad ji is volunteering as a proud adanian.

Adani Foundation is feeling proud to have employee volunteer like Shard Sharma – one of the HEROS AT WORK.

Our Change Makers

જીવન જીવવાના દરવાજા ખૂલે

ભુજના એક ૨૨ વર્ષના યુવાનની કથા બેકારીના રોદણા રોનારા યુવાનોને પ્રેરણા આપે છે. બાળપણમાં જ, લગભગ બે વર્ષની વયે જ જેને થેલિસિમિયા મેજર હોવાની ખબર પડી હતી, તેવા નખત્રાણા તાલુકાના નાનકડા ગામ દેશલપર(ગુંતલી)ના રાજુ કરસન ચાવડાની સારવાર તો તેનાં માતાપિતા પોતાના ક્ષમતા મુજબ કરાવતાં હતાં પરંતુ દસ વર્ષના રાજુને લઈને માતાપિતા ચોટીલા દર્શન કરવા ગયાં તો ત્યાં ગમખ્વાર અકસ્માતનો ભોગ બન્યાં ને

માતાપિતાને કાળે છીનવી લીધાં અને રાજુને પગમાં કાયમી ખોડ આવી. અનાથ બનેલા રાજુનો સહારો તેના માસી બન્યાં. બે વર્ષ તેમની સાથે રહ્યા બાદ રાજુ એક ચાની રેંકડી પર નોકરી કરીને પેટિયું રળવા લાગ્યો, પરંતુ આશરાનો સવાલ તો ઊભો જ હતો. ત્યાંના શેઠે તેને જાહેર શૌચાલયમાં નોકરીએ રખાવ્યો. આશરો મળતો હોવાથી રાજુ ત્યાં કામ કરવા તૈયાર થઈ ગયો. રાજુ કહે છે, 'મારો પોતાનો કંઈ વિશેષ ખર્ચ નથી. મને રોજ ટિફિન મળે છે, એટલે જમવાનો ખર્ચ થતો નથી. રોટરી ક્લબની સહાયથી જી.કે. જનરલ હોસ્પિટલમાં દર મહિને મારું લોહી બદલાવાય છે. દવા પણ મને નિ:શુલ્ક મળે છે. આમ મારું જીવન ચાલ્યા કરે છે. કોઈ સામે હાથ લાંબો કર્યા વગર જીવાય તેને ભગવાનના આશીર્વાદ ગણું છું.' કામ નથી મળતું કહીને નિરાશ થનારા યુવાનો માટે રાજુ ખરેખર પ્રેરણાસ્રોત સમો છે. ■

True Warrior : We Salute

This is the story of Raju residing at Desalpar village of Nakhatrana Taluka. He is lesser blessed child of the almighty as he got Thalassemia Major and needs blood transfusion regularly.

Not only this - he lost his parents at the age of 10 in accident. He stared work at tea stall for bread n butter for two ends meet. Then he started work at public toilet with the help of Village leaders.

In all this miseries - he says with smile that due to GKGH Hospital he could elongate his life span.

Every Month blood transfusion and free medicine n guidance by thalassemia ward by Rotary saved his life...

We salute this warrior and wish him best wishes.

World Environment Day

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.

555+ Tree plantation in Bhuj, Mundra & Nakhtrana Taluka

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

Eevnts

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 tofay award will be given in presence of DEO, DPEO and Vasan bhai Ahir Minister Gujarat .

Divine Feelings Towards Mata no Madh

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.

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

"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

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.

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

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

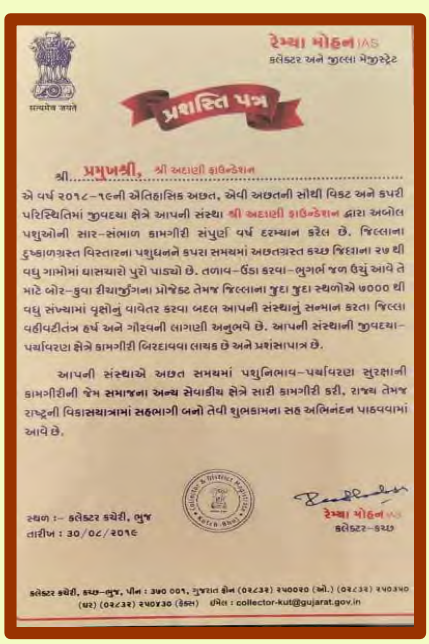
Awards and Accolades

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

1. Water Conservation works
2. More than 7000 Tree Plantation in Mundra, Anjar, Lakhpat and Mandvi Taluka

Felicitation of 3 CSR from Kutchh district for remarkable scarcity related work.

From Adani Foundation - Mr Karsanbhai Gadhvi received Award.



રેમ્યા મોહન IAS
કલેક્ટર અને જીલ્લા મેજીસ્ટ્રેટ

સત્યમેવ જયતે

પ્રશસ્તિ પત્ર

શ્રી પ્રમુખશ્રી, શ્રી અદાણી ફાઉન્ડેશન

એ વર્ષ ૨૦૧૮-૧૯ની ઐતિહાસિક અછત, એવી અછતની સૌથી વિકટ અને કપરી પરિસ્થિતિમાં જીવદયા ક્ષેત્રે આપની સંસ્થા શ્રી અદાણી ફાઉન્ડેશન દ્વારા અબોલ પશુઓની સાર-સંભાળ કામગીરી સંપુર્ણ વર્ષ દરમ્યાન કરેલ છે. જિલ્લાના દુષ્કાળગ્રસ્ત વિસ્તારના પશુધનને કપરા સમયમાં અછતગ્રસ્ત કચ્છ જિલ્લાના ૨૭ થી વધુ ગામોમાં ઘાસચારો પુરો પાડ્યો છે. તળાવ-ઉંડા કરવા-ભુગર્ભ જળ ઉંચું આવે તે માટે બોર-કુવા રીચાર્જીંગના પ્રોજેક્ટ તેમજ જિલ્લાના જુદા જુદા સ્થળોએ ૭૦૦૦ થી વધુ સંખ્યામાં વૃક્ષોનું વાવેતર કરવા બદલ આપની સંસ્થાનું સન્માન કરતા જિલ્લા વહીવટીતંત્ર હર્ષ અને ગૌરવની લાગણી અનુભવે છે. આપની સંસ્થાની જીવદયા-પર્યાવરણ ક્ષેત્રે કામગીરી બિરદાવવા લાયક છે અને પ્રશંસાપાત્ર છે.

આપની સંસ્થાએ અછત સમયમાં પશુનિભાવ-પર્યાવરણ સુરક્ષાની કામગીરીની જેમ સમાજના અન્ય સેવાકીય ક્ષેત્રે સારી કામગીરી કરી, રાજ્ય તેમજ રાષ્ટ્રની વિકાસયાત્રામાં સહભાગી બનો તેવી શુભકામના સહ અભિનંદન પાઠવવામાં આવે છે.

સ્થળ :- કલેક્ટર કચેરી, ભુજ
તારીખ : ૩૦/૦૮/૨૦૧૯

રેમ્યા મોહન IAS
કલેક્ટર-કચ્છ

કલેક્ટર કચેરી, કચ્છ-ભુજ, પીન : ૩૭૦ ૦૦૧, ગુજરાત ફોન (૦૨૮૩૨) ૨૫૦૦૪૦ (ઓ.) (૦૨૮૩૨) ૨૫૦૩૪૦ (૪૨) (૦૨૮૩૨) ૨૫૦૪૩૦ (રેસ.) ઈમેલ : collector-kut@gujarat.gov.in

Awards and Accolades

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.

Ms. 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.

Beneficiaries

No	Core Area	Beneficiaries	Remarks
1	Utthan (Education)	3000	Uthhan, Labour School, School Enrollment
2	Adani Vidya Mandir	450	School Students
3	UDAAN	15329	250 Institute Visited
4	Adani Skill Dev. Center	1544	Mundra and Bhuj
5	Health Mundra	30336	MHCU, Medical Camps, Senior Citizen
6	Health Bhuj	47526	Health Camps, Mahiti Setu,care
7	SLD Fisherman	5572	Water, Education, Mangroves etc.
8	SLD Agriculture	1232	Drip Irrigation, Bio gas, tissue
9	SLD Women Empowerment	132	Saheli mahila gruh udyog – 12 SHG
10	CID Work	12345	Pond deepening, AKBTPL,
11	Swachhagraha	5266	Mundra, Bhuj, Anjar and Gandhidham
12	Suposhan Mundra	21439	Adolescent, Children and RPA
13	CSR Tuna	745	Health Camp, Cattle feed,
14	CSR NaKhtrana	-	
15	CSR Bitta	2450	Pond Deepening, Fodder, School Praveshotsav
16	CSR Lakhpat	1890	Fodder, School Support, Dam Desilting

TOTAL 1,21,956

Adani Foundation -Mundra

Executive Summary-Budget Utilization up to September 2019

F.Y. 2019-20 (Rs. In Lacs)

Sr. No.	Budget Line Item	CAPEX	OPEX	Budget 2019-20	Expenditure up to Sept.19	% of utilization against FY 2019-20 budget
A	Admin Expense	1.30	70.20	71.50	28.56	39.94%
B.	Education	0.00	57.75	57.75	26.70	46.23%
C.	Community Health	0.60	220.06	220.66	78.91	35.76%
D.	Sustainable Livelihood Development	30.00	387.30	487.80	325.04	66.63%
E	Rural Infrastructure Development	358.93	33.10	321.53	28.53	8.87%
Total AF CSR Budget :		**390.83**	**768.41**	**1159.24**	**487.73**	**42.07%**
F.	Utthan - Education	49.97	58.96	108.93	31.86	29.25%
G.	Model Village	132.93	64.33	197.26	61.52	31.19%
Total Project Utthan Budget		**182.90**	**123.29**	**306.19**	**93.38**	**30.50%**
H.	Adani Vidya Mandir - Bhadreshwar	33.36	170.99	204.35	71.34	34.91%
Total AVMB Budget		**33.36**	**170.99**	**204.35**	**71.34**	**34.91%**
I.	Project Udaan_Mundra	5.00	368.14	373.14	92.41	24.77%
Total Project Udaan Budget		**5.00**	**368.14**	**373.14**	**92.41**	**24.77%**
GRAND TOTAL		**612.09**	**1430.83**	**2042.92**	**744.86**	**36.46%**

CSR

Adani Foundation Kutch

O/C

adani
Power

APMuL/ENV/GPCB/353/19
Date: 22/06/2019

To,

The Regional Officer,
GUJARAT POLLUTION CONTROL BOARD,
Kandala Port Trust Office,
Sector 8, Ghandhidham,
KUTCH, GUJARAT 370201

Sub: SUBMISSION OF ENVIRONMENT STATEMENT FOR THE YEAR OF 2018-19

Ref: CTO No. – AWH 71693 on dtd. 02/07/2015 GPCB ID - **29389**

Dear Sir,

With reference to above subject, kindly find enclosed herewith Environment Statement FORM-V for the financial year 2018-19 duly filed as per format of Environment Statement prescribed by GPCB.

Kindly acknowledge the same.

Thanking you,

Yours faithfully,
For **Adani Power (Mundra)Limited**

Ranen Kumar Roy
Station Head

Encl: As Above

CC : The Member Secretary,
GPCB, Paryavaranbhavan,
Sector- 10 A, Gandhinagar

26-6-19
Received
Gujarat Pollution Control Board
Regional Office
Kutch (East)

Adani Power (Mundra) Ltd
Adani House
Shantigram, S G Highway
Ahmedabad 382 421
Gujarat, India
CIN: U40300GJ2015PLC082295

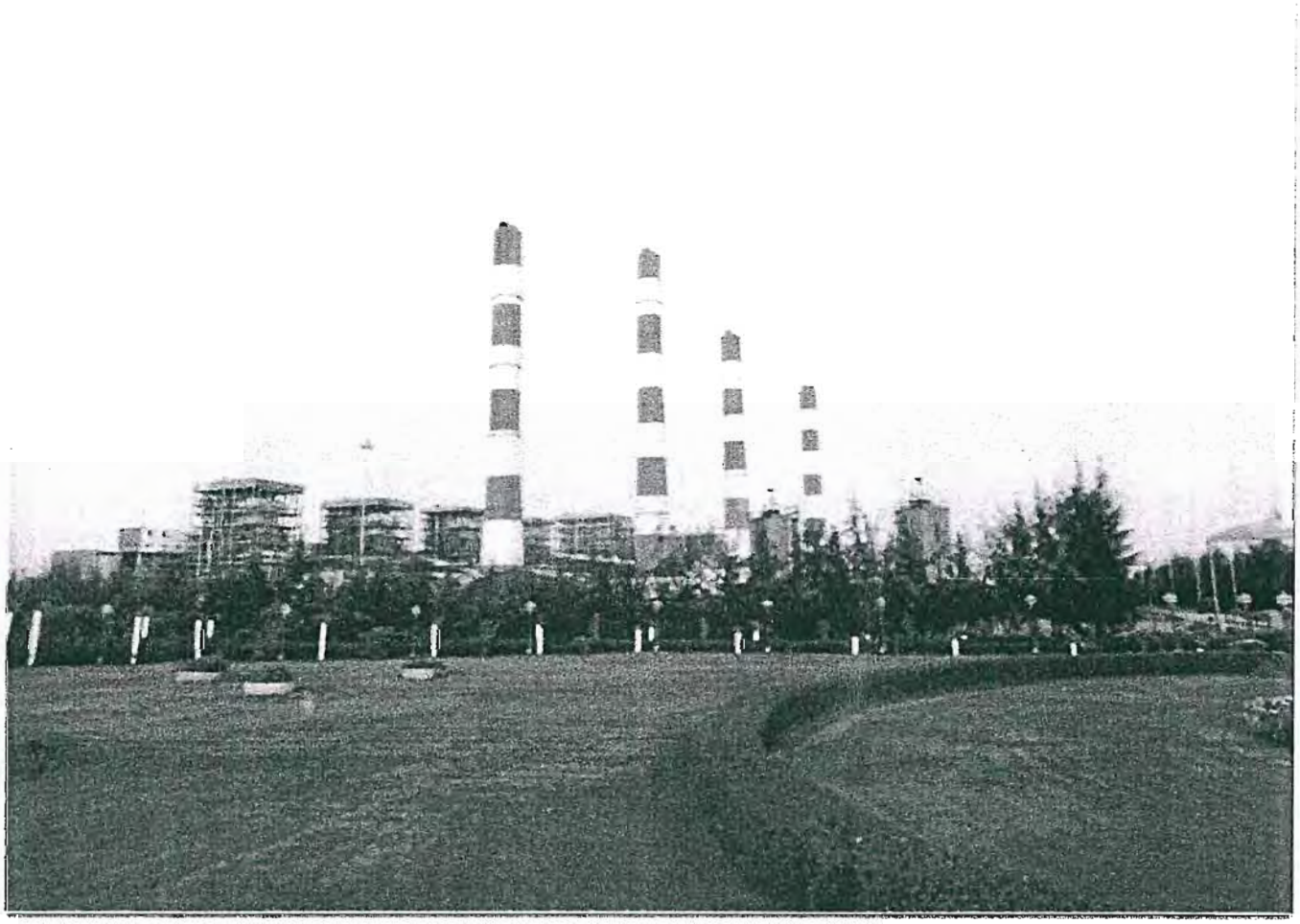
Tel +91 79 2656 7555
Fax +91 79 2555 7177
info@adani.com
www.adanipower.com

Registered Office: Adani House, Shantigram, S G Highway, Ahmedabad 382 421, Gujarat, India

ENVIRONMENTAL STATEMENT

FOR THE FINANCIAL YEAR

2018 - 2019



Adani Power (Mundra) Limited

Vill: Tunda & Siracha

Mundra, Kutch Gujarat

ENVIRONMENTAL STATEMENT

FORM-V

(See Rule 14)

From:

Adani Power (Mundra) Ltd.
Plot No. Tunda [180/P], Siracha,
Village: Tunda, Tal: Mundra,
Dist: Kutch
Gujarat – 370435

To,
Gujarat Pollution Control Board,
Paryavaran Bhavan,
Sector 10 A,
Gandhinagar 382010

Environmental Statement for the Financial Year ending the 31st March 2019

PART- A

(i) Name and address of the occupier of the industry operation	: Shri Ranen Kumar Roy, **Adani Power (Mundra) Ltd.** Tunda [180/P], Siracha. Village: Tunda Tal: Mundra Dist. Kutch Gujarat: 370435
(ii) Industry Category Primary (STC Code) Secondary – (SIC Code)	: AADCA2957LST001
(iii) Production Capacity (Power)	: Phase I: 2 x 330MW Phase II: 2 x 330M +2x660MW Phase III: 3 x 660 MW
(iv) Year of Establishment	: Phase I – U#1 - Aug'09, U#2-Mar'10 : Phase II –U#3 -Aug'10, U#4-Dec'10 -U#5 - Dec'10, U#6-Feb'12 : Phase III –U#7 – Nov'11, -U#8–Mar'12, U#9-Mar'12
(v) Date of the last Environmental Statement submitted	: **03/07/2018**

PART – B

WATER AND RAW MATERIAL CONSUMPTION

a. Water Consumption for the period (April'18 – March'19)

Process : Nil

Cooling & Boiler Feed : 587751 KL/day

Domestic** : 5274 KL/day

- **Domestic water quantity includes Potable water and service water

Name of Product	Process Water Consumption per Unit of Product Output	
	During the previous year (2017-2018)	During the current year (2018-2019)
Power Generation	NIL	NIL

b. Raw Material Consumption

Name of Product	Name of Raw Materials	Unit	Consumption of Raw Material Per Unit of Power	
			During the previous Financial Year (2017-2018)	During the current Financial year (2018-2019)
POWER	Fuel Oil	KL	0.07 KL/mus	0.05 KL/mus
	Coal	MT	511.12 MT/mus	554. 18 MT/mus

*mus: million units

PART – C

POLLUTION DISCHARGED TO ENVIRONMENT / UNIT OF OUTPUT

a. **Water:**

Outfall water Quantity	: 487793 KL/day
Avg. Domestic effluent quantity	: 90.4 KL/ Day

Note:

1. Average temperature of seawater intake and outlet water is enclosed as **Annexure –I.**
2. Effluent treated water is reused for water sprinkling to Coal stack yard and Road.
3. The Cooling tower (CT) blowdown and desalination reject water is utilized for FGD scrubber system to control the sulfur emission and FGD effluent is passes through aeration basin for final discharge. Treated water discharges to sea as per the norms and as per suggested by NIO recommendation.
4. Third party Environment monitoring reports is enclosed as **Annexure - III.**
5. Treated sewage water (STP) is being utilized in plantation & Green Belt development.

b. **Air:**

Sr. No.	Stack Attached to	Pollutant	Quantity of Pollutants Discharge in Mass/day (Kg/Day)	Concentration of Pollution Discharged in Mass/Volume (mg/Nm^3)	Variance (exceeding allowed Quantity)
1	Boiler unit I	PM	1212.1	38.8	No deviation
2	Boiler unit II	PM	1122.2	35.6	No deviation
3	Boiler unit III	PM	1236.5	36.1	No deviation
4	Boiler unit IV	PM	1259.1	37.8	No deviation
5	Boiler unit V	PM	2119.5	34.7	No deviation
6	Boiler unit VI	PM	2115.6	35.6	No deviation
7	Boiler unit VII	PM	2273.4	35.2	No deviation
		SO_2	9790.6	151.4	No deviation
8	Boiler unit VIII	PM	2261.2	34.7	No deviation
		SO_2	9765.9	149.9	No deviation
9	Boiler unit IX	PM	2292.9	35.2	No deviation
		SO_2	9376.3	143.8	No deviation

All Stack Emission data's are average of monthly monitoring reports.

PART - D

As specified under Hazardous Waste (Management & Handling & Transboundary movement rules) Amendment Rules 2008

Sr. No.	Hazardous Wastes	Total Quantity (KL)	
		During the previous financial year (2017-2018)	During the current financial year (2018- 2019)
1.	Used Oil	19.69	28.91
2.	Spent Resins	0.3	0
3.	Discarded Container	277 Nos. + 35.847 MT	16.907 MT
4.	Insulation Waste (Glass Wool)		1.12 MT
5.	Oily Cotton Waste		1.1 MT

PART – E

Solid Wastes

Details	Ash Generation (in MT)	
	(2017-2018)	(2018- 2019)
From Process	747267	772462
From Pollution Control facilities	NIL	NIL

PART-F

Please specify the characterization (in terms of composition and quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both the categories of wastes.

Non-Hazardous Solid Waste

Solid Waste generation : Ash (**Fly ash & Wet ash**)

Ash Utilization in 2018-19 : 103.08%

Ash utilization data is enclosed as **Annexure –II.**

PART – G

Impact of the Pollution abatement measures taken on conservation of natural resources and the cost of production

The unit has installed highly efficient super critical boilers in Unit 5, 6, 7, 8 and 9. The environmental advantages of super critical boiler are as below:

Reduction in coal consumption
Reduction in Green house gases
Reduction of water requirements
Overall reduction in Auxiliary Power Consumption
Reduction in requirement of Ash Emergency land & Consumptive water

The APL has commissioned the first supercritical 660 MW unit in India. APL, Mundra is also the world's first supercritical technology based thermal power project to have received 'Clean Development Mechanism (CDM) Project' certification from United Nations Framework Convention on Climate Change (UNFCCC).

PART – H

Additional measures / Investment proposal for environmental protection including abatement of pollution, prevention of pollution

1. Greenbelt of about 137.62 developed and further development in progress...

Area (ha)	No. of Trees & Plam Planted	No. of Shrubs Planted
137.62	257920	1393809

2. Online ambient air quality monitoring stations has been installed at three different directions & closed to the plant boundary.

3. Seawater based FGDs has been installed at Unit 7, 8 & 9 for SO_2 reduction in Stack Emissions. The Cooling tower (CT) blow down and Desalination plant Reject will be utilized for FGD scrubber system and FGD effluent will be disposed off to the sea through aeration chamber.

4. Online Effluent Quality monitoring System has installed at final outfall channel.

5. Emergency ash pond provided for disposal of unutilized ash.

6. We have adopted Ammonia Flue Gas Conditioning System in Unit 1 & 7 for bringing down the SPM level from the flue gas is through ESP. It is based on effective dispersion & diffusion of ammonia gas in the flue gas.

7. 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.
8. Wind breaking wall provided coal yard area for reducing fugitive emission & coal loss.

PART – I

Any other particulars for improving the quality of the environment

1. We have Implemented **ISO-14001:2015** Environment Management System (EMS) for Mundra TPP of Adani Power Limited. The department wise core team has been established to maintain the compliance of the standard. All Head of the Departments are responsible for ensuring the compliance of the standard. (Please refer Annexure III).
2. NABL: Accreditation of Environmental Laboratory (ISO/IEC 17025:2005) dated: 09.02.2017 vide Certificate No. TC-5215 valid until: 07.02.2019. Recertification Audit has been completed by QCI.
3. APL, Mundra also participated in GRI-G4 Sustainability reporting initiative for sustainable development and published reports for FY2014-15, FY 2015-16, FY 2016-17, FY 2017-18 which are available on the website.
4. Organic waste converter installed for converting the canteen waste into organic manure. The organic manure is used for gardening.
5. Fly ash utilized to produce vermicomposting
6. The Rooftop Rainwater collection & groundwater recharging Scheme has been adopted & installed at three locations within plant premises
7. Green belt development/plantation work is swing and our efforts are being made to develop more greenery in and around the plant.
8. Digital LED Display board is installed at main gate of plant for display the environmental parameters.
9. Integrated Ash silo system has been commissioned & make operational to handle ash at single location to minimize fugitive emission & minimize vehicle movement.
10. Ash bagging plant has been commissioned & make operational for fine ash bagging for export to increase ash utilization.
11. Boiler & turbine high-energy drain passing survey has been done for reducing heat losses
12. Condenser cleaning for vacuum improvement, which increase plant efficiency & improve heat rate
13. Best start-up practices adopted for reducing start-up oil consumption
14. Replacement of cooling tower fans existing blades with energy efficient blades for aux. power saving
15. CW pump & CT fans operation optimization for auxiliary power saving
16. Compressor operation optimization for auxiliary power saving.

17. Periodic energy audit and implementation
18. Elimination of chlorine tonner by replacing sea water based Electro chlorination plant. This eliminates the chlorine gas hazards from the environment.

19. Eco-Park:

An Eco-Park is developed, which is being prepared with waste and reusable material. The main concept for this park is to promote waste recovery, recycling, reuse and environmental engineering among the employees and visitors. It also gives a platform for experimental garden for plantation activities. This will also attracts different birds, reptiles and butterflies, which will help in maintaining the ecosystem of the area.

Sign:

22/06/19

ADANI POWER (MUNDRA) LTD. Turcda Sharda

Name: Ranen Kumar Roy

Designation: Station Head

Address: Adani Power (Mundra) Ltd, Mundra

Annexure-1

Monthly Temperature average differential records during

April-2018 to March-2019

Months	Intake Reservoir °C	Outfall channel °C	Temp. difference °C
April.2018	29.5	*	*
May.2018	30.5	*	*
June.2018	31.0	33.8	2.8
July.2018	30.4	33.4	3
August.2018	29.4	32.6	3.2
September.2018	29.6	32.4	2.8
October.2018	30.5	33.5	3.0
November.2018	28.5	30.5	2.0
December.2018	26.0	28.5	2.5
Janaury.2019	24.0	26.5	2.5
Febraury.2019	25.0	*	*
March.2019	27.5	*	*

Note: * Outfall channel under shutdown

Annexure-II

Ash Utilization Report

April-2018 to March-2019

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)	Bottom Ash (Export)	Dyke Ash lifted for Reutilization (MT)	Total Ash Utilized (Silo+Dyke) (MT)
April-18	4554	3129	459	965	0		0	4554
May-18	9019	4234	621	1804	0		0	6659
June-18	46030	13349	22188	9311	0		0	44848
July-18	69189	35783	14186	14155	0		0	64124
August-18	88297	47259	12330	27907	0		0	87495
September-18	81704	30245	17793	31616	0		0	79654
October-18	69781	27224	19016	26042	0	63.68	64	72346
November-18	60625	32771	21469	12321	0		0	66561
December-18	88267	35696	12949	30906	0		0	79551
January-19	104781	33440	25270	34853	0	46838	32583	140401
February-19	72519	33347	21298	15431	0	3502	0	73578
March-19	77696	48598	15064	12850	0		0	76513
Total	**772462**	**345077**	**182643**	**218161**	**0**	**50404**	**32647**	**796285**

*Note: Total 8824 MT Ash stocked (6592 MT Ash is stock in ash silo and 2232 MT Ash filled in bags) in the month of March 2019 and will be utilized in upcoming month.

Annex - XII

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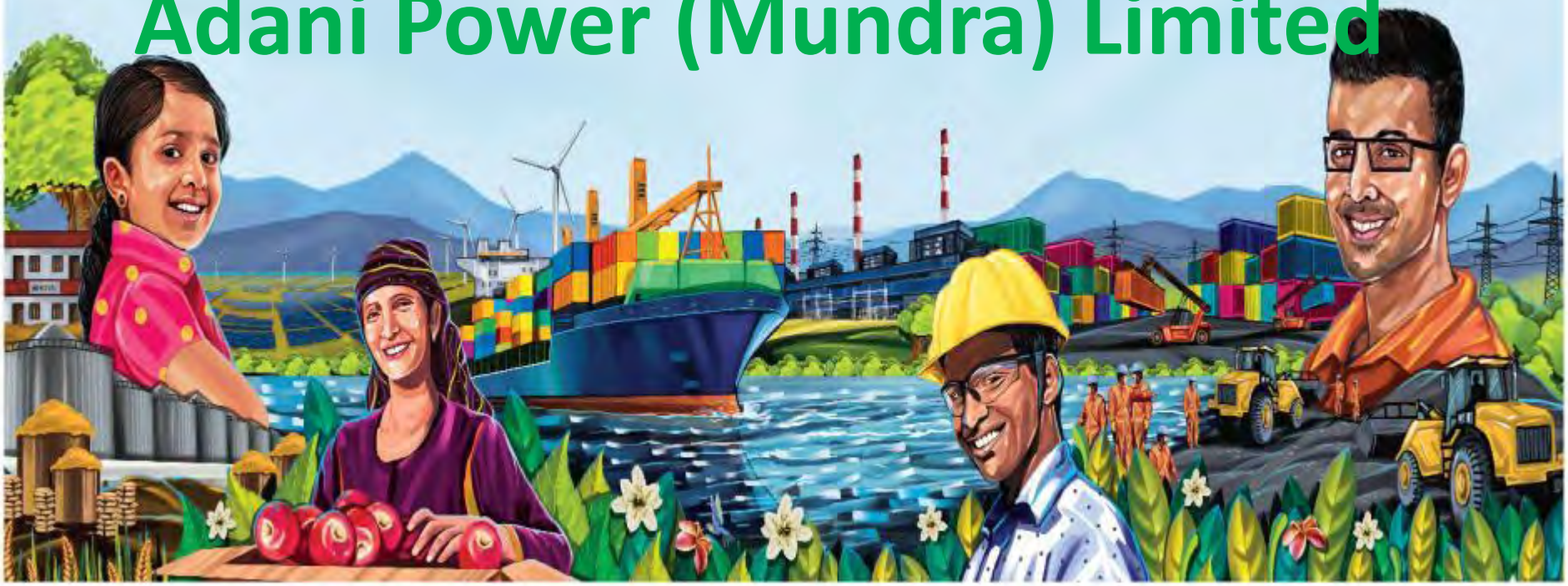
5th June 2019

World Environment Day, 2019 Celebration at Adani Power (Mundra) Limited



World Environment Day, 2019 Celebration at Adani Power (Mundra) Limited

It is well known that 5th of June is being celebrated as World Environment Day around the globe with an objective to enhance awareness on the environment. WED is also meant to be on preserving the environmental health of our planet for the benefit of the present generation as well as of generations to come. This annual event seeks to draw awareness on a particular theme. The theme slogan for this year's WED has been declared as **"WE CAN BEAT AIR POLLUTION"**.

To raise an awareness among APMuL employees every year, we have also celebrated this event this year during 4th to 6th June by organizing various competitions with lot of enthusiasm. An event was opened on 4th by releasing online quiz and spot quiz's at various APMuL Departments. A successful mass tree plantation behind the CHP area (Ph#4) was organized on 5th in the presence of Chief Guest **Shri Jayadeb Nanda, COO**; Shri Ranen Kumar Roy, Station Head, Shri Pramod Kumar Saxena, Head O&M, and Shri Manasa Rout, Head OTS; APMuL employees and associate business partners.

Mass Plantation Drive at Adani Power (Mundra) Limited

Team APMuL, Mundra on Plantation Site

Chief Guest Shri Jayadeb Nanda, COO planting saplings on the WED, 2019 Celebration

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Shri Ranen Kumar Roy, Station Head and Shri Pramod Kumar Saxena, Head O&M, planting saplings on the WED, 2019 Celebration

Shri Manasa Rout, Head OTS , planting saplings on the WED, 2019 Celebration

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APMuL Dignitaries and Employees planting saplings on the WED, 2019 Celebration






APMuL Dignitaries and employees planting saplings on the WED Celebration

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World Environment Day, 2019 Celebration at Samudra Township









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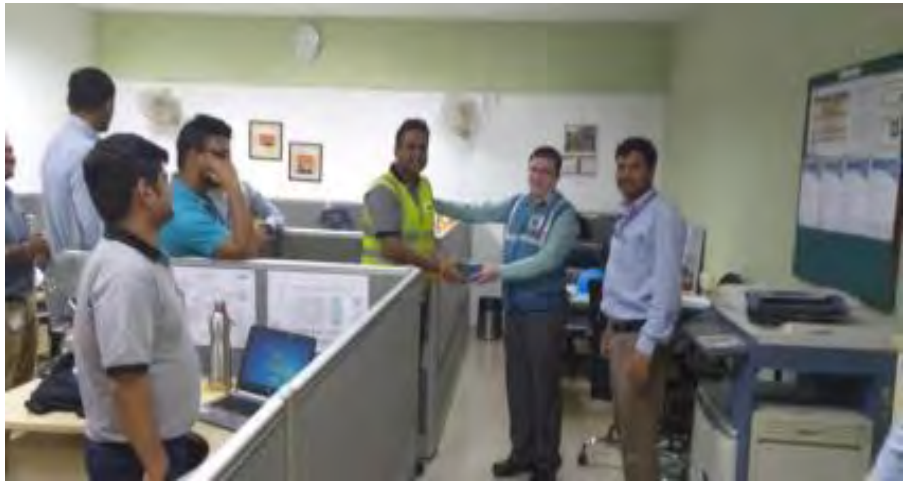
World Environment Day, 2019 Celebration at Adani Power (Mundra) Limited



Time Out for Environmental Awareness Programme at different locations

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Time Out for Environmental Awareness Programme at different locations

World Environment Day, 2019 Celebration at Adani Power (Mundra) Limited

Selected entries of Environmental Models & Posters Competition

World Environment Day, 2019 Celebration at Adani Power (Mundra) Limited

Online Quiz Competition for Environmental Awareness among APMuL employees

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Resources

Logistics

Energy